

# NACHI

# Standard Hydraulic Equipment

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## Using the NACHI Standard Hydraulic Equipment Catalog

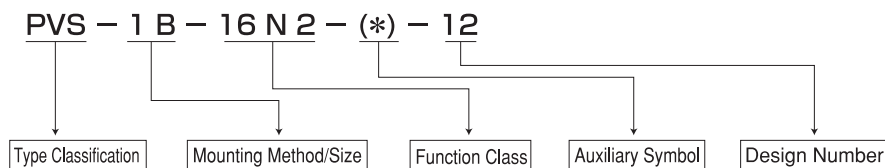
As a comprehensive manufacturer of a full range of hydraulic equipment, Nachi-Fujikoshi manufactures, markets, and provides a wide range of other services for a full lineup of outstanding products.

This general catalog introduces standard hydraulic equipment that has been carefully selected from the wide range of products manufactured by Nachi-Fujikoshi. We hope that this catalog will be of assistance in planning your hydraulic system and for providing some guidelines for your inquiries about Nachi-Fujikoshi products.

### ■ Interpreting Model Numbers

Model numbers are assigned in accordance with Nachi-Fujikoshi standards as described below.

#### Example: PVS Series Variable Volume Piston Pump



A change in the right digit of the design number indicates there is no component compatibility. However, installation method compatibility still exists. This is subject to change without notice.




### ■ Using the Model Number Index

The Model Number Index at the back of this catalog lists the model numbers for NACHI standard hydraulic equipment. Use the index when looking up equipment details.

## Hydraulic Equipment and Device Safety Precautions

■ Before using any Nachi-Fujikoshi hydraulic equipment or device, carefully read the precautions and the "Handling" section for each of the standard hydraulic equipment products.

■ Precautions are classified according to the three types described below. All three indicate important information that you need to know to ensure safety. Be sure to read all precautions and carefully follow the advice that they provide.

|  |   |
|--|---|
|  <b>Danger</b>  | This type of precaution indicates a condition in which incorrect handling creates the immediate risk of death or serious personal injury. |
|  <b>Warning</b> | This type of precaution indicates a condition in which incorrect handling creates the risk of death or serious personal injury.           |
|  <b>Caution</b> | This type of precaution indicates a condition in which incorrect handling creates the risk of personal injury or material damage.         |









\*Danger, Warning, and Caution precautions are not comprehensive. Other risks may exist, even though they are not specifically mentioned. Before actually using any Nachi-Fujikoshi product, be sure to read its user documentation. You should use the product or device only after you thoroughly understand its user documentation, always keeping safety first and foremost in your mind.

\*Be sure that you always comply with the following laws in order to ensure safe operation of a product.






- High Pressure Gas Safety Law
- Occupational Safety and Health Law
- Fire Codes

### ■ Hydraulic Operating Fluid Precautions



- Use of improper hydraulic operating fluid creates the risk of malfunction and breakdown.

|  |   |
|--|---|
|  <b>Danger</b>    | Many hydraulic operating fluids are flammable, so do not use open flame and do not perform welding in the vicinity of hydraulic devices and equipment. Failure to follow this precaution creates the risk of fire.  |
|  <b>Caution</b>   | Use only anti-wear type hydraulic operating fluid that is ISO3448 viscosity grade VG32 to VG68. Never use any other type of hydraulic operating fluid or fluid that is contaminated with foreign matter. Always check your user documentation for information before using non-mineral type hydraulic operating fluid (water based, synthetic, etc.)  |
|  <b>Caution</b>   | Use the proper type of hydraulic operating fluid, ensuring that fluid temperature, viscosity, contaminant level, and other factors are all within their prescribed ranges. Using hydraulic operating fluid outside of its prescribed ranges creates the risk of fire due to operational problems, mechanical damage, and fluid leaks.   |
|  <b>Caution</b> | Configure circuits and operate the system to ensure that the contamination level of the hydraulic operating fluid being used is always within the manufacturer's recommended values. Check the contamination level and the condition of the filter at regular intervals. Also periodically check hydraulic operating fluid for oxidation, deterioration, and moisture, and replace the hydraulic operating fluid whenever these levels exceed the recommended values of the fluid manufacturer. |
|  <b>Caution</b> | Whenever changing to another type of hydraulic operating fluid, be sure to thoroughly flush out the interior of the circuit. Never mix hydraulic operating fluids of different types. Continued use creates the risk of malfunction of and damage to the equipment.   |
|  <b>Caution</b> | Make sure to avoid splashing hydraulic operating fluid on you and others. Should fluid get on your skin, wash the area thoroughly with soap and water. Allowing hydraulic operating fluid to remain on the skin creates the risk of skin irritation.  |
|  <b>Caution</b> | Before replacing the hydraulic operating fluid, allow the fluid in the system to cool sufficiently. Hot fluid creates the risk of burn injury.  |
|  <b>Caution</b> | Allowing the hydraulic operating fluid level in the tank to become too low creates the risk of malfunction and breakdown.   |



### ■ Precautions when Preparing for a Test Run

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|--|---|
|  <b>Warning</b> | Always leave product installation, removal, piping, wiring, and other work up to specialists.   |
|  <b>Warning</b> | Never attempt any unauthorized modification of the hydraulic system or control circuit.   |
|  <b>Warning</b> | Never attempt any unauthorized modification of the setting values of the pressure and flow rate adjusting devices.  |
|  <b>Caution</b> | Always check new hydraulic devices for looseness of internal components that may have occurred during shipment and check to make sure that all components are fitted securely.                                      |
|  <b>Caution</b> | Whenever suspending a product, make sure that you use all of the attached eye plates or eye bolts. Using any other method (such as using a single eye plate) to suspend the product creates the risk of it falling. |


#### 1. Checking the Product Model Number

|  |   |
|--|---|
|  <b>Danger</b>  | In any atmosphere where there is the danger of explosion or fire, be sure to use only products that are designed for operation in such atmospheres.   |
|  <b>Caution</b> | Whenever installing a valve, pump, or motor, check its plate and engravings to confirm that it is the proper type. In many cases you cannot tell the difference between different hydraulic equipment types by their outward appearance only. |



## 2. Product Handling

|   |   |
|---|---|
|  Caution | Never climb onto, strike, tip over, or apply excessive force to a product. Doing so creates the risk of malfunction, damage, fluid leaks, etc.  |
|  Caution | Wipe up any hydraulic operating fluid that gets on the product or floor. Failure to do so creates the risk of personal injury due to the product slipping out of your hand and falling, and due to someone slipping on the fluid left on the floor. |


## 3. External Piping

|   |  |
|---|--|
|  Caution | <ul style="list-style-type: none"><li>• Be sure to perform sufficient flushing.</li><li>• Anchor pipe supports to a secure surface.</li><li>• Use pipe that has sufficient pressure rating. The rated pressure of the pipe should be double the pressure that you plan to be using.</li><li>• The finish of the O-ring seal surface should be within the equivalent of 6.3S. Make sure there are no cracks, etc.</li></ul> |
|---|--|





## 4. Electrical

|   |  |
|---|--|
|  Warning | Leave all electrical work up to a qualified professional. Be sure to turn off power before performing electrical work. Failure to do so creates the risk of electric shock.          |
|  Warning | Failure to check the condition of the gate valve and relief valve when checking the rotation direction of a hydraulic pump creates the risk of accident, malfunction, and breakdown. |


## 5. Coupling Alignment

|   |   |
|---|---|
|  Caution | Though motor and pump shaft alignment is checked at the factory prior to shipment, they may go out of alignment during shipping or due to installation conditions. Because of this, you should always check for proper alignment during the test run. |
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## 6. Valve, Pump, and Motor Installation

|   |  |
|---|--|
|  Caution | Make sure installation holes and surfaces are clean. Insufficient bolt tightening torque can allow fluid to leak, creating the risk of fire.   |
|  Caution | Whenever installing a product, always use bolts of the specified strength and specified number, and tighten them to the specified torque. Failure to observe proper specified values during installation creates the risk of fire due to malfunction, mechanical damage, and hydraulic fluid leaks.  |
|  Caution | During installation and removal, never strike the pump shaft or motor shaft with a hammer or otherwise subject them to impact. Doing so can damage the product.  |
|  Caution | In the case of a pump or motor that requires a drain pipe, the drain pipe that is used should not allow the pressure inside the casing to exceed the specified value. In the case of a pump or motor structure where operating fluid needs to be filled within the casing during operation, use a drain pipe that constantly replenishes operating fluid but does not allow air to collect inside of the casing. The drain pipe also should not let the level of operating fluid inside of the case to drop (does not allow fluid to return to the tank) during long periods of non-operation. |


## 7. High-pressure Restrictions

|   |   |
|---|---|
|  Warning | When using a pump that does not have a pressure compensation function (with maximum pressure adjustment), be sure to install a hydraulic circuit maximum pressure regulating relief valve near the pump discharge side. |
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## 8. Using an Accumulator

|   |  |
|---|--|
|  Warning | When using an accumulator, use only nitrogen gas. Be sure to read and understand all pertinent user documentation before using an accumulator. |
|  Warning | Never attempt to modify an accumulator by mechanical processing or welding.  |




## 9. Fluid Supply

|   |   |
|---|---|
|  Caution | Supply fluid up to the standard quantity through the prescribed oil supply port. Take care to ensure that no foreign matter or moisture contaminates the fluid. Also, check to make sure that the standard oil quantity is maintained even when the actuator is operated. |
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### ■ Precautions During a Test Run

|   |  |
|---|--|
|  Warning | Authorized personnel only should be allowed in the vicinity of hydraulic devices during operation. Never touch devices during operation.   |
|  Warning | Never remove covers of rotating parts or operate hydraulic devices with covers open.   |
|  Warning | Before turning on the power supply, first check to make sure that all operation switches are off.  |
|  Caution | Start up a pump while it is in the no-load state, and check to make sure that the rotation direction is correct.   |
|  Caution | Valves, pumps, and motor casings can become very hot during operation. Do not touch them.  |
|  Caution | Should you ever notice abnormal noise, abnormal heat, abnormal vibration, leaking oil, smoke, abnormal odor, or any other abnormal operation in a valve, pump, or motor, immediately shut down operation and take the necessary steps to correct the condition. Installation of sensors designed to detect abnormalities is recommended. Continued use under the above conditions creates the risk of damage, fire, and personal injury. |


### 1. Hydraulic Pump Operation

|   |  |
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|  Warning | Before starting operation, check to make sure that all stop valves are correctly open or closed as required. Particular attention is required in the case of the suction line and return line. |
|  Caution | Though there is some vibration during normal operation, extreme vibration may indicate a defective fitting. Continued use creates the risk of accident or breakdown.                           |
|  Caution | Use a current meter to check for abnormally high loads on the motor. A large load can indicate a defective fitting, sticking, etc. Correct the abnormality before operating the pump.          |


### 2. Priming (Air Bleeding)

|   |   |
|---|---|
|  Warning | Set the pressure to a value that does not operate the actuator (normally 72 to 200 psi). Perform operation carefully while monitoring the pressure with a pressure gauge.                               |
|  Warning | When bleeding air while the actuator is being operated, be careful about the movement of the machinery. Shut down the machinery immediately whenever there is the danger of accident.                   |
|  Caution | Performing work while operating fluid is below the prescribed level or using a mixture of different types of operating fluid creates the risk of malfunction or breakdown of the pump or other devices. |

### 3. Actuator Operation





|   |   |
|---|---|
|  Warning | Operate the actuator manually at low speed for initial operation. While carefully observing the operation of the machine, perform continuous operation and automatic operation. Trying to perform continuous operation and automatic operation for the initial operation creates the risk of unexpected accident and breakdown. |
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### 4. Cleaning the Filter





|   |  |
|---|--|
|  Caution | The filter can become clogged right from the first test run. Be sure to watch the filter indicator for signs of clogging. Continued use of a clogged filter creates the risk of unexpected accident and breakdown. |
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### 5. Valve Control

#### All Valves





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|---|---|
|  Warning   | Use valves within their prescribed maximum operating pressures (including surge pressure).  |
|  Warning   | Sudden operation of the handle (screw) is dangerous. Be sure to unload the valve before gradually increasing pressure. Never keep a valve at a pressure that is greater than its design specification pressure value.   |
|  Warning  | Make sure you understand the hydraulic circuit diagram and switching valve structure, and check the electrical operation circuit and solenoid valve before performing any operation. <ul style="list-style-type: none"><li>• An incorrect switching direction can cause reverse operation of the actuator and create the risk of unexpected accident and breakdown.</li></ul> |
|  Warning | Make sure you understand the hydraulic circuit diagram and flow control valve structure before performing any operations. <ul style="list-style-type: none"><li>• Sudden operation can change the operating speed of the actuator and create the risk of unexpected accident or breakdown.</li></ul>  |

#### Solenoid Valves, Proportional Valves, Servo Valves


|   |  |
|---|--|
|  Warning | Use valves within their prescribed maximum operating pressures (including surge pressure). |
|  Warning | Never charge both coils of a double solenoid valve at the same time.                       |
|  Caution | The pump casing and solenoid coil surface can become very hot. Never touch them.           |
|  Caution | Be sure to use the appropriate model in environments that require water resistance.        |

#### ■ Maintenance Precautions During Normal Daily Operation


##### 1. Operating Fluid

|   |   |
|---|---|
|  Caution | In order to ensure proper performance of hydraulic devices, check the fluid temperature, fluid level, and fluid color (for discoloration and deterioration) everyday. Any abnormalities create the risk of malfunction and breakdown.   |
|  Caution | Whiteish fluid indicates that water has contaminated the fluid, and blackish fluid indicates that the fluid has been subjected to high temperatures. Replace the operating fluid whenever these symptoms are noticed.   |
|  Caution | Operating fluid that is below the prescribed level can cause improper pump suction. Keep fluid filled to prescribed level.  |
|  Caution | As it is used for normal operations, operating fluid deteriorates and gradually loses its rust inhibiting, lubrication, and foam inhibiting characteristics. Deteriorated operating fluid creates the risk of malfunction and breakdown. As a general rule, replace operating fluid at least once a year. |


##### 2. Hydraulic Pumps

|   |   |
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|  Caution | A very hot hydraulic pump surface indicates the possibility of malfunction and breakdown. Immediately shut down the pump and take steps to correct the problem. |
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### 3. Fluid Leaks

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|  Warning | Fluid leaking from welded pipe seams, from a hydraulic pump, from hydraulic machinery, or from other sources creates the risk of serious accident. Always be on the lookout for possible leaks. |
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### 4. Filters

|   |   |
|---|---|
|  Caution | Continued use of a clogged filter creates the risk of unexpected accident and breakdown. Replace a filter as soon as possible after it shows signs of clogging. Never operate devices with filter elements removed. |
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### 5. Pressure Gauges

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|  Caution | Always be sure to tighten the gauge cock whenever you do not need to viewer the pressure gauge. Deflection of the needle can damage the pressure gauge. |
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### 6. Tank Interior

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|---|---|
|  Caution | Actual tank inspection needs depend on the contamination level of the operating fluid. As a general rule, the tank should be emptied of fluid and its interior inspected and cleaned once a year. |
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### 7. Hydraulic Devices

|   |   |
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|  Caution | Never allow cutting oil, grinding oil, clippings, water, or other similar matter to get on hydraulic devices. |
|---|---|










### 8. Coolers

|   |   |
|---|---|
|  Caution | For a water cooler, adjust the temperature adjusting valve to keep the water temperature below 140° F. Provide a fan cooler to allow proper intake, outflow, and flow of cooling air. |
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#### ■ Handling Precautions During Non-use

|   |   |
|---|---|
|  Caution | <p>If the system will not be operated for long periods, be sure to take proper anti-rust measures.</p> <ul style="list-style-type: none"><li>• Not operating the system for long periods without taking anti-rust measures creates the risk of malfunction and breakdown due to rust.</li><li>• Be sure to flush the system before using it again after a long period of non-use. Failure to flush out rust inhibitors creates the risk of malfunction and breakdown.</li></ul> |
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#### ■ Disassembly and Inspection Work Precautions

|   |   |
|---|---|
|  Warning | Never attempt to modify or reconfigure valves, pumps, or motors. Doing so can cause them to operate at levels that are lower than for which they are designed, and creates the risk of malfunction and breakdown.   |
|  Warning | All disassembly and inspection work should be left up to persons who possess the required special knowledge for such work. Attempting disassembly without the required knowledge creates the risk of unexpected accident. Incorrectly performed disassembly and inspection work creates the risk of malfunction and breakdown.  |
|  Warning | Before starting disassembly or maintenance work, make sure that all electrical breakers are cut off, and use an electroscope to check for the presence of electricity. Failure to do so creates the risk of unexpected accident to actuator free running, electric shock, etc.  |
|  Warning | Performing work while the electrical circuitry is charged creates the risk of unexpected accident due to electric shock.  |
|  Warning | Always make sure to release all residual pressure before starting disassembly work. Performing disassembly work without releasing residual pressure creates the risk of accident due to spurting fluid, actuator free running, or dropping, and also creates the risk of malfunction and breakdown.   |
|  Caution | Always place valves, pumps, and motors on a secure surface, and never place them on top of hydraulic machinery. Doing so creates the risk of damage to the hydraulic machinery.   |
|  Caution | Never strike or drop valves, pumps, or motors, and never subject hydraulic equipment to strong external force.  |
|  Caution | <p>During reassembly, failure to tighten to proper torques and contaminants getting into piping creates the risk of malfunction and breakdown.</p> <ul style="list-style-type: none"><li>• Take care to ensure that the tightening torques of hydraulic equipment are uniform and at prescribed levels.</li><li>• Take care that sealing materials, welding scales, and other contaminants do not get inside of piping.</li></ul> |
|  Caution | After disassembly and reassembly, double check to make sure that you did not forget to open stopper valves, and that you have properly tightened all bolts, stopper plugs, couplings, and other required parts before performing the first operation.   |

#### ■ Storage Precautions

|   |   |
|---|---|
|  Caution | Seals may need to be replaced before using a product for the first time after long storage. |
|---|---|

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| <b>TL, TLT</b>                       | TL, TLT Series Type Feed Control Valve.....   | J16 |                         |          |
|                                      | Fine Control Type with Pressure Compensation  |     |                         |          |
|                                      |   |     | Hydraulic Units         | <b>L</b> |
|                                      |   |     | Wheel Motors            | <b>M</b> |
|                                      |   |     | Technical Data          | <b>N</b> |
|                                      |   |     | Model Index             | <b>O</b> |

## **K** Check Valves

|               |  |    |
|---------------|--|----|
| <b>CA, CN</b> | CA, CN Series Right Angle Check Valve In-Line Check Valve..... | K1 |
| <b>CP</b>     | CP Series Pilot Check Valves.....                              | K4 |
| <b>K2</b>     | K2 Gauge Cock.....   | K7 |
| <b>CA</b>     | Flange Type Check Valve.....                                   | K8 |

### **NACHI Hydraulic Power Units**

## **L** Power Units

|                |  |     |
|----------------|--|-----|
| <b>NV</b>      | NV Vertical Units.....   | L1  |
| <b>NH</b>      | NH Horizontal Units.....   | L5  |
| <b>NCP</b>     | NCP Series Standard Variable Pump Unit.....                              | L9  |
| <b>NSP</b>     | NSP Series Compact Variable Pump Unit.....                               | L26 |
| <b>NSP-L</b>   | NSP-L Series Compact Variable Pump Unit.....                             | L32 |
| <b>NSP-I</b>   | NSP-I Series Energy-Saving Variable Pump Unit with Inverter Drive.....   | L34 |
| <b>NN</b>      | NN Pack High-Pressure Standard Variable Pump Unit.....                   | L38 |
| <b>NCP/NNP</b> | NCP/NNP Series Energy-Saving Variable Pump Unit with Inverter Drive..... | L43 |
|                | Power Meister.....   | L45 |
|                | Powerfit.....  | L49 |

### **NACHI Wheel Motors**

## **M** Wheel Motors

|              |            |     |
|--------------|------------|-----|
| <b>PHV-1</b> | PHV-1..... | M1  |
| <b>PHV-2</b> | PHV-2..... | M4  |
| <b>PHV-3</b> | PHV-3..... | M7  |
| <b>PHV-4</b> | PHV-4..... | M9  |
| <b>PHV-5</b> | PHV-5..... | M12 |

## **N** Technical Data

|  |  |    |
|--|--|----|
|  | Operating Fluid.....                                     | N1 |
|  | Water-Glycol Type Operating Fluid Hydraulic Devices..... | N3 |
|  | SI Units and Conversion Formulas.....                    | N7 |

## **O** Model No. Index

|  |                         |    |
|--|-------------------------|----|
|  | Model Number Index..... | O1 |
|--|-------------------------|----|



# NACHI Hydraulic Pumps

## Features

- 1 Nachi Fujikoshi hydraulic pumps are finished by high-grade, precision machining technology unique to the comprehensive manufacturer Nachi Fujikoshi using carefully selected materials and traditional heat treatment technology. High performance and quality are assured with all models of Nachi Fujikoshi hydraulic pumps.
- 2 Noise has been thoroughly reduced on hydraulic pumps, a general source of noise on machinery and equipment. All models such as the low-noise type IP series can be operated quietly with little noise.
- 3 Attention has been paid to surface treatment and selection of materials in NACHI hydraulic pumps so that they can be applied extensively with fire-resistant hydraulic operating fluid.

## Installation and Maintenance

- 1 Limit the eccentricity between the drive shaft and hydraulic pump shaft to .001 in., keep the angle error within 1° and use flexible couplings for connections.
- 2 When operating hydraulic pumps with belts, gears and chains, prevent a radial or thrust load exceeding the allowable value from being applied on the pump shaft. Also, if necessary, install a device that prevents a load (bending force) from being applied at right angles on the shaft. Mount hydraulic pumps so that the pump shaft is horizontal.
- 3 Use a rigid pump mounting base.
- 4 The direction of rotation is determined on each hydraulic pump. Operate the hydraulic pump in the correct direction of rotation after checking the indicated model No. on the nameplate or the arrow indicating the direction of rotation on the body. The direction of rotation is clockwise when viewed from the shaft end.
- 5 Limit the suction pressure to within the range 4.3 psi.
- 6 With external drain type hydraulic pumps, directly connect the drain to the tank, insert the drain pipe under the oil level, and limit the drain back pressure to 4.3 psi.
- 7 When connecting steel pipes to the suction and discharge sides, prevent force pressure from being applied on the hydraulic pump by the piping.
- 8 Set the clamping length of couplings and hydraulic pump shafts so that it is within at least 2/3 or more of the coupling width. Also, use a size of coupling that matches the shaft diameter.

- 9 When inserting couplings into shafts, insert them gently. When removing couplings from shafts, be sure to use a pulley extractor. Avoid hitting the shaft when attaching or removing couplings.
- 10 Connect to the suction port above the horizontal to keep oil inside hydraulic pumps.
- 11 Provide an air bleed valve in circuits where it is difficult to release air at startup.
- 12 Be sure to use only specified bolts on hydraulic pumps. Use grade 8 or equivalent.

## Uni-pumps

Uni-pumps are compact pump/motor units which have a motor directly coupled to the hydraulic pump. Variable discharge volume type vane pumps and piston pumps are available. As each of these pumps are ideally integrated with the motor, they can be easily installed, and more compact equipment configurations can be achieved economically.

- Standard Motor:
  - totally-enclosed splashproof housing surface flange cooled self-actuating type (totally enclosed fan-cooled type)
  - 5 hp to 4P or less: Class E insulation
  - 7 hp to 4P or more: Class B insulation
  - Voltage 200V··· 50/60 Hz
  - 220V··· 60 Hz

## Management of Hydraulic Operating Fluid

- 1 Use mineral oil-based hydraulic operating fluid.
- 2 Provide a suction filter of about 100 to 150 mesh on the suction port.
- 3 When operating hydraulic pumps at a high pressure or when using fire-resistant hydraulic operating fluid, oil contamination greatly affect pump service life. So, use a filter of 10 µm or less.
- 4 Consult your agent when using fire-resistant hydraulic operating fluid. When using water- or glycol-based hydraulic operating fluid, refer to page N-3 for details on applicable models of hydraulic pumps.
- 5 For details on the viscosity of hydraulic operating fluid, refer to the separate item "Hydraulic Operating Fluid."

## Terms Used in This Catalog

The following describes the meanings of the terms used in this catalog:

- Rated Pressure: The maximum pressure at which a hydraulic pump can be used continuously.
- Maximum Operating Pressure: The maximum pressure (including surge pressure) at which a hydraulic pump can be used within six seconds at most within 1/10 of the cycle time.
- Allowable Peak Pressure: The maximum pressure (set pressure + surge pressure) that can be momentarily allowed.

The following shows the standards in Lists of Sealing Parts:

- JIS standard B2401 (O-ring)
- JIS standard B2407 (backup ring)
- SAE standard AS568 (O-ring)

Pipe apertures mentioned in this catalog that are indicated as "G\*/\*" comply with JIS B2351 O-ring seal systems. Note, however, that G3/4 adopts dimensions before JIS revisions were made in 1990. Nachi Fujikoshi adopts P24 as the O-ring size whereas P22.4 is stated in current JIS standards.

## Calculation Formula Required when Selecting Hydraulic Pumps and Motors

1. Pump Discharge Flow Rate

$$Q_p = \left( \frac{q \cdot N \cdot \eta_v}{231} \right) \text{ gal / min}$$

q = discharge volume per rotation (cu in/rev)

N = revolution speed (min<sup>-1</sup>)

η<sub>v</sub> = volume efficiency

2. Power Required for Pump Drive

$$W_{P1} = \frac{P \cdot Q_p}{1714} \text{ (hp)}$$

p = discharge pressure (psi)

η = overall efficiency

3. Motor Revolution Speed

$$N = \left( \frac{120 \cdot f}{P} \right) \cdot (1 - S) \text{ (min}^{-1}\text{)}$$

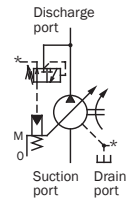
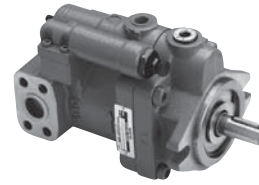
f = frequency (50Hz, 60 Hz)

P = number of motor poles

S = slip rate

# Hydraulic Pump Selection Table

| Pump Type                            | Name  | Type Classification | Rated Pressure psi | Displacement cu in / rev |       | Page |
|--------------------------------------|---|---------------------|--------------------|--------------------------|-------|------|
|                                      |   |                     |                    | min                      | max   |      |
| Variable piston pumps                | PVS series variable piston pump             | PVS                 | 3000               | .21                      | 2.74  | A-3  |
|                                      | Uni-pump                                    | UPV                 | 3000               | .21                      | 2.74  | A-19 |
|                                      | PZS series variable piston pump             | PZS                 | 3000               | 2.56                     | 13.4  | A-22 |
|                                      | PZ load-sensitive variable piston pump      | PZ                  | 3000               | .48                      | 13.4  | A-35 |
| Variable discharge volume vane pumps | VDS series compact variable vane pump       | VDS                 | 1015               | .18                      | .5    | B-1  |
|                                      | Uni-pump                                    | USV                 | 1015               | .18                      | .5    | B-4  |
|                                      | VDR22 design series variable vane pump      | VDR                 | 2030               | .3                       | 2.7   | B-6  |
|                                      | Uni-pump                                    | UVD                 | 1015               | .3                       | 2.0   | B-12 |
|                                      | VDR13 design series variable vane pump      | VDR                 | 870                | .24                      | 1.69  | B-15 |
|                                      | Uni-pump                                    | UVD                 | 870                | .24                      | 1.69  | B-22 |
|                                      | VDC series high-pressure variable vane pump | VDC                 | 2030               | .3                       | 5.42  | B-25 |
|                                      | Uni-pump                                    | UVC                 | 1015               | .3                       | 2.0   | B-37 |
|                                      | UVN series variable vane uni-pump           | UVN                 | 1160               | .49                      | 1.59  | B-39 |
| Internal gear pump                   | IPH series IP pump                          | IPH                 | 3625               | .21                      | 7.68  | C-1  |
|                                      | IPH series double IP pump                   | IPH                 | 3045               | .43                      | 15.36 | C-14 |



### PVS Series Variable Volume Piston Pumps

**.48 to 2.74 cu in/rev**  
**3045 psi**

- ☼ Design No. 30 is applied on PVS-0B to make the pump more compact and lighter, and reduce noise.
- ☼ Production of PVS-3B has been discontinued. Use PZS-3B.
- ☼ Pressure adjustment 3 type has been added to PVS-1B-22 and PVS-2B-45. (Design No. 20 is applied only on PVS-2B-45\*3)

### Features

#### Energy-saving Type with Drastically Reduced Loss

A NACHI-proprietary semi-circular barrel swash plate that receives pressure on its surface ensures a stable discharge volume at all times. This eliminates excess discharge volume, and enables the

effective use of power corresponding to the load cycle. This "energy-saving type" conserves energy, reduces power loss, and helps to reduce hydraulic costs.

#### Silent Type That Demonstrates Its Power Quietly

Proprietary low-noise mechanisms are incorporated on the shoe, swash plate, valve plate, and other locations to ensure silent operation. In particular, a semi-circular barrel swash plate stabilizes operation characteristics to ensure silent operation.

### Specifications

| Model No.   | Volume in <sup>3</sup> /rev (cm <sup>3</sup> /rev) | Discharge volume at no-load gpm |                       |                       |                       | Pressure adjustment range psi                           | Permitted peak pressure psi | Rotating speed min <sup>1</sup> |      | Mass lbs |
|---|--|---------------------------------|-----------------------|-----------------------|-----------------------|---|-----------------------------|---------------------------------|------|----------|
|   |  | 1000min <sup>-1</sup>           | 1200min <sup>-1</sup> | 1500min <sup>-1</sup> | 1800min <sup>-1</sup> |   |                             | Min.                            | Max. |          |
| <b>PVS-0B-8*0-E30</b><br>1<br>2<br>3                          | .18 - .48 (8.0)                                    | 2.1                             | 2.5                   | 3.2                   | 3.8                   | 290 to 507<br>290 to 1015<br>435 to 2030<br>435 to 3045 | 3625                        | 500                             | 2000 | 17       |
| <b>PVS-1B-16*0-(*)-E13</b><br>1<br>2<br>3                     | .3 - 1.0 (16.5)                                    | 4.4                             | 5.2                   | 6.5                   | 7.8                   | 290 to 507<br>290 to 1015<br>435 to 2030<br>435 to 3045 | 3625                        | 500                             | 2000 | 23       |
| <b>PVS-1B-22*0-(*)-E13</b><br>1<br>2<br>3                     | .42 - 1.34 (22.0)                                  | 5.8                             | 7.0                   | 8.7                   | 10.5                  | 290 to 507<br>290 to 1015<br>435 to 2030<br>435 to 3045 | 3625                        | 500                             | 2000 | 23       |
| <b>PVS-2B-35*0-(*)-E13</b><br>1<br>2<br>3                     | .48 - 2.1 (35.0)                                   | 9.2                             | 11.1                  | 13.9                  | 16.6                  | 290 to 507<br>290 to 1015<br>435 to 2030<br>435 to 3045 | 3625                        | 500                             | 2000 | 51       |
| <b>PVS-2B-45*0-(*)-E13</b><br>1<br>2<br>3<br><b>3-(*)-E20</b> | .67 - 2.74 (45.0)                                  | 11.9                            | 14.3                  | 17.9                  | 21.5                  | 290 to 507<br>290 to 1015<br>435 to 2030<br>435 to 3045 | 3625                        | 500                             | 2000 | 51       |

Note: Direction of rotation is clockwise when viewed from the shaft end.

- Handling
  - Cautions during Pump Installation and Piping
- 1 Use flexible couplings for connecting the pump shaft to the drive shaft, and prevent a radial or thrust load from being applied on the pump shaft.
  - 2 For centering of the pump shaft, limit the eccentricity between the drive shaft and hydraulic pump shaft to .002 in, and keep the angle error within 1°.
  - 3 Set the clamping length of couplings and hydraulic pump shafts so that it is within at least 2/3 or more of the coupling width.
  - 4 Use a sufficiently rigid pump mounting base.
  - 5 Set the pressure on the pump suction side to 4.3 or more (suction port flow velocity within 6 ft/sec).
  - 6 Raise part of the drain piping to above the topmost part of the pump body, and

insert the return section of the drain piping into the hydraulic operating fluid. Also, observe the values in the following table to limit the drain back pressure to 14 psi.

| Item            | Model No. | PVS-0B<br>PVS-1B | PVS-2B       |
|-----------------|-----------|------------------|--------------|
| Pipe joint size |           | 3/8" or more     | 1/2" or more |
| Pipe I.D        |           | 3/8"             | 1/2"         |
| Pipe length     |           | 39"              | 39"          |

#### • Management of Hydraulic Operating Fluid

- 1 Use good-quality hydraulic operating fluid, and use within a kinematic viscosity range of 20 to 200 centistokes during operation. Use an R&O type and antiwear hydraulic fluid of ISO-VG32 to 68. The optimum kinematic viscosity during

- operation is 20 to 50 centistokes.
- 2 The operating temperature range is 40 to 190° F. When the oil temperature at startup is 40° F or less, warm up the hydraulic pump by low-pressure, low-operation speed operation until the oil temperature reaches 40° F.
- 3 Provide a suction strainer with a filtering grade of about 100µm (150 mesh). Be sure to provide a return line filter of grade 10µm or less on the return line to the tank. (When the hydraulic pump is used at a high pressure of 2000 psi or more, we recommend providing a filter of 10µm or less.
- 4 Manage the hydraulic operating fluid so that contamination is maintained at class NAS10 or lower.
- 5 Use hydraulic operating fluid within an operating ambient temperature of 32 to 140° F.

(continued on following page)

- Caution at Startup NACHI-proprietary
- 1 Before you start pump operation, fill the pump body with clean hydraulic operating fluid via the lubrication port.

| Model No.     | Injection amount cu in |
|---------------|------------------------|
| PVS-0B-8      | 13                     |
| PVS-1B-16, 22 | 18                     |
| PVS-2B-35, 45 | 39                     |

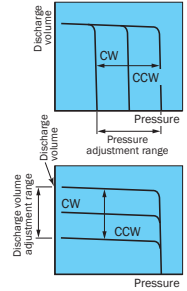
- 2 An unload is required when the motor is started under condition WYE.Delta Start. Consult your agent regarding the circuit.
- 3 Make sure that the pump operates in the direction of rotation the same as that indicated by the arrow on the pump body.

- 4 Air entering the pump or pipes may cause noise or vibration. At startup, set the pump discharge side to a no-load state, and operate the pump in the inching mode to release any air in the pump or pipes.
- 5 Provide an air bleed valve in circuits where it is difficult to release air at startup.
  - How to Set Pressure and Discharge Volume

The default pump discharge volume is set to "maximum" and default discharge pressure is set to "minimum". Change the discharge volume and discharge pressure settings according to your particular operating conditions.

[Pressure adjustment]  
Turning the pressure adjusting screw CW increases the pressure.

[Discharge volume adjustment]  
Turning the flow rate adjusting screw CW decreases the discharge volume.



Note:  
· For details regarding the relationship between flow rate adjustment length l and pump capacity q, see the tables provided in the installation dimension drawings for each of the pumps.  
· Firmly tighten the lock nuts after you have finished adjustments.

- Note:
- Variable control mechanism

Standard Type

N\* Pressure compensation type (manual mode)

Option type

P\* Pressure compensation type (remote control mode)

R Load Sense

N\*Q\* 2-pressure, 2-flow rate control

R\*  $\begin{matrix} A \\ S \end{matrix} \oplus$  Solenoid cutoff control

W\*  $\begin{matrix} A \\ S \end{matrix} \oplus$  2-pressure control

RQ\*  $\begin{matrix} A \\ S \end{matrix} \oplus$  2-pressure, 2-flow rate control w/ solenoid cutoff

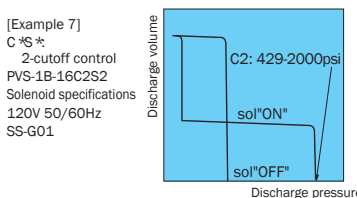
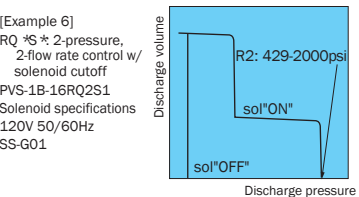
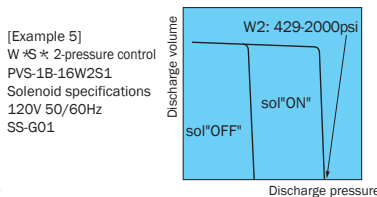
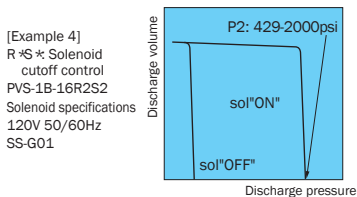
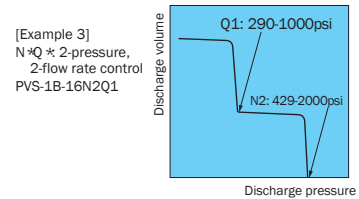
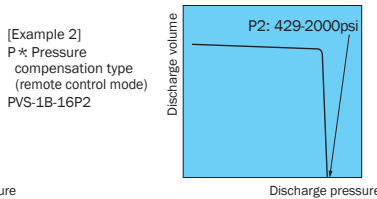
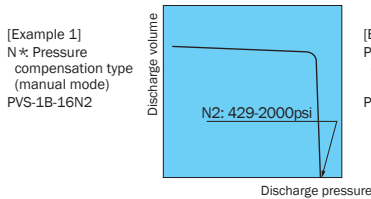
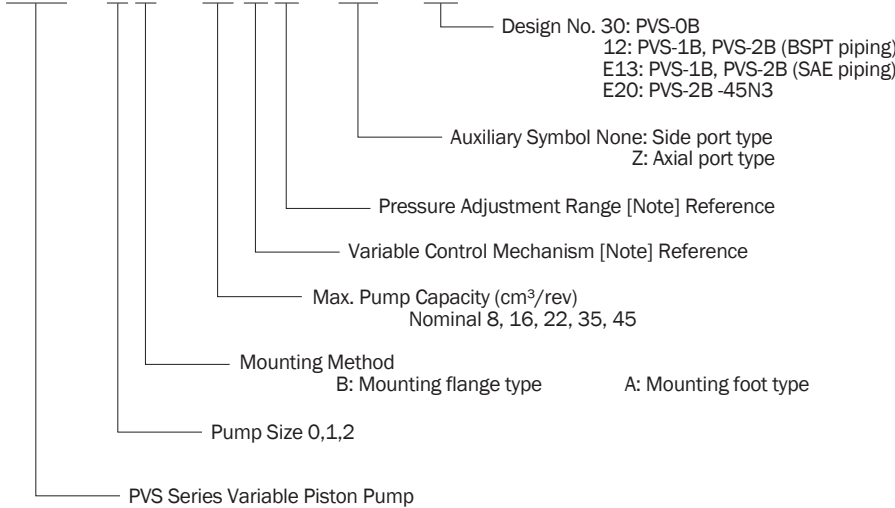
C\*  $\begin{matrix} A \\ S \end{matrix} \oplus$  2-cutoff control

- \* : Pressure adjustment range
- 0 : 286 - 500
- 1 : 286 - 1000
- 2 : 429 - 2000
- 3 : 429 - 3000

- $\oplus$  : Applicable to solenoid specifications A, S
- A  $\oplus$  : SA-G01
- S  $\oplus$  : SS-G01
- 1 : 100V 50/60Hz
- 2 : 200V 50/60Hz
- 3 : DC12V
- 4 : DC24V

### Explanation of Model No.

**PVS - 1 B - 16 N 2 - (\*) - 12**



- R, load sense available for all PVS models.
- NQ, RS, WS, RQS and CS types are not available for the PVS-0B-8.
- NQ, RQS and CS types are not available for the PVS-1B-16-22-Z and PVS-2B-35-45-Z.

# Variable Control Mechanisms

|               | Symbol  | External View | Characteristics | Hydraulic Circuit | Explanation   |
|---------------|---------|---------------|-----------------|-------------------|---|
| Standard type | N       |               |                 |                   | <b>Pressure compensation type (manual system)</b><br>When the discharge pressure reaches the preset volume set by the pressure compensator, the discharge volume is automatically reduced to hold the pressure at the set pressure.                                   |
|               |         |               |                 |                   | <b>Pressure compensation type (remote control mode)</b><br>This mode demonstrates the same characteristics as the manual mode. The discharge pressure can be adjusted by external pilot pressure. The discharge volume can be adjusted manually.                      |
| Option type   | NQ      |               |                 |                   | <b>2-pressure, 2-flow rate control type</b><br>The discharge volume changes in two stages by the pump's built-in sequence valve. This allows conventional high/ low pressure control to be performed on a single pump unit, and save energy in the hydraulic circuit. |
|               |         |               |                 |                   | <b>Solenoid cutoff control type</b><br>A solenoid valve for unload is integrated into the pressure compensation type to minimize energy loss when pump output is not required. Only a slight amount of heat is generated.   |
|               | WS (WA) |               |                 |                   | <b>2-pressure control type</b><br>Two pressure compensation types can be obtained by switching the solenoid valve ON/OFF. Two types of output control are possible with the actuator set to a constant speed.   |
|               |         |               |                 |                   | <b>2-pressure, 2-flow rate control type w/ solenoid cutoff</b><br>The discharge volume can be changed in two stages by the sequencer valve and solenoid valve for unload mounted on the pump, and unloading is possible when pressure oil is not required.            |
|               | CS (CA) |               |                 |                   | <b>2-cutoff control type</b><br>Two types of pressure - flow rate characteristics can be obtained by the solenoid valve and cylinder mounted on the pump.   |
|               |         |               |                 |                   | <b>Load sense type</b><br>This mode demonstrates the same characteristics as the manual mode. The discharge pressure can be adjusted by external pilot pressure. The discharge volume can be adjusted manually. (Note 2)  |

Note 1: Many other variable control mechanism are also available in addition to those in the above table. Please consult your agent for details.

Note 2: We recommend ZR-T02-\*5895\* as the remote adjusting control valve. For details, consult your agent. Prevent the pipe volume up to the remote control valve from falling below 10 cu in.

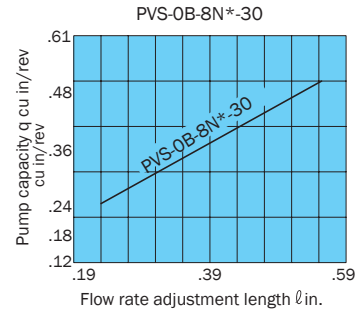
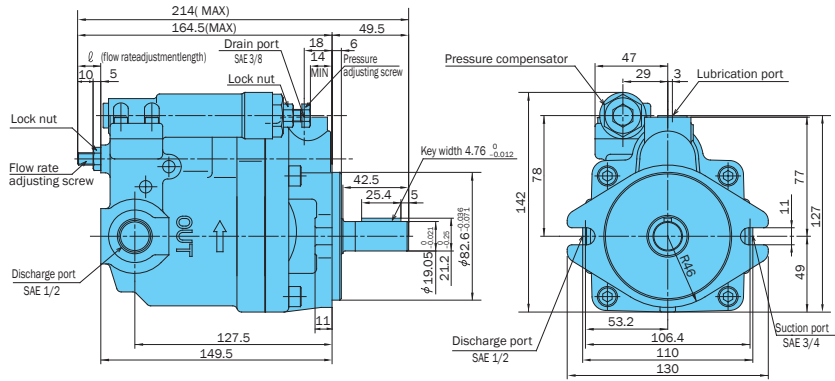
# Pressure Compensation Type

Manual Mode: Standard Type

PVS-0B-8N\*-30

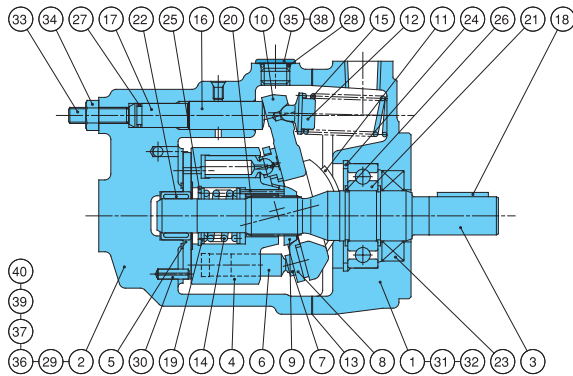
2 Bolt SAE A Mount

## Installation Dimension Drawing



Set a flow rate adjustment length within the above range. Oil will leak if the pump is operated below the adjustment range lower limit.

## Cross-Sectional Drawing



| Part No. | Part Name       | Part No. | Part Name      | Part No. | Part Name                             |
|----------|-----------------|----------|----------------|----------|---------------------------------------|
| 1        | Body            | 15       | Spring S       | 29       | Parallel pin                          |
| 2        | Case            | 16       | Control piston | 30       | Spring pin                            |
| 3        | Shaft           | 17       | Guide pin      | 31       | Hexagon socket head bolt              |
| 4        | Cylinder barrel | 18       | Parallel key   | 32       | Cross-recessed countersunk head screw |
| 5        | Valve plate     | 19       | Retainer       | 33       | Hexagon socket set screw              |
| 6        | Piston          | 20       | Needle         | 34       | Hexagon nut                           |
| 7        | Shoe            | 21       | Ball bearing   | 35       | Hexagon plug                          |
| 8        | Shoe holder     | 22       | Needle bearing | 36       | Metal plug                            |
| 9        | Barrel holder   | 23       | Oil seal       | 37       | Nameplate                             |
| 10       | Swash plate     | 24       | Snap ring      | 38       | Lubrication port plate                |
| 11       | Thrust bush     | 25       | Snap ring      | 39       | CAUTION plate                         |
| 12       | Spring holder   | 26       | Snap ring      | 40       | Rivet                                 |
| 13       | Gasket          | 27       | O-ring         |          |                                       |
| 14       | Spring C        | 28       | O-ring         |          |                                       |

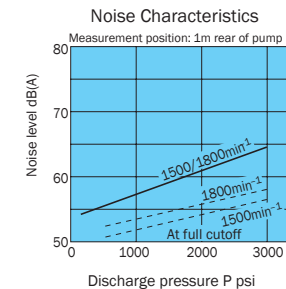
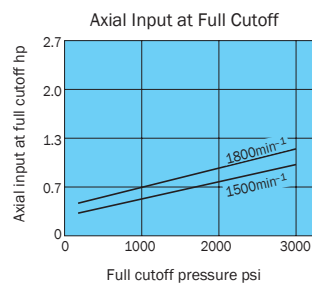
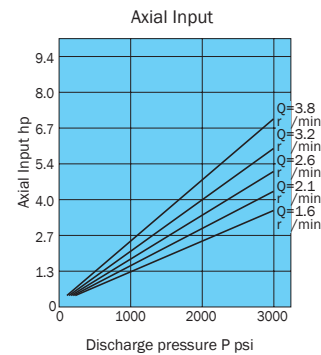
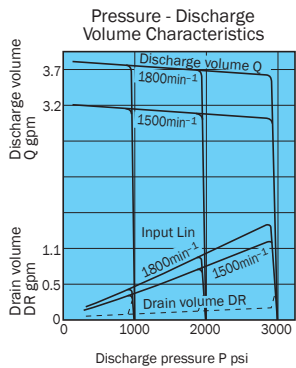
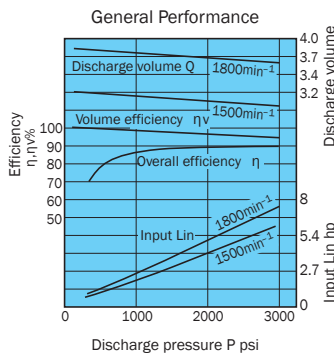
Seal Kit Part No. PSS-100000

| Part No. | Part Name | Q'ty | PVS-0B-8     |            |
|----------|-----------|------|--------------|------------|
|          |           |      | Size         | Remarks    |
| * 13     | Packing   | 1    | PSC46-100000 | 3 Bond     |
| 23       | Oil seal  | 1    | TCV-254511   | N.O.K      |
| 27       | O-ring    | 1    | 1B-P9        | JIS B 2401 |
| 28       | O-ring    | 1    | 1B-P11       | JIS B 2401 |

Parts marked by an asterisk "\*" are not available on the market. Consult your agent.

## Pressure Compensation Type

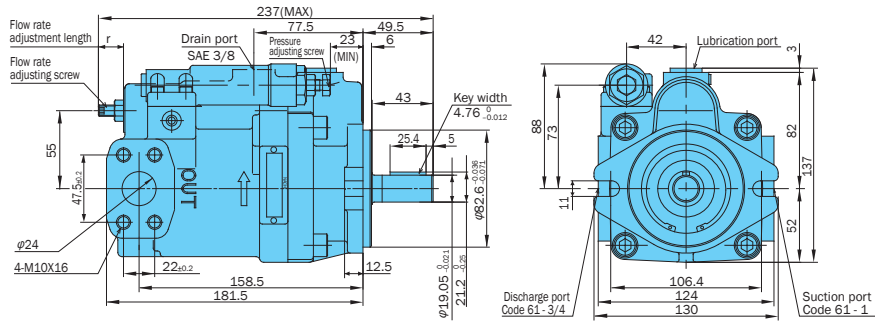
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes



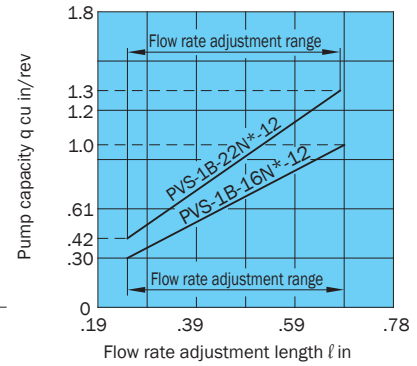
# Installation Dimension Drawing

PVS-1B-16/22N\*(Z)-E13

SAE A Mount  
(side port type)

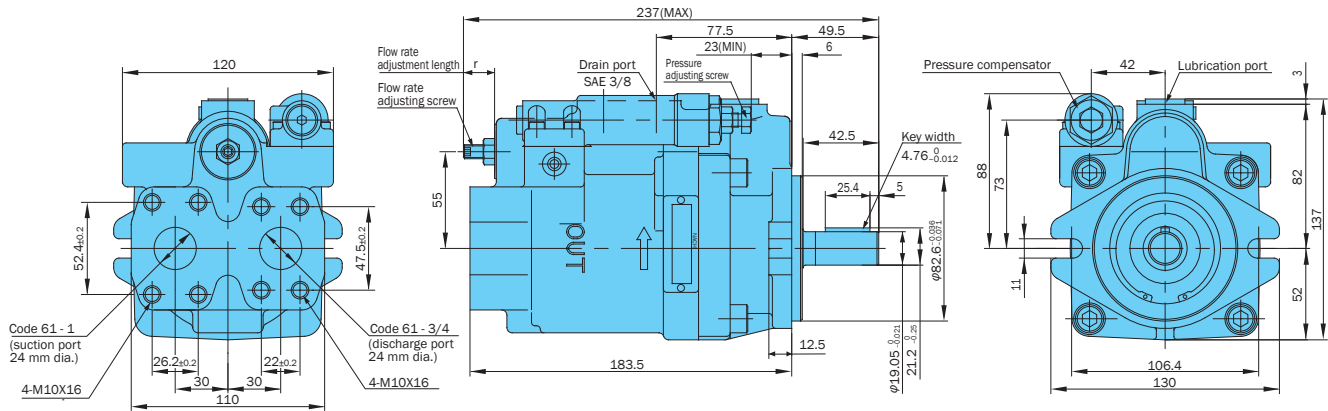


Relationship between flow rate adjustment length (l) and pump capacity (q)

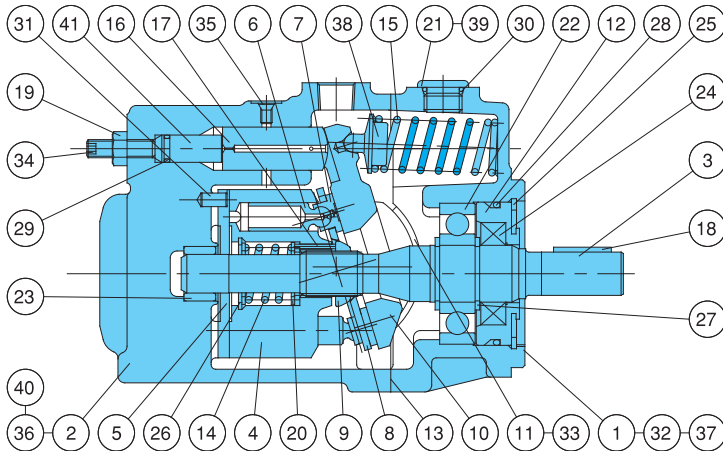


Set a flow rate adjustment length within the above range. Oil will leak if the pump is operated below the adjustment range lower limit.

(Axial Port Type)



# Cross-Sectional Drawing



| Part No. | Part Name       | Part No. | Part Name                             |
|----------|-----------------|----------|---------------------------------------|
| 1        | Body            | 22       | Ball bearing                          |
| 2        | Case            | 23       | Needle bearing                        |
| 3        | Shaft           | 24       | Oil seal                              |
| 4        | Cylinder barrel | 25       | Snap ring                             |
| 5        | Valve plate     | 26       | Snap ring                             |
| 6        | Piston          | 27       | Snap ring                             |
| 7        | Shoe            | 28       | O-ring                                |
| 8        | Shoe holder     | 29       | O-ring                                |
| 9        | Barrel holder   | 30       | O-ring                                |
| 10       | Swash plate     | 31       | Pin                                   |
| 11       | Thrust bush     | 32       | Hexagon socket head bolt              |
| 12       | Seal holder     | 33       | Cross-recessed countersunk head screw |
| 13       | Gasket          | 34       | Hexagon socket set screw              |
| 14       | Spring C        | 35       | Metal plug                            |
| 15       | Spring S        | 36       | Nameplate                             |
| 16       | Control piston  | 37       | CAUTION plate                         |
| 17       | Needle          | 38       | Spring holder                         |
| 18       | Key             | 39       | Lubrication port plate                |
| 19       | Nut             | 40       | Rivet                                 |
| 20       | Retainer        | 41       | Guide pin                             |
| 21       | Plug            |          |                                       |

List of Sealing Parts (Kit Model Number PSS-101000-2A)

| Part No. | Name     | Q'ty | Size        | Remarks      |
|----------|----------|------|-------------|--------------|
| * 13     | Gasket   | 1    | PS46-101000 | Nihon Gasket |
| 24       | Oil seal | 1    | TCN-254511  | N.O.K        |
| 28       | O-ring   | 1    | 1B-G55      | JIS B 2401   |
| 29       | O-ring   | 1    | 1B-P9       | JIS B 2401   |
| 30       | O-ring   | 1    | 1B-P14      | JIS B 2401   |

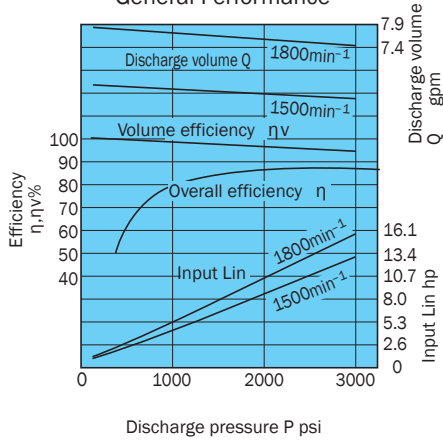
Parts marked by an asterisk "\*" are not available on the market. Consult your agent.

## Performance Curves

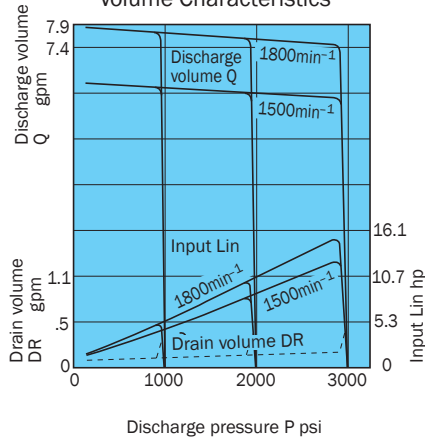
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

### PVS-1B-16N\*(Z)-E13

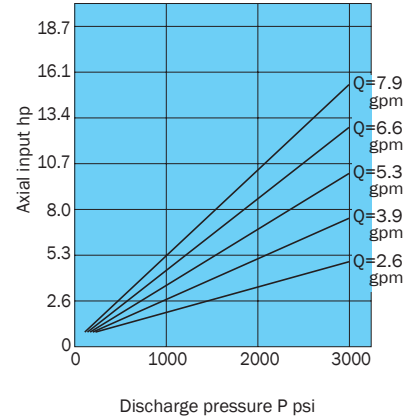
General Performance



Pressure - Discharge Volume Characteristics



Axial Input

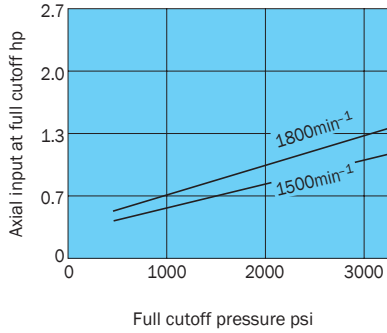


Discharge pressure P psi

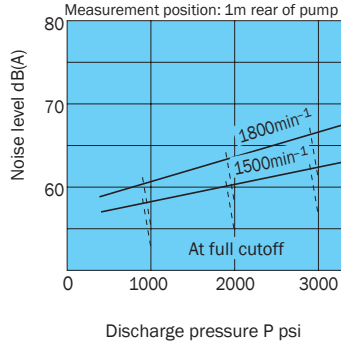
Discharge pressure P psi

Discharge pressure P psi

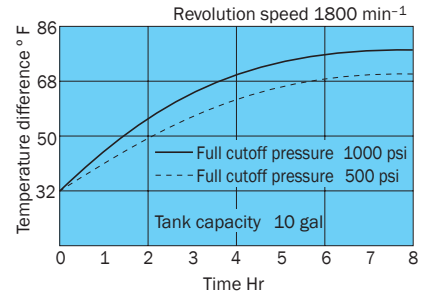
Axial Input at Full Cutoff



Noise Characteristics



Oil Temperature Rise Characteristics PVS-1B-16N1-12

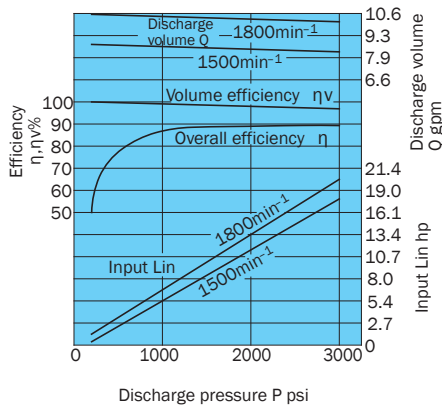


## Performance Curves

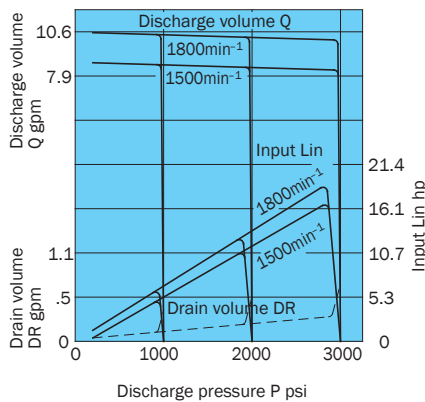
Curves Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

### PVS-1B-22N\*(Z)-E13

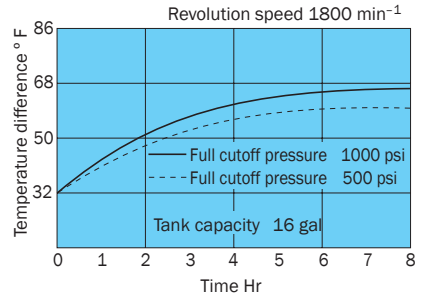
General Performance



Pressure - Flow Rate Characteristics



Axial Input

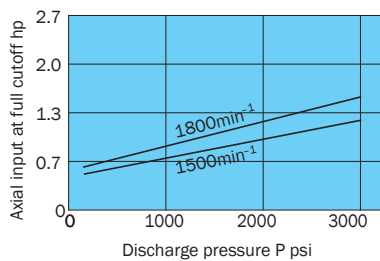


Discharge pressure P psi

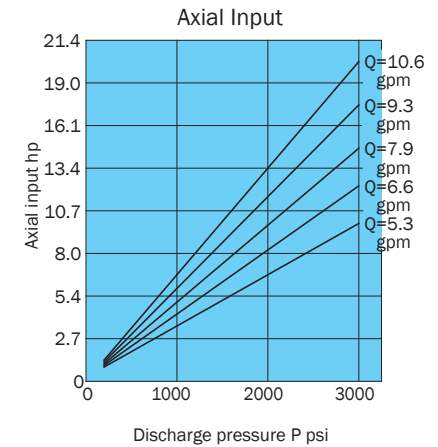
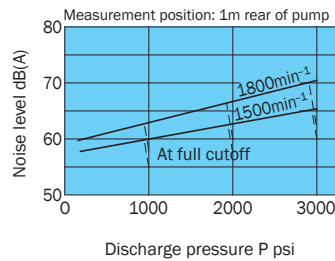
Discharge pressure P psi

Discharge pressure P psi

Axial input at full cutoff hp



Noise Characteristics

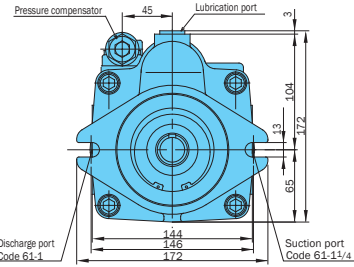
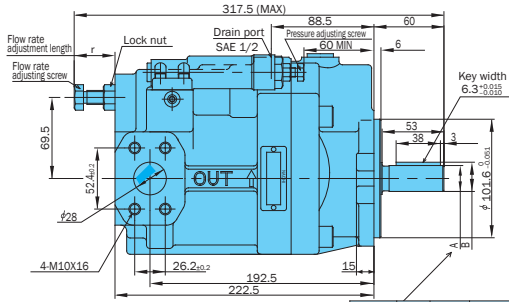




# Installation Dimension Drawing

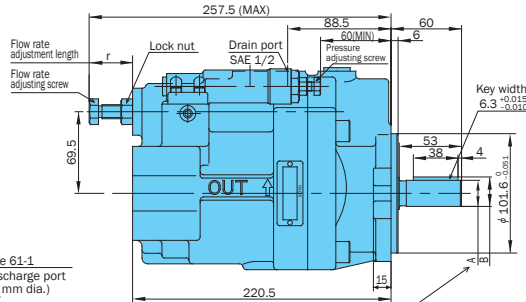
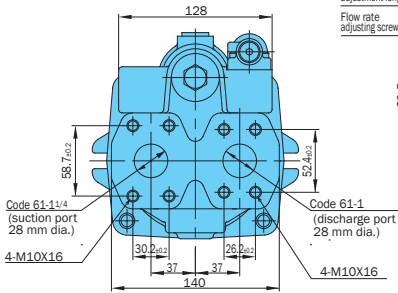
PVS-2B-35 N\*(Z)-E13

SAE B Mount (side port type)



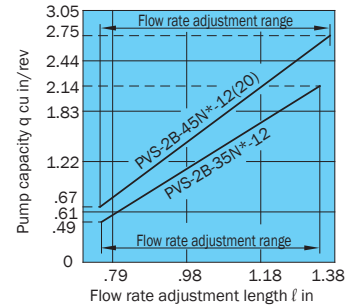
| cm <sup>3</sup> /rev | Pressure Range | Design No. | A     | B     |
|----------------------|----------------|------------|-------|-------|
| 35                   | 0 to 3         | 12D        | 0.875 | 0.987 |
|                      | 0 to 2         |            | 0.874 | 0.986 |
| 45                   | 3              | 20D        | 0.999 | 0.999 |
|                      |                |            | 0.998 | 0.998 |

(axial port type)

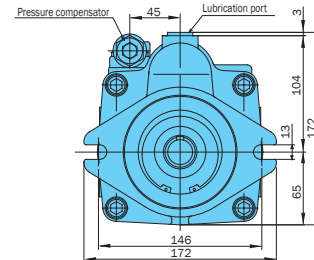


| cm <sup>3</sup> /rev | Pressure Range | Design No. | A     | B     |
|----------------------|----------------|------------|-------|-------|
| 35                   | 0 to 3         | 12D        | 0.875 | 0.987 |
|                      | 0 to 2         |            | 0.874 | 0.986 |
| 45                   | 3              | 20D        | 0.999 | 0.999 |
|                      |                |            | 0.998 | 0.998 |

Relationship between flow rate adjustment length (l) and pump capacity (q)



Set a flow rate adjustment length within the above range. Oil will leak if the pump is operated below the adjustment range lower limit.

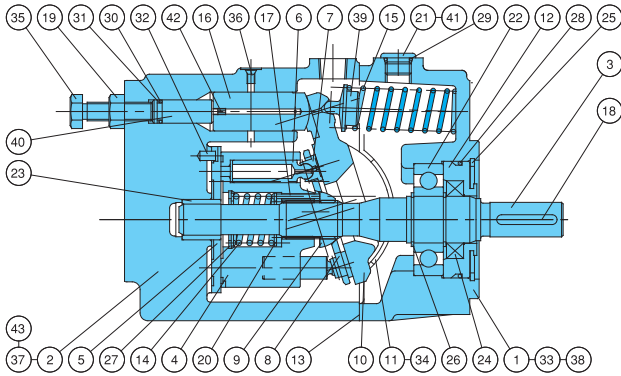


| Part No. | Part Name       | Part No. | Part Name      | Part No. | Part Name                             |
|----------|-----------------|----------|----------------|----------|---------------------------------------|
| 1        | Body            | 146      | Control piston | 31       | Backup ring                           |
| 2        | Case            | 172      | Needle         | 32       | Pin                                   |
| 3        | Shaft           | 18       | Key            | 33       | Hexagon socket head bolt              |
| 4        | Cylinder barrel | 19       | Nut            | 34       | Cross-recessed countersunk head screw |
| 5        | Valve plate     | 20       | Retainer       | 34       | Flow rate adjusting screw             |
| 6        | Piston          | 21       | Plug           | 35       | Ball bearing                          |
| 7        | Shoe            | 22       | Ball bearing   | 35       | Needle bearing                        |
| 8        | Shoe holder     | 23       | Needle bearing | 36       | Metal plug                            |
| 9        | Barrel holder   | 24       | Oil seal       | 36       | Metal plug                            |
| 10       | Swash plate     | 25       | Snap ring      | 37       | Nameplate                             |
| 11       | Thrust bush     | 26       | Snap ring      | 38       | CAUTION plate                         |
| 12       | Seal holder     | 27       | Snap ring      | 39       | Spring holder                         |
| 13       | Gasket          | 28       | O-ring         | 40       | Guide                                 |
| 14       | Spring C        | 29       | O-ring         | 41       | Lubrication port plate                |
| 15       | Spring S        | 30       | O-ring         | 42       | Orifice                               |
|          |                 |          |                | 43       | Rivet                                 |

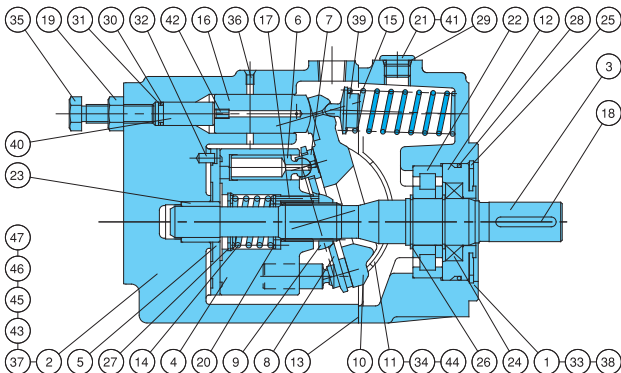
# Cross-Sectional Drawing

PVS-2B-35 N\*(Z)-E13

SAE B Mount



PVS-2B-45N3(Z)-E13



List of Sealing Parts (Kit Model Number PSS-102000-2A)

| Part No. | Part Name   | Q'ty | PVS-2B-35/45   |              |
|----------|-------------|------|----------------|--------------|
|          |             |      | Size           | Remarks      |
| * 13     | Gasket      | 1    | PS46-102000-0A | Nihon Gasket |
| * 24     | Oil seal    | 1    | TCN-305011Z    | N.O.K        |
| * 28     | O-ring      | 1    | 1B-G70         | JIS B 2401   |
| 29       | O-ring      | 1    | 1B-P14         | JIS B 2401   |
| 30       | O-ring      | 1    | 1B-P11         | JIS B 2401   |
| 31       | Backup ring | 1    | T2-P11         | JIS B 2407   |

Parts marked by an asterisk "\*" are not available on the market. Consult your agent.

| Part No. | Part Name       | Part No. | Part Name      | Part No. | Part Name                             |
|----------|-----------------|----------|----------------|----------|---------------------------------------|
| 1        | Body            | 17       | Needle         | 33       | Hexagon socket head bolt              |
| 2        | Case            | 18       | Key            | 34       | Cross-recessed countersunk head screw |
| 3        | Shaft           | 19       | Nut            | 34       | Flow rate adjusting screw             |
| 4        | Cylinder barrel | 20       | Retainer       | 35       | Roller bearing                        |
| 5        | Valve plate     | 21       | Plug           | 35       | Needle bearing                        |
| 6        | Piston          | 22       | Roller bearing | 36       | Metal plug                            |
| 7        | Shoe            | 23       | Needle bearing | 36       | Metal plug                            |
| 8        | Shoe holder     | 24       | Oil seal       | 37       | Nameplate                             |
| 9        | Barrel holder   | 25       | Snap ring      | 38       | CAUTION plate                         |
| 10       | Swash plate     | 26       | Snap ring      | 39       | Spring holder                         |
| 11       | Thrust bush     | 27       | Snap ring      | 40       | Guide                                 |
| 12       | Seal holder     | 28       | O-ring         | 41       | Lubrication port plate                |
| 13       | Gasket          | 29       | O-ring         | 42       | Orifice                               |
| 14       | Spring C        | 30       | O-ring         | 43       | Rivet                                 |
| 15       | Spring S        | 31       | Backup ring    | 44       | Orifice                               |
| 16       | Control piston  | 32       | Pin            | 45       | Pin                                   |
|          |                 |          |                | 46       | O-ring                                |
|          |                 |          |                | 47       | Plug                                  |

List of Sealing Parts (Kit Model Number PSBS-102220)

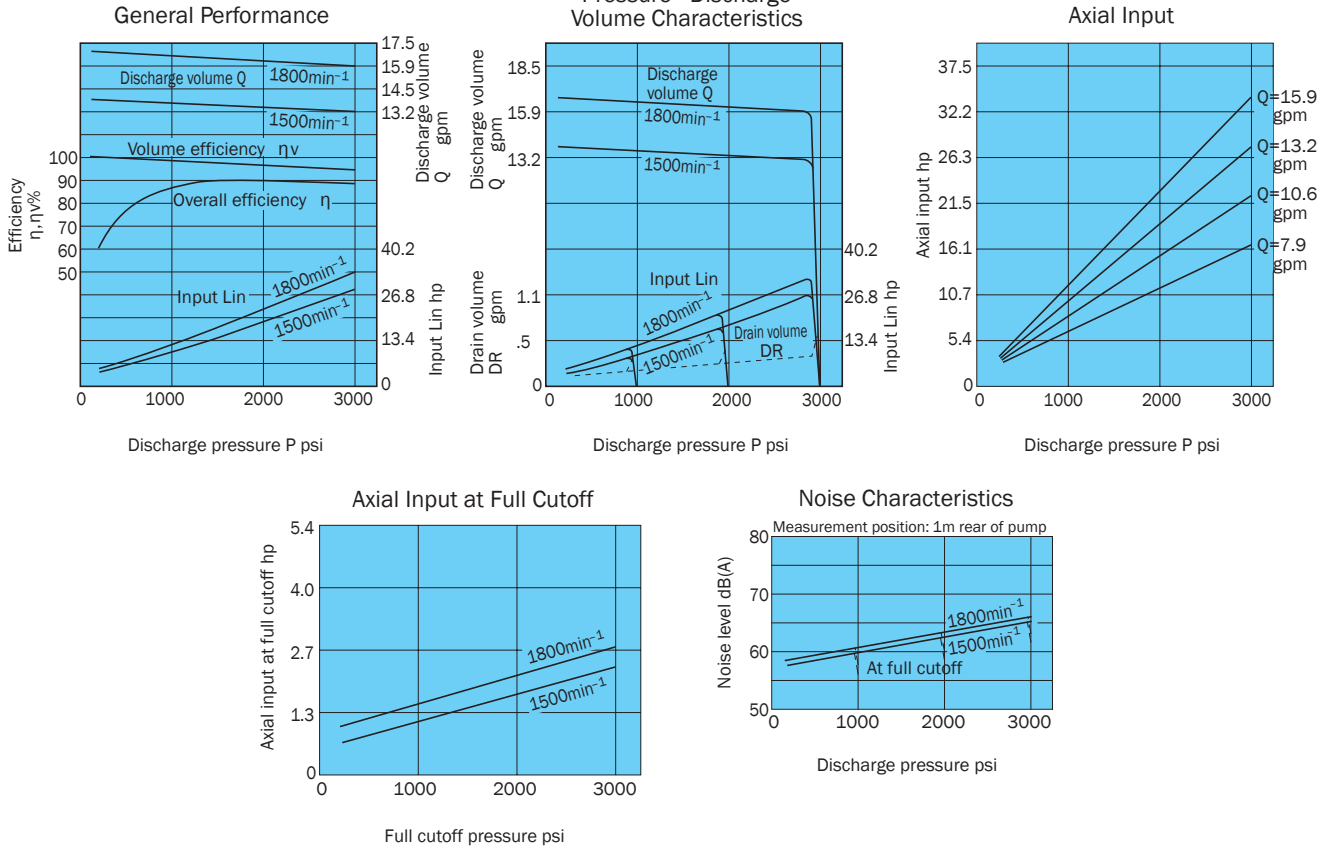
| Part No. | Part Name   | Q'ty | PVS-2B-45N3    |              |
|----------|-------------|------|----------------|--------------|
|          |             |      | Size           | Remarks      |
| * 13     | Gasket      | 1    | PS46-102000-0A | Nihon Gasket |
| * 24     | Oil seal    | 1    | TCN-305011Z    | N.O.K        |
| 28       | O-ring      | 1    | 1B-G70         | JIS B 2401   |
| 29       | O-ring      | 1    | 1B-P14         | JIS B 2401   |
| 30       | O-ring      | 1    | 1B-P11         | JIS B 2401   |
| 46       | O-ring      | 2    | 1B-P5          | JIS B 2401   |
| 31       | Backup ring | 1    | T2-P11         | JIS B 2407   |

Parts marked by an asterisk "\*" are not available on the market. Consult your agent.

### Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

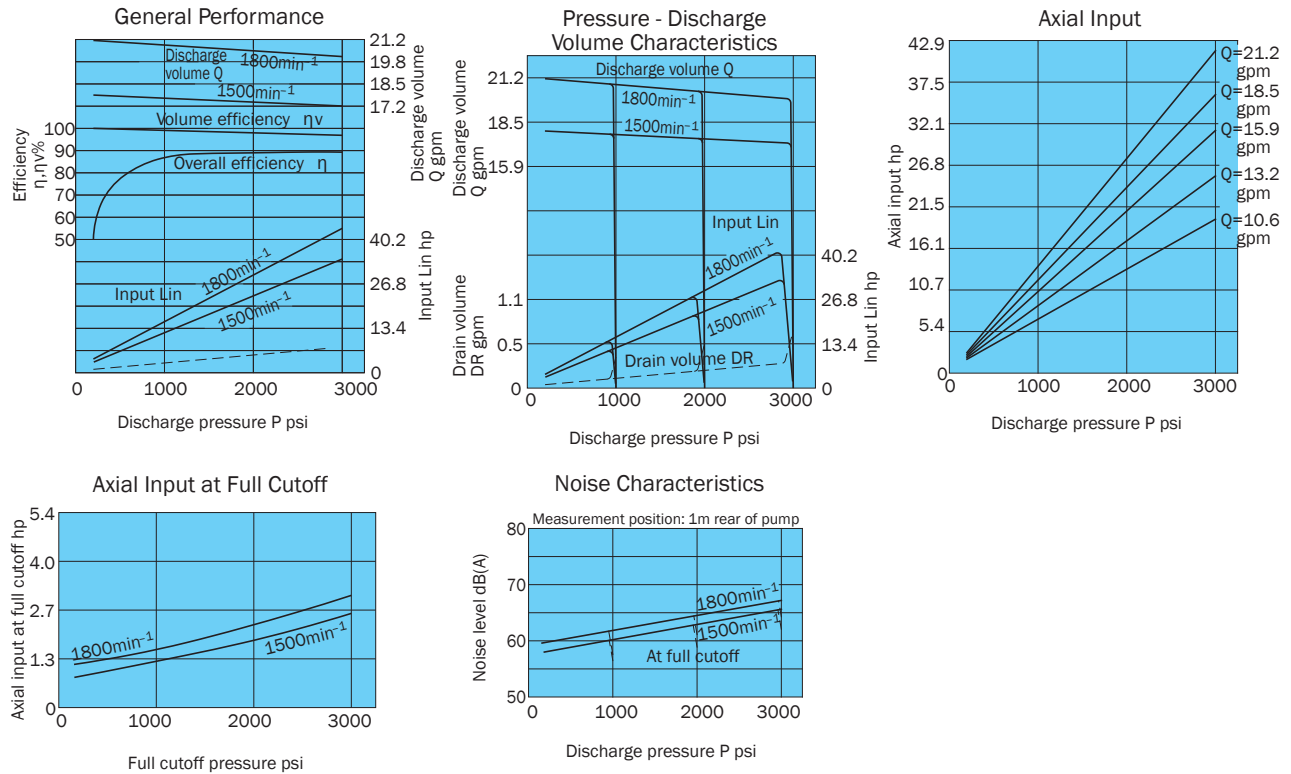
#### PVS-2B-35N\*-(Z)-E13



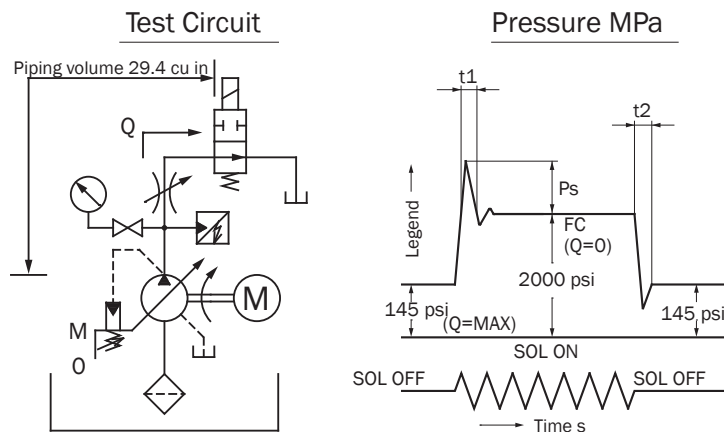
### Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

#### PVS-2B-45N\*-(Z)-E13



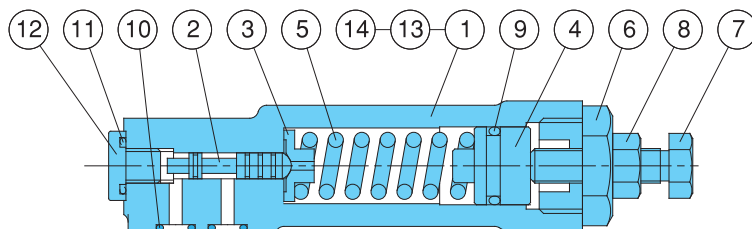
## Response Performance



| Model No. | Response Time (s) |              | Surge Pressure psi |
|-----------|-------------------|--------------|--------------------|
|           | $t_1$             | $t_2$        | $P_s$              |
| PVS-0B-8  | 0.03 to 0.04      | 0.04 to 0.06 | 290 to 580         |
| PVS-1B-16 | 0.05 to 0.06      | 0.07 to 0.08 | 580 to 1000        |
| PVS-1B-22 | 0.05 to 0.06      | 0.07 to 0.08 | 725 to 1160        |
| PVS-2B-35 | 0.05 to 0.06      | 0.05 to 0.07 | 870 to 1300        |
| PVS-2B-45 | 0.05 to 0.06      | 0.05 to 0.07 | 870 to 1300        |

Response performance changes according to pipe volume and size.  
Use a surgeless valve to prevent surge pressure.

## Pressure Compensator



| Part No. | Part Name               | Part No. | Part Name     |
|----------|-------------------------|----------|---------------|
| 1        | Body                    | 8        | Nut           |
| 2        | Spool                   | 9        | O-ring        |
| 3        | Holder                  | 10       | O-ring        |
| 4        | Plunger                 | 11       | O-ring        |
| 5        | Spring                  | 12       | Plug          |
| 6        | Retainer                | 13       | Plug          |
| 7        | Pressure adjusting bolt | 14       | Mounting bolt |

### List of Sealing Parts

| Part No. | Name   | Qty | Size           |
|----------|--------|-----|----------------|
|          |        |     | For 0B, 1B, 2B |
| 9        | O-ring | 1   | 1A-P14         |
| 10       | O-ring | 3   | 1B-P6          |
| 11       | O-ring | 1   | 1B-P10         |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

## Replacement Items

### PVS Rotating Group

|                 |                |
|-----------------|----------------|
| PVS-0B-8*E30    | PSCG-100000-0F |
| PVS-1B-16*E13   | PSG-101100-0A  |
| PVS-1B-22*E13   | PSG-101200-1E  |
| PVS-2B-35*E13   | PSG-102100-0A  |
| PVS-2B-45*E13   | PSG-102200-0A  |
| PVS-2B-45N3*E20 |                |

Includes Items 4,5,6 & 7

### PVS Thrust Plate Item 11

|               |             |
|---------------|-------------|
| PVS-0B-8*E30  | PS69-100000 |
| PVS-1B-16*E13 | PS69-101000 |
| PVS-1B-22*E13 | PS69-101000 |
| PVS-2B-35*E13 | PS69-102000 |
| PVS-2B-45*E13 | PS69-102000 |

### Compensator Part Numbers

|                 |                      |
|-----------------|----------------------|
| N0 - PSN-101000 | P - ZR-G01-P-E2405C  |
| N1 - PSN-101010 | R - ZR-G01-R3-E2171B |
| N2 - PSN-101020 |                      |
| N3 - PSN-101030 |                      |

## Pressure Compensation Type (remote control mode)

Explanation of Model No.: **PVS - 0 B - 8 P \* - E30**

Design No.  
E30: PVS-0\*  
E12: PVS-1\*, PVS-2 \*  
E20: PVS-2\*45P3 only

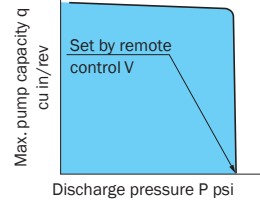
Pressure adjustment range  
0: 286 - 500  
1: 286 - 1000  
2: 429 - 2000  
3: 429 - 3000

P: Pressure compensation type (remote control mode)

Max. pump capacity (cm<sup>3</sup>/rev)  
Nominal 8, 16, 22, 35, 45

Pump size 0, 1, 2

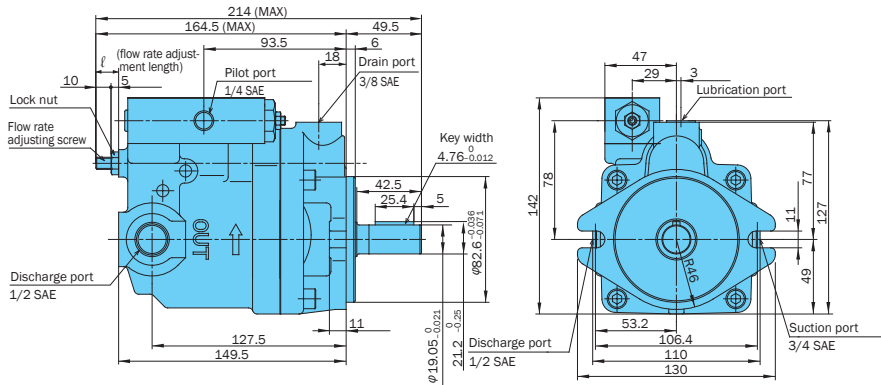
### P-Q Characteristics



## Installation Dimension Drawing

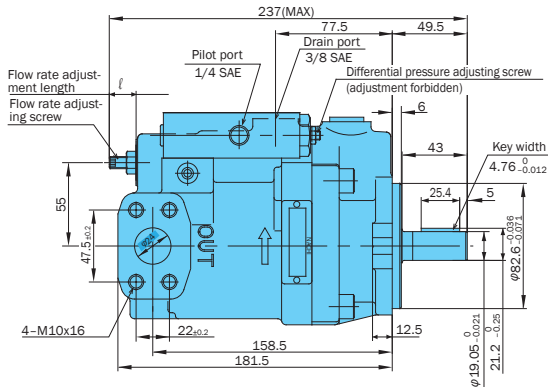
The ZR-T02\*-5895\* is the recommended remote control valve. Provide piping to the remote control valve at a pipe volume of 9 cu in or less.

PVS-0B-8P\*-E30

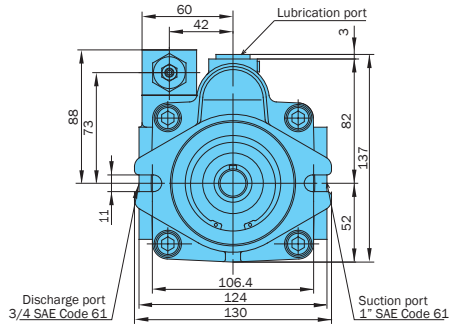


SAE A Mount

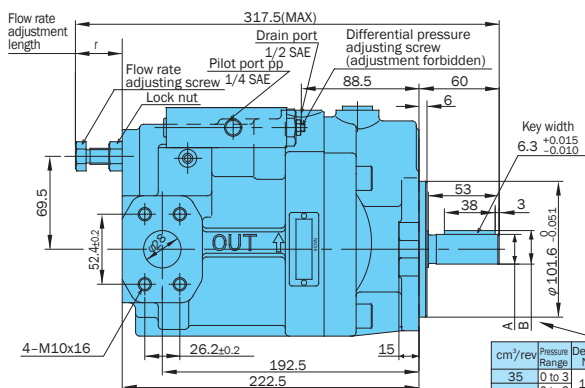
PVS-1B-<sup>16</sup>/<sub>22</sub> P\*-E13



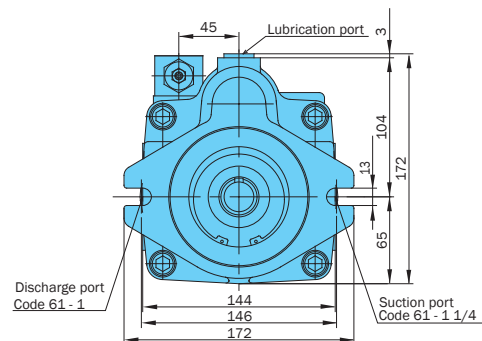
SAE A Mount



PVS-2B-<sup>35</sup>/<sub>45</sub> P\*-E13



SAE B Mount



| cm <sup>3</sup> /rev | Pressure Range | Design No. | A     | B     |
|----------------------|----------------|------------|-------|-------|
| 35                   | 0 to 3         | 12D        | 0.875 | 0.987 |
|                      | 0 to 2         |            | 0.874 | 0.978 |
| 45                   |                | 3          | 0.998 | 1.096 |
|                      |                | 20D        | 0.998 | 1.087 |

## 2-Pressure, 2-Flow Rate Control Type

Explanation of model No.: **PVS -- 1 B -- 16 N 3 Q 1 -- E13**

Design No.  
E13: PVS-1 \*, PVS-2 \*  
E20: PVS-2 \*-45N3Q\*

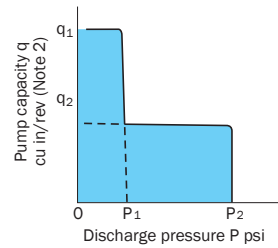
Pressure adjustment range  
N\*: High-pressure adjustment range,  
P2 (Set to lowest pressure before shipping)  
Q\*: Low-pressure adjustment range,  
P1 (Set to 3.5 MPa before shipping)  
0: 286 - 500 psi  
1: 286 - 1000 psi  
2: 429 - 2000 psi  
3: 429 - 3000 psi

NQ: 2-pressure, 2-flow rate control

Max. pump capacity (cm<sup>3</sup>/rev) Nominal 16, 22, 35, 45

Pump size 1, 2

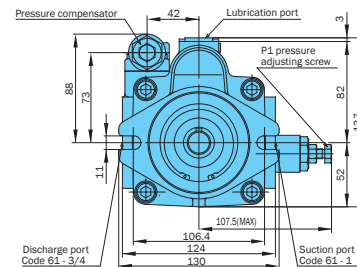
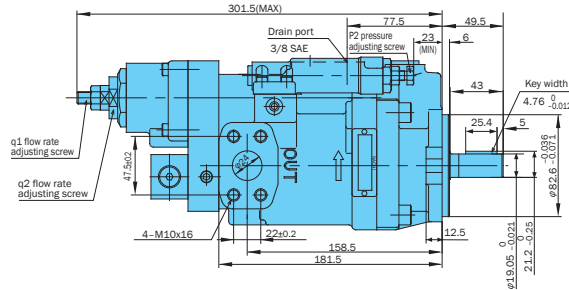
P-Q Characteristics



## Installation Dimension Drawing

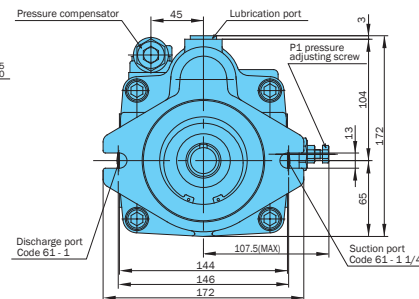
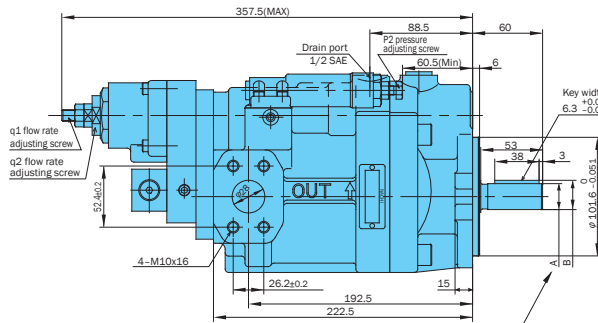
PVS-1B-<sup>16</sup>/<sub>22</sub> N\*Q\*-E13

SAE A Mount



PVS-2B-<sup>35</sup>/<sub>45</sub> N\*Q\*-E13(E20)

SAE B Mount

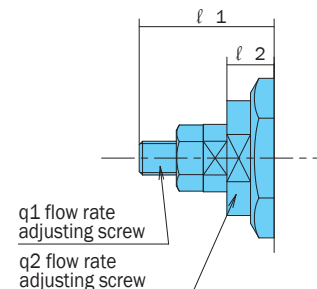


| cm <sup>3</sup> /rev | Pressure Range | Design No. | A     | B     |
|----------------------|----------------|------------|-------|-------|
| 35                   | 0 to 3         | 12D        | 0.875 | 0.987 |
|                      | 0 to 2         |            | 0.874 | 0.978 |
| 45                   | 0 to 3         | 20D        | 0.999 | 1.096 |
|                      | 3              |            | 0.998 | 1.087 |

| Pump Model No. | q <sub>2</sub> Adjustment Range (in <sup>3</sup> /rev) | Default q <sub>2</sub> (Setting in <sup>3</sup> /rev) |
|----------------|--|---|
| PVS-1B-16      | .12 to 0.6   | .2  |
| PVS-1B-22      | .12 to .79   | .26   |
| PVS-2B-35      | .12 to 1.16  | .42   |
| PVS-2B-45      | .18 to 1.46  | .54   |

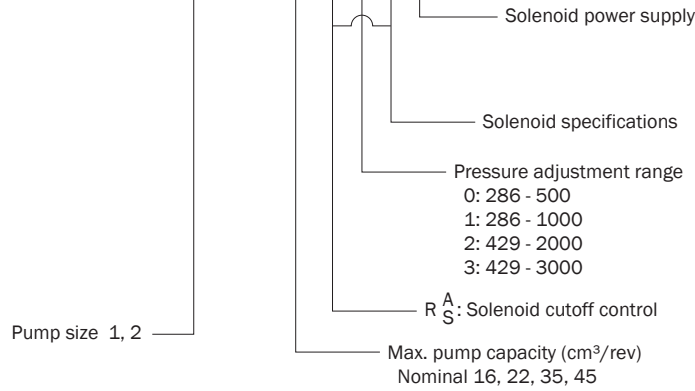
Note 1: The setting range of maximum pump capacity q<sub>1</sub> varies according to the setting of q<sub>2</sub>.

Note 2: Overall efficiency at a low flow rate is worse than at the maximum flow rate. Pay attention to this when selecting the motor capacity for the drive.

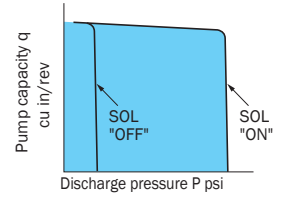


## Solenoid Cutoff Control Type

Explanation of Model No.: **PVS -- 1 B -- 16 R 2 S 1 -- E13**

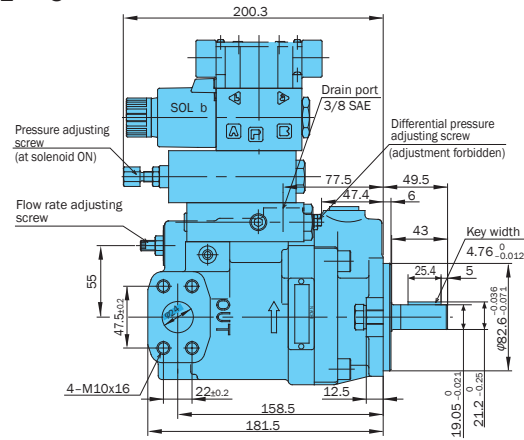


### P-Q Characteristics

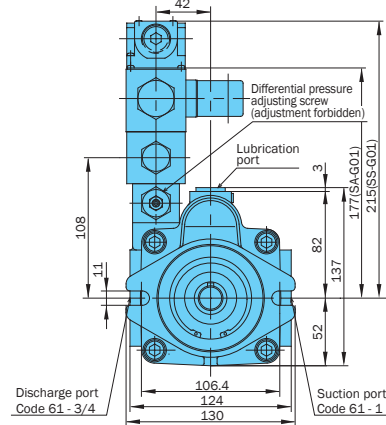


## Installation Dimension Drawing

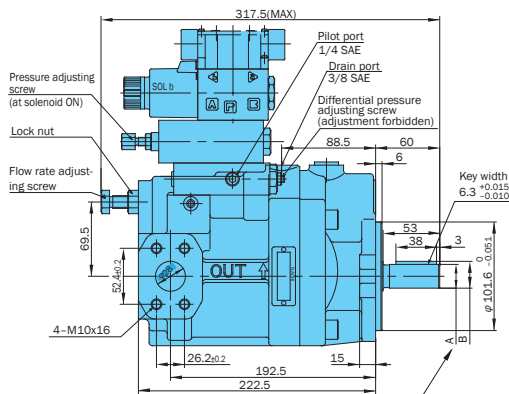
PVS-1B-<sup>16</sup>/<sub>22</sub>R<sup>A</sup>S\*-E13



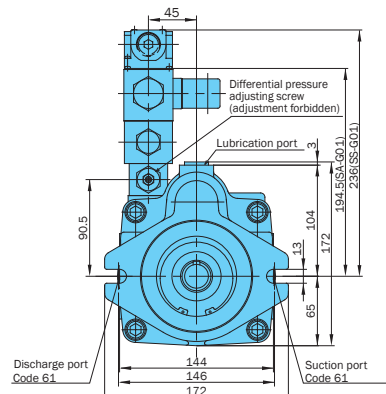
SAE A Mount



PVS-2B-<sup>35</sup>/<sub>45</sub>R<sup>A</sup>S\*-E13



SAE B Mount

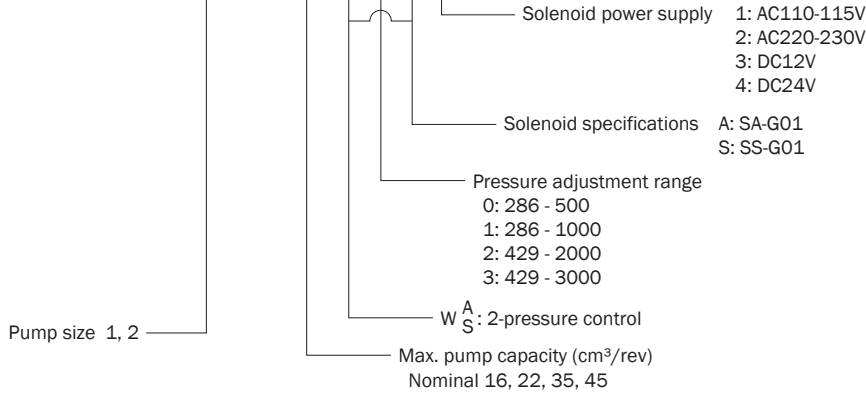


| cm <sup>3</sup> /rev | Pressure Range | Design No. | A     | B     |
|----------------------|----------------|------------|-------|-------|
| 35                   | 0 to 3         | 12D        | 0.875 | 0.987 |
|                      | 0 to 2         |            | 0.874 | 0.978 |
| 45                   |                | 20D        | 0.999 | 1.096 |
|                      |                |            | 0.998 | 1.087 |

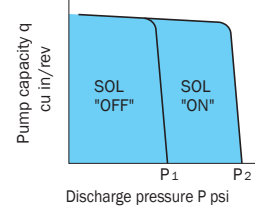
■ The coil surface temperature increases if this pump is kept continuously energized.  
Do not touch the surface of the coil directly with your hands.

## 2-Pressure Control Type

Explanation of model No.: **PVS -- 1 B -- 16 W 2 S 1 -- E13**

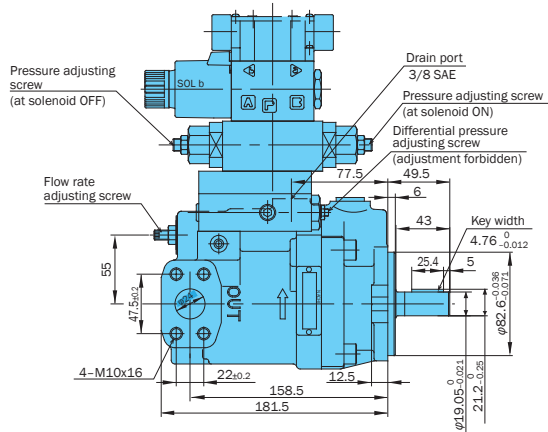


### P-Q Characteristics

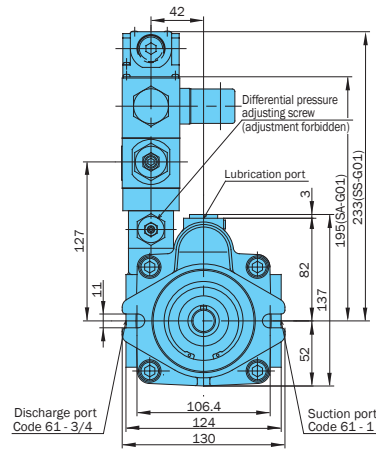


## Installation Dimension Drawing

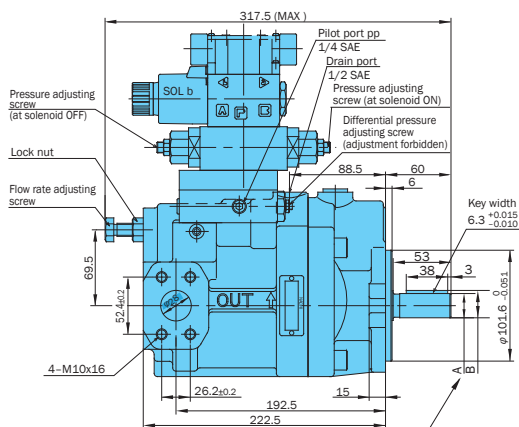
PVS-1B-<sup>16</sup><sub>22</sub> W<sup>A</sup><sub>S</sub> \*E13



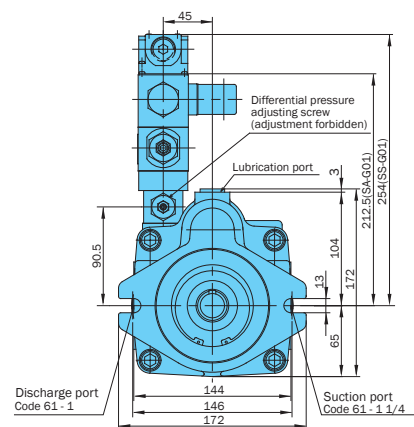
SAE A Mount



PVS-2B-<sup>35</sup><sub>45</sub> W<sup>A</sup><sub>S</sub> \*E13



SAE B Mount

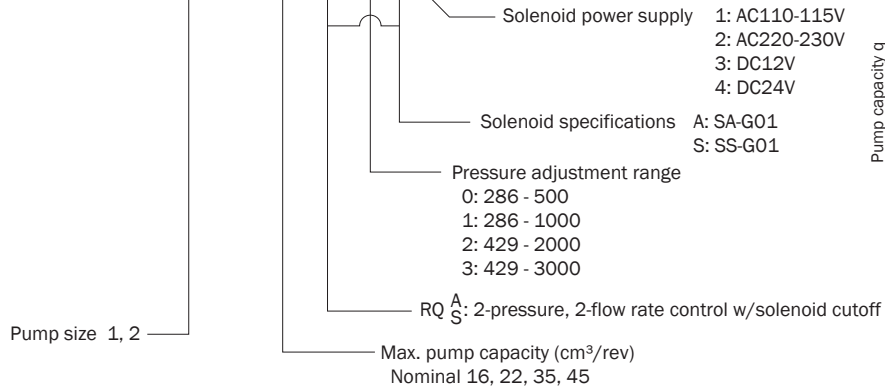


| cm <sup>3</sup> /rev | Pressure Range | Design No. | A     | B     |
|----------------------|----------------|------------|-------|-------|
| 35                   | 0 to 3         | 12D        | 0.875 | 0.987 |
|                      | 0 to 2         |            | 0.874 | 0.978 |
| 45                   | 3              | 20D        | 0.999 | 1.096 |
|                      |                |            | 0.998 | 1.087 |

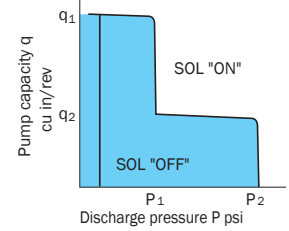
■ The coil surface temperature increases if this pump is kept continuously energized. Do not touch the surface of the coil directly with your hands.

## 2-Pressure, 2-Flow Rate Control Type w/Solenoid Cutoff

Explanation of Model No.: **PVS -- 1 B -- 16 RQ 2 S 1 -- E13**



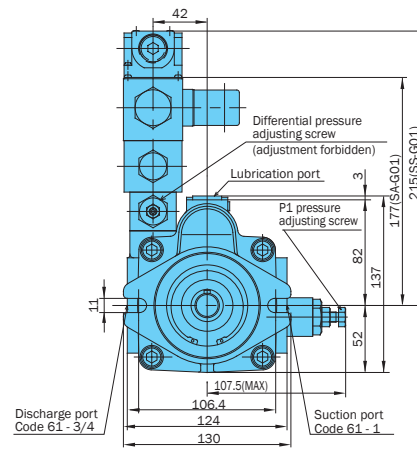
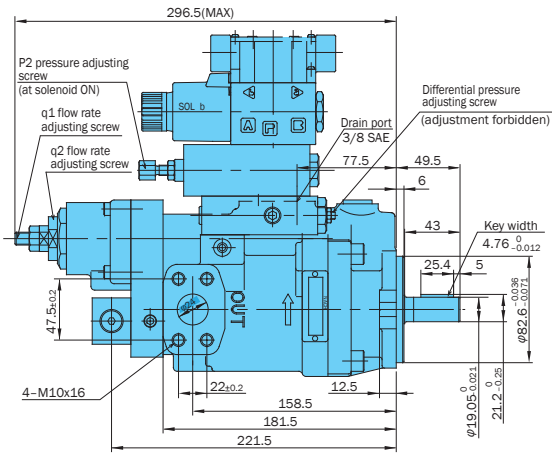
P-Q Characteristics



### Installation Dimension Drawing

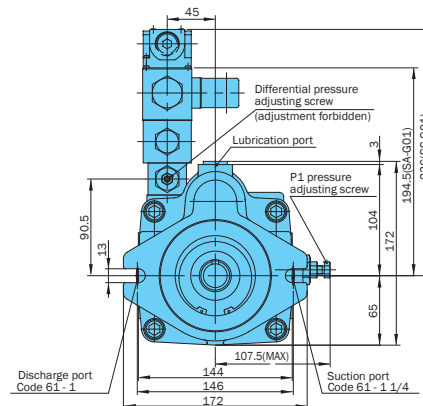
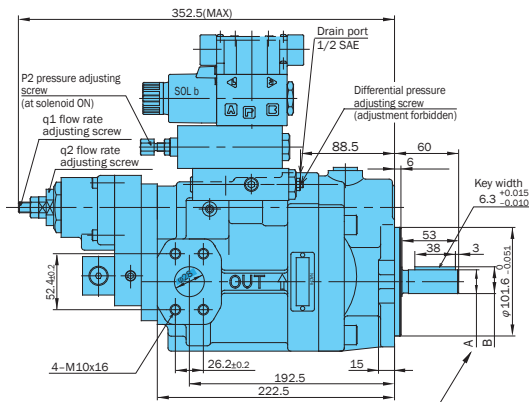
PVS-1B-16 RQ \* A S \* -E13

SAE A Mount



PVS-2B-35 RQ \* A S \* -E20

SAE B Mount



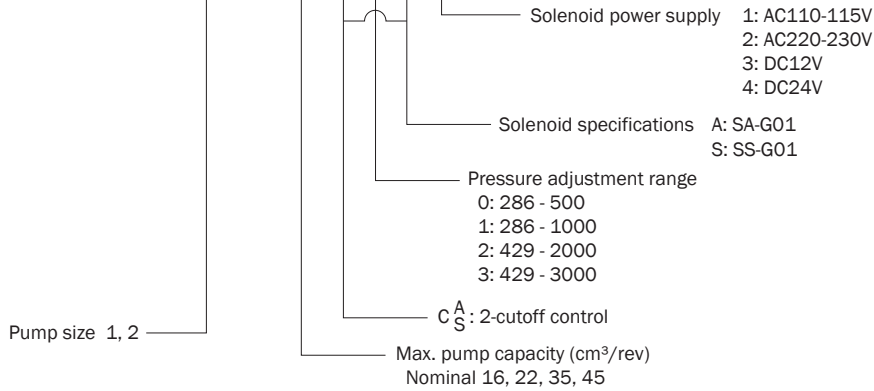
| cm³/rev | Pressure Range | Design No. | A     | B     |
|---------|----------------|------------|-------|-------|
| 35      | 0 to 3         | 12D        | 0.875 | 0.987 |
|         |                |            | 0.874 | 0.978 |
| 45      | 3              | 20D        | 0.999 | 1.096 |
|         |                |            | 0.998 | 1.087 |

■ The coil surface temperature increases if this pump is kept continuously energized.  
Do not touch the surface of the coil directly with your hands.

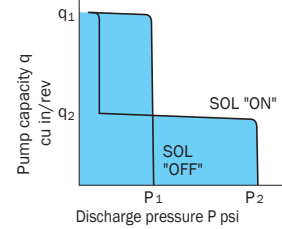


## 2-Cutoff Control Type

Explanation of Model No.: **PVS -- 1 B -- 16 C 2 S 1 -- E13**



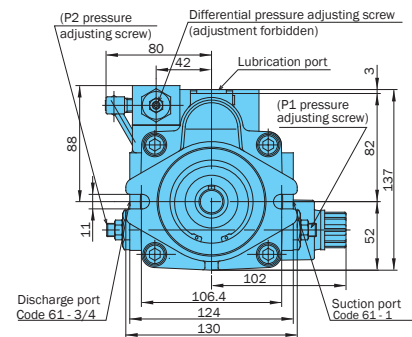
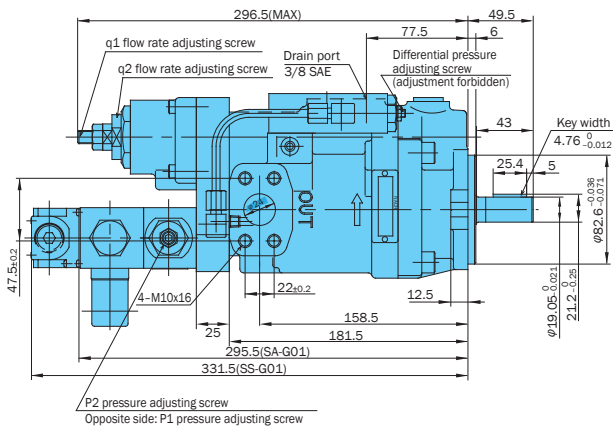
P-Q Characteristics



## Installation Dimension Drawing

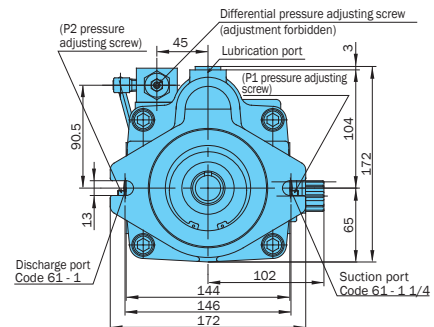
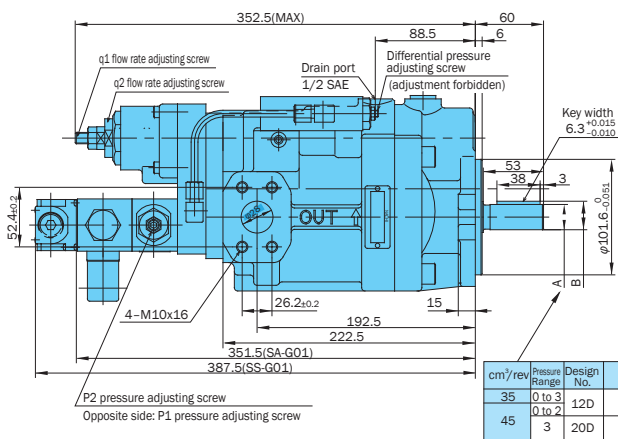
PVS-1B-<sup>16</sup>/<sub>22</sub> C\*<sup>A</sup>/<sub>S</sub>-E13

SAE A Mount



PVS-2B-<sup>35</sup>/<sub>45</sub> C\*<sup>A</sup>/<sub>S</sub>-E20

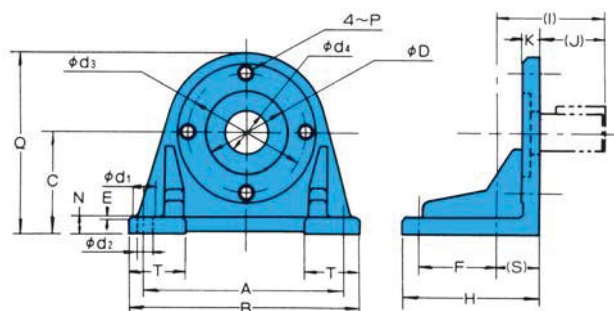
SAE B Mount



| cm <sup>3</sup> /rev | Pressure Range | Design No. | A     | B     |
|----------------------|----------------|------------|-------|-------|
| 35                   | 0 to 3         | 12D        | 0.875 | 0.987 |
| 45                   | 0 to 2         |            | 0.874 | 0.978 |
|                      | 3              | 20D        | 0.999 | 1.096 |
|                      |                |            | 0.998 | 1.087 |

■ The coil surface temperature increases if this pump is kept continuously energized. Do not touch the surface of the coil directly with your hands.

## Foot Mounting Kit



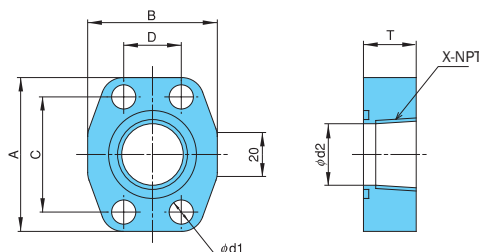
| Kit Model No. | Applicable Pump Model No. | Accessories |      |        |      | Dimensions |       |        |   |       |
|---------------|---------------------------|-------------|------|--------|------|------------|-------|--------|---|-------|
|               |                           | Bolt        | Q'ty | Washer | Q'ty | A          | B     | C      | E | F     |
| IHM-2-10      | PVS-0B<br>PVS-1B          | TB-10 ×30   | 2    | WP-10  | 2    | 127        | 152.5 | 69.8   | 1 | 50.8  |
| IHM-4-10      | PVS-2B                    | TB-12 ×30   | 2    | WP-12  | 2    | 220.7      | 246   | 107.95 | 1 | 114.3 |

| Kit Model No. | Dimensions |      |     |      |    |     |       |      |      |          |            |            |            |            | Weight<br>kg |
|---------------|------------|------|-----|------|----|-----|-------|------|------|----------|------------|------------|------------|------------|--------------|
|               | H          | (I)  | (J) | K    | N  | P   | Q     | (S)  | T    | $\phi D$ | $\phi d_1$ | $\phi d_2$ | $\phi d_3$ | $\phi d_4$ |              |
| IHM-2-10      | 96         | 64.5 | 32  | 17.5 | 13 | M10 | 135   | 32.5 | 36.5 | 82.6     | 22         | 11         | 106.4      | 50         | 2.0          |
| IHM-4-10      | 140        | 56.7 | 44  | 16   | 16 | M12 | 195.5 | 12.7 | 53   | 101.6    | 22         | 11         | 146        | 40         | 5.5          |

When only the mounting feet are required, the pump mounting bolts, washers and other parts are sold together as the Foot Mounting Kit.

## Piping Flange Kit

For PVS-1B, 2B



| Applicable Pump Model No. | PVS-1B-16/22 |                | PVS-2B-35/45 |                |
|---------------------------|--------------|----------------|--------------|----------------|
|                           | PSF-101000   |                | PSF-102000   |                |
| Plunger Kit model No.     | Suction port | Discharge port | Suction port | Discharge port |
| A                         | 70           | 65             | 79           | 70             |
| B                         | 59           | 52             | 73           | 59             |
| C                         | 52.4         | 47.5           | 58.7         | 52.4           |
| D                         | 26.2         | 22.0           | 30.2         | 26.2           |
| T                         | 24           | 24             | 28           | 24             |
| $\phi d_1$                | $\phi 11$    | $\phi 11$      | $\phi 11$    | $\phi 11$      |
| $\phi d_2$                | $\phi 28$    | $\phi 22$      | $\phi 37$    | $\phi 28$      |
| X                         | 1            | 3/4            | 1-1/4        | 1              |
| Mounting bolt             | TH-10 ×40    | TH-10 ×40      | TH-10 ×45    | TH-10 ×40      |
| Washer                    | WS-B-10      | WS-B-10        | WS-B-10      | WS-B-10        |
| O-ring                    | 1B-G35       | 1B-G30         | 1B-G45       | 1B-G35         |
| Weight lbs                | 1.3          | 1.1            | 1.6          | 1.3            |

Notes: 1. The piping flange is on sale in the Flange Kit which includes mounting bolts, washers and O-rings.

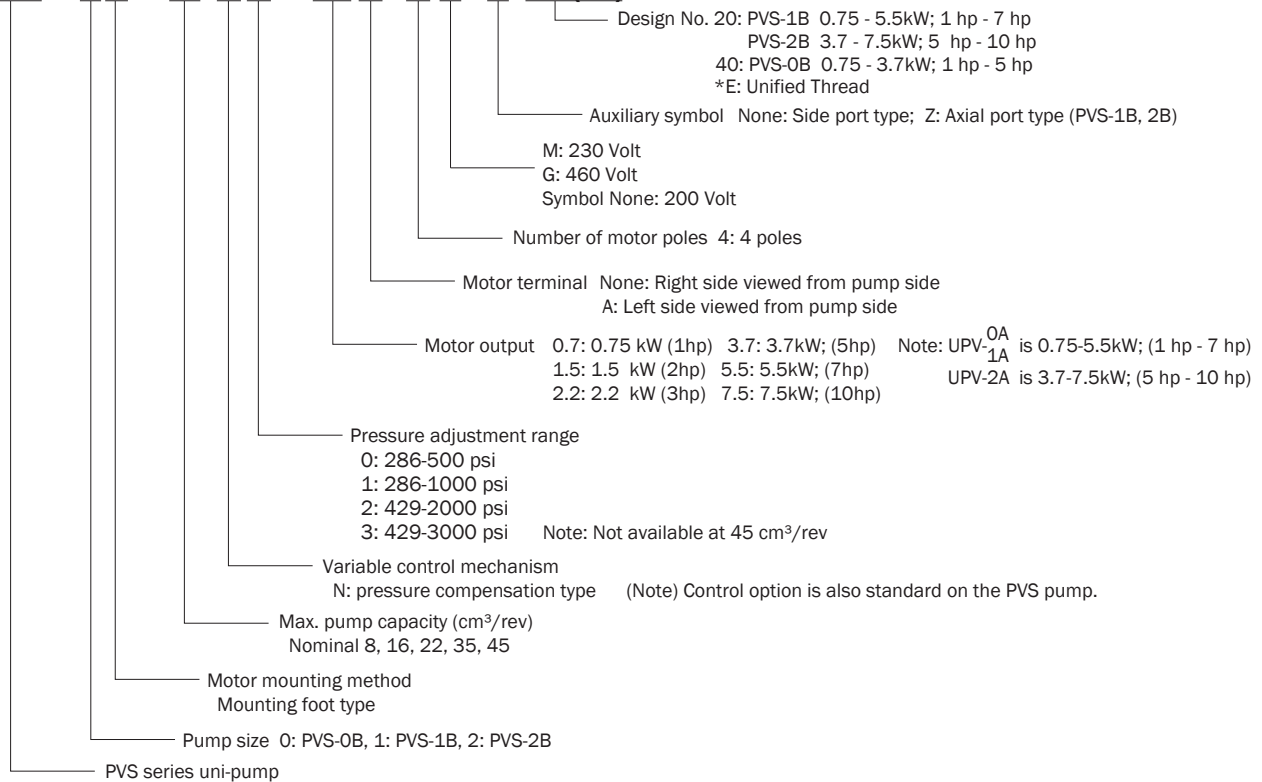
2. O-ring 1B/B-\*\* refers to JIS B2401-1B.

3. For details on tightening torque, see page C-11.

# Uni-Pump Specifications

Explanation of Model No.:

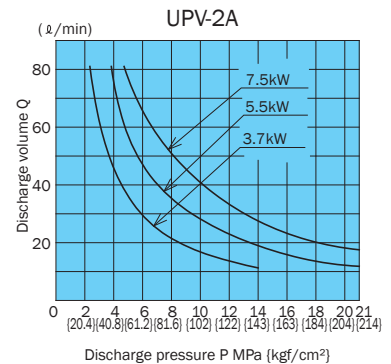
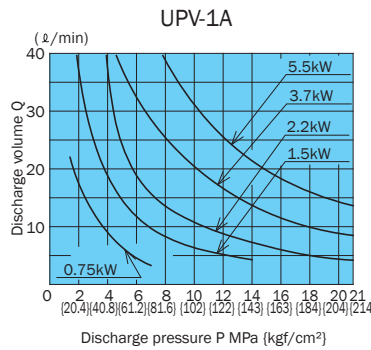
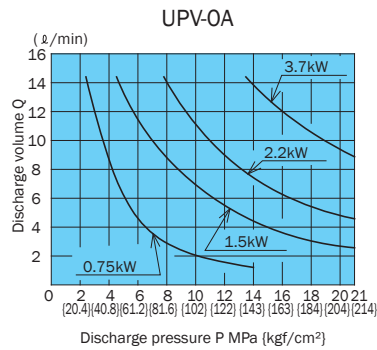
**UPV -- 1 A -- 16 N 1 -- 1.5 \* -- 4 \* \* -- \*20(40)**



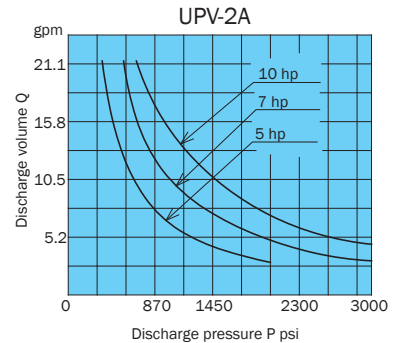
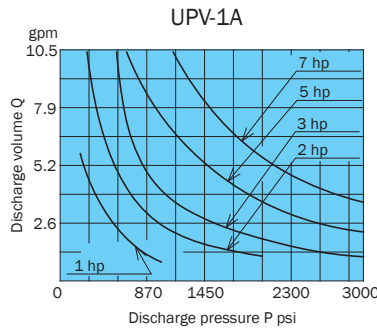
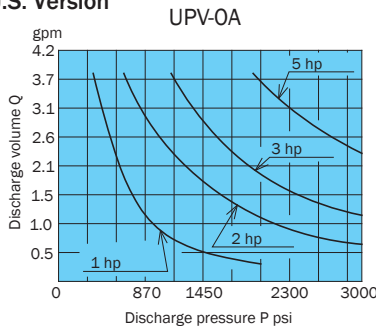
\*This Uni-Pump is the metric version from Japan

## Motor selection curves

### Metric Version



### U.S. Version

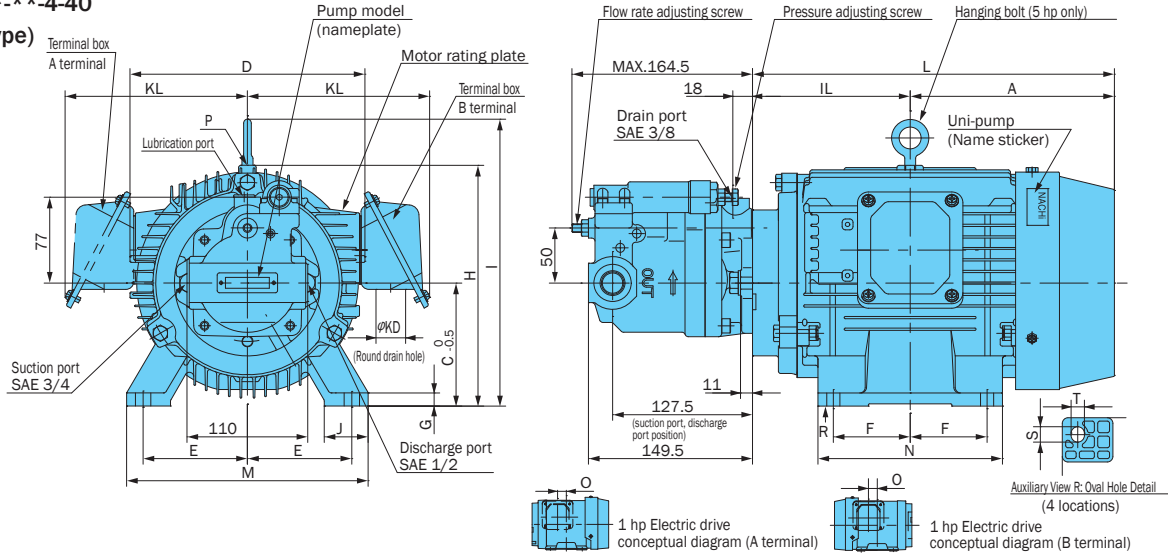


• How to select the motor  
 The lower side of the output curves for each of the motors shown above indicates the operating range under rated output for that motor.

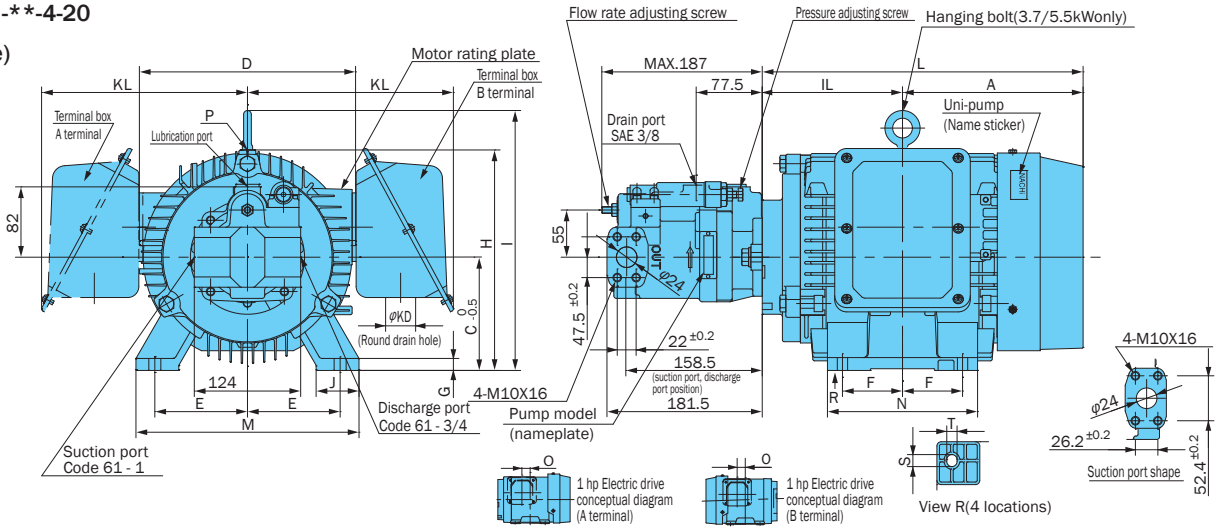
\* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload

## Installation Dimension Drawings

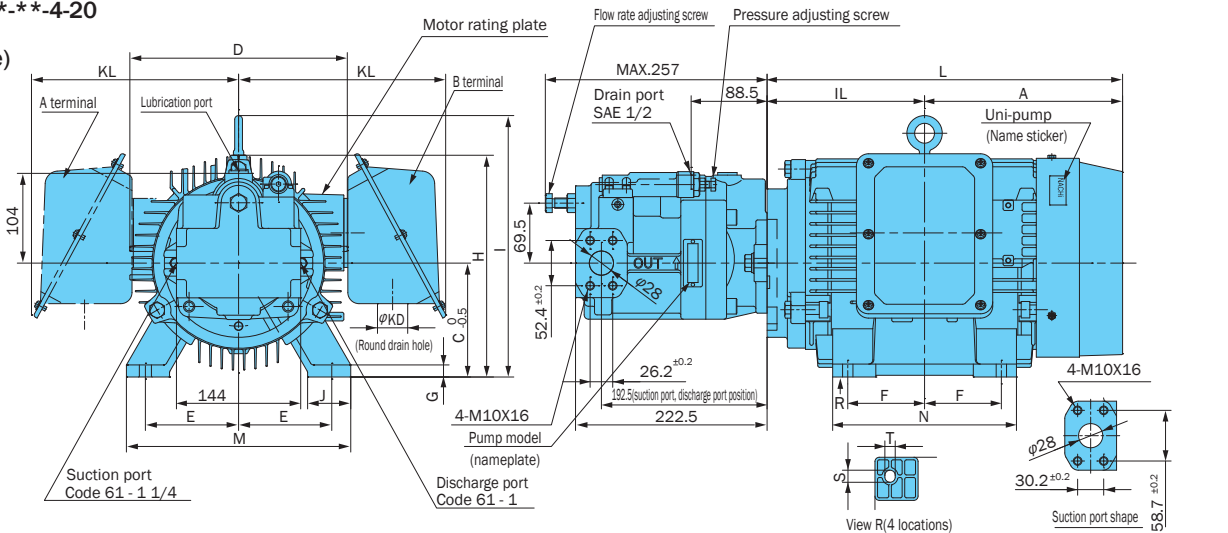
**UPV-0A-8\*\*-\*-4-40**  
(side port type)



**UPV-1A-16\*\*-\*-4-20**  
**22**  
(side port type)



**UPV-2A-35\*\*-\*-4-20**  
**45**  
(side port type)



\*These Pumps are Metric Versions from Japan

1. Drive motor is fully enclosed fan cooled, 1 to 5 hp is E type, and 7 to 10 hp is B type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz; EM - 230 VAC, EG - 460 VAC
3. Viewed from the pump side, suction port is on the left and discharge port is on the right.
4. Broken lines indicate instances for the A terminal. Broken lines pass through to the other side of the pump along its center.

Note: A terminal measurements are in parentheses ( ).

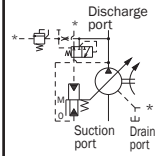
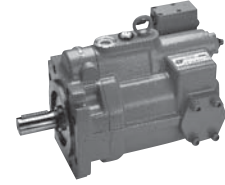
**Motor Specifications**

| Output hp | Motor Dimensions |       |     |     |      |      |     |     |     |    |       |     |     |       |     |     |      | Frame No. | Weight lbs |
|-----------|------------------|-------|-----|-----|------|------|-----|-----|-----|----|-------|-----|-----|-------|-----|-----|------|-----------|------------|
|           | A                | IL    | C   | D   | E    | F    | G   | H   | I   | J  | L     | M   | N   | S×T   | KD  | KL  | O    |           |            |
| 1         | 133              | 107.5 | 80  | 170 | 62.5 | 50   | 4.5 | 165 | -   | 35 | 240.5 | 165 | 130 | 18×10 | φ27 | 157 | 27.5 | 80M       | 14.5       |
| 2         | 143              | 118.5 | 90  | 198 | 70   | 62.5 | 10  | 190 | -   | 40 | 261   | 176 | 150 | 12×10 | φ27 | 159 | -    | 90L       | 16         |
| 3         | 157.5            | 133   | 100 | 198 | 80   | 70   | 12  | 200 | -   | 40 | 290.5 | 200 | 168 | 14×12 | φ27 | 159 | -    | 100L      | 21         |
| 5         | 186              | 143.5 | 112 | 214 | 95   | 70   | 12  | -   | 261 | 40 | 329.5 | 220 | 168 | 14×12 | φ27 | 166 | -    | 112M      | 27         |
| 7         | 210.5            | 163.5 | 132 | 252 | 108  | 70   | 15  | -   | 303 | 50 | 374   | 260 | 175 | 14×12 | φ35 | 240 | -    | 132S      | 42         |
| 10        | 229.5            | 182.5 | 132 | 252 | 108  | 89   | 15  | -   | 303 | 50 | 412   | 260 | 213 | 14×12 | φ35 | 240 | -    | 132M      | 48         |

**Characteristics of drive motor for unipump (domestic standard 3 rating)**

| Output hp | Poles | (Note1)<br>Model Number<br>TYPE (N) | Voltage [V] | Frequency [Hz] | Current rating [A] | RPM rating [min <sup>-1</sup> ] | Heat resistance |
|-----------|-------|-------------------------------------|-------------|----------------|--------------------|---------------------------------|-----------------|
| .5        | 4     | VBDA<br>(VDS series only)           | 200         | 50             | 2.2                | 1400                            | B               |
|           |       |                                     | 200         | 60             | 2.0                | 1680                            |                 |
|           |       |                                     | 230-460     | 60             | 2.0                | 1710                            |                 |
| 1         | 4     | V*DA-*A4*07                         | 200         | 50             | 3.8                | 1410                            | B               |
|           |       |                                     | 200         | 60             | 3.4                | 1690                            |                 |
|           |       |                                     | 230-460     | 60             | 3.4                | 1720                            |                 |
| 2         | 4     | V*DA-*A4*15                         | 200         | 50             | 7.0                | 1410                            | B               |
|           |       |                                     | 200         | 60             | 6.2                | 1690                            |                 |
|           |       |                                     | 230-460     | 60             | 6.0                | 1710                            |                 |
| 3         | 4     | V*DA-*A4*22                         | 200         | 50             | 9.8                | 1400                            | B               |
|           |       |                                     | 200         | 60             | 8.9                | 1680                            |                 |
|           |       |                                     | 230-460     | 60             | 8.5                | 1710                            |                 |
| 5         | 4     | V*DA-*A4*37                         | 200         | 50             | 16.0               | 1410                            | B               |
|           |       |                                     | 200         | 60             | 14.8               | 1690                            |                 |
|           |       |                                     | 230-460     | 60             | 14.0               | 1710                            |                 |
| 7         | 4     | V*DA-*A4*55                         | 200         | 50             | 23.8               | 1430                            | B               |
|           |       |                                     | 200         | 60             | 21.0               | 1730                            |                 |
|           |       |                                     | 230-460     | 60             | 20.0               | 1740                            |                 |
| 10        | 4     | V*DA-*A4*75                         | 200         | 50             | 31.8               | 1435                            | B               |
|           |       |                                     | 200         | 60             | 28.2               | 1730                            |                 |
|           |       |                                     | 230-460     | 60             | 27.0               | 1740                            |                 |

- The asterisks \* indicate variations in the hydraulic pump series, size, and position of terminal box. Check the ratings sticker on the top of the drive motor.
- Contact us for variations in voltage.



### PZS Series Variable Volume Piston Pumps

**4.27 to 13.47 cu in/rev**  
**4.27 to 6.10 cu in/rev 4085 psi**  
**7.93 to 13.42/rev 3642 psi**

#### Features

- High pressure, high reliability**  
 These pumps deliver the perfect combination of high pressure (4085 psi maximum) and high reliability. Hydraulic device energy efficiency is ensured because variable volume capabilities provide the means to keep the discharge rate to the desired level.
- Low noise, low vibration operation**  
 The semi-cylindrical swash plate of

the PVS series provides high support and rigidity, making it possible to increase the number of pistons (from nine to 11) and equip optimal valve plates, all of which make low-noise operation possible.

- High reliability, long life**  
 O-ring seals used for mating surfaces eliminate worries about oil leaks. A spherical valve plate maintains optimal

hydraulic pressure balance, for stable operation across a wide range and better contamination resistance characteristics.

- A wide range of possible applications  
 In addition to use as a stand-alone pump, a PZS Series pump can be combined with another IP pump in a wide range of possible applications with an adapter kit.

#### Specifications

| Model No.   | Pump Capacity<br>in <sup>3</sup> /rev<br>(cm <sup>3</sup> /rev) | Rated Pressure<br>psi | Maximum Working Pressure<br>psi | Pressure Adjustment Range<br>psi       | Revolution Speed min <sup>-1</sup> |      | Weight (lbs) | Fixed Discharge Pump (Note 1)     |                 | GPM |
|---|---|-----------------------|---------------------------------|--|------------------------------------|------|--------------|-----------------------------------|-----------------|-----|
|   |   |                       |                                 |  | Min.                               | Max. |              | Capacity<br>cu in/rev             | Pressure<br>psi |     |
| <b>PZS-3B- 70* 1-E4481A</b><br><b>3-E4481A</b><br><b>4-E10</b>  | 2.74 - 4.27<br>(70)   | 3000                  | 4085                            | 291 - 1000<br>291 - 3000<br>291 - 4085 | 500                                | 1800 | 81           | 3.6 to 15.8<br>(IPH-2.3 type)     | 21<br>{214}     | 32  |
| <b>PZS-4B- 100* 1-E4481A</b><br><b>3-E4481A</b><br><b>4-E10</b> | 2.44 - 6.10<br>(100)  | 3000                  | 4085                            | 291 - 1000<br>291 - 3000<br>291 - 4085 | 500                                | 1800 | 128          | 3.6 to 15.8<br>(IPH-2.3 type)     | 21<br>{214}     | 46  |
| <b>PZS-5B- 130* 1-E10</b><br><b>3-E5533A</b><br><b>4</b>        | 3.11 - 7.93<br>(130)  | 3000                  | 3642                            | 291 - 1000<br>291 - 3000<br>291 - 3642 | 500                                | 1800 | 189          | 3.6 to 32.3<br>(IPH-2.3.4 type)   | 21<br>{214}     | 60  |
| <b>PZS-6B- 180* 1-E10</b><br><b>3</b><br><b>4</b>               | 6.16 - 10.98<br>(180)   | 3000                  | 3642                            | 291 - 1000<br>291 - 3000<br>291 - 3642 | 500                                | 1800 | 271          | 3.6 to 63.9<br>(IPH-2.3.4.5 type) | 21<br>{214}     | 83  |
| <b>PZS-6B- 220* 1-E10</b><br><b>3</b><br><b>4</b>               | 7.56 - 13.42<br>(220)   | 3000                  | 3642                            | 291 - 1000<br>291 - 3000<br>291 - 3642 | 500                                | 1500 | 278          | 3.6 to 63.9<br>(IPH-2.3.4.5 type) | 21<br>{214}     | 87  |

Note 1. Fixed discharge pump can be configured by combining with an IP pump.  
 2. Pump capacity adjustment ranges are for control codes N, RS, and WS. For information about control code NQ, see page A-27.  
 3. Direction of rotation is clockwise when viewed from the shaft end.

- Handling
  - Cautions during Pump Installation and Piping
- Use flexible couplings for connecting the pump shaft to the drive shaft, and prevent a radial or thrust load from being applied to the pump shaft.
  - Eccentricity between the drive shaft and pump shaft should be no greater than .001 in, with an eccentric angle error of 1° or less.
  - Set the clamping length of couplings and pump shafts at least 2/3 the length of the coupling width.
  - Use a sufficiently rigid pump mounting base.
  - Set the pressure on the pump suction side to -5 psi or more (suction port flow velocity within 6 ft/sec).
  - Raise part of the drain piping to above the topmost part of the pump body, and

insert the return section of the drain piping into the hydraulic operating fluid. Also, observe the values in the following table to limit the drain back pressure to 14.5 psi.

| Item            | Model No. | 3B, 4B, 5B    | 6B          |
|-----------------|-----------|---------------|-------------|
| Pipe joint size |           | at least 3/4" | at least 1" |
| Pipe I.D        |           | 5/8           | 7/8         |
| Pipe length     |           | 1m or less    | 1m or less  |

- Mount the pump so the pump shaft is oriented horizontally.
- Use of rubber hose is recommended in order to minimize noise and vibration.
- Check valve is located on the discharge side of the pump. (To prevent reverse rotation and damage to the pump when it is off)

- Management of Hydraulic Operating Fluid
- Use only good-quality hydraulic operating fluid with a kinematic viscosity during operation within the range of 20 to 200 centistokes. Normally, you should use an R&O type and wear-resistant type of ISOVG32 to 68 or equivalent. The optimum kinematic viscosity during operation is 20 to 50 centistokes.
  - The operating temperature range is 40 to 140 °F. When the oil temperature at startup is 5 °C or less, run the pump at low pressure and low speed until the oil temperature reaches 40 °F.
  - Provide a suction strainer with a filtering grade of about 100µ (150 mesh).

(continued on following page)

- 4 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower.
- 5 Use hydraulic operating fluid when the operating ambient temperature is in the range of 32 to 140 °F.
  - Startup Precautions
- 1 Before starting up the pump, fill the pump body with clean hydraulic operating fluid through the lubrication port.

| Model No. | Oil Amount cu in |
|-----------|------------------|
| PZS-3B    | 61               |
| PZS-4B    | 110              |
| PZS-5B    | 134              |
| PZS-6B    | 183              |

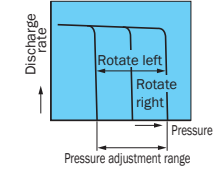
- 2 An unload circuit is required when the motor is started under condition WYE Delta . Contact your agent about the unload circuit.
- 3 Check to make sure that the rotation

direction of the pump is the same as the rotation direction indicated by the arrow on the pump body.

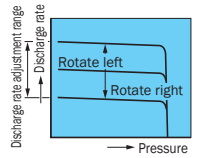
- 4 Air entering the pump or pipes can cause noise or vibration. At startup, set the pump discharge side to a no-load state, and operate the pump in the inching mode to remove any air that might be in the pump or pipes.
- 5 Equip an air bleed valve in circuits where it is difficult to release air before startup. (See "IP Pumps" on page C-13.)
- 6 Install a check valve on the discharge side to protect the pump if the load is large or if there is an accumulator in the circuit on the discharge side of the pump.
- 7 Do not release the pressure in the hydraulic circuit by switching the solenoid valve (RS/WS type) on the pump.
- 8 Provide a return filter of 10µm or less

- Configuring Pressure and Discharge Rate Settings  
The factory default pump discharge rate setting is the setting's maximum value, while the default discharge pressure is the settings minimum value. Change the discharge rate and discharge pressure settings in accordance with your particular operating conditions.

[Pressure Adjustment]  
Rotating the pressure adjusting screw clockwise increases pressure.



[Discharge Volume Adjustment]  
Rotating the flow rate adjusting screw clockwise decreases the discharge rate.

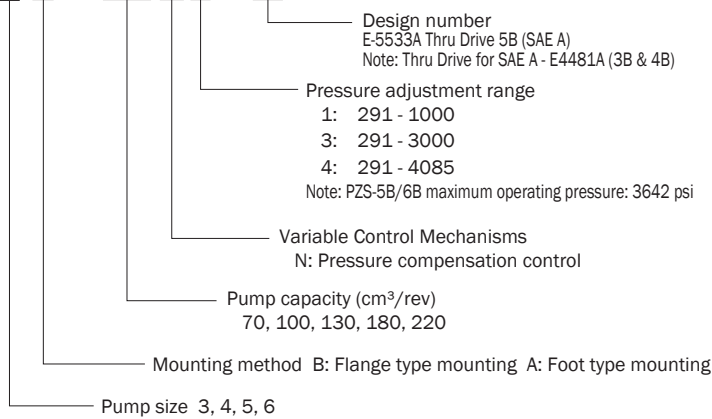


Note:  
Securely tighten the lock nut after making adjustments.

## Understanding Model Numbers

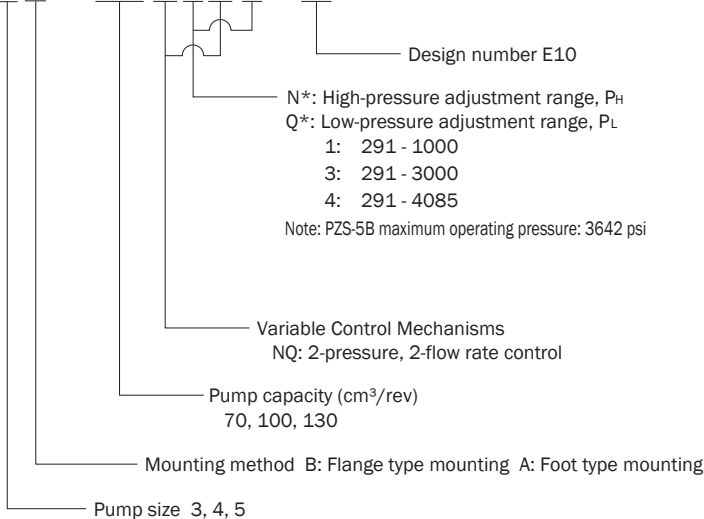
### Standard Type, Pressure compensation(N)

**PZS -- 4 B -- 100 N \* -- E10**

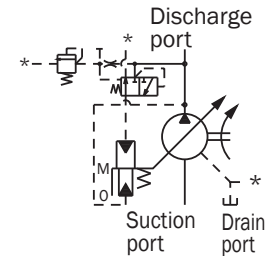
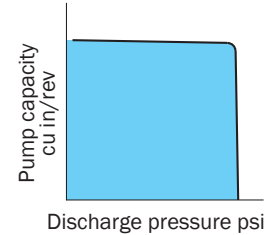


### Option type, 2-Pressure, 2-Flow Rate Control Type (NQ)

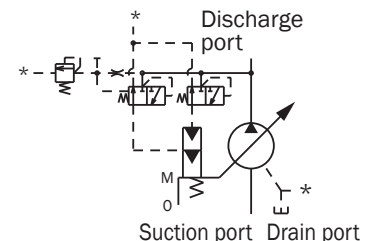
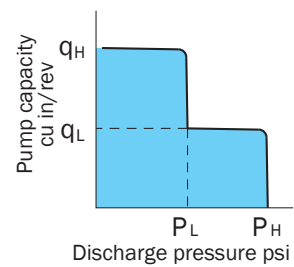
**PZS -- 4 B -- 100 N \* Q \* -- E10**



### P-Q characteristics

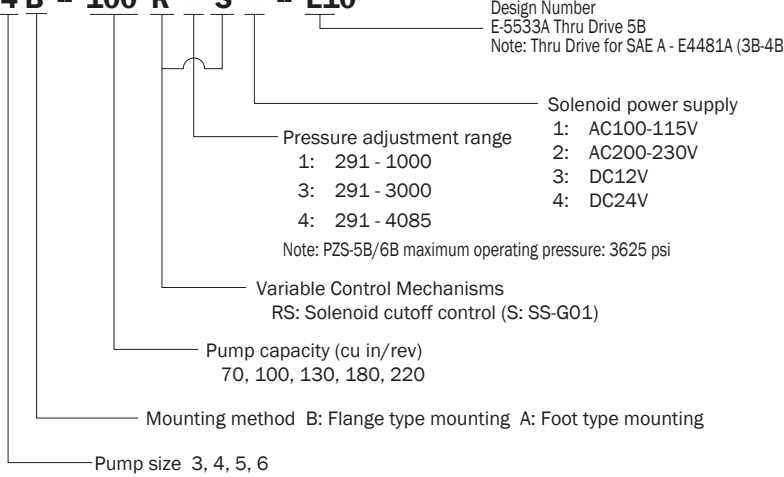


### P-Q characteristics



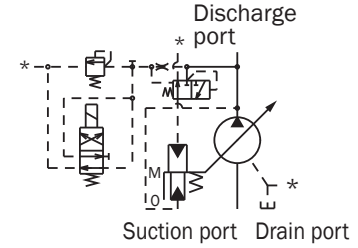
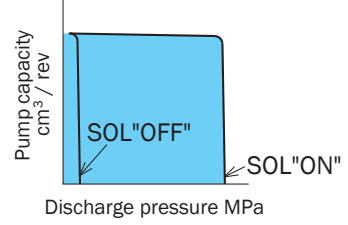
**Solenoid Cutoff Control Type (RS)**

**PZS - 4 B - 100 R \* S \* - E10**



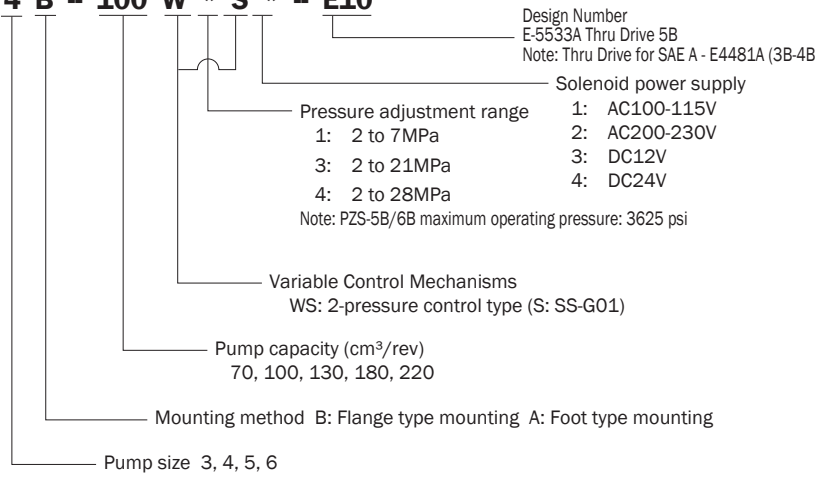
■ Do not use the solenoid valve to release the pressure in the hydraulic circuit.

**P-Q characteristics**

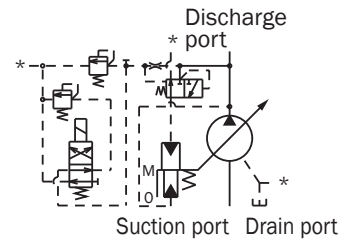
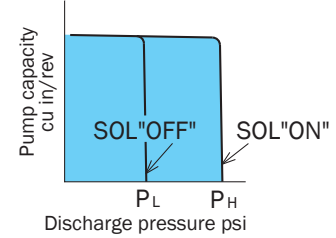


**2-Pressure Control System (WS)**

**PZS - 4 B - 100 W \* S \* - E10**



**P-Q characteristics**

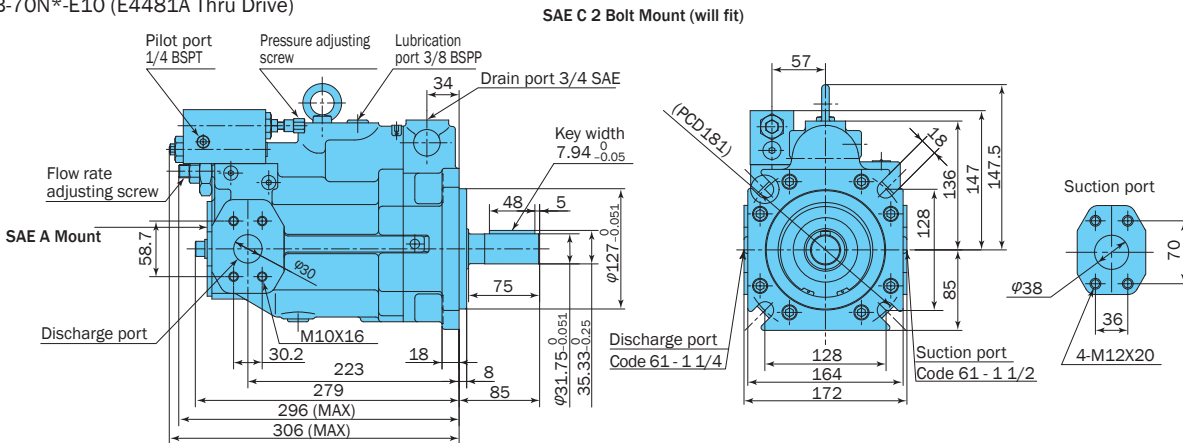


**Installation Dimension Drawings**

The ZR-T02\*-5895\* is the recommended remote control valve. Provide piping to the remote control valve at a pipe volume of 9 cu in or less.

**Pressure Compensation Type**

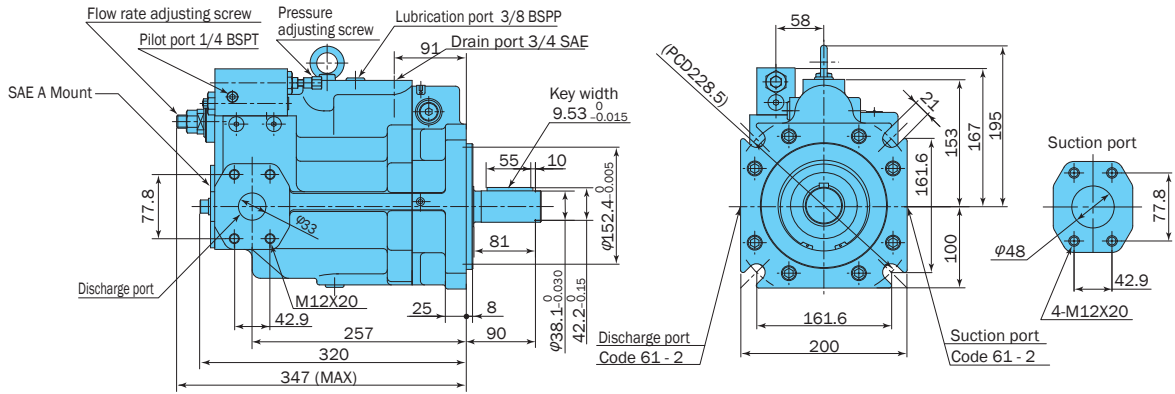
Installing a remote control relieve valve to the pilot port provides remote control of pressure compensation. (PZS series "P type")  
PZS-3B-70N\*-E10 (E4481A Thru Drive)





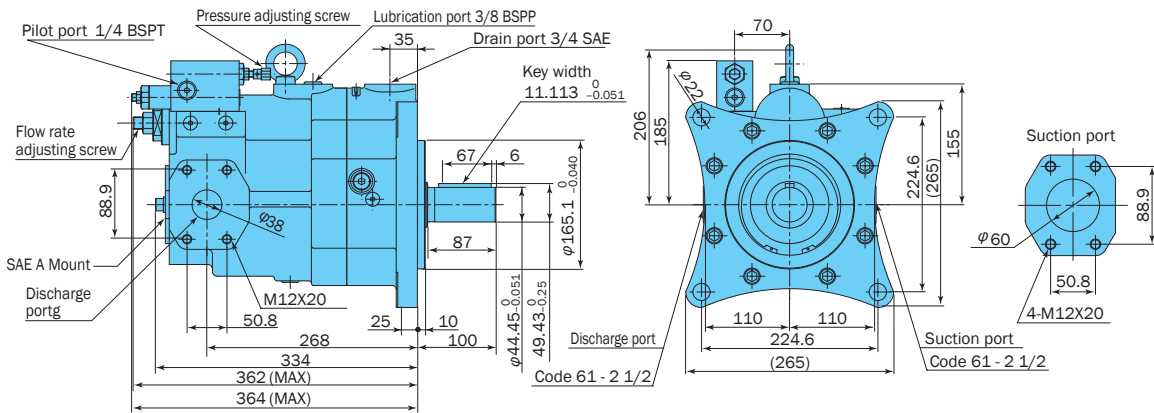
**PZS-4B-100N\*-10 (E4481A Thru Drive)**

**4 Bolt SAE D Mount**



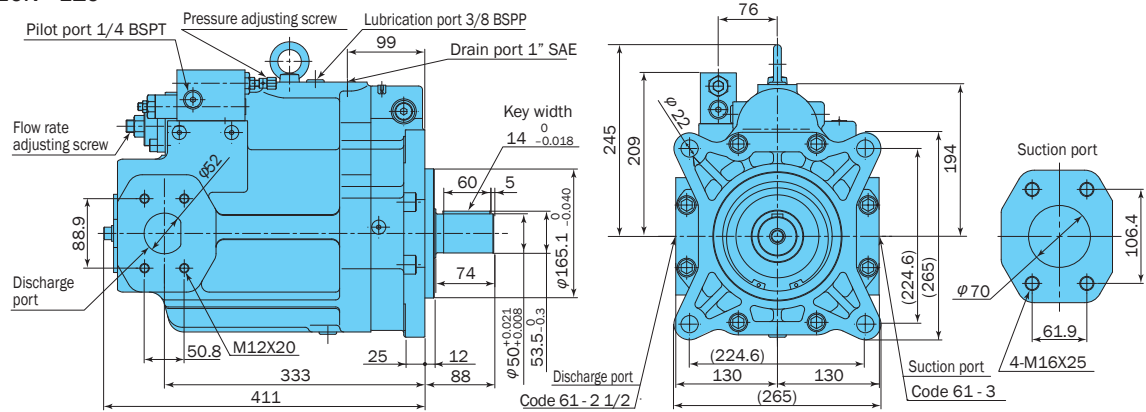
**PZS-5B-130N\*-E10 (E5533A Thru Drive)**

**4 Bolt SAE E Mount**

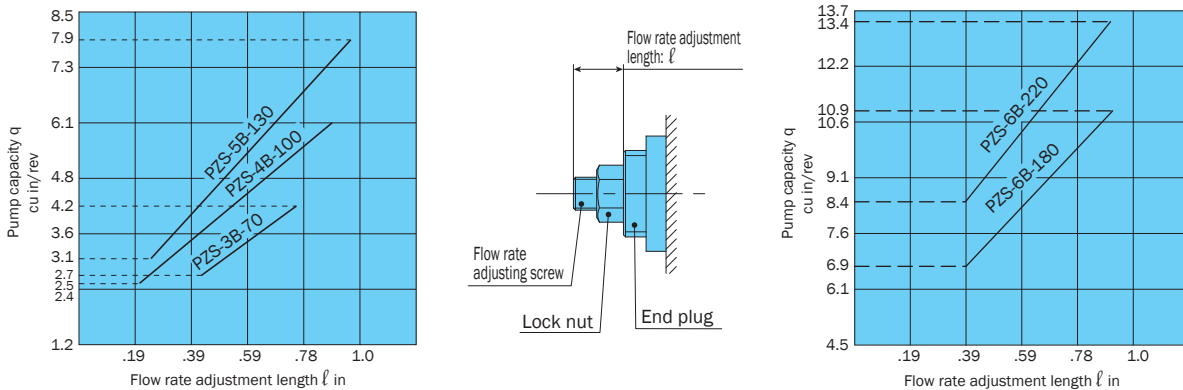


**PZS-6B-180N\*-E10  
PZS-6B-220N\*-E10**

**4 Bolt SAE E Mount**

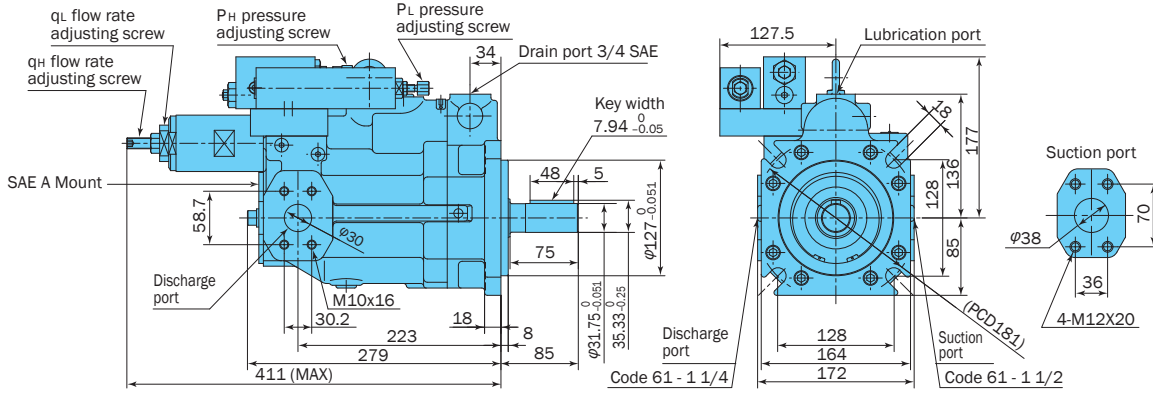


**Flow Adjustment Rotation Angle ( $\ell$ ) and Pump Capacity ( $q$ )**

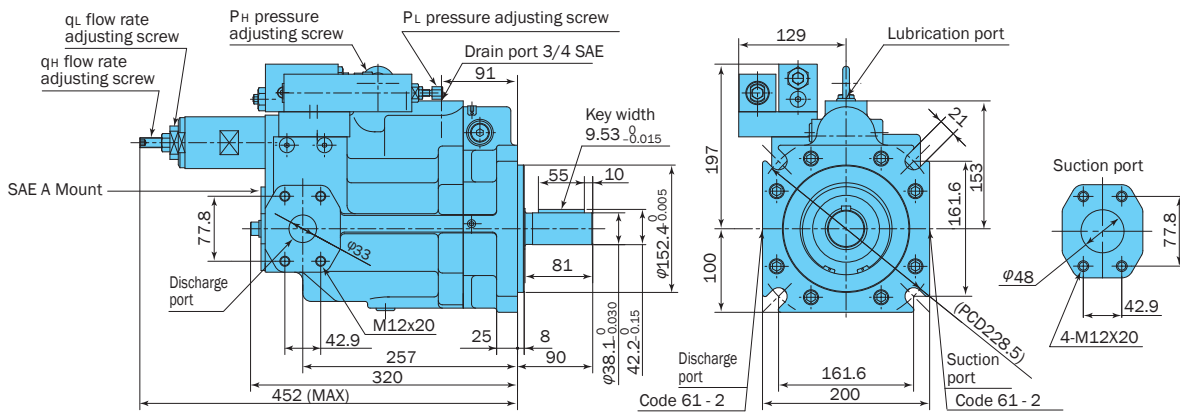


Use a flow adjustment length that is within the range noted in the above chart. Using a length that is outside the lower limit adjustment range can lead to oil leaks.

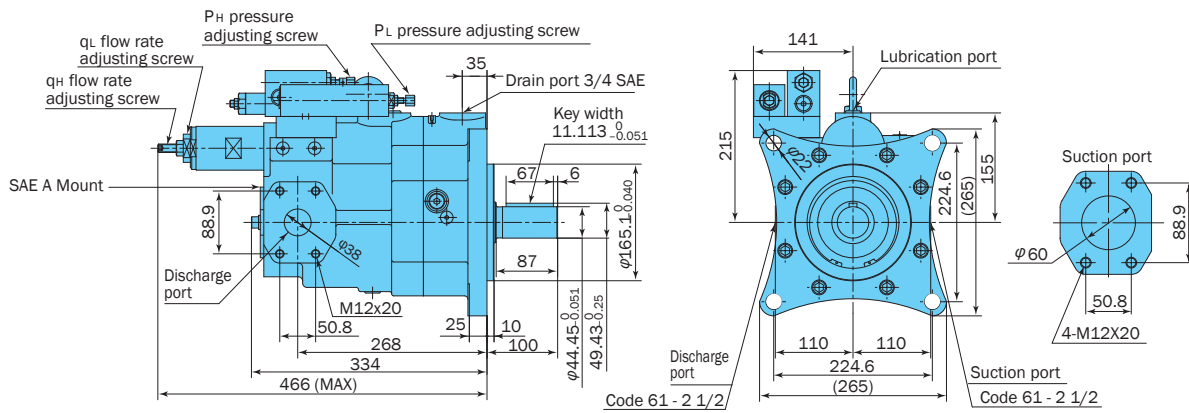
**2-Pressure, 2-Flow Rate Control Type**  
**PZS-3B-70N\*Q\*-10 (E4481A Thru Drive)** (will fit) **2 Bolt SAE C Mount**



**PZS-4B-100N\*Q\*-10 (E4481A Thru Drive)** **4 Bolt SAE D Mount**



**PZS-5B-130N\*Q\*-10 (E5533A Thru Drive)** **4 Bolt SAE E Mount**

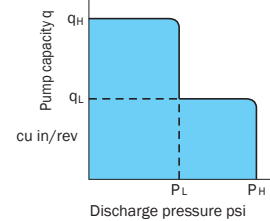


**Pump Volume Adjustable Range**

| Pump Model No.    | Volume Adjustment Range cu in/rev |                       | Factory Default<br>q. Setting (cu in/rev) |
|-------------------|-----------------------------------|-----------------------|---|
|                   | q <sub>H</sub> Note 1             | q <sub>L</sub> Note 2 |   |
| PZS-3B-70N*Q*-10  | .3 to 4.2                         | .3 to 2.4             | .85                                       |
| PZS-4B-100N*Q*-10 | .9 to 6.1                         | .4 to 3.6             | 1.2                                       |
| PZS-5B-130N*Q*-10 | 1.0 to 7.9                        | .48 to 4.2            | 1.5                                       |

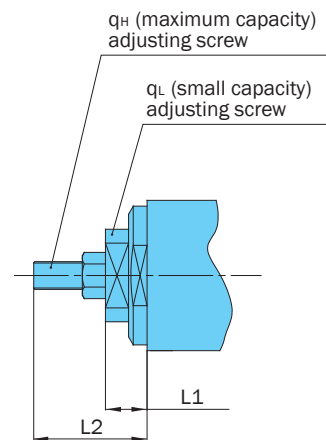
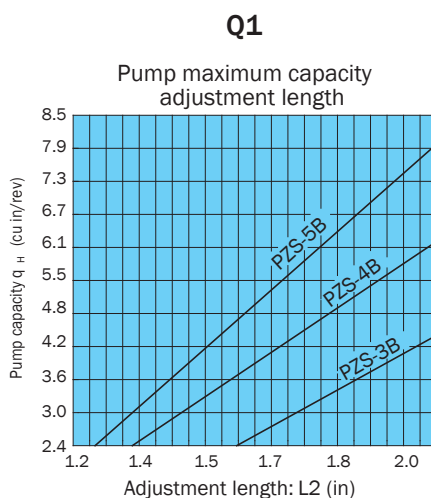
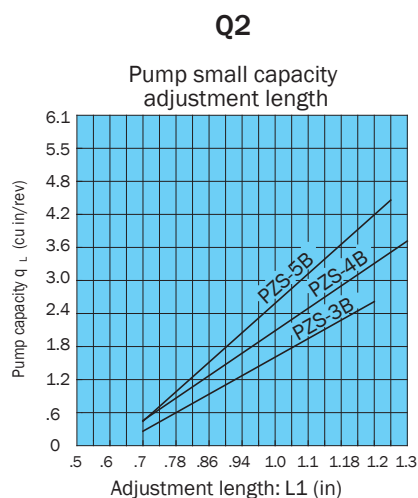
- Note 1: The setting range for pump maximum capacity q<sub>H</sub> depends on the q<sub>L</sub> setting.  
 Note 2: Overall efficiency at a low flow rate is worse than at the maximum flow rate. Keep this in mind when deciding on the drive motor capacity.  
 Note 3: P<sub>L</sub> is set to 500 psi before shipping. (P<sub>H</sub> is the lowest pressure)

**P-Q characteristics**



### PZS Pump 2-Pressure 2-Flow Rate Control Flow Rate Adjustment Graph

- Be sure to adjust the low flow rate first, and then adjust the maximum flow rate.
- Remember that the maximum flow rate adjustment range (lower limit) changes in accordance with the low flow rate adjustment. The maximum flow rate adjustment lower limit is equivalent to the low flow rate adjustment length (L1) plus .43".
- Pump efficiency at a low flow rate is worse than at the maximum flow rate. Keep this in mind when deciding on the drive motor capacity.



### Adapter with coupling for Thru Drive E4481A & E5533A

E4481A - PZMK SAE A (with 3/4" coupling)

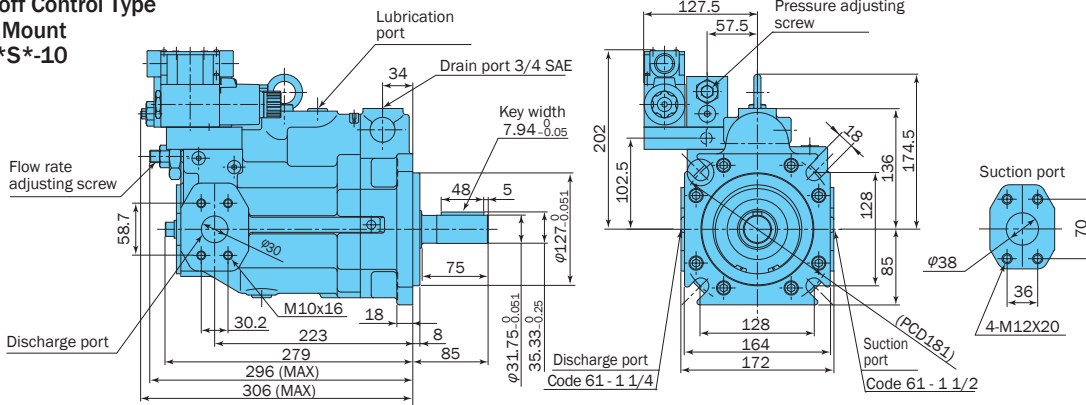
E4481A - PZMK SAE A 5/8 (with 5/8" coupling)

E5533A - JWF-SUB-0187-15-A (SAE A with 7/8" coupling)

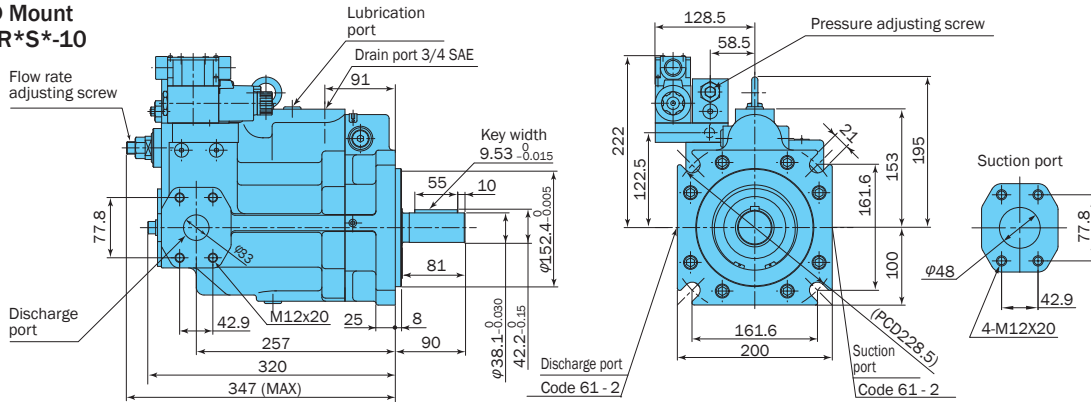
E5533A - JWF-SUB-0186-15-A (SAE A with 3/4" coupling)

E5533A - JWF-SUB-0188-15-A (SAE B with 1" coupling)

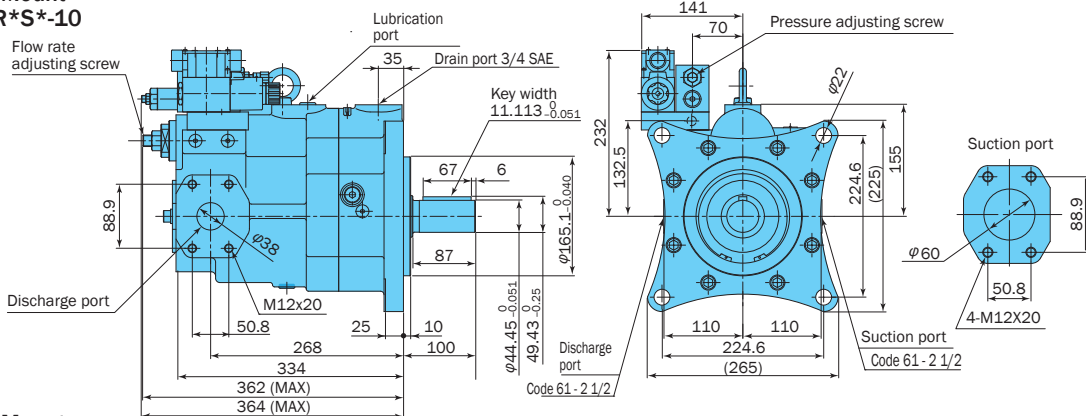
**Solenoid Cutoff Control Type**  
**2 Bolt SAE C Mount**  
**PZS-3B-70R\*S\*-10**



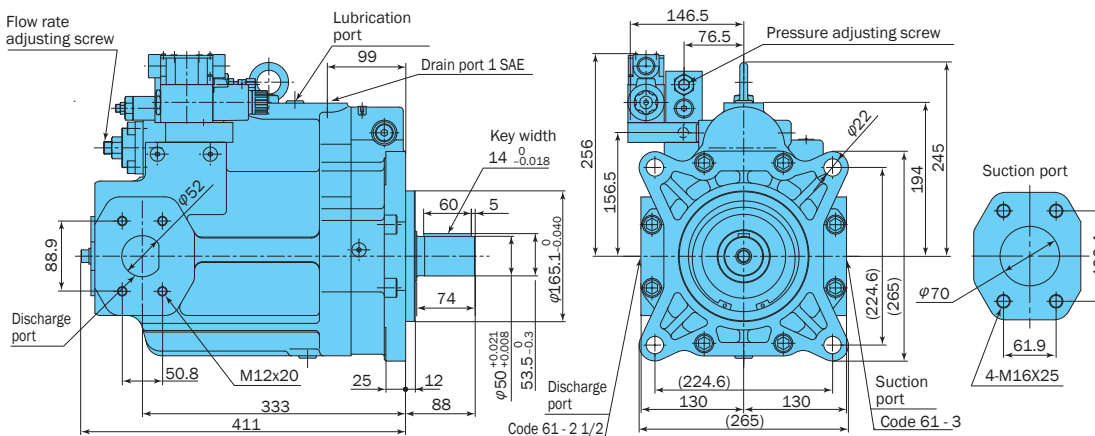
**4 Bolt SAE D Mount**  
**PZS-4B-100R\*S\*-10**



**4 Bolt SAE E Mount**  
**PZS-5B-130R\*S\*-10**

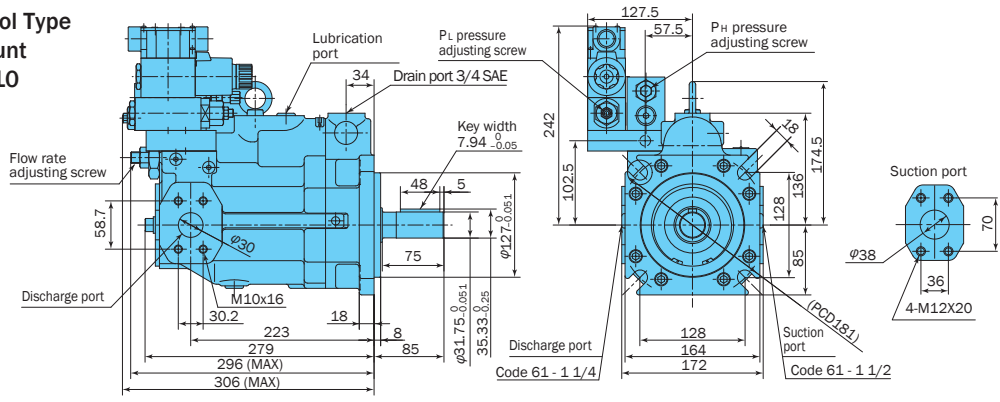


**4 Bolt SAE E Mount**  
**PZS-6B-180R\*S\*-10**  
**PZS-6B-220R\*S\*-10**

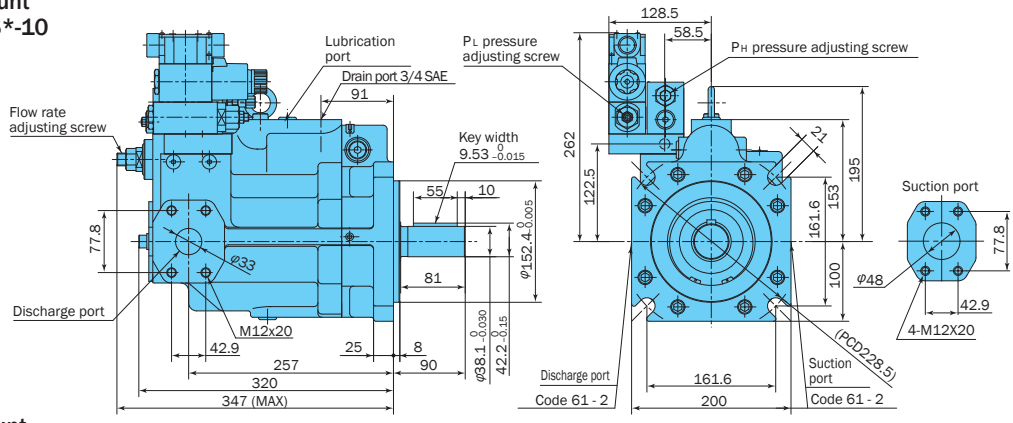


- Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot. Do not touch the surface of the coil directly with your hands.
- Do not use the solenoid valve to release the pressure in the hydraulic circuit

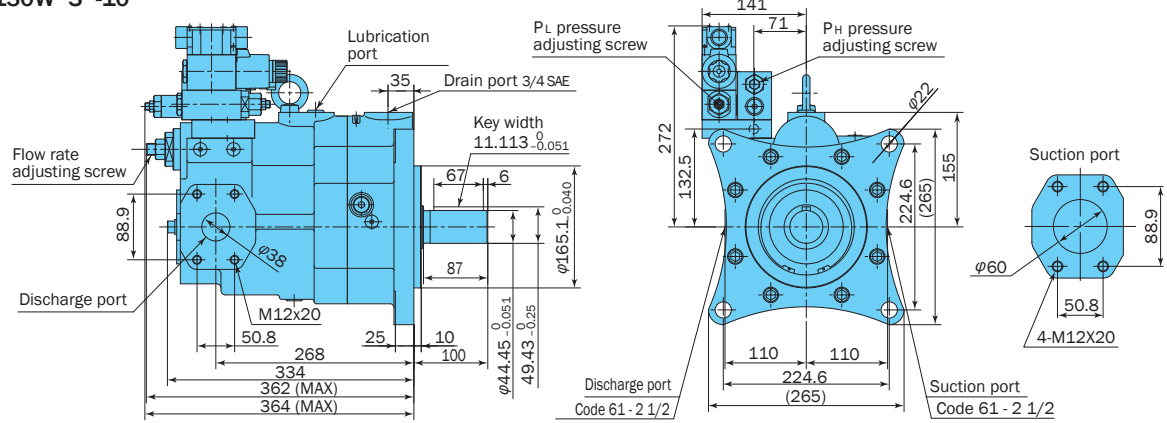
**2-Pressure Control Type  
2 Bolt SAE C Mount  
PZS-3B-70W\*S\*-10**



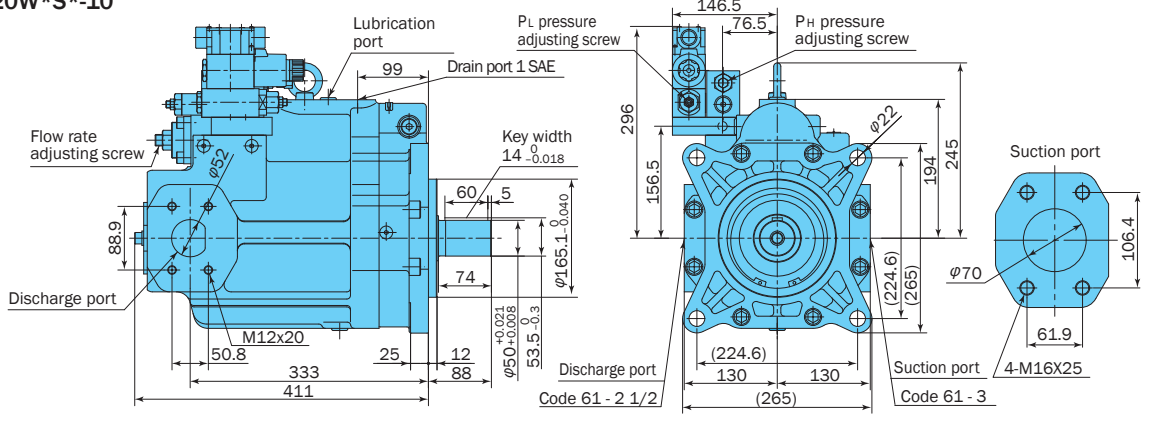
**4 Bolt SAE D Mount  
PZS-4B-100W\*S\*-10**



**4 Bolt SAE E Mount  
PZS-5B-130W\*S\*-10**



**4 Bolt SAE E Mount  
PZS-6B-180W\*S\*-10  
PZS-6B-220W\*S\*-10**

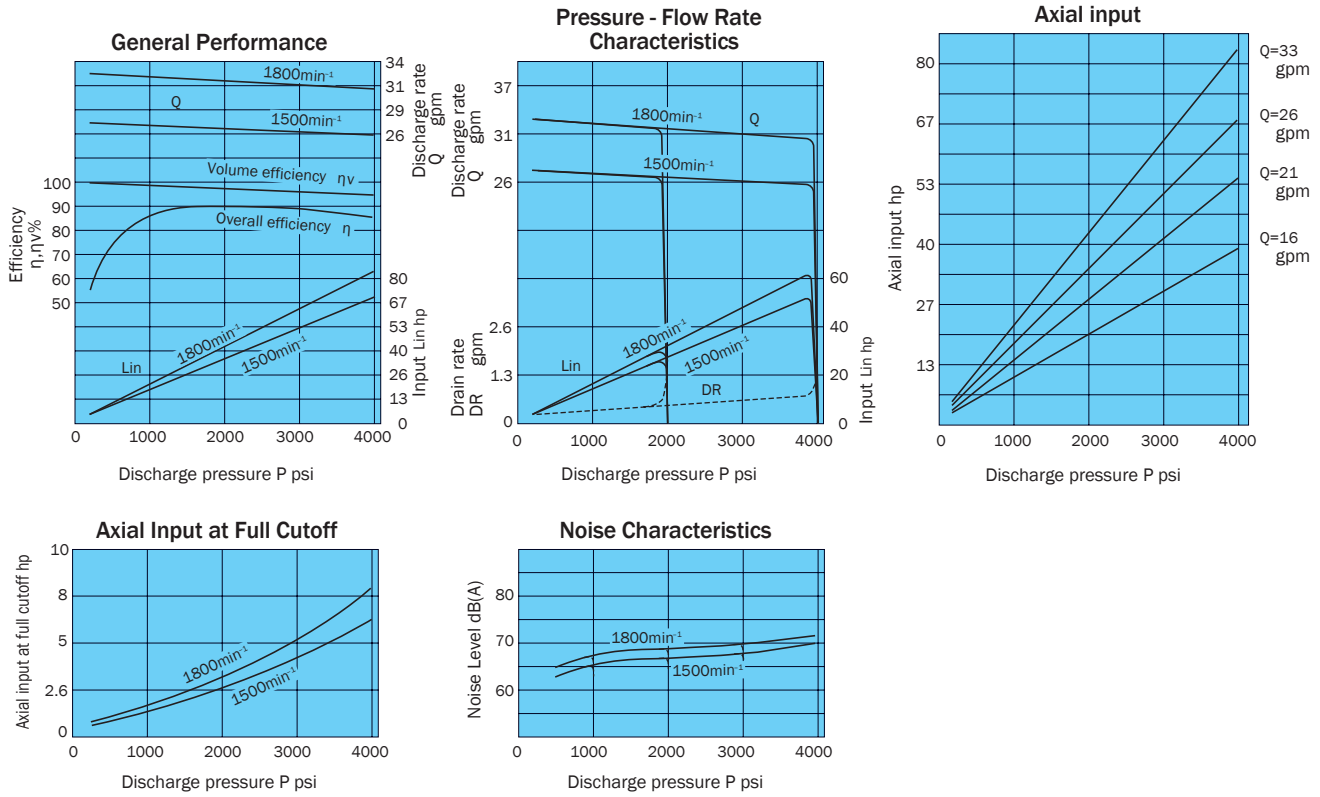


- Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot. Do not touch the surface of the coil directly with your hands.
- Do not use the solenoid valve to release the pressure in the hydraulic circuit

# Performance Curves

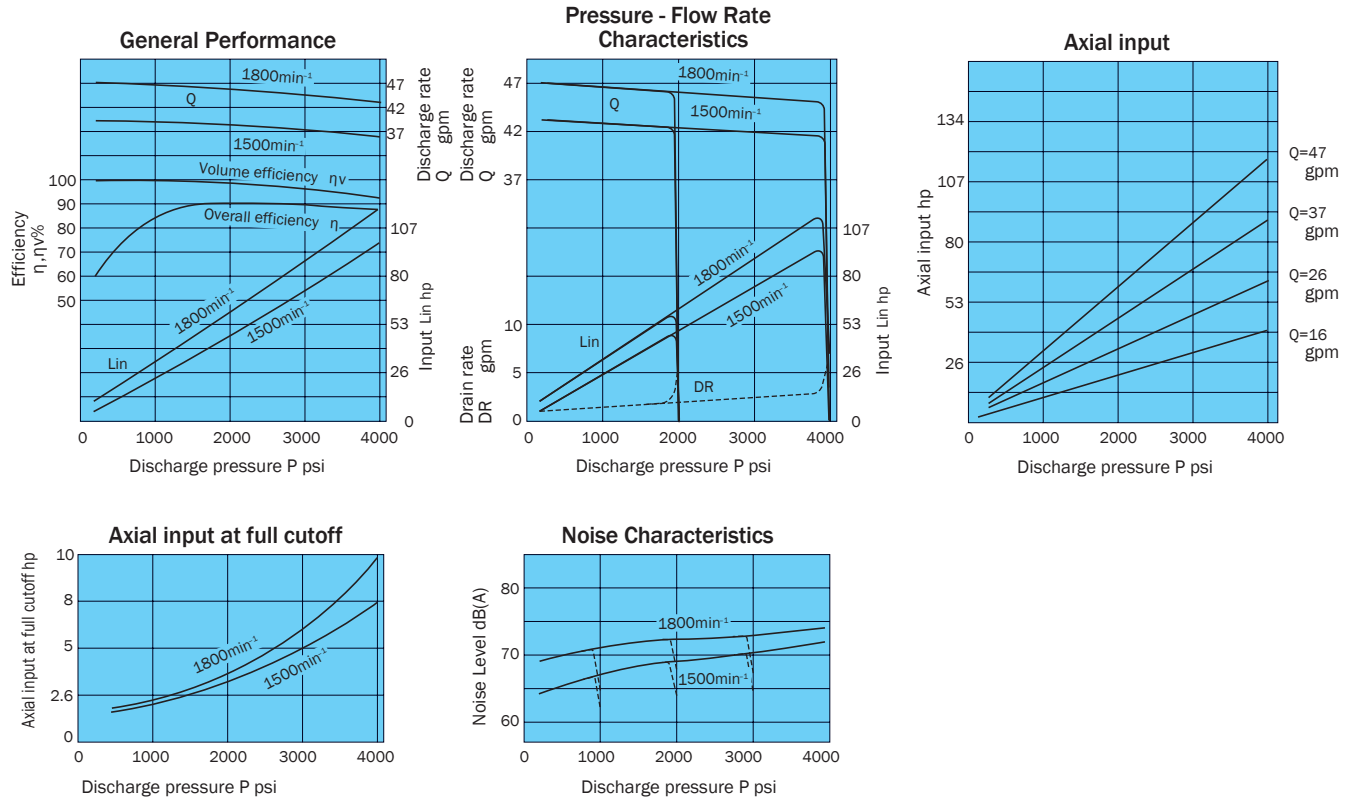
Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 centistokes

PZS-3B-70N\*-10



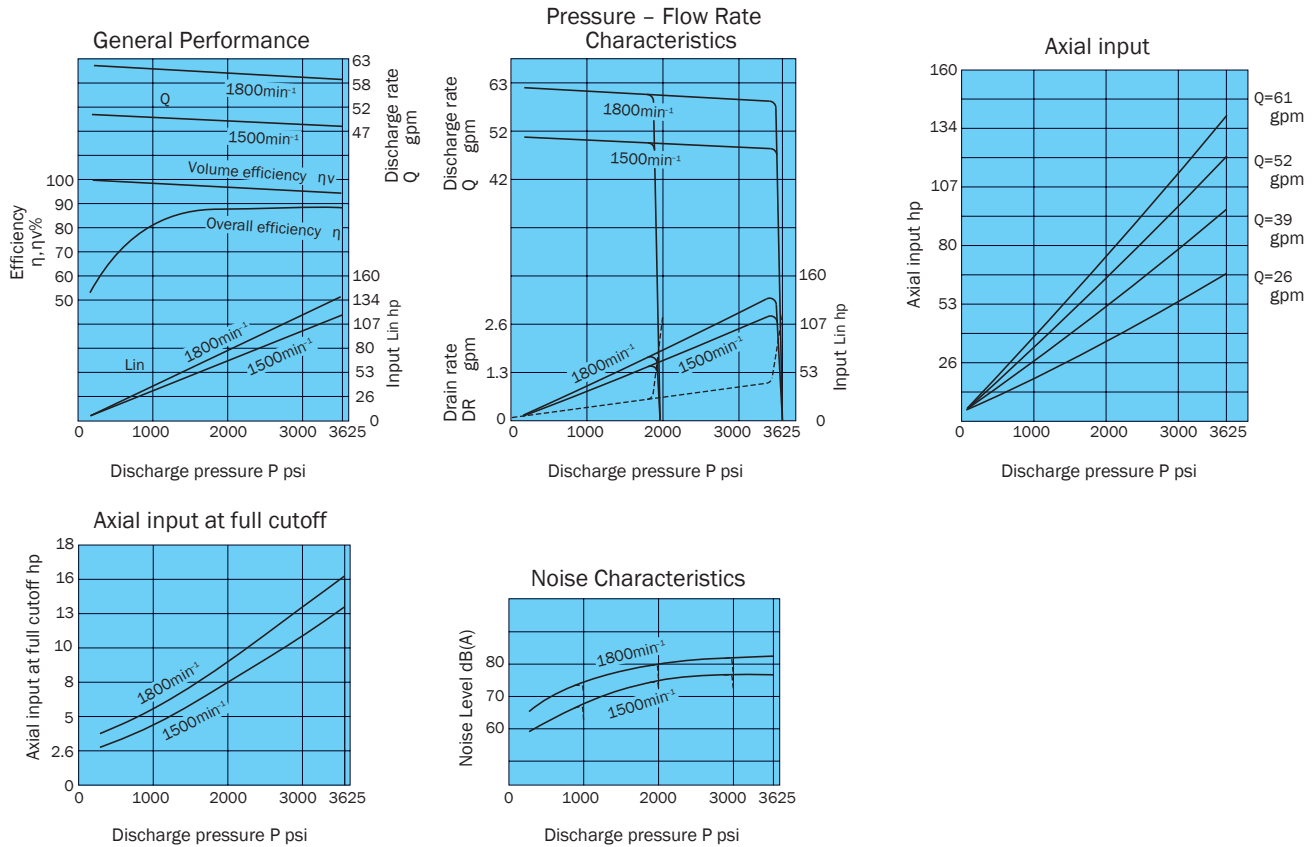
PZS-4B-100N\*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 centistokes



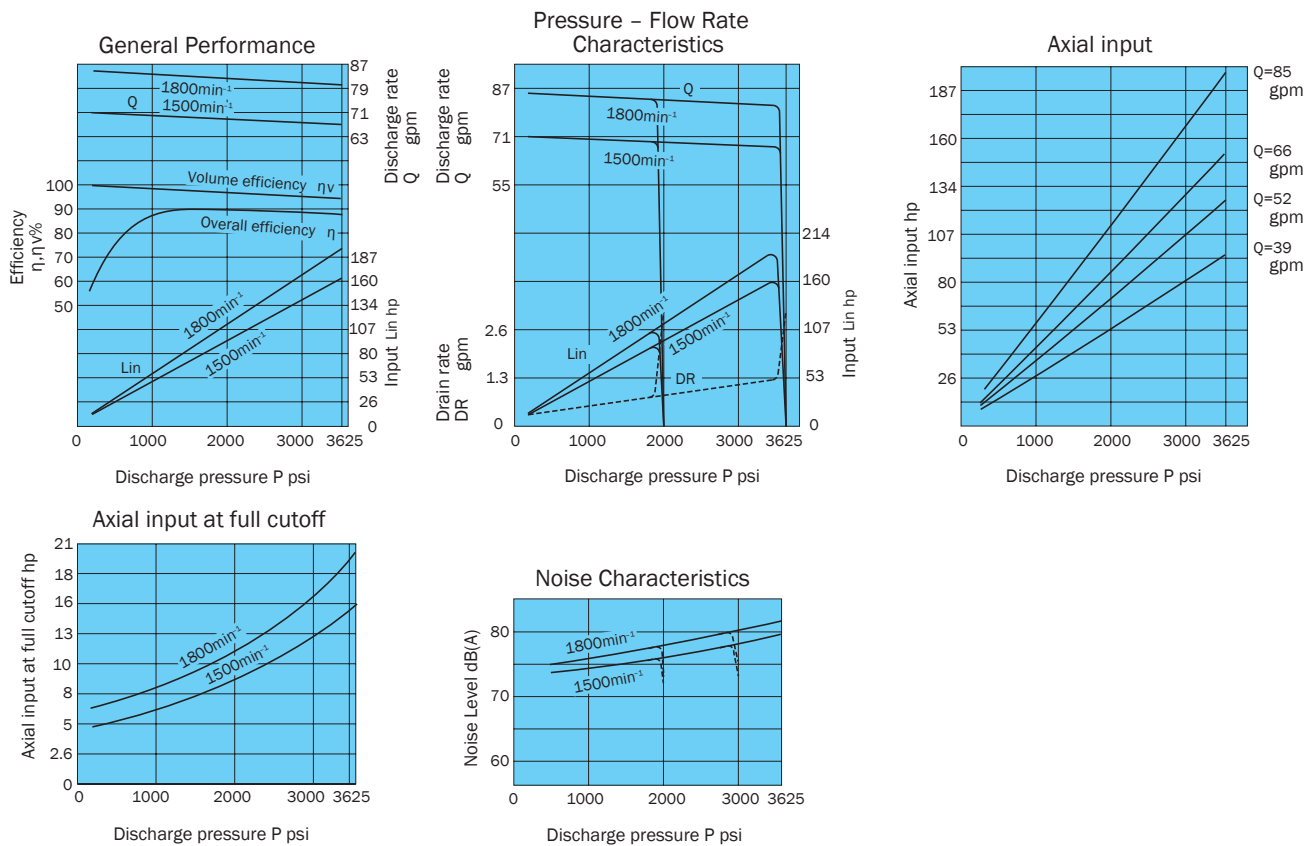
**PZS-5B-130N\*-10**

**Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 centistokes**



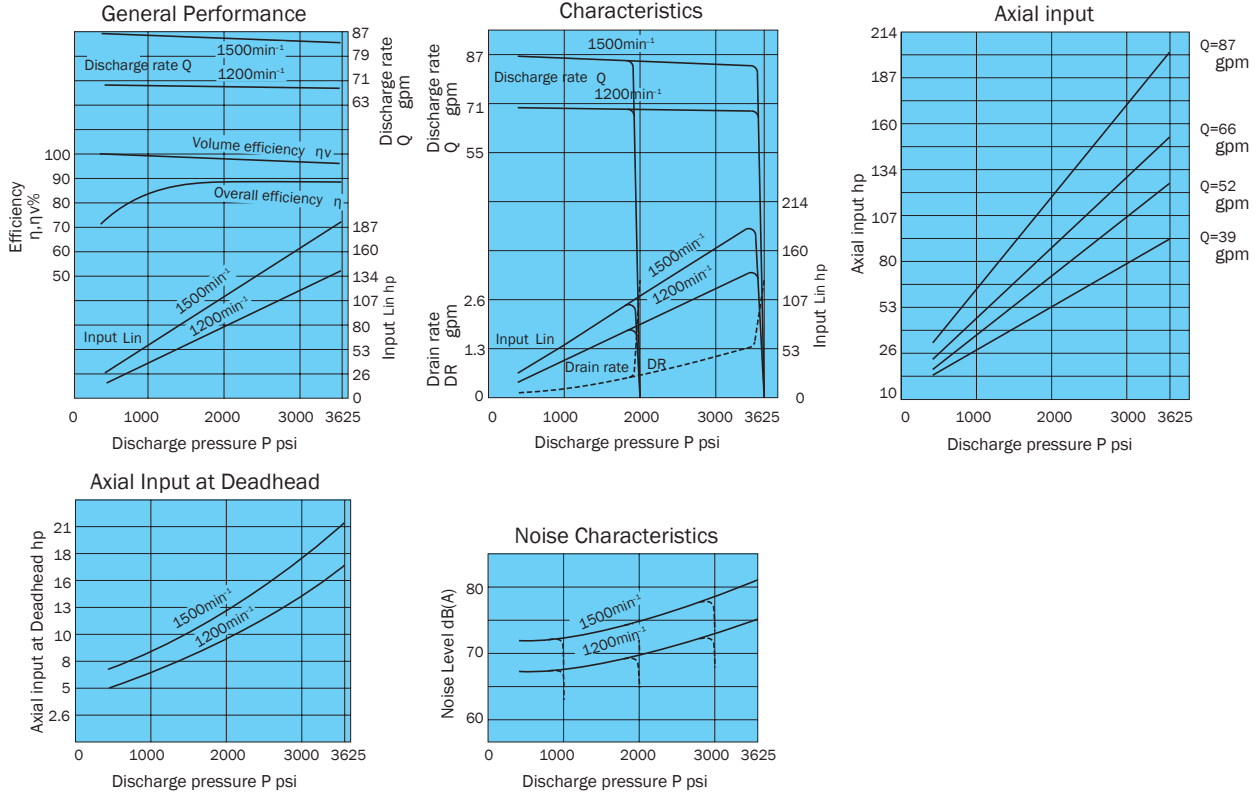
**PZS-6B-180N\*-10**

**Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 centistokes**



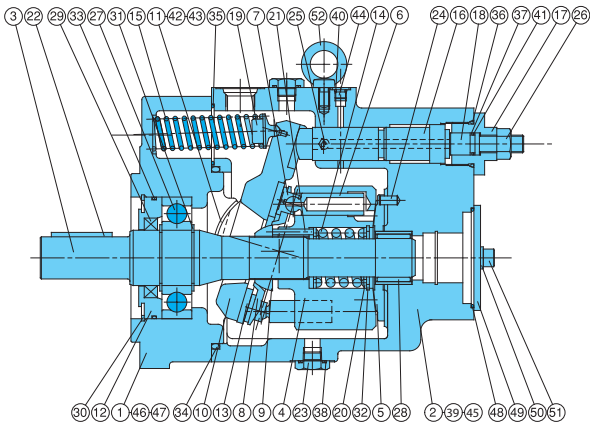
PZS-6B-220N\*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 centistokes



Performance Curves

PZS-3B-70N\*-10    PZS-4B-100N\*-10    PZS-6B-\*\*N\*-10



| Part No. | Part Name       | Part No. | Part Name      | Part No. | Part Name               |
|----------|-----------------|----------|----------------|----------|-------------------------|
| 1        | Body            | 19       | Spring holder  | 37       | O-ring                  |
| 2        | Case            | 20       | Retainer       | 38       | O-ring                  |
| 3        | Shaft           | 21       | Needle         | 39       | O-ring                  |
| 4        | Cylinder barrel | 22       | Key            | 40       | O-ring                  |
| 5        | Valve plate     | 23       | Plug           | 41       | Backup ring             |
| 6        | Piston          | 24       | Pin            | 42       | Orifice                 |
| 7        | Shoe            | 25       | Orifice        | 43       | Flat philips head screw |
| 8        | Shoe holder     | 26       | Nut            | 44       | Plug                    |
| 9        | Barrel holder   | 27       | Ball bearing   | 45       | Pin                     |
| 10       | Swash plate     | 28       | Needle bearing | 46       | Bolt                    |
| 11       | Thrust bush     | 29       | Oil seal       | 47       | Plug                    |
| 12       | Seal holder     | 30       | Snap ring      | 48       | O-ring                  |
| 13       | Thrust plate    | 31       | Snap ring      | 49       | Plate                   |
| 14       | Spring C        | 32       | Snap ring      | 50       | Washer                  |
| 15       | Spring S        | 33       | O-ring         | 51       | Bolt                    |
| 16       | Control piston  | 34       | O-ring         | 52       | Eye bolt                |
| 17       | End plug        | 35       | O-ring         |          |                         |
| 18       | Guide screw     | 36       | O-ring         |          |                         |

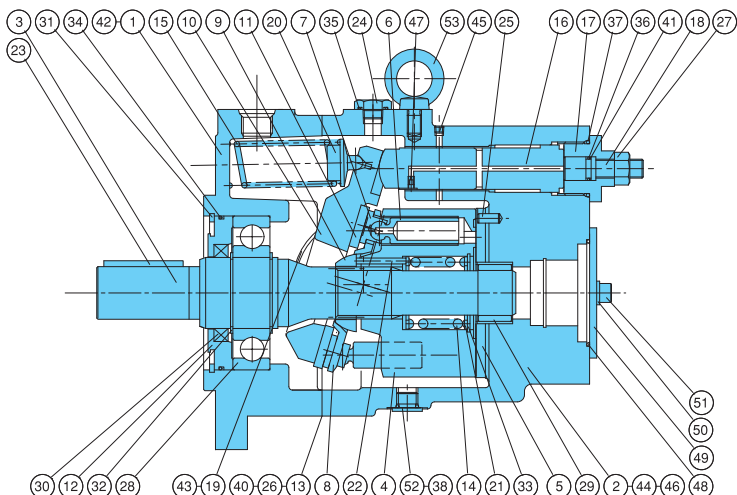
List of Sealing Parts (Kit Model Number 3B : PZBS-103000, 4B : PZAS-104100, 5B: PZAS-104000, 6B : PZBS-106000)

| Part No. | Name        | Product Number |      |            |      | Remarks    |        |            |
|----------|-------------|----------------|------|------------|------|------------|--------|------------|
|          |             | PZS-3B         | Q'ty | PZS-4B     | Q'ty |            | PZS-6B | Q'ty       |
| 29       | Oil seal    | TCN-456812     | 1    | TCN-507212 | 1    | TCN-659013 | 1      | NOK        |
| 33       | O-ring      | 1B-G95         | 1    | 1B-G105    | 1    | 1B-G135    | 1      | JIS B 2401 |
| 34       | O-ring      | 1B-G130        | 1    | 1B-G155    | 1    | 1B-G200    | 1      | "          |
| 35       | O-ring      | 1B-G50         | 1    | 1B-G50     | 1    | 1B-G65     | 1      | "          |
| 36       | O-ring      | 1B-P34         | 1    | 1B-P36     | 1    | 1B-P41     | 1      | "          |
| 37       | O-ring      | 1B-P12         | 1    | 1B-P16     | 1    | 1B-P16     | 1      | "          |
| * 38     | O-ring      | 1B-P14         | 2    | 1B-P14     | 3    | 1B-P14     | 3      | "          |
| 39       | O-ring      | Note 1         | 1    | 1B-P9      | 1    | 1B-P10     | 1      | "          |
| 40       | O-ring      | 1B-P8          | 5    | 1B-P8      | 5    | 1B-P8      | 8      | "          |
| 41       | Backup ring | T2-P12         | 1    | T2-P16     | 1    | T2-P16     | 1      | JIS B 2407 |
| 48       | O-ring      | Note 1         | 1    | 1B-G85     | 1    | 1B-G85     | 1      | JIS B 2401 |

Note 1: Contact your agent about this type of O-ring.



**PZS-5B-130N\*-10**



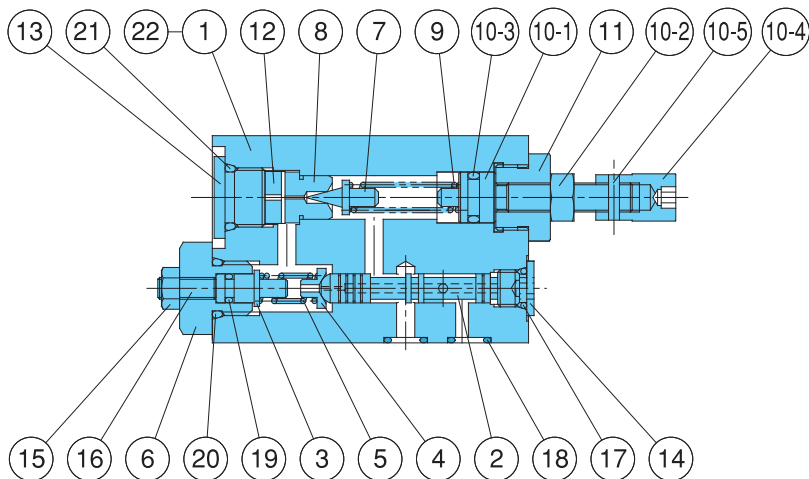
| Part No. | Part Name       | Part No. | Part Name               |
|----------|-----------------|----------|-------------------------|
| 1        | Body            | 28       | Ball bearing            |
| 2        | Case            | 29       | Needle bearing          |
| 3        | Shaft           | 30       | Oil seal                |
| 4        | Cylinder barrel | 31       | Snap ring               |
| 5        | Valve plate     | 32       | Snap ring               |
| 6        | Piston          | 33       | Snap ring               |
| 7        | Shoe            | 34       | O-ring                  |
| 8        | Shoe holder     | 35       | O-ring                  |
| 9        | Barrel holder   | 36       | O-ring                  |
| 10       | Swash plate     | 37       | O-ring                  |
| 11       | Thrust plate    | 38       | O-ring                  |
| 12       | Seal holder     | 39       | O-ring                  |
| 13       | Gasket          | 40       | O-ring                  |
| 14       | Spring C        | 41       | Backup ring             |
| 15       | Spring S        | 42       | Bolt                    |
| 16       | Control piston  | 43       | Flat philips head screw |
| 17       | End plug        | 44       | Plug                    |
| 18       | Guide screw     | 45       | Plug                    |
| 19       | Thrust bush     | 46       | Plug                    |
| 20       | Spring holder   | 47       | Orifice                 |
| 21       | Retainer        | 48       | O-ring                  |
| 22       | Needle          | 49       | Plate                   |
| 23       | Key             | 50       | Washer                  |
| 24       | Plug            | 51       | Bolt                    |
| 25       | Pin             | 52       | Plug                    |
| 26       | Connector       | 53       | Eye bolt                |
| 27       | Nut             |          |                         |

**PZS-5B (Kit Model Number 5B : PZAS-104000)**

| Part No. | Name        | Q'ty | Size       | Remarks    |
|----------|-------------|------|------------|------------|
| 13       | Gasket      | 1    | *          | 3 Bond     |
| 30       | Oil seal    | 1    | TCN-608212 | N. O. K    |
| 34       | O-ring      | 1    | 1B-G125    | JIS B 2401 |
| 35       | O-ring      | 2    | 1B-P21     | JIS B 2401 |
| 36       | O-ring      | 1    | 1B-P16     | JIS B 2401 |
| 37       | O-ring      | 1    | 1B-P42     | JIS B 2401 |
| 38       | O-ring      | 1    | 1B-P14     | JIS B 2401 |
| 39       | O-ring      | 5    | 1B-P8      | JIS B 2401 |
| 40       | O-ring      | 2    | 1B-P7      | JIS B 2401 |
| 41       | Backup ring | 1    | T2-P16     | JIS B 2407 |
| 48       | O-ring      | 1    | 1B-G85     | JIS B 2401 |

Parts marked by an asterisk "\*" are not available on the market. Consult your agent.

**Pressure Compensator**



| Part No. | Part Name            | Part No. | Part Name         |
|----------|----------------------|----------|-------------------|
| 1        | Valve body           | 12       | Collar            |
| 2        | Spool                | 13       | Plug              |
| 3        | Spring guide         | 14       | Plug              |
| 4        | Spring bearing       | 15       | Nut               |
| 5        | Spring               | 16       | Socket head screw |
| 6        | Retainer             | 17       | O-ring            |
| 7        | Needle valve         | 18       | O-ring            |
| 8        | Valve seat           | 19       | O-ring            |
| 9        | Spring               | 20       | O-ring            |
| 10       | Adjustment screw kit | 21       | O-ring            |
| 10-1     | Adjustment screw     | 22       | Plug              |
| 10-2     | Nut                  |          |                   |
| 10-3     | O-ring               |          |                   |
| 10-4     | Nut                  |          |                   |
| 10-5     | Spring pin           |          |                   |
| 11       | Retainer             |          |                   |

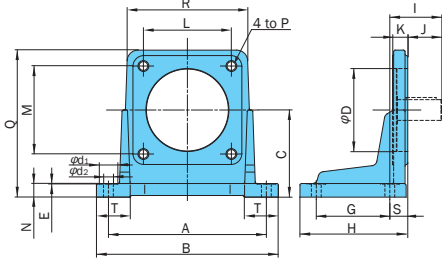
**List of Sealing Parts**

| Part No. | Name   | Part Number |      |            |      | Remarks    |
|----------|--------|-------------|------|------------|------|------------|
|          |        | PZS-3B, 4B  | Q'ty | PZS-5B, 6B | Q'ty |            |
| 10-3     | O-ring | 1B-P10A     | 1    | 1B-P10A    | 1    | JIS B 2401 |
| 17       | O-ring | 1B-P8       | 1    | 1B-P11     | 2    | "          |
| 18       | O-ring | 1B-P9       | 4    | 1B-P9      | 5    | "          |
| 19       | O-ring | 1B-P5       | 1    | 1B-P14     | 1    | "          |
| 20       | O-ring | 1B-P12      | 1    | 1B-P22     | 1    | "          |
| 21       | O-ring | 1B-P14      | 1    | 1B-P14     | 1    | "          |

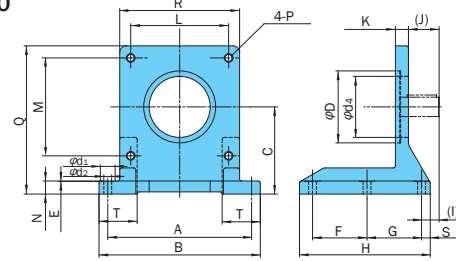
**Foot Mounting Kit**

**Foot Mounting Installation Measurement Chart**

PZM \*- 10



IHM - 55 - 10



| Foot Mounting Kit Model No. | Applicable Pump Model No. | Accessories |      |         |      | Measurements (mm) |     |       |   |     |       |     |       |
|-----------------------------|---------------------------|-------------|------|---------|------|-------------------|-----|-------|---|-----|-------|-----|-------|
|                             |                           | Bolt        | Q'ty | Washer  | Q'ty | A                 | B   | C     | E | F   | G     | H   | (l)   |
| PZM-3-10                    | PZS-3B                    | TH-16 ×40   | 4    | WP-16   | 4    | 295.3             | 334 | 152.4 | 1 | -   | 139.7 | 203 | 104.5 |
| PZM-4-10                    | PZS-4B                    | TH-20 ×45   | 4    | WP-20   | 4    | 290               | 334 | 160   | 1 | -   | 135   | 198 | 95    |
| IHM-55-10                   | PZS-5B , 6B               | TH-20 ×50   | 4    | WS-B-20 | 4    | 330               | 370 | 200   | 1 | 125 | 125   | 300 | 40    |

| Foot Mounting Kit Model No. | Measurements (mm) |    |       |       |    |     |     |     |      |    |       |                 |                 |                 |      | Weight kg |
|-----------------------------|-------------------|----|-------|-------|----|-----|-----|-----|------|----|-------|-----------------|-----------------|-----------------|------|-----------|
|                             | (J)               | K  | L     | M     | N  | P   | Q   | R   | (S)  | T  | φD    | φd <sub>1</sub> | φd <sub>2</sub> | φd <sub>4</sub> |      |           |
| PZM-3-10                    | 60                | 25 | 128   | 128   | 25 | M16 | 259 | -   | 44.5 | 61 | 127   | 35              | 18              | 86              | 13.5 |           |
| PZM-4-10                    | 62                | 28 | 161.6 | 161.6 | 25 | M20 | 270 | 220 | 33   | 62 | 152.4 | 34              | 18              | φ152.4          | 18.0 |           |
| IHM-55-10                   | 70 (Note)         | 30 | 224.6 | 224.6 | 30 | M20 | 340 | 275 | 20   | 90 | 165.1 | 34              | 18              | 140             | 32.0 |           |

Note: The IHM-55-10 (J) dimension (70) is the value for the PZS-5B. This dimension becomes 58 in the case of the PZS-6B. The IHM-55-10 (l) dimension (40) is the value for the PZS-5B. This dimension becomes 28 in the case of the PZS-6B. See the IHM-45-10 on pages B-36 and C-12 to see what the PZM-3-10 looks like.

**Piping Flange Kit**

**Screw In Type**

| Screw In Type Flange Kit model No. | Applicable Pump Model No. | IN Flange       |      |           |        |         |   |        |   |
|------------------------------------|---------------------------|-----------------|------|-----------|--------|---------|---|--------|---|
|                                    |                           | Flange Part No. | Bolt | Washer    | O-ring |         |   |        |   |
| PJFE-10300T                        | PZS-3B                    | IH03J-100120    | 1    | TH-12 ×55 | 4      | WS-B-12 | 4 | 1B-G50 | 1 |
| PJFE-10400T                        | PZS-4B                    | IH03J-100160    | 1    | TH-12 ×60 | 4      | WS-B-12 | 4 | 1B-G60 | 1 |
| PJFE-10500T                        | PZS-5B                    | IH03J-100200    | 1    | TH-12 ×65 | 4      | WS-B-12 | 4 | 1B-G75 | 1 |
| PJFE-10600T                        | PZS-6B                    | IH03J-100240    | 1    | TH-16 ×75 | 4      | WS-B-16 | 4 | 1B-G85 | 1 |

| OUT Flange      |      |           |        |         |   |        |   |
|-----------------|------|-----------|--------|---------|---|--------|---|
| Flange Part No. | Bolt | Washer    | O-ring |         |   |        |   |
| IH03J-100100    | 1    | TH-10 ×55 | 4      | WS-B-10 | 4 | 1B-G40 | 1 |
| IH03J-100160    | 1    | TH-12 ×60 | 4      | WS-B-12 | 4 | 1B-G60 | 1 |
| IH03J-100200    | 1    | TH-12 ×65 | 4      | WS-B-12 | 4 | 1B-G75 | 1 |
| IH03J-100200    | 1    | TH-12 ×65 | 4      | WS-B-12 | 4 | 1B-G75 | 1 |

**Welded Type**

| Welded Type Flange Kit model No. | Applicable Pump Model No. | IN Flange       |      |           |        |         |   |        |   |
|----------------------------------|---------------------------|-----------------|------|-----------|--------|---------|---|--------|---|
|                                  |                           | Flange Part No. | Bolt | Washer    | O-ring |         |   |        |   |
| PJF-10300E                       | PZS-3B                    | IH03J-200120    | 1    | TH-12 ×55 | 4      | WS-B-12 | 4 | 1B-G50 | 1 |
| PJF-10400E                       | PZS-4B                    | IH03J-200160    | 1    | TH-12 ×60 | 4      | WS-B-12 | 4 | 1B-G60 | 1 |
| PJF-10500E                       | PZS-5B                    | IH03J-200200    | 1    | TH-12 ×75 | 4      | WS-B-12 | 4 | 1B-G75 | 1 |
| PJF-10600E                       | PZS-6B                    | IH03J-200240    | 1    | TH-16 ×75 | 4      | WS-B-16 | 4 | 1B-G85 | 1 |

| OUT Flange      |      |           |        |         |   |        |   |
|-----------------|------|-----------|--------|---------|---|--------|---|
| Flange Part No. | Bolt | Washer    | O-ring |         |   |        |   |
| IH03J-200100    | 1    | TH-10 ×55 | 4      | WS-B-10 | 4 | 1B-G40 | 1 |
| IH03J-200160    | 1    | TH-12 ×60 | 4      | WS-B-12 | 4 | 1B-G60 | 1 |
| IH03J-200200    | 1    | TH-12 ×65 | 4      | WS-B-12 | 4 | 1B-G75 | 1 |
| IH03J-200200    | 1    | TH-12 ×65 | 4      | WS-B-12 | 4 | 1B-G75 | 1 |

See page C-11 for dimensions. O-ring 1B-\*\* refers to JIS B2401-1B-\*\*. See page C-11 for details on tightening torque.

## Replacement Items

### PZS Rotating Group

|                |             |
|----------------|-------------|
| PZS-3B-70N*10  | PZBG-103000 |
| PZS-4B-100N*10 | PZG-104100  |
| PZS-5B-130N*10 | PZG-104000  |
| PZS-6B-220N*10 | PZBG-106000 |
| PZS-6B-180N*10 | PZBG-106100 |

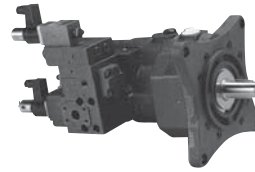
Includes Items 4,5,6 & 7

### PZS Thrust Plate Item 11 (2 required per pump)

|                 |              |
|-----------------|--------------|
| PZS-3B-70N*E30  | PZB69-103000 |
| PZS-4B-100N*E13 | PZ69-104100  |
| PZS-5B-130N*E13 | PZ69-104000  |
| PZS-6B-220N*E13 | PZB69-106000 |
| PZS-6B-180N*E13 | PZB69-106000 |

### PZS Compensator Kit

|                | N1              | N3              | N4              |
|----------------|-----------------|-----------------|-----------------|
| PZS-3B-70N*10  | ZR-G01-RI-2089C | ZR-G01-R3-2089C | ZR-G01-R4-2089C |
| PZS-4B-100N*10 | ZR-G01-RI-2089C | ZR-G01-R3-2089C | ZR-G01-R4-2089C |
| PZS-5B-130N*10 | ZR-G01-RI-4049B | ZR-G01-R3-4049B | ZR-G01-R4-4049B |
| PZS-6B-220N*10 | ZR-G01-RI-4049B | ZR-G01-R3-4049B | ZR-G01-R4-4049B |
| PZS-6B-180N*10 | ZR-G01-RI-4049B | ZR-G01-R3-4049B | ZR-G01-R4-4049B |



**PZ Series Load Sensitive Variable Piston Pump**

**2.13 to 13.42 cu in/rev  
3045 psi**

**Features**

- 1 The PZ Series load sensitive variable piston pump employs the semi-cylindrical swash plate that is part of the basic technology used by the PVS series variable piston pump. To this it adds a hydrostatic bearing mechanism, valve plate, and other noise reducing mechanisms for operation that is even quieter than that of PVS Series pumps.
- 2 The pump body houses an electro-hydraulic proportional control valve, compensator, and surge cutoff valve, which eliminates the need for superfluous piping.
- 3 The electro-hydraulic proportional control valve uses the proven force feedback system for improved hysteresis, repeatability, and response.
- 4 The ability to create a double pump configuration with an IP pump further expands the range of possible applications.

**Specifications**

**Pump System Specifications**

| Model No.                           | Pump Capacity cu in/rev | Maximum Working Pressure psi | Pressure Adjustment Range psi             | Flow Control Limit Range gpm Note 3 | Revolution Speed min <sup>-1</sup> |      | Weight lbs | Fixed Discharge Pump Note 1 |              |
|-------------------------------------|-------------------------|------------------------------|---|-------------------------------------|------------------------------------|------|------------|-----------------------------|--------------|
|                                     |                         |                              |   |                                     | Min.                               | Max. |            | Capacity cu in/rev          | Pressure psi |
| PZ-2B-* 35E1A-11<br>2<br>3          | 2.13                    | 3045                         | 290 to 1000<br>290 to 2000<br>290 to 3000 | .26 to 16.6                         | 600                                | 2000 | 79         | 3.6 to 8.18                 | 3000         |
| PZ-2B-* 45E1A-11<br>2               | 2.74                    | 2030                         | 290 to 2000<br>290 to 3000                | .26 to 21                           | 600                                | 2000 | 79         | 3.6 to 8.18                 | 3000         |
| PZ-3B-* 70E1A-10<br>2<br>3          | 4.27                    | 3045                         | 290 to 1000<br>290 to 2000<br>290 to 3000 | .26 to 33                           | 600                                | 1800 | 132        | 3.6 to 15.8                 | 3000         |
| PZ-4B-*100E1A-10<br>2<br>3          | 6.10                    | 3045                         | 290 to 1000<br>290 to 2000<br>290 to 3000 | .26 to 47.5                         | 600                                | 1800 | 167        | 3.6 to 15.8                 | 3000         |
| PZ-5B-*130E1A-10<br>2<br>(Note 2) 3 | 7.93                    | 3045                         | 290 to 1000<br>290 to 2000<br>290 to 3000 | .79 to 61.8                         | 600                                | 1800 | 220        | 3.6 to 32.3                 | 3000         |
| PZ-6B-*180E1A-20<br>2<br>3          | 10.98                   | 3045                         | 290 to 1000<br>290 to 2000<br>290 to 3000 | .79 to 85.6                         | 600                                | 1800 | 353        | 3.6 to 63.9                 | 3000         |
| PZ-6B-*220E1A-20<br>2<br>3          | 13.42                   | 3045                         | 290 to 1000<br>290 to 2000<br>290 to 3000 | .79 to 87.1                         | 600                                | 1500 | 357        | 3.6 to 63.9                 | 3000         |

Note 1: Can be used in combination with an IP pump to configure a fixed discharge pump.

Note 2: The PZ-4B-130 model number was changed to PZ-5B-130.

Note 3: Maximum flow rate depends on the revolution speed. Values in the above table are for a speed of 1800min<sup>-1</sup> for the PZ-2B to PZ-6B-180, and 1500min<sup>-1</sup> for the PZ-6B-220.

**Pressure/Flow Rate Control System Specifications  
Pressure Control System**

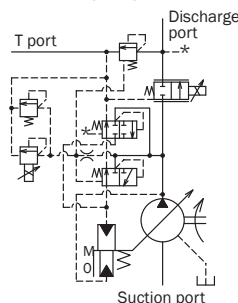
|                            |   |
|----------------------------|---|
| Pressure Control Range psi | .26 to 1000<br>.26 to 2000<br>.26 to 3000 |
| Rated Current mA           | 800                                       |
| Coil Resistance Ω          | 20 (20° C)                                |
| Hysteresis %               | 3% max. Note 1                            |

**Flow Rate Control System**

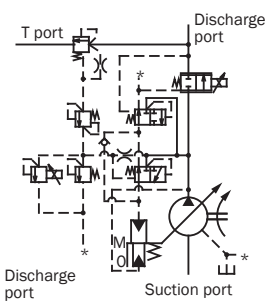
|                             |                |
|-----------------------------|----------------|
| Valve Differential Pressure | 145 Note 2     |
| Rated Current mA            | 800            |
| Coil Resistance Ω           | 20 (20° C)     |
| Hysteresis %                | 3% max. Note 1 |

- Note 1. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).  
 Note 2. Pressure differential of pump discharge pressure (valve IN side) and load pressure (valve OUT side).  
 Note 3. For information about power amplifiers, see pages G-26 through G-37.

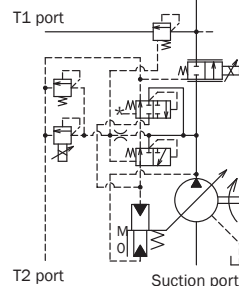
**PZ-2B/3B/5B**



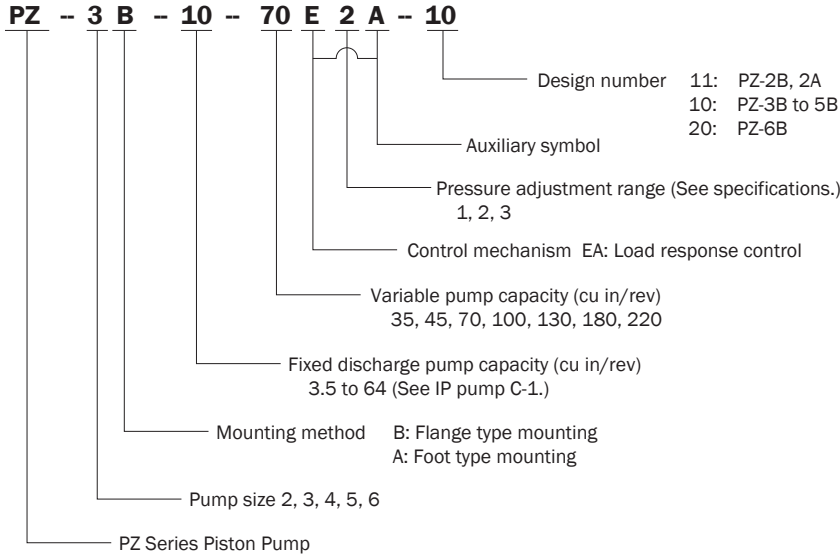
**PZ-4B-100**



**PZ-6B**



## Understanding Model Numbers



- Handling
- Pump Installation and Piping Precautions

- Use flexible couplings for connecting the pump shaft to the drive shaft, and prevent radial or thrust load from being applied to the pump shaft.
- Eccentricity between the drive shaft and pump shaft should be no greater than 0.01 in, with an eccentric angle error of 1° or less.
- Keep the clamping length of couplings and pump shafts at least 2/3 the length of the coupling width.
- Use a sufficiently rigid pump mounting base.
- Set pump suction side pressure to -4 psi or more (suction port flow velocity less than 6 ft/sec).
- Raise part of the drain piping so it is above the topmost part of the pump body, and insert the return section of the drain piping into the hydraulic operating fluid. Also, observe the values in the following table in order to limit the drain back pressure to 14.5 psi.

| Item<br>Model No. | PZ-2B         | 3B<br>PZ-4B<br>5B | PZ-6B       |
|-------------------|---------------|-------------------|-------------|
| Pipe Joint Size   | At least 1/2" | At least 3/4"     | At least 1" |
| Pipe I.D.         | 1/2"          | 5/8"              | 7/8"        |
| Pipe Length       | 1 m or less   | 1 m or less       | 1 m or less |

- Mount the pump so the pump shaft is oriented horizontally.
- Use of rubber hose is recommended in order to minimize noise and vibration.

- Management of Hydraulic Operating Fluid

- Use only good-quality hydraulic operating fluid with a kinematic viscosity during operation within the range of 20 to 200 centistokes.  
Normally, you should use an R&O type and wear-resistant type of ISOVG32 to 68 or equivalent.  
The optimum kinematic viscosity during operation is 20 to 50 centistokes.
- The operating temperature range is 41 to 140°F. When the oil temperature at startup is 41°F or less, run the pump at low pressure until the oil temperature reaches 40°F.
- Provide a suction strainer with a filtering grade of about 100μ (150 mesh). Provide a return line filter of grade 10μm or less on the return line to the tank. (When the pump is used at a high pressure of 2000 psi or greater, a filter of 10μm or less is recommended.)
- Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower.
- Use hydraulic operating fluid when the operating ambient temperature is in the range of 32 to 140°F.

- Startup Precautions

- Before starting up the pump, fill the pump body with clean hydraulic operating fluid through the lubrication port.

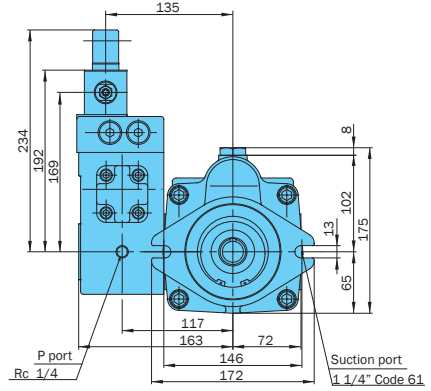
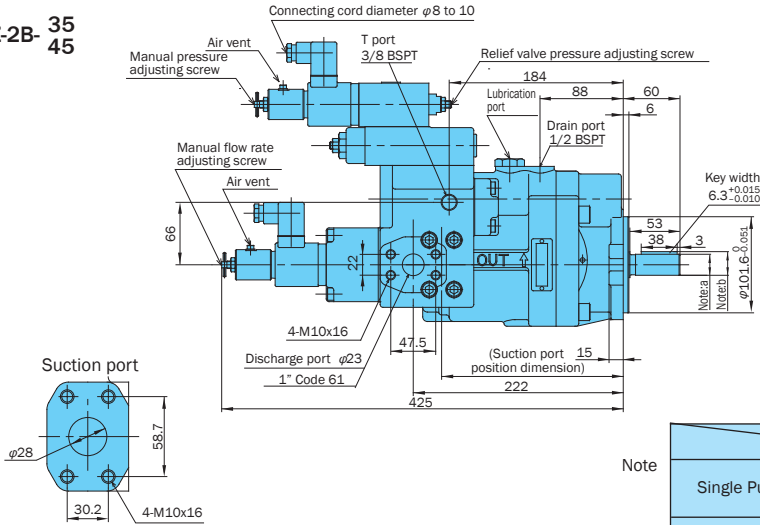
| Model No. | Oil Amount cu in |
|-----------|------------------|
| PZ-2B     | 39               |
| PZ-3B     | 61               |
| PZ-4B     | 110              |
| PZ-5B     | 134              |
| PZ-6B     | 183              |

- Check to make sure that the rotation direction of the pump is the same as the rotation direction indicated by the arrow on the pump body.
- Air entering the pump or pipes can cause noise or vibration. At startup, set the pump discharge side to a no-load state, and operate the pump in the inching mode to remove any air that might be in the pump or pipes.
- Equip an air bleed valve in circuits where it is difficult to release air before startup. (See "IP Pumps" on page C-13.)
- To enable superior pressure and flow control, loosen the air vent when starting up the pump in order to release any air, and fill the inside of the solenoid with hydraulic operating fluid. You can change the position of the air vent by rotating its cover.
- Before adjusting the manual adjusting screw from the first time or when there is no input current to the valve due to electrical malfunction or some other reason, you can control pump pressure and flow rate by rotating the manual adjusting screw. Normally, the manual adjusting screw should be returned completely to its original position and secured with the lock nut.

# Installation Diagram

## 2 Bolt SAE B Mount

PZ-2B-35  
45

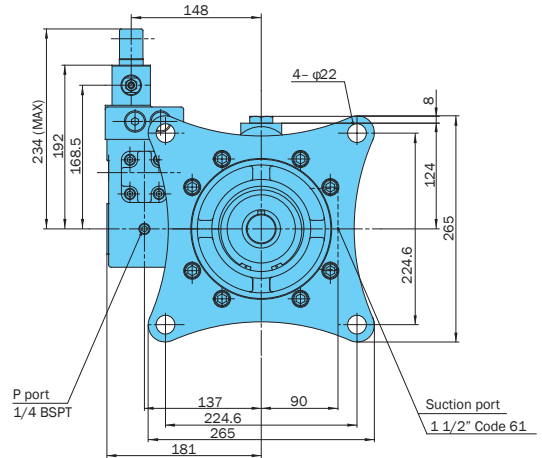
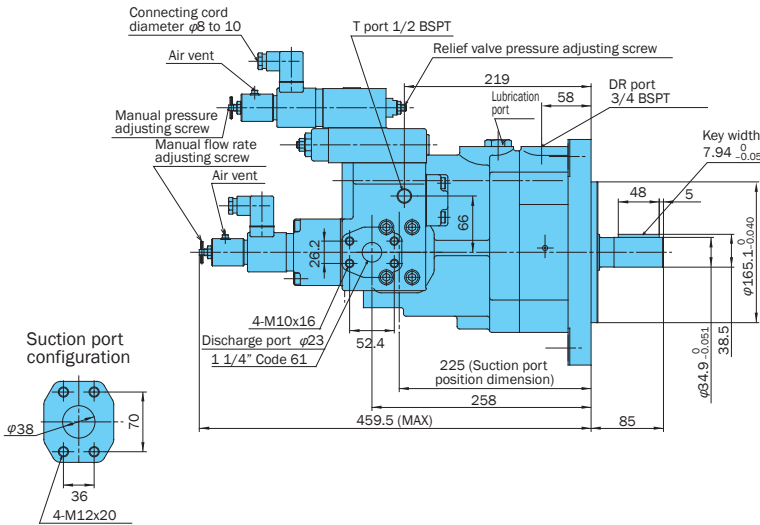


Note

|                                | a   | b  |
|--------------------------------|---|--|
| Single Pump                    | $\phi 22.23 \begin{smallmatrix} 0 \\ -0.021 \end{smallmatrix}$  | $24.9 \begin{smallmatrix} 0 \\ -0.5 \end{smallmatrix}$   |
| Double Pump with Fixed Flow IP | $\phi 25.385 \begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$ | $27.85 \begin{smallmatrix} 0 \\ -0.25 \end{smallmatrix}$ |

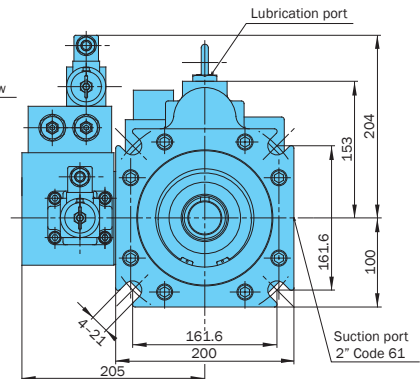
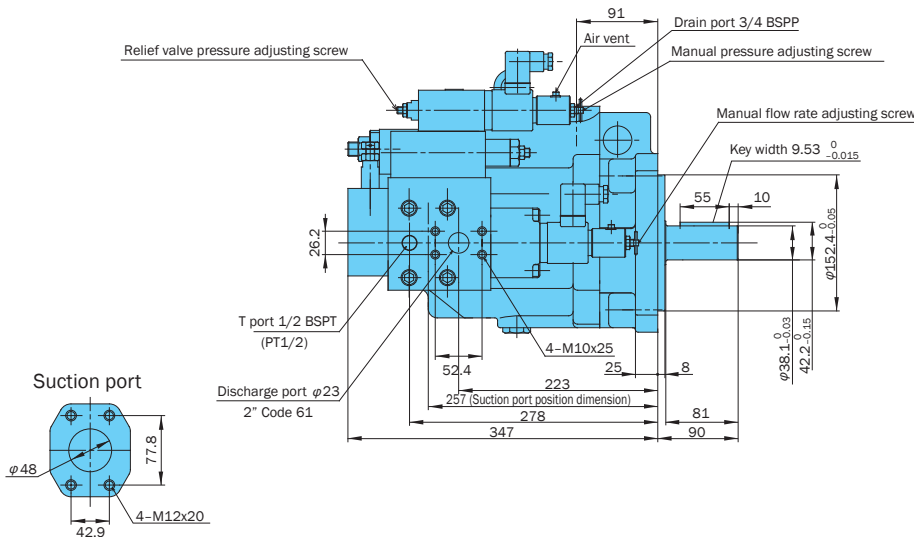
PZ-3B-70

## 4 Bolt SAE E Mount



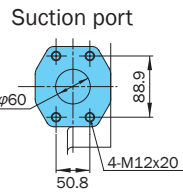
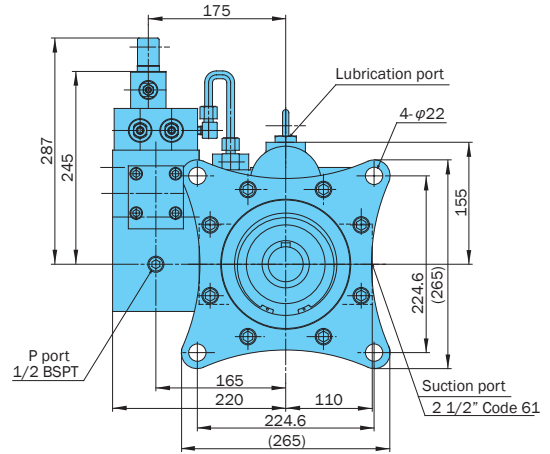
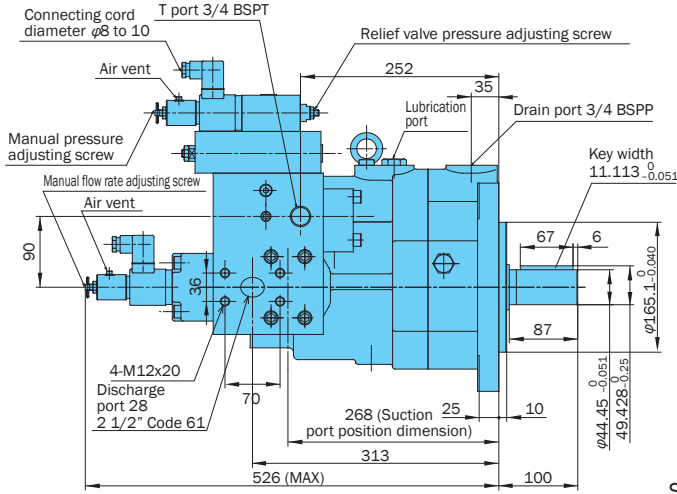
PZ-4B-100

## 4 Bolt SAE D Mount



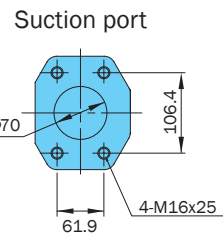
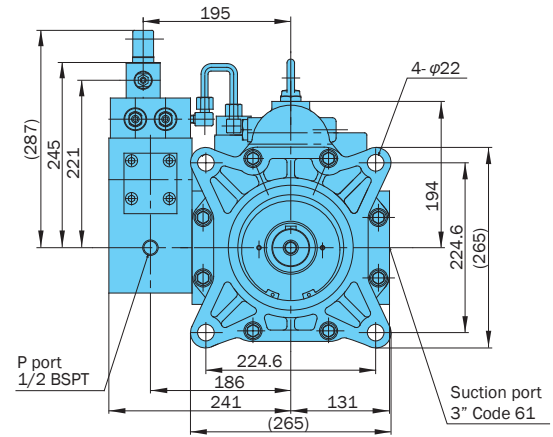
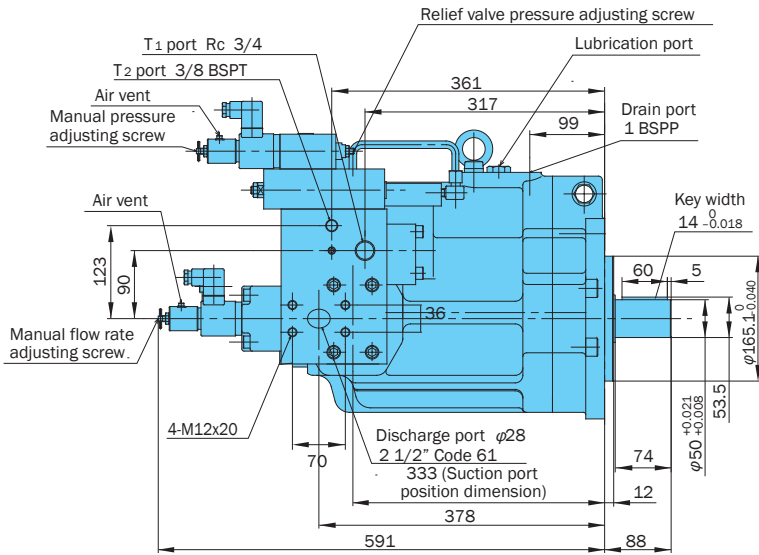
PZ-5B-130

4 Bolt SAE E Mount



PZ-6B-180  
220

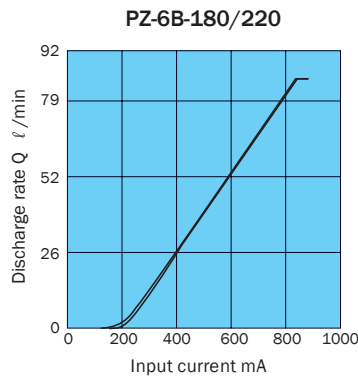
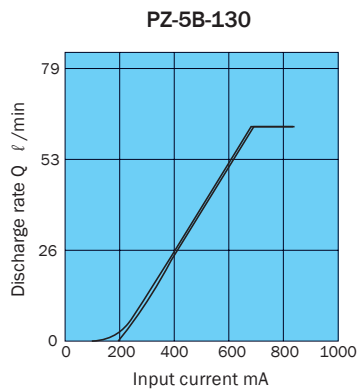
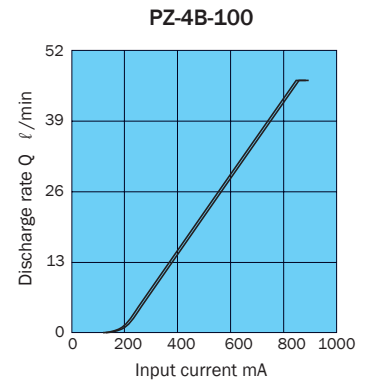
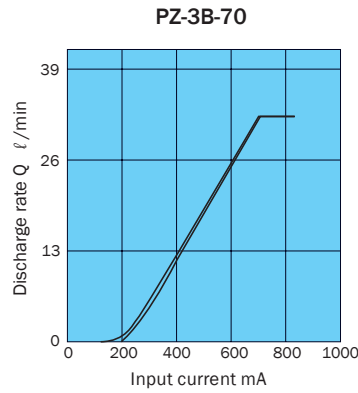
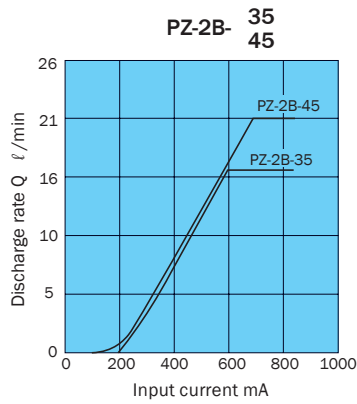
4 Bolt SAE E Mount



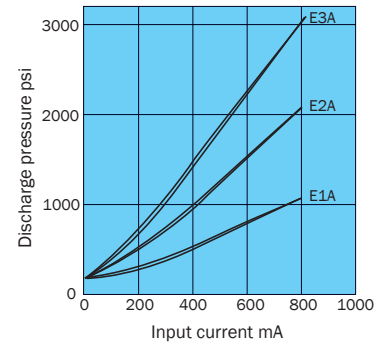
## Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

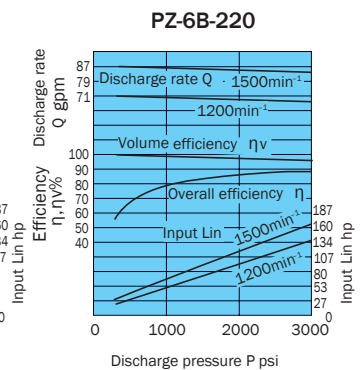
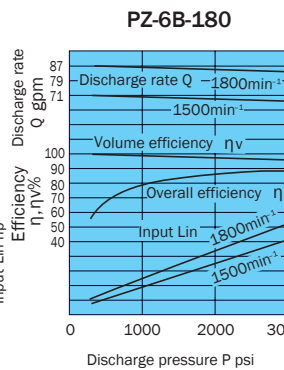
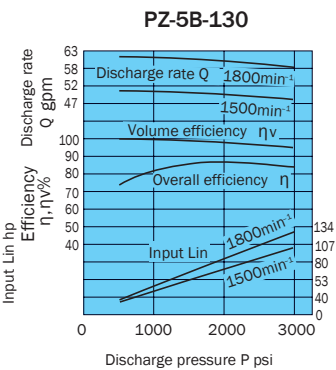
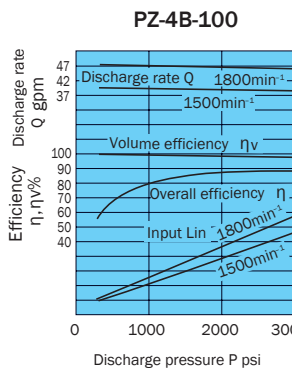
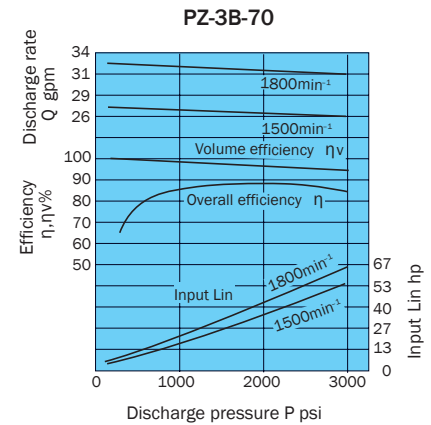
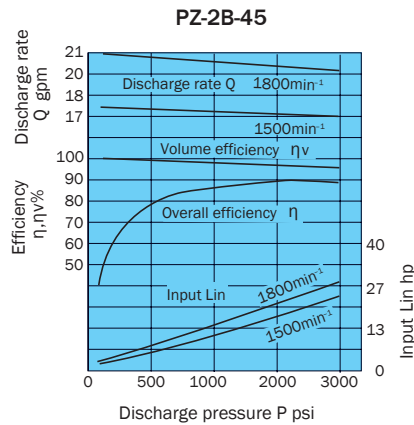
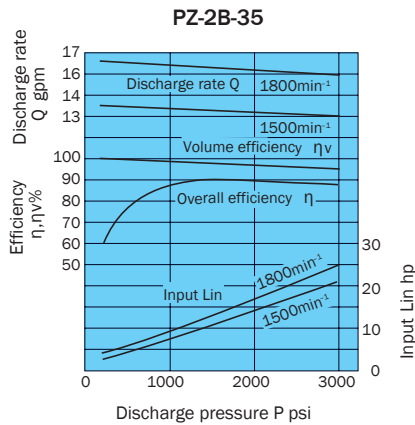
### Input Current - Discharge Rate Characteristics



### Input Current-Discharge Pressure Characteristics



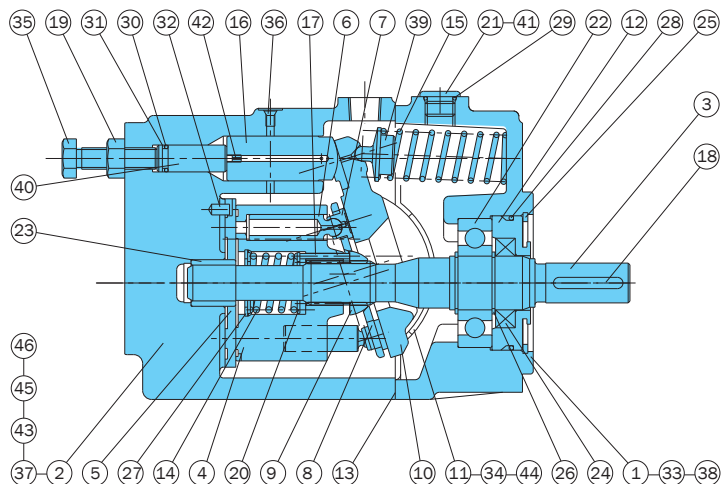
### General Performance





### Cross-Sectional Drawing

PZ-2B-<sup>35</sup>/<sub>45</sub>E\*A-11



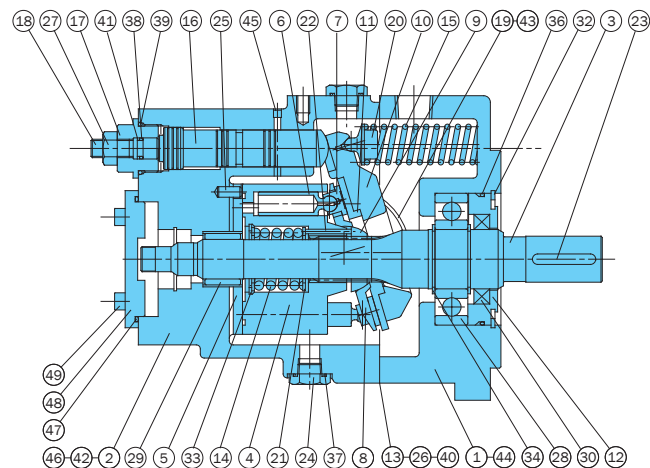
| Part No. | Part Name       | Part No. | Part Name                  |
|----------|-----------------|----------|----------------------------|
| 1        | Body            | 24       | Oil seal                   |
| 2        | Case            | 25       | Snap ring                  |
| 3        | Shaft           | 26       | Snap ring                  |
| 4        | Cylinder barrel | 27       | Snap ring                  |
| 5        | Valve plate     | 28       | O-ring                     |
| 6        | Piston          | 29       | O-ring                     |
| 7        | Shoe            | 30       | O-ring                     |
| 8        | Shoe holder     | 31       | Backup ring                |
| 9        | Barrel holder   | 32       | Pin                        |
| 10       | Swash plate     | 33       | Screw                      |
| 11       | Thrust bush     | 34       | Screw                      |
| 12       | Seal holder     | 35       | Screw                      |
| 13       | Gasket          | 36       | Plug                       |
| 14       | Spring C        | 37       | Plug                       |
| 15       | Spring S        | 38       | Plug                       |
| 16       | Control piston  | 39       | Spring holder              |
| 17       | Needle          | 40       | Guide                      |
| 18       | Key             | 41       | Hydraulic fluid input seal |
| 19       | Nut             | 42       | Orifice                    |
| 20       | Retainer        | 43       | Pin                        |
| 21       | Plug            | 44       | Orifice                    |
| 22       | Ball bearing    | 45       | Connector                  |
| 23       | Needle bearing  | 46       | O-ring                     |

#### List of Sealing Parts (Kit Model Number PSBS-102220)

| Part No. | Part Name   | Q'ty | Size           | Remarks    |
|----------|-------------|------|----------------|------------|
| * 13     | Gasket      | 1    | PS46-102000-0A | 3 Bond     |
| 24       | Oil seal    | 1    | TCN-305011     | N. O. K    |
| 28       | O-ring      | 1    | 1B-G70         | JIS B 2401 |
| 29       | O-ring      | 1    | 1B-P14         | JIS B 2401 |
| 30       | O-ring      | 1    | 1B-P11         | JIS B 2401 |
| 31       | Backup ring | 1    | T2-P11         | JIS B 2407 |
| 46       | O-ring      | 2    | 1B-P5          | JIS B 2401 |

Parts marked by an asterisk "\*" are not available on the market. Consult your agent.

PZ-3/5B-\*E\*A-10



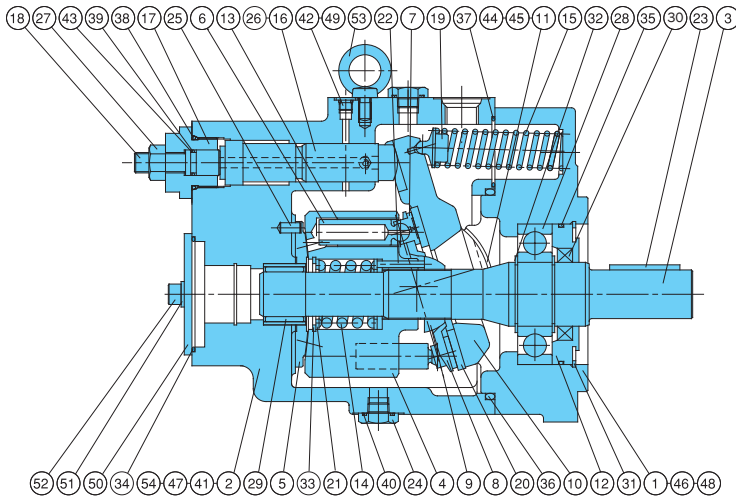
| Part No. | Part Name       | Part No. | Part Name      | Part No. | Part Name   |
|----------|-----------------|----------|----------------|----------|-------------|
| 1        | Body            | 18       | Guide screw    | 37       | O-ring      |
| 2        | Case            | 19       | Thrust bush    | 38       | O-ring      |
| 3        | Shaft           | 20       | Spring holder  | 39       | O-ring      |
| 4        | Cylinder barrel | 21       | Retainer       | 40       | O-ring      |
| 5        | Valve plate     | 22       | Needle         | 41       | Backup ring |
| 6        | Piston          | 23       | Key            | 42       | Bolt        |
| 7        | Shoe            | 24       | Plug           | 43       | Screw       |
| 8        | Shoe holder     | 25       | Pin            | 44       | Plug        |
| 9        | Barrel holder   | 26       | Connector      | 45       | Plug        |
| 10       | Swash plate     | 27       | Nut            | 46       | Pin         |
| 11       | Thrust plate    | 28       | Ball bearing   | 47       | O-ring      |
| 12       | Seal holder     | 29       | Needle bearing | 48       | Plate       |
| 13       | Gasket          | 30       | Oil seal       | 49       | Screw       |
| 14       | Spring C        | 32       | Snap ring      |          |             |
| 15       | Spring S        | 33       | Snap ring      |          |             |
| 16       | Control piston  | 34       | Snap ring      |          |             |
| 17       | End plug        | 36       | O-ring         |          |             |

#### List of Sealing Parts (Kit Model Number 3B; PZAS-103200, 5B; PZAS-104000)

| Part No. | Part Name   | PZ-3B      |      | PZ-5B      |      | Remarks    |
|----------|-------------|------------|------|------------|------|------------|
|          |             | Size       | Q'ty | Size       | Q'ty |            |
| 13       | Gasket      | *          | 1    | *          | 1    | 3 Bond     |
| 30       | Oil seal    | TCN-456812 | 1    | TCN-608212 | 1    | N. O. K    |
| 36       | O-ring      | 1B-G95     | 1    | 1B-G125    | 1    | JIS B 2401 |
| 37       | O-ring      | 1B-P21     | 2    | 1B-P21     | 2    | JIS B 2401 |
| 38       | O-ring      | 1B-P12     | 1    | 1B-P16     | 1    | JIS B 2401 |
| 39       | O-ring      | 1B-P34     | 1    | 1B-P42     | 1    | JIS B 2401 |
| 40       | O-ring      | 1B-P7      | 2    | 1B-P7      | 2    | JIS B 2401 |
| 41       | Backup ring | T2-P12     | 1    | T2-P16     | 1    | JIS B 2407 |
| 47       | O-ring      | 1B-G90     | 1    | 1B-G85     | 1    | JIS B 2401 |

Parts marked by an asterisk "\*" are not available on the market. Consult your agent.

PZ-4/6B-\*



| Part No. | Part Name       | Part No. | Part Name                            |
|----------|-----------------|----------|--------------------------------------|
| 1        | Body            | 31       | Snap ring                            |
| 2        | Case            | 32       | Snap ring                            |
| 3        | Shaft           | 33       | Snap ring                            |
| 4        | Cylinder barrel | 34       | O-ring                               |
| 5        | Valve plate     | 35       | O-ring                               |
| 6        | Piston          | 36       | O-ring                               |
| 7        | Shoe            | 37       | O-ring                               |
| 8        | Shoe holder     | 38       | O-ring                               |
| 9        | Barrel holder   | 39       | O-ring                               |
| 10       | Swash plate     | 40       | O-ring                               |
| 11       | Thrust bush     | 41       | O-ring                               |
| 12       | Seal holder     | 42       | O-ring                               |
| 13       | Sleeve          | 43       | Backup ring                          |
| 14       | Spring C        | 44       | Orifice                              |
| 15       | Spring S        | 45       | Screw                                |
| 16       | Control piston  | 46       | Plug                                 |
| 17       | End plug        | 47       | Pin                                  |
| 18       | Guide screw     | 48       | Bolt                                 |
| 19       | Spring holder   | 49       | Plug                                 |
| 20       | Thrust plate    | 50       | Plate                                |
| 21       | Retainer        | 51       | Washer                               |
| 22       | Needle          | 52       | Bolt                                 |
| 23       | Key             | 53       | Eye bolt                             |
| 24       | Plug            | 54       | Electro-hydraulic proportional valve |
| 25       | Pin             |          |                                      |
| 26       | Orifice         |          |                                      |
| 27       | Nut             |          |                                      |
| 28       | Ball bearing    |          |                                      |
| 29       | Needle bearing  |          |                                      |
| 30       | Oil seal        |          |                                      |

List of Sealing Parts (Kit Model Number 4B : PZAS-104100, 6B : PZBS-106000)

| Part No. | Part Name   | PZ-4B      |      | PZ-6B      |      | Remarks    |
|----------|-------------|------------|------|------------|------|------------|
|          |             | Size       | Q'ty | Size       | Q'ty |            |
| 30       | Oil seal    | TCN-507212 | 1    | TCN-659013 | 1    | N. O. K    |
| 34       | O-ring      | 1B-G85     | 1    | 1B-G85     | 1    | JIS B 2401 |
| 35       | O-ring      | 1B-G105    | 1    | 1B-G135    | 1    | JIS B 2401 |
| 36       | O-ring      | 1B-G155    | 1    | 1B-G200    | 1    | JIS B 2401 |
| 37       | O-ring      | 1B-G50     | 1    | 1B-G65     | 1    | JIS B 2401 |
| 38       | O-ring      | 1B-P36     | 1    | 1B-P41     | 1    | JIS B 2401 |
| 39       | O-ring      | 1B-P16     | 1    | 1B-P16     | 1    | JIS B 2401 |
| 40       | O-ring      | 1B-P21     | 3    | 1B-P21     | 3    | JIS B 2401 |
| 41       | O-ring      | 1B-P9      | 1    | 1B-P10     | 1    | JIS B 2401 |
| 42       | O-ring      | 1B-P8      | 5    | 1B-P8      | 8    | JIS B 2401 |
| 43       | Backup ring | T2-P16     | 1    | T2-P16     | 1    | JIS B 2407 |

Foot Mounting Kit

| Pump Model No. | Mounting Model No. |
|----------------|--------------------|
| PZ-2B          | IHM-44-10          |
| PZ-3B          |                    |
| PZ-5B          | IHM-55-10          |
| PZ-6B          |                    |
| PZ-4B          | PZM-4-10           |

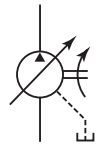
Note: See pages C-12 and A-34 for information about mounting methods.

Piping Flange Kit

| Flange Kit model No. | Applicable Pump Model No. | IN Flange       |      |            |        |         |   |        |   |
|----------------------|---------------------------|-----------------|------|------------|--------|---------|---|--------|---|
|                      |                           | Flange Part No. | Bolt | Washer     | O-ring |         |   |        |   |
| IHF -4-T-20          | PZ-2B-35/45               | IH03J-100100    | 1    | TH-10 × 55 | 4      | WS-B-10 | 4 | 1B-G40 | 1 |
| IHF -5-T-20          | PZ-3B-70                  | IH03J-100120    | 1    | TH-12 × 55 | 4      | WS-B-12 | 4 | 1B-G50 | 1 |
| PZF -4-T-10          | PZ-4B-100                 | IH03J-100160    | 1    | TH-12 × 60 | 4      | WS-B-12 | 4 | 1B-G60 | 1 |
| IHF -7-T-10          | PZ-5B-130                 | IH03J-100200    | 1    | TH-12 × 60 | 4      | WS-B-12 | 4 | 1B-G75 | 1 |
| PZF -6-T-10          | PZ-6B-180/220             | IH03J-100240    | 1    | TH-16 × 75 | 4      | WS-B-16 | 4 | 1B-G85 | 1 |

| OUT Flange      |      |            |        |         |   |        |   | Plug     |   |
|-----------------|------|------------|--------|---------|---|--------|---|----------|---|
| Flange Part No. | Bolt | Washer     | O-ring |         |   |        |   |          |   |
| IH03J-100060    | 1    | TH-10 × 50 | 4      | WS-B-10 | 4 | 1B-G30 | 1 | TPHA-1/4 | 1 |
| IH03J-100080    | 1    | TH-10 × 50 | 4      | WS-B-10 | 4 | 1B-G35 | 1 | TPHA-1/4 | 2 |
| IH03J-100080    | 1    | TH-10 × 50 | 4      | WS-B-10 | 4 | 1B-G35 | 1 | TPHA-1/4 | 1 |
| IH03J-100120    | 1    | TH-12 × 60 | 4      | WS-B-12 | 4 | 1B-G50 | 1 | TPHA-1/4 | 1 |
| IH03J-100120    | 1    | TH-12 × 60 | 4      | WS-B-12 | 4 | 1B-G50 | 1 | TPHA-1/4 | 1 |

Note 1. See page C-11 for dimensions.  
 2. O-ring 1B/B-\*\* refers to JIS B2401-1B.  
 3. See page C-11 for details on tightening torque.



### VDS Series Small Variable Volume Vane Pump

0.5 in<sup>3</sup>/rev  
3.94 gpm  
1015 psi

#### Features

##### High efficiency operation with minimal power loss

All the performance of the original new VDR series mechanisms combines with precision machining for a pump that minimizes power loss, especially at full cutoff.

##### Quiet operation

Journal bearings with a proven record on IP pumps plus new suction and discharge port configurations reduce operating noise and deliver quiet

operation with minimal vibration, even in the high-pressure range.

##### Compact and simple design, easy operation

Compact and quiet, VDS Series variable vane pumps are economical and easy to handle. A simple design allows use in a wide range of hydraulic systems.

##### Precise characteristics, prompt response

Prompt response at both ON-OFF

and OFF-ON ensures instantaneous, stable, high-precision operation.

##### Solidly built for high efficiency and long life

VDS Series pumps are built to last, with a design that incorporates years of NACHI experience and know-how. Specially selected materials and skilled workmanship provide outstanding durability along with stable, high-efficiency operation.

#### Specifications

| Model No.         | Capacity in <sup>3</sup> /rev | No-load Discharge Rate gpm |                       |                       |                       | Pressure Adjustment Range psi | Allowable Peak Pressure psi | Revolution Speed min <sup>-1</sup> |      | Weight lbs          |
|-------------------|-------------------------------|----------------------------|-----------------------|-----------------------|-----------------------|-------------------------------|-----------------------------|------------------------------------|------|---------------------|
|                   |                               | 1000min <sup>-1</sup>      | 1200min <sup>-1</sup> | 1500min <sup>-1</sup> | 1800min <sup>-1</sup> |                               |                             | Min.                               | Max. |                     |
| VDS-0A(B)-1A1-E11 |                               |                            |                       |                       |                       | 145 ~ 290                     |                             |                                    |      |                     |
| " -1A2-E11        | .50                           | 2.1                        | 2.6                   | 3.2                   | 3.94                  | 317 ~ 507                     | 2030                        | 800                                | 1800 | A : 14.3<br>B : 9.9 |
| " -1A3-E11        |                               |                            |                       |                       |                       | 435 ~ 1015                    |                             |                                    |      |                     |

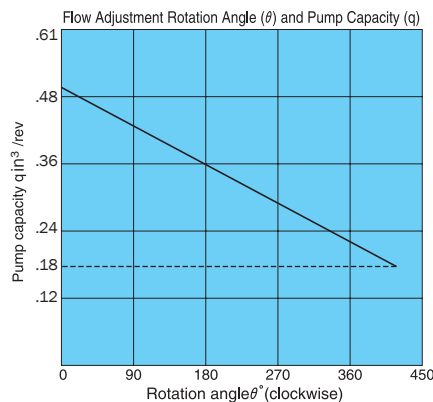
##### • Handling

- The direction of rotation for this pump is clockwise (rightward) when viewed from the shaft side.
- Drain piping must be direct piping up to a point that is below the tank fluid level, and back pressure due to pipe resistance should not exceed 4.3 psi.
- When adjusting pressure, pressure is increased by clockwise (rightward) rotation of the adjusting screw and decreased by counterclockwise (leftward) rotation.
- When adjusting the flow rate, the flow rate is decreased by clockwise (rightward) rotation of the adjusting screw and increased by counterclockwise (leftward) rotation. The graph on the right provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the no-load discharge rate.
- Factory Default P-Q Settings (Standard Model)
  - Flow Rate Setting = Maximum flow rate for model as indicated in the catalog.
  - Pressure Setting = Pressure shown in table below.

| Factory Default Pressure Settings kgf/cm <sup>2</sup> (psi) |             |
|---|-------------|
| 1 :   | 20.4 (290)  |
| 2 :   | 35.7 (507)  |
| 3 :   | 71.4 (1015) |

$$\text{Flow rate gpm} = \frac{\text{in}^3 \times \text{rpm}}{231}$$

Q: No-load Discharge Rate (gpm)  
q: Capacity (in<sup>3</sup>/rev)



The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position. The broken line shows the flow volume adjustment range lower limit value.

##### 6 Thrust Screw

The thrust screw is precision adjusted at the factory during assembly. Never touch the thrust screw.

See callout 9 in the cross-section diagram on page B-4.

##### 7 Initial Operation

Before operating the pump for the first time, put the pump discharge side into the no-load state and then repeatedly start and stop the motor to bleed all air from inside the pump and the suction piping. After confirming that the pump is discharging oil, continue the no-load operation for at least 10 minutes to discharge all the air from the circuit.

8 For the hydraulic operating fluid, use an R&O type and wear-resistant type of ISO VG32 to 68 or equivalent (viscosity index of at least 90). Use hydraulic operating fluid that provides kinematic viscosity during operation in the range of 20 to 150 centistokes.

9 The operating temperature range is 59 to 140 °F. When the oil temperature at startup is 59 °F or less, perform a warm-up operation at low pressure until the oil temperature reaches 59 °F. Use the pump in an area where the temperature is within the range of 59 to 140 °F.

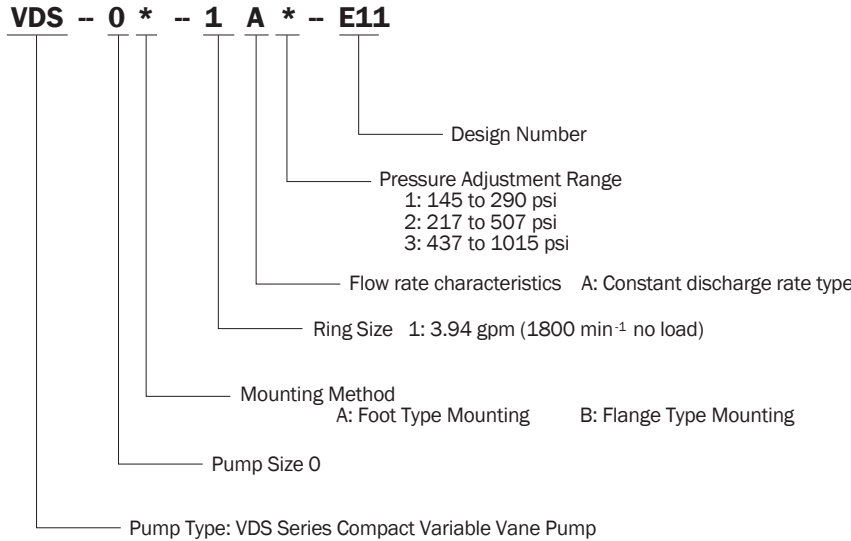
(continued on following page)

- 10 Suction pressure is 4.35 psi, and the suction port flow rate should be greater than 6 ft/sec.
- 11 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.
- 12 Provide a suction strainer with a filtering grade of about 100 μm (150 mesh). For the return line to the tank, use a 10 μm line filter.

- 13 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water or other foreign matter, and watch for discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.
- 14 Contact your agent about using water- and glycol-based hydraulic operating fluids.
- 15 At startup, repeat the inching operation

- (start-stop) to bleed air from the pump and pipes.
- 16 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.
- 17 To ensure proper lubrication of the pump's rubbing surfaces, supply oil to the interior of the pump before starting operation.
- 18 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.001 in. The angle error should be no greater than 1°.

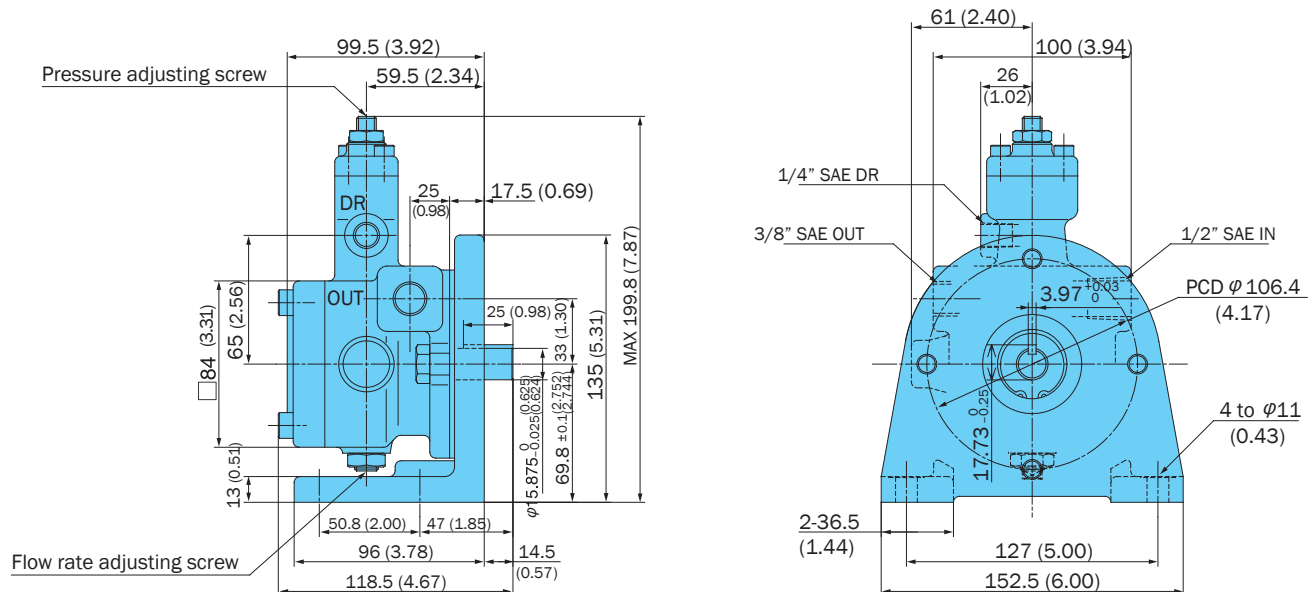
### Understanding Model Numbers



### Installation Dimension Drawings

VDS-0A-1A-\*-10

Foot Mounting Type mm (inch)

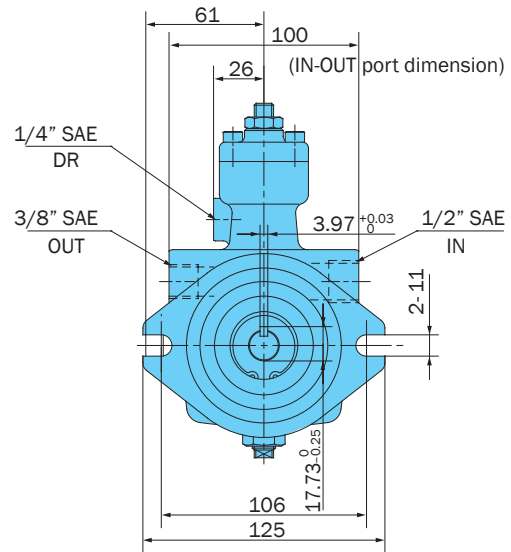
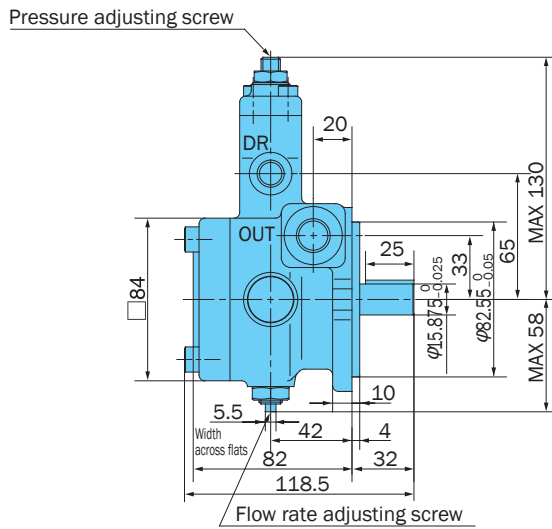


Note: Foot Mounting Kit: IHM-2-10

VDS-0B-1A-\*-10

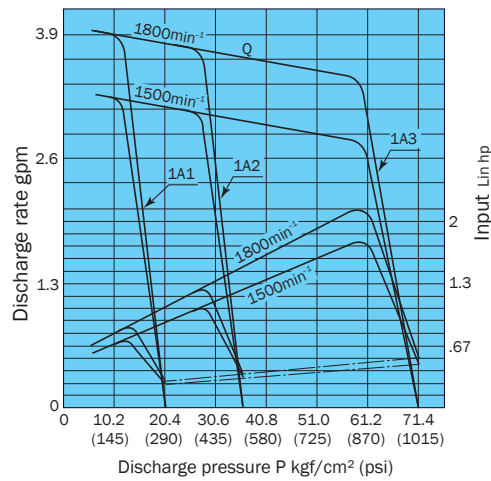
SAE A Mount

Flange Mounting

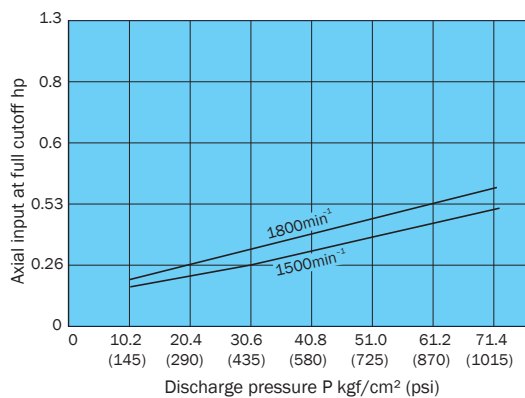


## Specifications

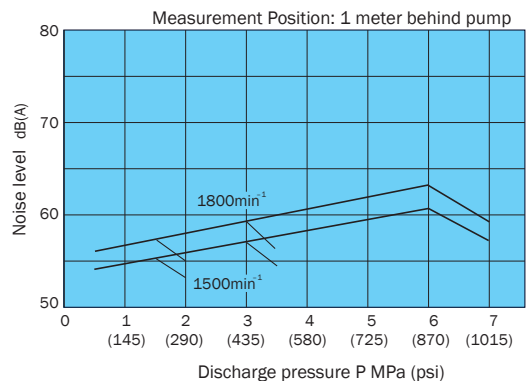
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes



Axial Input at Full Cutoff

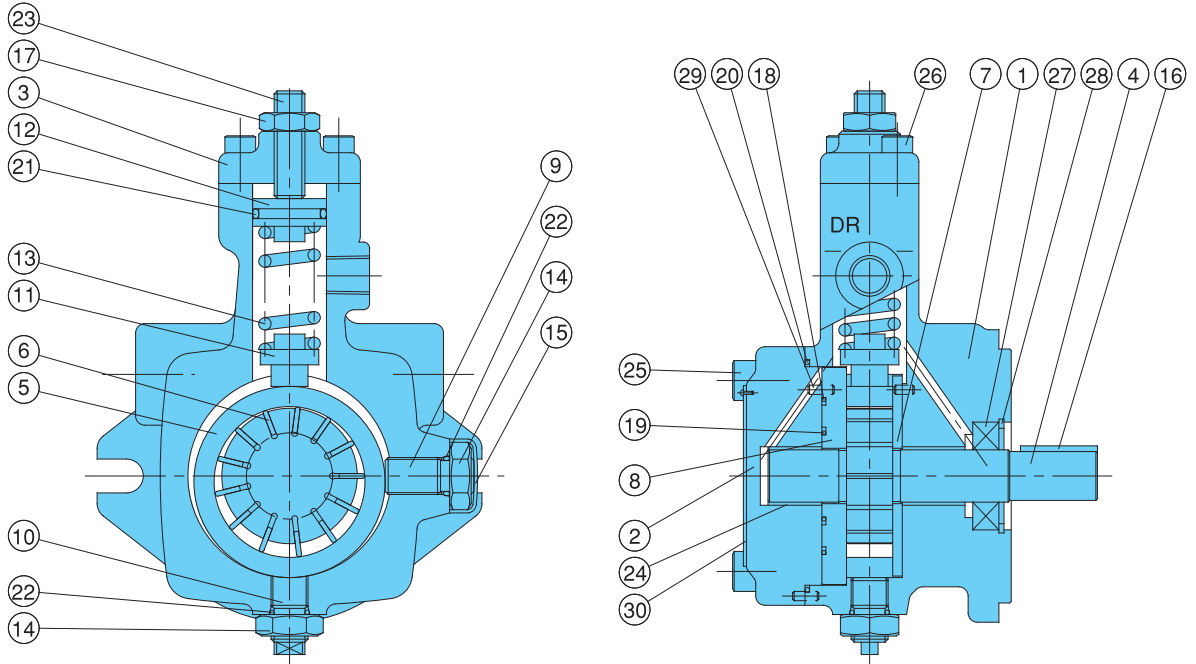


Noise Characteristics



## Cross-Sectional Drawing

VDS-0B-1A\*-10



### List of Sealing Parts

Seal Kit: VBAS-100B00

Applicable Pump Model: VDS-0A/B-1A \*10

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 18       | O-ring    | AS568-032   | 1    |
| 19       | O-ring    | AS568-023   | 1    |
| 20       | O-ring    | S71 (NOK)   | 1    |
| 21       | O-ring    | 1A-P20      | 1    |
| 22       | O-ring    | 1A-P10      | 2    |
| 27       | Oil seal  | TC-17358    | 1    |

Note:

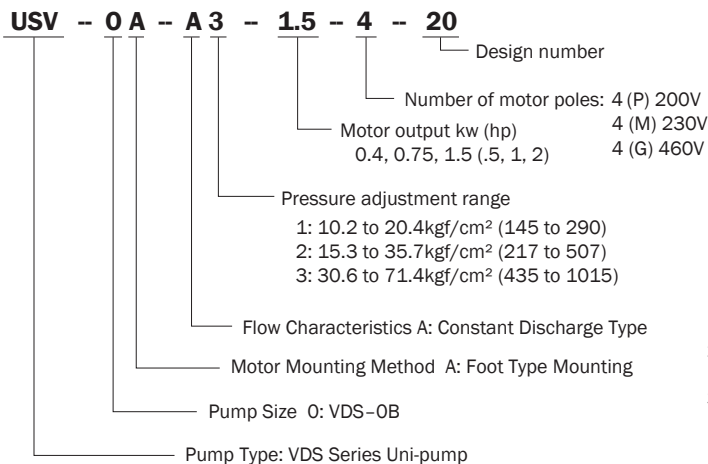
1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
2. O-ring 1A/B-\*\* refers to JIS B2401-1A.

| Part No. | Part Name    | Part No. | Part Name |
|----------|--------------|----------|-----------|
| 1        | Body         | 16       | Key       |
| 2        | Cover (A)    | 17       | Nut       |
| 3        | Cover (B)    | 18       | O-ring    |
| 4        | Shaft        | 19       | O-ring    |
| 5        | Cam ring     | 20       | O-ring    |
| 6        | Vane         | 21       | O-ring    |
| 7        | Plate (S)    | 22       | O-ring    |
| 8        | Plate (H)    | 23       | Screw     |
| 9        | Thrust screw | 24       | Bearing   |
| 10       | Screw        | 25       | Screw     |
| 11       | Piston       | 26       | Screw     |
| 12       | Holder       | 27       | Oil seal  |
| 13       | Spring       | 28       | Snap ring |
| 14       | Nut          | 29       | Pin       |
| 15       | Cap          | 30       | Nameplate |

## Uni-Pump Specifications

(CE mark standard compliant)

### Understanding Model Numbers



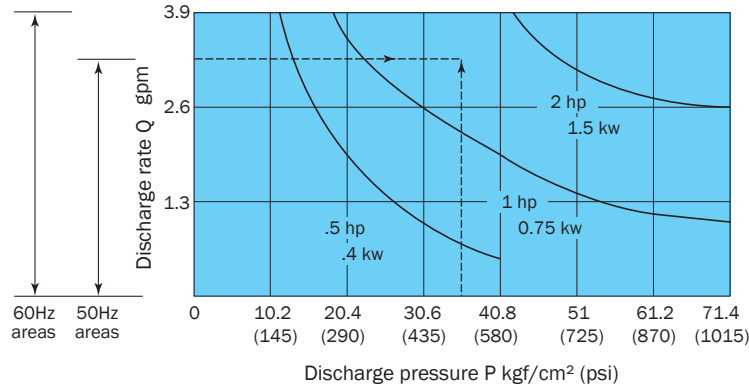
Cartridge Kit:  
VBAC-100\*A\*

Includes Items: 4, 5, 6, 7, 8, 16, 29

| Maximum Working Pressure<br>kgf/cm (psi) | Maximum Flow Rate gpm |      |
|--|-----------------------|------|
|  | 50Hz                  | 60Hz |
| 71.4 (1015)                              | 3.30                  | 3.94 |

1. Standard drive motor is the fully enclosed fan-cooled B type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).

**Motor Selection Curves**



**• How to select a motor**

The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.

**Example:**

To find the motor that can produce pressure of 507 psi and a discharge rate of 3.3 gpm.

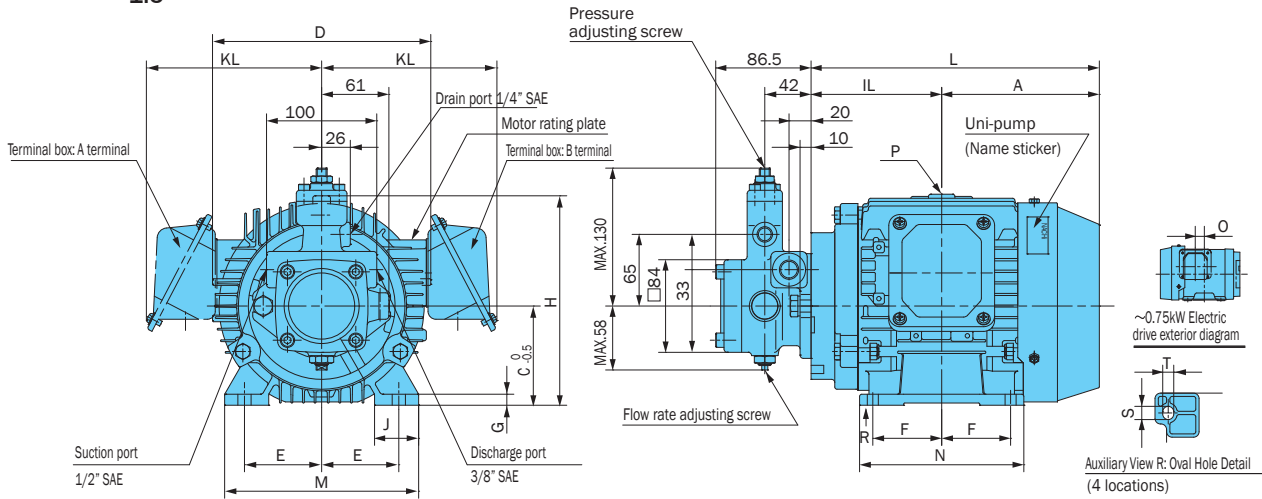
**Selection Process:**

Since the intersection of the two broken lines from a pressure of 507 psi and discharge rate of 3.3 gpm intersect in the area under the 2 hp curve, it means that a 2 hp motor should be used.

\* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.

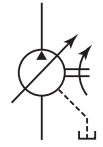
**Installation Dimension Drawings**

0.4  
 USV-0A-A\* - 0.75-4-20  
 1.5



| Uni-pump            | Motor Dimensions mm |       |    |     |      |      |     |     |    |       |     |     |         |     |     |      | Frame No. | Output hp (4 poles) | Weight lbs |
|---------------------|---------------------|-------|----|-----|------|------|-----|-----|----|-------|-----|-----|---------|-----|-----|------|-----------|---------------------|------------|
|                     | A                   | IL    | C  | D   | E    | F    | G   | H   | J  | L     | M   | N   | S x T   | KD  | KL  | O    |           |                     |            |
| USV-0A-A1-0.4-4-20  | 121                 | 107.5 | 71 | 150 | 56   | 45   | 2.3 | 146 | 30 | 228.5 | 140 | 110 | 15 x 7  | φ27 | 151 | 35   | 71M       | 0.5                 | 30         |
| USV-0A-A2-0.4-4-20  |                     |       |    |     |      |      |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| USV-0A-A3-0.4-4-20  |                     |       |    |     |      |      |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| USV-0A-A1-0.75-4-20 | 133                 | 107.5 | 80 | 170 | 62.5 | 50   | 4.5 | 165 | 35 | 240.5 | 165 | 130 | 18 x 10 | φ27 | 157 | 27.5 | 80M       | 1.0                 | 42         |
| USV-0A-A2-0.75-4-20 |                     |       |    |     |      |      |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| USV-0A-A3-0.75-4-20 |                     |       |    |     |      |      |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| USV-0A-A3-1.5-4-20  | 143                 | 118.5 | 90 | 198 | 70   | 62.5 | 10  | 190 | 40 | 261.5 | 176 | 150 | 12 x 10 | φ27 | 159 | -    | 90L       | 2                   | 45         |

\* See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).



### VDR Design Series Variable Volume Vane Pump

7.9 gpm at 2030 psi  
10.5 gpm at 1000 psi

#### Features

##### Stable, highly efficient operation up to 2030 psi

A biased piston that minimizes ring vibration and leak-free pressure balance construction enables highly efficient high-pressure operation, and very stable performance up to 2030 psi.

##### High-precision instantaneous response

Response has been improved by a special bias piston mechanism. Prompt response at both ON-OFF and OFF-ON

ensures instantaneous, stable, high-precision operation.

##### Silent operation, even in the high pressure range

CQuiet journal bearings, a bias piston that allows a 3-point support system, and new suction and discharge port shapes all contribute to minimize operation noise. Silent, vibration-free operation is ensured, even in the high pressure range.

A combination of NACHI-original mechanical innovations and precision machining create a pump that minimizes power loss, especially at full cutoff.

##### Solid construction stands up to harsh operating conditions

The tough and rugged construction of this pump is made possible by a long history of quality pump designs. This, in combination with specially selected materials and skilled workmanship, provides outstanding durability.

##### Reduced power loss

#### Specifications

##### Single Pump

| Model Type     |                 | No-load Discharge Rate l/min (gpm) |          |          | Pressure Adjustment Range psi | Allowable Peak Pressure psi | Revolution Speed min <sup>-1</sup> |      | Weight lbs |
|----------------|-----------------|------------------------------------|----------|----------|-------------------------------|-----------------------------|------------------------------------|------|------------|
| Foot Mounting  | Flange Mounting | 1800 rpm                           | 1500 rpm | 1200 rpm |                               |                             | Min.                               | Max. |            |
| VDR-1A-1A2-*22 | VDR-1B-1A2-*22  | 30 (7.9)                           | 25 (6.6) | 20 (5.3) | 217 ~ 507                     | 500                         | 800                                | 1800 | 19.9       |
| VDR-1A-1A3-*22 | VDR-1B-1A3-*22  |                                    |          |          | 435 ~ 1015                    | 1000                        |                                    |      |            |
| VDR-1A-1A4-*22 | VDR-1B-1A4-*22  |                                    |          |          | 942 ~ 1522                    | 1500                        |                                    |      |            |
| VDR-1A-1A5-*22 | VDR-1B-1A5-*22  |                                    |          |          | 1305 ~ 2030                   | 2000                        |                                    |      |            |
| VDR-1A-2A2-*22 | VDR-1B-2A2-*22  | 40 (10.6)                          | 33 (8.7) | 27 (7.1) | 214 ~ 500                     | 500                         | 800                                | 1800 | 19.9       |
| VDR-1A-2A3-*22 | VDR-1B-2A3-*22  |                                    |          |          | 429 ~ 1000                    | 1000                        |                                    |      |            |

##### Double Pump

| Model No.                                      | Vent Side          |                               | Shaft Side         |                               | Vent Side | Shaft Side | Revolution Speed min <sup>-1</sup> |      | Weight lbs |
|--|--------------------|-------------------------------|--------------------|-------------------------------|-----------|------------|------------------------------------|------|------------|
|  | Discharge Rate gpm | Pressure Adjustment Range psi | Discharge Rate gpm | Pressure Adjustment Range psi |           |            | Min.                               | Max. |            |
| VDR-11A(B)-1A2-1A2-22<br>VDR-11A(B)-1A2-1A3-22 | 7.9                | 217 ~ 507                     | 7.9                | 217 ~ 507<br>435 ~ 1015       | 2030      | 800        | 1800                               | 37   |            |
| VDR-11A(B)-1A3-1A3-22                          |                    | 435 ~ 1015                    |                    | 435 ~ 1015                    |           |            |                                    |      |            |
| VDR-11A(B)-2A2-2A2-22<br>VDR-11A(B)-2A2-2A3-22 | 10.5               | 217 ~ 507                     | 10.5               | 217 ~ 507<br>435 ~ 1015       | 2030      | 800        | 1800                               | 37   |            |
| VDR-11A(B)-2A3-2A3-22                          |                    | 435 ~ 1015                    |                    | 435 ~ 1015                    |           |            |                                    |      |            |

Note: 1. The discharge rate is the value at 1800min<sup>-1</sup> no load.

2. The change from design number 21 to design number 22 represents a change in the shaft key width from .125 in to .187 in. This means that when using a .125 in key coupling, you need to use a stepped key (VD31J-302000) or add a new key groove at .187 in.

##### • Handling

###### 1 Rotation Direction

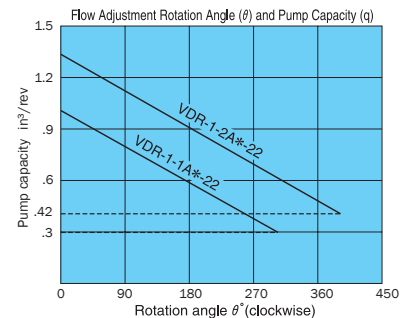
The direction of rotation is always clockwise (rightward) when viewed from the shaft side.

###### 2 Drain

Drain piping must be direct piping up to a point that is below the tank fluid level, and back pressure due to pipe resistance should not exceed 4.35 psi. When using a pump that has drain ports at two locations, use the drain port that is higher after the pump is installed.

###### 3 Discharge Volume Adjustment

The discharge flow rate is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation. Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut. The graph on the right provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the no-load discharge rate.



(continued on following page)



Flow rate gpm:  $Q = \frac{\text{in}^3 \times \text{rpm}}{231}$

Q: No-load Discharge Rate Q r/min  
 q: Volume cm<sup>3</sup>/rev  
 N: Revolution Speed min<sup>-1</sup>

The broken line shows the flow volume adjustment range lower limit value.

Note:

The values indicated above are at maximum discharge volume with the flow volume adjusting screw at the 0° position.

4 Pressure Adjustment

Pressure is decreased by clockwise (rightward) rotation of the discharge rate

adjusting screw, and increased by counterclockwise (leftward) rotation.

