NACHI

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Standard Hydraulic Equipment

NACHI-FUJIKOSHI CORP.

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NACHI
Standard Hydraulic Equipment

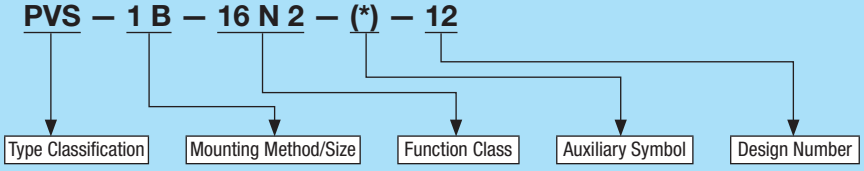
Using the NACHI Standard Hydraulic Equipment Catalog

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



(Note)Design numbers are always two digits.
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 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.

Danger	This type of precaution indicates a condition in which incorrect handling creates the immediate risk of death or serious personal injury.
Warning	This type of precaution indicates a condition in which incorrect handling creates the risk of death or serious personal injury.
Caution	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
- Industrial Safety and Health Act
- The Fire Laws

■ Hydraulic Operating Fluid Precautions

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

Danger	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.
Caution	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.)
Caution	Use the proper type of hydraulic operating fluid, ensuring that oil 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.
Caution	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 fluid for oxidation, deterioration, and moisture, and replace the hydraulic operating fluid whenever these levels exceed the recommended values of the fluid manufacturer.
Caution	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.
Caution	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 rough skin.
Caution	Before replacing the hydraulic operating fluid, allow the fluid in the system to cool sufficiently. Hot fluid creates the risk of burn injury.
Caution	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

Warning	Always leave product installation, removal, piping, wiring, and other work up to specialists.
Warning	Never attempt any unauthorized modification of the hydraulic system or control circuit.
Warning	Never attempt any unauthorized modification of the setting values of the pressure and flow rate with adjusting devices.
Caution	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.
Caution	Whenever suspending a product, make sure that you use all of the attached eye plates or eye bolts. Using any other method (such a using a single eye plate) to suspend the product creates the risk of it falling.

1. Checking the Product Model Number

Danger	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.
Caution	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, drop down, 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	• Be sure to perform sufficient flushing. • Anchor pipe supports to a secure surface. • Use pipe that has a sufficient pressure rating. (The rated pressure of the pipe should be quadruple the pressure that you plan to be using.) • The finish of the O-ring seal surface should be within the equivalent of 6.3S. Make sure there is no scratch, etc.

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.

6. Valve, Pump, and Motor Installation

Caution	Make sure installation holes and surfaces are clean. Insufficient tightening torque for bolt 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 observer 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.
Caution	Check to make sure the check valve is attached in the correct direction. Attaching the check valve in the incorrect direction may create abnormal pressure.

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.
Warning	When using a pump that has a pressure compensation function, piping capacity and additional conditions may delay the pump's response and cause pressure surges. Install a surge-cutting relief valve to limit the maximum pressure in the circuit if the surge pressure could exceed the maximum pressure of the hydraulic piping and hydraulic equipment.

8. 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.

■ Precautions During a trial operation

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 nor 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 with 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 anyother 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

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 0.5 to 1.5MPa). 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 machinery, perform the sequence operation and automatic operation. Trying to perform the sequence operation and automatic operation for the initial operation creates the risk of unexpected accident and breakdown.

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.

5. Valve Control

All Valves

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. • An incorrect switching direction can cause reverse operation of the actuator and create the risk of unexpected accident and breakdown.
Warning	Make sure you understand the hydraulic circuit diagram and flow control valve structure before performing any operation. • Sudden operation can change the operating speed of the actuator and create the risk of unexpected accident or breakdown.

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 oil temperature, fluid level, and fluid color (for discoloration and deterioration) everyday. Any abnormalities create the risk of malfunction and breakdown.
Caution	Whitish 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 prevention, lubrication, and anti-forming tendency. Deteriorated operating fluid creates the risk of malfunction and breakdown. As a general standard, replace operating fluid at least once a year.

2. Hydraulic Pumps

Caution	High temperature on the surface of pump indicates the possibility of malfunction and breakdown. Immediately shut down the pump and investigate the causes.

3. Fluid Leakage

Warning	Leakage from welding seam of piping, from a hydraulic pump, from hydraulic machinery, or from other sources creates the risk of serious accident. Always be cautious about the leakage strictly.

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 without filter elements.

5. Pressure Gauges

Caution	Always be sure to tighten the gauge cock whenever you do not need to check the pressure gauge. Vibration of the pointer can damage the pressure gauge.

6. Tank

Caution	It depends on the contamination level of the hydraulic fluid to make an inspection inside the tank. As a general standard, the tank should be emptied and cleaned up once a year.

7. Hydraulic Devices

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 60°C. Install a fan cooler to allow proper intake, outflow, and flow of cooling air.

■ Handing Precautions During Non-use

Caution	If the system will not be operated for long periods, be sure to take proper anti-rust measures. • Not operating the system for long periods without taking anti-rust measures creates the risk of malfunction and breakdown due to rust. • Be sure to flush the system before using it again after a long period of non-use. Failure to flush out anti-rust oil creates the risk of malfunction and breakdown.

■ Disassembly and Inspection Work Precautions

Warning	Never attempt to modify or reassemble valves, pumps, or motors. If not, it may cause the insufficient performance, and creates the risk of malfunction and breakdown.
Warning	All disassembly and inspection should be left up to persons with 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 electricity. If not, it creates the risk of unexpected accident such as actuator runs out of control, electric shock, etc.
Warning	Electricity work while turning on the power 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, the arbitrary movement of actuator, 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. If so, it 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	During reassembly, failure to tighten to proper torque and contaminants getting into piping creates the risk of malfunction and breakdown. • Take care to ensure that the tightening torque is at prescribed level and equal level. • Take care that sealing materials, welding scales, and other contaminants do not get inside of piping.
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 starting the first operation.

■ Storage Precautions

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

Standard Hydraulic Equipment ◎ Contents

E Solenoid Valve

F Pressure Control Valve

G Flow Control Valve

H Direction Control Valve

I Electro-hydraulic control valve

J Hydro-logic Valve

K Hydraulic Cylinder

L Hydraulic Unit

M Hydraulic Accessories

N Technical data

O Model No. Index

NACHI Hydraulic Pumps

Features

①NACHI-FUJIKOSHI guarantees the high quality and performance on all products through finishing with our unique and precise machining technology based on the selected material and traditional heat treatment.
②Noise 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.
③Attention 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 fluid.

Installation and Maintenance

①Limit the eccentricity between the drive shaft and hydraulic pump shaft to 0.05 mm, keep the angle error within 1° and use flexible couplings for connections.
②On 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.
③Use a rigid mounting base.
④The 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.
⑤Limit the suction pressure to within the range -0.03 to +0.03 MPa {-0.3 to +0.3 kgf/cm^2}.
⑥On 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 0.03 MPa {0.3 kgf/cm^2}.
⑦When connecting steel pipes to the suction and discharge sides, Never apply the abnormal force to the pump by the piping.
⑧Keep the fitting 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.
⑨When 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.
⑩Connect to the suction port above the horizontal to keep oil inside hydraulic pumps.
⑪Provide an air bleed valve in circuits where it is difficult to release air at startup.
⑫Be sure to use only specified bolts on hydraulic pumps. Use bolts of 12.9 strength classification or equivalent.

Uni-pumps

Uni-pumps are compact pump/motor units which have a motor directly coupled to the hydraulic pump. Variable 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)
  0.4 kW to 4P or less: Class E insulation
  0.75 kW to 4P or more: Class B insulation
  Voltage 200V…50/60 Hz
  220V…60 Hz

Management of Hydraulic Operating Fluid

①Use mineral oil-based hydraulic operating fluid.
②Provide a suction filter of about 100 to 150 mesh on the suction port.
③When 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 25μm or less.
④Consult your agent when using fireresistant 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.
⑤For details on the viscosity of hydraulic operating fluid, refer to the separate section "Hydraulic Operating Fluid."

Terms Used in This Catalog

The following describes the meanings of the following 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 thread type 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 Motor

1.Pump discharge flow rate

$$Qp=\frac{q\cdot N\cdot \eta v}{1000}\ (\ell/\text{min})$$

q=discharge volume per rotation (cm^3/rev)
N=revolution speed(min^{-1})
ηv=volume efficiency

2.Power required for pump drive

$$W_{P1}=\frac{P\cdot Qp}{60\eta}\ (\text{kW})$$

$$=\frac{P\cdot Qp}{44\eta}\ (\text{PS})$$

P=discharge pressure(MPa)
η=overall efficiency

3.Motor revolution speed

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

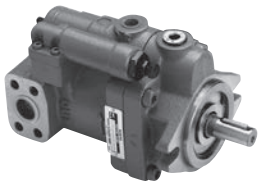
f=frequency(50Hz, 60Hz)
P=number of motor poles
S=slip rate

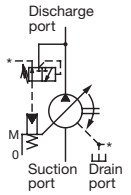
Hydraulic Pump Selection Table

Pump Type	Name	Type Classification	Rated Pressure MPa {kgf/cm²}	Displacement cm³/rev (1 2 5 10 20 50 100 200 500 1000 2000 5000)	Page
Variable piston pumps	PVS series variable piston pump	PVS	21 {214}	3 – 45	A-3
	Uni-pump	UPV	21 {214}	3 – 45	A-19
	PZS series variable piston pump	PZS	21 {214}	42 – 220	A-22
	PZ load-sensitive variable piston pump	PZ	21 {214}	8 – 220	A-35
Variable discharge volume vane pumps	VDS series compact variable vane pump	VDS	7 {71.4}	3 – 8.3	B-1
	Uni-pump	USV	7 {71.4}	3 – 8.3	B-4
	VDR22 design series variable vane pump	VDR	14 {143}	5 – 44.4	B-6
	Uni-pump	UVD	7 {71.4}	5 – 33.3	B-12
	VDR13 design series variable vane pump	VDR	6 {61.2}	4 – 27.8	B-15
	Uni-pump	UVD	6 {61.2}	4 – 27.8	B-22
	VDC series high-pressure variable vane pump	VDC	14 {143}	5 – 88.9	B-25
	Uni-pump	UVC	7 {71.4}	5 – 33.3	B-37
	UVN series variable vane uni-pump	UVN	8 {81.6}	8.1 – 26.0	B-40
Internal gear pump	IPH series IP pump	IPH	25 {255}	3.6 – 125.9	C-1
	IPH series double IP pump	IPH	21 {214}	7.2 – 251.8	C-14

PVS Series Variable Volume Piston Pumps

8.0 to 45.0cm³/rev
21MPa





- **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 cm³/rev	Discharge volume at no-load ℓ/min				Pressure adjustment range MPa {kgf/cm²}	Permitted peak pressure MPa {kgf/cm²}	Rotating speed min⁻¹		Mass kg
		1000min⁻¹	1200min⁻¹	1500min⁻¹	1800min⁻¹			Min.	Max.	
PVS-0B-8*0-30 1 2 3	8.0 (3.0 to 8.0)	8.0	9.6	12.0	14.4	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143 } 3 to 21 {30.6 to 214 }	25 {255}	500	2000	7.7
PVS-1B-16*0-(*)-12 1 2 3	16.5 (5.0 to 16.5)	16.5	19.8	24.7	29.7	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143 } 3 to 21 {30.6 to 214 }	25 {255}	500	2000	10.5
PVS-1B-22*0-(*)-12 1 2 3	22.0 (7.0 to 22.0)	22.0	26.4	33.0	39.6	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143 } 3 to 21 {30.6 to 214 }	25 {255}	500	2000	10.5
PVS-2B-35*0-(*)-12 1 2 3	35.0 (8.0 to 35.0)	35.0	42.0	52.5	63.0	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143 } 3 to 21 {30.6 to 214 }	25 {255}	500	2000	21
PVS-2B-45*0-(*)-12 1 2 3-(*)-20	45.0 (11.0 to 45.0)	45.0	54.0	67.5	81.0	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143 } 3 to 21 {30.6 to 214 }	25 {255}	500	2000	21

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 0.05 mm, and keep the angle error within 1°.
3. Set the length of insertion between coupling 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 -0.03 MPa or more (suction port flow velocity within 2 m/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 fluid. Also, observe the values in the following table to limit the drain back pressure to 0.1 MPa.

Item \ Model No.	PVS-0B PVS-1B	PVS-2B
Pipe joint size	3/8" or more	1/2" or more
Pipe I.D	ϕ7.6 dia ormore	ϕ12 dia ormore
Pipe length	1m or less	1m or less

7. Mount the pump so the pump shaft is oriented horizontally.

●Management of Hydraulic Operating Fluid

1. Use good-quality hydraulic operating fluid, and use within a kinematic viscosity range of 20 to 200 mm²/sec during operation. Use an R&O type and anti-wear hydraulic fluid of ISO-VG32 to 68. The optimum kinematic viscosity during operation is 20 to 50 mm²/sec.
2. The operating temperature range is 5 to 60°C. When the oil temperature at start-up is 5°C or less, warm up the hydraulic pump by low-pressure, low-operation speed operation until the oil temperature reaches 5°C.
3. Provide a suction strainer with a filtering grade of about 100μm (150 mesh). Besure to provide a return line filter of grade 20μm or less on the return line to the tank. (When the hydraulic pump is used at ahigh pressure of 14 MPa 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 0 to 60°C.

(continued on following page)

●Inverter Drive Precautions

1 Set the revolution speed within the range of the pump specification revolution speed.

2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

●Cautions at Startup

1 Before you start pump operation, fill the pump body with clean hydraulic fluid via the lubrication port.

Model No.	Injection amount cm^3
PVS-0B-8	220
PVS-1B-16, 22	300
PVS-2B-35, 45	650

2 An unload is required when the motor is started under condition λ–Δ. 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.

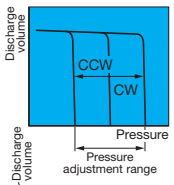
4 Air entering to the pump or pipes may cause noise or vibration. At startup, set the pump discharge side to a no-load state, and operate the pump in the inching mode to release any air in the pump or pipes.

5 Provide an air bleed valve in circuits where it is difficult to release air at start-up.
(See "IP Pumps" on page C-13.)

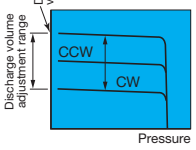
●How to Set Pressure and Discharge Volume

For the factory default pump discharge volume is set to "maximum" and 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)
N*Q* : 2-pressure, 2-flow rate control
$R^{*}_{S}^{A}$ ⊛ : Solenoid cutoff control
$W^{*}_{S}^{A}$ ⊛ : 2-pressure control
$RQ^{*}_{S}^{A}$ ⊛ : 2-pressure, 2-flow rate control w/ solenoid cutoff
$C^{*}_{S}^{A}$ ⊛ : 2-cutoff control

● * : Pressure adjustment range
0 : 2 to 3.5MPa {20.4 to 35.7kgf/cm^2}
1 : 2 to 7MPa {20.4 to 71.4kgf/cm^2}
2 : 3 to 14MPa {30.6 to 143kgf/cm^2}
3 : 3 to 21MPa {30.6 to 214kgf/cm^2}

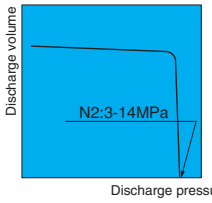
●⊛ : Applicable to solenoid specifications A, S
A⊛: SA-G01
S⊛: SS-G01
1 : 100V 50/60Hz
2 : 200V 50/60Hz
3 : DC12V
4 : DC24V

Explanation of model No.

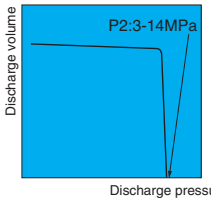
PVS – 1 B – 16 N 2 – (*) – 12

- 12: Design No. 30: PVS-0*, 12: PVS-1*, PVS-2*, 20: PVS-2*-45N3 only
- (*): Auxiliary symbol None: Side port type, Z: Axial port type (PVS-1*, PVS-2*)
- 2: Pressure adjustment range [Note] Reference
- N: Variable control mechanism [Note] Reference
- 16: Max. pump capacity (cm^3/rev) Nominal 8, 16, 22, 35, 45
- B: Mounting method — B: Mounting flange type, A: Mounting foot type
- 1: Pump size 0, 1, 2
- PVS: PVS series variable piston pump

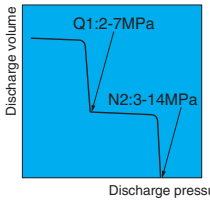
[Example 1]
N*: Pressure compensation type (manual mode)
PVS-1B-16N2



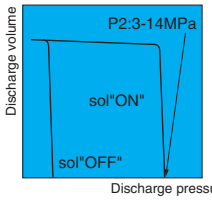
[Example 2]
P*: Pressure compensation type (remote control mode)
PVS-1B-16P2



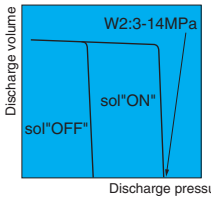
[Example 3]
N*Q*: 2-pressure, 2-flow rate control
PVS-1B-16N2Q1



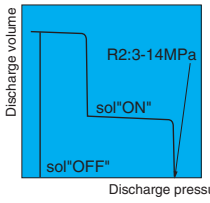
[Example 4]
R*S*: Solenoid cutoff control
PVS-1B-16R2S2
Solenoid specifications
200V 50/60Hz
SS-G01



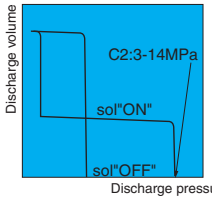
[Example 5]
W*S*: 2-pressure control
PVS-1B-16W2S1
Solenoid specifications
100V 50/60Hz
SS-G01



[Example 6]
RQ*S*: 2-pressure, 2-flow rate control w/ solenoid cutoff
PVS-1B-16RQ2S1
Solenoid specifications
100V 50/60Hz
SS-G01



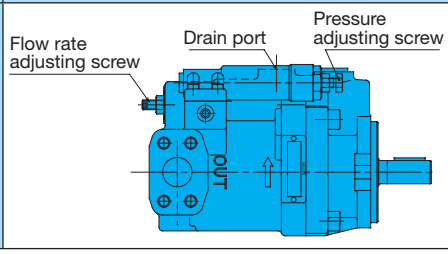
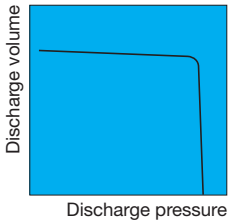
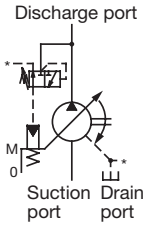
[Example 7]
C*S*:
2-cutoff control
PVS-1B-16C2S2
Solenoid specifications
200V 50/60Hz
SS-G01



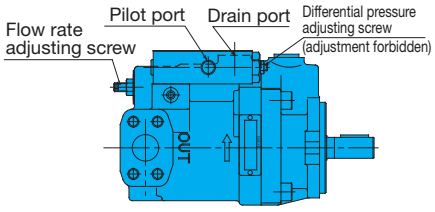
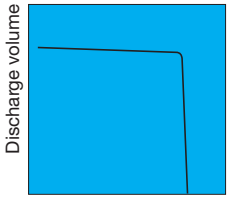
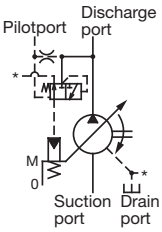
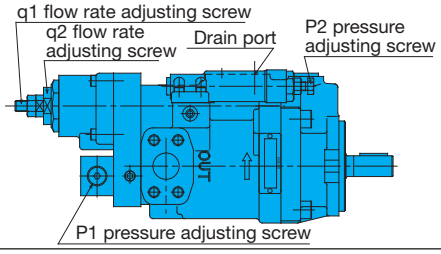
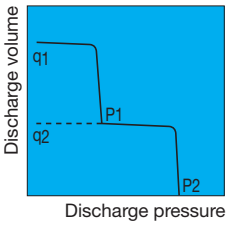
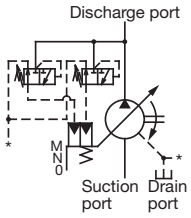
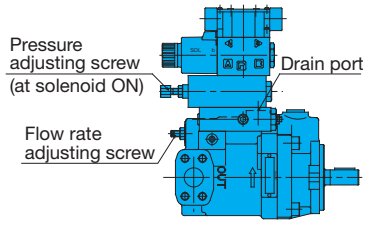
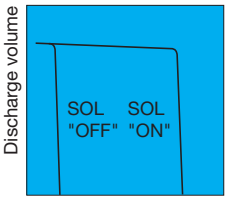
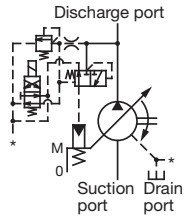
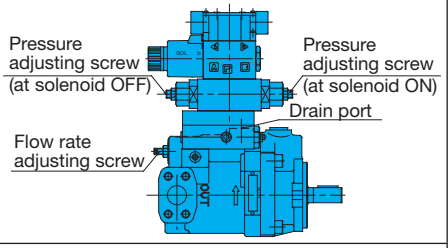
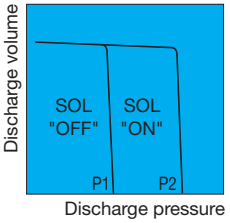
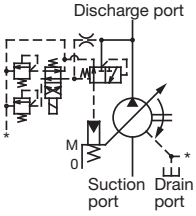
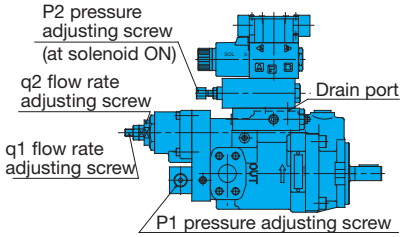
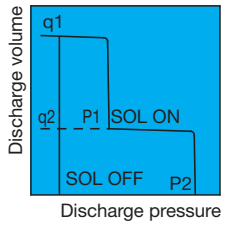
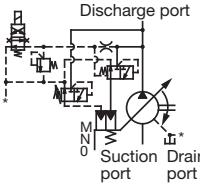
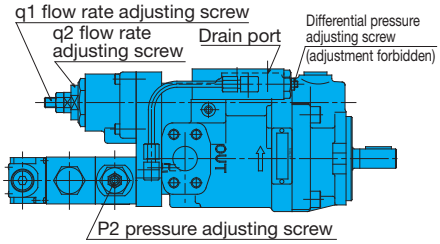
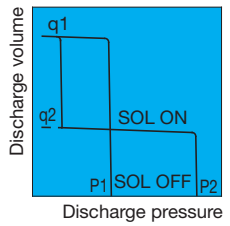
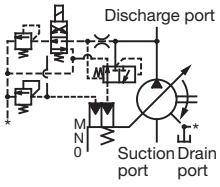
■ NQ, RS, WS, RQS and CS types are not available for the PVS-0B-8.
■ NQ, RQS and CS types are not available for the PVS-1B-$^{16}_{22}$-Z and PVS-2B-$^{35}_{45}$-Z.

Variable Control Mechanisms

Standard type

Symbol	External View	Characteristics	Hydraulic Circuit	Explanation
N				Pressure compensation type (manual system) When the discharge pressure reaches the preset pressure set by the pressure compensator, the discharge rate is automatically reduced to hold the pressure at the set pressure (full cutoff pressure).

Option type

P				Pressure compensation type (remote control mode) This mode demonstrates the same characteristics as the manual mode. The full cutoff pressure can be adjusted by external pilot pressure. The discharge rate can be adjusted manually. Note 2)
NQ				2-pressure, 2-flow rate control type 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.
RS (RA)				Solenoid cutoff control type 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)				2-pressure control type Two pressure compensation types can be obtained by switching the solenoid valve ON/OFF. Two types of pressure control are possible with the actuator set to a constant speed.
RQS (RQA)				2-pressure, 2-flow rate control type w/ solenoid cutoff 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)				2-cutoff control type Two types of pressure - flow rate characteristics can be obtained by the solenoid valve and cylinder mounted on the pump.

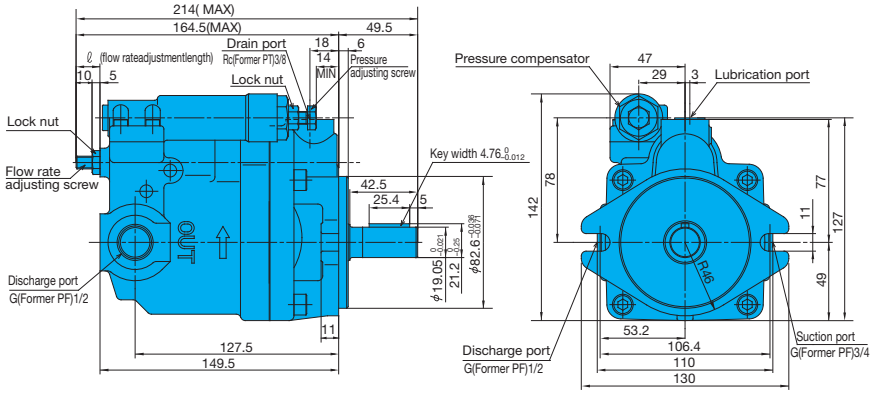
Note 1) Many other variable control mechanism are also available in addition to those in the above table. Please consult your agent for details.
Note 2) We recommend ZR-T02-*-5895* as the remote control valve. For details, consult your agent. The pipe volume up to the remote control valve should be less than 150cm^3.

Pressure Compensation Type

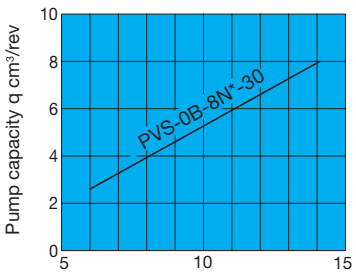
Manual mode: standard type

PVS-0B-8N*-30

Installation Dimension Drawing



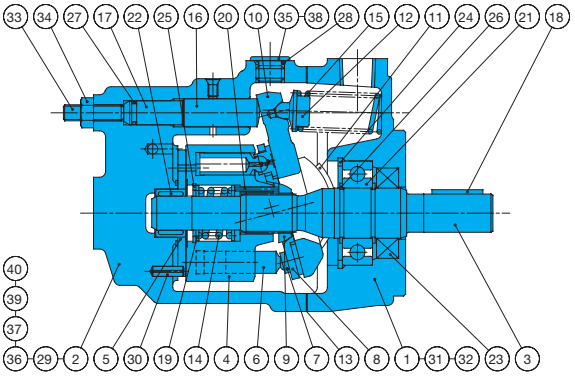
PVS-0B-8N*-30



Flow rate adjustment length ℓ mm

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		
6	Piston	20	Needle	33	Hexagon socket set screw
7	Shoe	21	Ball bearing		
8	Shoe holder	22	Needle bearing	34	Hexagon nut
9	Barrel holder	23	Oil seal	35	Hexagon plug
10	Swash plate	24	Snap ring	36	Metal plug
11	Thrust bush	25	Snap ring	37	Nameplate
12	Spring holder	26	Snap ring	38	Lubrication port plate
13	Gasket	27	O-ring	39	CAUTION plate
14	Spring C	28	O-ring	40	Rivet

List of Sealing Parts (Kit Model Number PSCS-100000)

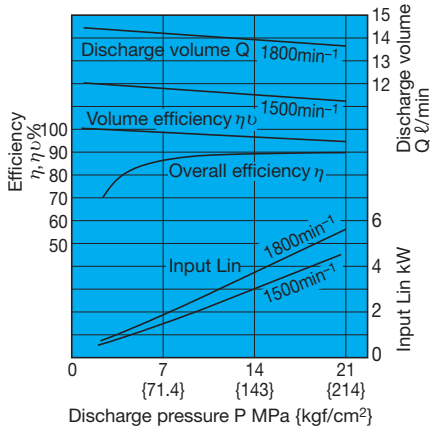
* Part No.	Part Name	Q'ty	PVS-0B-8	
			Size	Remarks
13	Packing	1	PSC46-100000	3 Bond
23	Oil seal	1	TCV-254511-V	N.O.K
27	O-ring	1	NBR-90 P9	JIS B 2401
28	O-ring	1	NBR-90 P11	JIS B 2401

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

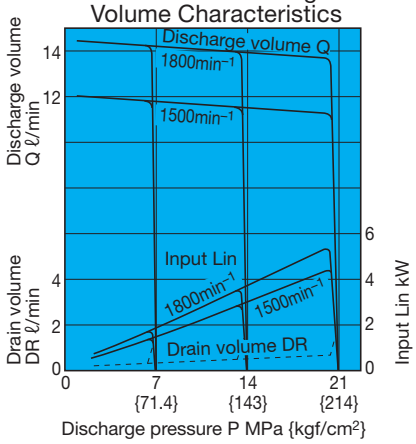
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

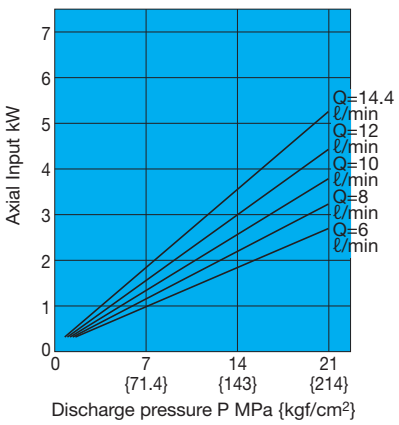
General Performance



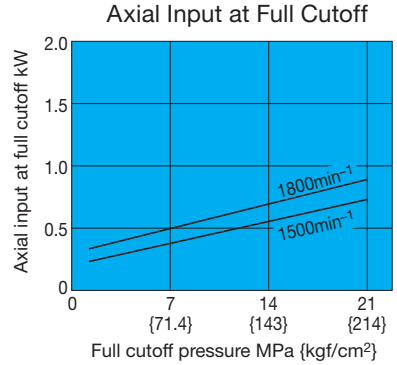
Pressure - Discharge Volume Characteristics



Axial Input

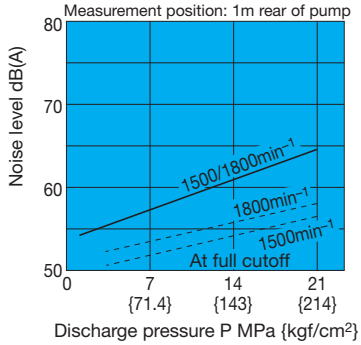


Axial Input at Full Cutoff



Noise Characteristics

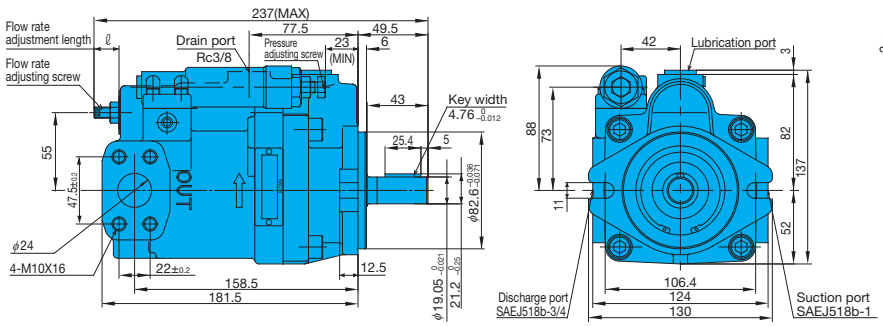
Measurement position: 1m rear of pump



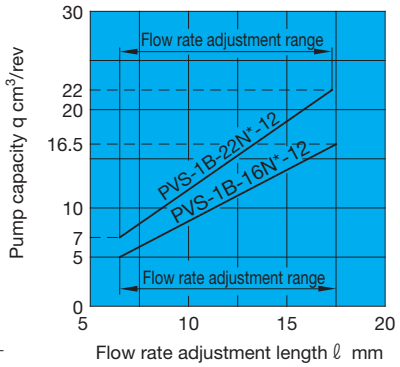
Installation Dimension Drawings

PVS-1B-$^{16}_{22}$N*-(Z)-12

(side port type)

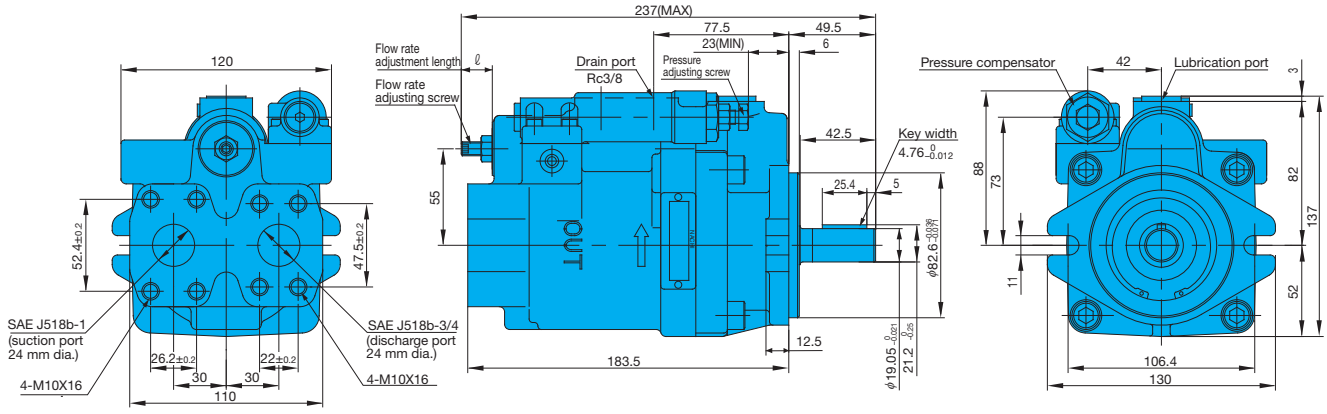


Relationship between flow rate adjustment length (ℓ) and pump capacity (q)

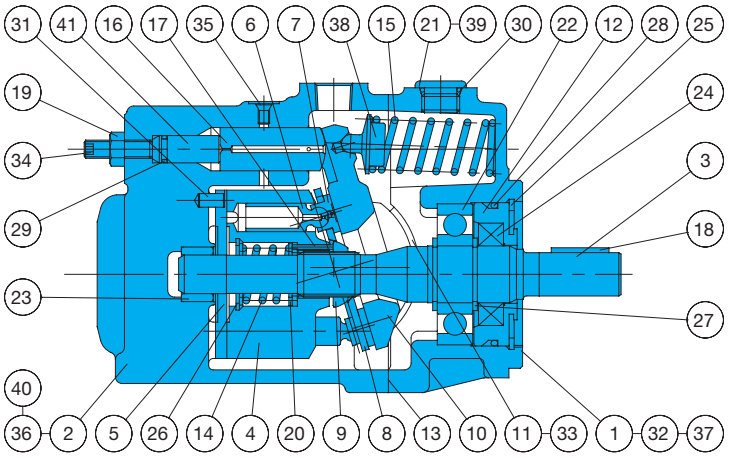


Set a flow rate adjustment length within the above range. Oil will leak if the pump is operated below the adjustment range lower limit.

(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		
14	Spring C	34	Hexagon socket set screw
15	Spring S	35	Metal plug
16	Control piston	36	Nameplate
17	Needle	37	CAUTION plate
18	Key	38	Spring holder
19	Nut	39	Lubrication port plate
20	Retainer	40	Rivet
21	Plug	41	Guide pin

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

Part No.	Part Name	Q'ty	Size	Remarks
* 13	Gasket	1	PSC46-101000	Nihon Gasket
24	Oil seal	1	TCN-254511-V	N.O.K
28	O-ring	1	NBR-90 G55	JIS B 2401
29	O-ring	1	NBR-90 P9	JIS B 2401
30	O-ring	1	NBR-90 P14	JIS B 2401

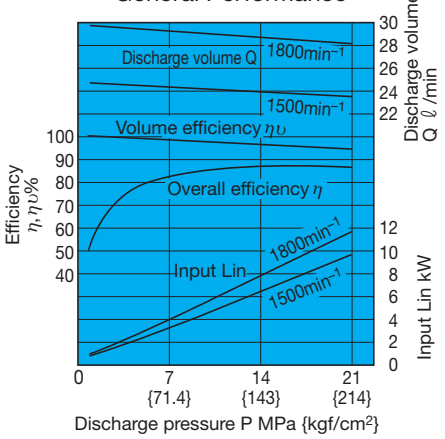
Parts marked by an asterisk "*"are not available on the market. Consult your agent.

Performance Curves

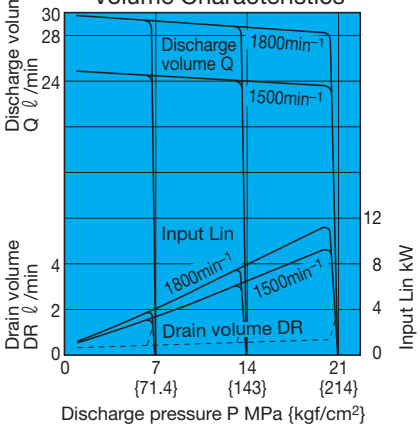
Typical characteristics at hydraulic fluid kinematic viscosity of 32 mm²/s

PVS-1B-16N*-(Z)-12

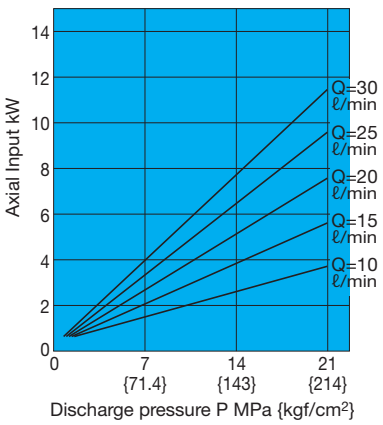
General Performance



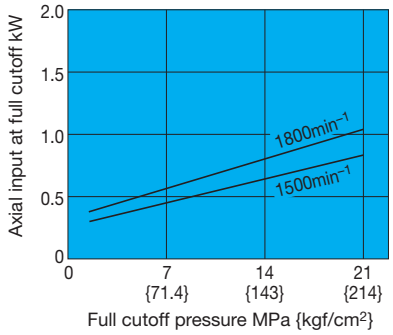
Pressure - Discharge Volume Characteristics



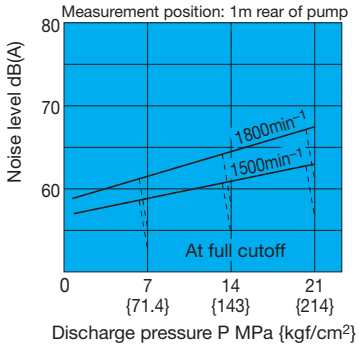
Axial Input



Axial Input at Full Cutoff



Noise Characteristics

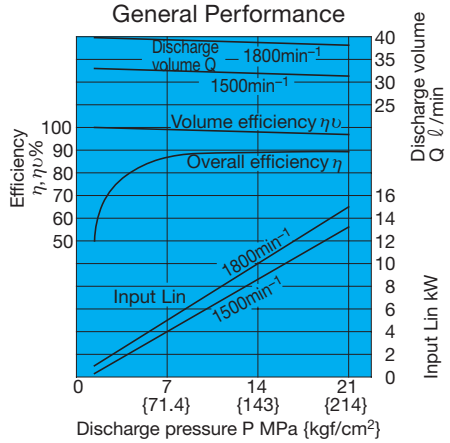


Performance Curves

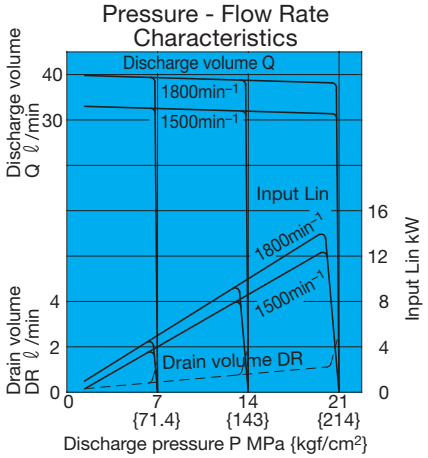
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

PVS-1B-22N*-(Z)-12

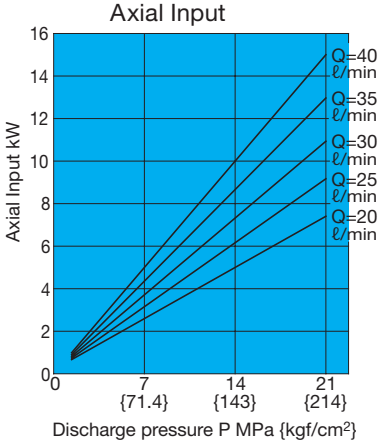
General Performance



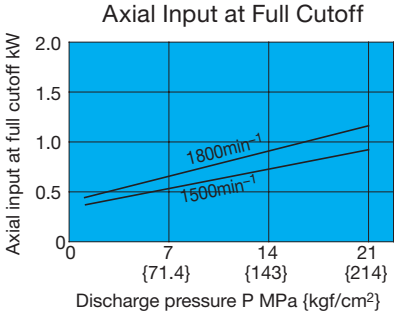
Pressure - Flow Rate Characteristics



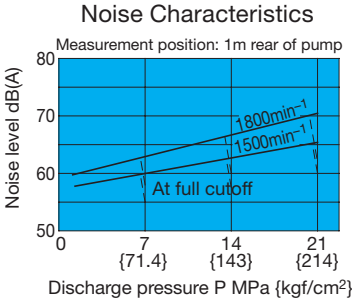
Axial Input



Axial Input at Full Cutoff



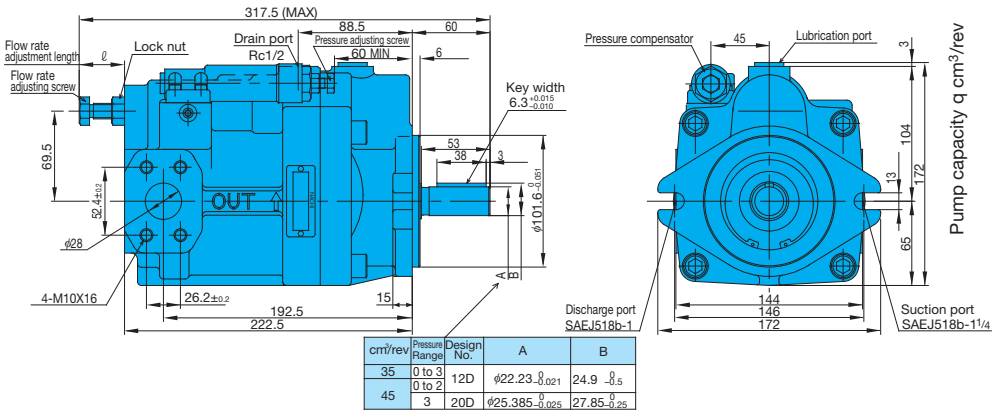
Noise Characteristics



Installation Dimension Drawings

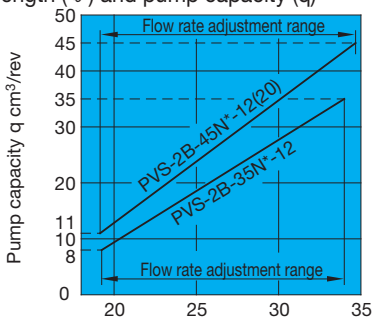
PVS-2B-$\frac{35}{45}$N*-(Z)-12(20)

(side port type)



cm³/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 $^{0}_{-0.021}$	24.9 $^{0}_{-0.5}$
45	0 to 2			
	3	20D	φ25.385 $^{0}_{-0.025}$	27.85 $^{0}_{-0.25}$

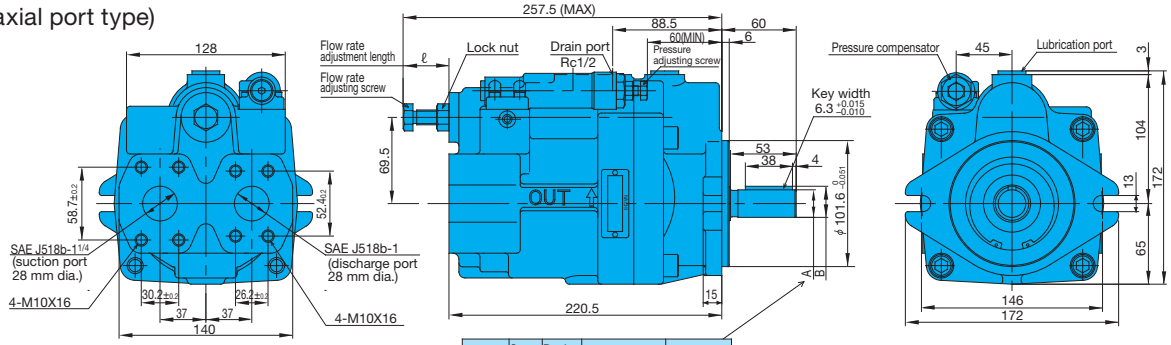
Relationship between flow rate adjustment length (ℓ) and pump capacity (q)



Flow rate adjustment length ℓ mm

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

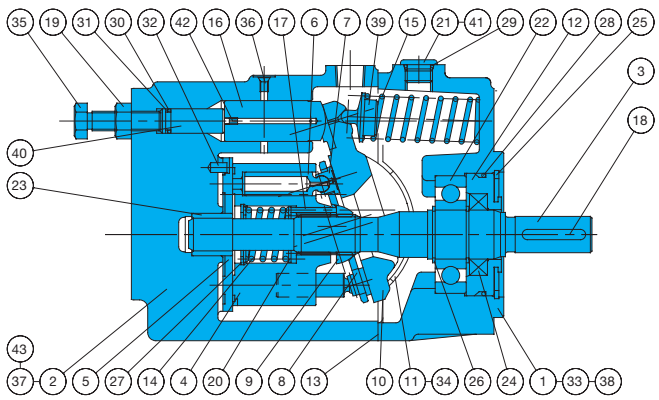
(axial port type)



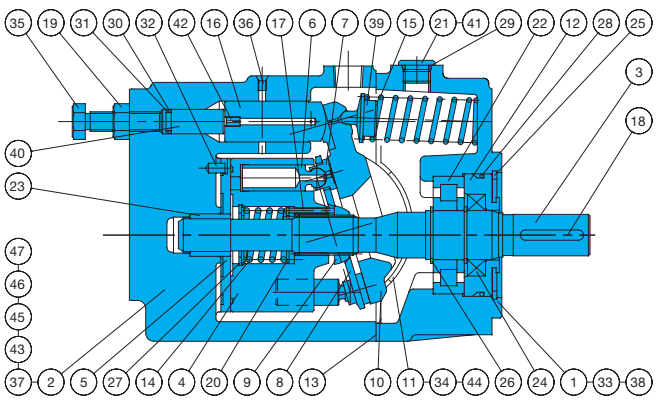
cm³/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 $^{0}_{-0.021}$	24.9 $^{0}_{-0.5}$
45	0 to 2			
	3	20D	φ25.385 $^{0}_{-0.025}$	27.85 $^{0}_{-0.25}$

Cross-sectional Drawings

PVS-2B-$\frac{35}{45}$N*-(Z)-12



PVS-2B-45N3-(Z)-20



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	16	Control piston	31	Backup ring
2	Case	17	Needle	32	Pin
3	Shaft	18	Key	33	Hexagon socket head bolt
4	Cylinder barrel	19	Nut		
5	Valve plate	20	Retainer	34	Cross-recessed countersunk head screw
6	Piston	21	Plug		
7	Shoe	22	Ball bearing	35	Flow rate adjusting screw
8	Shoe holder	23	Needle bearing		
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

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

* Part No.	Part Name	Q'ty	PVS-2B-35/45 Size	PVS-2B-35/45 Remarks
* 13	Gasket	1	PS46-102000-0A	Nihon Gasket
24	Oil seal	1	TCN-305011-V	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		
3	Shaft	19	Nut	34	Cross-recessed countersunk head screw
4	Cylinder barrel	20	Retainer		
5	Valve plate	21	Plug	35	Flow rate adjusting screw
6	Piston	22	Roller bearing		
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	PVS-2B-45N3 Remarks
* 13	Gasket	1	PS46-102000-0A	Nihon Gasket
24	Oil seal	1	TCN-305011-V	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

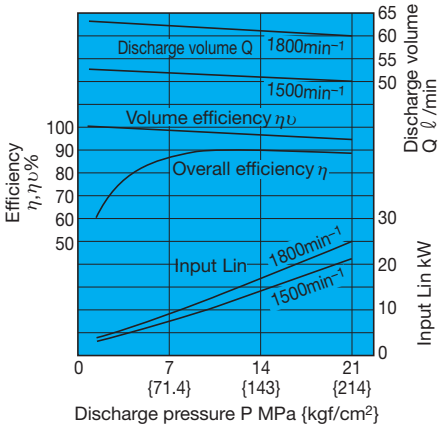
Parts marked by an asterisk "*" are not available on the market. Consult your agent.

Performance Curves

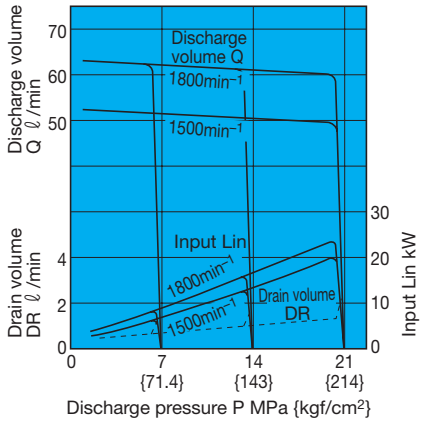
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

PVS-2B-35N*-(Z)-12

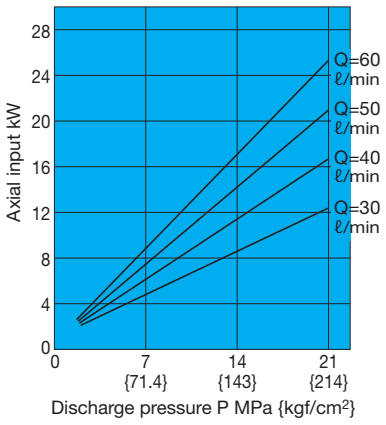
General Performance



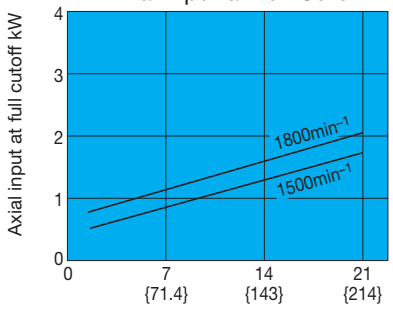
Pressure - Discharge Volume Characteristics



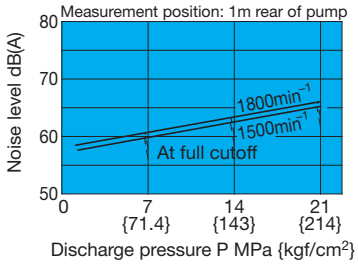
Axial Input



Axial Input at Full Cutoff



Noise Characteristics

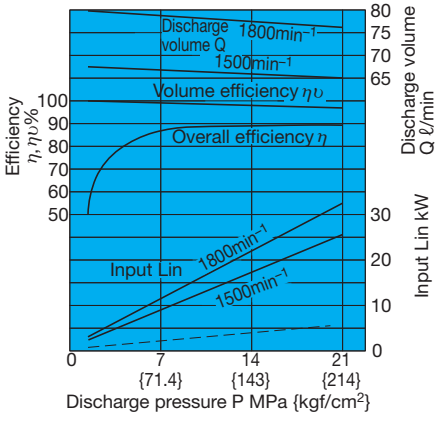


Performance Curves

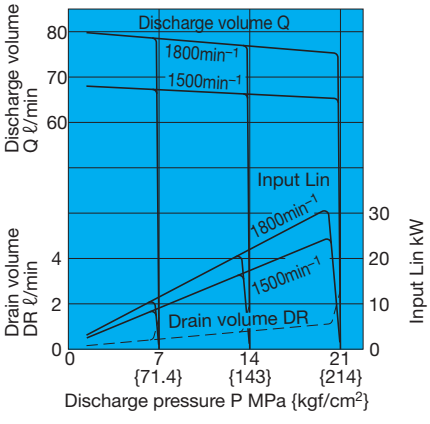
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

PVS-2B-45N*-(Z)-12(20)

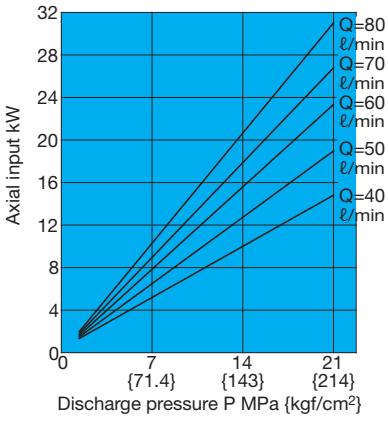
General Performance



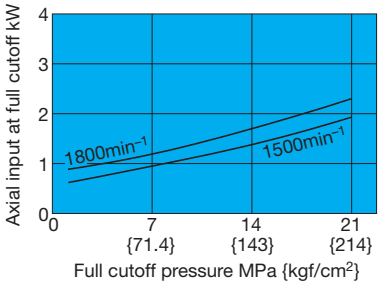
Pressure - Discharge Volume Characteristics



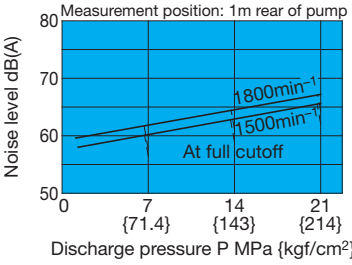
Axial Input



Axial Input at Full Cutoff

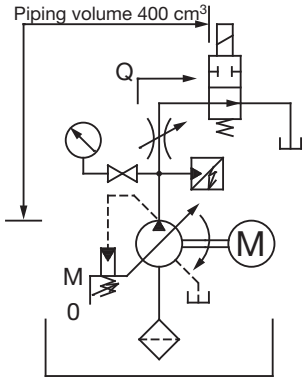


Noise Characteristics

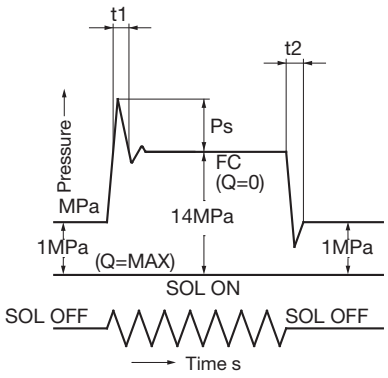


Response Performance

Test Circuit



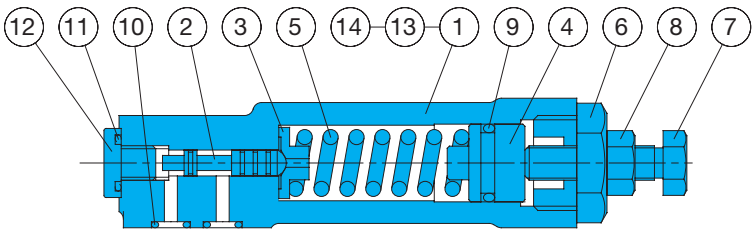
Graph Legend



Model No.	Response Time (s)		Surge Pressure MPa{kgf/cm²}
	t_1	t_2	P_S
PVS-0B-8	0.03 to 0.04	0.04 to 0.06	2 to 4{20.4 to 40.8}
PVS-1B-16	0.05 to 0.06	0.07 to 0.08	4 to 7{40.8 to 71.4}
PVS-1B-22	0.05 to 0.06	0.07 to 0.08	5 to 8{51 to 81.6}
PVS-2B-35	0.05 to 0.06	0.05 to 0.07	6 to 9{61.2 to 91.8}
PVS-2B-45	0.05 to 0.06	0.05 to 0.07	6 to 9{61.2 to 91.8}

Response performance changes according to pipe volume and size.
Use an anti-surging valve to prevent surge voltage.

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	Q'ty	Size
			For 0B, 1B, 2B
9	O-ring	1	NBR-70-1 P14
10	O-ring	3	NBR-90 P6
11	O-ring	1	NBR-90 P10

Note) The materials and hardness of the O-ring conform with JIS B2401.

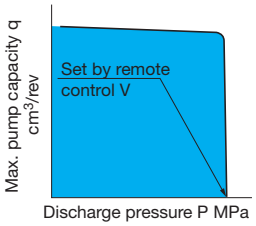
Pressure Compensation Type

(remote control mode)

Explanation of model No.: PVS – 0 B – 8 P * – 30

- Design No.
  - 30: PVS-0*
  - 12: PVS-1*, PVS-2*
  - 20: PVS-2*-45P3 only
- Pressure adjustment range
  - 0: 2- 3.5MPa {20.4- 35.7kgf/cm²}
  - 1: 2- 7MPa {20.4- 71.4kgf/cm²}
  - 2: 3-14MPa {30.6-143kgf/cm²}
  - 3: 3-21MPa {30.6-214kgf/cm²}
- P: Pressure compensation type (remote control mode)
- Max. pump capacity (cm³/rev) Nominal 8, 16, 22, 35, 45
- Pump size 0, 1, 2

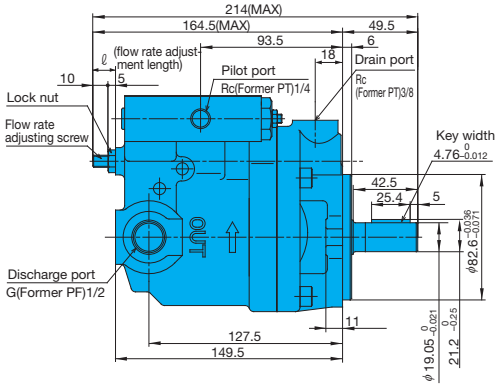
P-Q Characteristics

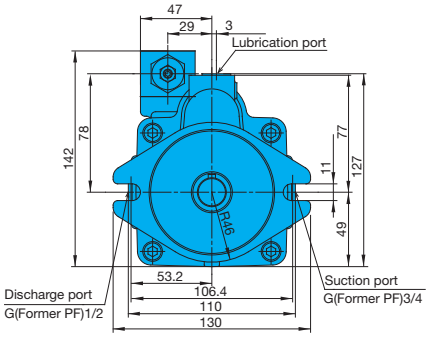


Installation Dimension Drawings

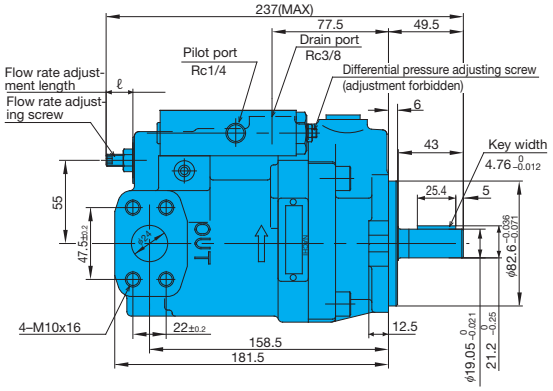
The ZR-T02-*-5895* is the recommended remote control valve. Provide piping to the remote control valve at a pipe volume of 150 cm³ or less.

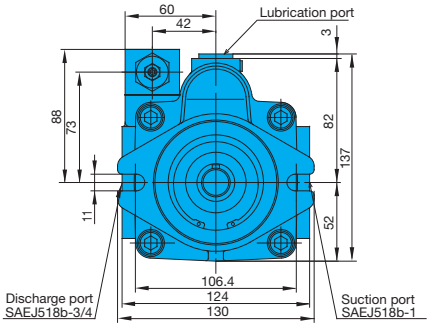
PVS-0B-8P*-30



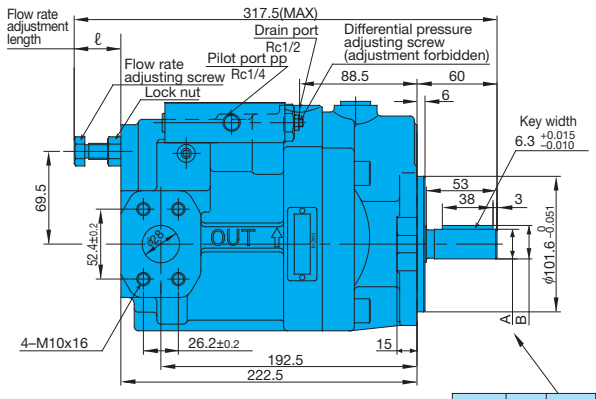


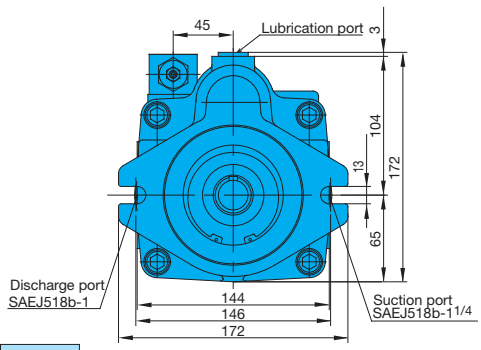
PVS-1B-$^{16}_{22}$P*-12





PVS-2B-$^{35}_{45}$P*-12(20)





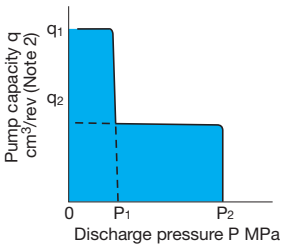
cm³/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 0 -0.021	24.9 0 -0.5
45	0 to 2			
	3	20D	φ25.385 0 -0.025	27.85 0 -0.25

2-pressure, 2-flow Rate Control Type

Explanation of model No.: PVS – 1 B – 16 N 3 Q 1 – 12

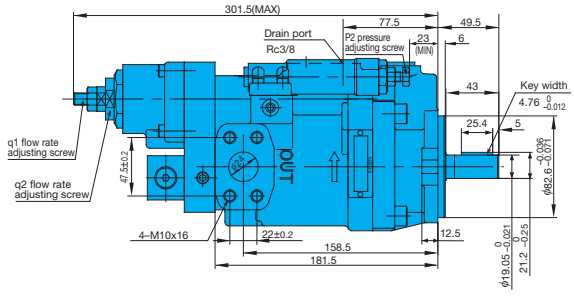
- 12: Design No. (12: PVS-1*, PVS-2*; 20: PVS-2*-45N3Q*)
- Pressure adjustment range
  - N*: High-pressure adjustment range, P2 (Set to lowest pressure before shipping)
  - Q*: Low-pressure adjustment range, P1 (Set to 3.5 MPa before shipping)
  - 0: 2- 3.5MPa {20.4- 35.7kgf/cm²}
  - 1: 2- 7MPa {20.4- 71.4kgf/cm²}
  - 2: 3-14MPa {30.6-143kgf/cm²}
  - 3: 3-21MPa {30.6-214kgf/cm²}
- NQ: 2-pressure, 2-flow rate control
- Max. pump capacity (cm³/rev) Nominal 16, 22, 35, 45
- Pump size 1, 2

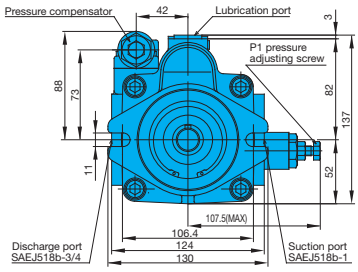
P-Q Characteristics



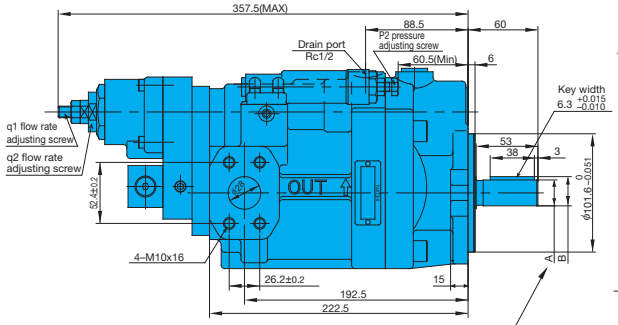
Installation Dimension Drawings

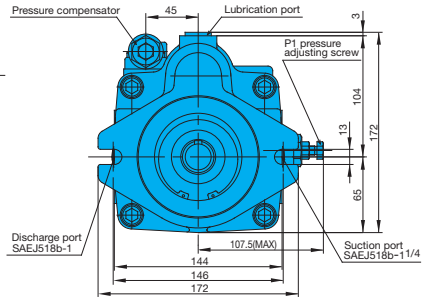
PVS-1B-$^{16}_{22}$N*Q*-12





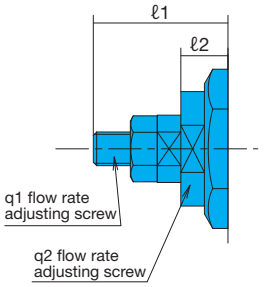
PVS-2B-$^{35}_{45}$N*Q*-12(20)



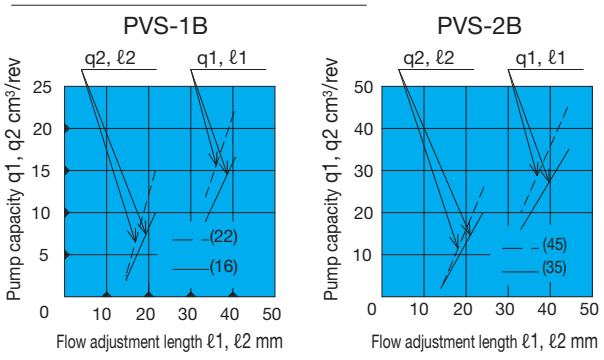


cm³/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	ϕ22.23 0 -0.021	24.9 0 -0.5
45	0 to 2			
	3	20D	ϕ25.385 0 -0.025	27.85 0 -0.25

Pump Model No.	q_2 Adjustment Range (cm³/rev)	Default q_2 (Setting cm³/rev)
PVS-1B-16	2 to 10	3.3
PVS-1B-22	2 to 13	4.4
PVS-2B-35	2 to 19	7
PVS-2B-45	3 to 24	9



Flow adjustment length and pump capacity



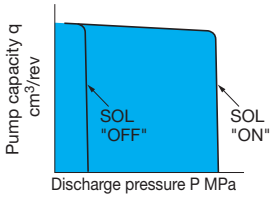
Note 1) The setting range of maximum pump capacity q_1 varies according to the setting of q_2.
Note 2) Overall efficiency at a low flow rate is lower than at the maximum flow rate. Pay attention to this when selecting the motor capacity for the drive.

Solenoid Cutoff Control Type

Explanation of model No.: PVS – 1 B – 16 R 2 S 1 – 12

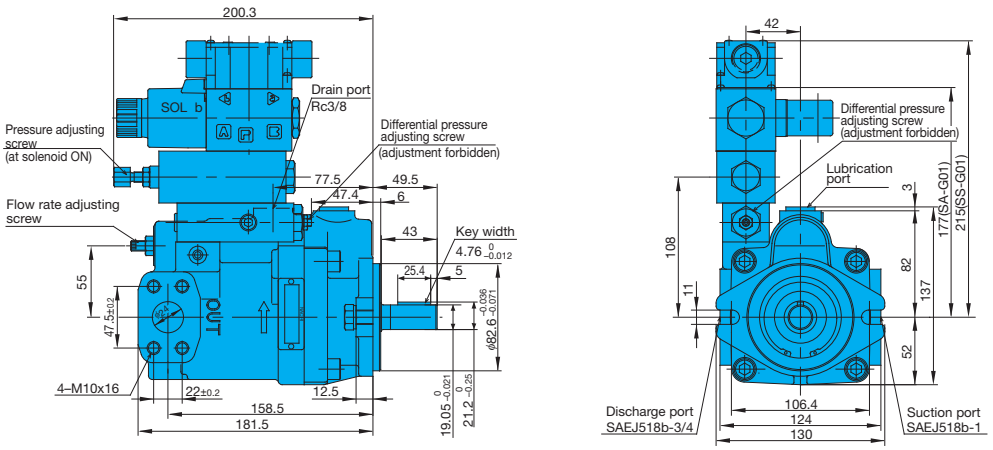
- Solenoid power supply 1: AC100V / 2: AC200V / 3: DC12V / 4: DC24V
- Solenoid specifications A: SA-G01 / S: SS-G01
- Pressure adjustment range
  - 0: 2- 3.5MPa {20.4- 35.7kgf/cm²}
  - 1: 2- 7MPa {20.4- 71.4kgf/cm²}
  - 2: 3-14MPa {30.6-143kgf/cm²}
  - 3: 3-21MPa {30.6-214kgf/cm²}
- R^{A}_{S} : Solenoid cutoff control
- Max. pump capacity (cm³/rev) Nominal 16, 22, 35, 45
- Pump size 1, 2

P-Q Characteristics

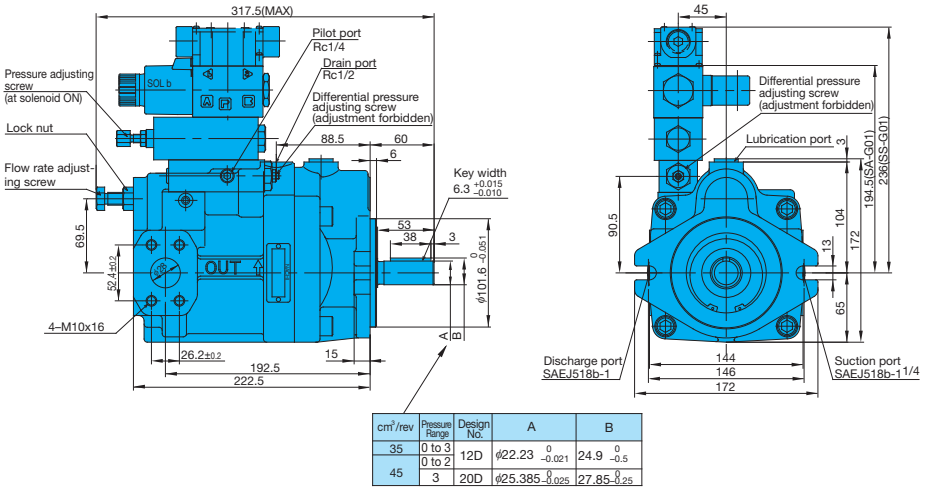


Installation Dimension Drawings

PVS-1B-$^{16}_{22}$R*$^{A}_{S}$*-12



PVS-2B-$^{35}_{45}$R*$^{A}_{S}$*-12(20)



cm³/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	ø22.23 0 -0.021	24.9 0 -0.5
45	0 to 2			
	3	20D	ø25.385 0 -0.025	27.85 0 -0.25

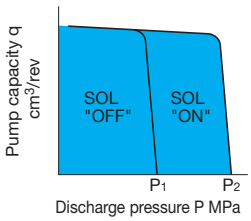
■ The coil surface temperature increases if this pump is kept continuously energized.
Do not touch the surface of the coil directly with your hands.

2-pressure Control Type

Explanation of model No.: PVS – 1 B – 16 W 2 S 1 – 12

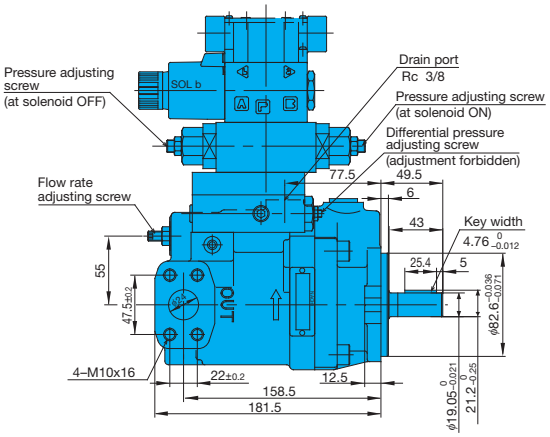
- Solenoid power supply 1: AC100V, 2: AC200V, 3: DC12V, 4: DC24V
- Solenoid specifications A: SA-G01, S: SS-G01
- Pressure adjustment range
  - 0: 2- 3.5MPa {20.4- 35.7kgf/cm²}
  - 1: 2- 7MPa {20.4- 71.4kgf/cm²}
  - 2: 3-14MPa {30.6-143kgf/cm²}
  - 3: 3-21MPa {30.6-214kgf/cm²}
- W^{A}_{S} : 2-pressure control
- Max. pump capacity (cm³/rev) Nominal 16, 22, 35, 45
- Pump size 1, 2

P-Q Characteristics

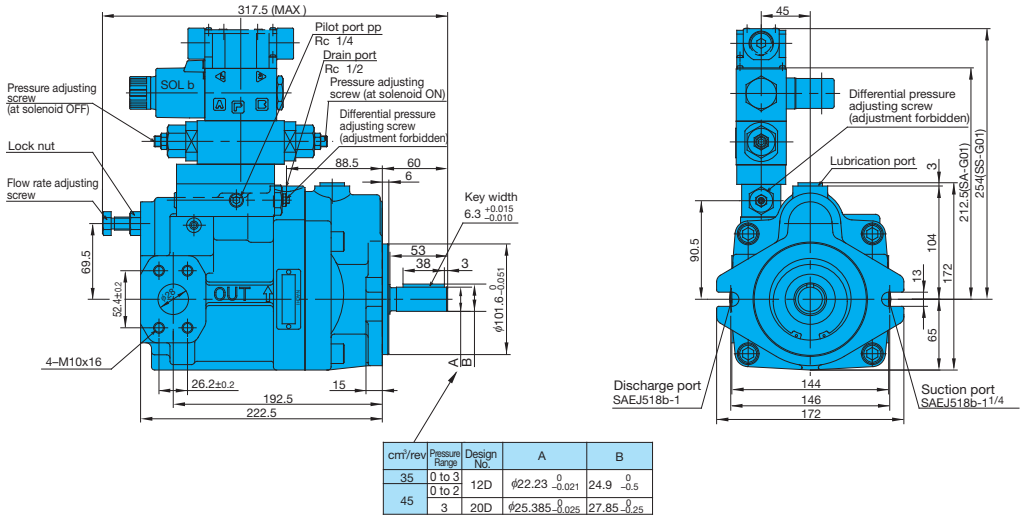


Installation Dimension Drawings

PVS-1B-$^{16}_{22}W^{A}_{S}$*-12



PVS-2B-$^{35}_{45}W^{A}_{S}$*-12(20)



cm³/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	$\phi 22.23\ ^{0}_{-0.021}$	$24.9\ ^{0}_{-0.5}$
45	0 to 2			
	3	20D	$\phi 25.385\ ^{0}_{-0.025}$	$27.85\ ^{0}_{-0.25}$

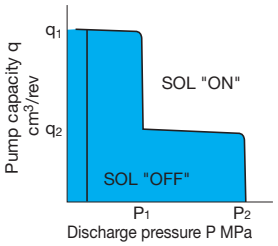
■ The coil surface temperature increases if this pump is kept continuously energized.
Do not touch the surface of the coil directly with your hands.

2-pressure, 2-flow rate Control Type w/ Solenoid Cutoff

Explanation of model No.: PVS – 1 B – 16 RQ 2 S 1 – 12

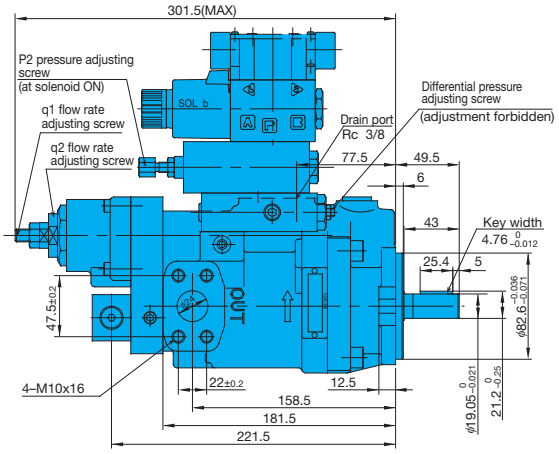
- Solenoid power supply 1: AC100V / 2: AC200V / 3: DC12V / 4: DC24V
- Solenoid specifications A: SA-G01 / S: SS-G01
- Pressure adjustment range
  - 0: 2- 3.5MPa {20.4- 35.7kgf/cm²}
  - 1: 2- 7MPa {20.4- 71.4kgf/cm²}
  - 2: 3-14MPa {30.6-143kgf/cm²}
  - 3: 3-21MPa {30.6-214kgf/cm²}
- RQ$^{A}_{S}$: 2-pressure, 2-flow rate control w/ solenoid cutoff
- Max. pump capacity (cm³/rev) Nominal 16, 22, 35, 45
- Pump size 1, 2

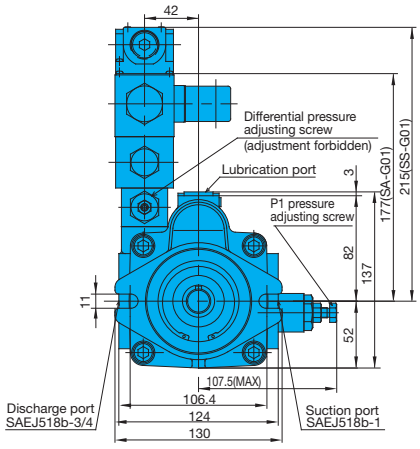
P-Q Characteristics



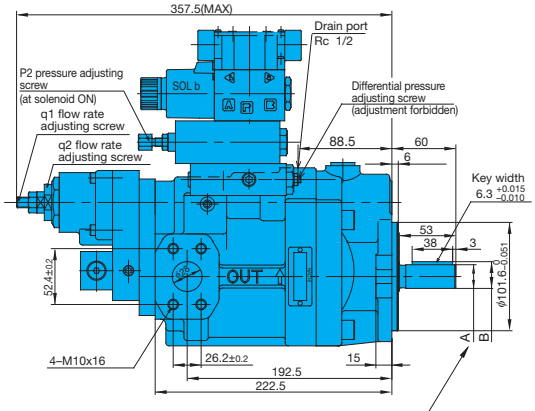
Installation Dimension Drawings

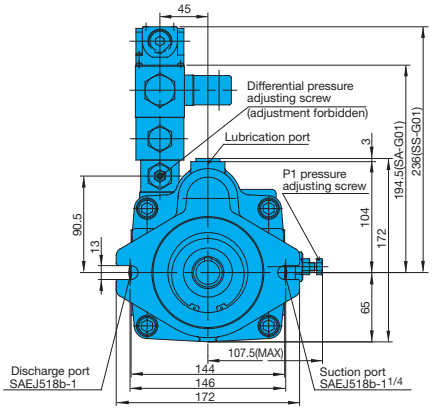
PVS-1B-$^{16}_{22}$RQ*$^{A}_{S}$*-12





PVS-2B-$^{35}_{45}$RQ*$^{A}_{S}$*-12(20)





cm³/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 0 -0.021	24.9 0 -0.5
45	0 to 2	3	φ25.385 0 -0.025	27.85 0 -0.25
		20D		

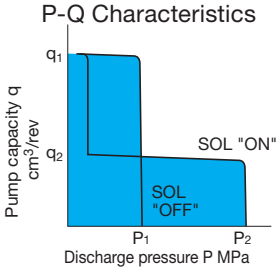
■ The coil surface temperature increases if this pump is kept continuously energized.
Do not touch the surface of the coil directly with your hands.

2-cutoff Control Type

Explanation of model No.: PVS – 1 B – 16 C 2 S 1 – 12

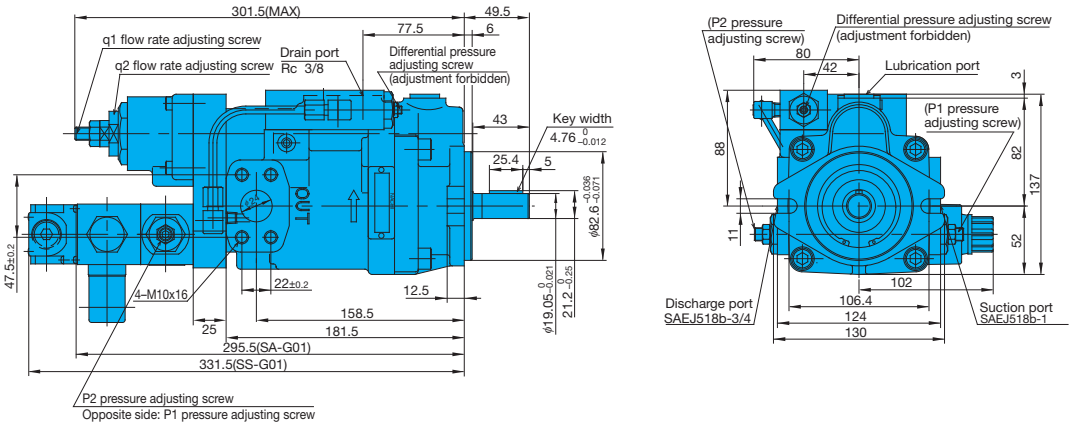
- Solenoid power supply 1: AC100V / 2: AC200V / 3: DC12V / 4: DC24V
- Solenoid specifications A: SA-G01 / S: SS-G01
- Pressure adjustment range
  - 0: 2- 3.5MPa {20.4- 35.7kgf/cm²}
  - 1: 2- 7MPa {20.4- 71.4kgf/cm²}
  - 2: 3-14MPa {30.6-143kgf/cm²}
  - 3: 3-21MPa {30.6-214kgf/cm²}
- C^{A}_{S} : 2-cutoff control
- Max. pump capacity (cm³/rev) Nominal 16, 22, 35, 45
- Pump size 1, 2

P-Q Characteristics

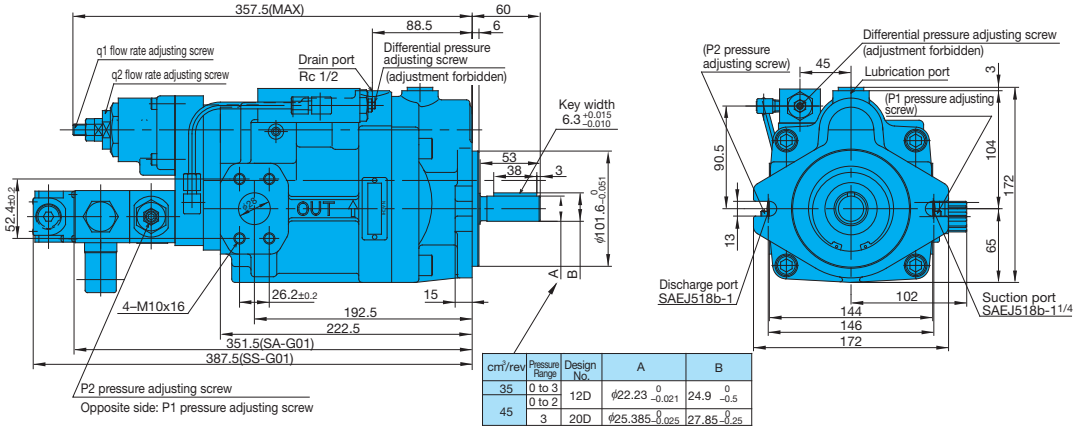


Installation Dimension Drawings

PVS-1B-$^{16}_{22}$C*$^{A}_{S}$*-12



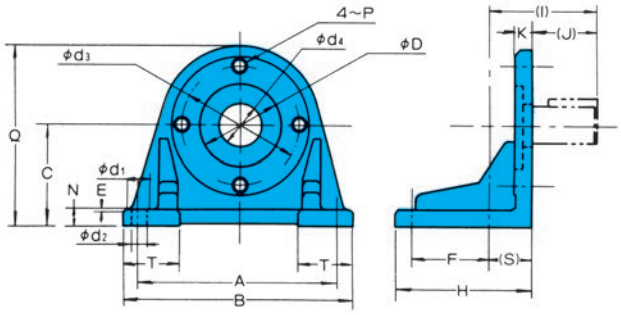
PVS-2B-$^{35}_{45}$C*$^{A}_{S}$*-12(20)



cm³/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 0 -0.021	24.9 0 -0.5
45	0 to 2			
	3	20D	φ25.385 0 -0.025	27.85 0 -0.25

■ 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



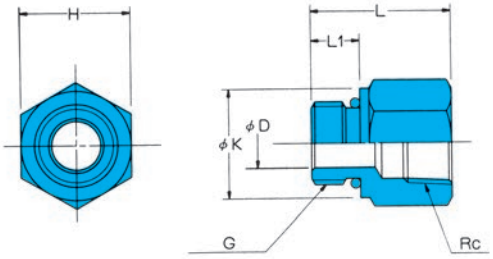
Kit Model No.	Applicable Pump Model No.	Accessories				Dimensions				
		Bolt	Q'ty	Washer	Q'ty	A	B	C	E	F
IHM-2-10	PVS-0B PVS-1B	TB-10×30	2	WP-10	2	127	152.5	69.8	1	50.8
IHM-4-10	PVS-2B	TB-12×30	2	WP-12	2	220.7	246	107.95	1	114.3

Kit Model No.	Dimensions													Weight
	H	(I)	(J)	K	N	P	Q	(S)	T	φD	φd1	φd2	φd3	φd4	kg
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.

Coupling kit

Kit for PVS-0B: PSCF-100000

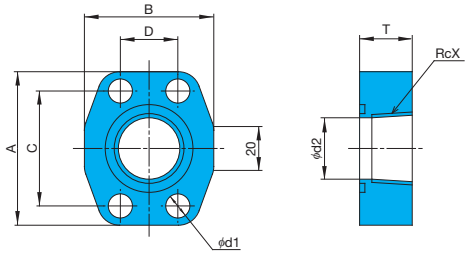


Applicable Pump Model No.	PVS-0B-8	
Plunger Kit model No.	Suction port	Discharge port
L	46	40
L_1	16	14
φK	φ36	φ27
φD	φ16	φ12
H	36	27
G screw size	G¾	G½
Rc screw size	Rc¾	Rc½
O-ring size	1B-P24	1B-P18

Notes) 1. Joints are on sale in the Joint Kit which includes O-rings.
2. The dimensions of the O-ring seal section on the connector conforms with JIS B2351.
3. O-ring 1B/B-** refers to JIS B2401-1B.

Piping Flange Kit

For PVS-1B, 2B



Applicable Pump Model No.	PVS-1B-16, 22		PVS-2B-35, 45	
Plunger Kit model No.	PSF-101000		PSF-102000	
	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
φd1	φ11	φ11	φ11	φ11
φd2	φ28	φ22	φ37	φ28
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	NBR-90 G35	NBR-90 G30	NBR-90 G45	NBR-90 G35
Weight kga	0.6	0.5	0.75	0.6

Notes) 1. The piping flange is on sale in the Flange Kit which includes mounting bolts, washers and O-rings.
2. The materials and hardness of the O-ring conform with JIS B2401
3. For details on tightening torque, see page C-11.

Uni-pump Specifications

(CE mark standard compliant)

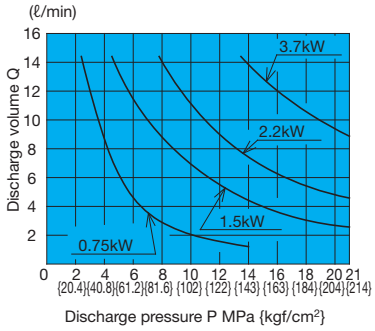
Explanation of model No.

UPV – 1 A – 16 N 1 – 1.5 * – 4 * – * – 30(50)

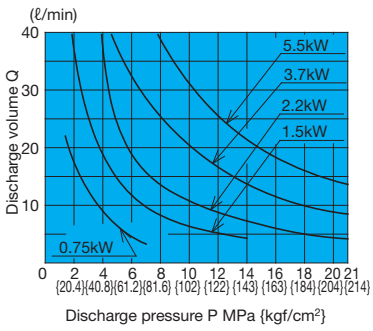
- Design No. 30: PVS-1B 0.75-5.5kW; PVS-2B 3.7 -7.5kW; 50: PVS-0B 0.75-3.7kW
- Auxiliary symbol None: Side port type; Z: Axial port type (PVS-1B, 2B)
- Abnormal Voltage symbol (See Motor Abnormal Voltage Specification list)
- Number of motor poles 4: 4 poles
- Motor terminal None: Right side viewed from pump side; A: Left side viewed from pump side
- Motor output 0.7: 0.75kW; 1.5: 1.5 kW; 2.2: 2.2 kW; 3.7: 3.7kW; 5.5: 5.5kW; 7.5: 7.5kW
  Note) UPV-0A/1A is 0.75-5.5kW; UPV-2A is 3.7-7.5kW
- Pressure adjustment range
  0: 2- 3.5MPa {20.4- 35.7kgf/cm²}
  1: 2- 7MPa {20.4- 71.4kgf/cm²}
  2: 3-14MPa {30.6-143kgf/cm²}
  3: 3-21MPa {30.6-214kgf/cm²}
  (Note) Not available at 45 cm³/rev
- Variable control mechanism
  N: pressure compensation type (Note) Control option is also standard on the PVS pump.
- Max. pump capacity (cm³/rev)
  Nominal 8, 16, 22, 35, 45
- Motor mounting method
  Mounting foot type
- Pump size 0: PVS-0B, 1: PVS-1B, 2: PVS-2B
- PVS series uni-pump

Motor selection curves

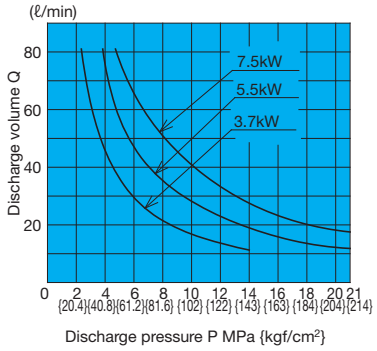
UPV-0A



UPV-1A



UPV-2A



• 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.
* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

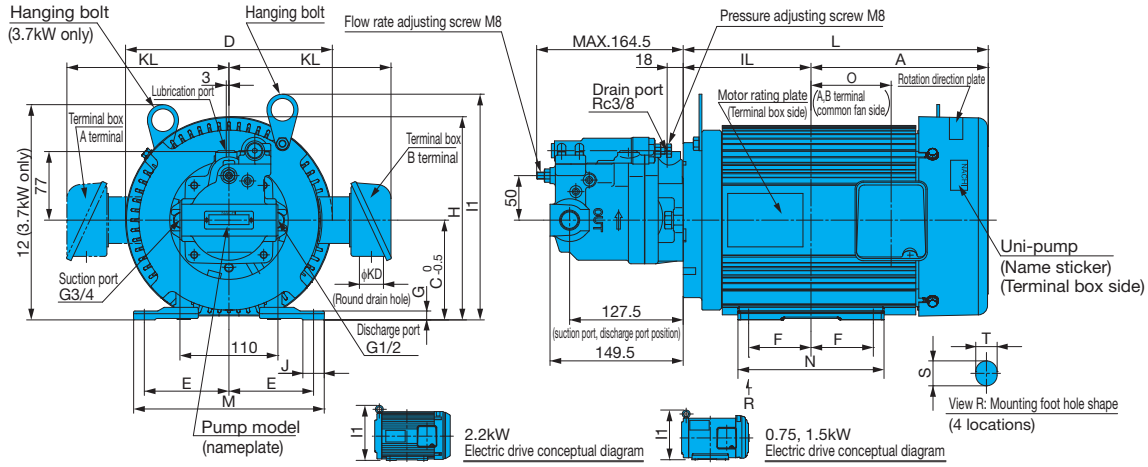
Motor Abnormal Voltage Specification list

Abnormal Voltage symbol	Voltage - Frequency
None	AC 200V-50/60Hz, AC 220V-60Hz
D	AC 380V - 50Hz
E	AC 415V - 50Hz
F	AC 440V - 60Hz
G	AC 460V - 60Hz
H	AC 480V - 60Hz
L	AC 220V - 50Hz

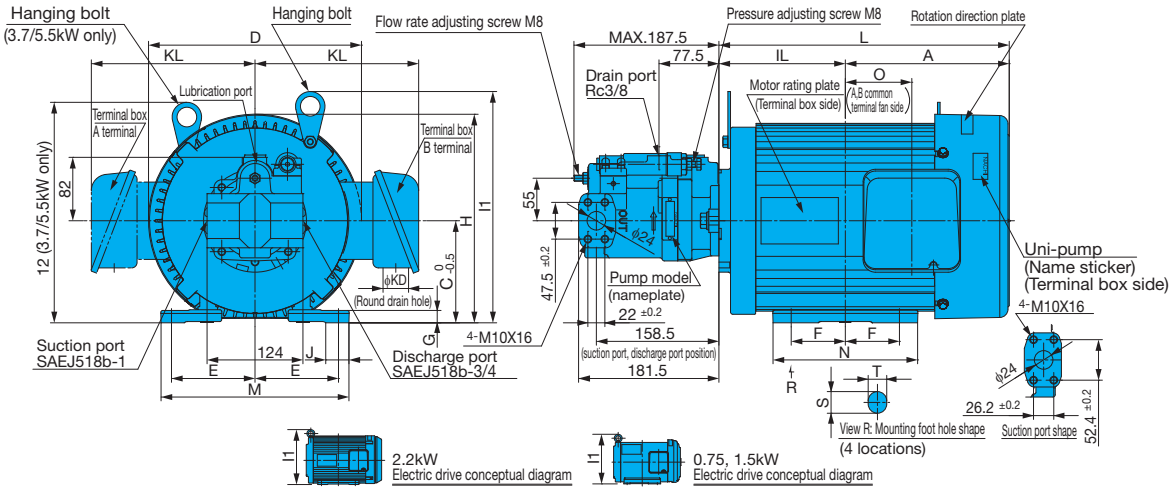
Abnormal Voltage symbol	Voltage - Frequency
M	AC 230V - 60Hz
N	AC 230V - 50Hz
R	AC 400V - 50Hz
S	AC 440V - 50Hz
U	AC 380V - 60Hz
V	AC 400V - 60Hz
W	AC 420V - 50HZ

Installation Dimension Drawings

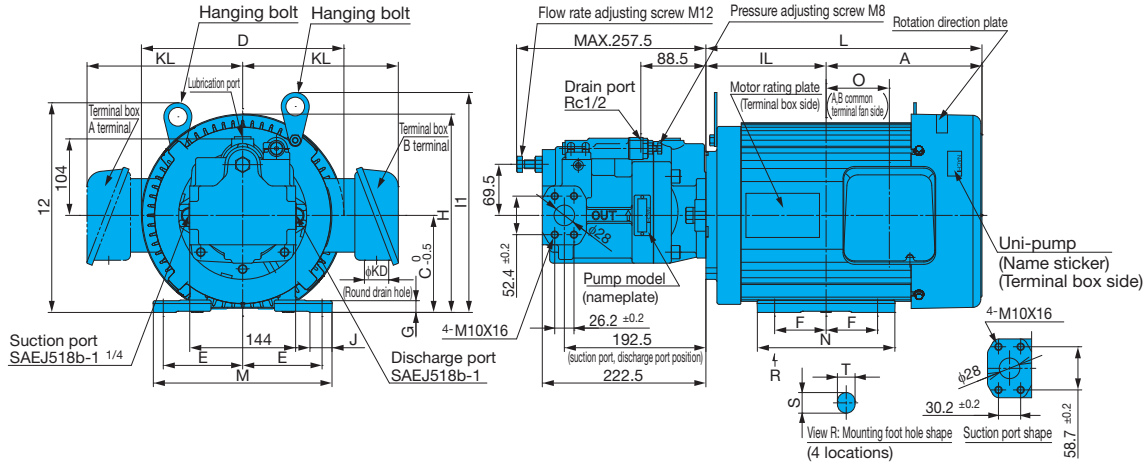
UPV-0A-8**-**-4-50
(side port type)



UPV-1A-$^{16}_{22}$**-**-4-30
(side port type)



UPV-2A-$^{35}_{45}$**-**-4-30
(side port type)



1. Drive motor is fully enclosed fan cooled, 0.75 to 3.7 kW is E type, and 5.5 to 7.5 kW is B type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
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.
5. See page (A-21) for the dimension table and characteristics of drive motor.

Motor Specifications

Output kW	Motor Dimensions [mm]																		Frame No.	Weight [kg]
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	ϕKD	KL	O		
0.75	137	107.5	80	152	62.5	50	4.5	160	193	–	47.5	244.5	165	130	25×10	27	137	65	80M	19
1.5	160.5	118.5	90	183	70	62.5	4.4	183	204	–	22	279	165	152.5	16×10	27	142	68	90L	22
2.2	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	36
3.7	199	143.5	112	233	95	70	10	228	253	242	24	342.5	214	164	14×12	27	182	90	112M	40
5.5	212	163.5	132	275	108	70	16	270	299	285	30	375.5	243	187	14×12	33	212	86	132S	52
7.5	231	182.5	132	275	108	89	16	269	299	285	30	413.5	243	226	14×12	33	212	105	132M	60

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

Output kW	Poles	(Note1). Model Number TYPE (N)	Voltage [V]	Frequency [Hz]	Current rating [A]	RPM rating [min^{-1}]	Heat resistance
0.4	4	VBEA- (VDS series only)	200	50	2.20	1420	E
			200	60	1.90	1710	
			220	60	1.91	1720	
0.75	4	V*EA-*A4*07	200	50	3.5	1430	F
			200	60	3.2	1720	
			220	60	3.1	1730	
1.5	4	V*EA-*A4*15	200	50	6.9	1450	F
			200	60	6.2	1740	
			220	60	6.0	1750	
2.2	4	V*EA-*A4*22	200	50	9.5	1460	F
			200	60	8.8	1750	
			220	60	8.5	1760	
3.7	4	V*EA-*A4*37	200	50	15.4	1460	F
			200	60	14.3	1760	
			220	60	13.5	1760	
5.5	4	V*EA-*A4*55	200	50	23.0	1470	F
			200	60	21.0	1760	
			220	60	19.9	1770	
7.5	4	V*EA-*A4*75	200	50	30.0	1460	F
			200	60	27.0	1760	
			220	60	26.0	1770	

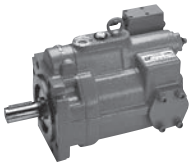
1. The asterisks * indicate variations in the hydraulic pump series, size, and position of terminal box. Check the ratings sticker on the side of the drive motor (terminal box side).
2. Contact us for variations in voltage.
3. The allowable fluctuating range of the voltage value is ±5%.
4. Paint Color: Nachi standard color Mancel No. 5B6/3

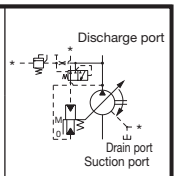
NACHI

PZS SERIES
VARIABLE VOLUME PISTON PUMP

PZS Series Variable Volume Piston Pump

70 to 220cm³/rev
70 to 100cm³/rev 28MPa
130 to 220cm³/rev 25MPa





Features

①High pressure, high reliability

These pumps deliver the perfect combination of high pressure (28MPa {286kgf/cm²}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.

②Low 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.

③High 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.

④A wide range of possible applications

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

Specifications

Model No.	Pump Capacity cm³/rev (Adjustment Range)	Rated Voltage MPa {kgf/cm²}	Maximum Working Pressure MPa {kgf/cm²}	Pressure Adjustment Range MPa {kgf/cm²}	Revolution Speed min⁻¹ Min.	Revolution Speed min⁻¹ Max.	Weight kg	Fixed Discharge Pump (Note 1) Capacity cm³/rev	Fixed Discharge Pump (Note 1) Pressure MPa {kgf/cm²}
PZS-3B-170* 1-10 3 4	70 (45 to 70)	21 {214}	28 {286}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 28 {20.4 to 286 }	500	1800	37	3.6 to 15.8 (IPH-2.3 type)	21 {214}
PZS-4B-100* 1-10 3 4	100 (40 to 100)	21 {214}	28 {286}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 28 {20.4 to 286 }	500	1800	58	3.6 to 15.8 (IPH-2.3 type)	21 {214}
PZS-5B-130* 1-10 3 4	130 (51 to 130)	21 {214}	25 {255}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 25 {20.4 to 255 }	500	1800	86	3.6 to 32.3 (IPH-2.3.4 type)	21 {214}
PZS-6B-180* 1-10 3 4	180 (101 to 180)	21 {214}	25 {255}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 25 {20.4 to 255 }	500	1800	123	3.6 to 63.9 (IPH-2.3.4.5 type)	21 {214}
PZS-6B-220* 1-10 3 4	220 (124 to 220)	21 {214}	25 {255}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 25 {20.4 to 255 }	500	1500	126	3.6 to 63.9 (IPH-2.3.4.5 type)	21 {214}

Note 1. Fixed discharged pump of IP pump can be configured by combining with PZS.
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

●Pump Installation and Piping Precautions

1. 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.
2. Eccentricity between the drive shaft and pump shaft should be no greater than 0.05mm, with an eccentric angle error of 1° or less.
3. Keep the fitting length of couplings and pump shafts at least 2/3 the length of the coupling width.
4. Use a sufficiently rigid pump mounting base.
5. Set pump suction side pressure to -0.03 MPa or more (suction port flow velocity less than 2 m/sec).
6. 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 0.1 MPa.

Item \ Model No.	3B, 4B, 5B	6B
Pipe joint size	At least 3/4"	At least 1"
Pipe I.D.	At least ϕ17	At least ϕ22
Pipe length	1 m or less	1 m or less

7. Mount the pump so the pump shaft is oriented horizontally.
8. Use of rubber hose is recommended in order to minimize noise and vibration.
9. 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

1. Use only good-quality hydraulic operating fluid with a kinematic viscosity during operation within the range of 20 to 200 mm²/sec. Normally, you should use an R&O type and wear-resistant type of ISOGV32 to 68 or equivalent. The optimum kinematic viscosity during operation is 20 to 50 mm²/sec.
2. The operating temperature range is 5 to 60°C. 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 5°C.
3. Provide a suction strainer with a filtering grade of about 100μ (150 mesh).
4. Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower.

(Continued on following page)

5 Use hydraulic operating fluid when the operating ambient temperature is in the range of 0 to 60°C.

● Inverter Drive Precautions

1 Set the revolution speed within the range of the pump specification revolution speed.

2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

● 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 cm³
PZS-3B	1000
PZS-4B	1800
PZS-5B	2200
PZS-6B	3000

2 An unload circuit is required when the motor i s started under condition λ–Δ. 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.)

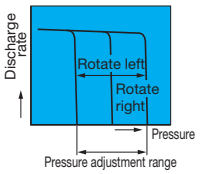
6 Install a check valve on the discharge side to protect the pump if the load is large or if there is an accumulator in the circuit on the discharge side of the pump.

7 Do not release the pressure in the hydraulic circuit by switching the solenoid valve (RS/WS type) on the pump.

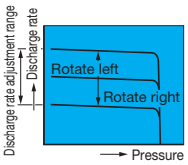
● Configuring Pressure and Discharge Rate Settings

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.

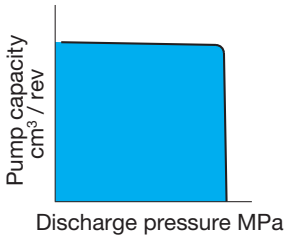
Explanation of model No.

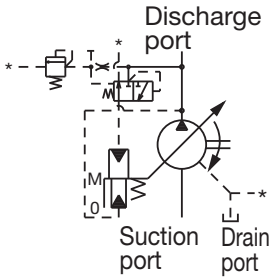
Standard type
Pressure compensation(N)

PZS – 4 B – 100 N * – 10

- 10: Design number
- *: Pressure adjustment range
  - 1: 2 to 7MPa {20.4 to 71.4kgf/cm²}
  - 3: 2 to 21MPa {20.4 to 214kgf/cm²}
  - 4: 2 to 28MPa {20.4 to 286kgf/cm²}
  - Note: PZS-5B/6B maximum operating pressure: 25MPa (255kgf/cm²)
- N: Variable Control Mechanisms — N: Pressure compensation control
- 100: Pump capacity (cm³/rev) — 70, 100, 130, 180, 220
- B: Mounting method — B: Flange type mounting A: Foot type mounting
- 4: Pump size 3, 4, 5, 6

P-Q characteristics



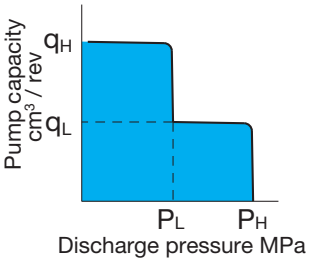


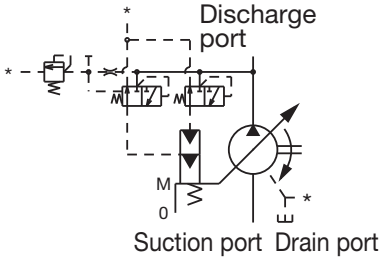
Option type
2-Pressure, 2-Flow Rate Control Type (NQ)

PZS – 4 B – 100 N * Q * – 10

- 10: Design number
- N*: High-pressure adjustment range, P_H
  Q*: Low-pressure adjustment range, P_L
  - 1: 2 to 7MPa {20.4 to 71.4kgf/cm²}
  - 3: 2 to 21MPa {20.4 to 214kgf/cm²}
  - 4: 2 to 28MPa {20.4 to 286kgf/cm²}
  - Note: PZS-5B maximum operating pressure: 25MPa (255kgf/cm²)
- NQ: Variable Control Mechanisms — NQ: 2-pressure, 2-flow rate control
- 100: Pump capacity (cm³/rev) — 70, 100, 130
- B: Mounting method — B: Flange type mounting A: Foot type mounting
- 4: Pump size 3, 4, 5

P-Q characteristics



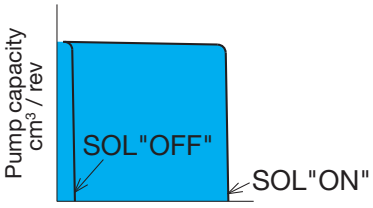


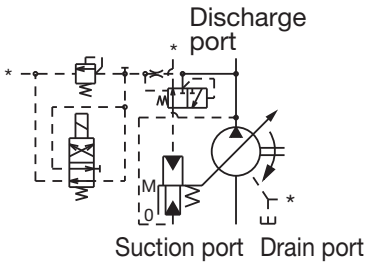
Solenoid Cutoff Control Type (WS)

PZS – 4 B – 100 R * S * – 10

- Design number
- Solenoid power supply
  1: AC100V
  2: AC200V
  3: DC12V
  4: DC24V
- Pressure adjustment range
  1: 2 to 7MPa {20.4 to 71.4kgf/cm²}
  3: 2 to 21MPa {20.4 to 214kgf/cm²}
  4: 2 to 28MPa {20.4 to 286kgf/cm²}
  Note: PZS-5B/6B maximum operating pressure: 25MPa (255kgf/cm²)
- Variable Control Mechanisms
  RS: Solenoid cutoff control (S: SS-G01)
- Pump capacity (cm³/rev)
  70, 100, 130, 180, 220
- Mounting method B: Flange type mounting A: Foot type mounting
- Pump size 3, 4, 5, 6

P-Q characteristics





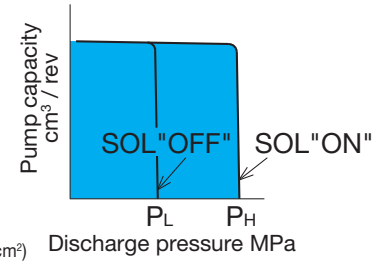
■Do not use the solenoid valve to release the pressure in the hydraulic circuit.

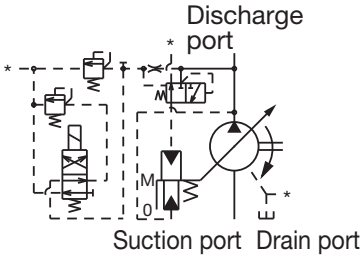
2-Pressure Control System (WS)

PZS – 4 B – 100 W * S * – 10

- Design number
- Solenoid power supply
  1: AC100V
  2: AC200V
  3: DC12V
  4: DC24V
- Pressure adjustment range
  1: 2 to 7MPa {20.4 to 71.4kgf/cm²}
  3: 2 to 21MPa {20.4 to 214kgf/cm²}
  4: 2 to 28MPa {20.4 to 286kgf/cm²}
  Note: PZS-5B/6B maximum operating pressure: 25MPa (255kgf/cm²)
- Variable Control Mechanisms
  WS: 2-pressure control type (S: SS-G01)
- Pump capacity (cm³/rev)
  70, 100, 130, 180, 220
- Mounting method B: Flange type mounting A: Foot type mounting
- Pump size 3, 4, 5, 6

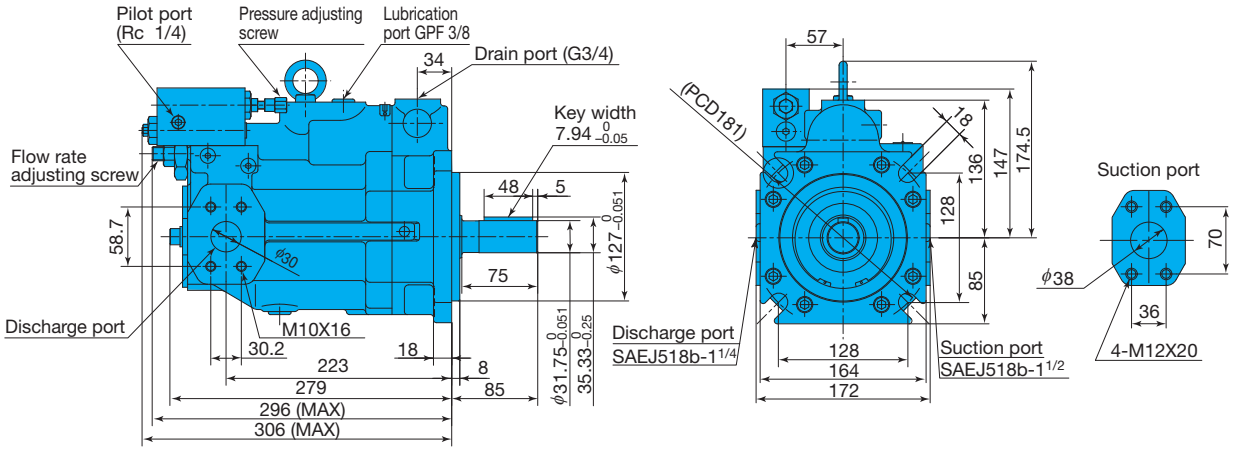
P-Q characteristics



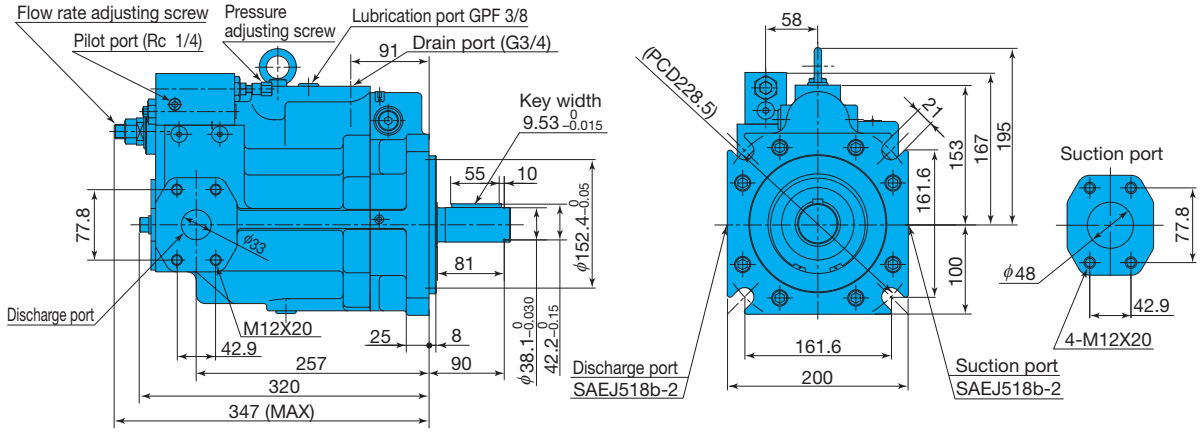


Installation Dimension Drawings

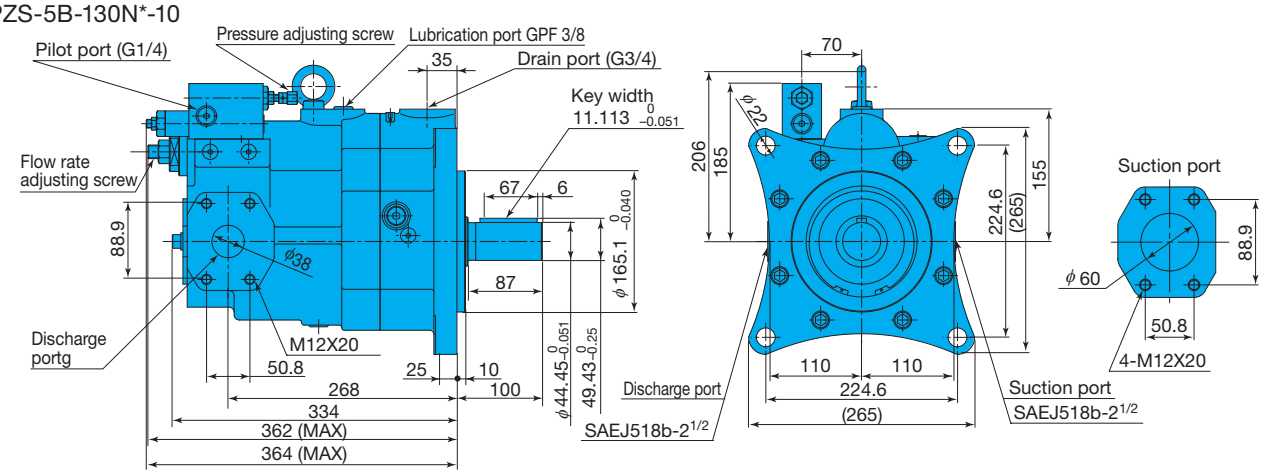
Pressure Compensation Type
Installing a remote control relieve valve to the pilot port provides remote control of pressure compensation. (PVS series "P type")
PZS-3B-70N*-10



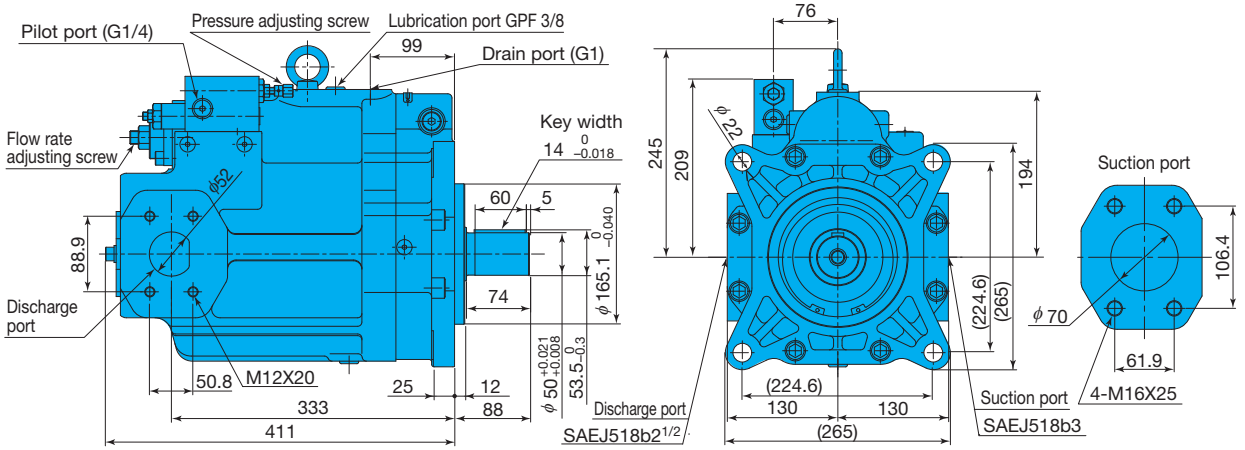
PZS-4B-100N*-10



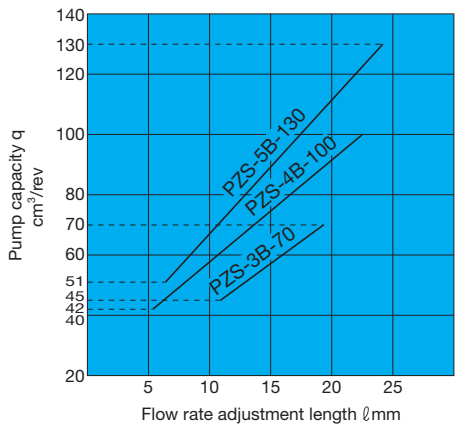
PZS-5B-130N*-10

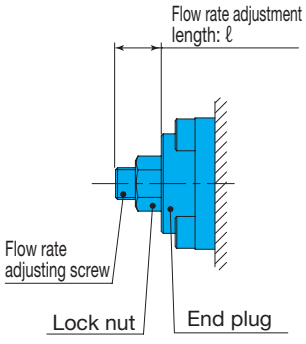


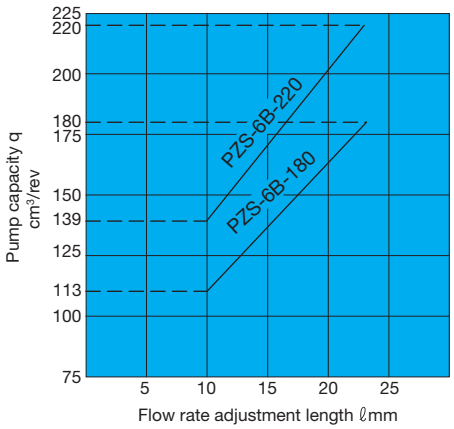
PZS-6B-180N*-10
PZS-6B-220N*-10



Flow Adjustment Rotation Angle (ℓ) and Pump Capacity (q)



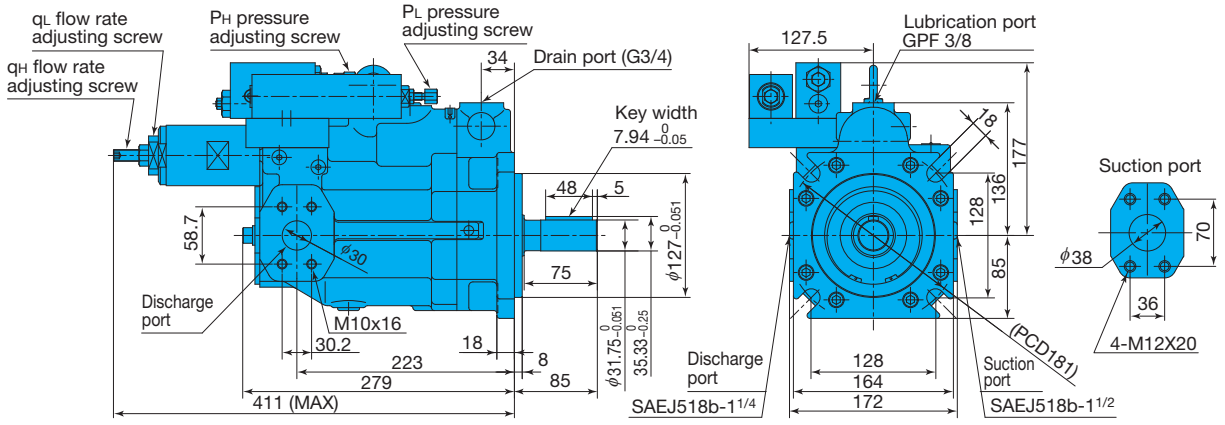




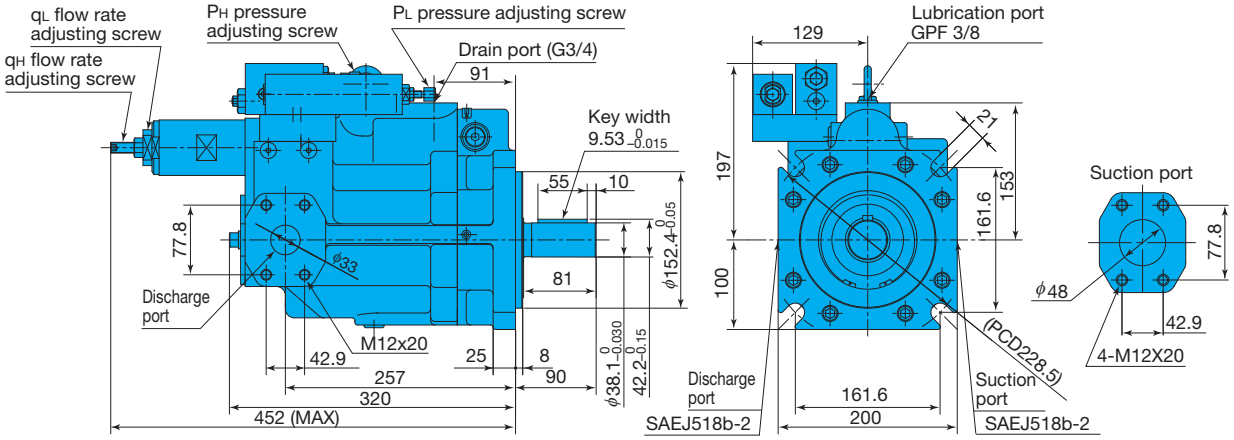
Use a flow adjustment length that is within the range noted in the above chart. Using a length that is outside the lower limit adjustment range can lead to oil leaks.

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.

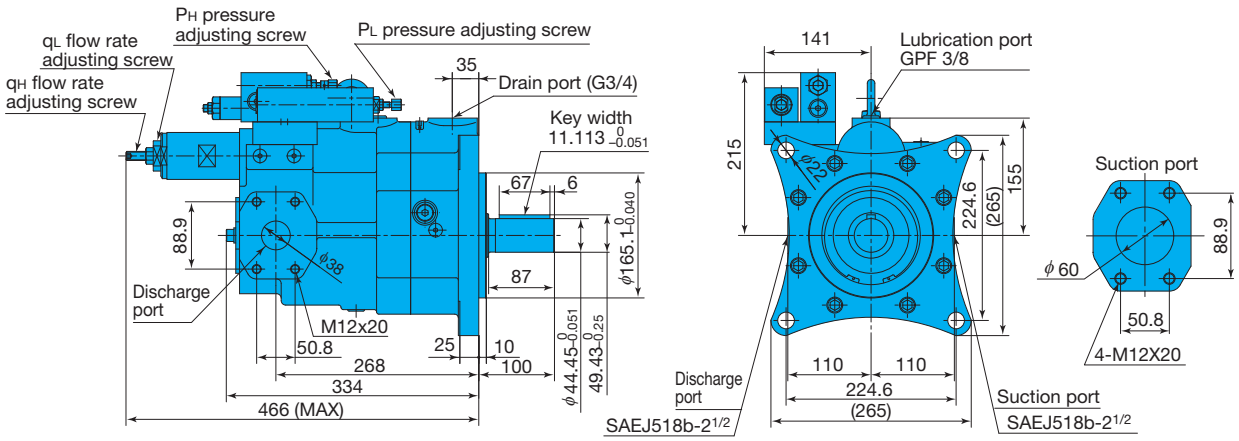
2-Pressure, 2-Flow Rate Control Type
PZS-3B-70N*Q*-10



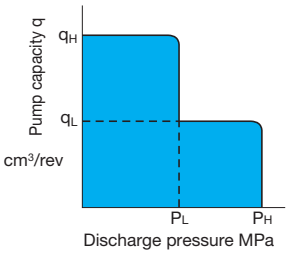
PZS-4B-100N*Q*-10



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



P-Q characteristics



Pump Volume Adjustable Range

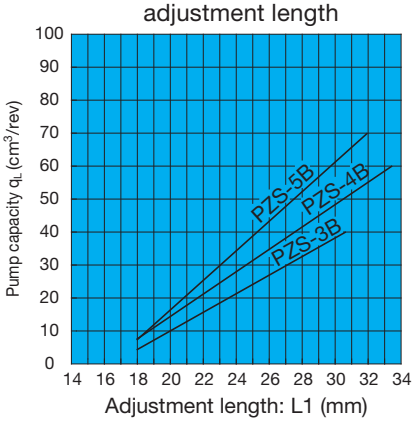
Pump Model No.	Volume Adjustment Range cm³/rev		Factory Default q_L Setting (cm³/rev)
	q_H Note 1	q_L Note 2	
PZS-3B- 70N*Q*-10	5 to 70	5 to 40	14
PZS-4B-100N*Q*-10	16 to 100	7 to 60	20
PZS-5B-130N*Q*-10	17 to 130	8 to 70	26

Note1: The setting range for pump maximum capacity qH depends on the qL setting.
Note2: Overall efficiency at a low flow rate is lower than at the maximum flow rate. Keep this in mind when deciding on the drive motor capacity.
Note3: P_L is set to 3.5 MPa before shipping. (P_H is the lowest pressure)

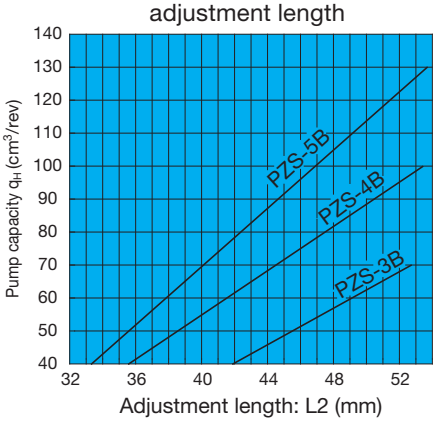
PZS Pump 2-Pressure 2-Flow Rate Control Flow Rate Adjustment Graph

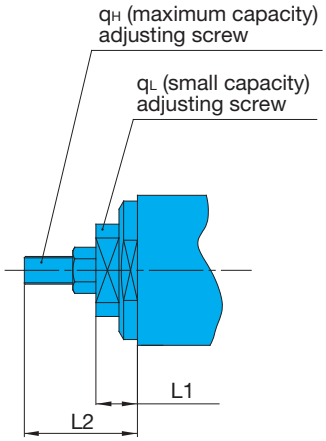
- Be sure to adjust the low flow rate first, and then adjust the maximum flow rate.
- Remember that the maximum flow rate adjustment range (lower limit) changes in accordance with the low flow rate adjustment. The maximum flow rate adjustment lower limit is equivalent to the low flow rate adjustment length (L1) plus 11mm.
- 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.

Pump small capacity adjustment length



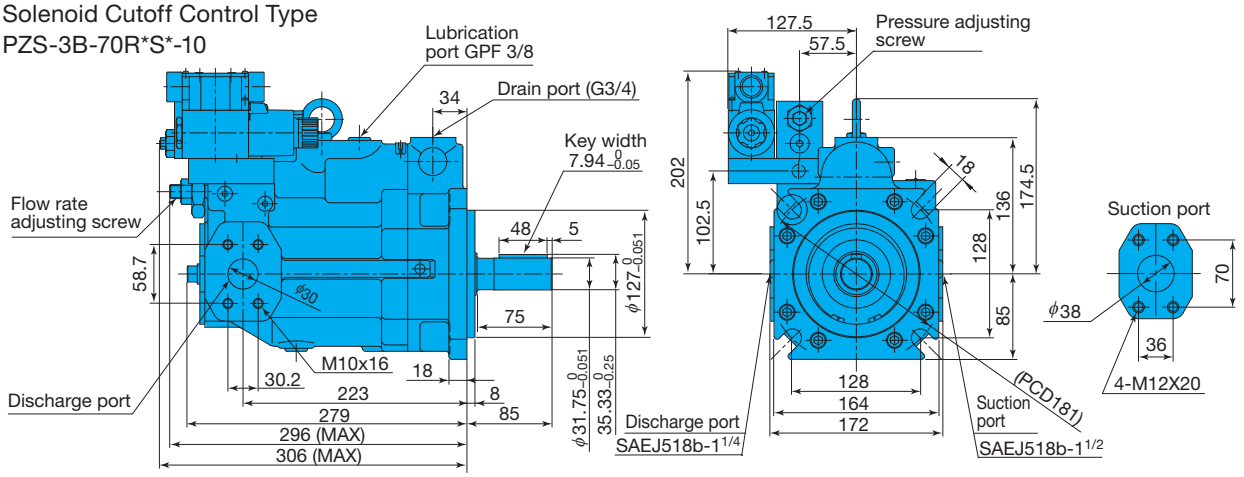
Pump maximum capacity adjustment length



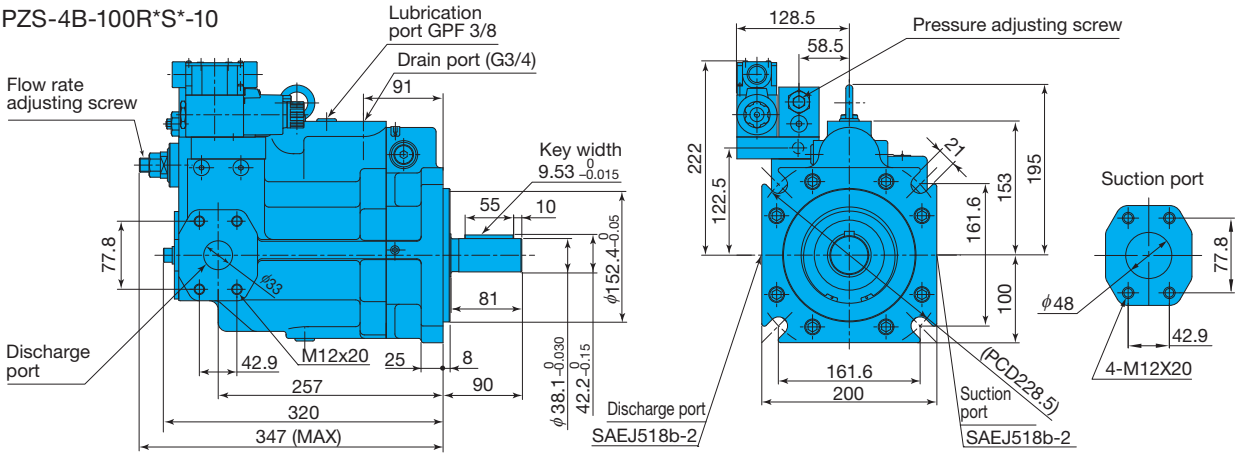


Solenoid Cutoff Control Type

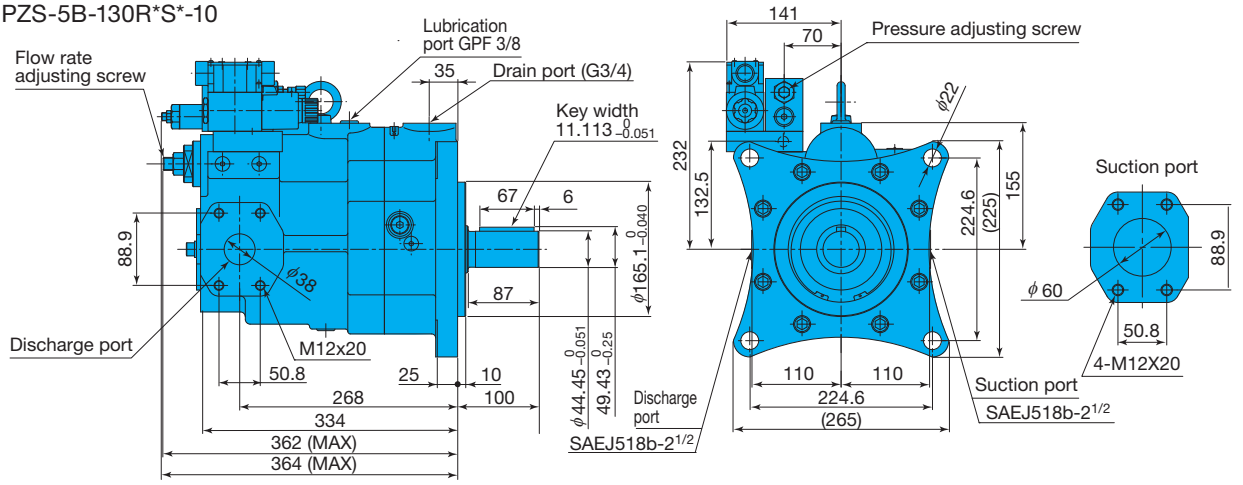
PZS-3B-70R*S*-10



PZS-4B-100R*S*-10

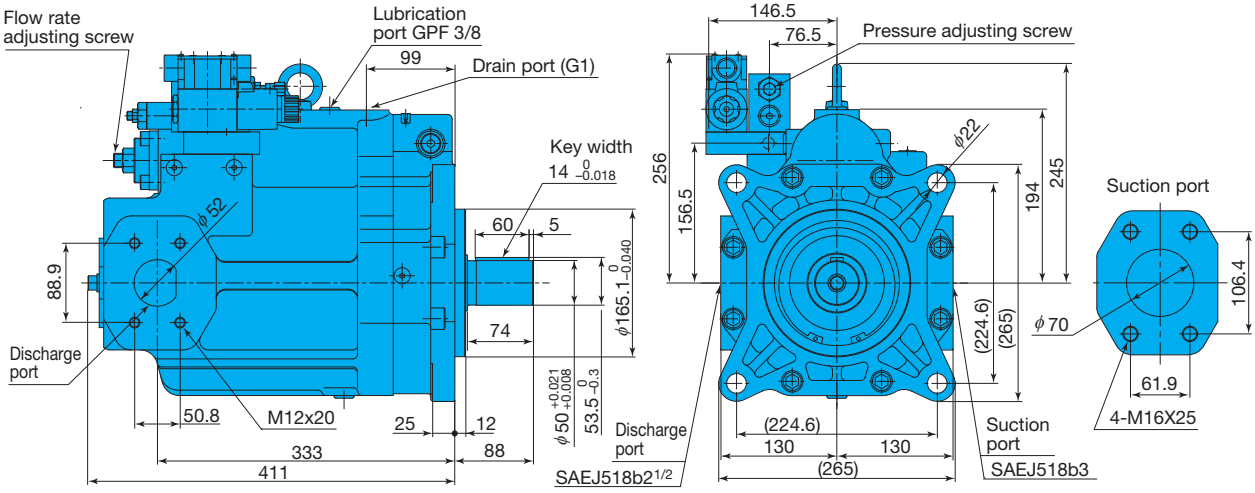


PZS-5B-130R*S*-10



PZS-6B-180R*S*-10

PZS-6B-220R*S*-10

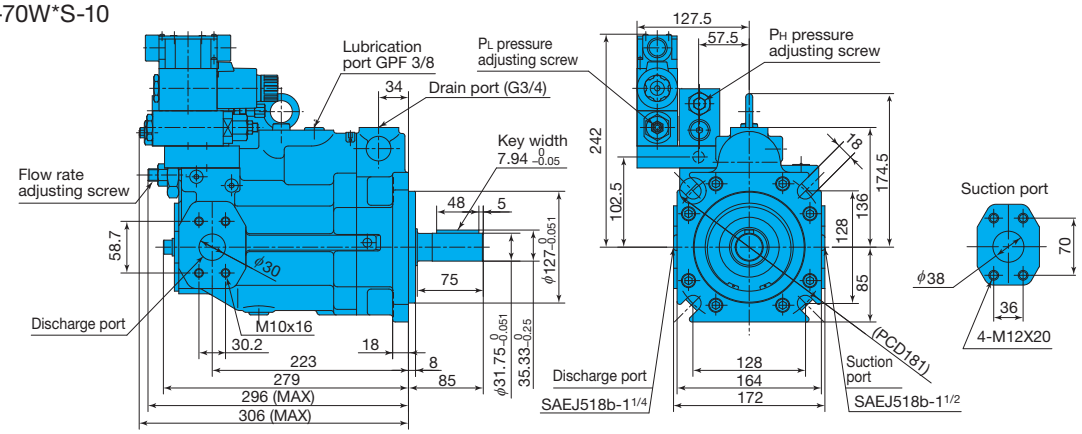


■Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot.
Do not touch the surface of the coil directly with your hands.

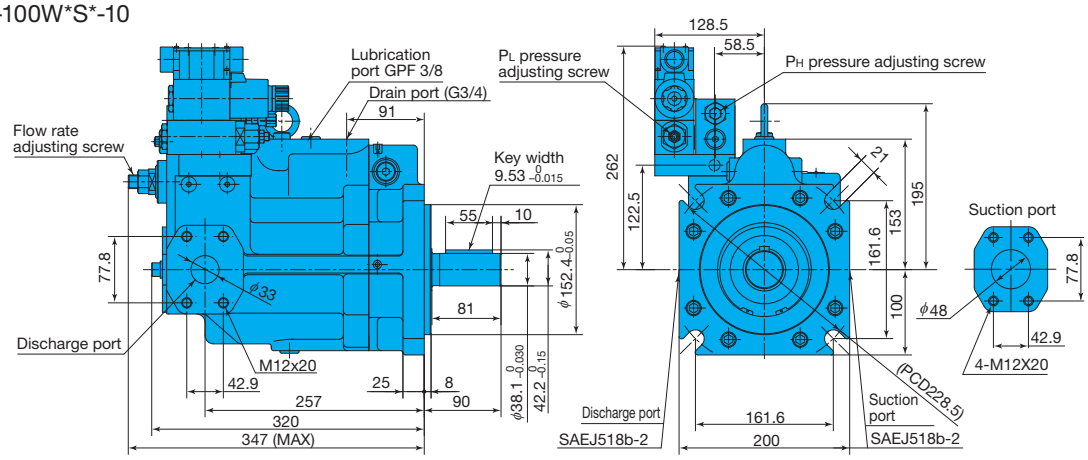
■Do not use the solenoid valve to release the pressure in the hydraulic circuit.

2-Pressure Control Type

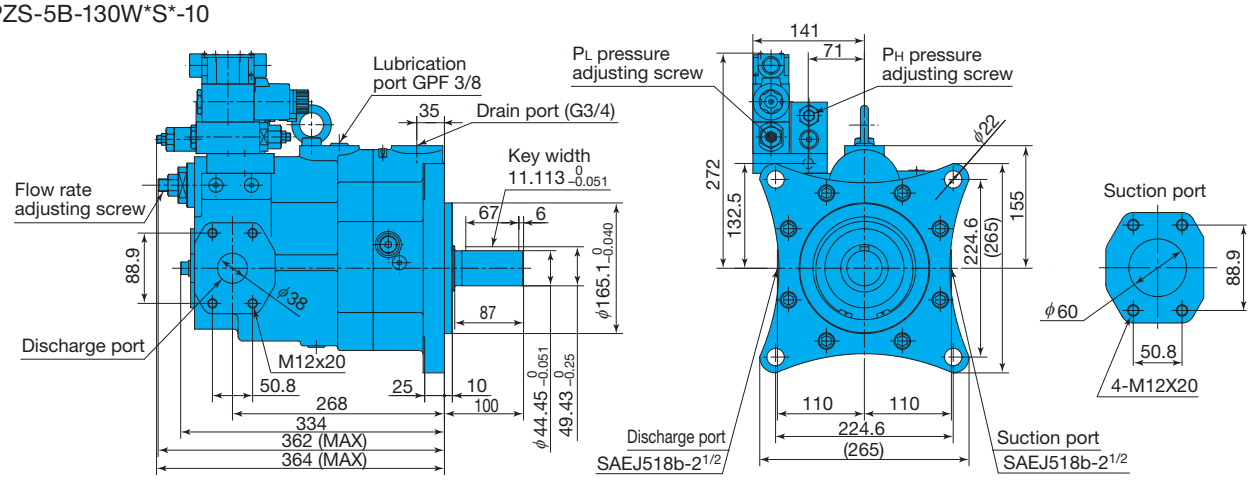
PZS-3B-70W*S-10



PZS-4B-100W*S*-10

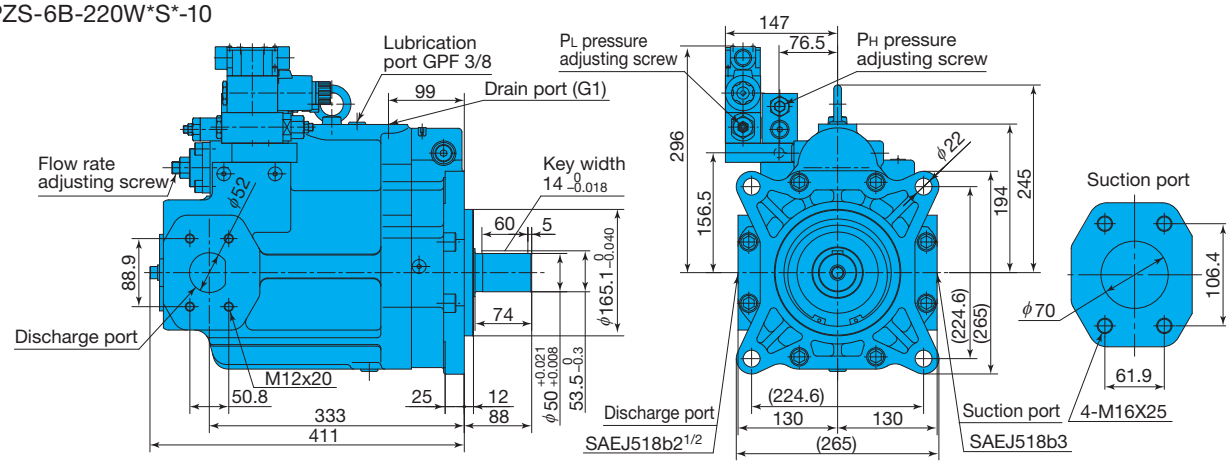


PZS-5B-130W*S*-10



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.

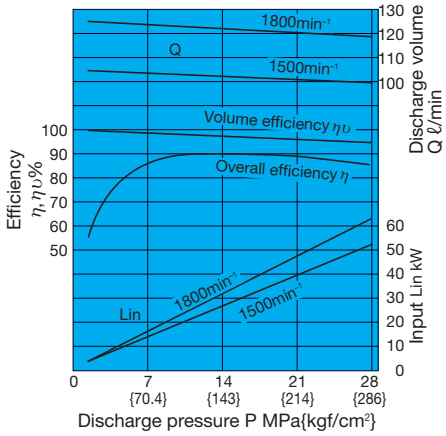
■Do not use the solenoid valve to release the pressure in the hydraulic circuit.