5 Factory Default P-Q Settings (Standard Model)

- Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
- Pressure Setting = Pressure shown in table to the right

6 Thrust Screw

The thrust screw is precision adjusted at the factory during assembly. Never touch the thrust screw. See callout ②1 in the cross-section diagram on page B-11.

| Factory Default Pressure Settings<br>kgf/cm <sup>2</sup> (psi) |               |
|--|---------------|
| 2  | : 35.7 (507)  |
| 3  | : 30.6 (435)  |
| 4  | : 66.3 (942)  |
| 5  | : 91.8 (1305) |

7 Initial Operation

Before operating the pump for the first time, put the pump discharge side into the no-load state and then repeatedly start and stop the motor to bleed all air from inside the pump and the suction piping. After confirming that the pump is discharging oil, continue the no-load operation for at least 10 minutes to discharge all the air from the circuit.

Provide an air bleed valve in circuits where it is difficult to bleed air before startup.

8 Sub Plate

Use the following table for specification when a sub plate is required. For detailed dimensions, see pages B-17 through B-19.

- 9 For the hydraulic operating fluid, use type ISO VG32 or equivalent (viscosity index of at least 90) for pressures of 1015 psi or lower, and type ISO VG68 or equivalent (viscosity index of at least 90) for pressures greater than 1015 psi.

| Pump Model No.         | Sub Plate Number | Motor(hp) |
|------------------------|------------------|-----------|
| VDR-1A-1A*-22          | MVD-1-115-10     | 1 ~ 2     |
|                        | MVD-1-135-10     | 3 ~ 5     |
| VDR-1A-2A*-22          | MVD-1-115Y-10    | 1 ~ 2     |
|                        | MVD-1-135Y-10    | 3 ~ 5     |
| VDR-11A-*A*<br>-*A*-22 | MVD-11-135-10    | 2 ~ 5     |
|                        | MVD-11-135X-10   |           |

- 10 The operating temperature range is 59 to 140 °F. When the oil temperature at startup is 59 °F or less, perform a warm-up operation at low pressure until the oil temperature reaches 59 °F. Use the pump in an area where the temperature is within the range of 32 to 140 °F.

- 11 Suction pressure is 4.35 psi, and the suction port flow rate should be to greater than 6 ft/sec.

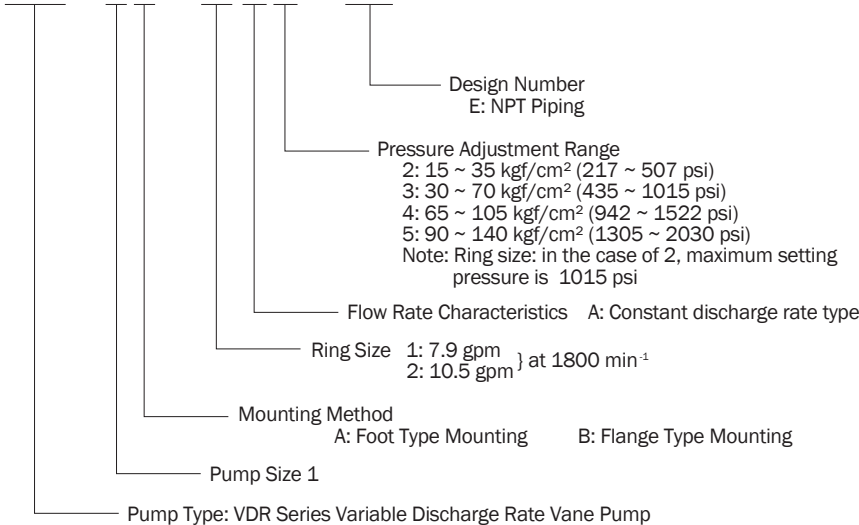
Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.

(Continued on following page)

**Understanding Model Numbers**

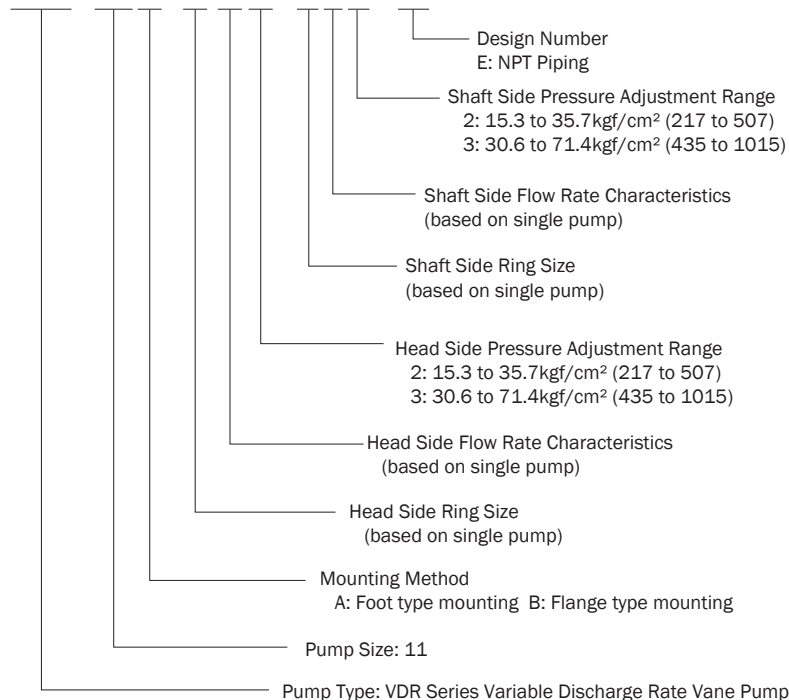
Single Pump

VDR -- 1 A -- 1 A 2 -- \*22



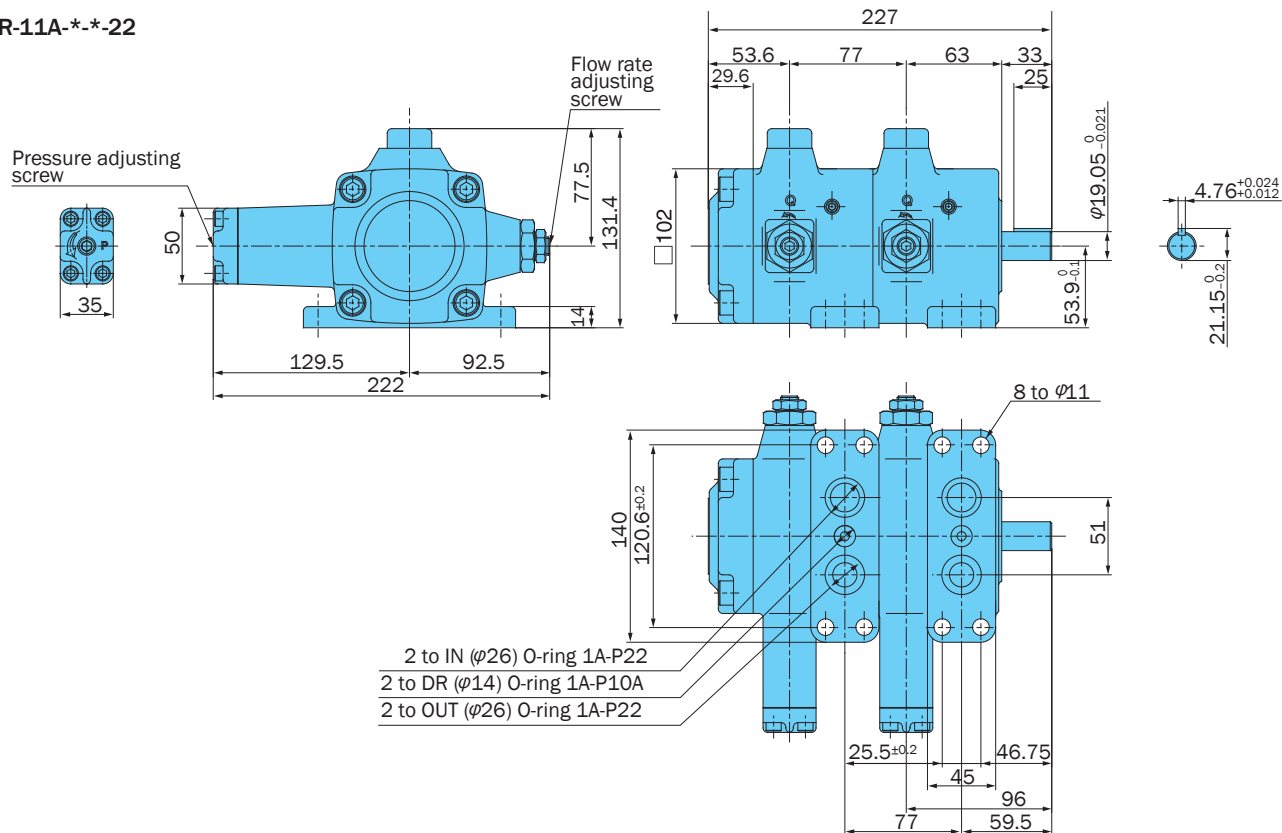
Double pump

VDR -- 11 A -- 1 A 2 -- 1 A 3 -- 22



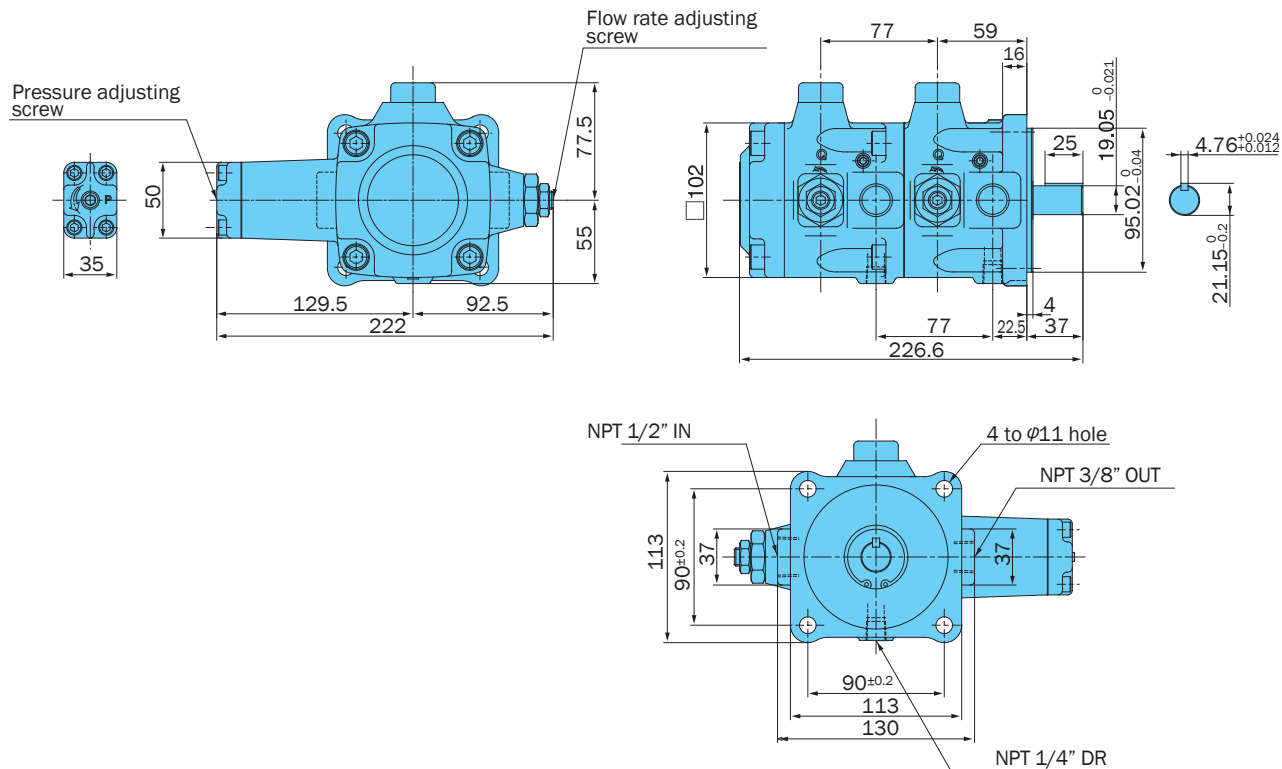


**VDR-11A-\*-\*-22**



**VDR-11B-\*-\*-22**

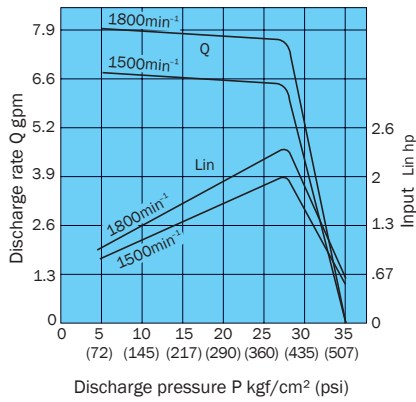
Not SAE Mount



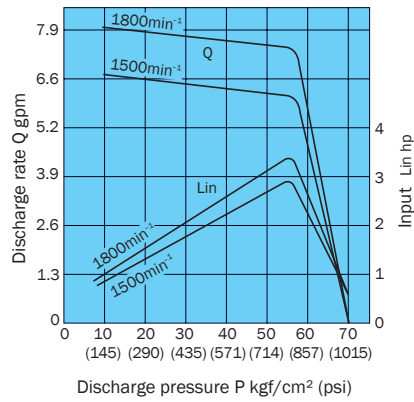
# Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes.

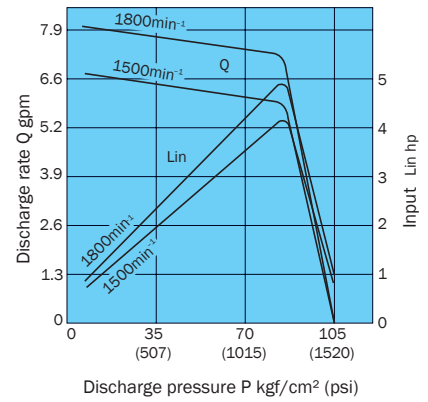
VDR-1\*-1A2-22



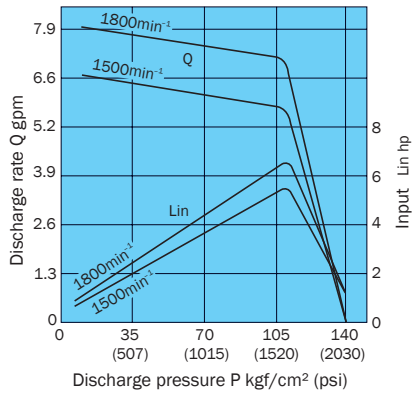
VDR-1\*-1A3-22



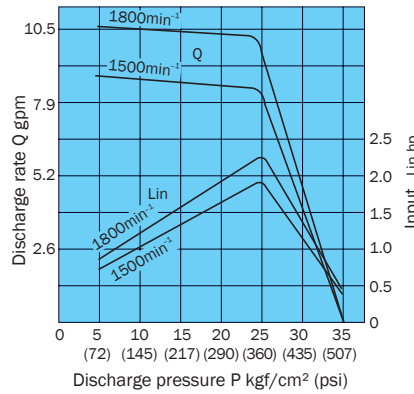
VDR-1\*-1A4-22



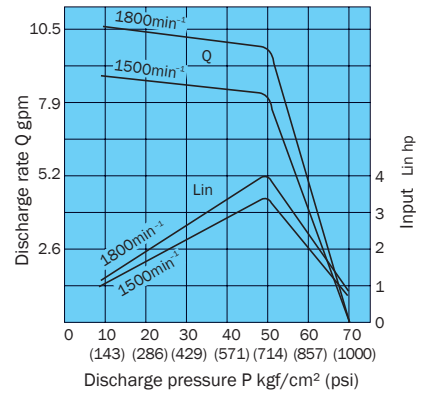
VDR-1\*-1A5-22



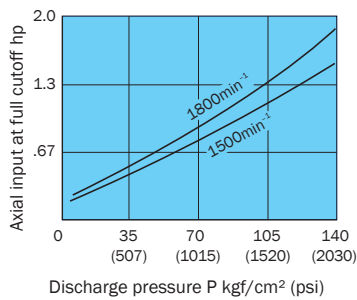
VDR-1\*-2A2-22



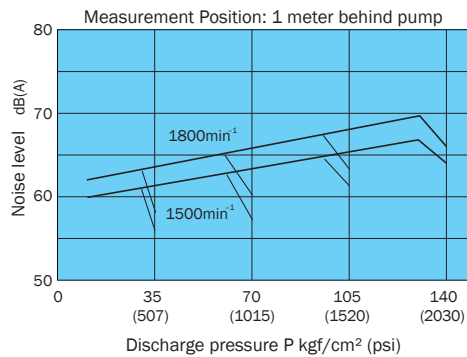
VDR-1\*-2A3-22



Axial Input At Full Cutoff

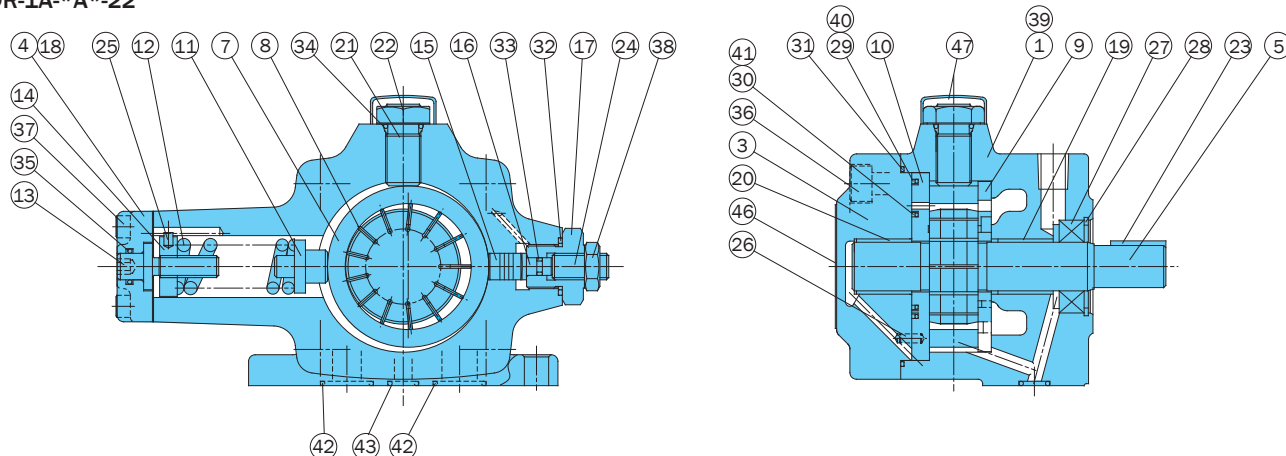


Noise Characteristics



## Cross-Sectional Drawing

VDR-1A-\*A\*-22



### List of Sealing Parts

#### Single Pump

| Part No. | Applicable Pump Model No. | VDR-1A-*A*-22 |      |
|----------|---------------------------|---------------|------|
|          | Seal Kit Number           | VDBS-101A00   |      |
|          | Part Name                 | Part Number   | Q'ty |
| 18       | Packing                   | VDB32-101000  | 1    |
| 27       | Oil seal                  | ISRD-224211   | 1    |
| 29       | Backup ring               | VDB34-101000  | 1    |
| 30       | Backup ring               | VDB34-201000  | 1    |
| 31       | O-ring                    | S85(NOK)      | 1    |
| 32       | O-ring                    | 1A-P22        | 1    |
| 33       | O-ring                    | 1A-P5         | 1    |
| 34       | O-ring                    | 1A-P14        | 1    |
| 35       | O-ring                    | 1A-P12        | 1    |
| 40       | O-ring                    | AS568-036     | 1    |
| 41       | O-ring                    | AS568-029     | 1    |
| 42       | O-ring                    | 1A-P22        | 2    |
| 43       | O-ring                    | 1A-P10A       | 1    |

Note:

- Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
- O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.
- For VDR-1B-\*A\*-22, the seal kit number becomes VDBS-101B00, without the 42 and 43 O-rings.

#### Double Pump

| Part Name | Applicable Pump Model No. | VDR-11A-*A*-22 |      |
|-----------|---------------------------|----------------|------|
|           | Seal Kit Number           | VDBS-111A00    |      |
|           | Part Name                 | Part Number    | Q'ty |
| 18        | Packing                   | VDB32-101000   | 2    |
| 27        | Oil seal                  | ISRD-224211    | 1    |
| 29        | Backup ring               | VDB34-101000   | 2    |
| 30        | Backup ring               | VDB34-201000   | 2    |
| 31        | O-ring                    | S85(NOK)       | 2    |
| 32        | O-ring                    | 1A-P22         | 2    |
| 33        | O-ring                    | 1A-P5          | 2    |
| 34        | O-ring                    | 1A-P14         | 2    |
| 35        | O-ring                    | 1A-P12         | 2    |
| 40        | O-ring                    | AS568-036      | 2    |
| 41        | O-ring                    | AS568-029      | 2    |
| 42        | O-ring                    | 1A-P22         | 4    |
| 43        | O-ring                    | 1A-P10A        | 2    |

Note:

- Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
- O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.
- For VDR-11B-\*A\*-22, the seal kit number becomes VDBS-111B00, without the 42 and 43 O-rings.

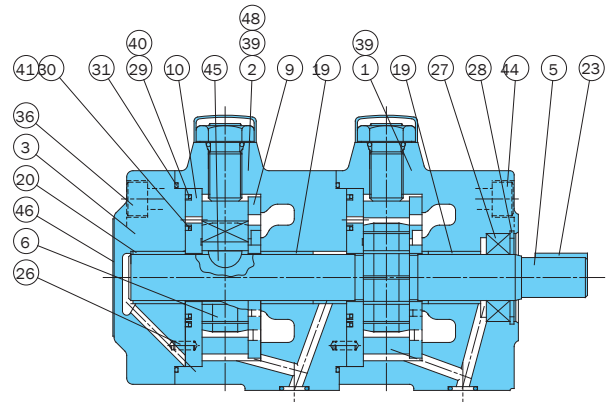
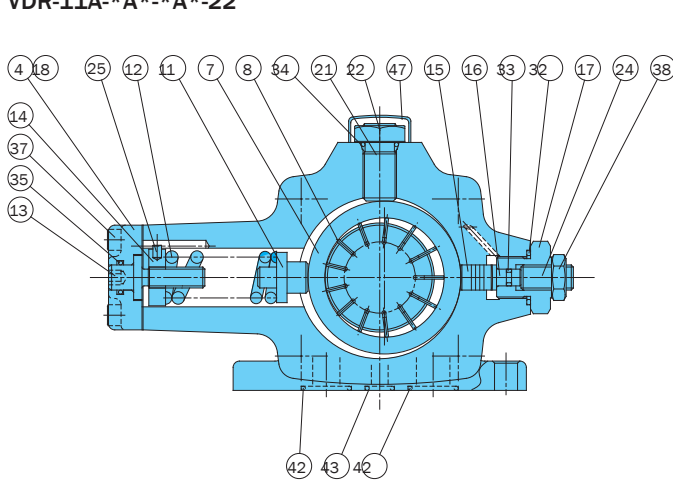
| Part No. | Part Name    | Part No. | Part Name   |
|----------|--------------|----------|-------------|
| 1        | Body (A)     | 25       | Pin         |
| 2        | Body (B)     | 26       | Spring pin  |
| 3        | Cover        | 27       | Oil seal    |
| 4        | Cover        | 28       | Snap ring   |
| 5        | Shaft        | 29       | Backup ring |
| 6        | Rotor        | 30       | Backup ring |
| 7        | Ring         | 31       | O-ring      |
| 8        | Vane         | 32       | O-ring      |
| 9        | Plate (S)    | 33       | O-ring      |
| 10       | Plate (H)    | 34       | O-ring      |
| 11       | Piston       | 35       | O-ring      |
| 12       | Spring       | 36       | Screw       |
| 13       | Screw        | 37       | Screw       |
| 14       | Nut          | 38       | Nut         |
| 15       | Piston       | 39       | Plug        |
| 16       | Holder       | 40       | O-ring      |
| 17       | Adapter      | 41       | O-ring      |
| 18       | Packing      | 42       | O-ring      |
| 19       | Bearing (S)  | 43       | O-ring      |
| 20       | Bearing (H)  | 44       | Screw       |
| 21       | Thrust screw | 45       | Key         |
| 22       | Nut          | 46       | Nameplate   |
| 23       | Key          | 47       | Cap         |
| 24       | Screw        | 48       | Pin         |

Cartridge Kit:

VDR-1-22; VDBC-101\*A\*

Includes Items: 5, 7, 8, 9, 10, 23, 25

**VDR-11A-\*A\*-\*A\*-\*22**

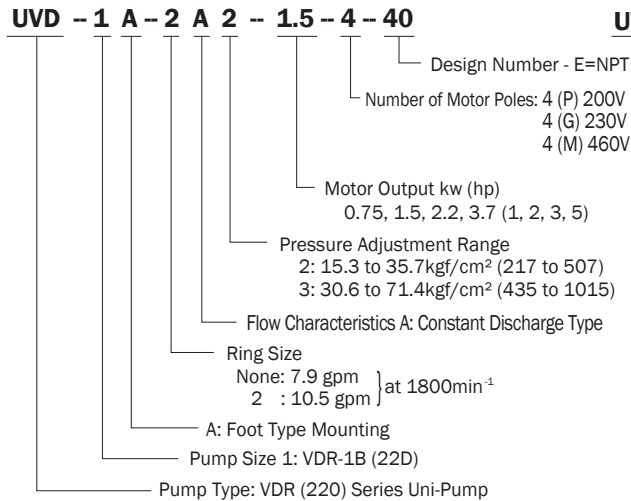


**Uni-Pump Specifications**

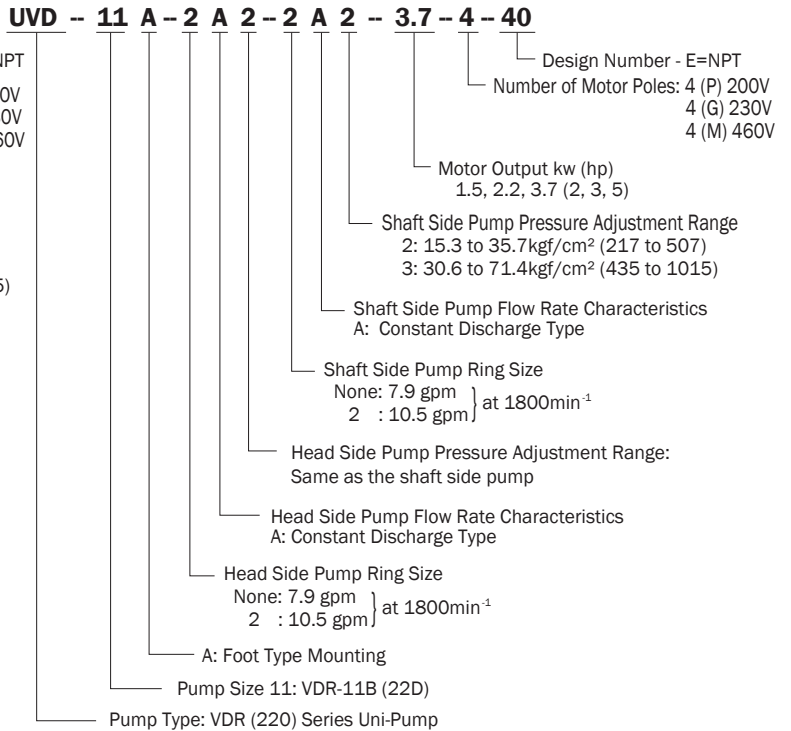
(CE mark standard compliant)

**Understanding Model Numbers**

**Single Pump**



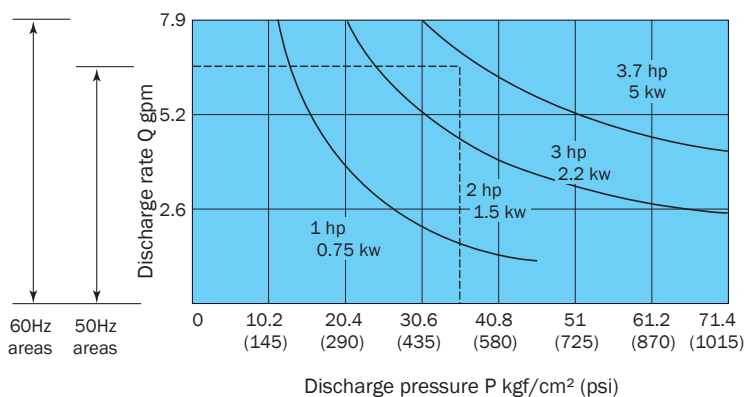
**Double Pump**



**Specifications**

| Model No. | Maximum Working Pressure<br>kgf/cm <sup>2</sup> (psi) | Maximum Flow Rate gpm (A*) |      | Maximum Flow Rate gpm (2A*) |      |
|-----------|---|----------------------------|------|-----------------------------|------|
|           |   | 50Hz                       | 60Hz | 50Hz                        | 60Hz |
| UVD-1A    | 71.4 (1015)   | 6.6                        | 7.9  | 8.7                         | 10.5 |
| UVD-11A   | 71.4 (1015)   |                            |      |                             |      |

**Motor Selection Curves**



\* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.

**• Selecting a motor**

The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.

Example:

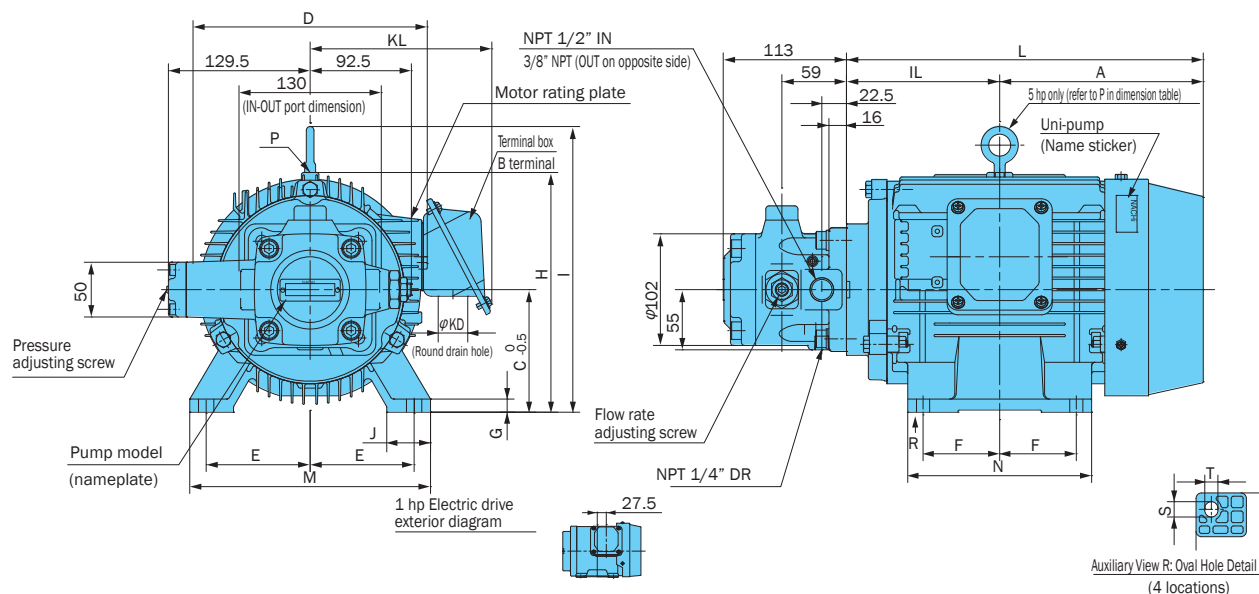
To find the motor that can produce pressure of 435 psi and a discharge rate of 6.6 gpm.

Selection Process:

Since the intersection of the two broken lines from a pressure of 435 psi and discharge rate of 6.6 gpm intersect in the area under the 3 hp curve, it means that a 3 hp motor should be used. In the case of a double pump configuration, select a motor that is larger than the total power required by both pumps.

**Installation Dimension Drawings**

**UVD-1A**



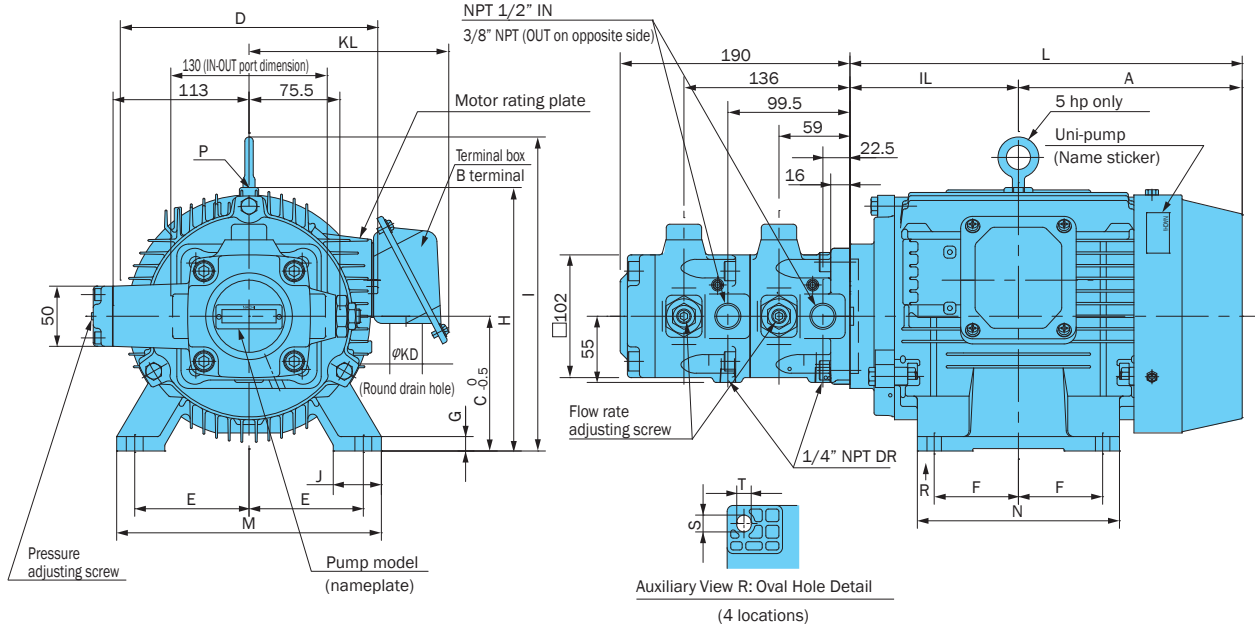
| Uni-pump            | Motor Dimensions mm |       |     |     |      |      |     |     |     |    |       |     |     |       |     |     | Frame No. | Output hp (4 poles) | Weight lbs |    |
|---------------------|---------------------|-------|-----|-----|------|------|-----|-----|-----|----|-------|-----|-----|-------|-----|-----|-----------|---------------------|------------|----|
|                     | A                   | IL    | C   | D   | E    | F    | G   | H   | I   | J  | L     | M   | N   | S x T | KD  | KL  |           |                     |            | O  |
| UVD-1A-A2-0.75-4-40 | 133                 | 105   | 80  | 170 | 62.5 | 50   | 4.5 | 165 | -   | 35 | 238   | 165 | 130 | 18x10 | ø27 | 157 | 27.5      | 80M                 | 1          | 53 |
| UVD-1A-A2-1.5-4-40  | 143                 | 118.5 | 90  | 198 | 70   | 62.5 | 10  | 190 | -   | 40 | 261.5 | 176 | 150 | 12x10 | ø27 | 159 | -         | 90L                 | 2          | 55 |
| UVD-1A-A3-1.5-4-40  |                     |       |     |     |      |      |     |     |     |    |       |     |     |       |     |     |           |                     |            |    |
| UVD-1A-2A2-1.5-4-40 |                     |       |     |     |      |      |     |     |     |    |       |     |     |       |     |     |           |                     |            |    |
| UVD-1A-A2-2.2-4-40  | 157.5               | 133   | 100 | 198 | 80   | 70   | 12  | 200 | -   | 40 | 290.5 | 200 | 168 | 14x12 | ø27 | 159 | -         | 100L                | 3          | 66 |
| UVD-1A-A3-2.2-4-40  |                     |       |     |     |      |      |     |     |     |    |       |     |     |       |     |     |           |                     |            |    |
| UVD-1A-2A2-2.2-4-40 |                     |       |     |     |      |      |     |     |     |    |       |     |     |       |     |     |           |                     |            |    |
| UVD-1A-A3-3.7-4-40  | 186                 | 140   | 112 | 214 | 95   | 70   | 12  | -   | 261 | 40 | 326   | 220 | 168 | 14x12 | ø27 | 166 | -         | 112M                | 5          | 80 |
| UVD-1A-2A2-3.7-4-40 |                     |       |     |     |      |      |     |     |     |    |       |     |     |       |     |     |           |                     |            |    |
| UVD-1A-2A3-3.7-4-40 |                     |       |     |     |      |      |     |     |     |    |       |     |     |       |     |     |           |                     |            |    |

- 1 - 3 hp model does not have hangers.
- 1. Standard drive motor is the fully enclosed fan-cooled B type.
- 2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
- 3. Standard terminal box is B terminal (right side viewed from pump).
- 4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

UVD-11A

B

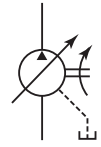
Vane Pumps



| Uni-Pump                 | Motor Dimensions mm |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   | Frame No. | Output hp (4 poles) | Weight lbs |  |
|--------------------------|---------------------|-------|-----|-----|----|------|----|-----|-----|----|-------|-----|-----|---------|-----|-----|---|-----------|---------------------|------------|--|
|                          | A                   | IL    | C   | D   | E  | F    | G  | H   | I   | J  | L     | M   | N   | S × T   | KD  | KL  | O |           |                     |            |  |
| UVD-11A-A2-A2-1.5-4-40   | 143                 | 118.5 | 90  | 198 | 70 | 62.5 | 10 | 190 | -   | 40 | 261.5 | 176 | 150 | 12 × 10 | φ27 | 159 | - | 90L       | 2                   | 73         |  |
| UVD-11A-A2-A3-1.5-4-40   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |
| UVD-11A-A3-A3-1.5-4-40   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |
| UVD-11A-A2-A2-2.2-4-40   | 157.5               | 133   | 100 | 198 | 80 | 70   | 12 | 200 |     | 40 | 290.5 | 200 | 168 | 14 × 12 | φ27 | 159 | - | 100L      | 3                   | 84         |  |
| UVD-11A-A2-A3-2.2-4-40   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |
| UVD-11A-A3-A3-2.2-4-40   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |
| UVD-11A-2A2-2A2-2.2-4-40 |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |
| UVD-11A-A2-A2-3.7-4-40   | 186                 | 140   | 112 | 214 | 95 | 70   | 12 | -   | 261 | 40 | 326   | 220 | 168 | 14 × 12 | φ27 | 166 | - | 112M      | 5                   | 97         |  |
| UVD-11A-A2-A3-3.7-4-40   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |
| UVD-11A-A3-A3-3.7-4-40   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |
| UVD-11A-2A2-2A2-3.7-4-40 |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |
| UVD-11A-2A2-2A3-3.7-4-40 |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |   |           |                     |            |  |

1. 2 to 3 hp model does not have hangers.
1. Standard drive motor is the fully enclosed fan-cooled B type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).





### VDR13 Design Series Variable Volume Vane Pump

5.2 to 11.8 gpm  
870 psi

The new design number 13 was created by modifying some of the components of old design numbers 11 and 12, and the new design installation is compatible with the old design.

#### Features

**Energy efficient, economical operation**

**Built-in high-precision temperature compensation mechanism**

The ring is displaced by a spring, and a rise in pressure automatically moves it to the center to make the discharge rate zero.

Relief valve and unloading valve can be eliminated from the circuit.

It was possible to reduce the size of the unit because there was no increase of proportional input to pressure which prevented increases in the temperature of the fluid.

**New design for lower noise and improved durability**

- Handling
- 1 Rotation Direction The direction of rotation is always is clockwise (rightward) when viewed from the shaft side.
- 2 Drain Drain piping must be direct piping up to a point that is below the tank fluid level, and back pressure due to pipe resistance should not exceed 4.35 psi.

#### Specifications

##### Single Pump

| Model No.         | Capacity<br>in <sup>3</sup> /rev | No-load Discharge Rate (gpm) |                       |                       |                       | Pressure<br>Adjustment Range<br>kgf/cm <sup>2</sup> (psi) | Allowable<br>Peak Pressure<br>kgf/cm <sup>2</sup> (psi) | Revolution Speed<br>min <sup>-1</sup> |      | Weight<br>lbs |
|-------------------|----------------------------------|------------------------------|-----------------------|-----------------------|-----------------------|---|---|---------------------------------------|------|---------------|
|                   |                                  | 1000min <sup>-1</sup>        | 1200min <sup>-1</sup> | 1500min <sup>-1</sup> | 1800min <sup>-1</sup> |   |   | Min.                                  | Max. |               |
| VDR-1A(B) -1A1-13 | .84                              | 3.6                          | 4.3                   | 5.5                   | 6.6                   | 10.2 ~ 20.6 (145 ~ 290)                                   | 143<br>(2030)   | 800                                   | 1800 | 17.6          |
|                   | .84                              | 3.6                          | 4.3                   | 5.5                   | 6.6                   | 15.3 ~ 35.7 (217 ~ 507)                                   |   |                                       |      |               |
|                   | .67                              | 2.9                          | 3.9                   | 4.5                   | 5.2                   | 30.6 ~ 61.2 (435 ~ 870)                                   |   |                                       |      |               |
| VDR-2A(B) -1A1-13 | 1.5                              | 6.6                          | 7.9                   | 10                    | 11.8                  | 10.2 ~ 20.6 (145 ~ 290)                                   | 143<br>(2030)   | 800                                   | 1800 | 46            |
|                   | 1.5                              | 6.6                          | 7.9                   | 10                    | 11.8                  | 15.3 ~ 35.7 (217 ~ 507)                                   |   |                                       |      |               |
|                   | 1.3                              | 5.8                          | 7.0                   | 8.9                   | 10.5                  | 30.6 ~ 61.2 (435 ~ 870)                                   |   |                                       |      |               |

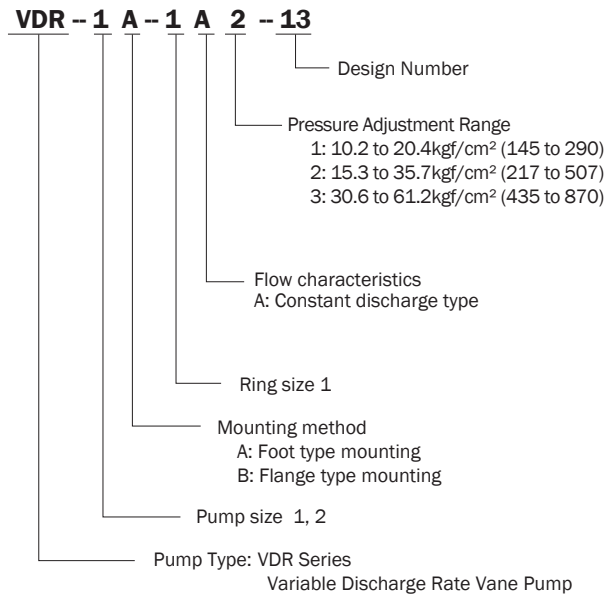
##### Double Pump

| Model No.   | Vent Side             |  | Shaft Side            |   | Vent Side  | Shaft Side | Revolution Speed<br>min <sup>-1</sup> |      | Weight<br>lbs    |
|---|-----------------------|--|-----------------------|---|--|------------|---------------------------------------|------|------------------|
|   | Discharge<br>Rate gpm | Pressure<br>Adjustment<br>Range<br>kgf/cm <sup>2</sup> (psi) | Discharge<br>Rate gpm | Pressure Adjustment<br>Range<br>kgf/cm <sup>2</sup> (psi)                   | Allowable Peak Pressure<br>kgf/cm <sup>2</sup> (psi) |            | Min.                                  | Max. |                  |
| VDR-11A(B)-1A1-1A1-13<br>VDR-11A(B)-1A1-1A2-13<br>VDR-11A(B)-1A1-1A3-13 | 6.6                   | 10.2 ~ 20.6<br>(145 ~ 290)                                   | 6.6                   | 10.2 ~ 20.6 (145 ~ 290)<br>15.3 ~ 35.7 (217 ~ 507)<br>30.6 ~ 51 (435 ~ 725) | 143<br>(2030)  |            | 800                                   | 1800 | A : 30<br>B : 30 |
|   |                       | 15.3 ~ 35.7<br>(217 ~ 507)                                   | 6.6                   | 15.3 ~ 35.7 (217 ~ 507)<br>30.6 ~ 51 (435 ~ 725)                            | 143<br>(2030)  |            |                                       |      |                  |
|   |                       | 30.6 ~ 51 (435 ~ 725)  | 5.2                   | 30.6 ~ 51 (435 ~ 725)   | 143 (2030)   |            |                                       |      |                  |
| VDR-11A(B)-1A3-1A3-13   | 5.2                   | 30.6 ~ 51 (435 ~ 725)  | 5.2                   | 30.6 ~ 51 (435 ~ 725)   | 143 (2030)   |            |                                       |      |                  |

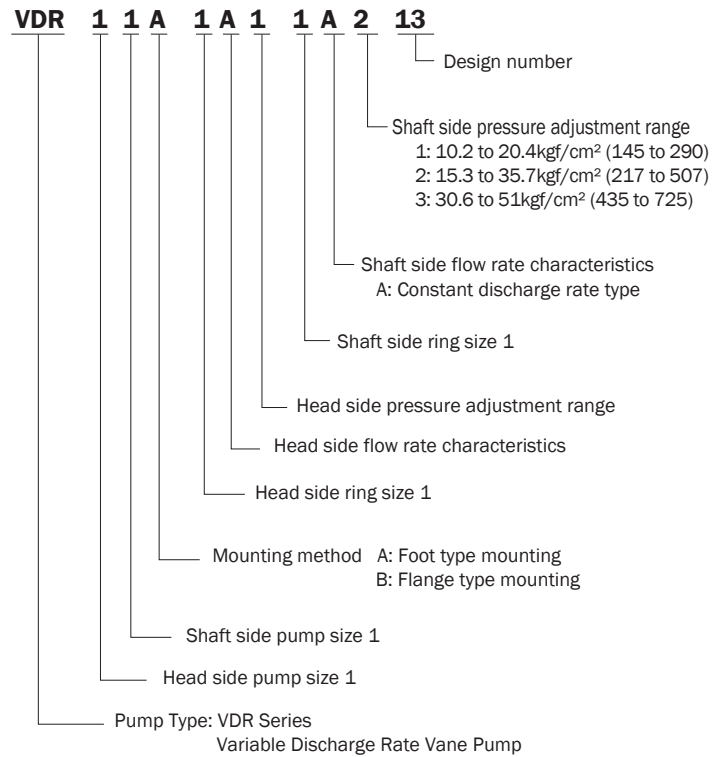
- Note: 1. The discharge rate is the value at 1800min<sup>-1</sup> no-load.  
 2. In addition to this model, the VDC Series (maximum working pressure: 2030 psi) high-pressure variable vane pump is also available. See page B-25 for more information.  
 3. The change from VDR-1 Series design number 11 to design number 12 represents a change in the shaft key width from .125 in. to .187 in. This means that when using a .125 in. key coupling, you need to use a stepped key (VD31J-302000) or add a new key groove at .187 in.  
 4. There is no change in the mounting method with the change from the VDR-1 size design number 12 and VDR-2 design number 11 to design number 13.

## Understanding Model Numbers

### Single Pump



### Double Pump

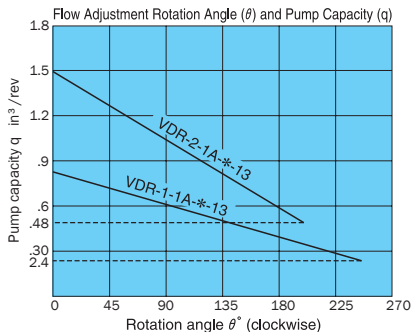


**3 Discharge Volume Adjustment**  
 The discharge flow rate is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation. Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut. The graph below provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the no-load discharge rate.

However:  

$$Q: \text{Flow rate gpm} = \frac{\text{in}^3 \times \text{rpm}}{231}$$

**4 Pressure Adjustment**  
 Pressure is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation.



- 5 Factory Default P-Q Settings (Standard Model)**
- Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
  - Pressure Setting = Pressure shown in table to the right
- 6 Initial Operation**  
 Before operating the pump for the first time, put the pump discharge side into the no-load state and then repeatedly start and stop the motor to bleed all air from inside the pump and the suction piping. After confirming that the pump is discharging oil, continue the no-load operation for at least 10 minutes to discharge all the air from the circuit. Provide an air bleed valve in circuits where it is difficult to bleed air before startup.
- 7 Sub Plate**  
 When a sub plate is required, specify a sub-plate type from the table in the installation dimension diagram.
- 8 For the hydraulic operating fluid, use an R&O type and wear-resistant type of ISO VG32 to 68 or equivalent (viscosity index of at least 90). Use hydraulic operating**

| Factory Default Pressure Settings kgf/cm <sup>2</sup> (psi) |
|---|
| 1: 20.4 (290)   |
| 2: 35.7 (507)   |
| 3: 30.6 (435)   |

Note) The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position. The broken line shows the flow volume adjustment range lower limit value.

- fluid that provides kinematic viscosity during operation in the range of 20 to 150 centistokes.
- 9** The operating temperature range is 59 to 140 °F. When the oil temperature at startup is 59 °F or less, perform a warm-up operation at low pressure and low speed until the oil temperature reaches 59 °F. Use the pump in an area where the temperature is within the range of 32 to 140 °F.
- 10** Suction pressure is 4.35 psi, and the suction port flow rate should be to greater than 6 ft/sec.

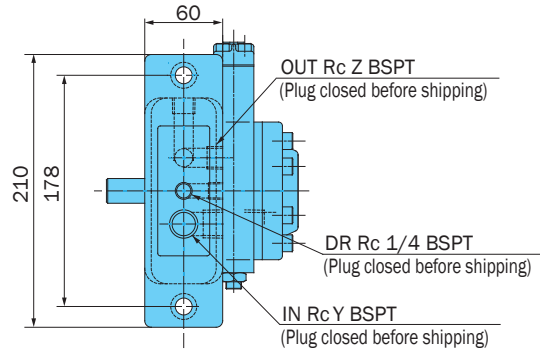
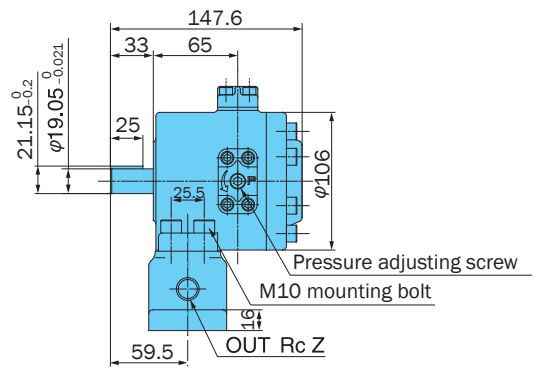
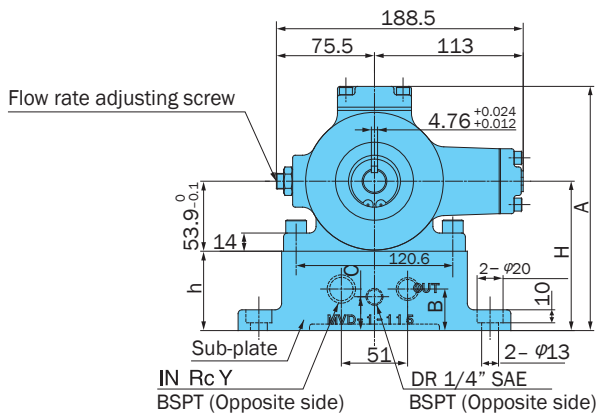
- 11 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.
- 12 Provide a suction strainer with a filtering grade of about 100µm (150 mesh). For the return line to the tank, use a 10µm line filter.
- 13 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water and other foreign matter, and watch out for

- discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.
- 14 At startup, repeat the inching operation (start-stop) to bleed air from the pump and pipes.
- 15 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.
- 16 To ensure proper lubrication of the pump's rubbing surfaces, supply oil to the interior of the pump before

- starting operation.
- 17 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.05mm. Use a pump mounting base of sufficient rigidity. The angle error should be no greater than 1°.

**Installation Dimension Drawings**

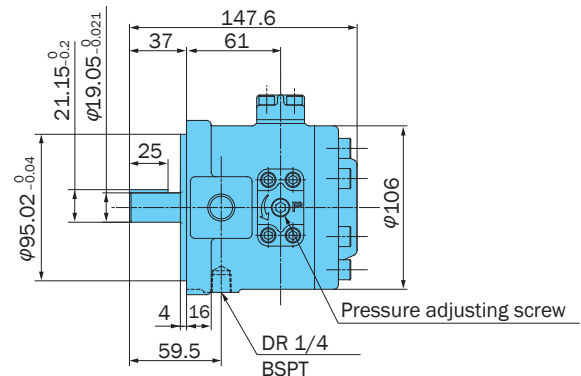
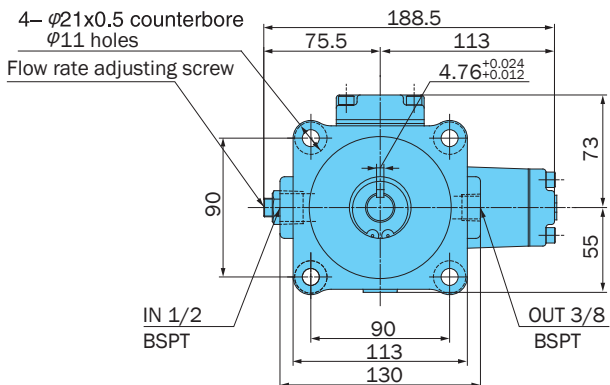
**VDR-1A-\*-13 (Foot Mounting)**



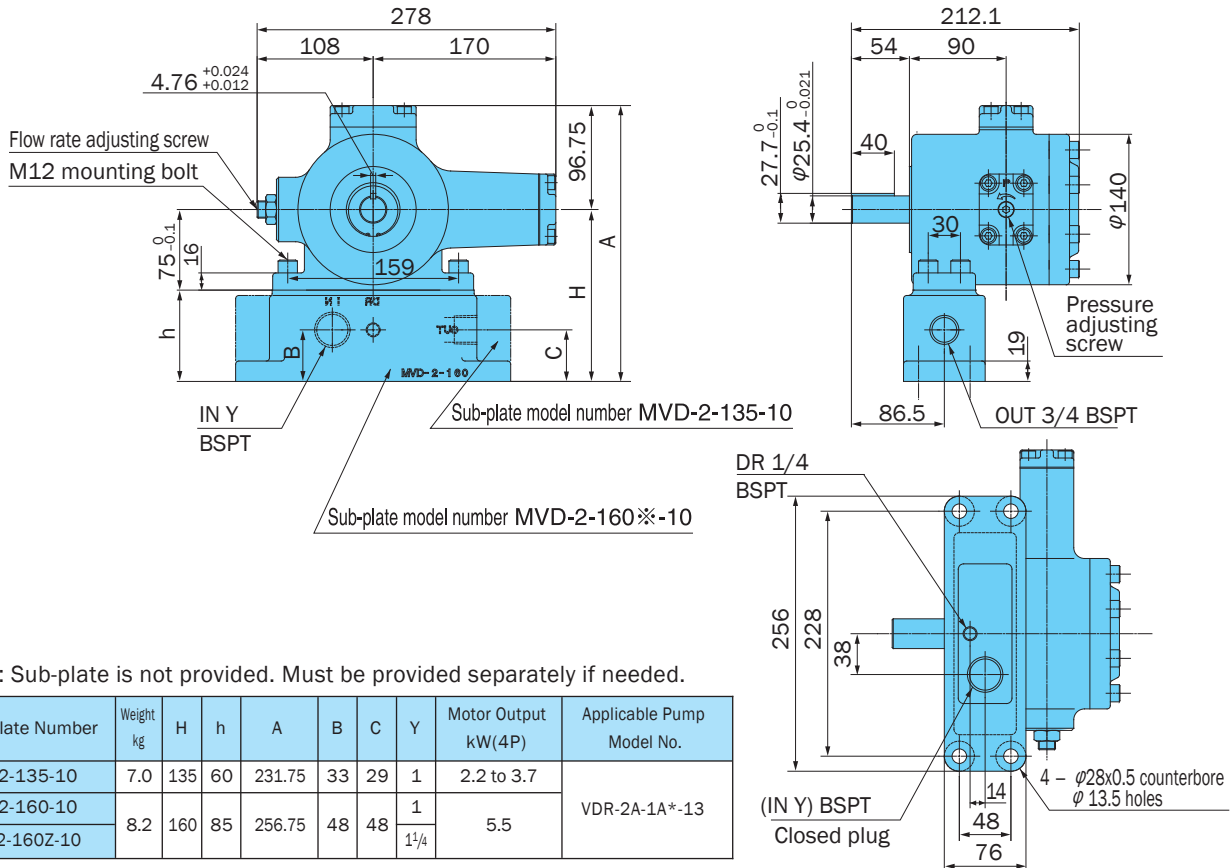
Note: Sub-plate is not provided. Must be provided separately if needed.

| Sub Plate Number | Weight lb | H   | h    | A   | B  | C  | Y   | Z   | Motor Output hp (4P) |
|------------------|-----------|-----|------|-----|----|----|-----|-----|----------------------|
| MVD-1-115-10     | 8         | 115 | 61.1 | 188 | 32 | 26 | 1/2 | 3/8 | 1 to 2               |
| MVD-1-115Y-10    |           |     |      |     |    |    | 3/4 | 1/2 |                      |
| MVD-1-135-10     | 10.8      | 135 | 81.1 | 208 | 40 | 40 | 1/2 | 3/8 | 3 to 5               |
| MVD-1-135Y-10    |           |     |      |     |    |    | 3/4 | 1/2 |                      |

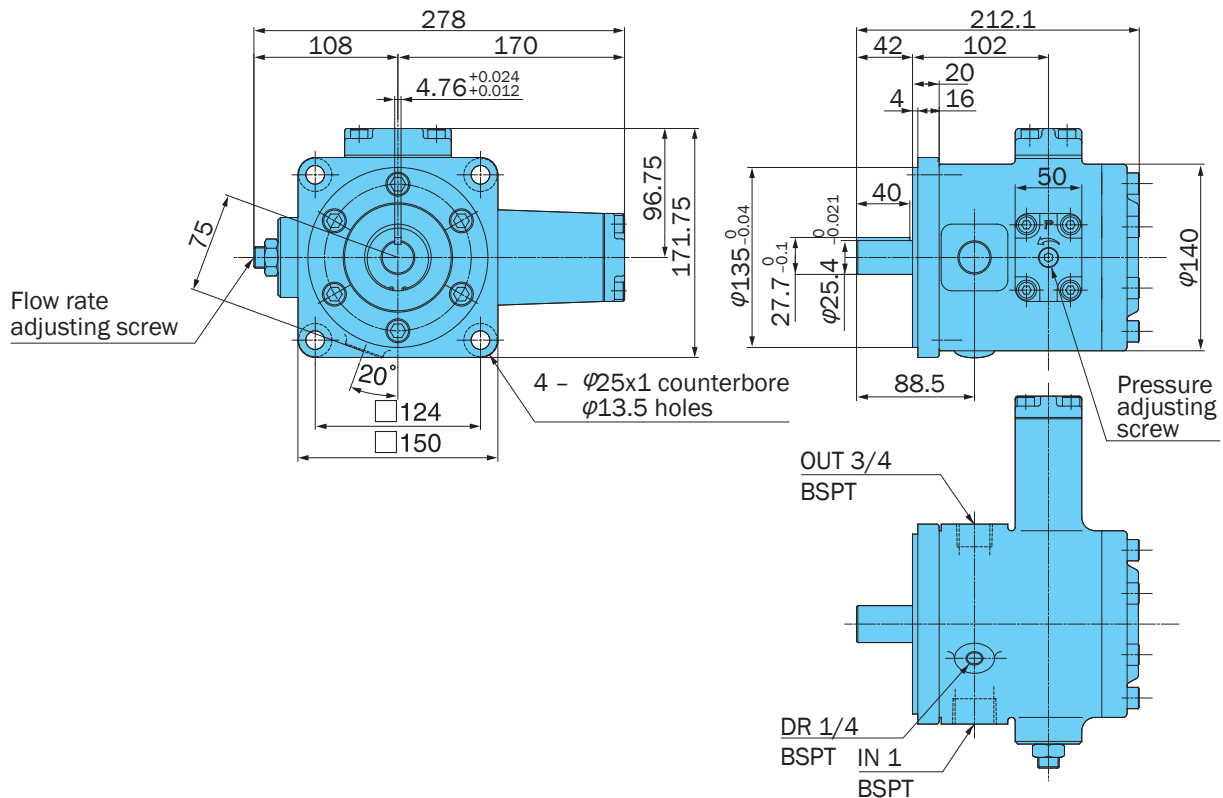
**VDR-1B-\*-13 (Flange Mounting) Not SAE Mount**



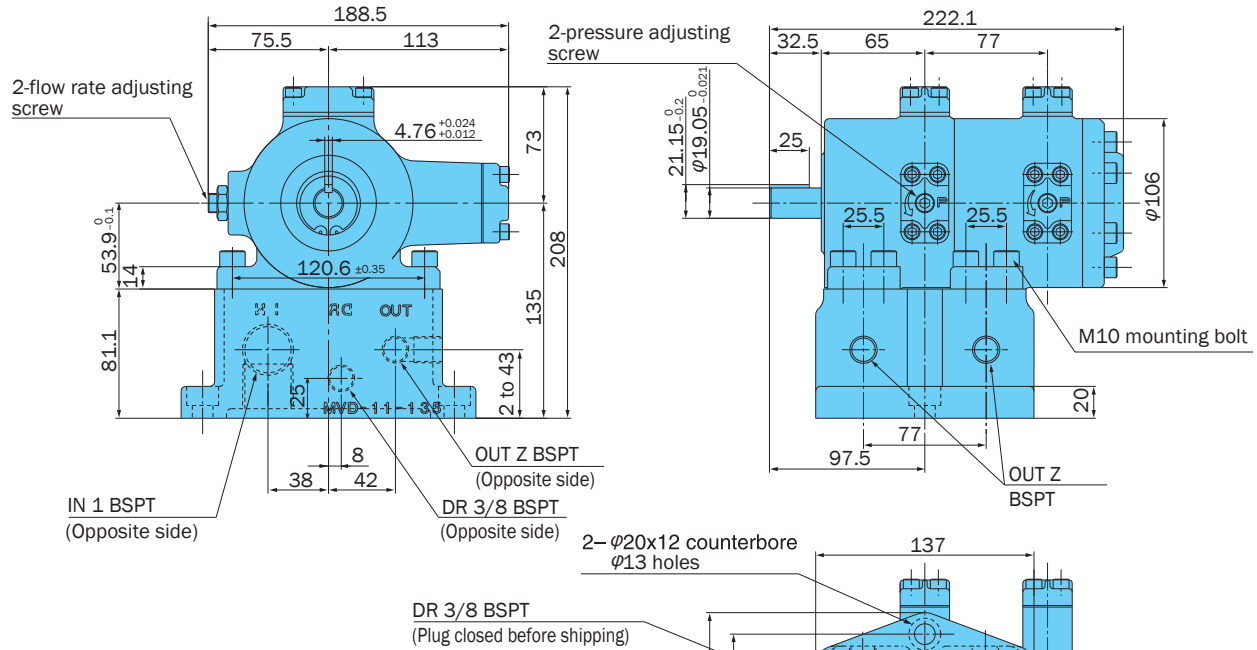
VDR-2A-\*-13 (Foot Mounting)



VDR-2B-\*-13 (Flange Mounting) Not SAE Mount



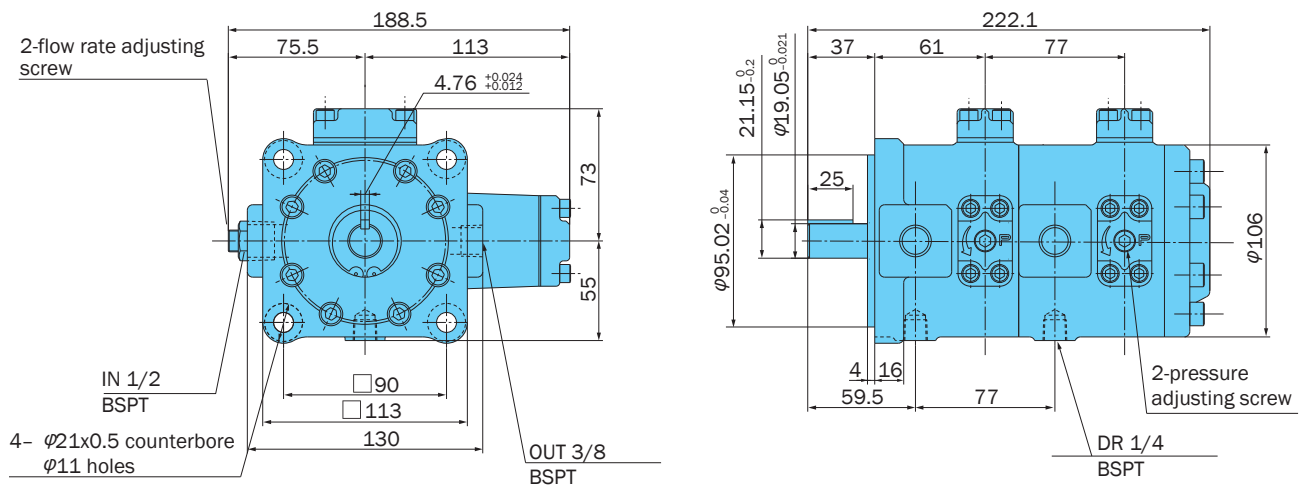
**VDR-11A-\*-13 (Foot Mounting)**



Note: Sub-plate is not provided. Must be provided separately if needed.

| Sub Plate Number | Z   | Weight lbs | Applicable Pump Model No. |
|------------------|-----|------------|---------------------------|
| MVD-11-135-10    | 3/8 | 10.3       | VDR-11A-1A-*-1A*-13       |
| MVD-11-135X-10   | 1/2 |            |                           |

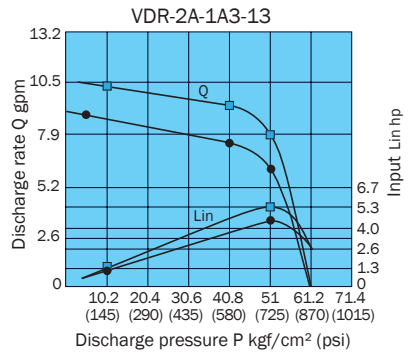
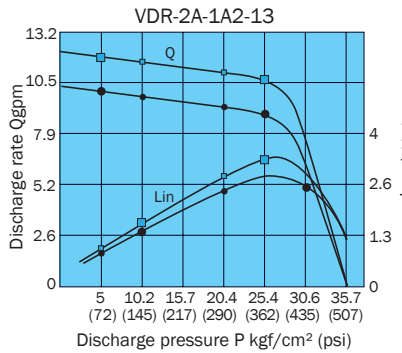
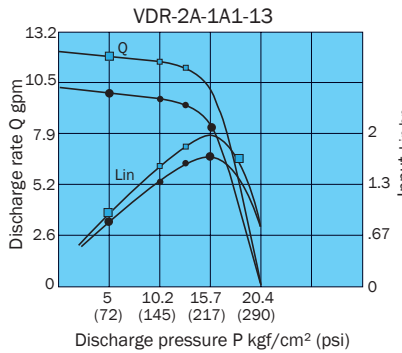
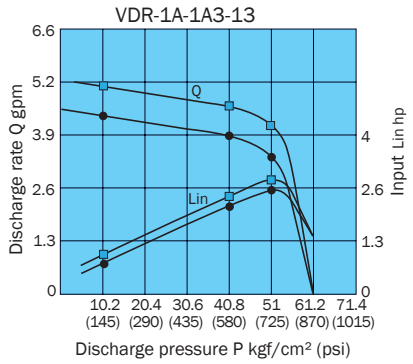
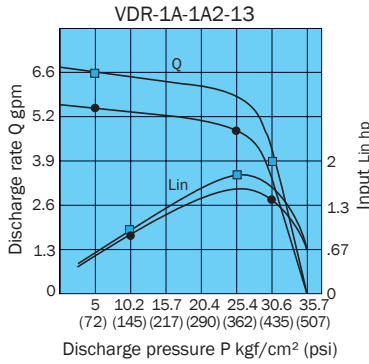
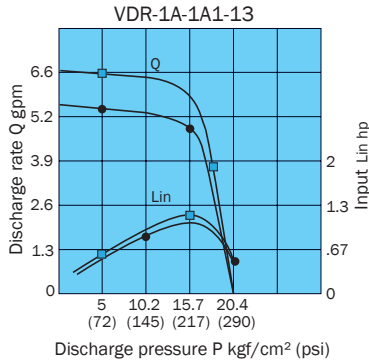
**VDR-11B-\*-13 (Flange Mounting) Not SAE Mount**



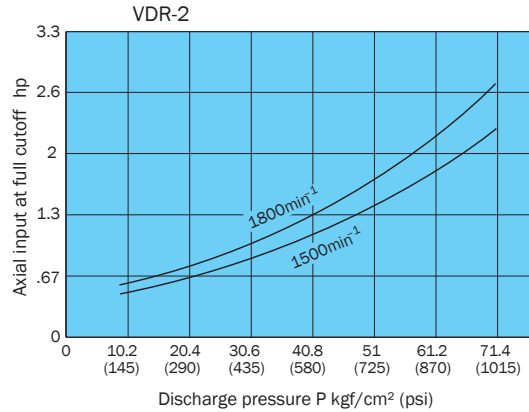
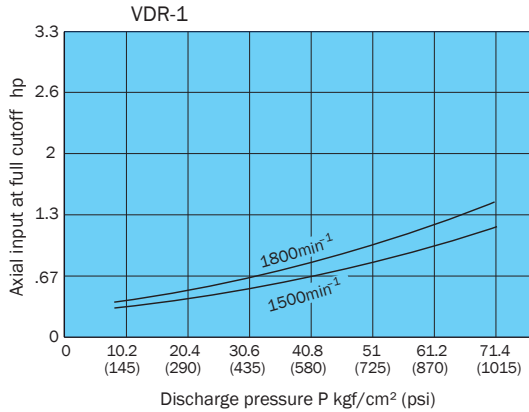
# Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes.

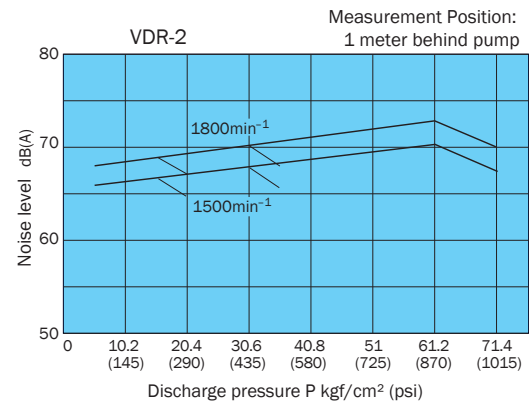
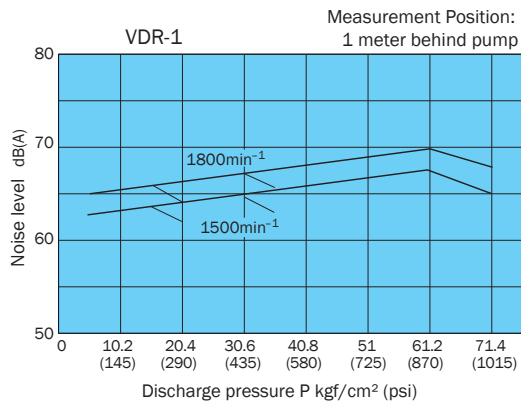
Revolution Speed  $1500\text{min}^{-1}$  —●—  
 $1800\text{min}^{-1}$  —□—



## Axial Input At Full Cutoff

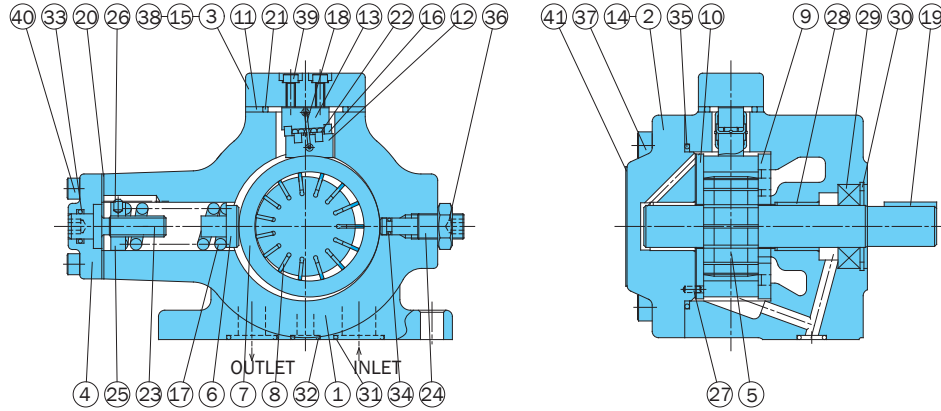


## Noise Characteristics



**Cross-sectional Drawing**

VDR-1A-\*-13  
VDR-2A-\*-13



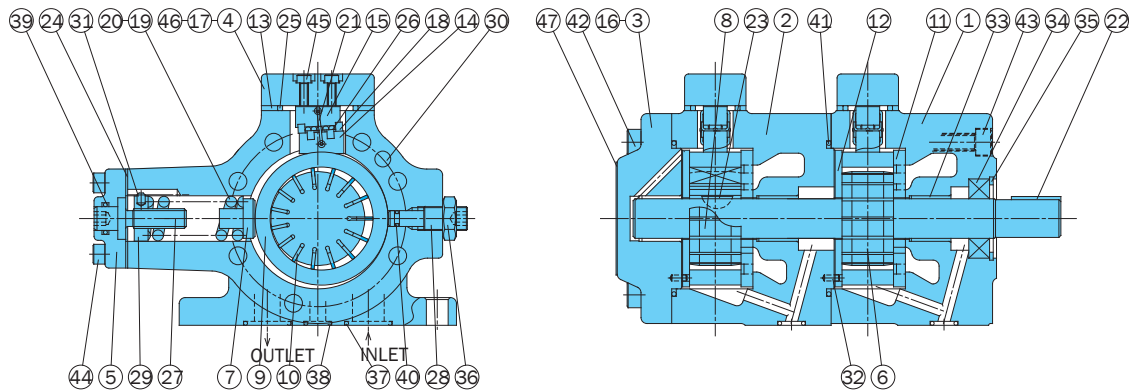
**List of Sealing Parts**

| Part No. | Applicable Pump Model No. | VDR-1A-*-13  |      | VDR-2A-*-13  |      |
|----------|---------------------------|--------------|------|--------------|------|
|          | Seal Kit Number           | VDAS-101A00  |      | VDAS-102A00  |      |
|          | Part Name                 | Part Number  | Q'ty | Part Number  | Q'ty |
| 20       | Packing                   | VD32J-101000 | 1    | VD32J-102000 | 1    |
| 21       | Square ring               | VD33J-101000 | 1    | 1A-G45       | 1    |
| 29       | Oil seal                  | ISRD-204010  | 1    | ISP-284811   | 1    |
| 31       | O-ring                    | 1A-P20       | 2    | 1A-G30       | 2    |
| 32       | O-ring                    | 1A-P10A      | 1    | 1A-P12       | 1    |
| 33       | O-ring                    | 1A-P12       | 1    | 1A-P14       | 1    |
| 34       | O-ring                    | 1A-P5        | 1    | 1A-P9        | 1    |
| 35       | O-ring                    | 1A-G70       | 1    | 1A-G100      | 1    |

| Part No. | Part Name | Part No. | Part Name            | Part No. | Part Name |
|----------|-----------|----------|----------------------|----------|-----------|
| 1        | Body      | 15       | Shim                 | 29       | Oil seal  |
| 2        | Cover     | 16       | Retainer             | 30       | Snap ring |
| 3        | Cover     | 17       | Spring               | 31       | O-ring    |
| 4        | Cover     | 18       | Spring               | 32       | O-ring    |
| 5        | Shaft     | 19       | Key                  | 33       | O-ring    |
| 6        | Piston    | 20       | Packing              | 34       | O-ring    |
| 7        | Ring      | 21       | Square ring (O-ring) | 35       | O-ring    |
| 8        | Vane      | 22       | Needle               | 36       | Nut       |
| 9        | Plate (S) | 23       | Screw                | 37       | Screw     |
| 10       | Plate (H) | 24       | Screw                | 38       | Screw     |
| 11       | Plate     | 25       | Nut                  | 39       | Screw     |
| 12       | Holder    | 26       | Pin                  | 40       | Screw     |
| 13       | Holder    | 27       | Pin                  | 41       | Nameplate |
| 14       | Shim      | 28       | Bearing              |          |           |

Note: 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK)  
2. O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.  
3. For VDR-\*B-\*-13, the seal kit number becomes VDBS-10\*B00, without the 31 and 32 O-rings.

**VDR-11A-\*-13**



**List of Sealing Parts**

| Part No. | Applicable Pump Model No. | VDR-11A-*-13 |      |
|----------|---------------------------|--------------|------|
|          | Seal Kit Number           | VDAS-111A00  |      |
|          | Part Name                 | Part Number  | Q'ty |
| 24       | Packing                   | VD32J-101000 | 2    |
| 25       | Square ring               | VD33J-101000 | 2    |
| 34       | Oil seal                  | ISRD-204010  | 1    |
| 37       | O-ring                    | 1A-P20       | 4    |
| 38       | O-ring                    | 1A-P10A      | 2    |
| 39       | O-ring                    | 1A-P12       | 2    |
| 40       | O-ring                    | 1A-P5        | 2    |
| 41       | O-ring                    | 1A-G70       | 2    |

| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name   | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-------------|----------|-----------|
| 1        | Body      | 11       | Plate (S) | 21       | Spring      | 31       | Pin       |
| 2        | Body      | 12       | Plate (H) | 22       | Key         | 32       | Pin       |
| 3        | Cover     | 13       | Plate     | 23       | Key         | 33       | Bearing   |
| 4        | Cover     | 14       | Holder    | 24       | Packing     | 34       | Oil seal  |
| 5        | Cover     | 15       | Holder    | 25       | Square ring | 35       | Snap ring |
| 6        | Shaft     | 16       | Shim      | 26       | Needle      | 36       | Nut       |
| 7        | Piston    | 17       | Shim      | 27       | Screw       | 37       | O-ring    |
| 8        | Rotor     | 18       | Retainer  | 28       | Screw       | 38       | O-ring    |
| 9        | Ring      | 19       | Spring    | 29       | Nut         | 39       | O-ring    |
| 10       | Vane      | 20       | Spring    | 30       | Pin         | 40       | O-ring    |
|          |           |          |           |          |             | 41       | O-ring    |
|          |           |          |           |          |             | 42       | Screw     |
|          |           |          |           |          |             | 43       | Screw     |
|          |           |          |           |          |             | 44       | Screw     |
|          |           |          |           |          |             | 45       | Screw     |
|          |           |          |           |          |             | 46       | Screw     |
|          |           |          |           |          |             | 47       | Nameplate |

Note: 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).  
2. O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.  
3. For VDR-11B-\*-13, the seal kit number becomes VDBS-111B00, without the 37 and 38 O-rings.

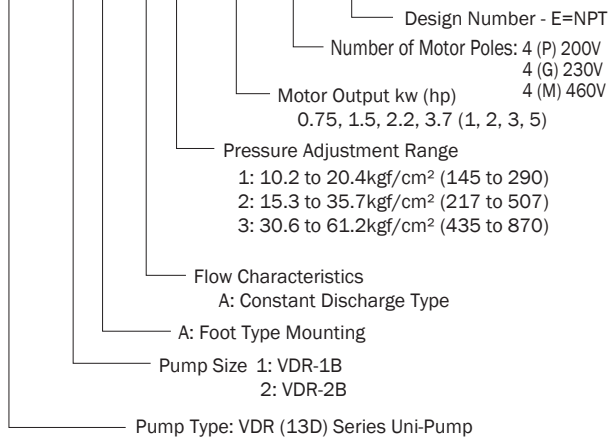
# Performance Curves

(CE mark standard compliant)

## Understanding Model Numbers

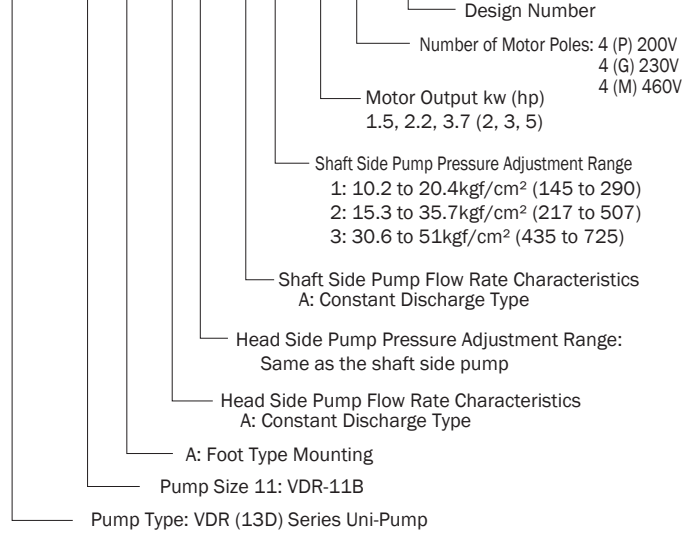
### Single Pump

**UVD - 1 A - A 2 - 1.5 - 4 - 30**



### Double Pump

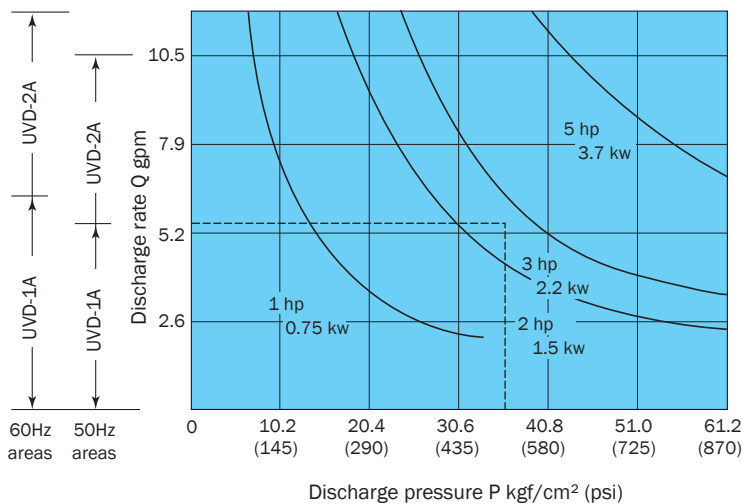
**UVD - 11 A - A \* - A \* - \* - 4 - 30**



## Specifications

| Model No. | Maximum Working Pressure<br>kgf/cm <sup>2</sup> (psi) | Maximum Flow Rate gpm |         |
|-----------|---|-----------------------|---------|
|           |   | 50Hz                  | 60Hz    |
| UVD- 1A   | 61.2 (870)  | 5.5                   | 6.6     |
| UVD- 2A   | 51.0 (725)  | 10                    | 11.8    |
| UVD- 11A  | 51.0 (725)  | 5.5                   | 6.5-6.6 |

## Motor Selection Curves



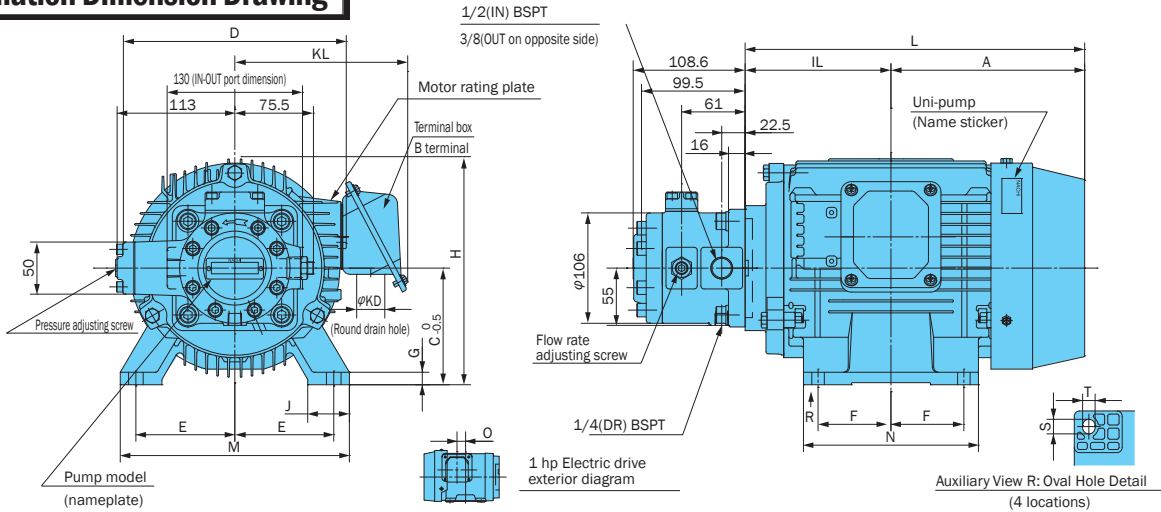
- Selecting a motor  
The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.  
Example:  
To find the motor that can produce pressure of 507 psi and a discharge rate of 5.5 gpm.  
Selection Process:  
Since the intersection of the two broken lines from a pressure of 507 psi and discharge rate of 5.5 gpm intersect in the area under the 3 hp curve, it means that a 3 hp motor should be used. In the case of a double pump configuration, select a motor that is larger than the total power required by both pumps.

\*Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.



### Installation Dimension Drawing

#### UVD-1A

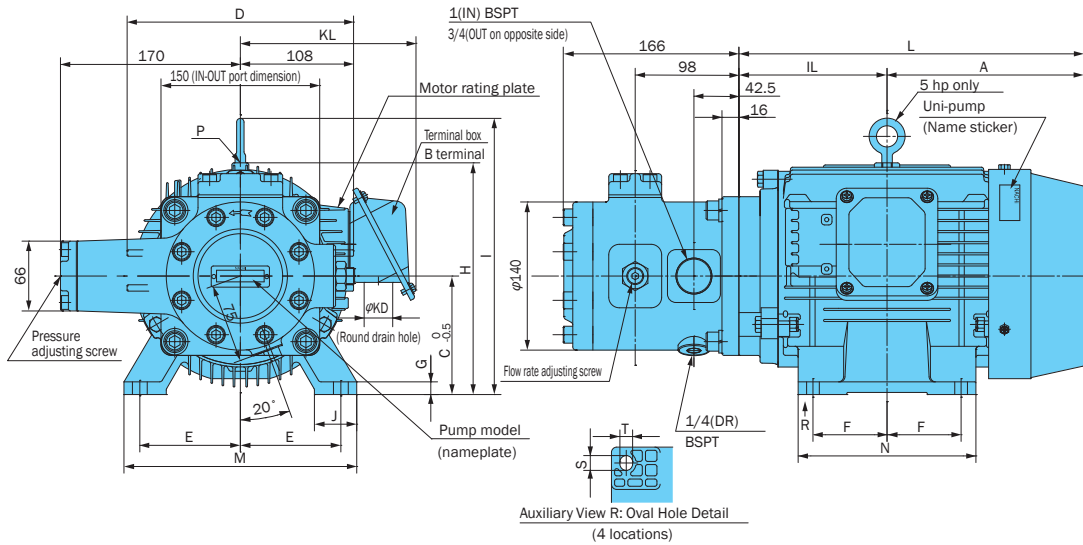


| Uni-pump            | Motor Dimensions mm |       |     |     |      |      |     |     |    |       |     |     |       |     |     |      | Frame No. | Output hp (4poles) | Weight lbs |  |
|---------------------|---------------------|-------|-----|-----|------|------|-----|-----|----|-------|-----|-----|-------|-----|-----|------|-----------|--------------------|------------|--|
|                     | A                   | IL    | C   | D   | E    | F    | G   | H   | J  | L     | M   | N   | S×T   | KD  | KL  | O    |           |                    |            |  |
| UVD-1A-A1-0.75-4-30 | 133                 | 105   | 80  | 170 | 62.5 | 50   | 4.5 | 165 | 35 | 238   | 165 | 130 | 18×10 | φ27 | 157 | 27.5 | 80M       | 1                  | 50         |  |
| UVD-1A-A2-0.75-4-30 |                     |       |     |     |      |      |     |     |    |       |     |     |       |     |     |      |           |                    |            |  |
| UVD-1A-A2-1.5-4-30  | 143                 | 118.5 | 90  | 198 | 70   | 62.5 | 10  | 190 | 40 | 261.5 | 176 | 150 | 12×10 | φ27 | 159 | -    | 90L       | 2                  | 53         |  |
| UVD-1A-A3-1.5-4-30  |                     |       |     |     |      |      |     |     |    |       |     |     |       |     |     |      |           |                    |            |  |
| UVD-1A-A3-2.2-4-30  | 157.5               | 133   | 100 | 198 | 80   | 70   | 12  | 200 | 40 | 290.5 | 200 | 168 | 14×12 | φ27 | 159 | -    | 100L      | 3                  | 64         |  |

No hanger.

1. Standard drive motor is the fully enclosed fan-cooled B type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

#### UVD-2A

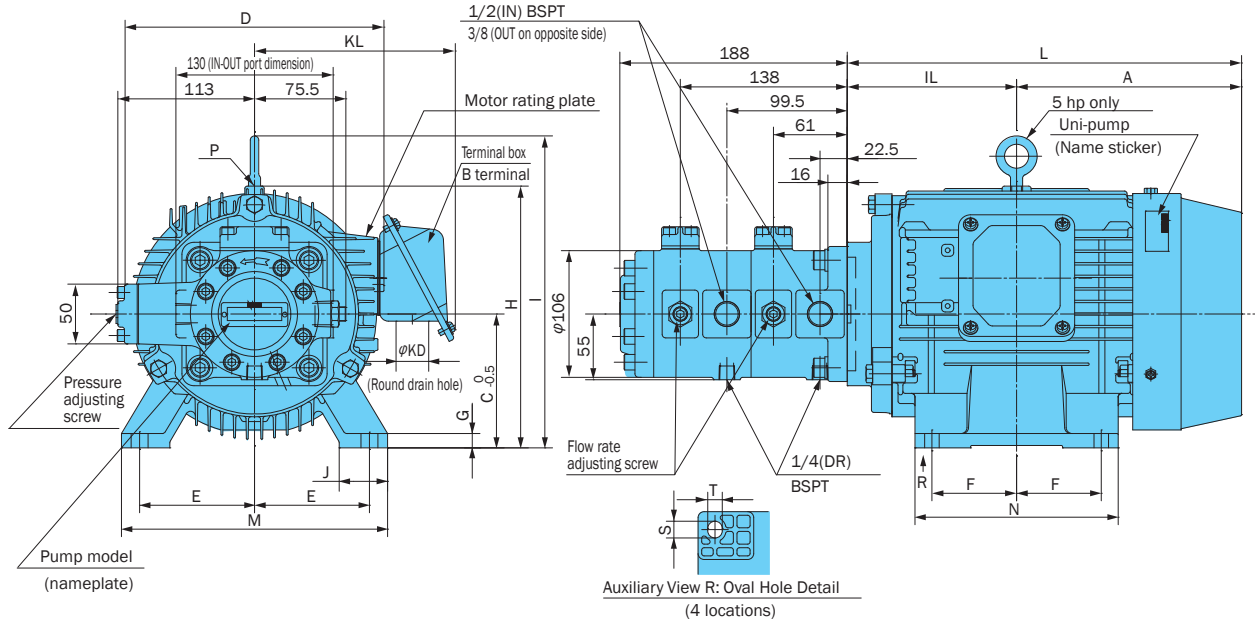


| Uni-pump           | Motor Dimensions mm |       |     |     |    |      |    |     |     |    |       |     |     |       |     |     | Frame No. | Output hp (4poles) | Weight lbs |     |
|--------------------|---------------------|-------|-----|-----|----|------|----|-----|-----|----|-------|-----|-----|-------|-----|-----|-----------|--------------------|------------|-----|
|                    | A                   | IL    | C   | D   | E  | F    | G  | H   | I   | J  | L     | M   | N   | S×T   | KD  | KL  |           |                    |            | O   |
| UVD-2A-A1-1.5-4-30 | 143                 | 118.5 | 90  | 198 | 70 | 62.5 | 10 | 190 | -   | 40 | 261.5 | 176 | 150 | 12×10 | φ27 | 159 | -         | 90L                | 2          | 84  |
| UVD-2A-A2-1.5-4-30 |                     |       |     |     |    |      |    |     |     |    |       |     |     |       |     |     |           |                    |            |     |
| UVD-2A-A2-2.2-4-30 | 157.5               | 133   | 100 | 198 | 80 | 70   | 12 | 200 | -   | 40 | 290.5 | 200 | 168 | 14×12 | φ27 | 159 | -         | 100L               | 3          | 95  |
| UVD-2A-A3-2.2-4-30 |                     |       |     |     |    |      |    |     |     |    |       |     |     |       |     |     |           |                    |            |     |
| UVD-2A-A2-3.7-4-30 | 186                 | 140   | 112 | 214 | 95 | 70   | 12 | -   | 261 | 40 | 326   | 220 | 168 | 14×12 | φ27 | 166 | -         | 112M               | 5          | 108 |
| UVD-2A-A3-3.7-4-30 |                     |       |     |     |    |      |    |     |     |    |       |     |     |       |     |     |           |                    |            |     |

2 to 3 hp model does not have hangers.

1. Standard drive motor is the fully enclosed fan-cooled B type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

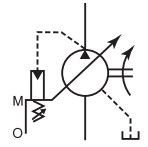
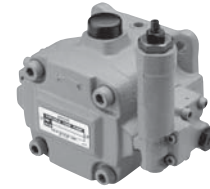
UVD-11A



| Uni-pump               | Motor Dimensions mm |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     | Frame No. | Output hp (4poles) | Weight lbs |    |
|------------------------|---------------------|-------|-----|-----|----|------|----|-----|-----|-------|-------|-----|-------|-------|-----|-----|-----------|--------------------|------------|----|
|                        | A                   | IL    | C   | D   | E  | F    | G  | H   | I   | J     | L     | M   | N     | S×T   | KD  | KL  |           |                    |            | O  |
| UVD-11A-A1-A1-1.5-4-30 | 143                 | 118.5 | 90  | 198 | 70 | 62.5 | 10 | 190 | 40  | 261.5 | 176   | 150 | 12×10 | φ27   | 159 | -   | 90L       | 2                  | 66         |    |
| UVD-11A-A1-A2-1.5-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A1-A3-1.5-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A2-A2-1.5-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A2-A3-1.5-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A1-A2-2.2-4-30 | 157.5               | 133   | 100 | 198 | 80 | 70   | 12 | 200 | -   | 40    | 290.5 | 200 | 168   | 14×12 | φ27 | 159 | -         | 100L               | 3          | 77 |
| UVD-11A-A1-A3-2.2-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A2-A2-2.2-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A2-A3-2.2-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A3-A3-2.2-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A1-A3-3.7-4-30 | 186                 | 140   | 112 | 214 | 95 | 70   | 12 | -   | 261 | 40    | 326   | 220 | 168   | 14×12 | φ27 | 166 | -         | 112M               | 5          | 90 |
| UVD-11A-A2-A2-3.7-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A2-A3-3.7-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |
| UVD-11A-A3-A3-3.7-4-30 |                     |       |     |     |    |      |    |     |     |       |       |     |       |       |     |     |           |                    |            |    |

No hanger on 2 and 3 hp models.

1. Standard drive motor is the fully enclosed fan-cooled B type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).



### VDC Series High Pressure Type Variable Volume Vane Pump

7.9 to 31.7 gpm  
2000 psi

#### Features

##### Highly efficient and stable high-pressure operation

Innovative pressure control and pressure balance mechanisms combine with an original 3-point ring support system dramatically improves high-pressure operation. The result is outstanding performance at high pressures up to 2000 psi.

##### Low vibration and noise

A number of innovative new mechanisms are adopted to minimize vibration and noise. In particular, a 3-point support system is used for the control piston and bias piston to increase ring

stability. This minimizes ring vibration and delivers quiet operation.

##### Outstanding response, high-precision operation

An innovative new ring stopper eliminates excessive ring displacement and improves response. The result is high precision operation at all times, including during starts, stops, and load changes.

##### Precise characteristics for a stable discharge rate

A revolutionary new pressure compensator type pressure control mechanism

ensures a highly stable fixed discharge rate, even in the high pressure range.

##### High efficiency operation with minimal power loss

New mechanical innovations minimize power loss, especially at full cutoff.

##### Simplified maintenance and handling

Pressure adjusting and discharge rate adjusting mechanisms are located on the same side of the pump for simplified maintenance and handling.

#### Specifications

##### Single Pump

| Model No.  |  | Capacity<br>in <sup>3</sup> /rev | No-load Discharge Rate gpm |                       | Pressure Adjustment<br>Range<br>kgf/cm (psi)   | Allowable Peak<br>Pressure<br>kgf/cm (psi) | Revolution Speed<br>min <sup>-1</sup> |      | Weight<br>lbs |
|--|--|----------------------------------|----------------------------|-----------------------|--|--|---------------------------------------|------|---------------|
| Foot Mounting  | Flange Mounting  |                                  | 1500min <sup>-1</sup>      | 1800min <sup>-1</sup> |  |  | Min.                                  | Max. |               |
| VDC-1A-1A2-*20<br>VDC-1A-1A3-*20<br>VDC-1A-1A4-*20<br>VDC-1A-1A5-*20 | VDC-1B-1A2-*20/35<br>VDC-1B-1A3-*20/35<br>VDC-1B-1A4-*20/35<br>VDC-1B-1A5-*20/35 | 1.0                              | 6.6                        | 7.9                   | 15.3 to 35.7 (217 to 507)<br>20.4 to 71.4 (290 to 1000)<br>51 to 107 (725 to 1500)<br>71.4 to 143 (1000 to 2000) | 143<br>(2000)<br>214<br>(3000)             | 800                                   | 1800 | 21            |
| VDC-1A-2A2-*20<br>VDC-1A-2A3-*20                                     | VDC-1B-2A2-*20/35<br>VDC-1B-2A3-*20/35   | 1.3                              | 8.7                        | 10.5                  | 15.3 to 35.7 (217 to 507)<br>20.4 to 71.4 (290 to 1000)  | 143<br>(2000)                              | 800                                   | 1800 | 21            |
| VDC-2A-1A2-*20<br>VDC-2A-1A3-*20<br>VDC-2A-1A4-*20<br>VDC-2A-1A5-*20 | VDC-2B-1A2-*20/35<br>VDC-2B-1A3-*20/35<br>VDC-2B-1A4-*20/35<br>VDC-2B-1A5-*20/35 | 1.8                              | 11.8                       | 14.2                  | 15.3 to 35.7 (217 to 507)<br>20.4 to 71.4 (290 to 1000)<br>51 to 107 (725 to 1500)<br>71.4 to 143 (1000 to 2000) | 143<br>(2000)<br>214<br>(3000)             | 800                                   | 1800 | 55            |
| VDC-2A-2A2-*20<br>VDC-2A-2A3-*20                                     | VDC-2B-2A2-*20/35<br>VDC-2B-2A3-*20/35   | 2.3                              | 15.3                       | 18.4                  | 15.3 to 35.7 (217 to 507)<br>20.4 to 71.4 (290 to 1000)  | 143<br>(2000)                              | 800                                   | 1800 | 55            |
| VDC-3A-1A2-*20<br>VDC-3A-1A3-*20<br>VDC-3A-1A4-*20<br>VDC-3A-1A5-*20 | VDC-3B-1A2-*20<br>VDC-3B-1A3-*20<br>VDC-3B-1A4-*20<br>VDC-3B-1A5-*20             | 4.0                              | 26.4                       | 31.7                  | 15.3 to 35.7 (217 to 507)<br>20.4 to 71.4 (290 to 1000)<br>51 to 107 (725 to 1500)<br>71.4 to 143 (1000 to 2000) | 143<br>(2000)<br>214<br>(3000)             | 800                                   | 1800 | 103           |

##### Double Pump

| Model No.  | Vent Side             |                       |  | Shaft Side                   |                              |  | Revolution<br>Speed min <sup>-1</sup> |      | Weight<br>lbs            |
|--|-----------------------|-----------------------|--|------------------------------|------------------------------|--|---------------------------------------|------|--------------------------|
|  | Discharge Rate gpm    |                       | Pressure Adjustment<br>Range<br>kgf/cm (psi)                   | Discharge Rate gpm           |                              | Pressure Adjustment<br>Range<br>kgf/cm (psi)   | Min.                                  | Max. |                          |
|  | 1800min <sup>-1</sup> | 1500min <sup>-1</sup> |  | 1800min <sup>-1</sup>        | 1500min <sup>-1</sup>        |  |                                       |      |                          |
| VDC-11A(B)-2A3-2A*20/35<br>VDC-11A(B)-2A3-1A*20/35   | 10.5                  | 8.7                   | 20.4 to 71.4<br>(290 to 1000)                                  | 10.5<br>7.9                  | 8.7<br>6.6                   | 20.4 to 71.4 (290 to 1000)<br>71.4 to 143 (1000 to 2000)   | 800                                   | 1800 | Type A 59<br>Type B 44   |
| VDC-12A(B)-2A3-2A*20/35<br>VDC-12A(B)-2A3-1A*20/35<br>VDC-12A(B)-1A5-2A*20/35<br>VDC-12A(B)-1A5-1A*20/35 | 10.5<br>7.9           | 8.7<br>6.6            | 20.4 to 71.4<br>(290 to 1000)<br>71.4 to 143<br>(1000 to 2000) | 18.4<br>14.2<br>18.4<br>14.2 | 15.3<br>11.8<br>15.3<br>11.8 | 20.4 to 71.4 (290 to 1000)<br>71.4 to 143 (1000 to 2000)<br>20.4 to 71.4 (290 to 1000)<br>71.4 to 143 (1000 to 2000) | 800                                   | 1800 | Type A 92<br>Type B 77   |
| VDC-22A(B)-2A3-2A*20/35<br>VDC-22A(B)-2A3-1A*20/35   | 18.4                  | 15.3                  | 20.4 to 71.4<br>(290 to 1000)                                  | 18.4<br>17.2                 | 15.3<br>11.8                 | 20.4 to 71.4 (290 to 1000)<br>71.4 to 143 (1000 to 2000)   | 800                                   | 1800 | Type A 136<br>Type B 110 |
| VDC-13A(B)-2A3-1A*20<br>VDC-13A(B)-2A3-1A*20<br>VDC-13A(B)-1A5-1A*20<br>VDC-13A(B)-1A5-1A*20             | 10.5<br>7.9           | 8.7<br>6.6            | 20.4 to 71.4<br>(290 to 1000)<br>71.4 to 143<br>(1000 to 2000) | 31.7                         | 26.4                         | 20.4 to 71.4 (290 to 1000)<br>71.4 to 143 (1000 to 2000)<br>20.4 to 71.4 (290 to 1000)<br>71.4 to 143 (1000 to 2000) | 800                                   | 1800 | Type A 136<br>Type B 105 |

Note: 1. VDC-3A, VDC-11A, VDC-12A and VDC-13A are foot mounting types, and come with foot mountings.  
2. VDC-1A and VDC-2A are sub plate types. Sub plates are not included.

• Handling

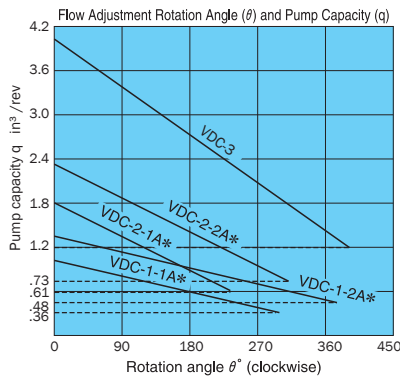
- 1 Rotation Direction The direction of rotation is always clockwise (rightward) when viewed from the shaft side.
- 2 Drain Drain piping must be direct piping up to a point that is below the tank fluid level, and piping should comply with the conditions shown in the table below to ensure that back pressure due to pipe resistance does not exceed 14 psi. When using a pump that has drain ports at two locations, use the drain port that is higher after the pump is installed. In the case of a double pump, run separate pipes from both the shaft side and the head side drains directly connect to the tank, so the drain pipe is below the surface of the oil.
- 3 Discharge Volume Adjustment

| Model No.<br>Item | VDC-1         | VDC-2         | VDC-3         |
|-------------------|---------------|---------------|---------------|
| Pipe Joint Size   | At least 1/4" | At least 1/4" | At least 3/8" |
| Pipe I.D.         | At least .29  | At least .29  | At least .37  |
| Pipe Length       | 1m or less    | 1m or less    | 1m or less    |

The discharge flow rate is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation.

Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut. The graph below provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the no-load discharge rate.

$$Q: \text{Flow rate gpm} = \frac{\text{in}^3 \times \text{rpm}}{231}$$



Note:

The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position. The broken line shows the flow volume adjustment range lower limit value.

- 4 Pressure Adjustment Pressure is increased by clockwise (rightward) rotation of the discharge rate adjusting screw, and decreased by counterclockwise (leftward) rotation. Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut.
- 5 Factory Default P-Q Settings (Standard Model)
  - Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
  - Pressure Setting = Pressure shown in table below
- 6 Thrust Screw and Stopper The thrust screw and stopper are precision adjusted at the factory during assembly. Never touch them. See callouts 15/43 and 15/38 in the VDC-1A and 2A/3A cross-section diagrams on pages B-33 and B-34.
- 7 An unload circuit is required when the motor is started under condition WYE Delta. Contact your agent about the unload circuit.
- 8 Initial Operation Before operating the pump for the first time, put the pump discharge side into the no-load state and then repeatedly start and stop the motor to bleed all air from inside the pump and the suction piping. After confirming that the pump is discharging oil, continue the no-load operation for at least 10 minutes to discharge all the air from the circuit. Provide an air bleed valve in circuits where it is difficult to bleed air before startup.
- 9 Sub Plate Use the table below for to specify a sub plate type when one is required.

| Factory Default Pressure Settings kgf/cm <sup>2</sup> (psi) |
|---|
| 2: 35.7 (507)   |
| 3: 30.6 (435)   |
| 4: 5.1 (725)  |
| 5: 71.4 (1000)  |

- 10 Foot Mounting For a double pump with VDC-3 foot mounting, the foot mounting kit and pump are sold as a set. When only the mounting feet are required, pump mounting bolts, washers and other parts are sold together as the Foot Mounting Kit. See page B-36 for detailed dimensions.
- 11 For the hydraulic operating fluid, use type ISO VG32 or equivalent (viscosity index of at least 90) for pressures of 1000 psi or lower, and type ISO VG68 or equivalent (viscosity index of at least 90) for pressures greater than 1000 psi.
- 12 The operating temperature range is 59 to 140°F. When the oil temperature at startup is 59°F or less, perform a warm-up operation at low pressure until the oil temperature reaches 59°F. Use the pump in an area where the temperature is within the range of 32 to 140°F.
- 13 Suction pressure is 4.35 psi, and the suction port flow rate should be no greater than 6 ft/sec.
- 14 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.
- 15 Provide a suction strainer with a filtering grade of about 100µm (150 mesh). For the return line to the tank, use a 10µm line filter.
- 16 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water and other foreign matter, and watch out for discoloration. Whitish fluid indicates that water has contaminated the fluid, and brownish fluid indicates the fluid is dirty.
- 17 Contact your agent about using water- and glycol-based hydraulic operating fluids.
- 18 At startup, repeat the inching operation (start-stop) to bleed air from the pump and pipes.

(Continued on following page)

Sub Plate Number

| Pump Model No. | Sub Plate Number | Motor (hp) |
|----------------|------------------|------------|
| VDC-1A-1A*-20  | MVD-1-115-10     | 1 - 2      |
|                | MVD-1-135-10     | 3 - 5      |
| VDC-1A-2A*-20  | MVD-1-115Y-10    | 1 - 2      |
|                | MVD-1-135Y-10    | 3 - 5      |
| VDC-2A-*A*-20  | MVD-2-135-10     | 3 - 5      |
|                | MVD-2-160-10     | 7          |
| VDC-2A-2A*-20  | MVD-2-160Z-10    | 7          |

Note: See pages B-17 and B-18 for detailed dimensions.

- 19 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.
- 20 To ensure proper lubrication of the pump's rubbing surfaces, supply oil to the interior of the pump before starting operation.

- 21 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.001 in. Use a pump mounting base of sufficient rigidity. The angle error should be no greater than 1°.

### Understanding Model Numbers

#### Single Pump

**VDC -- 2 A -- 1 A 2 \* 20**

20 Design Number Metric  
 E20 - VDC-1A, 2A, 3A/B; Unified Threads  
 E35 - VDC-1B, VDC-2B; Unified Threads  
 \* P - Remote Control Compensator

Pressure Adjustment Range  
 2: 15.3 to 35.7kgf/cm<sup>2</sup> (217 to 507)  
 3: 20.4 to 71.4kgf/cm<sup>2</sup> (290 to 1015)  
 4: 51 to 107kgf/cm<sup>2</sup> (725 to 1522)  
 5: 71.4 to 143kgf/cm<sup>2</sup> (1015 to 2000)  
 Note: Ring Size: In the case of 2, maximum setting pressure is 71.4kgf/cm<sup>2</sup> (1015).

Flow Characteristics A: Constant Discharge Type

Ring Size at 1800min<sup>-1</sup>

| Ring size | VDC-1    | VDC-2    | VDC-3  |
|-----------|----------|----------|--------|
| 1         | 7.9 gpm  | 14.2 gpm | 31 gpm |
| 2         | 10.5 gpm | 18.5 gpm | -      |

Mounting Method  
 A: Foot Type Mounting B: Flange Type Mounting

Pump Size  
 1, 2, 3

Pump Type: VDC Series High-pressure Variable Discharge Rate Vane Pump

The ZR-T02-\*5895\* is the recommended remote control valve. Provide piping to the remote control valve at a pipe volume of 9 cu in or less.

#### Double Pump

**VDC -- 1 2 A -- 1 A 5 -- 2 A 3 -- 20**

Design Number Metric  
 E35 - VDC-11B, 12B  
 E20 - VDC-13B

Shaft Side Pressure Adjustment Range  
 3: 20.4 to 71.4kgf/cm<sup>2</sup> (290 to 1015)  
 5: 71.4 to 143kgf/cm<sup>2</sup> (1015 to 2000)

Shaft Side Flow Rate Characteristics A: Constant Discharge Rate Type

Shaft Side Ring Size 1, 2  
 (Size 1 only for VDC-3)

Head Side Pressure Adjustment Range 3, 5

Head Side Flow Rate Characteristics A: Constant Discharge Rate Type

Head Side Ring Size 1, 2

Mounting Method  
 A: Foot Type Mounting B: Flange Type Mounting

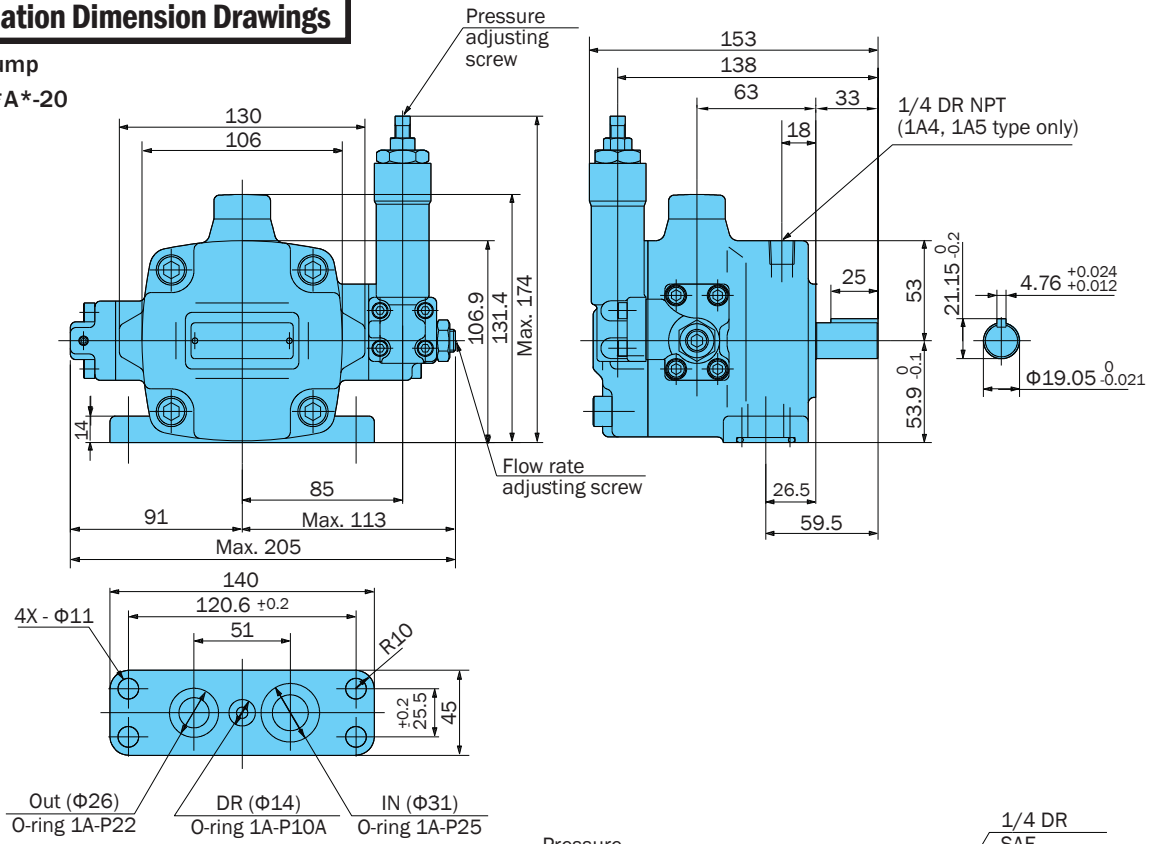
Shaft Side Pump Size 1, 2, 3

Head Side Pump Size 1, 2

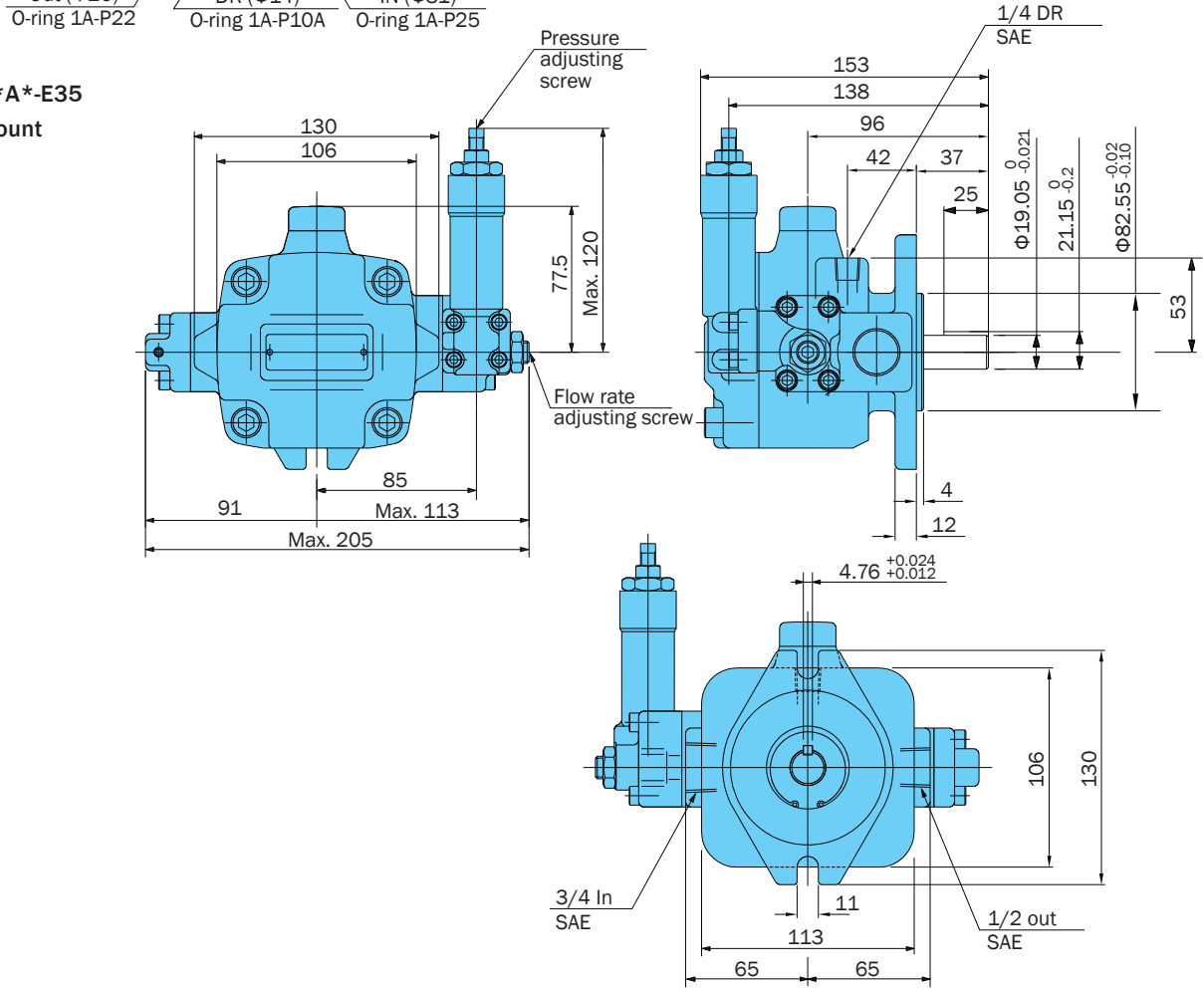
Pump Type: VDC Series High-Pressure Variable Discharge Rate Vane Pump

**Installation Dimension Drawings**

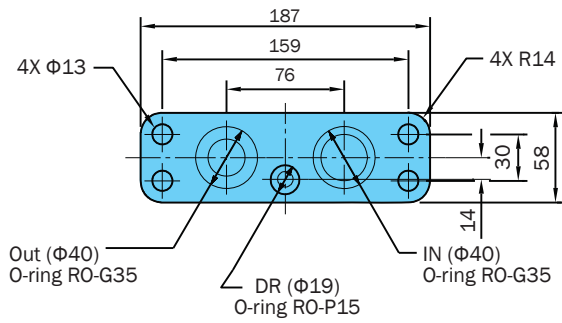
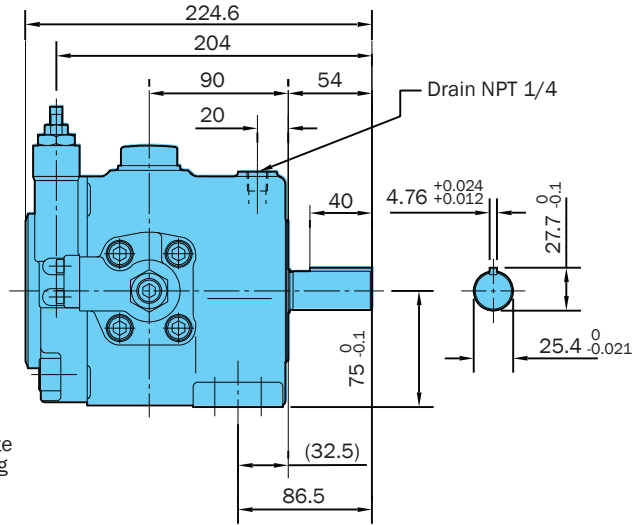
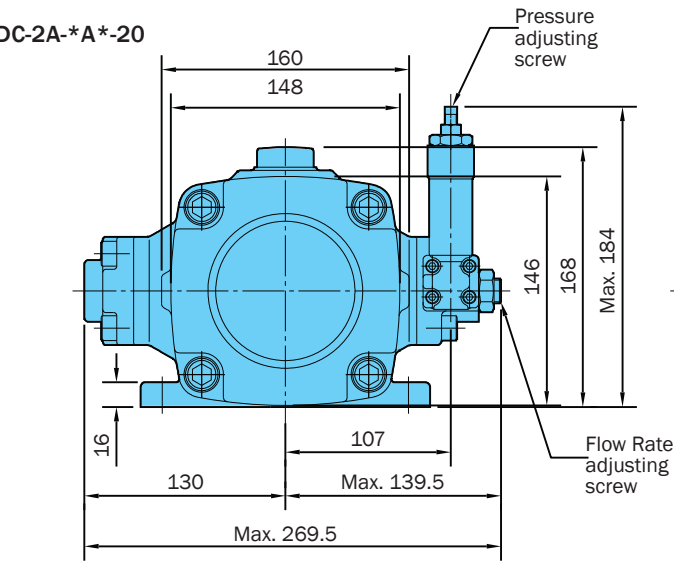
**Single Pump**  
**VDC-1A-\*A\*-20**



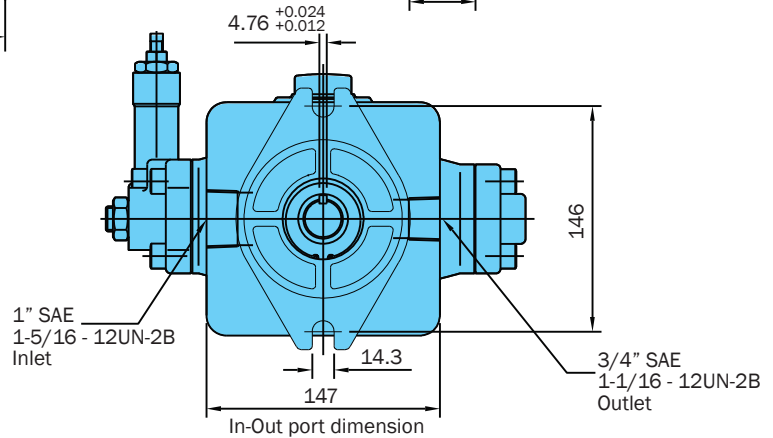
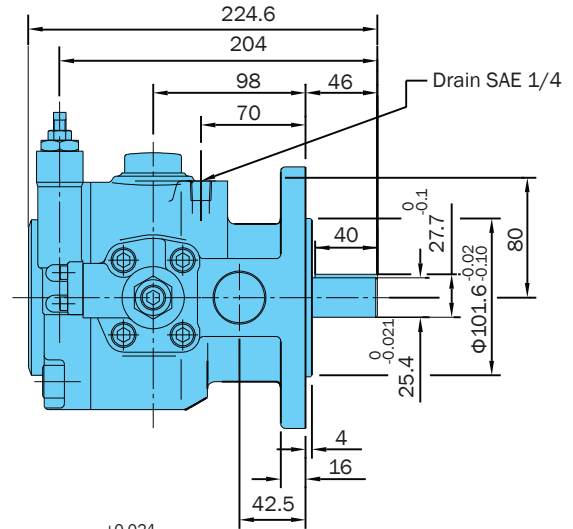
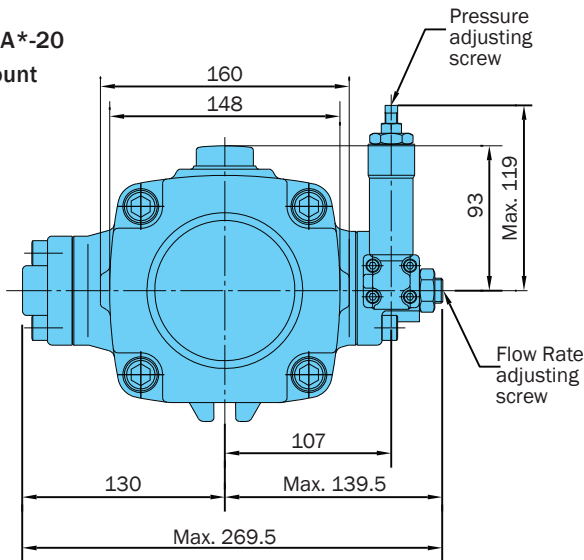
**VDC-1B-\*A\*-E35**  
**SAE A Mount**



**VDC-2A-\*A\*-20**

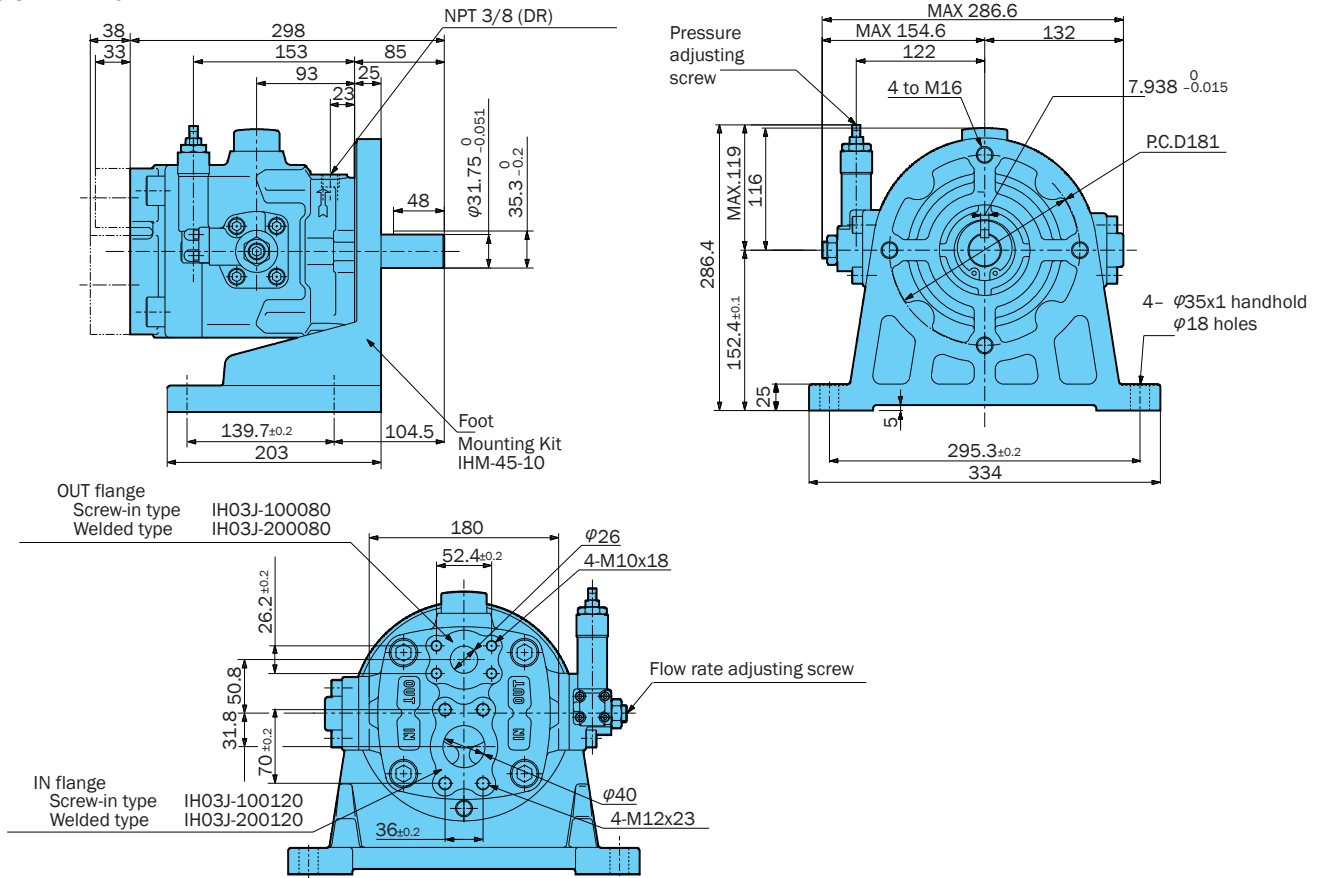


**VDC-2B-\*A\*-20**  
**SAE B Mount**



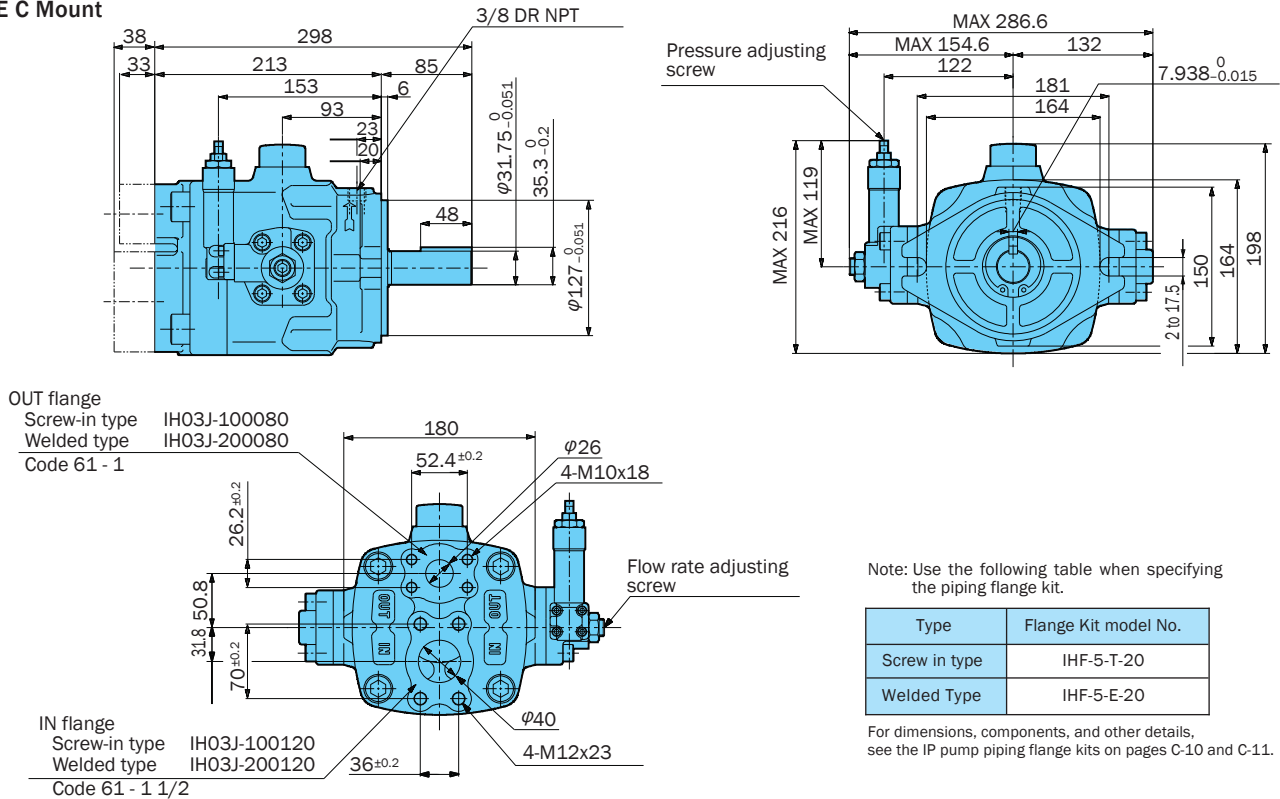
### Installation Dimension Drawings

#### VDC-3A-1A\*-20



#### VDC-3B-1A\*-E35

#### SAE C Mount



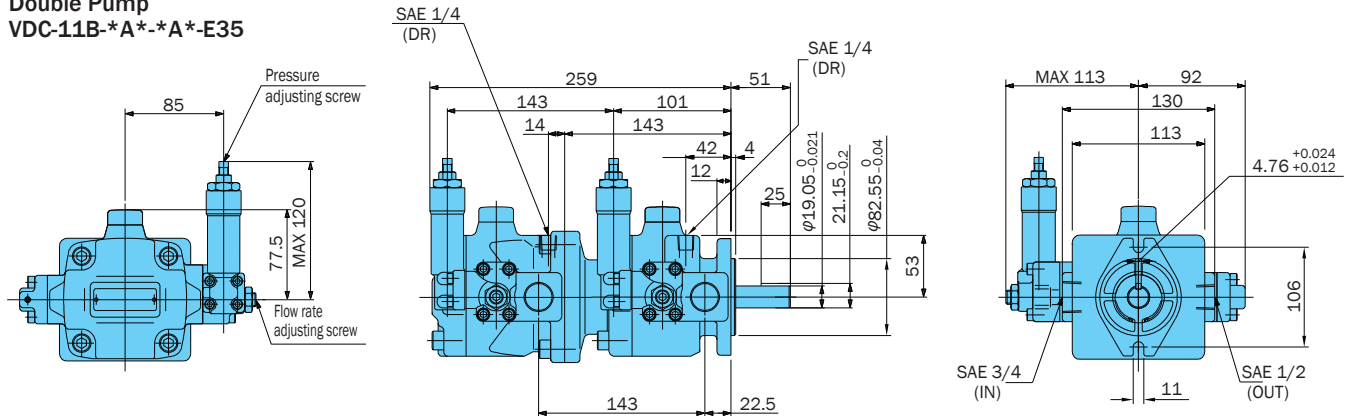
Note: Use the following table when specifying the piping flange kit.

| Type          | Flange Kit model No. |
|---------------|----------------------|
| Screw in type | IHF-5-T-20           |
| Welded Type   | IHF-5-E-20           |

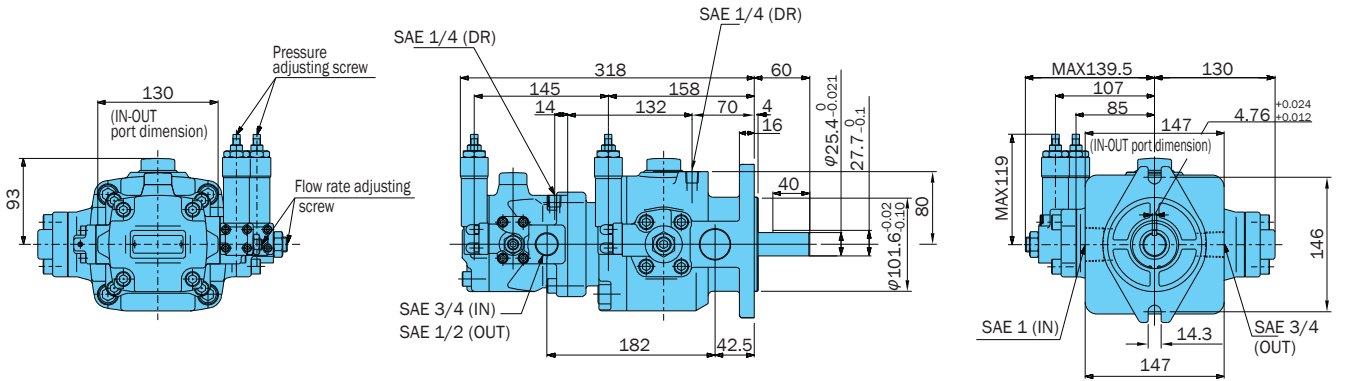
For dimensions, components, and other details, see the IP pump piping flange kits on pages C-10 and C-11.



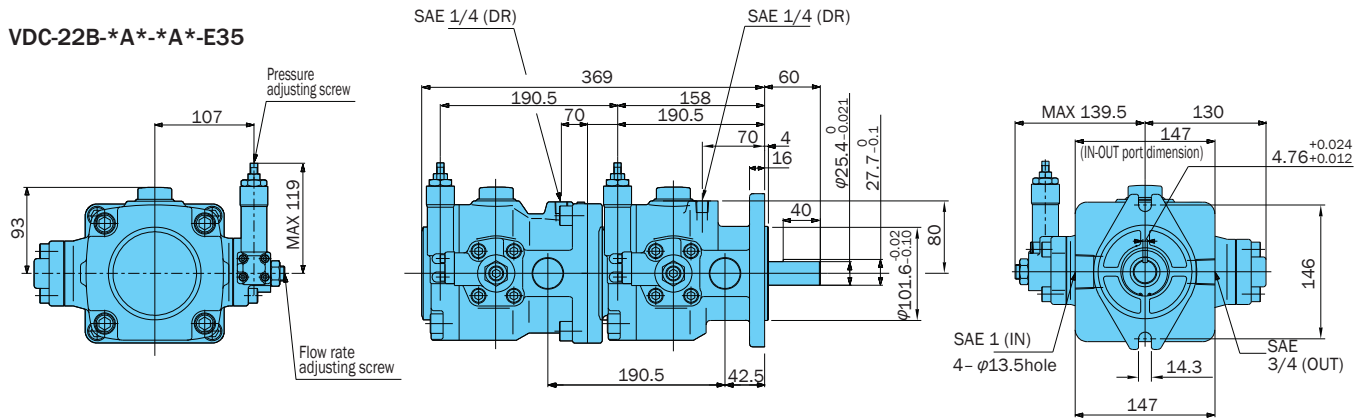
**Double Pump  
VDC-11B-\*A\*\*A\*-E35**



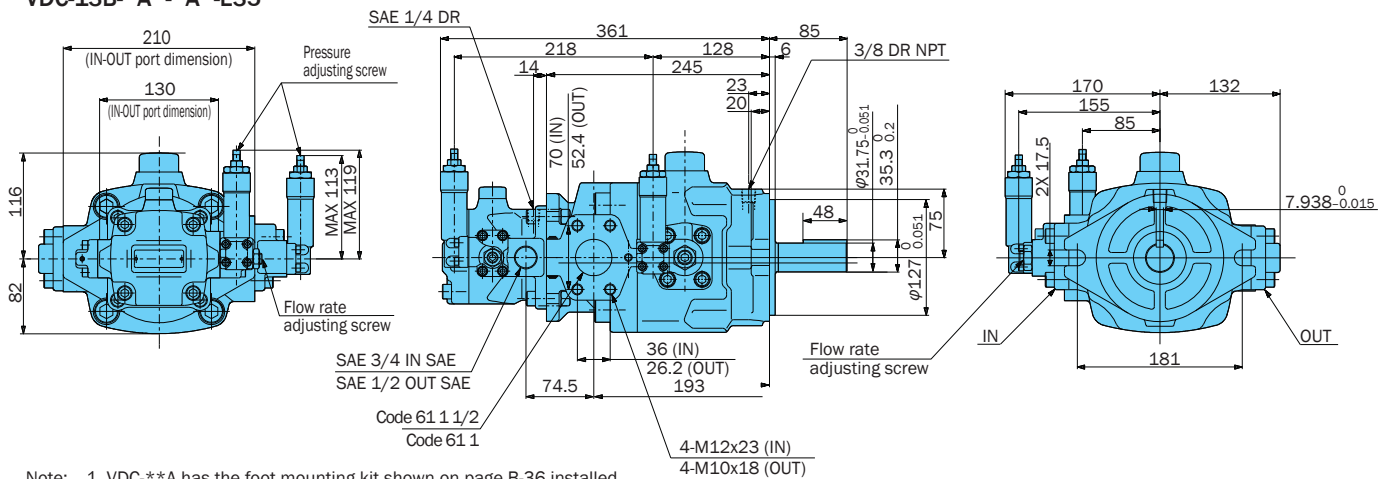
**VDC-12B-\*A\*\*A\*-E35**



**VDC-22B-\*A\*\*A\*-E35**



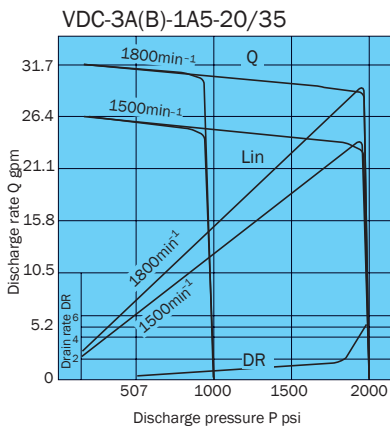
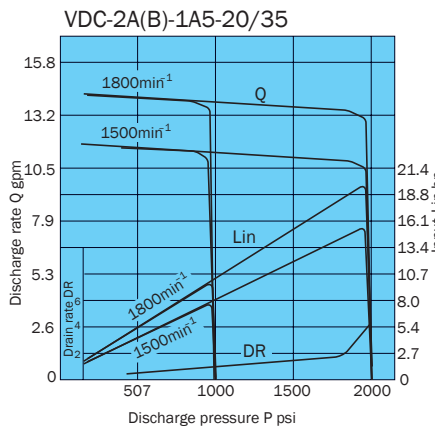
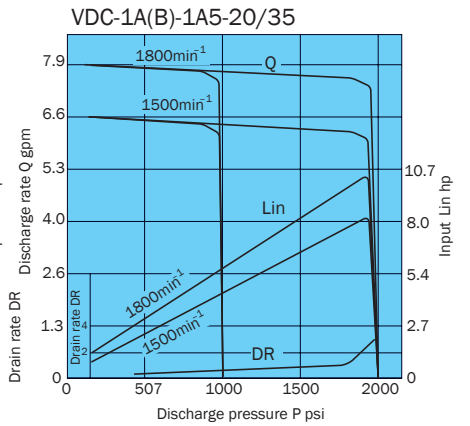
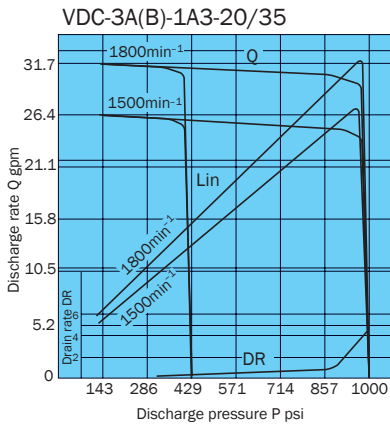
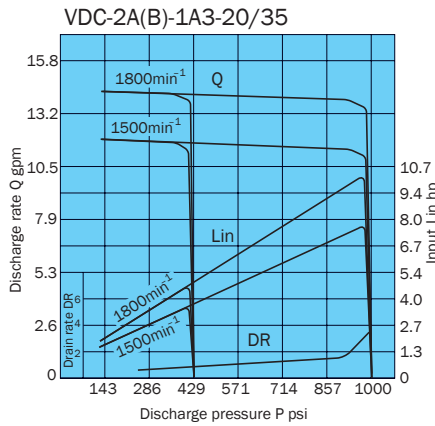
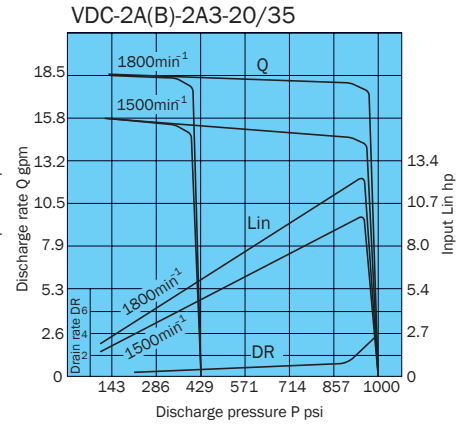
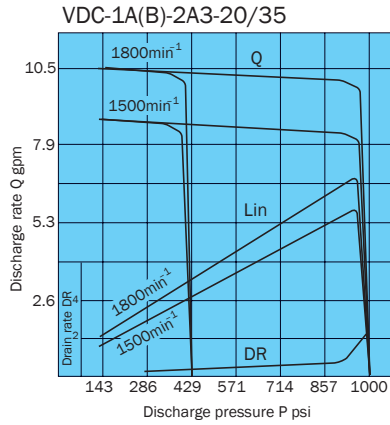
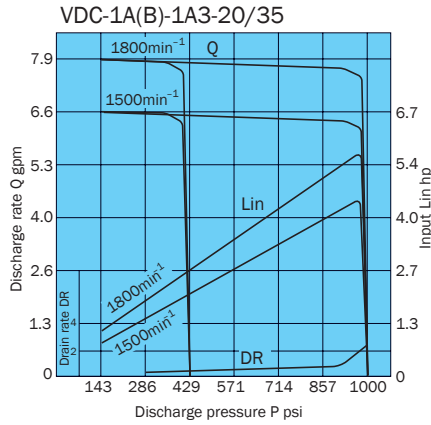
**VDC-13B-\*A\*\*A\*-E35**



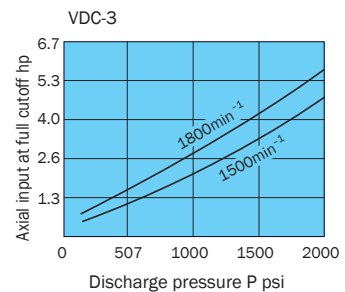
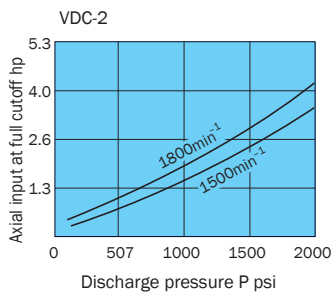
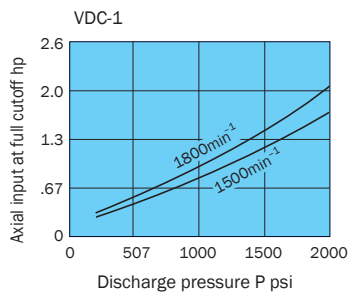
Note: 1. VDC-\*\*A has the foot mounting kit shown on page B-36 installed.

# Performance Curves

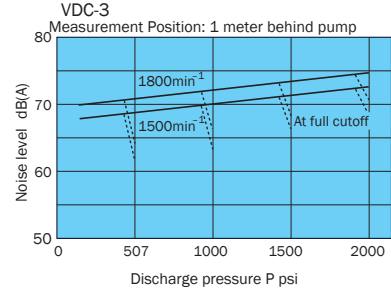
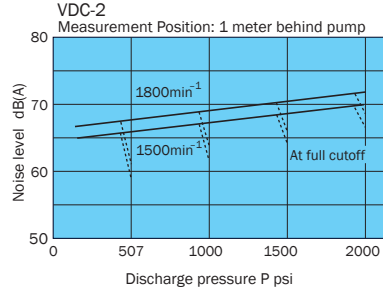
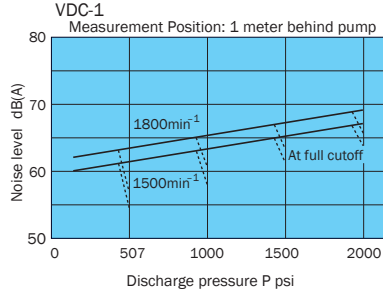
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes



## Axial input at full cutoff

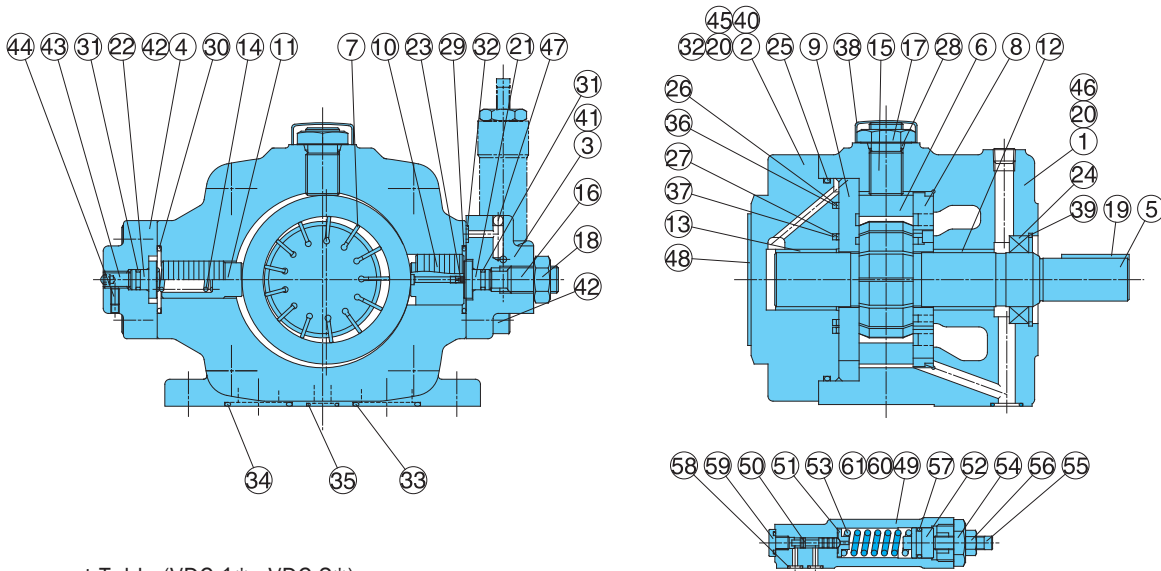


**Noise Characteristics**



**Cross-sectional Drawing**

VDC-1A-\*A\*-20  
VDC-2A-\*A\*-20



Seal Component Table (VDC-1\*, VDC-2\*)

| Part No. | Applicable Pump Model No. | VDC-1A-*A*-20 |      | VDC-2A-*A*-20 |      |
|----------|---------------------------|---------------|------|---------------|------|
|          | Seal Kit Number           | VCBS-101A00   |      | VCBS-102A00   |      |
|          | Part Name                 | Part Number   | Q'ty | Part Number   | Q'ty |
| 24       | Oil seal                  | TCV-224211    | 1    | TCN-325211    | 1    |
| 25       | O-ring                    | S85(NOK)      | 1    | 1A-G115       | 1    |
| 26       | O-ring                    | AS568-034     | 1    | AS568-150     | 1    |
| 27       | O-ring                    | AS568-026     | 1    | AS568-134     | 1    |
| 28       | O-ring                    | 1A-P14        | 1    | 1A-P18        | 1    |
| 29       | O-ring                    | 1A-P22        | 1    | 1A-G35        | 1    |
| 30       | O-ring                    | 1A-P20        | 1    | 1A-G35        | 1    |
| 31       | O-ring                    | 1A-P5         | 2    | 1A-P9         | 2    |
| 32       | O-ring                    | 1A-P6         | 4    | 1A-P7         | 4    |
| 33       | O-ring                    | 1A-P25        | 1    | 1A-G35        | 1    |
| 34       | O-ring                    | 1A-P22        | 1    | 1A-G35        | 1    |
| 35       | O-ring                    | 1A-P10A       | 1    | 1A-P15        | 1    |
| 36       | Backup ring               | VCB34-101000  | 1    | VCB34-102000  | 1    |
| 37       | Backup ring               | VCB34-201000  | 1    | VCB34-202000  | 1    |
| 57       | O-ring                    | 1A-P14        | 1    | 1A-P14        | 1    |
| 58       | O-ring                    | 1B-P6(Hs90)   | 3    | 1B-P6(Hs90)   | 3    |

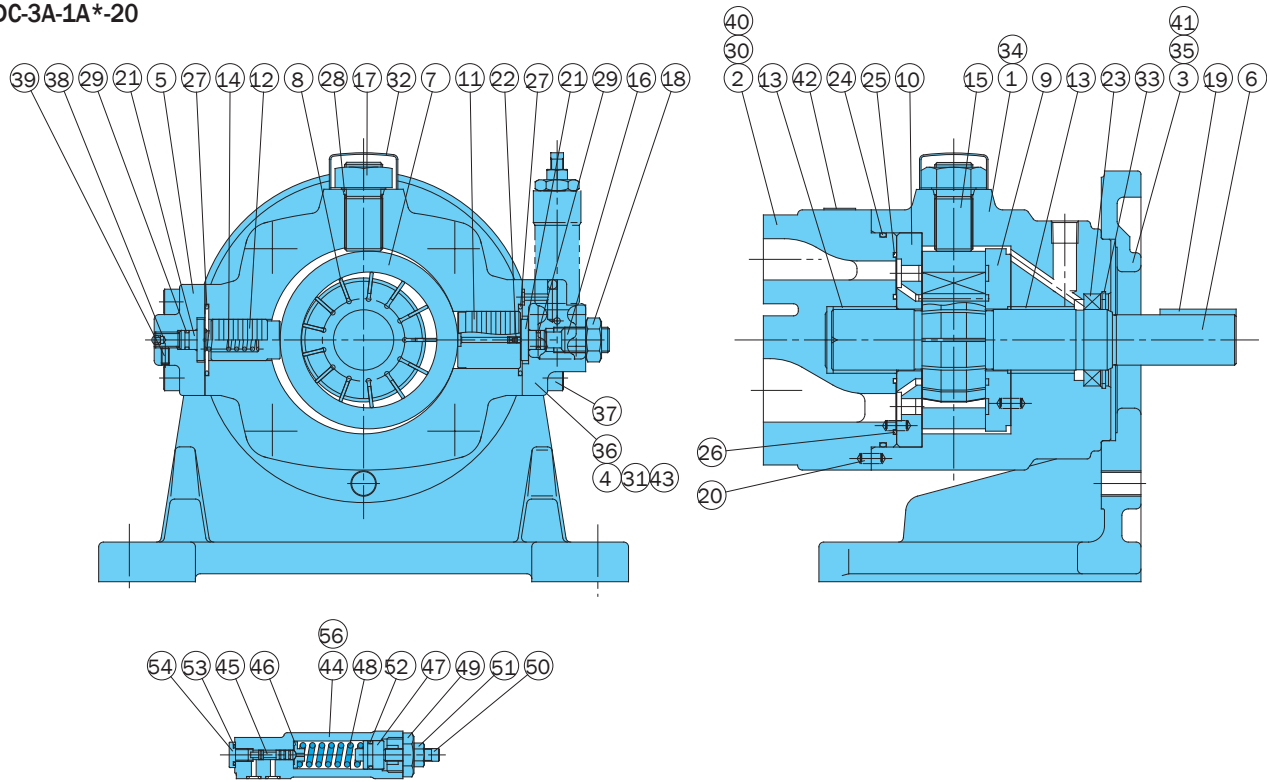
Note: 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).  
2. O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.  
3. For VDR-\*B\*-20, the seal kit number becomes VDBS-10\*B\*00, without the 33, 24, and 35 O-rings.

| Part No. | Part Name    | Part No. | Part Name   | Part No. | Part Name       |
|----------|--------------|----------|-------------|----------|-----------------|
| 1        | Body (1)     | 21       | Holder      | 41       | Screw           |
| 2        | Body (2)     | 22       | Holder      | 42       | Screw           |
| 3        | Cover (1)    | 23       | Orifice     | 43       | Screw (stopper) |
| 4        | Cover (2)    | 24       | Oil seal    | 44       | Screw           |
| 5        | Shaft        | 25       | O-ring      | 45       | Plug            |
| 6        | Ring         | 26       | O-ring      | 46       | Plug            |
| 7        | Vane         | 27       | O-ring      | 47       | Pole            |
| 8        | Plate (S)    | 28       | O-ring      | 48       | Nameplate       |
| 9        | Plate (H)    | 29       | O-ring      | 49       | Valve body      |
| 10       | Piston (1)   | 30       | O-ring      | 50       | Spool           |
| 11       | Piston (2)   | 31       | O-ring      | 51       | Holder          |
| 12       | Bearing      | 32       | O-ring      | 52       | Plunger         |
| 13       | Bearing      | 33       | O-ring      | 53       | Spring          |
| 14       | Spring       | 34       | O-ring      | 54       | Retainer        |
| 15       | Thrust screw | 35       | O-ring      | 55       | Screw           |
| 16       | Screw        | 36       | Backup ring | 56       | Nut             |
| 17       | Nut          | 37       | Backup ring | 57       | O-ring          |
| 18       | Nut          | 38       | Cap         | 58       | O-ring          |
| 19       | Key          | 39       | Snap ring   | 59       | Plug            |
| 20       | Pin          | 40       | Screw       | 60       | Plug            |
|          |              |          |             | 61       | Screw           |

Cartridge Kits:  
VDC-1 | VCBC-101\*A\*  
VDC-2 | VCBC-102\*A\*  
Includes Items: 5, 6, 7, 8, 9, 19, 20

## Performance Curves

VDC-3A-1A\*-20



Seal Component Table (VDC-3\*)

| Part No. | Applicable Pump Model No. VDC-3A(B)*-20 |                 |      |
|----------|---|-----------------|------|
|          | Seal Kit Number VCBS-103B00             |                 |      |
|          | Part Name                               | Part Number     | Q'ty |
| 23       | Oil seal                                | TCN-385811      | 1    |
| 24       | O-ring                                  | 1A-G130         | 1    |
| 25       | O-ring                                  | AS568-154(Hs90) | 1    |
| 26       | O-ring                                  | AS568-151(Hs90) | 1    |
| 27       | O-ring                                  | 1A-G40          | 2    |
| 28       | O-ring                                  | 1A-P22          | 1    |
| 29       | O-ring                                  | 1A-P9           | 2    |
| 30       | O-ring                                  | 1A-P7           | 2    |
| 31       | O-ring                                  | 1A-P7           | 2    |
| 52       | O-ring                                  | 1A-P14          | 1    |
| 53       | O-ring                                  | 1B-P6(Hs90)     | 3    |

Note: 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).  
2. O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.

| Part No. | Part Name    | Part No. | Part Name       | Part No. | Part Name  |
|----------|--------------|----------|-----------------|----------|------------|
| 1        | Body (1)     | 20       | Pin             | 39       | Screw      |
| 2        | Body (2)     | 21       | Holder          | 40       | Plug       |
| 3        | Mounting     | 22       | Orifice         | 41       | Washer     |
| 4        | Cover (1)    | 23       | Oil seal        | 42       | Nameplate  |
| 5        | Cover (2)    | 24       | O-ring          | 43       | Pole       |
| 6        | Shaft        | 25       | O-ring          | 44       | Valve body |
| 7        | Ring         | 26       | O-ring          | 45       | Spool      |
| 8        | Vane         | 27       | O-ring          | 46       | Holder     |
| 9        | Plate (S)    | 28       | O-ring          | 47       | Plunger    |
| 10       | Plate (H)    | 29       | O-ring          | 48       | Spring     |
| 11       | Piston (1)   | 30       | O-ring          | 49       | Retainer   |
| 12       | Piston (2)   | 31       | O-ring          | 50       | Screw      |
| 13       | Bearing      | 32       | Cap             | 51       | Nut        |
| 14       | Spring       | 33       | Snap ring       | 52       | O-ring     |
| 15       | Thrust screw | 34       | Screw           | 53       | O-ring     |
| 16       | Screw        | 35       | Screw           | 54       | Plug       |
| 17       | Nut          | 36       | Screw           | 55       | Plug       |
| 18       | Nut          | 37       | Screw           | 56       | Screw      |
| 19       | Key          | 38       | Screw (stopper) |          |            |

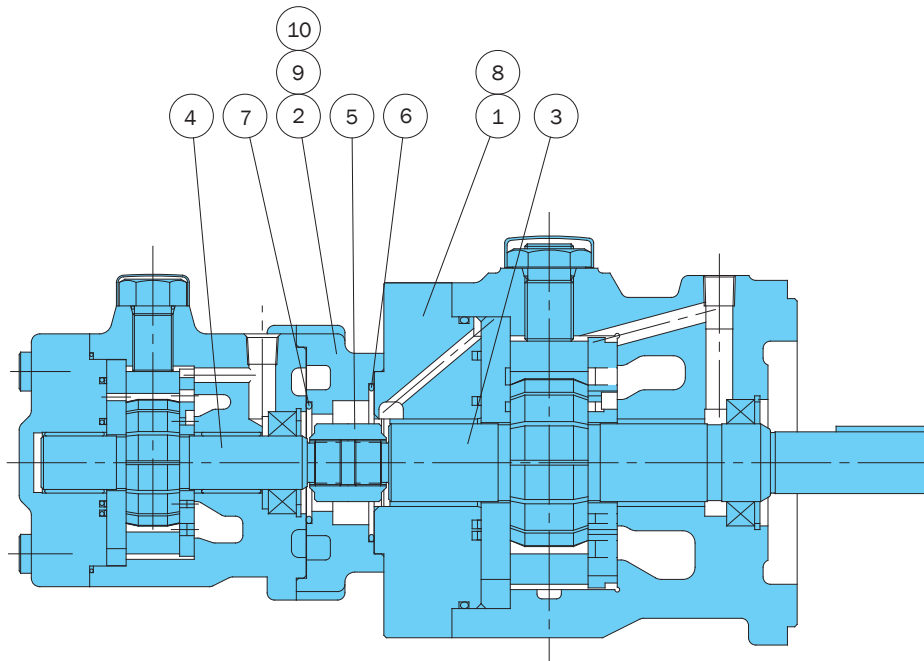
### Compensator Kits:

VDC-1 Thru -3 are same  
 VDC-A2 ZR-G01-A2-1688C  
 -A3 ZR-G01-A3-1688C  
 -A4 ZR-G01-A4-1688C  
 -A5 ZR-G01-A5-1688C  
 P-Remote ZR-G01-P-E1235A

### Cartridge Kits:

|  |   |
|--|---|
| VDC-1-20/35<br>VCBC-1011A2 (A2,A3)<br>VCBC-1011A4 (A4,A5)<br>VCBC-1012A2 (2A2,2A3) | VDC-3-20/35<br>VCBC-1031A2 (A2,A3)<br>VCBC-1031A4 (A4,A5) |
| VDC-2-20/35<br>VCBC-1021A2 (A2,A3)<br>VCBC-1021A4 (A4,A5)<br>VCBC-1022A2 (2A2,2A3) | Includes Items: 6, 7, 8, 9, 10, 19, 20                    |

VDC Series  
Double Pump



| Part No. | Part Name |
|----------|-----------|
| 1        | Body (2)  |
| 2        | Body (3)  |
| 3        | Shaft (S) |
| 4        | Shaft (H) |
| 5        | Joint     |
| 6        | O-ring    |
| 7        | O-ring    |
| 8        | Screw     |
| 9        | Screw     |
| 10       | Screw     |

Note:  
In the case of a double pump, use single pump parts in addition to the 10 parts listed above.

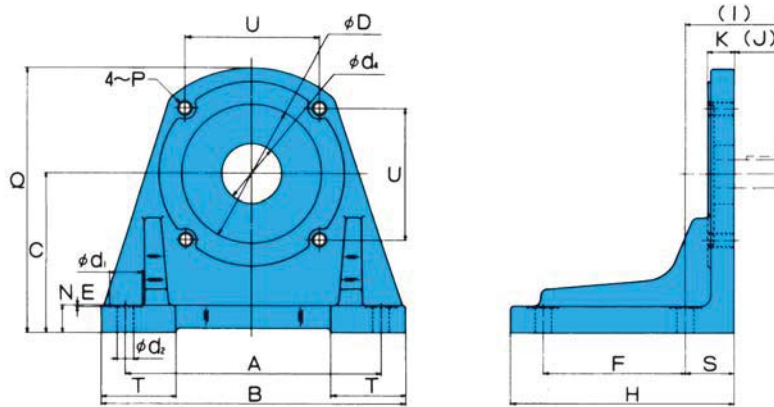
List of Sealing Parts

| Part No. | Part Name | VDC-11A-*-*-20 |      | VDC-12A-*-*-20 |      | VDC-22A-*-*-20 |      | VDC-13A-*-*-20 |      |
|----------|-----------|----------------|------|----------------|------|----------------|------|----------------|------|
|          |           | Part Number    | Q'ty | Part Number    | Q'ty | Part Number    | Q'ty | Part Number    | Q'ty |
| 6        | O-ring    | ☒              |      | 1A-G60         | 1    | 1A-G60         | 1    | ☒              |      |
| 7        | O-ring    | 1A-G85         | 1    | 1A-G45         | 1    | 1A-G60         | 1    | 1A-G85         | 1    |

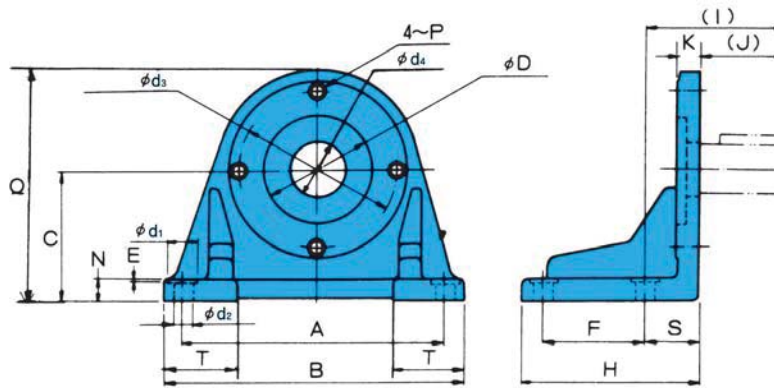
Note: 1. See the description of the single pump for seal parts that are not included in the list.  
2. O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.

### Foot Mounting Installation Measurement Chart

For VDC-11A, VDC-12 and VDC-22 (for double pump)



For VDC-3A and VDC-13A



| Foot Mounting Kit Model No. | Applicable Pump Model No.                | Accessories |      |         |      | Dimensions (mm) |     |        |   |       |     |
|-----------------------------|--|-------------|------|---------|------|-----------------|-----|--------|---|-------|-----|
|                             |  | Bolt        | Q'ty | Washer  | Q'ty | A               | B   | C      | E | F     | H   |
| VCM-11-20                   | VDC-1 (20)<br>VDC-11 (20)                | TH-10 × 30  | 4    | WS-B-10 | 4    | 171.45          | 204 | 107.95 | 1 | 95.25 | 150 |
| VCM-22-20                   | VDC-2 (20)<br>VDC-12 (20)<br>VDC-22 (20) | TH-12 × 35  | 4    | WS-B-12 | 4    | 235             | 267 | 139.7  | 1 | 127   | 193 |
| IHM-45-10                   | VDC-3 (20)<br>VDC-13 (20)                | TB-16 × 40  | 2    | WP-16   | 2    | 295.3           | 334 | 152.4  | 1 | 139.7 | 203 |

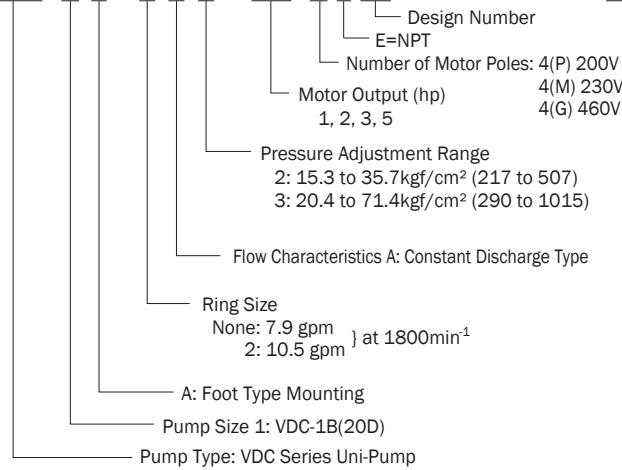
| Foot Mounting Kit Model No. | Dimensions (mm) |     |    |    |     |     |      |      |     |       |                  |                  |                  |                  | Weight lbs |
|-----------------------------|-----------------|-----|----|----|-----|-----|------|------|-----|-------|------------------|------------------|------------------|------------------|------------|
|                             | (I)             | (J) | K  | N  | P   | Q   | S    | T    | U   | φ D   | φ d <sub>1</sub> | φ d <sub>2</sub> | φ d <sub>3</sub> | φ d <sub>4</sub> |            |
| VCM-11-20                   | 66.5            | 33  | 18 | 18 | M10 | 180 | 32.5 | 50   | 90  | 95.02 | 22               | 11               | ∅                | 40               | 14.3       |
| VCM-22-20                   | 84.5            | 40  | 20 | 20 | M12 | 232 | 44.5 | 57.5 | 124 | 135   | 22               | 14               | ∅                | 40               | 26.4       |
| IHM-45-10                   | 104.5           | 60  | 25 | 25 | M16 | 259 | 44.5 | 61   | ∅   | 127   | 35               | 18               | 181              | 86               | 29.7       |

# Uni-Pump Specifications

(CE mark standard compliant)

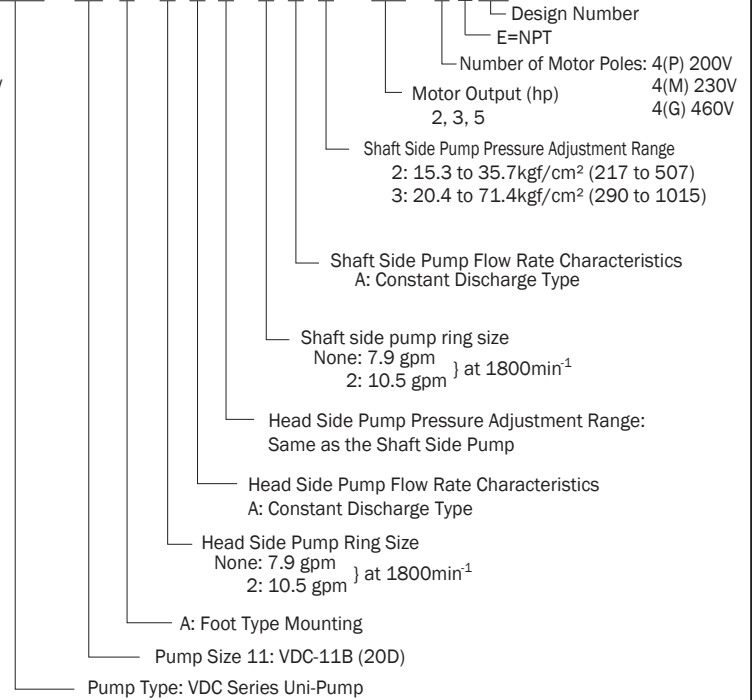
## Single Pump

**UVC - 1 A - 2 A 2 - 1.5 - 4 \* 30**



## Double Pump

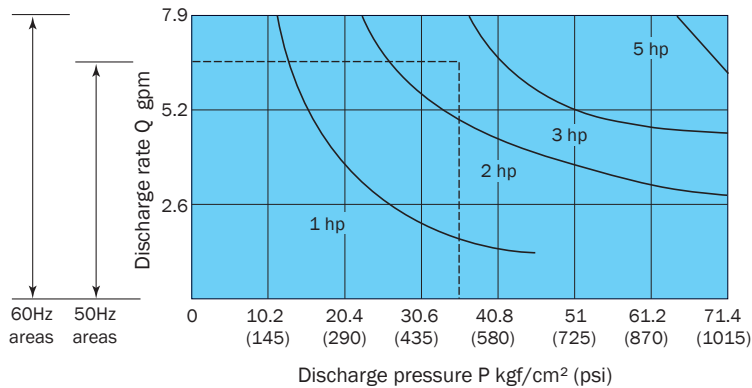
**UVC - 11 A - 2 A 2 - 2 A 2 - 3.7 - 4 \* 30**



## Specifications

| Model No.          | Maximum Working Pressure<br>kgf/cm <sup>2</sup> (psi) | Maximum Flow Rate gpm (A*) |      | Maximum Flow Rate gpm(2A*) |      |
|--------------------|---|----------------------------|------|----------------------------|------|
|                    |   | 50Hz                       | 60Hz | 50Hz                       | 60Hz |
| UVC- 1A<br>UVC-11A | 71.4<br>(1015)  | 6.6                        | 7.9  | 8.7                        | 10.3 |

## Motor selection curves



- Selecting a motor  
The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.

Example:

To find the motor that can produce pressure of 507 psi and a discharge rate of 6.6 gpm.

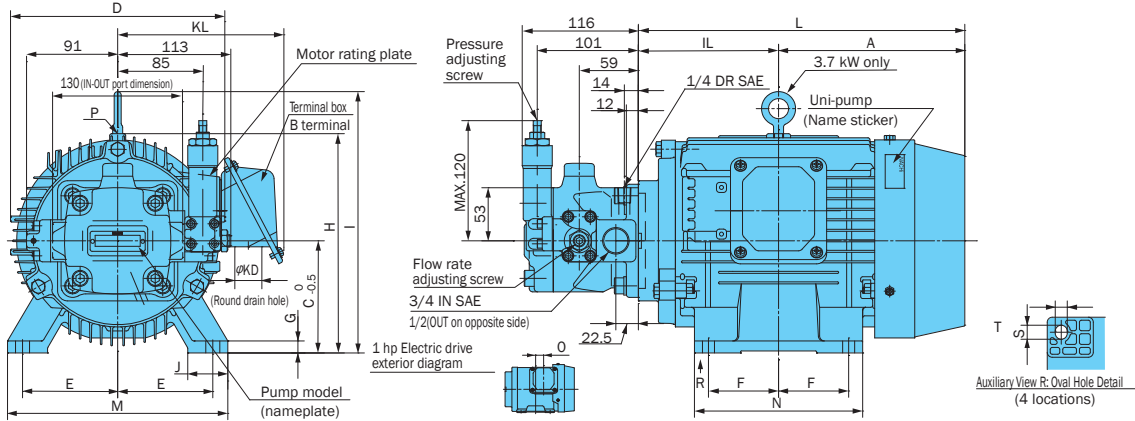
Selection Process:

Since the intersection of the two broken lines from a pressure of 507 psi and discharge rate of 6.6 gpm intersect in the area under the 3 hp curve, it means that a 3 hp motor should be used. In the case of a double pump configuration, select a motor that is larger than the total power required by both pumps.

\* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.

### Installation Dimension Drawings

#### UVC-1A

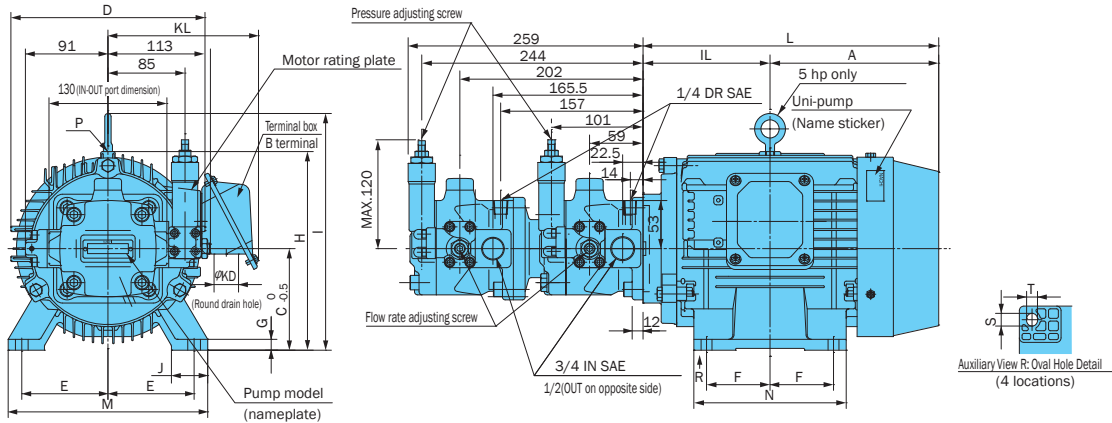


| Uni-pump            | Motor Dimensions mm |       |     |     |      |      |     |     |     |    |       |     |     |         |     |     |      | Frame No. | Output hp (4 poles) | Weight lbs |
|---------------------|---------------------|-------|-----|-----|------|------|-----|-----|-----|----|-------|-----|-----|---------|-----|-----|------|-----------|---------------------|------------|
|                     | A                   | IL    | C   | D   | E    | F    | G   | H   | I   | J  | L     | M   | N   | S * T   | KD  | KL  | O    |           |                     |            |
| UVC-1A-A2-0.75-4-30 | 133                 | 105   | 80  | 170 | 62.5 | 50   | 4.5 | 165 | -   | 35 | 238   | 165 | 130 | 18 * 10 | ø27 | 157 | 27.5 | 80M       | 1                   | 53         |
| UVC-1A-A2-1.5-4-30  | 143                 | 118.5 | 90  | 198 | 70   | 62.5 | 10  | 190 | -   | 40 | 261.5 | 176 | 150 | 12 * 10 | ø27 | 159 | -    | 90L       | 2                   | 56         |
| UVC-1A-A3-1.5-4-30  |                     |       |     |     |      |      |     |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-1A-2A2-1.5-4-30 | 157.5               | 133   | 100 | 198 | 80   | 70   | 12  | 200 | -   | 40 | 290.5 | 200 | 168 | 14 * 12 | ø27 | 159 | -    | 100L      | 3                   | 67         |
| UVC-1A-A2-2.2-4-30  |                     |       |     |     |      |      |     |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-1A-A3-2.2-4-30  |                     |       |     |     |      |      |     |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-1A-2A2-2.2-4-30 |                     |       |     |     |      |      |     |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-1A-A3-3.7-4-30  | 186                 | 140   | 112 | 214 | 95   | 70   | 12  | -   | 261 | 40 | 326   | 220 | 168 | 14 * 12 | ø27 | 166 | -    | 112M      | 5                   | 80         |
| UVC-1A-A4-3.7-4-30  |                     |       |     |     |      |      |     |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-1A-2A2-3.7-4-30 |                     |       |     |     |      |      |     |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-1A-2A3-3.7-4-30 |                     |       |     |     |      |      |     |     |     |    |       |     |     |         |     |     |      |           |                     |            |

0.75 to 2.2kW model does not have hangers.

- Standard drive motor is the fully enclosed fan-cooled B type.
- Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
- Standard terminal box is B terminal (right side viewed from pump).
- See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

#### UVC-11A

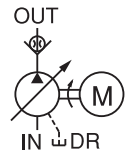


| Uni-pump                 | Motor Dimensions mm |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      | Frame No. | Output hp (4 poles) | Weight lbs |
|--------------------------|---------------------|-------|-----|-----|----|------|----|-----|-----|----|-------|-----|-----|---------|-----|-----|------|-----------|---------------------|------------|
|                          | A                   | IL    | C   | D   | E  | F    | G  | H   | I   | J  | L     | M   | N   | S * T   | KD  | KL  |      |           |                     |            |
| UVC-11A-A2-A2-1.5-4-30   | 143                 | 118.5 | 90  | 198 | 70 | 62.5 | 10 | 190 | -   | 40 | 261.5 | 176 | 150 | 12 * 10 | ø27 | 159 | 90L  | 2         | 79                  |            |
| UVC-11A-A2-A3-1.5-4-30   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-11A-A3-A3-1.5-4-30   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-11A-A2-A2-2.2-4-30   | 157.5               | 133   | 100 | 198 | 80 | 70   | 12 | 200 | -   | 40 | 290.5 | 200 | 168 | 14 * 12 | ø27 | 159 | 100L | 3         | 90                  |            |
| UVC-11A-A2-A3-2.2-4-30   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-11A-A3-A3-2.2-4-30   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-11A-2A2-2A2-2.2-4-30 |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-11A-A2-A2-3.7-4-30   | 186                 | 140   | 112 | 214 | 95 | 70   | 12 | -   | 261 | 40 | 326   | 220 | 168 | 14 * 12 | ø27 | 166 | 112M | 5         | 103                 |            |
| UVC-11A-A2-A3-3.7-4-30   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-11A-A3-A3-3.7-4-30   |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-11A-2A2-2A2-3.7-4-30 |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |
| UVC-11A-2A2-2A3-3.7-4-30 |                     |       |     |     |    |      |    |     |     |    |       |     |     |         |     |     |      |           |                     |            |

No hanger on 2 and 3 hp models.

- Standard drive motor is the fully enclosed fan-cooled B type.
- Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
- Standard terminal box is B terminal (right side viewed from pump).
- See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).





### UVN Series Variable Volume Vane Uni-Pump NSP Uni-Pump

7.9 to 31.7 gpm  
2000 psi

### Features

#### Energy efficient high performance

All the performance of a vane pump, right from the low pressure range, is enhanced even further by eliminating the external drain and optimizing the pressure balance, creating a design that generates little heat. The result is a pump that contributes to the energy efficiency of the

mother machine, as well as to process precision.

#### Lightweight, compact design

The pump and motor are designed for exclusive uni-pump use, making them lightweight, compact, easy to handle, and suitable for a wide range of applications.

#### Low noise, long life

The pump and motor shaft are linked by a joint, which minimizes noise by eliminating the effects of shaft vibration and an off-center shaft. The coupling is constructed to allow constant lubrication, for friction-free long life.

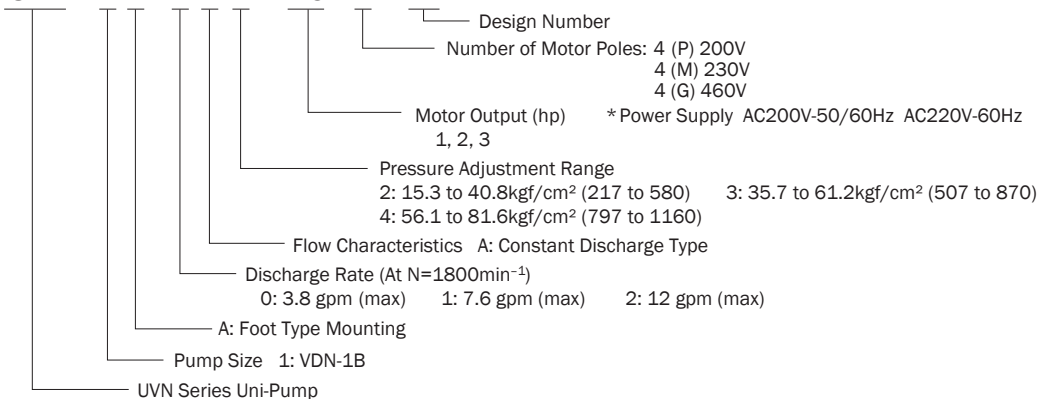
### Specifications

| Model No.   | Pump Capacity<br>in <sup>3</sup> /rev | Pressure Adjustment Range<br>kgf/cm <sup>2</sup> (psi) | No-load Discharge Rate gpm |          |
|---|---------------------------------------|--|----------------------------|----------|
|   |                                       |  | 50Hz                       | 60Hz     |
| UVN-1A-0A2- <sup>0.7</sup> / <sub>1.5</sub> -4-11 | .49                                   | 15.3 to 40.8 (217 to 580)                              | 3.1                        | 3.8      |
| UVN-1A-0A3- <sup>0.7</sup> / <sub>1.5</sub> -4-11 |                                       | 35.7 to 61.2 (507 to 870)                              |                            |          |
| UVN-1A-0A4- <sup>0.7</sup> / <sub>1.5</sub> -4-11 |                                       | 56.1 to 81.6 (797 to 1160)                             |                            |          |
| UVN-1A-1A2- <sup>1.5</sup> / <sub>2.2</sub> -4-11 | .98                                   | 15.3 to 40.8 (217 to 580)                              | 6.3                        | 7.6      |
| UVN-1A-1A3- <sup>1.5</sup> / <sub>2.2</sub> -4-11 |                                       | 35.7 to 61.2 (507 to 870)                              |                            |          |
| UVN-1A-1A4- <sup>1.5</sup> / <sub>2.2</sub> -4-11 |                                       | 56.1 to 81.6 (797 to 1160)                             |                            |          |
| UVN-1A-2A3- <sup>2.2</sup> / <sub>3.7</sub> -4-11 | 1.59                                  | (507 to 870)   | 10                         | 3.7 - 12 |
| UVN-1A-2A4- <sup>2.2</sup> / <sub>3.7</sub> -4-11 |                                       | (797 to 1160)  |                            |          |

Note: Contact your agent for combinations other than those noted above.

### Understanding Model Numbers

**UVN - 1 A - 1 A 4 - - 1.5 - 4 - - 11**



#### • Handling

1. Installation and Piping Precautions
  - 1 Provide a mounting base of sufficient rigidity, and install so that the pump shaft is oriented horizontally.
  - 2 Make sure the flow rate of the suction piping is no more than 6 ft/s, and that the suction pressure at the pump suction port is in the range of 4.35 psi.
  - 3 Drain piping must be direct piping up to a point that is below the tank fluid level, and back pressure due to pipe resistance should not exceed 14 psi.

Provide a suction strainer with a filtering grade of about 100 μm (150 mesh).

#### 2. Running Precautions

- 1 The direction of rotation is clockwise (rightward) when viewed from the motor fan side.
- 2 At startup, repeat the inching operation (start-stop) with the pump discharge side at no-load to bleed air from the pump and suction piping.
- 3 Equip an air bleed valve in circuits where it is difficult to bleed air before

startup.

- 4 Make sure the maximum peak pressure (setting pressure + surge pressure) during operation does not exceed 2000 psi. Refer to the following piping conditions as a guideline to keep the maximum peak pressure below 2000 psi. 1/2" x 2 m rubber hose (for 2000 psi) (pipe volume: approximately 15 in<sup>3</sup>)
- 5 Install a relief valve to cut surges in the circuit if pressure exceeds 2000 psi.

### 3. Management of Hydraulic Operating Fluid

- 1 Use only good-quality hydraulic operating fluid with a kinematic viscosity at a fluid temperature of 104 °F within the range of (30 to 50cSt).
- 2 Normally, you should use an R&O type and wear-resistant type of ISO VG32 or 46, or equivalent.  
The operating temperature range is 59 to 140 °F. When the oil temperature at startup is 59 °F or less, perform a warm-up operation at low pressure until the oil temperature reaches 59 °F. Use the pump in an area where the temperature is within the range of 50 to 104 °F.
- 3 For the return line to the tank, use a 10µm line filter.
- 4 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water, foreign matter, and other oil, and watch out for discoloration.

### 4. Setting the Pressure and Discharge Rate

- 1 When adjusting pressure, pressure is increased by clockwise (rightward) rotation of the adjusting screw and decreased by counterclockwise (leftward) rotation. After adjustment is complete, securely tighten the lock nut.
- 2 Turn adjustment screw right to decrease or left to increase volume of discharge. Refer to guidelines in the following diagram for the relationship of the non-load volume of discharge and the position of the flow adjustment screw.

After adjustment is complete, securely tighten the lock nut.

### 3 Factory Default P-Q Settings (Standard Model)

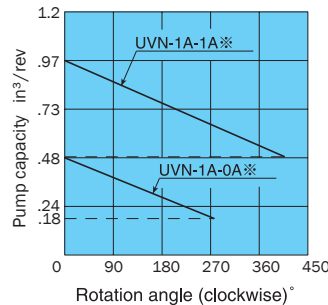
- Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
- Pressure Setting = Pressure shown in table below

| Factory Default Pressure Settings<br>kgf/cm <sup>2</sup> (psi) |
|--|
| 2: 35.7 (507)  |
| 3: 51.0 (725)  |
| 4: 71.4 (1015)   |

- 4 All adjustments, except the flow volume adjusting screw, are precision adjusted at the factory during assembly, do not adjust them. (Do not make any adjustments other than the pressure adjustment screw and the flow rate adjusting screw.)

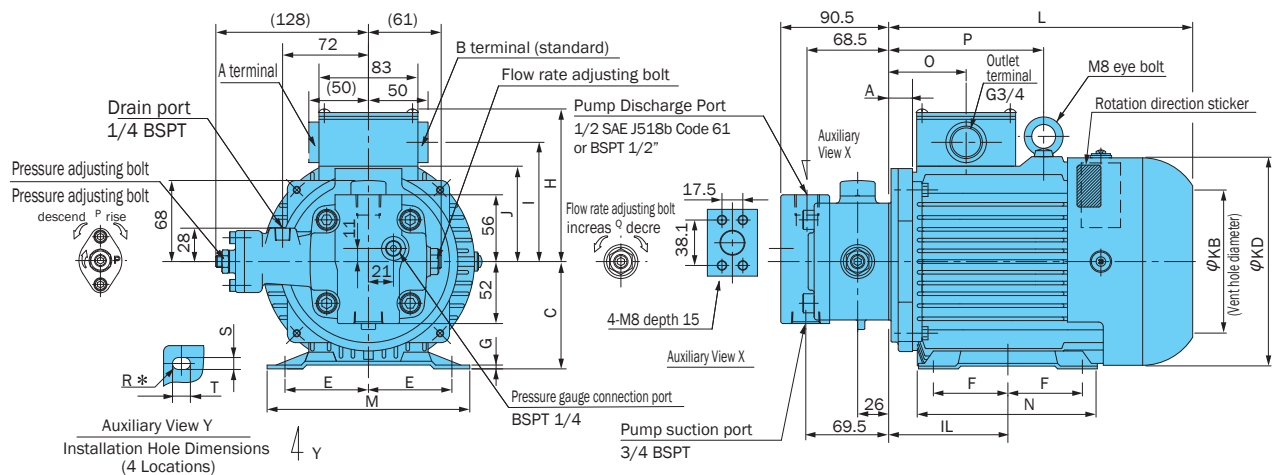
Note:

The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position. The broken lines show the flow volume adjustment range lower limit value.



## Installation Dimensions

Installation method is the same as design number 10D (old design).



| Model No.         | Output - Poles (hp - 4P) | Motor Dimensions mm (mm) |     |     |     |      |      |     |     |    |     |     |     |         |    |     |    |     | Weight lbs |    |
|-------------------|--------------------------|--------------------------|-----|-----|-----|------|------|-----|-----|----|-----|-----|-----|---------|----|-----|----|-----|------------|----|
|                   |                          | A                        | IL  | C   | φKD | E    | F    | G   | H   | J  | L   | M   | N   | T × S   | R* | φKB | O  | P   |            | I  |
| UVN-1A-A*0.7*4-11 | 1 - 4                    | 20                       | 90  | 80  | 157 | 62.5 | 50   | 2.3 | 120 | 72 | 230 | 155 | 120 | 15 × 10 | R5 | 110 | 65 | 130 | 92         | 37 |
| UVN-1A-A*1.5*4-11 | 2 - 4                    | 20                       | 100 | 90  | 175 | 70   | 62.5 | 3.2 | 128 | 80 | 255 | 170 | 150 | 15 × 10 | R5 | 120 | 65 | 130 | 100        | 46 |
| UVN-1A-A*2.2*4-11 | 3 - 4                    | 20                       | 110 | 100 | 195 | 80   | 70   | 3.2 | 138 | 90 | 285 | 200 | 165 | 17 × 12 | R6 | 134 | 65 | 135 | 110        | 57 |

No hanger.

1. Standard drive motor is the fully enclosed fan-cooled E type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).

### Characteristics of drive motor for Uni-Pump (domestic standard 3 rating)

| Output hp | Poles | (Note-1) Model Number   | Voltage [V] | Frequency [Hz] | Current rating [A] | RPM rating [min <sup>-1</sup> ] | Heat resistance |
|-----------|-------|---|-------------|----------------|--------------------|---------------------------------|-----------------|
| 1         | 4     | The drive motor is specialized for the unipump and is not a specific model. | 230 200 460 | 50             | 3.9                | 1400                            | E               |
|           |       |   | 230 200 460 | 60             | 3.6                | 1690                            |                 |
|           |       |   | 230 220 460 | 60             | 3.5                | 1710                            |                 |
| 2         | 4     |   | 230 200 460 | 50             | 7.1                | 1390                            | E               |
|           |       |   | 230 200 460 | 60             | 6.6                | 1670                            |                 |
|           |       |   | 230 220 460 | 60             | 6.3                | 1700                            |                 |
| 3         | 4     |   | 230 200 460 | 50             | 9.0                | 1410                            | E               |
|           |       |   | 230 200 460 | 60             | 8.7                | 1700                            |                 |
|           |       |   | 230 220 460 | 60             | 8.2                | 1720                            |                 |

## Performance Curves

UVN-1A-A\*-4-11  
 Operating Fluid : ISO VG 32  
 Oil temperature : 104 °F

Motor selection curves

The area under a motor output curve in the graph below is the operating range for that motor under the rated output for that motor.

Example:

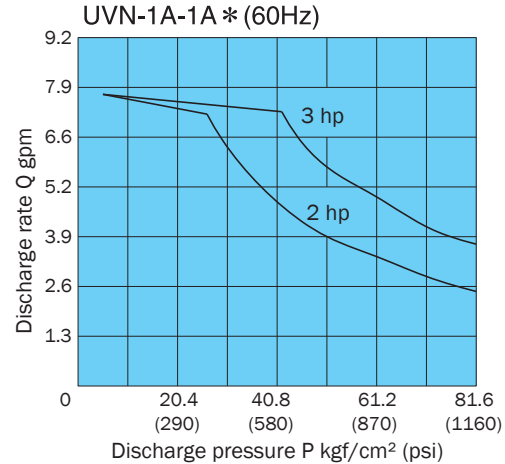
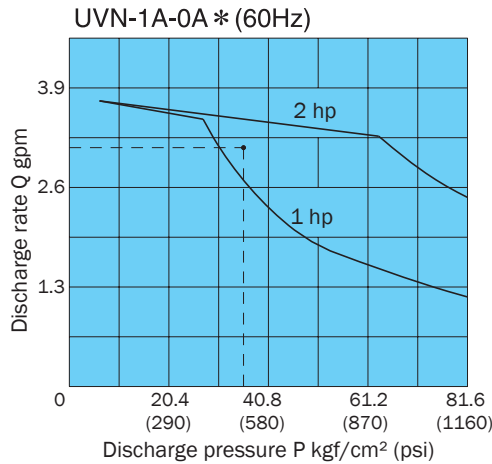
To find the motor that can produce pressure of 507 psi and a discharge rate of 3.1 gpm.

Selection Process

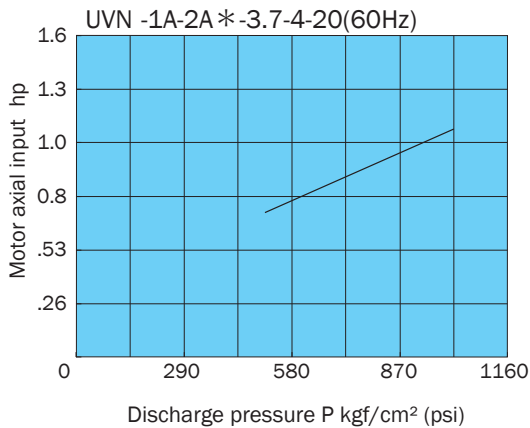
Since the intersection of the two broken lines from a pressure of 507 psi and discharge rate of 3.1 gpm intersect in

the area under the 2 hp curve, it means that a 2 hp motor should be used.

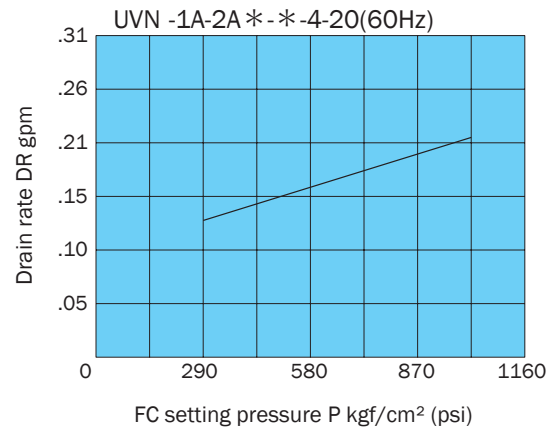
\* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.



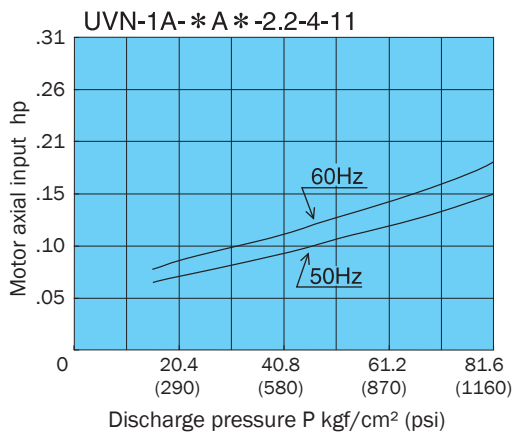
Motor Power Loss at Full Cutoff



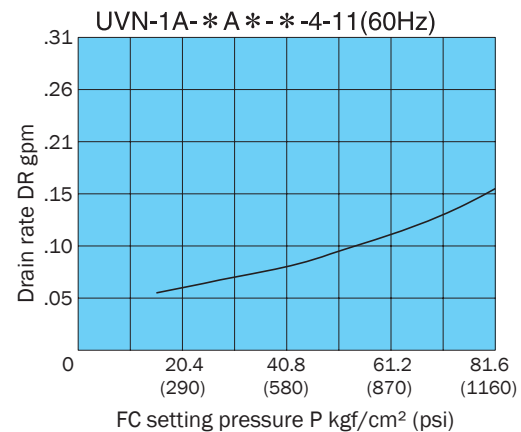
DR Volume at Full Cutoff

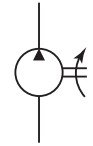


Motor Power Loss at Full Cutoff



DR Volume at Full Cutoff





### IPH Series IP Pump

.21 to 7.68 in<sup>3</sup>/rev  
4350 psi

This is a new design series in which all pump types are installation compatible with previous designs. Note, however, that there is no longer compatibility for some of the seal components between the IPH-3 and IPH-4 sizes and design numbers 10 and 12.

### Features

A patented axial and radial pressure loading system provides high efficiency and generates pressures up to 4350 psi.

Outstanding durability and very long life. A modified involute short-tooth gear enables internal gearing for greatly reduced pulsation and noise, and

exceptionally quiet operation. A simple structure makes maintenance and inspection easier.

### Specifications

| Model No.            | Capacity<br>cm <sup>3</sup> /rev (in <sup>3</sup> ) | Rated Pressure<br>psi | Maximum Operating<br>Pressure<br>psi | Minimum Revolution<br>Speed<br>min <sup>-1</sup> | Maximum Revolution<br>Speed<br>min <sup>-1</sup> | Weight lbs |        |
|----------------------|---|-----------------------|--------------------------------------|--|--|------------|--------|
|                      |   |                       |                                      |  |  | Type A     | Type B |
| IPH-2A(B)- 3.5-11    | 5   | 3625                  | 4350                                 | 600  | 2000   | 9.7        | 5.2    |
|                      | 6.5   |                       |                                      |  |  | 9.9        | 5.5    |
|                      | 8   |                       |                                      |  |  | 10.1       | 5.7    |
|                      |   |                       |                                      |  |  | 10.5       | 6.1    |
| IPH-3A(B) - 10-20    | 13  | 3625                  | 4350                                 | 600  | 2000   | 23.1       | 10.5   |
|                      | 16  |                       |                                      |  |  | 23.5       | 11.0   |
|                      |   |                       |                                      |  |  | 24.2       | 11.6   |
| IPH-4A(B) - 20-20    | 25  | 3625                  | 4350                                 | 500  | 2000   | 33.5       | 20.9   |
|                      | 32  |                       |                                      |  |  | 34.6       | 22.0   |
|                      |   |                       |                                      |  |  | 35.7       | 23.1   |
| IPH-5A(B)- 40-21(11) | 50  | 3625                  | 4350                                 | 400  | 2000   | 70.5       | 41.8   |
|                      | 64  |                       |                                      |  |  | 72.7       | 44.1   |
|                      |   |                       |                                      |  |  | 74.9       | 46.3   |
| IPH-6A(B)- 80-21(11) | 100   | 3625                  | 4350                                 | 300  | 2000   | 136.7      | 85.9   |
|                      | 125   |                       |                                      |  |  | 141.1      | 90.4   |
|                      |   |                       |                                      |  |  | 145.5      | 94.8   |

Note:

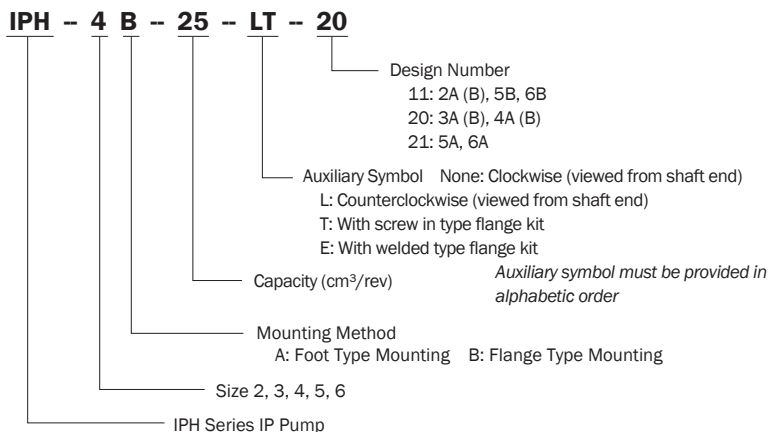
- Suction Pressure: 3.6 psi.
- Maximum working pressure shown here is the pressure limit when there are frequent pressure changes.
- Avoid installation with the suction port towards the bottom of the pump.
- Specify using the model number format shown below when pipe flanges are required.

- Handling
- For the hydraulic operating fluid, use an R&O type and wear-resistant type of ISO VG32 to 68 or equivalent (viscosity index of at least 90). Use hydraulic operating fluid that provides kinematic viscosity during operation in the range of 20 to 150 centistokes.
  - The operating temperature range is 40 to 149 °F. When the oil temperature at

- startup is 40 °F or less, perform a warm-up operation at low pressure until the oil temperature reaches 40 °F. Use the pump in an area where the temperature is within the range of 32 to 140 °F.
- Suction pressure 3.6 psi, and the suction port flow rate should be to greater than 5 ft/sec.
- Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft.
- Mount the hydraulic pump so its pump shaft is oriented horizontally. Provide a suction strainer with a filtering grade of about 100µm (150 mesh). For the return line to the tank, use a 10µm line filter.
- Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water and other foreign matter, and watch out for discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.

(continued on following page)

### Understanding Model Numbers



- 7 Operate within the RPM range in the catalog for the minimum RPM of the pump. Unload the pump's load pressure to operate at variable speeds. Condition of inflow piping must produce as little inflow load pressure as possible to minimize effect of cavitation.
- 8 When using water- or glycol-based hydraulic operating fluid, refer to page O-3 for details on applicable models
- 9 At startup, repeat the inching operation (start-stop) to bleed air from the pump and pipes.
- 10 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.
- 11 To ensure proper lubrication of the pump's rubbing surfaces, supply oil to the interior of the pump before starting operation.
- 12 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.001 in. Use a pump mounting base of sufficient rigidity. The angle error should be no greater than 1°.
- 13 Contact your agent for information about engines.

**Discharge Rate and Required Input for Each Pump Speed**

| Speed                     | Pressure psi<br>Model No.   |                        | Discharge Rate gpm |      |      |      |      | Required Input hp |     |      |      |       |      |       |
|---------------------------|-----------------------------|------------------------|--------------------|------|------|------|------|-------------------|-----|------|------|-------|------|-------|
|                           |                             |                        | 100                | 1015 | 2030 | 3045 | 3625 | 4350              | 100 | 1015 | 2030 | 3045  | 3625 | 4350  |
| 1200<br>min <sup>-1</sup> | IPH-2A(B)-<br>5<br>6.5<br>8 | 3.5-11                 | 1.1                | 1.1  | 1.0  | 1.0  | 1.0  | 1.0               | .14 | .68  | 1.6  | 2.4   | 2.8  | 3.5   |
|                           |                             |                        | 1.6                | 1.6  | 1.5  | 1.5  | 1.5  | 1.4               | .20 | 1.2  | 2.3  | 3.5   | 4.1  | 5.0   |
|                           |                             |                        | 2.0                | 2.0  | 1.9  | 1.9  | 1.8  | 1.8               | .25 | 1.5  | 2.9  | 4.3   | 5.1  | 6.2   |
|                           |                             |                        | 2.5                | 2.5  | 2.4  | 2.4  | 2.3  | 2.3               | .30 | 1.9  | 3.6  | 5.3   | 6.3  | 7.6   |
|                           |                             | IPH-3A(B)-<br>13<br>16 | 10-20              | 3.2  | 3.1  | 3.0  | 3.0  | 2.9               | 2.9 | .40  | 2.4  | 4.3   | 6.6  | 7.9   |
|                           |                             |                        | 4.2                | 4.2  | 4.0  | 3.9  | 3.9  | 3.8               | .52 | 3.1  | 5.7  | 8.6   | 10.1 |       |
|                           |                             |                        | 4.9                | 4.8  | 4.8  | 4.7  | 4.6  | 4.5               | .60 | 3.7  | 6.8  | 10.2  | 12   |       |
|                           | IPH-4A(B)-<br>25<br>32      | 20-20                  | 6.5                | 6.7  | 6.28 | 6.1  | 6.1  | 6.0               | .83 | 5.0  | 8.9  | 13.2  | 15.8 | 19.0  |
|                           |                             |                        | 8.1                | 8.0  | 7.8  | 7.7  | 7.6  | 7.5               | 1.0 | 6.1  | 11.0 | 16.4  | 19.7 | 23.4  |
|                           |                             |                        | 10.2               | 10.0 | 9.8  | 9.7  | 9.5  | 9.4               | 1.2 | 7.5  | 13.9 | 20.7  | 24.6 | 29.5  |
|                           | IPH-5A(B)-<br>50<br>64      | 40-21(11)              | 12.9               | 12.6 | 12.4 | 12.1 | 12.0 | 11.8              | 1.6 | 9.9  | 17.2 | 26.1  | 30.9 | 38.0  |
|                           |                             |                        | 15.9               | 15.6 | 15.4 | 15.1 | 14.9 | 14.7              | 1.9 | 11.9 | 21.7 | 32.1  | 38.3 | 45.9  |
|                           |                             |                        | 20.2               | 19.8 | 19.5 | 19.2 | 19.0 | 18.8              | 2.4 | 15.0 | 27.6 | 40.9  | 48.6 | 58.3  |
|                           | IPH-6A(B)-<br>100<br>125    | 80-21(11)              | 25.7               | 25.2 | 24.7 | 24.2 | 24.0 | 23.8              | 3.2 | 19.1 | 35.1 | 51.8  | 61.9 | 75.2  |
|                           |                             |                        | 32.2               | 31.6 | 31.0 | 30.5 | 30.2 | 30.2              | 3.9 | 23.4 | 43.3 | 64.9  | 77.3 | 92.7  |
|                           |                             |                        | 39.8               | 39.2 | 38.5 | 37.8 | 37.4 | 37.0              | 4.8 | 28.8 | 53.7 | 86.5  | 96.0 | 115.1 |
| 1800<br>min <sup>-1</sup> | IPH-2A(B)-<br>5<br>6.5<br>8 | 3.5-11                 | 1.7                | 1.6  | 1.6  | 1.5  | 1.5  | 1.5               | .22 | 1.5  | 2.7  | 3.9   | 4.6  | 5.5   |
|                           |                             |                        | 2.4                | 2.4  | 2.3  | 2.3  | 2.2  | 2.2               | .32 | 1.9  | 3.5  | 4.6   | 6.1  | 7.5   |
|                           |                             |                        | 3.0                | 3.0  | 2.9  | 2.9  | 2.8  | 2.8               | .40 | 2.3  | 4.3  | 6.5   | 7.6  | 9.2   |
|                           |                             |                        | 3.8                | 3.8  | 3.7  | 3.6  | 3.5  | 3.5               | .49 | 2.9  | 5.4  | 8.1   | 9.4  | 11.4  |
|                           |                             | IPH-3A(B)-<br>13<br>16 | 10-20              | 4.8  | 4.7  | 4.6  | 4.5  | 4.5               | 4.4 | .65  | 3.8  | 6.7   | 10.0 | 11.9  |
|                           |                             |                        | 6.3                | 6.2  | 6.1  | 5.9  | 5.9  | 5.8               | .83 | 4.9  | 8.8  | 12.9  | 15.1 | 18.6  |
|                           |                             |                        | 7.3                | 7.3  | 7.2  | 7.1  | 7.0  | 6.9               | .96 | 5.7  | 10.4 | 15.2  | 18.1 | 22.1  |
|                           | IPH-4A(B)-<br>25<br>32      | 20-20                  | 9.8                | 9.6  | 9.5  | 9.3  | 9.2  | 9.1               | 1.3 | 7.5  | 13.4 | 19.9  | 23.6 | 28.4  |
|                           |                             |                        | 12.2               | 12.0 | 11.8 | 11.7 | 11.5 | 11.4              | 1.6 | 9.1  | 16.6 | 24.8  | 29.0 | 35.2  |
|                           |                             |                        | 15.3               | 15.1 | 14.9 | 14.6 | 14.5 | 14.3              | 1.9 | 11.3 | 20.9 | 30.9  | 36.8 | 44.2  |
|                           | IPH-5A(B)-<br>50<br>64      | 40-21(11)              | 19.3               | 19.0 | 18.7 | 18.4 | 18.2 | 17.9              | 2.6 | 15.6 | 27.0 | 40.2  | 47.7 | 58.6  |
|                           |                             |                        | 23.9               | 23.5 | 23.2 | 22.8 | 22.6 | 22.4              | 3.1 | 18.9 | 33.0 | 49.4  | 58.7 | 70.5  |
|                           |                             |                        | 30.3               | 29.9 | 29.4 | 29.0 | 28.8 | 28.5              | 3.9 | 23.6 | 42.3 | 62.7  | 74.6 | 89.7  |
|                           | IPH-6A(B)-<br>100<br>125    | 80-21(11)              | 38.6               | 37.9 | 37.3 | 36.7 | 36.3 | 35.8              | 5.2 | 30.0 | 53.9 | 79.9  | 95.0 | 115   |
|                           |                             |                        | 46.2               | 47.6 | 46.9 | 46.2 | 45.8 | 45.3              | 6.3 | 37.1 | 67.4 | 99.7  | 118  | 142   |
|                           |                             |                        | 59.8               | 58.9 | 58.1 | 57.3 | 56.8 | 56.1              | 7.4 | 45.3 | 83.4 | 123.7 | 147  | 176   |

Note: Values in the table are general values at an operating fluid viscosity of 46 centistokes. Use the values when selecting the model for your needs.

**Parts for IPH Pump (Standard)**

| Single Pump       | Seal Kit                       | Najimi 3 Parts Set* | Radial Piston Kit** | Axial Plate Kit*** |
|-------------------|--------------------------------|---------------------|---------------------|--------------------|
|                   | Mineral Oil/<br>Water Glycoloi | Mineral Oil         | Mineral Oil         | Mineral Oil        |
| IPH-2B-***-(L)-11 | IHAS-2S2***-10                 | FZD-7004-***        | IHP-2-***-10        | IHQ-2-10           |
| IPH-3B-***-(L)-20 | IHAS-2S30***-20                | FZD-7004-0**        | IHP-3-0***-10       | IHQ-3-10           |
| IPH-4B-***-(L)-20 | IHAS-2S40***-30                | FZD-7004-0**        | IHP-4-0***-10       | IHQ-4-10           |
| IPH-5B-***-(L)-11 | IHAS-2S50***-10                | FZD-7004-0**        | IHP-5-0***-10       | IHQ-5-10           |
| IPH-6B-***-(L)-11 | IHAS-2S6***-10                 | FZD-7004-***        | IHP-6-***-10        | IHQ-6-10           |

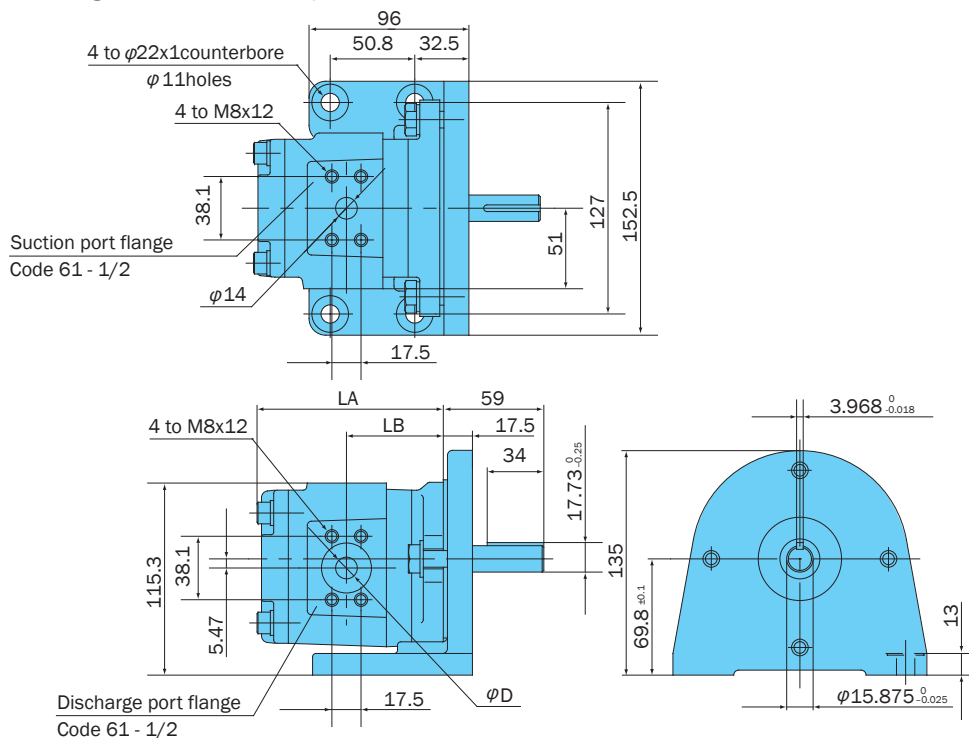
\*Najimi set includes: Stopper-pin, axial plate-1, axial plate-2, feeler piece, axial backup ring, O-ring; \*\*Radial Piston Kit includes: Radial piston, radial backup ring, backup ring, O-ring and washer  
\*\*\*Axial Plate Kit includes: Axial plate-1, axial plate-2, axial backup ring and O-ring

| Double Pump            | Head (Rear) Side Pump |                 | Shaft Side Pump    |                 |
|------------------------|-----------------------|-----------------|--------------------|-----------------|
|                        | Pump Model            | Seal Kit        | Pump Model         | Seal Kit        |
| IPH-22B-***-***-(L)-11 | IPH-2H-***-(L)-11     | IHAS-2H2***-10  | IPH-2S-***-(L)-11  | IHAS-2S2***-10  |
| IPH-23B-***-***-(L)-11 | IPH-2H-***-(L)-11     | IHAS-2H2***-10  | IPH-3S-***-(L)-11  | IHAS-2S30***-20 |
| IPH-24B-***-***-(L)-11 | IPH-2H-***-(L)-11     | IHAS-2H2***-10  | IPH-4S-***-H(L)-11 | IHAS-2S40***-30 |
| IPH-25B-***-***-(L)-11 | IPH-2H-***-(L)-11     | IHAS-2H2***-10  | IPH-5S-***-H(L)-11 | IHAS-2S50***-10 |
| IPH-26B-***-***-(L)-11 | IPH-2H-***-(L)-11     | IHAS-2H2***-10  | IPH-6S-***-H(L)-11 | IHAS-2S6***-10  |
| IPH-33B-***-***-(L)-11 | IPH-3H-***-(L)-11     | IHAS-2H30***-20 | IPH-3S-***-(L)-11  | IHAS-2S30***-20 |
| IPH-34B-***-***-(L)-11 | IPH-3H-***-(L)-11     | IHAS-2H30***-20 | IPH-4S-***-(L)-11  | IHAS-2S40***-30 |
| IPH-35B-***-***-(L)-11 | IPH-3H-***-(L)-11     | IHAS-2H30***-20 | IPH-5S-***-H(L)-11 | IHAS-2S50***-10 |
| IPH-36B-***-***-(L)-11 | IPH-3H-***-(L)-11     | IHAS-2H30***-20 | IPH-6S-***-H(L)-11 | IHAS-2S6***-10  |
| IPH-44B-***-***-(L)-11 | IPH-4H-***-(L)-11     | IHAS-2H40***-30 | IPH-4S-***-(L)-11  | IHAS-2S40***-30 |
| IPH-45B-***-***-(L)-11 | IPH-4H-***-(L)-11     | IHAS-2H40***-30 | IPH-5S-***-(L)-11  | IHAS-2S50***-10 |
| IPH-46B-***-***-(L)-11 | IPH-4H-***-(L)-11     | IHAS-2H40***-30 | IPH-6S-***-H(L)-11 | IHAS-2S6***-10  |
| IPH-55B-***-***-(L)-11 | IPH-5H-***-(L)-11     | IHAS-2H50***-10 | IPH-5S-***-F(L)-11 | IHAS-2S50***-10 |
| IPH-56B-***-***-(L)-11 | IPH-5H-***-(L)-11     | IHAS-2H50***-10 | IPH-6S-***-F(L)-11 | IHAS-2S6***-10  |
| IPH-66B-***-***-(L)-11 | IPH-6H-***-(L)-11     | IHAS-2H6***-10  | IPH-6S-***-F(L)-11 | IHAS-2S6***-10  |

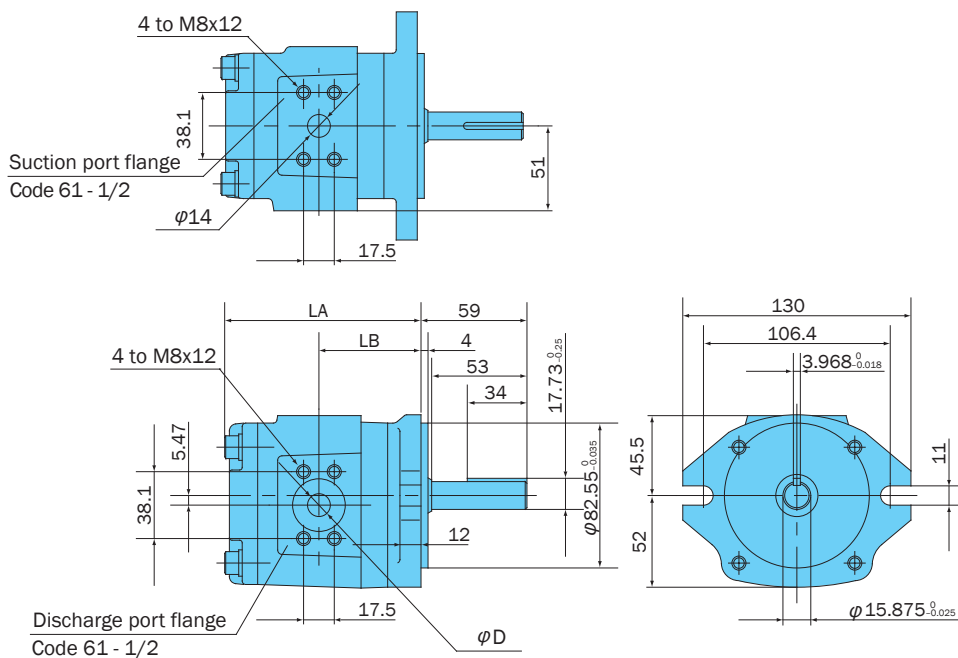
\*Regarding Shaft side pump: H, F means the way of the bolt - H: 2-Bolt type, F: 4-Bolt type

## Installation Dimension Drawings

IPH-2A-\*-11 (Foot Mounting, Clockwise Rotation)



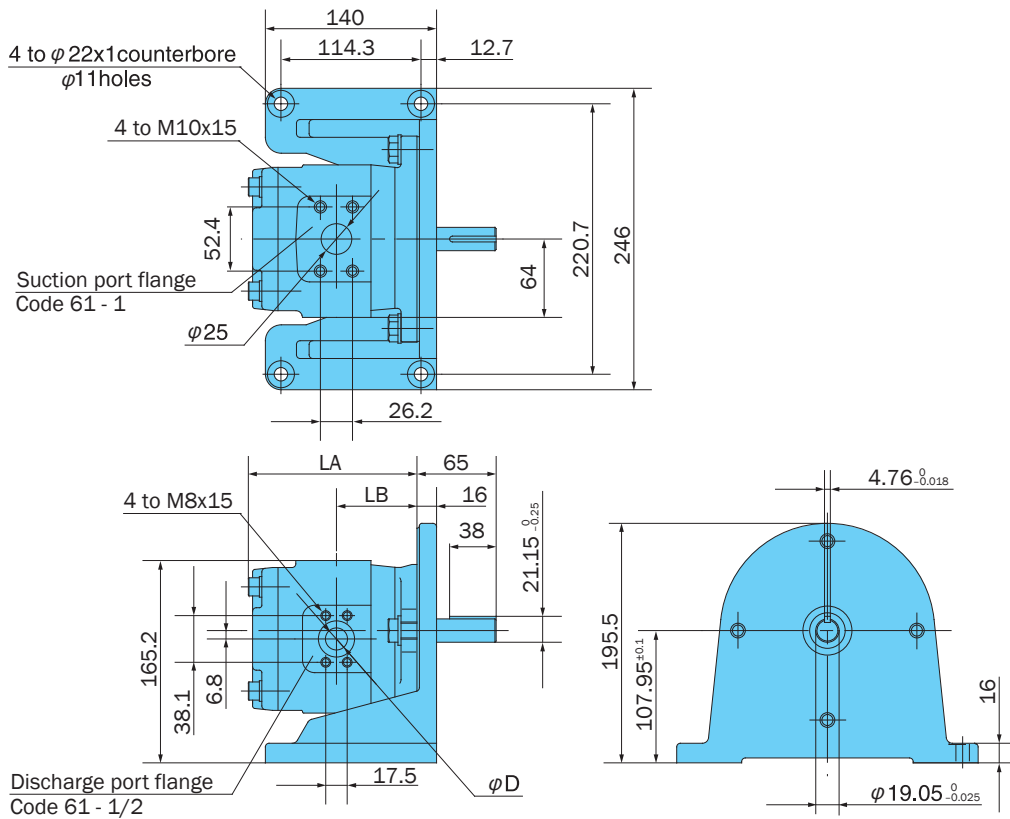
IPH-2B-\*-11 (Flange Mounting, Clockwise Rotation) SAE A Mount



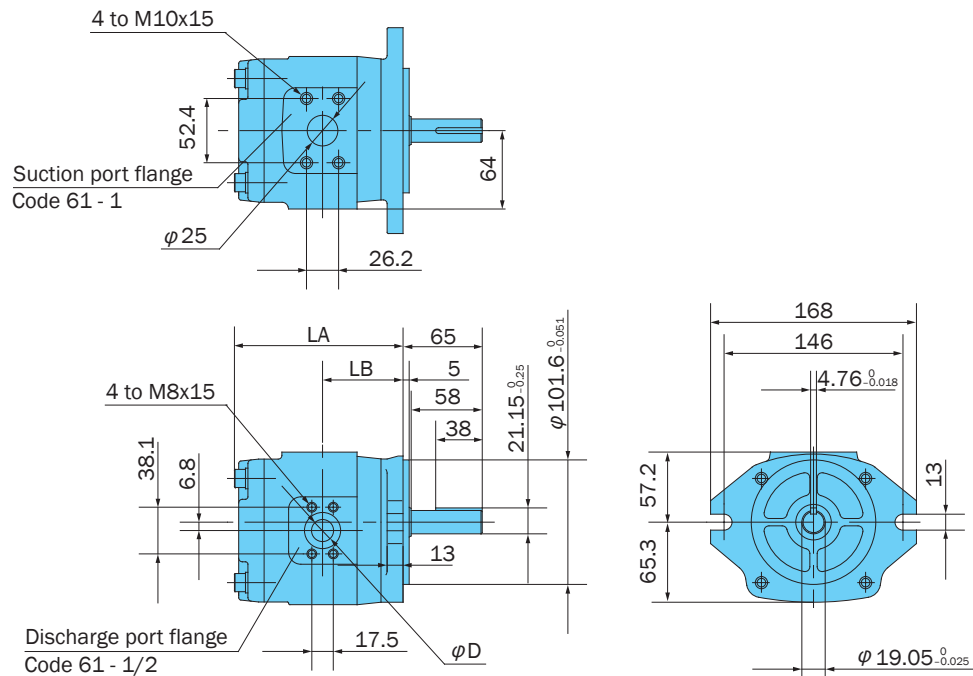
| Model No.       | Dimensions (mm) |      |          |
|-----------------|-----------------|------|----------|
|                 | LA              | LB   | $\phi D$ |
| IPH-2*-3.5-*-11 | 107             | 51.0 | 8.9      |
| IPH-2*-5-*-11   | 112             | 53.5 | 11       |
| IPH-2*-6.5-*-11 | 116             | 55.5 | 12       |
| IPH-2*-8-*-11   | 121             | 58.0 | 13       |

Note: IPH-2A (B)-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-3A-\*-20 (Foot Mounting, Clockwise Rotation)**



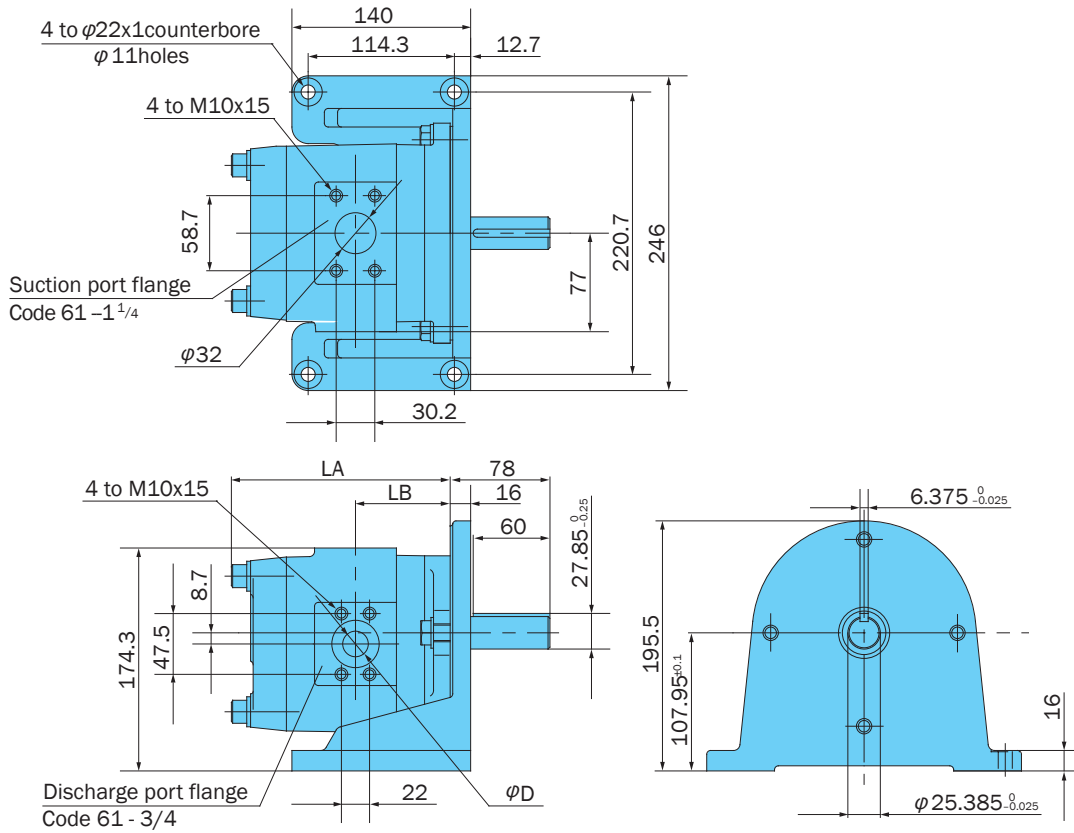
**IPH-3B-\*-20 (Flange Mounting, Clockwise Rotation) SAE B Mount 3/4 Shaft**



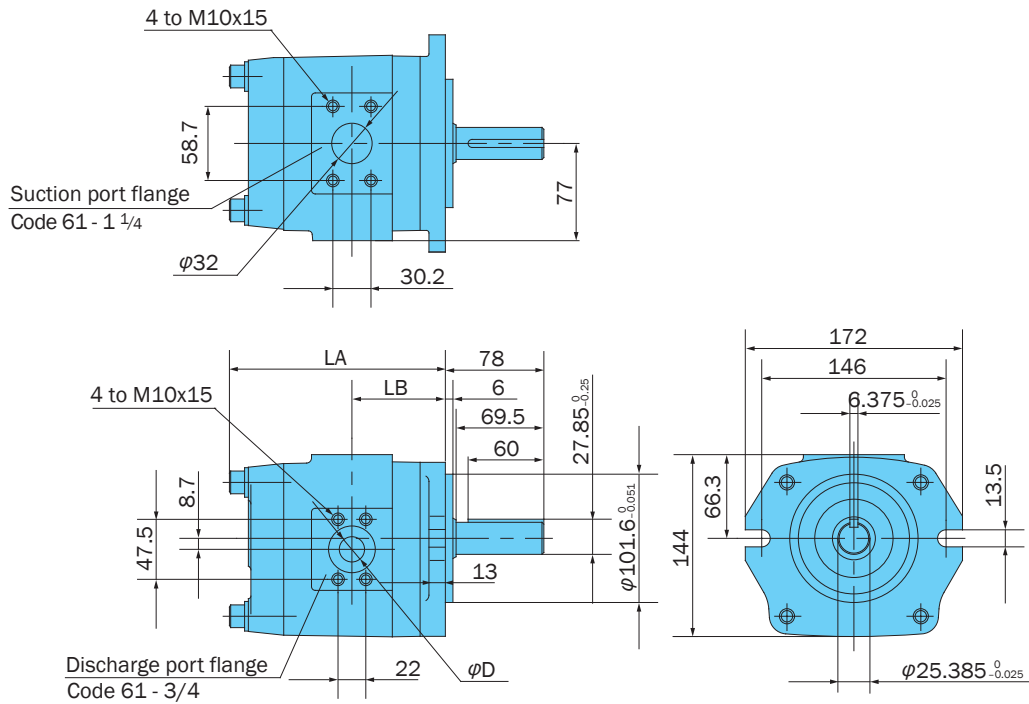
| Model No.      | Dimensions (mm) |      |          |
|----------------|-----------------|------|----------|
|                | LA              | LB   | $\phi D$ |
| IPH-3*-10-*-20 | 128.5           | 60.0 | 14       |
| IPH-3*-13-*-20 | 134.5           | 63.0 | 17       |
| IPH-3*-16-*-20 | 139.5           | 65.5 | 18       |

Note: IPH-3A (B)-\*-L-20 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-4A-\*-20 (Foot Mounting, Clockwise Rotation)**



**IPH-4B-\*-20 (Flange Mounting, Clockwise Rotation) SAE BB Mount**

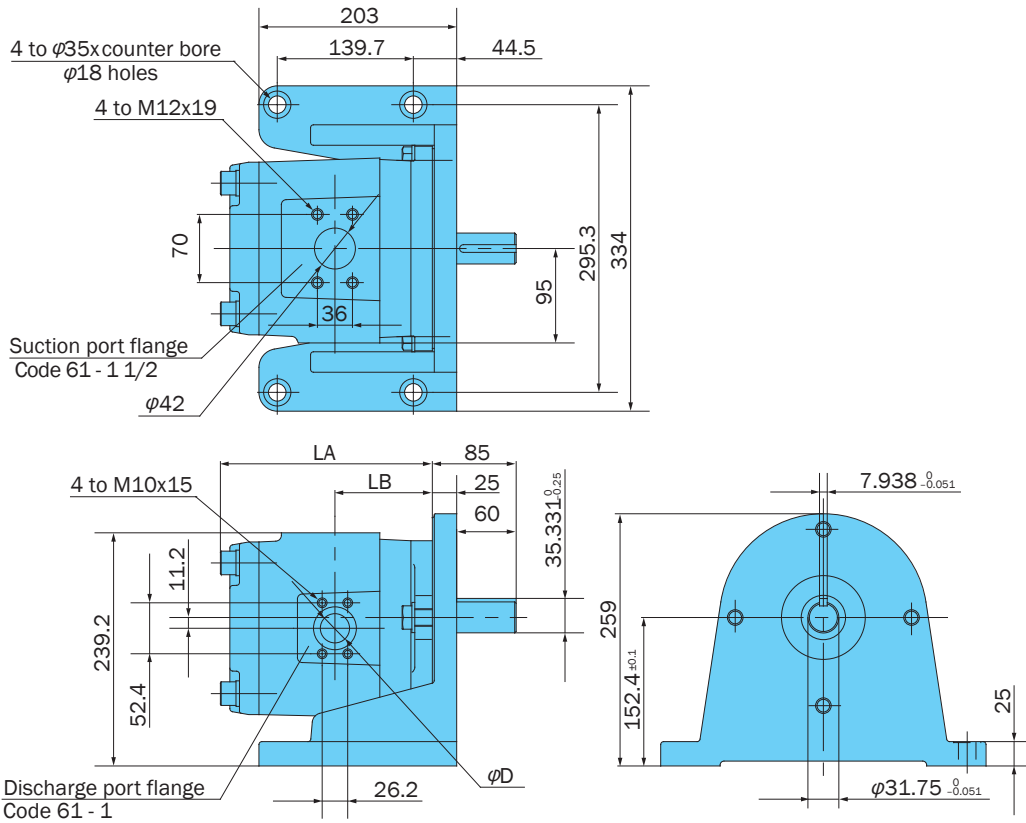


| Model No.      | Dimensions (mm) |    |          |
|----------------|-----------------|----|----------|
|                | LA              | LB | $\phi D$ |
| IPH-4*-20-*-20 | 164.5           | 71 | 18       |
| IPH-4*-25-*-20 | 170.5           | 74 | 20       |
| IPH-4*-32-*-20 | 178.5           | 78 | 24       |

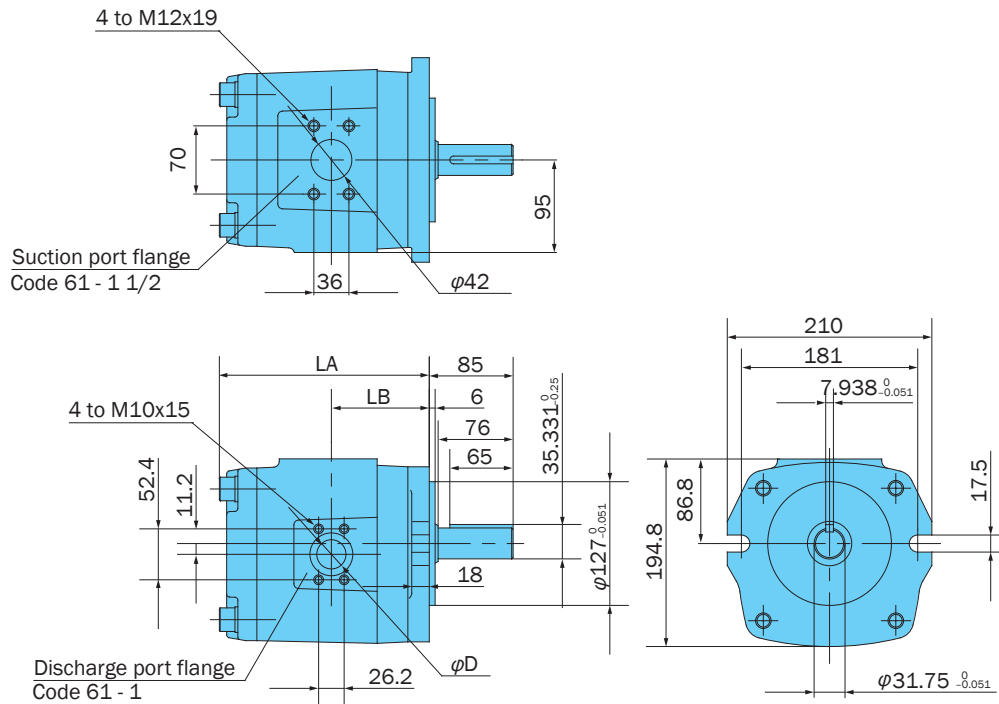
Note: IPH-4A (B)-\*-L-20 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.



**IPH-5A-\*-21 (Foot Mounting, Clockwise Rotation)**



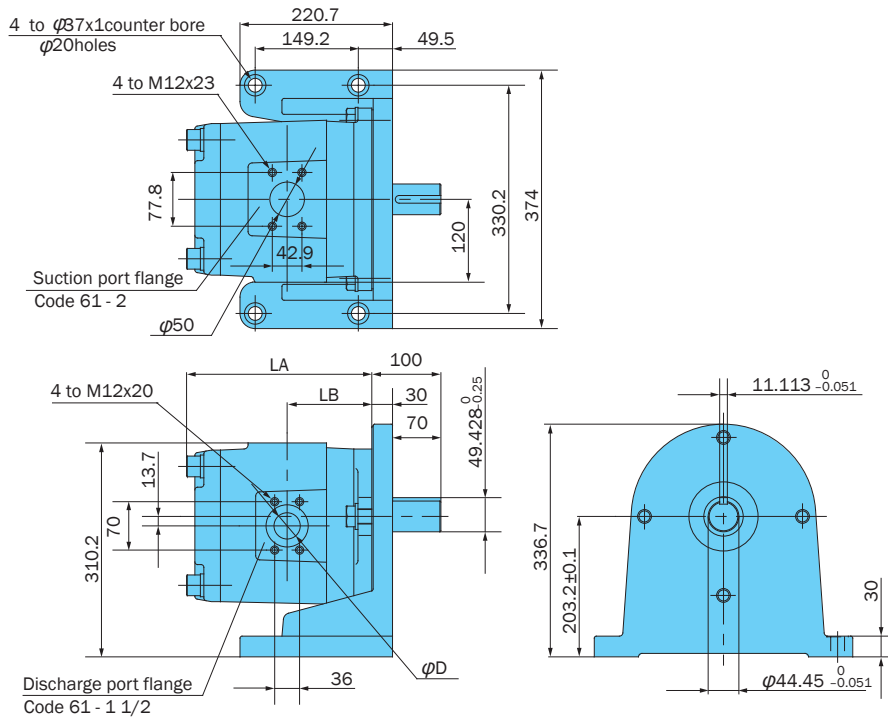
**IPH-5B-\*-11 (Flange Mounting, Clockwise Rotation) SAE C Mount**



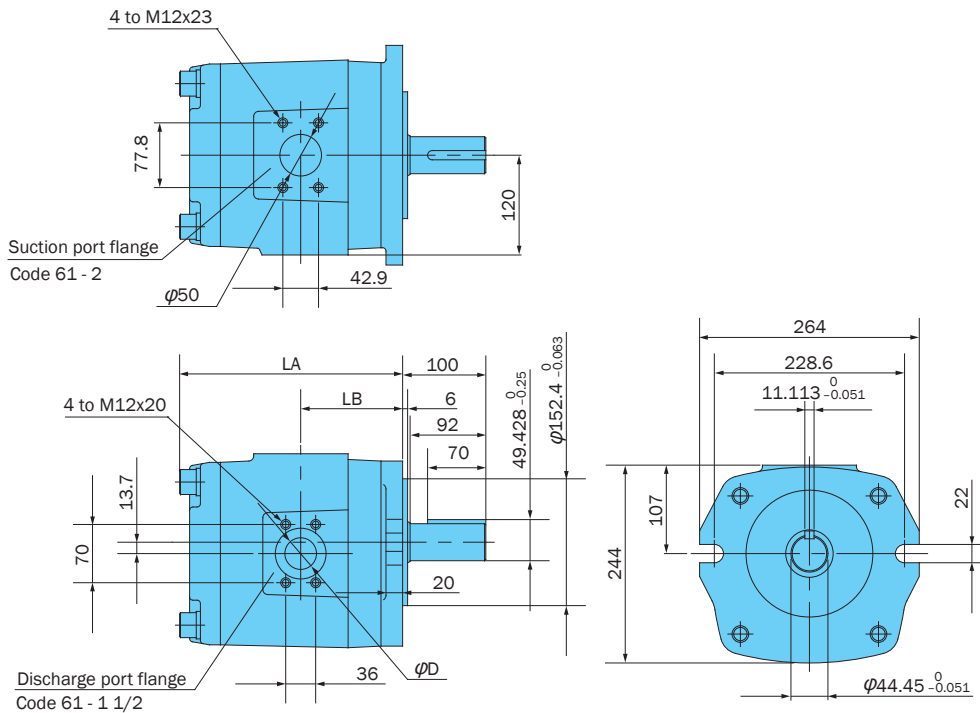
| Model No.           | Dimensions (mm) |      |          |
|---------------------|-----------------|------|----------|
|                     | LA              | LB   | $\phi D$ |
| IPH-5*-40-*-21 (11) | 201.5           | 91.0 | 24       |
| IPH-5*-50-*-21 (11) | 208.5           | 94.5 | 26       |
| IPH-5*-64-*-21 (11) | 218.5           | 99.5 | 28       |

Note: IPH-5A (B)-\*-L-21 (11) (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-6A-\*-21 (Foot Mounting, Clockwise Rotation)**



**IPH-6B-\*-11 (Flange Mounting, Clockwise Rotation) SAE D Mount**

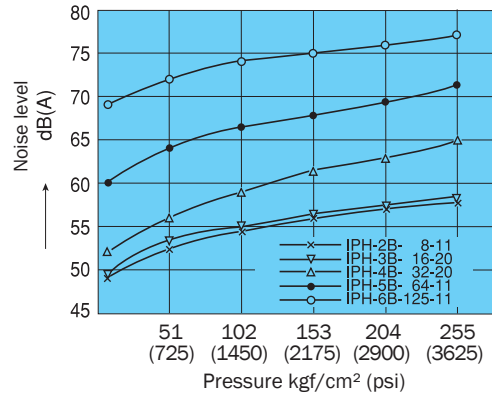
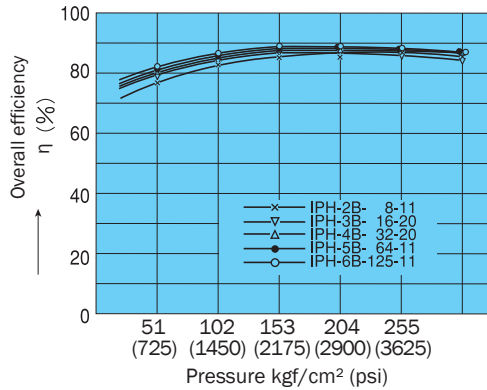
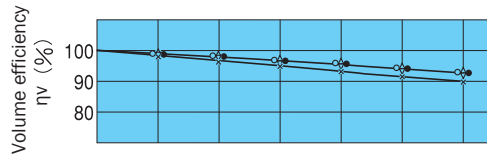


| Model No.            | Dimensions (mm) |       |                 |
|----------------------|-----------------|-------|-----------------|
|                      | LA              | LB    | $\varnothing D$ |
| IPH-6*- 80-*-21 (11) | 241.5           | 111.5 | 32              |
| IPH-6*-100-*-21 (11) | 251.5           | 116.5 | 36              |
| IPH-6*-125-*-21 (11) | 263.5           | 122.5 | 38              |

Note: IPH-6A (B)-\*-L-21 (11) (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

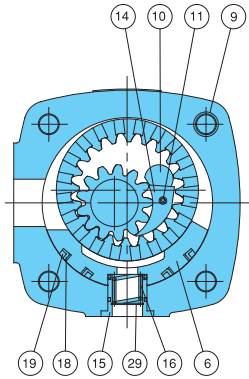
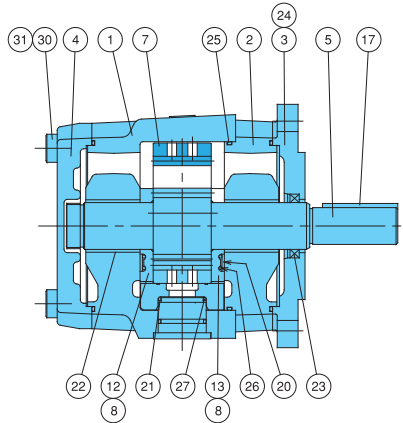
## Performance Curves

Revolution Speed 1200 rpm  
 Operating Hydraulic Fluid Viscosity 46 centistokes  
 Representative Characteristics Under Above Conditions

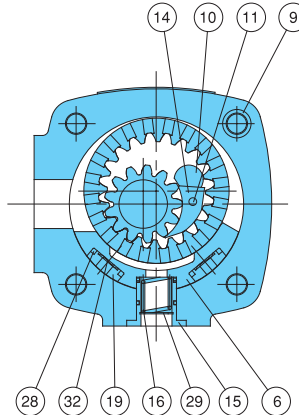
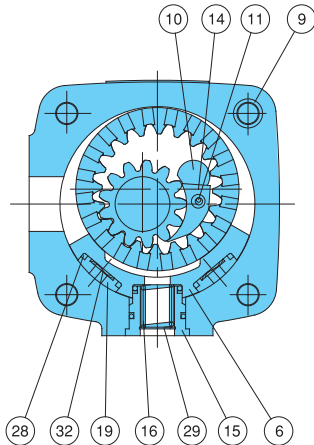


## Cross-sectional Drawing

IPH-\*B-\*-\*\*



Note: Drawings shown above are the IPH-5 and IPH-6.  
 The lower left cross-sectional drawing is the IPH-4, the radial seal #18 was removed and a wave washer was added.  
 The lower right cross-sectional drawing is the IPH-2 and IPH-3, the bushing #8 was removed, the spring pin #11 was replaced with a guide pin, and the radial seal #18 was removed and a wave washer #32 was added.

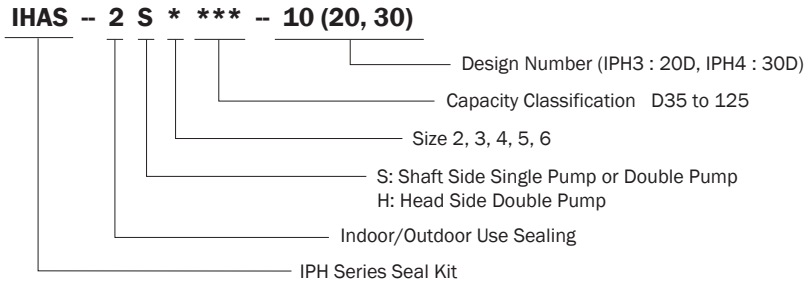


| Part No. | Part Name              |
|----------|------------------------|
| 1        | Body -1                |
| 2        | Body -2                |
| 3        | Mounting               |
| 4        | Rear cover             |
| 5        | Pinion shaft           |
| 6        | Radial piston          |
| 7        | Internal gear          |
| 8        | Bushing                |
| 9        | Knock pin              |
| 10       | Stopper pin            |
| 11       | Spring pin (guide pin) |
| 12       | Axial plate -1         |
| 13       | Axial plate -2         |
| 14       | Feeler piece           |
| 15       | Spring holder          |
| 16       | Spring                 |
| 17       | Key                    |
| 18       | Radial seal            |
| 19       | Radial backup ring     |
| 20       | Axial backup ring      |
| 21       | Backup ring            |
| 22       | Bearing                |
| 23       | Oil seal               |
| 24       | Pin                    |
| 25       | O-ring                 |
| 26       | O-ring                 |
| 27       | O-ring                 |
| 28       | O-ring                 |
| 29       | Snap ring              |
| 30       | Screw                  |
| 31       | Washer                 |
| 32       | Wave washer            |

\*Note: See page C2 for Parts/Kit Numbers

## IPH Series Seal Kit

Understanding Seal Kit Model Numbers :



| Seal Kit Number | Applicable Pump Model No. | Component Part Numbers |      |                    |      |                   |      |              |      |
|-----------------|---------------------------|------------------------|------|--------------------|------|-------------------|------|--------------|------|
|                 |                           | 18                     |      | 19                 |      | 20                |      | 21           |      |
|                 |                           | Radial Seal            | Q'ty | Radial Backup Ring | Q'ty | Axial Backup Ring | Q'ty | Backup ring  | Q'ty |
| IHAS-2S2D35-10  | IPH-2A(B)-3.5-11          |                        |      | IH34J-102D35-1A    | 2    | IH34J-202000      | 2    | IH34J-402D35 | 1    |
| 2S2005-10       | 5                         |                        |      | 102005-1A          | 2    | "                 | 2    | 402005       | 1    |
| 2S2D65-10       | 6.5                       |                        |      | 102D65-1A          | 2    | "                 | 2    | 402D65       | 1    |
| 2S2008-10       | 8                         |                        |      | 102008-1A          | 2    | "                 | 2    | 402008       | 1    |
| IHAS-2S3010-20  | IPH-3A(B)-10-20           |                        |      | IH34J-103010-1A    | 2    | IH34J-203000      | 2    | IH34J-403010 | 1    |
| 2S3013-20       | 13                        |                        |      | 103013-1A          | 2    | "                 | 2    | 403013       | 1    |
| 2S3016-20       | 16                        |                        |      | 103016-1A          | 2    | "                 | 2    | 403016       | 1    |
| IHAS-2S4020-30  | IPH-4A(B)-20-20           |                        |      | IH34J-104020-2A    | 2    | IH34J-204000-1A   | 2    | IH34J-404020 | 1    |
| 2S4025-30       | 25                        |                        |      | 104025-2A          | 2    | "                 | 2    | 404025       | 1    |
| 2S4032-30       | 32                        |                        |      | 104032-2A          | 2    | "                 | 2    | 404032       | 1    |
| IHAS-2S5040-10  | IPH-5A(B)-40-21(11)       | IH33J-105040-1A        | 2    | IH34J-105040-1A    | 2    | IH34J-205000      | 2    | IH34J-405040 | 1    |
| 2S5050-10       | 50                        | 105050-1A              | 2    | 105050-1A          | 2    | "                 | 2    | 405050       | 1    |
| 2S5064-10       | 64                        | 105064-1A              | 2    | 105064-1A          | 2    | "                 | 2    | 405064       | 1    |
| IHAS-2S6080-10  | IPH-6A(B)-80-21(11)       | IH33J-106080-1A        | 2    | IH34J-106080-1A    | 2    | IH34J-206000      | 2    | IH34J-406080 | 1    |
| 2S6100-10       | 100                       | 106100-1A              | 2    | 106100-1A          | 2    | "                 | 2    | 406100       | 1    |
| 2S6125-10       | 125                       | 106125-1A              | 2    | 106125-1A          | 2    | "                 | 2    | 406125       | 1    |

| Seal Kit Number | Component Part Numbers |      |          |      |           |      |           |      |           |      |
|-----------------|------------------------|------|----------|------|-----------|------|-----------|------|-----------|------|
|                 | 23                     |      | 25       |      | 26        |      | 27        |      | 28        |      |
|                 | Oil seal               | Q'ty | O-ring   | Q'ty | O-ring    | Q'ty | O-ring    | Q'ty | O-ring    | Q'ty |
| IHAS-2S2D35-10  | ISD-20328              | 1    | R68 × 2  | 3    | R23 × 2   | 2    | R10 × 2   | 1    | R10 × 2   | 2    |
| 2S2005-10       | "                      | 1    | "        | 3    | "         | 2    | R12 × 2   | 1    | R12 × 2   | 2    |
| 2S2D65-10       | "                      | 1    | "        | 3    | "         | 2    | R14 × 2   | 1    | R14 × 2   | 2    |
| 2S2008-10       | "                      | 1    | "        | 3    | "         | 2    | R16 × 2   | 1    | R16 × 2   | 2    |
| IHAS-2S3010-20  | ISD-25388              | 1    | R86 × 2  | 3    | R30 × 2   | 2    | R15 × 2.5 | 1    | R15 × 2.5 | 2    |
| 2S3013-20       | "                      | 1    | "        | 3    | "         | 2    | R18 × 2.5 | 1    | R18 × 2.5 | 2    |
| 2S3016-20       | "                      | 1    | "        | 3    | "         | 2    | R20 × 2.5 | 1    | R20 × 2.5 | 2    |
| IHAS-2S4020-30  | ISD-32458              | 1    | R108 × 3 | 3    | R38 × 2.5 | 2    | R21 × 2.5 | 1    | R21 × 2.5 | 2    |
| 2S4025-30       | "                      | 1    | "        | 3    | "         | 2    | R23 × 3   | 1    | R23 × 3   | 2    |
| 2S4032-30       | "                      | 1    | "        | 3    | "         | 2    | R26 × 3   | 1    | R26 × 3   | 2    |
| IHAS-2S5040-10  | ISD-40558              | 1    | R140 × 3 | 3    | R49 × 3   | 2    | R26 × 3   | 1    |           |      |
| 2S5050-10       | "                      | 1    | "        | 3    | "         | 2    | R29 × 3.5 | 1    |           |      |
| 2S5064-10       | "                      | 1    | "        | 3    | "         | 2    | R33 × 3.5 | 1    |           |      |
| IHAS-2S6080-10  | ISD-50659              | 1    | R172 × 4 | 3    | R60 × 3.5 | 2    | R34 × 3.5 | 1    |           |      |
| 2S6100-10       | "                      | 1    | "        | 3    | "         | 2    | R38 × 4   | 1    |           |      |
| 2S6125-10       | "                      | 1    | "        | 3    | "         | 2    | R43 × 4   | 1    |           |      |

Note: 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).  
 2. O-rings are not available through retail sources. Consult your agent for more information.

## IPH Series Pipe Flange Kit

### Understanding Flange Kit Model Numbers :

The pipe flange kit combines the flanges, bolts, washers, and O-rings required for each type of pump into a single kit.

The component parts table shows the screw in type flange kit. In the case of the welded type flange, the flange part number is IH03J-200040 (1 of IH03J-100040 changes to 2). All other included parts are the same.

IHF - 3 - T - 20

Design Number  
: 20 Design  
T : Screw in Type  
E : Welded Type

Pump Size  
: Single Pump  
2 to 6  
: Double Pump  
22 to 46

IPH Series Flange Kit  
Note: O-ring 1B-\* \*  
refers to JIS B2401-1B-\* \*

| Screw in type<br>Flange Kit model No. | Applicable Pump<br>Model No. | Code 61 | IN Flange       |   |            |   |         |   |        |   |
|---------------------------------------|------------------------------|---------|-----------------|---|------------|---|---------|---|--------|---|
|                                       |                              | Size    | Flange Part No. |   | Bolt       |   | Washer  |   | O-ring |   |
| IHF-2-T-20                            | IPH-2A(B)-*-11               | 1/2"    | IH03J-100040    | 1 | TH- 8 × 45 | 4 | WS-B- 8 | 4 | IB-P22 | 1 |
| IHF-3-T-20                            | IPH-3A(B)-*-20               | 1"      | IH03J-100080    | 1 | TH-10 × 50 | 4 | WS-B-10 | 4 | IB-G35 | 1 |
| IHF-4-T-20                            | IPH-4A(B)-*-20               | 1 1/4"  | IH03J-100100    | 1 | TH-10 × 55 | 4 | "       | 4 | IB-G40 | 1 |
| IHF-5-T-20                            | IPH-5A(B)-*-21(11)           | 1 1/2"  | IH03J-100120    | 1 | TH-12 × 55 | 4 | WS-B-12 | 4 | IB-G50 | 1 |
| IHF-6-T-20                            | IPH-6A(B)-*-21(11)           | 2"      | IH03J-100160    | 1 | TH-12 × 60 | 4 | "       | 4 | IB-G60 | 1 |

| Code 61 | OUT Flange      |      |            |        |         |        |        |   | Plug     |   |
|---------|-----------------|------|------------|--------|---------|--------|--------|---|----------|---|
| Size    | Flange Part No. | Bolt |            | Washer |         | O-ring |        |   |          |   |
| 1/2"    | IH03J-100040    | 1    | TH- 8 × 45 | 4      | WS-B- 8 | 4      | IB-P22 | 1 | TPHA-1/4 | 2 |
| 1/2"    | IH03J-100040    | 1    | TH- 8 × 45 | 4      | "       | 4      | IB-P22 | 1 | "        | 2 |
| 3/4"    | IH03J-100060    | 1    | TH-10 × 50 | 4      | WS-B-10 | 4      | IB-G30 | 1 | "        | 1 |
| 1"      | IH03J-100080    | 1    | TH-10 × 50 | 4      | "       | 4      | IB-G35 | 1 | "        | 2 |
| 1 1/2"  | IH03J-100120    | 1    | TH-12 × 60 | 4      | WS-B-12 | 4      | IB-G50 | 1 | "        | 1 |

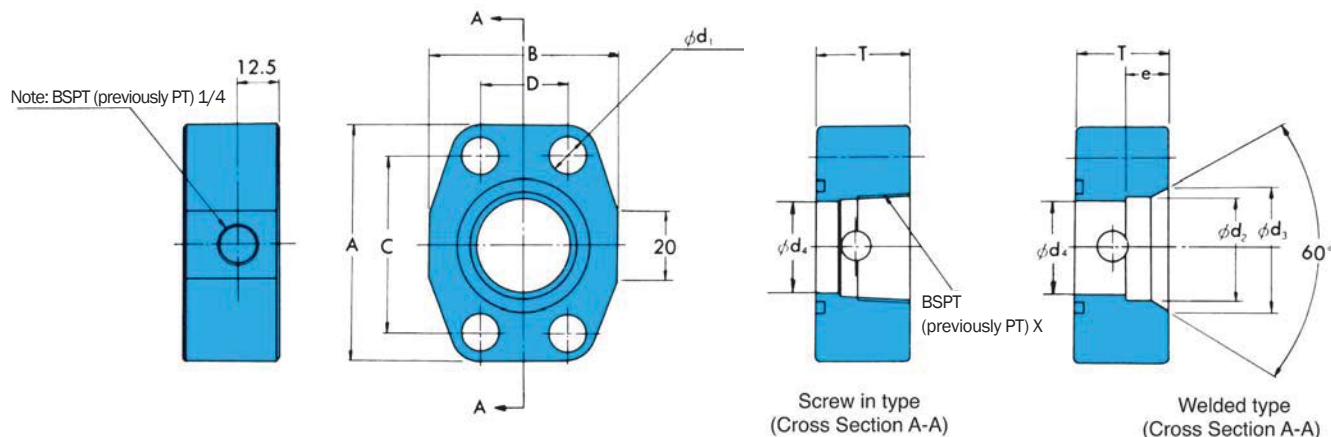
Note: 1. In the case of a double pump, the flange kit includes three flanges: one for the common IN port and two OUT port flanges. When using separate IN ports, use separate single pump flange kits, one each for the head side and the shaft side.

Note: 2. There is no common IN port in the case of the double pump models IPH-55, IPH-56, and IPH-66, or a single IN port is used.

| Screw in type<br>Flange Kit model No. | Applicable Pump Model<br>No. | IN Flange       |   |            |   |         |   |        |   |
|---------------------------------------|------------------------------|-----------------|---|------------|---|---------|---|--------|---|
|                                       |                              | Flange Part No. |   | Bolt       |   | Washer  |   | O-ring |   |
| IHF-22-T-20                           | IPH- 22B-*-*11               | IH03J-100060    | 1 | TH-10 × 50 | 4 | WS-B-10 | 4 | IB-G30 | 1 |
| IHF-23-T-20                           | 23                           | IH03J-100080    | 1 | "          | 4 | "       | 4 | IB-G35 | 1 |
| IHF-24-T-20                           | 24                           | IH03J-100120    | 1 | TH-12 × 55 | 4 | WS-B-12 | 4 | IB-G50 | 1 |
| IHF-25-T-20                           | 25                           | IH03J-100160    | 1 | TH-12 × 60 | 4 | "       | 4 | IB-G60 | 1 |
| IHF-26-T-20                           | 26                           | IH03J-100200    | 1 | TH-12 × 65 | 4 | "       | 4 | IB-G75 | 1 |
| IHF-33-T-20                           | IPH- 33B-*-*11               | IH03J-100100    | 1 | TH-10 × 55 | 4 | WS-B-10 | 4 | IB-G40 | 1 |
| IHF-34-T-20                           | 34                           | IH03J-100120    | 1 | TH-12 × 55 | 4 | WS-B-12 | 4 | IB-G50 | 1 |
| IHF-35-T-20                           | 35                           | IH03J-100160    | 1 | TH-12 × 60 | 4 | "       | 4 | IB-G60 | 1 |
| IHF-36-T-20                           | 36                           | IH03J-100200    | 1 | TH-12 × 60 | 4 | "       | 4 | IB-G75 | 1 |
| IHF-44-T-20                           | IPH- 44B-*-*11               | IH03J-100120    | 1 | TH-12 × 55 | 4 | "       | 4 | IB-G50 | 1 |
| IHF-45-T-20                           | 45                           | IH03J-100200    | 1 | TH-12 × 65 | 4 | "       | 4 | IB-G75 | 1 |
| IHF-46-T-20                           | 46                           | IH03J-100240    | 1 | TH-16 × 75 | 4 | WS-B-16 | 4 | IB-G85 | 1 |

\*IPH Numbers include both Inlet and Outlet Flange Kits

| OUT Flange (Shaft Side) |      |            |        |         |        |        | OUT Flange (Head Side) |              |   |            |   |         |   | Plug   |   |          |   |
|-------------------------|------|------------|--------|---------|--------|--------|------------------------|--------------|---|------------|---|---------|---|--------|---|----------|---|
| Flange Part No.         | Bolt |            | Washer |         | O-ring |        | Flange Part No.        | Bolt         |   | Washer     |   | O-ring  |   |        |   |          |   |
| IH03J-100040            | 1    | TH- 8 × 45 | 4      | WS-B- 8 | 4      | IB-P22 | 1                      | IH03J-100040 | 1 | TH- 8 × 45 | 4 | WS-B- 8 | 4 | IB-P22 | 1 | TPHA-1/4 | 3 |
| IH03J-100040            | 1    | "          | 4      | "       | 4      | IB-P22 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 3 |
| IH03J-100060            | 1    | TH-10 × 50 | 4      | WS-B-10 | 4      | IB-G30 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 3 |
| IH03J-100080            | 1    | "          | 4      | "       | 4      | IB-G35 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 2 |
| IH03J-100120            | 1    | TH-12 × 60 | 4      | WS-B-12 | 4      | IB-G50 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 2 |
| IH03J-100040            | 1    | TH- 8 × 45 | 4      | WS-B- 8 | 4      | IB-P22 | 1                      | IH03J-100040 | 1 | TH- 8 × 45 | 4 | WS-B- 8 | 4 | IB-P22 | 1 | "        | 2 |
| IH03J-100060            | 1    | TH-10 × 50 | 4      | WS-B-10 | 4      | IB-G30 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 3 |
| IH03J-100080            | 1    | "          | 4      | "       | 4      | IB-G35 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 2 |
| IH03J-100120            | 1    | TH-12 × 60 | 4      | WS-B-12 | 4      | IB-G50 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 2 |
| IH03J-100060            | 1    | TH-10 × 50 | 4      | WS-B-10 | 4      | IB-G30 | 1                      | IH03J-100060 | 1 | TH-10 × 50 | 4 | WS-B-10 | 4 | IB-G30 | 1 | "        | 3 |
| IH03J-100080            | 1    | "          | 4      | "       | 4      | IB-G35 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 2 |
| IH03J-100120            | 1    | TH-12 × 60 | 4      | WS-B-12 | 4      | IB-G50 | 1                      | "            | 1 | "          | 4 | "       | 4 | "      | 1 | "        | 2 |

**Pipe Flange Installation Dimension Diagram**

**Screw in type**

| Pipe Flange Kit Part Number | SAE Standard Code 61 | Nominal Diameter | Dimensions (mm) |     |       |      |    |            |            | Weight lbs |
|-----------------------------|----------------------|------------------|-----------------|-----|-------|------|----|------------|------------|------------|
|                             |                      |                  | A               | B   | C     | D    | T  | $\phi d_1$ | $\phi d_4$ |            |
| IH03J -100040               | SAE J518b 1/2        | 1/2              | 54              | 46  | 38.1  | 17.5 | 33 | 9          | 12.7       | .88        |
| -100060                     | SAE J518b 3/4        | 3/4              | 65              | 52  | 47.5  | 22.0 | 33 | 11         | 20         | 1.3        |
| -100080                     | SAE J518b 1          | 1                | 70              | 59  | 52.4  | 26.2 | 33 | 11         | 27         | 1.3        |
| ☆ -100100                   | SAE J518b 1 1/4      | 1 1/4            | 79              | 73  | 58.7  | 30.2 | 38 | 11         | 33         | 2.2        |
| -100120                     | SAE J518b 1 1/2      | 1 1/2            | 94              | 83  | 70.0  | 36.0 | 38 | 13         | 37.5       | 3.0        |
| ☆ -100160                   | SAE J518b 2          | 2                | 102             | 97  | 77.8  | 42.9 | 38 | 13         | 50         | 3.7        |
| ☆ -100200                   | SAE J518b 2 1/2      | 2 1/2            | 114             | 109 | 88.9  | 50.8 | 43 | 13         | 60         | 4.6        |
| ☆ -100240                   | SAE J518b 3          | 3                | 135             | 131 | 106.4 | 61.9 | 48 | 17.5       | 71         | 7.2        |

**Welded Type**

| Pipe Flange Kit Part Number | SAE Standard Code 61 | Pipe Diameter | Dimensions (mm) |     |       |      |    |    |            |            |            |            | Weight lbs |
|-----------------------------|----------------------|---------------|-----------------|-----|-------|------|----|----|------------|------------|------------|------------|------------|
|                             |                      |               | A               | B   | C     | D    | T  | e  | $\phi d_1$ | $\phi d_2$ | $\phi d_3$ | $\phi d_4$ |            |
| IH03J -200040               | SAE J518b 1/2        | 1/2           | 54              | 46  | 38.1  | 17.5 | 33 | 11 | 9          | 22.2       | 27         | 12.7       | .88        |
| -200060                     | SAE J518b 3/4        | 3/4           | 65              | 52  | 47.5  | 22.0 | 33 | 12 | 11         | 27.7       | 35         | 20         | 1.3        |
| -200080                     | SAE J518b 1          | 1             | 70              | 59  | 52.4  | 26.2 | 33 | 14 | 11         | 34.5       | 42         | 27         | 1.3        |
| ☆ -200100                   | SAE J518b 1 1/4      | 1 1/4         | 79              | 73  | 58.7  | 30.2 | 38 | 16 | 11         | 43.2       | 48         | 33         | 2.2        |
| -200120                     | SAE J518b 1 1/2      | 1 1/2         | 94              | 83  | 70.0  | 36.0 | 38 | 18 | 13         | 49.1       | 58         | 37.5       | 3.0        |
| ☆ -200160                   | SAE J518b 2          | 2             | 102             | 97  | 77.8  | 42.9 | 38 | 19 | 13         | 61.1       | 68         | 50         | 3.7        |
| ☆ -200200                   | SAE J518b 2 1/2      | 2 1/2         | 114             | 109 | 88.9  | 50.8 | 43 | 22 | 13         | 77.1       | 82         | 60         | 4.6        |
| ☆ -200240                   | SAE J518b 3          | 3             | 135             | 131 | 106.4 | 61.9 | 48 | 25 | 17.5       | 90.0       | 97         | 71         | 7.2        |

**Recommended Tightening Torque for Flange Installation Bolts**
**For aluminum body**

| Mounting bolt | Tightening Torque ft/lbs |
|---------------|--------------------------|
| M8            | 14 to 17                 |
| M10           | 36 to 43                 |
| M12           | 65 to 83                 |

**For cast body (shared IN port)**

| Mounting bolt | Tightening Torque ft/lbs |
|---------------|--------------------------|
| M10           | 36 to 47                 |
| M12           | 64 to 82                 |
| M16           | 158 to 202               |

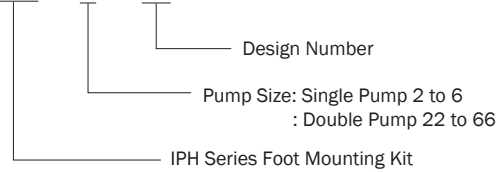
Note: There is no BSPT (previously PT) 1/4 tap for the above flange numbers (exclusively for suction port use) marked with a star (☆).

# IPH Series Pipe Flange Kit

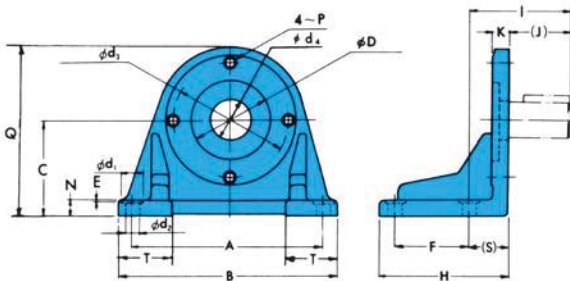
## Understanding Foot Mounting Kit Numbers:

When only the mounting feet are required for a single pump or double pump, pump mounting bolts, washers and other parts are sold together as the Foot Mounting Kit.

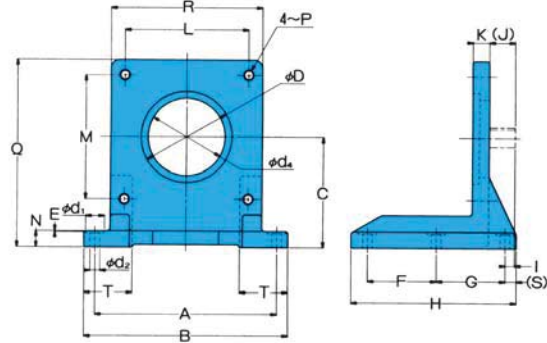
IHM - 2 - 10



## Foot Mounting Installation Measurement Chart SAE-2BOLT-MOUNTING



## SAE-4BOLT-MOUNTING



## SAE-2BOLT-MOUNTING

| Foot Mounting Kit Model No. | Applicable Pump Model No. |                        | Accessories |      |        |      | Dimensions (mm) |       |        |   |       |       |
|-----------------------------|---------------------------|------------------------|-------------|------|--------|------|-----------------|-------|--------|---|-------|-------|
|                             | SINGLE PUMP               | DOUBLE PUMP            | Bolt        | Q'ty | Washer | Q'ty | A               | B     | C      | E | F     | H     |
| IHM-2-10                    | IPH-2                     | --                     | TB-10 × 30  | 2    | WP-10  | 2    | 127             | 152.5 | 69.8   | 1 | 50.8  | 96    |
| IHM-4-10                    | IPH-3                     | --                     | TB-12 × 30  | 2    | WG-12  | 2    | 220.7           | 246   | 107.95 | 1 | 114.3 | 140   |
| IHM-4-10                    | IPH-4                     | --                     | TB-12 × 30  | 2    | WG-12  | 2    | 220.7           | 246   | 107.95 | 1 | 114.3 | 140   |
| IHM-22-10                   |                           | IPH-22                 | TB-10 × 30  | 2    | WP-10  | 2    | 171.45          | 204   | 107.95 | 1 | 95.25 | 150   |
| IHM-44-10                   |                           | IPH23, IPH-33          | TB-12 × 30  | 2    | WG-12  | 2    | 235             | 267   | 139.7  | 1 | 127   | 193   |
| IHM-44-10                   |                           | IPH-24, IPH-34, IPH-44 | TB-12 × 30  | 2    | WG-12  | 2    | 235             | 267   | 139.7  | 1 | 127   | 193   |
| IHM-45-10                   | IPH-5                     | IPH-25, IPH-35, IPH-45 | TB-16 × 40  | 2    | WP-16  | 2    | 295.3           | 334   | 152.4  | 1 | 139.7 | 203   |
| IHM-46-10                   | IPH-6                     | IPH-26, IPH-36, IPH-46 | TB-20 × 50  | 2    | WP-20  | 2    | 330.2           | 374   | 203.2  | 1 | 149.2 | 220.7 |

| Foot Mounting Kit Model No. | Dimensions (mm) |      |      |    |     |       |      |      |       |                 |                 |                 |                 | Weight lbs |
|-----------------------------|-----------------|------|------|----|-----|-------|------|------|-------|-----------------|-----------------|-----------------|-----------------|------------|
|                             | I               | (J)  | K    | N  | P   | Q     | (S)  | T    | φD    | φd <sub>1</sub> | φd <sub>2</sub> | φd <sub>3</sub> | φd <sub>4</sub> |            |
| IHM-2-10                    | 74              | 41.5 | 17.5 | 13 | M10 | 135   | 32.5 | 36.5 | 82.55 | 22              | 11              | 106.4           | 50              | 4.4        |
| IHM-4-10                    | 61.7            | 49   | 16   | 16 | M12 | 195.5 | 12.7 | 53   | 101.6 | 22              | 11              | 146             | 40              | 12.1       |
| IHM-4-10                    | 74.7            | 62   | 16   | 16 | M12 | 195.5 | 12.7 | 53   | 101.6 | 22              | 11              | 146             | 40              | 12.1       |
| IHM-22-10                   | 73.5            | 41   | 18   | 18 | M10 | 180   | 32.5 | 50   | 82.55 | 22              | 11              | 106.4           | 40              | 14.3       |
| IHM-44-10                   | 89.5            | 45   | 20   | 20 | M12 | 232   | 44.5 | 57.5 | 101.6 | 22              | 14              | 146             | 40              | 26.4       |
| IHM-44-10                   | 102.5           | 58   | 20   | 20 | M12 | 232   | 44.5 | 57.5 | 101.6 | 22              | 14              | 146             | 40              | 26.4       |
| IHM-45-10                   | 104.5           | 60   | 25   | 25 | M16 | 259   | 44.5 | 61   | 127   | 35              | 18              | 181             | 86              | 29.7       |
| IHM-46-10                   | 119.5           | 70   | 30   | 30 | M20 | 337   | 49.5 | 64   | 152.4 | 37              | 20              | 228.6           | 100             | 48.5       |

\*IHM-2-10, IHM-4-10, and IHM-45-10 are the same as PVS pump foot mounting PSM-101000, PSM102000, and PSM103000 respectively.

## SAE-4BOLT-MOUNTING

| Foot Mounting Kit Model No. | Applicable Pump Model No. | Accessories |      |         |      | Dimensions (mm) |     |     |   |     |     |     |    |  |
|-----------------------------|---------------------------|-------------|------|---------|------|-----------------|-----|-----|---|-----|-----|-----|----|--|
|                             | DOUBLE PUMP               | Bolt        | Q'ty | Washer  | Q'ty | A               | B   | C   | E | F   | G   | H   | I  |  |
| IHM-55-10                   | IPH-55                    | TH-20 × 50  | 4    | WS-B-20 | 4    | 330             | 370 | 200 | 1 | 125 | 125 | 300 | 17 |  |
| IHM-66-10                   | IPH56, IPH-66             | TH-24 × 60  | 4    | WS-B-24 | 4    | 380             | 430 | 260 | 1 | 140 | 140 | 340 | 17 |  |

| Foot Mounting Kit Model No. | Dimensions (mm) |    |       |       |    |     |     |     |     |     |       |                 |                 |                 | Weight lbs |
|-----------------------------|-----------------|----|-------|-------|----|-----|-----|-----|-----|-----|-------|-----------------|-----------------|-----------------|------------|
|                             | (J)             | K  | L     | M     | N  | P   | Q   | R   | (S) | T   | φD    | φd <sub>1</sub> | φd <sub>2</sub> | φd <sub>4</sub> |            |
| IHM-55-10                   | 47              | 30 | 224.6 | 224.6 | 30 | M20 | 340 | 275 | 20  | 90  | 165.1 | 34              | 18              | 140             | 70.5       |
| IHM-66-10                   | 52              | 40 | 247.5 | 247.5 | 40 | M24 | 415 | 310 | 25  | 105 | 177.8 | 34              | 18              | 150             | 105.8      |

## Air Bleed-off Valve

Equipping an air bleed-off valve on the pump's discharge side helps to simplify air bleeding during test operation.

## Specifications

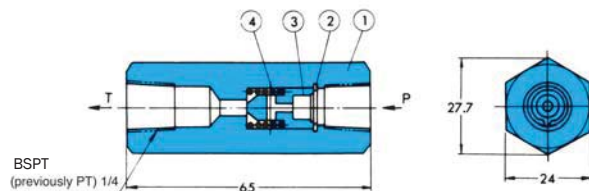
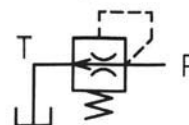
Air inside the pump and the suction pipe is exhausted rapidly when the pump is started up.

When discharge pressure reaches 29 psi or greater after the pump intakes oil, a valve closes to prevent oil from leaking.

Maximum operating pressure: 4350 psi.

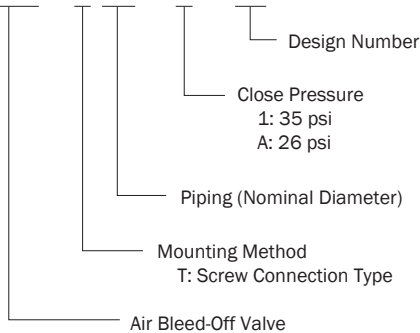
Provide piping to ensure that the tank port is under the oil level surface.

## JIS symbol



## Understanding Model Numbers

**CAB - T 02 - 1 - 11**



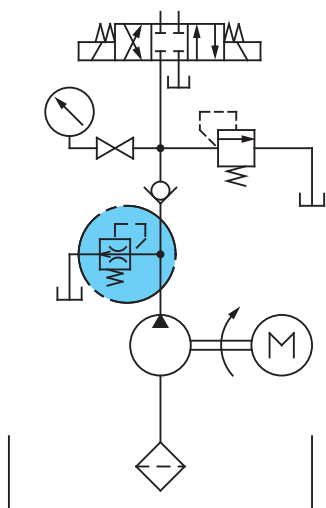
| Part No. | Part Name  | Q'ty |
|----------|------------|------|
| 1        | Valve body | 1    |
| 2        | Snap ring  | 1    |
| 3        | Valve      | 1    |
| 4        | Spring     | 1    |

Note: 1) If chattering occurs in a circuit when CAB-T02-1-11 is used, use CAB-T02-A-11 instead.  
 2) If chattering occurs in a circuit when CAB-T02-A-11 is used, use of a CAB air bleed-off valve is not required.

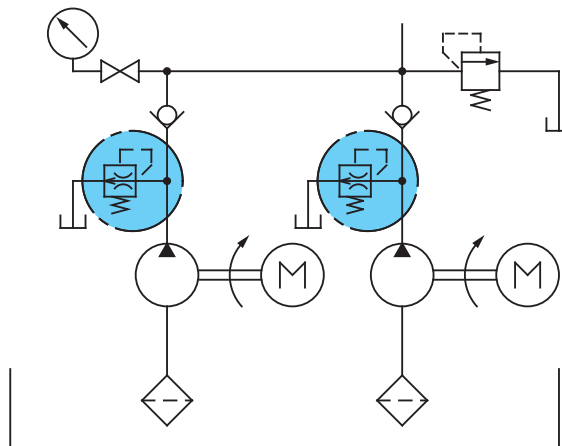
## Application Examples

Example of Circuits that Require an Air Bleed-off Valve:

- 1) When using a Type 2 or Type 3 check valve (Sample Circuit A)
- 2) When unload circuit function cannot be achieved (Sample Circuit A)
- 3) When the discharge sides of multiple pumps run together (Sample Circuit B)

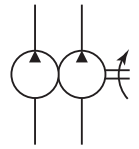


Circuit Diagram A



Circuit Diagram B





### IPH Series Double IP Pump

.21 to 7.68 in<sup>3</sup>/rev  
4350 psi

All the types in this new design (11D) series are installation compatible with the previous design (10D). Note, however, that there is no longer compatibility for some of the seal components between the IPH-3 and IPH-4 sizes and the 3 and 4 sizes.

### Features

Configured with the high-pressure, low-noise IPH Series and IP pumps, these double pumps greatly expand

the range of application for the IP pump.  
A wide selection of pump combinations

provides options that are perfect for just about any type of application imaginable.

### Specifications

| Model No.  | Discharge Rate (1200min <sup>-1</sup> No-load) |   | Revolution Speed       |                        | Operating Pressure MPa (psi)       | Required Power at 1200min <sup>-1</sup> , 3045 psi hp |  |
|--|--|---|------------------------|------------------------|------------------------------------|---|--|
|  | Vent Side gpm                                  | Shaft Side gpm  | Min. min <sup>-1</sup> | Max. min <sup>-1</sup> |                                    |   |  |
| IPH-22B-*.*(-*)-11<br>IPH-23B<br>IPH-24B<br>IPH-25B<br>IPH-26B | 1.1 to 2.5                                     | 4.3 to 9.8<br>12.2 to 18.9<br>24.8 to 38.7<br>48.9 to 76.6<br>97.5 to 151.0 | 600                    | 2000                   | Rated: 21 (3045)<br>Max: 30 (4350) | 10.7<br>15.5<br>26.1<br>46.2<br>85.8                  |  |
| IPH-33B<br>IPH-34B<br>IPH-35B<br>IPH-36B                       |  | 12.2 to 18.9<br>24.8 to 38.7<br>48.9 to 76.6<br>97.5 to 151.0               |                        |                        |                                    | 20.5<br>30.9<br>51.0<br>90.7                          |  |
| IPH-44B<br>IPH-45B<br>IPH-46B                                  |  | 24.8 to 38.7<br>48.9 to 76.6<br>97.5 to 151.0                               |                        |                        |                                    | 41.5<br>61.6<br>101.3                                 |  |
| IPH-55B<br>IPH-56B   |  | 48.9 to 76.6<br>97.5 to 151.0   |                        |                        |                                    | 81.8<br>121.4   |  |
| IPH-66B  |  | 97.5 to 151.0   |                        |                        |                                    | 159.9   |  |
|  | 6.5 to 10.2                                    | 24.8 to 38.7<br>48.9 to 76.6<br>97.5 to 151.0                               | 500                    |                        |                                    |   |  |
|  | 12.9 to 20.2                                   | 48.9 to 76.6<br>97.5 to 151.0   | 400                    |                        |                                    |   |  |
|  | 25.7 to 39.8                                   | 97.5 to 151.0   | 300                    |                        |                                    |   |  |

Note:

- Maximum Pressure: Maximum pressure limit when there are frequent pressure changes. However, maximum pressure is the same as rated pressure when load is applied to the head side and shaft side simultaneously.
- Suction Pressure: 4.3 psi
- Avoid installation with the suction port towards the bottom of the pump. If the revolution speed will exceed 1800mm-1, provide separate piping for shaft side and head size IN ports.
- Specify using the model number format shown below when pipe flange is required.

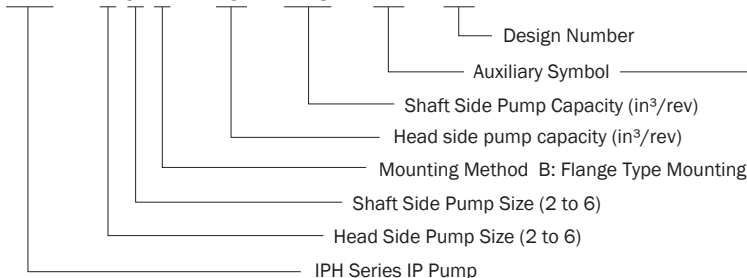
- Working pressure is continuous operating pressure when the same pressure exists on the head side and shaft side.
- Individual pump performance on the head side and shaft side is the same as that of the single pumps. Required power is the sum of the power required by each of the two pumps.
- The "Required Power at 1200min-1, 3045 psi (hp)" column in the above table are based on combinations that provide the maximum capacity for each model number, when pressure at both the head side and shaft side is 3045 psi. Examples

combinations that provide "the maximum capacity for each model number" are IPH-22B-8-8-11 for IPH-22B, and IPH-46B-32- 125-11 for IPH-46B.

- Handling
- 1 Handling is in accordance with procedures for the IPH pump. See page C-1 for more information.

### Understanding Model Numbers

IPH - 4 6 B - 20 - 125 - LT - 11



- None: Clockwise (viewed from shaft end)
- L : Counterclockwise (viewed from shaft end)
- T : Includes Screw IN Flange Kit (for shared IN port)
- TT : Includes Screw IN Flange Kit (for individual IN port)
- E : Includes Welded Flange Kit (for shared IN port)
- EE : Includes Welded Flange Kit (for individual IN port)

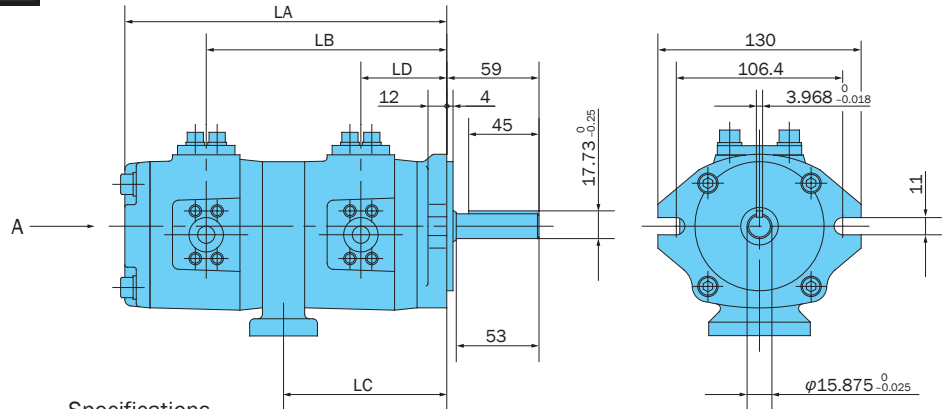
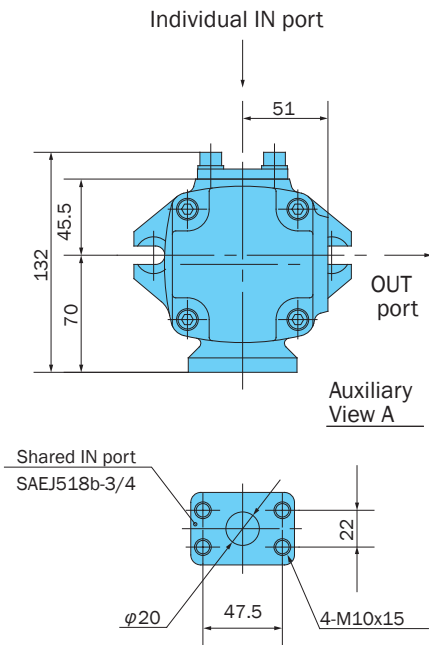
Auxiliary symbol must be provided in alphabetic order.

• IPH Series Double IP Pump Foot Mounting Kit  
See the IPH Series (single) IP pump section in page C-12.

• IPH Series Double IP Pump Pipe Flange  
See the IPH Series (single) IP pump section in page C-10.

## Installation Dimension Drawings

### IPH-22B-\*-\*-11 (Flange Mounting, Clockwise Rotation)

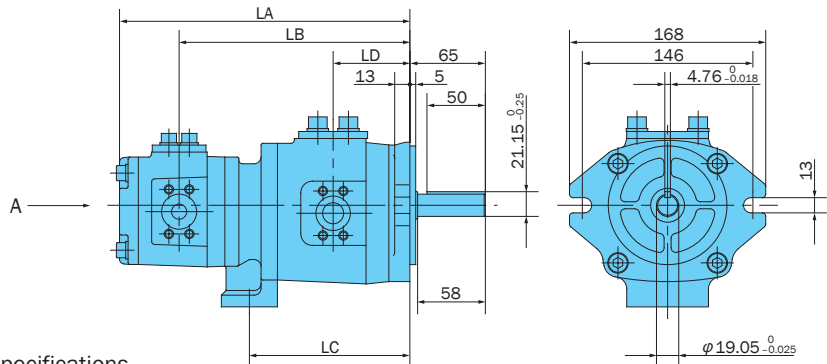
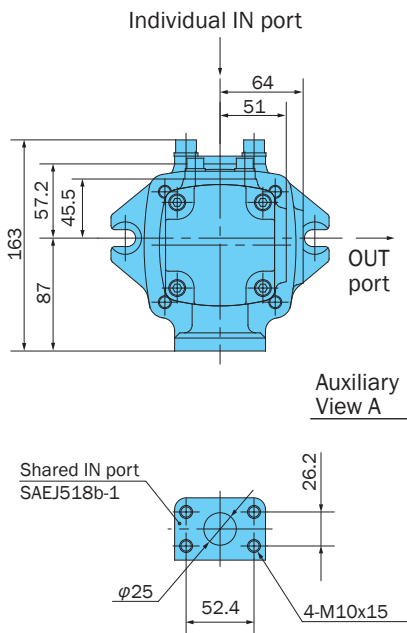


#### Specifications

| Model No.          | Volume in <sup>3</sup> |            | Weight<br>lbs | Dimensions (mm) |       |       |      |
|--------------------|------------------------|------------|---------------|-----------------|-------|-------|------|
|                    | Vent Side              | Shaft Side |               | LA              | LB    | LC    | LD   |
| IPH-22B-3.5-3.5-11 | .21                    | .21        | 12.7          | 211.5           | 160   | 105.5 | 51   |
| -5                 |                        | .31        | 13.0          | 216.5           | 165   | 110.5 | 53.5 |
| -6.5               |                        | .39        | 13.2          | 220.5           | 169   | 114.5 | 55   |
| -8                 |                        | .49        | 13.6          | 225.5           | 174   | 119.5 | 58   |
| IPH-22B-5-5-11     | .31                    | .31        | 13.2          | 221.5           | 167.5 | 110.5 | 53.5 |
| -6.5               |                        | .39        | 13.4          | 225.5           | 171.5 | 114.5 | 55   |
| -8                 |                        | .49        | 13.8          | 230.5           | 176.5 | 119.5 | 58   |
| IPH-22B-6.5-6.5-11 | .39                    | .39        | 13.6          | 229.5           | 173.5 | 114.5 | 55   |
| -8                 |                        | .49        | 14.1          | 234.5           | 178.5 | 119.5 | 58   |
| IPH-22B-8-8-11     | .49                    | .49        | 14.5          | 239.5           | 181   | 119.5 | 58   |

Note: Dimensions shown in this diagram are for a single pump.