Performance Curves

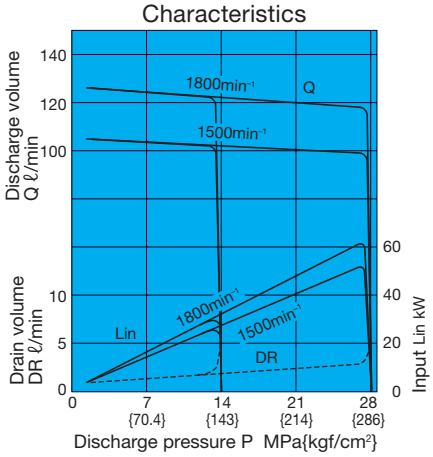
Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s

PZS-3B-70N*-10

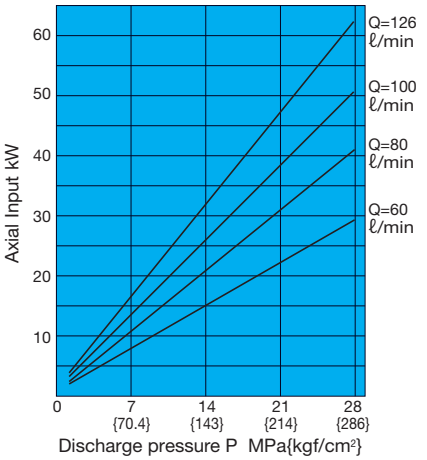
General Performance



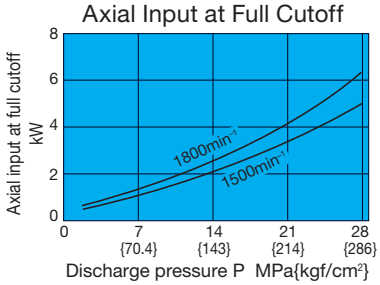
Pressure - Flow Rate Characteristics



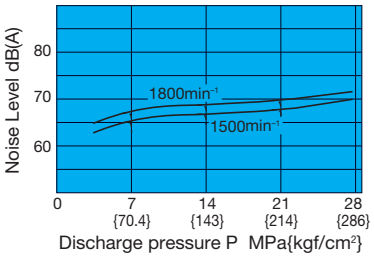
Axial Input



Axial Input at Full Cutoff



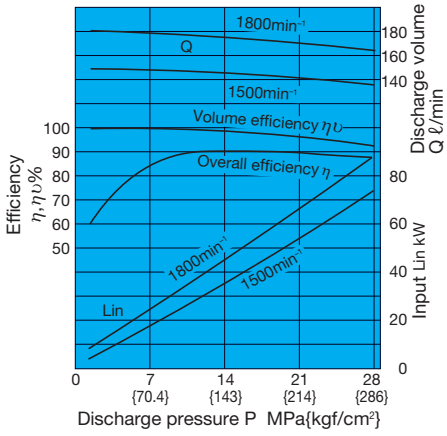
Noise Characteristics



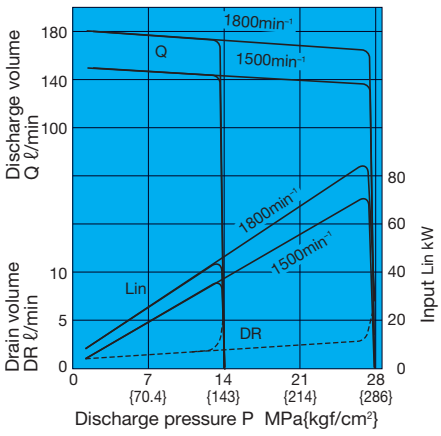
PZS-4B-100N*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s

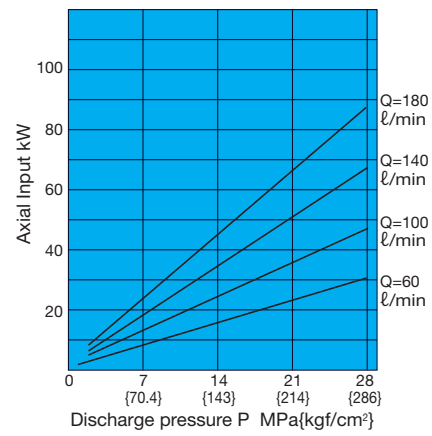
General Performance



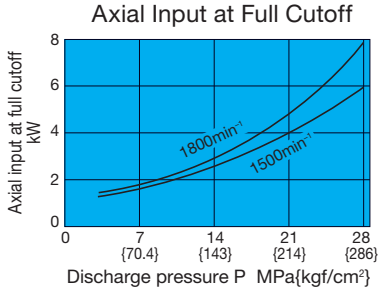
Pressure - Flow Rate Characteristics



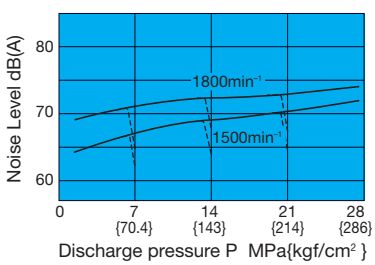
Axial Input



Axial Input at Full Cutoff



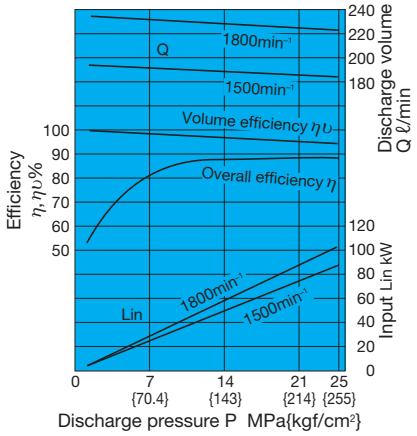
Noise Characteristics



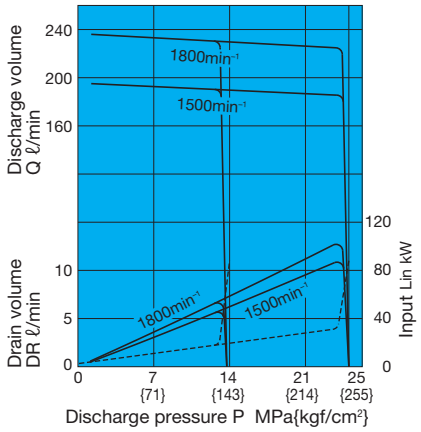
PZS-5B-130N*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s

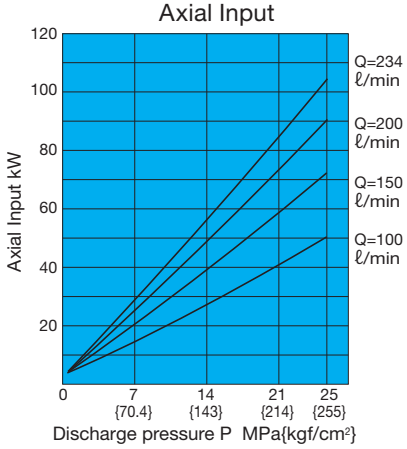
General Performance



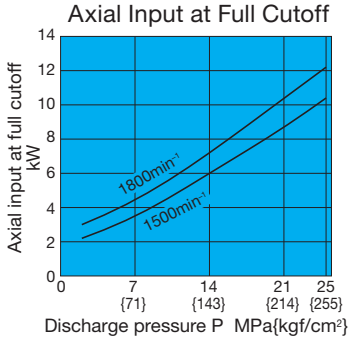
Pressure - Flow Rate Characteristics



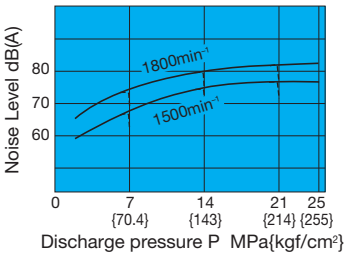
Axial Input



Axial Input at Full Cutoff



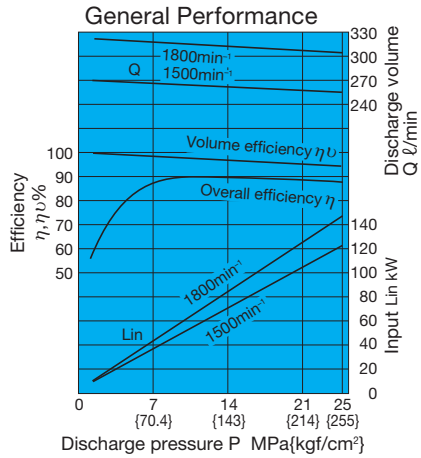
Noise Characteristics



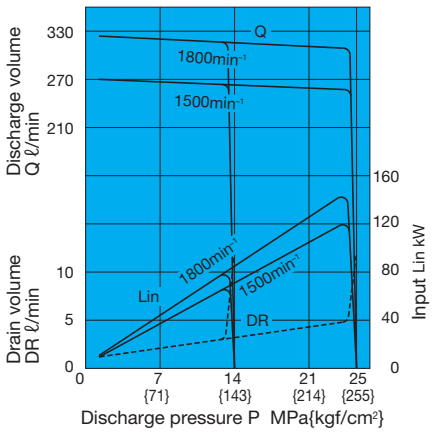
PZS-6B-180N*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s

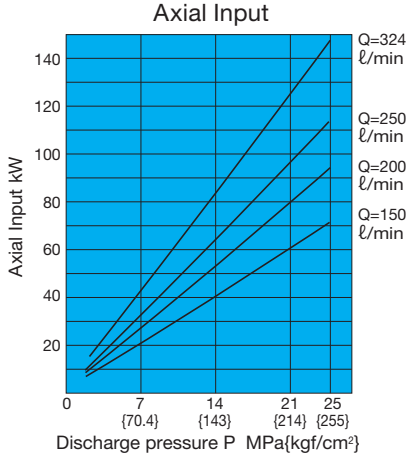
General Performance



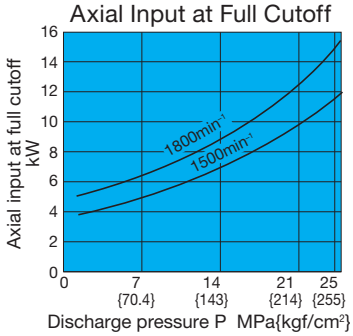
Pressure - Flow Rate Characteristics



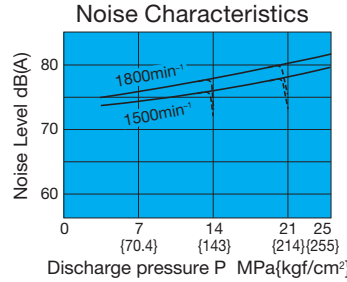
Axial Input



Axial Input at Full Cutoff



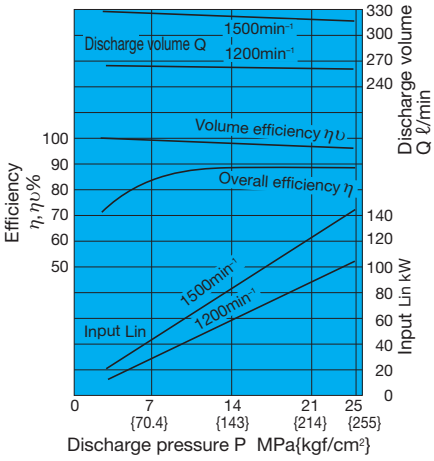
Noise Characteristics



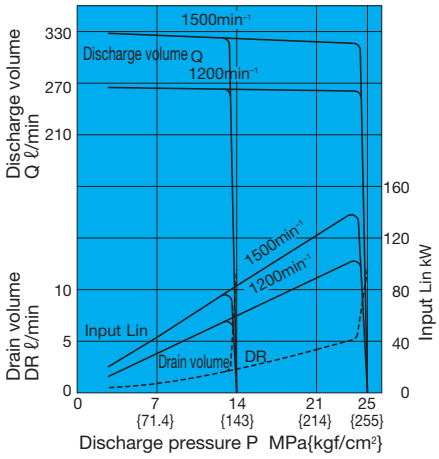
PZS-6B-220N*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s

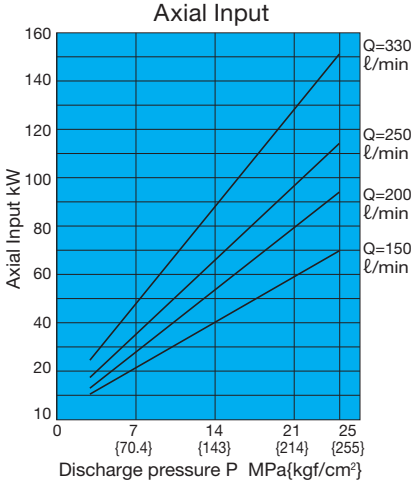
General Performance



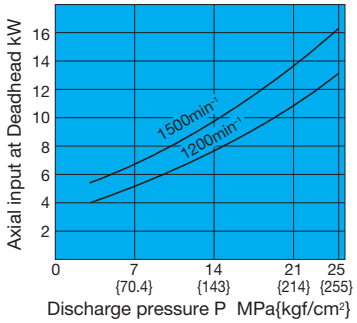
Pressure - Flow Rate Characteristics



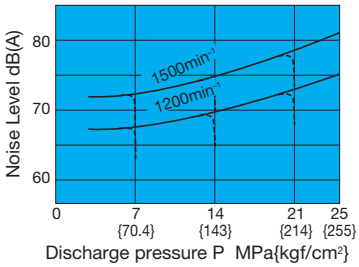
Axial Input



Axial Input at Deadhead

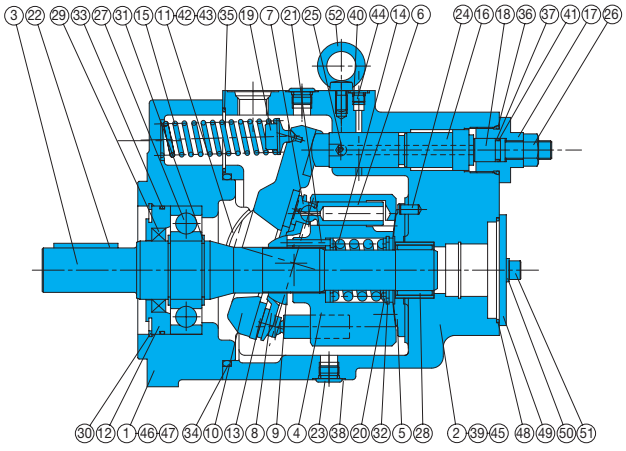


Noise Characteristics



Cross-sectional Drawings

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



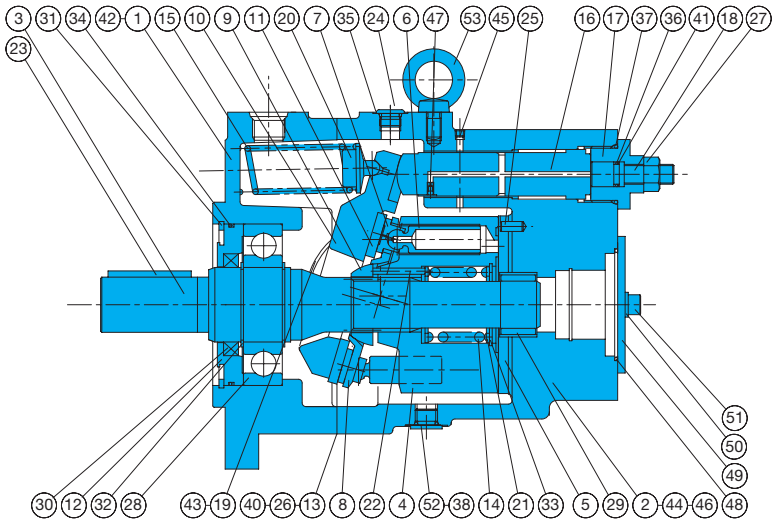
Part No.	Part Name	Part No.	Part Name
1	Body	28	Needle bearing
2	Case	29	Oil seal
3	Shaft	30	Snap ring
4	Cylinder barrel	31	Snap ring
5	Valve plate	32	Snap ring
6	Piston	33	O-ring
7	Shoe	34	O-ring
8	Shoe holder	35	O-ring
9	Barrel holder	36	O-ring
10	Swash plate	37	O-ring
11	Thrust bush	38	O-ring
12	Seal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

List of Sealing Parts (Kit Model Number 3B : PZBS-103000, 4B : PZAS-104100, 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	NBR-90 G95	1	NBR-90 G105	1	NBR-90 G135	1	JIS B 2401
34	O-ring	NBR-90 G130	1	NBR-90 G155	1	NBR-90 G200	1	〃
35	O-ring	NBR-90 G50	1	NBR-90 G50	1	NBR-90 G65	1	〃
36	O-ring	NBR-90 P34	1	NBR-90 P36	1	NBR-90 P41	1	〃
37	O-ring	NBR-90 P12	1	NBR-90 P16	1	NBR-90 P16	1	〃
* 38	O-ring	NBR-90 P14	2	NBR-90 P14	3	NBR-90 P14	3	〃
39	O-ring	Note 1	1	NBR-90 P9	1	NBR-90 P10	1	〃
40	O-ring	NBR-90 P8	5	NBR-90 P8	5	NBR-90 P8	8	〃
41	Backup ring	T2-P12	1	T2-P16	1	T2-P16	1	JIS B 2407
48	O-ring	Note 1	1	NBR-90 G85	1	NBR-90 G85	1	JIS B 2401

Note 1: Contact your agent about this type of O-ring. * Hydraulic fluid input changed to GPF 3/8. (from May 2008)

PZS-5B-130N*-10



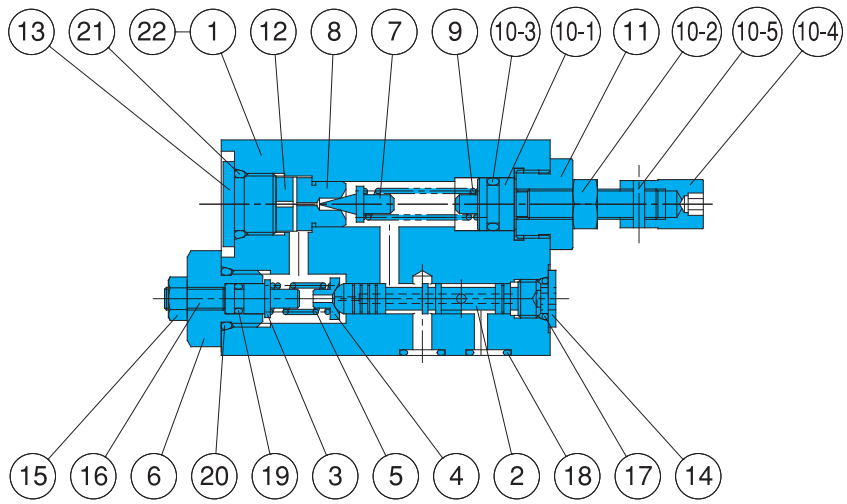
Part No.	Part Name	Part No.	Part Name
1	Body	28	Ball bearing
2	Case	29	Needle bearing
3	Shaft	30	Oil seal
4	Cylinder barrel	31	Snap ring
5	Valve plate	32	Snap ring
6	Piston	33	Snap ring
7	Shoe	34	O-ring
8	Shoe holder	35	O-ring
9	Barrel holder	36	O-ring
10	Swash plate	37	O-ring
11	Thrust plate	38	O-ring
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	NBR-90 G125	JIS B 2401
35	O-ring	2	NBR-90 P14	JIS B 2401
36	O-ring	1	NBR-90 P16	JIS B 2401
37	O-ring	1	NBR-90 P42	JIS B 2401
38	O-ring	1	NBR-90 P14	JIS B 2401
39	O-ring	5	NBR-90 P8	JIS B 2401
40	O-ring	2	NBR-90 P7	JIS B 2401
41	Backup ring	1	T2-P16	JIS B 2407
48	O-ring	1	NBR-90 G85	JIS B 2401

Parts marked by an asterisk "*" are not available on the market. Consult your agent.
* Lubrication port changed to GPF 3/8. (from May 2008)

Pressure Compensator



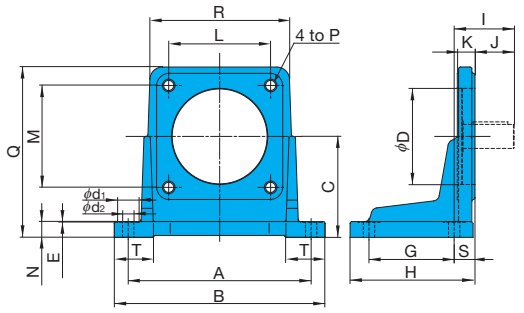
Part No.	Part Name	Part No.	Part Name
1	Valve body	12	Collar
2	Spool	13	Plug
3	Spring guide	14	Plug
4	Sprint bearing	15	Nut
5	Spring	16	Socket head screw
6	Retainer	17	O-ring
7	Needle valve	18	O-ring
8	Valve seat	19	O-ring
9	Spring	20	O-ring
10	Adjustment screw kit	21	O-ring
10-1	Adjustment screw	22	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	NBR-90 P10A	1	NBR-90 P10A	1	JIS B 2401
17	O-ring	NBR-90 P8	1	NBR-90 P11	2	〃
18	O-ring	NBR-90 P9	4	NBR-90 P9	5	〃
19	O-ring	NBR-90 P5	1	NBR-90 P14	1	〃
20	O-ring	NBR-90 P12	1	NBR-90 P22	1	〃
21	O-ring	NBR-90 P14	1	NBR-90 P14	1	〃

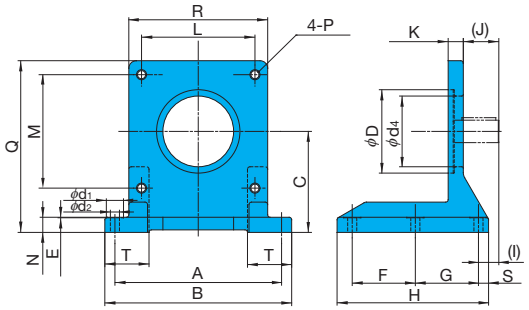
Foot Mounting Kit

PZM-*-10



Foot Mounting Installation Measurement Chart

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	φd1	φd2	φd4	
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	
PJF-10300T	PZS-3B	IH03J-100120	1	TH-12×55	4	WS-B-12	4	NBR-90 G50	1
PJF-10400T	PZS-4B	IH03J-100160	1	TH-12×60	4	WS-B-12	4	NBR-90 G60	1
PJF-10500T	PZS-5B	IH03J-100200	1	TH-12×65	4	WS-B-12	4	NBR-90 G75	1
PJF-10600T	PZS-6B	IH03J-100240	1	TH-16×75	4	WS-B-16	4	NBR-90 G85	1

OUT Flange							
Flange Part No.		Bolt		Washer		O-ring	
IH03J-100100	1	TH-10×55	4	WS-B-10	4	NBR-90 G40	1
IH03J-100160	1	TH-12×60	4	WS-B-12	4	NBR-90 G60	1
IH03J-100200	1	TH-12×65	4	WS-B-12	4	NBR-90 G75	1
IH03J-100200	1	TH-12×65	4	WS-B-12	4	NBR-90 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	NBR-90 G50	1
PJF-10400E	PZS-4B	IH03J-200160	1	TH-12×60	4	WS-B-12	4	NBR-90 G60	1
PJF-10500E	PZS-5B	IH03J-200200	1	TH-12×65	4	WS-B-12	4	NBR-90 G75	1
PJF-10600E	PZS-6B	IH03J-200240	1	TH-16×75	4	WS-B-16	4	NBR-90 G85	1

OUT Flange							
Flange Part No.		Bolt		Washer		O-ring	
IH03J-200100	1	TH-10×55	4	WS-B-10	4	NBR-90 G40	1
IH03J-200160	1	TH-12×60	4	WS-B-12	4	NBR-90 G60	1
IH03J-200200	1	TH-12×65	4	WS-B-12	4	NBR-90 G75	1
IH03J-200200	1	TH-12×65	4	WS-B-12		NBR-90 G75	1

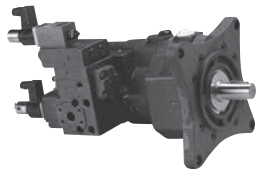
- See page C-11 for dimensions.
- The materials and hardness of the O-ring conform with JIS B2401
- See page C-11 for details on tightening torque.

NACHI

PZ SERIES PROPORTIONAL VOLUME PISTON PUMP

PZ Series
Load Sensitive Variable Piston Pump

35 to 220cm³/rev
21MPa



Features

①The 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.

②The pump body houses an electro-hydraulic proportional control valve, compensator, and surge cutoff valve, which eliminates the need for superfluous piping.

③The electro-hydraulic proportional control valve uses the proven force feedback system for improved hysteresis, repeatability, and response.

④The 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 cm³/rev	Maximum Working Pressure MPa {kgf/cm²}	Pressure Adjustment Range MPa {kgf/cm²}	Flow Control Limit Range ℓ/min Note 3	Revolution Speed min⁻¹ Min.	Revolution Speed min⁻¹ Max.	Weight kg	Fixed Discharge Pump Note 1 Capacity cm³/rev	Fixed Discharge Pump Note 1 Pressure MPa {kgf/cm²}
PZ-2B-*- 35E1A-11 2 3	35	21 {214}	2 to 7 {20.4 to 71.4} 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	1 to 63	600	2000	36	3.6 to 8.18	21 {214}
PZ-2B-*- 45E1A-11 2	45	14 {143}	2 to 7 {20.4 to 71.4} 2 to 14 {20.4 to 143 }	1 to 80	600	2000	36	3.6 to 8.18	21 {214}
PZ-3B-*- 70E1A-10 2 3	70	21 {214}	2 to 7 {20.4 to 71.4} 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	1 to 126	600	1800	60	3.6 to 15.8	21 {214}
PZ-4B-*-100E1A-10 2 3	100	21 {214}	2 to 7 {20.4 to 71.4} 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	1 to 180	600	1800	76	3.6 to 15.8	21 {214}
PZ-5B-*-130E1A-10 2 (Note 2) 3	130	21 {214}	2 to 7 {20.4 to 71.4} 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	3 to 234	600	1800	100	3.6 to 32.3	21 {214}
PZ-6B-*-180E1A-20 2 3	180	21 {214}	2 to 7 {20.4 to 71.4} 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	3 to 324	600	1800	160	3.6 to 63.9	21 {214}
PZ-6B-*-220E1A-20 2 3	220	21 {214}	2 to 7 {20.4 to 71.4} 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	3 to 330	600	1500	162	3.6 to 63.9	21 {214}

Note1. Can be used in combination with an IP pump to configure a fixed discharge pump.
Note2. The PZ-4B-130 model number was changed to PZ-5B-130.
Note3. Maximum flow rate depends on the revolution speed. Values in the above table are for a speed of 1800min⁻¹ for the PZ-2B to PZ-6B-180, and 1500min⁻¹ for the PZ-6B-220.

Pressure/Flow Rate Control System Specifications

Pressure Control System

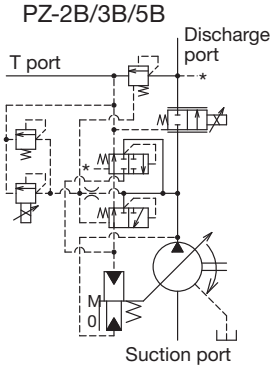
Pressure Control Range MPa {kgf/cm²}	1 : 2 to 7{20.4 to 71.4} 2 : 2 to 14{20.4 to 143 } 3 : 2 to 21{20.4 to 214 }
Rated Current mA	800
Coil Resistance Ω	20(20°C)
Hysteresis %	3% max. Note 1

Flow Rate Control System

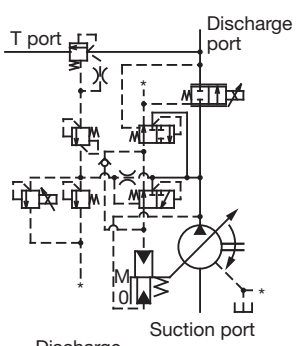
Valve Differential Pressure MPa {kgf/cm²}	1{10} Note 2
Rated Current mA	800
Coil Resistance Ω	20(20°C)
Hysteresis %	3% max. Note 1

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 I-26 through I-37.

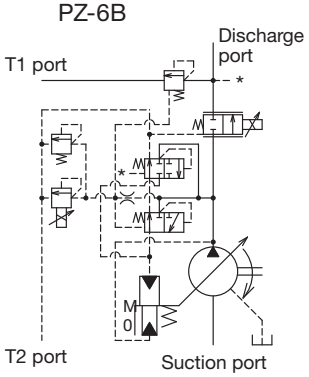
PZ-2B/3B/5B



PZ-4B-100



PZ-6B



Explanation of model No.

PZ – 3 B – 10 – 70 E 2 A – 10

- Design number 11: PZ-2B, 2A; 10: PZ-3B to 5B; 20: PZ-6B
- Auxiliary symbol
- Pressure adjustment range (See specifications.) 1, 2, 3
- Control mechanism EA: Load response control
- Variable pump capacity (cm^3/rev) 35, 45, 70, 100, 130, 180, 220
- Fixed discharge pump capacity (cm^3/rev) 3.5 to 64 (See IP pump C-1.)
- Mounting method B: Flange type mounting; A: Foot type mounting
- Pump size 2, 3, 4, 5, 6
- PZ Series Piston Pump

●Handling

●Pump Installation and Piping Precautions

1 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.
2 Eccentricity between the drive shaft and pump shaft should be no greater than 0.05mm, with an eccentric angle error of 1° or less.
3 Keep the fitting length of couplings and pump shafts at least 2/3 the length of the coupling width.
4 Use a sufficiently rigid pump mounting base.
5 Set pump suction side pressure to –0.03 MPa or more (suction port flow velocity less than 2 m/sec).
6 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 0.1 MPa

Item / Model No.	PZ-2B	3B PZ-4B 5B	PZ-6B
Pipe Joint Size	At least 1/2"	At least 3/4"	At least 1"
Pipe I.D.	At least ϕ12	At least ϕ17	At least ϕ22
Pipe Length	1 m or less	1 m or less	1 m or less

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

●Management of Hydraulic Operating Fluid

1 Use only good-quality hydraulic operating fluid with a kinematic viscosity during operation within the range of 20 to 200 mm^2/sec.
Normally, you should use an R&O type and wear-resistant type of ISOGV32 to 68 or equivalent.
The optimum kinematic viscosity during operation is 20 to 50 mm^2/sec.
2 The operating temperature range is 5 to 60°C. When the oil temperature at startup is 5°C or less, run the pump at low pressure until the oil temperature reaches 5°C.
3 Provide a suction strainer with a filtering grade of about 100μ (150 mesh). Provide a return line filter of grade 20μm or less on the return line to the tank. (When the pump is used at a high pressure of 14 MPa or greater, a filter of 10μm or less is recommended.)
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 0 to 60°C.

●Inverter Drive Precautions

1 Set the revolution speed within the range of the pump specification revolution speed.
2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

●Startup Precautions

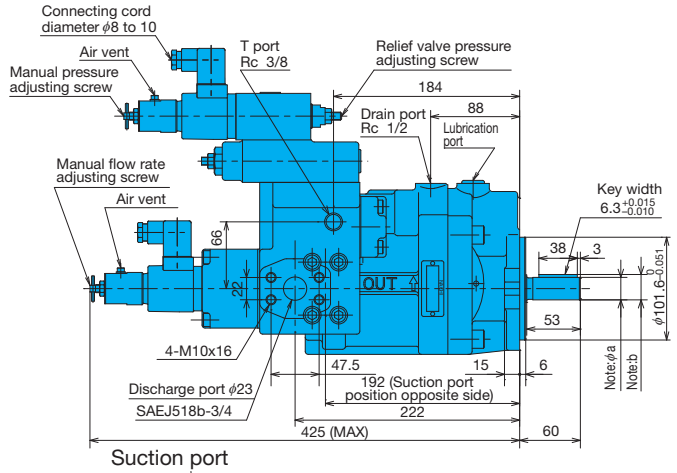
1 Before starting up the pump, fill the pump body with clean hydraulic operating fluid through the lubrication port.

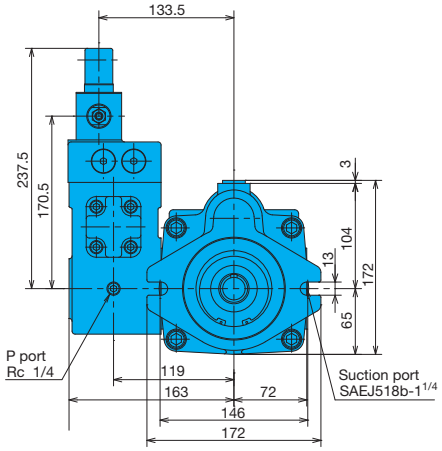
Model No.	Oil Amount cm^3
PZ-2B	650
PZ-3B	1000
PZ-4B	1800
PZ-5B	2200
PZ-6B	3000

2 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.
3 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.
4 Equip an air bleed valve in circuits where it is difficult to release air before startup. (See "IP Pumps" on page C-13.)
5 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.
6 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.

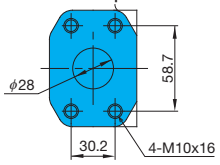
Installation Dimension Drawings

PZ-2B-$^{35}_{45}$





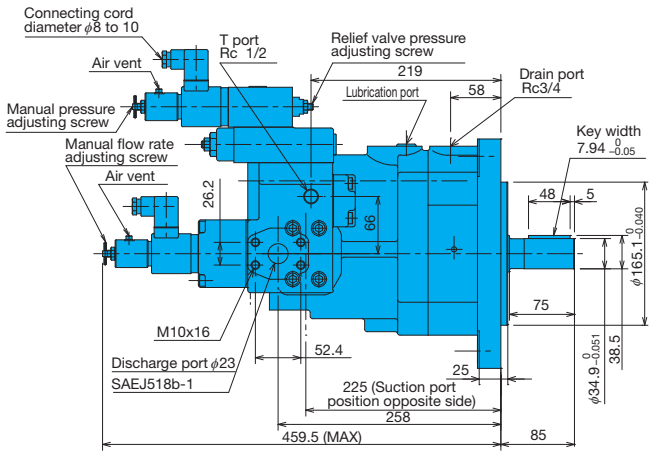
Suction port

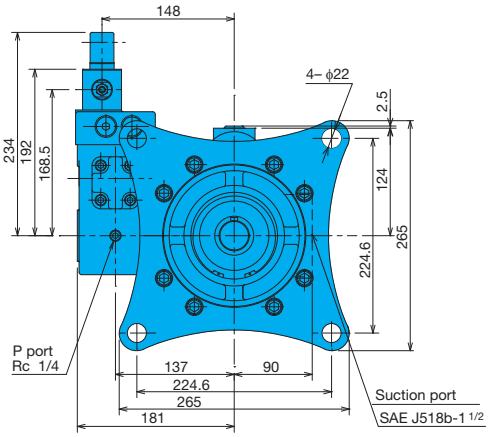


Note

	ϕ a	b
Single Pump	$\phi 22.23^{\ 0}_{-0.021}$	$24.9^{\ 0}_{-0.5}$
Double Pump with Fixed Flow IP	$\phi 25.385^{\ 0}_{-0.025}$	$27.85^{\ 0}_{-0.25}$

PZ-3B-70





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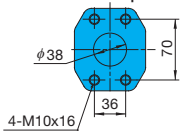
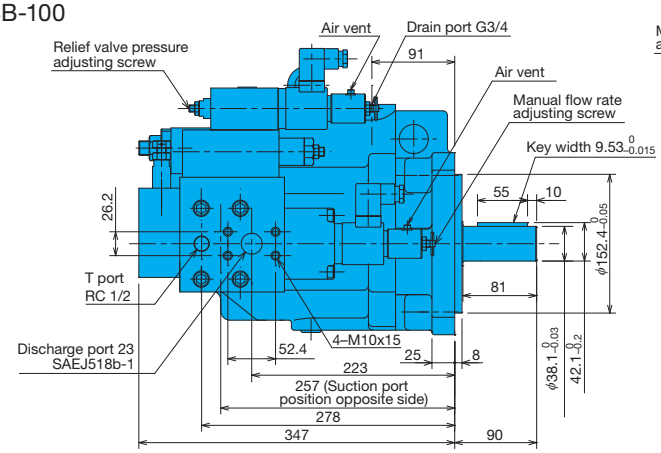
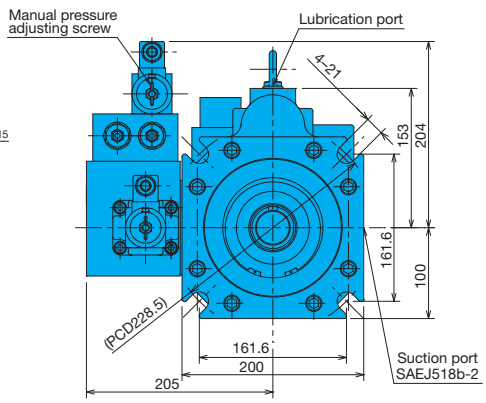


PZ-4B-100





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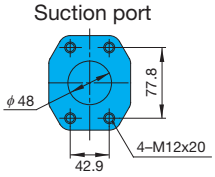

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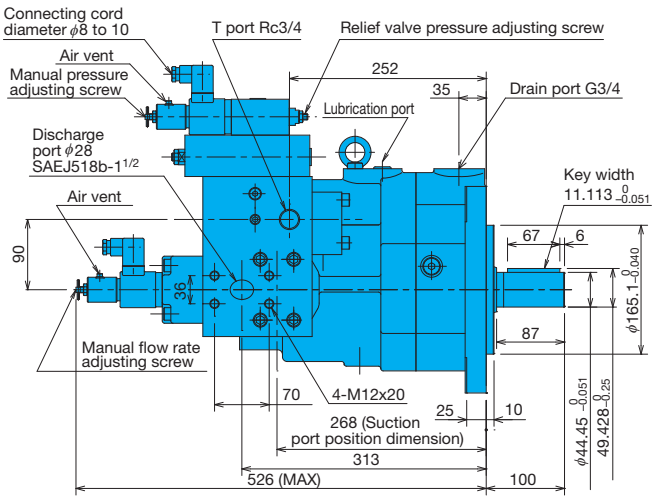
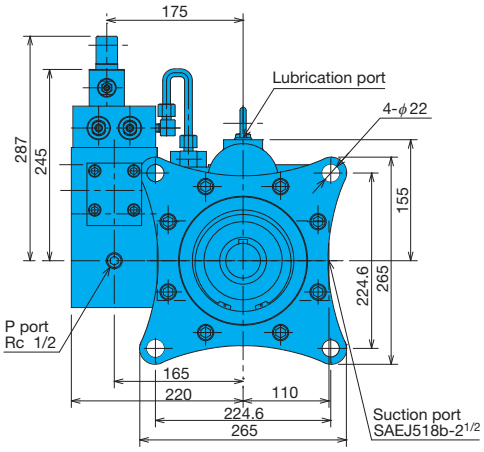
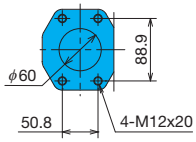
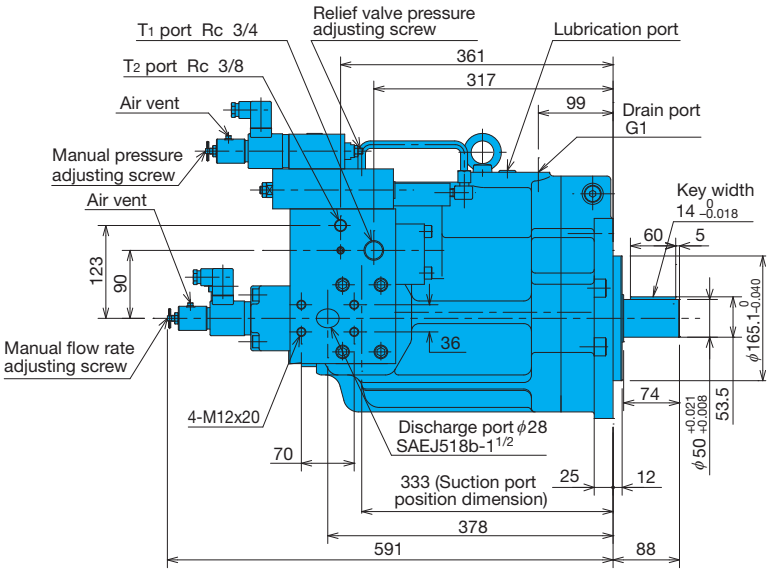


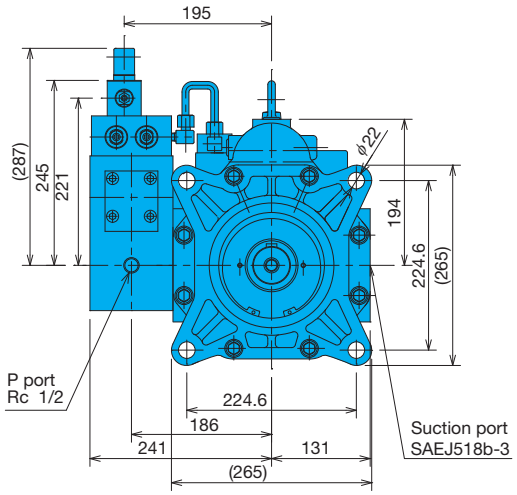


Suction port

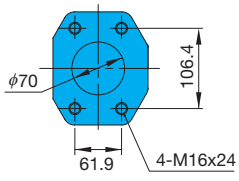


PZ-6B-$^{180}_{220}$





Suction port

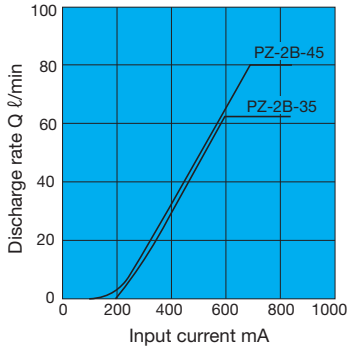


Performance Curves

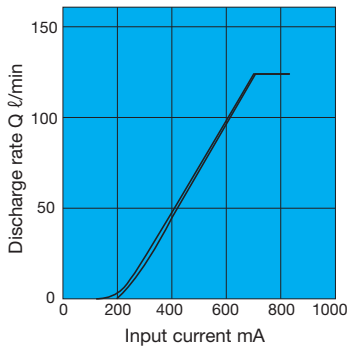
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

Input Current–Discharge Rate Characteristics

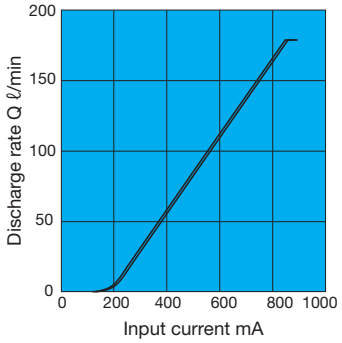
PZ-2B- 35 45



PZ-3B-70



PZ-4B-100



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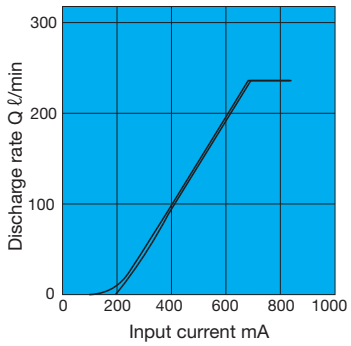
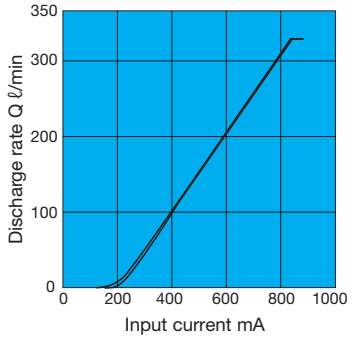
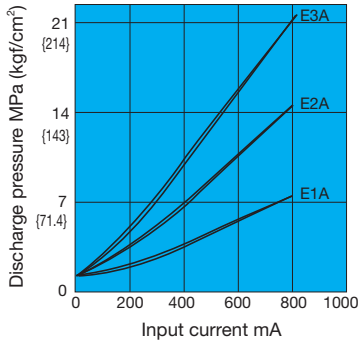


PZ-6B-180/220

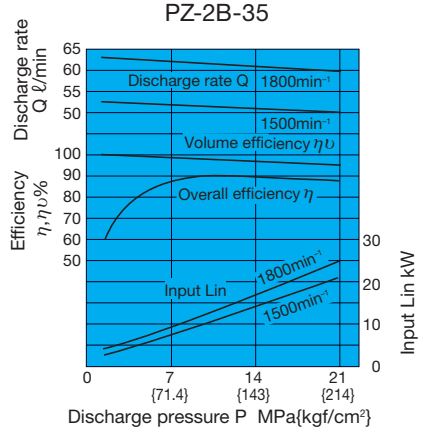


Input Current–Discharge Pressure Characteristics

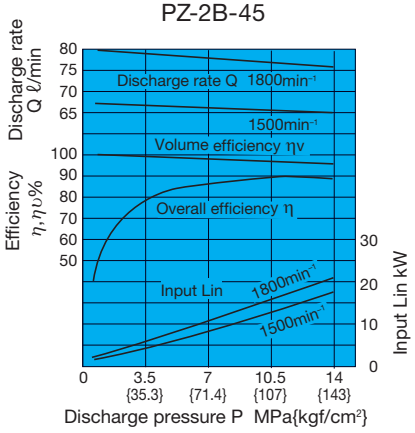


General Performance

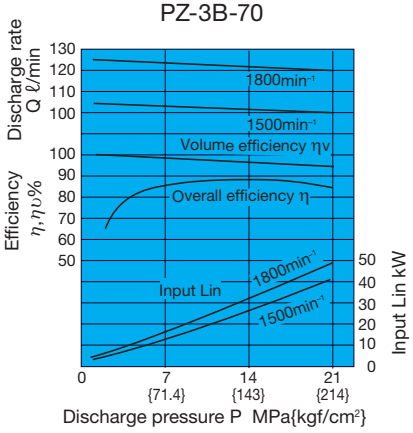
PZ-2B-35



PZ-2B-45



PZ-3B-70



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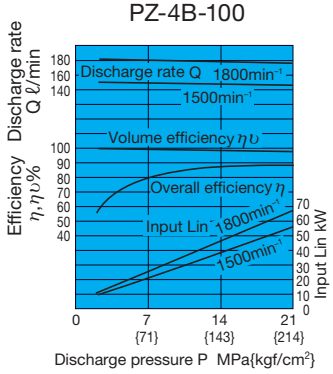

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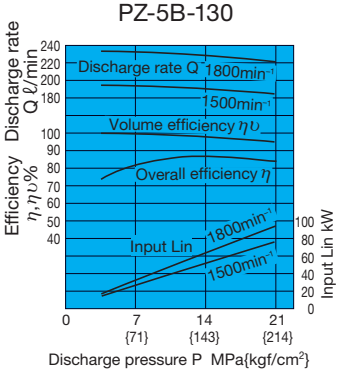
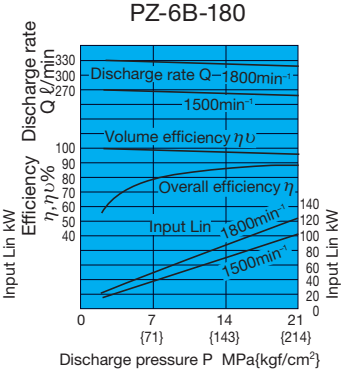
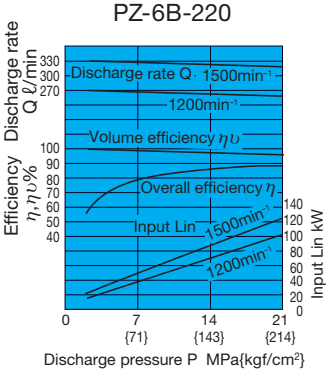


PZ-6B-180

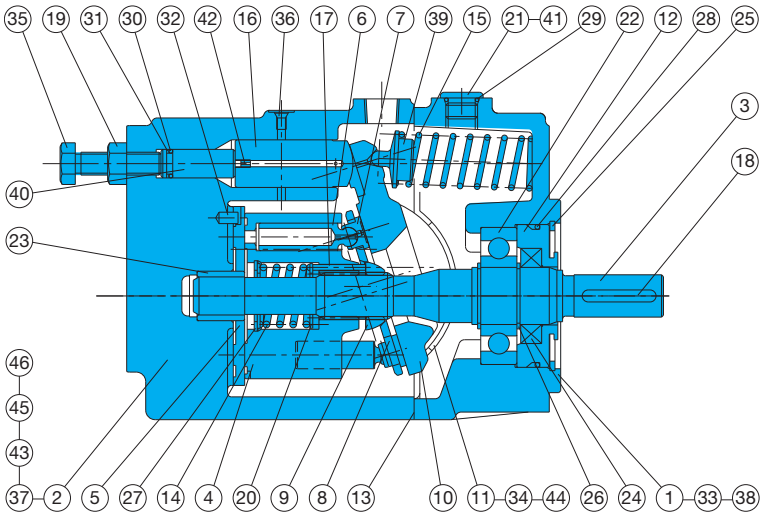


PZ-6B-220



Cross-sectional Drawings

PZ-2B-$\begin{matrix}35\\45\end{matrix}$E*A-11



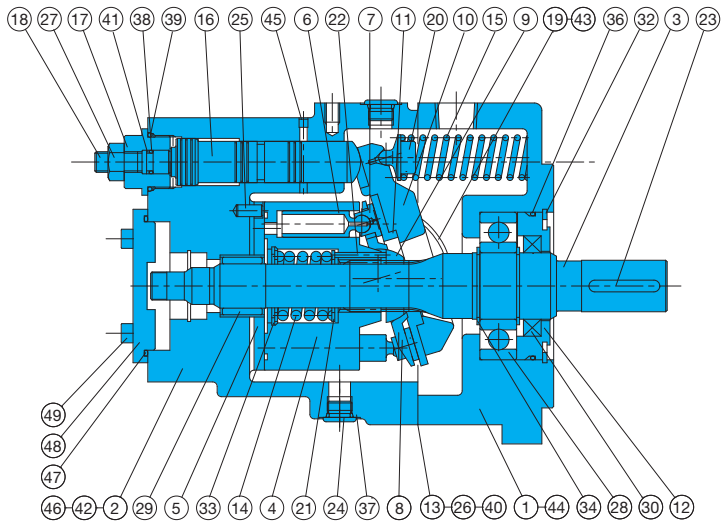
Part No.	Part Name	Part No.	Part Name
1	Body	24	Oil seal
2	Case	25	Snap ring
3	Shaft	26	Snap ring
4	Cylinder barrel	27	Snap ring
5	Valve plate	28	O-ring
6	Piston	29	O-ring
7	Shoe	30	O-ring
8	Shoe holder	31	Backup ring
9	Barrel holder	32	Pin
10	Swash plate	33	Screw
11	Thrust bush	34	Screw
12	Seal holder	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	NBR-90 G70	JIS B 2401
29	O-ring	1	NBR-90 P14	JIS B 2401
30	O-ring	1	NBR-90 P11	JIS B 2401
31	Backup ring	1	T2-P11	JIS B 2407
46	O-ring	2	NBR-90 P5	JIS B 2401

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

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



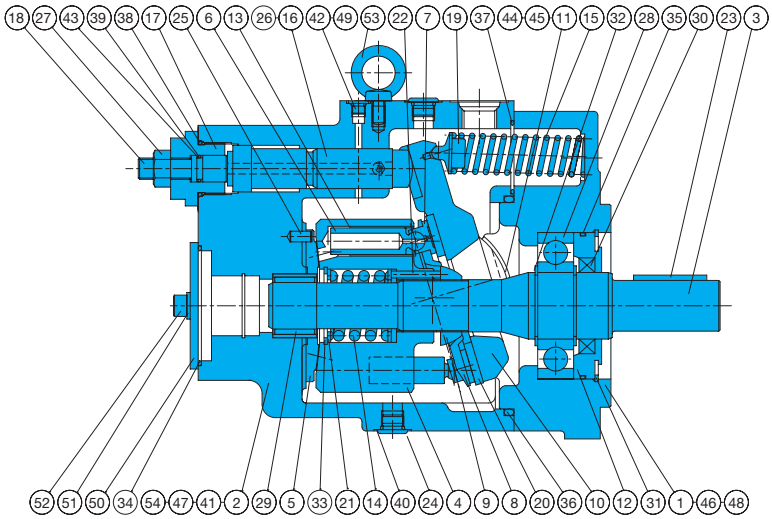
Part No.	Part Name	Part No.	Part Name
1	Body	24	Plug
2	Case	25	Pin
3	Shaft	26	Connector
4	Cylinder barrel	27	Nut
5	Valve plate	28	Ball bearing
6	Piston	29	Needle bearing
7	Shoe	30	Oil seal
8	Shoe holder	32	Snap ring
9	Barrel holder	33	Snap ring
10	Swash plate	34	Snap ring
11	Thrust plate	36	O-ring
12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

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	NBR-90 G95	1	NBR-90 G125	1	JIS B 2401
37	O-ring	NBR-90 P14	2	NBR-90 P21	2	JIS B 2401
38	O-ring	NBR-90 P12	1	NBR-90 P16	1	JIS B 2401
39	O-ring	NBR-90 P34	1	NBR-90 P42	1	JIS B 2401
40	O-ring	NBR-90 P7	2	NBR-90 P7	2	JIS B 2401
41	Backup ring	T2-P12	1	T2-P16	1	JIS B 2407
47	O-ring	NBR-90 G90	1	NBR-90 G85	1	JIS B 2401

Parts marked by an asterisk "*" are not available on the market. Consult your agent.
* Lubrication port changed to GPF 3/8. (from May 2008)

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	NBR-90 G85	1	NBR-90 G85	1	JIS B 2401
35	O-ring	NBR-90 G105	1	NBR-90 G135	1	JIS B 2401
36	O-ring	NBR-90 G155	1	NBR-90 G200	1	JIS B 2401
37	O-ring	NBR-90 G50	1	NBR-90 G65	1	JIS B 2401
38	O-ring	NBR-90 P36	1	NBR-90 P41	1	JIS B 2401
39	O-ring	NBR-90 P16	1	NBR-90 P16	1	JIS B 2401
40	O-ring	NBR-90 P14	3	NBR-90 P14	3	JIS B 2401
41	O-ring	NBR-90 P9	1	NBR-90 P10	1	JIS B 2401
42	O-ring	NBR-90 P8	5	NBR-90 P8	8	JIS B 2401
43	Backup ring	T2-P16	1	T2-P16	1	JIS B 2407

* Lubrication port changed to GPF 3/8. (from May 2008)

Foot Mounting Kit

Pump Model No.	Mounting Model No.
PZ-2B	IHM-44-10
PZ-3B PZ-5B PZ-6B	IHM-55-10
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	NBR-90 G40	1
IHF -5-T-20	PZ-3B-70	IH03J-100120	1	TH-12×55	4	WS-B-12	4	NBR-90 G50	1
PZF-4-T-10	PZ-4B-100	IH03J-100160	1	TH-12×60	4	WS-B-12	4	NBR-90 G60	1
IHF -7-T-10	PZ-5B-130	IH03J-100200	1	TH-12×60	4	WS-B-12	4	NBR-90 G75	1
PZF-6-T-10	PZ-6B-180/220	IH03J-100240	1	TH-16×75	4	WS-B-16	4	NBR-90 G85	1

OUT Flange								Plug	
Flange Part No.		Bolt		Washer		O-ring			
IH03J-100060	1	TH-10×50	4	WS-B-10	4	NBR-90 G30	1	TPHA-1/4	1
IH03J-100080	1	TH-10×50	4	WS-B-10	4	NBR-90 G35	1	TPHA-1/4	2
IH03J-100080	1	TH-10×50	4	WS-B-10	4	NBR-90 G35	1	TPHA-1/4	1
IH03J-100120	1	TH-12×60	4	WS-B-12	4	NBR-90 G50	1	TPHA-1/4	1
IH03J-100120	1	TH-12×60	4	WS-B-12	4	NBR-90 G50	1	TPHA-1/4	1

Note 1. See page C-11 for dimensions.
2. The materials and hardness of the O-ring conform with JIS B2401.
3. See page C-11 for details on tightening torque.

VDS Series
Small Variable Volume Vane Pump

8cm³/rev
15ℓ
7MPa

Features

①High 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.

②Quiet 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.

③Compact 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.

④Precise characteristics, prompt response

Prompt response at both ON-OFF and OFF-ON ensures instantaneous, stable, high-precision operation.

⑤Solidly 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 cm³/rev	No-load Discharge Rate ℓ/min				Pressure Adjustment Range MPa {kgf/cm²}	Allowable Peak Pressure MPa {kgf/cm²}	Revolution Speed min⁻¹		Weight kg
		1000min⁻¹	1200min⁻¹	1500min⁻¹	1800min⁻¹			Min.	Max.	
VDS-0A(B)-1A1-10	8.3	8	10	12.5	15	1 to 2 {10.2 to 20.4}	14 {143}	800	1800	A : 6.5
〃 -1A2 〃						1.5 to 3.5 {15.3 to 35.7}				B : 4.5
〃 -1A3 〃						3 to 7 {30.6 to 71.4}				

●Handling

1 The direction of rotation for this pump is clockwise (rightward) when viewed from the shaft side.

2 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 0.03MPa.

3 When adjusting pressure, pressure is increased by clockwise (rightward) rotation of the adjusting screw and decreased by counterclockwise (leftward) rotation.

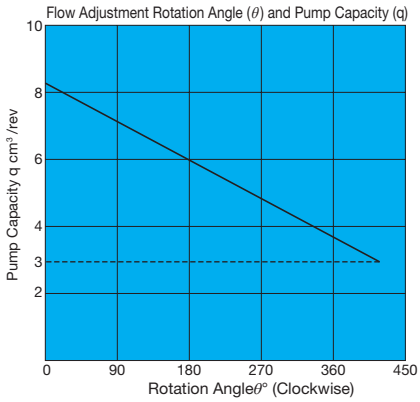
4 When adjusting the flow rate, the flow rate is decreased by clockwise (rightward) rotation of the adjusting screw and increased by counterclockwise (leftward) rotation. The graph on the right provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the noload discharge rate.

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

Factory Default Pressure Settings MPa{kgf/cm²}
1 : 2.0 {20.4}
2 : 3.5 {35.7}
3 : 7.0 {71.4}

However: $Q=q \times n \times 10^{-3}$
Q : No-load Discharge Rate (ℓ/min)
q : Capacity (cm³/rev)
N : Revolution Speed min⁻¹



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 precisely 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 150mm²/s.

9 The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.

(Continued on following page)

10 Suction pressure is -0.03 to +0.03MPa (-0.3 to +0.3kgf/cm²), and the suction port flow rate should to greater than 2m/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 25 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 At startup, repeat the inching operation (start-stop) to prime the pump and bleed air from the pump and pipes. (This pump has no fluid supply port.)
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 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.05mm. The angle error should be no greater than 1°.

● Inverter Drive Precautions
1 Set the revolution speed within the range of the pump specification revolution speed.
2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Explanation of model No.

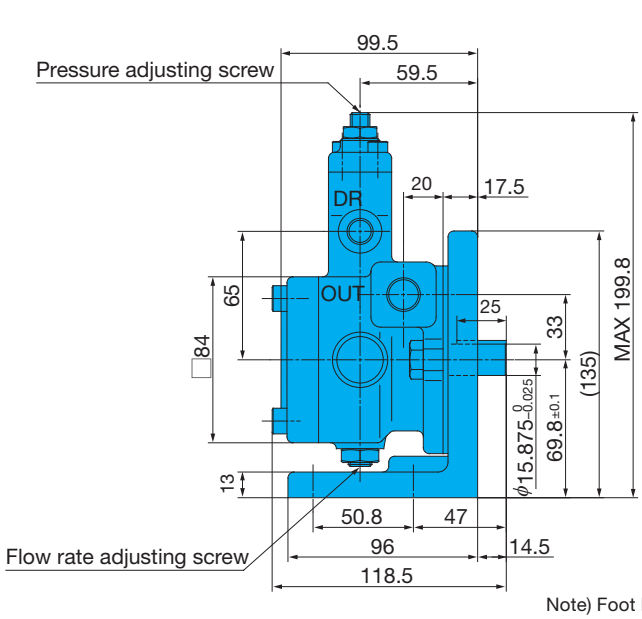
VDS – 0 * – 1 A * – 10

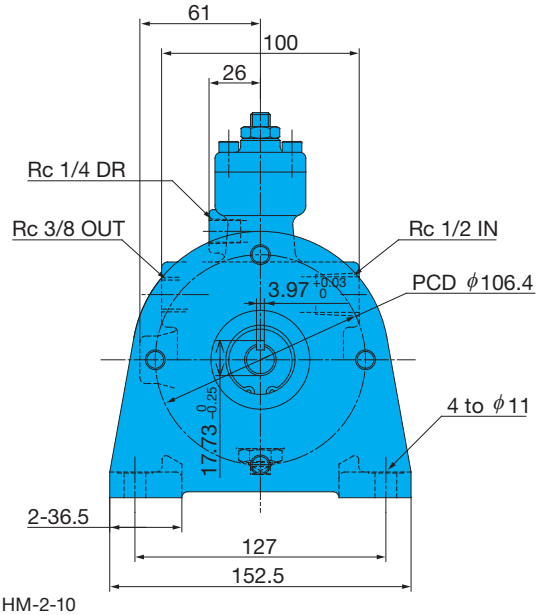
- Design number
- Pressure adjustment range
  1: 1 to 2MPa {10.2 to 20.4kgf/cm²} 2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 3 to 7MPa {30.6 to 71.4kgf/cm²}
- Flow ate characteristics A: Constant discharge rate type
- Ring size 1:15ℓ/min (1800 min⁻¹ no load)
- Mounting method
  A: Foot type mounting B: Flange type mounting
- Pump size: 0
- Pump Type: VDS Series Compact Variable Vane Pump

Installation Dimension Drawings

VDS-0A-1A-*-10

Foot Mounting Type

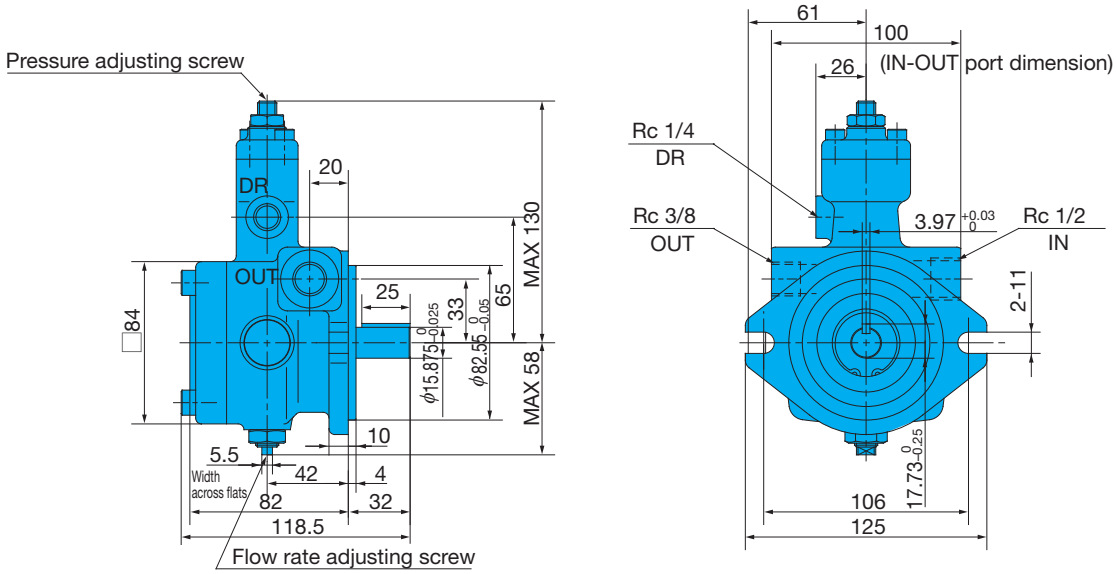




Note) Foot Mounting Kit: IHM-2-10

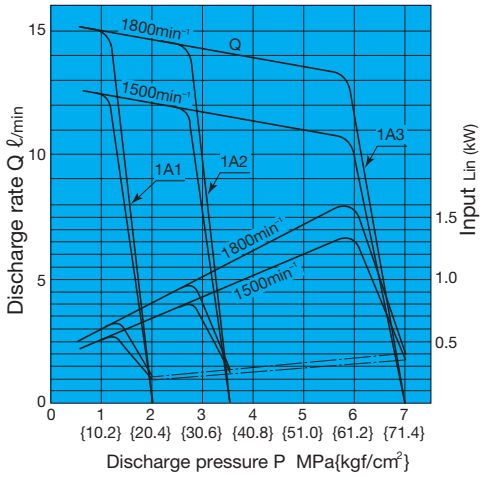
VDS-0B-1A-*-10

Flange Mounting

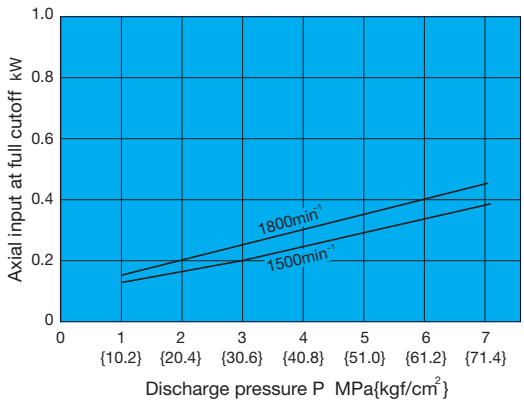


Performance Curves

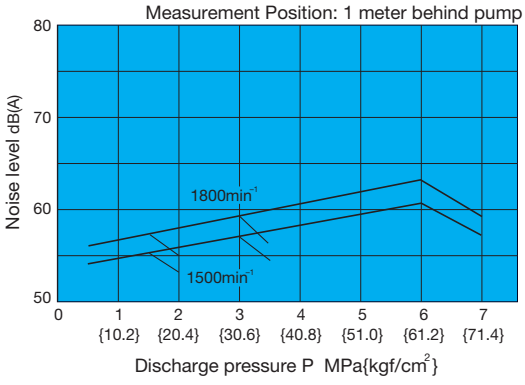
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s



Axial Input At Full Cutoff

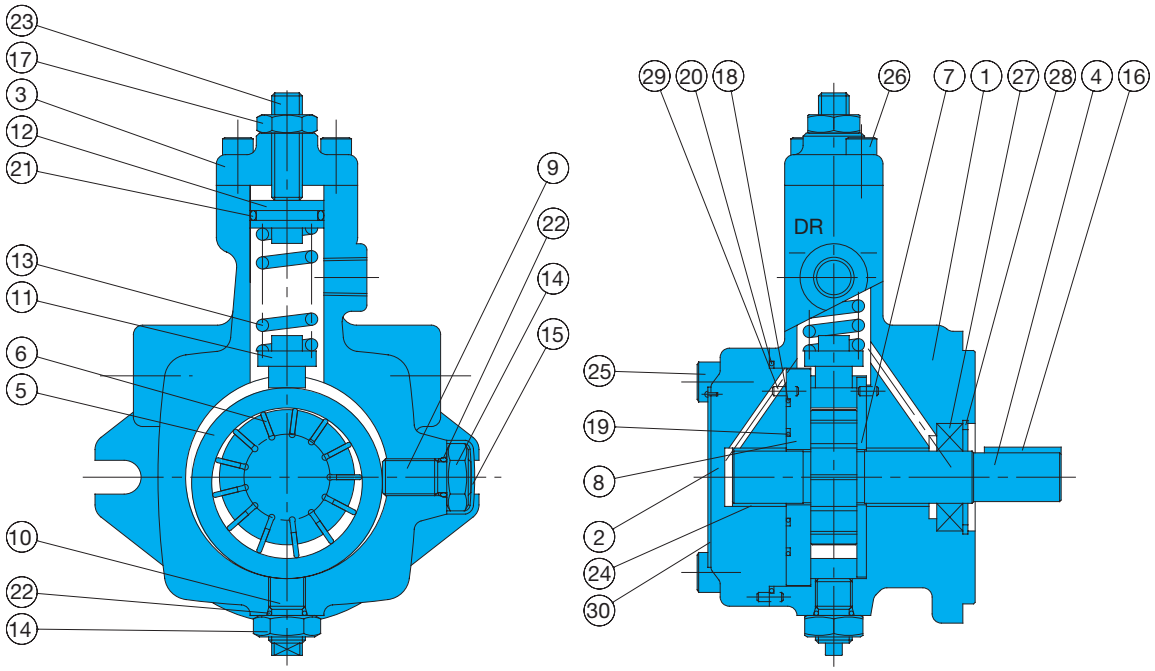


Noise Characteristics



Cross-sectional Drawings

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	AS568-023(NBR-90)	1
19	O-ring	AS568-032(NBR-90)	1
20	O-ring	S-71	1
21	O-ring	NBR-70-1 P20	1
22	O-ring	NBR-70-1 P10	2
27	Oil seal	TC-17358-V	1

Note) 1.Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
2.The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Cover (A)
3	Cover (B)
4	Shaft
5	Cam ring
6	Vane
7	Plate (S)
8	Plate (H)
9	Thrust screw
10	Screw
11	Piston
12	Holder
13	Spring
14	Nut
15	Cap

Part No.	Part Name
16	Key
17	Nut
18	O-ring
19	O-ring
20	O-ring
21	O-ring
22	O-ring
23	Screw
24	Bearing
25	Screw
26	Screw
27	Oil seal
28	Snap ring
29	Pin
30	Nameplate

Uni-pump Specifications

(CE mark standard compliant)

Understanding Model Numbers

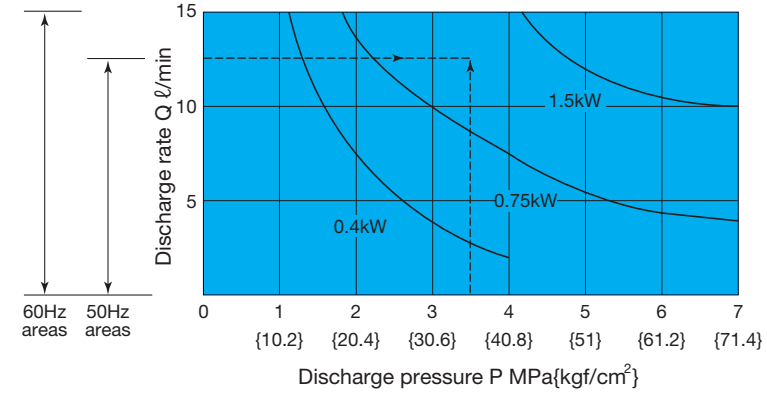
USV – 0A – A3 – 1.5 – 4 – 30

- 30: Design number
- 4: Number of motor poles: 4 (P)
- 1.5: Motor output (kW) 0.4, 0.75, 1.5
- A3: Pressure adjustment range
  - 1: 1.0 to 2.0MPa {10.2 to 20.4kgf/cm²}
  - 2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  - 3: 3.0 to 7.0MPa {30.6 to 71.4kgf/cm²}
- A: Flow characteristics — A: Constant discharge type
- A: Motor mounting method — A: Foot type mounting
- 0: Pump size — 0: VDS–0B
- USV: Pump Type: VDS Series Uni-pump

Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	
	50Hz	60Hz
7 {71.4}	12.5	15

1. Standard drive motor is the fully enclosed fan-cooled E type (0.4kW) and F type (0.75, 1.5kW).
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 3.5MPa and a discharge rate of 12.5 ℓ/min.

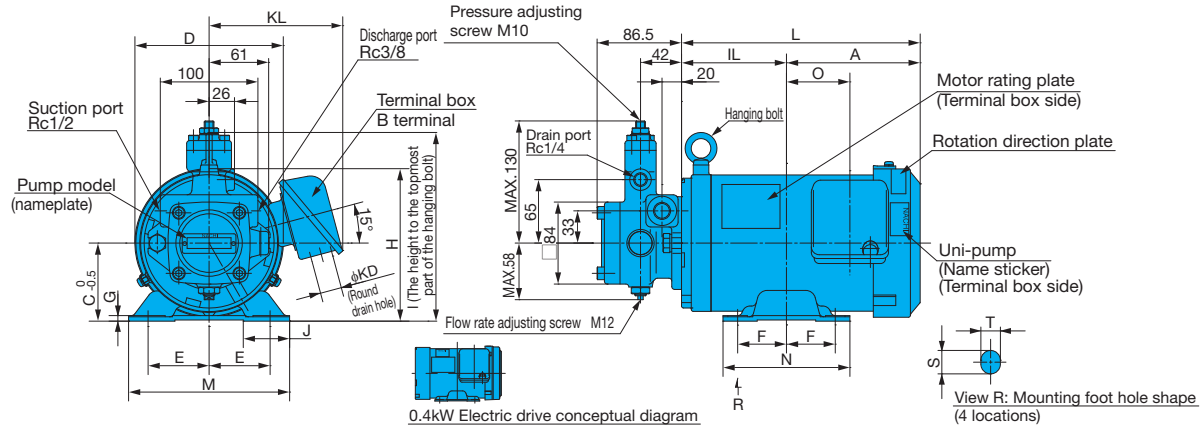
Selection Process

Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 12.5 ℓ/min intersect in the area under the 1.5kW curve, it means that a 1.5kW motor should be used.

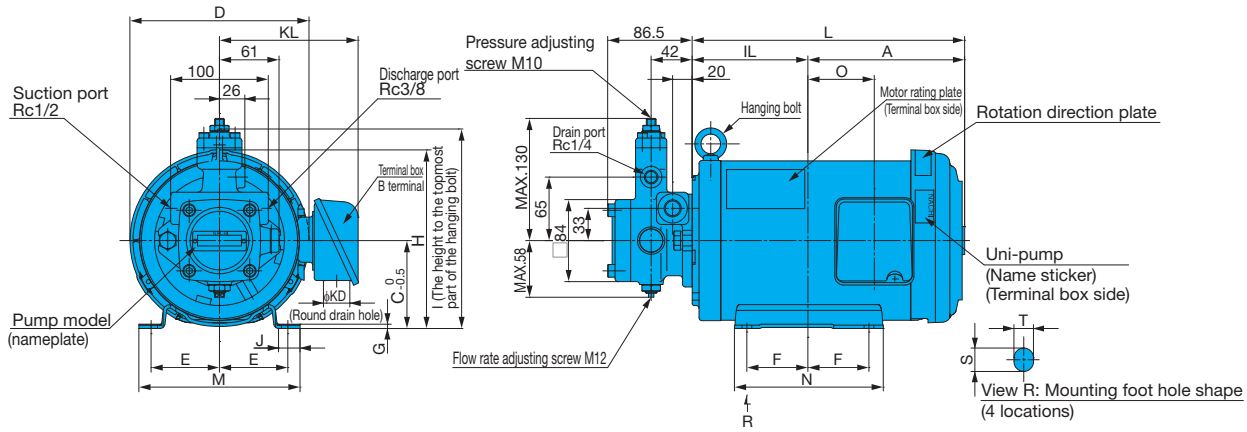
* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.
* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed. 0.4kW is not changed from IE 1.

Installation Dimension Drawings

USV-0A-A*-$\frac{0.4}{0.75}$-4-30



USV-0A-A*-1.5-4-30



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I	J	L	M	N	S×T	φ KD	KL	O			
USV-0A-A1-0.4-4-30	113	107.5	71	139.5	56	45	4	141	–	42	220.5	150	115	20×7	27	132	43.5	71M	0.4	15.5
USV-0A-A2-0.4-4-30																				
USV-0A-A3-0.4-4-30																				
USV-0A-A1-0.75-4-30	137	107.5	80	152	62.5	50	4.5	160	193	47.5	244.5	165	130	25×10	27	137	65	80M	0.75	23.5
USV-0A-A2-0.75-4-30																				
USV-0A-A3-0.75-4-30																				
USV-0A-A3-1.5-4-30	160.5	118.5	90	183	70	62.5	4.4	183	204	22	279	165	152.5	16×10	27	142	68	90L	1.5	26.5

* See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).
* The 0.4kW drive motor does not have hanging bolts.

NACHI VDR 22 DESIGN SERIES VARIABLE VOLUME VANE PUMP

VDR22 Design Series Variable Volume Vane Pump

30ℓ/min 14MPa
40ℓ/min 7MPa

Features

①Stable, highly efficient operation up to 14MPa

A biased piston that minimizes ring vibration and leak-free pressure balance construction enables highly efficient highpressure operation, and very stable performance up to 14MPa.

②High-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.

③Silent operation, even in the high pressure range

Quiet 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.

④Reduced power loss

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

⑤Solid 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.

Specifications

Single Pump

Model No.	Capacity cm³/rev	No-load Discharge Rate ℓ/min				Pressure Adjustment Range MPa{kgf/cm²}	Allowable Peak Pressure MPa{kgf/cm²}	Revolution Speed min⁻¹		Weight kg
		1000min⁻¹	1200min⁻¹	1500min⁻¹	1800min⁻¹			Min.	Max.	
VDR-1A(B)-1A2-22 1A3 1A4 1A5	16.7	16.7	20	25	30	1.5 to 3.5 {15.3 to 35.7} 3 to 7 {30.6 to 71.4} 6.5 to 10.5 {66.3 to 107} 9 to 14 {91.8 to 143}	14 {143} 21 {214}	800	1800	9
VDR-1A(B)-2A2-22 2A3	22	22	27	33	40	1.5 to 3.5 {15.3 to 35.7} 3 to 7 {30.6 to 71.4}	14 {143}	800	1800	9

Double Pump

Model No.	Vent Side		Shaft Side		Vent Side / Shaft Side		Revolution Speed min⁻¹		Weight kg
Foot Mounting Type (Flange Mounting Type)	Discharge Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Discharge Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Allowable Peak Pressure MPa{kgf/cm²}		Min.	Max.	
VDR-11A(B)-1A2-1A2-22 VDR-11A(B)-1A2-1A3-22	30	1.5 to 3.5 {15.3 to 35.7}	30	1.5 to 3.5 {15.3 to 35.7} 3 to 7 {30.6 to 71.4}	14 {143}		800	1800	17
VDR-11A(B)-1A3-1A3-22		3 to 7 {30.6 to 71.4}		3 to 7 {30.6 to 71.4}					
VDR-11A(B)-2A2-2A2-22 VDR-11A(B)-2A2-2A3-22	40	1.5 to 3.5 {15.3 to 35.7}	40	1.5 to 3.5 {15.3 to 35.7} 3 to 7 {30.6 to 71.4}	14 {143}		800	1800	17
VDR-11A(B)-2A3-2A3-22		3 to 7 {30.6 to 71.4}		3 to 7 {30.6 to 71.4}					

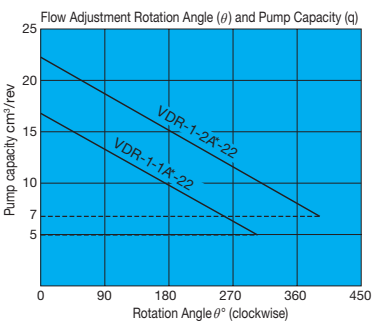
Note) 1. The discharge rate is the value at 1800min⁻¹ no-load.
2. The change from design number 21 to design number 22 represents a change in the shaft key width from 3.2mm to 4.76mm. This means that when using a 3.2mm key coupling, you need to use a stepped key (VD31J-301000) or add a new key groove at 4.76.

●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 0.03MPa. 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)

However: $Q=q \times n \times 10^{-3}$
Q : No-load Discharge Rate Q ℓ/min
q : Volume cm^3/rev
N : Revolution Speed min^{-1}
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

Factory Default Pressure Settings MPa{kgf/cm²}
2 : 3.5{35.7}
3 : 3 {30.6}
4 : 6.5{66.3}
5 : 9 {91.8}

6 Thrust Screw
The thrust screw is precisely adjusted at the factory during assembly. Never touch the thrust screw. See callout ㉑ in the crosssection diagram on page B-11.

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 noload 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.

Pump Model No.	Sub Plate Number	Motor(kW)
VDR-1A-1A*-22	MVD-1-115-10	0.75 to 1.5
	MVD-1-135-10	2.2 to 3.7
VDR-1A-2A*-22	MVD-1-115Y-10	0.75 to 1.5
	MVD-1-135Y-10	2.2 to 3.7
VDR-11A-*A* -*A*-22	MVD-11-135-10 MVD-11-135X-10	1.5 to 3.7

9 For the hydraulic operating fluid,use type ISO VG32 or equivalent (viscosity index of at least 90) for pressures of 7MPa or lower, and type ISO VG68 or equivalent (viscosity index of at least 90) for pressures greater than 7MP.

10 The operating temperature rangeis 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.

11 Suction pressure is -0.03 to+0.03MPa (-0.3 to +0.3kgf/cm²), and the suction port flow rate should be to greater than 2m/sec.

12 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.

13 Provide a suction strainer with a filtering grade of about 100 μm (150 mesh). For the return line to the tank, use a 25μm line filter.

(Continued on following page)

Explanation of model No.

Single pump

VDR – 1 A – 1 A 2 – 22

- Design number
- Pressure adjustment range
  2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 3 to 7MPa {30.6 to 71.4kgf/cm²}
  4: 6.5 to 10.5MPa {66.3 to 107kgf/cm²}
  5: 9 to 14MPa {91.8 to 143kgf/cm²}
  Note: Ring size: In the case of 2, maximum setting pressure is 7Mpa (71.4kgf/cm²).
- Flow rate characteristics A: Constant discharge rate type
- Ring size 1: 30ℓ/min, 2: 40ℓ/min } at 1800min⁻¹
- Mounting method A: Foot type mounting B: Flange type mounting
- Pump size: 1
- Pump Type: VDR Series Variable Discharge Rate Vane Pump

Double pump

VDR – 11 A – 1 A 2 – 1 A 3 – 22

- Design number
- Shaft side pressure adjustment range
  2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 3 to 7MPa {30.6 to 71.4kgf/cm²}
- Shaft side flow rate characteristics (based on single pump)
- Shaft side ring size (based on single pump)
- Head side pressure adjustment range
  2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 3 to 7MPa {30.6 to 71.4kgf/cm²}
- Head side flow rate characteristics (based on single pump)
- Head side ring size (based on single pump)
- Mounting method A: Foot type mounting B: Flange type mounting
- Pump size: 11
- Pump Type: VDR Series Variable Discharge Rate Vane Pump

14 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 out for discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.

15 Contact your agent about using water and glycol-based hydraulic operating fluids.

16 At startup, repeat the inching operation (start-stop) to prime the pump and bleed air from the pump and pipes. (This pump has no fluid supply port.)

17 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.

18 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°.

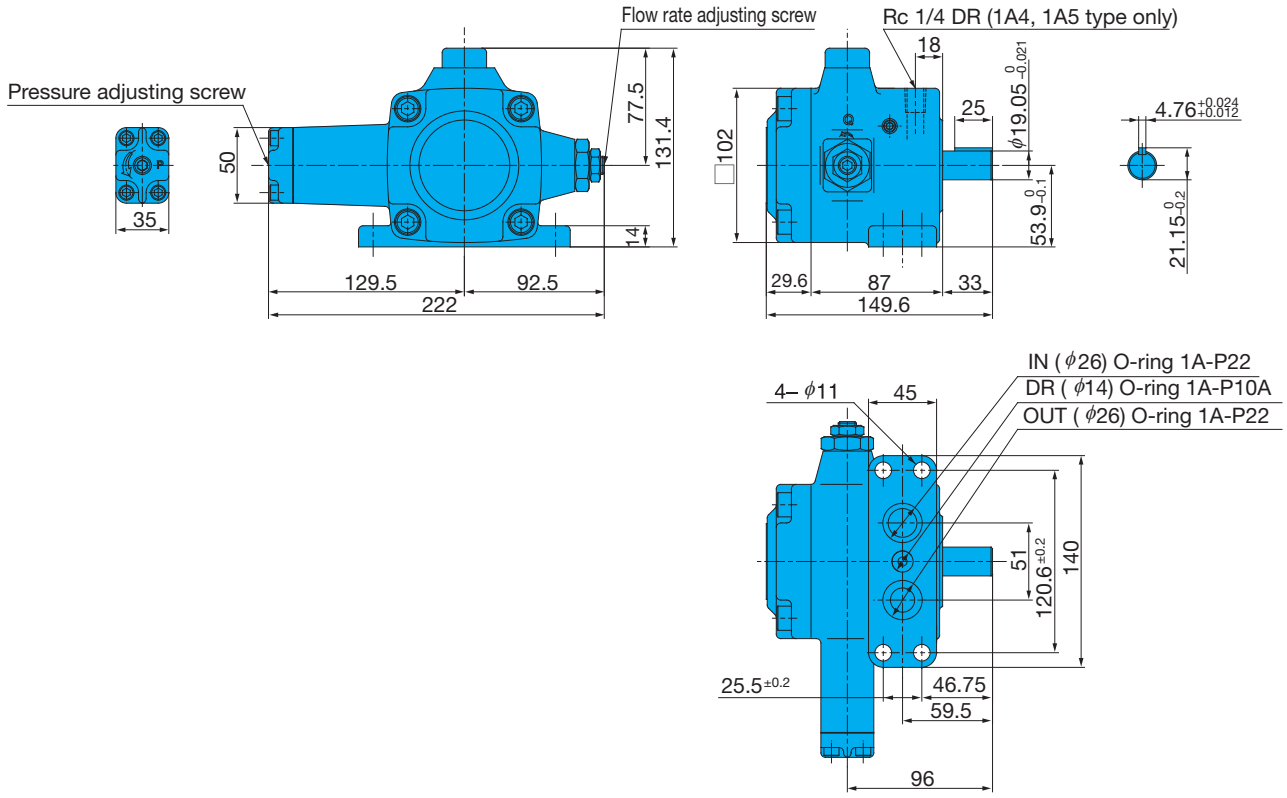
● Inverter Drive Precautions

1 Set the revolution speed within the range of the pump specification revolution speed.

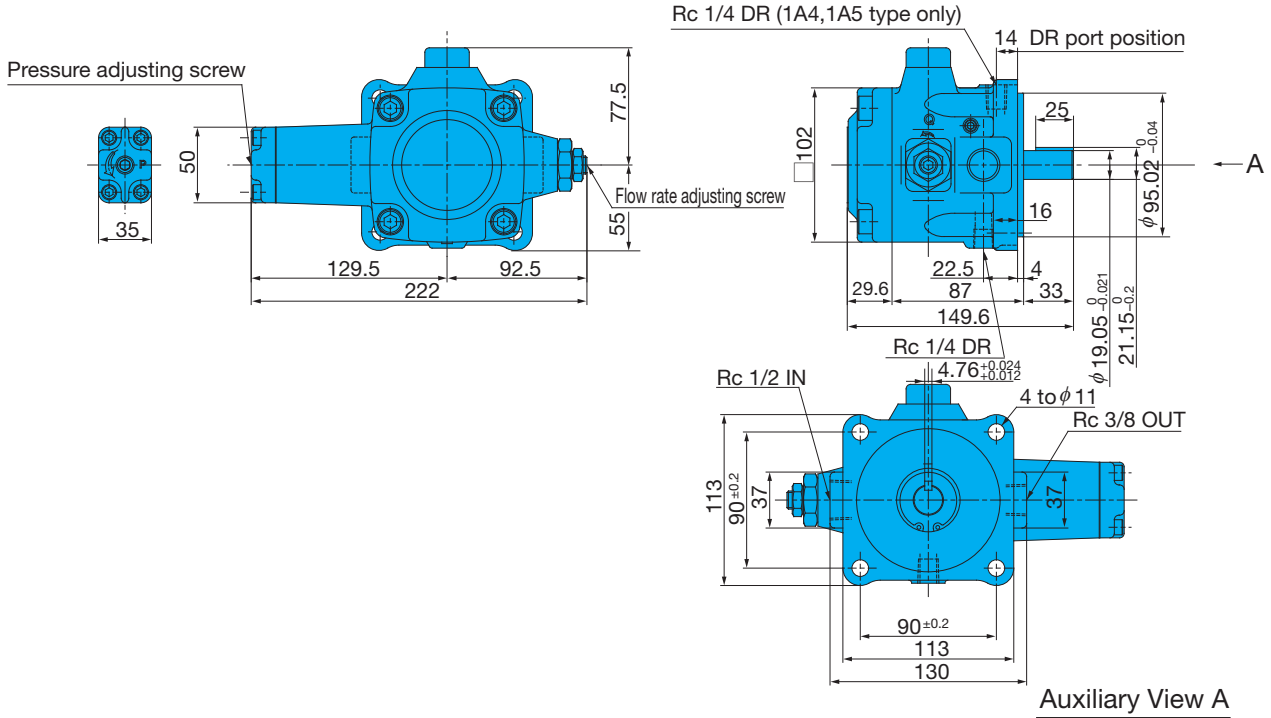
2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Installation Dimension Drawings

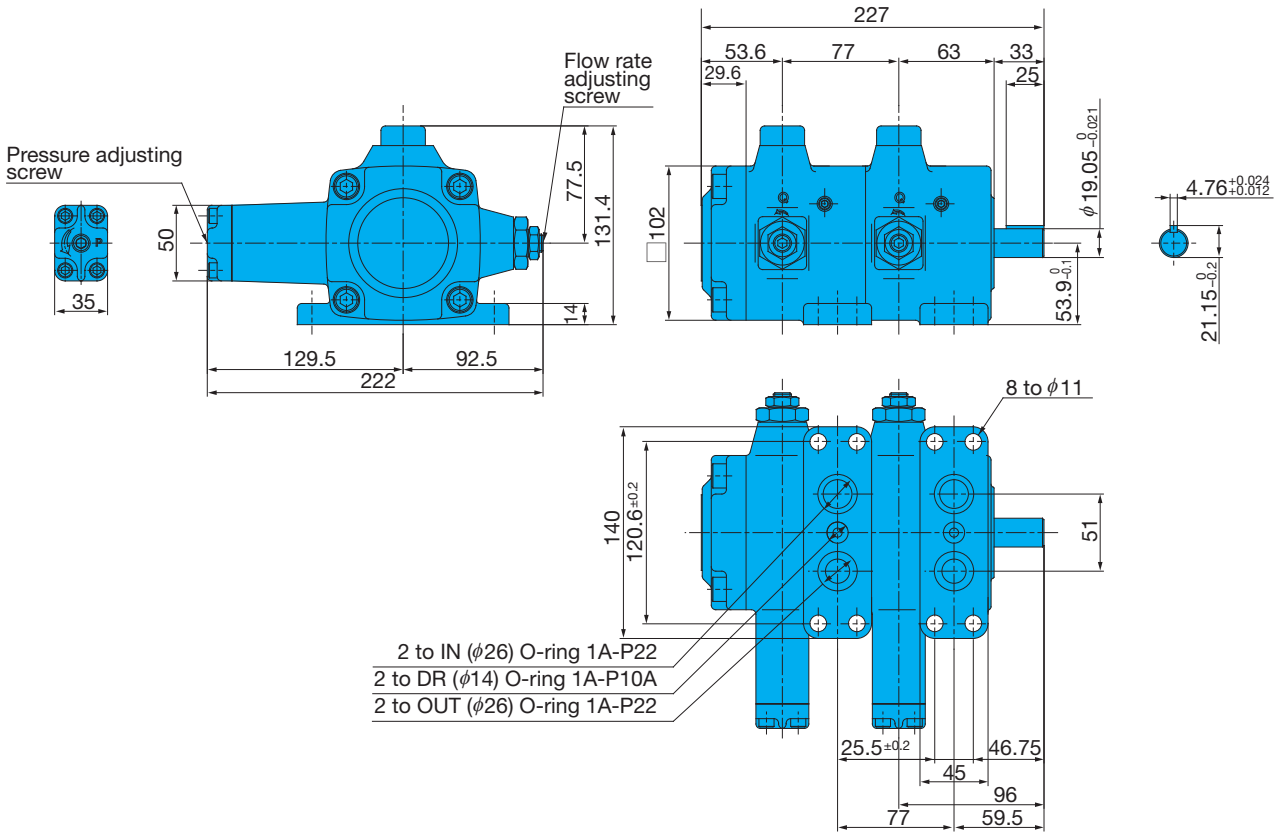
VDR-1A-*A*-22



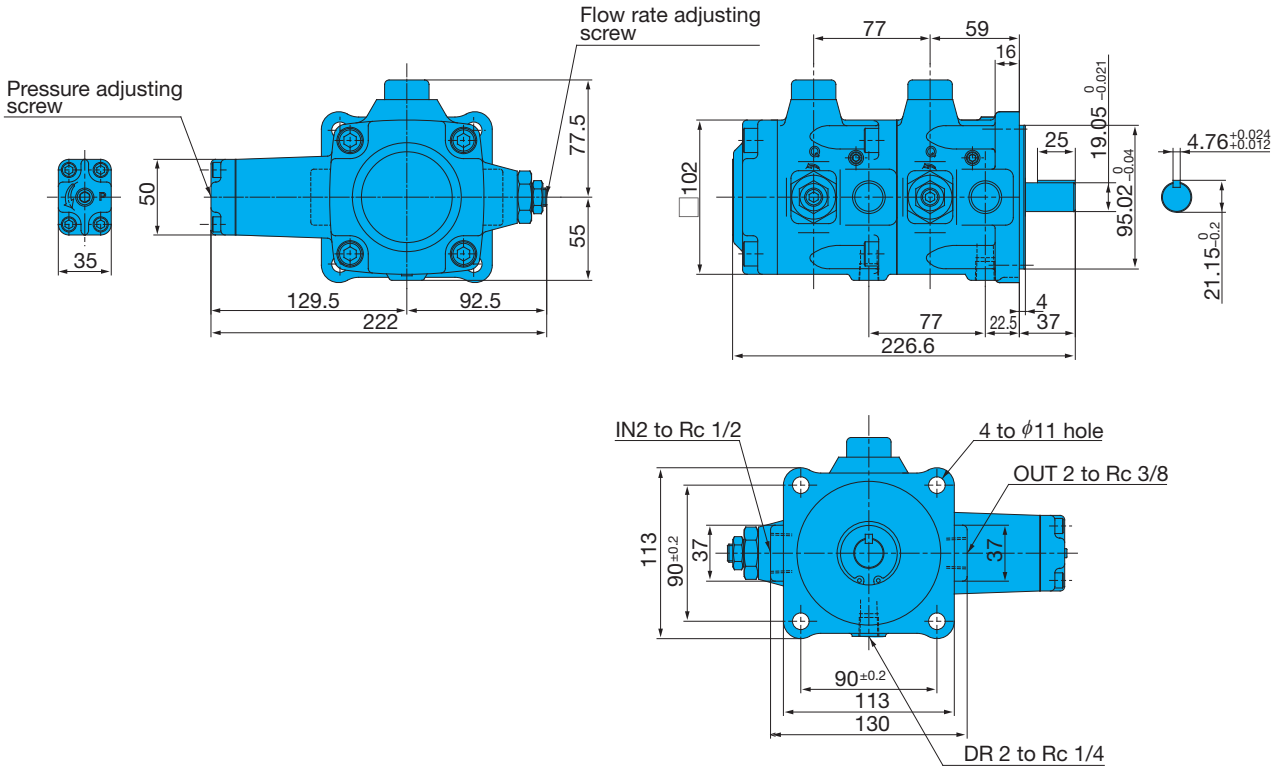
VDR-1B-*A*-22



VDR-11A-*-*-22



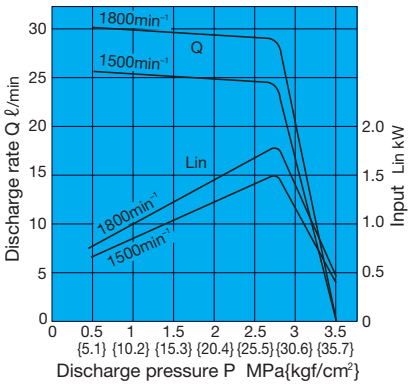
VDR-11B-*-*-22



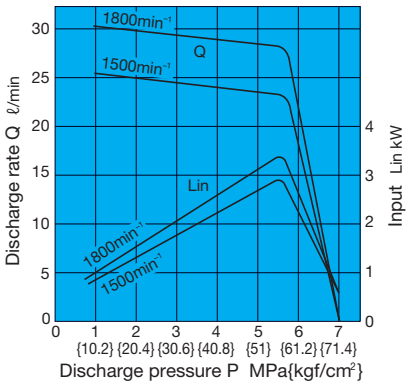
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

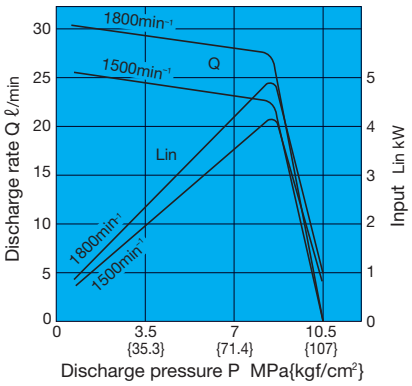
VDR-1*-1A2-22



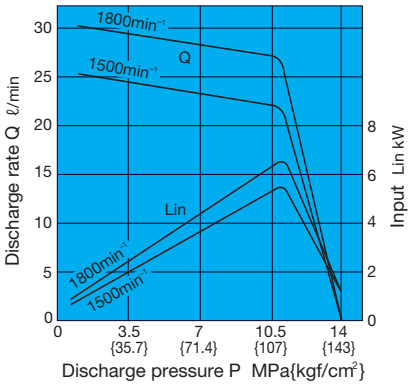
VDR-1*-1A3-22



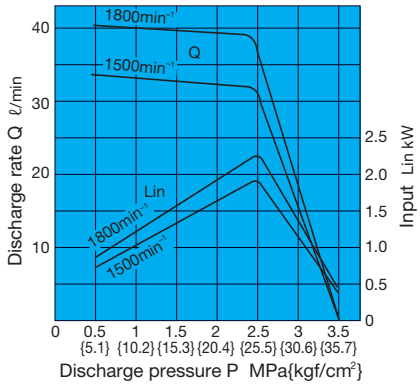
VDR-1*-1A4-22



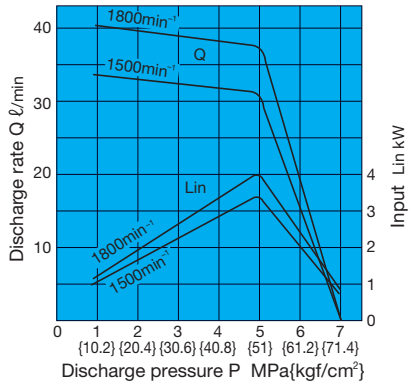
VDR-1*-1A5-22



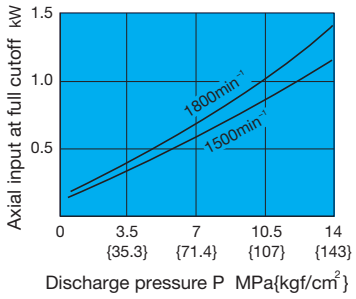
VDR-1*-2A2-22



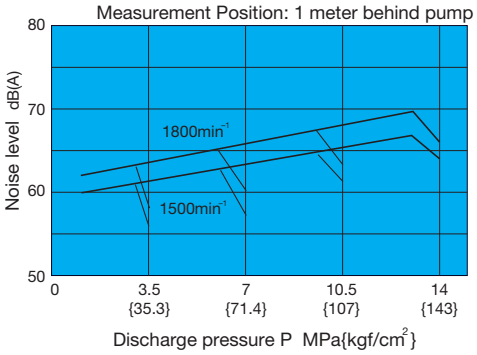
VDR-1*-2A3-22



Axial Input At Full Cutoff

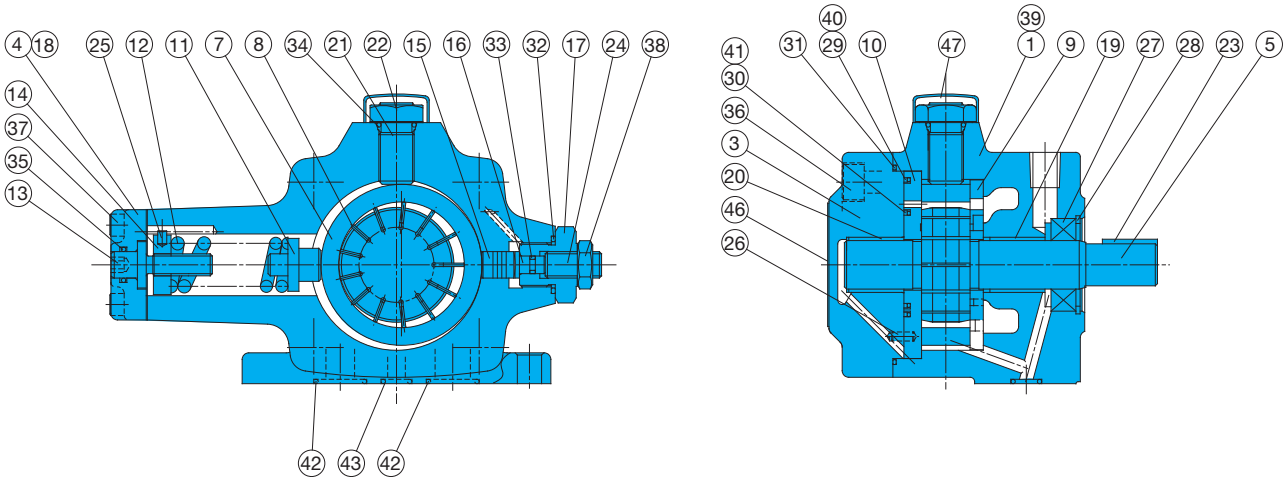


Noise Characteristics



Cross-sectional Drawings

VDR-1A-*A*-22



List of Sealing Parts

Single Pump

Part No.	Applicable Pump Model No.	VDR-1A-*-22	
	Seal Kit Number	VDBS-101A00	
	Part Name	Part Number	Q'ty
18	Packing	VDB32-101000	1
27	Oil seal	ISP1D-224211F	1
29	Backup ring	VDB34-101000	1
30	Backup ring	VDB34-201000	1
31	O-ring	S85(NOK)	1
32	O-ring	NBR-70-1 P22	1
33	O-ring	NBR-70-1 P5	1
34	O-ring	NBR-70-1 P14	1
35	O-ring	NBR-70-1 P12	1
40	O-ring	AS568-036	1
41	O-ring	AS568-029	1
42	O-ring	NBR-70-1 P22	2
43	O-ring	NBR-70-1 P10A	1

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
2. The materials and hardness of the O-ring conform with JIS B2401.
3. For VDR-1B-*-22, the seal kit number becomes VDBS-101B00, without the 42 and 43 O-rings.

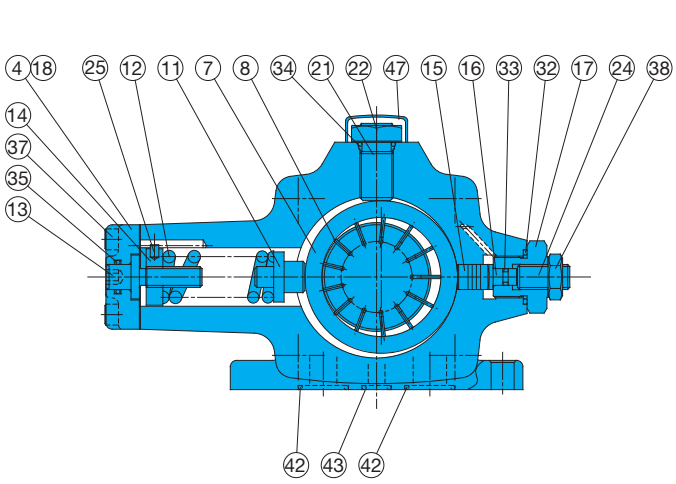
Part No.	Part Name	Part No.	Part Name
1	Body (A)	25	Pin
2	Body (B)	26	Spring pin
3	Cover	27	Oil seal
4	Cover	28	Snap ring
5	Shaft	29	Backup ring
6	Rotor	30	Backup ring
7	Ring	31	O-ring
8	Vane	32	O-ring
9	Plate (S)	33	O-ring
10	Plate (H)	34	O-ring
11	Piston	35	O-ring
12	Spring	36	Screw
13	Screw	37	Screw
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

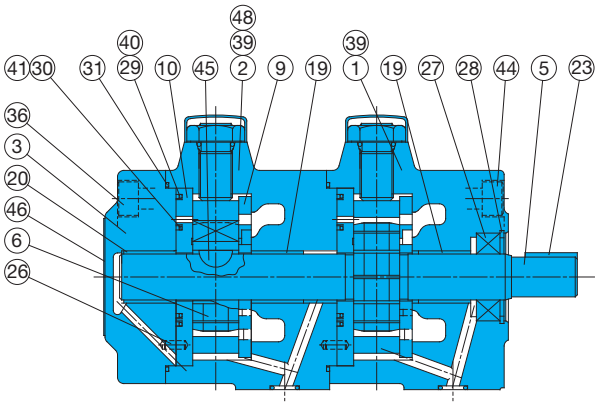
Double Pump

Part No.	Applicable Pump Model No.	VDR-11A-*-*-22	
	Seal Kit Number	VDBS-111A00	
	Part Name	Part Number	Q'ty
18	Packing	VDB32-101000	2
27	Oil seal	ISP1D-224211F	1
29	Backup ring	VDB34-101000	2
30	Backup ring	VDB34-201000	2
31	O-ring	S85(NOK)	2
32	O-ring	NBR-70-1 P22	2
33	O-ring	NBR-70-1 P5	2
34	O-ring	NBR-70-1 P14	2
35	O-ring	NBR-70-1 P12	2
40	O-ring	AS568-036	2
41	O-ring	AS568-029	2
42	O-ring	NBR-70-1 P22	4
43	O-ring	NBR-70-1 P10A	2

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
2. The materials and hardness of the O-ring conform with JIS B2401.
3. For VDR-11B-*-*-22, the seal kit number becomes VDBS-111B00, without the 42 and 43 O-rings.

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





Uni-pump Specifications

(CE mark standard compliant)

Understanding Model Numbers

Single Pump

UVD –1 A – 2 A 2 – 1.5 – 4 – 60

- Design number
- Number of motor poles: 4 (P)
- Motor output (kW)
  0.75, 1.5, 2.2, 3.7
- Pressure adjustment range
  2: 1.5 to 3.5MPa
  {15.3 to 35.7kgf/cm²}
  3: 3.0 to 7.0MPa
  {30.6 to 71.4kgf/cm²}
- Flow characteristics A: Constant discharge type
- Ring size
  None : 30ℓ/min
  2 : 40ℓ/min
  } at 1800min⁻¹
- A: Foot type mounting
- Pump size 1: VDR-1B (22D)
- Pump Type: VDR (22D) Series Uni-pump

Double Pump

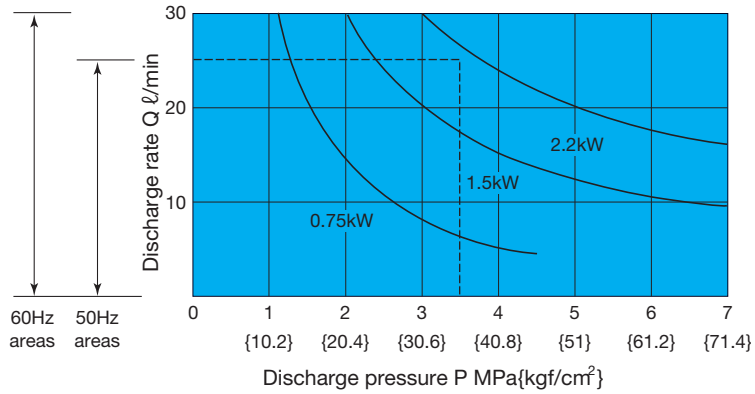
UVD – 11 A – 2 A 2 – 2 A 2 – 3.7 – 4 – 60

- Design number
- Number of motor poles: 4 (P)
- Motor output (kW)
  1.5, 2.2, 3.7
- Shaft side pump pressure adjustment range
  2: 1.5 to 3.5MPa
  {15.3 to 35.7kgf/cm²}
  3: 3.0 to 7.0MPa
  {30.6 to 71.4kgf/cm²}
- Shaft side pump flow rate characteristics
  A: Constant discharge type
- Shaft side pump ring size
  None: 30ℓ/min
  2 : 40ℓ/min
  } at 1800min⁻¹
- Head side pump pressure adjustment range:
  Same as the shaft side pump
- Head side pump flow rate characteristics
  A: Constant discharge type
- Head side pump ring size
  None: 30ℓ/min
  2 : 40ℓ/min
  } at 1800min⁻¹
- A: Foot type mounting
- Pump size 11: VDR-11B (22D)
- Pump Type: VDR (22D) Series Uni-pump

Specifications

Model No.	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min (A*)		Maximum Flow Rate ℓ/min (2A*)	
		50Hz	60Hz	50Hz	60Hz
UVD-1A	7 {71.4}	25	30	33	39
UVD-11A	7 {71.4}	25-25	30-30	33-33	39-39

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 3.5MPa and a discharge rate of 25ℓ/min.

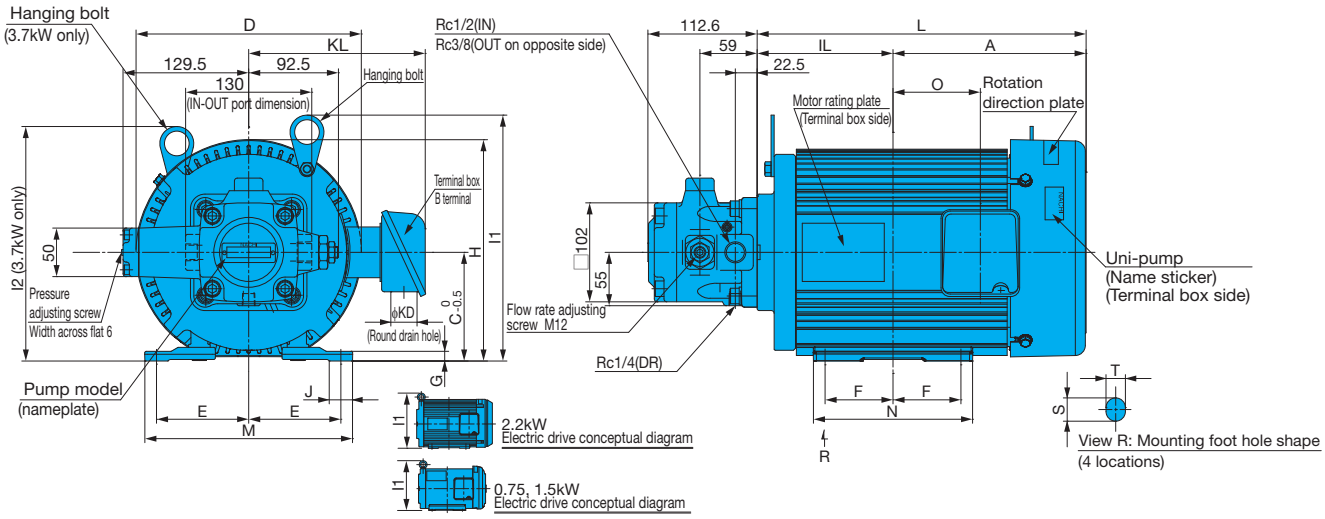
Selection Process

Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 25ℓ/min intersect in the area under the 2.2kW curve, it means that a 2.2kW 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.
* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

Installation Dimension Drawings

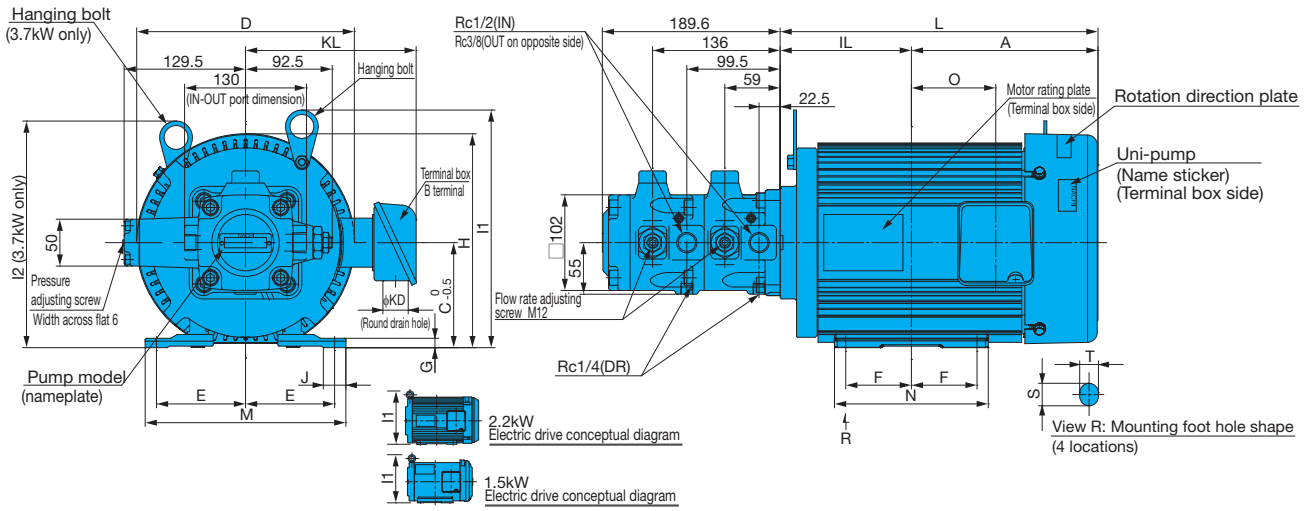
UVD-1A



Uni-pump	Motor Dimensions [mm]																		Frame No.	Output kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL	O			
UVD-1A-A2-0.75-4-60	137	105	80	152	62.5	50	4.5	160	193	–	47.5	242	165	130	25×10	27	137	65	80M	0.75	28
UVD-1A-A2-1.5-4-60																					
UVD-1A-A3-1.5-4-60	160.5	118.5	90	183	70	62.5	4.4	183	204	–	22	279	165	152.5	16×10	27	142	68	90L	1.5	31
UVD-1A-2A2-1.5-4-60																					
UVD-1A-A2-2.2-4-60																					
UVD-1A-A3-2.2-4-60	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	2.2	45
UVD-1A-2A2-2.2-4-60																					
UVD-1A-A3-3.7-4-60																					
UVD-1A-2A2-3.7-4-60	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	49
UVD-1A-2A3-3.7-4-60																					

1. Standard drive motor is the fully enclosed fan-cooled F 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 kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL	O			
UVD-11A-A2-A2-1.5-4-60	160.5	118.5	90	183	70	62.5	4.4	183	204	–	22	279	165	152.5	16×10	27	142	68	90L	1.5	39
UVD-11A-A2-A3-1.5-4-60																					
UVD-11A-A3-A3-1.5-4-60																					
UVD-11A-A2-A2-2.2-4-60	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	2.2	53
UVD-11A-A2-A3-2.2-4-60																					
UVD-11A-A3-A3-2.2-4-60																					
UVD-11A-2A2-2A2-2.2-4-60																					
UVD-11A-A2-A2-3.7-4-60	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	57
UVD-11A-A2-A3-3.7-4-60																					
UVD-11A-A3-A3-3.7-4-60																					
UVD-11A-2A2-2A2-3.7-4-60																					
UVD-11A-2A2-2A3-3.7-4-60																					

1. Standard drive motor is the fully enclosed fan-cooled F 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

20 to 45ℓ/min
6MPa

❖**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 compatible with the old design.**

Features

①Energy efficient, economical operation.
②Built-in high-precision temperature compensation mechanism.
③The ring is displaced by a spring, and a rise in pressure automatically moves it to the center to make the discharge rate zero.
④Relief valve and unloading valve can be eliminated from the circuit.
⑤It 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.
⑥New design for lower noise and improved durability.

Specifications

Single Pump

Model No.	Capacity cm^3/rev	No-load Discharge Rate (ℓ/min)				Pressure Adjustment Range MPa{kgf/cm^2}	Allowable Peak Pressure MPa {kgf/cm^2}	Revolution Speed min^{-1}		Weight kg
		1000min^{-1}	1200min^{-1}	1500min^{-1}	1800min^{-1}			Min.	Max.	
VDR-1A(B)-1A1-13	13.9	14	16.5	21	25	1 to 2 {10.2 to 20.6}	14 {143}	800	1800	8
-1A2-	13.9	14	16.5	21	25	1.5 to 3.5 {15.3 to 35.7}				
-1A3-	11.1	11	13	17	20	3 to 6 {30.6 to 61.2}				
VDR-2A(B)-1A1-13	25	25	30	38	45	1 to 2 {10.2 to 20.4}	14 {143}	800	1800	21
-1A2-	25	25	30	38	45	1.5 to 3.5 {15.3 to 35.7}				
-1A3-	22.2	22	26.5	34	40	3 to 6 {30.6 to 61.2}				

Double Pump

Model No.	Vent Side		Shaft Side		Vent Side / Shaft Side		Revolution Speed min^{-1}		Weight kg
Foot Mounting Type (Flange Mounting Type)	Discharge Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm^2}	Discharge Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm^2}	Allowable Peak Pressure MPa{kgf/cm^2}		Min.	Max.	
VDR-11A(B)-1A1-1A1-13	25	1 to 2 {10.2 to 20.4}	25	1 to 2 {10.2 to 20.4}	14 {143}		800	1800	A : 13.6
VDR-11A(B)-1A1-1A2-13				1.5 to 3.5 {15.3 to 35.7}					
VDR-11A(B)-1A1-1A3-13			20	3 to 5 {30.6 to 51}					B : 13.9
VDR-11A(B)-1A2-1A2-13		1.5 to 3.5 {15.3 to 35.7}	25	1.5 to 3.5 {15.3 to 35.7}	14 {143}				
VDR-11A(B)-1A2-1A3-13			20	3 to 5 {30.6 to 51}					
VDR-11A(B)-1A3-1A3-13	20	3 to 5 {30.6 to 51}	20	3 to 5 {30.6 to 51}	14 {143}				

Note) 1. The discharge rate is the value at 1800min^{-1} no-load.
2. In addition to this model, the VDC Series (maximum working pressure: 14MPa) 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 3.2mm to 4.76mm. This means that when using a 3.2mm key coupling, you need to use a stepped key (VD31J-302000) or add a new key groove at 4.76.
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.

Explanation of model No.

Single Pump

Single Pump

VDR – 1 A – 1 A 2 – 13

- 13: Design number
- 2: Pressure adjustment range
  1: 1 to 2MPa {10.2 to 20.4kgf/cm²}
  2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 3 to 6MPa {30.6 to 61.2kgf/cm²}
- A: Flow characteristics — A: Constant discharge type
- 1: Ring size 1
- A: Mounting method — A: Foot type mounting, B: Flange type mounting
- 1: Pump size 1, 2
- VDR: Pump Type: VDR Series Variable Discharge Rate Vane Pump

Double Pump

Double Pump

VDR – 1 1 A – 1 A 1 – 1 A 2 – 13

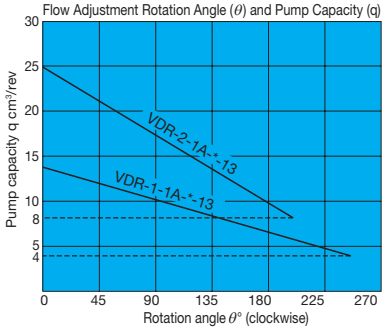
- 13: Design number
- 2: Shaft side pressure adjustment range
  1: 1 to 2MPa {10.2 to 20.4kgf/cm²}
  2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 3 to 5MPa {30.6 to 51kgf/cm²}
- A: Shaft side flow rate characteristics — A: Constant discharge rate type
- 1: Shaft side ring size 1
- 1: Head side pressure adjustment range
- A: Head side flow rate characteristics
- 1: Head side ring size 1
- A: Mounting method — A: Foot type mounting, B: Flange type mounting
- 1: Shaft side pump size 1
- 1: Head side pump size 1
- VDR: Pump Type: VDR Series Variable Discharge Rate Vane Pump

●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 0.03MPa.

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 : No-load Discharge RateQℓ/min
q : Volume cm³/rev
N : Revolution Speed min⁻¹

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 rightn

Factory Default Pressure Settings MPa{kgf/cm²}
1 : 2 {20.4}
2 : 3.5{35.7}
3 : 3 {30.6}

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.

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.

(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 fluid that provides kinematic viscosity during operation in the range of 20 to 150mm²/s.

9 The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure and low speed until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.

10 Suction pressure is -0.03 to +0.03MPa (-0.3 to +0.3kgf/cm²), and the suction port flow rate should be to greater than 2m/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 25μm 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 prime the pump and bleed air from the pump and pipes. (This pump has no fluid supply port.)

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 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°.

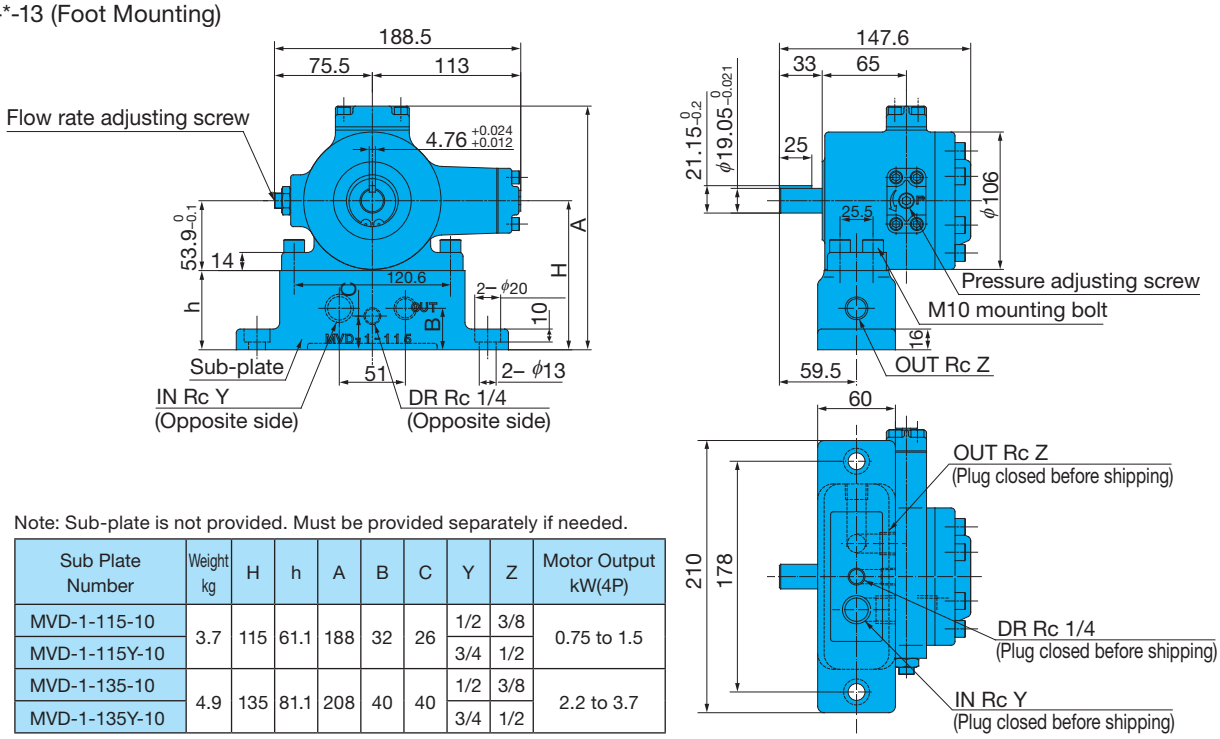
● Inverter Drive Precautions

1 Set the revolution speed within the range of the pump specification revolution speed.

2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Installation Dimension Drawings

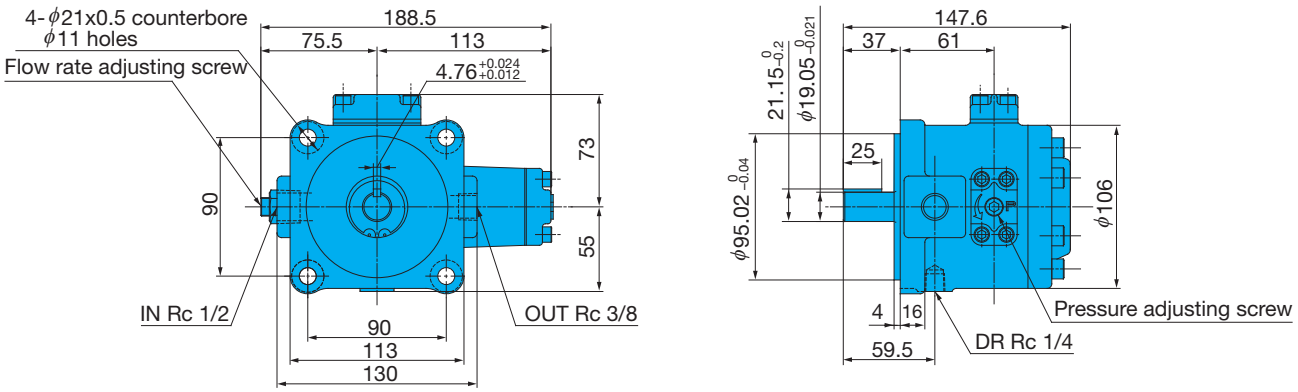
VDR-1A-*-13 (Foot Mounting)



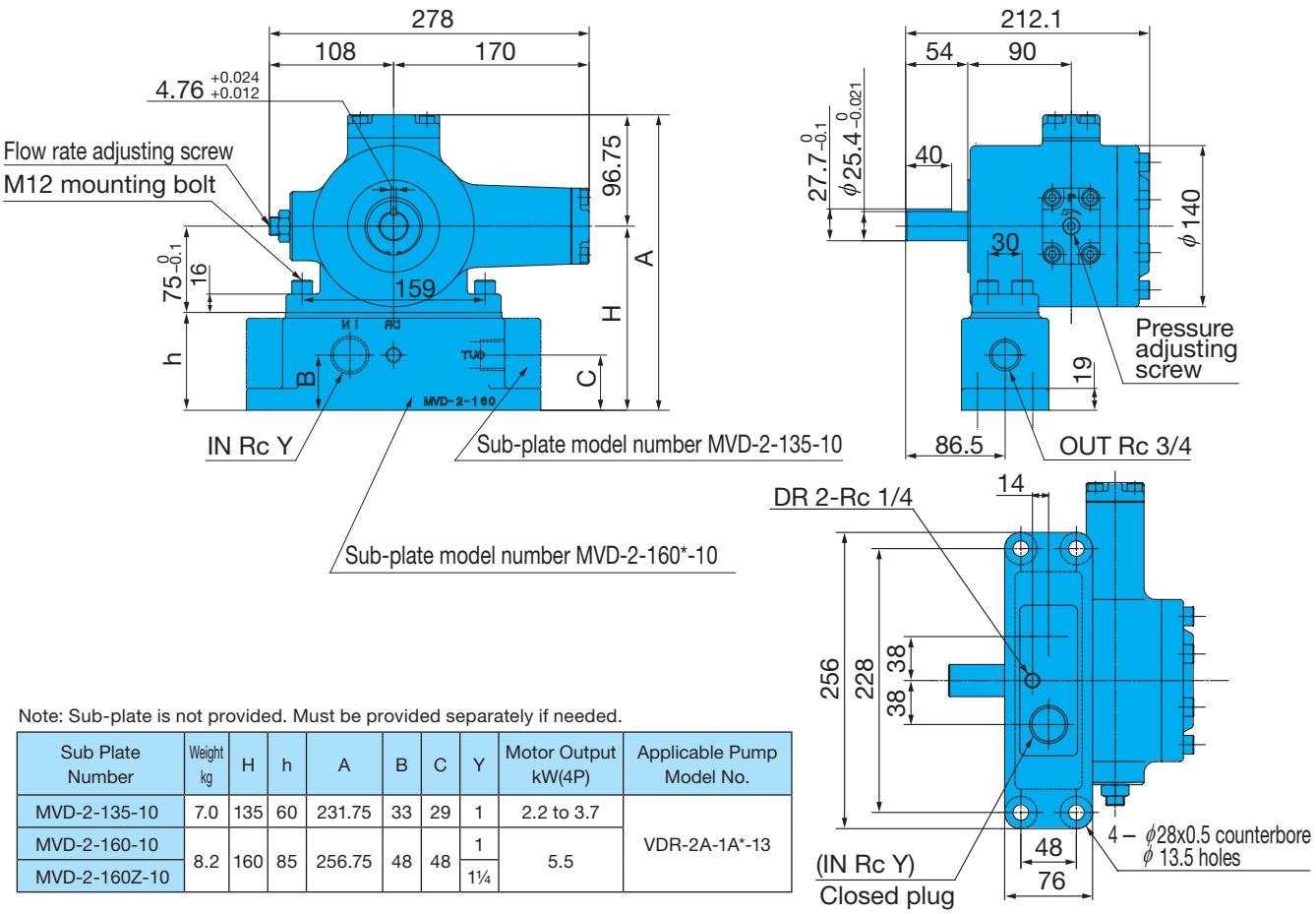
Note: Sub-plate is not provided. Must be provided separately if needed.

Sub Plate Number	Weight kg	H	h	A	B	C	Y	Z	Motor Output kW(4P)
MVD-1-115-10	3.7	115	61.1	188	32	26	1/2	3/8	0.75 to 1.5
MVD-1-115Y-10							3/4	1/2	
MVD-1-135-10	4.9	135	81.1	208	40	40	1/2	3/8	2.2 to 3.7
MVD-1-135Y-10							3/4	1/2	

VDR-1B-*-13 (Flange Mounting)



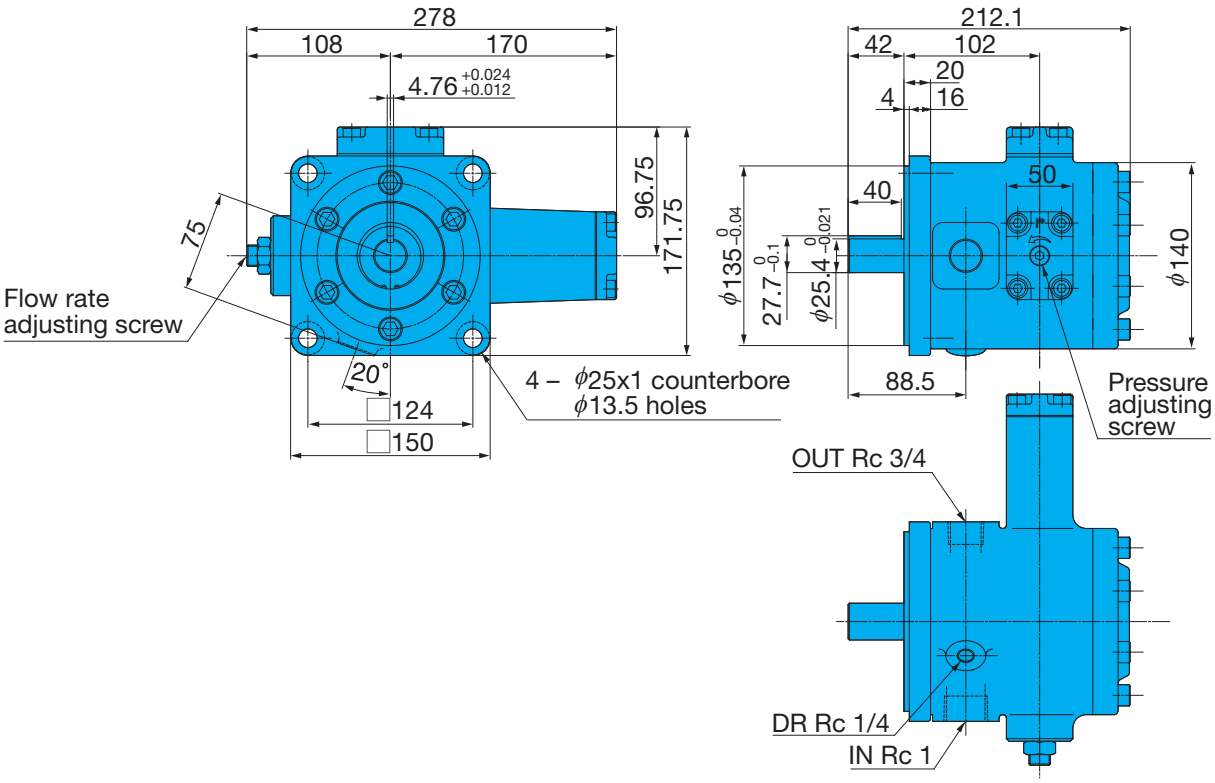
VDR-2A-*-13 (Foot Mounting)



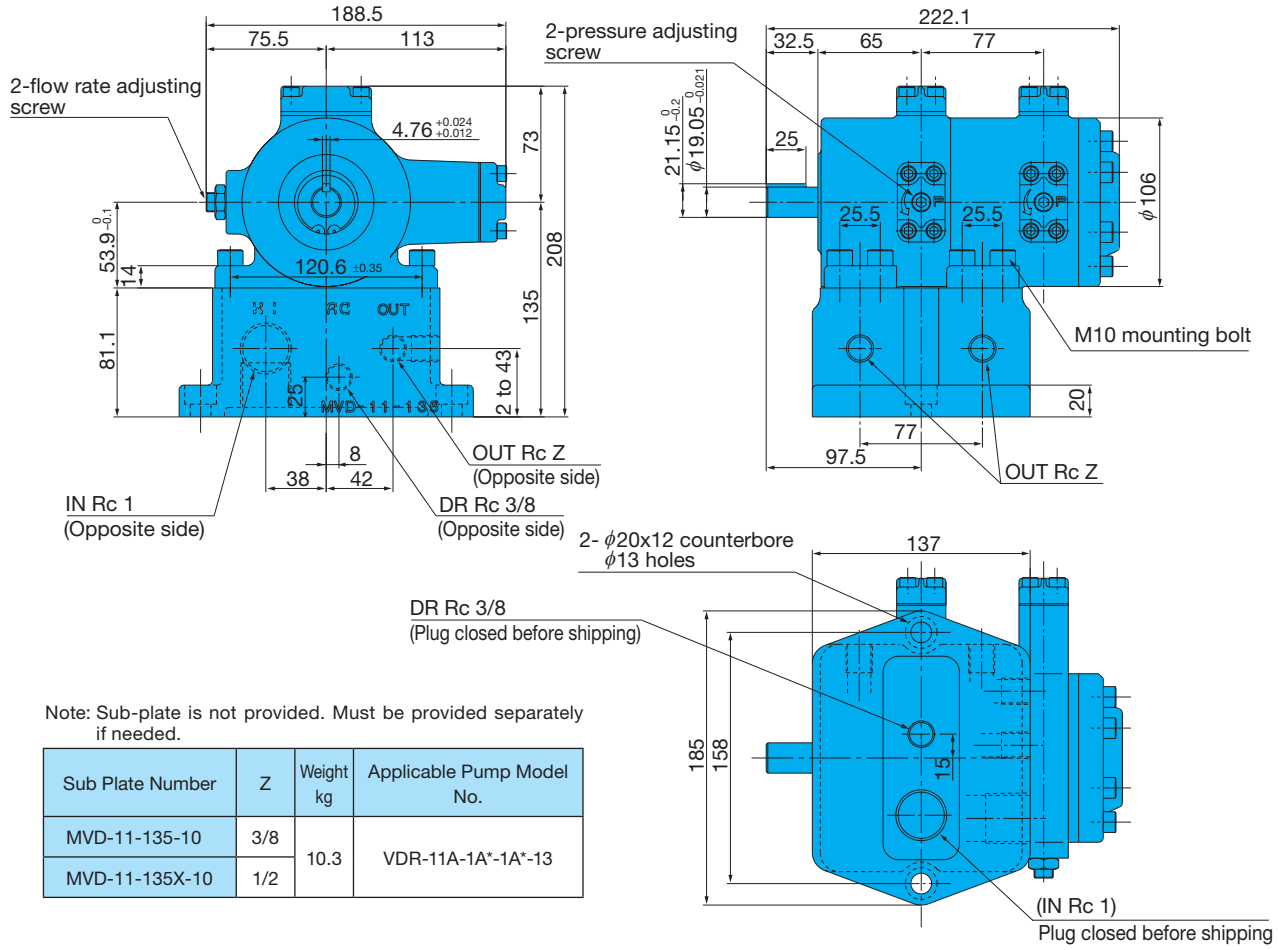
Note: Sub-plate is not provided. Must be provided separately if needed.

Sub Plate Number	Weight kg	H	h	A	B	C	Y	Motor Output kW(4P)	Applicable Pump Model No.
MVD-2-135-10	7.0	135	60	231.75	33	29	1	2.2 to 3.7	VDR-2A-1A*-13
MVD-2-160-10	8.2	160	85	256.75	48	48	1	5.5	
MVD-2-160Z-10							1¼		

VDR-2B-*-13 (Flange Mounting)



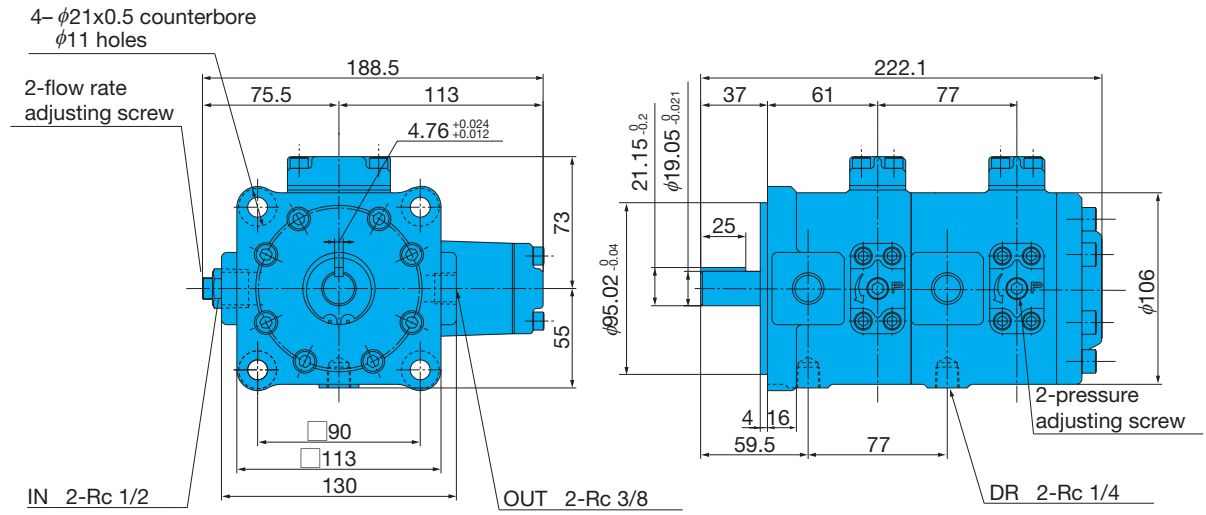
VDR-11A-*-13 (Foot Mounting)



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

Sub Plate Number	Z	Weight kg	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)

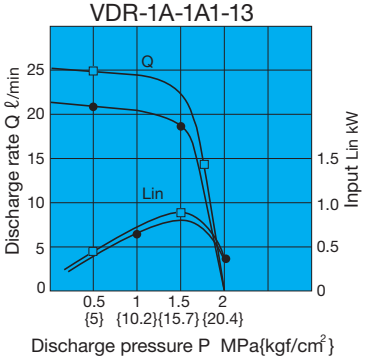


Performance Curves

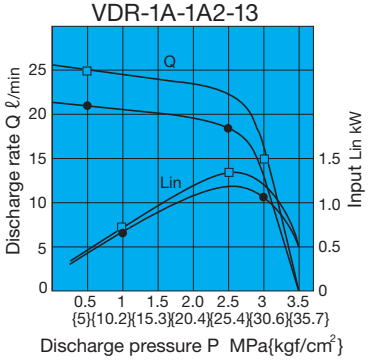
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

Revolution Speed 1500min⁻¹
1800min⁻¹

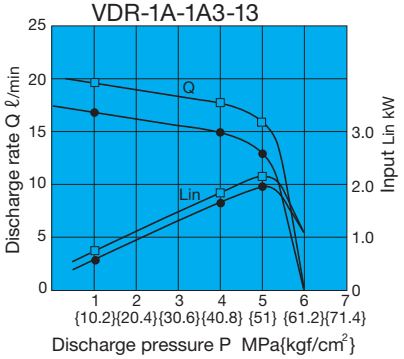
VDR-1A-1A1-13



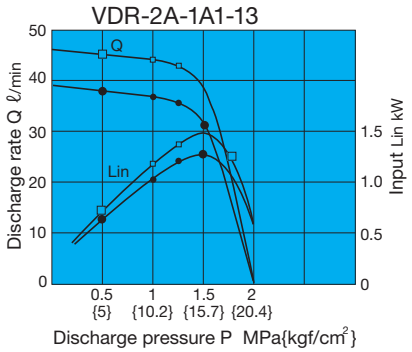
VDR-1A-1A2-13



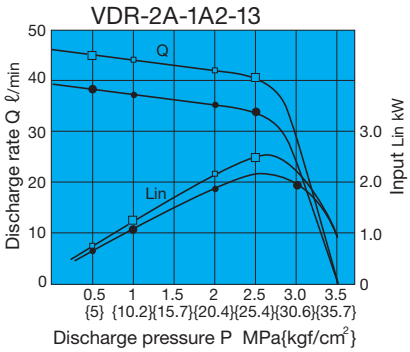
VDR-1A-1A3-13



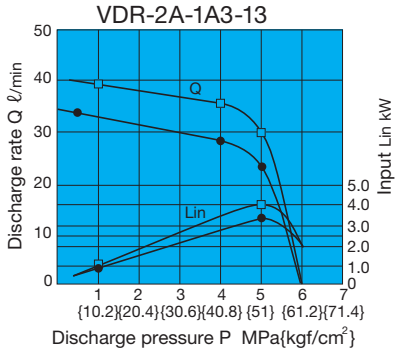
VDR-2A-1A1-13



VDR-2A-1A2-13

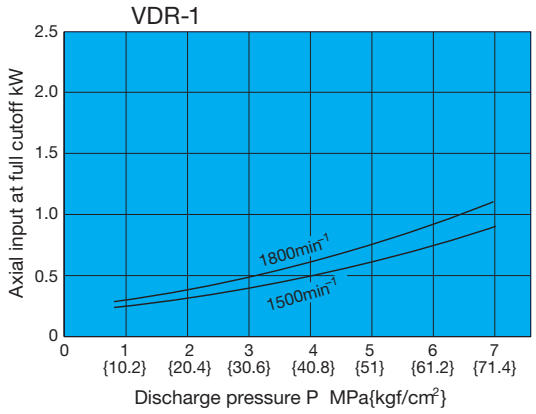


VDR-2A-1A3-13

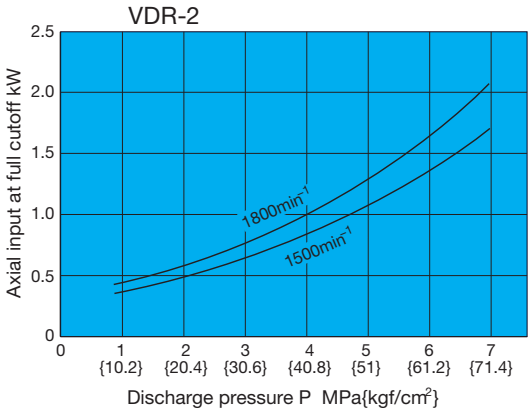


Axial Input At Full Cutoff

VDR-1

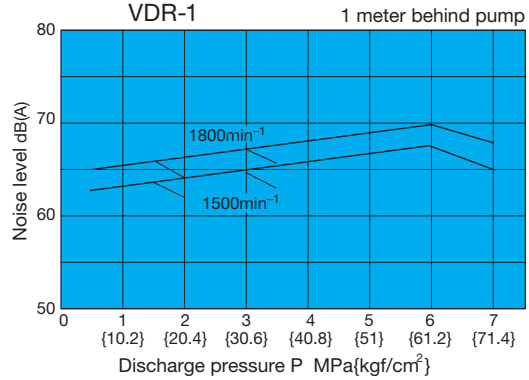


VDR-2

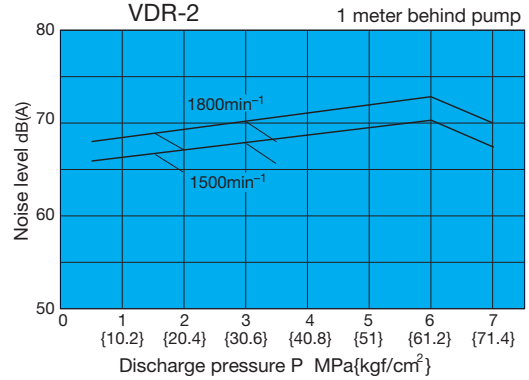


Noise Characteristics

VDR-1 — Measurement Position: 1 meter behind pump

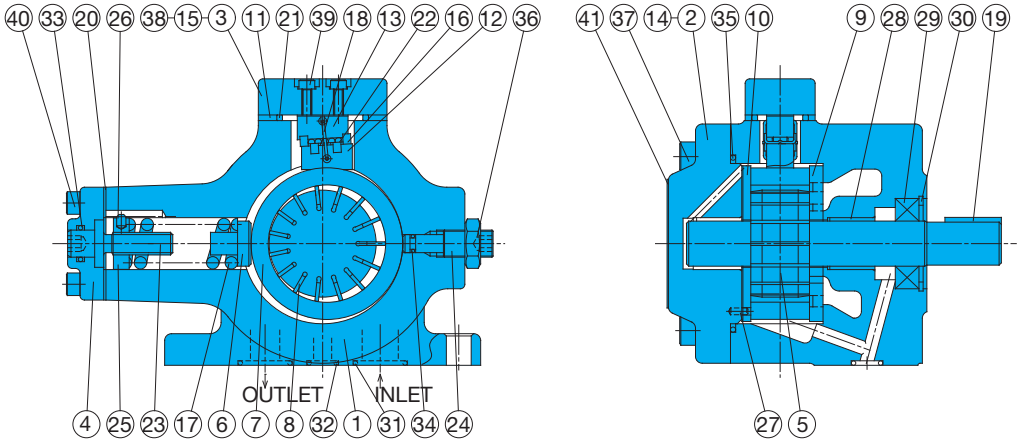


VDR-2 — Measurement Position: 1 meter behind pump



Cross-sectional Drawings

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



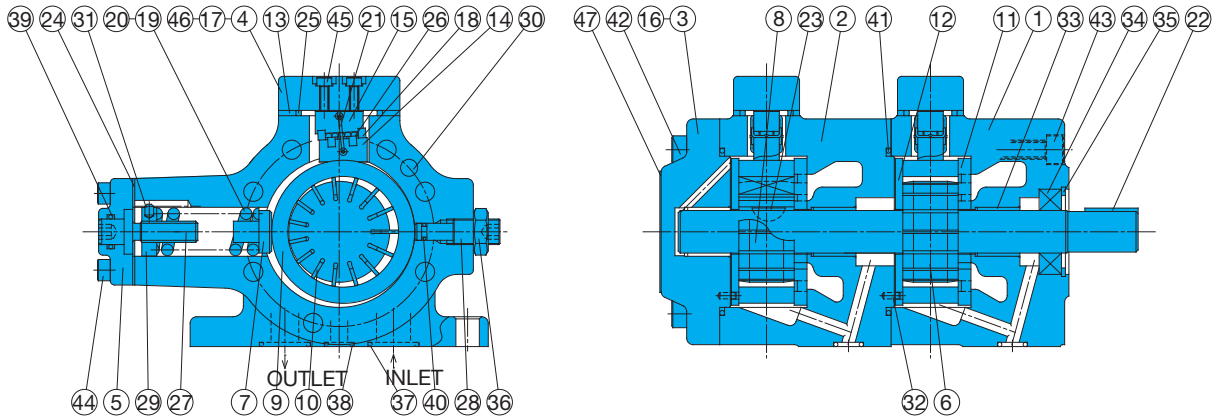
List of Sealing Parts

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	NBR-70-1 G45	1
29	Oil seal	ISRD-204010F	1	TCV-284811-V	1
31	O-ring	NBR-70-1 P20	2	NBR-70-1 G30	2
32	O-ring	NBR-70-1 P10A	1	NBR-70-1 P12	1
33	O-ring	NBR-70-1 P12	1	NBR-70-1 P14	1
34	O-ring	NBR-70-1 P5	1	NBR-70-1 P9	1
35	O-ring	NBR-70-1 G70	1	NBR-70-1 G100	1

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co.Ltd. (NOK).
2. The materials and hardness of the O-ring conform with JIS B2401.
3. For VDR-*B-*-13, the seal kit number becomes VDBS-10*B00, without the 31 and 32 O-rings.

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		

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-204010F	1
37	O-ring	NBR-70-1 P20	4
38	O-ring	NBR-70-1 P10A	2
39	O-ring	NBR-70-1 P12	2
40	O-ring	NBR-70-1 P5	2
41	O-ring	NBR-70-1 G70	2

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
2. The materials and hardness of the O-ring conform with JIS B2401.
3. For VDR-11B-*-*-13, the seal kit number becomes VDBS-111B00, without the 37 and 38 O-rings.

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	11	Plate (S)	21	Spring
2	Body	12	Plate (H)	22	Key
3	Cover	13	Plate	23	Key
4	Cover	14	Holder	24	Packing
5	Cover	15	Holder	25	Square ring
6	Shaft	16	Shim	26	Needle
7	Piston	17	Shim	27	Screw
8	Rotor	18	Retainer	28	Screw
9	Ring	19	Spring	29	Nut
10	Vane	20	Spring	30	Pin

Part No.	Part Name
31	Pin
32	Pin
33	Bearing
34	Oil seal
35	Snap ring
36	Nut
37	O-ring
38	O-ring
39	O-ring
40	O-ring
41	O-ring
42	Screw
43	Screw
44	Screw
45	Screw
46	Screw
47	Nameplate

Uni-pump Specifications

(CE mark standard compliant)

Understanding Model Numbers

Single Pump

UVD –1 A – A 2 – 1.5 – 4 – 50

- Design number
- Number of motor poles: 4 (P)
- Motor output (kW)
  0.75, 1.5, 2.2, 3.7 (Type 2 only)
- Pressure adjustment range
  1: 1.0 to 2.0MPa
  {10.2 to 20.4kgf/cm²}
  2: 1.5 to 3.5MPa
  {15.3 to 35.7kgf/cm²}
  3: 3.0 to 6.0MPa
  {30.6 to 61.2kgf/cm²}
- Flow characteristics
  A: Constant discharge type
- A: Foot type mounting
- Pump size 1: VDR–1B
  2: VDR–2B
- Pump Type: VDR (13D) Series Uni-pump

Double Pump

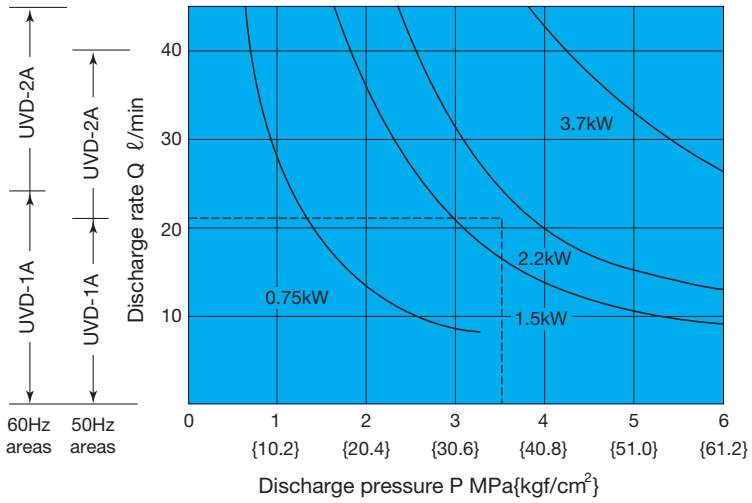
UVD – 11 A – A * – A * – * – 4 – 50

- Design number
- Number of motor poles: 4(P)
- Motor output (kW)
  1.5, 2.2, 3.7
- Shaft side pump pressure adjustment range
  1: 1.0 to 2.0MPa
  {10.2 to 20.4kgf/cm²}
  2: 1.5 to 3.5MPa
  {15.3 to 35.7kgf/cm²}
  3: 3.0 to 5.0MPa
  {30.6 to 51kgf/cm²}
- Shaft side pump flow rate characteristics
  A: Constant discharge type
- Head side pump pressure adjustment range:
  Same as the shaft side pump
- Head side pump flow rate characteristics
  A: Constant discharge type
- A: Foot type mounting
- Pump size 11: VDR–11B
- Pump Type: VDR (13D) Series Uni-pump

Specifications

Model No.	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	
		50Hz	60Hz
UVD- 1A	6 {61.2}	21	25
UVD- 2A	5 {51.0}	38	45
UVD-11A	5 {51.0}	21-21	25-25

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 3.5MPa and a discharge rate of 21 ℓ/min.