### IPH-23B-\*-\*-11 (Flange Mounting, Clockwise Rotation)

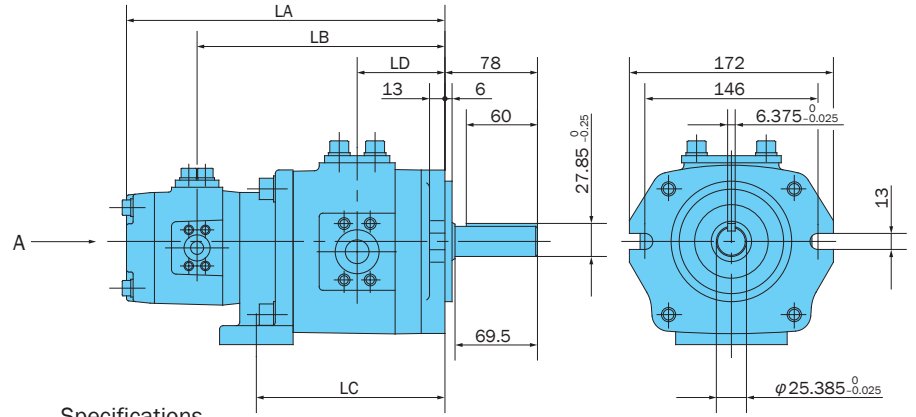
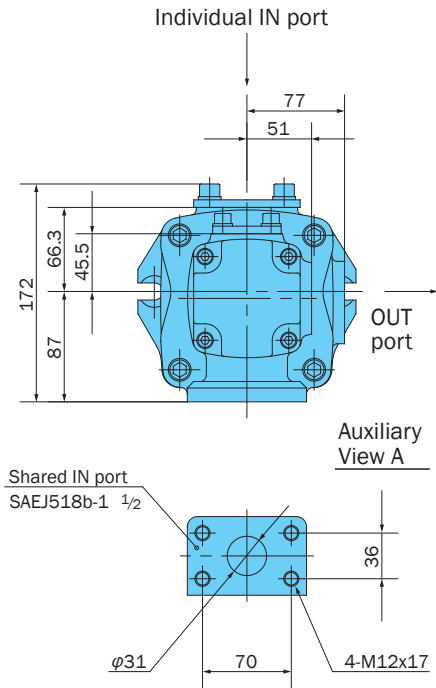


#### Specifications

| Model No.         | Volume in <sup>3</sup> |            | Weight<br>lbs | Dimensions (mm) |       |     |      |
|-------------------|------------------------|------------|---------------|-----------------|-------|-----|------|
|                   | Vent Side              | Shaft Side |               | LA              | LB    | LC  | LD   |
| IPH-23B-3.5-10-11 | .21                    | .62        | 18.0          | 230.5           | 179   | 126 | 60   |
| -13               |                        | .81        | 18.5          | 236.5           | 185   | 132 | 63   |
| -16               |                        | .96        | 19.1          | 241.5           | 190   | 137 | 65.5 |
| IPH-23B-5-10-11   | .31                    | .62        | 18.3          | 235.5           | 181.5 | 126 | 60   |
| -13               |                        | .81        | 18.7          | 241.5           | 187.5 | 132 | 63   |
| -16               |                        | .96        | 19.4          | 246.5           | 192.5 | 137 | 65.5 |
| IPH-23B-6.5-10-11 | .39                    | .62        | 18.5          | 239.5           | 183.5 | 126 | 60   |
| -13               |                        | .81        | 18.9          | 245.5           | 189.5 | 132 | 63   |
| -16               |                        | .96        | 19.6          | 250.5           | 194.5 | 137 | 65.5 |
| IPH-23B-8-10-11   | .49                    | .62        | 18.9          | 244.5           | 186   | 126 | 60   |
| -13               |                        | .81        | 19.4          | 250.5           | 192   | 132 | 63   |
| -16               |                        | .96        | 20.0          | 255.5           | 197   | 137 | 65.5 |

Note: IPH-22B (23B)-\*-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-24B-\*-11**  
(Flange Mounting, Clockwise Rotation)

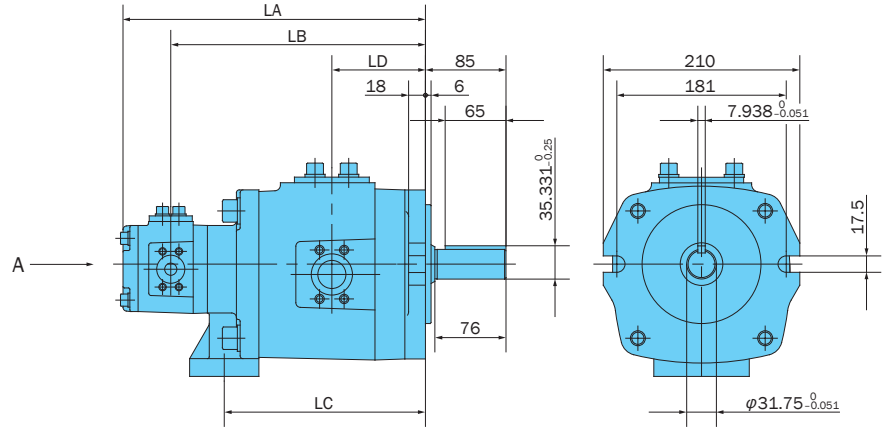
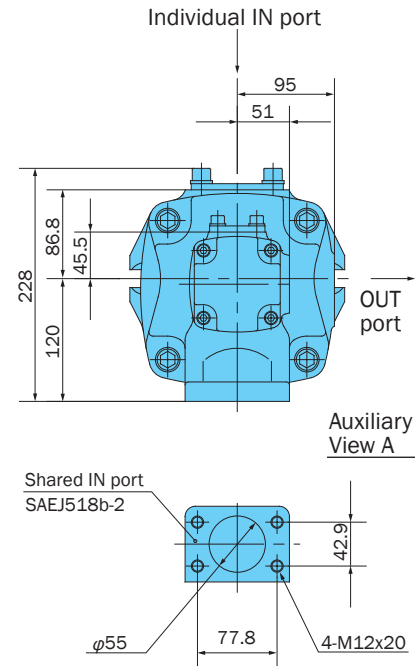


**Specifications**

| Model No.         | Volume in <sup>3</sup> |            | Weight<br>lbs | Dimensions (mm) |       |     |    |
|-------------------|------------------------|------------|---------------|-----------------|-------|-----|----|
|                   | Vent Side              | Shaft Side |               | LA              | LB    | LC  | LD |
| IPH-24B-3.5-20-11 | .21                    | 1.26       | 28.2          | 250.5           | 199   | 153 | 71 |
| -25               |                        | 1.56       | 19.3          | 256.5           | 205   | 159 | 74 |
| -32               |                        | 1.97       | 30.4          | 264.5           | 213   | 167 | 78 |
| IPH-24B-5-20-11   | .31                    | 1.26       | 28.4          | 255.5           | 201.5 | 153 | 71 |
| -25               |                        | 1.56       | 29.5          | 261.5           | 207.5 | 159 | 74 |
| -32               |                        | 1.97       | 30.6          | 269.5           | 215.5 | 167 | 78 |
| IPH-24B-6.5-20-11 | .39                    | 1.26       | 28.6          | 259.5           | 203.5 | 153 | 71 |
| -25               |                        | 1.56       | 29.7          | 265.5           | 209.5 | 159 | 74 |
| -32               |                        | 1.97       | 30.8          | 273.5           | 217.5 | 167 | 78 |
| IPH-24B-8-20-11   | .49                    | 1.26       | 29.1          | 264.5           | 206   | 153 | 71 |
| -25               |                        | 1.56       | 30.2          | 270.5           | 212   | 159 | 74 |
| -32               |                        | 1.97       | 31.3          | 278.5           | 220   | 167 | 78 |

Note: Dimensions shown in this diagram are for a single pump.

**IPH-25B-\*-11**  
(Flange Mounting, Clockwise Rotation)

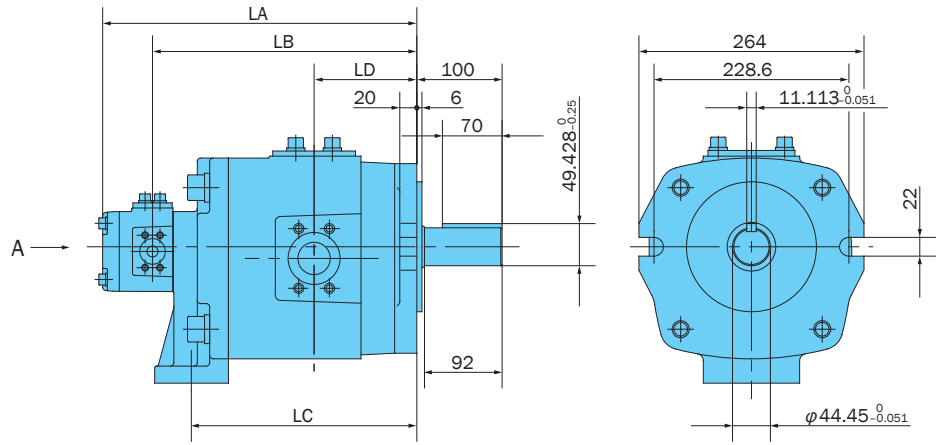
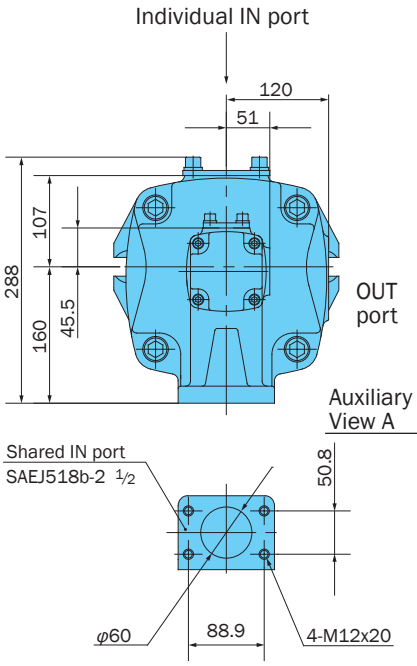


**Specifications**

| Model No.         | Volume in <sup>3</sup> |            | Weight<br>lbs | Dimensions (mm) |       |     |      |
|-------------------|------------------------|------------|---------------|-----------------|-------|-----|------|
|                   | Vent Side              | Shaft Side |               | LA              | LB    | LC  | LD   |
| IPH-25B-3.5-40-11 | .21                    | 2.48       | 53.1          | 298.5           | 247   | 197 | 91   |
| -50               |                        | 3.06       | 55.3          | 305.5           | 254   | 204 | 94.5 |
| -64               |                        | 3.89       | 57.5          | 315.5           | 264   | 214 | 99.5 |
| IPH-25B-5-40-11   | .31                    | 2.48       | 53.3          | 303.5           | 249.5 | 197 | 91   |
| -50               |                        | 3.06       | 55.5          | 310.5           | 256.5 | 204 | 94.5 |
| -64               |                        | 3.89       | 57.7          | 320.5           | 266.5 | 214 | 99.5 |
| IPH-25B-6.5-40-11 | .39                    | 2.48       | 53.5          | 307.5           | 251.5 | 197 | 91   |
| -50               |                        | 3.06       | 55.7          | 314.5           | 258.5 | 204 | 94.5 |
| -64               |                        | 3.89       | 57.9          | 324.5           | 268.5 | 214 | 99.5 |
| IPH-25B-8-40-11   | .49                    | 2.48       | 54.0          | 312.5           | 254   | 197 | 91   |
| -50               |                        | 3.06       | 56.2          | 319.5           | 261   | 204 | 94.5 |
| -64               |                        | 3.89       | 58.4          | 329.5           | 271   | 214 | 99.5 |

Note: IPH-24B (25B)-\*-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-26B-\*-11**  
(Flange Mounting, Clockwise Rotation)

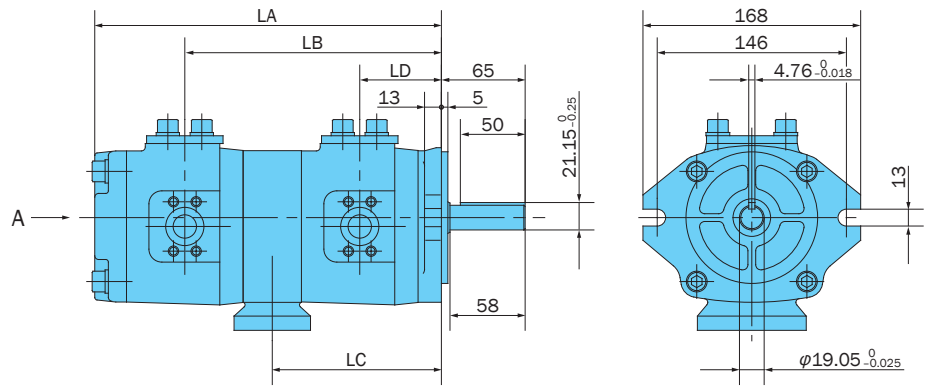
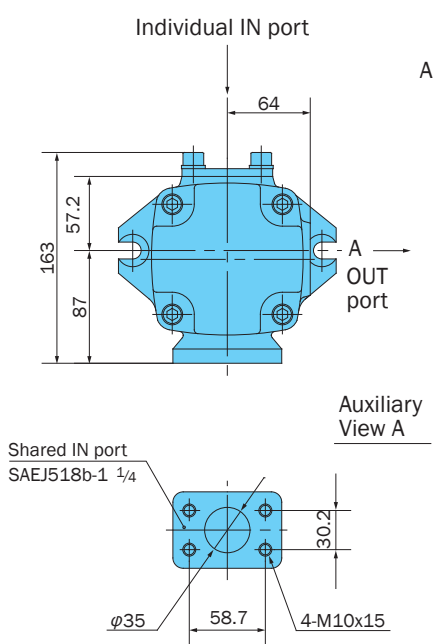


**Specifications**

| Model No.           | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |       |     |       |
|---------------------|------------------------|------------|------------|-----------------|-------|-----|-------|
|                     | Vent Side              | Shaft Side |            | LA              | LB    | LC  | LD    |
| IPH-26B-3.5 - 80-11 | .21                    | 4.96       | 101        | 345.5           | 294   | 240 | 111.5 |
|                     |                        | 6.19       | 105        | 355.5           | 304   | 250 | 116.5 |
|                     |                        | 7.68       | 110        | 367.5           | 316   | 262 | 122.5 |
| IPH-26B-5 - 80-11   | .31                    | 4.96       | 101        | 350.5           | 296.5 | 240 | 111.5 |
|                     |                        | 6.19       | 105        | 360.5           | 306.5 | 250 | 116.5 |
|                     |                        | 7.68       | 110        | 372.5           | 318.5 | 262 | 122.5 |
| IPH-26B-6.5 - 80-11 | .39                    | 4.96       | 101        | 354.5           | 298.5 | 240 | 111.5 |
|                     |                        | 6.19       | 106        | 364.5           | 308.5 | 250 | 116.5 |
|                     |                        | 7.68       | 110        | 376.5           | 320.5 | 262 | 122.5 |
| IPH-26B-8 - 80-11   | .49                    | 4.96       | 102        | 357             | 301   | 240 | 111.5 |
|                     |                        | 6.19       | 106        | 367             | 311   | 250 | 116.5 |
|                     |                        | 7.68       | 110        | 379             | 323   | 262 | 122.5 |

Note: Dimensions shown in this diagram are for a single pump.

**IPH-33B-\*-11**  
(Flange Mounting, Clockwise Rotation)

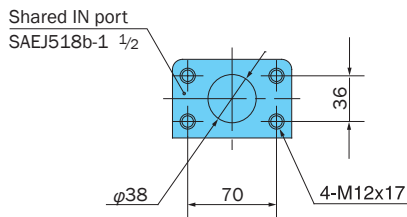
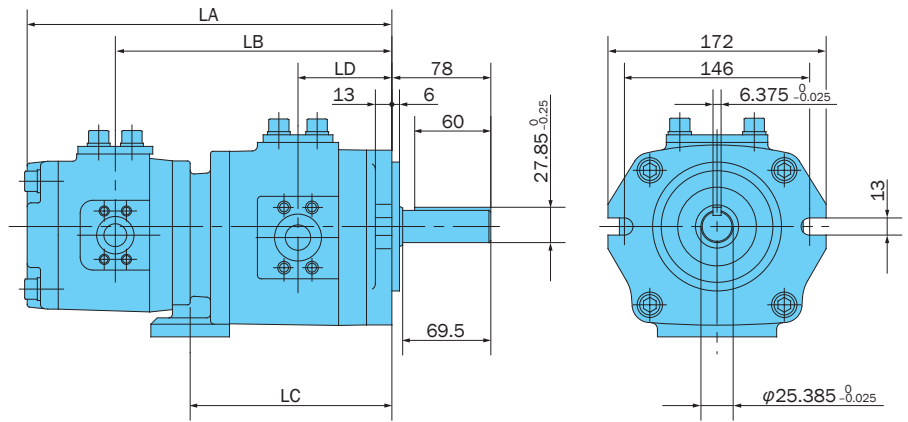
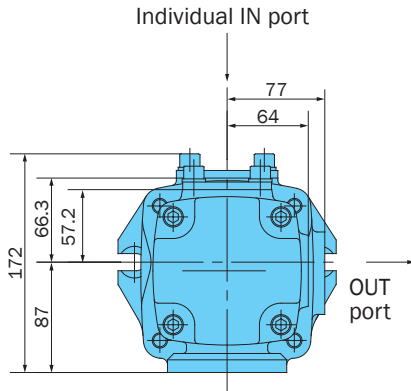


**Specifications**

| Model No.         | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |       |       |      |
|-------------------|------------------------|------------|------------|-----------------|-------|-------|------|
|                   | Vent Side              | Shaft Side |            | LA              | LB    | LC    | LD   |
| IPH-33B-10 -10-11 | .62                    | .62        | 22.7       | 255.5           | 189   | 124.5 | 60   |
|                   |                        | .81        | 23.1       | 261.5           | 195   | 130.5 | 63   |
|                   |                        | .96        | 23.8       | 266.5           | 200   | 135.5 | 65.5 |
| IPH-33B-13 -13-11 | .81                    | .81        | 23.1       | 267.5           | 198   | 130.5 | 63   |
|                   |                        | .96        | 24.2       | 272.5           | 203   | 135.5 | 65.5 |
| IPH-33B-16 -16-11 | .96                    | .96        | 24.9       | 277.5           | 205.5 | 135.5 | 65.5 |

Note: IPH-26B (33B)-\*-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-34B-\*-11**  
(Flange Mounting, Clockwise Rotation)

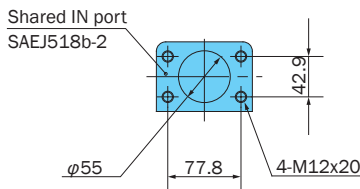
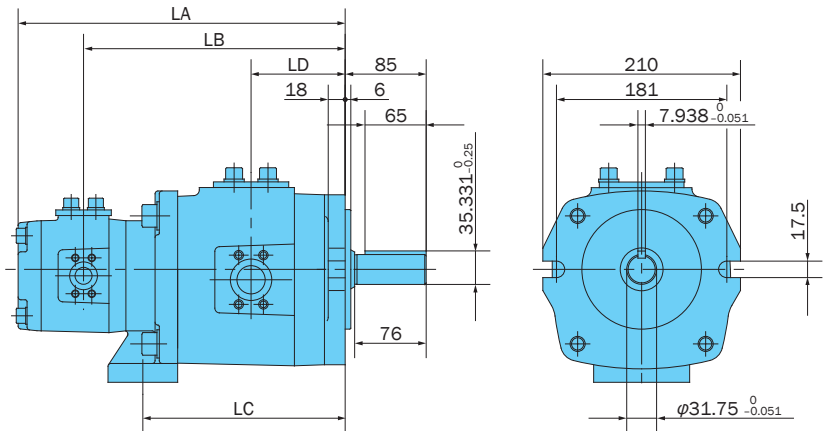
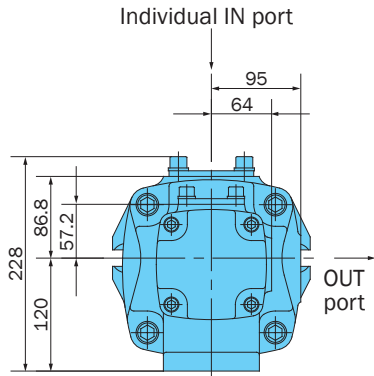


Specifications

| Model No.         | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |       |     |    |
|-------------------|------------------------|------------|------------|-----------------|-------|-----|----|
|                   | Vent Side              | Shaft Side |            | LA              | LB    | LC  | LD |
| IPH-34B-10 -20-11 | .62                    | 1.26       | 32.8       | 272             | 209   | 153 | 71 |
|                   |                        | 1.56       | 33.9       | 278             | 215   | 159 | 74 |
|                   |                        | 1.97       | 35.0       | 286             | 223   | 167 | 78 |
| IPH-34B-13 -20-11 | .81                    | 1.26       | 33.2       | 278             | 212   | 153 | 71 |
|                   |                        | 1.56       | 34.3       | 284             | 218   | 159 | 74 |
|                   |                        | 1.97       | 35.5       | 292             | 226   | 167 | 78 |
| IPH-34B-16 -20-11 | .96                    | 1.26       | 33.9       | 283             | 214.5 | 153 | 71 |
|                   |                        | 1.56       | 35.0       | 289             | 220.5 | 159 | 74 |
|                   |                        | 1.97       | 36.1       | 297             | 228.5 | 167 | 78 |

Note: Dimensions shown in this diagram are for a single pump.

**IPH-35B-\*-11**  
(Flange Mounting, Clockwise Rotation)

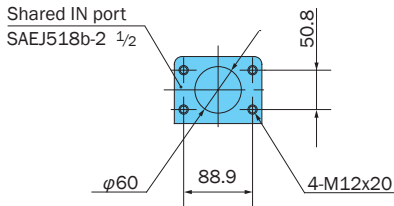
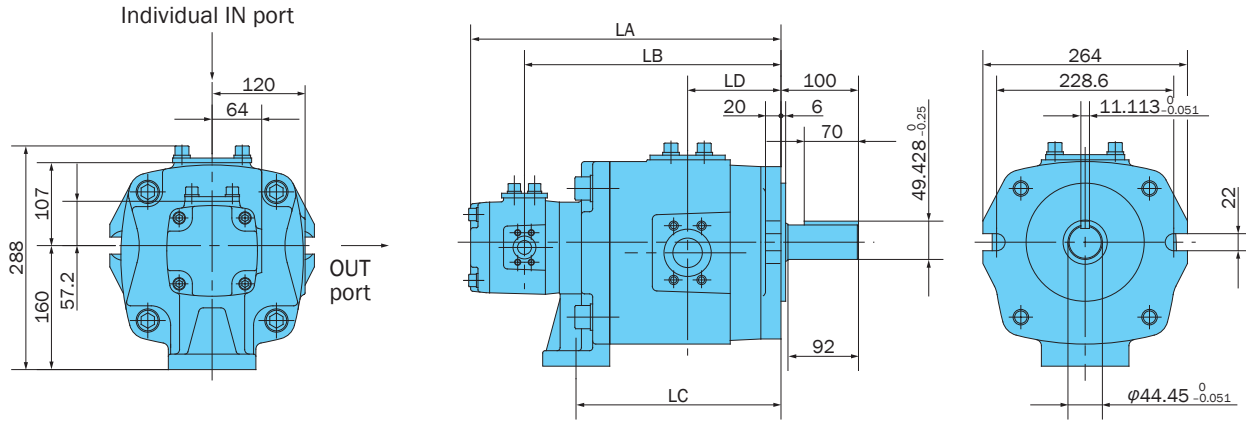


Specifications

| Model No.         | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |       |     |      |
|-------------------|------------------------|------------|------------|-----------------|-------|-----|------|
|                   | Vent Side              | Shaft Side |            | LA              | LB    | LC  | LD   |
| IPH-35B-10 -40-11 | .62                    | 2.48       | 58.2       | 323.5           | 257   | 197 | 91   |
|                   |                        | 3.06       | 60.4       | 330.5           | 264   | 204 | 94.5 |
|                   |                        | 3.89       | 62.6       | 340.5           | 274   | 214 | 99.5 |
| IPH-35B-13 -40-11 | .81                    | 2.48       | 58.6       | 329.5           | 260   | 197 | 91   |
|                   |                        | 3.06       | 60.8       | 336.5           | 267   | 204 | 94.5 |
|                   |                        | 3.89       | 63.0       | 346.5           | 277   | 214 | 99.5 |
| IPH-35B-16 -40-11 | .96                    | 2.48       | 59.3       | 334.5           | 262.5 | 197 | 91   |
|                   |                        | 3.06       | 61.5       | 341.5           | 269.5 | 204 | 94.5 |
|                   |                        | 3.89       | 62.7       | 351.5           | 279.5 | 214 | 99.5 |

Note: IPH-34B (35B)-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-36B-\*-\*-11**  
(Flange Mounting, Clockwise Rotation)

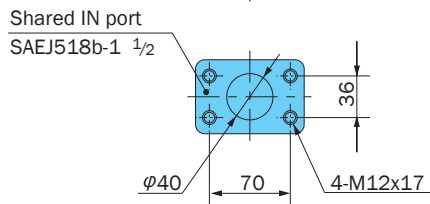
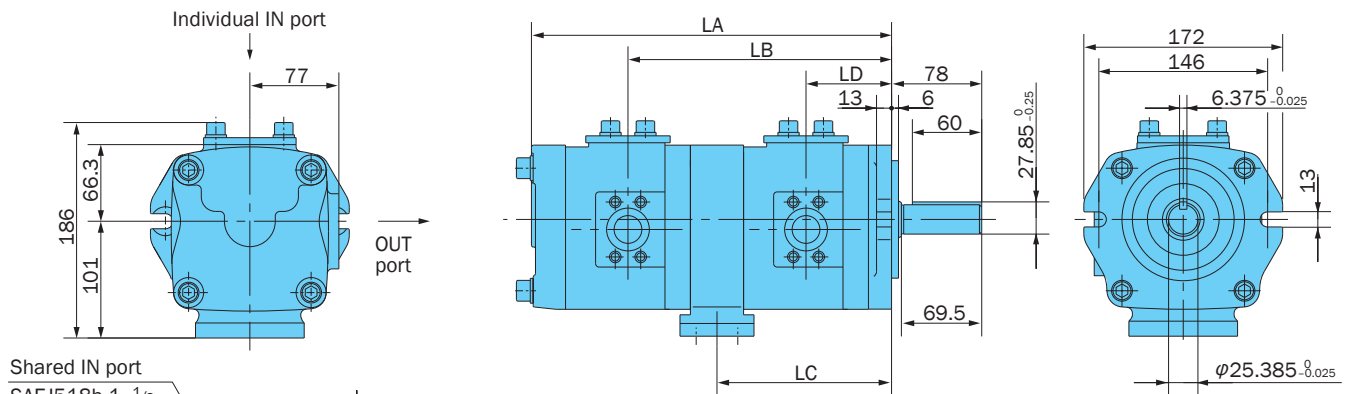


**Specifications**

| Model No.          | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |       |     |       |
|--------------------|------------------------|------------|------------|-----------------|-------|-----|-------|
|                    | Vent Side              | Shaft Side |            | LA              | LB    | LC  | LD    |
| IPH-36B-10 - 80-11 | .62                    | 4.96       | 105        | 370.5           | 304   | 240 | 111.5 |
|                    |                        | 6.19       | 110        | 380.5           | 314   | 250 | 116.5 |
|                    |                        | 7.68       | 114        | 392.5           | 326   | 262 | 122.5 |
| IPH-36B-13 - 80-11 | .81                    | 4.96       | 106        | 376.5           | 307   | 240 | 111.5 |
|                    |                        | 6.19       | 110        | 386.5           | 317   | 250 | 116.5 |
|                    |                        | 7.68       | 115        | 398.5           | 329   | 262 | 122.5 |
| IPH-36B-16 - 80-11 | .96                    | 4.96       | 106        | 381.5           | 309.5 | 240 | 111.5 |
|                    |                        | 6.19       | 111        | 391.5           | 319.5 | 250 | 116.5 |
|                    |                        | 7.68       | 115        | 403.5           | 331.5 | 262 | 122.5 |

Note) Dimensions shown in this diagram are for a single pump.

**IPH-44B-\*-\*-11**  
(Flange Mounting, Clockwise Rotation)

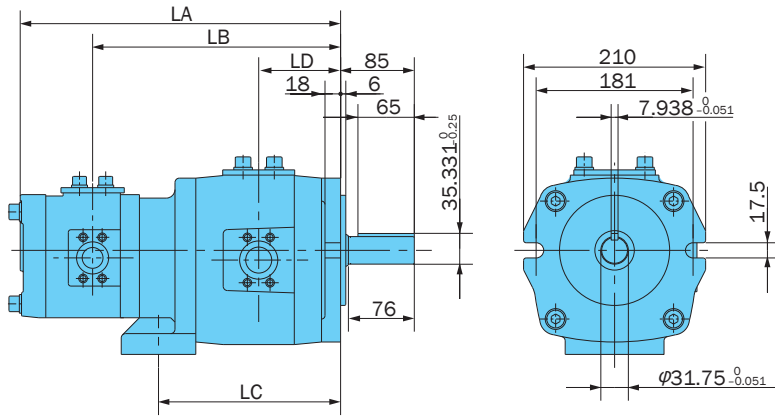
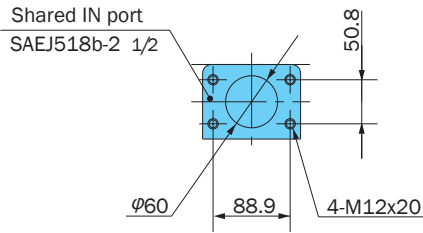
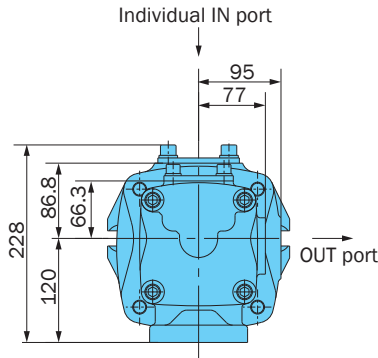


**Specifications**

| Model No.         | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |     |     |    |
|-------------------|------------------------|------------|------------|-----------------|-----|-----|----|
|                   | Vent Side              | Shaft Side |            | LA              | LB  | LC  | LD |
| IPH-44B-20 -20-11 | 1.26                   | 1.26       | 42.9       | 307             | 219 | 145 | 71 |
|                   |                        | 1.56       | 44.1       | 313             | 225 | 151 | 74 |
|                   |                        | 1.97       | 45.2       | 321             | 233 | 159 | 78 |
| IPH-44B-25 -25-11 | 1.56                   | 1.56       | 45.2       | 319             | 228 | 151 | 74 |
|                   |                        | 1.97       | 46.3       | 327             | 236 | 159 | 78 |
| IPH-44B-32 -32-11 | 1.97                   | 1.97       | 47.4       | 335             | 240 | 159 | 78 |

Note: IPH-36B (44B)-\*-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-45B-\*-11**  
(Flange Mounting, Clockwise Rotation)

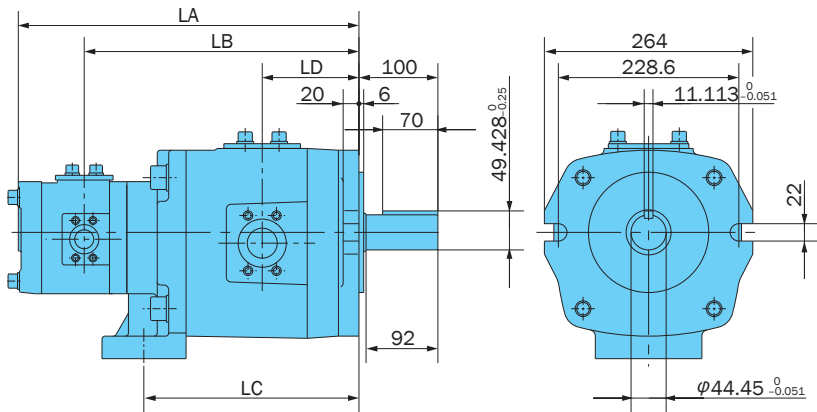
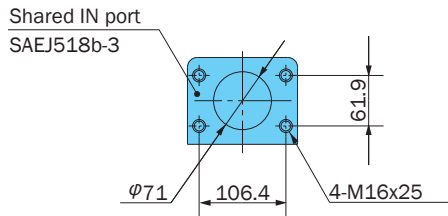
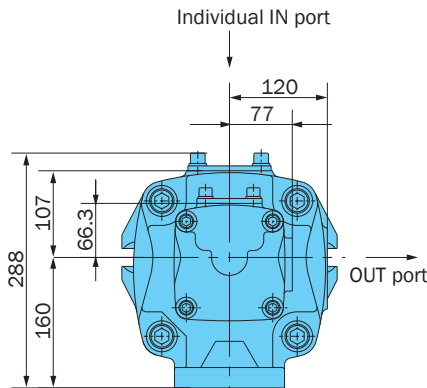


**Specifications**

| Model No.         | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |     |     |      |
|-------------------|------------------------|------------|------------|-----------------|-----|-----|------|
|                   | Vent Side              | Shaft Side |            | LA              | LB  | LC  | LD   |
| IPH-45B-20 -40-11 | 1.26                   | 2.48       | 66.3       | 357             | 276 | 203 | 91   |
|                   |                        | 3.06       | 68.5       | 364             | 283 | 210 | 94.5 |
|                   |                        | 3.89       | 70.7       | 374             | 293 | 220 | 99.5 |
| IPH-45B-25 -40-11 | 1.56                   | 2.48       | 67.4       | 363             | 279 | 203 | 91   |
|                   |                        | 3.06       | 69.6       | 370             | 286 | 210 | 94.5 |
|                   |                        | 3.89       | 71.3       | 380             | 296 | 220 | 99.5 |
| IPH-45B-32 -40-11 | 1.97                   | 2.48       | 68.5       | 371             | 283 | 203 | 91   |
|                   |                        | 3.06       | 70.7       | 378             | 290 | 210 | 94.5 |
|                   |                        | 3.89       | 72.9       | 388             | 300 | 220 | 99.5 |

Note: Dimensions shown in this diagram are for a single pump.

**IPH-46B-\*-11**  
(Flange Mounting, Clockwise Rotation)

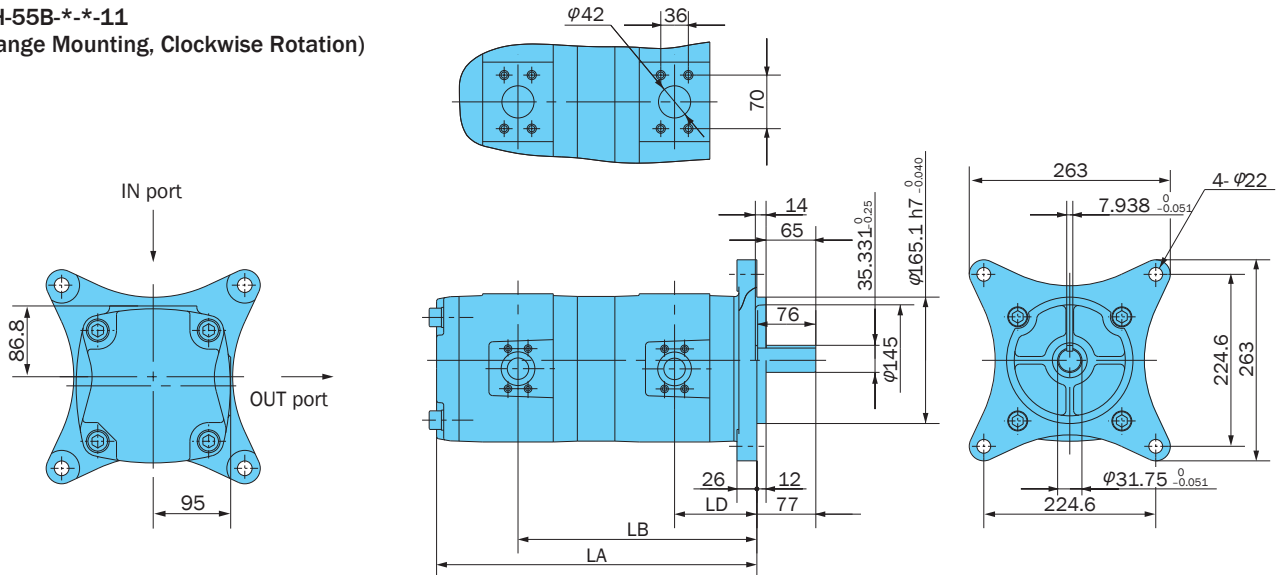


**Specifications**

| Model No.          | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |     |     |       |
|--------------------|------------------------|------------|------------|-----------------|-----|-----|-------|
|                    | Vent Side              | Shaft Side |            | LA              | LB  | LC  | LD    |
| IPH-46B-20 - 80-11 | 1.26                   | 4.96       | 115        | 404             | 323 | 250 | 111.5 |
|                    |                        | 6.19       | 119        | 414             | 333 | 260 | 116.5 |
|                    |                        | 7.68       | 124        | 426             | 345 | 272 | 122.5 |
| IPH-46B-25 - 80-11 | 1.56                   | 4.96       | 116        | 410             | 326 | 250 | 111.5 |
|                    |                        | 6.19       | 120        | 420             | 336 | 260 | 116.5 |
|                    |                        | 7.68       | 125        | 432             | 348 | 272 | 122.5 |
| IPH-46B-32 - 80-11 | 1.97                   | 4.96       | 117        | 418             | 330 | 250 | 111.5 |
|                    |                        | 6.19       | 121        | 428             | 340 | 260 | 116.5 |
|                    |                        | 7.68       | 126        | 440             | 352 | 272 | 122.5 |

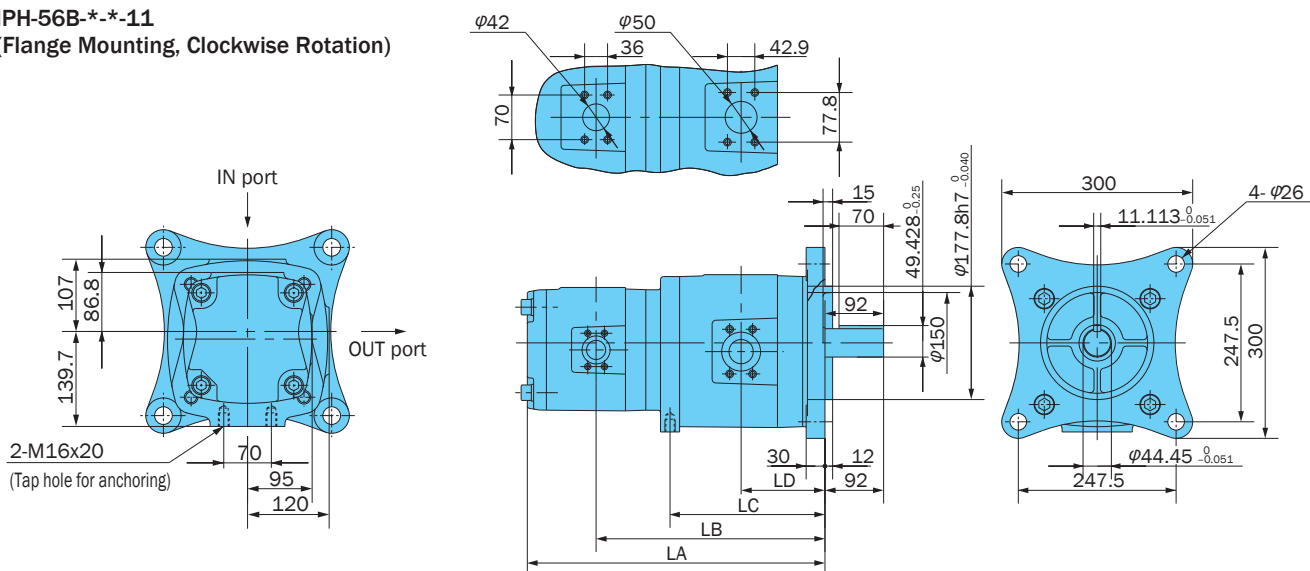
Note: Dimensions shown in this diagram are for a single pump.

Note: IPH-45B (46B)-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

**IPH-55B-\*-11**  
 (Flange Mounting, Clockwise Rotation)

**Specifications**

| Model No.         | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |       |       |
|-------------------|------------------------|------------|------------|-----------------|-------|-------|
|                   | Vent Side              | Shaft Side |            | LA              | LB    | LD    |
| IPH-55B-40 -40-11 | 2.48                   | 2.48       | 100        | 385             | 286   | 99    |
| -50               |                        | 3.06       | 102        | 392             | 293   | 102.5 |
| -64               |                        | 3.89       | 105        | 402             | 303   | 107.5 |
| IPH-55B-50 -50-11 | 3.06                   | 3.06       | 104        | 399             | 296.5 | 102.5 |
| -64               |                        | 3.89       | 107        | 409             | 306.5 | 107.5 |
| IPH-55B-64 -64-11 | 3.89                   | 3.89       | 109        | 419             | 311.5 | 107.5 |

Note: Dimensions shown in this diagram are for a single pump.

**IPH-56B-\*-11**  
 (Flange Mounting, Clockwise Rotation)

**Specifications**

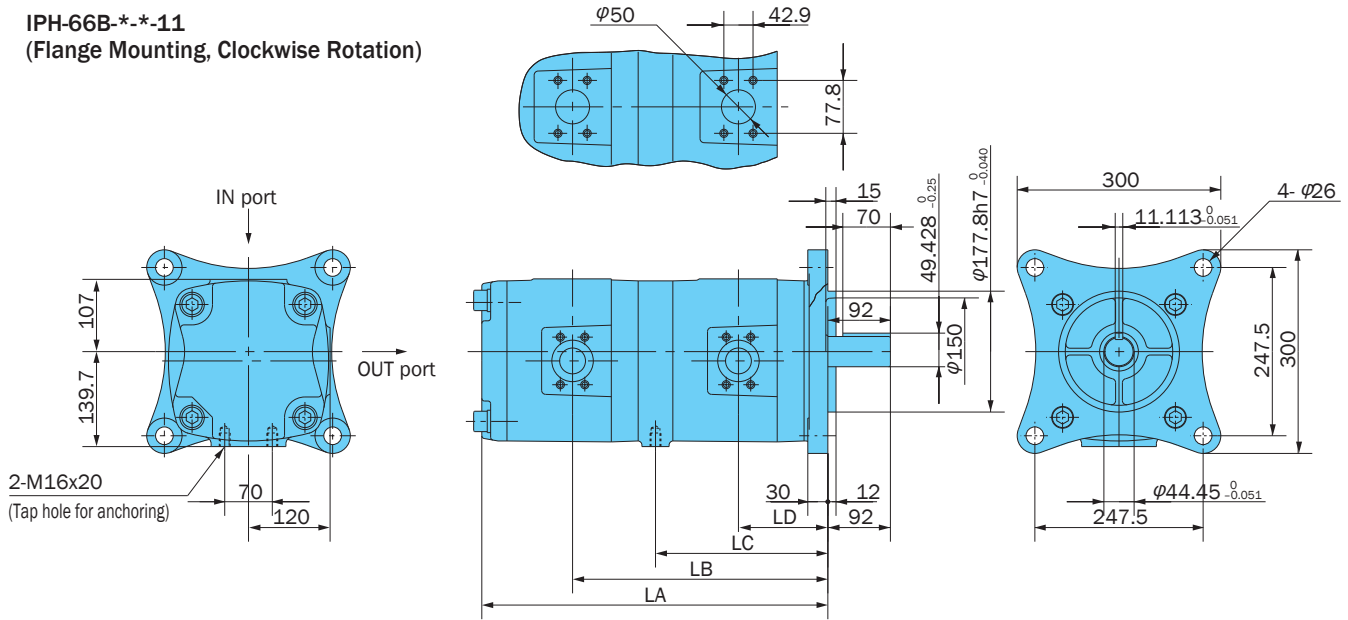
| Model No.          | Volume in <sup>3</sup> |            | Weight lbs | Dimensions (mm) |       |     |       |
|--------------------|------------------------|------------|------------|-----------------|-------|-----|-------|
|                    | Vent Side              | Shaft Side |            | LA              | LB    | LC  | LD    |
| IPH-56B-40 - 80-11 | 2.48                   | 4.96       | 156        | 427             | 328   | 221 | 120.5 |
| -100               |                        | 6.19       | 160        | 437             | 338   | 231 | 125.5 |
| -125               |                        | 7.68       | 164        | 449             | 350   | 243 | 131.5 |
| IPH-56B-50 - 80-11 | 3.06                   | 4.96       | 158        | 434             | 331.5 | 221 | 120.5 |
| -100               |                        | 6.19       | 162        | 444             | 341.5 | 231 | 125.5 |
| -125               |                        | 7.68       | 167        | 456             | 353.5 | 243 | 131.5 |
| IPH-56B-64 - 80-11 | 3.89                   | 4.96       | 160        | 444             | 336.5 | 221 | 120.5 |
| -100               |                        | 6.19       | 164        | 454             | 346.5 | 231 | 125.5 |
| -125               |                        | 7.68       | 169        | 466             | 358.5 | 243 | 131.5 |

Note: Dimensions shown in this diagram are for a single pump.

Note: IPH-55B (56B)-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.



**IPH-66B-\*-11**  
(Flange Mounting, Clockwise Rotation)



**Specifications**

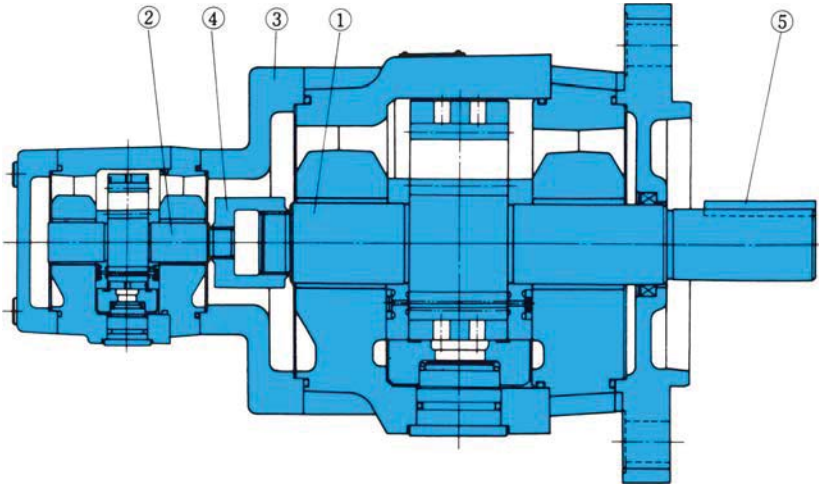
| Model No.          | Volume in <sup>3</sup> |            | Weight<br>lbs | Dimensions (mm) |       |     |       |
|--------------------|------------------------|------------|---------------|-----------------|-------|-----|-------|
|                    | Vent Side              | Shaft Side |               | LA              | LB    | LC  | LD    |
| IPH-66B- 80- 80-11 | 4.96                   | 4.96       | 196           | 470             | 347.5 | 234 | 120.5 |
| -100               |                        | 6.19       | 201           | 480             | 357.5 | 244 | 125.5 |
| -125               |                        | 7.68       | 205           | 492             | 369.5 | 256 | 131.5 |
| IPH-66B-100-100-11 | 6.19                   | 4.96       | 205           | 490             | 362.5 | 244 | 125.5 |
| -125               |                        | 7.68       | 209           | 502             | 374.5 | 256 | 131.5 |
| IPH-66B-125-125-11 | 7.68                   | 7.68       | 214           | 514             | 380.5 | 256 | 131.5 |

Note: Dimensions shown in this diagram are for a single pump.

Note: IPH-66B-\*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange position is to the right when viewed from the shaft side.

**Cross-sectional Drawing**

**IPH Series Double IP Pump**



| Part No. | Part Name       |
|----------|-----------------|
| 1        | Pinion shaft -1 |
| 2        | Pinion shaft -2 |
| 3        | Body -3         |
| 4        | Joint           |
| 5        | Key             |

Note: In the case of a double pump, use single pump parts in addition to the 5 parts listed above.

• **IPS Series Double IP Pump Seal Kit**  
The double pump seal kit combines a shaft side pump seal kit with a head pump seal kit. The shaft side pump seal kit (IHAS-2S\*\*\*\*.\*) is the same as the single pump seal

kit. The head side pump seal kit (IHAS-2H\*\*\*\*.\*) includes the same component parts as the single pump seal kit, except that it does not have a #23 oil seal. See the IPH Series (single) IP pump section in page C-9 for more information.

• **Air bleed-off valve**  
See the IPH Series (single) IP pump section in page C-13.

# NACHI Hydraulic Valves

## Features

- Maximum operating pressure of 3045 to 5000 psi provides smooth operation at high pressures. Low leakage for high efficiency.
- Extremely stable performance across all pressure ranges.
- Conformance with ISO recommended dimensions for most gasket installations enables a high degree of international compatibility.
- A highly reliable and quiet wet type solenoid valve series is available when the noise and reliability issues of solenoid valves are a problem.
- A comprehensive pipe-less series provides the ultimate in compact design and reliability.
- Make sure that the return piping from the hydraulic valve to the tank is below the fluid level surface.
- Be sure to use only specified bolts on hydraulic valves. Use grade 8 bolts or equivalent.
- Installation bolts are not included with any modular valves, the SS, SA, SF, and SNG G01 size solenoid valves, the DMA-G01 manual valve, or with sub plates. Bolts are included with gasket type valves other than those mentioned above.
- Use O-rings with a hardness of 90 durometer for valve gasket O-rings.

## Installation and Maintenance

- Installation is possible in horizontal, vertical, and diagonal configurations. However, the spool must be oriented horizontally in the case of a solenoid valve or hydraulic switching solenoid valve no-spring type.
- Precision finish the mounting surface to a surface roughness of 1.6a and degree of flatness of 0.0003 in.

## Management of Hydraulic Operating Fluid

- Use mineral oil-based hydraulic operating fluid.
- See pages N-1 and N-2 for information about the viscosity of the operating fluid you need to use.
- When using water- or glycol-based hydraulic operating fluid, refer to pages N-4 through N-6 for details on applicable

models. Contact your agent for information about other fire-resistant hydraulic fluids and special fluids.

- Foreign matter in the hydraulic operating fluid can lead to frequent valve operation problems. Use a 10µm line filter to protect against contamination.

## Terms Used in This Catalog

The following describes the meanings of the following terms used in this catalog:

- Rated Flow Rate :**  
Specific guaranteed flow rate under certain fixed conditions
- Maximum Flow Rate :**  
Maximum flow rate that satisfies valve function
- The following are the ratings that apply to the seal part list.  
JIS standard B2401 (O-ring)  
JIS standard B2407 (backup ring)  
SAE standard AS568 (O-ring)
- Pipe apertures mentioned in this catalog that are indicated as "G\*/\*" comply with BSPP O-ring seal systems.

## Calculation of Hydraulic Valve Pressure Loss

Use the following formula to convert pressure loss values for each hydraulic valve in accordance with changes in operating fluid viscosity.

$$\Delta P_2 = \left(\frac{V_1}{V_2}\right)^{1/4} \cdot \Delta P_1$$

$\Delta P_1$  : Pressure loss psi at for viscosity  $V_1$

$\Delta P_2$  : Pressure loss psi at for viscosity  $V_2$

$V_1$  : Viscosity centistokes

$V_2$  : Viscosity centistokes

The graph on the right shows coefficient values  $(V_2/V_1)^{1/4}$  viscosity ratios  $(V_1/V_2)$ .

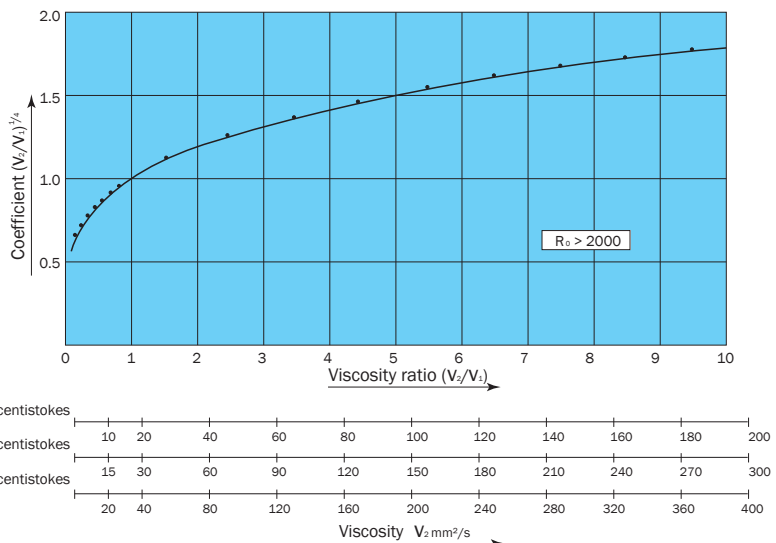
<Example>

For a value whose pressure loss at the rated flow rate when  $V_1 = 30$  centistokes is  $\Delta P_1 = 43$  psi, a change in viscosity to  $V_2 = 90$  centistokes produces a pressure loss of  $(V_2/V_1) = 3$ .

According to the graph on the right, coefficient  $(V_1/V_2)^{1/4} = 1.3$ .

Accordingly :

$$\Delta P_2 = 1.3\Delta P_1 = 1.3 \times 43 \text{ psi} = 56 \text{ psi}$$



## Factory Default Handle Setting

The following are the factory default pressure and flow rate settings for handles (screws) on adjustable valves.

- Pressure Control Valve: Near the minimum control pressure.
- Flow Control Valve: Near the minimum

control flow rate.

Note, however, that ER and ESR relief valves are set to rated pressures. For details, see the applicable pages for each type of valve.

Catalog 1501

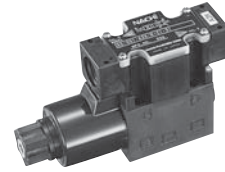
# Hydraulic Valve Selection Table

| Pump Type                              | Name  | Type Classification        | Maximum Working Pressure<br>psi | Maximum Flow Rate gpm |        |     |     |     |      |      |      |     |     |     |      |      | Page |
|--|---|----------------------------|---------------------------------|-----------------------|--------|-----|-----|-----|------|------|------|-----|-----|-----|------|------|------|
|  |   |                            |                                 | .26                   | .52    | 1.3 | 2.6 | 5.2 | 13.2 | 26.4 | 52.8 | 132 | 264 | 528 | 1320 |      |      |
| Modular Valves                         | Relief modular valve                                    | OR                         | 3600                            |                       |        |     | 01  |     |      | 03   | 04   |     |     |     |      |      | F10  |
|  | Brake modular valve                                     | ORO                        | 3600                            |                       | 01     |     |     |     | 03   |      |      |     |     |     |      |      | F16  |
|  | Direct relief modular valve                             | ORD                        | 3600                            |                       | 01     |     |     |     | 03   | 04   |      |     |     |     |      |      | F20  |
|  | Pressure reducing modular valve                         | OG                         | 3600                            |                       | 01     |     |     |     |      | 03   | 04   |     |     |     |      |      | F25  |
|  | 01 Size balance type<br>Pressure reducing modular valve | OGB                        | 3600                            |                       | 01     |     |     |     |      |      |      |     |     |     |      |      | F-32 |
|  | Reducing valve & modular valve                          | OG                         | 3600                            |                       | 01     |     |     |     |      | 03   | 04   |     |     |     |      |      | F-34 |
|  | 2-pressure reducing modular valve                       | OGS                        | 3600                            |                       | 01     |     |     |     |      |      |      |     |     |     |      |      | F-41 |
|  | Sequence modular valve                                  | OQ                         | 3600                            |                       | 01     |     |     |     |      | 03   |      |     |     |     |      |      | F-44 |
|  | Counter balance modular valve                           | OCQ                        | 3600                            |                       | 01     |     |     |     |      | 03   | 04   |     |     |     |      |      | F-47 |
|  | Pressure switching modular valve                        | OW                         | 3600                            |                       | 01     |     |     |     |      |      |      |     |     |     |      |      | F-52 |
|  | Flow regulator modular valve                            | O(C)Y                      | 3600                            |                       | 01     |     |     |     |      | 03   | 04   |     |     |     |      |      | F-55 |
|  | Flow control modular valve                              | O(C)F                      | 3600                            |                       | 01     |     |     |     |      | 03   | 04   |     |     |     |      |      | F-63 |
|  | Chceck modular valve                                    | OC(V)                      | 3600                            |                       | 01     |     |     |     |      | 03   | 04   |     |     |     |      |      | F-69 |
|  | Pilot operated check modular valve                      | OCP                        | 3600                            |                       | 01     |     |     |     |      | 03   | 04   |     |     |     |      |      | F-76 |
|  | Solenoid Valves   | SS wet type solenoid valve | SS                              | 5000                  |        |     |     | 01  |      |      |      |     |     | 03  |      |      | D-4  |
| SA wet type solenoid valve             |   | SA                         | 5000                            |                       |        |     | 01  |     |      |      |      |     | 03  |     |      | D-16 |      |
| SE low power type solenoid valve       |   | SE                         | 3000                            |                       |        | 01  |     |     |      |      |      | 03  |     |     |      | D-28 |      |
| SL wet type solenoid valve             |   | SL                         | 1000                            |                       |        | 01  |     |     |      |      |      |     |     |     |      | D-34 |      |
| DSS(A) solenoid control valve          |   | DSS<br>DSA                 | 5000                            |                       |        |     |     |     | 04   |      |      |     |     |     | 06   | D-41 |      |
| Fine solenoid Valve                    |   | SF                         | 3000                            |                       |        | 01  |     |     |      |      |      |     |     |     |      | D-49 |      |
| Non-leak type solenoid valve           |   | SNH                        | 5000                            |                       |        | 01  |     |     |      | 03   | 04   | 06  |     |     |      | D-53 |      |
| SAW solenoid with monitoring switch    |   | SAW                        |                                 |                       |        |     |     |     |      |      |      |     |     |     |      | D-62 |      |
| SCW poppet type with monitoring switch |   | SCW                        |                                 |                       |        |     |     |     |      |      |      |     |     |     |      | D-71 |      |
| SK solenoid with Deutsch connector     |   | SK                         |                                 |                       |        |     |     |     |      |      |      |     |     |     |      | D-76 |      |
| Pressure Control Valves                | Relief valve  | R                          | 3000                            |                       |        |     |     |     | 03   |      | 06   | 10  |     |     |      | I-1  |      |
|  | RI series relief valve                                  | RI                         | 5000                            |                       |        |     |     |     | 03   |      | 06   |     |     |     |      | I-5  |      |
|  | Remote control valve                                    | RC(D)                      | 3000                            | RC-02                 | RCD-02 |     |     |     |      |      |      |     |     |     |      | I-8  |      |
|  | Solenoid control relief valve                           | RSS(A)                     | 3000                            |                       |        |     |     |     | 03   |      | 06   | 10  |     |     |      | I-10 |      |
|  | RIS Series<br>Solenoid control relief valve             | RIS                        | 5000                            |                       |        |     |     |     | 03   |      | 06   |     |     |     |      | I-15 |      |
|  | Reducing (& check) valve                                | (C)G                       | 3000                            |                       |        |     | 03  |     |      |      | 06   | 10  |     |     |      | I-18 |      |
|  | Balancing valve   | GR                         | 3000                            |                       |        | 01  |     |     |      | 03   |      |     |     |     |      | I-23 |      |
|  | Pressure control (& check) valve                        | (C)Q                       | 3000                            |                       |        |     | 03  |     |      |      | 06   | 10  |     |     |      | I-25 |      |

Maximum operating pressure for the modular valve series is 5000 psi.

## Hydraulic Valve Selection Table

| Pump Type  | Name  | Type Classification                           | Maximum Working Pressure<br>psi | Maximum Flow Rate gpm |     |        |     |     |      |      |      |     |     |     |      |  | Page |
|--|---|---|---------------------------------|-----------------------|-----|--------|-----|-----|------|------|------|-----|-----|-----|------|--|------|
|  |   |   |                                 | .26                   | .52 | 1.3    | 2.6 | 5.2 | 13.2 | 26.4 | 52.8 | 132 | 264 | 528 | 1320 |  |      |
| Flow Control Valves                                      | Throttle (& check) valve                      | (C)FR   | 3000                            |                       |     | 03     |     |     |      | 06   | 10   |     |     |     |      |  | J-1  |
|  | FT type low control valve                     | (C)FT   | 3000                            |                       |     | 02     |     |     |      | 03   |      |     |     |     |      |  | J-4  |
|  | F type control valve                          | (C)F  | 3000                            |                       |     |        | 06  |     |      |      |      | 10  |     |     |      |  | J-8  |
|  | TN type flow control valve                    | (C)TN   | 1500                            |                       | 02  |        |     |     |      |      |      |     |     |     |      |  | J-11 |
|  | TS type flow control valve                    | (C)TS   | 1500                            |                       | 01  |        |     |     |      |      |      |     |     |     |      |  | J-14 |
|  | TL type flow control valve                    | TL(T)   | 1000                            |                       |     | 03, 04 |     |     |      |      |      |     |     |     |      |  | J-16 |
| Direction Control Valves                                 | Right angle check valve                       | CA  | 3000                            |                       |     | 03     |     |     |      | 06   | 10   |     |     |     |      |  | K-1  |
|  | In-line check valve                           | CN  | 3000                            |                       |     | 03     |     |     |      | 06   | 10   |     |     |     |      |  | K-1  |
|  | Pilot check valve                             | CP  | 3000                            |                       |     | 03     |     |     |      | 06   | 10   |     |     |     |      |  | K-4  |
|  | Gauge cock                                    | K <sub>2</sub>                                | 6000                            |                       |     |        |     |     |      |      |      |     |     |     |      |  | K-7  |
|  | Flange type check valve                       | CA  | 3625                            |                       |     |        | 06  |     |      |      | 10   | 16  | 24  |     |      |  | K-8  |
|  | DMA type manual valve                         | DMA   | 5000                            |                       |     | 01     |     |     |      |      | 03   |     |     |     |      |  | E-1  |
| Electro-hydraulic Proportional Control Valves            | Pilot relief valve                            | EPR   | 5000                            | 01                    |     |        |     |     |      |      |      |     |     |     |      |  | G-2  |
|  | Relief valve                                  | ER  | 5000                            |                       |     | 03     |     |     |      |      | 06   |     |     |     |      |  | G-4  |
|  | Relief and reducing valve                     | EGB   | 3600                            |                       |     | 03     |     |     |      | 06   |      |     |     |     |      |  | G-6  |
|  | Flow control valve                            | (C)ES   | 3000                            |                       |     | 02     |     |     |      | 03   | 06   | 10  |     |     |      |  | G-8  |
|  | Load response control valve                   | ESR   | 3600                            |                       |     |        | 03  |     |      |      | 06   | 10  |     |     |      |  | G-11 |
|  | Flow direction control valve                  | ESD   | 3600                            |                       | 01  |        |     | 03  | 04   | 06   | 10   |     |     |     |      |  | G-14 |
|  | Modular type reducing valve                   | EOG   | 3600                            |                       | 01  |        |     |     |      |      |      |     |     |     |      |  | G-22 |
|  | Modular type flow control valve               | EOF   | 3000                            |                       | 01  |        |     |     |      |      |      |     |     |     |      |  | G-24 |
|  | Driver power amplifier                        | EMA<br>EMC                                    | -                               |                       |     |        |     |     |      |      |      |     |     |     |      |  | G-26 |
|  | Driver power compact amplifier                | EBA<br>EBC                                    | -                               |                       |     |        |     |     |      |      |      |     |     |     |      |  | G-30 |
|  | Compact multi-function power amplifier        | EDA<br>EDC                                    | -                               |                       |     |        |     |     |      |      |      |     |     |     |      |  | G-34 |
|  | High-response Proportional Flow Control Valve | High-response proportional flow control valve | ESH                             | 4600                  |     |        | 01  |     |      |      | 03   | 04  | 06  |     |      |  |      |
| High-speed response proportional control valve amplifier |   | EHA   | -                               |                       |     |        |     |     |      |      |      |     |     |     |      |  |      |



**SS Series (Wiring System: Central Terminal Box) Wet Type Solenoid Valve** 26.4 to 42 gpm  
5075 psi

### Features

**Very long life**

The movable iron core of the wet type solenoid is immersed in oil, which keeps it lubricated and cushions it from impact and vibration, ensuring very long life.

**Low switching noise**

The wet-type solenoid valve provides very low core switching noise, for quiet operation.

**High pressure, large capacity, with minimal pressure loss**

Comprehensive fluid reaction force

compensation and low pressure compensation construction provide large capacity and low pressure loss.

G01 : 5075 psi (26.4 gpm)

G03 : 5075 psi (42 gpm)

Easy connections

A special wiring box provides a COM port and indicator light as standard for simple wiring and maintenance.

Easy coil replacement

A plug-in type coil enables one-touch coil replacement.

Wide-ranging backward compatibility makes it simple to replace previous valve models with this one. Combining this valve with a modular valve contributes to the compact configuration of the overall device.

Compliant with global and international safety regulations (G01 size CE, UL, CSA, and G03 size UL). Can be used safely around the world. Contact us for models and specifications of compliant products.

### Specifications

| Model No.             |                              | SS-G01 (D03)          |                              |                       |                              | SS-G03 (D05)          |                              |  |                              |                |      |
|-----------------------|------------------------------|-----------------------|------------------------------|-----------------------|------------------------------|-----------------------|------------------------------|--|------------------------------|----------------|------|
|                       |                              | Standard Type         |                              | Shockless Type        |                              | Standard Type         |                              |  |                              | Shockless Type |      |
|                       |                              | Maximum Flow Rate gpm | Maximum Working Pressure psi | Maximum Flow Rate gpm | Maximum Working Pressure psi | AC Solenoid Type      |                              | DC Solenoid Type (With built-in rectifier) |                              |                |      |
| Maximum Flow Rate gpm | Maximum Working Pressure psi |                       |                              |                       |                              | Maximum Flow Rate gpm | Maximum Working Pressure psi | Maximum Flow Rate gpm                      | Maximum Working Pressure psi |                |      |
| JIS Symbol            | Operation Symbol             |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -A2X-                        | 7.9                   | 5075                         | 7.9                   | 3625                         | 10.5                  | 5075                         | 22.4                                       | 5075                         | 22.4           | 3625 |
|                       | -H2X-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -E2X-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -A3X-                        | 21                    | 5075                         | 13.2                  | 3625                         | 22.4                  | 5075                         | 42.2                                       | 5075                         | 34.3           | 3625 |
|                       | -H3X-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -E3X-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -A3Z-                        | 17.1                  | 5075                         | 10.5                  | 3625                         | 18.5                  | 3625                         | 26.4                                       | 3625                         | 22.4           | 3625 |
|                       | -H3Z-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -E3Z-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -A4-                         | 13.2                  | 5075                         | 10.5                  | 3625                         | 18.5                  | 3625                         | 26.4                                       | 3625                         | 22.4           | 3625 |
|                       | -H4-                         |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -A5-                         |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -H5-                         | 26.4                  | 5075                         | 10.5                  | 3625                         | 18.5                  | 3625                         | 26.4                                       | 3625                         | 22.4           | 3625 |
|                       | -C2-                         |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -C5-                         |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -C9-                         |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -C1S-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -C6S-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -C1-                         | AC Solenoid 17.1      | 13.2                         | 10.5                  | 3625                         | 18.5                  | 3625                         | 26.4                                       | 3625                         | 22.4           | 3625 |
|                       | -C6-                         | DC Solenoid 21.1      |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -C4-                         | 13.2                  | 5075                         | 10.5                  | 3625                         | 18.5                  | 3625                         | 26.4                                       | 3625                         | 22.4           | 3625 |
|                       | -C7Y-                        |                       |                              |                       |                              |                       |                              |  |                              |                |      |
|                       | -C8-                         |                       |                              |                       |                              |                       |                              |  |                              |                |      |

Note: The maximum flow rate of each valve depends on the pressure. For details, see pages D-12 and D-13.

|                                     |                                       | SS-G01                          |                       |     | SS-G03              |                    |     |  |
|-------------------------------------|---------------------------------------|---------------------------------|-----------------------|-----|---------------------|--------------------|-----|--|
|                                     |                                       | AC Solenoid                     | DC Solenoid           |     | AC Solenoid         | DC Solenoid        |     |  |
|                                     |                                       |                                 | Built-in Rectifier    |     |                     | Built-in Rectifier |     |  |
|                                     |                                       | C*                              | E*                    | D*  | C*                  | E*                 | D*  |  |
| Maximum Working Pressure            | P, A, B ports                         | 5075 psi                        |                       |     |                     |                    |     |  |
| Maximum Allowable Backpressure      | T port                                | 3045 psi                        |                       |     | 2320 psi            |                    |     |  |
| Switching frequency (cycles/minute) | Standard Type                         | 300                             | 120                   | 300 | 300                 | 120                | 240 |  |
|                                     | Shockless Type                        | —                               |                       | 120 | —                   |                    | 120 |  |
| Standard                            | Indicator light                       | R                               |                       |     | R                   |                    |     |  |
| Option                              | Shockless                             | —                               | F                     |     | —                   | F                  |     |  |
|                                     | Surgeless                             | G                               | —                     | G   | G                   | —                  | G   |  |
|                                     | With manual push-button               | N                               |                       |     | N                   |                    |     |  |
|                                     | Quick Return                          | —                               | Q                     | —   | —                   | Q                  | —   |  |
| Weight (kg)                         | Double Solenoid                       | 1.8                             | 2.0                   |     | 4.2                 | 5.5                |     |  |
|                                     | Single Solenoid                       | 1.4                             | 1.5                   |     | 3.5                 | 4.1                |     |  |
| Operating Environment               | Dust Resistance/Water Resistance Rank | IP64 (Dust-tight, Splash-proof) |                       |     |                     |                    |     |  |
|                                     | Ambient Temperature                   | -4 to 122°F                     |                       |     |                     |                    |     |  |
|                                     | Operating Fluid                       | Temperature Range               | -4 to 158°F           |     |                     |                    |     |  |
|                                     |                                       | Viscosity Range                 | 15 to 300 centistokes |     |                     |                    |     |  |
|                                     |                                       | Filtration                      | 10 microns or less    |     |                     |                    |     |  |
| Mounting bolt                       | Size × Length                         | 10-24 x 1 3/4 LG (not included) |                       |     | 1/4-20 x 2 3/4      |                    |     |  |
|                                     | Tightening Torque                     | 3.6 to 5 ft lbs                 |                       |     | 14.7 to 18.4 ft lbs |                    |     |  |

- Note: 1. Maximum operating pressure depends on the valve type. For details, see page D-1.  
 2. For mounting bolts, use 12T, grade 8 or equivalent.  
 3. Mounting bolts are not included with the O1 size. Bolts are included with the O3 size.

#### • Handling

- In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T port. Never use a stopper plug in the T port.
- Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
- Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- When using petroleum type operating fluid, use ISO VG 32, 46.
- For details about using fire-resistant hydraulic fluid, contact your agent.
- Use this valve only within the allowable voltage range.
- Do not allow the AC solenoid to become charged until you install the coil into the valve.
- In the case of operation symbols A2X, H2X, and E2X, run drain piping from the valve T port.
- Maintaining a switching position under high pressure for a long period can cause

abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.

- When using a detent type (E2X, 3X, E3Z), use constant energization in order to securely maintain the switching position.

|  |   |
|--|---|
| RSS-***-AR*(H)-** <sup>15</sup> <sub>23</sub><br>RIS-***-AR*(H)-** <sup>21</sup> | SS-G01-AR-R-**-31                         |
| RSS-***-AQ*(H)-** <sup>15</sup> <sub>23</sub><br>RIS-***-AQ*(H)-** <sup>21</sup> | SS-G01-A3X-R-**-31                        |
| RSS-***-F(H)-** <sup>15</sup> <sub>23</sub><br>RIS-***-F-**-21                   | SS-G01-A8X0-R-**-31<br>SS-G01-A3X-R-**-31 |

- Note that manual pin operating pressure changes in accordance with tank line back pressure.

13 The series described in the table below are available for use as RSS and RIS Series solenoid control relief valves.

- The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.

15 Use the following table for specification when a sub plate is required.

| Model No.   | Pipe Diameter | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs | Applicable Valve Type |
|-------------|---------------|------------------------------|---------------------------|------------|-----------------------|
| MSA-01X-E10 | 1/4           | 3625                         | 5.2                       | 1.2        | SS-G01-**-R-**-31     |
| MSA-01Y-E10 | 3/8           |                              | 10.4                      |            |                       |
| MS-03-E30   | 3/8           |                              | 11.8                      | 2.3        | SS-G03-**-R-**-22     |
| MS-03X-E30  | 1/2           |                              | 21.1                      |            |                       |

Solenoid Assembly Specifications

| Solenoid Type              | Power Supply Type | Voltage (V) | Frequency (Hz) | For SS-G01         |                   |                     |                   | For SS-G03                  |                    |                   |                     |                   |                             |
|----------------------------|-------------------|-------------|----------------|--------------------|-------------------|---------------------|-------------------|-----------------------------|--------------------|-------------------|---------------------|-------------------|-----------------------------|
|                            |                   |             |                | Solenoid Coil Type | Drive Current (A) | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) | Solenoid Coil Type | Drive Current (A) | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) |
| AC                         | C1                | AC100       | 50             | EDC64-C1           | 2.2               | 0.52                | 25                | 80 to 110                   | ECB64-C1           | 5.4               | 0.92                | 36.0              | 80 to 110                   |
|                            |                   |             | 60             |                    | 2.0               | 0.38                | 22                | 90 to 120                   |                    | 4.6               | 0.62                | 34.0              |                             |
|                            |                   | AC110       | 60             |                    | 2.2               | 0.46                | 28                |                             |                    | 5.0               | 0.78                | 42.0              |                             |
|                            | C115              | AC110       | 50             | EDC64-C115         | 2.0               | 0.47                | 25                | 90 to 120                   | ECB64-C115         | 5.0               | 0.85                | 36.0              | 90 to 120                   |
|                            |                   |             | 60             |                    | 1.8               | 0.35                | 22                | 100 to 130                  |                    | 4.2               | 0.57                | 34.0              |                             |
|                            |                   | AC115       | 60             |                    | 2.0               | 0.42                | 28                |                             |                    | 4.6               | 0.72                | 42.0              |                             |
|                            | C2                | AC200       | 50             | EDC64-C2           | 1.1               | 0.26                | 25                | 160 to 220                  | ECB64-C2           | 2.7               | 0.46                | 36.0              | 160 to 220                  |
|                            |                   |             | 60             |                    | 1.0               | 0.19                | 22                | 180 to 240                  |                    | 2.3               | 0.31                | 34.0              |                             |
|                            |                   | AC220       | 60             |                    | 1.1               | 0.23                | 28                |                             |                    | 2.5               | 0.39                | 42.0              |                             |
|                            | C230              | AC220       | 50             | EDC64-C230         | 1.0               | 0.24                | 25                | 180 to 240                  | ECB64-C230         | 2.5               | 0.42                | 36.0              | 180 to 240                  |
|                            |                   |             | 60             |                    | 0.91              | 0.17                | 22                | 200 to 260                  |                    | 2.1               | 0.29                | 34.0              |                             |
|                            |                   | AC230       | 60             |                    | 1.0               | 0.21                | 28                |                             |                    | 2.3               | 0.36                | 42.0              |                             |
| DC with Built-in Rectifier | E1                | AC100       | 50/60          | EDC64-E1-1A        | 0.31              |                     | 27                | 90 to 110                   | ECB64-E1           | 0.40              |                     | 34.0              | 90 to 110                   |
|                            | E115              | AC110       | 50/60          | EDC64-E115-1A      | 0.26              |                     | 25                | 100 to 125                  | ECB64-E115         | 0.33              |                     | 31.0              | 100 to 125                  |
|                            |                   | AC115       |                |                    | 0.27              |                     | 27                |                             |                    | 0.34              |                     | 34.0              |                             |
|                            | E2                | AC200       | 50/60          | EDC64-E2-1A        | 0.15              |                     | 26                | 180 to 220                  | ECB64-E2           | 0.22              |                     | 37.0              | 180 to 220                  |
|                            | E230              | AC220       | 50/60          | EDC64-E230-1A      | 0.12              |                     | 24                | 200 to 250                  | ECB64-E230         | 0.16              |                     | 30.0              | 200 to 250                  |
| AC230                      |                   | 0.13        |                |                    | 27                | 0.17                |                   |                             |                    | 33.0              |                     |                   |                             |
| DC                         | D1                | DC12        | ☒              | EDC64-D1-1A        | 2.2               |                     | 26                | 10.8 to 13.2                | ECB64-D1           | 2.6               |                     | 31.0              | 10.8 to 13.2                |
|                            | D2                | DC24        | ☒              | EDC64-D2-1A        | 1.1               |                     | 26                | 21.6 to 26.4                | ECB64-D2           | 1.5               |                     | 36.0              | 21.6 to 26.4                |

Understanding Model Numbers

SS - G 03 - A 3 X - \* R - C2 - E22

Design number  
E31: 01 size; 10 - 24 mounting bolt  
E22: 03 size; 1/4 - 20 mounting bolt

Power supply  
C: AC (50/60Hz)      C1=AC100V    C115=AC110V    C2=AC200V    C230=AC220V  
D: DC      D1=DC12V    D2=DC24V  
E: AC (Built-in rectifier; 50/60Hz)    E1=AC100V    E115=AC115V    E2=AC200V    E230=AC230V

With indicator light

Auxiliary symbol (Can be combined in alphabetic sequence.)  
F: Shockless type (Available with power supply D\*, E)  
G: Surgeless type (Available with power supply C\*, D\*)  
N: With manual push-button  
Q: Quick return type (Available with power supply E\*)

Transition Flow Path (Specify for A2X, H2X, E2X, A3X, H3X, E3X, A3Z, H3Z, E3Z, C7Y only.)

| X      | Y         | Z    |
|--------|-----------|------|
| Closed | Semi-open | Open |
|        |           |      |

Center position

|   |   |   |   |    |    |
|---|---|---|---|----|----|
| 0 | 1 | 2 | 3 | 4  | 5  |
| 6 | 7 | 8 | 9 | 1S | 6S |

Note 1: P=Pressure port; A and B=Connection port to cylinder, etc.; T=Connection port to tank

Operation Method

| A             | H             | C             | E      |
|---------------|---------------|---------------|--------|
| Spring Offset | Spring Center | Spring Center | Detent |
|               |               |               |        |

Nominal diameter  
01 size (D03)  
03 size (D05)

Mounting method  
G: Cascade mounting

Wet type solenoid operated directional control valve

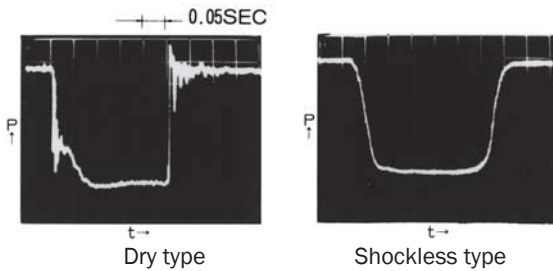
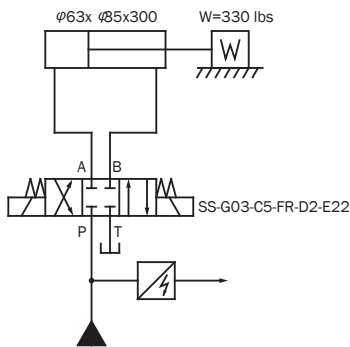
# Options

## (Auxiliary Symbol Explanations)

### Shockless Type (Auxiliary Symbol: F)

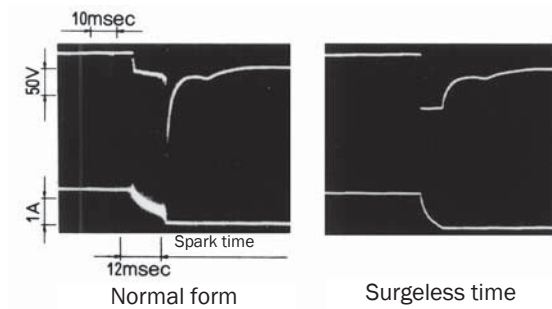
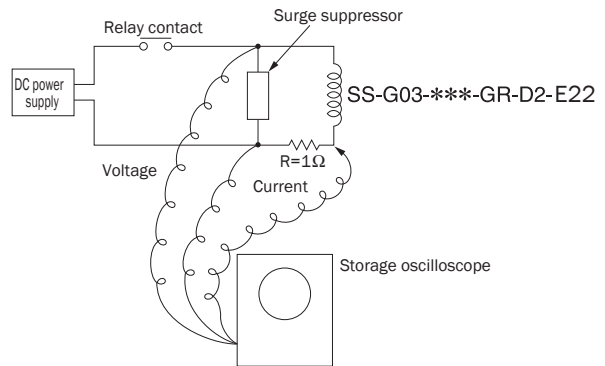
**Switching Response Characteristics**  
The pressure waveforms for each valve in the hydraulic circuit shown below are shown at the bottom of this block.

Opening and closing of a dry type valve generates shock (noise) and pipe vibration due to the sudden drop or rise in pressure. With a shockless solenoid valve, pressure fluctuation when the valve is opened or closed is smoothed, which eliminates shock (noise) and pipe vibration.

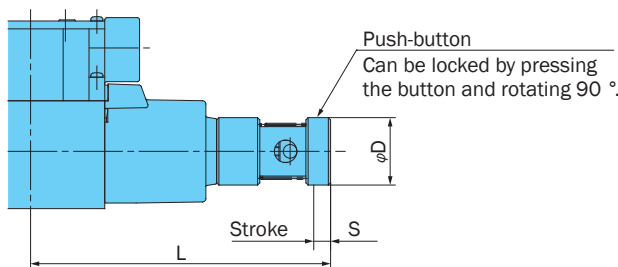


### Surgeless Type (Auxiliary Symbol: G)

The surge pressure waveforms when the DC solenoid valve power supply is opened and closed by a relay are shown at the bottom of this block. A built-in surge absorber element eliminates sparking and surge pressure.



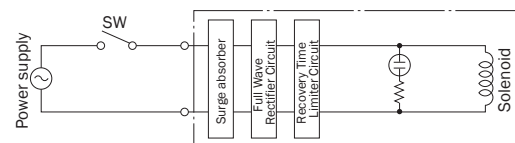
### Manual Button Type (Auxiliary Symbol: N)



| Part No.   |             | L     | S   | D  |
|------------|-------------|-------|-----|----|
| EDB14-D-1A | AC Solenoid | 133.5 | 7.5 | 30 |
| EDB14-A    | DC Solenoid | 140.5 |     |    |
| ECB14-A    | AC Solenoid | 155.5 | 9.5 | 35 |
| ECB14-D    | DC Solenoid | 173.5 |     |    |

### Quick Return (Auxiliary Symbol: Q)

- Handling
1. This type is used in the case of power supply type E\* (with built-in rectifier) to shorten the spring return time. This also applies to D\*.
  2. Quick return device is built-in to central terminal box.

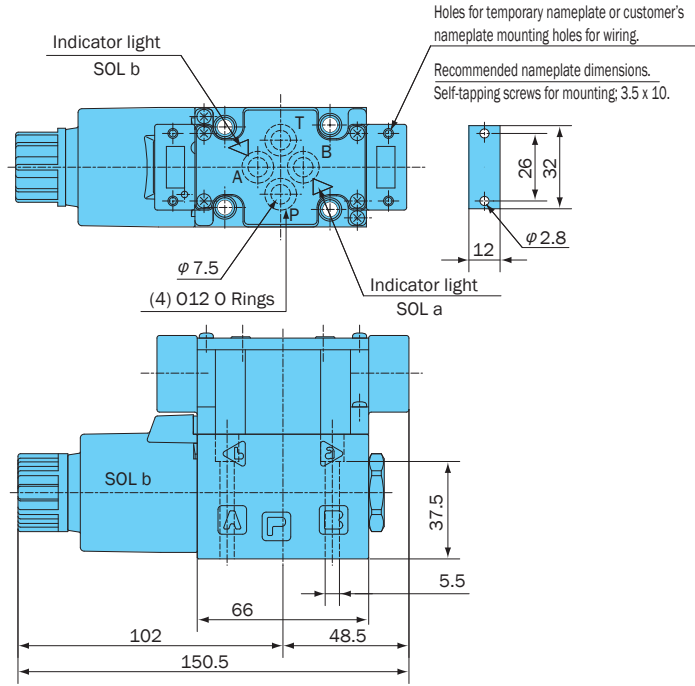
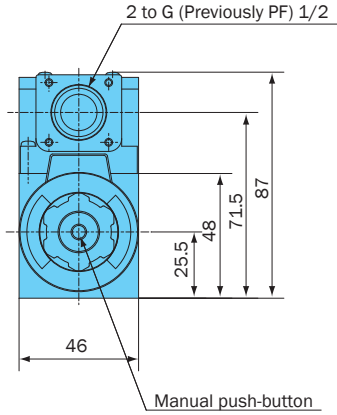




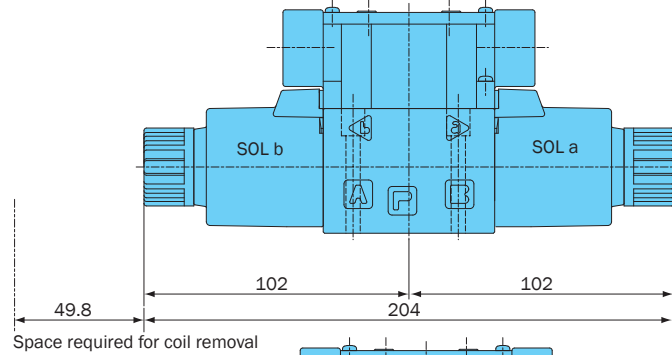
# Installation Dimension Drawings

AC Solenoid  
 SS-G01-A\*\*-R-C\*-31  
 SS-G01-H\*\*-R-C\*-31

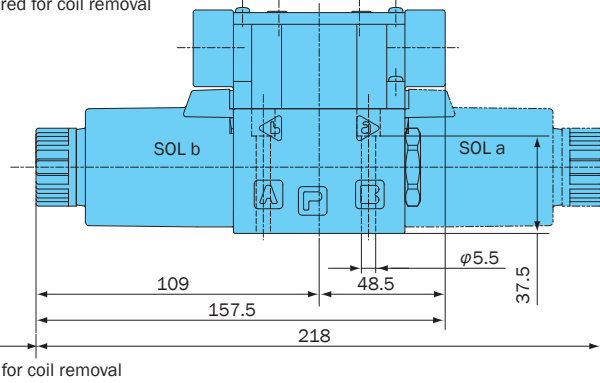
Note)  
 SS-G01-H\*\*-R\*\*-31  
 The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.



SS-G01-C \*\*-R-C\*-31  
 SS-G01-E \*\*-R-C\*-31



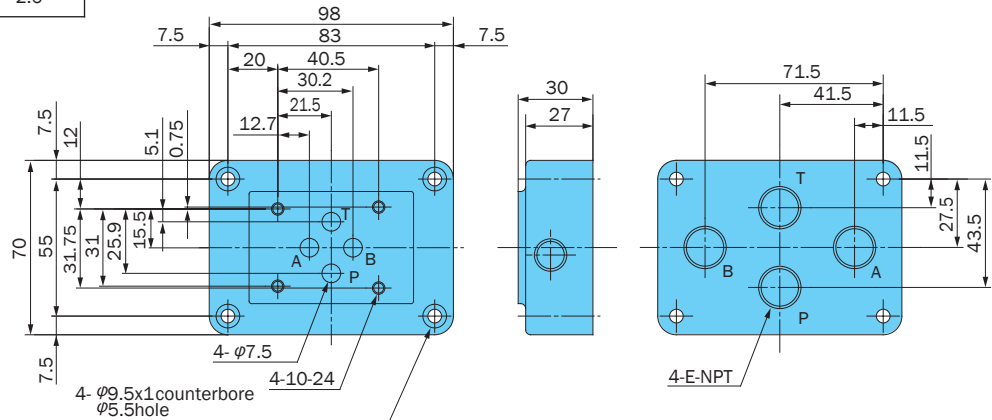
DDC Solenoid and Rectifier  
 SS-G01-A \*\*-R-D/E\*-31  
 SS-G01-H \*\*-R-D/E\*-31  
 SS-G01-C \*\*-R-D/E\*-31  
 SS-G01-E \*\*-R-D/E\*-31



For sub plate SS-G01

| Model No.   | E   | Weight lbs |
|-------------|-----|------------|
| MSA-01X-E10 | 1/4 | 2.6        |
| MSA-01Y-E10 | 3/8 | 2.6        |

Gasket Surface Dimensions  
 ISO 4401-03-02-0-94  
 ( JIS B 8355 D-03-02-0-94 )



# Installation Dimension Drawings

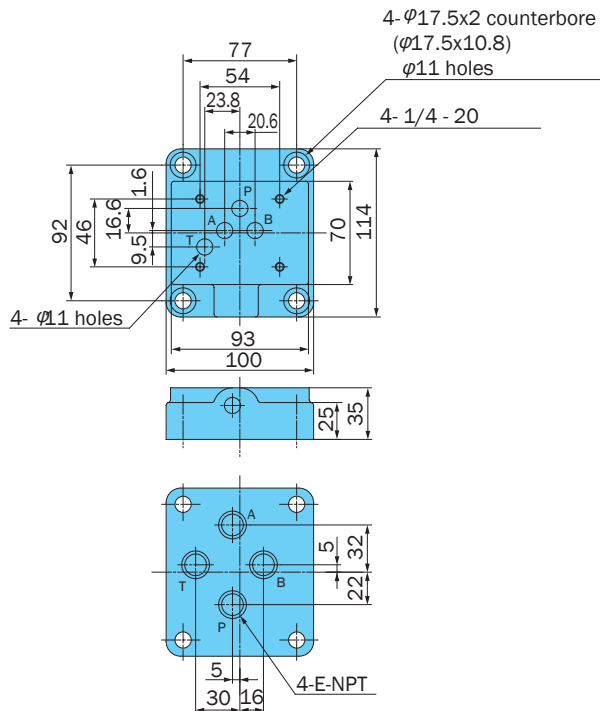
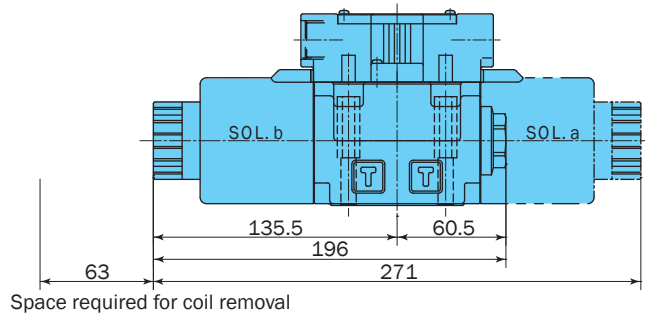
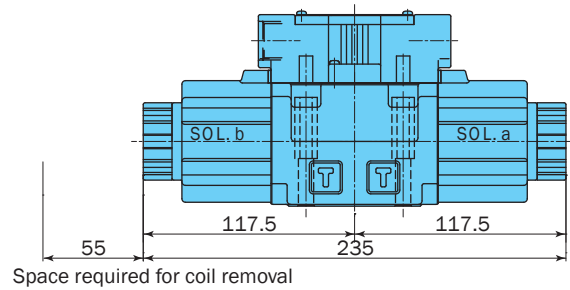
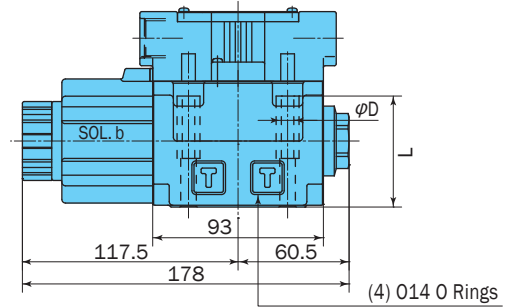
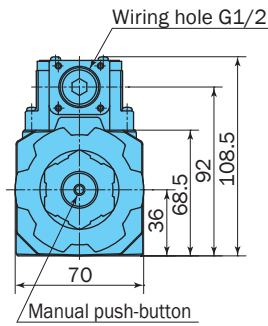
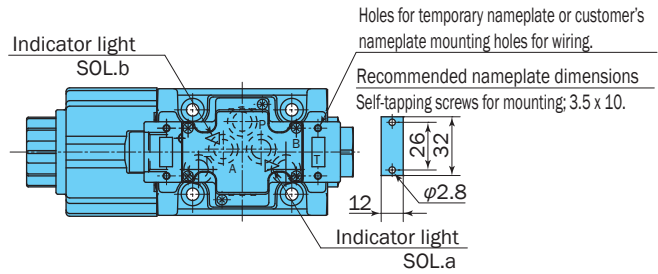
AC Solenoid  
 SS-G03-A\*\*-R-C\*-E22  
 SS-G03-H\*\*-R-C\*-E22

Note:  
 SS-G03-H\*\*-R\*\*-E22  
 The solenoid is on the opposite side of that shown for SOL.a in the illustrations shown here.

|          | SS-G03**-R**-J22 | SS-G03**-R**-22 |
|----------|------------------|-----------------|
| $\phi D$ | $\phi 6.8$       | $\phi 8.5$      |
| L        | 60.5             | 58              |

SS-G03-C\*\*-R-C\*-E22  
 SS-G03-E\*\*-R-C\*-E22

DC Solenoid and Rectifier  
 SS-G03-A \*\*-R-D\*/E\*-E22  
 SS-G03-H \*\*-R-D\*/E\*-E22  
 SS-G03-C \*\*-R-D\*/E\*-E22  
 SS-G03-E \*\*-R-D\*/E\*-E22



For sub plate SS-G03

| Mounting bolt    | Model No.   | E   | Weight lbs |
|------------------|-------------|-----|------------|
| 1/4 - 20 x 2 3/4 | MSA-03-E10  | 3/8 | 5.0        |
|                  | MSA-03X-E10 | 1/2 |            |

Gasket surface dimensions  
 ( ISO 4401-05-04-0-94  
 JIS B 8355 D-05-04-0-94 )

Wiring Diagram

Note:

1. In the case of a double solenoid valve, a common terminal is provided to simplify wiring. When the common terminal is not used, remove the terminal screws.
2. Use the ground terminal when grounding is required.
3. In the case of a solderless terminal, M3 screws.
4. Tighten terminal screws to a torque of 3.6 to 5 ft lbs.

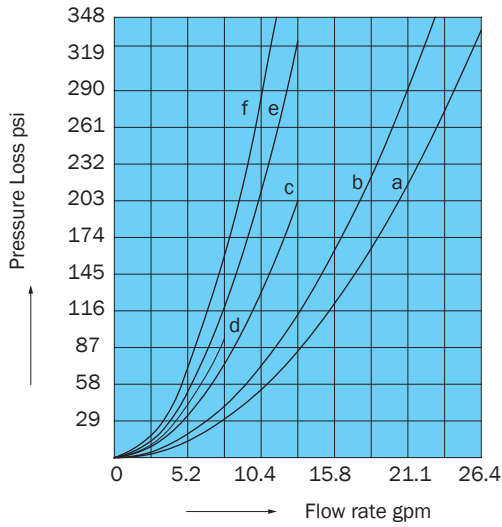
Electrical Circuit Diagram

| Type                                 | Model No.                                  | Electrical Circuit                 |
|--------------------------------------|--|------------------------------------|
| AC Solenoid                          | SS- G01-***-R-C*- 31<br>G03-***-R-C*- 22   |                                    |
| AC Solenoid Surgeless Type           | SS- G01-***-GR-C*- 31<br>G03-***-GR-C*- 22 |                                    |
| Built-in Rectifier                   | SS- G01-***-R-E*- 31<br>G03-***-R-E*- 22   |                                    |
| DC Solenoid                          | SS- G01-***-R-D*- 31<br>G03-***-R-D*- 22   |                                    |
| DC Solenoid Surgeless Type           | SS- G01-***-GR-D*- 31<br>G03-***-GR-D*- 22 |                                    |
| Built-in Rectifier Quick Return Type | SS- G01-***-QR-E*- 31<br>G03-***-QR-E*- 22 | See page D-7 for more information. |

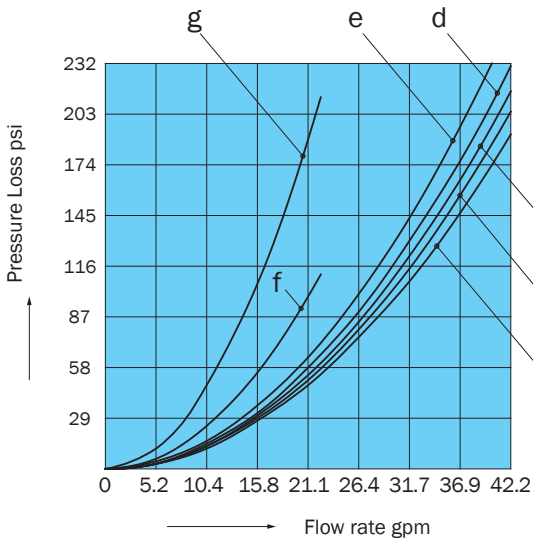
# Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics



| Pump Type | Flow Path       | P/ A | P/ B | A/ T | B/ T | P/ T |
|-----------|-----------------|------|------|------|------|------|
| SS-G01    | A2X, H2X, E2X   | d    | d    | —    | —    | —    |
|           | A3X, H3X        | b    | b    | b    | b    | —    |
|           | E3X             | b    | b    | b    | b    | —    |
|           | A3Z, H3Z, E3Z   | a    | a    | a    | a    | —    |
|           | A4, H4, C4      | a    | a    | a    | a    | a    |
|           | A5, H5, C5, C6S | b    | b    | b    | b    | —    |
|           | C1, C1S         | b    | b    | a    | b    | —    |
|           | C2              | a    | b    | b    | b    | —    |
|           | C6              | b    | b    | a    | a    | —    |
|           | C7Y             | f    | f    | e    | e    | c    |
|           | C8              | a    | f    | b    | e    | c    |
| C9        | a               | a    | b    | b    | —    |      |



| Pump Type | Flow Path     | P/ A | P/ B | A/ T | B/ T | P/ T |
|-----------|---------------|------|------|------|------|------|
| SS-G03    | A2X, H2X, E2X | e    | e    | —    | —    | —    |
|           | A5            | —    | c    | c    | —    | —    |
|           | H5            | c    | —    | —    | c    | —    |
|           | A3X, H3X, E3X | c    | c    | d    | d    | —    |
|           | A3Z, H3Z      | a    | a    | d    | d    | —    |
|           | E3Z           | b    | b    | a    | a    | —    |
|           | C1            | c    | c    | a    | c    | —    |
|           | C2            | a    | c    | c    | c    | —    |
|           | A4, H4, C4    | a    | a    | a    | a    | a    |
|           | C5, C1S, C6S  | c    | c    | c    | c    | —    |
|           | C6            | c    | c    | a    | a    | —    |
|           | C7Y           | g    | g    | g    | g    | f    |
|           | C8            | a    | g    | a    | g    | f    |
| C9        | a             | a    | c    | c    | —    |      |

## Switching Response Time

| Model No.              | Response Time (sec) |               | Measurement Conditions |
|------------------------|---------------------|---------------|------------------------|
|                        | Solenoid ON         | Spring Return |                        |
| SS-G01-**-R-C*-E31     | 0.02 to 0.03        | 0.02 to 0.03  | 2030 psi<br>7.9 gpm    |
| SS-G01-**-(G)R-D*-E31  | 0.03 to 0.04        | 0.02 to 0.04  |                        |
| SS-G01-**-R-E*-E31     | 0.03 to 0.04        | 0.07 to 0.10  |                        |
| SS-G01-**-F(G)R-D*-E31 | 0.07 to 0.10        | 0.04 to 0.07  |                        |
| SS-G01-**-FR-E*-E31    | 0.07 to 0.10        | 0.10 to 0.15  |                        |
| SS-G03-**-R-C*-E22     | 0.02 to 0.03        | 0.02 to 0.03  | 2030 psi<br>18.4 gpm   |
| SS-G03-**-(G)R-D*-E22  | 0.06 to 0.09        | 0.03 to 0.05  |                        |
| SS-G03-**-R-E*-E22     | 0.07 to 0.10        | 0.10 to 0.15  |                        |
| SS-G03-**-F(G)R-D*-E22 | 0.13 to 0.15        | 0.08 to 0.15  |                        |
| SS-G03-**-FR-E*-E22    | 0.10 to 0.15        | 0.15 to 0.20  |                        |

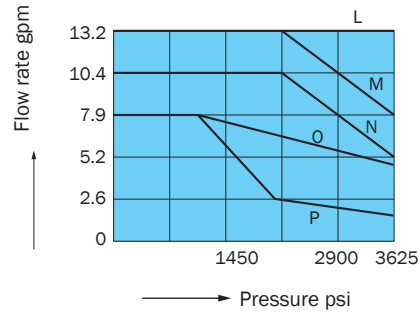
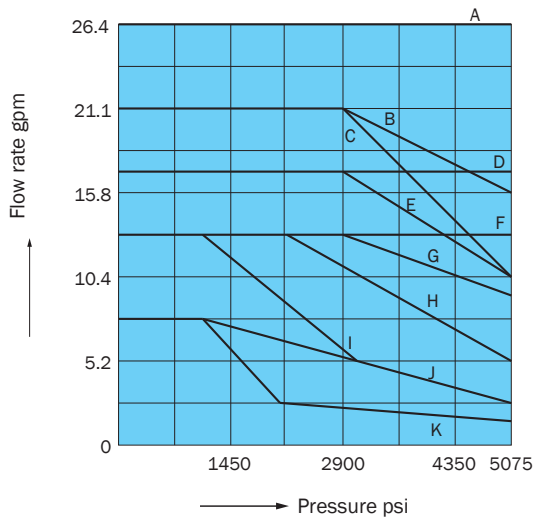
Note: 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)  
 2. In the case of power supply type E\* (with built-in rectifier), the spring return time using Quick Return (option symbol: Q) is the same as D\*.

Pressure – Flow Volume Allowable Value

| Size                                  | Standard Form, with AC, DC solenoid |   |   |
|---------------------------------------|-------------------------------------|---|---|
|                                       | SS-G01-**-R-**-31                   |   |   |
| Operation Example<br>Operation Symbol |                                     |   |   |
| A2X, H2X                              | -                                   | K | K |
| E2X                                   | -                                   | J | J |
| A3X, H3X                              | B                                   | K | K |
| E3X                                   | A                                   | J | J |
| A3Z, H3Z                              | D                                   | D | D |
| E3Z                                   | D                                   | D | D |
| A5                                    | A                                   | - | I |
| H5                                    | A                                   | I | - |
| C1, C6                                | Note1) C(E)                         | I | I |
| C1S, C5, C6S                          | A                                   | I | I |
| C2, C9                                | A                                   | K | K |
| A4                                    | F                                   | F | F |
| H4                                    | F                                   | F | F |
| C4                                    | F                                   | F | F |
| C7Y, C8                               | Note2) G(H)                         | K | K |

| Size                                  | Shockless Type, with DC solenoid |   |   |
|---------------------------------------|----------------------------------|---|---|
|                                       | SS-G01-**-FR-**-31               |   |   |
| Operation Example<br>Operation Symbol |                                  |   |   |
| A2X, H2X                              | -                                | P | P |
| E2X                                   | -                                | O | O |
| A3X, H3X                              | L                                | P | P |
| E3X                                   | L                                | O | O |
| A3Z, H3Z                              | L                                | L | L |
| E3Z                                   | L                                | L | L |
| A5                                    | L                                | - | P |
| H5                                    | L                                | P | - |
| C1, C6                                | M                                | P | P |
| C1S, C2, C5, C6S, C9                  | L                                | P | P |
| A4, H4                                | L                                | L | L |
| C4                                    | L                                | L | L |
| C7Y, C8                               | N                                | P | P |

Note: 1. Letter in parentheses is for AC solenoid.  
 2. Letter in parentheses is for solenoid with built-in rectifier (E\*), but without Quick Return, and for DC solenoid (D\*) with surge voltage absorbing diode on the electrical circuit.



Pressure – Flow Volume Allowable Value

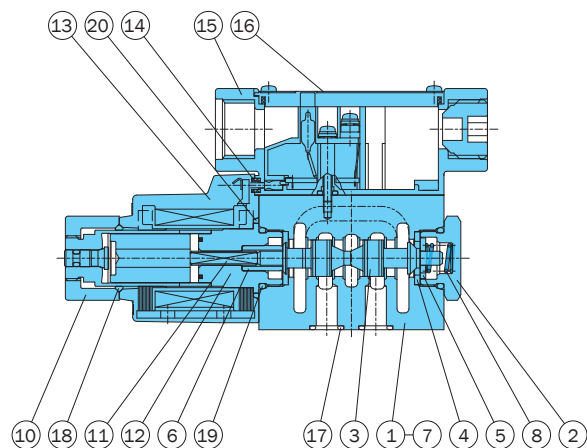
| Model No.            | Standard Form, with AC Solenoid  |                     |      | Standard Form, with DC Solenoid |                    |      |
|----------------------|----------------------------------|---------------------|------|---------------------------------|--------------------|------|
|                      |                                  | SS-G03-**-R-C*-E22  |      |                                 | SS-G03-**-R-**-E22 |      |
| Operation Example    |                                  |                     |      |                                 |                    |      |
| Operation Symbol     |                                  |                     |      |                                 |                    |      |
| A2X                  | —                                | F                   | E    | ☒                               | G                  | H    |
| H2X                  | —                                | E                   | F    | ☒                               | H                  | G    |
| E2X                  | —                                | C                   | C    | ☒                               | D                  | D    |
| A3X                  | A                                | E                   | E    | A                               | F                  | H    |
| H3X                  | A                                | E                   | E    | A                               | H                  | F    |
| A3Z                  | A                                | A                   | C    | A                               | D                  | D    |
| H3Z                  | A                                | C                   | A    | A                               | D                  | D    |
| E3X, E3Z             | A                                | C                   | C    | A                               | D                  | D    |
| A5                   | A                                | —                   | D    | A                               | —                  | G    |
| H5                   | A                                | D                   | —    | A                               | G                  | —    |
| C1S, C5, C6S         | A                                | D                   | D    | A                               | G                  | G    |
| C1, C6               | A                                | D                   | D    | B                               | G                  | G    |
| C2                   | A                                | G                   | D    | A                               | I                  | G    |
| A4, H4, C4           | A                                | A                   | A    | A                               | A                  | A    |
| C9                   | A                                | G                   | G    | A                               | I                  | I    |
| C7Y, C8              | B                                | B                   | B    | Note1) C(E)                     | C(E)               | C(E) |
|                      |                                  |                     |      |                                 |                    |      |
| Model No.            | Shockless Type, with DC solenoid |                     |      |                                 |                    |      |
|                      |                                  | SS-G03-**-FR-**-E22 |      |                                 |                    |      |
| Operation Example    |                                  |                     |      |                                 |                    |      |
| Operation Symbol     |                                  |                     |      |                                 |                    |      |
| A2X                  | —                                | E                   | F    |                                 |                    |      |
| H2X                  | —                                | F                   | E    |                                 |                    |      |
| E2X                  | —                                | C                   | C    |                                 |                    |      |
| A3X                  | A                                | D                   | F    |                                 |                    |      |
| H3X                  | A                                | F                   | D    |                                 |                    |      |
| A3Z                  | A                                | C                   | C    |                                 |                    |      |
| H3Z                  | A                                | C                   | C    |                                 |                    |      |
| E3X, E3Z             | A                                | C                   | C    |                                 |                    |      |
| A5                   | A                                | —                   | E    |                                 |                    |      |
| H5                   | A                                | E                   | —    |                                 |                    |      |
| C1, C1S, C5, C6, C6S | A                                | E                   | E    |                                 |                    |      |
| C2                   | A                                | G                   | E    |                                 |                    |      |
| A4, H4, C4           | A                                | A                   | A    |                                 |                    |      |
| C9                   | A                                | G                   | G    |                                 |                    |      |
| C7Y, C8              | Note1) B(H)                      | B(H)                | B(H) |                                 |                    |      |
|                      |                                  |                     |      |                                 |                    |      |

Note:

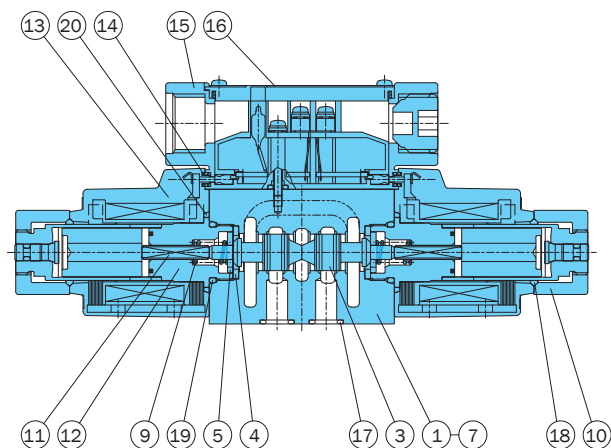
- Letter in parentheses is for solenoid with built-in rectifier (E\*), but without Quick Return, and for DC solenoid (D\*) with surge voltage absorbing diode on the electrical circuit.
- There is no shockless type for the AC solenoid (C\*), so use a solenoid with built-in rectifier (E\*) when shockless operation is required with an AC power supply.
- The maximum flow rate is the allowable value of each port.

## Cross-sectional Drawing

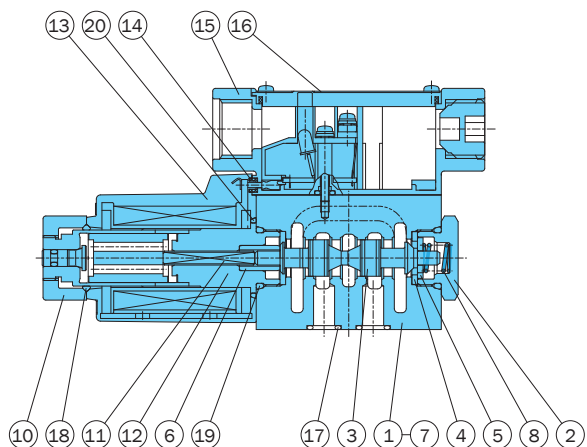
SS-G01-A\*\*-R-C\*-31



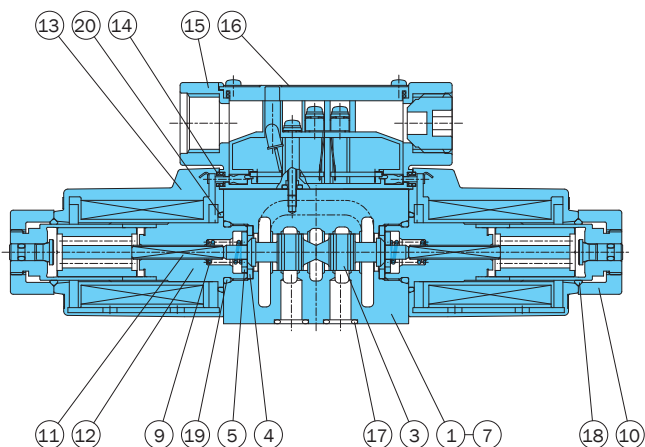
SS-G01-C\*\*-R-C\*-31



SS-G01-A\*\*-R-D/E\*-31



SS-G01-C\*\*-R-D/E\*-31



### List of Sealing Parts

| Part No. | Part Name | Part Number     | Q'ty            |                 |
|----------|-----------|-----------------|-----------------|-----------------|
|          |           |                 | Single Solenoid | Double Solenoid |
| 17       | O-ring    | AS568-012(Hs90) | 4               | 4               |
| 18       | O-ring    | 1A-P20          | 1               | 2               |
| 19       | O-ring    | 1B-P18          | 2               | 2               |
| 20       | O-ring    | S-25            | 1               | 2               |

Note: 1A and 1B are JIS Standard B 2401, while AS568 is SAE standard.

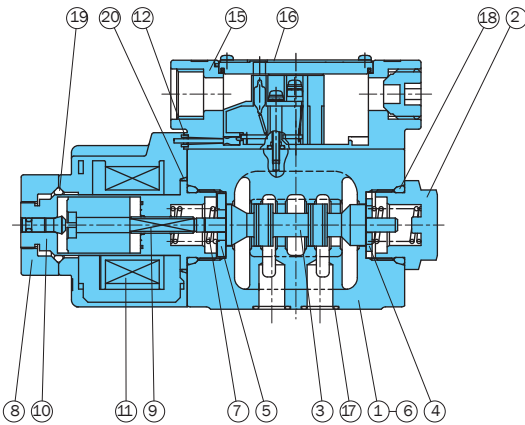
### Seal Kit Number

| Single Solenoid | Double Solenoid |
|-----------------|-----------------|
| EDCS-A          | EDCS-C          |

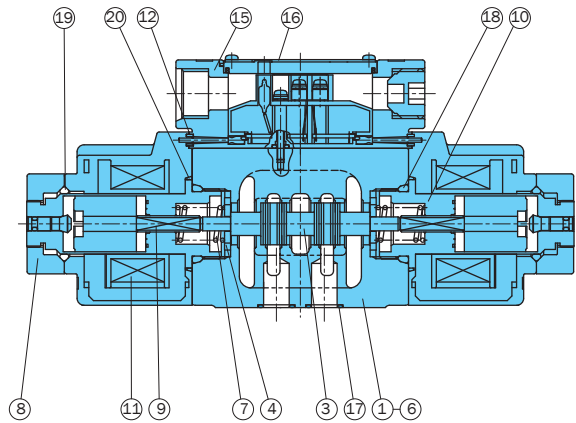
| Part No. | Part Name  | Part No. | Part Name        |
|----------|------------|----------|------------------|
| 1        | Body       | 11       | Rod              |
| 2        | Plug       | 12       | Solenoid guide   |
| 3        | Spool      | 13       | Solenoid coil    |
| 4        | Retainer A | 14       | Packing          |
| 5        | Retainer B | 15       | Terminal box kit |
| 6        | Retainer C | 16       | Nameplate        |
| 7        | Spacer     | 17       | O-ring           |
| 8        | Spring A   | 18       | O-ring           |
| 9        | Spring C   | 19       | O-ring           |
| 10       | Nut        | 20       | O-ring           |

**Cross-sectional Drawing**

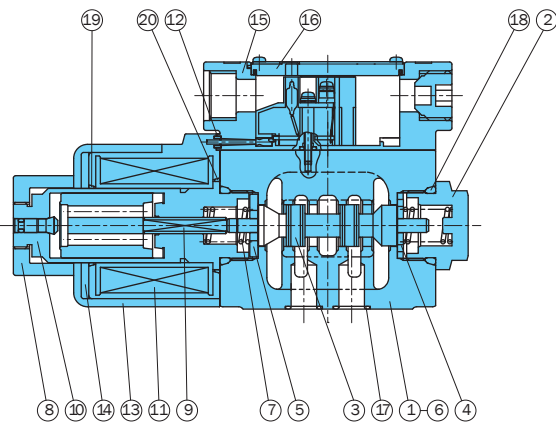
SS-G03-A\*\*-R-C\*-E22



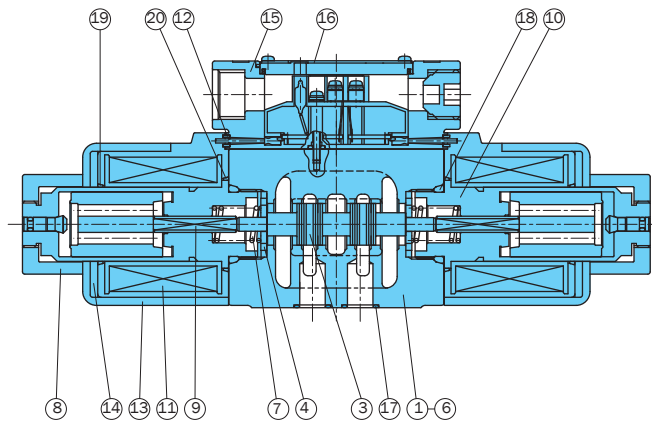
SS-G03-C\*\*-R-C\*-E22



SS-G03-A\*\*-R-D/E\*-E22



SS-G03-C\*\*-R-D/E\*-E22



List of Sealing Parts

| Part No. | Part Name | Type/Part Number |           | Q'ty            |                 |
|----------|-----------|------------------|-----------|-----------------|-----------------|
|          |           | AC SOL.          | DC SOL.   | Single Solenoid | Double Solenoid |
| 17       | O-ring    | AS568-014(Hs90)  |           | 5               | 5               |
| 18       | O-ring    | 1B-P28           |           | 2               | 2               |
| 19       | O-ring    | 1A-P26           | AS568-026 | 1               | 2               |
| 20       | O-ring    | AS568-029        |           | 2               | 2               |

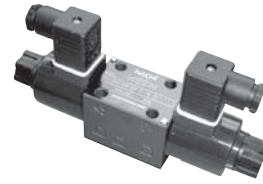
Note: 1A and 1B\*\* indicate JIS Standard B 2401-1A/1B-\*\*.

Seal Kit Number

| AC SOL.         |                 | DC SOL.         |                 |
|-----------------|-----------------|-----------------|-----------------|
| Single Solenoid | Double Solenoid | Single Solenoid | Double Solenoid |
| ECBS-AA         | ECBS-CA         | ECBS-AD         | ECBS-CD         |

| Part No. | Part Name      | Part No. | Part Name        |
|----------|----------------|----------|------------------|
| 1        | Body           | 14       | Coil yoke        |
| 2        | Plug           | 15       | Terminal box kit |
| 3        | Spool          | 16       | Nameplate        |
| 4        | Retainer       | 17       | O-ring           |
| 5        | Retainer B     | 18       | O-ring           |
| 6        | Spacer         | 19       | O-ring           |
| 7        | Spring         | 20       | O-ring           |
| 8        | Nut            |          |                  |
| 9        | Rod            |          |                  |
| 10       | Solenoid guide |          |                  |
| 11       | Solenoid coil  |          |                  |
| 12       | Packing B      |          |                  |
| 13       | Coil case      |          |                  |





**SA Series (Wiring System: DIN Connector Type) Wet Type Solenoid Valve**

26.4 to 42 gpm  
5075 psi

### Features

**Very long life**

The movable iron core of the wet type solenoid is immersed in oil, which keeps it lubricated and cushions it from impact and vibration, ensuring very long life.

**Low switching noise**

The wet-type solenoid valve provides very low core switching noise, for quiet operation.

**Shockless**

A switching speed adjustment mechanism enables direct, shockless operation (Option F).

**No surge voltage**

Sparking and surge voltage during solenoid switching is canceled for stable switching (Option G).

**Easy coil replacement**

A DIN connector type coil enables one-touch coil replacement.

Wide-ranging backward compatibility makes it simple to replace previous valve models with this one. Combining this valve with a modular valve contributes to the compact configuration of the overall device.

**Global support (G01 size)**

Meets overseas safety standards (CE, UL, and CSA). It can be safely used anywhere in the world. Contact your agent for certified products.

### Specifications

| Model No.             |                              | SA-G01 (D03)        |                  |                       |                              | SA-G03 (D05)          |                              |                       |                              |  |      |
|-----------------------|------------------------------|---------------------|------------------|-----------------------|------------------------------|-----------------------|------------------------------|-----------------------|------------------------------|--|------|
|                       |                              | Standard Type       |                  | Shockless Type        |                              | Standard Type         |                              |                       |                              | Shockless Type                             |      |
|                       |                              | JIS Symbol          | Operation Symbol | Maximum Flow Rate gpm | Maximum Working Pressure psi | Maximum Flow Rate gpm | Maximum Working Pressure psi | AC Solenoid Type      |                              | DC Solenoid Type (With built-in rectifier) |      |
| Maximum Flow Rate gpm | Maximum Working Pressure psi |                     |                  |                       |                              |                       |                              | Maximum Flow Rate gpm | Maximum Working Pressure psi |  |      |
|                       | -A2X                         | 7.9                 | 5075             | 7.9                   | 3625                         | 10.5                  | 5075                         | 22.4                  | 5075                         | 22.4                                       | 3625 |
|                       | -H2X                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -E2X                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -A3X                         | 21.1                | 5075             | 21.1                  | 3625                         | 22.4                  | 5075                         | 42.2                  | 5075                         | 34.3                                       | 3625 |
|                       | -H3X                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -E3X                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -A3Z                         | 17.1                | 5075             | 17.1                  | 3625                         | 34.3                  | 5075                         | 42.2                  | 5075                         | 34.3                                       | 3625 |
|                       | -H3Z                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -E3Z                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -A4                          | 13.2                | 5075             | 13.2                  | 3625                         | 34.3                  | 5075                         | 42.2                  | 5075                         | 34.3                                       | 3625 |
|                       | -H4                          |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -A5                          |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -H5                          | 26.4                | 5075             | 26.4                  | 3625                         | 18.4                  | 3625                         | 26.4                  | 3625                         | 22.4                                       | 3625 |
|                       | -C2                          |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -C5                          |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -C9                          |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -C1S                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -C6S                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -C1                          | AC Solenoid<br>17.1 |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -C6                          | DC Solenoid<br>21.1 |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -C4                          | 13.2                | 5075             | 10.5                  | 3625                         | 18.4                  | 3625                         | 26.4                  | 3625                         | 22.4                                       | 3625 |
|                       | -C7Y                         |                     |                  |                       |                              |                       |                              |                       |                              |  |      |
|                       | -C8                          |                     |                  |                       |                              |                       |                              |                       |                              |  |      |

|                                     |                                       | SA-G01                                     |                       |     | SA-G03            |                    |     |
|-------------------------------------|---------------------------------------|--|-----------------------|-----|-------------------|--------------------|-----|
|                                     |                                       | AC Solenoid                                | DC Solenoid           |     | AC Solenoid       | DC Solenoid        |     |
|                                     |                                       |  | Built-in Rectifier    |     |                   | Built-in Rectifier |     |
|                                     |                                       | C*   | E*                    | D*  | C*                | E*                 | D*  |
| Maximum Working Pressure            | P, A, B ports                         | 5075 psi (Note 1)                          |                       |     |                   |                    |     |
| Maximum Allowable Backpressure      | T port                                | 3045 psi                                   |                       |     | 2320 psi          |                    |     |
| Switching frequency (cycles/minute) | Standard Type                         | 300  | 120                   | 300 | 300               | 120                | 240 |
|                                     | Shockless Type                        | --   |                       | 120 | --                |                    | 120 |
| Option                              | Indicator light                       | R  |                       |     | R                 |                    |     |
|                                     | Shockless                             | --   | F                     |     | --                | F                  |     |
|                                     | Surgeless                             | G  | --                    | G   | G                 | --                 | G   |
|                                     | G Screw Connector                     | J  | --                    | J   | J                 | --                 | J   |
|                                     | With manual push-button               | N  |                       |     | N                 |                    |     |
|                                     | Quick Return                          | --   | Q                     | --  | --                | Q                  | --  |
| Weight (kg)                         | Double Solenoid                       | 1.8  | 2.0                   |     | 4.2               | 5.5                |     |
|                                     | Single Solenoid                       | 1.4  | 1.5                   |     | 3.5               | 4.1                |     |
| Operating Environment               | Dust Resistance/Water Resistance Rank | IP65 (Dust-tight, Waterjet-proof) (Note 2) |                       |     |                   |                    |     |
|                                     | Ambient Temperature                   | -4 to 122°F                                |                       |     |                   |                    |     |
|                                     | Temperature Range                     | -4 to 158°F                                |                       |     |                   |                    |     |
|                                     | Operating Fluid                       | Viscosity Range                            | 15 to 300 centistokes |     |                   |                    |     |
| Filtration                          |                                       | 10 microns or less                         |                       |     |                   |                    |     |
| Mounting bolt                       | Size × Length                         | 10-24 x 1 3/4 LG (not included)            |                       |     | 1/4-20 x 2 3/4    |                    |     |
|                                     | Tightening Torque                     | 3.6 to 5 ft lbs                            |                       |     | 7.3 to 9.5 ft lbs |                    |     |

- Note: 1. Maximum operating pressure depends on the valve type. For details, see page D-16.  
 2. The power supply type for E\* is IP64 (dust-tight, splash-proof).  
 3. For mounting bolts, use grade 8 or equivalent.  
 4. Mounting bolts are not included with the O1 size. Bolts are included with the O3 size.

• Handling

- In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T port. Never use a stopper plug in the T port.
- Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
- Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- When using petroleum type operating fluid, use ISO VG 32, 46.
- For details about using fire-resistant hydraulic fluid, contact your agent.
- Use this valve only within the allowable voltage range.
- Do not allow the AC solenoid to become charged until you install the coil into the valve.
- In the case of operation symbols A2X, H2X, and E2X, run drain piping from the valve T port.
- Maintaining a switching position under high pressure for a long period can cause

abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.

11 When using a detent type (E2X, 3X, E3Z), use constant energization in order to securely maintain the switching position.

|  |                   |
|--|-------------------|
| RSA-***-AR*(H)-** <sup>15</sup> <sub>23</sub>  | SA-G01-AR-**-31   |
| RSA-***-AQ*(H)-** <sup>15</sup> <sub>23</sub>  | SA-G01-A3X-**-31  |
| RSA-***-*(F(H))-** <sup>15</sup> <sub>23</sub> | SA-G01-A8X0-**-31 |

14 The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.

12 Note that manual pin operating pressure changes in accordance with tank line back pressure.

13 The series described in the table below are available for use as RSS and RIS Series solenoid control relief valves.

15 Use the following table for specification when a sub plate is required.

| Model No.   | Pipe Diameter | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs | Applicable Valve Type |
|-------------|---------------|------------------------------|---------------------------|------------|-----------------------|
| MSA-01X-E10 | 1/4           | 3625                         | 5.2                       | 2.6        | SA-G01-***-**-E31     |
| MSA-01Y-E10 | 3/8           |                              | 7.9                       |            |                       |
| MSA-03-E10  | 3/8           |                              | 11.8                      | 5.0        | SA-G03-***-**-E21     |
| MSA-03X-E10 | 1/2           |                              | 21.1                      |            |                       |

Solenoid Assembly Specifications

| Solenoid Type              | Power Supply Type | Voltage (V) | Frequency (Hz) | For SA-G01         |                   |                     |                   | For SA-G03                  |                    |                   |                     |                   |                             |
|----------------------------|-------------------|-------------|----------------|--------------------|-------------------|---------------------|-------------------|-----------------------------|--------------------|-------------------|---------------------|-------------------|-----------------------------|
|                            |                   |             |                | Solenoid Coil Type | Drive Current (A) | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) | Solenoid Coil Type | Drive Current (A) | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) |
| AC                         | C1                | AC100       | 50             | EAC64-C1           | 2.2               | 0.52                | 25                | 80 to 110                   | EBB64-C1           | 5.4               | 0.92                | 36.0              | 80 to 110                   |
|                            |                   |             | 60             |                    | 2.0               | 0.38                | 22                |                             |                    | 90 to 120         | 4.6                 | 0.62              |                             |
|                            |                   | AC110       | 60             |                    | 2.2               | 0.46                | 28                | 5.0                         |                    |                   | 0.78                | 42.0              | 90 to 120                   |
|                            | C115              | AC110       | 50             | EAC64-C115         | 2.0               | 0.47                | 25                | 90 to 120                   | EBB64-C115         | 5.0               | 0.85                | 36.0              | 90 to 120                   |
|                            |                   |             | 60             |                    | 1.8               | 0.35                | 22                |                             |                    | 100 to 130        | 4.2                 | 0.57              |                             |
|                            |                   | AC115       | 60             |                    | 2.0               | 0.42                | 28                | 4.6                         |                    |                   | 0.72                | 42.0              | 100 to 130                  |
|                            | C2                | AC200       | 50             | EAC64-C2           | 1.1               | 0.26                | 25                | 160 to 220                  | EBB64-C2           | 2.7               | 0.46                | 36.0              | 160 to 220                  |
|                            |                   |             | 60             |                    | 1.0               | 0.19                | 22                |                             |                    | 180 to 240        | 2.3                 | 0.31              |                             |
|                            |                   | AC220       | 60             |                    | 1.1               | 0.23                | 28                | 2.5                         |                    |                   | 0.39                | 42.0              | 180 to 240                  |
|                            | C230              | AC220       | 50             | EAC64-C230         | 1.0               | 0.24                | 25                | 180 to 240                  | EBB64-C230         | 2.5               | 0.42                | 36.0              | 180 to 240                  |
|                            |                   |             | 60             |                    | 0.91              | 0.17                | 22                |                             |                    | 200 to 260        | 2.1                 | 0.29              |                             |
|                            |                   | AC230       | 60             |                    | 1.0               | 0.21                | 28                | 2.3                         |                    |                   | 0.36                | 42.0              | 200 to 260                  |
| DC with Built-in Rectifier | E1                | AC100       | 50/60          | EAC64-E1-1A        | 0.31              |                     | 27                | 90 to 110                   | EBB64-E1           | 0.40              |                     | 34.0              | 90 to 110                   |
|                            |                   |             | AC110          | EAC64-E115-1A      | 0.26              |                     | 25                |                             |                    | 100 to 125        | 0.33                |                   |                             |
|                            | AC115             | 50/60       | EAC64-E115-1A  | 0.27               |                   | 27                  | EBB64-E115        | 0.34                        |                    |                   | 34.0                | 100 to 125        |                             |
|                            | E2                | AC200       | 50/60          | EAC64-E2-1A        | 0.15              |                     | 26                | 180 to 220                  | EBB64-E2           | 0.22              |                     | 37.0              | 180 to 220                  |
|                            |                   |             | AC220          | EAC64-E230-1A      | 0.12              |                     | 24                |                             |                    | 200 to 250        | 0.16                |                   |                             |
|                            | AC230             | 50/60       | EAC64-E230-1A  | 0.13               |                   | 27                  | EBB64-E230        | 0.17                        |                    |                   | 33.0                | 200 to 250        |                             |
| DC                         | D1                | DC12        | ☒              | EAC64-D1-1A        | 2.2               |                     | 26                | 10.8 to 13.2                | EBB64-D1           | 2.6               |                     | 31.0              | 10.8 to 13.2                |
|                            | D2                | DC24        | ☒              | EAC64-D2-1A        | 1.1               |                     | 26                | 21.6 to 26.4                | EBB64-D2           | 1.5               |                     | 36.0              | 21.6 to 26.4                |

Understanding Model Numbers

SA - G 01 - A 3 X - \* \* - C2 - 31

Design number  
E31: 01 size; 10 - 24 mounting bolt  
E21: 03 size; 1/4 - 20 mounting bolt

Power supply  
C: AC (50/60Hz)      C1=AC100V    C115=AC110V    C2=AC200V    C230=AC220V  
D: DC                    D1=DC12V    D2=DC24V  
E: AC (Built-in rectifier; 50/60Hz)    E1=AC100V    E115=AC115V    E2=AC200V    E230=AC230V

With indicator light

Auxiliary symbol (Can be combined in alphabetic sequence.)  
F: Shockless type (Available with power supply D\*, E)  
G: Surgeless type (Available with power supply C\*, D\*)  
N: With manual push-button  
Q: Quick return type (Available with power supply E\*)

Transition Flow Path (Specify for A2X, H2X, E2X, A3X, H3X, E3X, A3Z, H3Z, E3Z, C7Y only.)

| X      | Y         | Z    |
|--------|-----------|------|
| Closed | Semi-open | Open |
|        |           |      |

Center position

|   |   |   |   |    |    |
|---|---|---|---|----|----|
| 0 | 1 | 2 | 3 | 4  | 5  |
| 6 | 7 | 8 | 9 | 1S | 6S |

Note 1: P=Pressure port; A and B=Connection port to cylinder, etc.; T=Connection port to tank

Operation Method

| A             | H             | C      | E |
|---------------|---------------|--------|---|
| Spring Offset | Spring Center | Detent |   |
|               |               |        |   |

Nominal diameter  
01 size (D03)  
03 size (D05)

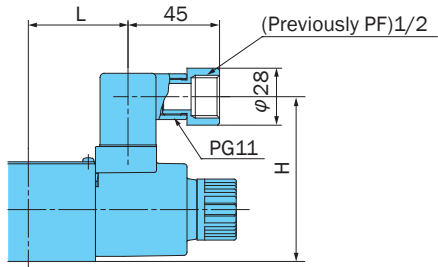
Mounting method  
G: Cascade mounting

Wet type solenoid operated directional control valve

## Options

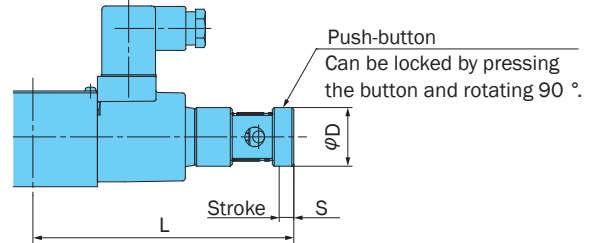
(Auxiliary Symbol Explanations)

### G Screw Adapter (Auxiliary Symbol: J)



| Model No. | L    | H     |
|-----------|------|-------|
| SA-G01    | 49   | 81    |
| SA-G03    | 60.5 | 100.5 |

### With manual push-button (Auxiliary Symbol: N)



| Part No.   |             | L     | S   | D  |
|------------|-------------|-------|-----|----|
| EDB14-D-1A | AC Solenoid | 133.5 | 7.5 | 30 |
|            | DC Solenoid | 140.5 |     |    |
| ECB14-A    | AC Solenoid | 155.5 | 9.5 | 35 |
|            | DC Solenoid | 173.5 |     |    |

### Other Options

Note: For information about the shockless and surgeless options, see page D-7.

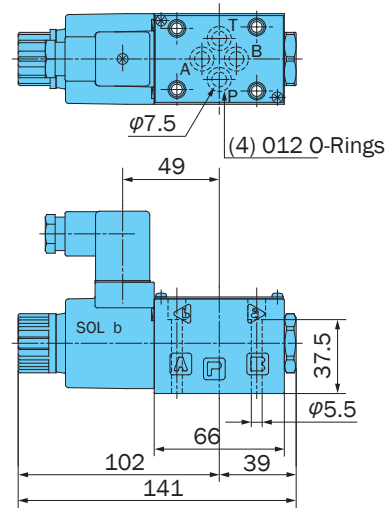
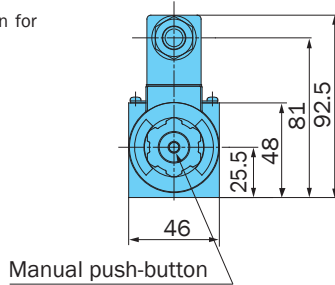
# Installation Dimension Drawings

AC Solenoid

SA-G01-A\*\*-\*-C\*-E31

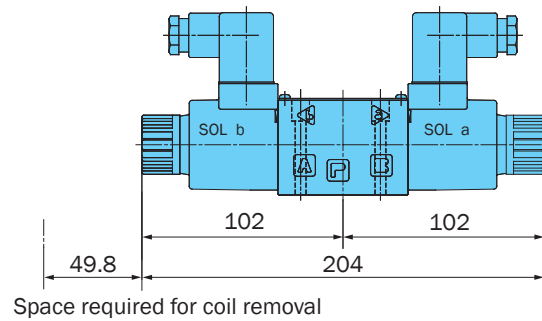
SA-G01-H\*\*-\*-C\*-E31

Note: SA-G01-H\*\*-R\*\*-E31  
The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.



SA-G01-C\*\*-R-C\*-E31

SA-G01-E\*\*-R-C\*-E31



DC Solenoid and Rectifier

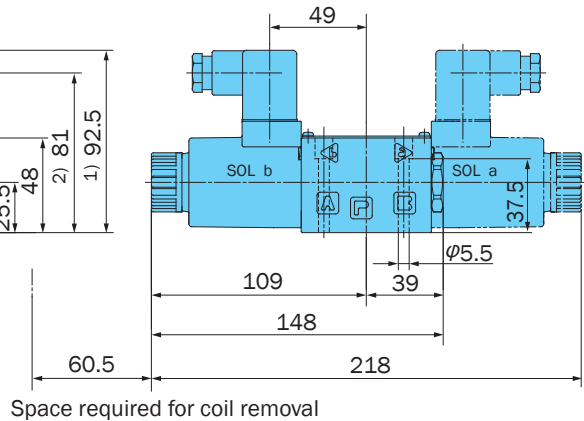
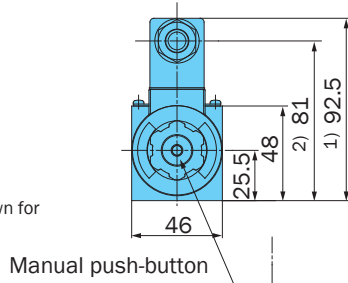
SA-G01-A\*\*-D\*/E\*-E31

SA-G01-H\*\*-D\*/E\*-E31

SA-G01-C\*\*-D\*/E\*-E31

SA-G01-E\*\*-D\*/E\*-E31

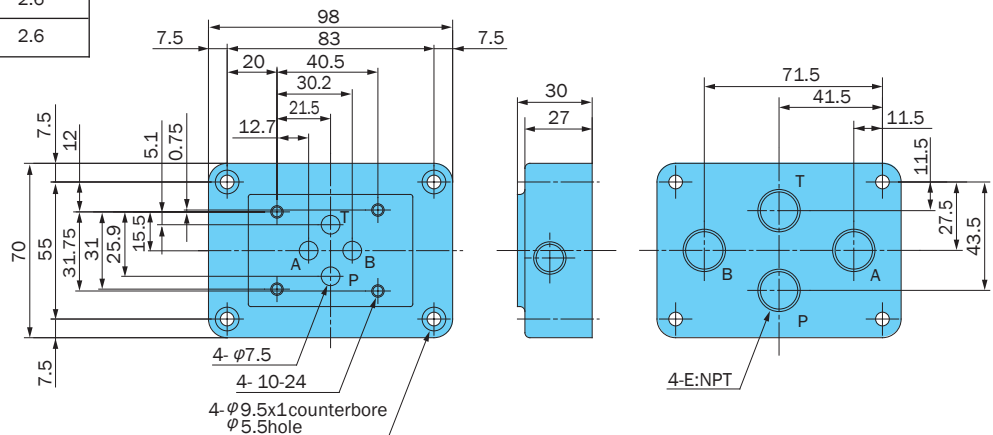
Note: 1.SA-G01-H\*\*-D\*/E\*-E31  
The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.  
2.SA-G01-\*\*-E\*-E31  
Dimension 1 is 96.  
Dimension 2 is 73.



For sub plate SA-G01

| Model No.   | E   | Weight lbs |
|-------------|-----|------------|
| MSA-01X-E10 | 1/4 | 2.6        |
| MSA-01Y-E10 | 3/8 | 2.6        |

Gasket Surface Dimensions  
( ISO 4401-03-02-0-94  
JIS B 8355 D-03-02-0-94 )



# Installation Dimension Drawings

AC Solenoid  
 SA-G03-A\*\*\*-C\*-E21  
 SA-G03-H\*\*\*-C\*-E21

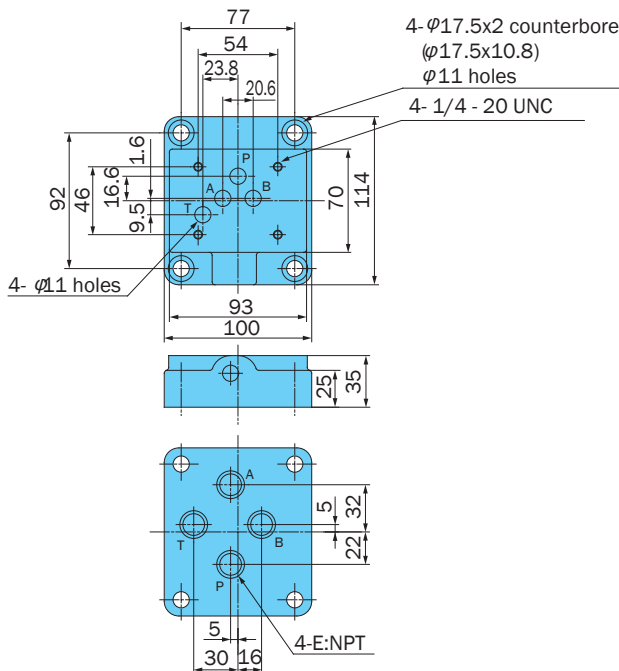
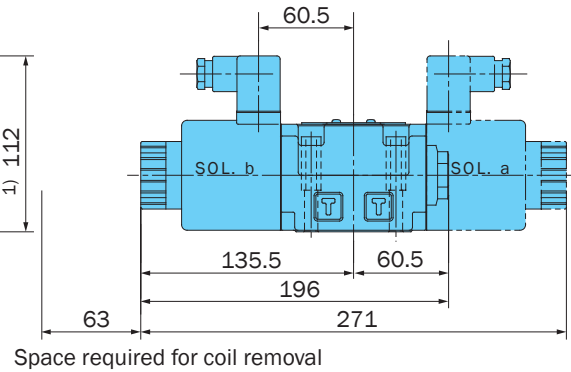
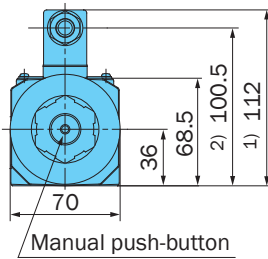
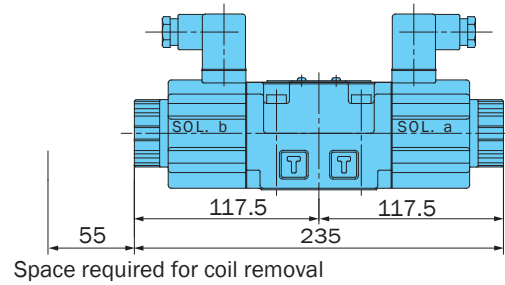
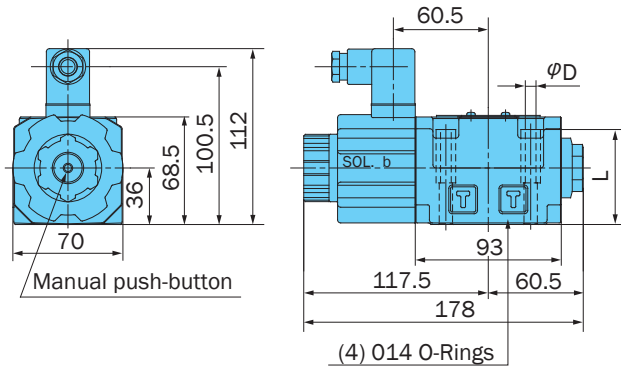
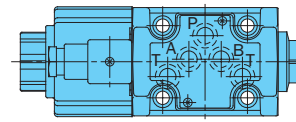
Note: SA-G03-H\*\*\*-C\*-E21  
 The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.

|          | SA-G03-***-C*-E21 | SA-G03-***-H*-E21 |
|----------|-------------------|-------------------|
| $\phi D$ | $\phi 6.8$        | $\phi 8.5$        |
| L        | 60.5              | 58                |

SA-G03-C\*\*\*-C\*-E21  
 SA-G03-E\*\*\*-C\*-E21

DC Solenoid and Rectifier  
 SA-G03-A\*\*\*-D\*/E\*-E21  
 SA-G03-H\*\*\*-D\*/E\*-E21  
 SA-G03-C\*\*\*-D\*/E\*-E21  
 SA-G03-E\*\*\*-D\*/E\*-E21

Note: 1.SA-G03-H\*\*\*-D\*/E21  
 The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.  
 2.SA-G03-\*\*\*-E\*-E21  
 Dimension 1 is 115.5.  
 Dimension 2 is 92.5.

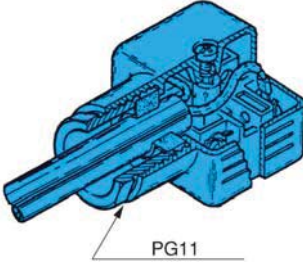
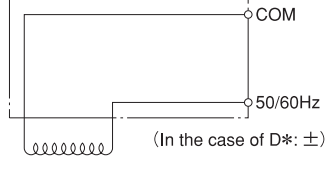
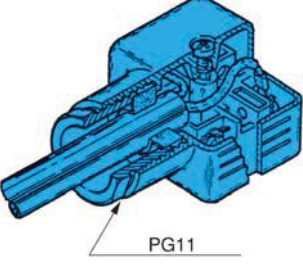
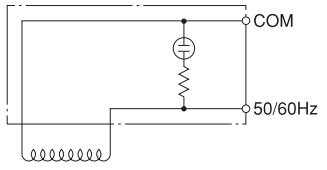
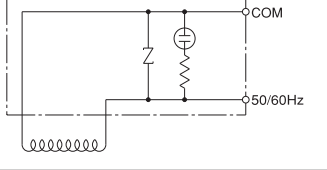
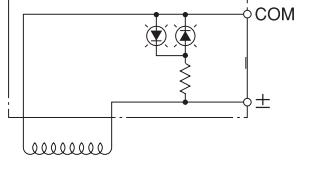
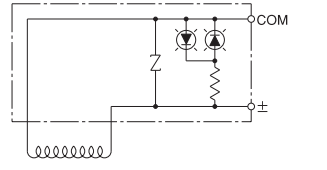
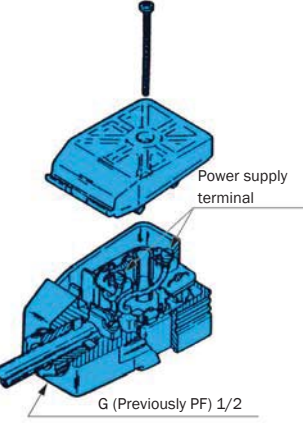
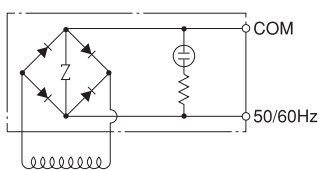


For sub plate SA-G03

| Mounting bolt       | Model No.   | E   | Weight lbs |
|---------------------|-------------|-----|------------|
| 1/4 - 20<br>x 2 3/4 | MSA-03-E10  | 3/8 | 5.0        |
|                     | MSA-03X-E10 | 1/2 |            |

Gasket surface dimensions  
 ( ISO 4401-05-04-0-94  
 JIS B 8355 D-05-04-0-94 )

• Connectors

| Model No.  | Wiring  | Electrical Circuit Diagram  |
|--|---|---|
| SA- G01-***C* 31<br>G03-***D* E21<br>(EA41-1A)   | <br>PG11 | Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.<br><br>(In the case of D*: ±) |
| SA- G01-***R-C* 31<br>G03 E21<br>(EA41-R*-1C)    | <br>PG11 |    |
| SA- G01-***GR-C* 31<br>G03 E21<br>(EA41-GRC*-1C) |   | Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.<br>                           |
| SA- G01-***R-D* 31<br>G03 E21<br>(EA41-DR*-1C)   |   |   |
| SA- G01-***GR-D* 31<br>G03 E21<br>(EA41-GRD*-1C) |   |    |
| SA- G01-***E* 31<br>G03 E21<br>(EA42-1B)         |   | <br>Power supply terminal<br>G (Previously PF) 1/2   |
| SA- G01-***R-E* 31<br>G03 E21<br>(EA42-R*-1B)    |      |   |

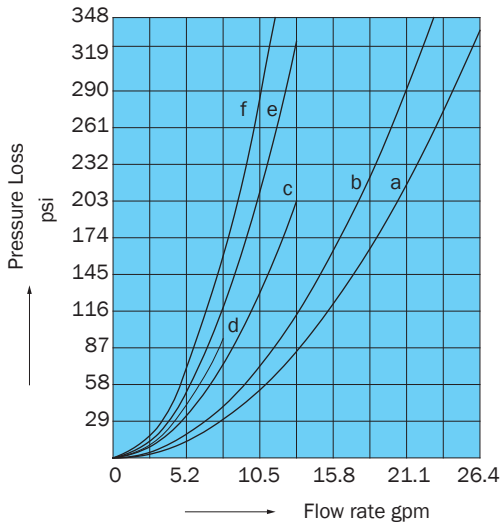
Symbols in parentheses indicate connector configuration.

- Note:
- 1.Asterisks in the connector configuration and power supply symbols are fillers for the voltage symbol (1 or 2).
  - 2.The connector cord diameter is  $\varnothing 8$  to 10. Anything outside this range causes water tightness to be lost.
  - 3.The orientation of the connectors can be changed in 90° increments by changing the terminal block.
  - 4.The cover cannot be removed unless the installation screws are removed.
  - 5.When J is specified for the auxiliary symbol, a G screw conversion adapter is attached to the connector, and the wiring port is a G (previously PF) 1/2 screw (standard: PG11). EA42 and EA42-R\* also have a G (previously PF) wiring port.
  - 6.Use M3 for round type and Y type solderless terminals.
  - 7.Tighten the M3 screws that secure connectors and terminals to a torque of 42 to 70 in lbs.
  - 8.An EA-41-1A or EA41-R\*-1C connector is used in the case of power supply type E\* with Quick Return type Q.

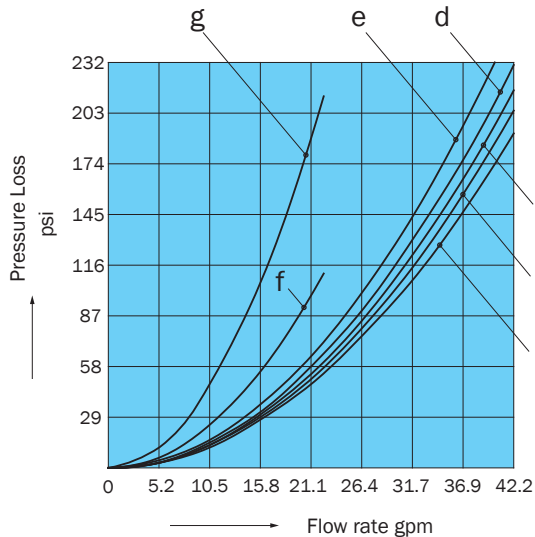
# Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics



| Pump Type | Flow Path       | P/ A | P/ B | A/ T | B/ T | P/ T |
|-----------|-----------------|------|------|------|------|------|
| SA-G01    | A2X, H2X, E2X   | d    | d    | --   | --   | --   |
|           | A3X, H3X        | b    | b    | b    | b    | --   |
|           | E3X             | b    | b    | b    | b    | --   |
|           | A3Z, H3Z, E3Z   | a    | a    | a    | a    | --   |
|           | A4, H4, C4      | a    | a    | a    | a    | a    |
|           | A5, H5, C5, C6S | b    | b    | b    | b    | --   |
|           | C1, C1S         | b    | b    | a    | b    | --   |
|           | C2              | a    | b    | b    | b    | --   |
|           | C6              | b    | b    | a    | a    | --   |
|           | C7Y             | f    | f    | e    | e    | c    |
|           | C8              | a    | f    | b    | e    | c    |
| C9        | a               | a    | b    | b    | --   |      |



| Pump Type | Flow Path     | P/ A | P/ B | A/ T | B/ T | P/ T |
|-----------|---------------|------|------|------|------|------|
| SA-G03    | A2X, H2X, E2X | e    | e    | --   | --   | --   |
|           | A5            | --   | c    | c    | --   | --   |
|           | H5            | c    | --   | --   | c    | --   |
|           | A3X, H3X, E3X | c    | c    | d    | d    | --   |
|           | A3Z, H3Z      | a    | a    | d    | d    | --   |
|           | E3Z           | b    | b    | a    | a    | --   |
|           | C1            | c    | c    | a    | c    | --   |
|           | C2            | a    | c    | c    | c    | --   |
|           | A4, H4, C4    | a    | a    | a    | a    | a    |
|           | C5, C1S, C6S  | c    | c    | c    | c    | --   |
|           | C6            | c    | c    | a    | a    | --   |
|           | C7Y           | g    | g    | g    | g    | f    |
|           | C8            | a    | g    | a    | g    | f    |
| C9        | a             | a    | c    | c    | --   |      |

## Switching Response Time

| Model No.              | Response Time (sec) |               | Measurement Conditions |
|------------------------|---------------------|---------------|------------------------|
|                        | Solenoid ON         | Spring Return |                        |
| SA-G01-**-*(GR)-C*-E31 | 0.02 to 0.03        | 0.02 to 0.03  | } 2030 psi<br>7.9 gpm  |
| SA-G01-**-*(GR)-D*-E31 | 0.03 to 0.04        | 0.02 to 0.04  |                        |
| SA-G01-**-*(R)-E*-E31  | 0.03 to 0.04        | 0.07 to 0.10  |                        |
| SA-G01-**-*(GR)-D*-E31 | 0.07 to 0.10        | 0.04 to 0.07  |                        |
| SA-G01-**-*(R)-E*-E31  | 0.07 to 0.10        | 0.10 to 0.15  |                        |
| SA-G03-**-*(GR)-C*-E21 | 0.02 to 0.03        | 0.02 to 0.03  | } 2030 psi<br>18.4 gpm |
| SA-G03-**-*(GR)-D*-E21 | 0.06 to 0.09        | 0.03 to 0.05  |                        |
| SA-G03-**-*(R)-E*-E21  | 0.07 to 0.10        | 0.10 to 0.15  |                        |
| SA-G03-**-*(GR)-D*-E21 | 0.13 to 0.15        | 0.08 to 0.15  |                        |
| SA-G03-**-*(R)-E*-E21  | 0.10 to 0.15        | 0.15 to 0.20  |                        |

Note: 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)

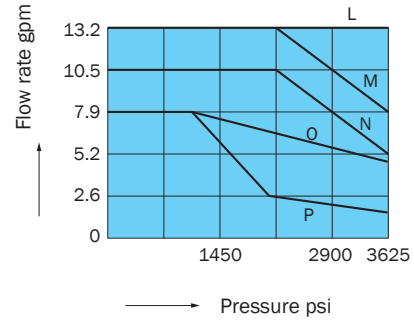
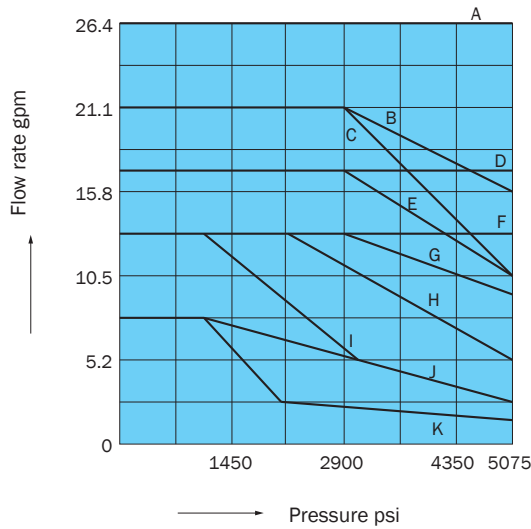


• Pressure - Flow Volume Allowable Value

| Size              | Standard Form, with AC, DC solenoid |   |   |
|-------------------|-------------------------------------|---|---|
|                   | SA-G01-**-R-**-31                   |   |   |
| Operation Example |                                     |   |   |
| Operation Symbol  |                                     |   |   |
| A2X, H2X          | -                                   | K | K |
| E2X               | -                                   | J | J |
| A3X, H3X          | B                                   | K | K |
| E3X               | A                                   | J | J |
| A3Z, H3Z          | D                                   | D | D |
| E3Z               | D                                   | D | D |
| A5                | A                                   | - | I |
| H5                | A                                   | I | - |
| C1, C6            | Note1) C(E)                         | I | I |
| C1S, C5, C6S      | A                                   | I | I |
| C2, C9            | A                                   | K | K |
| A4                | F                                   | F | F |
| H4                | F                                   | F | F |
| C4                | F                                   | F | F |
| C7Y, C8           | Note2) G(H)                         | K | K |

| Size                 | Shockless Type, with DC solenoid |   |   |
|----------------------|----------------------------------|---|---|
|                      | SA-G01-**-FR-**-31               |   |   |
| Operation Example    |                                  |   |   |
| Operation Symbol     |                                  |   |   |
| A2X, H2X             | -                                | P | - |
| E2X                  | -                                | O | P |
| A3X, H3X             | L                                | P | P |
| E3X                  | L                                | O | L |
| A3Z, H3Z             | L                                | L | L |
| E3Z                  | L                                | L | P |
| A5                   | L                                | - |   |
| H5                   | L                                | P |   |
| C1, C6               | M                                | P |   |
| C1S, C2, C5, C6S, C9 | L                                | P |   |
| A4, H4               | L                                | L |   |
| C4                   | L                                | L |   |
| C7Y, C8              | N                                | P |   |

Note: 1. Letter in parentheses is for AC solenoid.  
 2. Letter in parentheses is for solenoid with built-in rectifier, but without Quick Return, and for DC solenoid with surge voltage absorbing diode on the electrical circuit.



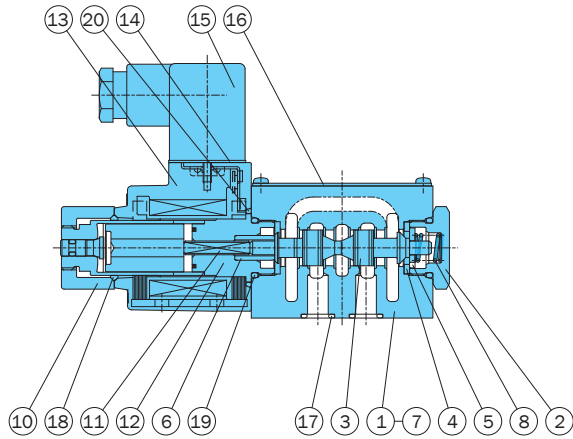
• Pressure - Flow Volume Allowable Value

| Model No.            | Standard Form, with AC, DC solenoid |      |      | Standard Form, with DC solenoid |      |      |
|----------------------|-------------------------------------|------|------|---------------------------------|------|------|
|                      | SA-G03-**-C*-E21                    |      |      | SA-G03-**-**-E21                |      |      |
| Operation Example    |                                     |      |      |                                 |      |      |
| Operation Symbol     |                                     |      |      |                                 |      |      |
| A2X                  | --                                  | F    | E    | --                              | G    | H    |
| H2X                  | --                                  | E    | F    | --                              | H    | G    |
| E2X                  | --                                  | C    | C    | --                              | D    | D    |
| A3X                  | A                                   | E    | E    | A                               | F    | H    |
| H3X                  | A                                   | E    | E    | A                               | H    | F    |
| A3Z                  | A                                   | A    | C    | A                               | D    | D    |
| H3Z                  | A                                   | C    | A    | A                               | D    | D    |
| E3X, E3Z             | A                                   | C    | C    | A                               | D    | D    |
| A5                   | A                                   | --   | D    | A                               | --   | G    |
| H5                   | A                                   | D    | --   | A                               | G    | --   |
| C1S, C5, C6S         | A                                   | D    | D    | A                               | G    | G    |
| C1, C6               | A                                   | D    | D    | B                               | G    | G    |
| C2                   | A                                   | G    | D    | A                               | I    | G    |
| A4, H4, C4           | A                                   | A    | A    | A                               | A    | A    |
| C9                   | A                                   | G    | G    | A                               | I    | I    |
| C7Y, C8              | B                                   | B    | B    | Note1) C(E)                     | C(E) | C(E) |
|                      |                                     |      |      |                                 |      |      |
| Model No.            | Shockless Type, with DC solenoid    |      |      |                                 |      |      |
|                      | SA-G03-**-F**-E21                   |      |      |                                 |      |      |
| Operation Example    |                                     |      |      |                                 |      |      |
| Operation Symbol     |                                     |      |      |                                 |      |      |
| A2X                  | ☒                                   | E    | F    |                                 |      |      |
| H2X                  | ☒                                   | F    | E    |                                 |      |      |
| E2X                  | ☒                                   | C    | C    |                                 |      |      |
| A3X                  | A                                   | D    | F    |                                 |      |      |
| H3X                  | A                                   | F    | D    |                                 |      |      |
| A3Z                  | A                                   | C    | C    |                                 |      |      |
| H3Z                  | A                                   | C    | C    |                                 |      |      |
| E3X, E3Z             | A                                   | C    | C    |                                 |      |      |
| A5                   | A                                   | --   | E    |                                 |      |      |
| H5                   | A                                   | E    | --   |                                 |      |      |
| C1, C1S, C5, C6, C6S | A                                   | E    | E    |                                 |      |      |
| C2                   | A                                   | G    | E    |                                 |      |      |
| A4, H4, C4           | A                                   | A    | A    |                                 |      |      |
| C9                   | A                                   | G    | G    |                                 |      |      |
| C7Y, C8              | Note 1: B(H)                        | B(H) | B(H) |                                 |      |      |

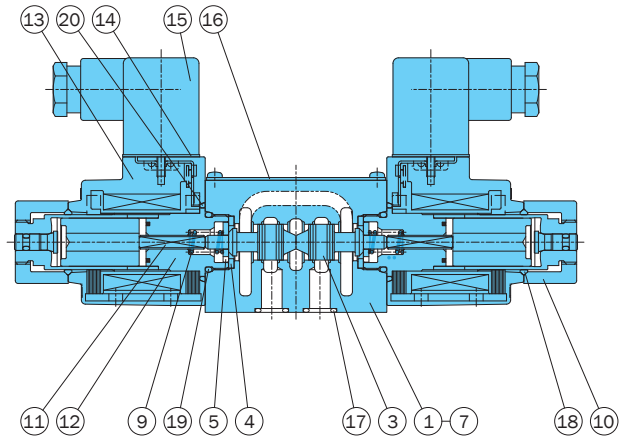
- Note: 1. Letter in parentheses is for solenoid with built-in rectifier (E\*), but without Quick Return, and for DC solenoid (D\*) with surge voltage absorbing diode on the electrical circuit.  
 2. There is no shockless type for the AC solenoid (C\*), so use a solenoid with built-in rectifier (E\*) when shockless operation is required with an AC power supply.  
 3. The maximum flow rate is the allowable value of each port.

**Cross-sectional Drawing**

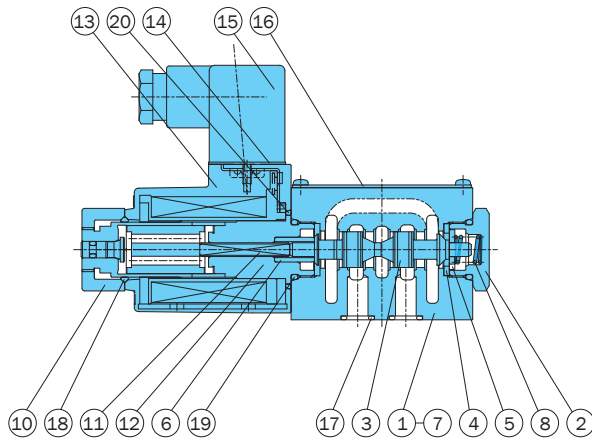
SA-G01-A\*\*-C\*-31



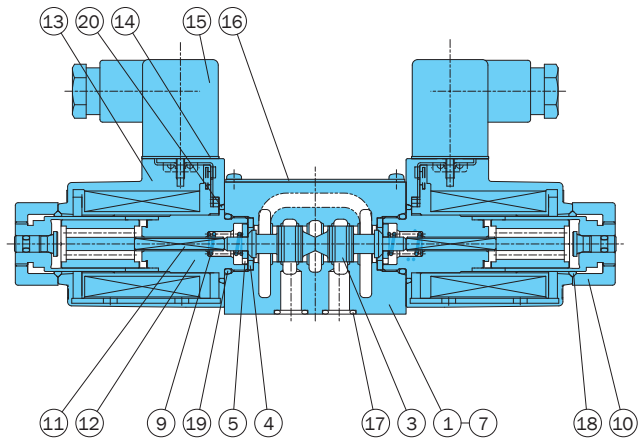
SA-G01-C\*\*-C\*-31



SA-G01-A\*\*-D/E\*-31



SA-G01-C\*\*-D/E\*-31



List of Sealing Parts

| Part No. | Part Name | Part Number     | Q'ty            |                 |
|----------|-----------|-----------------|-----------------|-----------------|
|          |           |                 | Single Solenoid | Double Solenoid |
| 17       | O-ring    | AS568-012(Hs90) | 4               | 4               |
| 18       | O-ring    | 1A-P20          | 1               | 2               |
| 19       | O-ring    | 1B-P18          | 2               | 2               |
| 20       | O-ring    | S-25            | 1               | 2               |

Note: 1A and 1B are JIS Standard B 2401, while AS568 is SAE standard.

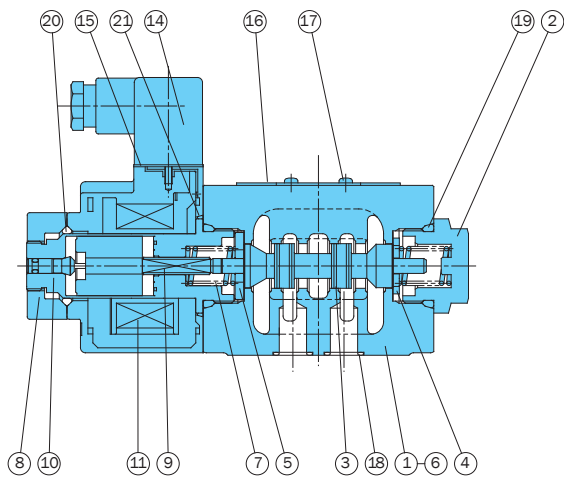
Seal Kit Number

| Single Solenoid | Double Solenoid |
|-----------------|-----------------|
| EDCS-A          | EDCS-C          |

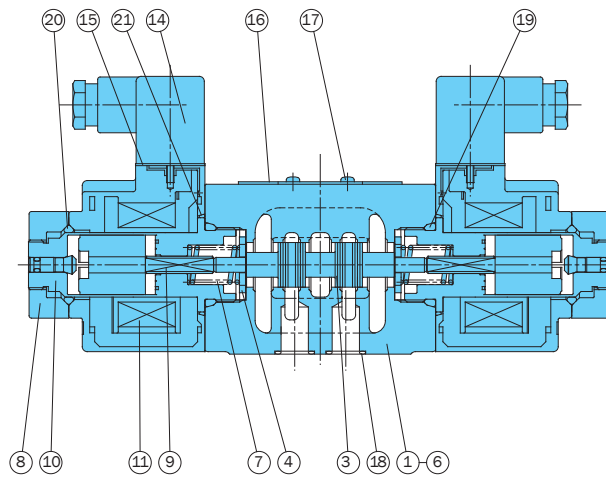
| Part No. | Part Name  | Part No. | Part Name      |
|----------|------------|----------|----------------|
| 1        | Body       | 11       | Rod            |
| 2        | Plug       | 12       | Solenoid guide |
| 3        | Spool      | 13       | Solenoid coil  |
| 4        | Retainer A | 14       | Packing        |
| 5        | Retainer B | 15       | Connector      |
| 6        | Spring pin | 16       | Nameplate      |
| 7        | Spacer     | 17       | O-ring         |
| 8        | Spring A   | 18       | O-ring         |
| 9        | Spring C   | 19       | O-ring         |
| 10       | Nut        | 20       | O-ring         |

**Cross-sectional Drawing**

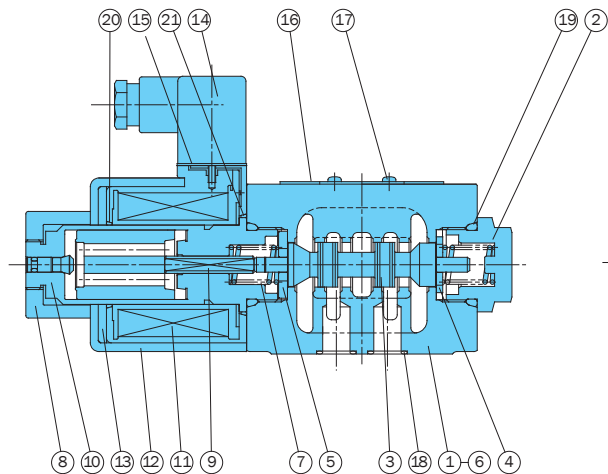
SA-G03-A\*\*-C\*-E21



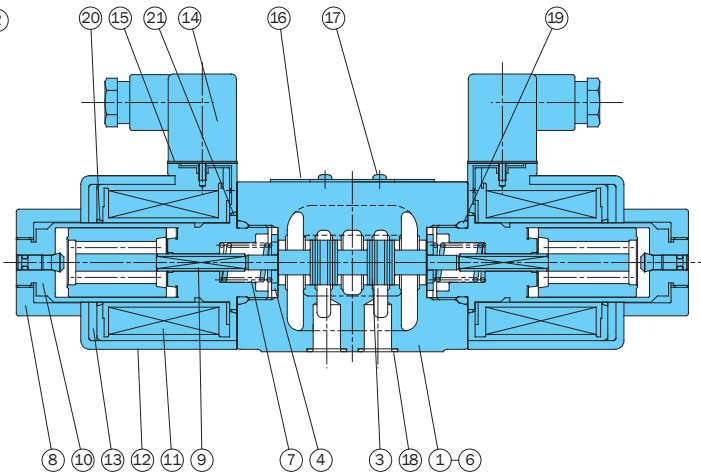
SA-G03-C\*\*-C\*-E21



SA-G03-A\*\*-D/E\*-E21



SA-G03-C\*\*-D/E\*-E21



List of Sealing Parts

| Part No. | Part Name | Type/Part Number |           | Q'ty            |                 |
|----------|-----------|------------------|-----------|-----------------|-----------------|
|          |           | AC SOL.          | DC SOL.   | Single Solenoid | Double Solenoid |
| 18       | O-ring    | AS568-014(Hs90)  |           | 5               | 5               |
| 19       | O-ring    | 1B-P28           |           | 2               | 2               |
| 20       | O-ring    | 1A-P26           | AS568-026 | 1               | 2               |
| 21       | O-ring    | AS568-029        |           | 1               | 2               |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

| Part No. | Part Name      | Part No. | Part Name         |
|----------|----------------|----------|-------------------|
| 1        | Body           | 11       | Solenoid coil     |
| 2        | Plug           | 12       | Coil case         |
| 3        | Spool          | 13       | Coil yoke         |
| 4        | Retainer       | 14       | Connector         |
| 5        | Retainer B     | 15       | Connector packing |
| 6        | Spacer         | 16       | Nameplate         |
| 7        | Spring         | 17       | Screw             |
| 8        | Nut            | 18       | O-ring            |
| 9        | Rod            | 19       | O-ring            |
| 10       | Solenoid guide | 20       | O-ring            |
|          |                | 21       | O-ring            |

Seal Kit Number

| AC SOL.         |                 | DC SOL.         |                 |
|-----------------|-----------------|-----------------|-----------------|
| Single Solenoid | Double Solenoid | Single Solenoid | Double Solenoid |
| ECBS-AA         | ECBS-CA         | ECBS-AD         | ECBS-CD         |

### SE Series Lower Power Solenoid Valve

10.5 to 15.8 gpm  
1450 to 2320 psi

#### Features

##### Low current, low power

The SE series magnetic switching valve's solenoid has significantly lower power consumption.

##### Directly drivable by a programmable controller

Low-current operation means not only allows direct drive by a programmable controller (PC) output circuit, it also enables the use of a compact and simple control circuit.

##### Little coil temperature rise

Low power operation means there is little heat generated from the coil, which minimizes the effects of heat on mechanisms. Even with the AC solenoid, there is little chance of coil burnout.

##### With M12-4 pin connector (option)

Makes it easier to interface with open networks like Device Net. This connector streamlines wiring work. The diode for

preventing current back surge is built in to the terminal box to protect the slave unit connection. (With M12-4 pin connector)

##### Global compliance (G01 size)

Meets overseas safety standards TÜV (CE marking). Can be used safely around the world.

#### Specifications

| Operation Symbol | JIS Symbol | SE-G01-**-*(G)R-**-40                   |                              | SE-G03-**-GR-**-*(J) 30                 |                              |
|------------------|------------|---|------------------------------|---|------------------------------|
|                  |            | Rated Flow Rate - Maximum Flow Rate gpm | Maximum Working Pressure psi | Rated Flow Rate - Maximum Flow Rate gpm | Maximum Working Pressure psi |
| A2X              |            | 7.9                                     | 2320                         | 10.5                                    | 1450                         |
| A3X              |            |   |                              | 13.2                                    |                              |
| H3X              |            | 10.5                                    |                              | —                                       |                              |
| E3X              |            | 13.2                                    |                              |   |                              |
| C4               |            | 7.9                                     |                              | 15.8                                    |                              |
| C5               |            | 10.5                                    |                              |   |                              |
| C6               |            |   |                              |   |                              |

Note: The maximum flow rate of each valve depends on the pressure. For details, see page D-32.

##### • Handling

- In order to realize the full benefits of the solenoid valve, configure piping so oil is constantly supplied to the T(DR) port.
- Ensure that surge pressure in excess of the maximum allowable back pressure can be accidentally at the T port.
- Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.

- When using petroleum type operating fluid, use ISO VG 32, 46.
- Be sure to note the allowable pressure range of the coil being used.
- Maintaining a switching position under high pressure for a long period can cause abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.
- When using a detent type (E3X), provide constant energization when secure maintenance of the switching position is required.
- Note that manual pin operating pressure changes in accordance with tank line back pressure.
- If you do not select the option with the M12-4 pin connector, current back surge may occur because there is no solenoid in the central terminal box. Therefore, install solenoid valves to protect against current back surge on both ends of the coil in the output circuit of the programmable controller (PC) if directly operating the solenoid valves.

#### Solenoid Assembly Specifications

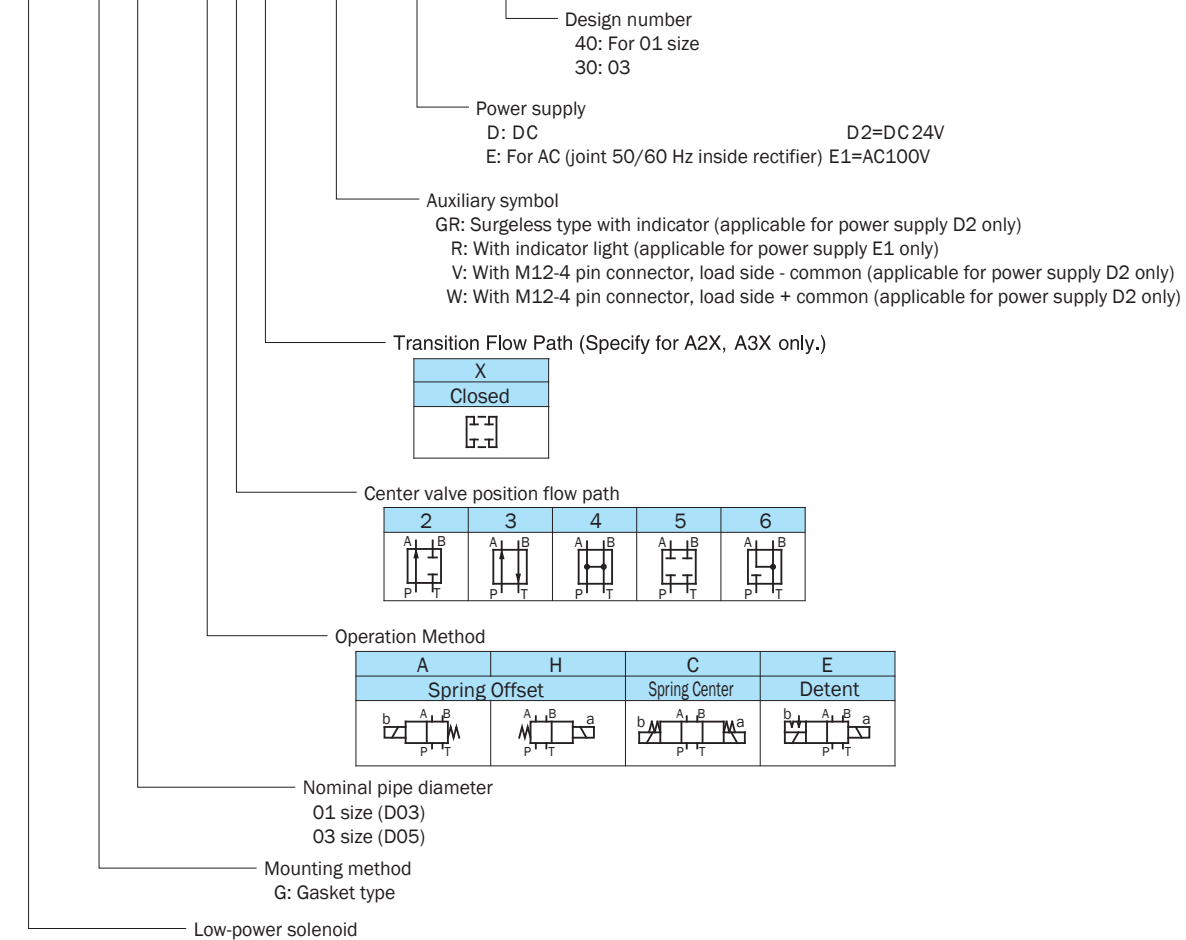
| Solenoid Type              | Power Supply Type | Voltage (V) | Frequency (Hz) | For SE-G01         |                     |                   |                             | For SE-G03         |                     |                   |                             |
|----------------------------|-------------------|-------------|----------------|--------------------|---------------------|-------------------|-----------------------------|--------------------|---------------------|-------------------|-----------------------------|
|                            |                   |             |                | Solenoid Coil Type | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) | Solenoid Coil Type | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) |
| Built-in rectifier type AC | E1                | AC100       | 50             | EED64-E1           | 0.08                | 7.0               | 80 to 120                   | SLH1-03BR1-01      | 0.06                | 5.8               | 80 to 120                   |
|                            |                   |             | 60             |                    |                     |                   |                             |                    |                     |                   |                             |
| DC                         | D2                | DC24        | —              | EED64-D2           | 0.2                 | 4.8               | 21.6 to 26.4                | SLH1-03BD2-01      | 0.2                 | 4.8               | 21.6 to 26.4                |

| Solenoid Type                     |                                       | SE-G01                              |                                    | SE-G03  |                                    |  |
|-----------------------------------|---------------------------------------|-------------------------------------|------------------------------------|---|------------------------------------|--|
|                                   |                                       | DC Solenoid                         | Internal DC solenoid for rectifier | DC Solenoid   | Internal DC solenoid for rectifier |  |
|                                   |                                       | D2                                  | E1                                 | D2  | E1                                 |  |
| Maximum Working Pressure          | P, A, B Ports                         | 2320 psi                            |                                    | 1450 psi  |                                    |  |
| Maximum Allowable Backpressure    | T port                                | 2320 psi                            |                                    | 1450 psi<br>(In the case of 290 psi operation symbol E3X) |                                    |  |
| Changeover Frequency (per minute) |                                       | 120                                 |                                    | 120   |                                    |  |
| Standard                          | Indicator light Surgeless             | GR                                  | R                                  |   | GR                                 |  |
|                                   |                                       |                                     |                                    |   |                                    |  |
| Weight lbs                        | Double Solenoid                       | 4.8                                 |                                    | 7.7   |                                    |  |
|                                   | Single Solenoid                       | 3.7                                 |                                    | 7.2   |                                    |  |
| Operating Environment             | Dust Resistance/Water Resistance Rank | IP64 (Dust-tight, Splash proof)     |                                    | IP65 (Dust-tight, Waterjet-proof)                         |                                    |  |
|                                   | Ambient Temperature                   | -4 to 122° F                        |                                    | 14 to 122° F  |                                    |  |
|                                   | Operating Fluid                       | Temperature Range                   | -4 to 158° F                       |   | 32 to 149° F                       |  |
|                                   |                                       | Viscosity Range                     | 15 to 300 centistokes              |   |                                    |  |
|                                   | Filtration                            | 10 microns or less                  |                                    |   |                                    |  |
| Bundled Accessories               | Mounting bolt                         | (4) 10-24 x 1 3/4 LG (not included) |                                    | 1/4-20 UNC x 2 3/4  |                                    |  |
|                                   | Tightening Torque                     | 3.6 to 5 ft lbs                     |                                    | 7.2 to 9.4 ft lbs   |                                    |  |

Note: For mounting bolts, use grade 8 or equivalent.

### Understanding Model Numbers

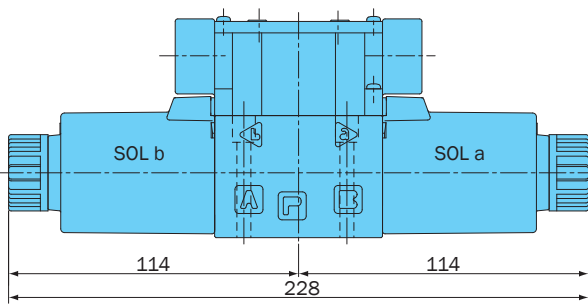
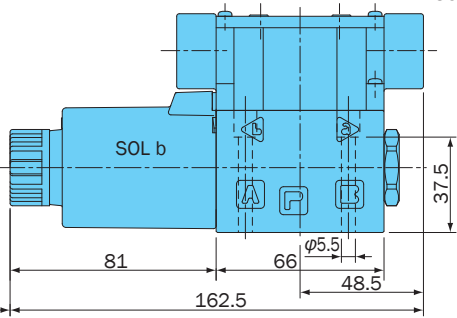
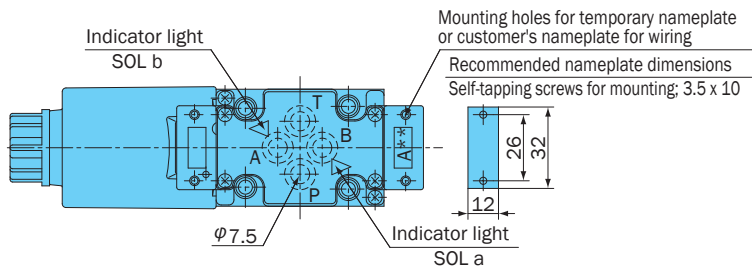
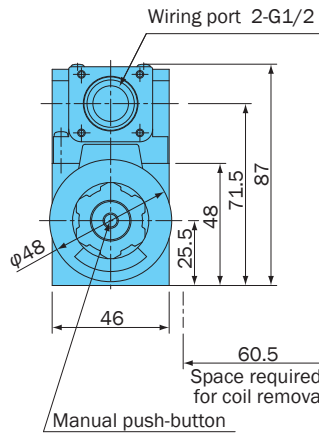
**SE - G 03 - A 3 X - GR - C2 - J30**



### Installation Dimension Drawings

SE-G01-A\*\*\*-(G)R-\*\*-40  
 SE-G01-H\*\*\*-(G)R-\*\*-40

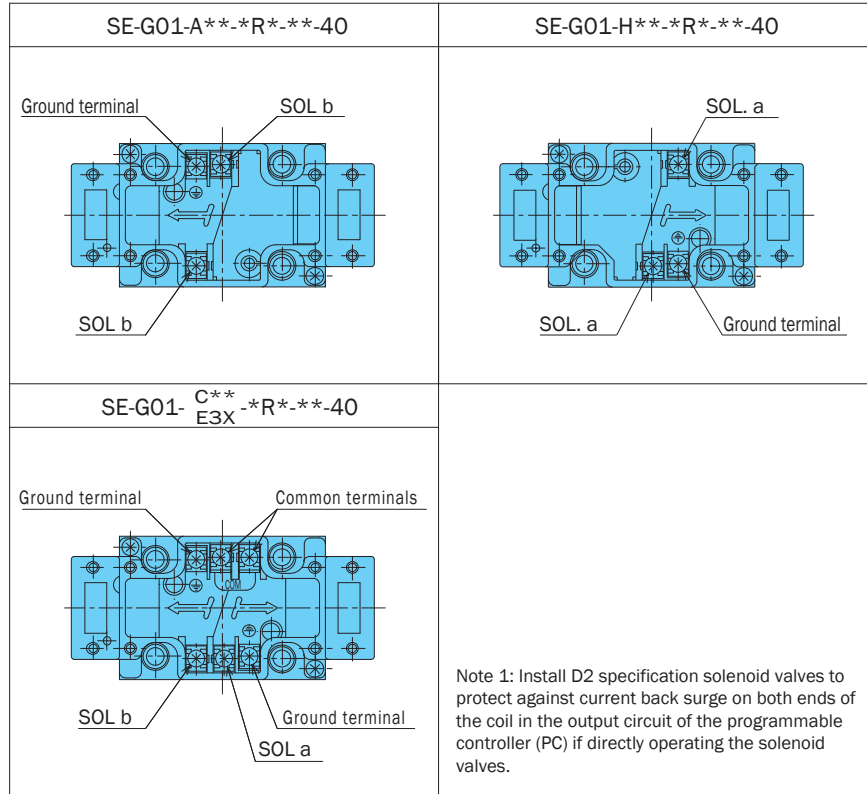
Note: For SE-G01-H\*\*\* (G) R \*\* 40, the solenoid is on the opposite side as that shown in the diagram (SOL.a).



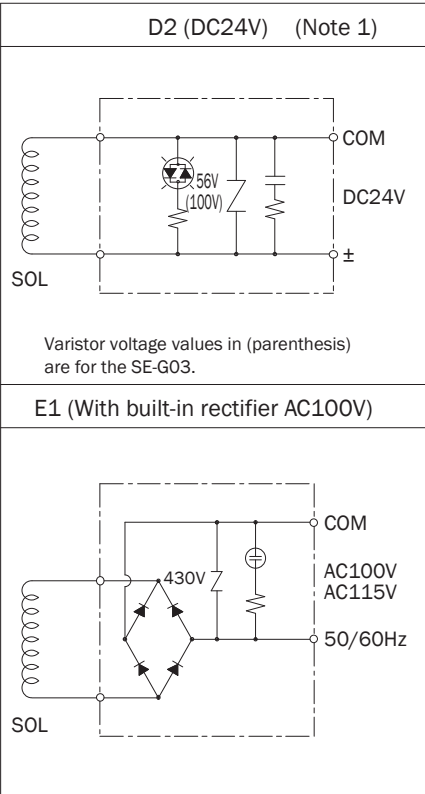
SE-G01-C\*\*-(G)R-\*\*-40  
 SE-G01-E3X-(G)R-\*\*-40

Note: Gasket surface dimensions and sub plate are the same as those for SS-G01. See page D-8 for more information.

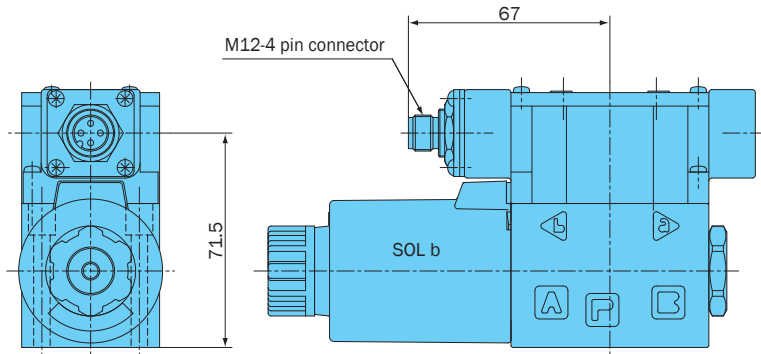
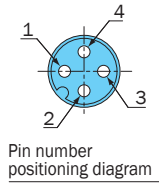
Wiring diagram for central terminal box kit



Electrical circuit diagram for central terminal box kit

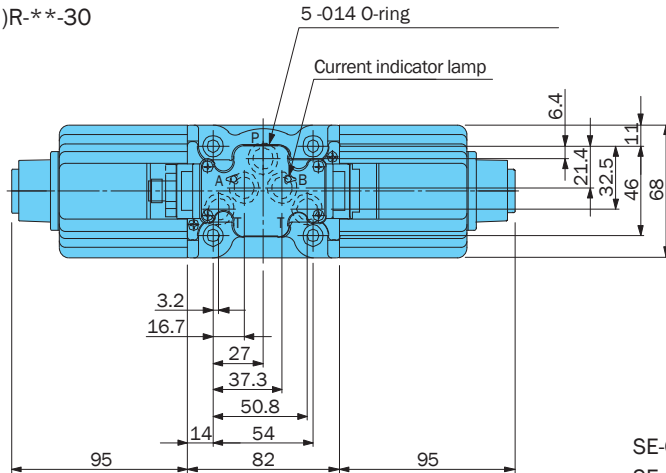


With M12-4 pin connector  
 SE-G01-\*\*-GRV-D2-40  
 SE-G01-\*\*-GRW-D2-40

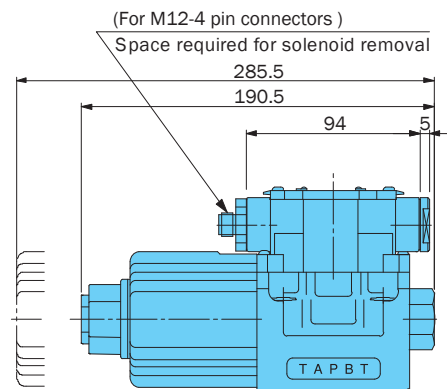
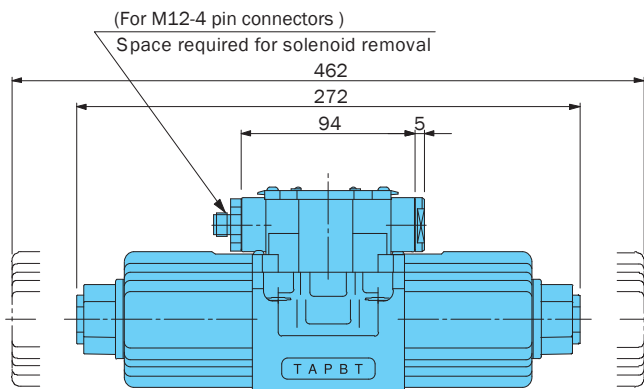


|        | M12-4 pin connector  | Electrical Circuit Diagram |
|--------|--|----------------------------|
| Type V | <p>1: Not used<br/>           2: SOL a<br/>           3: COM (-)<br/>           4: SOL b</p> |                            |
| Type W | <p>1: COM (+)<br/>           2: SOL a<br/>           3: Not used<br/>           4: SOL b</p> |                            |

SE-G03-A\*\*-(G)R\*\*-30



SE-G03-C\*-(G)R\*\*-30  
 SE-G03-E3X-(G)R\*\*-30

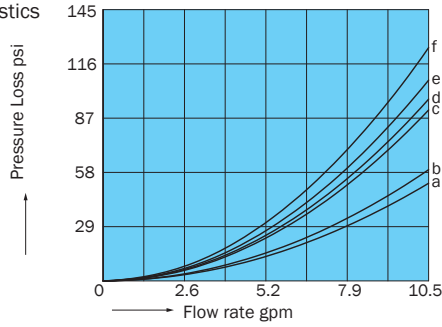




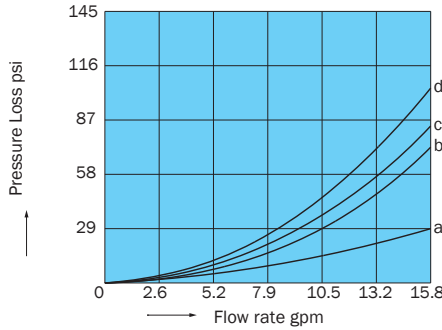
# Performance Curves

Differential Hydraulic Fluid Viscosity 32 centistokes

Pressure Loss Characteristics



| Pump Type | Flow Path | P/ A | P/ B | A/ T | B/ T | P/ T |
|-----------|-----------|------|------|------|------|------|
| SE-G01    | A2X       | d    | f    | -    | -    | -    |
|           | A3X       | f    | f    | e    | e    | -    |
|           | H3X       | f    | f    | e    | e    | -    |
|           | E3X       | c    | c    | e    | e    | -    |
|           | C4        | b    | b    | b    | b    | d    |
|           | C5        | e    | e    | d    | d    | -    |
| C6        | f         | f    | a    | a    | -    |      |



| Pump Type | Flow Path | P/ A | P/ B | A/ T | B/ T | P/ T |
|-----------|-----------|------|------|------|------|------|
| SE-G03    | A2X       | d    | d    | -    | -    | -    |
|           | A3X       | d    | d    | d    | d    | -    |
|           | E3X       | d    | d    | c    | c    | -    |
|           | C4        | c    | c    | a    | a    | b    |
|           | C5        | d    | d    | d    | d    | -    |
|           | C6        | d    | d    | b    | b    | -    |

Pressure -  
Flow Volume  
Allowable Value

| Pump Type         | SE-G01 |   |   | SE-G03 |   |   |
|-------------------|--------|---|---|--------|---|---|
| Operation Example |        |   |   |        |   |   |
| Operation symbol  |        |   |   |        |   |   |
| A2X               | -      | D | D | -      | E | A |
| A3X               | A      | D | D | C      | E | A |
| H3X               | A      | D | D | -      | - | - |
| E3X               | A      | C | C | D      | D | C |
| C4                | C      | C | C | C      | F | C |
| C5                | A      | D | D | A      | B | B |
| C6                | B      | D | D | A      | B | B |

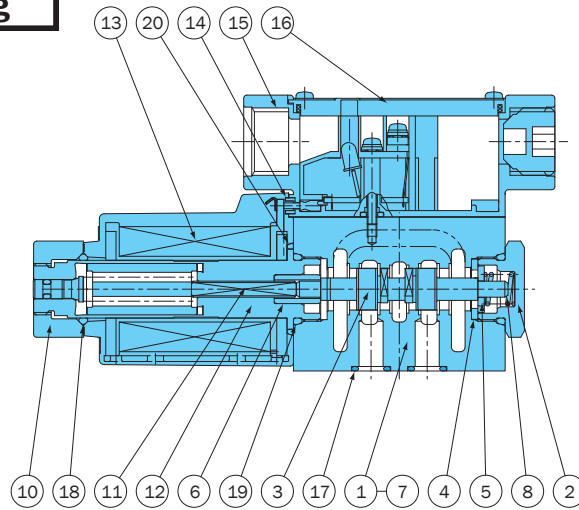
Note: 1.The maximum flow rate is the value when a rated 90%V is applied following solenoid temperature rise and saturation.  
2.The maximum flow rate is the allowable value of each port.

D

Solenoid Valves

## Cross-sectional Drawing

SE-G01-A3X-(G)R-\*\*-40



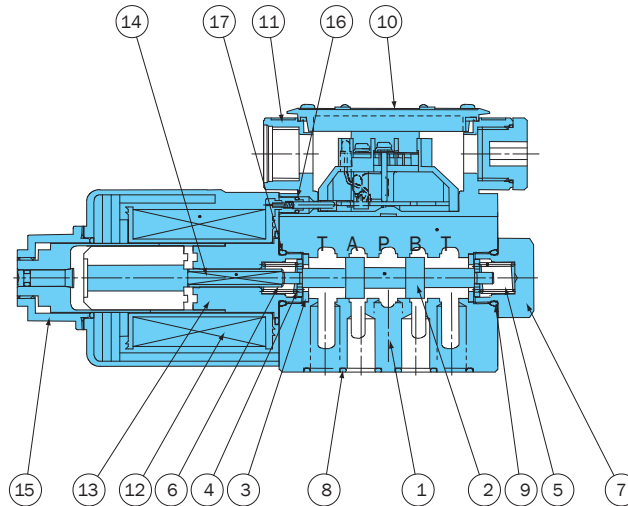
| Part No. | Part Name        |
|----------|------------------|
| 1        | Body             |
| 2        | Plug             |
| 3        | Spool            |
| 4        | Retainer A       |
| 5        | Retainer B       |
| 6        | Spring pin       |
| 7        | Spacer           |
| 8        | Spring A         |
| 9        | Spring C         |
| 10       | Nut              |
| 11       | Rod              |
| 12       | Solenoid guide   |
| 13       | Solenoid coil    |
| 14       | Packing          |
| 15       | Terminal box kit |
| 16       | Nameplate        |
| 17       | O-ring           |
| 18       | O-ring           |
| 19       | O-ring           |
| 20       | O-ring           |

### List of Sealing Parts

| Part No. | Part Name | SE-G01          |                 |                 |
|----------|-----------|-----------------|-----------------|-----------------|
|          |           | Part Number     | Q'ty            |                 |
|          |           |                 | Single Solenoid | Double Solenoid |
| 17       | O-ring    | AS568-012(HS90) | 4               | 4               |
| 18       | O-ring    | 1A-P18          | 1               | 2               |
| 19       | O-ring    | 1B-P18          | 2               | 2               |
| 20       | O-ring    | S-25            | 1               | 2               |

Note: O-ring 1A-\*\*-\*\* and 1B-\*\*-\*\* indicate JIS Standard B 2401-1A-\*\*-\*\* and 1B-\*\*-\*\*.

SE-G03-A3X-GR-\*\*-\*(J)30



| Part No. | Part Name        |
|----------|------------------|
| 1        | Body             |
| 2        | Spool            |
| 3        | Spacer           |
| 4        | Holder           |
| 5        | Spring           |
| 6        | Spring           |
| 7        | Plug             |
| 8        | O-ring           |
| 9        | O-ring           |
| 10       | Nameplate        |
| 11       | Terminal box kit |
| 12       | Solenoid coil    |
| 13       | Solenoid guide   |
| 14       | Rod              |
| 15       | Nut              |
| 16       | O-ring           |
| 17       | O-ring           |

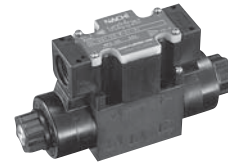
### List of Sealing Parts

| Part No. | Part Name | SE-G03      |                 |                 |
|----------|-----------|-------------|-----------------|-----------------|
|          |           | Part Number | Q'ty            |                 |
|          |           |             | Single Solenoid | Double Solenoid |
| 8        | O-ring    | 1B-P12      | 5               | 5               |
| 9, 17    | O-ring    | 1B-P18      | 2               | 2               |
| 16       | O-ring    | 1A-P3       | 2               | 4               |

Note: O-ring 1A-\*\*-\*\* and 1B-\*\*-\*\* indicate JIS Standard B 2401-1A-\*\*-\*\* and 1B-\*\*-\*\*.

### Seal Kit Number

| SE-G01          |                 | SE-G03          |                 |
|-----------------|-----------------|-----------------|-----------------|
| Single Solenoid | Double Solenoid | Single Solenoid | Double Solenoid |
| EEDS-01A        | EEDS-01C        | EECS-03A        | EECS-03C        |



### SL Series (Wiring System: Central Terminal Box) Lower Power Solenoid Valve

7.9 gpm  
1015 psi

### Features

#### Very long life

The movable iron core of the wet type solenoid is immersed in oil, which keeps it lubricated and cushions it from impact and vibration, ensuring very long life.

#### Low switching noise

The wet-type solenoid valve provides very low core switching noise, for quiet operation.

#### Low power consumption type.

The low power for the AC solenoid 9.6 W (60 Hz), DC solenoid 10 W contribute to energy conservation.

#### Easy connections

A special wiring box provides a COM port and indicator light as standard for simple wiring and maintenance.

#### Easy coil replacement

A plug-in type coil enables one-touch coil replacement.

#### Wide-ranging backward compatibility

makes it simple to replace previous valve models with this one. Combining this valve with a modular valve contributes to the compact configuration of the overall device.

#### Global support

Meets overseas safety standards (CE, UL, and CSA). It can be safely used anywhere in the world. Contact your agent for certified products.

### Specifications

| JIS Symbol | Operation symbol | Maximum flow rate gpm |
|------------|------------------|-----------------------|
|            | -A5-             | 7.9                   |
|            | -H5-             |                       |
|            | -A3X-            |                       |
|            | -H3X-            |                       |
|            | -E3X-            |                       |
|            | -C1-             |                       |
|            | -C2-             |                       |

| JIS Symbol | Operation symbol | Maximum flow rate gpm |
|------------|------------------|-----------------------|
|            | -C4-             | 7.9                   |
|            | -C5-             |                       |
|            | -C6-             |                       |
|            | -C9-             |                       |
|            | -C6S-            |                       |
|            | -C7Y-            | 3.9                   |

| Solenoid Type                     |                         | AC Solenoid                   |    | DC Solenoid              |     |
|-----------------------------------|-------------------------|-------------------------------|----|--------------------------|-----|
|                                   |                         | C1                            | C2 | Built-in Rectifier<br>E1 | D2  |
| Maximum Working Pressure          | P.A.B. Ports            | 1015 psi                      |    |                          |     |
| Maximum Allowable Backpressure    | T Port                  | 1015 psi                      |    |                          |     |
| Changeover Frequency (per minute) |                         | 240                           |    | 120                      | 240 |
| Standard                          | Indicator light         | R                             |    |                          |     |
| Options                           | Surgeless               | G                             |    | -                        | G   |
|                                   | With manual push-button | N                             |    |                          |     |
|                                   | Quick Return            | -                             |    | Q                        | -   |
| Mass lbs                          | Double Solenoid         | 3.3                           |    | 4.4                      |     |
|                                   | Single Solenoid         | 2.6                           |    | 3.3                      |     |
| Recommended                       | Ambient Temperature     | -4 to 158° F                  |    |                          |     |
|                                   | Viscosity Range         | 15 to 300 centistokes         |    |                          |     |
|                                   | Viscosity Index         | 90 or greater                 |    |                          |     |
|                                   | Filtration              | 10 microns or less            |    |                          |     |
| Mounting bolt                     |                         | Allen head - 10-24 x 1 3/4 LG |    |                          |     |
| Tightening Torque                 |                         | 3.6 to 5 ft lbs               |    |                          |     |

Note: Mounting bolts are not included.

• Handling

- 1 In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T port. Never use a stopper plug in the T port.
- 2 Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
- 3 Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- 4 Always keep the operating fluid clean. (contamination level: 12 or lower)

- 5 When using petroleum type operating fluid, use ISO VG 32, 46.
- 6 Use the SS series solenoid valve when using fire resistant hydraulic operating fluid.
- 7 Use this valve only within the allowable voltage range.
- 8 Do not allow the AC solenoid to become charged until you install the coil into the valve.
- 9 Maintaining a switching position under high pressure for a long period can cause abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.

- 10 When using a detent type (3X), use constant energization in order to securely maintain the switching position.
- 11 Note that manual pin operating pressure changes in accordance with tank line back pressure.
- 12 Use the following table for specification when a sub plate is required.

| Model No.   | Pipe Diameter | Maximum flow rate gpm | Weight lbs |
|-------------|---------------|-----------------------|------------|
| MSA-01X-E10 | 1/4           | 5.2                   | 2.6        |
| MSA-01Y-E10 | 3/8           | 10.5                  |            |

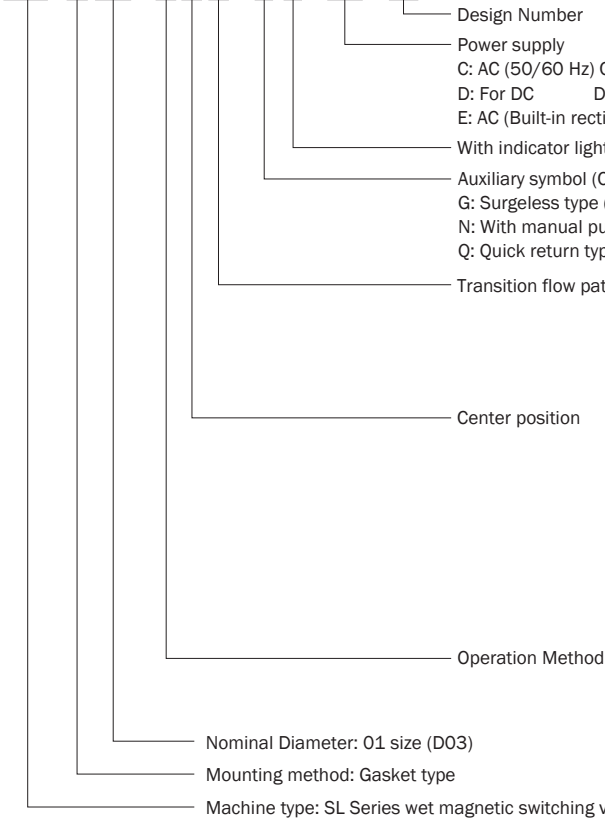
• Solenoid Assembly Specifications

| Solenoid Type              | AC Solenoid             |           |       |           |            |       | DC Solenoid        |             |              |
|----------------------------|-------------------------|-----------|-------|-----------|------------|-------|--------------------|-------------|--------------|
|                            | C1                      |           |       | C2        |            |       | Built-in Rectifier |             |              |
| Power Supply Type          | C1                      |           |       | C2        |            |       | E1                 | D2          |              |
| Voltage (V)                | AC100                   |           | AC110 | AC200     |            | AC220 | AC100              | DC24        |              |
| Cycles (Hz)                | 50                      | 60        | 60    | 50        | 60         | 60    | 50/60              | -           |              |
| For 01                     | Solenoid Coil Type      | EL64-C1   |       |           | EL64-C2    |       |                    | ELC64-E1-1A | ELC64-D2-1A  |
|                            | Drive Current (A)       | 1.30      | 1.10  | 1.30      | 0.65       | 0.55  | 0.65               | 0.11        | 0.42         |
|                            | Holding Current (A)     | 0.30      | 0.24  | 0.28      | 0.15       | 0.12  | 0.14               |             |              |
|                            | Holding Power (W)       | 12.0      | 9.6   | 12.2      | 12.0       | 9.6   | 12.2               | 10          | 10           |
|                            | Allowable Voltage Range | 80 to 110 |       | 90 to 120 | 160 to 220 |       | 180 to 240         | 90 to 110   | 21.6 to 26.4 |
| Allowable Pressure psi     | 1000                    |           |       |           |            |       |                    |             |              |
| Insulator Resistance (M Ω) | 100 or greater (500 V)  |           |       |           |            |       |                    |             |              |

- Note: 1. A DC solenoid surge absorption circuit is effective in preventing misoperation in sensitive relays and IC circuits. (Applicable for power supply display D", option: G)  
 2. A DC solenoid RAC type (power supply E1) greatly increases the life of the contacts by eliminating contact arc without changing circuit sequence on an AC line, 50/60Hz can be used.

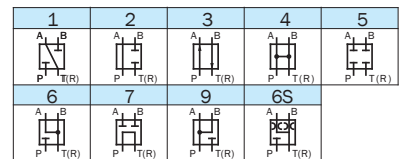
**Understanding Model Numbers**

SL - G 01 - A 3 X - ※ R - C2 - 31

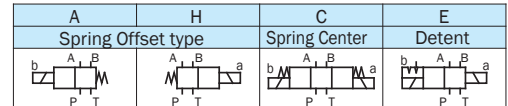


- Design Number
- Power supply
- C: AC (50/60 Hz) C1 = AC100 V C2 = AC200 V
- D: For DC D2 = DC24V
- E: AC (Built-in rectifier; 50/60Hz) E1 = AC100V
- With indicator light
- Auxiliary symbol (Can be combined in alphabetic sequence.)
- G: Surgeless type (Power supply C ※ D2 Applicable)
- N: With manual push-button (Available with power supply D2, E1)
- Q: Quick return type (Available with power supply E1)

| X     | Y         |
|-------|-----------|
| Close | Semi-open |
|       |           |



Note 1. P is pressure port, A and B are connection ports to cylinder. T (R) shows the connection port to the tank.



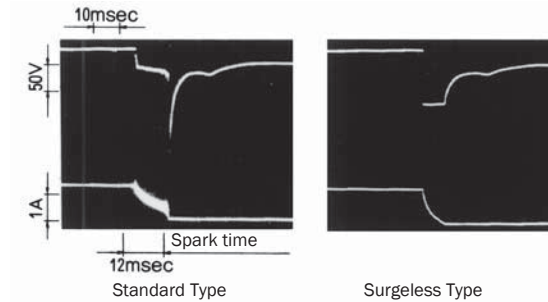
## Options

(Auxiliary Symbol)

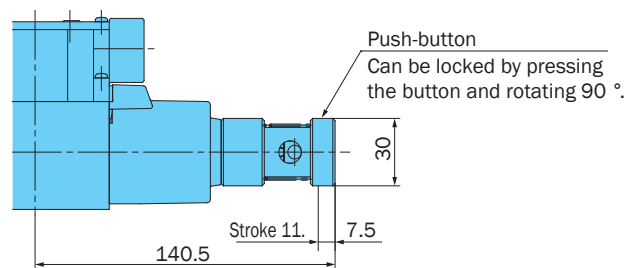
### Surgeless Type (Auxiliary Symbol: G)

The surge pressure waveforms when the DC solenoid valve power supply is opened and closed by a relay are shown at the bottom of this block. A built-in surge absorber element eliminates sparking and surge pressure.

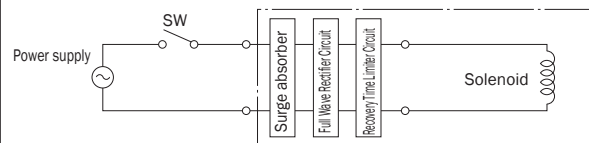
- Features
- ; Surge voltage is inhibited.
  - ; Sparking at relay contact points is eliminated.



### Manual Push-button Type (Auxiliary symbol: N)



### Quick Return Type (Auxiliary Symbol: Q)



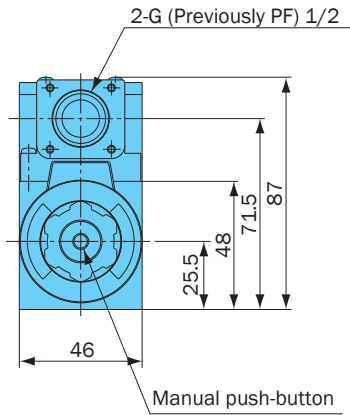
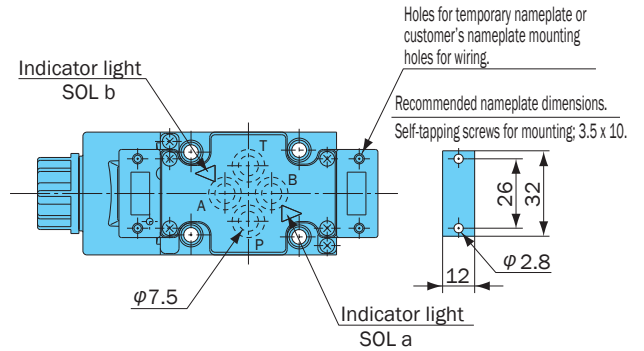
#### Handling

1. This type is used in the case of power supply type E1 (with built-in rectifier) to shorten the spring return time. This also applies to D2.
2. The quick return mechanism is built-in.

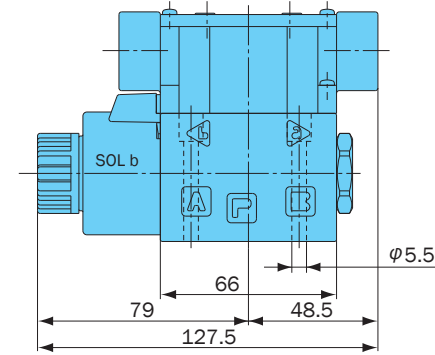
# Installation Dimension Drawing

AC Solenoid  
 SL-G01-A\*\*-R-C\*-31  
 SL-G01-H\*\*-R-C\*-31

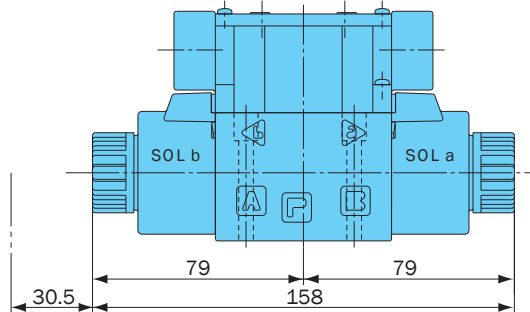
Note: The SL-G01-H\*\*-R\*\*-31 solenoid, is attached to the opposite side (SOL a) as shown in the diagram.



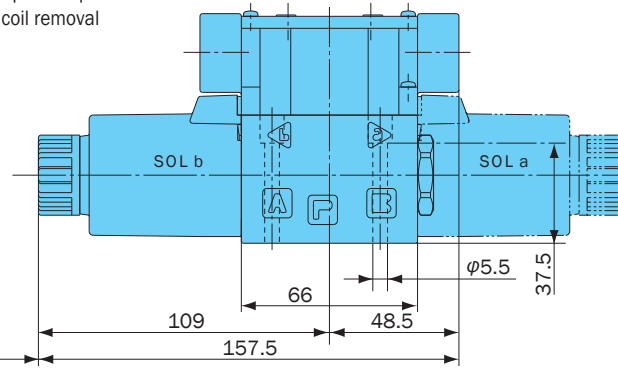
SL-G01-C\*\*-R-C\*-31  
 SL-G01-E\*\*-R-C\*-31



DC Solenoid and Rectifier  
 SL-G01-A\*\*-R-D/E\*-31  
 SL-G01-H\*\*-R-D/E\*-31  
 SL-G01-C\*\*-R-D/E\*-31  
 SL-G01-E\*\*-R-D/E\*-31



Space required for coil removal

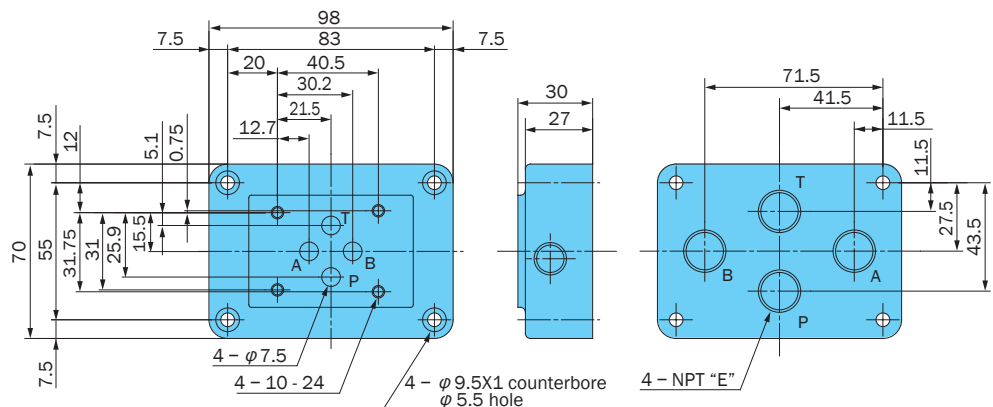


Space required for coil removal

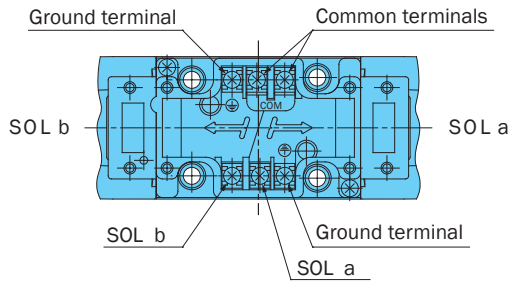
For sub plate SL-G01

| Model No.   | E   | Mass |
|-------------|-----|------|
| MSA-01X-E10 | 1/4 | 2.6  |
| MSA-01Y-E10 | 3/8 | 2.6  |

Gasket Surface Dimensions  
 ( ISO 4401-03-02-0-94 )  
 ( JIS B 8355 D-03-02-0-94 )



## Wiring Diagram



- Note:
1. In the case of a double solenoid valve, a common terminal is provided to simplify wiring.  
When the common terminal is not used, remove the terminal screws.
  2. Use the ground terminal when grounding is required.
  3. Use an M3 type as a solderless terminal.
  4. Tighten terminal screws to a torque of 4.4 to 6.1 in lbs

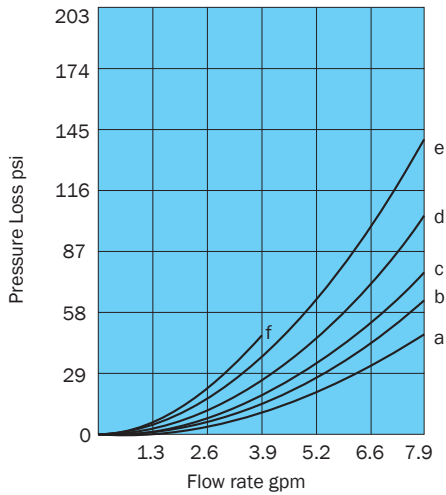
## Electrical Circuit Diagram

| Type                                 | Model No.           | Electrical Circuits                |
|--------------------------------------|---------------------|------------------------------------|
| AC Solenoid                          | SL-G01-***-R-C*-31  |                                    |
| AC Solenoid Surgeless Type           | SL-G01-***-GR-C*-31 |                                    |
| Built-in Rectifier                   | SL-G01-***-R-E*-31  |                                    |
| DC Solenoid                          | SL-G01-***-R-D*-31  |                                    |
| DC Solenoid Surgeless Type           | SL-G01-***-GR-D*-31 |                                    |
| Built-in Rectifier Quick Return Type | SL-G01-***-QR-E*-31 | See page D-7 for more information. |

## Performance Curves

Hydraulic Operating Fluid Viscosity 20 centistokes

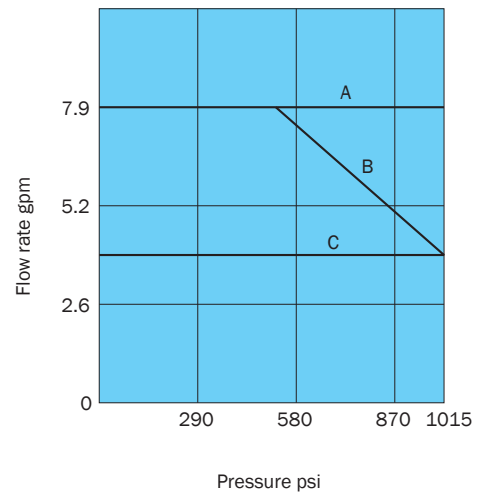
### Pressure Loss Characteristics



| Flow Path     | P/ A | P/ B | A/ T | B/ T | P/ T |
|---------------|------|------|------|------|------|
| A5            | -    | c    | c    | -    | -    |
| H5            | c    | -    | -    | c    | -    |
| A3X, H3X, E3X | b    | b    | e    | e    | -    |
| C1            | c    | c    | a    | c    | -    |
| C2            | a    | c    | e    | c    | -    |
| C4            | a    | a    | c    | c    | d    |
| C5, C6S       | c    | c    | c    | c    | -    |
| C6            | c    | c    | a    | a    | -    |
| C7Y           | f    | f    | e    | e    | d    |
| C9            | a    | a    | e    | e    | -    |

### Pressure - Flow Volume Allowable Value

| Operation symbol                               | Operation Example | Diagram 1 | Diagram 2 | Diagram 3 |   |
|--|-------------------|-----------|-----------|-----------|---|
| A5   | A                 | -         | B         | B         |   |
| H5   |                   |           |           | B         | - |
| A3X, H3X, E3X<br>C1, C2, C4, C5<br>C6, C9, C6S |                   |           |           | B         | B |
| C7Y  | C                 | C         | C         | C         |   |



### Switching Response Time

| Model No.           | Response Time (sec) |                | Measurement Conditions |
|---------------------|---------------------|----------------|------------------------|
|                     | Solenoid ON         | Spring Return  |                        |
| SL-G01-**-R-C*-31   | 0.010 to 0.020      | 0.010 to 0.020 | 1015 psi               |
| SL-G01-**-R-E1-31   | 0.055 to 0.080      | 0.150 to 0.185 | 5.2 gpm                |
| SL-G01-**-G)R-D2-31 | 0.055 to 0.080      | 0.025 to 0.035 | 40 centistokes         |

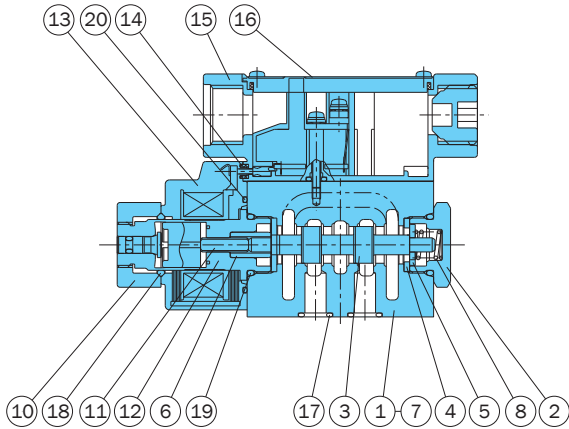
Note: 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)

2. In the case of power supply type E1 (with built-in rectifier), the spring return time using Quick Return (option symbol: Q) is the same as D2.

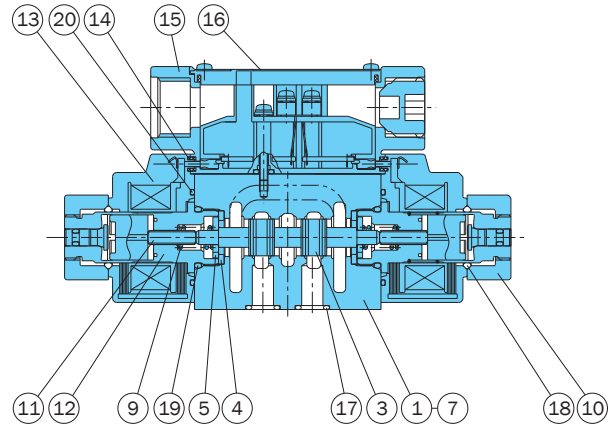


## Cross-sectional Drawing

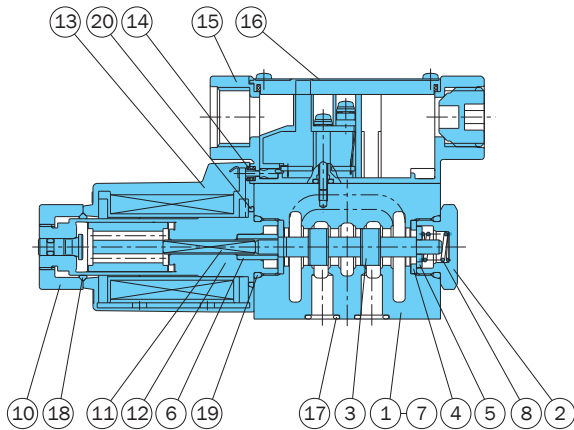
SL-G01-A\*\*-R-C\*-31



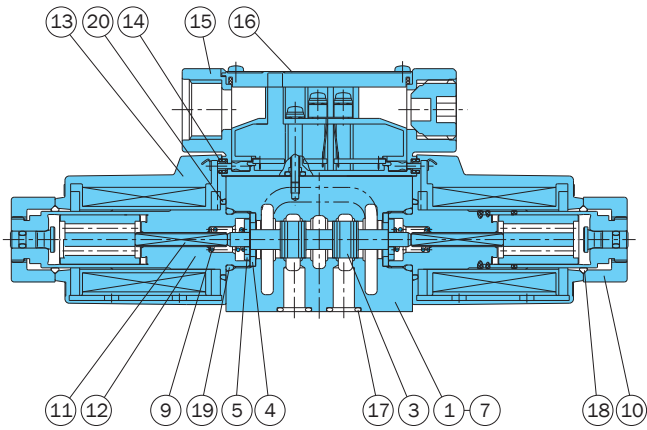
SL-G01-C\*\*-R-C\*-31



SL-G01-A\*\*-R-D/E\*-31



SL-G01-C\*\*-R-D/E\*-31

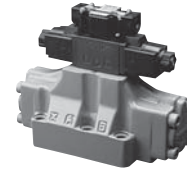


### List of Sealing Parts

| Part No. | Part Name | Type/ Part Number |                 | Q'ty            |                 |
|----------|-----------|-------------------|-----------------|-----------------|-----------------|
|          |           | DC SOL            | AC SOL          | Single Solenoid | Double Solenoid |
| 17       | O-ring    | AS568-012(Hs90)   |                 | 4               | 4               |
| 18       | O-ring    | 1A-P20            | 1A-P18          | 1               | 2               |
| 19       | O-ring    | 1B-P18            |                 | 2               | 2               |
| 20       | O-ring    | S-25              | AS568-025(Hs70) | 1               | 2               |

Note: O-ring 1A/1B-\*\* indicates JIS B2401-1A/1B\*\*. AS568 is SAE standard.

| Part No. | Part Name  | Part No. | Part Name        |
|----------|------------|----------|------------------|
| 1        | Body       | 11       | Rod              |
| 2        | Plug       | 12       | Solenoid guide   |
| 3        | Spool      | 13       | Solenoid coil    |
| 4        | Retainer A | 14       | Packing          |
| 5        | Retainer B | 15       | Terminal box kit |
| 6        | Retainer C | 16       | Nameplate        |
| 7        | Spacer     | 17       | O-ring           |
| 8        | Spring A   | 18       | O-ring           |
| 9        | Spring C   | 19       | O-ring           |
| 10       | Nut        | 20       | O-ring           |



### DSS (DSA) 22 Design Series Solenoid Control Valve

7.9 to 15.8 gpm  
4640 to 5075 psi

#### Features

Long-life operation is ensured by use of the high-performance, renowned SS (SA)-G01 wet solenoid valve as the pilot valve.

#### High pressure, high capacity

The 04 size can provides up to 79 gpm, while the 06 size delivers up to 158 gpm.

#### Low pressure loss

An original flow path design provides wide-ranging low pressure loss and enhanced system circuit efficiency. Internal modification of the pilot and drain can be accomplished without removing the valve by simply connecting and disconnecting plugs.

#### Built-in pilot pressure check valve

When tandem center type valve is used for the internal pilot valve (option), pilot pressure required for switching is self-maintained.

#### Specifications

| Valve Size                                   |   | 04 Size (D07)                                    | 06 Size (D08)   |  |
|--|---|--|---|--|
| Valve Model Number                           |   | DSS(DSA)-G04-***-R-**-22                         | DSS(DSA)-G06-***-R-**-22  |  |
| Maximum Working Pressure<br>psi              | P.A.B. Ports  | 5075   | 4640  |  |
|  | T Port  | Internal Drain Type                              | 2320  |  |
|  |   | External Drain Type                              | 3045  |  |
| Maximum Flow Rate gpm                        |   | 79   | 158   |  |
| Rated Flow Rate gpm                          |   | 39   | 79  |  |
| Maximum Pilot Pressure psi                   |   | 3625   | 3625  |  |
| Minimum pilot pressure psi                   | A** (Spring Offset Type)                                      | 116  | 116   |  |
|  | E** (No-spring Detent Type)                                   |  |   |  |
|  | C** (Spring Center Type)                                      | 174  | 174   |  |
|  | D** (Pressure Center Type)                                    |  |   |  |
|  | Built-in Pilot Pressure Check Valve Type (For Internal Pilot) |  | 65  |  |
| Maximum Changeover Frequency (cycles/minute) |   | 120  | 120   |  |
| Pilot Volume cu in                           | A** (Spring Offset Type)                                      | .48  | 1.2   |  |
|  | C** (Spring Center Type)                                      | .24  | .6  |  |
| Weight lbs                                   | A** (Spring Offset Type)                                      | 19   | 31.9  |  |
|  | E** (No-spring Detent Type)                                   | 20.2   | 33  |  |
|  | C** (Spring Center Type)                                      |  |   |  |
|  | D** (Pressure Center Type)                                    | 23   | 36.3  |  |
| Operating Environment                        | Dust-resistance/Water-resistance Rank JIS C 0920              |  | DSS: IP64 (Dust-tight, Splash-proof) DSA: IP65 (Dust-tight, Waterjet-proof) |  |
|  | Ambient Temperature   |  | -4 to 122° F  |  |
|  | Operating Fluid   | Temperature Range                                | -4 to 158° F  |  |
|  |   | Viscosity Range                                  | 15 to 300 centistokes   |  |
|  |   | Filtration                                       | 10 microns or less  |  |
| Bundled Accessories                          | Mounting bolt   | (2) 1/4-20 x 1 3/4<br>(4) 3/8-16 x 2             | (6) 1/2-13 x 2 3/8  |  |
|  | Tightening Torque   | 1/4 - 7.3 to 9.5 ft lbs<br>3/8 - 33 to 40 ft lbs | 44 to 51 ft lbs   |  |

Note: 1.The maximum flow rate of each valve depends on the pressure. For details, see pages D-46 and D-47.

2.Weight in parentheses is for stroke adjustment type.

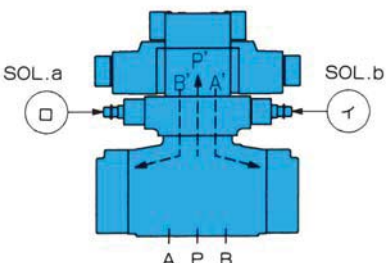
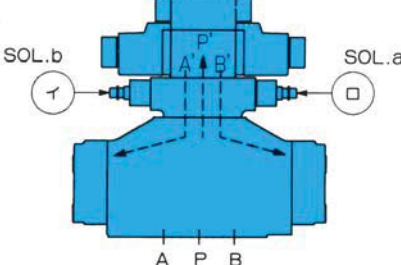
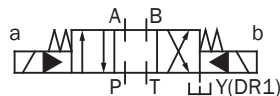
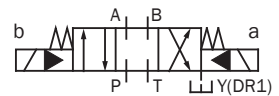
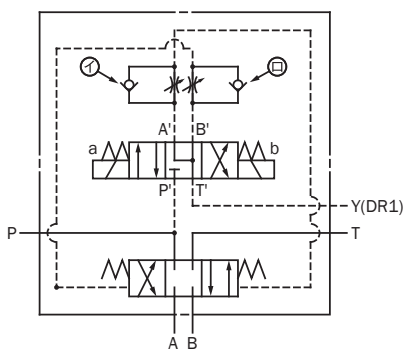
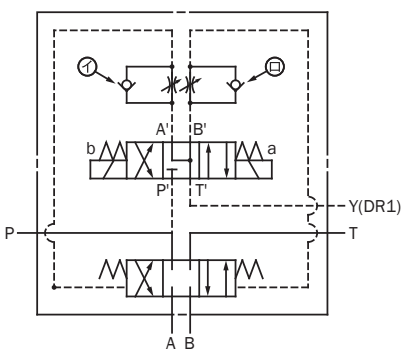
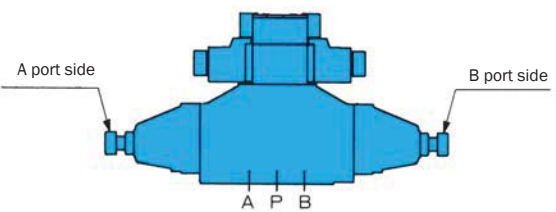
3.Solenoid specifications are the same as those for SS (SA)-G01. For more information, see pages D-6 and D-18.

• Handling

- 1 Pilot pressure values show the differential pressure between the pilot port and tank port or drain port. In the case of the pressure center, they show differential pressure between the pilot and drain ports (DR1, DR2).
- 2 The standard configuration is internal pilot and external drain, but other configurations are possible when required. See page D-48 for more information.
- 3 The JIS number on the nameplate indicates the standard internal pilot and external drain.  
Note therefore that the JIS numbers on

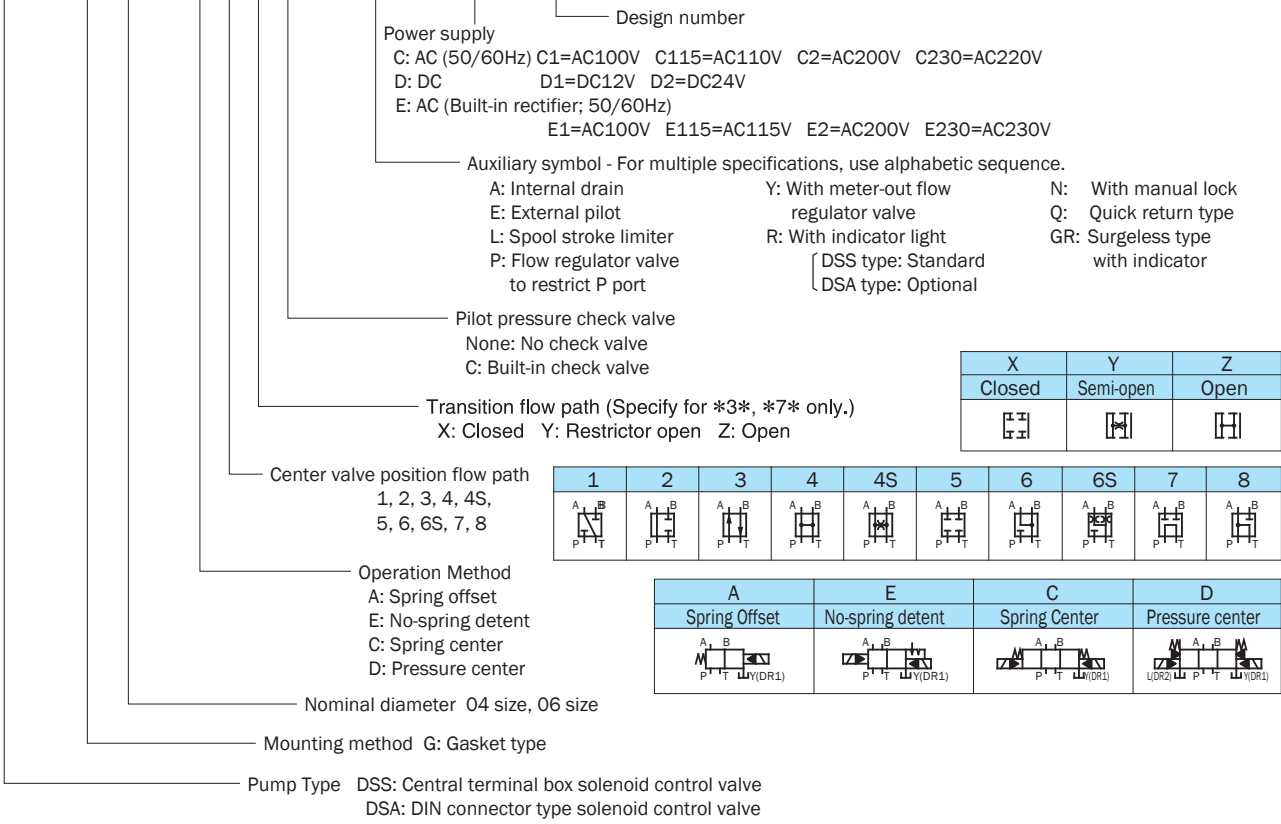
- page D-46 and D-47 are used even if the pilot is external and the drain is internal.
- 4 The maximum operating pressure for internal pilot is 3625 psi because it is limited by the pilot pressure.
- 5 For the PT mounting type DSS (DSA)-G\*\*-C7\*-\*\*-22, open cross over with restrictor C7Y is standard.
- 6 When adjustable spool stroke is desired, specify L in the auxiliary symbol position of the model number. Note, however, that this is not available with the pressure center type.
- 7 When using a detent type (E3\*), use

- constant energization in order to securely maintain the switching position.
- 8 Use of the pressure center type is recommended for large-volume flow control.
- 9 For the all ports open center type (A3Z, E3Z, C4, D4), PT mounting type (C7X, C7Y, D7X, D7Y), and PAT mounting type, use the type with built-in external pilot pressure check valve.
- 10 The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.

| Valve Model Number                          | DSS(DSA)-G04  | DSS(DSA)-G06  |
|---|---|---|
| Front Position                              |    |    |
| Simplified Symbols                          |   |   |
| Detailed Symbols                            |   |  |
| Flow Regulator Adjusting Screw Positions    | A Port Restrictor: Right side A<br>B Port Restrictor: Left side B   | A Port Restrictor: Left side A<br>B Port Restrictor: Right side B                     |
| Adjustable Stroke Adjusting Screw Positions | <p>A Port Side: P / A, B / T flow rate adjustment<br/>(For C7Y, P / B, A / T)<br/>B Port Side: P / B, A / T flow rate adjustment<br/>(For C7Y, P / A, B / T)</p>  |   |

# Understanding Model Numbers

**DSS - G 06 - C 7 Y C - \*\*R\* - C2 - E22**



**Pilot (PP), Drain (DR)**  
 \*High Pilot Pressure  
 Use at pressures that do not exceed 3625 psi  
 \*Internal PP, external DR are Nachi-Fujikoshi standards.  
 For external PP: Built-in stopper plug (Option E)  
 For internal DR: Stopper plug modification (Option A)  
 \* Internal DR Precautions  
 Make sure that the differential pressure between the pilot pressure and tank back pressure is greater than the minimum pilot pressure.  
 Do not connect any pipe that generates sudden surge pressure.

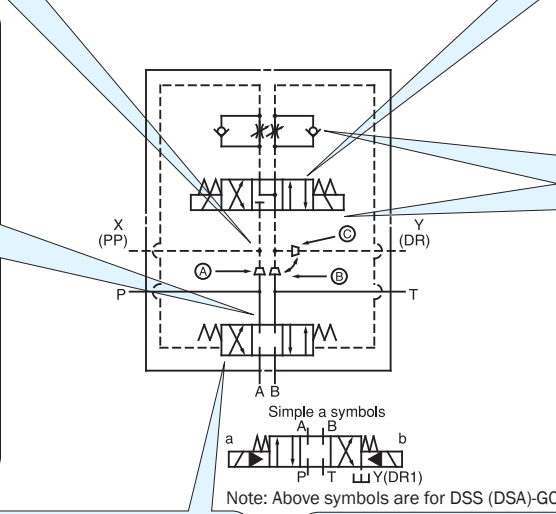
**Built-in Pilot Solenoid Valve**

| Valve Model Number | For G04        | For G06        |
|--------------------|----------------|----------------|
| DSS(DSA)-G**-A**   | SS(SA)-G01-A3X | SS(SA)-G01-H3X |
| DSS(DSA)-G**-E**   | SS(SA)-G01-E3X |                |
| DSS(DSA)-G**-C**   | SS(SA)-G01-C6  |                |
| DSS(DSA)-G**-D**   | SS(SA)-G01-C9  |                |

**Built-in Pilot Pressure Check Valve**  
 \*Like the C7Y, this internal PP type is used in a flow path configuration where maintenance of pilot pressure is required.

**Check Valve Pressure Loss**

| Flow rate (gpm) | 04 size Pressure Loss (psi) | 06 size Pressure Loss (psi) |
|-----------------|-----------------------------|-----------------------------|
| 26              | ~100                        | ~80                         |
| 52              | ~130                        | ~100                        |
| 79              | ~150                        | ~110                        |
| 105             | ~165                        | ~120                        |
| 132             | ~175                        | ~130                        |



**Flow Regulator Valve**  
 \*Rotating the adjusting screw clockwise (rightward) slows the main spool switching speed.  
 P: Excitation of the solenoid (starting of the actuator) causes a restrictor effect.  
 Y: The restrictor effect can be obtained especially when the solenoid is de-excited (actuator stopped).

**Pilot Valve Mounting Bolts**

| Standard | M5 x 45 (four)  |
|----------|-----------------|
| Stage 1  | M5 x 85 (four)  |
| Stage 2  | M5 x 125 (four) |
| Stage 3  | M5 x 165 (four) |

Tightening Torque: 3.6 to 5 ft.lbs.

**Detent Type Installation**

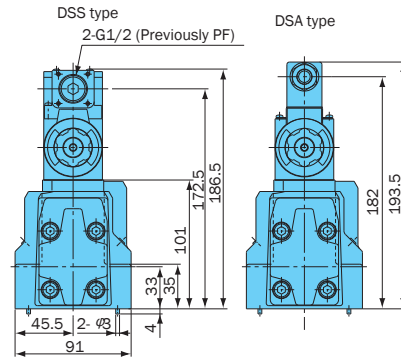
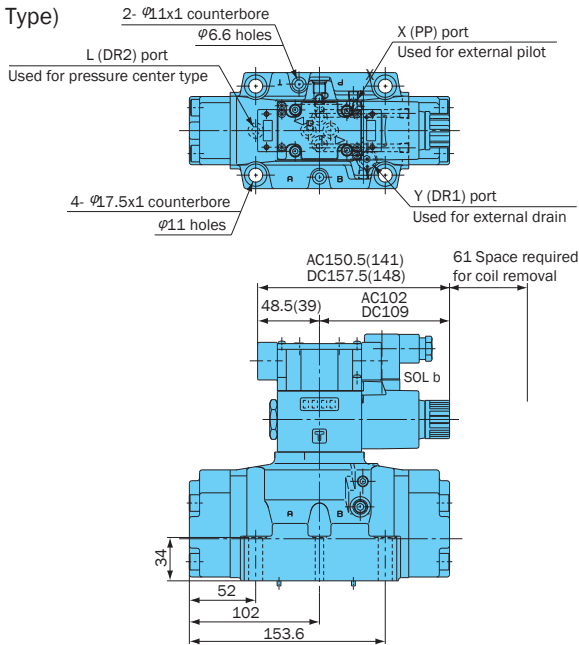
\*Install the valve in a horizontal configuration.  
 \*Provide constant energization for secure holding.

**Adjustable Stroke Type**  
 \*Tightening the adjusting screw makes the main spool stroke smaller, which restricts flow.

**Pressure center**  
 \*Use this valve in a high-pressure, large-volume circuit to ensure reliable return of the main spool to the neutral position.

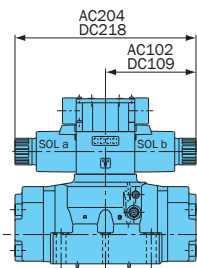
DSS(DSA)-G04-A\*\*R\*\*-22

(Spring Offset Type)



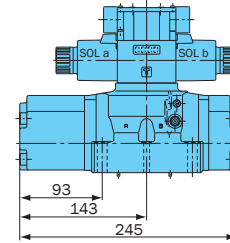
DSS(DSA)-G04-<sup>E</sup>/<sub>C</sub>\*\*R\*\*-22

(No-spring Detent Type)  
(Spring Center Type)



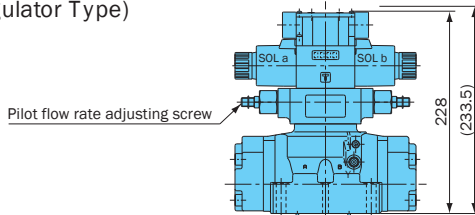
DSS(DSA)-G04-D\*\*R\*\*-22

(Pressure Center Type)



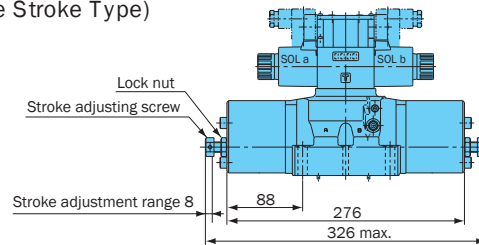
DSS(DSA)-G04-<sup>A</sup>/<sub>E</sub>/<sub>C</sub>/<sub>D</sub>\*\*RY\*\*-22

(Flow Regulator Type)



DSS(DSA)-G04-E\*\*LR\*\*-22

(Adjustable Stroke Type)



Dimensions in the parentheses are for the DSA-G04-\*\*\*-21.

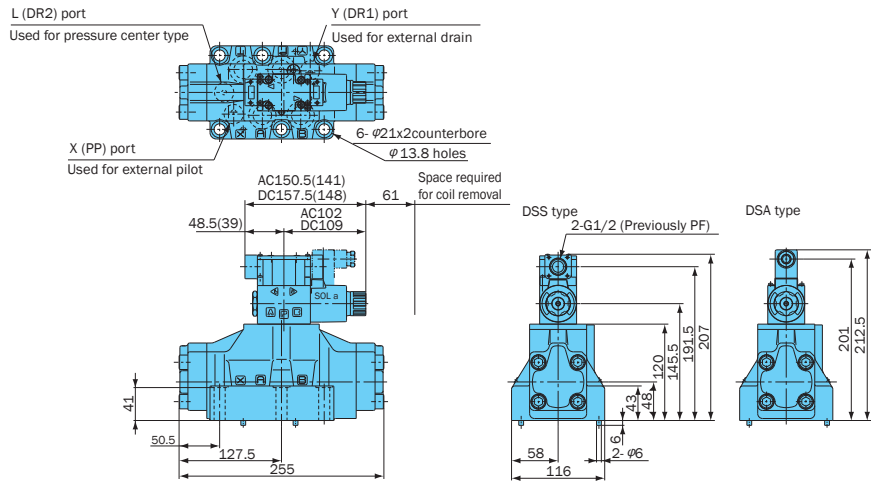
( ISO 4401-07-06-0-94  
JIS B 8355 D-07-06-0-94 )

For sub plate DSS (DSA) -G04

| Model No.     | E      | Weight  |
|---------------|--------|---------|
| MDS-04X-E10-D | SAE-12 | 4.1 lbs |

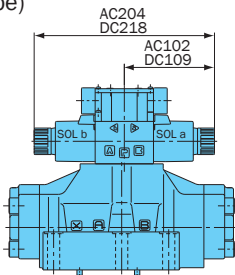
DSS(DSA)-G06-A\*\*R\*\*-22

(Spring Offset Type)



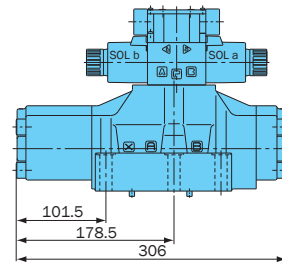
DSS(DSA)-G06-<sup>E</sup>/<sub>C</sub>\*\*R\*\*-22

(No-spring Detent Type)  
(Spring Center Type)



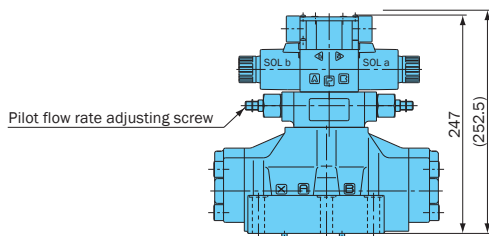
DSS(DSA)-G06-D\*\*R\*\*-22

(Pressure Center Type)



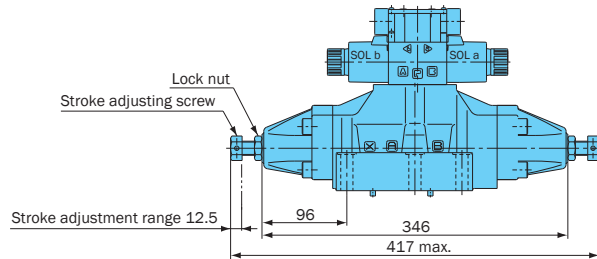
DSS(DSA)-G06-<sup>A</sup>/<sub>C</sub>\*\*RY\*\*-22

(Flow Regulator Type)



DSS(DSA)-G06-<sup>A</sup>/<sub>C</sub>\*\*LR\*\*-22

(Adjustable Stroke Type)



Dimensions in the parentheses are for the DSA-G06-\*\*\*RY\*\*-21.

( ISO 4401-08-07-0-94  
JIS B 8355 D-08-07-0-94 )

For sub plate DSS (DSA) -G06

| Model No.     | E      | Weight  |
|---------------|--------|---------|
| MDS-06X-E30-D | SAE-16 | 5.3 lbs |

# Performance Curves

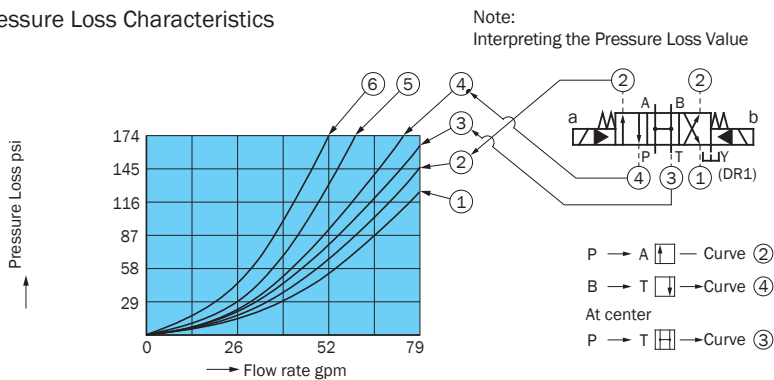
Hydraulic Operating Fluid Viscosity 32 centistokes

DSS(DSA)-G04

| Model No.                     |                           | JIS Symbol | Pressure - Flow Rate Allowable Value | Model No.                     |                           | JIS Symbol | Pressure - Flow Rate Allowable Value |
|-------------------------------|---------------------------|------------|--------------------------------------|-------------------------------|---------------------------|------------|--------------------------------------|
| 2-Position Spring Offset Type | DSS(DSA)<br>-G04<br>-A3X- |            |                                      | 2-Position Spring Offset Type | DSS(DSA)<br>-G04<br>-E3X- |            |                                      |
|                               | -A3Z-                     |            |                                      |                               | -E3Z-                     |            |                                      |
|                               | -A3Y-                     |            |                                      |                               | -E3Y-                     |            |                                      |
| 3-Position Spring Center Type | DSS(DSA)<br>-G04<br>-C1-  |            |                                      | 3-Position Spring Center Type | DSS(DSA)<br>-G04<br>-D1-  |            |                                      |
|                               | -C2-                      |            |                                      |                               | -D2-                      |            |                                      |
|                               | -C5-                      |            |                                      |                               | -D5-                      |            |                                      |
|                               | -C6-                      |            |                                      |                               | -D6-                      |            |                                      |
|                               | -C6S-                     |            |                                      |                               | -D6S-                     |            |                                      |
|                               | -C4S-                     |            |                                      |                               | -D4S-                     |            |                                      |
|                               | -C4-                      |            |                                      |                               | -D4-                      |            |                                      |
|                               | -C8-                      |            |                                      |                               | -D8-                      |            |                                      |
|                               | -C7X-<br>-C7Y-            |            |                                      |                               | -D7X-<br>-D7Y-            |            |                                      |

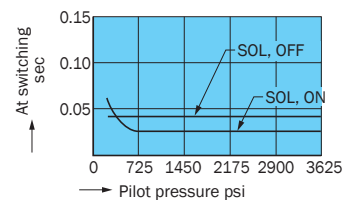
Note: The JIS number indicates the standard internal pilot and external drain.

## Pressure Loss Characteristics



## Switching Response Time

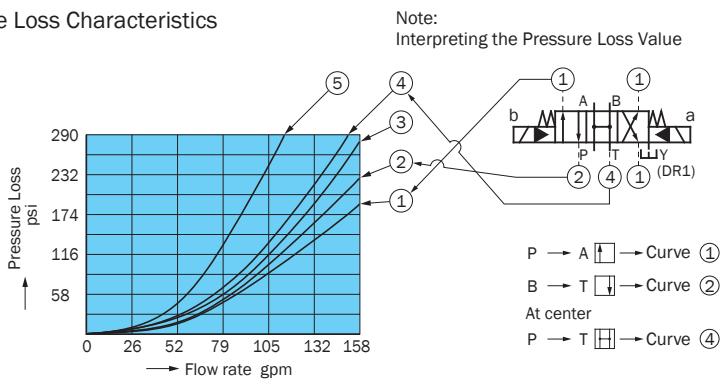
Model No. : DSS-G04-C5  
Voltage Symbol : C1 (AC Solenoid)



| Model No.                     |                           | JIS Symbol | Pressure - Flow Rate Allowable Value | Model No.                     | JIS Symbol                | Pressure - Flow Rate Allowable Value |
|-------------------------------|---------------------------|------------|--------------------------------------|-------------------------------|---------------------------|--------------------------------------|
| 2-Position Spring Offset Type | DSS(DSA)<br>-G06<br>-A3X- |            |                                      | 2-Position Spring Offset Type | DSS(DSA)<br>-G06<br>-E3X- |                                      |
|                               | -A3Z-                     |            |                                      |                               | -E3Z-                     |                                      |
|                               | -A3Y-                     |            |                                      |                               | -E3Y-                     |                                      |
| 3-Position Spring Center Type | DSS(DSA)<br>-G06<br>-C1-  |            |                                      | 3-Position Spring Center Type | DSS(DSA)<br>-G06<br>-D1-  |                                      |
|                               | -C2-                      |            |                                      |                               | -D2-                      |                                      |
|                               | -C5-                      |            |                                      |                               | -D5-                      |                                      |
|                               | -C6-                      |            |                                      |                               | -D6-                      |                                      |
|                               | -C6S-                     |            |                                      |                               | -D6S-                     |                                      |
|                               | -C4S-                     |            |                                      |                               | -D4S-                     |                                      |
|                               | -C4-                      |            |                                      |                               | -D4-                      |                                      |
|                               | -C8-                      |            |                                      |                               | -D8-                      |                                      |
|                               | -C7X-<br>-C7Y-            |            |                                      |                               | -D7X-<br>-D7Y-            |                                      |

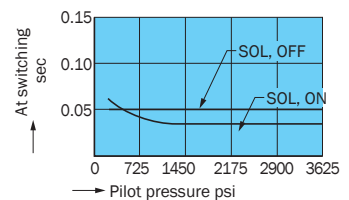
Note: The JIS number indicates the standard internal pilot and external drain.

Pressure Loss Characteristics



Switching Response Time

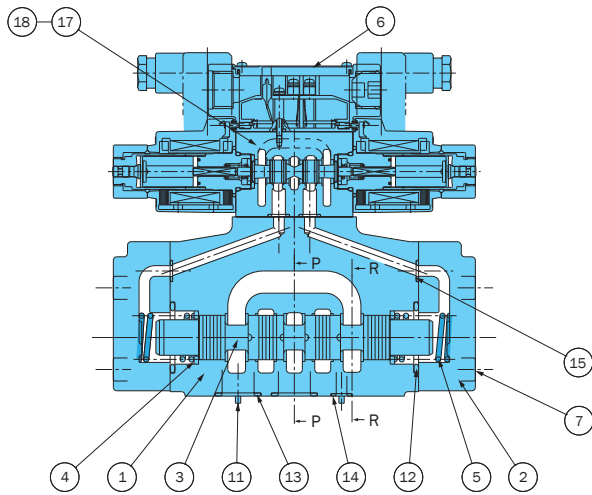
Model No. : DSS-G06-C5  
Voltage Symbol: C1 (AC Solenoid)



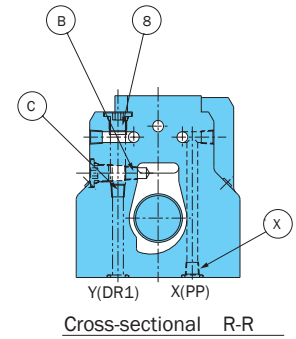
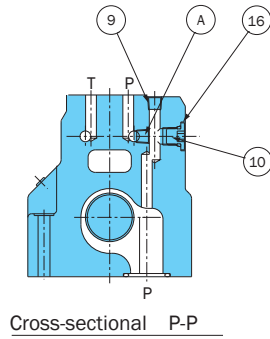


### Cross-sectional Drawing

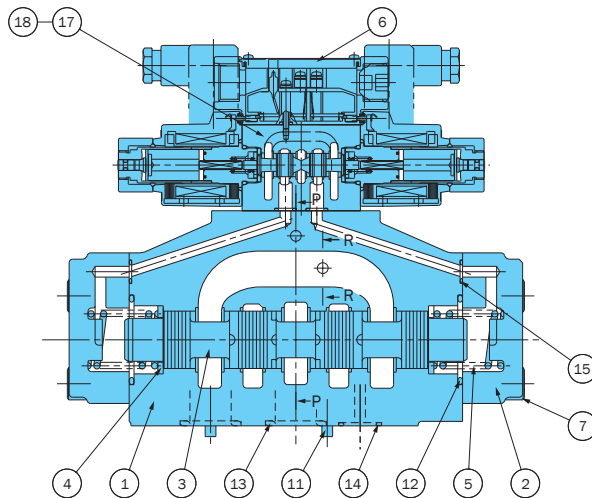
DSS(DSA)-G04-C\*\*-R-C\*-22



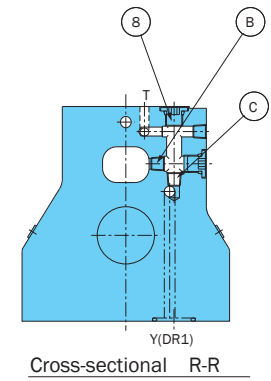
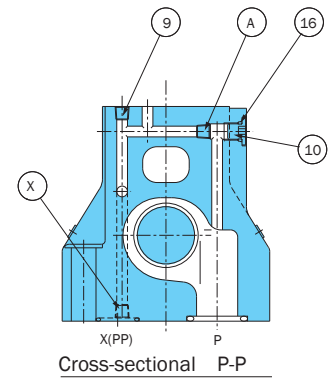
Pilot, Drain System Change



DSS(DSA)-G06-C\*\*-R-C\*-22



Pilot, Drain System Change



| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name       |
|----------|-----------|----------|-----------|----------|-----------------|
| 1        | Body      | 8        | Plug      | 14       | O-ring          |
| 2        | Cover     | 9        | Plug      | 15       | O-ring          |
| 3        | Spool     | 10       | Plug      | 16       | O-ring          |
| 4        | Ring      | 11       | Pin       | 17       | Solenoid Valves |
| 5        | Spring    | 12       | O-ring    | 18       | Screw           |
| 6        | Nameplate | 13       | O-ring    |          |                 |
| 7        | Screw     |          |           |          |                 |

Changing the Pilot and Drain Connections

| After Change |          | Hexagon Socket Head Plug |
|--------------|----------|--------------------------|
| Pilot        | Internal | Switch from A to x .     |
|              | External | Switch from x to A .     |
| Drain        | Internal | Switch from B to C .     |
|              | External | Switch from C to B .     |

List of Sealing Parts

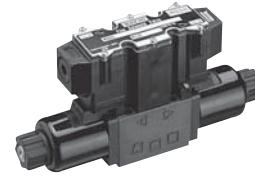
| Part No. | Part Name | Part Number |         | Q'ty |
|----------|-----------|-------------|---------|------|
|          |           | O4 size     | O6 Size |      |
| 12       | O-ring    | 1B-P34      | 1B-G45  | 2    |
| 13       | O-ring    | 1B-P22      | 1B-P28  | 4    |
| 14       | O-ring    | 1B-P10A     | 1B-P20  | 2    |
| 15       | O-ring    | 1B-P9       | 1B-P10  | 2    |
| 16       | O-ring    | 1B-P8       | 1B-P8   | 3    |

Seal Kit Number

| O4 size         |                 | O6 Size         |                 |
|-----------------|-----------------|-----------------|-----------------|
| Single Solenoid | Double Solenoid | Single Solenoid | Double Solenoid |
| EDBS-04AA-1A    | EDBS-04CA-1A    | EDBS-06AA-1A    | EDBS-06CA-1A    |

Note: The seal kit includes a seal for the pilot solenoid valve.

Note: 1.O-ring 1A/1B/4D-\*\* indicate JIS Standard B 2401-1A/1B/4D-\*\*. 2.See SS/SA-G01-\*\*-31for information about the seal part for the pilot solenoid valve.



### Fine Solenoid Valve SF Series

2.6 to 10.5 gpm  
3045 psi

### Features

#### The function of two valves in one

A two-speed controller provides smooth speed adjustment from low speed to high, and from high-speed to low.

#### Quiet starts and stops

A low-speed startup and stop feature makes startups and stops smooth and soft.

Separate control of forward and back cylinder movement  
There are five volume settings for highspeed flow rate and acceleration/-deceleration times that can be independently adjusted SOL.a and SOL.b (ON side, OFF side).

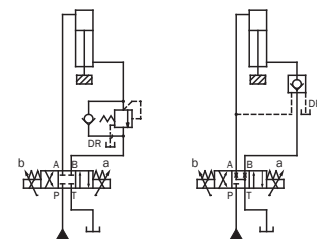
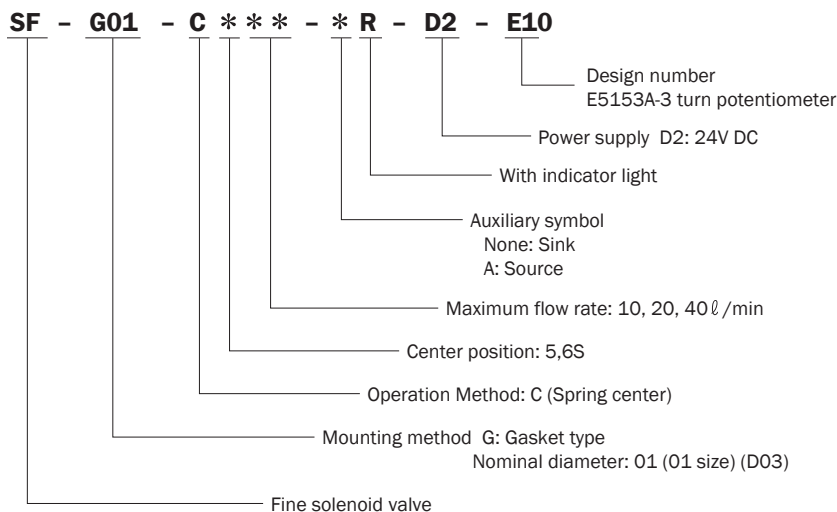
- Handling
- 1 Valve differential pressure  
Volume adjustment becomes sensitive when P→A (B) and B(A)→T differential pressure is large. Maintain the pressure differential so it is no greater than 500 psi.
- 2 Low-speed flow rate  
The spool may not move if the low-speed flow rate is below the minimum. Use this valve only within the allowable minimum low-speed flow rate range.
- 3 Deceleration circuit
  - Use a C5\*\* spool for the deceleration circuit. Deceleration is difficult with the C6S\*\* spool.
  - When large deceleration is required or for a system that uses a vertical cylinder, equip an external drain type counter balance valve. See the illustration below.
- 4 Pilot check circuit
  - For a circuit with a pilot check valve, knocking may occur in the pilot check valve due to large load inertia and circuit pressure loss. In cases like this, use an external drain type pilot check valve. See the illustration below.

### Specifications

| Item  | Model No.                             | SF-G01<br>-C*10-D2-10                | SF-G01<br>-C*20-D2-10 | SF-G01<br>-C*40-D2-10 |
|---|---------------------------------------|--------------------------------------|-----------------------|-----------------------|
| Valve Maximum Operating Pressure psi                |                                       | 3045                                 |                       |                       |
| Maximum Flow Rate ℓ (gpm)                           |                                       | 10 (2.6)                             | 20 (5.2)              | 40 (10.5)             |
| High-speed Flow Rate gpm                            |                                       | 1.3 to 2.6                           | 2.6 to 5.2            | 5.2 to 10.5           |
| Low-speed Flow Rate gpm                             |                                       | .13 to 1.0                           | .52 to 2.1            | 1.0 to 4.2            |
| Maximum Allowable Back Pressure psi                 |                                       | 1000                                 |                       |                       |
| Acceleration/Deceleration Time Adjustment Range SEC |                                       | 0.1 to 2                             |                       |                       |
| Hysteresis (Note 2)                                 |                                       | 7%                                   |                       |                       |
| Repeatability (Note 2)                              |                                       | 3%                                   |                       |                       |
| Power Supply Voltage V                              |                                       | D2: 24V DC regulated DC power supply |                       |                       |
| Maximum Power Consumption W                         |                                       | 36W                                  |                       |                       |
| Operating Environment                               | Dust Resistance/Water Resistance Rank | IP63 (Dust-tight, Rain-proof)        |                       |                       |
|   | Ambient Temperature                   | 41 to 122° F                         |                       |                       |
|   | Operating Fluid                       | Temperature Range                    | 41 to 140° F          |                       |
|   |                                       | Viscosity Range                      | 15 to 300centistokes  |                       |
| Mounting bolt                                       | Filtration                            | 10 microns or less                   |                       |                       |
|   | Size x Length                         | 10-24 x 1 3/4                        |                       |                       |
|   | Tightening Torque                     | 3.6 to 5 ft lbs                      |                       |                       |

- Note) 1.The above high-speed and low-speed flow rates are obtained with a differential pressure (PA, PB) of 145 psi. The flow rates depend on differential pressure.  
2.Hysteresis and repeatability values are those at maximum flow rate.  
3.For mounting bolts, use Grade 8 or equivalent.  
4.Mounting bolts are not included.

### Understanding Model Numbers



When large brake pressure is required (Use an external drain type counter valve.)

When there is the possibility of pilot check valve knocking (Use an external drain type pilot check valve.)

#### Environmental conditions

- 5 The IC circuit board is located inside the central control box, so care must be exercised concerning water-resistance and ambient temperature.
    - Water: Cover the box so there is no direct splashing with water.
    - Ambient Temperature: Use in an area where the temperature is 41 to 122° F
  - 6 Operating Fluid
    - Always keep the operating fluid clean. Allowable contamination is class NAS11 or less.
    - Use oil-based hydraulic operating fluid.
    - Contact your agent when you want to use fire-resistant hydraulic fluid.
- (Continued on following page)

7 Note the following points to optimize operation.

- (1) Control fluid temperature when using this valve. Since the valve perform restrictor valve control on all processes, temperature differential changes flow volume and acceleration/deceleration time. The recommended temperature range is 86 to 140° F.

- (2) During the positioning operation following deceleration, make sure that sufficient low-speed running is provided following deceleration

before stopping operation. If low-speed operation time is too short can cause stopping during deceleration and shock problems due to fluctuation in load, etc.

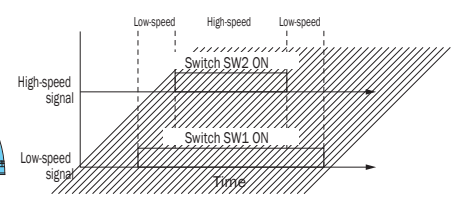
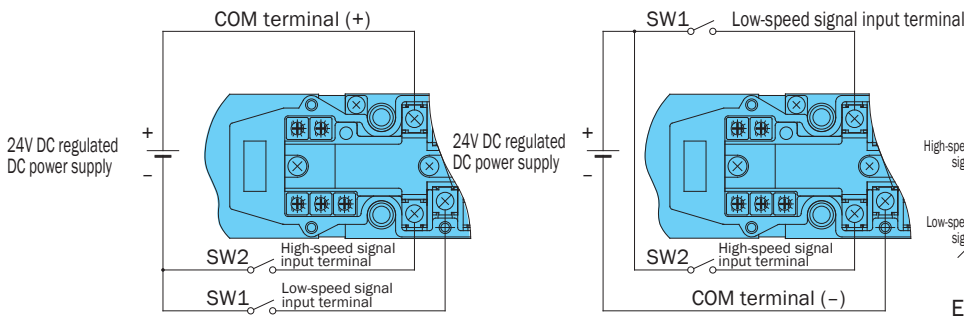
Spool Type and JIS Symbols

| Spool Type | C5** | C6S** |
|------------|------|-------|
| JIS Symbol |      |       |

Cross-sectional Drawing

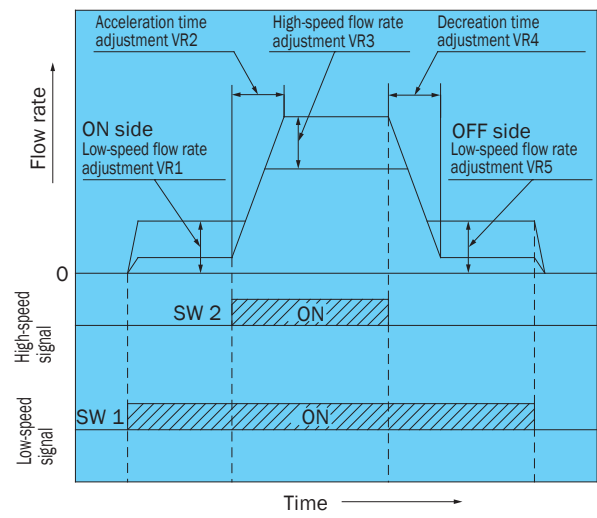
- Sink Type (Auxiliary Symbol: None)  
Switches on load and power supply minus side

- Source Type (Auxiliary Symbol: A)  
Switches on load and power supply plus side



Adjustment Elements

Control Pattern

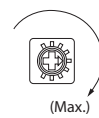


Electrical Control Precautions

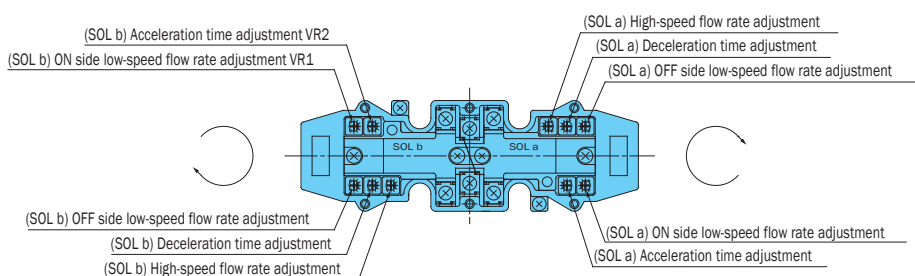
- Do not introduce a high-speed signal prior to a low-speed signal. Make sure the two signals are introduced simultaneously or that the low-speed signal is introduced first.
- (1) Repeatedly introducing the high-speed signal first in a source type configuration can damage the IC board.
- (2) The valve will not operate on the high-speed signal only.
- The following adjustments in the range of VR1 through VR5 can be made independently for SOL.a and SOL.b. You can make adjustments for the best conditions for forward and back operations when considering the cylinder operations.
- Adjustment volume is arranged in from VR1 through VR5 in clockwise (rightward) rotation sequence when viewed from the coil side.
- The following are the factory default volume settings.  
VR1 . 2 . 4 . 5  
--- Minimum setting  
VR3 --- Maximum setting

All Adjustment VRs

Maximum is clockwise (rightward) rotation.

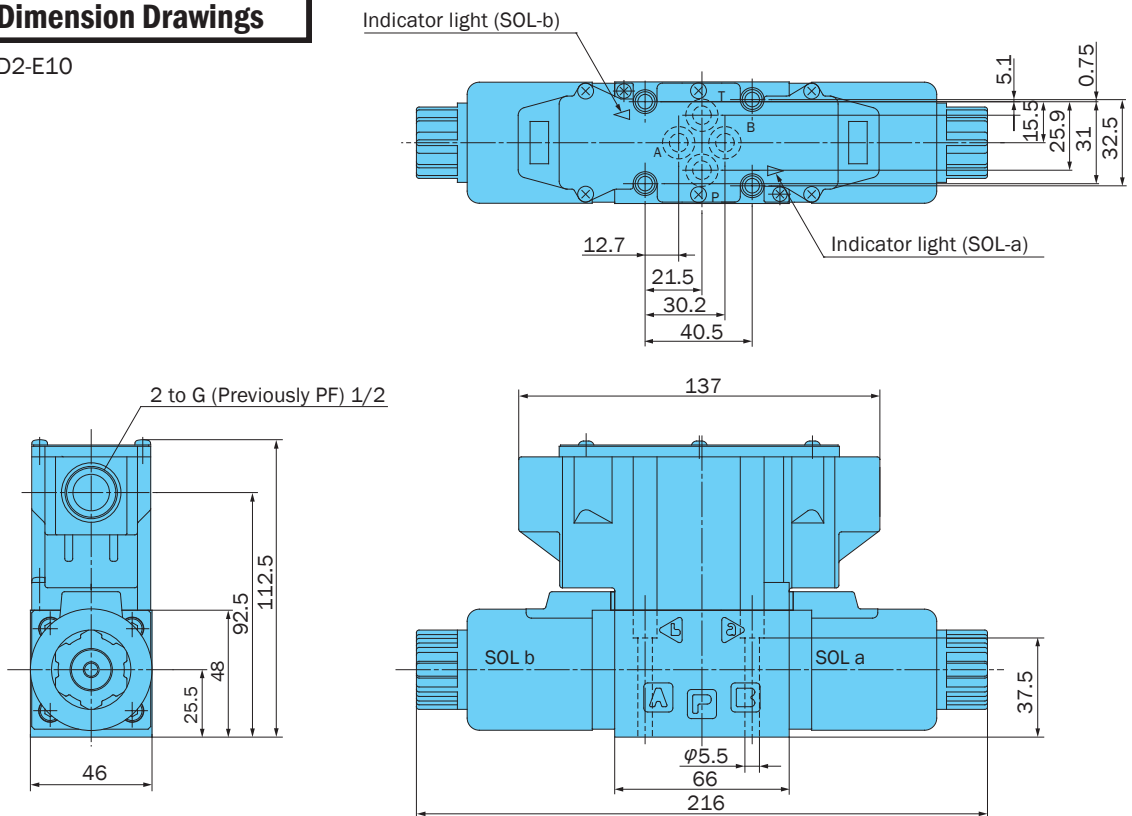


- The volume rotation angle is 270°. Contact your agent about a three-rotation type adjustor for fine adjustment.



## Installation Dimension Drawings

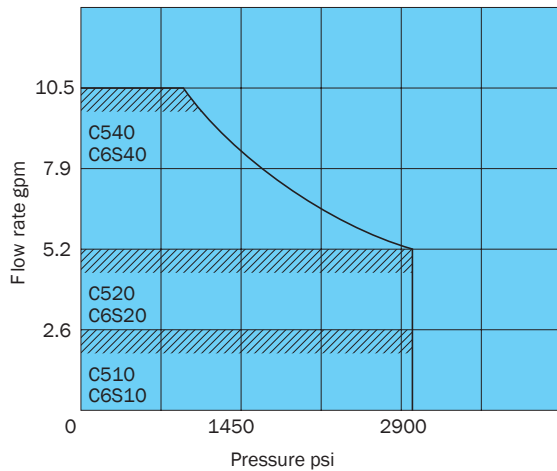
SF-G01-C\*\*\*-(A)R-D2-E10



## Performance Curves

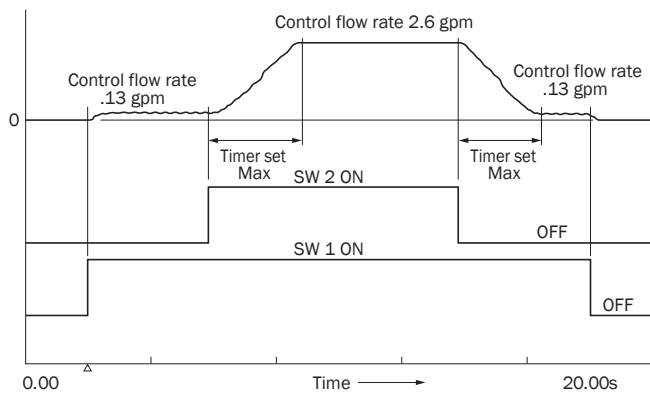
Hydraulic Operating Fluid Viscosity 32 centistokes

Pressure - Flow Rate Characteristics

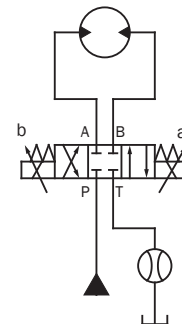


- Use the valve within the allowable flow rate range shown by the graph to the right.
- There are no operational problems within the allowable flow rate range, even when one-pass is used.

Control Waveform Example

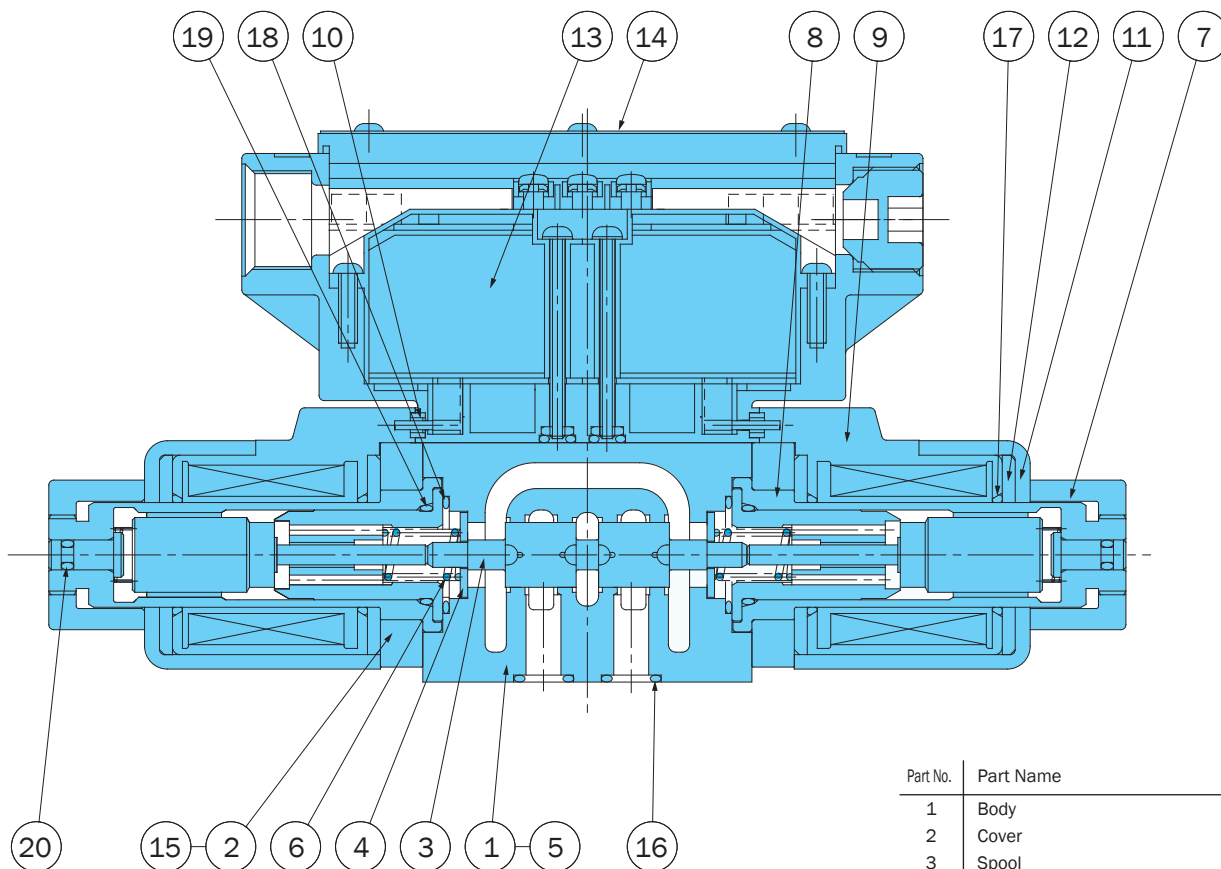


- Valve: SF-G01-C510-R-D2-E10
- Supply Pressure: 3000 psi
- Hydraulic Circuit



## Cross-sectional Drawing

SF-G01-C\*\*\*-(A)R-D2-E10



| Part No. | Part Name                |
|----------|--------------------------|
| 1        | Body                     |
| 2        | Cover                    |
| 3        | Spool                    |
| 4        | Retainer                 |
| 5        | Spacer                   |
| 6        | Spring                   |
| 7        | Nut                      |
| 8        | Solenoid guide           |
| 9        | Solenoid coil            |
| 10       | Packing B                |
| 11       | Coil case                |
| 12       | Coil yoke                |
| 13       | Central terminal box kit |
| 14       | Nameplate                |
| 15       | Hexagon Socket Head Bolt |
| 16       | O-ring                   |
| 17       | O-ring                   |
| 18       | O-ring                   |
| 19       | O-ring                   |
| 20       | O-ring                   |

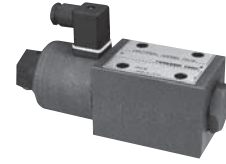
### Seal Part List (Kit Model Number EFS)

| Part No. | Part Name | Type/Part Number | Qty |
|----------|-----------|------------------|-----|
| 16       | O-ring    | AS568-012(Hs90)  | 4   |
| 17       | O-ring    | AS568-019        | 4   |
| 18       | O-ring    | AS568-019(Hs90)  | 2   |
| 19       | O-ring    | AS568-017(Hs90)  | 2   |
| 20       | O-ring    | P3 Note2         | 2   |

Note: 1.O-ring 1B-\*\* refers to JIS B 2401-1B-\*\*.  
 2.Special fluororubber is used (Part Number: RO-P3-VS).

D

Solenoid Valves



### SNH Series Non-Leak Type Solenoid Valve

5.2 to 26.4 gpm  
5075 psi

### Features

#### Virtually no internal leakage

A poppet structure minimizes internal leaks from low pressures to as high as 5075 psi. Enhanced hydraulic circuit efficiency reduces energy needs.

#### Virtually no pressure loss at high volumes

An original fluid reaction force suppression mechanism is provided for all sizes. Though compact, this valve provides the highest level switching capacity for its class.

#### High reliability

Since a wet type solenoid valve is used, the movable iron core remains immersed in oil as it moves, which minimizes switching noise and ensures reliable operation. A wet type valve also provides superior water resistance and longer life than a dry type valve.

#### ISO standard mounting service (01, 03 sizes)

This valve can be ganged together with a modular valve, enabling simple configuration of circuits and an overall

compact device configuration.

#### EC connector for improved switching (06 size)

During switching, twice the current (starting current) flows to the coil than normal (holding current), which ensures reliable switching operations. The 06 size has compact configuration made possible by an original design that uses a small coil that provides high output, without the need for a large coil.

### Specifications

| Model No.  |   | SNH-G01 (D03)   | SNH-G03 (D05)  | SNH-G04 (D07)  | SNH-G06 (D08)                      |
|--|---|---|----------------|----------------|------------------------------------|
| JIS Symbol   | AR  |   |                |                |                                    |
|  | HQ  |   |                |                |                                    |
|  | A2K                                       |   | ---            |                |                                    |
| Maximum Working Pressure<br>psi<br>(P, A, B Ports) |   | 5075  |                |                |                                    |
| Rated Flow Rate - Maximum Flow Rate<br>gpm         |   | AR,HQ; 2.6-5.2<br>A2K; 1.3-5.2                        | 5.2 - 10.5     | 10.5 - 15.8    | 15.8 - 26.4                        |
| Maximum Changeover Frequency (per minute)          |   | 120   |                |                |                                    |
| Operating Environment                              | Dust Resistance/<br>Water Resistance Rank | JIS C 0920 IP65 (Dust-tight, Waterjet-proof) (Note 2) |                |                | IP64 (Dust-tight,<br>Splash-proof) |
|  | Ambient Temperature                       | -4 to 122° F  |                |                |                                    |
|  | Temperature Range                         | -4 to 158° F  |                |                |                                    |
|  | Viscosity Range                           | 15 to 300 centistokes                                 |                |                |                                    |
| Operating Fluid                                    | Filtration                                | 10 microns or less                                    |                |                |                                    |
| Weight AR/HQ (A2K) lbs                             |   | 3.9   | 11.4           | 12.1           | 15.2                               |
| Mounting bolt                                      | Size x Length                             | M5 x 45 (Four)  | M8 x 70 (Four) | M8 x 70 (Four) | M10 x 75 (Four)                    |
|  | Tightening Torque<br>ft lbs               | 4.4 to 5.9  | 22 to 25       | 22 to 25       | 40 to 44                           |

- Note: 1. Internal leaking does not exceed 1 droplet/minute (.003 cu in)  
 2. The power supply type for E\* is IP64 (dust-tight, splash-proof).  
 3. For mounting bolts, use grade 8 or equivalent.  
 4. Mounting bolts are not included with the 01 size. Bolts are included with the 03, 04, 06 sizes.

- Handling
- 1 Take care so the B port is not subjected to abnormal surge pressure that is in excess of the maximum operating pressure.
  - 2 The manual switching (Options M, N) push pin receives B port pressure, so it cannot be pressed with a pressure in excess of about 725 psi. In the case of the HQ and A2K types, note that leaks are not completely stopped, even in the locked state.
  - 3 Use this valve only within the allowable voltage range.
  - 4 Use of water- or glycol-based hydraulic operating fluid is standard. Contact your agent about using other fire-resistant hydraulic fluid.
  - 5 Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
  - 6 In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the B port.
  - 7 The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.
  - 8 Never try to take this valve apart. The cap seal cannot be reassembled without using special tools.

• Solenoid Assembly Specifications

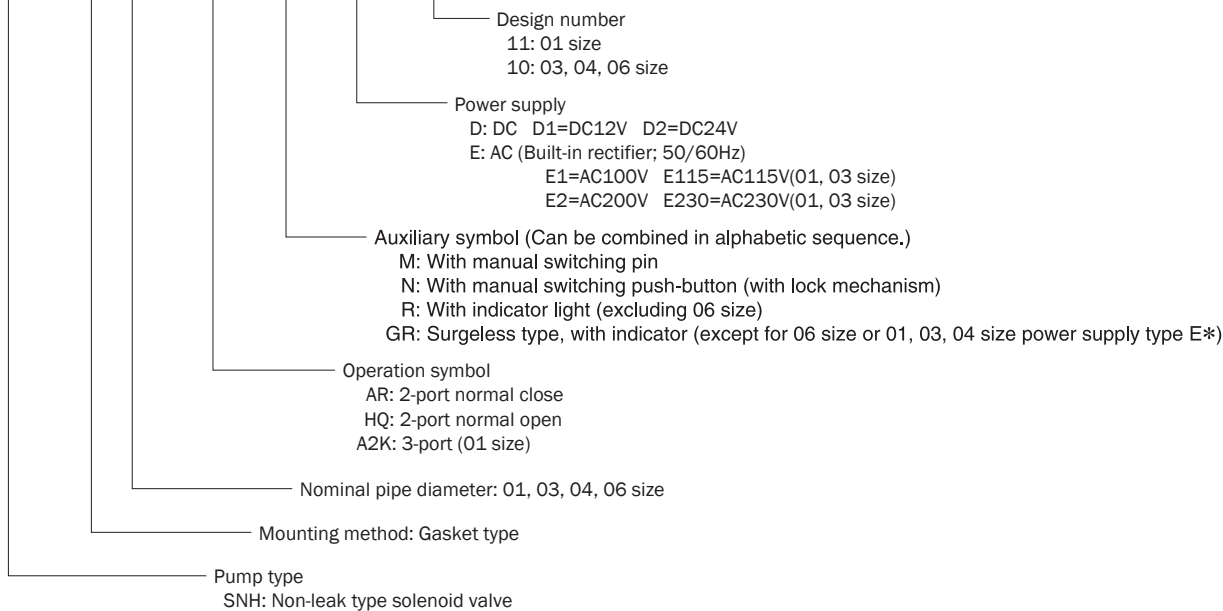
| Solenoid Type              | Power Supply Type | Voltage (V) | Frequency (Hz) | For SNH-G01        |             |           |                             | For SNH-G03        |             |           |                             |
|----------------------------|-------------------|-------------|----------------|--------------------|-------------|-----------|-----------------------------|--------------------|-------------|-----------|-----------------------------|
|                            |                   |             |                | Solenoid Coil Type | Current (A) | Power (W) | Allowable Voltage Range (V) | Solenoid Coil Type | Current (A) | Power (W) | Allowable Voltage Range (V) |
| DC with Built-in Rectifier | E1                | AC100       | 50/60          | EAC64-E1-1A        | 0.31        | 27        | 90 to 110                   | EBB64-E1           | 0.40        | 34        | 90 to 110                   |
|                            | E115              | AC110       | 50/60          | EAC64-E115-1A      | 0.26        | 25        | 100 to 125                  | EBB64-E115         | 0.33        | 31        | 100 to 125                  |
|                            |                   | AC115       |                |                    | 0.27        | 27        |                             |                    | 0.34        | 34        |                             |
|                            | E2                | AC200       | 50/60          | EAC64-E2-1A        | 0.15        | 26        | 180 to 220                  | EBB64-E2           | 0.22        | 37        | 180 to 220                  |
|                            | E230              | AC220       | 50/60          | EAC64-E230-1A      | 0.12        | 24        | 200 to 250                  | EBB64-E230         | 0.16        | 30        | 200 to 250                  |
|                            |                   | AC230       |                |                    | 0.13        | 27        |                             |                    | 0.17        | 33        |                             |
| DC                         | D1                | DC12        | ☒              | EAC64-D1-1A        | 2.2         | 26        | 10.8 to 13.2                | EBB64-D1           | 2.6         | 31        | 10.8 to 13.2                |
|                            | D2                | DC24        | ☒              | EAC64-D2-1A        | 1.1         | 26        | 21.6 to 26.4                | EBB64-D2           | 1.5         | 36        | 21.6 to 26.4                |

| Solenoid Type              | Power Supply Type | Voltage (V) | Frequency (Hz) | For SNH-G04        |             |           |                             |
|----------------------------|-------------------|-------------|----------------|--------------------|-------------|-----------|-----------------------------|
|                            |                   |             |                | Solenoid Coil Type | Current (A) | Power (W) | Allowable Voltage Range (V) |
| DC with Built-in Rectifier | E1                | AC100       | 50/60          | EBB64-E1           | 0.40        | 34        | 90 to 110                   |
|                            | E2                | AC200       | 50/60          | EBB64-E2           | 0.22        | 37        | 180 to 220                  |
| DC                         | D2                | DC24        | ☒              | EBB64-D2           | 1.5         | 36        | 21.6 to 26.4                |

| Solenoid Type              | Power Supply Type | Voltage (V) | Frequency (Hz) | For SNH-G06        |                   |                     |                   |                             |
|----------------------------|-------------------|-------------|----------------|--------------------|-------------------|---------------------|-------------------|-----------------------------|
|                            |                   |             |                | Solenoid Coil Type | Drive Current (A) | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) |
| DC with Built-in Rectifier | E1                | AC100       | 50/60          | EBB64-D60          | 0.71              | 0.36                | 33.2              | 90 to 110                   |
|                            | E2                | AC200       | 50/60          | EBB64-D120         | 0.39              | 0.19                | 36.4              | 180 to 220                  |
| DC                         | D2                | DC24        | ☒              | EBB64-D17          | 3.0               | 1.5                 | 37.4              | 21.6 to 26.4                |

## Understanding Model Numbers

**SNH - G 01 - AR - \* - D2 - 11**

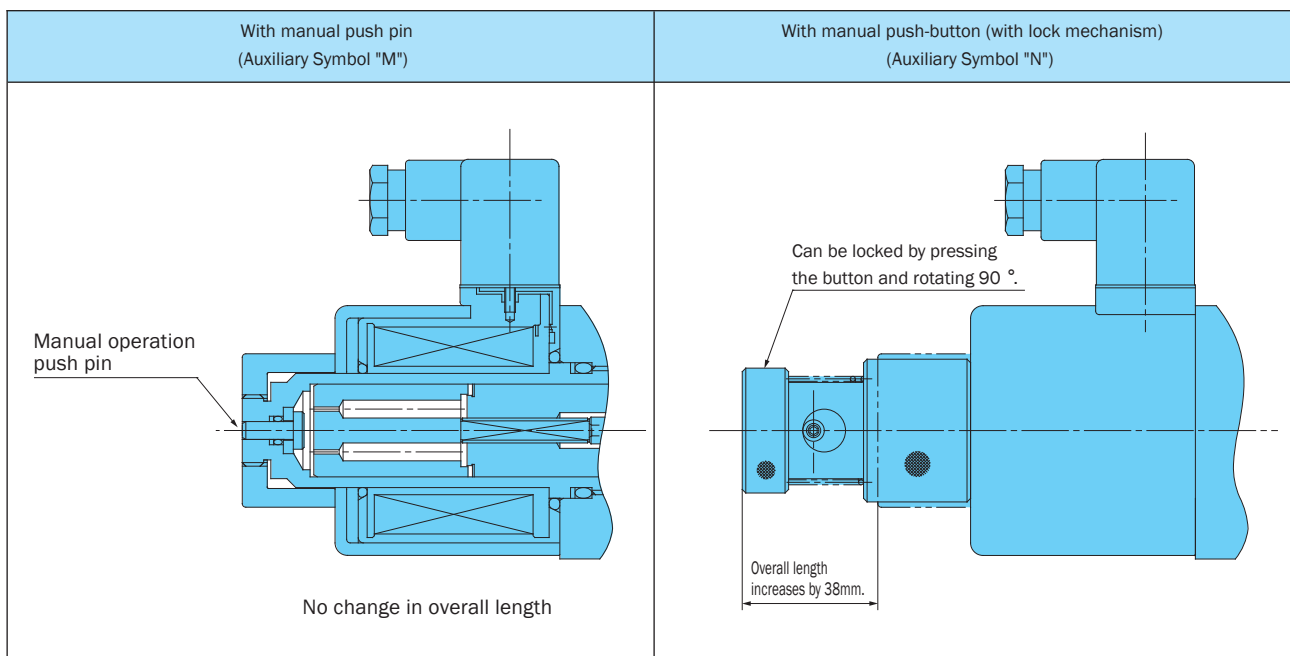


## Options

(Auxiliary Symbol)

- Select options in accordance with size, as shown in the table to the right.
- (1) The 06 size has an EC connector and a built in surge killer as standard. However, an indicator light is not provided because of space considerations.
- (2) Option N increases the measurement by the size of the pushbutton only.