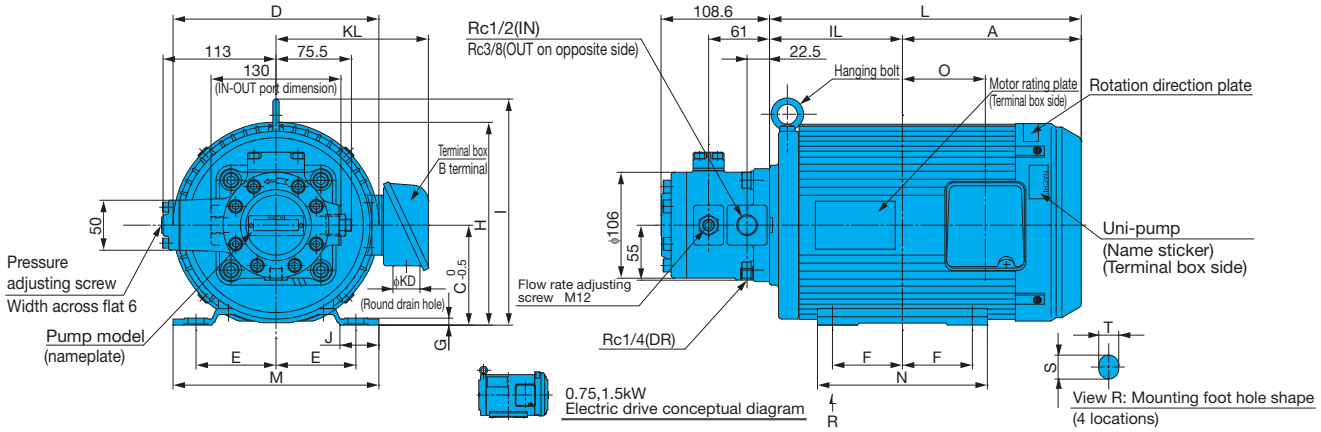
Selection Process

Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 21ℓ/min intersect in the area under the 2.2kW curve, it means that a 2.2kW 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.
* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

Installation Dimension Drawings

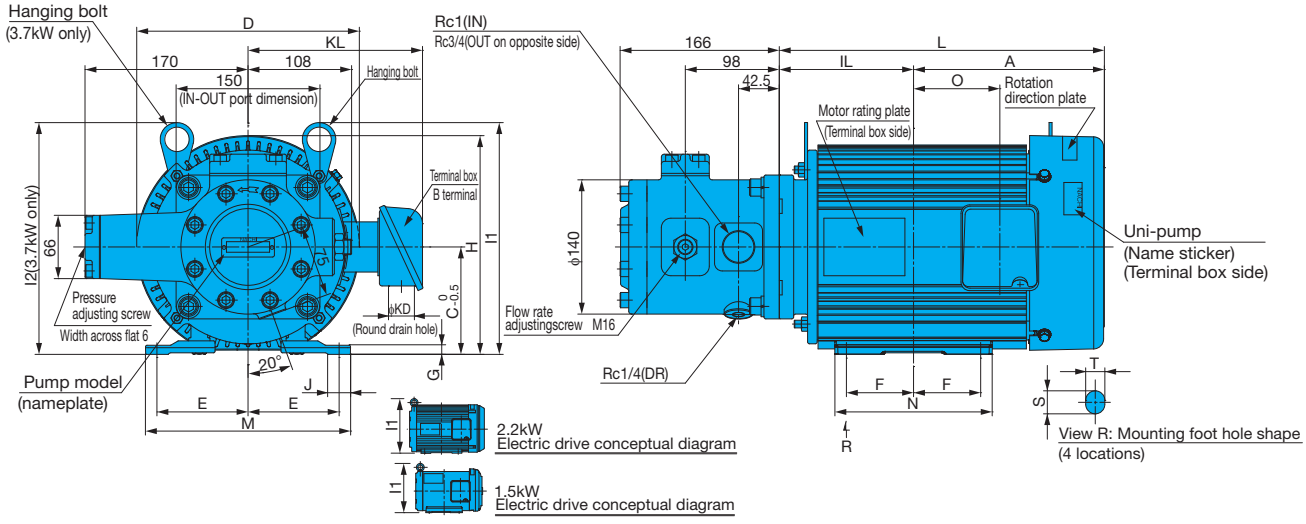
UVD-1A



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output [kW] (4 poles)	Weight [kg]
	A	IL	C	D	E	F	G	H	I	J	L	M	N	S×T	φKD	KL	O			
UVD-1A-A1-0.75-4-50	137	105	80	152	62.5	50	4.5	160	193	47.5	242	165	130	25×10	27	137	65	80M	0.75	27
UVD-1A-A2-0.75-4-50																				
UVD-1A-A2-1.5-4-50	160.5	118.5	90	183	70	62.5	4.4	183	204	22	279	165	152.5	16×10	27	142	68	90L	1.5	30
UVD-1A-A3-1.5-4-50																				
UVD-1A-A3-2.2-4-50	179	133	100	206	80	70	7	203	226	39	312	206	170	14×12	27	153	83	100L	2.2	44

1. Standard drive motor is the fully enclosed fan-cooled F 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).

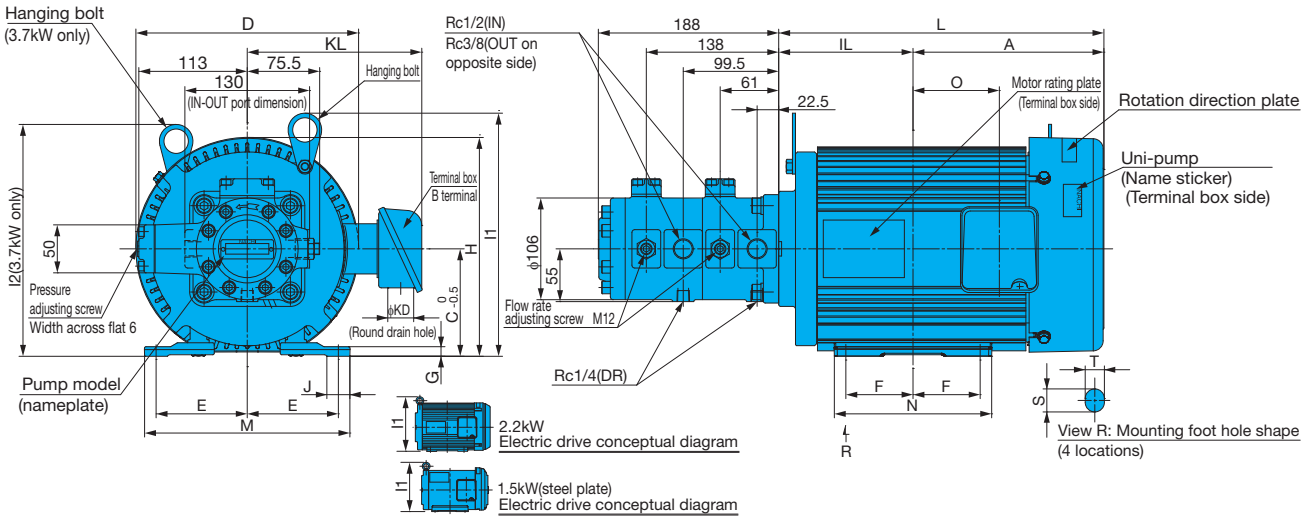
UVD-2A



Uni-pump	Motor Dimensions [mm]																		Frame No.	Output [kW] (4 poles)	Weight [kg]
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL	O			
UVD-2A-A1-1.5-4-50	160.5	118.5	90	183	70	62.5	4.4	183	204	–	22	279	165	152.5	16×10	27	142	68	90L	1.5	43
UVD-2A-A2-1.5-4-50																					
UVD-2A-A2-2.2-4-50	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	2.2	57
UVD-2A-A3-2.2-4-50																					
UVD-2A-A2-3.7-4-50	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	61
UVD-2A-A3-3.7-4-50																					

1. Standard drive motor is the fully enclosed fan-cooled F 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

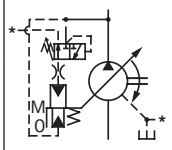


Uni-pump	Motor Dimensions [mm]																	Frame No.	Output kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL	O			
UVD-11A-A1-A1-1.5-4-50	160.5	118.5	90	183	70	62.5	4.4	183	204	–	22	279	165	152.5	16×10	27	142	68	90L	1.5	36
UVD-11A-A1-A2-1.5-4-50																					
UVD-11A-A1-A3-1.5-4-50																					
UVD-11A-A2-A2-1.5-4-50																					
UVD-11A-A2-A3-1.5-4-50																					
UVD-11A-A3-A3-1.5-4-50																					
UVD-11A-A1-A2-2.2-4-50	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	2.2	50
UVD-11A-A1-A3-2.2-4-50																					
UVD-11A-A2-A2-2.2-4-50																					
UVD-11A-A2-A3-2.2-4-50																					
UVD-11A-A3-A3-2.2-4-50																					
UVD-11A-A1-A3-3.7-4-50	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	54
UVD-11A-A2-A2-3.7-4-50																					
UVD-11A-A2-A3-3.7-4-50																					
UVD-11A-A3-A3-3.7-4-50																					

1. Standard drive motor is the fully enclosed fan-cooled F 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

30 to 120ℓ/min
14MPa



Features

①Highly 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 14MPa.

②Low 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.

③Outstanding 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.

④Precise 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.

⑤High efficiency operation with minimal power loss

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

⑥Simplified 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

Model No.	Capacity cm^3/rev	No-load Discharge Rate ℓ/min				Pressure Adjustment Range MPa {kgf/cm^2}	Allowable Peak Pressure MPa {kgf/cm^2}	Revolution Speed min^{-1}		Weight kg
		1000min^{-1}	1200min^{-1}	1500min^{-1}	1800min^{-1}			Min.	Max.	
VDC-1A(B)-1A2-20 1A3 1A4 1A5	16.7	16.7	20	25	30	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4} 5 to 10.5 {51 to 107} 7 to 14 {71.4 to 143}	14 {143} 21 {214}	800	1800	9.5
VDC-1A(B)-2A2-20 2A3	22	22	27	33	40	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4}	14 {143}	800	1800	9.5
VDC-2A(B)-1A2-20 1A3 1A4 1A5	30	30	36	45	54	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4} 5 to 10.5 {51 to 107} 7 to 14 {71.4 to 143}	14 {143} 21 {214}	800	1800	25
VDC-2A(B)-2A2-20 2A3	39	39	47	58	70	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4}	14 {143}	800	1800	25
VDC-3A(B)-1A2-20 1A3 1A4 1A5	67	67	80	100	120	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4} 5 to 10.5 {51 to 107} 7 to 14 {71.4 to 143}	14 {143} 21 {214}	800	1800	47 (33)

Double Pump

Model No.	Vent Side			Shaft Side			Revolution Speed min^{-1}		Weight kg
Foot Mounting Type (Flange Mounting)	Discharge Rate ℓ/min		Pressure Adjustment Range MPa {kgf/cm^2}	Discharge Rate ℓ/min		Pressure Adjustment Range MPa {kgf/cm^2}	Min.	Max.	
	1800min^{-1}	1500min^{-1}		1800min^{-1}	1500min^{-1}				
VDC-11A(B)-2A3-2A3-20 VDC-11A(B)-2A3-1A5-20	40	33	2 to 7 {20.4 to 71.4}	40 30	33 25	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	Type A 27 Type B 20
VDC-12A(B)-2A3-2A3-20 VDC-12A(B)-2A3-1A5-20	40	33	2 to 7 {20.4 to 71.4}	70 54	58 45	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	Type A 42 Type B 35
VDC-12A(B)-1A5-2A3-20 VDC-12A(B)-1A5-1A5-20	30	25	7 to 14 {71.4 to 143}	70 54	58 45	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	
VDC-22A(B)-2A3-2A3-20 VDC-22A(B)-2A3-1A5-20	70	58	2 to 7 {20.4 to 71.4}	70 54	58 45	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	Type A 62 Type B 50
VDC-13A(B)-2A3-1A3-20 VDC-13A(B)-2A3-1A5-20	40	33	2 to 7 {20.4 to 71.4}	120	100	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	Type A 62 Type B 48
VDC-13A(B)-1A5-1A3-20 VDC-13A(B)-1A5-1A5-20	30	25	7 to 14 {71.4 to 143}			2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}			

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.

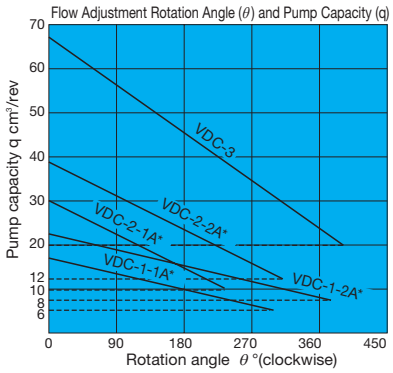
●Handling

1 Rotation Direction The direction of rotation is always 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 piping should comply with the conditions shown in the table below to ensure that back pressure due to pipe resistance does not exceed 0.1MPa. 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.

Item \ Model No.	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 ϕ7.6	At least ϕ7.6	At least ϕ9.6
Pipe Length	1m or less	1m or less	1m or less

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: $Q=q \times N \times 10^{-3}$
Q : No-load Discharge RateQℓ/min
q : Volume cm^3/rev
N : Revolution Speed min^{-1}



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 $\lambda - \Delta$. 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 noload 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.

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.

Factory Default Pressure Settings MPa{kgf/cm²}
2 : 3.5 {35.7}
3 : 3 {30.6}
4 : 5 {51 }
5 : 7 {71.4}

11 For the hydraulic operating fluid, use type ISO VG32 or equivalent (viscosity index of at least 90) for pressures of 7MPa or lower, and type ISO VG68 or equivalent (viscosity index of at least 90) for pressures greater than 7MP.

12 The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.

13 Suction pressure is -0.03 to +0.03MPa (-0.3 to +0.3kgf/cm^2), and the suction port flow rate should be no greater than 2m/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 25μm 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 air 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 prime the pump and bleed air from the pump and pipes. (This pump has no fluid supply port.)

(Continued on following page)

Sub Plate Number

Pump Model No.	Sub Plate Number	Motor kW
VDC-1A-1A*-20	MVD-1-115-10	0.75 to 1.5
	MVD-1-135-10	2.2 to 3.7
VDC-1A-2A*-20	MVD-1-115Y-10	0.75 to 1.5
	MVD-1-135Y-10	2.2 to 3.7
VDC-2A-*A*-20	MVD-2-135-10	2.2 to 3.7
	MVD-2-160-10	5.5
VDC-2A-2A*-20	MVD-2-160Z-10	5.5

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 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°.

● Inverter Drive Precautions

1 Set the revolution speed within the range of the pump specification revolution speed.

2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Explanation of model No.

Single Pump

VDC – 2 A – 1 A 2 – 20

- Design number
- Pressure adjustment range
  2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 2 to 7MPa {20.4 to 71.4kgf/cm²}
  4: 5 to 10.5MPa {51 to 107kgf/cm²}
  5: 7 to 14MPa {71.4 to 143kgf/cm²}
  Note: Ring size: In the case of 2, maximum setting pressure is 7Mpa (71.4kgf/cm²).
- Flow characteristics A: Constant discharge type
- Ring size

at 1800min⁻¹

Ring size	VDC-1	VDC-2	VDC-3
1	30ℓ/min	54ℓ/min	120ℓ/min
2	40ℓ/min	70ℓ/min	–

- Mounting method
  A: Foot type mounting B: Flange type mounting
- Pump size
  1: Type 1 2: Type 2 3: Type 3
- Pump Type: VDC Series High-pressure Variable Discharge Rate Vane Pump

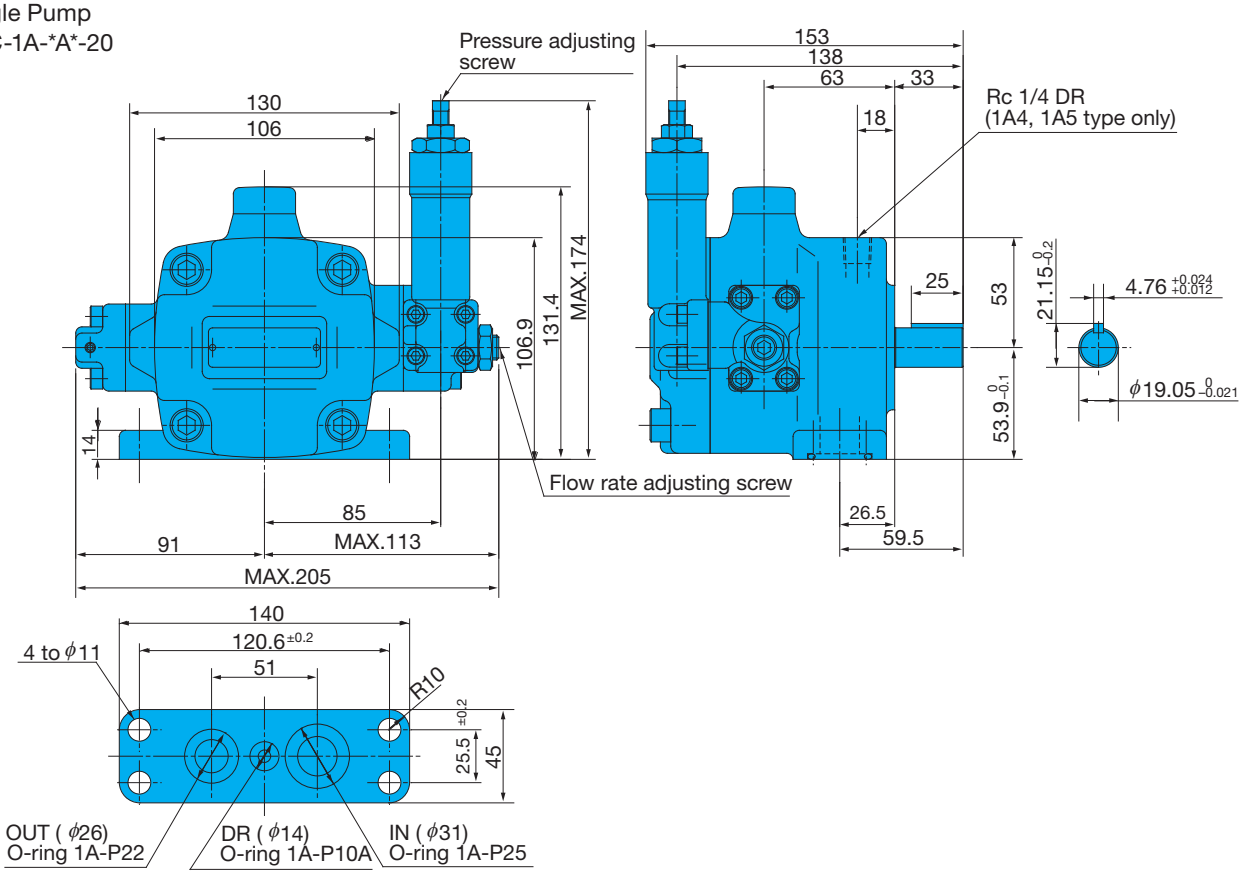
Double Pump

VDC – 1 2 A – 1 A 5 – 2 A 3 – 20

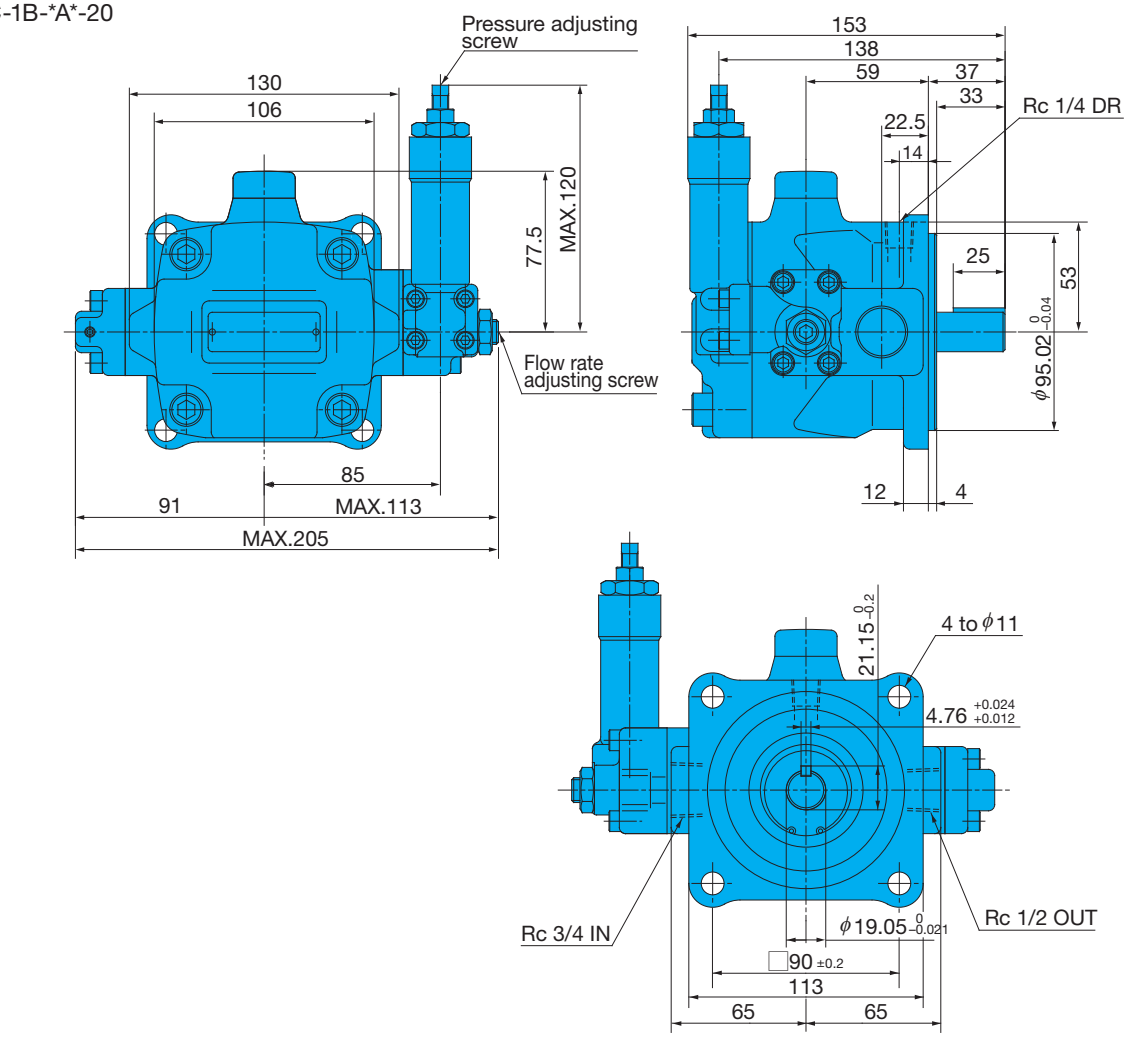
- Design number
- Shaft side pressure adjustment range
  3: 2 to 7MPa {20.4 to 71.4kgf/cm²}
  5: 7 to 14MPa {71.4 to 143kgf/cm²}
- Shaft side flow rate characteristics A: Constant discharge rate type
- Shaft side ring size 1, 2
  (Size 1 only for VDC-3)
- Head side pressure adjustment range 3, 5
- Head 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

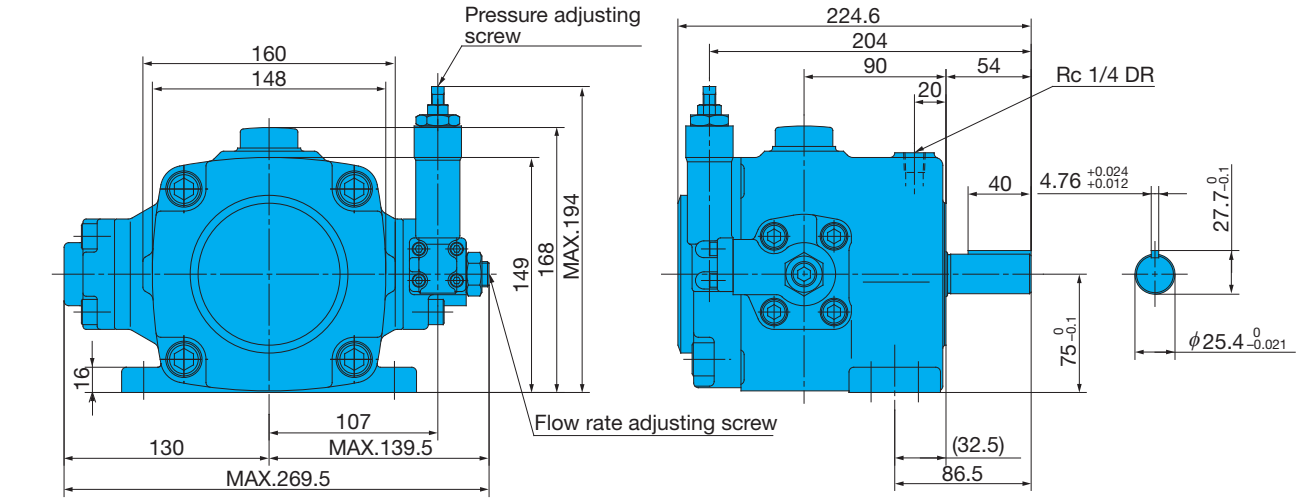
Single Pump
VDC-1A-*A*-20

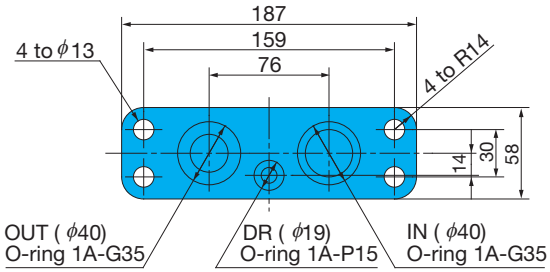


VDC-1B-*A*-20



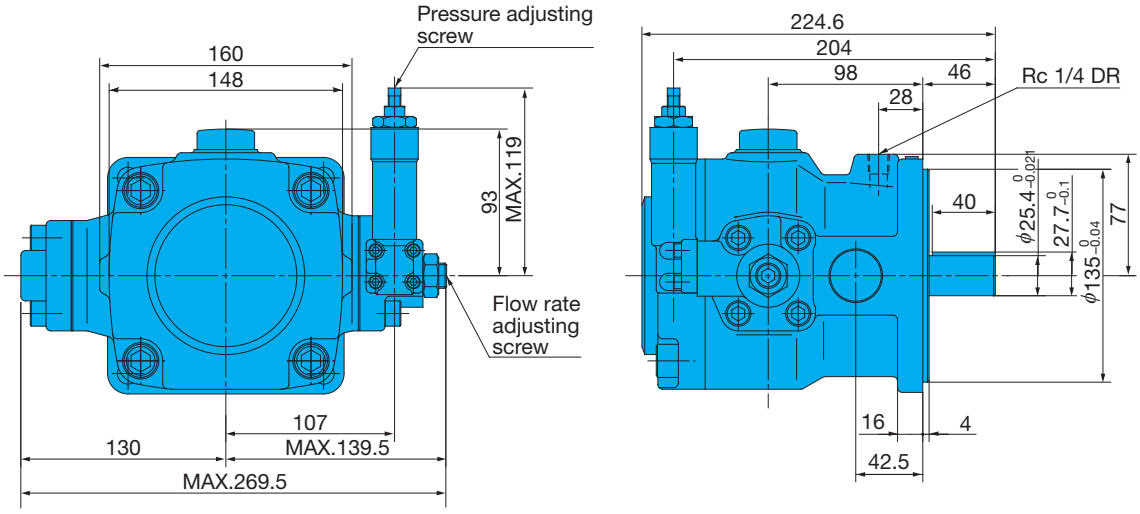
VDC-2A-*A*-20

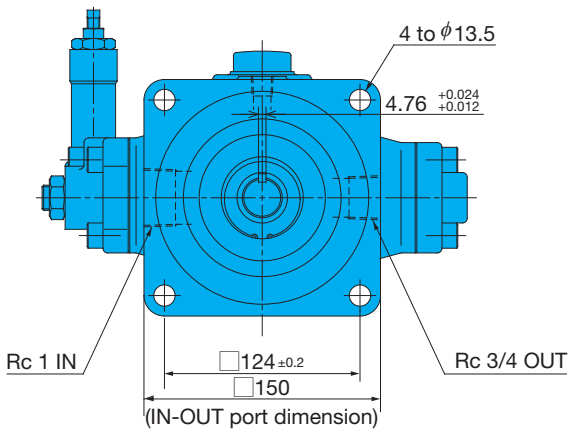




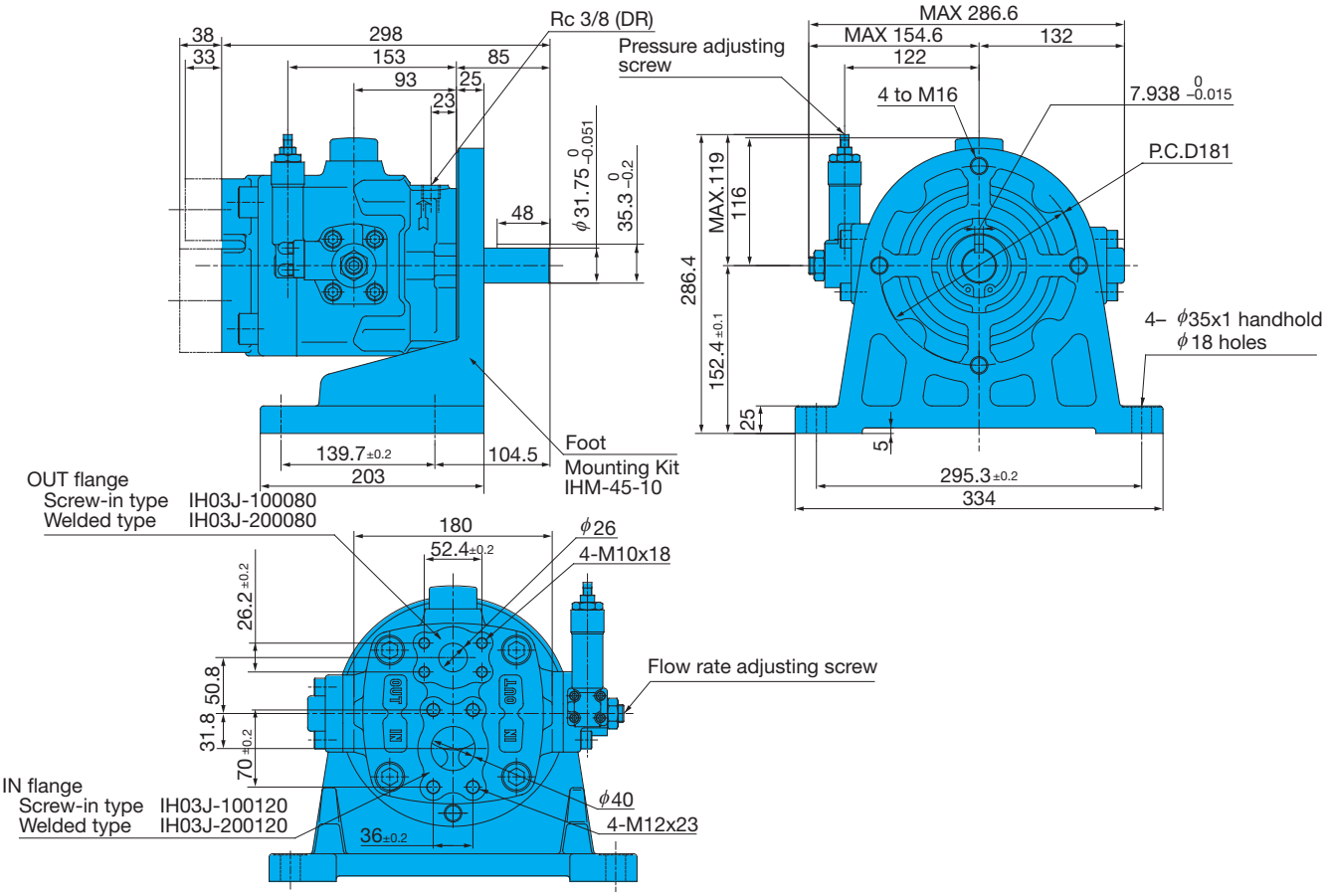
Note) O-ring 1A-** refers to JIS B2401-1A-**.

VDC-2B-*A*-20

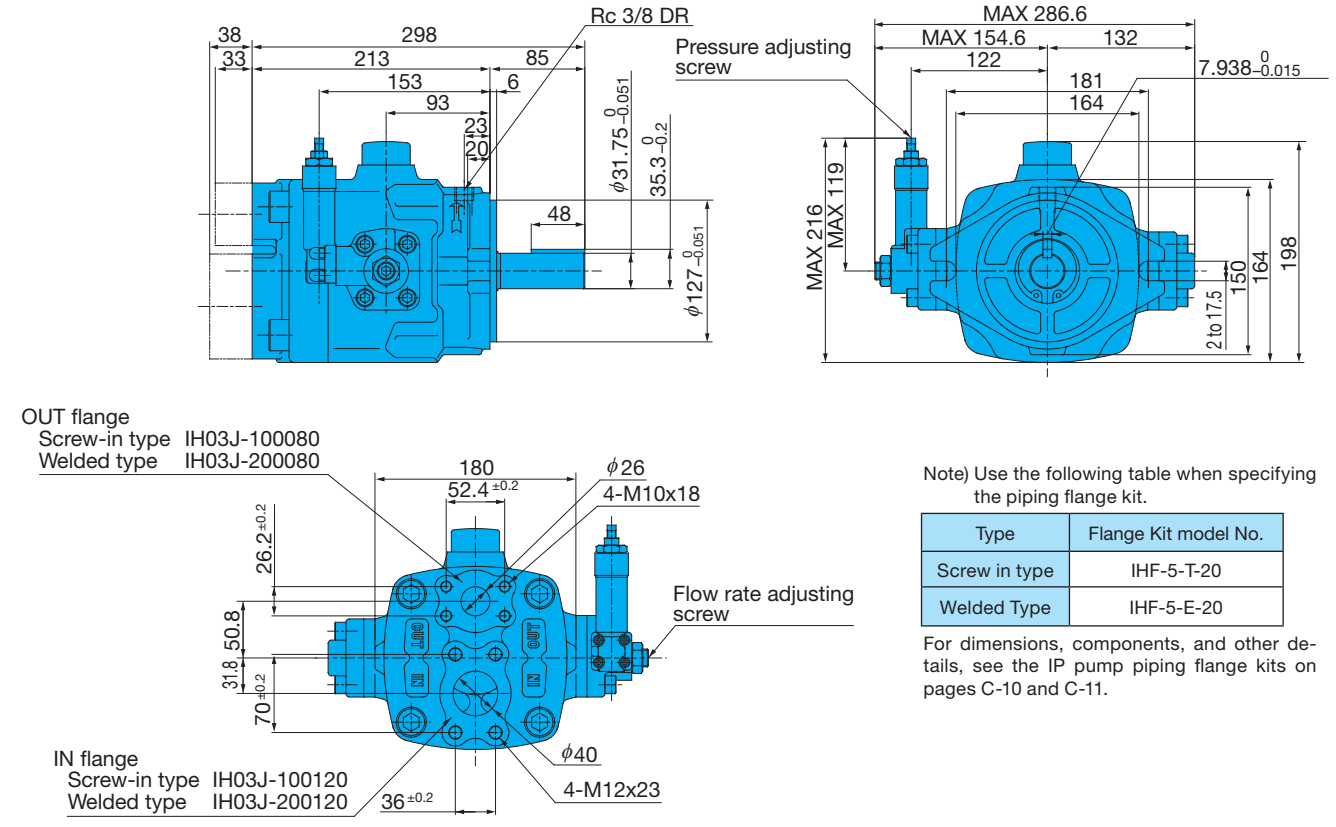




VDC-3A-1A*-20



VDC-3B-1A*-20

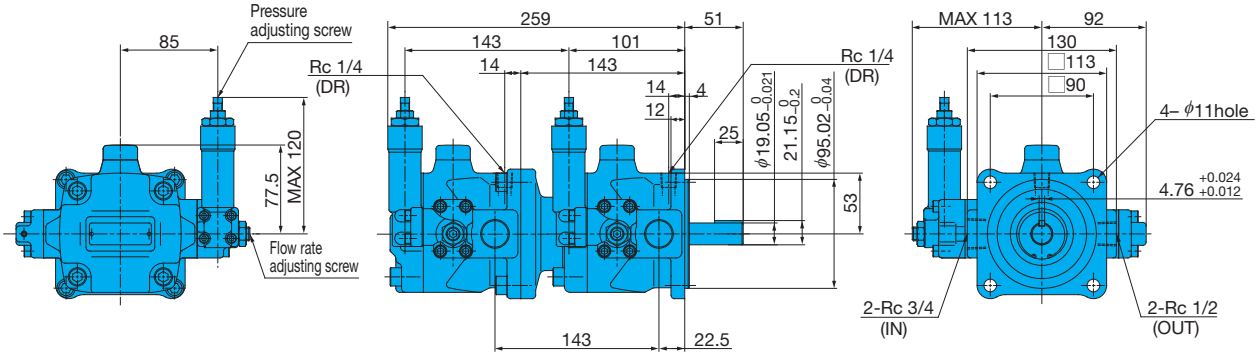


Note) Use the following table when specifying the piping flange kit.

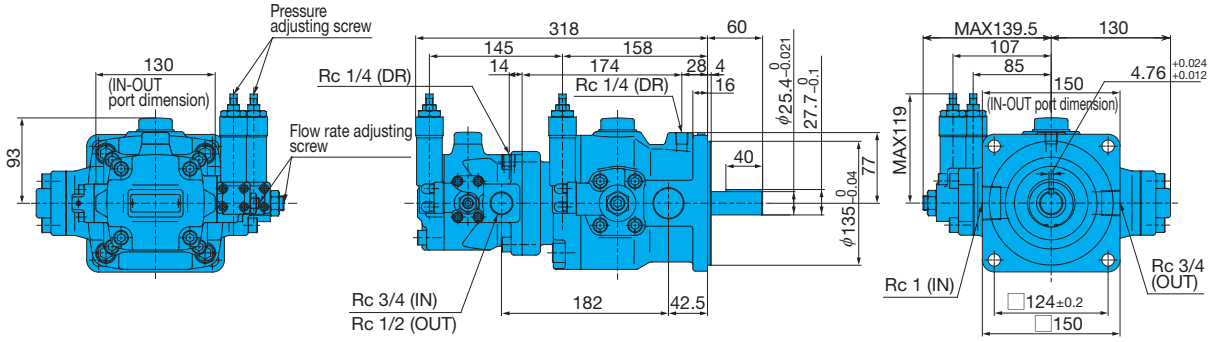
Type	Flange Kit model No.
Screw in type	IHF-5-T-20
Welded Type	IHF-5-E-20

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

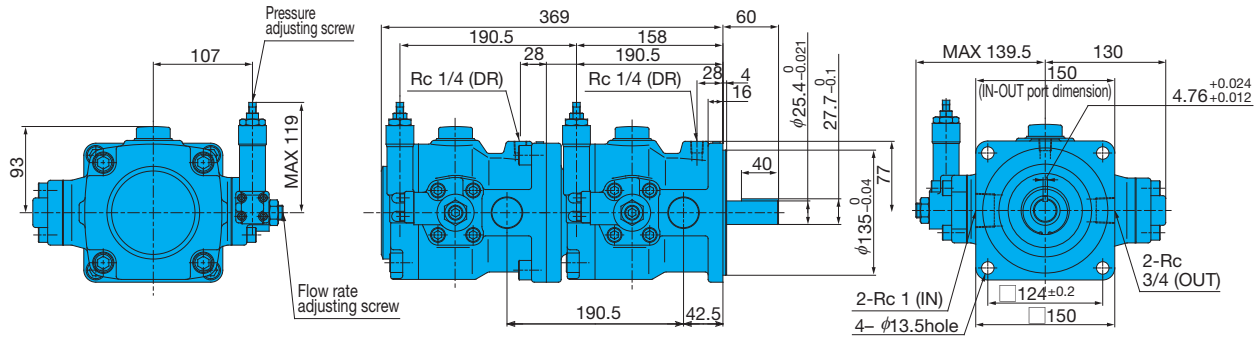
Double Pump
VDC-11B-*A*-*A*-20



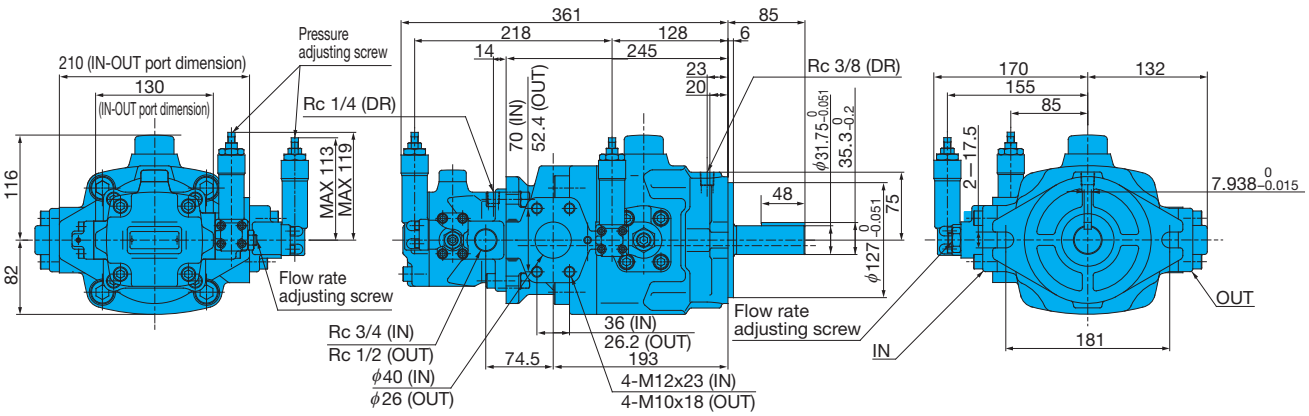
VDC-12B-*A*-*A*-20



VDC-22B-*A*-*A*-20



VDC-13B-*A*-*A*-20

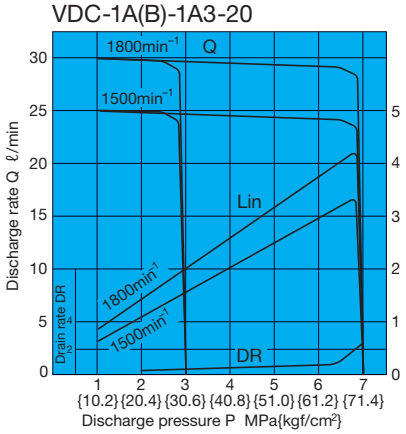


Note) 1. VDC-**A has the foot mounting kit shown on page B-36 installed.
2. Rc-* previously was PT*.

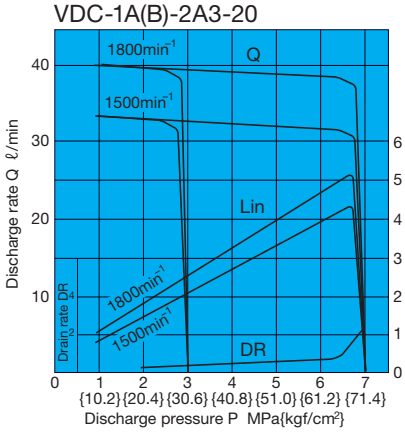
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

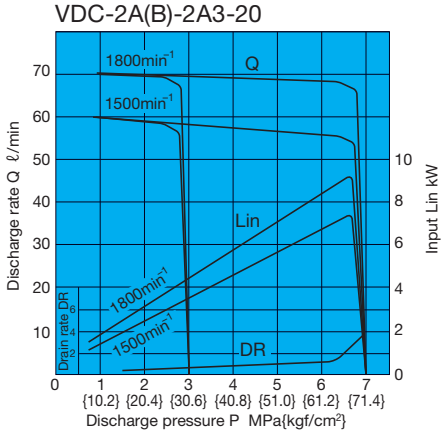
VDC-1A(B)-1A3-20



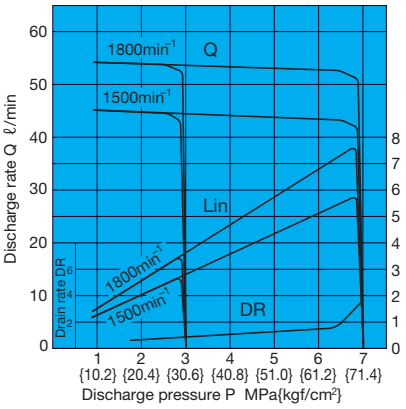
VDC-1A(B)-2A3-20



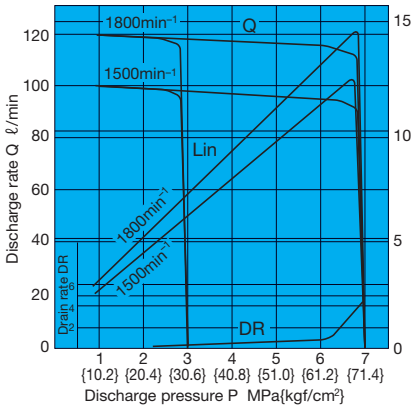
VDC-2A(B)-2A3-20



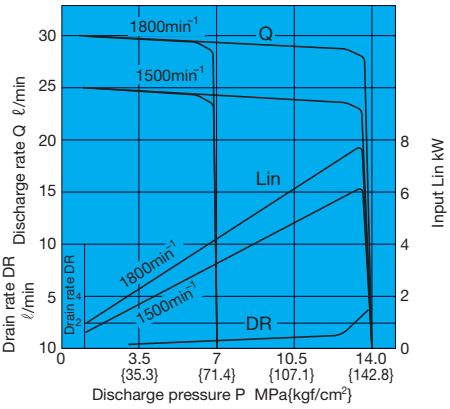
VDC-2A(B)-1A3-20



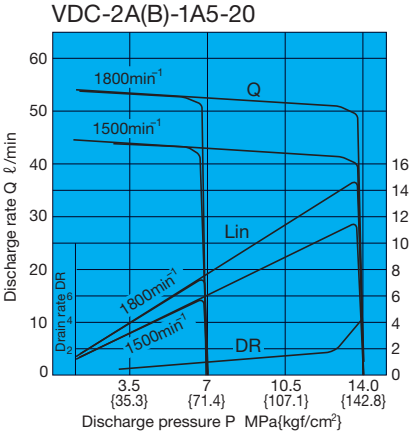
VDC-3A(B)-1A3-20



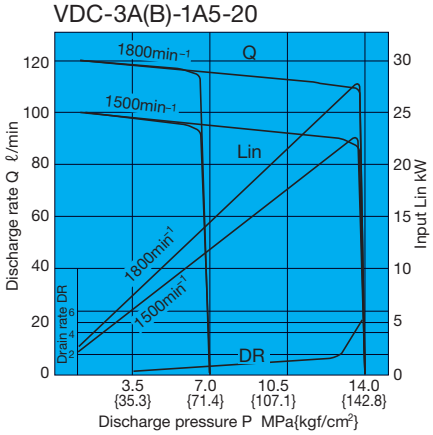
VDC-1A(B)-1A5-20



VDC-2A(B)-1A5-20

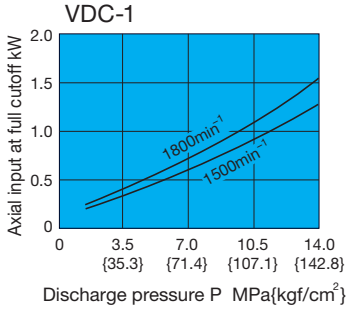


VDC-3A(B)-1A5-20

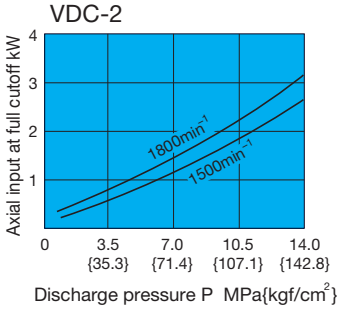


Axial input at full cutoff

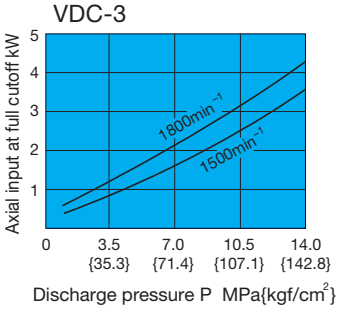
VDC-1



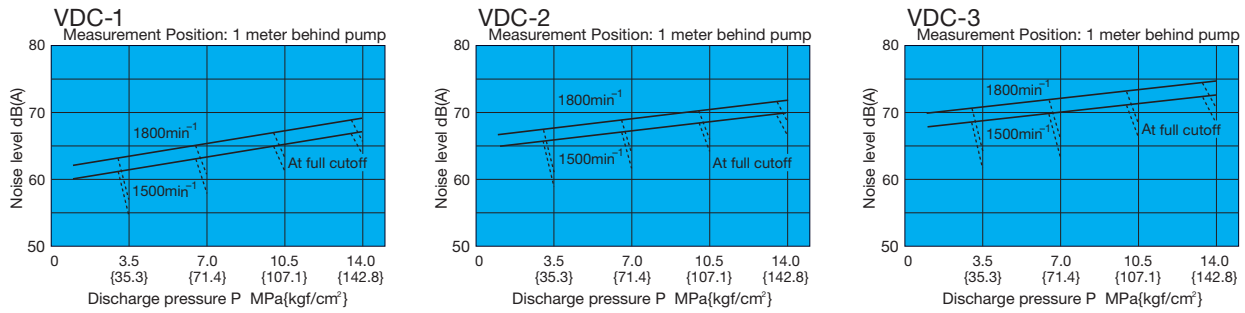
VDC-2



VDC-3

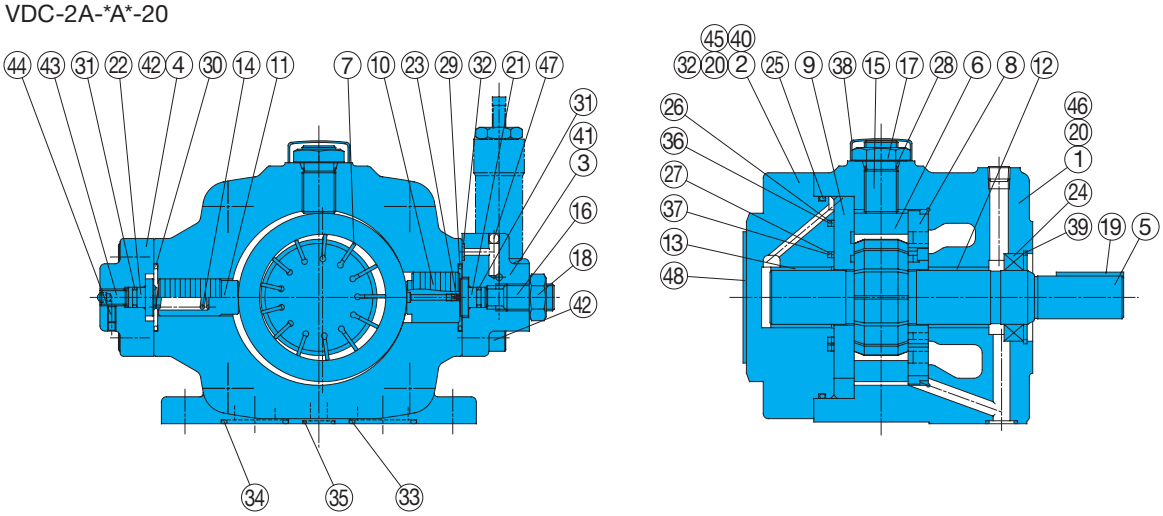


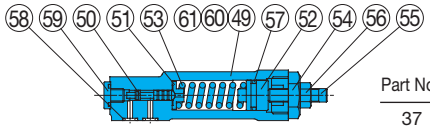
Noise Characteristics



Cross-sectional Drawings

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





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

Part No.	Applicable Pump Model No.	VDC-1A-*-20		VDC-2A-*-20	
	Seal Kit Number	VCBS-101A00		VCBS-102A00	
	Part Name	Part Number	Q'ty	Part Number	Q'ty
24	Oil seal	TCV-224211-V	1	TCN-325211-V	1
25	O-ring	S85(NOK)	1	NBR-70-1 G115	1
26	O-ring	AS568-034	1	AS568-150	1
27	O-ring	AS568-026	1	AS568-134	1
28	O-ring	NBR-70-1 P14	1	NBR-70-1 P18	1
29	O-ring	NBR-70-1 P22	1	NBR-70-1 G35	1
30	O-ring	NBR-70-1 P20	1	NBR-70-1 G35	1
31	O-ring	NBR-70-1 P5	2	NBR-70-1 P9	2
32	O-ring	NBR-70-1 P6	4	NBR-70-1 P7	4
33	O-ring	NBR-70-1 P25	1	NBR-70-1 G35	1
34	O-ring	NBR-70-1 P22	1	NBR-70-1 G35	1
35	O-ring	NBR-70-1 P10A	1	NBR-70-1 P15	1
36	Backup ring	VCB34-101000	1	VCB34-102000	1
37	Backup ring	VCB34-201000	1	VCB34-202000	1
57	O-ring	NBR-70-1 P14	1	NBR-70-1 P14	1
58	O-ring	NBR-90 P6	3	NBR-90 P6	3

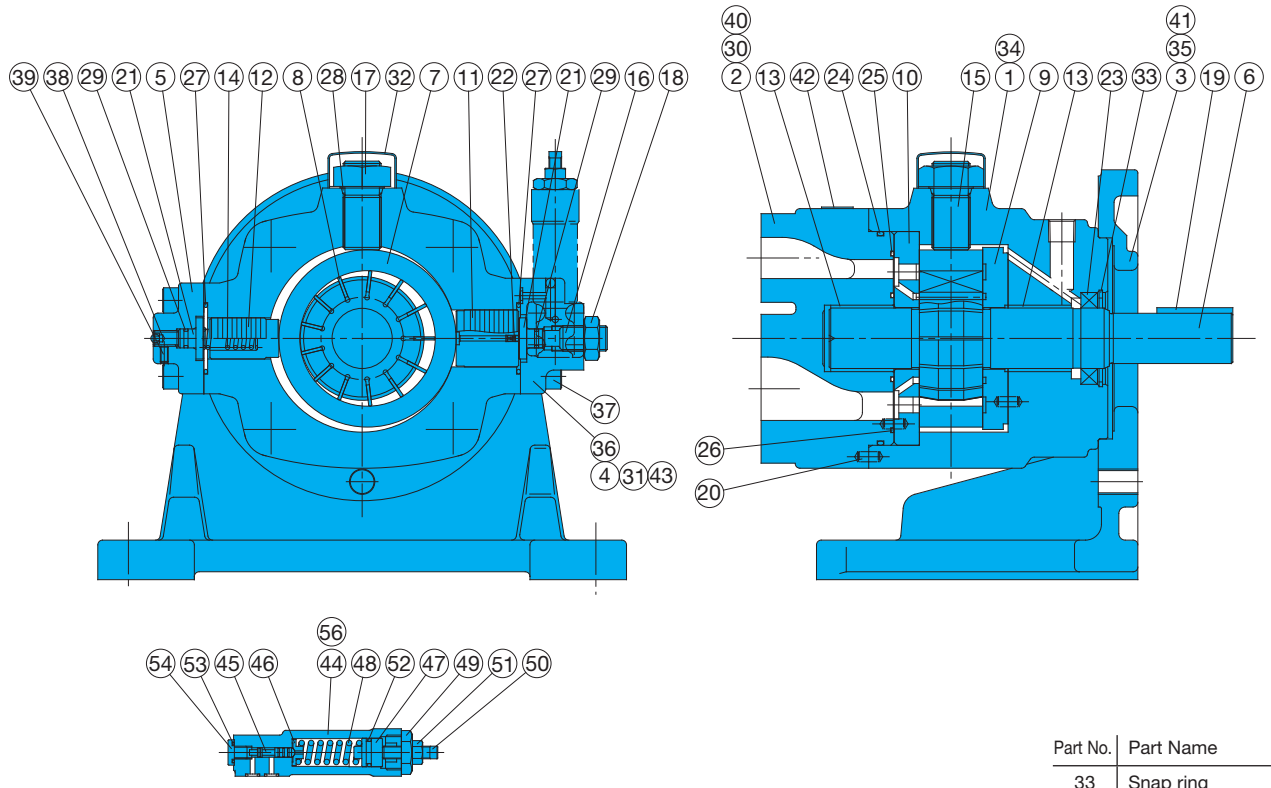
Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
2. The materials and hardness of the O-ring conform with JIS B2401.
3. For VDR-*B-*-20, the seal kit number becomes VDBS-10*B00, without the 33, 24, and 35 O-rings.

Part No.	Part Name
1	Body (1)
2	Body (2)
3	Cover (1)
4	Cover (2)
5	Shaft
6	Ring
7	Vane
8	Plate (S)
9	Plate (H)
10	Piston (1)
11	Piston (2)
12	Bearing
13	Bearing
14	Spring
15	Thrust screw
16	Screw
17	Nut
18	Nut

Part No.	Part Name
19	Key
20	Pin
21	Holder
22	Holder
23	Orifice
24	Oil seal
25	O-ring
26	O-ring
27	O-ring
28	O-ring
29	O-ring
30	O-ring
31	O-ring
32	O-ring
33	O-ring
34	O-ring
35	O-ring
36	Backup ring

Part No.	Part Name
37	Backup ring
38	Cap
39	Snap ring
40	Screw
41	Screw
42	Screw
43	Screw (stopper)
44	Screw
45	Plug
46	Plug
47	Pole
48	Nameplate
49	Valve body
50	Spool
51	Holder
52	Plunger
53	Spring
54	Retainer
55	Screw
56	Nut
57	O-ring
58	O-ring
59	Plug
60	Plug
61	Screw

VDC-3A-1A*-20



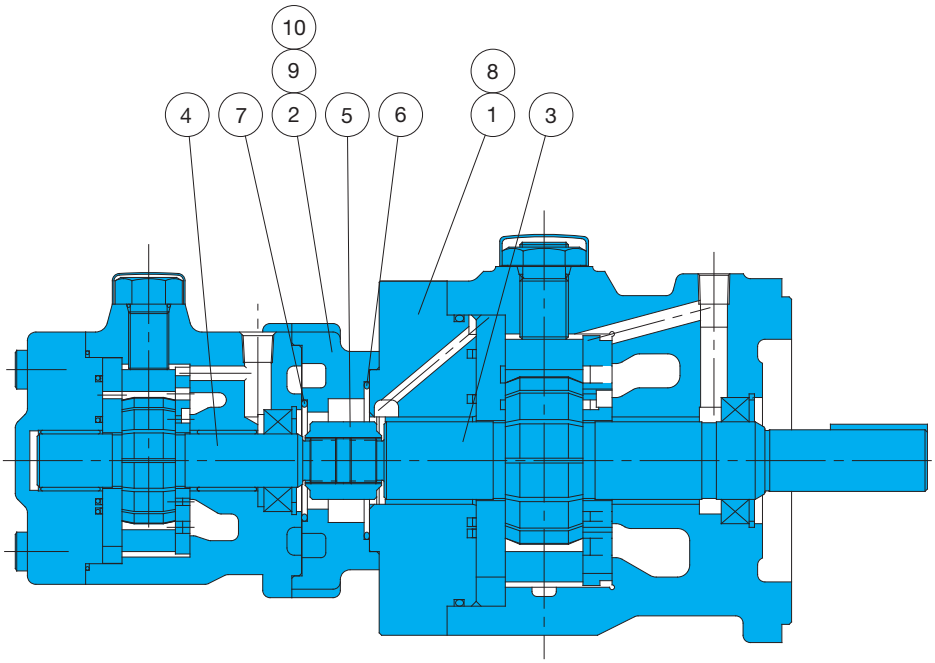
Seal Component Table (VDC-3*)

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-V	1
24	O-ring	NBR-70-1 G130	1
25	O-ring	AS568-154(NBR-90)	1
26	O-ring	AS568-151(NBR-90)	1
27	O-ring	NBR-70-1 G40	2
28	O-ring	NBR-70-1 P22	1
29	O-ring	NBR-70-1 P9	2
30	O-ring	NBR-70-1 P7	2
31	O-ring	NBR-70-1 P7	2
52	O-ring	NBR-70-1 P14	1
53	O-ring	NBR-90 P6(NBR-90)	3

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
2. The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name	Part No.	Part Name
1	Body (1)	17	Nut
2	Body (2)	18	Nut
3	Mounting	19	Key
4	Cover (1)	20	Pin
5	Cover (2)	21	Holder
6	Shaft	22	Orifice
7	Ring	23	Oil seal
8	Vane	24	O-ring
9	Plate (S)	25	O-ring
10	Plate (H)	26	O-ring
11	Piston (1)	27	O-ring
12	Piston (2)	28	O-ring
13	Bearing	29	O-ring
14	Spring	30	O-ring
15	Thrust screw	31	O-ring
16	Screw	32	Cap

Part No.	Part Name
33	Snap ring
34	Screw
35	Screw
36	Screw
37	Screw
38	Screw (stopper)
39	Screw
40	Plug
41	Washer
42	Nameplate
43	Pole
44	Valve body
45	Spool
46	Holder
47	Plunger
48	Spring
49	Retainer
50	Screw
51	Nut
52	O-ring
53	O-ring
54	Plug
55	Plug
56	Screw



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.

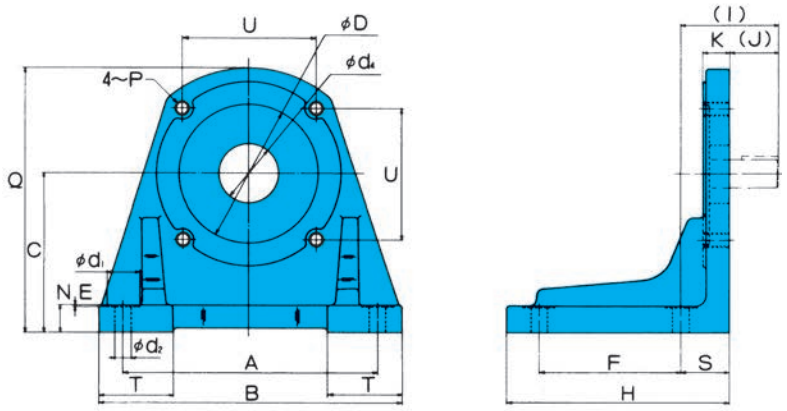
List of Sealing Parts

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	–		NBR-70-1 G60	1	NBR-70-1 G60	1	–	
7	O-ring	NBR-70-1 G85	1	NBR-70-1 G45	1	NBR-70-1 G60	1	NBR-70-1 G85	1

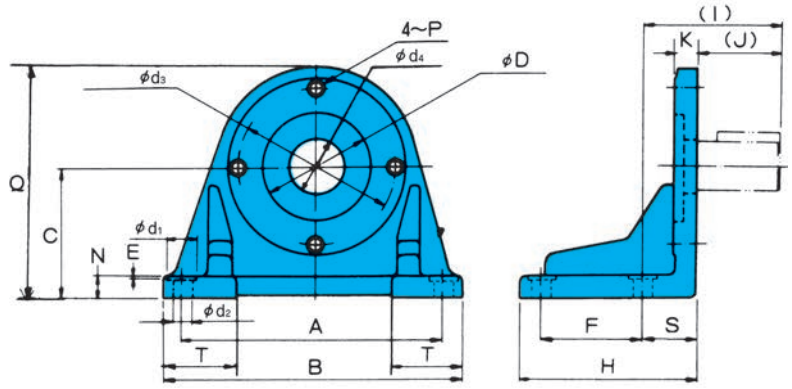
Note) 1. See the description of the single pump for seal parts that are not included in the list.
2. The materials and hardness of the O-ring conform with JIS B2401.

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 VDC-11	TH-10×30	4	WS-B-10	4	171.45	204	107.95	1	95.25	150
VCM-22-20	VDC-2 VDC-12 VDC-22	TH-12×35	4	WS-B-12	4	235	267	139.7	1	127	193
IHM-45-10	VDC-3 VDC-13	TB-16×40	2	WP-16	2	295.3	334	152.4	1	139.7	203

Foot Mounting Kit Model No.	Dimensions mm														Weight kg
	(I)	(J)	K	N	P	Q	S	T	U	φD	φd1	φd2	φd3	φd4	
VCM-11-20	66.5	33	18	18	M10	180	32.5	50	90	95.02	22	11	–	40	6.5
VCM-22-20	84.5	40	20	20	M12	232	44.5	57.5	124	135	22	14	–	40	12.0
IHM-45-10	104.5	60	25	25	M16	259	44.5	61	–	127	35	18	181	86	13.5

Uni-pump Specifications

(CE mark standard compliant)

Single Pump

UVC – 1 A – 2 A 2 – 1.5 – 4 – 40

- Design number
- Number of motor poles: 4(P)
- Motor output (kW) 0.75, 1.5, 2.2, 3.7
- Pressure adjustment range
  2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 2.0 to 7.0MPa {20.4 to 71.4kgf/cm²}
  4: 5 to 10.5MPa {51 to 107kgf/cm²}
- Flow characteristics A: Constant discharge type
- Ring size None: 30ℓ/min, 2: 40ℓ/min } at 1800min⁻¹
- A: Foot type mounting
- Pump size 1: VDC–1B(20D) 2: VDC–2B(20D)
- Pump Type: VDC Series Uni-pump

Double Pump

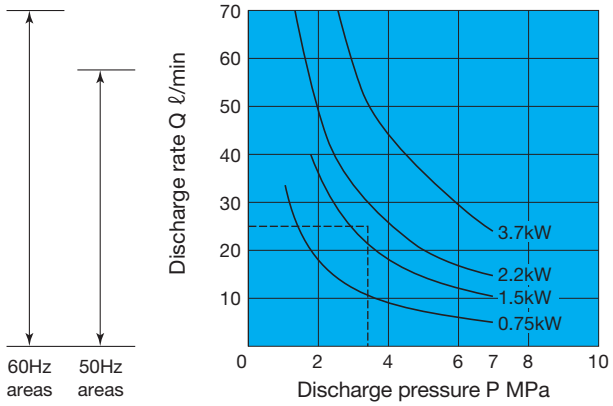
UVC – 11 A – 2 A 2 – 2 A 2 – 3.7 – 4 – 40

- Design number
- Number of motor poles: 4(P)
- Motor output (kW) 1.5, 2.2, 3.7
- Shaft side pump pressure adjustment range
  2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
  3: 2.0 to 7.0MPa {20.4 to 71.4kgf/cm²}
- Shaft side pump flow rate characteristics A: Constant discharge type
- Shaft side pump ring size None: 30ℓ/min, 2: 40ℓ/min } at 1800min⁻¹
- Head side pump pressure adjustment range: Same as the shaft side pump
- Head side pump flow rate characteristics A: Constant discharge type
- Head side pump ring size None: 30ℓ/min, 2: 40ℓ/min } at 1800min⁻¹
- A: Foot type mounting
- Pump size 11: VDC–11B(20D)
- Pump Type: VDC Series Uni-pump

Specifications

Model No.	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min (A*)		Maximum Flow Rate ℓ/min (2A*)	
		50Hz	60Hz	50Hz	60Hz
UVC- 1A	7 {71.4}	25	30	33	40
UVC- 2A	7 {71.4}	45	54	58	70
UVC-11A	7 {71.4}	25-25	30-30	33-33	40-40

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 3.5MPa and a discharge rate of 25.0 ℓ/min.

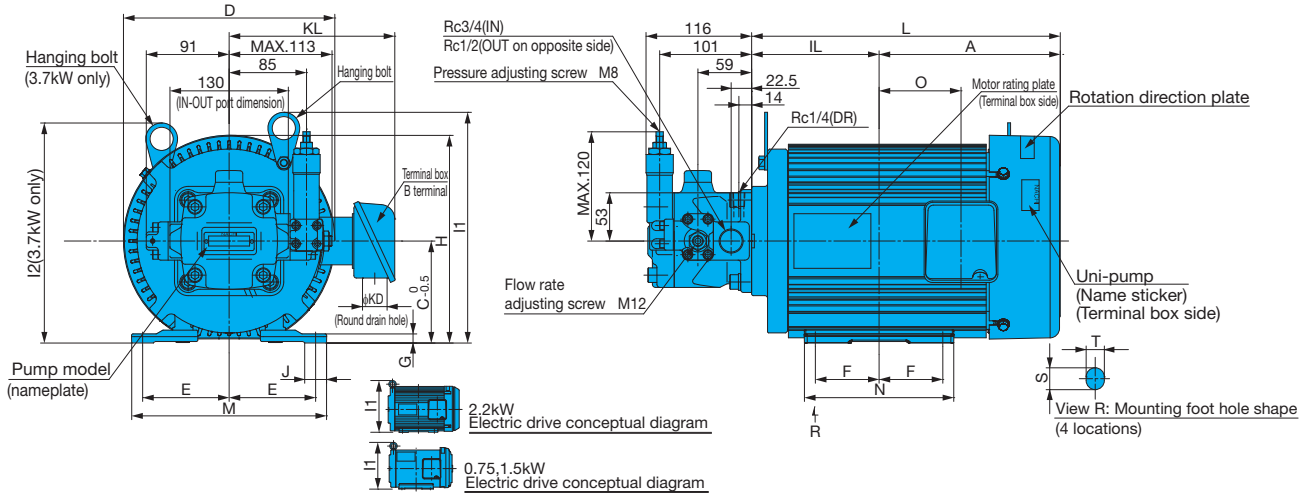
Selection Process

Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 25.0 ℓ/min intersect in the area under the 2.2kW curve, it means that a 2.2kW 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.
* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

Installation Dimension Drawings

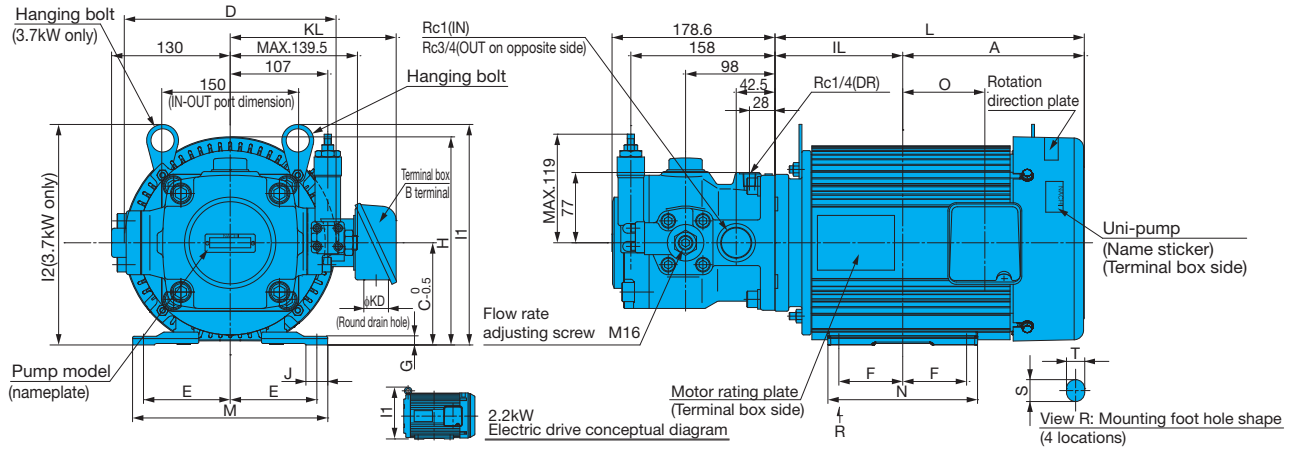
UVC-1A



Uni-pump	Motor Dimensions [mm]																		Frame No.	Output kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL	O			
UVC-1A-A2-0.75-4-40	137	105	80	152	62.5	50	4.5	160	193	–	47.5	242	165	130	25×10	27	137	65	80M	0.75	28.5
UVC-1A-A2-1.5-4-40																					
UVC-1A-A3-1.5-4-40	160.5	118.5	90	183	70	62.5	4.4	183	204	–	22	279	165	152.5	16×10	27	142	68	90L	1.5	31.5
UVC-1A-2A2-1.5-4-40																					
UVC-1A-A2-2.2-4-40																					
UVC-1A-A3-2.2-4-40	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	2.2	45.5
UVC-1A-2A2-2.2-4-40																					
UVC-1A-A3-3.7-4-40																					
UVC-1A-A4-3.7-4-40	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	49.5
UVC-1A-2A2-3.7-4-40																					
UVC-1A-2A3-3.7-4-40																					

1. Standard drive motor is the fully enclosed fan-cooled F 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).

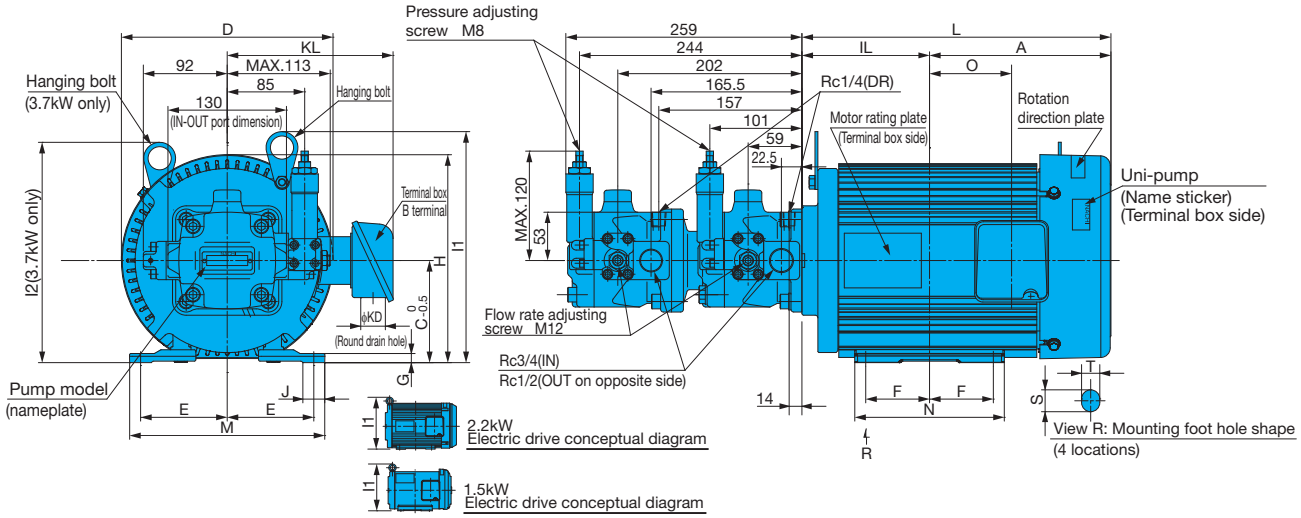
UVC-2A



Uni-pump	Motor Dimensions [mm]																		Frame No.	Output kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL	O			
UVC-2A-A2-2.2-4-40	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	2.2	61
UVC-2A-A3-2.2-4-40																					
UVC-2A-A2-3.7-4-40																					
UVC-2A-A3-3.7-4-40	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	65
UVC-2A-2A2-3.7-4-40																					
UVC-2A-2A3-3.7-4-40																					

1. Standard drive motor is the fully enclosed fan-cooled F 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).

UVC-11A

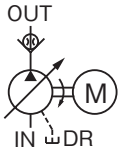


Uni-pump	Motor Dimensions [mm]																		Frame No.	Output kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL	O			
UVC-11A-A2-A2-1.5-4-40	160.5	118.5	90	183	70	62.5	4.4	183	204	–	22	279	165	152.5	16×10	27	142	68	90L	1.5	42
UVC-11A-A2-A3-1.5-4-40																					
UVC-11A-A3-A3-1.5-4-40																					
UVC-11A-A2-A2-2.2-4-40	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	2.2	56
UVC-11A-A2-A3-2.2-4-40																					
UVC-11A-A3-A3-2.2-4-40																					
UVC-11A-2A2-2A2-2.2-4-40																					
UVC-11A-A2-A2-3.7-4-40	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	60
UVC-11A-A2-A3-3.7-4-40																					
UVC-11A-A3-A3-3.7-4-40																					
UVC-11A-2A2-2A2-3.7-4-40																					
UVC-11A-2A2-2A3-3.7-4-40																					

1. Standard drive motor is the fully enclosed fan-cooled F 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).

UVN Series Variable Volume Vane Uni-pump (NSP Uni-pump)

3 to 26cm³/rev
8MPa{81.6kgf/cm²}



Features

1. 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.

2.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.

3.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 cm³/rev	Pressure Adjustment Range MPa{kgf/cm²}	No-load Discharge Rate ℓ/min	
			50Hz	60Hz
UVN-1A-0A2-$^{0.7}_{1.5}$-4-12	8.1	1.5 to 4.0 {15.3 to 40.8}	12	14.5
UVN-1A-0A3-$^{0.7}_{1.5}$-4-12		3.5 to 6.0 {35.7 to 61.2}		
UVN-1A-0A4-$^{0.7}_{1.5}$-4-12		5.5 to 8.0 {56.1 to 81.6}		
UVN-1A-1A2-$^{1.5}_{2.2}$-4-12	16.1	1.5 to 4.0 {15.3 to 40.8}	24	29
UVN-1A-1A3-$^{1.5}_{2.2}$-4-12		3.5 to 6.0 {35.7 to 61.2}		
UVN-1A-1A4-$^{1.5}_{2.2}$-4-12		5.5 to 8.0 {56.1 to 81.6}		
UVN-1A-2A2-$^{2.2}_{3.7}$-4-30	26.0	2.0 to 4.0 {20.4 to 40.7}	39	46
UVN-1A-2A3-$^{2.2}_{3.7}$-4-30		3.5 to 6.0 {35.7 to 61.2}		
UVN-1A-2A4-3.7-4-30		5.5 to 7.0 {56.1 to 71.4}		

Note1) Contact your agent for combinations other than those noted above.
Note2) Due to the change of designs from 11 to 12, 20 to 30, the color of paint is changed to black.

Explanation of model No.

UVN – 1 A – 1 A 4 – 1.5 – 4 – 12

- 12: Design number
- 4: Number of motor poles 4P
- 1.5: Motor output (kW) *Power supply AC200V-50/60Hz AC220V-60Hz
  0.7: 0.75kW 1.5: 1.5kW 2.2: 2.2kW
- A4: Pressure adjustment range
  2: 1.5 to 4.0MPa {15.3 to 40.8kgf/cm²} 3: 3.5 to 6.0MPa {35.7 to 61.2kgf/cm²}
  4: 5.5 to 8.0MPa {56.1 to 81.6kgf/cm²}
- A: Flow characteristics A: Constant discharge type
- 1: Discharge rate (At N=1800min⁻¹)
  0: 14.5 ℓ/min (max) 1: 29 ℓ/min (max)
- A: Foot type mounting
- 1: Pump size 1: VDN-1B
- UVN: UVN Series Uni-pump

UVN –1 A – 2 A 3 – 3.7 A E – 4 * – 30

- Design number
- Voltage symbol
- Number of motor poles 4P
- Special processings None: Standard / E: Tropicalization
- Terminal box position None: B terminal / A: A terminal
- Motor output 2.2: 2.2kW 3.7: 3.7kW
- Pressure adjustment range 2: 2.0 to 4.0MPa {20.4 to 40.7kgf/cm²} 3: 3.5 to 6.0MPa {35.7 to 61.2kgf/cm²} 4: 5.5 to 7.0MPa {56.1 to 71.4kgf/cm²}
- Flow characteristics A: Constant discharge type
- Discharge flow rate (At N=1800min⁻¹) 2: 46 ℓ/min (max)
- A: Foot type mounting
- Pump size 1: VDN-1B
- UVN Series Uni-pump

●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 2m/s, and that the suction pressure at the pump suction port is in the range of -0.03 to +0.03MPa.

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 0.01MPa.
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 with the pump discharge side at no-load to prime the pump and bleed air from the pump and suction piping. (This pump has no fluid supply port.)

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 14MPa.
Refer to the following piping conditions as a guideline to keep the maximum peak pressure below 14 MPa.
1/2" x 2 m rubber hose (Discharge rate 0; Type 1 14MPa, Type 2 13MPa)
(pipe volume: approximately 250 cm³)

5 Install a relief valve to cut surges in the circuit if pressure exceeds 14 MPa.

Note) The maximum peak pressure of the discharge rate Type 2 is 13MPa.

3.Management of Hydraulic Operating Fluid

1 Use only good-quality hydraulic operating fluid with a kinematic viscosity at a oil temperature of 40°C within the range of 30 to 50mm²/sec (30 to 50cSt). Normally, you should use an R&O type and wear-resistant type of ISO VG32 or 46, or equivalent.

2 The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 10 to 40°C.

3 For the return line to the tank, use a 25μm line filter.

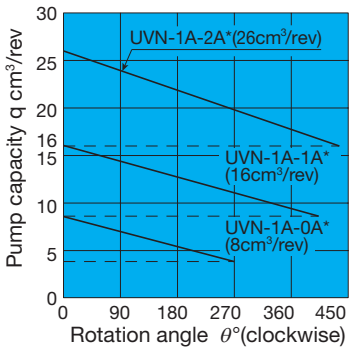
4 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water, foreign matter, and other oil, and watch out for discoloration.

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.

Flow Adjustment Rotation Angle (θ) and Pump Capacity (q)



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 MPa{kgf/cm²}
2 : 3.5 {35.7}
3 : 5.0 {51.0}
4 : 7.0 {71.4}

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.

●Inverter Drive Precautions

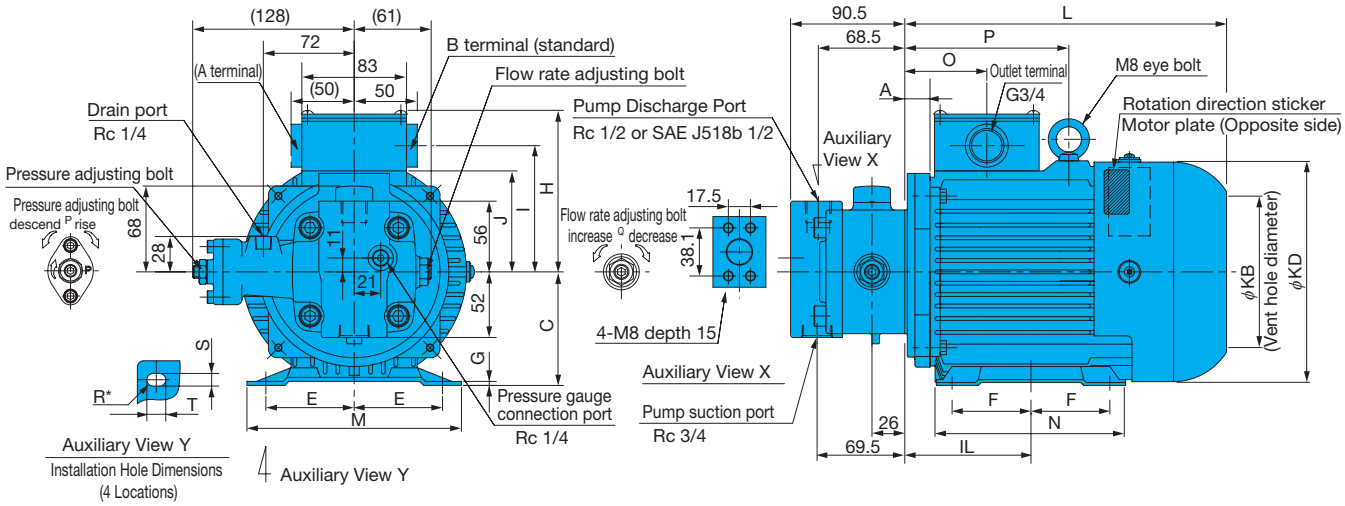
1 Set the revolution speed within the range of the pump specification revolution speed.

2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

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.

Installation Dimension Drawings

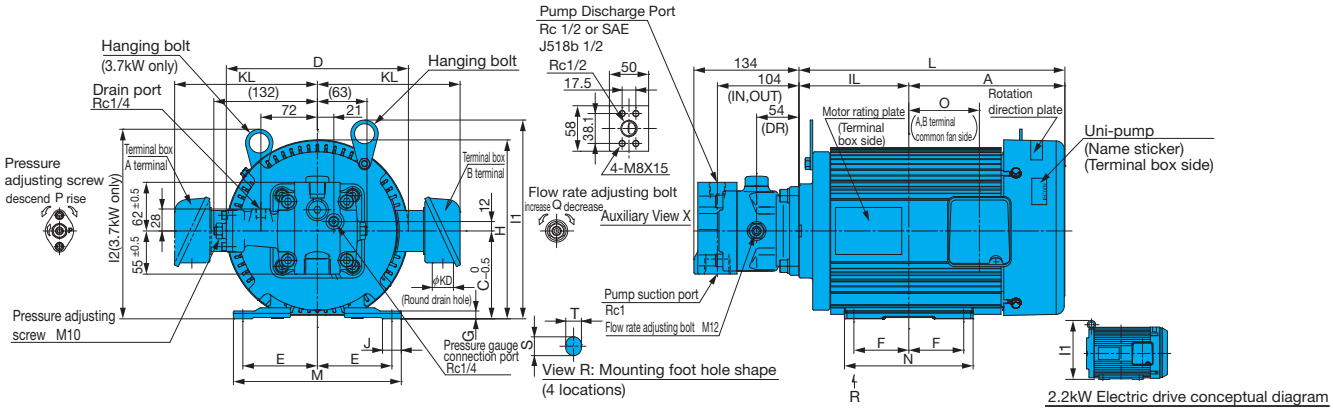
Installation method is the same as design number 10D (old design).



Model No.	Output - Poles (kW-4P)	Motor Dimensions (mm)																		Weight kg
		A	IL	C	ϕKD	E	F	G	H	J	L	M	N	T×S	R*	ϕKB	O	P	I	
UVN-1A-$^{0}_{1}$A*-0.7*-4-12	0.75-4	20	90	80	157	62.5	50	2.3	120	72	230	155	120	15×10	R5	110	65	130	92	19
UVN-1A-$^{0}_{1}$A*-1.5*-4-12	1.5-4	20	100	90	175	70	62.5	3.2	128	80	255	170	150	15×10	R5	120	65	130	100	23
UVN-1A-$^{0}_{1}$A*-2.2*-4-12	2.2-4	20	110	100	195	80	70	3.2	138	90	285	200	165	17×12	R6	134	65	135	110	30

- Pump Capacity and Motor Output Category Combinations -

	0.75kW	1.5kW	2.2kW
0A*	○	○	
1A*		○	○



Model No.	Motor Dimensions [mm]																	Frame No.	Output [kW] (4 poles)	Weight [kg]
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	ϕKD	KL	O		
UVN-1A-2A*-2.2**-4*-30	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	2.2	46
UVN-1A-2A*-3.7**-4*-30	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	50

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).

–Pump Pressure Classification and Motor Output Combinations–

	2.2kW	3.7kW
2A2	○	○
2A3	○	○
2A4		○

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

UVN-1A-$^{0}_{1}$A*

Output kW	Poles	Model Number	Voltage [V]	Frequency [Hz]	Current rating [A]	RPM rating [min^{-1}]	Heat resistance
0.75	4	The drive motor is specialized for the unipump and is not a specific model.	200	50	4.3	1440	E
			200	60	3.6	1730	
			220	60	3.6	1745	
1.5	4		200	50	7.3	1440	E
			200	60	6.4	1730	
			220	60	6.2	1740	
2.2	4		200	50	10.3	1450	E
			200	60	9.2	1745	
			220	60	8.9	1755	

UVN-1A-2A*

Output kW	Poles	Model Number	Voltage [V]	Frequency [Hz]	Current rating [A]	RPM rating [min^{-1}]	Heat resistance
2.2	4	VAEA-1A4*22-B	200	50	9.5	1460	F
			200	60	8.8	1750	
			220	60	8.5	1760	
3.7	4	VAEA-1A4*37-B	200	50	15.4	1460	F
			200	60	14.3	1760	
			220	60	13.5	1760	

Performance Curves

UVN-1A-*A*-*-4-12
Operating Fluid: ISO VG 32
Oil temperature: 40°C

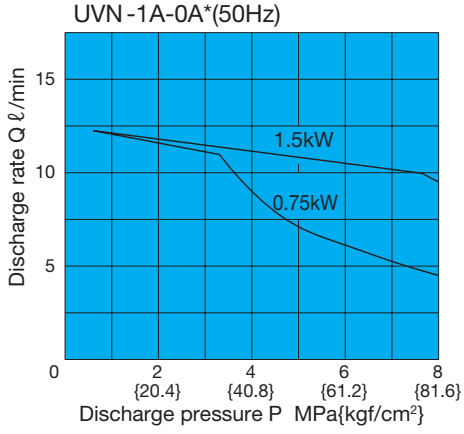
Motor selection curves

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 3.5MPa and a discharge rate of 12ℓ/min.

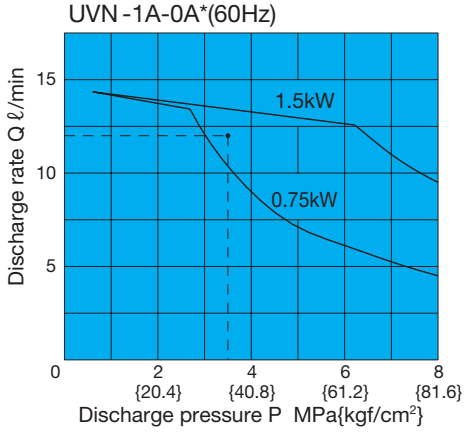
Selection Process
Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 12ℓ/min intersect in the area under the 1.5kW curve, it means that a 1.5kW motor should be used.

* 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.
* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

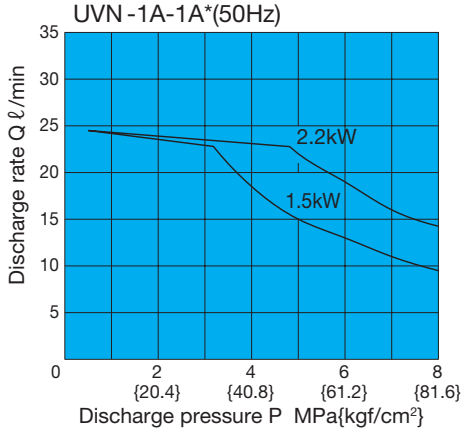
UVN-1A-0A*(50Hz)



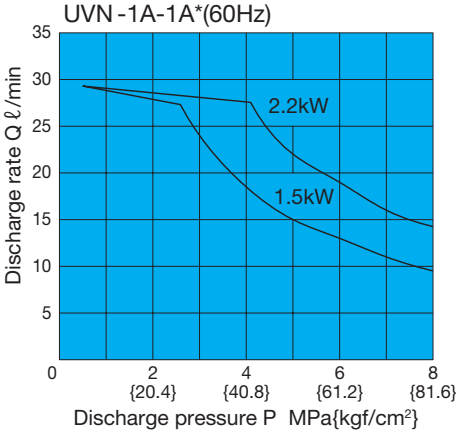
UVN-1A-0A*(60Hz)



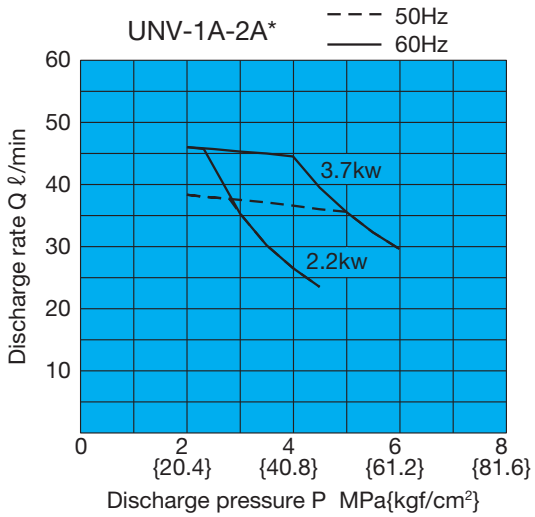
UVN-1A-1A*(50Hz)



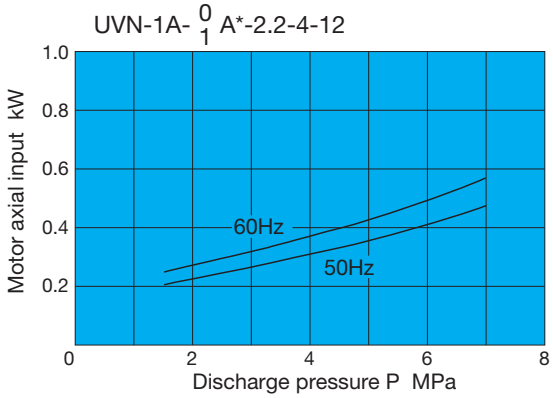
UVN-1A-1A*(60Hz)

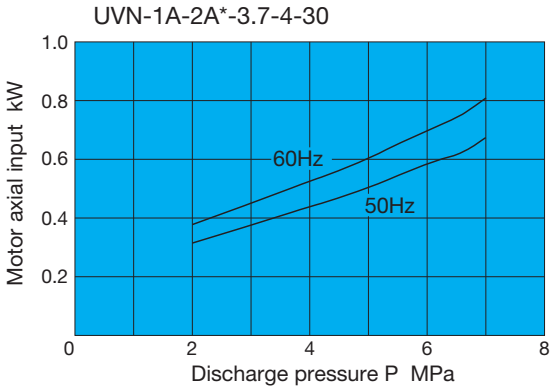


Motor selection curves (26cm³/rev)

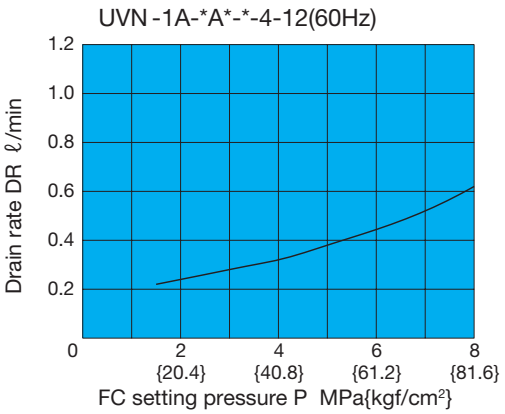


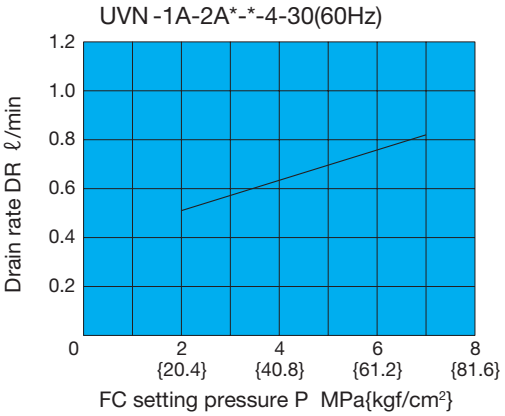
Motor Power Loss at Full Cutoff



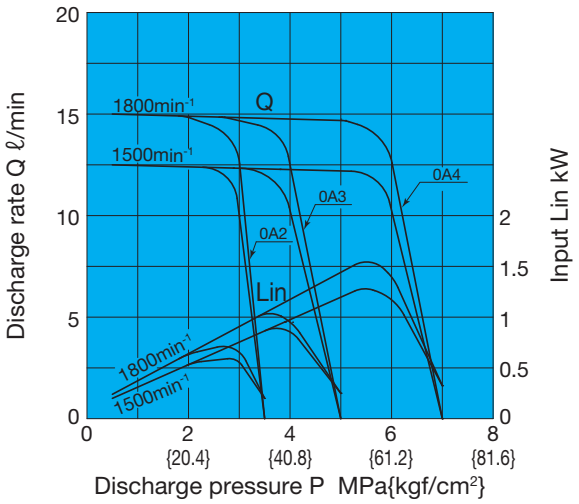


DR Volume a Full Cutoff

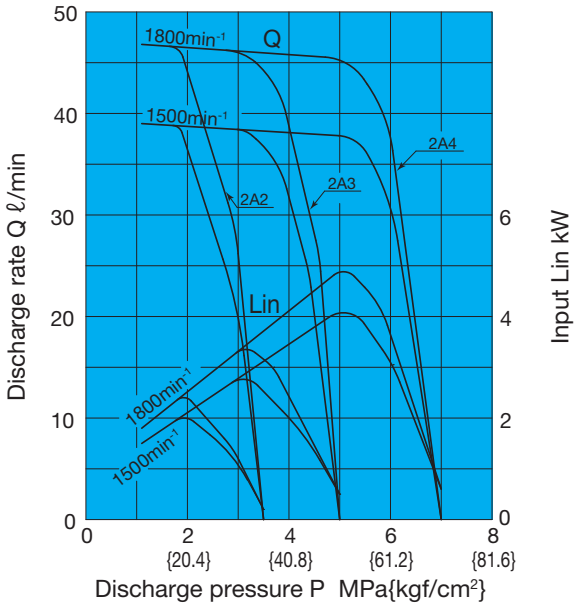




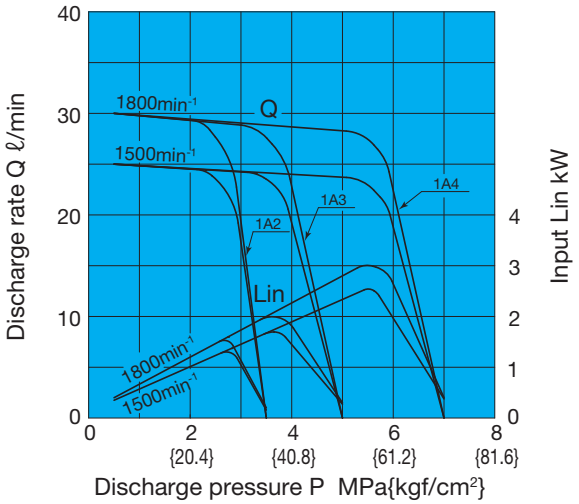
UVN-1A-0A* pump



UVN-1A-2A* pump



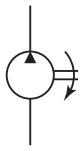
UVN-1A-1A* pump



*The pressure – flow rate characteristics are the characteristics for individual UVN pumps.
The pressure and flow rate must be within the output range of the motor.
See page B-43 for the output ranges of drive motors.

IPH Series IP Pump

3.6 to 125.9cm³/rev
30MPa



❖**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

①A patented axial and radial pressure loading system provides high efficiency and generates pressures up to 30MPa {306kgf/cm²}.

②Outstanding durability and very long life.

③A modified involute short-tooth gear enables internal gearing for greatly reduced pulsation and noise, and exceptionally quiet operation.

④A simple structure makes maintenance and inspection easier.

Specifications

Model No.	Capacity cm³/rev	Rated Voltage MPa	Maximum Operating Pressure MPa{kgf/cm²}	Minimum Revolution Speed min⁻¹	Maximum Revolution Speed min⁻¹	Weight kg	
						Type A	Type B
IPH-2A(B)- 3.5-11	3.60	25 {255}	30 {306}	600	2000	4.4	2.4
5	5.24					4.5	2.5
6.5	6.55					4.6	2.6
8	8.18					4.8	2.8
IPH-3A(B)- 10-20	10.2	25 {255}	30 {306}	600	2000	10.5	4.8
13	13.3					10.7	5.0
16	15.8					11.0	5.3
IPH-4A(B)- 20-20	20.7	25 {255}	30 {306}	500	2000	15.2	9.5
25	25.7					15.7	10.0
32	32.3					16.2	10.5
IPH-5A(B)- 40-21(11)	40.8	25 {255}	30 {306}	400	2000	32.0	19.0
50	50.3					33.0	20.0
64	63.9					34.0	21.0
IPH-6A(B)- 80-21(11)	81.3	25 {255}	30 {306}	300	2000	62.0	39.0
100	101.6					64.0	41.0
125	125.9					66.0	43.0

Note) 1.Capacity: Logical discharge rate per rotation.
2.Suction Pressure: +0.02 to +0.3MPa {−0.2 to +0.3kgf/cm²}
3.Maximum working pressure shown here is the pressure limit when there are frequent pressure changes.
4.Avoid installation with the suction port towards the bottom of the pump.
5.Specify using the model number format shown below when pipe flanging is required.

●Handling

1 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 150mm²/s.

2 The operating temperature range is 5 to 65°C. When the oil temperature at startup is 5°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 5°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.

3 Suction pressure is -0.02 to +0.03MPa (-0.2 to +0.3kgf/cm²), and the suction port flow rate should be to greater than 2m/sec.

4 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft.

5 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 25μm line filter.

6 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.

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 produces as little inflow load pressure as possible to minimize effect of cavitation.

(Continued on following page)

Explanation of model No.

IPH – 4 B – 25 – LT – 20

- IPH Series IP Pump
- Size 2, 3, 4, 5, 6
- Mounting method
  A: Foot type mounting B: Flange type mounting
- Capacity (cm³/rev)
- Auxiliary symbol None: Clockwise (viewed from shaft end)
  L: Counterclockwise (viewed from shaft end)
  T: With screw in type flange kit
  E: With welded type flange kit
  Auxiliary symbol must be provided in alphabetic order.
- Design number
  11: 2A (B) , 5B, 6B
  20: 3A (B) , 4A (B)
  21: 5A, 6A

8 When using water- or glycol-based hydraulic operating fluid, refer to page N-3 for details on applicable models of hydraulic pumps.

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 0.05mm. 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.

●Inverter Drive Precautions

1 Set the revolution speed within the range of the pump specification revolution speed.

2 Changing the revolution speed may also affect the pump performance curves.Before using the inverter, check if the pressure and motor load factor are within the range of use. Failure to follow these precautions creates the risk of damage to the pump and burnout of the motor.

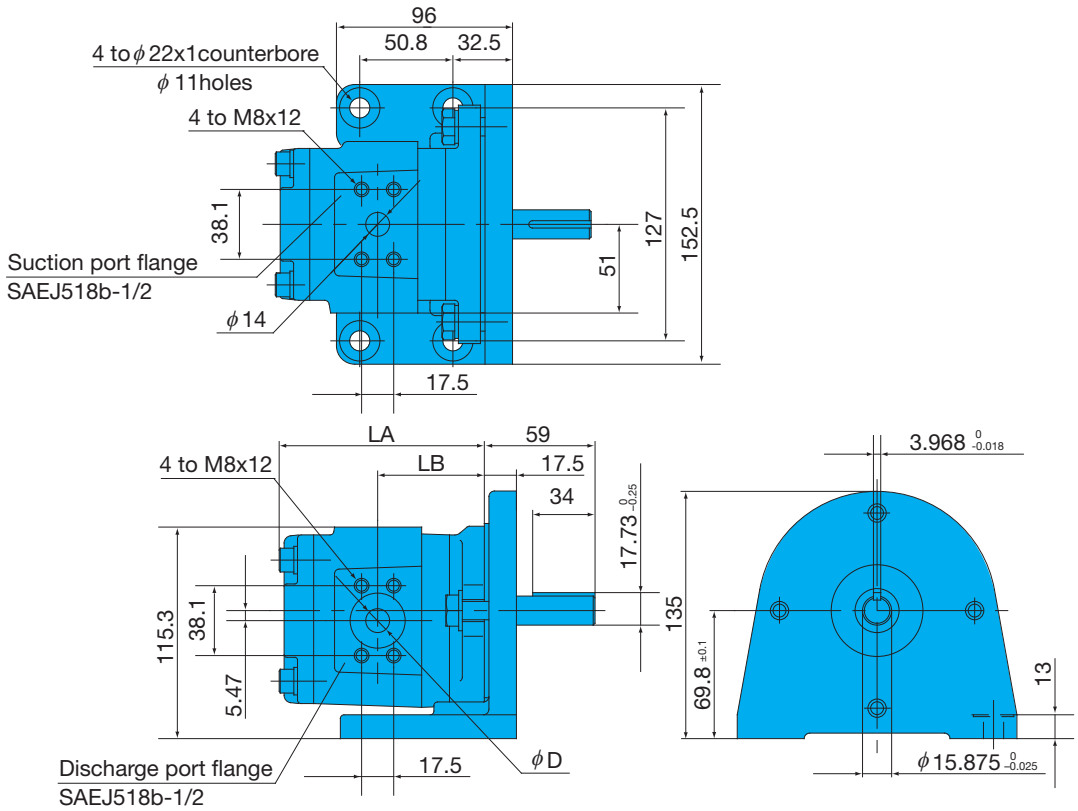
Discharge Rate and Required Input for Each Pump Speed

Speed	Pressure MPa / Model No.	Discharge Rate ℓ/min						Required Input kW					
		0.7	7	14	21	25	30	0.7	7	14	21	25	30
1000 min⁻¹	IPH-2A(B)- 3.5-11	3.60	3.49	3.39	3.28	3.23	3.15	0.09	0.62	1.12	1.63	1.93	2.30
	5	5.24	5.09	4.93	4.78	4.70	4.60	0.12	0.79	1.47	2.26	2.63	3.19
	6.5	6.55	6.37	6.19	6.03	5.93	5.82	0.16	0.97	1.82	2.79	3.25	3.95
	8	8.18	7.95	7.74	7.54	7.40	7.26	0.19	1.19	2.24	3.45	4.01	4.86
	IPH-3A(B)-10-20	10.2	9.95	9.71	9.47	9.23	9.17	0.25	1.59	2.73	4.25	5.06	6.14
	13	13.3	13.0	12.7	12.4	12.3	12.1	0.32	2.02	3.57	5.35	6.29	7.73
	16	15.8	15.4	15.1	14.8	14.6	14.3	0.37	2.37	4.23	6.35	7.47	9.19
	IPH-4A(B)-20-20	20.7	20.2	19.8	19.3	19.1	18.8	0.50	3.13	5.56	8.24	9.80	11.7
	25	25.7	25.2	24.7	24.2	23.9	23.6	0.61	3.79	6.89	10.3	12.1	14.6
	32	32.3	31.6	31.0	30.4	30.1	29.6	0.75	4.71	8.67	12.8	15.3	18.4
	IPH-5A(B)-40-21(11)	40.8	39.9	39.0	38.1	37.6	37.0	0.99	6.18	10.9	16.3	19.3	23.8
	50	50.3	49.3	48.4	47.3	46.8	46.2	1.20	7.42	13.6	20.1	23.8	28.6
	64	63.9	62.6	61.4	60.2	59.5	58.6	1.49	9.32	17.2	25.5	30.6	36.3
	IPH-6A(B)-80-21(11)	81.3	79.5	77.7	76.0	75.1	73.8	1.98	11.8	21.8	32.3	38.4	46.7
	100	101.6	99.6	97.7	95.8	94.6	93.2	2.42	14.6	27.3	40.5	48.1	57.7
	125	125.9	123.4	121.1	118.7	117.2	115.6	2.94	17.8	33.9	50.1	59.6	71.5
1200 min⁻¹	IPH-2A(B)- 3.5-11	4.32	4.20	4.08	3.97	3.91	3.83	0.11	0.66	1.23	1.83	2.15	2.61
	5	6.28	6.12	5.95	5.79	5.70	5.58	0.15	0.95	1.77	2.62	3.09	3.74
	6.5	7.86	7.67	7.48	7.29	7.18	7.05	0.19	1.16	2.19	3.24	3.81	4.63
	8	9.81	9.58	9.34	9.11	8.97	8.81	0.23	1.44	2.70	4.00	4.70	5.71
	IPH-3A(B)-10-20	12.2	11.9	11.7	11.4	11.3	11.1	0.30	1.86	3.28	4.93	5.93	7.20
	13	15.9	15.9	15.3	15.0	14.8	14.6	0.39	2.37	4.28	6.42	7.56	9.28
	16	18.9	18.5	18.2	17.8	17.6	17.4	0.45	2.77	5.09	7.63	8.98	11.1
	IPH-4A(B)-20-20	24.8	24.3	23.8	23.4	23.1	22.8	0.62	3.76	6.67	9.88	11.8	14.2
	25	30.8	30.3	29.8	29.3	29.0	28.6	0.75	4.56	8.27	12.3	14.7	17.5
	32	38.7	38.1	37.4	36.8	36.3	35.9	0.92	5.66	10.4	15.5	18.4	22.0
	IPH-5A(B)-40-21(11)	48.9	48.0	47.1	46.1	45.5	44.9	1.22	7.42	13.2	19.5	23.1	28.4
	50	60.3	59.3	58.3	57.3	56.6	56.0	1.47	8.91	16.2	24.0	28.6	34.3
	64	76.6	75.3	74.0	72.8	72.0	71.2	1.83	11.2	20.6	30.5	36.3	43.5
	IPH-6A(B)-80-21(11)	97.5	95.7	93.8	91.9	90.9	89.5	2.42	14.3	26.2	38.7	46.2	56.1
	100	121.9	119.7	117.7	115.8	114.5	113.1	2.96	17.5	32.3	48.4	57.7	69.2
	125	151.0	148.4	145.9	143.4	141.9	140.3	3.60	21.5	40.1	60.1	71.6	85.9
1500 min⁻¹	IPH-2A(B)- 3.5-11	5.40	5.25	5.10	4.97	4.89	4.79	0.14	0.96	1.68	2.46	2.89	3.46
	5	7.86	7.65	7.44	7.24	7.11	6.97	0.20	1.17	2.21	3.31	3.85	4.69
	6.5	9.82	9.59	9.35	9.12	8.97	8.82	0.25	1.49	2.73	4.09	4.76	5.78
	8	12.3	11.9	11.6	11.4	11.2	11.0	0.30	1.78	3.37	5.05	5.87	7.14
	IPH-3A(B)-10-20	15.3	14.9	14.6	14.3	14.1	13.9	0.40	2.31	4.15	6.22	7.40	8.99
	13	19.9	19.5	19.1	18.8	18.6	18.3	0.51	2.95	5.41	8.03	9.44	11.6
	16	23.7	23.2	22.7	22.3	22.1	21.8	0.59	3.46	6.42	9.53	11.2	13.8
	IPH-4A(B)-20-20	31.0	30.4	29.8	29.3	28.9	28.4	0.81	4.70	8.33	12.4	14.7	17.6
	25	38.5	37.8	37.2	36.6	36.1	35.7	0.98	5.69	10.4	15.4	18.3	21.9
	32	48.4	47.6	46.8	45.9	45.4	44.9	1.20	7.07	13.1	19.3	22.9	27.5
	IPH-5A(B)-40-21(11)	61.2	60.0	58.8	57.6	56.9	56.2	1.59	9.51	16.6	24.7	29.3	36.0
	50	75.4	74.1	72.8	71.6	70.8	70.0	1.91	11.4	20.5	30.4	36.1	43.3
	64	95.8	94.2	92.5	91.0	90.0	89.0	2.38	14.4	26.0	38.6	45.9	55.1
	IPH-6A(B)-80-21(11)	121.9	119.5	117.3	115.0	113.5	111.9	3.16	18.3	33.1	49.0	58.4	70.9
	100	152.4	149.7	147.3	144.7	143.2	141.5	3.86	22.5	41.4	61.4	73.0	87.6
	125	188.8	185.5	182.5	179.3	177.5	175.3	4.69	27.5	51.3	76.0	90.4	108.1
1800 min⁻¹	IPH-2A(B)- 3.5-11	6.48	6.33	6.16	6.01	5.92	5.82	0.17	1.16	2.02	2.95	3.46	4.15
	5	9.43	9.21	8.99	8.76	8.61	8.46	0.24	1.45	2.65	3.47	4.62	5.61
	6.5	11.7	11.5	11.2	11.0	10.9	10.7	0.30	1.78	3.27	4.92	5.71	6.93
	8	14.7	14.4	14.1	13.7	13.6	13.3	0.37	2.20	4.04	6.06	7.05	8.56
	IPH-3A(B)-10-20	18.3	18.0	17.6	17.3	17.1	16.8	0.49	2.90	5.04	7.47	8.89	10.8
	13	23.9	23.5	23.1	22.7	22.5	22.2	0.62	3.67	6.57	9.63	11.3	13.9
	16	28.4	27.9	27.5	27.0	26.7	26.4	0.72	4.30	7.80	11.4	13.5	16.5
	IPH-4A(B)-20-20	37.2	36.6	36.0	35.4	35.0	34.5	0.99	5.64	10.0	14.9	17.6	21.2
	25	46.2	45.6	44.9	44.3	43.8	43.3	1.20	6.83	12.4	18.5	21.9	26.3
	32	58.1	57.3	56.5	55.5	55.1	54.5	1.48	8.47	15.6	23.1	27.5	33.0
	IPH-5A(B)-40-21(11)	73.4	72.1	70.9	69.7	69.0	68.1	1.95	11.7	20.2	30.0	35.6	43.7
	50	90.5	89.2	87.9	86.6	85.9	85.0	2.34	14.1	24.9	36.9	43.8	52.6
	64	115.0	113.4	111.6	110.0	109.1	108.0	2.92	17.6	31.6	46.8	55.7	66.9
	IPH-6A(B)-80-21(11)	146.3	143.7	141.4	139.0	137.5	135.8	3.88	22.4	40.2	59.6	70.9	86.1
	100	182.8	180.2	177.6	174.9	173.5	171.7	4.74	27.7	50.3	74.4	88.6	106.0
	125	226.6	223.3	220.1	216.9	215.0	212.7	5.75	33.8	62.2	92.3	110.0	131.5

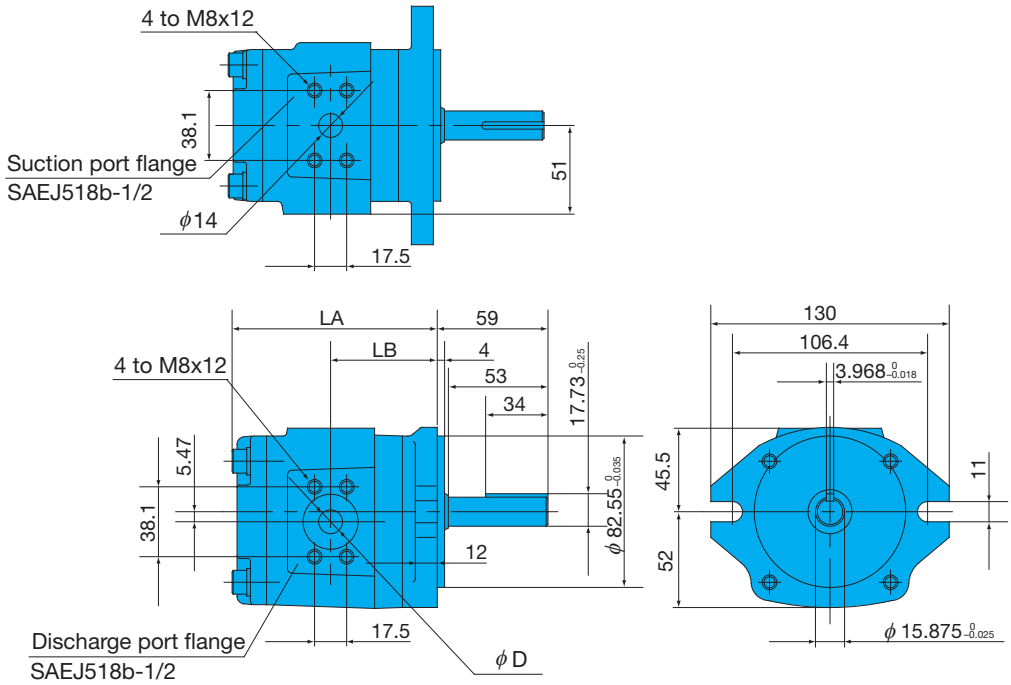
Note) Values in the table are general values at an operating fluid viscosity of 46mm²/s. Use the values when selecting the model for your needs.

Installation Dimension Drawings

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



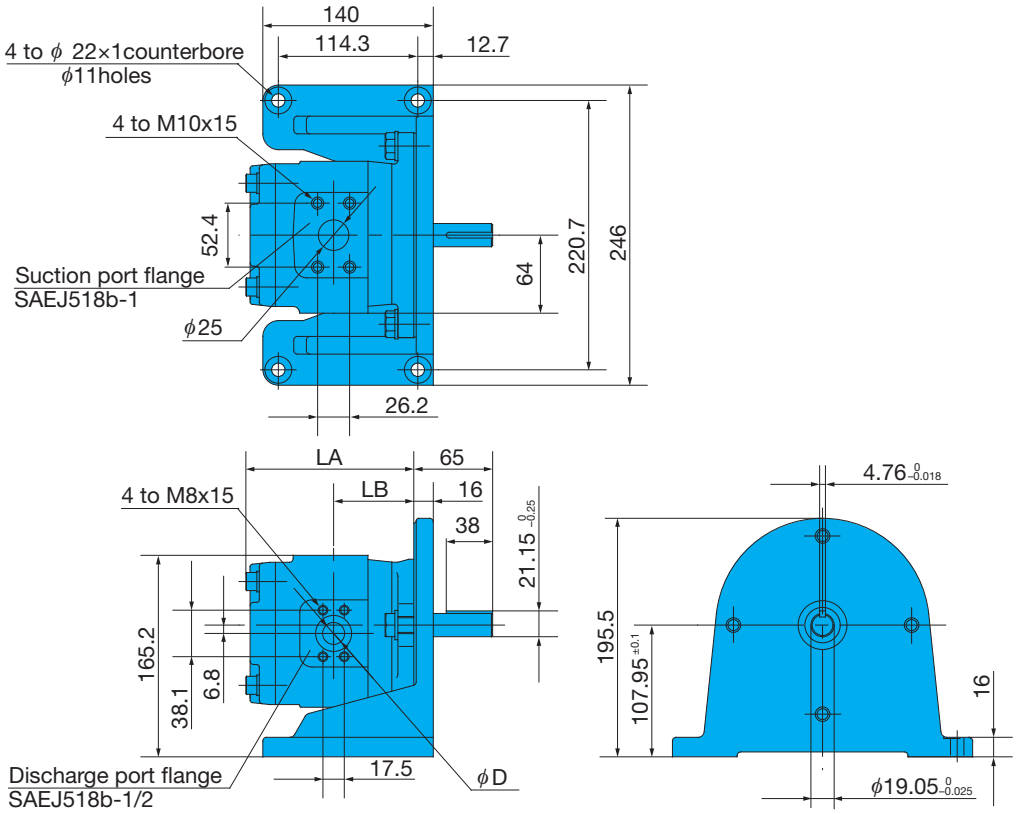
IPH-2B-*-11 (Flange Mounting, Clockwise Rotation)



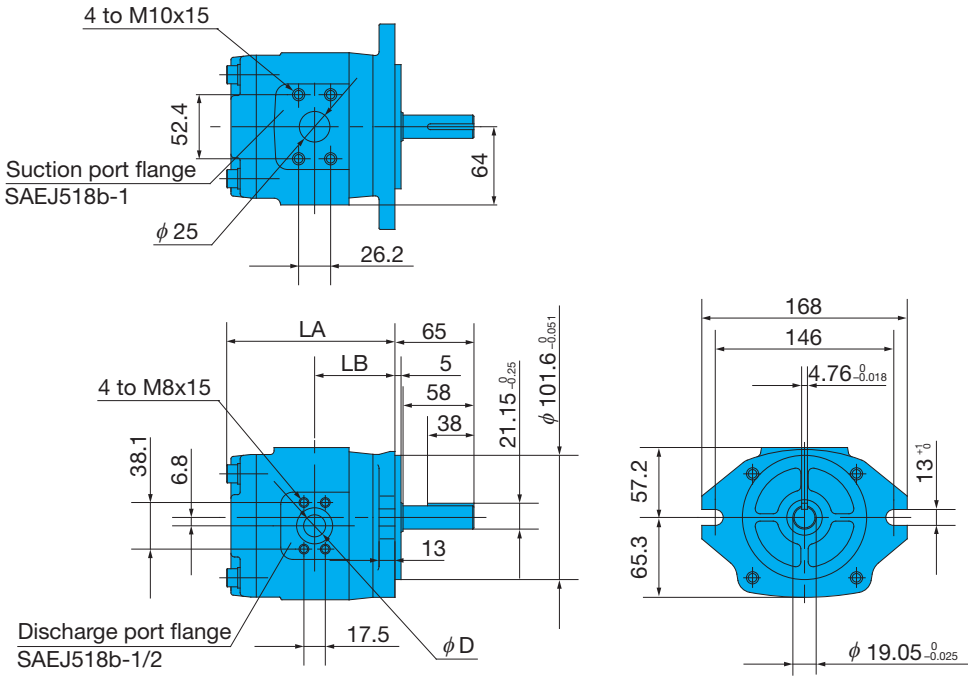
Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-2*-3.5-*-11	107	51.0	8.9
IPH-2*-5 -*-11	112	53.5	11
IPH-2*-6.5-*-11	116	55.5	12
IPH-2*-8 -*-11	121	58.0	13

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)



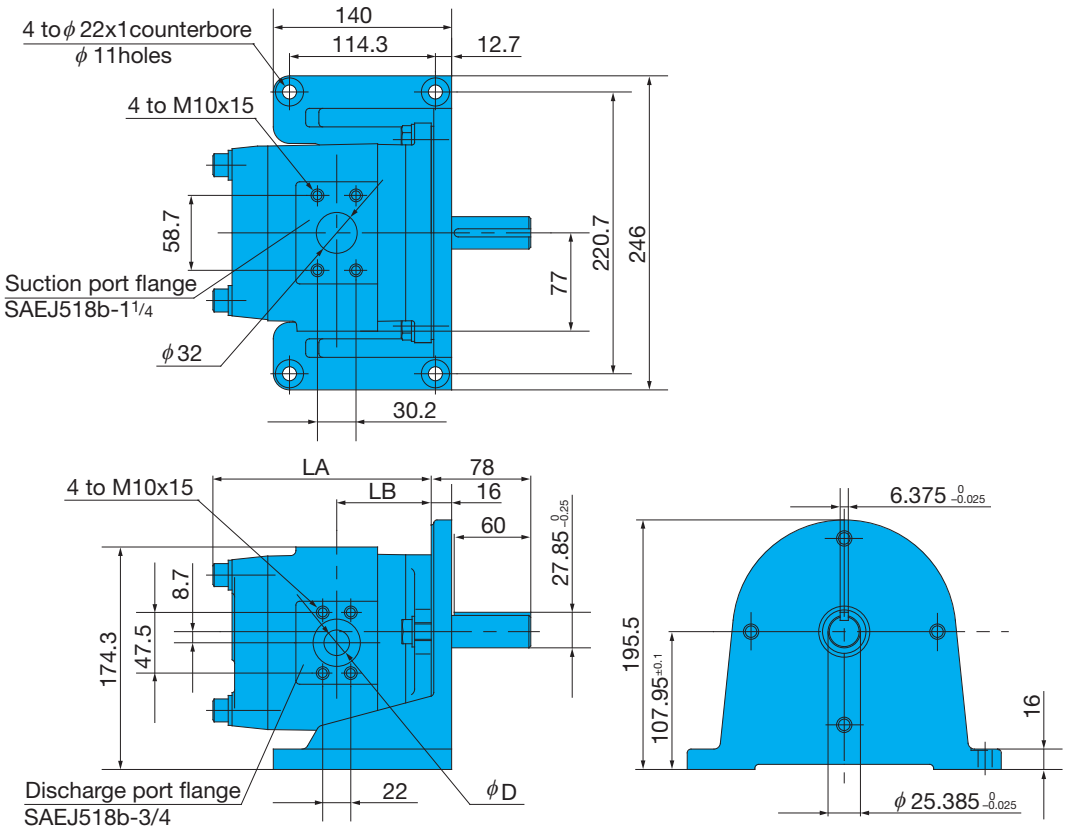
IPH-3B-*-20 (Flange Mounting, Clockwise Rotation)



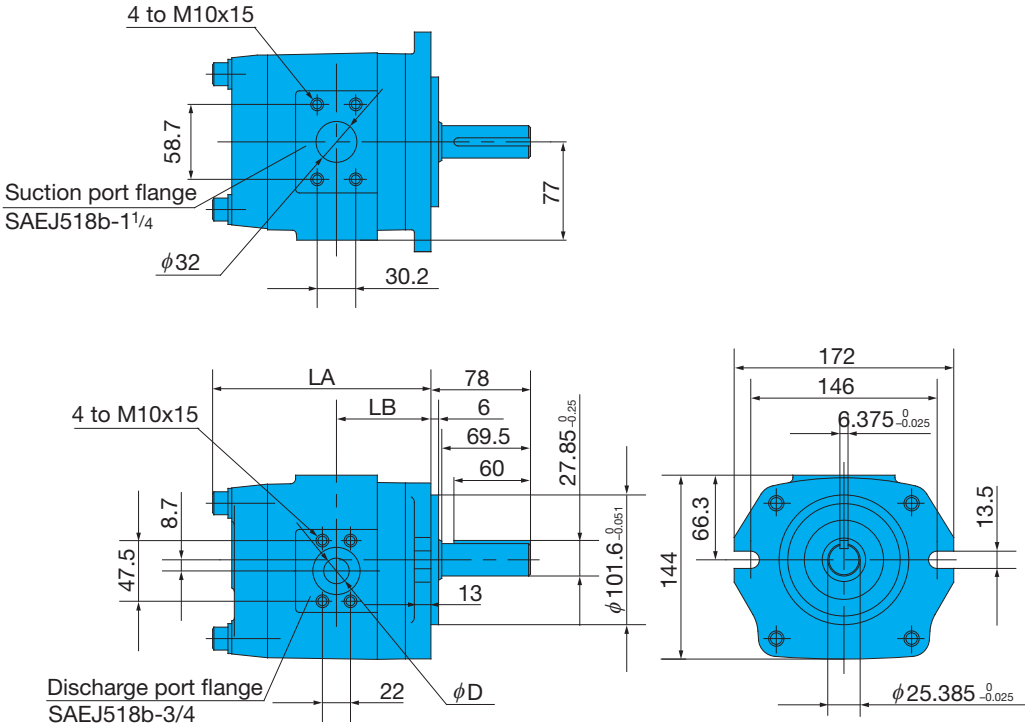
Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-3*-10-*-20	128.5	60.0	14
IPH-3*-13-*-20	134.5	63.0	17
IPH-3*-16-*-20	139.5	65.5	18

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)



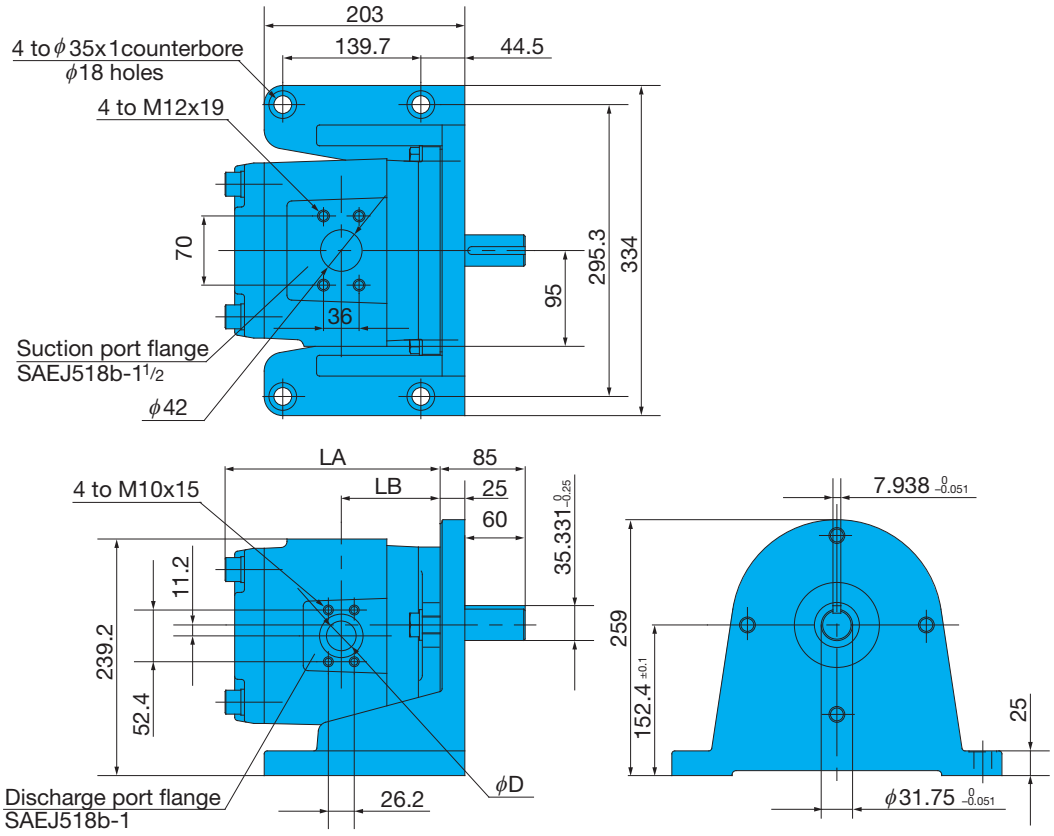
IPH-4B-*-20 (Flange Mounting, Clockwise Rotation)



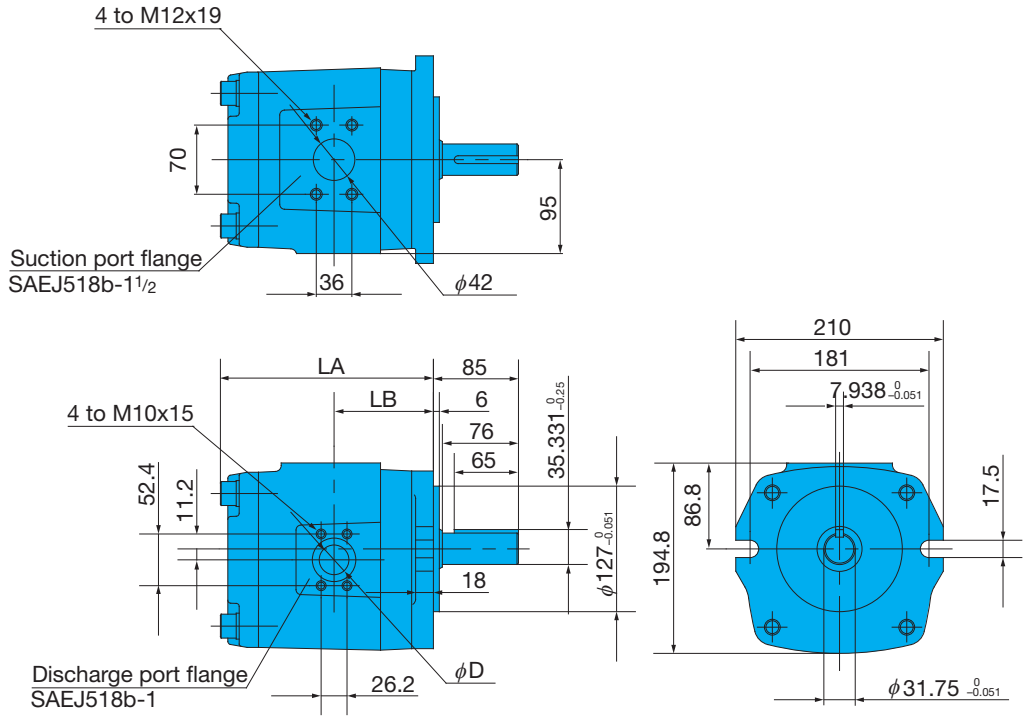
Model No.	Dimensions (mm)		
	LA	LB	φD
IPH-4*-20-*-20	164.5	71	18
IPH-4*-25-*-20	170.5	74	20
IPH-4*-32-*-20	178.5	78	24

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)



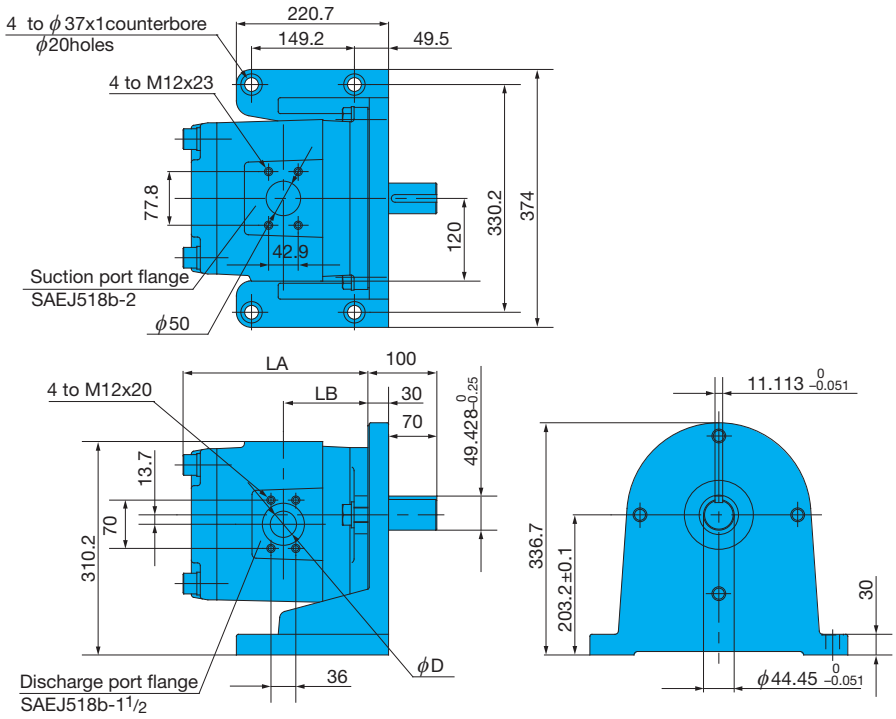
IPH-5B-*-11 (Flange Mounting, Clockwise Rotation)



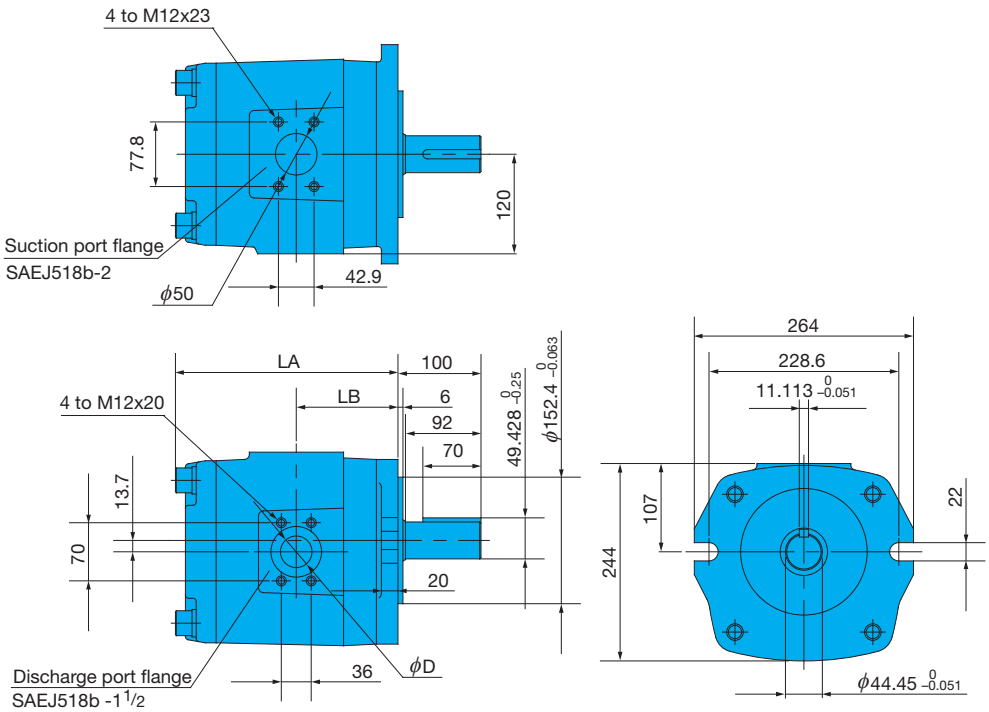
Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-5*-40-*-21(11)	201.5	91.0	24
IPH-5*-50-*-21(11)	208.5	94.5	26
IPH-5*-64-*-21(11)	218.5	99.5	28

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)

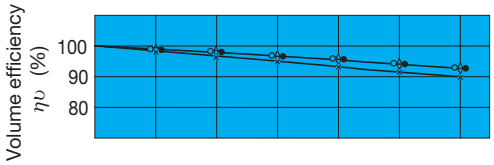


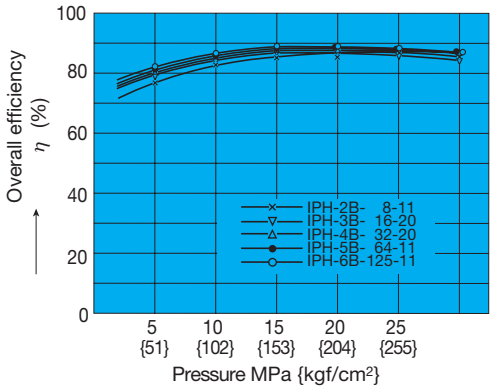
Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-6*- 80-*-21(11)	241.5	111.5	32
IPH-6*-100-*-21(11)	251.5	116.5	36
IPH-6*-125-*-21(11)	263.5	122.5	38

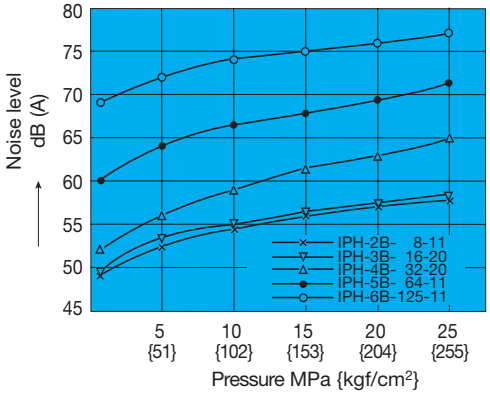
Note) IPH-6A (B)-*-L-21 (11) (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

Performance Curves

Revolution Speed 1200min^{-1}
Operating Hydraulic Fluid Viscosity 46mm^2/s
Representative Characteristics Under Above Conditions

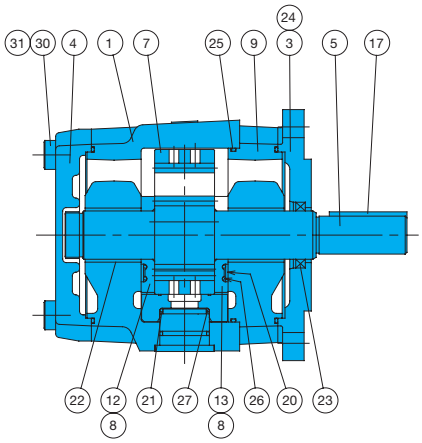


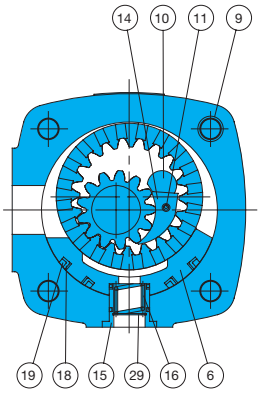




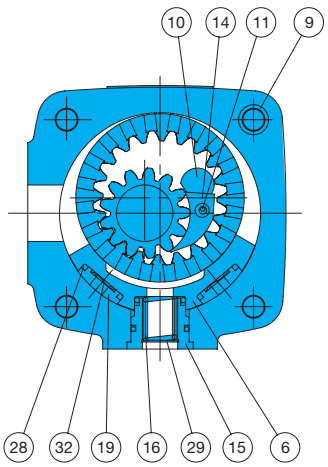
Cross-sectional Drawings

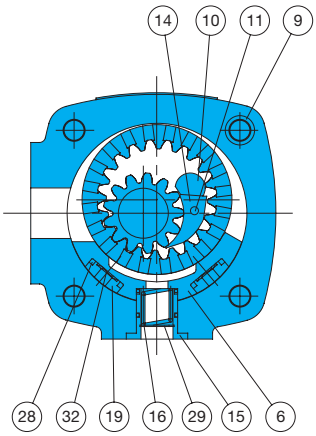
IPH-*B-*-**





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.

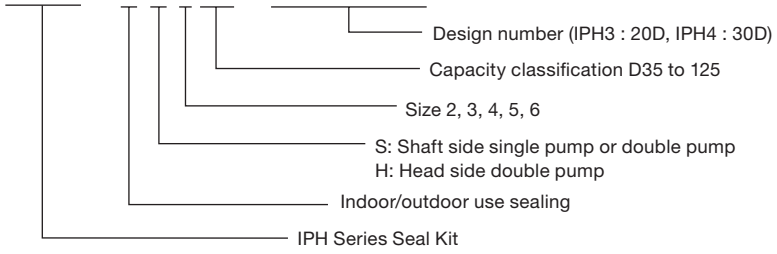




Part No.	Part Name
1	Body -1
2	Body -2
3	Mounting
4	Rear cover
5	Pinion shaft
6	Radial piston
7	Internal gear
8	Bushing
9	Knock pin
10	Stopper pin
11	Spring pin (guide pin)
12	Axial plate -1
13	Axial plate -2
14	Feeler piece
15	Spring holder
16	Spring
17	Key
18	Radial seal
19	Radial backup ring
20	Axial 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

IPH Series Seal Kit

Understanding Seal Kit Model Numbers : **IHAS – 2 S * *** – 10(20, 30)**



Seal Kit Number	Applicable Pump Model No.	Component Part Numbers							
		18	Q'ty	19	Q'ty	20	Q'ty	21	Q'ty
		Radial Seal		Radial Backup Ring		Axial Backup Ring		Backup ring	
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

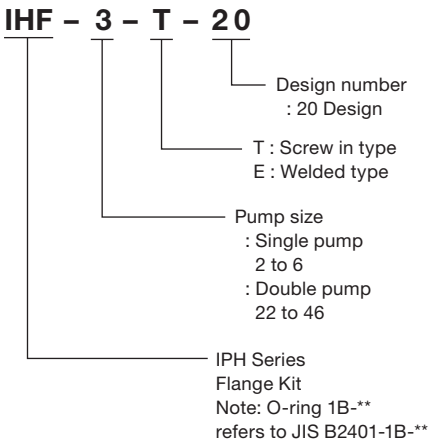
Seal Kit Number	Component Part Numbers									
	23	Q'ty	25	Q'ty	26	Q'ty	27	Q'ty	28	Q'ty
	Oil seal		O-ring		O-ring		O-ring		O-ring	
IHAS-2S2D35-10	ISD-20328	1	R68×2	3	R23×2	2	R10×2	1	R10×2	2
2S2005-10	〃	1	〃	3	〃	2	R12×2	1	R12×2	2
2S2D65-10	〃	1	〃	3	〃	2	R14×2	1	R14×2	2
2S2008-10	〃	1	〃	3	〃	2	R16×2	1	R16×2	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.



Screw in type Flange Kit model No.	Applicable Pump Model No.	IN Flange							
		Flange Part No.		Bolt		Washer		O-ring	
IHF-2-T-20	IPH-2A(B)-*-11	IH03J-100040	1	TH- 8×45	4	WS-B- 8	4	NBR-90 P22	1
IHF-3-T-20	IPH-3A(B)-*-20	IH03J-100080	1	TH-10×50	4	WS-B-10	4	NBR-90 G35	1
IHF-4-T-20	IPH-4A(B)-*-20	IH03J-100100	1	TH-10×55	4	〃	4	NBR-90 G40	1
IHF-5-T-20	IPH-5A(B)-*-21(11)	IH03J-100120	1	TH-12×55	4	WS-B-12	4	NBR-90 G50	1
IHF-6-T-20	IPH-6A(B)-*-21(11)	IH03J-100160	1	TH-12×60	4	〃	4	NBR-90 G60	1

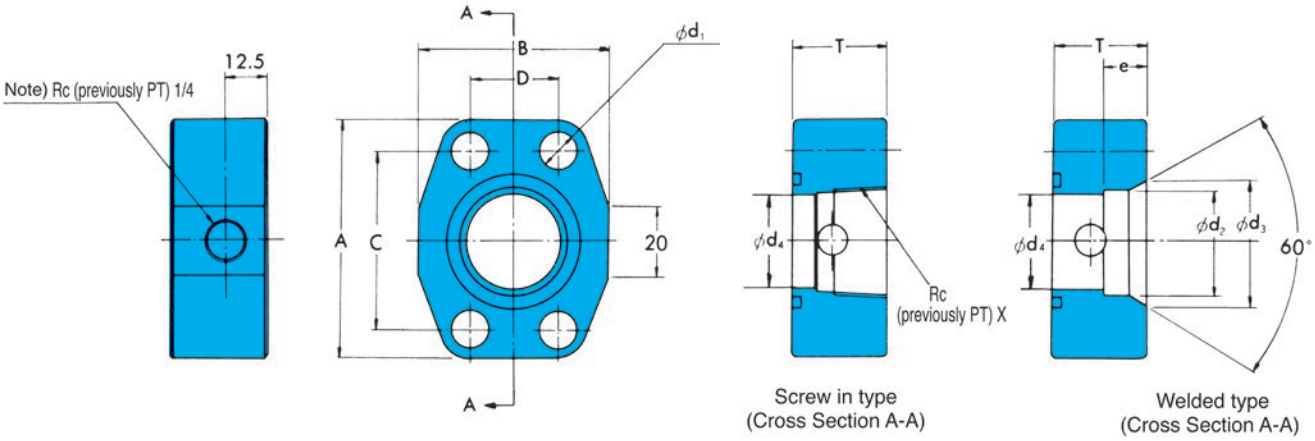
OUT Flange								Plug	
Flange Part No.		Bolt		Washer		O-ring			
IH03J-100040	1	TH- 8×45	4	WS-B- 8	4	NBR-90 P22	1	TPHA-1/4	2
IH03J-100040	1	TH- 8×45	4	〃	4	NBR-90 P22	1	〃	2
IH03J-100060	1	TH-10×50	4	WS-B-10	4	NBR-90 G30	1	〃	1
IH03J-100080	1	TH-10×50	4	〃	4	NBR-90 G35	1	〃	2
IH03J-100120	1	TH-12×60	4	WS-B-12	4	NBR-90 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 Flange Kit model No.	Applicable Pump Model 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	NBR-90 G30	1
IHF-23-T-20	23	IH03J-100080	1	〃	4	〃	4	NBR-90 G35	1
IHF-24-T-20	24	IH03J-100120	1	TH-12×55	4	WS-B-12	4	NBR-90 G50	1
IHF-25-T-20	25	IH03J-100160	1	TH-12×60	4	〃	4	NBR-90 G60	1
IHF-26-T-20	26	IH03J-100200	1	TH-12×65	4	〃	4	NBR-90 G75	1
IHF-33-T-20	IPH-33B-*-*-11	IH03J-100100	1	TH-10×55	4	WS-B-10	4	NBR-90 G40	1
IHF-34-T-20	34	IH03J-100120	1	TH-12×55	4	WS-B-12	4	NBR-90 G50	1
IHF-35-T-20	35	IH03J-100160	1	TH-12×60	4	〃	4	NBR-90 G60	1
IHF-36-T-20	36	IH03J-100200	1	TH-12×60	4	〃	4	NBR-90 G75	1
IHF-44-T-20	IPH-44B-*-*-11	IH03J-100120	1	TH-12×55	4	〃	4	NBR-90 G50	1
IHF-45-T-20	45	IH03J-100200	1	TH-12×65	4	〃	4	NBR-90 G75	1
IHF-46-T-20	46	IH03J-100240	1	TH-16×75	4	WS-B-16	4	NBR-90 G85	1

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	NBR-90 P22	1	IH03J-100040	1	TH- 8×45	4	WS-B- 8	4	NBR-90 P22	1	TPHA-1/4	3
IH03J-100040	1	〃	4	〃	4	NBR-90 P22	1	〃	1	〃	4	〃	4	〃	1	〃	3
IH03J-100060	1	TH-10×50	4	WS-B-10	4	NBR-90 G30	1	〃	1	〃	4	〃	4	〃	1	〃	3
IH03J-100080	1	〃	4	〃	4	NBR-90 G35	1	〃	1	〃	4	〃	4	〃	1	〃	2
IH03J-100120	1	TH-12×60	4	WS-B-12	4	NBR-90 G50	1	〃	1	〃	4	〃	4	〃	1	〃	2
IH03J-100040	1	TH- 8×45	4	WS-B- 8	4	NBR-90 P22	1	IH03J-100040	1	TH- 8×45	4	WS-B- 8	4	NBR-90 P22	1	〃	2
IH03J-100060	1	TH-10×50	4	WS-B-10	4	NBR-90 G30	1	〃	1	〃	4	〃	4	〃	1	〃	3
IH03J-100080	1	〃	4	〃	4	NBR-90 G35	1	〃	1	〃	4	〃	4	〃	1	〃	2
IH03J-100120	1	TH-12×60	4	WS-B-12	4	NBR-90 G50	1	〃	1	〃	4	〃	4	〃	1	〃	2
IH03J-100060	1	TH-10×50	4	WS-B-10	4	NBR-90 G30	1	IH03J-100060	1	TH-10×50	4	WS-B-10	4	NBR-90 G30	1	〃	3
IH03J-100080	1	〃	4	〃	4	NBR-90 G35	1	〃	1	〃	4	〃	4	〃	1	〃	2
IH03J-100120	1	TH-12×60	4	WS-B-12	4	NBR-90 G50	1	〃	1	〃	4	〃	4	〃	1	〃	2

Pipe Flange Installation Dimension Diagram



Screw in type

	Pipe Flange Kit Part Number	SAE Standard	Nominal Diameter X"	Dimensions (mm)							Weight kg
				A	B	C	D	T	ϕd_1	ϕd_4	
	IH03J-100040	SAE J518b ½	½	54	46	38.1	17.5	33	9	12.7	0.4
	-100060	SAE J518b ¾	¾	65	52	47.5	22.0	33	11	20	0.6
	-100080	SAE J518b 1	1	70	59	52.4	26.2	33	11	27	0.6
☆	-100100	SAE J518b 1¼	1¼	79	73	58.7	30.2	38	11	33	1.0
	-100120	SAE J518b 1½	1½	94	83	70.0	36.0	38	13	37.5	1.4
☆	-100160	SAE J518b 2	2	102	97	77.8	42.9	38	13	50	1.7
☆	-100200	SAE J518b 2½	2½	114	109	88.9	50.8	43	13	60	2.1
☆	-100240	SAE J518b 3	3	135	131	106.4	61.9	48	17.5	71	3.3

Welded Type

	Pipe Flange Kit Part Number	SAE Standard	Pipe Diameter	Dimensions (mm)										Weight kg
				A	B	C	D	T	e	ϕd_1	ϕd_2	ϕd_3	ϕd_4	
	IH03J-200040	SAE J518b ½	½	54	46	38.1	17.5	33	11	9	22.2	27	12.7	0.4
	-200060	SAE J518b ¾	¾	65	52	47.5	22.0	33	12	11	27.7	35	20	0.6
	-200080	SAE J518b 1	1	70	59	52.4	26.2	33	14	11	34.5	42	27	0.6
☆	-200100	SAE J518b 1¼	1¼	79	73	58.7	30.2	38	16	11	43.2	48	33	1.0
	-200120	SAE J518b 1½	1½	94	83	70.0	36.0	38	18	13	49.1	58	37.5	1.4
☆	-200160	SAE J518b 2	2	102	97	77.8	42.9	38	19	13	61.1	68	50	1.7
☆	-200200	SAE J518b 2½	2½	114	109	88.9	50.8	43	22	13	77.1	82	60	2.1
☆	-200240	SAE J518b 3	3	135	131	106.4	61.9	48	25	17.5	90.0	97	71	3.3

Recommended Tightening Torque for Flange Installation Bolts

For aluminum body

Mounting bolt	Tightening Torque N · m {kgf · cm}
M8	19.6 to 23.5 {200 to 240}
M10	49.0 to 58.8 {500 to 600}
M12	88.2 to 112.7 {900 to 1150}

For cast body (shared IN port)

Mounting bolt	Tightening Torque N · m {kgf · cm}
M10	50 to 65 { 510 to 662}
M12	88 to 112 { 898 to 1140}
M16	215 to 275 {2192 to 2800}

Note 1) There is no RC (previously PT) 1/4 tap for the above flange numbers (exclusively for suction port use) marked with a star (☆).
Note 2) The bolt's thread length should be more than 1.25 times the bolt's diameter and the bolt must not reach the bottom of the bolt hole.

IPH Series Foot Mounting Kit

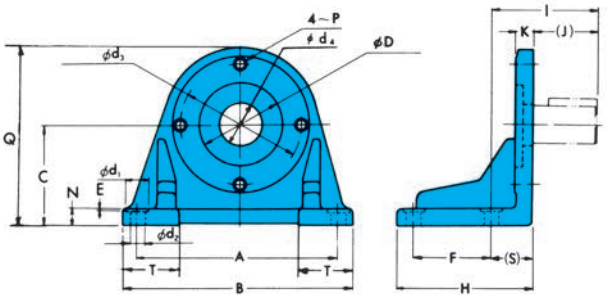
Understanding Foot Mounting Kit Numbers:
When only the mounting feet are required for a single pump or double pump, pump mounting bolts, washers and other parts are sold together as the Foot Mounting Kit.

IHM – 2 – 10

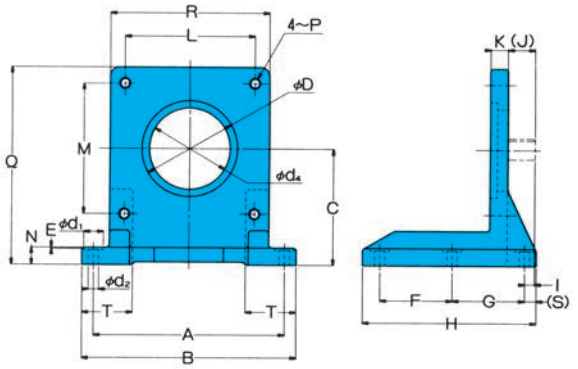
- 10 — Design number
- 2 — Pump size : Single pump 2 to 6 : Double pump 22 to 66
- IHM — IPH Series Foot Mounting Kit

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 kg
	I	(J)	K	N	P	Q	(S)	T	φD	φd1	φd2	φd3	φd4	
IHM-2-10	74	41.5	17.5	13	M10	135	32.5	36.5	82.55	22	11	106.4	50	2.0
IHM-4-10	61.7	49	16	16	M12	195.5	12.7	53	101.6	22	11	146	40	5.5
IHM-4-10	74.7	62	16	16	M12	195.5	12.7	53	101.6	22	11	146	40	5.5
IHM-22-10	73.5	41	18	18	M10	180	32.5	50	82.55	22	11	106.4	40	6.5
IHM-44-10	89.5	45	20	20	M12	232	44.5	57.5	101.6	22	14	146	40	12.0
IHM-44-10	102.5	58	20	20	M12	232	44.5	57.5	101.6	22	14	146	40	12.0
IHM-45-10	104.5	60	25	25	M16	259	44.5	61	127	35	18	181	86	13.5
IHM-46-10	119.5	70	30	30	M20	337	49.5	64	152.4	37	20	228.6	100	22.0

SAE-4BOLT-MOUNTING

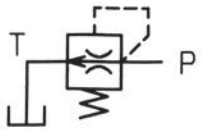
Foot Mounting Kit Model No.	Applicable Pump Model No.	Accessories				Dimensions (mm)							
	DOUBLE PUMP	Bolt	Q'ty	Washer	Q'ty	A	B	C	E	F	G	H	I
IHM-55-10	IPH-55	TH-20×50	4	WS-B-20	4	330	370	200	1	125	125	300	17
IHM-66-10	IPH56, IPH-66	TH-24×60	4	WS-B-24	4	380	430	260	1	140	140	340	17

Foot Mounting Kit Model No.	Dimensions (mm)													Weight kg
	(J)	K	L	M	N	P	Q	R	(S)	T	φD	φd1	φd2	φd4	
IHM-55-10	47	30	224.6	224.6	30	M20	340	275	20	90	165.1	34	18	140	32.0
IHM-66-10	52	40	247.5	247.5	40	M24	415	310	25	105	177.8	34	18	150	48.0

Air Bleed-off Valve

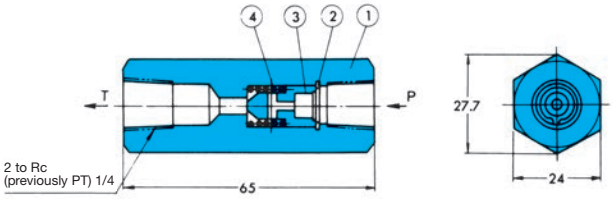
Equipping an air bleed-off valve on the pump's discharge side helps to simplify air bleeding during test operation.

JIS symbol



Specifications

① Air inside the pump and the suction pipe is exhausted rapidly when the pump is started up. When discharge pressure reaches 0.2MPa {2.0kgf/cm²} or greater after the pump intakes oil, a valve closes to prevent oil from leaking.
② Maximum operating pressure: 30MPa {306kgf/cm²}
③ Provide piping to ensure that the tank port is under the oil level surface.



Explanation of model No.

CAB – T 02 – 1 – 11

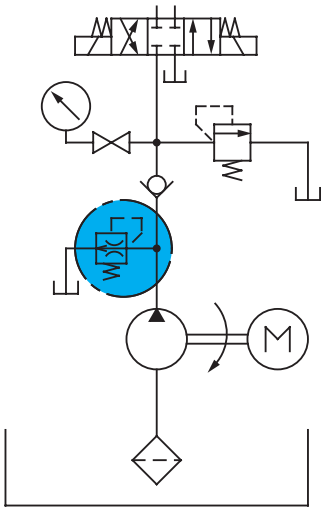
- Design number
- Close pressure
  1 : 0.24MPa {2.4kgf/cm²}
  A : 0.18MPa {1.8kgf/cm²}
- Piping (nominal diameter)
- Mounting method
  T: Screw connection type
- Air bleed-off valve

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

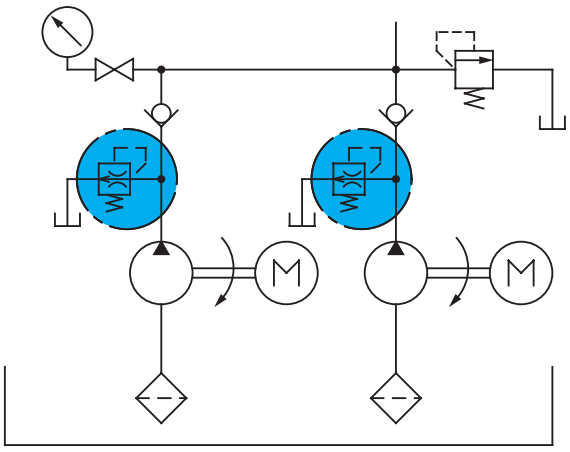
Note 1) If chattering occurs in a circuit when CAB-T02-1-11 is used, use CAB-T02-A-11 instead.
2) If chattering occurs in a circuit when CAB-T02-A-11 is used, use of a CAB air bleed-off valve is not required.

Application Examples

Example of Circuits that Require an Air Bleed-off Valve
①When using a Type 2 or Type 3 check valve (Sample Circuit A)
②When unload circuit function cannot be achieved (Sample Circuit A)
③When the discharge sides of multiple pumps run together (Sample Circuit B)



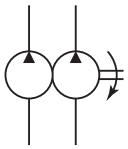
Circuit Diagram A



Circuit Diagram B

IPH Series Double IP Pump

3.6 to 125.9cm³/rev
30MPa



❖**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

①Configured with the high-pressure, low-noise IPH Series and IP pumps, these double pumps greatly expand the range of application for the IP pump.

②A wide selection of pump combinations provides options that are perfect for just about any type of application imaginable.

Specifications

Model No.	Discharge Rate (1200min⁻¹ No-load)		Revolution Speed		Operating Pressure MPa{kgf/cm²}	Required Power at 1200min⁻¹, 21MPa kW
	Vent Side ℓ/min	Shaft Side ℓ/min	Min. min⁻¹	Max. min⁻¹		
IPH-22B-*-*-(*)-11	4.3 to 9.8	4.3 to 9.8	600	2000	Rated: 21 {214} Max: 30 {306}	7.99
IPH-23B		12.2 to 18.9				11.6
IPH-24B		24.8 to 38.7				19.5
IPH-25B		48.9 to 76.6				34.5
IPH-26B		97.5 to 151.0				64.0
IPH-33B	12.2 to 18.9	12.2 to 18.9				15.3
IPH-34B		24.8 to 38.7				23.1
IPH-35B		48.9 to 76.6				38.1
IPH-36B		97.5 to 151.0				67.7
IPH-44B	24.8 to 38.7	24.8 to 38.7	500			31.0
IPH-45B		48.9 to 76.6				46.0
IPH-46B		97.5 to 151.0				75.6
IPH-55B	48.9 to 76.6	48.9 to 76.6	400			61.0
IPH-56B		97.5 to 151.0				90.6
IPH-66B	97.5 to 151.0	97.5 to 151.0	300			119.3

Note) 1. 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.
2. Suction Pressure: -0.02 to +0.03 MPa {–0.2 to +0.3 kgf/cm²}
3. 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.
4. Specify using the model number format shown below when pipe flange is required.
5. Working pressure is continuous operating pressure when the same pressure exists on the head side and shaft side.
6. Individual pump perform 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.
7. The "Required Power at 1200min⁻¹, 21MPa (kW)" 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 21MPa. Examples of 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. A capacity of 125 for all *6B Type 6 pumps is used for calculations.

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

Explanation of model No.

IPH – 4 6 B – 20 – 125 – LT – 11

- IPH Series IP Pump
- Head side pump size (2 to 6)
- Shaft side pump size (2 to 6)
- Mounting method B: Flange type mounting
- Head side pump capacity (cm³ /rev)
- Shaft side pump capacity (cm³ /rev)
- Auxiliary symbol
  - •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)
- Design number

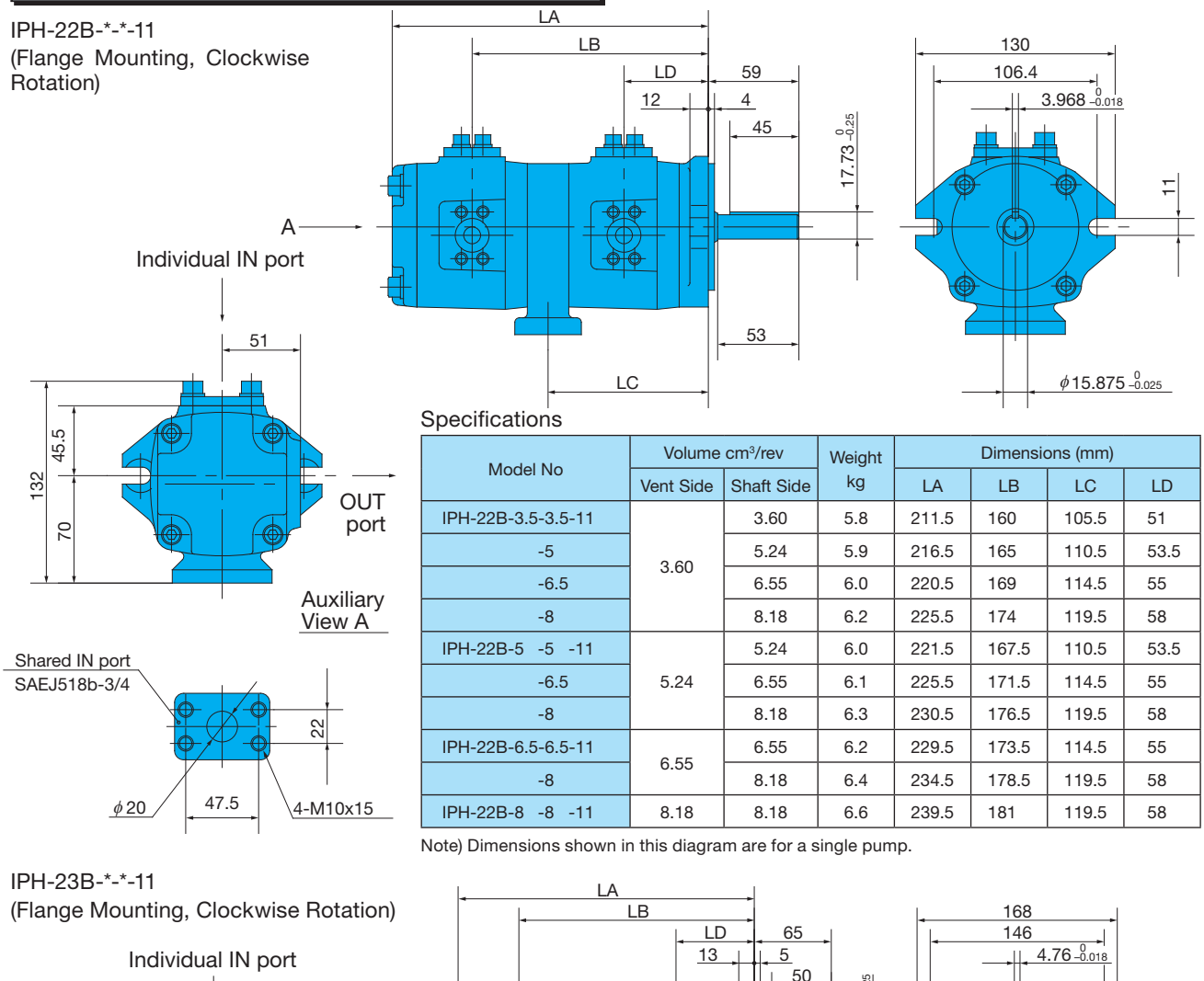
Auxiliary symbol must be provided in alphabetic order.

●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)

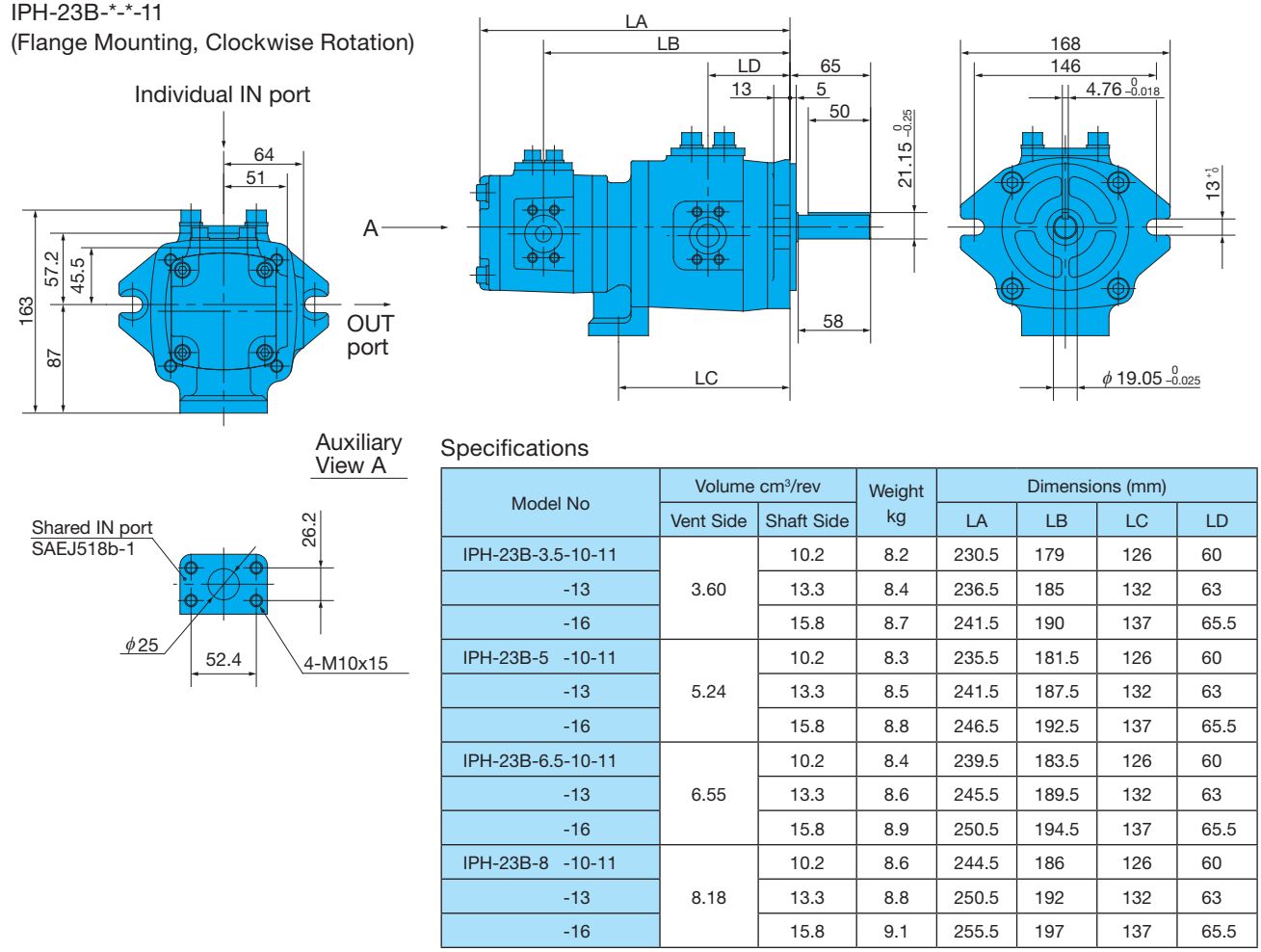


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-22B-3.5-3.5-11	3.60	3.60	5.8	211.5	160	105.5	51
-5		5.24	5.9	216.5	165	110.5	53.5
-6.5		6.55	6.0	220.5	169	114.5	55
-8		8.18	6.2	225.5	174	119.5	58
IPH-22B-5 -5 -11	5.24	5.24	6.0	221.5	167.5	110.5	53.5
-6.5		6.55	6.1	225.5	171.5	114.5	55
-8		8.18	6.3	230.5	176.5	119.5	58
IPH-22B-6.5-6.5-11	6.55	6.55	6.2	229.5	173.5	114.5	55
-8		8.18	6.4	234.5	178.5	119.5	58
IPH-22B-8 -8 -11	8.18	8.18	6.6	239.5	181	119.5	58

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

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

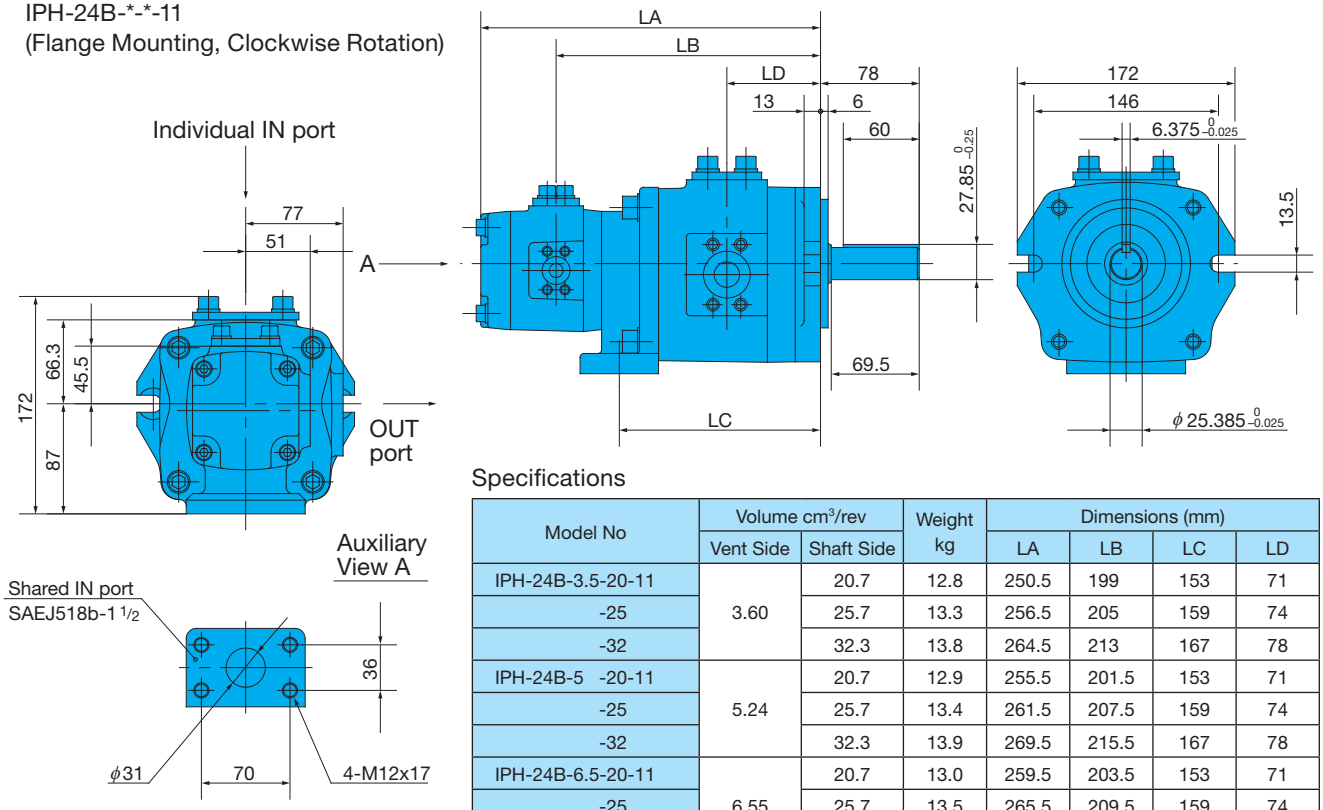


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-23B-3.5-10-11	3.60	10.2	8.2	230.5	179	126	60
-13		13.3	8.4	236.5	185	132	63
-16		15.8	8.7	241.5	190	137	65.5
IPH-23B-5 -10-11	5.24	10.2	8.3	235.5	181.5	126	60
-13		13.3	8.5	241.5	187.5	132	63
-16		15.8	8.8	246.5	192.5	137	65.5
IPH-23B-6.5-10-11	6.55	10.2	8.4	239.5	183.5	126	60
-13		13.3	8.6	245.5	189.5	132	63
-16		15.8	8.9	250.5	194.5	137	65.5
IPH-23B-8 -10-11	8.18	10.2	8.6	244.5	186	126	60
-13		13.3	8.8	250.5	192	132	63
-16		15.8	9.1	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)

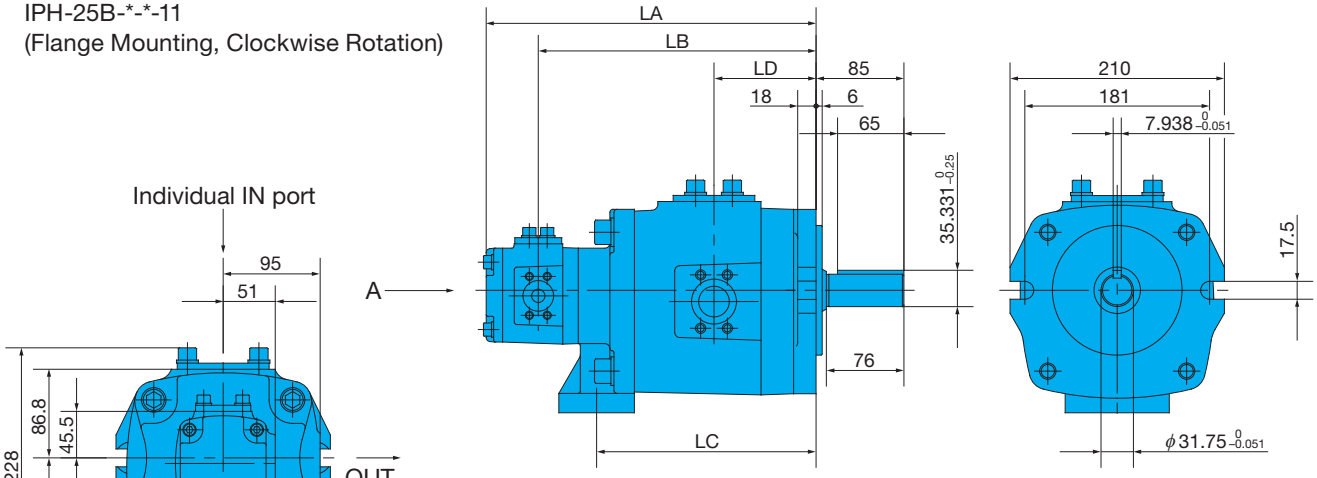


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-24B-3.5-20-11	3.60	20.7	12.8	250.5	199	153	71
-25		25.7	13.3	256.5	205	159	74
-32		32.3	13.8	264.5	213	167	78
IPH-24B-5 -20-11	5.24	20.7	12.9	255.5	201.5	153	71
-25		25.7	13.4	261.5	207.5	159	74
-32		32.3	13.9	269.5	215.5	167	78
IPH-24B-6.5-20-11	6.55	20.7	13.0	259.5	203.5	153	71
-25		25.7	13.5	265.5	209.5	159	74
-32		32.3	14.0	273.5	217.5	167	78
IPH-24B-8 -20-11	8.18	20.7	13.2	264.5	206	153	71
-25		25.7	13.7	270.5	212	159	74
-32		32.3	14.2	278.5	220	167	78

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

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

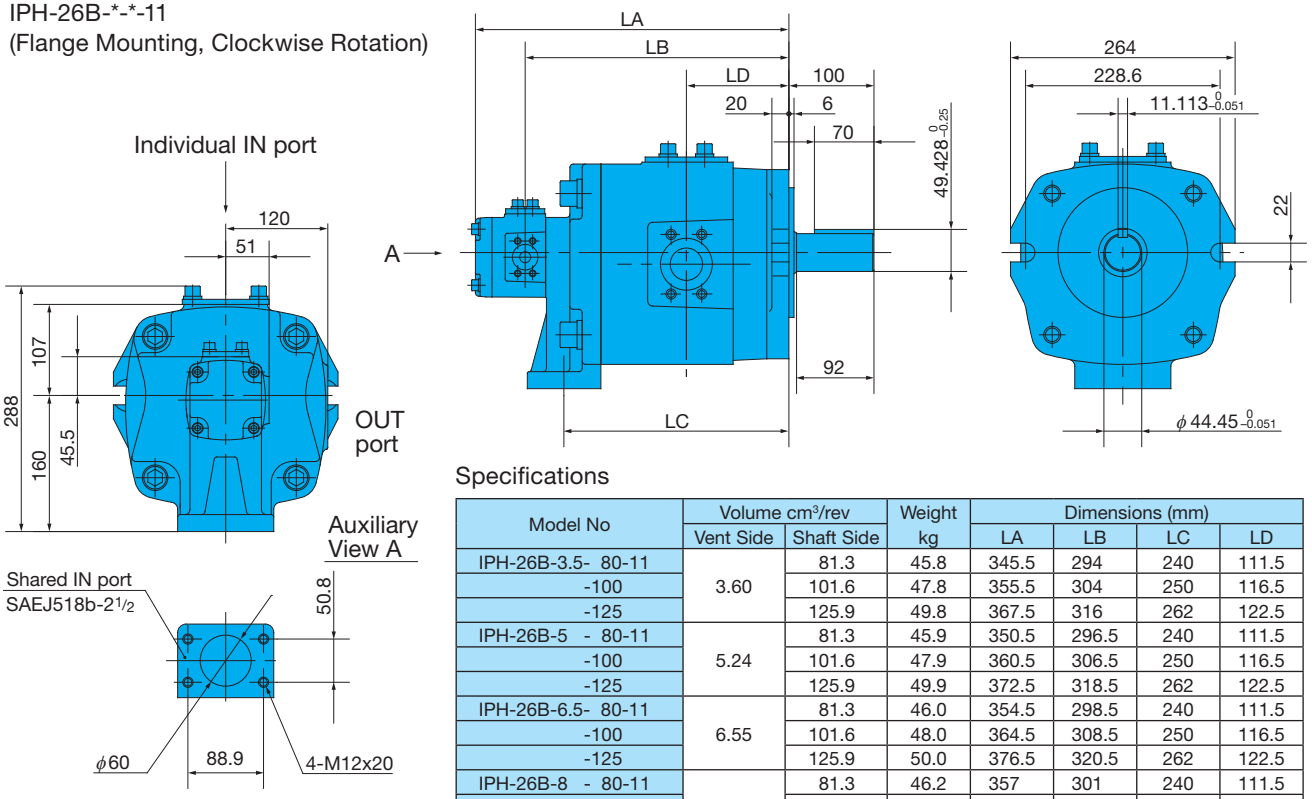


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-25B-3.5-40-11	3.60	40.8	24.1	298.5	247	197	91
-50		50.3	25.1	305.5	254	204	94.5
-64		63.9	26.1	315.5	264	214	99.5
IPH-25B-5 -40-11	5.24	40.8	24.2	303.5	249.5	197	91
-50		50.3	25.2	310.5	256.5	204	94.5
-64		63.9	26.2	320.5	266.5	214	99.5
IPH-25B-6.5-40-11	6.55	40.8	24.3	307.5	251.5	197	91
-50		50.3	25.3	314.5	258.5	204	94.5
-64		63.9	26.3	324.5	268.5	214	99.5
IPH-25B-8 -40-11	8.18	40.8	24.5	312.5	254	197	91
-50		50.3	25.5	319.5	261	204	94.5
-64		63.9	26.5	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)

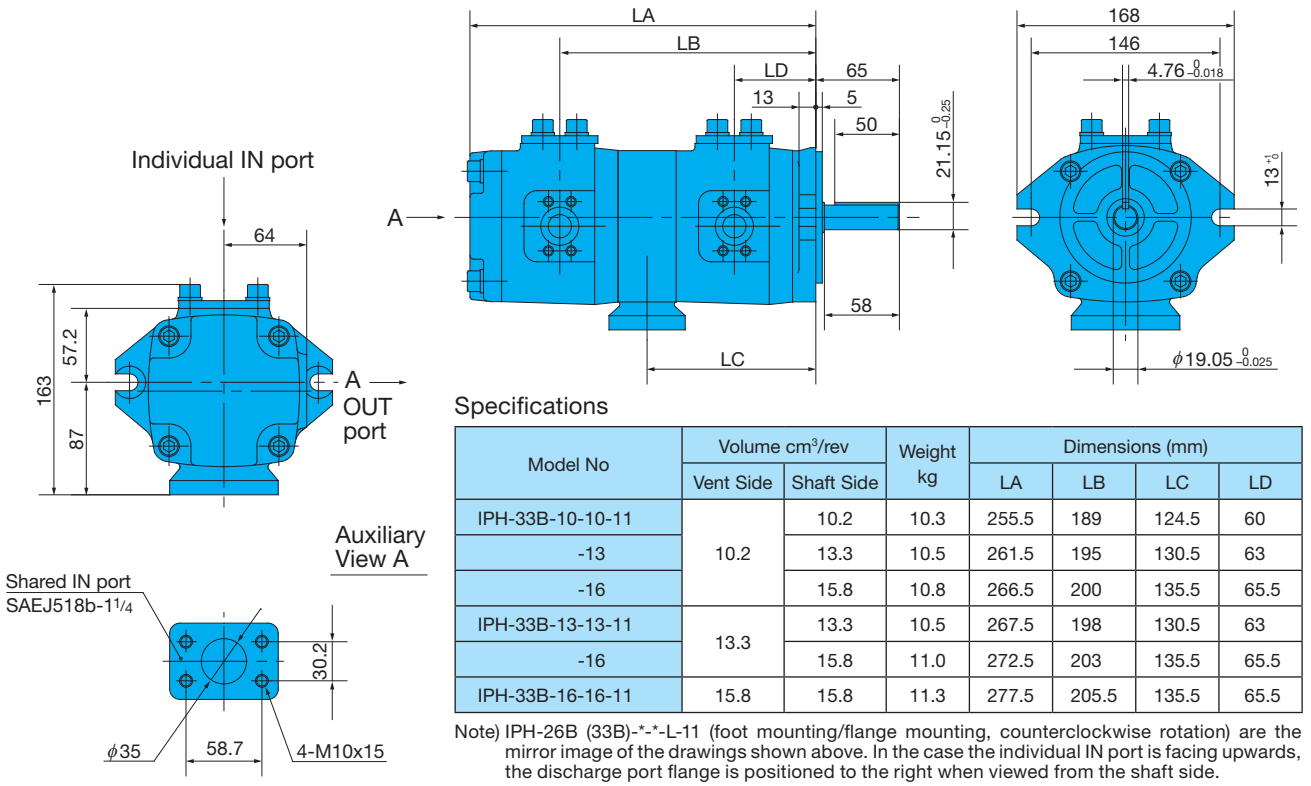


Specifications

Model No	Volume cm³/rev		Weight	Dimensions (mm)			
	Vent Side	Shaft Side	kg	LA	LB	LC	LD
IPH-26B-3.5- 80-11	3.60	81.3	45.8	345.5	294	240	111.5
-100		101.6	47.8	355.5	304	250	116.5
-125		125.9	49.8	367.5	316	262	122.5
IPH-26B-5 - 80-11	5.24	81.3	45.9	350.5	296.5	240	111.5
-100		101.6	47.9	360.5	306.5	250	116.5
-125		125.9	49.9	372.5	318.5	262	122.5
IPH-26B-6.5- 80-11	6.55	81.3	46.0	354.5	298.5	240	111.5
-100		101.6	48.0	364.5	308.5	250	116.5
-125		125.9	50.0	376.5	320.5	262	122.5
IPH-26B-8 - 80-11	8.18	81.3	46.2	357	301	240	111.5
-100		101.6	48.2	367	311	250	116.5
-125		125.9	50.2	379	323	262	122.5

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

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

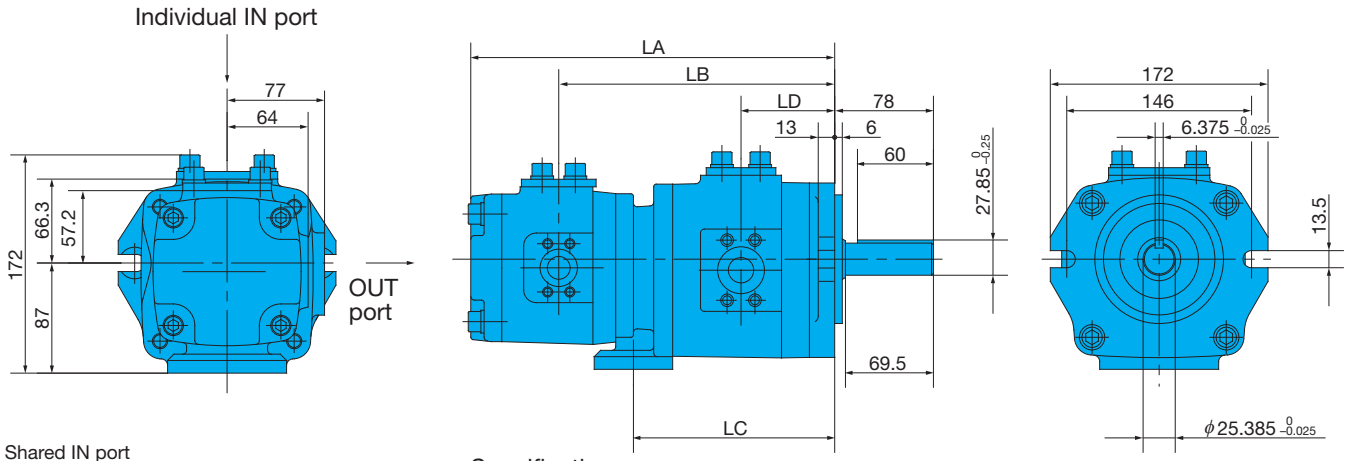


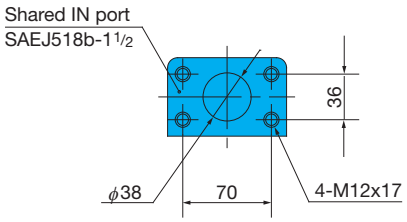
Specifications

Model No	Volume cm³/rev		Weight	Dimensions (mm)			
	Vent Side	Shaft Side	kg	LA	LB	LC	LD
IPH-33B-10-10-11	10.2	10.2	10.3	255.5	189	124.5	60
-13		13.3	10.5	261.5	195	130.5	63
-16		15.8	10.8	266.5	200	135.5	65.5
IPH-33B-13-13-11	13.3	13.3	10.5	267.5	198	130.5	63
-16		15.8	11.0	272.5	203	135.5	65.5
IPH-33B-16-16-11	15.8	15.8	11.3	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)



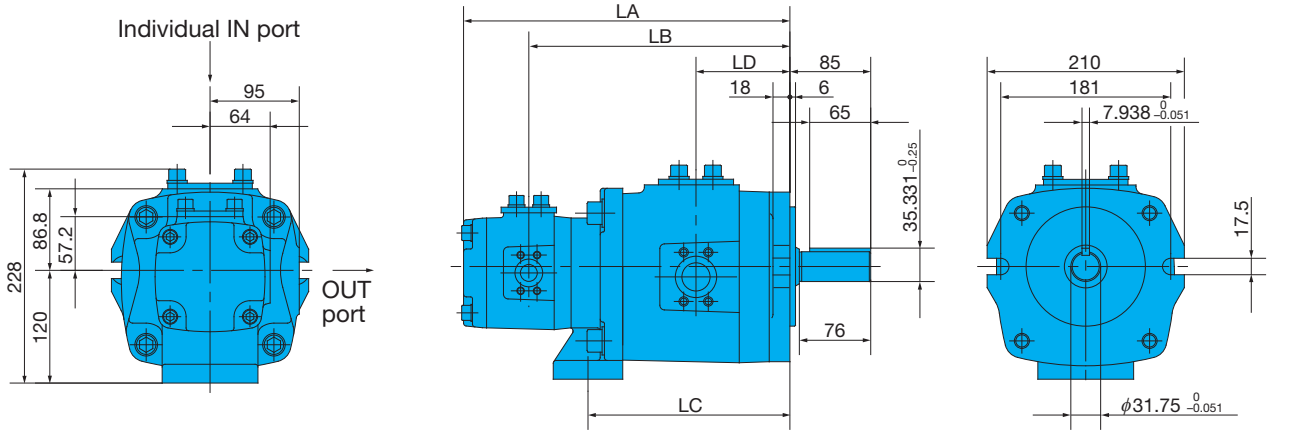


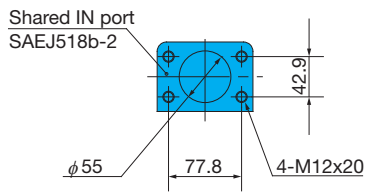
Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-34B-10-20-11	10.2	20.7	14.9	272	209	153	71
-25		25.7	15.4	278	215	159	74
-32		32.3	15.9	286	223	167	78
IPH-34B-13-20-11	13.3	20.7	15.1	278	212	153	71
-25		25.7	15.6	284	218	159	74
-32		32.3	16.1	292	226	167	78
IPH-34B-16-20-11	15.8	20.7	15.4	283	214.5	153	71
-25		25.7	15.9	289	220.5	159	74
-32		32.3	16.4	297	228.5	167	78

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

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



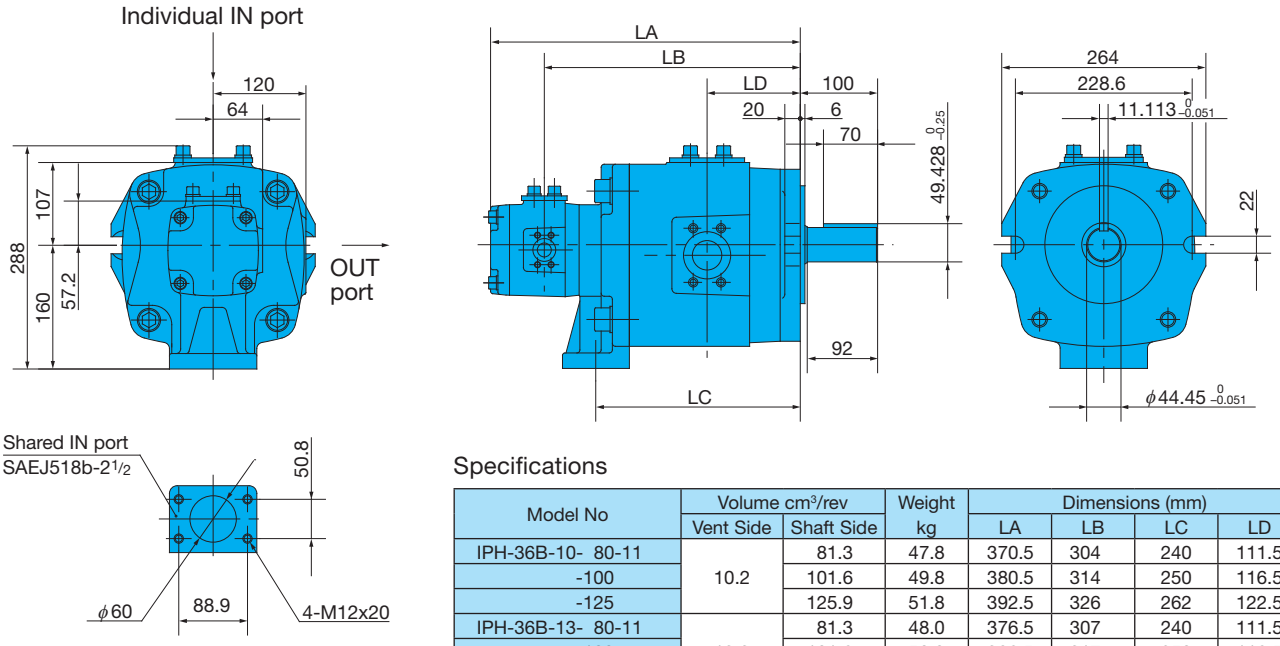


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-35B-10-40-11	10.2	40.8	26.4	323.5	257	197	91
-50		50.3	27.4	330.5	264	204	94.5
-64		63.9	28.4	340.5	274	214	99.5
IPH-35B-13-40-11	13.3	40.8	26.6	329.5	260	197	91
-50		50.3	27.6	336.5	267	204	94.5
-64		63.9	28.6	346.5	277	214	99.5
IPH-35B-16-40-11	15.8	40.8	26.9	334.5	262.5	197	91
-50		50.3	27.9	341.5	269.5	204	94.5
-64		63.9	28.9	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)

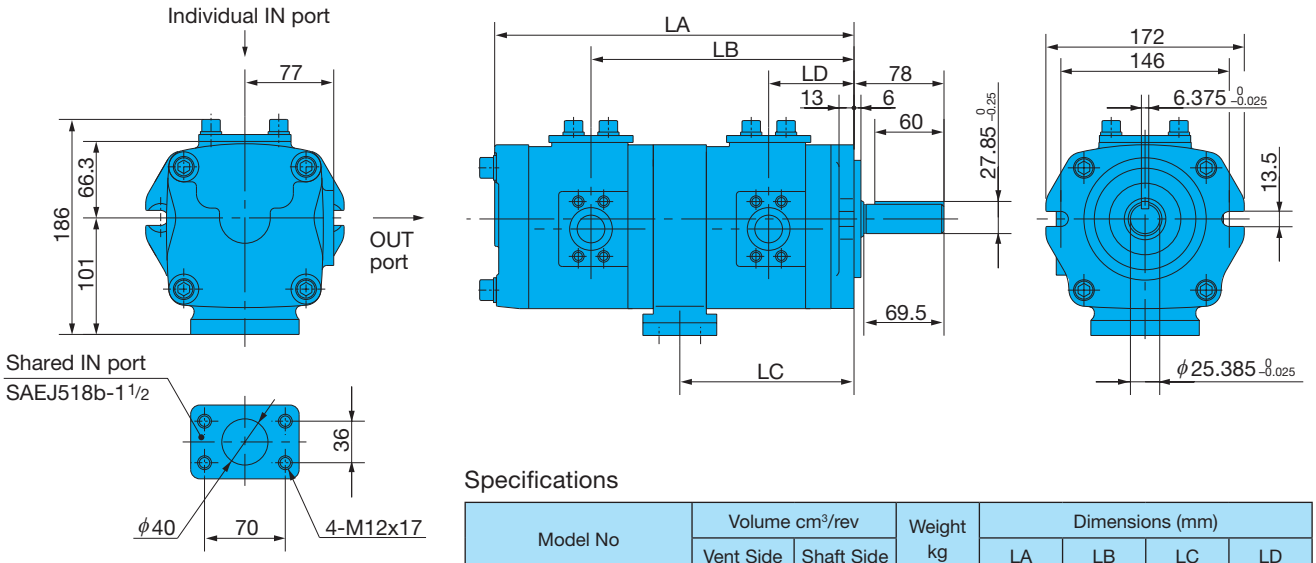


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-36B-10- 80-11	10.2	81.3	47.8	370.5	304	240	111.5
-100		101.6	49.8	380.5	314	250	116.5
-125		125.9	51.8	392.5	326	262	122.5
IPH-36B-13- 80-11	13.3	81.3	48.0	376.5	307	240	111.5
-100		101.6	50.0	386.5	317	250	116.5
-125		125.9	52.0	398.5	329	262	122.5
IPH-36B-16- 80-11	15.8	81.3	48.3	381.5	309.5	240	111.5
-100		101.6	50.3	391.5	319.5	250	116.5
-125		125.9	52.3	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)

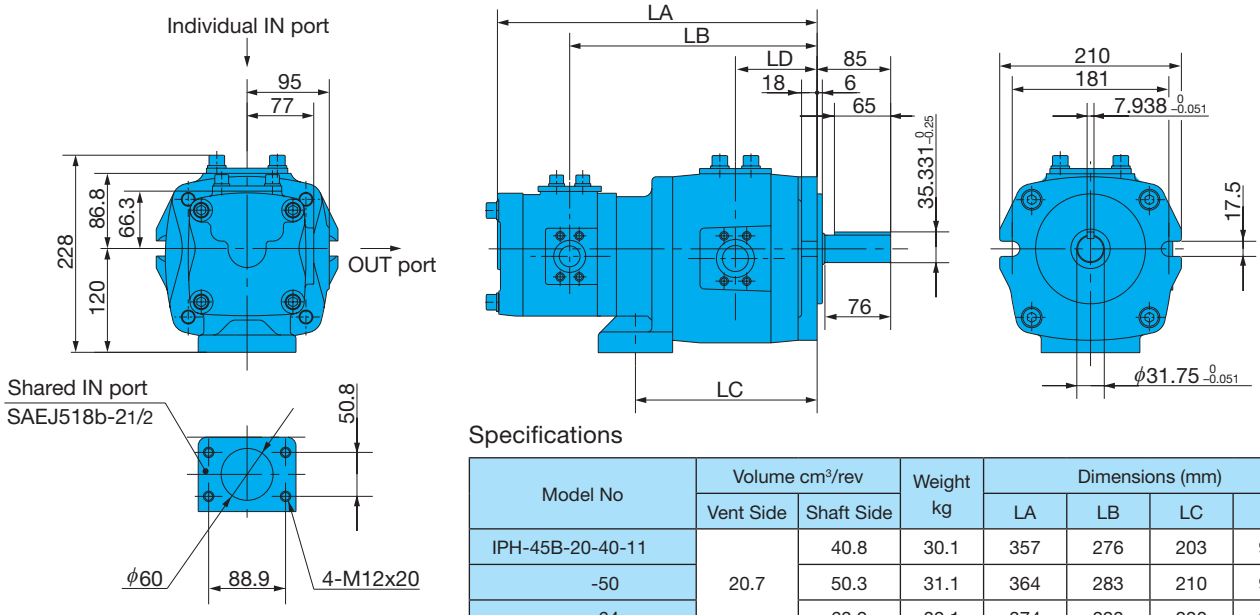


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-44B-20-20-11	20.7	20.7	19.5	307	219	145	71
-25		25.7	20.0	313	225	151	74
-32		32.3	20.5	321	233	159	78
IPH-44B-25-25-11	25.7	25.7	20.5	319	228	151	74
-32		32.3	21.0	327	236	159	78
IPH-44B-32-32-11	32.3	32.3	21.5	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)

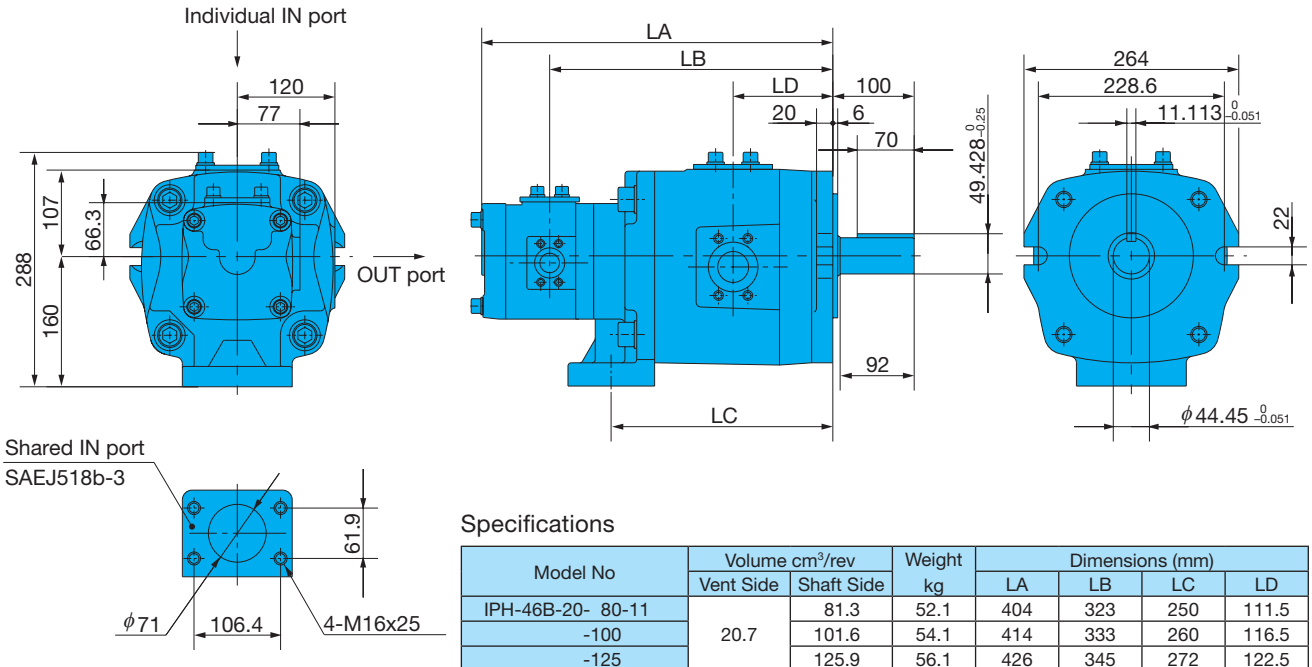


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-45B-20-40-11	20.7	40.8	30.1	357	276	203	91
-50		50.3	31.1	364	283	210	94.5
-64		63.9	32.1	374	293	220	99.5
IPH-45B-25-40-11	25.7	40.8	30.6	363	279	203	91
-50		50.3	31.6	370	286	210	94.5
-64		63.9	32.6	380	296	220	99.5
IPH-45B-32-40-11	32.3	40.8	31.1	371	283	203	91
-50		50.3	32.1	378	290	210	94.5
-64		63.9	33.1	388	300	220	99.5

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

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



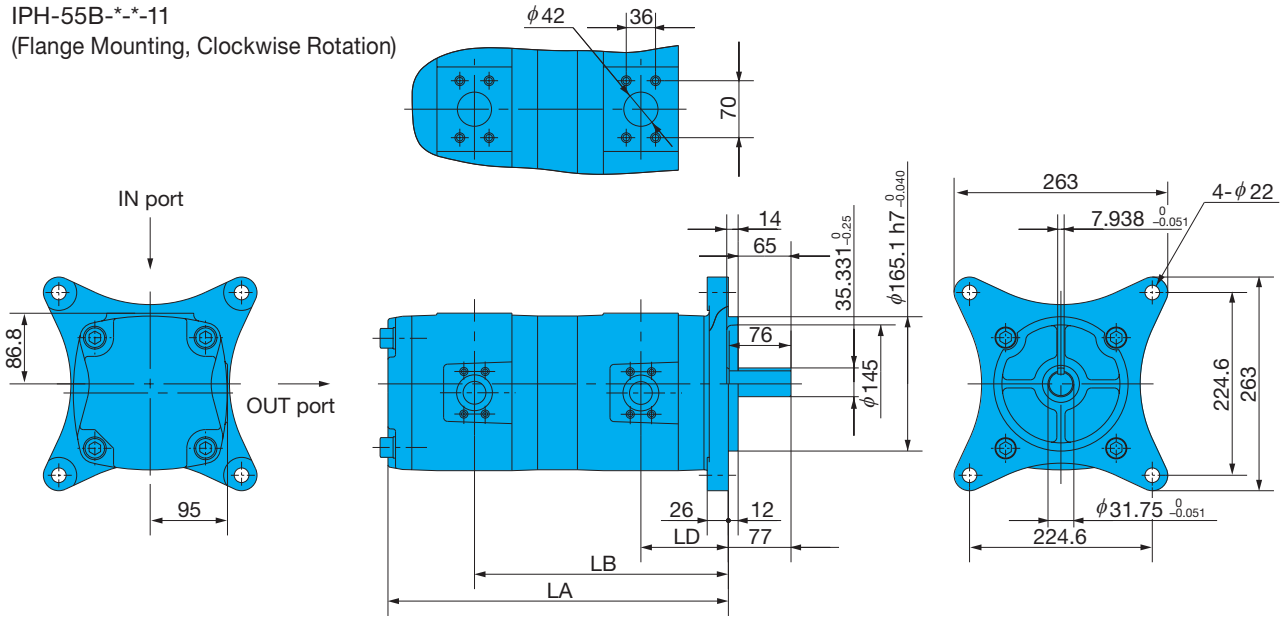
Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-46B-20- 80-11	20.7	81.3	52.1	404	323	250	111.5
-100		101.6	54.1	414	333	260	116.5
-125		125.9	56.1	426	345	272	122.5
IPH-46B-25- 80-11	25.7	81.3	52.6	410	326	250	111.5
-100		101.6	54.6	420	336	260	116.5
-125		125.9	56.6	432	348	272	122.5
IPH-46B-32- 80-11	32.3	81.3	53.1	418	330	250	111.5
-100		101.6	55.1	428	340	260	116.5
-125		125.9	57.1	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)

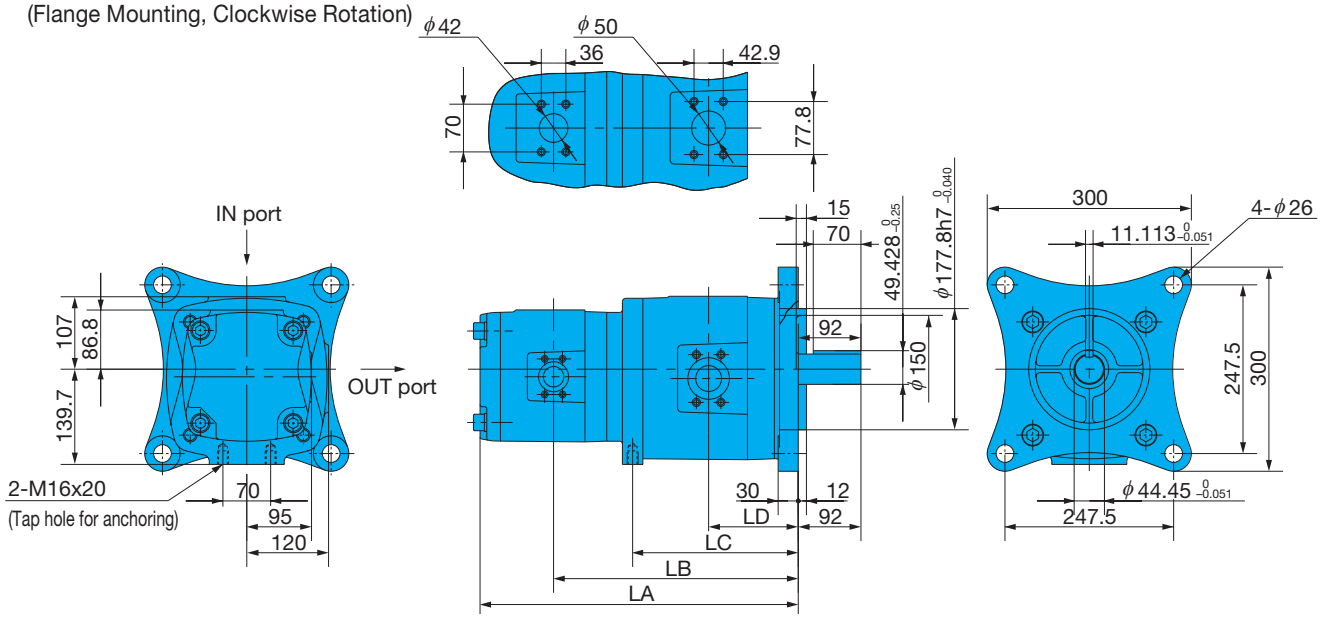


Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)		
	Vent Side	Shaft Side		LA	LB	LD
IPH-55B-40-40-11	40.8	40.8	45.5	385	286	99
-50		50.3	46.5	392	293	102.5
-64		63.9	47.5	402	303	107.5
IPH-55B-50-50-11	50.3	50.3	47.5	399	296.5	102.5
-64		63.9	48.5	409	306.5	107.5
IPH-55B-64-64-11	63.9	63.9	49.5	419	311.5	107.5

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

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



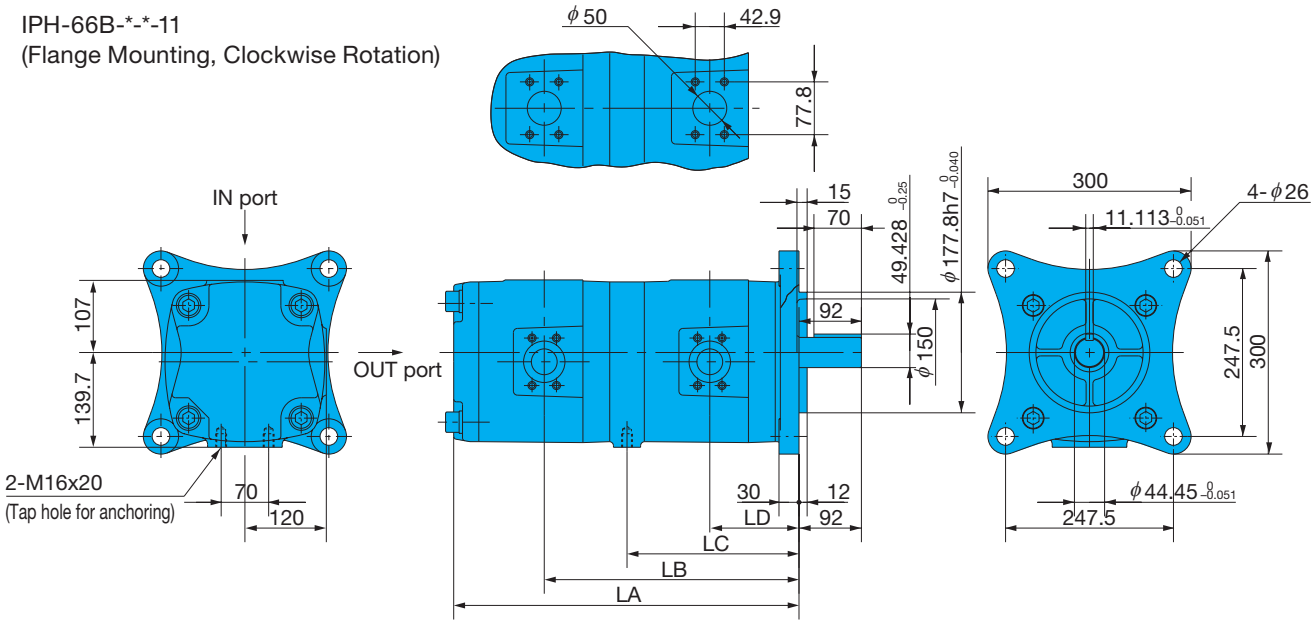
Specifications

Model No	Volume cm³/rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-56B-40- 80-11	40.8	81.3	70.6	427	328	221	120.5
-100		101.6	72.6	437	338	231	125.5
-125		125.9	74.6	449	350	243	131.5
IPH-56B-50- 80-11	50.3	81.3	71.6	434	331.5	221	120.5
-100		101.6	73.6	444	341.5	231	125.5
-125		125.9	75.6	456	353.5	243	131.5
IPH-56B-64- 80-11	63.9	81.3	72.6	444	336.5	221	120.5
-100		101.6	74.6	454	346.5	231	125.5
-125		125.9	76.6	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

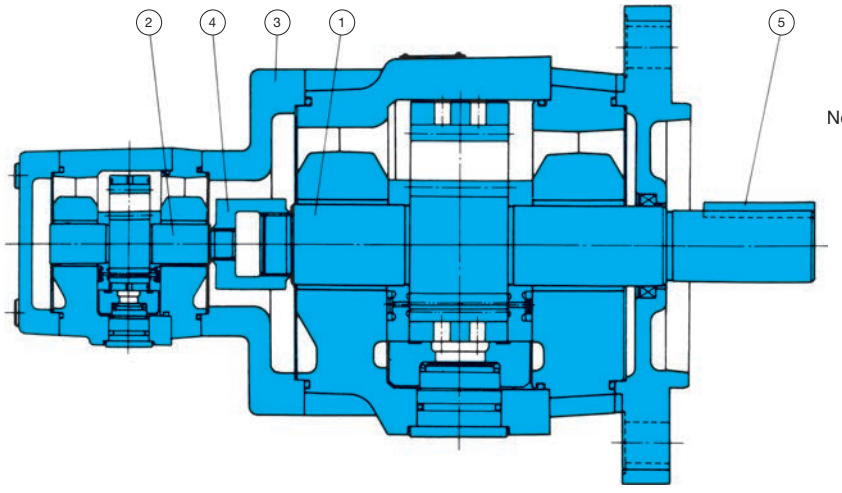
Model No	Volume cm³/rev		Weight	Dimensions (mm)			
	Vent Side	Shaft Side	kg	LA	LB	LC	LD
IPH-66B- 80- 80-11	81.3	81.3	89.1	470	347.5	234	120.5
-100		101.6	91.1	480	357.5	244	125.5
-125		125.9	93.1	492	369.5	256	131.5
IPH-66B-100-100-11	101.6	101.6	93.1	490	362.5	244	125.5
-125		125.9	95.1	502	374.5	256	131.5
IPH-66B-125-125-11	125.9	125.9	97.1	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 side 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

①Maximum operating pressure of 21 to 35MPa {214 to 357kgf/cm²} provides smooth operation at high pressures. Low leakage for high efficiency.
②Extremely stable performance across all pressure ranges.
③Conformance with ISO recommended dimensions for most gasket installations enables a high degree of international compatibility.
④A highly reliable and quiet wet type solenoid valve series is available when the noise and reliability issues of solenoid valves are a problem.
⑤A comprehensive pipe-less series provides the ultimate in compact design and reliability.

Installation and Maintenance

①Installation 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.
②Precision finish the mounting surface to a surface roughness of 1.6a and degree of flatness of 0.01mm.
③Make sure that the return piping from the hydraulic valve to the tank is below the fluid level surface.
④Be sure to use only specified bolts on hydraulic valves.
Use bolts of 12.9 strength classification or equivalent.
⑤Installation bolts are not included with any modular valves, the SS, SA, SF, SNH, SL, SE, SED, and SAW 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.
⑥Use O-rings with a hardness of Hs-90 for valve gasket O-rings.

Management of Hydraulic Operating Fluid

①Use mineral oil-based hydraulic operating fluid.
②See pages N-1 and N-2 for information about the viscosity of the operating fluid you need to use.
③When using phosphate ester base operating fluid, include "P-" at the beginning of the model number.
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.
④Foreign matter in the hydraulic operating fluid can lead to frequent valve operation problems. Use a 25μm 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 JIS B2351 O-ring seal systems.

Calculation of Hydraulic Valve Pressure Loss

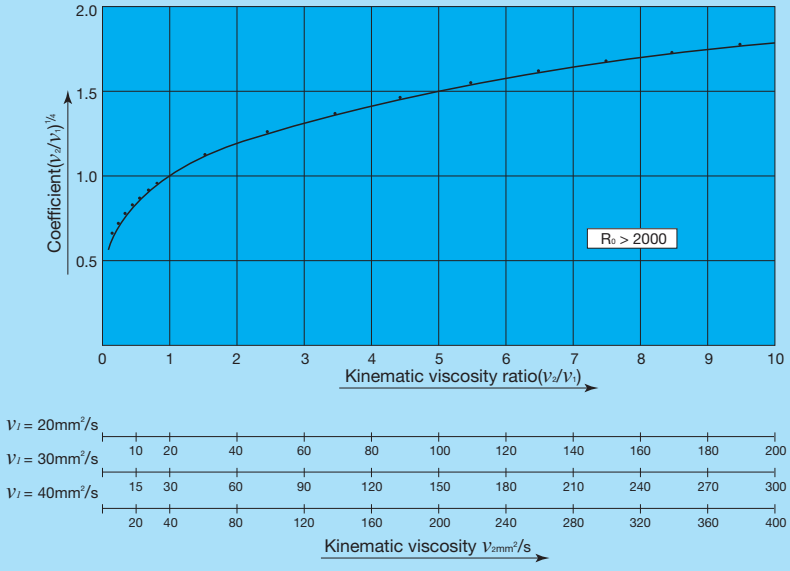
Use the following formula to convert pressure loss values for each hydraulic valve in accordance with changes in operating fluid viscosity.

$$\Delta P_2=(\frac{\nu_2}{\nu_1})^{1/4}\cdot\Delta P_1$$

ΔP_1 : Pressure loss MPa {kgf/cm²} at for kinematic viscosity ν_1
ΔP_2 : Pressure loss MPa {kgf/cm²} at for kinematic viscosity ν_2
ν_1 : Kinematic viscosity mm²/s
ν_2 : Kinematic viscosity mm²/s

The graph on the right shows coefficient values $(\nu_2/\nu_1)^{1/4}$ kinematic viscosity ratios (ν_1/ν_2).

<Example>
For a value whose pressure loss at the rated flow rate when ν_1 = 30mm²/s is ΔP_1 = 0.3MPa{3.1 kgf/cm²}, a change in viscosity to ν_2 = 90mm²/s produces a pressure loss of (ν_2/ν_1) = 3. According to the graph on the right, coefficient $(\nu_1/\nu_2)^{1/4}$ = 1.3.
Accordingly :
$\Delta P_2 = 1.3\Delta P_1 = 1.3 \times 0.3$MPa{3.1kgf/cm²}
= 0.39MPa{4.03kgf/cm²}



Factory Default Handle Setting

The following are the factory default pressure and flow rate settings for handles (screws) on adjustable valves.
①Pressure Control Valve: Near the minimum control pressure
②Flow 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.

Hydraulic Valve Selection Table

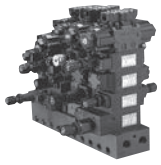
Pump Type	Name	Type Classification	Maximum Working Pressure MPa {kgf/cm²}	Maximum Flow Rate ℓ/min (1 2 5 10 20 50 100 200 500 1000 2000 5000)	Page
Modular Valves	Relief modular valve	OR	25 {255}	01 03 04	D-13
	Brake modular valve	ORO	25 {255}	01 03	D-19
	Direct relief modular valve	ORD	25 {255}	01 03 04	D-23
	Pressure reducing modular valve	OG	25 {255}	01 03 04	D-28
	01 Size balance type Pressure reducing modular valve	OGB	25 {255}	01	D-35
	Reducing valve & modular valve	OG	25 {255}	01 03 04	D-37
	2-pressure reducing modular valve	OGS	25 {255}	01	D-44
	Sequence modular valve	OQ	25 {255}	01 03	D-47
	Counter balance modular valve	OCQ	25 {255}	01 03 04	D-50
	Pressure switching modular valve	OW	25 {255}	01	D-55
	Flow regulator modular valve	O(C)Y	25 {255}	01 03 04	D-58
	Flow control modular valve	O(C)F	25 {255}	01 03 04	D-66
	Check modular valve	OC(V)	25 {255}	01 03 04	D-72
	Pilot operated check modular valve	OCP	25 {255}	01 03 04	D-79
Solenoid Valves	SS wet type solenoid valve	SS	35 {357}	01 03	E-1
	SA wet type solenoid valve	SA	35 {357}	01 03	E-13
	SE lower power solenoid valve	SE	16 {163}	01 03	E-25
	SED lower power solenoid valve	SED	16 {163}	01	E-32
	SL wet type solenoid valve	SL	7 {71}	01	E-38
	DSS(A) solenoid control valve	DSS DSA	35 {357}	04 06	E-45
	Fine Solenoid Valve	SF	21 {214}	01	E-53
	Non-leak Type Solenoid Valve	SNH	35 {357}	01 03 04 06	E-57
	Directional control valve with monitoring switch	SAW	35 {357}	01	E-66
	Poppet type directional control valve with monitoring switch	SCW	21 {214}	03	E-75
Pressure Control Valves	Relief valve	R	21 {214}	03 06 10	F-1
	RI series relief valve	RI	35 {357}	03 06	F-5
	Remote control valve	RC(D)	21 {214}	RC-02 RCD-02	F-8
	Solenoid control relief valve	RSS(A)	21 {214}	03 06 10	F-10
	RIS Series Solenoid control relief valve	RIS	35 {357}	03 06	F-15
	Reducing (& check) valve	(C)G	21 {214}	03 06 10	F-18

Note) Maximum operating pressure for the modular valve series is 35MPa {357kgf/cm²}.

Pump Type	Name	Type Classification	Maximum Working Pressure MPa {kgf/cm²}	Maximum Flow Rate ℓ/min (1 2 5 10 20 50 100 200 500 1000 2000 5000)	Page
Pressure Control Valves	Balancing valve	GR	21 {214}	01 03	F-23
	Pressure control (& check) valve	(C)Q	21 {214}	03 06 10	F-25
Flow Control Valves	Throttle (& check) valve	(C)FR	21 {214}	03 06 10	G-1
	FT type low control valve	(C)FT	21 {214}	02 03	G-4
	F type control valve	(C)F	21 {214}	06 10	G-8
	TN type flow control valve	(C)TN	10.5 {107}	02	G-11
	TS type flow control valve	(C)TS	10.5 {107}	01	G-14
	TL type flow control valve	TL(T)	7 {71}	03, 04	G-16
Direction Control Valves	Right angle check valve	CA	21 {214}	03 06 10	H-1
	In-line check valve	CN	21 {214}	03 06 10	H-1
	Pilot check valve	CP	21 {214}	03 06 10	H-4
	Gauge cock	K_2	42 {427}		H-7
	DMA type manual valve	DMA	35 {357}	01 03	H-8
Electro-hydraulic Proportional Control Valves	Pilot relief valve	EPR	35 {357}	01	I-2
	Relief valve	ER	35 {357}	03 06	I-4
	Relief and reducing valve	EGB	25 {255}	03 06	I-6
	Flow control valve	(C)ES	21 {214}	02 03 06 10	I-8
	Load response control valve	ESR	25 {255}	03 06 10	I-11
	Flow direction control valve	ESD	25 {255}	01 03 04 06 10	I-14
	Modular type reducing valve	EOG	25 {255}	01	I-22
	Modular type flow control valve	EOF	21 {214}	01	I-24
	Driver power amplifier	EMA EMC	-		I-26
	Driver power compact amplifier	EBA	-		I-30
	Compact multi-function power amplifier	EDA EDC	-		I-34
High-response Proportional Flow Control Valve	High-response proportional flow control valve	ESH	32 {327}	01 03 04 06	I-38
	High-speed response proportional control valve amplifier	EHA	-		I-42
Electro-hydraulic Servo Valves	NACHI-MOOG servo valve Driver servo amplifier	EA	-		I-44
Other	Hydro-logic valve	HT,HF	28 {286}	06 10 16 24	J-1

Modular Valve Series

20 to 300ℓ/min
21,25,35MPa



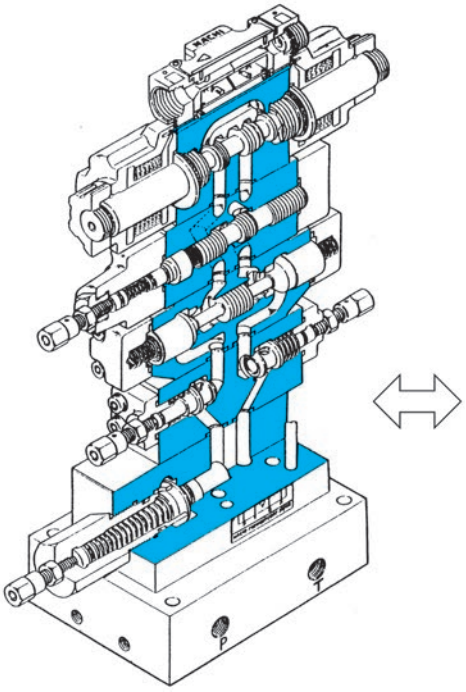
Overview

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.

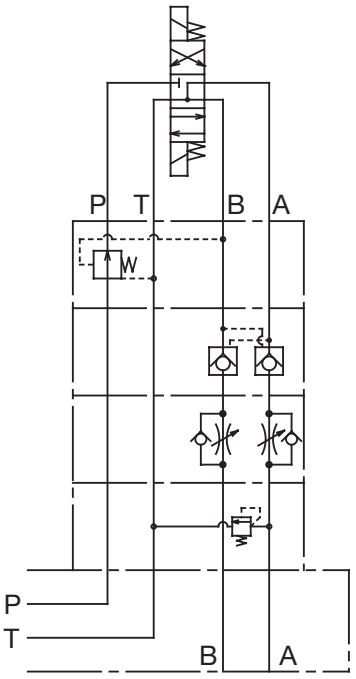
The illustrations below show one example of a circuit configuration using this system.

Features

①High pressure and high volume. Available maximum operating pressure operations are 21, 25, and 35MPa {214, 255, 357kgf/cm²}, while maximum control flow rates are G01 50ℓ/min, G03 100ℓ/min, G04 300ℓ/min.
②Ganging and bolting format allows for quick and easy circuit configuration as well as circuit changes and additions.
③Compact module configurations greatly reduce space requirements.
④Maintenance costs are also reduced because less piping and fewer couplings mean less need for acid rinsing and flushing of pipes.
⑤Fewer fluid leak problems due to pipe resonance, noise, and loose couplings.
⑥Circuit configuration is simple yet exact. Nameplates on the side of the valve show JIS codes that make it quick and easy to determine its performance.
⑦A full lineup of models is available to meet a wide range of needs and circuit configurations: Model G01 58 Type 131, G03 52 Type 96, G04 30 Type 68.



Integrated Structural Diagram



Integrated Circuit Diagram

Specifications

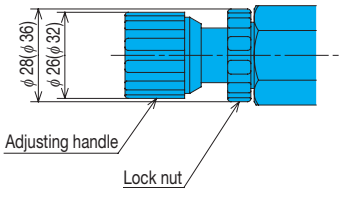
Name	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Gasket Surface Dimensions	Possible Number of Ganged Valves (Note 2)
01 Series	1/8	25{255}(Note 1)	50	ISO 4401-03-02-0-05	1 to 4
03 Series	3/8	25{255}(Note 1)	100	ISO 4401-05-04-0-05	1 to 4
04 Series	1/2	35{357}	300	ISO 4401-07-06-0-05	1 to 3(Note 3)

Note) 1. The M35 Series is available as a 35MPa {357kgf/cm²} maximum operating pressure version of the 01 and 03 Series. For details, see pages D-98 and D-99.
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 21 MPa.

K Series Modular Valve

The valve shown in the photograph is available with nominal diameter 01 and 03 size adjusting bolts. Use the following format for specification.

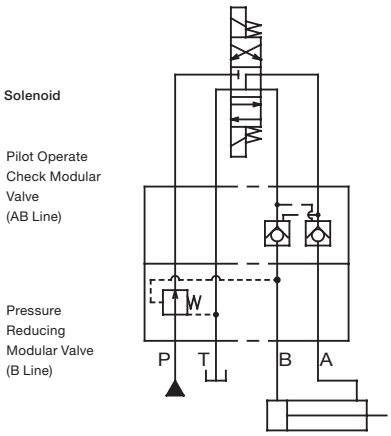
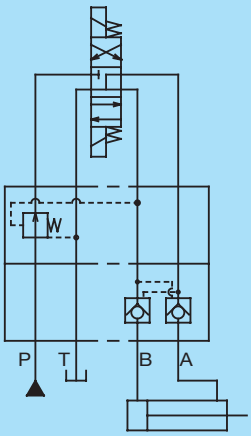
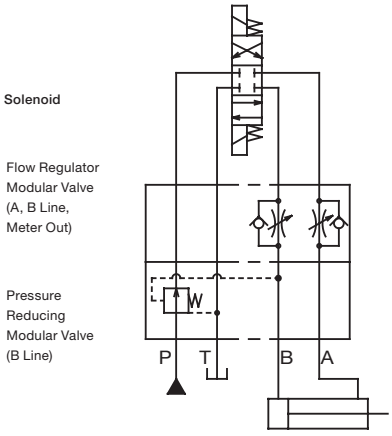
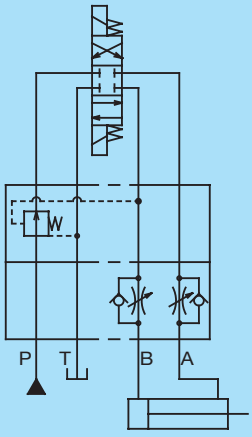
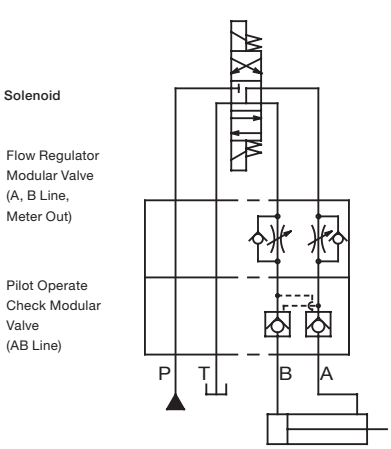
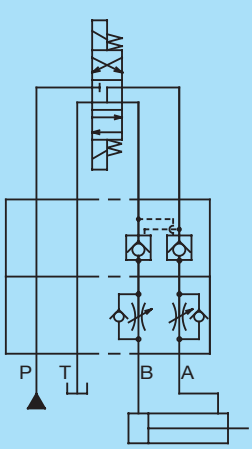
Example: OCY–G01–W–Y–K–20
Auxiliary symbol
K: With handle



Dimensions in parentheses indicate nominal diameter 03.

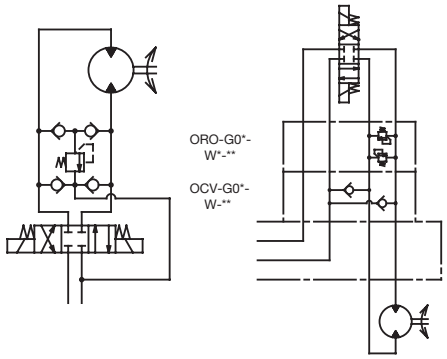
Precautions when Ganging Modular Valves

Note the following precautions when ganging modular valves together in the applicable example circuits.

Circuit Diagram	Description	Incorrect	Correct
Locking Circuit and Pressure Reducing Circuit	●Cylinder position not maintained ○Leaks occur because, during the pilot check, the line being maintained flows into the pilot line of the reducing valve.		
Pressure Reduction Circuit with Speed Control	●Insufficient cylinder output and drop in speed ○Pressure increases due to the restrictor effect of the flow regulator. Since the pilot runs from that line, pressure reduction makes smooth operation impossible.		
Locking Circuit and Speed Control Circuit	●Cylinder knocking ○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.		

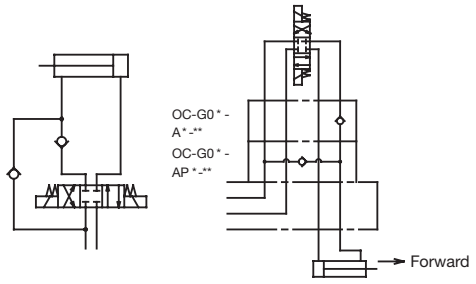
Valve Ganging Circuit Configuration Examples

Anti-cavitation Circuit G 01/03



- 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

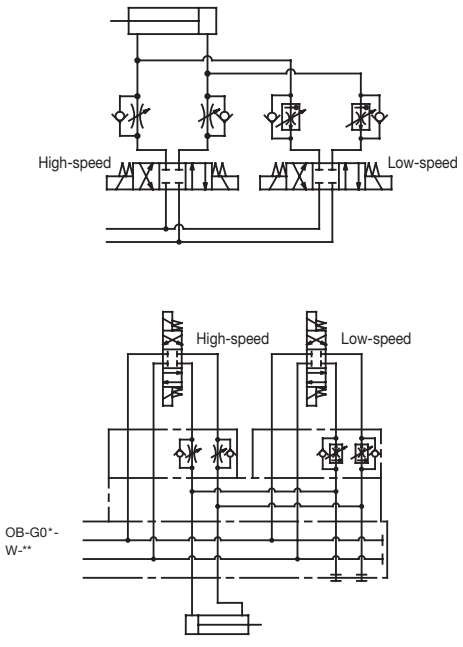
Differential Circuit G 01/03



- 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.

2-speed Circuit G 01/03

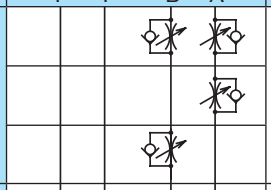


- This type of circuit allows variation between two actuator speeds. It prevents low-speed shock when the actuator starts up or stops, and it used when the intermediate stroke is operated at high speed.
- Example Valve Model Numbers (G03)
  2-speed Plate ——————————OB-G03-W-(H)-J30
  High-speed Flow Regulator Valve —OCY-G-03-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 (Check Valve Cracking Pressure) MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	JIS Symbol	Height mm	Weight kg	Catalog Page
Solenoid Valves	Solenoid Valve	SS-G01-**-R-**-31 SA-G01-**-**-31		100	P T B A			E-1 E-13
Pressure Control Valves	Relief Valves (Balance Type)	OR-G01-P$^{1}_{3}$-20	1:* to 7 {* to 71.4} 3:3.5 to 25 {35.7 to 255} *See page D-16 for these items.	50		40	1.5	D-13
		-W$^{1}_{3}$-20					2.3	
		-A$^{1}_{3}$-21					1.6	
		-B$^{1}_{3}$-21						
	Brake Valves (Direct Type)	ORO-G01-W$^{1}_{3}$-20	1:0.8 to 7 {8.2 to 71.4} 3:3.5 to 21 {35.7 to 214}	20		40	1.5	D-19
		-A$^{1}_{3}$-20					1.4	
		-B$^{1}_{3}$-20						
	Direct Relief Valves (Direct Type)	ORD-G01-W$^{1}_{3}$-20	1:0.8 to 7 {8.2 to 71.4} 3:3.5 to 21 {35.7 to 214}	20		40	1.5	D-23
		-A$^{1}_{3}$-20					1.4	
		-B$^{1}_{3}$-20						
	Reducing Valves (Direct Type)	OG-G01-P$^{C}_{2}$1-21	C:0.15 to 3.5 {1.5 to 35.7} 1:0.8 to 7 {8.2 to 71.4} 2:3.5 to 16 {35.7 to 163}	50		40	1.3	D-28
		-A$^{C}_{2}$1-21						D-37
		-B$^{C}_{2}$1-21						
	Balance Type Reducing Valves	OGB-G01-P$^{C}_{3}$1-20	C:0.15 to 3.5 {1.5 to 35.7} 1:0.8 to 7 {8.2 to 71.4} 3:3.5 to 21 {35.7 to 214}	40		40	1.9	D-35
		-A$^{C}_{3}$1-20						
		-B$^{C}_{3}$1-20						
	Pressure Control Valves (Sequence Valves)	OQ-G01-P2$^{1}_{3}$-20	1:0.8 to 7{8.2 to 71.4} 3:3.5 to 21{35.7 to 214}	40		40	1.1	D-47
	Pressure Control Valves (Counter Balance Valves)	OCQ-G01-A1$^{1}_{2}$-20	1:0.8 to 7{8.2 to 71.4} 2:3.5 to 14{35.7 to 143}					D-50
		-B1$^{1}_{2}$-20						
	Pressure Switches	OW-G01-P$^{C}_{3}$1-R-**-30	C:0.5 to 3.5 {5.1 to 35.7} 1:0.8 to 7{8.2 to 71.4} 3:3.5 to 21 {35.7 to 214} Contact Capacitance AC125V:5A DC 14V:5A DC 30V:4A	50		40	1.8	D-55
		-W$^{C}_{3}$1-R-**-30					2.6	
		-A$^{C}_{3}$1-R-**-30					1.8	
		-B$^{C}_{3}$1-R-**-30						
Flow Control Valve	Flow Regulator Valve	OY-G01-T-20		50		40	1.0	D-58
	Flow Regulator Valves with Check	OCY-G01-P-20	(0.04{0.4})					
	Meter-Out Flow Regulator Valves	OCY-G01-W-Y-20	(0.08{0.8})	50		40	1.3	D-58
		-A-Y-20					1.2	
		-B-Y-20						

G01 Modular Valve Series

Type	Name	Valve Model Number	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	JIS Symbol P T B A	Height mm	Weight kg	Catalog Page
Flow Control Valves	Meter-in Flow Regulator Valve	OCY-G01-W-X-20	(0.08{0.8})	50		40	1.3	D-58
		-A-X-20					1.2	
		-B-X-20						
	Flow Control Valve	OF-G01-P20-20	(Control Flow Rate) Differential Pressure 7{71.4}:0.1 to 20 Differential Pressure21{214}:0.3 to 20				1.2	D-66
	Meter-out Flow Control Valves	OCF-G01-W40-Y-30	(Control Flow Rate) Differential Pressure 7{71.4}:0.1 to 40 Differential Pressure25{255}:0.5 to 40 (0.08{0.8})	40		40	1.7	
		-A40-Y-30					1.5	
		-B40-Y-30						
	Meter-in Flow Control Valves	OCF-G01-W40-X-30					1.7	
		-A40-X-30					1.5	
		-B40-X-30						
Direction Control Valve	Check Valves	OC-G01-P$^{1}_{3}$2-21	Cracking pressure [1:0.04{0.4} 2:0.35{3.6} 3:0.50{5.1}] *For differential circuit	50		40	1.0	D-72
		T$^{1}_{3}$2-21					1.2	
		-A$^{1}_{3}$2-21 *					1.0	
		-AP$^{1}_{3}$2-20 *						
	Vacuum Check Valves	OCV-G01-W-20	(0.015{0.15})	50				
	Pilot Check Valves	OCP-G01-W$\frac{1}{2}$-(F)-21	Cracking pressure [1:0.2{2.0} 2:0.5{5.1}] (Auxiliary Symbol) Open Valve Ratio Standard: Parent Valve 37% F: Child Valve 6% Parent Valve 51%	50		40	1.2	D-79
		-A$\frac{1}{2}$-(F)-21						
		-B$\frac{1}{2}$-(F)-21						
Composite Valves	2-pressure Reducing Valves	OGS-G01-P$^{C}_{1}$C-K(R)-**-22 (High pressure side / Low pressure side) Power supply : C1, C2, D1, D2	C:0.2 to 3.5 {2.0 to 35.7} 1:0.8 to 7 {8.2 to 71.4} 2:3.5 to 14 {35.7 to 143}	40		90	4.8	D-44
Other	Gauge Modular Blocks	OK-G01-P-(H)-20		50	Rc1/4 Rc1/4	25 (H:40)	0.6 (H:1.0)	D-84
		-T-(H)-20			Rc1/4 Rc1/4			
		-W-(H)-20			Rc1/4 Rc1/4			
	2-speed Plates	OB-G01-W-(H)-20		50				D-86
	End Plates	MOB-G01-(H)-10		–		20	0.3	D-88
	Free-flow plate	MOB-G01-A-10		50		36	0.6	
		-B-10						
	Base Blocks (Multi-block)	MOB-01X-B*-10	B: A, B ports * : Sequential number from 2 to 6 Single side outlet		Rc3/8 Rc1/4	–	–	D-96
		-01Y-W*-10	W: A, B ports * : Sequential number from 1 to 6 Dual side outlet		Rc1/2 Rc3/8			
	Sub Plate	MSA-01Y-10 MSA-01Y-T-10	None: Back side outlet T: Side outlet		Rc3/8 Rc3/8			D-90

G03 Modular Valve Series

Type	Name	Valve Model Number	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	JIS Symbol	Height mm	Weight kg	Catalog Page
Solenoid Valves	Solenoid Valves	For M6 For M8 SS-G03-**-R-**-J22-22 SA-G03-**-** -J21-21		160	P T B A			E-1 E-13
Pressure Control Valve	Relief Valves (Balance Type)	OR-G03-P$^{1}_{3}$-J50	1:* to 7 {* to 71.4} 3:3.5 to 25 {35.7 to 255} (Auxiliary Symbol) V: With vent port *See page D-16 for these items.	80		55	3.1	D-13
		-W$^{1}_{3}$-J50					3.9	
		-A$^{1}_{3}$-J50					3.1	
		-B$^{1}_{3}$-J50						
		OR-G03-P$^{1}_{3}$-V-J50			V		3.1	
	Brake Valves (Direct Type)	ORO-G03-W$^{1}_{3}$-J50	1:0.8 to 7 {8.2 to 71.4} 3:3.5 to 25 {35.7 to 255}	30		55	4.8	D-19
		-A$^{1}_{3}$-J50					4.0	
		-B$^{1}_{3}$-J50						
	Direct Relief Valves (Direct Type)	ORD-G03-W$^{1}_{3}$-J50	1:0.8 to 7 {8.2 to 71.4} 3:3.5 to 25 {35.7 to 255}	30		55	3.9	D-23
		-A$^{1}_{3}$-J50					3.1	
		-B$^{1}_{3}$-J50						
	Reducing valve	OG-G03-P$^{C}_{3}$1-(B)-J51	C:0.25 to 3.5 {2.5 to 35.7} 1:0.8 to 7 {8.2 to 71.4} 3:3.5 to 21 {35.7 to 214}	80 However, C:50	DR	55	3.6	D-28
		-A$^{C}_{3}$1-(B)-J51			DR			D-37
		-B$^{C}_{3}$1-(B)-J51			DR			
		OG-G03-P$^{C}_{3}$1-(B)V-J51			V DR			D-28
	Pressure Control Valves (Sequence Valves)	OQ-G03-P$^{A}_{E}$2C-J50	A:0.25 to 0.85 {2.5 to 8.7} C:0.85 to 3.5 {8.7 to 35.7} E:3.5 to 14 {35.7 to 143}	80		55	3.5	D-47
	Pressure Control Valves (Counter Balance Valves)	OCQ-G03-A1$^{A}_{E}$C-J50				55		D-50
		-B1$^{A}_{E}$C-J50						
Flow Control Valve	Flow Regulator Valve	OCY-G03-$^{P}_{P\text{-}H}$-J50	(Function) H: High differential pressure regulator (0.1{1})	100		55	2.9	D-58
	Meter-Out Flow Regulator Valves	-$^{W\text{-}Y}_{W\text{-}HY}$-J51					3.1	
		-$^{A\text{-}Y}_{A\text{-}HY}$-J51					3.0	
		-$^{B\text{-}Y}_{B\text{-}HY}$-J51						

*There is no problem with seals and other parts when mixing these valves with NACHI G03 modular valve design number (J) 30 valves.

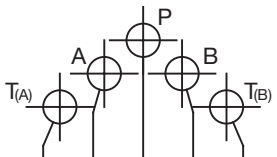
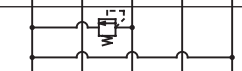
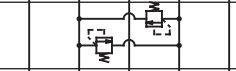
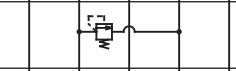
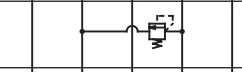
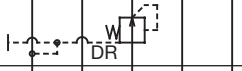
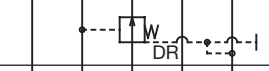
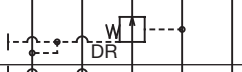
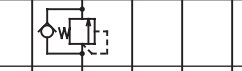
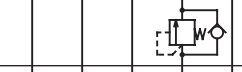
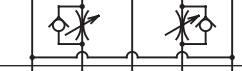
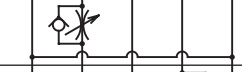
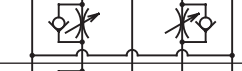
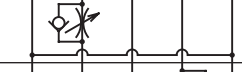
*G03 module valve installation bolts
For M6: Design number J50
For M8: Design number 50
Unit has commonality. Also, two J-pins have been inserted diagonally for M6 applications.

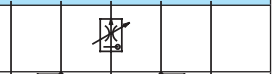
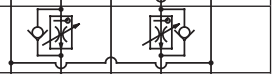
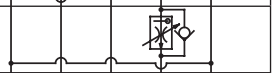
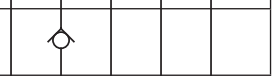
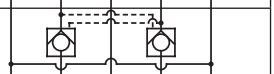
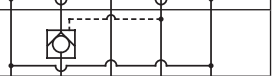
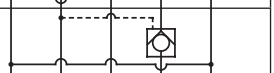
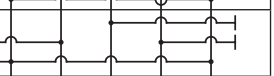
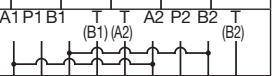
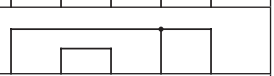
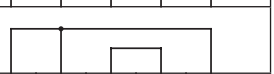
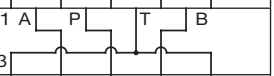
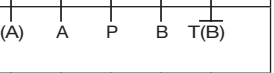
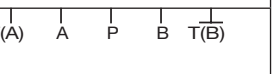
Note) G03 series modular valves have two T port locations: one on the A port side $T_{(A)}$ and one on the B port side $T_{(B)}$. The port that is used depends on the model number.
See page D-11 for details about JIS symbols.

G03 Modular Valve Series

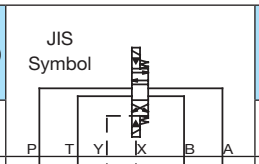
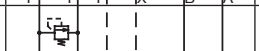
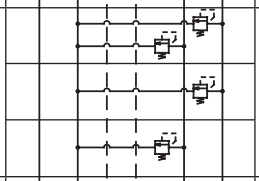
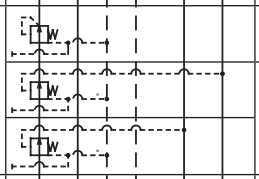
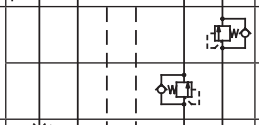
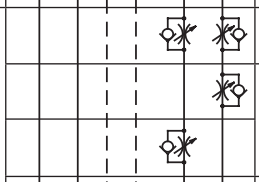
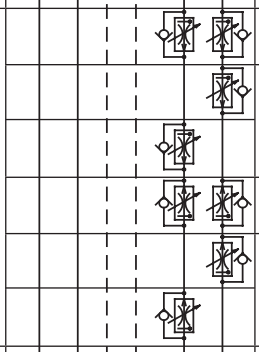
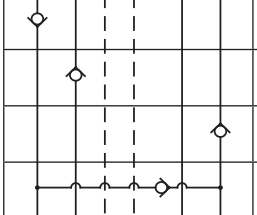
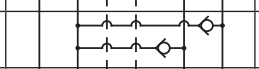
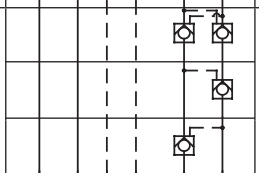
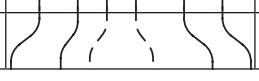
Type	Name	Valve Model Number	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	JIS Symbol P T B A	Height mm	Weight kg	Catalog Page
Flow Control Valves	Meter-in Flow Regulator Valve	OCY-G03-W-X -W-HX-J51	(Function) H: High differential pressure regula-tor (0.1{1})	100		55	3.1	D-58
		-A-X -A-HX-J51					3.0	
		-B-X -B-HX-J51						
	Flow Control Valve	OF-G03-P60-J50	(Control Flow Rate) Differential Pressure 7{71.4}:0.3 to 60 Differential Pressure 25{255}:0.5 to 60			55	3.1	D-66
	Meter-out Flow Control Valves	OCF-G03-W60-Y-J50	(Volume control flow rate) Differential Pressure7{71.4}:0.5 to 60 Differential Pressure25{255}:1 to 60 (0.1{1})	60			5.0	
		-A60-Y-J50					4.6	
		-B60-Y-J50						
	Meter-in Flow Control Valves	OCF-G03-W60-X-J50					5.0	
		-A60-X-J50					4.6	
		-B60-X-J50						
Direction Control Valve	Check Valves	OC-G03-P(1/2/3)-J50	Cracking pressure 1:0.04{0.4} 2:0.35{3.6} 3:0.50{5.1} *For differential circuit	100		55	2.7	D-72
		T(1/2/3)-J50						
		-A(1/2/3)-J50 *						
		-AP(1/2/3)-J50 *						
	Vacuum Check Valves	OCV-G03-W-J50	(0.015{0.15})	100		55	3.5	D-72
	Pilot Check Valves	OCP-G03-W1/2-(D)-J50	Cracking pressure 1:0.2{2.0} 2:0.5{5.1} (Auxiliary Symbol) Open Valve Ratio Standard : Child Valve 7% Parent Valve 49% D : Parent Valve 49%	100		55	3.6	D-79
		-A1/2-(D)-J50						
		-B1/2-(D)-J50						
Other	Gauge Block	OK-G03-J50		100	Rc1/4 A T P B	55	2.3	D-84
	2-speed Plates	OB-G03-W-(H)-J30		100	B A 35 (H:55) 4.5 (H:7.1)			D-86
	End Plates	MOB-G03-J50: For M6 MOB-G03-(H)-50: For M8		–		32 (H:58)	1.4 (H:2.5)	D-88
	Free Flow	MOB-G03-A-J50: For M6 MOB-G03-A-(H)-50: For M8		100		32 (H:58)	1.3 (H:2.3)	
		MOB-G03-B-J50: For M6 MOB-G03-B-(H)-50: For M8						
	Conversion plate (For 03/01 conversion)	MOB-G03-AA-50 MOB-G03-AA-J50		50	G01 P T B A G03 P T B A	45	2.3	
	Base Blocks	MOB-03-B*-J30	*:Sequential number from 2 to 5 A, B port dual side outlet		Rc3/4 Rc1/2	–	–	D-96
	Sub Plate	MSA-03(X)-10 MS-03(X)-30 MSA-03(X)-T-10 MS-03(X)-T-10	MSA : For M6 MS : For M8 None: Back side outlet T : Side outlet		Rc3/8 (Rc1/2)			D-90

G03 Modular Valve Series Detailed JIS Symbols

Type	Valve Model Number	Detailed JIS Symbols
Solenoid Valves	For M6, M8 SS-G03-**-R-**-J22 -22 SA-G03-**-** -J21 -21	
Pressure Control Valve	OR-G03-P$^{1}_{3}$-J50	
	OR-G03-W$^{1}_{3}$-J50	
	OR-G03-A$^{1}_{3}$-J50	
	OR-G03-B$^{1}_{3}$-J50	
	OR-G03-P$^{1}_{3}$-V-J50	
	ORO-G03-W$^{1}_{3}$-J50	
	ORO-G03-A$^{1}_{3}$-J50	
	ORO-G03-B$^{1}_{3}$-J50	
	ORD-G03-W$^{1}_{3}$-J50	
	ORD-G03-A$^{1}_{3}$-J50	
	ORD-G03-B$^{1}_{3}$-J50	
	OG-G03-P$^{C}_{1}$$_{3}$-(B)-J51	
	OG-G03-A$^{C}_{1}$$_{3}$-(B)-J51	
	OG-G03-B$^{C}_{1}$$_{3}$-(B)-J51	
	OG-G03-P$^{C}_{1}$$_{3}$-(B)V-J51	
	OQ-G03-P2$^{A}_{E}$-J50	
	OCQ-G03-A1$^{A}_{E}$-J50	
	OCQ-G03-B1$^{A}_{E}$-J50	
Flow Control Valve	OCY-G03-P-J50	
	OCY-G03-W-Y-J51	
	OCY-G03-A-Y-J51	
	OCY-G03-B-Y-J51	
	OCY-G03-W-X-J51	
	OCY-G03-A-X-J51	
	OCY-G03-B-X-J51	

Type	Valve Model Number	Detailed JIS Symbols
		T(A) A P B T(B)
Flow Control Valve	OF-G03-P60-J50	
	OCF-G03-W60-Y-J50	
	OCF-G03-A60-Y-J50	
	OCF-G03-B60-Y-J50	
	OCF-G03-W60-X-J50	
	OCF-G03-A60-X-J50	
	OCF-G03-B60-X-J50	
Direction Control Valve	OC-G03-P$^{1}_{2}$$_{3}$-J50	
	OC-G03-T$^{1}_{2}$$_{3}$-J50	
	OC-G03-A$^{1}_{2}$$_{3}$-J50	
	OC-G03-AP$^{1}_{2}$$_{3}$-J50	
	OCV-G03-W-J50	
	OCP-G03-W$^{1}_{2}$-J50	
	OCP-G03-A$^{1}_{2}$-J50	
	OCP-G03-B$^{1}_{2}$-J50	
	OK-G03-J50	
Other	OB-G03-W-J30	
	MOB-G03-(H)-50 MOB-G03-J50	
	MOB-G03-A-(H)-50 MOB-G03-A-J50	
	MOB-G03-B-(H)-50 MOB-G03-B-J50	
	MOB-G03-AA-50 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 Pressure	Maximum Flow Rate ℓ/min	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa{kgf/cm²}	JIS Symbol	Weight kg	Catalog Page
Solenoid Valves	Solenoid Control Valves	DSS-G04-****-R-**-22	35MPa {357 kgf/cm²}	300			15.0	E-45
Pressure Control Valve	Relief valve	ORH-G04-P$\frac{1}{3}_{5}$-10	35MPa {357 kgf/cm²}	300	1:0.8 to 7{8.2 to 71.4} 3:3.5 to 25{35.7 to 255}		7.0	D-13
	Direct Relief Valves	ORH-G04-DW-$\frac{1}{3}_{5}$-10		50	1:0.8 to 7 {8.2 to 71.4} 3:3.5 to 25 {35.7 to 255} 5:7 to 35 {71.4 to 357}		6.5	D-23
		ORH-G04-DA$\frac{1}{3}_{5}$-10						
		ORH-G04-DB$\frac{1}{3}_{5}$-10						
	Reducing valve	OGH-G04-P$\frac{1}{3}$-(B)-10		300	1:0.8 to 7 {8.2 to 71.4} 3:3.5 to 25 {35.7 to 255} (Auxiliary Symbol) B: External drain		8.0	D-28
		OGH-G04-A$\frac{1}{3}$-(B)-10					8.0	D-37
		OGH-G04-B$\frac{1}{3}$-(B)-10						
	Counter Balance Valves	OQH-G04-A1$\frac{A}{E}$-10		300	A:0.25 to 0.85{2.5 to 8.7} C:0.50 to 3.5{5.1 to 35.7} E:2 to 14{20.4 to 143}		8.0	D-50
		OQH-G04-B1$\frac{A}{E}$-10					8.0	
Flow Control Valve	Flow Regulator Valves	OYH-G04-P-10		300	Check Valve Cracking Pressure 0.04{0.4}		4.7	D-58
	Meter-in Flow Regulator Valve	OYH-G04-W-X-10		300	Check Valve Cracking Pressure 0.1{1.0}		6.5	D-58
		OYH-G04-A-X-10					6.3	
		OYH-G04-B-X-10						
	Meter-Out Flow Regulator Valves	OYH-G04-W-Y-10					6.5	
		OYH-G04-A-Y-10					6.3	
		OYH-G04-B-Y-10						
	Meter-in Flow Control Valves	OFH-G04-W200-X-10		200	Check Valve Cracking Pressure 0.1{1.0}		11.1	D-66
		OFH-G04-A200-X-10					10.2	
		OFH-G04-B200-X-10						
	Meter-out Flow Control Valves	OFH-G04-W200-Y-10					11.1	
		OFH-G04-A200-Y-10					10.2	
		OFH-G04-B200-Y-10						
Direction Control Valve	Check Valves	OCH-G04-P$\frac{1}{2}_{3}$-10		300	1:0.04{0.4} 2:0.35{3.6} 3:0.50{5.1}		4.5	D-72
		OCH-G04-T$\frac{1}{2}_{3}$-10					6.5	
		OCH-G04-A$\frac{1}{2}_{3}$-10					4.5	
		OCH-G04-AP$\frac{1}{2}_{3}$-10					4.5	
	Vacuum Check Valves	OVH-G04-W-10		300	0.01{0.1}		6.5	D-72
	Pilot Check Valves	OPH-G04-W$\frac{1}{2}$-(D)-10		300	1:0.20{2.0} 2:0.50{5.1} (Auxiliary Symbol) Open Valve Ratio Standard : Child Valve 7% Parent Valve 50% D : Parent Valve 50%		6.8	D-79
		OPH-G04-A$\frac{1}{2}$-(D)-10						
		OPH-G04-B$\frac{1}{2}$-(D)-10						
Others	Conversion plate (for 06/04 conversion)	MOB-G06-AA-5411A		300	G04 G06		10.0	D-88

The G04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Relief Modular Valve

50 to 300ℓ/min
25,35MPa

Features

①This modular relief valve provides maximum pressure control for a hydraulic circuit.

②Wide ranging applicability Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²} Pressure Adjustment Range: 0.8 to 25, 35MPa {8.2 to 255, 357kgf/cm²}

③Shockless 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 MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OR-G01-P1-20 P3	1/8	25 {255}	50	* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	1.5	ISO 4401-03-02-0-05
OR-G01-W1-20 W3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	2.3	
OR-G01-A1-21 A3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	1.6	
OR-G01-B1-21 B3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	1.6	
OR-G03-P1-(V)-J50 P3	3/8	25 {255}	80	* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	3.1	ISO 4401-05-04-0-05
OR-G03-W1-J50 W3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	3.9	
OR-G03-A1-J50 A3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	3.1	
OR-G03-B1-J50 B3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	3.1	
ORH-G04-P1-10 P3 P5	1/2	35 {357}	300	* to 7{ * to 71.4} 3.5 to 25{35.7 to 255} 7 to 35{71.4 to 357}	7.0	ISO 4401-07-06-0-05

Note) *See the Flow Rate - Low Pressure characteristics on page D-16 for information about items marked with an asterisk.

●Handling

1 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 ϕ4mm 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".

2 For use as a safety valve, use a pressure override that is higher than the required circuit pressure.

3 Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²},

4 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 5ℓ/min
03 size: At least 8ℓ/min
04 size: At least 8ℓ/min
For applications that require a flow rate that is less than the minimum flow rate, use an ORD-G** direct type relieve modular valve.

5 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

6 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

7 Connect OR-G03-W*- (J) 50 to the two T-ports on the tanks.

Explanation of model No.

01, 03 size

OR – G 03 – P 1 – (K) – J50

- Design number — Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50: M8.
- Auxiliary symbol — K: With handle (01, 03 size) V: With vane port (03 size only)
- Pressure adjustment range — 1, 3
- Control port — P: P port W: A, B ports A: A port B: B port
- Nominal diameter (size) — 01, 03
- Mounting method — G: Gasket type
- Relief modular valve

Explanation of model No.

04 size

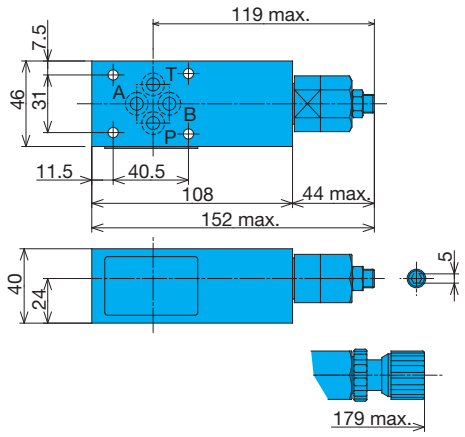
ORH – G 04 – P 5 – 10

- Design number
- Pressure adjustment range — 1, 3, 5
- Control port — P: P port
- Nominal diameter (size) — 04
- Mounting method — G: Gasket type
- M35 Series relief modular valve

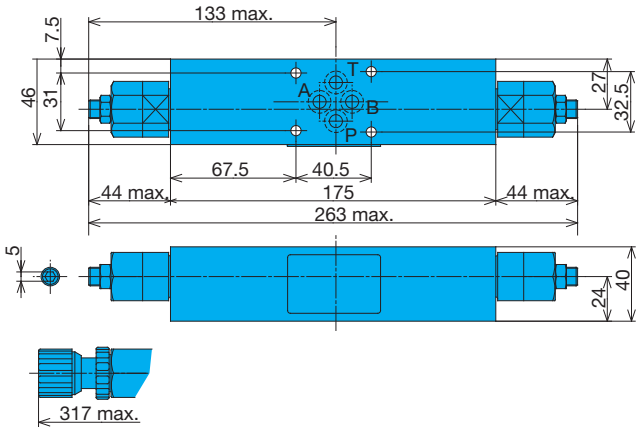
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

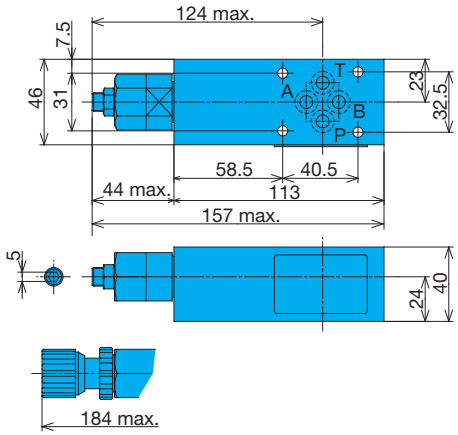
OR-G01-P-*-20



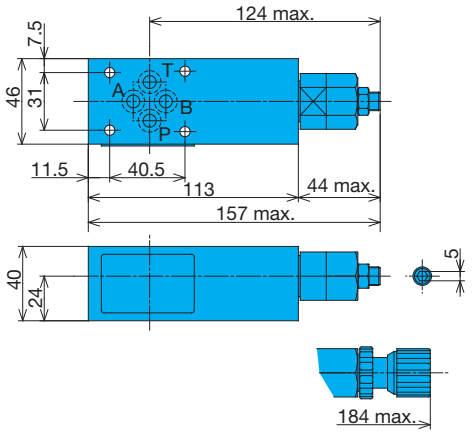
OR-G01-W*-20



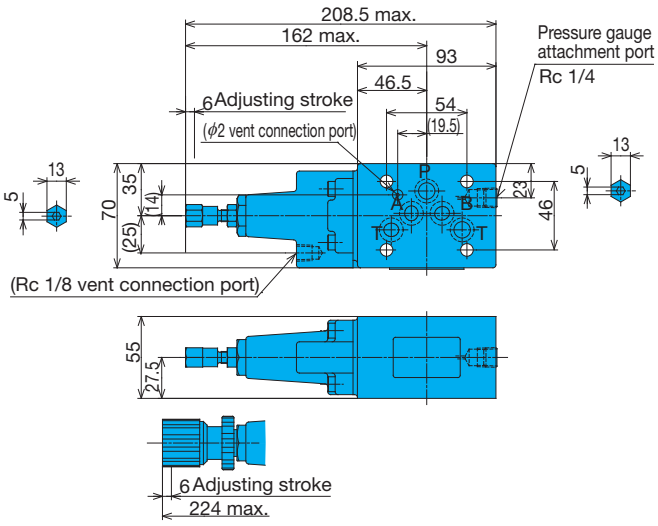
OR-G01-A*-21



OR-G01-B*-21

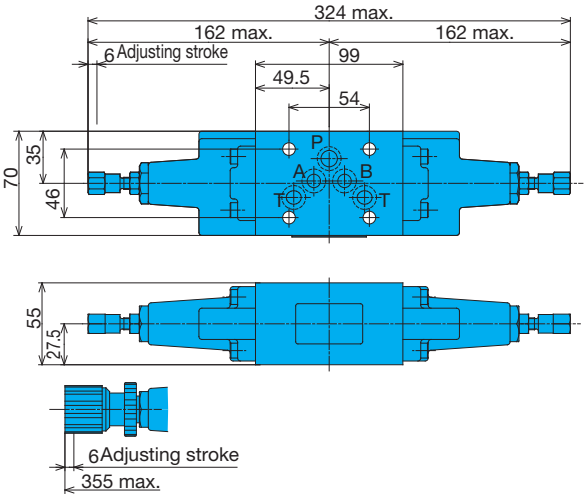


OR-G03-P*-(V)-J50

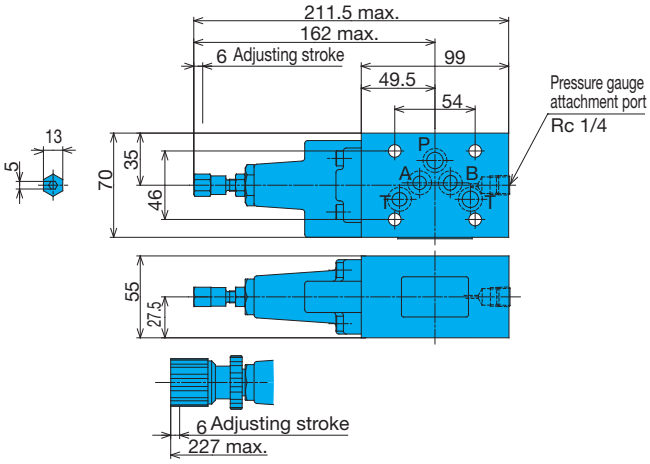


Note) Dimensions in parentheses show dimensions with vent port installed (V type)

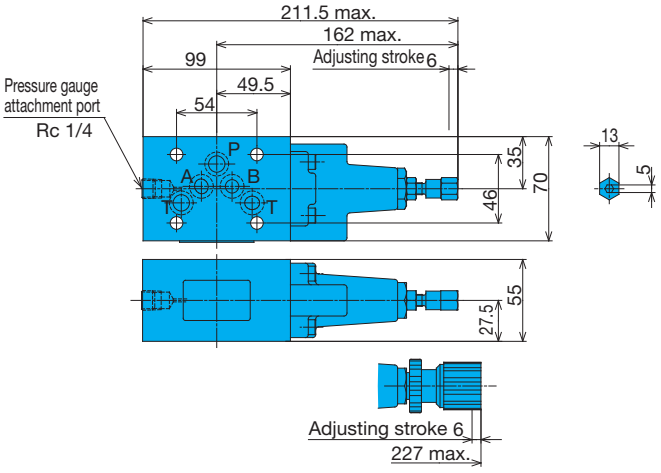
OR-G03-W*-J50



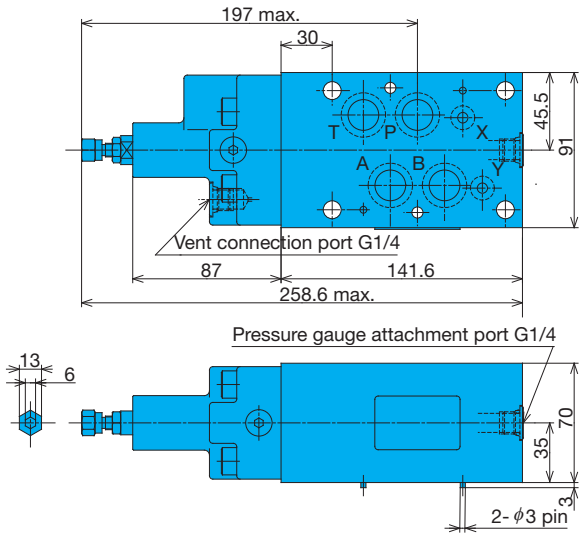
OR-G03-A*-J50



OR-G03-B*-J50



ORH-G04-P*-10

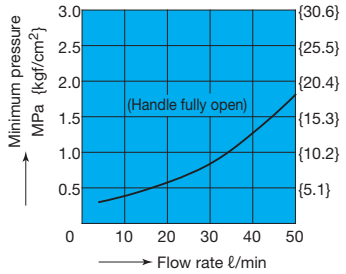


Performance Curves

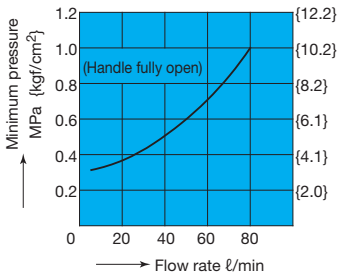
Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Flow Rate –Minimum Pressure Characteristics

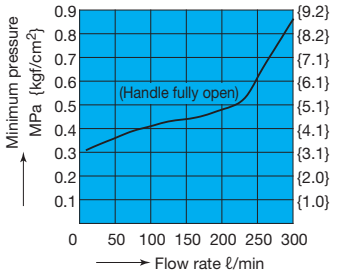
OR-G01-*1-20(21)



OR-G03-P1-J50

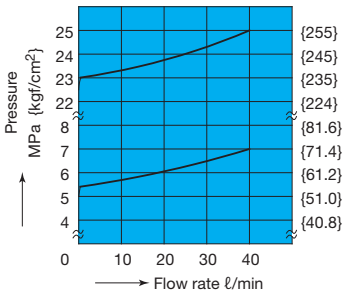


ORH-G04-P*-10

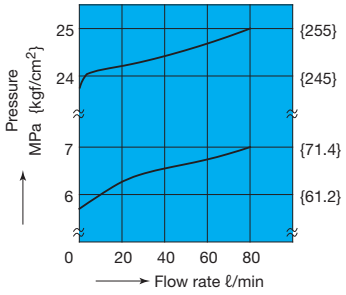


Pressure – Flow Rate Characteristics

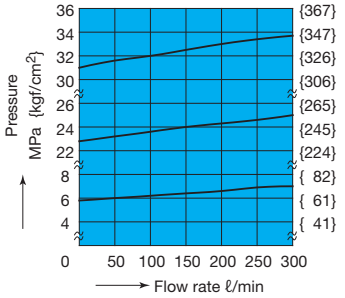
OR-G01-**-20(21)



OR-G03-P*-J50

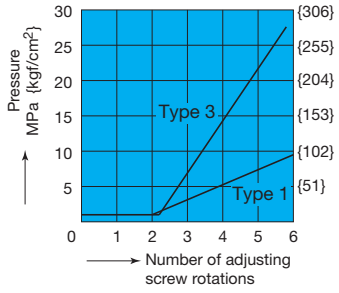


ORH-G04-P*-10

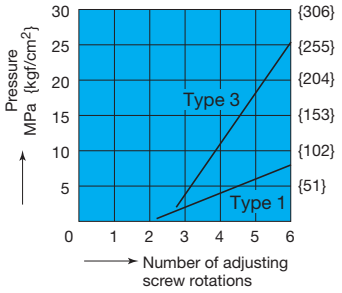


Number of Adjusting Screw Rotations – Pressure Characteristics

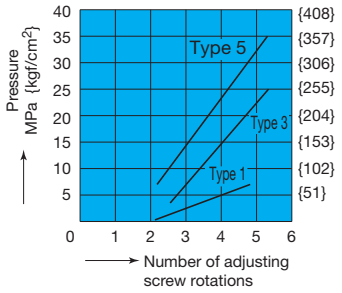
OR-G01-P*-20



OR-G03-P*-(J)50

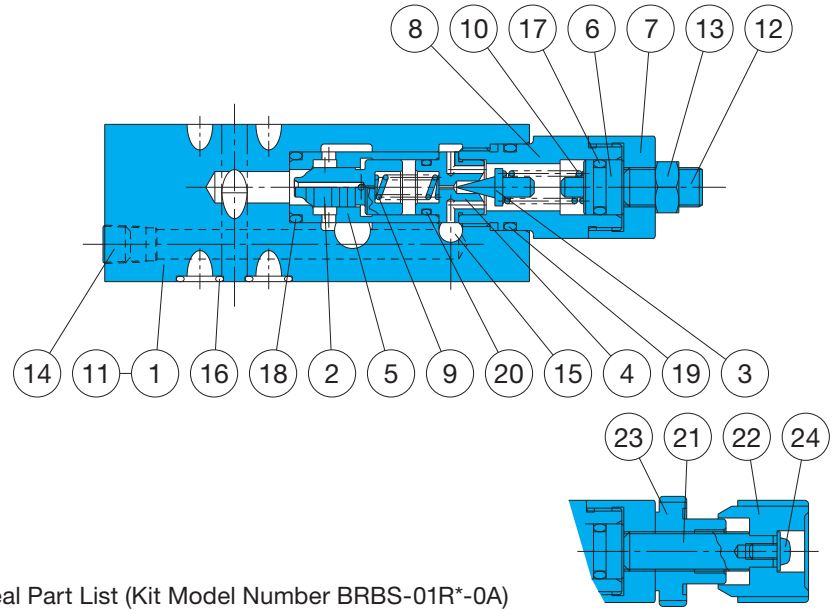


ORH-G04-P*-10



Cross-sectional Drawings

OR-G01-P*-20



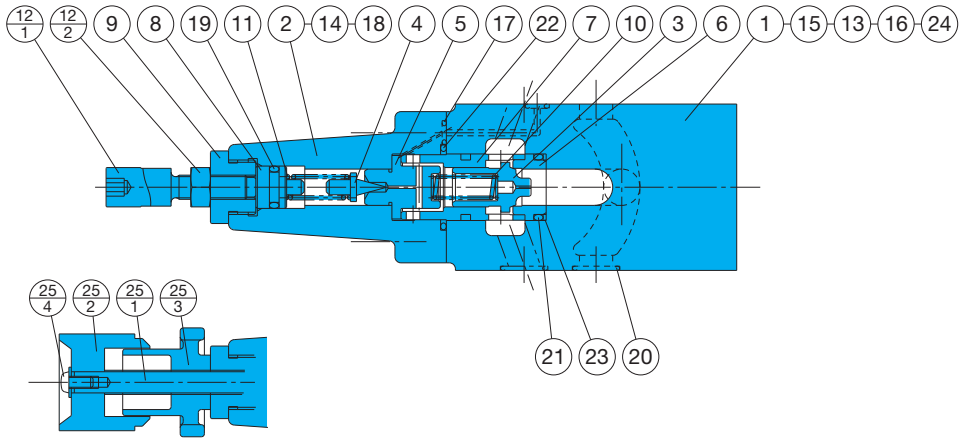
Part No.	Part Name
1	Body
2	Spool
3	Poppet
4	Seat
5	Sleeve
6	Plunger
7	Bushing
8	Retainer
9	Spring
10	Spring
11	Plate
12	Screw
13	Nut
14	Plug
15	Plug
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	O-ring
21	Screw
22	Knob
23	Nut
24	Screw

Seal Part List (Kit Model Number BRBS-01R*-0A)

Part No.	Part Name	Part Number	Q'ty			
			P	W	A	B
16	O-ring	AS568-012(NBR-90)	4	4	4	4
17	O-ring	NBR-70-1 P10A	1	2	1	1
18	O-ring	NBR-90 P14	1	2	1	1
19	O-ring	NBR-90 P18	1	2	1	1
20	O-ring	AS568-013(NBR-90)	1	2	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify P, W, A, or B for the asterisk (*) in the kit model number.

OR-G03-P*-V-J50



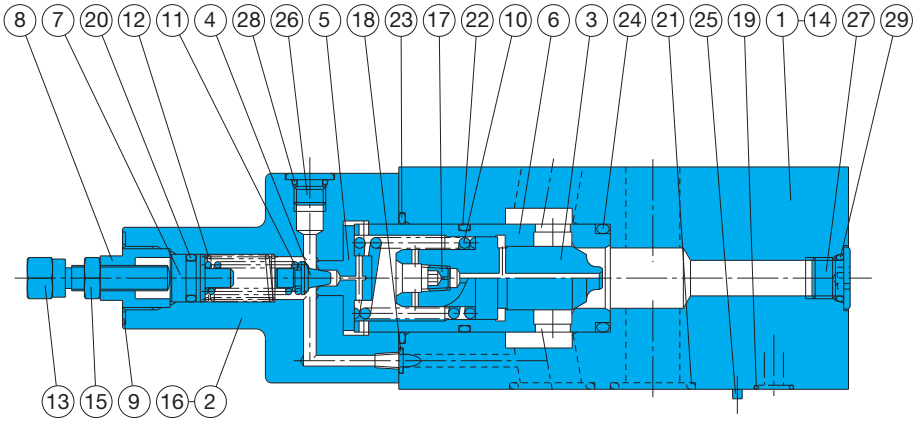
Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Seat
6	Seat
7	Sleeve
8	Plunger
9	Retainer
10	Spring
11	Spring
12	Screw kit
12_{-1}	Screw
12_{-2}	Nut
13	Plate
14	Screw
15	Plug
16	Plug
17	O-ring
18	O-ring
19	O-ring
20	O-ring
21	O-ring
22	O-ring
23	Backup ring
24	Pin
25	Handle kit
25_{-1}	Screw
25_{-2}	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	NBR-90 P5	–	–	2
18	O-ring	NBR-90 P7	1	2	1
19	O-ring	NBR-70-1 P10A	1	2	1
20	O-ring	AS568-014(NBR-90)	5	5	5
21	O-ring	NBR-90 P18	2	4	2
22	O-ring	AS568-119(NBR-90)	1	2	1
23	Backup ring	T2-P18	1	2	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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	NBR-90 P5	1
19	O-ring	AS568-012(NBR-90)	2
20	O-ring	NBR-70-1 P11	1
21	O-ring	AS568-118(NBR-90)	4
22	O-ring	AS568-122(NBR-90)	1
23	O-ring	AS568-127(NBR-90)	1
24	O-ring	NBR-90 P28	1
28	O-ring	NBR-90 P8	3
29	O-ring	NBR-90 P11	3

Note) The materials and hardness of the O-ring conform with JIS B2401.

Brake Modular Valve

20 to 30ℓ/min
0.8 to 21, 25MPa

Features

①This modular pressure control valve prevents abnormal pressure when the actuator stops, enabling smooth stops.

②Wide ranging applicability Maximum operating pressure:
25MPa{255kgf/cm²}

Pressure Adjustment Range:
0.8 to 21, 25MPa
{8.2 to 214, 255kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
ORO-G01-W1-20 W3	1/8	25 {255}	20	0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.5	ISO 4401-03-02-0-05
ORO-G01-A1-20 A3				0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.4	
ORO-G01-B1-20 B3				0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.4	
ORO-G03-W1-J50 W3	3/8	25 {255}	30	0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	4.8	ISO 4401-05-04-0-05
ORO-G03-A1-J50 A3				0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	4.0	
ORO-G03-B1-J50 B3				0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	4.0	

●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 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

Explanation of model No.

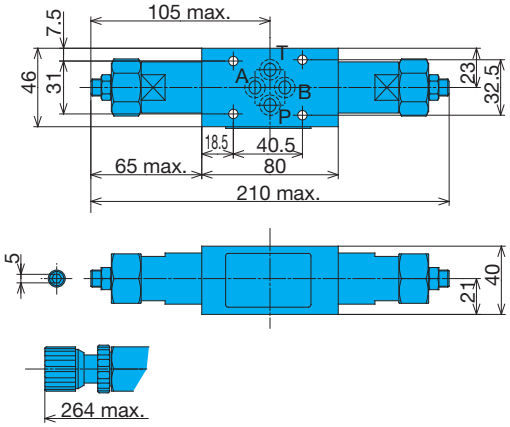
ORO – G 03 –A 3 – (K) – J50

- Design number — Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50: M8.
- Auxiliary symbol K: With handle
- Pressure adjustment range 1, 3
- Control port W: A, B ports A: A port B: B port
- Nominal diameter (size) 01, 03
- Mounting method G: Gasket type
- Break modulator valve

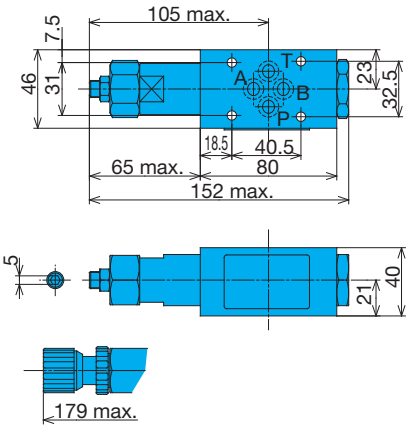
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

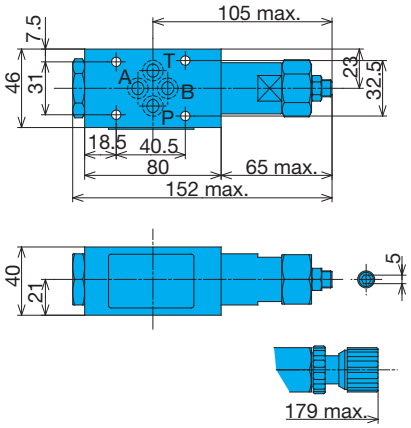
ORO-G01-W*-20



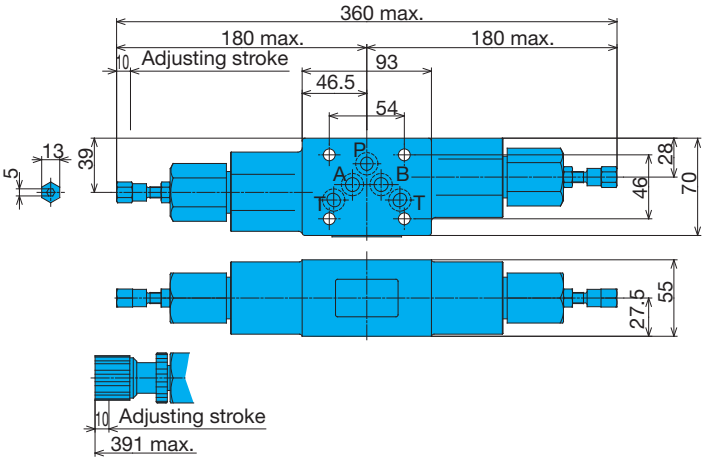
ORO-G01-A*-20



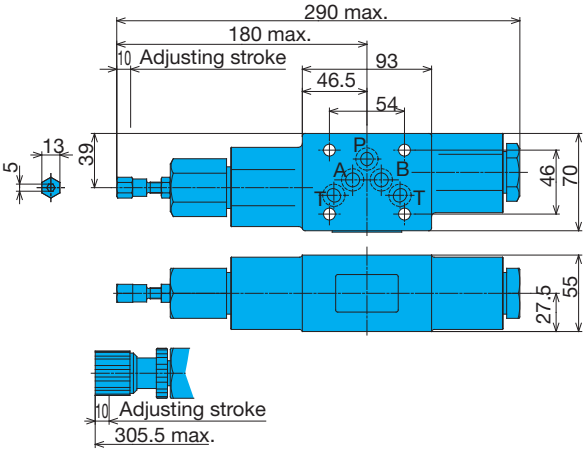
ORO-G01-B*-20



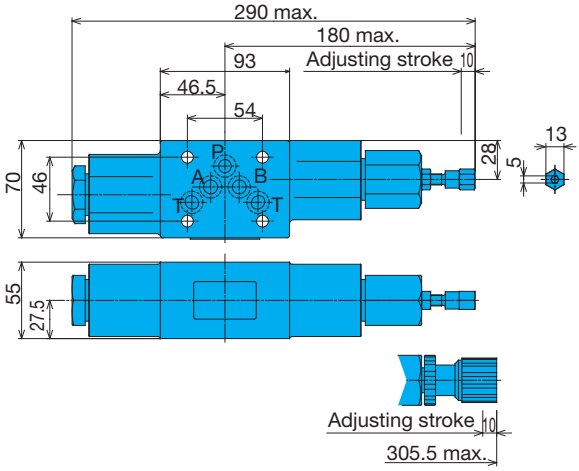
ORO-G03-W*-J50



ORO-G03-A*-J50



ORO-G03-B*-J50

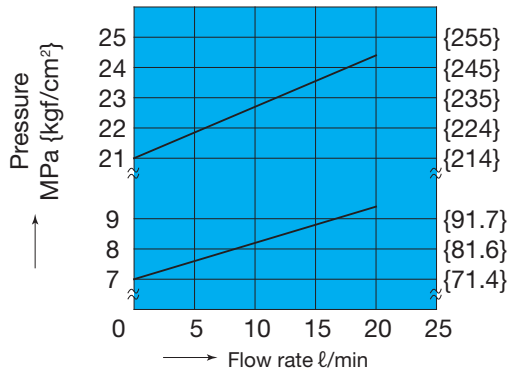


Performance Curves

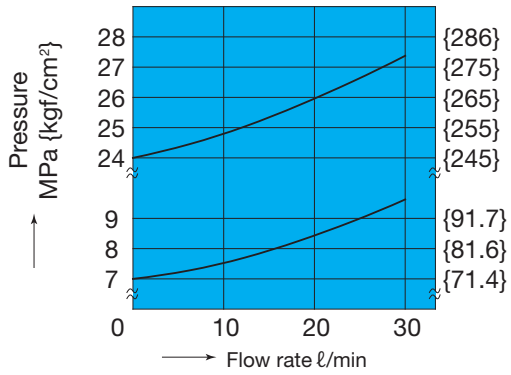
Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Pressure – Flow Rate Characteristics

ORO-G01-**-20

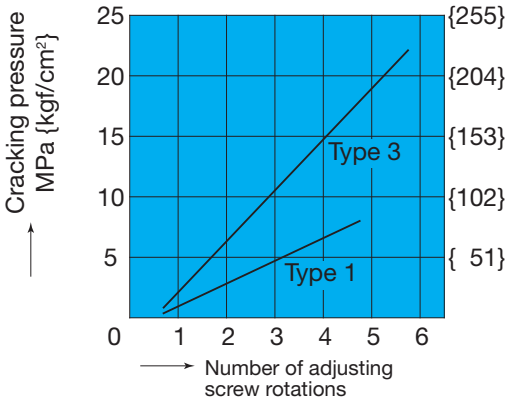


ORO-G03-**-J50

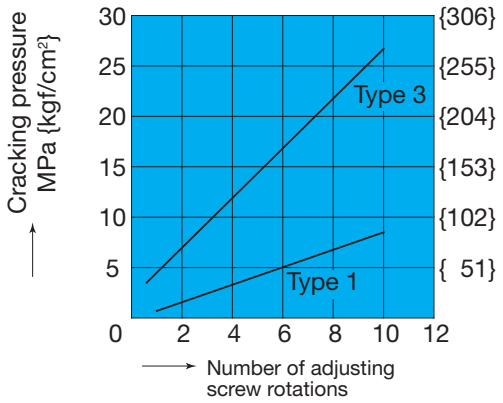


Number of Adjusting Screw Rotations – Pressure Characteristics

ORO-G01-**-20

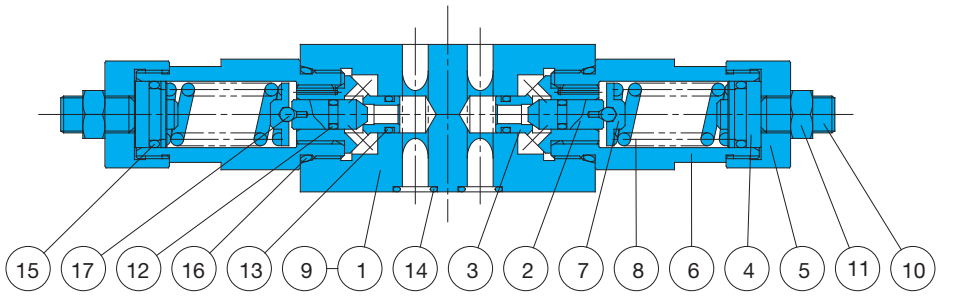


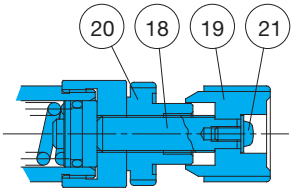
ORO-G03-**-J50



Cross-sectional Drawings

ORO-G01-W*-20





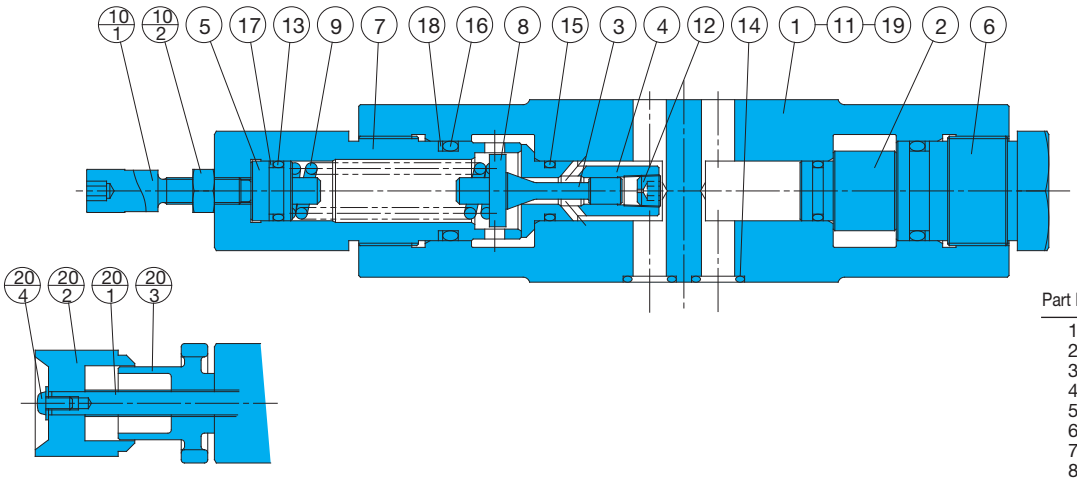
Part No.	Part Name
1	Body
2	Poppet
3	Seat
4	Plunger
5	Bushing
6	Retainer
7	Guide
8	Spring
9	Plate
10	Screw
11	Nut
12	O-ring
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Ball
18	Screw
19	Knob
20	Nut
21	Screw

Seal Part List (Kit Model Number BRBS-01R0*-0A)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
12	O-ring	NBR-70-1 P5	2	1	1
13	O-ring	NBR-90 P7	2	2	2
14	O-ring	AS568-012(NBR-90)	4	4	4
15	O-ring	NBR-90 P14	2	1	1
16	O-ring	NBR-90 P22	2	2	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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_{-1}	Screw
10_{-2}	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_{-1}	Screw
20_{-2}	Knob
20_{-3}	Nut
20_{-4}	Screw

Seal Part List (Kit Model Number BRES-03R0*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
13	O-ring	NBR-70-1 P14	2	1	1
14	O-ring	AS568-014(NBR90)	5	5	5
15	O-ring	NBR-90 P14	2	2	2
16	O-ring	NBR-90 P24	2	2	2
17	Backup ring	T2-P14	2	1	1
18	Backup ring	T2-P24	2	2	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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

20 to 50ℓ/min
0.8 to 21,25,35MPa

Features

①This modular relief valve provides maximum pressure control for a hydraulic circuit.

②Wide ranging applicability
Maximum Working Pressure: 25, 35 MPa {255, 357kgf/cm²}
Pressure Adjustment Range: 0.8 to 21, 25, 35 MPa {8.2 to 255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
ORD-G01-W1-20 W3	1/8	25{255}	20	0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.5	ISO 4401-03-02-0-05
ORD-G01-A1-20 A3				0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.4	
ORD-G01-B1-20 B3				0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.4	
ORD-G03-W1-J50 W3	3/8	25{255}	30	0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	4.8	ISO 4401-05-04-0-05
ORD-G03-A1-J50 A3				0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	4.0	
ORD-G03-B1-J50 B3				0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	4.0	
ORH-G04-DW1-10 DW3 DW5	1/2	35{357}	50	0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255} 7 to 35{71.4 to 357}	6.5	ISO 4401-07-06-0-05
ORH-G04-DA1-10 DA3 DA5				0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255} 7 to 35{71.4 to 357}	6.5	
ORH-G04-DB1-10 DB3 DB5				0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255} 7 to 35{71.4 to 357}	6.5	

●Handling

1. The pressure adjustment range is expressed in terms of 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 D-90 through D-95 if these items are required.
5. 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Explanation of model No.

01, 03 size

ORD – G 03 –W 3 – (K) – J50

- Design number — Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50: M8.
- Auxiliary symbol K: With handle
- Pressure adjustment range 1, 3
- Control port W: A, B ports A: A port B: B port
- Nominal diameter (size) 01, 03
- Mounting method G: Gasket type
- Direct relieve modular valve

Explanation of model No.

04 size

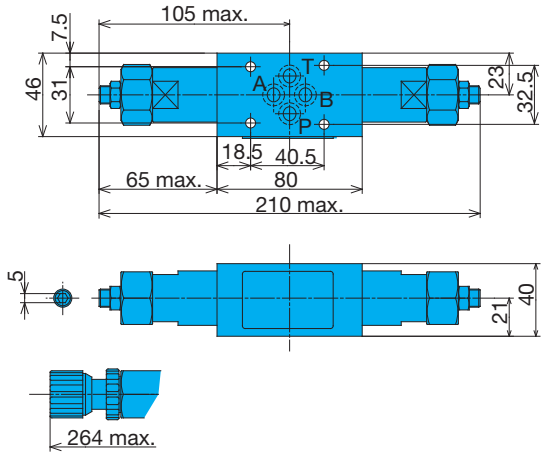
ORH – G 04 – D W 5 – 10

- 10: Design number
- 5: Pressure adjustment range 1, 3, 5
- W: Control port — W: A, B ports; A: A port; B: B port
- D: Function symbol — D: Direct type
- 04: Nominal diameter (size) 04
- G: Mounting method — G: Gasket type
- ORH: M35 Series relief modular valve

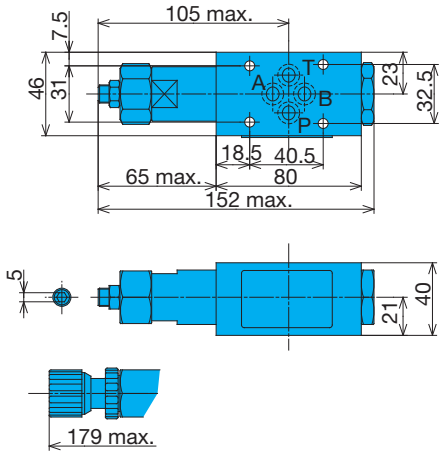
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

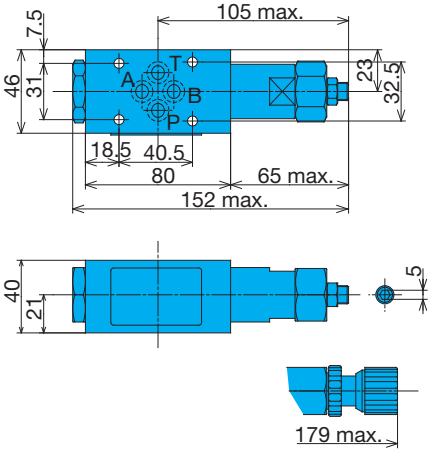
ORD-G01-W*-20



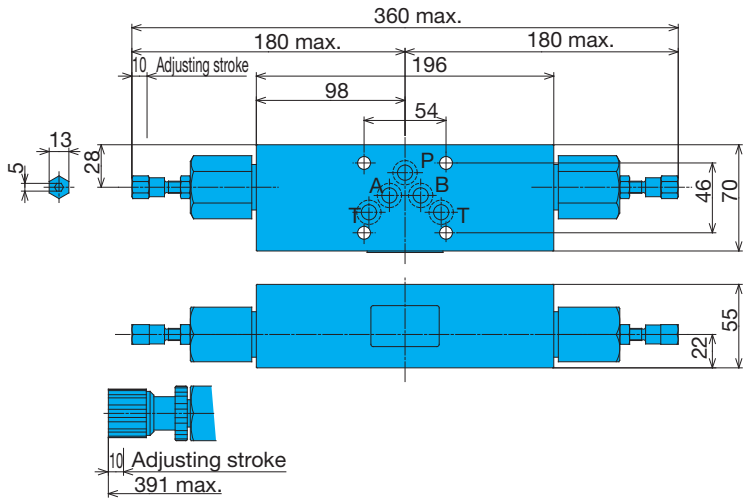
ORD-G01-A*-20



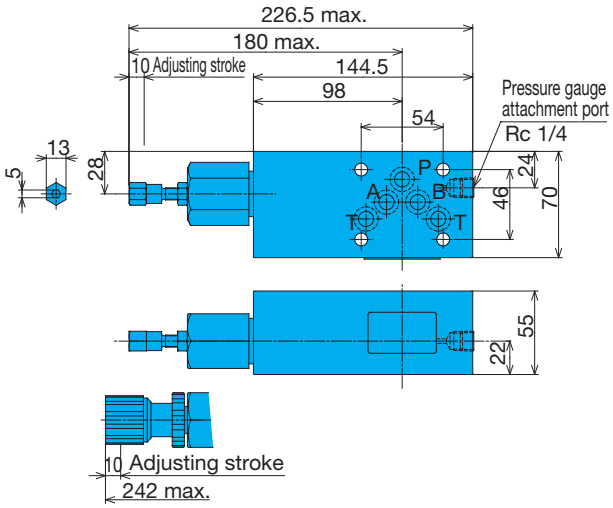
ORD-G01-B*-20



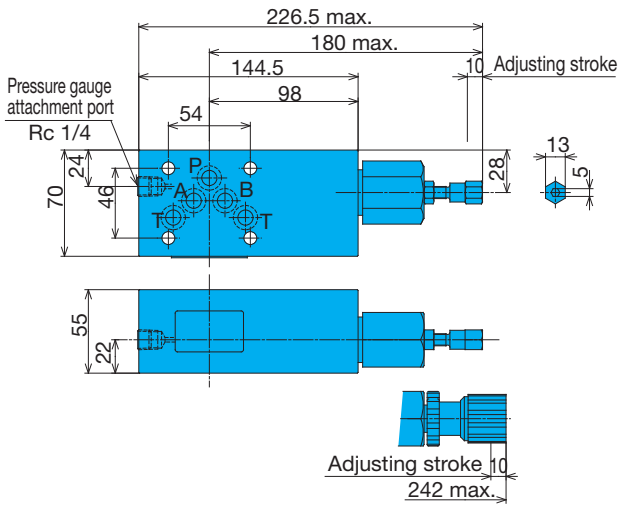
ORD-G03-W*-J50



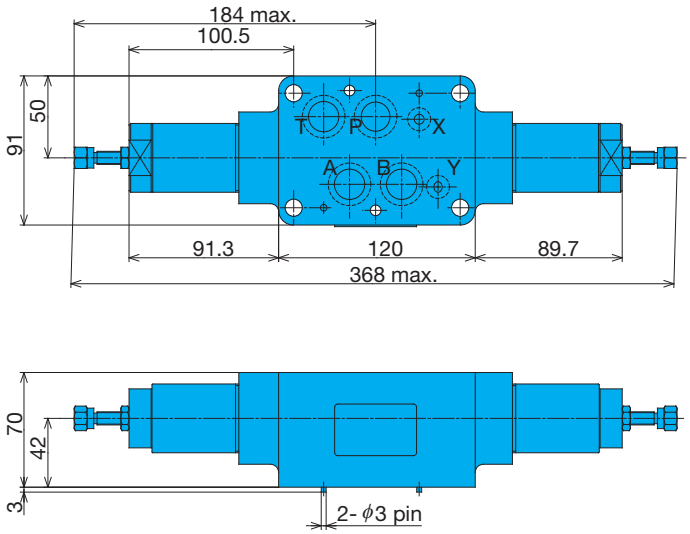
ORD-G03-A*-J50



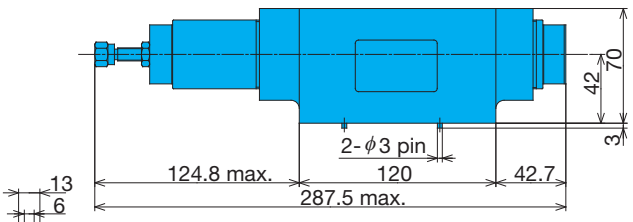
ORD-G03-B*-J50



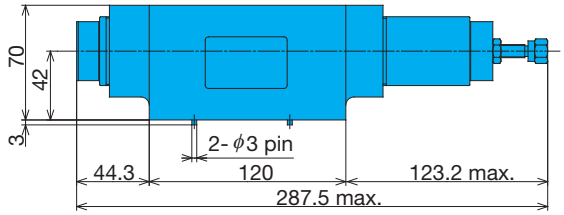
ORH-G04-DW*-10



ORH-G04-DA*-10



ORH-G04-DB*-10

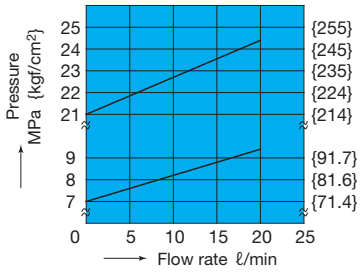


Performance Curves

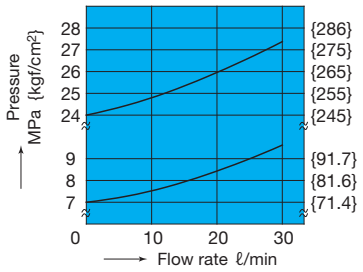
Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Pressure – Flow Rate Characteristics

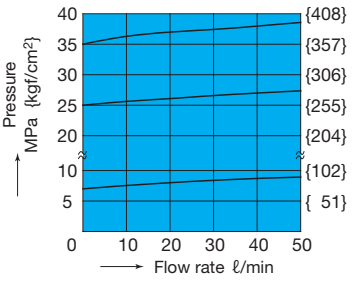
ORD-G01-**-20



ORD-G03-**-J50

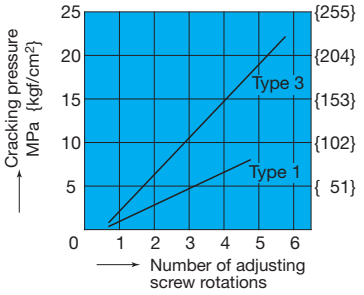


ORH-G04-DW*-10

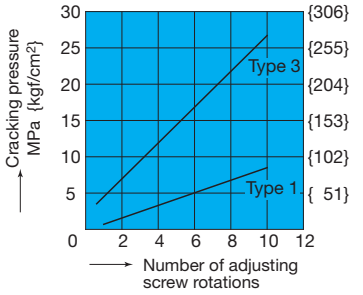


Number of Adjusting Screw Rotations – Pressure Characteristics

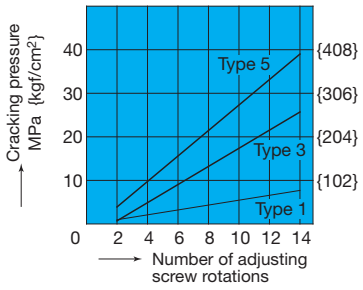
ORD-G01-**-20



ORD-G03-**-J50

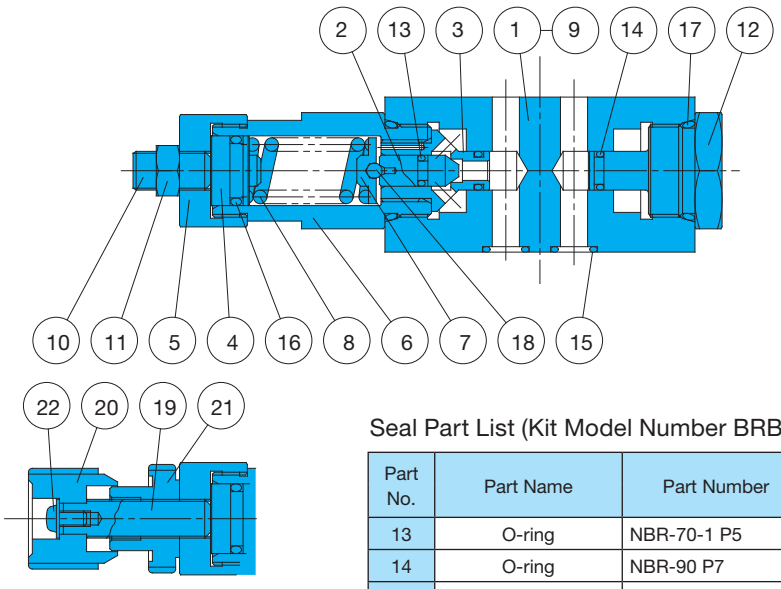


ORH-G04-DW*-10



Cross-sectional Drawings

ORD-G01-A*-20



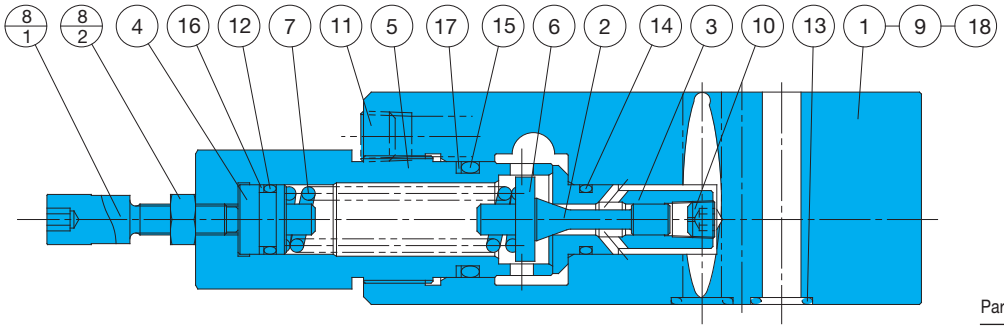
Seal Part List (Kit Model Number BRBS-01RD*-0A)

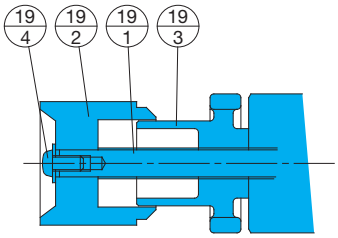
Part No.	Part Name	Part Number	Q'ty		
			W	A	B
13	O-ring	NBR-70-1 P5	2	1	1
14	O-ring	NBR-90 P7	2	2	2
15	O-ring	AS568-012(NBR-90)	4	4	4
16	O-ring	NBR-90 P14	2	1	1
17	O-ring	NBR-90 P22	2	2	2

Note) 1.The materials and hardness of the O-ring conform with JIS B2401.
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





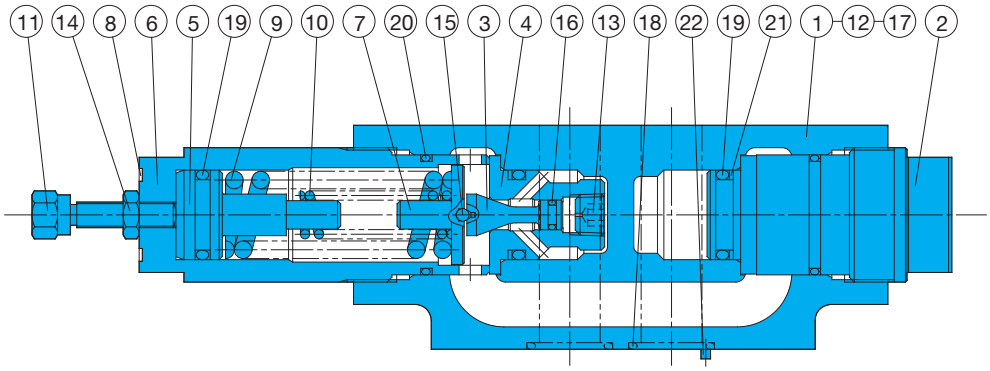
Part No.	Part Name
1	Body
2	Poppet
3	Seat
4	Plunger
5	Retainer
6	Guide
7	Spring
8	Screw kit
8-1	Screw
8-2	Nut
9	Plate
10	Orifice
11	Plug
12	O-ring
13	O-ring
14	O-ring
15	O-ring
16	Backup ring
17	Backup ring
18	Pin
19	Handle kit
19-1	Screw
19-2	Knob
19-3	Nut
19-4	Screw

Seal Part List (Kit Model Number BRES-03RD*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
12	O-ring	NBR-70-1 P14	1	1	2
13	O-ring	AS568-014(NBR-90)	5	5	5
14	O-ring	NBR-90 P14	1	1	2
15	O-ring	NBR-90 P24	1	1	2
16	Backup ring	T2-P14	1	1	2
17	Backup ring	T2-P24	1	1	2

Note) 1.The materials and hardness of the O-ring conform with JIS B2401.
2.Backup ring indicates JIS B2407-T2-**.
3.Specify W, A, or B for the asterisk (*) in the kit model number.