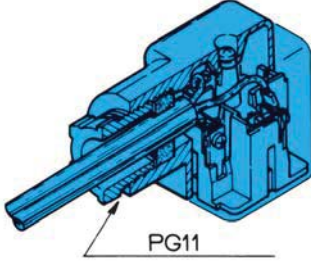
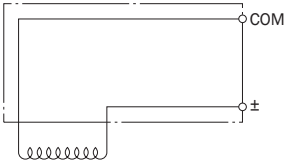
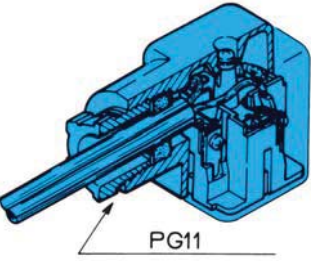
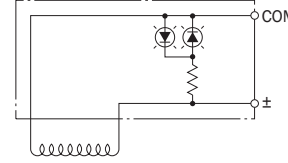
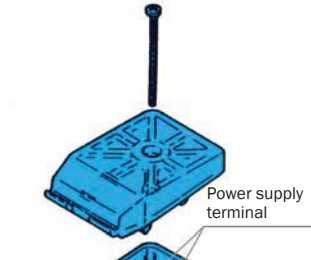
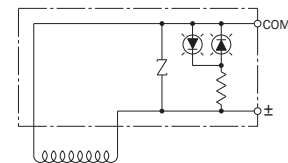
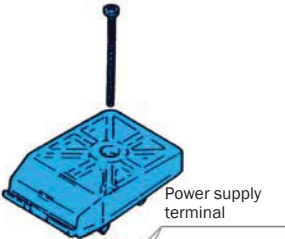
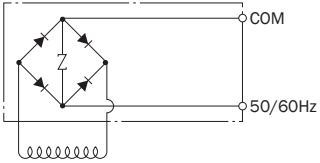
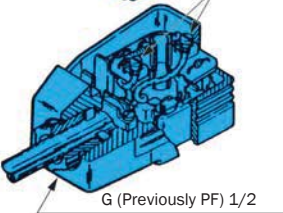
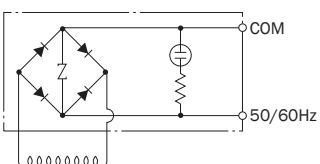
| Size \ Auxiliary symbol | M  | N  | R  | GR |
|-------------------------|----|----|----|----|
| 01                      | TM | TM | TM | TM |
| 03                      | TM | TM | TM | TM |
| 04                      | TM | TM | TM | TM |
| 06                      | TM | TM | ☒  | ☒  |





## Electrical Circuits

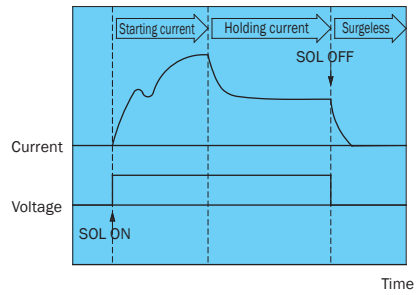
• These electrical circuits are for sizes 01, 03, 04. An EC connector is used for size 06. See the next page for more information

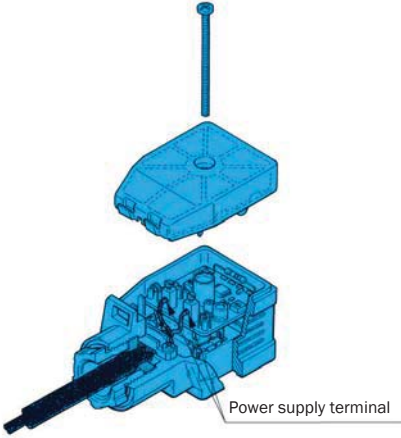
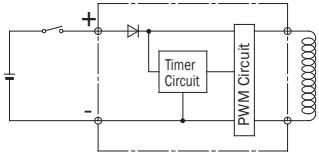
| Valve                          | Connector Type   | Wiring   | Electrical Circuit Diagram  |
|--------------------------------|--|--|---|
| G01<br>G03<br>G04<br>Size      | EA41-1A<br>(Standard for power supply type D*)   |  <p>PG11</p>                    | <p>Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.</p>    |
|                                | EA41-DR1/2-1C<br>(D* option: R)  |  <p>PG11</p>                   | <p>Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.</p>    |
|                                | EA41-GRD1/2-1C<br>(D* option: GR)  |  <p>PG11</p>                  |    |
|                                | EA42-1B<br>(For power supply type E*)  |  <p>Power supply terminal</p> | <p>Connect the power supply to the terminals on the board. When ground connection is required, remove the board and use the ⊕ terminal. In this case, do not connect the power supply to the No. 1 and No. 2 terminals.</p>  |
| EA42-R1/2-1B<br>(E* option: R) |  <p>G (Previously PF) 1/2</p> |                             |   |

- Note:
- 1.Connector types 1 and 2 indicate voltage. (1: 100V AC or 12V DC; 2: 200V AC or 24V DC)
  - 2.Use a connector cord with a diameter that is in the range of  $\phi 8$  to  $\phi 10$ .
  - 3.The orientation of the connectors can be changed in  $90^\circ$  increments by modifying the terminal block.
  - 4.The cover cannot be removed unless the installation screws are removed.
  - 5.Use an M3 type as a solderless terminal.
  - 6.Tighten the M3 screws that secure connectors and terminals to a torque of 2.6 to 4.4 in lbs.

- 06 Size EC Connector

SNH-G06 provides large switching power, so an EC connector is used. During switching, this EC connector supplies twice the current (starting current) that normally flows to the coil (holding current), and drops the current back to normal after switching is complete.

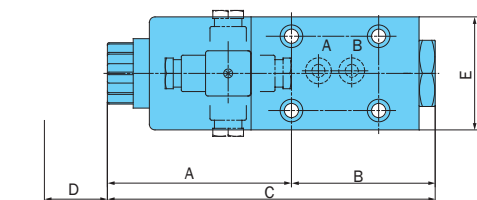


| Valve   | Connector Type   | Wiring   | Electrical Circuit Diagram   |
|---------|--|--|--|
| 06 Size | Surgeless Type (24V DC)<br>EC Connector<br>EN41 - 06D2 |  <p>Power supply terminal</p> |  <p>Note that correct polarity must be maintained with the power supply.</p>  |
|         | Built-in Rectifier<br>EC Connector<br>EN41 - 06E1/E2   |  | <p>Connect the power supply to the terminals on the board.<br/>When ground connection is required, remove the board and use the ⊕ terminal. In this case, do not connect the power supply to the No. 1 and No. 2 terminals.<br/>Round type, Y type, and other solderless terminals cannot be used.</p> |

Note: The orientation of the EN41-06\*\* connector cannot be changed at 90° intervals by modifying the terminal block.

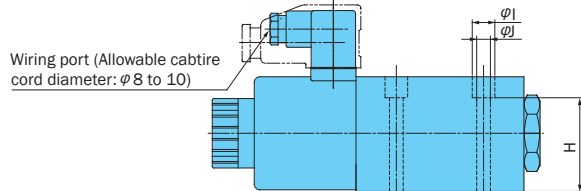
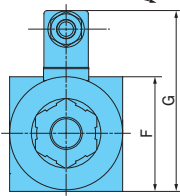
# Installation Dimension Drawings

SNH-G\*\*-AR\*\*-\*\*  
11  
10



Space required for coil removal

Rotatable 360° (Note 2)

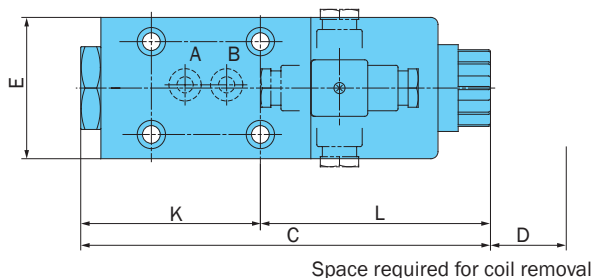


Dimension Table

| Size | A   | B    | C     | D    | E  | F  | G (Note) 2     | H    | I  | J   |
|------|-----|------|-------|------|----|----|----------------|------|----|-----|
| 01   | 100 | 60.5 | 160.5 | 60.5 | 46 | 48 | 91<br>(94.5)   | 37.5 | 9  | 5.5 |
| 03   | 114 | 89   | 203   | 63   | 70 | 72 | 112<br>(115.5) | 58   | 14 | 8.5 |
| 04   | 132 | 71   | 203   | 63   | 75 | 71 | 112<br>(115.5) | 58   | 14 | 8.5 |
| 06   | 137 | 82   | 219   | 63   | 85 | 71 | 115.5          | 60   | 18 | 11  |

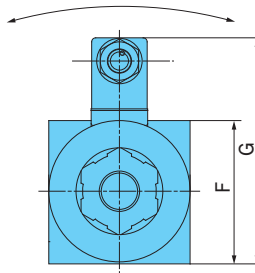
- Note: 1. The 01, 03, 04 size power supply type E\* allows rotation at 90° intervals, but the 06 size cannot be rotated.  
 2. Values in parentheses are for 01, 03, 04 size power supply type E\*.  
 3. The P and T ports of the 01, 03 sizes do not have O-ring grooves, so if the manifold has P and T ports, use end plates to close off the valve P and T ports. Contact your agent for information about end plates.

SNH-G\*\*-HQ\*\*-\*\*  
11  
10



Space required for coil removal

Rotatable 360° (Note 1)

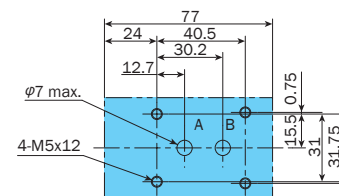


Dimension Table

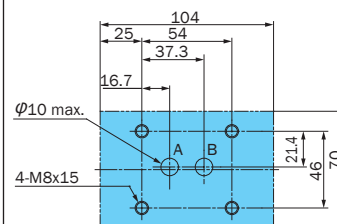
| Size | C     | D    | E  | F  | G (Note) 2     | K    | L   |
|------|-------|------|----|----|----------------|------|-----|
| 01   | 160.5 | 60.5 | 46 | 48 | 91<br>(94.5)   | 70.5 | 90  |
| 03   | 203   | 63   | 70 | 72 | 112<br>(115.5) | 89   | 114 |
| 04   | 203   | 63   | 75 | 71 | 112<br>(115.5) | 83   | 120 |
| 06   | 219   | 63   | 85 | 71 | 115.5          | 100  | 119 |

## Valve Mounting Surface Dimensions

01-AR/HQ (Conforms to ISO 4401-03-02-0-94)  
MSA-01X-E10

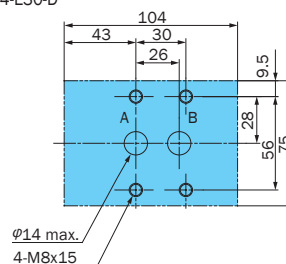


03-AR/HQ (Conforms to ISO 4401-05-04-0-94)  
MS-03-E30

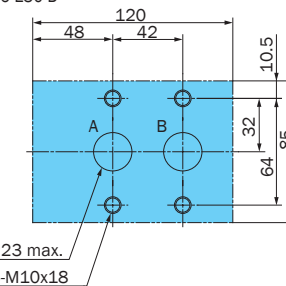


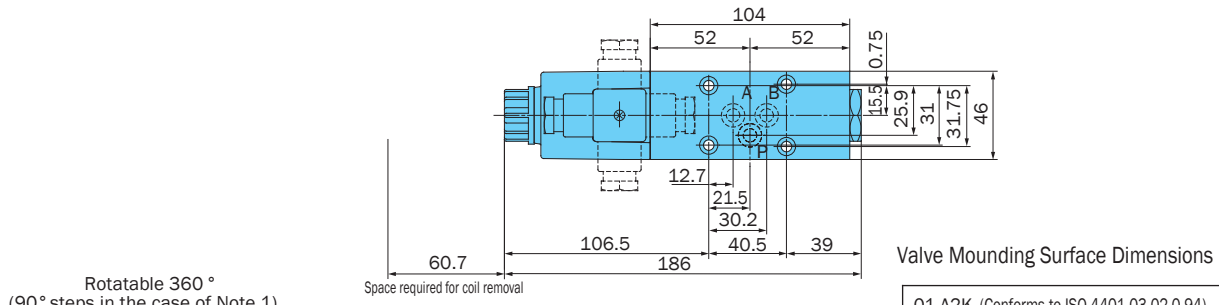
Note: An M6 mounting screw type is not yet available.

04-AR/HQ  
MS-04-E30-D

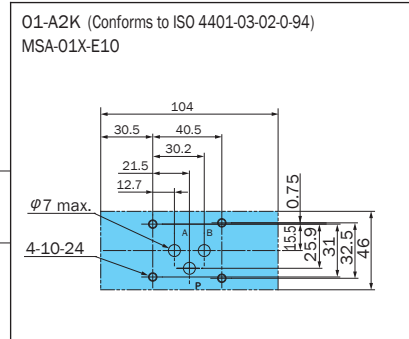


06-AR/HQ  
MS-06-E30-D





Valve Moulding Surface Dimensions



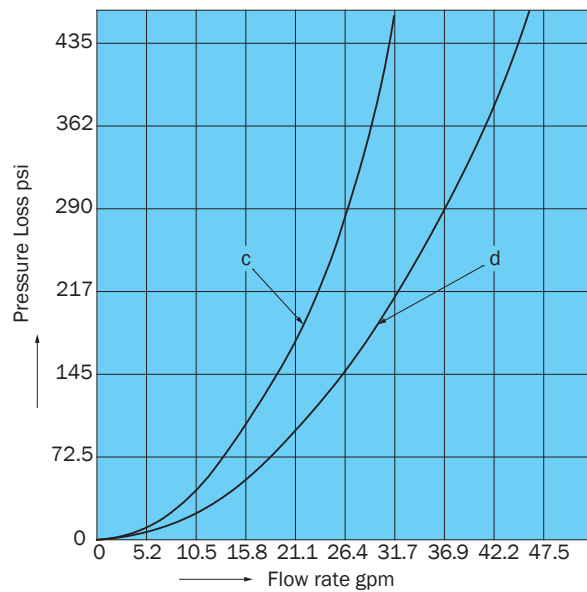
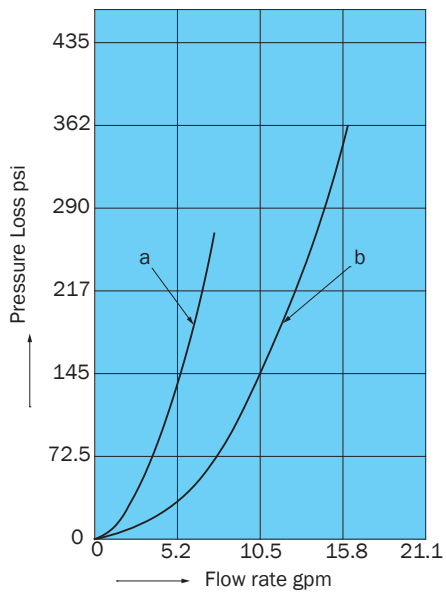
Note: 1. Power supply type E\* allows rotation at 90° intervals.  
 2. Values in parentheses are for power supply type E\*.

### Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

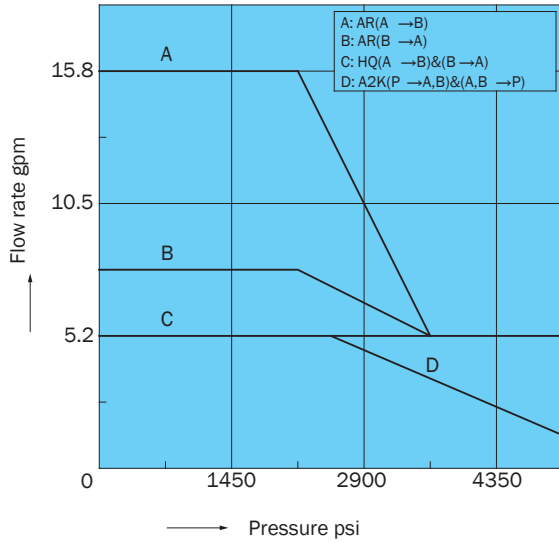
#### Pressure Loss Characteristics

| Flow Path \ Size | 01 | 03 | 04 | 06 |
|------------------|----|----|----|----|
| A ↔ B            | a  | b  | c  | d  |
| P ↔ A, P ↔ B     | a  | -- | -- | -- |

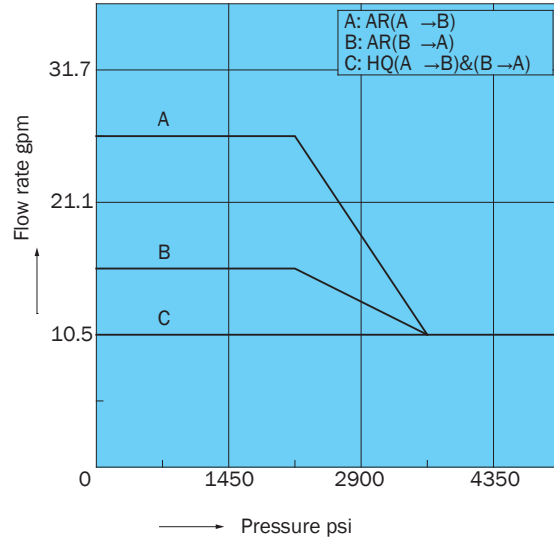


Pressure - Flow Volume Allowable Value

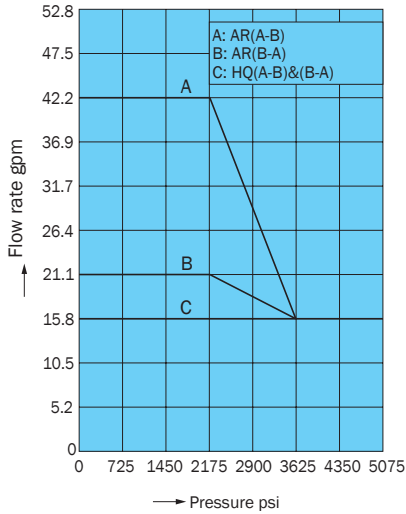
G01 Size



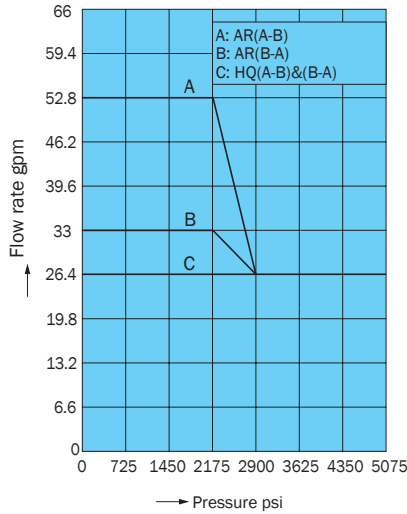
G03 Size



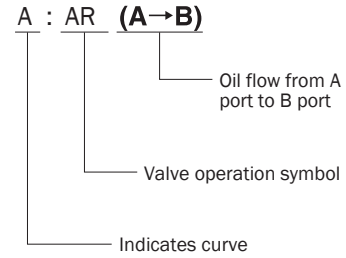
SNH-G04-AR/HQ



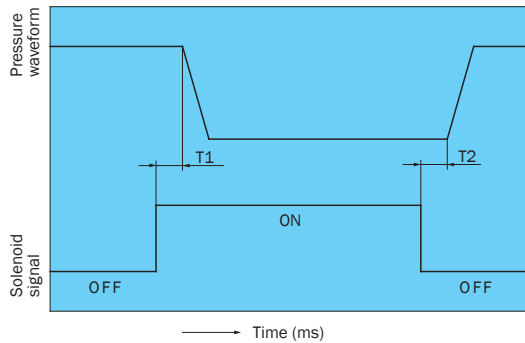
SNH-G06-AR/HQ



Note: Available flow rate values depend on pressure and fluid flow direction. The following shows how to read the data.



Switching Response Time



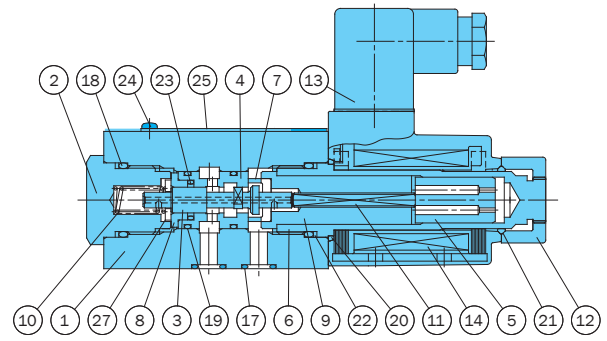
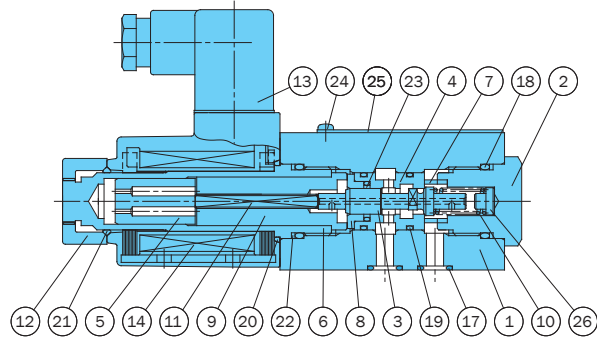
Pressure : 5075 psi  
Flow Rate : 01 : 5.2 gpm  
                  03 : 10.5 gpm  
                  04 : 15.8 gpm  
                  06 : 26.4 gpm  
Operating Fluid : ISO VG68

| Size | Power supply | Response Time (sec) |              |
|------|--------------|---------------------|--------------|
|      |              | T1(ON)              | T2(OFF)      |
| 01   | D*           | 0.03 to 0.05        | 0.04 to 0.06 |
|      | E*           | 0.04 to 0.06        | 0.08 to 0.10 |
| 03   | D*           | 0.06 to 0.08        | 0.04 to 0.06 |
|      | E*           | 0.07 to 0.09        | 0.08 to 0.10 |
| 04   | D*           | 0.09 to 0.11        | 0.06 to 0.08 |
|      | E*           | 0.12 to 0.14        | 0.14 to 0.16 |
| 06   | D*           | 0.04 to 0.06        | 0.06 to 0.08 |
|      | E*           | 0.09 to 0.11        | 0.14 to 0.16 |

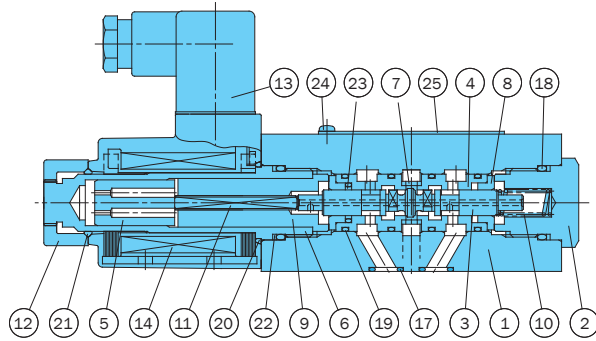
Note: The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)

# Cross-sectional Drawing

SNH-G01-HQ-\*\*-11



SNH-G01-A2K-\*\*-11

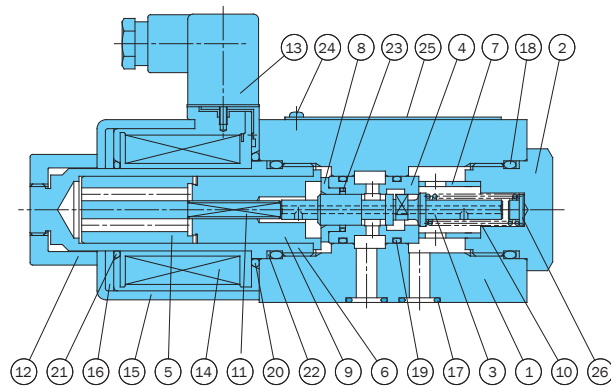


| Part No. | Part Name        | Part No. | Part Name                       |
|----------|------------------|----------|---------------------------------|
| 1        | Body             | 15       | Coil case                       |
| 2        | Plug             | 16       | Coil yoke                       |
| 3        | Poppet           | 17       | O-ring                          |
| 4        | Sleeve           | 18       | O-ring                          |
| 5        | Plunger          | 19       | O-ring                          |
| 6        | Solenoid guide   | 20       | O-ring                          |
| 7        | Ring             | 21       | O-ring                          |
| 8        | Collar           | 22       | Backup ring                     |
| 9        | Solenoid stopper | 23       | Cap seal                        |
| 10       | Spring           | 24       | Cross recessed head small screw |
| 11       | Rod              | 25       | Nameplate                       |
| 12       | Nut              | 26       | Stopper                         |
| 13       | Connector        | 27       | Retainer                        |
| 14       | Solenoid coil    |          |                                 |

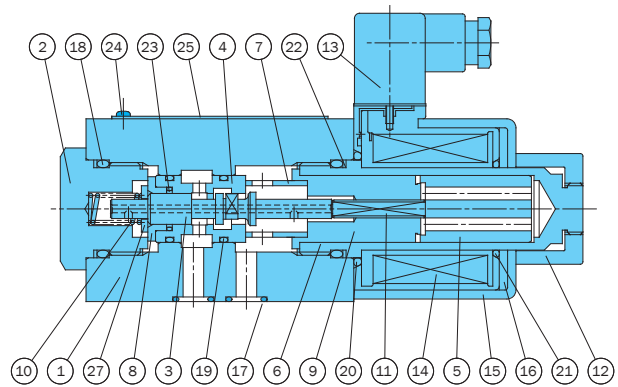
**D**

Solenoid Valves

03  
SNH-G04-AR-\*\*-10  
06



03  
SNH-G04-HQ-\*\*-10  
06

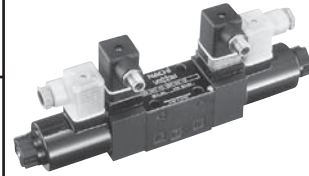


## List of Sealing Parts

| Part No. | Part Name   | 01               | 03        | 04               | 06        | Q'ty   |     |
|----------|-------------|------------------|-----------|------------------|-----------|--------|-----|
|          |             |                  |           |                  |           | AR, HQ | A2K |
| 17       | O-ring      | AS568-012 (HS90) | IB-P12    | IB-P16           | IB-P28    | 2      | 3   |
| 18       | O-ring      | IB-P22           | IB-P32    | IB-P32           | IB-P32    | 2      | 2   |
| 19       | O-ring      | AS568-017(HS90)  | IB-P22    | AS568-120 (HS90) | IB-P26    | 2      | 4   |
| 20       | O-ring      | S-25             | AS568-029 | AS568-029        | AS568-029 | 1      | 1   |
| 21       | O-ring      | 1A-P20           | AS568-026 | AS568-026        | AS568-026 | 1      | 1   |
| 22       | Backup ring | T2-P22           | T2-P32    | T2-P32           | T2-P32    | 2      | 2   |
| 23       | Cap seal    | *                | *         | *                | *         | 1      | 1   |

Note: O-ring 1B-\*\*-\*\* refers to JIS B2401-1B. Backup ring T2 indicates JIS B 2407-T2.

\*Parts marked by an asterisk "\*\*" are not available on the market. Contact your agent for more information.



### SAW Series Directional Control Valve with Monitoring Switch

26.4 gpm  
5075 psi

#### Features

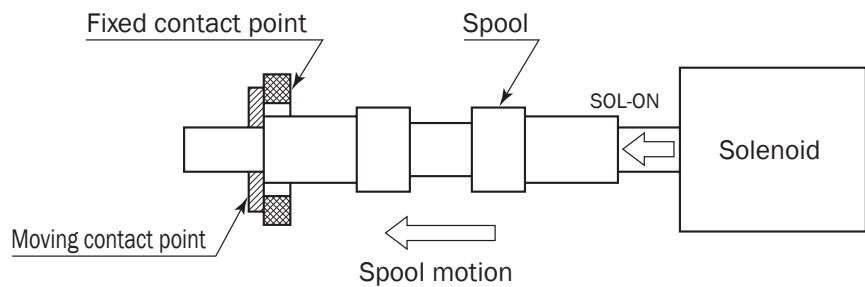
This valve is a spool activated directional control valve that uses mechanical detection to operate a switch to send an electric ON/OFF signal. This makes it possible, by monitoring the status of the spool operations, to use it as an information source for safety checks by using the ON/OFF signal as a basis for sequence control. In the future, they will be used in machinery that is compatible with inter-

national machine safety (ISO 12100) and JIS standards (JIS B 9700) standards. The directional control valve with monitoring switch was developed as a valve to support this demand. The switch contact has little dead zone and almost no temperature drift (variable motion caused by changes in temperature) or hysteresis because the

reaction of the spool action is mechanical. All valve functions, except for the monitoring function, are equivalent to the standard solenoid operated directional control valve (SA-G01). DIN connectors are used for the switches and solenoid coil wiring so connections are easy when installing or replacing valves.

#### Operational Principle

When the spool is in the center position, the fixed and moving parts are in contact forming an electric circuit. Operating the solenoid moves the spool so the moving part moves breaking the electric connection between the fixed and moving parts. PAT. PEND.



#### Specifications

| Model No.  |                  | Standard Type                   |                          | Shockless Type                  |                          |
|------------|------------------|---------------------------------|--------------------------|---------------------------------|--------------------------|
| JIS Symbol | Operation Symbol | Maximum Working Pressure<br>psi | Maximum Flow Rate<br>gpm | Maximum Working Pressure<br>psi | Maximum Flow Rate<br>gpm |
|            | -A2X-            | 5075                            | 7.9                      | 3625                            | 13.2                     |
|            | -A3X-            |                                 | 21.1                     |                                 |                          |
|            | -A5-             |                                 | 26.4                     |                                 |                          |
|            | -C1-             |                                 | 21.1                     |                                 |                          |
|            | -C5-             |                                 | 26.4                     |                                 |                          |
|            | -C6-             |                                 | 21.1                     |                                 |                          |
|            | -C1S-            |                                 | 26.4                     |                                 |                          |
|            | -C6S-            |                                 |                          |                                 |                          |

Note: The maximum flow rate of each valve depends on the pressure. For details, see page D-68.

• Valve Specifications

|   |                                       | AC Solenoid  | DC Solenoid        |  |
|---|---------------------------------------|--|--------------------|--|
|   |                                       |  | Built-in Rectifier |  |
| Maximum Working Pressure<br>P, A, B ports | Standard Type                         | 5075 psi   |                    |  |
|   | Shockless Type                        | 3625 psi   |                    |  |
| Maximum Allowable Backpressure T port     |                                       | 3045 psi   |                    |  |
| Maximum Flow Rate                         |                                       | See pressure-flow characteristics on page D-68 for more information. |                    |  |
| Switching Frequency                       |                                       | 120/minute   |                    |  |
| Weight                                    | Double Solenoid                       | 6.1 lbs  | 6.6 lbs            |  |
|   | Single Solenoid                       | 4.6 lbs  | 4.8 lbs            |  |
| Operating Environment                     | Dust Resistance/Water Resistance Rank | JISC 0920 IP65   |                    |  |
|   | Operating Fluid                       | Oil-based operating fluid (Note 1)                                   |                    |  |
|   | Ambient Temperature Range             | -4 to 122° F   |                    |  |
|   | Operating Fluid Temperature Range     | -4 to 158° F   |                    |  |
|   | Operating Viscosity Range             | 15 to 300 centistokes  |                    |  |
|   | Filtration                            | 10 µm or less  |                    |  |
| Mounting bolt (Note2)                     | Size × Length                         | Socket hex head bolt (grade 8 equivalent) 10-24 x 1 3/4              |                    |  |
|   | Tightening Torque                     | 3.6 to 5 ft lbs  |                    |  |

Note: 1. Use a petroleum based operating fluid because the ON/OFF mechanism of the valve's monitoring switch is immersed in oil and the oil must be a non-conducting fluid.  
 Use only petroleum based operating fluid (do not use fluids that are water, glycol, W/O emulsion, phosphate, or fatty ester based).  
 Petroleum based operating fluids must also have a water content that is less than 0.1% by volume.  
 2. Installation bolts are not provided with valves. Use the specified bolts.

• Monitoring Switch Specifications

|                                 |   |
|---------------------------------|---|
| Voltage Rating                  | 24VDC                                     |
| Allowable Voltage Range         | ± 20% of voltage rating                   |
| Maximum Current Load            | 100mA                                     |
| Residual Voltage (Note 3)       | Max. 1.2V                                 |
| Wiring for Connector for Switch | Connect with wires or M12-4 pin connector |

Note: 1. See page D-67 for the procedure to wire the connector for the switch.  
 2. The programmable controller input circuits are positive (+) common mode and negative (-) common mode.  
 The directional control valve with monitoring switch uses a source circuit [switch on the positive (+) side of the load and power source] for safety purposes.  
 Because of this, it is necessary to use a negative (-) common mode programmable controller to receive input from the monitoring switch output.  
 3. Set the voltage of the power supply to the monitoring switch within a range that satisfies the following conditions.  
 Load ON voltage + residual voltage ≤ switch supply voltage ≤ 28.8 V (+20% voltage rating)  
 4. The switch element (photocoupler) in the connector's internal circuit for the monitoring switch may malfunction in the ON state because of over voltage or over current.  
 Therefore, in addition to checking the ON output of the monitoring switch, monitor the current at the solenoid and the internal circuits of the connector and valve in conjunction with the switch output.

Condition of monitoring switch output and valve

|                          |     | Current to Solenoid   |   |
|--------------------------|-----|---|---|
|                          |     | ON  | OFF   |
| Monitoring Switch Output | ON  | Abnormal<br>Malfunction at internal circuit of connector or valve | Normal<br>Spool returns to middle position          |
|                          | OFF | Normal<br>Spool is switching                                      | Abnormal<br>Valve malfunction or signal wire is cut |

The monitoring switch outputs according to the motion of the spool, so the solenoid turns on and off according to the output signal which is delayed only as much as the spool operation is delayed.  
 Set a 0.3 second delay, including leeway, to monitor the output of the switch.



• Solenoid Specifications

Same specifications as the SA-G01 series (31 design).

| Solenoid Type              | Power Supply Type | Voltage (V) | Frequency (Hz) | Solenoid Coil Type | Drive Current (A) | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) |
|----------------------------|-------------------|-------------|----------------|--------------------|-------------------|---------------------|-------------------|-----------------------------|
| AC                         | C1                | AC100       | 50             | EAC64-C1           | 2.2               | 0.52                | 25                | 80 to 110                   |
|                            |                   |             | 60             |                    | 2.0               | 0.38                | 22                | 90 to 120                   |
|                            |                   | AC110       | 60             |                    | 2.2               | 0.46                | 28                |                             |
|                            | C115              | AC110       | 50             | EAC64-C115         | 2.0               | 0.47                | 25                | 90 to 120                   |
|                            |                   |             | 60             |                    | 1.8               | 0.35                | 22                | 100 to 130                  |
|                            |                   | AC115       | 60             |                    | 2.0               | 0.42                | 28                |                             |
|                            | C2                | AC200       | 50             | EAC64-C2           | 1.1               | 0.26                | 25                | 160 to 220                  |
|                            |                   |             | 60             |                    | 1.0               | 0.19                | 22                | 180 to 240                  |
|                            |                   | AC220       | 60             |                    | 1.1               | 0.23                | 28                |                             |
|                            | C230              | AC220       | 50             | EAC64-C230         | 1.0               | 0.24                | 25                | 180 to 240                  |
|                            |                   |             | 60             |                    | 0.91              | 0.17                | 22                | 200 to 260                  |
|                            |                   | AC230       | 60             |                    | 1.0               | 0.21                | 28                |                             |
| DC with Built-in Rectifier | E1                | AC100       | 50/60          | EAC64-E1-1A        | 0.31              |                     | 27                | 90 to 110                   |
|                            | E115              | AC110       | 50/60          | EAC64-E115-1A      | 0.26              |                     | 25                | 100 to 125                  |
|                            |                   | AC115       |                |                    | 0.27              |                     | 27                |                             |
|                            | E2                | AC200       | 50/60          | EAC64-E2-1A        | 0.15              |                     | 26                | 180 to 220                  |
|                            | E230              | AC220       | 50/60          | EAC64-E230-1A      | 0.12              |                     | 24                | 200 to 250                  |
| AC230                      |                   | 0.13        |                |                    | 27                |                     |                   |                             |
| DC                         | D1                | DC12        | —              | EAC64-D1-1A        | 2.2               |                     | 26                | 10.8 to 13.2                |
|                            | D2                | DC24        | —              | EAC64-D2-1A        | 1.1               |                     | 26                | 21.6 to 26.4                |

• Handling

- In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T port. Never use a stopper plug in the T port.
- Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
- Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- Use a ISO VG 32 petroleum-based operating fluid, or an equivalent, that has a water content that is less than 0.1% by volume.
- Do not use fire-resistant operating fluid.
- Use this valve only within the allowable voltage range.
- Do not allow the AC solenoid to become

- charged until you install the coil into the valve.
- In the case of operation symbol A2X, run drain piping from the valve T port.
- Maintaining a switching position under high pressure for a long period can cause abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.
- Note that manual pin operating pressure changes in accordance with tank line back pressure.
- The solenoid has a pin for switching the spool manually. However, use the cap (option symbol: D) to prevent manual operation for jobs where manual operation would cause a safety problem.
- The only way to prevent misoperation of the monitoring switch caused by noise generated by the solenoid turning on and off is to install the surgeless

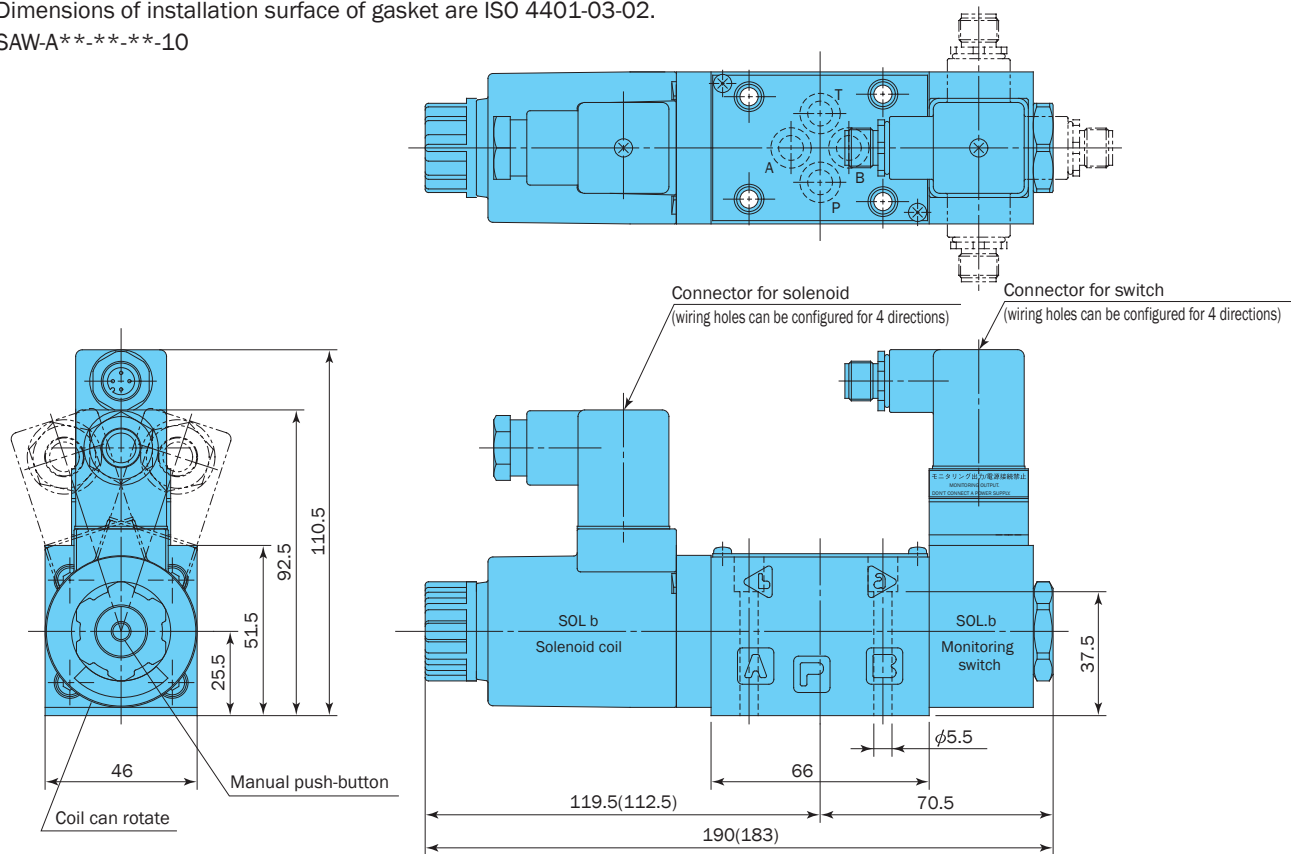
- directional control valve with monitoring switch (option symbol: GR). (If the solenoid power source is C\* and D\*)
- Use surgeless specification (with varistor diode) directional control valves with monitoring switches for all electric valves on the same machine to prevent mis-operation of the monitoring switch caused by noise when the solenoid turns on and off.
- The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.
- The connector for the solenoid is the same as for the SA series solenoid valve. See page D-22 for electrical circuit drawings and wiring procedures.
- Use the following table for specification when a sub plate is required.

| Model No.    | Pipe Diameter | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs | Dimension Drawings Page |
|--------------|---------------|------------------------------|---------------------------|------------|-------------------------|
| MSA-01X-E10  | 1/4           | 3625                         | 5.2                       | 2.6        | D-20                    |
| MSA-01Y-E10  | 3/8           |                              | 10.5                      |            |                         |
| MSA-01Y-TE10 | 3/8           |                              | 10.5                      | 1.9        |                         |

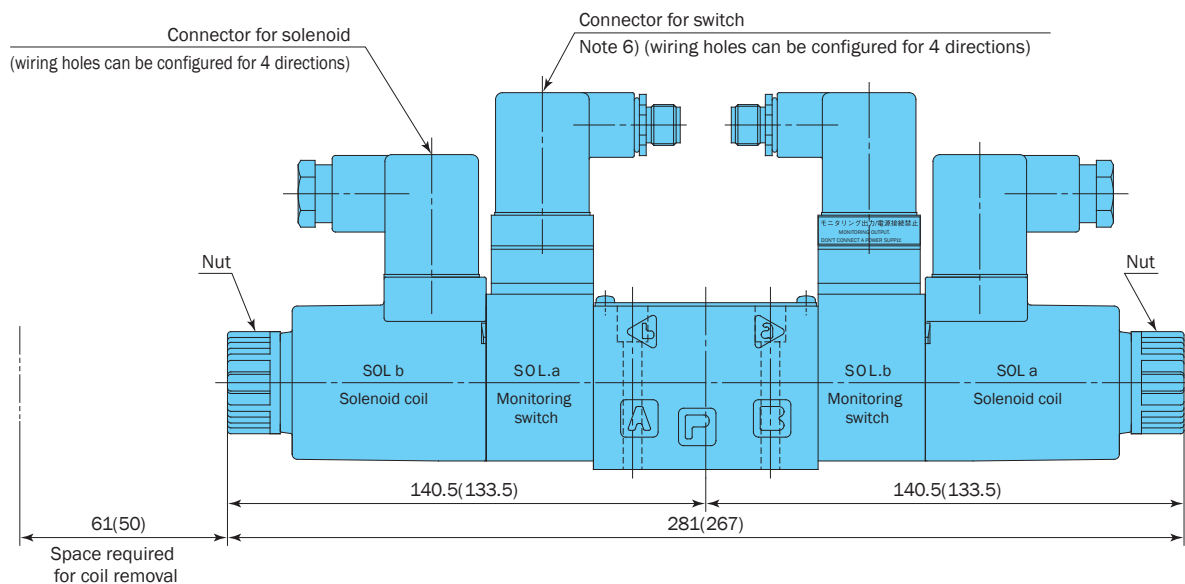


## Installation Dimension Drawings

Dimensions of installation surface of gasket are ISO 4401-03-02.  
SAW-A\*\*.\*-10



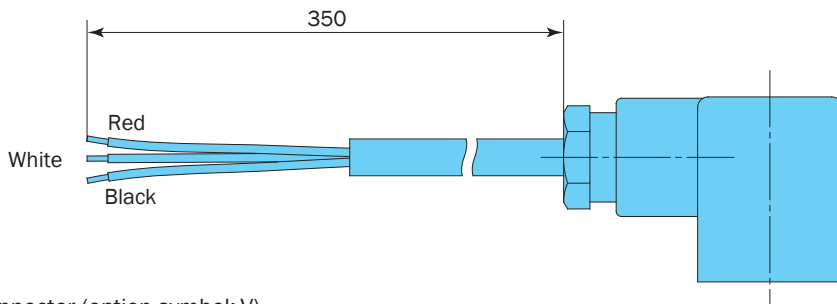
SAW-G01-C\*\*.\*-10



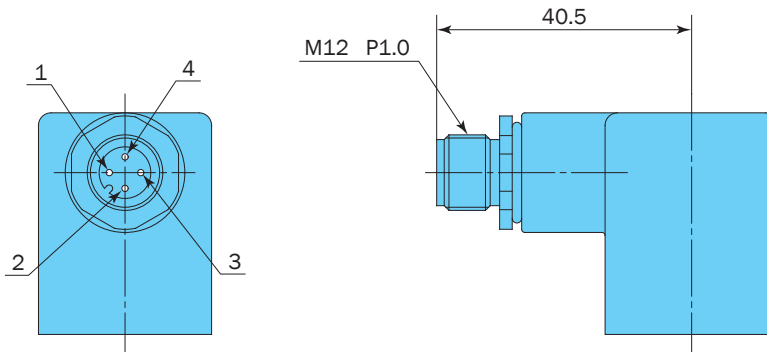
- Note:
1. Dimensions in parentheses apply in the case of an AC solenoid.
  2. For option symbol D (with cap to prevent manual operation), the nut for fixing coil is 5mm long. Include this length when calculating the total length of the valve.
  3. The connector for the switch in the drawing above is the M12-4 pin connector. In addition there are wire connections also. See page D-67 for more detailed information.
  4. The wiring hole for the connector is oriented as shown in the diagram for packaging purposes. The orientation can be changed according to the direction of the wiring.
  5. Use surgeless directional control valves with monitoring switches for all electric valves on the same machine to prevent misoperation of the monitoring switch caused by noise when the solenoid turns on and off.
  6. To orient the wiring hole for the connector for the switch towards the solenoid coil, loosen the nut and rotate the solenoid coil so the connector for the switch does not interfere with the connector for the solenoid.

• Details about the Connector for the Switch

(1) With wiring (option symbol: none)

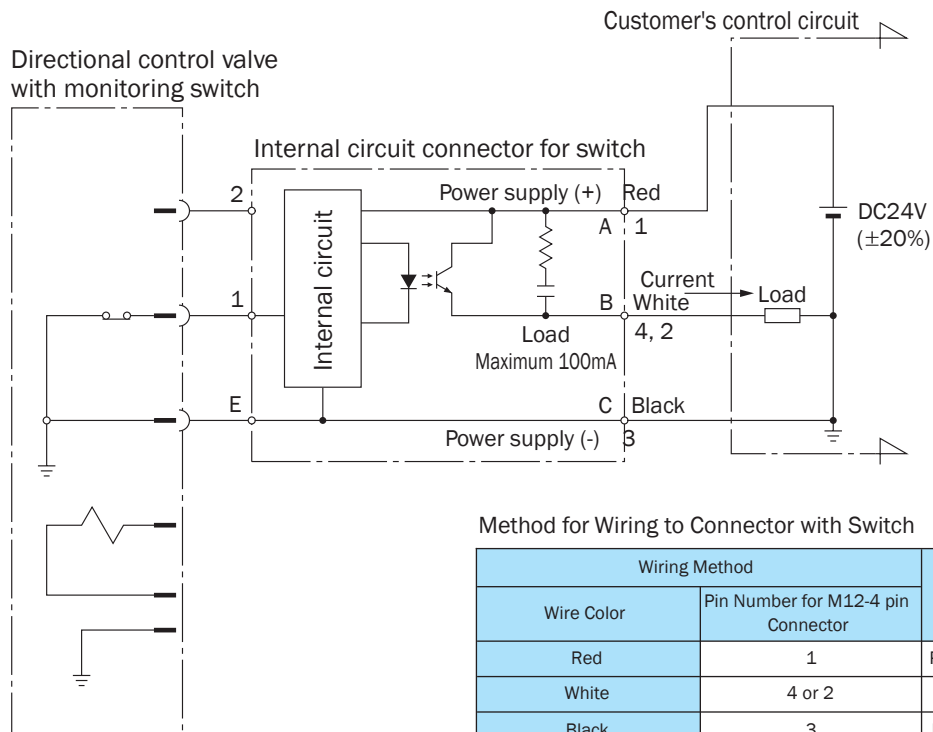


(2) With M12-4 pin connector (option symbol: V)



- Note: 1. The pin connector is screwed to the housing so it is rotated a certain amount compared to the drawing. Refer to the electrical circuit diagram below for how to connect it.  
 2. The connector that the M12-4 pin connector connects to is not provided.  
 (Example of connector with cable provided by customer: Omron XS2F-D421-D80-A)

(3) Electrical circuit diagram



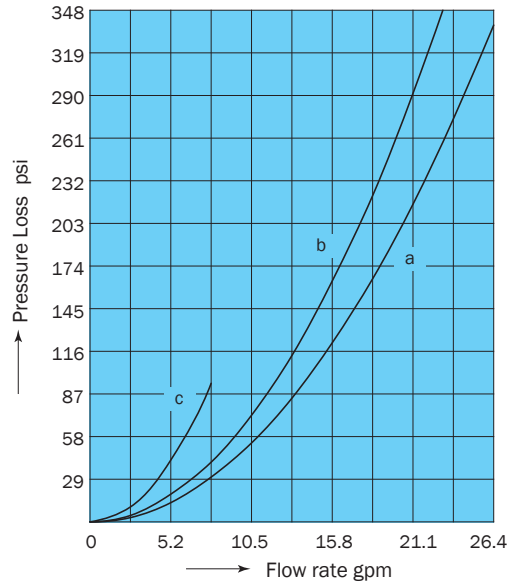
- Note: 3. Always install a diode to prevent surges in the current when connecting an inductive load, such as a relay, to the monitoring switch.  
 4. Do not modify or replace the lead wires.  
 5. Connect the load for the M12-4 pin connector to either pin number 4 or 2.  
 6. When connecting monitoring switches in sequence, use the negative (-) common mode (type that current runs to sequence side).

# Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics

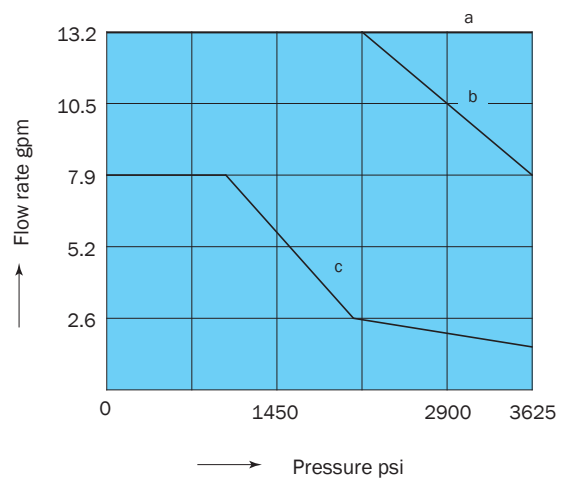
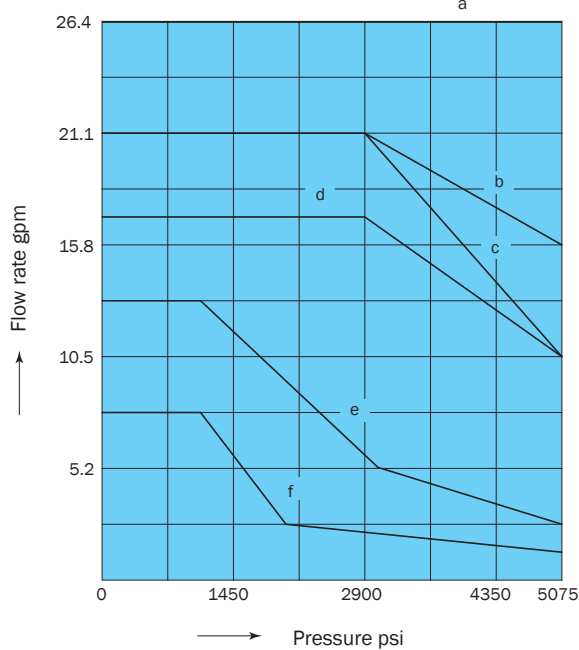
| Operation Symbol | P → A | P → B | A → T | B → T |
|------------------|-------|-------|-------|-------|
| A2X              | c     | c     | —     | —     |
| A3X              | b     | b     | b     | b     |
| A5               | —     | b     | b     | —     |
| C1               | b     | b     | a     | b     |
| C5               | b     | b     | b     | b     |
| C6               | b     | b     | a     | a     |
| C1S              | b     | b     | b     | b     |
| C6S              | b     | b     | b     | b     |



## Pressure – Flow Volume Allowable Value

| Operation Symbol | Standard Form, with AC, DC solenoid |   |   |
|------------------|-------------------------------------|---|---|
|                  |                                     |   |   |
| A2X              | —                                   | f | f |
| A3X              | b                                   | f | f |
| A5               | a                                   | — | e |
| C1               | AC SOL. d<br>DC SOL. c              | e | e |
| C5               | a                                   | e | e |
| C6               | AC SOL. d<br>DC SOL. c              | e | e |
| C1S              | a                                   | e | e |
| C6S              | a                                   | e | e |

| Operation Symbol | Shockless Type, with DC solenoid |   |   |
|------------------|----------------------------------|---|---|
|                  |                                  |   |   |
| A2X              | —                                | c | c |
| A3X              | a                                | c | c |
| A5               | a                                | — | c |
| C1               | b                                | c | c |
| C5               | a                                | c | c |
| C6               | b                                | c | c |
| C1S              | a                                | c | c |
| C6S              | a                                | c | c |

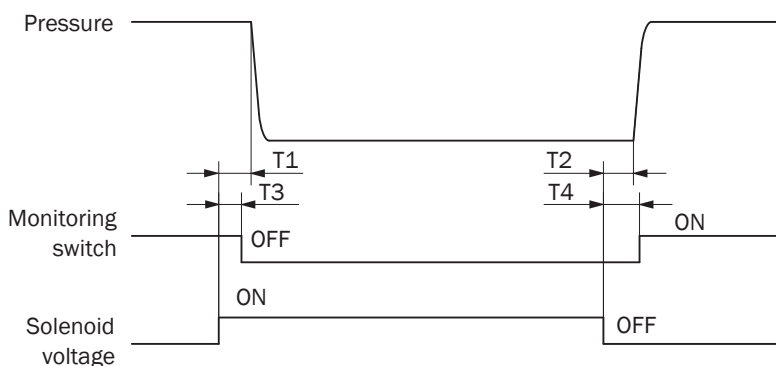


Range of Motion of Switch

| Positions        |                         | Stroke of Spool |        |          |
|------------------|-------------------------|-----------------|--------|----------|
|                  |                         | SOL.b ON        | Center | SOL.a ON |
| Flow Path        |                         |                 |        |          |
| Motion of Switch | SOL.b Monitoring Switch | OFF             | ON     |          |
|                  | SOL.a Monitoring Switch | ON              |        | OFF      |

Note: 1. Flow path is C5 type (all-port-block), other flow paths also activate switch in middle position.  
 2. ON and OFF indicate the state of the output transistor on the circuit board in the connector.

Switching Responsiveness



| Type of Machine | Model                                  | Response Time (s)    |              |              |            |            |
|-----------------|--|----------------------|--------------|--------------|------------|------------|
|                 |  | Pressure             |              | Switch       |            |            |
|                 |  | T1                   | T2           | T3           | T4         |            |
| AC Solenoid     | SAW-G01-C5-GR-C1-10                    | 0.02 to 0.03         | 0.02 to 0.03 | 0.01 to T1   | T2 to 0.05 |            |
| DC Solenoid     | Standard Type                          | SAW-G01-C5-GR-D2-10  | 0.03 to 0.04 | 0.02 to 0.04 | 0.01 to T1 | T2 to 0.06 |
|                 | Built-in Rectifier                     | SAW-G01-E1-10        | 0.03 to 0.04 | 0.07 to 0.10 | 0.01 to T1 | T2 to 0.15 |
|                 | Shockless Type                         | SAW-G01-C5-FGR-D2-10 | 0.07 to 0.10 | 0.04 to 0.07 | 0.02 to T1 | T2 to 0.10 |
|                 | Built-in Rectifier Type Shockless Type | SAW-G01-C5-F-E1-10   | 0.07 to 0.10 | 0.10 to 0.15 | 0.02 to T1 | T2 to 0.20 |

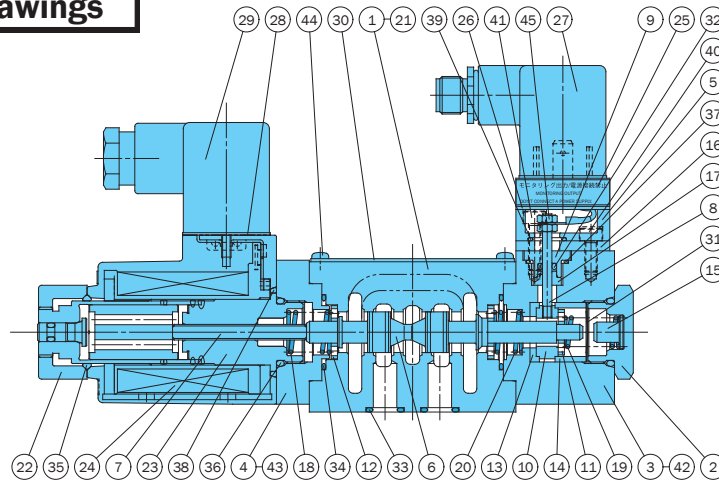
Note: May vary depending on switching response time and operating conditions (pressure, flow rate, and oil temperature).

[Measurement Conditions]

- Pressure 2030 psi
- Flow Rate 7.9 gpm
- Operating fluid ISO VG32 104° F

# Cross-sectional Drawings

SAW-G01-A\*\*-\*\*-10



| Part No. | Part Name                  | Part No. | Part Name                             | Part No. | Part Name                |
|----------|----------------------------|----------|---------------------------------------|----------|--------------------------|
| 1        | Body                       | 16       | Plate (connector)                     | 31       | Wave washer              |
| 2        | Plug                       | 17       | Collar (insulated)                    | 32       | O-ring *                 |
| 3        | Cover (switch)             | 18       | Spring (one SOL. guide side)          | 33       | O-ring *                 |
| 4        | Cover (one SOL.)           | 19       | Spring (one SOL. contact side)        | 34       | O-ring *                 |
| 5        | Cover (connector)          | 20       | Spring (main unit)                    | 35       | O-ring *                 |
| 6        | Spool                      | 21       | Spacer                                | 36       | O-ring *                 |
| 7        | Rod (guide)                | 22       | Nut                                   | 37       | O-ring *                 |
| 8        | Rod (conductor)            | 23       | Solenoid guide                        | 38       | O-ring *                 |
| 9        | Bush (insulated)           | 24       | Solenoid coil                         | 39       | O-ring *                 |
| 10       | Retainer (fixed contact)   | 25       | Connector with lead wire              | 40       | Hexagon socket head bolt |
| 11       | Retainer (movable contact) | 26       | Packing                               | 41       | Hexagon socket head bolt |
| 12       | Retainer (main unit)       | 27       | Connector with built-in photo-coupler | 42       | Hexagon socket head bolt |
| 13       | Ring (insulation inside)   | 28       | Connector packing                     | 43       | Hexagon socket head bolt |
| 14       | Ring (insulation outside)  | 29       | Connector                             | 44       | Philips pan head screw   |
| 15       | Stopper                    | 30       | Nameplate                             | 45       | Hexagon nut              |

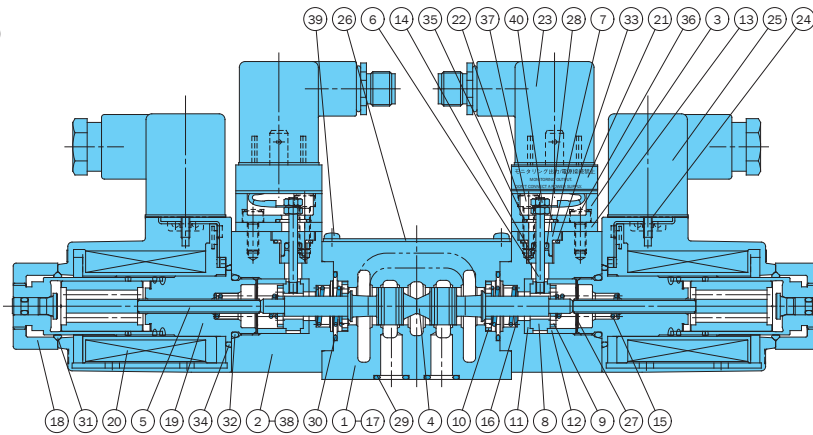
### Seal Part List (Kit Model Number EQS-01A)

| Part No. | Part Name | Part Number      | Q'ty |
|----------|-----------|------------------|------|
| 32       | O-ring    | 1B-P3            | 1    |
| 33       | O-ring    | AS568-012 (Hs90) | 4    |
| 34       | O-ring    | AS568-019 (Hs90) | 2    |
| 35       | O-ring    | 1A-P20           | 1    |
| 36       | O-ring    | 1B-P18           | 2    |
| 37       | O-ring    | S-11.2 (Hs90)    | 1    |
| 38       | O-ring    | S25 (Hs70)       | 1    |
| 39       | O-ring    | S-9 (Hs70)       | 1    |

Note: 1A and 1B are JIS Standard B 2401, while AS568 is SAE standard.

For details about parts marked with an asterisk "\*\*", refer to the list of seals in the table on the right.

SAW-G01-C\*\*-\*\*-10



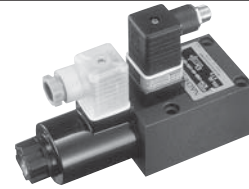
| Part No. | Part Name                      | Part No. | Part Name                             | Part No. | Part Name                |
|----------|--------------------------------|----------|---------------------------------------|----------|--------------------------|
| 1        | Body                           | 16       | Spring (main unit)                    | 31       | O-ring *                 |
| 2        | Cover (sensor)                 | 17       | Spacer                                | 32       | O-ring *                 |
| 3        | Cover (connector)              | 18       | Nut                                   | 33       | O-ring *                 |
| 4        | Spool                          | 19       | Solenoid guide                        | 34       | O-ring *                 |
| 5        | Rod (DC guide)                 | 20       | Solenoid coil                         | 35       | O-ring *                 |
| 6        | Rod (conductor)                | 21       | Connector with lead wire              | 36       | Hexagon socket head bolt |
| 7        | Bush (insulated)               | 22       | Packing                               | 37       | Hexagon socket head bolt |
| 8        | Retainer (fixed contact)       | 23       | Connector with built-in photo-coupler | 38       | Hexagon socket head bolt |
| 9        | Retainer (movable contact)     | 24       | Connector packing                     | 39       | Philips pan head screw   |
| 10       | Retainer (main unit)           | 25       | Connector                             | 40       | Hexagon nut              |
| 11       | Ring (insulation inside)       | 26       | Nameplate                             |          |                          |
| 12       | Ring (insulation outside)      | 27       | Wave washer                           |          |                          |
| 13       | Plate (connector)              | 28       | O-ring *                              |          |                          |
| 14       | Collar (insulated)             | 29       | O-ring *                              |          |                          |
| 15       | Spring (one SOL. contact side) | 30       | O-ring *                              |          |                          |

### Seal Part List (Kit Model Number EQS-01C)

| Part No. | Part Name | Part Number      | Q'ty |
|----------|-----------|------------------|------|
| 28       | O-ring    | 1B-P3            | 2    |
| 29       | O-ring    | AS568-012 (Hs90) | 4    |
| 30       | O-ring    | AS568-019 (Hs90) | 2    |
| 31       | O-ring    | 1A-P20           | 2    |
| 32       | O-ring    | 1B-P18           | 2    |
| 33       | O-ring    | S-11.2 (Hs90)    | 2    |
| 34       | O-ring    | S-25 (Hs70)      | 2    |
| 35       | O-ring    | S-9 (Hs70)       | 2    |

Note: 1A and 1B are JIS Standard B 2401, while AS568 is SAE standard.

For details about parts marked with an asterisk "\*\*", refer to the list of seals in the table on the right.



### SCW Series

**Poppet Type Directional Control Valve with Monitoring Switch**

13.2 gpm

3045 psi

### Features

This valve is a poppet activated directional control valve that uses mechanical detection to operate a switch to send an electric ON/OFF signal. This makes it possible, by monitoring the status of the spool operations, to use it as an information source for safety checks by using the ON/OFF signal as a basis for sequence control. In the future, they will be used in machinery that is compatible with

international machine safety (ISO 12100) and JIS standards (JIS B 9700) standards.

The poppet type directional control valve with monitoring switch was developed as a valve to support this demand. The switch contact has little dead zone and almost no temperature drift (variable motion caused by changes in temperature) or hysteresis because the reaction of the poppet action is

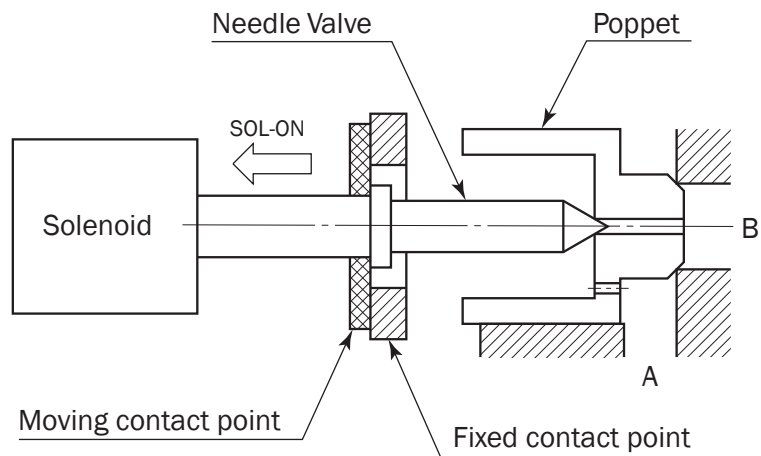
mechanical.

All valve functions, except for the monitoring function, are equivalent to the standard poppet type directional control valve.

DIN connectors are used for the switches and solenoid coil wiring so connections are easy when installing or replacing valves.

### Operational Principle

When the needle valve is in the center position, the fixed and moving parts are in contact forming an electric circuit. The solenoid turns on, the needle valve operates so there is no circuit between the fixed and moving parts.



### Specifications

#### • Valve Specifications

| Operation Symbol                      |                                       | -AR-  | -ARC-    |
|---------------------------------------|---------------------------------------|---|----------|
| JIS Symbol                            |                                       |   |          |
| Maximum Working Pressure (A, B ports) |                                       | 3045 psi  |          |
| Maximum Flow Rate                     | A → B                                 | 13.2 gpm  | 13.2 gpm |
|                                       | B → A                                 | —   |          |
| Cracking Pressure of Check Valve      |                                       | 29 psi  |          |
| Switching Frequency                   |                                       | 120/minute  |          |
| Weight                                |                                       | 5 lbs   |          |
| Operating Environment                 | Dust Resistance/Water Resistance Rank | JIS C 0920 IP65   |          |
|                                       | Operating Fluid                       | Oil-based operating fluid (Note 1)                      |          |
|                                       | Ambient Temperature Range             | -4 to 122° F  |          |
|                                       | Operating Fluid Temperature Range     | -4 to 158° F  |          |
|                                       | Operating Viscosity Range             | 15 to 300 centistokes                                   |          |
| Mounting bolt (Note2)                 | Filtration                            | 10µm or less  |          |
|                                       | Size × Length                         | Socket hex head bolt (grade 8 equivalent) 10-24 x 1 3/4 |          |
|                                       | Tightening Torque                     | 7.3 to 9.5 ft lbs                                       |          |

Note: 1. Use a petroleum based operating fluid because the ON/OFF mechanism of the valve's monitoring switch is immersed in oil and the oil must be a non-conducting fluid.

Use only petroleum based operating fluid (do not use fluids that are water, glycol, W/O emulsion, phosphate, or fatty ester based).

Petroleum based operating fluids must also have a water content that is less than 0.1% by volume.

2. Installation bolts are provided with valves.



• Monitoring Switch Specifications

|                                 |   |
|---------------------------------|---|
| Voltage Rating                  | 24VDC                                     |
| Allowable Voltage Range         | ± 20% of voltage rating                   |
| Maximum Current Load            | 100mA                                     |
| Residual Voltage (Note 3)       | Max. 1.2V                                 |
| Wiring for Connector for Switch | Connect with wires or M12-4 pin connector |

- Note: 1. See page D-74 for the procedure to wire the connector for the switch.  
 2. The programmable controller input circuits are positive (+) common mode and negative (-) common mode.  
 The directional control valve with monitoring switch uses a source circuit [switch on the positive (+) side of the load and power source] for safety purposes.  
 Because of this, it is necessary to use a negative (-) common mode programmable controller to receive input from the monitoring switch output.  
 3. Set the voltage of the power supply to the monitoring switch within a range that satisfies the following conditions.  
 Load ON voltage + residual voltage ≤ switch supply voltage ≤ 28.8 V (+20% voltage rating)  
 4. The switch element (photocoupler) in the connector's internal circuit for the monitoring switch may malfunction in the ON state because of over voltage or over current.  
 Therefore, in addition to checking the ON output of the monitoring switch, monitor the current at the solenoid and the internal circuits of the connector and valve in conjunction with the switch output.

Condition of monitoring switch output and valve

|  |   | Current to Solenoid   |   |                               |   |  |
|--|---|---|---|-------------------------------|---|--|
|  |   | ON  | OFF   |                               |   |  |
| Monitoring Switch Output                     | ON  | Abnormal<br>Malfunction at internal circuit of connector or valve | Normal<br>Needle valve returns to middle position   |                               |   |  |
|  | OFF   | Normal<br>Needle valve is switching                               | <table border="1"> <tr> <td>Pressure from A port (Closed)</td> <td>Abnormal<br/>Valve malfunction or signal wire is cut</td> </tr> <tr> <td>Pressure from B port (Flows from B → A port)</td> <td>Normal<br/>Poppet opens and needle valve operates</td> </tr> </table> | Pressure from A port (Closed) | Abnormal<br>Valve malfunction or signal wire is cut | Pressure from B port (Flows from B → A port) |
| Pressure from A port (Closed)                | Abnormal<br>Valve malfunction or signal wire is cut |   |   |                               |   |  |
| Pressure from B port (Flows from B → A port) | Normal<br>Poppet opens and needle valve operates    |   |   |                               |   |  |

The monitoring switch outputs according to the motion of the spool, so the solenoid turns on and off according to the output signal which is delayed only as much as the spool operation is delayed.  
 Set a 0.3 second delay, including leeway, to monitor the output of the switch.

• Solenoid Specifications

Same specifications as the SA-G01 series (31 design).

| Solenoid Type              | Power Supply Type | Voltage (V) | Frequency (Hz) | Solenoid Coil Type | Drive Current (A) | Holding Current (A) | Holding Power (W) | Allowable Voltage Range (V) |
|----------------------------|-------------------|-------------|----------------|--------------------|-------------------|---------------------|-------------------|-----------------------------|
| DC with Built-in Rectifier | E1                | AC100       | 50/60          | EAC64-E1-1A        | 0.31              |                     | 27                | 90 to 110                   |
|                            | E 115             | AC110       | 50/60          | EAC64-E 115-1A     | 0.26              |                     | 25                | 100 to 125                  |
|                            |                   | AC115       |                |                    | 0.27              |                     | 27                |                             |
|                            | E2                | AC200       | 50/60          | EAC64-E2-1A        | 0.15              |                     | 26                | 180 to 220                  |
|                            | E 230             | AC220       | 50/60          | EAC64-E230-1A      | 0.12              |                     | 24                | 200 to 250                  |
| AC230                      |                   | 0.13        |                |                    |                   | 27                  |                   |                             |
| DC                         | D1                | DC12        | —              | EAC64-D1-1A        | 2.2               |                     | 26                | 10.8 to 13.2                |
|                            | D2                | DC24        | —              | EAC64-D2-1A        | 1.1               |                     | 26                | 21.6 to 26.4                |

• Handling

- Do not allow abnormal surges greater than the maximum operating pressure to occur because pressure from the B port is used for the solenoid.
- Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- Use a ISO VG 32 petroleum-based operating fluid, or an equivalent, that has a water content that is less than 0.1% by volume.
- Do not use fire-resistant operating fluid.
- Use this valve only within the allowable voltage range.
- The only way to prevent misoperation of the monitoring switch caused by noise generated by the solenoid turning on and off is to install the surgeless directional

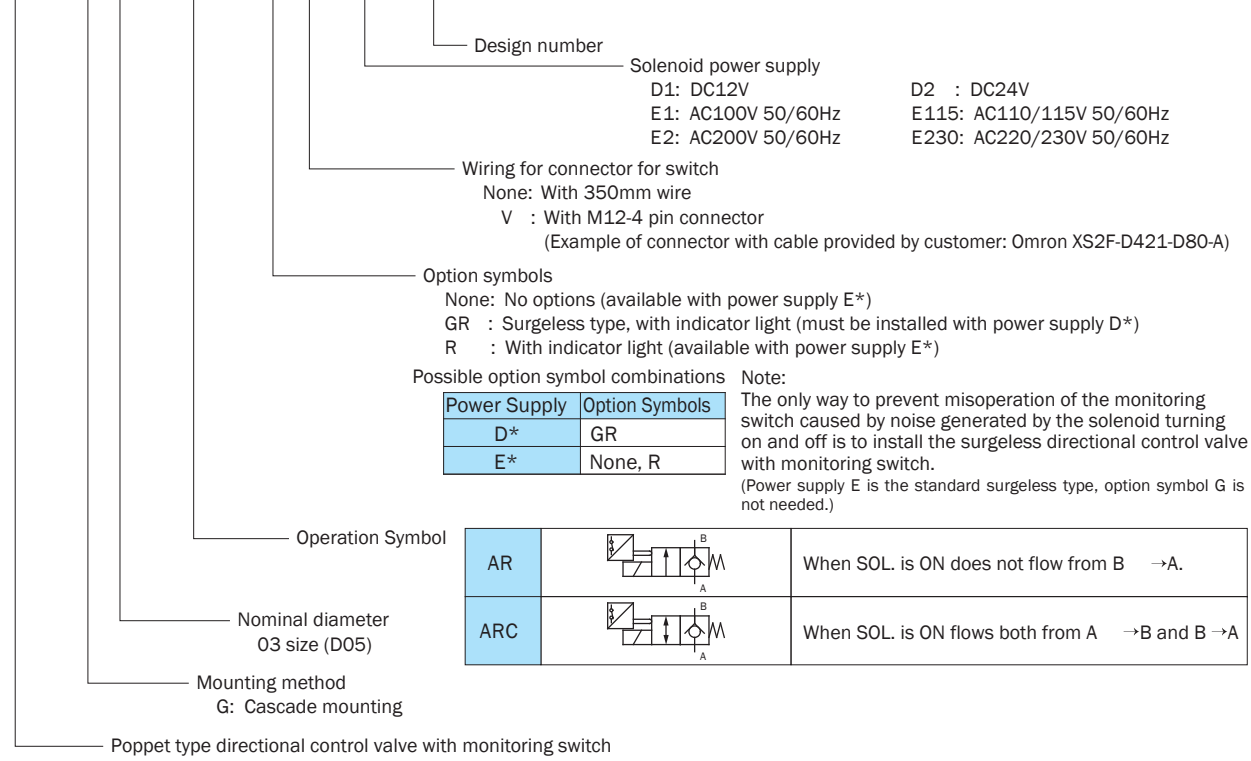
- control valve with monitoring switch (option symbol: GR). (If the solenoid power source is C\* and D\*)
- Use surgeless specification (with varistor diode) directional control valves with monitoring switches for all electric valves on the same machine to prevent misoperation of the monitoring switch caused by noise when the solenoid turns on and off.

- The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.
- The connector for the solenoid is the same as for the SA series solenoid valve. See page D-22 for electrical circuit drawings and wiring procedures.
- Use the following table for specification when a sub plate is required.

| Model No.    | Pipe Diameter | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs | Dimension Drawings Page |
|--------------|---------------|------------------------------|---------------------------|------------|-------------------------|
| MSA-03-E10   | 3/8           | 3625                         | 11.8                      | 5          | D-21                    |
| MSA-03X-E10  | 1/2           |                              | 21.1                      |            |                         |
| MSA-03-TE10  | 3/8           |                              | 11.8                      | 8.3        | H-4                     |
| MSA-03X-TE10 | 1/2           |                              | 21.1                      |            |                         |

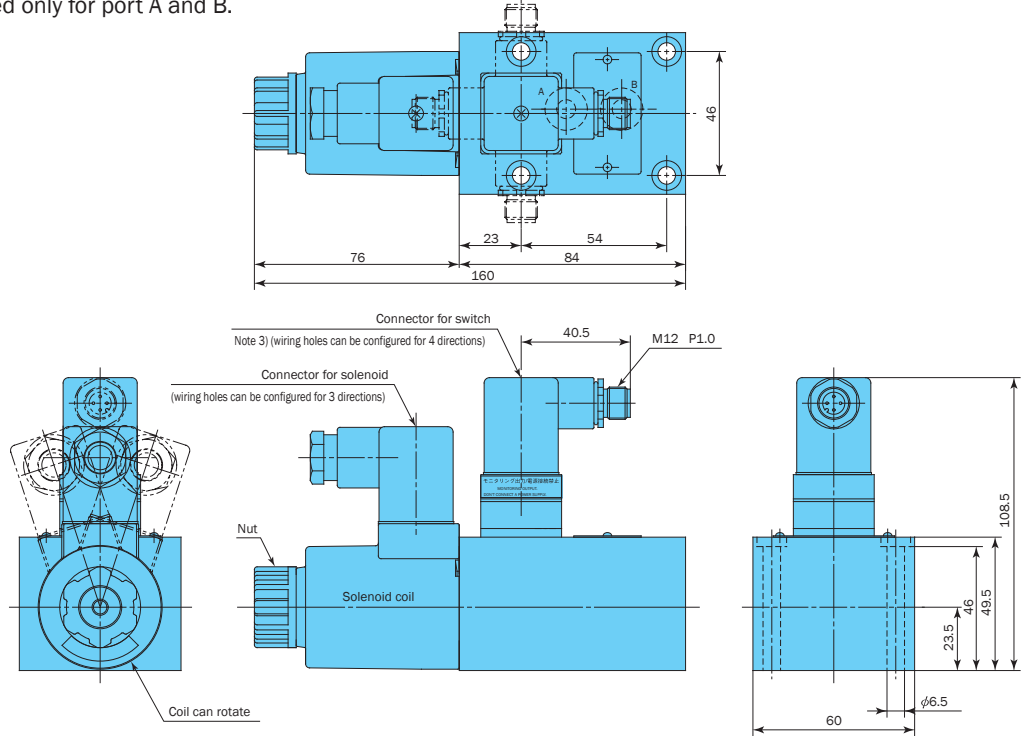
# Understanding Model Numbers

**SCW - G 03 - ARC - GR V - D2 - J10**



# Installation Dimension Drawings

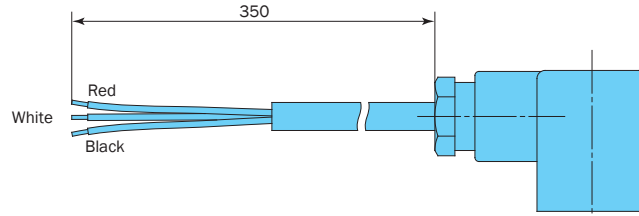
Dimensions of installation surface of gasket are ISO 4401-05-04.  
 However, used only for port A and B.



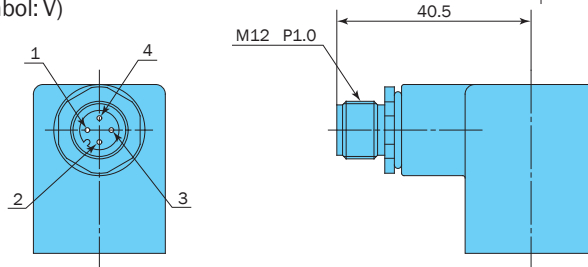
- Note: 1. The connector for the switch in the drawing above is the M12-4 pin connector. In addition there are wire connections also.  
 See page D-74 for more detailed information.
2. Use surgeless directional control valves with monitoring switches for all electric valves on the same machine to prevent misoperation of the monitoring switch caused by noise when the solenoid turns on and off.
3. To orient the wiring hole for the connector for the switch towards the solenoid coil, loosen the nut and rotate the solenoid coil so the connector for the switch does not interfere with the connector for the solenoid.

• Details about the Connector for the Switch

(1) With wiring (option symbol: none)

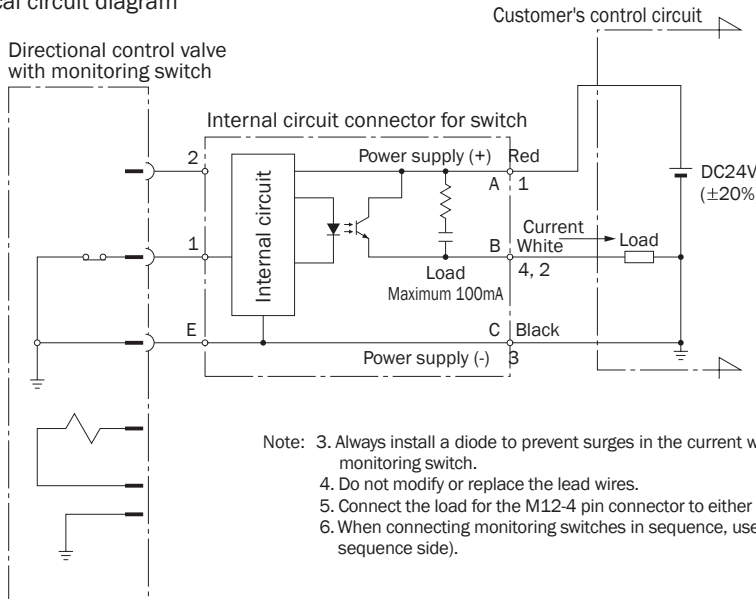


(2) With M12-4 pin connector (option symbol: V)



Note: 1. The pin connector is screwed to the housing so it is rotated a certain amount compared to the drawing. Refer to the electrical circuit diagram below for how to connect it.  
 2. The connector that the M12-4 pin connector connects to is not provided.  
 (Example of connector with cable provided by customer: Omron XS2F-D421-D80-A)

(3) Electrical circuit diagram



Method for Wiring to Connector with Switch

| Wiring Method |                                    | Connection       |
|---------------|------------------------------------|------------------|
| Wire Color    | Pin Number for M12-4 pin Connector |                  |
| Red           | 1                                  | Power supply (+) |
| White         | 4 or 2                             | Load             |
| Black         | 3                                  | Power supply (-) |

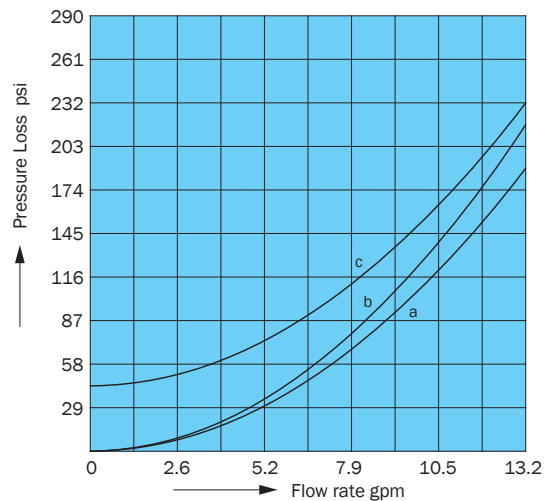
Note: 3. Always install a diode to prevent surges in the current when connecting an inductive load, such as a relay, to the monitoring switch.  
 4. Do not modify or replace the lead wires.  
 5. Connect the load for the M12-4 pin connector to either pin number 4 or 2.  
 6. When connecting monitoring switches in sequence, use the negative (-) common mode (type that current runs to sequence side).

**Performance Curves**

Hydraulic Operating Fluid Viscosity 32 centistokes

Pressure Loss Characteristics

| Operation Symbol | JIS Symbol | SOL OFF<br>B → A | SOL ON |       |
|------------------|------------|------------------|--------|-------|
|                  |            |                  | A → B  | B → A |
| AR               |            | c                | a      | —     |
| ARC              |            | c                | a      | b     |

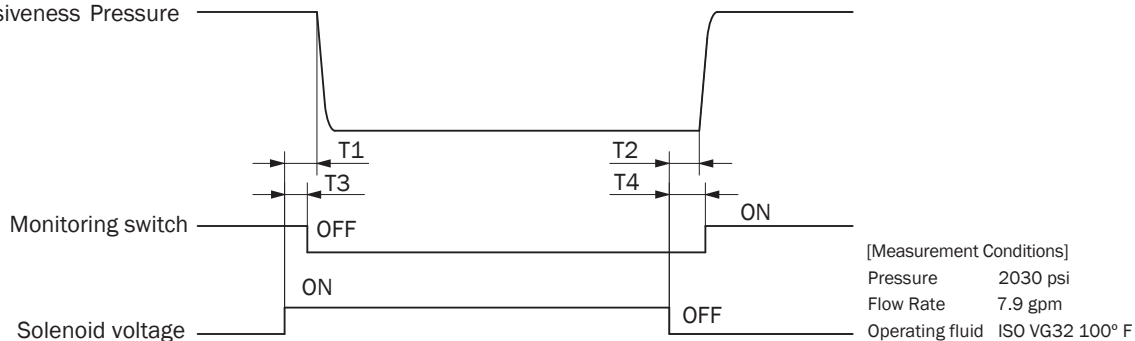


Range of Motion of Switch

| Positions        | Stroke of Poppet |                      |        |
|------------------|------------------|----------------------|--------|
|                  | SOL. ON          | Switching Transition | Center |
| Flow Path        |                  |                      |        |
| Motion of Switch | OFF              |                      | ON     |

Note: 1. Internal leak exists at of switching transition period.  
 2. ON and OFF indicate the state of the output transistor on the circuit board in the connector.

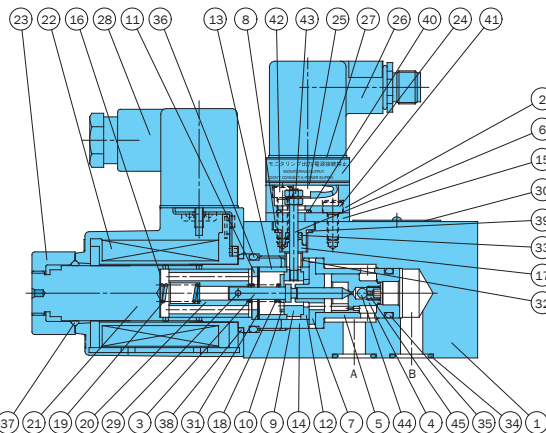
Switching Responsiveness Pressure



| Type of Machine                     | Model                | Response Time (s) |              |            |            |
|-------------------------------------|----------------------|-------------------|--------------|------------|------------|
|                                     |                      | Pressure          |              | Switch     |            |
|                                     |                      | T1                | T2           | T3         | T4         |
| DC Solenoid                         | SCW-G03-AR-GR-D2-J10 | 0.03 to 0.04      | 0.02 to 0.03 | 0.01 to T1 | T2 to 0.05 |
| DC Solenoid with Built-in Rectifier | SCW-G03-AR-E1-J10    | 0.03 to 0.04      | 0.08 to 0.11 | 0.01 to T1 | T2 to 0.20 |

Note: May vary depending on switching response time and operating conditions (pressure, flow rate, and oil temperature).

Cross-sectional Drawing



| Part No. | Part Name                   | Part No. | Part Name                             | Part No. | Part Name                         |
|----------|-----------------------------|----------|---------------------------------------|----------|-----------------------------------|
| 1        | Body                        | 16       | Spacer (sealing prevention)           | 31       | Wave washer                       |
| 2        | Cover (connector)           | 17       | Collar (insulated)                    | 32       | Spacer (ring rotation prevention) |
| 3        | Needle Valve                | 18       | Spring (contact side)                 | 33       | O-ring *                          |
| 4        | Poppet                      | 19       | Spring (guide side)                   | 34       | O-ring *                          |
| 5        | Sleeve                      | 20       | Solenoid plunger                      | 35       | O-ring *                          |
| 6        | Rod (conductor)             | 21       | Solenoid guide                        | 36       | O-ring *                          |
| 7        | Bush (needle valve support) | 22       | Solenoid coil                         | 37       | O-ring *                          |
| 8        | Bush (insulated)            | 23       | Nut                                   | 38       | O-ring *                          |
| 9        | Retainer (fixed contact)    | 24       | Connector with lead wire              | 39       | O-ring *                          |
| 10       | Retainer (movable contact)  | 25       | Packing                               | 40       | O-ring *                          |
| 11       | Retainer (flange side)      | 26       | Connector with built-in photo-coupler | 41       | Hexagon socket head bolt          |
| 12       | Ring (insulation inside)    | 27       | Connector packing                     | 42       | Hexagon socket head bolt          |
| 13       | Ring (insulation outside)   | 28       | Connector                             | 43       | Hexagon nut                       |
| 14       | Ring (fixed by sleeve)      | 29       | Parallel pin                          | 44       | Steel ball ★                      |
| 15       | Plate (connector)           | 30       | Nameplate                             | 45       | Set screw ★                       |

Seal Part List (Kit Model Number EQS-SC)

| Part No. | Part Name | Part Number      | Q'ty |
|----------|-----------|------------------|------|
| 33       | O-ring    | 1B-P3            | 1    |
| 34       | O-ring    | AS568-014 (Hs90) | 2    |
| 35       | O-ring    | 1B-P14           | 2    |
| 36       | O-ring    | AS568-119 (Hs90) | 1    |
| 37       | O-ring    | 1A-P20           | 1    |
| 38       | O-ring    | S-25 (Hs70)      | 1    |
| 39       | O-ring    | S-11.2 (Hs9)     | 1    |
| 40       | O-ring    | S-9 (Hs70)       | 1    |

Note) 1A and 1B are JIS Standard B 2401, while AS568 is SAE standard.

Note: 1. For details about parts marked with an asterisk "\*", refer to the list of seals in the table on the right.  
 2. Products marked with a ★ use only SCW-G03-ARC-\*\*-\*\*-J10 and do not use SCW-G03-AR-\*\*-\*\*-J10.



### SK-G01 Series Wet Type Solenoid Valve

#### Features

- High pressure, large capacity with minimal pressure loss
- High dust and water resistance (JIS C 0920 IP67)
- High vibration proof (JIS D 1601 3 D Grade 90 Division 400)
- Shockless type available (Option: F)
- Diode built in coil available (Option: G)
- Low switching noise and very long life

#### Specifications

| Model Number |           | SK-G01                       |                                   |                              |                                   |
|--------------|-----------|------------------------------|-----------------------------------|------------------------------|-----------------------------------|
|              |           | Standard Type                |                                   | Shockless Type               |                                   |
| JIS Symbol   | Operation | Maximum Flow Rate L/min(gpm) | Maximum Working Pressure MPa(psi) | Maximum Flow Rate L/min(gpm) | Maximum Working Pressure MPa(psi) |
|              | A3X       | 80 (21.1)                    | 35 (5075)                         | 50.0 (13.2)                  | 25 (3625)                         |
|              | H3X       |                              |                                   |                              |                                   |
|              | E3X       | 100 (26.4)                   |                                   |                              |                                   |
|              | C5        |                              |                                   |                              |                                   |
|              | C6        |                              |                                   |                              |                                   |
|              | C4        | 50.0 (13.2)                  |                                   |                              |                                   |
|              | C7Y       |                              |                                   |                              |                                   |

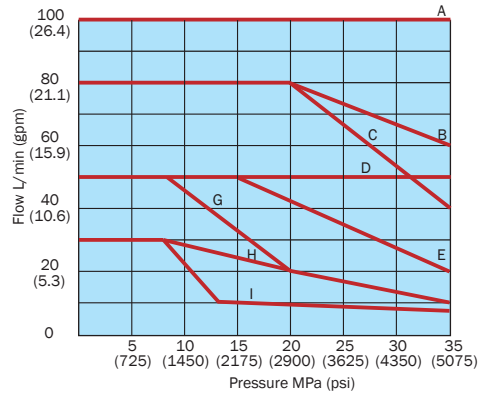
|   |                                       |   |
|---|---------------------------------------|---|
| Maximum Working Pressure MPa(psi) P, A, B ports | Standard Type                         | 35 (5075)   |
|   | Shockless Type                        | 25 (3625)   |
| Maximum Allowable Back Pressure MPa(psi) T port | Standard Type                         | 21 (3045)   |
|   | Shockless Type                        |   |
| Switches/min                                    | Standard Type                         | 120   |
|   | Shockless Type                        |   |
| Option  | Shockless                             | F   |
|   | Surgeless (Diode built in coil)       | G   |
| Weight kg (lbs)                                 | Double solenoid                       | 2.0 (4.41)  |
|   | Single solenoid                       | 1.5 (3.31)  |
| Operating Environment                           | Dust Resistance/Water Resistance Rank | JIS C 0920 IP67   |
|   | Vibration Proof                       | JIS D 1601 3 D Grade 90 Division 400                                      |
|   | Ambient Temperature                   | -30~+50°C (-22~+122°F)  |
| Operating Fluid                                 | Temperature Range                     | -25~+80°C (-13~+176°F)  |
|   | Viscosity Range                       | 15~300mm <sup>2</sup> /s(cSt)   |
|   | Filtration                            | 10 μm or less   |
| Mounting Bolts                                  | Size x Length                         | M5x45 or #10x1 3/4, four bolts<br>Hexagon socket head bolts 10-24 x 1 3/4 |
|   | Tightening Torque                     | 5~7N•m (3.69~5.16lbf•ft)  |

- Note: 1. Maximum operating pressure depends on the valve type. For details, see "Permissible pressure-flow rate values."  
 2. A protective cover is recommended to avoid splashing the valve directly.  
 3. For mounting bolts, use grade 8.  
 4. Mounting bolts are not included.

Permissible Pressure-Flow Rate Values

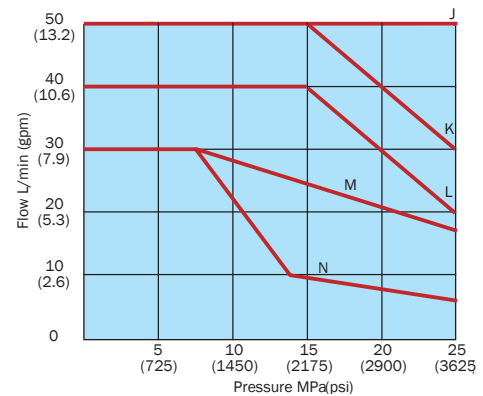
• Standard type

| Type              | Standard Type |   |   |
|-------------------|---------------|---|---|
| Operation Example |               |   |   |
| Operation Symbol  |               |   |   |
| A3X               | B             | I | I |
| H3X               | B             | I | I |
| E3X               | A             | H | H |
| C4                | D             | D | D |
| C5                | A             | G | G |
| C6                | C             | G | G |
| C7Y               | E             | I | I |

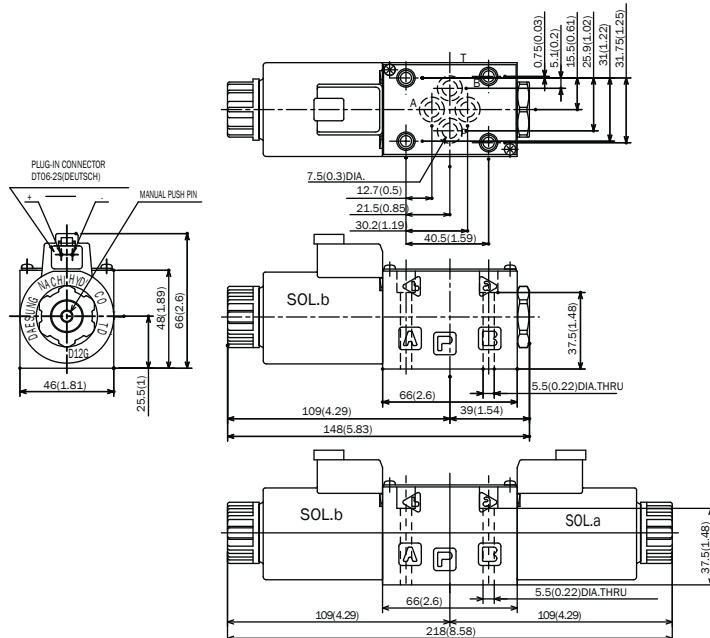


• Shockless type

| Type              | Shockless Type |   |   |
|-------------------|----------------|---|---|
| Operation Example |                |   |   |
| Operation Symbol  |                |   |   |
| A3X               | J              | N | N |
| H3X               | J              | N | N |
| E3X               | J              | M | M |
| C4                | J              | J | J |
| C5                | J              | N | N |
| C6                | K              | N | N |
| C7Y               | L              | N | N |



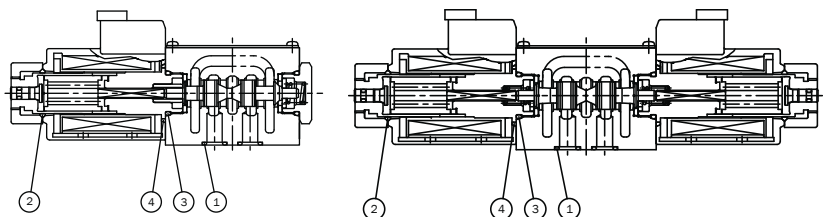
Dimensional Drawings



Sealing Parts

| Part No. | Part Name | Part No.        | Quantity        |                 |
|----------|-----------|-----------------|-----------------|-----------------|
|          |           |                 | Single Solenoid | Double Solenoid |
| 1        | O-ring    | AS568-012(Hs90) | 4               | 4               |
| 2        | O-ring    | 1A-P20          | 1               | 2               |
| 3        | O-ring    | 1B-P18          | 2               | 2               |
| 4        | O-ring    | S-25            | 1               | 2               |

Note: 1A and 1B are JIS Standard B 2401, while AS568 is SAE Standard.





### DMA Type Manual Valve

10.5 to 26.4 gpm  
5075 psi

### Features

The compact O1 and O3 sizes are perfect for small flow rate control. Since a balanced type valve is used, there is no need for drain piping, and use

use with back pressures up to 2320 psi is possible. Mounting methods are the same as SAG01/O3, and the O1, O3 size modular

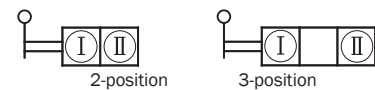
the reaction of the poppet action is valve can be used, so circuit configuration is quick and easy.

### Specifications

| Model No.         | Nominal Diameter (size) | Maximum Working Pressure psi | Tank Port Back Pressure psi | Maximum Flow Rate gpm | Spool Stroke (in) |            | Weight lbs |
|-------------------|-------------------------|------------------------------|-----------------------------|-----------------------|-------------------|------------|------------|
|                   |                         |                              |                             |                       | 2-position        | 3-position |            |
| DMA-G01-***-20    | 1/8                     | 5075                         | 2320                        | 10.5                  | .16               | .16 × 2    | 2.8        |
| DMA-G03-***-(J)20 | 3/8                     | 3625                         |                             | 26.4                  | .24               | .24 × 2    | 7.2        |

| Positions      | Type              | JIS Symbol            | Model No.            | Maximum Working Pressure psi |                      |      |
|----------------|-------------------|-----------------------|----------------------|------------------------------|----------------------|------|
| 2-position     | Closed Cross      |                       | DMA-G01-A3X-20 (J)20 | 5075                         |                      |      |
|                | Open Cross        |                       | DMA-G01-A3Z-20 (J)20 |                              |                      |      |
|                | Closed Cross      |                       | DMA-G01-E3X-20 (J)20 |                              |                      |      |
|                | Open Cross        |                       | DMA-G01-E3Z-20 (J)20 |                              |                      |      |
| 3-position     | All Ports Open    |                       | DMA-G01-C4-20 (J)20  | 5075                         |                      |      |
|                |                   |                       | DMA-G01-F4-20 (J)20  |                              |                      |      |
|                | All Parts Blocked |                       | DMA-G01-C5-20 (J)20  |                              |                      |      |
|                |                   |                       | DMA-G01-F5-20 (J)20  |                              |                      |      |
|                | ABT Connection    |                       | DMA-G01-C6-20 (J)20  |                              |                      |      |
|                |                   |                       | DMA-G01-F6-20 (J)20  |                              |                      |      |
|                | PT Connection     | Closed Cross          |                      |                              | DMA-G01-C7X-20 (J)20 | 3625 |
|                |                   | Restricted Open Cross |                      |                              | DMA-G01-C7Y-20 (J)20 |      |
|                |                   | Closed Cross          |                      |                              | DMA-G01-F7X-20 (J)20 |      |
|                |                   | Restricted Open Cross |                      |                              | DMA-G01-F7Y-20 (J)20 |      |
| PAT Connection |                   | DMA-G01-C8-20 (J)20   | 5075                 |                              |                      |      |
|                |                   | DMA-G01-F8-20 (J)20   |                      |                              |                      |      |

- Handling
- The following are the three types of lever operations.
    - Spring Offset Type (Type A) The lever is normally kept in the end position by the spring. Raising the lever performs switching, and the lever returns to its original position when released.
    - Spring Center Type (Type C) The spool is normally in the center of position 3. After switching to either end, the spring returns the lever to its center position when the lever is released.
    - Detent Type (Type F, Type E) A notch at spool position 3 or as a stop.
  - Pressure loss is the same as that for the SAG01/G03, so see SA-G01/G03 for more information.
  - The lever mounting orientation can be positioned at 90° increments by changing the orientation of the lever side cover.
  - For PT connection type DMA-G01/G03-\*7\*-(J)20, closed cross DMA-G01/G03-\*7X\*-(J)20 is the standard type.
  - The relationship between the lever switching positions and JIS symbols is shown below. (See the installation dimension diagrams for symbols & I and & II.)



6 Mounting bolts are not included with the O1 size.

|                |                |   |
|----------------|----------------|---|
| DMA-G01-***-20 | 10-24 x 1 3/4  | 4 |
| DMA-G03-***-20 | 1/4-20 x 2 3/4 | 4 |

Note: For mounting bolts, use grade 8 or equivalent.

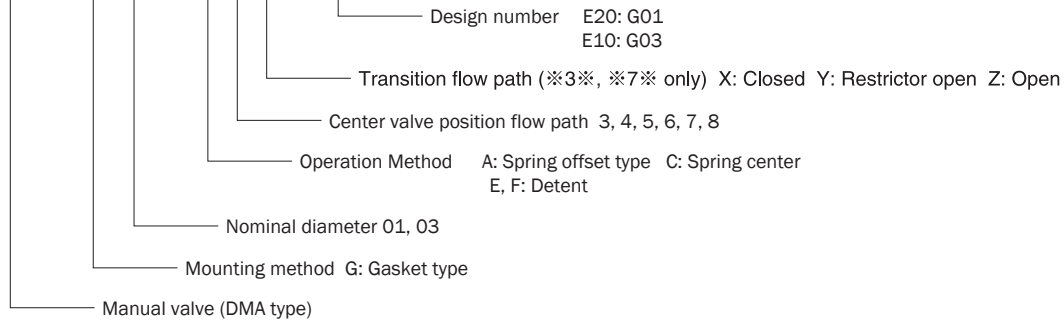
7 The following shows the sub plates.

| Model No.   | Pipe Diameter | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs | Applicable Valve Type |
|-------------|---------------|------------------------------|---------------------------|------------|-----------------------|
| MSA-01Y-E10 | 3/8           | 3625                         | 10.5                      | 2.6        | DMA-G01-***-20        |
| MS-03-E30   | 3/8           |                              | 10.5                      | 5          | DMA-G03-***-E10       |
| MS-03X-E30  | 1/2           |                              | 11.8                      |            |                       |

These sub plates can also be used with SA (SS)-G01/G03, so see SA (SS)-G01/G03 for mounting methods.

## Understanding Model Numbers

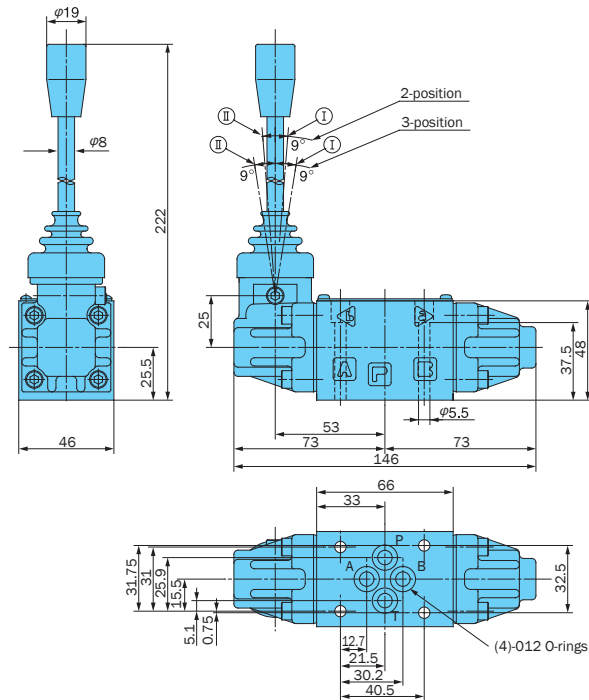
**DMA - G 01 - A 3 X - 20**



## Installation Dimension Drawings

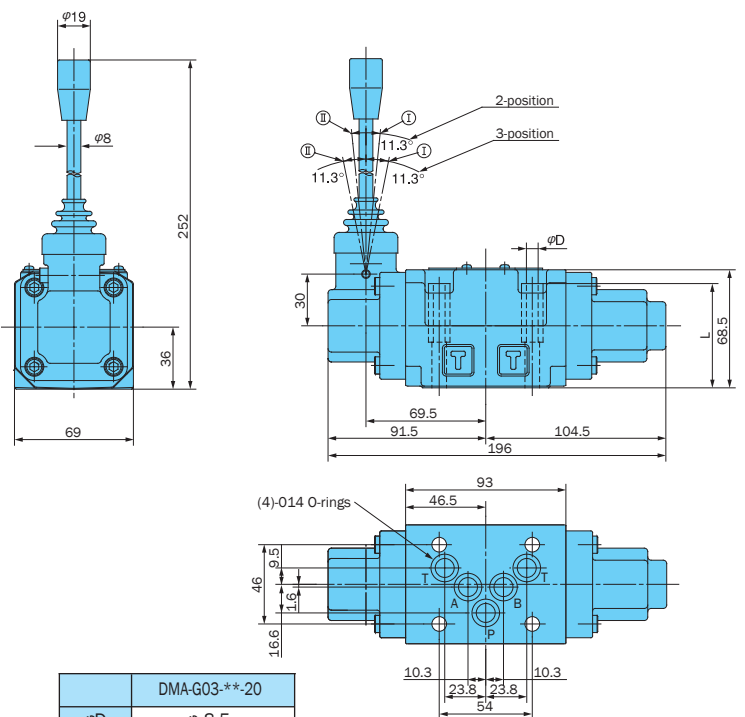
DMA-G01-\*E-20 (D03)

Gasket Surface Dimensions (ISO 4401-03-02-0-94  
JIS B8355 D-03-02-0-94)



DMA-G03-\*\*\*-E-10 (D05)

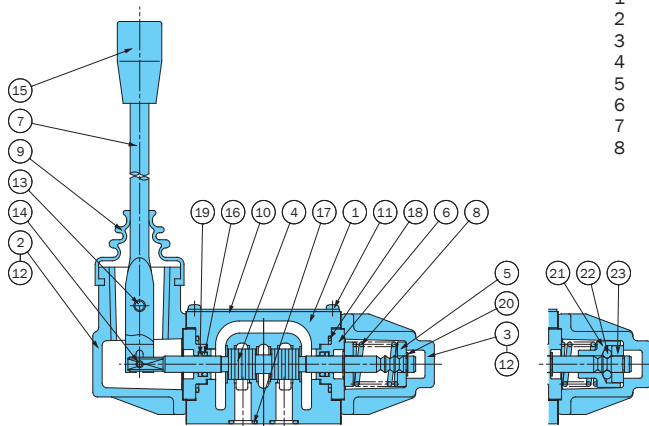
Gasket Surface Dimensions (ISO 4401-05-04-0-94  
JIS B8355 D-05-04-0-94)



| DMA-G03-**-20 |            |
|---------------|------------|
| $\phi D$      | $\phi 8.5$ |
| L             | 58         |

## Cross-sectional Drawing

DMA-G01-\*\*\*-20



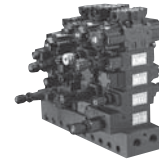
| Part No. | Part Name | Part No. | Part Name     | Part No. | Part Name   |
|----------|-----------|----------|---------------|----------|-------------|
| 1        | Body      | 9        | Rod cover     | 17       | O-ring      |
| 2        | Cover A   | 10       | Nameplate     | 18       | O-ring      |
| 3        | Cover B   | 11       | Stopper screw | 19       | Backup ring |
| 4        | Spool     | 12       | Screw         | 20       | Snap ring   |
| 5        | Ring      | 13       | Screw         | 21       | Guide       |
| 6        | Bush      | 14       | Pin           | 22       | Ball        |
| 7        | Lever     | 15       | Knob          | 23       | Retainer    |
| 8        | Spring    | 16       | O-ring        |          |             |

## Seal Part List

| Part No. | Part Name   | Model No.        |      |                 |      |
|----------|-------------|------------------|------|-----------------|------|
|          |             | DMA-G01          | Q'ty | DMA-G03         | Q'ty |
| 16       | O-ring      | 1A-P7            | 2    | 1A-P10          | 2    |
| 17       | O-ring      | AS568-012 (Hs90) | 4    | AS568-014(Hs90) | 5    |
| 18       | O-ring      | AS568-019 (Hs90) | 2    | 1B-P28          | 2    |
| 19       | Backup ring | T2-P7            | 2    | T2-P10          | 2    |

Note) 1.O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2.Backup ring indicates JIS B2407-T2-\*\*.





### Modular Valve Series

5.2 to 79 gpm  
3000, 3600, 5000 psi

#### Overview

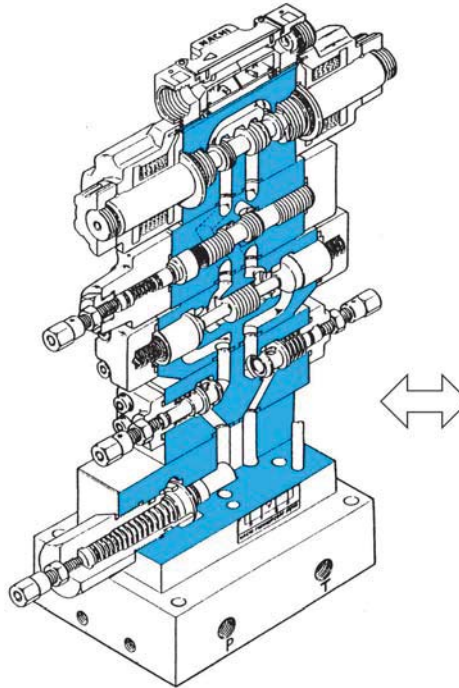
The modular valve is designed and engineered to integrate multiple hydraulic valve operations into a single unit, which eliminates the need for piping between valves and enables configuration of a

circuit using a single modular valve. The result is an innovative valve system whose energy and materials efficiency provide advantages in terms of

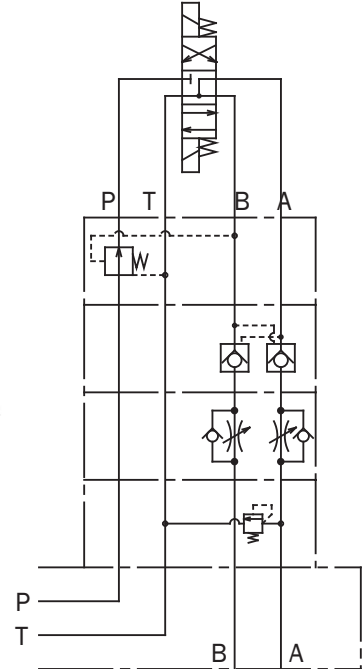
compact configuration, reliability, and more. The illustrations below show one example of a circuit configuration using this system.

#### Features

- 1 High pressure and high volume. Available maximum operating pressure operations are 3000, 3600, and 5000 psi, while maximum control flow rates are G01 13 gpm, G03 26 gpm, G04 79 gpm.
- 2 Ganging and bolting format allows for quick and easy circuit configuration as well as circuit changes and additions.
- 3 Compact module configurations greatly reduce space requirements.
- 4 Maintenance costs are also reduced because less piping and fewer couplings mean less need for acid rinsing and flushing of pipes.
- 5 Fewer fluid leak problems due to pipe resonance, noise, and loose couplings.
- 6 Circuit configuration is simple yet exact. Nameplates on the side of the valve show ISO codes that make it quick and easy to determine its performance.
- 7 A full lineup of models is available to meet a wide range of needs and circuit configurations: Model G01 (D03), G03 (D05), G04 (D07).



Integrated Structural Diagram



Integrated Circuit Diagram

#### Specifications

| Name      | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Gasket Surface Dimensions | Possible Number of Ganged Valves (Note 2) |
|-----------|-------------------------|------------------------------|-----------------------|---------------------------|---|
| O1 Series | 1/8                     | 3600 (Note 1)                | 13                    | ISO 4401-03-02-0-94       | 1 to 4                                    |
| O3 Series | 3/8                     | 3600 (Note 1)                | 26                    | ISO 4401-05-04-0-94       | 1 to 4                                    |
| O4 Series | 1/2                     | 5000                         | 79                    | ISO 4401-07-06-0-94       | 1 to 3 (Note 3)                           |

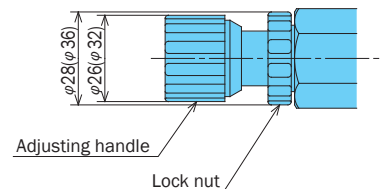
- Note) 1. The M35 Series is available as a 5000 psi maximum operating pressure version of the O1 and O3 Series. For details, see pages F92 and F93.  
 2. The number of ganged valves does not include solenoid valves.  
 3. Up to four valves can be ganged together if the maximum operating pressure is less than 3000 psi.

#### K Series Modular Valve

The valve shown in the photograph is available with nominal diameter O1 and O3 size adjusting bolts. Use the following format for specification.

**Example: OCY-G01-W-Y-K-20**

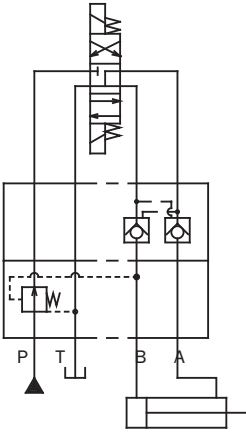
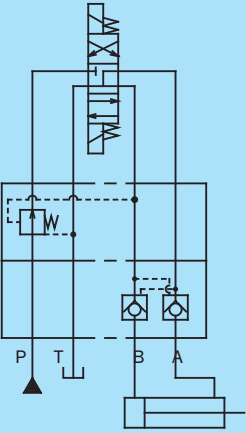
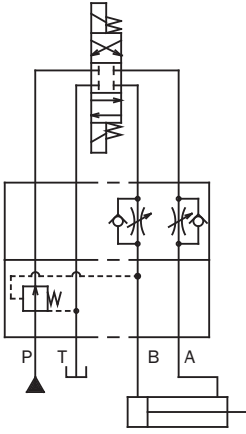
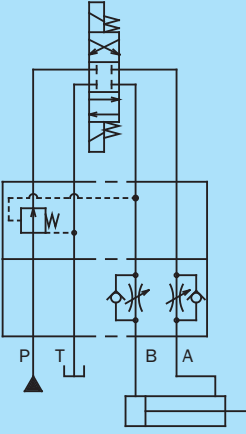
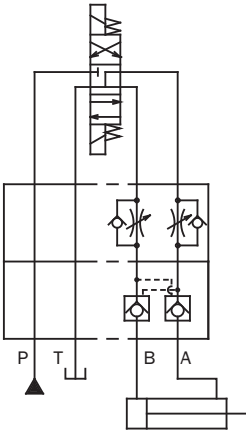
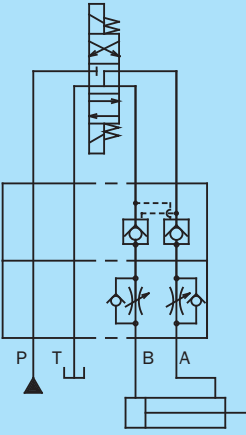
Auxiliary symbol  
K: With handle



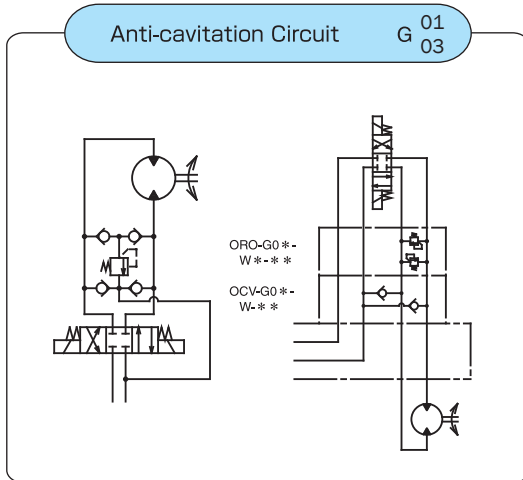
Dimensions in parentheses indicate nominal diameter O3.

## Precautions when Ganging Modular Valves

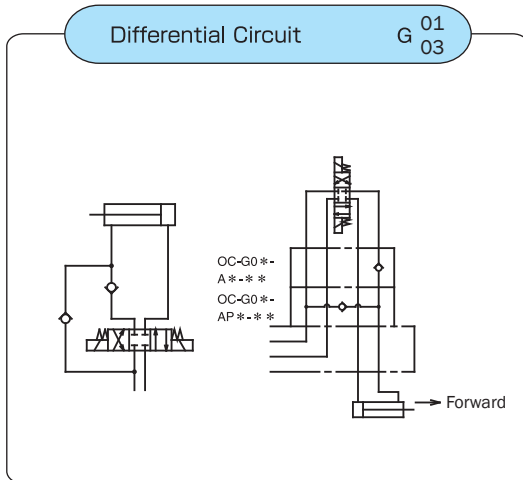
Note the following precautions when ganging modular valves together in the applicable example circuits.

| Circuit Diagram                                      | Description   | Incorrect  | Correct   |
|--|---|--|---|
| <p>Locking Circuit and Pressure Reducing Circuit</p> | <ul style="list-style-type: none"> <li>● Cylinder position not maintained</li> <li>○ Leaks occur because, during the pilot check, the line being maintained flows into the pilot line of the reducing valve.</li> </ul>   | <p>Solenoid</p> <p>Pilot Operate Check Modular Valve (AB Line)</p> <p>Pressure Reducing Modular Valve (B Line)</p>               |    |
| <p>Pressure Reduction Circuit with Speed Control</p> | <ul style="list-style-type: none"> <li>● Insufficient cylinder output and drop in speed</li> <li>○ Pressure increases due to the restrictor effect of the flow regulator. Since the pilot runs from that line, pressure reduction makes smooth operation impossible.</li> </ul> | <p>Solenoid</p> <p>Flow Regulator Modular Valve (A, B Line, Meter Out)</p> <p>Pressure Reducing Modular Valve (B Line)</p>      |   |
| <p>Locking Circuit and Speed Control Circuit</p>     | <ul style="list-style-type: none"> <li>● Cylinder knocking</li> <li>○ Pressure is increased by the restrictor effect of the flow regulator. That pressure moves the pilot check in the closed direction, which causes the valve to repeatedly open and close.</li> </ul>        | <p>Solenoid</p> <p>Flow Regulator Modular Valve (A, B Line, Meter Out)</p> <p>Pilot Operate Check Modular Valve (AB Line)</p>  |  |

## Valve Ganging Configuration Examples

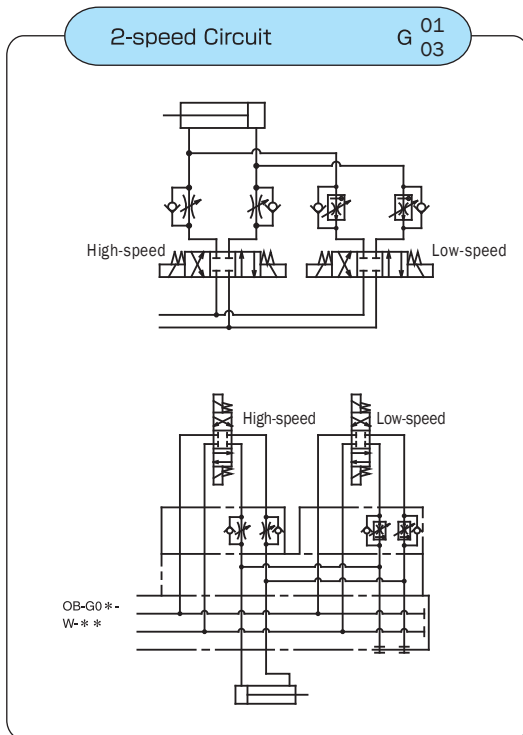


- Surge pressure is prevented by the inertia of the actuator, and cavitation by fluid being sucked in through the opposite port, which is in negative pressure, is prevented.
- Example Valve Model Numbers (G03)  
Relief Valve ———— ORO-G03-W\*-J50  
Vacuum Check Valve ——— OCV-G03-W-J50



- When the cylinder advances, the rod side return fluid returns to the P port and the pump discharge rate and confluence are advanced at high speed (differential).
- Example Valve Model Numbers (G03)  
Check valve ———— OC-G03-A\*-J50  
Differential check valve ——— OC-G03-AP\*-J50

Important:  
Cylinder effective output is the rod surface area portion only.



- This type of circuit allows variation between two actuator speeds. It prevents low-speed shock when the actuator starts up or stops, and it is used when the intermediate stroke is operated at high speed.
- Example Valve Model Numbers (G03)  
2-speed Plate ———— OB-G03-W-(H)-J30  
High-speed Flow Regulator Valve ——— OCY-G03-W-Y-J51  
Low-speed Flow Control Valve ——— OCF-G03-W60-Y-J50

# G01 Modular Valve Series

| Type  | Name  | Valve Model Number  | Pressure Adjustment Range<br>(Check Valve Cracking Pressure)<br>psi | Maximum<br>Flow Rate<br>gpm | JIS<br>Symbol | Height<br>in | Weight<br>lbs | Catalog<br>Page |
|---|---|---|---|-----------------------------|---------------|--------------|---------------|-----------------|
| Solenoid Valves                                     | Solenoid Valve  | SS-G01-**-R**-31<br>SA-G01-**-**-31   |   | 13                          |               |              |               | D-4<br>D-16     |
| Pressure Control Valves                             | Relief Valves<br>(Balance Type)                       | OR-G01-P $\frac{1}{3}$ -20  | 1: 145 to 1000<br>3: 500 to 3600                                    | 13                          |               | 1.57         | 3.3           | F-10            |
|   |   | -W $\frac{1}{3}$ -20  |   |                             |               |              | 5.0           |                 |
|   |   | -A $\frac{1}{3}$ -21  |   |                             |               |              | 3.5           |                 |
|   |   | -B $\frac{1}{3}$ -21  |   |                             |               |              |               |                 |
|   | Brake Valves<br>(Direct Type)                         | ORO-G01-W $\frac{1}{3}$ -20   | 1: 115 to 1000<br>3: 500 to 3600                                    | 5.2                         |               | 1.57         | 3.3           | F-16            |
|   |   | -A $\frac{1}{3}$ -20  |   |                             |               |              | 3.0           |                 |
|   |   | -B $\frac{1}{3}$ -20  |   |                             |               |              |               |                 |
|   | Direct Relief Valves<br>(Direct Type)                 | ORD-G01-W $\frac{1}{3}$ -20   | 1: 115 to 1000<br>3: 500 to 3600                                    | 5.2                         |               | 1.57         | 3.3           | F-20            |
|   |   | -A $\frac{1}{3}$ -20  |   |                             |               |              | 3.0           |                 |
|   |   | -B $\frac{1}{3}$ -20  |   |                             |               |              |               |                 |
|   | Reducing Valves<br>(Direct Type)                      | OG-G01-P $\frac{C}{1-21}$<br>$\frac{2}{2}$  | C: 20 to 500<br>1: 115 to 1000<br>2: 500 to 3000                    | 13                          |               | 1.57         | 2.8           | F-25            |
|   |   | $\frac{C}{1-21}$<br>$\frac{2}{2}$   |   |                             |               |              |               |                 |
|   |   | $\frac{C}{1-21}$<br>$\frac{2}{2}$   |   |                             |               |              |               |                 |
|   | Balance Type<br>Reducing Valves                       | OGB-G01-P $\frac{C}{1-20}$<br>$\frac{3}{3}$   | C: 20 to 500<br>1: 115 to 1000<br>3: 500 to 3000                    | 10.5                        |               | 1.57         | 4.1           | F-32            |
|   |   | -A $\frac{1-20}{3}$   |   |                             |               |              |               |                 |
| -B $\frac{1-20}{3}$                                 |   |   |   |                             |               |              |               |                 |
| Reducing Valves<br>(Direct Type)                    | OG-G01-A $\frac{C}{1-E21}$<br>$\frac{2}{2}$           | C: 20 to 500<br>1: 115 to 1000<br>2: 500 to 3000  |   |                             | 1.57          | 2.8          | F-34          |                 |
|   | OG-G01-B $\frac{C}{1-E21}$<br>$\frac{2}{2}$           |   |   |                             |               |              |               |                 |
| Pressure Control Valves<br>(Sequence Valves)        | OQ-G01-P2 $\frac{1}{3}$ -20                           | 1: 115 to 1000<br>3: 500 to 3000  | 10.5  |                             | 1.57          |              | F-44          |                 |
| Pressure Control Valves<br>(Counter Balance Valves) | OCQ-G01-A1 $\frac{1}{2}$ -20<br>-B1 $\frac{1}{2}$ -20 | 1: 115 to 1000<br>2: 500 to 2000  |   |                             |               |              | 2.4           | F-47            |
| Pressure Switches                                   | OW-G01-P $\frac{C}{1-R}$ -**-30                       | C: 72 to 500<br>1: 115 to 1000<br>3: 500 to 3000<br>Contact Capacitance<br>AC 125V:5A<br>DC 12V:2.2A<br>DC 24V:1.1A | 13  |                             | 1.57          | 3.9          | F-52          |                 |
|   | -W $\frac{1}{3}$ -R**-30                              |   |   |                             |               | 5.7          |               |                 |
|   | -A $\frac{1}{3}$ -R**-30                              |   |   |                             |               | 3.9          |               |                 |
|   | -B $\frac{1}{3}$ -R**-30                              |   |   |                             |               |              |               |                 |
| Flow Control Valve                                  | Flow Regulator Valve                                  | OY-G01-T-20   | 5.8   | 13                          |               | 1.57         | 2.2           | F-55            |
|   | Flow Regulator Valves<br>with Check                   | OCY-G01-P-20  |   |                             |               |              |               |                 |
|   | Meter-Out Flow<br>Regulator Valves                    | OCY-G01-W-Y-20  | 11.6  | 13                          |               | 1.57         | 2.8           | F-55            |
|   |   | -A-Y-20   |   |                             |               |              | 2.6           |                 |
|   |   | -B-Y-20   |   |                             |               |              |               |                 |

F Modular Valves

# G01 Modular Valve Series

| Type                      | Name  | Valve Model Number  | Pressure Adjustment Range<br>(Check Valve Cracking Pressure)<br>psi   | Maximum<br>Flow Rate<br>gpm  | JIS Symbol | Height<br>in | Weight<br>lbs | Catalog<br>Page |      |
|---------------------------|---|---|---|--|------------|--------------|---------------|-----------------|------|
| Flow Control Valves       | Meter-in Flow Regulator Valve               | OCY-G01-W-X-20  | 11.6  | 13   |            | 1.57         | 2.8           | F-55            |      |
|                           |   | -A-X-20   |   |  |            |              | 2.6           |                 |      |
|                           |   | -B-X-20   |   |  |            |              | 2.6           |                 |      |
|                           | Flow Control Valve (compensated)            | OF-G01-P20-20   | (Control Flow Rate)<br>Differential Pressure 1000: 2.6 to 10.5<br>Differential Pressure 3000: .13 to 10.5   | 10.5   |            | 1.57         | 2.6           | F-63            |      |
|                           | Meter-out Flow Control Valves (compensated) | OCF-G01-W40-Y-30  | 3.7   |  |            |              |               |                 |      |
|                           |   | -A40-Y-30   | 3.3   |  |            |              |               |                 |      |
|                           |   | -B40-Y-30   | 3.7   |  |            |              |               |                 |      |
|                           | Meter-in Flow Control Valves (compensated)  | OCF-G01-W40-X-30  | (Control Flow Rate)<br>Differential Pressure 1000: 2.6 to 10.5<br>Differential Pressure 3600: .13 to 10.5   |  |            |              | 3.7           |                 |      |
|                           |   | -A40-X-30   | 3.3   |  |            |              |               |                 |      |
|                           | Direction Control Valve                     | Check Valves  | OC-G01-P<br>1 2-20<br>3   | Cracking pressure<br>1: 5.8<br>2: 50<br>3: 72<br>*For differential circuit | 13         |              | 1.57          | 2.2             | F-69 |
| T 2-20<br>3               |   |   | 2.6   |  |            |              |               |                 |      |
| 1 -A 2-21 *<br>3          |   |   | 2.2   |  |            |              |               |                 |      |
| 1 -AP 2-20 *<br>3         |   |   | 2.2   |  |            |              |               |                 |      |
| Vacuum Check Valves       |   | OCV-G01-W-20  | 2   | 13   |            | 1.57         | 2.2           | F-76            |      |
| Pilot Check Valves        |   | OCP-G01-W 1 2(F)-21   | Cracking pressure<br>1: 29<br>2: 72<br>(Auxiliary Symbol)<br>Open Valve Ratio<br>Standard:<br>Parent Valve 37%<br>F: Child Valve 6%<br>: Parent Valve 51% | 13   |            | 1.57         | 2.6           | F-76            |      |
|                           |   | -A 1 2(F)-21  |   |  |            |              |               |                 |      |
|                           | -B 1 2(F)-21                                |   |   |  |            |              |               |                 |      |
| Composite Valves          | 2-pressure Reducing Valves                  | OGS-G01-P C 1 C-K(R)-**-.22<br>High pressure side<br>Low pressure side<br>Power supply : C1, C2, D1, D2 | C: 29 to 500<br>1: 115 to 1000<br>2: 500 to 2000  | 10.5   |            | 3.5          | 10.5          | F-41            |      |
| Other                     | Gauge Modular Blocks                        | OK-G01-P-(H)-E20  | -   | 13   |            | 1            | 1.3           | F-81            |      |
|                           |   | -T-(H)-E20  |   |  |            |              | 1.3           |                 |      |
|                           |   | -W-(H)-E20  |   |  |            |              | 1.3           |                 |      |
|                           | 2-speed Plates                              | OB-G01-W-(H)-20   | -   | 13   |            | 1            | 3.3           | F-83            |      |
|                           | End Plates                                  | MOB-G01-(H)-10  | -   | -  | -          |              | 20<br>1.41    | 0.3<br>0.6      | F-85 |
|                           |   | MOB-G01-A-10  | -   | -  | -          |              | 1.41          | 0.6             |      |
|                           | Free-flow plate                             | -B-10   | -   | -  | 13         |              | 1.41          | 0.6             | F-90 |
|                           |   | MOB -01X-B*-10  | B: A, B ports<br>*: Sequential number from 2 to 6<br>Single side outlet   | -  | -          |              | -             | -               |      |
| Base Blocks (Multi-block) | -01Y-W*-10                                  | W: A, B ports<br>Sequential number from 1 to 6<br>Dual side outlet                                      | -   | -  |            | -            | -             | H-4             |      |
|                           | MSA-01Y-10<br>MSA-01Y-T-10                  | None: Back side outlet<br>T: Side outlet  | -   | -  |            | -            | -             |                 |      |

# G03 Modular Valve Series

| Type   | Name                                  | Valve Model Number                            | Pressure Adjustment Range<br>(Check Valve Cracking Pressure)<br>psi      | Maximum<br>Flow Rate<br>gpm | JIS<br>Symbol | Height<br>in | Weight<br>lbs | Catalog<br>Page |
|--|---------------------------------------|---|--|-----------------------------|---------------|--------------|---------------|-----------------|
| Solenoid Valves                              | Solenoid Valves                       | SS-G03-**-R-**-E21-21<br>SA-G03-**-** -E21-21 |  | 26                          |               |              |               | D-4<br>D-16     |
| Pressure Control Valve                       | Relief Valves<br>(Balance Type)       | OR-G03-P $\frac{1}{3}$ -E50                   | 1: 1000<br>3: 500 to 3600<br><br>(Auxiliary Symbol)<br>V: With vent port | 21                          |               | 2.1          | 6.8           | F-10            |
|  |                                       | -W $\frac{1}{3}$ -E50                         |  |                             |               |              | 8.5           |                 |
|  |                                       | -A $\frac{1}{3}$ -E50                         |  |                             |               |              | 6.8           |                 |
|  |                                       | -B $\frac{1}{3}$ -E50                         |  |                             |               |              | 6.8           |                 |
|  |                                       | OR-G03-P $\frac{1}{3}$ -V-J50                 |  |                             |               |              | 6.8           |                 |
|  | Brake Valves<br>(Direct Type)         | ORO-G03-W $\frac{1}{3}$ -J50                  | 1: 115 to 1000<br>3: 500 to 3600   | 7.9                         |               | 2.1          | 10.5          | F-16            |
|  |                                       | -A $\frac{1}{3}$ -J50                         |  |                             |               |              | 8.8           |                 |
|  |                                       | -B $\frac{1}{3}$ -J50                         |  |                             |               |              | 8.8           |                 |
|  | Direct Relief Valves<br>(Direct Type) | ORD-G03-W $\frac{1}{3}$ -J50                  | 1: 115 to 1000<br>3: 500 to 3600   | 7.9                         |               | 2.1          | 8.5           | F-20            |
|  |                                       | -A $\frac{1}{3}$ -J50                         |  |                             |               |              | 6.8           |                 |
|  |                                       | -B $\frac{1}{3}$ -J50                         |  |                             |               |              | 6.8           |                 |
|  | Reducing valve                        | OG-G03-P $\frac{C}{3}$ 1-(B)-E51              | C: 36 to 500<br>1: 115 to 1000<br>3: 500 to 3000                         | 21<br>However,<br>C: 13     |               | 2.1          | 7.9           | F-25            |
|  |                                       | -A $\frac{C}{3}$ 1-(B)-E51                    |  |                             |               |              | 7.9           | F-34            |
|  |                                       | -B $\frac{C}{3}$ 1-(B)-E51                    |  |                             |               |              | 7.9           | F-34            |
| Pressure Control Valves<br>(Sequence Valves) | OQ-G03-P2 A C-J50 E                   | A: 36 to 125<br>C: 125 to 500                 | 21   |                             | 2.1           | 7.7          | F-44          |                 |
|  | OCQ-G03-A1 A C-J50 E                  | E: 500 to 2000                                |  |                             |               | 7.7          |               |                 |
| Flow Control Valve                           | Flow Regulator Valve                  | OCY-G03 -P -P-H -J50                          | (Function)<br>H: High differential<br>pressure regulator<br>14.5         |                             | 2.1           | 6.3          | F-55          |                 |
|  |                                       | -W-Y -W-HY -J51                               |  |                             |               | 6.8          |               |                 |
|  | Meter-Out Flow<br>Regulator Valves    | -A-Y -A-HY -J51                               |  |                             |               | 6.8          |               |                 |
|  |                                       | -B-Y -B-HY -J51                               |  |                             |               | 6.6          |               |                 |

\*There is no problem with seals and other parts when mixing these valves with NACHI G03 modular valve design number (J) 30 valves.

\*G03 module valve installation bolts  
For M6: Design number J50  
For M8: Design number 50  
For E: 1/4 - 20UNC  
Unit has commonality. Also, two J-pins have been inserted diagonally for M6 applications.

Note: G03 series modular valves have two T port locations: one on the A port side T<sub>(A)</sub> and one on the B port side T<sub>(B)</sub>. The port that is used depends on the model number.

# G03 Modular Valve Series

| Type                    | Name  | Valve Model Number   | Pressure Adjustment Range<br>(Check Valve Cracking Pressure)<br>psi  | Maximum<br>Flow Rate<br>gpm | ISO Symbol | Height<br>in | Weight<br>lbs | Catalog<br>Page |      |
|-------------------------|---|--|--|-----------------------------|------------|--------------|---------------|-----------------|------|
| Flow Control Valve      | Meter-in Flow Regulator Valve                                   | OCY-G03 -W-X -J51<br>-W-HX -J51                              | (Function)<br>H: High differential pressure regulator<br><br>14.5  | 26                          |            | 2.16         | 6.8           | F-55            |      |
|                         |   | -A-X -J51<br>-A-HX -J51                                      |  |                             |            |              |               |                 | 6.6  |
|                         |   | -B-X -J51<br>-B-HX -J51                                      |  |                             |            |              |               |                 | 6.6  |
|                         | Flow Control Valve (compensated)                                | OF-G03-P60-J50   | (Control Flow Rate)<br>Differential Pressure 1000: .07 to 15.8<br>Differential Pressure 3600: .13 to 15.8  |                             |            | 2.16         | 6.8           | F-63            |      |
|                         | Meter-out Flow Control Valves (compensated)                     | OCF-G03-W60-Y-J50  | (Volume control flow rate)<br>Differential Pressure 1000: .13 to 15.8<br>Differential Pressure 3600: .02 to 15.8   | 15.8                        |            | 2.16         | 11            |                 |      |
|                         |   | -A60-Y-J50   |  |                             |            |              | 10.1          |                 |      |
|                         |   | -B60-Y-J50   |  |                             |            |              | 10.1          |                 |      |
|                         | Meter-in Flow Control Valves (compensated)                      | OCF-G03-W60-X-J50  | (Volume control flow rate)<br>Differential Pressure 1000: .13 to 15.8<br>Differential Pressure 3600: .02 to 15.8   | 15.8                        |            | 2.16         | 11            |                 |      |
|                         |   | -A60-X-J50   |  |                             |            |              | 10.1          |                 |      |
|                         |   | -B60-X-J50   |  |                             |            |              | 10.1          |                 |      |
| Direction Control Valve | Check Valves  | 1<br>OC-G03-P 2-J50 3  | Cracking pressure<br>1: 5.8<br>2: 50<br>3: 72<br>*For differential circuit<br><br>   | 26                          |            | 2.16         | 5.9           | F-69            |      |
|                         |   | 1<br>T 2-J50 3   |  |                             |            |              |               |                 |      |
|                         |   | 1<br>-A 2-J50 * 3  |  |                             |            |              |               |                 |      |
|                         |   | 1<br>-AP 2-J50 * 3   |  |                             |            |              |               |                 |      |
|                         | Vacuum Check Valves   | OCV-G03-W-J50  | 2.1  | 26                          |            | 2.16         | 7.7           | F-69            |      |
|                         | Pilot Check Valves  | 1<br>OCP-G03-W 2-(D)-J50                                     | Cracking pressure<br>1: 29<br>2: 72<br><br>(Auxiliary Symbol)<br>Open Valve Ratio Standard<br>: Child Valve 7%<br>: Parent Valve 49%<br>D : Parent Valve 49% | 26                          |            | 2.16         | 7.9           | F-76            |      |
|                         |   | 1<br>-A 2-(D)-J50  |  |                             |            |              |               |                 |      |
| 1<br>-B 2-(D)-J50       |   |  |  |                             |            |              |               |                 |      |
| Other                   | Gauge Block   | OK-G03-E50   |  | 26                          |            | 2.16         | 5.0           | F-81            |      |
|                         | 2-speed Plates  | OB-G03-W-(H)-J30   |  | 26                          |            | 2.16         | 5.0           | F-83            |      |
|                         | End Plates  | MOB-G03-J50: For M6<br>MOB-G03-(H)-50: For M8                |  | -                           |            |              | 1.25 (H:58)   | 1.4 (H:2.5)     | F-85 |
|                         |   | MOB-G03-A-J50: For M6<br>MOB-G03-A-(H)-50: For M8            |  | 26                          |            | 1.25 (H:58)  | 1.3 (H:2.3)   |                 |      |
|                         | Free Flow   | MOB-G03-B-J50: For M6<br>MOB-G03-B-(H)-50: For M8            |  | 26                          |            | 1.25 (H:58)  | 1.3 (H:2.3)   | F-85            |      |
|                         |   | MOB-G03-B-J50: For M6<br>MOB-G03-B-(H)-50: For M8            |  | 26                          |            | 1.25 (H:58)  | 1.3 (H:2.3)   | F-85            |      |
|                         | Conversion plate (For 03/01 conversion)                         | MOB-G03-AA-50<br>MOB-G03-AA-J50                              |  | 13                          |            | 1.77         | 5.0           | F-91            |      |
|                         | Base Blocks   | MOB-03-B*-J30  | *:Sequential number from 2 to 5<br>A, B port dual side outlet  |                             |            |              |               | F-91            |      |
| Sub Plate               | MSA-03-E10<br>MS-03(X)-E10<br>MSA-03(X)-T-E10<br>MS-03(X)-T-E10 | Bottom Outlet<br>Bottom Outlet<br>Side outlet<br>Side outlet |  |                             |            |              |               | D-9             |      |
|                         |   |  |  |                             |            |              |               | H-5             |      |

# G03 Modular Valve Series Detailed ISO Symbols

| Type                   | Valve Model Number   | Detailed ISO Symbols | Type               | Valve Model Number | Detailed ISO Symbols |
|------------------------|--|----------------------|--------------------|--------------------|----------------------|
| Solenoid Valves        | SS-G03-**-R-**-E21 -21<br>SA-G03-**-** -E21 -21<br><small>For M6, M8</small> |                      | Flow Control Valve | OF-G03-P60-J50     |                      |
|                        | Pressure Control Valve   | OR-G03-P 1/3-E50     |                    |                    | OCF-G03-W60-Y-J50    |
| OR-G03-W 1/3-E50       |  |                      |                    | OCF-G03-A60-Y-J50  |                      |
| OR-G03-A 1/3-E50       |  |                      |                    | OCF-G03-B60-Y-J50  |                      |
| OR-G03-B 1/3-E50       |  |                      |                    | OCF-G03-B60-X-J50  |                      |
| OR-G03-P 1/3-V-J50     |  |                      |                    | OCF-G03-W60-X-J50  |                      |
| ORO-G03-W 1/3-E50      |  |                      |                    | OCF-G03-A60-X-J50  |                      |
| ORO-G03-A 1/3-J50      |  |                      |                    | OCF-G03-B60-X-J50  |                      |
| ORO-G03-B 1/3-J50      |  |                      |                    | OC-G03-P 1/2-J50   |                      |
| ORD-G03-W 1/3-J50      |  |                      |                    | OC-G03-T 1/2-J50   |                      |
| ORD-G03-A 1/3-J50      |  |                      | OC-G03-A 1/2-J50   |                    |                      |
| ORD-G03-B 1/3-J50      |  |                      | OC-G03-AP 1/2-J50  |                    |                      |
| OG-G03-P C 1-(B)-E51   |  |                      | OCV-G03-W-J50      |                    |                      |
| OG-G03-A C 1-(B)-E51   |  |                      | OCP-G03-W 1/2-J50  |                    |                      |
| OG-G03-B C 1-(B)-E51   |  |                      | OCP-G03-A 1/2-J50  |                    |                      |
| OG-G03-P C 1-(B)-V-J51 |  |                      | OCP-G03-B 1/2-J50  |                    |                      |
| OQ-G03-P2 A C-J50 E    |  |                      | OK-G03-J50         |                    |                      |
| OCQ-G03-A1 A C-J50 E   |  |                      | Other              | OB-G03-W-J30       |                      |
| OCQ-G03-B1 A C-J50 E   |  |                      |                    | MOB-G03-(H)-50     |                      |
| Flow Control Valve     | OCY-G03-P-J50  |                      |                    | MOB-G03-J50        |                      |
|                        | OCY-G03-W-Y-J51  |                      |                    | MOB-G03-A-(H)-50   |                      |
|                        | OCY-G03-A-Y-J51  |                      |                    | MOB-G03-A-J50      |                      |
|                        | OCY-G03-B-Y-J51  |                      |                    | MOB-G03-B-(H)-50   |                      |
|                        | OCY-G03-W-X-J51  |                      |                    | MOB-G03-B-J50      |                      |
|                        | OCY-G03-A-X-J51  |                      |                    | MOB-G03-AA-50      |                      |
|                        | OCY-G03-B-X-J51  |                      |                    | MOB-G03-AA-J50     |                      |
|                        |  |                      |                    | MOB-03X-B*-50      |                      |
|                        |  | MOB-03X-B*-J50       |                    |                    |                      |
|                        |  | MS-03(X)-30          |                    |                    |                      |
|                        |  | MSA-03(X)-10         |                    |                    |                      |
|                        |  | MS-03(X)-T-10        |                    |                    |                      |
|                        |  | MSA-03(X)-T-10       |                    |                    |                      |



# G04 Modular Valve Series

| Type                            | Name                             | Valve Model Number                | Maximum Working psi             | Maximum Flow Rate gpm  | Pressure Adjustment Range (Check Valve Cracking Pressure) psi               | JIS Symbol | Weight lbs                           | Catalog Page |      |
|---------------------------------|----------------------------------|-----------------------------------|---------------------------------|--|---|------------|--------------------------------------|--------------|------|
| Solenoid Valves                 | Solenoid Control Valves          | DSS-G04-****-R**-21               | 35MPa<br>5000                   | 79   |   |            | 33                                   | D-41         |      |
| Pressure Control Valve          | Relief valve                     | ORH-G04-P $\frac{1}{3-10}$<br>5   | 35MPa<br>5000                   | 79   | 1: 115 to 1000<br>3: 500 to 3600  |            | 15.4                                 | F-10         |      |
|                                 | Direct Relief Valves             | ORH-G04-DW- $\frac{1}{3-10}$<br>5 |                                 | 13.2   | 1: 115 to 1000<br>3: 500 to 3600<br>5: 1000 to 5000                         |            | 14.3                                 | F-20         |      |
|                                 |                                  | ORH-G04-DA $\frac{1}{3-10}$<br>5  |                                 |  | 79  |            | 1: 115 to 1000<br>3: 500 to 3600     | 17.6         | F-25 |
|                                 |                                  | ORH-G04-DB $\frac{1}{3-10}$<br>5  |                                 |  |   |            | 17.6                                 | F-32         |      |
|                                 | Reducing valve                   | OGH-G04-P $\frac{1}{3}$ (B)-10    |                                 | 79   | 1: 115 to 1000<br>3: 500 to 3600<br>(Auxiliary Symbol)<br>B: External drain |            | 17.6                                 | F-47         |      |
|                                 |                                  | OGH-G04-A $\frac{1}{3}$ (B)-10    |                                 |  | 17.6  |            | F-47                                 |              |      |
|                                 |                                  | OGH-G04-B $\frac{1}{3}$ (B)-10    |                                 |  | 17.6  |            | F-47                                 |              |      |
|                                 | Counter Balance Valves           | OQH-G04-A1 $\frac{A}{C-10}$<br>E  |                                 | 79   | A: 36 to 125<br>C: 72 to 500<br>E: 290 to 2000                              |            | 17.6                                 | F-55         |      |
|                                 |                                  | OQH-G04-B1 $\frac{A}{C-10}$<br>E  |                                 |  | 17.6  |            | F-55                                 |              |      |
|                                 | Flow Control Valve               | Flow Regulator Valves             |                                 | OYH-G04-P-10   | 79  |            | Check Valve Cracking Pressure<br>5.8 | 10.3         | F-55 |
| Meter-in Flow Regulator Valve   |                                  | OYH-G04-W-X-10                    | 79                              | Check Valve Cracking Pressure<br>14.5  | 14.3  | F-55       |                                      |              |      |
|                                 |                                  | OYH-G04-A-X-10                    |                                 |  | 14.3  |            |                                      |              |      |
|                                 |                                  | OYH-G04-B-X-10                    |                                 |  | 14.3  |            |                                      |              |      |
| Meter-Out Flow Regulator Valves |                                  | OYH-G04-W-Y-10                    | 79                              | Check Valve Cracking Pressure<br>14.5  | 14.3  | F-63       |                                      |              |      |
|                                 |                                  | OYH-G04-A-Y-10                    |                                 |  | 14.3  |            |                                      |              |      |
| Meter-in Flow Control Valves    |                                  | OFH-G04-W200-X-10                 | 52.8                            | Check Valve Cracking Pressure<br>14.5  | 24.4  | F-63       |                                      |              |      |
|                                 |                                  | OFH-G04-A200-X-10                 |                                 |  | 22.5  |            |                                      |              |      |
|                                 |                                  | OFH-G04-B200-X-10                 |                                 |  | 24.4  |            |                                      |              |      |
|                                 |                                  | OFH-G04-W200-Y-10                 |                                 |  | 22.5  |            |                                      |              |      |
|                                 |                                  | OFH-G04-A200-Y-10                 |                                 |  | 24.4  |            |                                      |              |      |
|                                 |                                  | OFH-G04-B200-Y-10                 |                                 |  | 22.5  |            |                                      |              |      |
| Direction Control Valve         |                                  | Check Valves                      | OCH-G04-P $\frac{1}{2-10}$<br>3 | 79   | 1: 5.8<br>2: 50<br>3: 72  | 9.9        | F-69                                 |              |      |
|                                 |                                  |                                   | OCH-G04-T $\frac{1}{2-10}$<br>3 |  |   | 14.3       |                                      |              |      |
|                                 | OCH-G04-A $\frac{1}{2-10}$<br>3  |                                   | 9.9                             |  |   |            |                                      |              |      |
|                                 | OCH-G04-AP $\frac{1}{2-10}$<br>3 |                                   | 9.9                             |  |   |            |                                      |              |      |
|                                 | Vacuum Check Valves              | OVH-G04-W-10                      | 79                              | 14.5   | 14.3  | F-69       |                                      |              |      |
|                                 | Pilot Check Valves               | OPH-G04-W $\frac{1}{2}$ (D)-10    | 79                              | 1: 29<br>2: 72<br>(Auxiliary Symbol)<br>Open Valve Ratio<br>Standard<br>: Child Valve 7%<br>: Parent Valve 50%<br>D : Parent Valve 50% | 15  | F-76       |                                      |              |      |
|                                 |                                  | OPH-G04-A $\frac{1}{2}$ (D)-10    |                                 |  | 15  |            |                                      |              |      |
|                                 |                                  | OPH-G04-B $\frac{1}{2}$ (D)-10    |                                 |  | 15  |            |                                      |              |      |

The G04 series modular valves do not have an L (DR<sub>2</sub>) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).



### Relief Modular Valve

**13 to 79 gpm**  
**3600 to 5000 psi**

#### Features

This modular relief valve provides maximum pressure control for a hydraulic circuit.

Wide ranging applicability Maximum Operating Pressure: 3600 to 5000 psi Pressure Adjustment Range: 115 to 3600, 5000.

Shockless unload, 2-pressure control, and other configurations are possible by switching the solenoid valve. Contact your agent for details.

#### Specifications

| Model No.                 | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi          | Weight lbs | Gasket Surface Dimensions |
|---------------------------|-------------------------|------------------------------|-----------------------|--|------------|---------------------------|
| OR-G01-P1-20<br>P3        | 1/8                     | 3600                         | 13                    | * to 1000<br>500 - 3600                | 3.3        | ISO 4401-03-02-0-94       |
| OR-G01-W1-20<br>W3        |                         |                              |                       | * to 1000<br>500 - 3600                | 5          |                           |
| OR-G01-A1-21<br>A3        |                         |                              |                       | * to 1000<br>500 - 3600                | 3.5        |                           |
| OR-G01-B1-21<br>B3        |                         |                              |                       | * to 1000<br>500 - 3600                | 3.5        |                           |
| OR-G03-P1-(V)-J50<br>P3   | 3/8                     | 3600                         | 21                    | * to 1000<br>500 - 3600                | 6.8        | ISO 4401-05-04-0-94       |
| OR-G03-W1-J50<br>W3       |                         |                              |                       | * to 1000<br>500 - 3600                | 8.6        |                           |
| OR-G03-A1-J50<br>A3       |                         |                              |                       | * to 1000<br>500 - 3600                | 6.8        |                           |
| OR-G03-B1-J50<br>B3       |                         |                              |                       | * to 1000<br>500 - 3600                | 6.8        |                           |
| ORH-G04-P1-10<br>P3<br>P5 | 1/2                     | 5000                         | 79                    | * to 1000<br>500 - 3600<br>1000 - 5000 | 15.4       | ISO 4401-07-06-0-94       |

Note: \*See the Flow Rate - Low Pressure characteristics on page D-17 for information about items marked with an asterisk.

#### • Handling

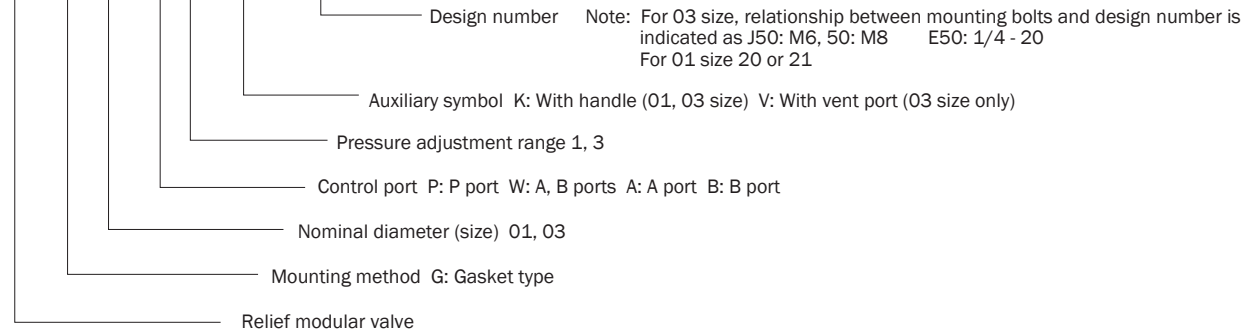
- When using a remote control valve in a vent circuit, certain vent circuit pipe capacities can cause vibration. Because of this, thick steel pipe with an inside diameter of .15 in that is no longer than three meters is recommended. Vent piping cannot be used with the 01 size. If a vent port is required for the 03 size, add the auxiliary code "V".
- For use as a safety valve, use a pressure override that is higher than the required circuit pressure.
- Make sure that tank port back pressure is no greater than 29 psi.
- A small control flow rate can cause pressure instability. Use a control flow rate that is in accordance with the values shown below.
  - 01 size: At least 1.3 gpm
  - 03 size: At least 2.1 gpm
  - 04 size: At least 2.1 gpm

For applications that require a flow rate that is less than the minimum flow rate, use an ORD-G\*\* direct type relieve modular valve.
- Note that a sub plate and installation bolts are not included. See pages H4 or F-87-89 if these items are required.
- 04 series modular valves do not have an L (DR drain port, so they cannot be used in combination with pressure center type solenoid valves (D).
- Connect OR-G03-W\*-(J) 50 to the two T-ports on the tanks.

## Understanding Model Numbers

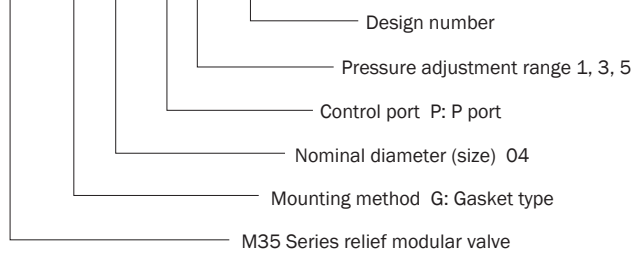
01: 03 size

**OR - G 03 - P 1 - (K) - J50**



04 size

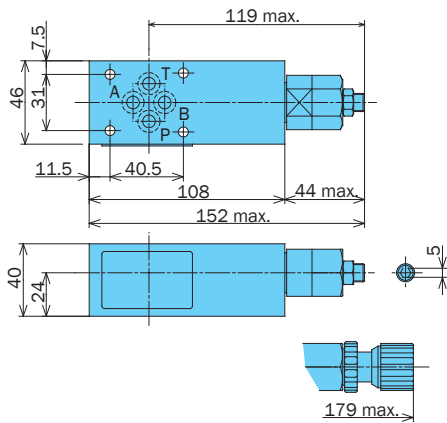
**ORH - G 04 - P 5 - 10**



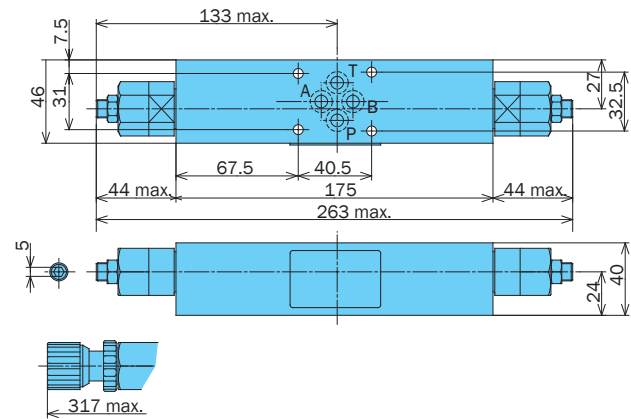
## Installation Dimension Drawings

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

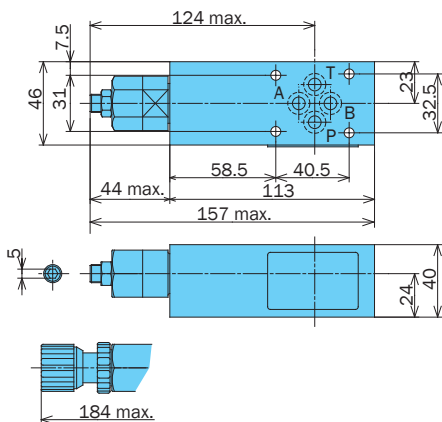
**OR-G01-P\*-20**



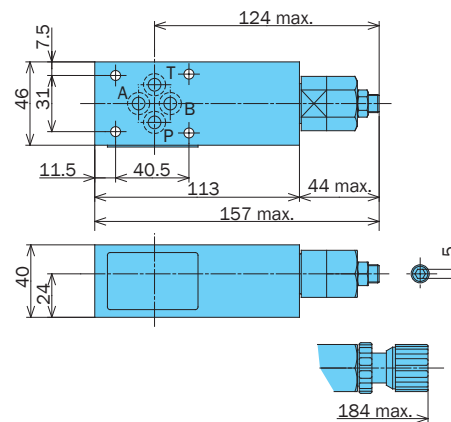
**OR-G01-W\*-20**



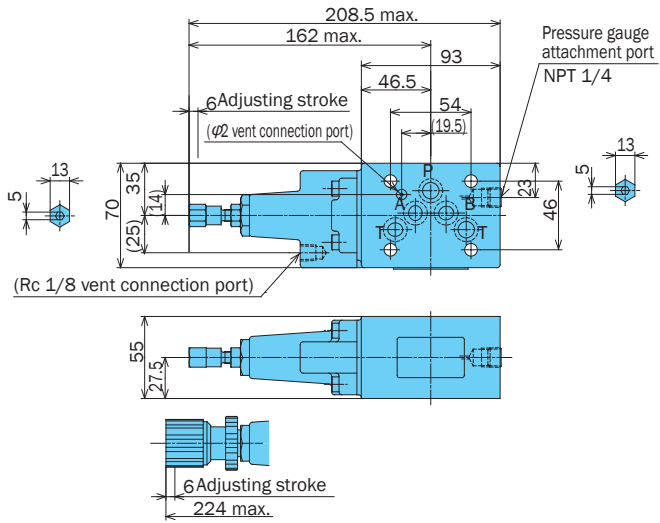
**OR-G01-A\*-21**



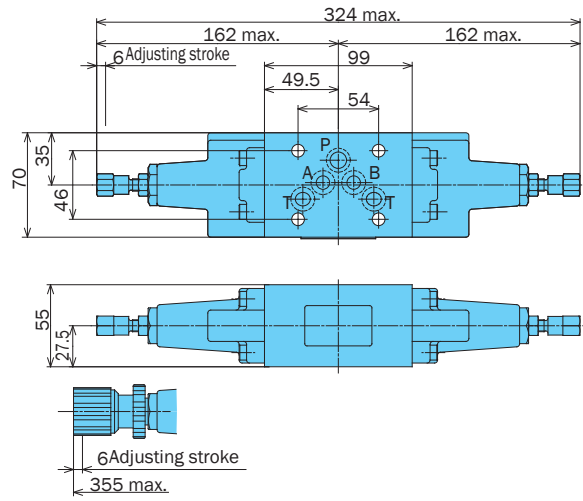
**OR-G01-B\*-21**



**OR-G03-P\*(V)-J50**

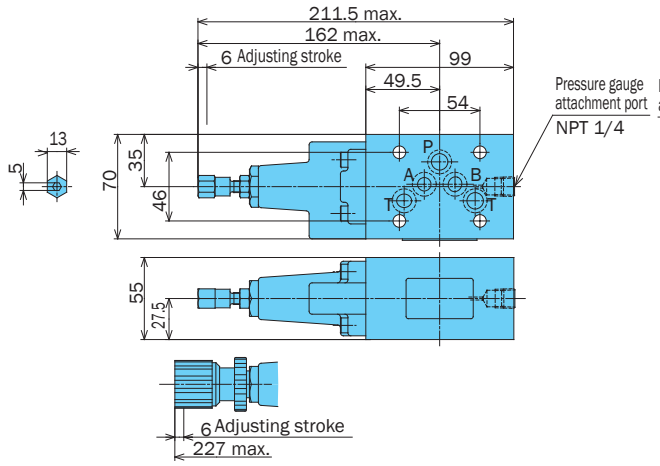


**OR-G03-W\*-J50**

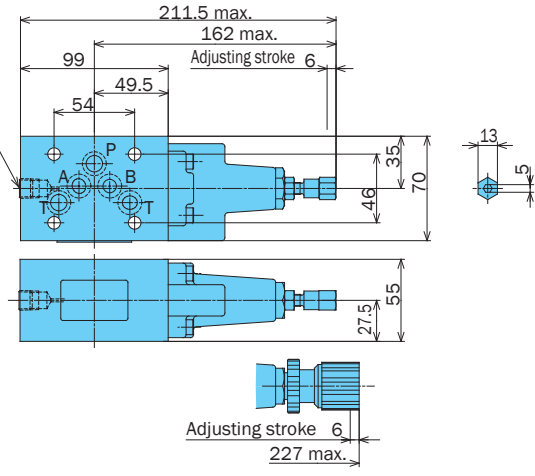


Note: Dimensions in parentheses show dimensions with vent port installed (V type)

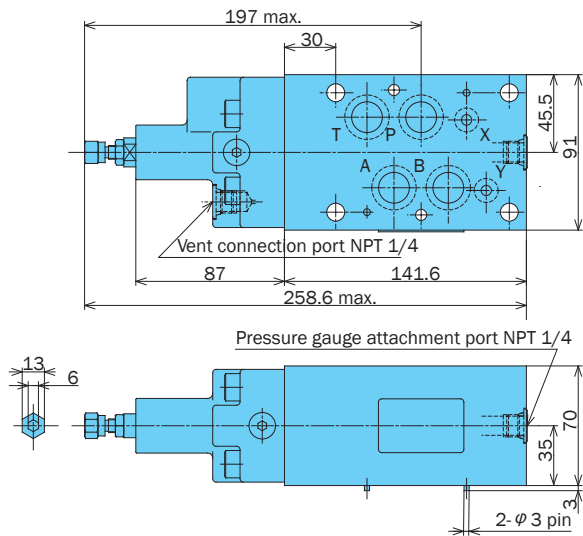
**OR-G03-A\*-J50**



**OR-G03-B\*-J50**



**ORH-G04-P\*-10**

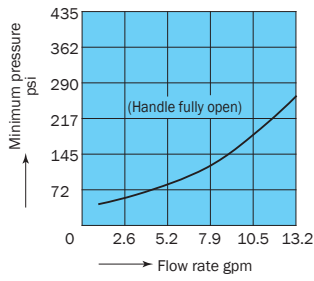


# Performance Curves

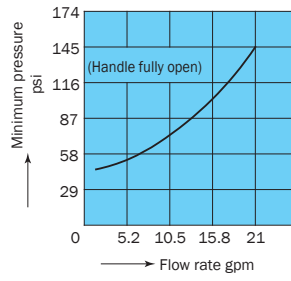
Differential Hydraulic Fluid Viscosity 32 centistokes

## Flow Rate - Minimum Pressure Characteristics

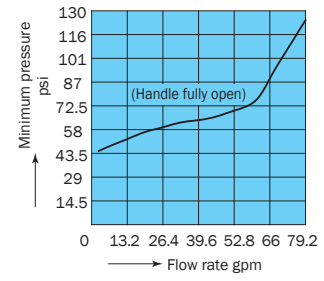
OR-G01-\*1-20(21)



OR-G03-P1-J50

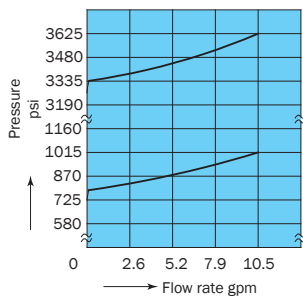


ORH-G04-P\*-10

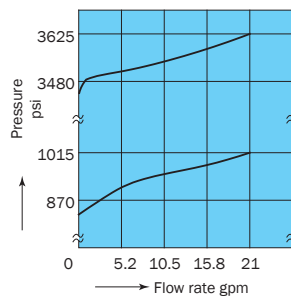


## Pressure - Flow Rate Characteristics

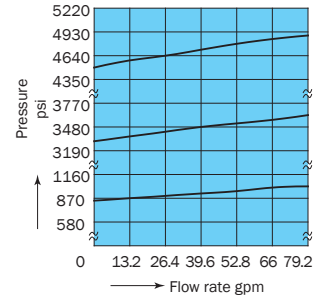
OR-G01-\* \*-20(21)



OR-G03-P\*-J50

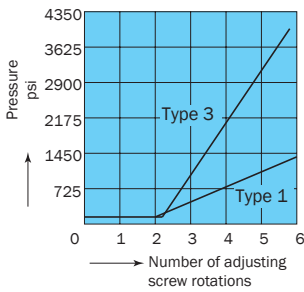


ORH-G04-P\*-10

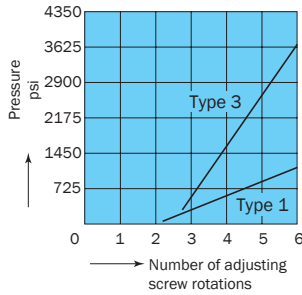


## Number of Adjusting Screw Rotations - Pressure Characteristics

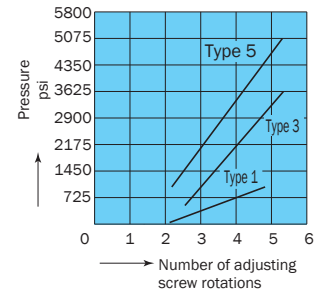
OR-G01-P\*-20



OR-G03-P\*-(J)50

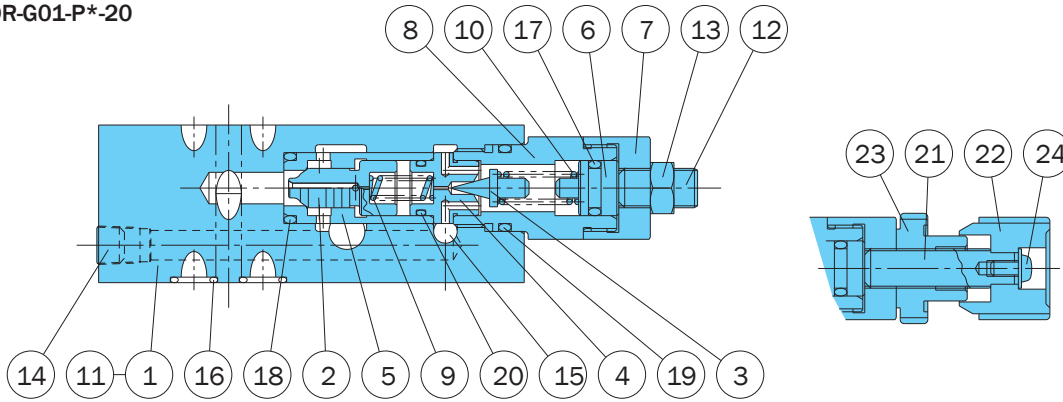


ORH-G04-P\*-10



## Cross-sectional Drawing

OR-G01-P\*-20



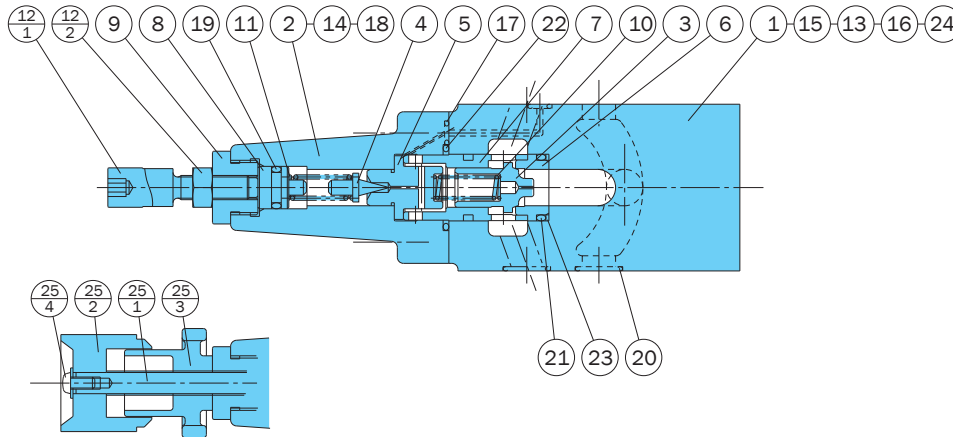
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Spool     |
| 3        | Poppet    |
| 4        | Seat      |
| 5        | Sleeve    |
| 6        | Plunger   |
| 7        | Bushing   |
| 8        | Retainer  |
| 9        | Spring    |
| 10       | Spring    |
| 11       | Plate     |
| 12       | Screw     |
| 13       | Nut       |
| 14       | Plug      |
| 15       | Plug      |
| 16       | O-ring    |
| 17       | O-ring    |
| 18       | O-ring    |
| 19       | O-ring    |
| 20       | O-ring    |
| 21       | Screw     |
| 22       | Knob      |
| 23       | Nut       |
| 24       | Screw     |

Seal Part List (Kit Model Number BRBS-01R\*)

| Part No. | Part Name | Part Number     | Q'ty |   |   |   |
|----------|-----------|-----------------|------|---|---|---|
|          |           |                 | P    | W | A | B |
| 16       | O-ring    | 1B-P9           | 4    | 4 | 4 | 4 |
| 17       | O-ring    | 1A-P10A         | 1    | 2 | 1 | 1 |
| 18       | O-ring    | 1B-P14          | 1    | 2 | 1 | 1 |
| 19       | O-ring    | 1B-P18          | 1    | 2 | 1 | 1 |
| 20       | O-ring    | AS568-013(Hs90) | 1    | 2 | 1 | 1 |

Note) 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify P, W, A, or B for the asterisk (\*) in the kit model number.

OR-G03-P\*-V-J50



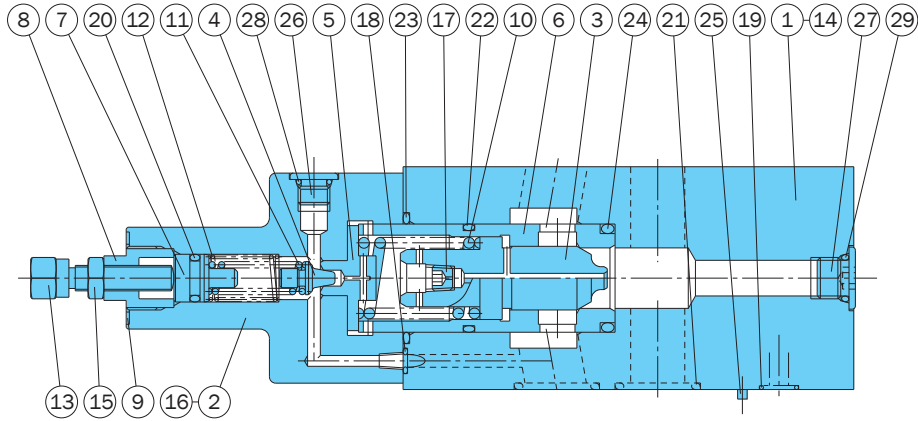
| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Cover       |
| 3        | Spool       |
| 4        | Poppet      |
| 5        | Seat        |
| 6        | Seat        |
| 7        | Sleeve      |
| 8        | Plunger     |
| 9        | Retainer    |
| 10       | Spring      |
| 11       | Spring      |
| 12       | Screw kit   |
| 12.1     | Screw       |
| 12.2     | Nut         |
| 13       | Plate       |
| 14       | Screw       |
| 15       | Plug        |
| 16       | Plug        |
| 17       | O-ring      |
| 18       | O-ring      |
| 19       | O-ring      |
| 20       | O-ring      |
| 21       | O-ring      |
| 22       | O-ring      |
| 23       | Backup ring |
| 24       | Pin         |
| 25       | Handle kit  |
| 25.1     | Screw       |
| 25.2     | Knob        |
| 25.3     | Nut         |
| 25.4     | Screw       |

Seal Part List (Kit Model Number BRES-03R\*)

| Part No. | Part Name   | Part Number     | Q'ty  |   |    |
|----------|-------------|-----------------|-------|---|----|
|          |             |                 | P/A/B | W | PV |
| 17       | O-ring      | 1B-P5           | -     | - | 2  |
| 18       | O-ring      | 1B-P7           | 1     | 2 | 1  |
| 19       | O-ring      | 1A-P10A         | 1     | 2 | 1  |
| 20       | O-ring      | AS568-014(Hs90) | 5     | 5 | 5  |
| 21       | O-ring      | 1B-P18          | 2     | 4 | 2  |
| 22       | O-ring      | AS568-119(Hs90) | 1     | 2 | 1  |
| 23       | Backup ring | T2-P18          | 1     | 2 | 1  |

Note) 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Backup ring indicates JIS B2407-T2-\*\*.  
3. Specify P, W, or PV for the asterisk (\*) in the kit model number.

ORH-G04-P\*-10



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Spool     |
| 4        | Poppet    |
| 5        | Seat      |
| 6        | Sleeve    |
| 7        | Plunger   |
| 8        | Retainer  |
| 9        | Plate     |
| 10       | Spring    |
| 11       | Spring    |
| 12       | Spring    |
| 13       | Screw     |
| 14       | Plate     |
| 15       | Nut       |
| 16       | Screw     |
| 17       | Choke     |
| 18       | O-ring    |
| 19       | O-ring    |
| 20       | O-ring    |
| 21       | O-ring    |
| 22       | O-ring    |
| 23       | O-ring    |
| 24       | O-ring    |
| 25       | Pin       |
| 26       | Plug      |
| 27       | Plug      |
| 28       | O-ring    |
| 29       | O-ring    |

Seal Part List (Kit Model Number BRKS-04RP)

| Part No. | Part Name | Part Number     | Q'ty |
|----------|-----------|-----------------|------|
| 18       | O-ring    | 1B-P5           | 1    |
| 19       | O-ring    | AS568-012(Hs90) | 2    |
| 20       | O-ring    | 1A-P11          | 1    |
| 21       | O-ring    | AS568-118(Hs90) | 4    |
| 22       | O-ring    | AS568-122(Hs90) | 1    |
| 23       | O-ring    | AS568-127(Hs90) | 1    |
| 24       | O-ring    | 1B-P28          | 1    |
| 28       | O-ring    | 1B-P8           | 3    |
| 29       | O-ring    | 1B-P11          | 3    |

Note) O-ring 1A/B-\*\* refers to JIS B2401-1A/B.



### Brake Modular Valve

**5.2 to 7.9 gpm**  
**115 to 3045, 3625 psi**

#### Features

This modular pressure control valve prevents abnormal pressure when the actuator stops, enabling smooth stops.

Wide ranging applicability Maximum Operating Pressure: 3625 psi.

Pressure Adjustment Range: 115 to 3045, 3625 psi.

#### Specifications

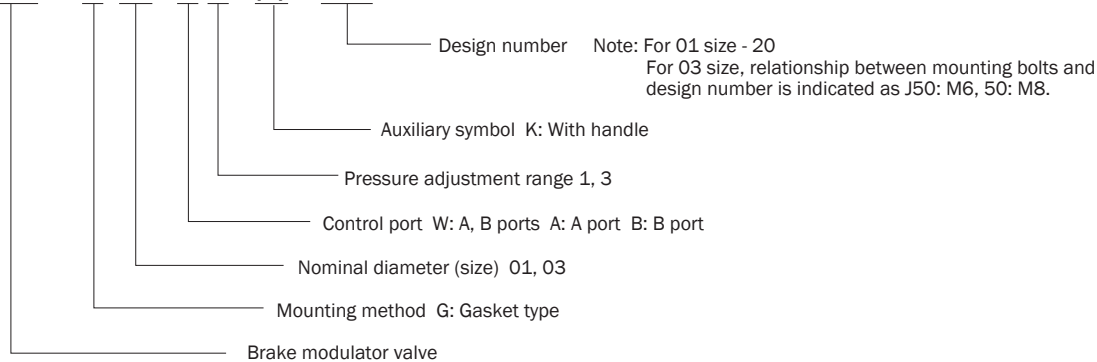
| Model No.            | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi | Weight lbs | Gasket Surface Dimensions |
|----------------------|-------------------------|------------------------------|-----------------------|-------------------------------|------------|---------------------------|
| ORO-G01-W1-20<br>W3  | 1/8                     | 3625                         | 5.2                   | 115 to 1000<br>500 to 3045    | 3.3        | ISO 4401-03-02-0-94       |
| ORO-G01-A1-20<br>A3  |                         |                              |                       | 115 to 1000<br>500 to 3045    | 3.0        |                           |
| ORO-G01-B1-20<br>B3  |                         |                              |                       | 115 to 1000<br>500 to 3045    | 3.0        |                           |
| ORO-G03-W1-J50<br>W3 | 3/8                     | 3625                         | 7.9                   | 115 to 1000<br>500 to 3045    | 10.5       | ISO 4401-05-04-0-94       |
| ORO-G03-A1-J50<br>A3 |                         |                              |                       | 115 to 1000<br>500 to 3045    | 8.8        |                           |
| ORO-G03-B1-J50<br>B3 |                         |                              |                       | 115 to 1000<br>500 to 3045    | 8.8        |                           |

#### • Handling

- The pressure adjustment range is expressed using cracking pressure.
- For use as a safety valve, use a pressure override that is higher than the required circuit pressure.
- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.

#### Understanding Model Numbers

**ORO - G 03 - A 3 - (K) - J50**

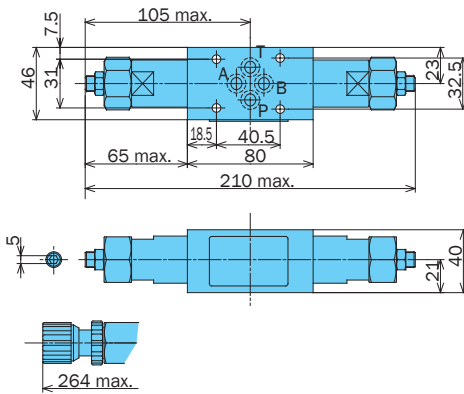




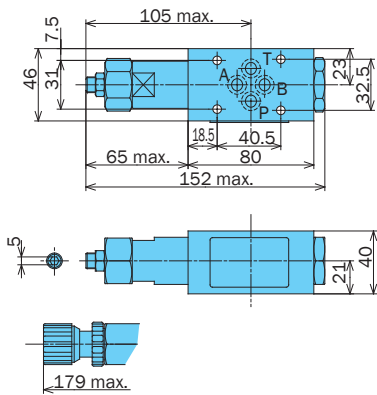
# Specifications

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

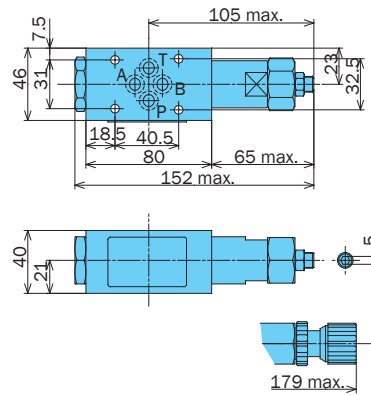
## ORO-G01-W\*-20



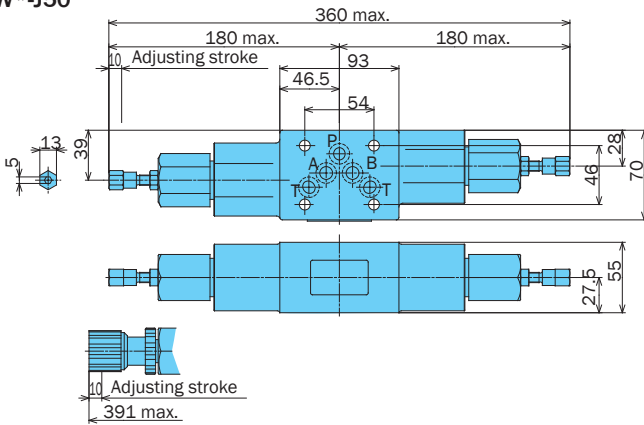
## ORO-G01-A\*-20



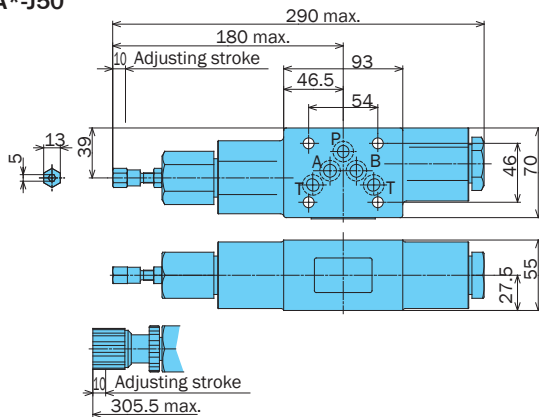
## ORO-G01-B\*-20



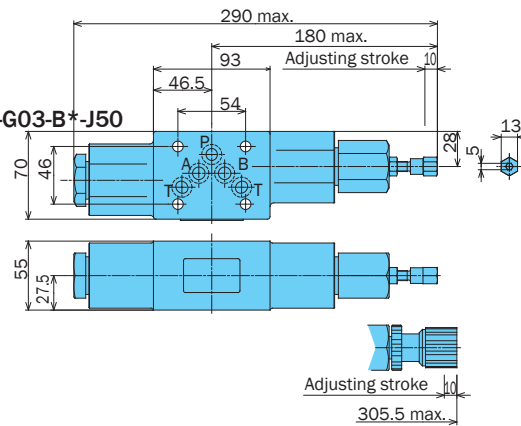
## ORO-G03-W\*-J50



## ORO-G03-A\*-J50



## ORO-G03-B\*-J50

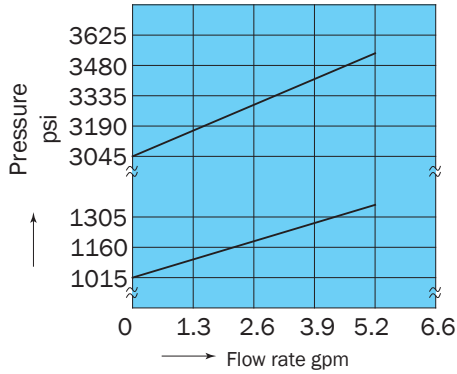


## Performance Curves

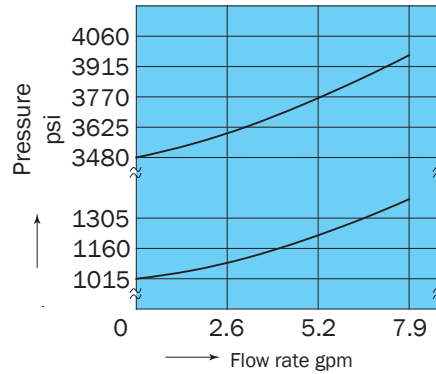
Differential Hydraulic Fluid Viscosity 32 centistokes

### Pressure - Flow Rate Characteristics

ORO-G01-\*\*-20

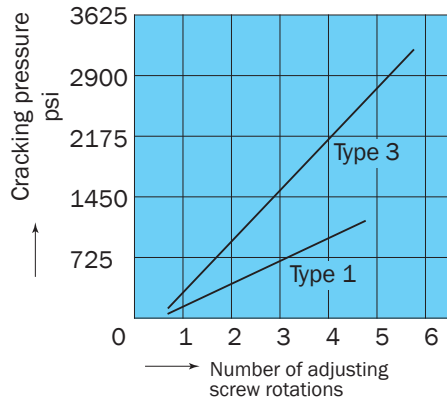


ORO-G03-\*\*-J50

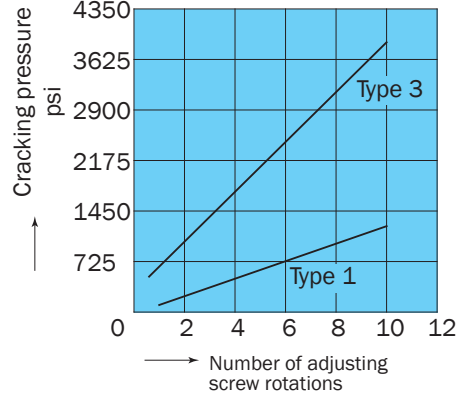


### Number of Adjusting Screw Rotations - Pressure Characteristics

ORO-G01-\*\*-20

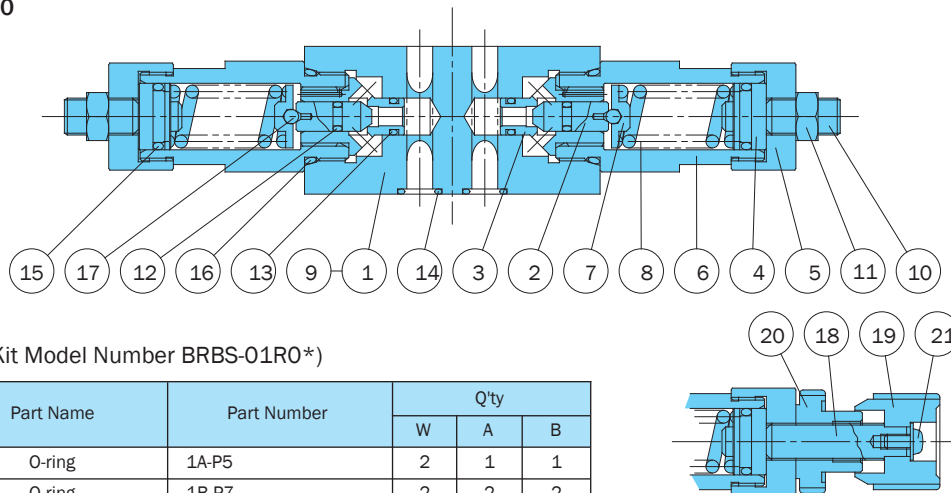


ORO-G03-\*\*-J50



## Cross-sectional Drawing

ORO-G01-W\*-20



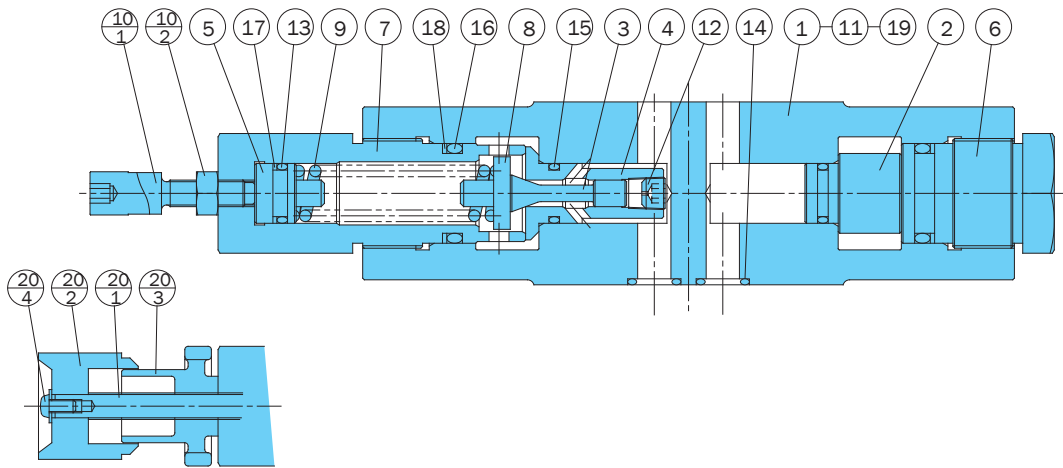
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Poppet    |
| 3        | Seat      |
| 4        | Plunger   |
| 5        | Bushing   |
| 6        | Retainer  |
| 7        | Guide     |
| 8        | Spring    |
| 9        | Plate     |
| 10       | Screw     |
| 11       | Nut       |
| 12       | O-ring    |
| 13       | O-ring    |
| 14       | O-ring    |
| 15       | O-ring    |
| 16       | O-ring    |
| 17       | Ball      |
| 18       | Screw     |
| 19       | Knob      |
| 20       | Nut       |
| 21       | Screw     |

### Seal Part List (Kit Model Number BRBS-01R0\*)

| Part No. | Part Name | Part Number | Q'ty |   |   |
|----------|-----------|-------------|------|---|---|
|          |           |             | W    | A | B |
| 12       | O-ring    | 1A-P5       | 2    | 1 | 1 |
| 13       | O-ring    | 1B-P7       | 2    | 2 | 2 |
| 14       | O-ring    | 1B-P9       | 4    | 4 | 4 |
| 15       | O-ring    | 1B-P14      | 2    | 1 | 1 |
| 16       | O-ring    | 1B-P22      | 2    | 2 | 2 |

Note: 1. O-ring 1A/B-\*\*-\*\* refers to JIS B2401-1A/B.  
2. Specify W, A, or B for the asterisk (\*) in the kit model number.

ORO-G03-A\*-J50



Part No. | Part Name

|                 |             |
|-----------------|-------------|
| 1               | Body        |
| 2               | Plug        |
| 3               | Poppet      |
| 4               | Seat        |
| 5               | Plunger     |
| 6               | Bushing     |
| 7               | Retainer    |
| 8               | Guide       |
| 9               | Spring      |
| 10              | Screw kit   |
| 10 <sub>1</sub> | Screw       |
| 10 <sub>2</sub> | Nut         |
| 11              | Plate       |
| 12              | Orifice     |
| 13              | O-ring      |
| 14              | O-ring      |
| 15              | O-ring      |
| 16              | O-ring      |
| 17              | Backup ring |
| 18              | Backup ring |
| 19              | Pin         |
| 20              | Handle kit  |
| 20 <sub>1</sub> | Screw       |
| 20 <sub>2</sub> | Knob        |
| 20 <sub>3</sub> | Nut         |
| 20 <sub>4</sub> | Screw       |

Seal Part List (Kit Model Number BRES-03R0\*)

| Part No. | Part Name   | Part Number     | Q'ty |   |   |
|----------|-------------|-----------------|------|---|---|
|          |             |                 | W    | A | B |
| 13       | O-ring      | 1A-P14          | 2    | 1 | 1 |
| 14       | O-ring      | AS568-014(Hs90) | 5    | 5 | 5 |
| 15       | O-ring      | 1B-P14          | 2    | 2 | 2 |
| 16       | O-ring      | 1B-P24          | 2    | 2 | 2 |
| 17       | Backup ring | T2-P14          | 2    | 1 | 1 |
| 18       | Backup ring | T2-P24          | 2    | 2 | 2 |

- Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Backup ring indicates JIS B2407-T2-\*\*.  
 3. Specify W, A, or B for the asterisk (\*) in the kit model number.



### Direct Relief Modular Valve

**5.2 to 13.2 gpm**  
**115 to 3045, 3625, 5075 psi**

#### Features

- 1 This modular relief valve provides maximum pressure control for a hydraulic circuit.
- 2 Wide ranging applicability Maximum Working Pressure: 3625, 5075 psi.
- 3 Pressure Adjustment Range: 115 to 3045, 3625, 5075 psi.

#### Specifications

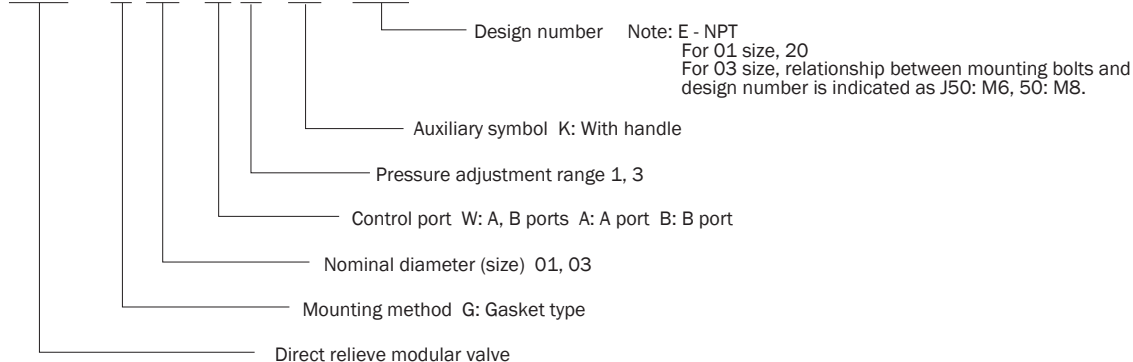
| Model No.                    | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi              | Weight lbs | Gasket Surface Dimensions |
|------------------------------|-------------------------|------------------------------|-----------------------|--|------------|---------------------------|
| ORD-G01-W1-20<br>W3          | 1/8                     | 3625                         | 5.2                   | 115 to 1000<br>500 to 3045                 | 3.3        | ISO 4401-03-02-0-94       |
| ORD-G01-A1-20<br>A3          |                         |                              |                       | 115 to 1000<br>500 to 3045                 | 3.0        |                           |
| ORD-G01-B1-20<br>B3          |                         |                              |                       | 115 to 1000<br>500 to 3045                 | 3.0        |                           |
| ORD-G03-W1-J50<br>W3         | 3/8                     | 3625                         | 7.9                   | 115 to 1000<br>500 to 3625                 | 10.5       | ISO 4401-05-04-0-94       |
| ORD-G03-A1-J50<br>A3         |                         |                              |                       | 115 to 1000<br>500 to 3625                 | 8.8        |                           |
| ORD-G03-B1-J50<br>B3         |                         |                              |                       | 115 to 1000<br>500 to 3625                 | 8.8        |                           |
| ORH-G04-DW1-10<br>DW3<br>DW5 | 1/2                     | 5075                         | 13.2                  | 115 to 1000<br>500 to 3625<br>1000 to 5075 | 14.3       | ISO 4401-07-06-0-94       |
| ORH-G04-DA1-10<br>DA3<br>DA5 |                         |                              |                       | 115 to 1000<br>500 to 3625<br>1000 to 5075 | 14.3       |                           |
| ORH-G04-DB1-10<br>DB3<br>DB5 |                         |                              |                       | 115 to 1000<br>500 to 3625<br>1000 to 5075 | 14.3       |                           |

#### • Handling

- 1 The pressure adjustment range is expressed using cracking pressure.
- 2 For use as a safety valve, use a pressure override that is higher than the required circuit pressure.
- 3 Tank port back pressure changes cracking pressure by the corresponding amount.
- 4 Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.
- 5 04 series modular valves do not have an L (DR2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

#### Understanding Model Numbers

**ORD - G 03 - W 3 - (K) - J50**

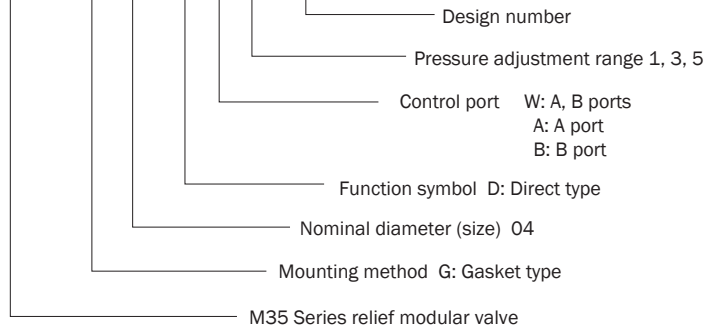


01, 03 size

## Understanding Model Numbers

04 size

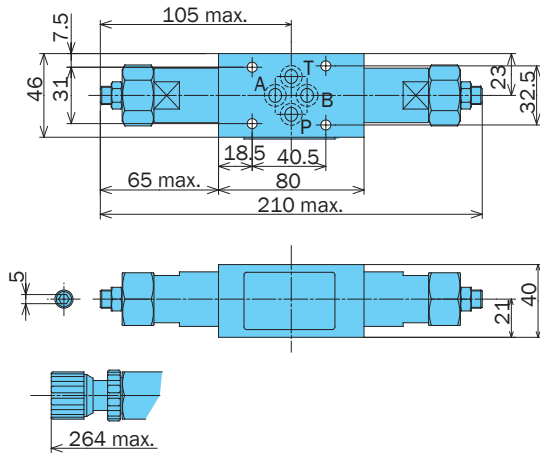
**ORH - G 04 - D W 5 - 10**



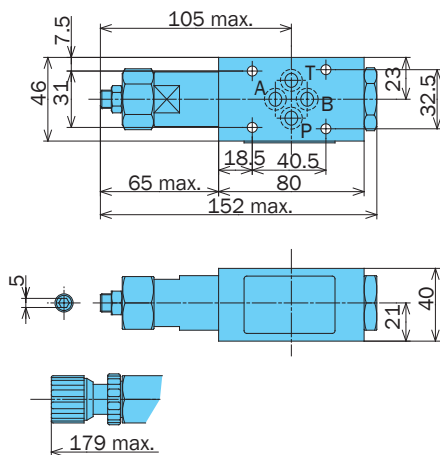
## Understanding Model Numbers

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation

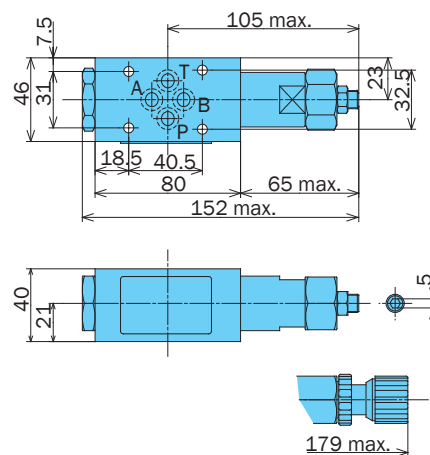
**ORD-G01-W\*-20**



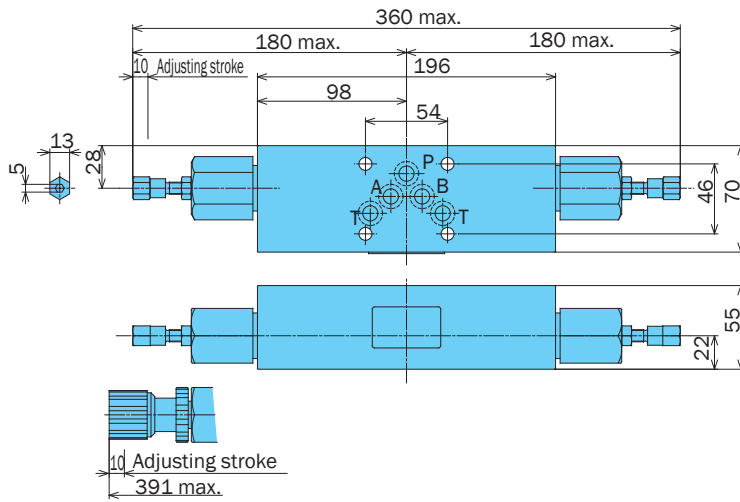
**ORD-G01-A\*-20**



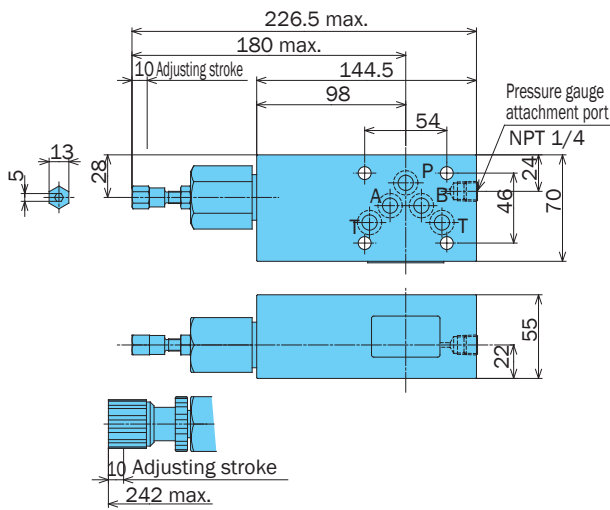
**ORD-G01-B\*-20**



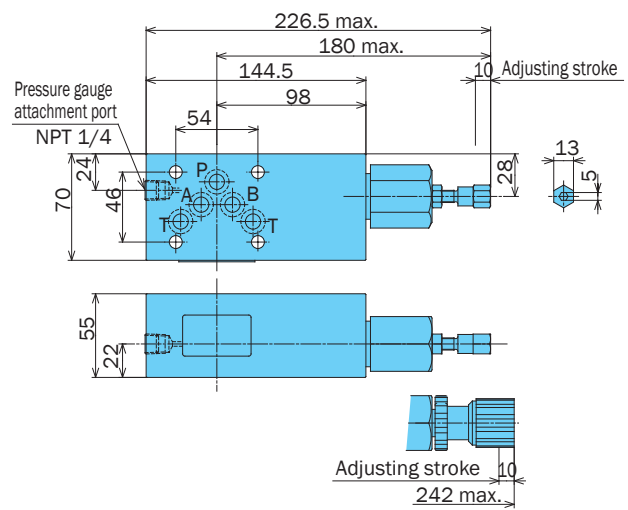
**ORD-G03-W\*-J50**



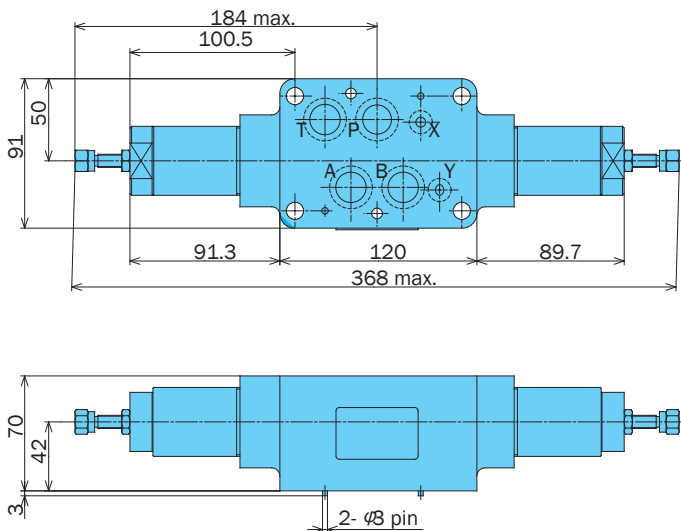
**ORD-G03-A\*-E50**



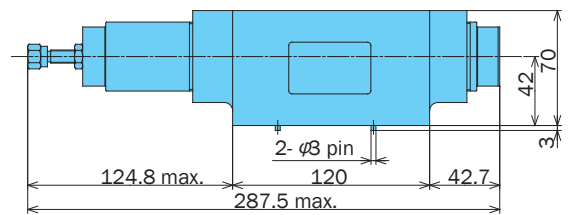
**ORD-G03-B\*-E50**



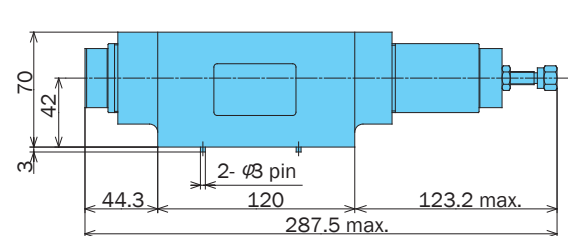
**ORH-G04-DW\*-10**



**ORH-G04-DA\*-10**



**ORH-G04-DB\*-10**

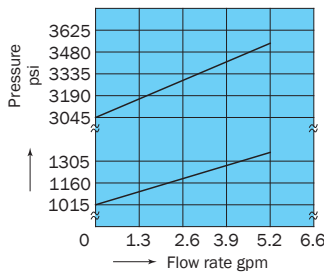


## Performance Curves

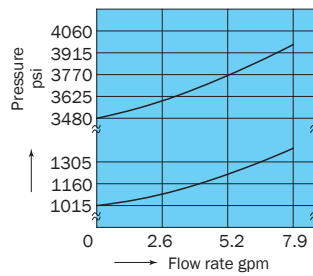
Differential Hydraulic Fluid Viscosity 32 centistokes

### Pressure - Flow Rate Characteristics

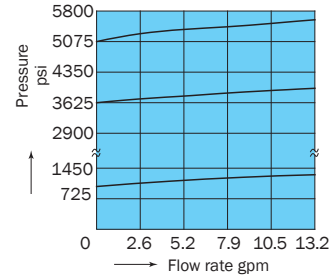
ORD-G01-\*\*-20



ORD-G03-\*\*-J50

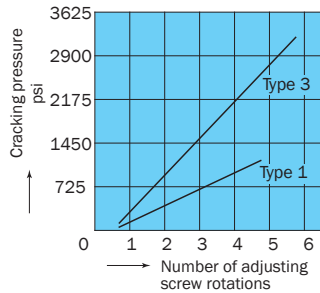


ORH-G04-DW\*-10

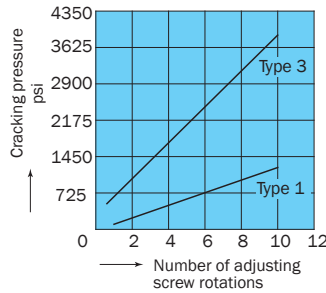


### Number of Adjusting Screw Rotations - Pressure Characteristics

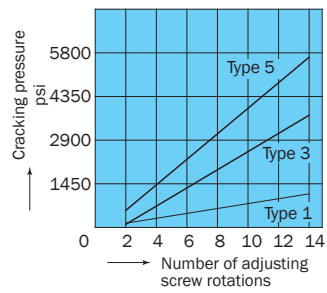
ORD-G01-\*\*-20



ORD-G03-\*\*-J50

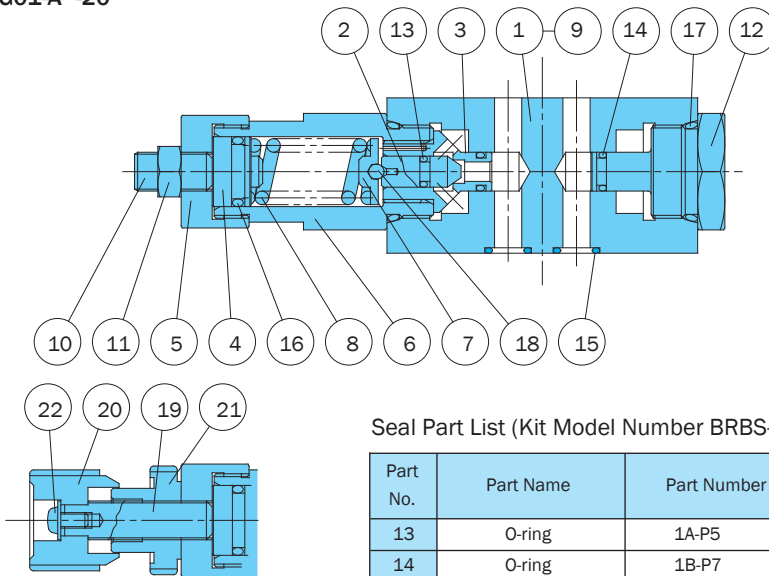


ORH-G04-DW\*-10



## Cross-sectional Drawing

ORD-G01-A\*-20



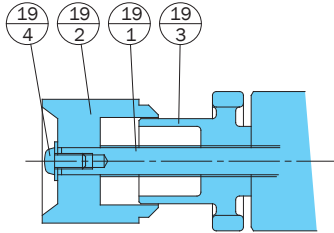
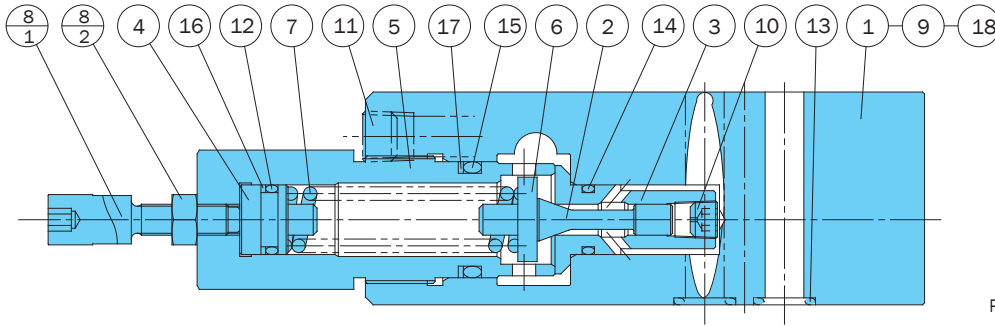
Seal Part List (Kit Model Number BRBS-01RD\*)

| Part No. | Part Name | Part Number | Q'ty |   |   |
|----------|-----------|-------------|------|---|---|
|          |           |             | W    | A | B |
| 13       | O-ring    | 1A-P5       | 2    | 1 | 1 |
| 14       | O-ring    | 1B-P7       | 2    | 2 | 2 |
| 15       | O-ring    | 1B-P9       | 4    | 4 | 4 |
| 16       | O-ring    | 1B-P14      | 2    | 1 | 1 |
| 17       | O-ring    | 1B-P22      | 2    | 2 | 2 |

Note: 1.O-ring 1A/B-\*\*- refers to JIS B2401-1A/B.  
2.Specify W, A, or B for the asterisk (\*) in the kit model number.

| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Poppet    |
| 3        | Seat      |
| 4        | Plunger   |
| 5        | Bushing   |
| 6        | Retainer  |
| 7        | Guide     |
| 8        | Spring    |
| 9        | Plate     |
| 10       | Screw     |
| 11       | Nut       |
| 12       | Bushing   |
| 13       | O-ring    |
| 14       | O-ring    |
| 15       | O-ring    |
| 16       | O-ring    |
| 17       | O-ring    |
| 18       | Ball      |
| 19       | Screw     |
| 20       | Knob      |
| 21       | Nut       |
| 22       | Screw     |

ORD-G03-A\*-J50



Seal Part List (Kit Model Number BRES-03RD\*)

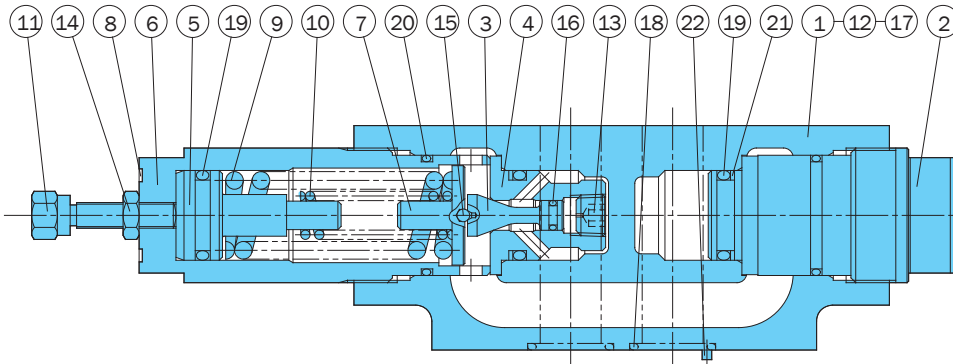
| Part No. | Part Name   | Part Number     | Q'ty |   |   |
|----------|-------------|-----------------|------|---|---|
|          |             |                 | A    | B | W |
| 12       | O-ring      | 1A-P14          | 1    | 1 | 2 |
| 13       | O-ring      | AS568-014(Hs90) | 5    | 5 | 5 |
| 14       | O-ring      | 1B-P14          | 1    | 1 | 2 |
| 15       | O-ring      | 1B-P24          | 1    | 1 | 2 |
| 16       | Backup ring | T2-P14          | 1    | 1 | 2 |
| 17       | Backup ring | T2-P24          | 1    | 1 | 2 |

Note) 1.O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2.Backup ring indicates JIS B2407-T2-\*\*.  
 3.Specify W, A, or B for the asterisk (\*) in the kit model number

Part No. Part Name

- 1 Body
- 2 Poppet
- 3 Seat
- 4 Plunger
- 5 Retainer
- 6 Guide
- 7 Spring
- 8 Screw kit
- 8<sub>1</sub> Screw
- 8<sub>2</sub> Nut
- 9 Plate
- 10 Orifice
- 11 Plug
- 12 O-ring
- 13 O-ring
- 14 O-ring
- 15 O-ring
- 16 Backup ring
- 17 Backup ring
- 18 Pin
- 19 Handle kit
- 19<sub>1</sub> Screw
- 19<sub>2</sub> Knob
- 19<sub>3</sub> Nut
- 19<sub>4</sub> Screw

ORH-G04-DA\*-10



Seal Part List (Kit Model Number BRKS-04RD\*)

| Part No. | Part Name   | Part Number     | Q'ty |   |   |
|----------|-------------|-----------------|------|---|---|
|          |             |                 | W    | A | B |
| 16       | O-ring      | 1A-P6           | 2    | 1 | 1 |
| 17       | O-ring      | AS568-012(Hs90) | 2    | 2 | 2 |
| 18       | O-ring      | AS568-118(Hs90) | 4    | 4 | 4 |
| 19       | O-ring      | 1B-P22A         | 4    | 3 | 3 |
| 20       | O-ring      | AS568-125(Hs70) | 2    | 2 | 2 |
| 21       | Backup ring | T2-P22A         | 2    | 2 | 2 |

Note) 1.O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2.Backup ring indicates JIS B2407-T2-\*\*.  
 3.Specify W, A, or B for the asterisk (\*) in the kit model number.

Part No. Part Name

- 1 Body
- 2 Plug
- 3 Poppet
- 4 Seat
- 5 Plunger
- 6 Retainer
- 7 Guide
- 8 Plate
- 9 Spring
- 10 Spring
- 11 Screw
- 12 Plate
- 13 Choke
- 14 Nut
- 15 Ball
- 16 O-ring
- 17 O-ring
- 18 O-ring
- 19 O-ring
- 20 O-ring
- 21 Backup ring
- 22 Pin





### Pressure Reducing Modular Valve

10.5 to 79.2 gpm  
3625, 5000 psi

### Features

This modular valve makes the pressure in part of the circuit lower than that of the main circuit.

Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a

constant level.  
Maximum Operating Pressure: 3625, 5075 psi.

### Specifications

| Model No.                     | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi             | Weight lbs | Gasket Surface Dimensions |
|-------------------------------|-------------------------|------------------------------|-----------------------|---|------------|---------------------------|
| OG-G01-PC-21<br>P1<br>P2      | 1/8                     | 3625                         | 13.2                  | 21.7 to 500<br>115 to 1000<br>500 to 2320 | 2.8        | ISO 4401-03-02-0-94       |
| OG-G03-PC-(V)-J51<br>P1<br>P3 | 3/8                     | 3625                         | 21<br>but C : 13.2    | 36 to 500<br>115 to 1000<br>500 to 3045   | 8.3        | ISO 4401-05-04-0-94       |
| OGH-G04-P1-10<br>P3           | 1/2                     | 5075                         | 79.2                  | 115 to 1000<br>500 to 3625                | 17.6       | ISO 4401-07-06-0-94       |

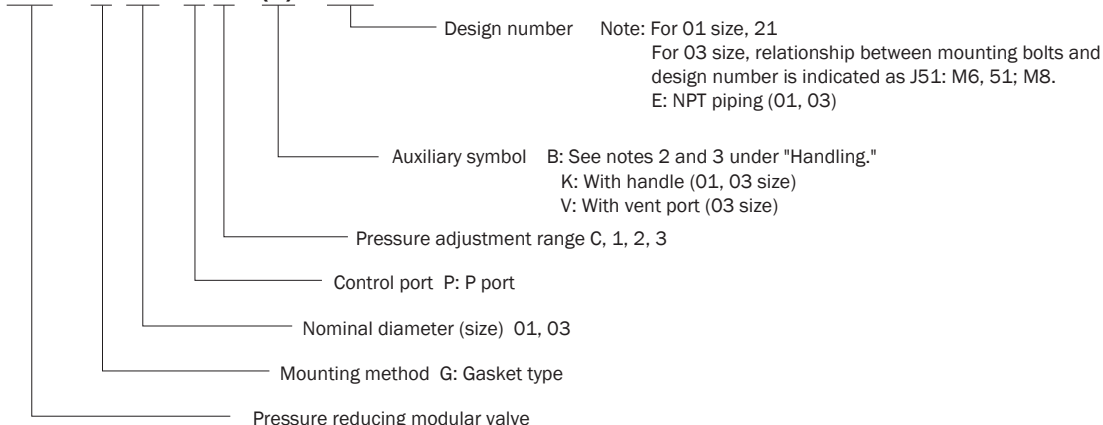
#### • Handling

- When using a remote control valve in a vent circuit, certain vent circuit pipe capacities can cause vibration. Because of this, thick steel pipe with an inside diameter of .15 in that is no longer than three meters is recommended. Vent piping cannot be used with the 01 size. If a vent port is required for the 03 size, add the auxiliary code "V".
- For the 03 size, the drainage can be allowed to escape through the T port. In the case of a valve with the auxiliary symbol B, however, run a return pipe from the drain discharge port directly to the tank.
- With the 04 sizes, piping is not required because drainage can be allowed to escape from the gasket side drain port. In the case of a valve with the auxiliary symbol B, however, run a return pipe from the drain discharge port directly to the tank.
- Note that a change in drain back pressure causes a change in setting pressure.
- With the 01, 03 sizes, the flow rate is limited at low pressures. See the Pressure-Flow Rate Characteristics on pages F-27 for more information.
- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.
- 04 series modular valves do not have an L (DR2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).
- With the 03, 04 sizes, the control port can be changed by altering the attachment orientation of the back cover. See the installation diagram for more information. After making this change, be sure also to make the other changes in accordance with the model number indicated on the nameplate.

### Understanding Model Numbers

01, 03, size

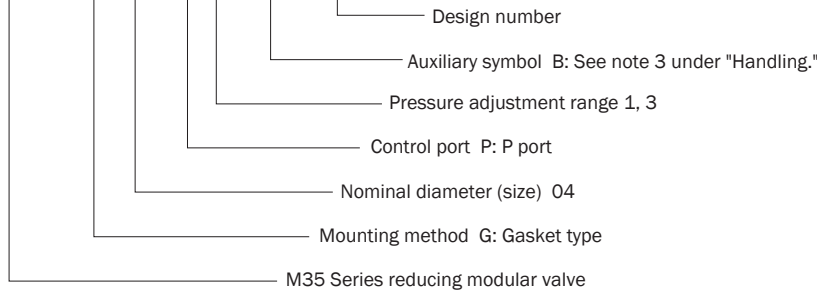
**OG - G 03 - P 1 - (B) - J51**



## Understanding Model Numbers

04 size

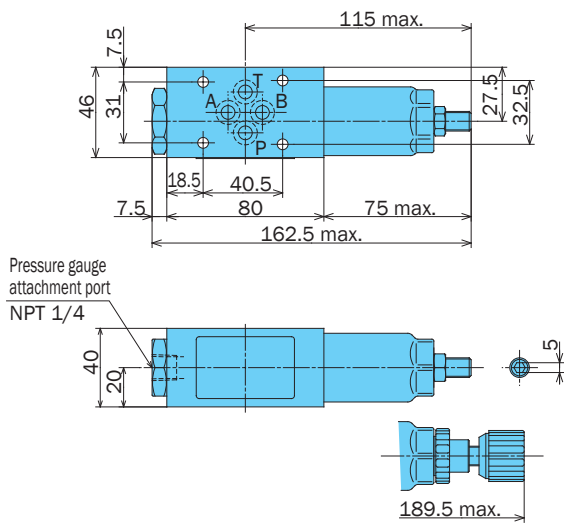
**OGH - G 04 - P 1 - (B) - 10**



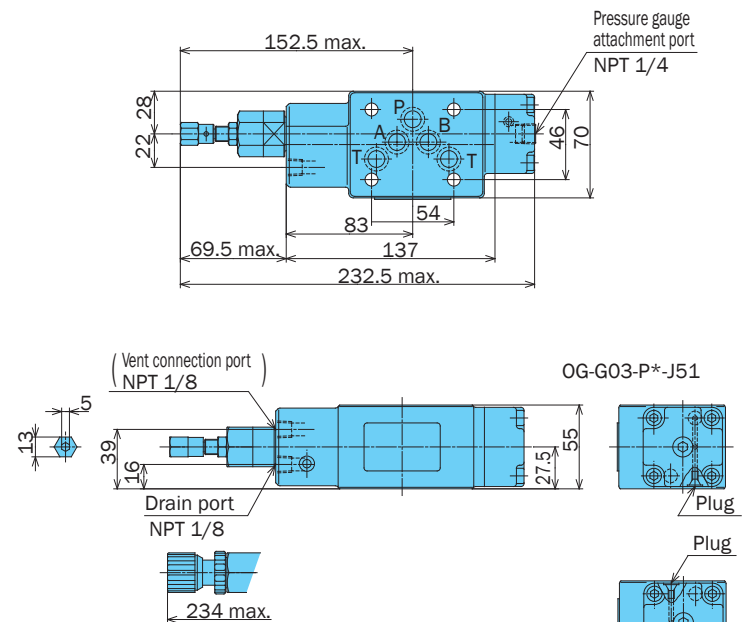
## Installation Dimension Drawings

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

**OG-G01-P\*-E21**



**OG-G03-P\*-(V)-E51**

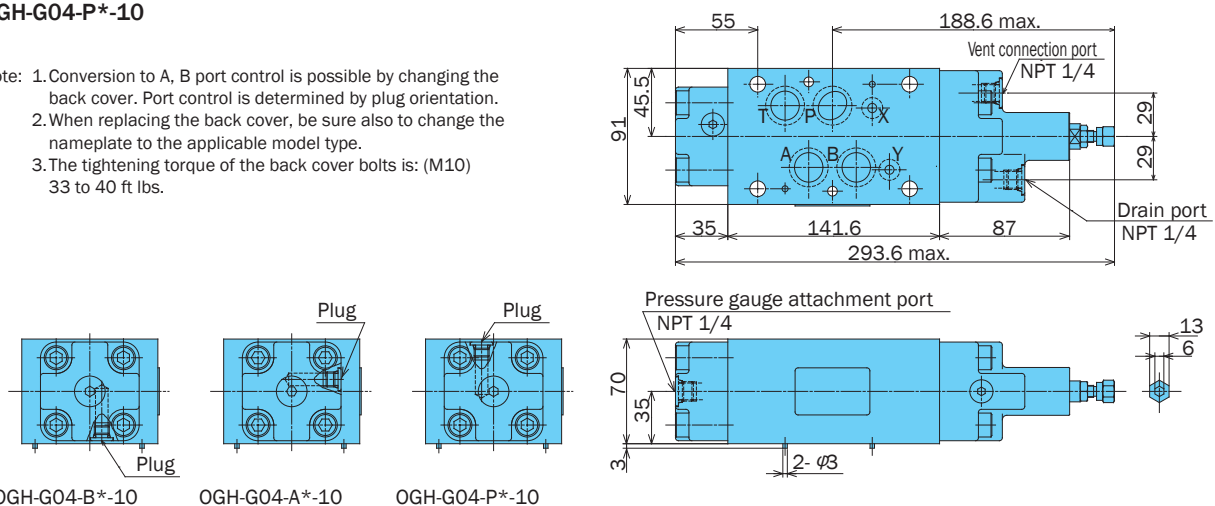


1. Conversion to B port control is possible by changing the back cover. Port control is determined by plug orientation.
2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
3. The tightening torque of the back cover bolts is: (M6) 7.3 to 9.5 ft lbs.

**OG-G03-B\*-J51**

**OGH-G04-P\*-10**

1. Conversion to A, B port control is possible by changing the back cover. Port control is determined by plug orientation.
2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
3. The tightening torque of the back cover bolts is: (M10) 33 to 40 ft lbs.

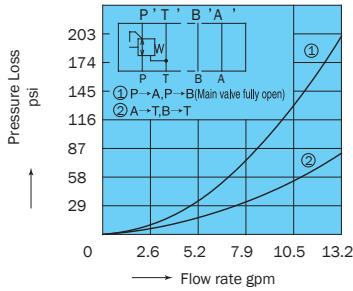


# Performance Curves

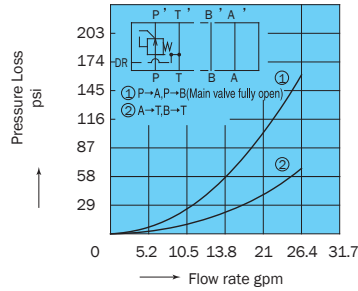
Differential Hydraulic Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics

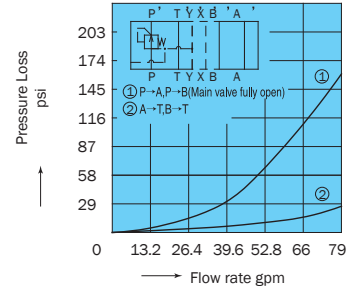
OG-G01-P\*-21



OG-G03-P\*-J51

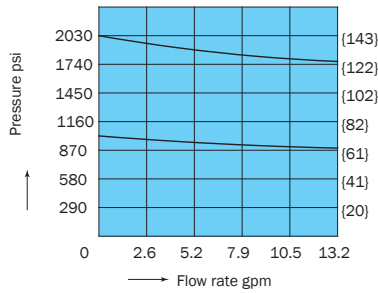


OGH-G04-\*\*-10

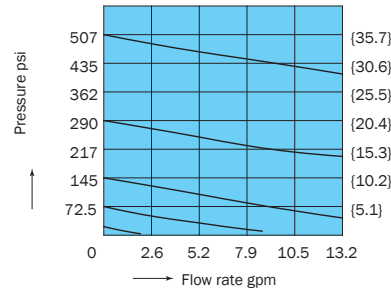


## Pressure - Flow Rate Characteristics

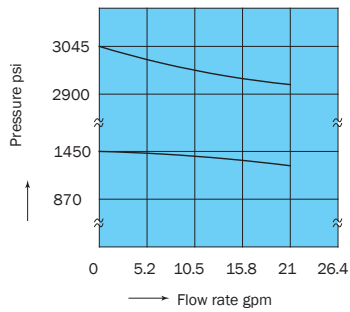
OG-G01-P  $\frac{1}{2}$ -21



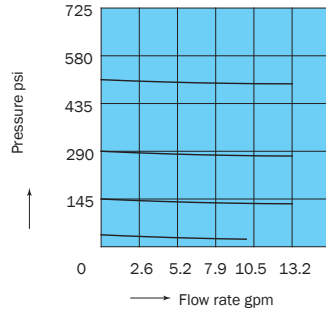
OG-G01-PC-21



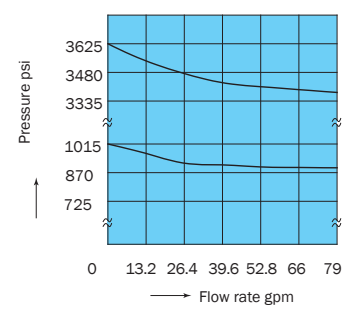
OG-G03-P  $\frac{1}{3}$ -J51



OG-G03-PC-J51

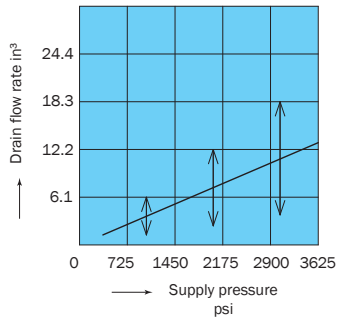


OGH-G04-\*\*-10

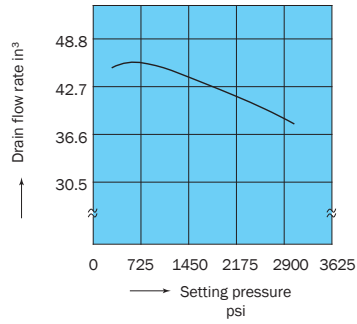


## Pressure - Drain Rate Characteristics

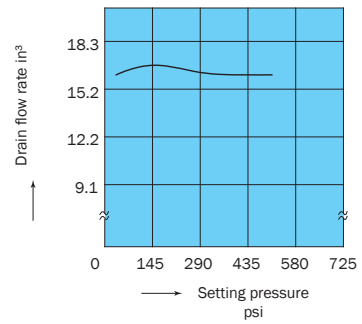
OG-G01-P\*-21



OG-G03-P\*-J51

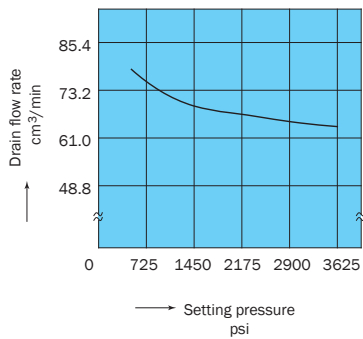


OG-G03-PC-J51



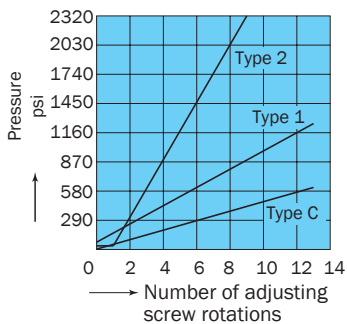
Determine it through the maximum value when designing the circuit.

OGH-G04-P3-10

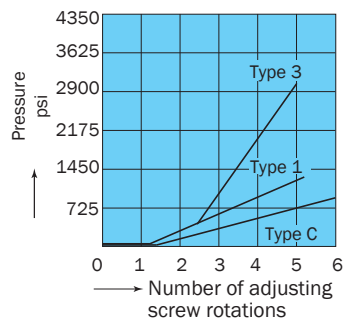


## Number of Adjusting Screw Rotations - Pressure Characteristics

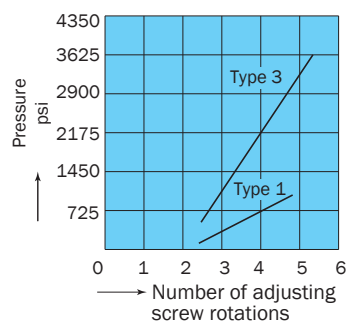
OG-G01-P\*-21



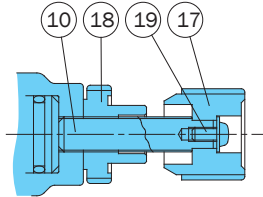
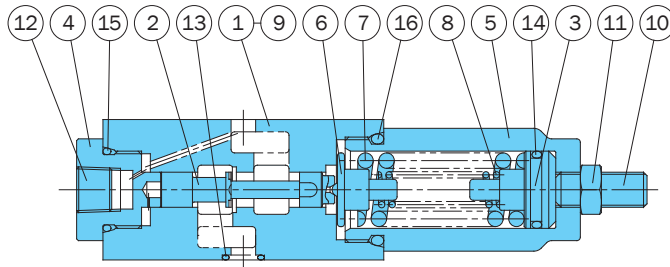
OG-G03-P\*-51



OGH-G04-P\*-10



OG-G01-P2-21



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Spool     |
| 3        | Push rod  |
| 4        | Bushing   |
| 5        | Retainer  |
| 6        | Guide     |
| 7        | Spring    |
| 8        | Spring    |
| 9        | Plate     |
| 10       | Screw     |
| 11       | Nut       |
| 12       | Plug      |
| 13       | O-ring    |
| 14       | O-ring    |
| 15       | O-ring    |
| 16       | O-ring    |
| 17       | Knob      |
| 18       | Nut       |
| 19       | Screw     |

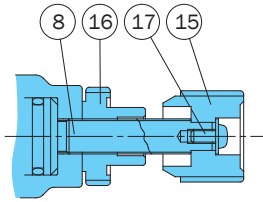
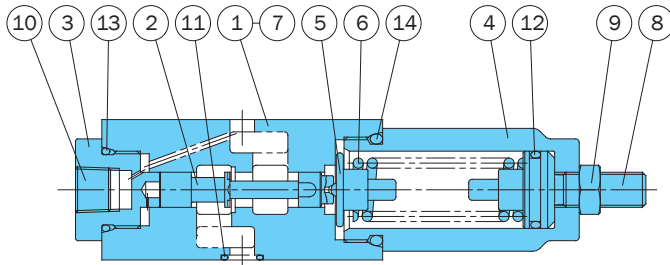
Seal Part List (Kit Model Number BRBS-01GP\*)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
|          |           |             | P    |
| 13       | O-ring    | 1B-P9       | 4    |
| 14       | O-ring    | 1A-P18      | 1    |
| 15       | O-ring    | 1B-P20      | 1    |
| 16       | O-ring    | 1B-P26      | 1    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

Note:  
Part number 8 is used in the case of pressure adjustment range type 2 only.

OG-G01-PC-21



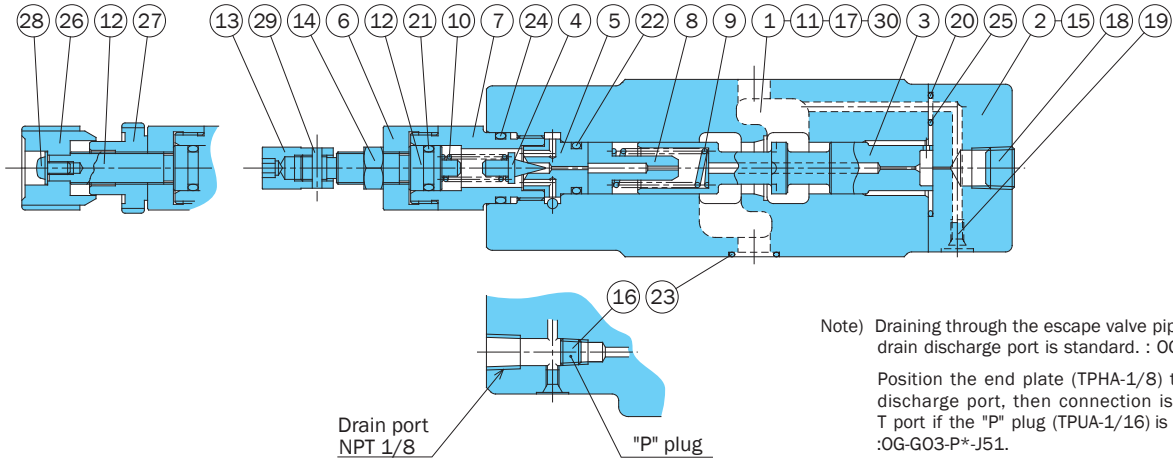
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Spool     |
| 3        | Bushing   |
| 4        | Retainer  |
| 5        | Guide     |
| 6        | Spring    |
| 7        | Plate     |
| 8        | Screw     |
| 9        | Nut       |
| 10       | Plug      |
| 11       | O-ring    |
| 12       | O-ring    |
| 13       | O-ring    |
| 14       | O-ring    |
| 15       | Knob      |
| 16       | Nut       |
| 17       | Screw     |

Seal Part List (Kit Model Number BRBS-01GP\*)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
|          |           |             | P    |
| 11       | O-ring    | 1B-P9       | 4    |
| 12       | O-ring    | 1A-P18      | 1    |
| 13       | O-ring    | 1B-P20      | 1    |
| 14       | O-ring    | 1B-P26      | 1    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

OG-G03-P\*-E51



Note) Draining through the escape valve piped to the drain discharge port is standard. : OG-G03-P\*-B-J51  
 Position the end plate (TPHA-1/8) to the drain discharge port, then connection is made to the T port if the "P" plug (TPUA-1/16) is removed. :OG-G03-P\*-J51.

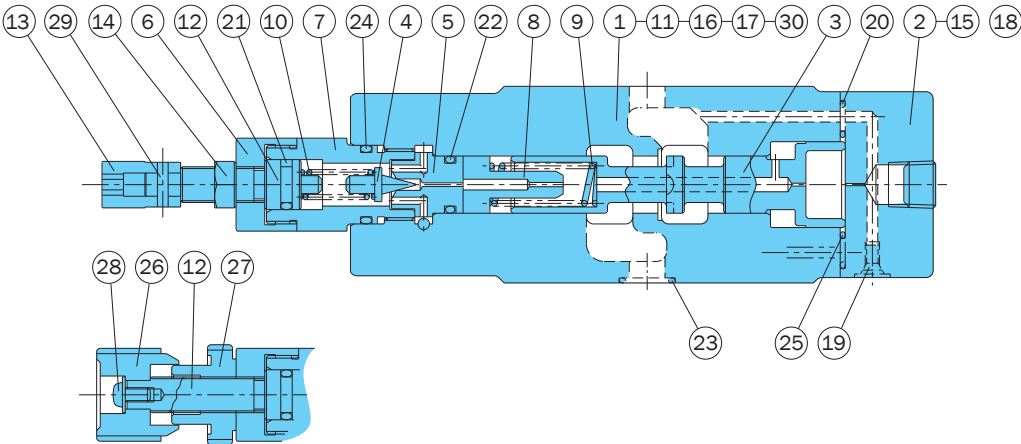
Seal Part List (Kit Model Number BRES-03GP-1A)

| Part No. | Part Name | Part Number     | Q'ty |  |
|----------|-----------|-----------------|------|--|
|          |           |                 | P    |  |
| 20       | O-ring    | 1B-P6           | 2    |  |
| 21       | O-ring    | 1A-P10A         | 1    |  |
| 22       | O-ring    | 1B-P12          | 1    |  |
| 23       | O-ring    | AS568-014(Hs90) | 5    |  |
| 24       | O-ring    | 1B-P18          | 1    |  |
| 25       | O-ring    | AS568-023(Hs90) | 1    |  |

Note) O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

| Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|
| 1        | Body      | 14       | Nut       |
| 2        | Cover     | 15       | Screw     |
| 3        | Spool     | 16       | Plug      |
| 4        | Poppet    | 17       | Plug      |
| 5        | Seat      | 18       | Plug      |
| 6        | Bushing   | 19       | Plug      |
| 7        | Retainer  | 20       | O-ring    |
| 8        | Choke     | 21       | O-ring    |
| 9        | Spring    | 22       | O-ring    |
| 10       | Spring    | 23       | O-ring    |
| 11       | Plate     | 24       | O-ring    |
| 12       | Screw     | 25       | O-ring    |
| 13       | Nut       | 26       | Knob      |
|          |           | 27       | Nut       |
|          |           | 28       | Screw     |
|          |           | 29       | Pin       |
|          |           | 30       | Pin       |

OG-G03-PC-E51



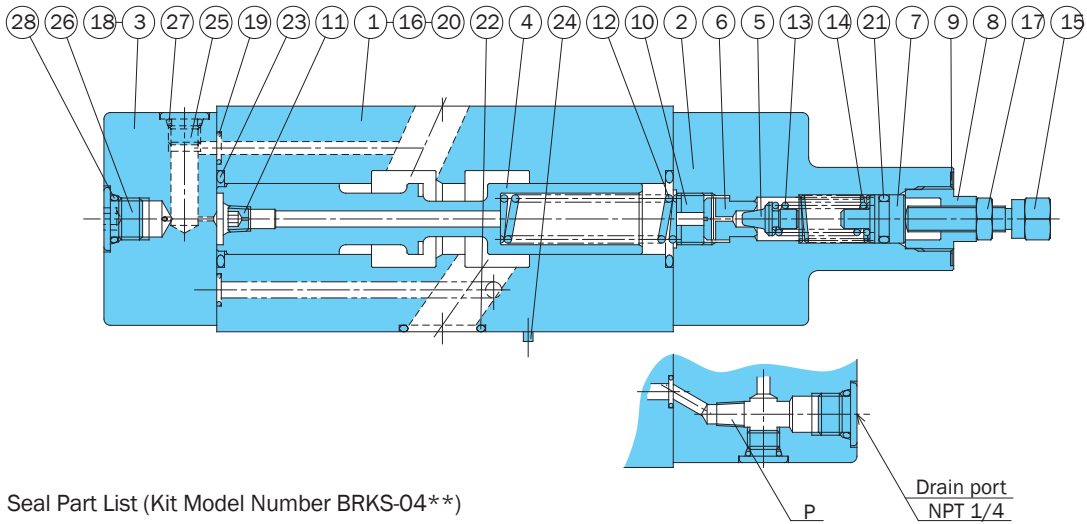
Seal Part List (Kit Model Number BRES-03GP\*-1A)

| Part No. | Part Name | Part Number     | Q'ty |  |
|----------|-----------|-----------------|------|--|
|          |           |                 | P    |  |
| 20       | O-ring    | 1B-P6           | 2    |  |
| 21       | O-ring    | 1A-P10A         | 1    |  |
| 22       | O-ring    | 1B-P12          | 1    |  |
| 23       | O-ring    | AS568-014(Hs90) | 5    |  |
| 24       | O-ring    | 1B-P18          | 1    |  |
| 25       | O-ring    | AS568-023(Hs90) | 1    |  |

Note) O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

| Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|
| 1        | Body      | 16       | Plug      |
| 2        | Cover     | 17       | Plug      |
| 3        | Spool     | 18       | Plug      |
| 4        | Poppet    | 19       | Plug      |
| 5        | Seat      | 20       | O-ring    |
| 6        | Bushing   | 21       | O-ring    |
| 7        | Retainer  | 22       | O-ring    |
| 8        | Choke     | 23       | O-ring    |
| 9        | Spring    | 24       | O-ring    |
| 10       | Spring    | 25       | O-ring    |
| 11       | Plate     | 26       | Knob      |
| 12       | Screw     | 27       | Nut       |
| 13       | Nut       | 28       | Screw     |
| 14       | Nut       | 29       | Pin       |
| 15       | Screw     | 30       | Pin       |

OGH-G04-P\*-E10



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Cover     |
| 4        | Spool     |
| 5        | Poppet    |
| 6        | Seat      |
| 7        | Plunger   |
| 8        | Retainer  |
| 9        | Plate     |
| 10       | Collar    |
| 11       | Choke     |
| 12       | Spring    |
| 13       | Spring    |
| 14       | Spring    |
| 15       | Screw     |
| 16       | Plate     |
| 17       | Nut       |
| 18       | Screw     |
| 19       | O-ring    |
| 20       | O-ring    |
| 21       | O-ring    |
| 22       | O-ring    |
| 23       | O-ring    |
| 24       | Pin       |
| 25       | Plug      |
| 26       | Plug      |
| 27       | O-ring    |
| 28       | O-ring    |

Seal Part List (Kit Model Number BRKS-04\*\*)

| Part No. | Part Name | Part Number     | Q'ty |    |
|----------|-----------|-----------------|------|----|
|          |           |                 | G    | GB |
| 19       | O-ring    | 1B-P7           | 4    | 4  |
| 20       | O-ring    | AS568-012(Hs90) | 2    | 2  |
| 21       | O-ring    | 1A-P11          | 1    | 1  |
| 22       | O-ring    | AS568-118(Hs90) | 4    | 4  |
| 23       | O-ring    | 1B-G25          | 2    | 2  |
| 27       | O-ring    | 1B-P8           | 4    | 4  |
| 28       | O-ring    | 1B-P11          | 3    | 2  |

Note:  
 In the standard configuration, OGH-G04-P\*-10 does not require a P plug, while OGH-G04-P\*-B-10 requires a P plug (TPUA-1/16) and drain pipe from the cover.

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Specify G (internal drain) or GB (external drain) for the asterisk (\*) in the kit model number.



### Balanced Piston Type Pressure Reducing Modular Valve

10.5 gpm  
21 to 3625 psi

### Features

This modular valve makes the pressure in part of the circuit lower than the main circuit. Even when pressure changes in the primary main circuit, the reduced

secondary pressure is maintained at a constant level. Compared with the direct type, this type of valve has outstanding

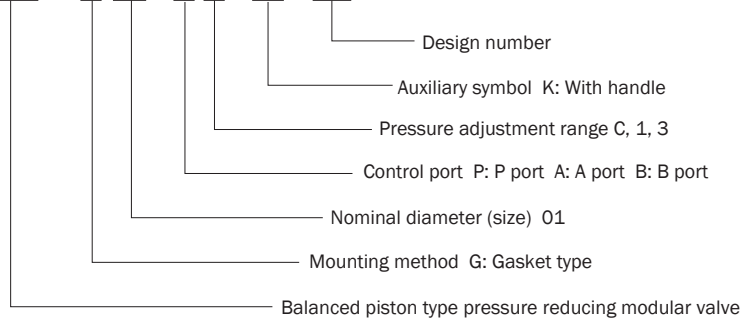
Pressure-Flow Rate Characteristics, and a superior flow rate in the low pressure control range. Maximum operating pressure: 3625 psi.

### Specifications

| Model No.                 | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi           | Weight lbs | Gasket Surface Dimensions |
|---------------------------|-------------------------|------------------------------|-----------------------|---|------------|---------------------------|
| OGB-G01-PC-20<br>P1<br>P3 | 1/8                     | 3625                         | 10.5                  | 21 to 500<br>115 to 1000<br>500 to 3000 | 4.1        | ISO 4401-03-02-0-94       |
| OGB-G01-AC-20<br>A1<br>A3 |                         |                              |                       | 21 to 500<br>115 to 1000<br>500 to 3000 |            |                           |
| OGB-G01-BC-20<br>B1<br>B3 |                         |                              |                       | 21 to 500<br>115 to 1000<br>500 to 3000 | 4.1        |                           |

### Understanding Model Numbers

**OGB - G 01 - P 1 - (K) - 20**



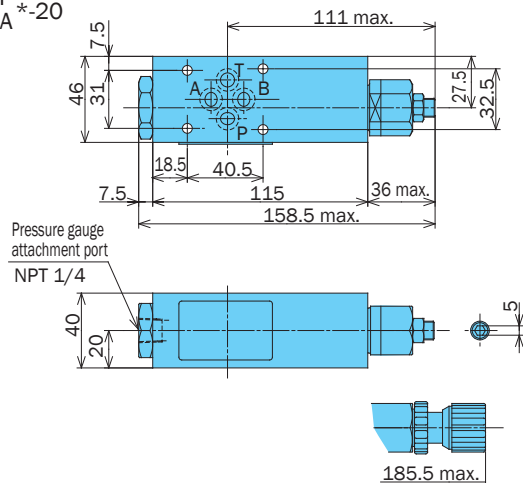
#### • Handling

- 1 See the Pressure-Flow Rate Characteristics for information about how the flow rate is controlled at low pressures.
- 2 Note that a change in tank port back pressure causes a change in setting pressure.
- 3 Vent piping is not possible.
- 4 Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.

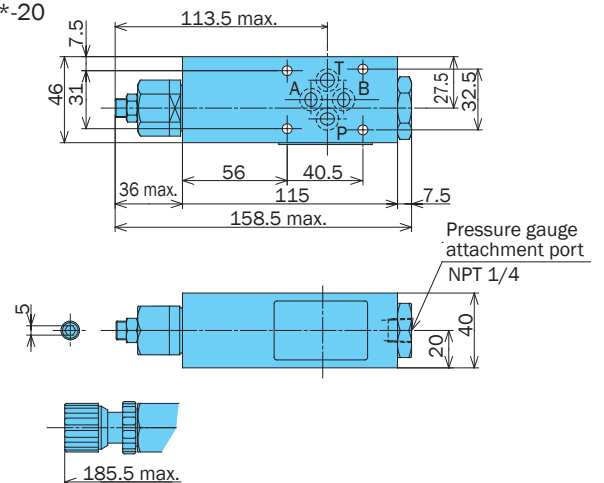
### Installation Dimension Drawings

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

OGB-G01-<sup>P</sup><sub>A</sub>\*-20



OGB-G01-B\*-20



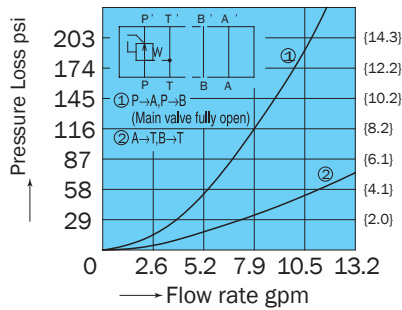


## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

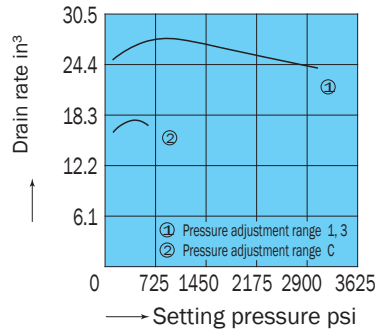
Pressure Loss Characteristics

OGB-G01-P\*-20



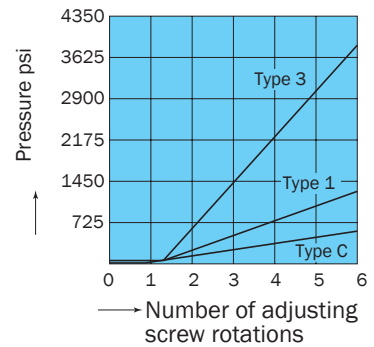
Pressure - Drain Rate Characteristics

OGB-G01-\*\*-20



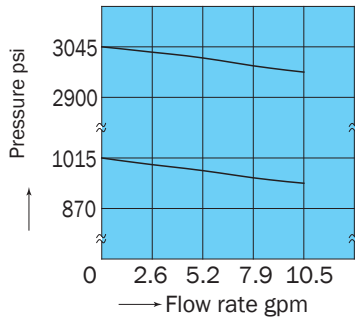
Number of Adjusting Screw Rotations - Pressure Characteristics

OGB-G01-P\*-20

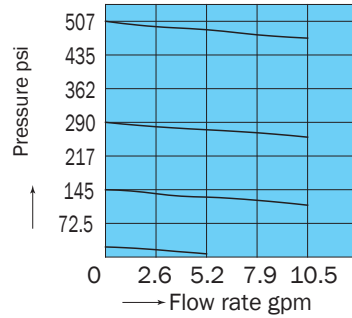


Pressure - Flow Rate Characteristics

OGB-G01-\* 1/3-20

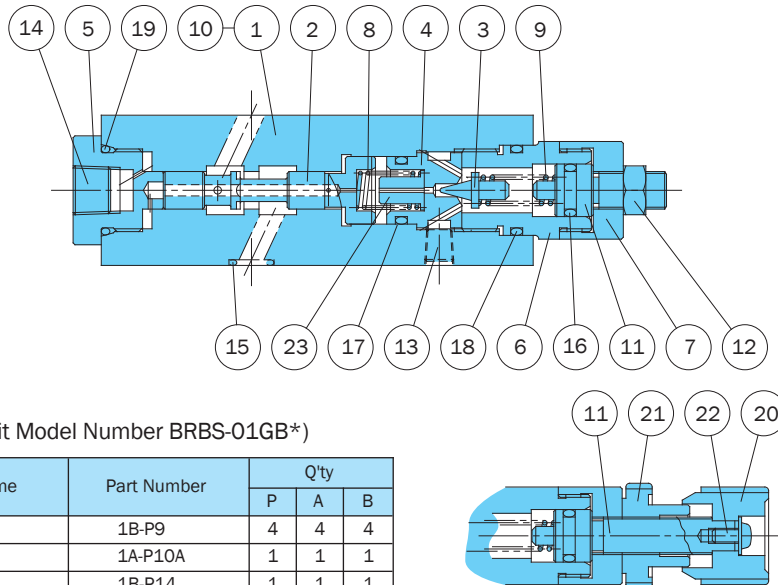


OGB-G01-\*C-20



## Cross-sectional Drawing

OGB-G01-P\*-20



Seal Part List (Kit Model Number BRBS-01GB\*)

| Part No. | Part Name | Part Number | Q'ty |   |   |
|----------|-----------|-------------|------|---|---|
|          |           |             | P    | A | B |
| 15       | O-ring    | 1B-P9       | 4    | 4 | 4 |
| 16       | O-ring    | 1A-P10A     | 1    | 1 | 1 |
| 17       | O-ring    | 1B-P14      | 1    | 1 | 1 |
| 18       | O-ring    | 1B-P20      | 1    | 1 | 1 |
| 19       | O-ring    | 1B-P20      | 1    | 1 | 1 |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify P, A, or B for the asterisk (\*) in the kit model number.

| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Spool     |
| 3        | Poppet    |
| 4        | Seat      |
| 5        | Bushing   |
| 6        | Retainer  |
| 7        | Bushing   |
| 8        | Spring    |
| 9        | Spring    |
| 10       | Plate     |
| 11       | Screw     |
| 12       | Nut       |
| 13       | Plug      |
| 14       | Plug      |
| 15       | O-ring    |
| 16       | O-ring    |
| 17       | O-ring    |
| 18       | O-ring    |
| 19       | O-ring    |
| 20       | Knob      |
| 21       | Nut       |
| 22       | Screw     |
| 23       | Choke     |



### Pressure Reducing Modular Valve

**10.5 to 79 gpm**  
**3625 to 5075 psi**

### Features

This modular valve makes the pressure in part of the circuit lower than the main circuit.

Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a

constant level.  
Maximum Operating Pressure: 3625 to 5075 psi.

### Specifications

| Model No.                 | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi           | Weight lbs | Gasket Surface Dimensions |
|---------------------------|-------------------------|------------------------------|-----------------------|---|------------|---------------------------|
| OG-G01-AC-21<br>A1<br>A2  | 1/8                     | 3625                         | 10.5                  | 21 to 500<br>115 to 1000<br>500 to 2320 | 2.8        | ISO 4401-03-02-0-94       |
| OG-G01-BC-21<br>B1<br>B2  |                         |                              |                       | 21 to 500<br>115 to 1000<br>500 to 2320 |            |                           |
| OG-G03-AC-J51<br>A1<br>A3 | 3/8                     | 3625                         | 21.1<br>but C : 13.2  | 36 to 500<br>115 to 1000<br>500 to 3000 | 8.3        | ISO 4401-05-04-0-94       |
| OG-G03-BC-J51<br>B1<br>B3 |                         |                              |                       | 36 to 500<br>115 to 1000<br>500 to 3000 |            |                           |
| OGH-G04-A1-10<br>A3       | 1/2                     | 5075                         | 79.2                  | 115 to 1000<br>500 to 3625              | 17.6       | ISO 4401-07-06-0-94       |
| OGH-G04-B1-10<br>B3       |                         |                              |                       | 115 to 1000<br>500 to 3625              |            |                           |

• Handling

- When using a remote control valve in a vent circuit, certain vent circuit pipe capacities can cause vibration. Because of this, thick steel pipe with an inside diameter of  $\phi$  4mm that is no longer than three meters is recommended. Vent piping cannot be used with the 01, 03 sizes.
- With the 01, 03 sizes, the flow rate is limited at low pressures. See the Pressure-

Flow Rate Characteristics on page F-37 and F-38 for more information.

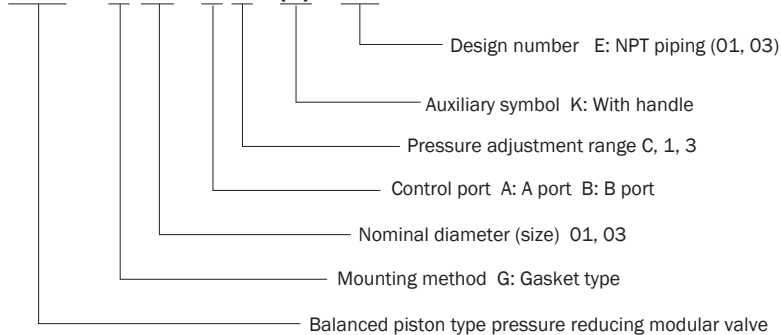
- For the 03 size, the drainage can be allowed to escape through the T port. In the case of a valve with the auxiliary symbol B, however, run a return pipe from the drain discharge port directly to the tank.
- With the 04 sizes, piping is not required because drainage can be

allowed to escape from the gasket side drain port. In the case of a valve with the auxiliary symbol B, however, run a return pipe from the drain discharge port directly to the tank.

- Note that a change in drain back pressure causes a change in setting pressure.
- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.
- 04 series modular valves do not have an L (DR2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).
- With the 03, 04 sizes, the control port can be changed by altering the attachment orientation of the back cover. See the installation diagram for more information. After making this change, be sure also to make the other changes as in accordance with the model number indicated on the nameplate.
- Use the P port control valve concurrently with the 01 size central all-port-block (C5) solenoid valve if when the valve is in the central position and external pressure may cause the pressure at the control port to exceed the set pressure.

### Understanding Model Numbers

**OG - G 01 - P 1 - (K) - 20**

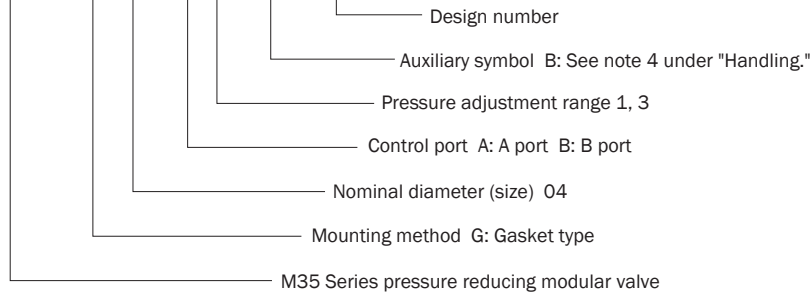


01, 03 size

## Understanding Model Numbers

04 size

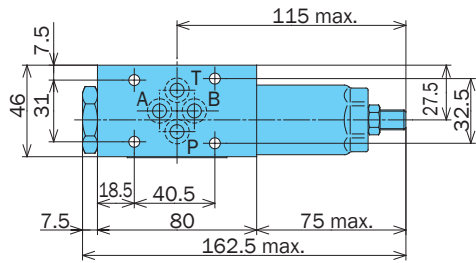
OGH - G 04 - A 1 - (B) - 10



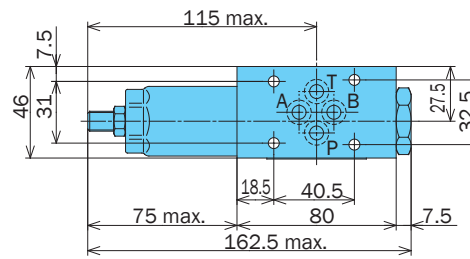
## Installation Dimension Drawings

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

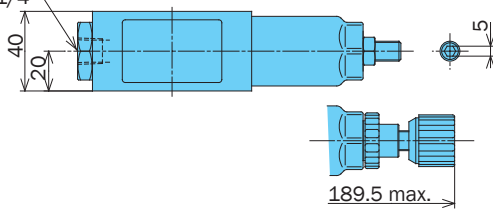
OG-G01-A\*-E21



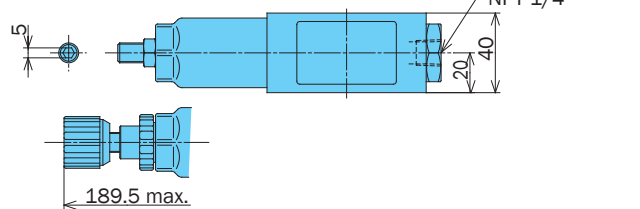
OG-G01-B\*-E21



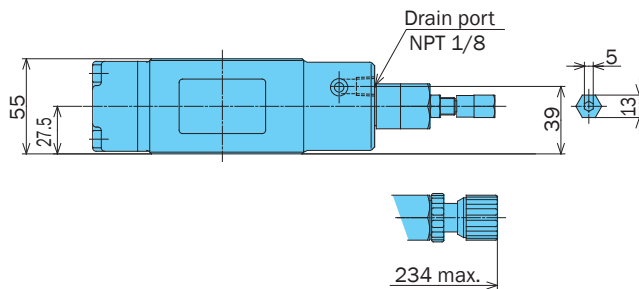
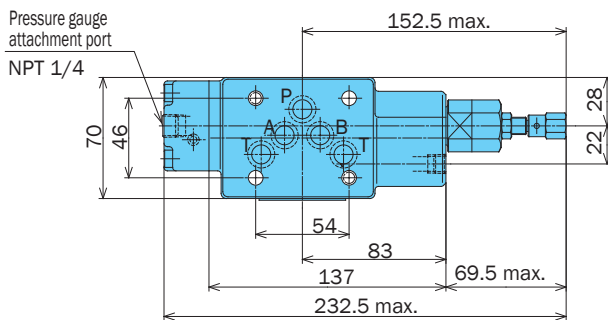
Pressure gauge attachment port  
NPT 1/4



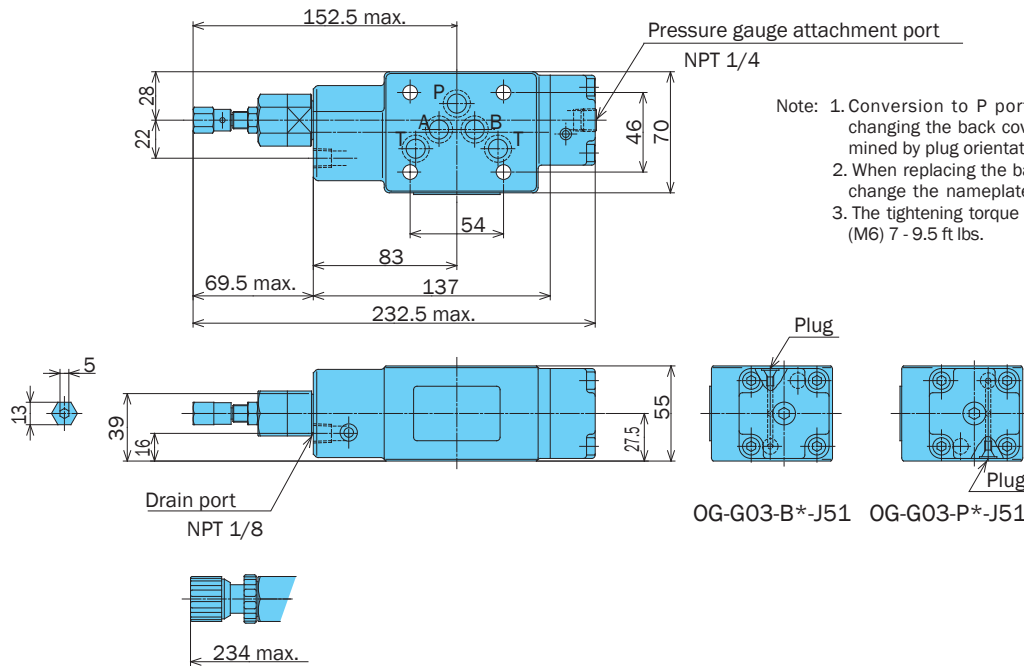
Pressure gauge attachment port  
NPT 1/4



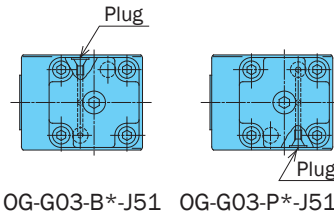
OG-G03-A\*-E51



OG-G03-B\*-E51

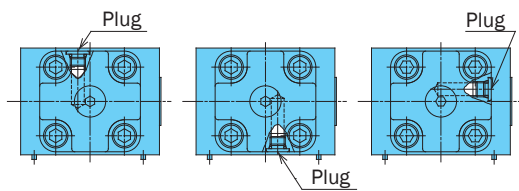
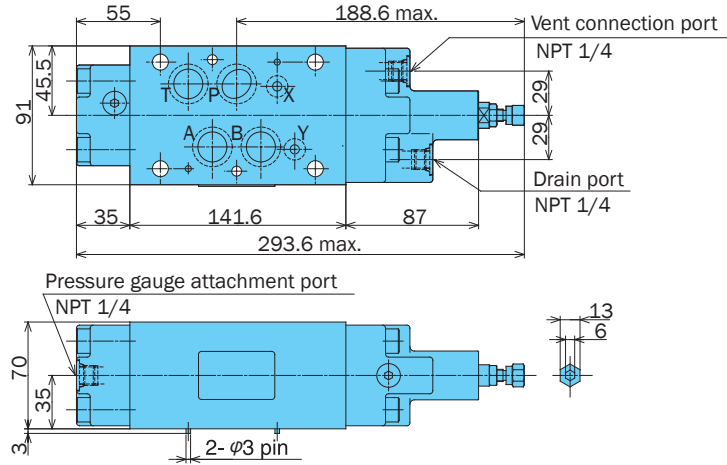


- Note:
1. Conversion to P port control is possible by changing the back cover. Port control is determined by plug orientation.
  2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
  3. The tightening torque of the back cover bolts is: (M6) 7 - 9.5 ft lbs.



OGH-G04-A\*-10

- Note:
1. Conversion to P, B port control is possible by changing the back cover. Port control is determined by plug orientation.
  2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
  3. The tightening torque of the back cover bolts is: (M10) 33 - 40 ft lbs.



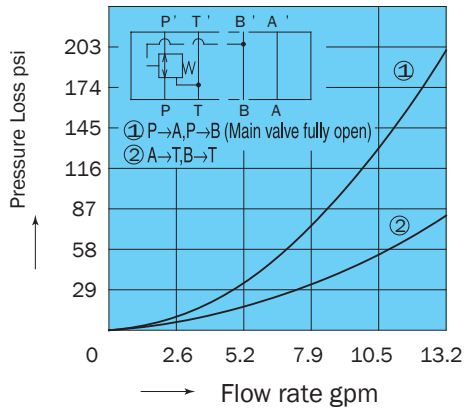
OGH-G04-P\*-10 OGH-G04-B\*-10 OGH-G04-A\*-10

# Performance Curves

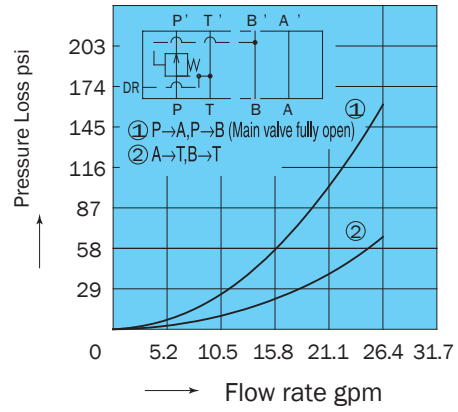
Hydraulic Operating Fluid Viscosity 32 centistokes.

## Pressure Loss Curve

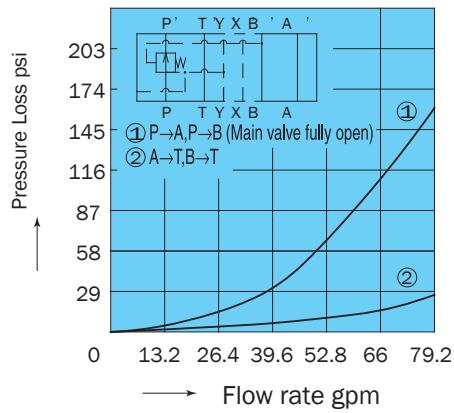
OG-G01-B\*-21



OG-G03-B\*-J51

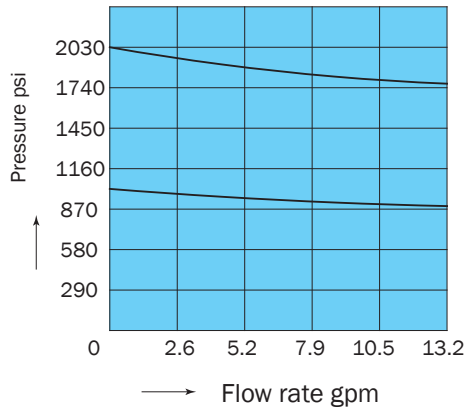


OGH-G04-\*\*-10

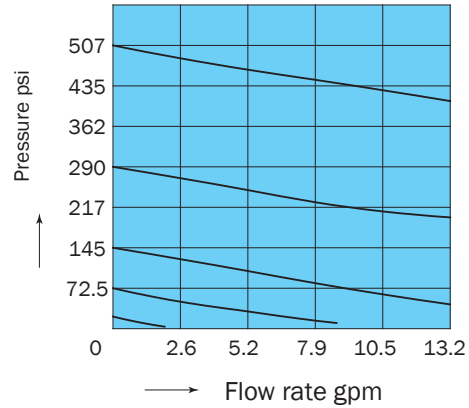


## Pressure - Flow Rate Characteristics

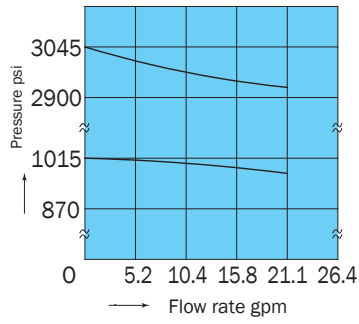
OG-G01-B  $\frac{1}{2}$ -21



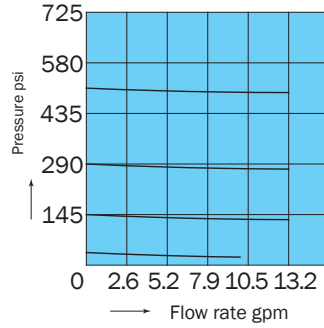
OG-G01-BC-21



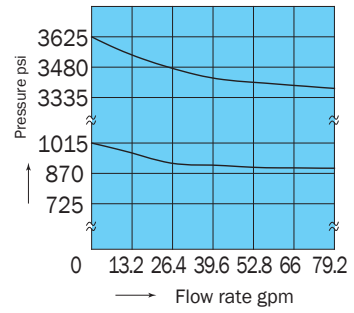
OG-G03-B  $\frac{1}{3}$ -J51



OG-G03-BC-J51

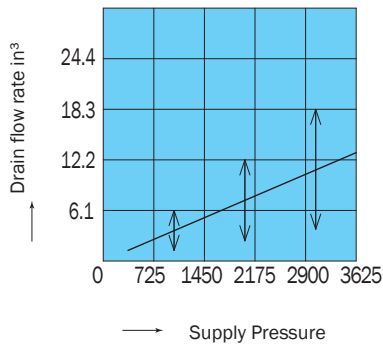


OGH-G04-\*\*-10

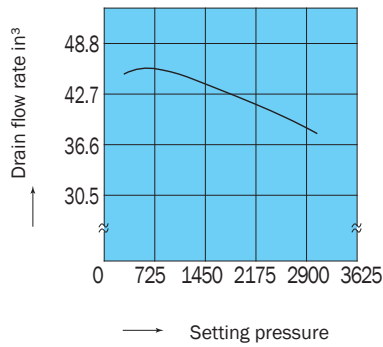


Pressure - Drain Rate Characteristics

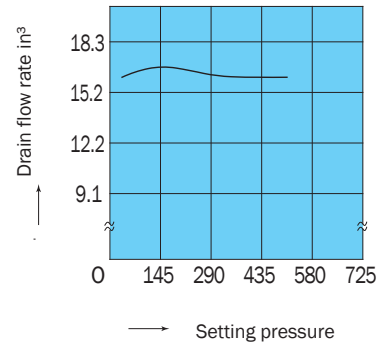
OG-G01-B\*-21



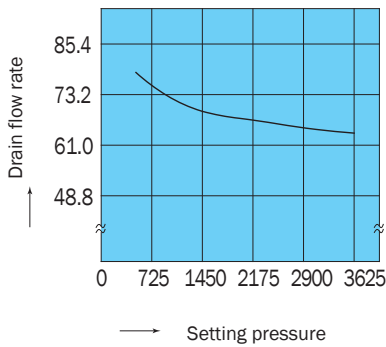
OG-G03-B\*-J51



OG-G03-BC-J51

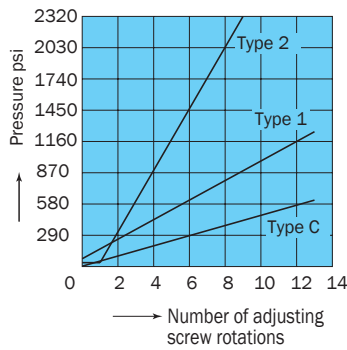


OGH-G04-\*3-10

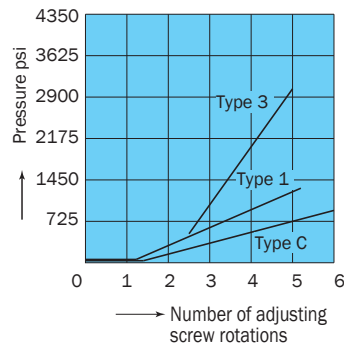


Number of Adjusting Screw Rotations - Pressure Characteristics

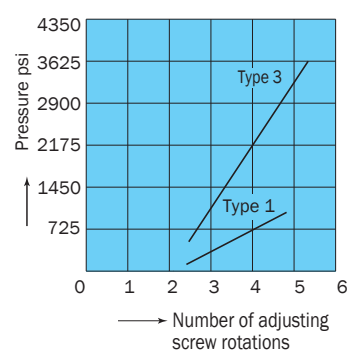
OG-G01-\*\*-21



OG-G03-\*\*-51

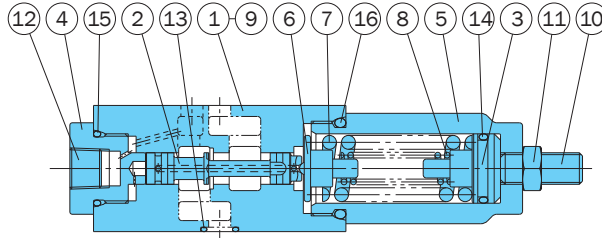


OGH-G04-\*\*-10



## Cross-sectional Drawing

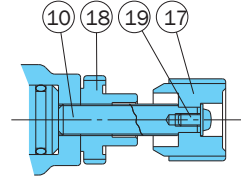
OG-G01-A2-21



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Spool     |
| 3        | Push rod  |
| 4        | Bushing   |
| 5        | Retainer  |
| 6        | Guide     |
| 7        | Spring    |
| 8        | Spring    |
| 9        | Plate     |
| 10       | Screw     |
| 11       | Nut       |
| 12       | Plug      |
| 13       | O-ring    |
| 14       | O-ring    |
| 15       | O-ring    |
| 16       | O-ring    |
| 17       | Knob      |
| 18       | Nut       |
| 19       | Screw     |

Seal Part List (Kit Model Number BRBS-01GP\*)

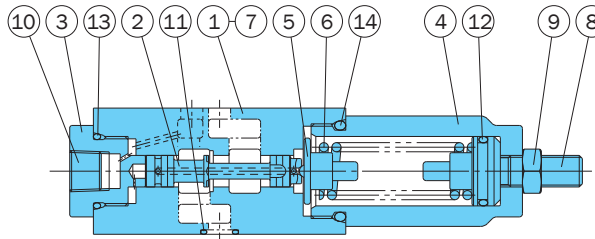
| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 13       | O-ring    | 1B-P9       | 4    |
| 14       | O-ring    | 1A-P18      | 1    |
| 15       | O-ring    | 1B-P20      | 1    |
| 16       | O-ring    | 1B-P26      | 1    |



Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

Note: Part number 8 is used in the case of pressure adjustment range type 2 only.

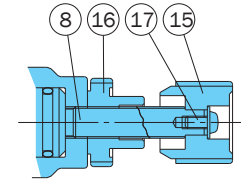
OG-G01-AC-21



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Spool     |
| 3        | Bushing   |
| 4        | Retainer  |
| 5        | Guide     |
| 6        | Spring    |
| 7        | Plate     |
| 8        | Screw     |
| 9        | Nut       |
| 10       | Plug      |
| 11       | O-ring    |
| 12       | O-ring    |
| 13       | O-ring    |
| 14       | O-ring    |
| 15       | Knob      |
| 16       | Nut       |
| 17       | Screw     |

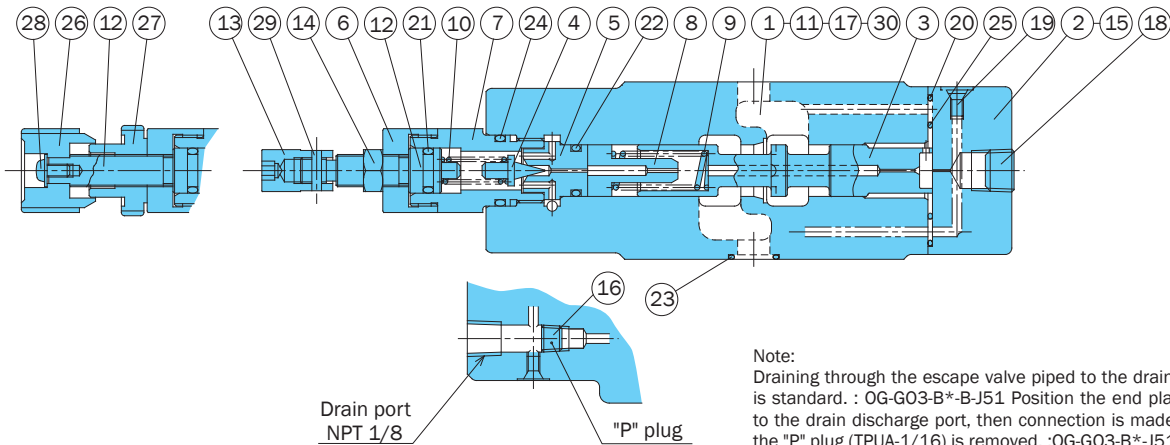
Seal Part List (Kit Model Number BRBS-01GP\*)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 11       | O-ring    | 1B-P9       | 4    |
| 12       | O-ring    | 1A-P18      | 1    |
| 13       | O-ring    | 1B-P20      | 1    |
| 14       | O-ring    | 1B-P26      | 1    |



Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

OG-G03-B\*-J51



Note:  
Draining through the escape valve piped to the drain discharge port is standard. : OG-G03-B\*-B-J51 Position the end plate (TPHA-1/8) to the drain discharge port, then connection is made to the T port if the "P" plug (TPUA-1/16) is removed. :OG-G03-B\*-J51.

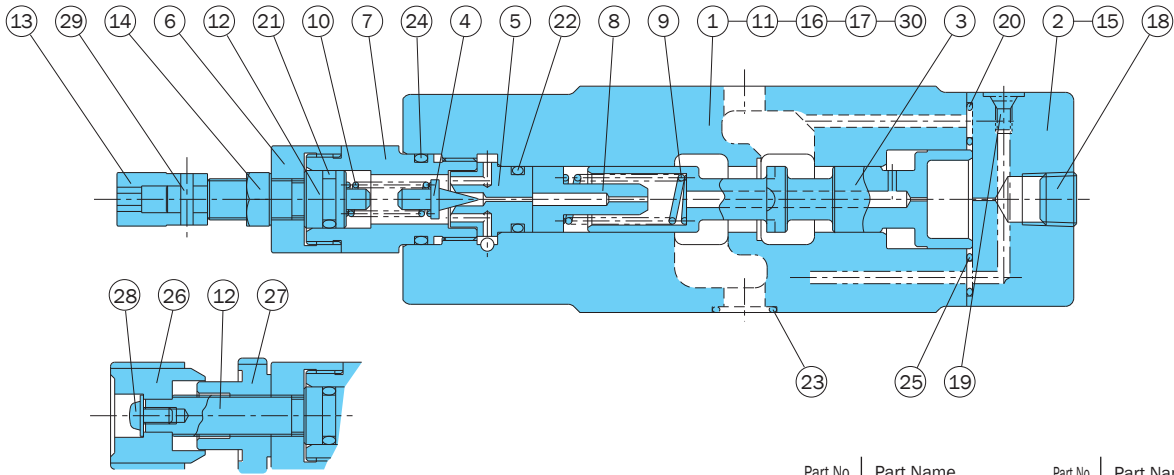
Seal Part List (Kit Model Number BRES-03G\*-1A)

| Part No. | Part Name | Part Number     | Q'ty |   |
|----------|-----------|-----------------|------|---|
|          |           |                 | A    | B |
| 20       | O-ring    | 1B-P6           | 2    | 2 |
| 21       | O-ring    | 1A-P10A         | 1    | 1 |
| 22       | O-ring    | 1B-P12          | 1    | 1 |
| 23       | O-ring    | AS568-014(Hs90) | 5    | 5 |
| 24       | O-ring    | 1B-P18          | 1    | 1 |
| 25       | O-ring    | AS568-023(Hs90) | 1    | 1 |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify A or B for the asterisk (\*) in the kit model number.

| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-----------|
| 1        | Body      | 11       | Plate     | 21       | O-ring    |
| 2        | Cover     | 12       | Screw     | 22       | O-ring    |
| 3        | Spool     | 13       | Nut       | 23       | O-ring    |
| 4        | Poppet    | 14       | Nut       | 24       | O-ring    |
| 5        | Seat      | 15       | Screw     | 25       | O-ring    |
| 6        | Bushing   | 16       | Plug      | 26       | Knob      |
| 7        | Retainer  | 17       | Plug      | 27       | Nut       |
| 8        | Choke     | 18       | Plug      | 28       | Screw     |
| 9        | Spring    | 19       | Plug      | 29       | Pin       |
| 10       | Spring    | 20       | O-ring    | 30       | Pin       |

**OG-G03-BC-J51**



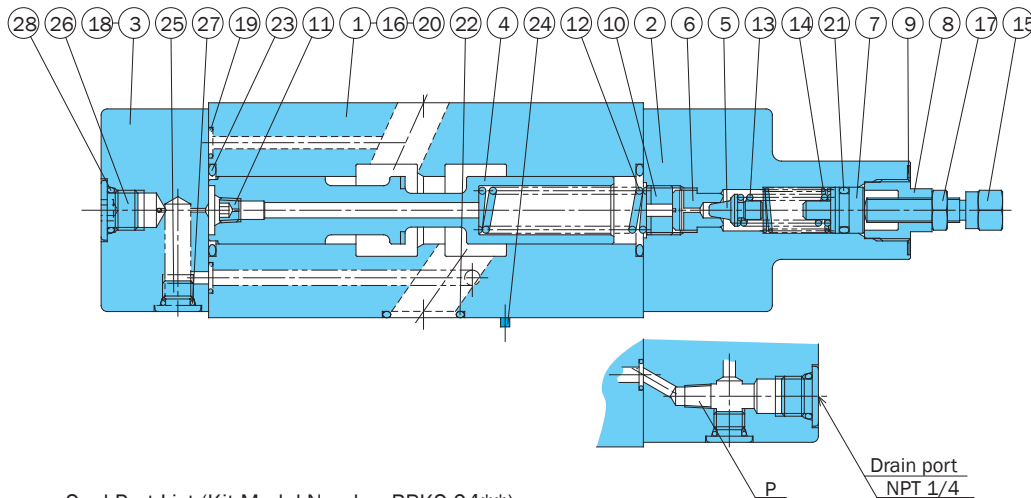
Seal Part List (Kit Model Number BRES-03GC\*-1A)

| Part No. | Part Name | Part Number     | Q'ty |   |
|----------|-----------|-----------------|------|---|
|          |           |                 | A    | B |
| 20       | O-ring    | 1B-P6           | 2    | 2 |
| 21       | O-ring    | 1A-P10A         | 1    | 1 |
| 22       | O-ring    | 1B-P12          | 1    | 1 |
| 23       | O-ring    | AS568-014(Hs90) | 5    | 5 |
| 24       | O-ring    | 1B-P18          | 1    | 1 |
| 25       | O-ring    | AS568-023(Hs90) | 1    | 1 |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Specify A or B for the asterisk (\*) in the kit model number.

| Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|
| 1        | Body      | 16       | Plug      |
| 2        | Cover     | 17       | Plug      |
| 3        | Spool     | 18       | Plug      |
| 4        | Poppet    | 19       | Plug      |
| 5        | Seat      | 20       | O-ring    |
| 6        | Bushing   | 21       | O-ring    |
| 7        | Retainer  | 22       | O-ring    |
| 8        | Choke     | 23       | O-ring    |
| 9        | Spring    | 24       | O-ring    |
| 10       | Spring    | 25       | O-ring    |
| 11       | Plate     | 26       | Knob      |
| 12       | Screw     | 27       | Nut       |
| 13       | Nut       | 28       | Screw     |
| 14       | Nut       | 29       | Pin       |
| 15       | Screw     | 30       | Pin       |

**OGH-G04-\*\*-10**



Seal Part List (Kit Model Number BRKS-04\*\*)

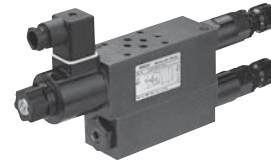
| Part No. | Part Name | Part Number     | Q'ty |    |
|----------|-----------|-----------------|------|----|
|          |           |                 | G    | GB |
| 19       | O-ring    | 1B-P7           | 4    | 4  |
| 20       | O-ring    | AS568-012(Hs90) | 2    | 2  |
| 21       | O-ring    | 1A-P11          | 1    | 1  |
| 22       | O-ring    | AS568-118(Hs90) | 4    | 4  |
| 23       | O-ring    | 1B-G25          | 2    | 2  |
| 27       | O-ring    | 1B-P8           | 4    | 4  |
| 28       | O-ring    | 1B-P11          | 3    | 2  |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Specify G (internal drain) or GB (external drain) for the asterisk (\*) in the kit model number.

| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Cover     |
| 4        | Spool     |
| 5        | Poppet    |
| 6        | Seat      |
| 7        | Plunger   |
| 8        | Retainer  |
| 9        | Plate     |
| 10       | Collar    |
| 11       | Choke     |
| 12       | Spring    |
| 13       | Spring    |
| 14       | Spring    |
| 15       | Screw     |
| 16       | Plate     |
| 17       | Nut       |
| 18       | Screw     |
| 19       | O-ring    |
| 20       | O-ring    |
| 21       | O-ring    |
| 22       | O-ring    |
| 23       | O-ring    |
| 24       | Pin       |
| 25       | Plug      |
| 26       | Plug      |
| 27       | O-ring    |
| 28       | O-ring    |

Note:  
 In the standard configuration, OGH-G04-\*\*-10 does not require a P plug, while OGH-G04-\*\*-B-10 requires a P plug (TPUA-1/16) and drain pipe from the cover.