ORH-G04-DA*-10



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

Seal Part List (Kit Model Number BRKS-04RD*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
16	O-ring	NBR-70-1 P6	2	1	1
17	O-ring	AS568-012(NBR-90)	2	2	2
18	O-ring	AS568-118(NBR-90)	4	4	4
19	O-ring	NBR-90 P22A	4	3	3
20	O-ring	AS568-125(NBR-70-1)	2	2	2
21	Backup ring	T2-P22A	2	2	2

Note) 1.The materials and hardness of the O-ring conform with JIS B2401.
2.Backup ring indicates JIS B2407-T2-**.
3.Specify W, A, or B for the asterisk (*) in the kit model number.

Pressure Reducing Modular Valve

40 to 300ℓ/min
25,35MPa

Features

①This modular valve makes the pressure in part of the circuit lower than that of the main circuit.

②Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a constant level.

③Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OG-G01-PC-21 P1 P2	1/8	25 {255}	50	0.15 to 3.5{ 1.5 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 16{35.7 to 163}	1.3	ISO 4401-03-02-0-05
OG-G03-PC-(V)-J51 P1 P3	3/8	25 {255}	80 but C : 50	0.25 to 3.5{ 2.5 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	3.8	ISO 4401-05-04-0-05
OGH-G04-P1-10 P3	1/2	35 {357}	300	0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	8.0	ISO 4401-07-06-0-05

●Handling

1 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 ϕ 4mm 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".

2 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.

3 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.

4 Note that a change in drain back pressure causes a change in setting pressure.

5 With the 01, 03 sizes, the flow rate is limited at low pressures. See the Pressure- Flow Rate Characteristics on pages D-30 for more information.

6 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

7 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

8 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.

Explanation of model No.

01, 03, size

OG – G 03 – P 1 – (B) – J51

- Design number — Note: For 03 size, relationship between mounting bolts and design number is indicated as J51: M6, 51; M8.
- Auxiliary symbol — B: See notes 2 and 3 under "Handling." K: With handle (01, 03 size) V: With vent port (03 size)
- Pressure adjustment range C, 1, 2, 3
- Control port — P: P port
- Nominal diameter (size) 01, 03
- Mounting method — G: Gasket type
- Pressure reducing modular valve

Explanation of model No.

04 size

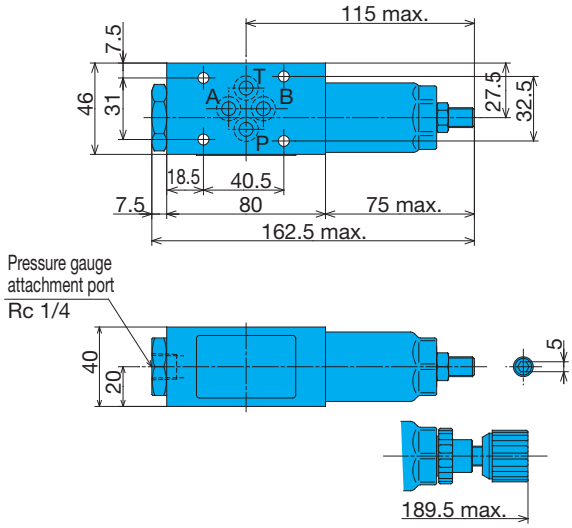
OGH – G 04 – P 1 – (B) – 10

- 10: Design number
- (B): Auxiliary symbol B: See note 3 under "Handling."
- 1: Pressure adjustment range 1, 3
- P: Control port P: P port
- 04: Nominal diameter (size) 04
- G: Mounting method G: Gasket type
- OGH: M35 Series reducing modular valve

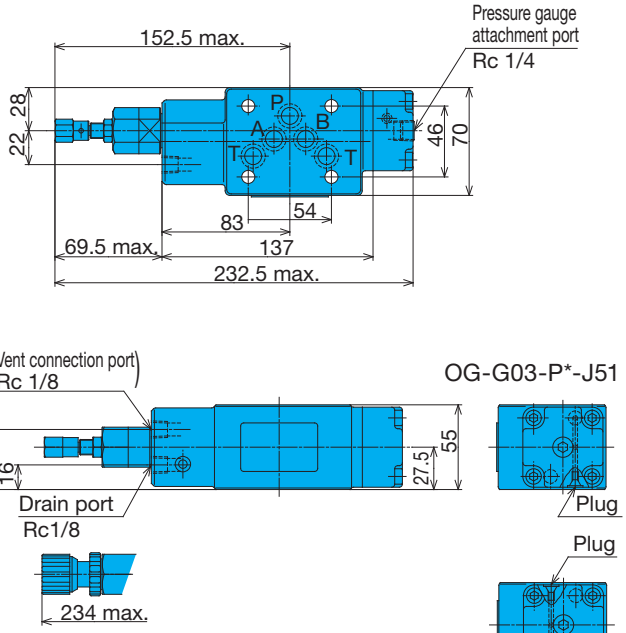
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

OG-G01-P*-21



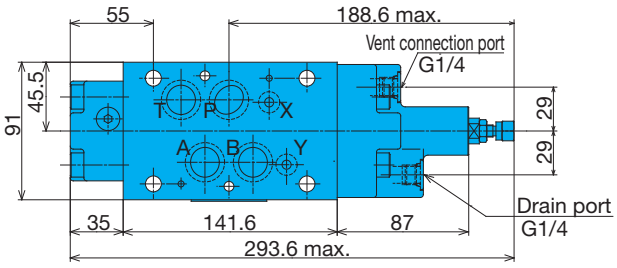
OG-G03-P*-(V)-J51

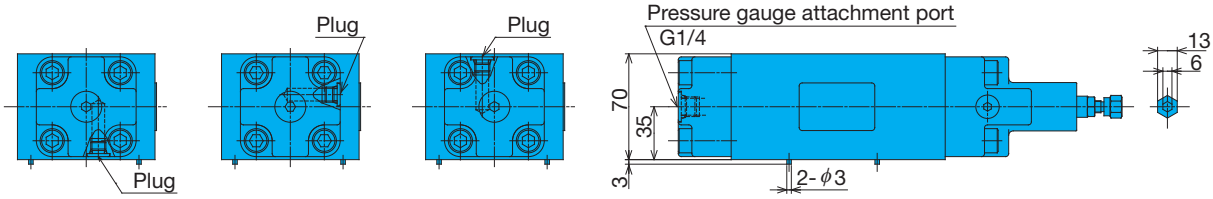


Note) 1. Conversion to B port control is possible by changing the back cover. Port control is determined by plug orientation.
2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
3. The tightening torque of the back cover bolts is: (M6) 10 to 13Nm (102 to 133 kgf-cm).

OGH-G04-P*-10

Note) 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) 45 to 55Nm (460 to 560 kgf-cm).





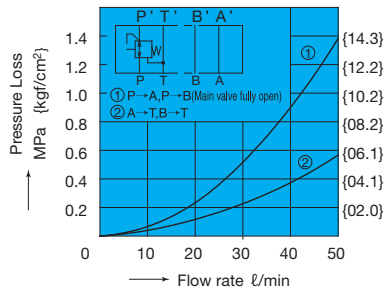
OGH-G04-B*-10 OGH-G04-A*-10 OGH-G04-P*-10

Performance Curves

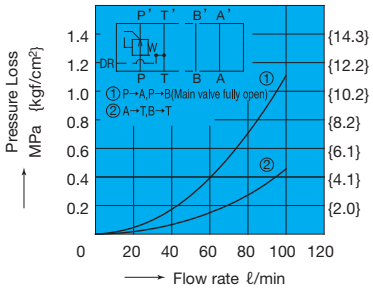
Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

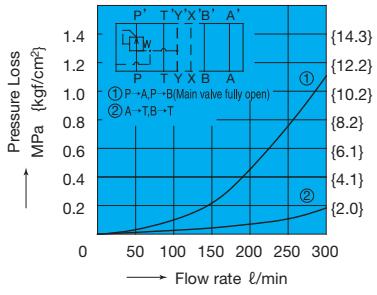
OG-G01-P*-21



OG-G03-P*-J51

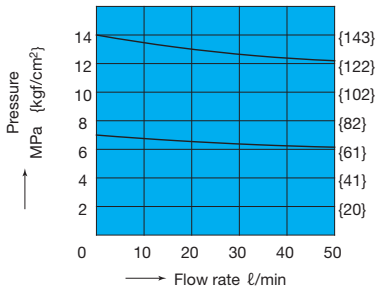


OGH-G04-**-10

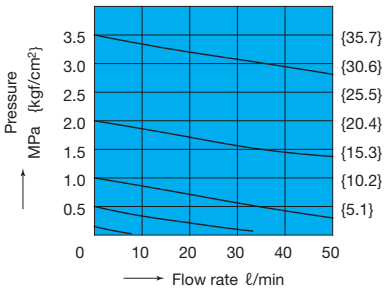


Pressure – Flow Rate Characteristics

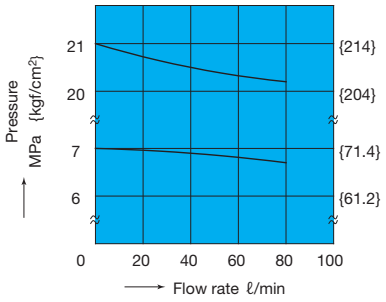
OG-G01-P$^{1}_{2}$-21



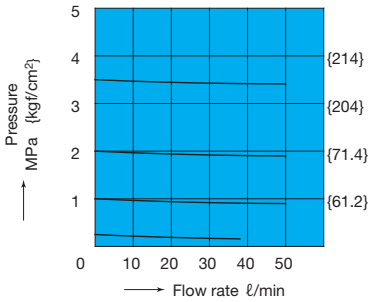
OG-G01-PC-21



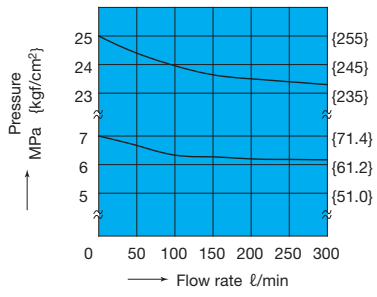
OG-G03-P$^{1}_{3}$-J51



OG-G03-PC-J51

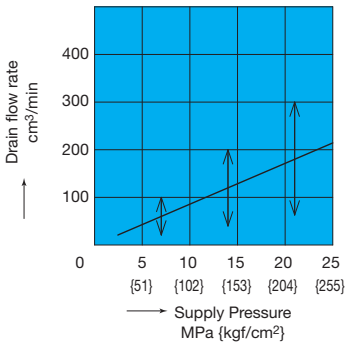


OGH-G04-**-10

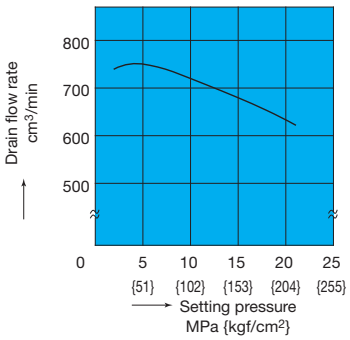


Pressure – Drain Rate Characteristics

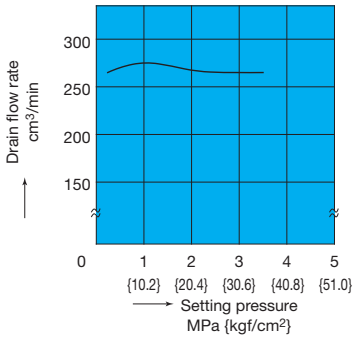
OG-G01-P*-21



OG-G03-P*-J51

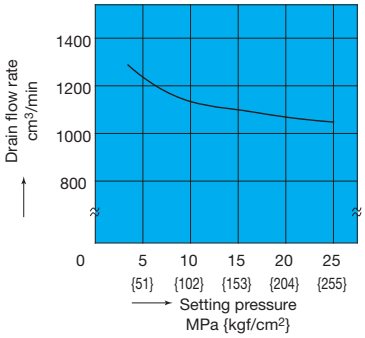


OG-G03-PC-J51



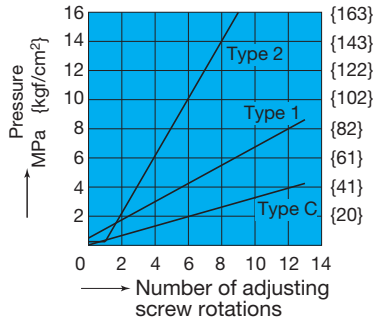
Determine it through the maximum value when designing the circuit.

OGH-G04-P3-10

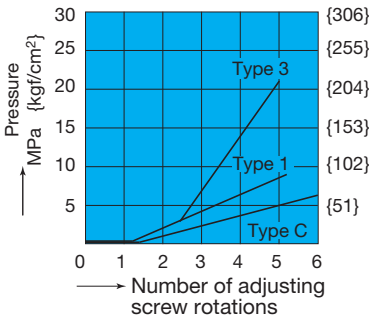


Number of Adjusting Screw Rotations – Pressure Characteristics

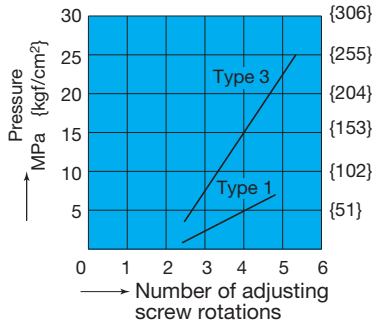
OG-G01-P*-21



OG-G03-P*-51

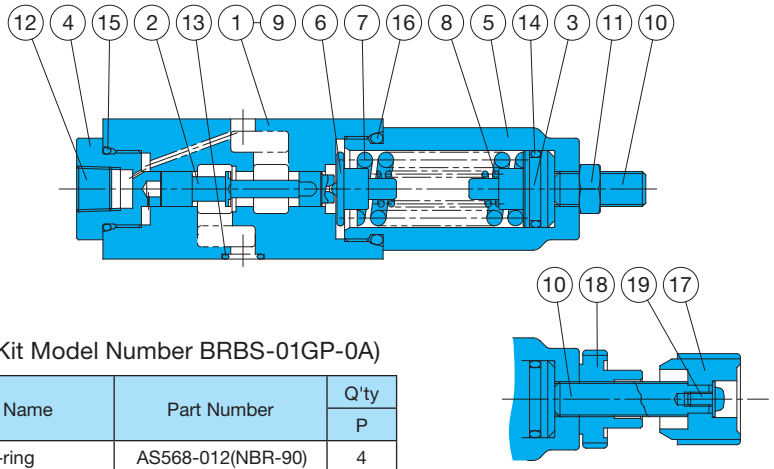


OGH-G04-P*-10



Cross-sectional Drawings

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

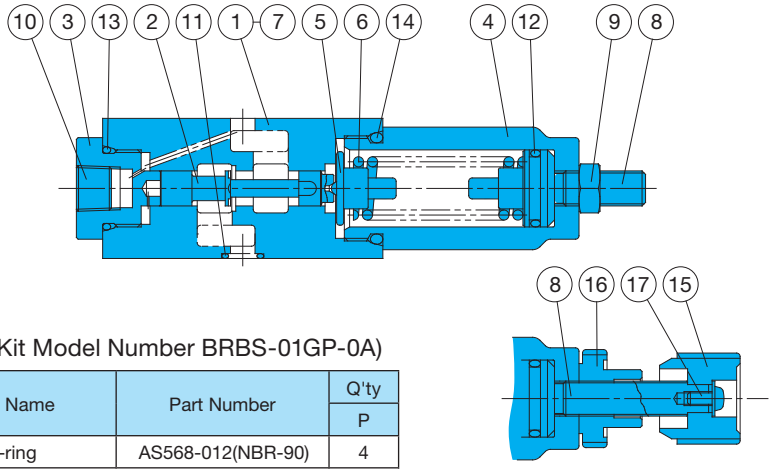
Seal Part List (Kit Model Number BRBS-01GP-0A)

Part No.	Part Name	Part Number	Q'ty
			P
13	O-ring	AS568-012(NBR-90)	4
14	O-ring	NBR-70-1 P18	1
15	O-ring	NBR-90 P20	1
16	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

Note) Part number 8 is used in the case of pressure adjustment range type 2 only.

OG-G01-PC-21



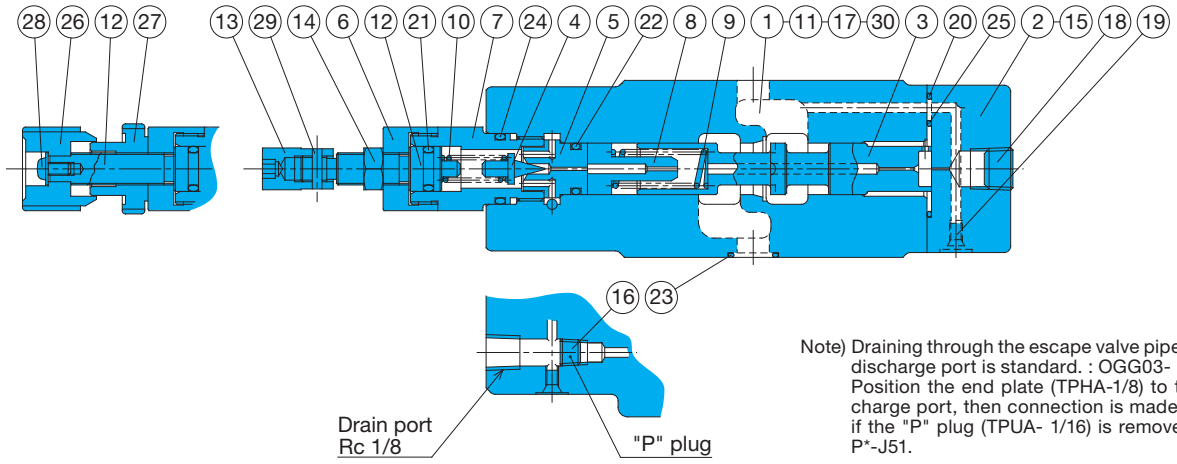
Part No.	Part Name
1	Body
2	Spool
3	Bushing
4	Retainer
5	Guide
6	Spring
7	Plate
8	Screw
9	Nut
10	Plug
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Knob
16	Nut
17	Screw

Seal Part List (Kit Model Number BRBS-01GP-0A)

Part No.	Part Name	Part Number	Q'ty
			P
11	O-ring	AS568-012(NBR-90)	4
12	O-ring	NBR-70-1 P18	1
13	O-ring	NBR-90 P20	1
14	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OG-G03-P*-J51



Note) Draining through the escape valve piped to the drain discharge port is standard. : OGG03- 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.

Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Seat
6	Bushing
7	Retainer
8	Choke
9	Spring
10	Spring
11	Plate
12	Screw
13	Nut

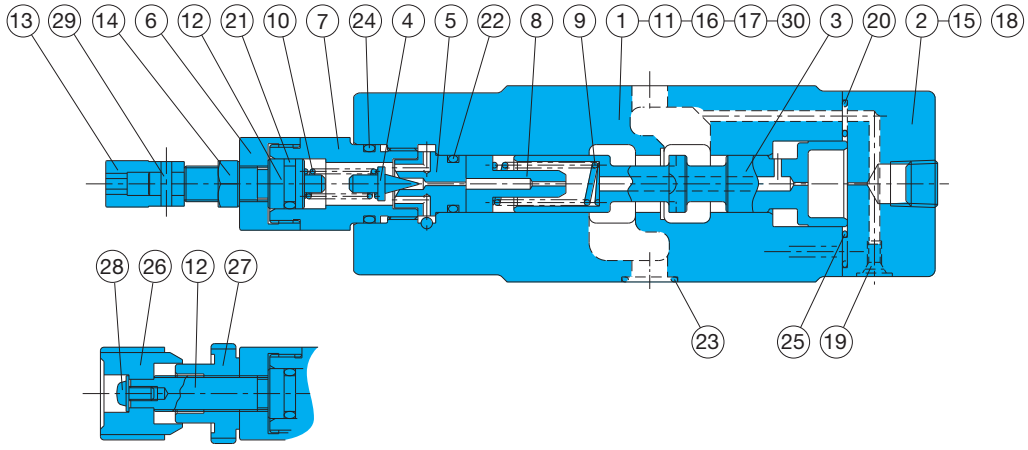
Part No.	Part Name
14	Nut
15	Screw
16	Plug
17	Plug
18	Plug
19	Plug
20	O-ring
21	O-ring
22	O-ring
23	O-ring
24	O-ring
25	O-ring
26	Knob
27	Nut
28	Screw
29	Pin
30	Pin

Seal Part List (Kit Model Number BRES-03GP-1A)

Part No.	Part Name	Part Number	Q'ty
			P
20	O-ring	NBR-90 P6	2
21	O-ring	NBR-70-1 P10A	1
22	O-ring	NBR-90 P12	1
23	O-ring	AS568-014(NBR-90)	5
24	O-ring	NBR-90 P18	1
25	O-ring	AS568-023(NBR-90)	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OG-G03-PC-J51



Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Seat
6	Bushing
7	Retainer
8	Choke
9	Spring
10	Spring
11	Plate
12	Screw
13	Nut
14	Nut
15	Screw

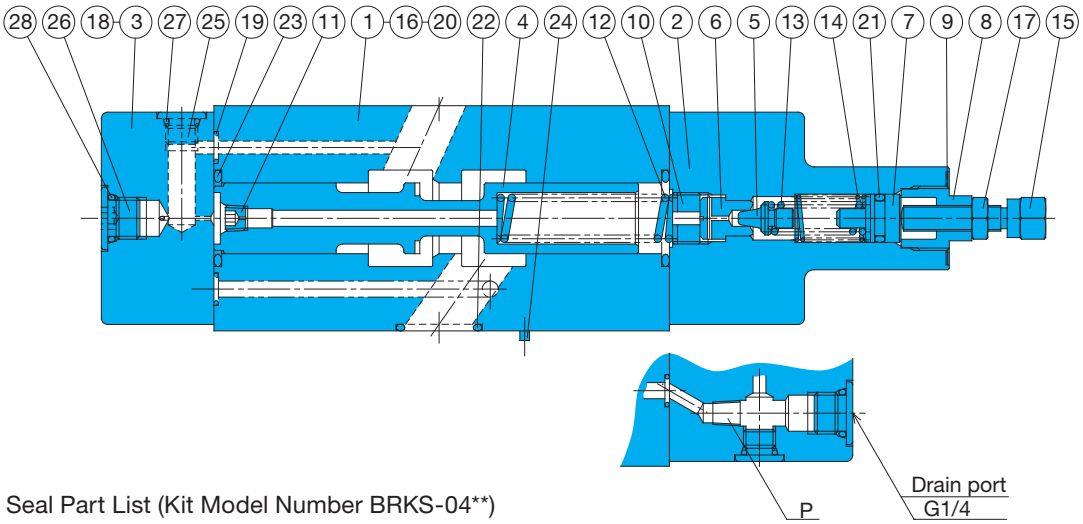
Part No.	Part Name
16	Plug
17	Plug
18	Plug
19	Plug
20	O-ring
21	O-ring
22	O-ring
23	O-ring
24	O-ring
25	O-ring
26	Knob
27	Nut
28	Screw
29	Pin
30	Pin

Seal Part List (Kit Model Number BRES-03GP*-1A)

Part No.	Part Name	Part Number	Q'ty
			P
20	O-ring	NBR-90 P6	2
21	O-ring	NBR-70-1 P10A	1
22	O-ring	NBR-90 P12	1
23	O-ring	AS568-014(NBR-90)	5
24	O-ring	NBR-90 P18	1
25	O-ring	AS568-023(NBR-90)	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OGH-G04-P*-10



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-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.

Seal Part List (Kit Model Number BRKS-04**)

Part No.	Part Name	Part Number	Q'ty	
			G	GB
19	O-ring	NBR-90 P7	4	4
20	O-ring	AS568-012(NBR-90)	2	2
21	O-ring	NBR-70-1 P11	1	1
22	O-ring	AS568-118(NBR-90)	4	4
23	O-ring	NBR-90 G25	2	2
27	O-ring	NBR-90 P8	4	4
28	O-ring	NBR-90 P11	3	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify G (internal drain) or GB (external drain) for the asterisk (*) in the kit model number.

01 Balanced Piston Type Pressure Reducing Modular Valve

40ℓ/min
0.15 to 25MPa

Features

①This modular valve makes the pressure in part of the circuit lower than the main circuit.
②Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a constant level.
③Compared 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.
④Maximum operating pressure: 25MPa {255kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OGB-G01-PC-20 P1 P3	1/8	25 {255}	40	0.15 to 3.5{ 1.5 to 35.7} 0.8 to 7 { 8.2 to 71.4} 3.5 to 21 {35.7 to 214}	1.9	ISO 4401-03-02-0-05
OGB-G01-AC-20 A1 A3				0.15 to 3.5{ 1.5 to 35.7} 0.8 to 7 { 8.2 to 71.4} 3.5 to 21 {35.7 to 214}	1.9	
OGB-G01-BC-20 B1 B3				0.15 to 3.5{ 1.5 to 35.7} 0.8 to 7 { 8.2 to 71.4} 3.5 to 21 {35.7 to 214}	1.9	

Explanation of model No.

OGB – G 01 – P 1 – (K) – 20

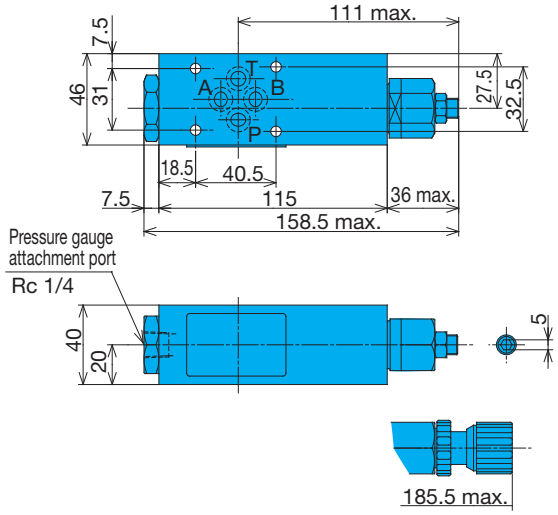
- Design number
- Auxiliary symbol K: With handle
- Pressure adjustment range C, 1, 3
- Control port P: P port A: A port B: B port
- Nominal diameter (size) 01
- Mounting method G: Gasket type
- Balanced piston type pressure reducing modular valve

●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 D-90 through D-95 if these items are required.

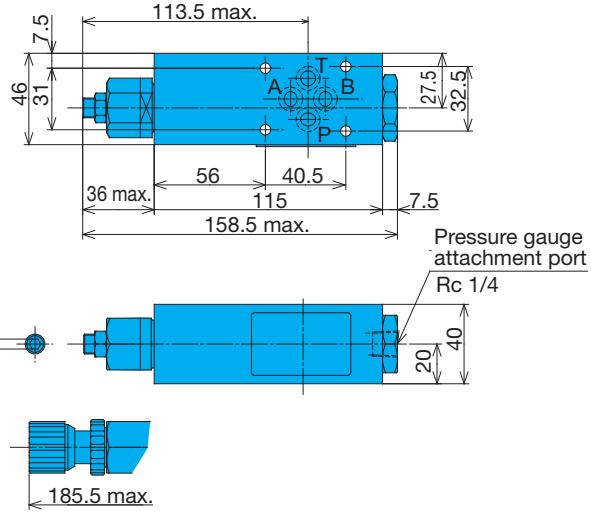
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

OGB-G01-$^{P}_{A}$*-20



OGB-G01-B*-20

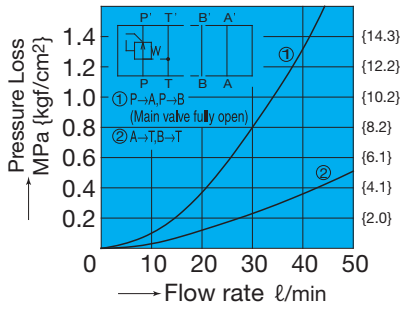


Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

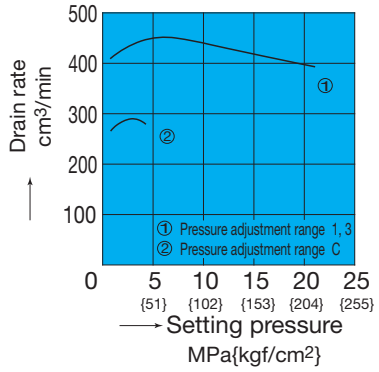
Pressure Loss Characteristics

OGB-G01-P*-20



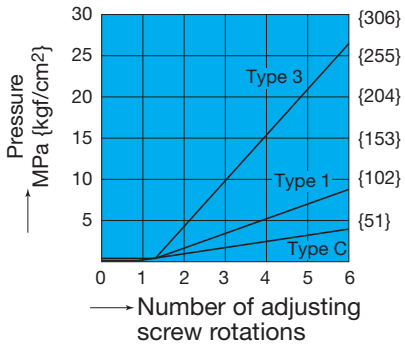
Pressure – Drain Rate Characteristics

OGB-G01-**-20



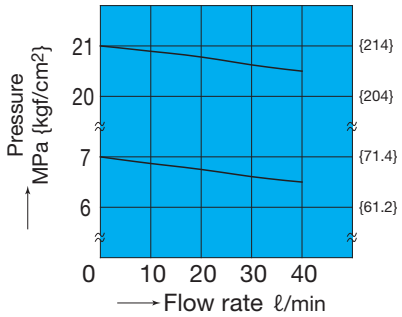
Number of Adjusting Screw Rotations – Pressure Characteristics

OGB-G01-P*-20

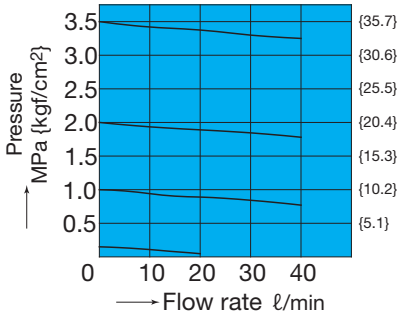


Pressure – Flow Rate Characteristics

OGB-G01-*$^{1}_{3}$-20

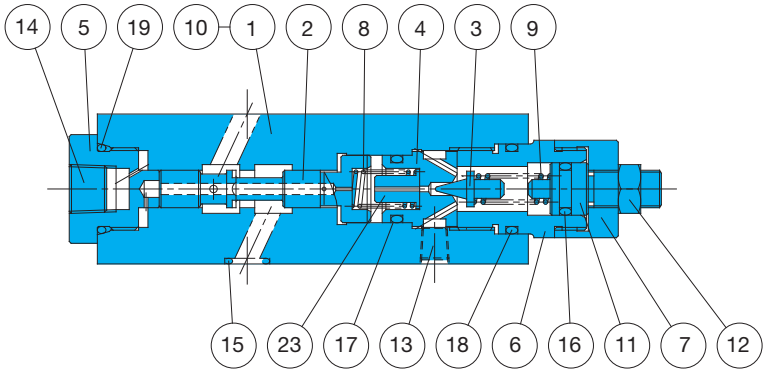


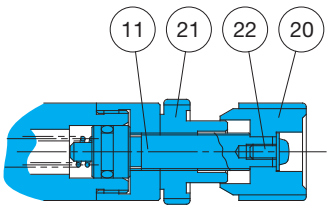
OGB-G01-*C-20



Cross-sectional Drawing

OGB-G01-P*-20





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

Seal Part List (Kit Model Number BRBS-01GB*-0A)

Part No.	Part Name	Part Number	Q'ty		
			P	A	B
15	O-ring	AS568-012(NBR-90)	4	4	4
16	O-ring	NBR-70-1 P10A	1	1	1
17	O-ring	NBR-90 P14	1	1	1
18	O-ring	NBR-90 P20	1	1	1
19	O-ring	NBR-90 P20	1	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify P, A, or B for the asterisk (*) in the kit model number.

Pressure Reducing Modular Valve

40 to 300ℓ/min
25,35MPa

Features

①This modular valve makes the pressure in part of the circuit lower than the main circuit.

②Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a constant level.

③Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OG-G01-AC-21 A1 A2	1/8	25{255}	50	0.15 to 3.5{ 1.5 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 16{35.7 to 163}	1.3	ISO 4401-03-02-0-05
OG-G01-BC-21 B1 B2				0.15 to 3.5{ 1.5 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 16{35.7 to 163}	1.3	
OG-G03-AC-J51 A1 A3	3/8	25{255}	80 but C : 50	0.25 to 3.5{ 2.5 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	3.8	ISO 4401-05-04-0-05
OG-G03-BC-J51 B1 B3				0.25 to 3.5{ 2.5 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	3.8	
OGH-G04-A1-10 A3	1/2	35{357}	300	0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	8.0	ISO 4401-07-06-0-05
OGH-G04-B1-10 B3				0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	8.0	

●Handling

1 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 ϕ4mm that is no longer than three meters is recommended. Vent piping cannot be used with the 01, 03 sizes.

2 With the 01, 03 sizes, the flow rate is limited at low pressures. See the Pressure- Flow Rate Characteristics on page D-40 and D-41 for more information.

3 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.

4 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.

5 Note that a change in drain back pressure causes a change in setting pressure.

6 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

7 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

8 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.

9 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.

Explanation of model No.

01, 03 size

OG – G 03 –B 1 – (B) – J51

- J51: Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J51: M6, 51; M8.
- (B): Auxiliary symbol B: See notes 3 and 4 under "Handling." K: With handle (01, 03 size)
- 1: Pressure adjustment range C, 1, 2, 3
- B: Control port A: A port B: B port
- 03: Nominal diameter (size) 01, 03
- G: Mounting method G: Gasket type
- OG: Pressure reducing (and check) modular valve

Explanation of model No.

04 size

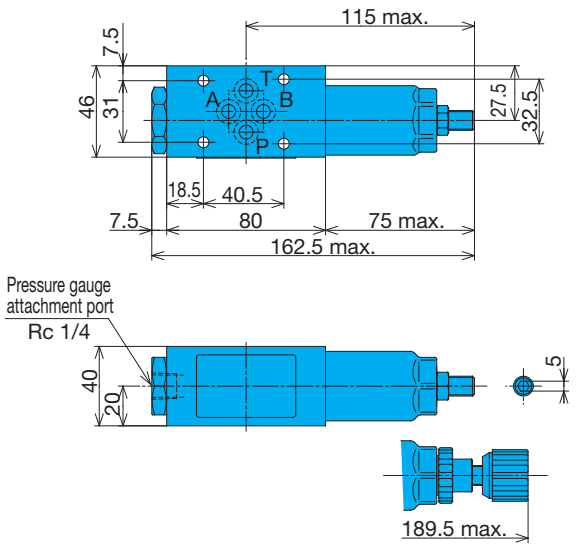
OGH – G 04 – A 1 – (B) – 10

- Design number
- Auxiliary symbol B: See note 4 under "Handling."
- Pressure adjustment range 1, 3
- Control port A: A port B: B port
- Nominal diameter (size) 04
- Mounting method G: Gasket type
- M35 Series pressure reducing modular valve

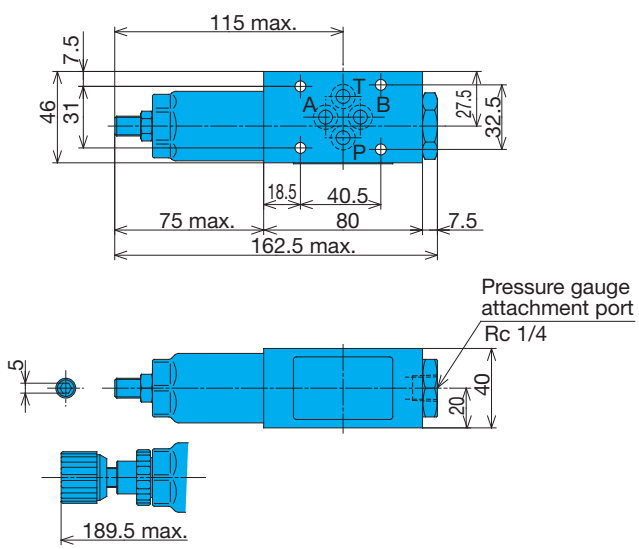
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

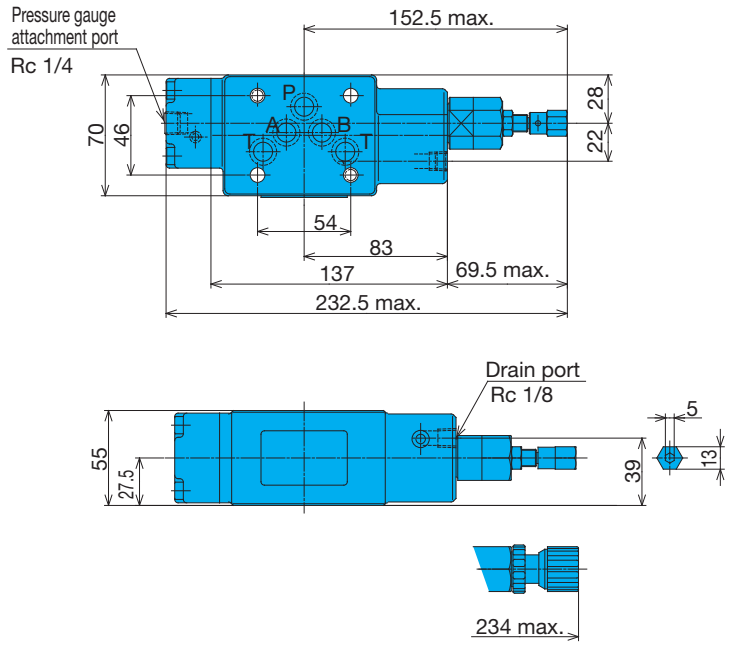
OG-G01-A*-21



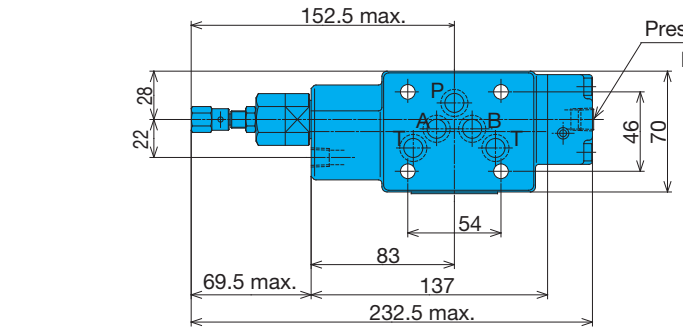
OG-G01-B*-21



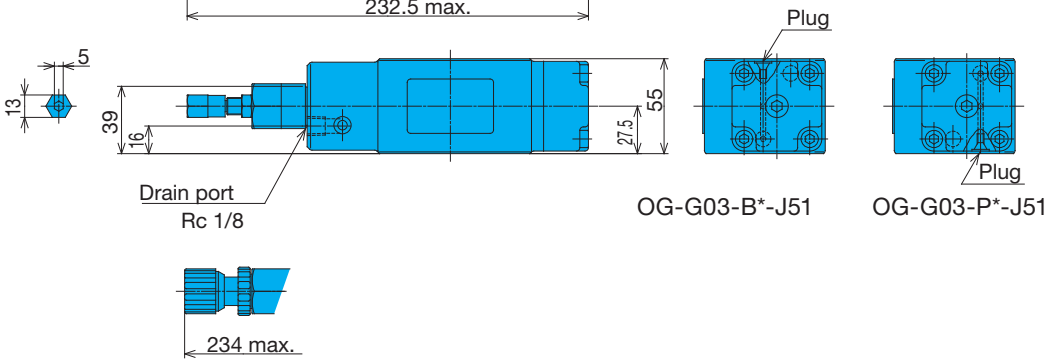
OG-G03-A*-J51



OG-G03-B*-J51



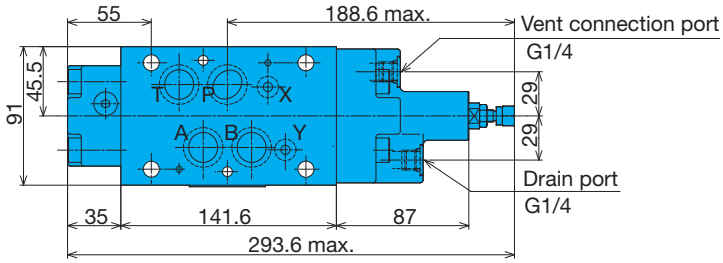
Note) 1. Conversion to P port control is possible by changing the back cover. Port control is determined by plug orientation.
2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
3. The tightening torque of the back cover bolts is: (M6) 10 to 13Nm (102 to 133 kgf-cm).

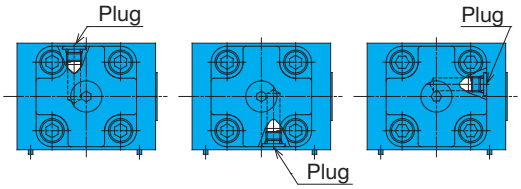


OG-G03-B*-J51 OG-G03-P*-J51

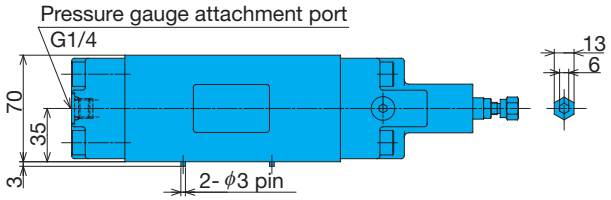
OGH-G04-A*-10

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) 45 to 55Nm (460 to 560 kgf-cm).





OGH-G04-P*-10 OGH-G04-B*-10 OGH-G04-A*-10

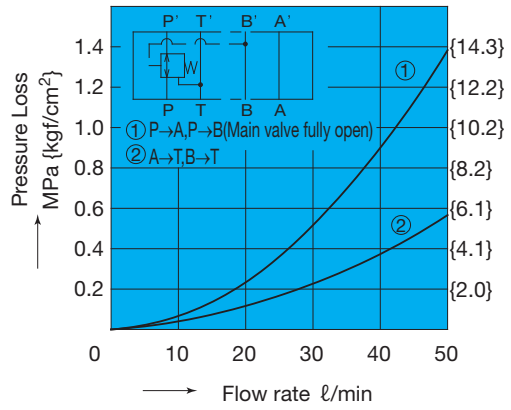


Performance Curves

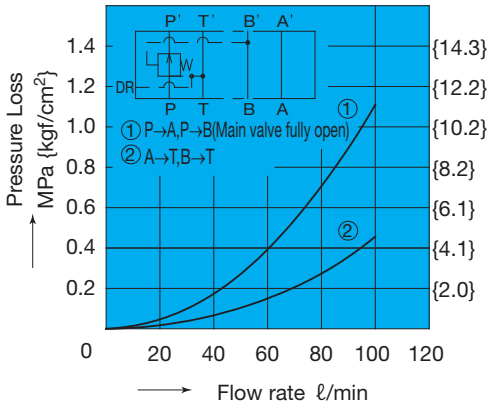
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Curve

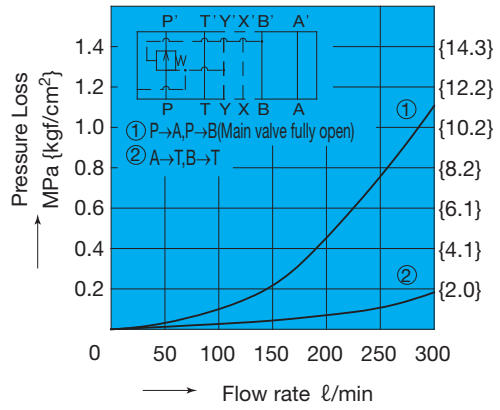
OG-G01-B*-21



OG-G03-B*-J51

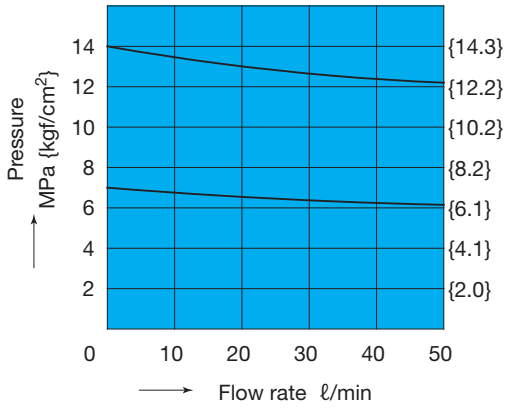


OGH-G04-**-10

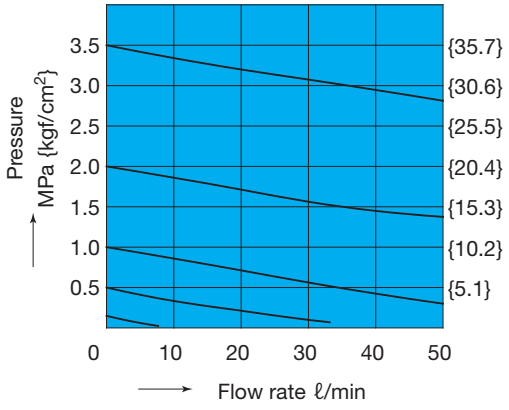


Pressure – Flow Rate Characteristics

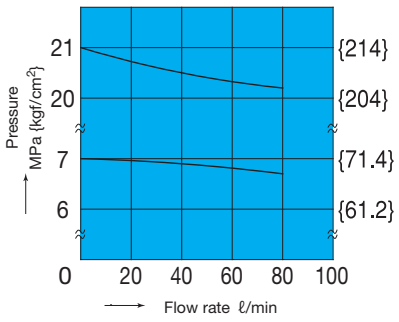
OG-G01-B$^{1}_{2}$-21



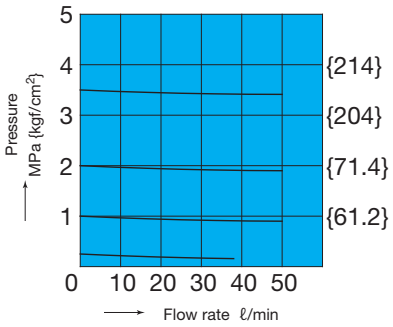
OG-G01-BC-21



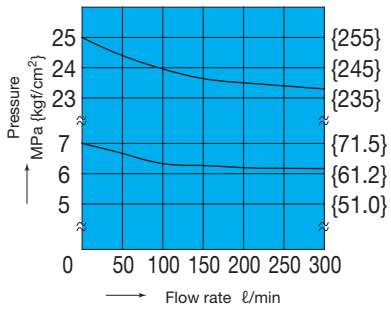
OG-G03-B^{1}_{3}-J51



OG-G03-BC-J51

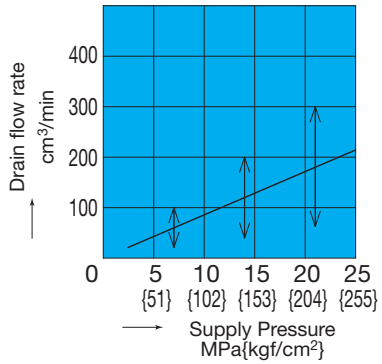


OGH-G04-**-10

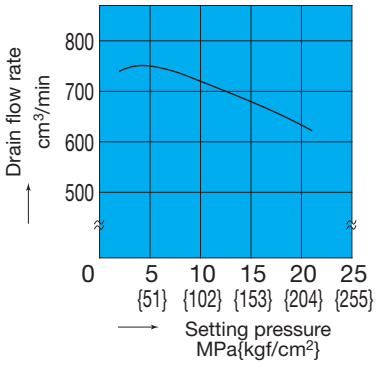


Pressure – Drain Rate Characteristics

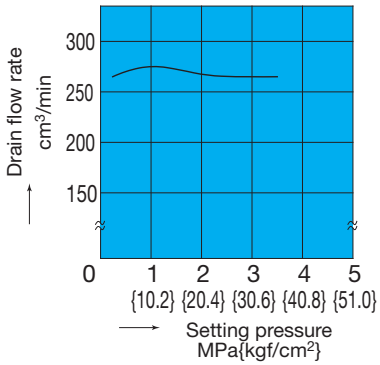
OG-G01-B*-21



OG-G03-B*-J51

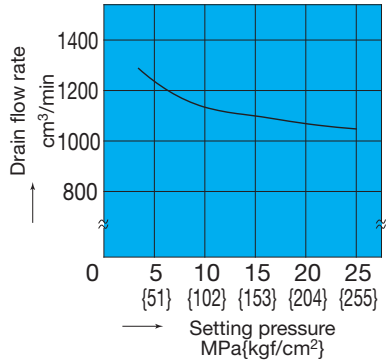


OG-G03-BC-J51



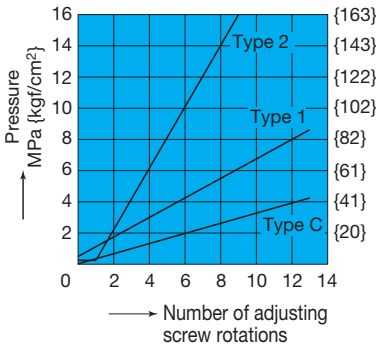
Determine it through the maximum value when designing the circuit.

OGH-G04-*3-10

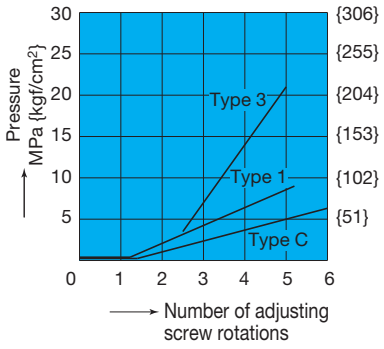


Number of Adjusting Screw Rotations – Pressure Characteristics

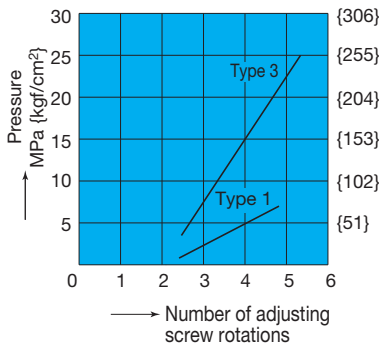
OG-G01-**-21



OG-G03-**-*-51

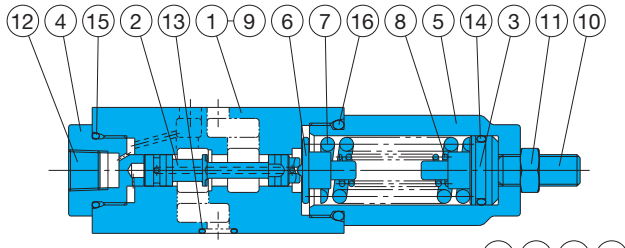


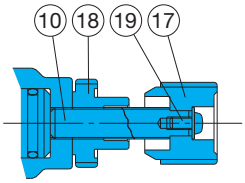
OGH-G04-**-10



Cross-sectional Drawings

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

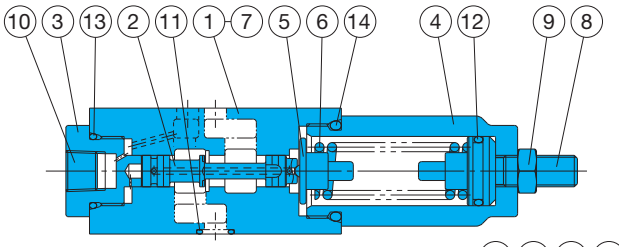
Seal Part List (Kit Model Number BRBS-01GP-0A)

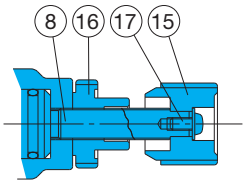
Part No.	Part Name	Part Number	Q'ty
13	O-ring	AS568-012(NBR-90)	4
14	O-ring	NBR-70-1 P18	1
15	O-ring	NBR-90 P20	1
16	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

Note) Part number 8 is used in the case of pressure adjustment range type 2 only.

OG-G01-AC-21





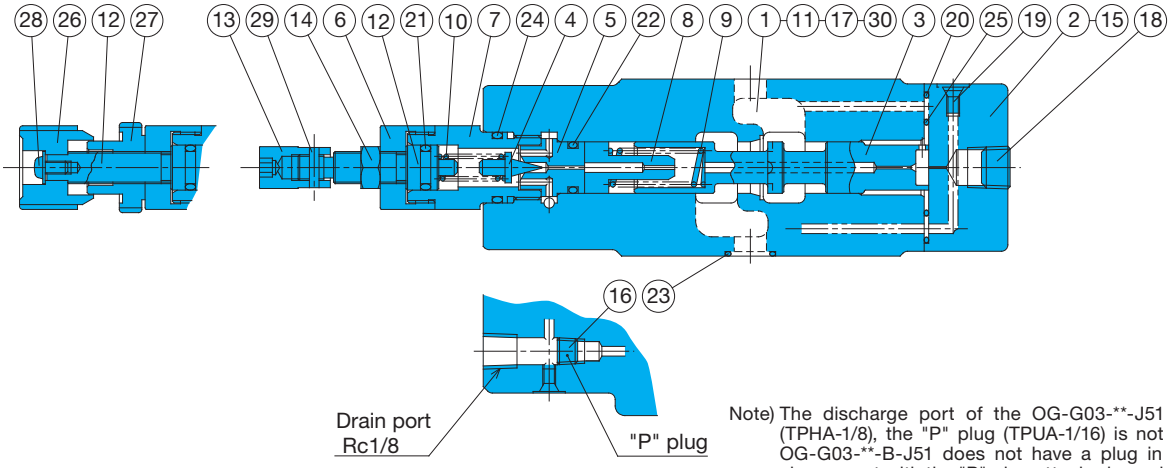
Part No.	Part Name
1	Body
2	Spool
3	Bushing
4	Retainer
5	Guide
6	Spring
7	Plate
8	Screw
9	Nut
10	Plug
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Knob
16	Nut
17	Screw

Seal Part List (Kit Model Number BRBS-01GP-0A)

Part No.	Part Name	Part Number	Q'ty
11	O-ring	AS568-012(NBR-90)	4
12	O-ring	NBR-70-1 P18	1
13	O-ring	NBR-90 P20	1
14	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OG-G03-B*-J51



Note) The discharge port of the OG-G03-**-J51 has the plug (TPHA-1/8), the "P" plug (TPUA-1/16) is not attached. The OG-G03-**-B-J51 does not have a plug in the drain discharge port with the "P" plug attached, so pipe must be run from the drain discharge port to provide drainage.

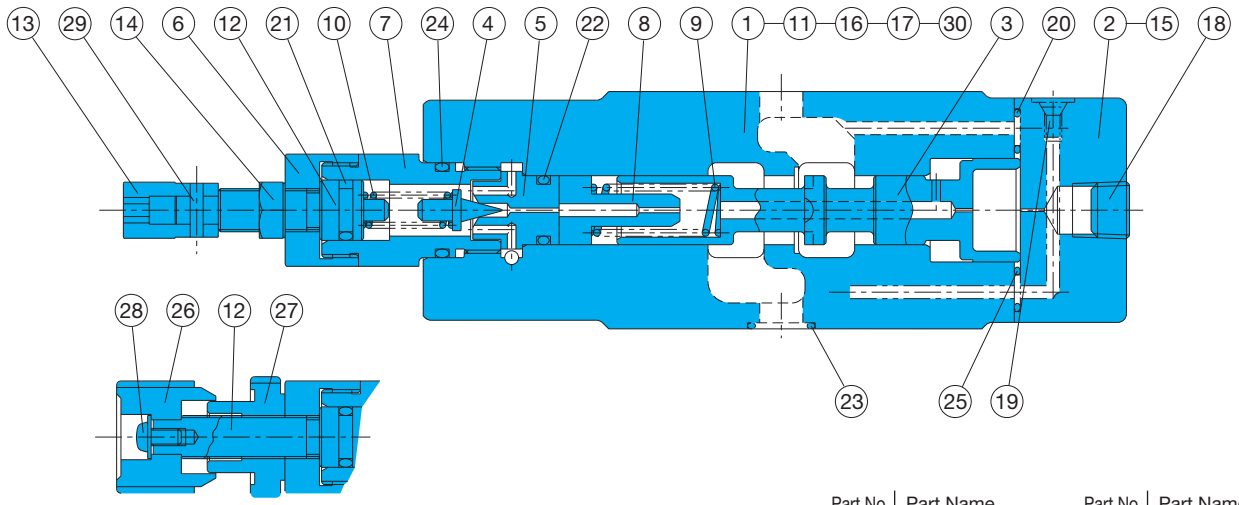
Seal Part List (Kit Model Number BRES-03G*-1A)

Part No.	Part Name	Part Number	Q'ty	
			A	B
20	O-ring	NBR-90 P6	2	2
21	O-ring	NBR-70-1 P10A	1	1
22	O-ring	NBR-90 P12	1	1
23	O-ring	AS568-014(NBR-90)	5	5
24	O-ring	NBR-90 P18	1	1
25	O-ring	AS568-023(NBR-90)	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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)

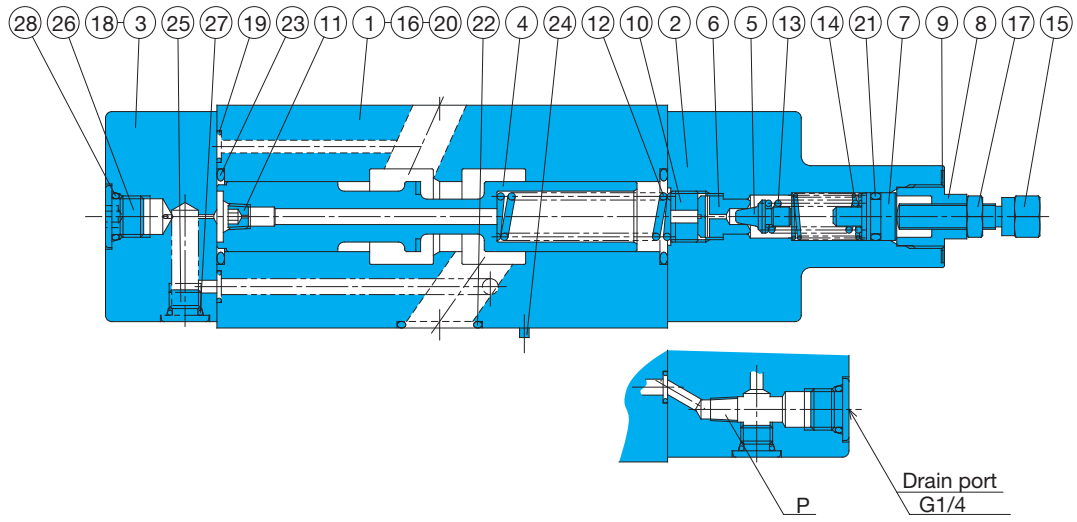
Part No.	Part Name	Part Number	Q'ty	
			A	B
20	O-ring	NBR-90 P6	2	2
21	O-ring	NBR-70-1 P10A	1	1
22	O-ring	NBR-90 P12	1	1
23	O-ring	AS568-014(NBR-90)	5	5
24	O-ring	NBR-90 P18	1	1
25	O-ring	AS568-023(NBR-90)	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify A or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Seat
6	Bushing
7	Retainer
8	Choke
9	Spring
10	Spring
11	Plate
12	Screw
13	Nut
14	Nut
15	Screw

Part No.	Part Name
16	Plug
17	Plug
18	Plug
19	Plug
20	O-ring
21	O-ring
22	O-ring
23	O-ring
24	O-ring
25	O-ring
26	Knob
27	Nut
28	Screw
29	Pin
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	NBR-90 P7	4	4
20	O-ring	AS568-012(NBR-90)	2	2
21	O-ring	NBR-70-1 P11	1	1
22	O-ring	AS568-118(NBR-90)	4	4
23	O-ring	NBR-90 G25	2	2
27	O-ring	NBR-90 P8	4	4
28	O-ring	NBR-90 P11	3	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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

40ℓ/min
0.2 to 14MPa

Features

①When 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).
②Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a constant level.
③Maximum Operating Pressure: 7, 25MPa {71.4, 255kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}		Weight kg	Gasket Surface Dimensions
				Low pressure side	High pressure side		
OGS-G01-PCC-K-**-22 P1C	1/8	7{71.4}	40	0.2 to 3.5 {2.0 to 35.7}	0.2 to 3.5{ 2.0 to 35.7}	4.8	ISO 4401-03-02-0-05
					0.8 to 7{ 8.2 to 71.4}		
P21		25{255}		0.8 to 7 {8.2 to 71.4}	3.5 to 14{35.7 to 143}		

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

Explanation of model No.

OGS – G 01 – P 1 C – K(R) – C1 – 22

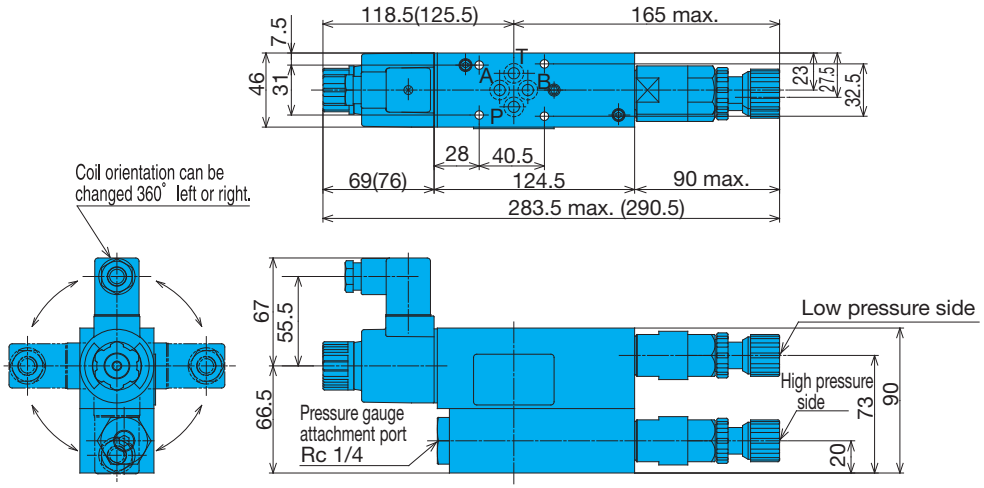
- 22: Design number
- C1 : AC100V, C2 : AC200V, D1 : DC12V, D2 : DC24V: Power supply
- K: With handle (standard), R: With indicator light (optional), GR: With surgeless type indicator light (Option): Auxiliary symbol
- C, 1: Low pressure side pressure adjustment range
- C, 1, 2: High pressure side pressure adjustment range
  (There is no 11, 2C combination.)
- P: P port: Control port
- 01: Nominal diameter (size)
- G: Gasket type: Mounting method
- OGS: Pressure reducing modular valve for two-press setting

●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 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 0.3MPa {3.1 kgf/cm²}
1, 2 Type:
At least 0.5MPa {5.1 kgf/cm²}
4 Vent piping is not possible.
5 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
6 Low pressure is attained when the solenoid is on.
7 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.
8 The wiring in the connector is the same as the SA series wet type solenoid valve. (See page E-19)

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

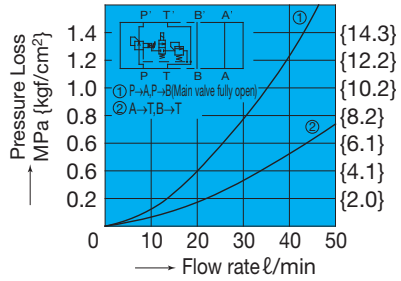
OGS-G01-P*C-K(R)-**-22



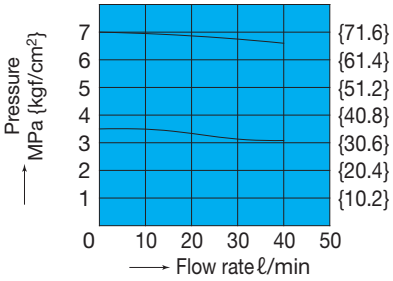
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

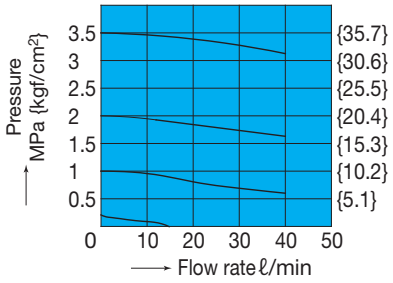
Pressure Loss Characteristics
OGS-G01-PIC-K-**-22



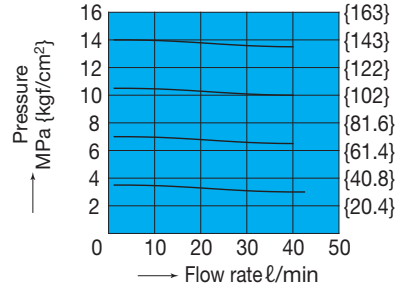
Pressure – Flow Rate Characteristics
OGS-G01-PIC-K-**-22
(Type 1)



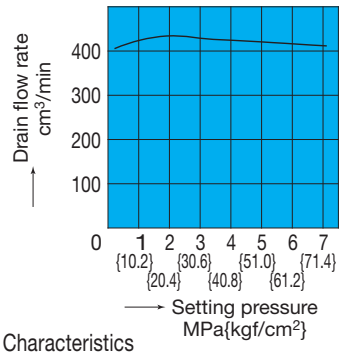
OGS-G01-P*C-K-**-22
(Type C)



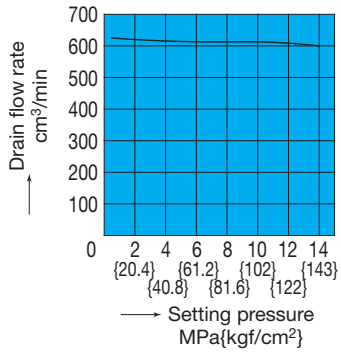
Pressure – Flow Rate Characteristics
OGS-G01-P21-K-**-22
(Type 2)



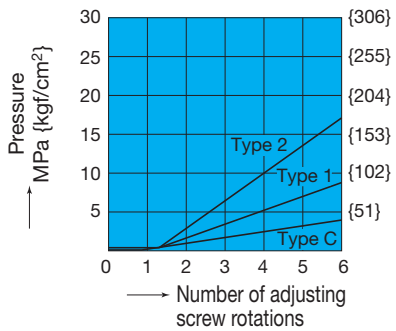
Pressure – Drain Rate Characteristics
OGS-G01-PIC-K-**-22



Pressure – Drain Rate Characteristics
OGS-G01-P21-K-**-22

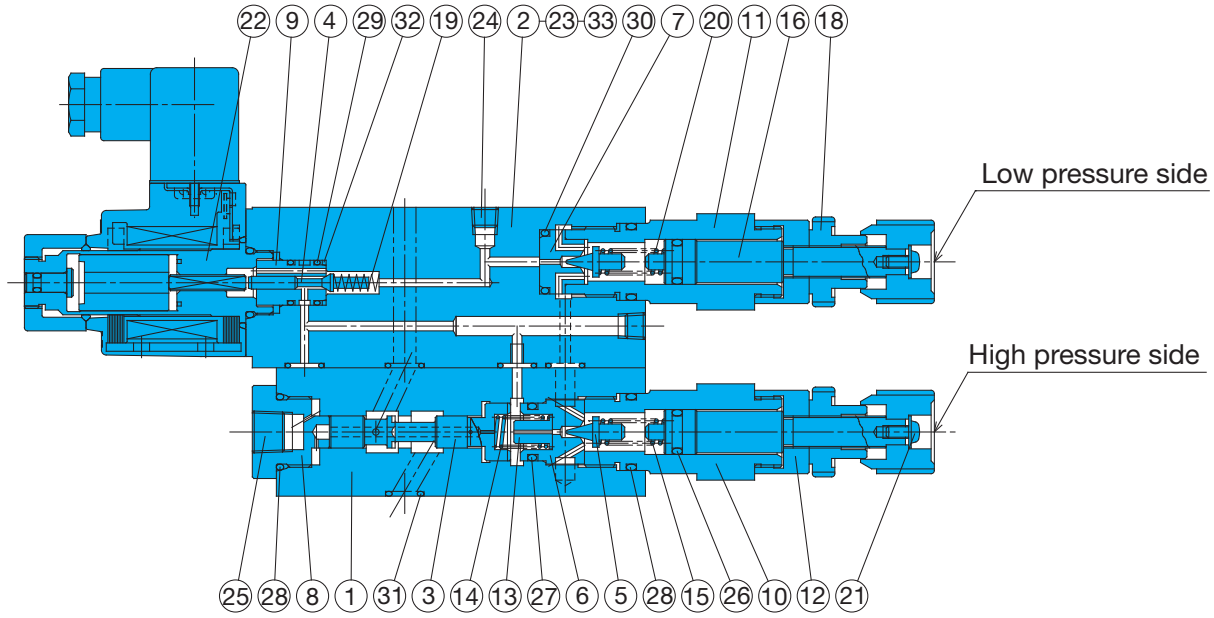


Number of Adjusting Screw Rotations – Pressure Characteristics
OGS-G01-P**-22



Cross-sectional Drawing

OGS-G01-P*C-K(R)-**1-22



Seal Part List (Kit Model Number BRBS-01GSP-1B)

Part No.	Part Name	Part Number	Q'ty
26	O-ring	NBR-70-1 P10A	2
27	O-ring	NBR-90 P14	1
28	O-ring	NBR-90 P20	3
29	O-ring	AS568-013(NBR-90)	2
30	O-ring	NBR-90 P16	1
31	O-ring	AS568-012(NBR-90)	11
32	Backup ring	For AS568-013	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Body
3	Spool
4	Spool
5	Poppet
6	Seat
7	Seat
8	Bushing
9	Sleeve
10	Retainer
11	Retainer
12	Bushing
13	Choke
14	Spring
15	Spring
16	Screw
17	Knob

Part No.	Part Name
18	Nut
19	Spring
20	Spring
21	Screw
22	Solenoid assy
23	Screw
24	Plug
25	Plug
26	O-ring
27	O-ring
28	O-ring
29	O-ring
30	O-ring
31	O-ring
32	Backup ring
33	Plate

Sequence Modular Valve

40 to 80ℓ/min
25MPa

Features

①This modular valve is a pressure control valve used for sequential actuator operations and for maintaining main circuit pressure.

②Pressure adjustment is possible across a wide range, from 0.25 to 21MPa {2.5 to 214 kgf/cm²}.

③Maximum Operating Pressure: 25MPa {255kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OQ-G01-P21-20 P23	1/8	25{255}	40	0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.1	ISO 4401-03-02-0-05
OQ-G03-P2A-J50 P2C P2E	3/8	25{255}	80	0.25 to 0.85{ 2.5 to 8.7} 0.85 to 3.5 { 8.7 to 35.7} 3.5 to 14{35.7 to 143}	3.5	ISO 4401-05-04-0-05

Explanation of model No.

OQ – G 03 – P 2 A – (K) – J50

- J50: Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50: M8.
- (K): Auxiliary symbol K: With handle (01, 03 size)
- A: Pressure adjustment range
- 2: Type 2: Internal pilot External drain
- P: Control port P: P port
- 03: Nominal diameter (size) 01, 03
- G: Mounting method G: Gasket type
- OQ: Sequence modular valve

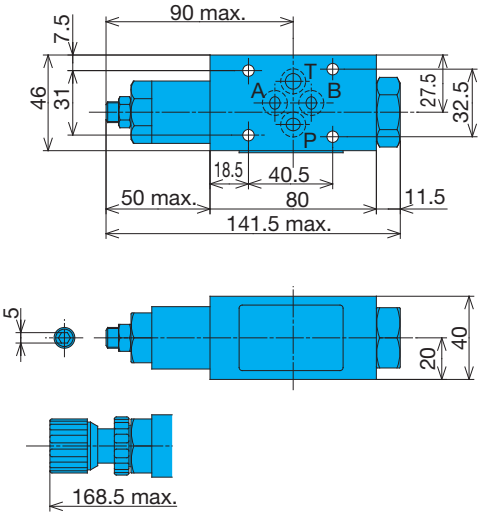
●Handling

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 1MPa {10.2kgf/cm²}.
4. Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

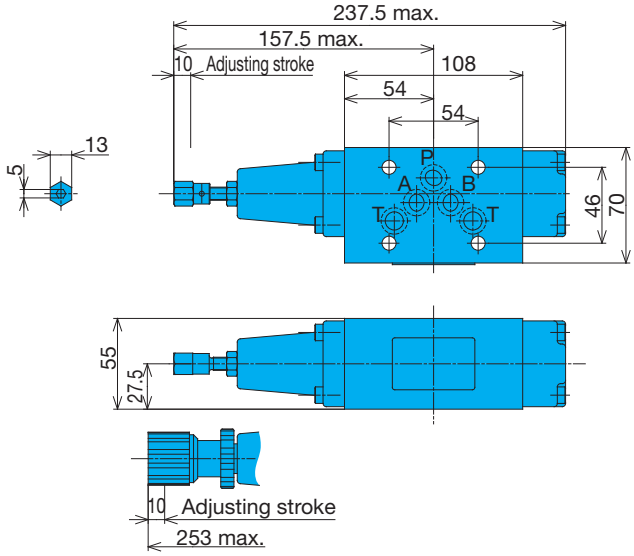
Installation Dimension Drawings

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

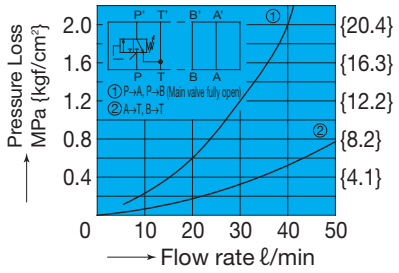


Performance Curves

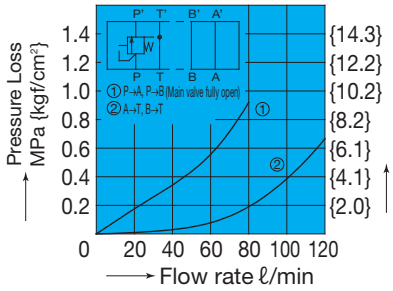
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

OQ-G01-P2*-20

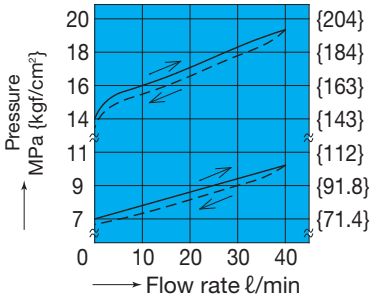


OQ-G03-P2A-J50

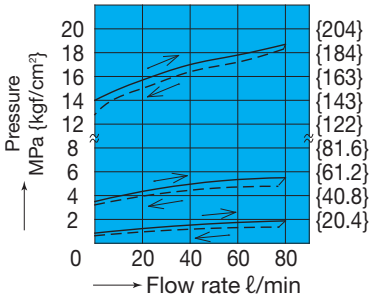


Pressure — Flow Rate Characteristics

OQ-G01-P2*-20

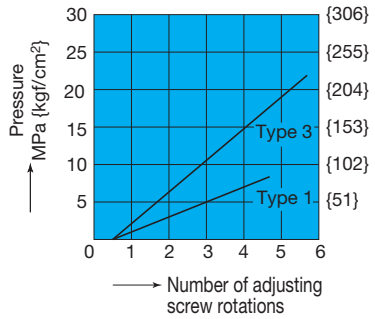


OQ-G03-P2*-J50

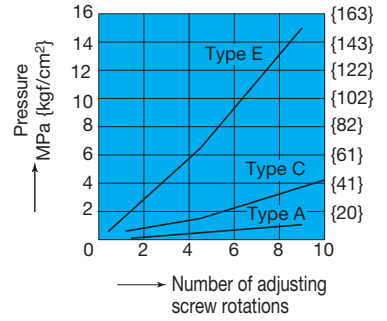


Number of Adjusting Screw Rotations — Pressure Characteristics

OQ-G01-P2*-20

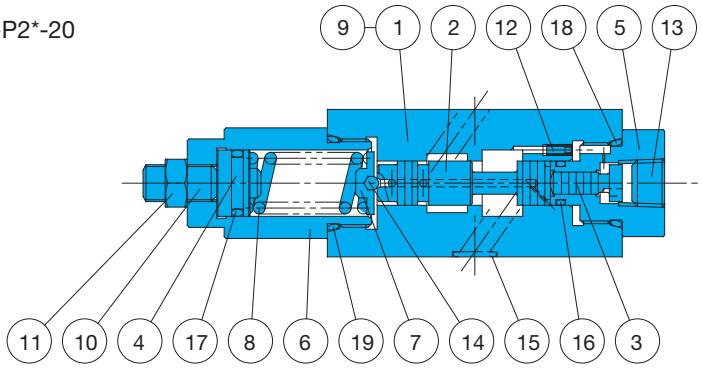


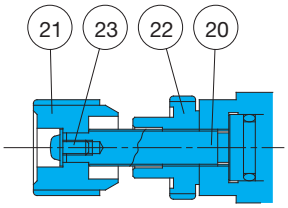
OQ-G03-P2*-J50



Cross-sectional Drawings

OQ-G01-P2*-20





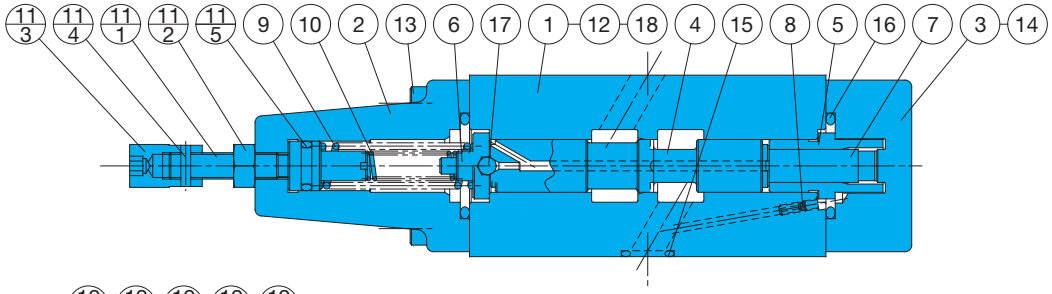
Part No.	Part Name
1	Body
2	Spool
3	Piston
4	Plunger
5	Bushing
6	Retainer
7	Guide
8	Spring
9	Plate
10	Screw
11	Nut
12	Choke
13	Plug
14	Ball
15	O-ring
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	Screw
21	Knob
22	Nut
23	Screw

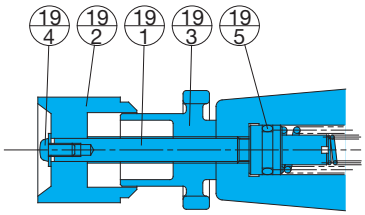
Seal Part List (Kit Model Number BRBS-01QP-0A)

Part No.	Part Name	Part Number	Q'ty
			P
15	O-ring	AS568-012(NBR-90)	4
16	O-ring	NBR-90 P9	1
17	O-ring	NBR-70-1 P14	1
18	O-ring	NBR-90 P20	1
19	O-ring	NBR-90 P22	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

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
$11(19)_{-5}$	O-ring	NBR-90 P11	1
15	O-ring	AS568-014(NBR-90)	5
16	O-ring	NBR-90 P26	2

Note) The materials and hardness of the O-ring conform with JIS B2401.

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

40 to 300ℓ/min
14MPa

Features

①This modular valve is used to control actuator back pressure and for other pressure control valve applications.

②Pressure adjustment is possible across a wide range, from 0.25 to 14MPa {2.5 to 143kgf/cm²}.

③Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OCQ-G01-A11-20 A12	1/8	25{255}	40	0.8 to 7{ 8.2 to 71.4} 3.5 to 14{35.7 to 143}	1.1	ISO 4401-03-02-0-05
OCQ-G01-B11-20 B12				0.8 to 7{ 8.2 to 71.4} 3.5 to 14{35.7 to 143}	1.1	
OCQ-G03-A1A-J50 A1C A1E	3/8	25{255}	80	0.25 to 0.85{ 2.5 to 8.7} 0.85 to 3.5{ 8.7 to 35.7} 3.5 to 14{35.7 to 143}	3.5	ISO 4401-05-04-0-05
OCQ-G03-B1A-J50 B1C B1E				0.25 to 0.85{ 2.5 to 8.7} 0.85 to 3.5{ 8.7 to 35.7} 3.5 to 14{35.7 to 143}	3.5	
OQH-G04-A1A-10 A1C A1E	1/2	35{357}	300	0.25 to 0.85{ 2.5 to 8.7} 0.5 to 3.5{ 5.1 to 35.7} 2.0 to 14{20.4 to 143}	8.0	ISO 4401-07-06-0-05
OQH-G04-B1A-10 B1C B1E				0.25 to 0.85{ 2.5 to 8.7} 0.5 to 3.5{ 5.1 to 35.7} 2.0 to 14{20.4 to 143}	8.0	

●Handling

1 The pressure adjustment range is expressed in terms of cracking pressure.

2 Run tank port piping directly to the tank, and ensure that back pressure is as small as possible.

3 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

4 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Explanation of model No.

01, 03 size

OCQ – G 03 –B 1 A – (K) – J50

- Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50 : M8.
- Auxiliary symbol K: With handle (01, 03 size)
- Pressure adjustment range
- Type 1 { Internal pilot / Internal drain
- Control port A: A port / B: B port
- Nominal diameter (size) 01, 03
- Mounting method G: Gasket type
- Counter balance modular valve

Explanation of model No.

04 size

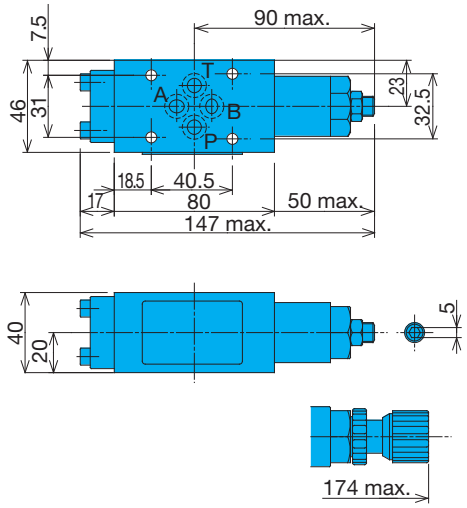
OQH – G 04 – B 1 A – 10

- 10: Design number
- A: Pressure adjustment range A, C, E
- 1: Type 1 { Internal pilot / Internal drain
- B: Control port A: A port, B: B port
- 04: Nominal diameter (size) 04
- G: Mounting method G: Gasket type
- OQH: M35 Series counter balance modular valve

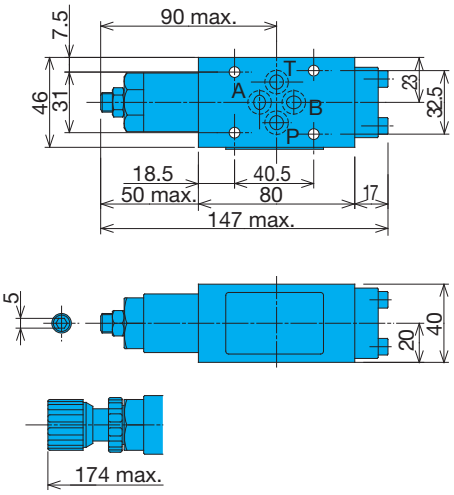
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

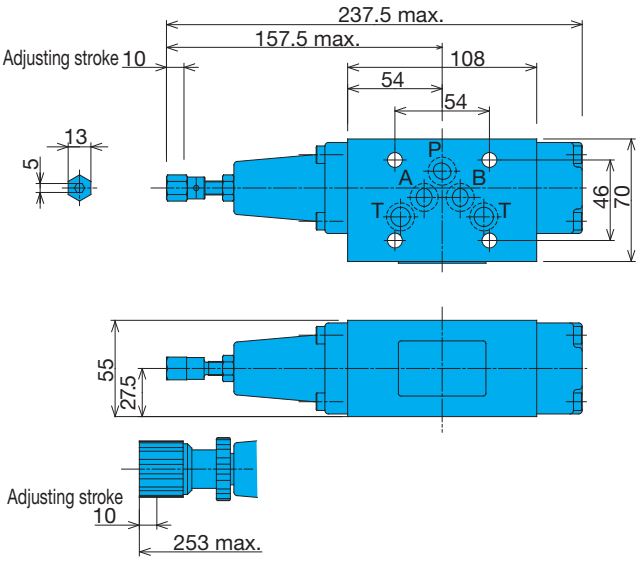
OCQ-G01-A1*-20



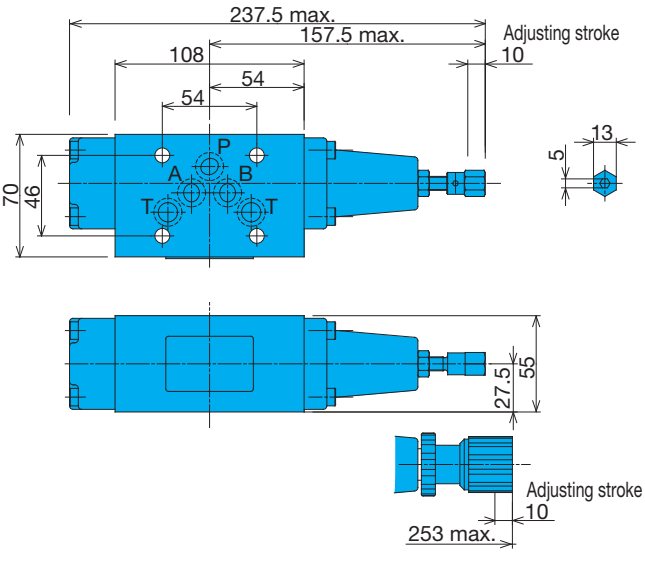
OCQ-G01-B1*-20



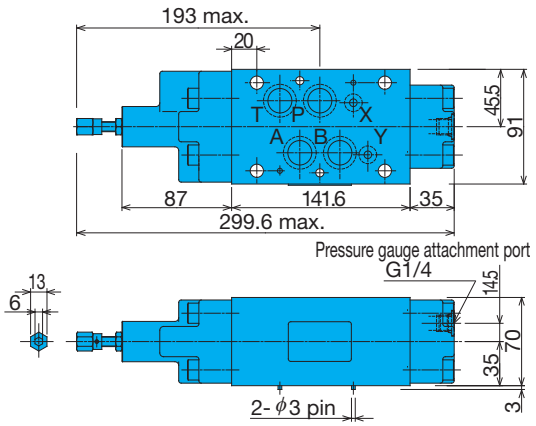
OCQ-G03-A1*-J50



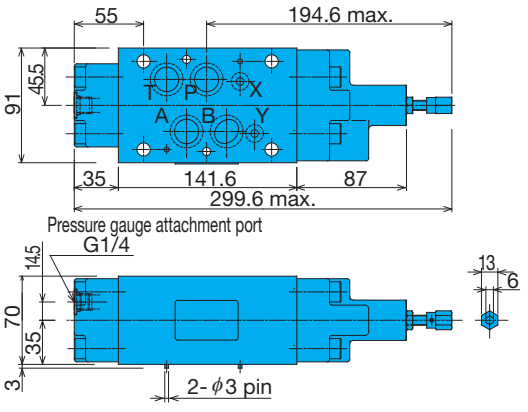
OCQ-G03-B1*-J50



OQH-G04-A1*-10



OQH-G04-B1*-10

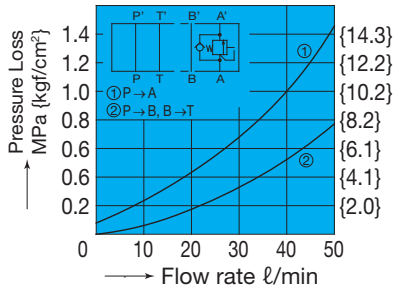


Performance Curves

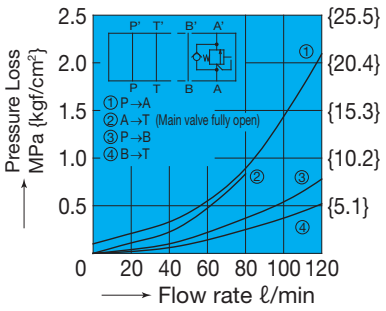
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

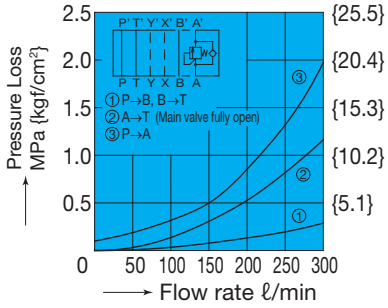
OCQ-G01-A1*-20



OCQ-G03-A1A-J50

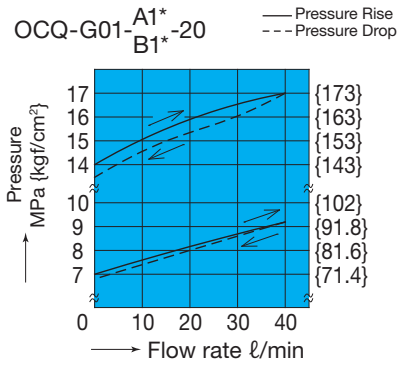


OQH-G04-A1A-10

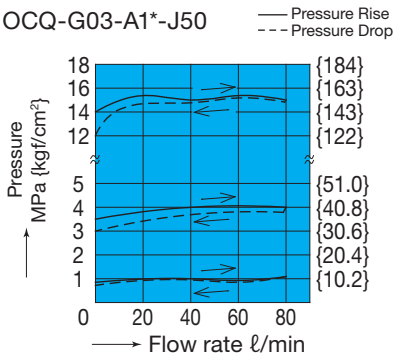


Pressure - Flow Rate Characteristics

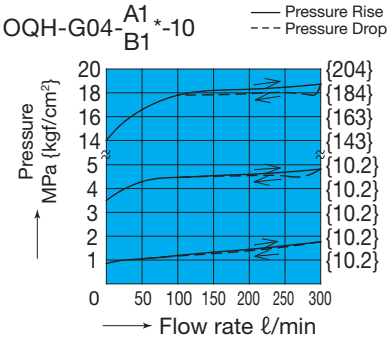
OCQ-G01-$\frac{A1*}{B1*}$-20



OCQ-G03-A1*-J50

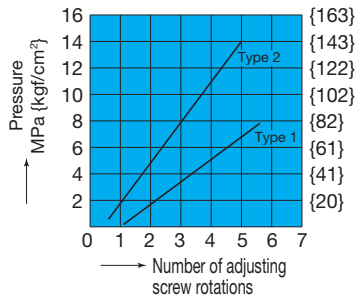


OQH-G04-$\frac{A1}{B1}$*-10

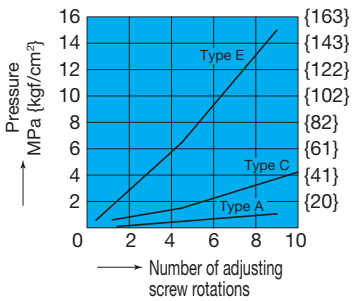


Number of Adjusting Screw Rotations — Pressure Characteristics

OCQ-G01-$\frac{A1^*}{B1^*}$-20



OCQ-G03-$\frac{A1^*}{B1^*}$-J50



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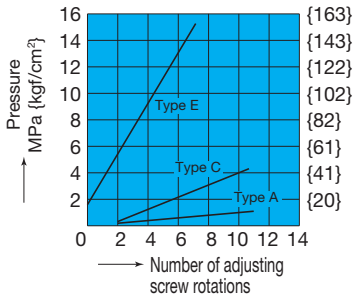
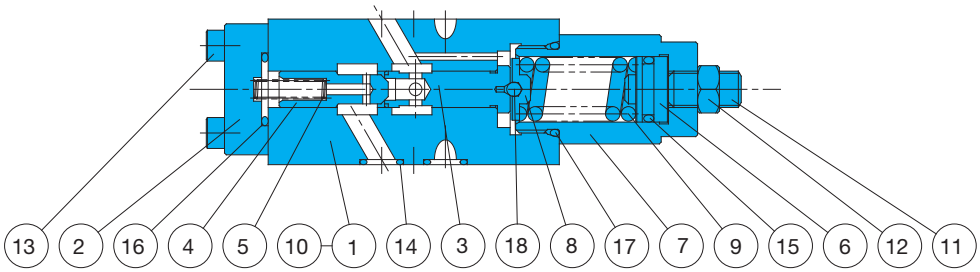
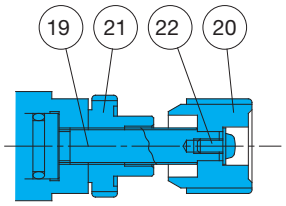


Cross-sectional Drawings

OCQ-G01-A1*-20





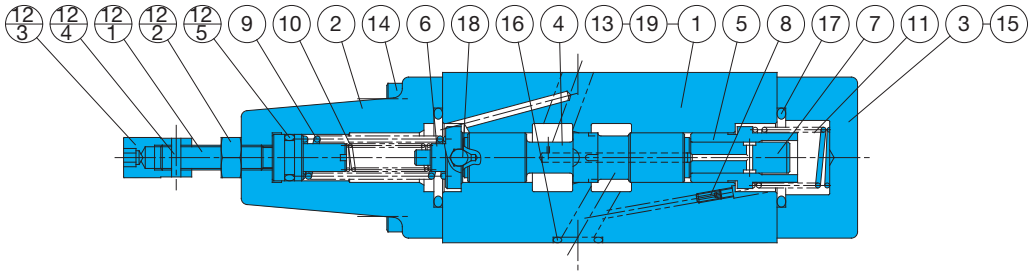
Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Spring
6	Plunger
7	Retainer
8	Guide
9	Spring
10	Plate
11	Screw
12	Nut
13	Screw
14	O-ring
15	O-ring
16	O-ring
17	O-ring
18	Ball
19	Screw
20	Knob
21	Nut
22	Screw

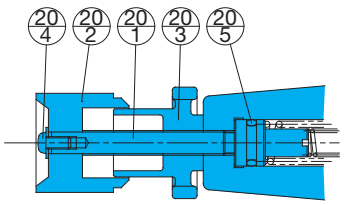
Seal Part List (Kit Model Number BRBS-01CQ*-0A)

Part No.	Part Name	Part Number	Q'ty	
			A	B
14	O-ring	AS568-012(NBR-90)	4	4
15	O-ring	NBR-90 P14	1	1
16	O-ring	NBR-90 P16	1	1
17	O-ring	NBR-90 P22	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify A or B for the asterisk (*) in the kit model number.

OCQ-G03-A1*-J50





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_{-1}	Screw
12_{-2}	Nut
12_{-3}	Nut
12_{-4}	Pin
12_{-5}	O-ring
13	Plate
14	Screw
15	Screw
16	O-ring
17	O-ring
18	Ball
19	Pin
20	Handle kit
20_{-1}	Screw
20_{-2}	Knob
20_{-3}	Nut
20_{-4}	Screw
20_{-5}	O-ring

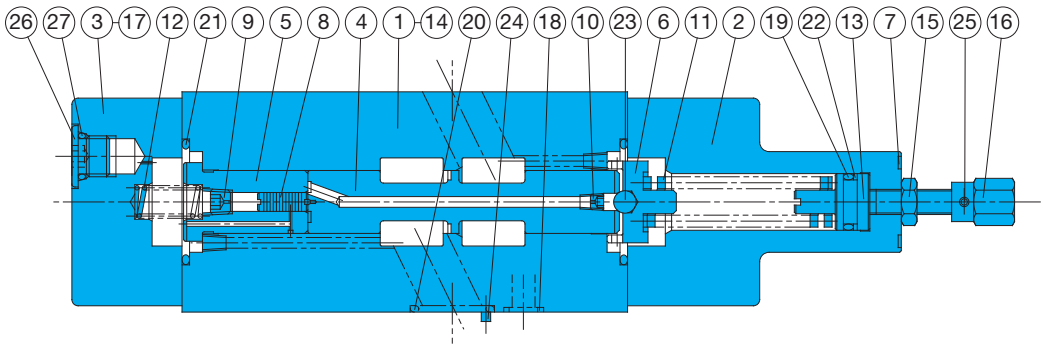
Seal Part List (Kit Model Number BRES-03CQ*)

Part No.	Part Name	Part Number	Q'ty	
			A	B
$12(20)_{-5}$	O-ring	NBR-90 P11	1	1
16	O-ring	AS568-014(NBR-90)	5	5
17	O-ring	NBR-90 P26	2	2

Note) The 10 spring is not included with pressure adjustment Type A.

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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

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.

Seal Part List (Kit Model Number BRKS-04CQ*)

Part No.	Part Name	Part Number	Q'ty	
			A	B
18	O-ring	AS568-012(NBR-90)	2	2
19	O-ring	NBR-90 P14	1	1
20	O-ring	AS568-118(NBR-90)	4	4
21	O-ring	NBR-90 G35	2	2
22	Backup ring	T2-P14	1	1
27	O-ring	NBR-90 P11	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Backup ring indicates JIS 2407-T2-**.
3. Specify A or B for the asterisk (*) in the kit model number.

Pressure Switch Modular Valve

50ℓ/min
25MPa

Features

①This modular valve detects pressure changes inside the hydraulic circuit and opens and closes an electrical circuit accordingly.
②High precision detection, high precision circuit control, outstanding reliability.
③Maximum operating pressure: 25MPa {255kgf/cm²}
④Indicator light built into the DIN connector shows operational status at a glance.
⑤A 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 MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OW-G01-PC-R-**-30 P1 P3	1/8	25{255}	50	0.5 to 3.5{ 5.1 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.8	ISO 4401-03-02-0-05
OW-G01-AC-R-**-30 A1 A3				0.5 to 3.5{ 5.1 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.8	
OW-G01-BC-R-**-30 B1 B3				0.5 to 3.5{ 5.1 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.8	
OW-G01-WC-R-**-30 W1 W3				0.5 to 3.5{ 5.1 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	2.6	

Electrical Specifications Micro Switch Manufacturer: Omron Model No. SS-5	Contact Capacitance (Resistive Load)		AC	125V	5A
				250V	3A
			DC	14V	5A
				30V	4A
	Mechanical Life	At least 1 × 10⁷			
	Electrical Life	At least 3 × 10⁶ (AC,0.1A,cosϕ=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	-20°C to 70°C (non-condensation)			
	Operating Fluid: Oil Temperature	-20°C to 70°C	Use a fluid that is within both ranges.		
	Operating Fluid: Allowable kinematic viscosity Range	15 to 300mm²/s{cSt}			
	Operating Fluid: Filtration	25μm maximum			

Explanation of model No.

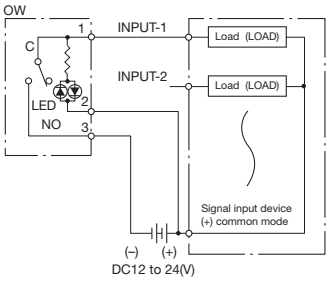
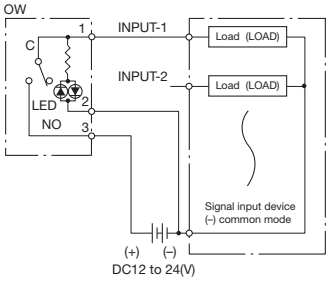
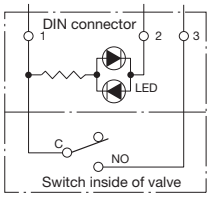
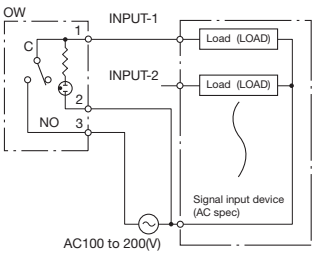
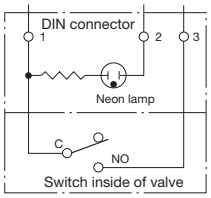
OW – G 01 – P 1 – (K)R – D2 – 30

- Design number: 30
- Power supply specification: D2: DC type Less than DC 30 V; C2: AC type Less than AC 250 V
- R: With indicator light (standard); K: With manual handle (optional)
- Pressure adjustment range: C: 0.5 to 3.5MPa(5.1 to 35.7kgf/cm²); 1 : 0.8 to 7MPa(8.2 to 71.4kgf/cm²); 3 : 3.5 to 21MPa(35.7 to 214kgf/cm²)
- Control port: P: P port A: A port B: B port; W: A, B ports
- Nominal diameter (size): 01
- Mounting method: G: Gasket type
- Pressure switch modular valve

●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 5 to 7Nm {51 to 71kgf/cm}.
7 This valve has drain volume the same as the OG-GO1 (decompression valve) the port for detecting structural pressure.
8 Do not include inductive components or capacitive components in the loaded circuit that connects to the valves because they significantly reduce the life of the micro-switches. Contact us for details.

●Connectors

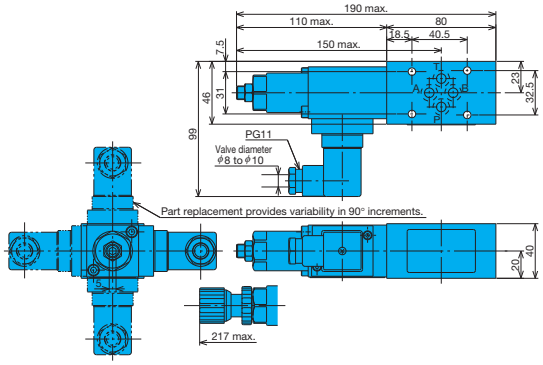
Model No.	Power supply specification	Wiring	Electrical Circuit Diagram
BRC41-01WD2	D2	◎When signal input device (load) remote common is plus OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 to +).  ◎When signal input device (load) common is minus OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 to –). 	Normal open type with indicator  Pressure increase causes indicator to light. Circuit closed (ON) Pressure decrease causes indicator to go out. Circuit open (OFF)
BRC41-01WC2	C2	◎When signal input device (load) is AC OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 is nonpolar). 	Normal open type with indicator  Pressure increase causes indicator to light. Circuit closed (ON) Pressure decrease causes indicator to go out. Circuit open (OFF)

Note) 1. The DIN connector wiring connector port size is PG11.
2. The compatible cable diameter for the DIN connector is ϕ8 to ϕ10. 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 0.3 to 0.5Nm.

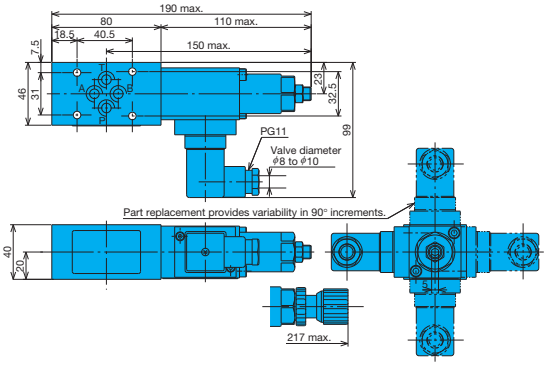
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw, and decreased by counterclockwise (leftward) rotation.

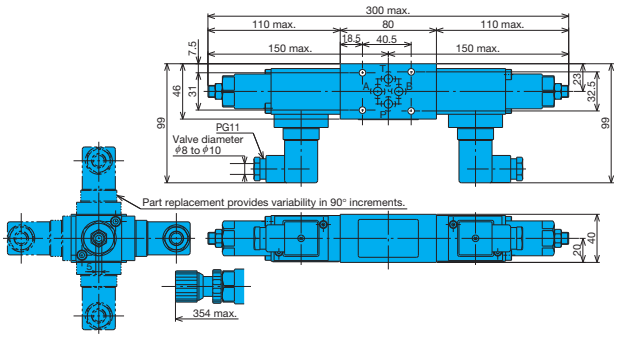
OW-G01-$\frac{P}{A}$*-R-*2-30



OW-G01-B*-R-*2-30



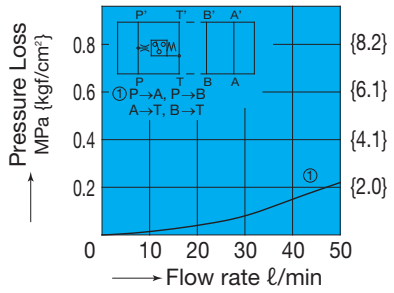
OW-G01-W*-R-*2-30



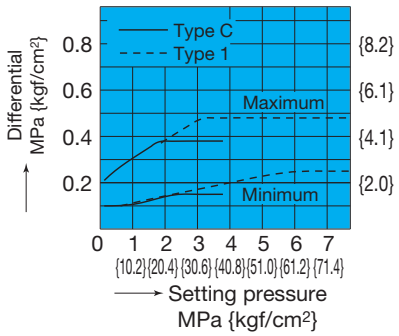
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

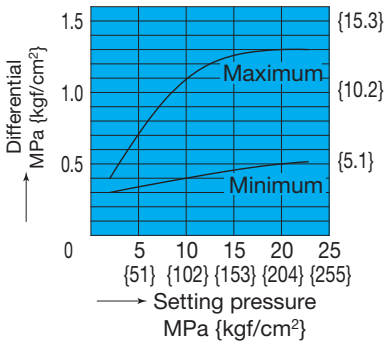
Pressure Loss Characteristics
OW-G01-**-R-**-30



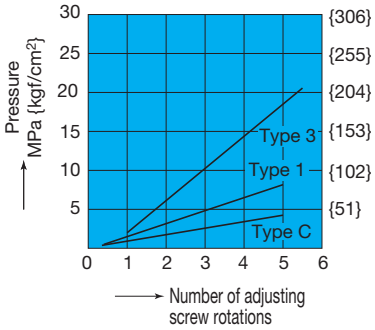
Setting Pressure — Differential Characteristics
OW-G01-*$^{C}_{1}$-R-**-30



OW-G01-*3-R-**-30

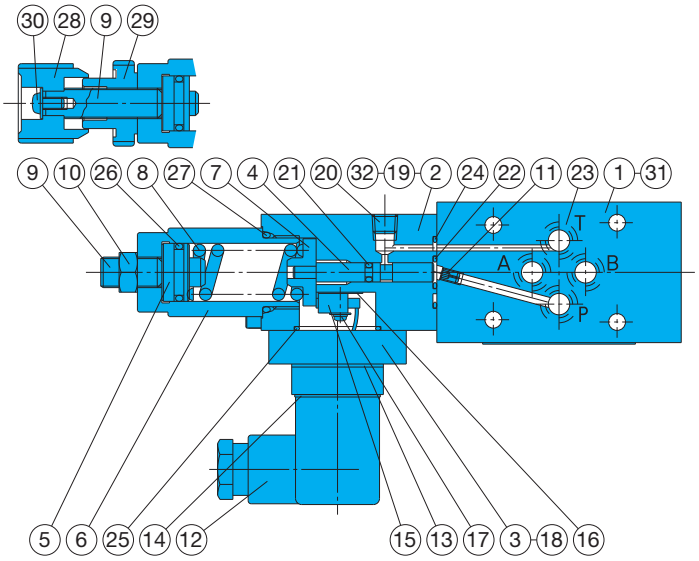


Number of Adjusting Screw Rotations — Pressure Characteristics
OW-G01-**-R-**-30



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*-0A)

Part No.	Part Name	Part Number	Q'ty			
			P	W	A	B
21	O-ring	NBR-70-1 P3	1	2	1	1
22	O-ring	AS568-011(NBR-90)	1	2	1	1
23	O-ring	AS568-012(NBR-90)	4	4	4	4
24	O-ring	AS568-019(NBR-70-1)	1	2	1	1
25	O-ring	AS568-022(NBR-70-1)	1	2	1	1
26	O-ring	NBR-70-1 P15	1	2	1	1
27	O-ring	NBR-90 P22	1	2	1	1

Note) Specify P, W, A, or B for the asterisk (*) in the kit model number.

Flow Regulator Modular Valve

50 to 300ℓ/min
25,35MPa

Features

①This modular valve is used to control actuator speed and for other flow control valve applications.

②A wide range of models are available for A and B port control, A or B port control, and P or T port control.

③Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Check Valve Cracking pressure MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OY-G01-T-20	1/8	25{255}	50	–	1.0	ISO 4401-03-02-0-05
OCY-G01-P-20				0.04{0.4}	1.0	
OCY-G01-W-X-20				0.08{0.8}	1.3	
A					1.2	
B						
OCY-G01-W-Y-20				0.08{0.8}	1.3	
A					1.2	
B						
OCY-G03-P-J50	3/8	25{255}	100	0.04{0.4}	2.9	ISO 4401-05-04-0-05
OCY-G03-W-X-J51				0.1{1.0}	3.1	
A					3.0	
B						
OCY-G03-W-Y-J51				0.1{1.0}	3.1	
A					3.0	
B						
OYH-G04-P-10	1/2	35{357}	300	0.04{0.4}	4.7	ISO 4401-07-06-0-05
OYH-G04-W-X-10				0.1{1.0}	6.5	
A					6.3	
B						
OYH-G04-W-Y-10				0.1{1.0}	6.5	
A					6.3	
B						

●Handling

1. In a 03 size application where control differential pressure is large, use of an H type makes adjustment easier.
2. Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
3. 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Explanation of model No.

01, 03 size

OCY – G 03 –W – (H) Y – (K) – J51

- Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J50, J51: M6, 50, 51 : M8.
- Auxiliary symbol K: With handle (01, 03 size only)
- Control mechanism X: Meter-in Y: Meter-out
- Control function None: Standard
  H: High-differential pressure type (03 size only)
- Control port W: A, B ports
  A: A port P: P port
  B: B port T: T port (01 size only)
- Nominal diameter (size) 01, 03
- Mounting method G: Gasket type
- Flow regulator modular type
  OCY: With check valve
  OY : Without check valve (01 size T port control)

Explanation of model No.

04 size

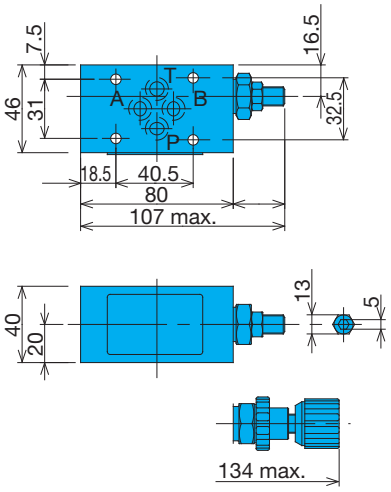
OYH – G 04 –W – Y – 10

- 10: Design number
- Y: Control mechanism X: Meter-in Y: Meter-out
- W: Control port P: P port / W: A, B ports / A: A port / B: B port
- 04: Nominal diameter (size) 04
- G: Mounting method G: Gasket type
- OYH: M35 Series flow regulator modular valve

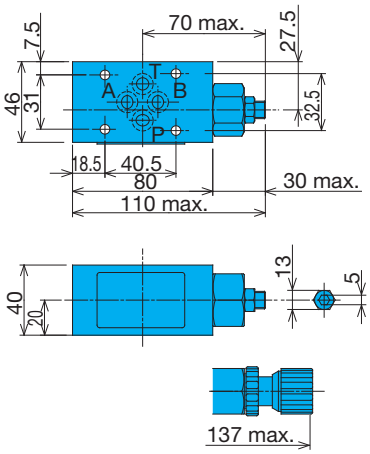
Installation Dimension Drawings

Note) The control flow rate is increased by counter clockwise (leftward) rotation of the adjusting screw.

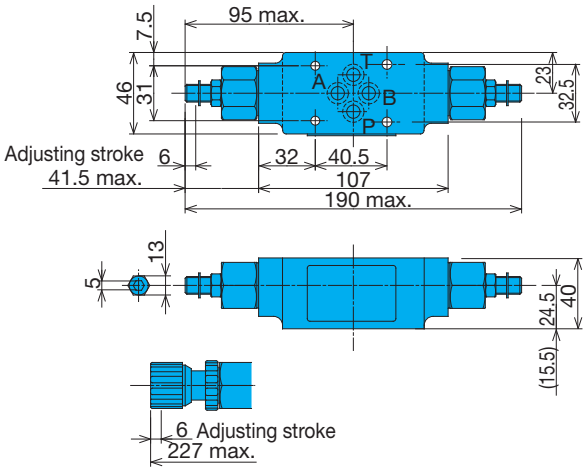
OY-G01-T-20



OCY-G01-P-20

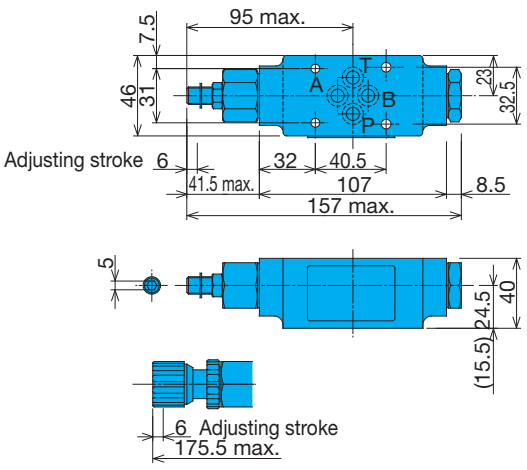


OCY-G01-W-$^{X}_{Y}$-20



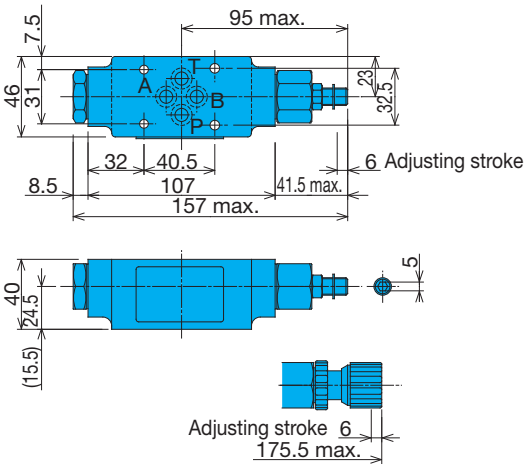
Note) Dimensions in the parentheses are for the OCY-G01-W-X-20.

OCY-G01-A-$^{X}_{Y}$-20



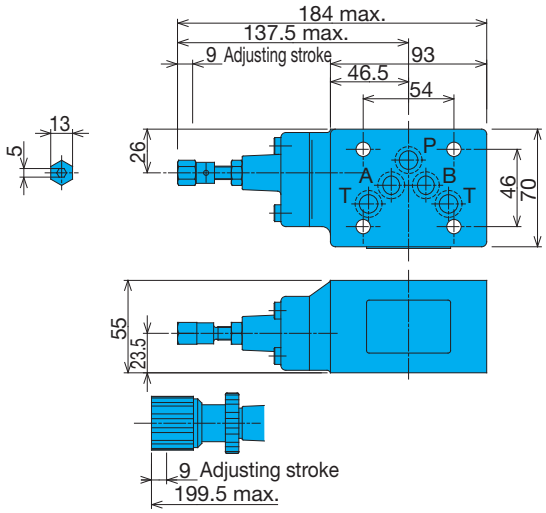
Note) Dimensions in the parentheses are for the OCY-G01-A-X-20.

OCY-G01-B-$^{X}_{Y}$-20

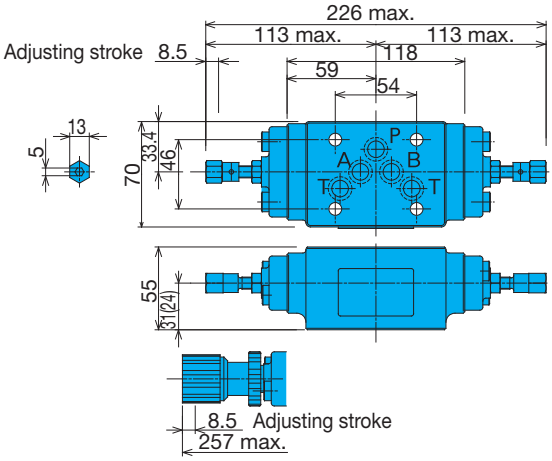


Note) Dimensions in the parentheses are for the OCY-G01-B-X-20.

OCY-G03-P-J50

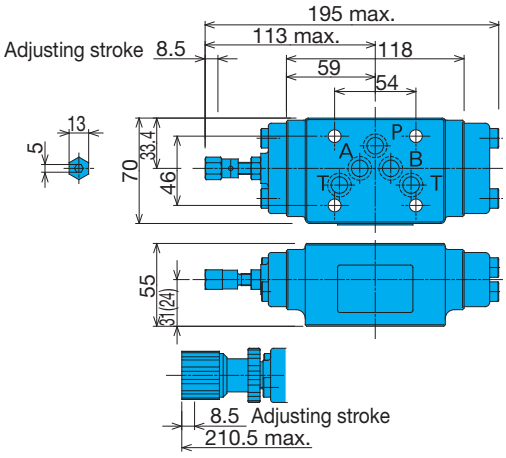


OCY-G03-W-$^{X}_{Y}$-J51



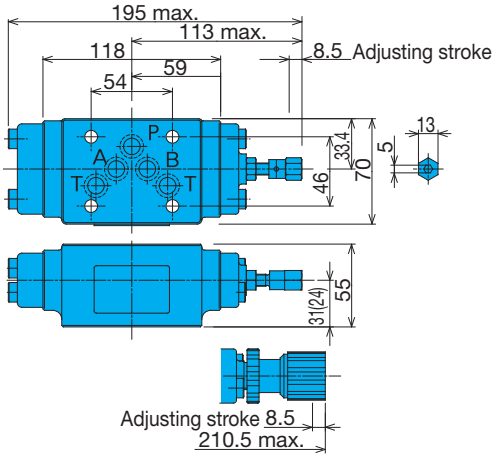
Note) Dimensions in the parentheses are for the OCY-G03-W-X-J51.

OCY-G03-A-$^{X}_{Y}$-J51



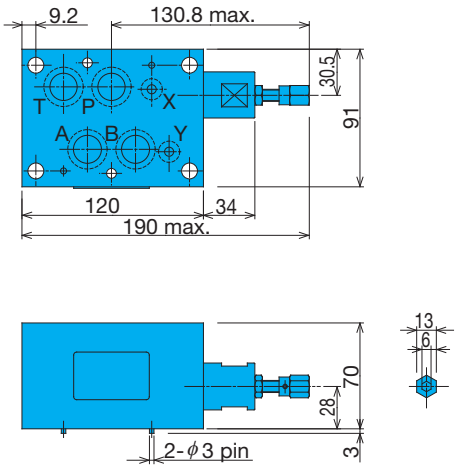
Note) Dimensions in the parentheses are for the OCY-G03-A-X-J51.

OCY-G03-B-$^{X}_{Y}$-J51

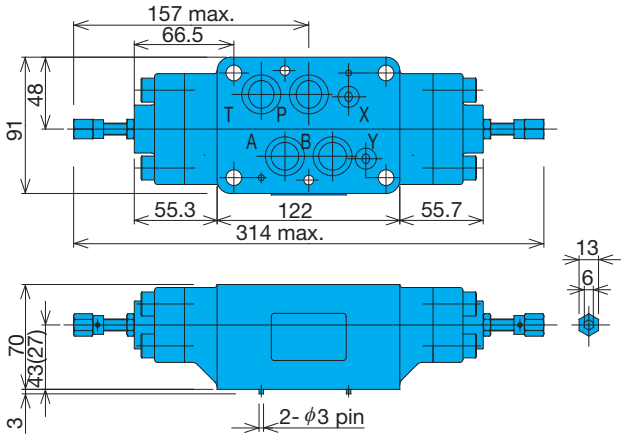


Note) Dimensions in the parentheses are for the OCY-G03-B-X-J51.

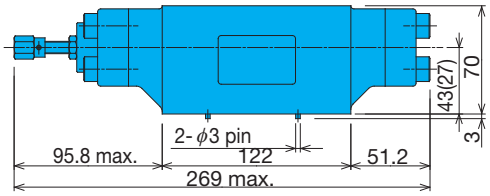
OYH-G04-P-10



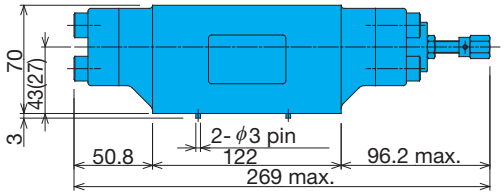
OYH-G04-W-$^{X}_{Y}$-10



OYH-G04-A-$^{X}_{Y}$-10



OYH-G04-B-$^{X}_{Y}$-10



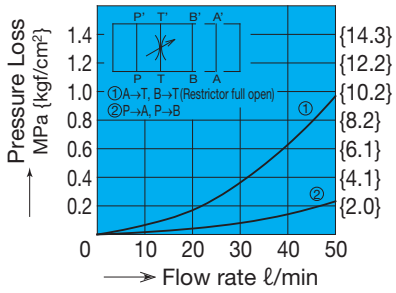
Note) Dimensions in the parentheses are for the OYH-G04-*-X-10.

Performance Curves

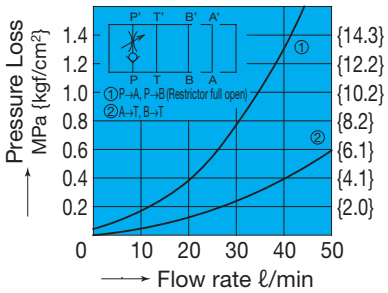
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

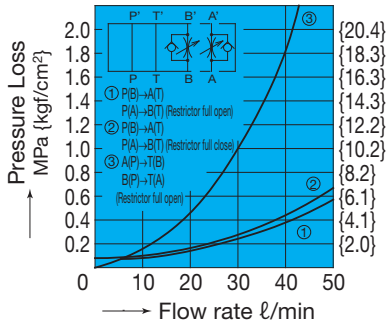
OY-G01-T-20



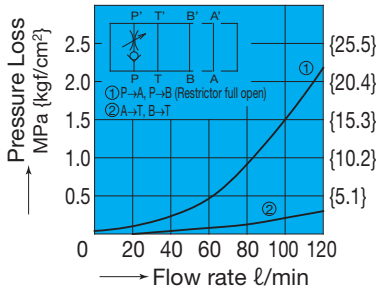
OCY-G01-P-20



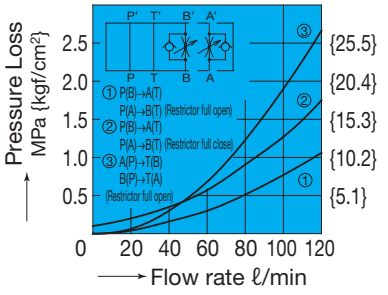
OCY-G01-W-Y-20
(OCY-G01-W-X-20)



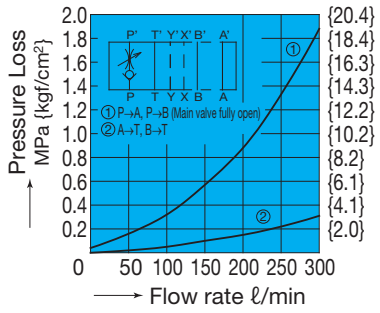
OCY-G03-P-J50



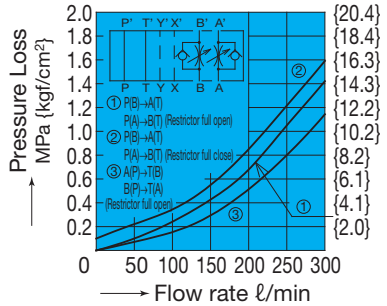
OCY-G03-W-Y-J51
(OCY-G03-W-X-J51)



OYH-G04-P-10

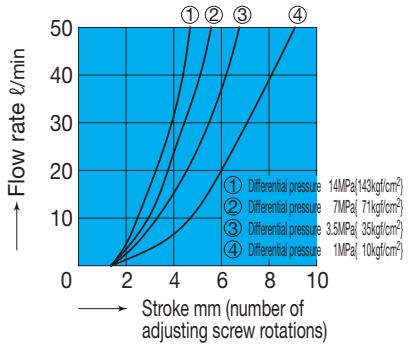


OYH-G04-W-Y-10
(OYH-G04-W-X-10)

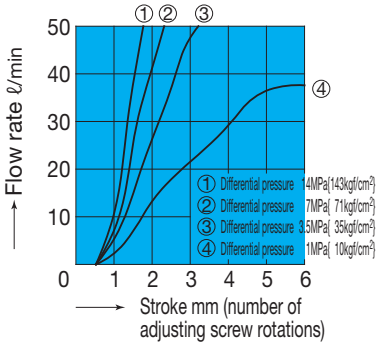


Stroke — Flow Rate Characteristics

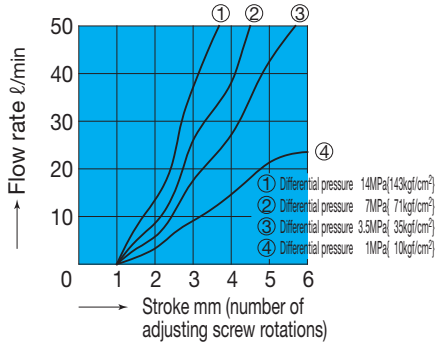
OY-G01-T-20



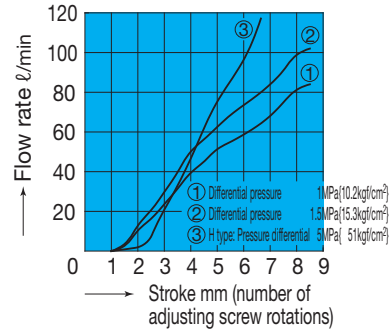
OCY-G01-P-20



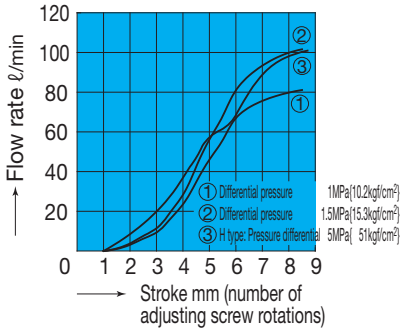
OCY-G01-*-*-20



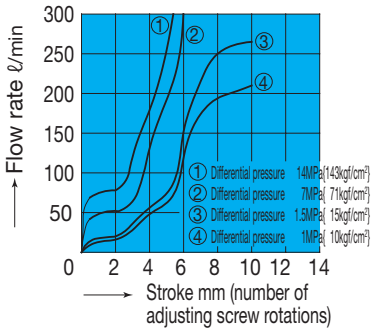
OCY-G03-P-(H)-J50



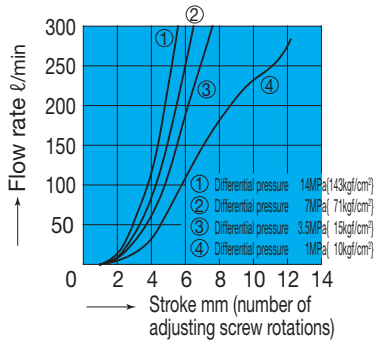
OCY-G03-W-(H)Y-J51



OYH-G04-P-10

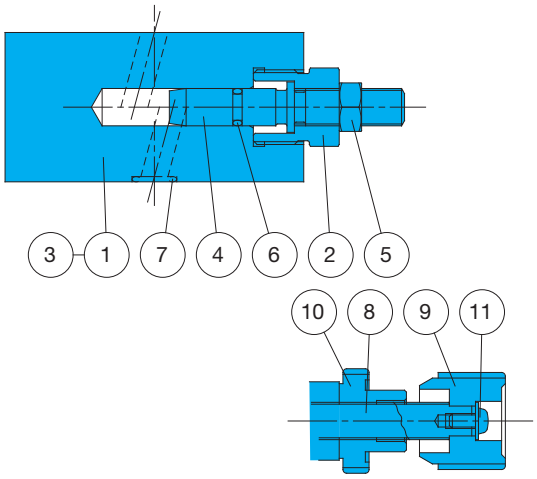


OYH-G04-W-Y-10



Cross-sectional Drawings

OY-G01-T-20



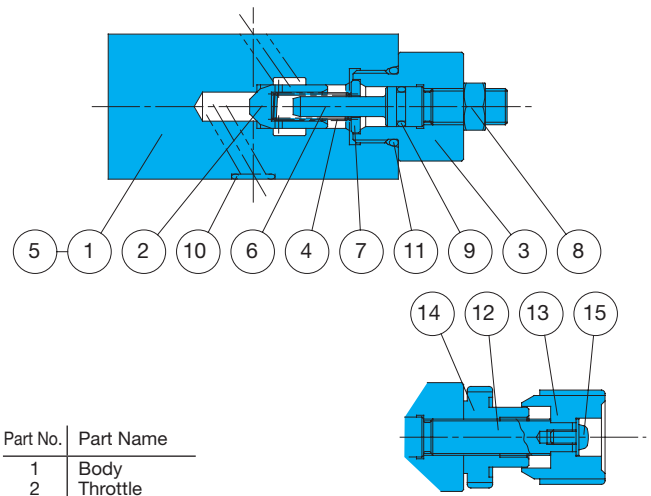
Part No.	Part Name
1	Body
2	Retainer
3	Plate
4	Screw
5	Nut
6	O-ring
7	O-ring
8	Screw
9	Knob
10	Nut
11	Screw

Seal Part List (Kit Model Number BFBS-01YT-0A)

Part No.	Part Name	Part Number	Q'ty T
6	O-ring	NBR-90 P7	1
7	O-ring	AS568-012(NBR-90)	4

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCY-G01-P-20



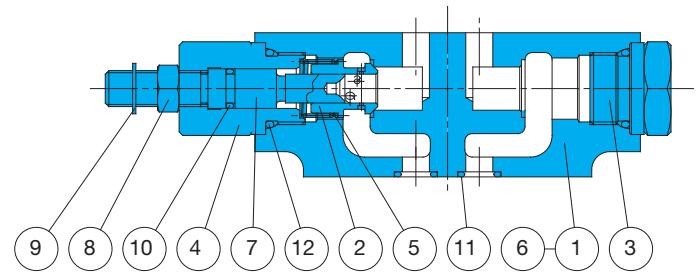
Part No.	Part Name
1	Body
2	Throttle
3	Retainer
4	Spring
5	Plate
6	Screw
7	Ring
8	Nut
9	O-ring
10	O-ring
11	O-ring
12	Screw
13	Knob
14	Nut
15	Screw

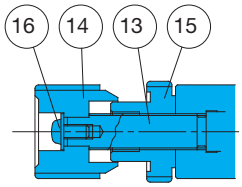
Seal Part List (Kit Model Number BFBS-01CYP-0A)

Part No.	Part Name	Part Number	Q'ty T
9	O-ring	NBR-90 P8	1
10	O-ring	AS568-012(NBR-90)	4
11	O-ring	NBR-90 P18	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCY-G01-A-Y-20





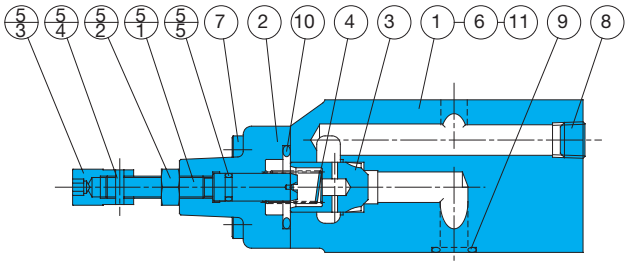
Seal Part List (Kit Model Number BFBS-01CY*-0A)

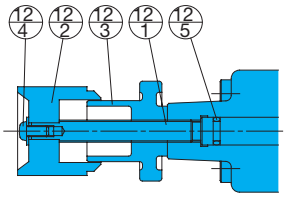
Part No.	Part Name	Part Number	Q'ty		
			W	A	B
10	O-ring	NBR-90 P8	2	1	1
11	O-ring	AS568-012(NBR-90)	4	4	4
12	O-ring	NBR-90 P18	2	2	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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





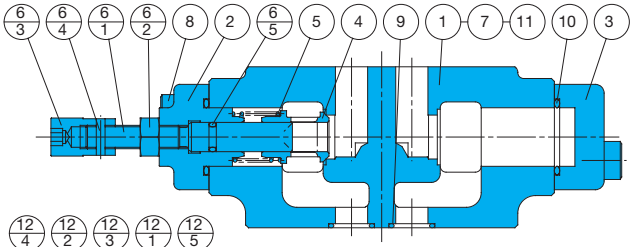
Seal Part List (Kit Model Number BFES-03CYP)

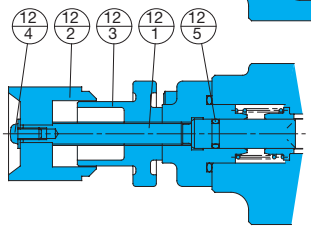
Part No.	Part Name	Part Number	Q'ty
			P
5(12)$_{-5}$	O-ring	NBR-90 P7	1
9	O-ring	AS568-014(NBR-90)	5
10	O-ring	NBR-90 P24	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Cover
3	Throttle
4	Spring
5	Screw kit
5$_{-1}$	Screw
5$_{-2}$	Nut
5$_{-3}$	Nut
5$_{-4}$	Pin
5$_{-5}$	O-ring
6	Plate
7	Screw
8	Plug
9	O-ring
10	O-ring
11	Pin
12	Handle kit
12$_{-1}$	Screw
12$_{-2}$	Knob
12$_{-3}$	Nut
12$_{-4}$	Screw
12$_{-5}$	O-ring

OCY-G03-A-Y-J51





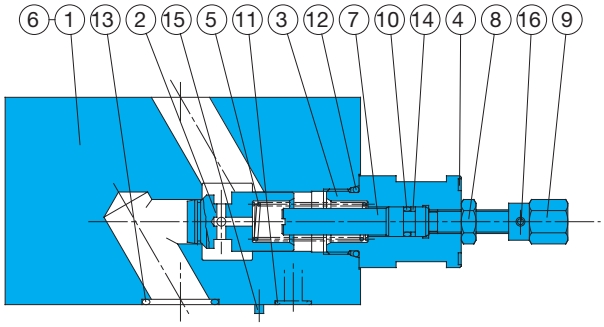
Seal Part List (Kit Model Number BFES-03CY*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
6(12)$_{-5}$	O-ring	NBR-90 P7	2	1	1
9	O-ring	AS568-014(NBR-90)	5	5	5
10	O-ring	NBR-90 P22	2	2	2

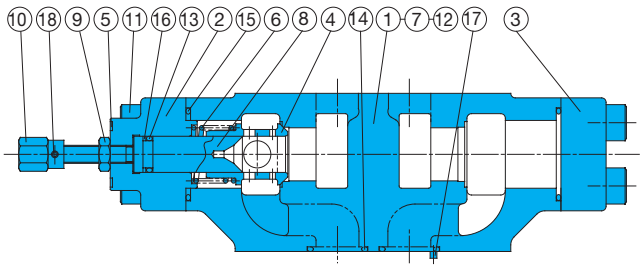
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify W, A, or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Throttle
5	Spring
6	Screw kit
6$_{-1}$	Screw
6$_{-2}$	Nut
6$_{-3}$	Nut
6$_{-4}$	Pin
6$_{-5}$	O-ring
7	Plate
8	Screw
9	O-ring
10	O-ring
11	Pin
12	Handle kit
12$_{-1}$	Screw
12$_{-2}$	Knob
12$_{-3}$	Nut
12$_{-4}$	Screw
12$_{-5}$	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	NBR-90 P7	1
11	O-ring	AS568-012(NBR-90)	2
12	O-ring	NBR-90 P20	1
13	O-ring	AS568-118(NBR-90)	4
14	Backup ring	T2-P7	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Backup ring indicates JIS B 2407-T2-**.

Part No.	Part Name
1	Body
2	Throttle
3	Retainer
4	Plate
5	Spring
6	Plate
7	Screw
8	Nut
9	Nut
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 (NBR-90)	2	2	2
13	O-ring	NBR-70-1 P12	2	1	1
14	O-ring	AS568-118 (NBR-90)	4	4	4
15	O-ring	AS568-127 (NBR-90)	2	2	2
16	Backup ring	T2-P12	2	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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
5	Plate
6	Spring
7	Plate
8	Screw
9	Nut
10	Nut
11	Screw
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)

20 to 200ℓ/min
21,25,35MPa

Features

①This modular valve is used to control actuator speed and for other flow control valve applications.
②A wide range of models are available for A and B port control, A or B port control, and P port control.
③A pressure compensation mechanism ensures that the control flow rate does not change, even when there is pressure fluctuation.
④The control flow rate remains stable, even when oil temperature changes.
⑤Maximum Operating Pressure : 21, 25, 35MPa {214, 255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Control Flow Rate ℓ/min	Check Valve Cracking pressure MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OF-G01-P20-20	1/8	21 {214}	0.1 to 20(differential pressure: 7MPa{71.4kgf/cm²}) 0.3 to 20(differential pressure:21MPa{214kgf/cm²})	–	1.2	ISO 4401-03-02-0-05
OCF-G01-W40-X-30 A40 B40		25 {255}	0.1 to 40(differential pressure: 7MPa{71.4kgf/cm²}) 0.5 to 40(differential pressure:25MPa{255kgf/cm²})	0.08 {0.8}	1.7 1.5	
OCF-G01-W40-Y-30 A40 B40				0.08 {0.8}	1.7 1.5	
OF-G03-P60-J50	3/8	25 {255}	0.3 to 60(differential pressure: 7MPa{71.4kgf/cm²}) 0.5 to 60(differential pressure:25MPa{255kgf/cm²})	–	3.1	ISO 4401-05-04-0-05
OCF-G03-W60-X-J50 A60 B60			0.5 to 60(differential pressure: 7MPa{71.4kgf/cm²}) 1 to 60(differential pressure:25MPa{255kgf/cm²})	0.1 {1.0}	5.0 4.6	
OCF-G03-W60-Y-J50 A60 B60				0.1 {1.0}	5.0 4.6	
OFH-G04-W200-X-10 A200 B200	1/2	35 {357}	10 to 200(differential pressure:21MPa{214kgf/cm²}) 15 to 200(differential pressure:25MPa{255kgf/cm²}) 20 to 200(differential pressure:35MPa{357kgf/cm²})	0.1 {1.0}	11.1 10.2	ISO 4401-07-06-0-05
OFH-G04-W200-Y-10 A200 B200				0.1 {1.0}	11.1 10.2	

●Handling

1 For flow rate control, make sure that the pressure differential between the input port and output port is at least 1MPa {10.2kgf/cm²}. See the Flow Rate - Minimum Differential Pressure Characteristics for information about the OCF-G01 and OFF- 04 maximum control flow rate.

2 The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control knob.

3 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.

4 After adjusting the flow rate, fix it in place by turning the lock screw on the end of the knob to the right.

5 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

6 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

7 Flow rate fluctuation is ±5% within the temperature range of 20°C to 60°C.

Explanation of model No.

01, 03 size

OCF – G 03 – W 60 – Y – J50

- J50: Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50: M8.
- Y: Control mechanism X: Meter-in Y: Meter-out
- 60: Maximum control flow rate
- W: Control port W: A, B ports A: A port P: P port B: B port
- 03: Nominal diameter (size) 01, 03
- G: Mounting method G: Gasket type
- OCF: Flow control modular type
  OCF: With check valve
  OF : Without check valve (P port control)

Explanation of model No.

04 size

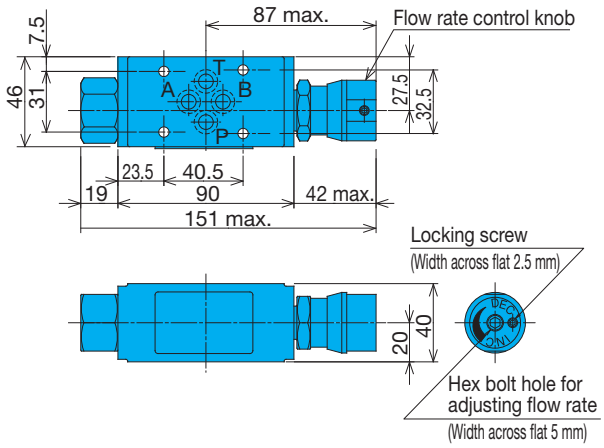
OFH – G 04 – W 200 – Y – 10

- Design number
- Control mechanism X: Meter-in Y: Meter-out
- Maximum control flow rate
- Control port W: A, B ports A: A port B: B port
- Nominal diameter (size) 04
- Mounting method G: Gasket type
- M35 Series flow control modular valve

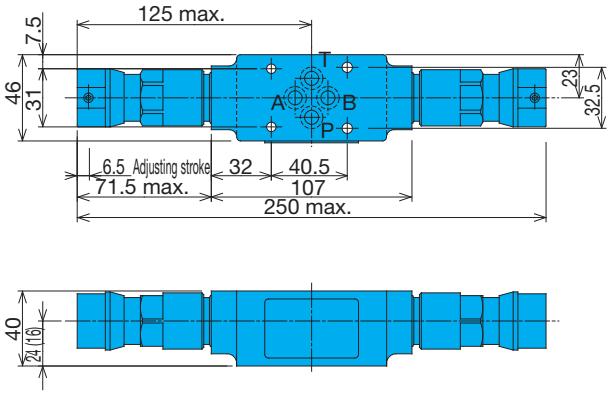
Installation Dimension Drawings

Note) The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control knob.

OF-G01-P20-20

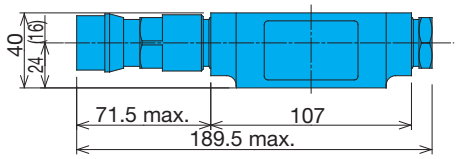


OCF-G01-W40-X/Y-30



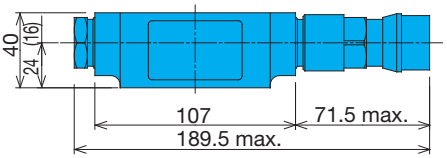
Note) Dimensions in the parentheses are for the OCF-G01-W40-X-30.

OCF-G01-A40-X/Y-30



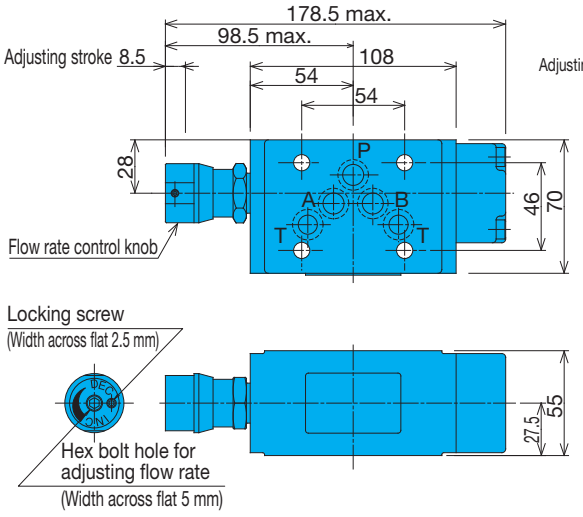
Note) Dimensions in the parentheses are for the OCF-G01-A40-X-30.

OCF-G01-B40-X/Y-30

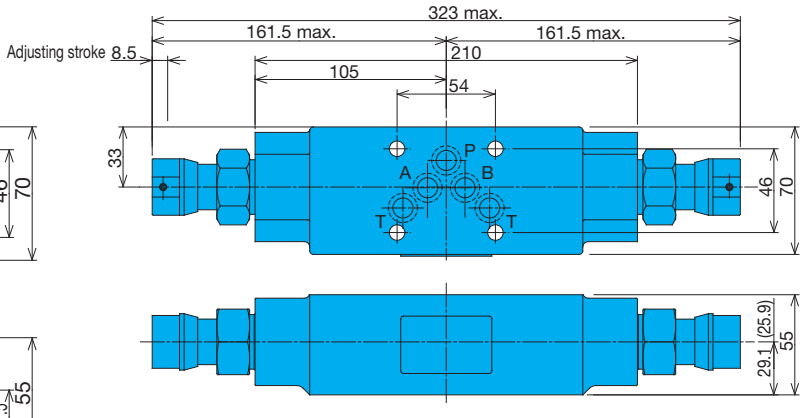


Note) Dimensions in the parentheses are for the OCF-G01-B40-X-30.

OF-G03-P60-J50

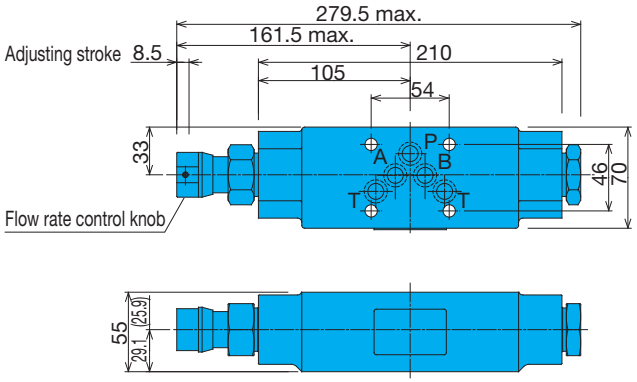


OCF-G03-W60-X/Y-J50



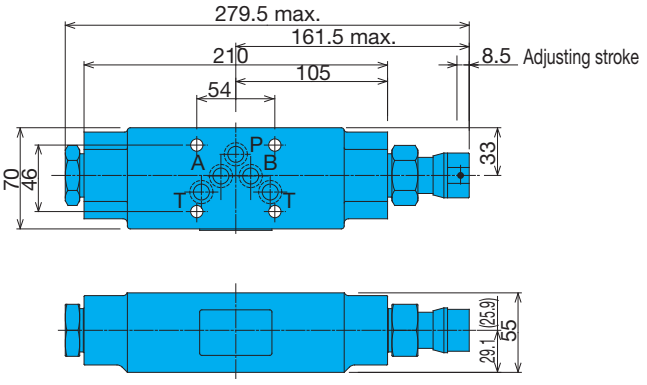
Note) Dimensions in the parentheses are for the OCF-G03-W60-X-J50.

OCF-G03-A60-X/Y-J50



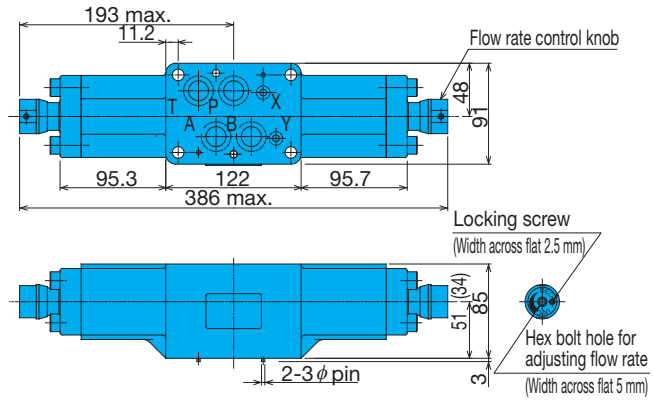
Note) Dimensions in the parentheses are for the OCF-G03-A60-X-J50.

OCF-G03-B60-X/Y-J50



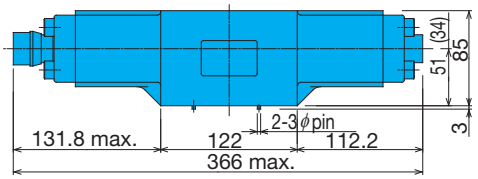
Note) Dimensions in the parentheses are for the OCF-G03-B60-X-J50.

OFH-G04-W200-X/Y-10



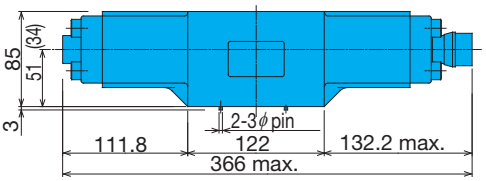
Note) Dimensions in the parentheses are for the OFH-G04-W200-X-10.

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



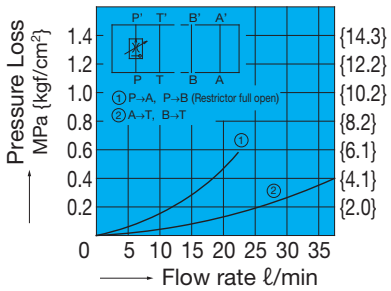
Note) Dimensions in the parentheses are for the OFH-G04-B200-X-10.

Performance Curves

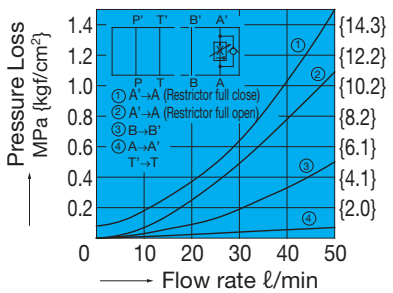
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

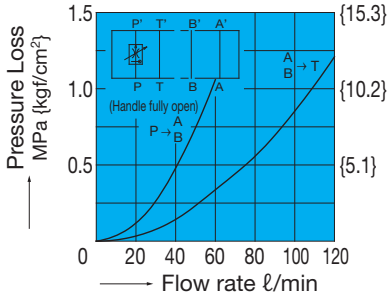
OF-G01-P20-20



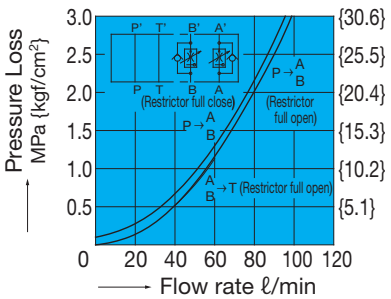
OCF-G01-A40-Y-30



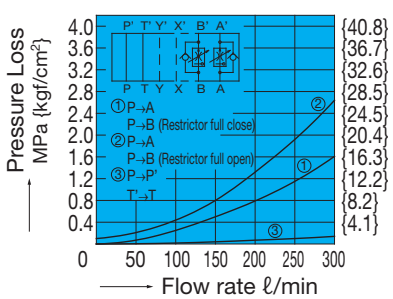
OF-G03-P60-J50



OCF-G03-W60-Y-J50

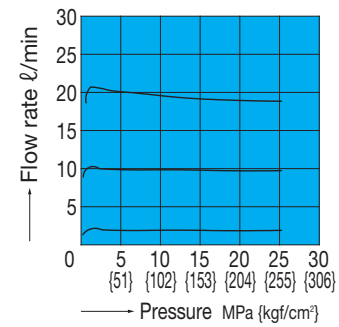


OFH-G04-W200-Y-10

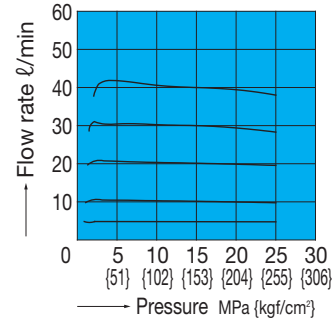


Pressure – Control Flow Rate Characteristics

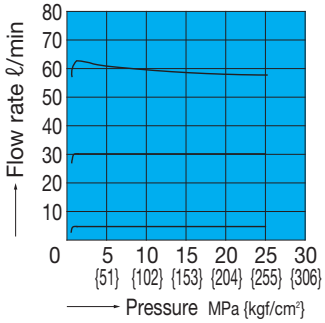
OF-G01-P20-20



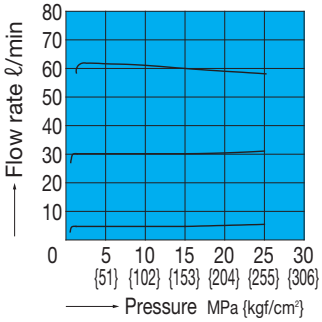
OCF-G01-*40-*-30



OF-G03-P60-J50

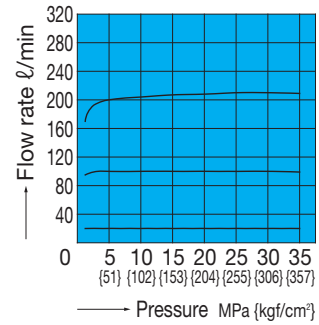


OCF-G03-W60-*-J50

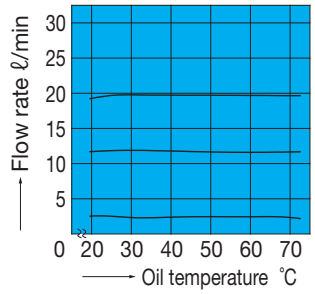


Oil Temperature – Control Flow Rate Characteristics

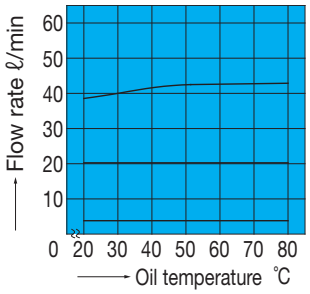
OFH-G04-W200-*-10



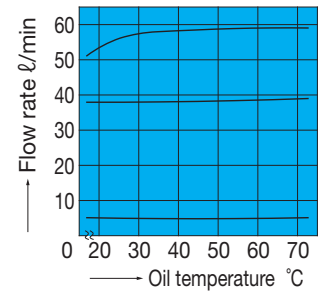
OF-G01-P20-20



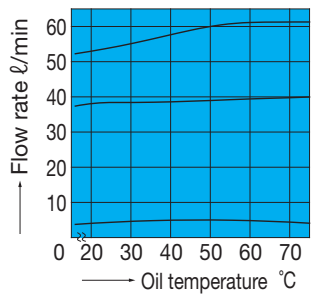
OCF-G01-*40-*-30



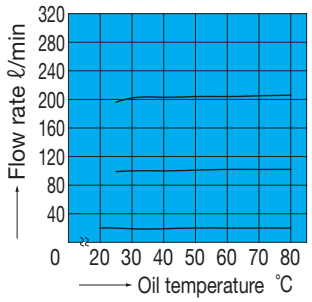
OF-G03-P60-J50



OCF-G03-W60-*-J50

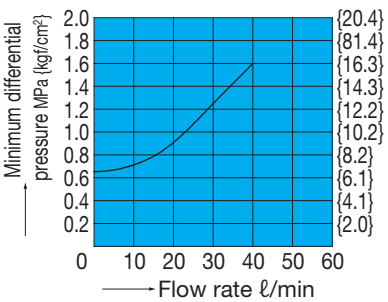


OFH-G04-W200-*-10

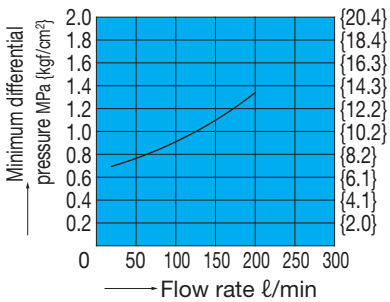


Flow Rate – Minimum Differential Pressure Characteristics

OCF-G01-*40-*-30

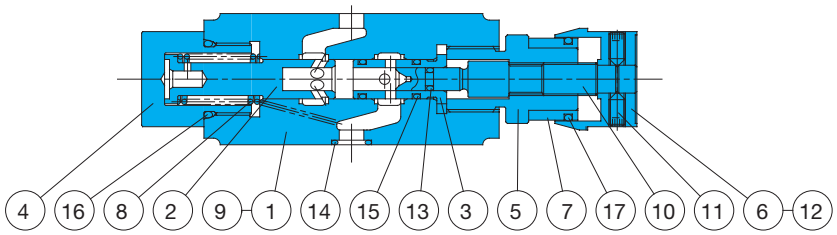


OFH-G04-W200-Y-10



Cross-sectional Drawings

OF-G01-P20-20



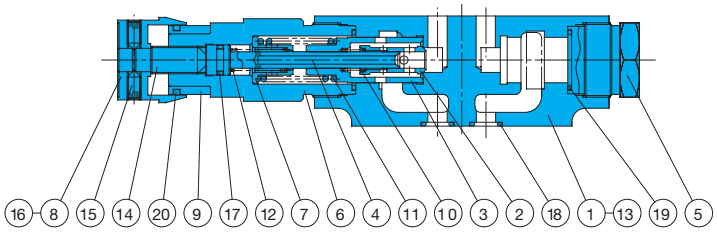
Part No.	Part Name
1	Body
2	Piston
3	Sleeve
4	Bushing
5	Retainer
6	Knob
7	Dial
8	Spring
9	Plate
10	Screw
11	Screw
12	Screw
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	O-ring

Seal Part List (Kit Model Number BFBS-01FP-0A)

Part No.	Part Name	Part Number	Q'ty
			P
13	O-ring	NBR-90 P4	1
14	O-ring	AS568-012(NBR-90)	4
15	O-ring	NBR-90 P9	2
16	O-ring	NBR-90 P20	1
17	O-ring	NBR-70-1 P21	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCF-G01-A40-Y-30



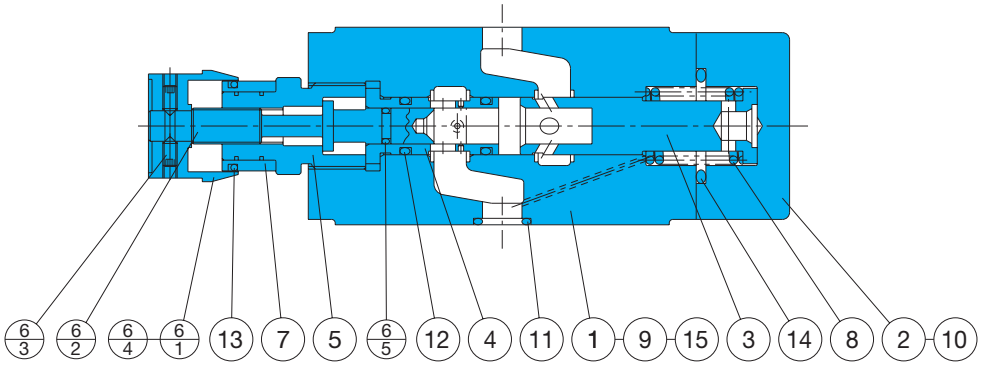
Part No.	Part Name
1	Body
2	Throttle
3	Piston
4	Rod
5	Bushing
6	Retainer
7	Guide
8	Knob
9	Dial
10	Spring
11	Spring
12	Spring
13	Plate
14	Screw
15	Screw
16	Screw
17	O-ring
18	O-ring
19	O-ring
20	O-ring

Seal Part List (Kit Model Number BFCS-01CF*-0A)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
17	O-ring	NBR-70-1 P8	2	1	1
18	O-ring	AS568-012(NBR-90)	4	4	4
19	O-ring	AS568-018(NBR-90)	2	2	2
20	O-ring	NBR-70-1 P21	1	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify W, A, or B for the asterisk (*) in the kit model number.

OF-G03-P60-J50



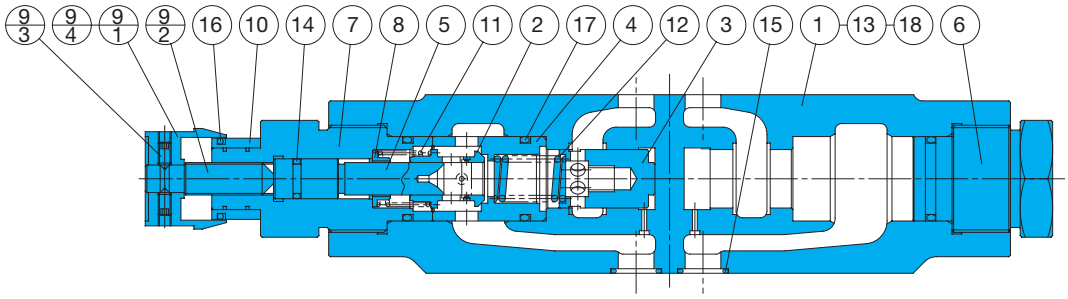
Part No.	Part Name
1	Body
2	Cover
3	Piston
4	Sleeve
5	Retainer
6	Screw kit
6_{-1}	Knob
6_{-2}	Screw
6_{-3}	Screw
6_{-4}	Screw
6_{-5}	O-ring
7	Dial
8	Spring
9	Plate
10	Screw
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Pin

Seal Part List (Kit Model Number BFES-03FP)

Part No.	Part Name	Part Number	Q'ty
			PC
6_{-5}	O-ring	NBR-70-1 P7	1
11	O-ring	AS568-014(NBR-90)	5
12	O-ring	NBR-90 P12	2
13	O-ring	NBR-70-1 P21	1
14	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCF-G03-A60-Y-J50



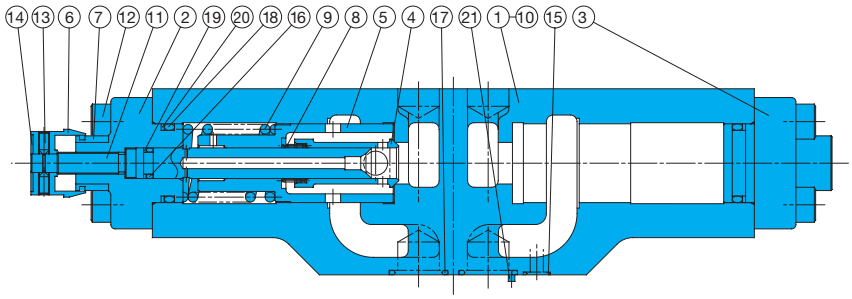
Part No.	Part Name
1	Body
2	Throttle
3	Piston
4	Sleeve
5	Rod
6	Bushing
7	Retainer
8	Guide
9	Screw kit
9_{-1}	Knob
9_{-2}	Screw
9_{-3}	Screw
9_{-4}	Screw
10	Dial
11	Spring
12	Spring
13	Plate
14	O-ring
15	O-ring
16	O-ring
17	O-ring
18	Pin

Seal Part List (Kit Model Number BFES-03CF*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
14	O-ring	NBR-70-1 P10	2	1	1
15	O-ring	AS568-014(NBR-90)	5	5	5
16	O-ring	NBR-70-1 P21	2	1	1
17	O-ring	NBR-90 P22	4	3	3

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify W, A, or B for the asterisk (*) in the kit model number.

OFH-G04-A200-Y-10



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(NBR-90)	2	2	2
16	O-ring	NBR-90 P10A	2	1	1
17	O-ring	AS568-118(NBR-90)	4	4	4
18	O-ring	NBR-90 P30	2	2	2
19	Backup ring	T2-P10A	2	1	1
20	Backup ring	T2-P30	2	2	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
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

50 to 300ℓ/min
25,35MPa

Features

①This modular valve is a check valve that prevents reverse-flow.

②The 01, 03, 04 sizes include types that can also be used as suction and differential circuits.

③Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

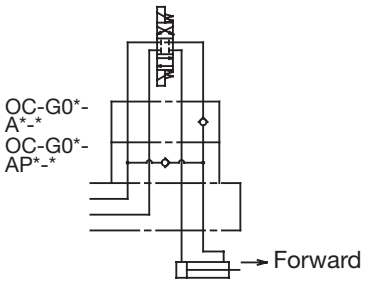
Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
OC-G01-P1-21 P2 P3	1/8	25 {255}	50	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	1.0	ISO 4401-03-02-0-05
OC-G01-T1-21 T2 T3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	1.0	
OC-G01-A1-21 A2 A3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	1.2	
OC-G01-AP1-20 AP2 AP3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	1.0	
OCV-G01-W-20				0.015 {0.15}	1.0	
OC-G03-P1-J50 P2 P3	3/8	25 {255}	100	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	2.7	ISO 4401-05-04-0-05
OC-G03-T1-J50 T2 T3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	2.7	
OC-G03-A1-J50 A2 A3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	2.7	
OC-G03-AP1-J50 AP2 AP3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	2.7	
OCV-G03-W-J50				0.015 {0.15}	3.5	
OCH-G04-P1-10 P2 P3	1/2	35 {357}	300	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	4.5	ISO 4401-07-06-0-05
OCH-G04-T1-10 T2 T3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	6.5	
OCH-G04-A1-10 A2 A3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	4.5	
OCH-G04-AP1-10 AP2 AP3				0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	4.5	
OVH-G04-W-10				0.01 {0.1}	6.5	

●Handling

1 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.)

2 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

3 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).



Differential circuit adjustment

Explanation of model No.

01, 03 size

OC (OCV) – G 03 – P 1 – J50

- Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50 : M8.
- Cracking pressure 1, 2, 3
- Control port P: P port T: T port W: A, B ports (01, 03 vacuum check)
  A: A port
  AP: A, P ports } Differential circuit at set
- Nominal diameter (Size) 01, 03
- Mounting method G: Gasket type
- Vacuum check modular valve (01, 03 size)
- Check modular valve (01, 03 size)

Explanation of model No.

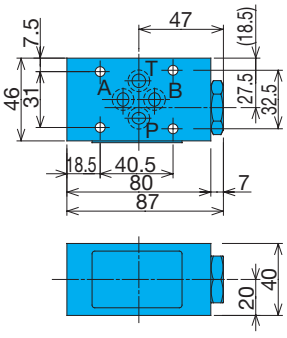
04 size

OCH (OVH) – G 04 – P 1 – 10

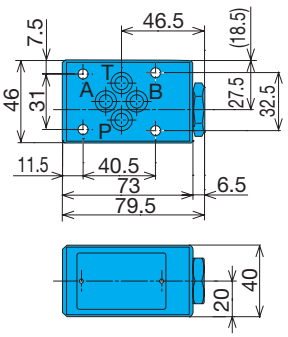
- Design number
- Cracking pressure 1, 2, 3
- Control port P: P port T: T port W: A, B ports (vacuum check)
  A: A port
  AP: A, P ports } Differential circuit at set
- Nominal diameter (Size) 04
- Mounting method G: Gasket type
- M35 Series vacuum check modular valve
- M35 Series check modular valve

Installation Dimension Drawings

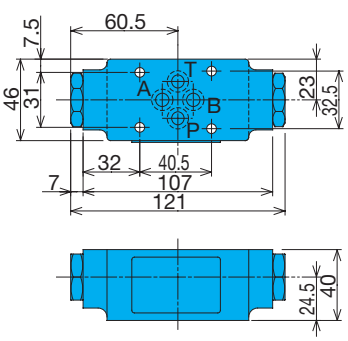
OC-G01-AP-20



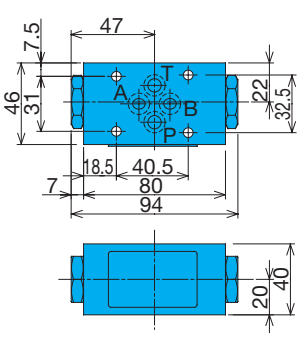
OC-G01-$\frac{P}{T^*}$-21



OC-G01-A*-21

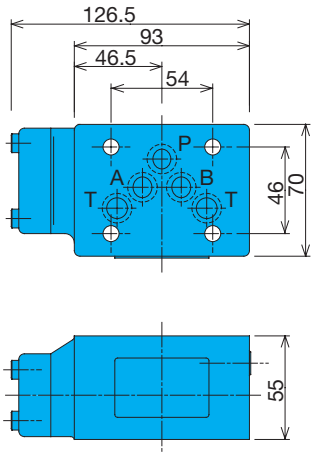


OCV-G01-W-20

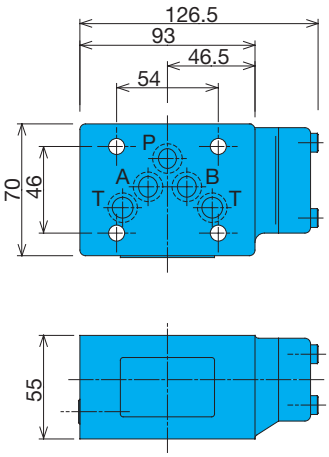


Note) Dimensions in the parentheses are for the OC-G01-T*-20.

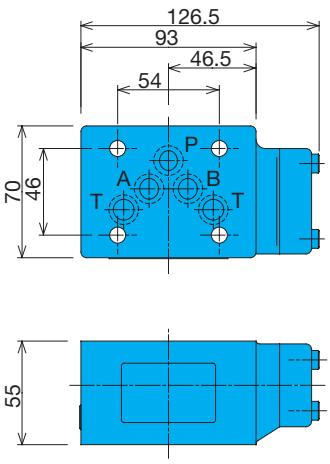
OC-G03-$\frac{P}{AP}$*-J50



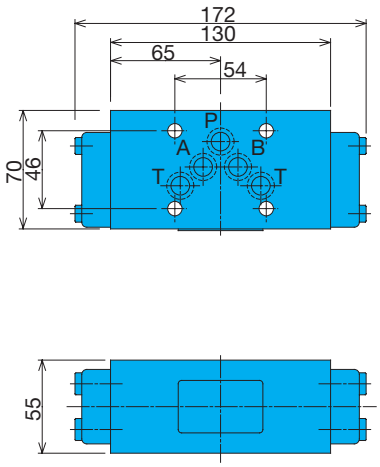
OC-G03-A*-J50



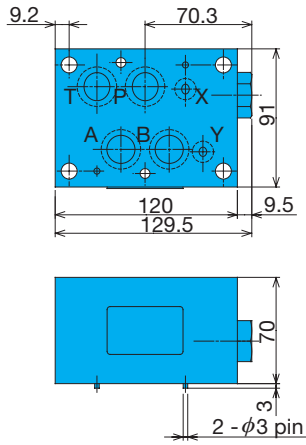
OC-G03-T*-J50



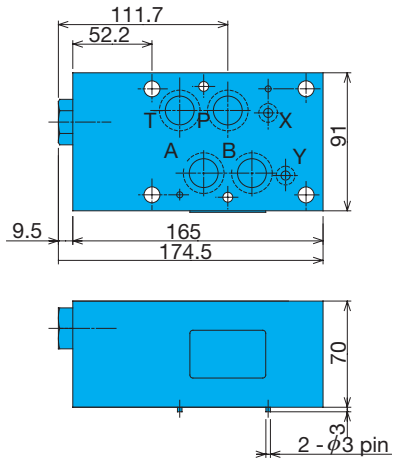
OCV-G03-W-J50



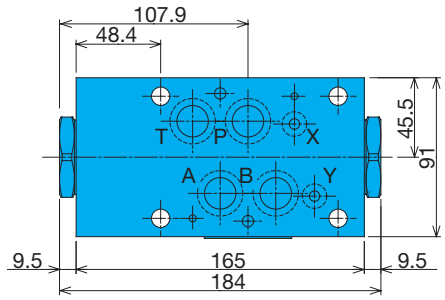
OCH-G04-$\frac{P}{AP}$A*-10

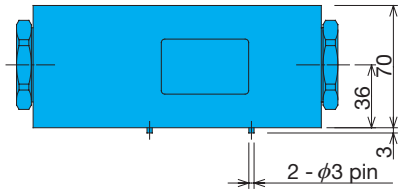


OCH-G04-T*-10



OVH-G04-W-10



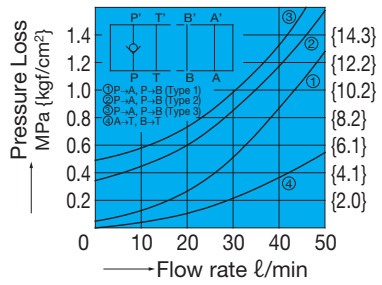


Performance Curves

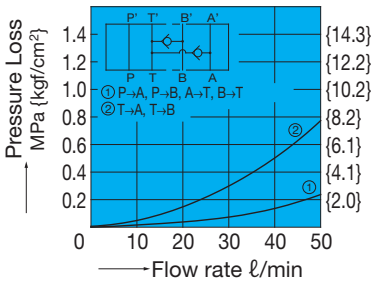
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

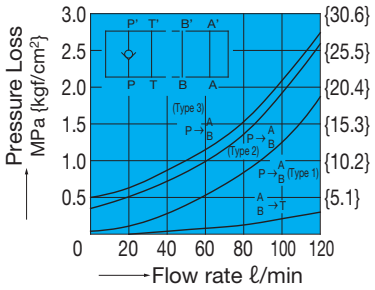
OC-G01-P*-21



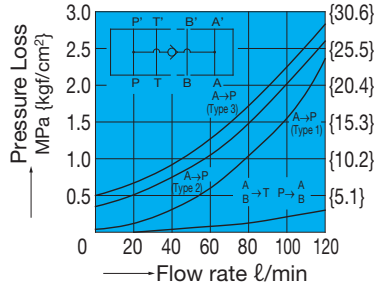
OCV-G01-W-20



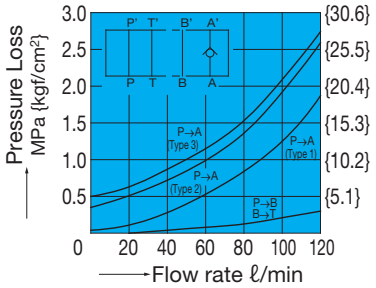
OC-G03-P*-J50



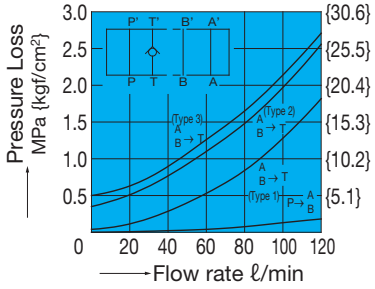
OC-G03-AP*-J50



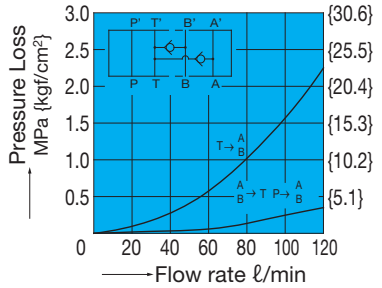
OC-G03-A*-J50



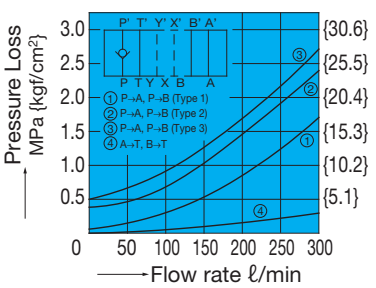
OC-G03-T*-J50



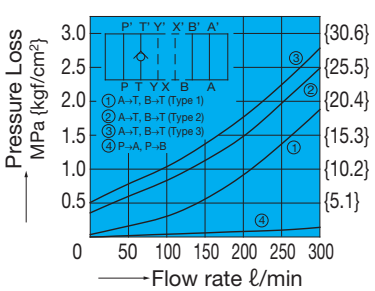
OCV-G03-W-J50



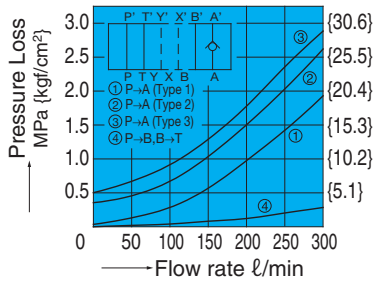
OCH-G04-P*-10



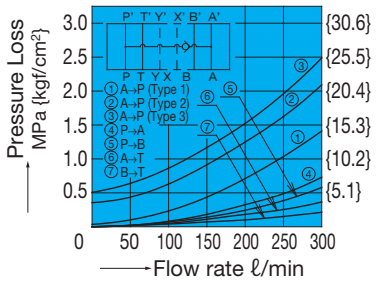
OCH-G04-T*-10



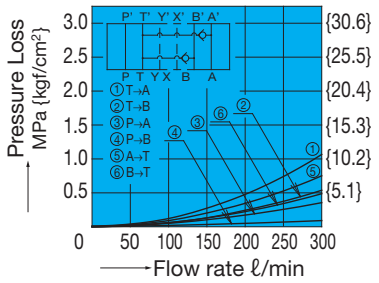
OCH-G04-A*-10



OCH-G04-AP*-10

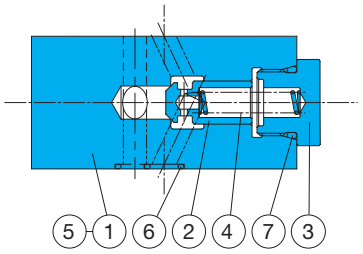


OVH-G04-W-10



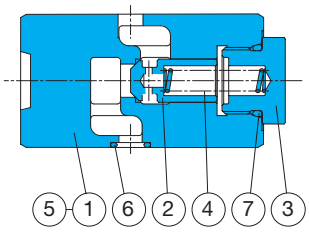
Cross-sectional Drawings

OC-G01-AP-20



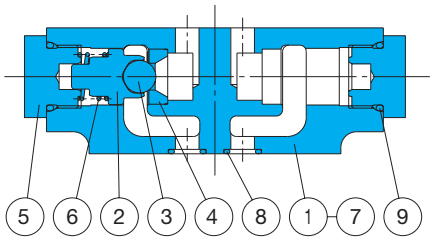
Part No.	Part Name
1	Body
2	Poppet
3	Spring seat
4	Spring
5	Plate
6	O-ring
7	O-ring

OC-G01-$\frac{P}{T}$*-21



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 BDBS-01C*-0A)

Part No.	Part Name	Part Number	Q'ty		
			P	T	AP
6	O-ring	AS568-012(NBR-90)	4	4	4
7	O-ring	NBR-90 P18	1	1	1

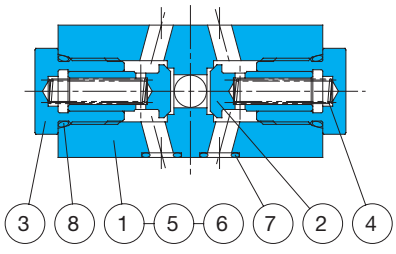
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify P, T, or AP for the asterisk (*) in the kit model number.

Seal Part List (Kit Model Number BDBS-01CA-0A)

Part No.	Part Name	Part Number	Q'ty
			A
8	O-ring	AS568-012(NBR-90)	4
9	O-ring	NBR-90 P18	2

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCV-G01-W-20



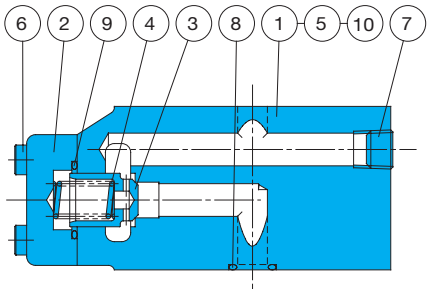
Part No.	Part Name
1	Body
2	Poppet
3	Guide
4	Spring
5	Plate
6	Plug
7	O-ring
8	O-ring

Seal Part List (Kit Model Number BDBS-01CVW)

Part No.	Part Name	Part Number	Q'ty
			W
7	O-ring	AS568-012(NBR-90)	4
8	O-ring	NBR-90 P18	2

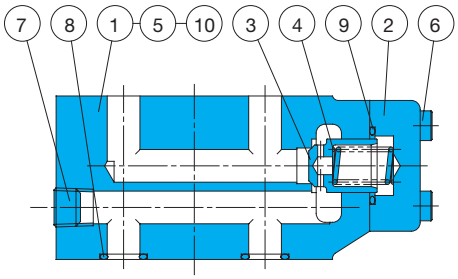
Note) The materials and hardness of the O-ring conform with JIS B2401.

OC-G03-P*-J50



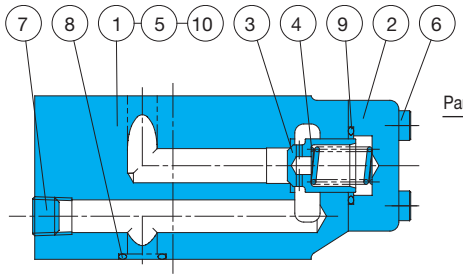
Part No.	Part Name
1	Body
2	Cover
3	Poppet
4	Spring
5	Plate
6	Screw
7	Plug
8	O-ring
9	O-ring
10	Pin

OC-G03-T*-J50



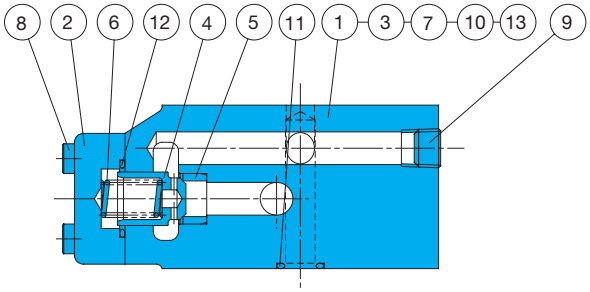
Part No.	Part Name
1	Body
2	Cover
3	Poppet
4	Spring
5	Plate
6	Screw
7	Plug
8	O-ring
9	O-ring
10	Pin

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(NBR-90)	5	5	5
9	O-ring	NBR-90 P22	1	1	1

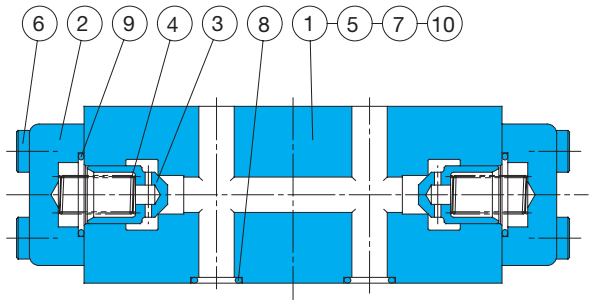
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify P, T, or A for the asterisk (*) in the kit model number.

Seal Part List (Kit Model Number BDES-03CAP)

Part No.	Part Name	Part Number	Q'ty
			AP
10	O-ring	NBR-90 P11	1
11	O-ring	AS568-014(NBR-90)	5
12	O-ring	NBR-90 P22	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCV-G03-W-J50

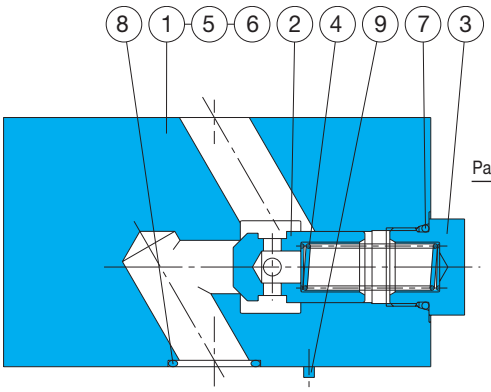


Seal Part List (Kit Model Number BDES-03CVW)

Part No.	Part Name	Part Number	Q'ty
			W
7	O-ring	NBR-90 P10A	2
8	O-ring	AS568-014(NBR-90)	5
9	O-ring	NBR-90 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



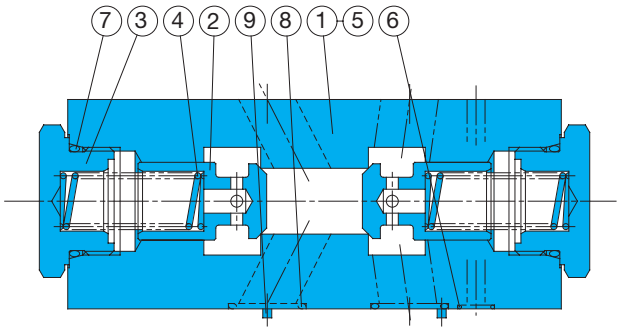
Part No.	Part Name
1	Body
2	Poppet
3	Spring seat
4	Spring
5	Plate
6	O-ring
7	O-ring
8	O-ring
9	Pin

Seal Part List (Kit Model Number BDKS-04C*)

Part No.	Part Name	Part Number	Q'ty			
			P	T	A	AP
6	O-ring	AS568-012(NBR-90)	2	2	2	2
7	O-ring	NBR-90 P20	1	1	1	1
8	O-ring	AS568-118(NBR-90)	4	4	4	4

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify P, T, A, or AP for the asterisk (*) in the kit model number.

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-04CVW)

Part No.	Part Name	Part Number	Q'ty
6	O-ring	AS568-012(NBR-90)	2
7	O-ring	NBR-90 P32	2
8	O-ring	AS568-118(NBR-90)	4

Note) The materials and hardness of the O-ring conform with JIS B2401.

Pilot Operated Check Modular Valve

50 to 300ℓ/min
25,35MPa

Features

①This modular valve is used to prevent actuator self-running and to maintain actuator position.

②Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm²}	Area Ratio			Weight kg	Gasket Surface Dimensions
					Pilot Piston	Check Valve Seat	Needle Valve Seat		
OCP-G01-W1-21 W2	1/8	25 {255}	50	0.2 {2.0} 0.5 {5.1}	1	0.37	–	1.2	ISO 4401-03-02-0-05
OCP-G01-A1-21 A2				0.2 {2.0} 0.5 {5.1}					
OCP-G01-B1-21 B2				0.2 {2.0} 0.5 {5.1}					
OCP-G01-W1-F-21 W2				0.2 {2.0} 0.5 {5.1}	1	0.51	0.06	1.2	
OCP-G01-A1-F-21 A2				0.2 {2.0} 0.5 {5.1}					
OCP-G01-B1-F-21 B2				0.2 {2.0} 0.5 {5.1}					
OCP-G03-W1-J50 W2	3/8	25 {255]	100	0.2 {2.0} 0.5 {5.1}	1	0.49	0.07	3.6	ISO 4401-05-04-0-05
OCP-G03-A1-J50 A2				0.2 {2.0} 0.5 {5.1}					
OCP-G03-B1-J50 B2				0.2 {2.0} 0.5 {5.1}					
OCP-G03-W1-D-J50 W2				0.2 {2.0} 0.5 {5.1}	1	0.49	–		
OCP-G03-A1-D-J50 A2				0.2 {2.0} 0.5 {5.1}					
OCP-G03-B1-D-J50 B2				0.2 {2.0} 0.5 {5.1}					
OPH-G04-W1-10 W2	1/2	35 {357}	300	0.2 {2.0} 0.5 {5.1}	1	0.50	0.07	6.8	ISO 4401-07-06-0-05
OPH-G04-A1-10 A2				0.2 {2.0} 0.5 {5.1}					
OPH-G04-B1-10 B2				0.2 {2.0} 0.5 {5.1}					
OPH-G04-W1-D-10 W2				0.2 {2.0} 0.5 {5.1}	1	0.50	–		
OPH-G04-A1-D-10 A2				0.2 {2.0} 0.5 {5.1}					
OPH-G04-B1-D-10 B2				0.2 {2.0} 0.5 {5.1}					

●Handling

1 Note that when the 01 size has the auxiliary symbol "F," tank port back pressure can cause the small valve to open, making it impossible to maintain pressure.

2 If tank port back pressure causes the small valve to open and make it impossible to maintain pressure with the 03, 04 size, use a direct type with auxiliary symbol "D."

3 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.

4 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

5 04 series modular valves do not have an L (DR_2) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Explanation of model No.

01, 03 size

OCP – G 03 – W 1 – (D) – J50

- Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50: M8.
- Auxiliary symbol F: With shock-resistant mechanism (01 size only)
  D: No small valve poppet (03 size only)
- Cracking pressure 1: 0.2MPa{2.0kgf/cm²} 2: 0.5MPa{5.1kgf/cm²}
- Control port W: A, B ports A: A port B: B port
- Nominal diameter (size) 01, 03
- Mounting method G: Gasket type
- Pilot operated check modular valve

Explanation of model No.

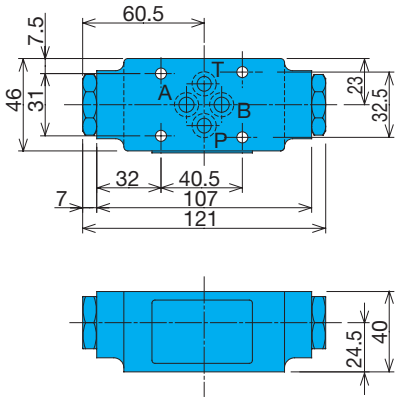
04 size

OPH – G 04 – W 1 – (D) – 10

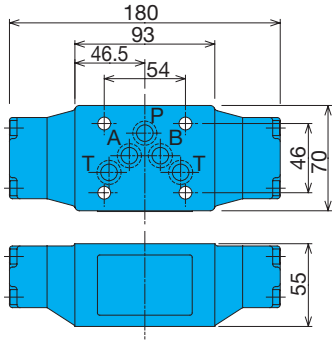
- Design number
- Auxiliary symbol D: No small valve poppet
- Cracking pressure 1: 0.2MPa{2.0kgf/cm²}
  2: 0.5MPa{5.1kgf/cm²}
- Control port W: A, B ports A: A port B: B port
- Nominal diameter (size) 04
- Mounting method G: Gasket type
- M35 Series pilot operated check modular valve

Installation Dimension Drawings

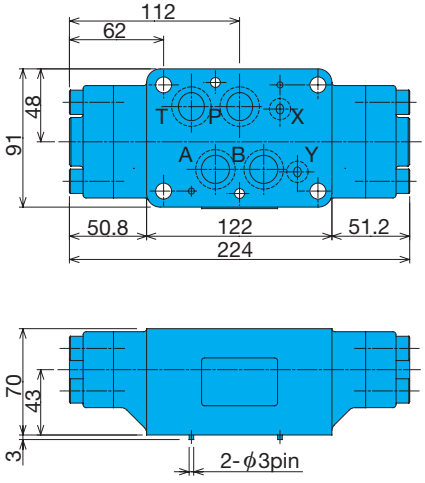
OCP-G01-**-(F)-21



OCP-G03-**-(D)-J50



OPH-G04-**-(D)-10

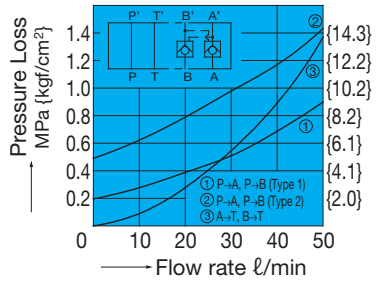


Performance Curves

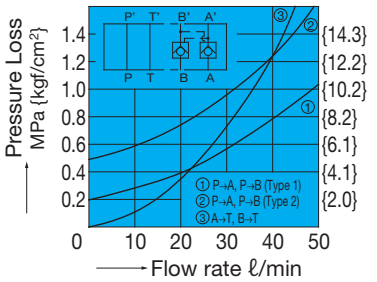
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

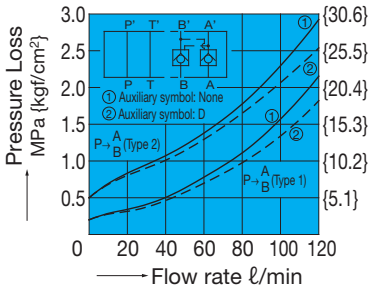
OCP-G01-W*-21



OCP-G01-W*-F-21

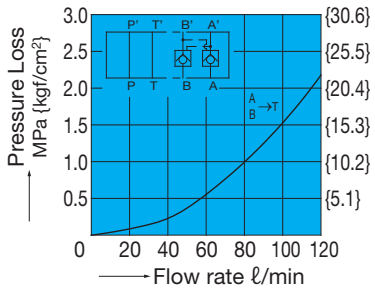


OCP-G03-W*-(D)-J50

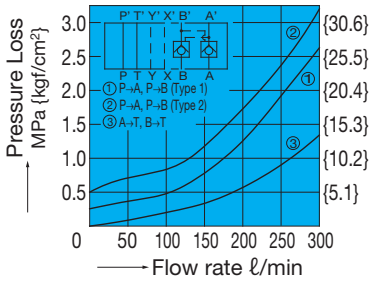


Pressure Loss Characteristics (Reverse Free Flow)

OCP-G03-W*-J50

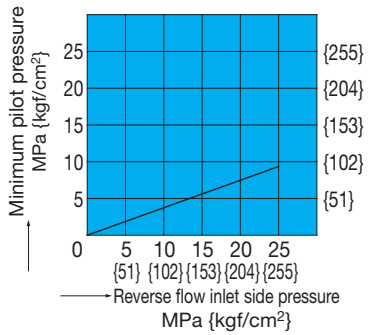


OPH-G04-W*-10

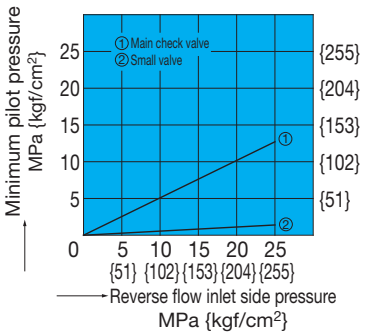


Minimum Pilot Pressure Characteristics

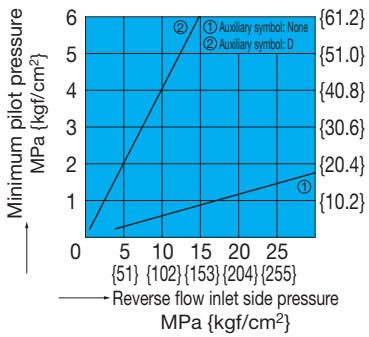
OCP-G01-**-21



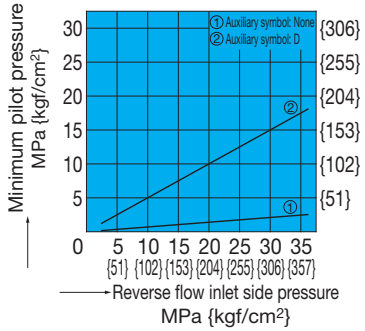
OCP-G01-**-F-21



OCP-G03-W*-(D)-J50

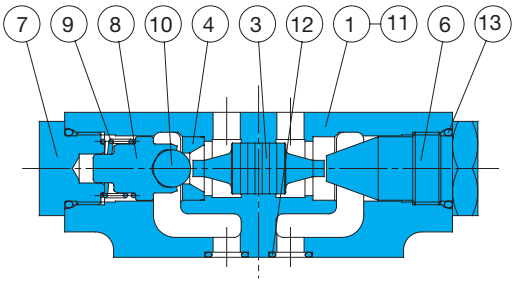


OPH-G04-W*-(D)-10

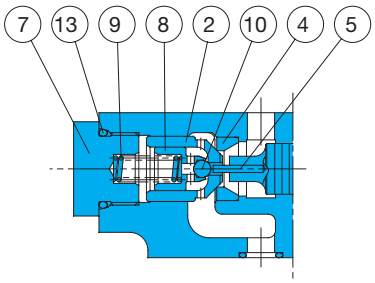


Cross-sectional Drawings

OCP-G01-A*-21



OCP-G01-A*-F-21



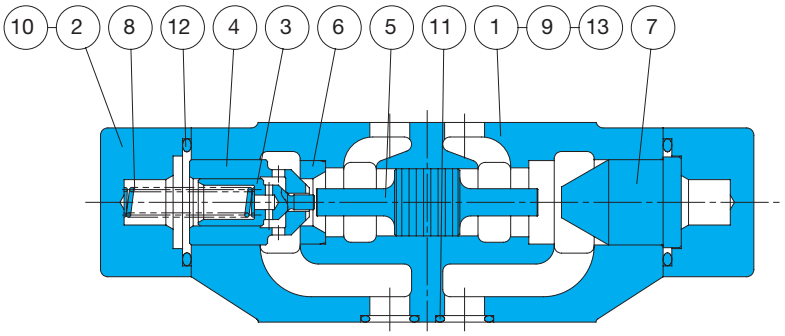
Part No.	Part Name
1	Body
2	Poppet
3	Piston
4	Seat
5	Rod
6	Bushing
7	Spring seat
8	Guide
9	Spring
10	Ball
11	Plate
12	O-ring
13	O-ring

Seal Part List (Kit Model Number BDBS-01CP*-0A)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
12	O-ring	AS568-012(NBR-90)	4	4	4
13	O-ring	NBR-90 P18	2	2	2

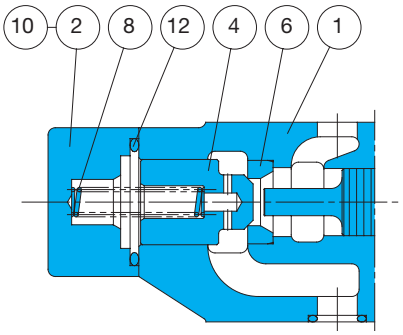
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify W, A, or B for the asterisk (*) in the kit model number.

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

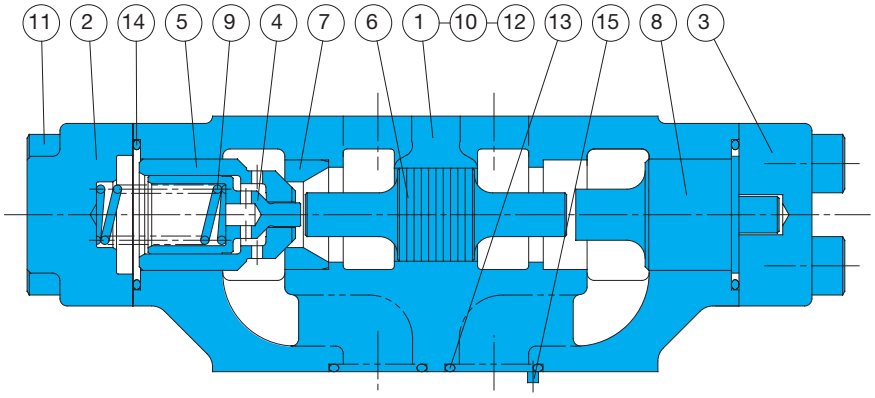


Seal Part List (Kit Model Number BDES-03CP*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
11	O-ring	AS568-014(NBR-90)	5	5	5
12	O-ring	NBR-90 P29	2	2	2

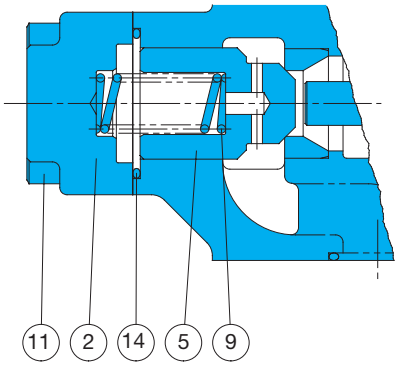
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify W, A, or B for the asterisk (*) in the kit model number.

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(NBR-90)	2	2	2
13	O-ring	AS568-118(NBR-90)	4	4	4
14	O-ring	AS568-127(NBR-90)	2	2	2

Note) Specify W, A, or B for the asterisk (*) in the kit model number.

Gauge Modular Block

50 to 100ℓ/min
25MPa

Features

①This modular block makes it possible to attach a pressure gauge to the P and T ports or the A and B ports.

②Connection to the ports is extremely simple.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Weight kg	Gasket Surface Dimensions
OK-G01-P-20 OK-G01-T-20	1/8	25 {255}	50	0.6	ISO 4401-03-02-0-05
OK-G01-W-20				0.6	
OK-G01-P-H-20 OK-G01-T-H-20				1.0	
OK-G01-W-H-20				1.0	
OK-G03-J50	3/8	25 {255}	100	2.3	ISO 4401-05-04-0-05

Explanation of model No.

OK – G 01 – P – (H) – 20

- 20 — Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J50: M6, 50 : M8.
- (H) — Auxiliary symbol H: 40 mm thick (01 size only)
- P — Pressure output port P: P port T: T port W: A, B ports
- 01 — Nominal Diameter (Size) 01, 03
- G — Mounting method G: Gasket type
- OK — Gauge modular block

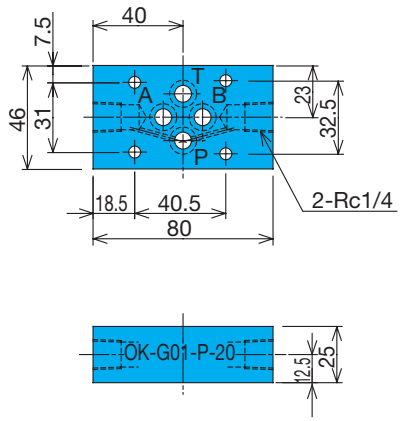
●Handling

1 When installing the OK-G01-P-(H)- 20, OK-G01-T-(H)-20, or OK-G01- W-(H)-20, make sure the model number printing is oriented so it can be read correctly from the P port side.

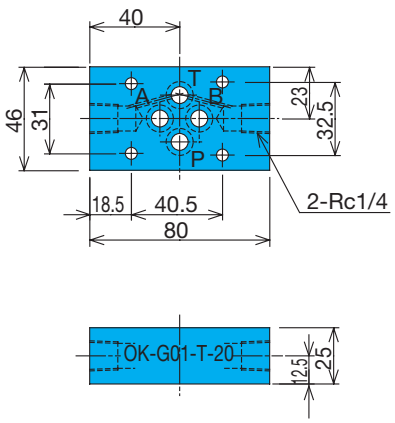
2 Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

Installation Dimension Drawings

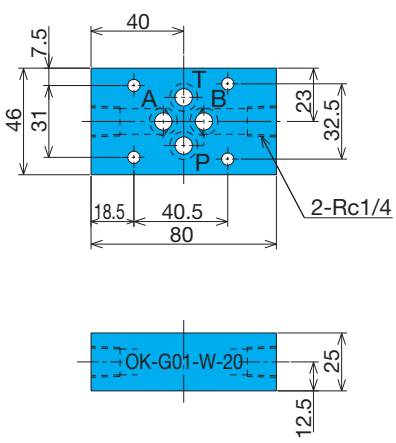
OK-G01-P-20



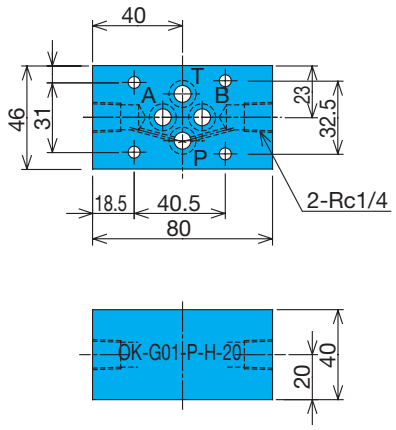
OK-G01-T-20



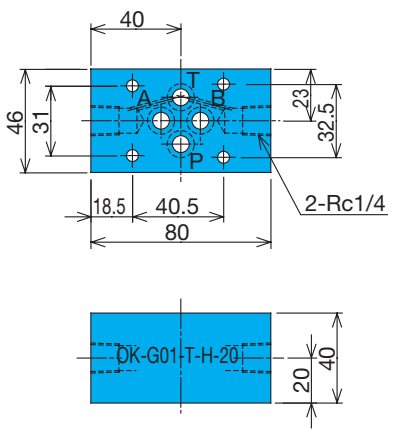
OK-G01-W-20



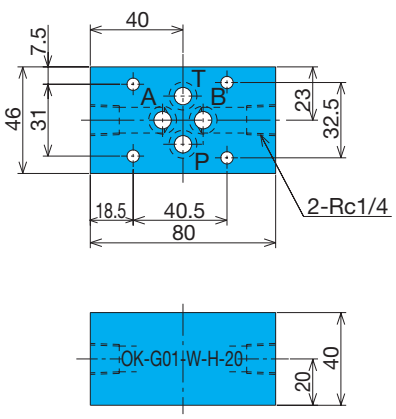
OK-G01-P-H-20



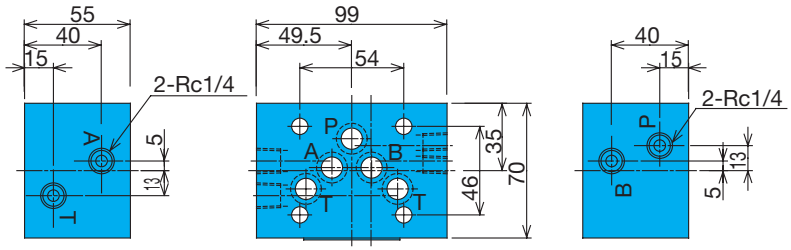
OK-G01-T-H-20



OK-G01-W-H-20



OK-G03-J50



Seal Part List

Size	Part Name	Part Number	Q'ty
01	O-ring	AS568-012(NBR-90)	4
03	O-ring	AS568-014(NBR-90)	5

Note) The materials and hardness of the O-ring conform with JIS B2401.

High-low System Block

50 to 100ℓ/min
25MPa

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 MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Weight kg
OB-G01-W-20	1/8	25 {255}	50	1.5
OB-G01-W-H-20				2.5
OB-G03-W-J30	3/8	25 {255}	100	4.5
OB-G03-W-H-J30				7.1

●Handling

1 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.

2 When installing this block, make sure the nameplate is oriented so it can be read correctly from the A port side.

3 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.

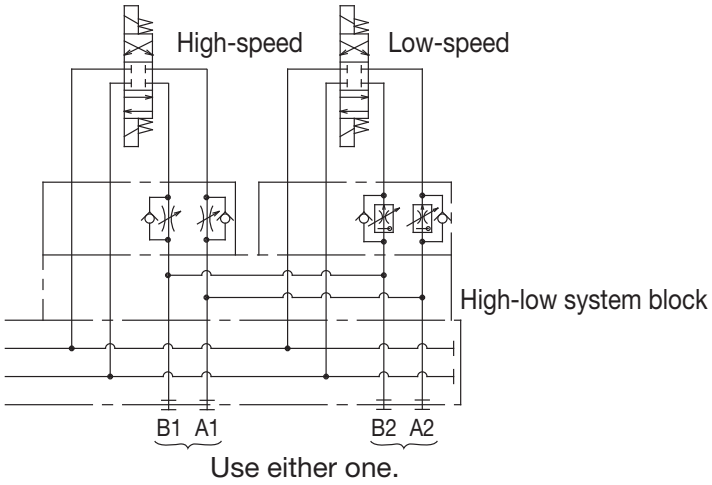
4 Note that installation bolts are not included. See pages D-90 through D-95 if these items are required.

Explanation of model No.

OB – G 01 – W – (H) – 20

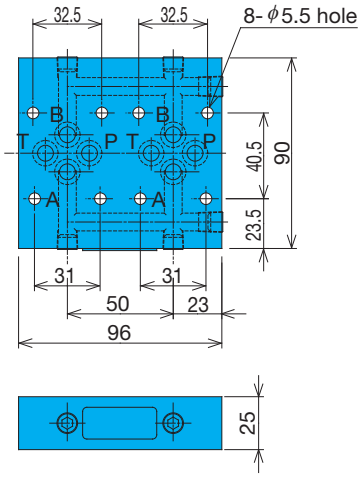
- 20: Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J30: M6, 30 : M8.
- (H): Auxiliary symbol H: 40mm thick (01 size) 50mm thick (03 size)
- W: High-low system
- 01: Nominal diameter (size) 01, 03
- G: Mounting method G: Gasket type
- OB: High-low system block

Example of Typical Circuit

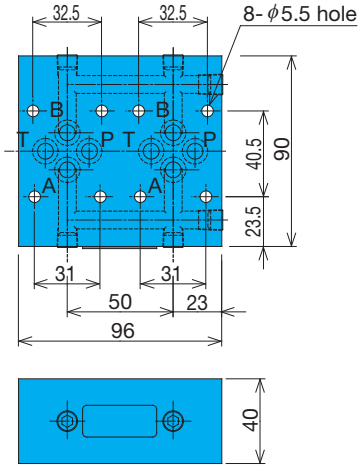


Installation Dimension Drawings

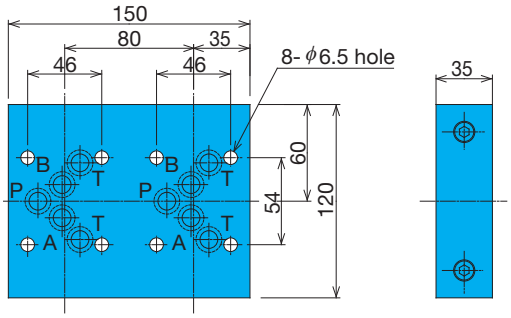
OB-G01-W-20



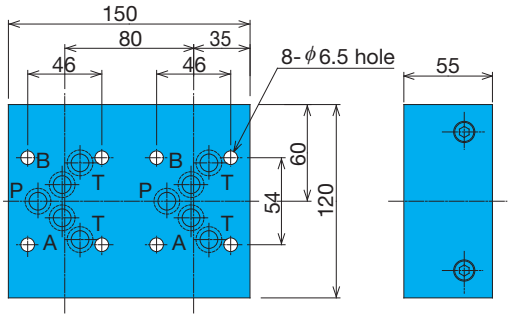
OB-G01-W-H-20



OB-G03-W-J30



OB-G03-W-H-J30



Seal Part List

Size	Part Name	Part Number	Q'ty
01	O-ring	AS568-012(NBR-90)	8
03	O-ring	NBR-90 P12	10

Note) The materials and hardness of the O-ring conform with JIS B2401.

End Plate, Free Flow Plate, 03/01 Change Plate

50 to 100ℓ/min
25MPa

Features

①The 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.
②The free flow plate is a modular valve plate is used in a one-way circuit that does not require a solenoid valve.
③The 03/01 change plate makes it possible to use an 01 size modular valve with an 03 size sub-plate and base block.
④The 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 MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Weight kg
MOB-G01-10	1/8	25 {255}	–	0.3
MOB-G01-H-10				0.6
MOB-G01-A-10 MOB-G01-B-10			50	0.6
MOB-G03-J50	3/8	25 {255}	–	1.4
MOB-G03-H-50				2.5
MOB-G03-A-J50 MOB-G03-B-J50			100	1.3
MOB-G03-A-H-50 MOB-G03-B-H-50				2.3
MOB-G03-AA-J50			50	2.3
MOB-G06-AA-5411A	3/4	21 {214}	200	8.0

Explanation of model No.

MOB – G 03 – A – (H) – J50

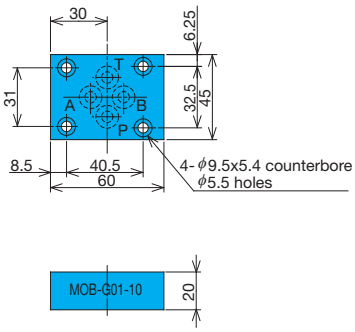
- Design number — Note: Auxiliary symbol (tightening height) and design number (G03 size)
  J50: M6 type 26.5mm
  50: M8 type 23.4mm
  H-50: M8 type 58mm (stop plate and relief low plate only)
  5411A: 06/04 conversion plate (special item)
- Auxiliary symbol — H: Tightening height 36mm (01 size), 58mm (03 size)
- Port connection status — None: All ports blocked (stop plate)
  A: P⟷A, B⟷T } (Free-flow plate)
  B: P⟷B, A⟷T }
  AA: G03→G01, G06→G04
  P→P
  T→T } 03/01 Switching plate
  A→A } 06/04 Conversion plate
  B→B
- Nominal diameter (size) 01, 03
- Mounting method — G: Gasket type
- Modular valve plate

●Handling
1 Installation bolts are not included. Use the table to the right to specify bolts for stand-alone use.

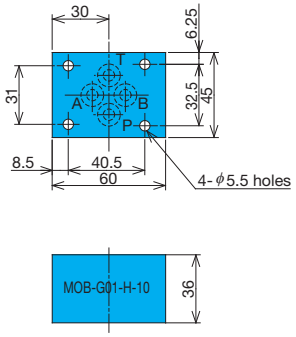
Model No.	Bolt Dimensions	Q'ty
MOB-G01-10	M5×25	4
MOB-G01-*-10	M5×45	4
MOB-G03-J50 MOB-G03-$\frac{A}{B}$-J50 MOB-G03-AA-J50	M6×35	4
MOB-G03-50 MOB-G03-$\frac{A}{B}$-50 MOB-G03-AA-50	M8×35	4
MOB-G03-H-50 MOB-G03-$\frac{A}{B}$-H-50	M8×70	4
MOB-G06-AA-5411A	M12×70	6

Installation Dimension Drawings

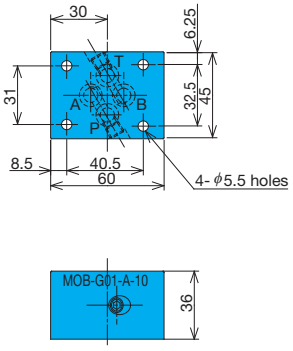
MOB-G01-10



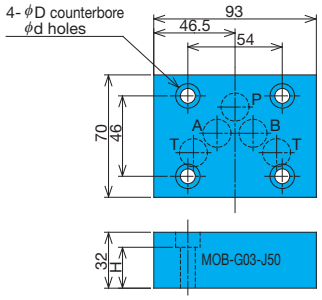
MOB-G01-H-10



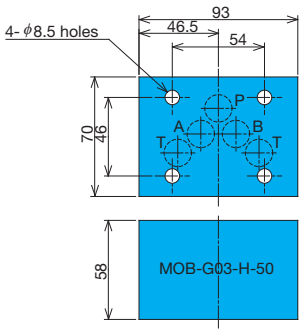
MOB-G01-$\frac{A}{(B)}$-10



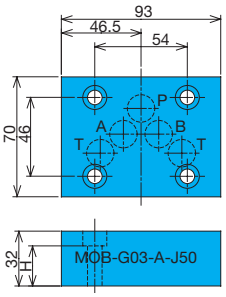
MOB-G03-J50



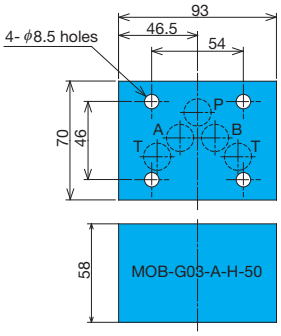
MOB-G03-H-50



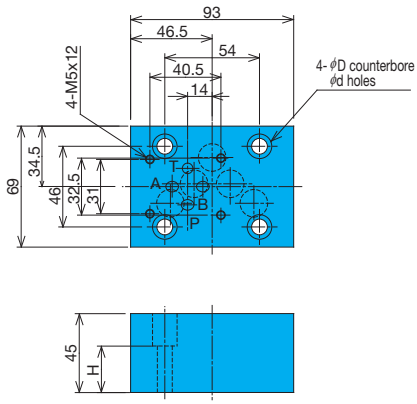
MOB-G03-$\frac{A}{B}$-J50



MOB-G03-$\frac{A}{B}$-H-50



MOB-G03-AA-J50



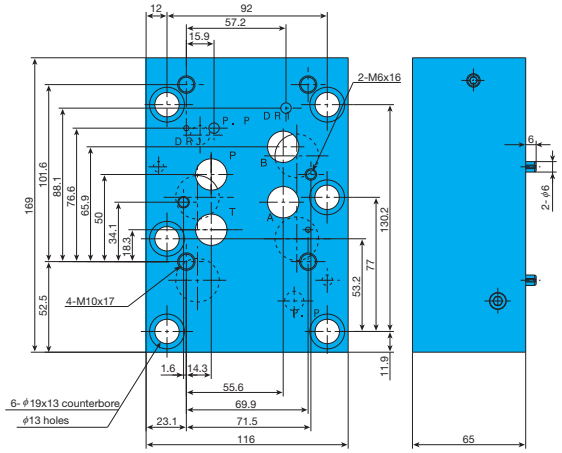
Model No.	D	H	d
MOB-G03-*-50	14	23.4	8.5
MOB-G03-*-J50	11	26.5	6.5

Seal Part List

Size	Part Name	Part Number	Q'ty
01	O-ring	AS568-012(NBR-90)	4
03	O-ring	AS568-014(NBR-90)	5
06	O-ring	NBR-90 P28	4
	O-ring	NBR-90 P20	2

Note) The materials and hardness of the O-ring conform with JIS B2401.

MOB-G06-AA-5411A

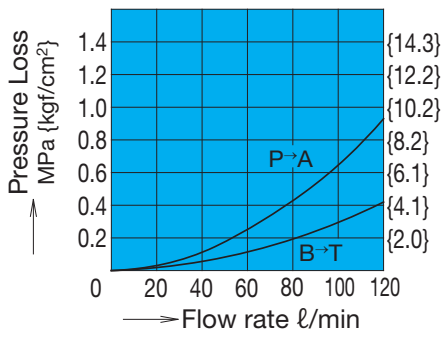


Performance Curves

Hydraulic Operating Fluid
Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

MOB-G03-A-J50



Solenoid Valve/Modular Valve Subplate

Features

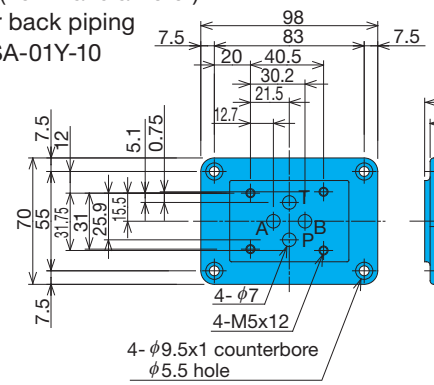
This plate is for when only a single solenoid valve and modular is used.

The 01 and 03 sizes include one-side piping types.

Installation Dimension Drawings

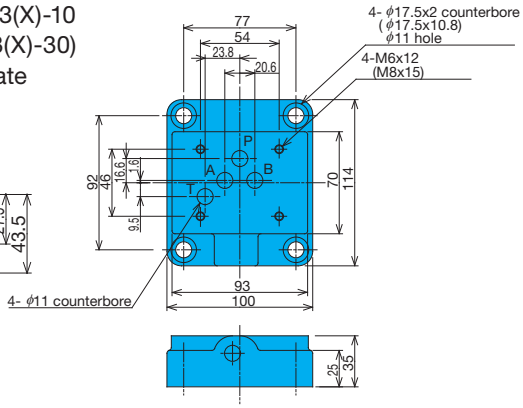
Use the following table for specification when a sub plate is required.

01 (nominal diameter)
For back piping
MSA-01Y-10



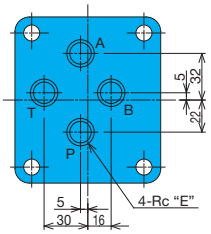
Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate ℓ/min	Weight kg
MSA-01X-10	1/4	25 {255}	20	1.2
MSA-01Y-10	3/8		40	1.2

03 (nominal diameter)
For back piping
MSA-03(X)-10
(MS-03(X)-30)
Sub Plate



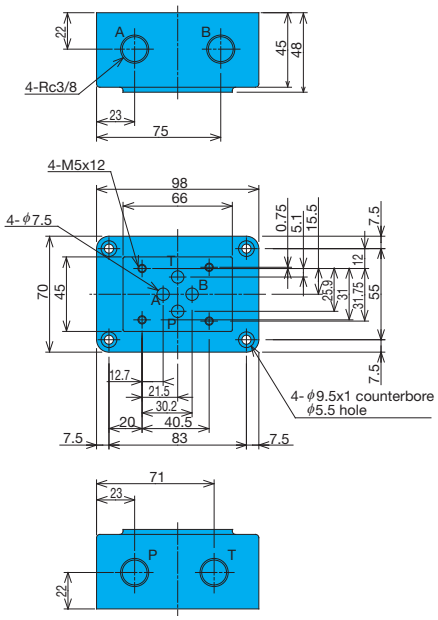
Sub Plate Number

Mounting bolt	Model No.	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate ℓ/min	E
M6	MSA-03-10	25 {255}	45	3/8
	MSA-03X-10		80	1/2
M8	MS-03-30	25 {255}	45	3/8
	MS-03X-30		80	1/2



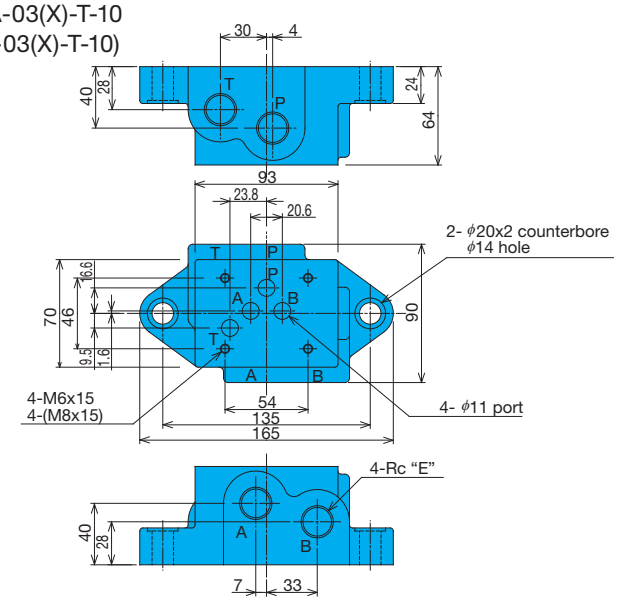
Note) Dimensions in parentheses indicate MS-03 (X) -30.

For one-side piping
MSA-01Y-T-10



Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate ℓ/min	Weight kg
MSA-01Y-T-10	3/8	25 {255}	40	1.9

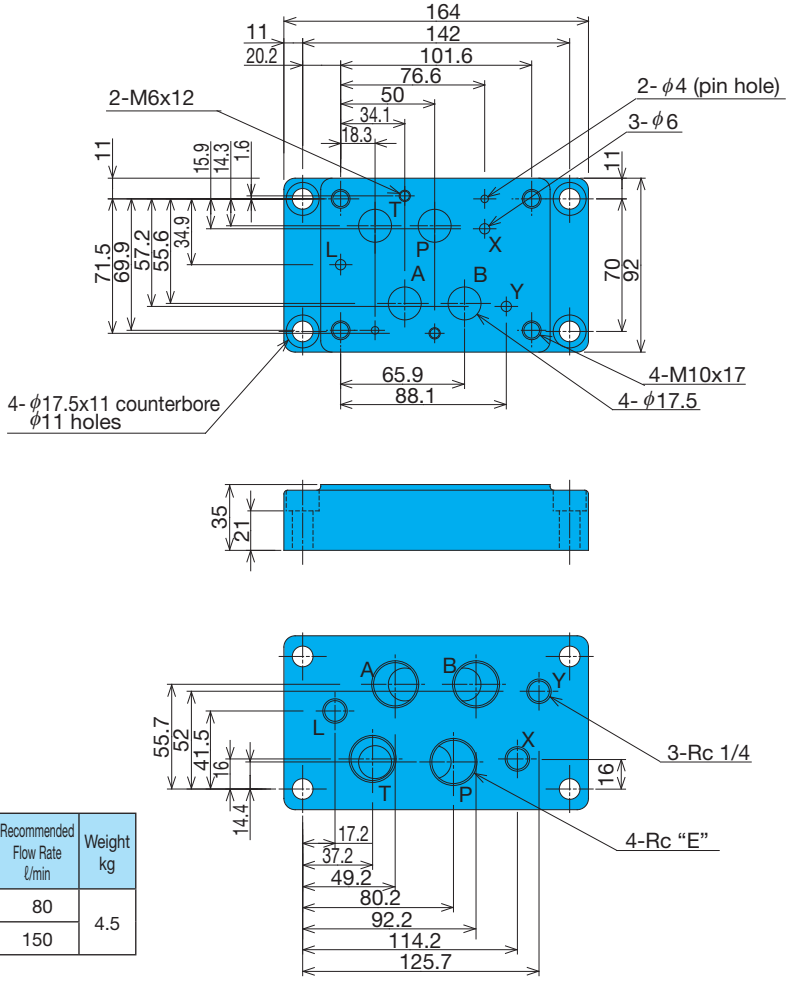
For one-side piping
MSA-03(X)-T-10
(MS-03(X)-T-10)



Note) Dimensions in parentheses indicate MS-03 (X) -T-10.

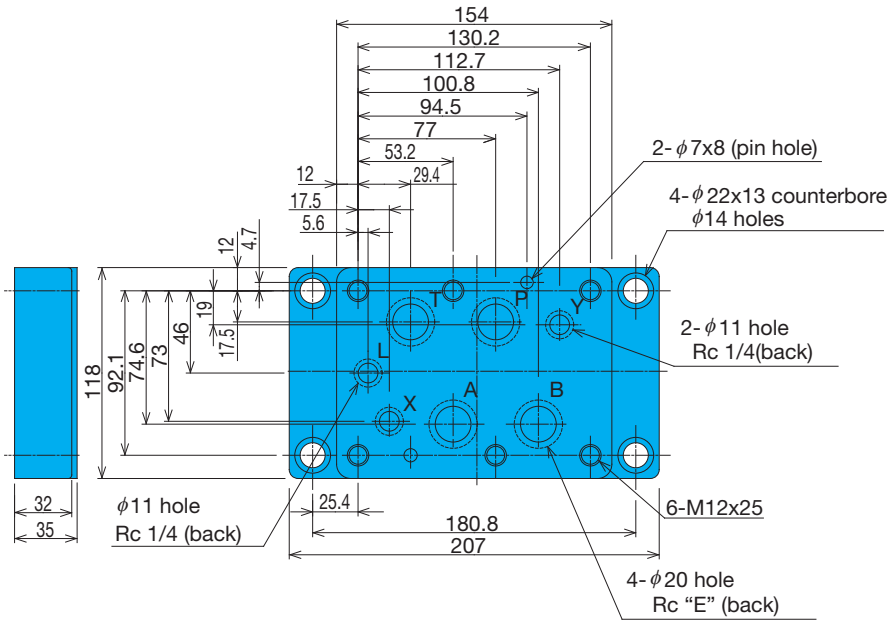
Mounting bolt	Model No.	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate ℓ/min	Pipe Outlet Size E	Weight kg
M6	MSA-03-T-10	25 {255}	45	3/8	3.8
	MSA-03X-T-10		80	1/2	
M8	MS-03-T-10	25 {255}	45	3/8	3.8
	MS-03X-T-10		80	1/2	

04 (nominal diameter)
MDS-04(X)-10



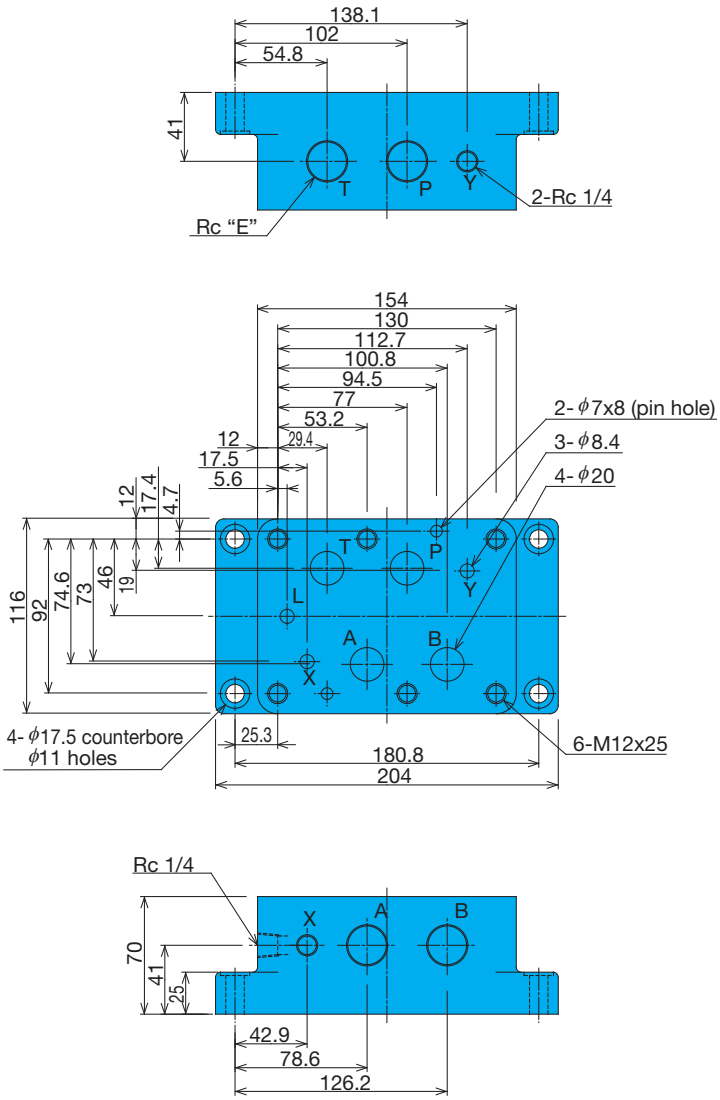
Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate ℓ/min	Weight kg
MDS-04-10	1/2	25 {255}	80	4.5
MDS-04X-10	3/4		150	

06 (nominal diameter)
MDS-06(X)-30 (for back piping)



Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate ℓ/min	Weight kg
MDS-06-30	3/4	25 {255}	150	5.2
MDS-06X-30	1		300	

MDS-06(X)-T-10 (for one-side piping)



Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate ℓ/min	Weight kg
MDS-06-T-10	3/4	25 {255}	150	9.0
MDS-06X-T-10	1		300	

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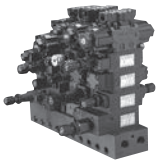
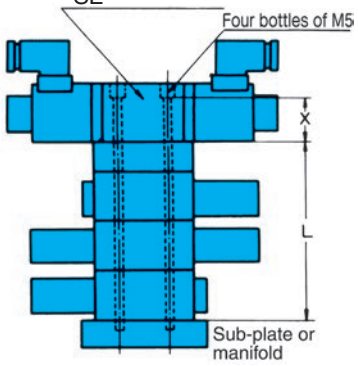
Valve Installation Bolt List



01 (nominal diameter)

SS
SA -G01-***-**-31

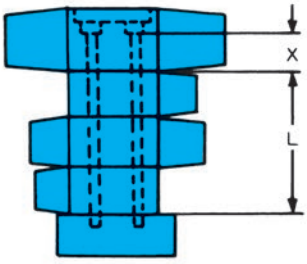
SL
SE -G01-***-**-40



Model Number	X
SA-G01-***-**-31	37.5
SS-G01-***-R-**-31	
SL-G01-***-R-**-31	
SE-G01-***-GR-**-40	

Type	Model Number	Dimension L	Bolt length
Hexagon Socket Head Bolt	OTH-01-45-10	0	45
	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

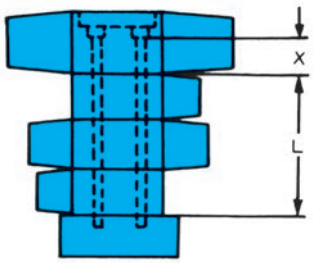
03 (nominal diameter)
SS-G03-***-**-J22
SA-G03-***-**-J21



Model Number	X
SS-G03-***-R-**-J22 SA-G03-***-R-**-J21	60.5

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
	-170-	90	M6×170
	-190-	110	M6×190
	-225-	145	M6×225
	-245-	165	M6×245
	-280-	200	M6×280
	-300-	220	M6×300

SS-G03-***-**-22
SA-G03-***-**-21

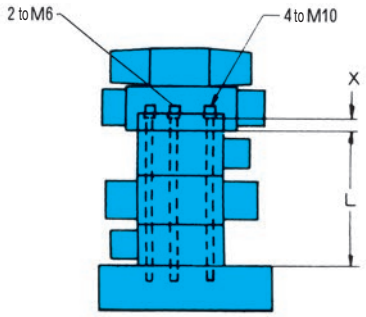


Model Number	X
SS-G03-***-R-**-22 SA-G03-***-R-**-21	58

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
	-170-	90	M8×170
	-190-	110	M8×190
	-225-	145	M8×225
	-245-	165	M8×245
	-280-	200	M8×280
	-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. 01 Size
Modular valves at a height of 40 + 25 = 65mm are ganged to one level.
4. 2-pressure reducing valves at a height of 90 mm are ganged to two levels.
5. Refer to page E-31 for installation bolts for SE-G03.

04 (nominal diameter)

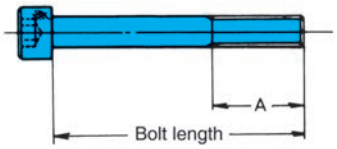


Model No.	X
DSS-G04-***-R-**-22 DSA-G04-***-**-22	34

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 21 MPa. For details, consult your agent.
(See page D-4)

Hexagon socket head bolt



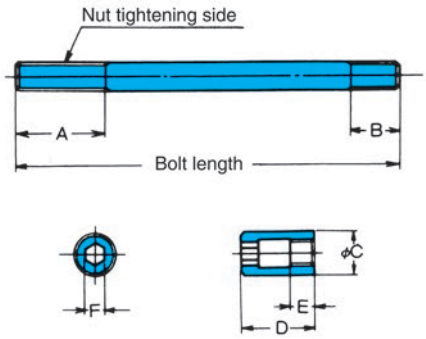
Nominal Diameter	A	Bolt Size
01	15	M5
03	18	M6
03	22	M8
04	18	M6
	26	M10

Dimensions other than bolt length are in accordance with JIS B 1176.

Tightening Torque

Nominal Diameter	Bolt Size	Tightening Torque N·m{kgf·cm}
01	M5	5 to 7 { 51 to 71}
03	M6	10 to 13 {102 to 133}
03	M8	20 to 25 {205 to 255}
04	M6	10 to 13 {102 to 133}
	M10	45 to 55 {460 to 560}

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.

Explanation of model No.

MOB – 01X – B3 – 10

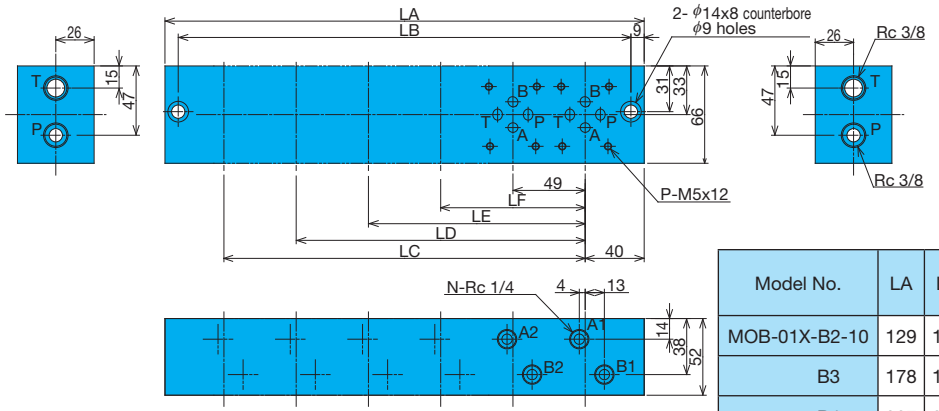
- Design number
- Sequential number
- A, B port piping diameter — X: One size larger than nominal diameter; Y: Two size larger than nominal diameter
- Nominal diameter (size) 01, 03
- Base block for modular valve

Note) Another series of multi-pump blocks is available for the MBS and MBW Series NACHI PACK. For details, see page L-16.

Installation Dimension Drawings

01 (nominal diameter) bass block

MOB-01X-B*-10



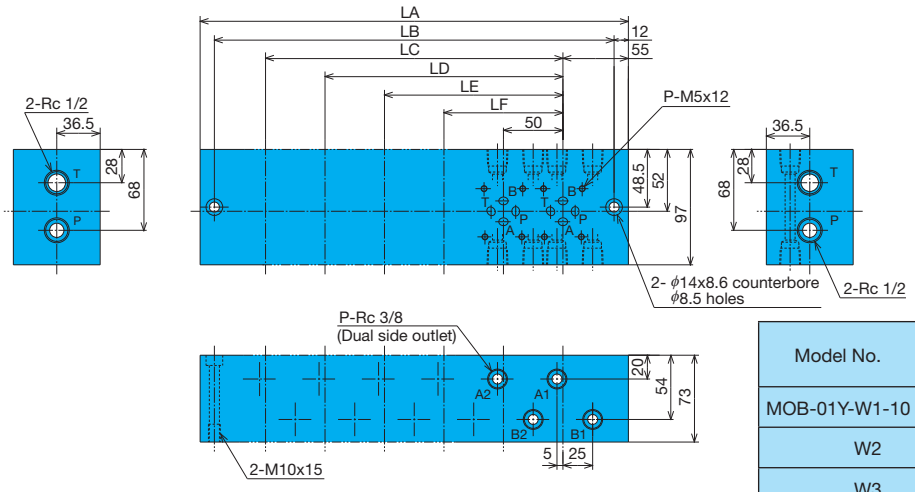
Plug Tightening Torque

Plug Configuration	Tightening Torque N·m{kgf·cm}
TPHA-1/4	25 to 30 {255 to 305}
TPHA-3/8	40 to 48 {410 to 490}

Model No.	Pipe Outlet Size (A, B)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min
MOB-01X-B*-10	1/4	25 {255}	20

Model No.	LA	LB	LC	LD	LE	LF	N	P	Weight kg
MOB-01X-B2-10	129	111	–	–	–	–	4	8	2.8
B3	178	160				98	6	12	3.8
B4	227	209			147		8	16	4.9
B5	276	258		196			10	20	5.9
B6	325	307	245				12	24	6.9

MOB-01Y-W*-10



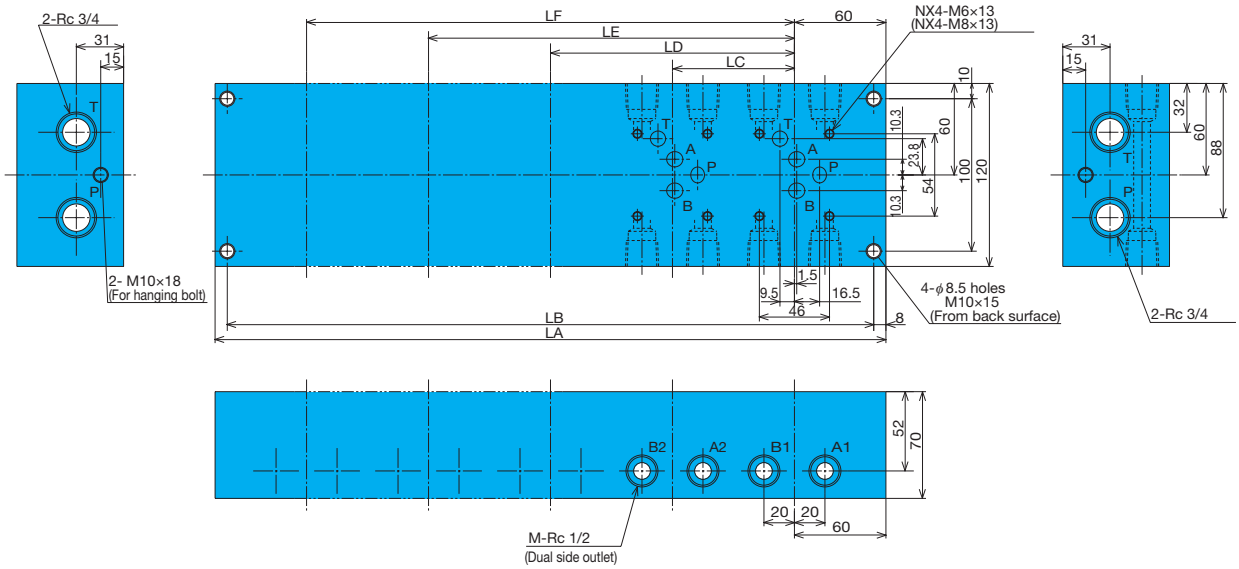
Plug Tightening Torque

Plug Configuration	Tightening Torque N·m{kgf·cm}
TPHA-3/8	40 to 48 {410 to 490}
TPHA-1/2	55 to 66 {560 to 675}

Model No.	Pipe Outlet Size (A, B)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min
MOB-01Y-W*-10	3/8	25 {255}	40

Model No.	LA	LB	LC	LD	LE	LF	P	Weight kg
MOB-01Y-W1-10	110	86	–	–	–	–	4	5.1
W2	160	136					8	7.3
W3	210	186				100	12	9.6
W4	260	236			150		16	11.8
W5	310	286		200			20	14.0
W6	360	336	250				24	16.2

03 (nominal diameter) bass block
MOB-03X-B*-(J)30



Plug Tightening Torque

Plug Configuration	Tightening Torque N·m{kgf·cm}
TPHA-1/2	55 to 66 {560 to 675}
TPHA-3/4	90 to 108 {918 to 1100}

Model No.	Pipe Outlet Size (A, B)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min
MOB-03X-B*-(J)30	1/2	25 {255}	80

Model No.	Dimensions								Weight kg
	LA	LB	LC	LD	LE	LF	M	N	
MOB-03X-B2-(J)30	200	184	80	–	–	–	8	2	10.3
B3	280	264	80	160			12	3	14.3
B4	360	344	80	160	240		16	4	18.4
B5	440	424	80	160	240	320	20	5	22.4

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

50 to 300ℓ/min
35MPa

Features

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.

●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 D-12 for information about the 04 size.
This series consists of pressure, flow rate, and flow direction control valves.
Maximum Working Pressure : 35MPa{357kgf/cm²}
Maximum Flow Rate : to 300ℓ/min

●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 E-57.
Maximum Working Pressure : 35MPa{357kgf/cm²}
Maximum Flow Rate : to 100ℓ/min

●M35 Series Related Components
- •High-response proportional flow control valve
  Maximum Working Pressure : 31.4MPa{320kgf/cm²}
  Maximum Flow Rate : to 350ℓ/min

●M35 Series Industry Specific Components
- •Jack Valve
  Maximum Working Pressure : 35MPa{357kgf/cm²}
  Maximum Flow Rate : to 100ℓ/min
- •Logic Cartridge Mono Block
  Maximum Working Pressure : 35MPa{357kgf/cm²}
  Maximum Flow Rate : to 7000ℓ/min

●M35 Series Industry Specific Components
- •Hydraulic accessories (stop valves, filters, accumulators, hoses, etc.); NACHI-MOOG servo level

Specifications

M35 Series Modular Valve

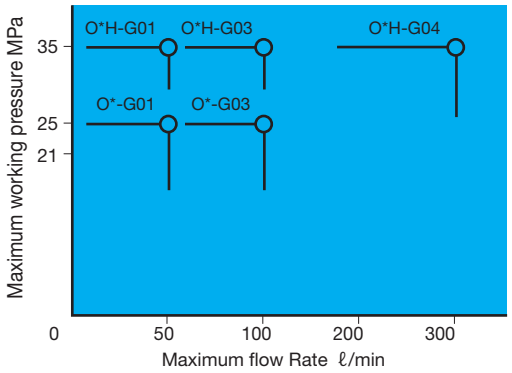
Size	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Number of Integration Levels
01	35 {357}	50	to 3
03		100	
04		300	

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 03 size.

Modular Valve Product Series



01 03 Size Specifications

Type	Name	Valve Model Number	Maximum Operating Power	Maximum Flow Rate	Pressure Adjustment Range (Cracking Pressure) MPa{kgf/cm²}	JIS Symbol
Solenoid Valves	Solenoid Valves	SA-G**-**-**-31(21) SS-G**-**-**-31(22)				
Pressure Control Valves	Relief Valves (Balance Type)	ORH-G01-P*-10 -W*- ORH-G03-P*-10 -W*-		G01 40ℓ/min G03 80ℓ/min	3:3.5 to 25MPa{35.7 to 255kgf/cm²} 5:7 to 35MPa{71.4 to 357kgf/cm²} P: P (→T) port W: AB (→T) port	
Pressure Control Valves	Relief Valves (Direct Type)	ORH-G01-DW*-10 -DA*- -DB*- ORH-G03-DW*-10 -DA*- -DB*-		G01 20ℓ/min G03 30ℓ/min	3:3.5 to 25MPa{35.7 to 255kgf/cm²} 5:7 to 35MPa{71.4 to 357kgf/cm²} DW: AB (→T) port DA: A (→T) port DB: B (→T) port	
Pressure Control Valves	Reducing Valve	OGH-G01-P*-10 -B*- OGH-G03-P*-(B)-10 -B*-		G01 40ℓ/min G03 80ℓ/min	3:3.5 to 25MPa{35.7 to 255kgf/cm²} P: P port B: B port	
Flow Control Valves	Flow Regulator Valves	OYH-G01-W-Y-10 -A-Y- -B-Y- -W-X- -A-X- -B-X OYH-G03-W-Y-10 -A-Y- -B-Y- -W-X- -A-X- -B-X	35MPa {357kgf/cm²}	G01 50ℓ/min G03 100ℓ/min	Y: Meter out X: Meter in W: AB port A: A port B: B port	
Direction Control Valves	Check Valves	OCH-G01-P*-10 -T*- OCH-G03-P*-10 -T*-		G01 50ℓ/min G03 100ℓ/min	1:0.04MPa{0.4kgf/cm²} 2:0.35MPa{3.6kgf/cm²} 3:0.5 MPa{5.1kgf/cm²} P: P port T: T port	
Direction Control Valves	Pilot Check Valves	OPH-G01-W*-(F)-10 -A*- -B*- OPH-G03-W*-(D)-10 -A*- -B**-		G01 50ℓ/min G03 100ℓ/min	1:0.2MPa{2.0kgf/cm²} 2:0.5MPa{5.1kgf/cm²} W: AB port A: A port B: B port D: Direct type (no small valve, G03 only) F: Decomp type (with small valve, G01 only)	

ORH : Relief valve

OGH : Reducing valve

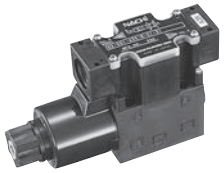
OPH : Pilot check valve

NACHI

WET TYPE SOLENOID OPERATED
DIRECTIONAL CONTROL VALVE

SS Series(Wiring System: Central Terminal Box)
Wet Type Solenoid Valve

100 to 160ℓ/min
35MPa



Features

①Very 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.

②Low switching noise
The wet-type solenoid valve provides very low core switching noise, for quiet operation.

③High 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 : 35MPa{357kgf/cm²}100ℓ/min
G03 : 35MPa{357kgf/cm²}160ℓ/min

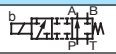
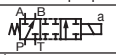
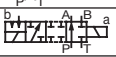
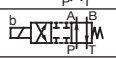
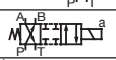
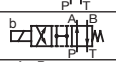
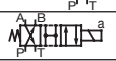
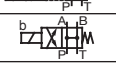
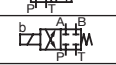
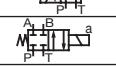
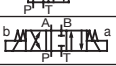
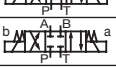
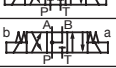
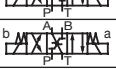
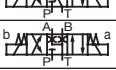
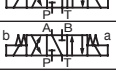
④Easy connections
A special wiring box provides a COM port and indicator light as standard for simple wiring and maintenance.

⑤Easy coil replacement
A plug-in type coil enables one-touch coil replacement.

⑥Wide-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.

⑦Compliant 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				SS-G03					
		Standard Type		Shockless Type		Standard Type				Shockless Type	
						AC Solenoid Type		DC Solenoid Type (With built-in rectifier)			
JIS Symbol	Operation Symbol	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}
	-A2X-	30	35{357}	30	25{255}	40	35{357}	85	35{357}	85	25{255}
	-H2X-										
	-E2X-					85					
	-A3X-	80		50		130		160		130	
	-H3X-										
	-E3X-	100									
	-A3Z-	65									
	-H3Z-										
	-E3Z-										
	-A4-	50									
	-H4-										
	-A5-	100									
	-H5-										
	-C2-										
	-C5-										
	-C9-										
	-C1S-										
	-C6S-										
	-C1-	AC Solenoid 65 DC Solenoid 80									
	-C6-										
	-C4-	50									
	-C7Y-			40		70	25{255}	100	25{255}	85	
	-C8-										

Note) The maximum flow rate of each valve depends on the pressure. For details, see pages E-9 and E-10.

			SS-G01			SS-G03		
			AC Solenoid	DC Solenoid Built-in Rectifier	DC Solenoid	AC Solenoid	DC Solenoid Built-in Rectifier	DC Solenoid
			C*	E*	D*	C*	E*	D*
Maximum Working Pressure	P, A, B ports		35(25)MPa{357(255)kgf/cm²}(Note1)					
Maximum Allowable Backpressure	T port		21MPa{214kgf/cm²}			16MPa{163kgf/cm²}		
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		JIS C 0920 IP64 (Dust-tight, Splash-proof)					
	Ambient Temperature		– 20 to 50°C					
	Operating Fluid	Temperature Range	– 20 to 70°C					
		Kinematic Viscosity Range	15 to 300mm²/s					
		Filtration	25 μm or less					
Mounting bolt	Size × Length		M5 × 45 (Four)			M6 × 70 (Four) (M8 × 70 (Four))		
	Tightening Torque		M5 5 to 7N·m{51 to 71kgf·cm}			M6 10 to 13N·m{102 to 133kgf·cm} (M8 20 to 25N·m{204 to 255kgf·cm})		

Note) 1. Maximum operating pressure depends on the valve type. For details, see page E-1.
2. For mounting bolts, use bolts with 12.9 strength classification or equivalent.
3. Mounting bolts are not included with the 01 size.
4. For 03 size installation bolts and spacers are provided. Attach the spacers to the valve to maintain the appropriate fitting length even if you do not use the installation bolts provided to add on modular valves.

●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(R) port. Never use a stopper plug in the T(R) 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. Allowable contamination is class NAS12 or less.
5. When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.
6. For details about using fire-resistant hydraulic fluid, see page D-1 for more information.
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. In the case of operation symbols A2X, H2X, and E2X, run drain piping from the valve T port.
10. 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.
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.

RSS-***-AR*-(H)-**-$^{15}_{23}$ RIS-***-AR*-(H)-**-21	SS-G01-AR-R-**-31
RSS-***-AQ*-(H)-**-$^{15}_{23}$ RIS-***-AQ*-(H)-**-21	SS-G01-A3X-R-**-31
RSS-***-*-F(H)-**-$^{15}_{23}$	SS-G01-A8X0-R-**-31
RIS-***-*-F-**-21	SS-G01-A3X-R-**-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.
15. Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate (ℓ/min)	Weight (kg)	Applicable Valve Type
MSA-01X-10	1/4	25{255}	20	1.2	SS-G01-**-R-**-31
MSA-01Y-10	3/8		40		
MSA-03-10	3/8		45	2.3	SS-G03-**-R-**-J22
MSA-03X-10	1/2		80		
MS-03-30	3/8		45	2.3	SS-G03-**-R-**-22
MS-03X-30	1/2		80		

●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	90 to 120
		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	100 to 130
		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	180 to 240
		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	200 to 260
		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

Explanation of model No.

SS – G 03 – A 3 X – * R – C2 – J22

Design number
31: 01 size
22: 03 size for mounting bolt M8
J22: 03 size for mounting bolt M6

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(R) = Connection port to tank

Operation Method

A	H	C	E
Spring Offset		Spring Center	Detent

Nominal diameter
01 size
03 size

Mounting method
G: Cascade mounting

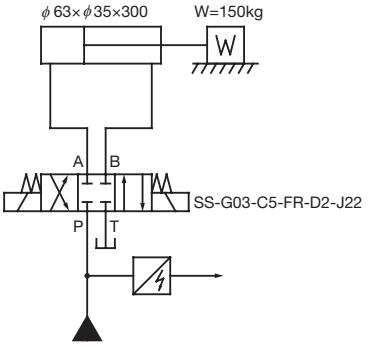
Wet type solenoid operated directional control valve

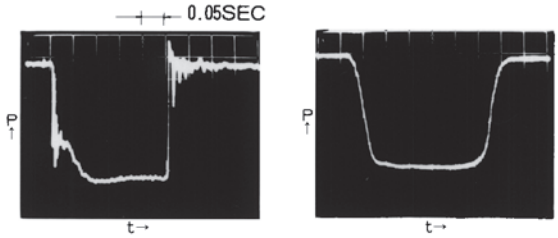
Options

(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 smoothened, which eliminates shock (noise) and pipe vibration.

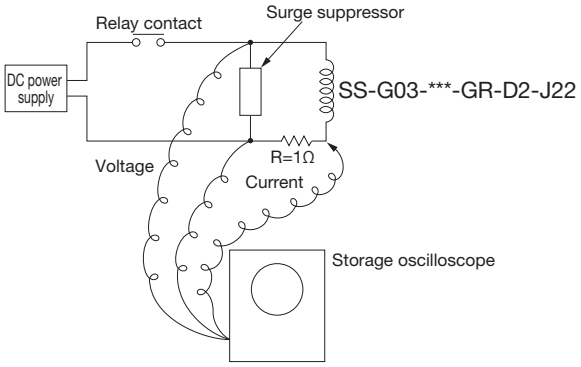


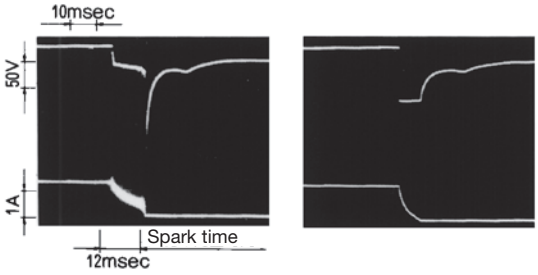


Dry type　　Shockless type

Surgeless Type (Auxiliary Symbol: G)

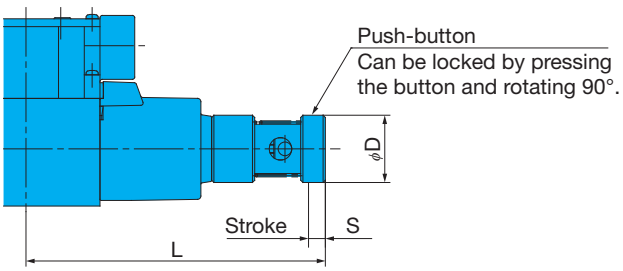
The surge pressure waveforms when the DC solenoid valve power supply is opened and closed by a relay are shown at the bottom of this block.
A built-in surge absorber element eliminates sparking and surge pressure.





Normal form　　Surgeless time

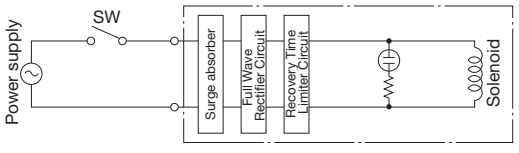
Manual Button Type (Auxiliary Symbol: N)



Model No.		L	S	D
SS-G01	AC Solenoid	133.5	7.5	30
	DC Solenoid	140.5		
SS-G03	AC Solenoid	155.5	9.5	35
	DC Solenoid	173.5		

Quick Return (Auxiliary Symbol: Q)

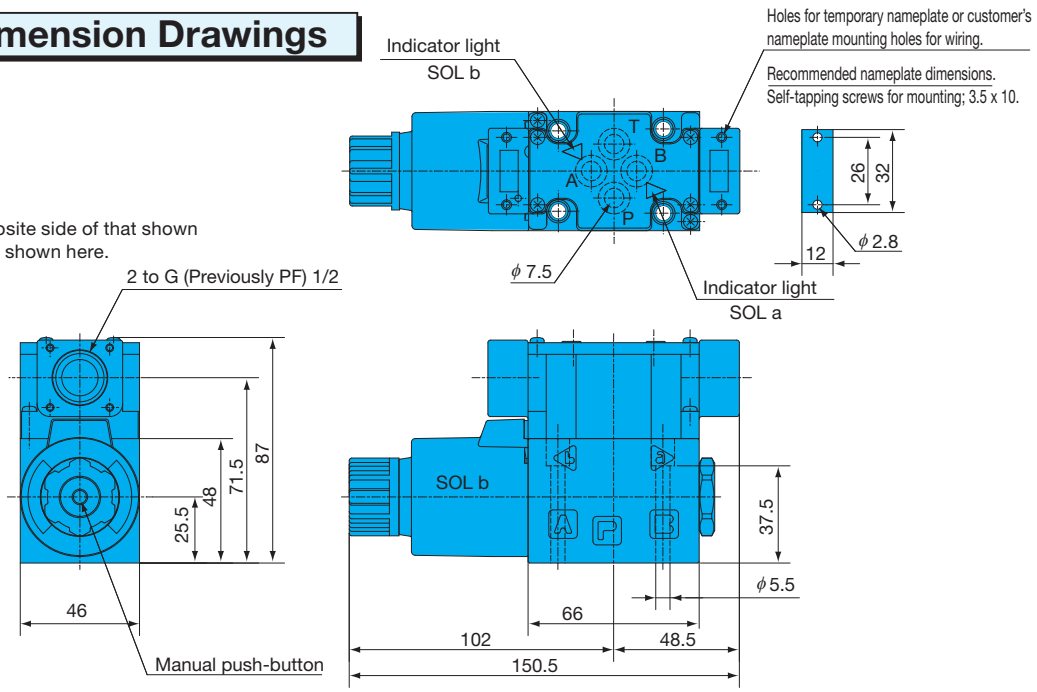
●Handling
1 This type is used in the case of power supply type E* (with built-in rectifier) to shorten the spring return time. This also applies to D*.
2 Quick return device is built-in to central terminal box.



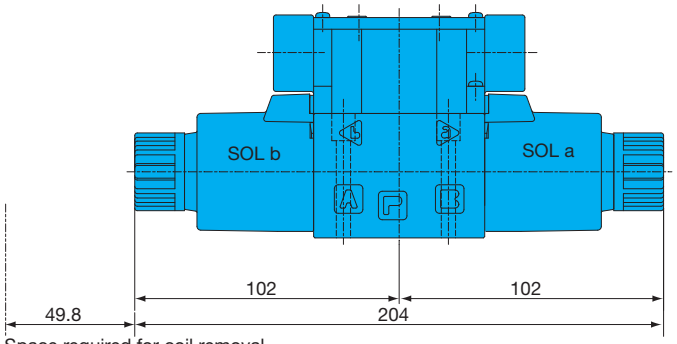
Installation Dimension Drawings

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

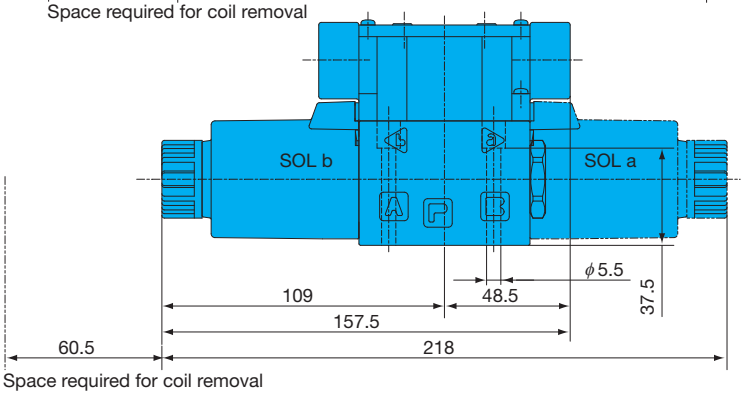
Note) SS-G01-H**-R-**-31
The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.



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



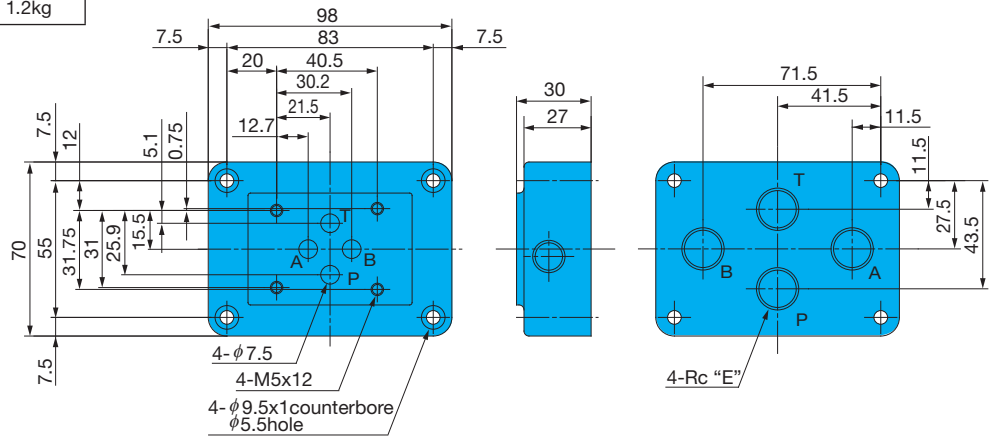
DDC Solenoid and Rectifier
SS-G01-A**-R-D/E*-31
SS-G01-H**-R-D/E*-31
SS-G01-C**-R-D/E*-31
SS-G01-E**-R-D/E*-31



For sub plate SS-G01

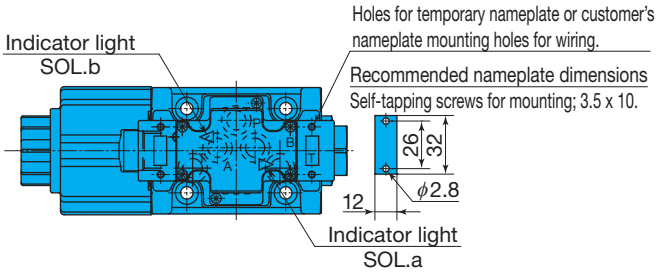
Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

Gasket Surface Dimensions
(ISO 4401-03-02-0-05
JIS B 8355 D-03-02-0-05)



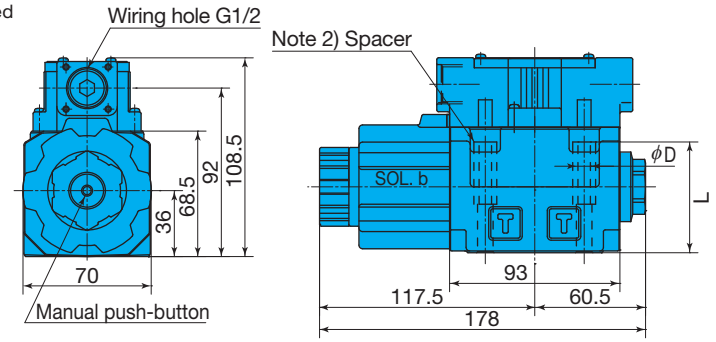
Installation Dimension Drawings

AC Solenoid
SS-G03-A**-R-C*-J22
SS-G03-H**-R-C*-J22

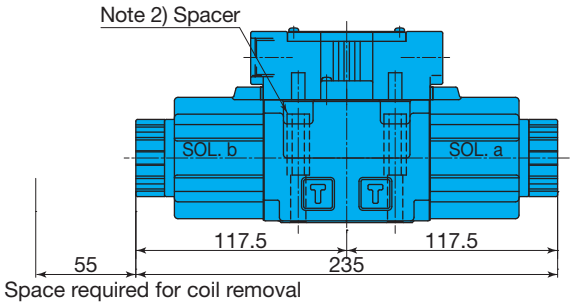


Note 1.) SS-G03-H**-R-**-J22
The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.
Note 2.) Attach the spacers to the valve, as shown in the diagram at right, to maintain the appropriate fitting length even if you do not use the installation bolts provided with the SS-G03.

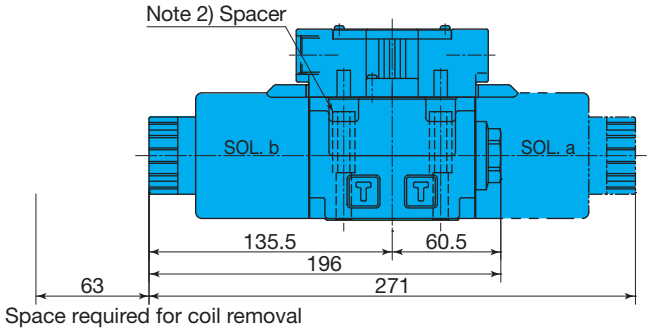
	SS-G03-**-*R-**-J22	SS-G03-**-*R-**-22
φD	φ6.8	φ8.5
L	60.5	58

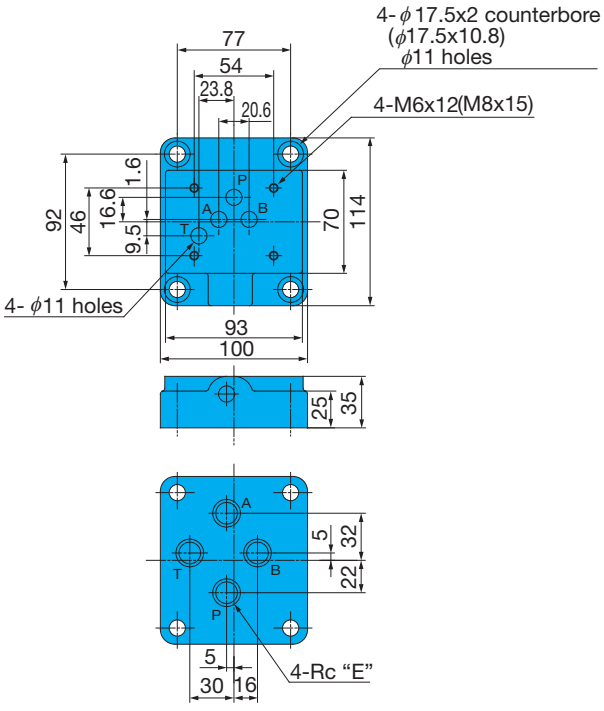


SS-G03-C**-R-C*-J22
SS-G03-E**-R-C*-J22



DC Solenoid and Rectifier
SS-G03-A**-R-D*/E*-J22
SS-G03-H**-R-D*/E*-J22
SS-G03-C**-R-D*/E*-J22
SS-G03-E**-R-D*/E*-J22



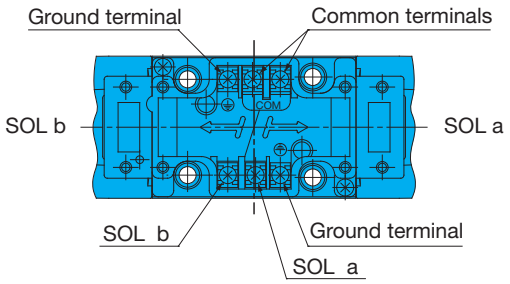


For sub plate SS-G03

Mounting bolt	Model No.	E	Weight
M6	MSA-03-10	3/8	2.3kg
	MSA-03X-10	1/2	
M8	MS-03-30	3/8	
	MS-03X-30	1/2	

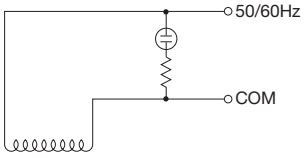
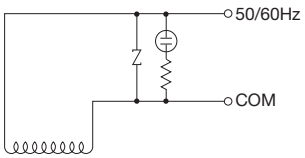
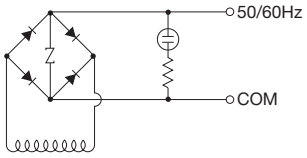
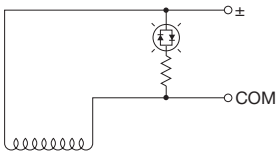
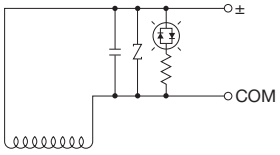
M6 gasket surface dimensions
(ISO 4401-05-04-0-05
JIS B 8355 D-05-04-0-05)

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 0.5 to 0.7N·m {5.1 to 7.1kgf·cm}.

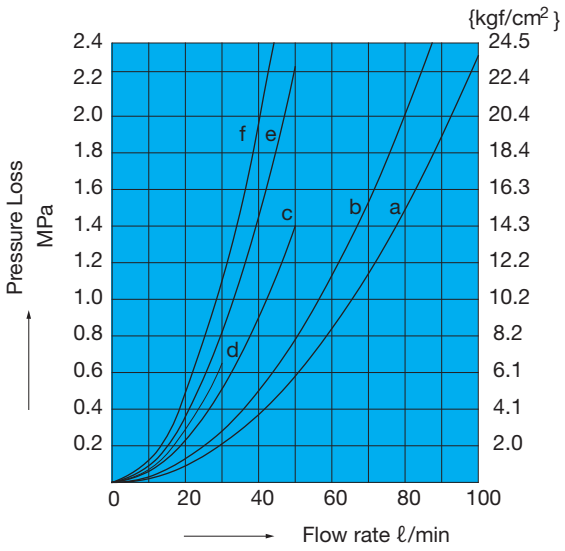
Electrical Circuit Diagram

Type	Model No.	Electrical Circuit
AC Solenoid	SS-$\frac{G01}{G03}$-***-R-C*-$\frac{31}{J22}$	
AC Solenoid Surgeless Type	SS-$\frac{G01}{G03}$-***-GR-C*-$\frac{31}{J22}$	
Built-in Rectifier	SS-$\frac{G01}{G03}$-***-R-E*-$\frac{31}{J22}$	
DC Solenoid	SS-$\frac{G01}{G03}$-***-R-D*-$\frac{31}{J22}$	
DC Solenoid Surgeless Type	SS-$\frac{G01}{G03}$-***-GR-D*-$\frac{31}{J22}$	
Built-in Rectifier Quick Return Type	SS-$\frac{G01}{G03}$-***-QR-E*-$\frac{31}{J22}$	See page E-4 for more information.

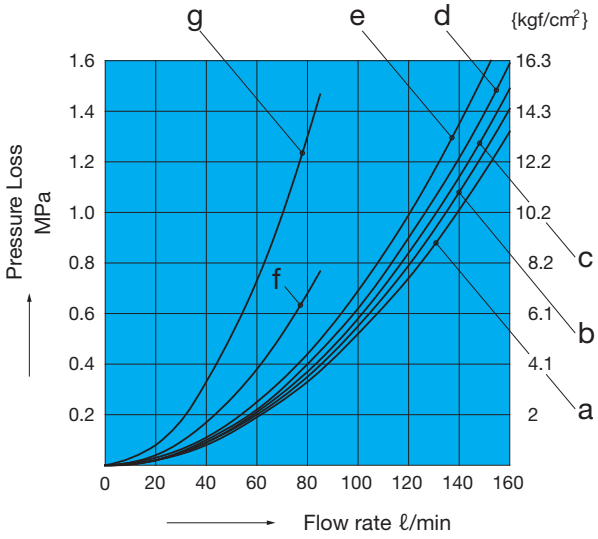
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

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	–



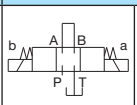
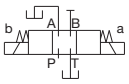
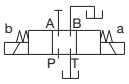
Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SS-G03	A2X, H2X, E2X	e	e	–	–	–
	A5	–	c	c	–	–
	H5	c	–	–	c	–
	A3X, H3X, E3X	c	c	d	d	–
	A3Z, H3Z	a	a	d	d	–
	E3Z	b	b	a	a	–
	C1	c	c	a	c	–
	C2	a	c	c	c	–
	A4, H4, C4	a	a	a	a	a
	C5, C1S, C6S	c	c	c	c	–
	C6	c	c	a	a	–
	C7Y	g	g	g	g	f
	C8	a	g	a	g	f
	C9	a	a	c	c	–

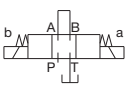
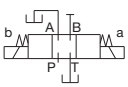
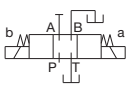
Switching Response Time

Model No.	Response Time (sec)		Measurement Conditions
	Solenoid ON	Spring Return	
SS-G01-**-R-C*-31	0.02 to 0.03	0.02 to 0.03	14MPa{143kgf/cm²} 30ℓ/min
SS-G01-**-(G)R-D*-31	0.03 to 0.04	0.02 to 0.04	
SS-G01-**-R-E*-31	0.03 to 0.04	0.07 to 0.10	
SS-G01-**-F(G)R-D*-31	0.07 to 0.10	0.04 to 0.07	
SS-G01-**-FR-E*-31	0.07 to 0.10	0.10 to 0.15	
SS-G03-**-R-C*-J22	0.02 to 0.03	0.02 to 0.03	14MPa{143kgf/cm²} 70ℓ/min
SS-G03-**-(G)R-D*-J22	0.06 to 0.09	0.03 to 0.05	
SS-G03-**-R-E*-J22	0.07 to 0.10	0.10 to 0.15	
SS-G03-**-F(G)R-D*-J22	0.13 to 0.15	0.08 to 0.15	
SS-G03-**-FR-E*-J22	0.10 to 0.15	0.15 to 0.20	

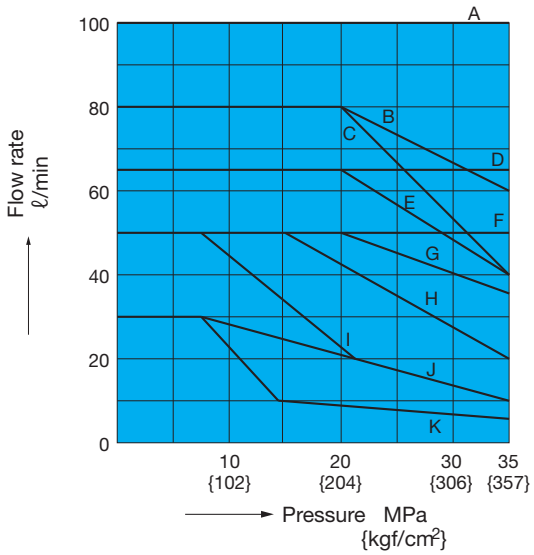
Note) 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)
2. In the case of power supply type E* (with built-in rectifier), the spring return time using Quick Return (option symbol: Q) is the same as D*.

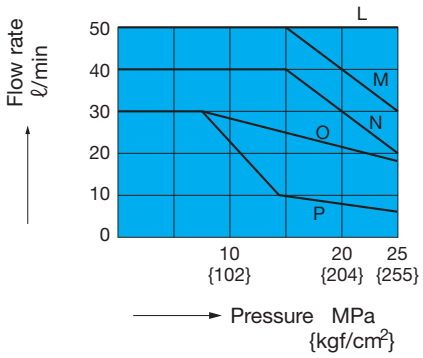
Pressure – Flow Volume Allowable Value

Size	Standard Form, with AC, DC solenoid SS-G01-**-R-**-31		
Operation Example / 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

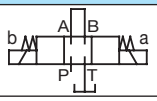
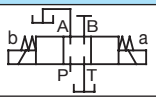
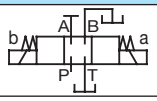
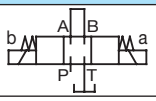
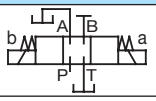
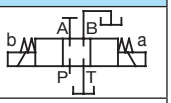
Size	Shockless Type, with DC solenoid SS-G01-**-FR-**-31		
Operation Example / Operation Symbol			
A2X, H2X	–	P	P
E2X	–	O	O
A3X, H3X	L	P	P
E3X	L	O	O
A3Z, H3Z	L	L	L
E3Z	L	L	L
A5	L	–	P
H5	L	P	–
C1, C6	M	P	P
C1S, C2, C5, C6S, C9	L	P	P
A4, H4	L	L	L
C4	L	L	L
C7Y, C8	N	P	P

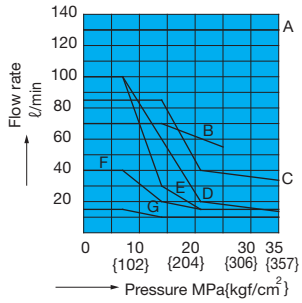
Note) 1. Letter in parentheses is for AC solenoid.
2. Letter in parentheses is for solenoid with built-in rectifier (E*), but without Quick Return, and for DC solenoid (D*) with surge voltage absorbing diode on the electrical circuit.

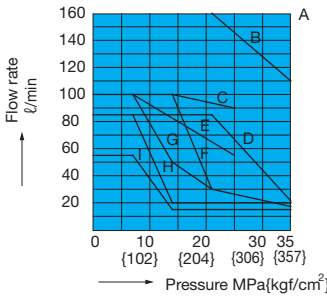


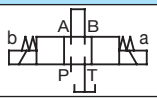
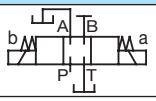
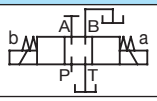


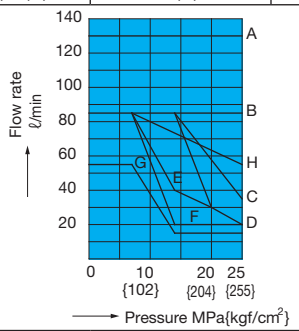
Pressure – Flow Volume Allowable Value

Model No.	Standard Form, with AC Solenoid			Standard Form, with DC Solenoid		
	SS-G03-**-R-C*-J22			SS-G03-**-R-**-J22		
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)





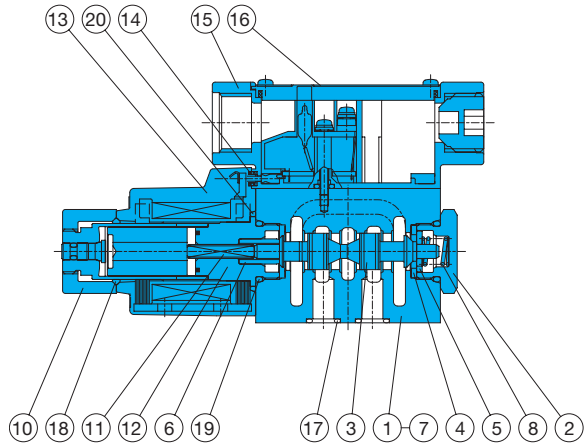
Model No.	Shockless Type, with DC solenoid		
	SS-G03-**-FR-**-J22		
Operation Example / Operation Symbol			
A2X	–	E	F
H2X	–	F	E
E2X	–	C	C
A3X	A	D	F
H3X	A	F	D
A3Z	A	C	C
H3Z	A	C	C
E3X, E3Z	A	C	C
A5	A	–	E
H5	A	E	–
C1, C1S, C5, C6, C6S	A	E	E
C2	A	G	E
A4, H4, C4	A	A	A
C9	A	G	G
C7Y, C8	Note1) B(H)	B(H)	B(H)



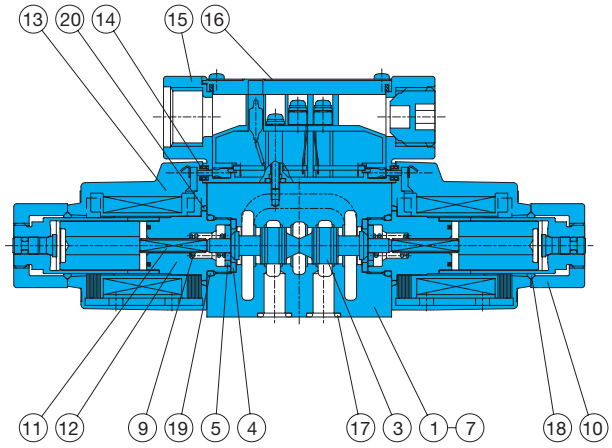
Note) 1. Letter in parentheses is for solenoid with built-in rectifier (E*), but without Quick Return, and for DC solenoid (D*) with surge voltage absorbing diode on the electrical circuit.
2. There is no shockless type for the AC solenoid (C*), so use a solenoid with built-in rectifier (E*) when shockless operation is required with an AC power supply.
3. The maximum flow rate is the allowable value of each port.

Cross-sectional Drawings

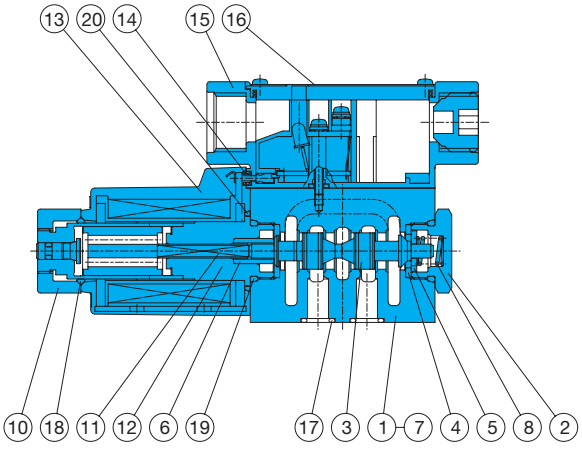
SS-G01-A**-R-C*-31



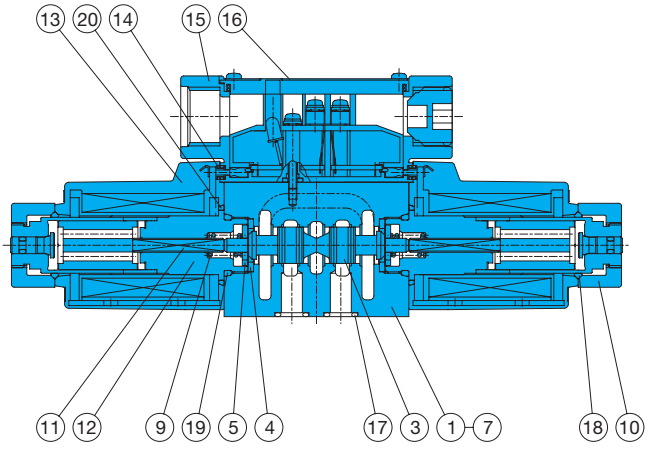
SS-G01-C**-R-C*-31



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(NBR-90)	4	4
18	O-ring	NBR-70-1 P20	1	2
19	O-ring	NBR-90 P18	2	2
20	O-ring	S-25(NBR-70-1)	1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Seal Kit Number

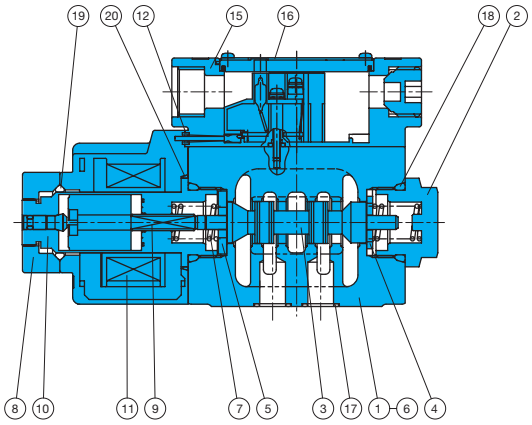
Single Solenoid	Double Solenoid
EDCS-A	EDCS-C

Part No.	Part Name
1	Body
2	Plug
3	Spool
4	Retainer A
5	Retainer B
6	Retainer C
7	Spacer
8	Spring A
9	Spring C
10	Nut

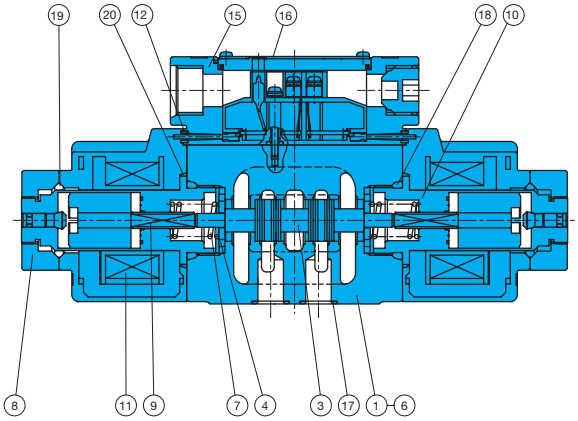
Part No.	Part Name
11	Rod
12	Solenoid guide
13	Solenoid coil
14	Packing
15	Terminal box kit
16	Nameplate
17	O-ring
18	O-ring
19	O-ring
20	O-ring

Cross-sectional Drawings

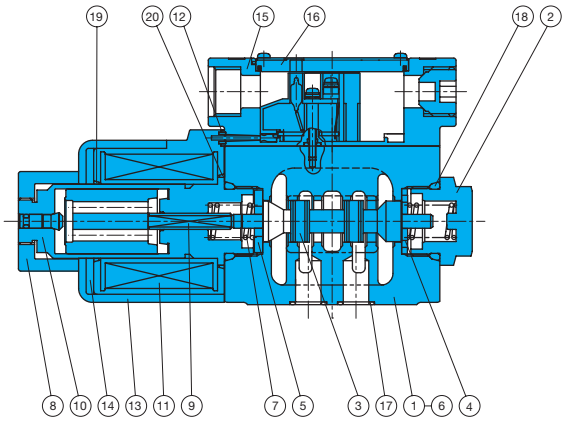
SS-G03-A**-R-C*-J22



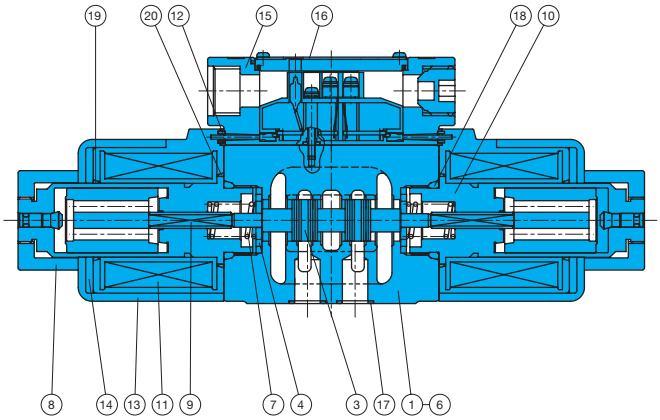
SS-G03-C**-R-C*-J22



SS-G03-A**-R-D/E*-J22



SS-G03-C**-R-D/E*-J22



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(NBR-90)		5	5
18	O-ring	NBR-90 P28		2	2
19	O-ring	NBR-70-1 P26	AS568-026(NBR-70-1)	1	2
20	O-ring	AS568-029(NBR-70-1)		1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Seal Kit Number

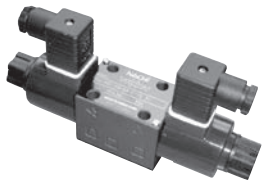
AC SOL.		DC SOL.	
Single Solenoid	Double Solenoid	Single Solenoid	Double Solenoid
ECBS-AA	ECBS-CA	ECBS-AD	ECBS-CD

Part No.	Part Name
1	Body
2	Plug
3	Spool
4	Retainer
5	Retainer B
6	Spacer
7	Spring
8	Nut
9	Rod
10	Solenoid guide
11	Solenoid coil
12	Packing B
13	Coil case

Part No.	Part Name
14	Coil yoke
15	Terminal box kit
16	Nameplate
17	O-ring
18	O-ring
19	O-ring
20	O-ring

SA Series(Wiring System: DIN Connector Type)
Wet Type Solenoid Valve

100 to 160ℓ/min
35MPa



Features

①Very 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.

②Low switching noise
The wet-type solenoid valve provides very low core switching noise, for quiet operation.

③Shockless
A switching speed adjustment mechanism enables direct, shockless operation (Option F).

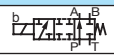
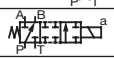
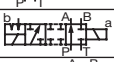
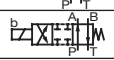
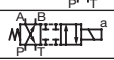
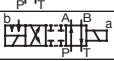
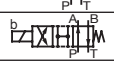
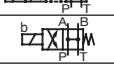
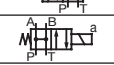
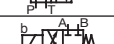
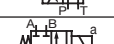
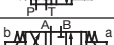
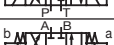
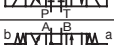
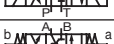
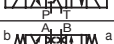
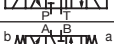
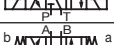
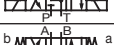
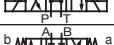
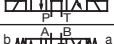
④No surge voltage
Sparking and surge voltage during solenoid switching is canceled for stable switching (Option G).

⑤Easy coil replacement
A DIN connector type coil enables one-touch coil replacement.

⑥Wide-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.

⑦Global 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				SA-G03					
		Standard Type		Shockless Type		Standard Type				Shockless Type	
						AC Solenoid Type		DC Solenoid Type (With built-in rectifier)			
JIS Symbol	Operation Symbol	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MP{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}
	-A2X-	30	35{357}	30	25{255}	40	35{357}	85	35{357}	85	25{255}
	-H2X-										
	-E2X-					85					
	-A3X-	80		50		130		160		130	
	-H3X-										
	-E3X-	100									
	-A3Z-	65									
	-H3Z-										
	-E3Z-										
	-A4-	50									
	-H4-										
	-A5-	100									
	-H5-										
	-C2-										
	-C5-										
	-C9-										
	-C1S-										
	-C6S-										
	-C1-	AC Solenoid 65 DC Solenoid 80									
	-C6-										
	-C4-	50									
	-C7Y-			40		70	25{255}	100	25{255}	85	
	-C8-										

Note) The maximum flow rate of each valve depends on the pressure. For details, see pages E-21 and E-22.

			SA-G01			SA-G03		
			AC Solenoid	DC Solenoid Built-in Rectifier		AC Solenoid	DC Solenoid Built-in Rectifier	
			C*	E*	D*	C*	E*	D*
Maximum Working Pressure	P, A, B ports		35(25)MPa{357(255)kgf/cm²}(Note1)					
Maximum Allowable Backpressure	T port		21MPa{214kgf/cm²}			16MPa{163kgf/cm²}		
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		
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		JIS C 0920 IP65 (Dust-tight, Waterjet-proof) (Note 2)					
	Ambient Temperature		-20 to 50°C					
	Operating Fluid	Temperature Range	-20 to 70°C					
		Kinematic Viscosity Range	15 to 300mm²/s					
		Filtration	25 μm or less					
Mounting bolt	Size × Length		M5×45 (Four)			M6×70 (Four) (M8×70 (Four))		
	Tightening Torque		M5 5 to 7N·m{51 to 71kgf·cm}			M6 10 to 13N·m{102 to 133kgf·cm} (M8 20 to 25N·m{204 to 255kgf·cm})		

Note) 1. Maximum operating pressure depends on the valve type. For details, see page E-13.
2. The power supply type for E* is IP64 (dust-tight, splash-proof).
3. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
4. Mounting bolts are not included with the 01 size. Bolts are included with the 03 size.

●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(R) port. Never use a stopper plug in the T(R) 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. Allowable contamination is class NAS12 or less.

5 When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.

6 For details about using fire-resistant hydraulic fluid, see page D-1 for more information.

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 In the case of operation symbols A2X, H2X, and E2X, run drain piping from the valve T port.

10 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.

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 the RSA Series solenoid control relief valve.

RSA-***-AR*-(H)-**-$^{15}_{23}$	SA-G01-AR-**-31
RSA-***-AQ*-(H)-**-$^{15}_{23}$	SA-G01-A3X-**-31
RSA-***-*-F(H)-**-$^{15}_{23}$	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.

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

Model No.	Pipe Diameter	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate (ℓ/min)	Weight (kg)	Applicable Valve Type
MSA-01X-10	1/4	25{255}	20	1.2	SA-G01-***-**-31
MSA-01Y-10	3/8		30		
MSA-03-10	3/8		45	2.3	SA-G03-***-**-J21
MSA-03X-10	1/2		80		
MS-03-30	3/8		45	2.3	SA-G03-***-**-21
MS-03X-30	1/2		80		

●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	34.0	90 to 120
		AC110	60		2.2	0.46	28			5.0	0.78	42.0	
	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	34.0	100 to 130
		AC115	60		2.0	0.42	28			4.6	0.72	42.0	
	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	34.0	180 to 240
		AC220	60		1.1	0.23	28			2.5	0.39	42.0	
	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	34.0	200 to 260
		AC230	60		1.0	0.21	28			2.3	0.36	42.0	
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
	E115	AC110	50/60	EAC64-E115-1A	0.26		25	100 to 125	EBB64-E115	0.33		31.0	100 to 125
		AC115			0.27		27			0.34		34.0	
	E2	AC200	50/60	EAC64-E2-1A	0.15		26	180 to 220	EBB64-E2	0.22		37.0	180 to 220
	E230	AC220	50/60	EAC64-E230-1A	0.12		24	200 to 250	EBB64-E230	0.16		30.0	200 to 250
		AC230			0.13		27			0.17		33.0	
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

Explanation of model No.

SA – G 01 – A 3 X – ** – C2 – 31

Design number
31:01 size
22:03 size for mounting bolt M8
J22:03 size for mounting bolt M6

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

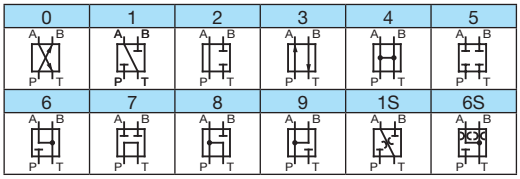
Auxiliary symbol (Can be combined in alphabetic sequence.)
F: Shockless type (Available with power supply D*, E)
GR: Surgeless type with indicator (Available with power supply C*, D*)
J: G screw conversion adapter (For power supply C*, D*)
K: No connector
N: With manual push-button
R: With indicator light

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

X	Y	Z
Closed	Semi-open	Open

Center position

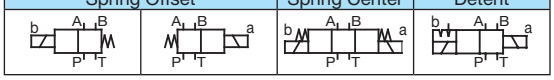
0	1	2	3	4	5
6	7	8	9	1S	6S



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

Operation Method

A	H	C	E
Spring Offset		Spring Center	Detent



Nominal diameter
01 size
03 size

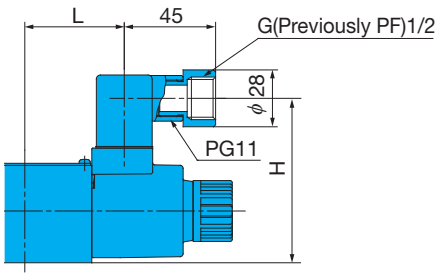
Mounting method
G: Cascade mounting

Wet type solenoid operated directional control valve with DIN connector

Options

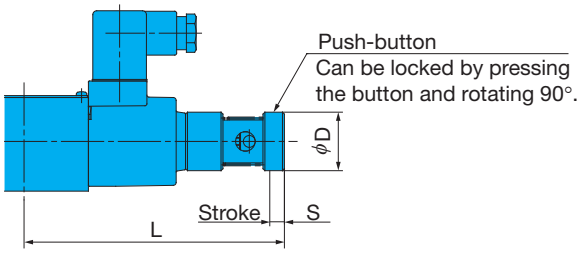
(Auxiliary Symbol Explanations)

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)



Model No.		L	S	D
SA-G01	AC Solenoid	133.5	7.5	30
	DC Solenoid	140.5		
SA-G03	AC Solenoid	155.5	9.5	35
	DC Solenoid	173.5		

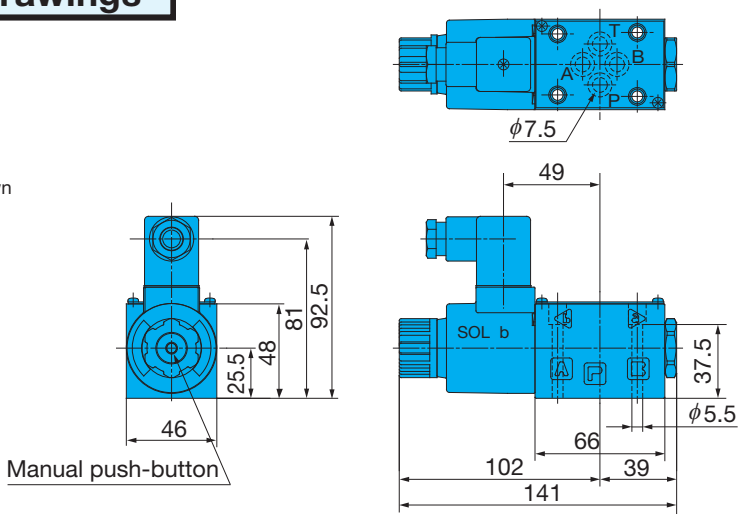
Other Options

Note) For information about the shockless and surgeless options, see page E-4.