### Two-Pressure Reducing Modular Valve

10.5 gpm  
29 to 2030 psi

#### Features

When the pressure in part of the circuit is lower than the main circuit, this modular valve controls pressure by switching the low pressure to secondary pressure (high

pressure, low pressure). Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained

at a constant level.  
Maximum Operating Pressure: 1000, 3625 psi

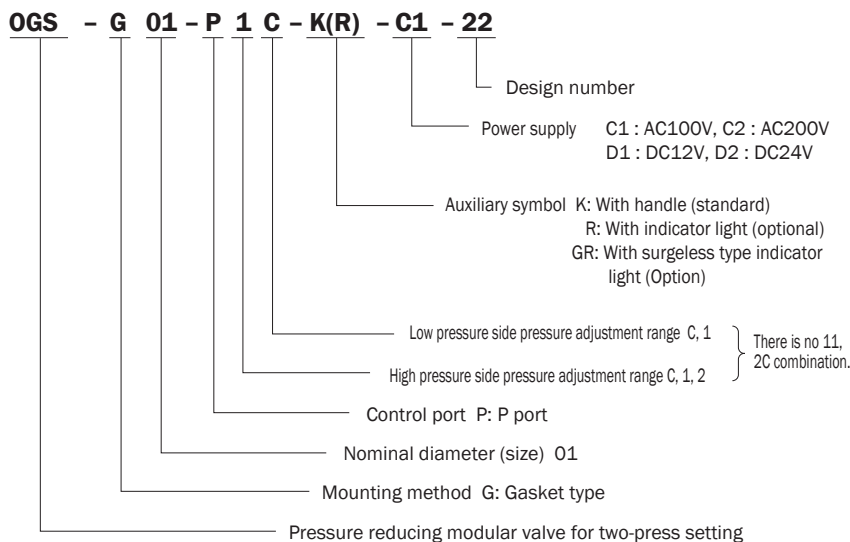
#### Specifications

| Model No.               | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi |                    | Weight lbs | Gasket Surface Dimensions |
|-------------------------|-------------------------|------------------------------|-----------------------|-------------------------------|--------------------|------------|---------------------------|
|                         |                         |                              |                       | Low pressure side             | High pressure side |            |                           |
| OGS-G01-PCC-K-22<br>P1C | 1/8                     | 1000                         | 10.5                  | 29 to 500                     | 29 to 5000         | 10.5       | ISO 4401-03-02-0-94       |
|                         |                         |                              |                       |                               | 115 to 1000        |            |                           |
| P21                     |                         | 3625                         |                       | 115 to 1000                   | 500 to 2030        |            |                           |

#### Solenoid Specifications

| Model No.           | Rated Voltage  | Starting Current | Holding Current | Holding Power |
|---------------------|----------------|------------------|-----------------|---------------|
| OGS-G01-P**K- C1-22 | AC100V 50/60HZ | 2.2/2.0A         | 0.52/0.38A      | 25/22W        |
| C2                  | AC200V 50/60HZ | 1.1/1.0A         | 0.26/0.19A      | 25/22W        |
| D1                  | DC12V          |                  | 2.2A            | 26W           |
| D2                  | DC24V          |                  | 1.1A            | 26W           |

#### Understanding Model Numbers



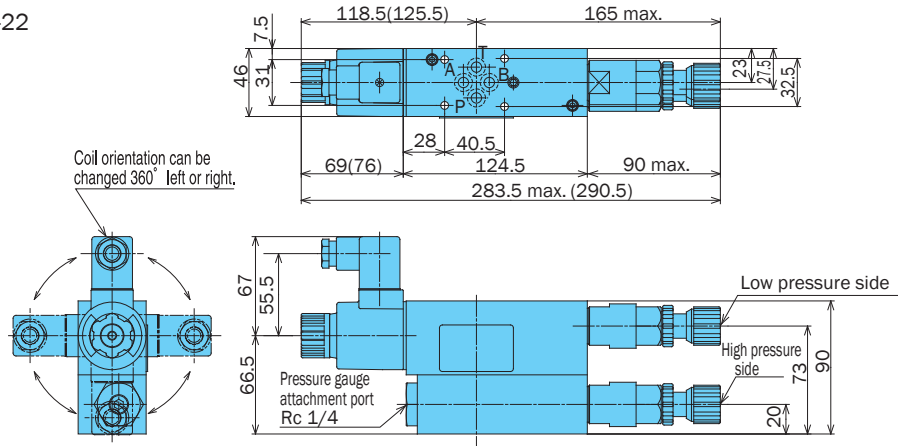
#### • Handling

- See the Pressure-Flow Rate Characteristics for information about how the flow rate is controlled at low pressures.
- Note that a change in tank port back pressure causes a change in setting pressure.
- Instability occurs when there is a small setting pressure differential between the high pressure and low pressure, so be sure to maintain at least the minimum pressure differentials described below.  
C Type:  
At least 43 psi  
1, 2 Type:  
At least 72 psi
- Vent piping is not possible.
- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.
- Low pressure is attained when the solenoid is on.
- The coil surface temperature increases if this pump is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.
- The wiring in the connector is the same as the SA series wet type solenoid valve. (See page D-22)

# Installation Dimension Drawings

Note: 1. Dimensions in parentheses apply in the case of a DC solenoid  
 2. Pressure is increased by clockwise (rightward) rotation of the adjusting handle, and decreased by counterclockwise (leftward) rotation.

OGS-G01-P\*C-K(R)-\*\*-22

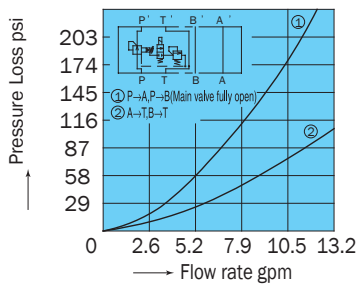


# Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics

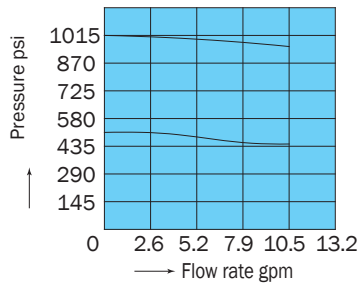
OGS-G01-PIC-K-\*\*-22



## Pressure - Flow Rate Characteristics

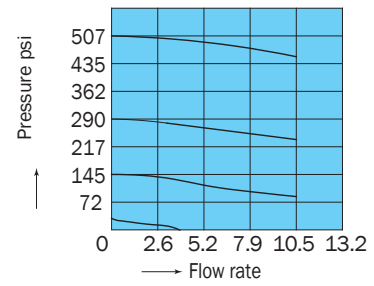
OGS-G01-PIC-K-\*\*-22

(Type 1)



OGS-G01-P\*C-K-\*\*-22

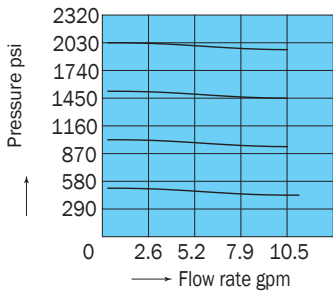
(Type C)



## Pressure - Flow Rate Characteristics

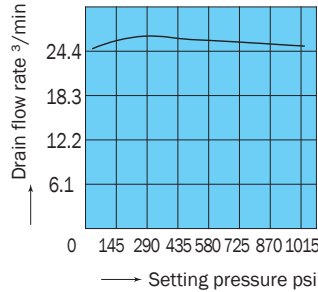
OGS-G01-P21-K-\*\*-22

(Type 2)



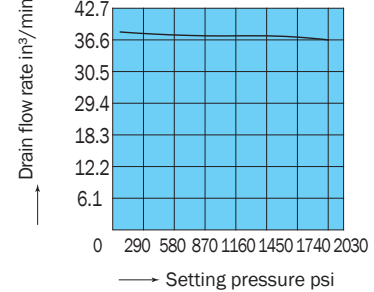
## Pressure - Drain Rate Characteristics

OGS-G01-PIC-K-\*\*-22



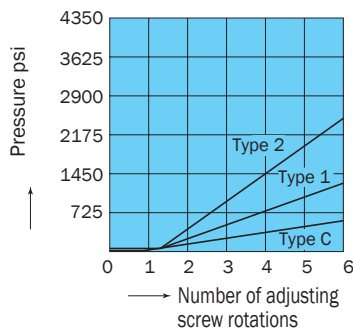
## Pressure - Drain Rate Characteristics

OGS-G01-P21-K-\*\*-22



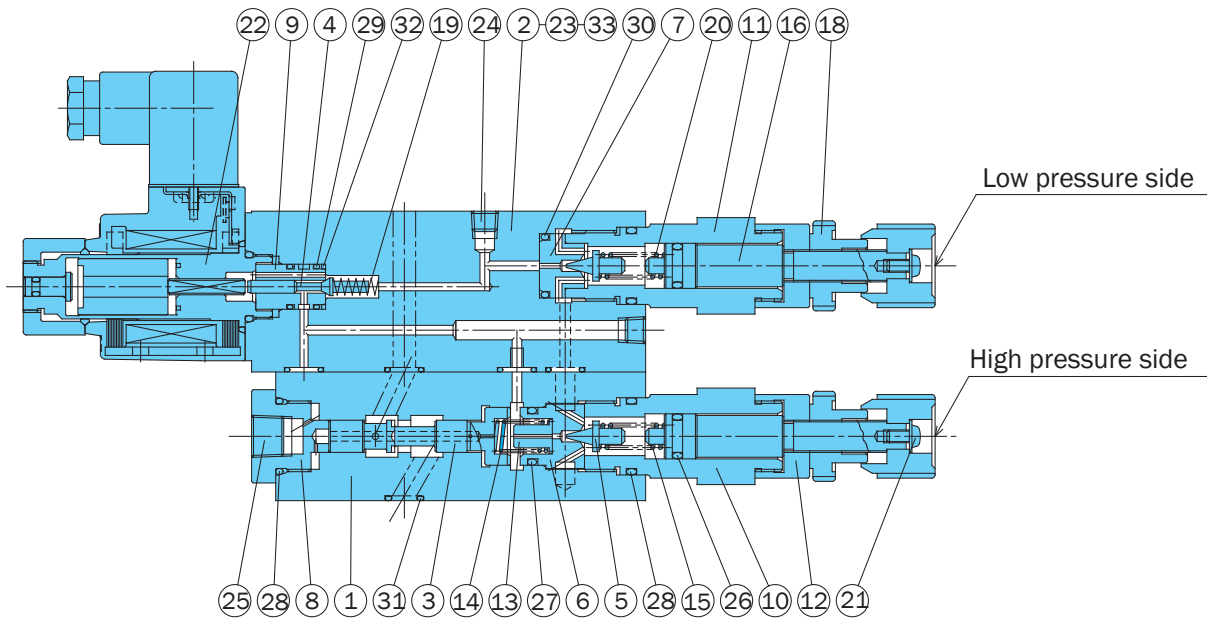
## Number of Adjusting Screw Rotations Pressure Characteristics

OGS-G01-P\*\*-22



## Cross-sectional Drawing

OGS-G01-P\*C-K(R)-\*\* 1-22



Seal Part List (Kit Model Number BRBS-01GSP-1A)

| Part No. | Part Name   | Part Number     | Q'ty |
|----------|-------------|-----------------|------|
| 26       | O-ring      | 1A-P10A         | 2    |
| 27       | O-ring      | 1B-P14          | 1    |
| 28       | O-ring      | 1B-P20          | 3    |
| 29       | O-ring      | AS568-013(Hs90) | 2    |
| 30       | O-ring      | 1B-P16          | 1    |
| 31       | O-ring      | 1B-P9           | 11   |
| 32       | Backup ring | For AS568-013   | 1    |

Note: 1.O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

| Part No. | Part Name | Part No. | Part Name     |
|----------|-----------|----------|---------------|
| 1        | Body      | 18       | Nut           |
| 2        | Body      | 19       | Spring        |
| 3        | Spool     | 20       | Spring        |
| 4        | Spool     | 21       | Screw         |
| 5        | Poppet    | 22       | Solenoid assy |
| 6        | Seat      | 23       | Screw         |
| 7        | Seat      | 24       | Plug          |
| 8        | Bushing   | 25       | Plug          |
| 9        | Sleeve    | 26       | O-ring        |
| 10       | Retainer  | 27       | O-ring        |
| 11       | Retainer  | 28       | O-ring        |
| 12       | Bushing   | 29       | O-ring        |
| 13       | Choke     | 30       | O-ring        |
| 14       | Spring    | 31       | O-ring        |
| 15       | Spring    | 32       | Backup ring   |
| 16       | Screw     | 33       | Plate         |
| 17       | Knob      |          |               |



### Sequence Modular Valve

**10.5 to 21 gpm**  
**3625 psi**

### Features

This modular valve is a pressure control valve used for sequential actuator operations and for maintaining main circuit pressure.

Pressure adjustment is possible across a wide range, from 36 to 3045 psi.

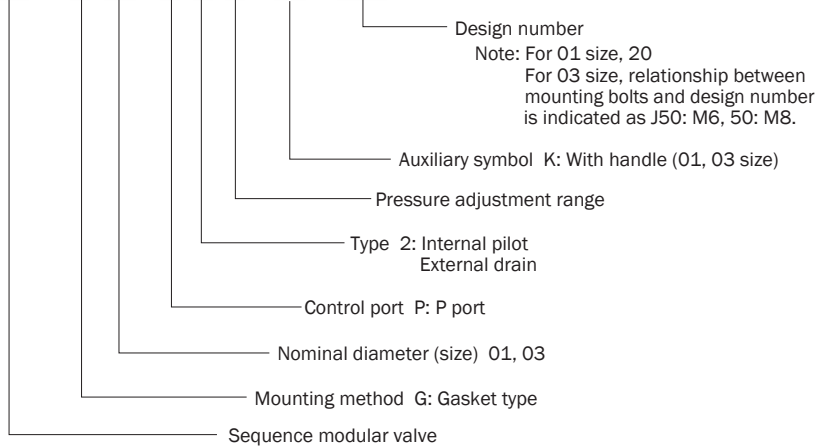
Maximum Operating Pressure: 3625 psi.

### Specifications

| Model No.                    | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi          | Weight lbs | Gasket Surface Dimensions |
|------------------------------|-------------------------|------------------------------|-----------------------|--|------------|---------------------------|
| OQ-G01-P21-20<br>P23         | 1/8                     | 3625                         | 10.5                  | 115 to 1000<br>500 to 3045             | 2.4        | ISO 4401-03-02-0-94       |
| OQ-G03-P2A-J50<br>P2C<br>P2E | 3/8                     | 3625                         | 21                    | 36 to 123<br>123 to 500<br>500 to 2030 | 7.7        | ISO 4401-05-04-0-94       |

### Understanding Model Numbers

**OQ - G 03 - P 2 A - (K) - J50**



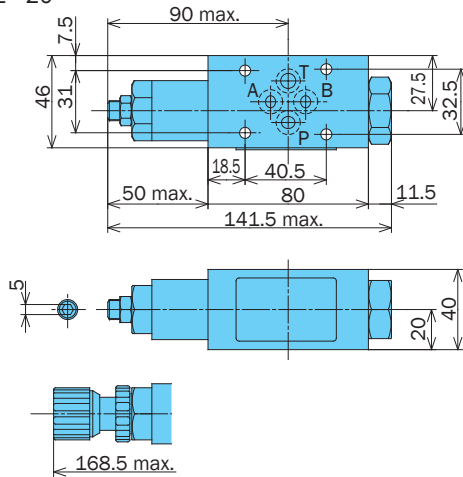
#### • Handling

- 1 The pressure adjustment range is expressed in terms of cracking pressure.
- 2 Install this valve directly above the sub plate or manifold.
- 3 When two or more of these valves are ganged in sequence, make sure the setting pressure differential between them is at least 145 psi.
- 4 Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.

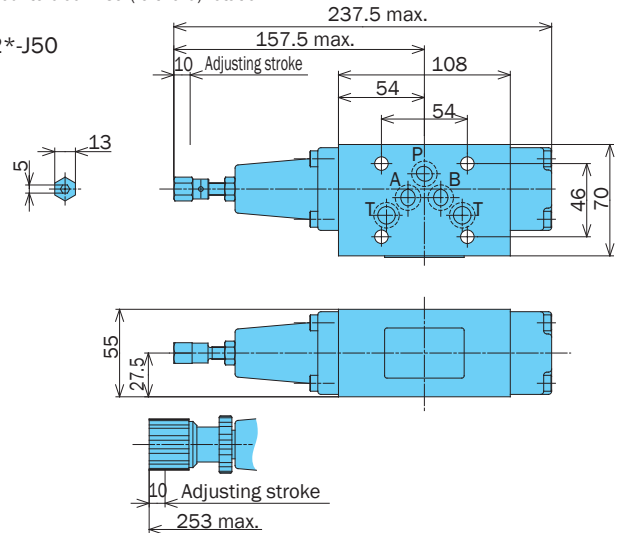
### Installation Dimension Drawings

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

OQ-G01-P2\*-20



OQ-G03-P2\*-J50

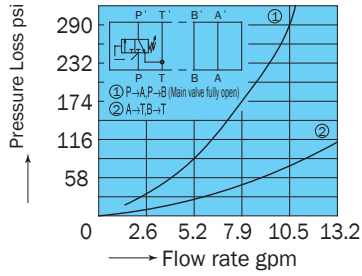


# Performance Curves

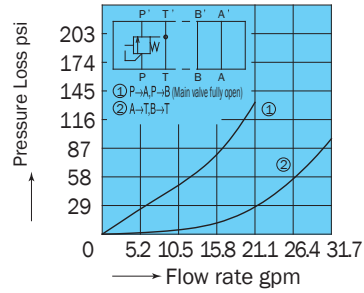
Hydraulic Operating Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics

OQ-G01-P2\*-20

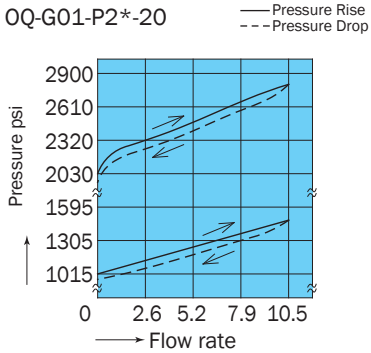


OQ-G03-P2A-J50

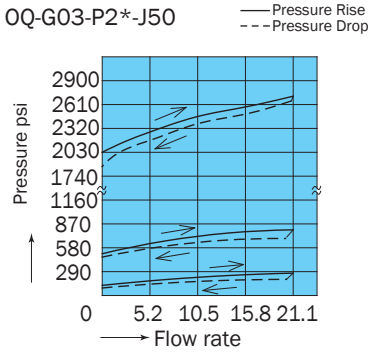


## Pressure - Flow Rate Characteristics

OQ-G01-P2\*-20

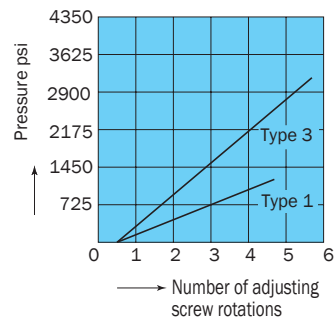


OQ-G03-P2\*-J50

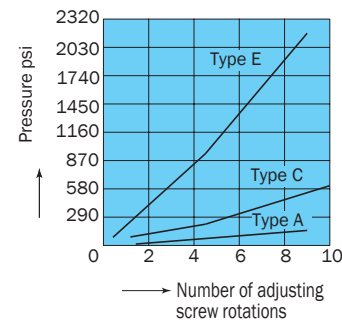


## Number of Adjusting Screw Rotations - Pressure Characteristics

OQ-G01-P2\*-20

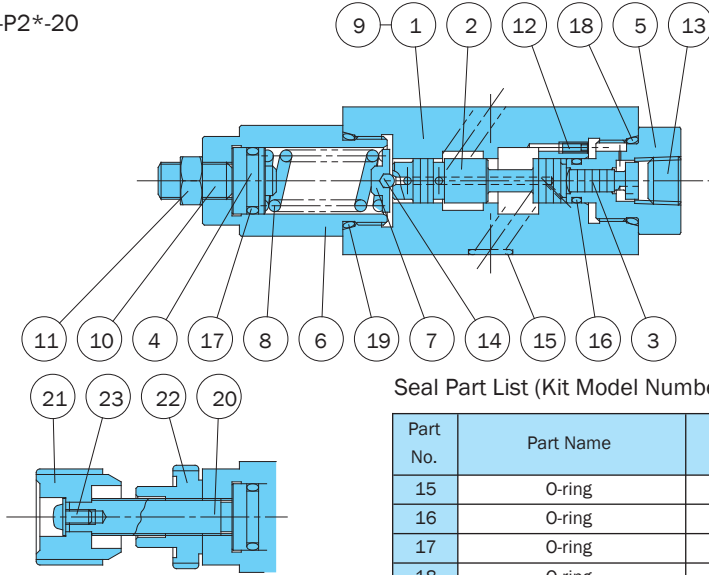


OQ-G03-P2\*-J50



# Installation Dimension Drawings

OQ-G01-P2\*-20



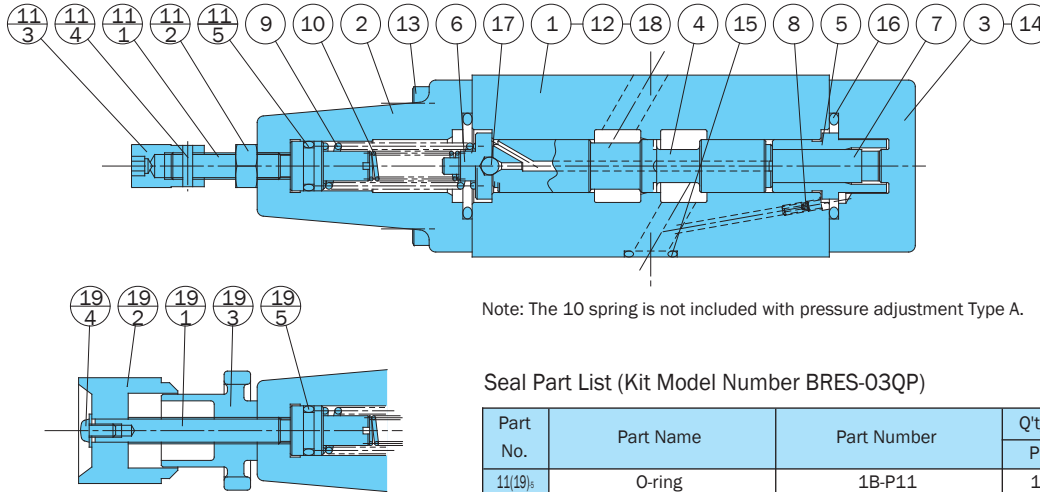
Seal Part List (Kit Model Number BRBS-01QP)

| Part No. | Part Name | Part Number | Q'ty |  |
|----------|-----------|-------------|------|--|
|          |           |             | P    |  |
| 15       | O-ring    | 1B-P9       | 4    |  |
| 16       | O-ring    | 1B-P9       | 1    |  |
| 17       | O-ring    | 1A-P14      | 1    |  |
| 18       | O-ring    | 1B-P20      | 1    |  |
| 19       | O-ring    | 1B-P22      | 1    |  |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Spool     |
| 3        | Piston    |
| 4        | Plunger   |
| 5        | Bushing   |
| 6        | Retainer  |
| 7        | Guide     |
| 8        | Spring    |
| 9        | Plate     |
| 10       | Screw     |
| 11       | Nut       |
| 12       | Choke     |
| 13       | Plug      |
| 14       | Ball      |
| 15       | O-ring    |
| 16       | O-ring    |
| 17       | O-ring    |
| 18       | O-ring    |
| 19       | O-ring    |
| 20       | Screw     |
| 21       | Knob      |
| 22       | Nut       |
| 23       | Screw     |

OQ-G03-P2\*-J50



Note: The 10 spring is not included with pressure adjustment Type A.

Seal Part List (Kit Model Number BRES-03QP)

| Part No.            | Part Name | Part Number     | Q'ty |  |
|---------------------|-----------|-----------------|------|--|
|                     |           |                 | P    |  |
| 11(19) <sub>1</sub> | O-ring    | 1B-P11          | 1    |  |
| 15                  | O-ring    | AS568-014(Hs90) | 5    |  |
| 16                  | O-ring    | 1B-P26          | 2    |  |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

| Part No. | Part Name  |
|----------|------------|
| 1        | Body       |
| 2        | Cover      |
| 3        | Cover      |
| 4        | Spool      |
| 5        | Sleeve     |
| 6        | Guide      |
| 7        | Plunger    |
| 8        | Choke      |
| 9        | Spring     |
| 10       | Spring     |
| 11       | Screw kit  |
| 11.1     | Screw      |
| 11.2     | Nut        |
| 11.3     | Nut        |
| 11.4     | Pin        |
| 11.5     | O-ring     |
| 12       | Plate      |
| 13       | Screw      |
| 14       | Screw      |
| 15       | O-ring     |
| 16       | O-ring     |
| 17       | Ball       |
| 18       | Pin        |
| 19       | Handle kit |
| 19.1     | Screw      |
| 19.2     | Knob       |
| 19.3     | Nut        |
| 19.4     | Screw      |
| 19.5     | O-ring     |



### Counter Balance Modular Valve

10.5 to 79 gpm  
2030 psi

#### Features

This modular valve is used to control actuator back pressure and for other pressure control valve applications.

Pressure adjustment is possible across a wide range, from 36 to 2030 psi

Maximum Operating Pressure: 3625, 5075 psi

#### Specifications

| Model No.                     | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi          | Weight lbs | Gasket Surface Dimensions |
|-------------------------------|-------------------------|------------------------------|-----------------------|--|------------|---------------------------|
| OCQ-G01-A11-20<br>A12         | 1/8                     | 3625                         | 10.5                  | 115 to 1000<br>500 to 2030             | 2.4        | ISO 4401-03-02-0-94       |
| OCQ-G01-B11-20<br>B12         |                         |                              |                       | 115 to 1000<br>500 to 2030             | 2.4        |                           |
| OCQ-G03-A1A-J50<br>A1C<br>A1E | 3/8                     | 3625                         | 21                    | 36 to 123<br>123 to 500<br>500 to 2030 | 7.7        | ISO 4401-05-04-0-94       |
| OCQ-G03-B1A-J50<br>B1C<br>B1E |                         |                              |                       | 36 to 123<br>123 to 500<br>500 to 2030 | 7.7        |                           |
| OQH-G04-A1A-10<br>A1C<br>A1E  | 1/2                     | 5075                         | 79                    | 36 to 123<br>72 to 500<br>290 to 2030  | 17.6       | ISO 4401-07-06-0-94       |
| OQH-G04-B1A-10<br>B1C<br>B1E  |                         |                              |                       | 36 to 123<br>72 to 500<br>290 to 2030  | 17.6       |                           |

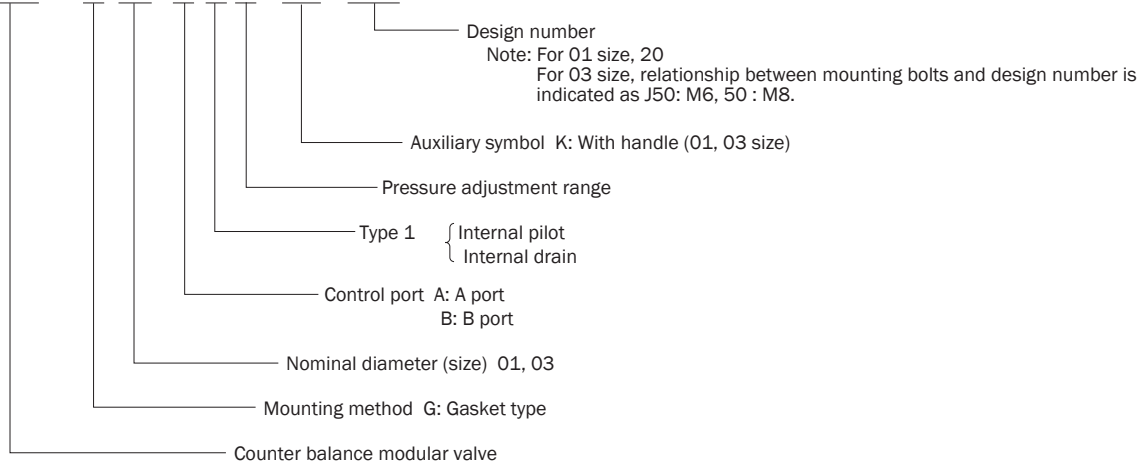
• Handling

- The pressure adjustment range is expressed in terms of cracking pressure.
- Run tank port piping directly to the tank, and ensure that back pressure is as small as possible.
- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.
- 04 series modular valves do not have an L (DR2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

#### Understanding Model Numbers

01, 03 size

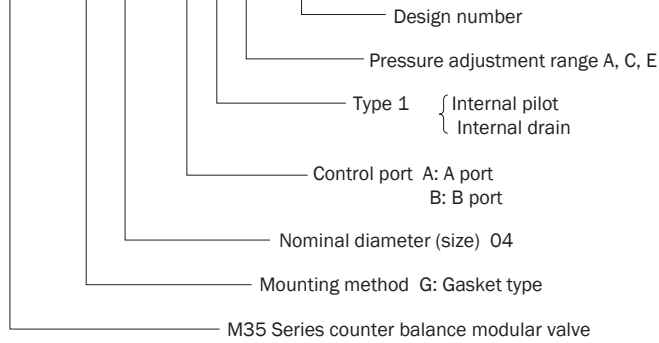
**OCQ - G 03 - B 1 A - (K) - J50**



# Understanding Model Numbers

O4 size

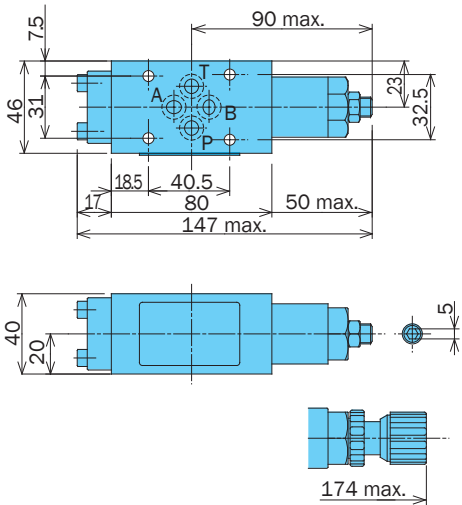
**OQH - G 04 - B 1 A - 10**



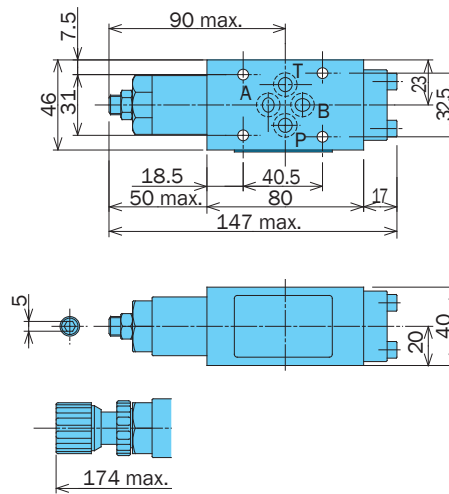
# Installation Dimension Drawings

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

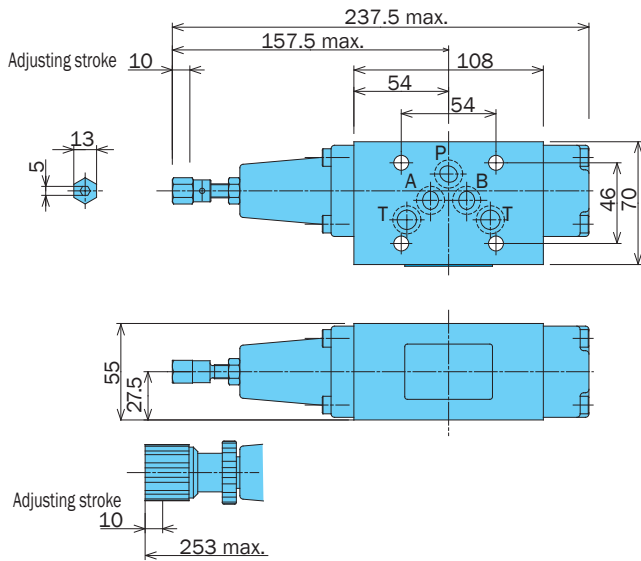
OCQ-G01-A1\*-20



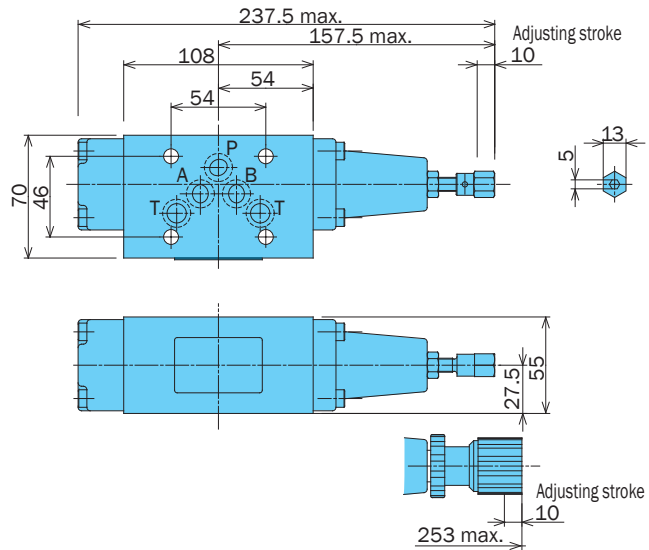
OCQ-G01-B1\*-20



OCQ-G03-A1\*-J50

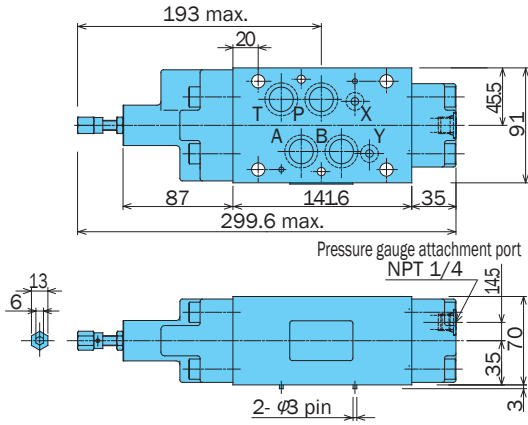


OCQ-G03-B1\*-J50

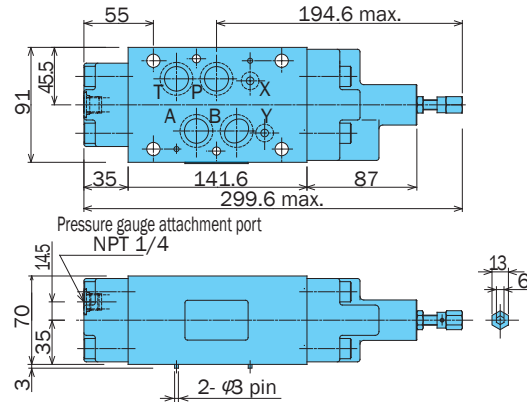




OQH-G04-A1\*-10



OQH-G04-B1\*-10

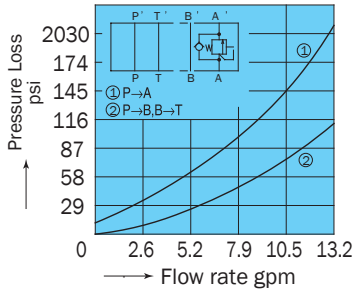


**Performance Curves**

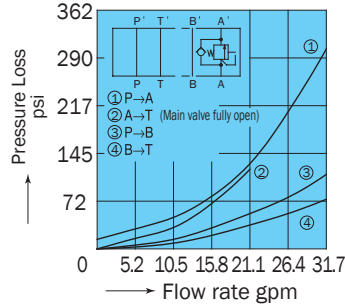
Hydraulic Operating Fluid Viscosity 32 centistokes

Pressure Loss Characteristics

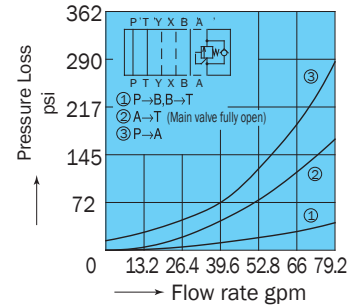
OCQ-G01-A1\*-20



OCQ-G03-A1A-J50

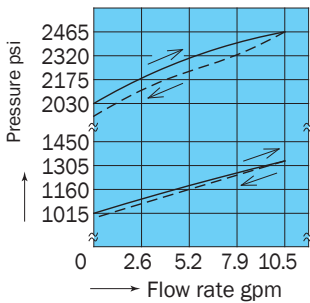


OQH-G04-B1A-10

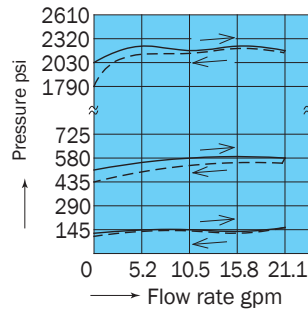


Pressure - Flow Rate Characteristics

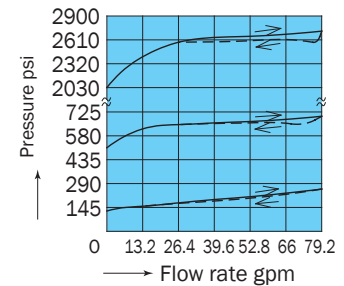
OCQ-G01-A1\*  
B1\* -20



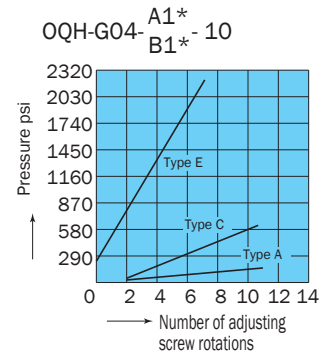
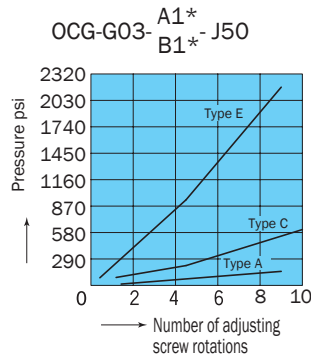
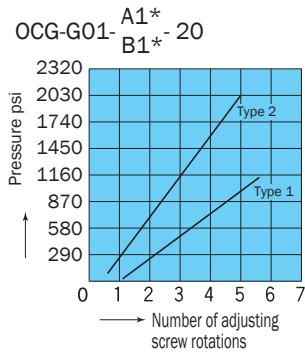
OCQ-G03-A1\*-J50



OQH-G04-A1  
B1 \*-10

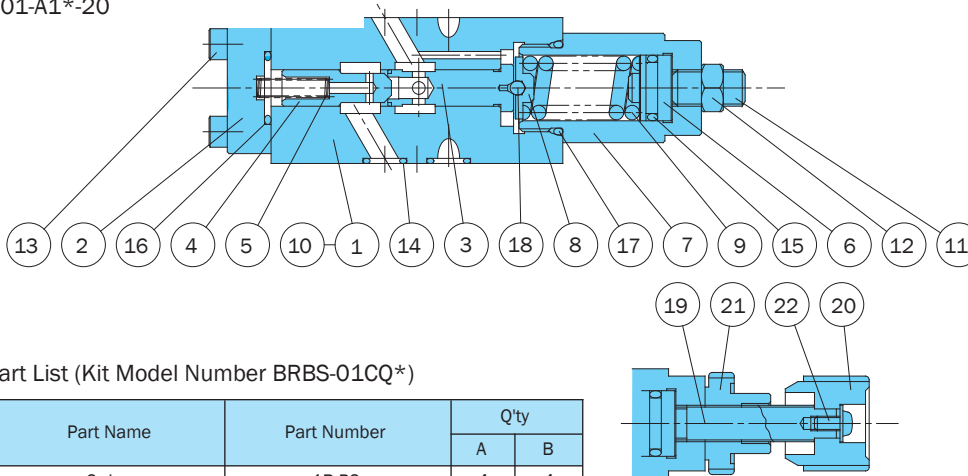


Number of Adjusting Screw Rotations - Pressure Characteristics



**Cross-sectional Drawing**

OCQ-G01-A1\*-20



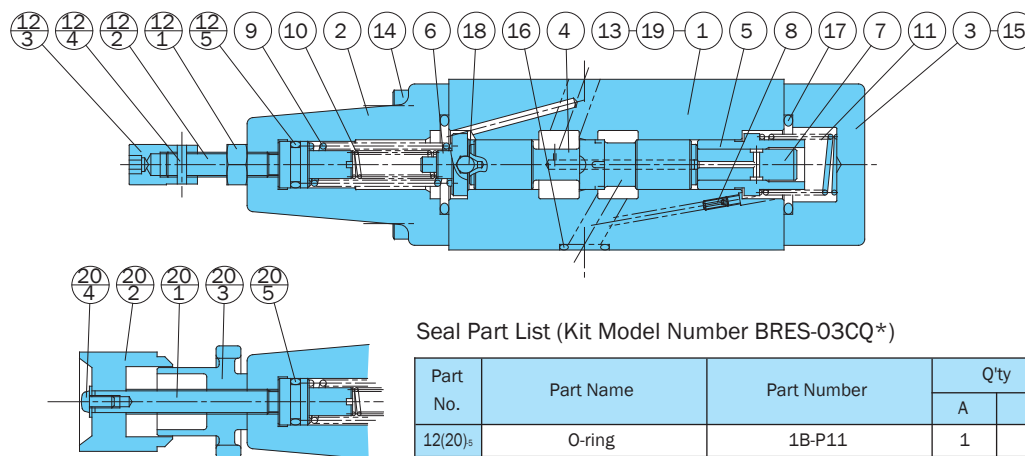
Seal Part List (Kit Model Number BRBS-01CQ\*)

| Part No. | Part Name | Part Number | Q'ty |   |
|----------|-----------|-------------|------|---|
|          |           |             | A    | B |
| 14       | O-ring    | 1B-P9       | 4    | 4 |
| 15       | O-ring    | 1B-P14      | 1    | 1 |
| 16       | O-ring    | 1B-P16      | 1    | 1 |
| 17       | O-ring    | 1B-P22      | 1    | 1 |

| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Spool     |
| 4        | Poppet    |
| 5        | Spring    |
| 6        | Plunger   |
| 7        | Retainer  |
| 8        | Guide     |
| 9        | Spring    |
| 10       | Plate     |
| 11       | Screw     |
| 12       | Nut       |
| 13       | Screw     |
| 14       | O-ring    |
| 15       | O-ring    |
| 16       | O-ring    |
| 17       | O-ring    |
| 18       | Ball      |
| 19       | Screw     |
| 20       | Knob      |
| 21       | Nut       |
| 22       | Screw     |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify A or B for the asterisk (\*) in the kit model number.

OCQ-G03-A1\*-J50



Seal Part List (Kit Model Number BRES-03CQ\*)

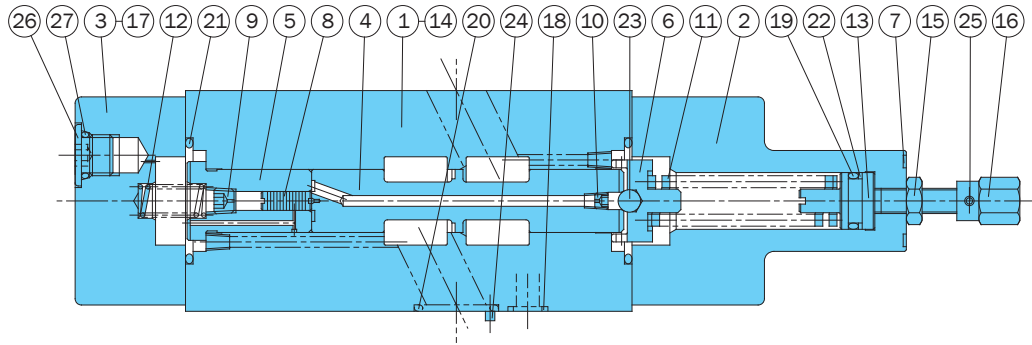
| Part No.            | Part Name | Part Number     | Q'ty |   |
|---------------------|-----------|-----------------|------|---|
|                     |           |                 | A    | B |
| 12(20) <sub>s</sub> | O-ring    | 1B-P11          | 1    | 1 |
| 16                  | O-ring    | AS568-014(Hs90) | 5    | 5 |
| 17                  | O-ring    | 1B-P26          | 2    | 2 |

| Part No.        | Part Name  |
|-----------------|------------|
| 1               | Body       |
| 2               | Cover      |
| 3               | Cover      |
| 4               | Spool      |
| 5               | Sleeve     |
| 6               | Guide      |
| 7               | Plunger    |
| 8               | Choke      |
| 9               | Spring     |
| 10              | Spring     |
| 11              | Spring     |
| 12              | Screw kit  |
| 12 <sub>1</sub> | Screw      |
| 12 <sub>2</sub> | Nut        |
| 12 <sub>3</sub> | Nut        |
| 12 <sub>4</sub> | Pin        |
| 12 <sub>5</sub> | O-ring     |
| 13              | Plate      |
| 14              | Screw      |
| 15              | Screw      |
| 16              | O-ring     |
| 17              | O-ring     |
| 18              | Ball       |
| 19              | Pin        |
| 20              | Handle kit |
| 20 <sub>1</sub> | Screw      |
| 20 <sub>2</sub> | Knob       |
| 20 <sub>3</sub> | Nut        |
| 20 <sub>4</sub> | Screw      |
| 20 <sub>5</sub> | O-ring     |

Note: The 10 spring is not included with pressure adjustment Type A.

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify A or B for the asterisk (\*) in the kit model number.

OQH-G04-B1\*-10



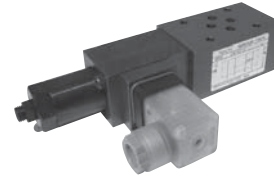
| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Cover       |
| 3        | Cover       |
| 4        | Spool       |
| 5        | Sleeve      |
| 6        | Guide       |
| 7        | Plate       |
| 8        | Plunger     |
| 9        | Choke       |
| 10       | Choke       |
| 11       | Spring      |
| 12       | Spring      |
| 13       | Screw       |
| 14       | Plate       |
| 15       | Nut         |
| 16       | Nut         |
| 17       | Screw       |
| 18       | O-ring      |
| 19       | O-ring      |
| 20       | O-ring      |
| 21       | O-ring      |
| 22       | Backup ring |
| 23       | Ball        |
| 24       | Pin         |
| 25       | Pin         |
| 26       | Plug        |
| 27       | O-ring      |

Seal Part List (Kit Model Number BRKS-04CQ\*)

| Part No. | Part Name   | Part Number     | Q'ty |   |
|----------|-------------|-----------------|------|---|
|          |             |                 | A    | B |
| 18       | O-ring      | AS568-012(Hs90) | 2    | 2 |
| 19       | O-ring      | 1B-P14          | 1    | 1 |
| 20       | O-ring      | AS568-118(Hs90) | 4    | 4 |
| 21       | O-ring      | 1B-G35          | 2    | 2 |
| 22       | Backup ring | T2-P14          | 1    | 1 |
| 27       | O-ring      | 1B-P11          | 1    | 1 |

Note: The illustration shows the configuration for pressure adjustment ranges Type C and Type E. For Type A, there is no #8 piston or #10 choke.

- Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Backup ring indicates JIS 2407-T2-\*\*.  
 3. Specify A or B for the asterisk (\*) in the kit model number.



### Pressure Switch Modular Valve

**13.2 gpm**  
**3625 psi**

### Features

This modular valve detects pressure changes inside the hydraulic circuit and opens and closes an electrical circuit accordingly.

High precision detection, high precision circuit control, outstanding reliability. Maximum operating pressure: 3625 psi. Indicator light built into the DIN connector shows operational status at

a glance. A double type is also available for control of both port A and port B in a compact configuration.

### Specifications

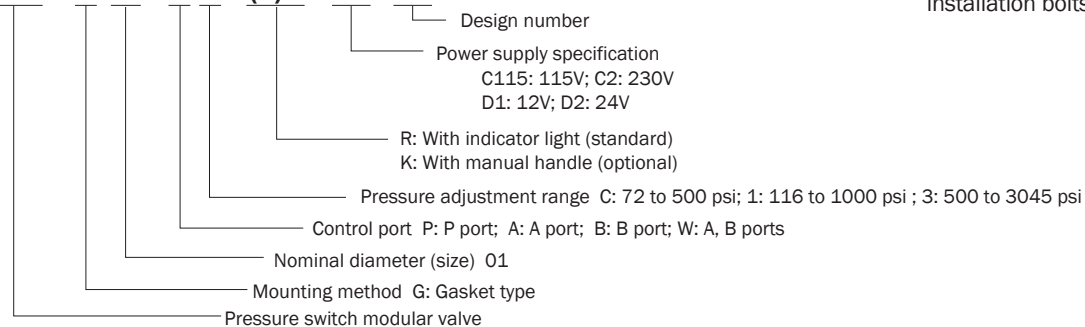
| Model No.                     | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi           | Weight lbs | Gasket Surface Dimensions |
|-------------------------------|-------------------------|------------------------------|-----------------------|---|------------|---------------------------|
| OW-G01-PC-R-**-30<br>P1<br>P3 | 1/8                     | 3625                         | 13.2                  | 72 to 500<br>116 to 1000<br>500 to 3045 | 3.9        | ISO 4401-03-02-0-94       |
| OW-G01-AC-R-**-30<br>A1<br>A3 |                         |                              |                       | 72 to 500<br>116 to 1000<br>500 to 3045 |            |                           |
| OW-G01-BC-R-**-30<br>B1<br>B3 |                         |                              |                       | 72 to 500<br>116 to 1000<br>500 to 3045 | 3.9        |                           |
| OW-G01-WC-R-**-30<br>W1<br>W3 |                         |                              |                       | 72 to 500<br>116 to 1000<br>500 to 3045 |            |                           |

|   |                                       |  |               |   |
|---|---------------------------------------|--|---------------|---|
| Electrical Specifications<br>Micro Switch<br>Manufacturer:<br>Omron<br>Model No. SS-5 | Contact Capacitance (Resistive Load)  | AC   | 125V          | 5A                                      |
|   |                                       |  | 250V          | 3A                                      |
|   |                                       | DC   | 12V           | 2.2A                                    |
|   |                                       |  | 24V           | 1.1A                                    |
|   | Mechanical Life                       | At least 1 × 10 <sup>7</sup>                     |               |   |
|   | Electrical Life                       | At least 3 × 10 <sup>6</sup> (AC, 0.1A, cos φ=1) |               |   |
|   | Contact Resistance                    | 30MΩ maximum (initial value)                     |               |   |
| Insulation Resistance   | At least 100MΩ                        |  |               |   |
| Allowable Operating Frequency   | 60 times/minute (electrical)          |  |               |   |
| Operating Environment   | Dust Resistance/Water Resistance Rank | JIS C0920 IP64                                   |               |   |
|   | Ambient Temperature                   | -4° F to 158° F (non-condensation)               |               |   |
|   | Operating Fluid                       | Fluid Temperature                                | -4° F to 158° | Use a fluid that is within both ranges. |
|   |                                       | Allowable Viscosity Range                        | 15 to 300     |   |
| Filtration  |                                       | 10μm maximum                                     |               |   |

- Handling
- 1 See the detailed explanation on the next page for information about wiring inside connectors.
  - 2 Contacts are normally open type only, not normally closed type.
  - 3 In addition to load wiring, power supply wiring is also required to illuminate the indicator light. See the wiring diagram for more information.
  - 4 If the DIN connector interferes with other valves, remove the two switch installation bolts and change the installation orientation. If interference is caused in all orientations, install an interference blanker plate on top of the connector. Contact your agent if an interference blanker plate is required.
  - 5 Note that a special type of DIN connector is required. The DIN connector is not interchangeable with the one for the SA type solenoid valve.
  - 6 If you cannot remove the DIN connector when wiring, remove the switch installation bolts and then remove the DIN connector. The tightening torque for the installation bolts is 3.6 to 5.1 ft lbs.

### Understanding Model Numbers

**OW - G 01 - P 1 - (K)R - D2 - 30**



# Connectors

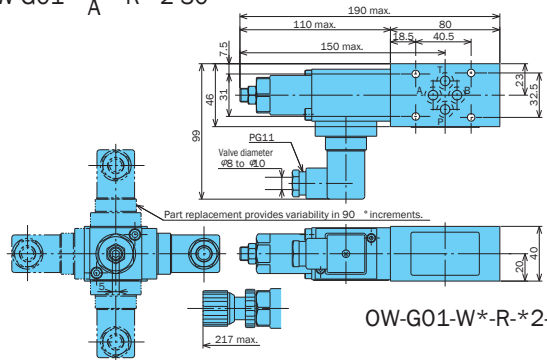
| Model No.   | Power supply specification | Wiring   | Electrical Circuit Diagram   |
|-------------|----------------------------|--|--|
| BRC41-01WD2 | D2                         | <p>⊙When signal input device (load) remote common is plus</p> <p>OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 to +).</p> | <p>Normal open type with indicator</p> <p>Pressure increase causes indicator to light. Circuit closed (ON)</p> <p>Pressure decrease causes indicator to go out. Circuit open (OFF)</p> |
|             |                            | <p>⊙When signal input device (load) common is minus</p> <p>OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 to -).</p>       |  |
| BRC41-01WC2 | C2                         | <p>⊙When signal input device (load) is AC</p> <p>OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 is nonpolar).</p>          | <p>Normal open type with indicator</p> <p>Pressure increase causes indicator to light. Circuit closed (ON)</p> <p>Pressure decrease causes indicator to go out. Circuit open (OFF)</p> |

- Note: 1. The DIN connector wiring connector port size is PG11.  
 2. The compatible cable diameter for the DIN connector is  $\phi 8$  to  $\phi 10$ . Dust resistance and water resistance is lost for any cable outside this range.  
 3. The connector can be installed in different orientations are 90-degree increments by changing the orientation of the terminal block.  
 4. The connector is designed so the cover cannot be removed unless the installation screws are removed.  
 5. Use M3 for round type and Y type solderless terminals.  
 6. The tightening torque of M3 screws used for securing connectors and for terminals is 42 to 70 in lbs.

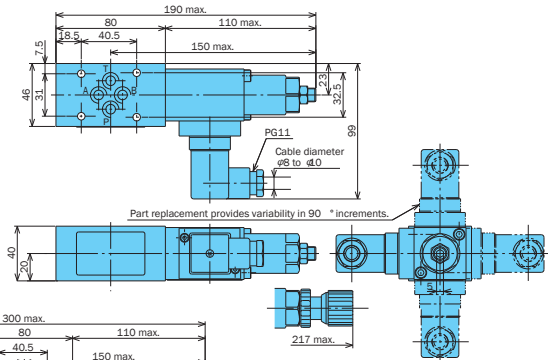
## Installation Dimension Drawings

Note: Pressure is increased by clockwise (rightward) rotation of the adjusting screw, and decreased by counterclockwise (leftward) rotation.

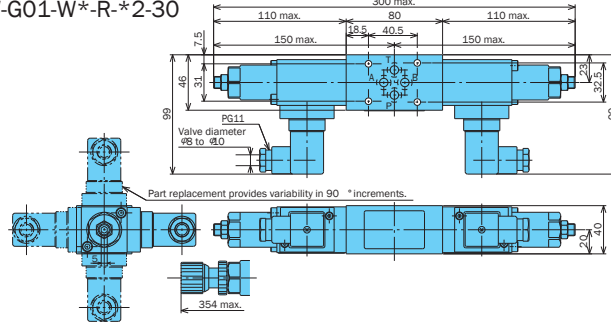
OW-G01-<sup>P</sup>/<sub>A</sub>\*-R-\*2-30



OW-G01-B\*-R-\*2-30



OW-G01-W\*-R-\*2-30

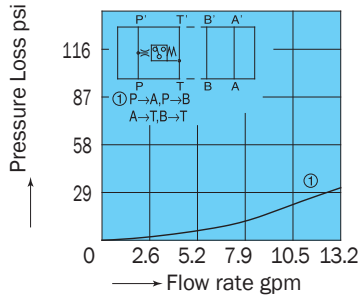


## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

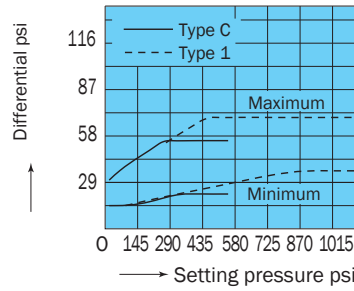
Pressure Loss Characteristics

OW-G01-\*\*-R-\*\*-30

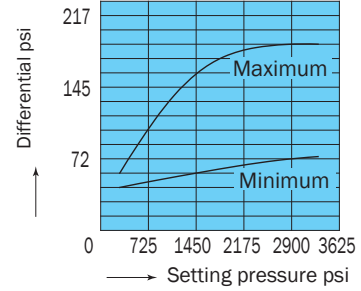


Setting Pressure - Differential Characteristics

OW-G01-<sup>C</sup><sub>1</sub>-R-\*\*-30

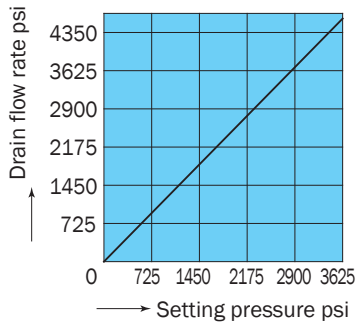


OW-G01-3-R-\*\*-30



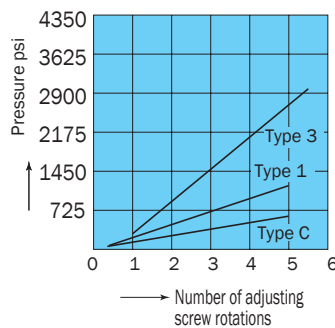
Drain Rate Characteristics

OW-G01-\*\*-R-\*\*-30



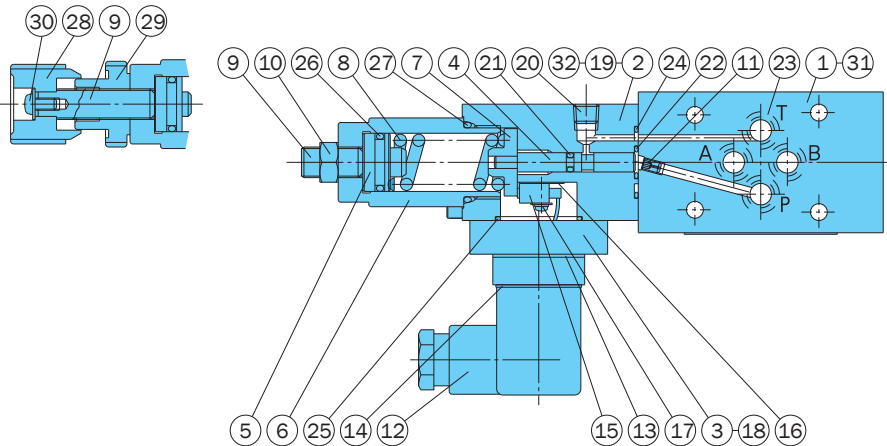
Number of Adjusting Screw Rotations Pressure Characteristics

OW-G01-\*\*-R-\*\*-30



## Cross-sectional Drawing

OW-G01-P\*-R-2-30



| Part No. | Part Name         | Part No. | Part Name |
|----------|-------------------|----------|-----------|
| 1        | Body              | 17       | Screw     |
| 2        | Cover             | 18       | Screw     |
| 3        | Cover             | 19       | Screw     |
| 4        | Piston            | 20       | Plug      |
| 5        | Push rod          | 21       | O-ring    |
| 6        | Retainer          | 22       | O-ring    |
| 7        | Guide             | 23       | O-ring    |
| 8        | Spring            | 24       | O-ring    |
| 9        | Screw             | 25       | O-ring    |
| 10       | Nut               | 26       | O-ring    |
| 11       | Choke             | 27       | O-ring    |
| 12       | Connector         | 28       | Knob      |
| 13       | Gasket            | 29       | Nut       |
| 14       | Gasket            | 30       | Screw     |
| 15       | Micro switch assy | 31       | Plate     |
| 16       | Separator         | 32       | Plate     |

Seal Part List (Kit Model Number BRCS-01W\*)

| Part No. | Part Name | Part Number     | Q'ty |   |   |   |
|----------|-----------|-----------------|------|---|---|---|
|          |           |                 | P    | W | A | B |
| 21       | O-ring    | 1A-P3           | 1    | 2 | 1 | 1 |
| 22       | O-ring    | AS568-011(Hs90) | 1    | 2 | 1 | 1 |
| 23       | O-ring    | 1B-P9           | 4    | 4 | 4 | 4 |
| 24       | O-ring    | AS568-019(Hs70) | 1    | 2 | 1 | 1 |
| 25       | O-ring    | AS568-022(Hs70) | 1    | 2 | 1 | 1 |
| 26       | O-ring    | 1A-P15          | 1    | 2 | 1 | 1 |
| 27       | O-ring    | 1B-P22          | 1    | 2 | 1 | 1 |

Note: Specify P, W, A, or B for the asterisk (\*) in the kit model number.



### Flow Regulator Modular Valve

13.2 to 79 gpm  
3625 to 5075 psi

#### Features

This modular valve is used to control actuator speed and for other flow control valve applications.

A wide range of models are available for A and B port control, A or B port control, and P or T port control.

Maximum Operating Pressure: 3625, 5075 psi

#### Specifications

| Model No.                 | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure Adjustment Range psi | Weight lbs | Gasket Surface Dimensions |
|---------------------------|-------------------------|------------------------------|-----------------------|-------------------------------|------------|---------------------------|
| OY-G01-T-20               | 1/8                     | 3625                         | 50                    | -                             | 2.2        | ISO 4401-03-02-0-94       |
| OCY-G01-P-20              |                         |                              |                       | 5.7                           | 2.2        |                           |
| OCY-G01-W-X-20<br>A<br>B  |                         |                              |                       | 11.4                          | 2.8        |                           |
|                           |                         |                              |                       |                               | 2.6        |                           |
| OCY-G01-W-Y-20<br>A<br>B  | 11.4                    | 2.8                          |                       |                               |            |                           |
|                           |                         | 2.6                          |                       |                               |            |                           |
| OCY-G03-P-J50             | 3/8                     | 3625                         | 100                   | 5.7                           | 6.4        | ISO 4401-05-04-0-94       |
| OCY-G03-W-X-J51<br>A<br>B |                         |                              |                       | 14.3                          | 6.8        |                           |
|                           |                         |                              |                       |                               | 6.6        |                           |
| OCY-G03-W-Y-J51<br>A<br>B |                         |                              |                       | 14.3                          | 6.8        |                           |
|                           |                         | 6.6                          |                       |                               |            |                           |
| OYH-G04-P-10              | 1/2                     | 5075                         | 300                   | 5.7                           | 10.3       | ISO 4401-07-06-0-94       |
| OYH-G04-W-X-10<br>A<br>B  |                         |                              |                       | 14.3                          | 14.3       |                           |
|                           |                         |                              |                       |                               | 14.3       |                           |
| OYH-G04-W-Y-10<br>A<br>B  |                         |                              |                       | 14.3                          | 14.3       |                           |
|                           |                         | 14.3                         |                       |                               |            |                           |

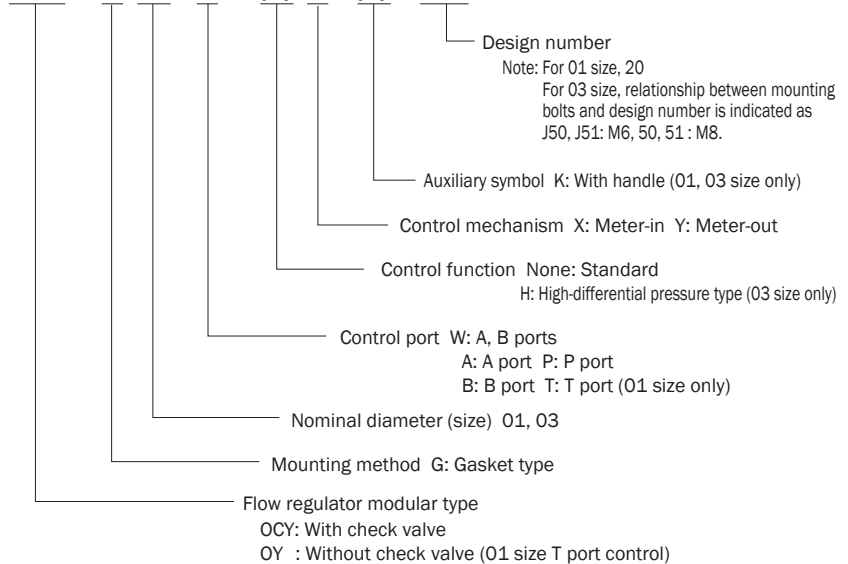
#### • Handling

- In a 03 size application where control differential pressure is large, use of an H type makes adjustment easier.
- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.
- O4 series modular valves do not have an L (DR2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

#### Understanding Model Numbers

01, 03 size

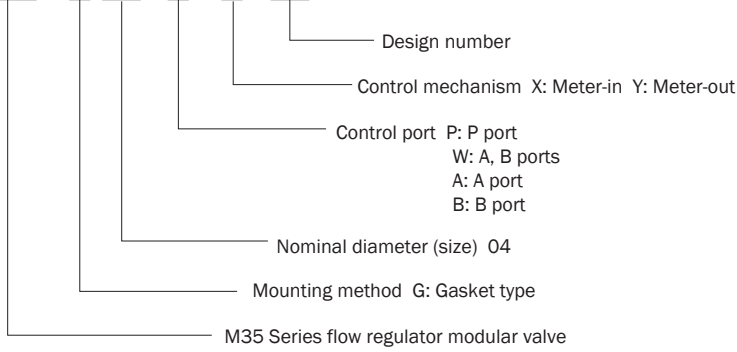
**OCY - G 03 - W - (H) Y - (K) - J51**



# Understanding Model Numbers

O4 size

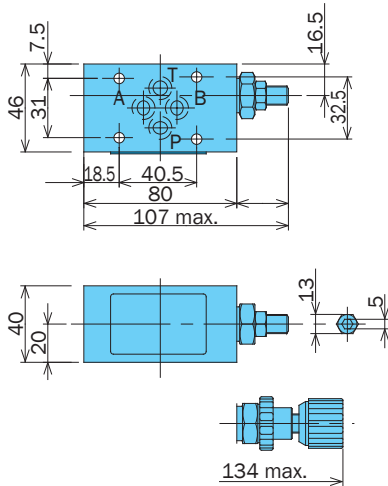
**OYH - G 04 - W - Y - 10**



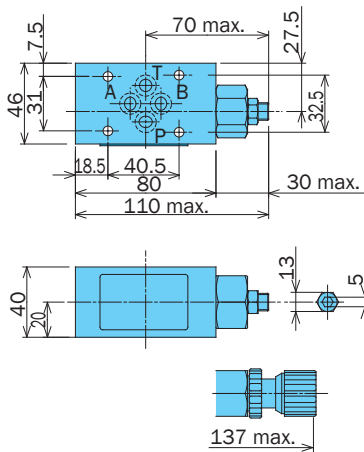
# Installation Dimension Drawings

Note: The control flow rate is increased by counter clockwise (leftward) rotation of the adjusting screw.

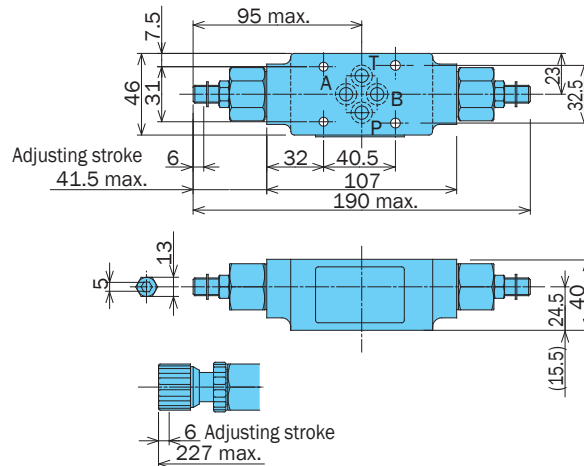
OY-G01-T-20



OCY-G01-P-20



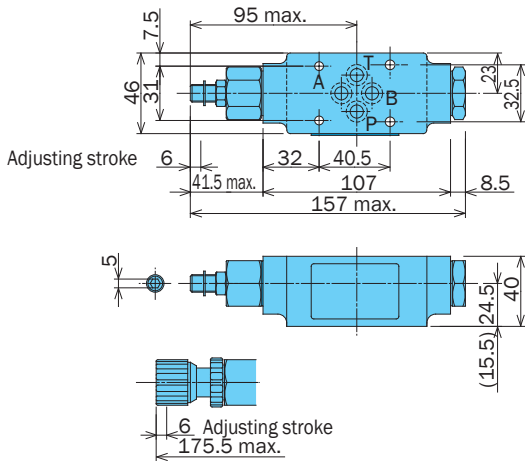
OCY-G01-W- X -20  
Y



Note: Dimensions in the parentheses are for the OCY-G01-W-X-20.

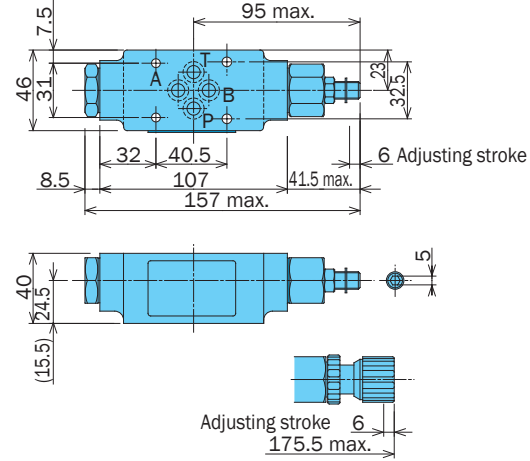


OCY-G01-A- X  
Y-20



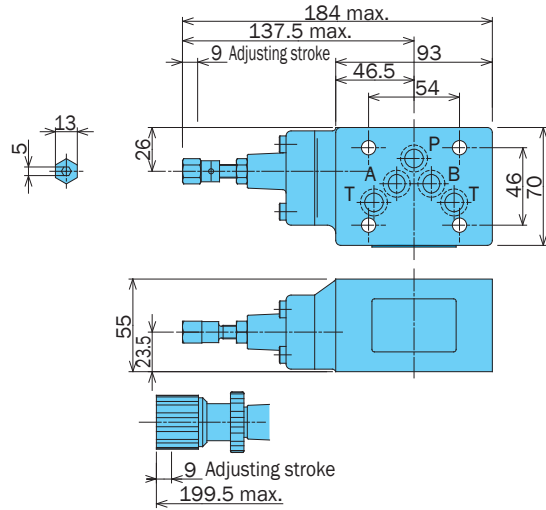
Note:  
Dimensions in the parentheses are for the OCY-G01-A-X-20.

OCY-G01-B- X  
Y-20

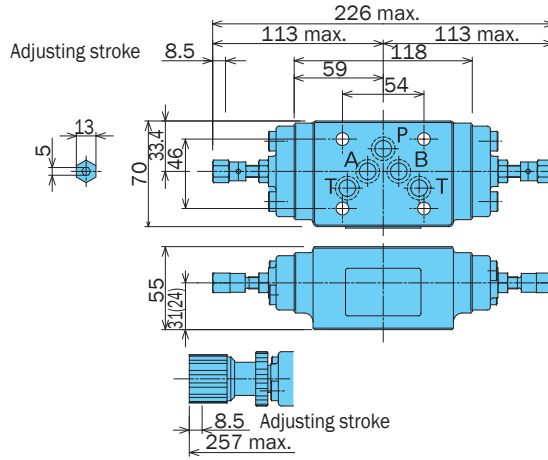


Note:  
Dimensions in the parentheses are for the OCY-G01-B-X-20.

OCY-G03-P-J50

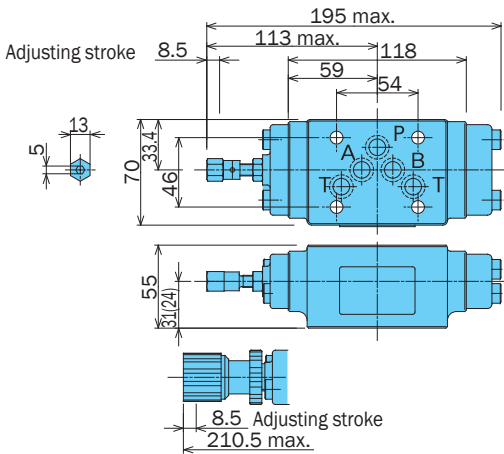


OCY-G03-W- X  
Y-J51

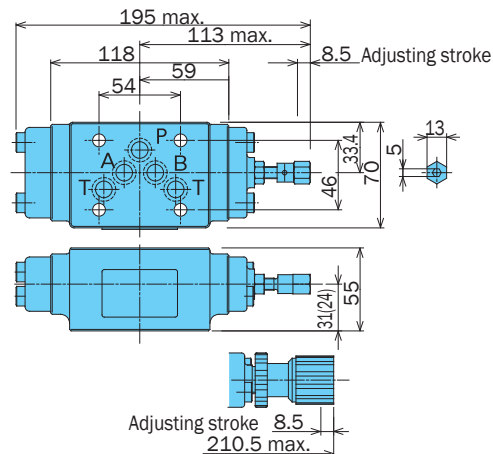


Note:  
Dimensions in the parentheses are for the OCY-G03-W-X-J51.

OCY-G03-A- X  
Y-J51



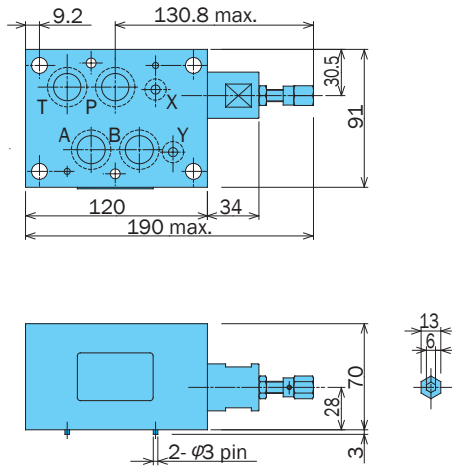
OCY-G03-B- X  
Y-J51



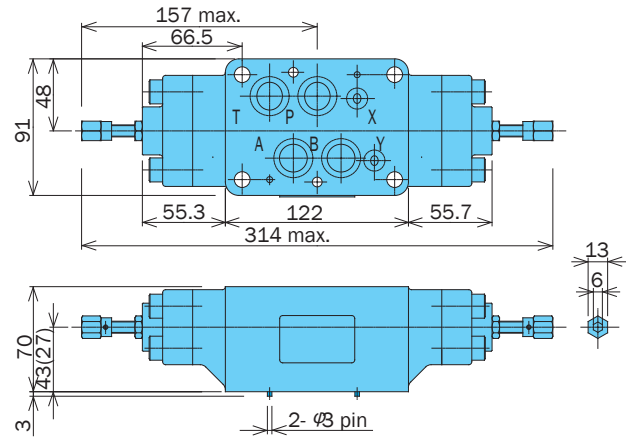
Note:  
Dimensions in the parentheses are for the OCY-G03-A-X-J51.

Note:  
Dimensions in the parentheses are for the OCY-G03-B-X-J51.

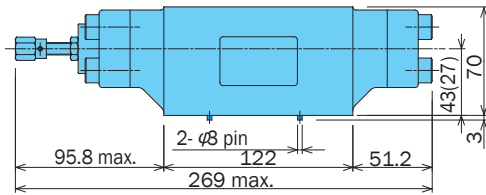
OYH-G04-P-10



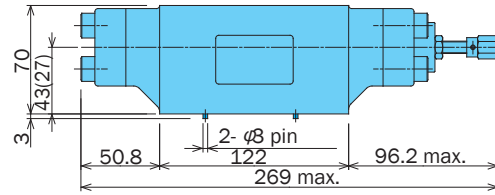
OYH-G04-W-X-Y-10



OYH-G04-A-X-Y-10



OYH-G04-B-X-Y-10



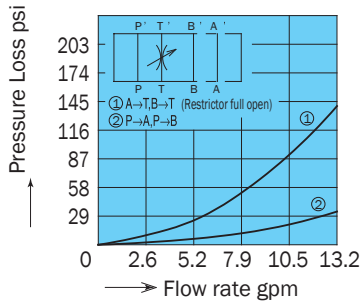
Note: Dimensions in the parentheses are for the OYH-G04-\*X-10.

# Performance Curves

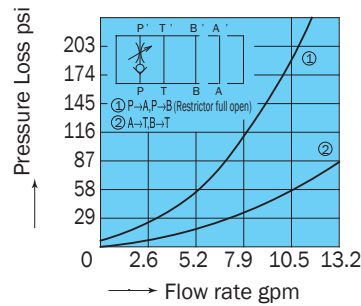
Hydraulic Operating Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics

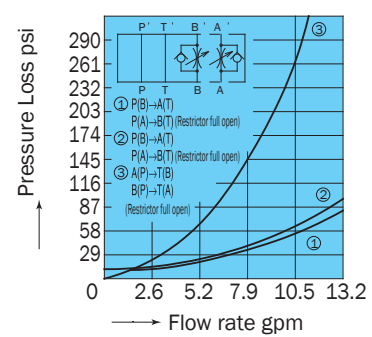
OY-G01-T-20



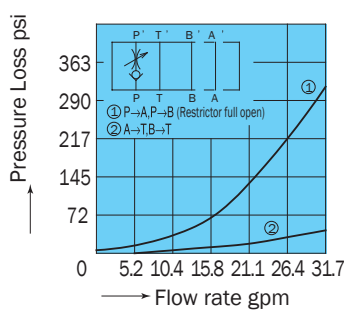
OCY-G01-P-20



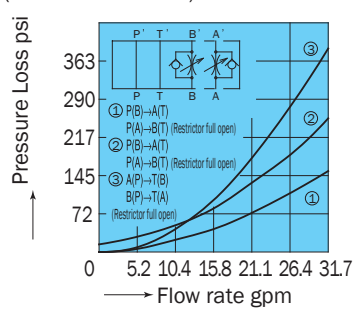
OCY-G01-W-Y-20  
(OCY-G01-W-X-20)



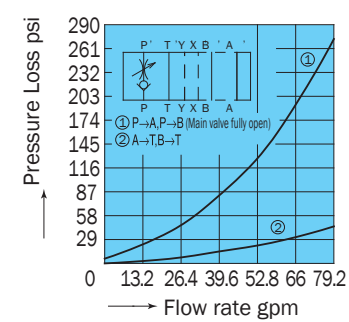
OCY-G03-P-J50



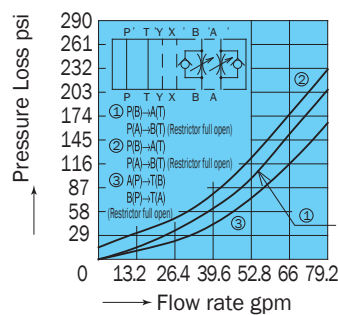
OCY-G03-W-Y-J51  
(OCY-G03-W-X-J51)



OYH-G04-P-10

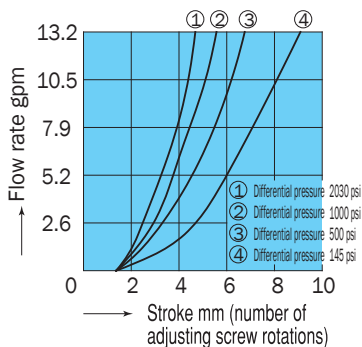


OYH-G04-W-Y-10  
(OYH-G04-W-X-10)

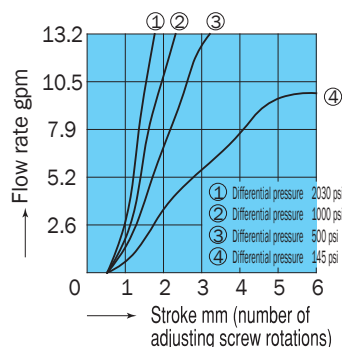


## Stroke -- Flow Rate Characteristics

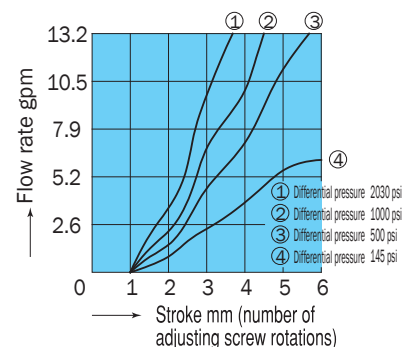
OY-G01-T-20



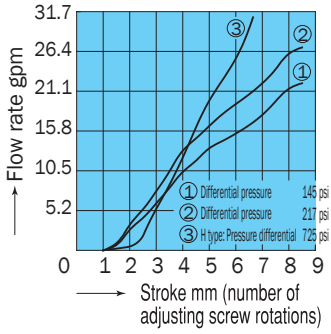
OCY-G01-P-20



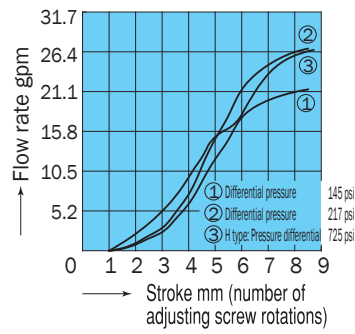
OCY-G01-\*-\*-20



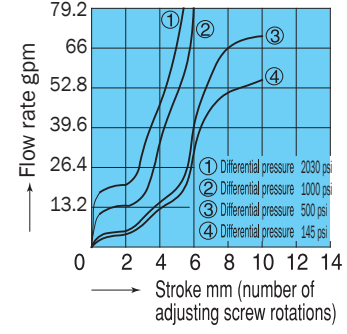
OCY-G03-P-(H)-J50



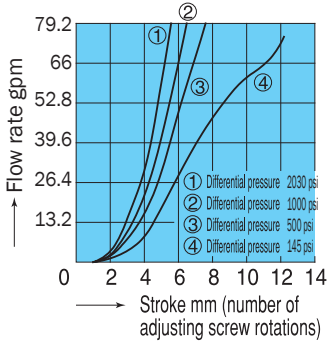
OCY-G03-W-(H)Y-J51



OYH-G04-P-10

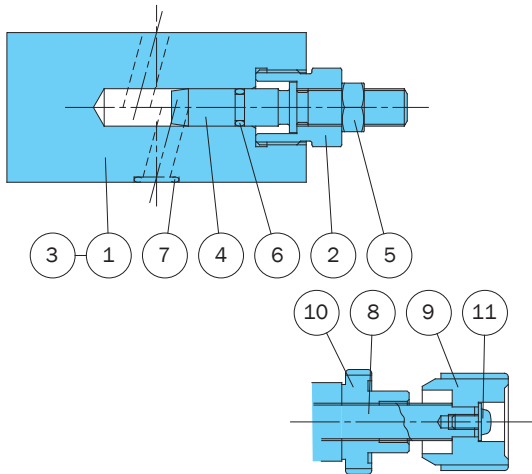


OYH-G04-W-Y-10



## Cross-sectional Drawing

OY-G01-T-20



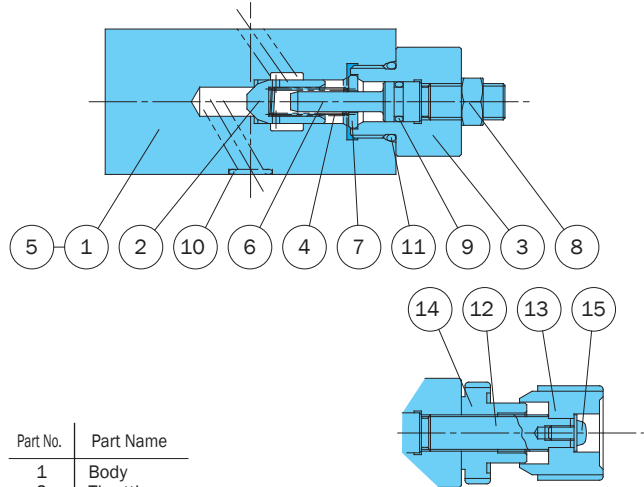
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Retainer  |
| 3        | Plate     |
| 4        | Screw     |
| 5        | Nut       |
| 6        | O-ring    |
| 7        | O-ring    |
| 8        | Screw     |
| 9        | Knob      |
| 10       | Nut       |
| 11       | Screw     |

Seal Part List (Kit Model Number BFBS-01YT)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
|          |           |             | T    |
| 6        | O-ring    | 1B-P7       | 1    |
| 7        | O-ring    | 1B-P9       | 4    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

OCY-G01-P-20



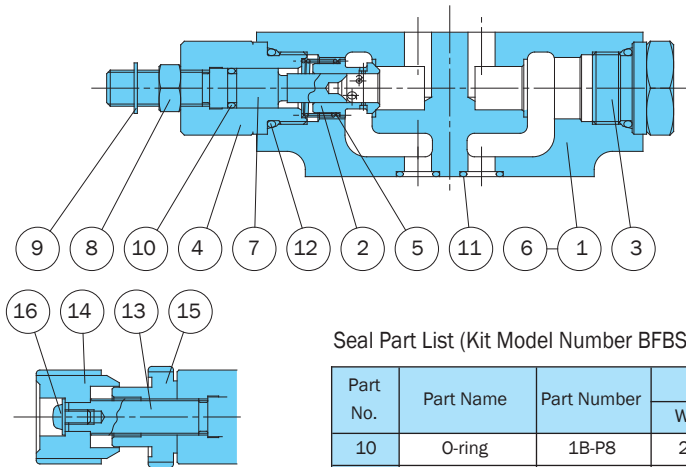
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Throttle  |
| 3        | Retainer  |
| 4        | Spring    |
| 5        | Plate     |
| 6        | Screw     |
| 7        | Ring      |
| 8        | Nut       |
| 9        | O-ring    |
| 10       | O-ring    |
| 11       | O-ring    |
| 12       | Screw     |
| 13       | Knob      |
| 14       | Nut       |
| 15       | Screw     |

Seal Part List (Kit Model Number BFBS-01CYP)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
|          |           |             | T    |
| 9        | O-ring    | 1B-P8       | 1    |
| 10       | O-ring    | 1B-P9       | 4    |
| 11       | O-ring    | 1B-P18      | 1    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

OCY-G01-A-Y-20



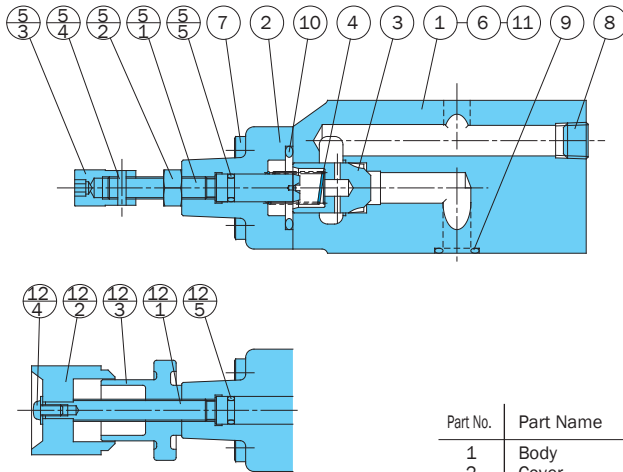
Seal Part List (Kit Model Number BFBS-01CY\*)

| Part No. | Part Name | Part Number | Q'ty |   |   |
|----------|-----------|-------------|------|---|---|
|          |           |             | W    | A | B |
| 10       | O-ring    | 1B-P8       | 2    | 1 | 1 |
| 11       | O-ring    | 1B-P9       | 4    | 4 | 4 |
| 12       | O-ring    | 1B-P18      | 2    | 2 | 2 |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify W, A, or B for the asterisk (\*) in the kit model number.

| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Throttle  |
| 3        | Bushing   |
| 4        | Retainer  |
| 5        | Spring    |
| 6        | Plate     |
| 7        | Screw     |
| 8        | Nut       |
| 9        | E-ring    |
| 10       | O-ring    |
| 11       | O-ring    |
| 12       | O-ring    |
| 13       | Screw     |
| 14       | Knob      |
| 15       | Nut       |
| 16       | Screw     |

OCY-G03-P-J50



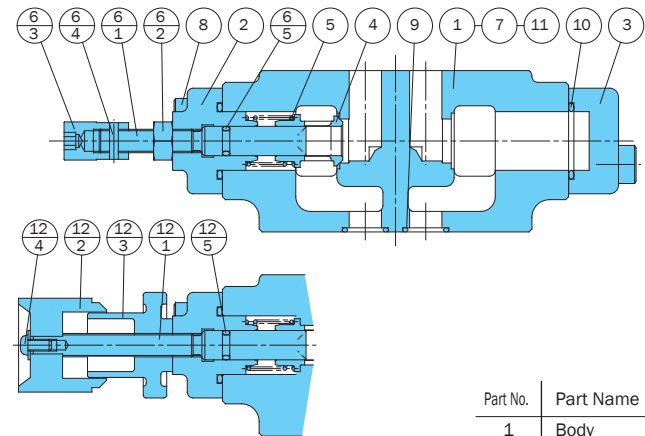
Seal Part List (Kit Model Number BFES-03CYP)

| Part No.            | Part Name | Part Number     | Q'ty |
|---------------------|-----------|-----------------|------|
|                     |           |                 | P    |
| 5(12) <sub>-5</sub> | O-ring    | 1B-P7           | 1    |
| 9                   | O-ring    | AS568-014(Hs90) | 5    |
| 10                  | O-ring    | 1B-P24          | 1    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

| Part No.        | Part Name  |
|-----------------|------------|
| 1               | Body       |
| 2               | Cover      |
| 3               | Throttle   |
| 4               | Spring     |
| 5               | Screw kit  |
| 5 <sub>1</sub>  | Screw      |
| 5 <sub>2</sub>  | Nut        |
| 5 <sub>3</sub>  | Nut        |
| 5 <sub>4</sub>  | Pin        |
| 5 <sub>5</sub>  | O-ring     |
| 6               | Plate      |
| 7               | Screw      |
| 8               | Plug       |
| 9               | O-ring     |
| 10              | O-ring     |
| 11              | Pin        |
| 12              | Handle kit |
| 12 <sub>1</sub> | Screw      |
| 12 <sub>2</sub> | Knob       |
| 12 <sub>3</sub> | Nut        |
| 12 <sub>4</sub> | Screw      |
| 12 <sub>5</sub> | O-ring     |

OCY-G03-A-Y-J51



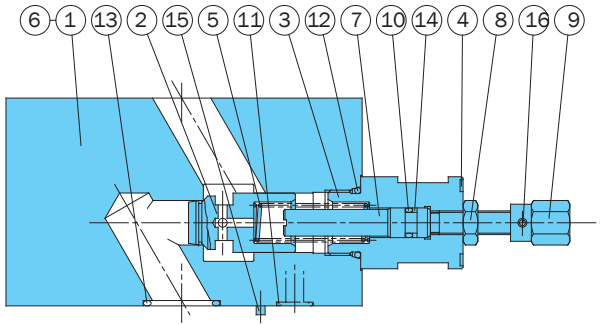
Seal Part List (Kit Model Number BFES-03CY\*)

| Part No.            | Part Name | Part Number     | Q'ty |   |   |
|---------------------|-----------|-----------------|------|---|---|
|                     |           |                 | W    | A | B |
| 6(12) <sub>-5</sub> | O-ring    | 1B-P7           | 2    | 1 | 1 |
| 9                   | O-ring    | AS568-014(Hs90) | 5    | 5 | 5 |
| 10                  | O-ring    | 1B-P22          | 2    | 2 | 2 |

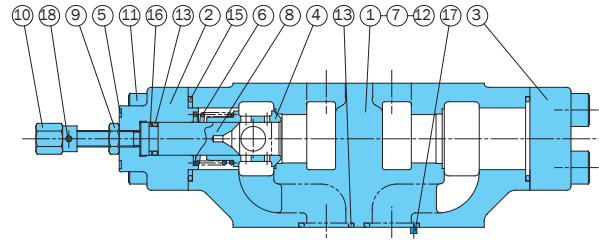
Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify W, A, or B for the asterisk (\*) in the kit model number.

| Part No.        | Part Name  |
|-----------------|------------|
| 1               | Body       |
| 2               | Cover      |
| 3               | Cover      |
| 4               | Throttle   |
| 5               | Spring     |
| 6               | Screw kit  |
| 6 <sub>1</sub>  | Screw      |
| 6 <sub>2</sub>  | Nut        |
| 6 <sub>3</sub>  | Nut        |
| 6 <sub>4</sub>  | Pin        |
| 6 <sub>5</sub>  | O-ring     |
| 7               | Plate      |
| 8               | Screw      |
| 9               | O-ring     |
| 10              | O-ring     |
| 11              | Pin        |
| 12              | Handle kit |
| 12 <sub>1</sub> | Screw      |
| 12 <sub>2</sub> | Knob       |
| 12 <sub>3</sub> | Nut        |
| 12 <sub>4</sub> | Screw      |
| 12 <sub>5</sub> | O-ring     |

OYH-G04-P-10



OYH-G04-A-Y-10



**Seal Part List**  
(Kit Model Number BFKS-04CYP)

| Part No. | Part Name   | Part Number     | Q'ty |  |
|----------|-------------|-----------------|------|--|
|          |             |                 | P    |  |
| 10       | O-ring      | 1B-P7           | 1    |  |
| 11       | O-ring      | AS568-012(Hs90) | 2    |  |
| 12       | O-ring      | 1B-P20          | 1    |  |
| 13       | O-ring      | AS568-118(Hs90) | 4    |  |
| 14       | Backup ring | T2-P7           | 1    |  |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Backup ring indicates JIS B 2407-T2-\*\*.

| Part No. | Part Name         |
|----------|-------------------|
| 1        | Body              |
| 2        | Throttle Retainer |
| 3        | Plate             |
| 4        | Spring            |
| 5        | Plate             |
| 6        | Screw             |
| 7        | Nut               |
| 8        | Nut               |
| 9        | O-ring            |
| 10       | O-ring            |
| 11       | O-ring            |
| 12       | O-ring            |
| 13       | O-ring            |
| 14       | Backup ring       |
| 15       | Pin               |
| 16       | Pin               |

**Seal Part List**  
(Kit Model Number BFKS-04CY\*)

| Part No. | Part Name   | Part Number      | Q'ty |   |   |
|----------|-------------|------------------|------|---|---|
|          |             |                  | W    | A | B |
| 12       | O-ring      | AS568-012 (Hs90) | 2    | 2 | 2 |
| 13       | O-ring      | 1A-P12           | 2    | 1 | 1 |
| 14       | O-ring      | AS568-118 (Hs90) | 4    | 4 | 4 |
| 15       | O-ring      | AS568-127 (Hs90) | 2    | 2 | 2 |
| 16       | Backup ring | T2-P12           | 2    | 1 | 1 |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Backup ring indicates JIS B 2407-T2-\*\*.  
3. Specify W, A, or B for the asterisk (\*) in the kit model number.

| Part No. | Part Name      |
|----------|----------------|
| 1        | Body           |
| 2        | Cover          |
| 3        | Cover          |
| 4        | Throttle Plate |
| 5        | Spring         |
| 6        | Plate          |
| 7        | Screw          |
| 8        | Nut            |
| 9        | Nut            |
| 10       | O-ring         |
| 11       | O-ring         |
| 12       | O-ring         |
| 13       | O-ring         |
| 14       | O-ring         |
| 15       | O-ring         |
| 16       | Backup ring    |
| 17       | Pin            |
| 18       | Pin            |



### Flow Control Modular Valve (Pressure and temperature compensated)

5.2 to 52.8 gpm  
3045, 3625, 5075 psi

#### Features

This modular valve is used to control actuator speed and for other flow control valve applications. A wide range of models are available for A and B port control, A or B port control, and

P port control. A pressure compensation mechanism ensures that the control flow rate does not change, even when there is pressure fluctuation.

The control flow rate remains stable, even when fluid temperature changes. Maximum Operating Pressure: 3045, 3625, 5075 psi

#### Specifications

| Model No.                         | Nominal Diameter (Size) | Maximum Working Pressure psi | Control Flow Rate gpm  | Check Valve Cracking pressure psi | Weight lbs | Gasket Surface Dimensions |      |      |
|-----------------------------------|-------------------------|------------------------------|--|-----------------------------------|------------|---------------------------|------|------|
| OF-G01-P20-20                     | 1/8                     | 3045                         | .02 to 5.2(differential pressure: 1000 psi)<br>.07 to 5.2(differential pressure: 3045 psi)   | --                                | 2.6        | ISO 4401-03-02-0-94       |      |      |
| OCF-G01-W40-X-30<br>A40<br>B40    |                         |                              |  |                                   |            |                           | .02  | 3.7  |
| OCF-G01-W40-Y-30<br>A40<br>B40    |                         |                              |  |                                   |            |                           | 11.6 | 3.3  |
| OF-G03-P60-J50                    | 3/8                     | 3625                         | .07 to 15.8(differential pressure: 1000 psi)<br>.13 to 15.8(differential pressure: 3625 psi)   | --                                | 6.8        | ISO 4401-05-04-0-94       |      |      |
| OCF-G03-W60-X-J50<br>A60<br>B60   |                         |                              |  |                                   |            |                           | 14.5 | 11   |
| OCF-G03-W60-Y-J50<br>A60<br>B60   |                         |                              |  |                                   |            |                           | 14.5 | 10.1 |
| OFH-G04-W200-X-10<br>A200<br>B200 | 1/2                     | 5075                         | 2.6 to 52.8(differential pressure: 3045 psi)<br>3.9 to 52.8(differential pressure: 3625 psi)<br>5.2 to 52.8(differential pressure: 5075 psi) | 14.5                              | 24.4       | ISO 4401-07-06-0-94       |      |      |
| OFH-G04-W200-Y-10<br>A200<br>B200 |                         |                              |  |                                   |            |                           | 22.4 |      |
|                                   |                         |                              |  |                                   |            |                           | 24.4 | 22.4 |

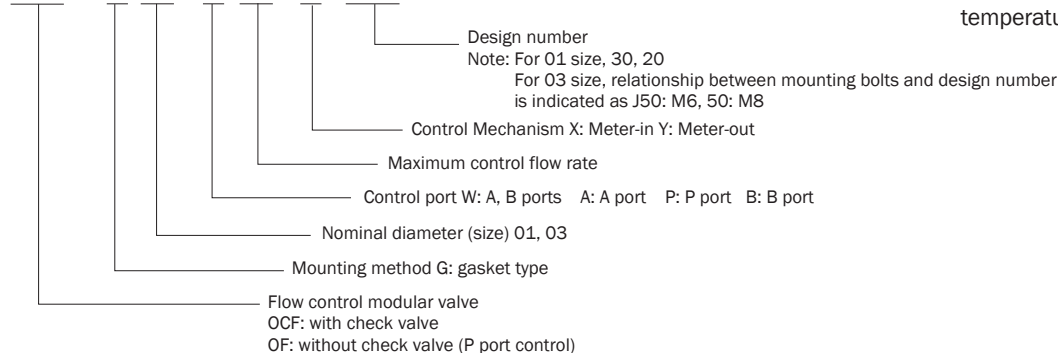
#### • Handling

- For flow rate control, make sure that the pressure differential between the input port and output port is at least 145 psi. See the Flow Rate - Minimum Differential Pressure Characteristics for information about the OCF-G01 and OFF-G04 maximum control flow rate.
- The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control knob.
- Pressure rate control knob rotation resistance will increase as the pressure increases. However, do not use a spanner or other tool that fits around the knob to turn it. Instead, insert a 5mm hex spanner into the hex hole in the center of the knob and rotate it that way.
- After adjusting the flow rate, fix it in place by turning the lock screw on the end of the knob to the right.
- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.
- O4 series modular valves do not have an L (DR2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).
- Flow rate fluctuation is  $\pm 5\%$  within the temperature range of 68°F to 140°F.

#### Understanding Model Numbers

01, 03 size

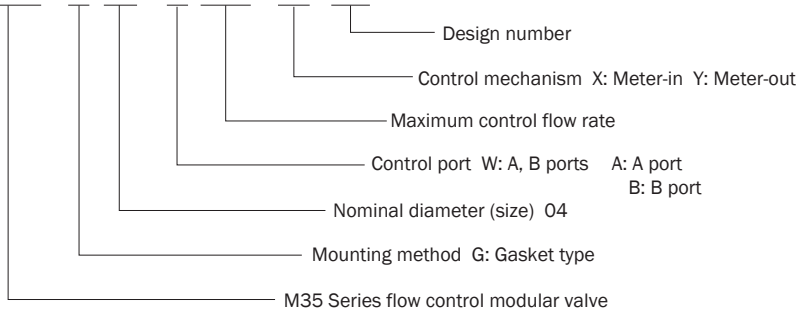
**OCF - G 03 - W 60 - Y - J50**



# Understanding Model Numbers

04 size

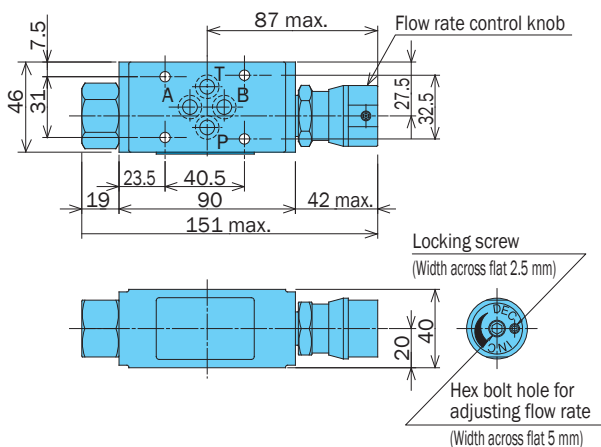
**OFH - G 04 - W 200 - Y - 10**



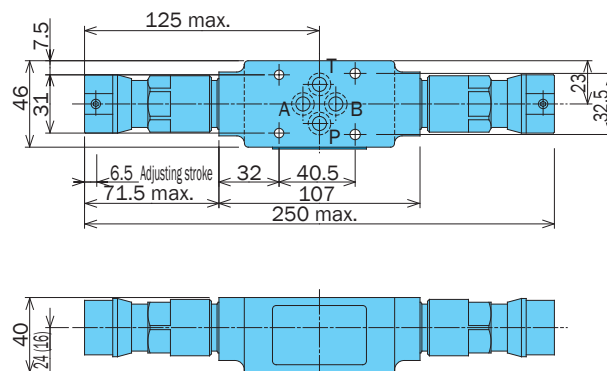
# Installation Dimension Drawings

Note: The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control knob.

OF-G01-P20-20

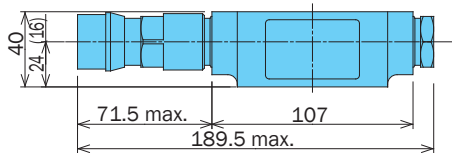


OCF-G01-W40-X/Y-30



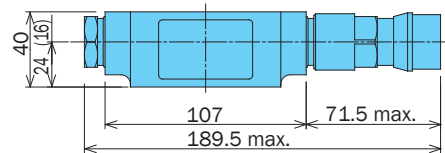
Note: Dimensions in the parentheses are for the OCF-G01-W40-X-30.

OCF-G01-A40-X/Y-30



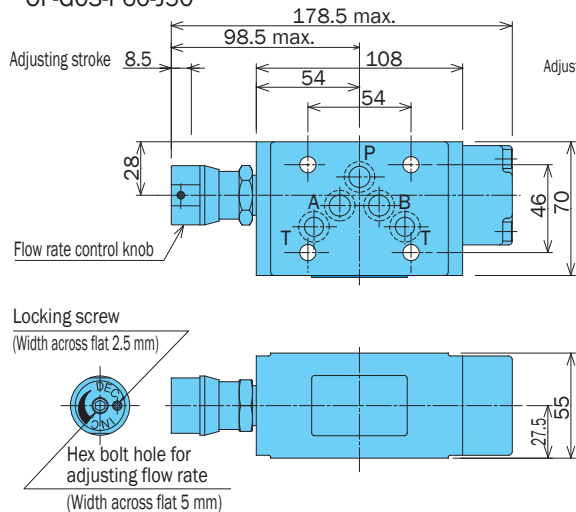
Note: Dimensions in the parentheses are for the OCF-G01-A40-X-30.

OCF-G01-B40-X/Y-30

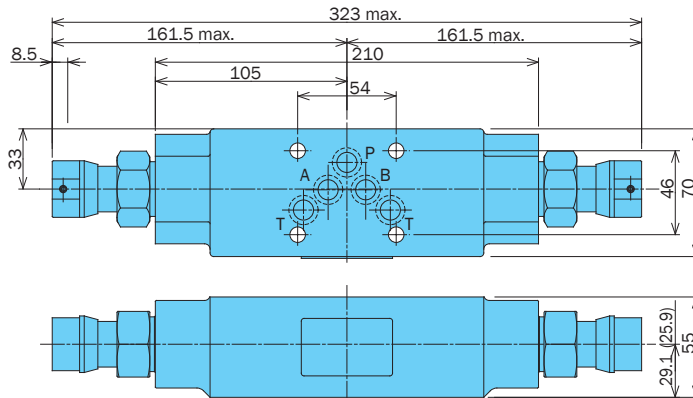


Note: Dimensions in the parentheses are for the OCF-G01-B40-X-30.

OF-G03-P60-J50



OCF-G03-W60-X/Y-J50

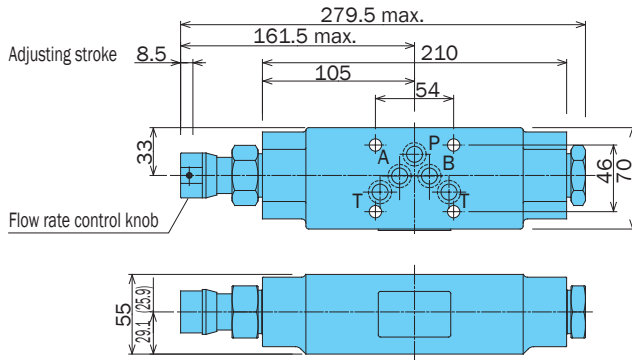


Note: Dimensions in the parentheses are for the OCF-G03-W60-X-J50.

Modular Valves

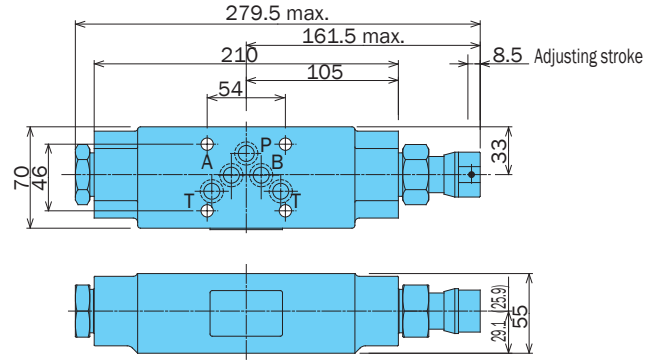


OCF-G03-A60-X/Y-J50



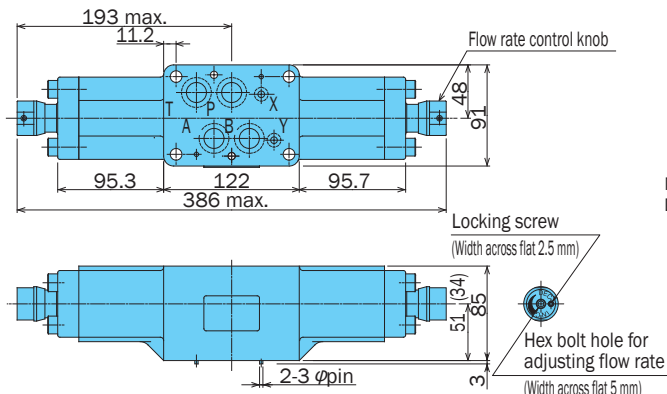
Note:  
Dimensions in the parentheses are for the OCF-G03-A60-X-J50.

OCF-G03-B60-X/Y-J50



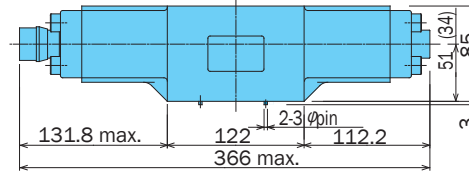
Note:  
Dimensions in the parentheses are for the OCF-G03-B60-X-J50.

OFH-G04-W200-X/Y-10



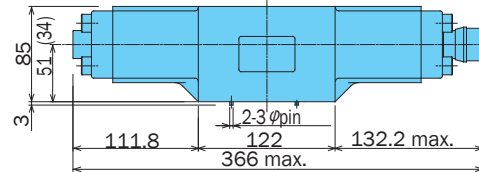
Note:  
Dimensions in the parentheses are for the OFH-G04-W200-X-10.

OFH-G04-A200-X/Y-10



Note:  
Dimensions in the parentheses are for the OCF-G04-A200-X-10

OFH-G04-B200-X/Y-10



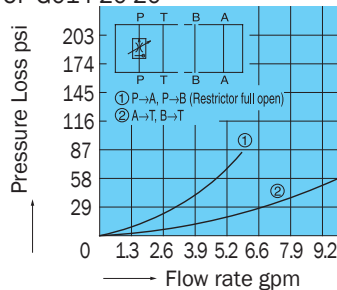
Note:  
Dimensions in the parentheses are for the OFH-G04-B200-X-10.

## Performance Curves

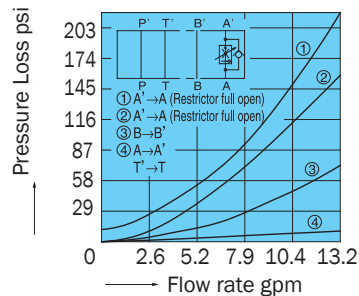
Hydraulic Operating Fluid Viscosity 32 centistokes

### Pressure Loss Characteristics

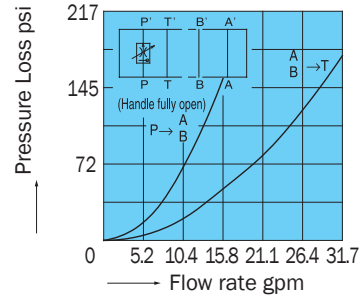
OF-G01-P20-20



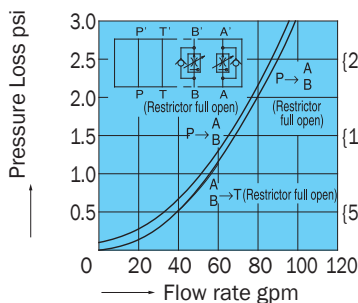
OCF-G01-A40-Y-30



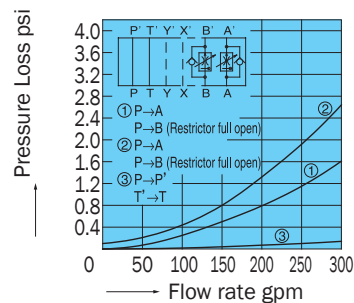
OF-G03-P60-J50



OCF-G03-W60-Y-J50

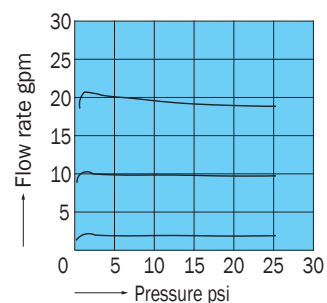


OFH-G04-W200-Y-10

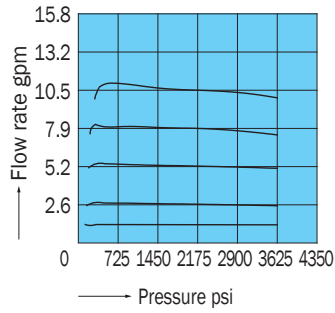


### Pressure - Control Flow Rate Characteristics

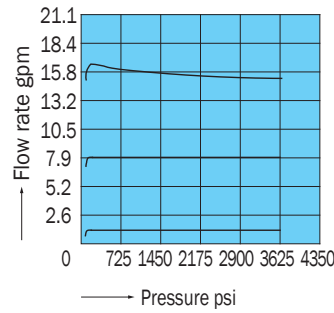
OF-G01-P20-20



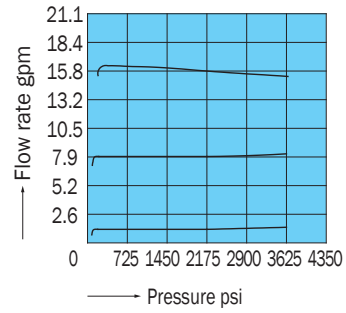
OCF-G01-\*40-\*30



OF-G03-P60-J50

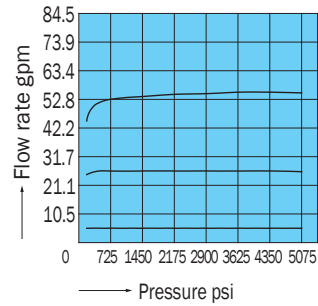


OCF-G03-W60-\*J50

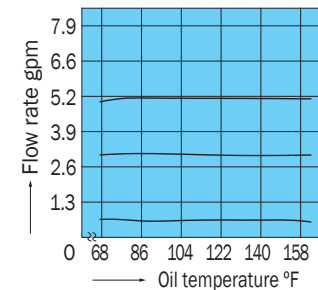


Fluid Temperature - Control Flow Rate Characteristics

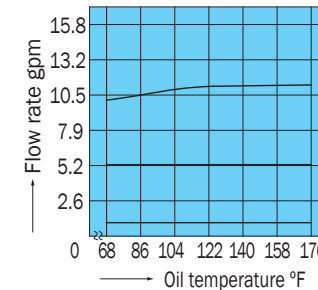
OFH-G04-W200-\*10



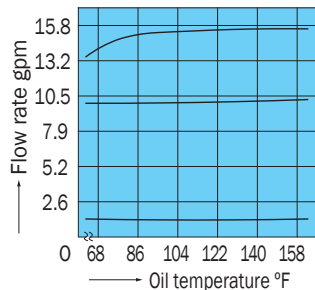
OF-G01-P20-20



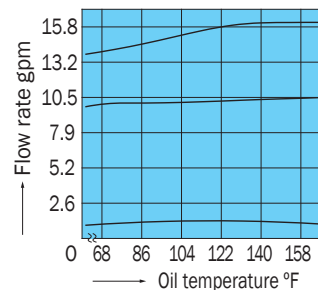
OCF-G01-\*40-\*30



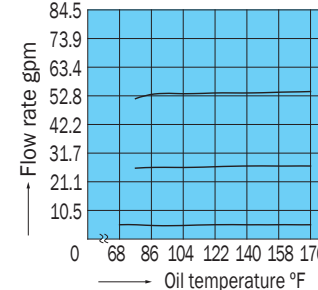
OF-G03-P60-J50



OCF-G03-W60-\*J50

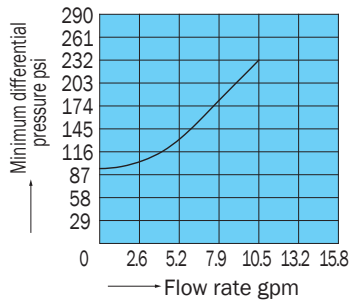


OFH-G04-W200-\*10

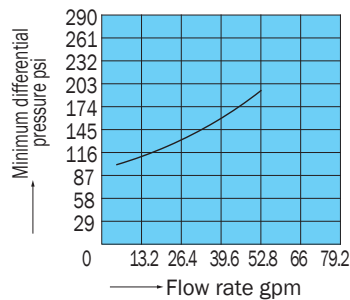


Flow Rate - Minimum Differential Pressure Characteristics

OCF-G01-\*40-\*30

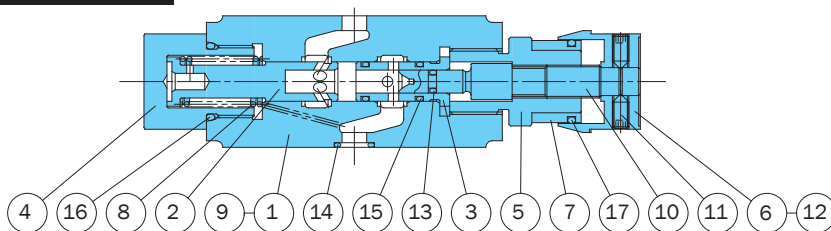


OFH-G04-W200-Y-10



### Cross-sectional Drawing

OF-G01-P20-20



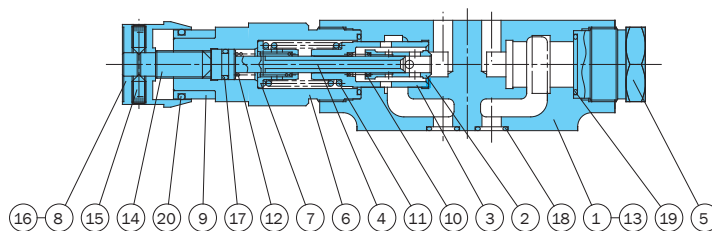
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Piston    |
| 3        | Sleeve    |
| 4        | Bushing   |
| 5        | Retainer  |
| 6        | Knob      |
| 7        | Dial      |
| 8        | Spring    |
| 9        | Plate     |
| 10       | Screw     |
| 11       | Screw     |
| 12       | Screw     |
| 13       | O-ring    |
| 14       | O-ring    |
| 15       | O-ring    |
| 16       | O-ring    |
| 17       | O-ring    |

Seal Part List (Kit Model Number BFBS-01FP)

| Part No. | Part Name | Part Number | Q'ty |   |
|----------|-----------|-------------|------|---|
|          |           |             | W    | P |
| 13       | O-ring    | 1B-P4       | 1    | 1 |
| 14       | O-ring    | 1B-P9       | 4    | 4 |
| 15       | O-ring    | 1B-P9       | 2    | 2 |
| 16       | O-ring    | 1B-P20      | 1    | 1 |
| 17       | O-ring    | 1A-P21      | 1    | 1 |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

OCF-G01-A40-Y-30



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Throttle  |
| 3        | Piston    |
| 4        | Rod       |
| 5        | Bushing   |
| 6        | Retainer  |
| 7        | Guide     |
| 8        | Knob      |
| 9        | Dial      |
| 10       | Spring    |
| 11       | Spring    |
| 12       | Spring    |
| 13       | Plate     |
| 14       | Screw     |
| 15       | Screw     |
| 16       | Screw     |
| 17       | O-ring    |
| 18       | O-ring    |
| 19       | O-ring    |
| 20       | O-ring    |

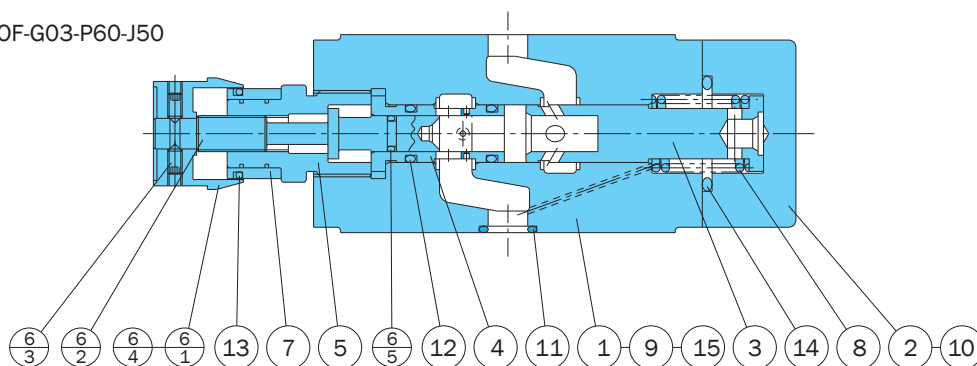
Seal Part List (Kit Model Number BFCS-01CF\*)

| Part No. | Part Name | Part Number     | Q'ty |   |   |
|----------|-----------|-----------------|------|---|---|
|          |           |                 | W    | A | B |
| 17       | O-ring    | 1A-P8           | 2    | 1 | 1 |
| 18       | O-ring    | 1B-P9           | 4    | 4 | 4 |
| 19       | O-ring    | AS568-018(Hs90) | 2    | 2 | 2 |
| 20       | O-ring    | 1A-P21          | 1    | 1 | 1 |

Note:

- O-ring 1A/B-\*\* refers to JIS B2401-1A/B.
- Specify W, A, or B for the asterisk (\*) in the kit model number.

OF-G03-P60-J50

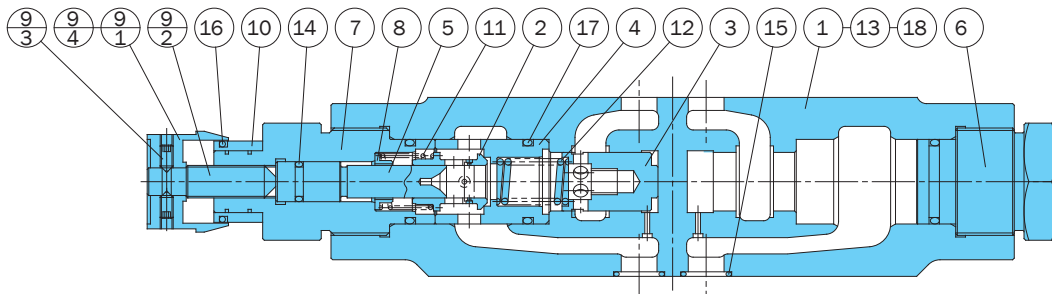


| Part No.       | Part Name |
|----------------|-----------|
| 1              | Body      |
| 2              | Cover     |
| 3              | Piston    |
| 4              | Sleeve    |
| 5              | Retainer  |
| 6              | Screw kit |
| 6 <sub>1</sub> | Knob      |
| 6 <sub>2</sub> | Screw     |
| 6 <sub>3</sub> | Screw     |
| 6 <sub>4</sub> | Screw     |
| 6 <sub>5</sub> | O-ring    |
| 7              | Dial      |
| 8              | Spring    |
| 9              | Plate     |
| 10             | Screw     |
| 11             | O-ring    |
| 12             | O-ring    |
| 13             | O-ring    |
| 14             | O-ring    |
| 15             | Pin       |

Seal Part List (Kit Model Number BFES-03FP)

| Part No.       | Part Name | Part Number     | Q'ty |    |
|----------------|-----------|-----------------|------|----|
|                |           |                 | W    | PC |
| 6 <sub>5</sub> | O-ring    | 1A-P7           | 1    | 1  |
| 11             | O-ring    | AS568-014(Hs90) | 5    | 5  |
| 12             | O-ring    | 1B-P12          | 2    | 2  |
| 13             | O-ring    | 1A-P21          | 1    | 1  |
| 14             | O-ring    | 1B-P26          | 1    | 1  |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

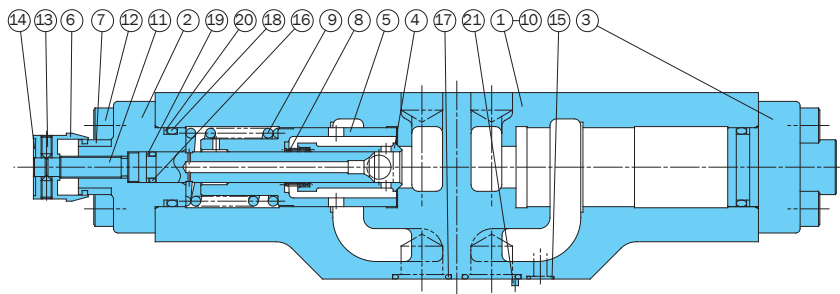


| Part No.       | Part Name |
|----------------|-----------|
| 1              | Body      |
| 2              | Throttle  |
| 3              | Piston    |
| 4              | Sleeve    |
| 5              | Rod       |
| 6              | Bushing   |
| 7              | Retainer  |
| 8              | Guide     |
| 9              | Screw kit |
| 9 <sub>1</sub> | Knob      |
| 9 <sub>2</sub> | Screw     |
| 9 <sub>3</sub> | Screw     |
| 9 <sub>4</sub> | Screw     |
| 10             | Dial      |
| 11             | Spring    |
| 12             | Spring    |
| 13             | Plate     |
| 14             | O-ring    |
| 15             | O-ring    |
| 16             | O-ring    |
| 17             | O-ring    |
| 18             | Pin       |

Seal Part List (Kit Model Number BFES-03CF\*)

| Part No. | Part Name | Part Number     | Q'ty |   |   |
|----------|-----------|-----------------|------|---|---|
|          |           |                 | W    | A | B |
| 14       | O-ring    | 1A-P10          | 2    | 1 | 1 |
| 15       | O-ring    | AS568-014(Hs90) | 5    | 5 | 5 |
| 16       | O-ring    | 1A-P21          | 2    | 1 | 1 |
| 17       | O-ring    | 1B-P22          | 4    | 3 | 3 |

Note:  
 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Specify W, A, or B for the asterisk (\*) in the kit model number.



| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Cover       |
| 3        | Cover       |
| 4        | Throttle    |
| 5        | Piston      |
| 6        | Knob        |
| 7        | Dial        |
| 8        | Spring      |
| 9        | Spring      |
| 10       | Plate       |
| 11       | Screw       |
| 12       | Screw       |
| 13       | Screw       |
| 14       | Screw       |
| 15       | O-ring      |
| 16       | O-ring      |
| 17       | O-ring      |
| 18       | O-ring      |
| 19       | Backup ring |
| 20       | Backup ring |
| 21       | Pin         |

Seal Part List (Kit Model Number BFKS-04CF\*)

| Part No. | Part Name   | Part Number     | Q'ty |   |   |
|----------|-------------|-----------------|------|---|---|
|          |             |                 | W    | A | B |
| 15       | O-ring      | AS568-012(Hs90) | 2    | 2 | 2 |
| 16       | O-ring      | 1B-P10A         | 2    | 1 | 1 |
| 17       | O-ring      | AS568-118(Hs90) | 4    | 4 | 4 |
| 18       | O-ring      | 1B-P30          | 2    | 2 | 2 |
| 19       | Backup ring | T2-P10A         | 2    | 1 | 1 |
| 20       | Backup ring | T2-P30          | 2    | 2 | 2 |

Note:  
 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Backup ring indicates JIS B 2407-T2-\*\*.  
 3. Specify W, A, or B for the asterisk (\*) in the kit model number.



### Check Modular Valve

13.2 to 79.2 gpm  
3625, 5075 psi

#### Features

This modular valve is a check valve that prevents reverse-flow.

The 01, 03, 04 sizes include types that can also be used as suction and differential circuits.

Maximum Operating Pressure: 3625, 5075 psi

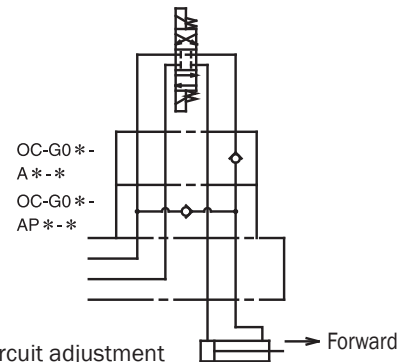
#### Specifications

| Model No.                    | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Cracking pressure psi | Weight lbs | Gasket Surface Dimensions |                     |                     |
|------------------------------|-------------------------|------------------------------|-----------------------|-----------------------|------------|---------------------------|---------------------|---------------------|
| OC-G01-P1-20<br>P2<br>P3     | 1/8                     | 3625                         | 13.2                  | 5.8                   | 2.2        | ISO 4401-03-02-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OC-G01-T1-20<br>T2<br>T3     | 1/8                     | 3625                         | 13.2                  | 5.8                   | 2.2        | ISO 4401-03-02-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OC-G01-A1-21<br>A2<br>A3     | 1/8                     | 3625                         | 13.2                  | 5.8                   | 2.6        | ISO 4401-03-02-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OC-G01-AP1-20<br>AP2<br>AP3  | 1/8                     | 3625                         | 13.2                  | 5.8                   | 2.2        | ISO 4401-03-02-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 2.1                          |                         |                              |                       | 2.2                   |            |                           | ISO 4401-03-02-0-94 |                     |
| OCV-G01-W-20                 |                         |                              |                       |                       |            |                           |                     |                     |
| OC-G03-P1-J50<br>P2<br>P3    | 3/8                     | 3625                         | 26.4                  |                       | 5.8        | 5.9                       |                     | ISO 4401-05-04-0-94 |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OC-G03-T1-J50<br>T2<br>T3    | 3/8                     | 3625                         | 26.4                  | 5.8                   | 5.9        | ISO 4401-05-04-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OC-G03-A1-J50<br>A2<br>A3    | 3/8                     | 3625                         | 26.4                  | 5.8                   | 5.9        | ISO 4401-05-04-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OC-G03-AP1-J50<br>AP2<br>AP3 | 3/8                     | 3625                         | 26.4                  | 5.8                   | 5.9        | ISO 4401-05-04-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 2.1                          |                         |                              |                       | 7.7                   |            |                           | ISO 4401-05-04-0-94 |                     |
| OCV-G03-W-J50                |                         |                              |                       |                       |            |                           |                     |                     |
| OC-H04-P1-10<br>P2<br>P3     | 1/2                     | 5075                         | 79.2                  |                       | 5.8        | 9.9                       |                     | ISO 4401-07-06-0-94 |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OCH-G04-T1-10<br>T2<br>T3    | 1/2                     | 5075                         | 79.2                  | 5.8                   | 14.3       | ISO 4401-07-06-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OCH-G04-A1-10<br>A2<br>A3    | 1/2                     | 5075                         | 79.2                  | 5.8                   | 9.9        | ISO 4401-07-06-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 5.8                          |                         |                              |                       |                       |            |                           |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| OCH-G04-AP1-10<br>AP2<br>AP3 | 1/2                     | 5075                         | 79.2                  | 5.8                   | 9.9        | ISO 4401-07-06-0-94       |                     |                     |
| 50.7                         |                         |                              |                       |                       |            |                           |                     |                     |
| 72.5                         |                         |                              |                       |                       |            |                           |                     |                     |
| 1.4                          |                         |                              |                       | 14.3                  |            |                           | ISO 4401-07-06-0-94 |                     |
| OVH-G04-W-10                 |                         |                              |                       |                       |            |                           |                     |                     |

#### • Handling

- Differential circuit can be easily configured at P → B by attaching OC-G\*\*-A\* above the OC-G\*\*-AP\* on the subplate. (See the figure to the right.)
- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.

3 04 series modular valves do not have an L (DR2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

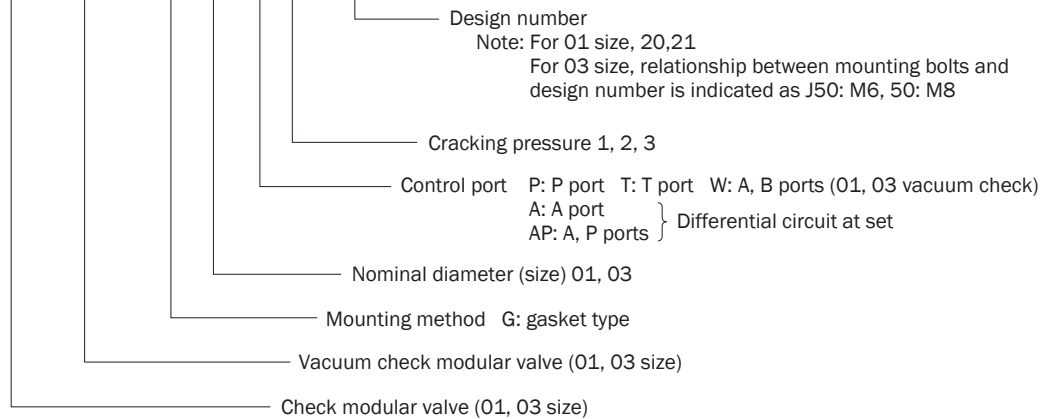


Differential circuit adjustment

## Understanding Model Numbers

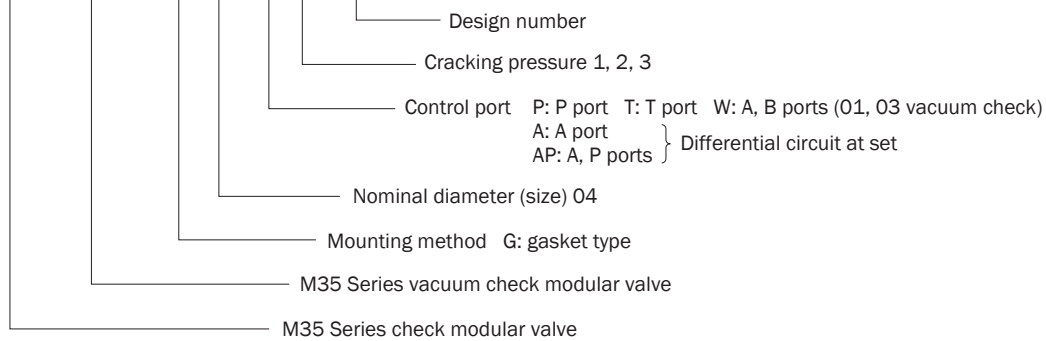
01, 03 size

**OC (OCV) - G 03 - P 1 - J50**

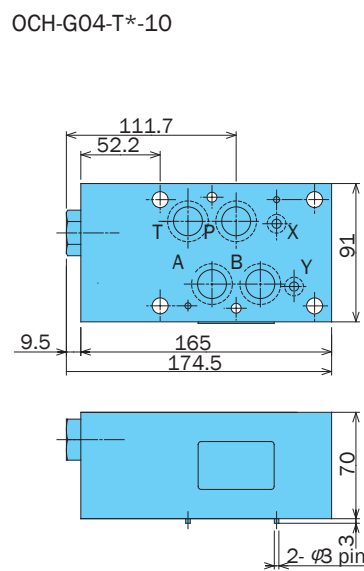
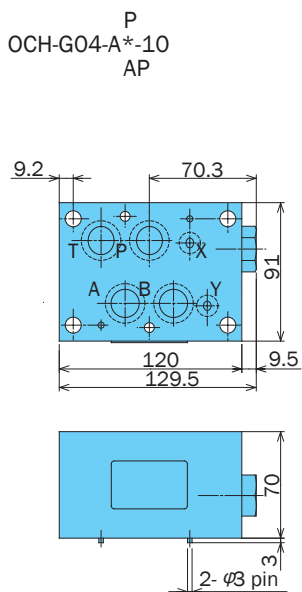
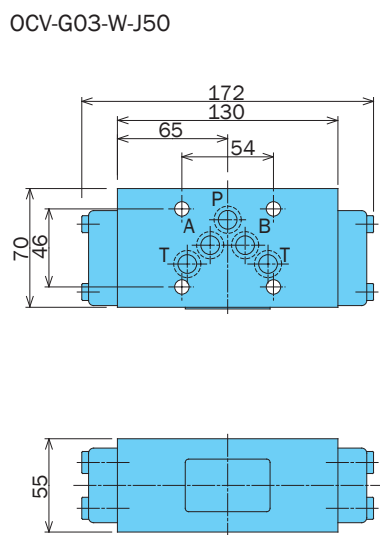
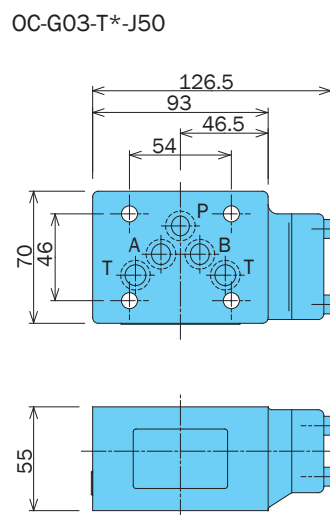
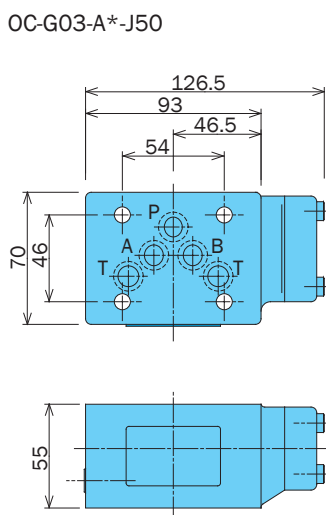
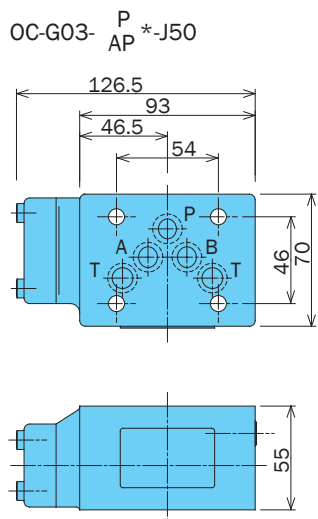
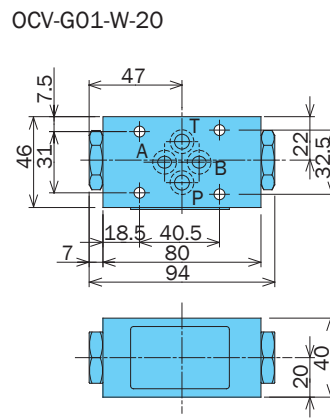
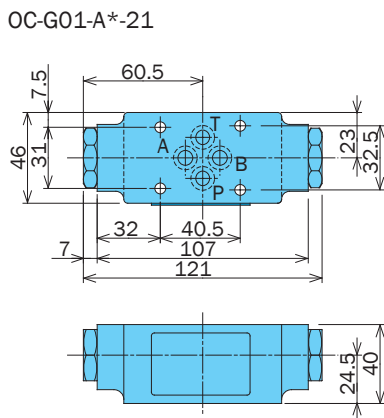
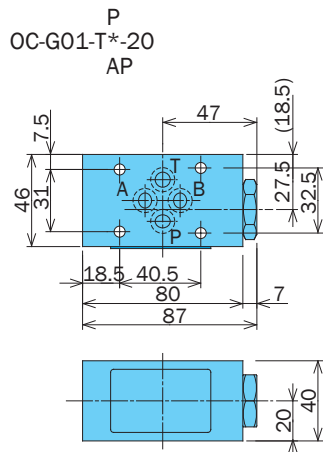


04 size

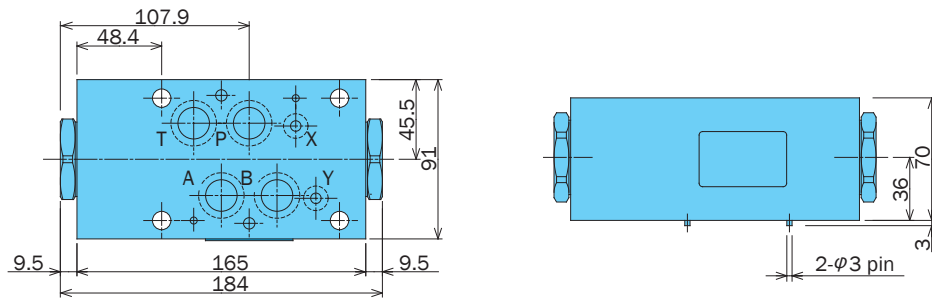
**OCH (OVH) - G 04 - P 1 - 10**



# Installation Dimension Drawing



OVH-G04-W-10

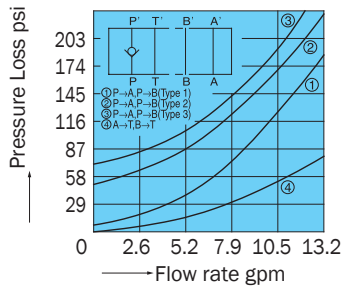


**Performance Curves**

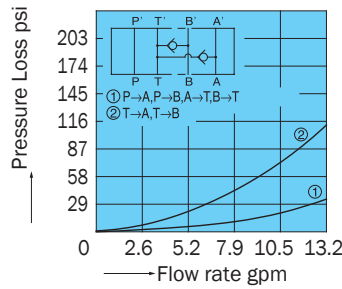
Hydraulic Operating Fluid Viscosity 32 centistokes

Pressure Loss Characteristics

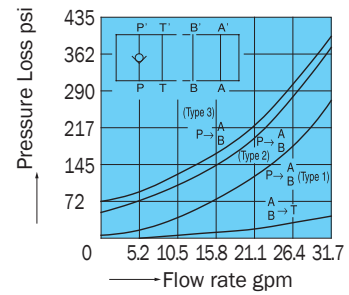
OC-G01-P\*-20



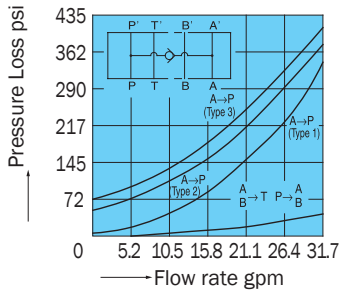
OCV-G01-W-20



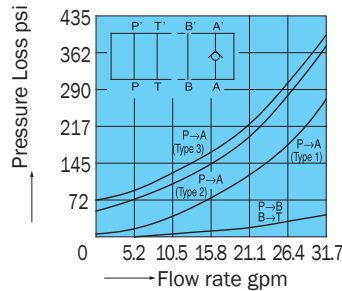
OC-G03-P\*-J50



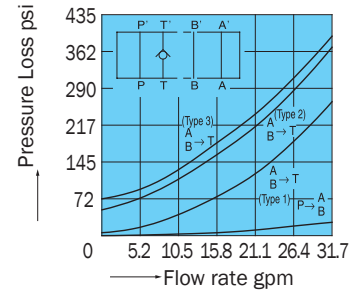
OC-G03-AP\*-J50



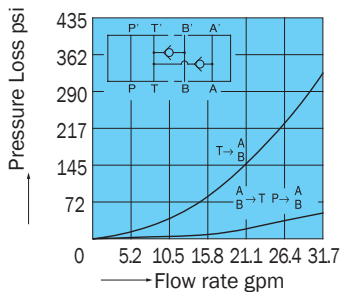
OC-G03-A\*-J50



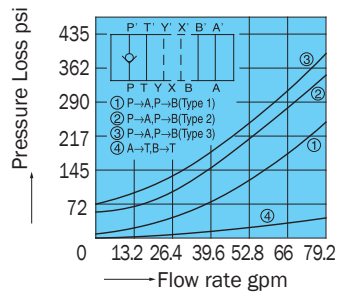
OC-G03-T\*-J50



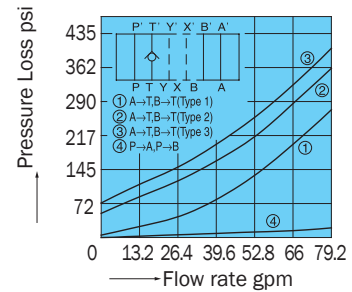
OCV-G03-W-J50



OCH-G04-P\*-10

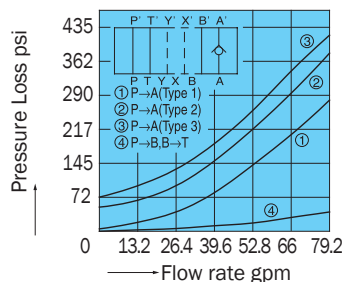


OCH-G04-T\*-10

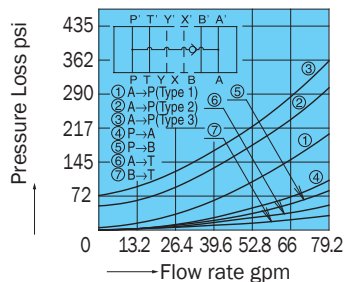




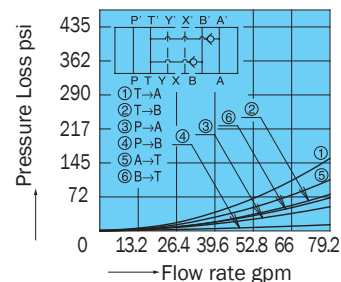
OCH-G04-A\*-10



OCH-G04-AP\*-10

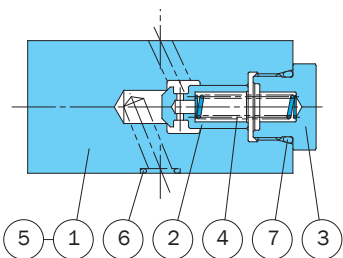


OVH-G04-W-10



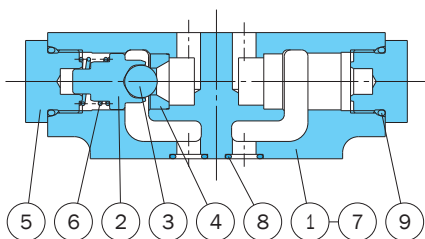
**Cross-sectional Drawing**

P  
OC-G01-T\*-20  
AP



| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Poppet      |
| 3        | Spring seat |
| 4        | Spring      |
| 5        | Plate       |
| 6        | O-ring      |
| 7        | O-ring      |

OC-G01-A\*-21



| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Poppet      |
| 3        | Ball        |
| 4        | Seat        |
| 5        | Spring seat |
| 6        | Spring      |
| 7        | Plate       |
| 8        | O-ring      |
| 9        | O-ring      |

Seal Part List (Kit Model Number BRBS-01C\*)

| Part No. | Part Name | Part Number | Q'ty |   |    |
|----------|-----------|-------------|------|---|----|
|          |           |             | P    | T | AP |
| 6        | O-ring    | 1B-P9       | 4    | 4 | 4  |
| 7        | O-ring    | 1B-P18      | 1    | 1 | 1  |

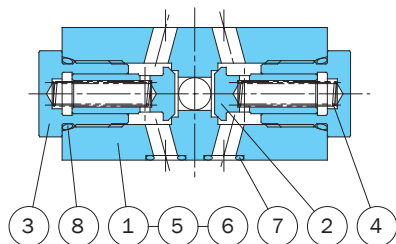
Note:  
1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify P, T, or AP for the asterisk (\*) in the kit model number.

Seal Part List (Kit Model Number BDBS-01CA)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
|          |           |             | A    |
| 8        | O-ring    | 1B-P9       | 4    |
| 9        | O-ring    | 1B-P18      | 2    |

Note:  
O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

OCV-G01-W-20



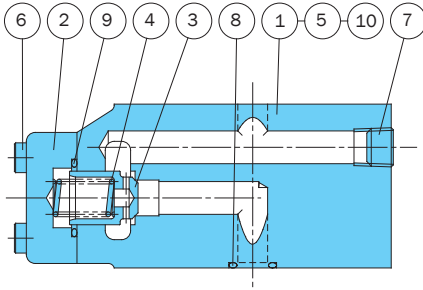
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Poppet    |
| 3        | Guide     |
| 4        | Spring    |
| 5        | Plate     |
| 6        | Plug      |
| 7        | O-ring    |
| 8        | O-ring    |

Seal Part List (Kit Model Number BDBS-01CVW)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
|          |           |             | W    |
| 7        | O-ring    | 1B-P9       | 4    |
| 8        | O-ring    | 1B-P18      | 2    |

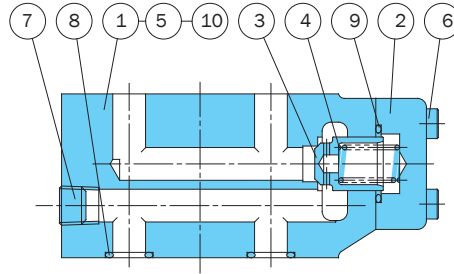
Note:  
1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

OC-G03-P\*-J50



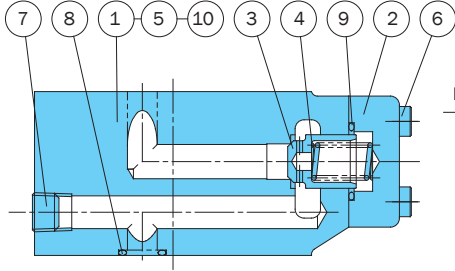
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Poppet    |
| 4        | Spring    |
| 5        | Plate     |
| 6        | Screw     |
| 7        | Plug      |
| 8        | O-ring    |
| 9        | O-ring    |
| 10       | Pin       |

OC-G03-T\*-J50



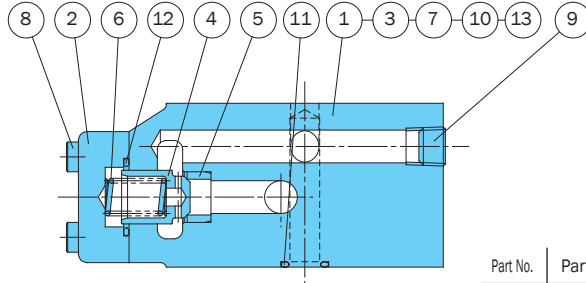
| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Poppet    |
| 4        | Spring    |
| 5        | Plate     |
| 6        | Screw     |
| 7        | Plug      |
| 8        | O-ring    |
| 9        | O-ring    |
| 10       | Pin       |

OC-G03-A\*-J50



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Poppet    |
| 4        | Spring    |
| 5        | Plate     |
| 6        | Screw     |
| 7        | Plug      |
| 8        | O-ring    |
| 9        | O-ring    |
| 10       | Pin       |

OC-G03-AP\*-J50



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Plug      |
| 4        | Poppet    |
| 5        | Seat      |
| 6        | Spring    |
| 7        | Plate     |
| 8        | Screw     |
| 9        | Plug      |
| 10       | O-ring    |
| 11       | O-ring    |
| 12       | O-ring    |
| 13       | Pin       |

Seal Part List (Kit Model Number BDES-03C\*)

| Part No. | Part Name | Part Number     | Q'ty |   |   |
|----------|-----------|-----------------|------|---|---|
|          |           |                 | P    | T | A |
| 8        | O-ring    | AS568-014(Hs90) | 5    | 5 | 5 |
| 9        | O-ring    | 1B-P22          | 1    | 1 | 1 |

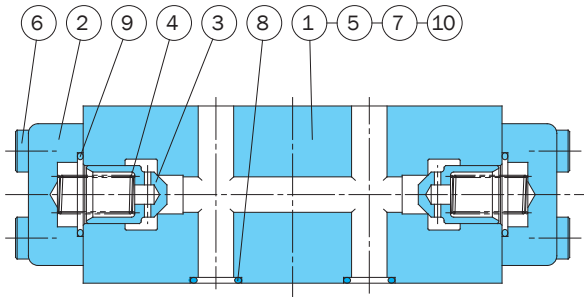
Note:  
 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Specify P, T, or A for the asterisk (\*) in the kit model number.

Seal Part List (Kit Model Number BDES-03CAP)

| Part No. | Part Name | Part Number     | Q'ty |
|----------|-----------|-----------------|------|
|          |           |                 | AP   |
| 10       | O-ring    | 1B-P11          | 1    |
| 11       | O-ring    | AS568-014(Hs90) | 5    |
| 12       | O-ring    | 1B-P22          | 1    |

Note:  
 O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

OCV-G03-W-J50

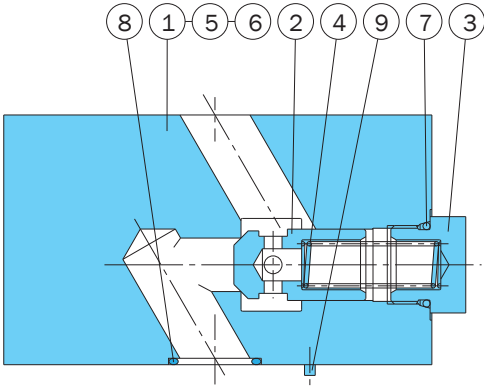


Seal Part List (Kit Model Number BDES-03CVW)

| Part No. | Part Name | Part Number     | Q'ty |
|----------|-----------|-----------------|------|
|          |           |                 | W    |
| 7        | O-ring    | 1B-P10A         | 2    |
| 8        | O-ring    | AS568-014(Hs90) | 5    |
| 9        | O-ring    | 1B-P22          | 2    |

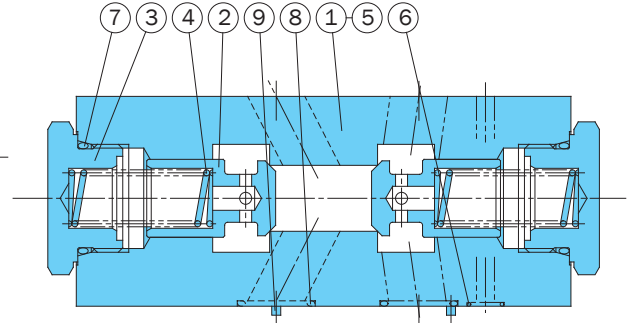
| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-----------|
| 1        | Body      | 5        | Plate     | 9        | O-ring    |
| 2        | Cover     | 6        | Screw     | 10       | Pin       |
| 3        | Poppet    | 7        | O-ring    |          |           |
| 4        | Spring    | 8        | O-ring    |          |           |

OCH-G04-P\*-10



| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Poppet      |
| 3        | Spring seat |
| 4        | Spring      |
| 5        | Plate       |
| 6        | O-ring      |
| 7        | O-ring      |
| 8        | O-ring      |
| 9        | Pin         |

OVH-G04-W-10



| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Poppet      |
| 3        | Spring seat |
| 4        | Spring      |
| 5        | Plate       |
| 6        | O-ring      |
| 7        | O-ring      |
| 8        | O-ring      |
| 9        | Pin         |

Seal Part List (Kit Model Number BDKS-04C\*)

| Part No. | Part Name | Body            | Q'ty |   |   |    |
|----------|-----------|-----------------|------|---|---|----|
|          |           |                 | P    | T | A | AP |
| 6        | O-ring    | AS568-012(Hs90) | 2    | 2 | 2 | 2  |
| 7        | O-ring    | 1B-P20          | 1    | 1 | 1 | 1  |
| 8        | O-ring    | AS568-118(Hs90) | 4    | 4 | 4 | 4  |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
 2. Specify P, T, A, or AP for the asterisk (\*) in the kit model number.

Seal Part List (Kit Model Number BDKS-04CVW)

| Part No. | Part Name | Part Number     | Q'ty |
|----------|-----------|-----------------|------|
| 6        | O-ring    | AS568-012(Hs90) | 2    |
| 7        | O-ring    | 1B-P32          | 2    |
| 8        | O-ring    | AS568-118(Hs90) | 4    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.



### Pilot Operated Check Modular Valve

13.2 to 79.2 gpm  
3625 to 5075 psi

#### Features

This modular valve is used to prevent actuator self-running and to maintain actuator position.

Maximum Operating Pressure: 3625, 5075 psi

#### Specifications

| Model No.           | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Cracking pressure psi | Area Ratio   |                  |                   | Weight lbs | Gasket Surface Dimensions |      |
|---------------------|-------------------------|------------------------------|-----------------------|-----------------------|--------------|------------------|-------------------|------------|---------------------------|------|
|                     |                         |                              |                       |                       | Pilot Piston | Check Valve Seat | Needle Valve Seat |            |                           |      |
| OCP-G01-W1-21 W2    | 1/8                     | 3625                         | 13.2                  | 29                    | 1            | 0.37             | --                | 2.6        | ISO 4401-03-02-0-94       |      |
| OCP-G01-A1-21 A2    |                         |                              |                       | 72                    |              |                  |                   |            |                           |      |
| OCP-G01-B1-21 B2    |                         |                              |                       | 29                    |              |                  |                   |            |                           |      |
| OCP-G01-W1-F-21 W2  |                         |                              |                       | 72                    | 1            | 0.51             | 0.06              |            |                           | 2.6  |
| OCP-G01-A1-F-21 A2  |                         |                              |                       | 29                    |              |                  |                   |            |                           |      |
| OCP-G01-B1-F-21 B2  |                         |                              |                       | 72                    |              |                  |                   |            |                           |      |
| OCP-G03-W1-J50 W2   | 3/8                     | 3625                         | 26.4                  | 29                    | 1            | 0.49             | 0.07              | 7.9        | ISO 4401-05-04-0-94       |      |
| OCP-G03-A1-J50 A2   |                         |                              |                       | 72                    |              |                  |                   |            |                           |      |
| OCP-G03-B1-J50 B2   |                         |                              |                       | 29                    |              |                  |                   |            |                           |      |
| OCP-G03-W1-D-J50 W2 |                         |                              |                       | 72                    | 1            | 0.49             | --                |            |                           | 14.9 |
| OCP-G03-A1-D-J50 A2 |                         |                              |                       | 29                    |              |                  |                   |            |                           |      |
| OCP-G03-B1-D-J50 B2 |                         |                              |                       | 72                    |              |                  |                   |            |                           |      |
| OPH-G04-W1-10 W2    | 1/2                     | 5075                         | 79.2                  | 29                    | 1            | 0.50             | 0.07              | 14.9       | ISO 4401-07-06-0-94       |      |
| OPH-G04-A1-10 A2    |                         |                              |                       | 72                    |              |                  |                   |            |                           |      |
| OPH-G04-B1-10 B2    |                         |                              |                       | 29                    |              |                  |                   |            |                           |      |
| OPH-G04-W1-D-10 W2  |                         |                              |                       | 72                    | 1            | 0.50             | --                |            |                           |      |
| OPH-G04-A1-D-10 A2  |                         |                              |                       | 29                    |              |                  |                   |            |                           |      |
| OPH-G04-B1-D-10 B2  |                         |                              |                       | 72                    |              |                  |                   |            |                           |      |

• Handling

- Note that when the O1 size has the auxiliary symbol "F," tank port back pressure can cause the small valve to open, making it impossible to maintain pressure.
- If tank port back pressure causes the small valve to open and make it impossible to maintain pressure with the

O3, O4 size, use a direct type with auxiliary symbol "D."

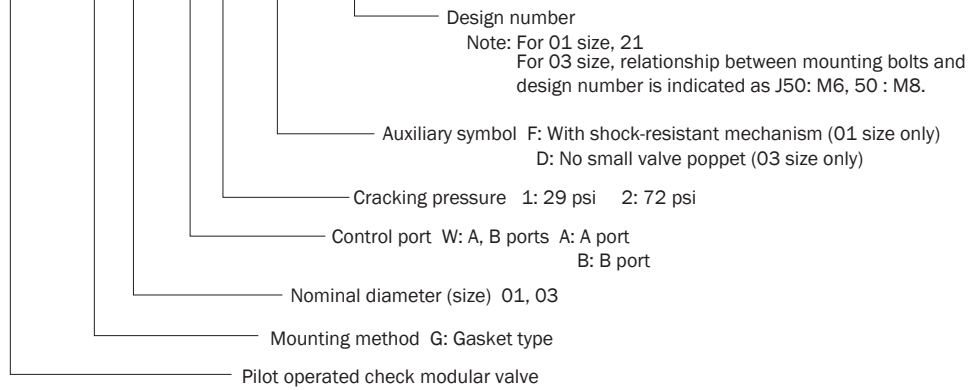
- Minimum pilot pressure fluctuates with the input side pressure during reverse flow. Operate the valve so pressure is at least twice as high as the required pressure obtained using the minimum pilot pressure characteristics graph.

- Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.
- O4 series modular valves do not have an L (DR2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

## Understanding Model Numbers

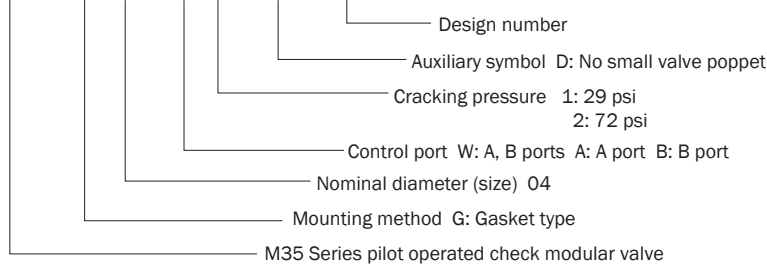
**OCP - G 03 - W 1 - (D) - J50**

01, 03 size



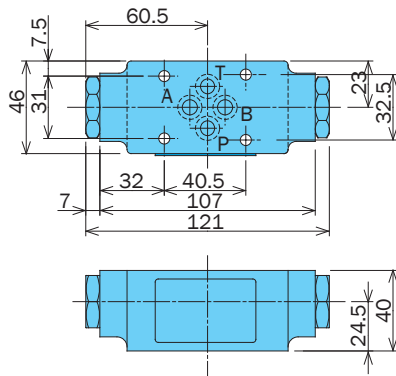
**OPH - G 04 - W 1 - (D) - 10**

04 size

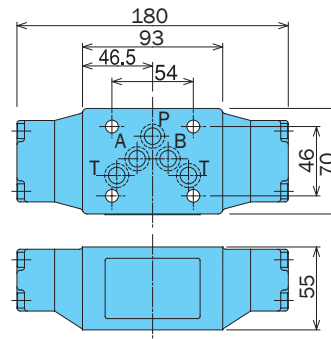


## Installation Dimension Drawings

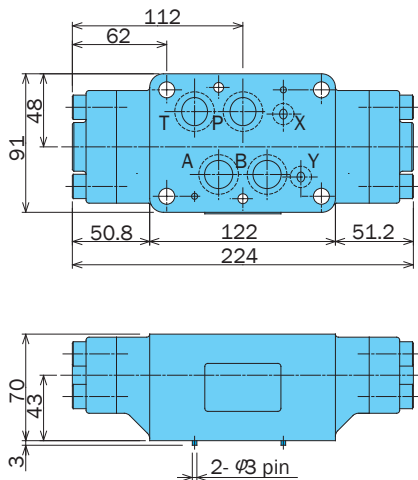
OCP-G01-\*\*-(-F)-21



OCP-G03-\*\*-(-D)-J50



OPH-G04-\*\*-(-D)-10

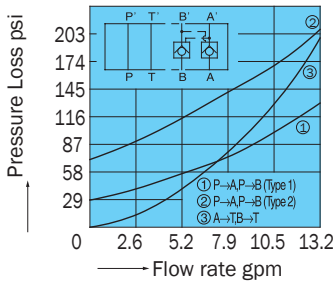


# Specifications

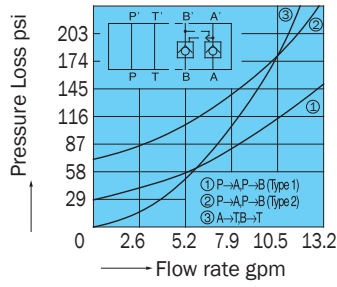
Hydraulic Operating Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics

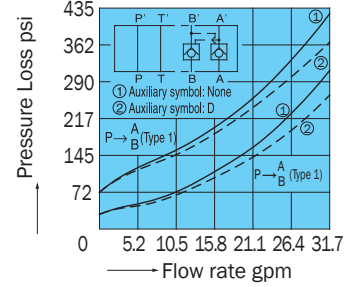
OCP-G01-W\*-21



OCP-G01-W\*-F-21

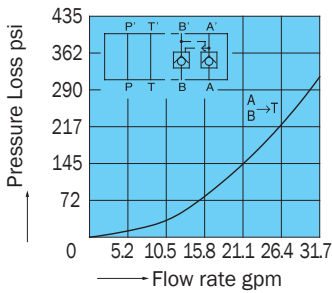


OCP-G03-W\*-(D)-J50

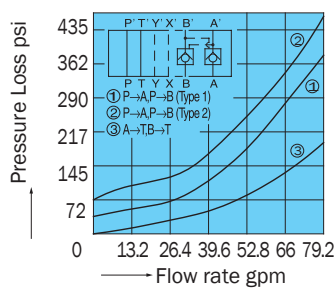


## Pressure Loss Characteristics (Reverse Free Flow)

OCP-G03-W\*-J50

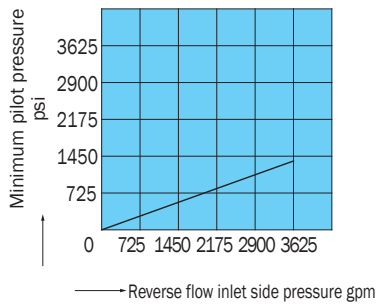


OPH-G04-W\*-10

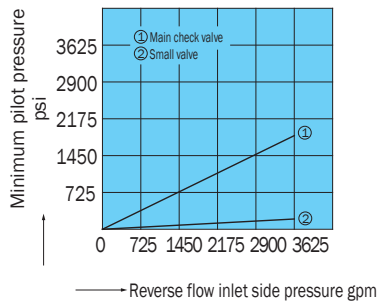


## Minimum Pilot Pressure Characteristics

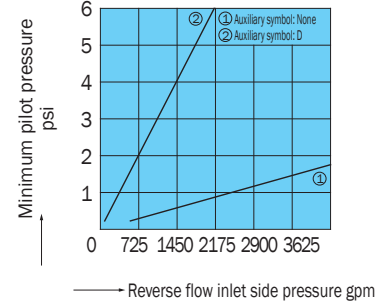
OCP-G01-\*\*-21



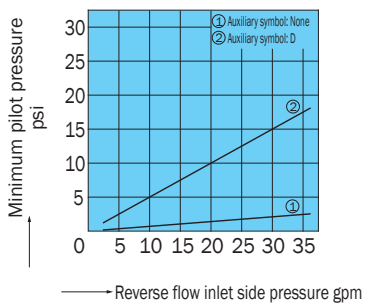
OCP-G01-\*\*-F-21



OCP-G03-W\*-(D)-J50

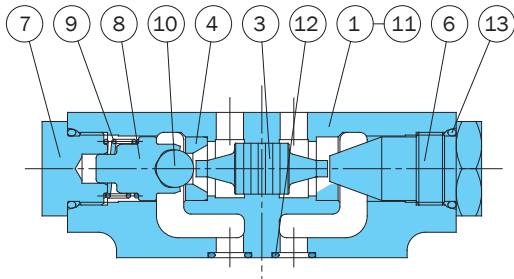


OPH-G04-W\*-(D)-10

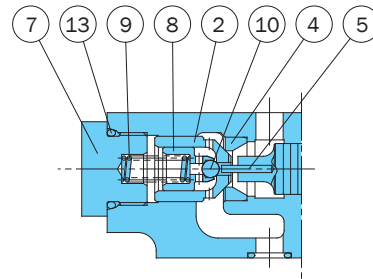


## Cross-sectional Drawing

OCP-G01-A\*-21



OCP-G01-A\*-F-21



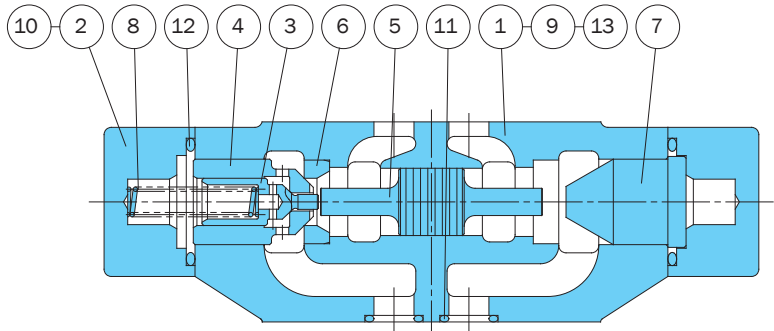
| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Poppet      |
| 3        | Piston      |
| 4        | Seat        |
| 5        | Rod         |
| 6        | Bushing     |
| 7        | Spring seat |
| 8        | Guide       |
| 9        | Spring      |
| 10       | Ball        |
| 11       | Plate       |
| 12       | O-ring      |
| 13       | O-ring      |

Seal Part List (Kit Model Number BDBS-01CP)

| Part No. | Part Name | Part Number | Q'ty |   |   |
|----------|-----------|-------------|------|---|---|
|          |           |             | W    | A | B |
| 12       | O-ring    | 1B-P9       | 4    | 4 | 4 |
| 13       | O-ring    | 1B-P18      | 2    | 2 | 2 |

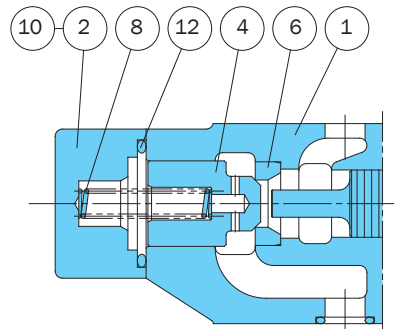
Note: 1.O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2.Specify W, A, or B for the asterisk (\*) in the kit model number.

OCP-G03-A\*-J50



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Poppet    |
| 4        | Poppet    |
| 5        | Piston    |
| 6        | Seat      |
| 7        | Bushing   |
| 8        | Spring    |
| 9        | Plate     |
| 10       | Screw     |
| 11       | O-ring    |
| 12       | O-ring    |
| 13       | Pin       |

OCP-G03-\*\*-D-J50

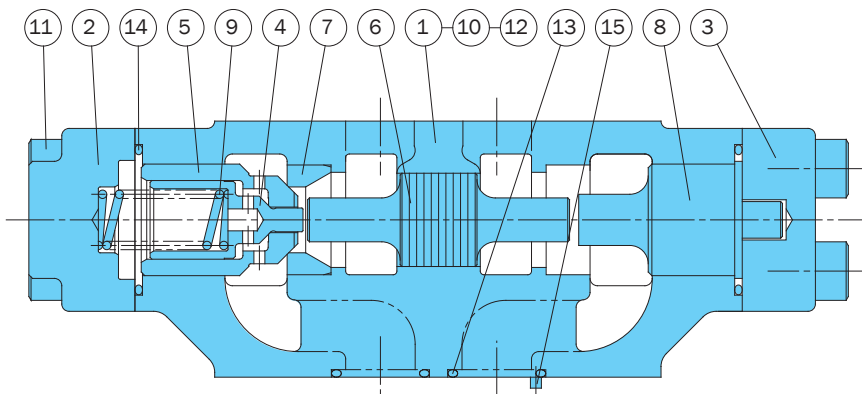


Seal Part List (Kit Model Number BDES-03CP\*)

| Part No. | Part Name | Part Number     | Q'ty |   |   |
|----------|-----------|-----------------|------|---|---|
|          |           |                 | W    | A | B |
| 11       | O-ring    | AS568-014(Hs90) | 5    | 5 | 5 |
| 12       | O-ring    | 1B-P29          | 2    | 2 | 2 |

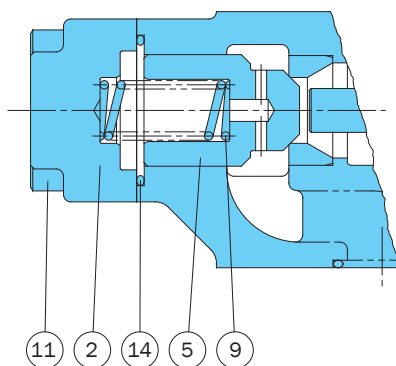
Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. Specify W, A, or B for the asterisk (\*) in the kit model number.

OPH-G04-A\*-10



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover     |
| 3        | Cover     |
| 4        | Poppet    |
| 5        | Poppet    |
| 6        | Piston    |
| 7        | Seat      |
| 8        | Bushing   |
| 9        | Spring    |
| 10       | Plate     |
| 11       | Screw     |
| 12       | O-ring    |
| 13       | O-ring    |
| 14       | O-ring    |
| 15       | Pin       |

OPH-G04-\*\*-D-10



Seal Part List (Kit Model Number BDKS-04CP\*)

| Part No. | Part Name | Part Number     | Q'ty |   |   |
|----------|-----------|-----------------|------|---|---|
|          |           |                 | W    | A | B |
| 12       | O-ring    | AS568-012(Hs90) | 2    | 2 | 2 |
| 13       | O-ring    | AS568-118(Hs90) | 4    | 4 | 4 |
| 14       | O-ring    | AS568-127(Hs90) | 2    | 2 | 2 |

Note: 1.Specify W, A, or B for the asterisk (\*) in the kit model number.





### Gauge Modular Block

13.2 to 26.4 gpm  
3625 psi

#### Features

This modular block makes it possible to attach a pressure gauge to the P and T ports or the A and B ports.

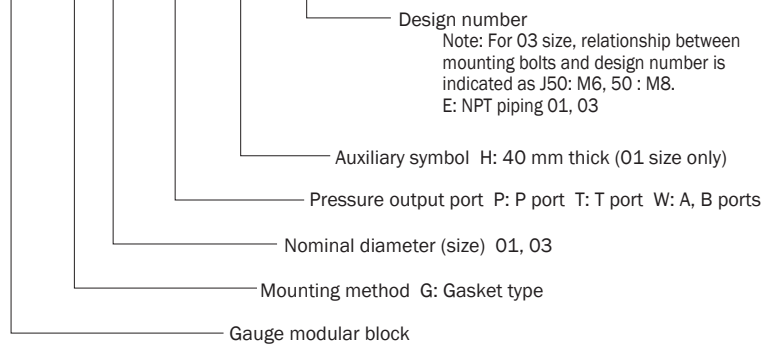
Connection to the ports is extremely simple.

#### Specifications

| Model No.                        | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Weight lbs | Gasket Surface Dimensions |
|----------------------------------|-------------------------|------------------------------|-----------------------|------------|---------------------------|
| OK-G01-P-E20<br>OK-G01-T-E20     | 1/8                     | 3625                         | 13.2                  | 1.3        | ISO 4401-03-02-0-94       |
| OK-G01-W-E20                     |                         |                              |                       | 1.3        |                           |
| OK-G01-P-H-E20<br>OK-G01-T-H-E20 |                         |                              |                       | 2.2        |                           |
| OK-G01-W-H-E20                   |                         |                              |                       | 2.2        |                           |
| OK-G03-E50                       | 3/8                     | 3625                         | 26.4                  | 5.0        | ISO 4401-05-04-0-94       |

#### Understanding Model Numbers

**OK - G 01 - P - (H) - 20**

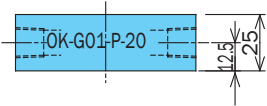
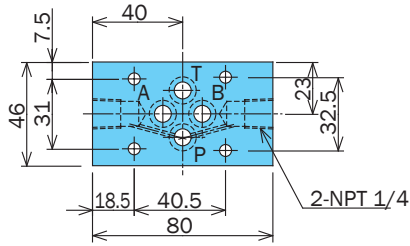


#### • Handling

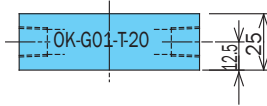
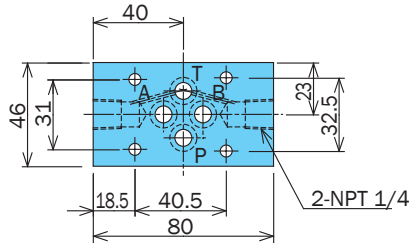
- 1 When installing the OK-G01-P- (H)-E20, OK-G01-T-(H)-E20, or OK-G01-W-(H)-E20, make sure the model number printing is oriented so it can be read correctly from the P port side.
- 2 Note that a sub plate and installation bolts are not included. See pages H4 and F87-89 if these items are required.

# Installation Dimension Drawings

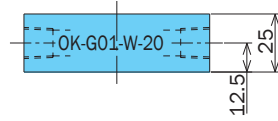
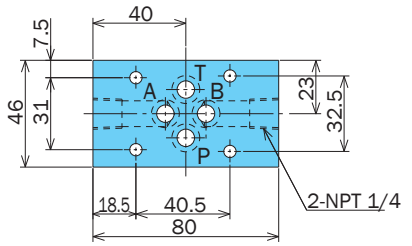
OK-G01-P-E20



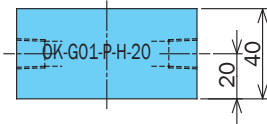
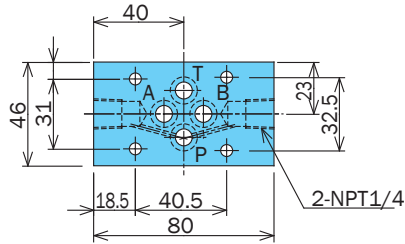
OK-G01-T-E20



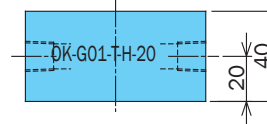
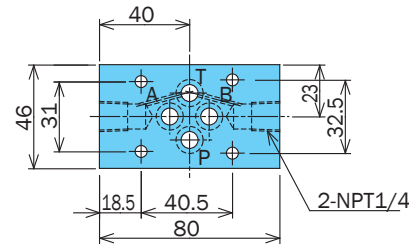
OK-G01-W-E20



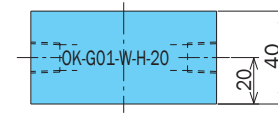
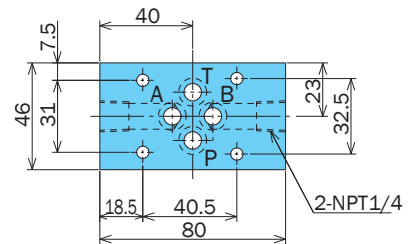
OK-G01-P-H-E20



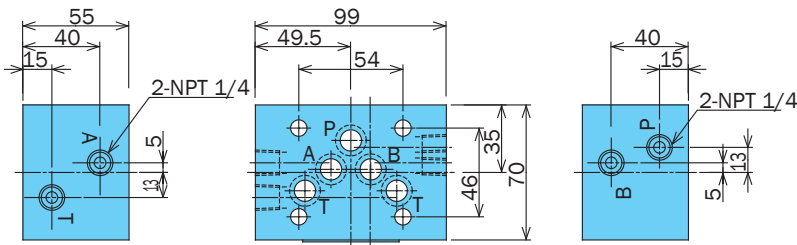
OK-G01-T-H-E20



OK-G01-W-H-E20



OK-G03-E50





### High-Low System Block

13.2 to 26.4 gpm  
3625 psi

#### Features

Simple high-low 2-speed control can be attained by stacking this block on top of a high-low base block and manifold, which configures a speed control circuit.

#### Specifications

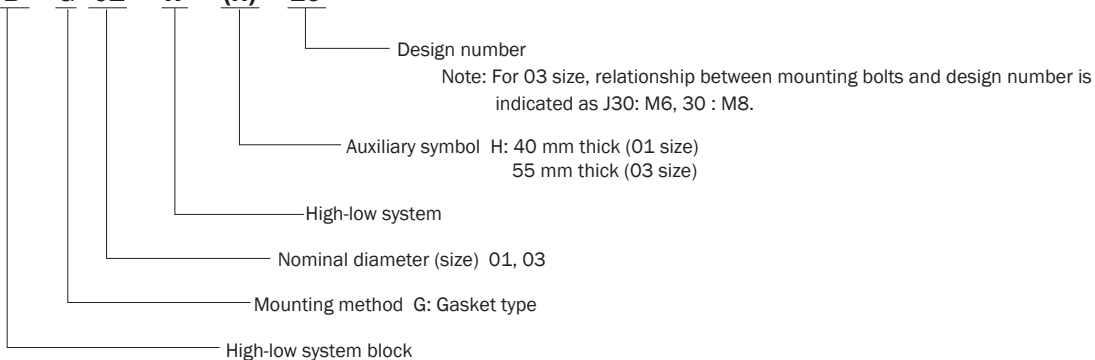
| Model No.      | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Weight lbs |
|----------------|-------------------------|------------------------------|-----------------------|------------|
| OB-G01-W-20    | 1/8                     | 3625                         | 13.2                  | 3.3        |
| OB-G01-W-H-20  |                         |                              |                       | 5.5        |
| OB-G03-W-J30   | 3/8                     | 3625                         | 26.4                  | 9.9        |
| OB-G03-W-H-J30 |                         |                              |                       | 15.6       |

• Handling

- If a base block is required, use MOB-01Y-W\*-10 for the 01 size and MOB-03X-B\*-J30 for the 03 size, because their valve pitches match. MOB-01X-B\*-10 has a different valve pitch, and so cannot be used.
- When installing this block, make sure the nameplate is oriented so it can be read correctly from the A port side.
- Both of the cylinder ports on this block's manifold side (bottom) are open. Because of this, close one of the base block cylinder ports (A1, B1 or A2, B2 on the next page), or modify the manifold so it has a single cylinder port only.
- Note that installation bolts are not included. See pages H4 and F87-89 if these items are required.

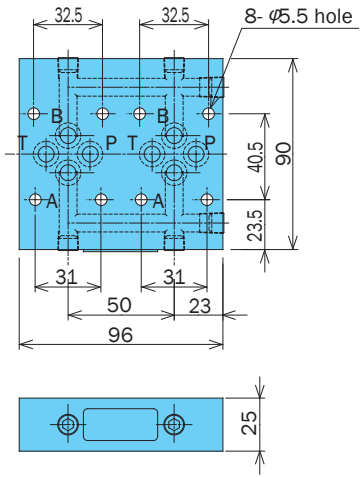
#### Understanding Model Numbers

**OB - G 01 - W - (H) - 20**

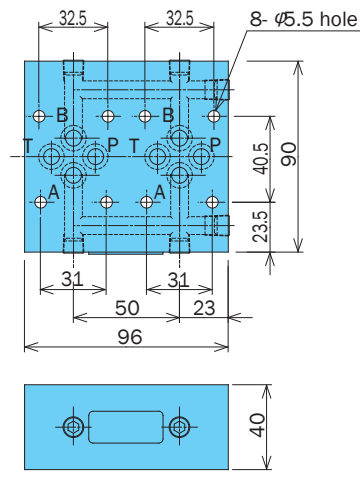


# Installation Dimension Drawings

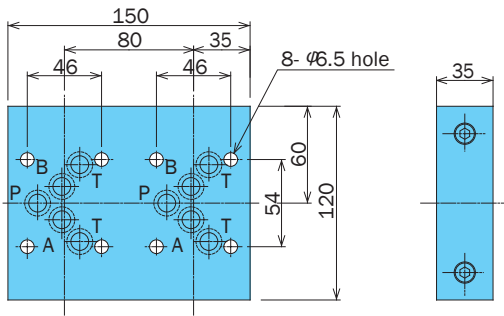
OB-G01-W-20



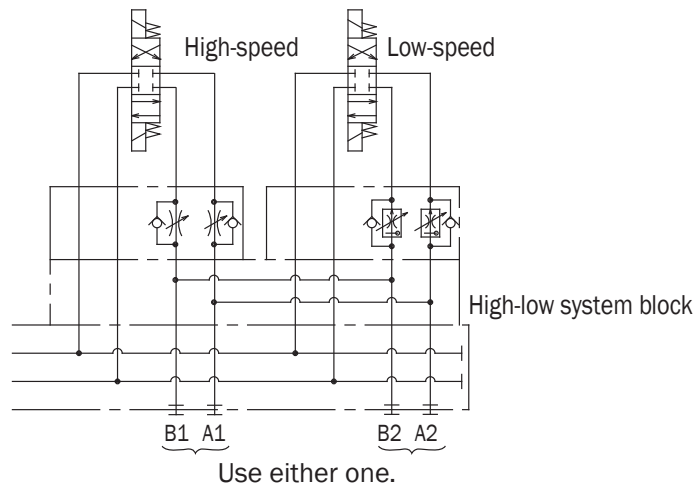
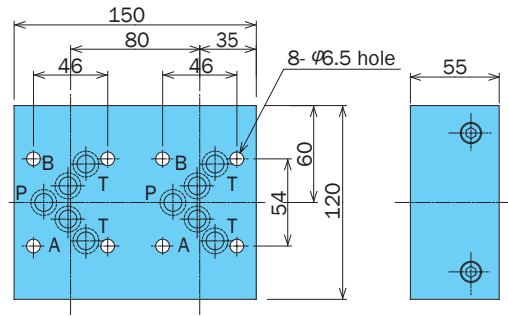
OB-G01-W-H-20



OB-G03-W-J30



OB-G03-W-H-J30



## End Plate, Free Flow Plate, 03/01 Change Plate

13.2 to 26.4 gpm  
3625 psi

### Features

The end plate is a modular valve plate used to close off a circuit that is not required, and when using a relief modular valve in a standalone configuration. The free flow plate is a modular valve

plate is used in a one-way circuit that does not require a solenoid valve. The 03/01 change plate makes it possible to use an 01 size modular valve with an 03 size sub-plate and base block.

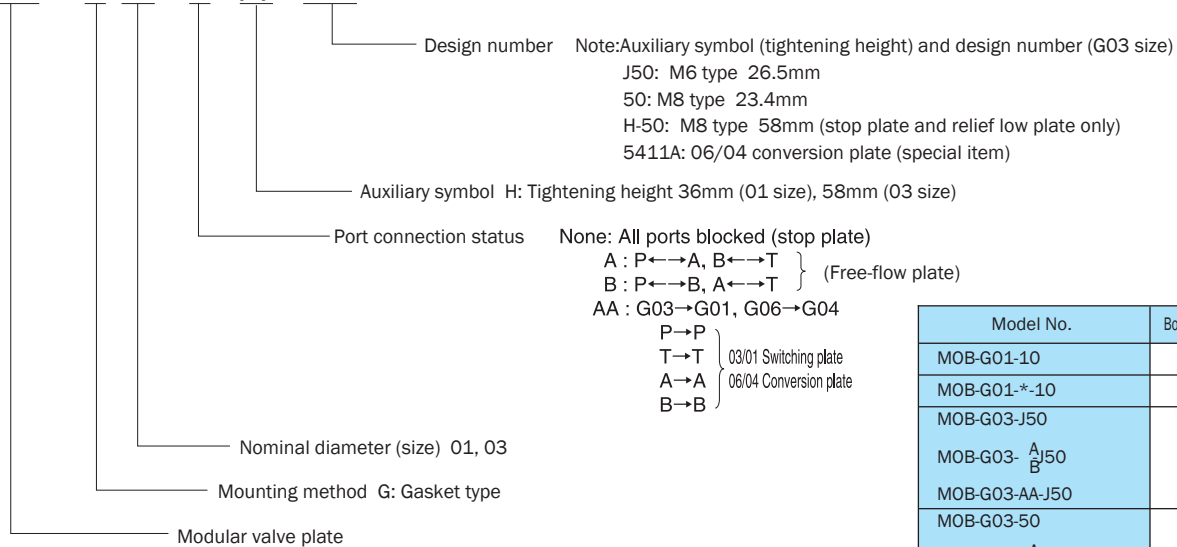
The 06/04 change plate makes it possible to use an 04 size modular valve with an 06 size sub-plate and base block.

### Specifications

| Model No.                        | Nominal Diameter(Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Weight lbs |      |      |
|----------------------------------|------------------------|------------------------------|-----------------------|------------|------|------|
| MOB-G01-10                       | 1/8                    | 3625                         | -                     | .6         |      |      |
| MOB-G01-H-10                     |                        |                              | -                     | 1.3        |      |      |
| MOB-G01-A-10<br>MOB-G01-B-10     |                        |                              | 13.2                  | 1.3        |      |      |
| MOB-G03-J50                      | 3/8                    | 3625                         | -                     | 3.0        |      |      |
| MOB-G03-H-50                     |                        |                              | -                     | 5.5        |      |      |
| MOB-G03-A-J50<br>MOB-G03-B-J50   |                        |                              | 26.4                  | 2.8        |      |      |
| MOB-G03-A-H-50<br>MOB-G03-B-H-50 |                        |                              |                       | 5.0        |      |      |
| MOB-G03-AA-J50                   |                        |                              | 13.2                  | 5.0        |      |      |
| MOB-G06-AA-5411A                 |                        |                              | 3/4                   | 3045       | 52.8 | 17.6 |

### Understanding Model Numbers

**MOB - G 03 - A - (H) - J50**

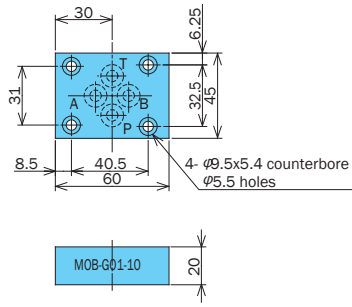


- Handling
- 1 Installation bolts are not included. Use the table to the right to specify bolts for stand-alone use.

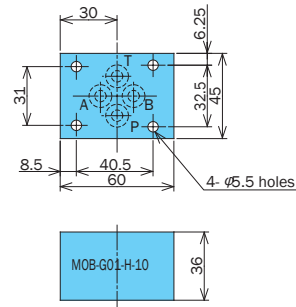
| Model No.  | Bolt Dimensions | Q'ty |
|--|-----------------|------|
| MOB-G01-10   | M5 × 25         | 4    |
| MOB-G01-*.10                                       | M5 × 45         | 4    |
| MOB-G03-J50  | M6 × 35         | 4    |
| MOB-G03- $\begin{matrix} A \\ B \end{matrix}$ J50  |                 |      |
| MOB-G03-AA-J50                                     | M8 × 35         | 4    |
| MOB-G03-50   |                 |      |
| MOB-G03- $\begin{matrix} A \\ B \end{matrix}$ 50   |                 |      |
| MOB-G03-H-50                                       | M8 × 70         | 4    |
| MOB-G03- $\begin{matrix} A \\ B \end{matrix}$ H-50 |                 |      |
| MOB-G06-AA-5411A                                   | M12 × 70        | 6    |

# Installation Dimension Drawings

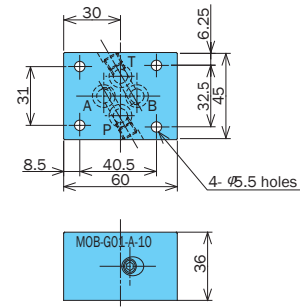
MOB-G01-10



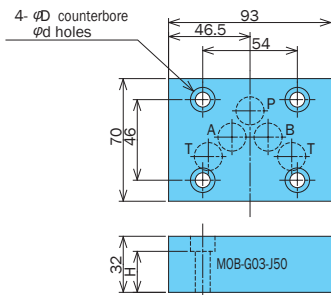
MOB-G01-H-10



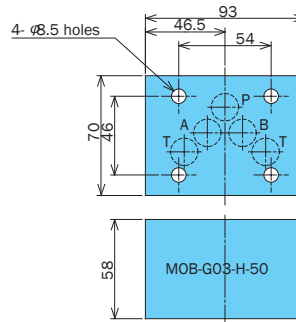
MOB-G01-<sup>A</sup><sub>(B)</sub>-10



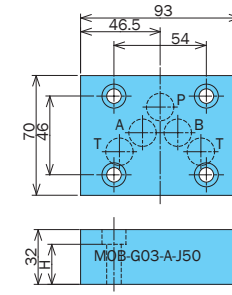
MOB-G03-J50



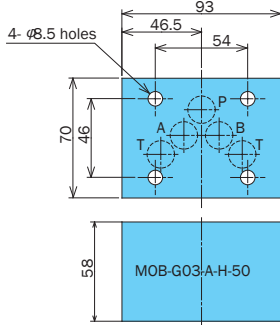
MOB-G03-H-50



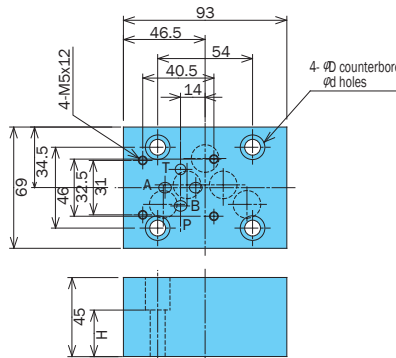
MOB-G03-<sup>A</sup><sub>B</sub>-J50



MOB-G03-<sup>A</sup><sub>B</sub>-H-50

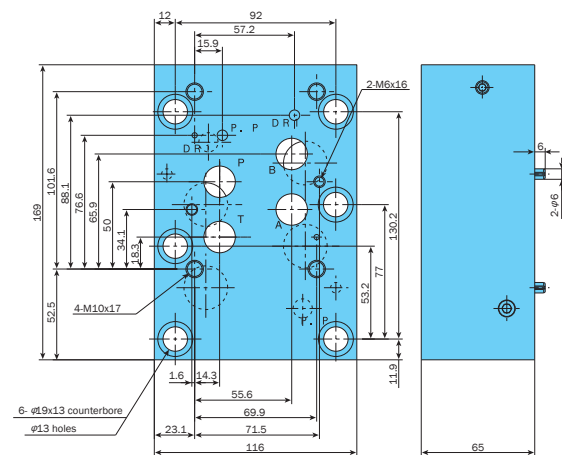


MOB-G03-AA-J50



| Model No.     | D  | H    | d   |
|---------------|----|------|-----|
| MOB-G03-*-50  | 14 | 23.4 | 8.5 |
| MOB-G03-*-J50 | 11 | 26.5 | 6.5 |

MOB-G06-AA-5411A

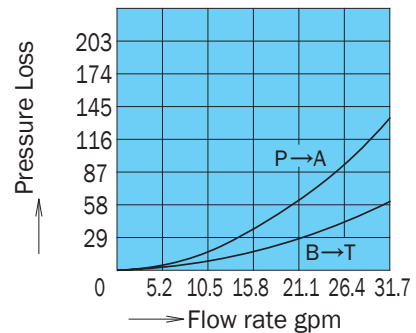


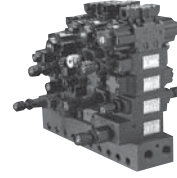
## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

### Pressure Loss Characteristics

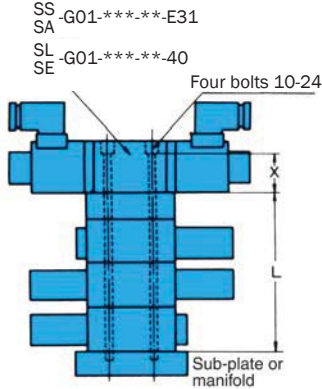
MOB-G03-A-J50





### Valve Installation Bolt List

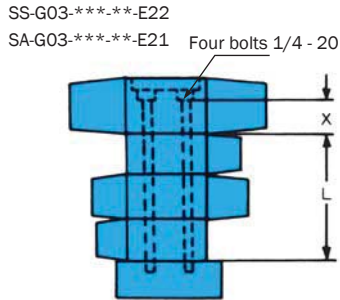
E: UNC Thread  
O1 (nominal diameter)



| Model Number      | X    |
|-------------------|------|
| SA-G01-***-**-E31 | 37.5 |
| SS-G01-***-**-E31 |      |
| SL-G01-***-**-E31 |      |
| SE-G01-***-**-E40 |      |

| Type                     | Model Number | Dimension L | Bolt length |
|--------------------------|--------------|-------------|-------------|
| Hexagon Socket Head Bolt | OTH-01-70-10 | 25          | 70          |
|                          | 85           | 40          | 85          |
|                          | 110          | 65          | 110         |
|                          | 125          | 80          | 125         |
|                          | 150          | 105         | 150         |
|                          | 165          | 120         | 165         |
|                          | 190          | 145         | 190         |
|                          | 205          | 160         | 205         |
| Stat Bolt                | OTD-01-80-10 | 25          | 80          |
|                          | 95           | 40          | 95          |
|                          | 120          | 65          | 120         |
|                          | 135          | 80          | 135         |
|                          | 145          | 90          | 145         |
|                          | 160          | 105         | 160         |
|                          | 175          | 120         | 175         |
|                          | 185          | 130         | 185         |
|                          | 200          | 145         | 200         |
|                          | 210          | 155         | 210         |
|                          | 215          | 160         | 215         |
|                          | 225          | 170         | 225         |
|                          | 240          | 185         | 240         |
|                          | 250          | 195         | 250         |
| 265                      | 210          | 265         |             |
| 275                      | 220          | 275         |             |

E: UNC Thread  
O3 (nominal diameter)

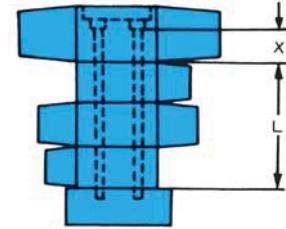


| Model Number      | X    |
|-------------------|------|
| SS-G03-***-**-E22 | 60.5 |
| SA-G03-***-**-E21 |      |

| Type                     | Model Number   | Dimension L | Bolt length |
|--------------------------|----------------|-------------|-------------|
| Hexagon Socket Head Bolt | OTH-03-125-J30 | 55          | M6 × 125    |
|                          | -180-          | 110         | M6 × 180    |
| Stat Bolt                | OTD-03-135-J30 | 55          | M6 × 135    |
|                          | -190-          | 110         | M6 × 190    |
|                          | -245-          | 165         | M6 × 245    |
|                          | -300-          | 220         | M6 × 300    |

E: UNC Thread

SS-G03-\*\*\*-\*\*-22  
SA-G03-\*\*\*-\*\*-21



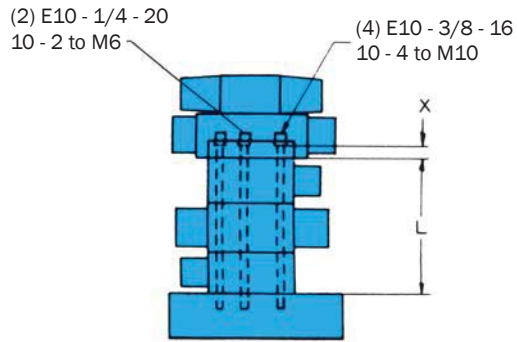
| Model Number     | X  |
|------------------|----|
| SS-G03-***-**-22 | 58 |
| SA-G03-***-**-21 |    |

| Type                     | Model Number  | Dimension L | Bolt length |
|--------------------------|---------------|-------------|-------------|
| Hexagon Socket Head Bolt | OTH-03-125-30 | 55          | M8 × 125    |
|                          | -180-         | 110         | M8 × 180    |
| Stat Bolt                | OTD-03-135-30 | 55          | M8 × 135    |
|                          | -190-         | 110         | M8 × 190    |
|                          | -245-         | 165         | M8 × 245    |
|                          | -300-         | 220         | M8 × 300    |

**Note:**

- 1 Model numbers indicate bolt kits for one solenoid valve.
- 2 Up to four modular valves can be ganged together.
- 3 O1 Size Modular valves at a height of 40 + 25 = 65 mm are ganged to one level.
- 4 2-pressure reducing valves at a height of 90 mm are ganged to two levels.

O4 (nominal diameter)



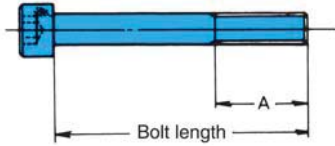
| Model Number                             | X  |
|--|----|
| DSS-G04-***-R-**-22<br>DSA-G04-***-**-22 | 34 |

| Type                     | Model Number  | Dimension L | Bolt Size | Bolt length |
|--------------------------|---------------|-------------|-----------|-------------|
| Hexagon Socket Head Bolt | OTH-04-120-10 | 70          | M6        | 115         |
|                          |               |             | M10       | 120         |
|                          | -135-         | 85          | M6        | 130         |
|                          |               |             | M10       | 135         |
|                          | -190-         | 140         | M6        | 185         |
|                          |               |             | M10       | 190         |
|                          | -205-         | 155         | M6        | 200         |
|                          |               |             | M10       | 205         |
| Stat Bolt                | OTD-04-135-10 | 70          | M6        | 123         |
|                          |               |             | M10       | 135         |
|                          | -150-         | 85          | M6        | 138         |
|                          |               |             | M10       | 150         |
|                          | -205-         | 140         | M6        | 193         |
|                          |               |             | M10       | 205         |
|                          | -220-         | 155         | M6        | 210         |
|                          |               |             | M10       | 220         |
|                          | -275-         | 210         | M6        | 265         |
|                          |               |             | M10       | 275         |
|                          | -290-         | 225         | M6        | 278         |
|                          |               |             | M10       | 290         |

- Note: 1. The above model numbers indicate bolt kits for one solenoid valve.  
 2. Up to three modular valves can be ganged together.  
 3. There is a bolt for ganging four valves, but the maximum operating pressure is limited to 3045 psi. For details, consult your agent. (See page D-4)



### Hexagon socket head bolt

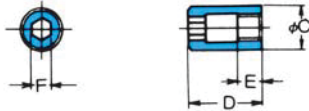
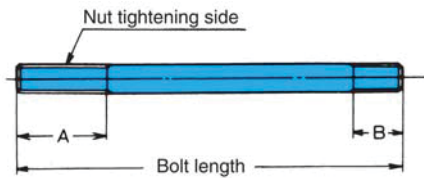


| Nominal Diameter | A  | Bolt Size |
|------------------|----|-----------|
| 01               | 15 | 10 - 24   |
| 03               | 18 | 1/4 - 20  |

### Tightening Torque

| Nominal Diameter | Bolt Size    | Tightening Torque N ft lbs |
|------------------|--------------|----------------------------|
| 01               | 10 - 24 UNC  | 3.6 to 5.1                 |
| 03               | 1/4 - 20 UNC | 7.3 to 9.5                 |

### Stat Bolts and Nuts



| Model No.      | A  | B    | C   | D  | E    | F | Bolt Size |
|----------------|----|------|-----|----|------|---|-----------|
| OTD-01-***-10  | 12 | 9    | 8.5 | 16 | 11   | 4 | M5        |
| OTD-03-***-J30 | 20 | 10   | 10  | 18 | 11.5 | 5 | M6        |
| OTD-03-***-30  | 25 | 12.5 | 13  | 22 | 15   | 6 | M8        |
| OTD-04-***-10  | 20 | 10   | 10  | 18 | 11.5 | 5 | M6        |
|                | 25 | 18   | 16  | 23 | 15   | 8 | M10       |

Stat bolts and nuts are included. The E dimension is the effective screw depth.

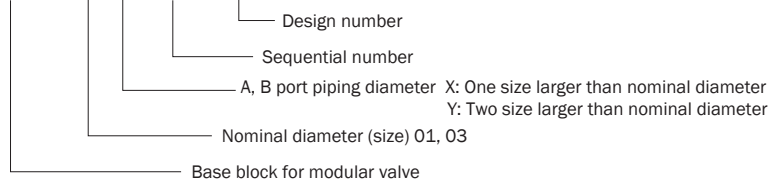
### 01, 03 Base Block

#### Features

This block, which allows piping from both sides, is designed for use with combinations of two or more solenoid valves and modular valves.

#### Understanding Model Numbers

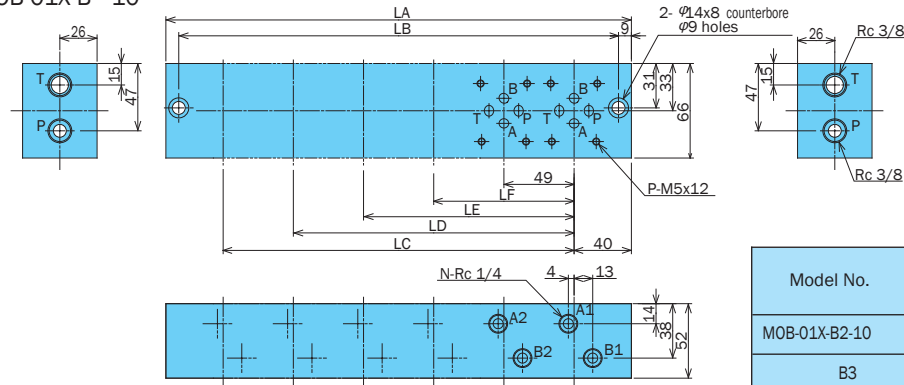
##### MOB - 01 X - B3 - 10



Note: Another series of multi-pump blocks is available for the MBS and MBW Series NACHI PACK. For details, see page L-24.

#### Installation Dimension Drawings

01 (nominal diameter) base block  
MOB-01X-B\*-10



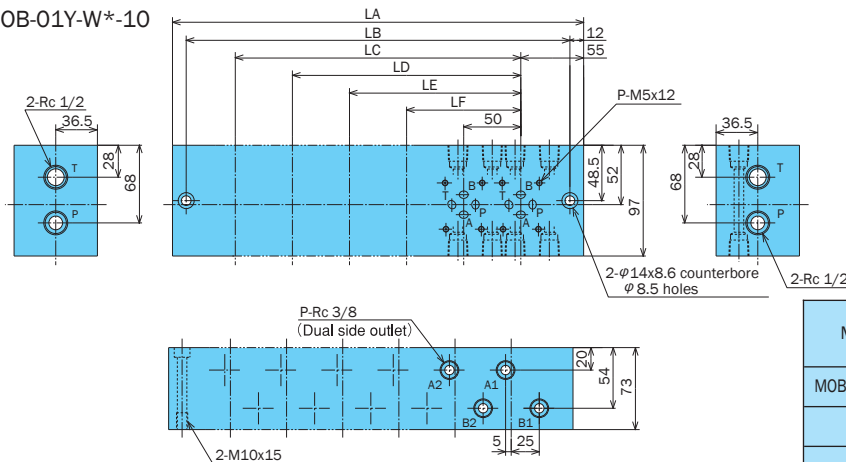
#### Plug Tightening Torque

| Plug Configuration | Tightening Torque N ft lbs |
|--------------------|----------------------------|
| TPHA-1/4           | 13.4 to 22                 |
| TPHA-3/8           | 29.5 to 35                 |

| Model No      | Pipe Outlet Size (A, B) | Maximum Working Pressure psi | Recommended Flow Rate gpm |
|---------------|-------------------------|------------------------------|---------------------------|
| MOB-01X-B*-10 | 1/4                     | 3625                         | 5.2                       |

| Model No.     | LA  | LB  | LC  | LD  | LE | LF | N  | P    | Weight lbs |
|---------------|-----|-----|-----|-----|----|----|----|------|------------|
| MOB-01X-B2-10 | 129 | 111 | -   | -   | -  | -  | 4  | 8    | 6.1        |
| B3            | 178 | 160 |     |     |    |    |    |      |            |
| B4            | 227 | 209 |     |     |    |    |    |      |            |
| B5            | 276 | 258 |     |     |    |    |    |      |            |
| B6            | 325 | 307 |     |     |    |    |    |      |            |
|               |     |     |     |     |    |    |    |      |            |
|               |     |     | 196 | 147 | 98 | 6  | 12 | 8.3  |            |
|               |     |     |     |     |    | 8  | 16 | 10.8 |            |
|               |     |     |     |     |    | 10 | 20 | 13.0 |            |
|               |     |     |     |     |    | 12 | 24 | 15.2 |            |

MOB-01Y-W\*-10



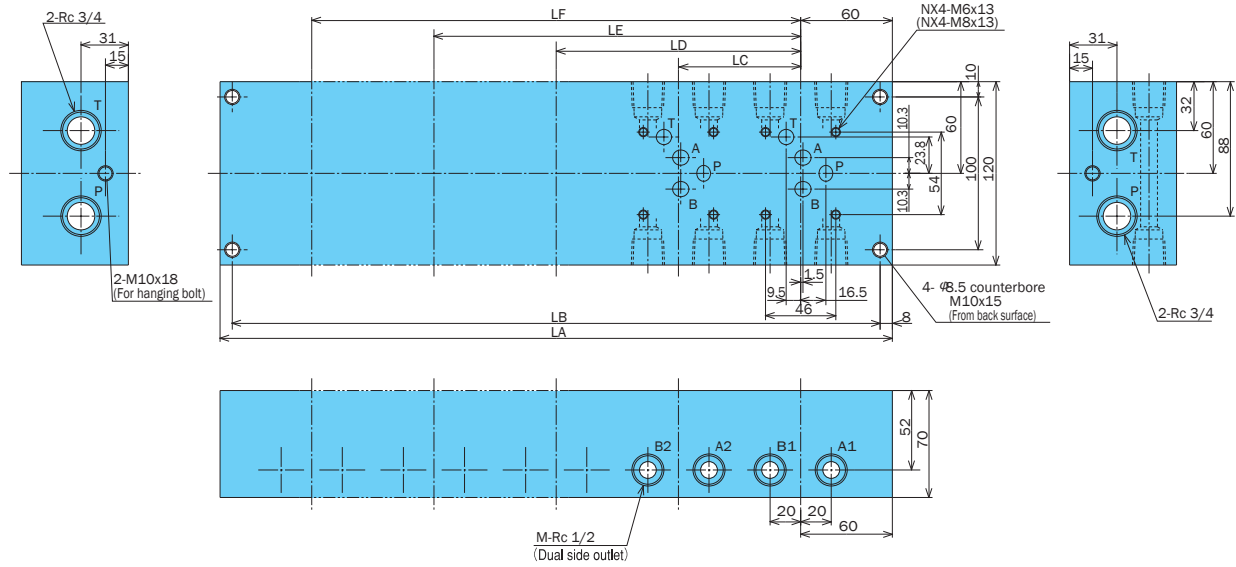
#### Plug Tightening Torque

| Plug Configuration | Tightening Torque N ft lbs |
|--------------------|----------------------------|
| TPHA-3/8           | 29.5 to 35                 |
| TPHA-1/2           | 40.5 to 48                 |

| Model No      | Pipe Outlet Size (A, B) | Maximum Working Pressure psi | Recommended Flow Rate gpm |
|---------------|-------------------------|------------------------------|---------------------------|
| MOB-01Y-W*-10 | 3/8                     | 3625                         | 10.5                      |

| Model No.     | LA  | LB  | LC  | LD  | LE  | LF | P    | Weight lbs |
|---------------|-----|-----|-----|-----|-----|----|------|------------|
| MOB-01Y-W1-10 | 110 | 86  | -   | -   | -   | -  | 4    | 11.2       |
| W2            | 160 | 136 |     |     |     |    |      |            |
| W3            | 210 | 186 |     |     |     |    |      |            |
| W4            | 260 | 236 |     |     |     |    |      |            |
| W5            | 310 | 286 |     |     |     |    |      |            |
| W6            | 360 | 336 |     |     |     |    |      |            |
|               |     |     | 200 | 150 | 100 | 8  | 16.0 |            |
|               |     |     |     |     |     | 12 | 21.1 |            |
|               |     |     |     |     |     | 16 | 26.0 |            |
|               |     |     |     |     |     | 20 | 30.8 |            |
|               |     |     |     |     |     | 24 | 35.7 |            |

03 (nominal diameter) base block  
 MOB-03X-B\*-(J)30



Plug Tightening Torque

| Plug Configuration | Tightening Torque N ft. lbs |
|--------------------|-----------------------------|
| TPHA-1/2           | 40.5 to 48                  |
| TPHA-3/4           | 66 to 73.7                  |

| Model No          | Pipe Outlet Size (A, B) | Maximum Working Pressure psi | Recommended Flow Rate gpm |
|-------------------|-------------------------|------------------------------|---------------------------|
| MOB-03X-B*-(J) 30 | 1/2                     | 3625                         | 21.1                      |

| Model No.         | Dimensions |     |    |     |     |     |    |   | Weight lbs |
|-------------------|------------|-----|----|-----|-----|-----|----|---|------------|
|                   | LA         | LB  | LC | LD  | LE  | LF  | M  | N |            |
| MOB-03X-B2-(J) 30 | 200        | 184 | 80 | -   | -   | -   | 8  | 2 | 22.7       |
| B3                | 280        | 264 | 80 | 160 | -   | -   | 12 | 3 | 31.5       |
| B4                | 360        | 344 | 80 | 160 | 240 | -   | 16 | 4 | 40.5       |
| B5                | 440        | 424 | 80 | 160 | 240 | 320 | 20 | 5 | 49.3       |

Note: Dimensions in parentheses are for model number MOB-03X-B\*-30, which is the model number when using M8 valve mounting bolts.

### High-pressure M35 Series

13 to 80 gpm  
5075 psi

#### Overview

The High-Pressure M35 Series responds to the needs of high density in a variety of fields by enabling higher density hydraulic systems. This valve incorporates NACHI original flow control technology and heat

treatment, plus precision machining to create high-performance valves with the following features:

- High-pressure 35MPa
- High reliability and compact design

- Press Machinery  
Press brakes, punching presses
  - Underground Machinery  
Shield tunneling machinery, removal systems, etc.
  - Construction Machinery  
From mini vehicles to 6 to 10-ton vehicles, shovels, etc.
  - Environmental Related  
Granulators, filter presses, scrap presses
  - Testing Equipment  
Impulse, durability, performance testers, etc.
- (For details see catalog number 9265-3.)

- M35 Series Modular Valve (O \* H)  
By integrating multiple hydraulic devices, this valve can be used when configuring hydraulic circuits even in the high-pressure range. See page F9 for information about the O4 size. This series consists of pressure, flow rate, and flow direction control valves. Maximum Working Pressure: 5075 psi Maximum Flow Rate: to 80 gpm

- M35 Series Non-leak Solenoid Valve (SNH)  
A NACHI original structure is used to configure this wettype shutoff valve that isolates internal leaks. Installation conforms to ISO4401 standards, so it can be used in a wide range of applications in combination with modular valves. For more information, see page D-53. Maximum Working Pressure: 5075 psi Maximum Flow Rate: to 25 gpm

- M35 Series Related Components
  - Pump (See page A-42.)  
Rated Pressure: 5075 psi  
Capacity: 1.7 to 2.4 cu in/rev
  - High-response proportional flow control valve  
Maximum Working Pressure: 5075 psi  
Maximum Flow Rate: to 90 gpm
- M35 Series Industry Specific Components
  - Jack Valve  
Maximum Working Pressure: 5075 psi  
Maximum Flow Rate: to 25 gpm
  - Logic Cartridge Mono Block  
Maximum Working Pressure: 5075 psi  
Maximum Flow Rate: to 1850 gpm
- M35 Series Industry Specific Components
  - Hydraulic accessories (stop valves, filters, accumulators, hoses, etc.); NACHI-MOOG servo level

#### Specifications

##### M35 Series Modular Valve

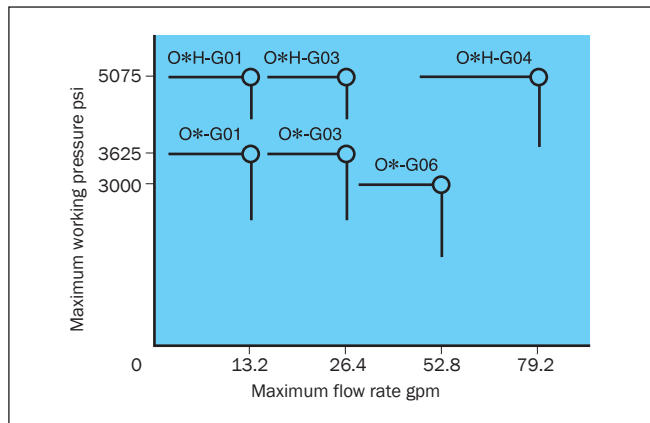
| Size | Maximum Working Pressure psi | Maximum Flow Rate gpm | Number of Integration Levels |
|------|------------------------------|-----------------------|------------------------------|
| 01   | 5075                         | 13.2                  | to 3                         |
| 03   |                              | 26.4                  |                              |
| 04   |                              | 79.2                  |                              |

##### Dimensions

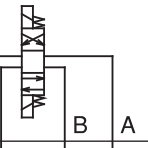

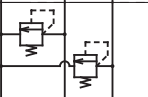
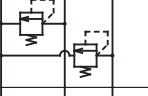
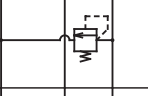







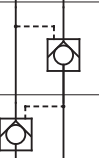
| Size | Height (mm) | Width (mm) | Remarks                           |
|------|-------------|------------|-----------------------------------|
| 01   | 40          | 46         | Same dimensions as the M25 Series |
| 03   | 55          | 70         |                                   |
| 04   | 70          | 91         |                                   |

Note: M8 installation bolts only are used for the O3 size.

##### Modular Valve Product Series



# 01, 03 Size Specifications

|                         |                                 | Valve Model Number  | Maximum Operating Power<br>psi | Maximum Flow Rate<br>gpm                               | Pressure Adjustment Range<br>(Cracking Pressure)<br>psi                               | ISO Symbol   |   |
|-------------------------|---------------------------------|---|--------------------------------|--|---|--|---|
| Solenoid Valves         | Solenoid Valves                 | SA-G***.***-31(21)  | 5075                           |  |   |   |   |
|                         |                                 | SS-G***.***-31(22)  |                                |  |   |  |   |
| Pressure Control Valves | Relief Valves<br>(Balance Type) | ORH-G01-P*-10<br>-W*-                                       | G01<br>10.5                    | 500 - 3625<br>1000 - 5075                              |   |    |   |
|                         |                                 | ORH-G03-P*-10<br>-W*-                                       | G03<br>21.1                    | P: P (→T) port<br>W: AB (→T) port                      |    |  |   |
|                         | Relief Valves<br>(Direct Type)  | ORH-G01-DW*-10<br>-DA*-<br>-DB*-                            | G01<br>5.2                     | 500 - 3625<br>1000 - 5075                              |   |   |   |
|                         |                                 | ORH-G03-DW*-10<br>-DA*-<br>-DB*-                            | G03<br>7.9                     | DW: AB (→T) port<br>DA: A (→T) port<br>DB: B (→T) port |    |  |   |
|                         | Reducing Valve                  | OGH-G01-P*-10<br>-B*-                                       | G01<br>10.5                    | 500 - 3625   |   |   |   |
|                         |                                 | OGH-G03-P*-(B)-10<br>-B*-                                   | G03<br>21.1                    | P: P port<br>B: B port                                 |      |  |   |
| Flow Control Valves     | Flow Regulator Valves           | OYH-G01-W-Y-10<br>-A-Y-<br>-B-Y-<br>-W-X-<br>-A-X-<br>-B-X- | 5075                           | G01<br>13.2  | Y: Meter out<br>X: Meter in<br><br>W: AB port<br>A: A port<br>B: B port               |    |   |
|                         |                                 | OYH-G03-W-Y-10<br>-A-Y-<br>-B-Y-<br>-W-X-<br>-A-X-<br>-B-X- |                                | G03<br>26.4  |  |  |   |
|                         |                                 | Check Valves  | OCH-G01-P*-10<br>-T*-          | G01<br>13.2  | 1: 5.8<br>2: 50.7<br>3: 72.5  |   |   |
|                         |                                 |   | OCH-G03-P*-10<br>-T*-          | G03<br>26.4  | P: P port<br>T: T port  |    |   |
|                         |                                 |   | Pilot Check Valves             | OPH-G01-W*-(F)-10<br>-A*-<br>-B*-                      | G01<br>13.2   | 1: 29<br>2: 72.5   |  |
|                         |                                 |   |                                | OPH-G03-W*-(D)-10<br>-A*-<br>-B*-                      | G03<br>26.4   | W: AB port<br>A: A port<br>B: B port<br>D: Direct type (no small valve, G03 only)<br>F: Decomp type (with small valve, G01 only) |  |

ORH : Relief valve

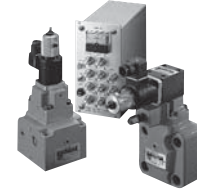


OGH : Reducing valve



OPH : Pilot check valve





### Electro-Hydraulic Proportional Valve Series

.5 to 132 gpm  
3000, 3600, 4000, 5000 psi

#### Overview

Today's hydraulic systems demand high levels of automation, power efficiency, and energy efficiency, which is why the use of electro-hydraulic proportional valves is on the rise. Built-in electronic

components deliver outstanding response and fluid pressure that allows high output, as well as superior operation, and control. The NACHI Electrohydraulic Proportional Valve

Series includes the pressure control valves, flow control valves, and direction control valves that make it easy to meet these needs.

#### Features

##### 1 Pressure Control Valve Series

- EPR Series:** Small-volume direct driver type pilot relief valve
- ER Series:** Large-volume balanced piston type relief valve
- EGB Series:** Large-volume balanced piston type pressure reducing valve with relief function

The pressure control section uses a poppet structure, which is virtually impervious to the effects of dirt in the operating fluid for outstanding pressure stability.

##### Flow Control Valve Series

- ES Series:** This 3-directional valve provides proportional flow control in accordance with **input current**.
- ESR Series:** With a built-in load sensing function, this 3-way valve is for use in low-energy circuits.

A force feedback mechanism is used for main spool positioning, and amplification is performed by the pilot spool. The result is superior response with small hysteresis

and outstanding flow rate reproduction.

##### 3 Direction Flow Control Valve Series

- ESD Series:** This electro-hydraulic proportional valve provides both direction control and flow control functions. Mounting methods are the same as those for standard directional valves, which allows simple structuring and maintenance.

##### 4 Modular Type Control Valve Series

- EOG-G01:** This reduction valve with relief function can be used in ganged configurations.
- EOF-G01:** This flow control valve combines a restrictor valve with a pressure compensation valve.

This dual configuration provides easy installation along with dramatically reduced space requirements.

##### 5 Power Amplifiers

- EMA Series:** Amplifier type
  - EMC Series:** Controller type
- A **current-feedback** amplifier system is used to virtually eliminate **output current** fluctuation. The same power supply specifications apply to all types.

##### 6 Compact Power Amplifiers

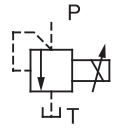
- EBA Series:** Amplifier type
- The highly efficient PWM control system of this new series ensures high reliability in a compact configuration.

##### 7 Compact, Multi-function Power Amplifiers

- EDA Series:** Amplifier type
  - EDC Series:** Amplifier controller type
- A choice of inputs: 6-contact or DC 2 input/4-contact compensation valve.

#### Series List

| Name  | Maximum Working Pressure psi | Rated Flow Rate gpm |    |     |      |      |      |      |     |     |
|---|------------------------------|---------------------|----|-----|------|------|------|------|-----|-----|
|   |                              | .26                 | .5 | 2.6 | 13.2 | 26.4 | 52.8 | 79.2 | 105 | 132 |
| Electro-hydraulic Proportional Valve (EPR)  | 5000                         | 01 — Size           |    |     |      |      |      |      |     |     |
| Electro-hydraulic Proportional Relief Valve (ER)                                  | 5000                         |                     |    |     | 03   |      | 06   |      |     |     |
| Electro-hydraulic Proportional Relief and Reducing Valve (EGB)                    | 3600                         |                     |    | 03  |      | 06   |      |      |     |     |
| Electro-hydraulic Proportional Flow Control Valve (ES)                            | 3000                         | 02                  |    | 03  |      | 06   |      | 10   |     |     |
| Load Sensitive Electro-hydraulic Proportional Relief and Flow Control Valve (ESR) | 3600                         | 03                  |    |     | 06   |      | 10   |      |     |     |
| Electro-hydraulic Proportional Flow Control Valve (ESD)                           | 3600                         | 01                  |    | 03  |      | 04   |      | 06   |     |     |
| Modular Type Electro-hydraulic Proportional Reducing Valve (EOG)                  | 3600                         | 01                  |    |     |      |      |      |      |     |     |
| Modular Type Electro-hydraulic Flow Control Valve (EOF)                           | 3000                         | 01                  |    |     |      |      |      |      |     |     |
| Power Amplifier (EMA)<br>(EMC)  |                              | ————                |    |     |      |      |      |      |     |     |
| Compact Power Amplifier (EBA)   |                              | ————                |    |     |      |      |      |      |     |     |
| Compact, Multi-function Power Amplifier (EDA)<br>(EDC)                            |                              | ————                |    |     |      |      |      |      |     |     |



### Electro-Hydraulic Proportional Pilot Relief Valve

0.3 gpm  
43 to 4000 psi

#### Features

This DC solenoid relief valve matches the attraction force of a DC solenoid with fluid pressure. When connected to a

small-volume hydraulic system or the poppet of a balanced piston type pressure control valve, this valve provides

continual pressure control in proportion to **input current**.

#### Specifications

| Item                       | Model No. | EPR-G01-*-***-12   |
|----------------------------|-----------|--|
| Rated Flow Rate gpm        |           | 0.3  |
| Pressure Control Range psi |           | B: 43 to 360<br>1: 100 to 1000<br>2: 145 to 2000<br>3: 215 to 3000<br>4: 215 to 4000<br>5: 290 to 5000 |
| Rated Current mA           |           | 800  |
| Coil Resistance Ω          |           | 20 (68° F)   |
| Hysteresis %               |           | 3 max. (Note)  |
| Weight lbs                 |           | 3.5  |

Note: Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

#### Series List

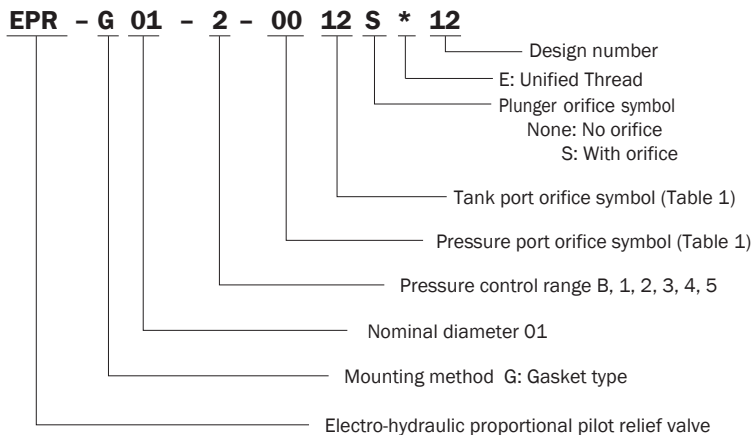


Table 1 Pressure Port and Tank Port Orifice Symbols

| Orifice Symbol   | 00   | 08   | 09   | 10   | 11   | 12   | 13   |
|------------------|------|------|------|------|------|------|------|
| Orifice Diameter | None | φ0.8 | φ0.9 | φ1.0 | φ1.1 | φ1.2 | φ1.3 |

Note: The following are the standards for the orifice auxiliary symbols.

| Pressure Control Range | Orifice Auxiliary Symbol |
|------------------------|--------------------------|
| Type B, Type 1         | 0013S                    |
| Type 2, Type 3         | 0012S                    |
| Type 4                 | 1212S                    |
| Type 5                 | 1111S                    |

#### • Handling

##### 1 Air Bleeding

To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid. The position of the air vent can change by loosening the M4 screw and rotating the cover.

##### 2 Mounting Method

Mounting on a vertical surface causes minimum pressure to increase by 14 psi.

##### 3 Manual Pressure Adjusting Screw

For the initial adjustment or when there is no **input current** to the valve due to an electrical problem or some other reason, valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counter-clockwise) and secured with the lock nut.

##### 4 Minimum Relief Flow Rate

A small flow rate can cause setting pressure to become unstable. Use a flow rate of at least .18 in<sup>3</sup>/min.

##### 5 Load Capacity

When using this valve to control direct circuit pressure, make sure the load volume (valve P port side volume) is at least 2.4 in<sup>3</sup>.

##### 6 Bundled Accessories (Valve Mounting Bolts)

10-24 x 1 3/4" (four) Tightening torque: 3.6-7 ft lbs.

##### 7 Sub Plate

When a sub plate is required, order using the following model number. MSA-01Y-E10 (See the next page for dimensions.)

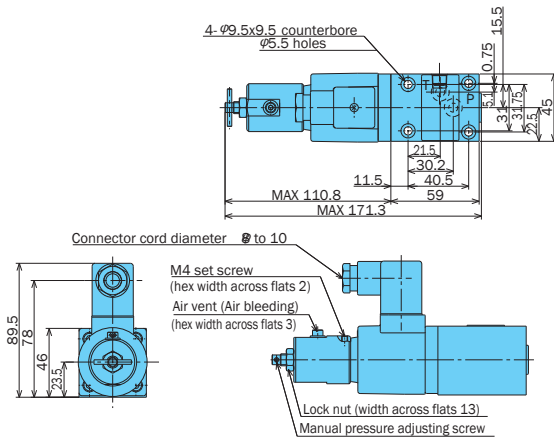
##### 8 Use an operating fluid that conforms to the both of the following.

Fluid Temperature: 4 °F to 140 °F  
Viscosity: 12 to 400 centistokes. The recommended viscosity range is 15 to 60 centistokes.

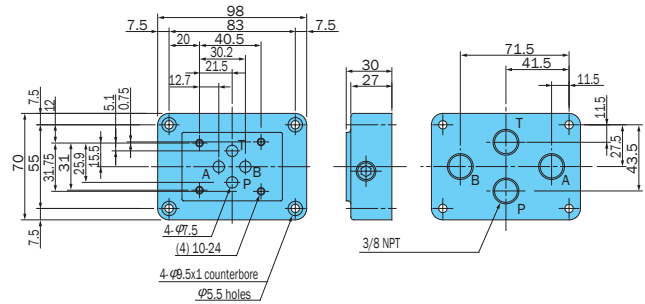
Proportional Valves

## Installation Dimension Drawings

EPR-G01



Sub Plate  
MSA-01Y-E10

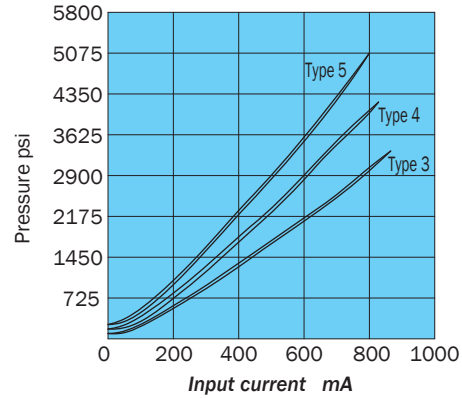
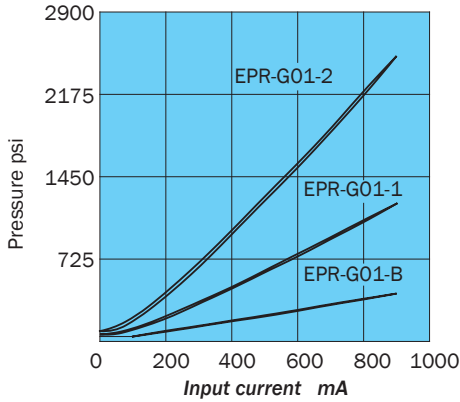


Note: Install the sub plate so the valve's P port is aligned with the sub plate's B port.  
The gasket surface dimensions comply with the ISO standard shown below.  
ISO 4401-03-02-0-94

## Performance Curves

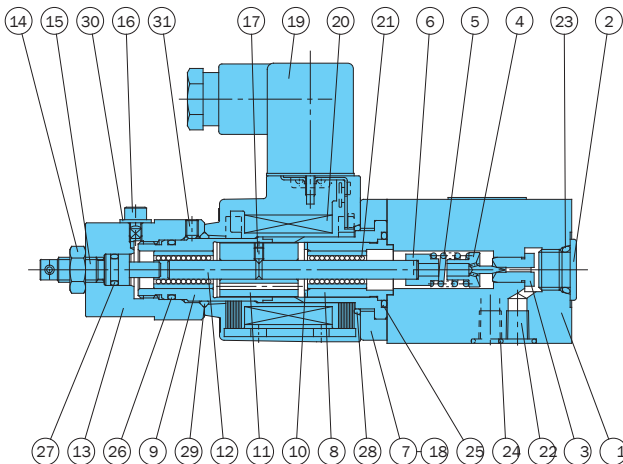
Hydraulic Operating Fluid Viscosity 32 centistokes

Input Current – Pressure Characteristics



## Cross-sectional Drawing

EPR-G01-\*.\*\*\*\*-12



| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-----------|
| 1        | Body      | 12       | Rod       | 22       | Choke     |
| 2        | Plug      | 13       | Cover     | 23       | O-ring    |
| 3        | Seat      | 14       | Nut       | 24       | O-ring    |
| 4        | Poppet    | 15       | Screw     | 25       | O-ring    |
| 5        | Spring    | 16       | Screw     | 26       | O-ring    |
| 6        | Retainer  | 17       | Screw     | 27       | O-ring    |
| 7        | Cover     | 18       | Screw     | 28       | O-ring    |
| 8        | Stopper   | 19       | Connector | 29       | O-ring    |
| 9        | Guide     | 20       | Coil      | 30       | Seal      |
| 10       | Shim      | 21       | Ball bush | 31       | Screw     |
| 11       | Plunger   |          |           |          |           |

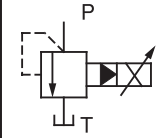
Note: Coil model number JD64-D2

Seal Part List (Kit Model Number JPS-G01-1A)

| Part No. | Part Name | Part Number      | Q'ty |
|----------|-----------|------------------|------|
| 23       | O-ring    | 1B-P11           | 1    |
| 24       | O-ring    | 1B-P9            | 2    |
| 25       | O-ring    | 1B-P22           | 1    |
| 26       | O-ring    | AS 568-016(Hs90) | 1    |
| 27       | O-ring    | 1B-P7            | 1    |
| 28       | O-ring    | S-25             | 1    |
| 29       | O-ring    | 1A-P20           | 1    |
| 30       | Seal      | CW1000FO         | 1    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.





### Electro-Hydraulic Proportional Relief Valve

39 to 84.5 gpm  
43 to 5075 psi

#### Features

This valve combines a compact, high-performance electro-hydraulic proportional pilot relief valve and balanced piston type relief valve to provide pressure control in proportion to **input current**.

Throughput volume and fluid temperature fluctuation has little effect on control pressure, so this valve provides open loop control of even complex pressures (forces).

#### • Handling

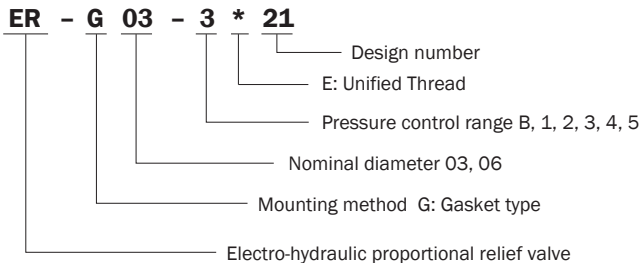
- 1 To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid.
- 2 Manual Pressure Adjusting Screw  
For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise) and secured with the lock nut.
- 3 Tank Port Back Pressure  
Make sure that tank port back pressure is as small as possible; no greater than 29 psi.
- 4 Safety Valve Setting Pressure  
The safety valve is set to maximum adjustment pressure plus 217 to 290 psi. When actually using the valve, adjust in accordance with actual pressure.
- 5 Bundled Accessories (Valve Mounting Bolts)

#### Specifications

| Item                         | Model No. | ER-G03-*-21  | ER-G06-*-21 |
|------------------------------|-----------|--|-------------|
| Rated Flow Rate gpm          |           | 39   | 84          |
| Pressure Control Range psi   |           | B: 43 to 357<br>1: 100 to 1000<br>2: 143 to 2000<br>3: 214 to 3000<br>4: 214 to 3571<br>5: 286 to 5000 |             |
| Rated Current mA             |           | 800  |             |
| Coil Resistance Ω            |           | 20 (68° F)   |             |
| Hysteresis %                 |           | 3 max. (Note 2)  |             |
| Minimum Relief Flow Rate gpm |           | 1.3  | 2.1         |
| Weight lbs                   |           | 13.2   | 15.7        |

Note: 1. G03 type only Flow rate: 10.5 gpm  
2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

#### Understanding Model Numbers

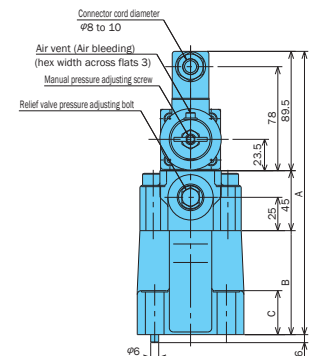
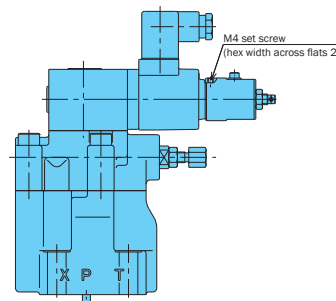
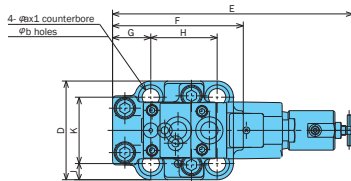


| Model No. | Bolt Size       | Q'ty | Tightening Torque ft lbs |
|-----------|-----------------|------|--------------------------|
| ER-G03    | 1/2-13 x 2"     | 4    | 55 to 70                 |
| ER-G06    | 5/8-11 x 2 3/8" | 4    | 140 to 170               |

- 6 Use an operating fluid that conforms to the both of the following.  
Fluid Temperature: 4° F to 140° F  
Viscosity: 12 to 400 centistokes. The recommended viscosity range is 15 to 60 centistokes.

#### Installation Dimension Drawings

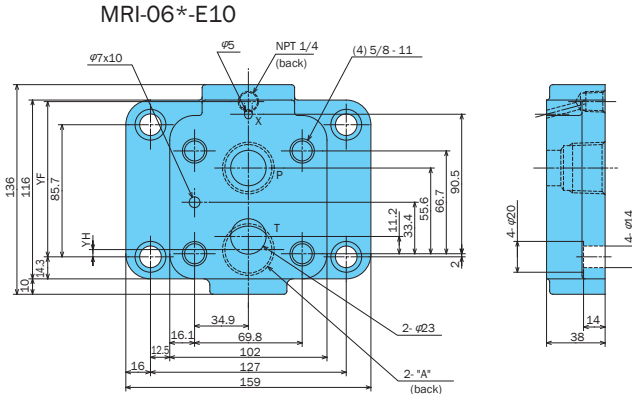
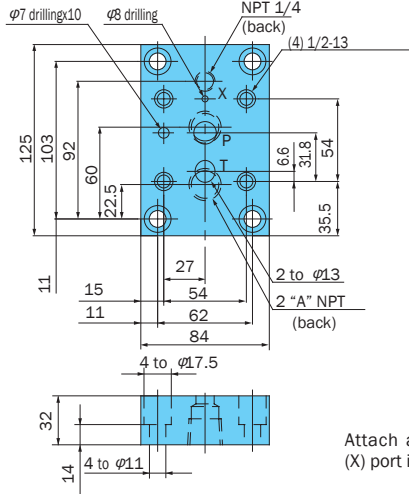
ER-G\*\*-\*-21



The gasket surface dimensions comply with the ISO standard shown below.  
G03-ISO 6264-AR-06-2-A  
G06-ISO 6264-AS-08-2-A

| Model No. | A     | B  | C  | D   | E     | F   | G  | H    | J    | K    | a  | b    |
|-----------|-------|----|----|-----|-------|-----|----|------|------|------|----|------|
| ER-G03    | 212.5 | 78 | 33 | 80  | 194.8 | 106 | 31 | 53.8 | 13.1 | 53.8 | 20 | 14   |
| ER-G06    | 217.5 | 83 | 37 | 100 | 203.8 | 119 | 37 | 66.7 | 15   | 70   | 26 | 17.5 |

Sub Plate (Maximum Operating Pressure: 3625 psi)  
MRI-03\*-E10 MRI-03X-E10 MRI-06\*-E10



Attach a plug when the vent (X) port is not used.

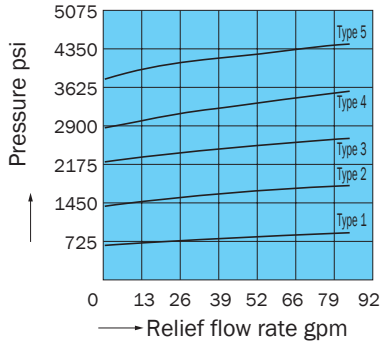
| Model No.   | A NPT |
|-------------|-------|
| MRI-03-E10  | 3/8   |
| MRI-03X-E10 | 1/2   |
| MRI-06-E10  | 3/4   |
| MRI-06X-E10 | 1     |

| Model No.   | YF    | YH   |
|-------------|-------|------|
| MRI-06-E10  | 92.5  | 13.2 |
| MRI-06X-E10 | 100.7 | 4.7  |

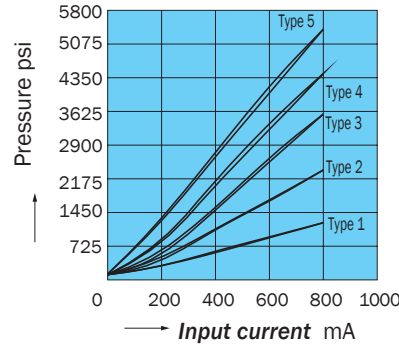
## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

Flow Rate – Pressure Characteristics ER-G06-\*-E21



Input Current – Pressure Characteristics ER-G06-\*-E21



## Cross-sectional Drawing

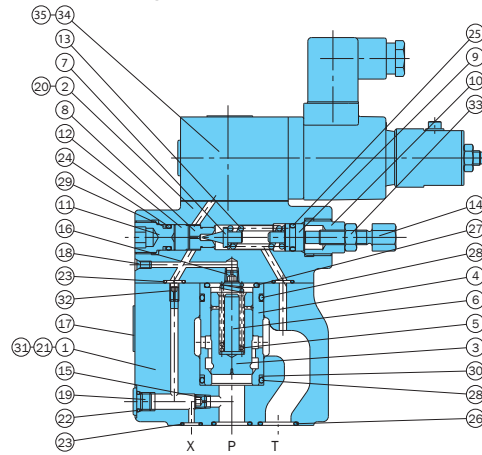
ER-G\*\*-\*-21

ER Valve Built-in Pilot Relief Valve List

| Model No.   | Built-in Pilot Relief Valve |
|-------------|-----------------------------|
| ER-G03-B-21 | EPR-G01-B-0011S-12          |
| 1           | 1-0011S-12                  |
| 2           | 2-1313S-12                  |
| 3           | 3-1212S-12                  |
| 4           | 4-1111S-12                  |
| 5           | 5-1010S-12                  |
| ER-G06-1-21 | EPR-G01-1-0011S-12          |
| 2           | 2-1313S-12                  |
| 3           | 3-1212S-12                  |
| 4           | 4-1111S-12                  |
| 5           | 5-1010S-12                  |

Seal Part List (Kit Model Number JPS-G01-1A)

| Part No. | Part Name   | Nominal Diameter/Part Number |         | Q'ty |
|----------|-------------|------------------------------|---------|------|
|          |             | G03                          | G06     |      |
| 22       | O-ring      | 1B-P8                        | 1B-P8   | 1    |
| 23       | O-ring      | 1B-P9                        | 1B-P9   | 3    |
| 24       | O-ring      | 1B-P10A                      | 1B-P10A | 1    |
| 25       | O-ring      | 1A-P11                       | 1A-P11  | 1    |
| 26       | O-ring      | 1B-P18                       | 1B-P28  | 2    |
| 27       | O-ring      | 1B-G25                       | 1B-P28  | 1    |
| 28       | O-ring      | 1B-G30                       | 1B-P32  | 2    |
| 29       | Backup ring | T2-P10A                      | T2-P10A | 1    |
| 30       | Backup ring | T2-G30                       | T2-P32  | 1    |

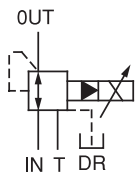


| Part No. | Part Name | Part No. | Part Name   | Part No. | Part Name          |
|----------|-----------|----------|-------------|----------|--------------------|
| 1        | Body      | 17       | Plate       | 33       | Nut                |
| 2        | Cover     | 18       | Plug        | 34       | Pilot relief valve |
| 3        | Poppet    | 19       | Plug        | 35       | Screw              |
| 4        | Sleeve    | 20       | Screw       |          |                    |
| 5        | Spring    | 21       | Pin         |          |                    |
| 6        | Spacer    | 22       | O-ring      |          |                    |
| 7        | Poppet    | 23       | O-ring      |          |                    |
| 8        | Seat      | 24       | O-ring      |          |                    |
| 9        | Plunger   | 25       | O-ring      |          |                    |
| 10       | Retainer  | 26       | O-ring      |          |                    |
| 11       | Plug      | 27       | O-ring      |          |                    |
| 12       | Collar    | 28       | O-ring      |          |                    |
| 13       | Spring    | 29       | Backup ring |          |                    |
| 14       | Handle    | 30       | Backup ring |          |                    |
| 15       | Orifice   | 31       | Screw       |          |                    |
| 16       | Orifice   | 32       | Choke       |          |                    |

Note: 1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
2. For the \*\* part of the kit number, specify the valve size (G03, G06).  
3. EPR-G01 pilot valve seal is available separately. See page G-3 for more information.

### Electro-Hydraulic Proportional Reducing and Relief Valve

13.2 to 26.4 gpm  
43.5 to 3625 psi



### Features

This valve combines a compact, high-performance electro-hydraulic pilot relief valve, and a reducing and relief valve for low-pressure control of pressure within a hydraulic system in proportion to *input*

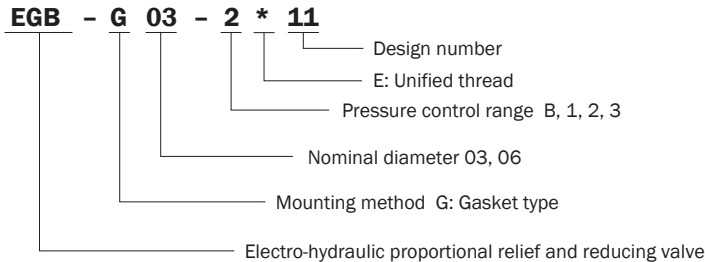
**current.**  
Since this valve includes a relief function, OUT side pressure can be maintained at a virtually fixed level, even when the valve's OUT side is used as reaction force. This valve also provides outstanding response as pressure drops.

### Specifications

| Item                           | Model No. | EGB-G03-*-11   | EGB-G06-*-11 |
|--------------------------------|-----------|--|--------------|
| Maximum Operating Pressure psi |           | 3625   |              |
| Maximum Flow Rate gpm          |           | 13.2   | 26.4         |
| Pressure Control Range psi     |           | B: 43 to 357<br>1: 100 to 1000<br>2: 129 to 2000<br>3: 214 to 3000 |              |
| Rated Current mA               |           | 800  |              |
| Coil Resistance Ω              |           | 20 (68° F)   |              |
| Hysteresis %                   |           | 3 max. (Note 2)  |              |
| Weight lbs                     |           | 12   | 17           |

Note: 1. G03 type only Rated flow rate: 5.2 gpm  
2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

### Understanding Model Numbers

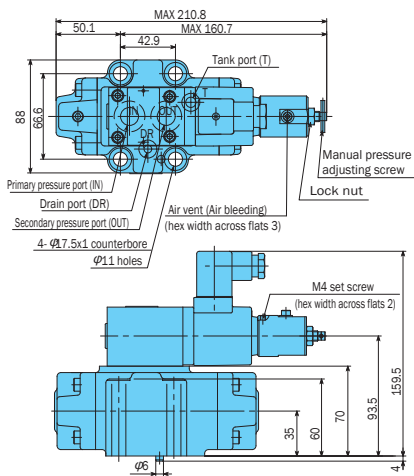


| Model No. | Bolt Size       | Qty | Tightening Torque ft lbs |
|-----------|-----------------|-----|--------------------------|
| EGB-G03   | 3/8-16 x 3"     | 4   | 33 to 40                 |
| EGB-G06   | 3/8-16 x 3 3/8" | 4   | 33 to 40                 |

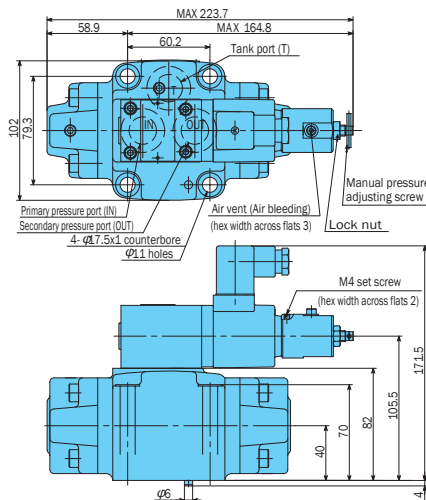
6 Use an operating fluid that conforms to the both of the following.  
Oil temperature: 4 to 140 °F  
Viscosity: 12 to 400 centistokes. The recommended viscosity range is 15 to 60 centistokes.

### Installation Dimension Drawings

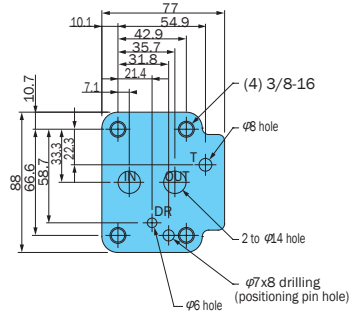
EGB-G03-\*-11



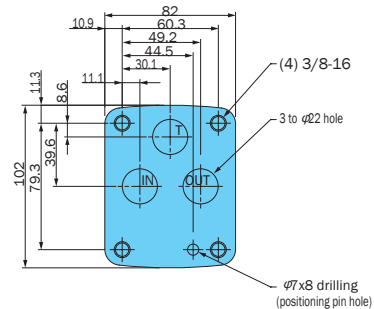
EGB-G06-\*-11



Mounding Gasket Dimensions EGB-G03-\*-11



Mounding Gasket Dimensions EGB-G06-\*-11

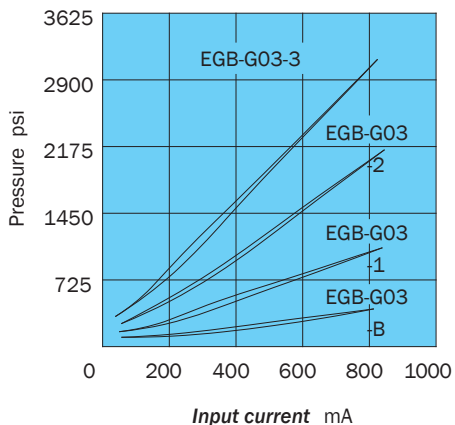


## Performance Curves

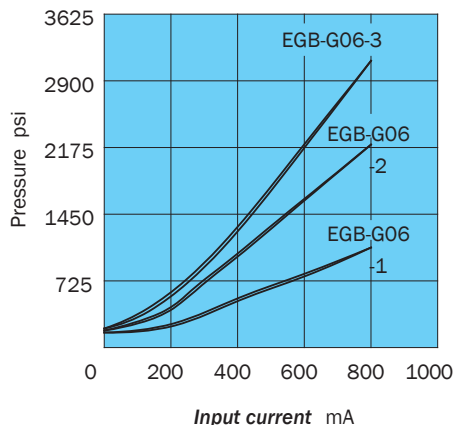
Hydraulic Operating Fluid Viscosity 32 centistokes

### Input Current – Pressure Characteristics

EGB-G03

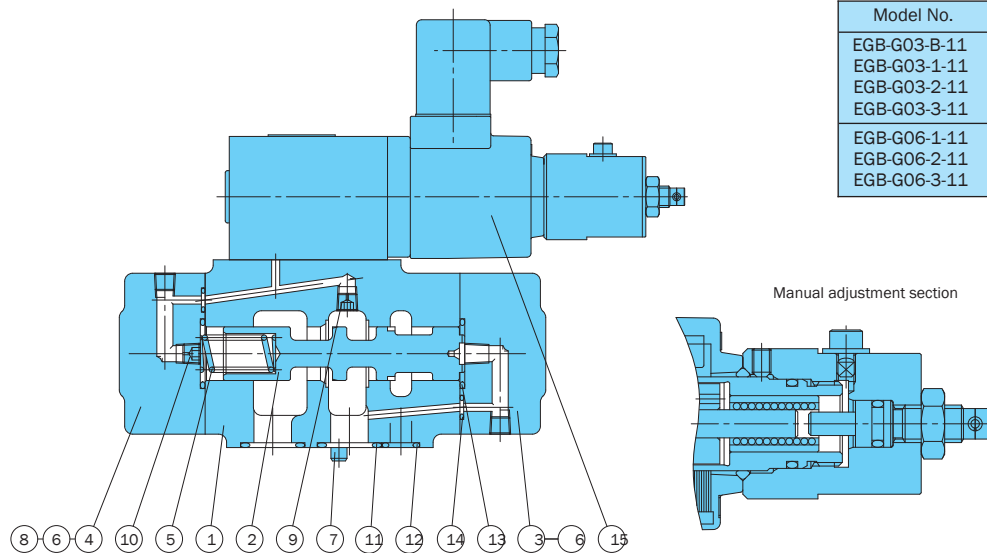


EGB-G06



## Cross-sectional Drawing

EGB-G\*\*-\*-11



### EGB Valve Built-in Pilot Relief Valve List

| Model No.    | Built-in Pilot Relief Valve |
|--------------|-----------------------------|
| EGB-G03-B-11 | EPR-G01-B-0000-12           |
| EGB-G03-1-11 | 1-0013-12                   |
| EGB-G03-2-11 | 2-0012-12                   |
| EGB-G03-3-11 | 3-0011-12                   |
| EGB-G06-1-11 | EPR-G01-1-0013-12           |
| EGB-G06-2-11 | 2-0012-12                   |
| EGB-G06-3-11 | 3-0012-12                   |

### Seal Part List (Kit Model Number JGS-\*\*\*)

| Part No. | Part Name | EGB-G03-*-11 |      | EGB-G06-*-11 |      |
|----------|-----------|--------------|------|--------------|------|
|          |           | Part Number  | Q'ty | Part Number  | Q'ty |
| 11       | O-ring    | 1B-P20       | 2    | 1B-P26       | 3    |
| 12       | O-ring    | 1B-P10A      | 2    | -            | -    |
| 13       | O-ring    | 1B-P22       | 2    | 1B-G30       | 2    |
| 14       | O-ring    | 1B-P6        | 2    | 1B-P6        | 2    |

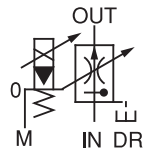
Note: 1.O-ring 1B-\*\* refers to JIS B2401-1B-\*\*.  
 2.For the \*\* part of the kit number, specify the valve size (G03, G06).  
 3.EPR-G01 pilot valve seal is available separately. See page G-3 for more information.

| Part No. | Part Name          |
|----------|--------------------|
| 1        | Body               |
| 2        | Piston             |
| 3        | Cover              |
| 4        | Cover              |
| 5        | Spring             |
| 6        | Screw              |
| 7        | Pin                |
| 8        | Pin                |
| 9        | Choke              |
| 10       | Choke              |
| 11       | O-ring             |
| 12       | O-ring             |
| 13       | O-ring             |
| 14       | O-ring             |
| 15       | Pilot relief valve |

Note:  
 Coil model number JD64-D2

### Electro-Hydraulic Proportional Flow Control Valve

.5 to 132 gpm  
3045 psi



### Features

This valve controls actuator speed in response to the size of **input current**. Pressure and control fluid temperature fluctuation has little effect on setting

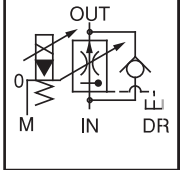
pressure which enables high-precision speed control. This valve is the perfect choice for actuator acceleration and deceleration control, and remote control.

### Specifications

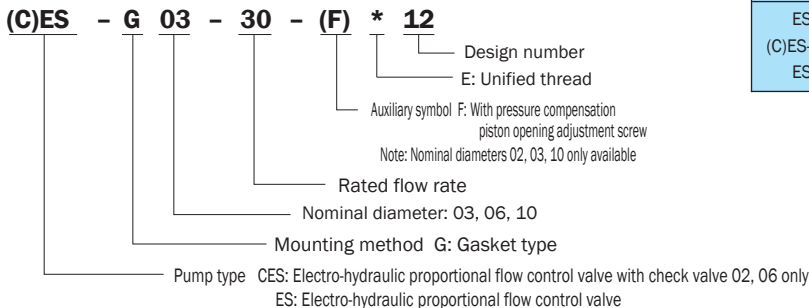
| Item  | Model No. | ES-G03-60 (F)-12<br>125 | (C)ES-G06-250-11 | ES-G10-500(F)-11 |
|---|-----------|-------------------------|------------------|------------------|
| Maximum Operating Pressure psi                    |           | 3045                    | 3045             | 3045             |
| Flow Rate Control Range gpm                       |           | .5 to 15.8              | 1.3 to 66        | 3.9 to 132       |
| Minimum Allowable Valve Pressure Differential psi |           | 145 (Note1)             | 217 (Note1)      | (Note1)          |
| Reverse Flow Rate gpm (With check valve only)     |           | 33 (Note3)              | 52               | -                |
| Hysteresis %                                      |           | 3 max. (Note 2)         | 3 max. (Note 2)  | 3 max. (Note 2)  |
| Rated Current mA                                  |           | 800                     | 800              | 800              |
| Coil Resistance Ω                                 |           | 20 (68°F)               | 20 (68°F)        | 20 (68°F)        |
| Weight lbs  |           | 28.6                    | 55               | 121              |

Note: 1. Control valve inlet and outlet pressure differential required to obtain favorable pressure compensation.  
2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).  
3. ES-G03 does not have a built-in check valve, but a sub plate with check valve (Model No. MCF-03-D-22) is available for it.

- Handling
- 1 Air Bleeding  
To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid. The position of the air vent can change by loosening the M4 screw and rotating the cover.
- 2 Manual Flow Rate Adjusting Screw  
For the initial adjustment or when there is no **input current** to the valve due to an electrical problem or some other reason, the flow rate can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, this adjusting screw should be returned completely to its original position and secured with the lock nut.
- 3 Drain Port  
Make sure that back pressure is no greater than 29 psi, and that his port is connected directly to the fluid tank at a point that is below the oil surface.
- 4 Bundled Accessories (Valve Mounting Bolts)



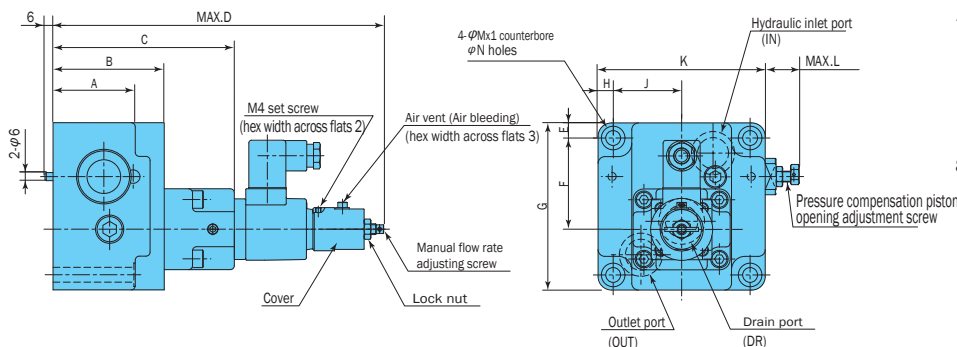
### Understanding Model Numbers



| Model No. | Bolt Size       | Q'ty | Tightening Torque ft lbs |
|-----------|-----------------|------|--------------------------|
| ES-G03    | 3/8-16 x 3"     | 4    | 33 to 40                 |
| (C)ES-G06 | 5/8-11 x 5 1/2" | 4    | 140 to 170               |
| ES-G10    | 3/4-10 x 6 1/4" | 4    | 270 to 339               |

- 5 The loss coefficient and control valve can cause resonance when there is a great distance between the flow control valve and actuator (when the pipe internal volume is large). Be sure to keep the distance between the flow control valve and actuator as small as possible, and to avoid the use of flexible hose as much as possible.
- 6 Sub Plate  
See the next page for more information about sub plates.
- 7 Use an operating fluid that conforms to the both of the following.  
Oil temperature: 4 to 140 °F  
Viscosity: -12 to 400 centistokes.  
The recommended viscosity range is 15 to 60 centistokes.
- 8 Since this valve has a built-in pressure compensation valve, changing of the inertial load (using a high inertial oil motor, etc.) can create the risk of hunching under certain conditions. Contact your sales agent before changing the inertial load.  
Note: Use a hex wrench that has a width across flats of 8 to adjust the aperture adjustment screw of nominal diameter 10.

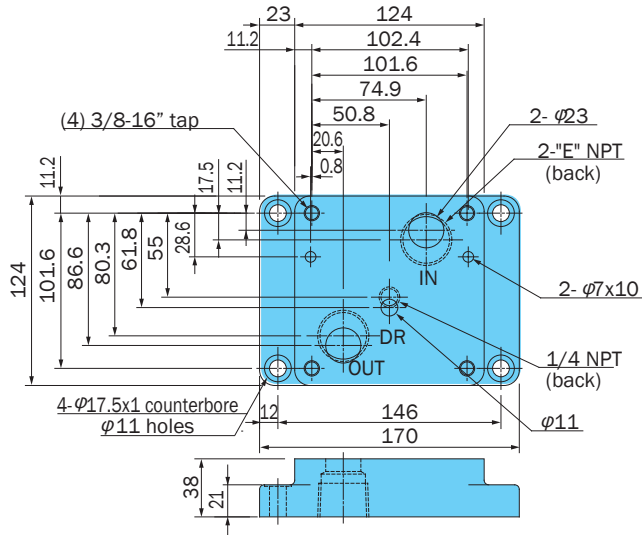
### Installation Dimension Drawings



| Model No. | A   | B    | C     | D     | E    | F     | G   | H    | J    | K   | L  | M    | N  |
|-----------|-----|------|-------|-------|------|-------|-----|------|------|-----|----|------|----|
| ES-G03    | 61  | 82.5 | 134.5 | 245.3 | 11.2 | 67.8  | 124 | 11.2 | 50.8 | 124 | 26 | 17.5 | 11 |
| (C)ES-G06 | 115 | 130  | 182   | 292.8 | 16.8 | 104.8 | 167 | 17   | 73   | 180 | -  | 26   | 18 |
| ES-G10    | 137 | 160  | 215   | 326.3 | 25   | 148   | 228 | 23.5 | 98.5 | 244 | 18 | 32   | 22 |

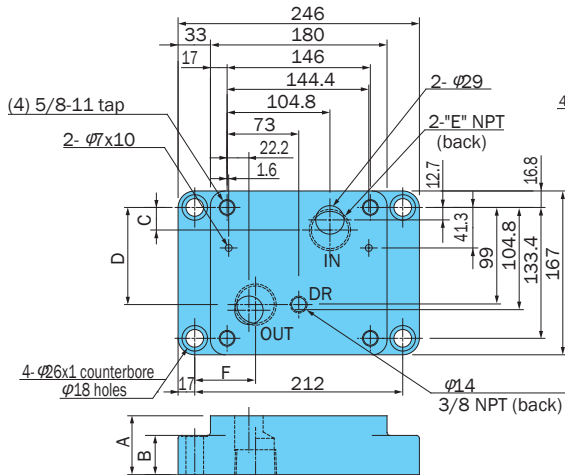
• The gasket surface dimensions comply with the ISO standard shown below.  
(C) ES-G03 ...ISO 6263-07-09-97  
(C) ES-G06 ...ISO 6263-08-13-97

Sub Plate  
MES-03\*-E10

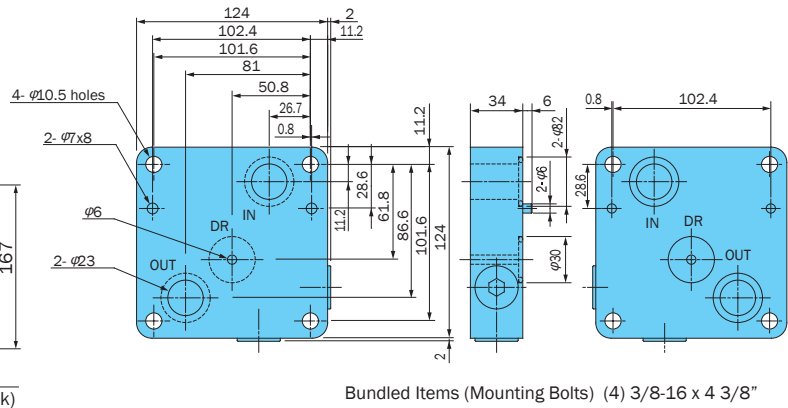


| Model No.   | E NPT |
|-------------|-------|
| MES-03Y-E10 | 3/4   |
| MES-03Z-E10 | 1     |

MES-06\*-E10

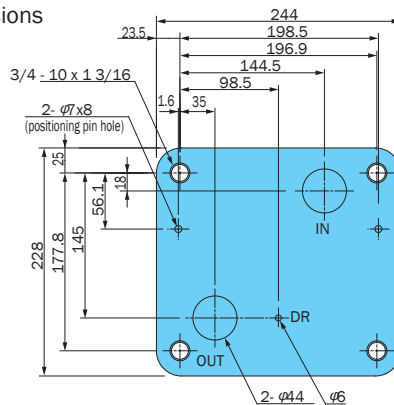


Auxiliary Plate with Check Valve  
MCF-03-D-22



| Model No.   | A  | B  | C  | D     | E    | F    |
|-------------|----|----|----|-------|------|------|
| MES-06X-E10 | 45 | 25 | 16 | 104.8 | 1    | 55.2 |
| MES-06Y-E10 | 60 | 40 | 23 | 99    | 11/4 | 62   |

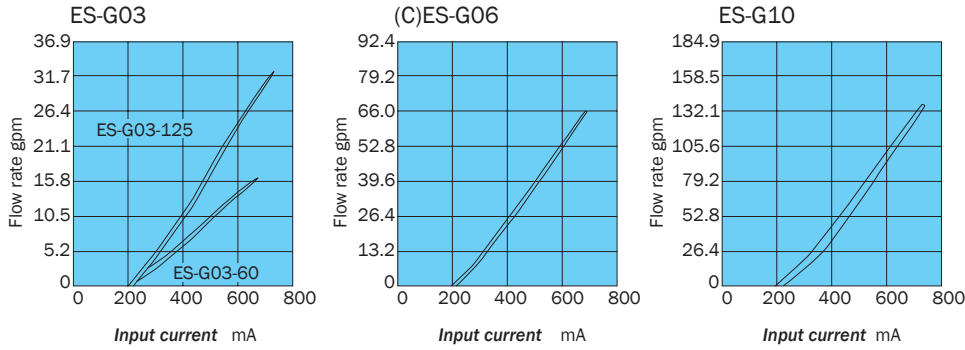
ES-G10\*-E10 Mounting Gasket Surface Dimensions



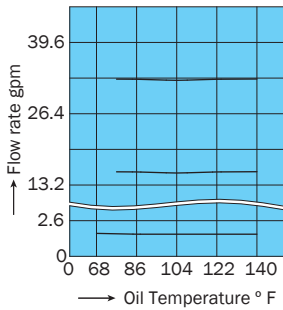
# Performance Curves

Hydraulic Operating Fluid Viscosity Centistokes

## Input Current – Flow Rate Characteristics

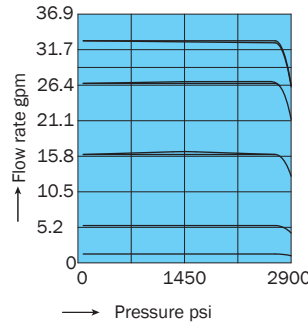


## Fluid Temperature – Control Flow Rate Characteristics



Supply Pressure 2000 psi  
Load Pressure 1450 psi  
Operating Fluid VG32  
Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

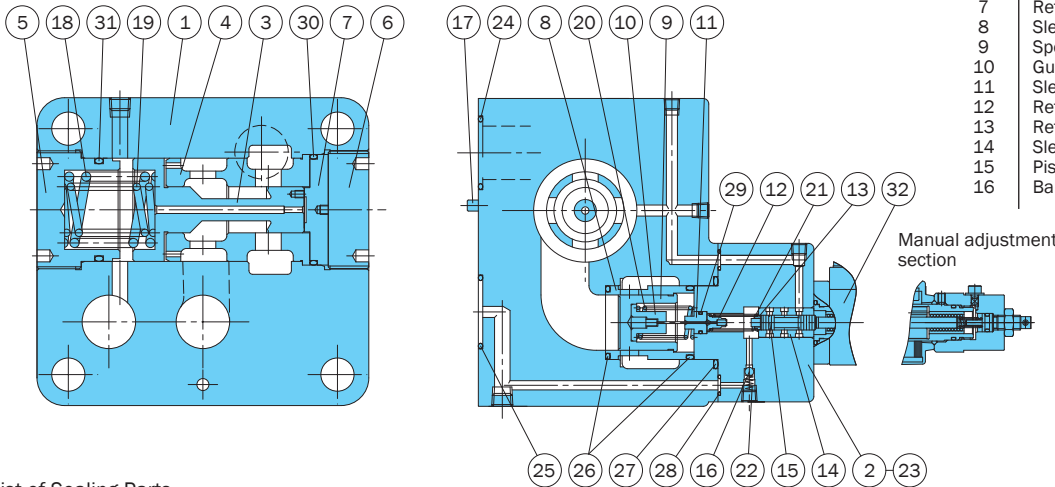
## Pressure – Control Flow Rate Characteristics



Supply Pressure 3000 psi  
Operating Fluid VG32  
Fluid Temperature 104° F  
Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

# Cross-sectional Drawing

ES-G\*\*-\*-11(12)

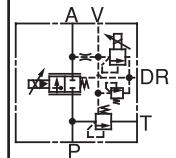
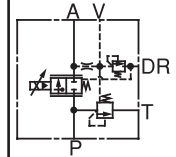


| Part No. | Part Name | Part No. | Part Name             |
|----------|-----------|----------|-----------------------|
| 1        | Body      | 17       | Pin                   |
| 2        | Cover     | 18       | Spring                |
| 3        | Piston    | 19       | Spring                |
| 4        | Sleeve    | 20       | Spring                |
| 5        | Plug      | 21       | Spring                |
| 6        | Plug      | 22       | Spring                |
| 7        | Retainer  | 23       | Spring                |
| 8        | Sleeve    | 24       | O-ring                |
| 9        | Spool     | 25       | O-ring                |
| 10       | Guide     | 26       | O-ring                |
| 11       | Sleeve    | 27       | O-ring                |
| 12       | Retainer  | 28       | O-ring                |
| 13       | Retainer  | 29       | O-ring                |
| 14       | Sleeve    | 30       | O-ring                |
| 15       | Piston    | 31       | O-ring                |
| 16       | Ball      | 32       | Proportional solenoid |

## List of Sealing Parts

| Part No.        | Part Name | ES-G03      |      | (C)ES-G06   |      | ES-G10      |      |
|-----------------|-----------|-------------|------|-------------|------|-------------|------|
|                 |           | Part Number | Q'ty | Part Number | Q'ty | Part Number | Q'ty |
| 24              | O-ring    | 1B-P26      | 2    | 1B-G35      | 2    | 1B-P48      | 2    |
| 25              | O-ring    | 1B-P28      | 1    | 1B-G35      | 1    | 1B-P48      | 1    |
| 26              | O-ring    | -           | -    | 1B-G35      | 2    | 1B-G50      | 2    |
| 27              | O-ring    | 1B-P29      | 1    | 1B-G45      | 1    | 1B-G60      | 1    |
| 28              | O-ring    | 1B-P5       | 4    | 1B-P8       | 3    | 1B-P9       | 3    |
| 29              | O-ring    | 1B-P9       | 1    | 1B-P9       | 1    | 1B-P9       | 1    |
| 30              | O-ring    | 1B-P20      | 1    | 1B-G55      | 1    | 1B-G75      | 2    |
| 31              | O-ring    | 1B-P38      | 1    | 1B-P50      | 1    | 1B-G75      | 1    |
| Seal Kit Number |           | JFS-G03     |      | JFS-G06     |      | JFS-G10     |      |

Note: O-ring 1B-\*\* refers to JIS B2401-1B-\*\*.



### Load Response Electro-Hydraulic Proportional Relief and Flow Control Valve

.26 to 132 gpm  
3625 psi

#### Features

The load sensing function of this meter in flow control valve makes it possible to control pump discharge pressure automatically in accordance with the size of the load

pressure. Using this valve suppresses wasteful pump pressure rises and makes it possible to configure an energy-efficient circuit.

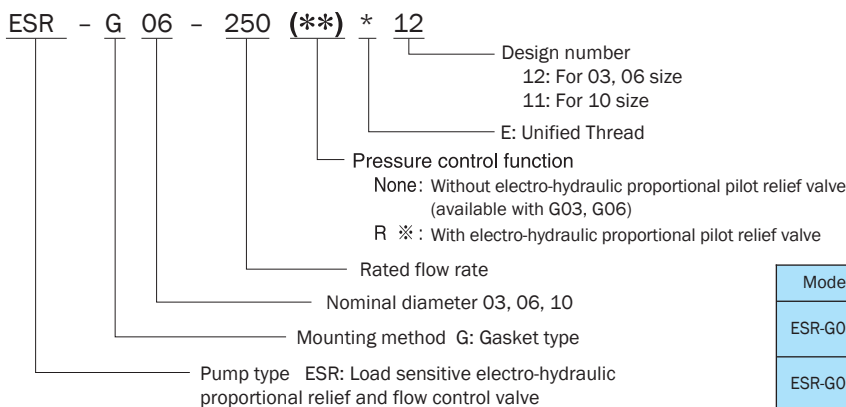
- Handling
  - 1 In order to ensure stable control, loosen the air vent and bleed air from the valve before starting operation.
  - 2 Manual Adjusting Screw  
For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, pressure or flow rate can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, this adjusting screw should be returned completely to its original position and secured with the lock nut.
  - 3 Drain Port  
Minimum control pressure is increased by drain port back pressure, so be sure to connect the drain port directly to the fluid tank at a point that is below the oil surface.
  - 4 Safety Valve Setting Pressure  
For a safety valve without an electro-hydraulic proportional pilot relief valve, safety valve pressure is set to minimum pressure (507 psi). In the case of a safety valve with an electrohydraulic proportional pilot relief valve, the safety valve setting pressure is set to the minimum adjustment pressure plus 217 psi. When actually using the valve, adjust in accordance with hydraulic circuit pressure.
  - 5 Minimum Relief Flow Rate During Pressure Control  
Setting pressure can become unstable when the relief flow rate to the valve's T port is small. Because of this, use a relief flow rate of at least 2.6 gpm with a nominal diameter of .1", and a relief flow rate of at least 2.6 gpm with a nominal diameter of .39".
  - 6 Valve Mounting Orientation  
When an electro-hydraulic proportional pilot relief valve main valve is mounted on a vertical surface with the pilot relief valve part facing downwards make it difficult to bleed air from the pilot relief valve. Because of this, you should not use this type of mounting orientation.
  - 7 Bundled Accessories (Valve Mounting Bolts)

#### Specifications

| Item                             | Model No.                       | ESR-G03-125 (R*)-12  | ESR-G06-250 (R*)-12  | ESR-G10-500 R*-11  |
|----------------------------------|---------------------------------|--|--|--|
| Maximum Operating Pressure psi   |                                 | 3625   | 3625   | 3625   |
| Rated Flow Rate l/min (gpm)      |                                 | 125 (33)   | 250 (66)   | 500 (132)  |
| Flow Rate Control System         | Flow Rate Control Range gpm     | .5 to 33   | 1.3 to 66  | 3.9 to 132   |
|                                  | Valve Differential Pressure psi | 72 (Note1)   | 101 (Note1)  | 130 (Note1)  |
|                                  | Hysteresis %                    | 3 max. (Note 2)  | 3 max. (Note 2)  | 3 max. (Note 2)  |
|                                  | Repeatability %                 | 1  | 1  | 1  |
|                                  | Rated Current mA                | 800  | 800  | 800  |
|                                  | Coil Resistance Ω               | 20 (68°F)  | 20 (68°F)  | 20 (68°F)  |
| Pressure Control System (Note 3) | Pressure Control Range psi      | R1 174 to 1000<br>R2 203 to 2000<br>R3 232 to 3000<br>R4 232 to 3625 | R1 174 to 1000<br>R2 203 to 2000<br>R3 232 to 3000<br>R4 232 to 3625 | R1 174 to 1000<br>R2 203 to 2000<br>R3 232 to 3000<br>R4 232 to 3625 |
|                                  | Hysteresis %                    | 3 max. (Note 2)  | 3 max. (Note 2)  | 3 max. (Note 2)  |
|                                  | Repeatability %                 | 1  | 1  | 1  |
|                                  | Rated Current mA                | 800  | 800  | 800  |
|                                  | Coil Resistance Ω               | 20 (68°F)  | 20 (68°F)  | 20 (68°F)  |
| Weight lbs                       |                                 | 30.8   | 61.7   | 132  |

Note: 1.Indicates the pressure differential between the valve P port and A port.  
2.Value when a Nachi-Fujikoshi special amplifier is used (with dithering).  
3.These specifications apply to valves that include an electro-hydraulic proportional pilot relief valve (i.e. ESR-G06-250R2-11).  
4.The maximum adjustment pressure is 3625 psi for a valve that does not include an electro-hydraulic proportional pilot relief valve.  
Factory default is minimum output (507 psi max.) Set this value in accordance with the pressure of the hydraulic circuit being used.

#### Understanding Model Numbers



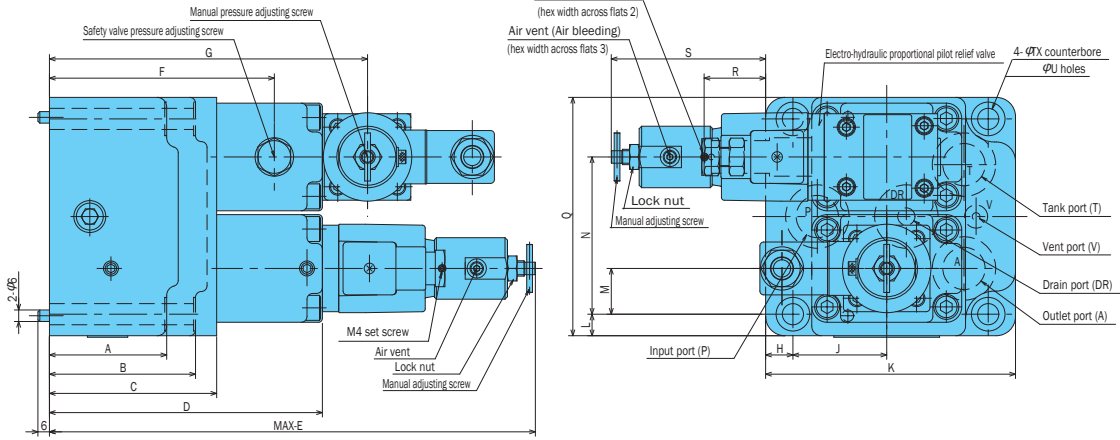
| Model No. | Bolt Size      | Q'ty | Tightening Torque ft lbs |
|-----------|----------------|------|--------------------------|
| ESR-G03   | 3/8-16 x 3 1/2 | 4    | 33 to 40                 |
| ESR-G06   | 5/8-11 x 5 1/4 | 4    | 140 to 173               |
| ESR-G10   | 3/4-10 x 5     | 4    | 272 to 339               |

- 8 Sub Plate  
See the next page for more information about sub plates.
- 9 Use an operating fluid that conforms to the both of the following. Oil temperature: -4 to 158°F  
Viscosity: 12 to 400 centistokes. The recommended viscosity range is 15 to 60 centistokes.

10 Since this valve has a built-in pressure compensation valve, changing of the inertial load (using a high inertial oil motor, etc.) can create the risk of hunching under certain conditions. Contact your sales agent before changing the inertial load.

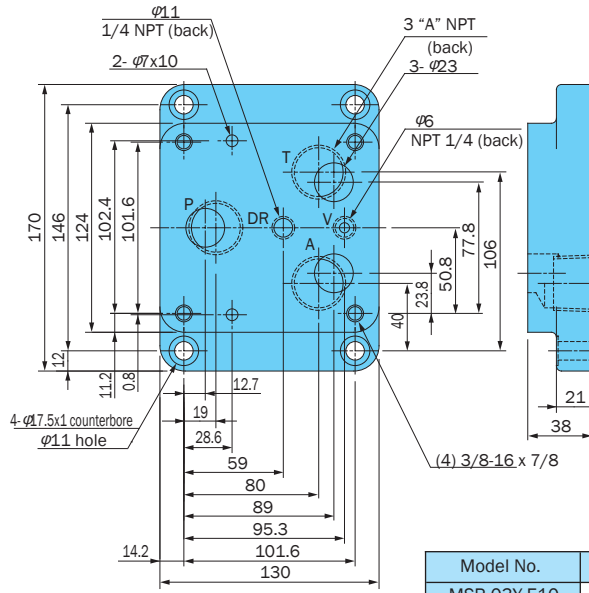


# Installation Dimension Drawings



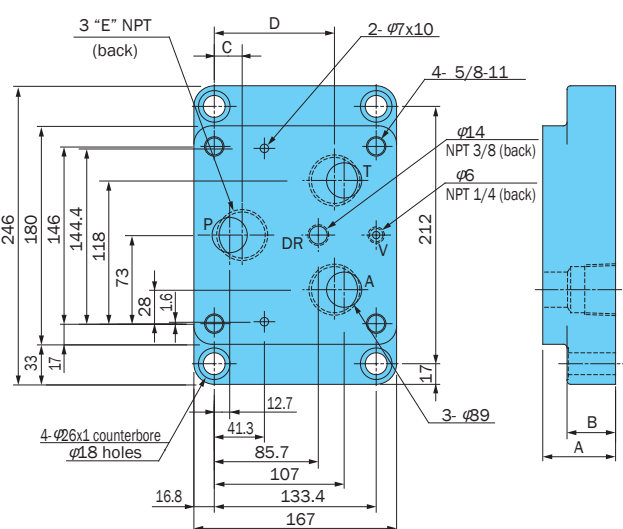
| Model No. | A   | B   | C   | D   | E     | F   | G     | H    | J    | K   | L    | M    | N    | Q   | R  | S    | T    | U  |
|-----------|-----|-----|-----|-----|-------|-----|-------|------|------|-----|------|------|------|-----|----|------|------|----|
| ESR-G03   | 61  | 76  | 87  | 142 | 252.8 | 117 | 165.5 | 14.2 | 48.8 | 130 | 11.2 | 23.8 | 81.8 | 124 | 32 | 80.3 | 17.5 | 11 |
| ESR-G06   | 76  | 110 | 120 | 172 | 282.8 | 154 | 195.5 | 16.8 | 57.2 | 167 | 17   | 28   | 118  | 180 | 21 | 68.3 | 26   | 18 |
| ESR-G10   | 107 | 107 | 150 | 205 | 317.3 | 183 | 228.5 | 25   | 76   | 228 | 23.5 | 35   | 162  | 244 | -3 | 35.3 | 32   | 22 |

Sub Plate  
MSR-03\*-E10



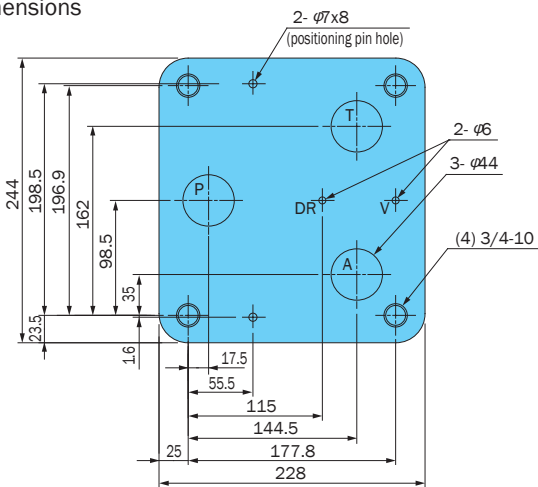
| Model No.   | A NPT |
|-------------|-------|
| MSR-03Y-E10 | 3/4   |
| MSR-03Z-E10 | 1     |

MSR-06\*-E10



| Model No.   | A  | B  | C  | D   | E         |
|-------------|----|----|----|-----|-----------|
| MSR-06X-E10 | 95 | 25 | 16 | 107 | 1 NPT     |
| MSR-06Y-E10 | 60 | 40 | 23 | 99  | 1 1/4 NPT |

ESR-G10 Mounting Gasket Surface Dimensions

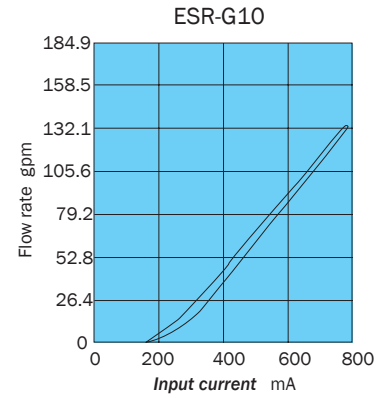
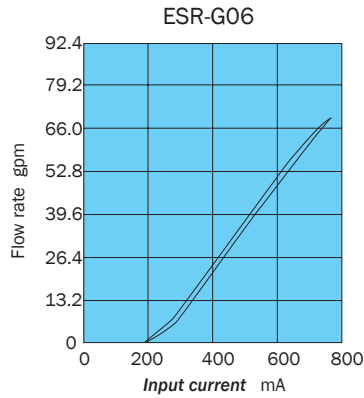
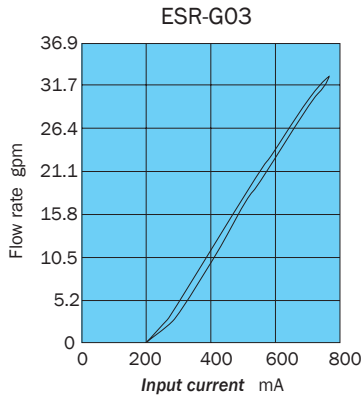


The gasket surface dimensions comply with the ISO standards shown below.  
 ESR-G03-ISO 6263-07-11-97  
 ESR-G06-ISO 6263-08-15-97

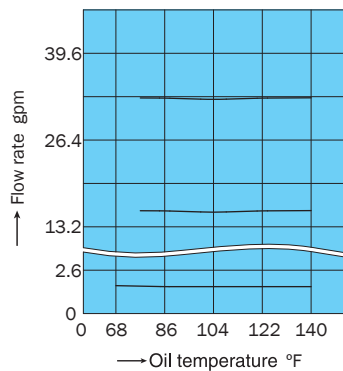
## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

Input Current – Flow Rate Characteristics

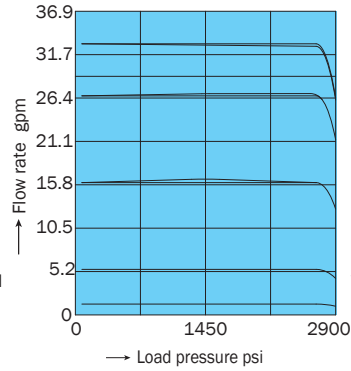


Fluid Temperature – Control Flow Rate Characteristics



Load Pressure: 1450 psi  
Operating Fluid: VG32  
Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

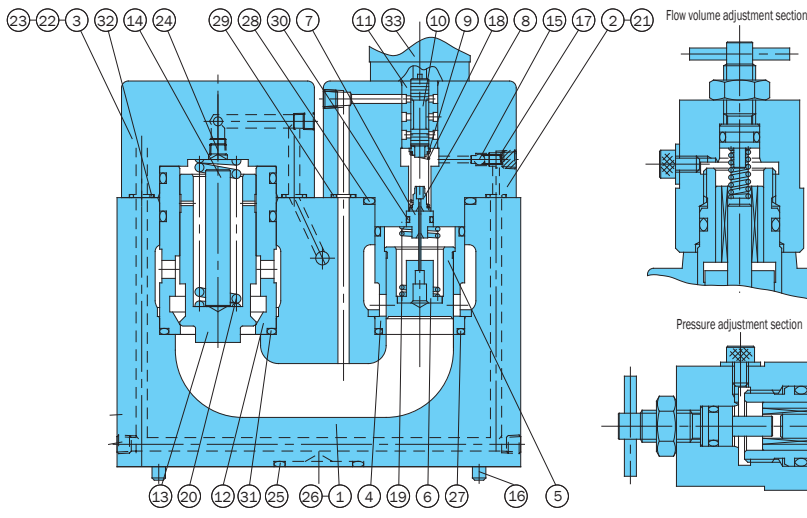
Pressure – Control Flow Rate Characteristics



Electro-hydraulic Proportional Pilot  
Relief Valve Setting Pressure 3045 psi  
Operating Fluid: VG32  
Fluid Temperature: 104° F  
Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

## Cross-sectional Drawing

ESR-G\*\*\*-11, 12



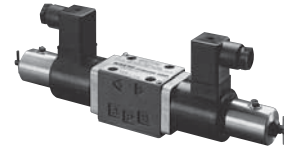
| Part No. | Part Name | Part No. | Part Name             |
|----------|-----------|----------|-----------------------|
| 1        | Body      | 18       | Spring                |
| 2        | Cover (A) | 19       | Spring                |
| 3        | Cover (B) | 20       | Spring                |
| 4        | Sleeve    | 21       | Screw                 |
| 5        | Spool     | 22       | Screw                 |
| 6        | Guide     | 23       | Safety valve          |
| 7        | Sleeve    | 24       | Choke                 |
| 8        | Retainer  | 25       | O-ring                |
| 9        | Retainer  | 26       | O-ring                |
| 10       | Piston    | 27       | O-ring                |
| 11       | Sleeve    | 28       | O-ring                |
| 12       | Sleeve    | 29       | O-ring                |
| 13       | Poppet    | 30       | O-ring                |
| 14       | Guide     | 31       | O-ring                |
| 15       | Ball      | 32       | O-ring                |
| 16       | Pin       | 33       | Proportional solenoid |
| 17       | Spring    |          |                       |

Note: Coil model number JD64-D2

List of Sealing Parts

| Part No.        | Part Name | ESR-G03     |      | ESR-G06     |      | ESR-G10     |      |
|-----------------|-----------|-------------|------|-------------|------|-------------|------|
|                 |           | Part Number | Q'ty | Part Number | Q'ty | Part Number | Q'ty |
| 25              | O-ring    | 1B-P26      | 4    | 1B-G35      | 4    | 1B-P48      | 4    |
| 26              | O-ring    | 1B-P9       | 1    | 1B-P9       | 1    | 1B-P9       | 1    |
| 27              | O-ring    | 1B-G25      | 2    | 1B-G35      | 2    | 1B-G50      | 2    |
| 28              | O-ring    | 1B-G35      | 1    | 1B-G45      | 1    | 1B-G60      | 1    |
| 29              | O-ring    | 1B-P6       | 3    | 1B-P8       | 3    | 1B-P9       | 3    |
| 30              | O-ring    | 1B-P9       | 1    | 1B-P9       | 1    | 1B-P9       | 1    |
| 31              | O-ring    | 1B-G35      | 3    | 1B-P46      | 3    | 1B-G65      | 3    |
| 32              | O-ring    | 1B-P6       | 2    | 1B-P8       | 2    | 1B-P9       | 2    |
| Seal Kit Number |           | JLS-G03R    |      | JLS-G06R    |      | JLS-G10R    |      |

Note: 1.O-ring 1B-\*\* refers to JIS B2401-1B-\*\*. 2.EPR-G01 seal is available separately. See page G-3 for more information.



### Electro-Hydraulic Proportional Flow and Directional Control Valve

2.6 to 132 gpm  
3625 psi

#### Features

This valve uses a DC solenoid in a traditional 4-way solenoid valve to create a solenoid valve capable of both direction switching and high-speed control. The lineup consists of the direct system O1 size and the pilot system O3, O4, and O6 sizes.

Direction control is performed by supplying **input current** to one of the two proportional solenoid valves, and the size of the flow rate is controlled in accordance with the size of the **input current**. This type of valve can be used for remote control and shockless acceleration and deceleration control, and for simple configuration of hydraulic circuits.

#### Specifications

| Model No.                          | ESD-G01-** 10<br>20<br>-12  | ESD-G03-**<br>40- (**)-12<br>80             | ESD-G04-<br>**140(**)-12 | ESD-G06-<br>**250(**)-13 |
|------------------------------------|-----------------------------|---|--------------------------|--------------------------|
| Maximum Operating Pressure psi     | 3625                        |   |                          |                          |
| Rated Flow Rate l/min (gpm)        | 10/20 (2.6/5.2)<br>(Note 1) | 40/80 (10.5/21)<br>(Note 1)                 | 139 (36.9)<br>(Note 1)   | 125/250 (66)<br>(Note 1) |
| Maximum Flow Rate gpm              | 6.6 (Note 2)                | 26.4 (Note 2)                               | 36.9 (Note 2)            | 66 (Note 2)              |
| Pilot Pressure psi                 | -                           | At least 145 (Note 3)                       |                          |                          |
| Pilot Flow Rate gpm                | -                           | At least .5 (Note 4)                        | At least .79 (Note 4)    | At least 1.3 (Note 4)    |
| T Port Allowable Back Pressure psi | 2.5 (25.5)                  | Internal Drain: 362<br>External Drain: 3045 |                          |                          |
| Rated Current mA                   | 850                         |   |                          |                          |
| Coil Resistance Ω                  | 20 (68° F)                  |   |                          |                          |
| Hysteresis %                       | 5 max. (Note 5)             |   |                          |                          |
| Response Time s                    | 0.04 (Note 6)               | 0.05 (Note 6)                               | 0.08 (Note 6)            | 0.1 (Note 6)             |
| Weight lbs                         | 4.8                         | 15.4  | 20.2                     | 33                       |

Note: 1. Value when pressure drop volume to P → A and P → B is ΔP = 145 psi  
2. Indicates maximum throughput volume value between each port.  
3. Indicates differential between the pilot port and tank port, or drain port.  
4. Value when 0.1 second is assumed for the response time from zero to the rated flow volume.  
5. Value when a Nachi-Fujikoshi special amplifier is used.  
6. Response time is typical value for a supply pressure of 2030 psi and fluid temperature of 104° F (kinematic viscosity: 40 centistokes)

#### Understanding Model Numbers

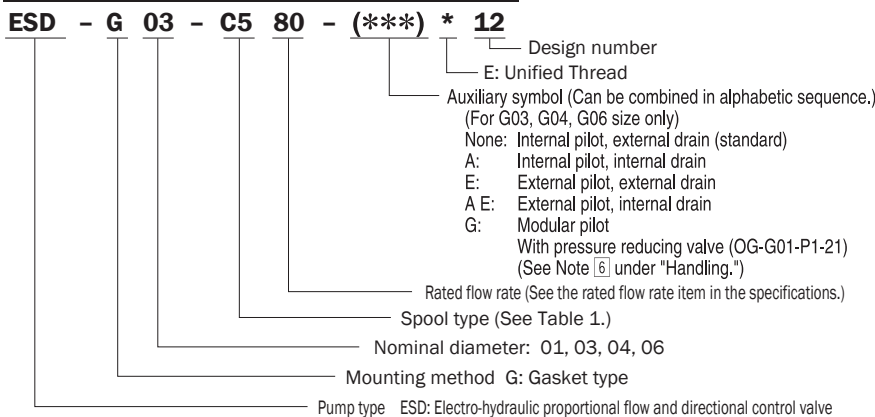


Table 1

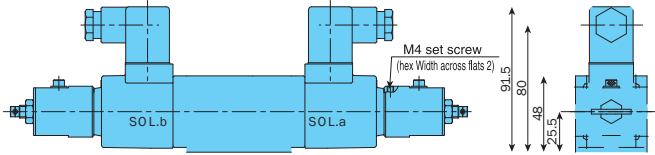
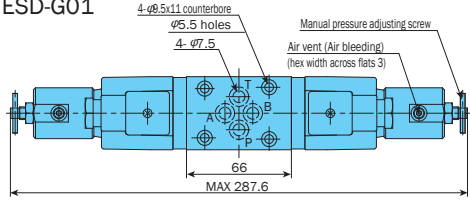
| Spool Type | Hydraulic Circuit |              |         |
|------------|-------------------|--------------|---------|
|            | ESD-G01           | ESD-G03, G04 | ESD-G06 |
| C5         |                   |              |         |
| C6S        |                   |              |         |

- Handling
- 1 Air Bleeding  
In order to ensure stable control, loosen the air vent and bleed air from the valve before starting operation. For details, see the user's guide.
- 2 T Port Piping  
When configuring piping, ensure that the T port (pilot valve T port for the G03, G04, and G06 sizes) is filled with operating fluid.
- 3 Manual Adjusting Screw  
For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, the valve can be operated and valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise).
- 4 Valve Mounting Orientation  
Install the valve so the spool axis line is horizontal.
- 5 Combining with a Pressure Compensation Valve  
Use of the optional pressure compensation kit is recommended when higher precision flow rate control is required or in high-pressure applications. For details, see page G-20.
- 6 If pilot pressure (ESD-G03, G04, G06) exceeds 1300 psi use a modular type P port reduction valve (OG-G01-P1-21) at a setting of 290 psi.
- 7 On a system that requires large brake pressure during deceleration or a system that uses a vertical cylinder, equip a counter balance valve.  
Use a single rod, if the rod exit is not slowed sufficiently, use a counter balance valve on the rod.
- 8 Maintain hydraulic operating fluid contamination so it is at least Class 9. Use of a G01 modular filter (Absolute: 8μ m) is also helpful.

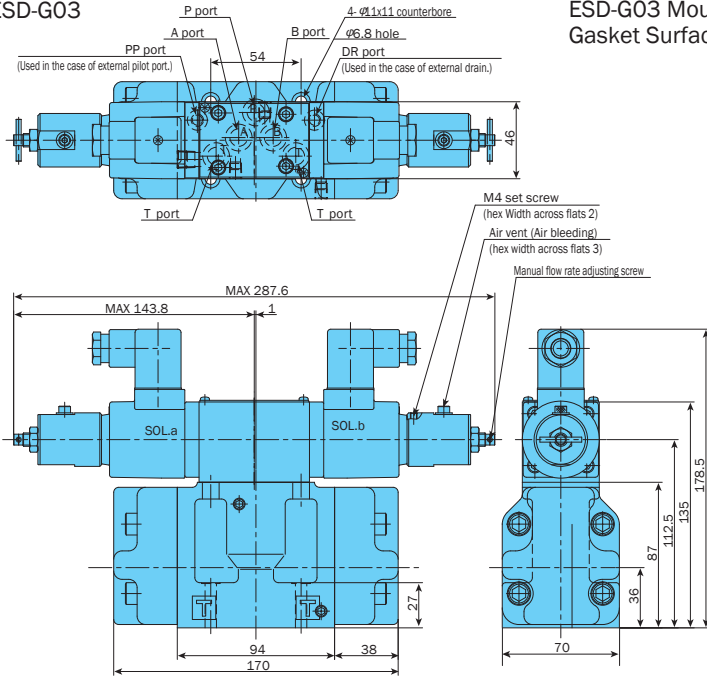
(Continued on next page)

# Installation Dimension Drawings

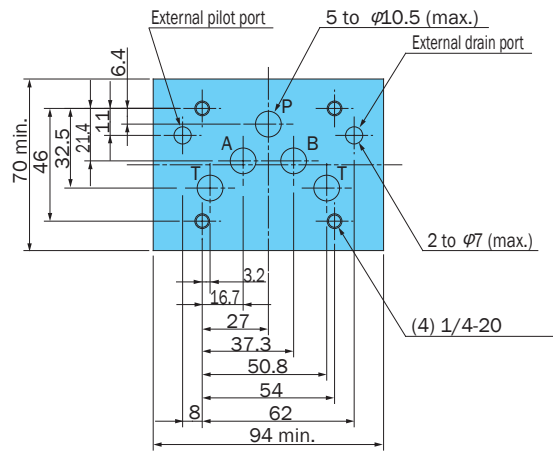
ESD-G01



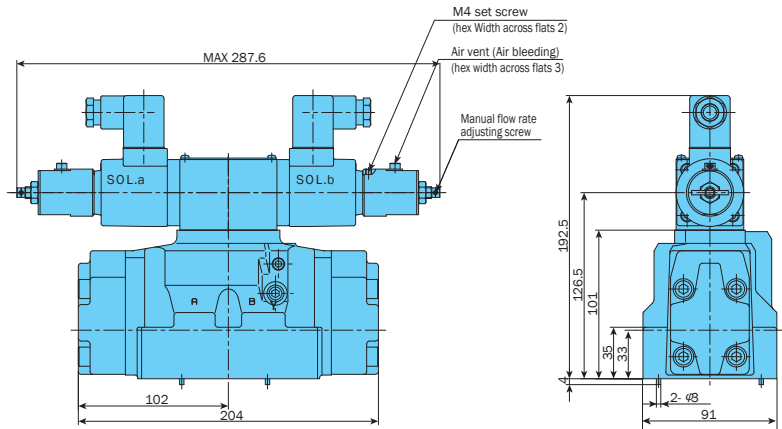
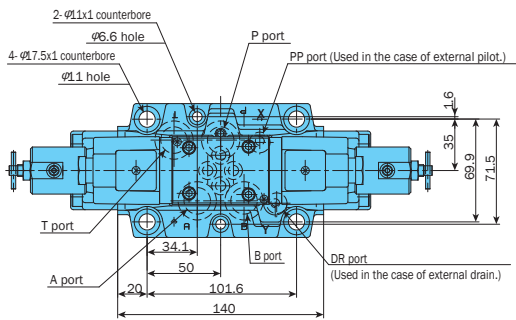
ESD-G03



ESD-G03 Mounting Gasket Surface Dimensions  
Gasket Surface Mounting Dimensions (ISO4401-05-0-94)



ESD-G04



## Bundled Accessories (Valve Mounting Bolts)

| Model No. | Bolt Size      | Q'ty | Tightening Torque ft lbs |
|-----------|----------------|------|--------------------------|
| ESD-G01   | 10-24 x 1 3/4  | 4    | 3.6 to 5 ft lbs          |
| ESD-G03   | 1/4-20 x 1 3/8 | 4    | 7 to 9.5 ft lbs          |
| ESD-G04   | 1/4-20 x 1 3/4 | 2    | 7 to 9.5 ft lbs          |
|           | 3/8-16 x 2     | 4    | 33 to 40 ft lbs          |
| ESD-G06   | 1/2-13 x 2 3/8 | 6    | 44 to 51 ft lbs          |

For information about sub plates, see MSA-01Y-E10 on page G-3.

## Gasket Surface Dimensions (ISO 4401-03-02-0-94)

Use an operating fluid that conforms to both of the following.

Oil temperature: -4 to 158° F Viscosity: 12 to 400 centistokes. The recommended viscosity range is 15 to 60 centistokes.

- Auxiliary symbol G: Equipping a modular type pilot reduction valve increases the height by 1.57".
- The gasket surface dimensions comply with the ISO standards shown below.

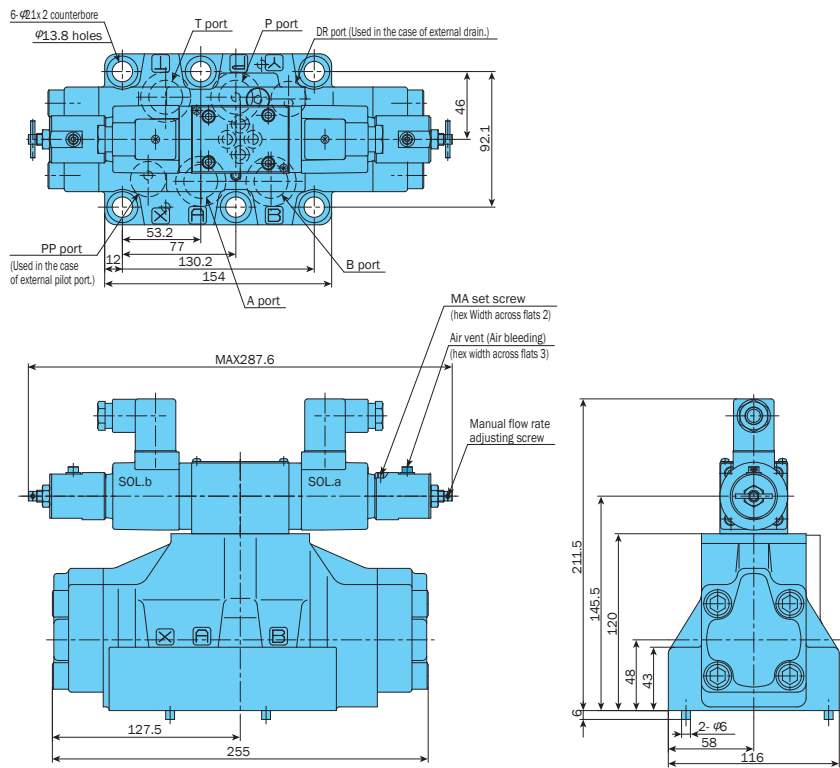
ESD-G04 - ISO 4401-07-06-0-94

ESD-G06 - ISO 4401-08-07-0-94

ESD-G10 - ISO 4401-10-08-0-94

Note: The coil cover has an M4 set screw. To change the air vent orientation, loosen the M4 screw and then rotate the cover. After bleeding air, tighten the cover and then secure it with the M4 screw.

ESD-G06



**Performance Curves**

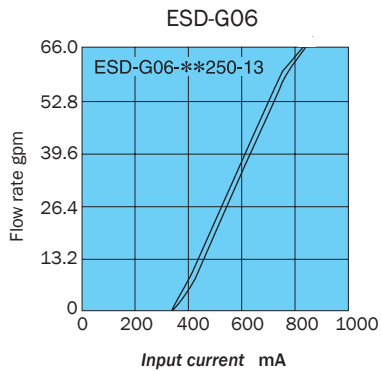
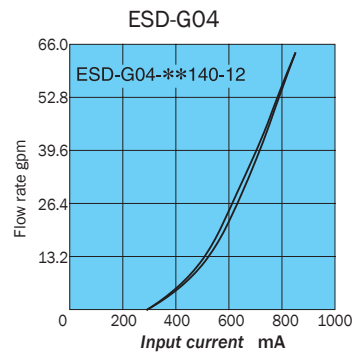
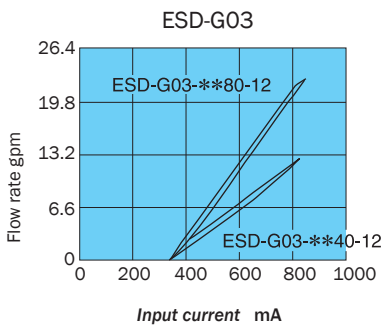
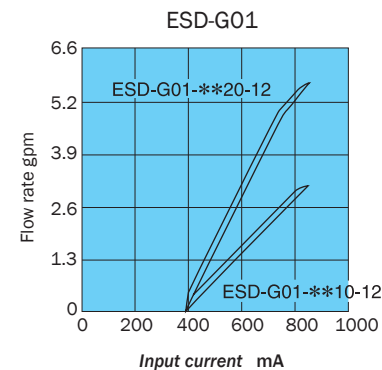
Hydraulic Operating Fluid Viscosity 32 centistokes

**Input Current - Flow Rate Characteristics** are characteristic when the P → A or P → B pressure drop is  $\Delta P = 145$  psi.

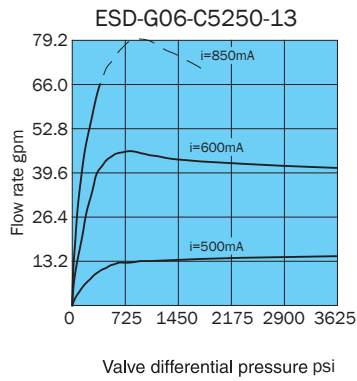
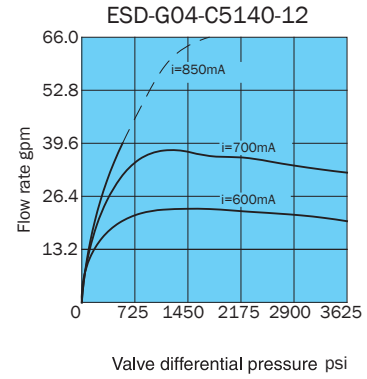
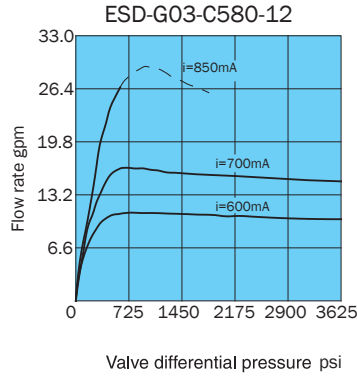
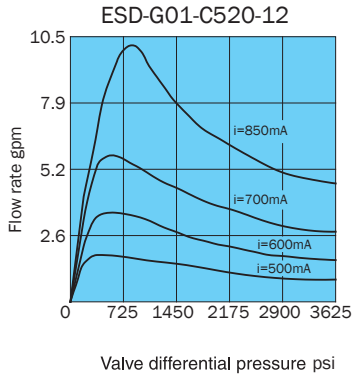
For Pressure - Flow Rate Characteristics, the horizontal shaft valve differential pressure indicates the pressure drop volume of the entire control valve

(between P, A, B, T), and flow rate is measured at the oil motor.

**Input Current - Flow Rate Characteristics**

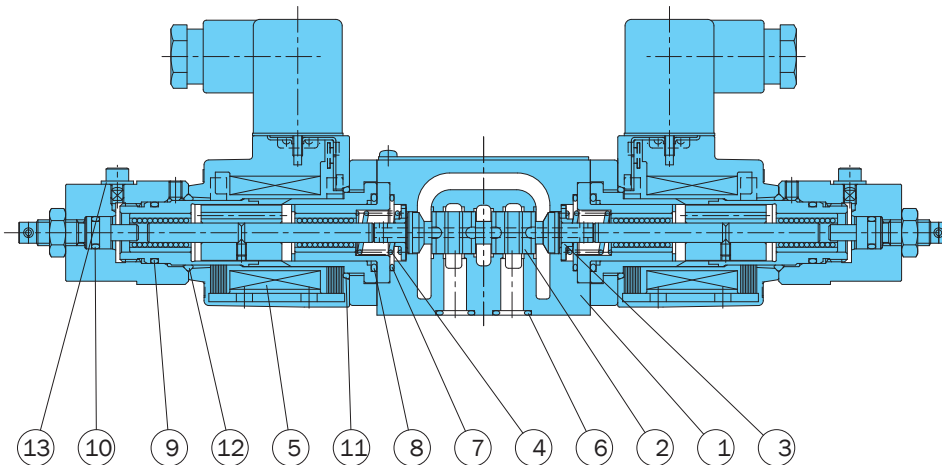


Pressure – Flow Rate Characteristics



**Cross-sectional Drawing**

ESD-G01-\*\*\*-12



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Spool     |
| 3        | Retainer  |
| 4        | Spring    |
| 5        | Coil      |
| 6        | O-ring    |
| 7        | O-ring    |
| 8        | O-ring    |
| 9        | O-ring    |
| 10       | O-ring    |
| 11       | O-ring    |
| 12       | O-ring    |
| 13       | Seal      |

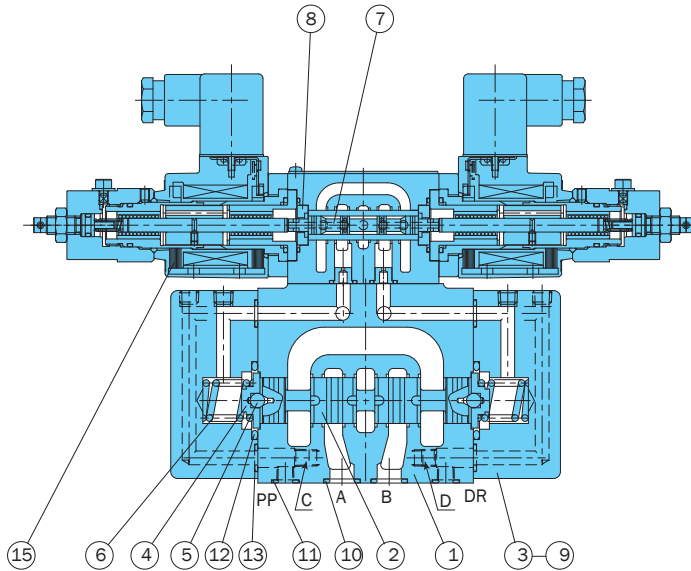
Note: Coil model number JD64-D2

Seal Part List (Kit Model Number JDS-G01-1A)

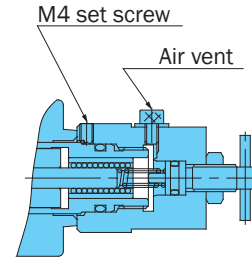
| Part No. | Part Name | Part Number      | Q'ty |
|----------|-----------|------------------|------|
| 6        | O-ring    | AS 568-012(Hs90) | 4    |
| 7        | O-ring    | AS 568-019(Hs90) | 2    |
| 8        | O-ring    | 1B-P22           | 2    |
| 9        | O-ring    | AS 568-016(Hs90) | 2    |
| 10       | O-ring    | 1B-P7            | 2    |
| 11       | O-ring    | S-25             | 1    |
| 12       | O-ring    | 1A-P20           | 1    |
| 13       | Seal      | CW1000F0         | 2    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B-\*\*.

ESD-G03-\*\*\*-(\*\*)-12



Manual adjustment section  
(ESD-G03, G04, G06, G10)

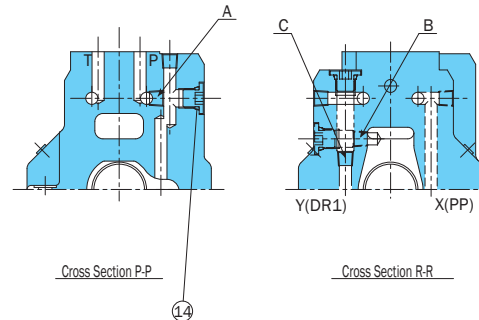
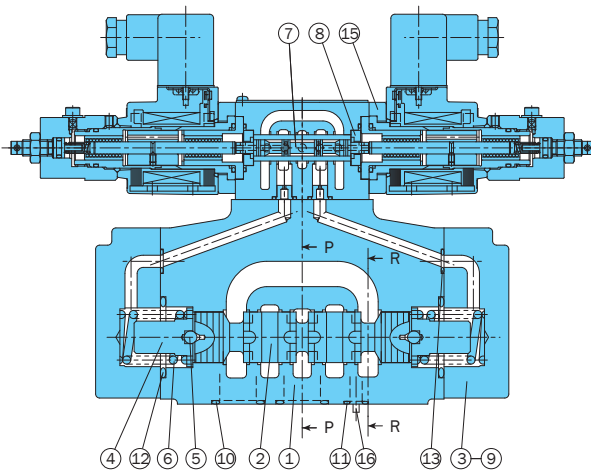


Note: The coil cover has an M4 set screw.  
When changing the orientation of the air vent, loosen the M4 screw and rotate the cover. Retighten after bleeding the air.

Methods for Changing the Pilot/Drain System

| After Change |          | Hexagon Socket Head Plug  |
|--------------|----------|---------------------------|
| Pilot        | Internal | Change to PP port from C. |
|              | External | Change from PP port to C. |
| Drain        | Internal | Change from D to DR port. |
|              | External | Change from DR port to D. |

ESD-G04-\*\*\*-(\*\*)-12



Methods for Changing the Pilot/Drain System

| After Change |          | Hexagon Socket Head Plug |
|--------------|----------|--------------------------|
| Pilot        | Internal | Remove from A            |
|              | External | Insert from A            |
| Drain        | Internal | Change from B to C       |
|              | External | Change from C to B       |

Note: A single hex head plug (NPTF 1/16) is required when changing to external pilot.  
Hex Head Plug: TPUA-1/16

| Part No. | Part Name             |
|----------|-----------------------|
| 1        | Body                  |
| 2        | Spool                 |
| 3        | Cover                 |
| 4        | Retainer              |
| 5        | Ball                  |
| 6        | Spring                |
| 7        | Pilot spool           |
| 8        | Stopper               |
| 9        | Screw                 |
| 10       | O-ring                |
| 11       | O-ring                |
| 12       | O-ring                |
| 13       | O-ring                |
| 14       | O-ring                |
| 15       | Proportional solenoid |

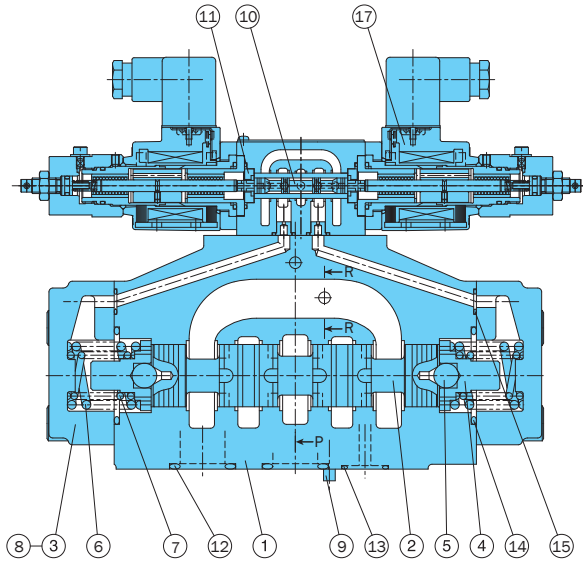
Note: Coil model number JD64-D2

Seal Part List (Kit Model Number JHS-\*\*\*)

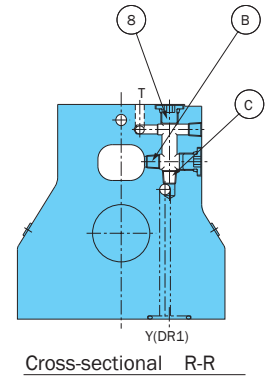
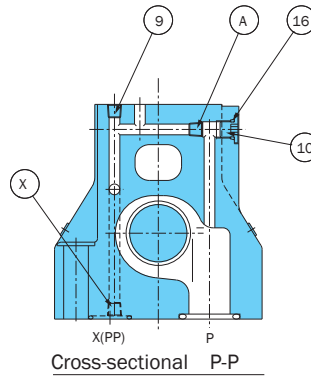
| Part No.      | Part Name | ESD-G03     |      | ESD-G04     |      |
|---------------|-----------|-------------|------|-------------|------|
|               |           | Part Number | Q'ty | Part Number | Q'ty |
| 10            | O-ring    | 1B-P12      | 5    | 1B-P22      | 4    |
| 11            | O-ring    | 1B-P9       | 2    | 1B-P10A     | 2    |
| 12            | O-ring    | 1B-P28      | 2    | 1B-P34      | 2    |
| 13            | O-ring    | 1B-P9       | 6    | 1B-P9       | 2    |
| 14            | O-ring    | ---         | -    | 1B-P8       | 3    |
| Kit Model No. |           | JHSG03      |      | JHSG04      |      |

Note: O-ring 1B-\*\*\* refers to JIS B 2401-1B-\*\*\*.

ESD-G06-\*\*\*-(\*\*\*)-13



Pilot, Drain System Change



Changing the Pilot and Drain Connections

| After Change |          | Hexagon Socket Head Plug |
|--------------|----------|--------------------------|
| Pilot        | Internal | Switch from A to x .     |
|              | External | Switch from x to A .     |
| Drain        | Internal | Switch from B to C .     |
|              | External | Switch from C to B .     |

Seal Part List (Kit Model Number JHS-G06)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 12       | O-ring    | 1B-P28      | 4    |
| 13       | O-ring    | 1B-P20      | 2    |
| 14       | O-ring    | 1B-G45      | 2    |
| 15       | O-ring    | 1B-P10      | 2    |
| 16       | O-ring    | 1B-P8       | 3    |

Note: O-ring 1B-\*\* refers to JIS B 2401-1B-\*\*.

| Part No. | Part Name             |
|----------|-----------------------|
| 1        | Body                  |
| 2        | Spool                 |
| 3        | Cover                 |
| 4        | Retainer              |
| 5        | Ball                  |
| 6        | Spring                |
| 7        | Spring                |
| 8        | Screw                 |
| 9        | Pin                   |
| 10       | Pilot spool           |
| 11       | Stopper               |
| 12       | O-ring                |
| 13       | O-ring                |
| 14       | O-ring                |
| 15       | O-ring                |
| 16       | O-ring                |
| 17       | Proportional solenoid |



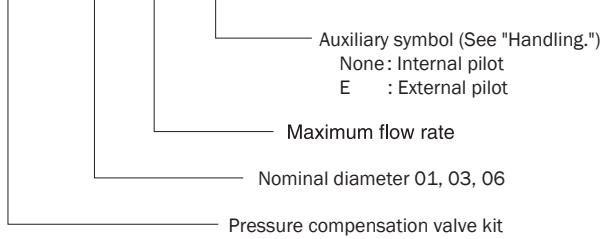
## Pressure Compensation Valve Kit

### Specifications

| Item \ Model No.                                | JHF-01027 | JHF-03040(E) | JHF-03080(E) | JHF-06170(E) |
|---|-----------|--------------|--------------|--------------|
| Maximum Operating Pressure psi                  | 3045      | 3625         | 3625         | 3045         |
| Pressure Compensation Differential Pressure psi | 145       | 87           | 203          | 116          |
| Maximum Flow Rate ℓ/min (gpm)                   | 27 (7.1)  | 40 (10.5)    | 80 (21.1)    | 170 (44.9)   |
| Weight lbs                                      | 3.3       | 10.3         | 11.0         | 26.4         |

### Understanding Model Numbers

**JHF - 03 040 (E)**



#### • Handling

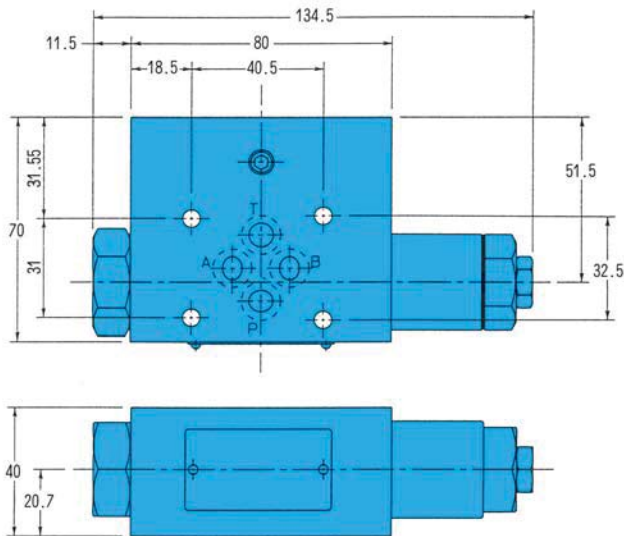
When using the pressure compensation kit, use an external pilot type for the ESD valve (G03, 06).

An internal pilot type pressure compensation valve kit is used when the pilot flow rate is supplied from the P port, without an external pilot port (Pp port) on the manifold. An

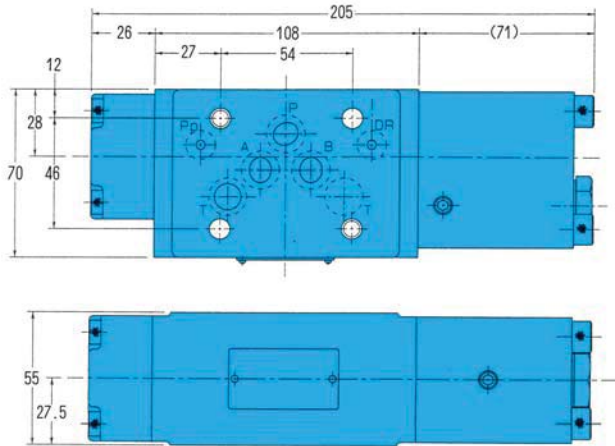
external pilot type pressure compensation valve kit is used when there is an external pilot port (Pp port) on the manifold.

### Installation Dimension Drawings

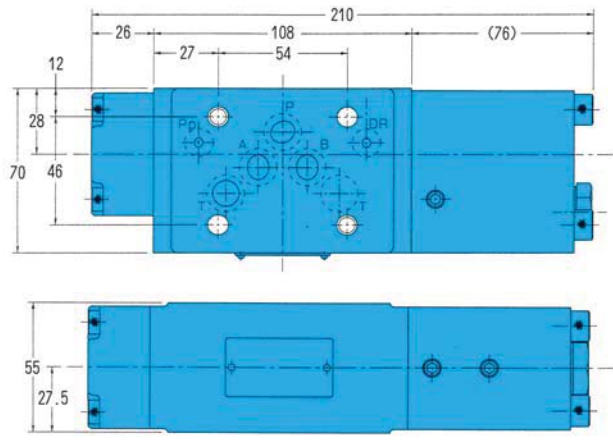
Pressure compensation valve kit  
JHF-01027



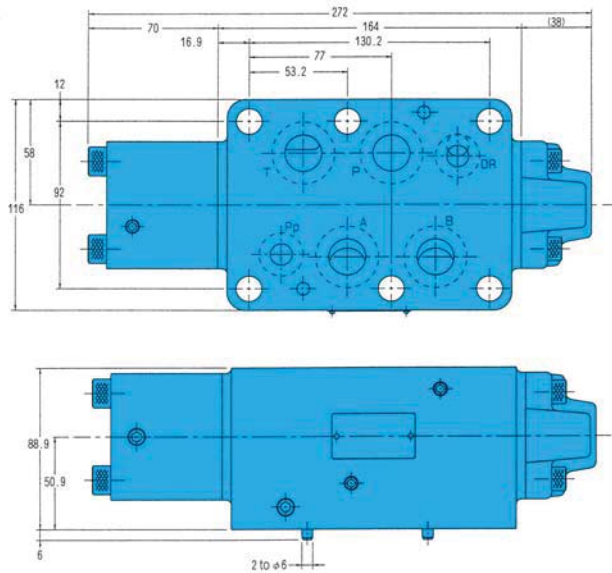
JHF-03040(E)



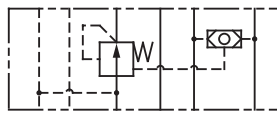
JHF-03080(E)



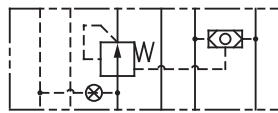
JHF-06170(E)



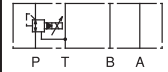
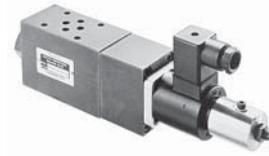
Note: Mounting bolts are not included with the pressure compensation kit. Use the valve mounting bolt lists on pages F-87 through F-89 to select mounting bolts.



Internal pilot



External pilot



### Modular Type Electro-Hydraulic Proportional Reducing Valve

7.9 gpm  
43.5 to 2030 psi

#### Features

This valve incorporates the ease-of-use principles of the modular valve into an electro-hydraulic proportional reducing valve to provide reduction

control of hydraulic system pressure in proportion to **input current**. This valve is perfect for a small-scale hydraulic system, such as those used

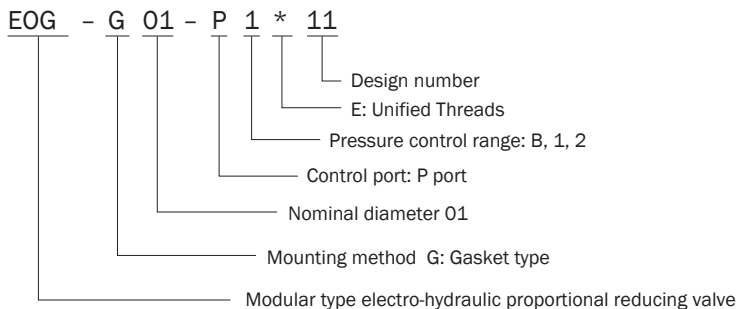
for continuous proportional control of lathe chuck pressure. A relief function ensures outstanding pressure response characteristics.

#### Specifications

| Item                               | Model No. | EOG-G01-P*-11                                    |
|------------------------------------|-----------|--|
| Maximum Operating Pressure psi     |           | 3625   |
| Maximum Flow Rate gpm              |           | 7.9  |
| Pressure Control Range psi         |           | B: 43.5 to 362<br>1: 58 to 1000<br>2: 87 to 2000 |
| T Port Allowable Back Pressure psi |           | 362  |
| Rated Current mA                   |           | 850  |
| Coil Resistance $\Omega$           |           | 20 (68° F)                                       |
| Hysteresis %                       |           | 3 max. (Note 1)                                  |
| Weight lbs                         |           | 7.9  |

Note: Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

#### Understanding Model Numbers

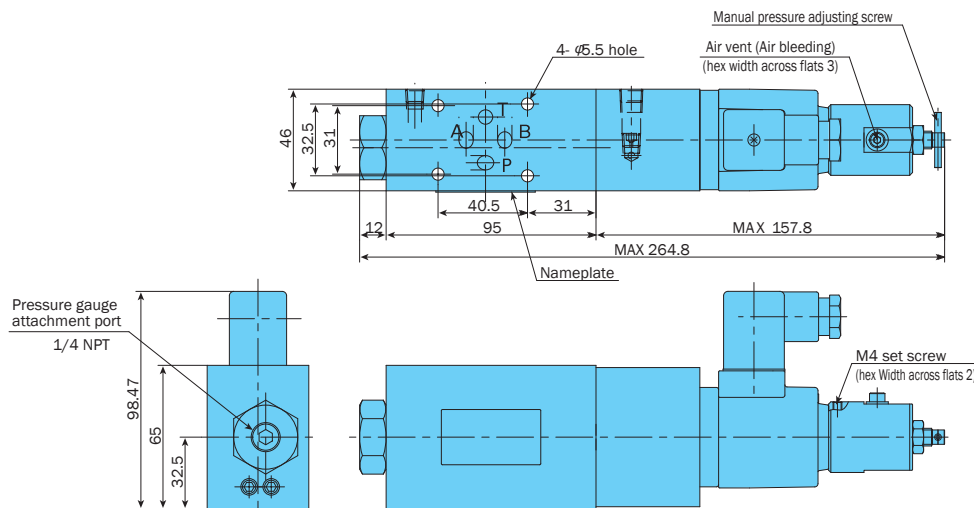


#### • Handling

- Air Bleeding**  
To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid.
- Manual Pressure Adjusting Screw**  
For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise) and secured with the lock nut.
- Minimum Control Pressure**  
Since this valve has an internal drain system, T port back pressure has an effect on minimum control pressure.
- Load Capacity**  
Make load capacity (valve OUT side capacity) at least .13 gpm.
- Use an operating fluid that conforms to the both of the following.**  
Oil temperature: -4 to 158° F  
Viscosity: 12 to 400 centistokes  
The recommended viscosity range is 15 to 60 centistokes.

#### Installation Dimension Drawings

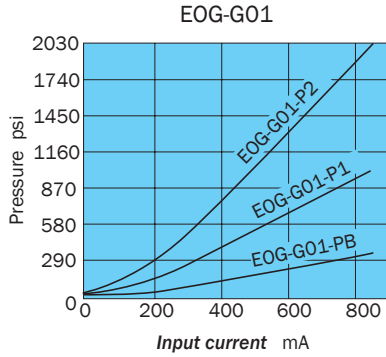
EOG-G01-P\*-E11



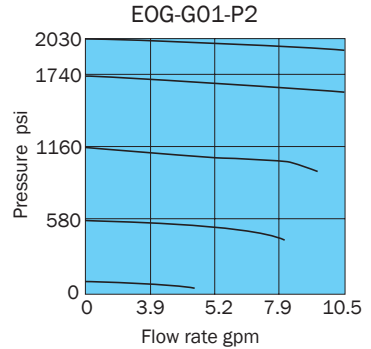
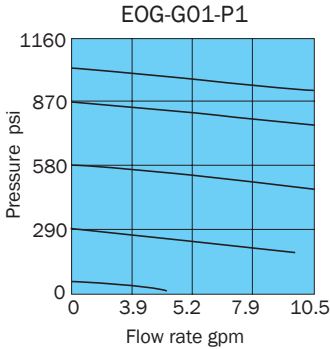
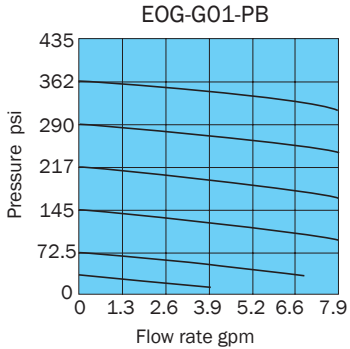
# Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

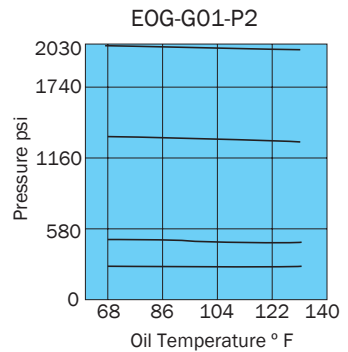
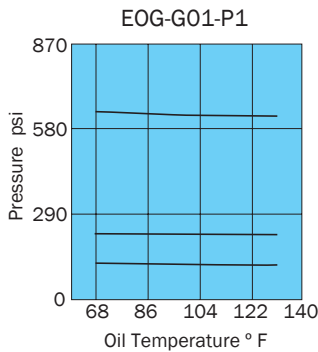
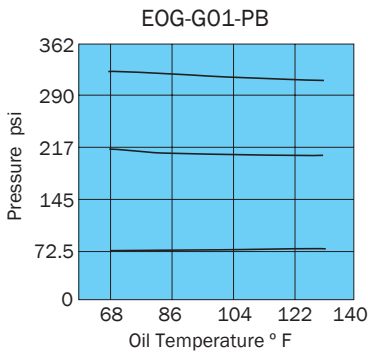
## Input Current - Pressure Characteristics



## Flow Rate - Pressure Characteristics

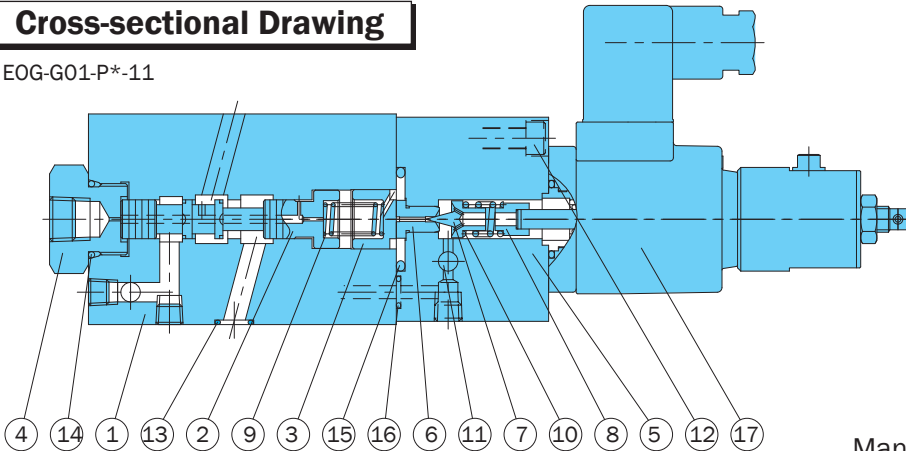


## Fluid Temperature Characteristics



# Cross-sectional Drawing

EOG-G01-P\*-11



| Part No. | Part Name | Part No. | Part Name             |
|----------|-----------|----------|-----------------------|
| 1        | Body      | 10       | Spring                |
| 2        | Spool     | 11       | Choke                 |
| 3        | Retainer  | 12       | Screw                 |
| 4        | Plug      | 13       | O-ring                |
| 5        | Cover     | 14       | O-ring                |
| 6        | Seat      | 15       | O-ring                |
| 7        | Poppet    | 16       | O-ring                |
| 8        | Retainer  | 17       | Proportional solenoid |
| 9        | Spring    |          |                       |

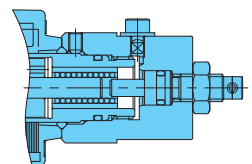
Note: Coil model number JD64-D2

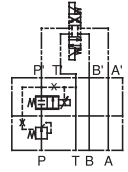
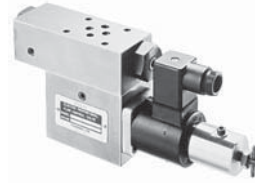
## Seal Part List (Kit Model Number JBS-G01)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 13       | O-ring    | 1B-P9       | 4    |
| 14       | O-ring    | 1B-P20      | 1    |
| 15       | O-ring    | 1B-P26      | 1    |
| 16       | O-ring    | 1B-P7       | 1    |

Note: O-ring 1B-\*\* refers to JIS B2401 1B-\*\*.

## Manual adjustment section





### Modular Type Electro-Hydraulic Proportional Flow Control Valve

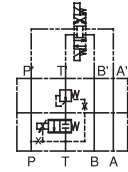
.07 to 6.6 gpm  
3045 psi

#### Features

An electro-hydraulic proportional restrictor valve and pressure compensation valve are combined into a modular configuration, available as one of two types: the meter in control EOF-G01-P and meter out control EOF-G01-T.

The pressure fluctuations have little influence on the setting flow rate making this valve perfect for electro-hydraulic proportional control of small hydraulic systems used for machine tool APC and ATC high-speed shockless control, remote control, etc.

- Handling
- 1 Air Bleeding  
To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid. The position of the air vent can change by loosening the lock screw and rotating the cover.
- 2 Manual flow rate adjusting screw  
For the initial adjustment or when there is no **input current** to the valve due to an electrical problem or some other reason, the flow rate can be adjusted by rotating the manual adjustment screw. Rotate clockwise (rightward) to increase flow rate.  
Normally, this adjusting screw should be returned completely to its original position and secured with the lock nut.
- 3 T Port Back Pressure  
Since this valve has an internal drain system, make sure that valve T port back pressure is no greater than 362 psi.
- 4 Use an operating fluid that conforms to the both of the following.  
Oil temperature: -4 to 158 °F  
Viscosity: 12 to 400 centistokes  
The recommended viscosity range is 15 to 60 centistokes.
- 5 O-ring Plate Orientation
  - The port nearest the nameplate surface is the P port.
  - The port with a mounting pitch width of 31 (narrow pitch width) is the A port.
  - The cutout on the O-ring plate is on the A port side.

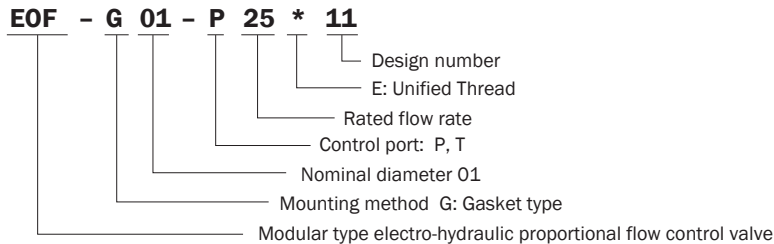


#### Specifications

| Item                                | Model No. | EOF-G01-<br>P<br>T 25-11                 |
|-------------------------------------|-----------|--|
| Maximum Operating Pressure psi      |           | 3045                                     |
| Flow Rate Control Range ℓ/min (gpm) |           | 0.3 to 25 (.07 to 6.6)                   |
| Flow Rate Control Port              |           | EOF-G01-P : P port<br>EOF-G01-T : T Port |
| T Port Allowable Back Pressure psi  |           | 362 max.                                 |
| Hysteresis %                        |           | 3 max. (Note 1)                          |
| Response Speed S                    |           | 0.05                                     |
| Rated Current mA                    |           | 800                                      |
| Coil Resistance Ω                   |           | 20 (68° F)                               |
| Weight lbs                          |           | 8.1                                      |

Note: Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

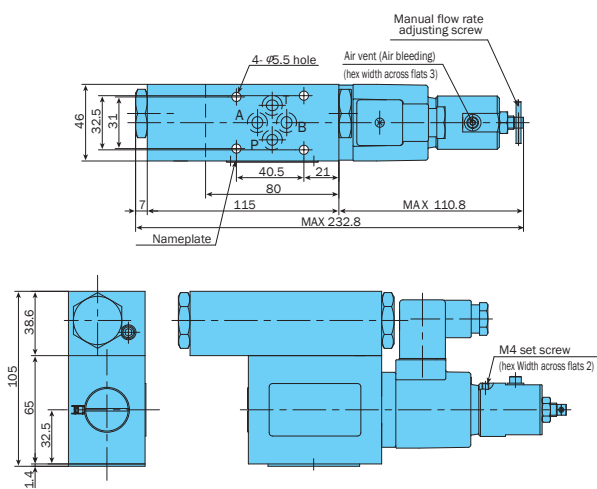
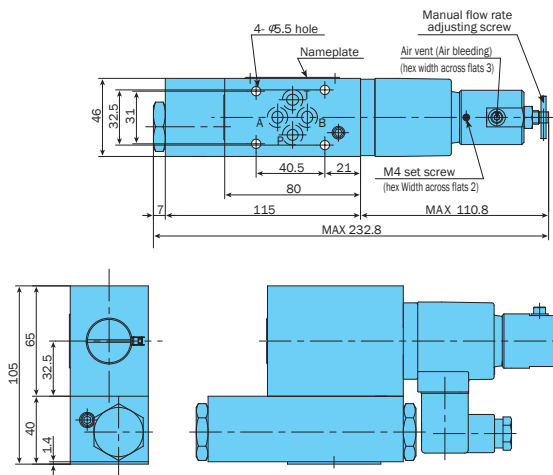
#### Understanding Model Numbers



#### Installation Dimension Drawings

EOF-G01-P25-11

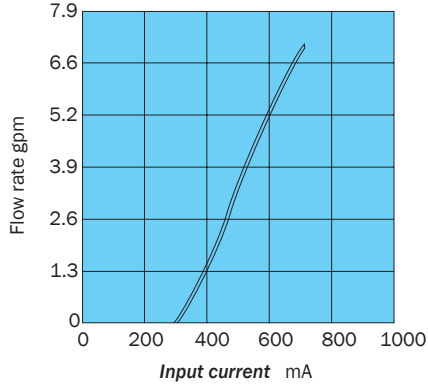
EOF-G01-T25-11



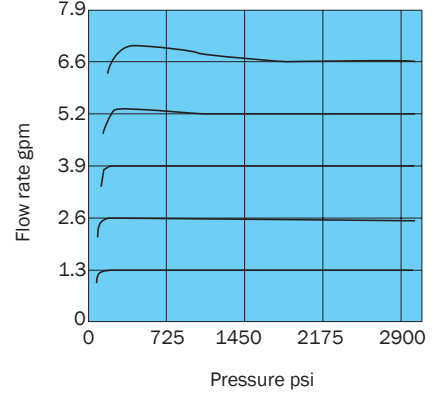
## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

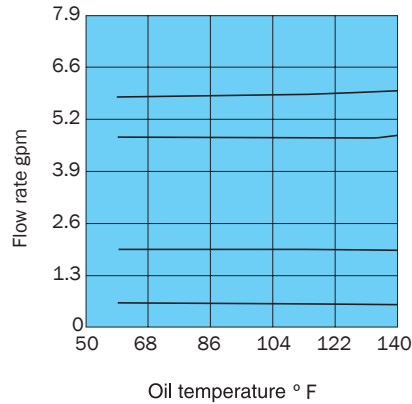
Input Current -  
Flow Rate  
Characteristics



Pressure -  
Flow Rate  
Characteristics

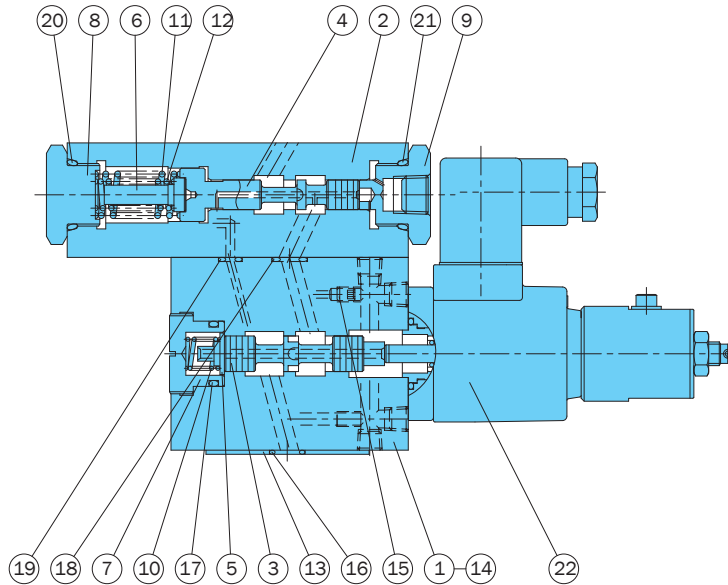


Fluid Temperature  
Characteristics



## Cross-sectional Drawing

EOF-G01-T25



Part No. Part Name

| Part No. | Part Name             |
|----------|-----------------------|
| 1        | Body                  |
| 2        | Body                  |
| 3        | Spool                 |
| 4        | Piston                |
| 5        | Retainer              |
| 6        | Retainer              |
| 7        | Plug                  |
| 8        | Plug                  |
| 9        | Plug                  |
| 10       | Spring                |
| 11       | Spring                |
| 12       | Spring                |
| 13       | Plate                 |
| 14       | Screw                 |
| 15       | Screw                 |
| 16       | O-ring                |
| 17       | O-ring                |
| 18       | O-ring                |
| 19       | O-ring                |
| 20       | O-ring                |
| 21       | O-ring                |
| 22       | Proportional solenoid |

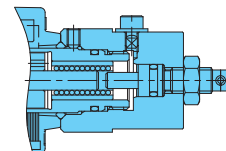
Note: Coil model number JD64-D2

Seal Part List (Kit Model Number JMS-G01)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 16       | O-ring    | 1B-P9       | 4    |
| 17       | O-ring    | 1B-P18      | 1    |
| 18       | O-ring    | 1B-P9       | 4    |
| 19       | O-ring    | 1B-P5       | 1    |
| 20       | O-ring    | 1B-P20      | 1    |
| 21       | O-ring    | 1B-P20      | 1    |

Note: 1B-\*\* refers to JIS B2401-1B-\*\*.

Manual adjustment section





### Power Amplifier Series for Electro-Hydraulic Proportional Valve Drive

#### Overview

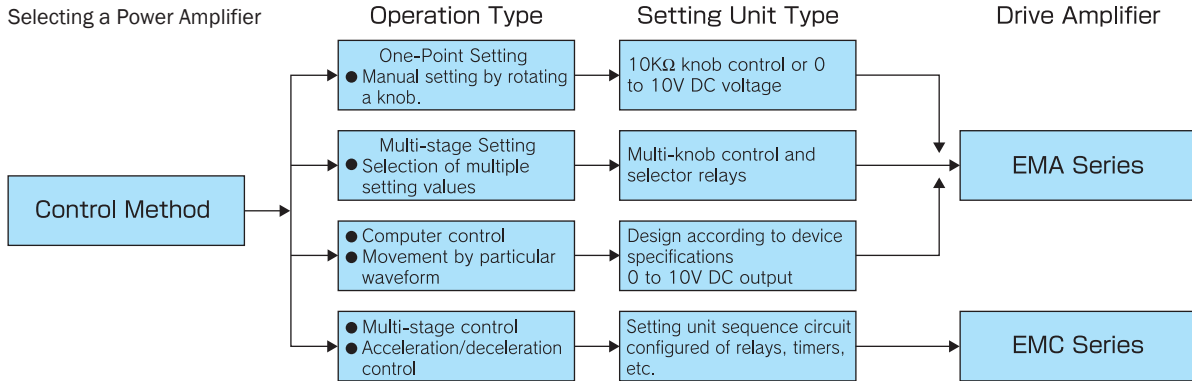
This special amplifier is for driving electrohydraulic proportional pressure control valves, electro-hydraulic proportional flow control valves, and electro-hydraulic proportional direction control valves. It comes in a choice of two different types: an amp type and a controller type.

Basically, the amp type converts 0 to 10V DC range command voltage to a **DC current** of in the range of 0 to 900mA, which is then supplied to the control valve. The control type performs multi-stage control of **output current** in accordance with the ON-OFF signal of external contacts.

#### Power Amplifier Types and Functions

| Type            | Model No.    | Drive Control Valve  | Functions  |
|-----------------|--------------|--|--|
| Amp Type        | EMA-PD5-N-20 | Pressure Control Valves<br>Flow Control Valves<br>Direction Control Valves | Three functions: open loop control, feedback control, and acceleration/deceleration control.   |
| Controller Type | EMC-PC6-A-20 | Same as above.   | Built-in command voltage setting units (potentiometers)<br>Setting unit selection is performed by relay contacts, limit switches, timer contacts, etc. |

#### Selecting a Power Amplifier



#### Specifications

| Item                               | Model No. | EMA-PD5-N-20                                     | EMC-PC6-A-20                                      |
|------------------------------------|-----------|--|---|
| Function                           |           | Amp Type (Closed Loop)                           | Controller Type                                   |
| Number of Inputs                   |           | 5 DC inputs                                      | -   |
| Number of Channels                 |           | -  | 6   |
| Maximum Output Current             |           | 900mA (20Ω solenoid)                             | 900mA (20Ω solenoid)                              |
| Input voltage                      |           | 0 to +10V DC                                     | -   |
| Feedback Voltage                   |           | 0 to +10V DC                                     | -   |
| Input Impedance                    |           | At least 50kΩ                                    | -   |
| Externally Set Variable Resistance |           | 10kΩ   | -   |
| Zero Adjust(NULL)                  |           | 0 to 900mA                                       | 0 to 900mA  |
| Time Lag (T-UP, DOWN)              |           | 0.3 to 3sec                                      | -   |
| Gain Adjustment (GAIN)             |           | $\frac{900mA}{10V_{oc}}$ to $\frac{900mA}{1.5V}$ | 0 to $\frac{900mA}{80\% \text{ channel setting}}$ |
| External power supply              |           | +10V <sub>oc</sub> (10mA)                        | -   |
| External Contact Resistance        |           | -  | 10Ω max. when closed                              |
| Dither (Internal, semi-fixed)      |           | Level: 0 to 500mAp-p<br>Frequency: 50 to 220Hz   | Level: 0 to 500mAp-p<br>Frequency: 50 to 220Hz    |
| Channel Time Lag (TIME)            |           | -  | 0.3 to 3 seconds<br>Externally variable           |
| Power Supply Voltage               |           | AC100, 110, 200, 220V (±10%)50/60Hz              | AC100, 110, 200, 220V (±10%)50/60Hz               |
| Power Consumption                  |           | 50VA   | 50VA  |
| Allowable Ambient Temperature      |           | 32 to 122° F                                     | 32 to 122° F                                      |
| Temperature Drift                  |           | 0.2mA/°C max.                                    | 0.2mA/°C max.                                     |
| Weight lbs                         |           | 7.7  | 7.7   |

#### • Handling

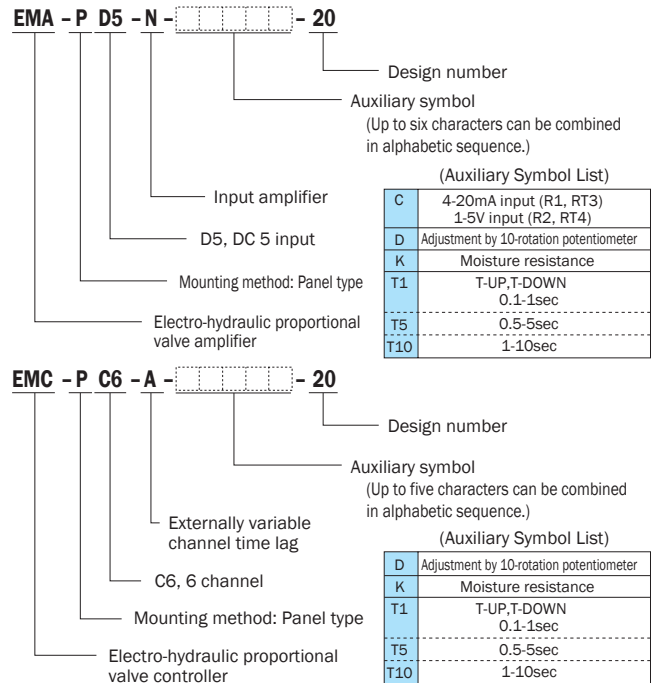
- 1 Power supply voltage can be either 110V or 230V.
- 2 When selecting a location, avoid areas subject to high temperatures and high

humidity, and select an area where there is little vibration and dust.

- 3 Use shielded wire for the analog signal and valve output signal wires.

- 4 When performing valve output signal line ON-OFF switching with a relay, connect a surge absorber or varistor parallel with the relay.

#### Understanding Model Numbers

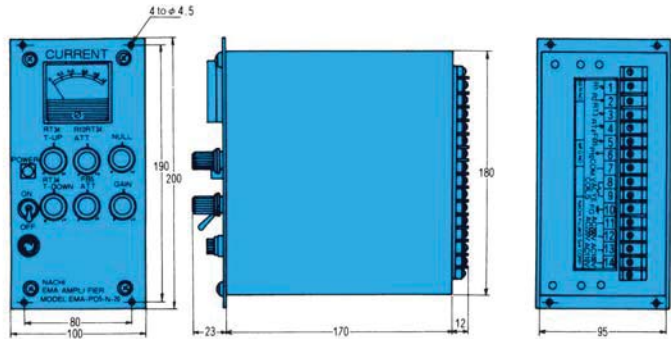
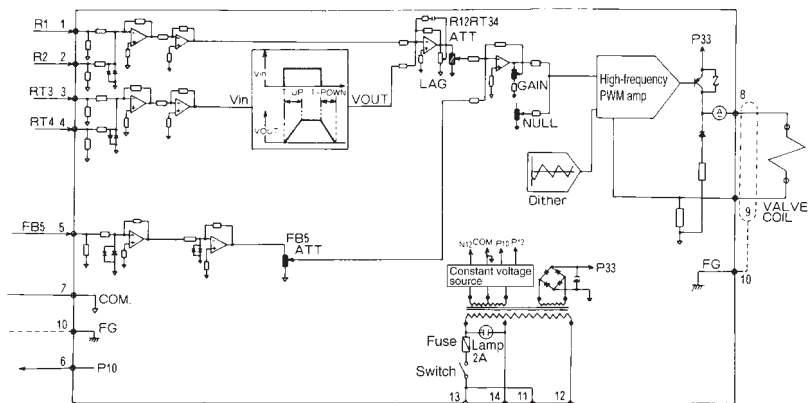


Note: T-UP, DOWN, and TIMER all become 0.3-3 sec when there is no signal for T1, T5, and T10.

# Power Amplifier Series for Electro-Hydraulic Proportional Valve Drive

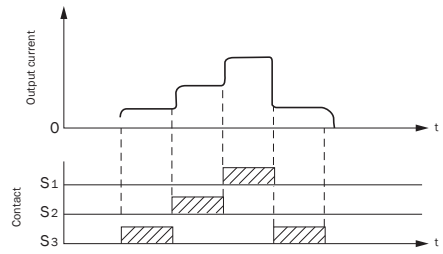
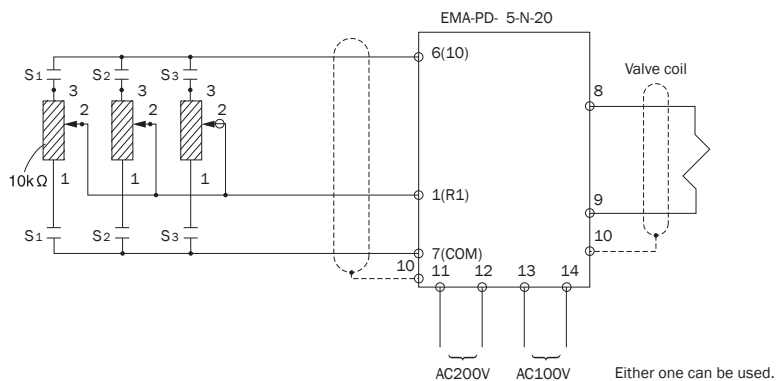
EMA-PD5-N-20

| No. | Name                       | No. | Name               |
|-----|----------------------------|-----|--------------------|
| 1   | R1                         | 8   | Output terminal to |
| 2   | R2                         | 9   | VALVE COIL valve   |
| 3   | RT3, delay input           | 10  | FG, case ground    |
| 4   | RT4, delay input           | 11  | AC200, 220V        |
| 5   | FB5, feedback input        | 12  | AC100, 110V        |
| 6   | P10, external power supply | 13  |                    |
| 7   | COM, signal land           | 14  |                    |



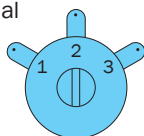
## Application Examples

### 1. Multi-stage Setting Using Multiple Potentiometers

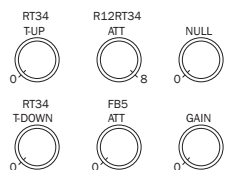


(1) Wiring the amp and external potentiometer

A potentiometer has three terminals numbered 1, 2, and 3.



(2) Setting the adjusting knobs  
Terminals 2 (R2), 3 (RT3), and 4 (RT4) can also be used in place of terminal 1. An RT34T-UP and RT34T-DOWN acceleration/ deceleration timer can also be used in the case of terminal 3 (RT3) and terminal 4 (RT4). In this case, the settings of the knobs on the front panel of the amp are normally as shown in the illustration below. The manual setting unit provides **output current** control in the range of 0 to 900mA as it is rotated from full counterclockwise to full clockwise.



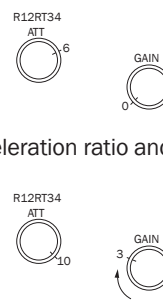
Wiring

- Amp terminal 7 (0V) Potentiometer terminal 1
- Amp terminal 6 (10V) Potentiometer terminal 3
- Amp terminal 1 (R1) Potentiometer terminal 2

With this wiring, rotating the potentiometer clockwise causes the **output current** to increase.

- If an output in the range of 0 to 600mA is desired even while the manual setting unit is rotated fully clockwise, restrict the setting of R12RT34ATT to 6.

- When the level deceleration ratio and other factors limit the effective use of the manual setting unit to only 150° of the 300°, use GAIN to adjust the **output current** to 900mA.



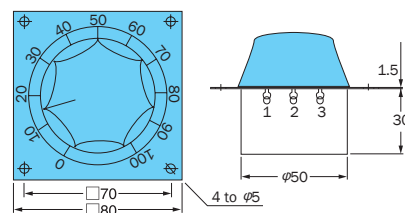
Note: 1. A range of 5KΩ to 10KΩ is recommended for external knobs and potentiometers.

2. In order to prevent **current** loss across terminals 6 and 7, insert relays between terminal 6 and the potentiometers and terminal 7 and the potentiometers.

3. Do not enable more than one potentiometer at the same time.

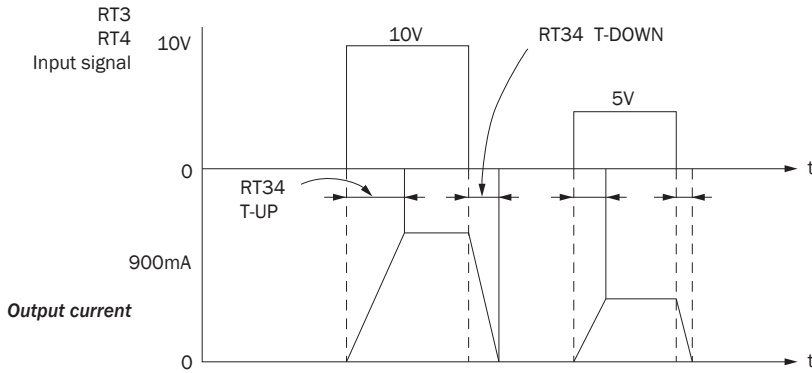
(3) The following is available for the external setting knob.

Model No. F ZS-6350-101





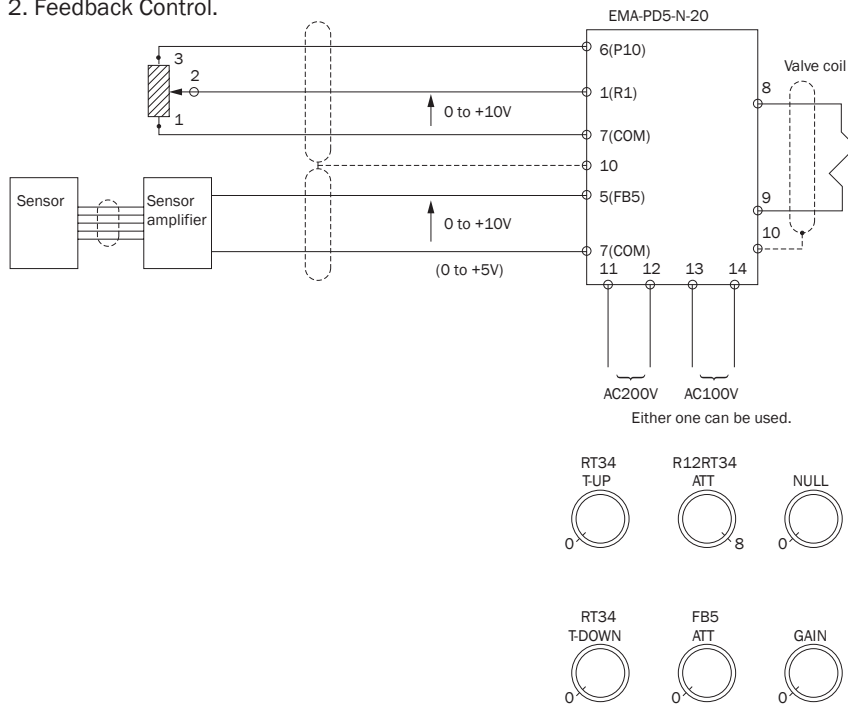
(4) Acceleration time adjustment (RT34T-UP) and deceleration time adjustment (RT34T-DOWN)



This circuit creates a fixed acceleration time lag in accordance with the voltage that added the input signal to terminals 3 and 4 (RT3, RT4). The time lag is adjustable in the range of 0.3 to 3 seconds, as standard. As shown in the diagram to the left, even when RT34T-UP is set to 3 seconds, the change to 5V during stepped input from 0 to 10V and stepped input from 0 to 5V takes 1.5 seconds, which is half the set time.

With the wiring shown to the left, **output current** is increased or decreased in accordance with the feedback signal of the sensor, which regulates pressure or the flow rate.

2. Feedback Control.



Note:  
Using terminal 3 (RT3) and terminal 4 (RT4) in place of terminal 1 (R1) enables T-UP and T-DOWN, which allows feedback control without overshooting or undershooting, even when input signal voltage is stepped.

Adjustment Method

- Initially, set FB5ATT to 0 as shown in the illustration to the left, and check to see if open loop control is possible.
- Next, set FB2ATT to 2 and GAIN to 2, and input a feedback signal. Gradually rotate FB5ATT clockwise and increase gain. Set the feedback gain to the level that is immediately before the point where vibration is generated in the control system. (FB5ATT, GAIN)

Note:

- To measure **current**, measure the voltage at terminal 9, using terminal 7 as reference. The voltage across the 0.5Ω **current** detection resistor at 1A is 0.5V. Use a measurement device with an input impedance of at least 1MΩ.
- Switch the terminal 8 line using a relay. Make sure that both relays are not on at the same time.
- To absorb surge voltage, include 82V varistors in parallel with the relay contacts.

Recommended Model  
Tama Electric Co., Ltd. NV082D10  
Matsushita ERZV10D820

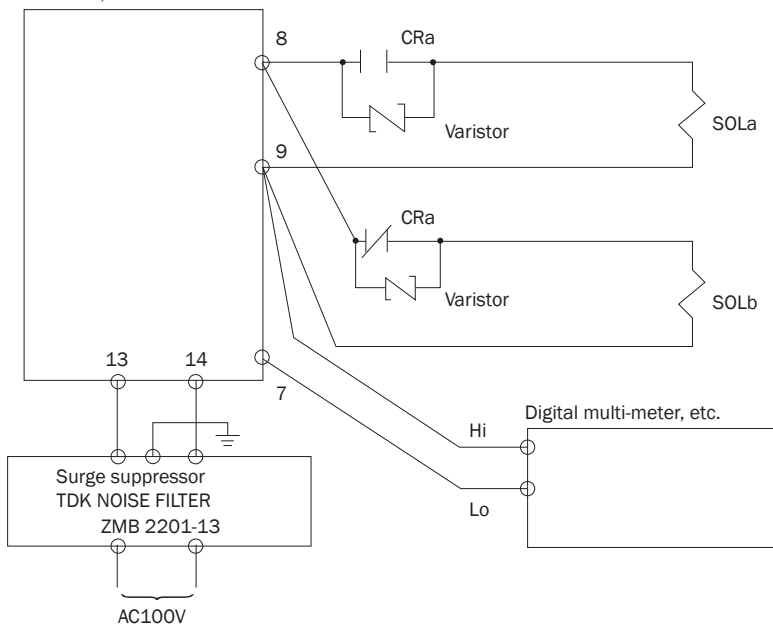
4 For relays, use OMRON LY type power relays or the equivalent.

5 Too much noise in the 110V AC or 230V AC power supply line can result in unstable **output current**. If this happens, equip a surge absorber on the power supply.

Recommended Model  
TDK NOISE FILTER  
ZMB2201-13

3. Direction Control Valve (ESD) Drive

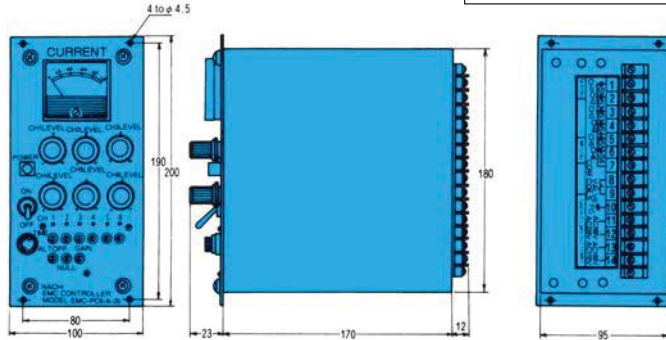
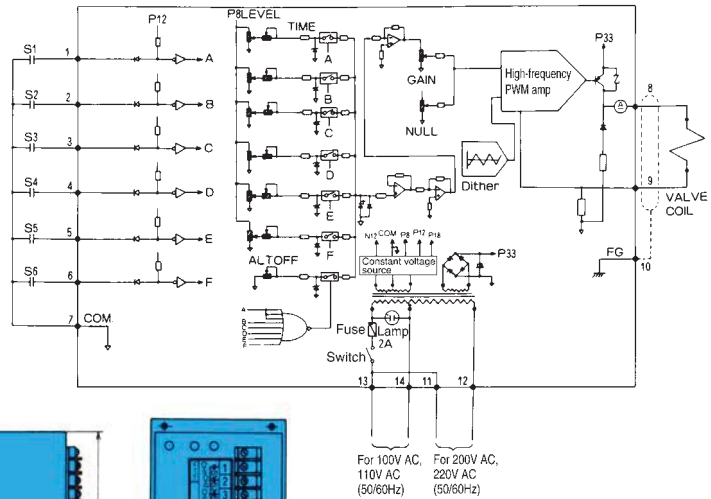
EMA-PD5-N-20, EMC-PC6-A-20



**Power Amplifier Series for Electro-hydraulic Proportional Valve Drive**

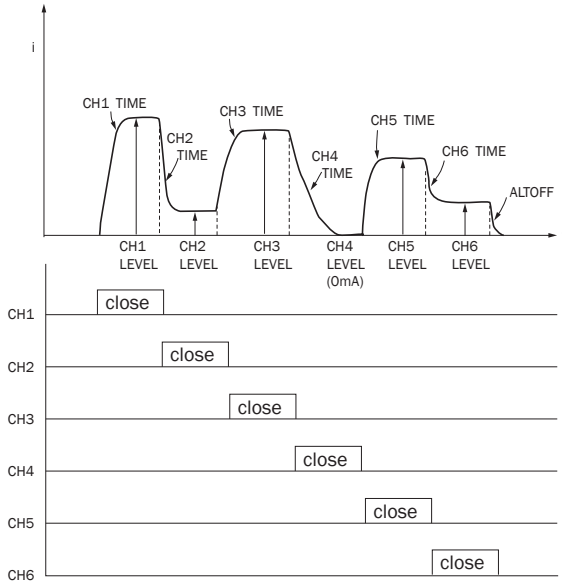
EMC-PC6-A-20

| No. | Name                      | No. | Name                     |
|-----|---------------------------|-----|--------------------------|
| 1   | CH1 Input command contact | 8   | Output terminal to valve |
| 2   | CH2 "                     | 9   | VALVE COIL               |
| 3   | CH3 "                     | 10  | FG, case ground          |
| 4   | CH4 "                     | 11  | AC200 220V               |
| 5   | CH5 "                     | 12  | AC100 110V               |
| 6   | CH6 "                     | 13  | AC100 110V               |
| 7   | Common COM input contact  | 14  |                          |



Note: When external contacts S1 through S6 are closed, use a non-voltage contact no greater than 10 Ω .

**Application**

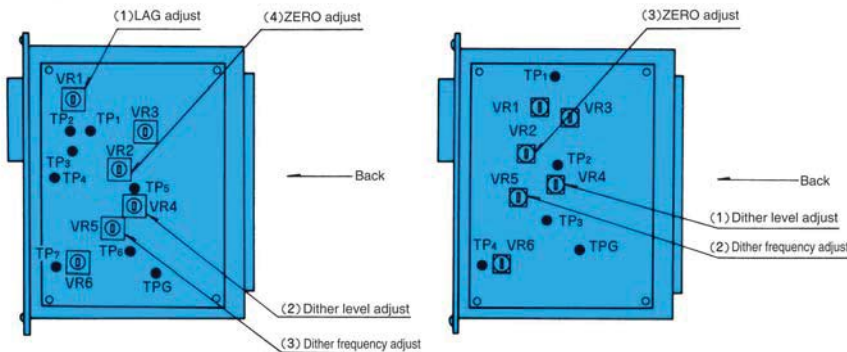


- LEDs are provided to indicate channel selection.
- The TIME knob of each channel adjusts the time until the selected channel's level is reached, as shown to the left. Make sure that the lap time (or time when channel is not selected) when changing the channel selection is 30msec maximum.
- Use independent external contacts. Even when external contacts are superimposed, output is not the sum of each channel, so use of superimposed external contacts is not supported.

Note: When replacing a Design Number 10 controller with a Design Number 20 controller, you must also change the sequence from superimposed external contacts to independent.

Dither Adjustment Method (Dither is set to load 400mA<sub>p-pm</sub> 100Hz.)

- (1) EMA-PD-N-20                      (2) EMC-PC6-A-20



Removing the left side panel when viewed from the front reveals the configuration shown in the illustrations to the left.

1. If piping or other items vibrate in response to the dither, raise the dither frequency by rotating the trimmer clockwise.
2. When repeat stability is poor and the hysteresis is large, increase the dither level by rotating clockwise. If this does not resolve the problem, lower the dither frequency by rotating the trimmer counterclockwise.
3. When repeatability is poor with the ES valve or ESD valve due to insufficient air bleeding within the guide, raise the dither frequency by rotating the tripper clockwise, as described in 1.



### Small Type Power Amplifier Series for Electro-Hydraulic Proportional Valve Drive

#### Features

This power amplifier provides high efficiency and reliability in a compact configuration.

**Lightweight, compact design** – The configuration of this amplifier is 1/3 the weight and 1/2 the volume of existing models.

**High efficiency** – A PWM control system enables a highly efficient design with little heat generation.

**High reliability** – All functions are integrated onto a single circuit board for a highly reliable design with no internal wiring.

#### Specifications

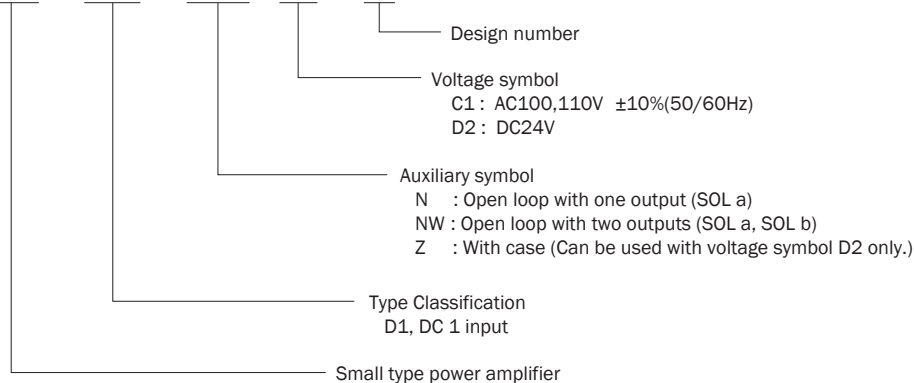
| Item                               | Model No. | EBA-PD1-N-C1-10                                | EBA-PD1-NW-C1-10                            | EBA-PD1-N(Z)-D2-10                             | EBA-PD1-NW(Z)-D2-10                         |
|------------------------------------|-----------|--|---|--|---|
| Function                           |           | Amp Type (Open Loop)                           | Amp Type (Open Loop)                        | Amp Type (Open Loop)                           | Amp Type (Open Loop)                        |
| Number of Inputs                   |           | 1 DC inputs                                    | 1 DC inputs                                 | 1 DC inputs                                    | 1 DC inputs                                 |
| Drive Solenoid                     |           | SOL a  | SOL a, SOL b                                | SOL a  | SOL a, SOL b                                |
| Maximum Output Current             |           | 900mA (20Ω solenoid)                           | 900mA (20Ω solenoid)                        | 900mA (20Ω solenoid)                           | 900mA (20Ω solenoid)                        |
| Input voltage                      |           | 0 to +10V DC                                   | -10 to +10V DC                              | 0 to +10V DC                                   | -10 to +10V DC                              |
| Input Impedance                    |           | 50kΩ   | 50kΩ  | 50kΩ   | 50kΩ  |
| Externally Set Variable Resistance |           | 10kΩ   | 10kΩ  | 10kΩ   | 10kΩ  |
| Zero Adjust (NULL)                 |           | 0 to 900mA                                     | 0 to 900mA                                  | 0 to 900mA                                     | 0 to 900mA                                  |
| Gain Adjustment (GAIN)             |           | 0 to $\frac{900\text{mA}}{5\text{V input}}$    | 0 to $\frac{900\text{mA}}{5\text{V input}}$ | 0 to $\frac{900\text{mA}}{5\text{V input}}$    | 0 to $\frac{900\text{mA}}{5\text{V input}}$ |
| External power supply              |           | +5V DC (5mA)                                   | +5V DC (5mA)<br>-5V DC (5mA)                | +5V DC (5mA)                                   | +5V DC (5mA)<br>-5V DC (5mA)                |
| Dither Frequency (DITHER)          |           | Variable: 80 to 220Hz                          | Variable: 80 to 220Hz                       | Variable: 80 to 220Hz                          | Variable: 80 to 220Hz                       |
| Time Lag (LAG)                     |           | Internally Variable:<br>0.05 to 2 seconds      | Internally Variable:<br>0.05 to 2 seconds   | Internally Variable:<br>0.05 to 2 seconds      | Internally Variable:<br>0.05 to 2 seconds   |
| Power Supply Voltage               |           | AC100 · 110V ±10%<br>(50/60Hz)                 | AC100 · 110V ±10%<br>(50/60Hz)              | DC24V<br>(DC24 to 30V)                         | DC24V<br>(DC24 to 30V)                      |
| Power Consumption                  |           | 30VA   | 30VA  | 30VA   | 30VA  |
| Allowable Ambient Temperature      |           | 32 to 122° F                                   | 32 to 122° F                                | 32 to 122° F                                   | 32 to 122° F                                |
| Temperature Drift                  |           | 0.2mA/°F max.                                  | 0.2mA/°F max.                               | 0.2mA/°F max.                                  | 0.2mA/°F max.                               |
| Weight lbs                         |           | 4.8  | 4.8   | .3<br>(1.3 with Z)                             | 3.0<br>(1.3 with Z)                         |
| Driven Valve                       |           | Pressure Control Valves<br>Flow Control Valves | Direction Control Valve                     | Pressure Control Valves<br>Flow Control Valves | Direction Control Valve                     |

#### • Handling

- When selecting a location, avoid areas subject to high temperatures and high humidity, and select an area where there is little vibration and dust.
- Use shielded wire for the analog signal and valve output signal wires.
- The brightness of the LED changes in accordance with the size of the output current.

#### Understanding Model Numbers

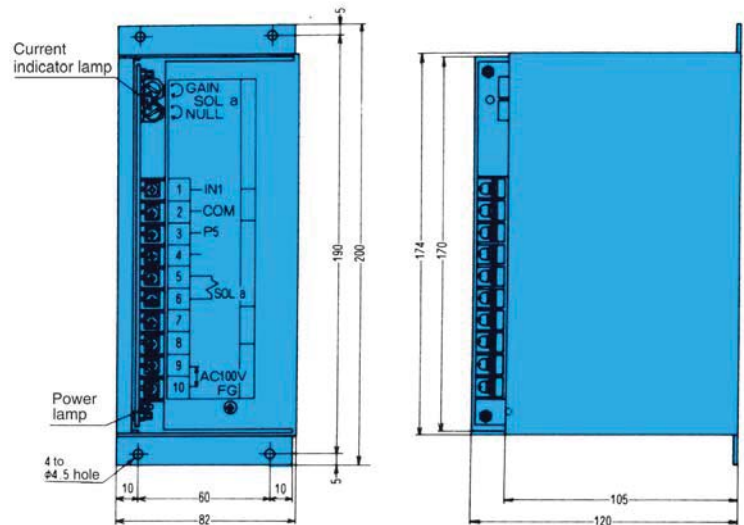
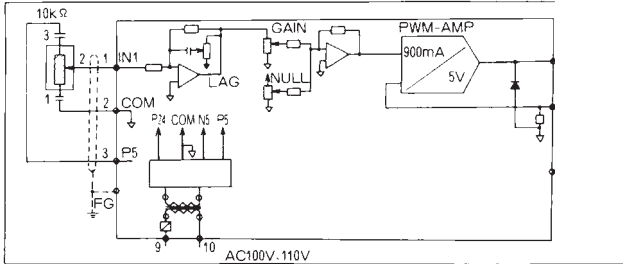
**EBA - PD1 - NWZ - D2 - 10**



## Installation Dimension Drawings

### EBA-PD1-N-C1-10

| No. | Name                      | No. | Name               |
|-----|---------------------------|-----|--------------------|
| 1   | Input signal terminal IN1 | 5   | Output terminal to |
| 2   | Input signal terminal COM | 6   | valve SOL a        |
| 3   | External power supply P5  | 7   |                    |
|     |                           | 8   |                    |
|     |                           | 9   |                    |
|     |                           | 10  | AC100 · 110V       |

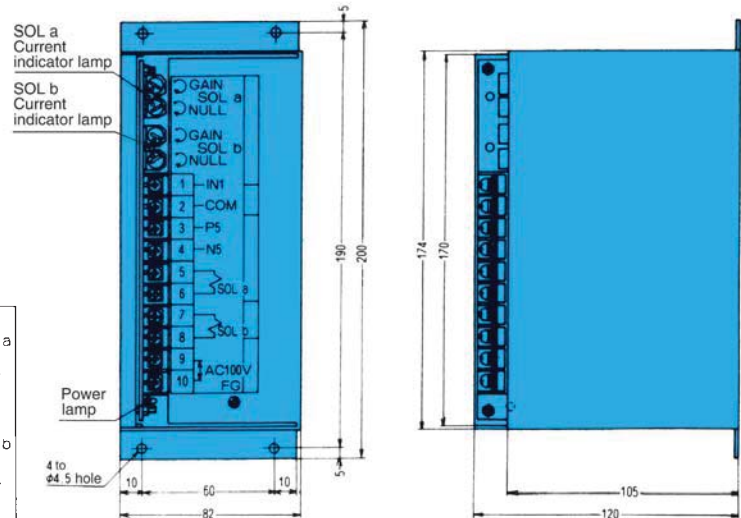
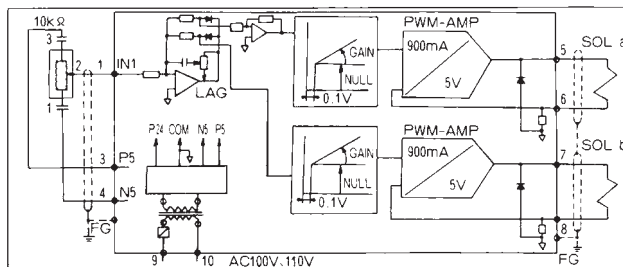


- With EBA-PD1-N (Z), **current** is supplied to the control valve in proportion to input signal voltage in the range of 0 to +10V.
- To measure **current**, measure the voltage at terminal 6, using terminal 2 as reference. The voltage across the 0.5Ω **current** detection resistor at 1A is 0.5V. Input impedance of the measurement device should be at least 1MΩ.

- With EBA-PD1-NW (Z), the polarity of the input voltage is determined, and current is supplied to SOLa when it's positive and to SOLb when it is negative.
- NULL and GAIN for SOL a and SOL b are enabled when each of their input signal voltage is ±0.1V or more.

### EBA-PD1-NW-C1-10

| No. | Name                      | No. | Name               |
|-----|---------------------------|-----|--------------------|
| 1   | Input signal terminal IN1 | 5   | Output terminal to |
| 2   | Input signal terminal COM | 6   | valve SOL a        |
| 3   | External power supply P5  | 7   | Output terminal to |
| 4   | External power supply N5  | 8   | valve SOL b        |
|     |                           | 9   |                    |
|     |                           | 10  | AC100 · 110V       |

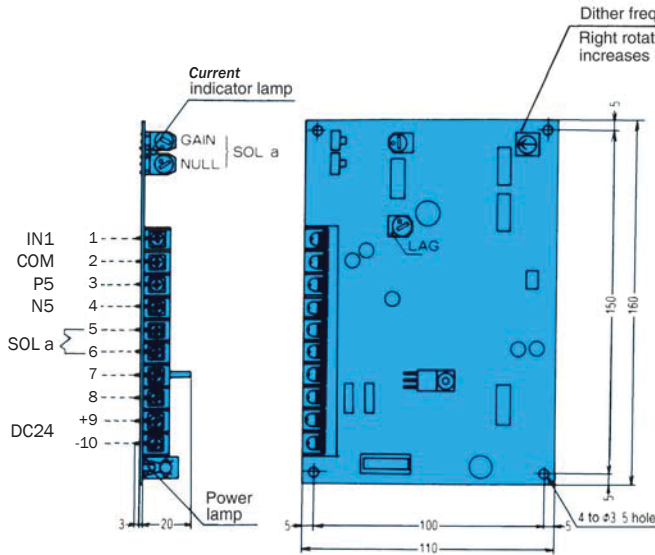
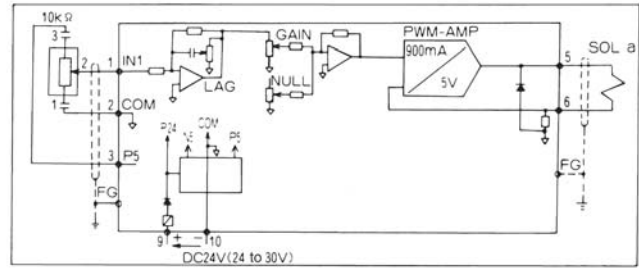


- To measure **current**, measure the voltage at SOLa terminal 6 and SOLb terminal 6, using terminal 2 as reference. The voltage across

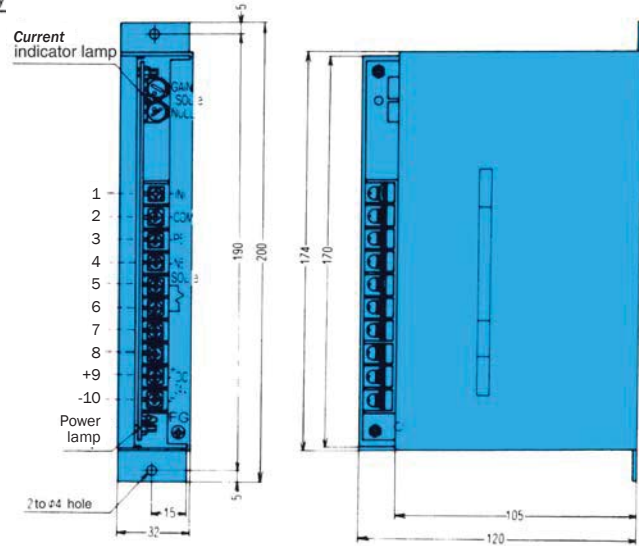
- the 0.5Ω **current** detection resistor at 1A is 0.5V. Input impedance of the measurement device should be at least 1MΩ.

EBA-PD1-N(Z)-D2-10

| No. | Name                      | No. | Name                           |
|-----|---------------------------|-----|--------------------------------|
| 1   | Input signal terminal IN1 | 5   | Output terminal to valve SOL a |
| 2   | Input signal terminal COM | 6   |                                |
| 3   | External power supply P5  | 7   |                                |
|     |                           | 8   |                                |
|     |                           | 9   | + DC24V                        |
|     |                           | 10  | - DC24V                        |



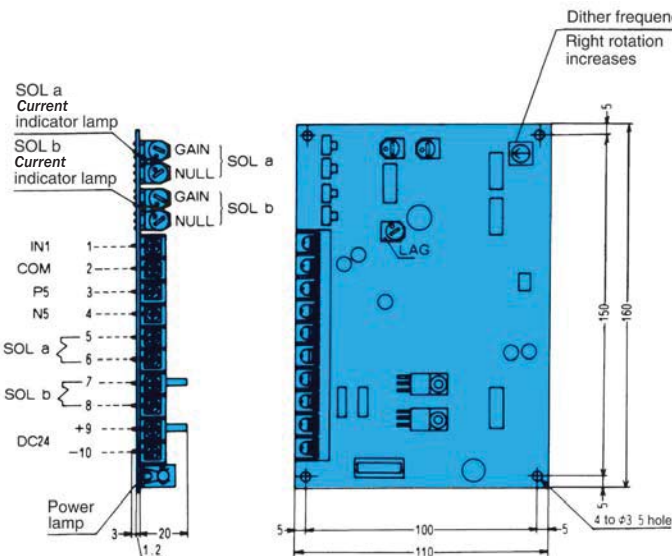
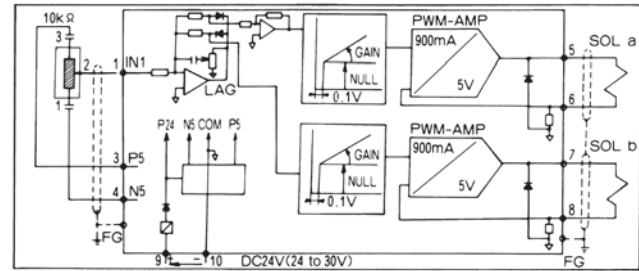
EBA-PD1-N-D2-10



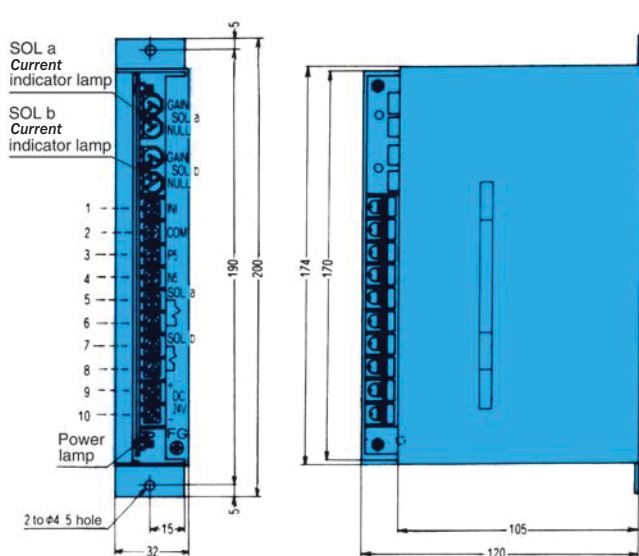
EBA-PD1-NZ-D2-10

EBA-PD1-NW(Z)-D2-10

| No. | Name                      | No. | Name                           |
|-----|---------------------------|-----|--------------------------------|
| 1   | Input signal terminal IN1 | 5   | Output terminal to valve SOL a |
| 2   | Input signal terminal COM | 6   |                                |
| 3   | External power supply P5  | 7   | Output terminal to valve SOL b |
| 4   | External power supply N5  | 8   |                                |
|     |                           | 9   | + DC24V                        |
|     |                           | 10  | - DC24V                        |



EBA-PD1-NW-D2-10



EBA-PD1-NWZ-D2-10

Note: Use a 24V switching regulator with a capacitance of at least 1A.

### Example

| Manufacturer  | Model No.  | Capacity |
|---------------|------------|----------|
| COSEL         | R25A-24    | 24V 1.1A |
| TDK           | EAK24-1R3G | 24V 1.3A |
| DENSEI-LAMBDA | EWS25-24   | 24V 1.2A |

#### • General Precautions

##### 1 Measuring **current** flow in the solenoid coil

As shown in the illustration below, disconnect the line supplying **current** to the solenoid coil, and then insert a 1A DC rated **current** meter or measure voltage across terminals 5 and 6. Solenoid coil resistance is 20Ω, so the relationship between voltage and **current** is as shown below. Note, however, that these values are not exact, because coil resistance changes with temperature.

| Voltage (V) | Current (mA) |
|-------------|--------------|
| 0           | 0            |
| 4           | 200          |
| 8           | 400          |
| 12          | 600          |
| 16          | 800          |

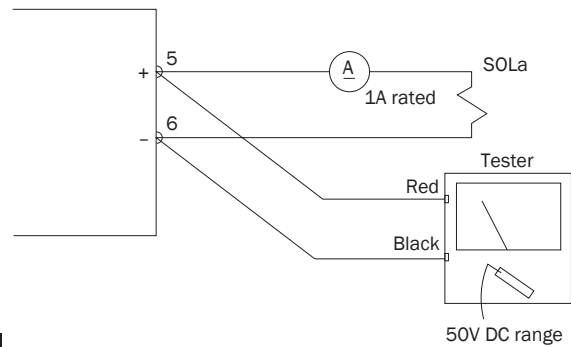
Measurements across terminals 7 and 8 can be performed the same as shown in the illustration below.

2 Never energize only the solenoid coil. The amp will not operate correctly if the iron coil is not inserted.

3 For connection between the amp/controller and solenoid coil, use a 2-conductor shielded wire with a conductor nominal cross-section area of 2.0mm<sup>2</sup>. Type VCTF (Rated Voltage: 300V vinyl cab tire cord).

Wiring between the command voltage generator and amplifier should be VCTF 0.75m<sup>2</sup> 3-conductor wire.

Use a shield that conforms to JIS Class 3 grounding. If the ground line is unstable, do not connect the shield to anything.



## Power Amplifier Operation and Terminology

#### • Zero Adjust (NULL)

This knob sets the lower limit of the operating pressure and flow rate. Rotating it clockwise increases the **output current**. This knob is also used for manual control while checking valve operation.

#### • Channel Time Lag (TIME)

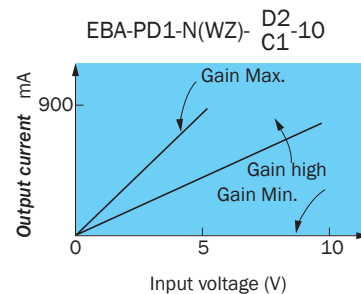
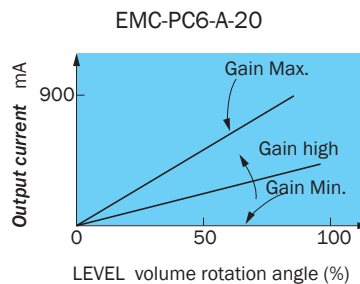
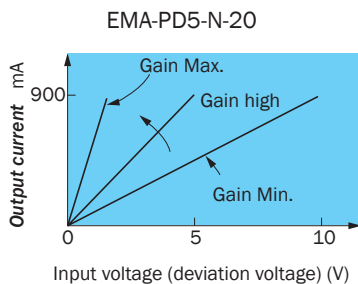
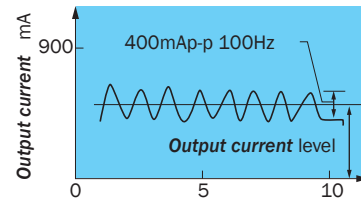
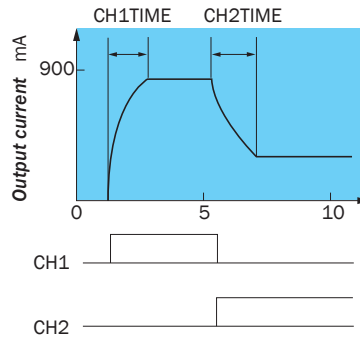
This knob adjusts the time it takes for a channel selected by external contact to reach its channel level. Rotating it clockwise increases the time lag.

#### • Dither

Dither plays a role in improving control valve hysteresis, response, stability, etc.

#### • Gain Adjust (GAIN)

This knob adjusts **output current** in proportion to input signal voltage or the channel level knob rotation angle. Rotating it clockwise increases gain.





### Small Type Multi-Function Power Amplifier

#### Features

This compact, multi-function power amplifier uses advanced hybrid integrated circuits (HIC).

**Compact design** – Less than half the size of previous models.

**High reliability** – Circuit board configuration eliminates the need for wiring.

**Multi-Function** –

- Simultaneous driving of two valves
- Controller with built-in amplifier (EDC-PC6-AWZ-D2-20)
- Dither frequency selection function (From Designs 11, 20)

#### Specifications

| Item                               | Model No. | EDA-PD1-NWZ-D2-11                        | EDC-PC6-AWZ-D2-20                        |
|------------------------------------|-----------|--|--|
| Function                           |           | Amp Type                                 | Amp/Controller Type                      |
| Input type                         |           | 1 DC inputs                              | Contacts, 6 inputs, DC 2 inputs          |
| Maximum Output Current             |           | 900mA (20Ω solenoid)                     | 900mA (20Ω solenoid)                     |
| Input voltage                      |           | -10 to +10VDC                            | 0 to +10VDC                              |
| Input Impedance                    |           | 50kΩ                                     | 50kΩ                                     |
| Externally Set Variable Resistance |           | 10kΩ                                     | 10kΩ                                     |
| Drive Solenoid                     |           | SOL a, SOL b                             | SOL 1, SOL 2                             |
| Zero Adjust (NULL)                 |           | 0 to 900mA                               | 0 to 900mA                               |
| Gain Adjust (GAIN)                 |           | 0 to $\frac{900mA}{2.5V}$                | 0 to $\frac{900mA}{2.5V}$                |
| External power supply              |           | +5VDC(5mA)<br>-5VDC(5mA)                 | +5VDC(10mA)                              |
| Time Lag (LAG)                     |           | 0 to 2sec                                | 0 to 2sec                                |
| Dither Frequency (DITHER)          |           | 80 to 250Hz                              | 80 to 250Hz                              |
| Power Supply Voltage               |           | DC24V (DC24 to 30V)                      | DC24V (DC24 to 30V)                      |
| Power Consumption                  |           | 30VA                                     | 60VA                                     |
| Allowable Ambient Temperature      |           | 32 to 122° F                             | 32 to 122° F                             |
| Temperature Drift                  |           | 0.2mA/°F max.                            | 0.2mA/°F max.                            |
| Weight lbs                         |           | .6 lbs                                   | .8 lbs                                   |
| Driven Valve                       |           | Pressure, flow, direction control valves | Pressure, flow, direction control valves |

• Handling

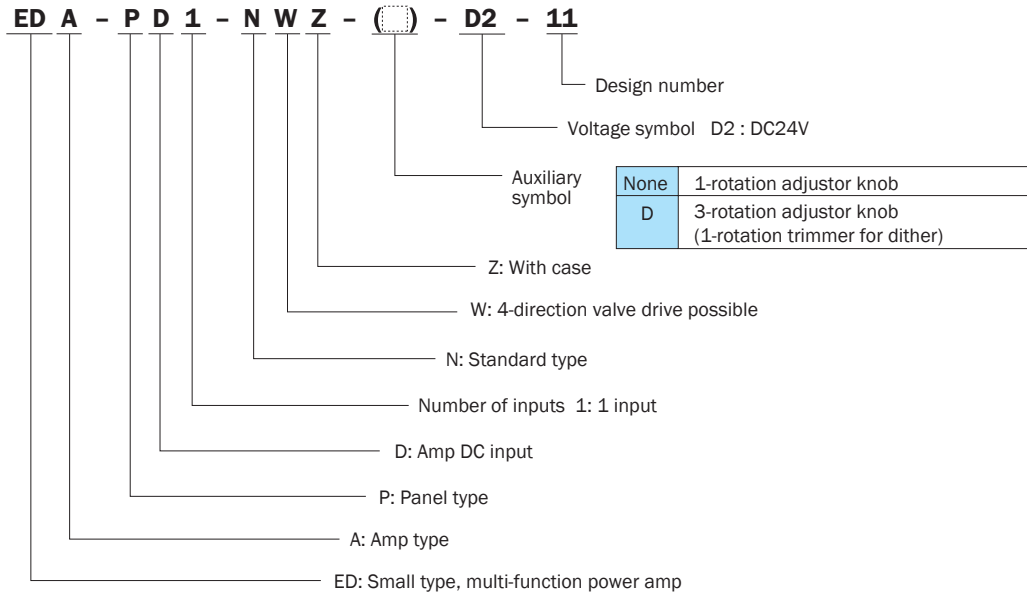
1 When selecting a location, avoid areas subject to high temperatures and high humidity, and select an area where there is little vibration and dust.

2 Use shielded wire for the analog signal and valve output signal wires. See page G-33 for general precautions.

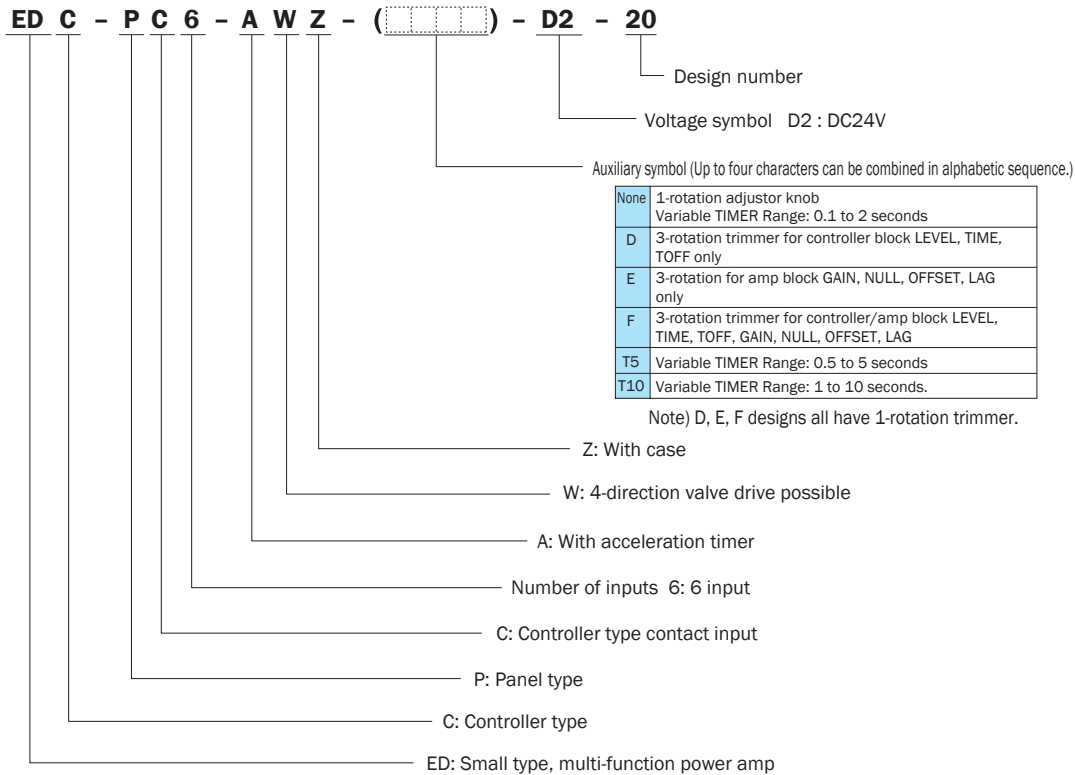
3 The brightness of the LED changes in accordance with the size of the **output current**.

# Power Amplifier Operation and Terminology

## (1) Amp Type



## (2) Amp/Controller Type

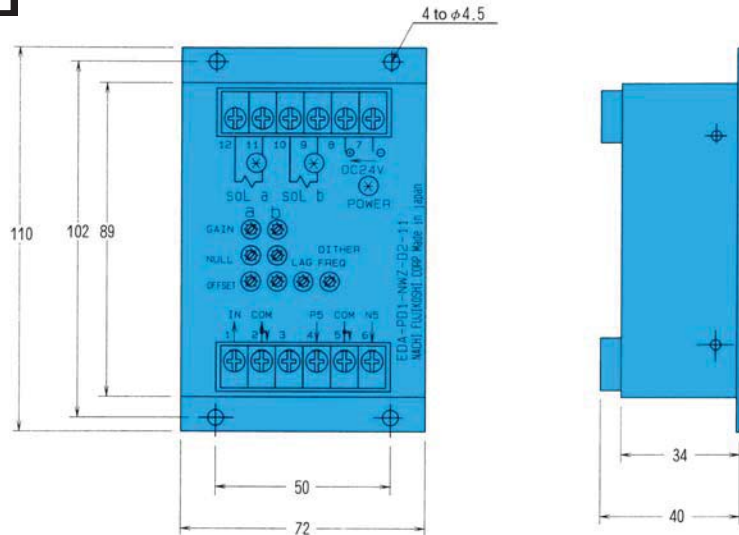




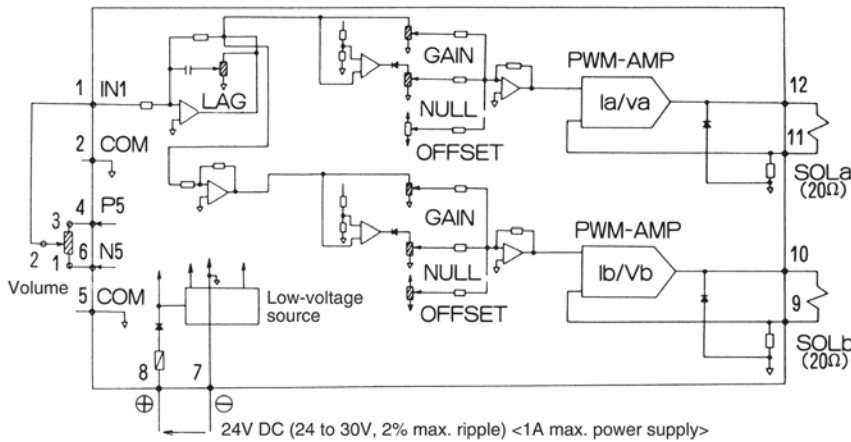
# Power Amplifier Operation and Terminology

EDA-PD1-NWZ-D2-11

| No. | Name                      | No. | Name                     |
|-----|---------------------------|-----|--------------------------|
| 1   | Input signal terminal IN1 | 7   | - DC24V                  |
| 2   | Input signal terminal COM | 8   | + DC24V                  |
| 3   |                           | 9   | Output terminal to valve |
| 4   | External power supply P5  | 10  | SOL b                    |
| 5   | Input signal terminal COM | 11  | Output terminal to valve |
| 6   | External power supply N5  | 12  | SOL a                    |



Block Diagram

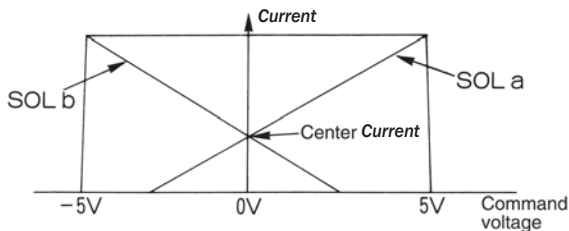


- **Current** is supplied to SOL a when input signal voltage polarity is positive, and to SOL b when negative. Either SOL a or SOL b can be driven at any one time.
- Push-pull drive is also supported.
- To measure **current**, measure the voltage at SOL a terminal 11 and SOL b terminal 9, using terminal 5 as reference. The voltage across the 0.5Ω **current** detection resistor at 1A is 0.5V. Use a measurement device with an input impedance of at least 1MΩ.
- To use SOL a only, connect terminal 1 of the knob to amp terminal 2, use an input voltage range of 0 to 5V. (ER, ES only)

## Application Examples

Adjusting Push-pull Drive for a Special Proportional Valve (Special Specification Direction Control Valve)

- a) Overlap Type Proportional Valve      ESD-G01-C5  $\frac{10}{20}$  -6333D:300mA (Center **Current**)
- b) Zero-Lap Type Proportional Valve      ESD-G01-C5  $\frac{10}{20}$  -6586C:200mA (Center **Current**)



As shown in the figure to the left, push-pull control aims at increasing response at the zero point by simultaneously energizing both solenoids.

### Adjustment Procedure

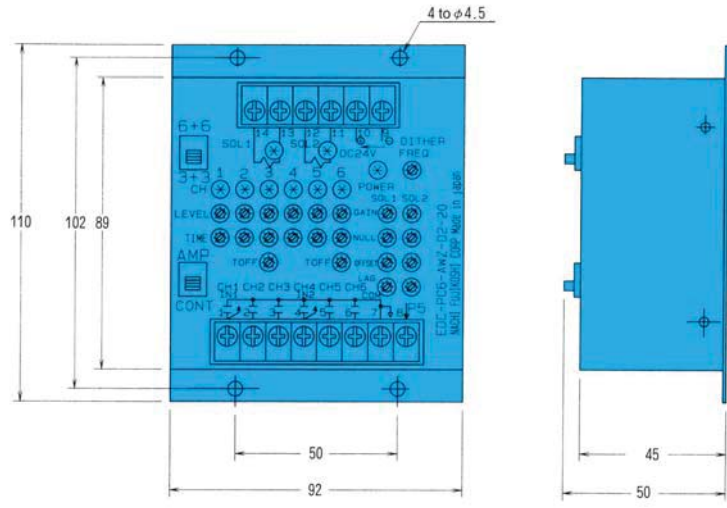
- 1 NULL, GAIN, OFFSET  
Rotate all seven knobs counterclockwise as far as they will go.
- 2 Without any connection between terminals 1 and 2, use the OFFSET knob to simultaneously energize SOL a and SOL b as follows.  
SOL a 300mA(200mA)  
SOL b 300mA(200mA)
- 3 Next, apply +5V to terminal 1 (connecting 1 and 4), and set the SOL a GAIN knob to the following:  
SOL a 850mA  
SOL b 300mA  
For the SOL b **current** here, SOL b GAIN should be fully rotated counterclockwise, and its setting should not be changed. Apply -5V to terminal 1 (connecting 1 and 6), and set the SOL b GAIN knob for the following:  
SOL a 0mA  
SOL b 850mA

This completes the setting procedure.

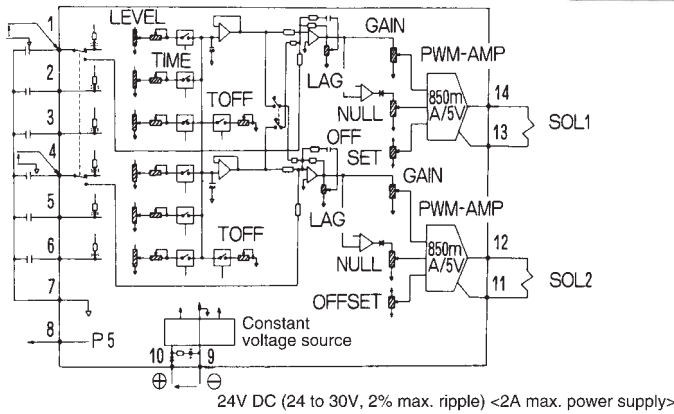
- The three LAG and NULL knobs should be left rotated fully counterclockwise. There is no need to change their settings.
- EDA-PD1-NWZ-D2-11 is configured with a feedback system, so it does not have a feedback gain adjustment function. In this case, use EDA-PD1-NWZ-D2-11 in combination with the EA-PD4-D10-\*-10 NACHI servo amp.

EDC-PC6-AWZ-D2-20

| No. | Name                  | No. | Name                     |
|-----|-----------------------|-----|--------------------------|
| 1   | CH1 select terminal   | 7   | COM                      |
|     | Input signal terminal | 8   | External power supply P5 |
| 2   | CH2 select terminal   | 9   | -                        |
| 3   | CH3 select terminal   | 10  | + DC24V                  |
| 4   | CH4 select terminal   | 11  | Output terminal to       |
|     | Input signal terminal | 12  | valve SOL 2              |
| 5   | CH5 select terminal   | 13  | Output terminal to       |
| 6   | CH6 select terminal   | 14  | valve SOL 1              |



Block Diagram

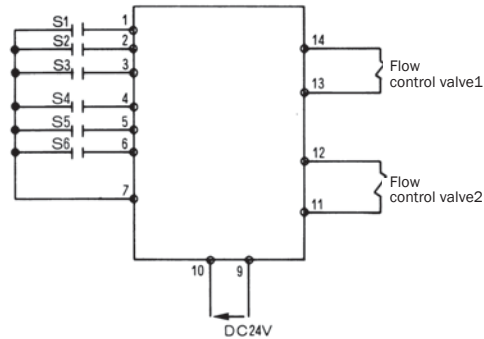


- Dual simultaneous output to SOL 1 and SOL 2 is supported.
- To measure **current**, measure the voltage at SOL a terminal 13 and SOL b terminal 1, using terminal 7 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Use a measurement device with an input impedance of at least 1MΩ.

Application Examples

1) Switch Position

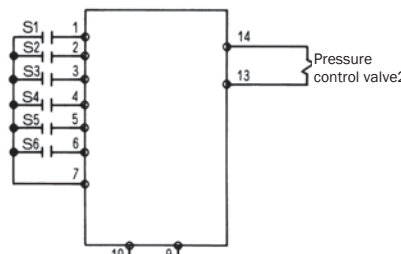
- CONT
- 3+3



- Simultaneous control using two flow control valves (3-speed)  
As shown in the diagram to the left, flow control 1 speed is controlled with CH1 LEVEL when CH1 and CH2 are turned on at the same time. Next, flow control valve 2 speed is controlled by CH4 LEVEL, and simultaneous control is possible by adjusting flow control valve 1 speed in the same way. 3-speed synchronous control is possible by grouping CH1 through CH3 and CH4 through CH6.

2) Switch Position

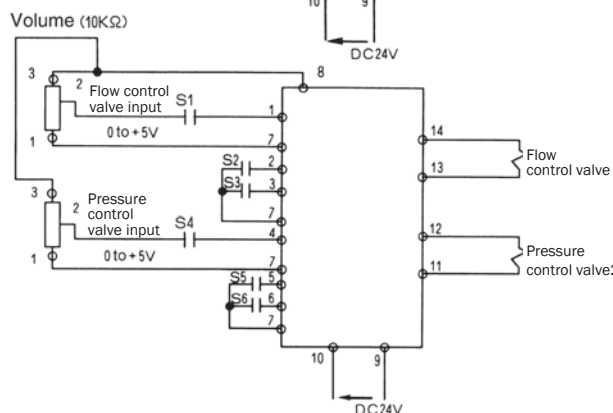
- CONT
- 6+6



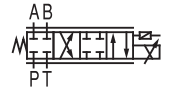
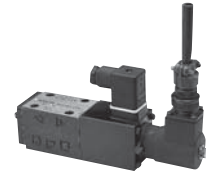
- Pressure control valve 6-pressure control  
As shown in the diagram to the left, this amplifier can be use as a 6-channel controller for a single pressure control valve. Minimum pressure at this time is in accordance with the setting of the OFFSET knob. The NULL knob cannot be used to configure settings unless a channel is selected.

3) Switch Position

- AMP
- 3+3



- 2-output amplifier for simultaneous control of load-sensitive system pressure and flow rate  
As shown in the diagram to the left, 0 to +5V input and channel CH2 or CH3 input are added together and output to the flow control valve. Likewise, 0 to +5V and CH5 or CH6 input is added together and output to the pressure control valve.



### High-Response Proportional Flow Control Valve ESH-G01

2.6 to 13.2 gpm  
4640 psi

#### Features

Frequency response equivalent to an electro-hydraulic servo valve. Direct spool by a high-output proportional solenoid. Differential transformer for accurate spool positioning with minor feedback.

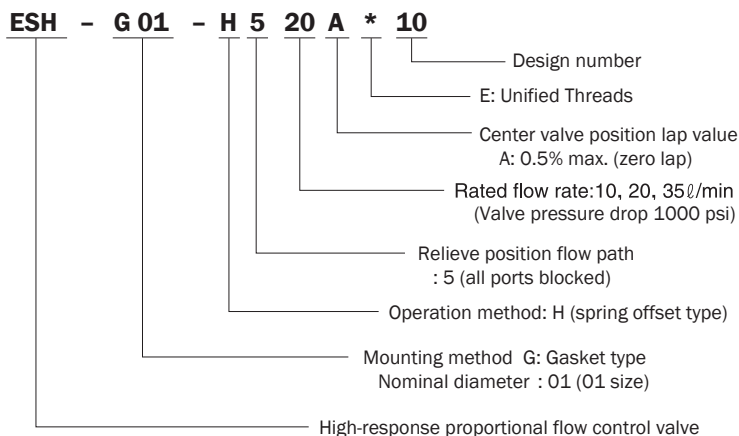
Recovery of all port block positions following amp power off or wiring disconnection (Failsafe Function). Steel spool and spring for long life.

#### Specifications

| Model No.  |                   | ESH-G01-H510A-10               | ESH-G01-H520A-10 | ESH-G01-H540A-10 |
|--|-------------------|--------------------------------|------------------|------------------|
| Item   |                   |                                |                  |                  |
| Maximum Operating Pressure P, A, B psi   |                   | 4640                           |                  |                  |
| T Port Allowable Back Pressure psi   |                   | 362 max.                       |                  |                  |
| Rated Flow Rate l/min (gpm)<br>(Valve pressure drop 1000 psi)                      |                   | 10 (2.6)                       | 20 (5.2)         | 40 (9.2)         |
| Maximum Flow Rate gpm  |                   | 5.8                            | 9.2              | 13               |
| Limit Valve Pressure Drop psi  |                   | 4640                           | 3045             | 2030             |
| Hysteresis %   |                   | 0.5 max.                       |                  |                  |
| Step Response ms<br>(0→100% Displacement)  |                   | 16 max. (Note 1)               |                  |                  |
| Frequency Response Hz<br>(90° Phase Delay ±10% Displacement)                       |                   | At least 80 (Note 1)           |                  |                  |
| Center   | Supply Pressure   | 0.5% max/FS ( Δp=3625 psi)     |                  |                  |
| Drift  | Fluid Temperature | 1.5% max/FS ( Δt=104°F)        |                  |                  |
| Filtration   |                   | Class NAS9 max.                |                  |                  |
| Operating Fluid Temperature Range ° F<br>(Recommended Fluid Temperature Range ° F) |                   | 32 to 140° F<br>(86 to 140° F) |                  |                  |
| Water and Dust Resistance  |                   | IP53                           |                  |                  |
| Weight lbs   |                   | 5                              |                  |                  |

Note: 1. Step response is typical value for a supply pressure of 1000 psi and fluid temperature of 104° F (kinematic viscosity: 40 centistokes)

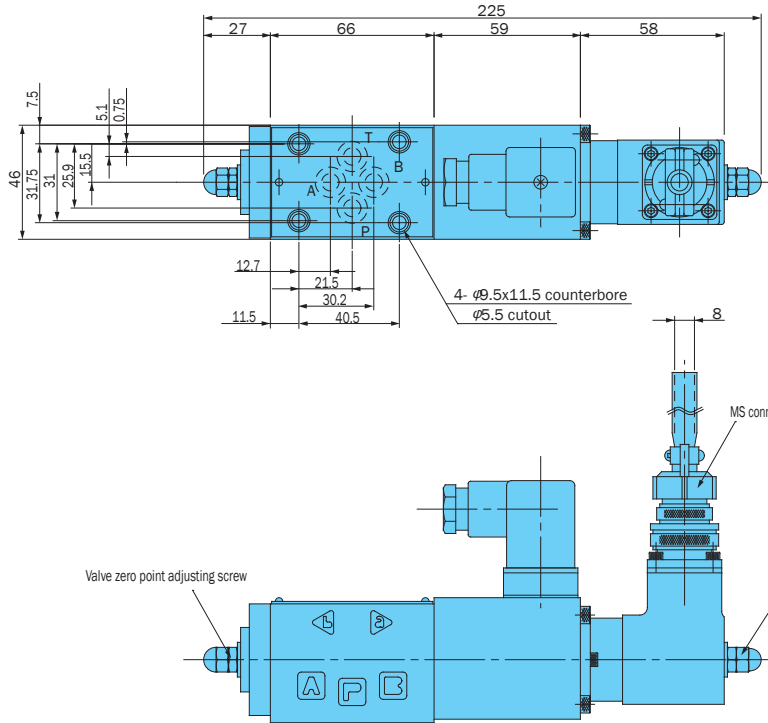
#### Understanding Model Numbers



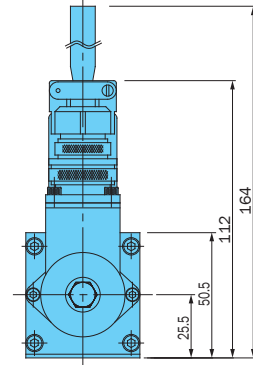
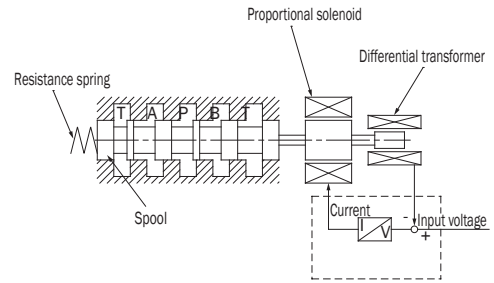
#### • Handling

- The amp and valve are adjusted to match at the factory, so be sure to use items that have the same MFG No.
- The differential transformer zero adjust screw and valve zero adjust screw are adjusted and fixed at the factory. Because of this, you should not touch the screws (sealed cap nuts).
- Install the valve so the spool axis line is horizontal.
- In the case of 3-port applications and for the direction that throughflow is most common, use of the following flow is recommended P→A→B→T. P→A limit differential pressure is greater than that of P→B.
- Be sure to perform sufficient flushing before a test run.
- Use steel piping for this valve and the main actuator, and keep piping as short as possible.
- There is no air bleeding.
- Mineral oil hydraulic operating fluid is standard. Use an R&O type and wear resistant type of ISO VG32, 46, or 68 or equivalent.
- Use an operating fluid that conforms to the both of the following.  
Kinematic viscosity: 20 to 140 centistokes  
Oil temperature: 86 to 140° F
- Filtration  
Maintain hydraulic operating fluid contamination so it is at least NAS Class 9.
- Electrical wiring between the amp and valve should be no longer than 30 meters. For the solenoid valve use VCTF 2 mm<sup>2</sup>, 2-conductor shielded wire, and for the differential transformer use VCTF 0.5 mm<sup>2</sup>, 4-conductor shielded wire.
- After disassembling the valve, be sure to fill the inside of the guide with operating fluid before reassembling.
- Bundled Accessories (Valve Mounting Bolts)  
(4) 10-24 x 1 3/4"  
Tightening Torque: 3.5 to 5 ft lbs

## Installation Dimension Drawings

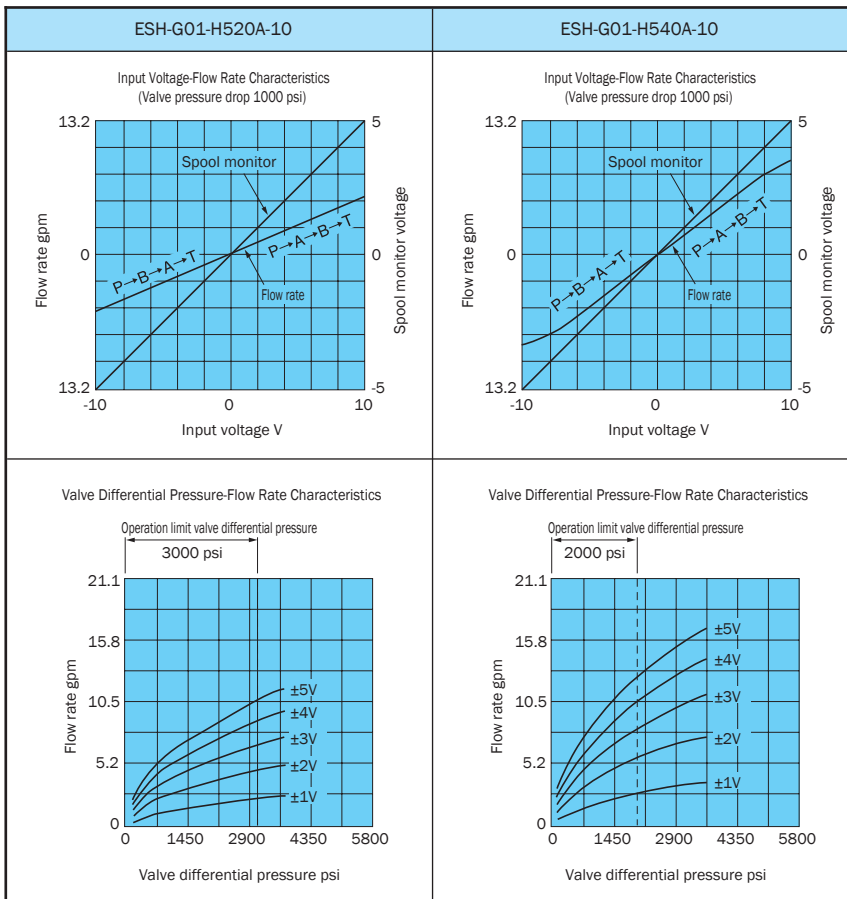


## Operation Principle



The gasket mounting method conforms to ISO4401-AB-03-4-A.

## Performance Curves



Note:  $\pm 10V$  input amp factory default data.  
Rotating the GAIN trimmer clockwise (rightward) increases the flow rate by up to 10%.

- Valve Pressure Drop and Rated Flow Rate  
Valve Pressure Drop ( $\Delta P_x$ )  
 $= P_s - P_L - P_T$   
 $P_s$  : Valve supply pressure  
 $P_L$  : Load pressure  
 $P_T$  : T Port back pressure  
The rated flow rate is the value when the above valve pressure drop is 1000 psi.

- Valve Pressure Drop and Control Flow Rate  
The following is the maximum control flow rate when the size of the obtained valve pressure drop is  $\Delta P_x$ ,

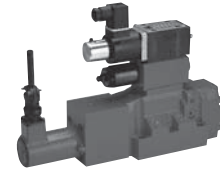
$$Q_x = Q_{rate} \times \sqrt{\frac{\Delta P_x}{7}}$$

Qrate : Rated flow rate  
 $\Delta P_x = P_s - P_L - P_T$

- Calculation example  
When ESH-G01-H520A-10 is used under the following conditions:  
 $P_s = 102 \text{ kgf/cm}^2$  (1450 psi)  
 $P_L = 61 \text{ kgf/cm}^2$  (870 psi)  
 $P_T = 10 \text{ kgf/cm}^2$  (145 psi)  
Maximum control flow rate  $Q_x$  is as shown below:

$$Q_x = Q_{rate} \times \sqrt{\frac{P_s - P_L - P_T}{7}}$$

$$= 20 \times \sqrt{\frac{10 - 6 - 1}{7}} = 13 \text{ l/min}$$



### High-Response Proportional Flow Control Valve ESH-G03, 04, 06

21 to 158 gpm  
4060 to 4640 psi

#### Features

- Main spool minor feedback for greatly increased hysteresis and repeatability.
- Response characteristics suitable to 20Hz and high precision acceleration control.
- Recovery of center position following amp power off or wiring disconnection (Failsafe Function).
- Single rod cylinder spool available for easy use.
- Built-in pilot pressure reducing valve for stable operation.

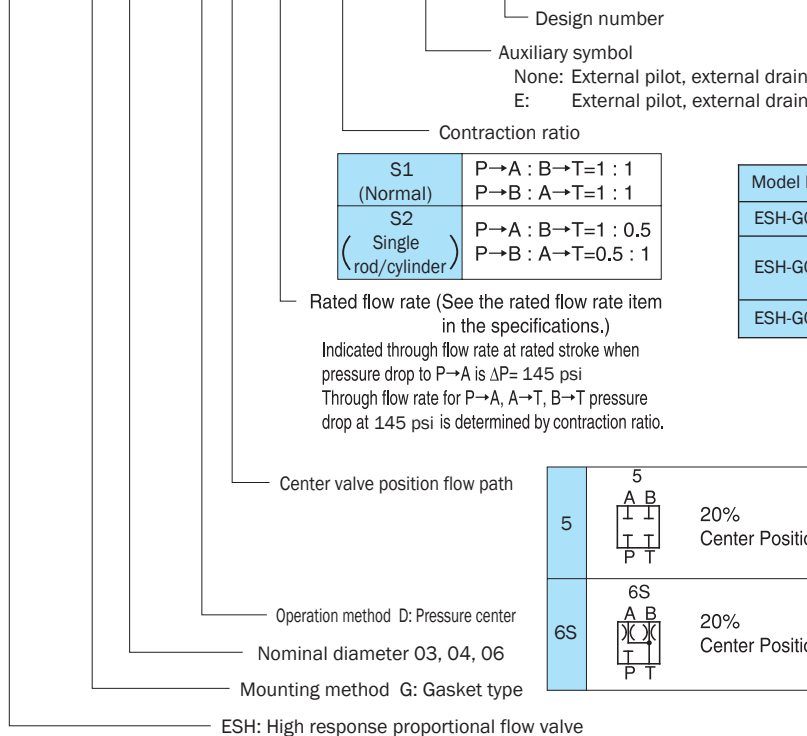
#### Specifications

| Item   | Model No.                      |                | ESH-G03-D*****-(*)-11 | ESH-G04-D*****-(*)-11 | ESH-G06-D*****-(*)-11 |      |
|--|--------------------------------|----------------|-----------------------|-----------------------|-----------------------|------|
|  | Maximum Operating Pressure psi | P,A,B Ports    | External Pilot        | 4060                  | 4640                  | 4640 |
| T Port   |                                | Internal Pilot | 3625                  | 3625                  | 3625                  |      |
|  |                                | Pp Port        |                       | 3045                  | 3045                  | 3045 |
|  |                                |                |                       | 3625                  | 3625                  | 3625 |
| Minimum Pilot Pressure psi   |                                |                | 217                   | 217                   | 217                   |      |
| Rated Flow Rate $l/min$ (gpm) Rated stroke, P→A pressure drop, 145 psi |                                |                | 80 (21)               | 180 (47.5)            | 350 (92.5)            |      |
| Maximum Flow Rate gpm  |                                |                | 37                    | 79.2                  | 158                   |      |
| Pilot Pressure Reducing Valve Set Pressure psi                         |                                |                | 290                   | 290                   | 580                   |      |
| Hysteresis %   |                                |                | 0.5 max.              | 0.5 max.              | 0.5 max.              |      |
| Step Response ms (0 →100% displacement)                                |                                |                | 50(Note1)             | 50(Note1)             | 50(Note1)             |      |
| Frequency Response Hz ( ±10% input, 90 ° phase delay)                  |                                |                | 20(Note1)             | 20(Note1)             | 20(Note1)             |      |
| Pilot Flow Rate gpm  |                                |                | 1                     | 2.1                   | 3.1                   |      |
| Y (DR1), L (DR2) allowable back pressure psi                           |                                |                | 29                    | 29                    | 29                    |      |
| Weight lbs   |                                |                | 17.6                  | 26.4                  | 39.7                  |      |

Note: 1. Step response is typical value for a supply pressure of 1000 psi and fluid temperature of 104° F (kinematic viscosity: 40 centistokes)

#### Understanding Model Numbers

**ESH - G 04 - D 5 180 S1 - (\*) - 11**



#### • Handling

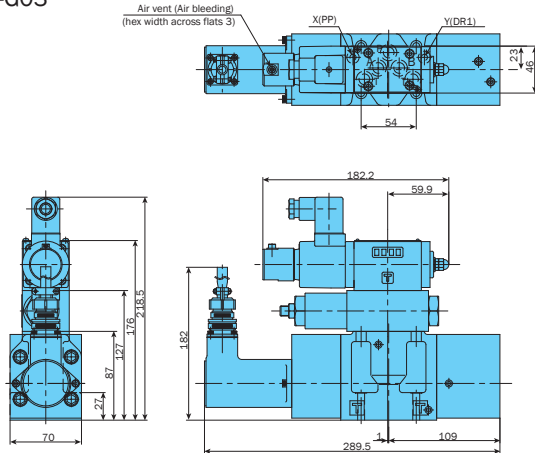
- 1 Air Bleeding  
In order to ensure stable control, loosen the air vent and bleed air from the valve before starting operation.
- 2 Y (DR1), L (DR2) Ports  
Connect ports Y (DR1) and L (DR2) directly to the fluid tank so they are always supplied with operating fluid, in order to keep back pressure no greater than 29 psi.
- 3 L (DR2) Port  
Since this valve is a pressure center type, G04 and G06 have an L (DR2) port. Be sure to connect this port directly to the fluid tank.  
G03 has a Y (DR1) port only, and this is connected internally to L.
- 4 Valve Mounting Orientation  
Install the valve so the spool axis line is horizontal.
- 5 Filtration  
Maintain hydraulic operating fluid contamination so it is at least NAS Class 9.
- 6 The amp and valve are adjusted to match at the factory, so be sure to use items that have the same MFG No.
- 7 Oil-based operating fluid is standard. Use an R&O type and wear-resistant type of ISO VG32, 46, or 68 or equivalent.
- 8 Use an operating fluid that conforms to the both of the following.  
Kinematic viscosity: 20 to 140 centistokes  
Oil temperature: 86 to 140° F
- 9 Electrical wiring between the amp and valve should be no longer than 30 meters. For the solenoid valve use VCTF 2 mm2 2-conductor shielded wire, and for the differential transformer use VCTF 0.5 mm2 4-conductor shielded wire.
- 10 Bundled Accessories (Valve Mounting Bolts)

| Model No. | Bolt Size       | Q'ty | Tightening Torque ft lbs |
|-----------|-----------------|------|--------------------------|
| ESH-G03   | 1/4-20 x 1 3/8" | 4    | 7 to 9.5                 |
| ESH-G04   | 3/8-16 x 2"     | 4    | 33 to 40                 |
|           | 1/4-20 x 1 3/4" | 2    | 7 to 9.5                 |
| ESH-G06   | 1/2-13 x 2 3/8" | 6    | 44 to 51                 |

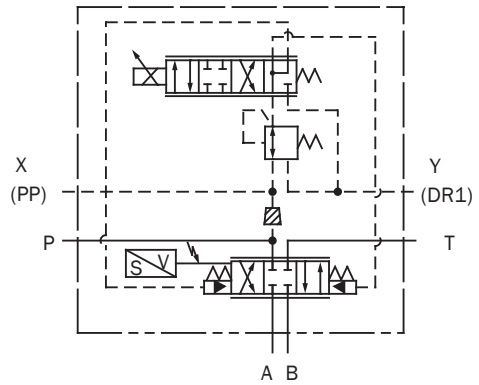
- 11 With G03 and G04, providing command in the range of 0 to +10V to the amp's RF input produces a flow of P→A→B→T. With G06, flow is P→B→A→T.
- 12 For G03 and G04, connect the ports and actuator to achieve a working of P→A→B→T. For G06, connect for a working of P→B→A→T.
- 13 Contact your agent for a contraction ratio S2 with the G06 size.

## Installation Dimension Drawings

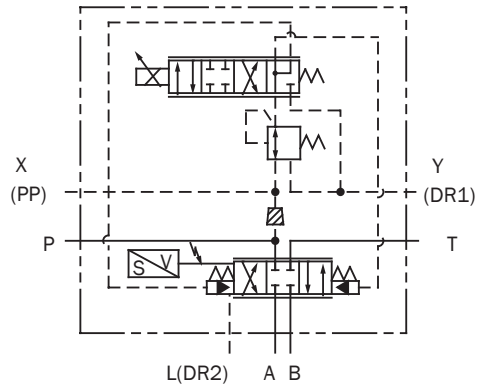
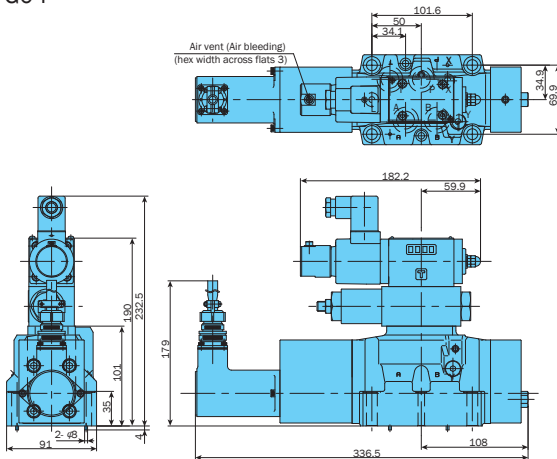
ESH-G03



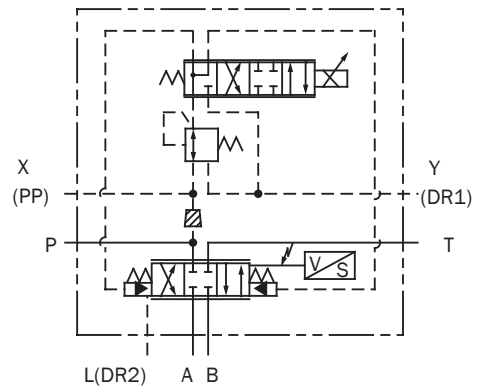
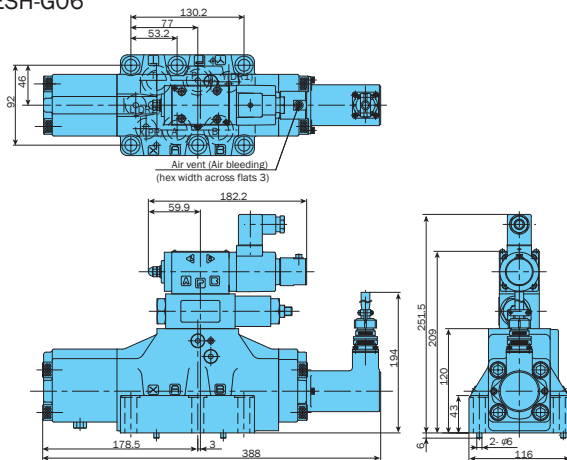
## JIS Symbol




ESH-G04



ESH-G06



Note:  
A stopper plug is needed for the  area if the pilot is external.

## Gasket Surface Dimensions

For G03, see ESD-G03 gasket surface dimensions, and for G04 and G06, see DSS-G04, 06-\*\*-20 gasket surface dimensions. Y (DR1) and L (DR2) are required. Gasket surface dimensions conform to the following.

G03: ISO 4401-03-02-0-94 (D05)

G04: ISO 4401-07-06-0-94 (D07)

G06: ISO 4401-08-07-0-94 (D08)



### High-Speed Response Proportional Control Valve Amplifier EHA Series

#### Features

**Coil current feedback** and spool position feedback amplification for stable, high-speed spool positioning. Built in check connector ICS simplifies maintenance.

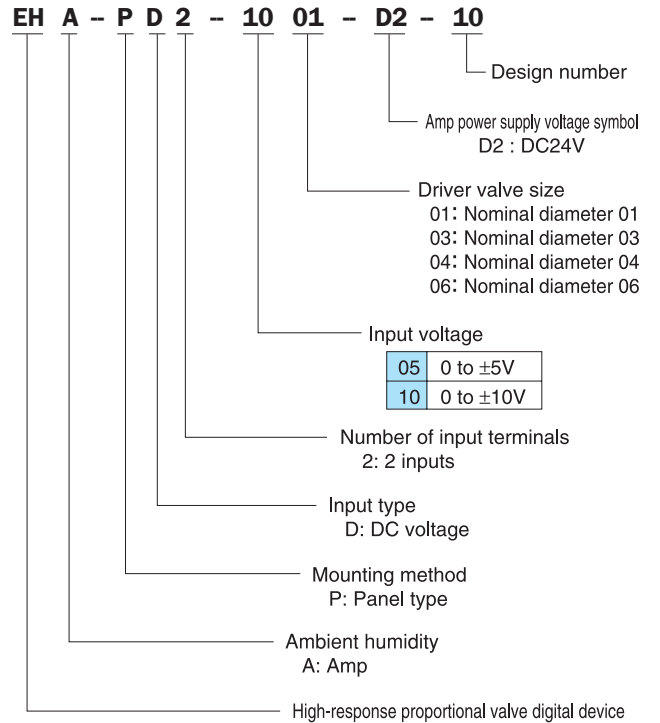
A single printed circuit board allows separation of connectors and the terminal box. Built-in differential transformer disconnect detection circuit drops **coil current** to 0mA

when disconnection occurs. Servo ready and servo ON interfaces. Power supply and **current** control switching system for improved efficiency.

#### Specifications

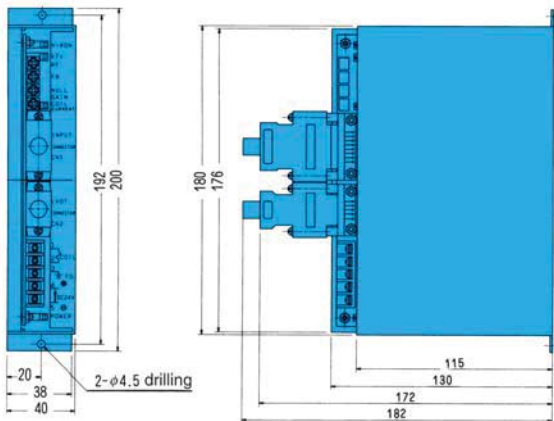
|                                |  |
|--------------------------------|--|
| Power Supply Voltage           | 24V DC (22V DC to 28V DC)<br>Lip Noise: 150mVp-p max.                        |
| Power Supply Capacity          | At least 2.1A<br>(COSEL R50A-24 equivalent switching regulator)              |
| Ambient Temperature            | 32 to 122° F   |
| Ambient Temperature            | 35 to 85% RH (non-condensation)  |
| Input Signal Voltage           | 0 to ±5V DC or 0 to ±10V DC  |
| Input Impedance                | 50kΩ   |
| Power Consumption              | 2.1A maximum consumption current at 24V                                      |
| Weight lbs                     | 2  |
| External Supply Voltage        | +5V : (10mA maximum supply possible)<br>-5V : (10mA maximum supply possible) |
| Drive Coil                     | 2.5Ω; max. 2.7A or 5 Ω; max. 2.4A  |
| Spool Displacement Measurement | Differential transformer (LVDT)  |
| Servo ON                       | Application of 24V DC during valve operation                                 |
| Ready                          | During normal valve operation: ON  |
| Spool displacement monitor     | 0 to ±5V   |

#### Understanding Model Numbers

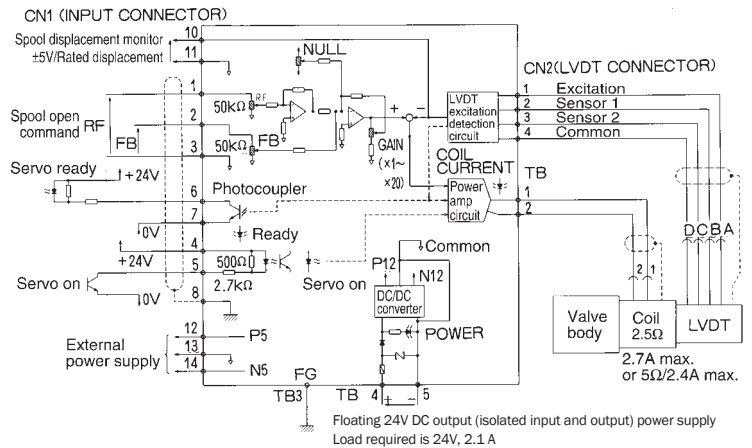


Note: Select an amp that matches the valve size.

#### Installation Dimension Drawings



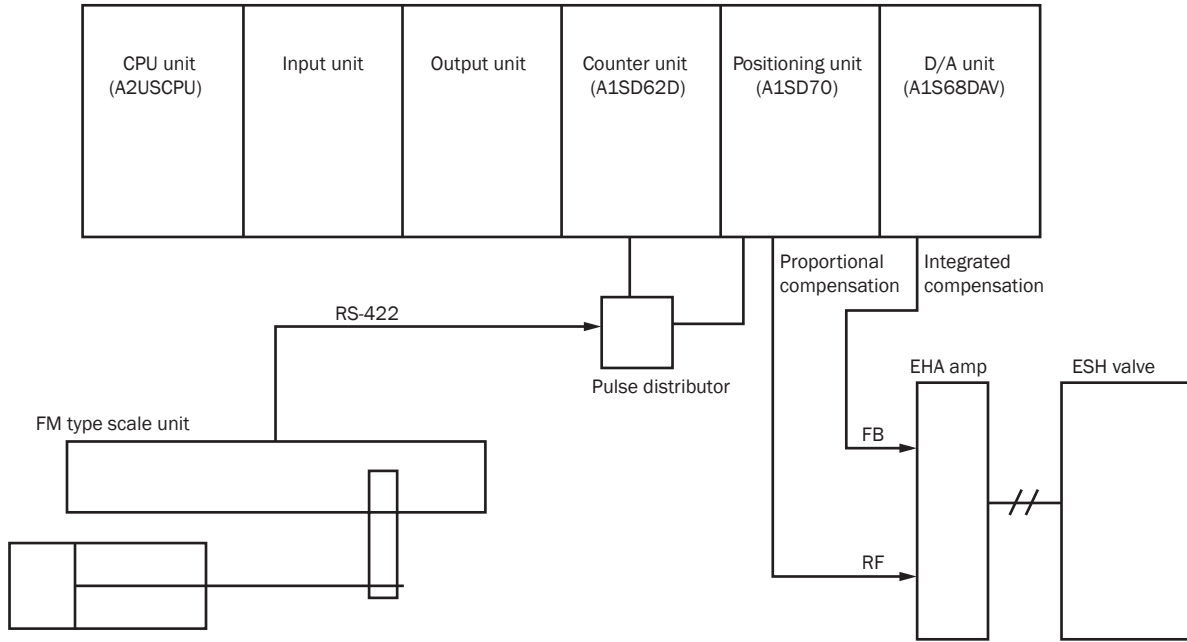
#### Block Diagram



Note:  
 Since G03, G04, and G05 are pilot operation types, there is an LVDT on the main spool, but connection is identical.

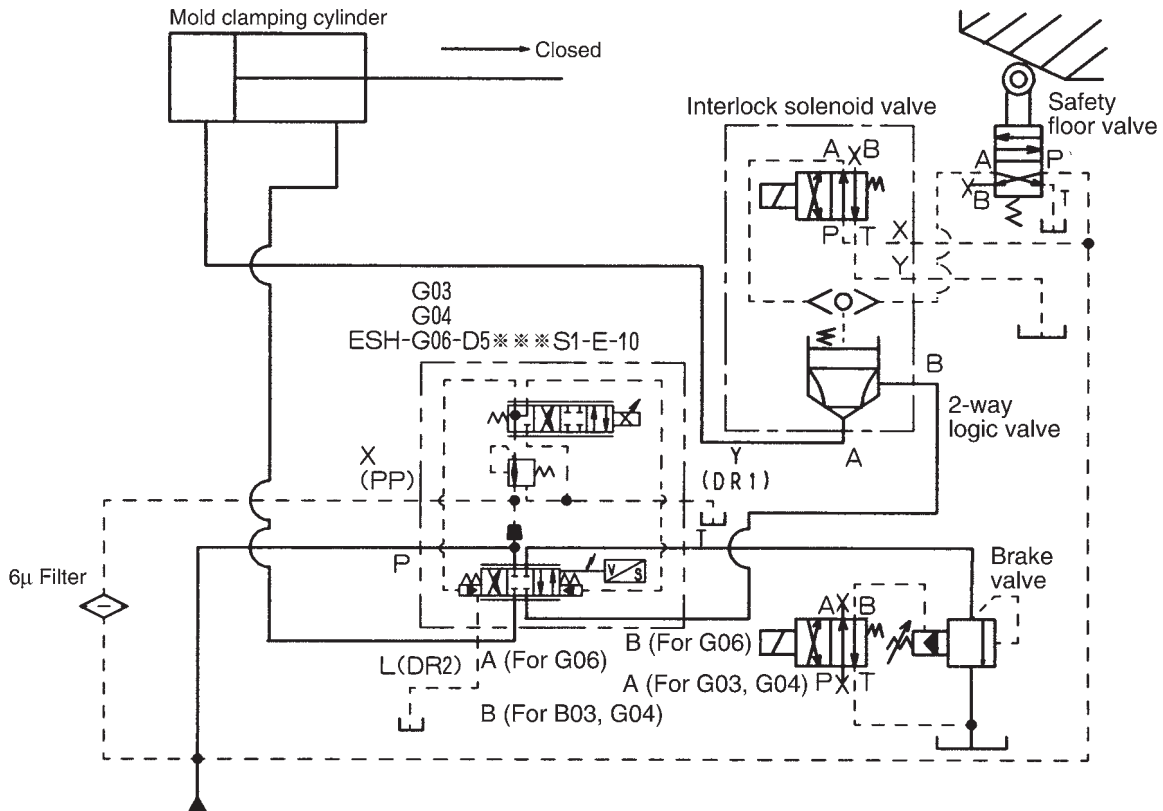
(1) Example Application in ESH-G01 Positioning Circuit

This is an ESH-G01 positioning circuit using a sequencer. Proportional control is performed by the positioning unit, while integral compensation is performed by the counter unit and D/A unit. The result is high-precision positioning.



(2) Example Application in ESH-G03, G04, G06 Molding Machine Mold Clamping Circuit

This hydraulic circuit is a basic application example. The actual application hydraulic circuit would require modification to match the machinery and to provide the necessary functions. Cut off flow to the cylinder with the safety door valve and interlock solenoid valve, in accordance with the logic valve.





### Electro-Hydraulic Servo Valve Driver Amplifier

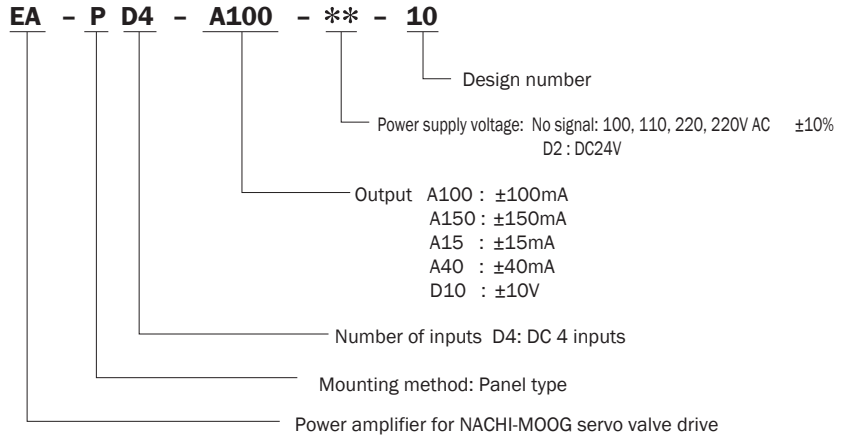
#### Features

- Compact design.
- Capable of driving virtually all NACHI-MOOG servo valve series.
- Power supply support for 24V DC in addition to 100V AC and 200V AC.

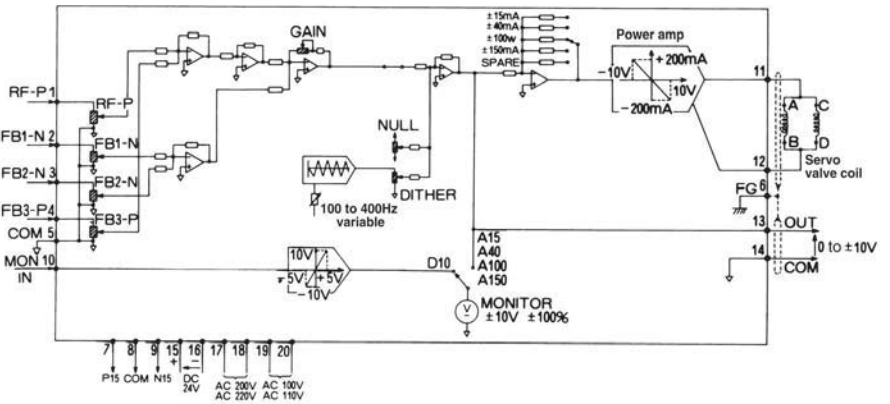
#### Specifications

| Item                           | Description   |
|--------------------------------|---|
| Number of Inputs               | 4 (RF-P,FB1-N,FB2-N,FB3-P)  |
| Input Voltage Range            | ±10VDC ( Command Signal/ Feedback Signal )  |
| Input Impedance                | 50kΩ  |
| Gain Adjust (GAIN)             | 1 to 20 X/5 to 100 X switchable   |
| Zero Adjust (NULL)             | 0 to ±20%   |
| Frequency Characteristics      | -3dB attenuation at 700Hz   |
| Dither (DITHER)                | 100 to 400Hz variable (Factory default; 200Hz)  |
| Power Supply Voltage           | AC100, 110, 200, 220V (±10%) 50/60Hz  |
| Power Consumption              | 20VA  |
| External power supply          | +15V (200mA)<br>-15V (200mA)  |
| Allowable Ambient Temperature  | 32 to 122° F  |
| Temperature Drift              | 50μV/°C max.  |
| Weight lbs                     | 6.6   |
| Servo Valve Coil Drive Current | ± 15mA(100Ω)<br>± 40mA( 40Ω)<br>±100mA( 14Ω)<br>±150mA( 14Ω)<br>It is possible to switch the output voltage<br>±10V for the four types noted above.<br>Resistance values in parentheses indicate resistance in the case of parallel wiring of the servo valve coil. |

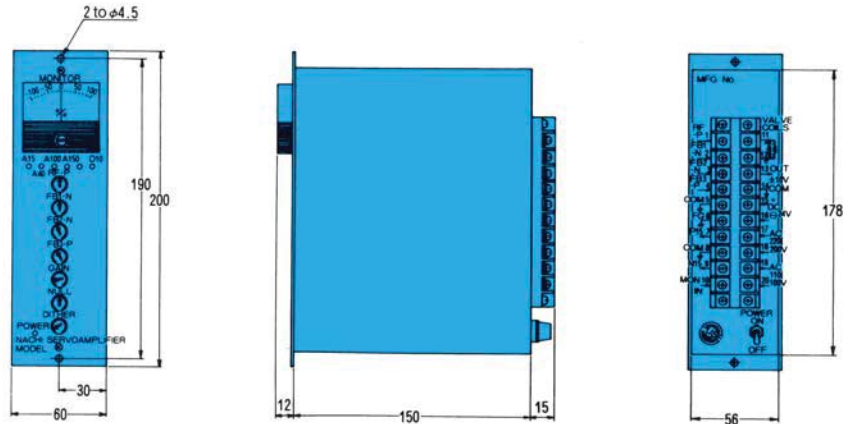
#### Understanding Model Numbers



Note: 24V DC only can be used in the case of power supply voltage signal D2. 100V, 200V AC cannot be used.



| No. | Name                      | No. | Name            |
|-----|---------------------------|-----|-----------------|
| 1   | RF-P input                | 11  | Control current |
| 2   | FB1-N feedback input      | 12  | Output terminal |
| 3   | FB2-N feedback input      | 13  | Control voltage |
| 4   | FB3-P feedback input      | 14  | Output terminal |
| 5   | COM signal land           | 15  | +               |
| 6   | FG case ground            | 16  | - DC24V         |
| 7   | P15 external power supply | 17  | AC200, 220V     |
| 8   | COM signal land           | 18  |                 |
| 9   | N15 external power supply | 19  |                 |
| 10  | MON/IN monitor in         | 20  | AC100, 110V     |

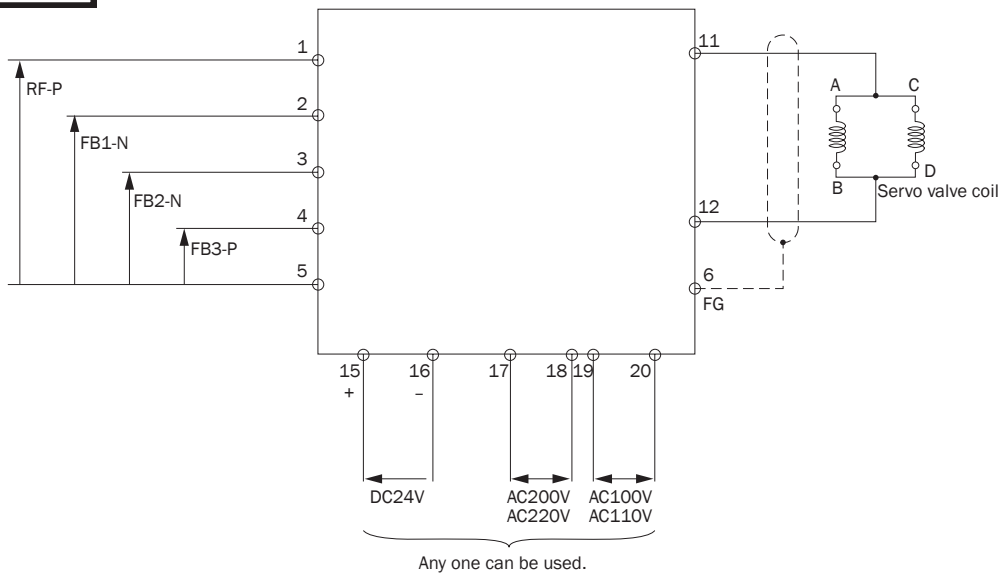


## Installation Dimension Drawings

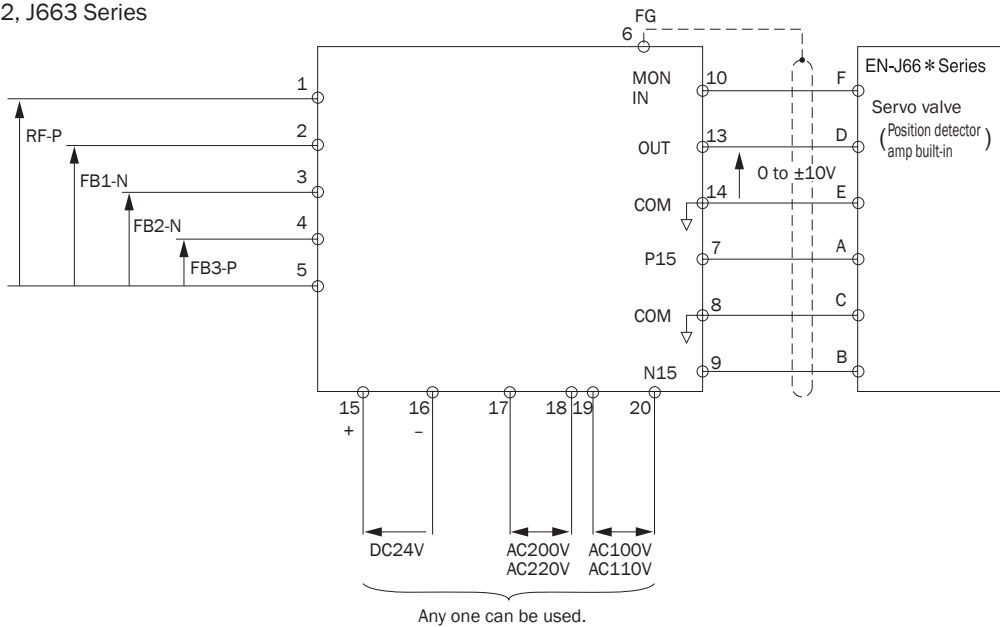
| Servo Model Number   | Rated Output             | Applicable Servo Amplifier Model Number |
|--|--------------------------|---|
| EN-J631 Series   | ±100mA (parallel wiring) | EA-PD4-A100                             |
| EN-31 Series Center Flow 19.8 gpm Rated Models   | ±150mA (parallel wiring) | EA-PD4-A150                             |
| EN-J072-401, EN-J072-402,<br>EN-J073-401, EN-J073-402, EN-J073-403, EN-J073-404,<br>EN-J073-405,<br>EN-J076-401, EN-J076-402, EN-J076-403, EN-J076-404,<br>EN-J076-405 | ±15mA (parallel wiring)  | EA-PD4-A15                              |
| EN-J072-403,<br>EN-J770,<br>EN-J073-406,<br>EN-J076-406  | ±40mA (parallel wiring)  | EA-PD4-A40                              |
| EN-J661<br>EN-J662 (Main Valve Position Detector or AmP Built In)<br>EN-J663   | ±10V                     | EA-PD4-D10                              |

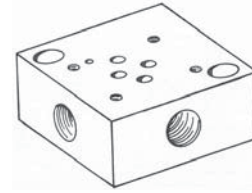
## Wiring Diagram

EN-J631, J072, J073,  
J076, J770 Series



EN-J661, J662, J663 Series

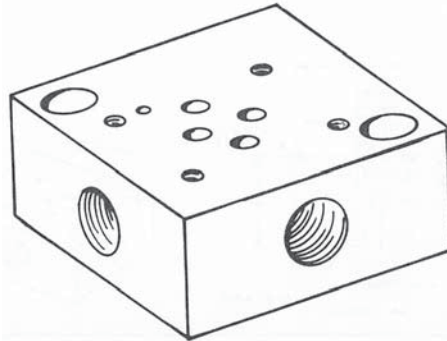




### MSA-01/03-S10 & MDS-06-S10 Series Aluminum Subplates

#### Features

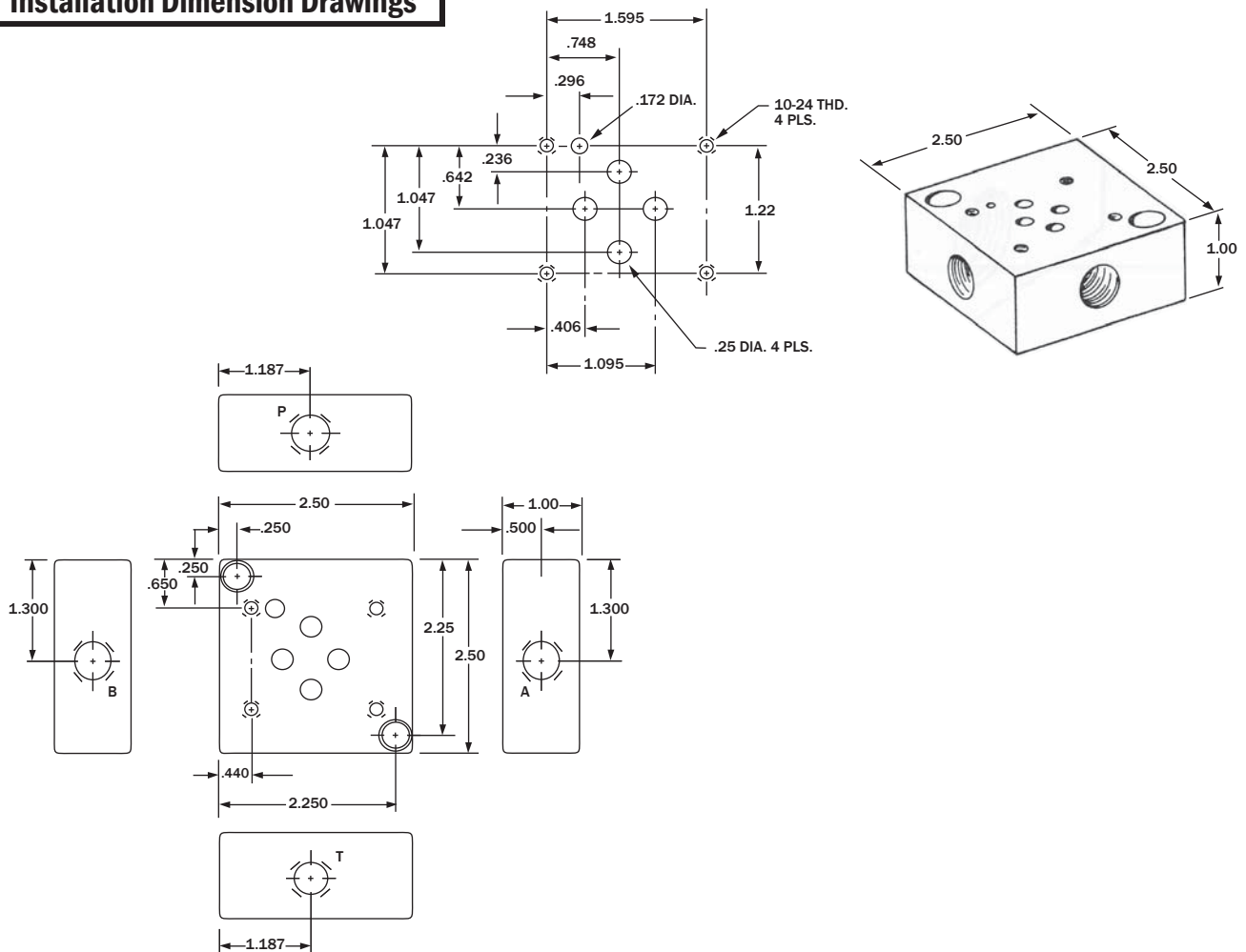
Aluminum construction with "SAE" Ports. Workports are located on sides for easy piping.



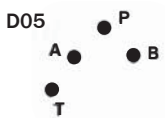
#### Specifications

| Model                                       | NFPA Mfg. Standard                 | Material            | Max Pressure Rating |
|---|------------------------------------|---------------------|---------------------|
| MSA-01Y-T-S10<br>Side Ported<br>9/16-18 SAE | D03<br>P<br>●<br>B ● ● A<br>●<br>T | Aluminum<br>6061-T6 | 3000 psi            |

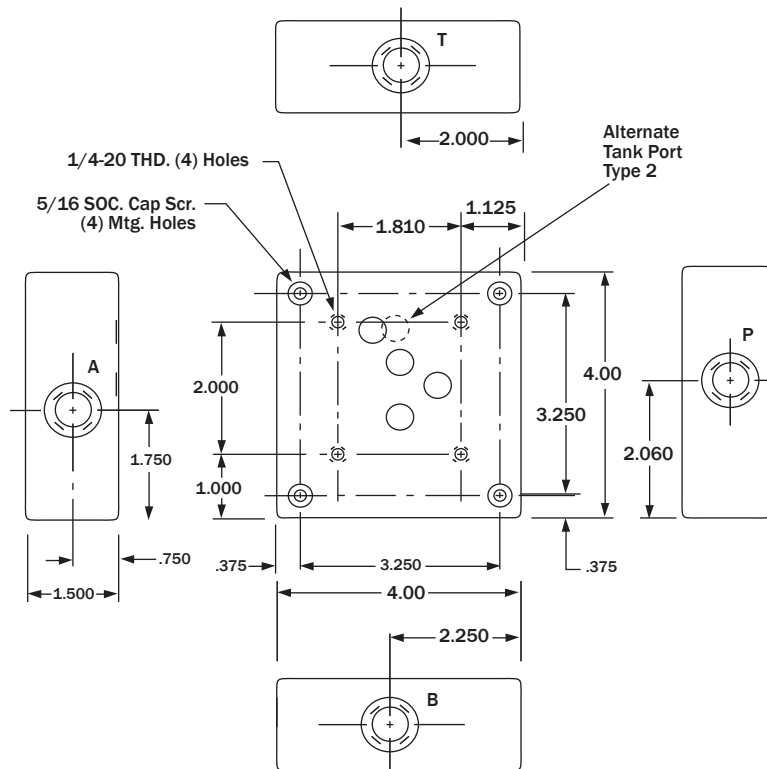
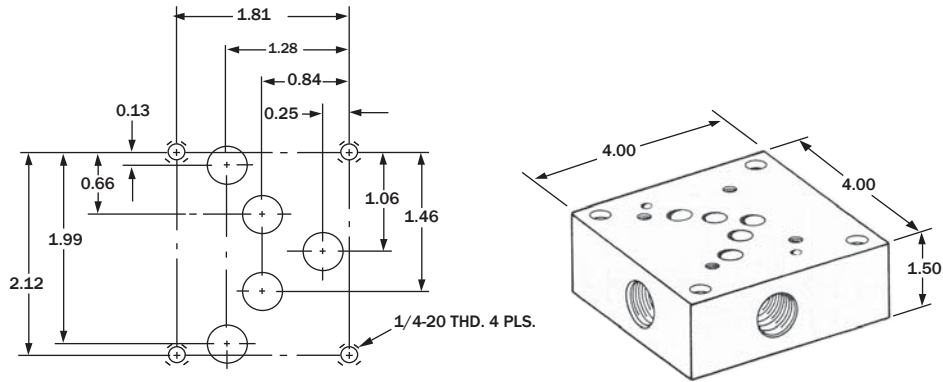
#### Installation Dimension Drawings



## Specifications

| Model                                      | NFPA Mfg. Standard   | Material            | Max Pressure Rating |
|--|--|---------------------|---------------------|
| MSA-03X-T-S10<br>Side Ported<br>3/4-16 SAE | D05<br> | Aluminum<br>6061-T6 | 3000 psi            |

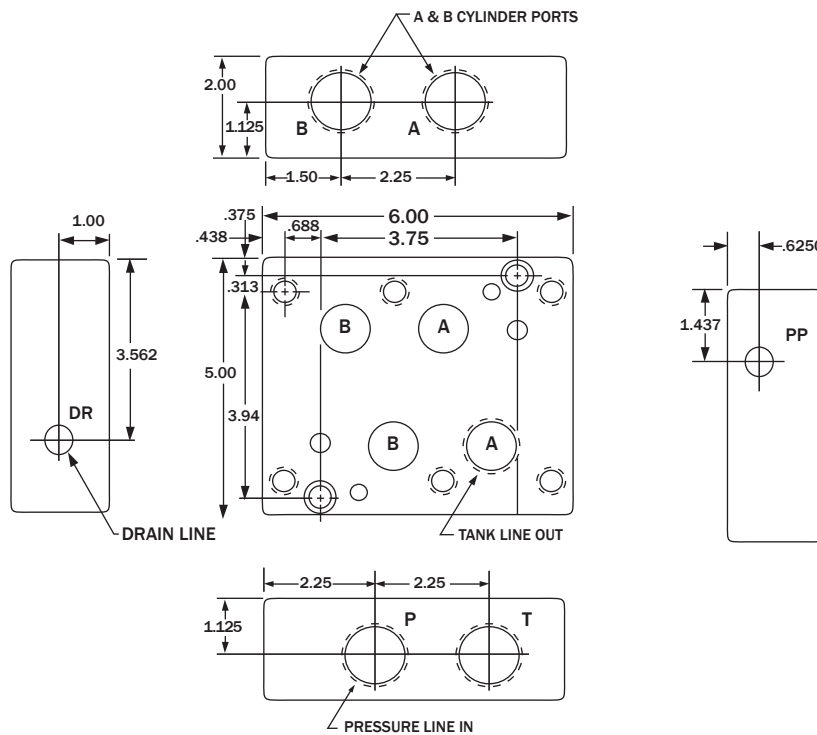
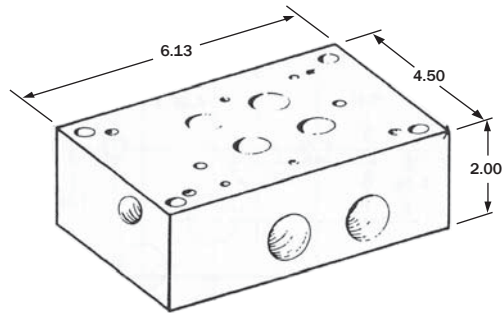
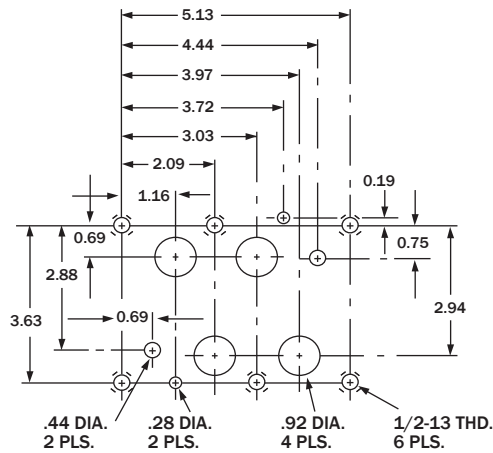
## Installation Dimension Drawings



## Specifications

| Model   | NFPA Mfg. Standard                 | Material            | Max Pressure Rating |
|---|------------------------------------|---------------------|---------------------|
| MSA-06Y-T-S10<br>Side Ported<br>1 5/16-12 SAE | D08<br>P<br>●<br>B ● ● A<br>●<br>T | Aluminum<br>6061-T6 | 3000 psi            |

## Installation Dimension Drawings



## Solenoid Valve/Modular Valve Subplate

### Features

This plate is for when only a single solenoid valve and modular is used.

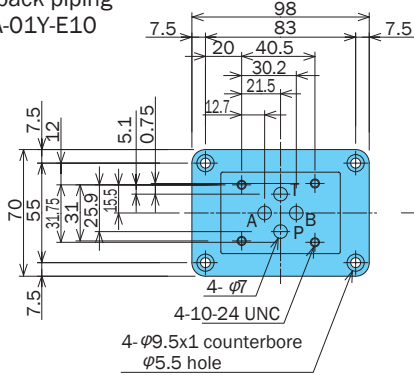
The 01 and 03 sizes include one-side piping types. E includes NPT piping.

### Installation Dimension Drawings

Use the following table for specification when a sub plate is required.

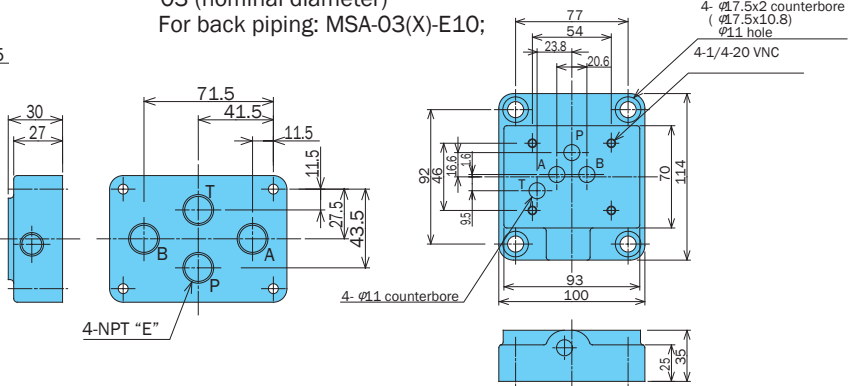
01 (nominal diameter)

For back piping  
MSA-01Y-E10



03 (nominal diameter)

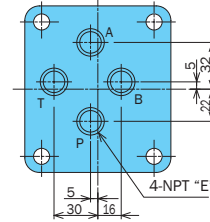
For back piping: MSA-03(X)-E10;



| Model No.   | Pipe Outlet Size E | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs |
|-------------|--------------------|------------------------------|---------------------------|------------|
| MSA-01X-E10 | 1/4                | 3625                         | 5.2                       | 2.6        |
| MSA-01Y-E10 | 3/8                |                              | 10.5                      | 2.6        |

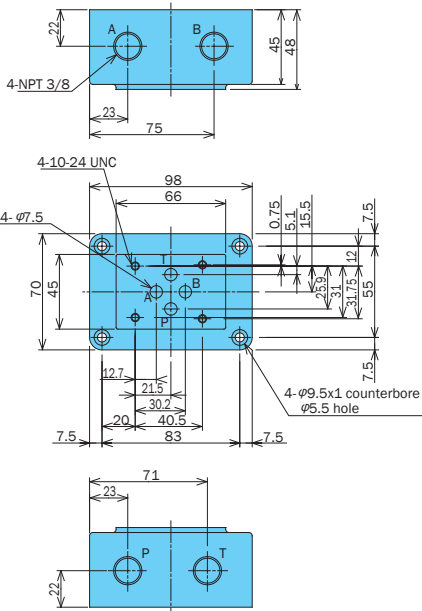
Sub Plate Number

| Mounting bolt | Model No.   | Maximum Working Pressure psi | Recommended Flow Rate gpm | E NPT |
|---------------|-------------|------------------------------|---------------------------|-------|
| 1/4-20        | MSA-03-E10  | 3625                         | 11.8                      | 3/8   |
|               | MSA-03X-E10 |                              | 21.1                      | 1/2   |

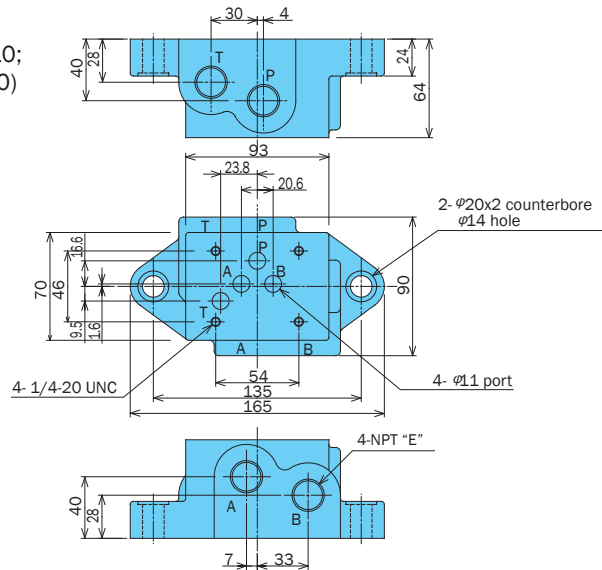


Note: Dimensions in parentheses indicate MS-03 (X) -30.

For side piping MSA-01Y-T-E10



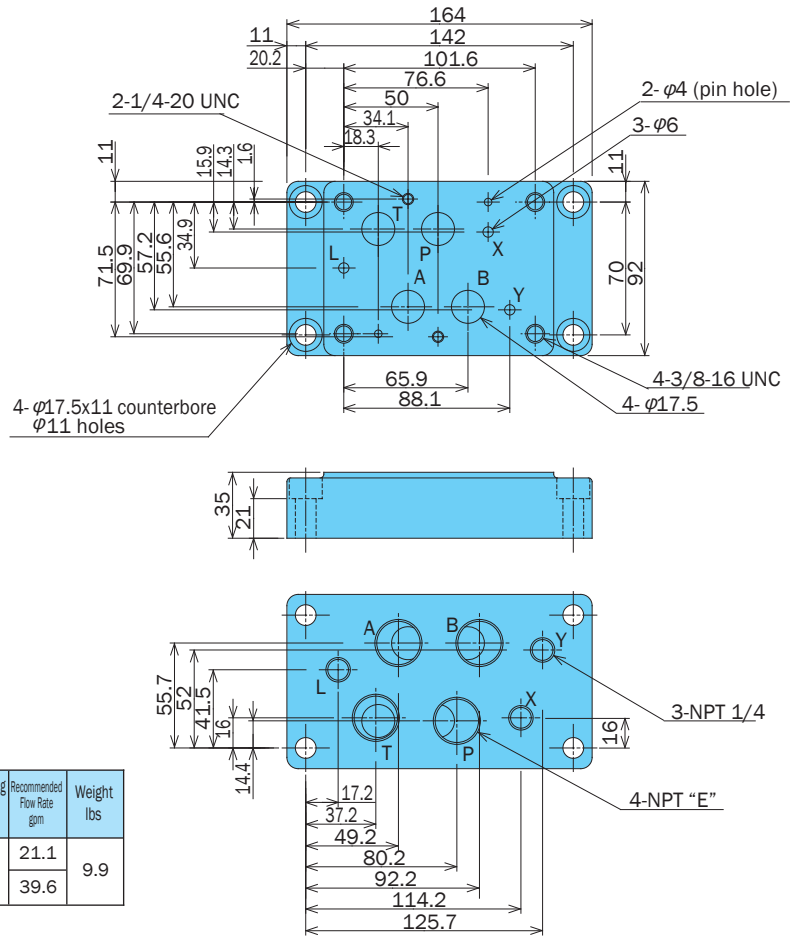
For side piping  
MSA-03(X)-T-E10;  
(MS-03(X)-T-E10)



| Model No.     | Pipe Outlet Size E | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs |
|---------------|--------------------|------------------------------|---------------------------|------------|
| MSA-01Y-T-E10 | 3/8                | 3625                         | 10.5                      | 4.1        |

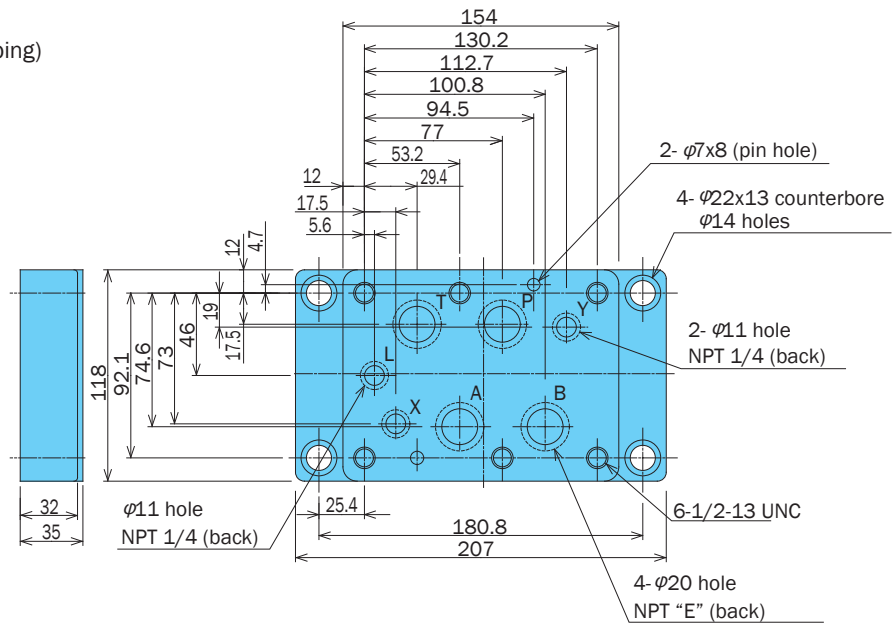
| Mounting bolt | Model No.     | Maximum Working Pressure psi | Recommended Flow Rate gpm | Pipe Outlet Size E | Weight lbs |
|---------------|---------------|------------------------------|---------------------------|--------------------|------------|
| 1/4-20        | MSA-03-T-E10  | 3625                         | 11.1                      | 3/8                | 8.3        |
|               | MSA-03X-T-E10 |                              | 21.1                      | 1/2                |            |

O4 (nominal diameter)  
MDS-04(X)-E10



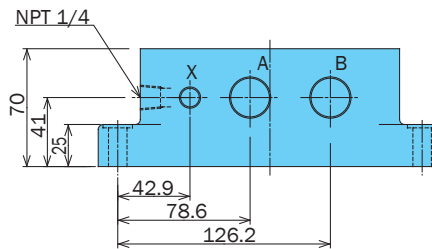
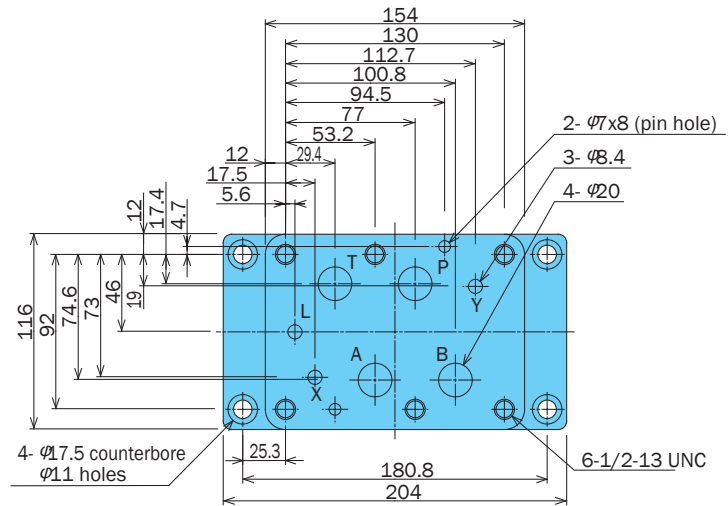
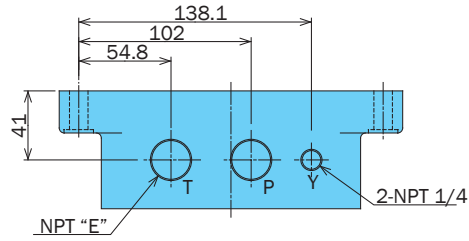
| Model No.   | Pipe Outlet Size E | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs |
|-------------|--------------------|------------------------------|---------------------------|------------|
| MDS-04-E10  | 1/2                | 3625                         | 21.1                      | 9.9        |
| MDS-04X-E10 | 3/4                |                              | 39.6                      |            |

O6 (nominal diameter)  
MDS-06(X)-E30(for back piping)



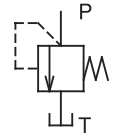
| Model No.   | Pipe Outlet Size E | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs |
|-------------|--------------------|------------------------------|---------------------------|------------|
| MDS-06-E30  | 3/4                | 3625                         | 39.6                      | 11.4       |
| MDS-06X-E30 | 1                  |                              | 79.2                      |            |

MDS-06(X)-T-10(for side piping)



| Model No.     | Pipe Outlet Size E | Maximum Working Pressure psi | Recommended Flow Rate gpm | Weight lbs |
|---------------|--------------------|------------------------------|---------------------------|------------|
| MDS-06-T-E10  | 3/4                | 3625                         | 39.6                      | 19.8       |
| MDS-06X-T-E10 | 1                  |                              | 79.2                      |            |





### Relief Valve

5.2 to 100 gpm  
3045 psi

### Features

Balanced piston relief valve.  
Optimum pressure control for hydraulic circuit allows operation as a safety valve.

A vent port enables remote control of pressure and use of an unloading circuit.

### Specifications

| Model No.             |                       | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure adjustment range psi | Weight lbs |        |
|-----------------------|-----------------------|-------------------------|------------------------------|-----------------------|-------------------------------|------------|--------|
| Screw Mounting        | Gasket Mounting       |                         |                              |                       |                               | T Type     | G Type |
| R-T03- A-12<br>B-12   | R-G03- A-E12<br>B-E12 | 3/8                     | 3045<br>P, X (Vent Ports)    | 5.2                   | 0 to 145<br>0 to 362          | 6.6        | 9.5    |
| R-T03- 1-12<br>3-12   | R-G03- 1-E20<br>3-E20 | 3/8                     |                              | 21                    | 0 to 1000<br>500 to 3000      | 6.6        | 9.5    |
| R-T06- 1-E20<br>3-E20 | R-G06- 1-E20<br>3-E20 | 3/4                     |                              | 45                    | 0 to 1000<br>500 to 3000      | 8.5        | 11.6   |
| R-T10- 1-E20<br>3-E20 | R-G10- 1-E20<br>3-E20 | 1 1/4                   |                              | 100                   | 0 to 1000<br>500 to 3000      | 17         | 17     |

Note: See the Flow Rate - Low Pressure characteristics for information about items marked with an asterisk (\*).

#### Handling

- To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- Make sure that tank port back pressure is no greater than 29 psi. For tank piping of the A and B type pressure adjusting ranges, return directly to the tank without connecting any other piping and eliminate back pressure.
- The pressure adjustment range for the high vent type is 188 psi. Note that R-T/G03 is not a high vent type.
- When using a relief valve as a safety valve, use a pressure override that is higher than the required circuit pressure.
- When using a remote control valve, connect piping to the relief valve port. Pipe capacity can be a source of vibration. Use of thick iron pipe with an inside diameter of no more than .15 in. and a connection length of no more than three meters is recommended.
- Pressure becomes unstable when at slow control flow rates. Use a flow rate of no less than 2.1 gpm for the 03, 06 sizes, and 2.6 gpm for the 10 size. Use

a drain type relief valve in the case of a flow rate that is less than the minimum flow rate.

- Use the following table for specification when a sub plate is required.

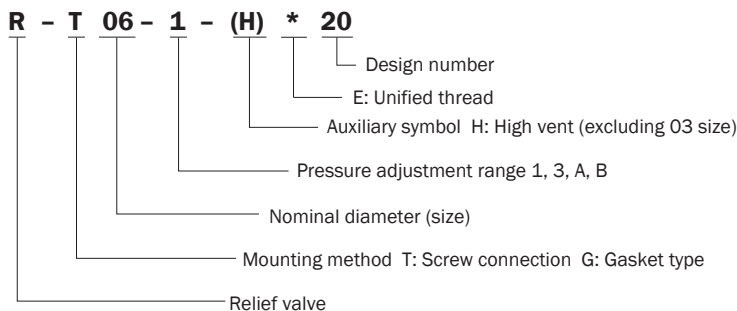
| Model No.  | Pipe Diameter | Weight lbs | Applicable Valve Model |
|------------|---------------|------------|------------------------|
| MR-03-E10  | 3/8           | 3.5        | R-G03-*-12             |
| MR-06-E20  | 3/4           | 7.7        | R-G06-*-E20            |
| MR-06X-E20 | 1             |            |                        |
| MR-10-E20  | 1 1/4         | 18.7       | R-G10-*-E20            |
| MR-10X-E20 | 1 1/2         |            |                        |

- The following are the bundled mounting bolts.

| Model No.   | Bolt Dimensions | Q'ty | Tightening Torque ft lbs |
|-------------|-----------------|------|--------------------------|
| R-G03-*-12  | 3/8-16 x 3"     | 4    | 33 to 40                 |
| R-G06-*-E20 | 5/8-11 x 3 1/8" | 4    | 140 to 173               |
| R-G10-*-E20 | 7/8-9 x 4 1/8"  | 4    | 272 to 339               |

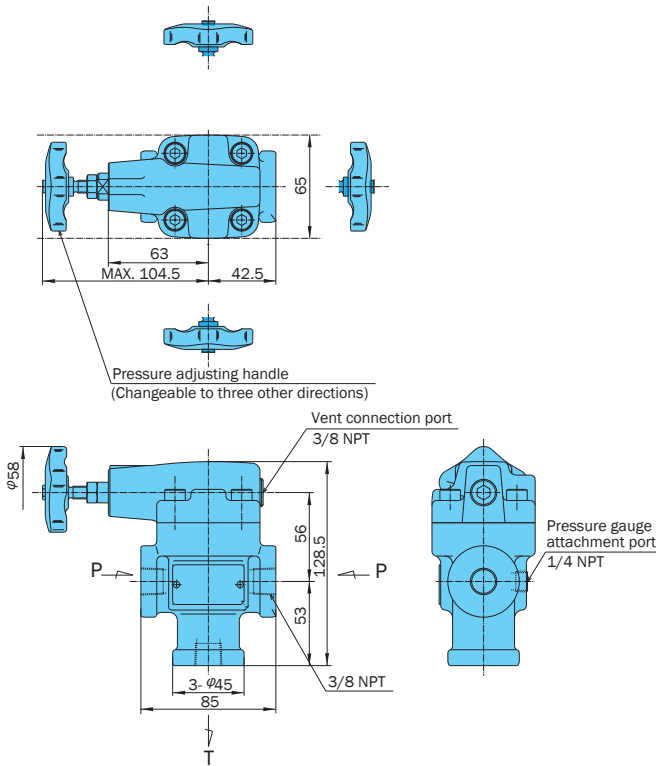
Note: For mounting bolts, use grade 8 or equivalent.

### Understanding Model Numbers

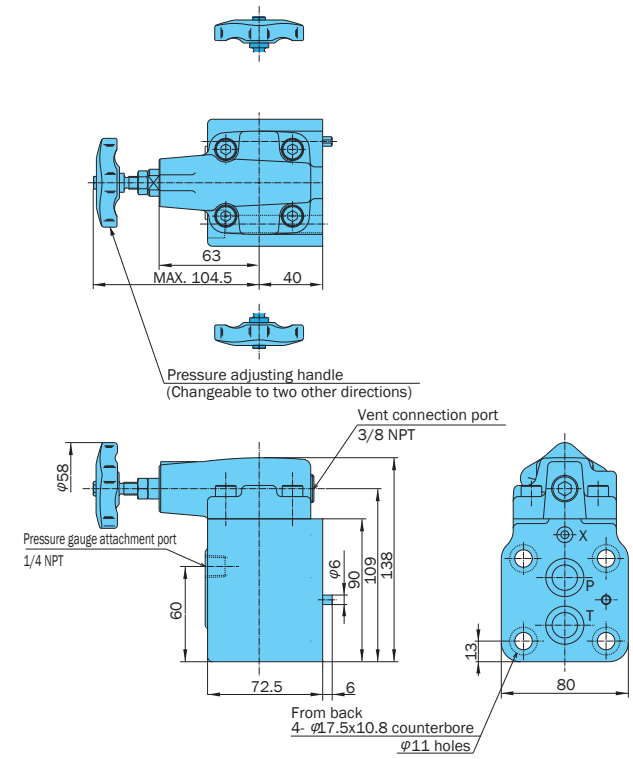


# Installation Dimension Drawings

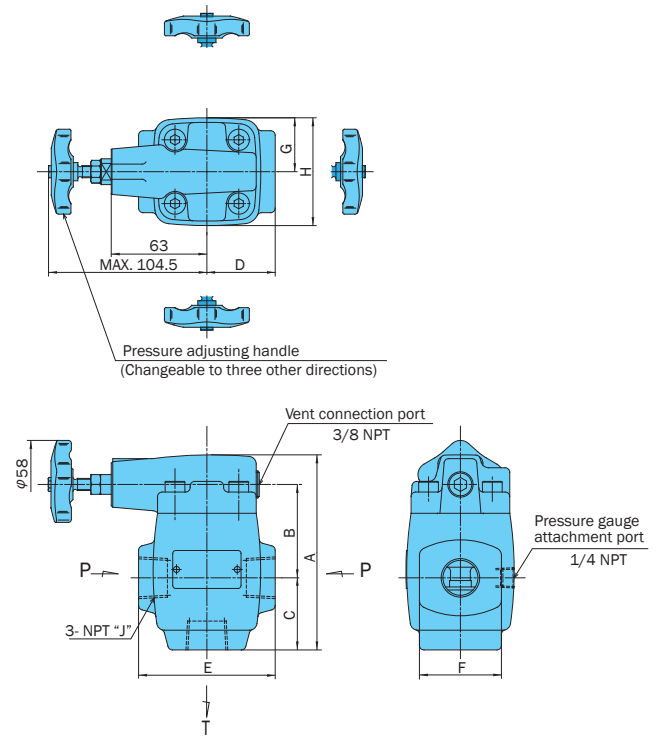
R-T03-\*- E12 (Screw Mounting)



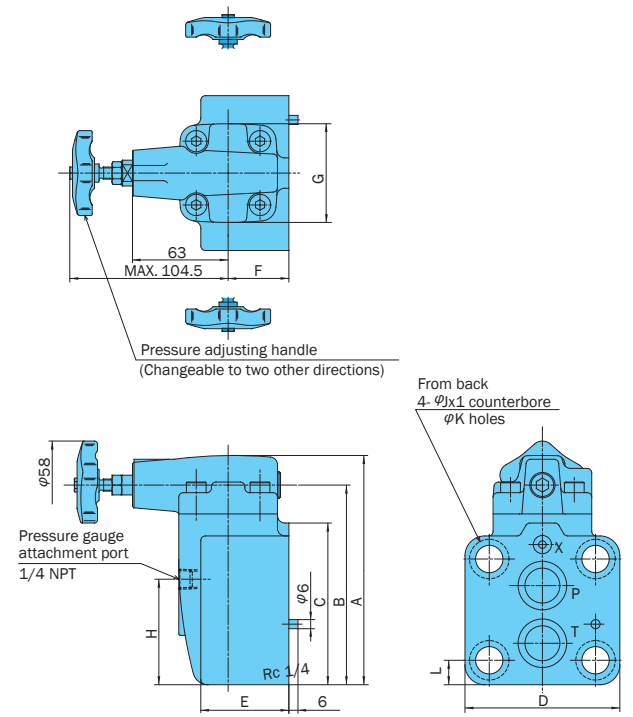
R-G03-\*-12 (Gasket Mounting)



R-T\*\*-\*- E20 (Screw Mounting)



R-G\*\*-\*-20 (Gasket Mounting)

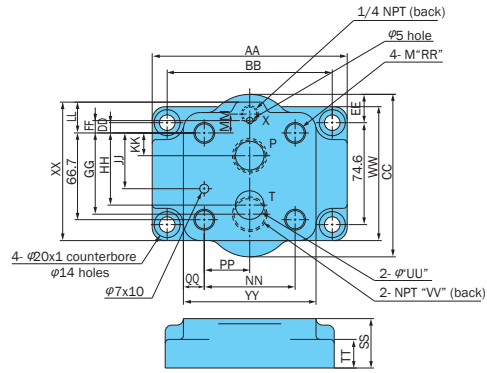
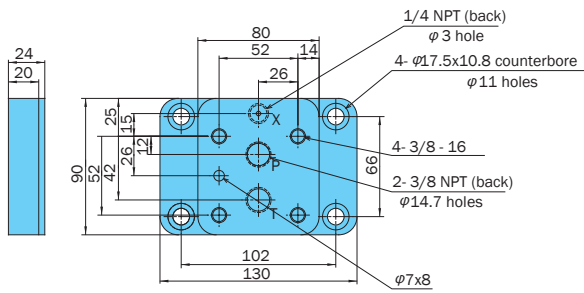


| Model No.  | A     | B    | C    | D    | E   | F  | G    | H  | J     |
|------------|-------|------|------|------|-----|----|------|----|-------|
| R-T06-*-20 | 128.5 | 61.5 | 47.5 | 45   | 90  | 54 | 35.5 | 71 | 3/4   |
| R-T10-*-20 | 153.5 | 72   | 62   | 62.5 | 125 | 69 | 47   | 94 | 1 1/4 |

| Model No.  | A     | B     | C     | D   | E  | F  | G  | H    | J  | K  | L    |
|------------|-------|-------|-------|-----|----|----|----|------|----|----|------|
| R-G06-*-20 | 151   | 131.5 | 106.5 | 102 | 58 | 40 | 65 | 69.5 | 26 | 18 | 16.1 |
| R-G10-*-20 | 162.5 | 143   | 110   | 127 | 80 | 50 | 86 | 70.5 | 32 | 22 | 17.7 |

### Sub Plate MR-03- E10

### MR-\*\*- E20



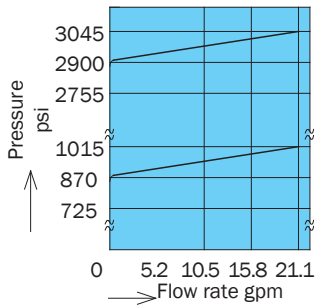
| Model No.  | Dimensions (mm) |       |     |     |      |      |      |      |      |      |      |      |      |      |      |        |    |    |      |       |       |       |     |
|------------|-----------------|-------|-----|-----|------|------|------|------|------|------|------|------|------|------|------|--------|----|----|------|-------|-------|-------|-----|
|            | AA              | BB    | CC  | DD  | EE   | FF   | GG   | HH   | JJ   | KK   | LL   | MM   | NN   | PP   | QQ   | RR     | SS | TT | UU   | VV    | WW    | XX    | YY  |
| MR-06-E20  | 150             | 127   | 125 | 7.9 | 21.8 | 9.5  | 62.5 | 55.5 | 42.9 | 17.5 | 23.7 | 14.5 | 69.9 | 34.9 | 16.1 | 5/8-11 | 38 | 22 | 22   | 3/4   | 98.5  | 106.5 | 102 |
| MR-06X-E20 |                 |       |     |     |      |      |      |      |      |      |      |      |      |      |      |        |    |    |      | 1     |       |       |     |
| MR-10-E20  | 175             | 152.4 | 150 | 6.4 | 39.2 | 15.9 | 71.3 | 58.7 | 50.8 | 14.3 | 25.6 | 25.9 | 92.1 | 46.1 | 17.5 | 7/8-9  | 55 | 22 | 28.5 | 1 1/4 | 102.5 | 110   | 127 |
| MR-10X-E20 |                 |       |     |     |      |      |      |      |      |      |      |      |      |      |      |        |    |    |      | 1 1/2 |       |       |     |

## Performance Curves

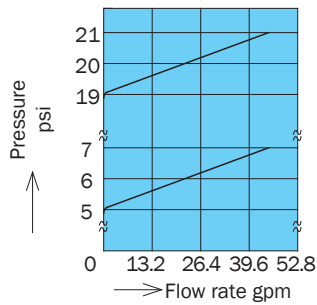
Hydraulic Operating Fluid Viscosity 32 centistokes

### Pressure - Flow Rate Characteristics

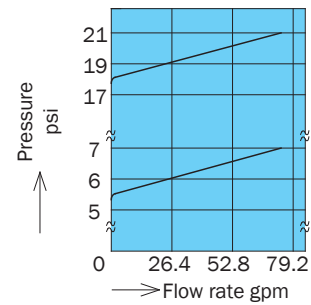
R-03-\*\*-E12



R-06-\*\*-E20

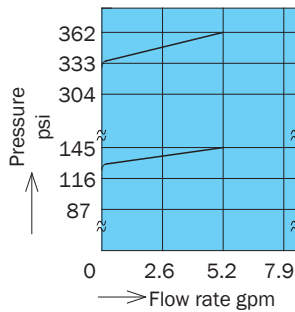


R-10-\*\*-E20

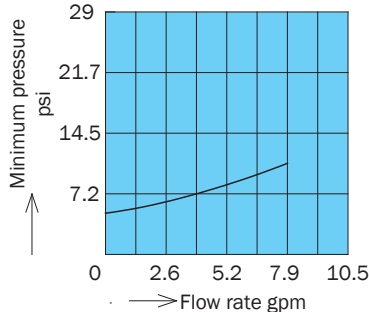


### Flow Rate - Minimum Pressure Characteristics

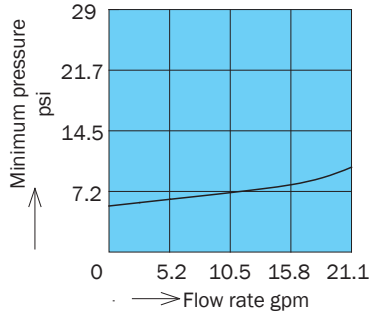
R-03-A  
B-E12



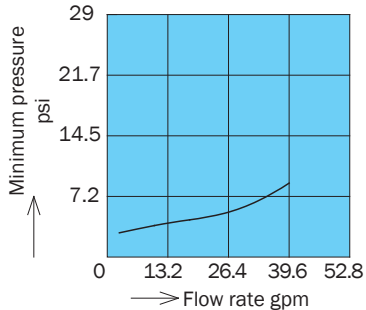
R-03-A  
B-E12



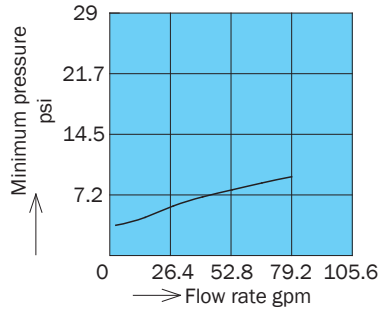
R-03-1-E12



R-06-1-E20



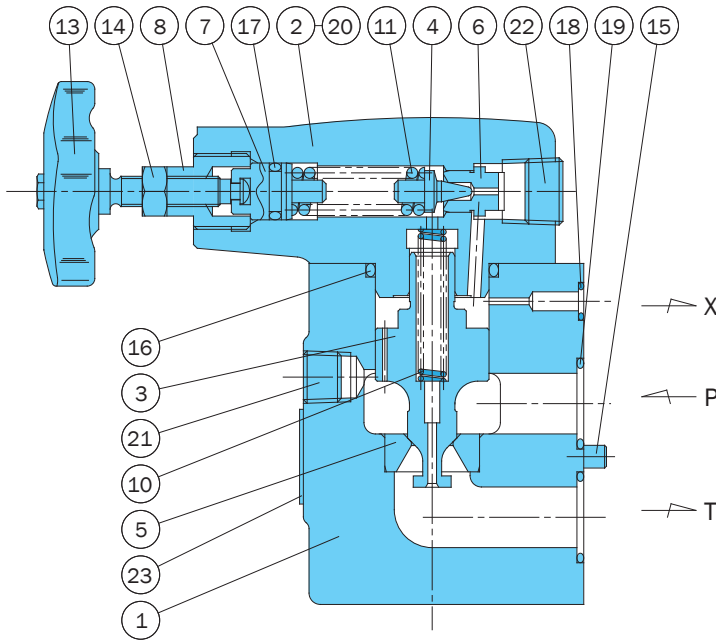
R-10-1-E20



Note: The performance curves do not include T port back pressure.

# Installation Dimension Drawings

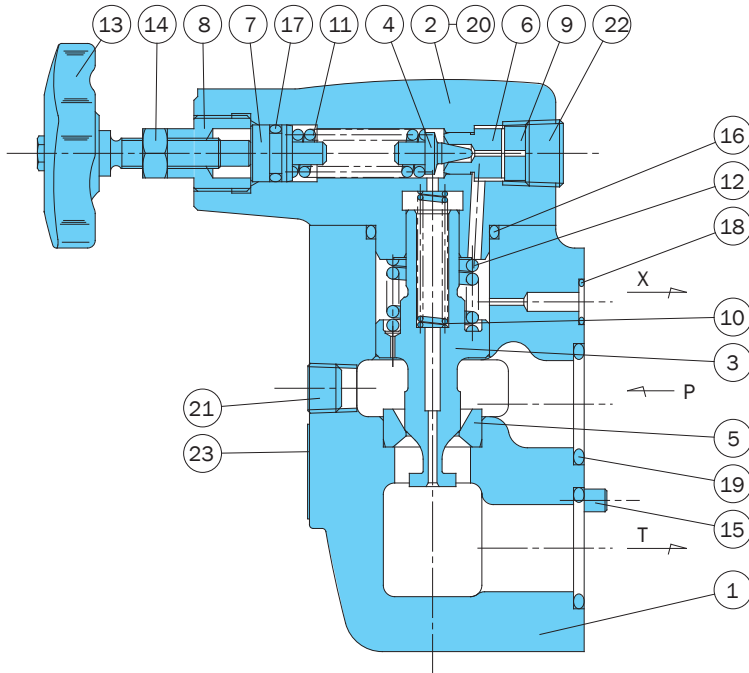
R-G03- $\frac{A}{B}$ -12



| Part No. | Part Name  |
|----------|------------|
| 1        | Body       |
| 2        | Cover      |
| 3        | Spool      |
| 4        | Poppet     |
| 5        | Seat       |
| 6        | Seat       |
| 7        | Plunger    |
| 8        | Retainer   |
| 9        | Collar     |
| 10       | Spring     |
| 11       | Spring     |
| 12       | Spring     |
| 13       | Handle     |
| 14       | Nut        |
| 15       | Spring pin |
| 16       | O-ring     |
| 17       | O-ring     |
| 18       | O-ring     |
| 19       | O-ring     |
| 20       | Screw      |
| 21       | Plug       |
| 22       | Plug       |
| 23       | Nameplate  |

Note:  
The No. 12 spring is not included when auxiliary symbol H is selected (except with the 03 size).

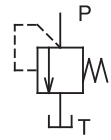
R-G03- $\frac{1}{3}$ -12      R-G  $\frac{06}{10}$   $\frac{1}{3}$ -20



Seal Part List ( Kit Model Number RRS-\*\*\* (03 size)  
RRBS-\*\*\* (06, 10 size) )

| Part No. | Part Name | Type/Part Number |            |            |            |            |            | Q'ty |
|----------|-----------|------------------|------------|------------|------------|------------|------------|------|
|          |           | R-G03-*-12       | R-T03-*-12 | R-G06-*-20 | R-T06-*-20 | R-G10-*-20 | R-T10-*-20 |      |
| 16       | O-ring    | IB-G30           | IB-G30     | IB-G30     | IB-G30     | IB-G40     | IB-G40     | 1    |
| 17       | O-ring    | IA-P11           | IA-P11     | IA-P11     | IA-P11     | IA-P11     | IA-P11     | 1    |
| 18       | O-ring    | IB-P7            | -          | IB-P9      | -          | IB-P9      | -          | 1    |
| 19       | O-ring    | IB-P20           | -          | IB-P26     | -          | IB-G35     | -          | 2    |

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.  
\*\*\* in the kit number is used for specification of the valve size (G03, T06, etc.)



### RI Series Relief Valve (ISO Mounting, Balanced Piston Type)

10.5 to 84.5 gpm  
5075 psi

#### Features

Balanced piston relief valve.  
Optimum pressure control for hydraulic circuit allows operation as a safety valve.

A vent port enables remote control of pressure and use of an unloading circuit.

#### Specifications

| Model No.             | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure adjustment range psi             | Weight lbs | Gasket Surface Dimensions |
|-----------------------|-------------------------|------------------------------|-----------------------|---|------------|---------------------------|
| RI-G03-C-20           | 3/8                     | 5075<br>P, X Ports           | 10.5                  | 21 to 507                                 | 9.9        | ISO 6264-AR-06-2-A        |
| RI-G03-1-20<br>3<br>5 | 3/8                     |                              | 39.6                  | 116 to 1000<br>507 to 3625<br>507 to 5075 | 9.9        |                           |
| RI-G06-1-20<br>3<br>5 | 3/4                     |                              | 84.5                  | 116 to 1000<br>507 to 3625<br>507 to 5075 | 12.3       | ISO 6264-AS-08-2-A        |

#### Handling

- To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- Make sure that tank port back pressure is no greater than 29 psi.
- For use as a safety valve, use a pressure override that is higher than the required circuit pressure.
- When using a remote control valve, connect piping to the relief valve port. Pipe capacity can cause vibration. Use of thick iron pipe with an inside diameter of no

more than .15" and a connection length of no more than three meters is recommended.

5 The following are the bundled mounting bolts.

| Model No.   | Bolt Dimensions | Qty | Tightening Torque ft lbs |
|-------------|-----------------|-----|--------------------------|
| RI-G03-*-20 | 3/8 - 16        | 4   | 55 to 70                 |
| RI-G06-*-20 | 5/8 - 11        | 4   | 140 to 173               |

Note: For mounting bolts, use grade 8 or equivalent.

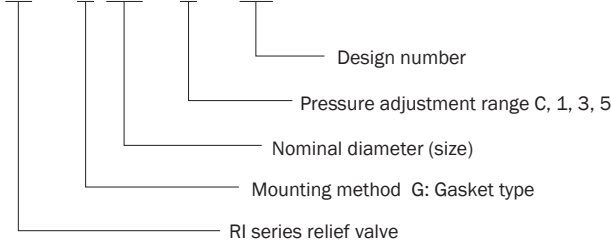
- 6 A small control flow rate can cause pressure instability. Use a control flow rate that is at least 2.1 gpm.

- Use a drain type relief valve in the case of a flow rate that is less than the minimum flow rate.
- 7 Use the following table for specification when a sub plate is required.

| Model No.   | Pipe Diameter | Weight lbs | Applicable Valve Model |
|-------------|---------------|------------|------------------------|
| MRI-03-E10  | 3/8           | 5.7        | RI-G03                 |
| MRI-03X-E10 | 1/2           |            |                        |
| MRI-06-E10  | 3/4           | 7.7        | RI-G06                 |
| MRI-06X-E10 | 1             |            |                        |

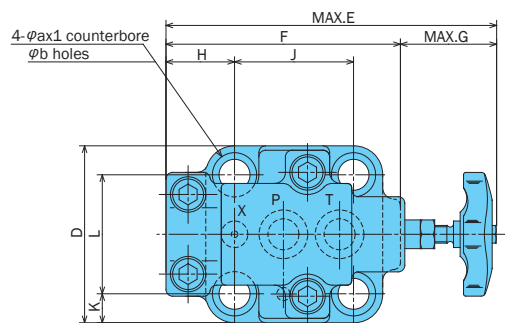
#### Understanding Model Numbers

**RI - G 06 - 1 - 20**

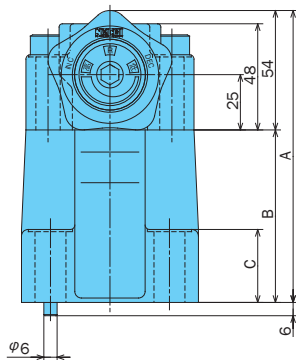
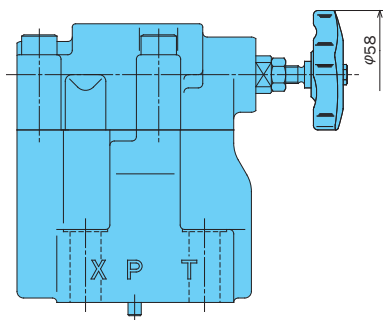


# Installation Dimension Drawings

RI-G\*\*-\*-20

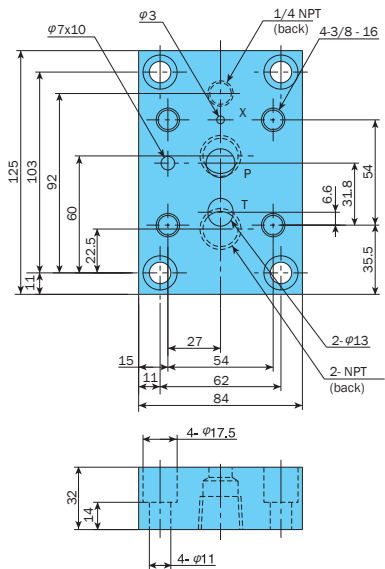


| Model No.   | A   | B  | C  | D   | E     | F   | G    | H  | J    | K    | L    | a  | b    |
|-------------|-----|----|----|-----|-------|-----|------|----|------|------|------|----|------|
| RI-G03-*-20 | 132 | 78 | 32 | 80  | 149.5 | 106 | 43.5 | 31 | 53.8 | 13.1 | 53.8 | 20 | 14   |
| RI-G06-*-20 | 137 | 83 | 36 | 100 | 158.5 | 119 | 39.5 | 37 | 66.7 | 15   | 70   | 26 | 17.5 |



Sub Plate MRI-03\*-E10

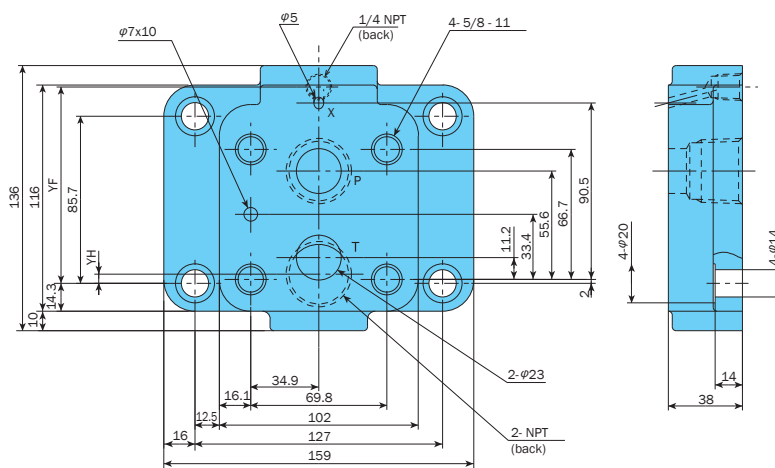
(Maximum Operating Pressure: 3625 psi)



| Model No.   | A   |
|-------------|-----|
| MRI-03-E10  | 3/8 |
| MRI-03X-E10 | 1/2 |
| MRI-06-E10  | 3/4 |
| MRI-06X-E10 | 1   |

Sub Plate MRI-06\*-E10

(Maximum Operating Pressure: 3625 psi)



Attach a plug when the vent (X) port is not used.

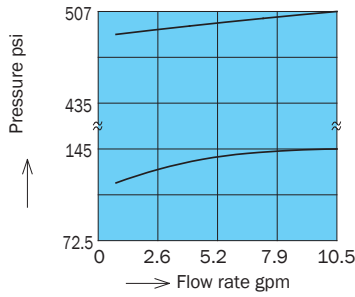
| Model No.   | YF    | YH   |
|-------------|-------|------|
| MRI-06-E10  | 92.5  | 13.2 |
| MRI-06X-E10 | 100.7 | 4.7  |

## Performance Curves

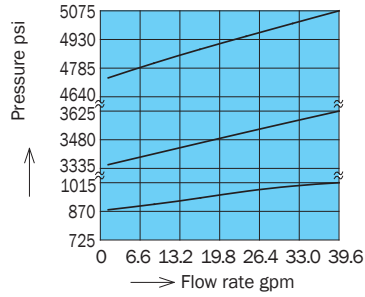
Hydraulic Operating Fluid Viscosity 32 centistokes

Pressure - Flow Rate Characteristics

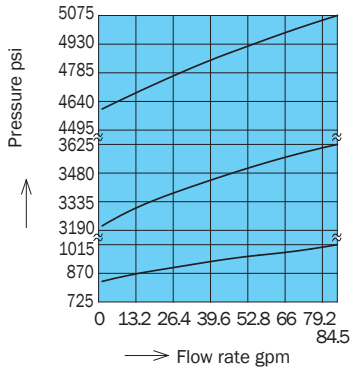
RI-G03-C-20



RI-G03-\*-20



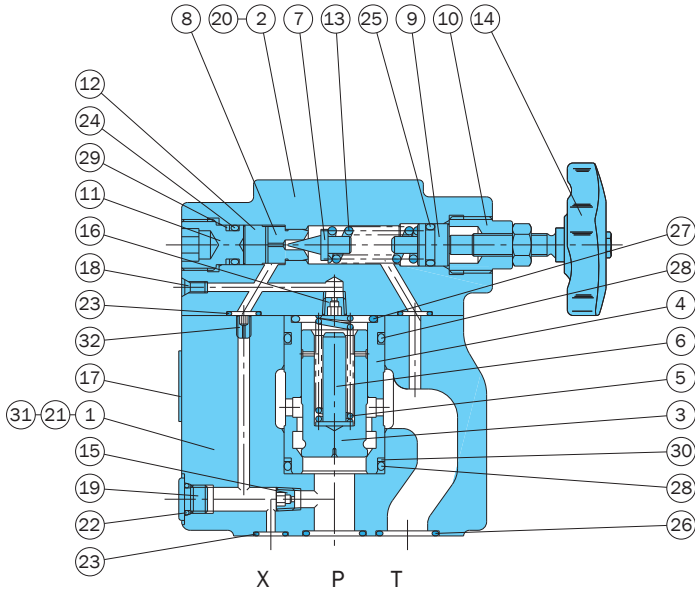
RI-G06-\*-20



Note: The performance curves do not include T port back pressure.

## Cross-sectional Drawing

RI-G\*\*-\*-20

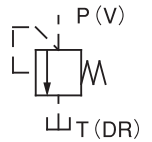


| Part No. | Part Name   | Part No. | Part Name   |
|----------|-------------|----------|-------------|
| 1        | Body        | 17       | Plate       |
| 2        | Cover       | 18       | Plug        |
| 3        | Poppet      | 19       | Plug        |
| 4        | Sleeve      | 20       | Screw       |
| 5        | Spring      | 21       | Pin         |
| 6        | Spacer      | 22       | O-ring      |
| 7        | Poppet      | 23       | O-ring      |
| 8        | Seat        | 24       | O-ring      |
| 9        | Plunger     | 25       | O-ring      |
| 10       | Retainer    | 26       | O-ring      |
| 11       | Plug        | 27       | O-ring      |
| 12       | Collar      | 28       | O-ring      |
| 13       | Spring      | 29       | Backup ring |
| 14       | Handle assy | 30       | Backup ring |
| 15       | Orifice     | 31       | Screw       |
| 16       | Orifice     | 32       | Choke       |

Seal Part List (Kit Model Number REBS-\*\*\*)

| Part No. | Part Name   | Nominal Diameter/Part Number |         | Qty |
|----------|-------------|------------------------------|---------|-----|
|          |             | G03                          | G06     |     |
| 22       | O-ring      | 1B-P8                        | 1B-P8   | 1   |
| 23       | O-ring      | 1B-P9                        | 1B-P9   | 3   |
| 24       | O-ring      | 1B-P10A                      | 1B-P10A | 1   |
| 25       | O-ring      | 1A-P11                       | 1A-P11  | 1   |
| 26       | O-ring      | 1B-P18                       | 1B-P28  | 2   |
| 27       | O-ring      | 1B-G25                       | 1B-P28  | 1   |
| 28       | O-ring      | 1B-G30                       | 1B-P32  | 2   |
| 29       | Backup ring | T2-P10A                      | T2-P10A | 1   |
| 30       | Backup ring | T2-G30                       | T2-P32  | 1   |

Note: O-ring 1A/B-\*\* refers to JIS B 2401-1A/1B-\*\*. For the \*\*\* part of the kit number, specify the valve size (G03, G06).



### Remote Control Relief Valve

.52 to 3.9 gpm  
3045 psi

### Features

Connecting a relief valve or reducing valve to the vent port of a balanced piston type pressure control valve provides

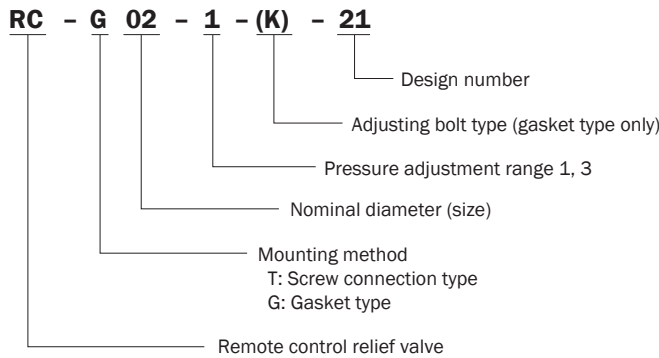
simple remote control of pressure. RCD type can also be used as a direct type relief valve.

### Specifications

| Model No.            |                     | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure adjustment range psi | Weight lbs |
|----------------------|---------------------|-------------------------|------------------------------|-----------------------|-------------------------------|------------|
| Screw Mounting       | Gasket mounting     |                         |                              |                       |                               |            |
| RCD-T02-1-11<br>3-11 | -                   | 1/4                     | 3045<br>P, V ports           | 3.9                   | 116 to 1015<br>507 to 3045    | 4.6        |
| RC-T02-1-12<br>3-12  | RC-G02-1-21<br>3-21 |                         |                              |                       |                               |            |

Note: The pressure adjustment range indicates cracking pressure.

### Understanding Model Numbers

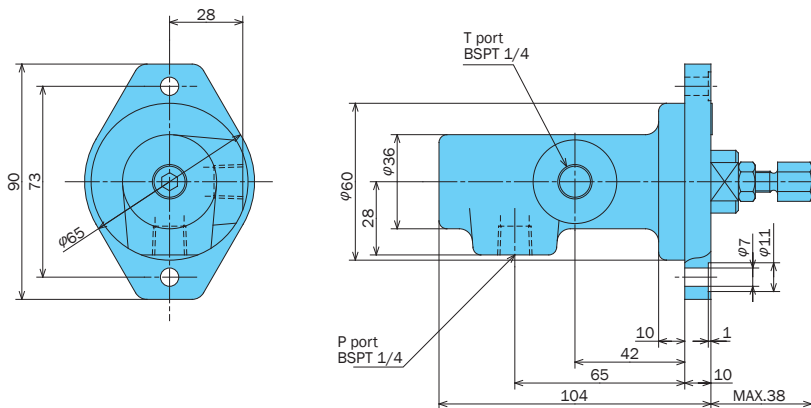


#### • Handling

- To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- Make sure that drain port back pressure is no greater than 29 psi.
- When configuring pipes for the pressure control valve and remote control valve, use of thick iron pipe with an inside diameter of no more than .15" and a connection length of no more than three meters is recommended. Pipe capacity can be a source of vibration.
- When an adjustment bolt type is required for the pressure adjustment block, insert K for the type specification. See the dimension drawings, RC-G02 only.
- Use the following to specify a sub plate.

### Installation Dimension Drawings

RCD-T02-\*-11 (Screw Mounting)



| Model No. | Weight lbs |
|-----------|------------|
| MRC-02-20 | 2.2        |

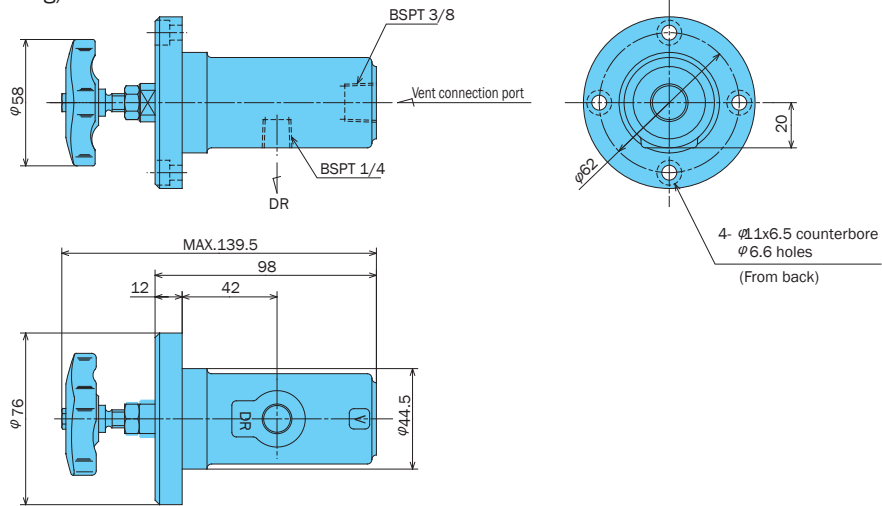
- The following are the bundled mounting bolts.

| Model No.   | Bolt Dimensions | Q'ty | Tightening Torque ft lbs |
|-------------|-----------------|------|--------------------------|
| RC-G02-*-21 | M8 x 25r        | 4    | 14 to 18.5               |

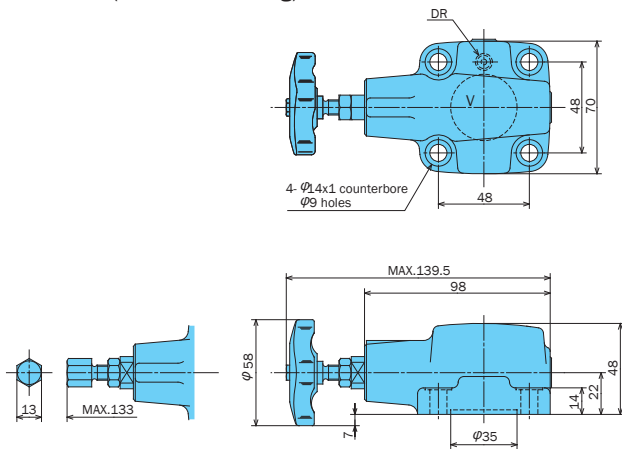
Note: For mounting bolts, use 12T or equivalent.



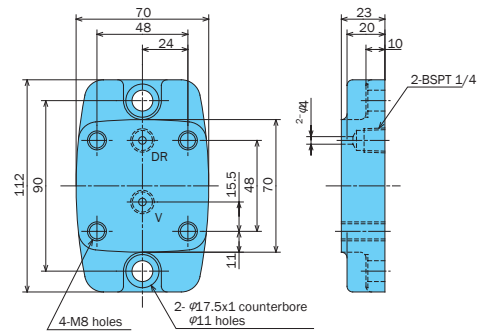
RC-T02-\*-12 (Screw Mounting)



RC-G02-\*-21 (Gasket Mounting)

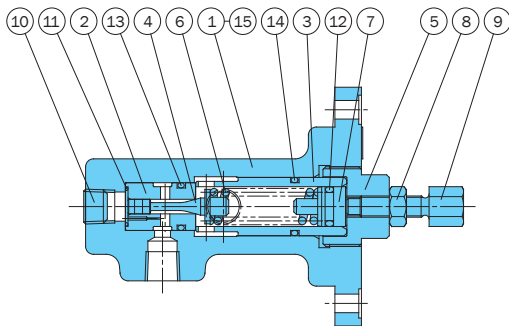


Sub Plate MRC-02-20

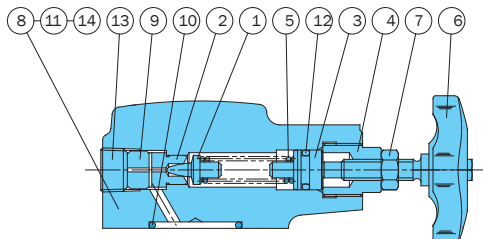


**Cross-sectional Drawing**

RCD-T02-\*-11



RC-G02-\*- (K)-21



| Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|
| 1        | Body      | 12       | O-ring    |
| 2        | Sleeve    | 13       | O-ring    |
| 3        | Sleeve    | 14       | O-ring    |
| 4        | Poppet    | 15       | Nameplate |
| 5        | Retainer  |          |           |
| 6        | Spring    |          |           |
| 7        | Guide     |          |           |
| 8        | Nut       |          |           |
| 9        | Screw     |          |           |
| 10       | Plug      |          |           |
| 11       | O-ring    |          |           |

Seal Part List (Kit Model Number RCS-T02CD)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 11       | O-ring    | S12.5(NOK)  | 1    |
| 12       | O-ring    | 1A-P11      | 1    |
| 13       | O-ring    | 1B-P14      | 1    |
| 14       | O-ring    | 1B-P18      | 1    |

Note: O-ring 1A/B-\*\* refers to JIS B2401 1A/B.

| Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|
| 1        | Poppet    | 8        | Cover     |
| 2        | Seat      | 9        | Collar    |
| 3        | Plunger   | 10       | O-ring    |
| 4        | Retainer  | 11       | O-ring    |
| 5        | Spring    | 12       | O-ring    |
| 6        | Handle    | 13       | Plug      |
| 7        | Nut       | 14       | Plate     |

Seal Part List (Kit Model Number RCBS-G02)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 10       | O-ring    | 1B-G30      | 1    |
| 11       | O-ring    | 1B-P6       | 1    |
| 12       | O-ring    | 1A-P11      | 1    |

Note: O-ring 1A/B-\*\* refers to JIS B2401 1A/B.



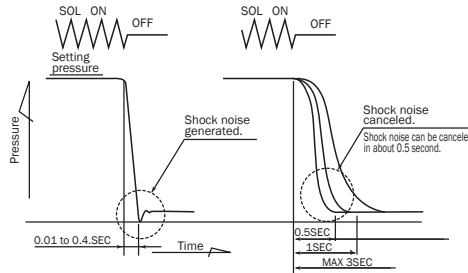
### Solenoid Controlled Relief Valve 7.9 to 100 gpm 3045 psi

#### Features

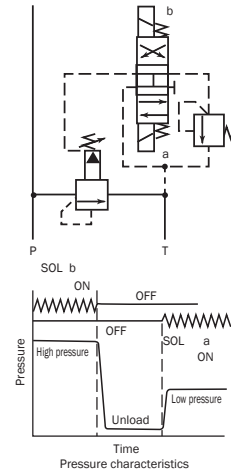
This valve adds a wet type solenoid valve to a balanced type piston type relief valve to form a hydraulic device unload circuit. The shockless type has an internal structure that prevents shock generated during unloading. This valve can also be used in a pressure relief circuit, and has a maximum adjustment time of three seconds. See the pressure relief circuit example.

A two-pressure control circuit can be configured by adding a relief modular valve. Contact your agent for more information.

(Pressure Relief Circuit Example)



(Two-pressure Control Circuit Example)



#### Specifications

| Model No.                    |                              | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure adjustment range psi      | Weight lbs |        | JIS Symbol | Used Solenoid Valve Model Number |
|------------------------------|------------------------------|-------------------------|------------------------------|-----------------------|------------------------------------|------------|--------|------------|----------------------------------|
| Screw Mounting               | Gasket Mounting              |                         |                              |                       |                                    | T Type     | G Type |            |                                  |
| RSS (RSA) -T03-AQ 1/3-**-15  | RSS (RSA) -G03-AQ 1/3-**-15  | 3/8                     | 3045<br>P, X Ports           | 21                    | Type 1<br>0.8 to 7<br>116 to 1015  | 7          | 9.9    |            | SS (SA) -G01-A3X-**-31           |
| RSS (RSA) -T06-AQ 1/3-**-E23 | RSS (RSA) -G06-AQ 1/3-**-E23 | 3/4                     |                              | 45                    |                                    | 8.8        | 14     |            |                                  |
| RSS (RSA) -T10-AQ 1/3-**-E23 | RSS (RSA) -G10-AQ 1/3-**-E23 | 1 1/4                   |                              | 100                   |                                    | 19.4       | 22     |            |                                  |
| RSS (RSA) -T03-AR 1/3-**-15  | RSS (RSA) -G03-AR 1/3-**-15  | 3/8                     |                              | 21                    | Type 3<br>3.5 to 21<br>507 to 3045 | 7          | 9.9    |            | SS (SA) -G01-AR-**-31            |
| RSS (RSA) -T06-AR 1/3-**-E23 | RSS (RSA) -G06-AR 1/3-**-E23 | 3/4                     |                              | 45                    |                                    | 8.8        | 14     |            |                                  |
| RSS (RSA) -T10-AR 1/3-**-E23 | RSS (RSA) -G10-AR 1/3-**-E23 | 1 1/4                   |                              | 100                   |                                    | 19.4       | 22     |            |                                  |

#### Shockless Type

|                             |                             |       |                    |     |   |      |      |  |                         |
|-----------------------------|-----------------------------|-------|--------------------|-----|---|------|------|--|-------------------------|
| RSS (RSA) -T03-1/3-F-**-15  | RSS (RSA) -G03-1/3-F-**-15  | 3/8   | 3045<br>P, X Ports | 21  | Type 1<br>1 to 7<br>145 to 1015<br>Type 3<br>3.5 to 21<br>507 to 3045 | 9.2  | 12   |  | SS (SA) -G01-A8X0-**-31 |
| RSS (RSA) -T06-1/3-F-**-E23 | RSS (RSA) -G06-1/3-F-**-E23 | 3/4   |                    | 45  |   | 11   | 16.3 |  |                         |
| RSS (RSA) -T10-1/3-F-**-E23 | RSS (RSA) -G10-1/3-F-**-E23 | 1 1/4 |                    | 100 |   | 21.6 | 26.4 |  |                         |

Note: For information about electrical specifications, see the SS type and SA type solenoid valve items on pages D-4 and D-16.

#### • Handling

- To adjust pressure, loosen the lock nut and then rotate the adjusting bolt clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- To adjust the time from onload to unload, loosen the lock nut and rotate the restrictor adjusting bolt clockwise (rightward) to make the time longer, or counterclockwise (leftward) to make it shorter.
- Make sure that tank port back pressure is no greater than 29 psi.
- The \*\* before the design number in the model number of the solenoid valve used shows voltage. See the voltage symbols in the model number explanation.

- Pressure becomes unstable when at slow control flow rates. Use a flow rate of no less than 2.1 gpm for the 03, 06 sizes, and 2.6 gpm for the 10 size.
- Use 90 to 110% of rated voltage.
- The pressure adjustment range for the high vent type is 188 psi. Note that RSS (RSA) -T/G03 is not a high vent type.
- Use the following table for specification when a sub plate is required.

| Model No.  | Pipe Diameter | Weight lbs | Applicable Valve Type   |
|------------|---------------|------------|-------------------------|
| MR-03-E10  | 3/8           | 3.5        | RSS (RSA) -G03-**-**-15 |
| MR-06-E20  | 3/4           | 7.7        | RSS (RSA) -G06-**-**-23 |
| MR-06X-E20 |               |            | 1                       |
| MR-10-E20  | 1 1/4         | 18.7       | RSS (RSA) -G10-**-**-23 |
| MR-10X-E20 | 1 1/2         |            |                         |

Note: See page relief valve page item on I-3 for dimensions.

- The following are the bundled mounting bolts.

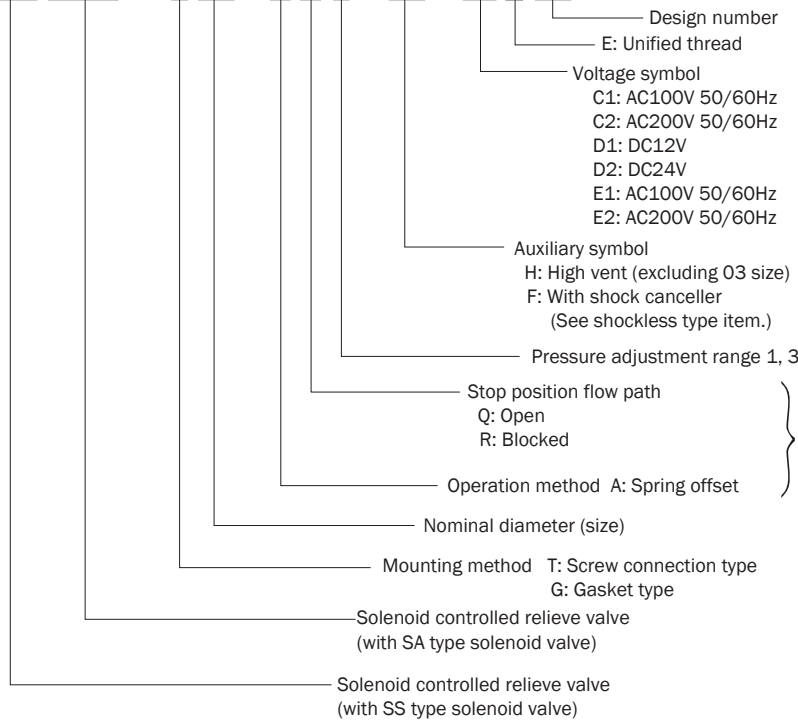
| Model No.               | Bolt Dimensions | Q'ty | Tightening Torque ft lbs |
|-------------------------|-----------------|------|--------------------------|
| RSS (RSA) -G03-**-**-15 | 3/8-16          | 4    | 33 to 40.5               |
| RSS (RSA) -G06-**-**-23 | 5/8-11          | 4    | 140 to 173               |
| RSS (RSA) -G10-**-**-23 | 7/8-9           | 4    | 272 to 339               |

Note: For mounting bolts, use 12T or equivalent.

- The coil surface temperature increases if this pump is kept continuously energized. Install the valve so there is not chance of it being touched directly by hand.

## Understanding Model Numbers

RSS (RSA) - G 06 - A Q 1 - (H) - C1 \* 23



Other auxiliary symbols can be used  
(enter them in alphabetic order if there are 2 or more).

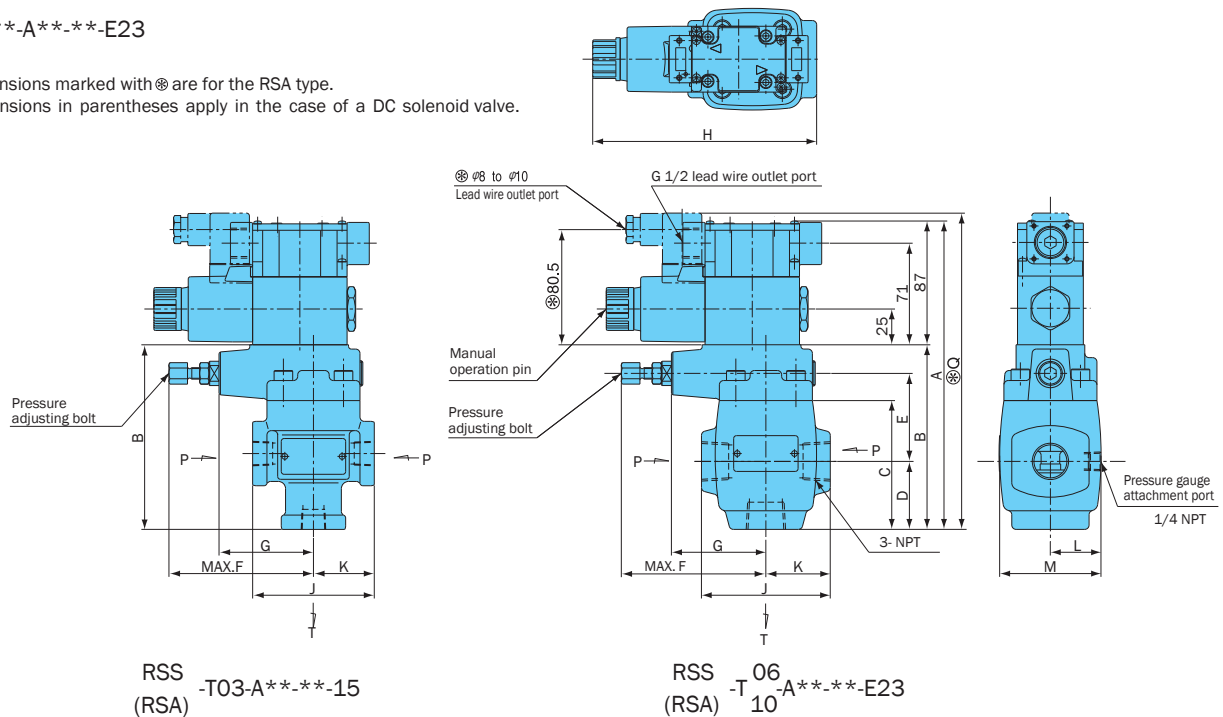
|                             |                         |
|-----------------------------|-------------------------|
| With SS type solenoid valve | G, N, Q (R is omitted). |
| With SA type solenoid valve | GR, J, N, Q, R          |

Not required with the shockless type.

## Installation Dimension Drawings

RSS  
(RSA) -T\*\*-A\*\*-\*\*-E23

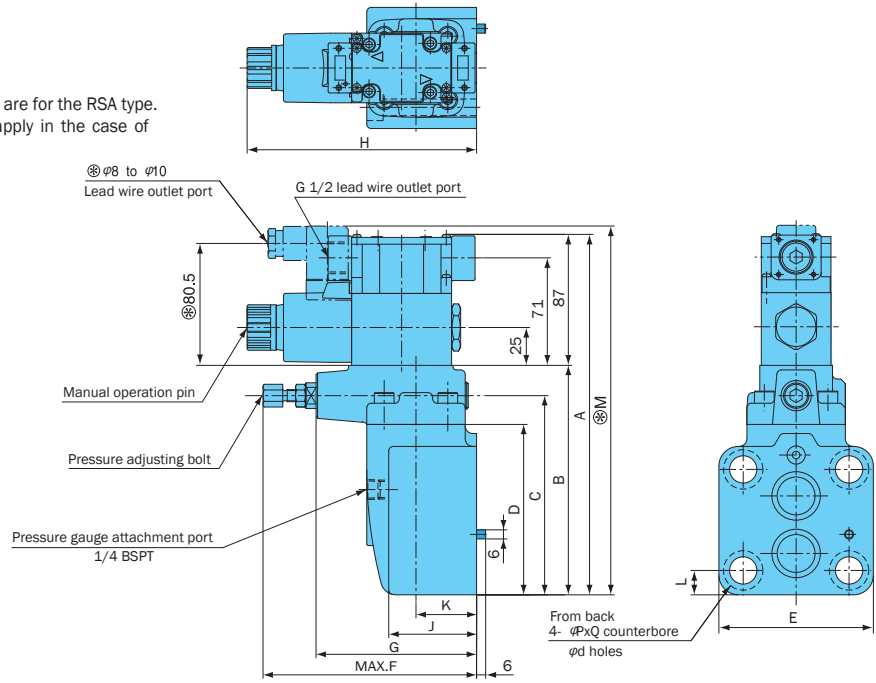
Note: Dimensions marked with Ⓢ are for the RSA type.  
Note: Dimensions in parentheses apply in the case of a DC solenoid valve.



| Model No.                    | A     | B     | C     | D    | E    | F   | G  | H                | J   | K    | L    | M  | N     | Q     |
|------------------------------|-------|-------|-------|------|------|-----|----|------------------|-----|------|------|----|-------|-------|
| RSS<br>(RSA) -T03-A**-**-15  | 214.5 | 129   | 90    | 53   | 56   | 101 | 66 | 154<br>(161)     | 85  | 42.5 | 32.5 | 65 | 3/8   | 221.5 |
| RSS<br>(RSA) -T06-A**-**-E23 | 214.5 | 129   | 90    | 47.5 | 61.5 | 101 | 66 | 156.5<br>(163.5) | 90  | 45   | 35.5 | 71 | 3/4   | 221.5 |
| RSS<br>(RSA) -T10-A**-**-E23 | 239   | 153.5 | 111.5 | 62   | 72   | 98  | 63 | 164.5<br>(171.5) | 125 | 62.5 | 47   | 94 | 1 1/4 | 246   |

RSS  
(RSA) -G\*\*-A\*\*-\*\*-E23

Note: Dimensions marked with Ⓢ & are for the RSA type.  
Note: Dimensions in parentheses apply in the case of a DC solenoid valve.

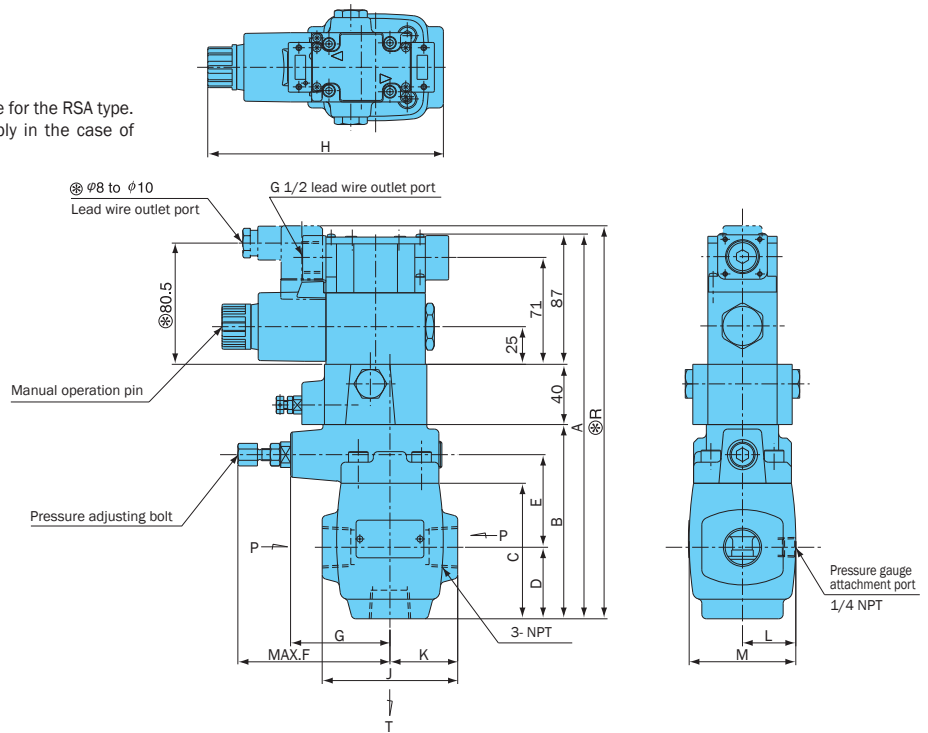


| Model No.                 | A     | B     | C     | D     | E   | F   | G   | H             | J    | K  | L    | P    | Q    | d  | M     |
|---------------------------|-------|-------|-------|-------|-----|-----|-----|---------------|------|----|------|------|------|----|-------|
| RSS (RSA) -G03-A**-**-15  | 214.5 | 129   | 109   | 90    | 80  | 141 | 106 | 150.5 (157.5) | 72.5 | 40 | 13   | 17.5 | 10.8 | 11 | 221.5 |
| RSS (RSA) -G06-A**-**-E23 | 237   | 151.5 | 131.5 | 112.5 | 102 | 141 | 106 | 151.5 (158.5) | 58   | 40 | 16.1 | 26   | 1    | 18 | 244   |
| RSS (RSA) -G10-A**-**-E23 | 248   | 162.5 | 143   | 120.5 | 127 | 148 | 113 | 152 (159)     | 80   | 50 | 17.7 | 32   | 1    | 22 | 255   |

Note: For gasket surface dimensions, see R-G\*\*-\*\* 12/20.

RSS  
(RSA) -T\*\*-\*-F\*\*-\*-E23

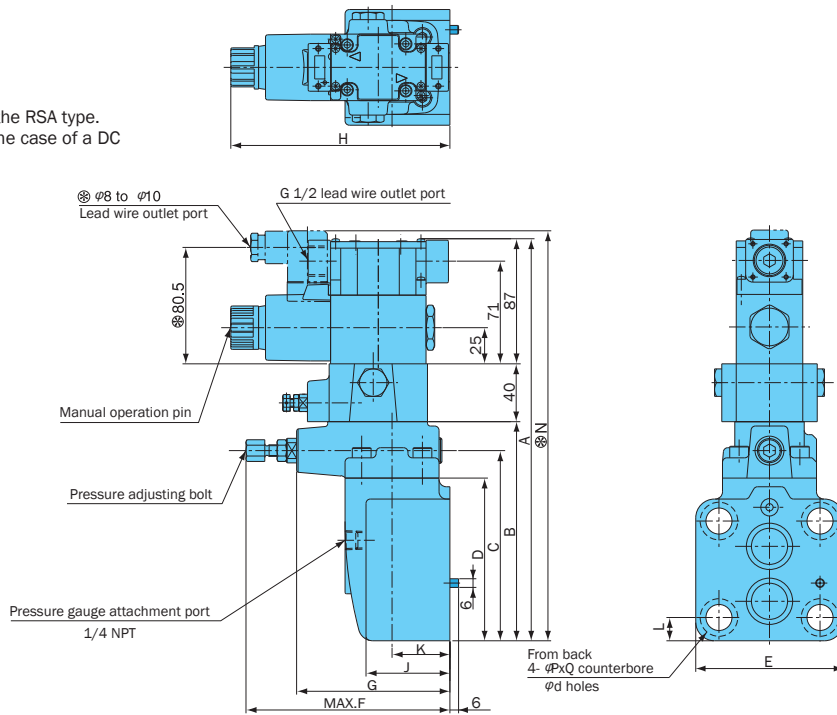
Note: Dimensions marked with Ⓢ & are for the RSA type.  
Note: Dimensions in parentheses apply in the case of a DC solenoid valve.



| Model No.                  | A     | B     | C     | D    | E    | F   | G  | H             | J   | K    | L    | M  | N    | Q     | R     |
|----------------------------|-------|-------|-------|------|------|-----|----|---------------|-----|------|------|----|------|-------|-------|
| RSS (RSA) -T03-*-F**-*-15  | 254.5 | 129   | 90    | 53   | 56   | 101 | 66 | 154 (161)     | 85  | 42.5 | 32.5 | 65 | 32   | 3/8   | 261.5 |
| RSS (RSA) -T06-*-F**-*-E23 | 254.5 | 129   | 90    | 47.5 | 61.5 | 101 | 66 | 156.5 (163.5) | 90  | 45   | 35.5 | 71 | 33   | 3/4   | 261.5 |
| RSS (RSA) -T10-*-F**-*-E23 | 279   | 153.5 | 111.5 | 62   | 72   | 98  | 63 | 164.5 (171.5) | 125 | 62.5 | 47   | 94 | 32.5 | 1 1/4 | 286   |

RSS  
(RSA) -G\*\*-\*-F\*\*-23

Note: Dimensions marked with ® & are for the RSA type.  
 Note: Dimensions in parentheses apply in the case of a DC solenoid valve.

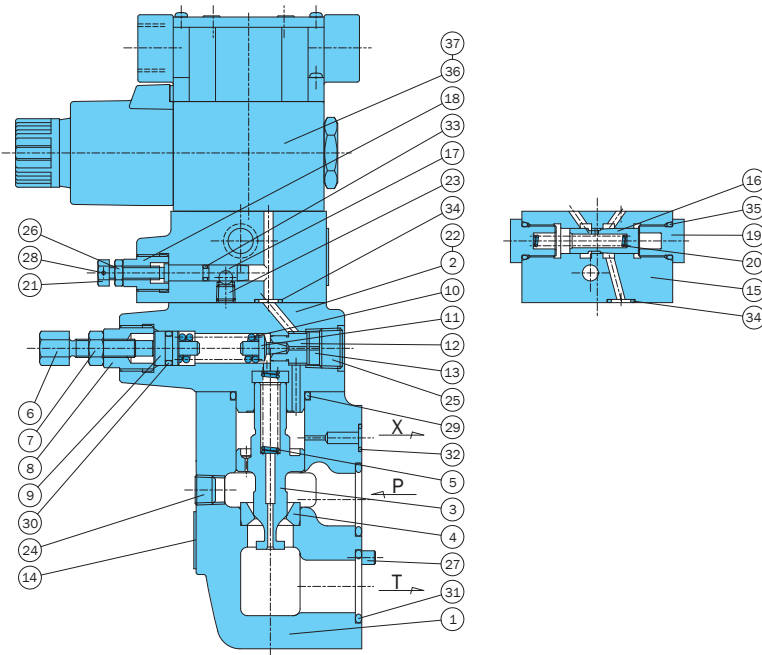


| Model No.              | A     | B     | C     | D     | E   | F   | G   | H             | J    | K  | L    | M    | N     | P    | Q    | d  |
|------------------------|-------|-------|-------|-------|-----|-----|-----|---------------|------|----|------|------|-------|------|------|----|
| RSS (RSA) -G03*-F**-15 | 254.5 | 129   | 109   | 90    | 80  | 141 | 106 | 150.5 (157.5) | 72.5 | 40 | 13   | 32   | 261.5 | 17.5 | 10.8 | 11 |
| RSS (RSA) -G06*-F**-23 | 277   | 151.5 | 131.5 | 112.5 | 102 | 141 | 106 | 151.5 (158.5) | 58   | 40 | 16.1 | 33   | 284   | 26   | 1    | 18 |
| RSS (RSA) -G10*-F**-23 | 288   | 162.5 | 143   | 120.5 | 127 | 148 | 113 | 152 (159)     | 80   | 50 | 17.7 | 32.5 | 295   | 32   | 1    | 22 |

Note: For gasket surface dimensions, see R-G\*\*-\* 12/20.

### Cross-sectional Drawing

RSS-G\*\*-\*-F\*\*-23



| Part No. | Part Name    | Part No. | Part Name       |
|----------|--------------|----------|-----------------|
| 1        | Body         | 20       | Spring          |
| 2        | Cover        | 21       | Nut             |
| 3        | Spool        | 22       | Screw           |
| 4        | Seat         | 23       | Plug            |
| 5        | Spring       | 24       | Plug            |
| 6        | Screw        | 25       | Plug            |
| 7        | Nut          | 26       | Nut             |
| 8        | Retainer     | 27       | Spring pin      |
| 9        | Plunger      | 28       | Spring pin      |
| 10       | Spring       | 29       | O-ring          |
| 11       | Poppet       | 30       | O-ring          |
| 12       | Seat         | 31       | O-ring          |
| 13       | Collar       | 32       | O-ring          |
| 14       | Nameplate    | 33       | O-ring          |
| 15       | Body         | 34       | O-ring          |
| 16       | Spool        | 35       | O-ring          |
| 17       | Throttle     | 36       | Solenoid Valves |
| 18       | Retainer     | 37       | Screw           |
| 19       | Spring guide |          |                 |

Seal Parts List (Kit Model Number RSBS-\*\*\*F)

| Part No. | Part Name | Type/Part Number |                  |                  | Q'ty |
|----------|-----------|------------------|------------------|------------------|------|
|          |           | RSS-G03-*F-**-15 | RSS-G06-*F-**-23 | RSS-G10-*F-**-23 |      |
| 29       | O-ring    | 1B-G30           | 1B-G30           | 1B-G40           | 1    |
| 30       | O-ring    | 1A-P11           | 1A-P11           | 1A-P11           | 1    |
| 31       | O-ring    | 1B-P20           | 1B-P26           | 1B-G35           | 2    |
| 32       | O-ring    | 1B-P7            | 1B-P9            | 1B-P9            | 1    |
| 33       | O-ring    | 1B-P4            | 1B-P4            | 1B-P4            | 1    |
| 34       | O-ring    | 1B-P9            | 1B-P9            | 1B-P9            | 2    |
| 35       | O-ring    | 1B-P12.5         | 1B-P12.5         | 1B-P12.5         | 2    |

- Note:
1. O-ring 1A/B-\*\* refers to JIS B2401-1A/B.
  2. For the \*\*\* part of the kit number, specify the valve size (G03, G06, G10).
  3. SS (SA)-G01 pilot valve seal is available separately. For details, see pages D-14 (D-26).



### RI Series Solenoid Controlled Relief Valve

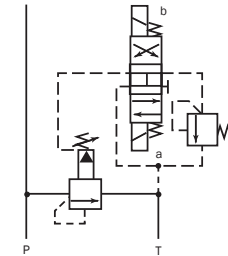
39.6 to 84.5 gpm  
5075 psi

#### Features

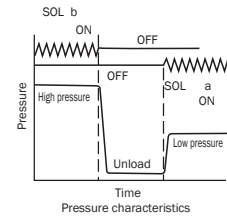
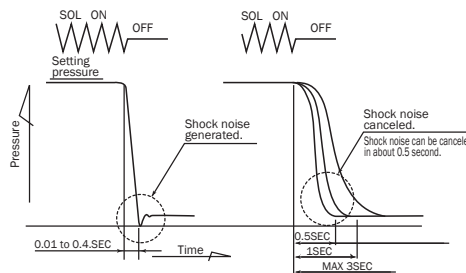
This valve adds a wet type solenoid valve to a balanced type piston type relief valve to form a hydraulic device unload circuit. The shockless type has an internal structure that prevents shock generated during unloading. This valve can also be used in a pressure relief circuit, and has a maximum adjustment time of three seconds. See the pressure relief circuit example.

A two-pressure control circuit can be configured by adding a relief modular valve.  
Contact your agent for more information.

(Two-pressure Control Circuit Example)



(Pressure Relief Circuit Example)



#### Specifications

| Model No.<br>Gasket Mounting    | Nominal Diameter (Size) | Maximum Flow Rate gpm | Maximum Working Pressure psi | Pressure adjustment range psi | Weight lbs | Gasket Surface Dimensions | JIS Symbol | Used Solenoid Valve Type |
|---------------------------------|-------------------------|-----------------------|------------------------------|-------------------------------|------------|---------------------------|------------|--------------------------|
| RIS-G03-AQ<br>1<br>3-**-21<br>5 | 3/8                     | 39.6                  | 5075<br>P, X Ports           | Type 1: 116 to 1015           | 13.2       | ISO 6264-AR-06-2-A        |            | SS-G01-A3X-**-31         |
| RIS-G06-AQ<br>1<br>3-**-21<br>5 | 3/4                     | 84.5                  |                              | Type 3: 507 to 3625           | 15.6       | ISO 6264-AS-08-2-A        |            |                          |
| RIS-G03-AR<br>1<br>3-**-21<br>5 | 3/8                     | 39.6                  |                              | Type 5: 507 to 5075           | 13.2       | ISO 6264-AR-06-2-A        |            | SS-G01-AR-**-31          |
| RIS-G06-AR<br>1<br>3-**-21<br>5 | 3/4                     | 84.5                  |                              |                               | 15.6       | ISO 6264-AS-08-2-A        |            |                          |

#### Shockless Type

|                             |     |      |                    |                     |      |                    |  |                  |
|-----------------------------|-----|------|--------------------|---------------------|------|--------------------|--|------------------|
| RIS-G03-3-F-**-21<br>1<br>5 | 3/8 | 39.6 | 5075<br>P, X Ports | Type 1: 145 to 1015 | 15.4 | ISO 6264-AR-06-2-A |  | SS-G01-A3X-**-31 |
| RIS-G06-3-F-**-21<br>1<br>5 | 3/4 | 84.5 |                    | Type 3: 507 to 3625 | 17.8 | ISO 6264-AS-08-2-A |  |                  |

Note: For electrical specifications, see the SS type solenoid valve item on page D-4.

#### Handling

- To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- To adjust the time from onload to unload, loosen the lock nut and rotate the restrictor adjusting bolt clockwise (rightward) to make the time longer, or counterclockwise (leftward) to make it shorter.
- Make sure that tank port back pressure is no greater than 29 psi.
- The \*\* before the design number in the model number of the solenoid valve used shows voltage. See the voltage symbols in

- the model number explanation.
- A small control flow rate can cause pressure instability. Use a control flow rate that is at least 2.1 gpm. Use a drain type relief valve in the case of a flow rate that is less than the minimum flow rate.
- Use 90 to 110% of rated voltage. Use the following table for specification when a sub plate is required. Maximum operating pressure is 3625 psi.

| Model No.   | Pipe Diameter | Weight lbs | Applicable Valve Model |
|-------------|---------------|------------|------------------------|
| MRI-03-E10  | 3/8           | 5.7        | RIS-G03                |
| MRI-03X-E10 | 1/2           |            |                        |
| MRI-06-E10  | 3/4           | 7.7        | RIS-G06                |
| MRI-06X-E10 | 1             |            |                        |

- The following are the bundled mounting bolts.

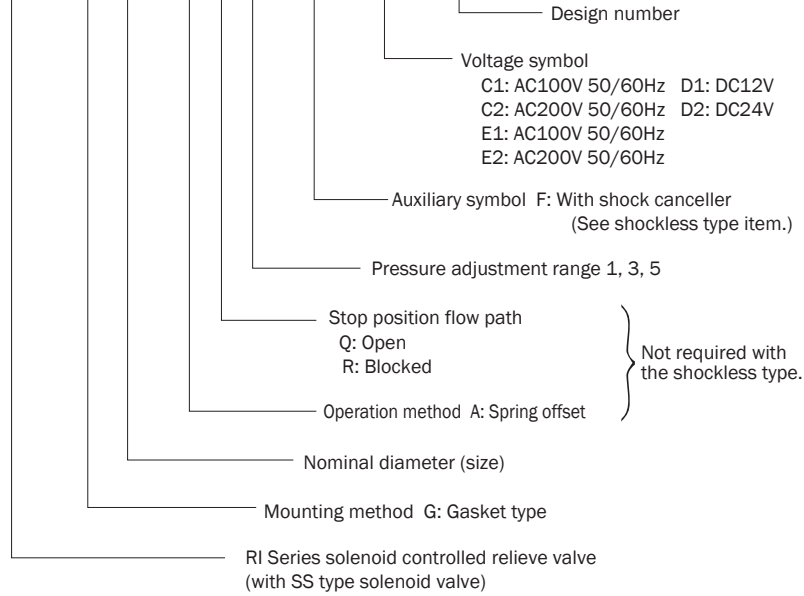
| Model No.        | Bolt Dimensions | Qty | Tightening Torque ft lbs |
|------------------|-----------------|-----|--------------------------|
| RIS-G03-**-**-21 | 3/8 - 16        | 4   | 55 to 70                 |
| RIS-G06-**-**-21 | 5/8 - 11        | 4   | 140 to 173               |

Note: For mounting bolts, use Grade 8 or equivalent.

- The coil surface temperature increases if this pump is kept continuously energized. Install the valve so there is not chance of it being touched directly by hand.

## Understanding Model Numbers

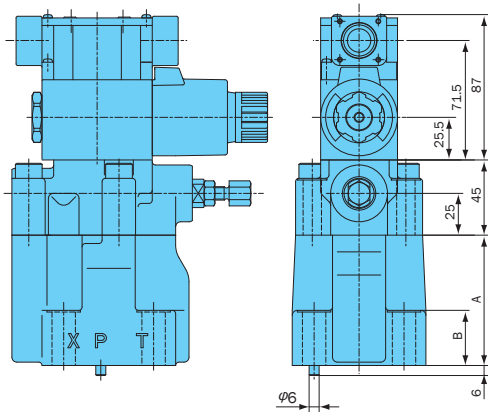
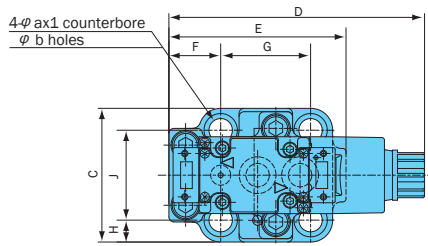
**RIS - G 06 - A Q 1 - (F) - C1 - 21**



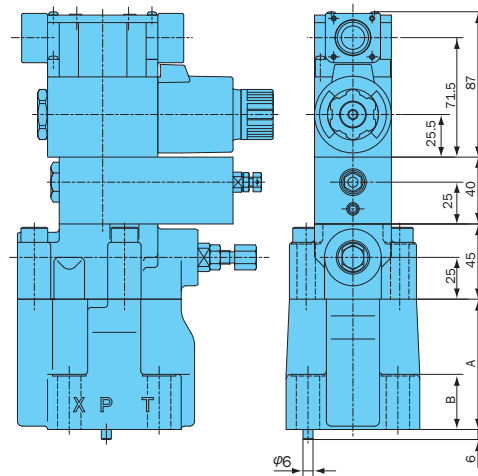
Other auxiliary symbols G, N, and Q (R is omitted) can be used (enter them in alphabetic order if there are 2 or more).

## Installation Dimension Drawings

RIS-G\*\*-A\*\*-\*\*-21



RIS-G\*\*-\*-F\*\*-\*\*-21

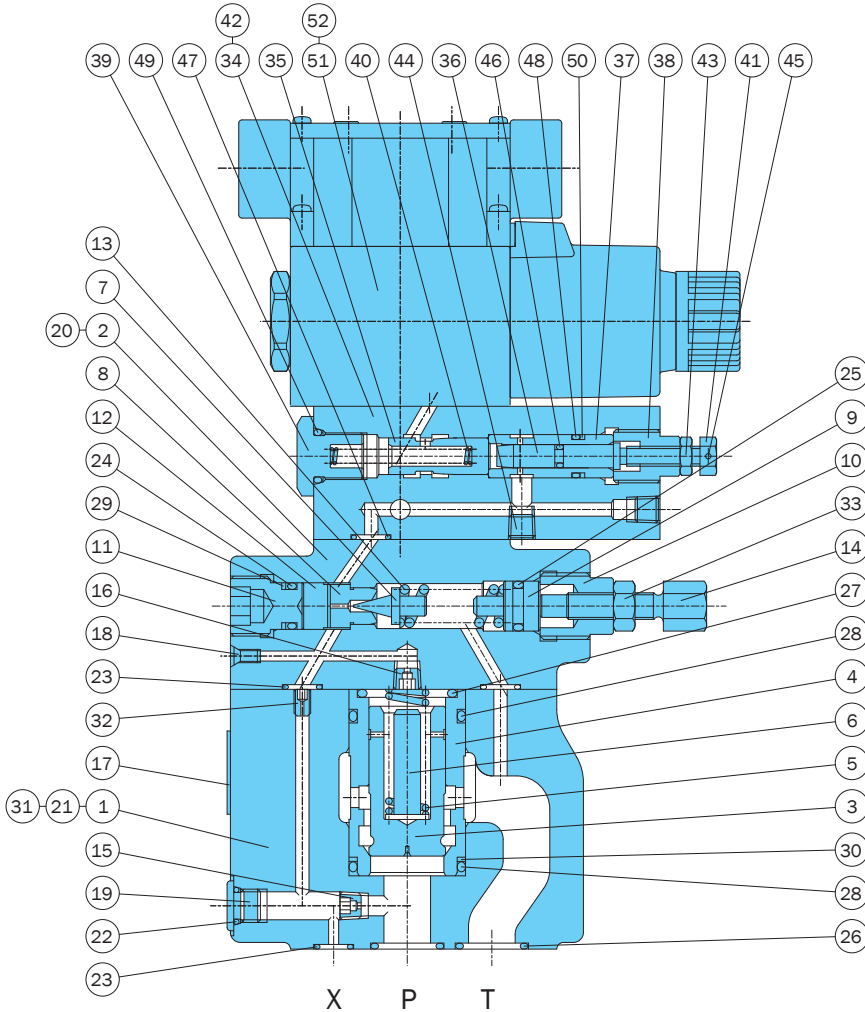


| Model No.        | A  | B  | C   | D            | E   | F  | G    | H    | J    | a  | b    |
|------------------|----|----|-----|--------------|-----|----|------|------|------|----|------|
| RIS-G03-**-**-21 | 78 | 32 | 80  | 153<br>(160) | 106 | 31 | 53.8 | 13.1 | 53.8 | 20 | 14   |
| RIS-G06-**-**-21 | 83 | 36 | 100 | 162<br>(169) | 119 | 37 | 66.7 | 15   | 70   | 26 | 17.5 |

Note: 1. For gasket surface dimensions, see RI-G\*\*-\*\* on page I-5.  
 2. Figures in (parenthesis) are for the DC solenoid valve.



## Cross-sectional Drawing



| Part No. | Part Name   |
|----------|-------------|
| 1        | Body        |
| 2        | Cover       |
| 3        | Poppet      |
| 4        | Sleeve      |
| 5        | Spring      |
| 6        | Spacer      |
| 7        | Poppet      |
| 8        | Seat        |
| 9        | Plunger     |
| 10       | Retainer    |
| 11       | Plug        |
| 12       | Collar      |
| 13       | Spring      |
| 14       | Handle assy |
| 15       | Orifice     |
| 16       | Orifice     |
| 17       | Plate       |

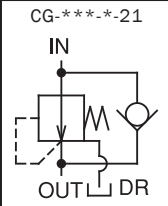
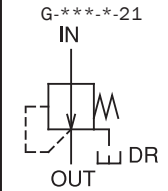
| Part No. | Part Name   |
|----------|-------------|
| 18       | Plug        |
| 19       | Plug        |
| 20       | Screw       |
| 21       | Pin         |
| 22       | O-ring      |
| 23       | O-ring      |
| 24       | O-ring      |
| 25       | O-ring      |
| 26       | O-ring      |
| 27       | O-ring      |
| 28       | O-ring      |
| 29       | Backup ring |
| 30       | Backup ring |
| 31       | Screw       |
| 32       | Choke       |
| 33       | Nut         |
| 34       | Body        |

| Part No. | Part Name       |
|----------|-----------------|
| 35       | Spool           |
| 36       | Throttle        |
| 37       | Sleeve          |
| 38       | Retainer        |
| 39       | Guide           |
| 40       | Spring          |
| 41       | Nut             |
| 42       | Plate           |
| 43       | Nut             |
| 44       | Plug            |
| 45       | Pin             |
| 46       | O-ring          |
| 47       | O-ring          |
| 48       | O-ring          |
| 49       | O-ring          |
| 50       | Backup ring     |
| 51       | Solenoid Valves |
| 52       | Screw           |

Seal Part List (Kit Model Numbers: Main REBS-\*\*\*, Restrictor Valve DFS-01H)

| Component Parts | Part No.         | Part Name   | Nominal Diameter/Part Number |         | Q'ty |
|-----------------|------------------|-------------|------------------------------|---------|------|
|                 |                  |             | G03                          | G06     |      |
| Main            | 22               | O-ring      | 1B-P8                        | 1B-P8   | 1    |
|                 | 23               | O-ring      | 1B-P9                        | 1B-P9   | 3    |
|                 | 24               | O-ring      | 1B-P10A                      | 1B-P10A | 1    |
|                 | 25               | O-ring      | 1A-P11                       | 1A-P11  | 1    |
|                 | 26               | O-ring      | 1B-P18                       | 1B-P28  | 2    |
|                 | 27               | O-ring      | 1B-G25                       | 1B-P28  | 1    |
|                 | 28               | O-ring      | 1B-G30                       | 1B-P32  | 2    |
|                 | 29               | Backup ring | T2-P10A                      | T2-P10A | 1    |
|                 | 30               | Backup ring | T2-G30                       | T2-P32  | 1    |
|                 | Restrictor Valve | 46          | O-ring                       | 1B-P4   |      |
| 47              |                  | O-ring      | 1B-P9                        |         | 2    |
| 48              |                  | O-ring      | 1B-P10                       |         | 1    |
| 49              |                  | O-ring      | 1B-P12.5                     |         | 1    |
| 50              |                  | Backup ring | T2-P10                       |         | 1    |

- Note: 1. O-ring 1A/1B-\*\* refers to JIS B 2401-1A/1B-\*\*.  
 2. For the \*\*\* part of the kit number, specify the valve size (G03, G06).  
 3. The restrictor valve kit is required only when a shockless valve is included.  
 4. SS (SA)-G01 pilot valve seal is available separately. For details, see pages D-14 (D-26).



### Pressure Reducing (and Check) Valve

5.2 to 73.9 gpm  
3045 psi

#### Features

This valve is used when part of the circuit uses pressure that is lower than the main circuit.

Even when pressure changes in the primary main circuit, the reduced secondary pressure is adjusted automati-

cally and maintained at a constant level. Connecting a remote control valve to the vent port allows remote control of adjustment pressure.

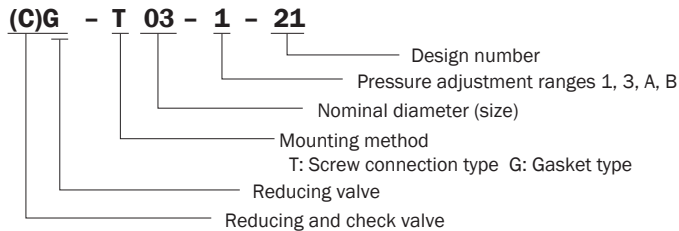
The mounting surface of the gasket conforms to the ISO standards shown in the table below.

#### Specifications

| Model No.              |                        | Nominal Diameter (Size) | Maximum Working Pressure psi  | Maximum Flow Rate gpm      | Pressure adjustment range psi | Weight lbs   |                    | Gasket Surface Dimensions |
|------------------------|------------------------|-------------------------|-------------------------------|----------------------------|-------------------------------|--------------|--------------------|---------------------------|
| Screw Mounting         | Gasket Mounting        |                         |                               |                            |                               | T Type       | G Type             |                           |
| (C)G-T03- A-21<br>B-21 | (C)G-G03- A-21<br>B-21 | 3/8                     | 3045<br>IN, OUT,<br>Vent Port | 5.2                        | 36 to 145<br>43 to 362        | 7.2<br>7.9   | 8.5<br>9.2         | ISO 5781-AG-06-2-A        |
| (C)G-T03-1-21<br>3-21  | (C)G-G03-1-21<br>3-21  | 3/8                     |                               |                            | 116 to 1015<br>507 to 3045    | 7.2<br>7.9   | 8.5<br>9.2         |                           |
| (C)G-T06-1-21<br>3-21  | (C)G-G06-1-21<br>3-21  | 3/4                     |                               | 116 to 1015<br>507 to 3045 | 12.5<br>13.4                  | 13.6<br>14.5 | ISO 5781-AH-08-2-A |                           |
| (C)G-T10-1-21<br>3-21  | (C)G-G10-1-21<br>3-21  | 1 1/4                   |                               | 116 to 1015<br>507 to 3045 | 22<br>25                      | 26<br>29     | ISO 5781-AJ-10-2-A |                           |

Weight values in parentheses are for when a check valve is included.  
The cracking pressure of the check valve is 14.5 psi.

#### Understanding Model Numbers

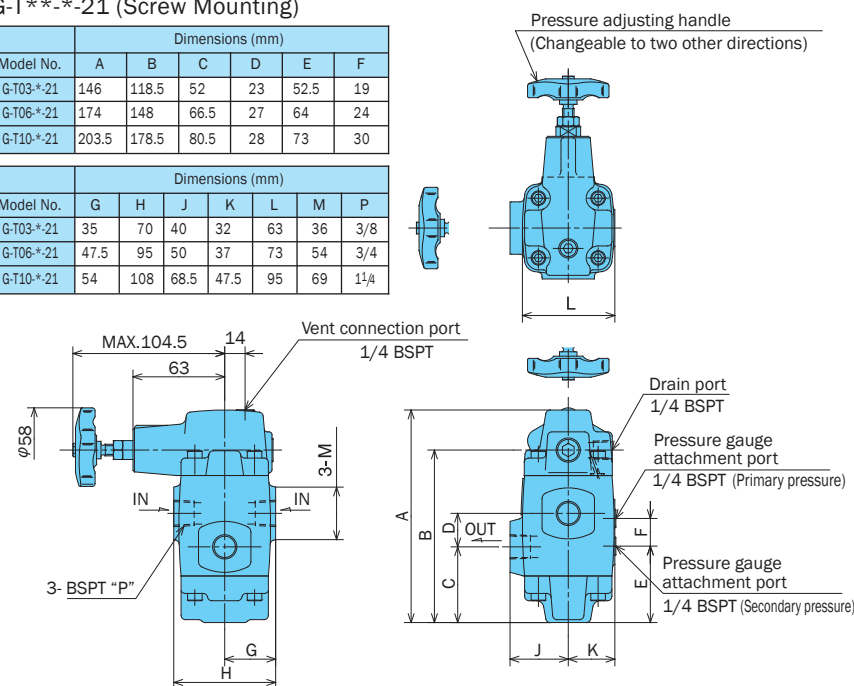


#### Installation Dimension Drawings

##### G-T\*-\*-21 (Screw Mounting)

| Model No. | Dimensions (mm) |       |      |    |      |    |
|-----------|-----------------|-------|------|----|------|----|
|           | A               | B     | C    | D  | E    | F  |
| G-T03*-21 | 146             | 118.5 | 52   | 23 | 52.5 | 19 |
| G-T06*-21 | 174             | 148   | 66.5 | 27 | 64   | 24 |
| G-T10*-21 | 203.5           | 178.5 | 80.5 | 28 | 73   | 30 |

| Model No. | Dimensions (mm) |     |      |      |    |    |       |
|-----------|-----------------|-----|------|------|----|----|-------|
|           | G               | H   | J    | K    | L  | M  | P     |
| G-T03*-21 | 35              | 70  | 40   | 32   | 63 | 36 | 3/8   |
| G-T06*-21 | 47.5            | 95  | 50   | 37   | 73 | 54 | 3/4   |
| G-T10*-21 | 54              | 108 | 68.5 | 47.5 | 95 | 69 | 1 1/4 |



- Handling
- 1 Provide an independent drain pipe directly to the tank.
  - 2 When using a remote control valve, connect piping to the reducing valve vent port. Pipe capacity can be a source of vibration. Use of thick iron pipe with an inside diameter of no more than .15" and a connection length of no more than three meters is recommended.
  - 3 Use the following table for specification when a sub plate is required.

| Model No. | Pipe Diameter | Weight lbs | Applicable Valve Model |
|-----------|---------------|------------|------------------------|
| MG-03-20  | 3/8           | 3.5        | (C)G-G03*-21           |
| MG-03X-20 | 1/2           |            |                        |
| MG-06-20  | 3/4           | 8.6        | (C)G-G06*-21           |
| MG-06X-20 | 1             |            |                        |
| MG-10-20  | 1 1/4         | 14.7       | (C)G-G10*-21           |
| MG-10X-20 | 1 1/2         |            |                        |

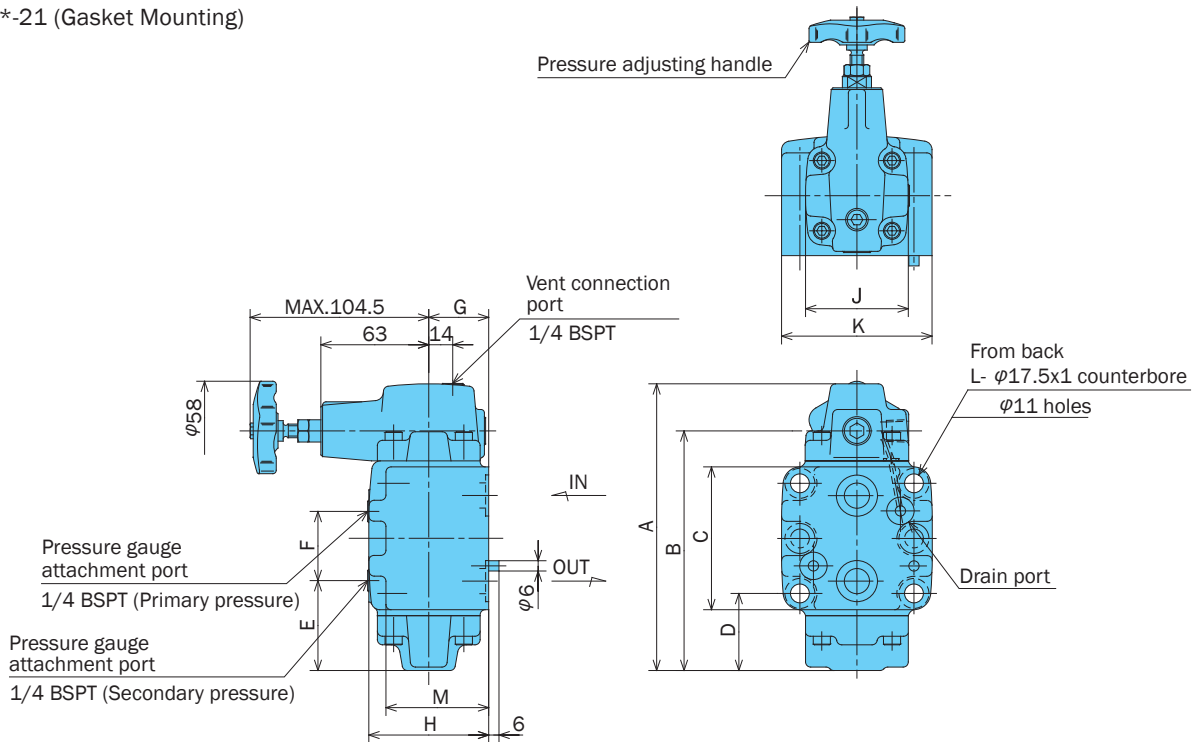
These sub plates can also be used for pressure control valves.