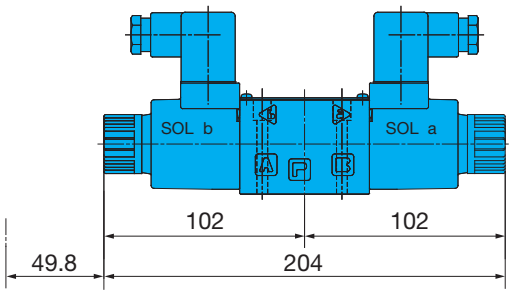
Installation Dimension Drawings

AC Solenoid
SA-G01-A**-*-C*-31
SA-G01-H**-*-C*-31

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

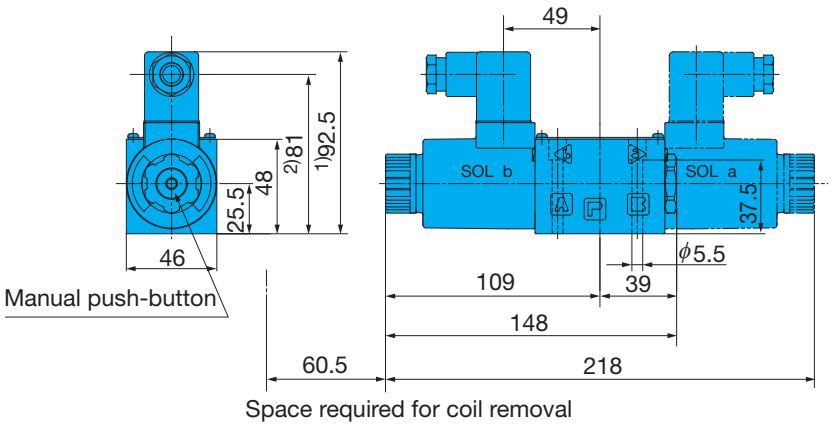


SA-G01-C**-R-C*-31
SA-G01-E**-R-C*-31



DC Solenoid and Rectifier
SA-G01-A**-D*/E*-31
SA-G01-H**-D*/E*-31
SA-G01-C**-D*/E*-31
SA-G01-E**-D*/E*-31

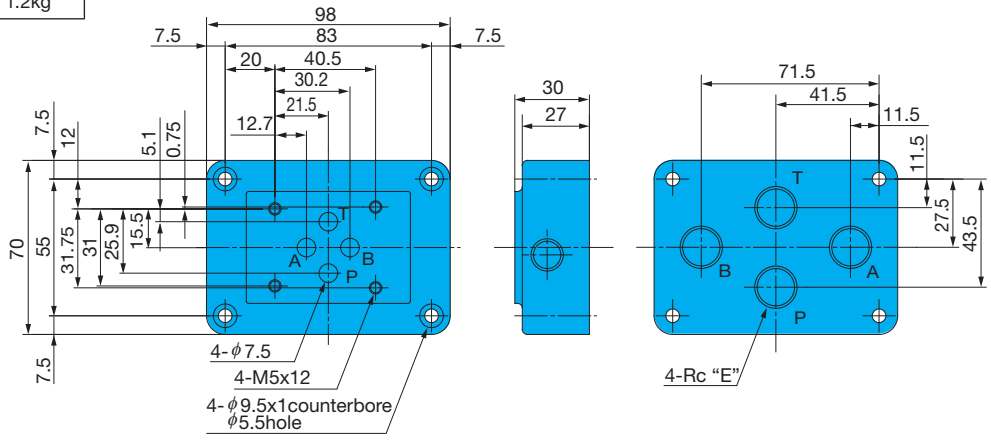
Note) 1. SA-G01-H**-*-D*/E*-31
The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.
2. SA-G01-**-E*-31
Dimension 1 is 96.
Dimension 2 is 73.



For sub plate SA-G01

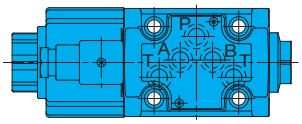
Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

Gasket Surface Dimensions
(ISO 4401-03-02-0-05
JIS B 8355 D-03-02-0-05)



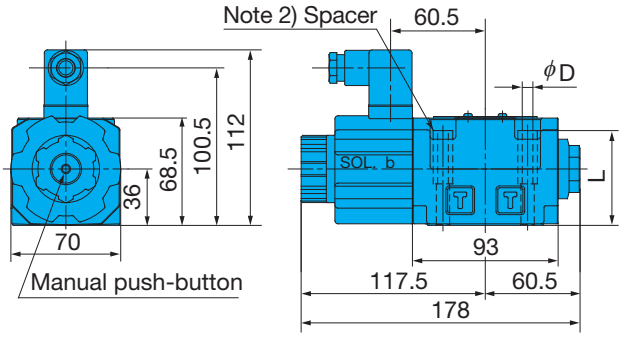
Installation Dimension Drawings

AC Solenoid
SA-G03-A**-*-C*-J21
SA-G03-H**-*-C*-J21

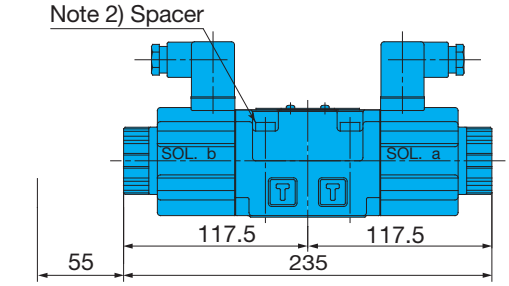


Note 1.) SS-G03-H**-R-**-J22
The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.
Note 2.) Attach the spacers to the valve, as shown in the diagram at right, to maintain the appropriate fitting length even if you do not use the installation bolts provided with the SS-G03.

	SA-G03-**-*-**-J21	SA-G03-**-*-**-21
ϕD	ϕ6.8	ϕ8.5
L	60.5	58

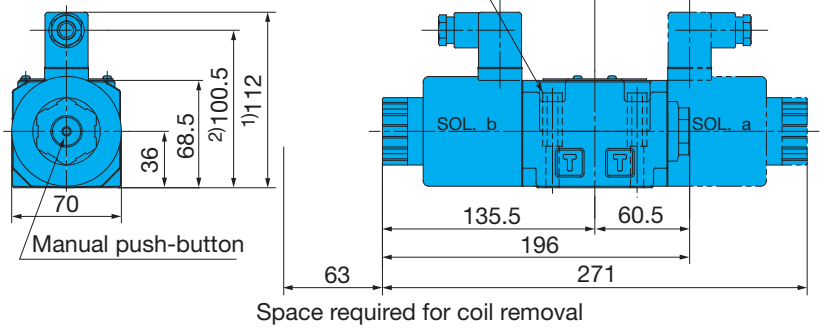


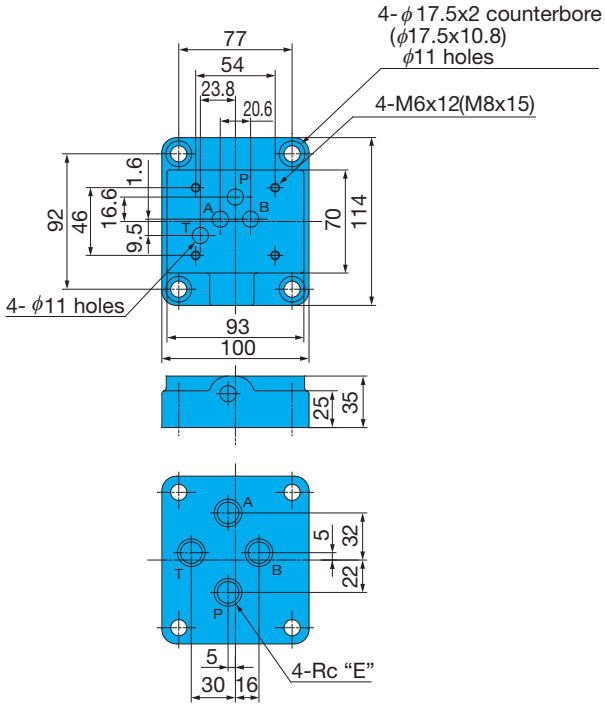
SA-G03-C**-*-C*-J21
SA-G03-E**-*-C*-J21



DC Solenoid and Rectifier
SA-G03-A**-*-D*/E*-J21
SA-G03-H**-*-D*/E*-J21
SA-G03-C**-*-D*/E*-J21
SA-G03-E**-*-D*/E*-J21

Note) 1. SA-G03-H**-*-D*/E-J21
The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.
2. SA-G03-**-E*-J21
Dimension 1 is 115.5.
Dimension 2 is 92.5.



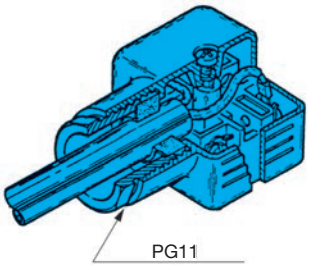
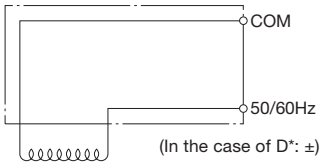
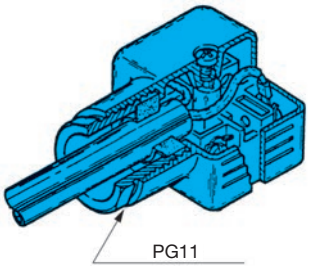
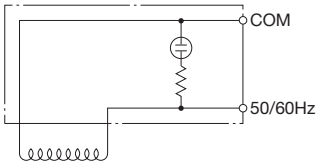
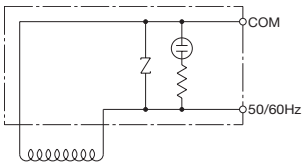
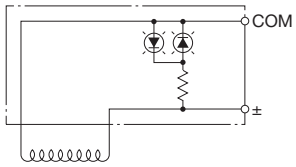
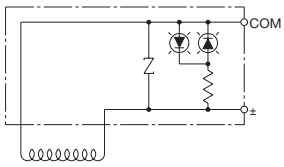
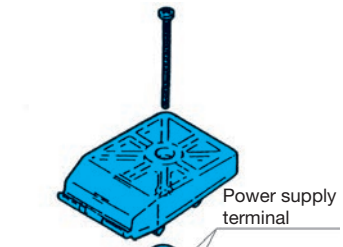
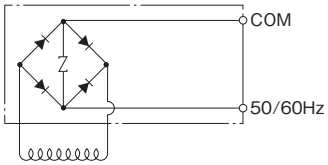
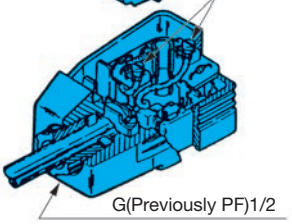
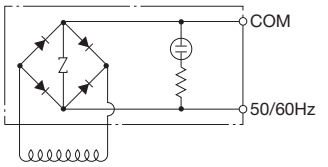


For sub plate SA-G03

Mounting bolt	Model No.	E	Weight
M6	MSA-03-10	3/8	2.3kg
	MSA-03X-10	1/2	
M8	MS-03-30	3/8	
	MS-03X-30	1/2	

M6 gasket surface dimensions
(ISO 4401-05-04-0-05
JIS B 8355 D-05-04-0-05)

●Connectors

Model No.	Wiring	Electrical Circuit Diagram
SA-G01/G03-***-C*-D*-31/(J)21 (EA41-1A)	 Connect the power supply to terminals No.1 and No. 2. The ⏚ terminal is ground. Use this terminal as required.	
SA-G01/G03-***-R-C*-31/(J)21 (EA41-R*-1C)	 Connect the power supply to terminals No.1 and No. 2. The ⏚ terminal is ground. Use this terminal as required.	
SA-G01/G03-***-GR-C*-31/(J)21 (EA41-GRC*-1C)		
SA-G01/G03-***-R-D*-31/(J)21 (EA41-DR*-1C)		
SA-G01/G03-***-GR-D*-31/(J)21 (EA41-GRD*-1C)		
SA-G01/G03-***-E*-31/(J)21 (EA42-1B)	 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.	
SA-G01/G03-***-R-E*-31/(J)21 (EA42-R*-1B)		

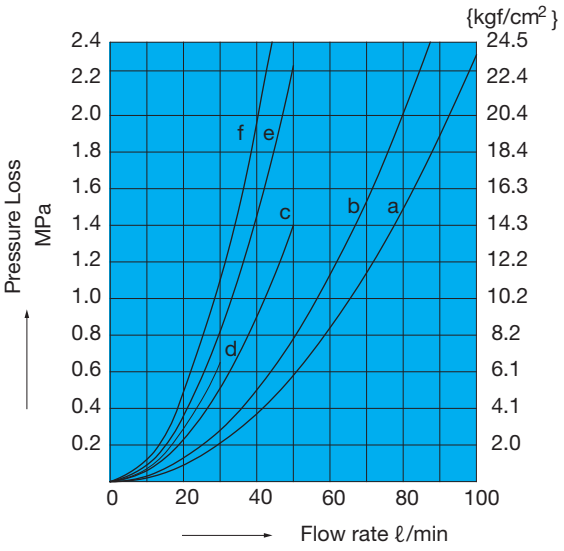
Symbols in parentheses indicate connector configuration.

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 ϕ8 to ϕ10. 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 0.3 to 0.5N·m (3.1 to 5.1kgf·cm).

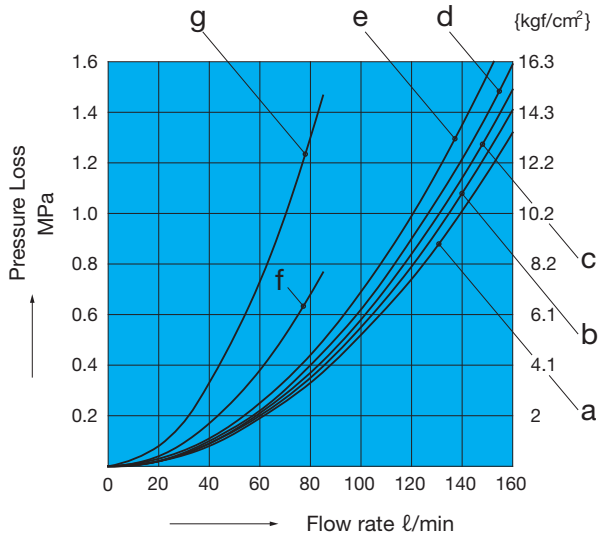
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

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	–



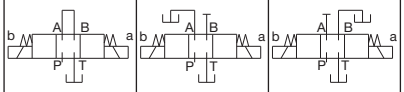
Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SA-G03	A2X, H2X, E2X	e	e	–	–	–
	A5	–	c	c	–	–
	H5	c	–	–	c	–
	A3X, H3X, E3X	c	c	d	d	–
	A3Z, H3Z	a	a	d	d	–
	E3Z	b	b	a	a	–
	C1	c	c	a	c	–
	C2	a	c	c	c	–
	A4, H4, C4	a	a	a	a	a
	C5, C1S, C6S	c	c	c	c	–
	C6	c	c	a	a	–
	C7Y	g	g	g	g	f
	C8	a	g	a	g	f
	C9	a	a	c	c	–

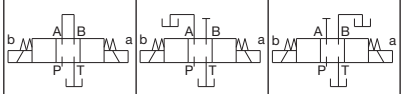
Switching Response Time

Model No.	Response Time (sec)		Measurement Conditions
	Solenoid ON	Spring Return	
SA-G01-**-(GR)-C*-31	0.02 to 0.03	0.02 to 0.03	14MPa {143kgf/cm²} 30ℓ/min
SA-G01-**-(GR)-D*-31	0.03 to 0.04	0.02 to 0.04	
SA-G01-**-(R)-E*-31	0.03 to 0.04	0.07 to 0.10	
SA-G01-**-F(GR)-D*-31	0.07 to 0.10	0.04 to 0.07	
SA-G01-**-F(R)-E*-31	0.07 to 0.10	0.10 to 0.15	
SA-G03-**-(GR)-C*-J21	0.02 to 0.03	0.02 to 0.03	14MPa {143kgf/cm²} 70ℓ/min
SA-G03-**-(GR)-D*-J21	0.06 to 0.09	0.03 to 0.05	
SA-G03-**-(R)-E*-J21	0.07 to 0.10	0.10 to 0.15	
SA-G03-**-F(GR)-D*-J21	0.13 to 0.15	0.08 to 0.15	
SA-G03-**-F(R)-E*-J21	0.10 to 0.15	0.15 to 0.20	

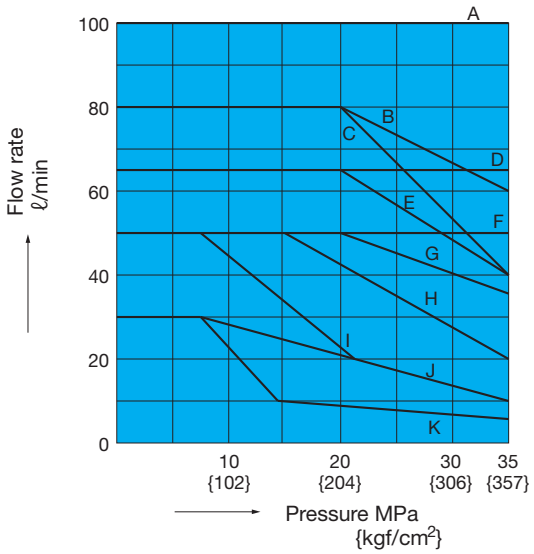
Note) 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)

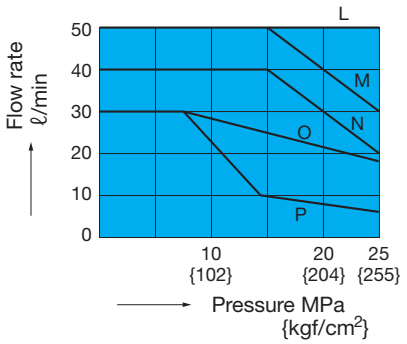
Pressure – Flow Volume Allowable Value

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

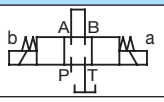
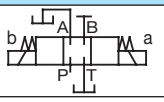
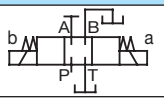
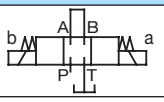
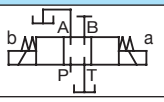
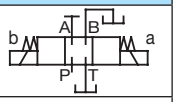
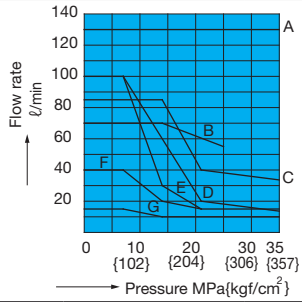
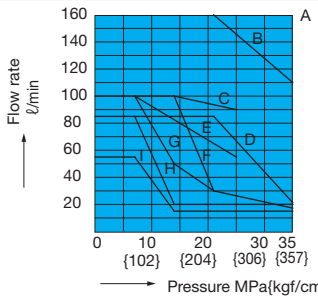
Size	Shockless Type, with DC solenoid SA-G01-**-FR-**-31		
Operation Example / Operation Symbol			
A2X, H2X	–	P	P
E2X	–	O	O
A3X, H3X	L	P	P
E3X	L	O	O
A3Z, H3Z	L	L	L
E3Z	L	L	L
A5	L	–	P
H5	L	P	–
C1, C6	M	P	P
C1S, C2, C5, C6S, C9	L	P	P
A4, H4	L	L	L
C4	L	L	L
C7Y, C8	N	P	P

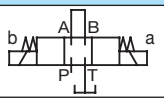
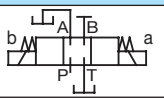
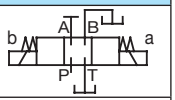
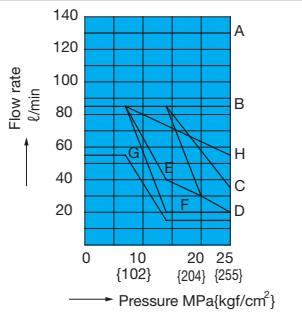
Note) 1. Letter in parentheses is for AC solenoid.
2. Letter in parentheses is for solenoid with built-in rectifier, but without Quick Return, and for DC solenoid with surge voltage absorbing diode on the electrical circuit.





Pressure – Flow Volume Allowable Value

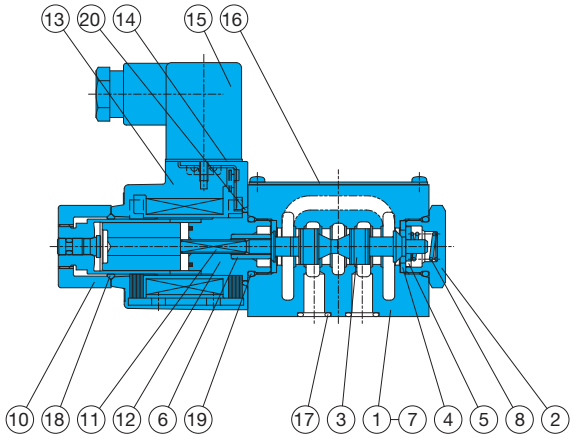
Model No.	Standard Form, with AC, DC solenoid			Standard Form, with DC solenoid		
	SA-G03-**-C*-J21			SA-G03-**-**-J21		
Operation Example / Operation Symbol						
A2X	–	F	E	–	G	H
H2X	–	E	F	–	H	G
E2X	–	C	C	–	D	D
A3X	A	E	E	A	F	H
H3X	A	E	E	A	H	F
A3Z	A	A	C	A	D	D
H3Z	A	C	A	A	D	D
E3X, E3Z	A	C	C	A	D	D
A5	A	–	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-**-J21		
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)
			

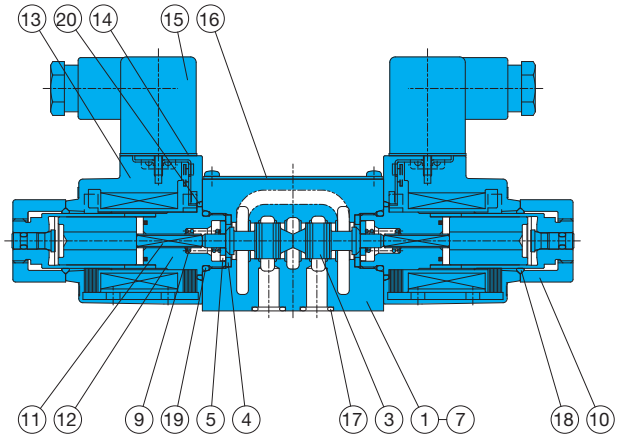
Note) 1. Letter in parentheses is for solenoid with built-in rectifier (E*), but without Quick Return, and for DC solenoid (D*) with surge voltage absorbing diode on the electrical circuit.
2. There is no shockless type for the AC solenoid (C*), so use a solenoid with built-in rectifier (E*) when shockless operation is required with an AC power supply.
3. The maximum flow rate is the allowable value of each port.

Cross-sectional Drawings

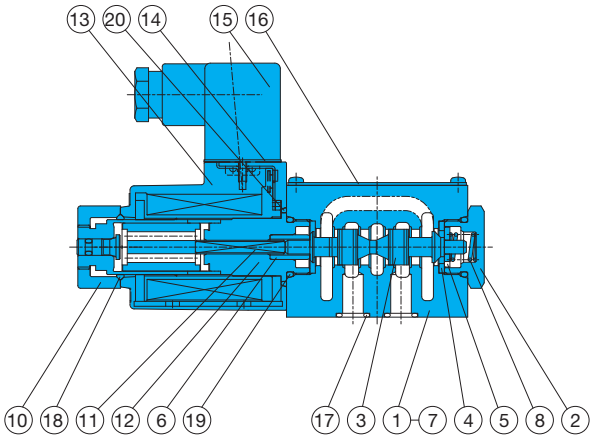
SA-G01-A**-C*-31



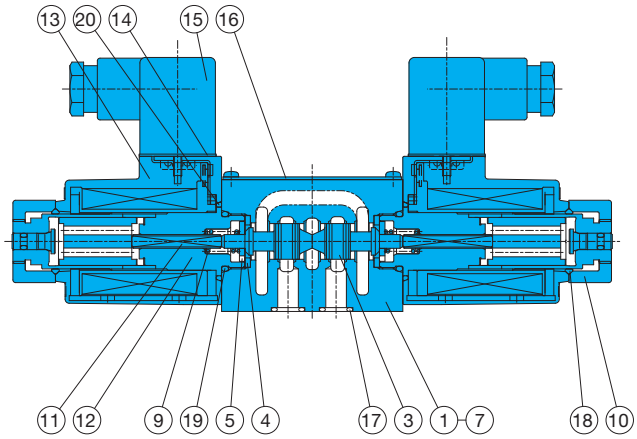
SA-G01-C**-C*-31



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(NBR-90)	4	4
18	O-ring	NBR-70-1 P20	1	2
19	O-ring	NBR-90 P18	2	2
20	O-ring	S-25(NBR-70-1)	1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

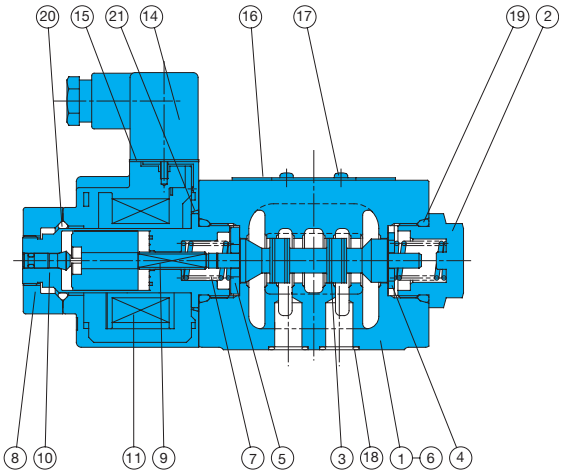
Seal Kit Number

Single Solenoid	Double Solenoid
EDCS-A	EDCS-C

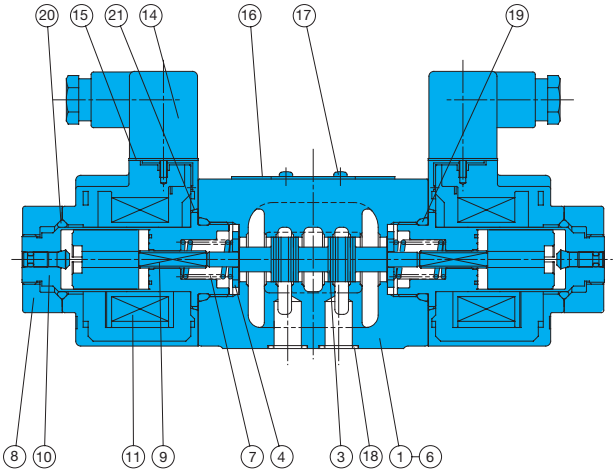
Part No.	Part Name	Part No.	Part Name
1	Body	11	Rod
2	Plug	12	Solenoid guide
3	Spool	13	Solenoid coil
4	Retainer A	14	Packing
5	Retainer B	15	Connector
6	Spring pin	16	Nameplate
7	Spacer	17	O-ring
8	Spring A	18	O-ring
9	Spring C	19	O-ring
10	Nut	20	O-ring

Cross-sectional Drawings

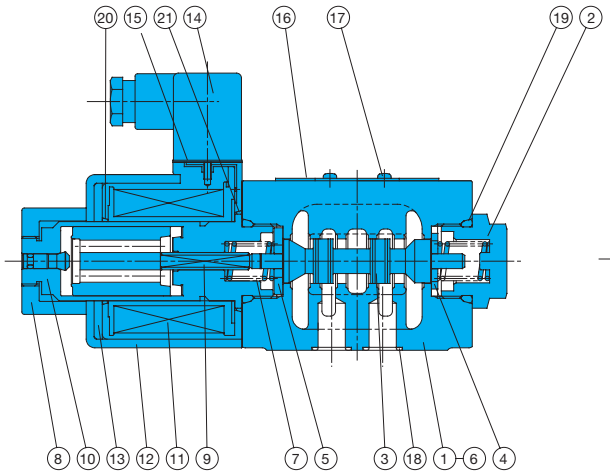
SA-G03-A**-C*-(J)21



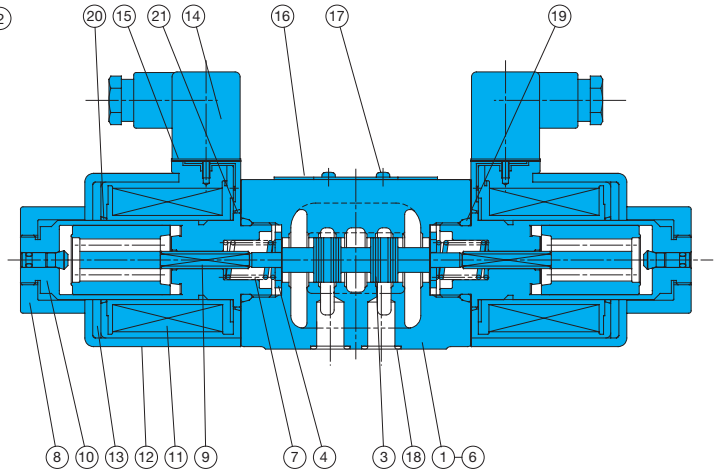
SA-G03-C**-C*-(J)21



SA-G03-A**-D/E*-(J)21



SA-G03-C**-D/E*-(J)21



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(NBR-90)		5	5
19	O-ring	NBR-90 P28		2	2
20	O-ring	NBR-70-1 P26	AS568-026(NBR-70-1)	1	2
21	O-ring	AS568-029(NBR-70-1)		1	2

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Plug
3	Spool
4	Retainer
5	Retainer B
6	Spacer
7	Spring
8	Nut
9	Rod
10	Solenoid guide

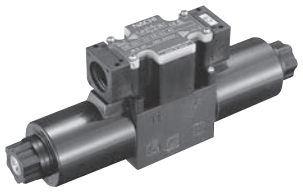
Part No.	Part Name
11	Solenoid coil
12	Coil case
13	Coil yoke
14	Connector
15	Connector packing
16	Nameplate
17	Screw
18	O-ring
19	O-ring
20	O-ring
21	O-ring

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 (Wiring System: Central Terminal Box)
Lower Power Solenoid Valve

40 to 60ℓ/min
10 to 16MPa



Features

①Low current, low power
The SE series magnetic switching valve's solenoid has significantly lower power consumption.

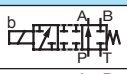
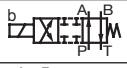
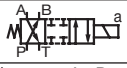
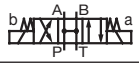
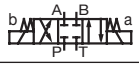
②Directly drivable by a programmable controller
Low-current operation means not only allows direct drive by a programmable controller (PC) output circuit, it also enables the use of a compact and simple control circuit.

③Little 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.

④With 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)

⑤Global 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	
		Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}
A2X		30	16 {163}	40	10 {102}
A3X		40		50	
H3X				–	
E3X				50	
C4		30			
C5		40		60	
C6					

Note) The maximum flow rate of each valve depends on the pressure. For details, see page E-30.

●Handling
1. In order to realize the full benefits of the solenoid valve, configure piping so oil is constantly supplied to the T(DR) port.
2. Ensure that surge pressure in excess of the maximum allowable back pressure can be accidentally at 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 oneway valve.
4. Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
5. When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.
6. Use the SS series solenoid valve if using flame resistant operating fluid.
7. Be sure to note the allowable pressure range of the coil being used.
8. 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.
9. When using a detent type (E3X), provide constant energization when secure maintenance of the switching position is required.
10. Note that manual pin operating pressure changes in accordance with tank line back pressure.
11. 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.
(Recommended diode: Hitachi V07J or equivalent)

●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	SLH1-03B-R1-01	0.06	5.8	80 to 120
			60								
DC	D2	DC24	–	EED64-D2	0.2	4.8	21.6 to 26.4	SLH1-03B-D2-01	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		16MPa{163kgf/cm²}		10MPa{102kgf/cm²}	
Maximum Allowable Backpressure	T port		16MPa{163kgf/cm²}		10MPa {102kgf/cm²} (In the case of 2MPa {21kgf/cm²} operation symbol E3X)	
Changeover Frequency (per minute)			120		120	
Standard	Indicator light Surgeless		GR	R	GR	
Weight (kg)	Double Solenoid		2.2		3.5	
	Single Solenoid		1.7		3.3	
Operating Environment	Dust Resistance/Water Resistance Rank		JIS C0920 IP64 (Dust-tight, Splash proof)		JIS C0920 IP65 (Dust-tight, Waterjet-proof)	
	Ambient Temperature		-20 to 50°C		-10 to 50°C	
	Operating Fluid	Temperature Range	-20 to 70°C		0 to 65°C	
		Kinematic Viscosity Range	15 to 300mm²/s			
		Filtration	25 μm or less			
Bundled Accessories	Mounting bolt		Refer to page D-93 for bolt lengths for usage of M5 x 45 4-module valves.		Refer to page E-31 for bolt lengths for usage of M6 x 40 (M8 x 40) 4-module valves.	
	Tightening Torque		5 to 7N·m {51 to 71kgf·cm}		M6 10 to 13N·m{102 to 133kgf·cm} M8 18 to 21N·m{184 to 214kgf·cm}	

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Explanation of model No.

SE – G 03 – A 3 X – GR – D2 – J30

Design number
40: For 01 size
J30: 03 size for mounting bolt M6 (30 if mounting bolt is M8)

Power supply
D: DC D2=DC24V
E: For AC (joint 50/60 Hz inside rectifier) E1=AC100V

Auxiliary symbol
GR: Surgeless type with indicator (applicable for power supply D2 only)
R: With indicator light (applicable for power supply E1 only)
V: With M12-4 pin connector, load side - common (applicable for power supply D2 only)
W: With M12-4 pin connector, load side + common (applicable for power supply D2 only)

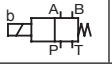
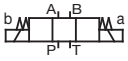
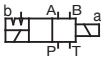
Transition Flow Path (Specify for A2X, A3X only)

X
Closed


Center valve position flow path

2	3	4	5	6
				

Operation Method

A	H	C	E
Spring Offset		Spring Center	Detent
			

Nominal pipe diameter
01 size
03 size

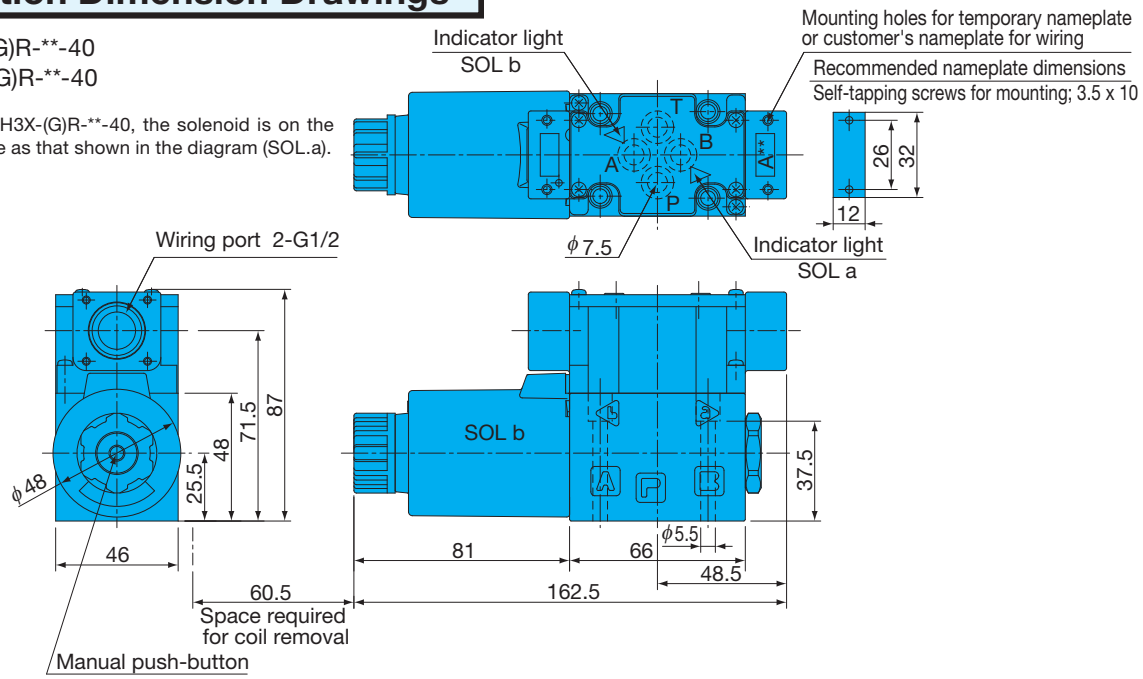
Mounting method
G: Gasket type

Central terminal box with low-power solenoid valve

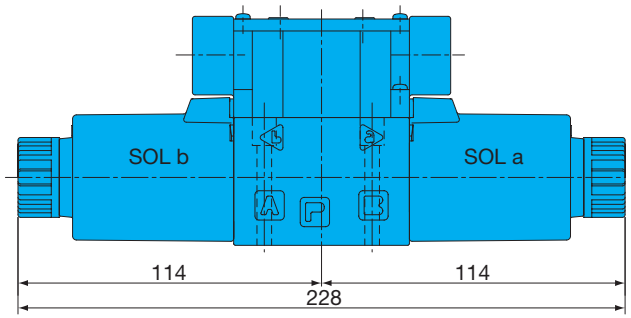
Installation Dimension Drawings

SE-G01-A***-(G)R-**-40
SE-G01-H***-(G)R-**-40

Note) For SE-G01-H3X-(G)R-**-40, the solenoid is on the opposite side as that shown in the diagram (SOL.a).



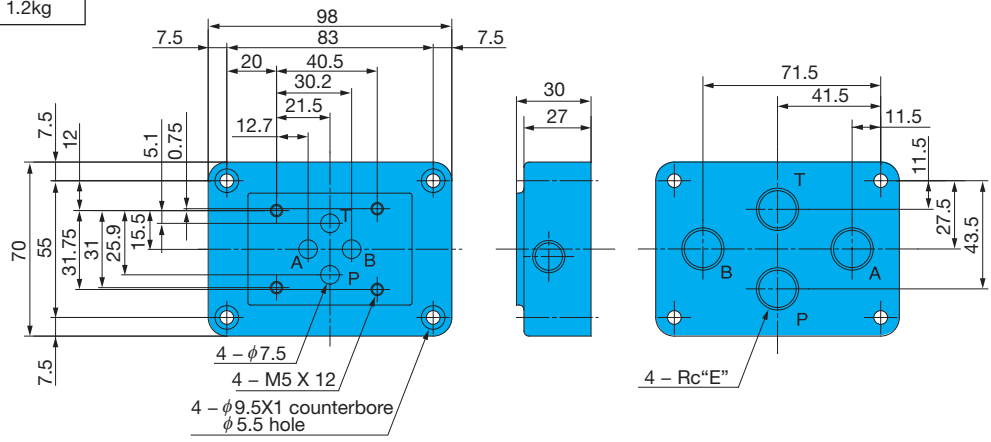
SE-G01-C**-(G)R-**-40
SE-G01-E3X-(G)R-**-40



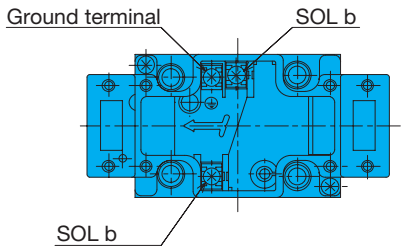
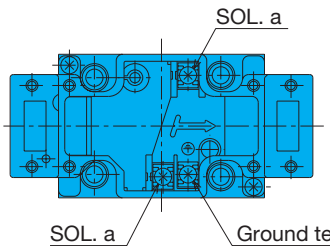
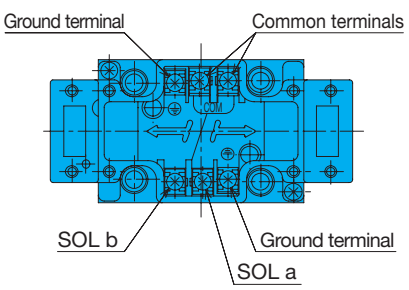
For sub plate SE-G01

Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

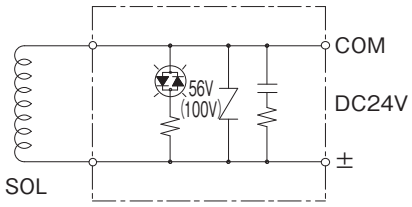
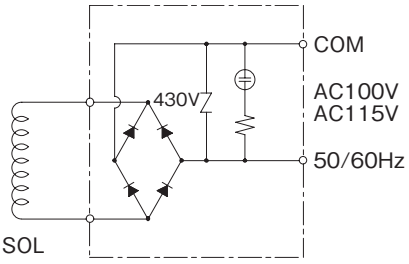
Gasket Surface Dimensions
(ISO 4401-03-02-0-05
JIS B 8355 D-03-02-0-05)



Wiring diagram for central terminal box kit

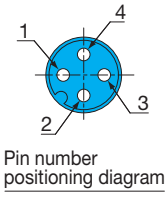
SE-G01-A**-*R*-**-40	SE-G01-H3X-*R*-**-40	SE-G01-$^{C**}_{E3X}$-*R*-**-40
		

Electrical circuit diagram for central terminal box kit

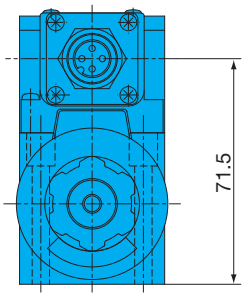
D2 (DC24V) (Note 1)	E1 (With built-in rectifier AC100V)
 Varistor voltage values in (parenthesis) are for the SE-G03.	

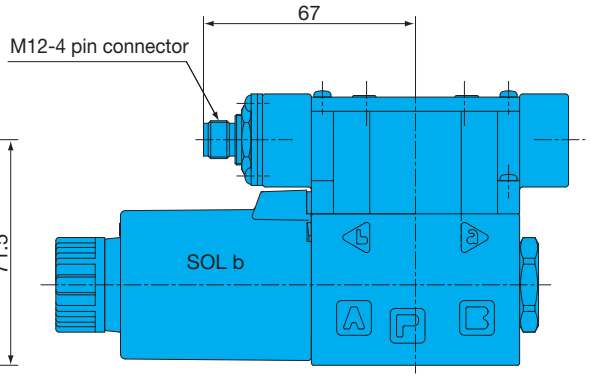
Note 1) Install D2 specification solenoid valves to protect against current back surge on both ends of the coil in the output circuit of the programmable controller (PC) if directly operating the solenoid valves.

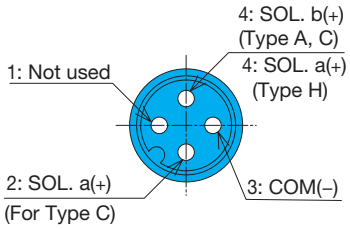
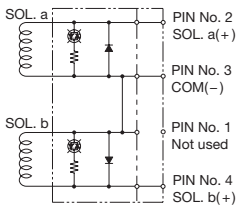
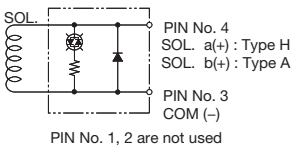
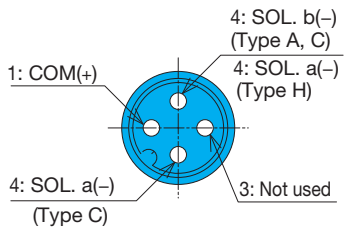
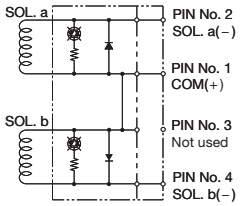
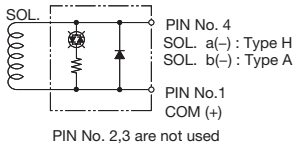
With M12-4 pin connector
SE-G01-**-GRV-D2-40
SE-G01-**-GRW-D2-40



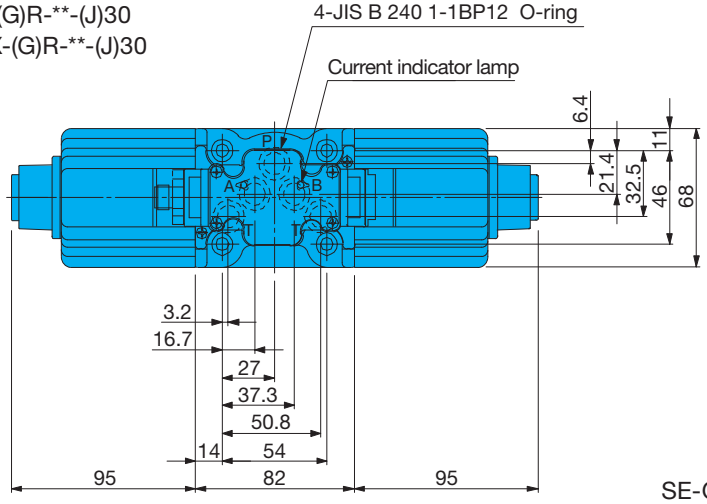
Pin number positioning diagram

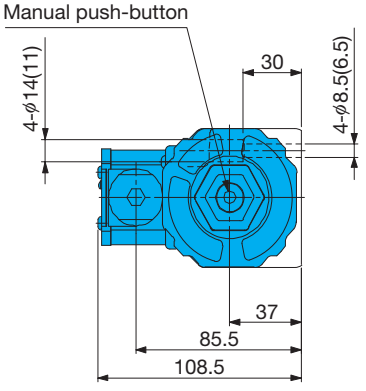




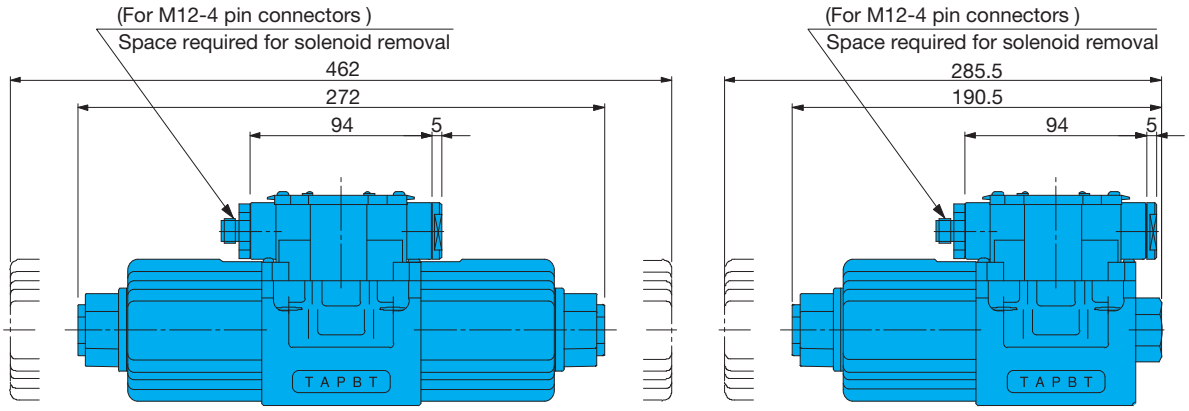
	Pin number position	Electrical Circuit Diagram	
		Operation Symbol C*	Operation Symbol A*, H*
Type V			 PIN No. 1, 2 are not used
Type W			 PIN No. 2,3 are not used

SE-G03-C*-(G)R-**-(J)30
SE-G03-E3X-(G)R-**-(J)30





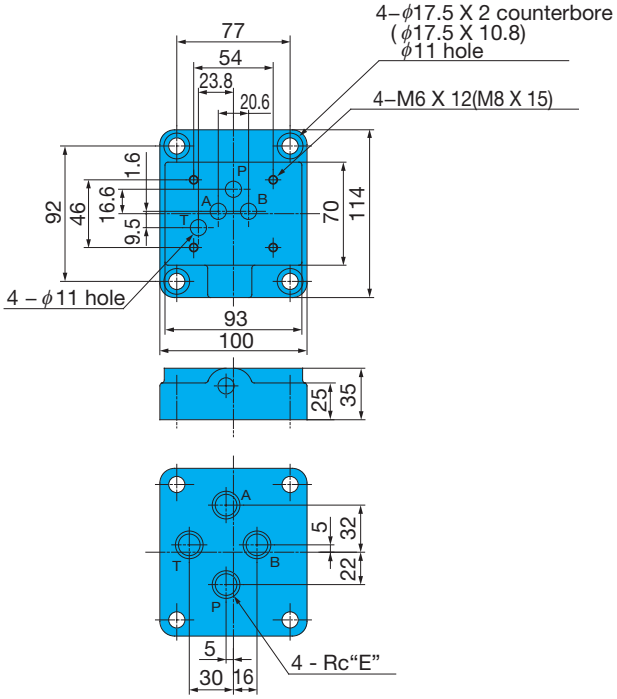
SE-G03-A***-(G)R-**-(J)30



For sub plate SE-G03

Mounting bolt	Model No.	E	Weight
M6	MSA-03-10	3/8	2.3kg
	MSA-03X-10	1/2	
M8	MS-03-30	3/8	
	MS-03X-30	1/2	

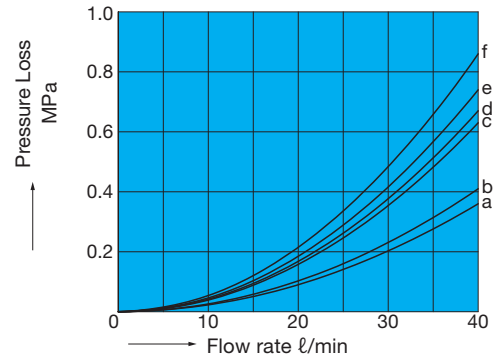
M6 gasket surface dimensions
(ISO 4401-05-04-0-05
JIS B 8355 D-05-04-0-05)



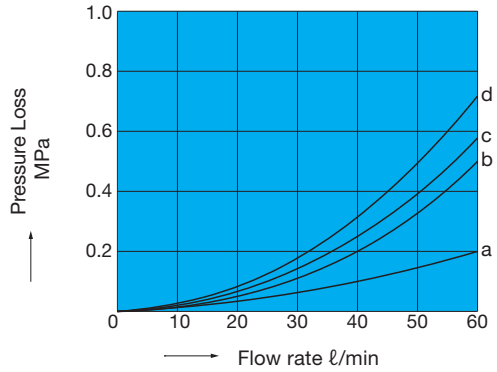
Performance Curves

Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

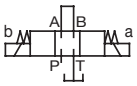
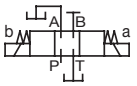
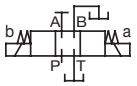
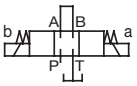
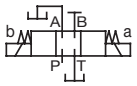
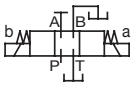


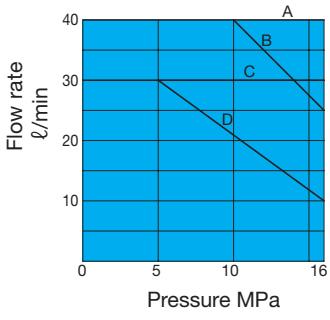
Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SE-G01	A2X	d	f	–	–	–
	A3X	f	f	e	e	–
	H3X	f	f	e	e	–
	E3X	c	c	e	e	–
	C4	b	b	b	b	d
	C5	e	e	d	d	–
	C6	f	f	a	a	–

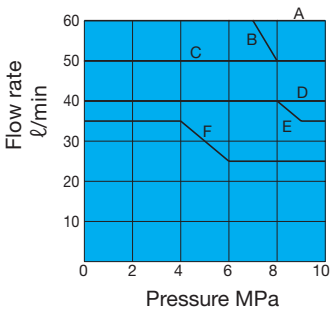


Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SE-G03	A2X	d	d	–	–	–
	A3X	d	d	d	d	–
	E3X	d	d	c	c	–
	C4	c	c	a	a	b
	C5	d	d	d	d	–
	C6	d	d	b	b	–

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

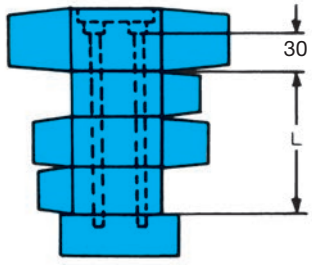




Note) 1. The maximum flow rate is the value when a rated 90%V is applied following solenoid temperature rise and saturation.
2. The maximum flow rate is the allowable value of each port.

Installation bolts

Refer to the following table for length of installation bolts for SE-G03 size. (Refer page D-93 for length of installation bolts for SE-G01 size.)

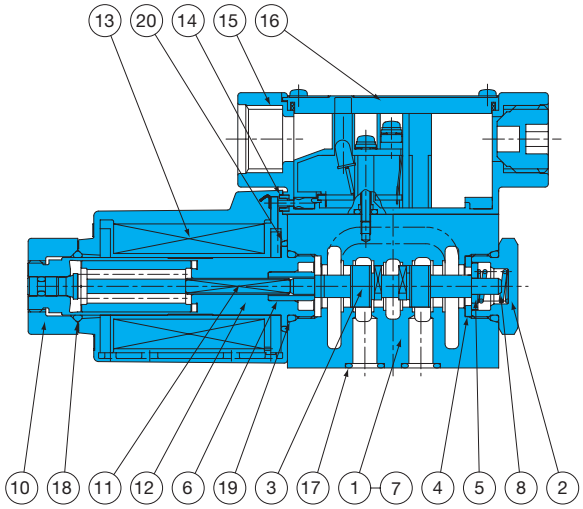


Type	Dimensions L	Bolt length
Hexagon socket head bolt	0 (Solenoid only)	40
	55	95
	110	150

Type	Dimensions L	Bolt length
Stat bolt	55	106
	110	161
	165	216
	220	271

Cross-sectional Drawings

SE-G01-A3X-(G)R-**-40



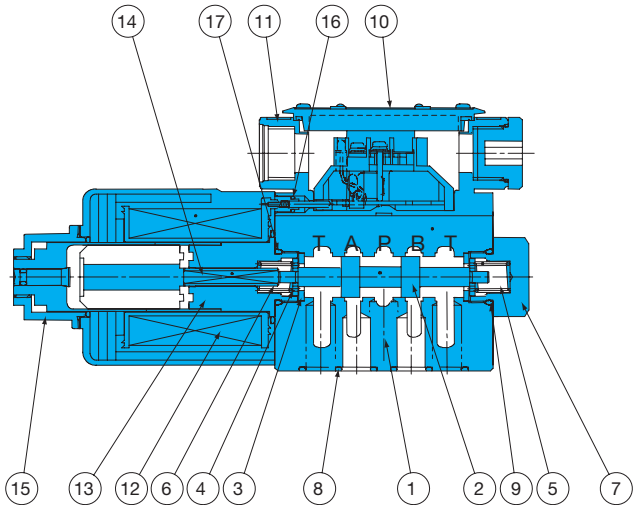
Part No.	Part Name
1	Body
2	Plug
3	Spool
4	Retainer A
5	Retainer B
6	Spring pin
7	Spacer
8	Spring A
9	Spring C
10	Nut
11	Rod
12	Solenoid guide
13	Solenoid coil
14	Packing
15	Terminal box kit
16	Nameplate
17	O-ring
18	O-ring
19	O-ring
20	O-ring

List of Sealing Parts

Part No.	Part Name	SE-G01		
		Part Number	Q'ty	
			Single Solenoid	Double Solenoid
17	O-ring	AS568-012(NBR-90)	4	4
18	O-ring	NBR-70-1 P18	1	2
19	O-ring	NBR-90 P18	2	2
20	O-ring	S-25(NBR-70-1)	1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

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	NBR-90 P12	5	5
9, 17	O-ring	NBR-90 P18	2	2
16	O-ring	NBR-70-1 P3	2	4

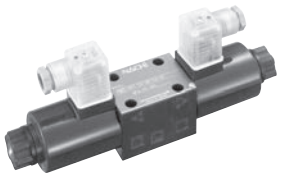
Note) The materials and hardness of the O-ring conforms with JIS B2401.

Seal Kit Number

SE-G01		SE-G03	
Single Solenoid	Double Solenoid	Single Solenoid	Double Solenoid
EEDS-01A	EEDS-01C	EECS-03A	EECS-03C

SED Series (Wiring System: DIN Connector Type)
Lower Power Solenoid Valve

40ℓ/min
16MPa



Features

①Low current, low power
The SED series magnetic switching valve's solenoid has significantly lower power consumption.

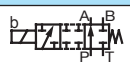
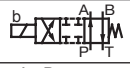
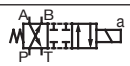
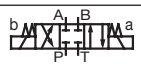
②Directly drivable by a programmable controller
Low-current operation means not only allows direct drive by a programmable controller (PC) output circuit, it also enables the use of a compact and simple control circuit.

③Little 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.

④Easy coil replacement
A DIN connector type coil enables one-touch coil replacement.

⑤Global compliance (G01 size)
Meets overseas safety standards TÜV (CE marking). Can be used safely around the world.

Specifications

Operation Symbol	JIS Symbol	SED-G01-**-(G)R-**-40	
		Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}
A2X		30	16 {163}
A3X		40	
H3X			
E3X			
C4		30	
C5		40	
C6			

Note) The maximum flow rate of each valve depends on the pressure. For details, see page E-36.

●Handling
1. In order to realize the full benefits of the solenoid valve, configure piping so oil is constantly supplied to the T(DR) port.
2. Ensure that surge pressure in excess of the maximum allowable back pressure can be accidentally at 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 oneway valve.
4. Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
5. When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.
6. Use the SA series solenoid valve if using flame resistant operating fluid.
7. Be sure to note the allowable pressure range of the coil being used.
8. 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.
9. When using a detent type (E3X), provide constant energization when secure maintenance of the switching position is required.
10. Note that manual pin operating pressure changes in accordance with tank line back pressure.
11. If you select the DC solenoid (D2 power model), reverse surge voltage occurs because there is no diode mounted in the DIN connector. 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. (Recommended diode: Hitachi V07J or equivalent)

●Solenoid Assembly Specifications

Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	For SED-G01			
				Solenoid Coil Type	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)
Built-in rectifier type AC	E1	AC100	50	EED64-E1D	0.08	7.0	80 to 120
			60				
DC	D2	DC24	–	EED64-D2D	0.2	4.8	21.6 to 26.4

Solenoid Type			SED-G01	
			DC Solenoid	Internal DC solenoid for rectifier
			D2	E1
Maximum Working Pressure	P, A, B Ports		16MPa{163kgf/cm²}	
Maximum Allowable Backpressure	T port		16MPa{163kgf/cm²}	
Changeover Frequency (per minute)			120	
Standard	Indicator light Surgeless		GR	R
Weight (kg)	Double Solenoid		2.2	
	Single Solenoid		1.7	
Operating Environment	Dust Resistance/Water Resistance Rank		JIS C0920 IP65 (Dust-tight, Waterjet-proof)	
	Ambient Temperature		-20 to 50°C	
	Operating Fluid	Temperature Range	-20 to 70°C	
		Kinematic Viscosity Range	15 to 300mm²/s	
		Filtration	25 μm or less	
Bundled Accessories	Mounting bolt		Refer to page D-93 for bolt lengths for usage of M5 x 45 4-module valves.	
	Tightening Torque		5 to 7N·m {51 to 71kgf·cm}	

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Explanation of model No.

SED – G 01 – A 3 X – GR – D2 – 40

- **SED**: Low-power solenoid valve with DIN connector
- **G**: Mounting method — G: Gasket type
- **01**: Nominal pipe diameter — 01 size
- **A**: Operation Method

A	H	C	E
Spring Offset		Spring Center	Detent

- **3**: Center valve position flow path

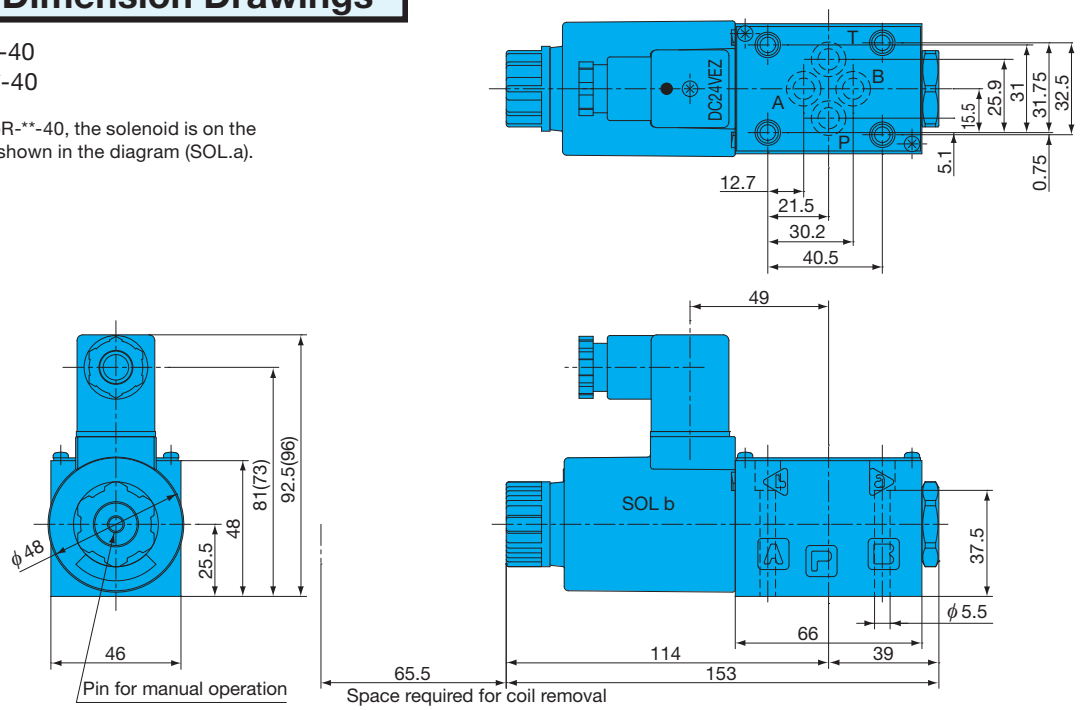
2	3	4	5	6

- **X**: Transition Flow Path (Specify for A2X, A3X only) — Closed
- **GR**: Auxiliary symbol — GR: Surgeless type with indicator (applicable for power supply D2 only); R: With indicator light (applicable for power supply E1 only)
- **D2**: Power supply — D: DC (D2=DC24V); E: For AC (joint 50/60 Hz inside rectifier) (E1=AC100V)
- **40**: Design number — 40: For 01 size

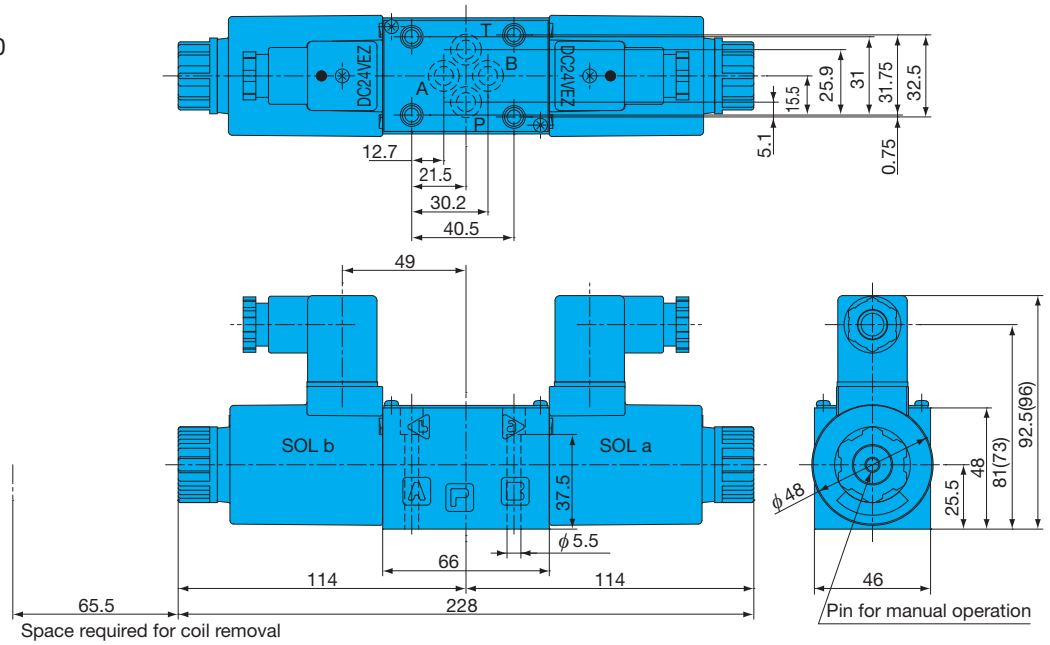
Installation Dimension Drawings

SED-G01-A***-(G)R-**-40
SED-G01-H***-(G)R-**-40

Note) For SED-G01-H3X-(G)R-**-40, the solenoid is on the opposite side as that shown in the diagram (SOL.a).



SED-G01-C**-(G)R-**-40
SED-G01-E3X-(G)R-**-40

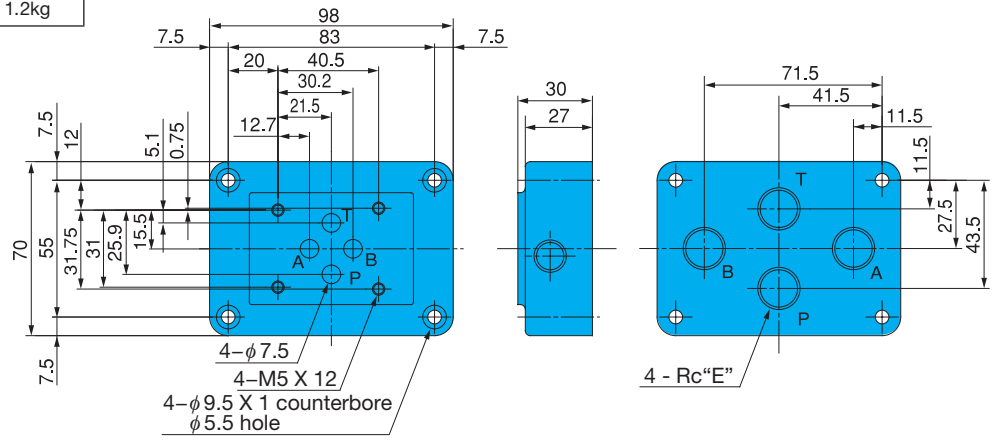


Note) Gasket surface dimensions and sub plate are the same as those for SS-G01. See page E-5 for more information.

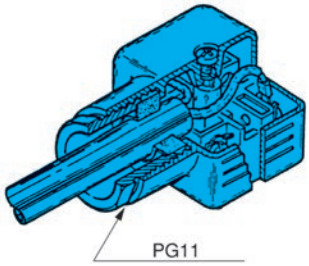
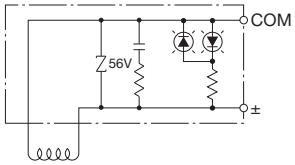
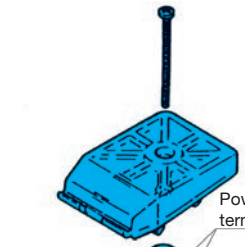
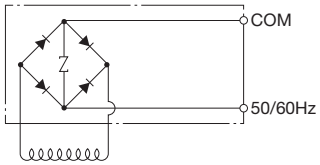
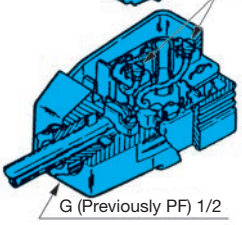
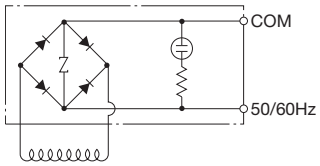
For sub plate SED-G01

Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

Gasket Surface Dimensions
(ISO 4401-03-02-0-05
JIS B 8355 D-03-02-0-05)



● Connectors

Model No.	Wiring	Electrical Circuit Diagram
SED-G01-***-GR-D2-40 (EA41-EGRD2)	 Connect the power supply to terminals No.1 and No. 2. The ⏚ terminal is ground. Use this terminal as required.	
SED-G01-***-E1-40 (EA42-1B)	 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.	
SED-G01-***-R-E1-40 (EA42-R*-1B)		

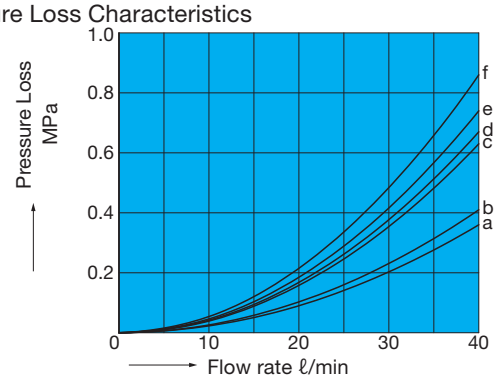
Symbols in parentheses indicate connector configuration.

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 ϕ8 to ϕ10. 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. Use M3 for round type and Y type solderless terminals.
6. Tighten the M3 screws that secure connectors and terminals to a torque of 0.3 to 0.5N·m (3.1 to 5.1kgf·cm).

Performance Curves

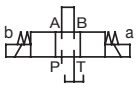
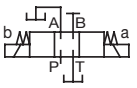
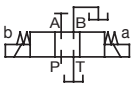
Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

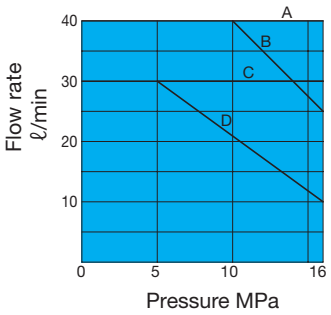
Pressure Loss Characteristics



Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SED-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	–

Pressure - Flow Volume Allowable Value

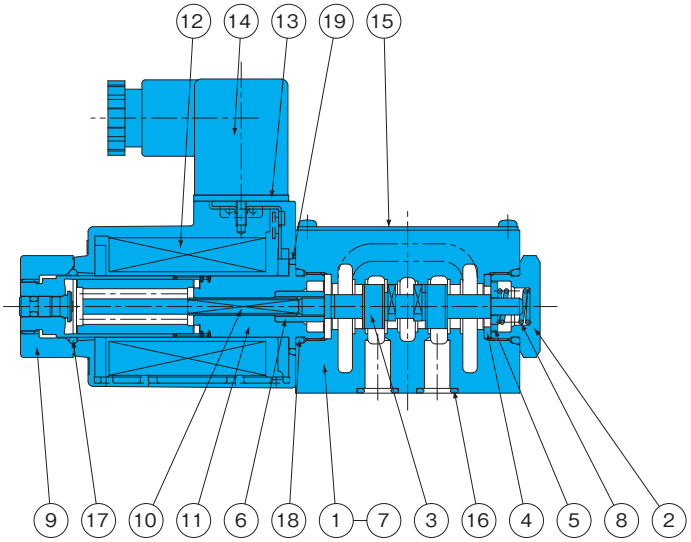
Pump Type	SED-G01		
Operation Example / Operation Symbol			
A2X	–	D	D
A3X	A	D	D
H3X	A	D	D
E3X	A	C	C
C4	C	C	C
C5	A	D	D
C6	B	D	D



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.

Cross-sectional Drawings

SED-G01-A3X-(G)R-**-40



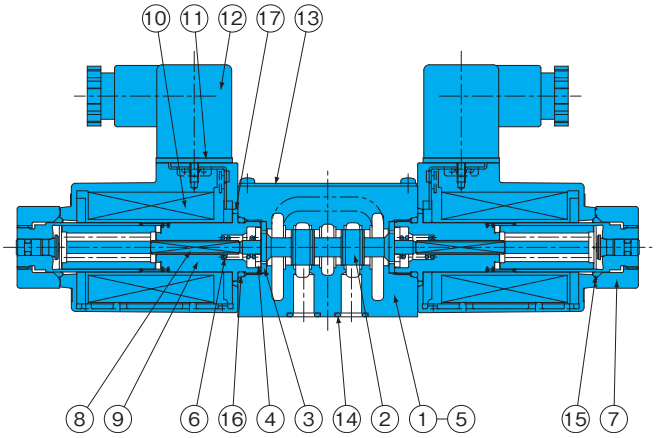
Part No.	Part Name
1	Body
2	Plug
3	Spool
4	Retainer A
5	Retainer B
6	Spring pin
7	Spacer
8	Spring A
9	Nut
10	Rod
11	Solenoid guide
12	Solenoid coil
13	Packing
14	Terminal box kit
15	Nameplate
16	O-ring
17	O-ring
18	O-ring
19	O-ring

List of Sealing Parts

Part No.	Part Name	SED-G01		
		Part Number	Q'ty	
			Single Solenoid	Double Solenoid
17	O-ring	AS568-012(NBR-90)	4	4
18	O-ring	NBR-70-1 P18	1	2
19	O-ring	NBR-90 P18	2	2
20	O-ring	S-25(NBR-70-1)	1	2

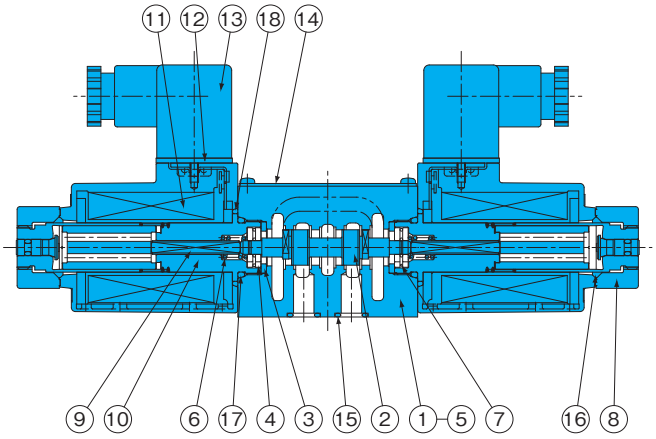
Note) The materials and hardness of the O-ring conforms with JIS B2401.

SED-G01-C*-(G)R-**-40



Part No.	Part Name
1	Body
2	Spool
3	Retainer A
4	Retainer B
5	Spacer
6	Spring C
7	Nut
8	Rod
9	Solenoid guide
10	Solenoid coil
11	Packing
12	Terminal box kit
13	Nameplate
14	O-ring
15	O-ring
16	O-ring
17	O-ring

SED-G03-A3X-GR-**-(J)30



Part No.	Part Name
1	Body
2	Spool
3	Retainer A
4	Retainer B
5	Spacer
6	Spring C
7	Detent spring
8	Nut
9	Rod
10	Solenoid guide
11	Solenoid coil
12	Packing
13	Terminal box kit
14	Nameplate
15	O-ring
16	O-ring
17	O-ring
18	O-ring

SL Series (Wiring System: Central Terminal Box)
Lower Power Solenoid Valve

30ℓ/min
7MPa

Features

①Very 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.

②Low switching noise
The wet-type solenoid valve provides very low core switching noise, for quiet operation.

③Low power consumption type.
The low power for the AC solenoid 9.6 W (60 Hz), DC solenoid 10 W contribute to energy conservation.

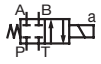
④Easy connections
A special wiring box provides a COM port and indicator light as standard for simple wiring and maintenance.

⑤Easy coil replacement
A plug-in type coil enables one-touch coil replacement.

⑥Wide-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.

⑦Global standard
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 (ℓ/min)
	-A5-	30
	-H5-	
	-A3X-	
	-H3X-	
	-E3X-	
	-C1-	
	-C2-	

JIS Symbol	Operation symbol	Maximum flow rate (ℓ/min)
	-C4-	30
	-C5-	
	-C6-	
	-C9-	
	-C6S-	
	-C7Y-	15

Solenoid Type			AC Solenoid		DC Solenoid	
					Built-in Rectifier	
			C1	C2	E1	D2
Maximum Working Pressure	P, A, B Ports		7MPa{71kgf/cm²}			
Maximum Allowable Backpressure	T Port		7MPa{71kgf/cm²}			
Changeover Frequency (per minute)			240		120	240
Standard	Indicator light		R			
Options	Surgeless		G		–	G
	With manual push-button		N			
	Quick Return		–		Q	–
Weight (kg)	Double Solenoid		1.5		2.0	
	Single Solenoid		1.2		1.5	
Operating Environment	Dust Resistance/Water Resistance Rank		JIS C 0920 IP64 (Dust-tight, Splash-proof)			
	Ambient Temperature		–20 to 50°C			
	Operating Fluid	Temperature Range	–20 to 70°C			
		Kinematic Viscosity Range	15 to 300mm²/s			
		Filtration	25 μm or less			
Mounting bolt			Hex bolt with hole of 12.9 strength classification M5 × 45 4 each			
Tightening Torque			5 to 7N·m{51 to 71kgf·cm}			

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(R) port. Never use a stopper plug in the T(R) 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 JIS K 2213 Class 1 or Class 2, or equivalent.
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 (E3X), 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 (ℓ/min)	Weight (kg)
MSA-01X-10	1/4	20	1.2
MSA-01Y-10	3/8	40	

●Solenoid Assembly Specifications

Solenoid Type		AC Solenoid						DC Solenoid	
								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 (V)	80 to 110	90 to 120		160 to 220	180 to 240		90 to 110	21.6 to 26.4
	Allowable Pressure (MPa{kgf/cm²})	7{71}							
	Insulator Resistance (MΩ)	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.

Explanation of model No.

SL - G 01 - A 3 X - * R - C2 - 31

- Design Number
- Power supply
  C: AC (50/60 Hz) C1=AC100V C2=AC200V
  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 supple E1)
- Transition flow path (A3X, H3X, E3X, C7Y only)

X	Y
Close	Semi-open

- Center position

1	2	3	4	5
6	7	9	6S	

Note P is pressure port, A and B are connection ports to cylinder.
T (R) shows the connection port to the tank.

- Operation Method

A	H	C	E
Spring Offset type		Spring Center	Detent

- Nominal Diameter: 01 size
- Mounting method: Gasket type
- Machine type: SL Series wet magnetic switching valve.

Options

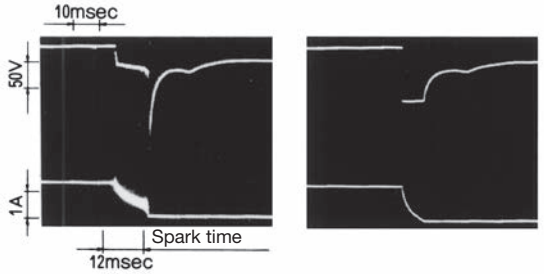
(Auxiliary Symbol)

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.

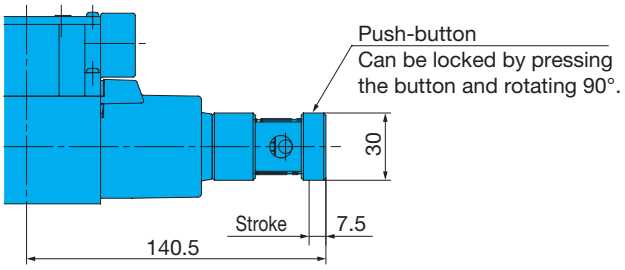
A built-in surge absorber element eliminates sparking and surge pressure.

Features
- Surge voltage is inhibited.
- Sparking at relay contact points is eliminated.

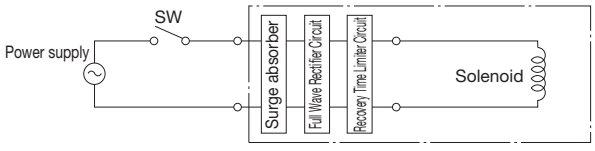


Standard Type　　Surgeless Type

Manual Push-button Type (Auxiliary symbol: N)



Quick Return Type (Auxiliary Symbol: Q)



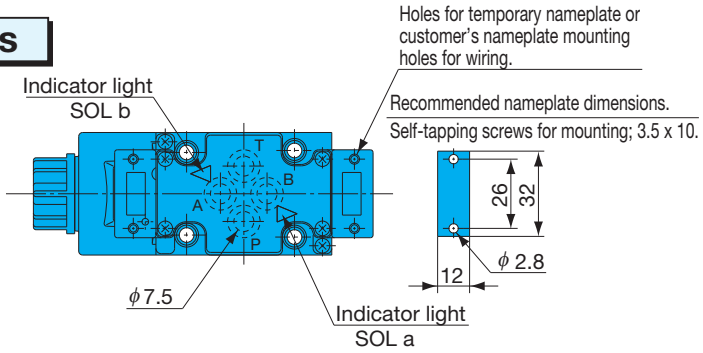
Handling

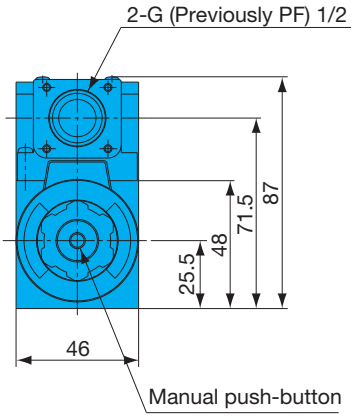
1. This type is used in the case of power supply type E1 (with built-in rectifier) to shorten the spring return time. This also applies to D2.
2. The quick return mechanism is built-in.

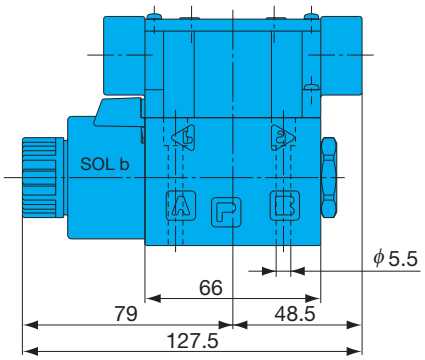
Installation Dimension Drawings

AC Solenoid
SL-G01-A**-R-C*-31
SL-G01-H**-R-C*-31

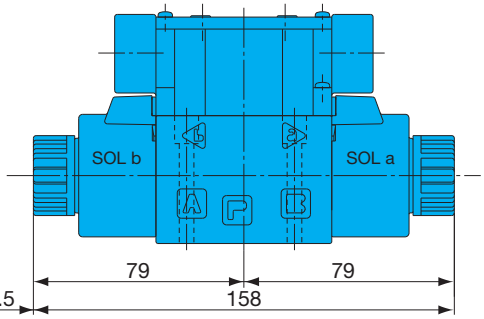
Note) The SL-G01-H**-R-**-31 solenoid, is attached to the opposite side (SL a) as shown in the diagram.



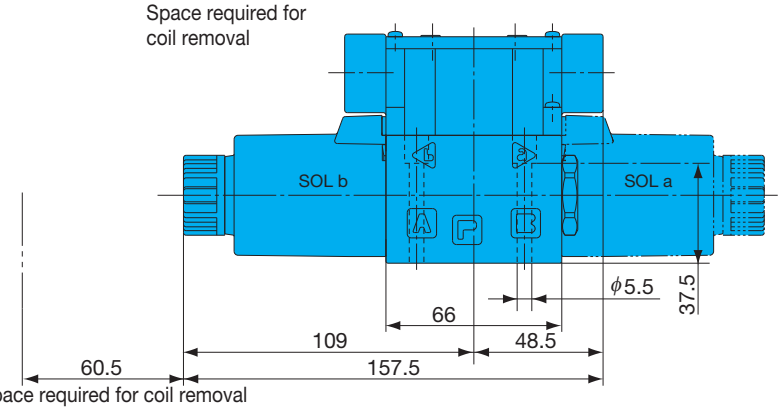




SL-G01-C**-R-C*-31
SL-G01-E**-R-C*-31



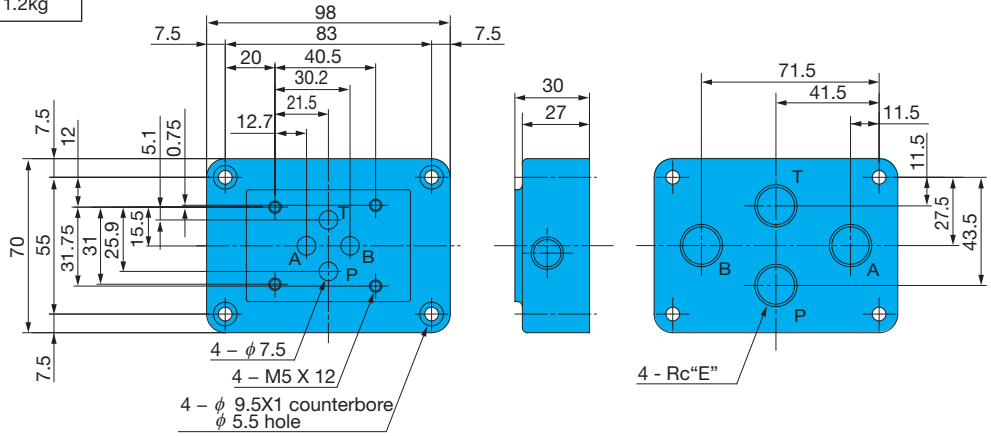
DC Solenoid and Rectifier
SL-G01-A**-R-D/E*-31
SL-G01-H**-R-D/E*-31
SL-G01-C**-R-D/E*-31
SL-G01-E**-R-D/E*-31



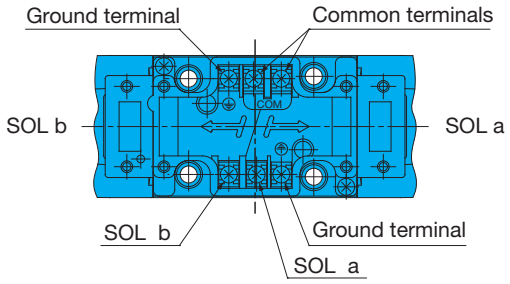
For sub plate SL-G01

Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

Gasket Surface Dimensions
(ISO 4401-03-02-0-05
JIS B 8355 D-03-02-0-05)

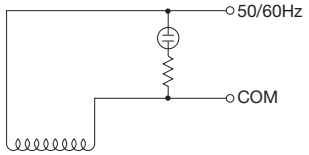
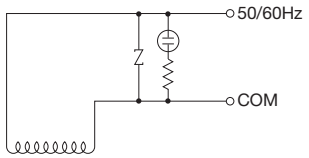
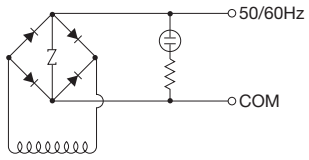
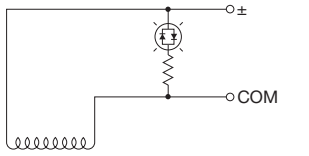
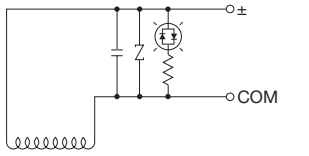


Wiring Diagram



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 0.5 to 0.7N·m {5.1 to 7.1kgf·cm}.

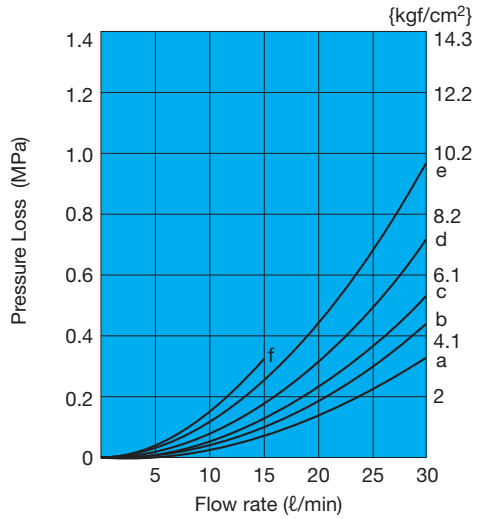
Electrical Circuit Diagram

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 E-4 for more information.

Performance Curves

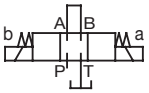
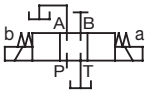
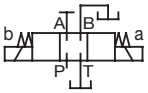
Hydraulic Operating Fluid Kinematic Viscosity 20 mm²/s {cSt}

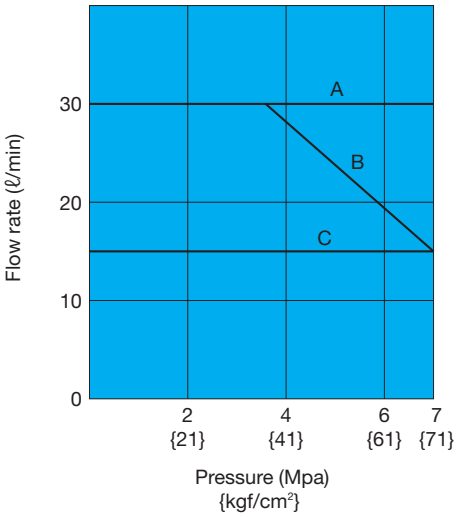
Pressure Loss Characteristics



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 Example / Operation Symbol			
A5	A	–	B
H5		B	–
A3X, H3X, E3X C1, C2, C4, C5 C6, C9, C6S		B	B
C7Y	C	C	C



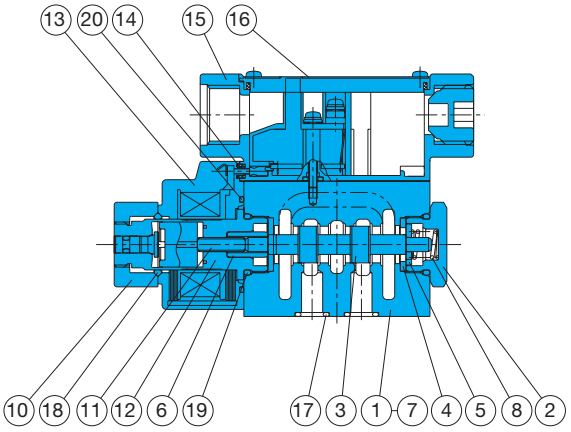
Switching Response Time

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	7MPa{71kgf/cm²}
SL-G01-**-R-E1-31	0.055 to 0.080	0.150 to 0.185	20ℓ/min
SL-G01-**-(G)R-D2-31	0.055 to 0.080	0.025 to 0.035	40mm²/s {cSt}

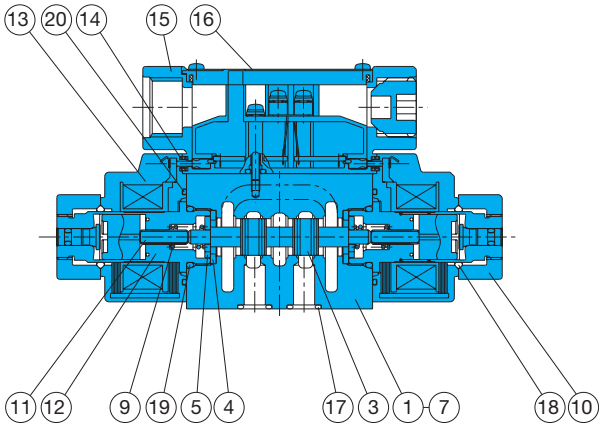
Note) 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)
2. In the case of power supply type E1 (with built-in rectifier), the spring return time using Quick Return (option symbol: Q) is the same as D2.

Cross-sectional Drawings

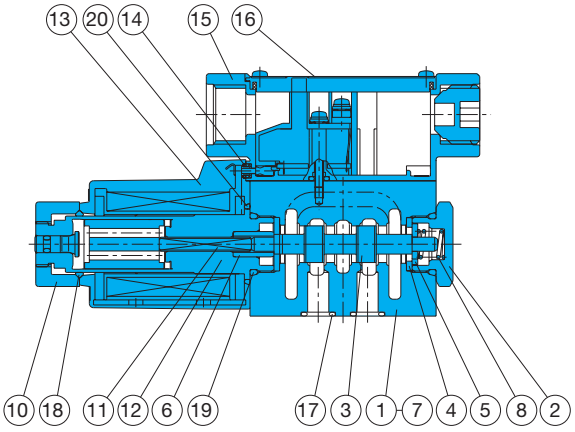
SL-G01-A**-R-C*-31



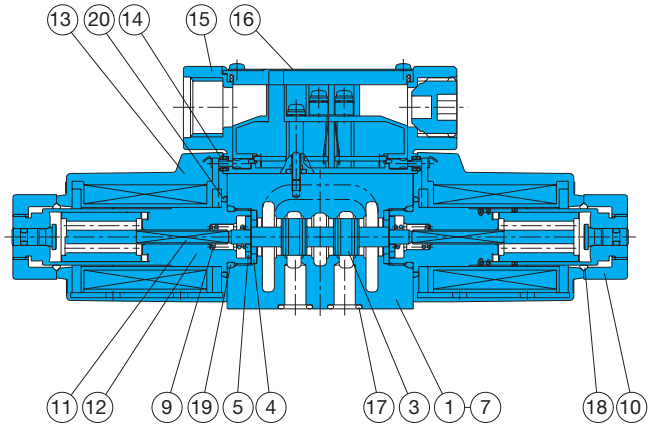
SL-G01-C**-R-C*-31



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(NBR-90)		4	4
18	O-ring	NBR-70-1 P20	NBR-70-1 P18	1	2
19	O-ring	NBR-90 P18		2	2
20	O-ring	S-25(NBR-70-1)	AS568-025(NBR-70-1)	1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.
AS568 is SAE standard.

Part No.	Part Name
1	Body
2	Plug
3	Spool
4	Retainer A
5	Retainer B
6	Retainer C
7	Spacer
8	Spring A
9	Spring C
10	Nut

Part No.	Part Name
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

Seal Kit Number

AC SOL.		DC SOL.	
Single Solenoid	Double Solenoid	Single Solenoid	Double Solenoid
ELCS-AA	ELCS-CA	ELCS-AD	ELCS-CD

NACHI

DSS(DSA) TYPE SOLENOID CONTROLLED PILOT OPERATED DIRECTIONAL VALVE

DSS (DSA) 22 Design Series Solenoid Control Valve

300 to 600ℓ/min
32 to 35MPa

Features

①Long-life operation is ensured by use of the high-performance, renowned SS(SA)-G01 wet solenoid valve as the pilot valve.

②High pressure, high capacity
The 04 size can provides up to 300 ℓ/min, while the 06 size delivers up to 600 ℓ/min.

③Low pressure loss
An original flow path design provides wide-ranging low pressure loss and enhanced system circuit efficiency.

④Internal modification of the pilot and drain can be accomplished without removing the valve by simply connecting and disconnecting plugs.

⑤Built-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	06 Size
Valve Model Number			DSS(DSA)-G04-***-R-**-22	DSS(DSA)-G06-***-R-**-22
Maximum Working Pressure MPa{kgf/cm²}	P.A.B. Ports		35{357}	32{326}
	T Port	Internal Drain Type	16{163}	16{163}
		External Drain Type	21{214}	21{214}
Maximum Flow Rate ℓ/min			300	600
Rated Flow Rate ℓ/min			150	300
Maximum Pilot Pressure MPa{kgf/cm²}			25{255}	25{255}
Minimum pilot pressure MPa{kgf/cm²}	A** (Spring Offset Type)		0.8{8.2}	0.8{8.2}
	E** (No-spring Detent Type)			
	C** (Spring Center Type)			
	D** (Pressure Center Type)		1.2{12.2}	1.2{12.2}
	Built-in Pilot Pressure Check Valve Type (For Internal Pilot)		0.45 {4.6} (for *3Z, *4, *7*, *8 pilot pressure generation)	
Maximum Changeover Frequency (cycles/minute)			120	120
Pilot Volume (cm³)	A** (Spring Offset Type)		8.0	20.0
	C** (Spring Center Type)		4.0	10.0
Weight (kg)	A** (Spring Offset Type)		8.7(9.5)	14.5(15.4)
	E** (No-spring Detent Type)		9.2(10.0)	15.0(15.9)
	C** (Spring Center Type)			
	D** (Pressure Center Type)		10.5	16.5
Operating Environment	Dust-resistance/Water-resistance Rank JIS C 0920		DSS: IP64 (Dust-tight, Splash-proof) DSA: IP65 (Dust-tight, Waterjet-proof)	
	Ambient Temperature		-20 to 50°C	
	Operating Fluid	Temperature Range	-20 to 70°C	
		Kinematic Viscosity Range	15 to 300mm²/s	
		Filtration	25 μm or less	
Bundled Accessories	Mounting bolt		M6 × 45 (Two) M10 × 50 (Four)	M12 × 60 (Six)
	Tightening Torque N-m{kgf-cm}		M6 10 to 13{102 to 133} M10 45 to 55{460 to 560}	M12 60 to 70{612 to 714}

Note) 1. The maximum flow rate of each valve depends on the pressure. For details, see pages E-50 and E-51.
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 E-3 and E-15.
4. For mounting bolts, use bolts of 12.9 strength classification or equivalent.

●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 E-52 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 E-50 and E-51 are used even if the pilot is external and the drain is internal.

4 The maximum operating pressure for internal pilot is 25MPa 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.

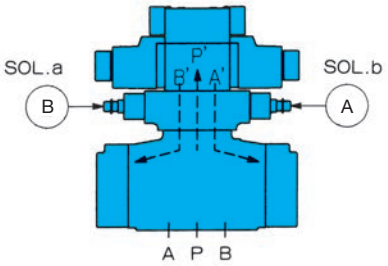
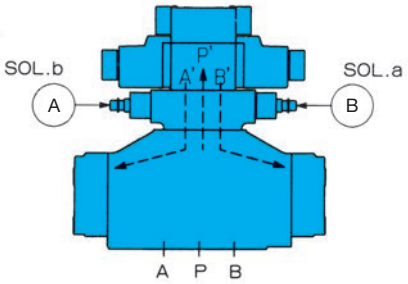
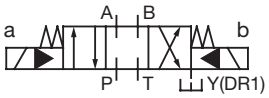
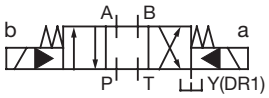
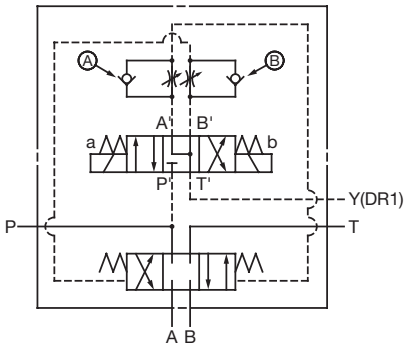
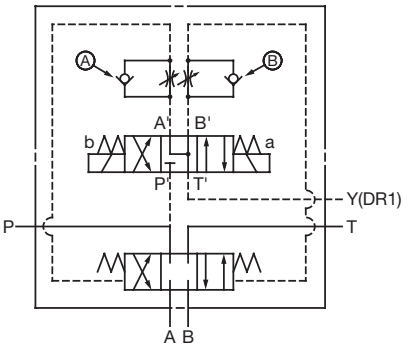
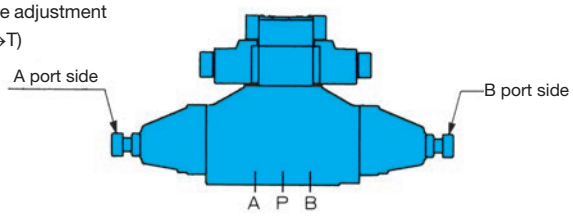
6 When adjustable spool stroke is desired, specify L in the auxiliary symbol position of the model number. Note, however, that this is not available with the pressure center type.

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		
	The pilot solenoid valve on the 04 size and the 06 size are mounted in opposite directions. Refer to the middle of the next page for models of the pilot solenoid valve that are mounted.	
Simplified Symbols		
Detailed Symbols		
Flow Regulator Adjusting Screw Positions	A Port Restrictor: Right side A B Port Restrictor: Left side B	A Port Restrictor: Left side A B Port Restrictor: Right side B
Adjustable Stroke Adjusting Screw Positions	A Port Side: P→A, B→T flow rate adjustment (For C7Y, P→B, A→T) B Port Side: P→B, A→T flow rate adjustment (For C7Y, P→A, B→T) 	

Explanation of model No.

DSS – G 06 – C 7 Y C – **R* – C2 – 22

- Design number: 22
- Power supply: C2
  - 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
- Auxiliary symbol (For multiple specifications, use alphabetic sequence.): R*
  - A: Internal drain
  - E: External pilot
  - L: Spool stroke limiter
  - P: Flow regulator valve to restrict P port
  - Y: With meter-out flow regulator valve
  - R: With indicator light (DSS type: Standard; DSA type: Optional)
  - N: With manual lock
  - Q: Quick return type
  - GR: Surgeless type with indicator
- Pilot pressure check valve: C
  - None: No check valve
  - C: Built-in check valve
- Transition flow path (Specify for *3*, *7* only.): Y
  - X: Closed Y: Restrictor open Z: Open

X	Y	Z
Closed	Semi-open	Open

- Center valve position flow path: 7
  - 1, 2, 3, 4, 4S, 5, 6, 6S, 7, 8

1	2	3	4	4S	5	6	6S	7	8

- Operation Method: C
  - A: Spring offset
  - E: No-spring detent
  - C: Spring center
  - D: Pressure center

A	E	C	D
Spring Offset	No-spring detent	Spring Center	Pressure center

- Nominal diameter 04 size, 06 size: 06
- Mounting method G: Gasket type: G
- Pump Type: DSS
  - DSS: Central terminal box solenoid control valve
  - DSA: DIN connector type solenoid control valve

Pilot (PP), Drain (DR)

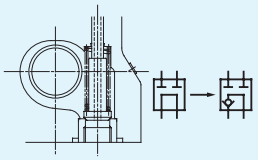
*High Pilot Pressure
Use at pressures that do not exceed 25MPa{255kgf/cm²}
*Internal PP, external DR are Nachi-Fujikoshi standards.
For external PP: Built-in stopper plug (Option E)
For internal DR: Stopper plug modification (Option A)
*Internal DR Precautions
Make sure that the differential pressure 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

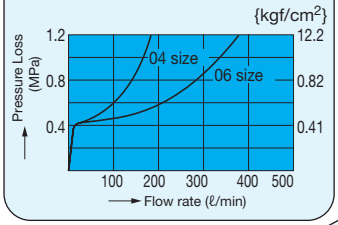
Valve Model Number	For G04	For G06
DSS(DSA)-G**-A**	SS(SA)-G01-A3X	SS(SA)-G01-H3X
DSS(DSA)-G**-E**	SS(SA)-G01-E3X	
DSS(DSA)-G**-C**	SS(SA)-G01-C6	
DSS(DSA)-G**-D**	SS(SA)-G01-C9	

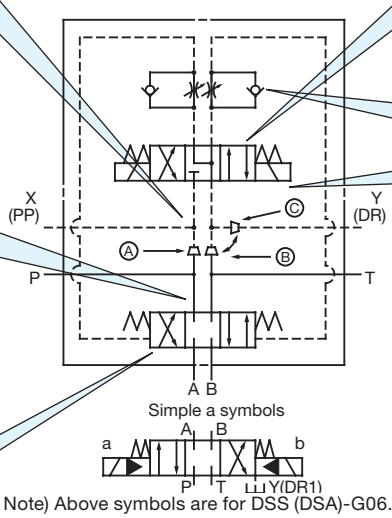
Built-in Pilot Pressure Check Valve

*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





Simple a symbols

Note) Above symbols are for DSS (DSA)-G06.

Flow Regulator Valve

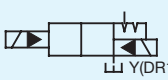
*Rotating the adjusting screw clockwise (rightward) slows the main spool switching speed.
P: Excitation of the solenoid (starting of the actuator) causes a restrictor effect.
Y: The restrictor effect can be obtained especially when the solenoid is de-excited (actuator stopped).

Pilot Valve Mounting Bolts

Standard	M5×45 (four)
Stage 1	M5×85 (four)
Stage 2	M5×125 (four)
Stage 3	M5×165 (four)

(Tightening Torque: 5 to 7N·m {51 to 71kgf-cm})

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.

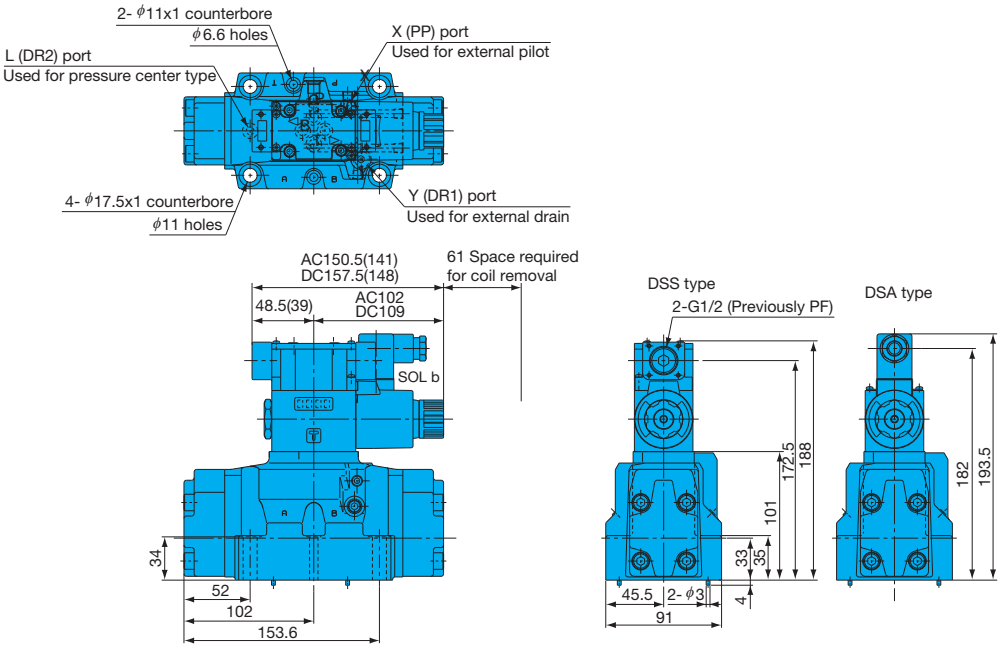
Pressure center

*Use this valve in a high-pressure, large-volume circuit to ensure reliable return of the main spool to the neutral position.

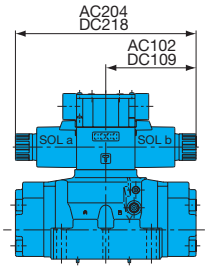
Sub Plate Number

Size	Model No.	Connecting Pipe Diameter	Weight (kgf)
For G04	MDS-04-10	Rc 1/2	4.5
	MDS-04X-10	Rc 3/4	
For G06	MDS-06-30	Rc 3/4	5.2
	MDS-06X-30	Rc1	

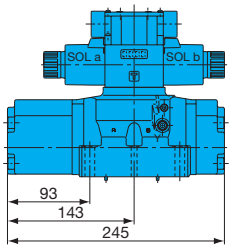
DSS(DSA)-G04-A**-R-**-22
(Spring Offset Type)



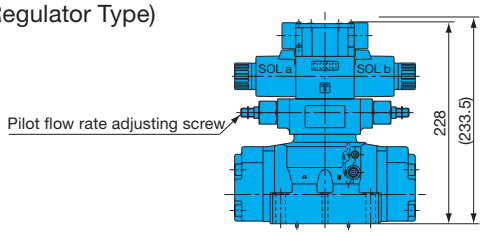
DSS(DSA)-G04-$\begin{matrix}E\\C\end{matrix}$**-R-**-22
(No-spring Detent Type)
(Spring Center Type)



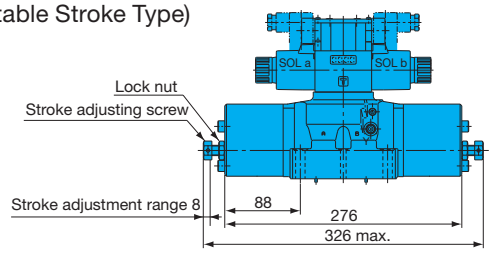
DSS(DSA)-G04-D**-R-**-22
(Pressure Center Type)



DSS(DSA)-G04-$\begin{matrix}A\\E\\C\\D\end{matrix}$**-RY-**-22
(Flow Regulator Type)



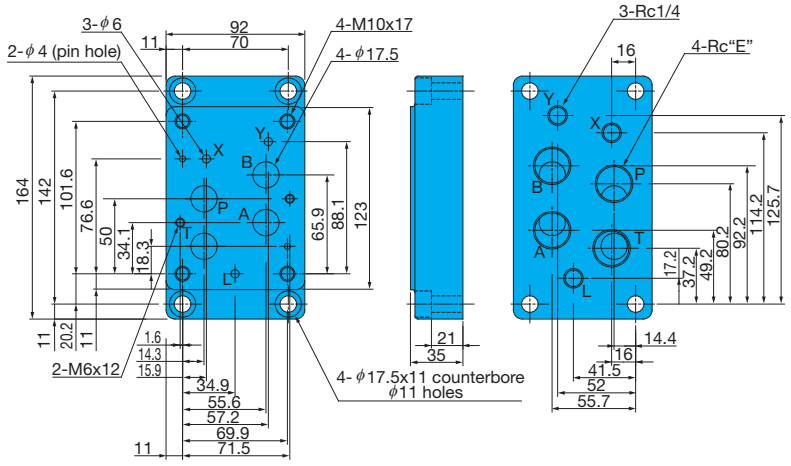
DSS(DSA)-G04-$\begin{matrix}A\\C\end{matrix}$**-LR-**-22
(Adjustable Stroke Type)



Dimensions in the parentheses are for the DSA-G04-***-RY-**-22.

Gasket Surface Dimensions

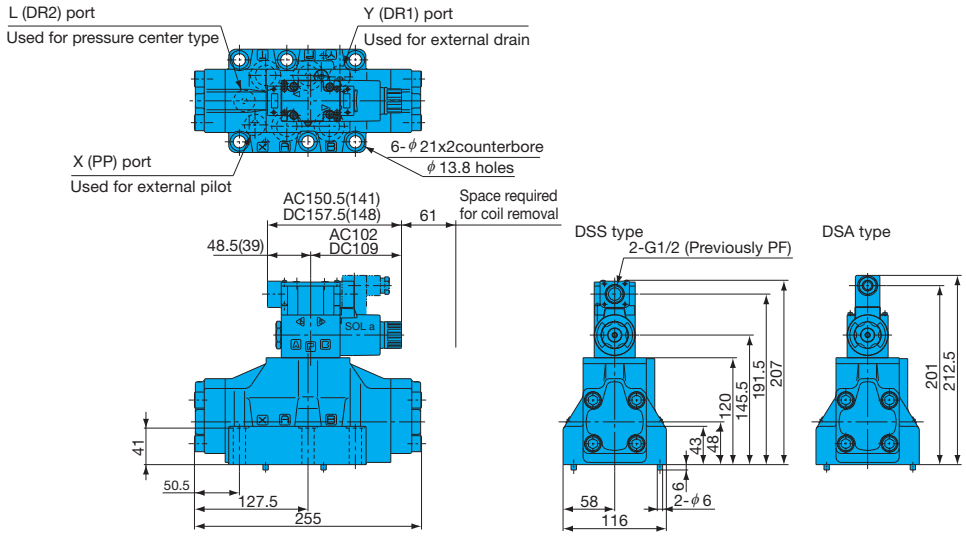
(ISO 4401-07-06-0-05
JIS B 8355 D-07-06-0-05)



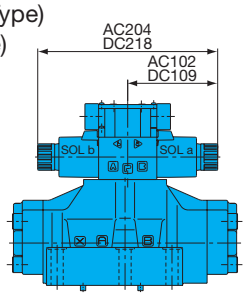
For sub plate DSS (DSA) -G04

Model No.	E	Weight
MDS-04-10	1/2	4.5kg
MDS-04X-10	3/4	

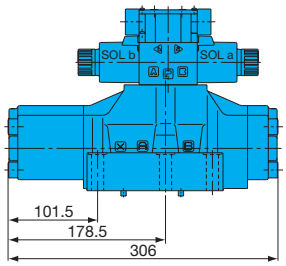
DSS(DSA)-G06-A**-R-**-22
(Spring Offset Type)



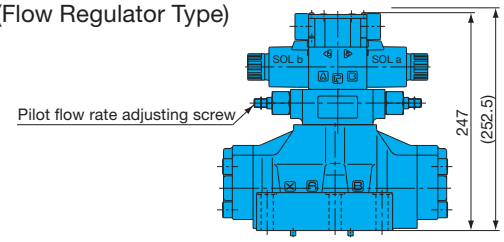
DSS(DSA)-G06-$\begin{matrix}E\\C\end{matrix}$**-R-**-22
(No-spring Detent Type)
(Spring Center Type)



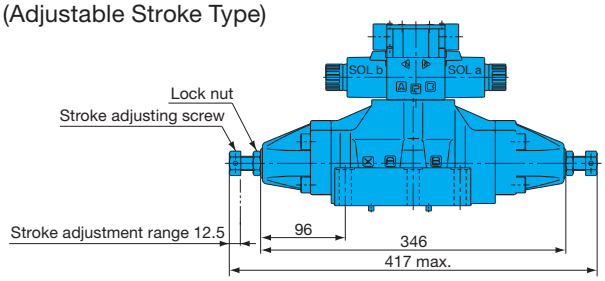
DSS(DSA)-G06-D**-R-**-22
(Pressure Center Type)



DSS(DSA)-G06-$\begin{matrix}A\\E\\C\\D\end{matrix}$**-RY-**-22
(Flow Regulator Type)



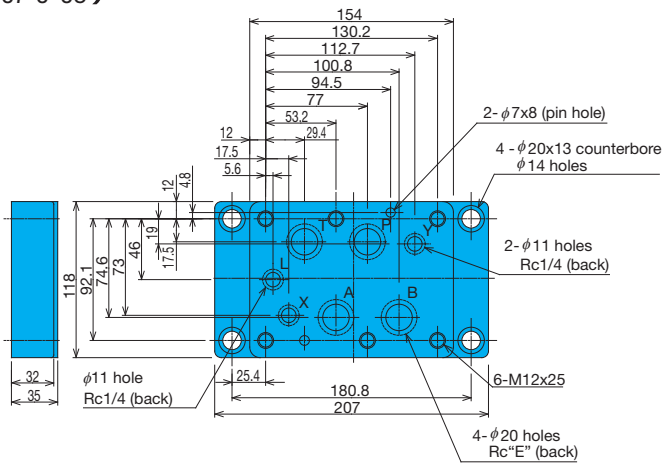
DSS(DSA)-G06-$\begin{matrix}A\\E\\C\end{matrix}$**-LR-**-22
(Adjustable Stroke Type)



Dimensions in the parentheses are for the DSA-G06-***-RY-**-21.

Gasket Surface Dimensions

(ISO 4401-08-07-0-05
JIS B 8355 D-08-07-0-05)



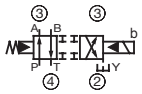
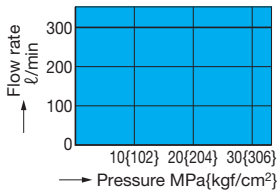
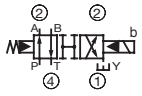
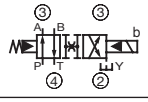
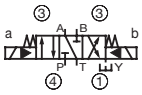
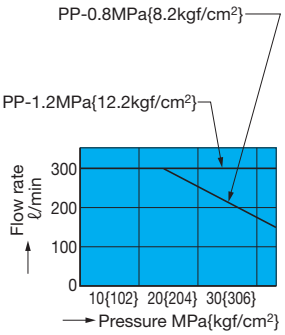
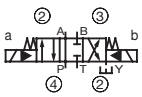
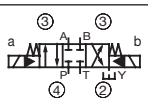
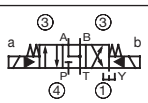
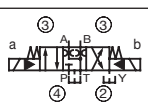
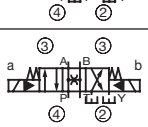
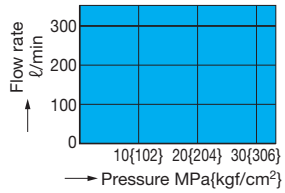
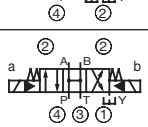
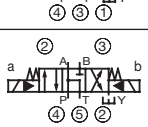
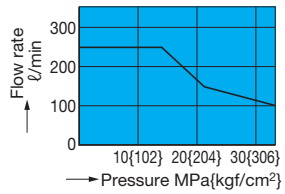
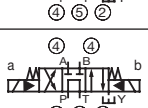
For sub plate DSS (DSA) -G06

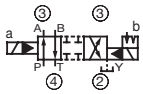
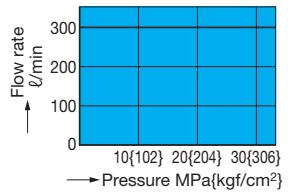
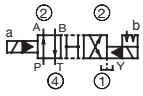
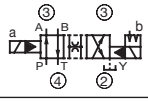
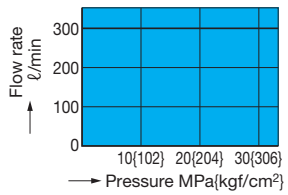
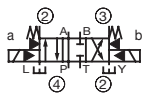
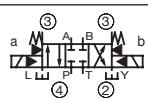
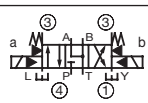
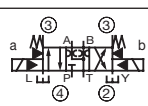
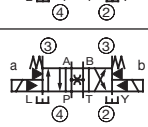
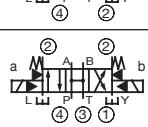
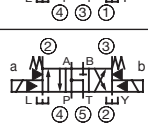
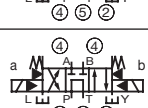
Model No.	E	Weight
MDS-06-30	3/4	5.2kg
MDS-06X-30	1	

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

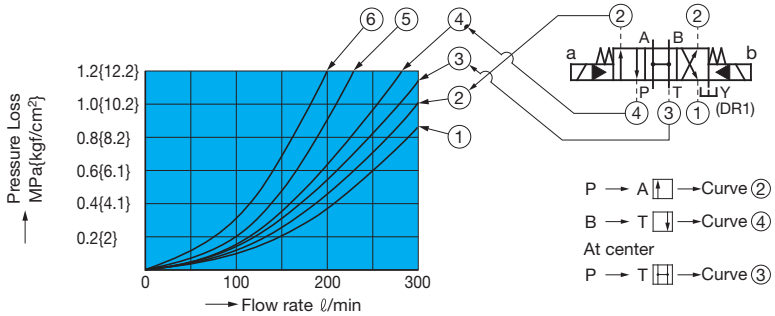
DSS(DSA)-G04

Model No.		JIS Symbol	Pressure - Flow Rate Allowable Value
2-Position Spring Offset Type	DSS(DSA) -G04 -A3X-		
	-A3Z-		
	-A3Y-		
3-Position Spring Center Type	DSS(DSA) -G04 -C1-		
	-C2-		
	-C5-		
	-C6-		
	-C6S-		
	-C4S-		
	-C4-		
	-C8-		
	-C7X- -C7Y-		

Model No.		JIS Symbol	Pressure - Flow Rate Allowable Value
2-Position No-spring Detent Type	DSS(DSA) -G04 -E3X-		
	-E3Z-		
	-E3Y-		
3-Position Pressure Center Type	DSS(DSA) -G04 -D1-		
	-D2-		
	-D5-		
	-D6-		
	-D6S-		
	-D4S-		
	-D4-		
	-D8-		
	-D7X- -D7Y-		

Note) The JIS number indicates the standard internal pilot and external drain.

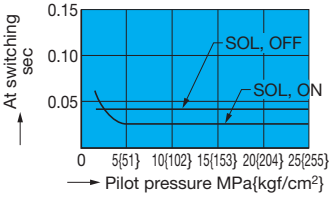
Pressure Loss Characteristics



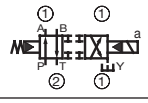
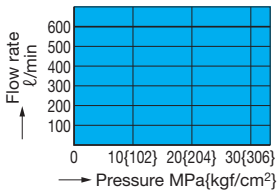
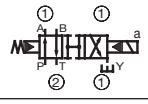
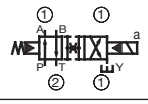
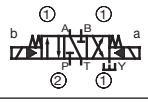
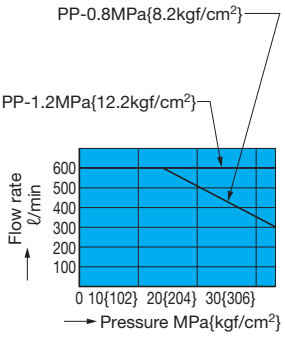
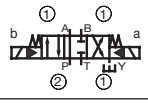
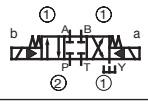
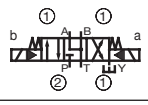
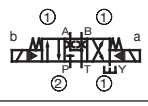
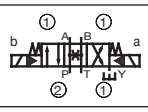
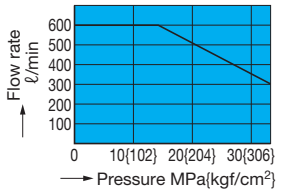
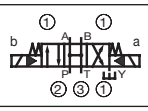
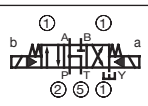
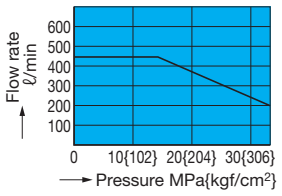
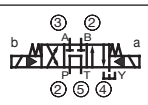
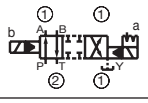
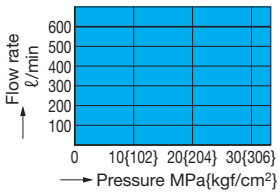
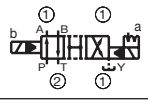
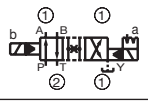
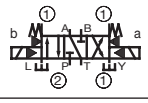
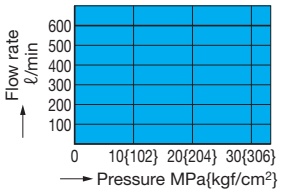
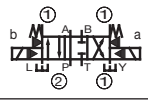
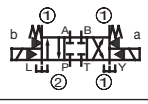
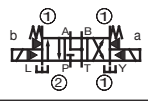
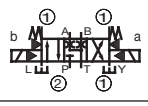
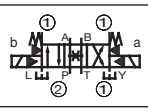
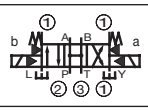
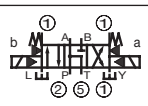
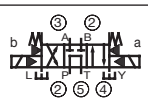
Note) Interpreting the Pressure Loss Value

Switching Response Time

Model No. : DSS-G04-C5
Voltage Symbol: C1 (AC Solenoid)

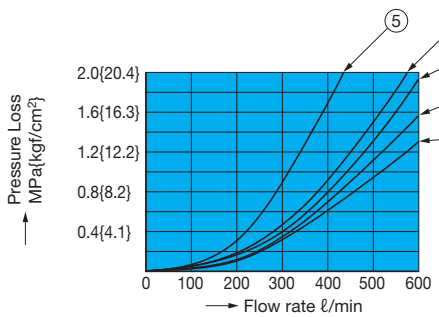


DSS(DSA)-G06

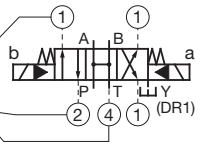
	Model No.	JIS Symbol	Pressure - Flow Rate Allowable Value
2-Position Spring Offset Type	DSS(DSA)-G06-A3X-		
	-A3Z-		
	-A3Y-		
3-Position Spring Center Type	DSS(DSA)-G06-C1-		
	-C2-		
	-C5-		
	-C6-		
	-C6S-		
	-C4S-		
	-C4-		
	-C8-		
	-C7X- -C7Y-		
2-Position No-spring Detent Type	DSS(DSA)-G06-E3X-		
	-E3Z-		
	-E3Y-		
3-Position Pressure Center Type	DSS(DSA)-G06-D1-		
	-D2-		
	-D5-		
	-D6-		
	-D6S-		
	-D4S-		
	-D4-		
	-D8-		
	-D7X- -D7Y-		

Note) The JIS number indicates the standard internal pilot and external drain.

Pressure Loss Characteristics



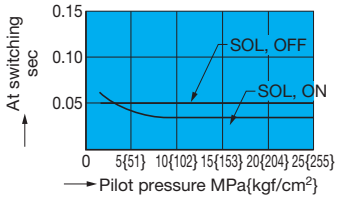
Note) Interpreting the Pressure Loss Value



P → A → Curve ①
B → T → Curve ②
At center
P → T → Curve ④

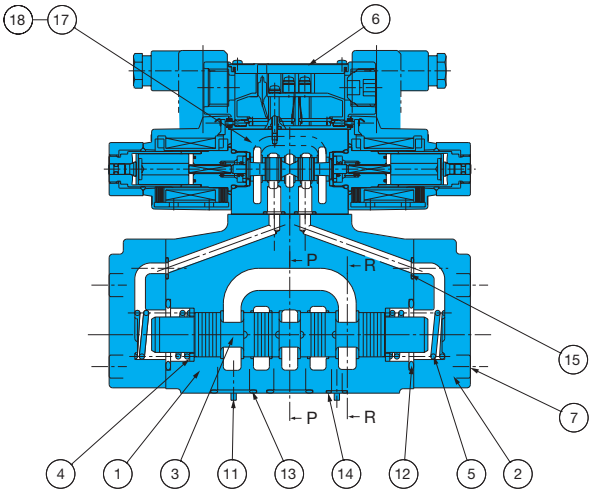
Switching Response Time

Model No. : DSS-G06-C5
Voltage Symbol: C1 (AC Solenoid)

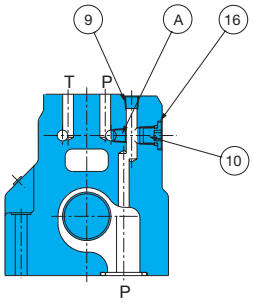


Cross-sectional Drawings

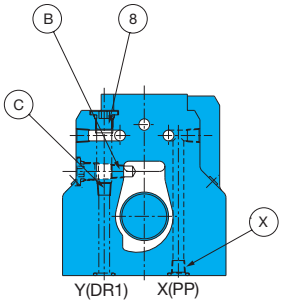
DSS(DSA)-G04-C**-R-C*-22



Pilot, Drain System Change

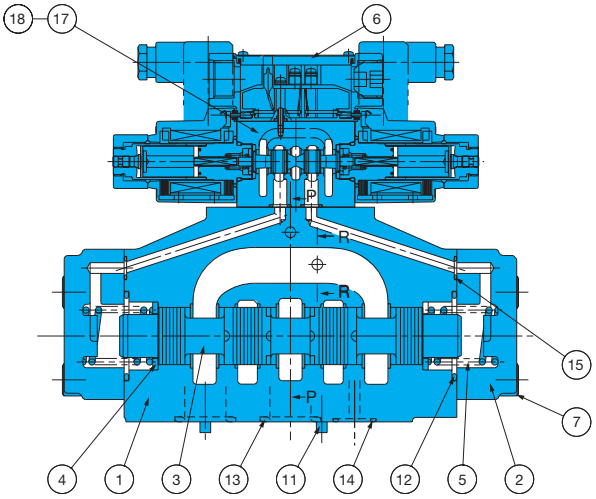


Cross-sectional P-P

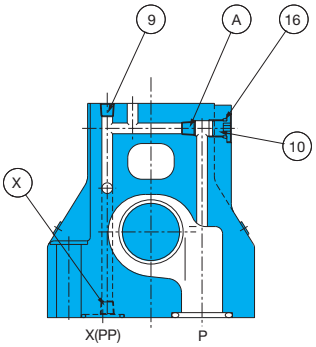


Cross-sectional R-R

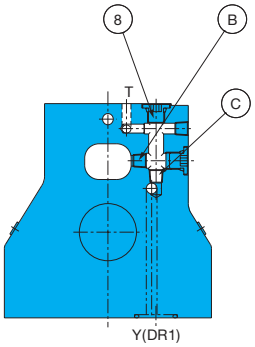
DSS(DSA)-G06-C**-R-C*-22



Pilot, Drain System Change



Cross-sectional P-P



Cross-sectional R-R

Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Ring
5	Spring
6	Nameplate
7	Screw

Part No.	Part Name
8	Plug
9	Plug
10	Plug
11	Pin
12	O-ring
13	O-ring

Part No.	Part Name
14	O-ring
15	O-ring
16	O-ring
17	Solenoid Valves
18	Screw

Changing the Pilot and Drain Connections

After Change		Hexagon Socket Head Plug
Pilot	Internal	Switch from Ⓐ to Ⓧ.
	External	Switch from Ⓧ to Ⓐ.
Drain	Internal	Switch from Ⓑ to Ⓒ.
	External	Switch from Ⓒ to Ⓑ.

List of Sealing Parts

Part No.	Part Name	Part Number		Q'ty
		04 size	06 Size	
12	O-ring	NBR-90 P34	NBR-90 G45	2
13	O-ring	NBR-90 P22	NBR-90 P28	4
14	O-ring	NBR-90 P10A	NBR-90 P20	2
15	O-ring	NBR-90 P9	NBR-90 P10	2
16	O-ring	NBR-90 P8	NBR-90 P8	3

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2.See SS/SA-G01-**-31for information about the seal part for the pilot solenoid valve.

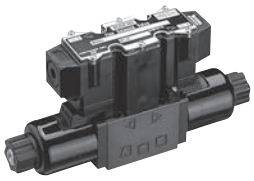
Seal Kit Number

04 size		06 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.

Fine Solenoid Valve SF Series

10 to 40ℓ/min
21MPa



Features

①The 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.

②Quiet starts and stops
A low-speed startup and stop feature makes startups and stops smooth and soft.

③Separate 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).

Specifications

Item \ Model No.			SF-G01 -C*10-D2-10	SF-G01 -C*20-D2-10	SF-G01 -C*40-D2-10
Valve Maximum Operating Pressure MPa{kgf/cm²}			21{214}		
Maximum Flow Rate ℓ/min(Note1)			10	20	40
High-speed Flow Rate ℓ/min(Note1)			5 to 10	10 to 20	20 to 40
Low-speed Flow Rate ℓ/min(Note1)			0.5 to 4	2 to 8	4 to 16
Maximum Allowable Pressure MPa{kgf/cm²}			7{71}		
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		JIS C 0920 IP63(Dust-tight, Rain-proof)		
	Ambient Temperature		5 to 50°C		
	Operating Fluid	Temperature Range	5 to 60°C		
		Kinematic Viscosity Range	15 to 300mm²/s		
		Filtration	25 μm or less		
Mounting bolt	Size x Length		M5×45 (four)		
	Tightening Torque		5 to 7N·m{51 to 71kgf·cm}		

Note) 1. The above high-speed and low-speed flow rates are obtained with a differential pressure (PA, PB) of 1.0MPa {10.2kgf/cm²}. The flow rates depend on differential pressure.
2. Hysteresis and repeatability values are those at maximum flow rate.
3. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
4. Mounting bolts are not included.

Explanation of model No.

SF – G01 – C * * * – * R – D2 – 10

- 10: Design number
- D2: Power supply D2: 24VDC
- R: With indicator light
- *: Auxiliary symbol None: Sink A: Source
- * * *: Maximum flow rate: 10, 20, 40ℓ/min
- C: Center position: 5, 6S
- C: Operation Method: C (Spring center)
- G01: Mounting method G: Gasket type Nominal diameter: 01 (01 size)
- SF: Fine solenoid valve

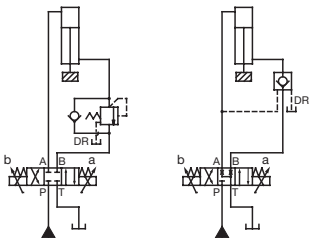
●Handling

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 3.5MPa {35.7kgf/cm²}.

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.



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.)

5 Environmental conditions
- 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 5°C to 50°C.

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 oil 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 30°C to 60°C.

(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.

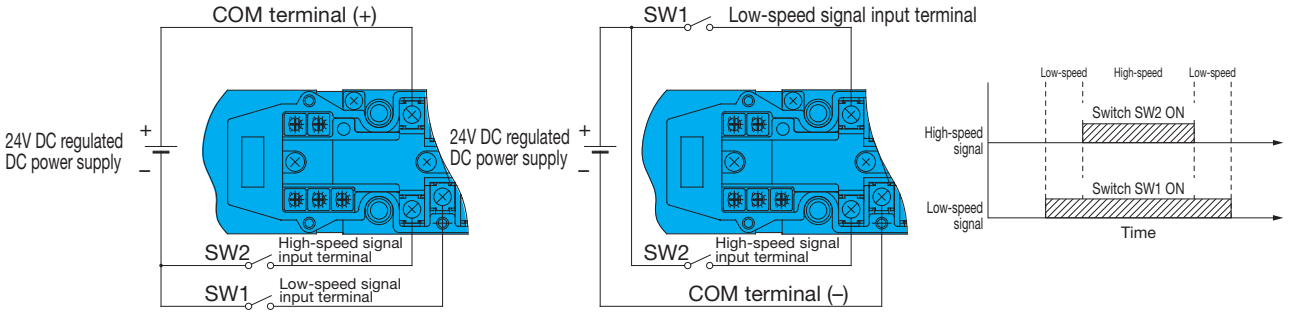
Spool Type and JIS Symbols

Spool Type	C5**	C6S**
JIS Symbol		

Electrical Wiring

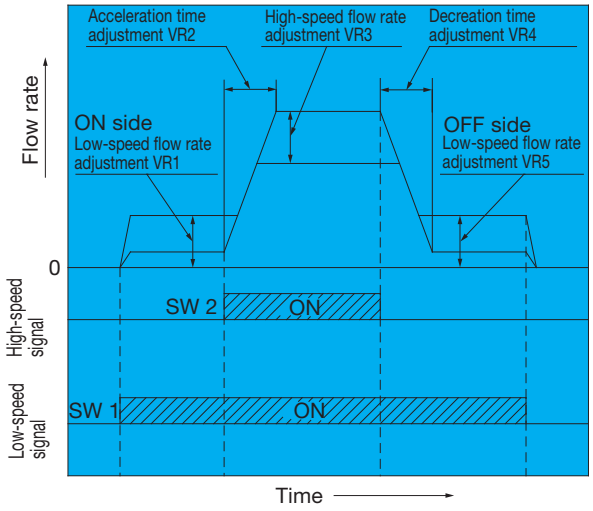
● Sink Type (Auxiliary Symbol: None)
Switches on load and power supply minus side

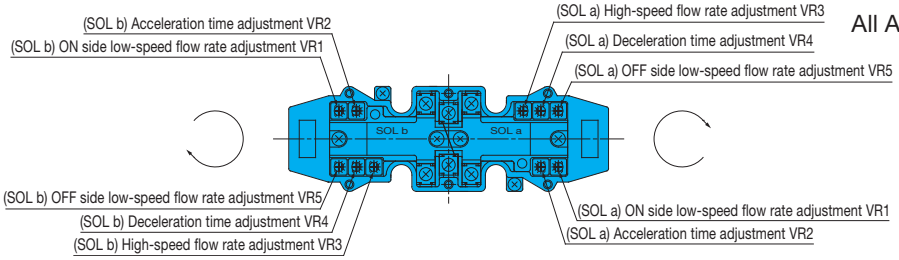
● Source Type (Auxiliary Symbol: A)
Switches on load and power supply plus side



Adjustment Elements

Control Pattern





Electrical Control Precautions

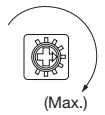
- Do not introduce a high-speed signal prior to a low-speed signal. Make sure the two signals are introduced simultaneously or that the low-speed signal is introduced first.

(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

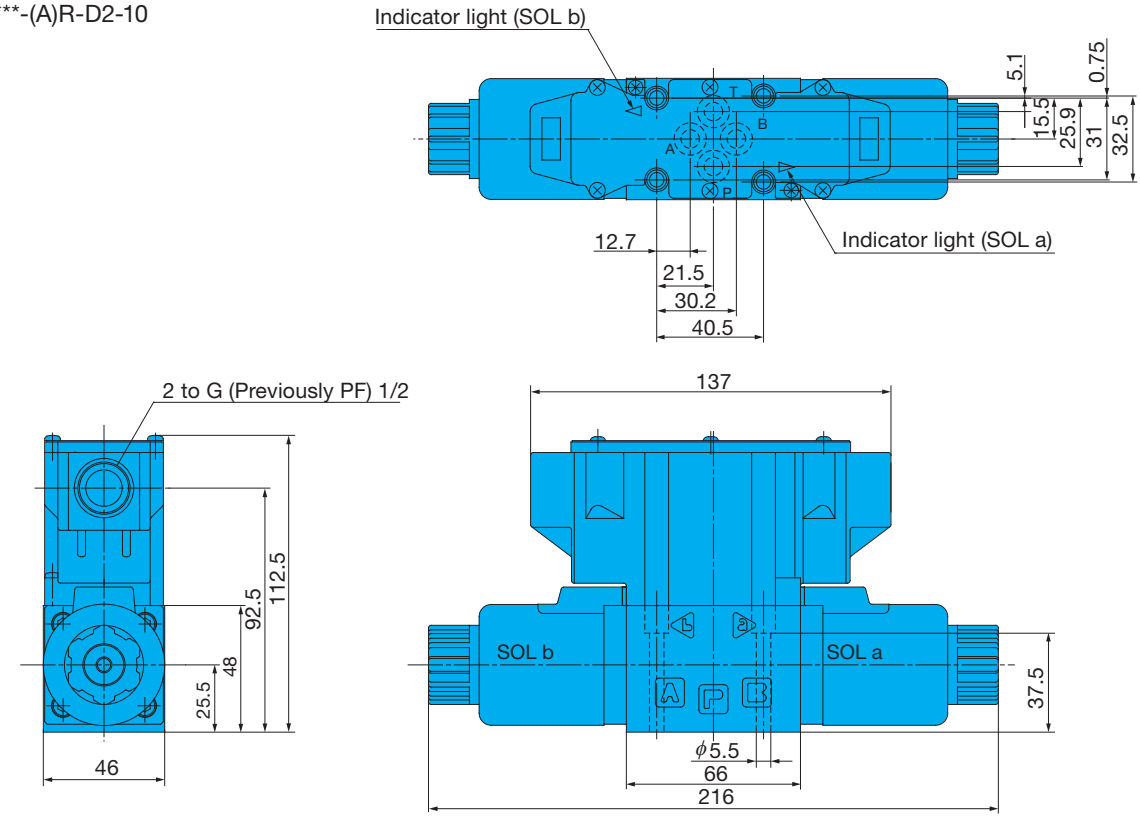


Maximum is clockwise (rightward) rotation.

- The volume rotation angle is 270°. Contact your agent about a three-rotation type adjustor for fine adjustment.

Installation Dimension Drawings

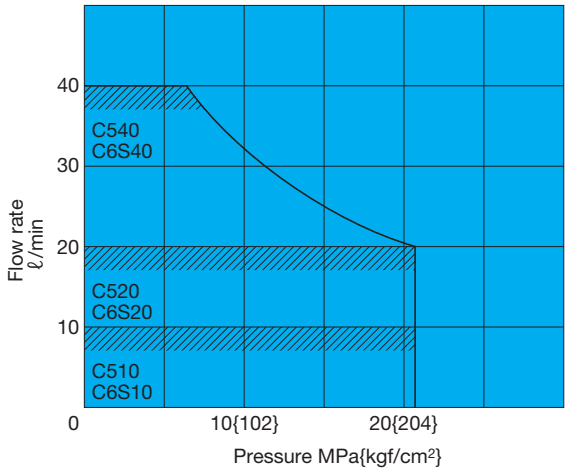
SF-G01-C***-(A)R-D2-10



Performance Curves

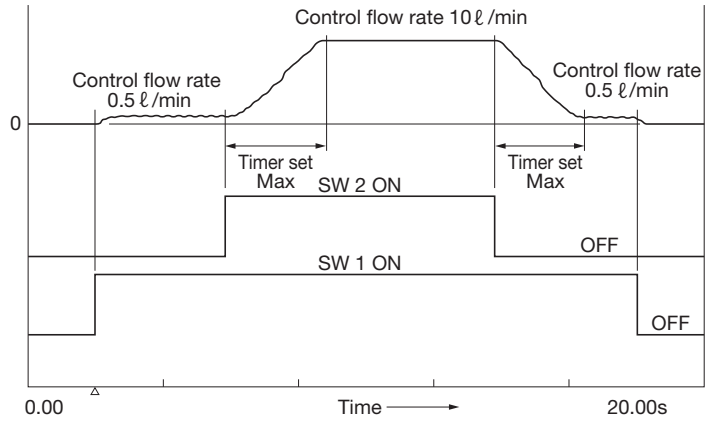
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

●Pressure – Flow Rate Characteristics

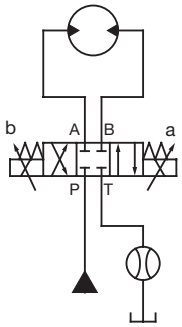


- Use the valve within the allowable flow rate range shown by the graph to the Left.
- There are no operational problems within the allowable flow rate range, even when one-pass is used.

●Control Waveform Example

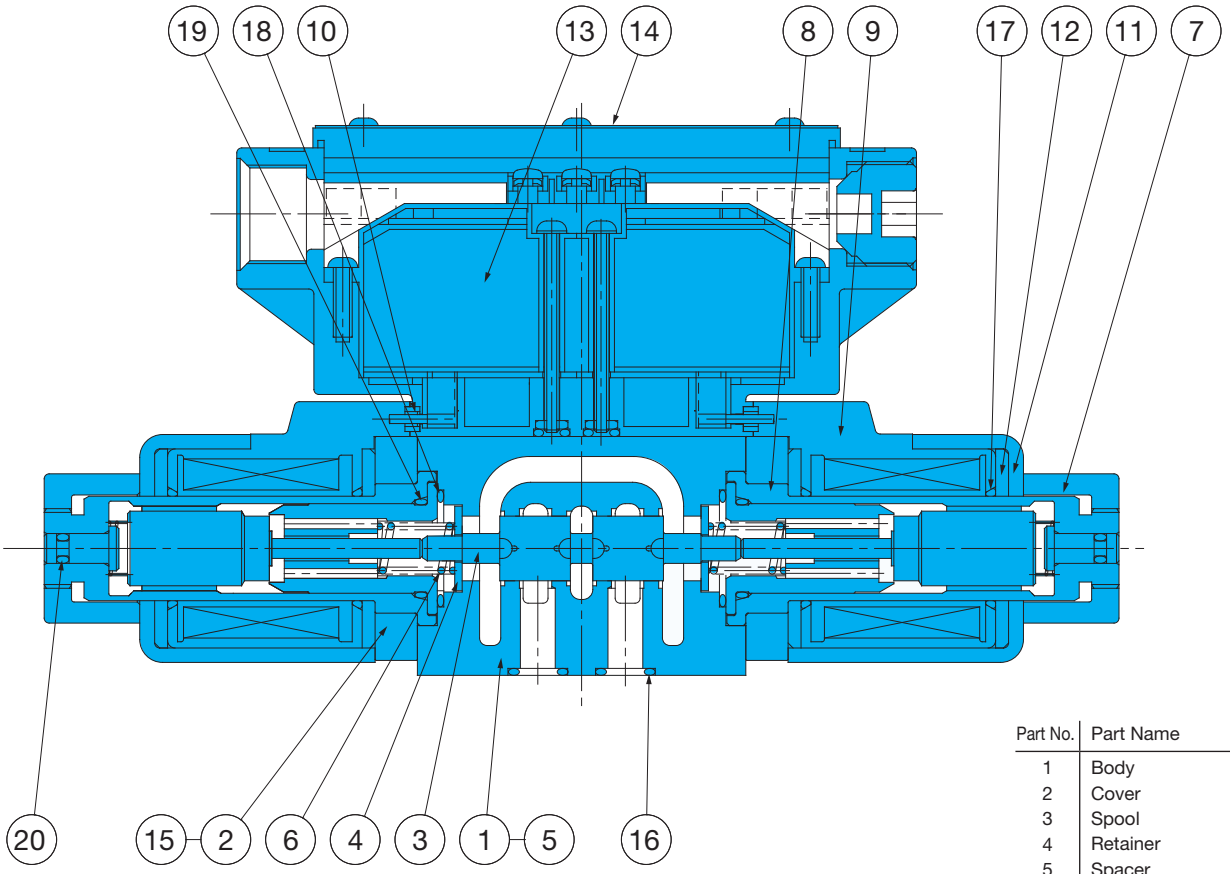


- Valve: SF-G01-C510-R-D2-10
- Supply Pressure:21MPa{214kgf/cm²}
- Hydraulic Circuit



Cross-sectional Drawing

SF-G01-C***-(A)R-D2-10



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	Q'ty
16	O-ring	AS568-012(NBR-90)	4
17	O-ring	AS568-019(NBR-70-1)	4
18	O-ring	AS568-019(NBR-90)	2
19	O-ring	AS568-017(NBR-90)	2
20	O-ring	P3 Note2	2

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. Special flurorubber is used (Part Number: RO-P3-VS).

SNH Series Non-leak Type Solenoid Valve

20 to 100ℓ/min
35MPa

Features

①Virtually no internal leakage

A poppet structure minimizes internal leaks from low pressures to as high as 35MPa {357kgf/cm²}.
Enhanced hydraulic circuit efficiency reduces energy needs.

②Virtually 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.

③High 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.

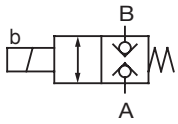
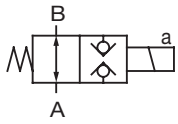
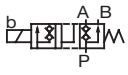
④ISO standard mounting service (01, 03 sizes)

This valve can be ganged together with a modular valve, enabling simple configuration of circuits and an overall compact device configuration.

⑤EC 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	SNH-G03	SNH-G04	SNH-G06
JIS Symbol	AR					
	HQ					
	A2K			———		
Maximum Working Pressure MPa{kgf/cm²} (P, A, B Ports)			35{357}			
Rated Flow Rate - Maximum Flow Rate ℓ/min			AR,HQ;10-20 A2K; 5-20	20-40	40-60	60-100
Maximum Changeover Frequency (per minute)			120			
Operating Environment	Dust Resistance/Water Resistance Rank		JIS C 0920 IP65(Dust-tight, Waterjet-proof) (Note 2)			IP64 (Dust-tight, Splash-proof)
	Ambient Temperature		-20 to 50°C			
	Operating Fluid	Temperature Range	-20 to 70°C			
		Kinematic Viscosity Range	15 to 300mm²/s			
		Filtration	25 μm or less			
Weight AR·HQ(A2K)kg			1.8(2.2)	5.2	5.5	6.9
Mounting bolt	Size x Length		M5×45 (Four)	M8×70 (Four)	M8×70 (Four)	M10×75 (Four)
	Tightening Torque N·m{kgf·cm}		6 to 8 {61 to 81}	30 to 35 {306 to 357}	30 to 35 {306 to 357}	55 to 60 {561 to 612}

Note) 1. Internal leaking does not exceed 1 droplet/minute (0.05cm³/min).
2. The power supply type for E* is IP64 (dust-tight, splash-proof).
3. For mounting bolts, use bolts of 12.9 strength classification 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 pushed with pressure in excess of about 5 MPa {51 kgf/cm²}. Also, note that with the HQ and A2K types, even if the manual switching push button (option N) is locked, leaks are not completely stopped.
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 (SNH-G01)

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 Assembly Specifications (SNH-G03, G04)

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 Assembly Specifications (SNH-G06)

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

Explanation of model No.