- 4 The following are the bundled mounting bolts.

| Model No.    | Bolt Dimensions | Q'ty | Tightening Torque ft lbs |
|--------------|-----------------|------|--------------------------|
| (C)G-G03*-21 | M10 × 75 ℓ      | 4    | 33 to 40.5               |
| (C)G-G06*-21 | M10 × 85 ℓ      | 4    |                          |
| (C)G-G10*-21 | M10 × 105 ℓ     | 6    |                          |

Note: For mounting bolts, use 12T or equivalent.

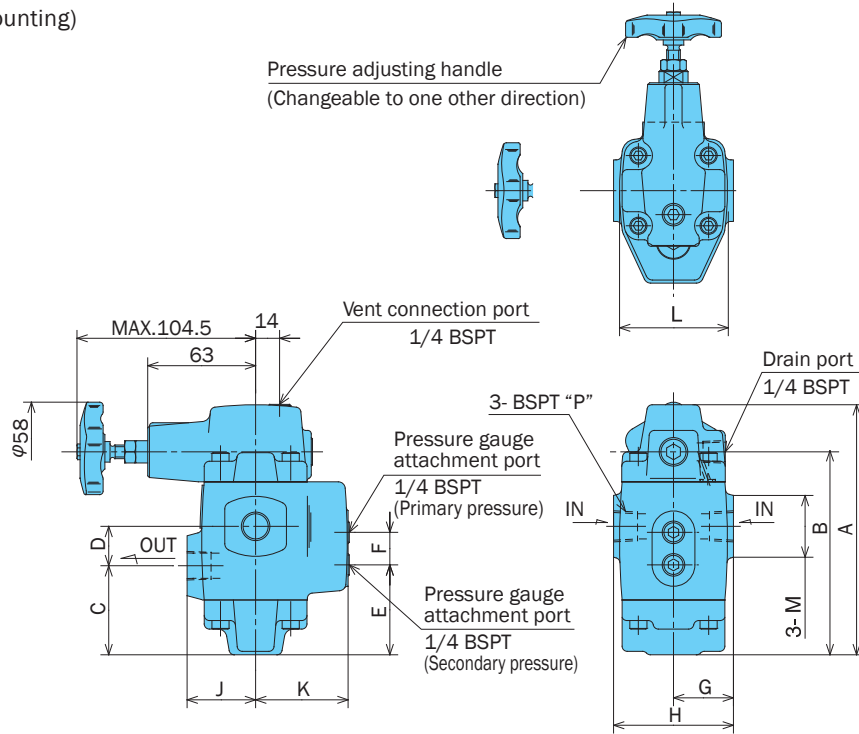
G-G\*\*-\*-21 (Gasket Mounting)



| Model No.  | A     | B     | C   | D    | E    | F  | G  | H   | J  | K   | L | M  |
|------------|-------|-------|-----|------|------|----|----|-----|----|-----|---|----|
| G-G03-*-21 | 146   | 118.5 | 62  | 45.1 | 52.5 | 19 | 35 | 70  | 60 | 88  | 4 | 60 |
| G-G06-*-21 | 174   | 148   | 82  | 51.4 | 64   | 24 | 40 | 80  | 70 | 102 | 4 | 70 |
| G-G10-*-21 | 203.5 | 178.5 | 102 | 54   | 73   | 30 | 51 | 102 | 92 | 122 | 6 | 92 |

Note: The orientation of the pressure adjusting handle cannot be change.

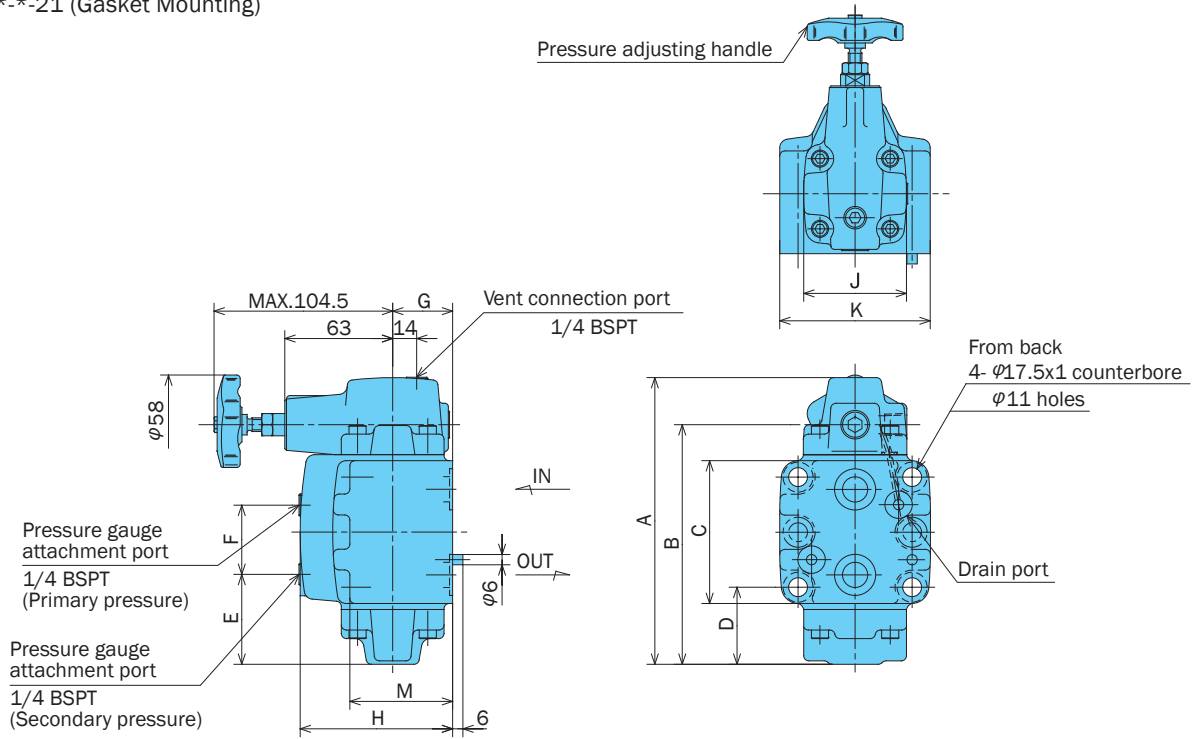
CG-T\*\*-\*-21 (Screw Mounting)



| Model No.   | A     | B     | C    | D  | E    | F  | G    | H   | J    | K  | L  | M  | P     |
|-------------|-------|-------|------|----|------|----|------|-----|------|----|----|----|-------|
| CG-T03-*-21 | 146   | 118.5 | 52   | 23 | 52.5 | 19 | 35   | 70  | 40   | 54 | 63 | 36 | 3/8   |
| CG-T06-*-21 | 174   | 148   | 66.5 | 27 | 64   | 24 | 47.5 | 95  | 50   | 60 | 73 | 54 | 3/4   |
| CG-T10-*-21 | 203.5 | 178.5 | 80.5 | 28 | 73   | 30 | 54   | 108 | 68.5 | 80 | 95 | 69 | 1 1/4 |

Note: After the orientation of the pressure adjusting handle has been changed, also modify the cover alignment surface ring (1B-P6).

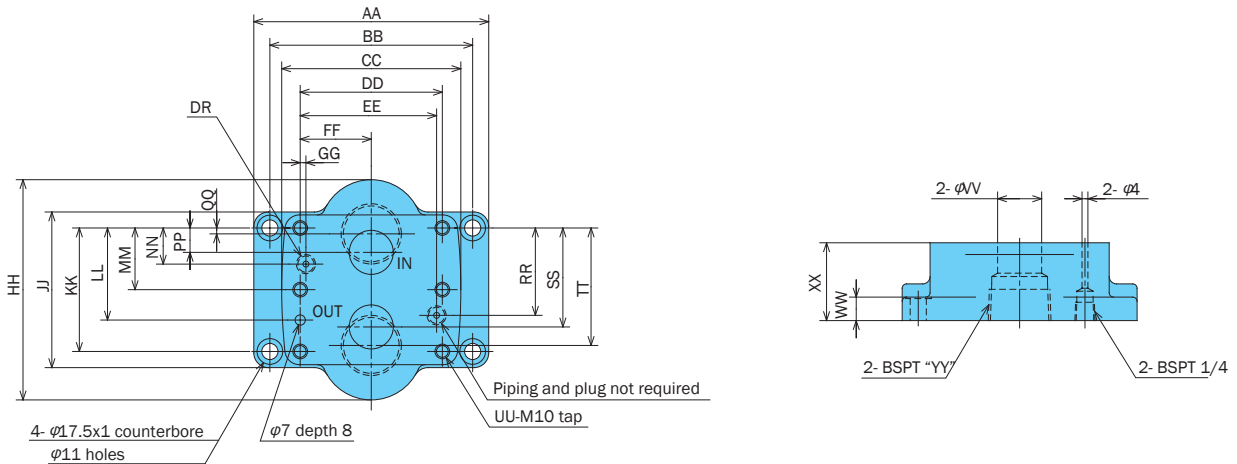
CG-G\*\*-\*-21 (Gasket Mounting)



| Model No.  | Dimensions mm |       |     |      |      |    |    |     |    |     |   |    |
|------------|---------------|-------|-----|------|------|----|----|-----|----|-----|---|----|
|            | A             | B     | C   | D    | E    | F  | G  | H   | J  | K   | L | M  |
| CG-G03*-21 | 146           | 118.5 | 62  | 45.1 | 52.5 | 19 | 35 | 89  | 60 | 88  | 4 | 60 |
| CG-G06*-21 | 174           | 148   | 82  | 51.4 | 64   | 24 | 40 | 100 | 70 | 102 | 4 | 70 |
| CG-G10*-21 | 203.5         | 178.5 | 102 | 54   | 73   | 30 | 51 | 131 | 92 | 122 | 6 | 92 |

Note: The orientation of the pressure adjusting handle cannot be change.

Sub Plate MG\*\*-\*\*-20

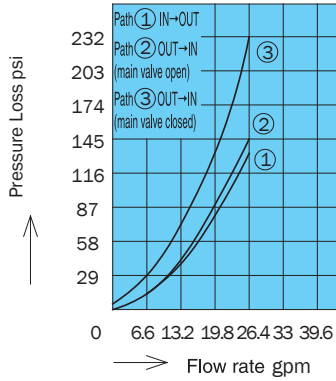


| Model No. | Dimensions mm |       |     |      |      |      |     |     |     |      |      |      |      |      |     |      |      |      |    |    |    |    |       |
|-----------|---------------|-------|-----|------|------|------|-----|-----|-----|------|------|------|------|------|-----|------|------|------|----|----|----|----|-------|
|           | AA            | BB    | CC  | DD   | EE   | FF   | GG  | HH  | JJ  | KK   | LL   | MM   | NN   | PP   | QQ  | RR   | SS   | TT   | UU | VV | WW | XX | YY    |
| MG-03-20  | 128           | 106.4 | 88  | 66.6 | 58.7 | 33.3 | 7.9 | 76  | 62  | 42.9 | 31.8 | -    | 21.4 | 7.2  | 3.5 | 21.5 | 35.7 | 39.5 | 4  | 14 | 11 | 30 | 3/8   |
| MG-03X-20 |               |       |     |      |      |      |     |     |     |      |      |      |      |      |     |      |      |      |    |    |    |    | 1/2   |
| MG-06-20  | 146           | 123.8 | 102 | 79.3 | 72.9 | 39.7 | 6.4 | 110 | 82  | 60.3 | 44.5 | -    | 20.6 | 11.1 | 3.7 | 39.7 | 49.2 | 56.7 | 4  | 22 | 16 | 40 | 3/4   |
| MG-06X-20 |               |       |     |      |      |      |     |     |     |      |      |      |      |      |     |      |      |      |    |    |    |    | 1     |
| MG-10-20  | 160           | 138.1 | 122 | 96.8 | 92.9 | 48.4 | 3.9 | 150 | 102 | 84.1 | 62.7 | 42.1 | 24.6 | 16.7 | 4.1 | 59.5 | 67.5 | 80.1 | 6  | 30 | 16 | 53 | 1 1/4 |
| MG-10X-20 |               |       |     |      |      |      |     |     |     |      |      |      |      |      |     |      |      |      |    |    |    |    | 1 1/2 |

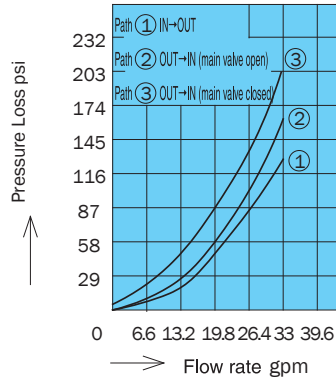
# Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

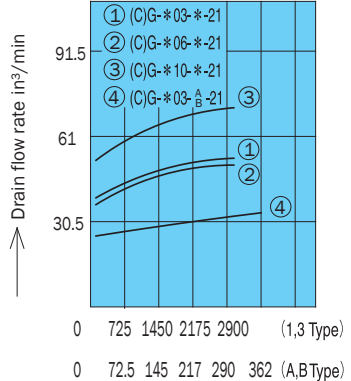
Pressure Loss Characteristics  
(C)G-G03-\*-21



(C)G-T03-\*-21

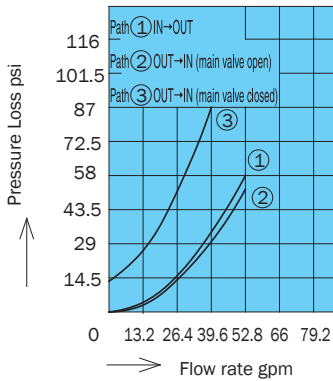


Pressure - Drain Flow Rate Characteristics  
(C)G-\*\*\*-\*-21

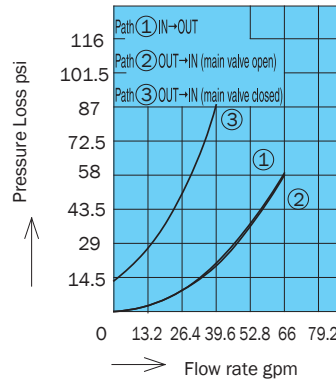


→ Differential pressure psi  
Secondary Pressure - Flow Rate Characteristics

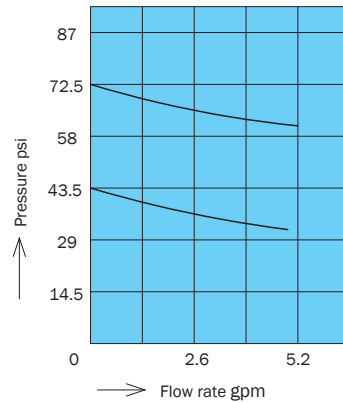
(C)G-G06-\*-21



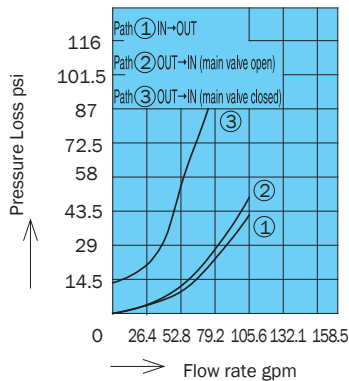
(C)G-T06-\*-21



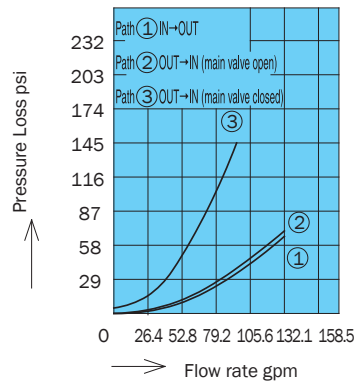
(C)G-\*03-A-B-21



(C)G-G10-\*-21

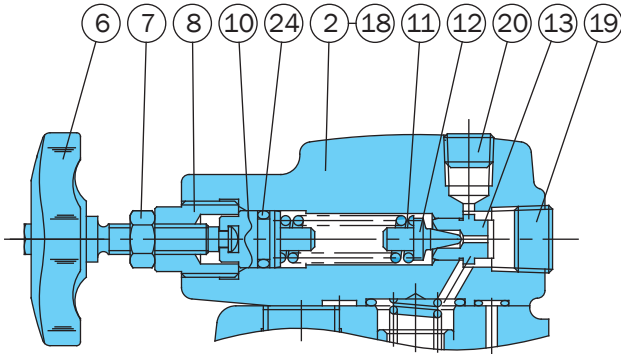


(C)G-T10-\*-21

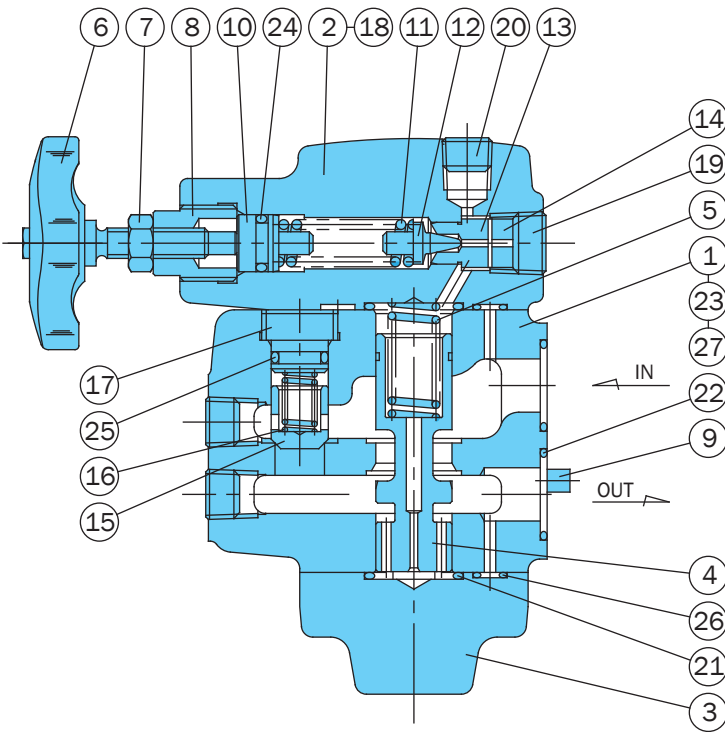


## Cross-sectional Drawing

(C)G-G\*\*-<sup>A</sup>/<sub>B</sub>-21



CG-G\*\*-\*\*-21



| Part No. | Part Name    |
|----------|--------------|
| 1        | Body         |
| 2        | Cover        |
| 3        | Cover        |
| 4        | Piston       |
| 5        | Spring       |
| 6        | Handle       |
| 7        | Nut          |
| 8        | Retainer     |
| 9        | Spring pin   |
| 10       | Push rod     |
| 11       | Spring       |
| 12       | Poppet       |
| 13       | Seat         |
| 14       | Collar       |
| 15       | Poppet       |
| 16       | Spring       |
| 17       | Spring guide |
| 18       | Screw        |
| 19       | Plug         |
| 20       | Plug         |
| 21       | O-ring       |
| 22       | O-ring       |
| 23       | O-ring       |
| 24       | O-ring       |
| 25       | O-ring       |
| 26       | O-ring       |
| 27       | Nameplate    |

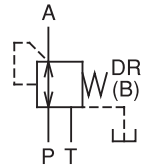
Note: Part numbers 15, 16, 17, and 25 are not required when there is no check valve.

### Seal Part List (Kit Model Number RGS-\*\*\*)

| Part No. | Part Name | Part Number |             |             |             |             |             | Q'ty |
|----------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|------|
|          |           | CG-G03-*-21 | CG-T03-*-21 | CG-G06-*-21 | CG-T06-*-21 | CG-G10-*-21 | CG-T10-*-21 |      |
| 21       | O-ring    | 1B-P22      | 1B-P22      | 1B-G30      | 1B-G30      | 1B-G40      | 1B-G40      | 2    |
| 22       | O-ring    | 1B-P20      | -           | 1B-P26      | -           | 1B-G35      | -           | 2    |
| 23       | O-ring    | 1B-P12      | -           | 1B-P12      | -           | 1B-P12      | -           | 2    |
| 24       | O-ring    | 1A-P11      | 1A-P11      | 1A-P11      | 1A-P11      | 1A-P11      | 1A-P11      | 1    |
| 25       | O-ring    | 1B-P11      | 1B-P11      | 1B-P14      | 1B-P14      | 1B-P22      | 1B-P22      | 1    |
| 26       | O-ring    | 1B-P6       | 1B-P6       | 1B-P6       | 1B-P6       | 1B-P6       | 1B-P6       | 4    |

Note: O-ring 1A/B-\*\* refers to JIS B2401 1A/B-\*\*.

\*\*\* in the kit number is used for specification of the valve size (G03, T06, etc.) To specify inclusion of a check valve, add C to the end.



### Balancing Valve (Pressure Reducing and Relief Valve)

7.9 to 13.2 gpm  
2030 psi

#### Features

2-in-1 operation allows a simpler circuit configuration. Combination valve that provides both pressure reducing and counter balance functions.

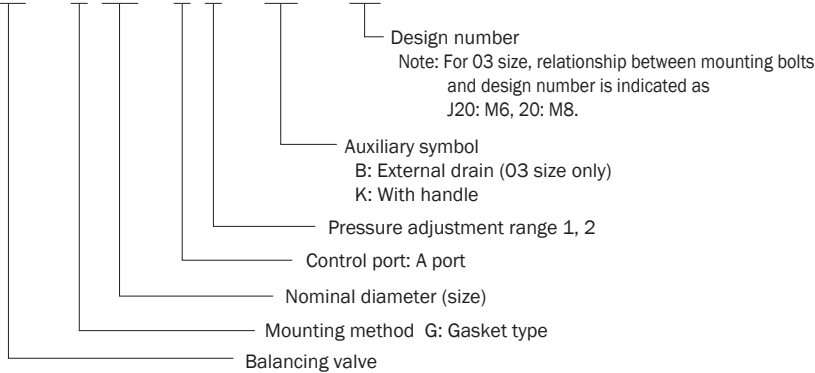
Pressure adjustment using a single screw (bolt). Compact and lightweight valve that can be mounted using the same methods as a 01, 03 size solenoid valve.

#### Specifications

| Model No.               | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure adjustment range psi | Weight lbs | Gasket Surface Dimensions |
|-------------------------|-------------------------|------------------------------|-----------------------|-------------------------------|------------|---------------------------|
| GR-G01- A1-20<br>A2     | 1/8                     | 3045<br>P port               | 30                    | 116 to 1015<br>507 to 2030    | 3.3        | ISO 4401-03-02-0-94       |
| GR-G03- A1-(B)-20<br>A2 | 3/8                     |                              | 50                    | 145 to 1015<br>507 to 2030    | 7.7        | ISO 4401-05-04-0-94       |

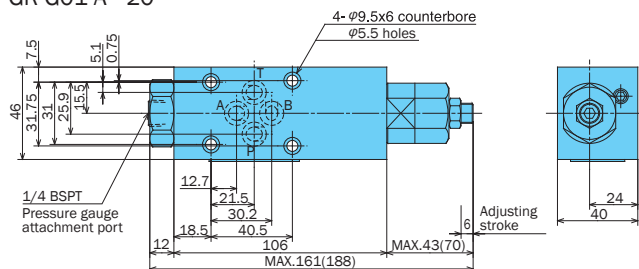
#### Understanding Model Numbers

**GR - G 03 - A 1 - BK - 20**

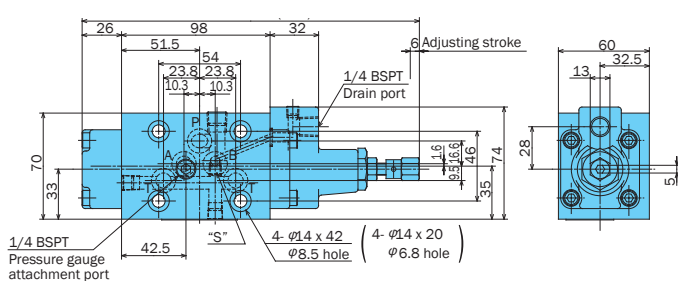


#### Installation Dimension Drawings

GR-G01-A\*-20



GR-G03-A\*-B-20



Note: 1. For size 03, an escape valve with piping from the drain discharge port is standard for the drain (GR-G03-A\*-B-20). To change from internal drain to external drain, install a plug (NPTF 1/16) in part S, and remove the drain discharge port plug (1/4 BSPT). To change from external drain to internal drain, install a plug (1/4 BSPT) into the drain discharge port, and remove the S part plug (NPTF 1/16). In this case, however, the B port cannot be used as the tank port.  
2. Dimensions in parentheses show dimensions with handle (K type).

- Handling
- To adjust pressure, loosen the lock nut and then rotate the adjusting screw (bolt) clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
  - For the 01 size, draining is from the gasket side B port.
  - For the drain of a 03 size valve when auxiliary symbol B is specified, run a pipe from the drain discharge port directly to the tank. The drain discharge port can also be plugged for direct draining from the gasket side B port. In the case of modification, be sure to change the valve type marking on the nameplate. When using drain piping, use a tightening torque of 16-18.4 ft lbs for pipe joints.
  - The drain of 03 size valve that does not have a B auxiliary symbol can be directly from the T port.
  - Make sure that drain back pressure is no greater than 29 psi.
  - When an adjustment handle is required for pressure adjustment block, insert K for the type specification.
  - Set the difference between the pressure at the primary circuit (port P) and the secondary circuit (port A) at least 72 psi.
  - Use the following table for specification when a sub plate is required.

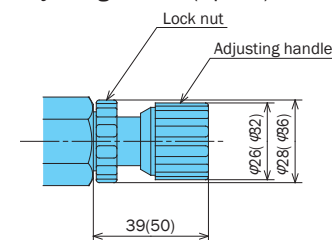
| Model No.   | Pipe Outlet Size | Weight lbs |
|-------------|------------------|------------|
| MSA-01Y-E10 | 3/8              | 2.6        |
| MSA-03-E10  | 3/8              | 8.3        |
| MSA-03X-E10 | 1/2              |            |

The following are the bundled mounting bolts.

| Model No.    | Bolt Dimensions | Q'ty | Tightening Torque ft lbs |
|--------------|-----------------|------|--------------------------|
| GR-G01-A*-20 | 1024 x 13/4"    | 4    | 3.6 to 5                 |
| GR-G03-A*-20 | 1/4-20 x 1 1/8" | 4    | 14.7 to 18.4             |

Note: For mounting bolts, use grade 8 or equivalent.

#### Adjusting Handle (Option)

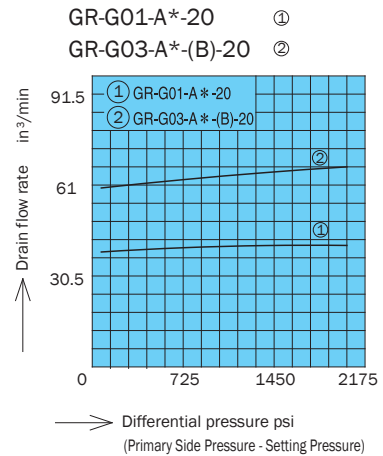
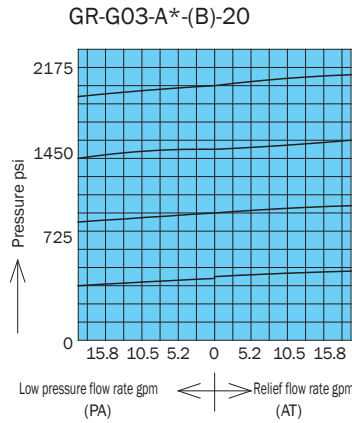
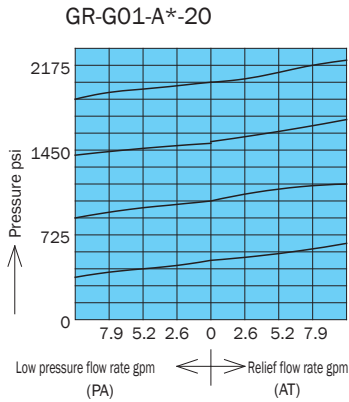


## Performance Curves

Pressure - Flow Rate Characteristics

Hydraulic Operating Fluid Viscosity 32 centistokes

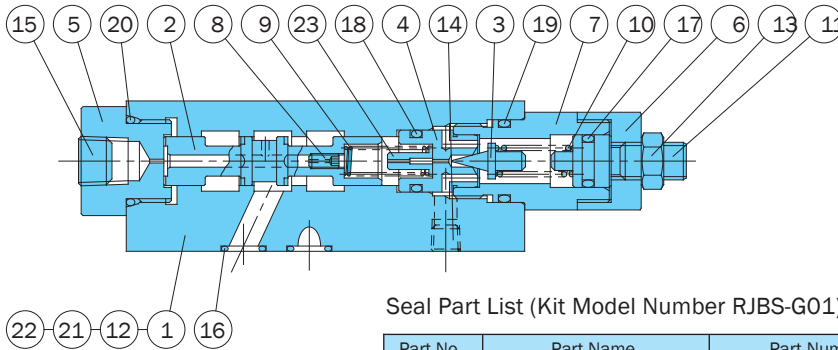
Setting Pressure - Drain Flow Rate Characteristics



## Cross-sectional Drawing

Note: O-ring 1A/B-\*\* refers to JIS B2401- 1A/B-\*\*.

GR-G01-A\*-20

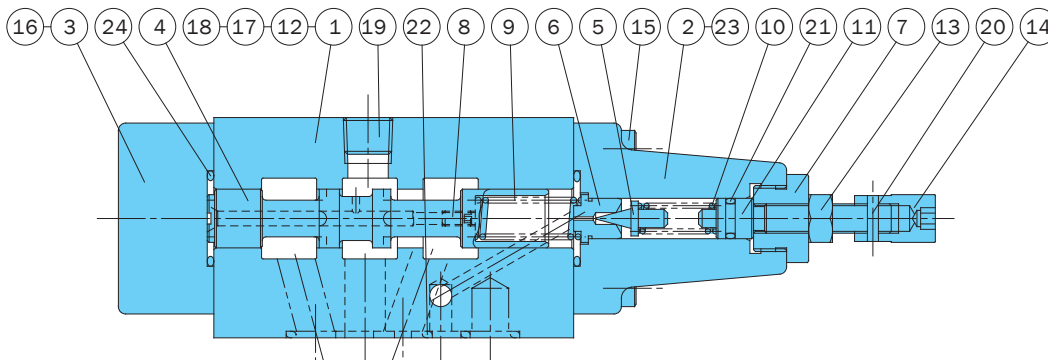


Seal Part List (Kit Model Number RJBS-G01)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 16       | O-ring    | 1B-P9       | 4    |
| 17       | O-ring    | 1A-P10A     | 1    |
| 18       | O-ring    | 1B-P12.5    | 1    |
| 19       | O-ring    | 1B-P18      | 1    |
| 20       | O-ring    | 1B-P20      | 1    |

| Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|
| 1        | Body      | 7        | Retainer  |
| 2        | Spool     | 8        | Choke     |
| 3        | Poppet    | 9        | Spring    |
| 4        | Seat      | 10       | Spring    |
| 5        | Bushing   | 11       | Screw     |
| 6        | Bushing   | 12       | Plate     |
|          |           | 13       | Nut       |
|          |           | 14       | Plug      |
|          |           | 15       | Plug      |
|          |           | 16       | O-ring    |
|          |           | 17       | O-ring    |
|          |           | 18       | O-ring    |
|          |           | 19       | O-ring    |
|          |           | 20       | O-ring    |
|          |           | 21       | Plug      |
|          |           | 22       | Spacer    |
|          |           | 23       | Choke     |

GR-G03-A\*-B-20



Seal Part List (Kit Model Number RJBS-G03)

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 21       | O-ring    | 1A-P8       | 1    |
| 22       | O-ring    | 1B-P12      | 5    |
| 23       | O-ring    | 1B-P9       | 1    |
| 24       | O-ring    | 1B-P22      | 2    |

| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Cover (A) |
| 3        | Cover (B) |
| 4        | Spool     |
| 5        | Poppet    |
| 6        | Seat      |
| 7        | Retainer  |
| 8        | Choke     |
| 9        | Spring    |
| 10       | Spring    |
| 11       | Screw     |
| 12       | Plate     |
| 13       | Nut       |
| 14       | Nut       |
| 15       | Screw     |
| 16       | Screw     |
| 17       | Plug      |
| 18       | Plug      |
| 19       | Plug      |
| 20       | Pin       |
| 21       | O-ring    |
| 22       | O-ring    |
| 23       | O-ring    |
| 24       | O-ring    |



### Pressure Control (and Check) Valve

13.2 to 73.9 gpm  
2030 psi

#### Features

This circuit control valve works as a sequence valve, unloading valve, and counter balance valve.

Maximum operating pressure is 3045 psi. Though a direct type valve, there is little pressure override.

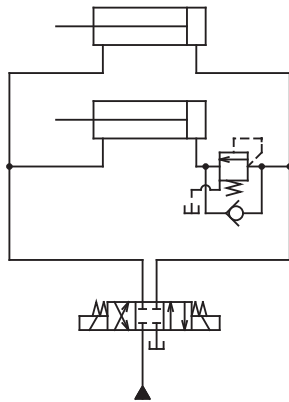
The mounting surface of the gasket conforms to the ISO standards shown in the table below.

#### Specifications

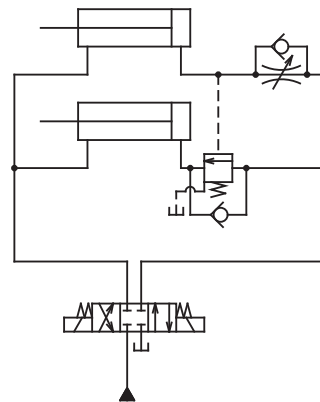
| Model No.                          |                                    | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Pressure adjustment range psi | Weight lbs |        | Gasket Surface Dimensions |
|------------------------------------|------------------------------------|-------------------------|------------------------------|-----------------------|-------------------------------|------------|--------|---------------------------|
| Screw Mounting                     | Gasket Mounting                    |                         |                              |                       |                               | T Type     | G Type |                           |
| (C)Q-T03-*A-21<br>B<br>C<br>D<br>E | (C)Q-G03-*A-21<br>B<br>C<br>D<br>E | 3/8                     | 3045 IN, OUT, PP Ports       | 13.2                  | Type A<br>36 to 123           | 6.3        | 7.7    | ISO 5781-AG-06-2-A        |
|                                    |                                    |                         |                              |                       | Type B<br>72 to 253           |            |        |                           |
| (C)Q-T06-*A-21<br>B<br>C<br>D<br>E | (C)Q-G06-*A-21<br>B<br>C<br>D<br>E | 3/4                     | 3045 IN, OUT, PP Ports       | 31.7                  | Type C<br>123 to 507          | 11         | 13.2   | ISO 5781-AH-08-2-A        |
|                                    |                                    |                         |                              |                       | Type D<br>253 to 1015         |            |        |                           |
| (C)Q-T10-*A-21<br>B<br>C<br>D<br>E | (C)Q-G10-*A-21<br>B<br>C<br>D<br>E | 1 1/4                   |                              | 73.9                  | Type E<br>507 to 2030         | 21.6       | 25.3   | ISO 5781-AJ-10-2-A        |

Weight values in parentheses are for when a check valve is included. The cracking pressure of the check valve is 14.5 psi.

Example circuit 1  
When using type 2.



Example circuit 2  
When using type 3.



- Handling
- 1 To adjust pressure, loosen the lock nut and then rotate the adjusting bolt clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- 2 The pressure adjustment range is expressed in terms of cracking pressure.
- 3 Run the out port of Q-T/G\*\* type 1 and 4 directly to the tank.
- 4 The following describes the method for using Types 2 and 3. Application of back pressure to the valve output side such as in the example circuit shown below, use Type 2 or Type 3 and run the drain port directly to the tank.
- 5 When two or more of these valves are ganged in sequence, make sure the setting pressure (cracking pressure) differential between them is at least 145 psi.
- 6 Vibration (chattering) may occur with the (C) Q-\*\*\*-1E-21 depending on operating conditions when using type 1 and pressure adjustment range E. Use external drain type 2E if it happens.
- 7 Type 2 is standard. When Type 1, 3, or 4 is required, make modifications in accordance with the figures on the next page. Modifications change the valve type, so be sure to change the markings on the nameplate.
- 8 Use the following table for specification when a sub plate is required.

| Model No. | Pipe Diameter | Weight lbs | Applicable Valve Model |
|-----------|---------------|------------|------------------------|
| MG-03-20  | 3/8           | 3.5        | (C)Q-G03-**-21         |
| MG-03X-20 | 1/2           |            |                        |
| MG-06-20  | 3/4           | 8.5        | (C)Q-G06-**-21         |
| MG-06X-20 | 1             |            |                        |
| MG-10-20  | 1 1/4         | 14.7       | (C)Q-G10-**-21         |
| MG-10X-20 | 1 1/2         |            |                        |

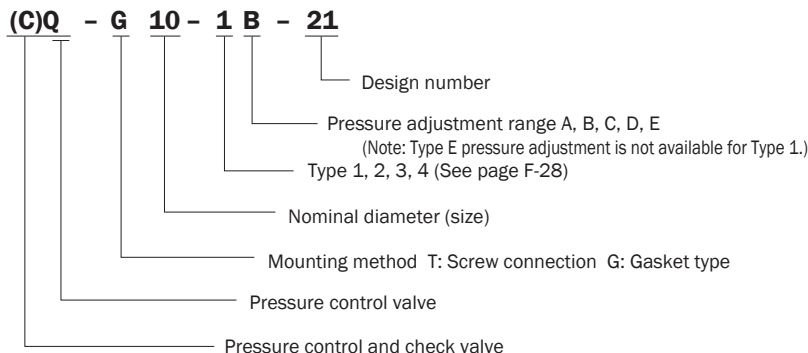
Note: These sub plates can also be used for reducing valves.

The following are the bundled mounting bolts.

| Model No.      | Bolt Dimensions | Q'ty | Tightening Torque ft. lbs |
|----------------|-----------------|------|---------------------------|
| (C)Q-G03-**-21 | M10 x 75        | 4    | 33 to 40                  |
| (C)Q-G06-**-21 | M10 x 85        | 4    |                           |
| (C)Q-G10-**-21 | M10 x 105       | 6    |                           |

Note: For mounting bolts, use 12T or equivalent.

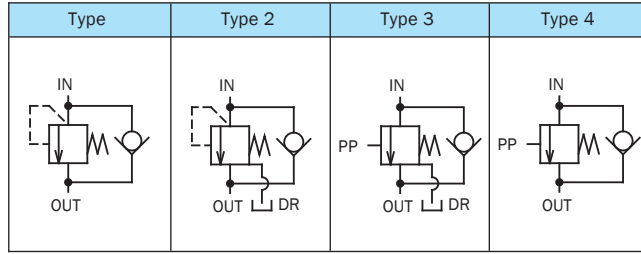
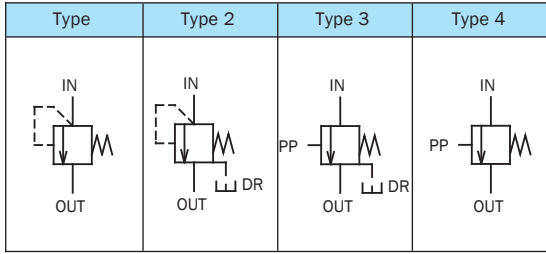
#### Understanding Model Numbers



# Performance Curves

Q-\*\*\*-\*\*-21

CQ-\*\*\*-\*\*-21

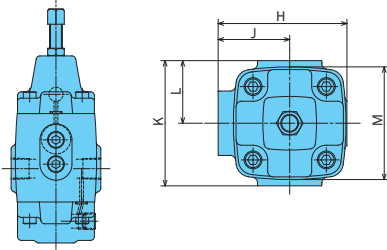


Type 2 is standard.

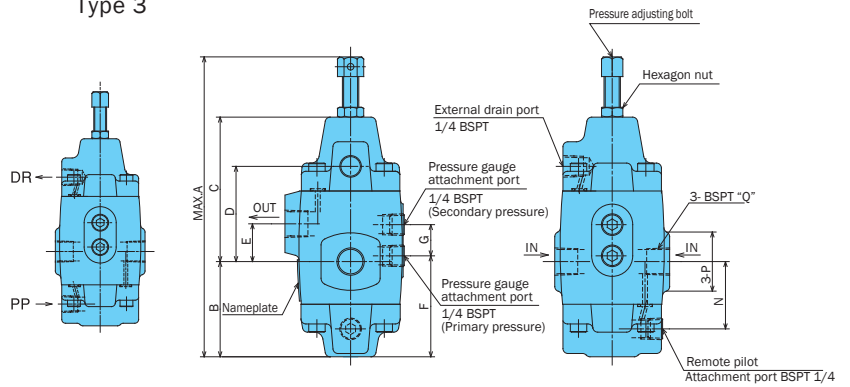
# Installation Dimension Drawing

Q-T\*\*-2\*-21 (Screw Mounting)

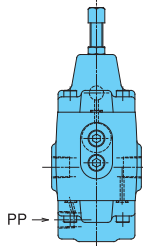
Type 1



Type 3



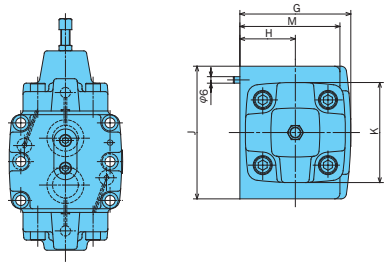
Type 4



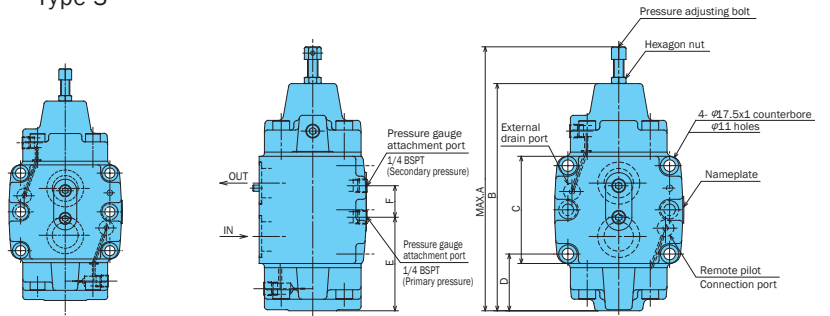
| Model No.      | A     | B    | C     | D    | E  | F    | G  | H   | J    | K   | L    | M  | N    | P  | Q     |
|----------------|-------|------|-------|------|----|------|----|-----|------|-----|------|----|------|----|-------|
| (C)Q-T03-**-21 | 179.5 | 58   | 88    | 58   | 23 | 61.5 | 19 | 72  | 40   | 70  | 35   | 63 | 41   | 36 | 3/8   |
| (C)Q-T06-**-21 | 204.5 | 69.5 | 101.5 | 71.5 | 27 | 85   | 24 | 87  | 50   | 95  | 47.5 | 73 | 52.5 | 54 | 3/4   |
| (C)Q-T10-**-21 | 251   | 83.5 | 132.5 | 87.5 | 28 | 89   | 30 | 116 | 68.5 | 108 | 54   | 95 | 62.5 | 69 | 1 1/4 |

Q-G\*\*-2\*-21 (Gasket Mounting)

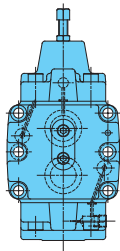
Type 1



Type 3



Type 4

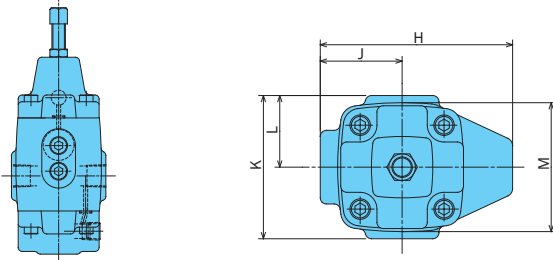


| Model No.   | A     | B   | C   | D    | E    | F  | G   | H  | J   | K  | L | M  |
|-------------|-------|-----|-----|------|------|----|-----|----|-----|----|---|----|
| Q-G03-**-21 | 179.5 | 146 | 62  | 45.1 | 61.5 | 19 | 72  | 35 | 88  | 60 | 4 | 60 |
| Q-G06-**-21 | 204.5 | 171 | 82  | 51.4 | 75   | 24 | 80  | 40 | 102 | 70 | 4 | 70 |
| Q-G10-**-21 | 251   | 216 | 102 | 54   | 89   | 30 | 102 | 51 | 122 | 92 | 6 | 92 |

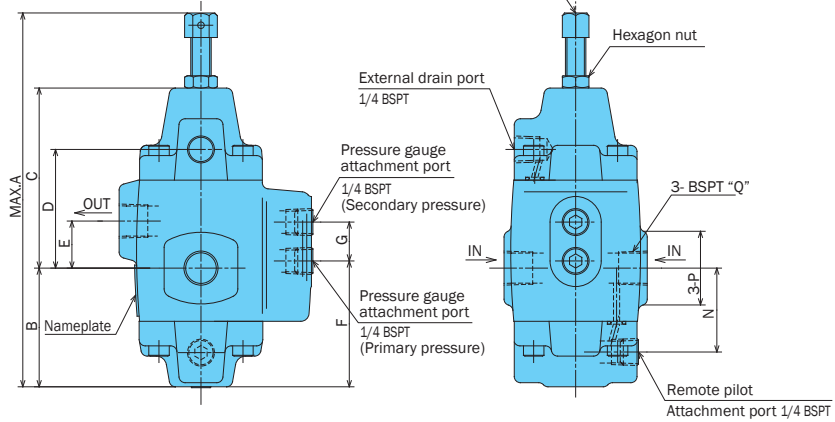
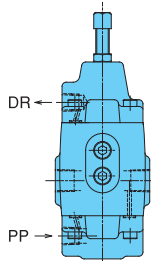
# Installation Dimension Drawing

CQ-T\*\*-2\*-21 (Screw Mounting)

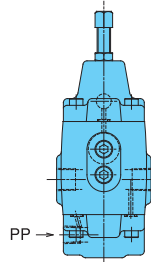
Type 1



Type 3



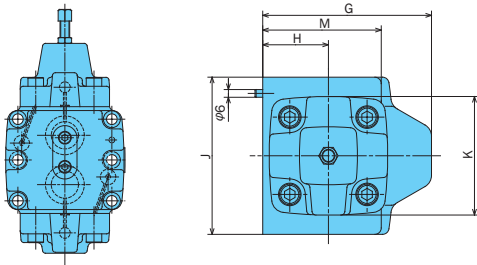
Type 4



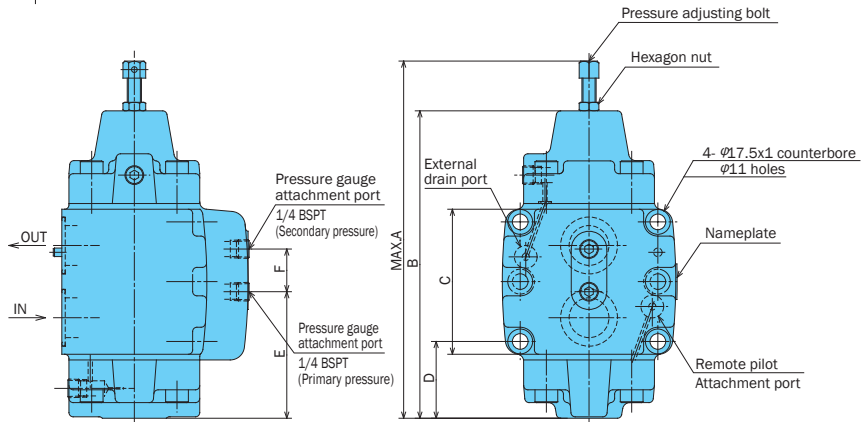
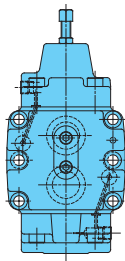
| Model No.   | A     | B    | C     | D    | E  | F    | G  | H     | J    | K   | L    | M  | N    | P  | Q     |
|-------------|-------|------|-------|------|----|------|----|-------|------|-----|------|----|------|----|-------|
| CQ-T03**-21 | 179.5 | 58   | 88    | 58   | 23 | 61.5 | 19 | 94    | 40   | 70  | 35   | 63 | 41   | 36 | 3/8   |
| CQ-T06**-21 | 204.5 | 69.5 | 101.5 | 81.5 | 27 | 75   | 24 | 110   | 50   | 95  | 47.5 | 73 | 52.5 | 54 | 3/4   |
| CQ-T10**-21 | 251   | 83.5 | 132.5 | 87.5 | 28 | 89   | 30 | 148.5 | 68.5 | 108 | 54   | 95 | 62.5 | 69 | 1 1/4 |

CQ-G\*\*-2\*-21 (Gasket Mounting)

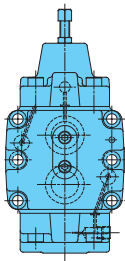
Type 1



Type 3

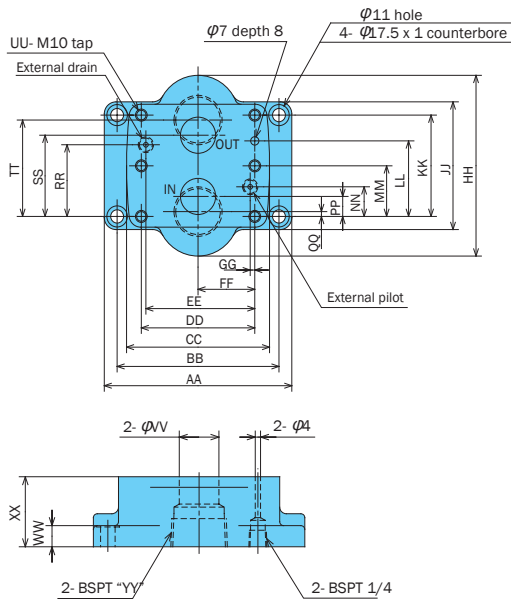


Type 4



| Model No.   | A     | B   | C   | D    | E    | F  | G   | H  | J   | K  | L | M  |
|-------------|-------|-----|-----|------|------|----|-----|----|-----|----|---|----|
| CQ-G03**-21 | 179.5 | 146 | 62  | 45.1 | 61.5 | 19 | 89  | 35 | 88  | 60 | 4 | 60 |
| CQ-G06**-21 | 204.5 | 171 | 82  | 51.4 | 75   | 24 | 100 | 40 | 102 | 70 | 4 | 70 |
| CQ-G10**-21 | 251   | 216 | 102 | 54   | 89   | 30 | 131 | 51 | 122 | 92 | 6 | 92 |

Sub Plate MG-\*\*\*-20



Note 1: The figure shows size 10(X), with four M10 tap holes for size 03(X) and 06(X) valve mounting bolts.

Note 2: When a valve cover external drain and external pilot port are used, remove the plugs from the sub plate external drain and external pilot port.

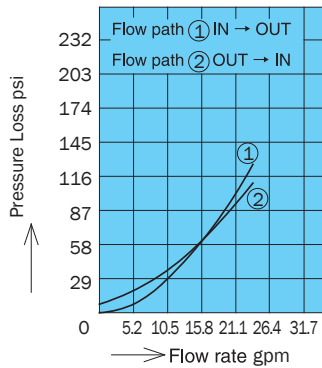
| Model No. | AA  | BB    | CC  | DD   | EE   | FF   | GG  | HH  | JJ  | KK   | LL   | MM   | NN   | PP   | QQ  | RR   | SS   | TT   | UU | VV | WW | XX | YY    |
|-----------|-----|-------|-----|------|------|------|-----|-----|-----|------|------|------|------|------|-----|------|------|------|----|----|----|----|-------|
| MG-03-20  | 128 | 106.4 | 88  | 66.6 | 58.7 | 33.3 | 7.9 | 76  | 62  | 42.9 | 31.8 | -    | 21.4 | 7.2  | 3.5 | 21.4 | 35.7 | 39.5 | 4  | 14 | 11 | 30 | 3/8   |
| MG-03X-20 |     |       |     |      |      |      |     |     |     |      |      |      |      |      |     |      |      |      |    |    |    |    | 1/2   |
| MG-06-20  | 160 | 123.8 | 102 | 79.3 | 72.9 | 39.7 | 6.4 | 110 | 82  | 60.3 | 44.5 | -    | 20.6 | 11.1 | 3.7 | 39.7 | 49.2 | 56.7 | 4  | 22 | 16 | 40 | 3/4   |
| MG-06X-20 |     |       |     |      |      |      |     |     |     |      |      |      |      |      |     |      |      |      |    |    |    |    | 1     |
| MG-10-20  | 160 | 138.1 | 122 | 96.8 | 92.9 | 48.4 | 3.9 | 150 | 102 | 84.1 | 62.7 | 42.1 | 24.6 | 16.7 | 4.1 | 59.5 | 67.5 | 80.1 | 6  | 30 | 16 | 53 | 1 1/4 |
| MG-10X-20 |     |       |     |      |      |      |     |     |     |      |      |      |      |      |     |      |      |      |    |    |    |    | 1 1/2 |

**Performance Curves**

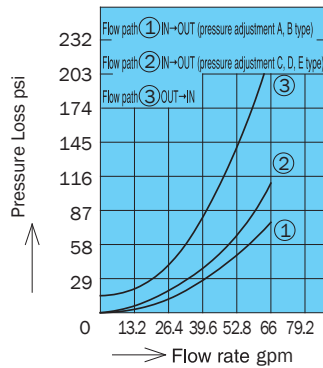
Hydraulic Operating Fluid Viscosity 32 centistokes

Pressure Loss Characteristics

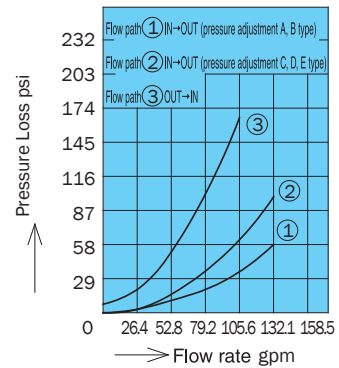
(C)Q-T03-\*\*\*-21



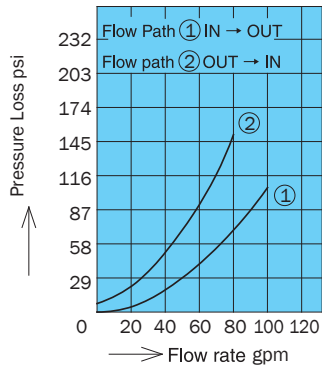
(C)Q-T06-\*\*\*-21



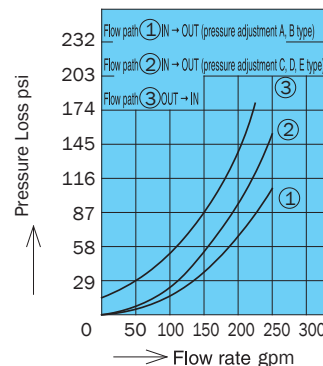
(C)Q-T10-\*\*\*-21



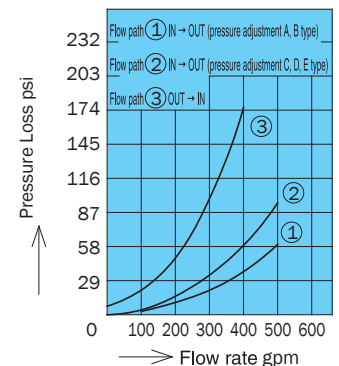
(C)Q-G03-\*\*\*-21



(C)Q-G06-\*\*\*-21

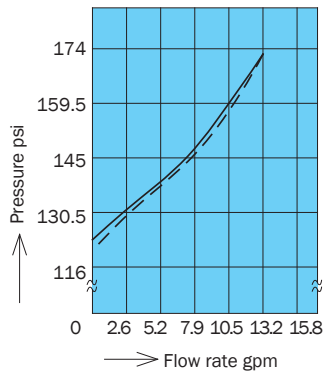


(C)Q-G10-\*\*\*-21

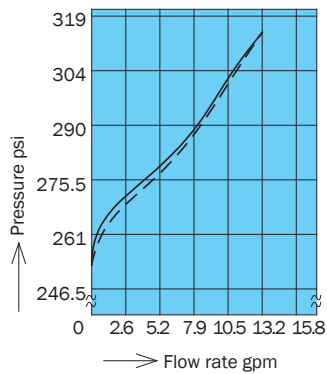


Pressure - Flow Rate Characteristics ( — : Press rise  
 - - - : Pressure drop )

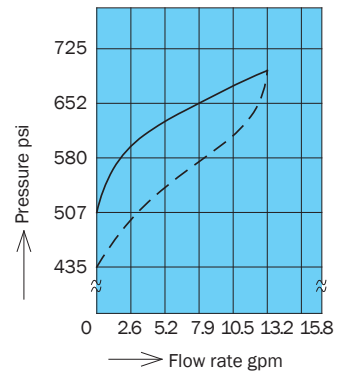
(C)Q-\*03-2A-21



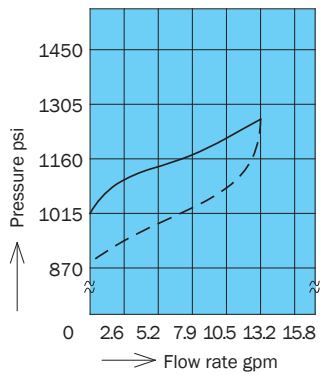
(C)Q-\*03-2B-21



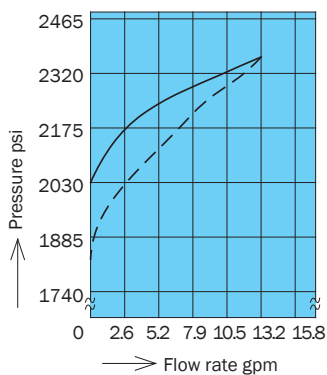
(C)Q-\*03-2C-21



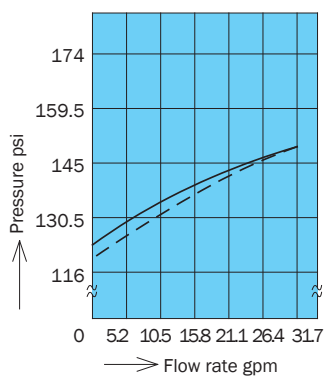
(C)Q-\*03-2D-21



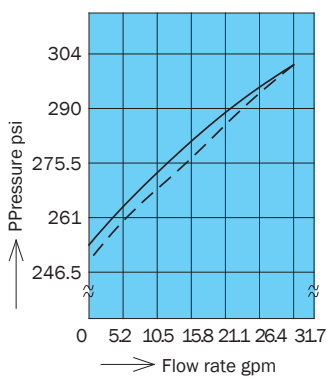
(C)Q-\*03-2E-21



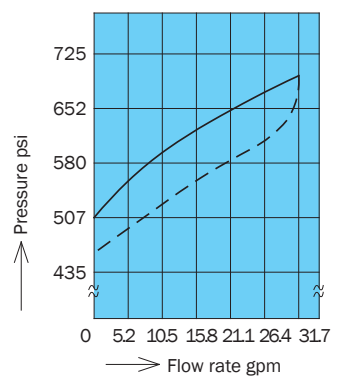
(C)Q-\*06-2A-21



(C)Q-\*06-2B-21

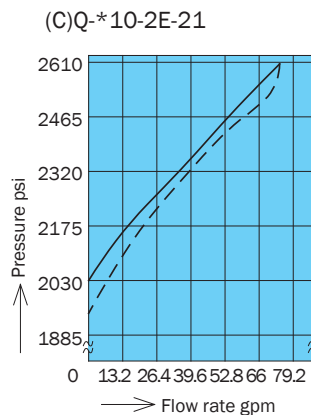
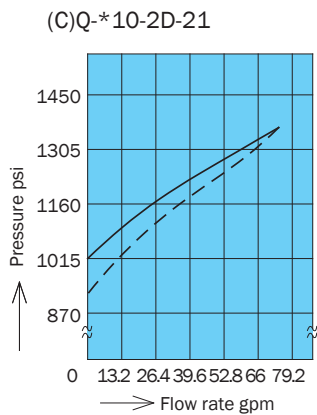
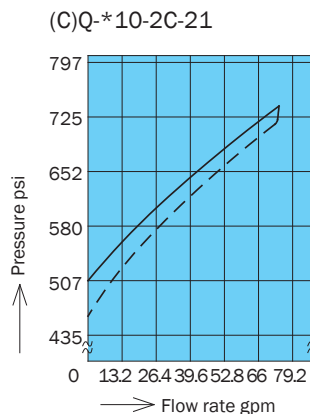
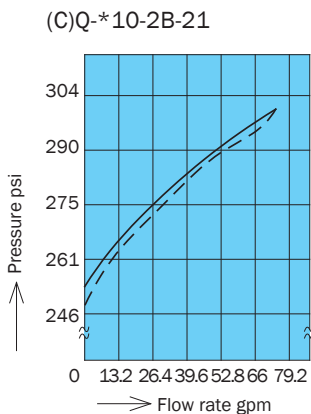
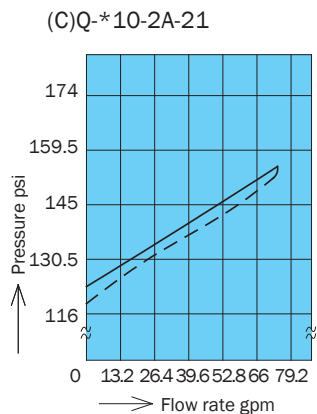
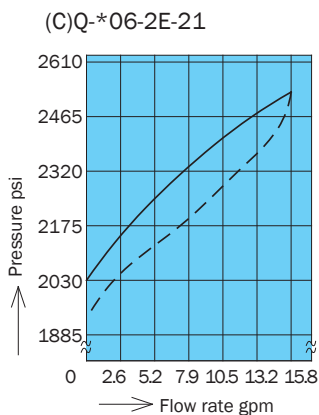
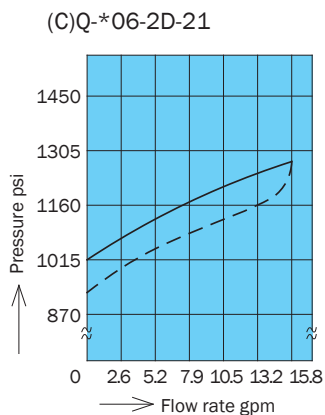


(C)Q-\*06-2C-21

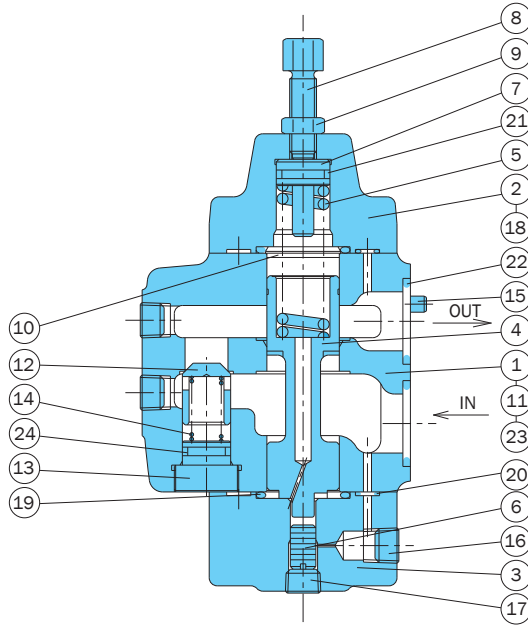


Pressure - Flow Rate Characteristics

( — : Press rise  
 - - - : Pressure drop )



CQ-G\*\*\*-21



| Part No. | Part Name    |
|----------|--------------|
| 1        | Body         |
| 2        | Cover        |
| 3        | Cover        |
| 4        | Piston       |
| 5        | Spring       |
| 6        | Plunger      |
| 7        | Push rod     |
| 8        | Screw        |
| 9        | Nut          |
| 10       | Spacer       |
| 11       | Nameplate    |
| 12       | Poppet       |
| 13       | Spring guide |
| 14       | Spring       |
| 15       | Pin          |
| 16       | Plug         |
| 17       | Plug         |
| 18       | Screw        |
| 19       | O-ring       |
| 20       | O-ring       |
| 21       | O-ring       |
| 22       | O-ring       |
| 23       | O-ring       |
| 24       | O-ring       |

Note: The illustration shows the configuration for pressure adjustment ranges Type C, Type D, and Type E. For Type A and Type B, the #6 piston is eliminated, and the #4 spool and #5 spring are different.

Note: Part numbers 12, 13, 14, and 24 are not required when there is no check valve.

Seal Part List (Kit Model Number RQBS-\*\*\* (C))

| Part No. | Part Name | Type/Part Number |              |              |              |              |              | Q'ty |
|----------|-----------|------------------|--------------|--------------|--------------|--------------|--------------|------|
|          |           | CQ-G03-**-21     | CQ-T03-**-21 | CQ-G06-**-21 | CQ-T06-**-21 | CQ-G10-**-21 | CQ-T10-**-21 |      |
| 19       | O-ring    | 1B-P22           | 1B-P22       | 1B-G30       | 1B-G30       | 1B-P40       | 1B-G40       | 2    |
| 20       | O-ring    | 1B-P6            | 1B-P6        | 1B-P6        | 1B-P6        | 1B-P6        | 1B-P6        | 4    |
| 21       | O-ring    | 1B-P11           | 1B-P11       | 1B-P16       | 1B-P16       | 1B-P22A      | 1B-P22A      | 1    |
| 22       | O-ring    | 1B-P20           | -            | 1B-P26       | -            | 1B-G35       | -            | 2    |
| 23       | O-ring    | 1B-P12           | -            | 1B-P12       | -            | 1B-P12       | -            | 2    |
| 24       | O-ring    | 1B-P11           | 1B-P11       | 1B-P14       | 1B-P14       | 1B-P22       | 1B-P22       | 1    |

Note: O-ring 1B-\*\* refers to JIS B2401-1B-\*\*. For the \*\*\* part of the kit number, specify the valve size (G03, T06). To specify inclusion of a check valve, add C to the end.



### Throttle (and Check) Valve

50 gpm  
3045 psi



#### Features

Compact and lightweight, requires very little space for installation. Special needle valve configuration provides smooth flow rate control.

Pressure is internally balanced for light handle operation, even at high pressure.

#### Specifications

| Model No.      |                 | Nominal Diameter (Size) | Maximum Flow Rate gpm | Cracking pressure psi | Maximum Working Pressure psi | Weight lbs |        |
|----------------|-----------------|-------------------------|-----------------------|-----------------------|------------------------------|------------|--------|
| Screw Mounting | Gasket Mounting |                         |                       |                       |                              | T Type     | G Type |
| (C)FR-T03-10   | (C)FR-G03-10    | 3/8                     | 7.9                   | 21.7                  | 3045                         | 2.8        | 3.7    |
| (C)FR-T06-10   | (C)FR-G06-10    | 3/4                     | 19.8                  | 14.5                  |                              | 6.6        | 8.1    |
| (C)FR-T10-10   | (C)FR-G10-10    | 1 1/4                   | 50                    |                       |                              | 12.3       | 12.7   |

#### • Handling

- The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control handle.
- The control flow rate does not become zero even if the handle is fully turned.
- There is no pressure or temperature compensation mechanism.
- Bi-directional restriction is possible when there is no check valve.
- Use the table to the right for specification when a sub plate is required.
- See the table to the right for installation hex socket bolts. However, bolts are not included for a screw mounting type.

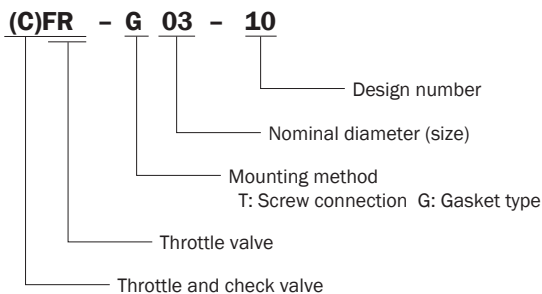
| Applicable Pump Model | Bolt Size  | Q'ty | Tightening Torque ft lbs |
|-----------------------|------------|------|--------------------------|
| (C)FR-G03-10          | M8 × 65 ℓ  | 4    | 14.7 to 18.4             |
| (C)FR-G06-10          | M12 × 75 ℓ | 4    | 55 to 70                 |
| (C)FR-G10-10          | M14 × 90 ℓ | 4    | 88 to 110                |

Note: For mounting bolts, use 12T or equivalent.

#### • Sub Plate

| Model No. | Pipe Diameter | Recommended Flow Rate gpm | Weight lbs | Applicable Valve Type |
|-----------|---------------|---------------------------|------------|-----------------------|
| MFR-03-10 | 3/8           | 7.9                       | 2.2        | (C)FR-G03-10          |
| MFR-06-10 | 3/4           | 19.8                      | 4.8        | (C)FR-G06-10          |
| MFR-10-10 | 1 1/4         | 50                        | 9          | (C)FR-G10-10          |

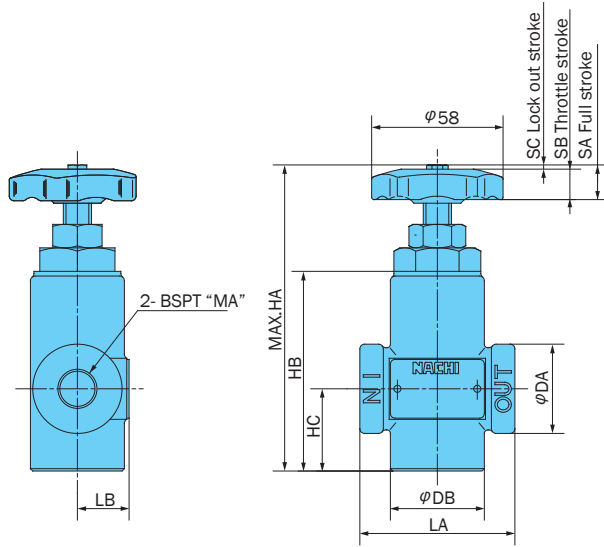
#### Understanding Model Numbers





# Installation Dimension Drawings

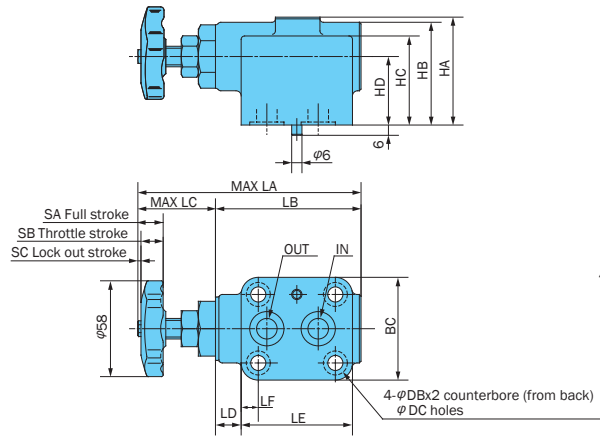
(C)FR-T\*\*-10 (Screw Mounting)



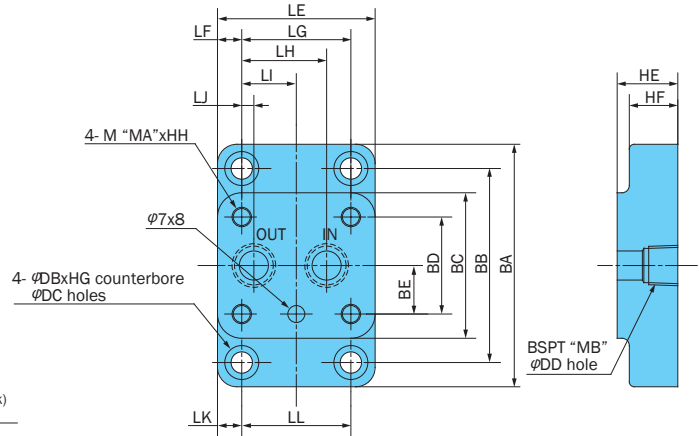
| Model No.    | LA  | LB   | DA | DB |
|--------------|-----|------|----|----|
| (C)FR-T03-10 | 66  | 21.5 | 38 | 40 |
| (C)FR-T06-10 | 95  | 30.5 | 55 | 55 |
| (C)FR-T10-10 | 130 | 38.5 | 74 | 70 |

| HA    | HB  | HC | SA | SB | SC | MA    |
|-------|-----|----|----|----|----|-------|
| 130.5 | 85  | 35 | 7  | 6  | 1  | 3/8   |
| 175.5 | 123 | 55 | 10 | 9  | 1  | 3/4   |
| 206.5 | 150 | 70 | 14 | 12 | 2  | 1 1/4 |

(C)FR-G\*\*-10 (Gasket Mounting)



Sub Plate MFR\*\*-10



| DB | DC  | DD | MA | MB    | SA | SB | SC |
|----|-----|----|----|-------|----|----|----|
| 14 | 8.8 | 12 | 8  | 3/8   | 7  | 6  | 1  |
| 20 | 13  | 20 | 12 | 3/4   | 10 | 9  | 1  |
| 23 | 15  | 30 | 14 | 1 1/4 | 14 | 12 | 2  |

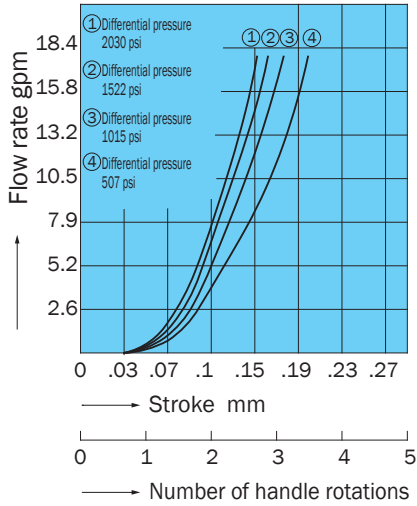
| Model Number | LA    | LB  | LC | LD | LE  | LF | LG | LH   | LI   | LJ   | LK | LL | BA  | BB  | BC | BD | BE | HA | HB | HC | HD | HE | HF | HG   | HH |
|--------------|-------|-----|----|----|-----|----|----|------|------|------|----|----|-----|-----|----|----|----|----|----|----|----|----|----|------|----|
| (C)FR-G03-10 | 130.5 | 85  | 45 | 15 | 65  | 10 | 45 | 35   | 22.5 | 5    | 10 | 45 | 100 | 80  | 60 | 40 | 20 | 63 | 60 | 52 | 40 | 25 | 20 | 8.6  | 18 |
| (C)FR-G06-10 | 175.5 | 123 | 52 | 14 | 96  | 13 | 70 | 55   | 35   | 15   | 14 | 68 | 132 | 106 | 80 | 54 | 27 | 71 | 68 | 57 | 40 | 30 | 25 | 13   | 20 |
| (C)FR-G10-10 | 206.5 | 150 | 56 | 14 | 120 | 15 | 90 | 72.5 | 45   | 17.5 | 16 | 88 | 154 | 122 | 90 | 60 | 30 | 83 | 80 | 68 | 45 | 40 | 35 | 15.2 | 25 |

## Performance Curves

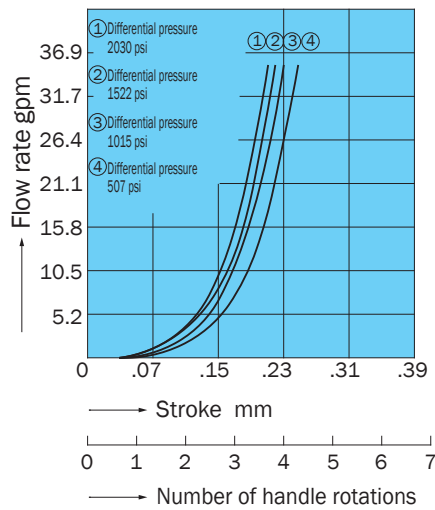
Hydraulic Operating Fluid Viscosity 32 centistokes

Stroke – Flow Rate Characteristics

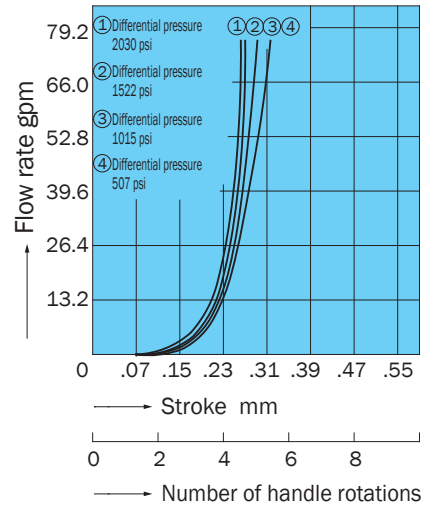
(C)FR-\*03-10



(C)FR-\*06-10



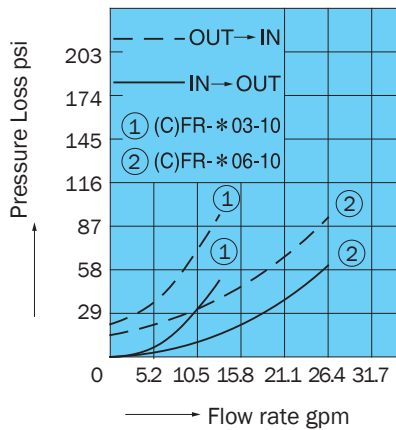
(C)FR-\*10-10



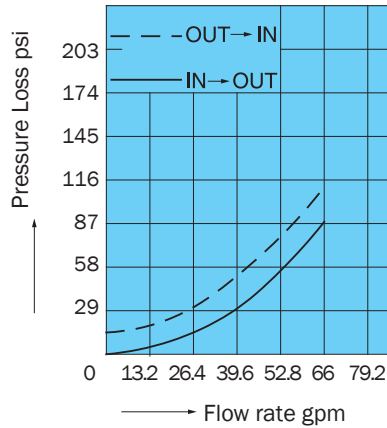
Pressure Loss Characteristics

(C)FR-\*03-10

(C)FR-\*06-10

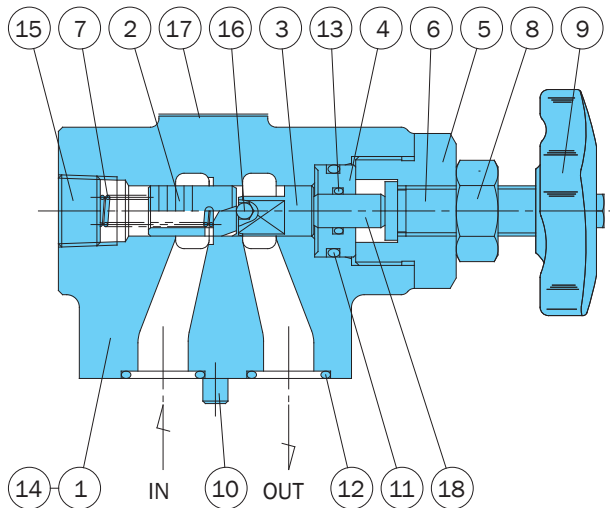


(C)FR-\*10-10



## Cross-sectional Drawing

CFR-G\*\*-10



Part No. Part Name

- 1 Body
- 2 Poppet
- 3 Piston
- 4 Bracket
- 5 Stopper
- 6 Screw
- 7 Spring
- 8 Nut
- 9 Handle
- 10 Pin
- 11 O-ring
- 12 O-ring
- 13 O-ring
- 14 Plug
- 15 Plug
- 16 Ball
- 17 Plate
- 18 Rod

Seal Part List (Kit Model Number FSS-\*\*\*)

| Part No. | Part Name | CFR-G03-10  |      | CFR-G06-10  |      | CFR-G10-10  |      |
|----------|-----------|-------------|------|-------------|------|-------------|------|
|          |           | Part Number | Q'ty | Part Number | Q'ty | Part Number | Q'ty |
| 11       | O-ring    | IB-P18      | 1    | IB-G25      | 1    | IB-G25      | 1    |
| 12       | O-ring    | IB-P16      | 2    | IB-G25      | 2    | IB-G35      | 2    |
| 13       | O-ring    | IB-P8       | 1    | IB-P8       | 1    | IB-P8       | 1    |

Note: O-ring 1B-\*\* refers to JIS B2401:1B-\*\*.

\*\*\* in the kit number is used for specification of the valve size (G03, T06, etc.)



FT-GO\*-\*\*-22



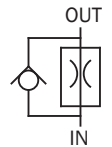
**FT Type Flow Control (and Check) Valve (with Pressure and Temperature Compensation)** .01 to 28 gpm  
3045 psi

### Features

Pressure compensation and temperature compensation mechanisms provide a stable control flow rate, even when fluid

temperature fluctuates. A wider control flow rate range as well as easier minute flow rate adjustability than previous products.

CFT-G02\*-\*\*-22



### Specifications

| Model No.               | Nominal Diameter (Size) | Volume control flow rate gpm | Maximum Working Pressure psi | Reverse Flow Rate gpm | Cracking pressure psi | Weight lbs | Gasket Surface Dimensions |
|-------------------------|-------------------------|------------------------------|------------------------------|-----------------------|-----------------------|------------|---------------------------|
| (C)FT-G02-8-22<br>30-22 | 1/4                     | .01 to 2.1<br>.02 to 7.9     | 3045                         | 13.2                  | 14.5                  | 8.1        | ISO 6263-AK-06-2-A        |
| FT-G03-42-22<br>106-22  | 3/8                     | .02 to 11.0<br>.05 to 28.0   |                              | 31.7                  |                       | 17.4       | ISO 6263-AM-07-2-A        |

Asterisk (\*) indicates values for auxiliary plate with check valve.

#### • Handling

- In the temperature range of 68°F to 140°F, flow rate fluctuation is within ±5% of the standard flow rate at 104°F.
- In the pressure range of 145 to 3045 psi, flow rate fluctuation is within ±5% of the setting flow rate.
- Note that flow rate fluctuation exceeds the rated fluctuation amount slightly in the vicinity of the minimum control flow rate, due to changes in operating temperature and hydraulic fluid viscosity.
- When controlling flow rates that are less than .05 gpm, use with a filter that does not exceed 10µm.
- For flow rate control, make sure that the pressure differential between the input port and output port is at least 145 psi.
- The control flow rate is increased by clockwise (rightward) rotation of the control handle.

7 See the table below for installation hex socket bolts.

8 Use the following table for specification when a sub plate is required.

#### • Sub Plate and Auxiliary Plate Application Table

| Name                               | Model No.   | Pipe Diameter | Recommended Flow Rate gpm | Weight lbs | Applicable Valve Type | Use With Sub Plate |               |   |
|------------------------------------|-------------|---------------|---------------------------|------------|-----------------------|--------------------|---------------|---|
| Sub Plate                          | MF-02X-10   | 3/8           | 7.9                       | 4.8        | (C)FT-G02*-**-22      | -                  |               |   |
|                                    | MF-02Y-20   | 1/2           | 13.2                      |            |                       |                    |               |   |
| Sub Plate                          | MF-03-10    | 3/8           | 11                        | 7.2        | FT-G03*-**-22         | -                  |               |   |
|                                    | MF-03Y-20   | 3/4           | 19.8                      |            |                       |                    |               |   |
|                                    | MF-03Z-20   | 1             | 31.7                      |            |                       |                    |               |   |
| Sub Plate with Check Valve         | MF-03Y-C-22 | 3/4           | 19.8                      | 12.5       |                       |                    | FT-G03*-**-22 | - |
|                                    | MF-03Z-C-22 | 1             | 31.7                      |            |                       |                    |               |   |
| Auxiliary Plate A with Check Valve | MCF-03-A-22 | φ23           | 31.7                      | 7.0        |                       |                    |               |   |

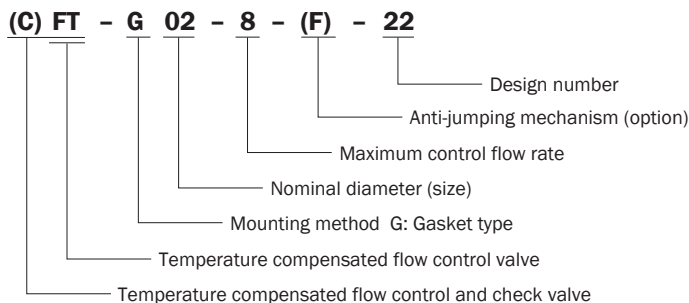
9 Though FT-G03 does not have a built-in check valve, a sub plate with check valve and auxiliary plate with check valve is

used in addition to the normal sub-plate. (Use the auxiliary plate in combination with the sub plate.)

| Applicable Model            | Bolt Size   | Q'ty | Tightening Torque ft lbs |
|-----------------------------|-------------|------|--------------------------|
| (G)FT-G02*-**-22            | M8 × 55 ℓ   | 4    | 14.7 to 18.4             |
| FT-G03*-**-22               | M10 × 75 ℓ  | 4    | 55 to 70                 |
| With FT-G03 Auxiliary Plate | M10 × 110 ℓ | 4    | 55 to 70                 |

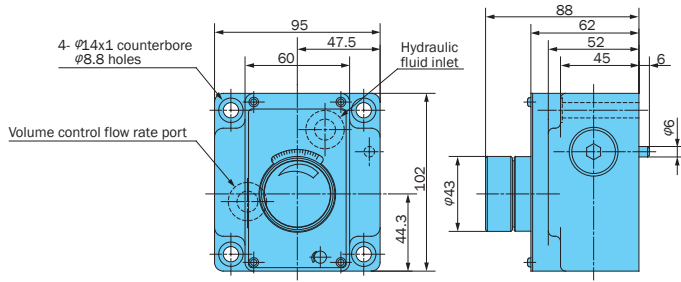
Note: For mounting bolts, use grade 8 or equivalent.

### Understanding Model Numbers

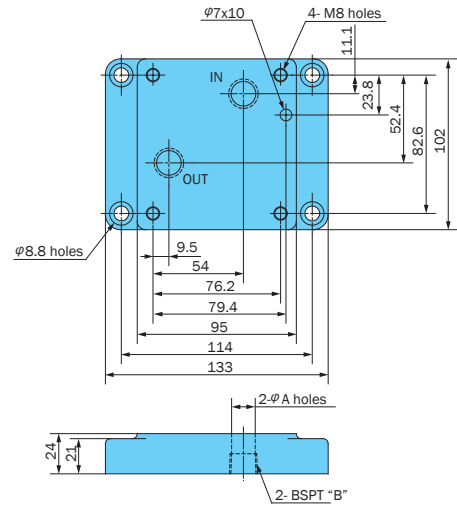


# Installation Dimension Drawings

(C)FT-G02-\*\*-22

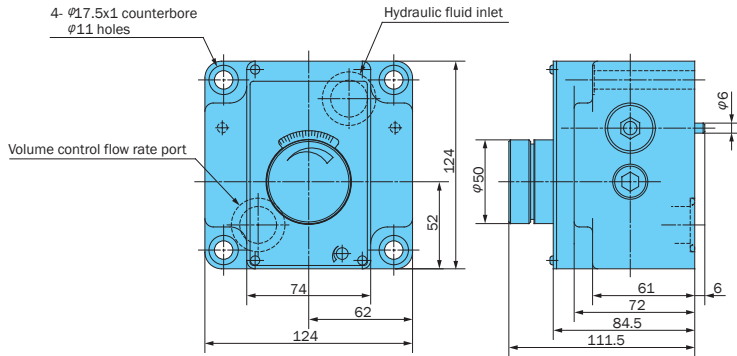


Sub Plate MF-02\*-.\*



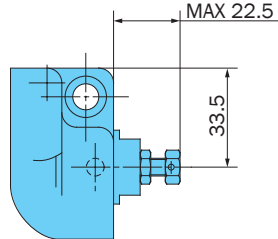
| Sub Plate | A    | B   |
|-----------|------|-----|
| MF-02X-10 | 14.7 | 3/8 |
| MF-02Y-20 | 17   | 1/2 |

FT-G03-\*\*\*-22

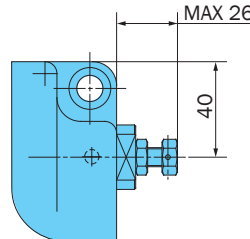


Anti-jumping mechanism

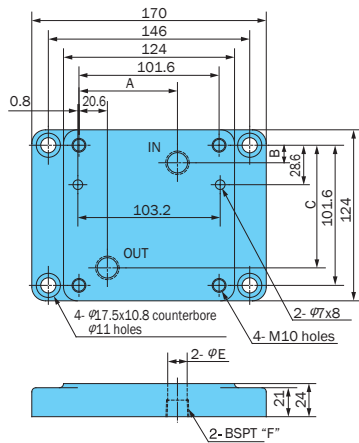
(C)FT-G02-\*\*-F-22



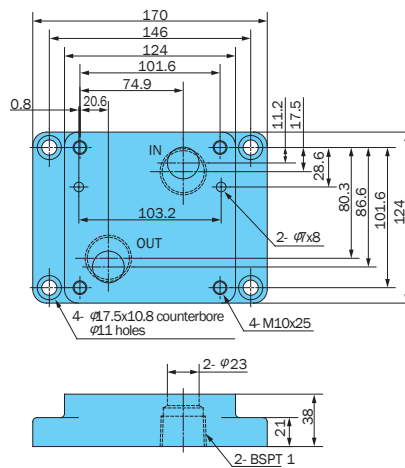
(C)FT-G03-\*\*-F-22



Sub Plate MF-03-10  
MF-03Y-20

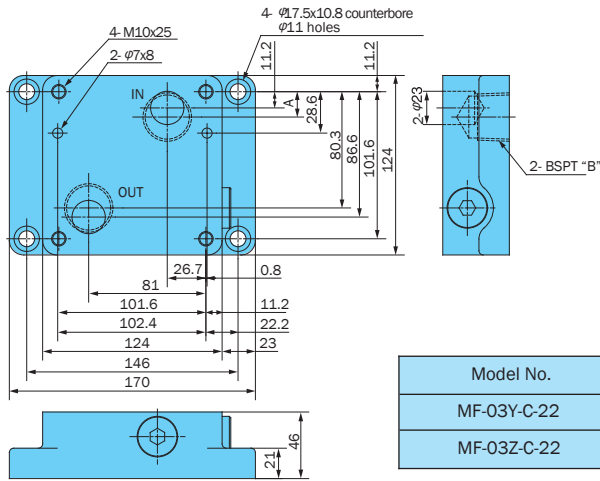


MF-03Z-20

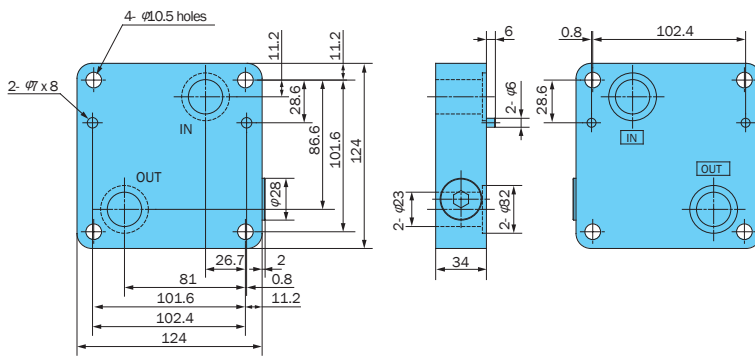


| Sub Plate | A    | B    | C    | E    | F   |
|-----------|------|------|------|------|-----|
| MF-03-10  | 71.4 | 12.7 | 88.9 | 14.7 | 3/8 |
| MF-03Y-20 | 74.9 | 11.2 | 86.6 | 23.0 | 3/4 |

### Sub Plate with Check Valve MF-03\*-C-22



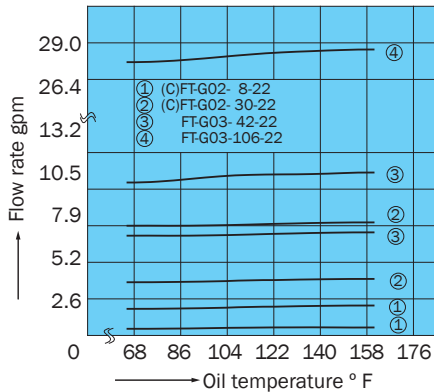
### Auxiliary Plate with Check Valve MCF-03-A-22



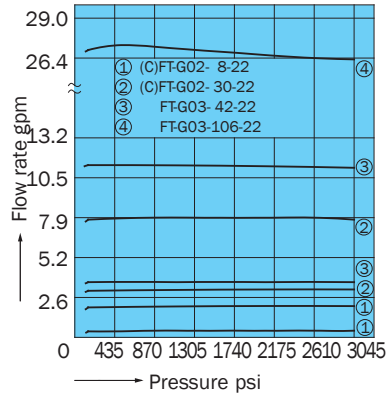
## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

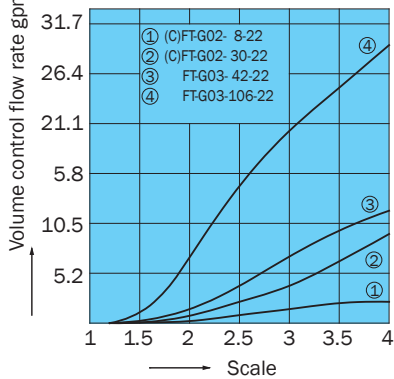
Fluid Temperature - Control Flow Rate Characteristics



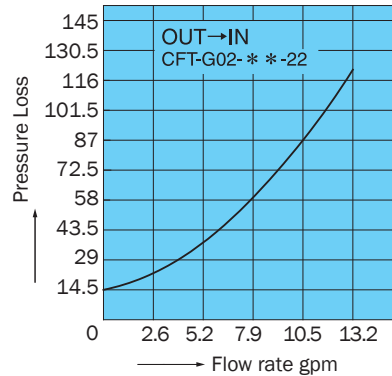
Pressure - Control Flow Rate Characteristics



Scale - Control Flow Rate Characteristics



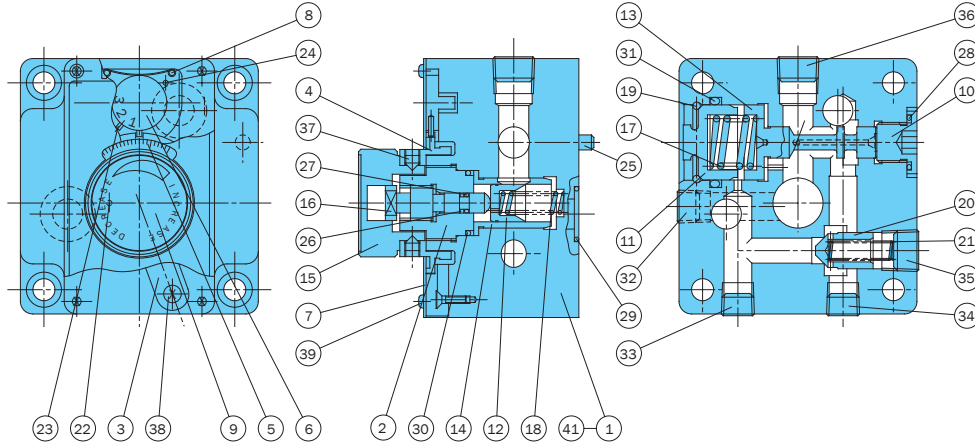
Pressure Loss Characteristics



# Cross-sectional Drawing

Note: O-ring 1A/B-\*\* refers to JIS B2401-1A/B.

CFT-G02-\*-22



| Part No. | Part Name | Part No. | Part Name   | Part No. | Part Name |
|----------|-----------|----------|-------------|----------|-----------|
| 1        | Body      | 15       | Knob        | 29       | O-ring    |
| 2        | Retainer  | 16       | Screw       | 30       | O-ring    |
| 3        | Stopper   | 17       | Spring      | 31       | O-ring    |
| 4        | Dial      | 18       | Spring      | 32       | Plug      |
| 5        | Plate     | 19       | Snap ring   | 33       | Plug      |
| 6        | Plate     | 20       | Poppet      | 34       | Plug      |
| 7        | Plate     | 21       | Spring      | 35       | Plug      |
| 8        | Spring    | 22       | Pin         | 36       | Plug      |
| 9        | Plate     | 23       | Pin         | 37       | Screw     |
| 10       | Plug      | 24       | Pin         | 38       | Screw     |
| 11       | Plug      | 25       | Pin         | 39       | Screw     |
| 12       | Throttle  | 26       | Backup ring | 40       | Washer    |
| 13       | Piston    | 27       | O-ring      | 41       | O-ring    |
| 14       | Sleeve    | 28       | O-ring      |          |           |

## Seal Part List (Kit Model Number FBBS-\*\*\*)

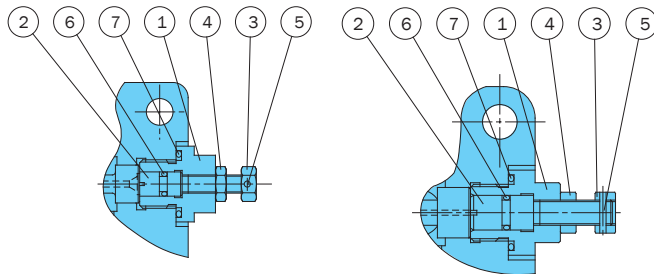
| Part No.        | Part Name   | (C)FT-G02-*-22 |      | FT-G03-*-22 |      |
|-----------------|-------------|----------------|------|-------------|------|
|                 |             | Part Number    | Q'ty | Part Number | Q'ty |
| 26              | Backup ring | T2-P5          | 1    | T2-P5       | 1    |
| 27              | O-ring      | IB-P5          | 1    | IB-P5       | 1    |
| 28              | O-ring      | IB-P18         | 1    | IB-P20      | 1    |
| 29              | O-ring      | IB-P18         | 2    | IB-P26      | 2    |
| 30              | O-ring      | IB-P22         | 1    | IB-P26      | 1    |
| 31              | O-ring      | IB-P30         | 1    | IB-P38      | 1    |
| 41              | O-ring      | -              | -    | IB-P20      | 1    |
| Seal Kit Number |             | FBBS-G02-1A    |      | FBBS-G03    |      |

Note: 1.O-ring 1B-\*\* refers to JIS B2401-1B-\*\*. 2.Backup ring indicates JIS B2407-T2\*\*.

## Anti-jumping mechanism

(C)FT-G02-\*-F-22

(C)FT-G03-\*-22



## Anti-jumping mechanism

Part No. Part Name

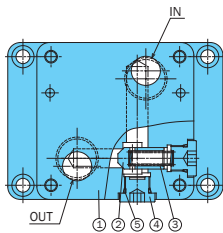
|   |            |
|---|------------|
| 1 | Retainer   |
| 2 | Bolt       |
| 3 | Nut        |
| 4 | Nut        |
| 5 | Spring pin |
| 6 | O-ring     |
| 7 | O-ring     |

## List of Sealing Parts

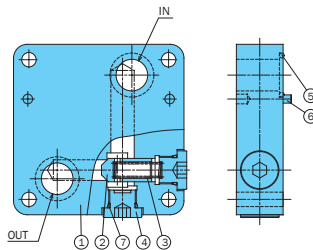
| Part No. | Part Name | (C)FT-G02-*-22 |      | FT-G03-*-22 |      |
|----------|-----------|----------------|------|-------------|------|
|          |           | Part Number    | Q'ty | Part Number | Q'ty |
| 6        | O-ring    | IB-P5          | 1    | IB-P8       | 1    |
| 7        | O-ring    | IB-P18         | 1    | IB-P20      | 1    |

Note: 1.O-ring 1B-\*\* refers to JIS B2401-1B-\*\*. 2.#7 O-ring and #29 O-ring are interchangeable.

## Sub Plate MF-03\*-C-22



## MCF-03-A-22



| Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|
| 1        | Sub Plate | 4        | Plug      |
| 2        | Poppet    | 5        | O-ring    |
| 3        | Spring    |          |           |

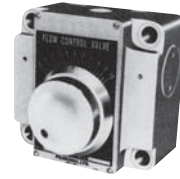
## List of Sealing Parts

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 5        | O-ring    | 1B-P18      | 2    |

| Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|
| 1        | Sub Plate | 5        | O-ring    |
| 2        | Poppet    | 6        | Pin       |
| 3        | Spring    | 7        | O-ring    |
| 4        | Plug      | 8        | Screw     |

## List of Sealing Parts

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 5        | O-ring    | 1B-P26      | 2    |
| 7        | O-ring    | 1B-P18      | 2    |



F-G\*\*\*-20



### F Type Flow Control (and Check) Valve (with Pressure Compensation)

2.3 to 98.5 gpm  
3045 psi

CF-G\*\*\*-20



#### Features

Wide control flow rate range.  
A pressure compensation mechanism ensures that the control flow rate does not change, even when there is pressure fluctuation.

#### Specifications

| Model No.       | Nominal Diameter (Size) | Volume control flow rate gpm | Maximum Working Pressure psi | Cracking pressure psi | Weight lbs | Gasket Surface Dimensions |
|-----------------|-------------------------|------------------------------|------------------------------|-----------------------|------------|---------------------------|
| (C)F-G06-170-20 | 3/4                     | 2.3 to 44.9                  | 3045                         | 14.5                  | 45.2       | ISO 6263-AP-08-2-A        |
| (C)F-G10-373-20 | 1 1/4                   | 5.2 to 98.5                  |                              |                       | 95         | -                         |

#### • Handling

- 1 In the pressure range of 145 to 3045 psi, flow rate fluctuation is within  $\pm 5\%$  of the setting flow rate.
- 2 For flow rate control, make sure that the pressure differential between the input port and output port is at least 145 psi.
- 3 The control flow rate is increased by clockwise (rightward) rotation of the control handle.

4 See the table below for installation hex socket bolts.

5 Use the following table for specification when a sub plate is required.

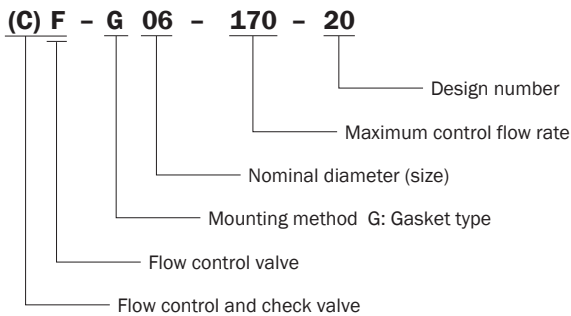
Sub Plate Application Table

| Model No. | Pipe Diameter | Recommended Flow Rate gpm | Weight lbs | Applicable Valve Type |
|-----------|---------------|---------------------------|------------|-----------------------|
| MF-06-10  | 3/4           | 28                        | 13.8       | (C)F-G06-170-20       |
| MF-06X-20 | 1             | 44.9                      | 21.3       |                       |
| MF-10-10  | 1 1/4         | 64.9                      | 46.5       | (C)F-G10-373-20       |

| Applicable Model | Bolt Size   | Q'ty | Tightening Torque ft lbs |
|------------------|-------------|------|--------------------------|
| (C)F-G06         | M16 × 100 ℓ | 4    | 140 to 173               |
| (C)F-G10         | M20 × 115 ℓ | 4    | 272 to 339               |

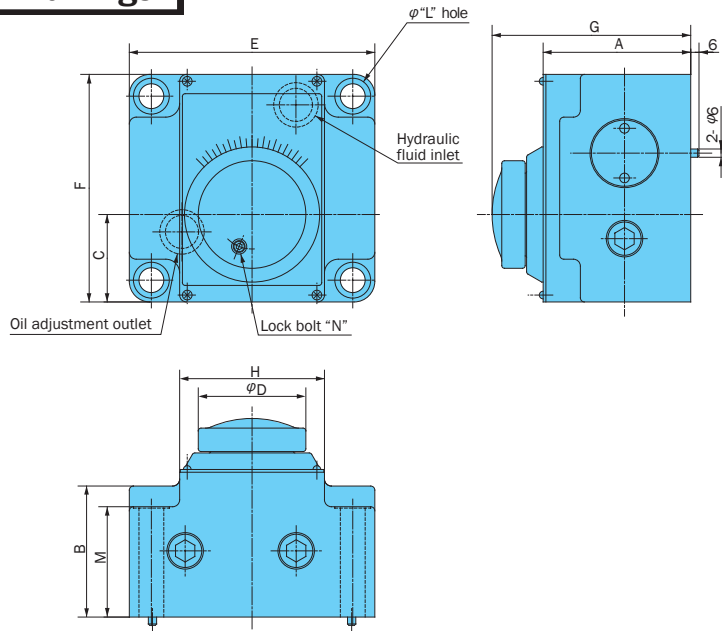
Note: For mounting bolts, use 12T or equivalent.

#### Understanding Model Numbers



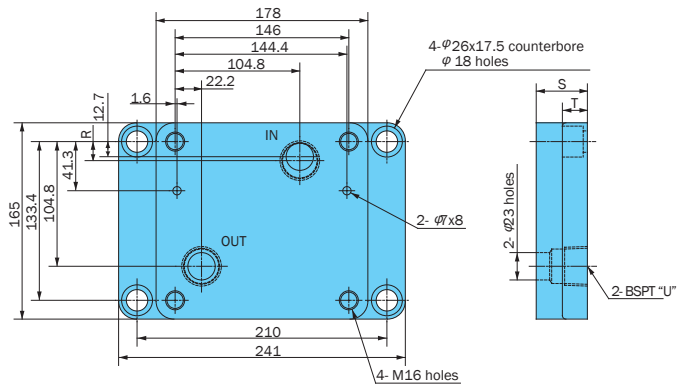
# Installation Dimension Drawings

(C)F-G\*\*-\*-20



| Model No.     | Dimensions mm |     |      |    |     |     |       |     |    |   |    |    |    |
|---------------|---------------|-----|------|----|-----|-----|-------|-----|----|---|----|----|----|
|               | A             | B   | C    | D  | E   | F   | G     | H   | J  | K | L  | M  | N  |
| (C)F-G06-*-20 | 107           | 95  | 63.4 | 80 | 178 | 165 | 144.5 | 105 | 26 | 1 | 18 | 80 | M5 |
| (C)F-G10-*-20 | 124           | 108 | 81.8 | 90 | 245 | 225 | 169.5 | 140 | 32 | 1 | 22 | 89 | M6 |

Sub Plate MF-06\*-20



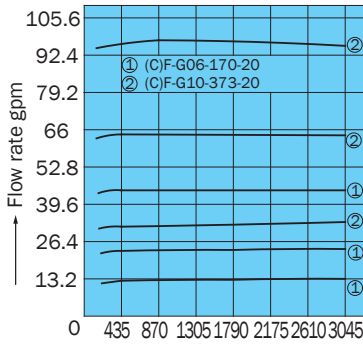
| Sub Plate | Dimensions mm |    |    |     |
|-----------|---------------|----|----|-----|
|           | R             | S  | T  | U   |
| MF-06-20  | 12.7          | 25 | 22 | 3/4 |
| MF-06X-20 | 16            | 43 | 21 | 1   |



## Performance Curves

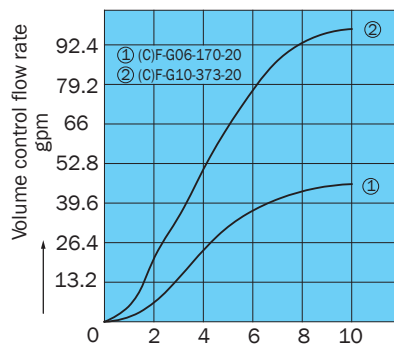
Hydraulic Operating Fluid Viscosity 32 centistokes

Pressure - Control Flow Rate Characteristics



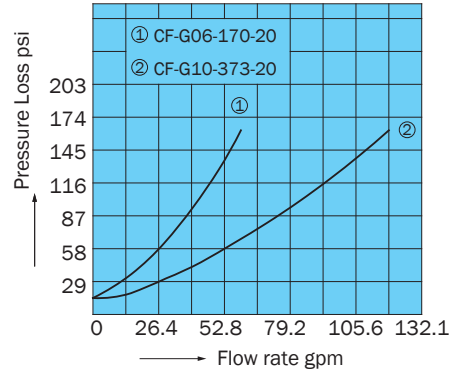
→ Pressure psi

Scale - Control Flow Rate Characteristics



→ Scale

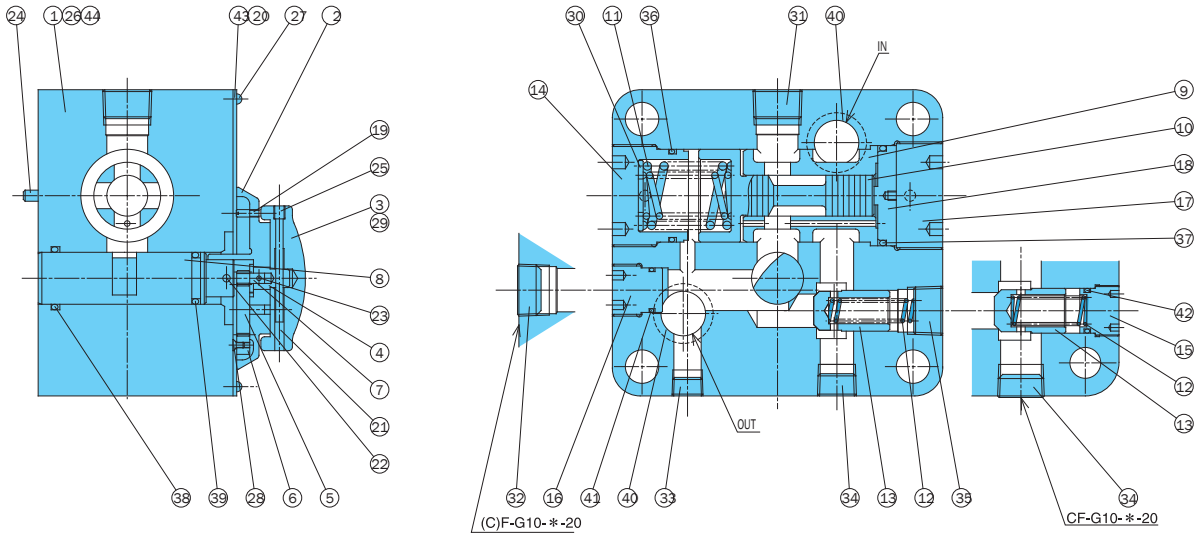
Pressure Loss Characteristics



→ Flow rate gpm

## Cross-sectional Drawing

CF-G\*\*-\*-\*20



| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name | Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 1        | Body      | 9        | Sleeve    | 18       | Retainer  | 27       | Screw     | 36       | O-ring    |
| 2        | Cover     | 10       | Piston    | 19       | Stopper   | 28       | Screw     | 37       | O-ring    |
| 3        | Knob      | 11       | Spring    | 20       | Pin       | 29       | Screw     | 38       | O-ring    |
| 4        | Gear      | 12       | Spring    | 21       | Pin       | 30       | Washer    | 39       | O-ring    |
| 5        | Gea       | 13       | Poppet    | 22       | Pin       | 31       | Plug      | 40       | O-ring    |
| 6        | Gear      | 14       | Plug      | 23       | Pin       | 32       | Plug      | 41       | O-ring    |
| 7        | Bushing   | 15       | Plug      | 24       | Pin       | 33       | Plug      | 42       | O-ring    |
| 8        | Throttle  | 16       | Plug      | 25       | Screw     | 34       | Plug      | 43       | Plate     |
|          |           | 17       | Plug      | 26       | Screw     | 35       | Plug      | 44       | Screw     |

Seal Part List (Kit Model Number FBBS-\*\*\*)

| Part No. | Part Name | CF-G06-170-20 |      | CF-G10-373-20 |      |
|----------|-----------|---------------|------|---------------|------|
|          |           | Part Number   | Q'ty | Part Number   | Q'ty |
| 36       | O-ring    | IB-G45        | 1    | IB-G60        | 1    |
| 37       | O-ring    | IB-P48        | 1    | IB-G65        | 1    |
| 38       | O-ring    | IB-P28        | 1    | IB-P45        | 1    |
| 39       | O-ring    | IB-P22A       | 1    | IB-P39        | 1    |
| 40       | O-ring    | IB-P29        | 2    | IB-P32        | 2    |
| 41       | O-ring    | IB-P20        | 1    | -             | -    |
| 42       | O-ring    | -             | -    | IB-P26        | 1    |

Note: O-ring 1B-\*\*\* refers to JIS B2401-1B-\*\*\*.  
For the \*\*\* part of the kit number, specify the valve size (G06, G10).



TN-G02-\*-11



**TN Type Flow Control (and Check) Valve** .0079 to 2.1 gpm  
**(Fine Adjustment Type with Pressure and Temperature Compensation)** 1522 psi

### Features

With a very compact, lightweight configuration, the intelligent design of this valve makes it a low-cost option. Minute flow rate control from 1.8 in<sup>3</sup>.

Stable control of each setting flow rate, even as pressure and fluid temperature are fluctuating. Dial markings are proportional

to flow rate for simple and accurate control flow rate adjustment.

### Specifications

| Model No.              | Nominal Diameter (Size) | Volume control flow rate gpm | Maximum Working Pressure psi | Reverse Flow Rate gpm | Cracking pressure psi | Weight lbs |
|------------------------|-------------------------|------------------------------|------------------------------|-----------------------|-----------------------|------------|
| (C)TN-G02-2-11<br>8-11 | 1/4                     | .007 to .52<br>.01 to 2.1    | 1522                         | 9.2                   | 14.5                  | 4.8        |

#### • Handling

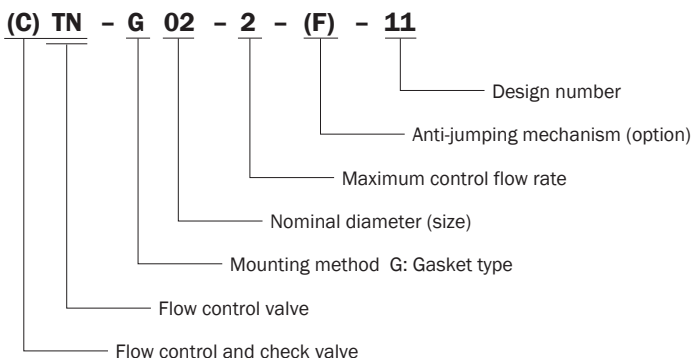
- In the temperature range of 68° to 140° F, flow rate fluctuation is within ±5% of the standard flow rate at 104° F.
- In the pressure range 145 to 1522 psi, flow rate fluctuation is within ±5% of the setting flow rate.
- Note that flow rate fluctuation exceeds the rated flow rate fluctuation amount slightly in the vicinity of the minimum control flow rate, due to changes in operating temperature and hydraulic fluid viscosity.
- When controlling flow rates that are less than .05 gpm, use with a filter that does not exceed 10µm.
- Make sure that the pressure differential between the inlet port and outlet is at least 87 psi at 1 gpm or less, and at least 145 psi at 16 gpm or greater.
- The control flow rate is increased by clockwise (rightward) rotation of the adjustment handle.

- For connection to piping, normally connect to the sub plate. Valve mounting is gasket type, using an O-ring. When a screw in connection is required, seal the gasket surface, remove the side plug, and create a screw in connection directly to the valve unit. In this case, remove all seal material affixed to the plug.
- Use the following table for specification when a sub plate is required.

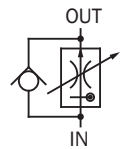
| Model No  | Pipe Diameter | Recommended Flow Rate gpm | Weight lbs |
|-----------|---------------|---------------------------|------------|
| MTL-03-10 | 3/8           | 9.2                       | 2.8        |

- Bundled Accessories: Hex Socket Bolts M8 x 60 ℓ, (four)  
 Note: 1.For mounting bolts, use 12T or equivalent.  
 2.Tightening torque is 14.7 to 18.4 ft lbs.

### Understanding Model Numbers

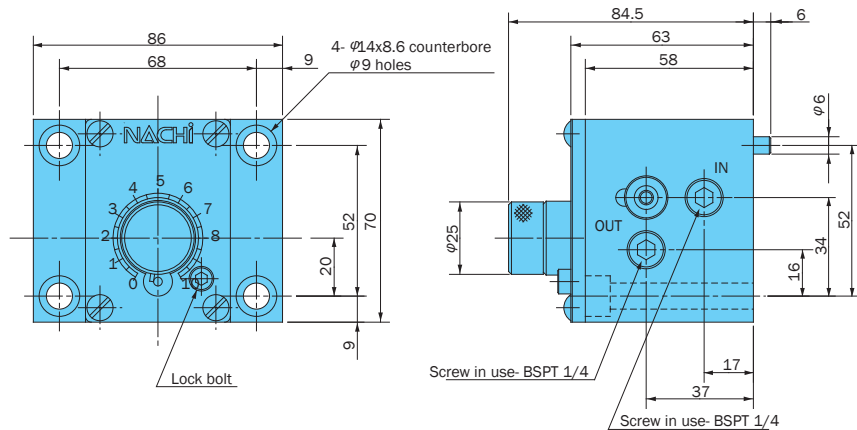


CTN-G02-\*-11

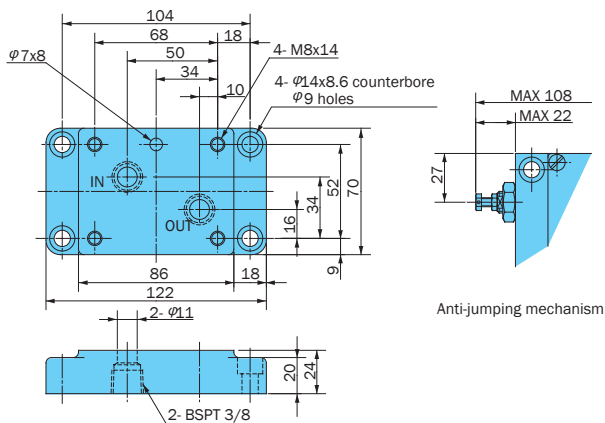


## Installation Dimension Drawings

(C)TN-G02-\*\*-11



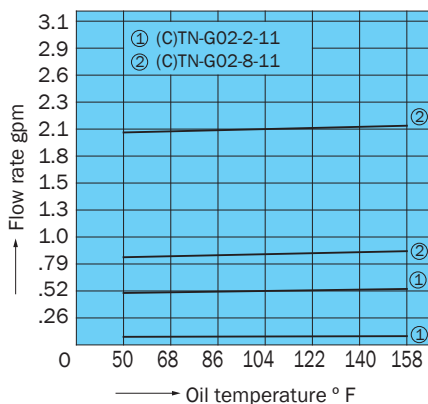
Sub Plate MTL-03-10



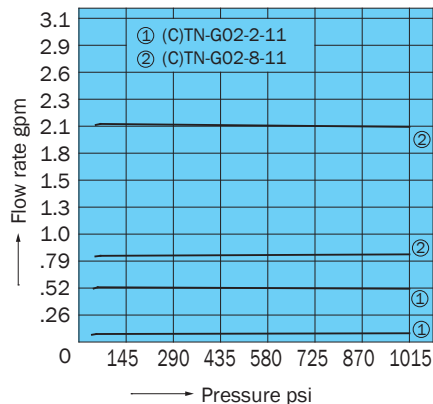
## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

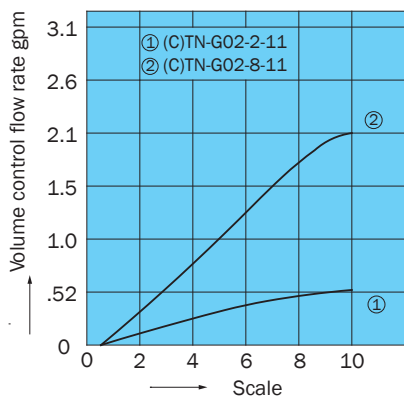
Fluid Temperature - Control Flow Rate Characteristics



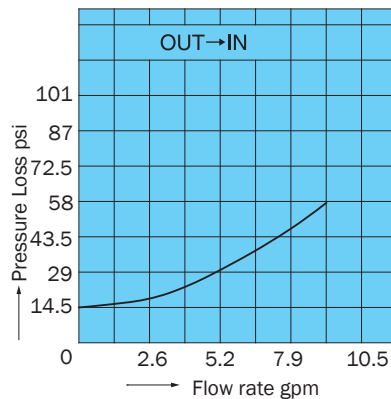
Pressure - Control Flow Rate Characteristics



Scale - Control Flow Rate Characteristics

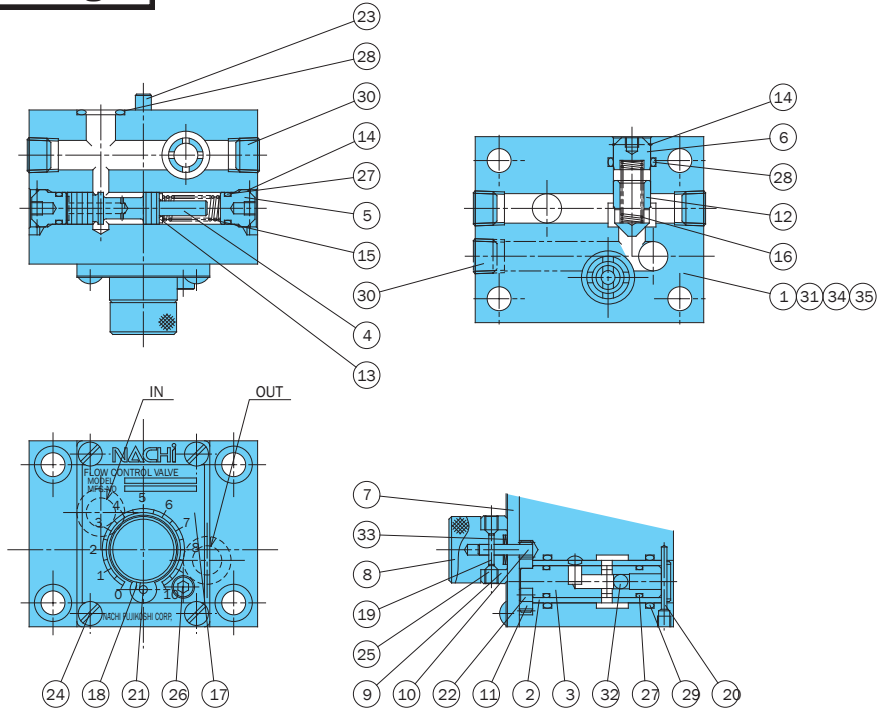


Pressure Loss Characteristics



# Cross-sectional Drawing

CTN-G02-\*-11



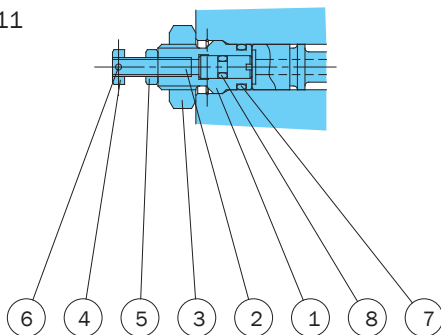
| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-----------|
| 1        | Body      | 13       | Spacer    | 25       | Screw     |
| 2        | Sleeve    | 14       | Snap ring | 26       | Screw     |
| 3        | Spool     | 15       | Spring    | 27       | O-ring    |
| 4        | Piston    | 16       | Spring    | 28       | O-ring    |
| 5        | Plug      | 17       | Plate     | 29       | O-ring    |
| 6        | Plug      | 18       | Pin       | 30       | Plug      |
| 7        | Plate     | 19       | Pin       | 31       | Ball      |
| 8        | Knob      | 20       | Pin       | 32       | Ball      |
| 9        | Ring      | 21       | Pin       | 33       | Washer    |
| 10       | Gear      | 22       | Pin       | 34       | Screw     |
| 11       | Gear      | 23       | Pin       | 35       | Plate     |
| 12       | Poppet    | 24       | Screw     |          |           |

## Seal Part List (Kit Model Number FNS-G02(C))

| Part No. | Part Name | TN-G02-*-11 |      | CTN-G02-*-11 |      |
|----------|-----------|-------------|------|--------------|------|
|          |           | Part Number | Q'ty | Part Number  | Q'ty |
| 27       | O-ring    | IA-P9       | 4    | IA-P9        | 4    |
| 28       | O-ring    | IA-P14      | 2    | IA-P14       | 3    |
| 29       | O-ring    | IA-P16      | 2    | IA-P16       | 2    |

Note: Specify C at the end of the model number for the CTN kit.  
 Note: O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.

## Anti-jumping mechanism (C)TN-G02-\*-F-11



| Part No. | Part Name  |
|----------|------------|
| 1        | Retainer   |
| 2        | Bolt       |
| 3        | Nut        |
| 4        | Nut        |
| 5        | Nut        |
| 6        | Spring pin |
| 7        | O-ring     |
| 8        | O-ring     |

## Seal Part List

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 7        | O-ring    | IA-P9       | 1    |
| 8        | O-ring    | IA-P3       | 1    |

Note: #7 O-ring and #27 O-ring are interchangeable.



TS-G01-2-11



### TS Type Flow Control (and Check) Valve .002 to .52 gpm (Fine Adjustment Type with Pressure and Temperature Compensation) 1522 psi

#### Features

Original compact, lightweight configuration.  
High-precision control up to minute flow rates of .61 in<sup>3</sup>.  
Design allows large 5.2 gpm reverse flow

rate relative to control flow rate, which means there is no need to include an extra valve in the quick return circuit.  
Stable control of each setting flow rate,

even as pressure and fluid temperature are fluctuating.

#### Specifications

| Model No.      | Nominal Diameter (Size) | Volume control flow rate gpm | Maximum Working Pressure psi | Reverse Flow Rate gpm | Cracking pressure psi | Weight lbs |
|----------------|-------------------------|------------------------------|------------------------------|-----------------------|-----------------------|------------|
| (C)TS-G01-2-11 | 1/8                     | .002 to .52                  | 1522                         | 5.2                   | 11.6                  | 1.9        |

#### • Handling

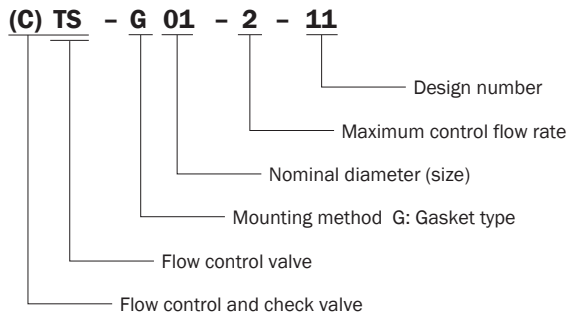
- In the temperature range of 68° to 140° F, flow rate fluctuation is within ±5% of the standard flow rate at 104° F.
- In the pressure range of 87 to 1522 psi, flow rate fluctuation is within ±5% of the setting flow rate.
- Note that flow rate fluctuation exceeds the rated fluctuation amount slightly in the vicinity of the minimum control flow rate, due to changes in operating temperature and hydraulic fluid viscosity.
- When controlling flow rates that are less than .05 gpm, use with a filter that does not exceed 10 μm.
- For flow rate control, make sure that the pressure differential between the input port and output port is at least 87 psi.
- The control flow rate is increased by clockwise (rightward) rotation of the control handle.
- Use the table to the right for specification when a sub plate is required.

| Model No.  | Pipe Diameter | Recommended Flow Rate gpm | Weight lbs |
|------------|---------------|---------------------------|------------|
| MTS-01Y-10 | 3/8           | 5.2                       | 1.7        |

8 Bundled Accessories: Hex Socket Bolts: M4 x 35 ℓ (four)

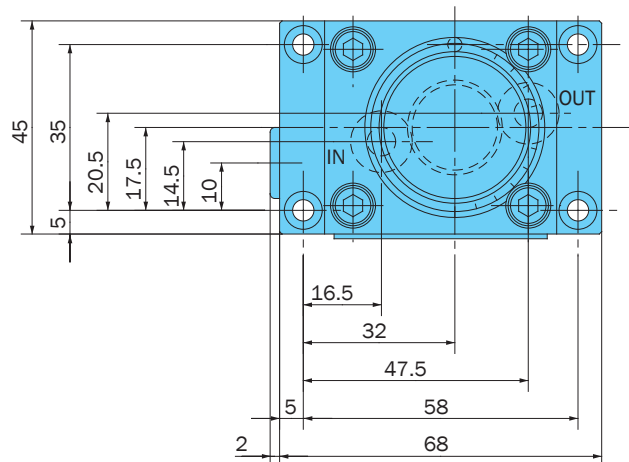
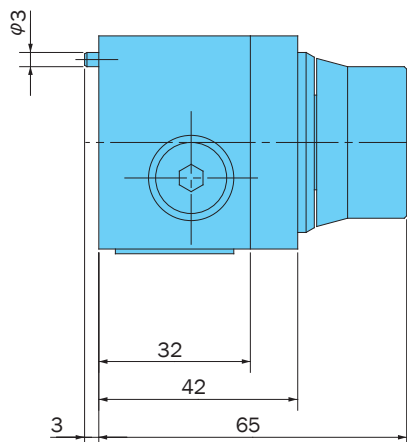
Note: 1.For mounting bolts, use 12T or equivalent.  
2.Tightening torque is 1.9 to 2.4 ft lbs.

#### Understanding Model Numbers

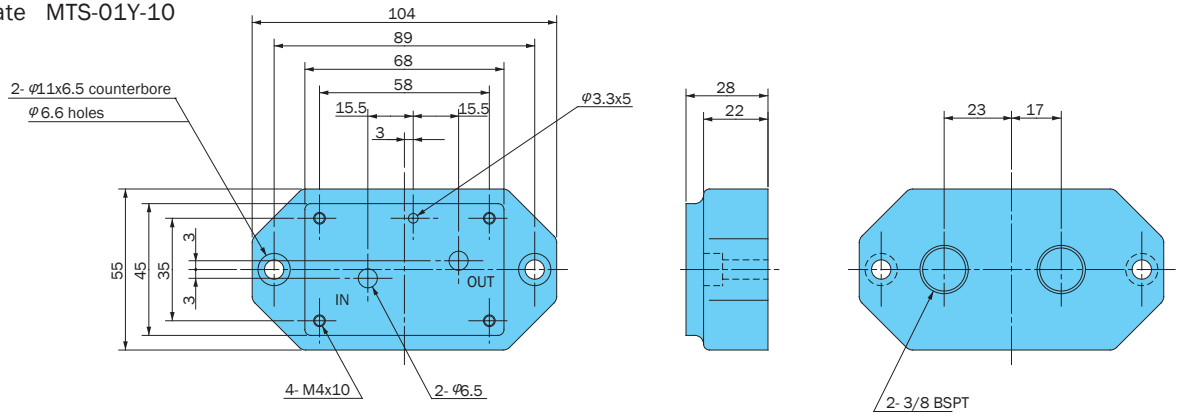


#### Installation Dimension Drawings

(C)TS-G01-2-11



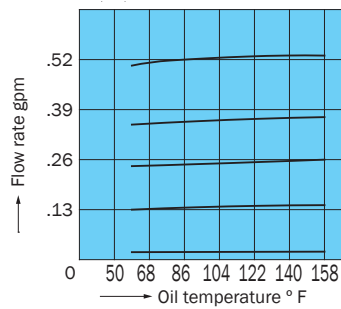
Sub Plate MTS-01Y-10



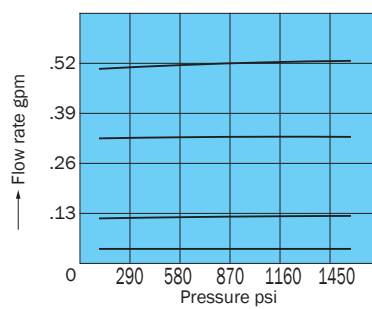
**Performance Curves**

Hydraulic Operating Fluid Viscosity 32 centistokes

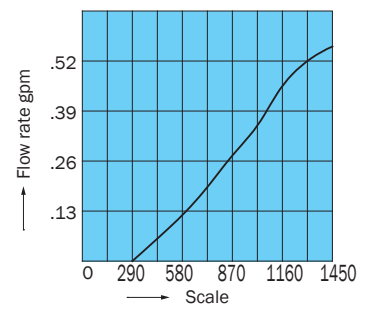
Fluid Temperature - Control Flow Rate Characteristics



Pressure - Control Flow Rate Characteristics

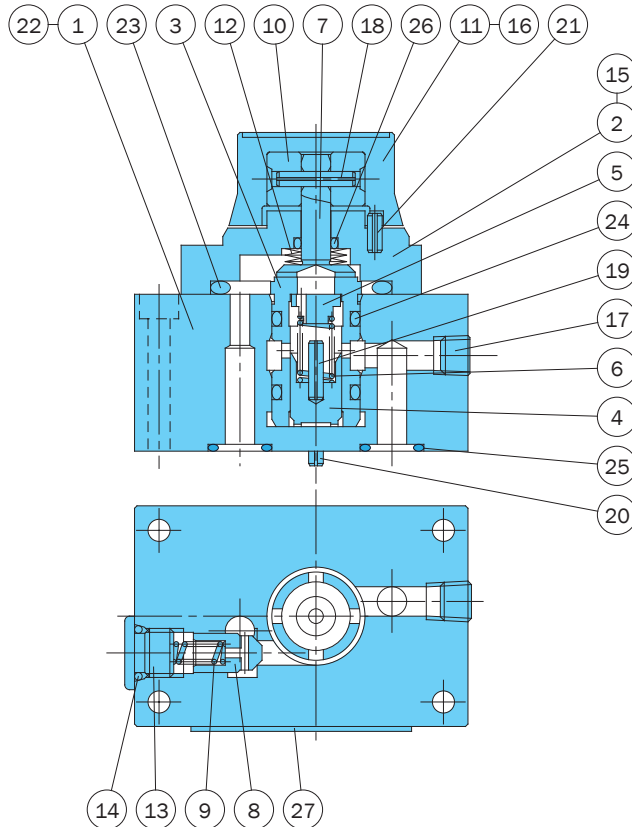


Scale - Control Flow Rate Characteristics

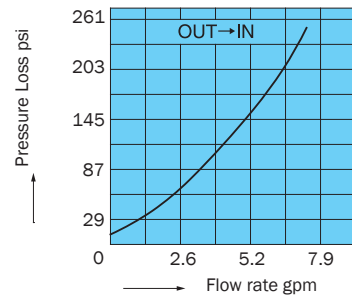


**Cross-sectional Drawing**

CTS-G01-2-11



Pressure Loss Characteristics



| Part No. | Part Name | Part No. | Part Name  | Part No. | Part Name  |
|----------|-----------|----------|------------|----------|------------|
| 1        | Body      | 10       | Spacer     | 19       | Spring pin |
| 2        | Cover     | 11       | Knob       | 20       | Spring pin |
| 3        | Sleeve    | 12       | Spring     | 21       | Spring pin |
| 4        | Piston    | 13       | Plug       | 22       | Spring pin |
| 5        | Guide     | 14       | O-ring     | 23       | O-ring     |
| 6        | Spring    | 15       | Screw      | 24       | O-ring     |
| 7        | Throttle  | 16       | Screw      | 25       | O-ring     |
| 8        | Poppet    | 17       | Plug       | 26       | O-ring     |
| 9        | Spring    | 18       | Spring pin | 27       | Nameplate  |

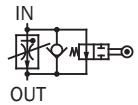
Seal Part List (Kit Model Number FKS-G01(C))

| Part No. | Part Name | TS-G01-2-11 |      | CTS-G01-2-11 |      |
|----------|-----------|-------------|------|--------------|------|
|          |           | Part Number | Q'ty | Part Number  | Q'ty |
| 14       | O-ring    | —           | —    | IB-P8        | 1    |
| 23       | O-ring    | IB-P31      | 1    | IB-P31       | 1    |
| 24       | O-ring    | IB-P14      | 2    | IB-P14       | 2    |
| 25       | O-ring    | IB-P10      | 2    | IB-P10       | 2    |
| 26       | O-ring    | IB-P6       | 1    | IB-P6        | 1    |

Note: O-ring 1B-\*\* refers to JIS B2401-1B-\*\*. Specify C at the end of the model number for the CTS kit.



TL-G0\*-\*-11



Note: O4 has DR

### TL (TLT) Type Feed Control Valve (Fine Control Type with Pressure Compensation)

.02 to 2.1 gpm  
1000 psi

#### Features

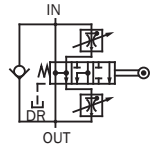
Very compact, lightweight, and economically priced.

Applicable for control of machine tool table operations. For example, a single valve provides smooth control of: Fast Feed =>

Cutting Feed (2 stage) => Fast Return.  
Stable control of each setting flow rate, even as pressure and fluid temperature are fluctuating.  
Dial markings are proportional to flow rate for simple control flow rate adjustment

Sealing the gasket surface allows as-is screw-in connection.

TLT-G04\*-\*-11



#### Specifications

| Model No                   | Nominal Diameter (Size) | Volume control flow rate gpm |                         | Reverse Flow Rate gpm | Maximum Working Pressure psi | Cracking pressure psi | Weight lbs |
|----------------------------|-------------------------|------------------------------|-------------------------|-----------------------|------------------------------|-----------------------|------------|
|                            |                         | Feed 1                       | Feed 2                  |                       |                              |                       |            |
| TL-G03-2-11<br>8-11        | 3/8                     | .02 to .5<br>.02 to 2.1      | -                       | 9.2                   | 1015                         | 14.5                  | 4.8        |
| TL-G04-2-11<br>8-11        | 1/2                     | .02 to .5<br>.02 to 2.1      | -                       | 14.0                  |                              |                       | 15.4       |
| TLT-G04-2-1.5-11<br>8-2-11 |                         | .02 to .5<br>.02 to 2.1      | .02 to .39<br>.02 to .5 |                       |                              |                       |            |

#### • Handling

- In the temperature range of 68° F to 140° F, flow rate fluctuation is within ±5% of the standard flow rate at 104° F.
- In the pressure range of 145 to 1000 psi, flow rate fluctuation is within ±5% of the setting flow rate.
- Note that flow rate fluctuation exceeds the rated fluctuation amount slightly in the vicinity of the minimum control flow rate, due to changes in operating temperature and hydraulic fluid viscosity.
- When controlling flow rates that are less than .05 gpm, use with a line filter no greater than 10µm.
- Make sure that the pressure differential between the inlet port and outlet is at least 87 psi at 1 gpm or less, and at least 145 psi at 1 gpm or greater.
- The control flow rate is increased by clockwise (rightward) rotation of the control handle.
- For connection to piping, normally connect to the sub plate. Valve mounting is gasket type, using an O-ring. When a screw in connection is required, seal the gasket surface, remove the side plug, and create a screw in connection directly to the valve unit. In this case, remove all seal material affixed to the plug.
- See the table below for installation hex socket bolts.
- Use the table to the right for specification when a sub plate is required.

| Model No. | Pipe Diameter | Recommended Flow Rate gpm | Applicable Valve Type |
|-----------|---------------|---------------------------|-----------------------|
| MTL-03-10 | 3/8           | 9.2                       | TL-G03*-11            |
| MTL-04-10 | 1/2           | 14.0                      | TL(T)-G04*-*-11       |

TL-G03-11 -

Cam Down Force  
27 lbs minimum

TLT-G04\*-\*-11

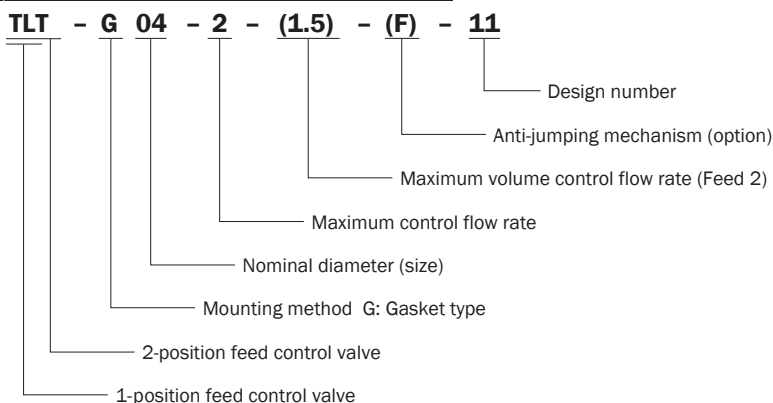
Feed 1 Cam Down Force  
31 lbs minimum  
Feed 2 Cam Down Force  
45 lbs minimum

- Make the cam angle no greater than 30 degrees.

| Applicable Model | Bolt Size | Qty | Tightening Torque ft lbs |
|------------------|-----------|-----|--------------------------|
| TL-G03*-11       | M8 × 60r  | 4   | 14.7 to 18.4             |
| TL(T)-G04*-11    | M10 × 75r | 4   | 33 to 40.5               |

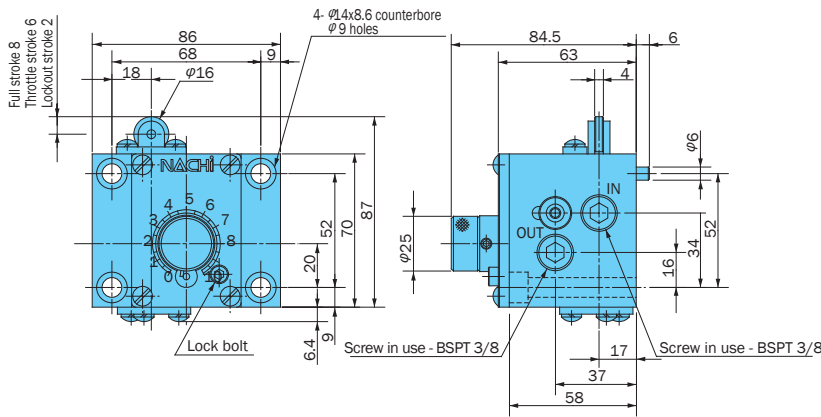
Note: For mounting bolts, use 12T or equivalent.

#### Understanding Model Numbers

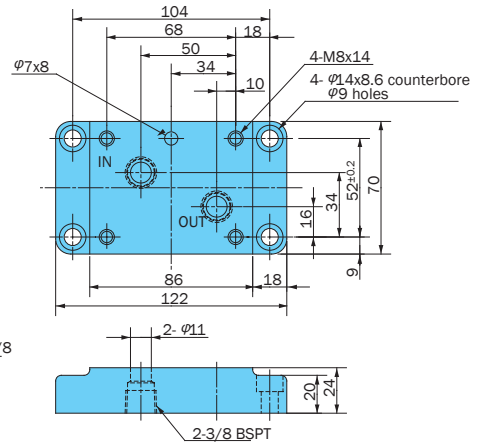


# Installation Dimension Drawings

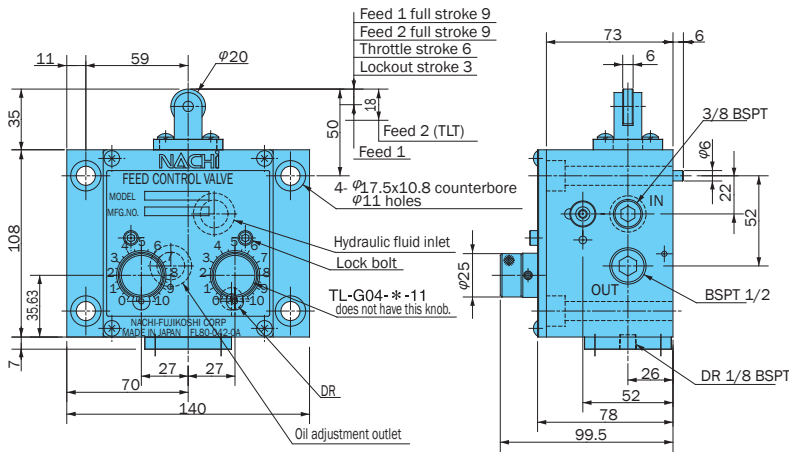
TL-G03-\*-11



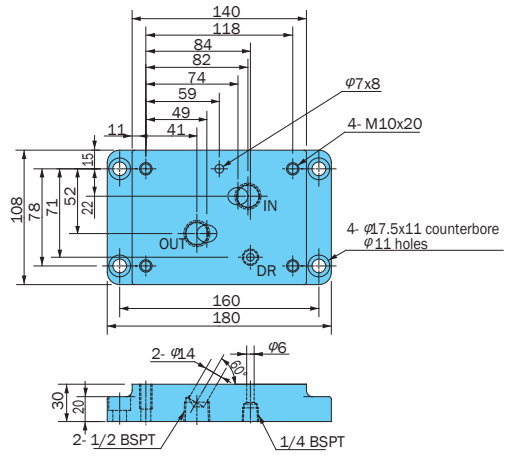
Sub Plate MTL-03-10



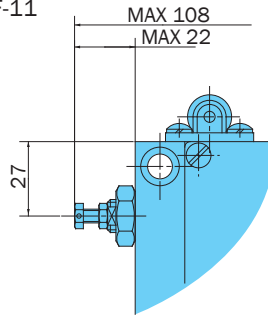
TL(T)-G04-\*-11



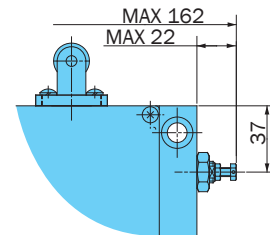
Sub Plate MTL-04-10



Anti-jumping Mechanism TL-G03-\*-F-11



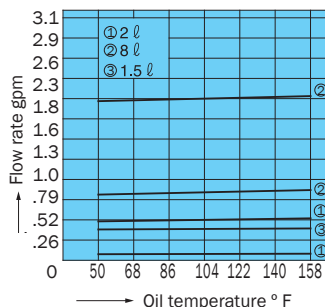
TL(T)-G04-\*-F-11



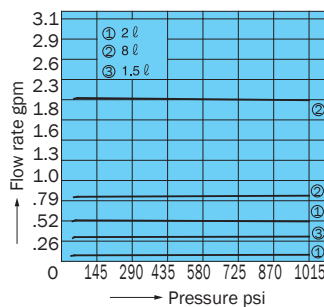
## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

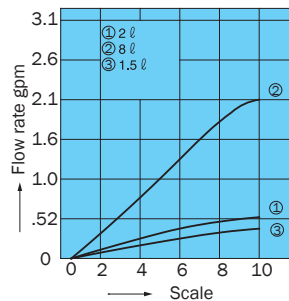
Fluid Temperature - Control Flow Rate Characteristics



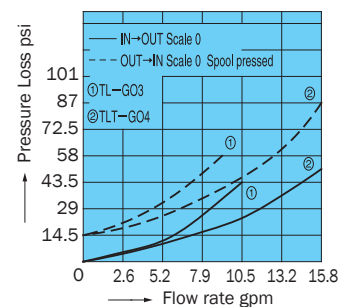
Pressure - Control Flow Rate Characteristics



Scale - Control Flow Rate Characteristics



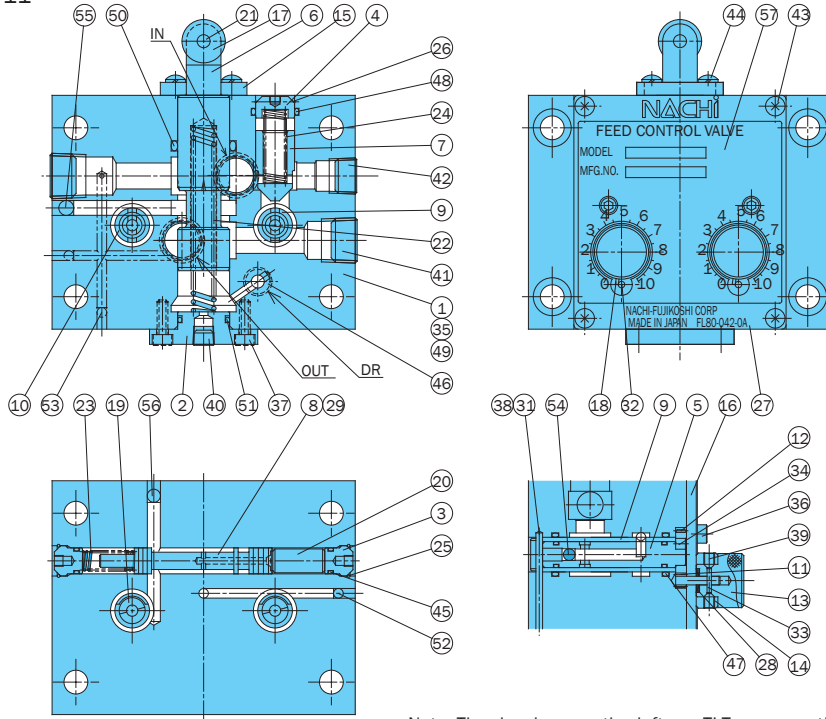
Pressure Loss Characteristics





# Cross-sectional Drawing

TLT-G04-\*-F-11

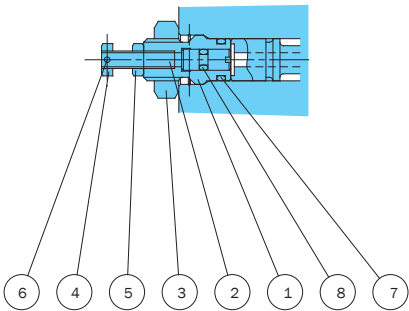


Note: The drawings on the left are TLT cross sections. In the case of TL, there is no knob on the right side.

## Anti-jumping mechanism

TL-G03-\*-F-11

TL(T)-G04-\*-F-11



| Part No. | Part Name  |
|----------|------------|
| 1        | Retainer   |
| 2        | Bolt       |
| 3        | Nut        |
| 4        | Nut        |
| 5        | Nut        |
| 6        | Spring pin |
| 7        | O-ring     |
| 8        | O-ring     |

## Seal Part List

| Part No. | Part Name | Part Number | Q'ty |
|----------|-----------|-------------|------|
| 7        | O-ring    | IA-P9       | 1    |
| 8        | O-ring    | IA-P3       | 1    |

Note: 1. #7 O-ring and #45 O-ring are interchangeable.  
2. O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.

| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-----------|
| 1        | Body      | 20       | Spacer    | 39       | Screw     |
| 2        | Cover     | 21       | Pin       | 40       | Plug      |
| 3        | Plug      | 22       | Spring    | 41       | Plug      |
| 4        | Plug      | 23       | Spring    | 42       | Plug      |
| 5        | Throttle  | 24       | Spring    | 43       | Screw     |
| 6        | Spool     | 25       | Snap ring | 44       | Screw     |
| 7        | Poppet    | 26       | Snap ring | 45       | O-ring    |
| 8        | Piston    | 27       | Plate     | 46       | O-ring    |
| 9        | Sleeve    | 28       | Washer    | 47       | O-ring    |
| 10       | Sleeve    | 29       | Pin       | 48       | O-ring    |
| 11       | Gear      | 30       | Pin       | 49       | O-ring    |
| 12       | Gear      | 31       | Pin       | 50       | O-ring    |
| 13       | Knob      | 32       | Pin       | 51       | O-ring    |
| 14       | Ring      | 33       | Pin       | 52       | Ball      |
| 15       | Stopper   | 34       | Pin       | 53       | Ball      |
| 16       | Plate     | 35       | Pin       | 54       | Ball      |
| 17       | Roller    | 36       | Screw     | 55       | Ball      |
| 18       | Pin       | 37       | Screw     | 56       | Ball      |
| 19       | Spacer    | 38       | Screw     | 57       | Plate     |

## Seal Part List (Kit Model Number FLS-\*\*(2))

| Part No. | Part Name | TL-G03-*-11 |      | TL-G04-*-11 |      | TLT-G04-*-F-11 |      |
|----------|-----------|-------------|------|-------------|------|----------------|------|
|          |           | Part Number | Q'ty | Part Number | Q'ty | Part Number    | Q'ty |
| 45       | O-ring    | IA-P9       | 4    | IA-P9       | 4    | IA-P9          | 6    |
| 46       | O-ring    | -           | -    | IA-P10      | 1    | IA-P10         | 1    |
| 47       | O-ring    | IA-P16      | 2    | IA-P16      | 2    | IA-P16         | 4    |
| 48       | O-ring    | IA-P14      | 1    | IA-P18      | 1    | IA-P18         | 1    |
| 49       | O-ring    | IA-P14      | 2    | IA-P20      | 2    | IA-P20         | 2    |
| 50       | O-ring    | IA-P18      | 2    | IA-P24      | 1    | IA-P24         | 1    |
| 51       | O-ring    | -           | -    | IA-P20      | 1    | IA-P20         | 1    |

Note: 1. \*\* in the kit number is used for specification of the valve size. To specify TLT, add 2 to the end.  
2. O-ring 1A-\*\* refers to JIS B2401-1A-\*\*.



### Right Angle Check Valve In-Line Check Valve

84.5 gpm  
3045 psi

### Features

The right angle type check valve changes the flow direction of fluid 90 degrees, while the in-line check valve allows only axial direction flow.

The cracking pressures of these valves are fixed, so fluid passes freely in one direction, but is restricted from flowing in the opposite direction.

### Specifications

|                         | Model No.             |                       | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Cracking Pressure psi | Weight lbs |        |
|-------------------------|-----------------------|-----------------------|-------------------------|------------------------------|-----------------------|-----------------------|------------|--------|
|                         | Screw Mounting        | Gasket Mounting       |                         |                              |                       |                       | T Type     | G Type |
| Right Angle Check Valve | CA-T03-1-20<br>2<br>3 | CA-G03-1-20<br>2<br>3 | 3/8                     | 3045                         | 10.5                  | 5.8<br>50<br>72       | 2.2        | 3.9    |
|                         | CA-T06-1-20<br>2<br>3 | CA-G06-1-20<br>2<br>3 | 3/4                     |                              | 29                    | 5.8<br>50<br>72       | 4.8        | 8.5    |
|                         | CA-T10-1-20<br>2<br>3 | CA-G10-1-20<br>2<br>3 | 1 1/4                   |                              | 84.5                  | 5.8<br>50<br>72       | 8.8        | 13.4   |
| In-line Check Valve     | CN-T03-1-11<br>2<br>3 | -                     | 3/8                     |                              | 7.9                   | 5.8<br>50<br>72       | .8         | -      |
|                         | CN-T06-1-11<br>2<br>3 |                       | 3/4                     |                              | 19.8                  | 5.8<br>50<br>72       | 1.5        |        |
|                         | CN-T10-1-11<br>2<br>3 |                       | 1 1/4                   |                              | 50                    | 5.8<br>50<br>72       | 4.8        |        |

#### • Handling

- 1 Use the following table for specification when a sub plate is required.
- 2 The following are the bundled mounting bolts.

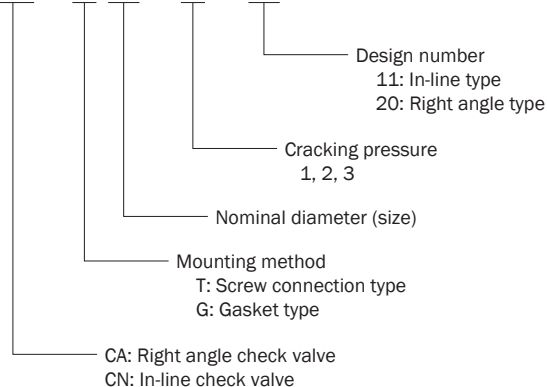
| Model No. | Pipe Diameter | Recommended Flow Rate gpm | Weight lbs | Applicable Valve Type |
|-----------|---------------|---------------------------|------------|-----------------------|
| MCA-03-20 | 3/8           | 10.5                      | 3          | CA-G03-*-20           |
| MCA-06-20 | 3/4           | 29                        | 7.7        | CA-G06-*-20           |
| MCA-10-20 | 1 1/4         | 84.5                      | 13.4       | CA-G10-*-20           |

| Model No.   | Bolt Dimensions | Q'ty | Tightening Torque ft lbs |
|-------------|-----------------|------|--------------------------|
| CA-G03-*-20 | M8 × 45 ℓ       | 4    | 14.7 to 18.4             |
| CA-G06-*-20 | M16 × 65 ℓ      | 4    | 140 to 173               |
| CA-G10-*-20 | M20 × 75 ℓ      | 4    | 272 to 339               |

Note: For mounting bolts, use 12T or equivalent.

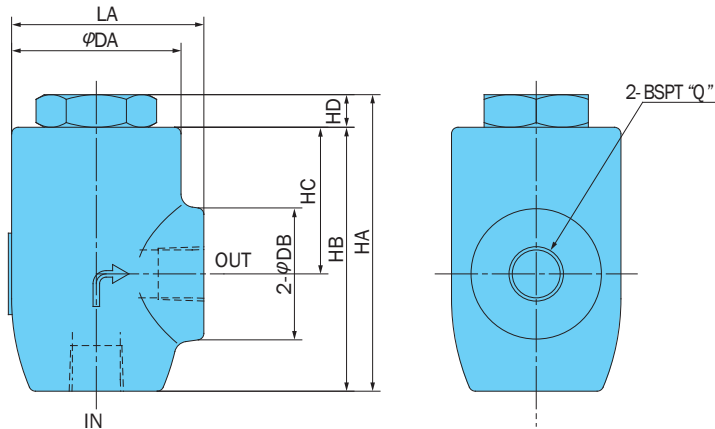
### Understanding Model Numbers

**CA - T 03 - 1 - 20**



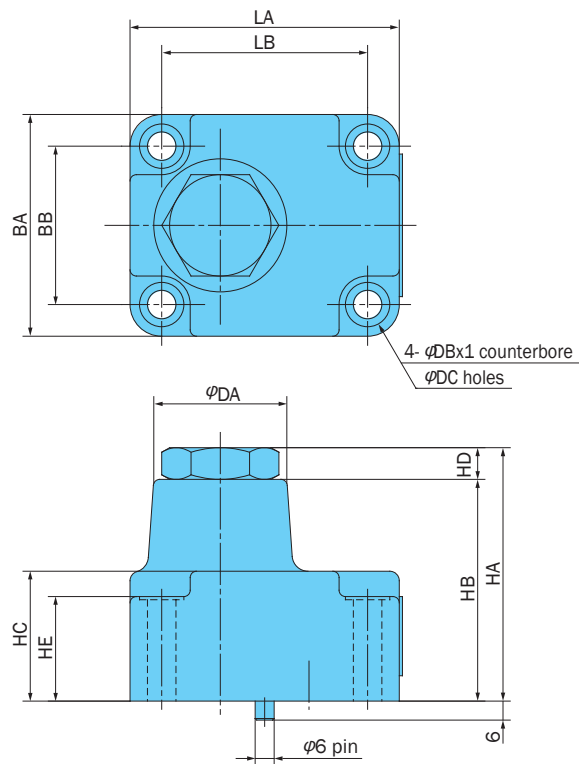
# Installation Dimension Drawings

CA-T\*\*-20(Screw Mounting)

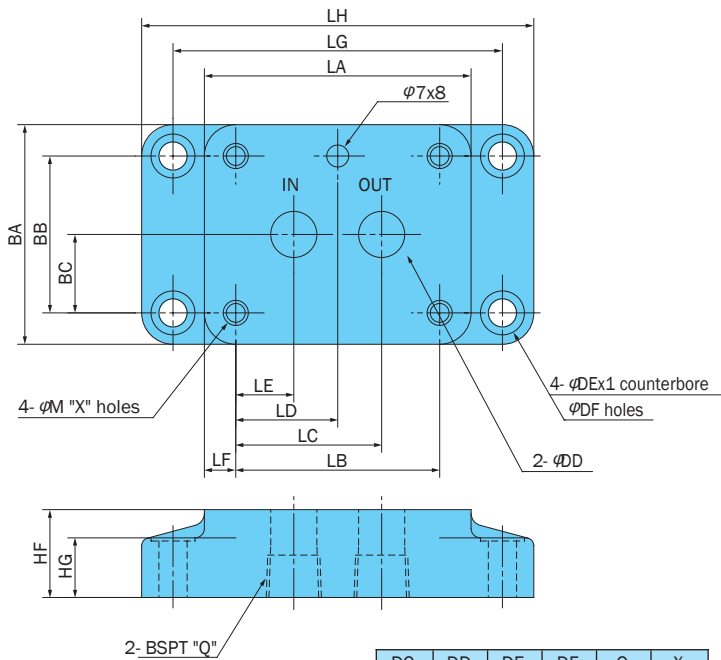


| Model No.   | LA | HA  | HB  | HC | HD | DA | DB | Q   |
|-------------|----|-----|-----|----|----|----|----|-----|
| CA-T03-*-20 | 59 | 91  | 81  | 45 | 10 | 52 | 40 | 3/8 |
| CA-T06-*-20 | 72 | 106 | 96  | 55 | 10 | 60 | 45 | 3/4 |
| CA-T10-*-20 | 96 | 139 | 127 | 70 | 12 | 80 | 62 | 1¼  |

CA-G\*\*-20(Gasket Mounting)



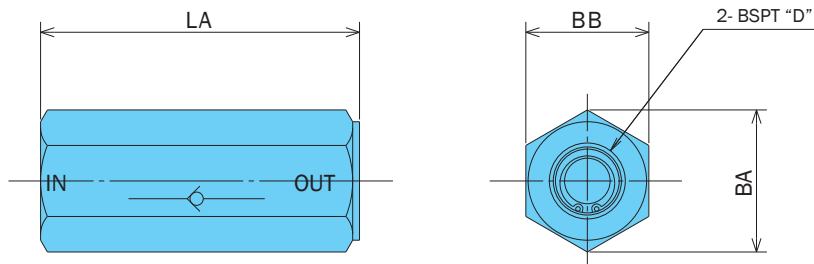
Sub Plate MCA\*\*-20



| DC | DD   | DE | DF | Q   | X  |
|----|------|----|----|-----|----|
| 9  | 14.7 | 14 | 9  | 3/8 | 8  |
| 17 | 23   | 20 | 14 | 3/4 | 16 |
| 22 | 30   | 20 | 14 | 1¼  | 20 |

| Model No.   | LA  | LB | LC   | LD   | LE   | LF   | LG  | LH  | BA  | BB | BC   | HA  | HB  | HC | HD | HE | HF | HG | DA | DB |
|-------------|-----|----|------|------|------|------|-----|-----|-----|----|------|-----|-----|----|----|----|----|----|----|----|
| CA-G03-*-20 | 86  | 65 | 46.5 | 32.5 | 18.5 | 10.5 | 105 | 125 | 71  | 50 | 25   | 80  | 70  | 41 | 10 | 33 | 28 | 19 | 42 | 14 |
| CA-G06-*-20 | 117 | 81 | 68.2 | 40.5 | 22.2 | 18   | 140 | 172 | 101 | 65 | 32.5 | 98  | 88  | 58 | 10 | 43 | 31 | 19 | 52 | 26 |
| CA-G10-*-20 | 133 | 92 | 71.4 | 46   | 20.6 | 20.5 | 152 | 187 | 133 | 92 | 46   | 119 | 107 | 65 | 12 | 46 | 40 | 28 | 68 | 32 |

CN-T\*\*-11(Screw Mounting)



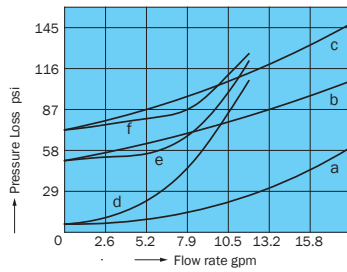
| Model No.   | LA  | BA   | BB | D   |
|-------------|-----|------|----|-----|
| CN-T03-*-11 | 70  | 31.2 | 27 | 3/8 |
| CN-T06-*-11 | 95  | 43.9 | 38 | 3/4 |
| CN-T10-*-11 | 130 | 69.3 | 60 | 1¼  |

## Performance Curves

Hydraulic Operating Fluid Viscosity 32 centistokes

Pressure Loss Characteristics

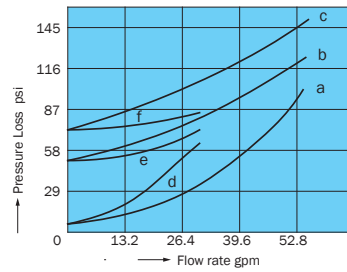
CA-\*03 CN-T03



Applicable Valve Type

- a. CA-\*03-1-20
- b. CA-\*03-2-20
- c. CA-\*03-3-20
- d. CN-T03-1-11
- e. CN-T03-2-11
- f. CN-T03-3-11

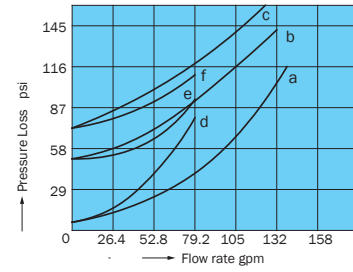
CA-\*06 CN-T06



Applicable Valve Type

- a. CA-\*06-1-20
- b. CA-\*06-2-20
- c. CA-\*06-3-20
- d. CN-T06-1-11
- e. CN-T06-2-11
- f. CN-T06-3-11

CA-\*10 CN-T10

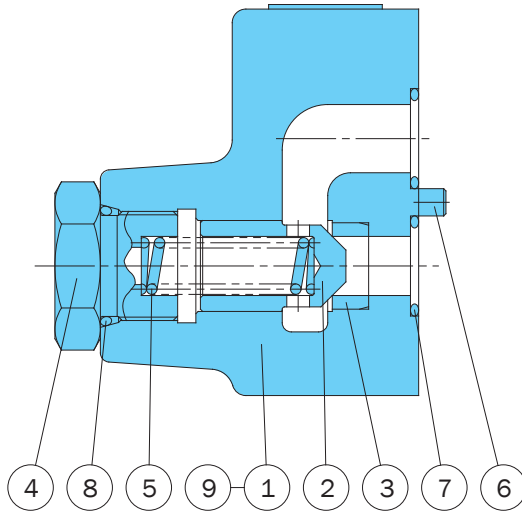


Applicable Valve Type

- a. CA-\*10-1-20
- b. CA-\*10-2-20
- c. CA-\*10-3-20
- d. CN-T10-1-11
- e. CN-T10-2-11
- f. CN-T10-3-11

## Cross-sectional Drawing

CA-G\*\*-\*-20



| Part No. | Part Name |
|----------|-----------|
| 1        | Body      |
| 2        | Poppet    |
| 3        | Seat      |
| 4        | Plug      |
| 5        | Spring    |
| 6        | Pin       |
| 7        | O-ring    |
| 8        | O-ring    |
| 9        | Nameplate |

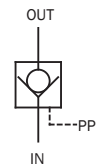
Seal Part List (Kit Model Number DAS-\*\*\*)

| Part No. | Part Name | Type/Part Number |        |        | Qty |
|----------|-----------|------------------|--------|--------|-----|
|          |           | CA-G03           | CA-G06 | CA-G10 |     |
| 7        | O-ring    | 1B-P18           | 1B-G30 | 1B-G40 | 2   |
| 8        | O-ring    | 1B-P22           | 1B-P30 | 1B-P42 | 1   |

Note: O-ring 1B-\*\* refers to JIS B2401-1B-\*\*,  
\*\*\* in the kit number is used for specification of the valve size (G03, G06, G10, etc.)



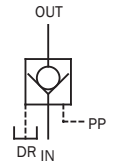
Normal form



### Pilot Check Valve

84.5 gpm  
3045 psi

External drain type



### Features

Normally, fluid is allowed to flow in a single direction, just as with a standard check valve. Reverse flow can be enabled,

however, when the check valve is pushed upwards by external pilot pressure. Very compact configuration.

### Specifications

| Model No           |                    | Nominal Diameter (Size) | Maximum Working Pressure psi | Maximum Flow Rate gpm | Cracking Pressure psi | Weight lbs     |                | Area Ratio   |       |             |
|--------------------|--------------------|-------------------------|------------------------------|-----------------------|-----------------------|----------------|----------------|--------------|-------|-------------|
| Screw Mounting     | Gasket Mounting    |                         |                              |                       |                       | T Type         | G Type         | Pilot Piston | Valve | Small Valve |
| CP-T03-1-*-20<br>2 | CP-G03-1-*-20<br>2 | 3/8                     | 3045                         | 10.5                  | 29<br>72.5            | 8.3<br>(10.3)  | 9.4<br>(11.4)  | 1            | 0.35  | 0.05        |
| CP-T06-1-*-20<br>2 | CP-G06-1-*-20<br>2 | 3/4                     |                              | 29.0                  | 29<br>72.5            | 15.4<br>(18)   | 14.5<br>(17.1) | 1            | 0.37  | 0.03        |
| CP-T10-1-*-20<br>2 | CP-G10-1-*-20<br>2 | 1¼                      |                              | 84.5                  | 29<br>72.5            | 26.4<br>(31.5) | 27.5<br>(32.6) | 1            | 0.36  | 0.03        |

Note: Weight values in parentheses are for the external drain type.

#### • Handling

1 The following explains how to use the external drain. Be sure to always use the external drain type when back pressure is applied to fluid outlet port side A during reverse flow as in the circuit illustrated below.

2 Minimum pilot pressure is altered by input side B pressure during reverse flow. Because of this, operate the valve so pressure is at least twice as high as the required pilot pressure obtained using the minimum pilot pressure characteristics.

3 Use the following table for specification when a sub plate is required.

| Model No. | Pipe Diameter | Recommended Flow Rate gpm | Weight lbs | Applicable Valve Type |
|-----------|---------------|---------------------------|------------|-----------------------|
| MCP-03-20 | 3/8           | 10.5                      | 2.4        | CP-G03-*-20           |
| MCP-06-20 | 3/4           | 29                        | 3.7        | CP-G06-*-20           |
| MCP-10-20 | 1¼            | 84.5                      | 7.9        | CP-G10-*-20           |

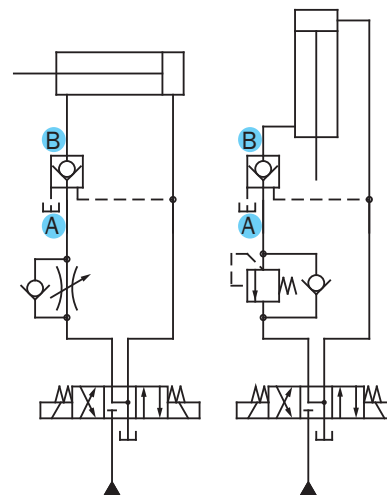
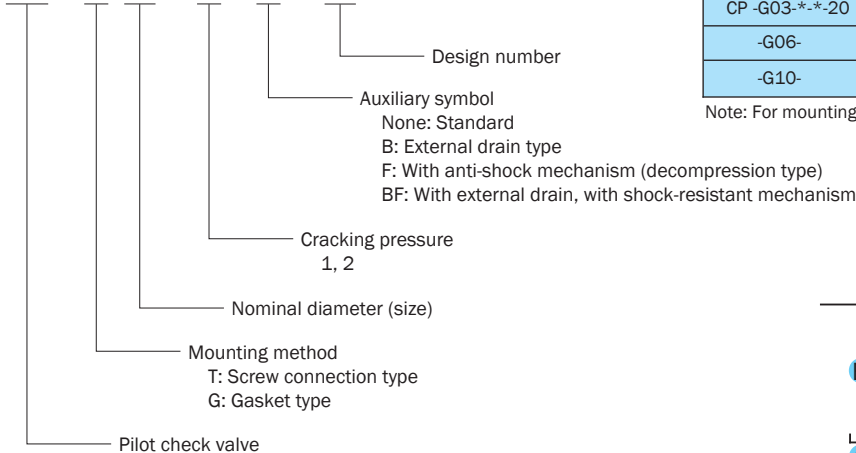
4 The following are the bundled mounting bolts.

| Model No.   | Bolt Dimensions | Q'ty | Tightening Torque ft lbs |
|-------------|-----------------|------|--------------------------|
| CP-G03-*-20 | M8 × 45 ℓ       | 4    | 14.7 to 18.4             |
| -G06-       | M10 × 55 ℓ      | 4    | 33 to 40.5               |
| -G10-       | M10 × 65 ℓ      | 6    | 33 to 40.5               |

Note: For mounting bolts, use 12T or equivalent.

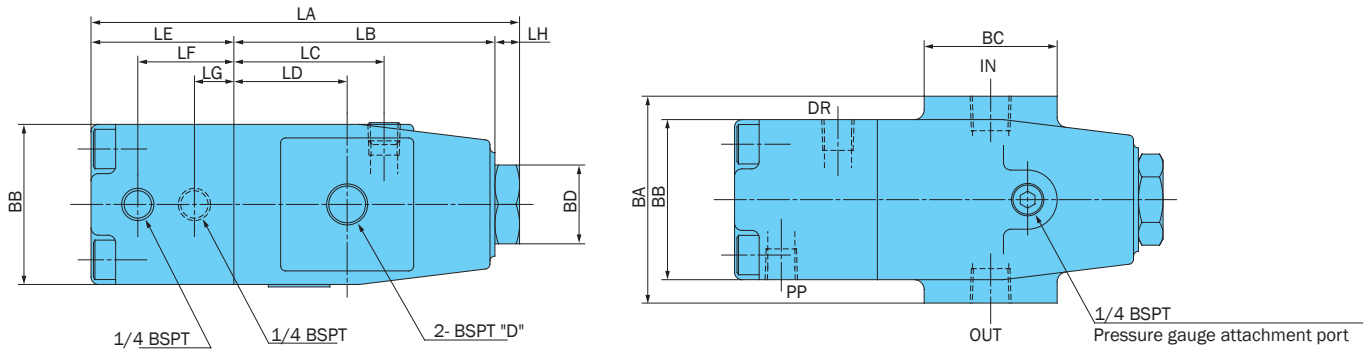
### Understanding Model Numbers

CP - G 03 - 1 - B - 20



## Installation Dimension Drawings

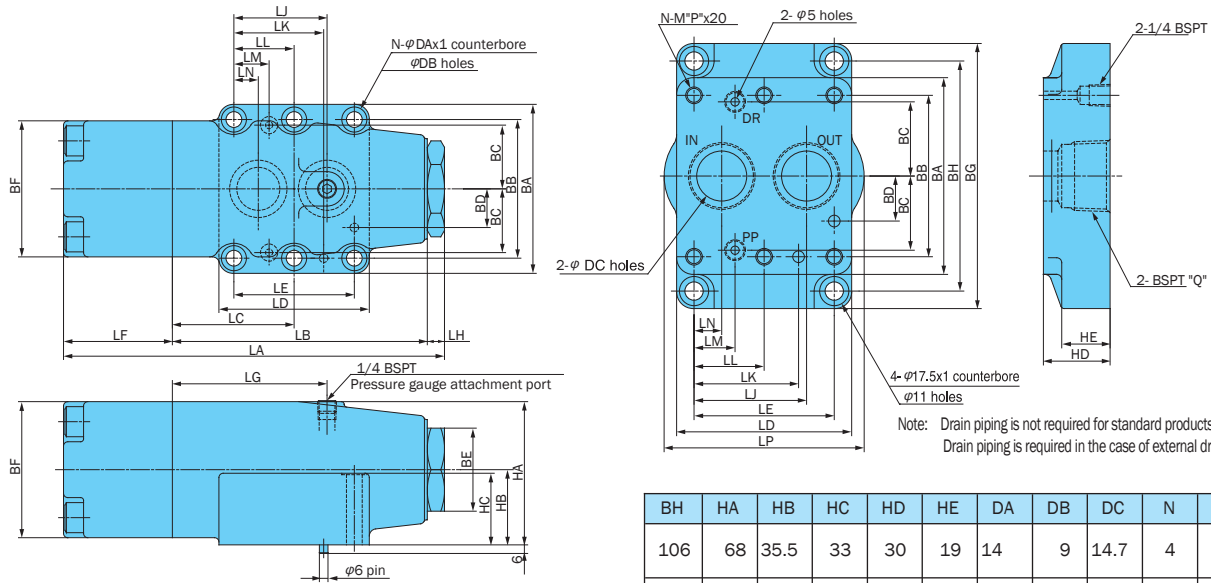
CP-T\*\*-\*\*-20 (Screw Mounting)



| Model No.         | LA  | LB  | LC  | LD | LE | LF | LG | LH | BA  | BB | BC | BD | D     |
|-------------------|-----|-----|-----|----|----|----|----|----|-----|----|----|----|-------|
| CP-T03-*(F)-20    | 146 | 106 | 61  | 46 | 30 | 15 | -  | 10 | 84  | 65 | 54 | 32 | 3/8   |
| CP-T03-*(B)(F)-20 | 174 |     |     |    | 58 | 39 | 16 |    |     |    |    |    |       |
| CP-T06-*(F)-20    | 180 | 140 | 85  | 66 | 30 | 15 | -  | 10 | 122 | 76 | 64 | 41 | 3/4   |
| CP-T06-*(B)(F)-20 | 212 |     |     |    | 62 | 43 | 16 |    |     |    |    |    |       |
| CP-T10-*(F)-20    | 225 | 178 | 108 | 85 | 35 | 15 | -  | 12 | 150 | 95 | 85 | 58 | 1 1/4 |
| CP-T10-*(B)(F)-20 | 266 |     |     |    | 76 | 57 | 16 |    |     |    |    |    |       |

CP-G\*\*-\*\*-20 (Gasket Mounting)

Sub Plate MCP\*\*-\*\*-20



Note: Drain piping is not required for standard products.  
Drain piping is required in the case of external drain type (B).

| BH  | HA  | HB   | HC | HD | HE | DA   | DB | DC   | N | P  | Q     |
|-----|-----|------|----|----|----|------|----|------|---|----|-------|
| 106 | 68  | 35.5 | 33 | 30 | 19 | 14   | 9  | 14.7 | 4 | 8  | 3/8   |
| 124 | 79  | 41   | 38 | 30 | 19 | 17.5 | 11 | 22   | 4 | 10 | 3/4   |
| 138 | 100 | 52.5 | 50 | 40 | 29 | 17.5 | 11 | 30   | 6 | 10 | 1 1/4 |

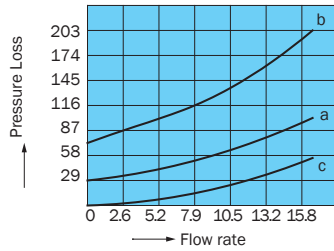
| Model No.         | LA  | LB  | LC | LD  | LE   | LF | LG  | LH | LJ   | LK   | LL    | LM   | LN   | LP  | BA  | BB   | BC   | BD | BE | BF | BG  |
|-------------------|-----|-----|----|-----|------|----|-----|----|------|------|-------|------|------|-----|-----|------|------|----|----|----|-----|
| CP-G03-*(F)-20    | 146 | 106 | 51 | 64  | 44   | 30 | 61  | 10 | 37   | -    | -     | 16   | 7    | -   | 82  | 64   | 23   | 18 | 32 | 65 | 126 |
| CP-G03-*(B)(F)-20 | 174 |     |    |     |      | 58 |     |    |      |      |       |      |      |     |     |      |      |    |    |    |     |
| CP-G06-*(F)-20    | 180 | 140 | 66 | 83  | 60.3 | 30 | 85  | 10 | 49.2 | 44.5 | -     | 20.6 | 11.1 | -   | 102 | 79.4 | 33.3 | -  | 41 | 76 | 146 |
| CP-G06-*(B)(F)-20 | 212 |     |    |     |      | 62 |     |    |      |      |       |      |      |     |     |      |      |    |    |    |     |
| CP-G10-*(F)-20    | 225 | 178 | 85 | 105 | 84.1 | 35 | 108 | 12 | 67.5 | 62.7 | 42.05 | 24.6 | 16.6 | 120 | 118 | 96.8 | 44.5 | -  | 58 | 95 | 159 |
| CP-G10-*(B)(F)-20 | 266 |     |    |     |      | 76 |     |    |      |      |       |      |      |     |     |      |      |    |    |    |     |

# Performance Curves

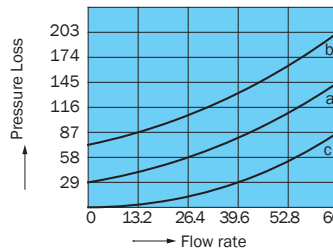
Hydraulic Operating Fluid Viscosity 32 centistokes

## Pressure Loss Characteristics

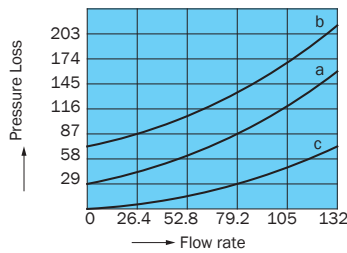
- CP-\*03** Applicable Valve Type  
 a. CP-\*03-1-\*20 Free Flow  
 b. CP-\*03-2-\*20 "  
 c. CP-\*03-\*-\*20 Reverse Flow



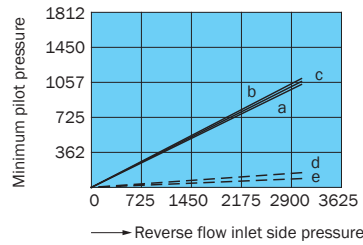
- CP-\*06** Applicable Valve Type  
 a. CP-\*06-1-\*20 Free Flow  
 b. CP-\*06-2-\*20 "  
 c. CP-\*06-\*-\*20 Reverse Flow



- CP-\*10** Applicable Valve Type  
 a. CP-\*10-1-\*20 Free Flow  
 b. CP-\*10-2-\*20 "  
 c. CP-\*10-\*-\*20 Reverse Flow



## Minimum Pilot Pressure Characteristics



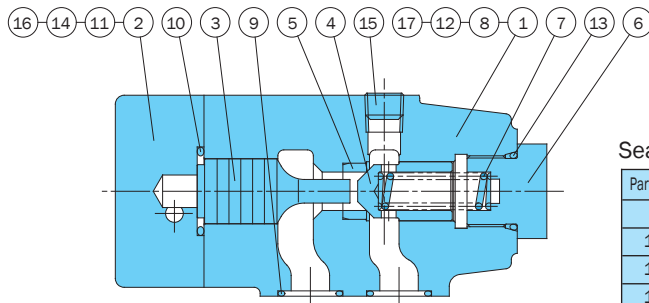
## Applicable Valve

| Model No. | Valve Open | Small Valve Open |
|-----------|------------|------------------|
| CP-*03    | a          | d                |
| CP-*06    | b          | e                |
| CP-*10    | c          | e                |

# Cross-sectional Drawing

Note: O-ring 1B-\*\* refers to JIS B2401-1B-\*\*.

## CP-G\*\*-\*20



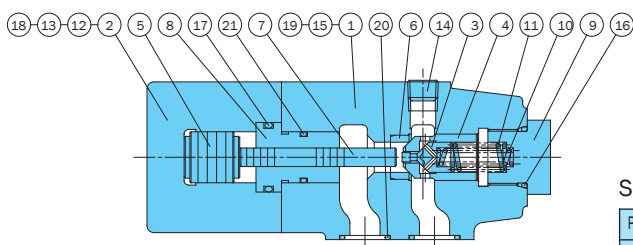
| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-----------|
| 1        | Body      | 7        | Spring    | 13       | O-ring    |
| 2        | Cover     | 8        | Pin       | 14       | Screw     |
| 3        | Piston    | 9        | O-ring    | 15       | Plug      |
| 4        | Poppet    | 10       | O-ring    | 16       | Plug      |
| 5        | Seat      | 11       | O-ring    | 17       | Plate     |
| 6        | Plug      | 12       | O-ring    |          |           |

## Seal Part List (Kit Model Number DPS-\*\*\*)

| Part No. | Part Name | CP-G03-*20 | CP-G06-*20 | CP-G10-*20 | Q'ty |
|----------|-----------|------------|------------|------------|------|
| 9        | O-ring    | 1B-P18     | 1B-G25     | 1B-G35     | 2    |
| 10       | O-ring    | 1B-G25     | 1B-G40     | 1B-G55     | 1    |
| 11       | O-ring    | 1B-P7      | 1B-P9      | 1B-P9      | 2    |
| 12       | O-ring    | 1B-P9      | 1B-P9      | 1B-P9      | 2    |
| 13       | O-ring    | 1B-P22     | 1B-P30     | 1B-P42     | 1    |

\*\*\*in the kit number is used for specification of the valve size.

## CP-G\*\*-\*BF-20



| Part No. | Part Name | Part No. | Part Name | Part No. | Part Name |
|----------|-----------|----------|-----------|----------|-----------|
| 1        | Body      | 9        | Plug      | 17       | O-ring    |
| 2        | Cover     | 10       | Spring    | 18       | O-ring    |
| 3        | Poppet    | 11       | Spring    | 19       | O-ring    |
| 4        | Poppet    | 12       | Screw     | 20       | O-ring    |
| 5        | Piston    | 13       | Plug      | 21       | O-ring    |
| 6        | Seat      | 14       | Plug      | 22       | Plate     |
| 7        | Rod       | 15       | Pin       |          |           |
| 8        | Bushing   | 16       | O-ring    |          |           |

## Seal Part List (Kit Model Number DPS-\*\*\*R)

| Part No. | Part Name | CP-G03-*BF-20 | CP-G06-*BF-20 | CP-G10-*BF-20 | Q'ty |
|----------|-----------|---------------|---------------|---------------|------|
| 16       | O-ring    | 1B-P22        | 1B-P30        | 1B-P42        | 1    |
| 17       | O-ring    | 1B-G25        | 1B-G40        | 1B-G55        | 1    |
| 18       | O-ring    | 1B-P7         | 1B-P9         | 1B-P9         | 2    |
| 19       | O-ring    | 1B-P9         | 1B-P9         | 1B-P9         | 2    |
| 20       | O-ring    | 1B-P18        | 1B-G25        | 1B-G35        | 2    |
| 21       | O-ring    | 1B-P18        | 1B-P30        | 1B-G45        | 1    |

\*\*\*in the kit number is used for specification of the valve size.



### Gauge Cock

5075 psi

#### Features

Ultra-compact configuration requires minimal installation space. Intelligent design packs plenty of function into a simple configuration.

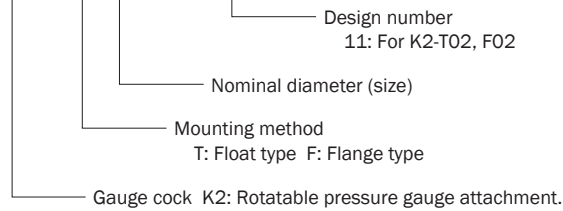
Maximum operating pressure of 5075 psi allows operation across a wide range.

#### Specifications

| Model No.  |             | G "A"<br>(Nominal Dimension) | B<br>mm | C<br>mm | Maximum<br>Working Pressure<br>psi | Weight<br>lbs |
|------------|-------------|------------------------------|---------|---------|------------------------------------|---------------|
| Float Type | Flange Type |                              |         |         |                                    |               |
| K2-T02-11  | K2-F02-11   | G1/4 (BSPP)                  | 10      | 19      | 3045                               | .77           |
| K2-T03-10  | K2-F03-10   | G3/8 (BSPP)                  | 16      | 23      | 5075                               |               |
| K2-T04-10  | K2-F04-10   | G1/2 (BSPP)                  | 16      | 26      |                                    |               |

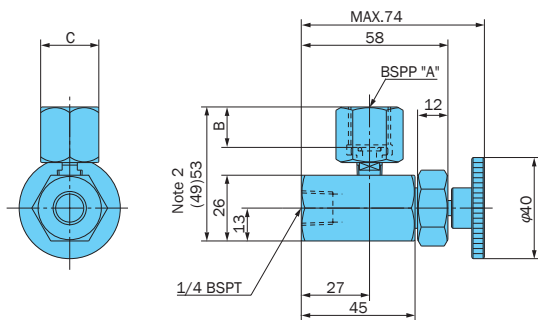
#### Understanding Model Numbers

**K2 - T 02 - 10(11)**



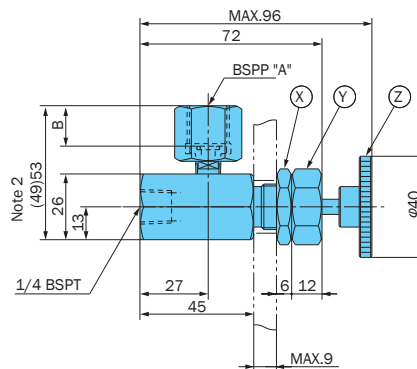
#### Installation Dimension Drawings

K2-T\*\*-10 (11)



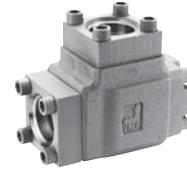
Note: 1. Maximum iron plate thickness: 9t; Mounting Bolt Hole Diameter:  $\phi 20$   
When mounted to panel  
Loosen the X lock nut and Y cap nut, and pull out the Z adjusting screw. To return to its original position, reverse this process.  
2. Dimensions in parentheses are for the 02 size.

K2-F\*\*-10 (11)



3. For information about G "A" and B, see the specifications. The O-ring shown below is used as a pressure gauge seal beneath screw G.  
G1/4 JIS B2401-1B-P5  
G3/8 JIS B2401-1B-P6  
G1/2 JIS B2401-1B-P9





### Flange Type Check Valve / Throttle Valve Pilot Operated Check Valve

33 to 343 gpm  
3625 psi

#### Features

This series provides high capacity and flange connection, as well as compliance with new standards.

Measurable higher pressure and higher capacity than previous models.

#### Specifications

Contact your agent for more information about mounting methods, etc.

|                            | Model No.             | Nominal Diameter (Size) | Maximum Working Pressure psi | Rated flow rate gpm | Cracking pressure psi | Weight lbs |
|----------------------------|-----------------------|-------------------------|------------------------------|---------------------|-----------------------|------------|
|                            | Flange Mounting       |                         |                              |                     |                       |            |
| Right-Angle Check Valve    | CA-F06-1-30<br>2<br>3 | 3/4                     | 3625                         | 33                  | 5.8<br>50<br>72       | 8.3        |
|                            | CA-F10-1-30<br>2<br>3 | 1¼                      |                              | 79                  | 5.8<br>50<br>72       | 16.5       |
|                            | CA-F16-1-30<br>2<br>3 | 2                       |                              | 158                 | 5.8<br>50<br>72       | 44.3       |
|                            | CA-F24-1-30<br>2<br>3 | 3                       |                              | 343                 | 5.8<br>50<br>72       | 139        |
| Pilot Operated Check Valve | CP-F06-1-*<br>2       | 3/4                     | 3625                         | 33                  | 29<br>72              | 14.1       |
|                            | CP-F10-1-*<br>2       | 1¼                      |                              | 66                  | 29<br>72              | 25.3       |
|                            | CP-F16-1-*<br>2       | 2                       |                              | 158                 | 29<br>72              | 70.5       |

|            | Model No.       | Nominal Diameter (Size) | Maximum Working Pressure psi | Rated flow rate gpm | Cracking pressure psi | Weight lbs |
|------------|-----------------|-------------------------|------------------------------|---------------------|-----------------------|------------|
|            | Flange Mounting |                         |                              |                     |                       |            |
| Slot Valve | (C)FR-F06-30    | 3/4                     | 3625                         | 22.4                | 14.5                  | 10.3       |
|            | (C)FR-F10-30    | 1¼                      |                              | 60.7                |                       | 24.2       |
|            | (C)FR-F16-30    | 2                       |                              | 132                 |                       | 47.4       |



### Vertical Power Unit

NACHI Standard Vertical Hydraulic Power Units offer standard systems complete with:

- Reservoir, Pump, Pump Motor Adaptor, Electric Motor, Flexible Coupling, Pressure Control Relief Valve for Gear Pumps.
- Remote Compensator for Pressure

#### Features

##### Noise Levels:

Noise levels are well below the 90db (a) specified under the WALSH-HEALY ACT.

##### Standard Units:

Standard units can be ordered using the simple model codes. Optional selections can be obtained with the same codes. Custom units can be manufactured using standard unit components.

##### Capacities:

Reservoir capacities available from 5 gallon to 30 gallons (specials upon request). Reservoir capacities vs. pump

#### Operating Instructions

Fill reservoir with new premium grade hydraulic fluid (Mobil DTE26 or equal). It is highly recommended to filter all hydraulic fluid before filling the reservoir. Fluid level gauge will indicate proper level. Electric motor wiring must conform to the motor wiring nameplate. Jog motor to check proper rotation, indicated by the rotation arrow on the unit. Incorrect rotation can be reversed by interchanging any two lines on a three phase motor. Relief or compensator control valve should be set at lowest pressure setting for startup. Decrease pressure by turning the adjusting screw counterclockwise. If pump does not prime, vent pump pressure line to atmosphere and into an open container to establish flow. After pump has primed, reconnect pressure line and run at lowest pressure setting to purge air from the system piping. Recheck the fluid level in the reservoir, as some fluid could be lost in the filling of piping and components. Most foreign material and contaminants will be trapped by the return line filter after a few hours of operation. The return line filter element should be replaced when gauge indicates. Most industrial applications should operate at a temperature below 140 degrees fahrenheit. At higher temperatures, problems are often experienced in maintaining reliable and consistent hydraulic control. Component service life is also reduced and hydraulic oil deteriorates. If the system tends to operate at an elevated temperature level, steps must be taken to reduce this elevated operating temperature.

Compensated Piston or Vane pumps.

- Pressure Gauge w/Shut Off, Air Breather/Filter Combination, Sight Gauge w/Thermometer, Drain Plug, Pressure and Return Connections, Suction Strainer w/3PSI By-Pass (except on 5 gallon) and check valve.

flow can vary depending on specific applications. Generally a 2:1 reservoir to pump ratio is acceptable. Pressures at specific pump flow will determine the hydraulic horsepower required. Refer to "TABLE A", below.

##### Quality:

Quality components and high manufacturing standards make these factory assembled units fit virtually any application. The wide variety of pumps, motors, reservoirs, manifolds and choice of options enable you to match

your application requirements for optimum productivity and Cost-Effective operation.

##### Reliability:

Strict control of accepted hydraulic assembly practices, testing procedures, plus high quality components assure successful operation in a variety of industrial applications.

##### Low Cost:

Production line assembling, combined with minimal piping offers compact systems at low cost.

Once a year or every 4000 hours of operation, the reservoir's air breather filter and the suction strainer should be replaced. The reservoir oil should be drained, and the reservoir cleaned. Dusty or contaminated environments may require more frequent cleaning and maintenance.

Pressures shown will load AC electric motors to their nameplate horsepower rating. Pressures shown should not be exceeded when system must be started at full pressure. Momentary pressures higher than those listed can be applied if sufficient operating time at lower pump

pressure or lower motor load during the cycle will provide for motor cooling. Dead head pressure loading would require full motor HP using a constant displacement gear pump. Dead head pressure with a pressure compensated Piston or Vane pump would require a small percentage of the full flow loading, consequently generating less heat. Actual HP requirements depend on the duty cycle and operating conditions. This is many times best determined by actual testing by the customer. The components and piping are designed for the use of petroleum base fluids.

#### THEORETICAL PRESSURE TABLE (PSI)

Table "A"

| GPM                 | HORSEPOWER REQUIREMENTS ▲ |      |      |      |      |      |      |      |      |   |
|---------------------|---------------------------|------|------|------|------|------|------|------|------|---|
|                     | 1                         | 1.5  | 2    | 3    | 5    | 7.5  | 10   | 15   | 20   |   |
| <b>GEAR PUMPS</b>   |                           |      |      |      |      |      |      |      |      |   |
| 1.6                 | 1071                      | 1607 | 2143 | *    |      |      |      |      |      |   |
| 2.4                 | 714                       | 1071 | 1428 | 2143 | *    |      |      |      |      |   |
| 3.0                 | 571                       | 857  | 1143 | 1714 | 2857 | *    |      |      |      |   |
| 5.2                 |                           | 494  | 659  | 989  | 1648 | 2472 | *    |      |      |   |
| 7.0                 |                           | 367  | 490  | 735  | 1224 | 1836 | 2449 | *    |      |   |
| 9.0                 |                           |      | 381  | 571  | 952  | 1428 | 1904 | 2857 | *    |   |
| 10.4                |                           |      |      | 494  | 824  | 1236 | 1648 | 2472 | *    |   |
| 12.3                |                           |      |      |      | 418  | 697  | 1045 | 1393 | 2090 | * |
| <b>PISTON PUMPS</b> |                           |      |      |      |      |      |      |      |      |   |
| 3.8                 | 451                       | 677  | 902  | 1353 | 2255 | *    |      |      |      |   |
| 7.8                 | 220                       | 330  | 439  | 659  | 1099 | 1648 | 2197 | *    |      |   |
| 10.5                | 163                       | 245  | 326  | 490  | 816  | 1224 | 1632 | *    |      |   |
| <b>VANE PUMPS</b>   |                           |      |      |      |      |      |      |      |      |   |
| 7.9                 |                           | 325  | 434  | 651  | 1085 | 1627 | *    |      |      |   |
| 10.5                |                           | 245  | 325  | 490  | 816  | *    |      |      |      |   |
| 14.2                |                           |      | 241  | 362  | 604  | 905  | 1207 | 1811 | *    |   |

▲ 5 Horsepower and larger can only be used on 10 gallon and larger reservoirs.  
\* Using this horsepower could cause pump to exceed maximum rated pressure

# THEORETICAL PRESSURE TABLE (PSI)

Table "B"

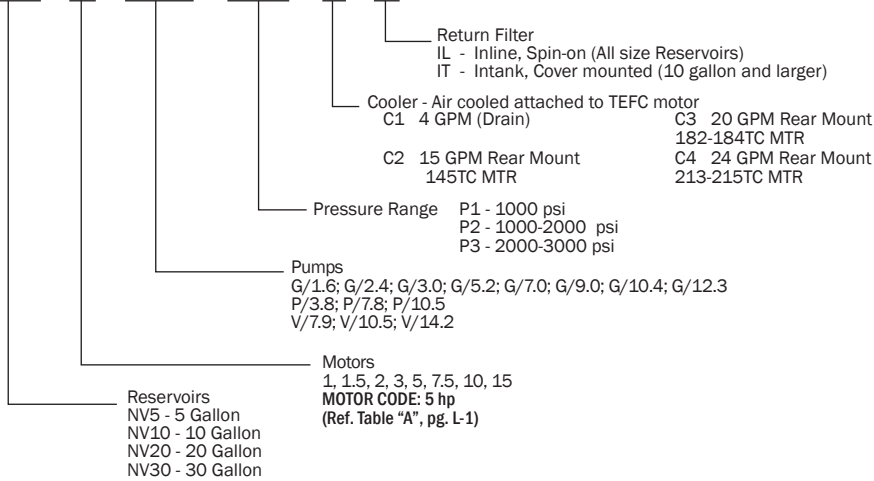
| ORDERING CODE     | THEORETICAL FLOW (GPM) | DISPLACEMENT CU IN/REV |
|-------------------|------------------------|------------------------|
| <b>GEAR PUMPS</b> |                        |                        |
| G/1.6             | 1.63                   | 0.21                   |
| G/2.4             | 2.41                   | 0.31                   |
| G/3.0             | 3.03                   | 0.39                   |
| G/5.2             | 5.22                   | 0.67                   |
| G/7.0             | 7.09                   | 0.91                   |
| G/9.0             | 9.03                   | 1.16                   |
| G/10.4            | 10.44                  | 1.34                   |
| G/12.3            | 12.38                  | 1.59                   |

| ORDERING CODE       | THEORETICAL FLOW (GPM) | DISPLACEMENT CU IN/REV |
|---------------------|------------------------|------------------------|
| <b>PISTON PUMPS</b> |                        |                        |
| P/3.8               | 3.80                   | 0.49                   |
| P/7.8               | 7.80                   | 1.01                   |
| P/10.5              | 10.50                  | 1.34                   |
| <b>VANE PUMPS</b>   |                        |                        |
| V/7.9               | 7.90                   | 1.02                   |
| V/10.5              | 10.50                  | 1.34                   |
| V/14.2              | 14.20                  | 1.83                   |

## Reservoir Code

**NV20 - 5 - G/5.2 - P1~3 - N - IL**

### How to Order



### Replacement Items:

|                          |         |
|--------------------------|---------|
| FILTER ELEMENT (INLINE)  | #72-001 |
| FILTER ELEMENT (INTANK)  | #72-015 |
| AIR BREATHER FILTER      | #42-001 |
| SUCTION STRAINER (5GPM)  | #70-001 |
| SUCTION STRAINER (8GPM)  | #70-002 |
| SUCTION STRAINER (10GPM) | #70-003 |
| SUCTION STRAINER (20GPM) | #70-004 |

### Motor Enclosure

Totally enclosed motors (TEFC) are intended for use where moisture, dirt, and/or corrosive materials are present in indoor or outdoor locations.

### Motor Voltage

3 PHASE - 208-230/460V, 60HZ  
(Special voltages upon request)

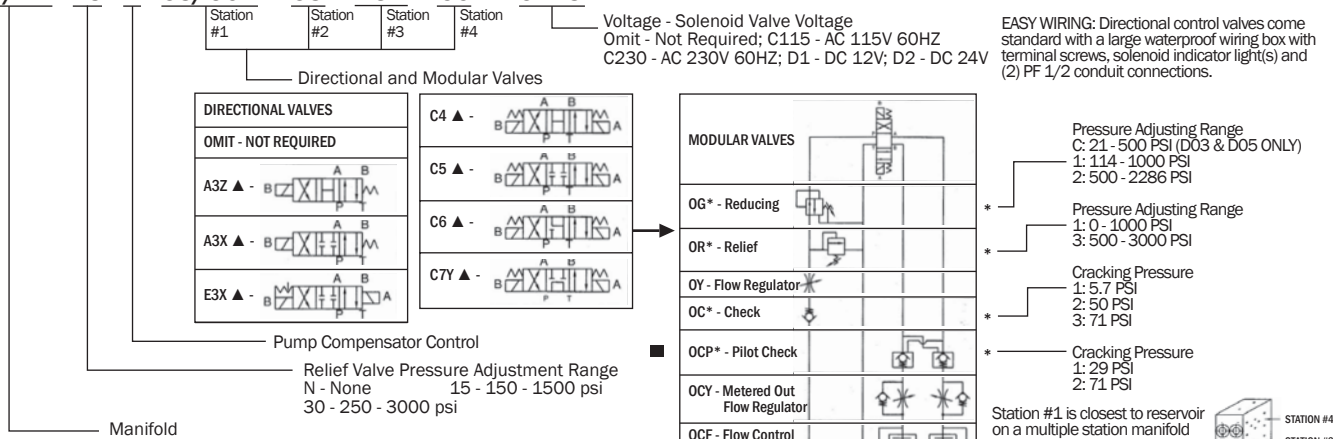
\*Combination of reservoir and pumps are generally a 2:1 reservoir to pump flow ratio. Smaller pump and motor combinations may be mounted on larger reservoirs.

NOTE: Piston and Vane Pumps must use 10 gallon or larger reservoir

## Manifold Code

**D05/4R - 15 - N - C5/OG1 - C5 - A3X - C6 - C115**

### How to Order



### ALUMINUM MANIFOLD BLOCKS

D03/\*R - D03 Directional valve manifold with relief valve.  
(\*Number of valve stations required, 4 maximum. Consult factory if more stations are required.)



PB3R - Pressure block (#8SAE pressure connection) with relief valve for gear pumps.



D05/\*R - D05/(D02) Directional valve manifold with relief valve.  
(\*Number of valve stations required, 4 maximum. Consult factory if more stations are required. 8 gallon and larger reservoir only)



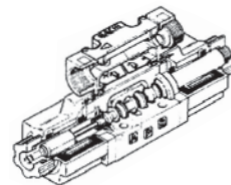
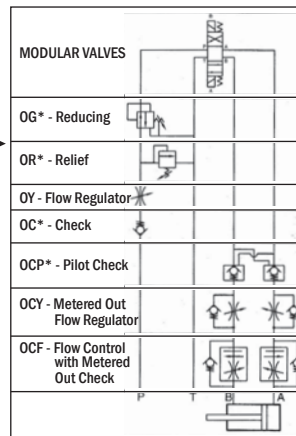
PB3C - Pressure block (#8SAE pressure connection) with compensator control for piston and vane pumps.



PB5R - Pressure block (#12SAE pressure connection) with relief valve for gear pumps. (8 gallons and larger reservoir only)

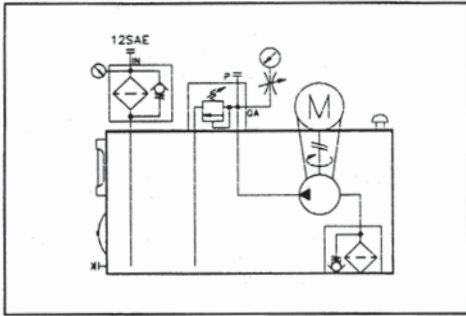


PB5C - Pressure block (#12SAE pressure connection) with compensator control for piston and vane pumps. (8 gallons and larger reservoir only)

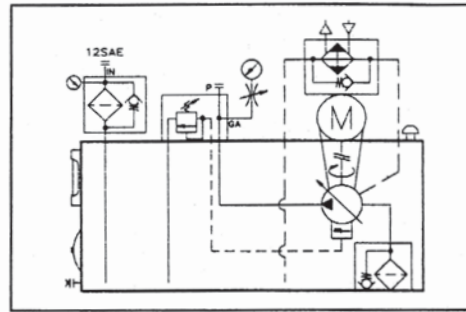


Note: "A" and "B" port connections on "D03" and "D05" manifolds are #8SAE (3/4 - 16 UNF).  
Consult factory for additional configurations.

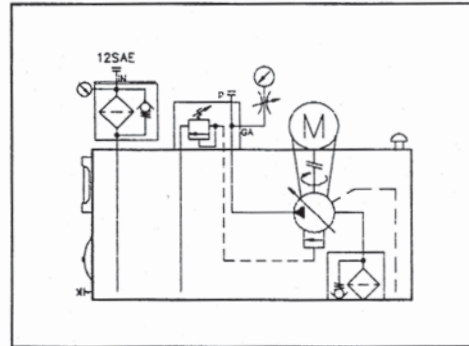
## Schematics



Gear Pump Unit  
with Manifold Option "PB3R" (8SAE)  
or "PB5R" (12SAE)



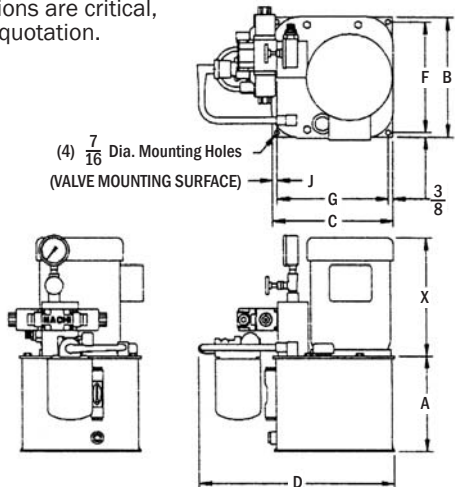
Piston/Vane Pump Unit  
with Case Drain Air Cooler with By-Pass



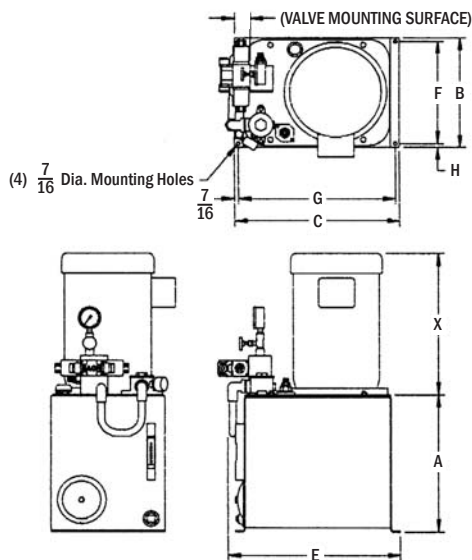
Piston/Vane Pump Unit  
with Manifold Option "PB3C" (8SAE)  
or "PB5C" (12SAE)

## Dimensional Drawings

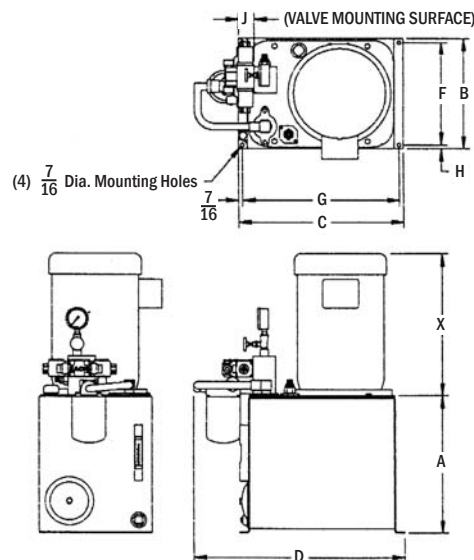
Measurements are approximate.  
Where dimensions are critical,  
obtain special quotation.



NV5 Gallon w/Inline Filter

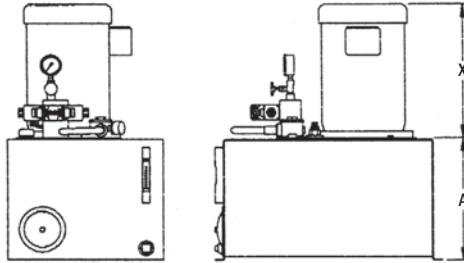
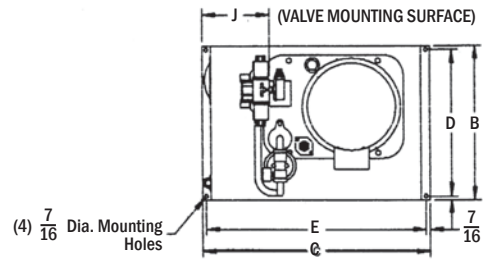
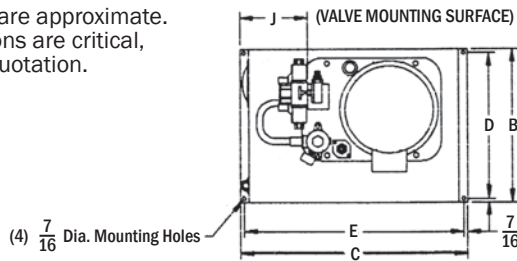


NV10 Gallon w/Intank Filter

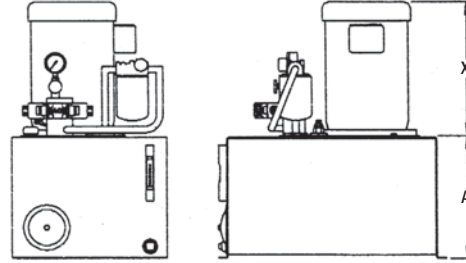


NV10 Gallon w/Inline Filter

Measurements are approximate.  
Where dimensions are critical,  
obtain special quotation.



NV20 Thru NV30 Gallon w/Intank Filter

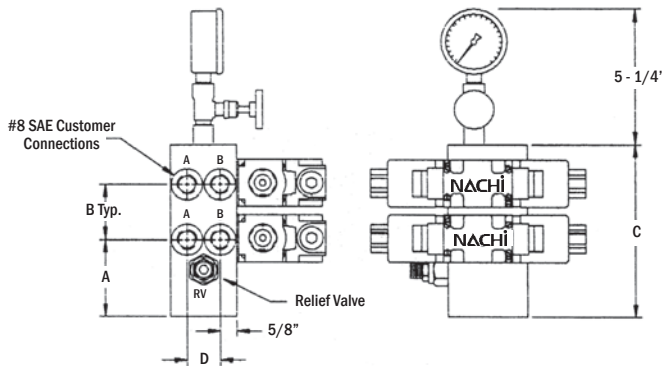


NV20 Thru NV30 Gallon w/Inline Filter

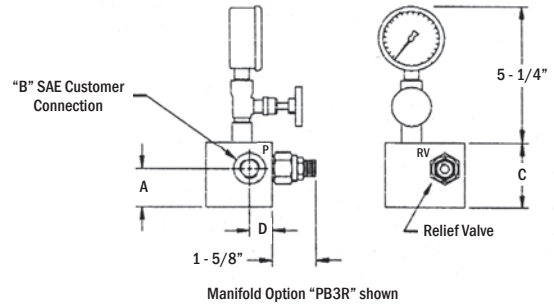
| RESERVOIR | UNIT DIMENSIONS (INCHES) |       |       |   |   |     |       |       |       |
|-----------|--------------------------|-------|-------|---|---|-----|-------|-------|-------|
|           | A                        | B     | C     | D | E | F   | G     | H     | J     |
| NV5       | 10"                      | 12.5" | 14.5" | - | - | 10" | 13.5" | 1.25" | .05"  |
| NV10      | 19.7"                    | 16.5" | 19"   | - | - | 14" | 13.5" | 1.25" | .075" |
| NV20      | 23.7"                    | 16.5" | 19"   | - | - | 14" | 17.5" | 1.25" | .075" |
| NV30      | 35.7"                    | 16.5" | 19"   | - | - | 14" | 17.5" | 1.25" | .075" |

| HORSEPOWER | "X" (TEFC) |
|------------|------------|
| 1          | 10 5/8     |
| 1.5        | 10 5/8     |
| 2          | 11 5/8     |
| 3          | 12 1/4     |
| 5          | 14 1/2     |
| 7.5        | 16 1/4     |
| 10         | 18 1/8     |
| 15         | 20 3/8     |

### Manifold Dimensions



Manifold Option "D03/2R" shown

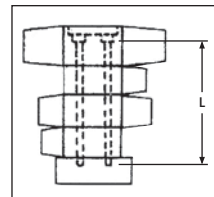


Manifold Option "PB3R" shown

| MANIFOLD OPTIONS | MANIFOLD DIMENSION (INCHES) |    |      |      |
|------------------|-----------------------------|----|------|------|
|                  | A                           | B  | C    | D    |
| PB3*             | 1.50                        | 8  | 2.50 | .84  |
| PB5*             | 1.63                        | 12 | 2.75 | 1.13 |

| MANIFOLD OPTIONS | MANIFOLD DIMENSION (INCHES) |       |       |       |
|------------------|-----------------------------|-------|-------|-------|
|                  | A                           | B     | C     | D     |
| D03/1"           | 1.06"                       | 2.13" | 2.13" | 1.75" |
| D03/2"           | 1.06"                       | 2.13" | 4.25" | 1.75" |
| D03/3"           | 1.06"                       | 2.13" | 6.38" | 1.75" |
| D03/4"           | 1.06"                       | 2.13" | 8.50" | 1.75" |
| D05/1"           | 1.56"                       | 3.25" | 3.25" | 2.12" |
| D05/2"           | 1.56"                       | 3.25" | 6.50" | 2.12" |
| D05/3"           | 1.56"                       | 3.25" | 9.75" | 2.12" |
| D05/4"           | 1.56"                       | 3.25" | 13.0" | 2.12" |

### Optional Component Information - Bolt Kit Length



| Bolt Length for D03              |  |
|----------------------------------|--|
| Valve - 10 - 24 x 1 3/4          |  |
| Valve & module - 10 - 24 x 3 1/4 |  |
| Valve & 2 modules - 10 - 24 x 5  |  |
| Bolt Length for D05              |  |
| Valve - 1/4 - 20 x 2 3/4         |  |
| Valve & module - 1/4 - 20 x 5    |  |
| Valve & 2 modules - 1/4 - 20 x 7 |  |

Note:

1. Bolt kits to be ordered separately when using modulators.
2. Bolt kits are furnished with directional valves when no modulators are required.
3. All "D03" modulators are 40mm thick.
4. "D05" modulators are 55mm thick.



### Horizontal Power Unit

NACHI Standard Horizontal Hydraulic Power Units offer standard systems complete with:

- Reservoir, Pump, Pump Motor Adaptor, Electric Motor, Motor Channel, Flexible Coupling, Pressure Control Relief Valve for

Gear Pumps.

- Pressure Compensated Piston or Vane pumps.
- Pressure Gauge w/Shut Off, Air Breather/Filter Combination, Sight Gauge w/Thermometer, Drain Plug, Pressure and

Return Connections, Return Line Filter w/By-pass and Dirt Indicator, Suction Strainer w/3PSI By-Pass.

### Features

#### Noise Levels:

Noise levels are well below the 90db (a) specified under the WALSH-HEALY ACT.

#### Standard Units:

Standard units can be ordered using the simple model codes. Optional selections can be obtained with the same codes. Custom units can be manufactured using standard unit components.

#### Capacities:

Reservoir capacities available from 10 gallon to 40 gallons. Reservoir capacities vs. pump flow can vary depending on

specific applications. Generally a 2:1 reservoir to pump ratio is acceptable. Pressures at specific pump flow will determine the hydraulic horsepower required. Refer to "TABLE A", below.

#### Quality:

Quality components and high manufacturing standards from such companies as VESCOR, DAMAN and others, make these factory assembled units fit virtually any application. The wide variety of pumps, motors, reservoirs, manifolds and choice of

options enable you to match your application requirements for optimum productivity and Cost-Effective operation.

#### Reliability:

Strict control of accepted hydraulic assembly practices, testing procedures, plus high quality components assure successful operation in a variety of industrial applications.

#### Low Cost:

Production line assembling, combined with minimal piping offers compact systems at low cost.

### Operating Instructions

Fill reservoir with new premium grade hydraulic fluid (Mobil DTE26 or equal). It is highly recommended to filter all hydraulic fluid before filling the reservoir. Fluid level gauge will indicate proper level. Electric motor wiring must conform to the motor wiring nameplate. Jog motor to check proper rotation, indicated by the rotation arrow on the unit. Incorrect rotation can be reversed by interchanging any two lines on a three phase motor.

Relief or compensator control valve should be set at lowest pressure setting for startup. Decrease pressure by turning the adjusting screw counterclockwise. If pump does not prime, vent pump pressure line to atmosphere and into an open container to establish flow. After pump has primed, reconnect pressure line and run at lowest pressure setting to purge air from the system piping. Recheck the fluid level in the reservoir, as some fluid could be lost in the filling of piping and components.

Most foreign material and contaminants will be trapped by the return line filter after a few hours of operation. The return line filter element should be replaced when gauge indicates. (See pg. 8 for spare element numbers). Most industrial applications should operate at a temperature below 140 degrees fahrenheit. At higher temperatures, problems are often experienced in maintaining reliable and consistent hydraulic control. Component service life is also reduced and hydraulic oil deteriorates. If the system tends to operate at an elevated temperature level, steps must be taken to reduce this elevated operating temperature.

Once a year or every 4000 hours of operation, the reservoir's air breather filter and the suction strainer should be replaced. The reservoir oil should be drained, and the reservoir cleaned. Dusty or contaminated environments may require more frequent cleaning and maintenance.

Pressures shown will load AC electric motors to their nameplate horsepower rating. Pressures shown should not be exceeded when system must be started at full pressure. Momentary pressures higher than those listed can be applied if sufficient operating time at lower pump

pressure or lower motor load during the cycle will provide for motor cooling. Dead head pressure loading would require full motor HP using a constant displacement gear pump. Dead head pressure with a pressure compensated Piston or Vane pump would require a small percentage of the full flow loading, consequently generating less heat. Actual HP requirements depend on the duty cycle and operating conditions. This is many times best determined by actual testing by the customer.

The components and piping are designed for the use of petroleum base fluids.

**PRESSURE TABLE (PSI) AT 1800 RPM**  
Table "A"

| GPM                 | HORSEPOWER REQUIREMENTS |      |      |      |      |      |      |
|---------------------|-------------------------|------|------|------|------|------|------|
|                     | 2                       | 3    | 5    | 7.5  | 10   | 15   | 20   |
| <b>GEAR PUMPS</b>   |                         |      |      |      |      |      |      |
| 1.6                 | 1821                    | 2732 | *    |      |      |      |      |
| 2.4                 | 1214                    | 1821 | *    |      |      |      |      |
| 3.0                 | 971                     | 1457 | 2428 | *    |      |      |      |
| 5.2                 | 560                     | 841  | 1401 | 2101 | 2802 |      |      |
| 7.0                 | 416                     | 624  | 1041 | 2101 | 2802 |      |      |
| 9.0                 | 325                     | 486  | 809  | 1214 | 1619 |      |      |
| 10.4                | 280                     | 420  | 700  | 1051 | 1401 | 2101 | 2802 |
| 12.3                | 237                     | 355  | 592  | 88   | 1185 | 1777 | 2369 |
| <b>PISTON PUMPS</b> |                         |      |      |      |      |      |      |
| 3.8                 | 767                     | 1150 | 1917 | 2876 | *    |      |      |
| 7.8                 | 374                     | 560  | 934  | 1401 | 1868 | *    | *    |
| 10.5                | n/a                     | 416  | 694  | 1041 | 1388 | 2081 | 2775 |
| 16.6                | n/a                     | n/a  | 439  | 658  | 878  | 1317 | 1775 |
| 21.5                | n/a                     | n/a  | 339  | 508  | 678  | 1017 | 1355 |
| <b>VANE PUMPS</b>   |                         |      |      |      |      |      |      |
| 4.0                 | 728                     | *    |      |      |      |      |      |
| 7.9                 | 369                     | 553  | 992  | 1383 | 1844 | *    |      |
| 10.5                | 278                     | 416  | 694  | *    |      |      |      |
| 14.2                | n/a                     | 309  | 513  | 770  | 1026 | 1539 | *    |
| 7.9                 | n/a                     | 238  | 396  | 594  | 792  | *    |      |

\* Using this horsepower could cause pump to exceed maximum rated pressure

# THEORETICAL PRESSURE TABLE (PSI)

Table "B"

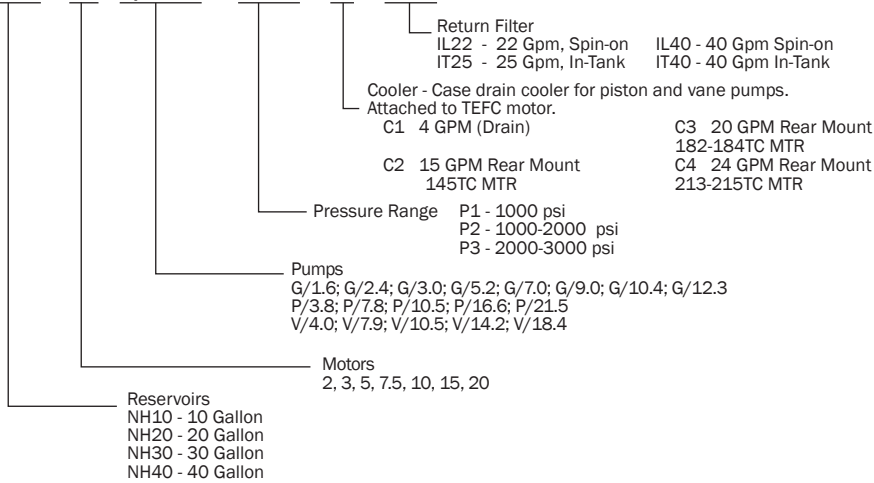
| ORDERING CODE     | THEORETICAL FLOW (GPM) | DISPLACEMENT CU IN/REV |
|-------------------|------------------------|------------------------|
| <b>GEAR PUMPS</b> |                        |                        |
| G/1.6             | 1.63                   | 0.21                   |
| G/2.4             | 2.41                   | 0.31                   |
| G/3.0             | 3.03                   | 0.39                   |
| G/5.2             | 5.22                   | 0.67                   |
| G/7.0             | 7.09                   | 0.91                   |
| G/9.0             | 9.03                   | 1.16                   |
| G/10.4            | 10.44                  | 1.34                   |
| G/12.3            | 12.38                  | 1.59                   |

| ORDERING CODE       | THEORETICAL FLOW (GPM) | DISPLACEMENT CU IN/REV |
|---------------------|------------------------|------------------------|
| <b>PISTON PUMPS</b> |                        |                        |
| P/3.8               | 3.80                   | 0.49                   |
| P/7.8               | 7.80                   | 1.01                   |
| P/10.5              | 10.50                  | 1.34                   |
| P/16.6              | 16.60                  | 2.14                   |
| P/21.5              | 21.50                  | 6.10                   |
| <b>VANE PUMPS</b>   |                        |                        |
| V/4.0               | 4.00                   | 0.51                   |
| V/10.5              | 7.90                   | 1.02                   |
| V/14.2              | 10.50                  | 1.34                   |
| V/14.2              | 14.20                  | 1.83                   |
| V/18.4              | 18.40                  | 2.38                   |

## Reservoir Code

How to Order

**NH40 - 10 - P/10.5 - P1~3 - N - IL40**



### Motor Enclosure

Nachi standard horizontal power units come with totally enclosed fan cooled motors (TEFC). These motors are intended for use where moisture, dirt, and/or corrosive materials are present in indoor or outdoor locations.

### Motor Voltage

All standard horizontal power units come with 3 PHASE - 208-230/460V, 60HZ (Single phase and special voltages available upon request)

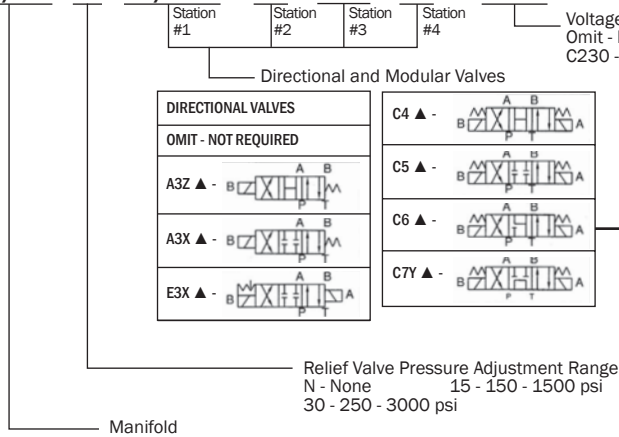
\*Combination of reservoir and pumps are generally a 2:1 reservoir to pump flow ratio. Smaller pump and motor combinations may be mounted on larger reservoirs.

NOTE: Piston and Vane Pumps must use 10 gallon or larger reservoir

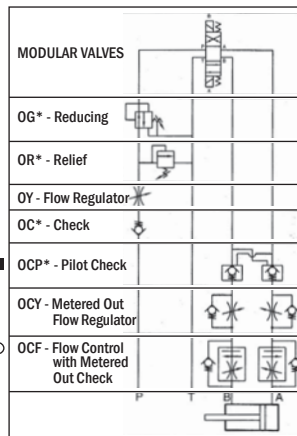
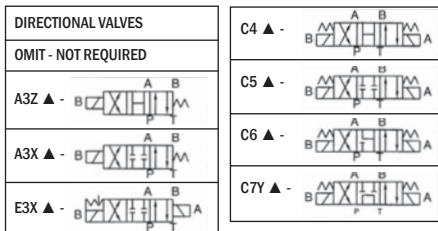
## Manifold Code

How to Order

**D05/4R - 15 - C5/OG1 - C5 - A3X - C6 - C115**



EASY WIRING: Directional control valves come standard with a large waterproof wiring box with terminal screws, solenoid indicator light(s) and (2) PF 1/2 conduit connections.



Pressure Adjusting Range  
C: 21 - 500 PSI (D03 & D05 ONLY)  
1: 114 - 1000 PSI  
2: 500 - 2286 PSI

Pressure Adjusting Range  
1: 0 - 1000 PSI  
3: 500 - 3000 PSI

Cracking Pressure  
1: 5.7 PSI  
2: 50 PSI  
3: 71 PSI

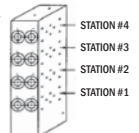
Cracking Pressure  
1: 29 PSI  
2: 71 PSI

Station #1 is closest to reservoir on a multiple station manifold

▲ ADD "F" FOR OPTIONAL HYDRAULIC SHOCKLESS SOLENOID

■ "D03" SIZE ONLY

○ "D03" & "D05" SIZE ONLY



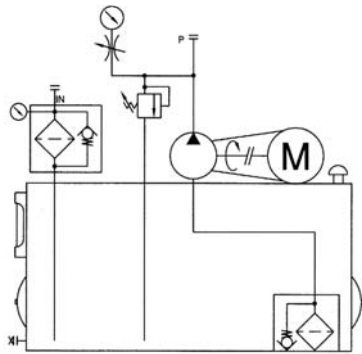
### ALUMINUM MANIFOLD BLOCKS

|   |   |
|---|---|
| D03/*R - D03 Directional valve manifold with relief valve.<br>(*Number of valve stations required, 6 maximum. Consult factory if more stations are required.) | D08/*R - D08 Directional valve manifold with relief valve.<br>(*Number of valve stations required, 2 maximum. Consult factory if more stations are required.) |
| D05/*R - D05 Directional valve manifold with relief valve.<br>(*Number of valve stations required, 6 maximum. Consult factory if more stations are required.) | N - No Manifold, Pressure Connection at Pump (Piston and Vane Pumps Only)   |
|   | RV1 - No Manifold with 50 - 1000 PSI Relief Valve (Required for Gear Pumps)   |
|   | RV2 - No Manifold with 500 - 3000 PSI Relief Valve (Required for Gear Pumps)  |

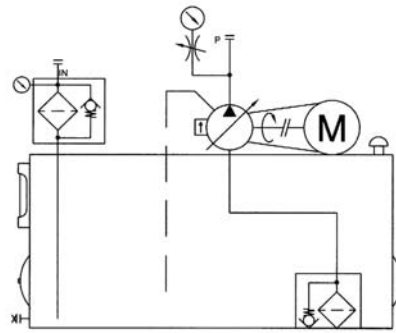
Note: "A" and "B" port connections on "D03" and "D05" manifolds are #8SAE (3/4 - 16 UNF).

Consult factory for additional configurations.

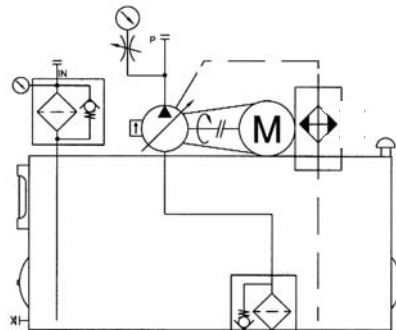
## Schematics



Gear Pump Unit  
with Manifold Option "RV\*"



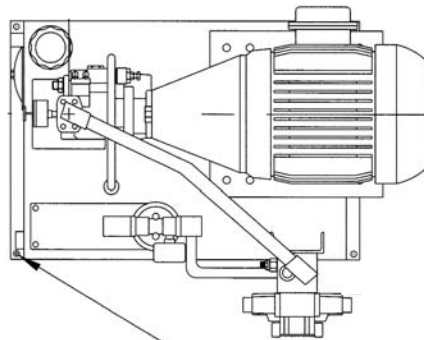
Piston/Vane Pump Unit  
with Manifold Option "N"



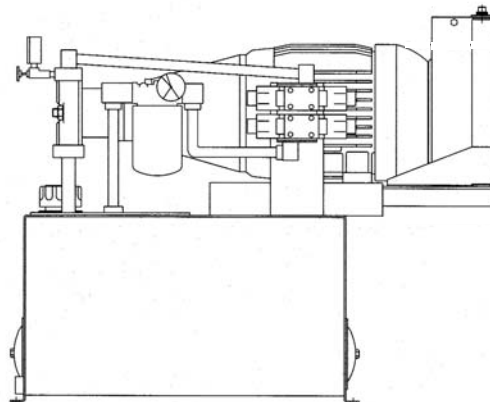
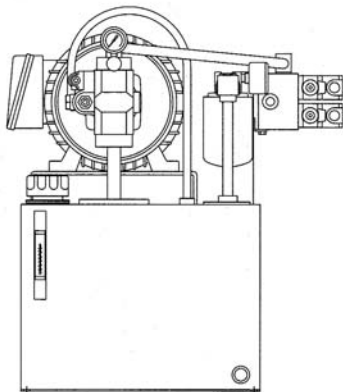
Piston/Vane Pump Unit  
with "AO\*" Cooler Option

## Dimensional Drawings

Measurements are approximate.  
Where dimensions are critical,  
obtain special quotation.



(4) 7/16" DIA. MOUNTING HOLES





## Dimensional Information

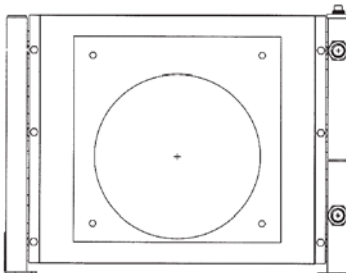
### UNIT DIMENSIONAL INFORMATION

| NHID | BASIC RESERVOIR DIMENSIONS |    |      |      |    |      |      |
|------|----------------------------|----|------|------|----|------|------|
|      | A                          | B  | C    | D    | E  | F    | G    |
| NH10 | 26                         | 16 | 9.5  | 25.2 | 15 | 3.38 | 7    |
| NH20 | 26                         | 16 | 15.5 | 25.2 | 15 | 3.38 | 7    |
| NH30 | 26                         | 16 | 21.5 | 25.2 | 15 | 3.38 | 7    |
| NH40 | 26                         | 16 | 27.5 | 25.2 | 15 | 5.38 | 9.25 |

| NHID      | MANIFOLD ASSEMBLY HEIGHT (L DIMENSION) |       |                 |
|-----------|--|-------|-----------------|
|           | D03                                    | D05   | D08             |
| 1 Station | 12.00                                  | 12.00 | CONSULT FACTORY |
| 2 Station | 12.00                                  | 12.00 |                 |
| 3 Station | 12.00                                  | 12.00 |                 |
| 4 Station | 12.00                                  | 15.25 |                 |
| 5 Station | 14.25                                  | 18.50 |                 |
| 6 Station | 16.25                                  | 21.75 |                 |

|   | MOTOR HORSEPOWER |       |       |       |       |       |       |
|---|------------------|-------|-------|-------|-------|-------|-------|
|   | 2                | 3     | 5     | 7.5   | 10    | 15    | 20    |
| J | 9.95             | 11.88 | 11.88 | 13.50 | 13.50 | 16.59 | 16.59 |
| K | 7.04             | 8.08  | 8.08  | 9.31  | 9.31  | 10.96 | 10.96 |

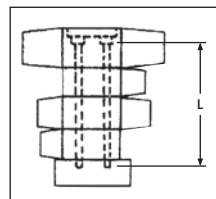
|                 |        | PUMP/MOTOR ASSEMBLY LENGTH CHART (H DIMENSION) |       |       |       |       |       |       |
|-----------------|--------|--|-------|-------|-------|-------|-------|-------|
|                 |        | MOTOR HORSEPOWER                               |       |       |       |       |       |       |
|                 |        | 2  | 3     | 5     | 7.5   | 10    | 15    | 20    |
| AVAILABLE PUMPS | G/1.1  | 17.58  |       |       |       |       |       |       |
|                 | G/1.6  | 17.68  | 20.26 |       |       |       |       |       |
|                 | G/2.4  | 17.8   | 20.38 |       |       |       |       |       |
|                 | G/3.0  | 17.48  | 19.62 | 20.62 |       |       |       |       |
|                 | G/5.2  | 17.8   | 19.94 | 20.94 | 24.03 | 25.53 |       |       |
|                 | G/7.0  | 17.8   | 19.94 | 20.94 | 24.03 | 25.53 |       |       |
|                 | G/9.0  | 18.06  | 20.18 | 21.18 | 24.27 | 25.77 | 28.98 |       |
|                 | G/10.4 | 18.14  | 20.25 | 21.25 | 24.34 | 25.84 | 29.05 | 30.8  |
|                 | G/12.3 | 18.14  | 20.25 | 21.25 | 24.34 | 25.84 | 29.05 | 30.8  |
|                 | P/3.8  | 21.64  | 23.09 | 24.09 | 27.75 |       |       |       |
|                 | P/7.8  | 22.84  | 24.29 | 25.29 | 28.95 | 30.45 | 33.09 |       |
|                 | P/10.5 | N/A  | 24.29 | 25.29 | 28.95 | 30.45 | 33.09 | 34.84 |
|                 | P/16.6 | N/A  | N/A   | 27.44 | 30.29 | 31.79 | 34.43 | 36.18 |
|                 | P/21.5 | N/A  | N/A   | 27.44 | 30.29 | 31.79 | 34.43 | 36.18 |
|                 | V/4.0  | 16.75  |       |       |       |       |       |       |
|                 | V/7.9  | 17.26  | 18.96 | 19.96 | 23.05 | 24.55 |       |       |
| V/10.5          | 17.26  | 18.96  | 19.96 |       |       |       |       |       |
| V/14.2          | N/A    | 19.74  | 20.74 | 23.83 | 25.33 | 27.97 |       |       |
| V/18.4          | N/A    | 19.74  | 20.74 | 23.83 | 25.33 | 27.97 |       |       |



**Air/Oil Return Oil Cooler**

|     | GPM | Max Hp Removed |
|-----|-----|----------------|
| A01 | 15  | .85 HP         |
| A02 | 20  | 1.50 HP        |
| A03 | 24  | 2.50 HP        |
| A04 | 24  | 2.85 HP        |

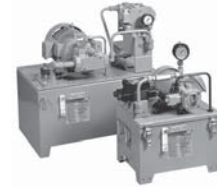
### Optional Component Information - Bolt Kit Length



| Bolt Length for D03              |  |
|----------------------------------|--|
| Valve - 10 - 24 x 1 3/4          |  |
| Valve & module - 10 - 24 x 3 1/4 |  |
| Valve & 2 modules - 10 - 24 x 5  |  |
| Bolt Length for D05              |  |
| Valve - 1/4 - 20 x 2 3/4         |  |
| Valve & module - 1/4 - 20 x 5    |  |
| Valve & 2 modules - 1/4 - 20 x 7 |  |

Note:

1. Bolt kits to be ordered separately when using modulars.
2. Bolt kits are furnished with directional valves when no modulars are required.
3. All "D03" modulars are 40mm thick.
4. "D05" modulars are 55mm thick.



### NCP Series Standard Variable Pump Unit

NCP Series is a compact, low-cost standard unit that includes a variable vane pump (VDS, VDR, VDC Series) or a variable piston pump (PVS/PZS Series). The power unit is low-noise, low-heat, energy-efficient, and highly reliable. The NCP Series has been expanded to include a choice of models that are optimized for a very wide range of needs. Available tank capacities range from 30 ℓ to 650 ℓ.

### Features

#### Low energy, high efficiency

A built-in low-noise, high-efficiency NACHI variable pump ensures low heat, high-efficiency, low-energy operation.

#### A rich range of options

A full selection of options include base block, cooler, terminal box, microseparator, oil pan, return filter, and more, so you can configure a unit that meets your particular needs.

#### A selection of versatile circuits

Virtually any type of circuit can be configured using ganged type NACHI modular valves.

#### Low cost, short lead time

Components are all standard and mass produced, so parts are readily available at low prices.

#### • Handling

- 1 All pump rotation is clockwise (rightward) when viewed from the shaft side.
- 2 See the table below for information about adjusting discharge volume and pressure.
- 3 For operating fluid, use regular oil equivalent to ISO VG 32 to 68 (Viscosity Index: 90 or greater).

|                   | Adjusting Screw<br>Rotation Direction | Pump type             |          |
|-------------------|---------------------------------------|-----------------------|----------|
|                   |                                       | VDS · VDC · PVS · PZS | VDR      |
| Pressure          | Clockwise                             | Increase              | Decrease |
|                   | Counterclockwise                      | Decrease              | Increase |
| Discharge<br>rate | Clockwise                             | Decrease              |          |
|                   | Counterclockwise                      | Increase              |          |

### Specifications

- Note: 1. For direct connect type, use a Nachi Uni-pump.  
 2. Fluid temperature limit is room temperature +25 °C setting conditions are full cutoff continual operation, tank located in a well-ventilated area.  
 3. An unload circuit is required when the motor is started under condition -Δ. Contact your agent about the unload circuit.  
 4. Unless specified otherwise, electrical systems and paint colors are NACHI standards (see page L-13).

#### Variable Vane Pump Series

Power supply for all types is 200V AC.

| Model No.                               | Pump Model No.                   | Conne-<br>ction | Motor<br>(All External)<br>kW, 4P | Tank<br>Capacity<br>ℓ | Full Cutoff Pressure at Tank Fluid Temperature<br>Limit Note 3) MPa(kgf/cm <sup>2</sup> ) |                             |                                   | Approximate Weight<br>kg        |
|---|----------------------------------|-----------------|-----------------------------------|-----------------------|---|-----------------------------|-----------------------------------|---------------------------------|
|   |                                  |                 |                                   |                       | No Fan<br>Cooler  | With Standard<br>Fan Cooler | With High-<br>power Fan<br>Cooler |                                 |
| (VC1A2)<br>NCP-40-0.7VD1A2- M-12(21)    | (VDC-1B-1A*-20)<br>VDR-1B-1A*-22 | Direct          | 0.75                              | 40                    | 3.0<br>(30.6)   | 8.0<br>(81.6)               | -                                 | 70                              |
| (VC1A*)<br>NCP-60-**VD1A*- M-12(21)     | (VDC-1B-1A*-20)<br>VDR-1B-1A*-22 | Direct          | 1.5<br>2.2<br>3.7                 | 60                    | 4.5<br>(45.9)   | 9.0<br>(91.8)               | -                                 | 90<br>95<br>115                 |
| (VC q A3)<br>NCP-100-3.7VD q A3-C12(21) | (VDC-1B-2A3-20)<br>VDR-1B-2A3-22 | Direct          | 3.7                               | 100                   | 7.0<br>(71.4)   | -                           | -                                 | 155                             |
| 2A*<br>NCP-160-**VC w A*-M-12           | VDC-2A-1A*-20<br>2A*             | Coupling        | 5.5<br>7.5<br>11                  | 160                   | 3.5<br>(35.7)   | 6.5<br>(66.3)               | 8.5<br>(86.7)                     | 240<br>250<br>300               |
| 2A*<br>NCP-250-**VC w A*-M-12           | VDC-2A-1A*-20<br>2A*             | Coupling        | 7.5<br>11<br>15                   | 250                   | 4.5<br>(45.9)   | 7.0<br>(71.4)               | 9.5<br>(96.9)                     | 300<br>350<br>375               |
| NCP-400-**VC3A*- M-12                   | VDC-3A-1A*-20                    | Coupling        | 7.5<br>11<br>15<br>18.5<br>22     | 400                   | 4.5<br>(45.9)   | 7.0<br>(71.4)               | 8.5<br>(86.7)                     | 475<br>505<br>525<br>560<br>590 |
| NCP-650-**VC3A*- M-12                   | VDC-3A-1A*-20                    | Coupling        | 11<br>15<br>18.5<br>22<br>30      | 650                   | 6.0<br>(61.2)   | 8.5<br>(86.7)               | 10.0<br>(102.0)                   | 600<br>620<br>660<br>685<br>750 |

- Note: 1. Contact your agent when mounting motors enclosed in parentheses. These motors require special handling concerning operating pressure, heat generation, etc.  
 2. Equip a return filter for pressures of 7MPa or greater.  
 3. A radiator is equipped as standard with the 100 ℓ type.

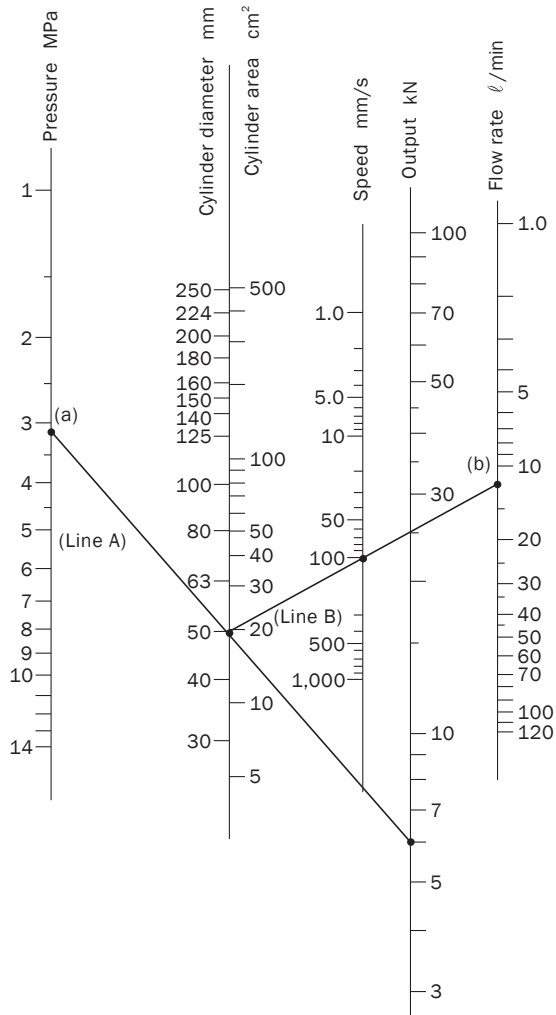
#### Variable Piston Pump Series

Power supply for all types is 200V AC.

| Model No.  | Pump Model No.                            | Conne-<br>ction | Motor<br>(All External)<br>kW, 4P | Tank<br>Capacity<br>ℓ | Full Cutoff Pressure at Tank Fluid Temperature<br>Limit Note 3) MPa(kgf/cm <sup>2</sup> ) |                             |                                   | Approximate Weight<br>kg        |
|--|---|-----------------|-----------------------------------|-----------------------|---|-----------------------------|-----------------------------------|---------------------------------|
|  |   |                 |                                   |                       | No Fan<br>Cooler  | With Standard<br>Fan Cooler | With High-<br>power Fan<br>Cooler |                                 |
| NCP-30-**PV8N*-R-12                                  | PVS-0B-8N*-30                             | Direct          | 0.75<br>1.5                       | 30                    | 5.0<br>(51.0)   | -                           | -                                 | 43<br>46                        |
| NCP-40-**PV8N*-R-12                                  | PVS-0B-8N*-30                             | Direct          | 0.75<br>1.5                       | 40                    | 5.0<br>(51.0)   | 21.0<br>(214.1)             | -                                 | 75<br>80                        |
| NCP-60-**PV8N*-R-12                                  | PVS-0B-8N*-30                             | Direct          | 1.5<br>2.2<br>3.7                 | 60                    | 7.0<br>(71.4)   | 21.0<br>(214.1)             | -                                 | 90<br>95<br>115                 |
| NCP-40-**PV16N*-R-12(21)                             | PVS-1B-16N*-12                            | Direct          | 0.75<br>1.5                       | 40                    | 4.5<br>(45.9)   | 21.0<br>(214.1)             | -                                 | 75<br>80                        |
| NCP-60-**PV16N*-R-12(21)                             | PVS-1B-16N*-12                            | Direct          | 1.5<br>2.2<br>3.7                 | 60                    | 7.0<br>(71.4)   | 21.0<br>(214.1)             | -                                 | 90<br>95<br>115                 |
| NCP-100-**PV <sup>16</sup> <sub>22</sub> N*-R-12(21) | PVS-1B- <sup>16</sup> <sub>22</sub> N*-12 | Coupling        | 3.7<br>5.5<br>7.5                 | 100                   | 8.5<br>(86.7)   | 21.0<br>(214.1)             | -                                 | 145<br>170<br>185               |
| NCP-160-**PV35N*-R-12                                | PVS-2B-35N*-12                            | Coupling        | 5.5<br>7.5<br>11                  | 160                   | 7.0<br>(71.4)   | 14.0<br>(142.7)             | 21.0<br>(214.1)                   | 235<br>245<br>295               |
| NCP-250-**PV <sup>35</sup> <sub>45</sub> N*-R-12     | PVS-2B- <sup>35</sup> <sub>45</sub> N*-12 | Coupling        | 7.5<br>11<br>15                   | 250                   | 9.5<br>(96.9)   | 17.0<br>(173.3)             | 21.0<br>(214.1)                   | 295<br>345<br>370               |
| NCP-400-**PV70N*-R-12                                | PZS-3B-70N*-10                            | Coupling        | 7.5<br>11<br>15<br>18.5<br>22     | 400                   | 5.5<br>(56.1)   | 14.0<br>(142.7)             | 16.0<br>(163.1)                   | 490<br>525<br>545<br>580<br>605 |
| NCP-650-**PV70N*-R-12                                | PZS-3B-70N*-10                            | Coupling        | 11<br>15<br>18.5<br>22<br>30      | 650                   | 8.5<br>(86.7)   | 16.0<br>(163.1)             | 18.0<br>(183.5)                   | 620<br>640<br>680<br>705<br>770 |

Note: All models in this series are equipped with a return filter as standard.

# Specifications



**[Example]**

To determine the NCP Series model that drives a  $\phi$  50 cylinder with an output of 6kN and speed of 100mm/s.

- (a) Draw a line (Line A) between 6kN on the output line and the  $\phi$  50 point on the cylinder diameter line. Extend Line A until it intersects with the pressure line at Point (a). Though Point (a) indicates a pressure of 3.1MPa, we need to add about 1MPa to compensate for pressure loss due to piping and other factors, so a pressure of 4MPa is required.
- (b) From the  $\phi$  50 point on the cylinder diameter line, draw a line (Line B) to the

100 mm/s point on the speed line. Extend Line B until it intersects with the flow rate line at Point (b), which indicates a required flow rate of 11.8 l/min.

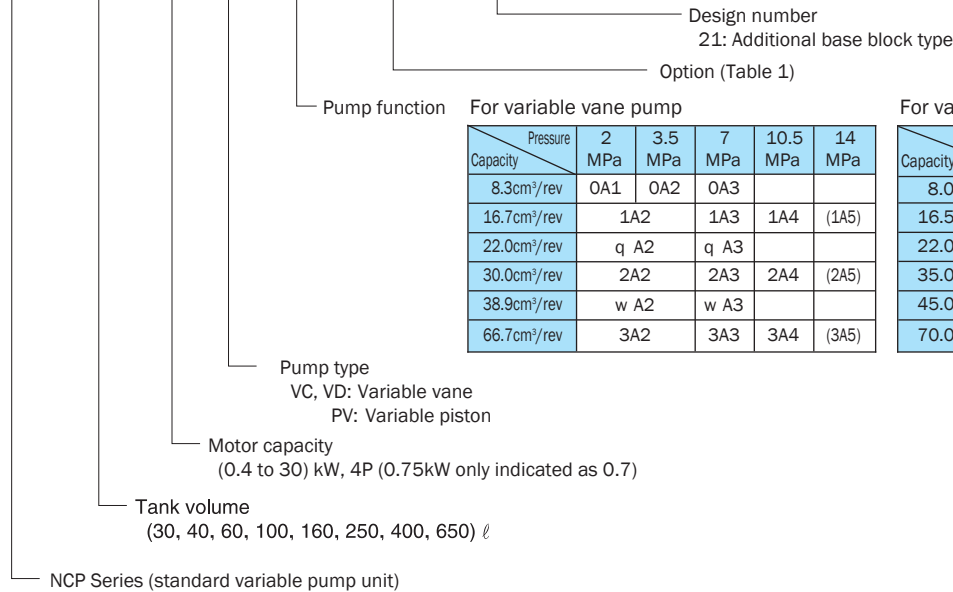
- (c) Based on the required flow rate of 11.8 l/min. and required pressure of 4MPa obtained above, we can now check the selection chart where we easily find out that the required model is NCP-60-1.5 VD1A3-12. Next, select the required option from Table 1 on the following page.

| Flow rate<br>$l/min$ | Area    | Pressure<br>MPa   | NCP Series Model                                     |  |
|----------------------|---------|---|--|--|
|                      |         |   | Variable Vane Pump Series                            | Variable Piston Pump Series  |
| 5                    |         | 3.5 to 5.0  |  | NCP-30-0.7V8N1-R-12  |
| 10                   |         | 4.5 to 8.0<br>8.0 to 14.0   |  | NCP-40-1.5PV16N2-CR-12(21)<br>-60-2.2PV16N2-CR-12(21)  |
| 15                   | 50/60Hz | 1.0 to 3.0<br>3.0 to 4.5<br>4.5 to 7.0<br>7.0 to 14.0                   | NCP-40-0.7V*1A2-12(21)<br>-60-1.5V*1A3-12(21)        | NCP-60-2.2PV16N1-R-12(21)<br>-60-3.7PV16N2-CR-12(21)   |
| 20                   |         | 1.0 to 3.0<br>3.0 to 5.0<br>5.0 to 10.0<br>10.0 to 14.0                 | NCP-40-0.7V*1A2-12(21)<br>-60-1.5V*1A3-12(21)        | NCP-60-3.7PV16N2-(C)R-12(21)<br>NCP-100-5.5PV16N2-CR-12(21)  |
| 25                   | 50Hz    | 1.0 to 3.0<br>3.0 to 5.0<br>5.0 to 12.0<br>12.0 to 14.0                 | NCP-60-1.5V* q A2-12(21)<br>-100-3.7V* q A3-C-12(21) | NCP-100-5.5PV22N2-(C)R-12(21)<br>-100-7.5PV22N2-CR-12(21)  |
|                      | 60Hz    | 1.0 to 3.5<br>3.5 to 5.0<br>5.0 to 12.0<br>12.0 to 14.0                 | NCP-60-1.5V*1A2-12(21)<br>-60-2.2V*1A3-C-12(21)      | NCP-100-5.5PV16N2-(C)R-12(21)<br>-100-7.5PV16N2-CR-12(21)  |
| 30                   | 50/60Hz | 1.0 to 3.5<br>3.5 to 5.0<br>5.0 to 8.0<br>8.0 to 14.0                   | NCP-60-2.2V* q A2-12(21)<br>-100-3.7V* q A3-C-12(21) | NCP-100-5.5PV22N2-(C)R-12(21)<br>-100-7.5PV22N2-CR-12(21)  |
| 35                   | 50Hz    | 2.0 to 7.0<br>7.0 to 10.5<br>10.5 to 14.0                               | NCP-160-5.5VC2A3-(C)-12                              | NCP-160-7.5PV35N2-CR-12<br>-160-11PV35N2-CR-12   |
|                      | 60Hz    | 2.0 to 6.0<br>6.0 to 10.5<br>10.5 to 14.0                               | NCP-100-3.7V* q A3-C-12(21)                          | NCP-100-7.5PV22N2-CR-12(21)  |
| 40                   |         | 2.0 to 7.0<br>7.0 to 10.0<br>10.0 to 14.0                               | NCP-160-5.5VC2A3-(C)-12                              | NCP-160-7.5PV35N2-CR-12<br>-160-11PV35N2-CR-12   |
| 50                   | 50/60Hz | 2.0 to 5.0<br>5.0 to 7.0<br>7.0 to 11.5<br>11.5 to 14.0                 | NCP-160-5.5VC w A3-(C)-12<br>-160-7.5VC w A3-C-12    | NCP-160-11PV35N2-CR-12<br>-250-15PV45N2-CR-12  |
|                      | 50Hz    | 2.0 to 7.0<br>7.0 to 10.0<br>10.0 to 14.0                               |  | NCP-250-7.5PV45N2-R-12<br>-250-11PV45N2-CR-12<br>-250-15PV45N2-CR-12   |
| 60                   | 50Hz    | 2.0 to 4.5<br>4.5 to 7.0<br>7.0 to 10.0<br>10.0 to 13.5                 | NCP-250-5.5VC w A3-12<br>-250-7.5VC w A3-C-12        | NCP-250-11PV35N2-CR-12<br>-250-15PV35N2-CR-12  |
|                      | 60Hz    | 2.0 to 4.5<br>4.5 to 7.0<br>7.0 to 10.0<br>10.0 to 13.5                 | NCP-400-7.5VC3A3-12<br>-400-11VC3A3-C-12             | NCP-400-15PV70N3-CR-12<br>-400-18.5PV70N3-CR-12  |
| 75                   | 50Hz    | 2.0 to 5.5<br>5.5 to 8.0<br>8.0 to 11.0<br>11.0 to 13.5                 |  | NCP-250-7.5PV45N1-R-12<br>-250-11PV45N2-(C)R-12<br>-250-15PV45N2-CR-12<br>-250-18.5PV45N2-CR-12                    |
|                      | 60Hz    | 2.0 to 4.0<br>4.0 to 6.5<br>6.5 to 9.0<br>9.0 to 11.5<br>11.5 to 13.5   | NCP-400-7.5VC3A3-12<br>-400-11VC3A3-C-12             | NCP-400-15PV70N3-CR-12<br>-400-18.5PV70N3-CR-12<br>-400-22PV70N3-CR-12   |
| 90                   | 50/60Hz | 2.0 to 6.0<br>6.0 to 8.0<br>8.0 to 10.0<br>10.0 to 12.0<br>12.0 to 14.0 |  | NCP-650-11PV70N1-R-12<br>-650-15PV70N3-R-12<br>-650-18.5PV70N3-CR-12<br>-650-22PV70N3-CR-12<br>-650-30PV70N3-CR-12 |
|                      | 50Hz    | 2.0 to 6.0<br>6.0 to 8.0<br>8.0 to 10.0<br>10.0 to 12.0<br>12.0 to 14.0 | NCP-650-11VC3A3-12                                   | NCP-650-15PV70N3-R-12<br>-650-18.5PV70N3-CR-12<br>-650-22PV70N3-CR-12<br>-650-30PV70N3-CR-12                       |
| 100                  | 50Hz    | 2.0 to 5.5<br>5.5 to 7.0<br>7.0 to 9.0<br>9.0 to 11.0<br>11.0 to 14.0   | NCP-650-11VC3A3-12<br>-650-15VC3A3-(C)-12            | NCP-650-18.5PV70N3-(C)R-12<br>-650-22PV70N3-CR-12<br>-650-30PV70N3-CR-12   |
|                      | 60Hz    | 2.0 to 5.0<br>5.0 to 7.0<br>7.0 to 8.5<br>8.5 to 10.0<br>10.0 to 13.5   |  | NCP-650-11PV70N1-R-12<br>-650-15PV70N3-R-12<br>-650-18.5PV70N3-CR-12<br>-650-22PV70N3-CR-12<br>-650-30PV70N3-CR-12 |
| 110                  | 60Hz    | 2.0 to 5.0<br>5.0 to 7.0<br>7.0 to 8.5<br>8.5 to 10.0<br>10.0 to 13.5   |  | NCP-650-11PV70N1-R-12<br>-650-15PV70N3-R-12<br>-650-18.5PV70N3-CR-12<br>-650-22PV70N3-CR-12<br>-650-30PV70N3-CR-12 |
| 120                  | 60Hz    | 2.0 to 5.0<br>5.0 to 7.0<br>7.0 to 8.5<br>8.5 to 10.0<br>10.0 to 13.5   |  | NCP-650-11PV70N1-R-12<br>-650-15PV70N3-R-12<br>-650-18.5PV70N3-CR-12<br>-650-22PV70N3-CR-12<br>-650-30PV70N3-CR-12 |

- Note: 1. Contact your agent if you need a low-pressure NCP unit with piston pump.
- 2. If flow rate and pressure are not specified, products are configured with company standard settings before shipping.
- 3. When running items marked with a star (\*) to the right of the table for long periods at pump setting pressure, fluid temperature may exceed 60 °C even when a fan cooler is used. In this case, use a water cooler.
- 4. Contact your agent for applications where there is the chance of frequent momentary return flow due to the use of ACC, or surge voltage generated due to the use of fast switching valve response and a high cycle.

# Understanding Model Numbers

NCP - 100 - 3.7 \* \* \* \* \* - [ ] - 12(21)



| For variable vane pump   |          |       |         |       |          | For variable piston pump |                          |          |           |            |
|--------------------------|----------|-------|---------|-------|----------|--------------------------|--------------------------|----------|-----------|------------|
| Capacity                 | Pressure | 2 MPa | 3.5 MPa | 7 MPa | 10.5 MPa | 14 MPa                   | Capacity                 | Pressure | 2 to 7MPa | 7 to 14MPa |
| 8.3cm <sup>3</sup> /rev  |          | OA1   | OA2     | OA3   |          |                          | 8.0cm <sup>3</sup> /rev  |          | 8N1       | 8N2        |
| 16.7cm <sup>3</sup> /rev |          | 1A2   |         | 1A3   | 1A4      | (1A5)                    | 16.5cm <sup>3</sup> /rev |          | 16N1      | 16N2       |
| 22.0cm <sup>3</sup> /rev |          | q A2  |         | q A3  |          |                          | 22.0cm <sup>3</sup> /rev |          | 22N1      | 22N2       |
| 30.0cm <sup>3</sup> /rev |          | 2A2   |         | 2A3   | 2A4      | (2A5)                    | 35.0cm <sup>3</sup> /rev |          | 35N1      | 35N2       |
| 38.9cm <sup>3</sup> /rev |          | w A2  |         | w A3  |          |                          | 45.0cm <sup>3</sup> /rev |          | 45N1      | 45N2       |
| 66.7cm <sup>3</sup> /rev |          | 3A2   |         | 3A3   | 3A4      | (3A5)                    | 70.0cm <sup>3</sup> /rev |          | 70N1      | 70N2       |

Table 1: Option Symbols

| Symbol | Description  | Model Number and Description   | 30L      | 40 to 100L                        | 160, 250L | 400, 650L |
|--------|--|--|----------|-----------------------------------|-----------|-----------|
| B      | Base Block (Design No. 12 Only)                              | MPU Series built-in  | ○ Note 2 | ○                                 | ○         | ○         |
| C      | Radiator   | 3A92-001-1050  | ○        | ○                                 |           |           |
| C1     | General-purpose Fan Cooler                                   | 3A92-001-0000<br>16/15W Single-phase 200V AC 50/60Hz   |          | ○                                 | ○         | ○         |
| C2     | High-power Fan Cooler  | 3A92-002-0000<br>33/30W Single-phase 200V AC 50/60Hz   |          |                                   |           | ○         |
| D      | Terminal Wiring (Drive System + Control System)              | Wiring from each electrical device to the terminal box (Drive System + Control System)         | ○        | ○                                 | ○         | ○         |
| E      | Terminal Wiring (Control System Only)                        | Wiring from each electrical device to the terminal box (Control System Only)                   | ○        | ○                                 | ○         | ○         |
| F      | Mounting Foot for Forklift                                   | See mounting foot for forklift specifications.   |          | ○                                 |           |           |
| M      | Microseparator   | MSB-110  | ○        | ○                                 | ○         | ○         |
| N      | Noise Control  | Motor 6P specifications  |          |                                   |           | ○         |
| P      | Oil pan  | See oil pan specifications.  |          | ○                                 | ○         | ○         |
| R      | Return Filter  | WS-20-20-V(20 μ paper)   | ○        |                                   |           |           |
| R1     | Return Filter  | CF-0*(10 μ paper)<br>FRS-**-20P**(20μ paper)   |          | ○ Note 3                          | ○ Note 3  |           |
| R2     | Return Filter  | FPL-0*(10 μ paper)   |          | ○                                 | ○         |           |
| T      | Temperature Gauge (With Fluid Level Gauge)                   | φ6 × 80L φ 25 (0 to 100°C) with guard<br>φ8 × 120L φ 35  | ○        | ○                                 | ○         | ○         |
| V      | Vibration Control  | Anti-vibration rubber, rubber hoses, etc.  |          |                                   |           | ○         |
| W1     | Self Leak Test   | Tank leak test by NACHI  |          | ○                                 | ○         | ○         |
| W2     | Government-mandated Leak Test                                | Tank leak test by fire department  |          | ○                                 | ○         | ○         |
| TH     | Thermostat (Abnormal fluid temperature detection: Contact a) | TNS-C1070C (Contact on: 65° C and above)   |          | ○                                 | ○         | ○         |
| PS     | Pressure Switch (Abnormal pressure detection: Contact a)     | CP20-223 Contact ON: (Pump Setting Pressure) -(1.5MPa) and above                               |          | ○                                 | ○         | ○         |
| FS     | Float Switch (Low fluid level detection: Contact a)          | OLV-2A Contact on: (Fluid Level Gauge Visual Low Level) -(10mm) or less                        |          | ○                                 | ○         | ○         |
| G      | Fluid Level Gauge Guard                                      | Protective cover installation  | ○        | ○                                 | ○         | ○         |
| R3     | Return Filter (Tank Top Type)                                | VLR**-**P-S  |          |                                   |           |           |
| L      | Anchor Hole Outer Side                                       | Anchor hole set on outer side  |          |                                   |           |           |
|        | Motor Abnormal Voltage                                       | Reference Voltage Other than 200V AC 50/60Hz; 220V AC 60Hz                                     |          | Supported for Design Number 5100A |           |           |
|        | Special Paint (Exterior)                                     | Other than standard lacquer paint (phthalates, epoxy, etc.)                                    |          |                                   |           |           |
|        | Piston Pump Variable Control Option                          | Other than standard control system N (NQ, RS, WS, RQS, etc.)                                   |          |                                   |           |           |
|        | Fire Resistant Operating Fluid (W/G Type)                    | Water- or glycol-based hydraulic operating fluid (Contact your agent about other fluid types.) |          |                                   |           |           |
|        | Water Cooler   | When capacity of pump DR fan cooler is insufficient  |          |                                   |           |           |
|        | Electric Oil Heater  | When there is the possibility of fluid pressure dropping below 0° C                            |          |                                   |           |           |

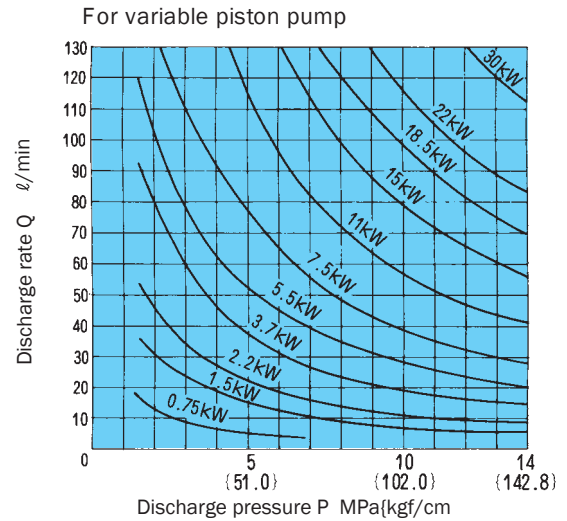
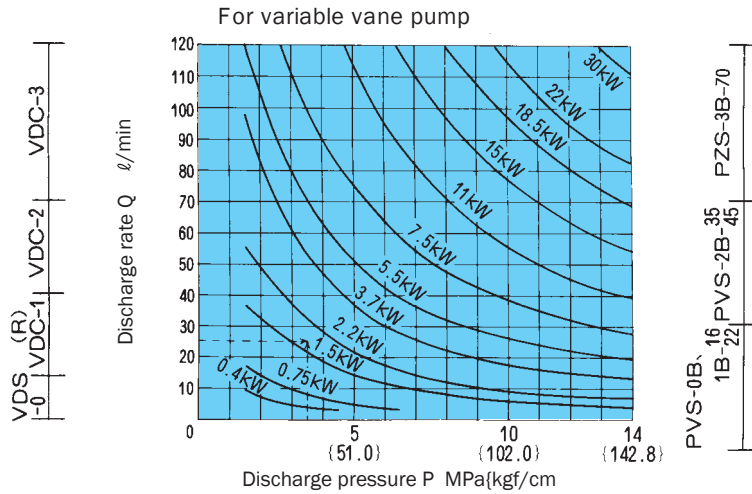
- Note: 1. Design 12 when option symbol B is selected. (Base block additional 21 design is not applicable)  
 2. With the optional Symbol B capacity 30L, a special base block can be used in a configuration of up to O1 × 3.  
 3. Option symbol R1 CF-0\* is applicable to pump functions \*A2 and \*NO only.  
 4. FRS-08-20P08T for option symbol R1, capacity 250L using a 45cm<sup>3</sup>/rev type.  
 5. Contact Nachi for information about design number 5100A.

## Selecting a Motor

- The lower side of the output curves for each of the motors shown in the graph indicates the operating range under rated output for that motor.
- Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.

Example: To find the motor that can produce pressure of 3.5MPa {35.7kgf/cm<sup>2</sup>} and a discharge rate of 25r/min.  
Since the intersection of the two broken

lines from a pressure of 3.5MPa {35.7kgf/cm<sup>2</sup>} and discharge rate of 25r/min intersect in the area under the 2.2kW curve, it means that a 2.2kW motor should be used.

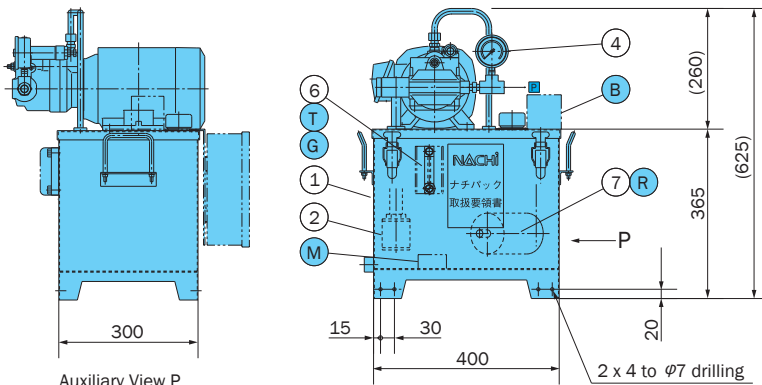
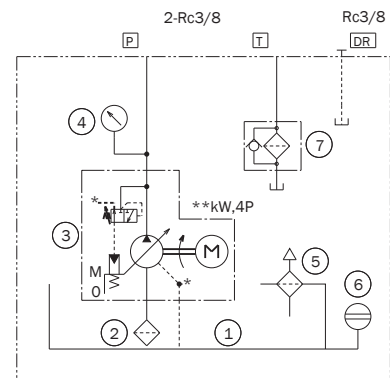
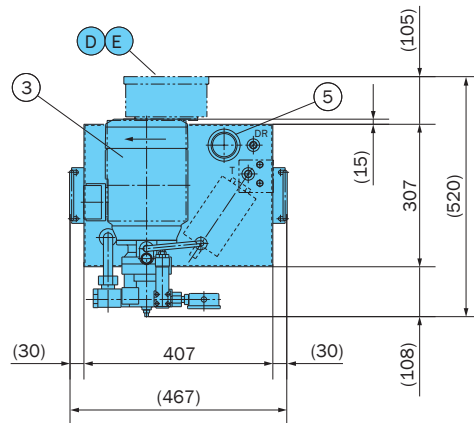


## Installation Dimension Drawings

- Mini NCP Series
- NCP-30-\*\*PV8N\*-\*-12

Note: Catalog dimensions, layout, and used devices are subject to change without notice. In particular, be sure to check in cases where dimensions are limited.

- Option item numbers are colored.

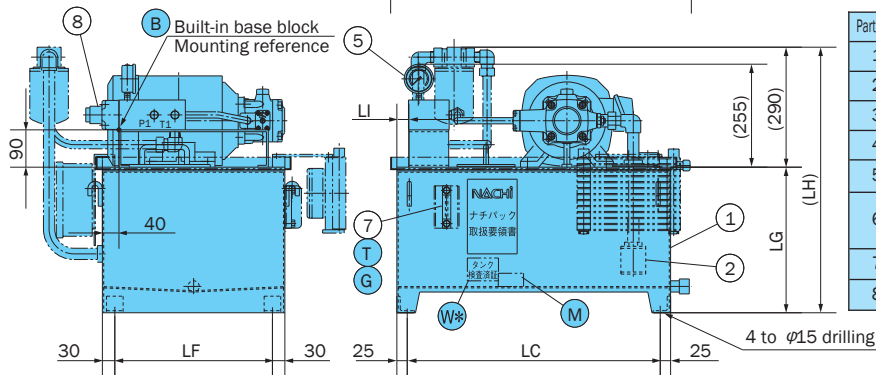
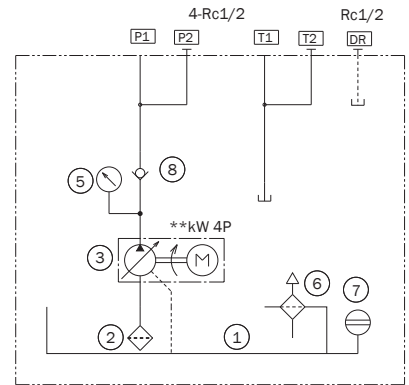
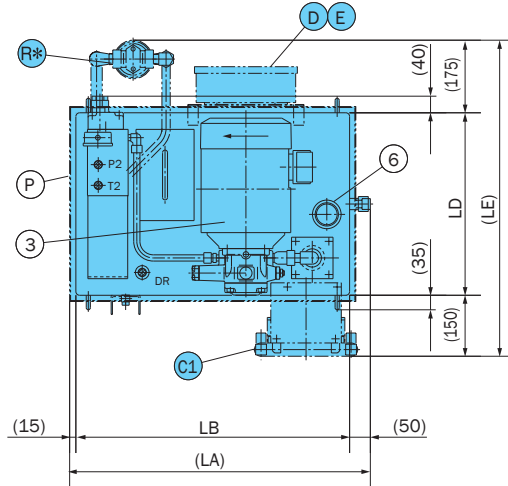


| Part No. | Name                           | Model No.           | Q'ty |
|----------|--------------------------------|---------------------|------|
| 1        | Tank                           | 30 l                | 1    |
| 2        | Strainer                       | CS-06(150 mesh)     | 1    |
| 3        | Uni-pump                       | UPV-0A-8N*-**A-4-31 | 1    |
| 4        | Pressure gauge                 | AUR1/4-φ60 × **M    | 1    |
| 5        | Fluid supply port/air breather | MSA-V30             | 1    |
| 6        | Fluid level gauge              | φ6 × 80L            | 1    |
| 7        | Return filter                  | WS-20-20-V          | 1    |

NCP-40-0.7V<sup>C</sup><sub>D</sub> 1A2-\*-12

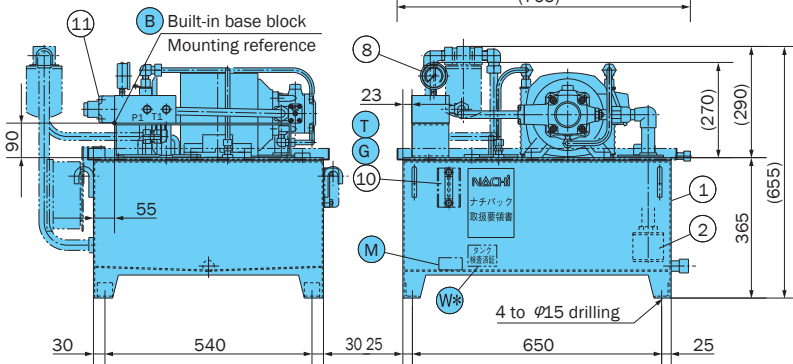
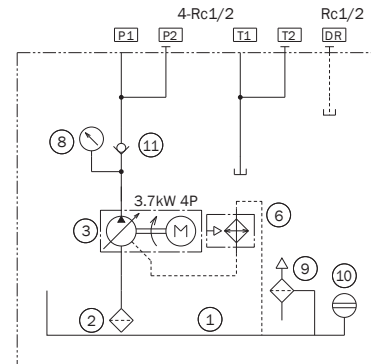
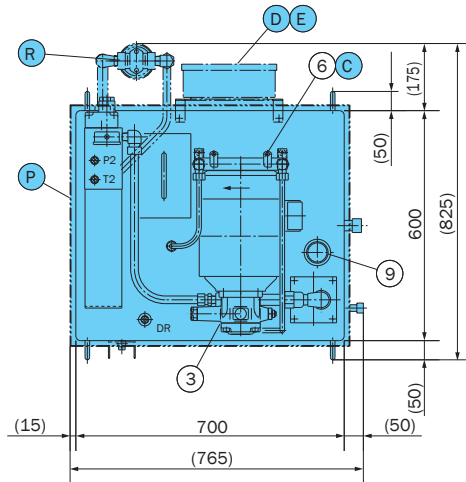
NCP-60-\*\*V<sup>C</sup><sub>D</sub> 1A-\*-12

| Symbol | Dimensions (mm) |      |
|--------|-----------------|------|
|        | 40 l            | 60 l |
| LA     | 625             | 725  |
| LB     | 560             | 660  |
| LC     | 510             | 610  |
| LD     | 350             | 440  |
| LE     | 675             | 765  |
| LF     | 290             | 380  |
| LG     | 300             | 350  |
| LH     | 590             | 640  |
| LI     | 31              | 33   |



| Part No. | Name                           | Model No.            | Q'ty |
|----------|--------------------------------|----------------------|------|
| 1        | Tank                           | **l                  | 1    |
| 2        | Strainer                       | CS-06(150 mesh)      | 1    |
| 3        | Uni-pump                       | UVC(D)-1A-A-*-**4-26 | 1    |
| 4        |                                |                      |      |
| 5        | Pressure gauge                 | AUR1/4-φ60 × **M     | 1    |
| 6        | Fluid supply port/air breather | MSA-V30              | 1    |
| 7        | Fluid level gauge              | φ6 × 80L             | 1    |
| 8        | Check valve                    | CA-G03-1-20          | 1    |

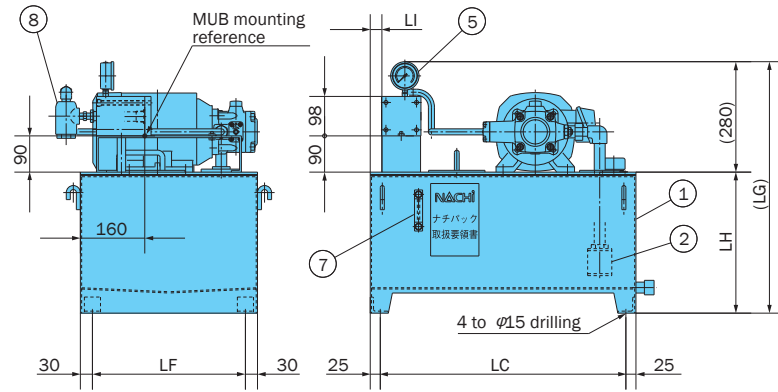
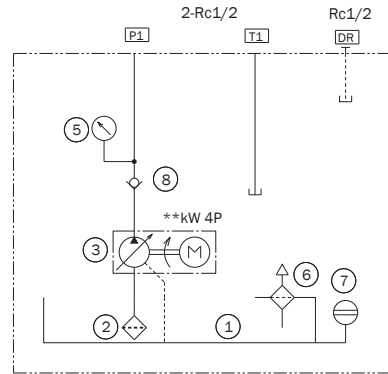
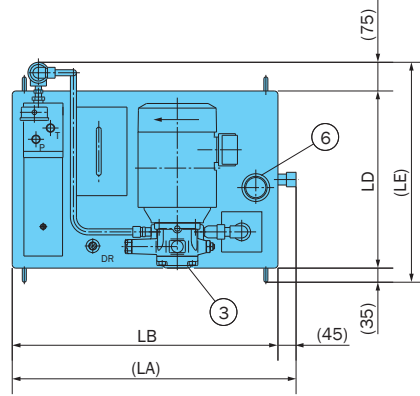
NCP-100-3.7V<sup>C</sup><sub>D</sub> 1A3-C-12



| Part No. | Name                           | Model No.              | Q'ty |
|----------|--------------------------------|------------------------|------|
| 1        | Tank                           | 100 l                  | 1    |
| 2        | Strainer                       | CS-08(150 mesh)        | 1    |
| 3        | Uni-pump                       | UVC(D)-1A-2A3-3.7-4-26 | 1    |
| 4        |                                |                        |      |
| 5        |                                |                        |      |
| 6        | Radiator                       | 3A92-001-1050          | 1    |
| 7        |                                |                        |      |
| 8        | Pressure gauge                 | AUR1/4-φ60 × **M       | 1    |
| 9        | Fluid supply port/air breather | MSA-V30                | 1    |
| 10       | Fluid level gauge              | φ6 × 80L               | 1    |
| 11       | Check valve                    | CA-G03-1-20            | 1    |

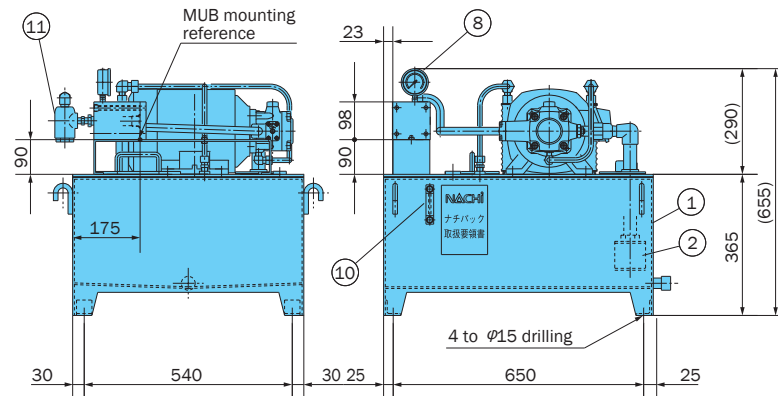
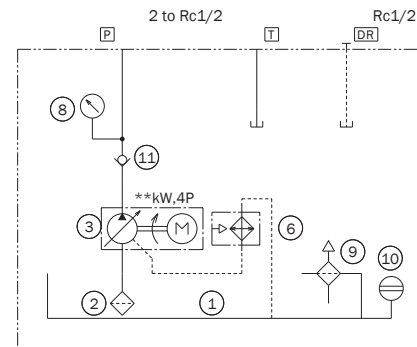
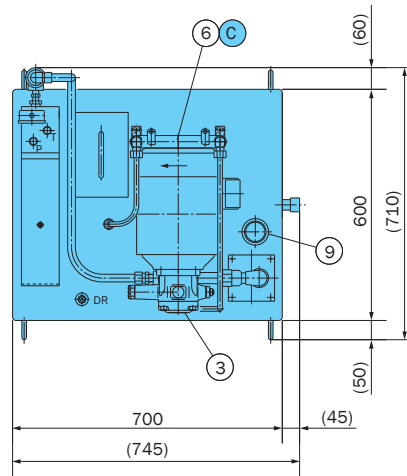
**NCP-40-0.7VD1A2-\*-21**  
**NCP-60-\*\*VD1A\*-\*-21**

| Symbol | Dimensions (mm) |      |
|--------|-----------------|------|
|        | 40 ℓ            | 60 ℓ |
| LA     | 605             | 705  |
| LB     | 560             | 660  |
| LC     | 510             | 610  |
| LD     | 350             | 440  |
| LE     | 460             | 550  |
| LF     | 290             | 380  |
| LG     | 580             | 630  |
| LH     | 300             | 350  |
| LI     | 31              | 33   |



| Part No. | Name                           | Model No.         | Q'ty |
|----------|--------------------------------|-------------------|------|
| 1        | Tank                           | ** ℓ              | 1    |
| 2        | Strainer                       | CS-06(150 mesh)   | 1    |
| 3        | Uni-pump                       | UVD-1A-A**-*-4-26 | 1    |
| 4        |                                |                   |      |
| 5        | Pressure gauge                 | AUR1/4-φ60 × **M  | 1    |
| 6        | Fluid supply port/air breather | MSA-V30           | 1    |
| 7        | Fluid level gauge              | φ6 × 80L          | 1    |
| 8        | Check valve                    | CA-T03-1-20       | 1    |

**NCP-100-3.7VD1A3-C-21**

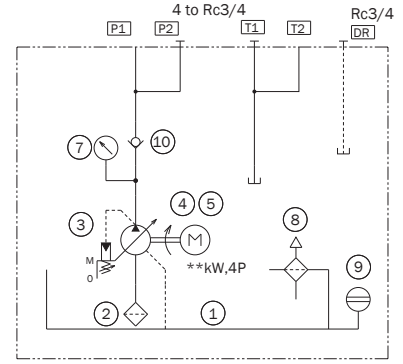
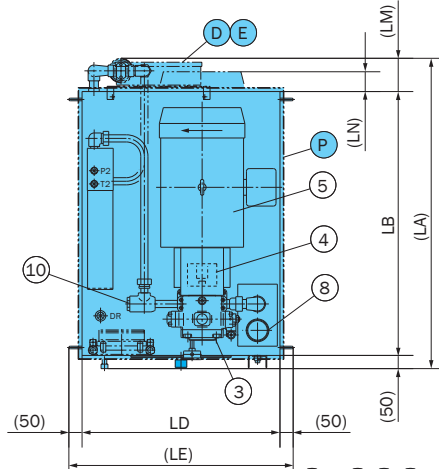


| Part No. | Name                           | Model No.           | Q'ty |
|----------|--------------------------------|---------------------|------|
| 1        | Tank                           | 100 ℓ               | 1    |
| 2        | Strainer                       | CS-08(150 mesh)     | 1    |
| 3        | Uni-pump                       | UVD-1A-2A3-3.7-4-26 | 1    |
| 4        |                                |                     |      |
| 5        |                                |                     |      |
| 6        | Radiator                       | 3A92-001-1050       | 1    |
| 7        |                                |                     |      |
| 8        | Pressure gauge                 | AUR1/4-φ60 × 16M    | 1    |
| 9        | Fluid supply port/air breather | MSA-V30             | 1    |
| 10       | Fluid level gauge              | φ6 × 80L            | 1    |
| 11       | Check valve                    | CA-T03-1-20         | 1    |

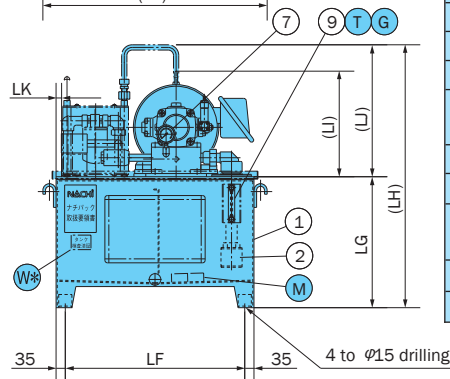
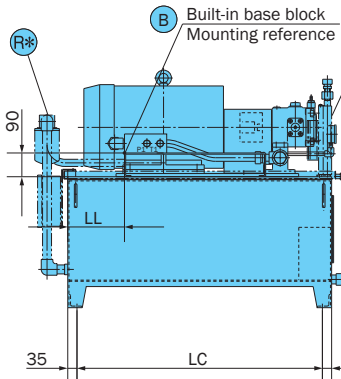
NCP-160-\*\*VC2A\*-.-12

NCP-250-\*\*VC2A\*-.-12

| Symbol | Dimensions (mm) |       |
|--------|-----------------|-------|
|        | 160 ℓ           | 250 ℓ |
| LA     | 1120            | 1175  |
| LB     | 850             | 1000  |
| LC     | 780             | 930   |
| LD     | 650             | 750   |
| LE     | 750             | 850   |
| LF     | 580             | 680   |
| LG     | 415             | 495   |
| LH     | 835             | 995   |
| LI     | 385             | 420   |
| LJ     | 420             | 500   |
| LK     | 0               | 20    |
| LL     | 100             | 215   |
| LM     | 220             | 125   |
| LN     | 75              | 0     |



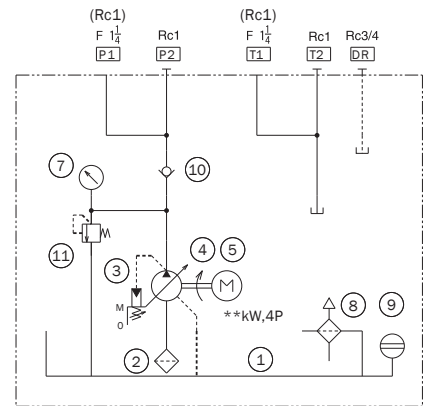
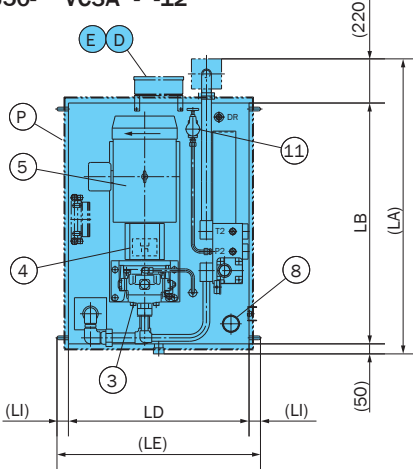
| Part No. | Name                           | Model No.                                      | Q'ty |
|----------|--------------------------------|--|------|
| 1        | Tank                           | ** ℓ   | 1    |
| 2        | Strainer                       | CS-10(150 mesh)                                | 1    |
| 3        | Uni-pump                       | VDC-2A-*A*-20                                  | 1    |
| 4        | Coupling                       | CR-***J  | 1    |
| 5        | Motor                          | Fully closed external fan Terminal B<br>*kW-4P | 1    |
| 6        |                                |  |      |
| 7        | Pressure gauge                 | AUR1/4-φ60 × **M                               | 1    |
| 8        | Fluid supply port/air breather | MSA-V50-VS10                                   | 1    |
| 9        | Fluid level gauge              | φ8 × 120L                                      | 1    |
| 10       | Check valve                    | CA-T06-1-20                                    | 1    |



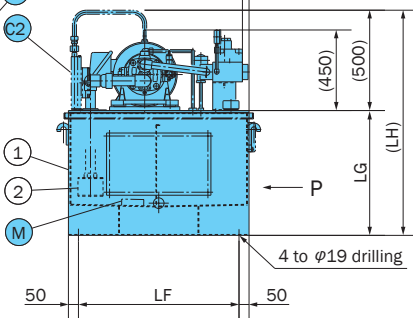
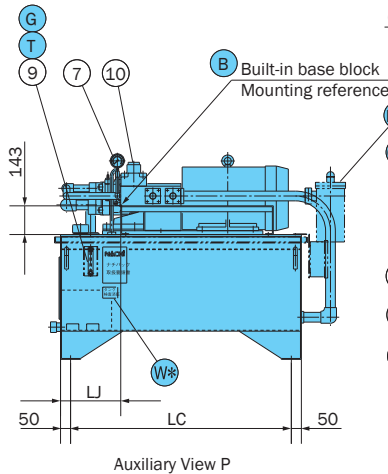
NCP-400-\*\*VC3A\*-.-12

NCP-650-\*\*VC3A\*-.-12

| Symbol | Dimensions (mm) |       |
|--------|-----------------|-------|
|        | 400 ℓ           | 650 ℓ |
| LA     | 1470            | 1790  |
| LB     | 1200            | 1520  |
| LC     | 1100            | 1420  |
| LD     | 900             | 1010  |
| LE     | 1014            | 1164  |
| LF     | 800             | 910   |
| LG     | 620             | 670   |
| LH     | 1120            | 1170  |
| LI     | 57              | 77    |
| LJ     | 300             | 450   |

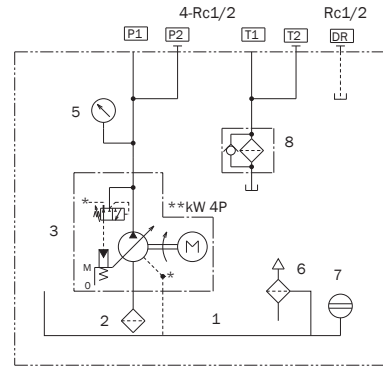
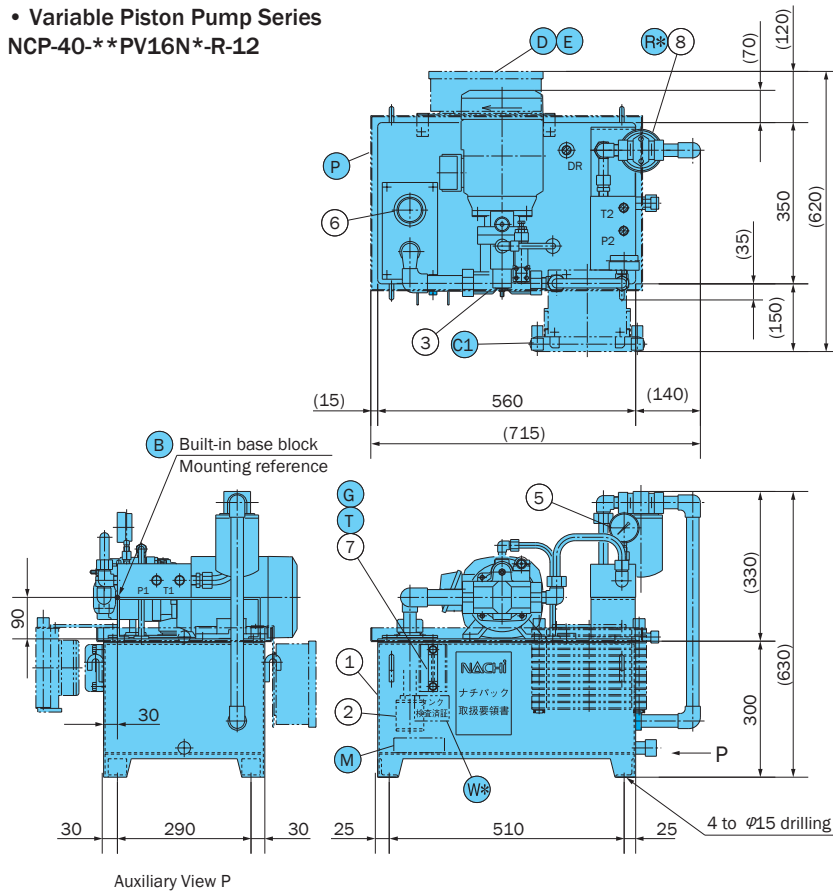


| Part No. | Name                           | Model No.                                      | Q'ty |
|----------|--------------------------------|--|------|
| 1        | Tank                           | ** ℓ   | 1    |
| 2        | Strainer                       | CS-12(150 mesh)                                | 1    |
| 3        | Uni-pump                       | VDC-3A-1A*-20                                  | 1    |
| 4        | Coupling                       | CR-***J  | 1    |
| 5        | Motor                          | Fully closed external fan A terminal<br>*kW-4P | 1    |
| 6        |                                |  |      |
| 7        | Pressure gauge                 | AUR1/4-φ60 × **M                               | 1    |
| 8        | Fluid supply port/air breather | MSA-V50-VS10                                   | 1    |
| 9        | Fluid level gauge              | φ8 × 120L                                      | 1    |
| 10       | Check valve                    | CA-G10-1-20                                    | 1    |
| 11       | Relief valve                   | R-T03-3-11                                     | 1    |



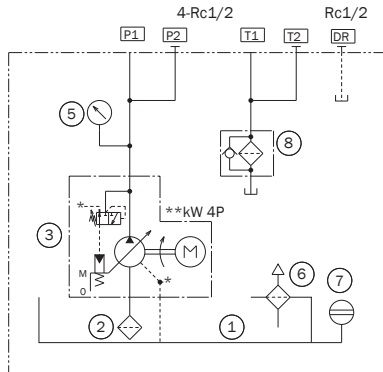
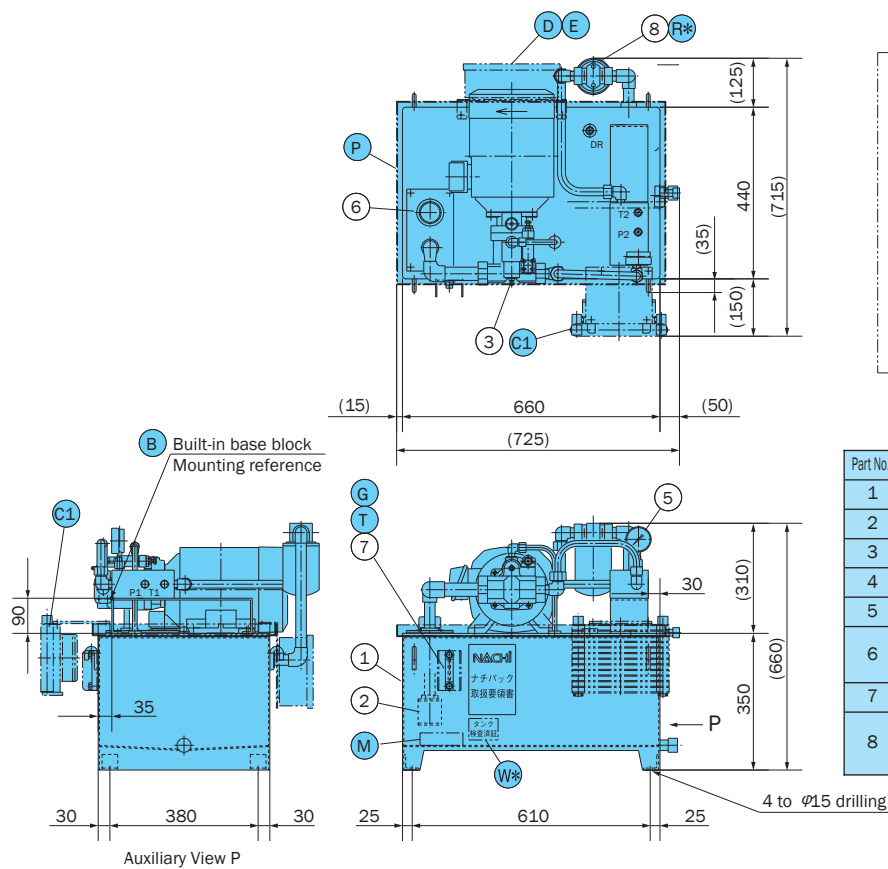


• Variable Piston Pump Series  
NCP-40-\*\*PV16N\*-R-12



| Part No. | Name                           | Model No.                  | Q'ty |
|----------|--------------------------------|----------------------------|------|
| 1        | Tank                           | 40 l                       | 1    |
| 2        | Strainer                       | CS-06(150 mesh)            | 1    |
| 3        | Uni-pump                       | UPV-1A-16N*-**A-4-17       | 1    |
| 4        |                                |                            |      |
| 5        | Pressure gauge                 | AUR1/4-φ60 × **M           | 1    |
| 6        | Fluid supply port/air breather | MSA-V30                    | 1    |
| 7        | Fluid level gauge              | φ6 × 80L                   | 1    |
| 8        | Return filter                  | (FPL-06)CF-06<br>10μ paper | 1    |

NCP-60-\*\*PV16N\*-R-12

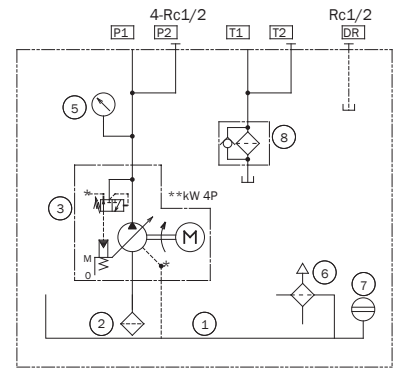
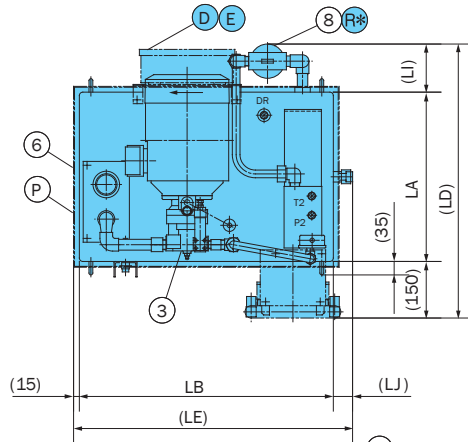


| Part No. | Name                           | Model No.                  | Q'ty |
|----------|--------------------------------|----------------------------|------|
| 1        | Tank                           | 60 l                       | 1    |
| 2        | Strainer                       | CS-06(150 mesh)            | 1    |
| 3        | Uni-pump                       | UPV-1A-16N*-**A-4-17       | 1    |
| 4        |                                |                            |      |
| 5        | Pressure gauge                 | AUR1/4-φ60 × **M           | 1    |
| 6        | Fluid supply port/air breather | MSA-V30                    | 1    |
| 7        | Fluid level gauge              | φ6 × 80L                   | 1    |
| 8        | Return filter                  | (FPL-06)CF-06<br>10μ paper | 1    |

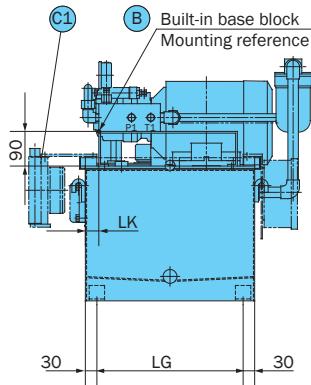
NCP-40-\*\*PV8N\*-\*-12

NCP-60-\*\*PV8N\*-\*-12

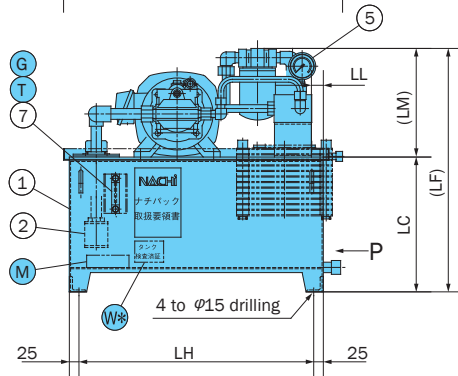
| Symbol | Dimensions (mm) |     |
|--------|-----------------|-----|
|        | 40ℓ             | 60ℓ |
| LA     | 350             | 440 |
| LB     | 560             | 660 |
| LC     | 300             | 350 |
| LD     | 620             | 715 |
| LE     | 715             | 725 |
| LF     | 630             | 660 |
| LG     | 290             | 380 |
| LH     | 510             | 610 |
| LI     | 120             | 125 |
| LJ     | 140             | 50  |
| LK     | 30              | 35  |
| LL     | 0               | 30  |
| LM     | 330             | 310 |



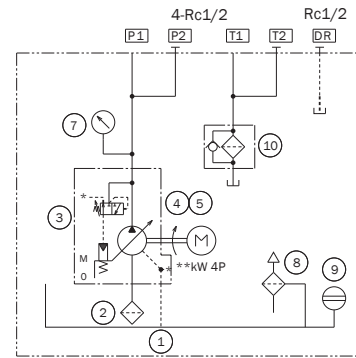
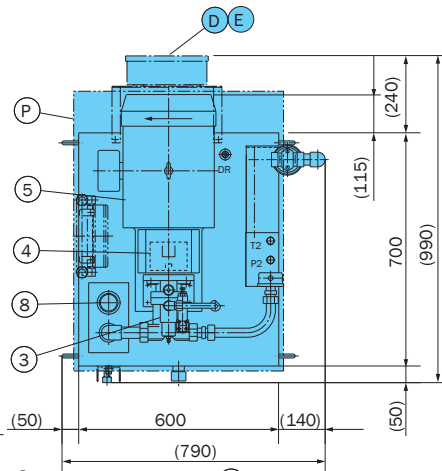
| Part No. | Name                           | Model No.                  | Q'ty |
|----------|--------------------------------|----------------------------|------|
| 1        | Tank                           | ** ℓ                       | 1    |
| 2        | Strainer                       | CS-06(150 mesh)            | 1    |
| 3        | Uni-pump                       | UPV-0A-8N*-*-A-4-31        | 1    |
| 4        |                                |                            |      |
| 5        | Pressure gauge                 | AUR1/4-φ60 × **M           | 1    |
| 6        | Fluid supply port/air breather | MSA-V30                    | 1    |
| 7        | Fluid level gauge              | φ6 × 80L                   | 1    |
| 8        | Return filter                  | (FPL-06)CF-06<br>10μ paper | 1    |



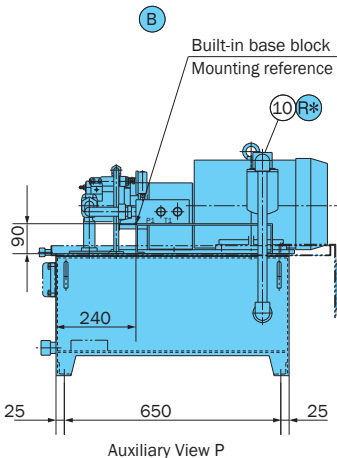
Auxiliary View P



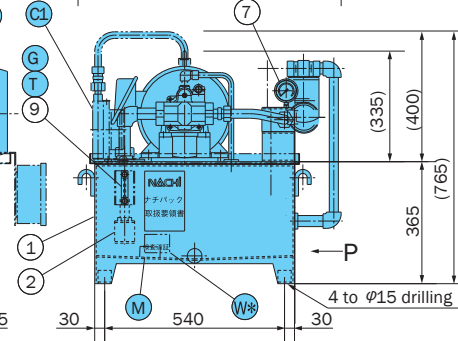
NCP-100-\*\*PV<sup>16</sup>N<sup>22</sup>\*-\*-12



| Part No. | Name                           | Model No.                                       | Q'ty |
|----------|--------------------------------|---|------|
| 1        | Tank                           | 100 ℓ   | 1    |
| 2        | Strainer                       | CS-06(150 mesh)                                 | 1    |
| 3        | Pump                           | PVS-1A-**N*-12                                  | 1    |
| 4        | Coupling                       | CR-***J   | 1    |
| 5        | Motor                          | Fully closed external fan A terminal<br>**kW-4P | 1    |
| 6        |                                |   |      |
| 7        | Pressure gauge                 | AUR1/4-φ60 × **M                                | 1    |
| 8        | Fluid supply port/air breather | MSA-V30   | 1    |
| 9        | Fluid level gauge              | φ6 × 80L  | 1    |
| 10       | Return filter                  | (FPL-06)CF-06<br>10μ paper                      | 1    |



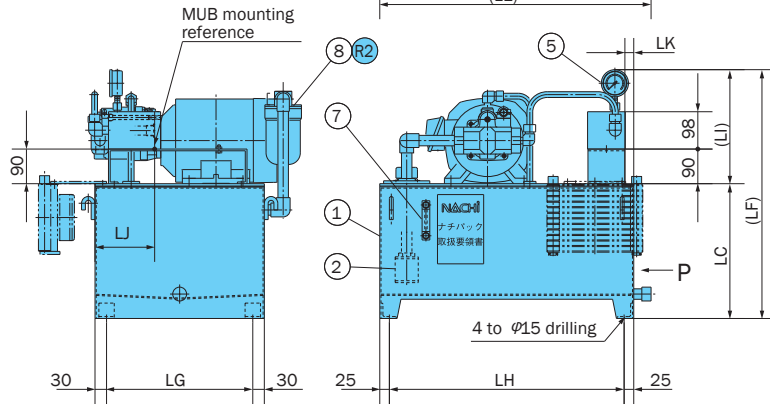
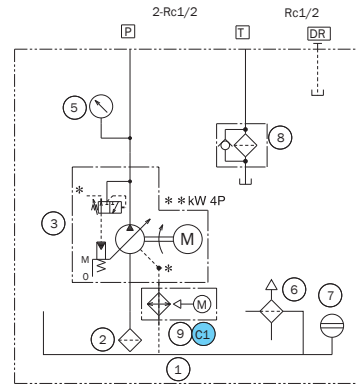
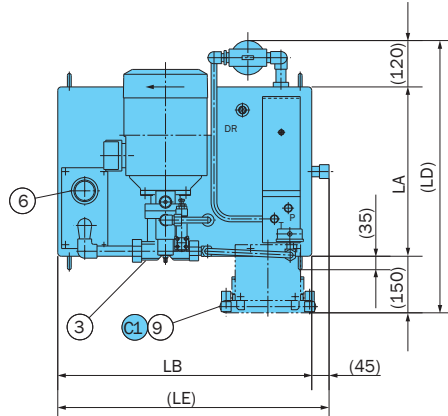
Auxiliary View P



NCP-40-\*\*PV16N\*-(C1)R2-21

NCP-60-\*\*PV16N\*-(C1)R2-21

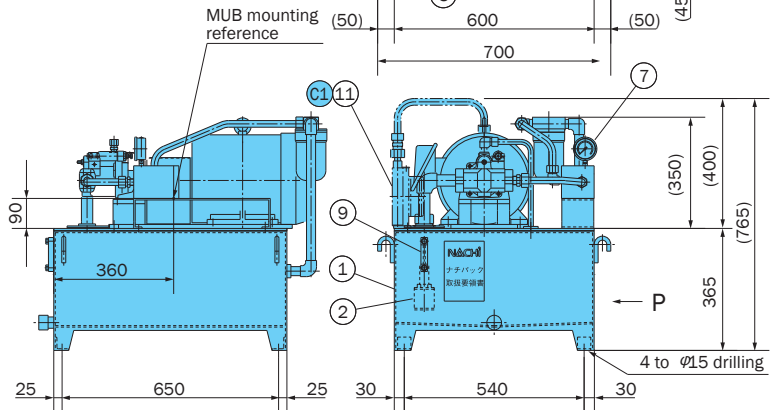
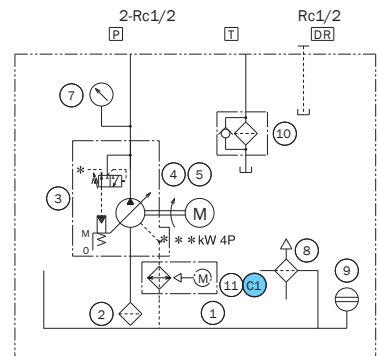
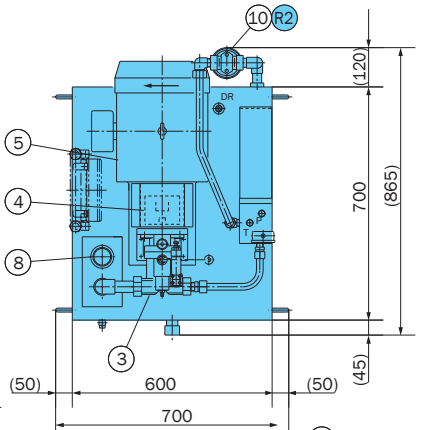
| Symbol | Dimensions (mm) |     |
|--------|-----------------|-----|
|        | 40l             | 60l |
| LA     | 350             | 440 |
| LB     | 560             | 660 |
| LC     | 300             | 350 |
| LD     | 620             | 710 |
| LE     | 605             | 705 |
| LF     | 630             | 665 |
| LG     | 290             | 380 |
| LH     | 510             | 610 |
| LI     | 330             | 315 |
| LJ     | 150             | 155 |
| LK     | 0               | 30  |



Auxiliary View P

| Part No. | Name                           | Model No.            | Q'ty |
|----------|--------------------------------|----------------------|------|
| 1        | Tank                           | ** l                 | 1    |
| 2        | Strainer                       | CS-06(150 mesh)      | 1    |
| 3        | Uni-pump                       | UPV-1A-16N*-**A-4-17 | 1    |
| 4        |                                |                      |      |
| 5        | Pressure gauge                 | AUR1/4-φ60 × **M     | 1    |
| 6        | Fluid supply port/air breather | MSA-V30              | 1    |
| 7        | Fluid level gauge              | φ6 × 80L             | 1    |
| 8        | Return filter                  | FPL-06(10 μ paper)   | 1    |
| 9        | Fan cooler                     | 3A92-001-0000        | 1    |

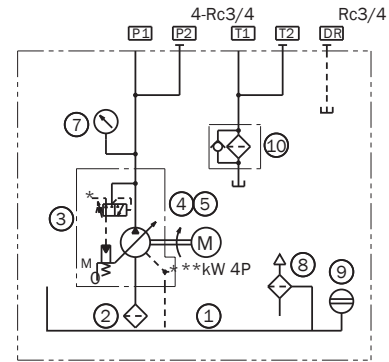
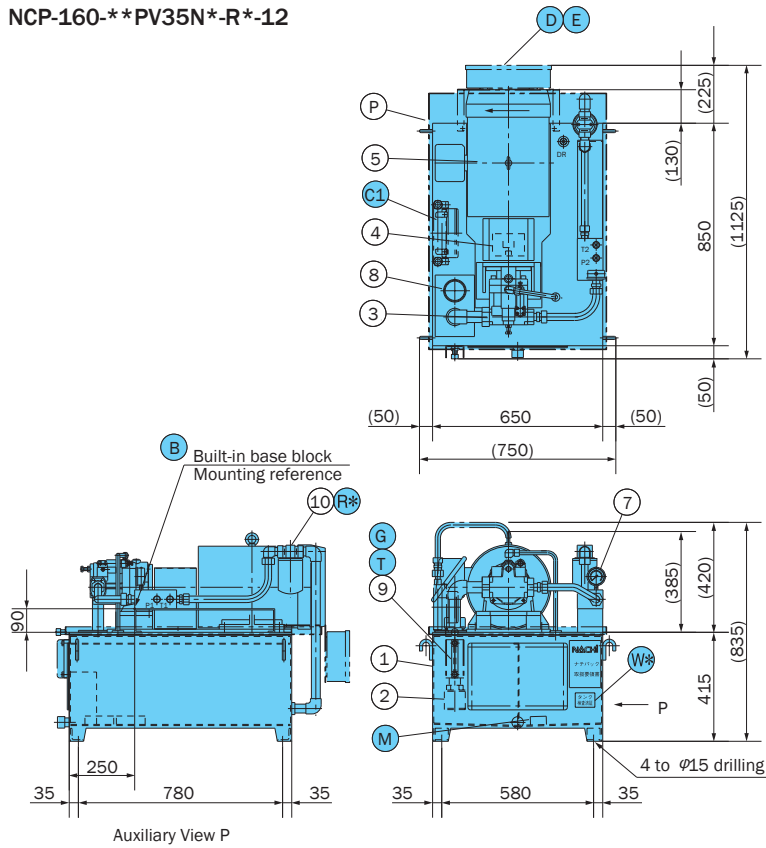
NCP-100-\*\*PV<sup>16</sup>/<sub>22</sub>N\*-(C1)R2-21



Auxiliary View P

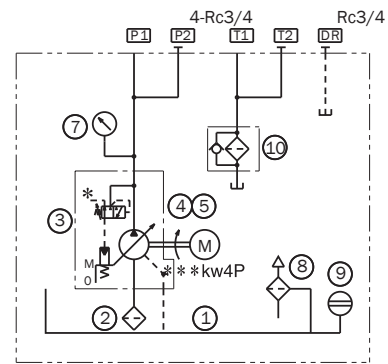
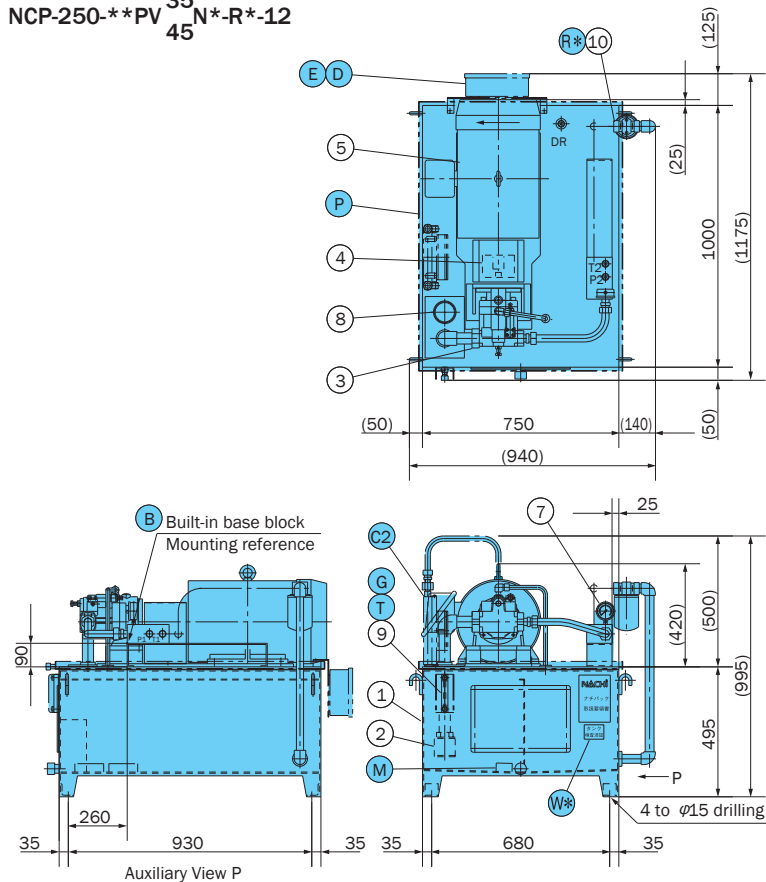
| Part No. | Name                           | Model No.                                      | Q'ty |
|----------|--------------------------------|--|------|
| 1        | Tank                           | 100l   | 1    |
| 2        | Strainer                       | CS-06(150 mesh)                                | 1    |
| 3        | Pump                           | PVS-1A- <sup>16</sup> / <sub>22</sub> N*-12    | 1    |
| 4        | Coupling                       | CR-****J                                       | 1    |
| 5        | Motor                          | Fully closed external fan A terminal<br>*kW-4P | 1    |
| 6        | ---                            | ---  |      |
| 7        | Pressure gauge                 | AUR1/4-φ60 × **M                               | 1    |
| 8        | Fluid supply port/air breather | MSA-V30  | 1    |
| 9        | Fluid level gauge              | φ6 × 80L                                       | 1    |
| 10       | Return filter                  | FPL-06(10 μ paper)                             | 1    |
| 11       | Fan cooler                     | 3A92-001-0000                                  | 1    |

NCP-160-\*\*PV35N\*-R\*-12



| Part No. | Name                           | Model No.                                       | Q'ty |
|----------|--------------------------------|---|------|
| 1        | Tank                           | 160r  | 1    |
| 2        | Strainer                       | CS-10(150 mesh)                                 | 1    |
| 3        | Uni-pump                       | PVS-2A-35N*-12                                  | 1    |
| 4        | Coupling                       | CR-***J   |      |
| 5        | Motor                          | Fully closed external fan A terminal<br>**kW-4P | 1    |
| 6        |                                |   |      |
| 7        | Pressure gauge                 | AUR1/4- $\phi 60 \times **M$                    | 1    |
| 8        | Fluid supply port/air breather | MSA-V50-VS10                                    | 1    |
| 9        | Fluid level gauge              | $\phi 8 \times 120L$                            | 1    |
| 10       | Return filter                  | (FPL-08)CF-08<br>10 $\mu$ paper                 | 1    |

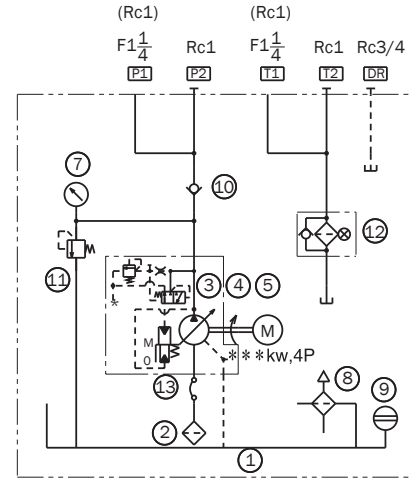
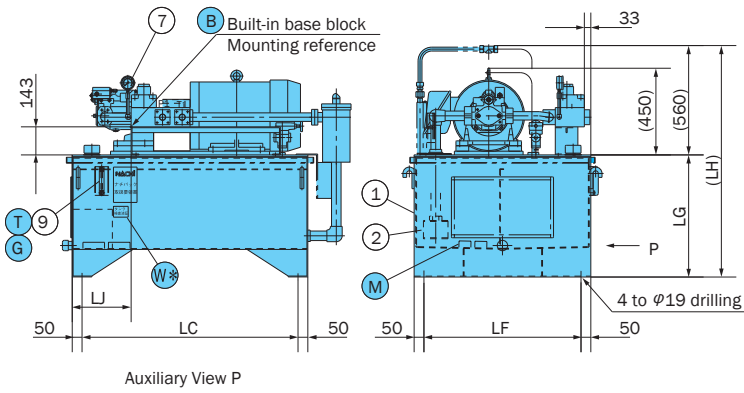
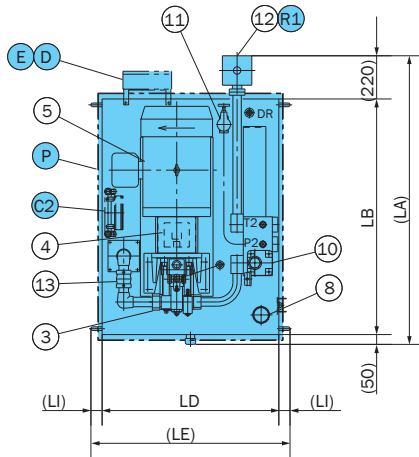
NCP-250-\*\*PV<sup>35</sup>/<sub>45</sub>N\*-R\*-12



| Part No. | Name                           | Model No.   | Q'ty |
|----------|--------------------------------|---|------|
| 1        | Tank                           | 250l  | 1    |
| 2        | Strainer                       | CS-10(150 mesh)   | 1    |
| 3        | Uni-pump                       | PVS-2A-**N*-12  | 1    |
| 4        | Coupling                       | CR-***J   | 1    |
| 5        | Motor                          | Fully closed external fan A terminal<br>**kW-4P             | 1    |
| 6        |                                |   |      |
| 7        | Pressure gauge                 | AUR1/4- $\phi 60 \times **M$                                | 1    |
| 8        | Fluid supply port/air breather | MSA-V50-VS10  | 1    |
| 9        | Fluid level gauge              | $\phi 8 \times 120L$  | 1    |
| 10       | Return filter                  | FRS-08-20P08T(20 $\mu$ )<br>(FPL-08)CF-08<br>10 $\mu$ paper | 1    |

NCP-400-\*\*PV70N\*-R1\*-12  
 NCP-650-\*\*PV70N\*-R1\*-12

| Symbol | Dimensions mm |       |
|--------|---------------|-------|
|        | 400 ℓ         | 650 ℓ |
| LA     | 1470          | 1790  |
| LB     | 1200          | 1520  |
| LC     | 1100          | 1420  |
| LD     | 900           | 1010  |
| LE     | 1014          | 1164  |
| LF     | 800           | 910   |
| LG     | 620           | 670   |
| LH     | 1180          | 1230  |
| LI     | 57            | 77    |
| LJ     | 300           | 450   |

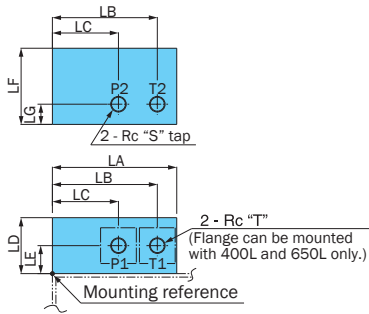


| Part No. | Name                           | Model No.                                       | Q'ty |
|----------|--------------------------------|---|------|
| 1        | Tank                           | ** ℓ  | 1    |
| 2        | Strainer                       | CS-12(150 mesh)                                 | 1    |
| 3        | Uni-pump                       | PZS-3A-70N*-10                                  | 1    |
| 4        | Coupling                       | CR-****J  |      |
| 5        | Motor                          | Fully closed external fan A terminal<br>**kW-4P | 1    |
| 6        |                                |   |      |
| 7        | Pressure gauge                 | AUR1/4-φ60 × **M                                | 1    |
| 8        | Fluid supply port/air breather | MSA-V50-VS10                                    | 1    |
| 9        | Fluid level gauge              | φ8 × 120L                                       | 1    |
| 10       | Check valve                    | CA-G10-1-20                                     | 1    |
| 11       | Relief valve                   | R-T03-3-11                                      | 1    |
| 12       | Return filter                  | FRS-12-20P-12F                                  | 1    |
| 13       | Flexmaster joint               | M1600-150-0350                                  | 1    |

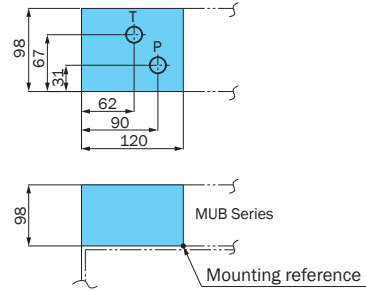
Note: Set (11) relief valve setting pressure so it is equivalent to pump setting pressure plus 1.0MPa {10.2kgf/cm<sup>2</sup>}.

## Outlet Block Specifications

Design number 12  
Outlet Block Dimensions



Design number 21  
Outlet Block Dimensions

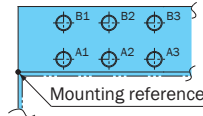


| Tank Capacity | Dimensions (mm) |     |     |    |    |     |    | Outlet Size |                              |  |
|---------------|-----------------|-----|-----|----|----|-----|----|-------------|------------------------------|--|
|               | LA              | LB  | LC  | LD | LE | LF  | LG | S           | T                            |  |
| 40L           | 160             | 135 | 85  | 72 | 36 | 98  | 26 | 1/2         | 1/2                          |  |
| 60L           |                 |     |     |    |    |     |    | 3/4         | 3/4                          |  |
| 100L          |                 |     |     |    |    |     |    |             |                              |  |
| 160L          | 300             | 260 | 160 | 98 | 49 | 148 | 48 | 1           | JIS B 2291<br>SSA-32<br>(Rc) |  |
| 250L          |                 |     |     |    |    |     |    |             |                              |  |
| 400L          |                 |     |     |    |    |     |    |             |                              |  |
| 650L          |                 |     |     |    |    |     |    |             |                              |  |

Option B

MPU Series Built-in

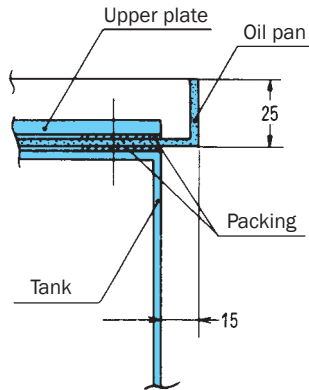
(See base block specifications for dimensions.)



## Oil Pan Specifications

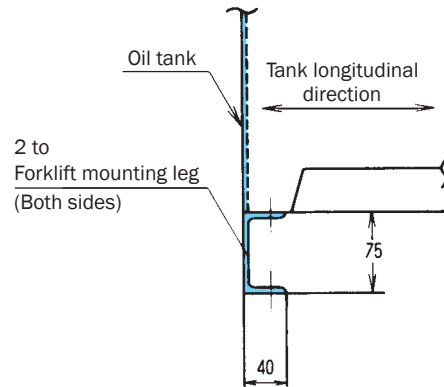
A "headband type" oil pan is standard, and an oil pan drain is provided at one location (Rc3/8).

Structural Diagram



## Forklift Mounting Leg Specifications

Forklift Mounting Leg Specifications



## Standard Specifications

1. Paint Color: Mancel No. 5B6/3 (lacquer)

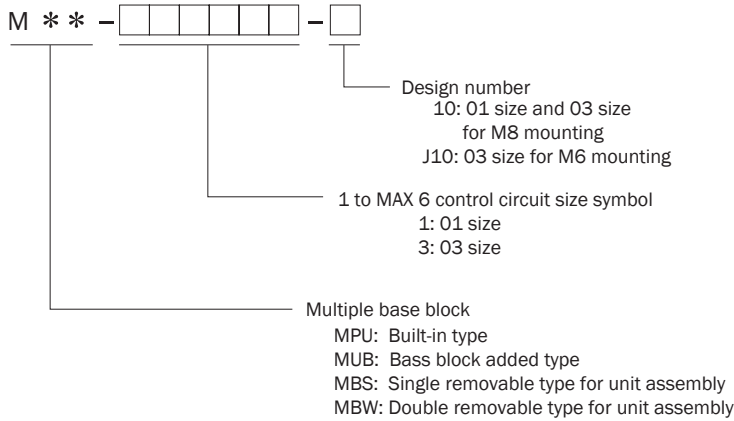
Note: Mancel No. 5B/0.5 for tank capacity 30L uni-pump motor only.

2. Motor Specifications:

|                |                      | Wiring                  | Color Coding                        | Terminal number                                | Terminal          | Terminal box specifications  |
|----------------|----------------------|-------------------------|-------------------------------------|--|-------------------|--|
| Control System | SA<br>SS             | VCT-1.25mm <sup>2</sup> | Single SOL White, Black             | 1, 2-<br>Consecutive<br>numbers<br>(Common: C) | Y Type Solderless | Inner : Mancel No. 2.5Y8/2<br>Dust-tight type, cover fastened<br>by screws |
|                |                      |                         | Double SOL Red, White, Black, Green |  |                   |  |
| Drive System   | to 3.7kW<br>5.5kW to | VCT                     | Red, White, Black, Green            | U, V, W, E                                     | Round Solderless  | Outer : Mancel No 5B6/3<br>(Lacquer)                                       |
|                |                      | IV + PF                 | Black (3) + Green                   |  |                   |  |

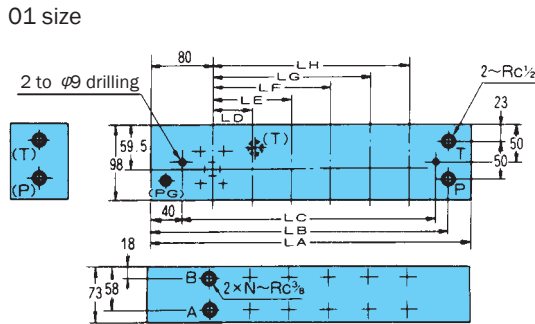
# Base Block Specifications

## Understanding Model Numbers

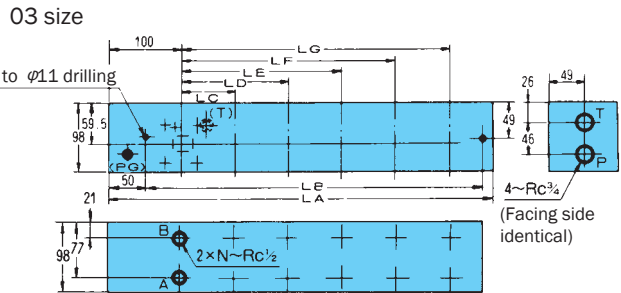


- MPU Series (Unit Built-in)  
 This base block is a special type built into the NCP Series.

## Block Model Numbers, Appearance, Dimensions



| Model No.  | Dimensions (mm) |     |     |    |     |     |     |     |   | Weight kg |
|------------|-----------------|-----|-----|----|-----|-----|-----|-----|---|-----------|
|            | LA              | LB  | LC  | LD | LE  | LF  | LG  | LH  | N |           |
| MPU -1-10  | 160             | 130 | 75  |    |     |     |     |     | 1 | 8.3       |
| -11-10     | 210             | 180 | 125 | 50 |     |     |     |     | 2 | 10.9      |
| -111-10    | 260             | 230 | 175 | 50 | 100 |     |     |     | 3 | 13.4      |
| -1111-10   | 310             | 280 | 225 | 50 | 100 | 150 |     |     | 4 | 16.0      |
| -11111-10  | 360             | 330 | 275 | 50 | 100 | 150 | 200 |     | 5 | 18.6      |
| -111111-10 | 410             | 380 | 325 | 50 | 100 | 150 | 200 | 250 | 6 | 21.2      |



| Model No.       | Dimensions (mm) |     |    |     |     |     |     |   |   | Weight kg |
|-----------------|-----------------|-----|----|-----|-----|-----|-----|---|---|-----------|
|                 | LA              | LB  | LC | LD  | LE  | LF  | LG  | N |   |           |
| MPU -3-J10(10)  | 160             | 95  |    |     |     |     |     |   | 1 | 11.1      |
| -33-J10(10)     | 235             | 170 | 75 |     |     |     |     |   | 2 | 16.3      |
| -333-J10(10)    | 310             | 245 | 75 | 150 |     |     |     |   | 3 | 21.5      |
| -3333-J10(10)   | 385             | 320 | 75 | 150 | 225 |     |     |   | 4 | 26.7      |
| -33333-J10(10)  | 460             | 395 | 75 | 150 | 225 | 300 |     |   | 5 | 31.9      |
| -333333-J10(10) | 535             | 470 | 75 | 150 | 225 | 300 | 375 |   | 6 | 37.0      |

- Note:
- There are two types of mounting bolts available for the O3 size: M6 and M8. Be sure to specify the type of bolt you need.  
 M6 : SA, SS-J Series  
 M8 : SS Series
  - When using the O1/O3 combination type
    - The installation pitch uses the O3 size dimensions shown above, and for A and B ports only the O1 size installation part is Rc3/8.
    - In the case of MPU-313131-J10, for example, valve installation locations 1, 3, and 5 counting from the left are O3 size, while 2, 4, 6 are O1 size.

Other  
 Space is limited in accordance with tank capacity, so use the basic data in the following table when designing the circuit.

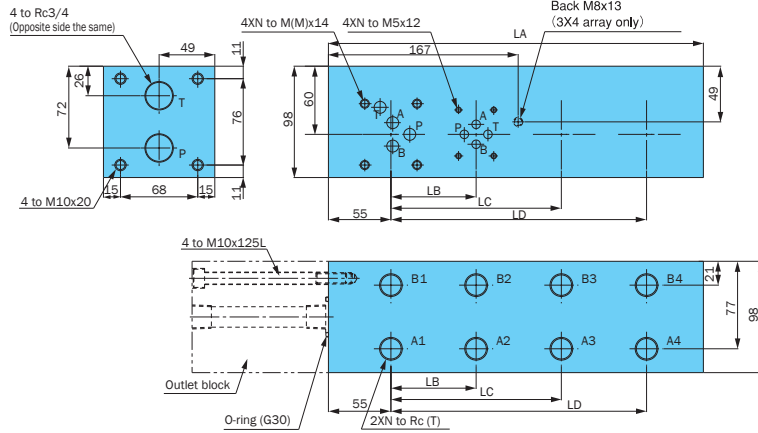
|            | Tank Capacity | O1 Space Block | O3 Space Block                    |         |
|------------|---------------|----------------|-----------------------------------|---------|
| VD* Series | 30 l          | Up to 3        |                                   |         |
|            | 40 l          | Up to 4        | Up to 3                           |         |
|            | 60 l          | Up to 5        | Up to 3                           |         |
|            | 100 l         | Up to 6        | Up to 5                           |         |
|            | 160 l         | Up to 6        | Up to 5                           |         |
|            | 250 l         | Up to 6        | Up to 6                           |         |
|            | 400, 650 l    |                | Up to (2, 4, 6) + Up to (3, 2, 1) |         |
| PVS Series | 30 l          | Up to 3        |                                   |         |
|            | 40 l          | Up to 4        | Up to 3                           |         |
|            | 60 l          |                | Up to 5                           | Up to 3 |
|            |               | Z              | Up to 6                           | Up to 4 |
|            | 100 l         | Up to 6        | Up to 4                           |         |
|            | 160, 250 l    | Up to 6        | Up to 6                           |         |
|            | 400, 650 l    |                | Up to (2, 4, 6) + Up to (3, 2, 1) |         |

Note: Using in series larger than those noted above causes overhang from the top plate.

• MUB Series (Base Block Additional Configurations)

This series makes it easy to add an option base block using only four mounting bolts. The following shows the range of the possible addition. In this configuration, the NCP unit design number becomes 21.

Block Model Numbers, Appearance, Dimensions



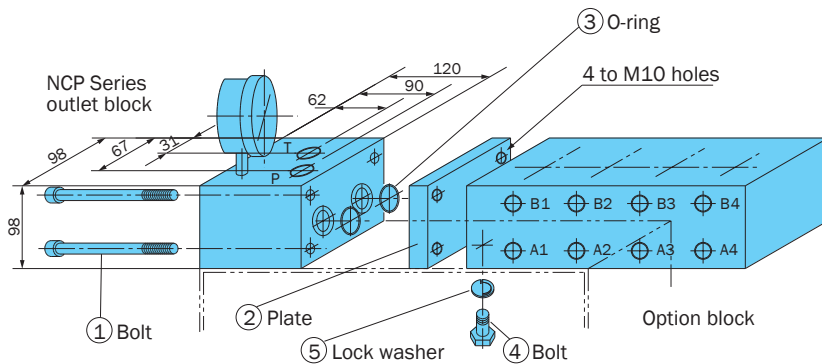
| Model No.        | Dimensions (mm) |    |     |     |   |      |     | Weight kg |
|------------------|-----------------|----|-----|-----|---|------|-----|-----------|
|                  | LA              | LB | LC  | LD  | N | M    | T   |           |
| MUB-1-10         | 105             |    |     |     | 1 | -    | 3/8 | 7.6       |
| MUB-3-J10(10)    | 105             |    |     |     | 1 | 6(8) | 1/2 | 7.6       |
| MUB-11-10        | 180             | 75 |     |     | 2 | -    | 3/8 | 12.8      |
| MUB-33-J10(10)   | 180             | 75 |     |     | 2 | 6(8) | 1/2 | 12.8      |
| MUB-111-10       | 255             | 75 | 150 |     | 3 | -    | 3/8 | 18.0      |
| MUB-333-J10(10)  | 255             | 75 | 150 |     | 3 | 6(8) | 1/2 | 18.0      |
| MUB-1111-10      | 330             | 75 | 150 | 225 | 4 | -    | 3/8 | 23.2      |
| MUB-3333-J10(10) | 330             | 75 | 150 | 225 | 4 | 6(8) | 1/2 | 23.2      |

- Note:
- There are two types of mounting bolts available for the 03 size: M6 and M8. Be sure to specify the type of bolt you need.  
M6 : SA, SS-J Series  
M8 : SS Series
  - When using the 01/03 combination
    - The installation pitch uses the 03 size dimensions shown above, and for A and B ports only the 01 size installation part is Rc3/8.
    - In the case of MUB-3131-J10, for example, valve installation locations 1 and 3 counting from the left are 03 size, while 2, 4 are 01 size.
  - When using a 2-speed plate, a special MUB type is used. Contact your agent for more information.

Option Base Block Installation Procedure

Loosen bolts ① and ④ and remove plate ②. Next, after checking to ensure that O-ring ③ is installed, install the option base block using ①, ④, and ⑤.

- Note:
- ④ and ⑤ are used only in 3 and 4 multi configurations.
  - In single and double configurations, ④ and ⑤ are just removed.

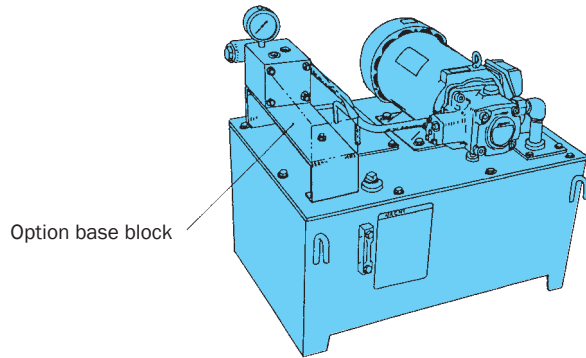


21 Design Series Scope

This series consists of a total of six best-seller piston and vane types with 40, 60, and 100 l tanks. Note that piston Z type and vane VC type are not included.

Option Base Block Addition Scope

| Tank Capacity | 01 Base Block | 03 Base Block |
|---------------|---------------|---------------|
| 40 l          | Up to 2       | Up to 2       |
| 60 l          | Up to 3       | Up to 3       |
| 100 l         | Up to 4       | Up to 4       |



| Part No. | Name                     | Model No.     |
|----------|--------------------------|---------------|
| 1        | Hexagon Socket Head Bolt | M10 x 125     |
| 2        | Plate                    | 98 x 98 x 15t |
| 3        | O-ring                   | 1B-G30        |
| 4        | Hex bolt                 | M8 x 25       |
| 5        | Lock washer              | For M8        |



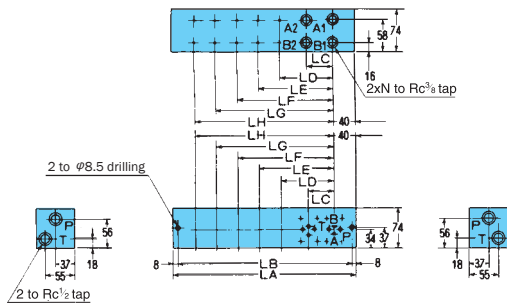
• MBS, MBW Series (Unit Assembly Type)

This base block is used to install the valve unit only around machinery.

Block Model Numbers, Appearance, Dimensions

MBS Series (Single Ejection Multi Block)

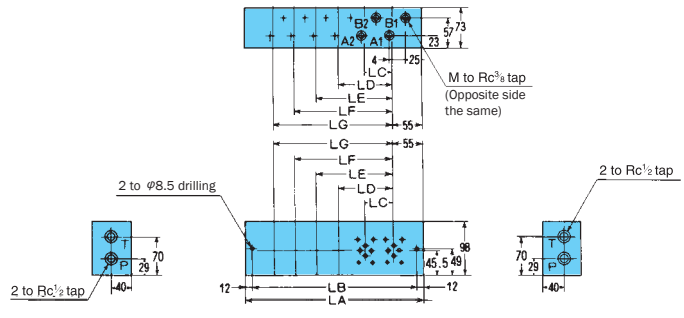
O1 size



| Model No.   | Dimensions (mm) |     |    |     |     |     |     |     |   | Weight<br>kg |
|-------------|-----------------|-----|----|-----|-----|-----|-----|-----|---|--------------|
|             | LA              | LB  | LC | LD  | LE  | LF  | LG  | LH  | N |              |
| MBS -1-10   | 80              | 64  |    |     |     |     |     |     | 1 | 3.4          |
| -11-10      | 130             | 114 | 50 |     |     |     |     |     | 2 | 5.5          |
| -111-10     | 180             | 164 | 50 | 100 |     |     |     |     | 3 | 7.6          |
| -1111-10    | 230             | 214 | 50 | 100 | 150 |     |     |     | 4 | 9.8          |
| -11111-10   | 280             | 264 | 50 | 100 | 150 | 200 |     |     | 5 | 11.9         |
| -111111-10  | 330             | 314 | 50 | 100 | 150 | 200 | 250 |     | 6 | 14           |
| -1111111-10 | 380             | 364 | 50 | 100 | 150 | 200 | 250 | 300 | 7 | 16           |

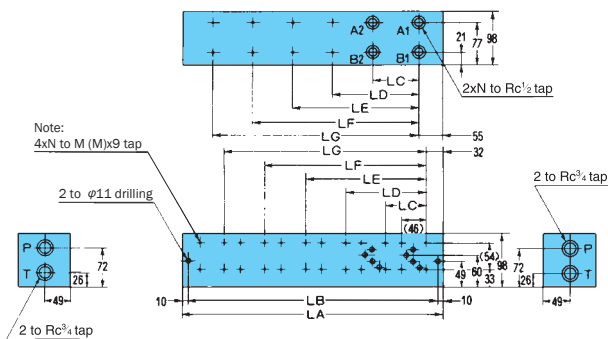
MBW Series (Double Ejection Multi Block)

O1 size



| Model No.  | Dimensions (mm) |     |    |     |     |     |     |      |   | Weight<br>kg |
|------------|-----------------|-----|----|-----|-----|-----|-----|------|---|--------------|
|            | LA              | LB  | LC | LD  | LE  | LF  | LG  | M    | N |              |
| MBW -1-10  | 110             | 86  |    |     |     |     |     | 2x2  | 1 | 5.7          |
| -11-10     | 160             | 136 | 50 |     |     |     |     | 4x2  | 2 | 8.3          |
| -111-10    | 210             | 186 | 50 | 100 |     |     |     | 6x2  | 3 | 10.9         |
| -1111-10   | 260             | 236 | 50 | 100 | 150 |     |     | 8x2  | 4 | 13.4         |
| -11111-10  | 310             | 286 | 50 | 100 | 150 | 200 |     | 10x2 | 5 | 16           |
| -111111-10 | 360             | 336 | 50 | 100 | 150 | 200 | 250 | 12x2 | 6 | 18.6         |

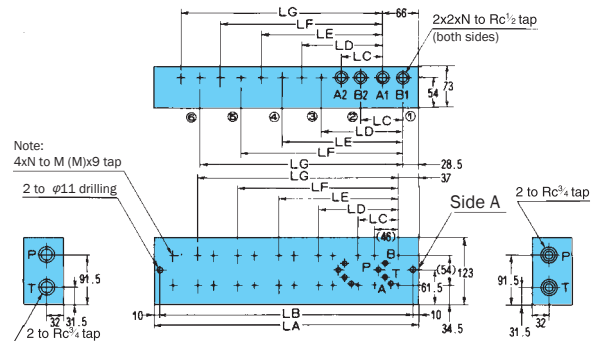
O3 Size (O1, O3 Connection Type)



| Model No.      | Dimensions (mm) |     |    |     |     |     |     |                 |   | Weight<br>kg |
|----------------|-----------------|-----|----|-----|-----|-----|-----|-----------------|---|--------------|
|                | LA              | LB  | LC | LD  | LE  | LF  | LG  | M <sup>mm</sup> | N |              |
| MBS-3 -J10(10) | 110             | 90  |    |     |     |     |     | 6(8)            | 1 | 8.2          |
| -**-J10(10)    | 185             | 165 | 75 |     |     |     |     | 6(8)            | 2 | 13.8         |
| -***-J10(10)   | 260             | 240 | 75 | 150 |     |     |     | 6(8)            | 3 | 19.4         |
| -****-J10(10)  | 335             | 315 | 75 | 150 | 225 |     |     | 6(8)            | 4 | 25.0         |
| -*****-J10(10) | 410             | 390 | 75 | 150 | 225 | 300 |     | 6(8)            | 5 | 30.7         |
| -*****-J10(10) | 485             | 465 | 75 | 150 | 225 | 300 | 375 | 6(8)            | 6 | 36.3         |

Note: 1. There are two types of mounting bolts available for the O3 size: M6 and M8. Be sure to specify the type of bolt you need.  
M6 : SA, SS-J Series  
M8 : SS Series  
2. When using the O1/O3 combination type  
a) The installation pitch uses the O3 size dimensions shown above, and for A and B ports only the O1 size installation part is Rc3/8.  
b) In the case of MBS-313131-J10, for example, valve installation locations 1, 3, 5 counting from the right are O3 size, while 2, 4, 6 are O1 size.

O3 Size (O1, O3 Connection Type)



| Model No.      | Dimensions (mm) |     |    |     |     |     |     |                 |   | Weight<br>kg |
|----------------|-----------------|-----|----|-----|-----|-----|-----|-----------------|---|--------------|
|                | LA              | LB  | LC | LD  | LE  | LF  | LG  | M <sup>mm</sup> | N |              |
| MBW -3-J10(10) | 120             | 100 |    |     |     |     |     | 6(8)            | 1 | 8.4          |
| -**-J10(10)    | 195             | 175 | 75 |     |     |     |     | 6(8)            | 2 | 13.6         |
| -***-J10(10)   | 270             | 250 | 75 | 150 |     |     |     | 6(8)            | 3 | 18.9         |
| -****-J10(10)  | 345             | 325 | 75 | 150 | 225 |     |     | 6(8)            | 4 | 24.1         |
| -*****-J10(10) | 420             | 400 | 75 | 150 | 225 | 300 |     | 6(8)            | 5 | 29.4         |
| -*****-J10(10) | 495             | 475 | 75 | 150 | 225 | 300 | 375 | 6(8)            | 6 | 34.6         |

Note: 1. There are two types of mounting bolts available for the O3 size: M6 and M8. Be sure to specify the type of bolt you need.  
M6 : SA, SS-J Series  
M8 : SS Series  
2. When using the O1/O3 combination type  
a) The installation pitch uses the O3 size dimensions shown above, and for A and B ports only the O1 size installation part is Rc3/8.  
b) In the case of MBS-313131-J10, for example, valve installation locations 1, 3, and 5 counting from the right are O3 size, while 2, 4, 6 are O1 size.

# Control Circuit Option Specifications

A wide variety of systems can be configured by combining a base block with valve unit that forms the assembly of the basic control circuit and a NCP unit. Or the base block alone can be used by installing it in the vicinity of the valve unit.

## Understanding Model Numbers

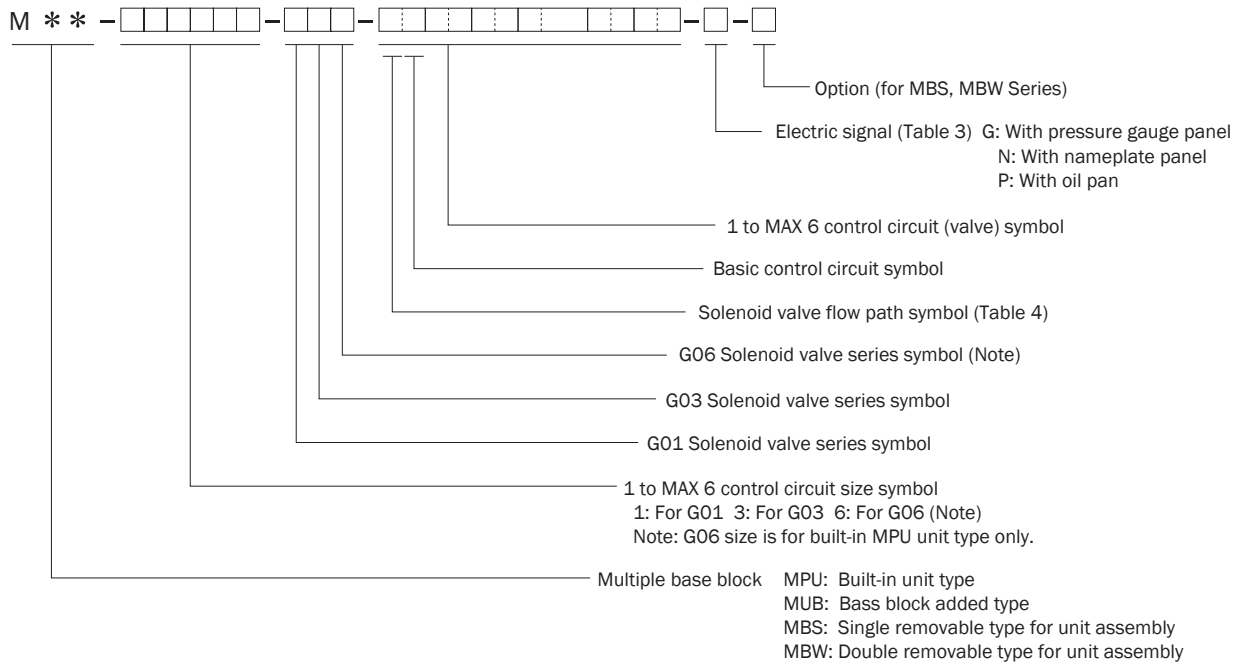


Table 2: Solenoid Valve Series Symbols

| Series Size | G01, (G06) | G03 |
|-------------|------------|-----|
| (D)SA       | A          | A   |
| (D)SS       | S          | (S) |
| SS-J        | -          | J   |

Table 3: Solenoid Valve Voltage Symbols

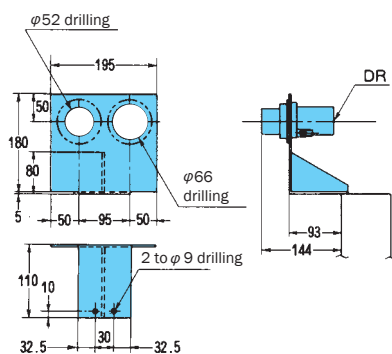
| Power Supply Voltage | Symbol | Remarks |
|----------------------|--------|---------|
| AC 100V              | C1 E1  | 50/60Hz |
| AC 200V              | C2 E2  |         |
| DC 12V               | D1     |         |
| DC 24V               | D2     |         |

Table 4: Solenoid Valve Flow Path Symbols

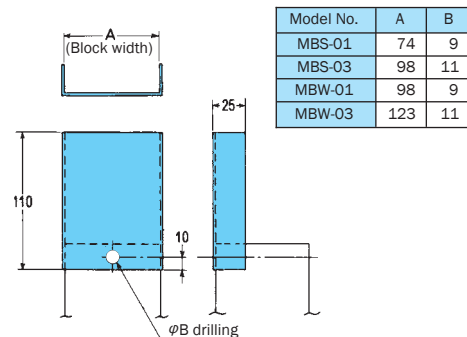
| JIS Symbol        | Symbol | JIS Symbol | Symbol | JIS Symbol | Symbol |
|-------------------|--------|------------|--------|------------|--------|
| No solenoid valve | -      |            | 1      |            | 7      |
|                   | A      |            | 2      |            | 8      |
|                   | H      |            | 4      |            | 9      |
|                   | E      |            | 5      |            | 1S     |
|                   |        |            | 6      |            | 6S     |

Note: A separate basic control circuit selection table is also available for control circuit symbols. Contact your agent for more information.  
Also contact your agent concerning hydraulic circuit drawings, specification drawings, etc.

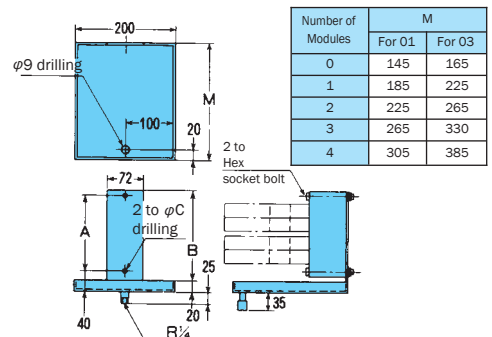
Option G (Pressure Gauge Panel Dimension Diagram)



Option N (Nameplate Panel Dimension Diagram)



Option P (Oil Pan Dimension Diagram)



Option P Dimension Table

| Model No. | A   | B   | C | Applicable |
|-----------|-----|-----|---|------------|
| PS1-1     | 64  | 92  | 9 | MBS-1      |
| -2        | 114 | 142 | 9 | 11         |
| -3        | 164 | 192 | 9 | 111        |
| -4        | 214 | 242 | 9 | 1111       |
| -5        | 264 | 292 | 9 | 11111      |
| -6        | 314 | 342 | 9 | 111111     |
| -7        | 364 | 392 | 9 | 1111111    |

Note: The nameplate panel is separate from the base block when shipped, so fasten them together during installation.

Note: When shipped, the oil pan is fastened from the back by the same nut as the block.

| Model No. | A   | B   | C | Applicable |
|-----------|-----|-----|---|------------|
| PW1-1     | 86  | 118 | 9 | MBW-1      |
| -2        | 136 | 168 | 9 | 11         |
| -3        | 186 | 218 | 9 | 111        |
| -4        | 236 | 268 | 9 | 1111       |
| -5        | 286 | 318 | 9 | 11111      |
| -6        | 336 | 368 | 9 | 111111     |

| Model No. | A   | B   | C  | Applicable |
|-----------|-----|-----|----|------------|
| PS3-1     | 90  | 120 | 11 | MBS-3      |
| -2        | 165 | 195 | 11 | 33         |
| -3        | 240 | 270 | 11 | 333        |
| -4        | 315 | 345 | 11 | 3333       |
| -5        | 390 | 420 | 11 | 33333      |
| -6        | 465 | 495 | 11 | 333333     |

| Model No. | A   | B   | C  | Applicable |
|-----------|-----|-----|----|------------|
| PW3-1     | 100 | 130 | 11 | MBW-3      |
| -2        | 175 | 205 | 11 | 33         |
| -3        | 250 | 280 | 11 | 333        |
| -4        | 325 | 335 | 11 | 3333       |
| -5        | 400 | 430 | 11 | 33333      |
| -6        | 475 | 505 | 11 | 333333     |



### NSP Series Compact Variable Pump Unit

Compact hydraulic units are widely used as a power source in such machine tool applications as NC lathe check opening and closing, tool rotation, machining center spindle raise and lower operations, etc.

During pressure holding, NSP unit enables machine efficiency that delivers energy savings of approximately 40% when compared with standard Nachi units, all in a compact, lightweight hydraulic unit.

#### Features

##### Space-saving, lightweight design

A smaller tank capacity makes it easier for the unit to fit in, and greatly reduces space requirements.

##### New structure increases efficiency

A structure that draws on years of accumulated know-how includes an improved pump joint that provides more efficient operation.

##### Greatly improved cooling capacity

A powerful, energy-efficient built-in cooling system eliminates the need for fan motor wiring and coolant pipes.

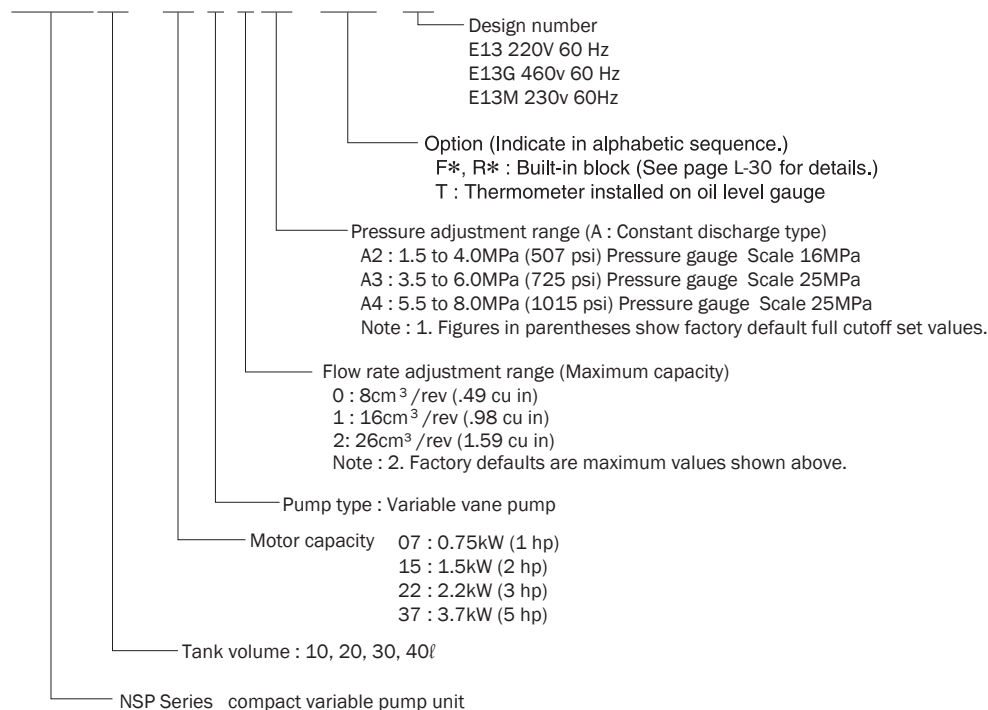
#### Specifications

| Item               | Model No.            | NSP-*-VOA*                            | NSP-*-V1A*      | NSP-*-V2A*   |
|--------------------|----------------------|---------------------------------------|-----------------|--|
| Pump Capacity      | cm <sup>3</sup> /rev | 8.0                                   | 16.0            | 26.0   |
| Maximum Pressure   | MPa (psi)            | 8.0 (1160 psi) (Full Cutoff Pressure) |                 | 7.0 (Full Cutoff Pressure) * Allowed peak pressure is 13.0 |
| Motor Output       | kW (hp)              | 0.75, 1.5 (1, 2)                      | 1.5, 2.2 (2, 3) | 2.2, 3.7 (3, 5)  |
| Tank Capacity      | ℓ                    | 10, 20                                |                 | 30, 40   |
| Installation Space | mm                   | 300 × 400                             |                 | 340 × 450  |
| Approximate Weight | kg                   | 37 (10 ℓ, 1.5kW, excluding options)   |                 | 63 (30 ℓ, 2.2kW, excluding options)                        |
| Pump Volume 60 Hz  |                      | 3.8 gpm                               | 7.6 gpm         | 12 gpm   |

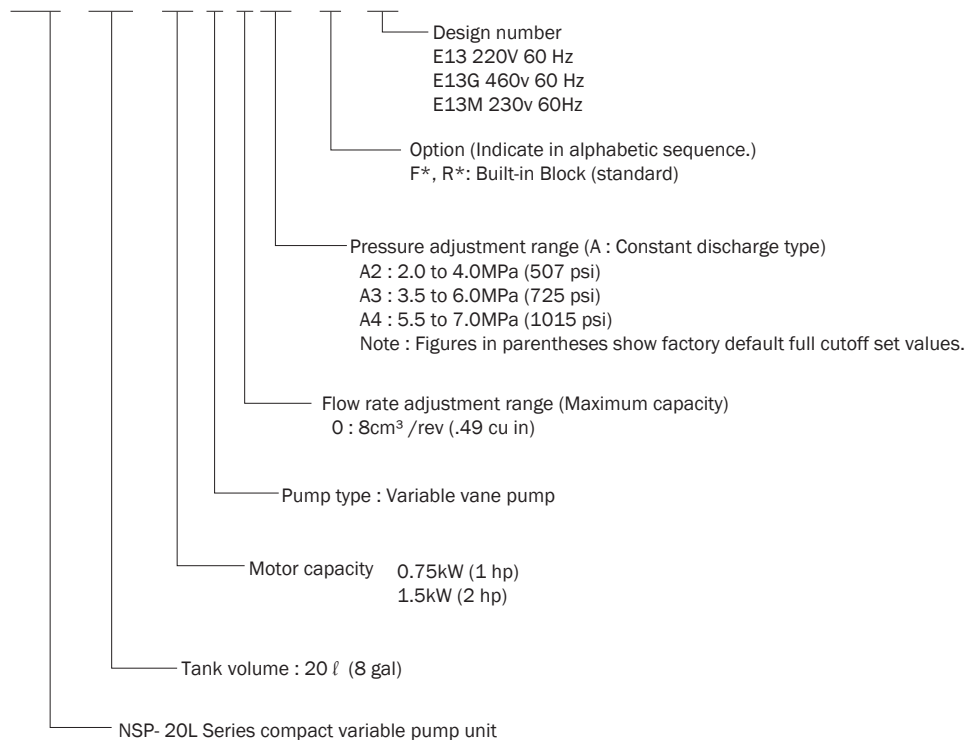
## Understanding Model Numbers

Note: 1. Note that there are certain restrictions on pump capacity and motor capacity combinations. See the Selection Precautions on page L-23 before selecting a model.  
2. Design numbers are subject to change without notice.

### NSP - 10 - 07 V 0 A2 - F2T - E13



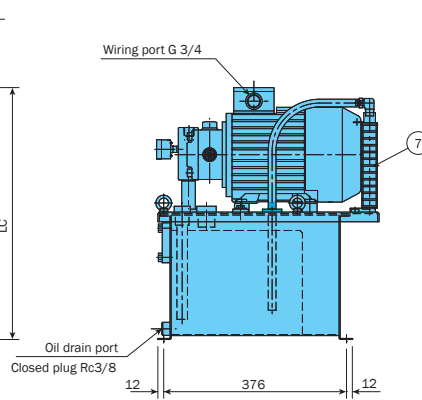
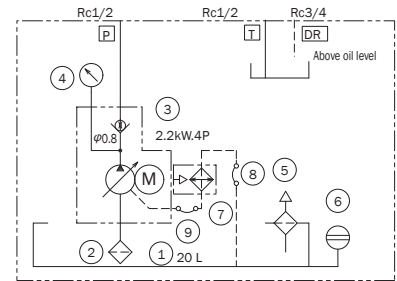
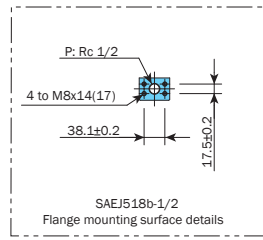
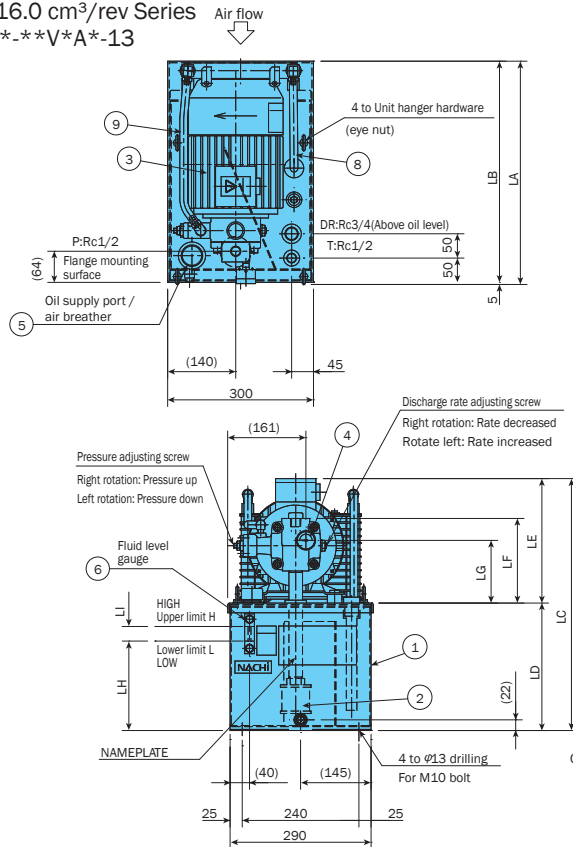
### NSP - 20L - 07 V 0 A2 - F - 13



# Design Drawings, Dimension Tables

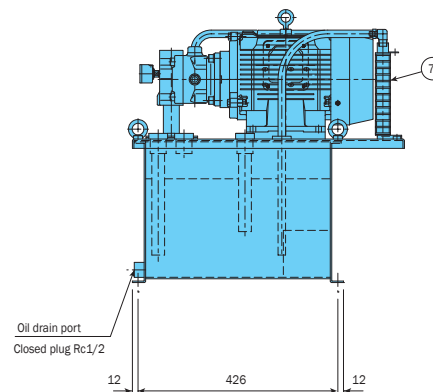
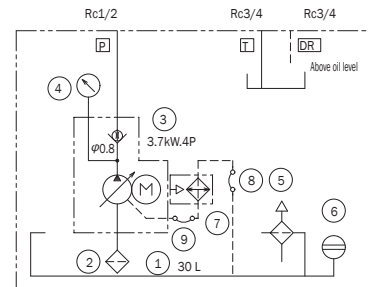
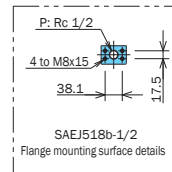
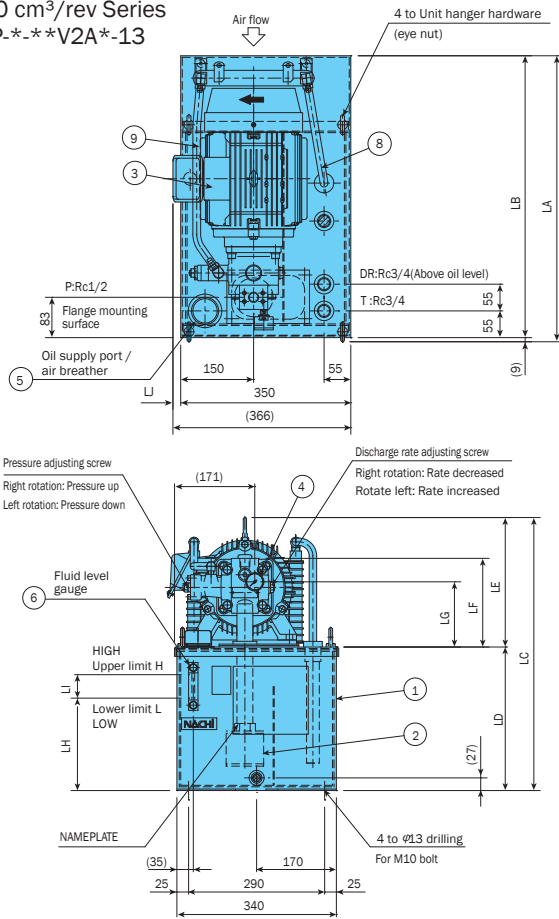
Note: See the following page for dimensions.

8.0, 16.0 cm<sup>3</sup>/rev Series  
NSP-\*\*\*V\*A\*-13



| Part No. | Part Name                      |
|----------|--------------------------------|
| 1        | Oil tank                       |
| 2        | Suction strainer               |
| 3        | Uni-pump                       |
| 4        | Pressure gauge                 |
| 5        | Fluid supply port/air breather |
| 6        | Fluid level gauge              |
| 7        | Radiator                       |
| 8        | Flexible hose                  |
| 9        | Flexible hose                  |

26.0 cm<sup>3</sup>/rev Series  
NSP-\*\*\*V2A\*-13



| Part No. | Part Name                      |
|----------|--------------------------------|
| 1        | Oil tank                       |
| 2        | Suction strainer               |
| 3        | Uni-pump                       |
| 4        | Pressure gauge                 |
| 5        | Fluid supply port/air breather |
| 6        | Fluid level gauge              |
| 7        | Radiator                       |
| 8        | Flexible hose                  |
| 9        | Flexible hose                  |

Hydraulic Unit

8.0, 16.0cm<sup>3</sup>/rev Series

| Model No.          | Motor (kW-P) | Dimensions |     |     |     |     |     |     |     |    |     |     | Approximate Weight (kg) |
|--------------------|--------------|------------|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-------------------------|
|                    |              | LA         | LB  | LC  | LD  | LE  | LF  | LG  | LH  | LI | H   | L   |                         |
| NSP-10-07V*A*-*-13 | 0.75 - 4     | 405        | 400 | 394 | 160 | 234 | 154 | 109 | 102 | 10 | 10L | 9L  | 33                      |
| NSP-10-15V*A*-*-13 | 1.5 - 4      | 430        | 425 | 396 |     | 236 | 164 | 119 |     |    |     |     | 37                      |
| NSP-10-22V*A*-*-13 | 2.2 - 4      | 460        | 455 | 422 |     | 262 | 174 | 129 |     |    |     |     | 42                      |
| NSP-20-07V*A*-*-13 | 0.75 - 4     | 405        | 400 | 496 | 262 | 234 | 154 | 109 | 185 | 30 | 20L | 17L | 35                      |
| NSP-20-15V*A*-*-13 | 1.5 - 4      | 430        | 425 | 498 |     | 236 | 164 | 119 |     |    |     |     | 39                      |
| NSP-20-22V*A*-*-13 | 2.2 - 4      | 460        | 455 | 524 |     | 262 | 174 | 129 |     |    |     |     | 44                      |

(Excluding operating fluid)

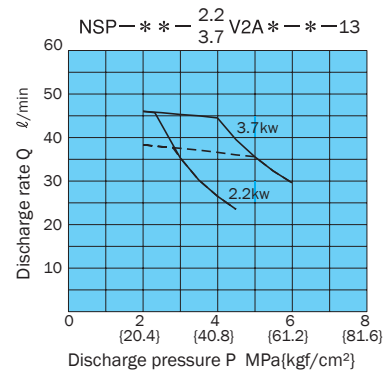
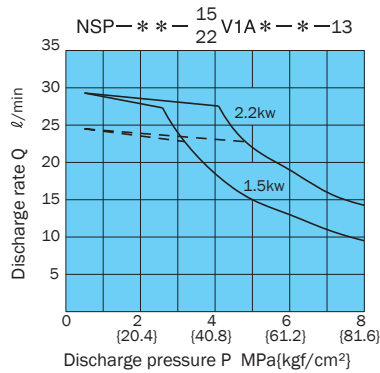
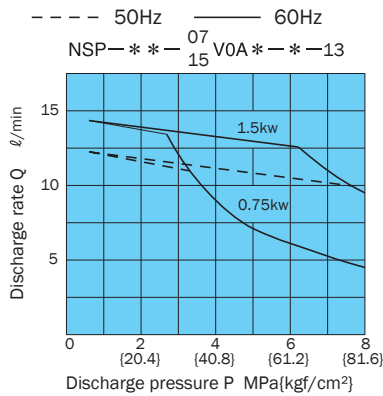
26.0cm<sup>3</sup>/rev Series

| Model No.          | Motor (kW-P) | Dimensions |     |     |     |     |     |     |     |    |    |     | Approximate Weight (kg) |    |
|--------------------|--------------|------------|-----|-----|-----|-----|-----|-----|-----|----|----|-----|-------------------------|----|
|                    |              | LA         | LB  | LC  | LD  | LE  | LF  | LG  | LH  | LI | LJ | H   |                         | L  |
| NSP-30-22V2A*-*-13 | 2.2 - 4      | 564        | 555 | 619 | 306 | 234 | 177 | 127 | 197 | 50 | 9  | 30L | 23L                     | 63 |
| NSP-30-37V2A*-*-13 | 3.7 - 4      | 589        | 580 | 661 |     | 276 | 189 | 139 |     |    | 15 |     | 73                      |    |
| NSP-40-22V2A*-*-13 | 2.2 - 4      | 564        | 555 | 619 | 385 | 234 | 177 | 127 | 256 | 70 | 9  | 40L | 31L                     | 67 |
| NSP-40-37V2A*-*-13 | 3.7 - 4      | 589        | 580 | 661 |     | 276 | 189 | 139 |     |    | 15 |     | 77                      |    |

(Excluding operating fluid)

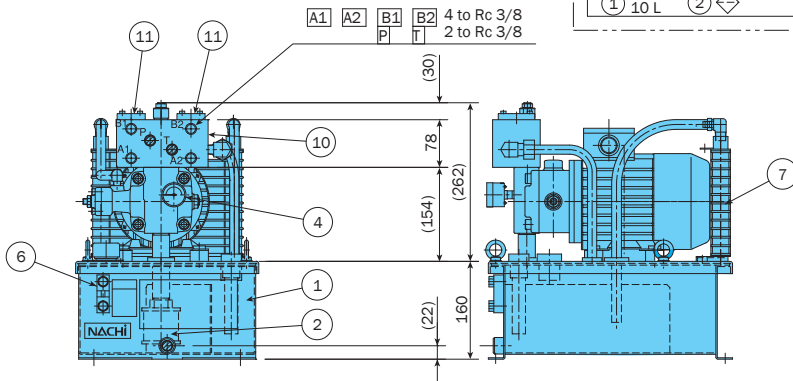
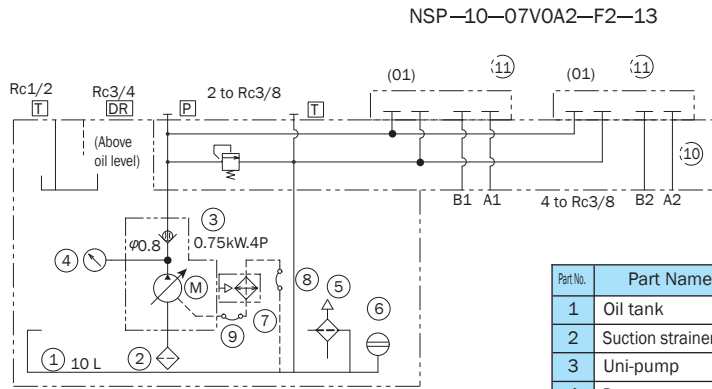
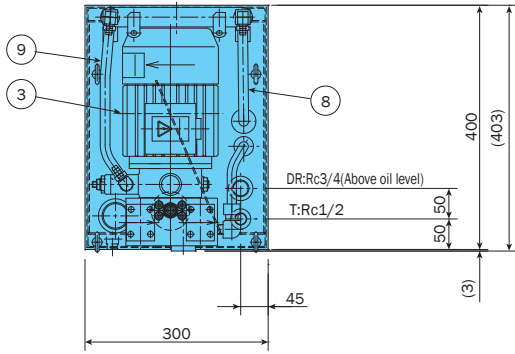
## Selecting a Motor

NSP Motor Selection Curves (Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.)



\* See page B-40 for the characteristics of the drive motor.

[Block Addition Example]  
NSP-10-07V0 A2-F2-13

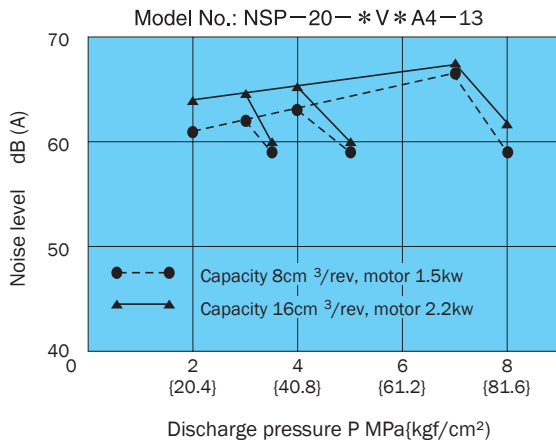


| Part No. | Part Name                      |
|----------|--------------------------------|
| 1        | Oil tank                       |
| 2        | Suction strainer               |
| 3        | Uni-pump                       |
| 4        | Pressure gauge                 |
| 5        | Fluid supply port/air breather |
| 6        | Fluid level gauge              |
| 7        | Radiator                       |
| 8        | Flexible hose                  |
| 9        | Flexible hose                  |
| ☆ 10     | Base Blocks                    |
| ☆ 11     | End Plates                     |

☆ : Part numbers 10 and 11 are options. Part number 11 is standard when a block is equipped.

## Performance Characteristics

### Noise Characteristics



### Conditions

(The values shown in the graph to the left are typical characteristics under the following conditions.)

Operating Fluid: ISO VG32 equivalent

Fluid Temperature: 40±5°C

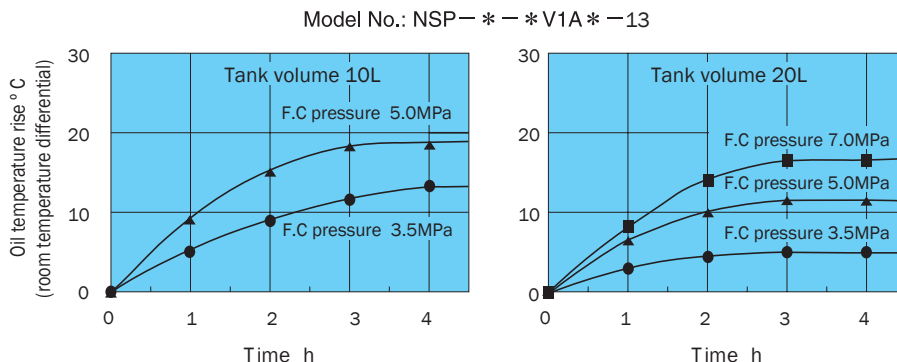
Revolution Speed: 1800min<sup>-1</sup>

Measurement Distance:

1 meter around the unit  
(Average value from four directions )

Note: Noise characteristics are affected by the condition of the floor and stand where the unit is mounted, whether there are noise reflective items nearby, and other factors. Such factors can produce different characteristics than those indicated above.

### Fluid Temperature Characteristics



### Conditions

(The values shown in the graph to the left are typical characteristics under the following conditions.)

Operating Fluid: ISO VG32 equivalent

Revolution Speed: 1800min<sup>-1</sup>

Room Temperature: 29 °C

Motor: 0.75 to 2.2kW

Note) 1.Note that continuous operation at pressures of 5.0MPa or greater with the 10 l tank cause a large rise in fluid temperature. A 20 l tank is recommended in this case.  
2.Rises in fluid temperature depend on actual operating conditions, and so actual temperatures may be different from those indicated above.

Note: For information about power consumption, see the data for the UVN Series variable vane uni-pump on page B-41.

## Selection Precautions

### • Model Combinations

The table below shows the standard pump and motor combinations.

| Pump | Motor kW | 0.75 | 1.5 | 2.2 | 3.7 |
|------|----------|------|-----|-----|-----|
| 0A*  |          | ○    |     |     |     |
| 1A*  |          |      | ○   |     |     |
| 2A2  |          |      |     | ○   | ○   |
| 2A3  |          |      |     | ○   | ○   |
| 2A4  |          |      |     |     | ○   |

A 30ℓ tank capacities with 8.0 or 16.0 cm<sup>3</sup>/rev are special specifications.

A model equipped with a block comes with a stopper plate on the block.

### • Circuit Configuration

The basic configuration is a standard NSP-\*\* plus an external manifold (circuit).

Provide piping with sufficient flexibility between the unit and external manifold.

Make sure the maximum peak pressure (setting pressure + surge pressure) during operation does not exceed 14MPa.

The following are typical pipe conditions at a reference maximum peak pressure at 14MPa or less as reference.

Rubber hose (for 14MPa) 1/2" x 2m  
(Pipe Capacity: 250cm<sup>3</sup>) pump operating conditions: 1MPa→7MPa, full cutoff

At pressures in excess of 14MPa, equip a circuit side surge cutoff relief valve.

### • Built-in Manifold Block

When a manifold block (optional) is built

into the pump, make sure the block and valve total weight is not greater than 15kg.

| Block Type                       | F1R1 | F2R2 | F3  |
|----------------------------------|------|------|-----|
| Block Weight (kg)                | 4.5  | 6.5  | 8.5 |
| Allowable Additional Weight (kg) | 10.5 | 8.5  | 6.5 |

Contact your agent for information about equipping a circuit.

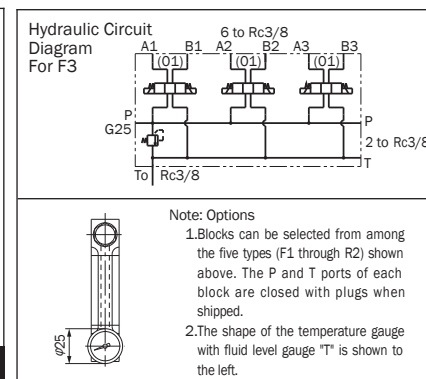
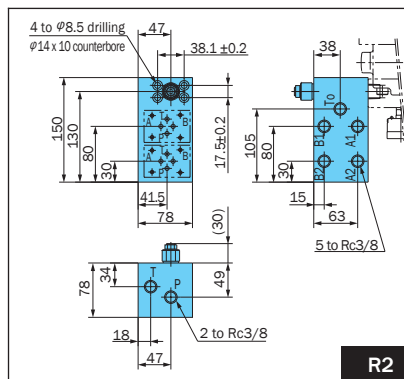
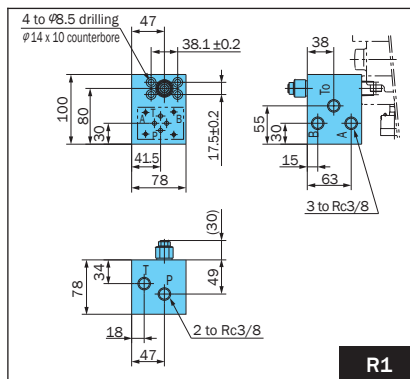
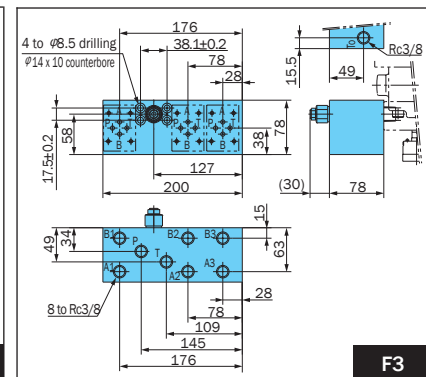
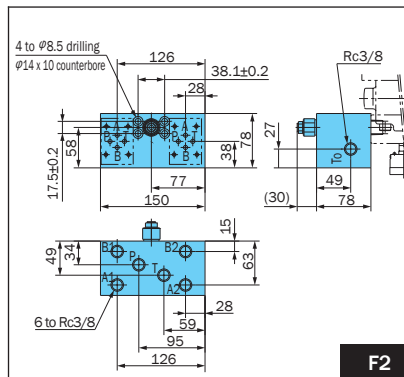
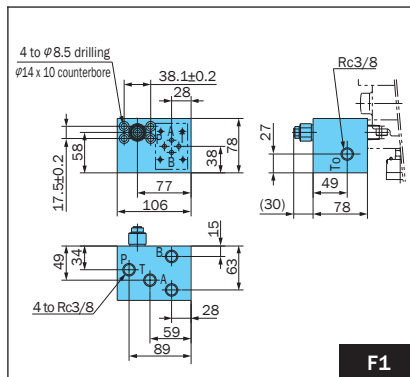
The 26 cm<sup>3</sup>/rev series blocks are different, contact us for information.

### • Paint Specifications

The interior and exterior of the tank and the motor are covered with a melanic baked-on resin coating, while the pump is spray painted with a lacquer finish. Color is Nachi standard color (Mancel No. 5B6/3).

Contact your agent about specifying external paint colors.

## Option Details



### Note: Options

- Blocks can be selected from among the five types (F1 through R2) shown above. The P and T ports of each block are closed with plugs when shipped.
- The shape of the temperature gauge with fluid level gauge "T" is shown to the left.

## Handling Overview

### Startup Precautions

Check to make sure that the operating fluid in the tank is at the prescribed level.

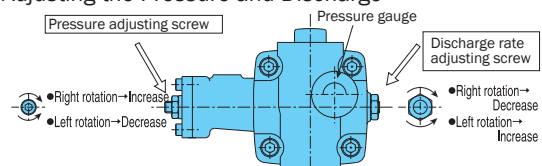
- Upper Limit Mark (Yellow): Prescribed fluid level (nominal capacity)
  - Lower Limit Mark (Red): Minimum fluid level
- Hydraulic Operating Fluid: General oil-based operating fluid equivalent to ISO VG32

Perform electrical wiring exactly as shown below.

| Motor and Power Supply Polarity | If wiring is performed incorrectly...   |
|---------------------------------|---|
| R → U                           | <ul style="list-style-type: none"> <li>• Electric pump rotates in reverse, fluid is not discharged</li> <li>• Continued operation can damage the pump.</li> <li>• Attach a pressure gauge to the discharge side and check for pressure rise.</li> </ul> |
| S → V                           |   |
| T → W                           |   |

Perform repeated motor starts and stops to bleed air from the interior of the pump and the suction piping. A no-load circuit allows faster bleeding.

### • Adjusting the Pressure and Discharge



Note: Do not touch anything except the adjustment screw shown above.

### • Maintenance and Inspection

Fluid Temperature: Use in an area where the temperature is 15° C to 60° C.

Operating Fluid Replacement Cycle: Perform the initial fluid replacement after three months of operation. After that, replace fluid when it becomes dirty or once a year, whichever comes first.

Radiator Fin Cleaning and Fin Strainer Cleaning: Every six months or 4,000 hours of operation, whichever comes first.

### • Environment

Temperature: 10 to 35° C

Avoid areas exposed to mist of water-soluble coolant.





### NSP-L Series Compact Variable Pump Unit

Compact hydraulic units are widely used as a power source in such machine tool applications as NC lathe check opening and closing, tool rotation, machining center spindle raise and lower operations, etc.

During pressure holding, NSP-L unit enables machine efficiency that delivers energy savings of approximately 40% when compared with standard Nachi units, all in a compact, lightweight hydraulic unit.

#### Features

##### Space-saving, lightweight design

A smaller tank capacity makes the power unit more compact, and greatly reduces space requirements.

##### New structure increases efficiency

Based on years of experience, the structure includes an improved pump joint that provides more efficient operation.

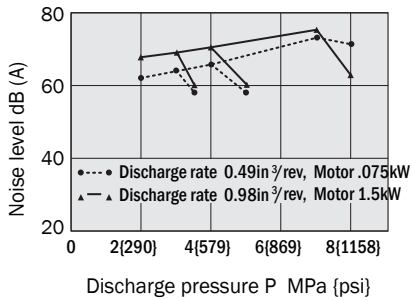
##### Greatly improved cooling capacity

A powerful, energy-efficient built-in cooling system eliminates the need for fan motor wiring and coolant pipes.

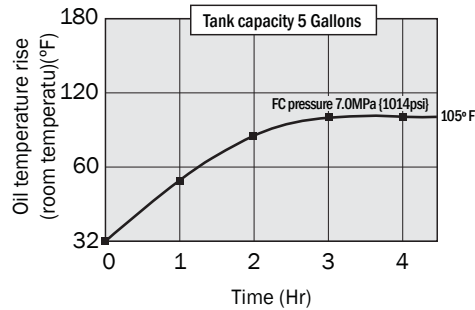
#### Specifications

| Item               | Model No.            | NSP-*-VOA*                            | NSP-*-V1A*      |
|--------------------|----------------------|---------------------------------------|-----------------|
| Pump Capacity      | cm <sup>3</sup> /rev | 8.0                                   | 16.0            |
| Maximum Pressure   | MPa (psi)            | 8.0 (1160 psi) (Full Cutoff Pressure) |                 |
| Motor Output       | kW (hp)              | 0.75, 1.5 (1, 2)                      | 1.5, 2.2 (2, 3) |
| Tank Capacity      | ℓ                    | 20                                    |                 |
| Installation Space | mm                   | 300 × 400                             |                 |
| Approximate Weight | kg                   | 39 (20 ℓ, 1.5kW, excluding options)   |                 |
| Pump Volume 60 Hz  |                      | 3.8 gpm                               | 7.6 gpm         |

#### Noise Characteristics



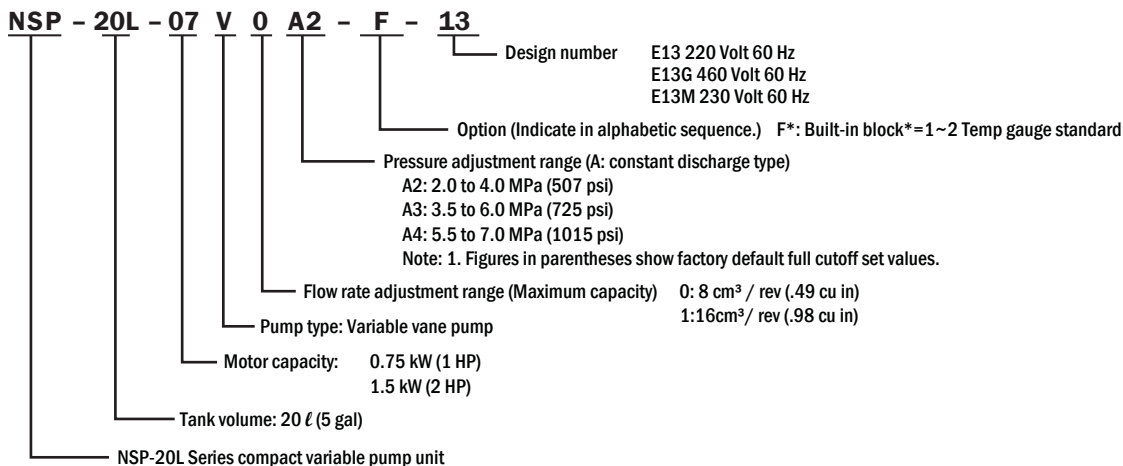
#### Oil Temperature Characteristics



#### Conditions

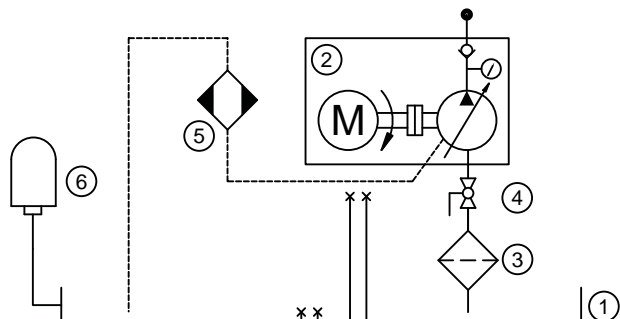
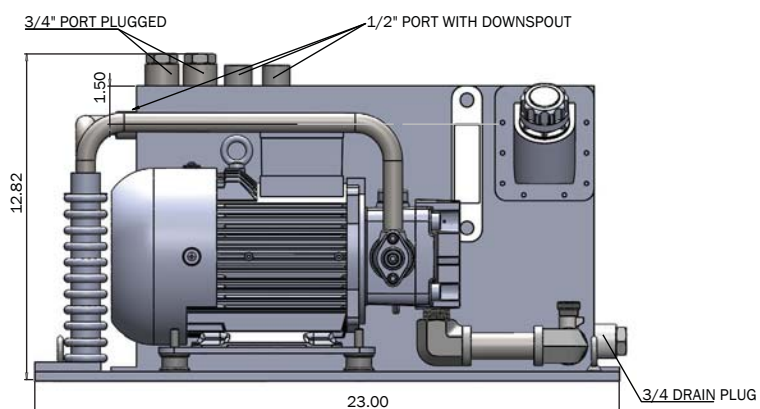
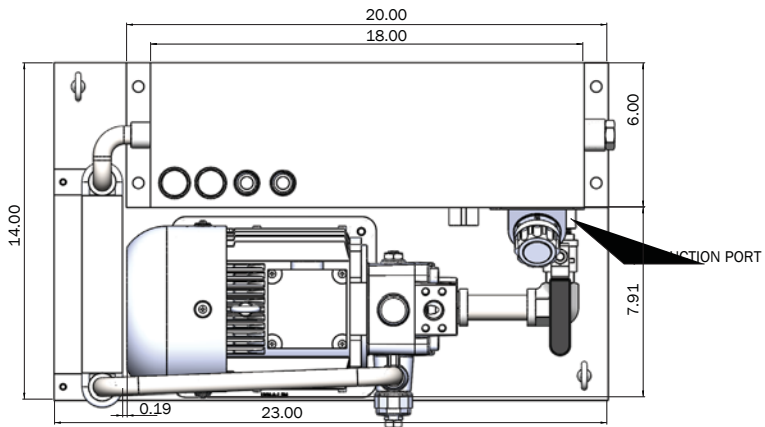
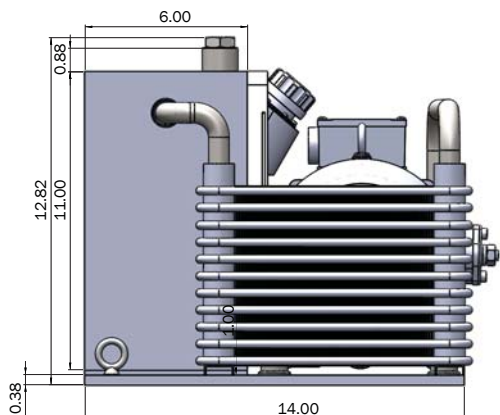
The value on the left-hand drawing represents typical characteristics under the following conditions:  
 Oil used: ISO VG32 or its equivalent  
 Speed: 1800 min-1  
 Room temperature: 65°F  
 Motor: 0.75~1.5kW

#### Understanding Model Numbers



## Design Drawings & Dimensions

8.0, 16.0 cm<sup>3</sup> / rev Series  
NSP-20L-\*\*V\*\*A\*-13



NSP-20L-07V0A\*-(\*)-E13

NSP-20L-15V0A\*-(\*)-E13

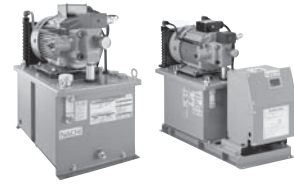
NSP-20L-15V1A\*-(\*)-E13

( ) 220V 60 Hz

(G) 460V 60 Hz

(M) 230V 60 Hz

| PART NO. | PART NAME                      |
|----------|--------------------------------|
| 1        | NL-4 L Shape Reservoir         |
| 2        | UVN-1A-1A4-1.5-4-11 Pump Motor |
| 3        | SUS-A088-068-N16F Strainer     |
| 4        | 948-173 3/4' Ball Valve        |
| 5        | 3A92-001-1050 Cooler           |
| 6        | SM57XL-10 Filler/Breather      |



### Inverter Drive NSP Series Energy-saving Variable Pump Unit with Inverter Drive

The "Inverter Drive NSP Series" is a hydraulic unit that reduces energy consumption by approximately 60% (dwelling, in-house comparison) compared to the standard unit by adding an energy saving NSP Series inverter drive. They are great for jobs that need to dwell for long periods.

#### Features

##### Hydraulic fluid temperature is kept at room temperature +1.5°C

The NSP series benefits your entire system by lowering oil temperature to improve machining accuracy, lengthen the life of seals and hydraulic fluid, and reduce factory air conditioning costs.

NSP-20E-22V1A4-13  
6.0MPa maintained while dwelling

##### Quiet operation at only 53dB (A)

NSP-20E-22V1A4-13  
6.0MPa dwelling  
4-directional average  
Standard unit sound level is 64dB (A)

##### Easy Operation

Starts up as soon as the power is turned on  
Absolutely no external commands or delicate electrical adjustments needed because the pump's RPMs are controlled automatically in response to the load.

##### Operates with the inverter removed also

Can operate as an NSP unit just by switching out the wiring in case of emergencies.  
Production lines continue running even if there is trouble with the inverter because it is based on our reliable NSP unit and keeps running as a regular NSP unit.

##### Inverter drive function can be installed separately later

If you are already using an NSP unit, you can add the inverter drive function by installing the inverter control box kit, which is sold separately.

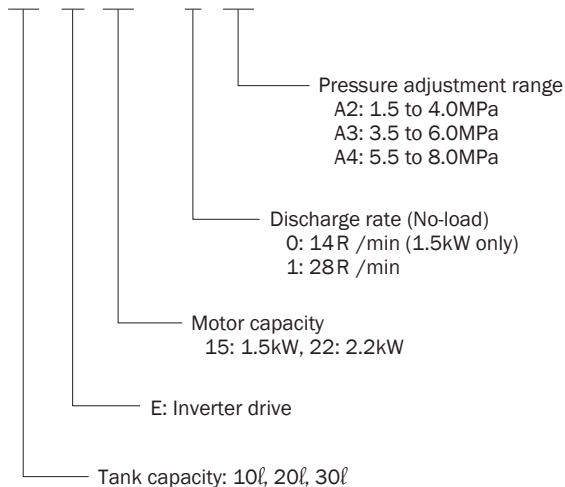
#### Specifications

|  |   |  |
|--|---|--|
| 1. Power Supply<br>Rated Input Current | 3φ AC200 to 220V, 50/60Hz<br>9.7A/1.5kW, 13.4A/2.2kW<br>22.4A/3.7kW                                     |  |
| 2. Pressure Adjustment<br>Range        | 8, 16cm <sup>3</sup> /rev series<br>A2: 1.5 to 4.0MPa<br>A3: 3.5 to 6.0MPa<br>A4: 5.5 to 8.0MPa         | 26cm <sup>3</sup> /rev series<br>A2: 2.0 to 4.0MPa<br>A3: 3.5 to 6.0MPa<br>A4: 5.5 to 7.0MPa |
| 3. Output Flow (at No-load)            | 0A*: 14l /min, 1A*: 28l /min<br>2A*: 46l /min   |  |
| 4. Hydraulic Fluid                     | Standard mineral-based hydraulic fluid (equivalent to ISO VG32)   |  |
| 5 Hydraulic Fluid<br>Temperature       | 10 to 60:   |  |
| 6 Color of Paint                       | Munsell number 5B 6/3 (NACHI color)   |  |
| 7. Ambient Temperature/<br>Humidity    | 0 to 35 / 20 to 85%RH (non-condensation)<br>(Keep the unit away from water-soluble cutting fluid mist.) |  |

## Understanding Model Numbers

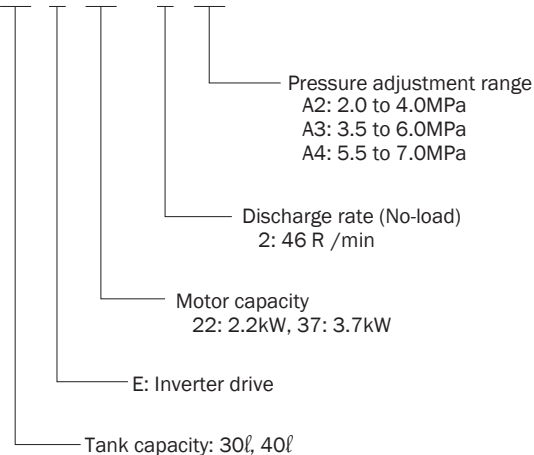
### 8.0, 16.0 cm<sup>3</sup>/rev Series

**NSP - 20 - E - 15 V - 0 - A2 - 13**



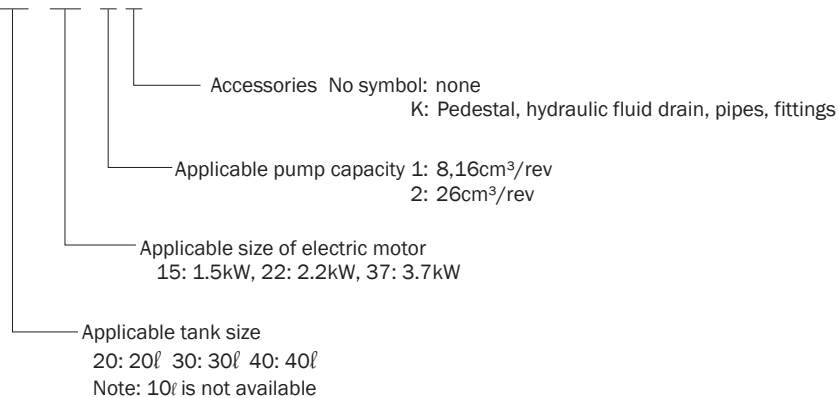
### 26.0 cm<sup>3</sup>/rev Series

**NSP - 30 - E - 22 V - 2 - A2 - 13**



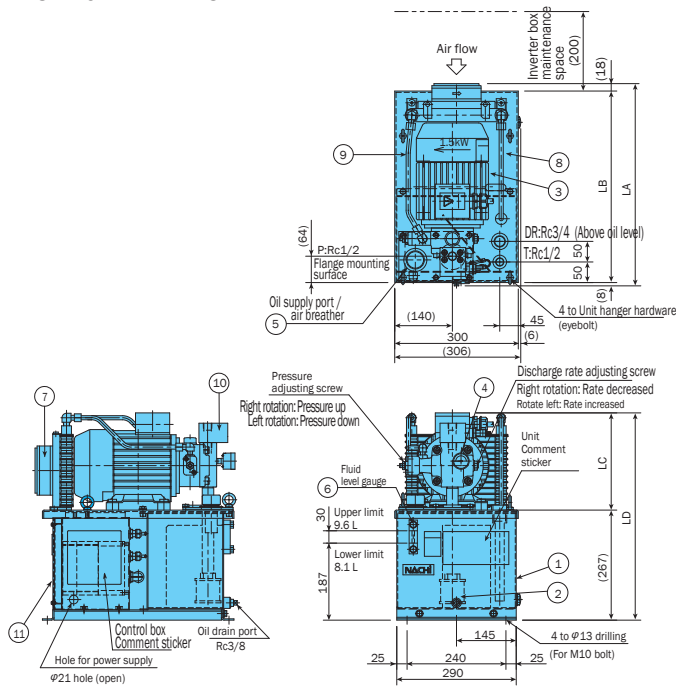
### Inverter Control Box Kit Specifications

**EBK - 20 - 22 - 1 K - 10**

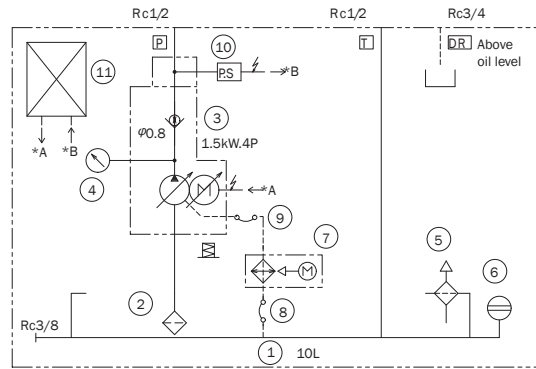


# Design Drawings, Dimension Tables

8.0, 16.0cm<sup>3</sup>/rev Series  
NSP-10E-\*\*V\*A-13

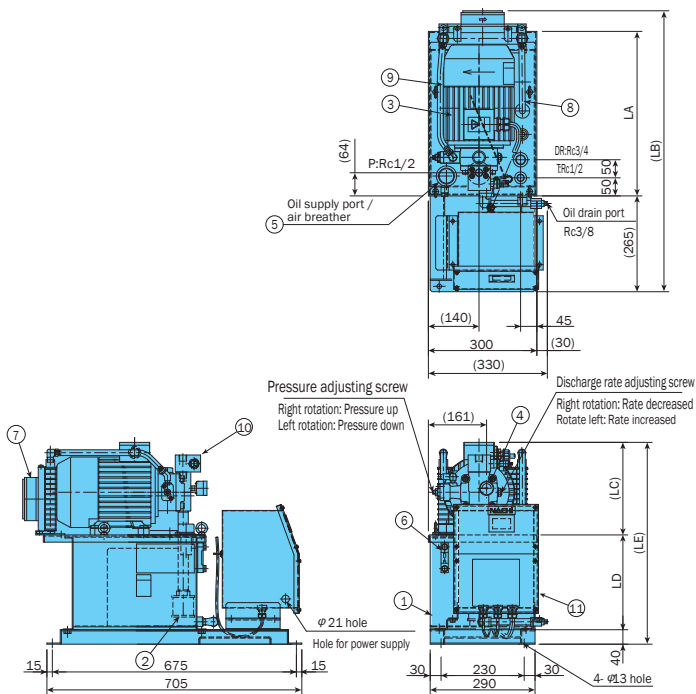


Note: See the following page for dimensions.

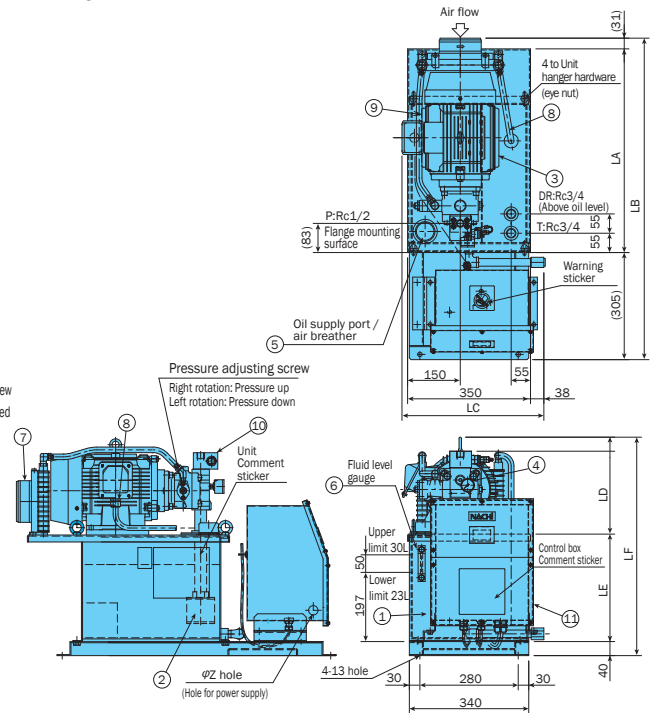


| Part No. | Part Name                      | Part No. | Part Name            |
|----------|--------------------------------|----------|----------------------|
| 1        | Oil tank                       | 7        | Fan cooler           |
| 2        | Suction strainer               | 8        | Flexible hose        |
| 3        | Uni-pump                       | 9        | Flexible hose        |
| 4        | Pressure gauge                 | 10       | Pressure sensor      |
| 5        | Fluid supply port/air breather | 11       | Inverter control box |
| 6        | Fluid level gauge              |          |                      |

NSP- 20  
30 E-\*\*V\*A\*-13



26.0cm<sup>3</sup>/rev Series  
NSP- 30  
40 E-\*\*V2A\*-13



## 8.0, 16.0cm<sup>3</sup>/rev Series

| Model No.         | Dimensions |     |     |     |     | Approximate Weight (kg) |
|-------------------|------------|-----|-----|-----|-----|-------------------------|
|                   | LA         | LB  | LC  | LD  | LE  |                         |
| NSP-10E-15V*A*-13 | 465        | 491 | 211 | 503 | -   | 51                      |
| NSP-10E-22V1A*-13 | 485        | 521 | 221 | 523 | -   | 56                      |
| NSP-20E-15V*A*-13 | 425        | 750 | 211 | 262 | 545 | 65                      |
| NSP-20E-22V1A*-13 | 455        | 780 | 221 |     | 564 | 71                      |
| NSP-30E-15V*A*-13 | 425        | 750 | 211 | 364 | 647 | 70                      |
| NSP-30E-22V1A*-13 | 455        | 780 | 221 |     | 666 | 76                      |

## 26.0cm<sup>3</sup>/rev Series

| Model No.         | Dimensions |     |     |     |     |     |    | Approximate Weight (kg) |
|-------------------|------------|-----|-----|-----|-----|-----|----|-------------------------|
|                   | LA         | LB  | LC  | LD  | LE  | LF  | Z  |                         |
| NSP-30E-22V2A*-13 | 555        | 895 | 409 | 229 | 306 | 582 | 21 | 84                      |
| NSP-30E-37V2A*-13 | 580        | 915 | 415 | 241 |     |     | 27 | 96                      |
| NSP-40E-22V2A*-13 | 555        | 895 | 409 | 229 | 385 | 661 | 21 | 89                      |
| NSP-40E-37V2A*-13 | 580        | 915 | 415 | 241 |     |     | 27 | 101                     |

### Precautions

- Turning the inverter on and off by cutting the main power supply (circuit breaker) significantly reduces the life of the inverter and should be limited to once an hour.  
Contact us if you need to start and stop operations frequently.
- Do not change or adjust any switches except the inverter parameter settings and the pressure setting switches.
- Use a flexible hose with a 1/2 inch inner diameter that is 2 meters long and is rated for maximum pressure of 14MPa to connect the hydraulic unit's P port (output port) and the external manifold (or actuator).
- Maximum peak pressure (set pressure + surge pressure) must be 14MPa or below for the 8 and 16cm<sup>3</sup>/rev series, and 13MPa or below for the 26cm<sup>3</sup>/rev series.  
Install a relief valve to cut surges in the circuit if the maximum peak pressure exceeds these figures.

[For 10ℓ tanks]

- Leakage amount in the hydraulic circuits must be 1ℓ/min or less. Contact us if leakage in the hydraulic circuit exceeds 1ℓ/min.
- Level of hydraulic fluid in the tank must stay within the visible range on the fluid level meter (approximately 1.5ℓ).



### NACHI NN Pack High-Pressure Standard Variable Pump Unit

Newly developed compact variable pump unit has environmentally friendly low hydraulic fluid temperature for cutting and manufacturing equipment hydraulic units. Extensive lineup in the series to handle requirements exactly.

#### Features

Low hydraulic fluid temperature = room temperature + 7 °C

NNP-20-22P16N1-20  
 60Hz, 7MPa Full cut-off in  
 continuous operation

A wide selection of models from which to choose

Basic Series: 10 types  
 Pump Variable Controllers: 5 types  
 Options: 8 types

Fan to cool pump drain is standard equipment, hydraulic fluid temperatures are kept low using tank construction focused on anti-foaming.

A wide range of models provides a selection of capacity levels, and selecting a variable control mechanism helps to reduce energy needs.

#### Specifications

Power supply: AC200V-50/60Hz AC220V-60Hz

| Model No.           | Pump Capacity<br>cm <sup>3</sup> /rev | Motor capacity<br>kW-P | Maximum Pressure<br>[Full Cutoff Pressure]<br>MPa(kgf/cm <sup>2</sup> ) | Tank Capacity<br>ℓ | Fan Cooler Motor Input<br>W(at50/60Hz) | Standard Weight<br>kg (Note) |
|---------------------|---------------------------------------|------------------------|---|--------------------|--|------------------------------|
| NNP-20-22P8N***-20  | 8.0                                   | 2.2 - 4                | 21(214)   | 20                 | 16/15W<br>Single-phase                 | 65                           |
| NNP-20-37P8N***-20  |                                       | 3.7 - 4                |   | 20                 |  | 75                           |
| NNP-20-22P16N***-20 | 2.2 - 4                               | 20                     |   | 70                 |  |                              |
| NNP-30-37P16N***-20 | 3.7 - 4                               | 30                     |   | 80                 |  |                              |
| NNP-20-22P22N***-20 | 22.0                                  | 2.2 - 4                | 14(143)   | 20                 | 33/30W<br>Single-phase                 | 70                           |
| NNP-30-37P22N***-20 |                                       | 3.7 - 4                |   | 30                 |  | 80                           |
| NNP-40-37P35N***-20 | 35.0                                  | 3.7 - 4                | 21(214)   | 40                 | 33/30W<br>Single-phase                 | 105                          |
| NNP-60-55P35N***-20 |                                       | 5.5 - 4                |   | 60                 |  | 125                          |
| NNP-80-37P45N***-20 | 45.0                                  | 3.7 - 4                | 14(143)   | 80                 | 33/30W<br>Single-phase                 | 120                          |
| NNP-80-55P45N***-20 |                                       | 5.5 - 4                |   | 80                 |  | 130                          |

Note: Operating fluid is not included in options

#### Understanding Model Numbers

**NNP - 20 - 22 P 16 N2 - \*\* - 20**

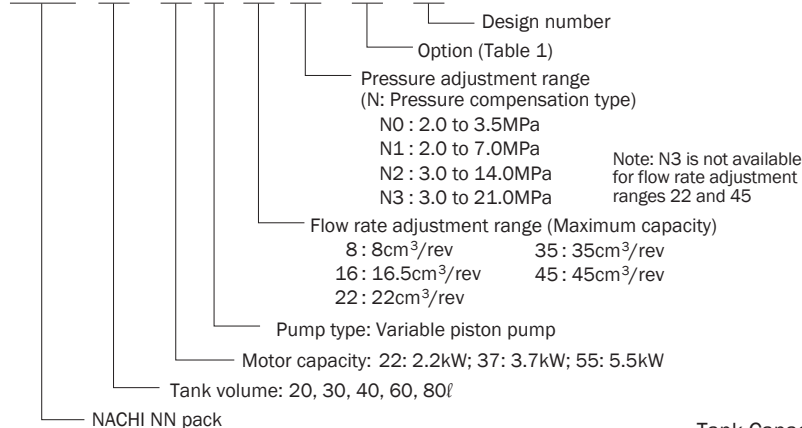


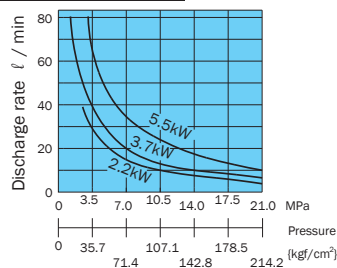
Table 1: Option Symbols (Specify in alphabetic sequence.)

| Symbol | Description   |
|--------|---|
| F*     | F*Type block (See block specifications.)                      |
| R*     | R*Type block (See block specifications.)                      |
| G      | Fluid level gauge guard                                       |
| H      | Temperature switch (Contact on at fluid temperature of 65 °C) |
| M      | Microseparator  |
| P      | Bottom oil pan  |
| S      | Float switch (Contact on at fluid low limit level)            |
| T      | Fluid level gauge with temperature gauge (with guard)         |
| W      | Self Leak Test  |

Note: Return filter and fan cooler are equipped as standard.

#### Selecting a Motor

The lower sides of the curves for each of the motors shown in the graph, indicate the operating range under rated output for that motor.

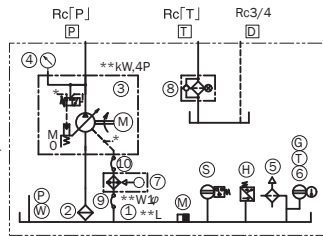
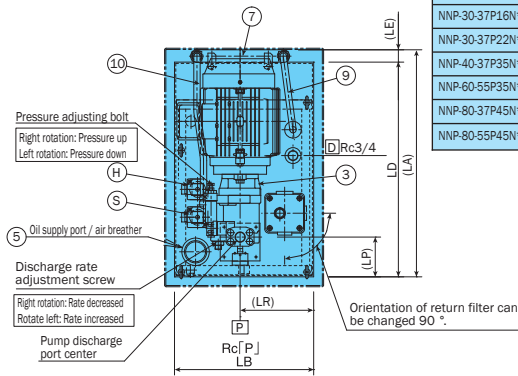


#### Tank Capacity and Motor/Pump Combinations

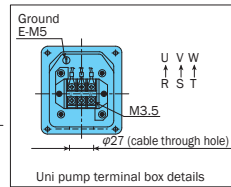
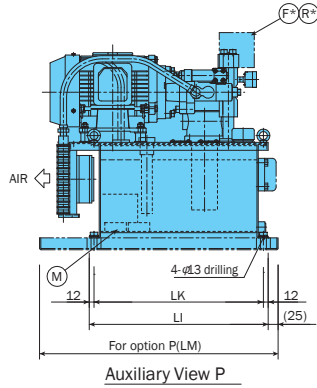
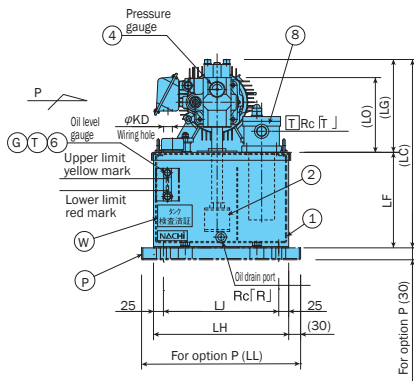
| Tank Capacity ( ℓ ) | Motor capacity (kW-P) | 2.2 - 4 |    |    | 3.7 - 4 |    |    |    | 5.5 - 4 |    |    |
|---------------------|-----------------------|---------|----|----|---------|----|----|----|---------|----|----|
|                     |                       | 8       | 16 | 22 | 8       | 16 | 22 | 35 | 45      | 35 | 45 |
| 20ℓ                 |                       | ○       | ○  | ○  | ○       |    |    |    |         |    |    |
| 30ℓ                 |                       |         |    |    | ○       | ○  |    |    |         |    |    |
| 40ℓ                 |                       |         |    |    |         |    | ○  |    |         |    |    |
| 60ℓ                 |                       |         |    |    |         |    |    |    |         | ○  |    |
| 80ℓ                 |                       |         |    |    |         |    |    |    | ○       |    | ○  |

# Design Drawings, Dimension Tables

| Model No.          | Dimensions |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |     |     |     |  |
|--------------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|--|
|                    | LA         | LB  | LC  | LD  | LE  | LF  | LG  | LH  | LI  | LJ  | LK  | LL  | LM  | LO  | LP  | LR  | KD | P   | T   | R   |  |
| NNP-20-22P 8N**+20 |            |     | 466 |     |     |     | 226 |     |     |     |     |     |     | 179 |     |     |    | 1/2 |     |     |  |
| NNP-20-22P16N**+20 | 571        | 350 | 474 | 540 |     | 240 | 234 |     |     |     |     |     | 600 | 188 |     |     |    | 3/4 |     |     |  |
| NNP-20-22P22N**+20 |            |     | 526 |     |     |     |     |     | 340 | 450 | 290 | 426 | 400 |     | 191 |     |    |     | 1/2 | 3/4 |  |
| NNP-20-37P 8N**+20 |            |     | 601 | 605 | 570 | 31  | 319 | 286 |     |     |     |     |     | 630 | 200 |     |    |     |     | 3/4 |  |
| NNP-30-37P16N**+20 |            |     |     |     |     |     |     |     |     |     |     |     | 820 |     |     |     |    |     |     |     |  |
| NNP-30-37P22N**+20 |            |     |     |     |     |     |     |     |     |     |     |     | 885 | 230 |     |     |    |     |     |     |  |
| NNP-40-37P35N**+20 | 711        |     | 575 | 680 |     | 267 | 308 |     |     |     |     |     | 885 | 230 |     |     |    |     |     |     |  |
| NNP-60-55P35N**+20 | 776        |     | 686 | 745 |     | 358 | 328 |     |     |     |     |     | 820 |     |     |     |    |     |     |     |  |
| NNP-80-37P45N**+20 | 711        | 450 | 762 | 680 |     | 308 |     | 440 | 560 | 390 | 536 | 500 |     |     | 172 | 245 |    |     |     |     |  |
| NNP-80-55P45N**+20 | 776        |     | 783 | 745 |     | 454 | 329 |     |     |     |     |     | 885 | 231 |     |     |    |     |     |     |  |



| Part No. | Part Name                      |
|----------|--------------------------------|
| 1        | Fluid tank                     |
| 2        | Suction strainer               |
| 3        | Uni-pump                       |
| 4        | Pressure gauge                 |
| 5        | Fluid supply port/air breather |
| 6        | Fluid level gauge              |
| 7        | Fan cooler                     |
| 8        | Return filter                  |
| 9        | Flexible hose                  |
| 10       | Flexible hose                  |

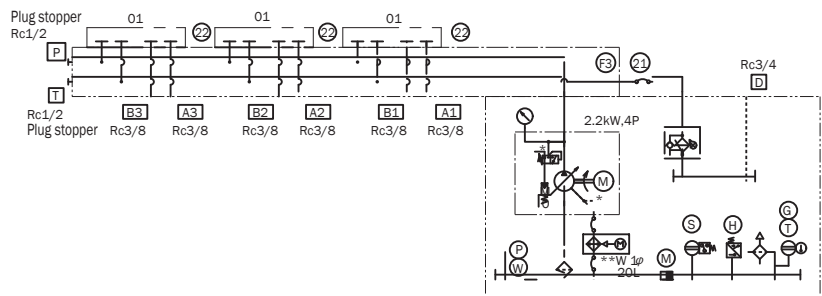
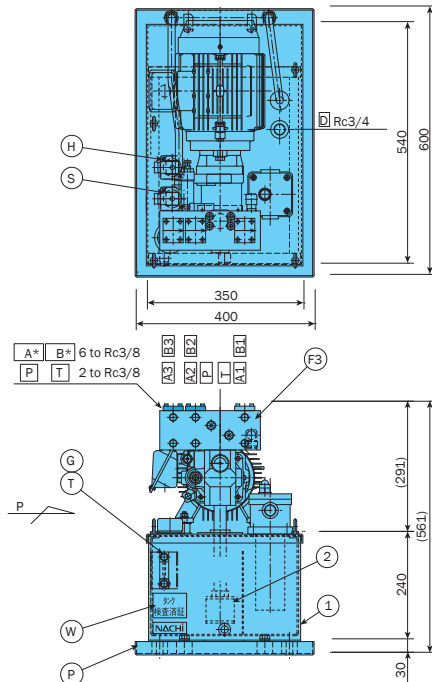


## Options

| Part No. | Part Name   |
|----------|---|
| F*       | Built-in block (F Type)                               |
| R*       | Built-in block (R Type)                               |
| G        | Fluid level gauge with guard                          |
| H        | Temperature switch                                    |
| M        | Microseparator  |
| P        | Bottom oil pan  |
| S        | Float switch  |
| T        | Fluid level gauge with temperature gauge (with guard) |
| W        | Self leak test  |

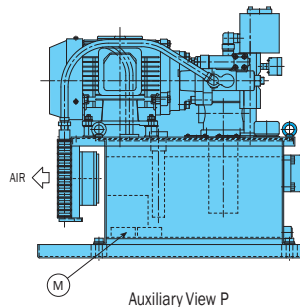
## Option Installation Example

Model No. : NNP-20-22P16N2-F3HMPSTW-20



| Symbol | Name          |
|--------|---------------|
| 11     | Flexible hose |
| 12     | End Plates    |

Note: Part numbers 11 and 12 are standard with a built-in block.





# F\* and R\* Block Specifications

Note: Note that there are certain restrictions on block-equipped combinations. See the Selection Precautions on page L-32.

| Options F1, F2, F3, F6 |                             |                        |  |  |  |  |  |                            |  |  |  |  |  |  | Options R1, R2, R3, R6 |     |     |        |                             |                        |  |  |  |  |  |                            |  |  |  |  |  |  |   |     |     |
|------------------------|-----------------------------|------------------------|--|--|--|--|--|----------------------------|--|--|--|--|--|--|------------------------|-----|-----|--------|-----------------------------|------------------------|--|--|--|--|--|----------------------------|--|--|--|--|--|--|---|-----|-----|
| Symbol                 | Description                 | Model No.              |  |  |  |  |  |                            |  |  |  |  |  |  | N                      | F   | S   | Symbol | Description                 | Model No.              |  |  |  |  |  |                            |  |  |  |  |  |  | N | F   | S   |
|                        |                             | Tank Capacity 20, 30 l |  |  |  |  |  | Tank Capacity 40, 60, 80 l |  |  |  |  |  |  |                        |     |     |        |                             | Tank Capacity 20, 30 l |  |  |  |  |  | Tank Capacity 40, 60, 80 l |  |  |  |  |  |  |   |     |     |
| F1                     | F1 Type Block (01 x 1)      | F1-1A                  |  |  |  |  |  | F1-2A                      |  |  |  |  |  |  | 2                      |     |     | R1     | R1 Type Block (01 x 1)      | R1-1A                  |  |  |  |  |  | R1-2A                      |  |  |  |  |  |  | 2 |     |     |
| F2                     | F2 Type Block (01 x 2)      | F2-1A                  |  |  |  |  |  | F2-2A                      |  |  |  |  |  |  | 4                      | 3/8 | 1/2 | R2     | R2 Type Block (01 x 2)      | R2-1A                  |  |  |  |  |  | R2-2A                      |  |  |  |  |  |  | 4 | 3/8 | 1/2 |
| F3                     | F3 Type Block (01 x 3)      | F3-1A                  |  |  |  |  |  | F3-2A                      |  |  |  |  |  |  | 6                      |     |     | R3     | R3 Type Block (01 x 3)      | R3-1A                  |  |  |  |  |  | R3-2A                      |  |  |  |  |  |  | 6 |     |     |
| F6                     | F6 Type Block (03 x 1 - M6) | F6-1A-M6 (Standard M6) |  |  |  |  |  | F6-2A-M6 (Standard M6)     |  |  |  |  |  |  | 2                      | 1/2 | 3/4 | R6     | R6 Type Block (03 x 1 - M6) | R6-1A-M6 (Standard M6) |  |  |  |  |  | R6-2A-M6 (Standard M6)     |  |  |  |  |  |  | 2 | 1/2 | 3/4 |

| Tank Capacity     | Options | Dimensions |     |    |    |     |    |     |    |    |    |    |     |    |    |     |     |     |
|-------------------|---------|------------|-----|----|----|-----|----|-----|----|----|----|----|-----|----|----|-----|-----|-----|
|                   |         | MA         | MB  | MC | MD | ME  | MF | MG  | MH | MI | MJ | MK | ML  | MM | MN | N   | F   | S   |
| 20r<br>30r        | F1      | 133        | -   | -  |    |     |    |     |    |    |    |    |     |    |    | 2   |     |     |
|                   | F2      | 175        | -   |    | 20 | 90  | 55 | 88  | 15 | 58 | 33 | 22 | 88  | 65 | 21 | 4   | 3/8 | 1/2 |
|                   | F3      | 225        | 105 | 55 |    |     |    |     |    |    |    |    |     |    |    | 6   |     |     |
| 40r<br>60r<br>80r | F6      | 152        | -   |    | 25 | 102 | 67 | 103 | 18 | 67 | 39 | 25 | 103 | 80 | 26 | 2   | 1/2 | 3/4 |
|                   | F1      | 143        | -   |    |    |     |    |     |    |    |    |    |     |    |    | 2   |     |     |
|                   | F2      | 183        | -   |    | 20 | 96  | 58 | 88  | 15 | 58 | 33 | 22 | 98  | 68 | 24 | 4   | 3/8 | 1/2 |
| 40r<br>60r<br>80r | F3      | 233        | 108 | 58 |    |     |    |     |    |    |    |    |     |    | 6  |     |     |     |
|                   | F6      | 155        | -   |    | 25 | 105 | 70 | 103 | 18 | 67 | 39 | 25 | 103 | 73 | 2  | 1/2 | 3/4 |     |

Valve mounting surface

01 mounting surface (ISO 4401-AB-03-4-A)

03 mounting surface (ISO 4401-AC-05-4-A)

Pump discharge port center

MA, MB, ME, MC, MF, MD, MK, MJ, MI, MG, MH

A\*, B\*, P, T

N to Rc "F"

2 to Rc "S"

ML, MM, MO, MN, MK, MJ, MI, MG, MH

P, T, R\*

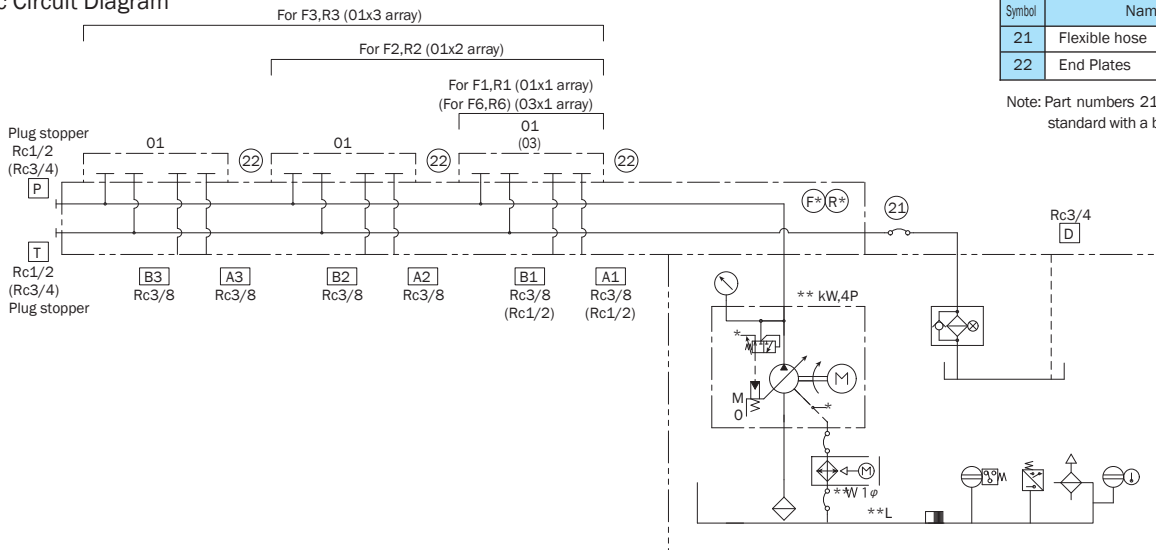
2 to Rc "S"

A\*, B\*

N to Rc "F"

Note: Each block is shipped with plug stoppers in the P and T ports.

## Hydraulic Circuit Diagram



## Typical Performance Characteristics

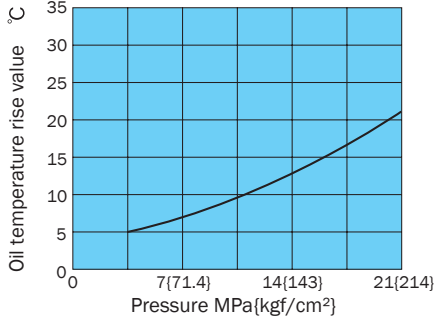
### Fluid Temperature Rise Characteristics - Full Cutoff

These graphs show fluid temperature rise during continuous operation.

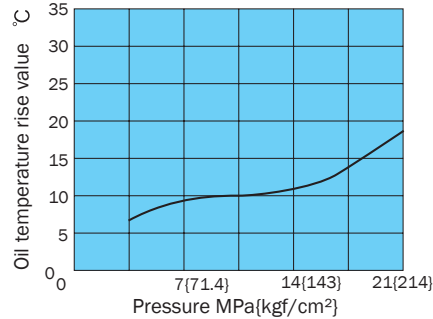
- Tank Fluid Pressure = Room Temperature + Fluid Temperature Rise Value
- Operating Fluid: ISO VG32 equivalent
- Revolution Speed: 1800min<sup>-1</sup> (60Hz)

Note: The fluid temperature rise value depends on actual operating conditions, and so actual temperatures may be different from those indicated above.

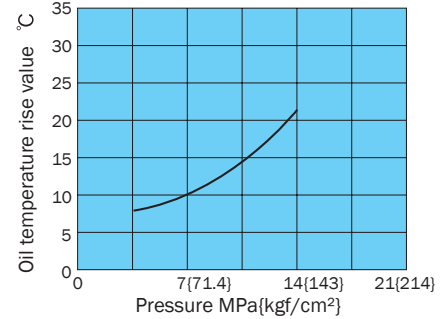
**NNP-20-22P16N\*-10**



**NNP-60-55P35N\*-10**



**NNP-30-37P22N\*-10**



### Noise Characteristics - Measurement Position

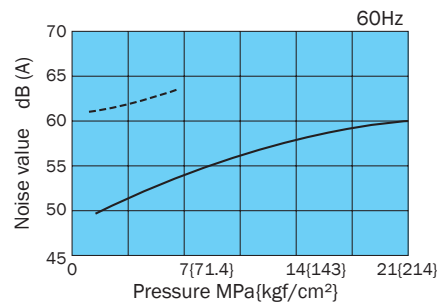
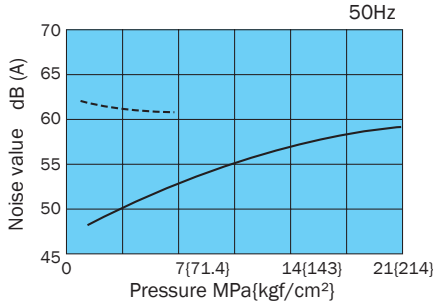
These graphs show noise values at locations one meter in front of and behind the pump.

- ISO VG32 equivalent
- Fluid Temperature: 40±5°C

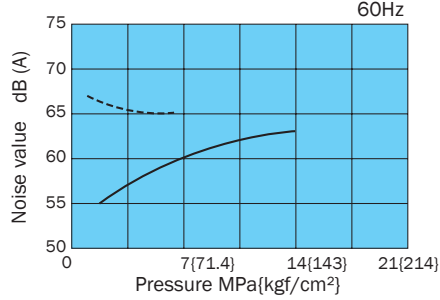
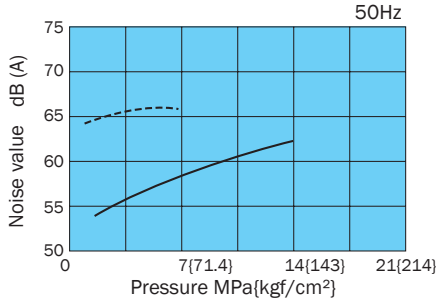
Note: Noise characteristics are affected by the condition of the floor and stand where the unit is mounted, whether there are noise reflective items nearby, and other factors. Such factors can produce different characteristics than those indicated below.

----- Full flow  
 ——— Full cutoff

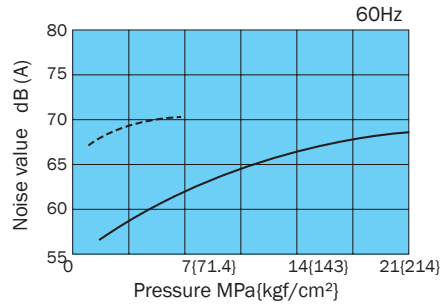
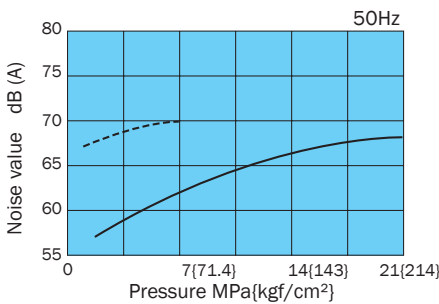
**NNP-20-22P16N\*-10**



**NNP-30-37P22N\*-10**



**NNP-60-55P35N\*-10**



## Selection Precautions

- **Standard Accessories**  
A return filter with visual clogging inspection tool, and a fan cooler are equipped as standard.
- **Options**  
Options F\* and R\* cannot be selected for inclusion with an 8N\* pump (NNP-\*\*-\*P8N\* Type).  
For optional F\* and R\* blocks, up to three blocks can be specified for O1 size, and only one block can be specified for O3 size. Note, however, that the total weight of blocks and valves should not exceed 20kg.

• Tank Capacity 20ℓ, 30ℓ

| Block Type                       | F1   | F2   | F3   | F6   | R1   | R2   | R3   | R6   |
|----------------------------------|------|------|------|------|------|------|------|------|
| Block Weight (kg)                | 7.5  | 9.5  | 12.5 | 11.5 | 6.5  | 8.5  | 11.0 | 12.0 |
| Allowable Additional Weight (kg) | 12.5 | 10.5 | 7.5  | 8.5  | 13.5 | 11.5 | 9.0  | 8.0  |

• Tank Capacity 40ℓ, 60ℓ, 80ℓ

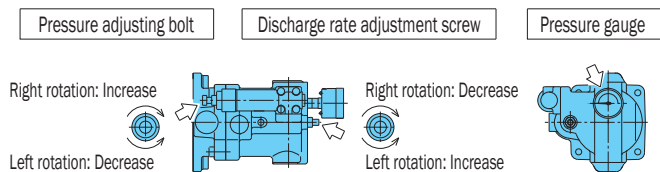
| Block Type                       | F1   | F2   | F3   | F6   | R1   | R2   | R3   | R6   |
|----------------------------------|------|------|------|------|------|------|------|------|
| Block Weight (kg)                | 8.5  | 11.0 | 14.0 | 11.5 | 7.0  | 9.5  | 12.0 | 12.5 |
| Allowable Additional Weight (kg) | 11.5 | 9.0  | 6.0  | 8.5  | 13.0 | 10.5 | 8.0  | 7.5  |

Note: M6 is the standard mounting tap for O3 size.

## Handling Overview

- **Hydraulic Operating Fluid**  
Use general oil-based operating fluid equivalent to viscosity grade ISO VG32 or 46. Just contact us regarding options to petroleum based hydraulic operating fluid. The following is the viscosity grade and operating pressure.  
  - Up to 7.0MPa: ISO VG32
  - 7.0MPa or higher: ISO VG46
- Keep the moisture content of the operating fluid below 0.1% vol. Excessive moisture in the fluid creates the risk of short-circuiting and current leakage.  
Contaminated operating fluid can lead to malfunction and shortened pump life. Manage operating fluid so that contamination is maintained at class NAS10 or lower.
- **Startup Precautions**  
Before starting the pump, inch the electric drive to make sure there is hydraulic fluid being sucked up.  
Check to make sure that the operating fluid in the tank is at the prescribed level.  
  - Upper Limit Mark (Yellow): Prescribed fluid level (nominal capacity)
  - Lower Limit Mark (Red): Minimum fluid level
- Do not touch the surface of the pump while it is operating, it is very hot.

### Adjusting the Pressure and Discharge Rate



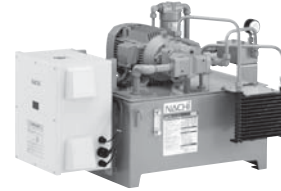
- O1, O3 size solenoid valves and modular valves can be selected.
- With option F\* and R\*, block and cylinder piping is hoses, configured by Nachi.
- Contact your agent for information about equipping a circuit.
- Option P is a bottom type oil pan.  
The oil pan does not have an oil drain port.  
The oil drain port is secured in place with the same mounting holes as the hydraulic unit.
- Option W is a leak test performed by Nachi.
- **Circuit Configuration**  
Allow for sufficient flexibility in the piping between the NN pack, external manifold, and actuator.
- **Paint**  
Nachi-Fujikoshi standard color: Mancel No. 5B6/3 (Iacquer)  
However, the electric drive is Munsell No. N7.  
Contact your agent about specifying external paint colors.

- **Electrical Wiring**  
Perform electrical wiring exactly as shown below.

| Motor and Power Supply | If wiring is performed incorrectly...  |
|------------------------|--|
| R - U                  | • Electric pump rotates in reverse, fluid is not discharged                  |
| S - V                  | • Attach a pressure gauge to the discharge side and check for pressure rise. |
| T - W                  |  |

- Do not forget to ground the pump!
- After wiring is complete, be sure to cover the terminal box with the cover that comes with it.
- Do not forget to wire the fan motor of the fan cooler. The power supply is single-phase 200V AC, non-polarity.  
Provide a no fuse breaker on the main power supply to protect electric circuitry against shorts and other current leakage, and as protection against motor overload. Also provide a leak breaker to protect against the risk of electric shock, etc.
- **Air intake and Exhaust**  
Take care so there is nothing blocking the area around air intake and exhaust of the pump drain fan cooler. Also, be sure to locate the pump in a well-ventilated area where heat will not build up.
- **Transport and Installation**  
Use the hangers when transporting the pump.  
Since this is a stationary type pump, secure it with bolts on a vibration-free, level surface.

- **Maintenance and Inspection**  
Fluid Temperature: Use the pump in an area where the temperature is 10°C to 60°C.  
Operating Fluid Replacement Cycle: Perform the initial fluid replacement after three months of operation. After that, replace fluid when it becomes dirty or once a year, whichever comes first.  
Strainer and Tank Internal Inspection and Cleaning: Every three months  
Return Filter Element Inspection: Every three months (replace as required)  
Fan Cooler Fin Inspection and Cleaning: Every six months
- **Environment**  
Temperature: 10 to 35°C  
Avoid areas exposed to mist of water-soluble coolants, etc.



### Inverter Drive NCP/NNP Series Energy-Saving Variable Pump Unit with Inverter Drive

By adding an inverter drive to our NCP/NNP series standard variable pump unit, we created the inverter drive NCP/NNP series hydraulic units to achieve great energy savings. They are great for jobs that need to dwell for long periods.

#### Features

##### Low increase in hydraulic fluid temperature

Maintained at room temperature +2.5:.

- NNP-60E-55P35N1-10
- 7MPa maintained while dwelling

##### 40% energy savings compared to the NCP unit

- NCP-60E-3.7PV16N3-C1R2-12
- 21MPa while dwelling (in contrast to standard unit)

##### Quiet

Sound level is 52dB (A).

- NNP-20E-22P16N1-10
- 7MPa while dwelling
- One meter behind pump

##### Easy Operation

Can start as soon as power is turned on. Absolutely no external commands or delicate electrical adjustments needed.

- Operates even with the inverter removed in emergencies.

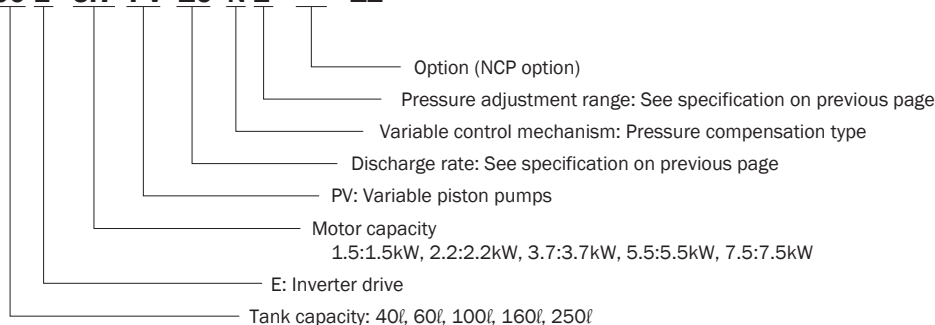
#### Specifications

|  |   |
|--|---|
| 1. Power Supply<br>Rated Input Current           | 3φ AC200 to 220V, 50/60Hz<br>9.8A/1.5kW (NCP series only)<br>13.5A/2.2kW<br>22.5A/3.7kW<br>21.4A/5.5kW<br>29.1A/7.5kW (NCP series only) |
| 2. Pressure Adjustment Range                     | N0: 2.0 to 3.5MPa<br>N1: 2.0 to 7.0MPa<br>N2: 3.0 to 14.0MPa<br>N3: 3.0 to 21.0MPa  |
| 3. Output Flow<br>(Theoretical Value at No-load) | 8: 14.4ℓ /min<br>16: 29.7ℓ /min<br>22: 39.6ℓ /min<br>35: 63.0ℓ /min<br>45: 81.0ℓ /min   |
| 4. Hydraulic Fluid                               | Standard mineral-based hydraulic fluid<br>ISO VG32 or 46  |
| 5. Hydraulic Fluid Temperature                   | 0 to 60:  |
| 6. Ambient Temperature/Humidity                  | 10 to 35: /20 to 85%RH (non-condensation)   |
| 7. Color of Inverter Box                         | Munsell no. 2.5Y9/1 (cream)   |

## Understanding Model Numbers

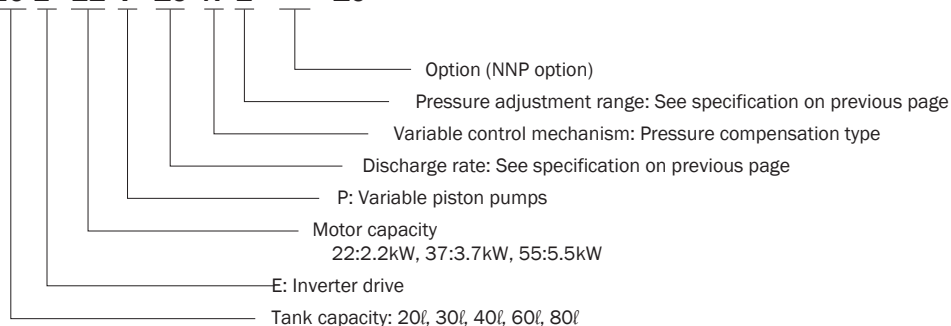
Inverter Drive NCP Series

**NCP - 60 E - 3.7 PV 16 N 2 - \*\* - 12**



Inverter Drive NNP Series

**NNP - 20 E - 22 P 16 N 2 - \*\* - 10**

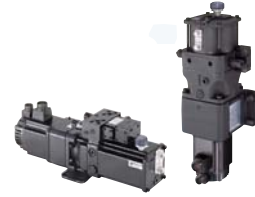


## Design Drawings, Dimension Tables

Contact us for more information.

### Precautions

- Turning the inverter on and off by cutting the main power supply (circuit breaker) significantly reduces the life of the inverter and should be limited to once an hour.  
Contact us if you need to start and stop operations frequently.
- Do not change or adjust any switches except the inverter parameter settings and the pressure setting switches.
- Allow for sufficient flexibility in the piping between the hydraulic unit, external manifold, and actuator.  
(Recommended: Flexible hose that is at least 1 meter long)
- Some options are not compatible with the inverter drive models, contact us for more information.
- Contact us if excessive leakage in the external hydraulic circuit limits energy saving efficiency.



### Power Meister

By adding an inverter drive to our NCP/NNP series standard variable pump unit, we created the inverter drive NCP/NNP series hydraulic units to achieve great energy savings. They are great for jobs that need to dwell for long periods.

#### Features

##### Compact Hydraulic System

- Superior energy savings
- High precision

AC servo motor controls rotational speed and direction of pump.

Generates flow and pressure to match the operating cycle of machinery and to stop during idle times.

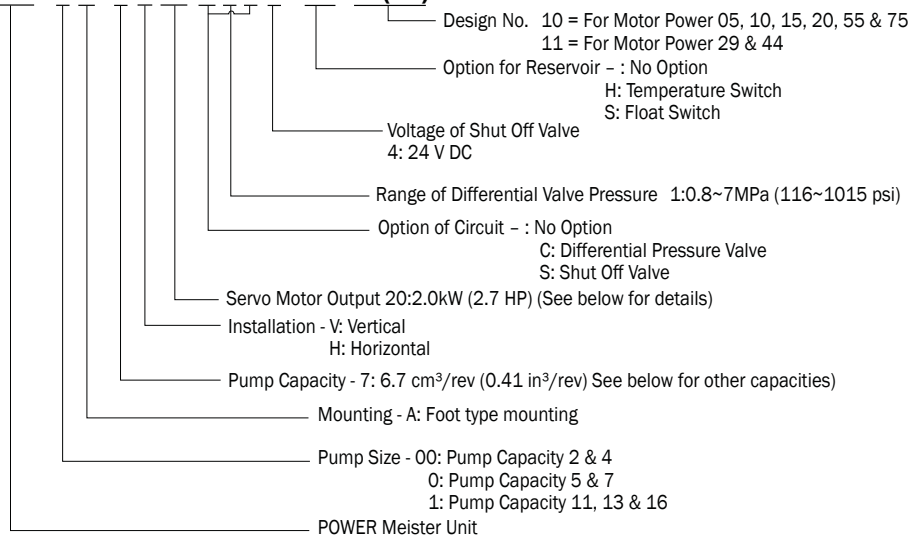
Incredible energy savings by only operating when necessary. Position, Speed and Pressure are controlled with great precision by using a high-speed digital processing servo controller.

#### Specifications

|                                  |  |
|----------------------------------|--|
| Electric Motor                   | AC servo motor (0.5~7.5kW) (0.7~10.0HP)                          |
| Piston Pump                      | (2.0~15.8 cm <sup>3</sup> /rev) (0.12~0.96 in <sup>3</sup> /rev) |
| Ambient Temperature/<br>Humidity | 0~+40 °C (32~104 °F) / 20~90% RH                                 |
| Fluid Temperature                | 5~60 °C (41~140 °F)  |
| Recommended Fluid                | ISO VG32~68 (VG 46 recommended)                                  |
| Range of Viscosity               | 20~200 mm <sup>2</sup> /s (cSt)                                  |
| Cleanliness Level                | NAS class 10   |
| Setting Range of<br>Relief Valve | 3.5~30MPa (508~4350 psi)   |
| Maximum Pressure                 | 30MPa (4350 psi)   |
| Color                            | Black  |

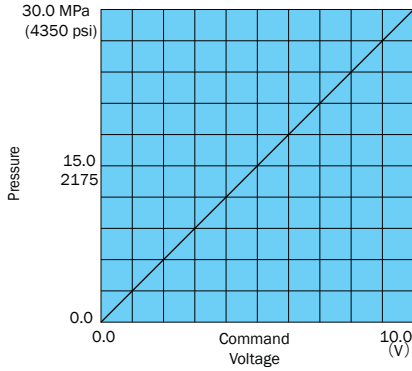
#### Understanding Model Numbers

##### UPS - 0 A - 7 V 20 C 1 S 4 - HS - 1 - (11)



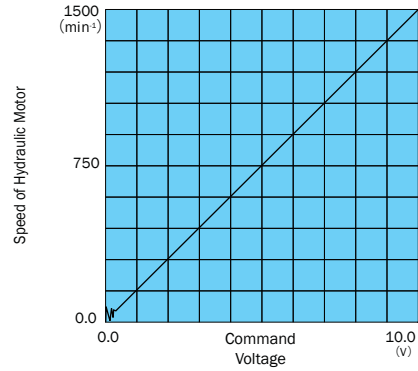
# Performance Characteristics

Pressure: Pressure Command Voltage - Pressure Characteristic (0-100%)



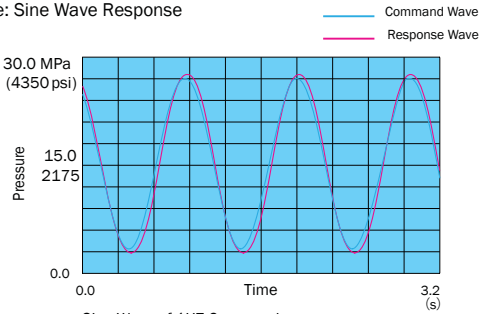
30MPa (4350 psi) at 10V Minimum Pressure: 0.15 MPa (22 psi)  
 Command of 0V → 10V → 0V Maximum Pressure: 30 MPa (4350 psi)

Speed: Speed Command Voltage- Speed Characteristic (0-100%)



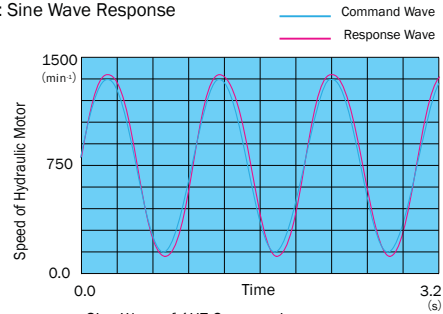
1500 min<sup>-1</sup> at 10V Minimum Speed: 50 min<sup>-1</sup>  
 Command of 0V → 10V → 0V Maximum Speed: 1500 min<sup>-1</sup>  
 (In case of oil motor as actuator)

Pressure: Sine Wave Response



Sine Wave of 1HZ Command  
 Range of Wave 10-90%

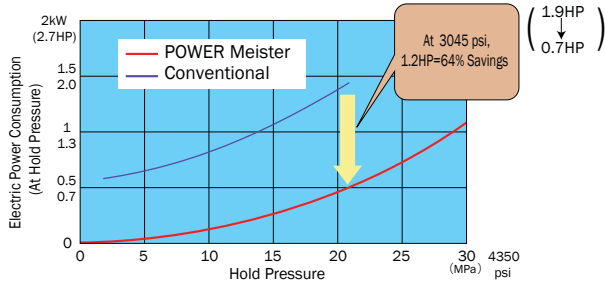
Speed: Sine Wave Response



Sine Wave of 1HZ Command  
 Range of Wave 10-90%  
 (In case of oil motor as actuator)

Hold Pressure: Electric Power Consumption Characteristic

Hydraulic Unit (UPS)  
 Pump 0.29 in<sup>3</sup>/rev, Motor 2.7HP



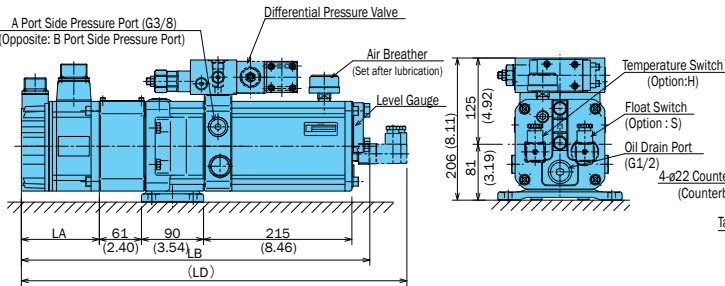
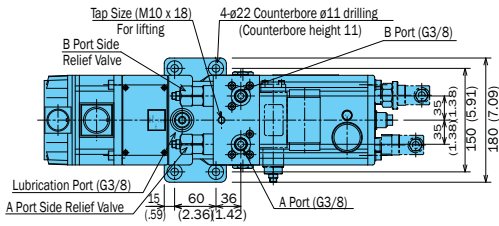
Ref. 2.2kW unipump (variable piston pump)  
 Consumption at full cut off (N=1.800 min<sup>-1</sup>)

# Installation Dimensional Drawings

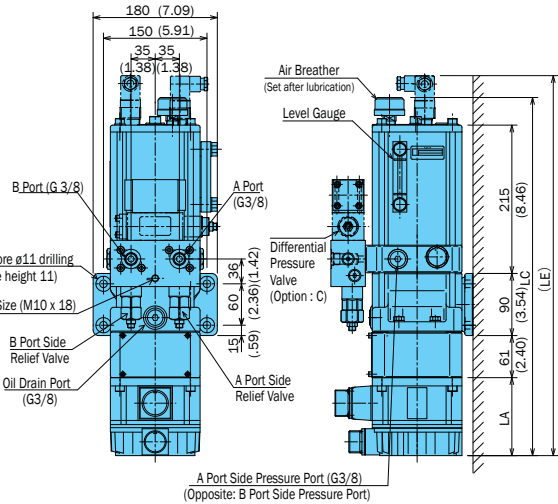
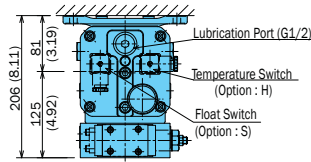
## UPS-00A Series

Option : Without option S (Shut Off Valve)

### UPS-00A-\*H\*\*\*\* (Horizontal type)



### UPS-00A-\*V\*\*\*\* (Vertical type)



| UPS Model    | L A        | L B         | LC          | LD          | LE          | (Note 2) Weight |
|--------------|------------|-------------|-------------|-------------|-------------|-----------------|
| UPS-00A-*V05 | 113 (4.45) | 505 (19.88) | 519 (20.43) | 559 (20.01) | 551 (21.69) | 28 (61.7)       |
| UPS-00A-*V10 | 133 (5.24) | 525 (20.67) | 539 (21.22) | 579 (22.80) | 571 (22.48) | 30 (66.2)       |
| UPS-00A-*V15 | 152 (5.98) | 544 (21.42) | 558 (21.97) | 598 (23.54) | 590 (23.23) | 31 (68.4)       |
| UPS-00A-*V20 | 171 (6.73) | 563 (22.17) | 577 (21.93) | 617 (24.29) | 609 (23.98) | 33 (72.8)       |

mm (inch) / kg (lbs)

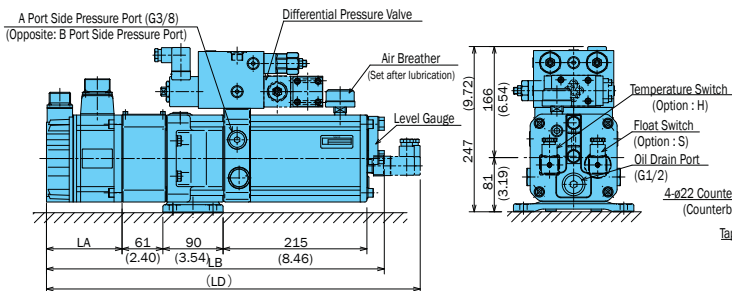
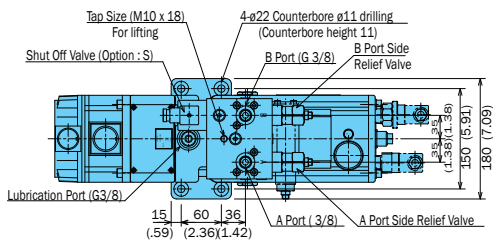
Note 1: Dimensions in (parentheses) and two dot chain lines are for circuit options C and S and tank options H and S.

Note 2: Does not include circuit or tank options or weight of hydraulic fluid.

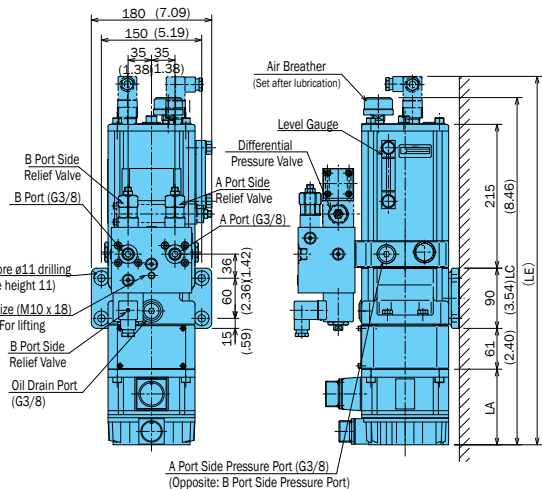
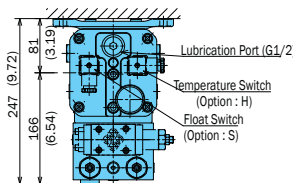
Note 3: Install the air breather face up.

Option : With option S (Shut Off Valve)

### UPS-00A-\*H\*\*\*\*S4 (Horizontal type)

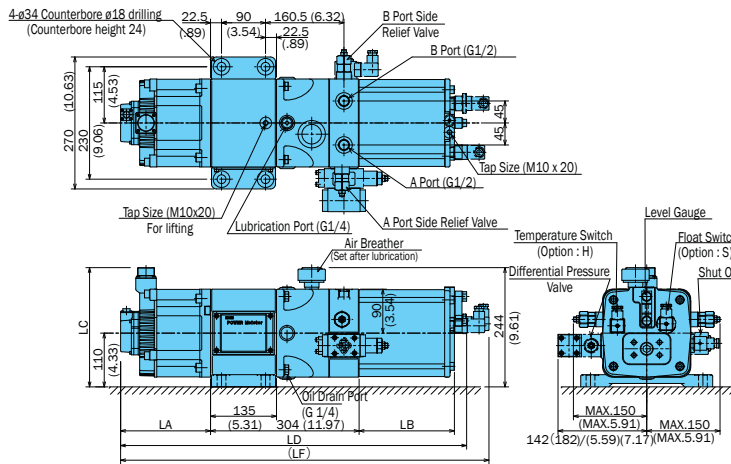


### UPS-00A-\*V\*\*\*\*S4 (Vertical type)

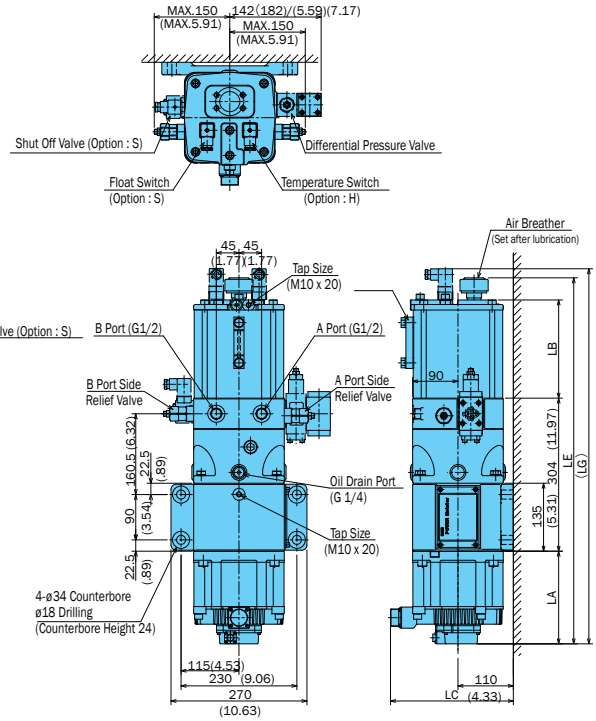




**UPS-0A/1A Series**  
**UPS-00\*A-\*\*H\*\*\*\* (Horizontal type)**



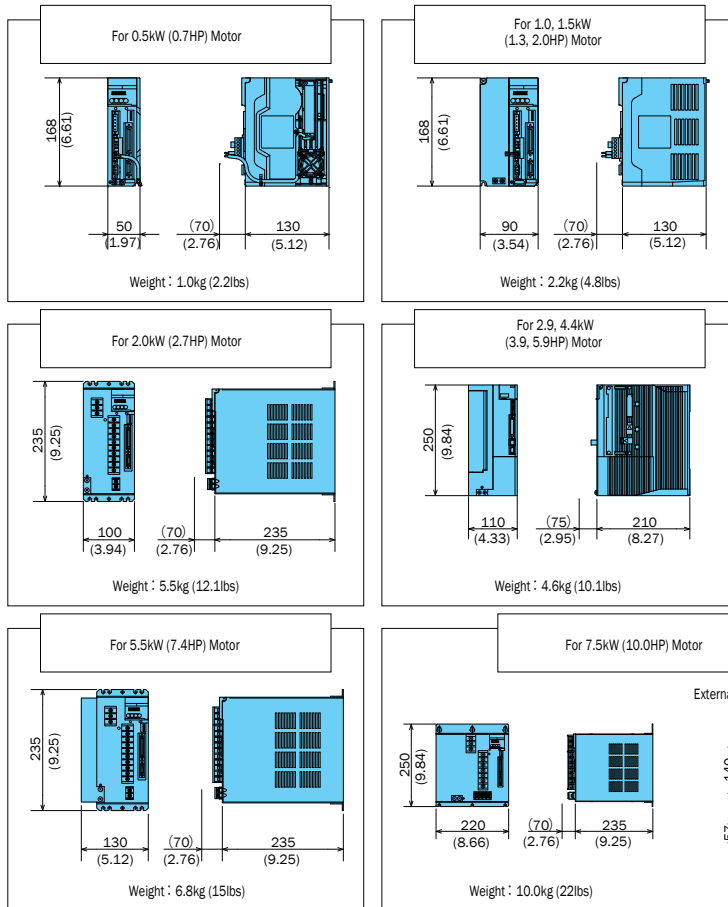
**UPS-\*A-\*\*V\*\*\*\* (Vertical type)**



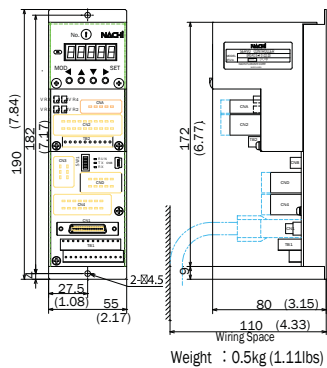
| UPS                    | L A         | L B         | L C         | L D         | L E         | L F         | L G         | (Note 2) Weight |
|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| UPS-0A- * <b>V</b> -20 | 171 (6.73)  | 120 (4.72)  | 229 (9.01)  | 620 (24.40) | 639 (25.15) | 666 (26.22) | 657 (25.86) | 52 (114.7)      |
| UPS-1A- * <b>V</b> -29 | 160 (6.29)  | 244 (9.60)  | 684 (26.92) | 703 (27.67) | 730 (28.74) | 721 (28.38) | 58 (127.9)  |                 |
| UPS-1A- * <b>V</b> -44 | 184 (7.24)  | 195 (7.67)  | 708 (27.87) | 727 (28.62) | 754 (29.68) | 745 (29.33) | 62 (136.7)  |                 |
| UPS-1A- * <b>V</b> -55 | 267 (10.51) | 276 (10.86) | 791 (31.14) | 810 (31.88) | 837 (32.95) | 828 (32.59) | 76 (174.2)  |                 |
| UPS-1A- * <b>V</b> -75 | 332 (13.07) | 856 (33.70) | 875 (34.44) | 902 (35.51) | 893 (35.15) | 87 (191.8)  |             |                 |

Note 1: Dimensions in (parentheses) and two dot chain lines are for circuit options C and S and tank options H and S.  
 Note 2: Does not include circuit or tank options or weight of hydraulic fluid.  
 Note 3: Install the air breather face up.

**Servo Amplifier**



**Servo Controller - EPD-PD3-10-D2-20**



Hydraulic Unit



### Power Fit

Energy-Saving Power Unit - Variable Displacement Piston Pumps Driven by AC Servo Motor. Precise Pressure Flow Control Based on Machine Motion

#### Features

- Energy saving type power unit with two displacement piston pumps driven by AC servo motor.
- Pressure and flow is controlled by motor drive speed and pump displacement.

Pressure and flow can be set digitally at given value by control panel.

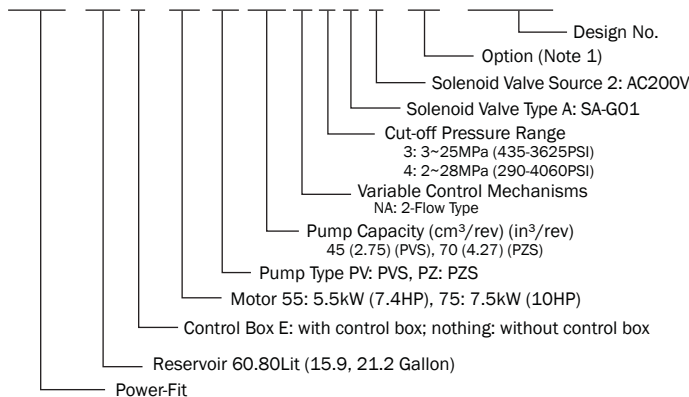
- Multiple settings of pressure and flow are possible by an external signal input.

#### Specifications

| Model                    | Max. pressure   | Max. flow          | Pump Displacement Hi/Lo (initial setting)       | Servo motor     | Reservoir      |
|--------------------------|-----------------|--------------------|---|-----------------|----------------|
| NPQ-60E-55PV45N3A2-6161A | 3625PSI (25MPa) | 23.8GPM (90 L/min) | 2.74 / 0.73"cu in (45 / 12cm <sup>3</sup> /rev) | 7.37HP (5.5kW)  | 15.85GAL (60L) |
| NPQ-80E-75PZ70N4A2-6161A | 4061PSI (28MPa) | 37GPM (140 L/min)  | 4.27 / 1.04"cu in (70 / 17cm <sup>3</sup> /rev) | 10.05HP (7.5kW) | 21.13GAL (80L) |

#### Understanding Model Numbers

**NPQ - 60 E - 55 PV 45 N 3 A 2 - \*\* - 6161A**

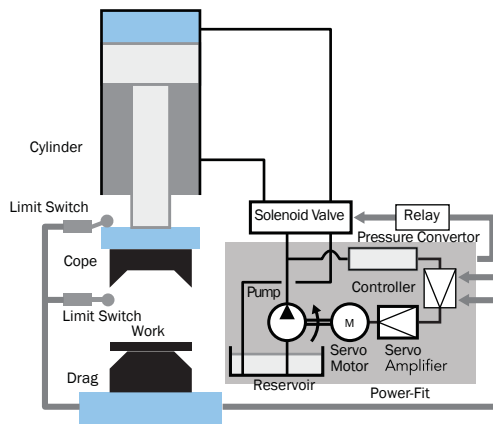


Notes: G: Guard Level Gauge H: Thermostat M: Microseparator P: Oil Pan  
S: Float Switch (for lower) T: Level Gauge with Thermometer

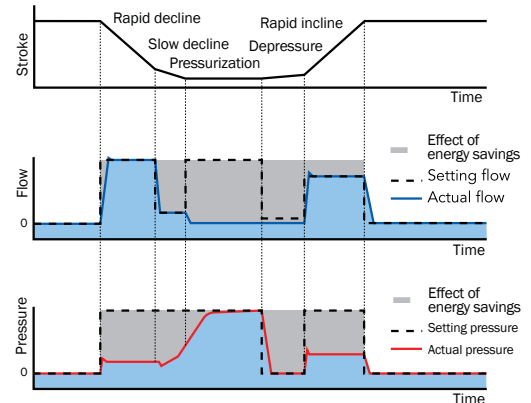
#### Outline Diagram

- Speed (flow) and force (pressure) are automatically controlled by controller based on load situation.

- No need to use additional valves for flow and pressure control.



Example of Press Motion





### PHV Track Motors

#### Features

This product is the 2 speed hydraulic motor with reduction gear for the crawler type machine, which is a mini-excavator or a similar one in the operating condition and the operating rate.

Remove the upper side plug of "DRAIN PORTS"(DR1 or DR2), and then connect directly to the tank after installing this track motor to the machine.

Please refer to page M3 and the instruction manual for other notes.

#### Specifications

| Model No.           | SPECIFICATION (THEORETICAL)      |                 |         |                 |                     |         |                    |          | (Note 3)      | (Note 4)                                  |            | (Note 5)  | (Note 6)                                 |     | (Note 7)    |            |
|---------------------|----------------------------------|-----------------|---------|-----------------|---------------------|---------|--------------------|----------|---------------|---|------------|-----------|--|-----|-------------|------------|
|                     | Code for Hyd. Motor Displacement |                 |         |                 | Code for Gear Ratio |         | Final Displacement |          | Max. Pressure | Max. Output Torque (Theoretical, Lo mode) |            | Max. Flow | Max. Output Speed (Theoretical, Hi mode) |     | Option      |            |
|                     | Lo mode                          |                 | Hi mode |                 | code:*3             | ratio   | Lo mode            | Hi mode  |               | Intermittent                              | Continuous |           | rpm                                      | rpm | Track Motor | Hyd. Motor |
|                     | code:*1                          | in <sup>3</sup> | code:*2 | in <sup>3</sup> |                     |         | psi                | Ft. Lbs. | Ft. Lbs.      |   |            | Ft. Lbs.  |  |     |             |            |
| PHV-1B-1213A-(P)-10 | 1                                | .57             | 3       | .28             | A                   | 1/25.26 | 240.0              | 118.7    | 3552          | 689                                       | 556        | 2.5       | 80                                       |     | (2021)      | 365        |
| PHV-1B-1213B-(P)-10 |                                  |                 |         |                 | B                   | 1/36.96 | 351.1              | 173.7    |               | 1010                                      |            |           |  |     | 3.6         | (2957)     |
| PHV-1B-1223A-(P)-10 | 2                                | .66             | 3       | .34             | A                   | 1/25.26 | 275.3              | 141.5    | 3407          | 791                                       | 556        | 2.9       | 80                                       |     | (2021)      | 365        |
| PHV-1B-1223B-(P)-10 |                                  |                 |         |                 | B                   | 1/36.96 | 402.9              | 207.0    |               | 1113                                      |            |           |  |     | 4.3         | (2957)     |
| PHV-1B-1233A-(P)-10 | 3                                | .69             | 3       | .35             | A                   | 1/25.26 | 288.0              | 146.5    | 3552          | 953                                       | 556        | 3.0       | 80                                       |     | (2021)      | 365        |
| PHV-1B-1233B-(P)-10 |                                  |                 |         |                 | B                   | 1/36.96 | 421.3              | 214.4    |               | 1113                                      |            |           |  |     | 4.5         | (2957)     |
| PHV-1B-1243A-(P)-10 | 4                                | .75             | 3       | .37             | A                   | 1/25.26 | 313.2              | 156.6    | 3552          | 900                                       | 556        | 3.3       | 80                                       |     | (2021)      | 365        |
| PHV-1B-1243B-(P)-10 |                                  |                 |         |                 | B                   | 1/36.96 | 458.3              | 229.2    |               | 1113                                      |            |           |  |     | 4.8         | (2957)     |

Note 1: Use this track motor within the Specification.

Note 2: The Specification is theoretical value. Real torque at 10 rpm (lo) should be approximately 83% of Theoretical Torque.

Real Speed at Hi(P<1493 psi) should be approximate 96% of Theoretical Speed.

The particular performance is shown on page M3.

Note 3: Max. Pressure is 3550 psi. However, the value in ( ) is limited by Max. Output Torque.

Note 4: Max. Output Torque is 1113 Ft. Lbs. However, the value in ( ) is limited by Max. Pressure.

"Intermittent" means less than 7% of operating time.

Note 5: Max. Flow is 5.2 gpm. However, the value in ( ) is limited by Max. Output Speed (track motor or hydraulic motor).

Note 6: Max. Output Speed is 80 rpm (track motor), 3000 rpm (hydraulic motor).

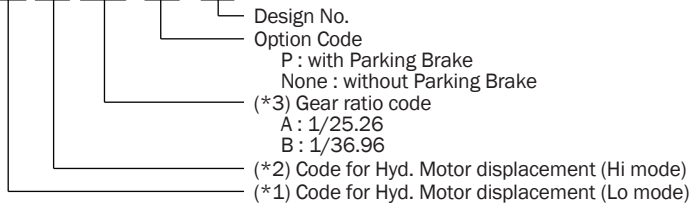
However, the value in ( ) is limited by Max. Flow or Max. Output Speed (track motor or hydraulic motor).

Note 7: Parking Brake Torque (hydraulic motor) is 14.5 Ft Lbs.

Therefore, Parking Brake Torque (track motor) is different value between Gear Ratio "A(1/25.26)" and "B(1/36.96)".

#### Understanding Model Numbers

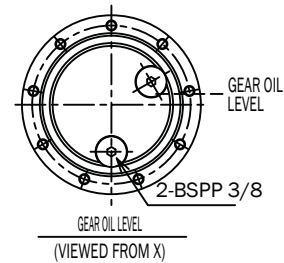
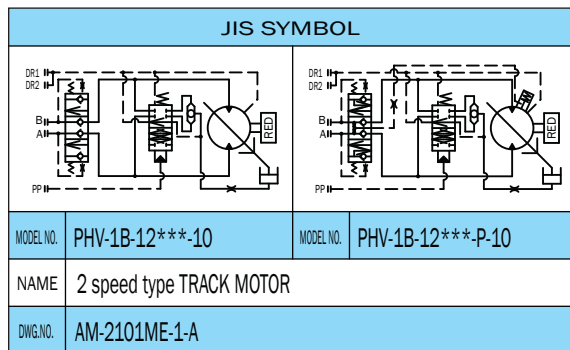
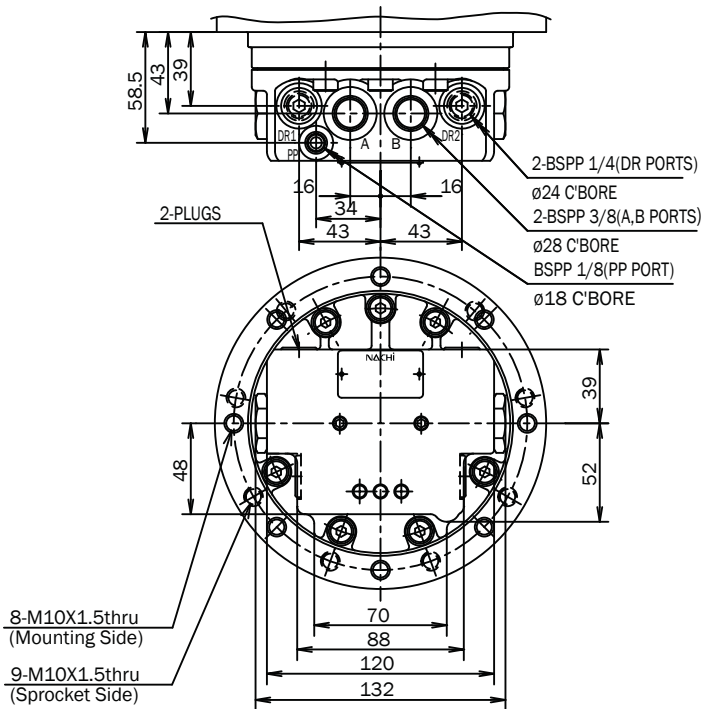
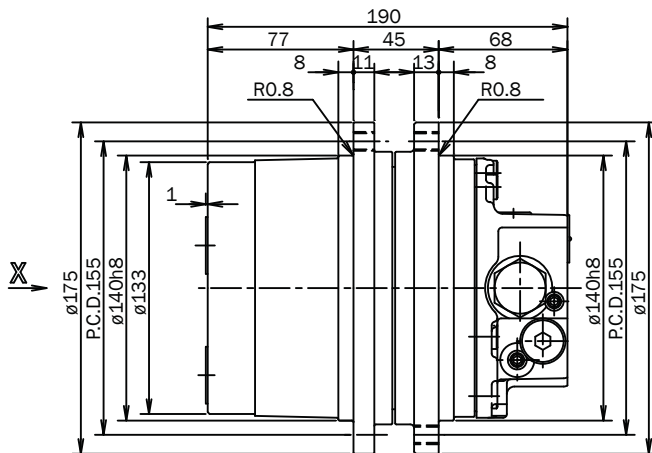
##### PHV-1B-12 \*\*\*- (\*) - 10



## Installation Dimension Drawings

### CAUTION

1. Speed Control Pressure: min. 217 psi
2. Hydraulic Fluid: ISO VG46  
(Anti-Wear Hydraulic Fluid)
3. Contamination: within NAS Grade 10
4. Oil Temp: -4 ~ 180° F
5. Filter: 10µm
6. Gear Oil: SAE-30-CD (Amount of Oil 20 in<sup>3</sup>)
7. Mass: 37.4 lbs.
8. Paint Color: Red (Under Coat)



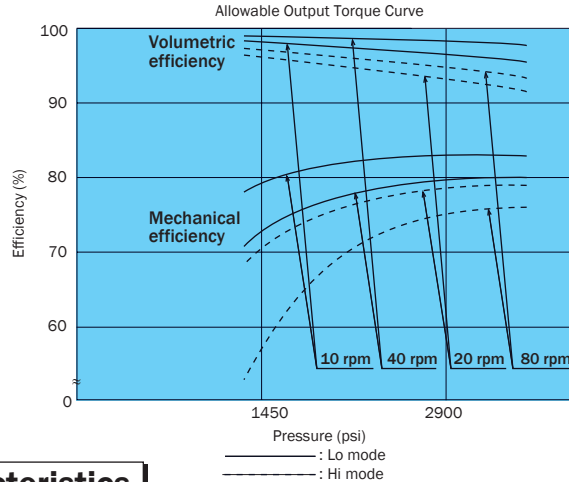
| ALLOWED DRAIN PRESSURE |              |
|------------------------|--------------|
| RATED                  | Max. 43 psi  |
| SURGE                  | Max. 145 psi |

| ROTATIONAL DIRECTION (VIEWED FROM X) |       |        |
|--------------------------------------|-------|--------|
|                                      | INLET | OUTLET |
| CLOCKWISE                            | B     | A      |
| COUNTER-CLOCKWISE                    | A     | B      |

## Performance Curves

PHV-1B-12 \*\*\* - (P) - 10

Condition:  
Hydraulic Fluid: ISO VG46  
Oil Temperature: 50±5 °C



## Performance Characteristics

PHV-1B-12 \*\*\* - (P) - 10

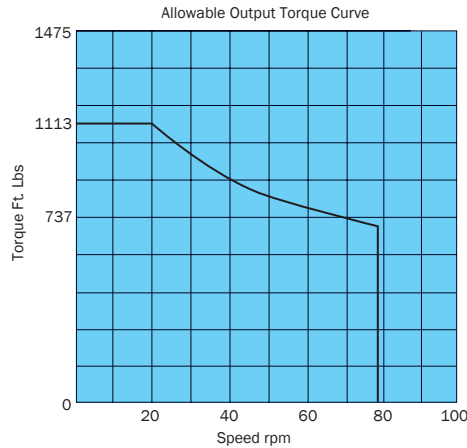
Condition of allowable output torque

Life: 200 hr (driving time)

Clockwise - 100 hr

Counterclockwise - 100 hr

Reduction gear life under your using condition



$$L_h = 200 \frac{20}{N} \left(\frac{T_o}{T}\right)^3$$

Lh: Life (hr)  
N: Your using speed (min<sup>-1</sup>)  
T<sub>o</sub>: Torque on curve at N  
T: Your using Torque (N·m) (Theoretical)

Note: When the track motor is driven only side direction, the life is reduced by half.

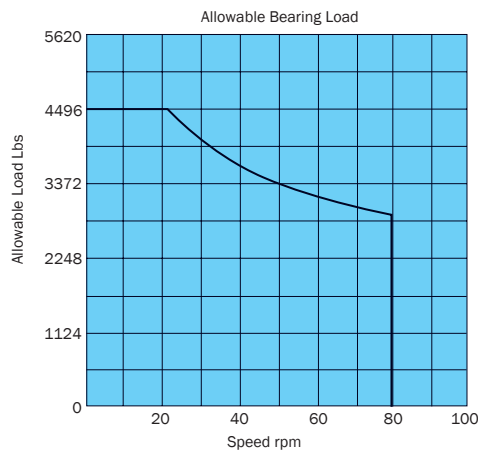
Condition of allowable bearing load

Life: 500 hr

Bearing life under your using condition

$$L_h = 500 \left(\frac{W_o}{W}\right)^3$$

Lh: Life (hr)  
W<sub>o</sub>: Load on curve at your using speed  
W: Your using equivalent load (N) [\*1]

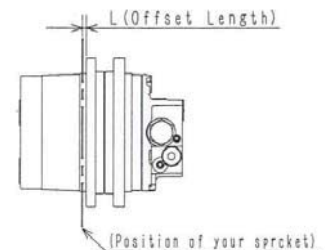


[\*1] Figure that W (your using equivalent load) is the following:

$$W = \frac{L+38.7}{74.8} W_r \frac{(D/2)}{74.8} W_{th}$$

L: Offset length [\*2] of your sprocket (mm)  
D: Pitch circle diameter of your sprocket (mm)  
W<sub>r</sub>: Your using radial load (N)  
W<sub>th</sub>: Your using thrust load (N)

[\*2] Refer to the figure below



Instructions:

1. Use this track motor within 'Specification' shown in DWG. No. AM-2101ME-1.
2. Use an installation mounting with stiffness and clean the mounting before installing this track motor to the machine.
3. Install this track motor horizontally.
4. Remove the upper side plug of 'Drain ports' (DR1 or DR2: refer to DWG. No. AM-2101ME-1) and then connect to the tank after installing this track motor to the machine.
5. Fill the motor case with clean hydraulic fluid through the 'Drain port' before starting.
6. When the 'PP port' (refer to DWG. No. AM-2101ME-1) is connected to the tank, this track motor is operated at Lo mode. (permitted back pressure: 0.5 MPa)
7. When the 'PP port' is supplied pressure, this track motor is operated at Hi mode. (speed control pressure: min. 1.5 MPa)
8. The parking brake (option) of this track motor is negative brake system. Parking brake is working when 'A port' and 'B port' (refer to DWG. No. AM-2101ME-1) are not supplied pressure; is not working when 'A port' or 'B port' is supplied pressure. (parking brake releasing pressure: 1.5 MPa)
9. Change the gear oil to the new one each following period. First: 200 hr or 2 months; Second and after: 1000 hr or 1 year
10. Please refer to the instruction manual for other notes.



### PHV Track Motors

#### Features

This product is the 2 speed hydraulic motor with reduction gear for the crawler type machine, which is a mini-excavator or a similar one in the operating condition and the operating rate.

Remove the upper side plug of "DRAIN PORTS" (DR1 or DR2), and then connect directly to the tank after installing this track motor to the machine.

Please refer to page M6 and the instruction manual for other notes.

#### Specifications

| Model No.           | SPECIFICATION (THEORETICAL)     |                 |         |                 |                     |         |                    |         | (Note 3)      |  | (Note 4)     |           | (Note 5)                                | (Note 6) |        | (Note 7)             |          |
|---------------------|---------------------------------|-----------------|---------|-----------------|---------------------|---------|--------------------|---------|---------------|--|--------------|-----------|---|----------|--------|----------------------|----------|
|                     | Code for Hyd.Motor Displacement |                 |         |                 | Code for Gear Ratio |         | Final Displacement |         | Max. Pressure | Max.Output Torque (Theoretical, Lo mode) |              | Max. Flow | Max.Output Speed (Theoretical, Hi mode) |          | Option |                      |          |
|                     | Lo mode                         |                 | Hi mode |                 | code:*3             | ratio   | Lo mode            | Hi mode |               | psi                                      | Intermittent |           | Continuous                              | rpm      | rpm    | Parking Brake Torque |          |
|                     | code:*1                         | in <sup>3</sup> | code:*2 | in <sup>3</sup> |                     |         |                    |         | Ft. Lbs.      |  |              | Ft. Lbs.  |   |          |        | Ft. Lbs.             | Ft. Lbs. |
| PHV-2B-2012A-(P)-10 | 1                               | 98              | 2       | .55             | A                   | 1/31.00 | 499.1              | 282.1   | 3552          | 1435                                     | 892          | 5.6       | 75                                      | (2325)   | 694    | 22.4                 |          |
| PHV-2B-2012B-(P)-10 |                                 |                 |         |                 | B                   | 1/39.00 | 627.9              | 354.9   | 3509          | 1784                                     |              | 7.0       |   | (2925)   | 874    |                      |          |
| PHV-2B-2013A-(P)-10 |                                 |                 | 3       | .51             | A                   | 1/31.00 | 499.1              | 280.4   | 3552          | 1435                                     |              | 5.1       |   | (2325)   | 694    |                      |          |
| PHV-2B-2013B-(P)-10 |                                 |                 |         |                 | B                   | 1/39.00 | 627.9              | 327.6   | 3509          | 1784                                     |              | 6.5       |   | (2925)   | 874    |                      |          |
| PHV-2B-2022A-(P)-10 | 2                               | 1.04            | 2       | .57             | A                   | 1/31.00 | 533.2              | 294.5   | 3552          | 1553                                     | 892          | 5.8       | 75                                      | (2325)   | 694    | 22.4                 |          |
| PHV-2B-2022B-(P)-10 |                                 |                 |         |                 | B                   | 1/39.00 | 670.8              | 370.5   | 3277          | 1784                                     |              | 7.3       |   | (2925)   | 874    |                      |          |
| PHV-2B-2023A-(P)-10 |                                 |                 | 3       | .52             | A                   | 1/31.00 | 533.2              | 266.6   | 3552          | 1533                                     |              | 5.2       |   | (2325)   | 694    |                      |          |
| PHV-2B-2023B-(P)-10 |                                 |                 |         |                 | B                   | 1/39.00 | 670.8              | 335.4   | 3277          | 1784                                     |              | 6.6       |   | (2925)   | 874    |                      |          |

Note 1: Use this track motor within the Specification.

Note 2: The Specification is theoretical value. Real torque at 10 rpm (lo) should be approximately 85% of Theoretical Torque.

Real Speed at Hi(P<1493 psi) should be approximate 96% of Theoretical Speed.

The particular performance is shown on page M6.

Note 3: Max. Pressure is 3552 psi. However, the value in ( ) is limited by Max. Output Torque.

Note 4: Max. Output Torque is 1784 Ft. Lbs. However, the value in ( ) is limited by Max. Pressure.

"Intermittent" means less than 7% of operating time.

Note 5: Max. Flow is 5.2 gpm. However, the value in ( ) is limited by Max. Output Speed (track motor or hydraulic motor).

Note 6: Max. Output Speed is 70 rpm (track motor), 3500 rpm (hydraulic motor).

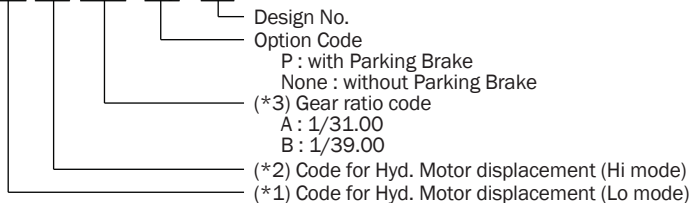
However, the value in ( ) is limited by Max. Flow or Max. Output Speed (track motor or hydraulic motor).

Note 7: Parking Brake Torque (hydraulic motor) is 22.4 Ft. Lbs.

Therefore, Parking Brake Torque (track motor) is different value between Gear Ratio "A(1/31.00)" and "B(1/39.00)".

#### Understanding Model Numbers

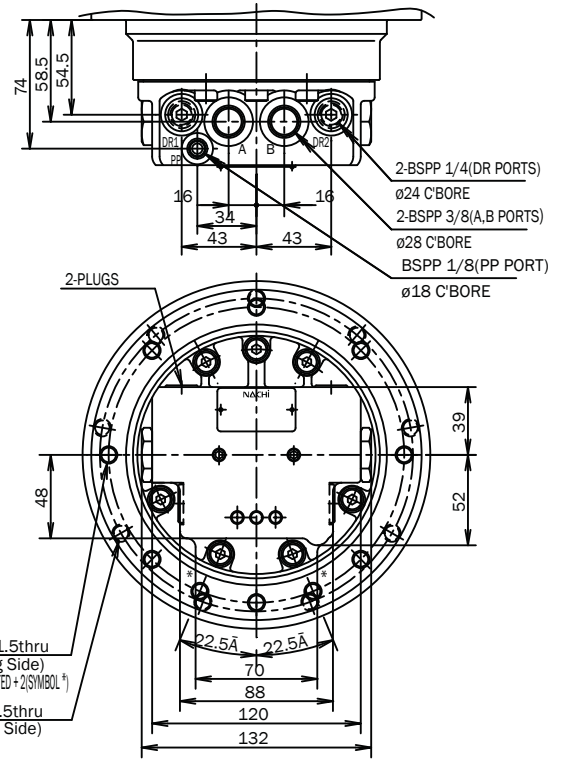
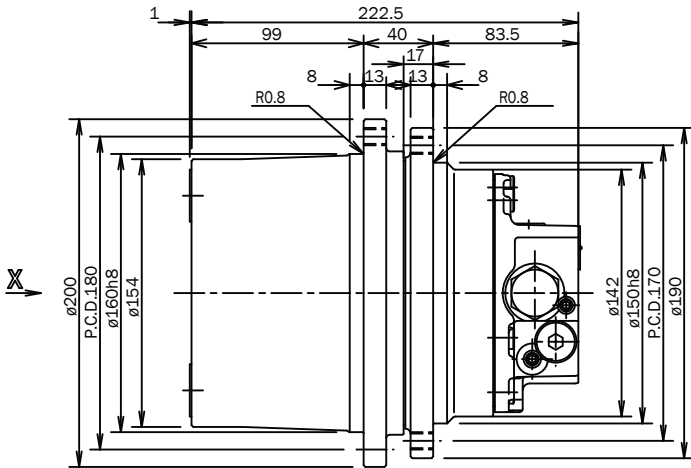
**PHV-2B-20 \*\*\*- (\*) - 10**



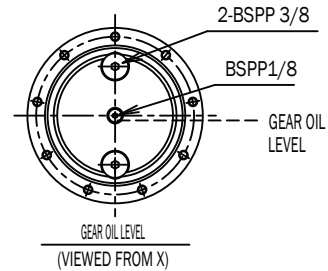
# Installation Dimension Drawings

**CAUTION**

1. Speed Control Pressure: min. 217 psi
2. Hydraulic Fluid: ISO VG46  
(Anti-Wear Hydraulic Fluid)
3. Contamination: within NAS Grade 10
4. Oil Temp: -4 ~ 180° F
5. Filter: 10µm
6. Gear Oil: SAE-30-CD (Amount of Oil 20 in³)
7. Mass: 53 lbs
8. Paint Color: Black (Under Coat)



| JIS SYMBOL |           |                          |  |
|------------|-----------|--------------------------|--|
|            | MODEL NO. | PHV-2B-20***-10          |  |
| NAME       |           | 2 speed type TRACK MOTOR |  |
| DWG. NO.   |           | AM-2201ME-1-A            |  |

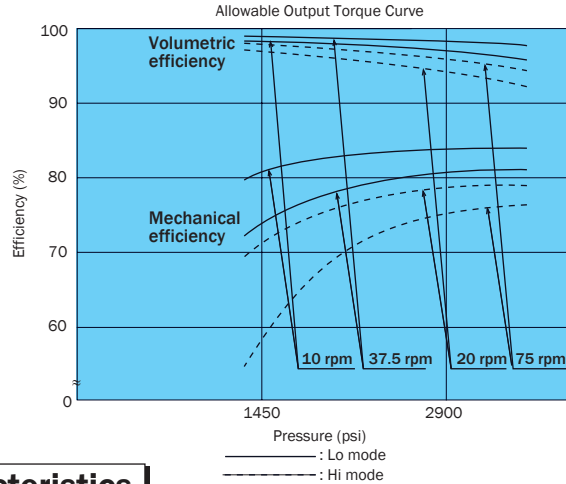


| ALLOWED DRAIN PRESSURE |              | ROTATIONAL DIRECTION (VIEWED FROM X) |     |
|------------------------|--------------|--------------------------------------|-----|
| RATED                  | Max. 43 psi  | CLOCKWISE                            | B A |
| SURGE                  | Max. 145 psi | COUNTER-CLOCKWISE                    | A B |

## Performance Curves

PHV-2B-20 \*\*\* - (P) - 10

Condition:  
Hydraulic Fluid: ISO VG46  
Oil Temperature: 50±5 °C



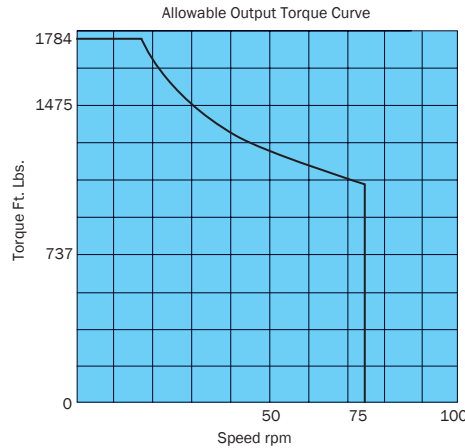
## Performance Characteristics

PHV-2B-20 \*\*\* - (P) - 10

Condition of allowable output torque

Life: 200 hr (driving time)  
Clockwise - 100 hr  
Counterclockwise - 100 hr

Reduction gear life under your using condition



$$Lh = 200 \frac{20}{N} \left(\frac{T_o}{T}\right)^3$$

Lh: Life (hr)  
N: Your using speed (min<sup>-1</sup>)  
To: Torque on curve at N  
T: Your using Torque (N·m) (Theoretical)

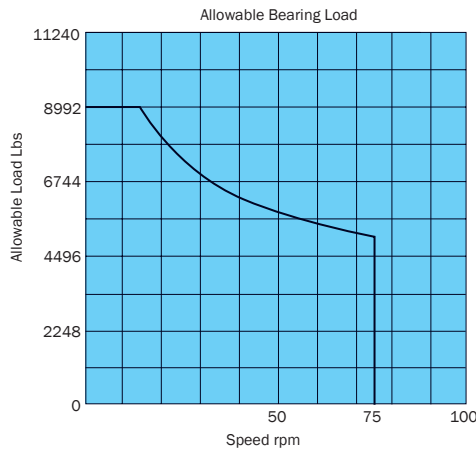
Note: When the track motor is driven only side direction, the life is reduced by half.

Condition of allowable bearing load

Life: 500 hr  
Bearing life under your using condition

$$Lh = 500 \left(\frac{W_o}{W}\right)^3$$

Lh: Life (hr)  
Wo: Load on curve at your using speed  
W: Your using equivalent load (N) [\*1]



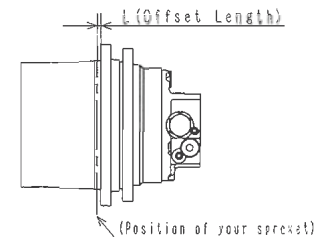
[\*1] Figure that W (your using equivalent load) is the following:

$$W = \frac{52.9-L}{92} W_r \frac{(D/2)}{92} W_{th} (L \leq 6.9)$$

$$W = \frac{39.1+L}{92} W \frac{(D/2)}{92} W_{th} (6.9 < L)$$

L: Offset length [\*2] of your sprocket (mm)  
D: Pitch circle diameter of your sprocket (mm)  
Wr: Your using radial load (N)  
Wth: Your using thrust load (N)

[\*2] Refer to the figure below



Instructions:

1. Use this track motor within 'Specification' shown in DWG. No. AM-2201ME-1.
2. Use an installation mounting with stiffness and clean the mounting before installing this track motor to the machine.
3. Install this track motor horizontally.
4. Remove the upper side plug of 'Drain ports' (DR1 or DR2: refer to DWG. No. AM-2201ME-1) and then connect to the tank after installing this track motor to the machine.
5. Fill the motor case with clean hydraulic fluid through the 'Drain port' before starting.
6. When the 'PP port' (refer to DWG. No. AM-2201ME-1) is connected to the tank, this track motor is operated at Lo mode. (permitted back pressure: 0.5 MPa)
7. When the 'PP port' is supplied pressure, this track motor is operated at Hi mode. (speed control pressure: min. 1.5 MPa)
8. The parking brake (option) of this track motor is negative brake system. Parking brake is working when 'A port' and 'B port' (refer to DWG. No. AM-2201ME-1) are not supplied pressure; is not working when 'A port' or 'B port' is supplied pressure. (parking brake releasing pressure: 1.5 MPa)
9. Change the gear oil to the new one each following period. First: 200 hr or 2 months; Second and after: 1000 hr or 1 year
10. Please refer to the instruction manual for other notes.





### PHV Track Motors

#### Features

This product is the 2 speed hydraulic motor with reduction gear for the crawler type machine, which is a mini-excavator or a similar one in the operating condition and the operating rate.

Remove the upper side plug of "DRAIN PORTS"(DR1 or DR2), and then connect directly to the tank after installing this track motor to the machine.

Please refer to page M9 and the instruction manual for other notes.

#### Specifications

| Model No.           | SPECIFICATION (THEORETICAL)     |                 |         |                 |                     |         |                    |         | (Note 3)      | (Note 4)                                 |              | (Note 5)  | (Note 6)                                |        | (Note 7)                    |           |
|---------------------|---------------------------------|-----------------|---------|-----------------|---------------------|---------|--------------------|---------|---------------|--|--------------|-----------|---|--------|-----------------------------|-----------|
|                     | Code for Hyd.Motor Displacement |                 |         |                 | Code for Gear Ratio |         | Final Displacement |         | Max. Pressure | Max.Output Torque (Theoretical, Lo mode) |              | Max. Flow | Max.Output Speed (Theoretical, Hi mode) |        | Option Parking Brake Torque |           |
|                     | Lo mode                         |                 | Hi mode |                 | code:*3             | ratio   | Lo mode            | Hi mode |               | psi                                      | Intermittent |           | Continuous                              | gpm    | Track Motor                 | Hyd.Motor |
|                     | code:*1                         | in <sup>3</sup> | code:*2 | in <sup>3</sup> |                     |         |                    |         | Ft. Lbs.      |  |              | Ft. Lbs.  |   |        |                             |           |
| PHV-3B-3513A-(P)-11 | 1                               | 1.26            | 3       | .66             | A                   | 1/36.51 | 755.8              | 398.0   | 3552          | 2173                                     | 1517         | 7.37      | 70                                      | (2556) | 977                         | 26.7      |
| PHV-3B-3513B-(P)-11 |                                 |                 |         |                 | B                   | 1/45.20 | 935.6              | 492.7   |               | 2690                                     |              |           |   | 9.11   | (3164)                      |           |
| PHV-3B-3521A-(P)-11 | 2                               | 1.30            | 1       | .78             | A                   | 1/36.51 | 781.3              | 471.0   | 3509          | 2247                                     | 1517         | 8.71      | 70                                      | (2556) | 977                         | 26.7      |
| PHV-3B-3521B-(P)-11 |                                 |                 |         |                 | B                   | 1/45.20 | 967.3              | 583.1   |               | 2781                                     |              |           |   | 10.77  | (3164)                      |           |
| PHV-3B-3531A-(P)-11 | 3                               | 1.44            | 1       | .95             | A                   | 1/36.51 | 861.6              | 573.2   | 3509          | 2478                                     | 1517         | 10.59     | 70                                      | (2556) | 977                         | 26.7      |
| PHV-3B-3531B-(P)-11 |                                 |                 |         |                 | B                   | 1/45.20 | 1066.7             | 709.6   |               | 3034                                     |              |           |   | 11.1   | (59.2)                      |           |
| PHV-3B-3532A-(P)-11 | 3                               | 1.44            | 2       | .78             | A                   | 1/36.51 | 861.6              | 471.0   | 3552          | 2478                                     | 1517         | 8.71      | 70                                      | (2446) | 977                         | 26.7      |
| PHV-3B-3532B-(P)-11 |                                 |                 |         |                 | B                   | 1/45.20 | 1066.7             | 583.1   |               | 3509                                     |              |           |   | 3034   | 10.77                       |           |
| PHV-3B-3533A-(P)-11 | 3                               | 1.44            | 3       | .73             | A                   | 1/36.51 | 861.6              | 438.1   | 3552          | 2478                                     | 1517         | 8.11      | 70                                      | (2556) | 977                         | 26.7      |
| PHV-3B-3533B-(P)-11 |                                 |                 |         |                 | B                   | 1/45.20 | 1066.7             | 542.4   |               | 3509                                     |              |           |   | 3034   | 10.0                        |           |
| PHV-3B-3542A-(P)-11 | 4                               | 1.53            | 2       | .86             | A                   | 1/36.51 | 916.4              | 518.4   | 3552          | 2635                                     | 1517         | 9.66      | 70                                      | (2556) | 977                         | 26.7      |
| PHV-3B-3542B-(P)-11 |                                 |                 |         |                 | B                   | 1/45.20 | 1134.5             | 641.8   |               | 3291                                     |              |           |   | 3034   | 11.0                        |           |

Note 1: Use this track motor within the Specification.

Note 2: The Specification is theoretical value. Real torque at 10 rpm (lo) should be approximately 85% of Theoretical Torque.

Real Speed at Hi(P<1493 psi) should be approximate 96% of Theoretical Speed.

The particular performance is shown on page M9.

Note 3: Max. Pressure is 3552 psi. However, the value in ( ) is limited by Max. Output Torque.

Note 4: Max. Output Torque is 3034 Ft. Lbs. However, the value in ( ) is limited by Max. Pressure.

"Intermittent" means less than 7% of operating time.

Note 5: Max. Flow is 11 gpm. However, the value in ( ) is limited by Max. Output Speed (track motor or hydraulic motor).

Note 6: Max. Output Speed is 70 rpm (track motor), 3500 rpm (hydraulic motor).

However, the value in ( ) is limited by Max. Flow or Max. Output Speed (track motor or hydraulic motor).

Note 7: Parking Brake Torque (hydraulic motor) is 26.7 Ft. Lbs.

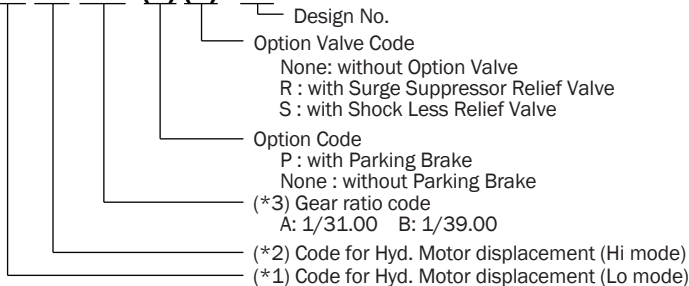
Therefore, Parking Brake Torque (track motor) is different value between Gear Ratio "A(1/36.51)" and "B(1/45.20)".

Note 8: You can select "Option Valve". This drawing is showing the track motor without Option Valve.

Other options available are Surge Suppressor Relief Valve and Shock Less Relief Valve.

#### Understanding Model Numbers

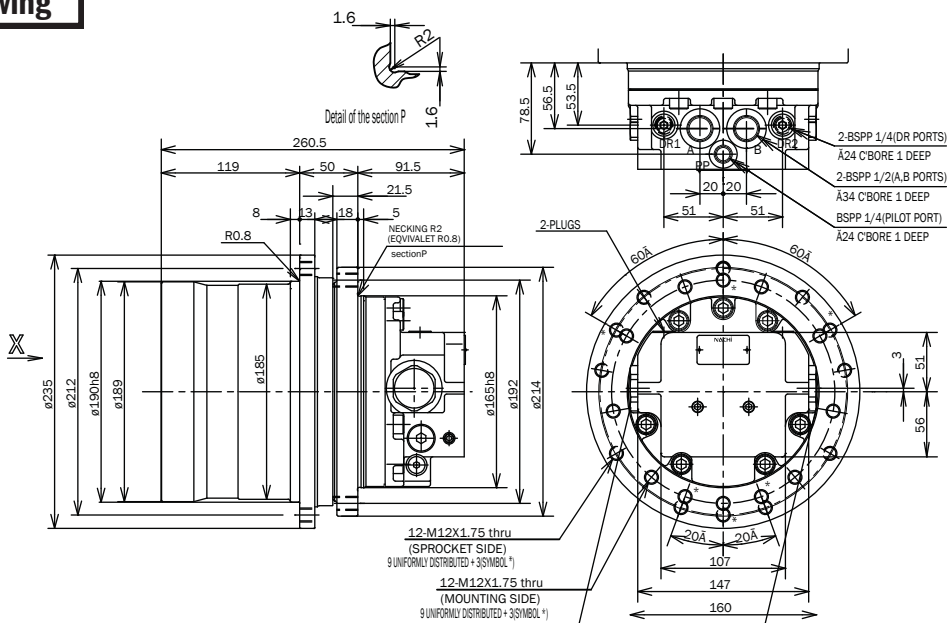
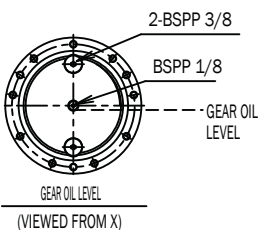
**PHV-3B-35 \*\*\*- (\*) (\*) - 11**



# Installation Dimensional Drawing

**CAUTION**

1. Speed Control Pressure: min. 217 psi
2. Hydraulic Fluid: ISO VG46 (Anti-Wear Hydraulic Fluid)
3. Contamination: within NAS Grade 10
4. Oil Temp: -4 ~ 180° F
5. Filter: 10µm
6. Gear Oil: SAE-30-CD (Amount of Oil 20 in<sup>3</sup>)
7. Mass: 79 lbs
8. Paint Color: Ebony Gray (Under Coat)



| JIS SYMBOL |                          |           |                   |
|------------|--------------------------|-----------|-------------------|
|            |                          |           |                   |
| MODEL NO.  | PHV-3B-35***-11          | MODEL NO. | PHV-3B-35***-P-11 |
| NAME       | 2 speed type TRACK MOTOR |           |                   |
| DWGNO.     | AM-2301ME-1-0A           |           |                   |

ROTATIONAL DIRECTION (VIEWED FROM X)

|                   | INLET | OUTLET |
|-------------------|-------|--------|
| CLOCKWISE         | B     | A      |
| COUNTER-CLOCKWISE | A     | B      |

ALLOWED DRAIN PRESSURE

|       |              |
|-------|--------------|
| RATED | Max. 43 psi  |
| SURGE | Max. 145 psi |

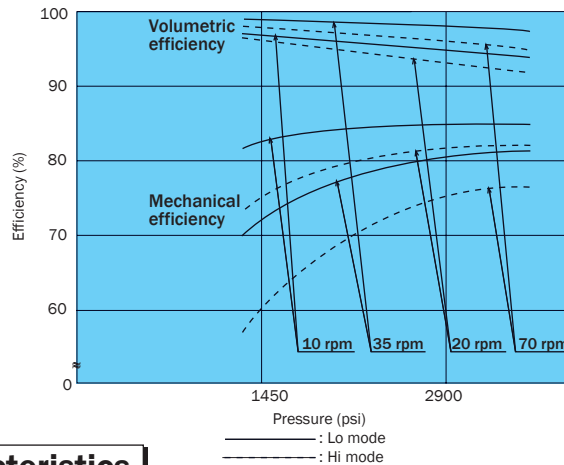
## Performance Curves

PHV-3B-35 \*\*\* - (\*) (\*) - 11

Condition:

Hydraulic Fluid: ISO VG46

Oil Temperature: 50±5 °C



## Performance Characteristics

PHV-3B-35 \*\*\* - (\*) (\*) - 11

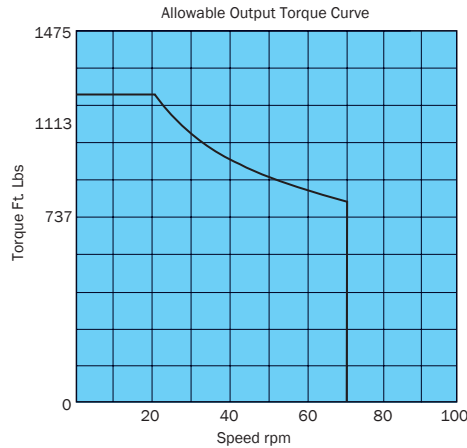
Condition of allowable output torque

Life: 200 hr (driving time)

Clockwise - 100 hr

Counterclockwise - 100 hr

Reduction gear life under your using condition



$$L_h = 200 \frac{20}{N} \left(\frac{T_o}{T}\right)^3$$

Lh: Life (hr)  
N: Your using speed (min<sup>-1</sup>)  
T<sub>o</sub>: Torque on curve at N  
T: Your using Torque (N • m) (Theoretical)

Note: When the track motor is driven only side direction, the life is reduced by half.

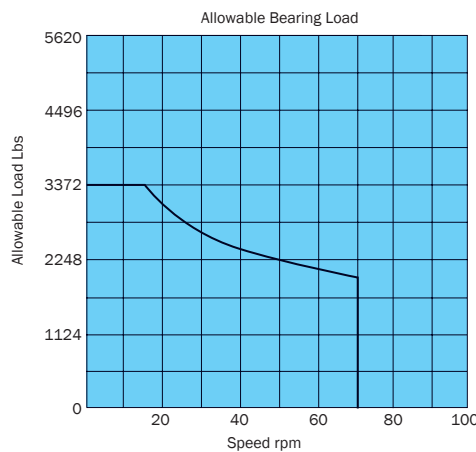
Condition of allowable bearing load

Life: 500 hr

Bearing life under your using condition

$$L_h = 500 \left(\frac{W_o}{W}\right)^3$$

Lh: Life (hr)  
W<sub>o</sub>: Load on curve at your using speed  
W: Your using equivalent load (N) [\*1]



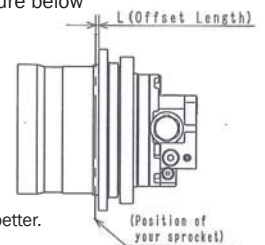
[\*1] Figure that W (your using equivalent load) is the following:

$$W = \frac{64.1 \cdot L}{106.4} W_r \left(\frac{D/2}{106.4}\right) W_{th} (L \leq 10.9)$$

$$W = \frac{42.3 + L}{106.4} W \left(\frac{D/2}{106.4}\right) W_{th} (10.9 \leq L)$$

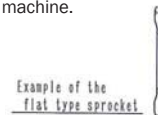
L: Offset length [\*2] of your sprocket (mm)  
D: Pitch circle diameter of your sprocket (mm)  
W<sub>r</sub>: Your using radial load (N)  
W<sub>th</sub>: Your using thrust load (N)

[\*2] Refer to the figure below



Instructions:

- Use this track motor within 'Specification' shown in DWG. No. AM-2301ME-1, -2, -3.
- A machining process is necessary on the track motor installation face of the track frame. Flatness of the installation face should be 0.1 mm or better.
- Use an installation mounting with stiffness and clean the mounting before installing this track motor to the machine.
- Install this track motor horizontally.
- The sprocket should be a flat type - see drawing:
- Remove the upper side plug of 'Drain ports' (DR1 or DR2: refer to DWG. No. AM-2301ME-1, -2, -3) and then connect to the tank after installing this track motor to the machine.
- Fill the motor case with clean hydraulic fluid through the 'Drain port' before starting.
- When the 'PP port' (refer to DWG. No. AM-2101ME-1, -2, -3) is connected to the tank, this track motor is operated at Lo mode. (permitted back pressure: 0.5 MPa)
- When the 'PP port' is supplied pressure, this track motor is operated at Hi mode. (speed control pressure: min. 1.5 MPa)
- The parking brake (option) of this track motor is negative brake system. Parking brake is working when 'A port' and 'B port' (refer to DWG. No. AM-2101ME-1, -2, -3) are not supplied pressure; is not working when 'A port' or 'B port' is supplied pressure. (parking brake releasing pressure: 1.5 MPa)
- Change the gear oil to the new one each following period. First: 200 hr or 2 months; Second and after: 1000 hr or 1 year
- Please refer to the instruction manual for other notes.





### PHV Track Motors

#### Features

This product is the 2 speed hydraulic motor with reduction gear for the crawler type machine, which is a mini-excavator or a similar one in the operating condition and the operating rate.

Remove the upper side plug of "DRAIN PORTS"(DR1 or DR2), and then connect directly to the tank after installing this track motor to the machine.  
Following drawings show the models

"PHV-4B-60\*\*\*-10" and "PHV-4B-60\*\*\*-P-10" Other models not shown.

#### Specifications

| Model No.           | SPECIFICATION (THEORETICAL) (Note 3) |                 |         |                 |                     |         |                    |         | (Note 4)      |  | (Note 5)   | (Note 6)  |   | (Note 7) |                             |      |             |
|---------------------|--------------------------------------|-----------------|---------|-----------------|---------------------|---------|--------------------|---------|---------------|--|------------|-----------|---|----------|-----------------------------|------|-------------|
|                     | Code for Hyd.Motor Displacement      |                 |         |                 | Code for Gear Ratio |         | Final Displacement |         | Max. Pressure | Max.Output Torque (Theoretical, Lo mode) |            | Max. Flow | Max.Output Speed (Theoretical, Hi mode) |          | Option Parking Brake Torque |      |             |
|                     | Lo mode                              |                 | Hi mode |                 | code:*3             | ratio   | Lo mode            | Hi mode |               | Intermittent                             | Continuous |           | rpm                                     | rpm      | rpm                         | rpm  | Track Motor |
|                     | code:*1                              | in <sup>3</sup> | code:*2 | in <sup>3</sup> |                     |         |                    |         | psi           |  |            | Ft. Lbs.  |   |          |                             |      |             |
| PHV-4B-6011A-(P)-10 | 1                                    | 1.74            | 1       | 1.06            | A                   | 1/36.80 | 1052.5             | 640.3   | 3552          | 3026                                     | 2542       | 10.9      | 65                                      | (2392)   | 2342                        | 63.6 |             |
| PHV-4B-6011B-(P)-10 |                                      |                 |         |                 | B                   | 1/47.53 | 1359.4             | 827.0   |               | 3909                                     |            |           |   | 14.2     | (3089)                      |      | 3025        |
| PHV-4B-6021A-(P)-10 | 2                                    | 1.81            | 1       | 1.11            | A                   | 1/36.80 | 1093.0             | 673.4   |               | 3143                                     |            |           |   | 11.5     | (2392)                      |      | 2342        |
| PHV-4B-6021B-(P)-10 |                                      |                 |         |                 | B                   | 1/47.53 | 1411.6             | 869.8   |               | 4059                                     |            |           |   | 14.9     | (3089)                      |      | 3025        |
| PHV-4B-6032A-(P)-10 | 3                                    | 2.08            | 2       | 1.16            | A                   | 1/36.80 | 1258.6             | 702.9   |               | 3619                                     |            |           |   | 12.0     | (2392)                      |      | 2342        |
| PHV-4B-6032B-(P)-10 |                                      |                 |         |                 | B                   | 1/47.53 | 1652.5             | 907.8   |               | 4672                                     |            |           |   | 15.5     | (3089)                      |      | 3025        |
| PHV-4B-6041A-(P)-10 | 4                                    | 2.15            | 1       | 1.29            | A                   | 1/36.80 | 1299.0             | 783.8   |               | 3735                                     |            |           |   | 13.4     | (2392)                      |      | 2342        |
| PHV-4B-6041B-(P)-10 |                                      |                 |         |                 | B                   | 1/47.53 | 1677.8             | 1012.4  |               | 4824                                     |            |           |   | 15.8     | (59.3)                      |      | (2817)      |

Note 1: Use this track motor within the Specification.

Note 2: The Specification is theoretical value. Real torque at 10 rpm (lo) should be approximately 85% of Theoretical Torque.

Real Speed at Hi(P<1493 psi) should be approximate 96% of Theoretical Speed.

The particular performance is shown in "DWG.NO. AM-2301ME-4".

Note 3: Max. Pressure is 3552 psi. However, the value in ( ) is limited by Max. Output Torque.

Note 4: Max. Output Torque is 4824 Ft. Lbs. However, the value in ( ) is limited by Max. Pressure.

"Intermittent" means less than 7% of operating time.

Note 5: Max. Flow is 15.8 gpm. However, the value in ( ) is limited by Max. Output Speed (track motor or hydraulic motor).

Note 6: Max. Output Speed is 70 rpm (track motor), 3500 rpm (hydraulic motor).

However, the value in ( ) is limited by Max. Flow or Max. Output Speed (track motor or hydraulic motor).

Note 7: Parking Brake Torque (hydraulic motor) is 63.6 Ft. Lbs.

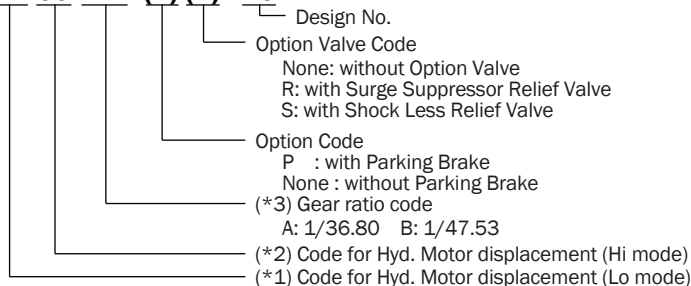
Therefore, Parking Brake Torque (track motor) is different value between Gear Ratio "A(1/36.80)" and "B(1/47.53)".

Note 8: You can select "Option Valve". This drawing is showing the track motor without Option Valve.

Other options available are Surge Suppressor Relief Valve and Shock Less Relief Valve.

#### Understanding Model Numbers

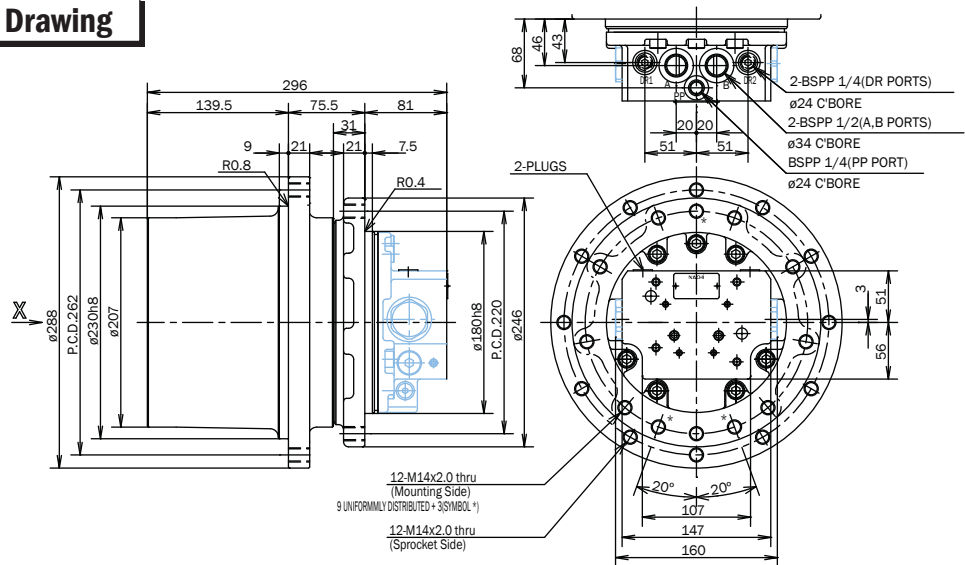
**PHV-4B-60 \*\*\*- (\*) (\*) - 10**



## Installation Dimensional Drawing

### CAUTION

1. Speed Control Pressure: min. 217 psi
2. Hydraulic Fluid: ISO VG46  
(Anti-Wear Hydraulic Fluid)
3. Contamination: within NAS Grade 10
4. Oil Temp: -4 ~ 180° F
5. Filter: 10µm
6. Gear Oil: SAE-30-CD  
(Amount of Oil 20 in<sup>3</sup>)
7. Mass: 124 lbs.
8. Paint Color: Red (Under Coat),  
Black (Top Coat)



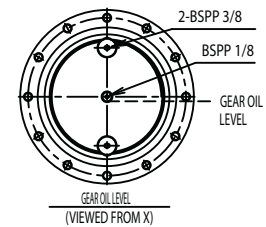
| HYDRAULIC SYMBOL |                          |           |                   |
|------------------|--------------------------|-----------|-------------------|
|                  |                          |           |                   |
| MODEL NO.        | PHV-4B-60***-10          | MODEL NO. | PHV-4B-60***-P-10 |
| NAME             | 2 speed type TRACK MOTOR |           |                   |
| DWG. NO.         | AM-2401ME-1-B            |           |                   |

### ROTATIONAL DIRECTION (VIEWED FROM X)

|                   | INLET | OUTLET |
|-------------------|-------|--------|
| CLOCKWISE         | B     | A      |
| COUNTER-CLOCKWISE | A     | B      |

### ALLOWED DRAIN PRESSURE

|       |              |
|-------|--------------|
| RATED | Max. 43 psi  |
| SURGE | Max. 145 psi |





### PHV Track Motors

#### Features

This product is the 2 speed hydraulic motor with reduction gear for the crawler type machine, which is a mini-excavator or a similar one in the operating condition and the operating rate.

Remove the upper side plug of "DRAIN PORTS"(DR1 or DR2), and then connect directly to the tank after installing this track motor to the machine.

Please refer to page M3 and the instruction manual for other notes.

#### Specifications

| Model No.           | SPECIFICATION (THEORETICAL)     |                 |         |                 | (Note 3)            |         | (Note 4)           |               | (Note 5)                                  | (Note 6)  |  | (Note 7)  |                      | Shock Less Relief Valve |                   |                  |   |   |
|---------------------|---------------------------------|-----------------|---------|-----------------|---------------------|---------|--------------------|---------------|---|-----------|--|-----------|----------------------|-------------------------|-------------------|------------------|---|---|
|                     | Code for Hyd.Motor Displacement |                 |         |                 | Code for Gear Ratio |         | Final Displacement | Max. Pressure | Max. Output Torque (Theoretical, Lo mode) | Max. Flow | Max. Output Speed (Theoretical, Hi mode) |           | Parking Brake Torque |                         | Cracking Pressure | Setting Pressure |   |   |
|                     | Lo mode                         |                 | Hi mode |                 | Lo mode             | Hi mode |                    |               |   |           | Track Motor                              | Hyd.Motor | Track Motor          | Hyd.Motor               |                   |                  |   |   |
|                     | code:*1                         | in <sup>3</sup> | code:*2 | in <sup>3</sup> |                     |         | code:*3            | ratio         | psi                                       | Ft. Lbs   |  |           |                      |                         | Ft. Lbs           | gpm              | rpm                                     | rpm                                     |
| PHV-5B-11011A-PS-10 | 1                               | 1.99            | 1       | 1.23            | A                   | 1/64.25 | 127.81             | 79.20         | 4640                                      | (7869)    | 4794                                     | (20.58)   | 60                   | (3855)                  | 5019              | 78               | 4350 psi <sup>+435</sup><br>at 0.26 gpm | 4640 psi <sup>+145</sup><br>at 5.28 gpm |
| PHV-5B-11032A-PS-10 | 2                               | 2.26            | 2       | 1.25            |                     |         | 145.45             | 80.37         |   |           |  |           |                      |                         |                   |                  |   |   |
| PHV-5B-11043A-PS-10 | 3                               | 2.58            | 3       | 1.30            |                     |         | 165.84             | 83.51         | (4350)                                    | 9588      | 21.14                                    | (58.5)    | (3756)               |                         |                   |                  |   |   |

Note 1: Use this track motor within the Specification.

Note 2: The Specification is theoretical value. Real torque at 10 rpm (lo) should be approximately 85% of Theoretical Torque.

Real Speed at Hi(P<1494 psi) should be approximate 96% of Theoretical Speed.

The particular performance is shown on page M3.

Note 3: Max. Pressure is 4640 psi. However, the value in ( ) is limited by Max. Output Torque.

Note 4: Max. Output Torque is 9588 Ft. Lbs. However, the value in ( ) is limited by Max. Pressure.

"Intermittent" means less than 7% of operating time.

Note 5: Max. Flow is 21.14 gpm. However, the value in ( ) is limited by Max. Output Speed (track motor or hydraulic motor).

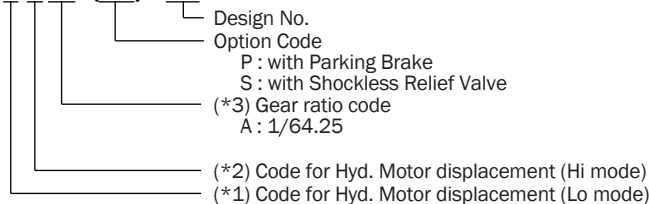
Note 6: Max. Output Speed is 60 rpm (track motor), 3855 rpm (hydraulic motor).

However, the value in ( ) is limited by Max. Flow or Max. Output Speed (track motor or hydraulic motor).

Note 7: Parking Brake Torque (hydraulic motor) is 78 Ft Lbs.

#### Understanding Model Numbers

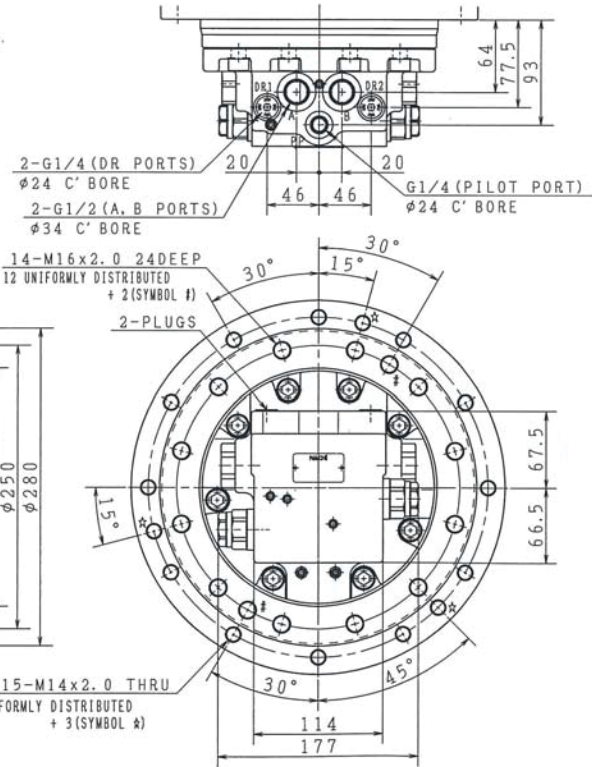
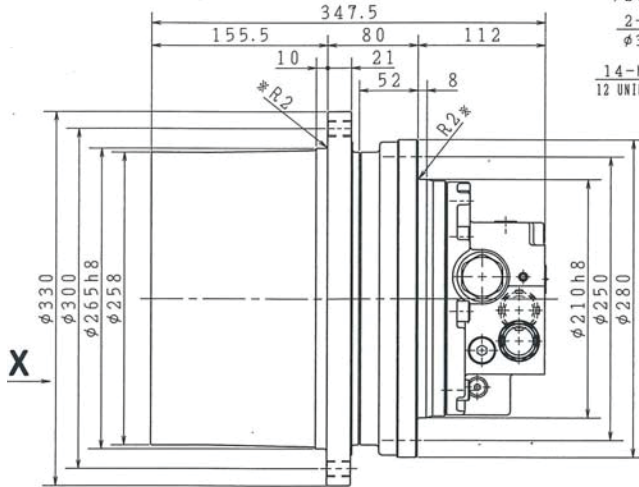
**PHV-5B-110 \* \* A - (PS) - 10**



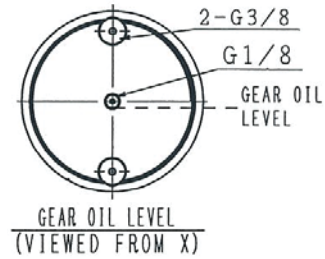
# Installation Dimension Drawings

**CAUTION**

1. Speed Control Pressure: min. 217 psi
2. Hydraulic Fluid: ISO VG46  
(Anti-Wear Hydraulic Fluid)
3. Contamination: within NAS Grade 10
4. Oil Temp: -4 ~ 194° F (Instantaneous Max. 212° F)
5. Filter: 10µm
6. Gear Oil: SAE-30-CD (Amount of Oil 91.5 in<sup>3</sup>)
7. Mass: 192 lbs.
8. Paint Color: Ebony Gray (Under Coat)



| JIS SYMBOL |                          |
|------------|--------------------------|
|            |                          |
| MODEL NO.  | PHV-5B-110**A-PS-10      |
| NAME       | 2 speed type TRACK MOTOR |
| DWG. NO.   | AM-2701ME-2              |



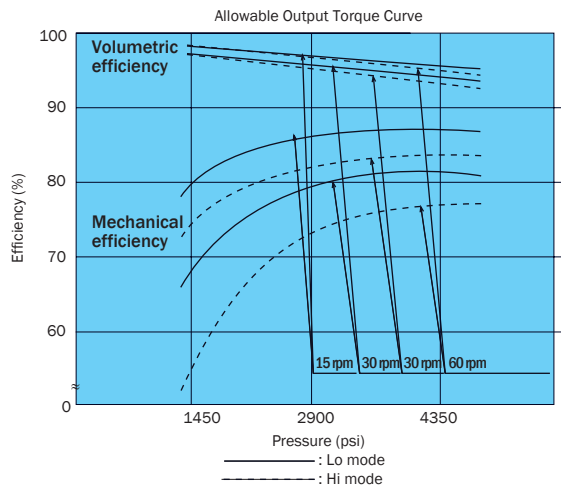
| ALLOWED DRAIN PRESSURE |               |
|------------------------|---------------|
| RATED                  | Max. 43.5 psi |
| SURGE                  | Max. 145 psi  |

| ROTATIONAL DIRECTION (VIEWED FROM X) |   |   |
|--------------------------------------|---|---|
| CLOCKWISE                            | B | A |
| COUNTER-CLOCKWISE                    | A | B |

## Performance Curves

PHV-5B-110\*\*A-PS-10

Condition:  
Hydraulic Fluid: ISO VG46  
Oil Temperature: 122±41 ° F



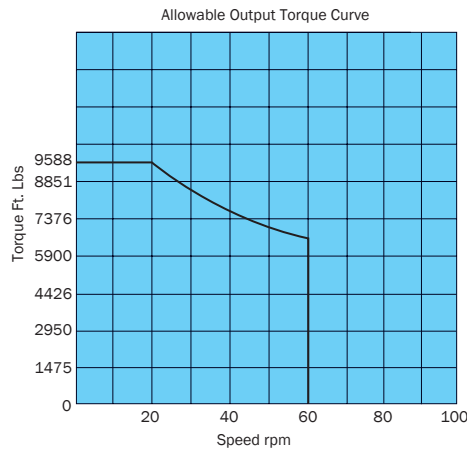
## Performance Characteristics

PHV-5B-110\*\*A-PS-10

### Condition of allowable output torque

Life: 300 hr (driving time)  
Clockwise - 150 hr  
Counterclockwise - 150 hr

Reduction gear life under your using condition



$$Lh = 300 \frac{20}{N} \left( \frac{T_0}{T} \right)^3$$

Lh: Life (hr)  
N: Your using speed (min<sup>-1</sup>)  
T<sub>0</sub>: Torque on curve at N  
T: Your using Torque (N • m) (Theoretical)

Note: When the track motor is driven only side direction, the life is reduced by half.

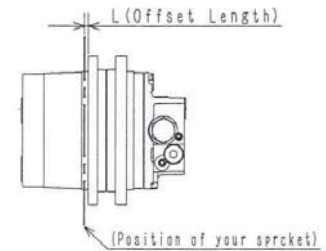
[\*1] Figure that W (your using equivalent load) is the following:

$$W = \frac{73.5 \cdot L}{143.2} W_r \frac{(D/2)}{143.2} W_{th} (L \leq 1.9)$$

$$W = \frac{69.7 + L}{143.2} W_r \frac{(D/2)}{143.2} W_{th} (1.9 < L)$$

L: Offset length [\*2] of your sprocket (mm)  
D: Pitch circle diameter of your sprocket (mm)  
W<sub>r</sub>: Your using radial load (N)  
W<sub>th</sub>: Your using thrust load (N)

[\*2] Refer to the figure below

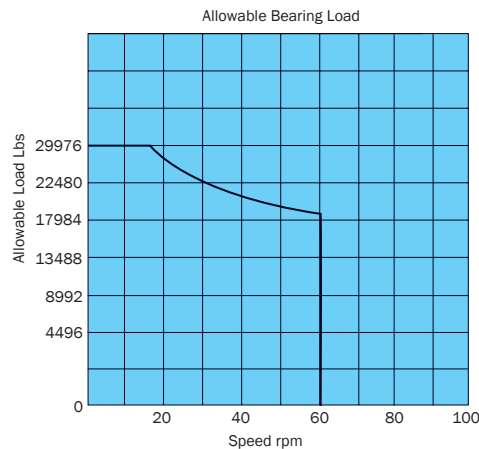


### Condition of allowable bearing load

Life: 500 hr  
Bearing life under your using condition

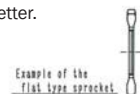
$$Lh = 500 \left( \frac{W_0}{W} \right)^3$$

Lh: Life (hr)  
W<sub>0</sub>: Load on curve at your using speed  
W: Your using equivalent load (N) [\*1]



### Instructions:

1. Use this track motor within 'Specification' shown in DWG. No. AM-2701ME-1
2. A machining process is necessary on the track motor installation face of the track frame. Flatness of the installation face should be 0.1 mm or better.
3. Use an installation mounting with stiffness and clean the mounting before installing this track motor to the machine.
4. Install this track motor horizontally.
5. The sprocket should be a flat type. (Refer to drawing at right)
6. Remove the upper side plug of 'Drain ports' (DR1 or DR2: refer to DWG. No. AM-2701ME-1) and then connect to the tank after installing this track motor to the machine.
7. Fill the motor case with clean hydraulic fluid through the 'Drain port' before starting.
8. When the 'PP port' (refer to DWG. No. AM-2701ME-1) is connected to the tank, this track motor is operated at Lo mode. (permitted back pressure: 72 psi)
9. When the 'PP port' is supplied pressure, this track motor is operated at Hi mode. (speed control pressure: min. 217 psi)
10. The parking brake (option) of this track motor is negative brake system. Parking brake is working when 'A port' and 'B port' (refer to DWG. No. AM-2701ME-1) are not supplied pressure; is not working when 'A port' or 'B port' is supplied pressure. (parking brake releasing pressure: 217 psi)
11. Change the gear oil to the new one each following period. First: 200 hr or 2 months; Second and after: 1000 hr or 1 year
12. The neutral position of the control valve should be AB-T open. Please secure enough open area (more than 78 mm<sup>2</sup>), not to occur abnormal pressure rising at A • B port.
13. Please refer to the instruction manual for other notes.





### Operating Fluid

Operating fluid is liquid inside of a hydraulic device that acts as a medium to transmit power. In addition to its operational task, hydraulic operating fluid also performs such

- Oil-based operating fluid  
The most commonly used mineral oil hydraulic fluids are general operating fluid and anti-wear operating fluid. General operating fluid is called "R&O type." It is made by adding oxidation inhibitors, rust inhibitors, foam inhibitors, and other additives to a highly refined paraffin base oil to enhance its characteristics. Anti-wear operating fluid contains extreme pressure additives that enhances the extreme pressure characteristics required for high-pressure, high-speed hydraulic operations. These oil-based operating fluid have a very wide range of application in hydraulic

tasks as lubrication, rust prevention, sealing, and cooling. Because of the vital contributions hydraulic operating fluid makes to the operation, efficiency, and

equipment, and account for most hydraulic operation fluid in use today.

- Fire-resistant Hydraulic Fluid  
Fire-resistant hydraulic fluid (FRHF) is used in fire fighting equipment and in hydraulic equipment in applications where there is the danger of fire. There are two types of FRHF: water-containing and synthetic. The common types are water-glycol type and water in oil emulsion type for water-containing FRHF, and phosphate ester type and fatty acid ester type for synthetic FRHF. Care is required when using an FRHF

reliability of hydraulic equipment, it is important to exercise sufficient care when selecting the correct type for your needs and when storing fluid.

concerning seal material, paint and metal compatibility (see table below), and because their lubrication characteristics are different from those of mineral oil.

- See the pages for each hydraulic device or contact your agent to find out if a fire-resistant hydraulic fluid can be used with a particular device.

Fire-resistant Hydraulic Fluid Seal Material Compatibility

| Fluid                | Water In Oil Emulsion | Water-glycol | Phosphate Ester | Fatty Acid Ester |
|----------------------|-----------------------|--------------|-----------------|------------------|
| Nitril Rubber        | ○                     | ○            | ×               | ○                |
| E . P . R .          | ×                     | ○            | ○               | ○                |
| Fluro Rubber         | ○                     | ×            | ○               | ○                |
| Teflon               | ○                     | ○            | ○               | ○                |
| Butyl Rubber         | ×                     | ○            | ▲               | ×                |
| Urethane Rubber      | ×                     | ×            | ×               | ○                |
| Silicon Rubber       | ×                     | ×            | ○               | ○                |
| Leather (Wax Sealed) | ×                     | ×            | ○               | ○                |
| Beech N              | ○                     | ○            | ×               | ○                |
| Beech S              | ○                     | ○            | ×               | ○                |

Fire-resistant Hydraulic Fluid Paint Compatibility

| Fluid          | Water In Oil Emulsion | Water-glycol | Phosphate Ester | Fatty Acid Ester |
|----------------|-----------------------|--------------|-----------------|------------------|
| Epoxy Resin    | ×                     | ×            | ×               | ○                |
| Vinyl Resin    | ×                     | ×            | ×               | ○                |
| Urethane Resin | ×                     | ×            | ×               | ○                |
| Phtalic Resin  | ×                     | ×            | ×               | ×                |
| Phenolic Resin | ×                     | ×            | ×               | ×                |

Fire-resistant Hydraulic Fluid Metal Compatibility (Δ indicates partial problem.)

| Fluid     | Water In Oil Emulsion | Water-glycol | Phosphate Ester | Fatty Acid Ester |
|-----------|-----------------------|--------------|-----------------|------------------|
| Aluminum  | ○                     | ×            | ▲               | ○                |
| Cast Iron | ○                     | ○            | ○               | ○                |
| Steel     | ○                     | ○            | ○               | ○                |
| Brass     | ○                     | ○            | ○               | ○                |
| Copper    | ▲                     | ○            | ○               | ○                |
| Magnesium | ○                     | ×            | ▲               | ○                |
| Cadmium   | ▲                     | ×            | ▲               | ▲                |
| Zinc      | ▲                     | ×            | ○               | ▲                |

Note: The ▲ symbol indicates items that may have problems. For details, consult your agent or a hydraulic operating fluid manufacturer.  
○ symbol indicates items that may be used. × symbol indicates not ok.

#### General Properties of Hydraulic Fluid (Typical)

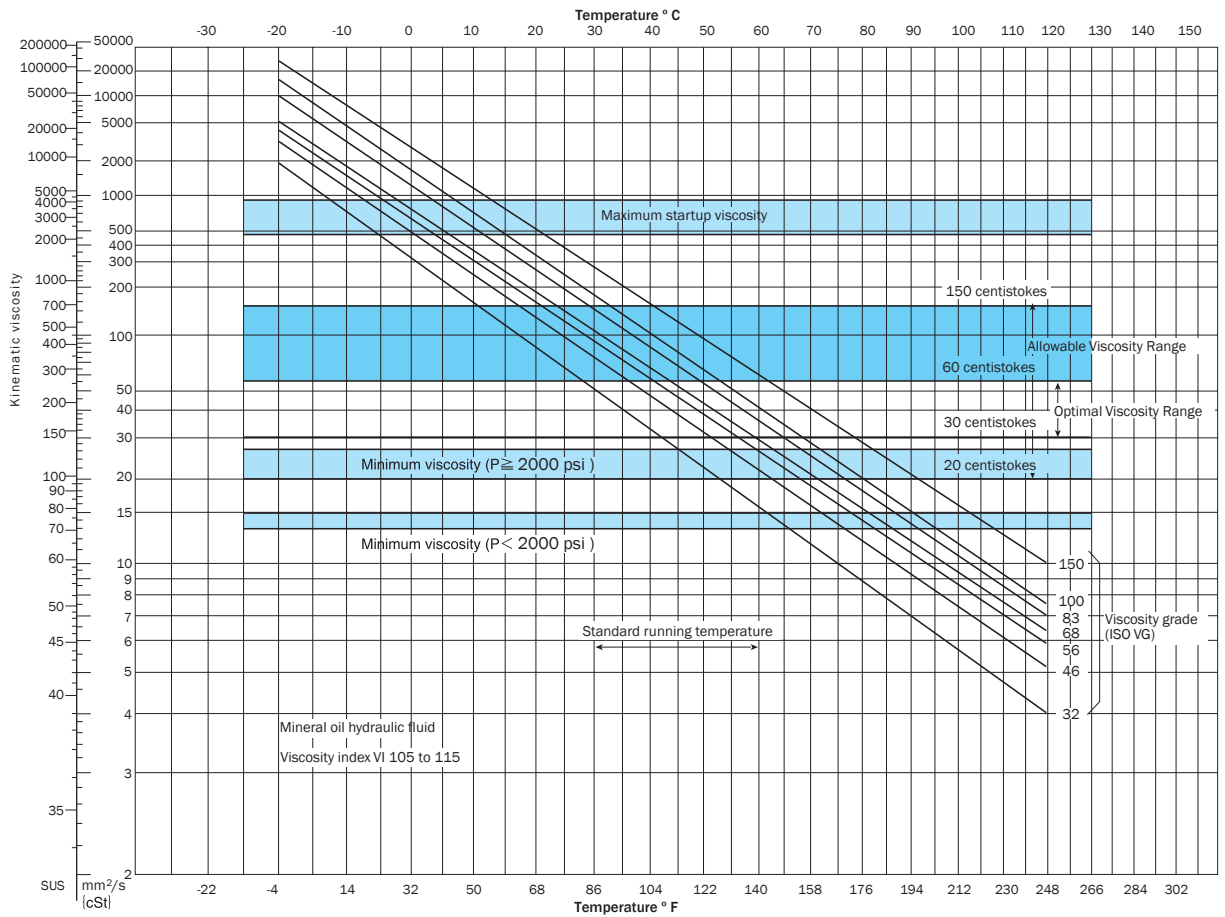
| Type                     | Oil-based operating fluid | Water-glycol | Water In Oil Emulsion | Phosphate Ester | Fatty Acid Ester |      |
|--------------------------|---------------------------|--------------|-----------------------|-----------------|------------------|------|
| Specific Gravity 15/4 °C | 0.874                     | 1.072        | 0.890                 | 1.152           | 0.900            |      |
| Fire Point° F            | 435                       | None         | None                  | 503             | 494              |      |
| Viscosity centistokes    | 40° C / 100° F            | 59.8         | 45.5                  | 67.9            | 36.4             | 43.6 |
|                          | 100° C / 212° F           | 8.09         | 9.09                  | 12.0            | 4.72             | 8.00 |
| Viscosity index          | 113                       | 206          | 146                   | 110             | 165              |      |
| Pour Point° C (F)        | -25 (-13)                 | -40 (F/C)    | -12.5 (9.5)           | -20 (-4)        | -10 (14) or less |      |

#### Viscosity-Temperature Characteristics (Oil-based operating fluid )

Viscosity is the most important factor to consider when selecting hydraulic operating fluid. Viscosity has a major effect on a variety of characteristics, including the volumetric efficiency, mechanical efficiency, and pipe resistance, valve leakage, operational characteristics, etc.

Though the overall efficiency and characteristics of the hydraulic device should be considered when determining the proper viscosity of the fluid, the main consideration should be the needs of the hydraulic pump at the heart of the hydraulic system. The following pages show typical Viscosity-Temperature

characteristics for oil-based operating fluid with viscosity indexes from 105 to 115, as well as ASTM Viscosity Index-Temperature tables with information about suitable and optimal viscosity ranges for hydraulic pumps.



**Fluid Cleanliness Levels**

Today's high-pressure, high-speed, high-precision control hydraulic equipment is more susceptible than ever before to problems caused by hydraulic fluid contaminants. Fluid contaminants can cause a loss of machine performance, shorten machine life, and even lead to equipment malfunction. Because of this, the U.S. has taken the lead in defining numeric contamination limits to govern cleanliness levels for hydraulic operating fluid. Japan also applies the same standards (normally, NAS-1638) to classify fluid contamination limits. In the future, the world standard ISO cleanliness codes (ISO 4406) will use a range code to define the cumulative number of particles by diameter per milliliter. The range codes are separated by a slash in order of the diameter of the particle: larger than 4 μm (C), larger than 6 μm (C), and larger than 14 μm (C).

For example:

- Larger than 4μm (C) 1200 particles/mr
- Larger than 6μm (C) 300 particles/mr
- Larger than 14μm (C) 40 particles/mr

The cleanliness code looks like: 17/15/12

Allowable Number of Particles in Hydraulic Fluid - NAS-1638 (100 mℓ ; 6.1 in<sup>3</sup>)

| Particle Size Class | Particle Size |            |            |              |                  | Device                                | Filter                               | Remarks                                 |
|---------------------|---------------|------------|------------|--------------|------------------|---------------------------------------|--------------------------------------|---|
|                     | 5 to 15μm     | 15 to 25μm | 25 to 50μm | 50 to 100 μm | 100 μm or larger |                                       |                                      |   |
| 00                  | 125           | 22         | 4          | 1            | 0                |                                       |                                      |   |
| 0                   | 250           | 44         | 8          | 2            | 0                |                                       |                                      |   |
| 1                   | 500           | 89         | 16         | 3            | 1                |                                       |                                      |   |
| 2                   | 1,000         | 178        | 32         | 6            | 1                |                                       |                                      |   |
| 3                   | 2,000         | 356        | 63         | 11           | 2                |                                       |                                      |   |
| 4                   | 4,000         | 712        | 126        | 22           | 4                |                                       |                                      |   |
| 5                   | 8,000         | 1,425      | 253        | 45           | 8                |                                       |                                      |   |
| 6                   | 16,000        | 2,850      | 506        | 90           | 16               |                                       | From nominal 0.8 μm to absolute 3 μm | ↕ Clean oil                             |
| 7                   | 32,000        | 5,700      | 1,012      | 180          | 32               | ↕ Electric -Hydraulic Servo Device    |                                      | ↕ NC hydraulic fluid                    |
| 8                   | 64,000        | 11,400     | 2,025      | 360          | 64               |                                       | From nominal 10 μm to absolute 40 μm | ↕ In drum General hydraulic fluid (new) |
| 9                   | 128,000       | 22,800     | 4,050      | 720          | 128              | ↕ Electric -Hydraulic Pulse Motor     |                                      |   |
| 10                  | 256,000       | 45,600     | 8,100      | 1,440        | 256              |                                       |                                      |   |
| 11                  | 512,000       | 91,200     | 16,200     | 2,880        | 512              |                                       |                                      |   |
| 12                  | 1,024,000     | 182,400    | 32,400     | 5,760        | 1,024            | ↕ General Industrial Hydraulic Device |                                      |   |

Weight of Contaminants Per 100 mℓ (6.1 in<sup>3</sup>) of Hydraulic Fluid -NAS-1638

| Class     | 100  | 101  | 102  | 103  | 104  | 105  | 106 | 107 | 108 |
|-----------|------|------|------|------|------|------|-----|-----|-----|
| Weight mg | 0.02 | 0.05 | 0.01 | 0.30 | 0.50 | 0.70 | 1.0 | 2.0 | 4.0 |

ISO Contamination Limit Equivalents (ISO 4406:1999)

Number of particles show upper limit values for each scale number.

| Number of Particles (Particles/mℓ) | Scale Number | Number of Particles (Particles/mℓ) | Scale Number | Number of Particles (Particles/mℓ) | Scale Number |
|------------------------------------|--------------|------------------------------------|--------------|------------------------------------|--------------|
| 2,500,000 +                        | >28          | 5,000                              | 19           | 5                                  | 9            |
| 2,500,000                          | 28           | 2,500                              | 18           | 2.25                               | 8            |
| 1,300,000                          | 27           | 1,300                              | 17           | 1.3                                | 7            |
| 640,000                            | 26           | 640                                | 16           | 0.64                               | 6            |
| 320,000                            | 25           | 320                                | 15           | 0.32                               | 5            |
| 160,000                            | 24           | 160                                | 14           | 0.16                               | 4            |
| 80,000                             | 23           | 80                                 | 13           | 0.08                               | 3            |
| 40,000                             | 22           | 40                                 | 12           | 0.04                               | 2            |
| 20,000                             | 21           | 20                                 | 11           | 0.02                               | 1            |
| 10,000                             | 20           | 10                                 | 10           | 0.01 or less                       | 0            |

## Subplate/Conversion Chart

Hydraulic Component for use with Water - Glycol

### Pump Specifications for Water - Glycol Oil

#### VDR22 Design Series Variable Vane Pump

| Pump Model for W/G    | Rated Pressure<br>psi | Max. Pressure<br>psi | Max. Drive Speed<br>rpm | Suction Pressure<br>psi |
|-----------------------|-----------------------|----------------------|-------------------------|-------------------------|
| W-VDR-1 * - 1A2-(E)22 | 500                   | 500                  | 1800                    | -2.1 to 4.3             |
| 1A3                   | 1000                  | 1000                 |                         |                         |
| 2A2                   | 500                   | 500                  |                         |                         |
| 2A3                   | 714                   | 714                  |                         |                         |

#### VDC Series Variable Vane Pump

| Pump Model for W/G        | Rated Pressure<br>psi | Max. Pressure<br>psi | Max. Drive Speed<br>rpm | Suction Pressure<br>psi |
|---------------------------|-----------------------|----------------------|-------------------------|-------------------------|
| W-VDC-1 * - 1A2-20, (E)35 | 500                   | 500                  | 1800                    | -2.1 to 4.3             |
| 1A3                       | 1000                  | 1000                 |                         |                         |
| 2A2                       | 500                   | 500                  |                         |                         |
| 2A3                       | 714                   | 714                  |                         |                         |
| W-VDC-2 * - 1A2-20, (E)35 | 500                   | 500                  | 1800                    | -2.1 to 4.3             |
| 1A3                       | 1000                  | 1000                 |                         |                         |
| 2A2                       | 500                   | 500                  |                         |                         |
| 2A3                       | 714                   | 714                  |                         |                         |
| W-VDC-3 * - 1A2- (E)35    | 500                   | 500                  | 1800                    | -2.1 to 4.3             |
| 1A3                       | 1000                  | 1000                 |                         |                         |

#### IPH Series Internal Gear Pump

| Pump Model for W/G     | Rated Pressure<br>psi | Max. Pressure<br>psi | Max. Drive Speed<br>rpm | Suction Pressure<br>psi |
|------------------------|-----------------------|----------------------|-------------------------|-------------------------|
| W-IPH-2 * - * - 11     | 3000                  | 3571                 | 1200                    | -2.1 to 4.3             |
| W-IPH-3 * - * - 20     |                       |                      |                         |                         |
| W-IPH-4 * - * - 20     |                       |                      |                         |                         |
| W-IPH-5 * - * - 21(11) |                       |                      |                         |                         |
| W-IPH-6 * - * - 21(11) |                       |                      |                         |                         |

#### PVS, PZS Series Variable Piston Pump

| Pump Model for W/G        | Rated Pressure<br>psi | Max. Pressure<br>psi | Max. Drive Speed<br>rpm | Suction Pressure<br>psi |
|---------------------------|-----------------------|----------------------|-------------------------|-------------------------|
| W-PVS-0B- 8N *-(E)30      | 2000                  | 2000                 | 1200                    | -2.1 to 4.3             |
| W-PVS-1B- 16N *-, 11, E12 | 2000                  | 2000                 | 1200                    | -2.1 to 4.3             |
| 22N *                     | 1500                  | 1500                 |                         |                         |
| W-PVS-2B- 35N *-, 11, E12 | 2000                  | 2000                 | 1200                    | -2.1 to 4.3             |
| 45N *                     | 1500                  | 1500                 |                         |                         |
| W-PZS-3B- 70N *-(E)10     | 2000                  | 2000                 | 1200                    | -2.1 to 4.3             |
| W-PZS-4B- 100N *-(E)10    |                       |                      |                         |                         |
| W-PZS-5B- 130N *-(E)10    |                       |                      |                         |                         |

## Subplate/Conversion Chart Valve Specifications for Water - Glycol

### Pressure Control Valve

| Valve Name                      | Valve Model for W/G         | Specifications    |                 |
|---------------------------------|-----------------------------|-------------------|-----------------|
|                                 |                             | Max. Pressure psi | Max. Flow gpm   |
| Relief Valve                    | R- * 03 - * - 11            | 3000              | 7.9 (5.3) Note  |
|                                 | R- * 06 - * - (E)20         |                   | 39.7            |
|                                 | R- * 10 - * - (E)20         |                   | 89.9            |
| Relief Valve                    | RI- * G03 - * - (E)10       | 3000              | 22.5 (5.3) Note |
|                                 | RI- * G06 - * - (E)10       |                   | 44.9            |
| Direct Type Relief Valve        | RD- * G03 - * - 11          | 3000              | 11.9            |
|                                 | RD- * G06 - * - 11          |                   | 19.8            |
| Relief Valve for Remote Control | RCD- T02 - * - 11           | 3000              | 4.0             |
|                                 | RC- T02 - * - 12            |                   | 0.5             |
|                                 | RC- G02 - * - 21            |                   | 0.5             |
| Solenoid Control Relief Valve   | RSA- * 03 - * * - * - 13    | 3000              | 7.9             |
|                                 | RSA- * 06 - * * - * - 22    |                   | 39.7            |
|                                 | RSA- * 10 - * * - * - 22    |                   | 89.9            |
|                                 | RSS- * 03 - * * - * - 13    |                   | 7.9             |
|                                 | RSS- * 06 - * * - * - (E)22 |                   | 39.7            |
|                                 | RSS- * 10 - * * - * - (E)22 |                   | 89.9            |
| Solenoid Control Relief Valve   | RIS- G03 - * * - * - 11     | 3000              | 22.5            |
|                                 | RIS- G06 - * * - * - 11     |                   | 44.9            |
| Reducing Valve                  | W-(C)G - * 03 - * - 21      | 3000              | 10.6 (5.3) Note |
|                                 | W-(C)G - * 06 - * - 21      |                   | 26.4            |
|                                 | W-(C)G - * 10 - * - 21      |                   | 66.1            |
| Balancing Valve                 | GR- G01 - A * - 20          | 2000              | 5.3             |
|                                 | GR- G03 - A * (B) - 20      |                   | 10.6            |
| Pressure Control Valve          | (C)G - * 03 - * * - 21      | 3000              | 10.6            |
|                                 | (C)G - * 06 - * * - 21      |                   | 26.4            |
|                                 | (C)G - * 10 - * * - 21      |                   | 66.1            |

Note: ( ) value is for pressure range "A", "B" and "C".

### Directional Control Valve

| Valve Name                   | Valve Model for W/G            | Specifications    |               |
|------------------------------|--------------------------------|-------------------|---------------|
|                              |                                | Max. Pressure psi | Max. Flow gpm |
| Right Angle Check Valve      | CA- * 03 - * - 20              | 3000              | 10.6          |
|                              | CA- * 06 - * - 20              |                   | 29.1          |
|                              | CA- * 10 - * - 20              |                   | 84.6          |
| Inline Check Valve           | W-CN - T03 - * - 10            | 3000              | 7.9           |
|                              | W-CN - T06 - * - 10            |                   | 19.8          |
|                              | W-CN - T10 - * - 10            |                   | 50.2          |
| Pilot Check Valve            | CP- * 03 - * - 20              | 3000              | 10.6          |
|                              | CP- * 06 - * - 20              |                   | 29.1          |
|                              | CP- * 10 - * - 20              |                   | 84.6          |
| DMA Type Manual Valve        | W-DMA- G01 - * * - (E)20       | 3000              | 9.3           |
|                              | W-DMA- G03 - * * - (E)10       |                   | 17.2          |
| Manual Valve                 | W-DM- T03 - * * - (B)-10       | 3000              | 11.9          |
|                              | W-DM- T06 - * * - (B)-10       |                   | 26.4          |
| SA Type Solenoid Valve       | SA- G01 - * * - * - (E)30      | 4000              | Note. 22.5    |
|                              | DSA- G04 - * * - * - (E)21     |                   | 66.1          |
|                              | DSA- G06 - * * - * - (E)21     |                   | 132.2         |
| SS Type Solenoid Valve       | SS- G01 - * * - * - (E)30      | 4000              | Note. 22.5    |
|                              | SS- G03 - * * - * - (E)20      |                   | 24.1          |
|                              | DSS- G04 - * * - * - (E)21     |                   | 66.1          |
|                              | DSS- G06 - * * - * - (E)21     | 132.2             |               |
|                              | SS- G01 - * * - FR - * - (E)30 | 3000              | Note. 11.9    |
|                              | SS- G03 - * * - FR - * - (E)20 |                   | 17.2          |
| Fine Solenoid Valve          | SS- G03 - * * - * - (E)10      | 3000              | 18.5          |
|                              | SF- G01 - * * - * - 10 - (E)10 |                   | 2000          |
| Non Leak Type Solenoid Valve | SNH- G01 - * * - * - 10        | 4500              | Note. 4.5     |
|                              | SNH- G03 - * * - * - 10        |                   | 9.0           |
|                              | SNH- G04 - * * - * - 10        |                   | 13.2          |
|                              | SNH- G06 - * * - * - 10        |                   | 22.5          |
| Gauge Valve                  | W- K - * * - 10                | 5000              | --            |
|                              | K2- * 02 - 10                  | 3000              | --            |
|                              | K2- * 03/04 - 10               | 6000              | --            |

Note: Max. flow capacity changes depending on spool type. Flow rating is 85% of standard max. oil flow.

## Subplate/Conversion Chart Valve Specifications for Water - Glycol

### Flow Control Valve

| Valve Name                       | Valve Model for W/G          | Specifications    |               |
|----------------------------------|------------------------------|-------------------|---------------|
|                                  |                              | Max. Pressure psi | Max. Flow gpm |
| Flow Regulator                   | R- * 03 - * - 11             | 3000              | 7.9           |
|                                  | R- * 06 - * - (E)20          |                   | 19.8          |
|                                  | R- * 10 - * - (E)20          |                   | 50.2          |
| FT Type Flow Control Valve       | RI- * G03 - * - (E)10        | 3000              | Note.         |
|                                  | RI- * G06 - * - (E)10        |                   |               |
| F Type Flow Control Valve        | RD- * G03 - * - 11           | 3000              |               |
| TN Type Flow Control Valve       | RD- * G06 - * - 11           | 1500              |               |
|                                  | RCD- T02 - * - 11            |                   |               |
| TS Type Flow Control Valve       | RC- T02 - * - 12             | 1500              |               |
| TL (TLT) Type Feed Control Valve | RC- G02 - * - 21             | 1000              |               |
|                                  | RSA- * 03 - * * * - * * - 13 |                   |               |
|                                  | RSA- * 06 - * * * - * * - 22 |                   |               |

Note: Flow rating is 85% of standard max. oil flow.

### Modular Valve

| Valve Name                   | Valve Model for W/G           | Specifications    |               |
|------------------------------|-------------------------------|-------------------|---------------|
|                              |                               | Max. Pressure psi | Max. Flow gpm |
| Relief Valve                 | OR- G01 - * * - 20 (21)       | 3000              | 7.9           |
|                              | OR- G03 - * * - (E)50         |                   | 17.2          |
|                              | OR- G06 - * * - (E)10         |                   | 31.7          |
| Brake Valve                  | ORO- G01 - * * - 20           | 3000              | 5.3           |
|                              | ORO- G03 - * * - (J)50        |                   | 7.9           |
| Direct Type Relief Valve     | ORD- G01 - * * - 20           | 3000              | 5.3           |
|                              | ORD- G03 - * * - (J)50        |                   | 7.9           |
| Reducing Valve               | OG- G01 - P * - (E)20         | 3000              | 7.9           |
|                              | OGB- G01 - P * - 20           |                   | 7.9           |
|                              | W-OG- G03 - P * - (E)50       |                   | 17.2          |
|                              | W-OG- G06 - P * - (E)12       | 31.7              |               |
|                              | OGS- G01 - P * C - 20         | 1000              | 7.9           |
| Reducing Valve               | OGC- G01 - P * - (E)12        | 3000              | 4.0           |
|                              | OG- G01 - * * - (E)20         |                   | 7.9           |
|                              | OGB- G01 - * * - 20           |                   | 7.9           |
|                              | W-OG- G03 - * * - (E)50       |                   | 17.2          |
| Sequence Valve               | W-OG- G06 - * * - (E)12       | 3000              | 31.7          |
|                              | OCQ- G01 - P2 - 20            |                   | 7.9           |
|                              | OCQ- G03 - P2 * - (J)50       |                   | 17.2          |
| Counter Balance Valve        | OCQ- G06 - P2 * - (E)11       | 3000              | 31.7          |
|                              | OCQ- G01 - * 1 * - 20         |                   | 7.9           |
|                              | OCQ- G03 - * 1 * - (J)50      |                   | 17.2          |
| Flow Regulator               | OCQ- G06 - * 1 * - (E)11      | 3000              | 31.7          |
|                              | OW- G01 - * * - 20            |                   | 7.9           |
|                              | OY- G01 - * - 20              |                   | 7.9           |
|                              | OCY- G01 - P - 20             |                   | 7.9           |
|                              | OCY- G03 - P - (J)50          |                   | 22.5          |
|                              | OCY- G06 - P - 10             |                   | 31.7          |
|                              | OCY- G01 - * - X/Y - 20       |                   | 7.9           |
| OCY- G03 - * - X/Y - (J)50   | 22.5                          |                   |               |
| Flow Control Valve           | OCY- G06 - * - X/Y - 11       | 3000              | 31.7          |
|                              | OF- G01 - P20 - 20            |                   | Note.         |
|                              | OF- G03 - P60 - J50           |                   |               |
|                              | OCF- G01 - * 40 - X/Y - 30    |                   |               |
| Check Valve                  | OCF- G03 - * 60 - X/Y - (J)50 | 3000              |               |
|                              | OC- G01 - * * - 20            |                   | 22.5          |
|                              | OC- G03 - * * - (J)50         |                   | 31.7          |
| Vacuum Check Valve           | OC- G06 - * * - 10            | 3000              | 7.9           |
|                              | OCV- G01 - W - 20             |                   | 17.2          |
| Pilot Check Valve            | OCV- G03 - W - (J)50          | 3000              | 7.9           |
|                              | OCP- G01 - * * - (F) - 21     |                   | 22.5          |
|                              | OCP- G03 - * * - (J)50        |                   | 31.7          |
| D07 Relief Valve             | OCP- G06 - * * - 11           | 4500              | 66.1          |
| D07 Direct Type Relief Valve | ORH- G04 - P * - 10           | 4500              | 10.6          |
| D07 Reducing Valve           | ORH- G04 - D * - 10           | 4500              | 66.1          |
| D07 Counter Balance Valve    | OGH- G04 - * * - 10           | 4500              | 66.1          |
| D07 Flow Regulator           | OQH- G04 - * * - 10           | 4500              | 66.1          |
| D07 Flow Control Valve       | OYH- G04 - * * - 10           | 4500              | Note.         |
| D07 Check Valve              | OFH- G04 - * 200 - X/Y - 10   | 4500              | 66.1          |
| D07 Vacuum Check Valve       | OCH- G04 - * * - 10           | 4500              | 66.1          |
| D07 Pilot Check Valve        | OVH- G04 - W - 10             | 4500              | 66.1          |
|                              | OPH- G04 - * * - 10           | 4500              | 66.1          |

Note: Flow rating is 85% of standard max. oil flow.

## Subplate/Conversion Chart Valve Specifications for Water - Glycol

### Proportional Valve

| Valve Name                              | Valve Model for W/G          | Specifications    |               |
|---|------------------------------|-------------------|---------------|
|   |                              | Max. Pressure psi | Max. Flow gpm |
| Pilot Relief Valve                      | EPR- G01 - * - (E)11         | 4000              | 0.3           |
| Relief Valve                            | ER- G03 - * - (E)10          | 3571              | 10.6          |
|   | ER- G06 - * - (E)10          |                   | 39.7          |
| Reducing Valve                          | W-EBG- G03 - * - (E)10       | 3571              | 10.6          |
|   | W-EBG- G06 - * - (E)10       |                   | 21.2          |
| Flow Control Valve                      | (O)ES- G02 - * - (F) - (E)11 | 3000              | Note.         |
|   | ES- G03 - * - (F) - (E)11    |                   |               |
|   | (C)ES- G06 - 250 - (E)10     |                   |               |
|   | ES- G10 - 500 - (F) - (E)10  |                   |               |
| Load Sensing Type<br>Flow Control Valve | ESR- G03 - 125 - (E)11       | 3571              | Note.         |
|   | ESR- G03 - 125R * - (E)11    |                   |               |
|   | ESR- G06 - 250 - (E)11       |                   |               |
|   | ESR- G06 - 250R * - (E)11    |                   |               |
|   | ESR- G10 - 500 - (E)11       |                   |               |
|   | ESR- G10 - 500R * - (E)11    |                   |               |
| Directional and Flow Control Valve      | ESD- G01 - *** - (E)11       | 3571              | Note.         |
|   | ESD- G03 - *** - (E)11       |                   |               |
|   | ESD- G06 - *** - (E)11       |                   |               |
| Modular Type Reducing Valve             | EOG- G01 - P * - 10          | 3571              | 6.6           |
| Modular Type Flow Control Valve         | EOF- G01 - * 25 - 10         | 3000              | Note.         |

Note: Flow rating is 85% of standard max. oil flow.

## Conversions and Formulas

### Conversions

| TO CONVERT              | INTO      | MULTIPLY BY                                  |
|-------------------------|-----------|--|
| Bar                     | PSI       | 14.5   |
| cc                      | Cu. In.   | 0.06102                                      |
| °C                      | °F        | $(^{\circ}\text{C} \times \frac{9}{5}) + 32$ |
| Kg                      | lbs.      | 2.205  |
| KW                      | HP        | 1.341  |
| Liters                  | Gallons   | 0.2642                                       |
| mm                      | inches    | 0.03937                                      |
| Nm                      | Lb. - ft. | 0.7375                                       |
| N                       | Lbs.      | 0.22481                                      |
| Cu. In.                 | cc        | 16.39  |
| °F                      | °C        | $(^{\circ}\text{F} - 32) / 1.8$              |
| Gallons                 | Liters    | 3.785  |
| HP                      | KW        | 0.7457                                       |
| Inches                  | mm        | 25.4   |
| Lbs.                    | Kg        | 0.4535                                       |
| Lb.-ft.                 | Nm        | 1.356  |
| PSI                     | Bar       | 0.06896                                      |
| In. of HG               | PSI       | 0.4912                                       |
| In. of H <sub>2</sub> O | PSI       | 0.03613                                      |
| Lbs.                    | Nm        | 4.4482                                       |

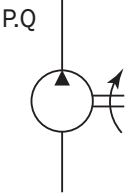
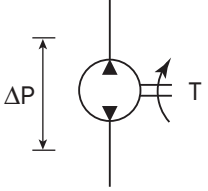
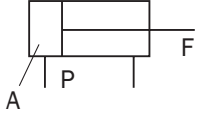
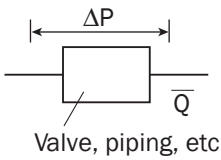
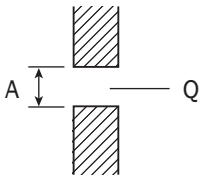
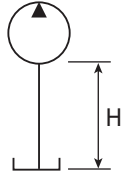
### Formulas

|                  |   |   |
|------------------|---|---|
| <b>CYLINDERS</b> | Cylinder Area = diameter <sup>2</sup> x .7854   | Tube Area = $\frac{\text{GPM} \times .3208}{\text{oil velocity}}$                                 |
|                  | Cylinder Force = pressure x area  | Adjust GPM on Return = $\frac{\text{cyl area} \times \text{GPM}}{\text{area}}$                    |
|                  | Cylinder Time (in seconds) = $\frac{\text{area} \times \text{stroke} \times .26}{\text{GPM}}$ | Cylinder Speed (Ft/Min) = $\frac{\text{stroke} \times 5}{\text{time (in secs)}}$                  |
|                  | Pneumatic HP = $\frac{\text{compressed CFM} \times \text{PSI} \times 144}{33,000}$            | Cylinder Speed (Ft/Min) = $\frac{\text{GPM} \times 19.25}{\text{area}}$                           |
|                  | Cylinder HP = $\frac{\text{cyl speed} \times \text{cyl force}}{33,000}$                       | Comp CFM = $\frac{\text{area} \times \text{stroke} \times 60}{\text{time (in secs)} \times 1728}$ |

|                     |  |  |
|---------------------|--|--|
| <b>PUMPS MOTORS</b> | HP Out = $\frac{\text{HP IN} \times \text{overall Eff.}}{100}$               | GPM = $\frac{\text{RPM} \times \text{disp. (in inches)}^3}{231}$               |
|                     | Actual Torque = $\frac{\text{theo. torque} \times \text{mech. eff.}}{100}$   | Hyd. HP = $\frac{\text{GPM} \times \text{PSI}}{1714}$                          |
|                     | Actual Motor RPM = $\frac{\text{theo. RPM} \times \text{vol. eff.}}{100}$    | Torque (in lbs.) = $\frac{\text{PSI} \times \text{disp. (in inches)}^3}{6.28}$ |
|                     | Overall Efficiency = $\frac{\text{mech. eff.} \times \text{vol. eff.}}{100}$ | Torque (in lbs.) = $\frac{\text{HP} \times 63025}{\text{RPM}}$                 |
|                     | Actual Pump GPM = $\frac{\text{theo. GPM} \times \text{vol. eff.}}{100}$     |  |

|  |   |
|--|---|
| <b>VEHICLE SIZING</b>                                | RPM = $\frac{\text{MPH} \times 168}{\text{LR}}$ |
|  | Torque = TE x LR                                |
|  | Wheel Slip Torque = WD x ADC x LR               |
|  | TE = RR + GR + DP                               |
|  | RR = $\frac{\text{GVW} \times \text{R}}{1000}$  |
| GR = $\frac{\% \text{Grade} \times \text{GVW}}{100}$ |   |

|               |                             |                                    |
|---------------|-----------------------------|------------------------------------|
| <b>LEGEND</b> | G = Gear Reduction Ratio    | GR = Grade Resistance              |
|               | LR = Load Radius            | DP = Draw Bar Pull Desired         |
|               | TE = Tractive Effort        | TE = RR + GR + DP                  |
|               | WD = Weight on Drive Wheels | R = Rolling Resistance Coefficient |
|               | ADC = Adhesion Coefficient  | GVW = Gross Vehicle Weight         |
|               | RR = Rolling Resistance     |                                    |

|                                | Item   | SI units   | Power (engineering) units   |
|--------------------------------|--|--|---|
| Requirement                    |                               | $hp = \frac{PQ}{1714 \times \eta}$ <p>           L : Power Requirement [hp]<br/>           P : Discharge Pressure [psi]<br/>           Q : Discharge Rate [gpm]<br/> <math>\eta</math> : Pump Efficiency         </p>  | $hp = \frac{PQ}{1714 \times \eta}$ <p>           L : Power Requirement [hp]<br/>           P : Discharge Pressure [psi]<br/>           Q : Discharge Rate [gpm]<br/> <math>\eta</math> : Pump Efficiency         </p>   |
| Oil Motor Output Torque        |                               | $T = \frac{PQ \times 36.77}{RPM}$ <p>           T : Output Torque [in lbs]<br/>           P : Inlet/Outlet Pressure Differential [psi]<br/>           Q : Discharge rate [gpm]<br/> <math>\eta</math> : Torque Efficiency         </p>   | $T = \frac{\Delta P q}{200 \times \eta} \times \eta$ <p>           T : Output Torque [kgf·m]<br/> <math>\Delta P</math> : Inlet/Outlet Pressure Differential [kgf/cm<sup>2</sup>]<br/>           q : Volume per Oil Motor Turn [cm<sup>3</sup>]<br/> <math>\eta</math> : Torque Efficiency         </p>   |
| Cylinder Output                |                               | $F = PA \eta$ <p>           F : Cylinder Force [lbs]<br/>           P : Working Pressure [psi]<br/>           A : Cylinder Contact Area [in<sup>2</sup>]<br/> <math>\eta</math> : Cylinder Efficiency         </p>   | $F = P \times A \times \eta$ <p>           F : Cylinder Output [kgf]<br/>           P : Working Pressure [kgf/cm<sup>2</sup>]<br/>           A : Cylinder Contact Area [cm<sup>2</sup>]<br/> <math>\eta</math> : Cylinder Efficiency         </p>   |
| Pressur Loss Conversion Energy |  <p>Valve, piping, etc.</p> | $H = 60 \times P \times Q$ <p>           H : Heat Release [kJ/h]<br/>           P : Pressure Loss [MPa]<br/>           Q : Flow Rate [ℓ / min]         </p>  | $H = 1.4 \times P \times Q$ <p>           H : Heat Release [kcal/h]<br/>           P : Pressure Loss [kgf/cm<sup>2</sup>]<br/>           Q : Flow Rate [ℓ / min]         </p>   |
| Orifice Flow                   |                             | $Q = 29.81 CA^2 \sqrt{\frac{\Delta P}{S}}$ <p>           Q : Flow Rate [gpm]<br/>           C : Compressible Flow Coefficient [Dimensionless]<br/>           A : Passage Area [Dia. in<sup>2</sup>]<br/> <math>\Delta P</math> : Pressure Differential [psi]<br/>           S : Sp. Gr.         </p> | $Q = CA \sqrt{\frac{2g \Delta P}{\gamma}} \times 0.06$ <p>           Q : Flow Rate [ℓ / min]<br/>           C : Compressible Flow Coefficient [Dimensionless] (≈0.6)<br/>           A : Passage Area [cm<sup>2</sup>]<br/>           g : Gravitational Acceleration [980cm/s<sup>2</sup>]<br/> <math>\Delta P</math> : Pressure Differential [kg/cm<sup>2</sup>]<br/> <math>\gamma</math> : Specific Gravity [kg/cm<sup>3</sup>] (≈0.87×10<sup>-3</sup>)         </p> |
| Pressure Loss                  |                             | $\Delta P = \rho \times g \times H \times 10^{-6}$ <p> <math>\Delta P</math> : Pressure Loss [MPa]<br/> <math>\rho</math> : Density [kg/m<sup>3</sup>]<br/>           g : Gravitational Acceleration [9.8m/s<sup>-2</sup>]<br/>           H : Height [m]         </p>                                | $\Delta P = \gamma \times g \times H \times 10^{-4}$ <p> <math>\Delta P</math> : Pressure Loss [kg/m<sup>-2</sup>]<br/> <math>\gamma</math> : Specific Gravity [kg/cm<sup>3</sup>]<br/>           H : Height [m]         </p>   |

Note: When performing calculations, make sure that you first convert values correctly. Cutting off and rounding up values can cause differences in calculation results.







**P**

|                    |             |
|--------------------|-------------|
| PHV-1B-12***(*)-10 | M-1         |
| PHV-2B-20***(*)-10 | M-4         |
| PHV-3B-35***(*)-11 | M-7         |
| PHV-4B-60***(*)-10 | M-10        |
| PJF-10300E         | A-34        |
| PJF-10400E         | A-34        |
| PJF-10500E         | A-34        |
| PJF-10600E         | A-34        |
| PJF-10300T         | A-34        |
| PJF-10400T         | A-34        |
| PJF-10500T         | A-34        |
| PJF-10600T         | A-34        |
| PSF-101000         | A-18        |
| PSF-102000         | A-18        |
| PVS-0B-8**E30      | A-03        |
| PVS-1B-16**(*)E13  | A-03        |
| PVS-1B-22**(*)E13  | A-03        |
| PVS-2B-35**(*)E13  | A-03        |
| PVS-2B-45**(*)E20  | A-03        |
| PZ-2B-*35E*A-11    | A-36        |
| PZ-2B-*45E*A-11    | A-36        |
| PZ-3B-*70E*A-10    | A-36        |
| PZ-4B-*100E*A-10   | A-36        |
| PZ-5B-*130E*A-10   | A-36        |
| PZ-6B-*180E*A-20   | A-36        |
| PZ-6B-*220E*A-20   | A-36        |
| PZF-4-T-10         | A-42        |
| PZF-6-T-10         | A-42        |
| PZM-3-10           | A-42        |
| PZM-4-10           | A-34 · A-42 |
| PZMK-SAE A         | A-27        |
| PZMK-SAE A 5/8     | A-27        |
| PZS-3B-70**E10     | A-22        |
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