SNH – G 01 – AR – * – D2 – 11

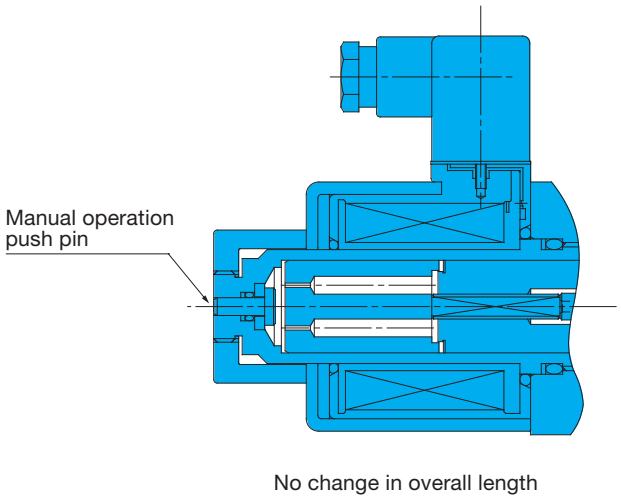
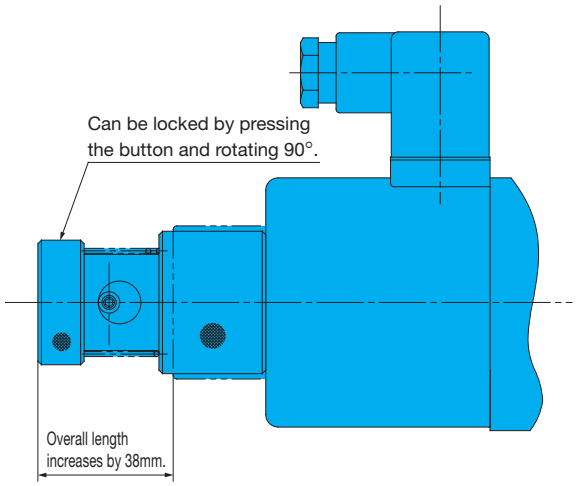
- **11**: Design number
  - 11: 01size
  - 10: 03, 04, 06size
- **D2**: Power supply
  - D: DC D1=DC12V D2=DC24V
  - E: AC (Built-in rectifier; 50/60Hz)
    - E1=AC100V E115=AC115V (only with 01 and 03 sizes, there are no 04 or 06 size settings)
    - E2=AC200V E230=AC230V (only with 01 and 03 sizes, there are no 04 or 06 size settings)
- *****: Auxiliary symbol (Can be combined in alphabetic sequence.)
  - M: With manual switching pin
  - N: With manual switching push-button (with lock mechanism)
  - R: With indicator light (excluding 06 size)
  - GR: Surgeless type, with indicator (except for 06 size or 01, 03, 04 size power supply type E*)
- **AR**: Operation symbol
  - AR: 2-port normal close
  - HQ: 2-port normal open
  - A2K: 3-port (01 size)
- **01**: Nominal pipe diameter: 01, 03, 04, 06 size
- **G**: Mounting method: Gasket type
- **SNH**: Pump type
  - SNH: Non-leak type solenoid valve

Options

(Auxiliary Symbol)

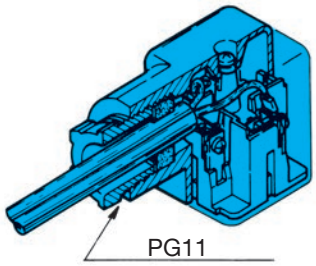
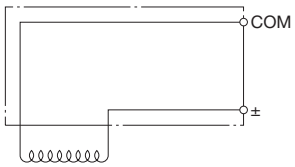
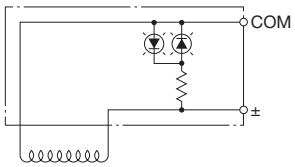
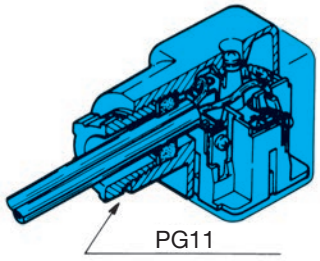
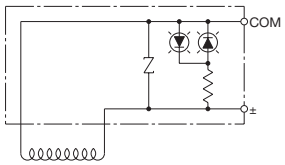
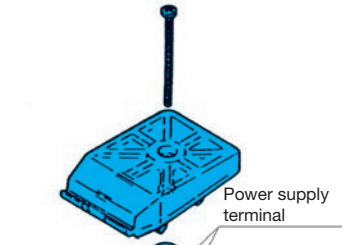
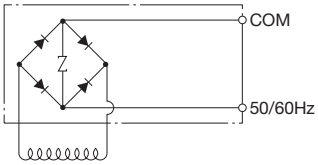
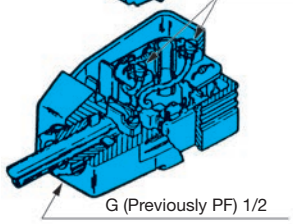
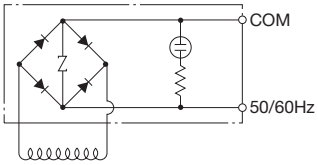
- Select options in accordance with size, as shown in the table to the right.
  (1) The 06 size has an EC connector and a built in surge killer as standard. However, an indicator light is not provided because of space considerations.
  (2) Option N increases the measurement by the size of the pushbutton only.

Size \ Auxiliary symbol	M	N	R	GR
01	○	○	○	○
03	○	○	○	○
04	○	○	○	○
06	○	○	—	—

With manual push pin (Auxiliary Symbol "M")	With manual push-button (with lock mechanism) (Auxiliary Symbol "N")
 No change in overall length	

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.

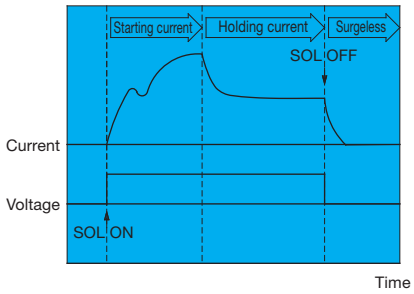
Valve	Connector Type	Wiring	Electrical Circuit Diagram
G01 G03 G04 Size	EA41-1A (Standard for power supply type D*)	 Connect the power supply to terminals No.1 and No. 2. The ⏚ terminal is ground. Use this terminal as required.	
	EA41-DR1/2-1C (D* option: R)	Connect the power supply to terminals No.1 and No. 2. The ⏚ terminal is ground. Use this terminal as required.	
	EA41-GRD1/2-1C (D* option: GR)		
	EA42-1B (For power supply type E*)	 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.	
	EA42-R1/2-1B (E* option: R)		

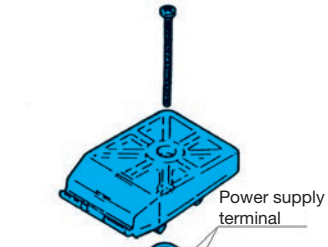
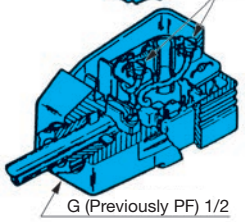
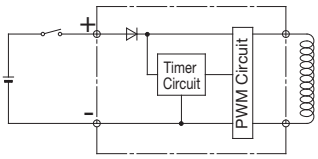
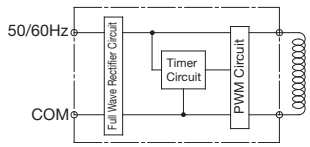
Note) 1. Connector types 1 and 2 indicate voltage. (1: 100V AC or 12V DC; 2: 200V AC or 24V DC)
2. Use a connector cord with a diameter that is in the range of ϕ8 to ϕ10.
3. The orientation of the connectors can be changed in 90° increments by modifying the terminal block.
4. The cover cannot be removed 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 0.3 to 0.5N·m (3 to 5.1kgf·cm).

●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.

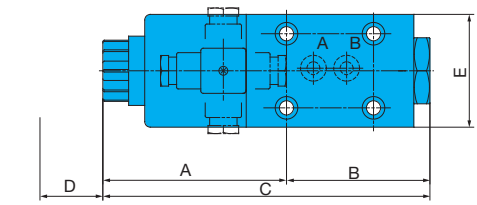


Valve	Connector Type	Wiring	Electrical Circuit Diagram
06 Size	Surgeless Type (24V DC) EC Connector EN41-06D2	  Connect the power supply to the terminals on the board. When ground connection is required, remove the board and use the ⏚ terminal. In this case, do not connect the power supply to the No. 1 and No. 2 terminals. Round type, Y type, and other solderless terminals cannot be used.	 Note that correct polarity must be maintained with the power supply.
	Built-in Rectifier EC Connector EN41-06E1/E2		

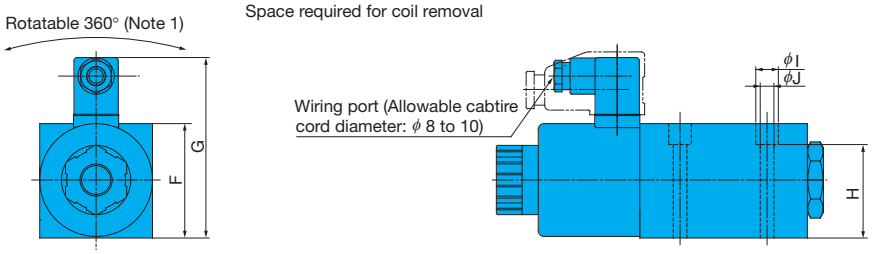
Note) The orientation of the EN41-06** connector cannot be changed at 90° intervals by modifying the terminal block.

Installation Dimension Drawings

SNH-G**-AR-**-$^{11}_{10}$

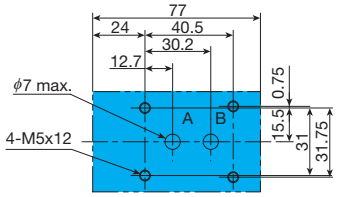


Space required for coil removal

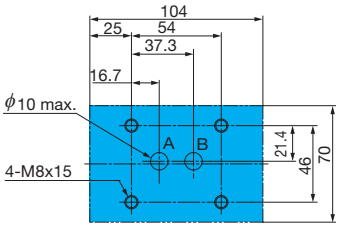


Valve Mounding Surface Dimensions

01-AR/HQ(Conforms to ISO 4401-03-02-0-05)

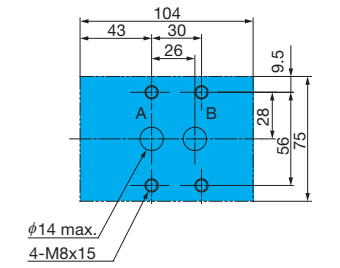


03-AR/HQ(Conforms to ISO 4401-05-04-0-05)

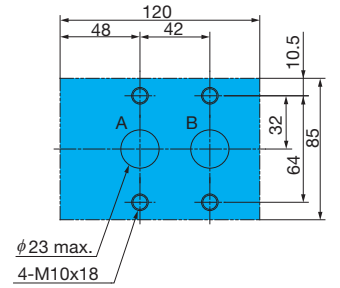


Note) An M6 mounting screw type is not yet available.

04-AR/HQ



06-AR/HQ

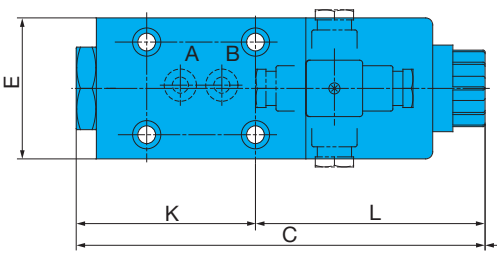


Dimension Table

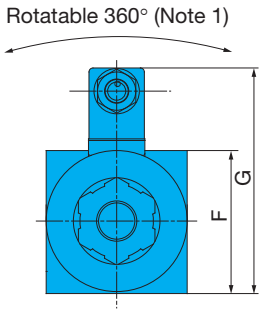
Size	A	B	C	D	E	F	G(Note)$_2$	H	I	J
01	100	60.5	160.5	60.5	46	48	91 (94.5)	37.5	9	5.5
03	114	89	203	63	70	72	112 (115.5)	58	14	8.5
04	132	71	203	63	75	71	112 (115.5)	58	14	8.5
06	137	82	219	63	85	71	115.5	60	18	11

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-**-$^{11}_{10}$



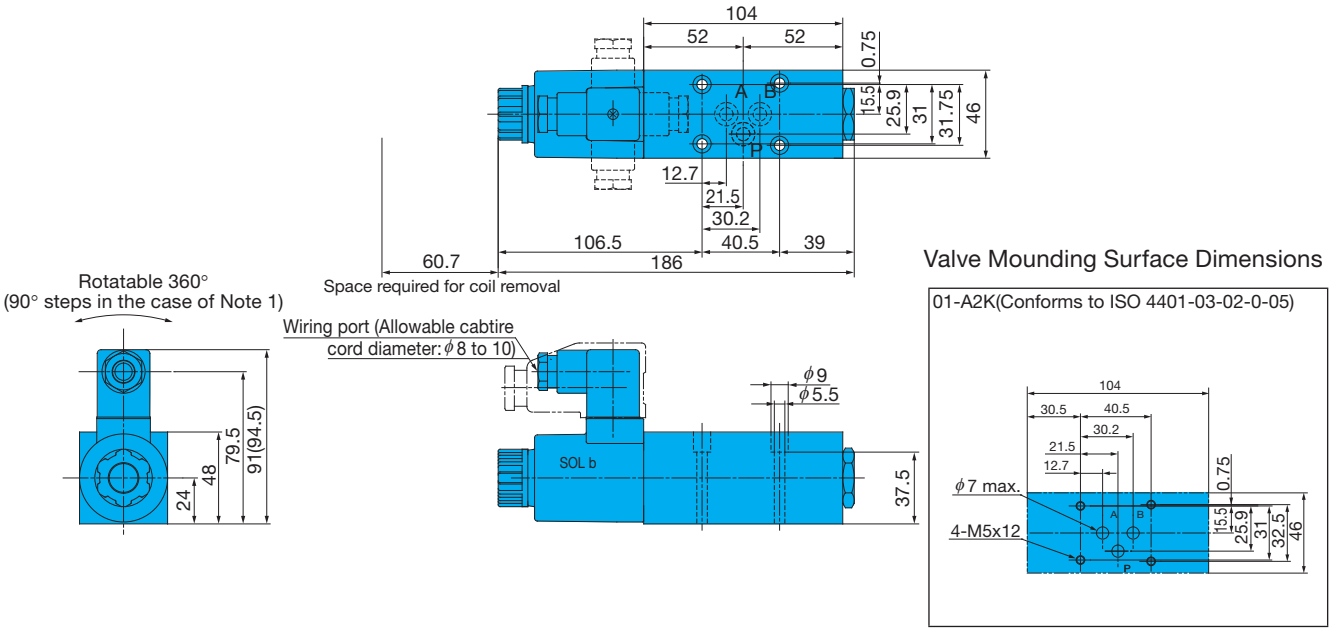
Space required for coil removal



Dimension Table

Size	C	D	E	F	G(Note)$_2$	K	L
01	160.5	60.5	46	48	91 (94.5)	70.5	90
03	203	63	70	72	112 (115.5)	89	114
04	203	63	75	71	112 (115.5)	83	120
06	219	63	85	71	115.5	100	119

SNH-G01-A2K-*-D*/E*-11



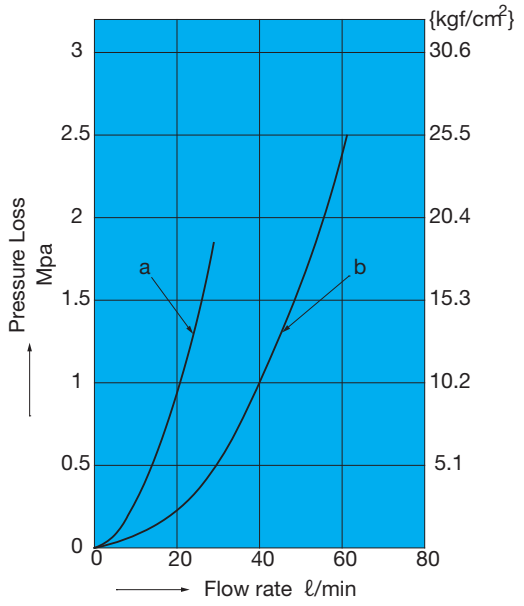
Note) 1. Power supply type E* allows rotation at 90° intervals.
2. Values in parentheses are for power supply type E*.

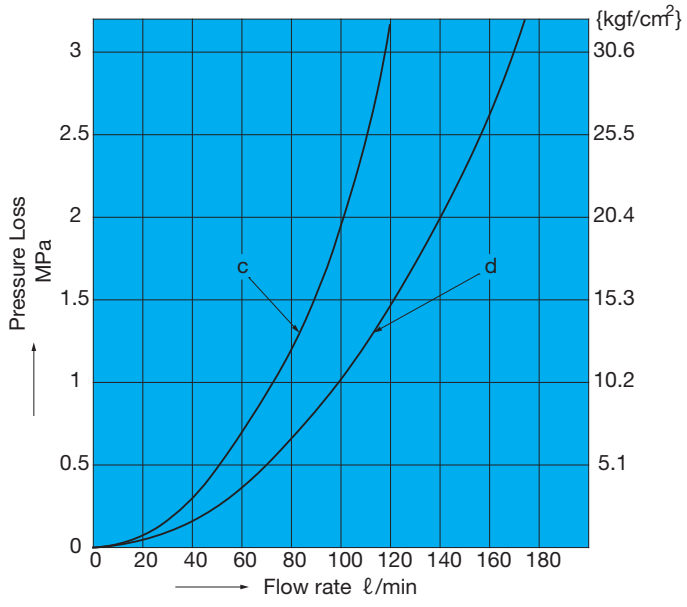
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

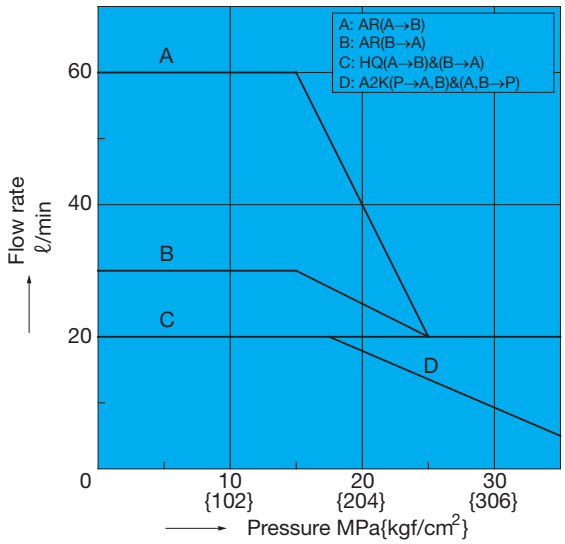
Flow Path \ Size	01	03	04	06
A↔B	a	b	c	d
P↔A, P↔B	a	—	—	—



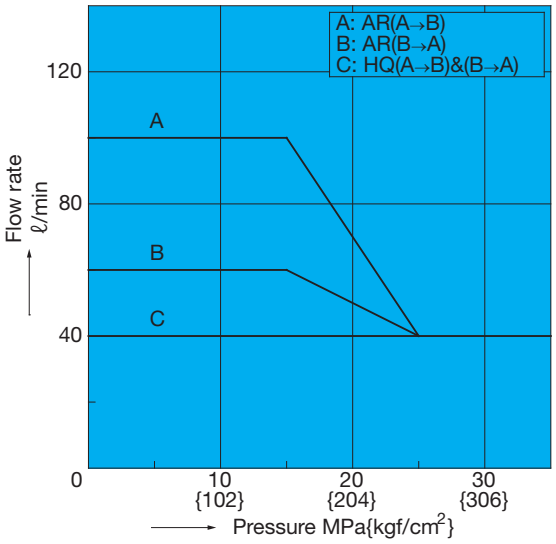


Pressure - Flow Volume Allowable Value

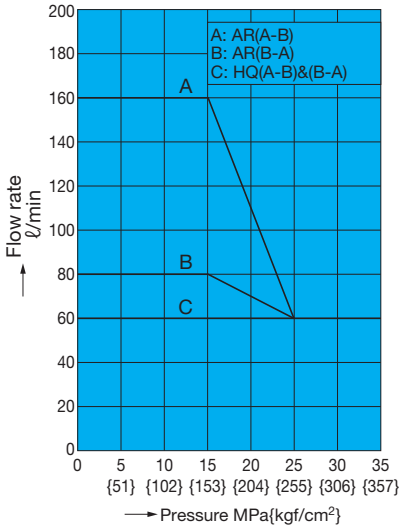
G01 Size



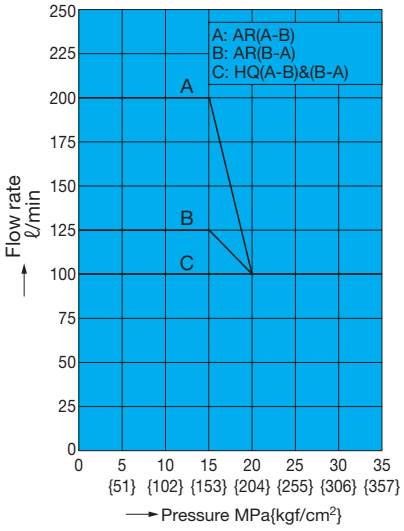
G03 Size



SNH-G04-AR/HQ



SNH-G06-AR/HQ

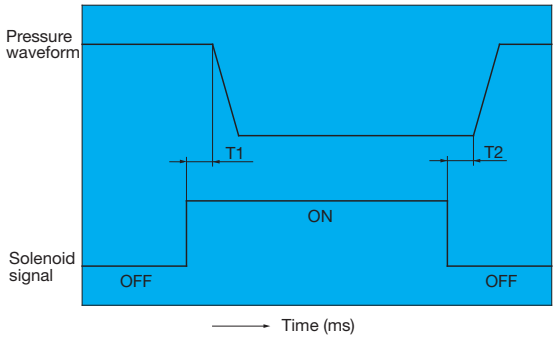


Note) Available flow rate values depend on pressure and fluid flow direction.
The following shows how to read the data.

A : AR (A→B)

- Oil flow from A port to B port
- Valve operation symbol
- Indicates curve

Switching Response Time



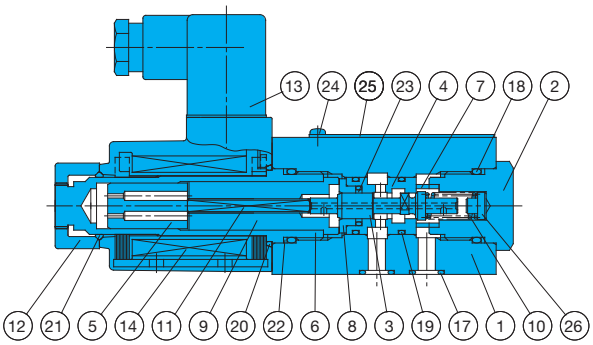
Size	Power supply	Response Time (SEC)	
		T1 (ON)	T2 (OFF)
01	D*	0.03 to 0.05	0.04 to 0.06
	E*	0.04 to 0.06	0.08 to 0.10
03	D*	0.06 to 0.08	0.04 to 0.06
	E*	0.07 to 0.09	0.08 to 0.10
04	D*	0.09 to 0.11	0.06 to 0.08
	E*	0.12 to 0.14	0.14 to 0.16
06	D*	0.04 to 0.06	0.06 to 0.08
	E*	0.09 to 0.11	0.14 to 0.16

Note) The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)

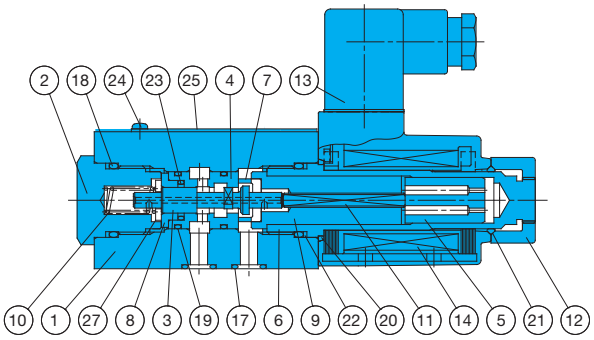
Pressure : 35MPa{357kgf/cm²}
Flow Rate : 01 : 20ℓ/min
03 : 40ℓ/min
04 : 60ℓ/min
06 : 100ℓ/min
Operating Fluid : ISO VG68

Cross-sectional Drawings

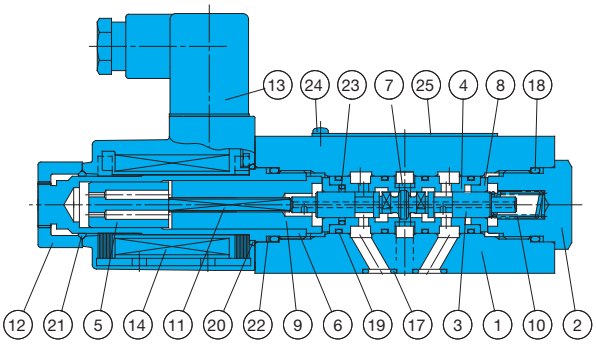
SNH-G01-AR-**-11



SNH-G01-HQ-**-11



SNH-G01-A2K-**-11



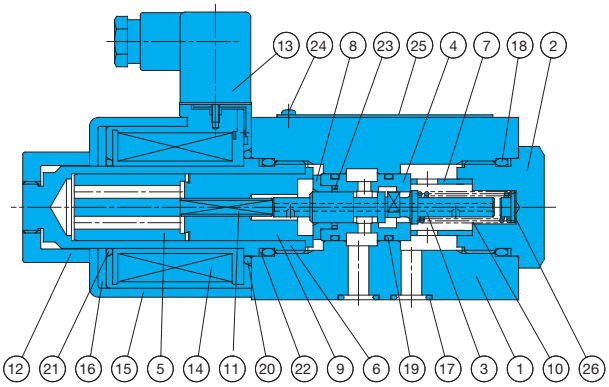
Part No.	Part Name
1	Body
2	Plug
3	Poppet
4	Sleeve
5	Plunger
6	Solenoid guide
7	Ring
8	Collar
9	Solenoid stopper
10	Spring
11	Rod
12	Nut
13	Connector
14	Solenoid coil

Part No.	Part Name
15	Coil case
16	Coil yoke
17	O-ring
18	O-ring
19	O-ring
20	O-ring
21	O-ring
22	Backup ring
23	Cap seal
24	Cross recessed head small screw
25	Nameplate
26	Stopper
27	Retainer

03

SNH-G04 -AR-**-10

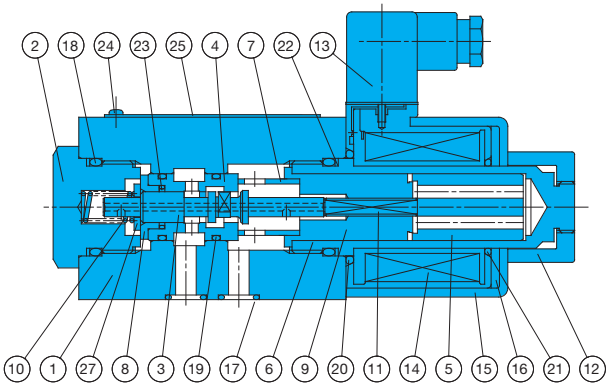
06



03

SNH-G04 -HQ-**-10

06



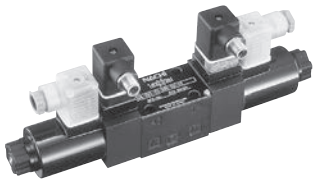
List of Sealing Parts

Part No.	Part Name	01	03	04	06	Q'ty	
						AR,HQ	A2K
17	O-ring	AS568-012(NBR-90)	NBR-90 P12	NBR-90 P16	NBR-90 P28	2	3
18	O-ring	NBR-90 P22	NBR-90 P32	NBR-90 P32	NBR-90 P32	2	2
19	O-ring	AS568-017(NBR-90)	NBR-90 P22	AS568-120(NBR-90)	NBR-90 P26	2	4
20	O-ring	S-25(NBR-70-1)	AS568-029(NBR-70-1)	AS568-029(NBR-70-1)	AS568-029(NBR-70-1)	1	1
21	O-ring	NBR-70-1 P20	AS568-026(NBR-70-1)	AS568-026(NBR-70-1)	AS568-026(NBR-70-1)	1	1
22	Backup ring	T2-P22	T2-P32	T2-P32	T2-P32	2	2
23	Cap seal	*	*	*	*	1	1

Note) The materials and hardness of the O-ring conforms with JIS B2401. 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

100ℓ/min
35MPa



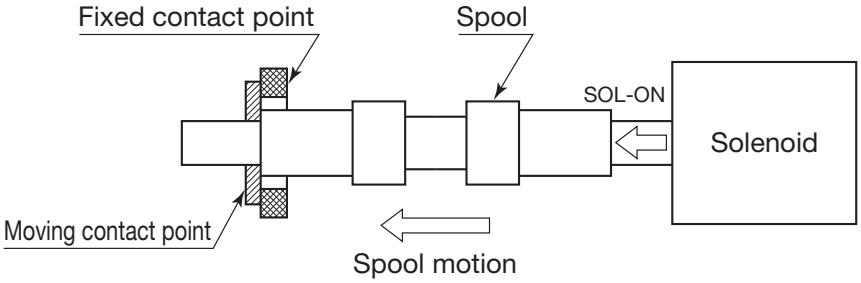
Features

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 international 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.

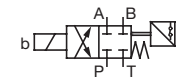
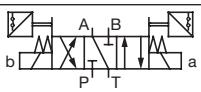
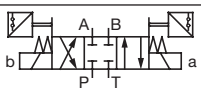
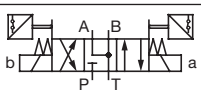
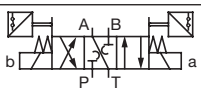
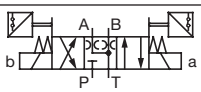
①The switch contact has little dead zone and almost no temperature drift (variable motion caused by changes in temperature) or hysteresis because the reaction of the spool action is mechanical.
②All valve functions, except for the monitoring function, are equivalent to the standard solenoid operated directional control valve (SA-G01).
③DIN 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.



Specifications

Model No.		Standard Type		Shockless Type	
JIS Symbol	Operation Symbol	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min
	-A2X-	35{357}	30	25{255}	30
	-A3X-		80		50
	-A5-		100		
	-C1-		80		
	-C5-		100		
	-C6-		80		
	-C1S-		100		
	-C6S-				

Note) The maximum flow rate of each valve depends on the pressure. For details, see page E-72.

●Valve Specifications

		AC Solenoid	DC Solenoid Built-in Rectifier
Maximum Working Pressure P, A, B ports	Standard Type	35MPa	
	Shockless Type	25MPa	
Maximum Allowable Backpressure T port		21MPa	
Maximum Flow Rate		See pressure-flow characteristics on page E-72 for more information.	
Switching Frequency		120/minute	
Weight	Double Solenoid	2.8kg	3.0kg
	Single Solenoid	2.1kg	2.2kg
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C 0920 IP65	
	Operating Fluid	Oil-based operating fluid (Note 1)	
	Ambient Temperature Range	-20 to 50°C	
	Operating Oil Temperature Range	-20 to 70°C	
	Operating Kinematic Viscosity Range	15 to 300mm^2/s	
	Filtration	25 μm or less	
Mounting bolt (Note2)	Size × Length	Socket hex head bolt (12.9 strength classification or equivalent) M5 × 45, 4 each	
	Tightening Torque	5 to 7N·m	

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 nonconducting 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	DC24V
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 E-71 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 Malfunction at internal circuit of connector or valve	Normal Spool returns to middle position
	OFF	Normal Spool is switching	Abnormal 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

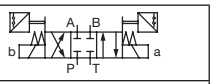
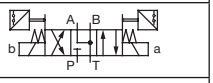
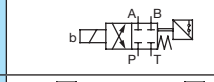
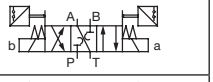
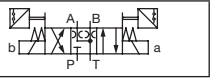
1 In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T port. Never use a stopper plug in the T port.
2 Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
3 Note that the maximum 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. Allowable contamination is class NAS12 or less.
5 Use a JIS K 2213 petroleum-based operating fluid, or an equivalent, that has a water content that is less than 0.1% by volume.
6 Do not use fire-resistant 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 In the case of operation symbol A2X, run drain piping from the valve T port.
10 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 Note that manual pin operating pressure changes in accordance with tank line back pressure.
12 The solenoid has a pin for switching the spool manually. However, use the cap (option symbol: D) to prevent manual operation for jobs were manual operation would cause a safety problem.
13 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*)
14 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.
15 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.
16 The connector for the solenoid is the same as for the SA series solenoid valve.See page E-19 for electrical circuit drawings and wiring procedures.
17 Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate (ℓ/min)	Weight (kg)	Dimension Drawings Page
MSA-01X-10	1/4	25{255}	20	1.2	E-17
MSA-01Y-10	3/8		40		
MSA-01Y-T-10	3/8		40	1.9	D-90

Explanation of model No.

SAW – G 01 – A3X – FGR V – D2 – 11

- **SAW**: Directional control valve with monitoring switch (DIN connector type)
- **G**: Mounting method
  G: Cascade mounting
- **01**: Nominal diameter
  01 size
- **A3X**: Operation Symbol

A2X		C5	
A3X		C6	
A5		C1S	
C1		C6S	

- **FGR**: Option symbols
  None: No options (available with power supply E*)
  D : With cap to prevent operation of manual push pin
  F : Shockless type (available with power supply D* and E*)
  GR : Surgeless type, with indicator light (must be installed with power supply C* and D*)
  R : With indicator light (available with power supply E*)

Possible option symbol combinations

Power Supply	Option Symbols
C*	GR, DGR
D*	GR, DGR, FGR, DFGR
E*	None, D, F, DF, R, DR, FR, DFR

Note)
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.
(Power supply E* is the standard surgeless type, option symbol G is not needed.)

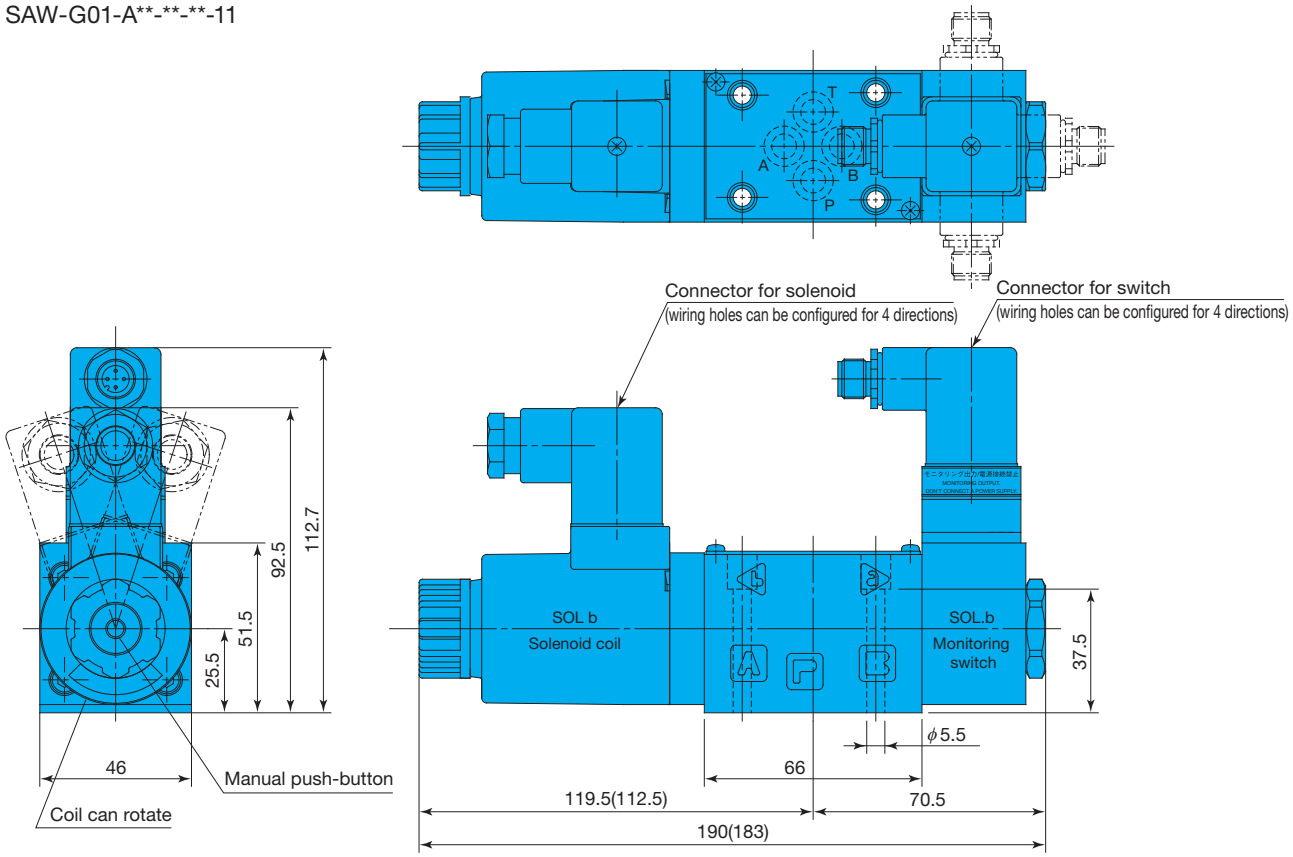
- **V**: Wiring for connector for switch
  None: With 350mm wire
  V : With M12-4 pin connector
  (Example of connector with cable provided by customer: Omron XS2F-D421-D80-A)
- **D2**: Solenoid power supply
  C1 : AC100V 50/60Hz, AC110V 60Hz
  C115: AC110V 50/60Hz, AC115V 60Hz
  C2 : AC200V 50/60Hz, AC220V 60Hz
  C230: AC220V 50/60Hz, AC230V 60Hz
  D1: DC12V D2 : DC24V
  E1: AC100V 50/60Hz E115: AC110/115V 50/60Hz
  E2: AC200V 50/60Hz E230: AC220/230V 50/60Hz
- **11**: Design number

Note) See page E-4 for an explanation of the shockless type (option symbol F) and surgeless type (option symbol G).

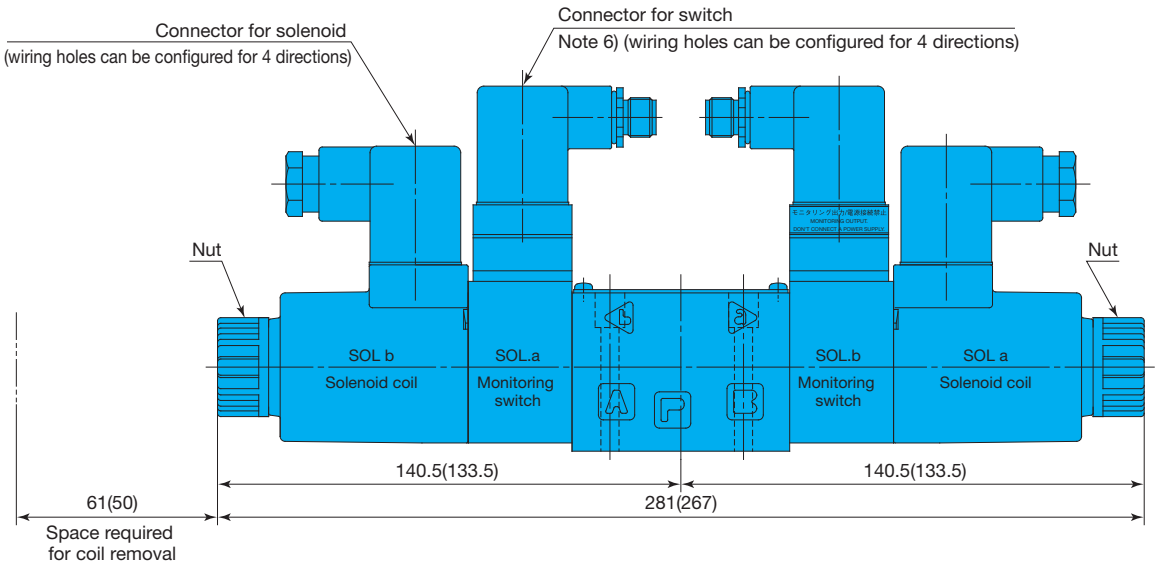
Installation Dimension Drawings

Dimensions of installation surface of gasket are ISO 4401-03-02-0-05.

SAW-G01-A**-**-**-11



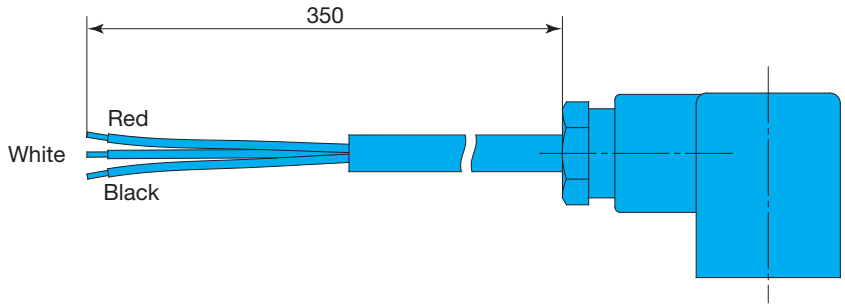
SAW-G01-C**-**-**-11



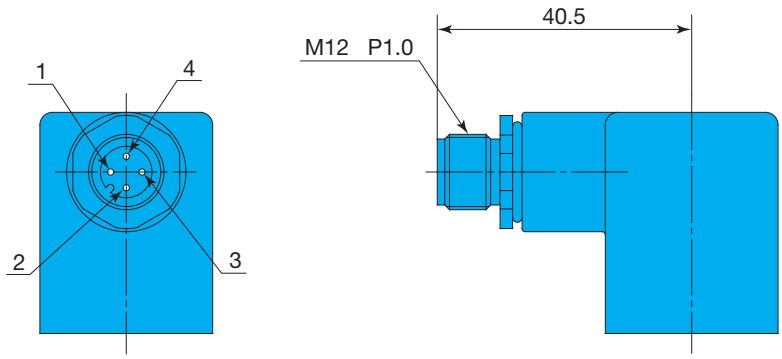
Note) 1. Dimensions in parentheses apply in the case of an AC solenoid.
2. For option symbol D (with cap to prevent manual operation), the nut for fixing coil is 5mm long.
Include this length when calculating the total length of the valve.
3. The connector for the switch in the drawing above is the M12-4 pin connector. In addition there are wire connections also.
See page E-71 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)

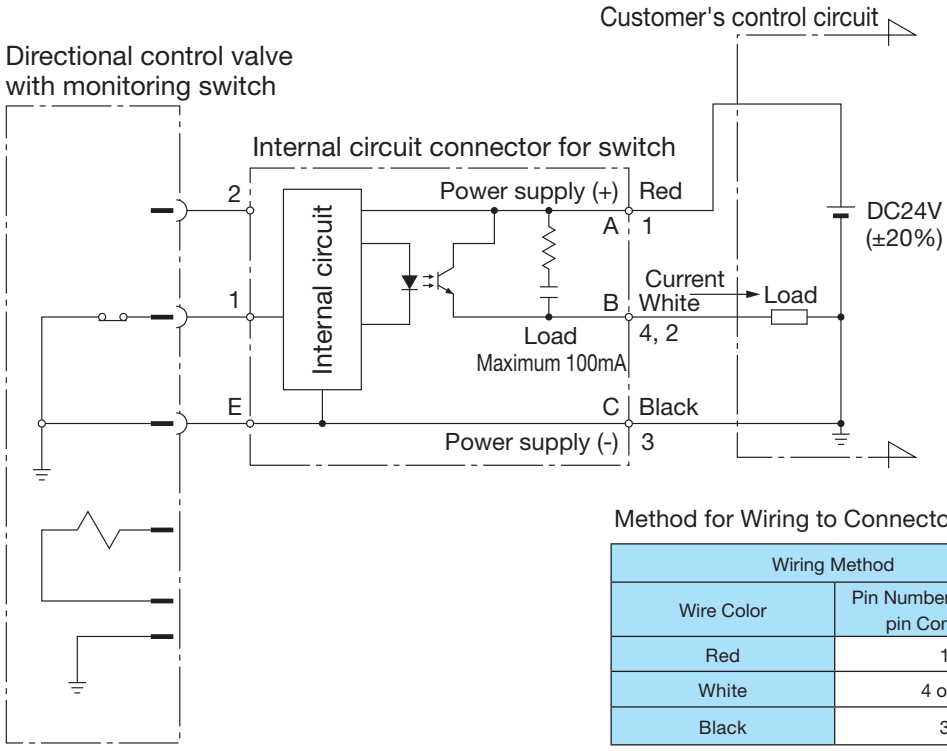


(2) With M12-4 pin connector (option symbol: V)



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



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 (-)

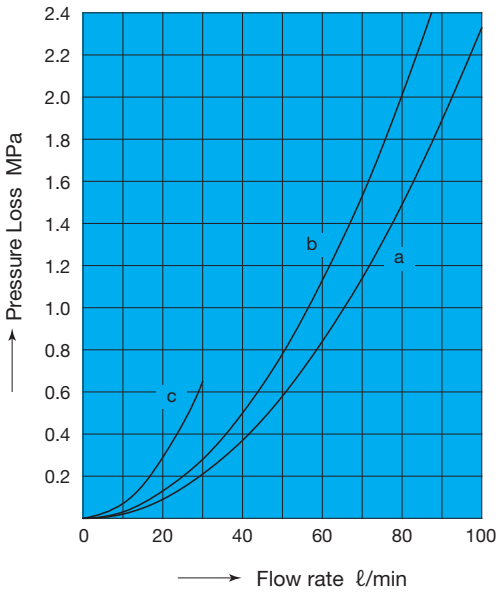
Note) 3. Always install a diode to prevent surges in the current when connecting an inductive load, such as a relay, to the monitoring switch.
4. Do not modify or replace the lead wires.
5. Connect the load for the M12-4 pin connector to either pin number 4 or 2.
6. When connecting monitoring switches in sequence, use the negative (-) common mode (type that current runs to sequence side).

Performance Curves

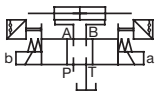
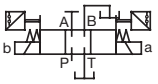
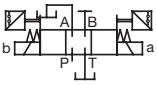
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

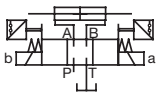
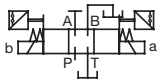
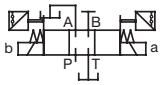
Pressure Loss Characteristics

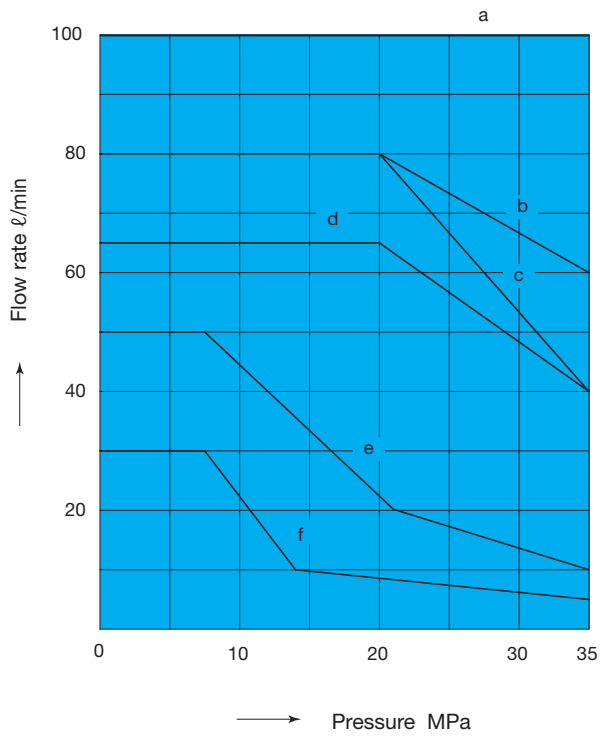
Operation Symbol	P → A	P → B	A → T	B → T
A2X	c	c	—	—
A3X	b	b	b	b
A5	—	b	b	—
C1	b	b	a	b
C5	b	b	b	b
C6	b	b	a	a
C1S	b	b	b	b
C6S	b	b	b	b

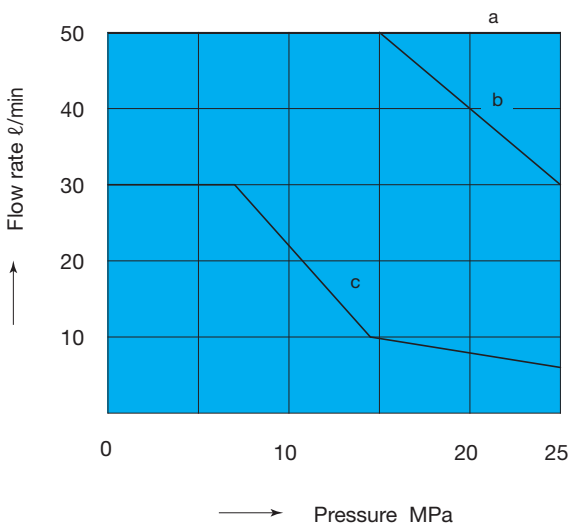


Pressure — Flow Volume Allowable Value

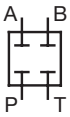
Operation Symbol	Standard Form, with AC, DC solenoid		
			
A2X	—	f	f
A3X	b	f	f
A5	a	—	e
C1	AC SOL. d DC SOL. c	e	e
C5	a	e	e
C6	AC SOL. d DC SOL. c	e	e
C1S	a	e	e
C6S	a	e	e

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



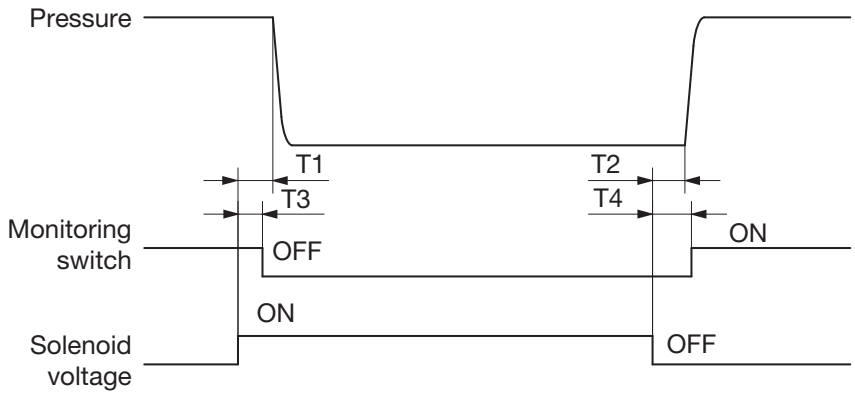


Range of Motion of Switch

		Stroke of Spool		
Positions		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

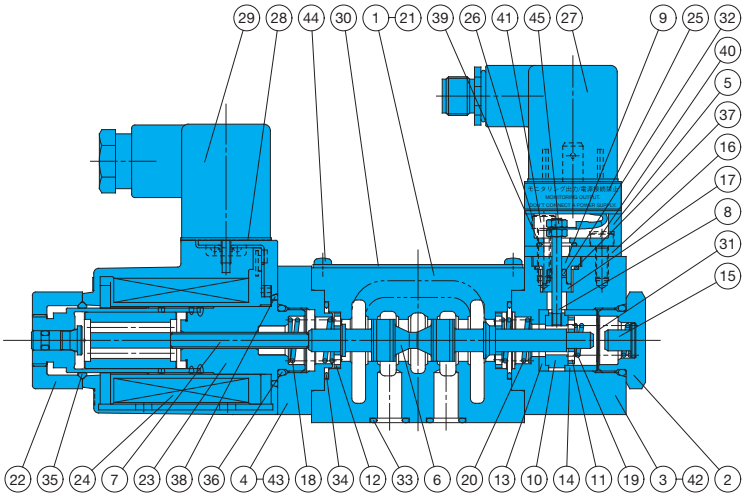


Type of Machine		Model	Response Time (s)			
			Pressure		Switch	
			T1	T2	T3	T4
AC Solenoid		SAW-G01-C5-GR-C1-11	0.02 to 0.03	0.02 to 0.03	0.01 to T1	T2 to 0.05
DC Solenoid	Standard Type	SAW-G01-C5-GR-D2-11	0.03 to 0.04	0.02 to 0.04	0.01 to T1	T2 to 0.06
	Built-in Rectifier Type	SAW-G01-E1-11	0.03 to 0.04	0.07 to 0.10	0.01 to T1	T2 to 0.15
	Shockless Type	SAW-G01-C5-FGR-D2-11	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-E1-11	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 14MPa
Flow Rate 30ℓ/min
Operating fluid ISO VG32 40°C

Cross-sectional Drawings

SAW-G01-A**-**-**-11



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

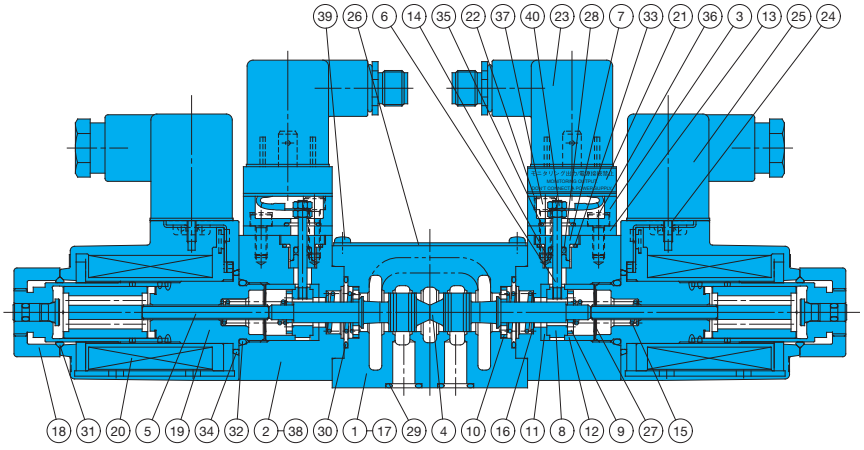
For details about parts marked with an asterisk "*", refer to the list of seals in the table on the right.

Seal Part List (Kit Model Number EQS-01A)

Part No.	Part Name	Part Number	Q'ty
32	O-ring	NBR-90 P3	1
33	O-ring	AS568-012(NBR-90)	4
34	O-ring	AS568-019(NBR-90)	2
35	O-ring	NBR-70-1 P20	1
36	O-ring	NBR-90 P18	2
37	O-ring	S-11.2(NBR-90)	1
38	O-ring	S25(NBR-70-1)	1
39	O-ring	S-9(NBR-70-1)	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.

SAW-G01-C**-**-**-11



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 *		

For details about parts marked with an asterisk "*", refer to the list of seals in the table on the right.

Seal Part List (Kit Model Number EQS-01C)

Part No.	Part Name	Part Number	Q'ty
28	O-ring	NBR-90 P3	2
29	O-ring	AS568-012(NBR-90)	4
30	O-ring	AS568-019(NBR-90)	2
31	O-ring	NBR-70-1 P20	2
32	O-ring	NBR-90 P18	2
33	O-ring	S-11.2(NBR-90)	2
34	O-ring	S-25(NBR-70-1)	2
35	O-ring	S-9(NBR-70-1)	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

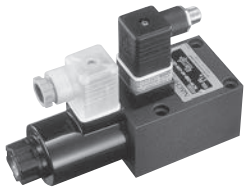
NACHI

POPPET TYPE SOLENOID VALVE WITH MONITORING SWITCH

SCW Series

Poppet type directional control valve with monitoring switch

50ℓ/min
21MPa



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.

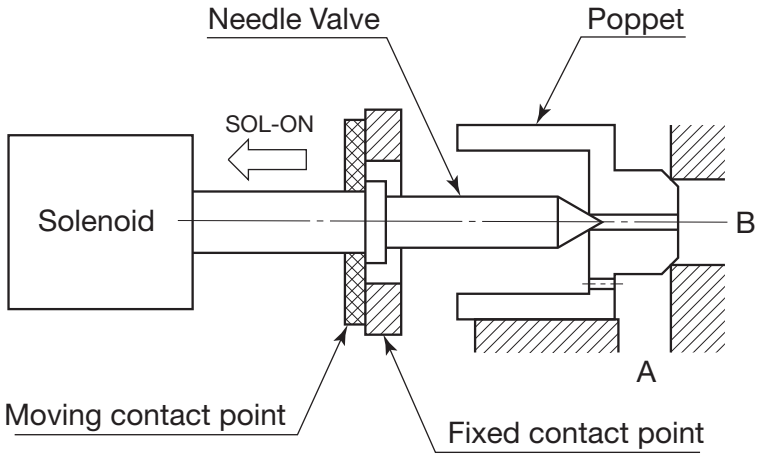
①The switch contact has little dead zone and almost no temperature drift (variable motion caused by changes in temperature) or hysteresis because the reaction of the poppet action is mechanical.

②All valve functions, except for the monitoring function, are equivalent to the standard poppet type directional control valve.

③DIN connectors are used for the switches and solenoid coil wiring so connections are easy when installing or replacing valves.

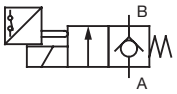
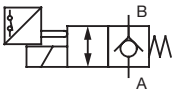
Operational Principle

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)		21MPa	
Maximum Flow Rate	A → B	50ℓ/min	50ℓ/min
	B → A	———	
Cracking Pressure of Check Valve		0.3MPa	
Switching Frequency		120/minute	
Weight		2.3kg	
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C 0920 IP65	
	Operating Fluid	Oil-based operating fluid (Note 1)	
	Ambient Temperature Range	–20 to 50°C	
	Operating Oil Temperature Range	–20 to 70°C	
	Operating Kinematic Viscosity Range	15 to 300mm²/s	
	Filtration	25μm or less	
Mounting bolt (Note2)	Size × Length	Socket hex head bolt (12.9 strength classification or equivalent) M6 × 55, 4 each	
	Tightening Torque	10 to 13N·m	

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 nonconducting 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	DC24V
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 E-78 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

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">Current to Solenoid</td></tr>
<tr><td>ON</td><td colspan="2">OFF</td></tr>
<tr><td rowspan="3">Monitoring Switch Output</td><td>ON</td><td>Abnormal
Malfunction at internal circuit of connector or valve</td><td colspan="2">Normal
Needle valve returns to middle position</td></tr>
<tr><td rowspan="2">OFF</td><td rowspan="2">Normal
Needle valve is switching</td><td>Pressure from A port
(Closed)</td><td>Abnormal
Valve malfunction or signal wire is cut</td></tr>
<tr><td>Pressure from B port
(Flows from B → A port)</td><td>Normal
Poppet opens and needle valve operates</td></tr>
</table>

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
	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

1 Do not allow abnormal surges greater than the maximum operating pressure to occur because pressure from the B port is used for the solenoid.
2 Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
3 Use a JIS K 2213 petroleum-based operating fluid, or an equivalent, that has a water content that is less than 0.1% by volume.
4 Do not use fire-resistant operating fluid.
5 Use this valve only within the allowable voltage range.
6 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*)
7 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.
8 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.
9 The connector for the solenoid is the same as for the SA series solenoid valve.
See page E-19 for electrical circuit drawings and wiring procedures.
10 Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate (ℓ/min)	Weight (kg)	Dimension Drawings Page
MSA-03-10	3/8	25{255}	45	2.3	E-18
MSA-03X-10	1/2		80		
MSA-03-T-10	3/8		45	3.8	D-90
MSA-03X-T-10	1/2		80		

Explanation of model No.

SCW – G 03 – ARC – GR V – D2 – J11

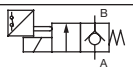
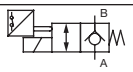
- Design number
- Solenoid power supply
  - D1: DC12V
  - E1: AC100V 50/60Hz
  - E2: AC200V 50/60Hz
  - D2 : DC24V
  - E115: AC110/115V 50/60Hz
  - E230: AC220/230V 50/60Hz
- Wiring for connector for switch
  - None: With 350mm wire
  - V : With M12-4 pin connector
    (Example of connector with cable provided by customer: Omron XS2F-D421-D80-A)
- Option symbols
  - None: No options (available with power supply E*)
  - GR : Surgeless type, with indicator light (must be installed with power supply D*)
  - R : With indicator light (available with power supply E*)

Possible option symbol combinations

Power Supply	Option Symbols
D*	GR
E*	None, R

Note)
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.
(Power supply E is the standard surgeless type, option symbol G is not needed.)

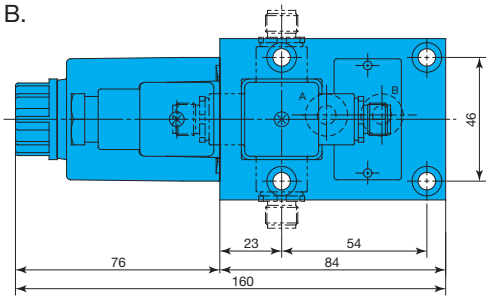
- Operation Symbol

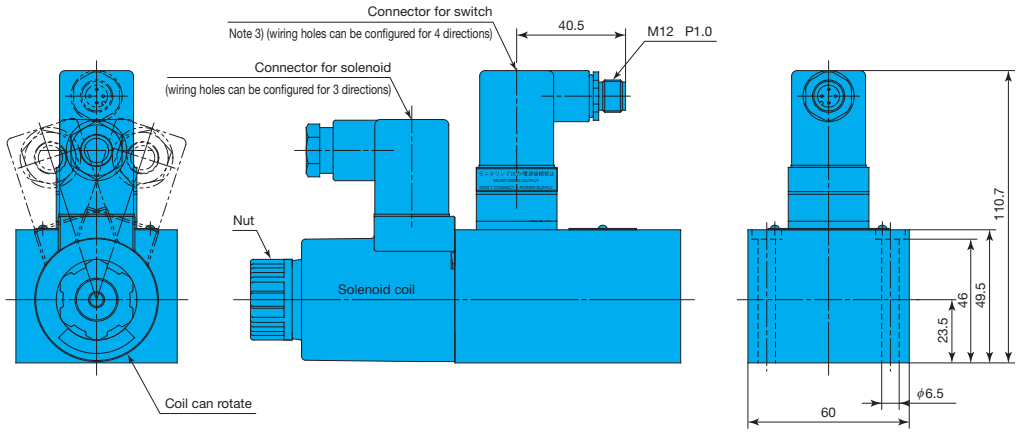
AR		When SOL. is ON does not flow from B→A.
ARC		When SOL. is ON flows both from A→B and B→A

- Nominal diameter
  03 size
- Mounting method
  G: Cascade mounting
- Poppet type directional control valve with monitoring switch

Installation Dimension Drawings

Dimensions of installation surface of gasket are ISO 4401-05-04-0-05.
However, used only for port A and B.

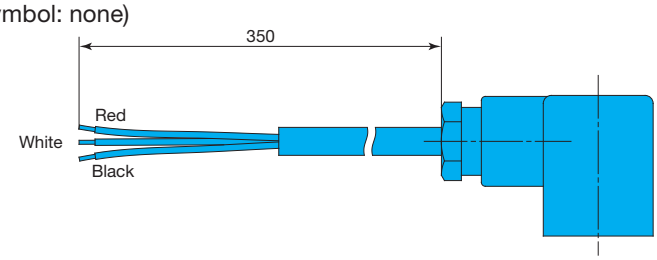




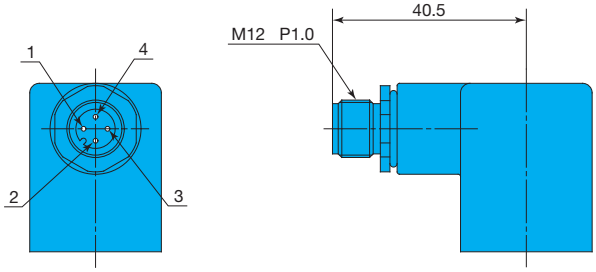
Note) 1. The connector for the switch in the drawing above is the M12-4 pin connector. In addition there are wire connections also.
See page E-78 for more detailed information.
2. Use surgeless directional control valves with monitoring switches for all electric valves on the same machine to prevent 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)

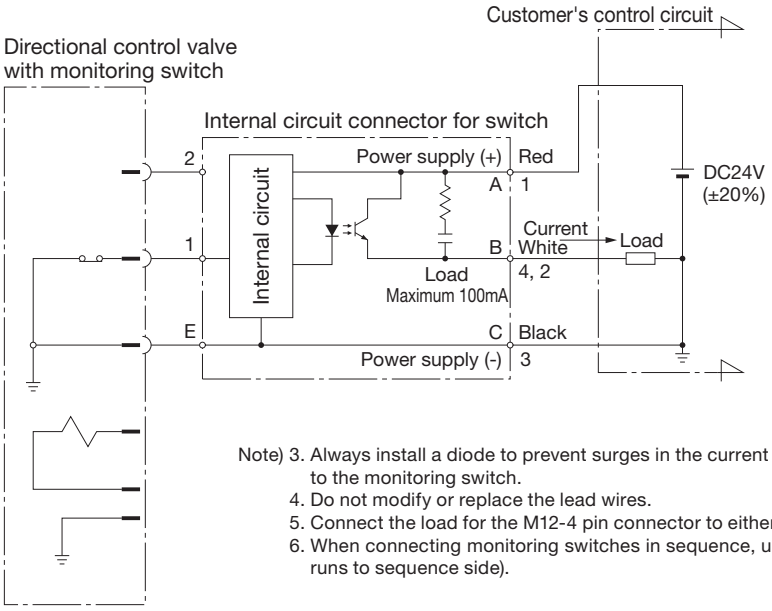


(2) With M12-4 pin connector (option symbol: V)



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

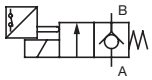
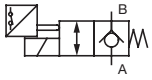
Wiring Method		Connection
Wire Color	Pin Number for M12-4 pin Connector	
Red	1	Power supply (+)
White	4 or 2	Load
Black	3	Power supply (-)

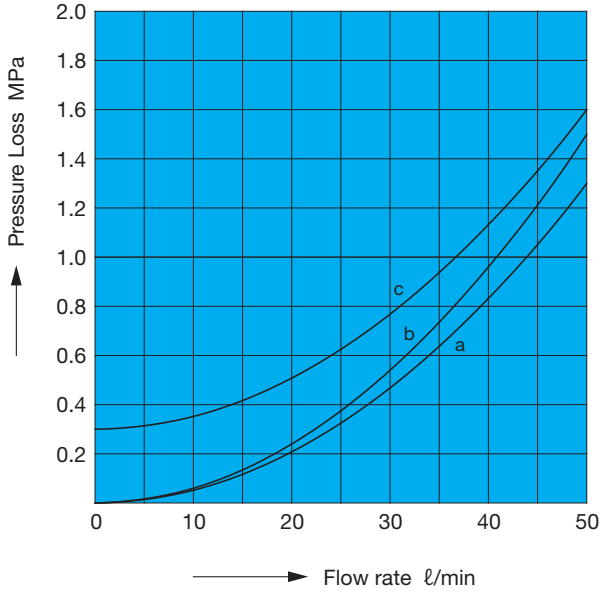
Note) 3. Always install a diode to prevent surges in the current when connecting an inductive load, such as a relay, to the monitoring switch.
4. Do not modify or replace the lead wires.
5. Connect the load for the M12-4 pin connector to either pin number 4 or 2.
6. When connecting monitoring switches in sequence, use the negative (-) common mode (type that current runs to sequence side).

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

Operation Symbol	JIS Symbol	SOL OFF B → A	SOL ON	
			A → B	B → A
AR		c	a	—
ARC		c	a	b



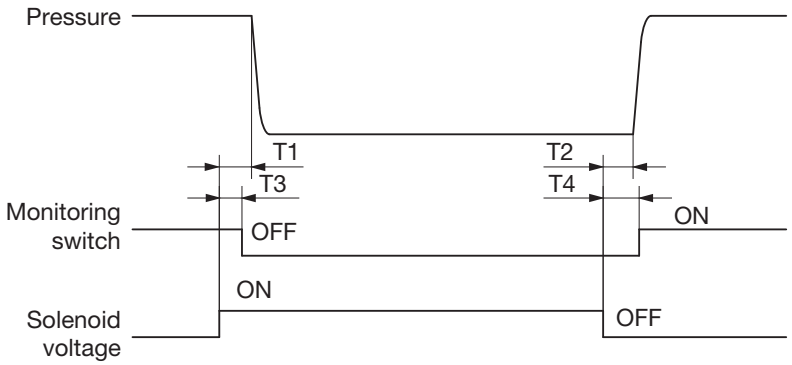
Range of Motion of Switch

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

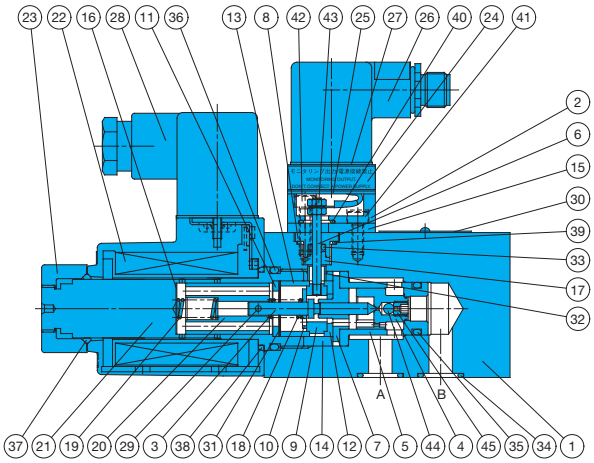


[Measurement Conditions]
Pressure 14MPa
Flow Rate 30ℓ/min
Operating fluid ISO VG32 40°C

Type of Machine	Model	Response Time (s)			
		Pressure		Switch	
		T1	T2	T3	T4
DC Solenoid	SCW-G03-AR-GR-D2-J11	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-J11	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 ★

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-**-**-J11 and do not use SCWG03-AR-**-**-J11.

Seal Part List (Kit Model Number EQS-SC)

Part No.	Part Name	Part Number	Q'ty
33	O-ring	NBR-90 P3	1
34	O-ring	AS568-014(NBR-90)	2
35	O-ring	NBR-90 P14	1
36	O-ring	AS568-119(NBR-90)	1
37	O-ring	NBR-70-1 P20	1
38	O-ring	S-25(NBR-70-1)	1
39	O-ring	S-11.2(NBR-90)	1
40	O-ring	S-9(NBR-70-1)	1

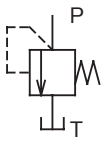
Note) NBR are JIS Standard B 2401, while AS568 is SAE standard.

NACHI

BALANCED PISTON TYPE
RELIEF VALVE

Relief Valve

20 to 380ℓ/min
21MPa



Features

①Balanced piston relief valve.
②Optimum pressure control for hydraulic circuit allows operation as a safety valve.
③A vent port enables remote control of pressure and use of an unloading circuit.

Specifications

Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm²}	Weight kg	
Screw Mounting	Gasket Mounting					T Type	G Type
R-T03-A-12 B-12	R-G03-A-12 B-12	3/8	21 {214} P, X (Vent Ports)	20	* to 1 {* to 10.2} * to 2.5 {* to 25.5}	3.0	4.3
R-T03-1-12 3-12	R-G03-1-12 3-12	3/8		80	* to 7 {* to 71.4} 3.5 to 21 {35.7 to 214}	3.0	4.3
R-T06-1-20 3-20	R-G06-1-20 3-20	3/4		170	* to 7 {* to 71.4} 3.5 to 21 {35.7 to 214}	3.9	5.3
R-T10-1-20 3-20	R-G10-1-20 3-20	1¼		380	* to 7 {* to 71.4} 3.5 to 21 {35.7 to 214}	7.7	7.7

Note) See the Flow Rate - Low Pressure characteristics for information about items marked with an asterisk (*).

●Handling

1 To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.

2 Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}. 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.

3 The pressure adjustment range for the high vent type is 1.3MPa {13.3kgf/cm²}. Note that R-T/G03 is not a high vent type.

4 When using a relief valve as a safety valve, use a pressure override that is higher than the required circuit pressure.

5 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 4mm and a connection length of no more than three meters is recommended.

6 Pressure becomes unstable when at slow control flow rates. Use a flow rate of no less than 8 ℓ/min for the 03, 06 sizes, and 10 ℓ/min 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.

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

Model No.	Pipe Diameter	Weight kg	Applicable Pump Model
MR-03-10	3/8	1.6	R-G03-*-12
MR-06-20	3/4	3.5	R-G06-*-20
MR-06X-20	1		
MR-10-20	1¼	8.5	R-G10-*-20
MR-10X-20	1½		

8 The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
R-G03-*-12	M10×75ℓ	4	45 to 55 {460 to 560}
R-G06-*-20	M16×80ℓ	4	190 to 235 {1940 to 2400}
R-G10-*-20	M20×105ℓ	4	370 to 460 {3770 to 4690}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

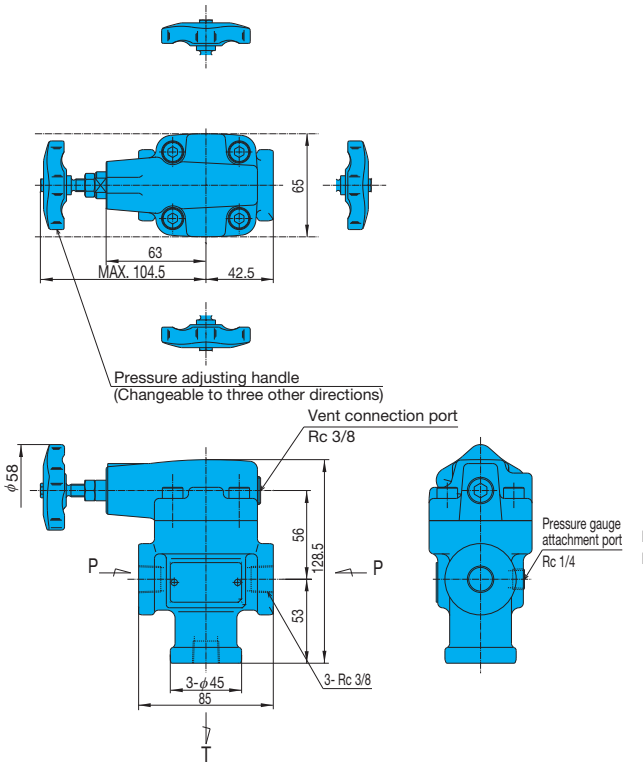
Explanation of model No.

R – T 06 – 1 – (H) – 20

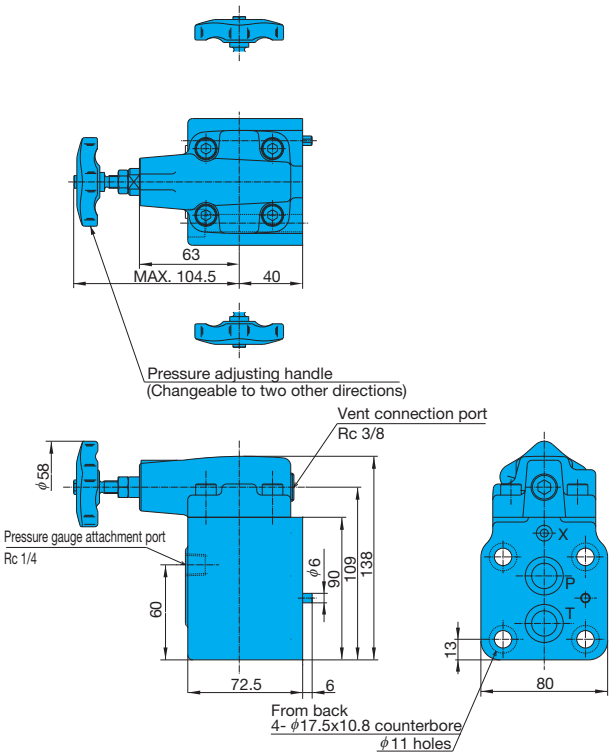
- 20 — Design number
- (H) — Auxiliary symbol H: High vent (excluding 03 size)
- 1 — Pressure adjustment range 1, 3, A, B
- 06 — Nominal diameter (size)
- T — Mounting method T: Screw Mounting G: Gasket Mounting
- R — Relief valve

Installation Dimension Drawings

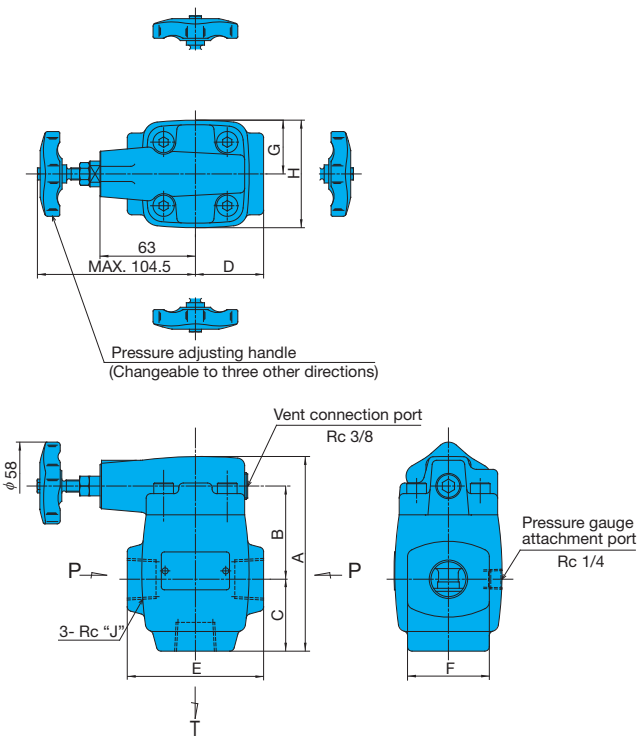
R-T03-*-12 (Screw Mounting)



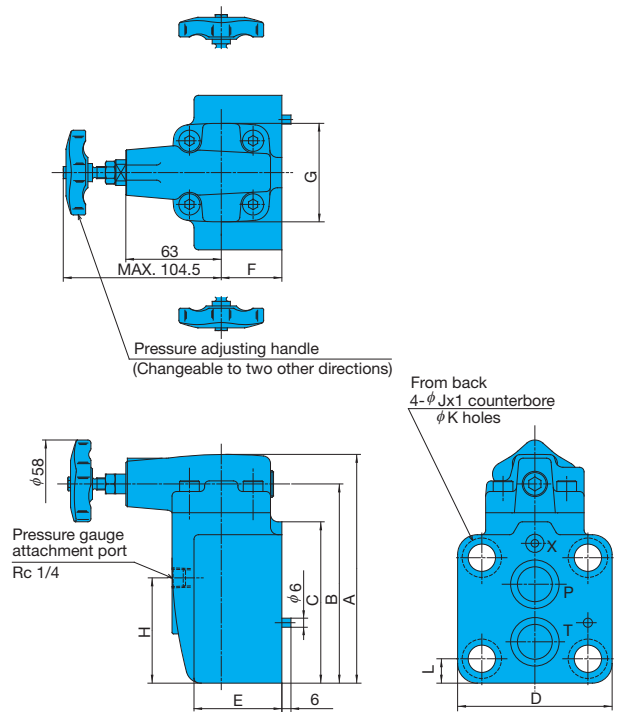
R-G03-*-12 (Gasket Mounting)



R-T**-*-20 (Screw Mounting)



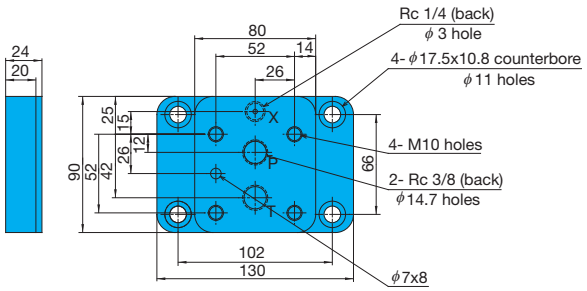
R-G**-*-20 (Gasket Mounting)



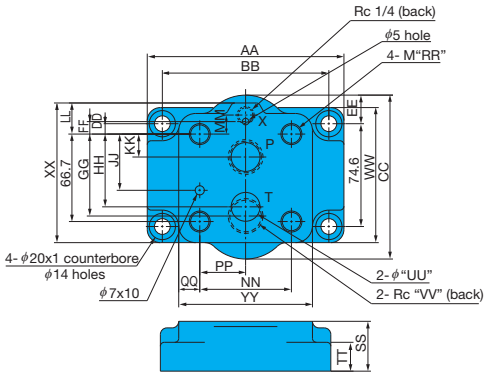
Model No.	A	B	C	D	E	F	G	H	J
R-T06-*-20	128.5	61.5	47.5	45	90	54	35.5	71	3/4
R-T10-*-20	153.5	72	62	62.5	125	69	47	94	1¼

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-03-10



MR-**-20



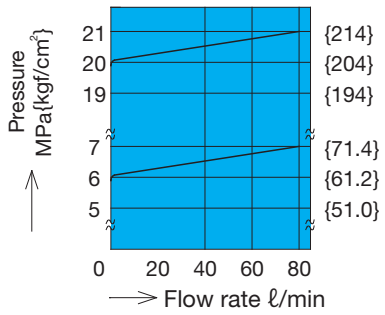
Model No.	Dimensions (mm)																						
	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP	QQ	RR	SS	TT	UU	VV	WW	XX	YY
MR-06-20	150	127	125	7.9	21.8	9.5	62.5	55.5	42.9	17.5	23.7	14.5	69.9	34.9	16.1	16	38	22	22	3/4	98.5	106.5	102
MR-06X-20																				1			
MR-10-20	175	152.4	150	6.4	39.2	15.9	71.3	58.7	50.8	14.3	25.6	25.9	92.1	46.1	17.5	20	55	22	28.5	1¼	102.5	110	127
MR-10X-20																				1½			

Performance Curves

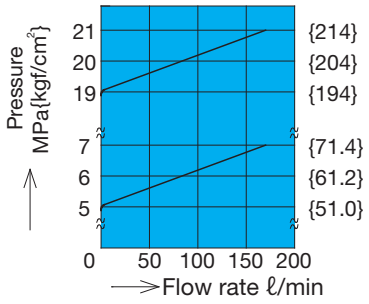
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure - Flow Rate Characteristics

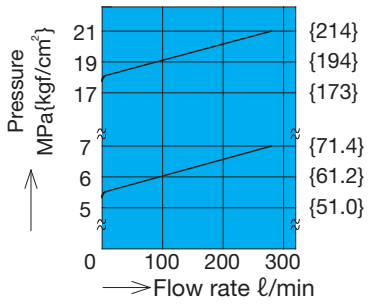
R-*03-*-12



R-*06-*-20

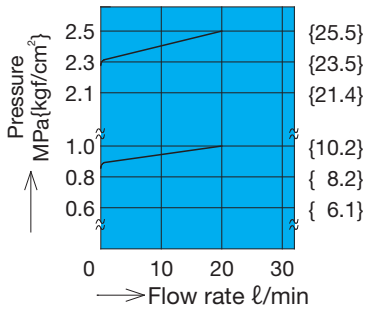


R-*10-*-20

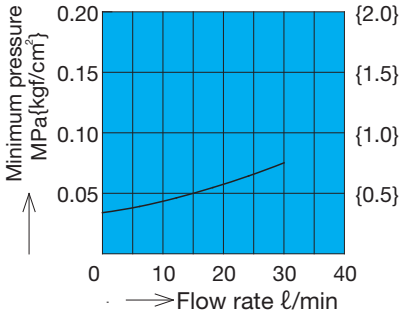


Flow Rate - Minimum Pressure Characteristics

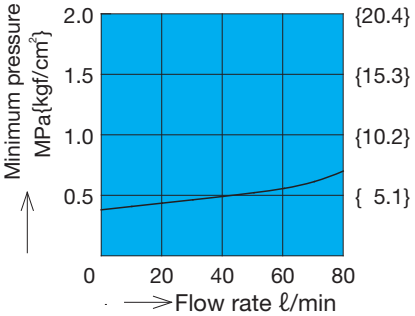
R-*03-$\frac{A}{B}$-12



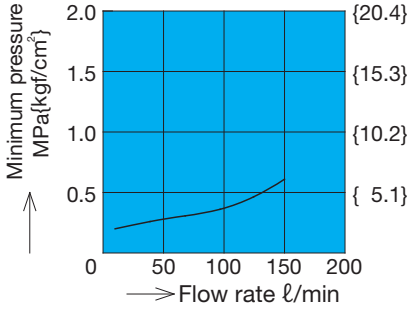
R-*03-$\frac{A}{B}$-12



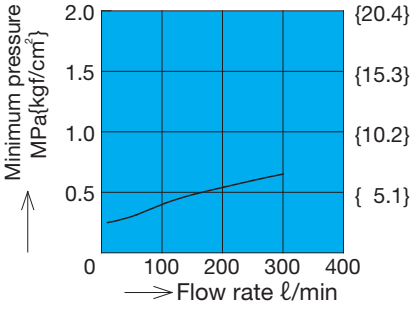
R-*03-1-12



R-*06-1-20



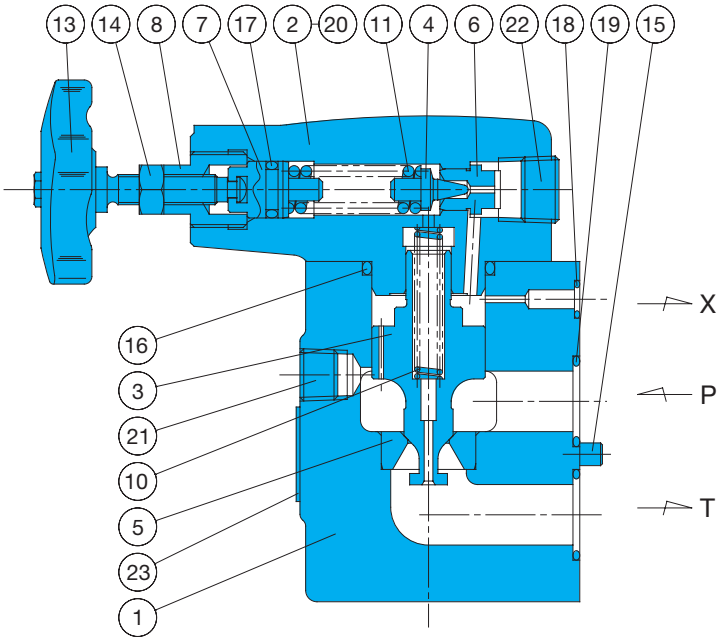
R-*10-1-20



Note) The performance curves do not include T port back pressure.

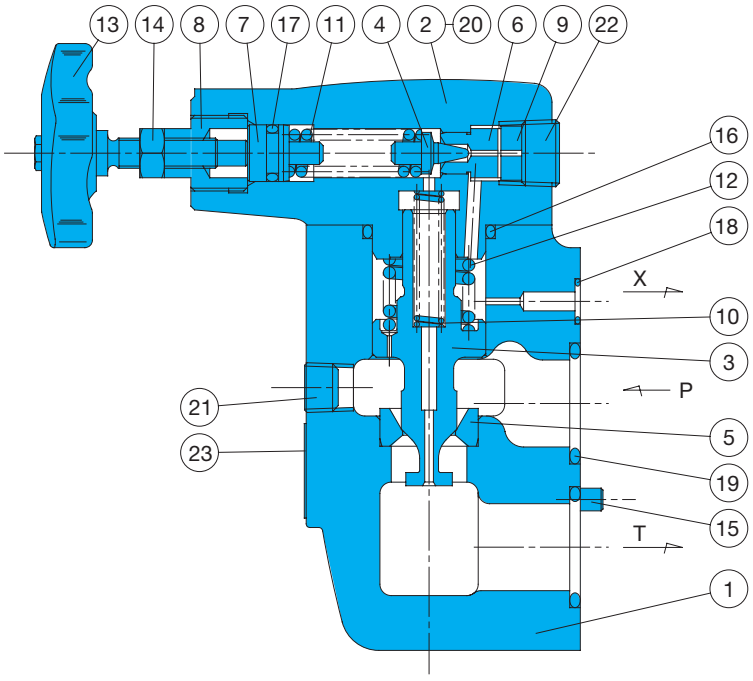
Cross-sectional Drawings

R-G03-$\frac{A}{B}$-12



R-G03-$\frac{1}{3}$-12

R-G$\frac{06}{10}$-$\frac{1}{3}$-20



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).

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	NBR-90 G30	NBR-90 G30	NBR-90 G30	NBR-90 G30	NBR-90 G40	NBR-90 G40	1
17	O-ring	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	1
18	O-ring	NBR-90 P7	–	NBR-90 P9	–	NBR-90 P9	–	1
19	O-ring	NBR-90 P20	–	NBR-90 P26	–	NBR-90 G35	–	2

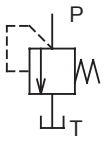
Note) The materials and hardness of the O-ring conforms with JIS B2401.
*** in the kit number is used for specification of the valve size (G03, T06, etc.)

NACHI

BALANCED PISTON TYPE
RELIEF VALVE (WITH ISO TYPE)

RI Series Relief Valve
(ISO Mounting, Balanced Piston Type)

40 to 320ℓ/min
35MPa



Features

①High pressure capacity balanced piston relief valve.
②Optimum pressure control for hydraulic circuit allows operation as a safety valve.
③A vent port enables remote control of pressure and use of an unloading circuit.
④ISO standard mounting service (see table below).

Specifications

Model No. Gasket Mounting	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
RI-G03-C-20	3/8	35 {357} P, X Ports	40	0.15 to 3.5 {1.5 to 35.7}	4.5	ISO 6264-06-09-0-97
RI-G03-1-20 3 5	3/8		150	0.8 to 7 { 8.2 to 71.4} 3.5 to 25 {35.7 to 255 } 3.5 to 35 {35.7 to 357 }	4.5	
RI-G06-1-20 3 5	3/4		320	0.8 to 7 { 8.2 to 71.4} 3.5 to 25 {35.7 to 255 } 3.5 to 35 {35.7 to 357 }	5.6	ISO 6264-08-13-0-97

●Handling

1 To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.

2 Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.

3 For use as a safety valve, use a pressure override that is higher than the required circuit pressure.

4 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 4mm and a connection length of no more than three meters is recommended.

5 The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
RI-G03-*-20	M12×50ℓ	4	75 to 95 {765 to 970}
RI-G06-*-20	M16×60ℓ	4	190 to 235 {1940 to 2400}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

6 A small control flow rate can cause pressure instability. Use a control flow rate that is at least 8 ℓ/min. 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 kg	Applicable Pump Model
MRI-03-10	3/8	2.6	RI-G03
MRI-03X-10	1/2		
MRI-06-10	3/4	3.5	RI-G06
MRI-06X-10	1		

Explanation of model No.

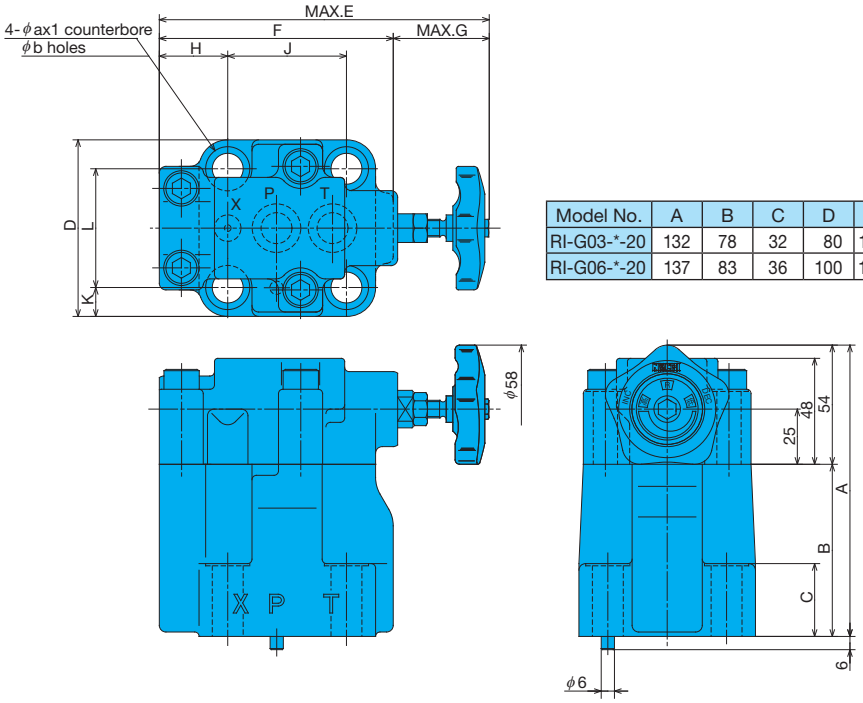
RI – G 06 – 1 – 20

- 20 — Design number
- 1 — Pressure adjustment range C, 1, 3, 5
- 06 — Nominal diameter (size)
- G — Mounting method G: Gasket type
- RI — RI series relief valve

F
Pressure Control Valve

Installation Dimension Drawings

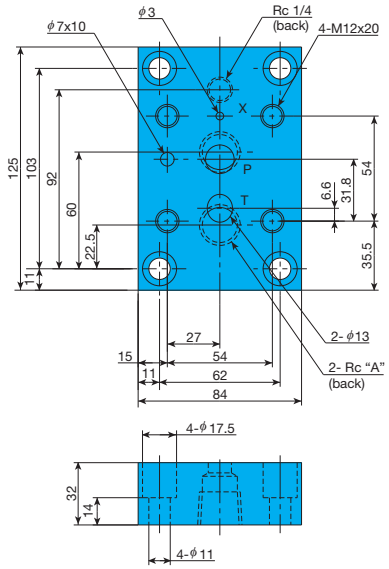
RI-G**-*-20



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*-10

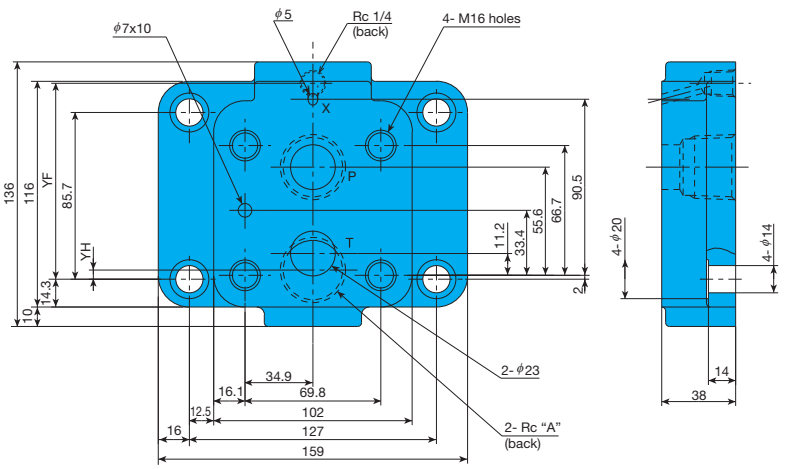
(Maximum Operating Pressure: 25MPa)



Model No.	A
MRI-03-10	3/8
MRI-03X-10	1/2
MRI-06-10	3/4
MRI-06X-10	1

Sub Plate MRI-06*-10

(Maximum Operating Pressure: 25MPa)



Attach a plug when the vent (X) port is not used.

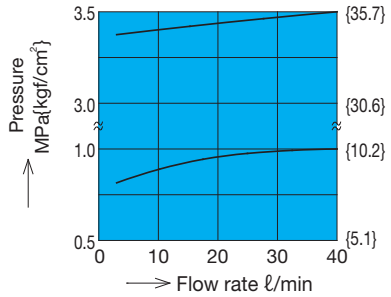
Model No.	YF	YH
MRI-06-10	92.5	13.2
MRI-06X-10	100.7	4.7

Performance Curves

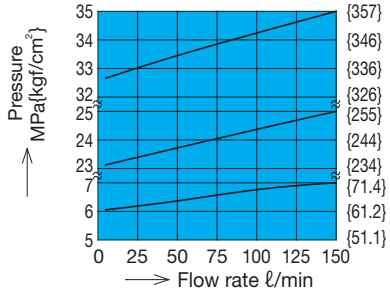
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure - Flow Rate Characteristics

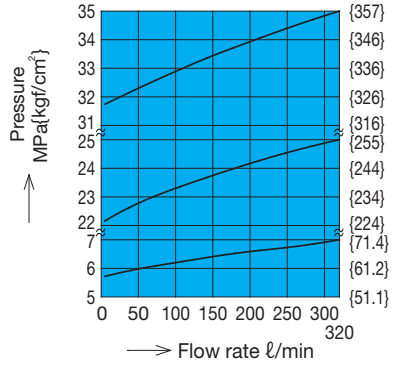
RI-G03-C-20



RI-G03-*-20



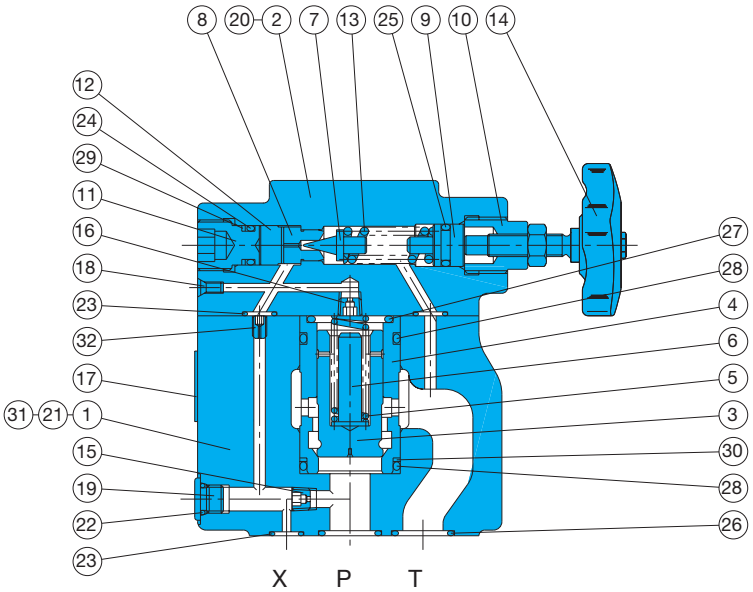
RI-G06-*-20



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

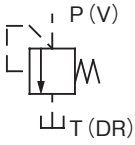
Seal Part List (Kit Model Number REBS-***)

Part No.	Part Name	Nominal Diameter/Part Number		Q'ty
		G03	G06	
22	O-ring	NBR-90 P8	NBR-90 P8	1
23	O-ring	NBR-90 P9	NBR-90 P9	3
24	O-ring	NBR-90 P10A	NBR-90 P10A	1
25	O-ring	NBR-70-1 P11	NBR-70-1 P11	1
26	O-ring	NBR-90 P18	NBR-90 P28	2
27	O-ring	NBR-90 G25	NBR-90 P28	1
28	O-ring	NBR-90 G30	NBR-90 P32	2
29	Backup ring	T2-P10A	T2-P10A	1
30	Backup ring	T2-G30	T2-P32	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.
For the *** part of the kit number, specify the valve size (G03, G06).

Remote Control Relief Valve

2 to 15ℓ/min
21MPa



Features

①Connecting a relief valve or reducing valve to the vent port of a balanced piston type pressure control valve provides simple remote control of pressure.

②RCD type can also be used as a direct type relief valve.

Specifications

Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm²}	Weight kg
Screw Mounting	Gasket mounting					
RCD-T02-1-11 3-11	–	1/4	21 {214} P, V ports	15	0.8 to 7 { 8.2 to 71.4} 3.5 to 21 {35.7 to 214 }	2.1
RC-T02-1-12 3-12	RC-G02-1-21 3-21			2	0.8 to 7 { 8.2 to 71.4} 3.5 to 21 {35.7 to 214 }	1.4

Note) The pressure adjustment range indicates cracking pressure.

Explanation of model No.

RC – G 02 – 1 – (K) – 21

- 21: Design number
- (K): Adjusting bolt type (gasket type only)
- 1: Pressure adjustment range 1, 3
- 02: Nominal diameter (size)
- G: Mounting method (T: Screw Mounting, G: Gasket Mounting)
- RC: Remote control relief valve

●Handling

1. To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
2. Make sure that drain port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
3. 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 4mm and a connection length of no more than three meters is recommended. Pipe capacity can be a source of vibration.
4. 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.
5. Use the following to specify a sub plate.

Model No.	Weight kg
MRC-02-20	1.0

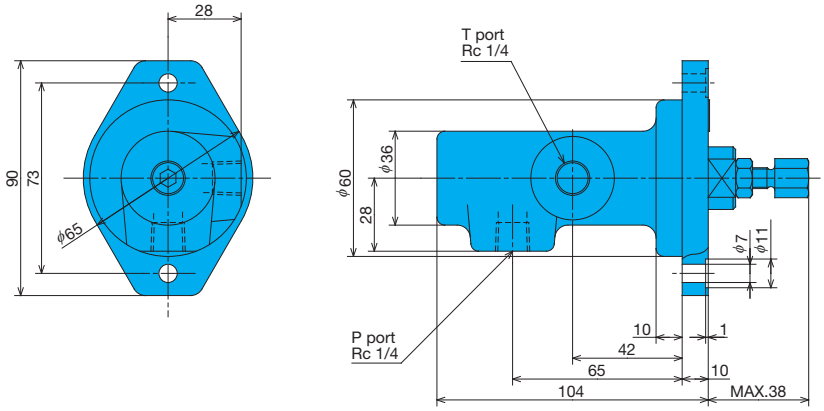
6. The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
RC-G02-*-21	M8×25ℓ	4	20 to 25 {205 to 255}

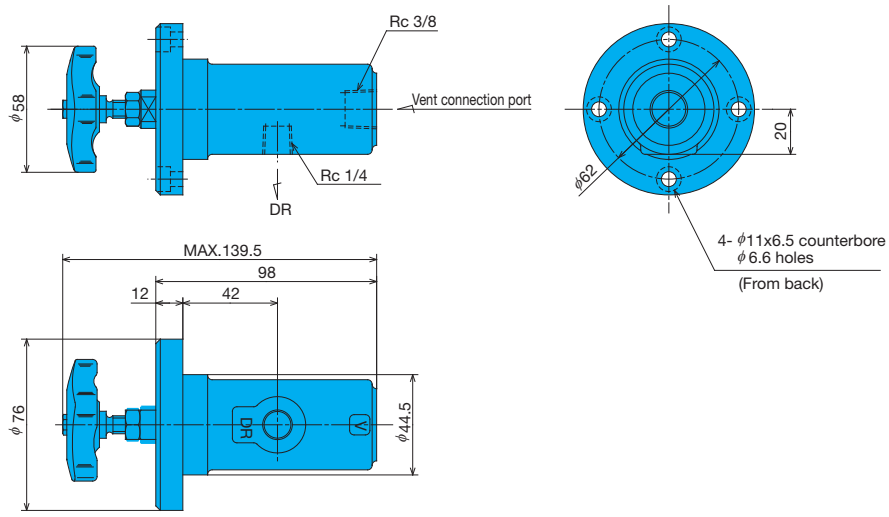
Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Installation Dimension Drawings

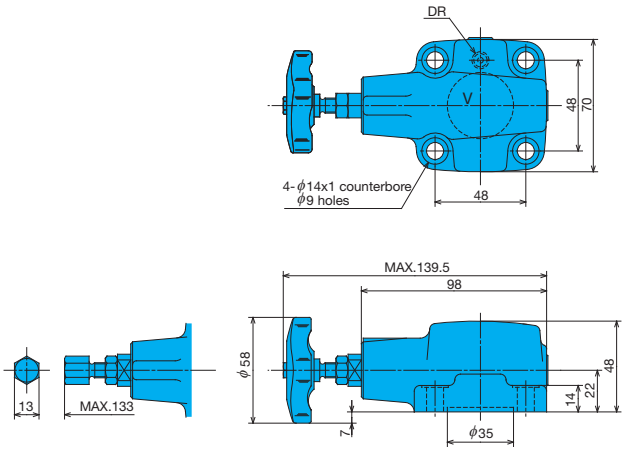
RCD-T02-*-11 (Screw Mounting)



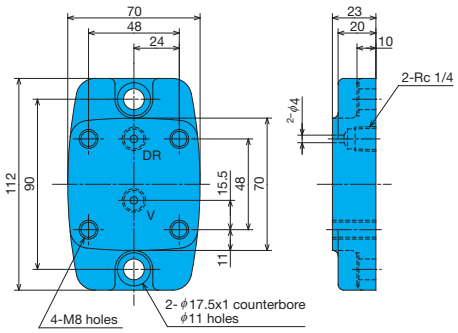
RC-T02-*-12 (Screw Mounting)



RC-G02-*-21 (Gasket Mounting)

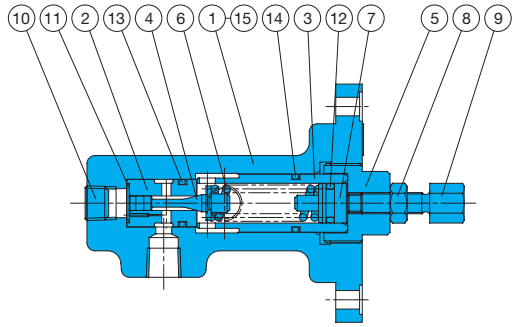


Sub Plate MRC-02-20



Cross-sectional Drawings

RCD-T02-*-11



Part No.	Part Name
1	Body
2	Sleeve
3	Sleeve
4	Poppet
5	Retainer
6	Spring
7	Guide
8	Nut
9	Screw
10	Plug
11	O-ring

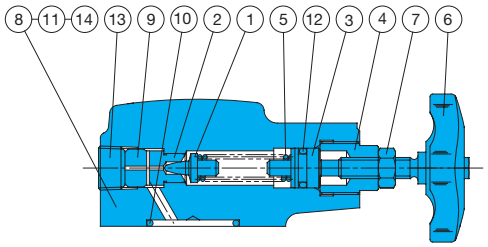
Part No.	Part Name
12	O-ring
13	O-ring
14	O-ring
15	Nameplate

Seal Part List (Kit Model Number RCS-T02CD)

Part No.	Part Name	Part Number	Q'ty
11	O-ring	S12.5(NBR-70-1)	1
12	O-ring	NBR-70-1 P11	1
13	O-ring	NBR-90 P14	1
14	O-ring	NBR-90 P18	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.

RC-G02-*-(K)-21



Part No.	Part Name
1	Poppet
2	Seat
3	Plunger
4	Retainer
5	Spring
6	Handle
7	Nut
8	Cover
9	Collar
10	O-ring
11	O-ring
12	O-ring
13	Plug
14	Plate

Seal Part List (Kit Model Number RCBS-G02)

Part No.	Part Name	Part Number	Q'ty
10	O-ring	NBR-90 G30	1
11	O-ring	NBR-90 P6	1
12	O-ring	NBR-70-1 P11	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.

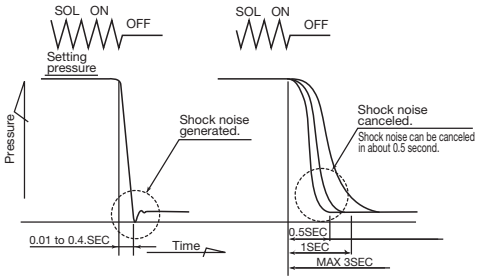
Solenoid Controlled Relief Valve

30 to 380ℓ/min
21MPa

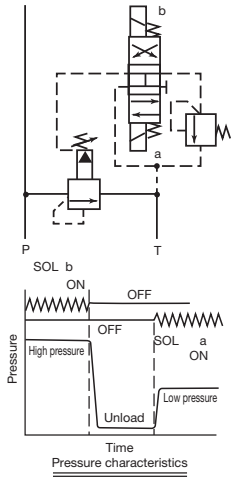
Features

①This valve adds a wet type solenoid valve to a balanced type piston type relief valve to form a hydraulic device unload circuit.
②The 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.
③A two-pressure control circuit can be configured by adding a relief modular valve. Contact your agent for more information.

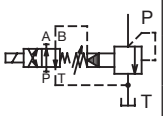
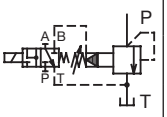
(Pressure Relief Circuit Example)



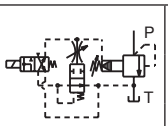
(Two-pressure Control Circuit Example)



Specifications

Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm²}	Weight kg		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	21 {214} P, X Ports	80	Type 1 0.8 to 7 {8.2 to 71.4} Type 3 3.5 to 21 {35.7 to 214}	3.2	4.5		SS (SA) -G01-A3X-**-31
RSS (RSA) -T06-AQ$^{1}_{3}$-**-23	RSS (RSA) -G06-AQ$^{1}_{3}$-**-23	3/4		170		4.0	6.4		
RSS (RSA) -T10-AQ$^{1}_{3}$-**-23	RSS (RSA) -G10-AQ$^{1}_{3}$-**-23	1¼		380		8.8	10.0		
RSS (RSA) -T03-AR$^{1}_{3}$-**-15	RSS (RSA) -G03-AR$^{1}_{3}$-**-15	3/8		80		3.2	4.5		SS (SA) -G01-AR-**-31
RSS (RSA) -T06-AR$^{1}_{3}$-**-23	RSS (RSA) -G06-AR$^{1}_{3}$-**-23	3/4		170		4.0	6.4		
RSS (RSA) -T10-AR$^{1}_{3}$-**-23	RSS (RSA) -G10-AR$^{1}_{3}$-**-23	1¼		380		8.8	10.0		

Shockless Type

RSS (RSA) -T03-$^{1}_{3}$-F-**-15	RSS (RSA) -G03-$^{1}_{3}$-F-**-15	3/8	21 {214} P, X Ports	80	Type 1 1 to 7 {10.2 to 71.4} Type 3 3.5 to 21 {35.7 to 214}	4.2	5.5		SS (SA) -G01-A8X0-**-31
RSS (RSA) -T06-$^{1}_{3}$-F-**-23	RSS (RSA) -G06-$^{1}_{3}$-F-**-23	3/4		170		5.0	7.4		
RSS (RSA) -T10-$^{1}_{3}$-F-**-23	RSS (RSA) -G10-$^{1}_{3}$-F-**-23	1¼		380		9.8	12.0		

Note) For information about electrical specifications, see the SS type and SA type solenoid valve items on pages E-1 and E-13.

●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 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.
3 Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
4 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.
5 Pressure becomes unstable when at slow control flow rates. Use a flow rate of no less than 8 ℓ/min for the 03, 06 sizes, and 10 ℓ/min for the10 size.
6 Use 90 to 110% of rated voltage.
7 The pressure adjustment range for the high vent type is 1.3MPa {13.3kgf/cm²}.
Note that RSS (RSA) -T/G03 is not a high vent type.
8 Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Weight kg	Applicable Valve Type
MR-03-10	3/8	1.6	RSS (RSA) -G03-***-**-15
MR-06-20	3/4	3.5	RSS (RSA) -G06-***-**-23
MR-06X-20	1		
MR-10-20	1¼	8.5	RSS (RSA) -G10-***-**-23
MR-10X-20	1½		

Note) See page relief valve page item on F-3 for dimensions.

9 The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
RSS (RSA) -G03-***-**-15	M10×75ℓ	4	45 to 55 {460 to 560}
RSS (RSA) -G06-***-**-23	M16×80ℓ	4	190 to 235 {1940 to 2400}
RSS (RSA) -G10-***-**-23	M20×105ℓ	4	370 to 460 {3770 to 4690}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

10 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.

Explanation of model No.

RSS(RSA) – G 06 – A Q 1 – (H) – C1 – 23

- Design number: 23
- Voltage symbol: C1 : AC100V 50/60Hz; C2 : AC200V 50/60Hz; D1 : DC12V; D2 : DC24V; E1 : AC100V 50/60Hz; E2 : AC200V 50/60Hz
- Auxiliary symbol: H: High vent (excluding 03 size); F: With shock canceller (See shockless type item.)
- Pressure adjustment range: 1, 3
- Stop position flow path: Q: Open; R: Blocked (Not required with the shockless type.)
- Operation method: A: Spring offset
- Nominal diameter (size): 06
- Mounting method: T: Screw Mounting; G: Gasket Mounting
- Solenoid controlled relief valve (with SA type solenoid valve)
- Solenoid controlled relief valve (with SS type solenoid valve)

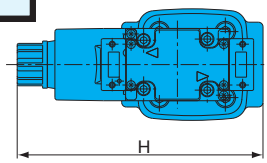
Other auxiliary symbols can be used (enter them in alphabetic order if there are 2 or more).

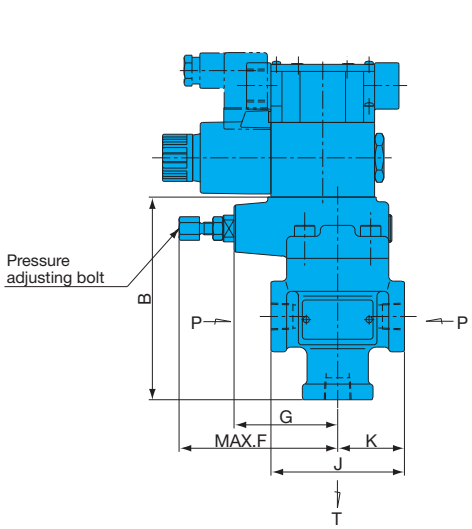
With SS type solenoid valve	G, N, Q (R is omitted).
With SA type solenoid valve	GR, J, N, Q, R

Installation Dimension Drawings

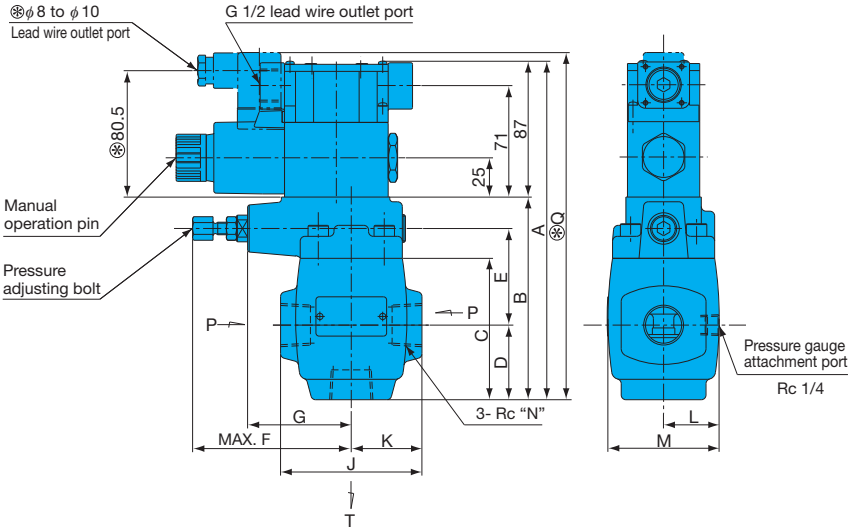
RSS (RSA) -T**-A**-**-15, 23

Note) Dimensions marked with ⊛ are for the RSA type.
Note) Dimensions in parentheses apply in the case of a DC solenoid valve.





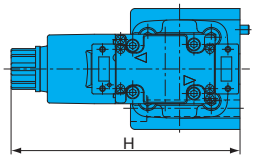
RSS (RSA) -T03-A**-**-15



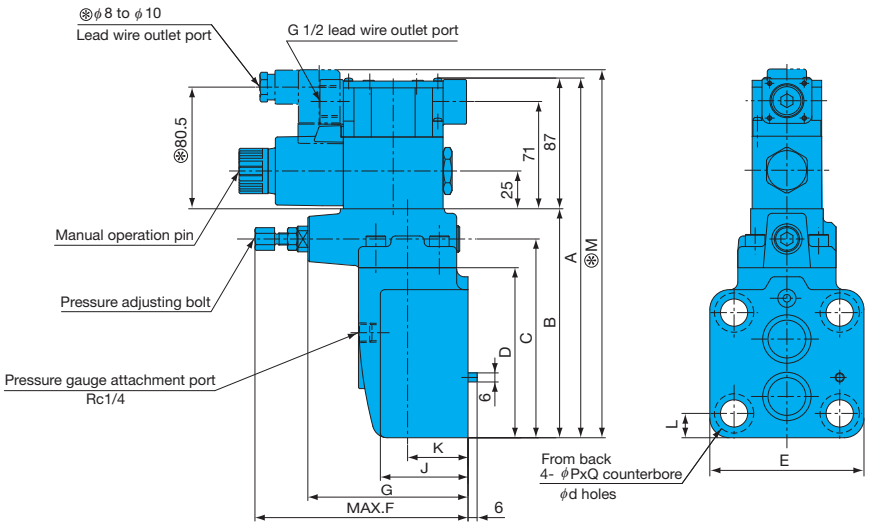
RSS (RSA) -T$^{06}_{10}$-A**-**-23

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	Q
RSS (RSA) -T03-A-**-**-15	214.5	129	90	53	56	101	66	154 (161)	85	42.5	32.5	65	3/8	221.5
RSS (RSA) -T06-A-**-**-23	214.5	129	90	47.5	61.5	101	66	156.5 (163.5)	90	45	35.5	71	3/4	221.5
RSS (RSA) -T10-A-**-**-23	239	153.5	111.5	62	72	98	63	164.5 (171.5)	125	62.5	47	94	1¼	246

RSS (RSA) -G**-A**-**-15, 23



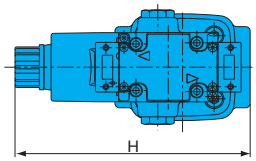
Note) Dimensions marked with ⊛ are for the RSA type.
Note) Dimensions in parentheses apply in the case of a DC solenoid valve.



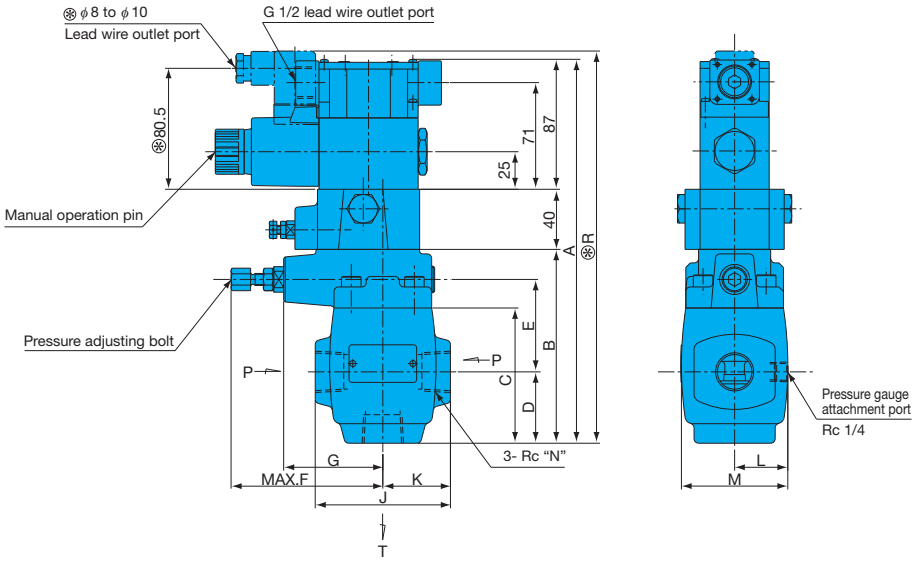
Model No.	A	B	C	D	E	F	G	H	J	K	L	P	Q	d	M
RSS (RSA) -G03-A**-**-15	214.5	129	109	90	80	141	106	150.5 (157.5)	72.5	40	13	17.5	10.8	11	221.5
RSS (RSA) -G06-A**-**-23	237	151.5	131.5	112.5	102	141	106	151.5 (158.5)	58	40	16.1	26	1	18	244
RSS (RSA) -G10-A**-**-23	248	162.5	143	120.5	127	148	113	152 (159)	80	50	17.7	32	1	22	255

Note) For gasket surface dimensions, see R-G**-* 12/20.

RSS (RSA) -T**-*-F-**-15, 23



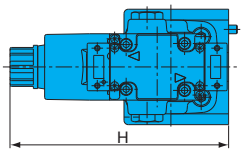
Note) Dimensions marked with ⊛ are for the RSA type.
Note) Dimensions in parentheses apply in the case of a DC solenoid valve.

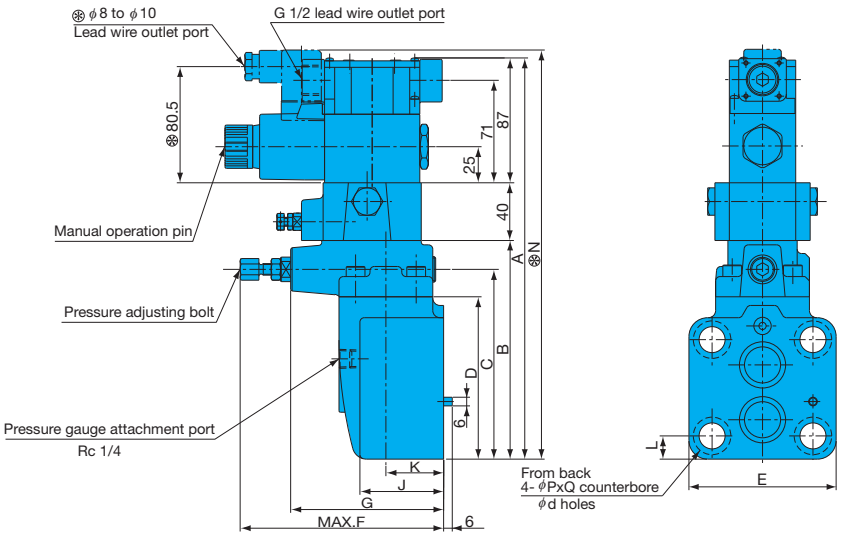


Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	Q	R
RSS (RSA) -T03-*-F-**-15	254.5	129	90	53	56	101	66	154 (161)	85	42.5	32.5	65	32	3/8	261.5
RSS (RSA) -T06-*-F-**-23	254.5	129	90	47.5	61.5	101	66	156.5 (163.5)	90	45	35.5	71	33	3/4	261.5
RSS (RSA) -T10-*-F-**-23	279	153.5	111.5	62	72	98	63	164.5 (171.5)	125	62.5	47	94	32.5	1¼	286

RSS
(RSA) -G**-*-F-**-15, 23

Note) Dimensions marked with ⊛ are for the RSA type.
Note) Dimensions in parentheses apply in the case of a DC solenoid valve.



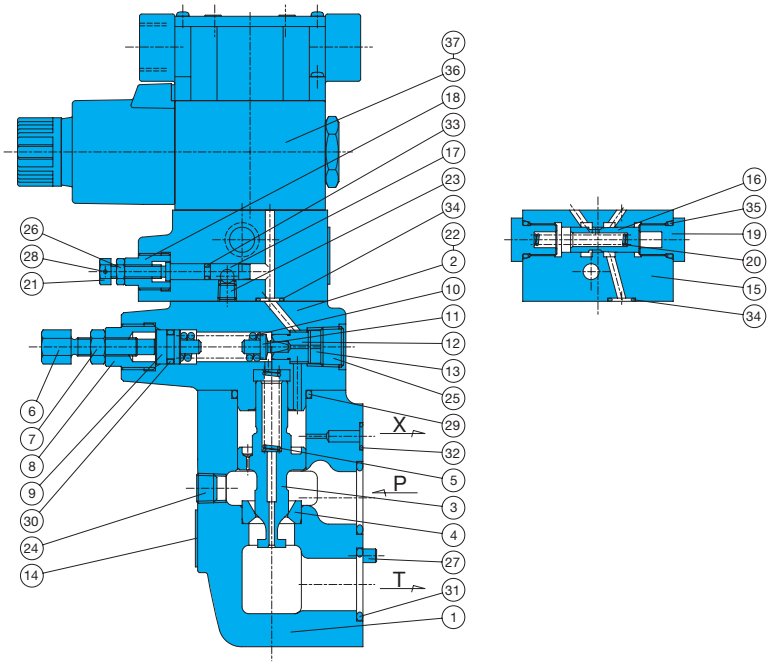


Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	d
RSS (RSA) -G03-*-F-**-15	254.5	129	109	90	80	141	106	150.5 (157.5)	72.5	40	13	32	261.5	17.5	10.8	11
RSS (RSA) -G06-*-F-**-23	277	151.5	131.5	112.5	102	141	106	151.5 (158.5)	58	40	16.1	33	284	26	1	18
RSS (RSA) -G10-*-F-**-23	288	162.5	143	120.5	127	148	113	152 (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-**-15, 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	NBR-90 G30	NBR-90 G30	NBR-90 G40	1
30	O-ring	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	1
31	O-ring	NBR-90 P20	NBR-90 P26	NBR-90 G35	2
32	O-ring	NBR-90 P7	NBR-90 P9	NBR-90 P9	1
33	O-ring	NBR-90 P4	NBR-90 P4	NBR-90 P4	1
34	O-ring	NBR-90 P9	NBR-90 P9	NBR-90 P9	2
35	O-ring	NBR-90 P12.5	NBR-90 P12.5	NBR-90 P12.5	2

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
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 E-11(E-23).

NACHI

SOLENOID CONTROLLED
RELIEF VALVE (WITH ISO TYPE)

RI Series Solenoid Controlled Relief Valve

150 to 320ℓ/min
35MPa

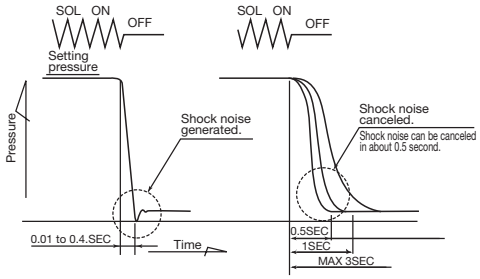
Features

①This valve adds a wet type solenoid valve to a balanced type piston type relief valve to form a hydraulic device unload circuit.

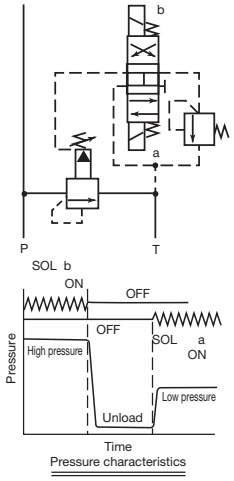
②The shockless type has an internal structure that prevents shock generated during unloading. This valve can also be used in a pressure relief circuit, and has a maximum adjustment time of three seconds. See the pressure relief circuit example.

③A two-pressure control circuit can be configured by adding a relief modular valve.
Contact your agent for more information.

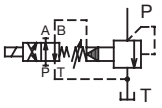
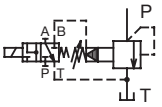
(Pressure Relief Circuit Example)



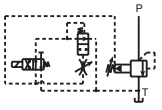
(Two-pressure Control Circuit Example)



Specifications

Model No. Gasket Mounting	Nominal Diameter (Size)	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Pressure adjustment range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions	JIS Symbol	Used Solenoid Valve Model Number
1 RIS-G03-AQ3 -**-21 5	3/8	150	35 {357} P, X Ports	Type 1 0.8 to 7 {8.2 to 71.4} Type 3 3.5 to 25 {35.7 to 255} Type 5 3.5 to 35 {35.7 to 357}	6.0	ISO 6264-06-09-0-97		SS-G01-A3X-**-31
1 RIS-G06-AQ3 -**-21 5	3/4	320			7.1	ISO 6264-08-13-0-97		
1 RIS-G03-AR3 -**-21 5	3/8	150			6.0	ISO 6264-06-09-0-97		SS-G01-AR-**-31
1 RIS-G06-AR3 -**-21 5	3/4	320			7.1	ISO 6264-08-13-0-97		

Shockless Type

1 RIS-G03-3 -F-**-21 5	3/8	150	35 {357} P, X Ports	Type 1 1 to 7 {10.2 to 71.4} Type 3 3.5 to 25 {35.7 to 255} Type 5 3.5 to 35 {35.7 to 357}	7.0	ISO 6264-06-09-0-97		SS-G01-A3X-**-31
1 RIS-G06-3 -F-**-21 5	3/4	320			8.1	ISO 6264-08-13-0-97		

Note) For electrical specifications, see the SS type solenoid valve item on page E-1.

●Handling

1 To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.

2 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.

3 Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.

4 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.

5 A small control flow rate can cause pressure instability. Use a control flow rate that is at least 8ℓ/min. Use a drain type relief valve in the case of a flow rate that is less than the minimum flow rate.

6 Use 90 to 110% of rated voltage.

7 Use the following table for specification when a sub plate is required. Maximum operating pressure is 25MPa {255kgf·cm²}.

Model No.	Pipe Diameter	Weight kg	Applicable Pump Model
MRI-03-10	3/8	2.6	RIS-G03
MRI-03X-10	1/2		
MRI-06-10	3/4	3.5	RIS-G06
MRI-06X-10	1		

8 The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
RIS-G03-***-**-21	M12×50ℓ	4	75 to 95 {765 to 969}
RIS-G06-***-**-21	M16×60ℓ	4	190 to 235 {1940 to 2400}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

9 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.

Explanation of model No.

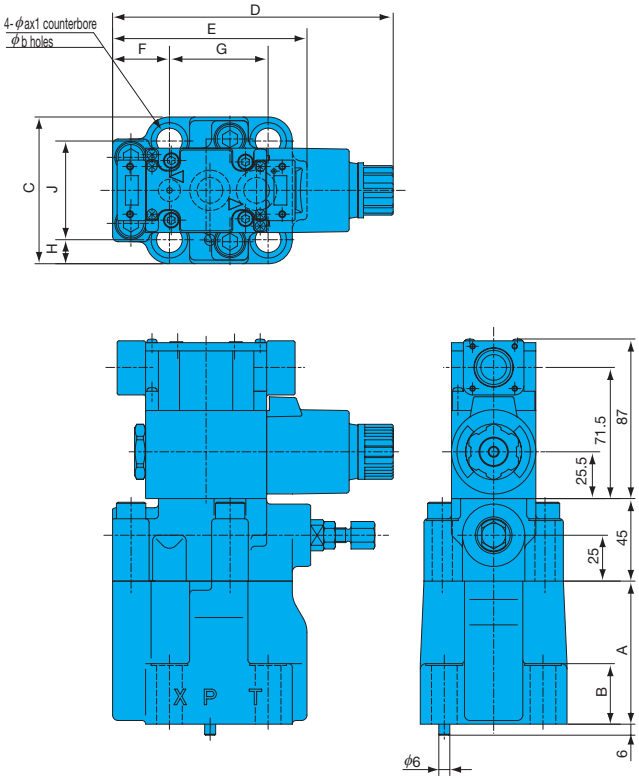
RIS – G 06 – A Q 1 – (F) – C1 – 21

- Design number
- Voltage symbol
  - C1: AC100V 50/60Hz
  - C2: AC200V 50/60Hz
  - E1: AC100V 50/60Hz
  - E2: AC200V 50/60Hz
  - D1: DC12V
  - D2: DC24V
- Auxiliary symbol F: With shock canceller (See shockless type item.)
  - Other auxiliary symbols G, N, and Q (R is omitted) can be used (enter them in alphabetic order if there are 2 or more).
- Pressure adjustment range 1, 3, 5
- Stop position flow path
  - Q: Open
  - R: Blocked
- Operation method A: Spring offset

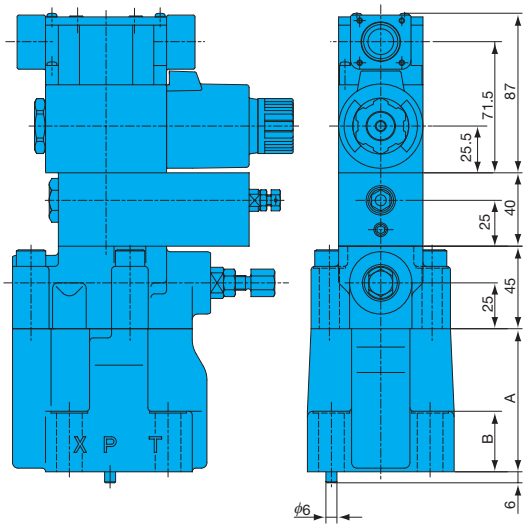
  } Not required with the shockless type.
- Nominal diameter (size)
- Mounting method G: Gasket type
- RI Series solenoid controlled relief valve (with SS type solenoid valve)

Installation Dimension Drawings

RIS-G**-A**-**-21



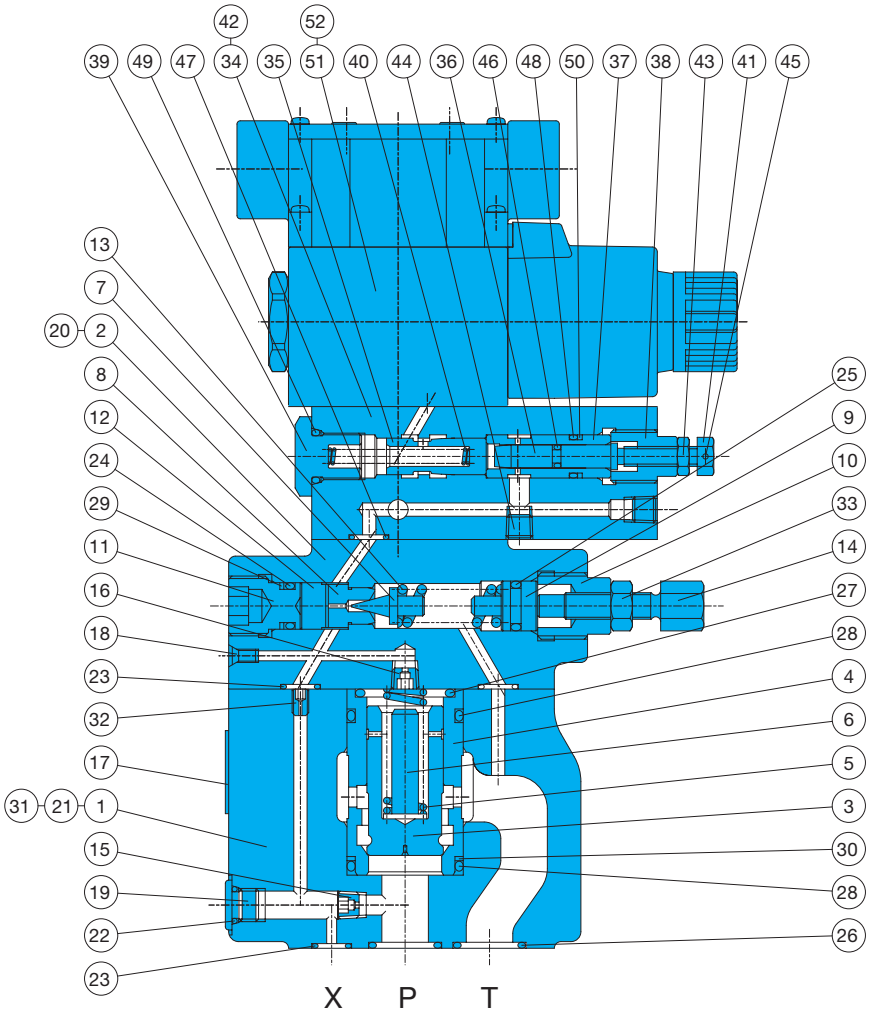
RIS-G**-*-F-**-21



Model No.	A	B	C	D	E	F	G	H	J	a	b
RIS-G03-***-**-21	78	32	80	153 (160)	106	31	53.8	13.1	53.8	20	14
RIS-G06-***-**-21	83	36	100	162 (169)	119	37	66.7	15	70	26	17.5

Note) 1. For gasket surface dimensions, see RI-G**-* on page F-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	NBR-90 P8	NBR-90 P8	1
	23	O-ring	NBR-90 P9	NBR-90 P9	3
	24	O-ring	NBR-90 P10A	NBR-90 P10A	1
	25	O-ring	NBR-70-1 P11	NBR-70-1 P11	1
	26	O-ring	NBR-90 P18	NBR-90 P28	2
	27	O-ring	NBR-90 G25	NBR-90 P28	1
	28	O-ring	NBR-90 G30	NBR-90 P32	2
	29	Backup ring	T2-P10A	T2-P10A	1
	30	Backup ring	T2-G30	T2-P32	1
Restrictor Valve	46	O-ring	NBR-90 P4		1
	47	O-ring	NBR-90 P9		2
	48	O-ring	NBR-90 P10		1
	49	O-ring	NBR-90 P12.5		1
	50	Backup ring	T2-P10		1

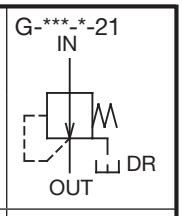
Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. For the *** part of the kit number, specify the valve size (G03, G06).
3. The restrictor valve kit is required only when a shockless valve is included.
4. SS (SA)-G01 pilot valve seal is available separately. For details, see pages E-11 (E-23).

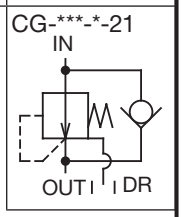
NACHI

PRESSURE REDUCING (AND CHECK) VALVE

Pressure Reducing (and Check) Valve

20 to 280ℓ/min
21MPa





Features

①This valve is used when part of the circuit uses pressure that is lower than the main circuit.
②Even when pressure changes in the primary main circuit, the reduced secondary pressure is adjusted automatically and maintained at a constant level.
③Connecting a remote control valve to the vent port allows remote control of adjustment pressure.
④The mounting surface of the gasket conforms to the ISO standards shown in the table below.

Specifications

Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm²}	Weight kg		Gasket Surface Dimensions
Screw Mounting	Gasket Mounting					T Type	G Type	
(C) G-T03-A-21 B-21	(C) G-G03-A-21 B-21	3/8	21 {214} IN, OUT, Vent Port	20	0.25 to 1 {2.6 to 10.2} 0.3 to 2.5 {3.1 to 25.5}	3.3 (3.6)	3.9 (4.2)	ISO 5781-06-07-0-00
(C) G-T03-1-21 3-21	(C) G-G03-1-21 3-21	3/8		50	0.8 to 7 { 8.2 to 71.4} 3.5 to 21 {35.7 to 214 }	3.3 (3.6)	3.9 (4.2)	
(C) G-T06-1-21 3-21	(C) G-G06-1-21 3-21	3/4		120	0.8 to 7 { 8.2 to 71.4} 3.5 to 21 {35.7 to 214 }	5.7 (6.1)	6.2 (6.6)	ISO 5781-08-10-0-00
(C) G-T10-1-21 3-21	(C) G-G10-1-21 3-21	1¼		280	0.8 to 7 { 8.2 to 71.4} 3.5 to 21 {35.7 to 214 }	10.0 (11.3)	11.8 (13.1)	ISO 5781-10-13-0-00

Weight values in parentheses are for when a check valve is included. The cracking pressure of the check valve is 0.1MPa{1.0kgf/cm²}

Explanation of model No.

(C)G – T 03 – 1 – 21

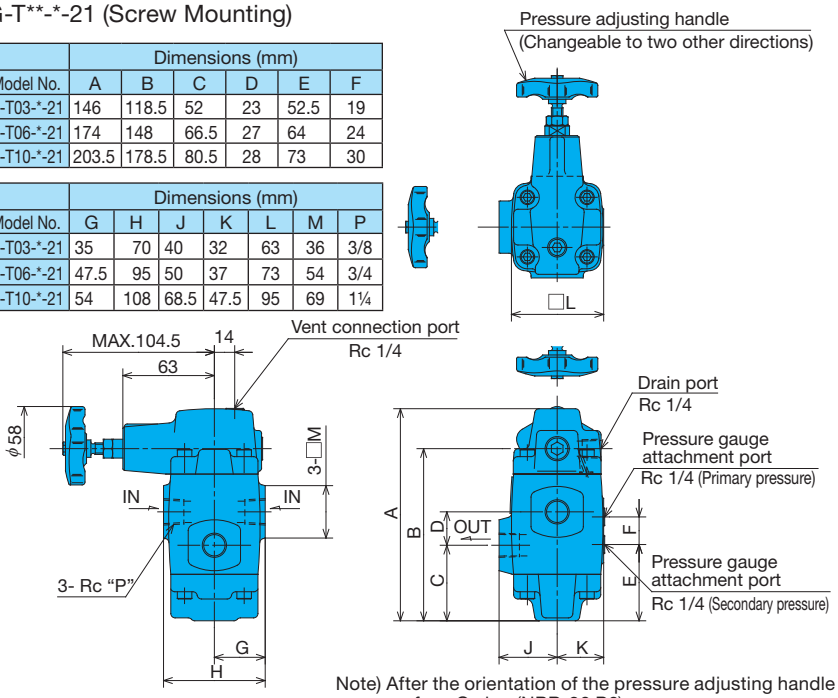
- Design number
- Pressure adjustment ranges 1, 3, A, B
- Nominal diameter (size)
- Mounting method
  T: Screw Mounting G: Gasket Mounting
- Reducing valve
- Reducing and check valve

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	1¼



Note) After the orientation of the pressure adjusting handle has been changed, also modify the cover alignment surface O-ring (NBR-90 P6).

●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 4mm 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 kg	Applicable Pump Model
MG-03-20	3/8	1.6	(C) G-G03-*-21
MG-03X-20	1/2		
MG-06-20	3/4	3.9	(C) G-G06-*-21
MG-06X-20	1		
MG-10-20	1¼	6.7	(C) G-G10-*-21
MG-10X-20	1½		

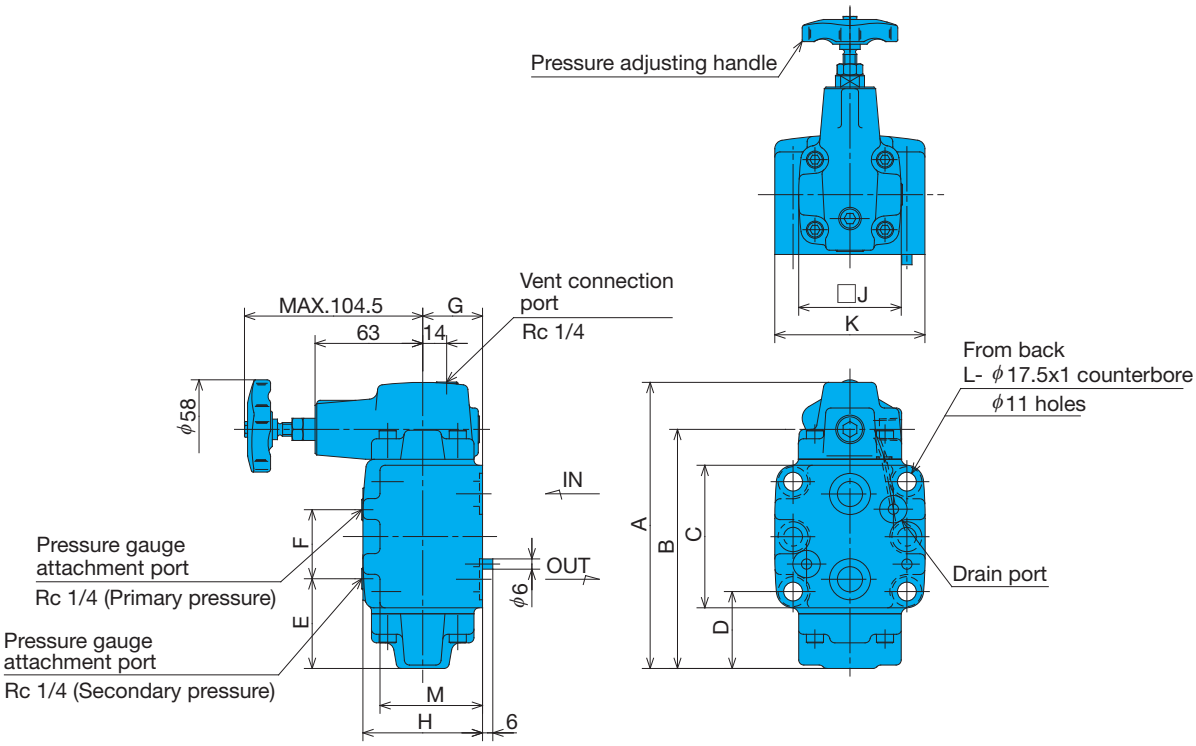
These sub plates can also be used for pressure control valves.

4 The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
(C) G-G03-*-21	M10×75ℓ	4	45 to 55 {460 to 560}
(C) G-G06-*-21	M10×85ℓ	4	
(C) G-G10-*-21	M10×105ℓ	6	

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

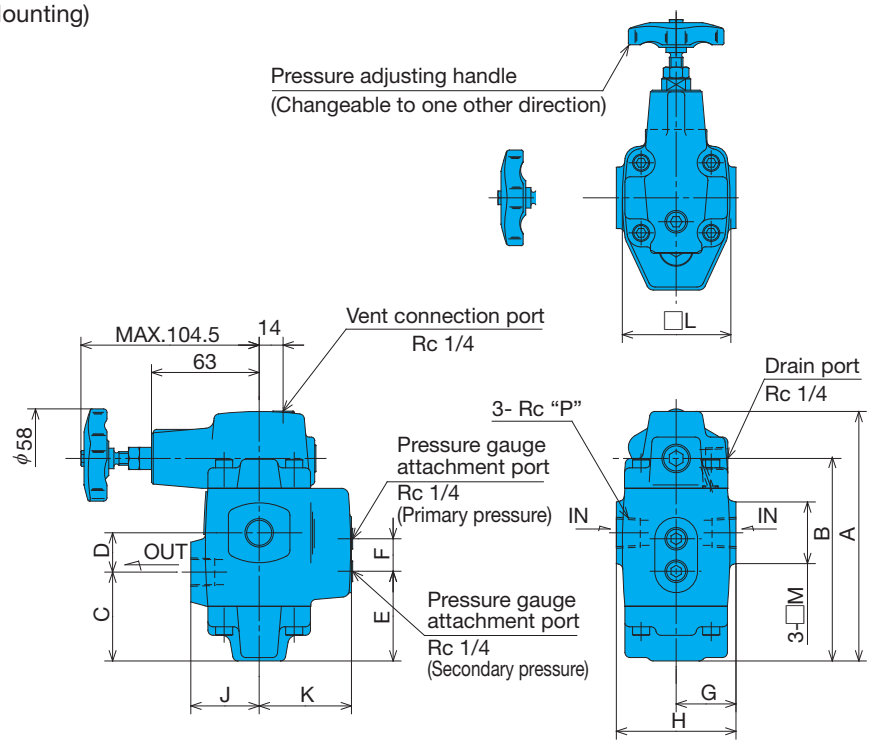
G-G**-*-21 (Gasket Mounting)



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.

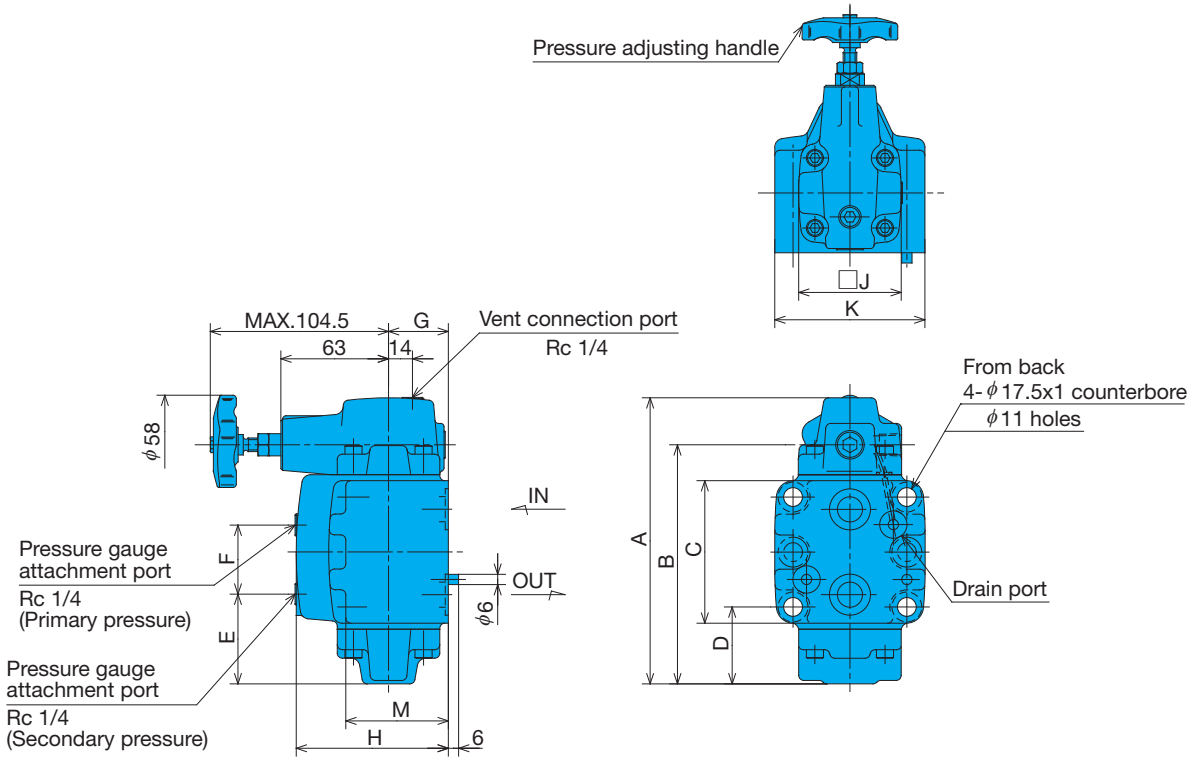
CG-T**-*-21 (Screw Mounting)



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	1¼

Note) After the orientation of the pressure adjusting handle has been changed, also modify the cover alignment surface O-ring (NBR-90 P6).

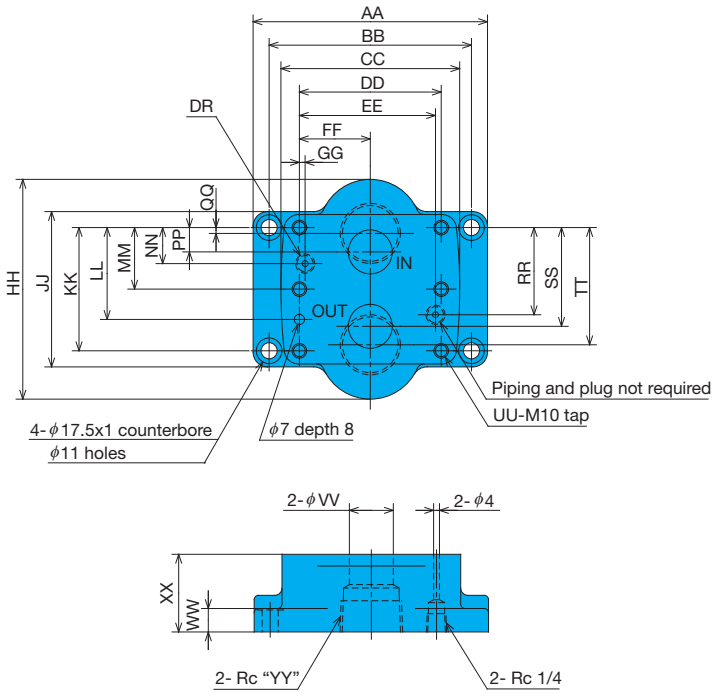
CG-G**-*-21 (Gasket Mounting)



	Dimensions (mm)											
Model No.	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



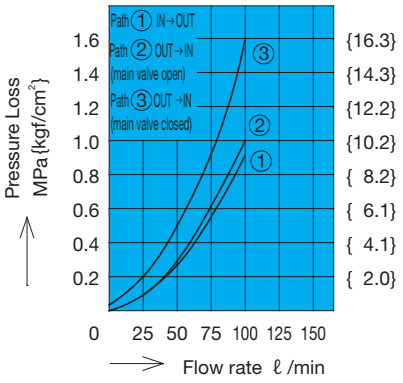
	Dimensions (mm)																					
Model No.	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP	QQ	RR	SS	TT	UU	VV	WW	XX	YY
MG-03-20	128	106.4	88	66.6	58.7	33.3	7.9	76	62	42.9	31.8	–	21.4	7.2	3.5	21.5	35.7	39.5	4	14	11	30	3/8
MG-03X-20																							1/2
MG-06-20	146	123.8	102	79.3	72.9	39.7	6.4	110	82	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	1¼
MG-10X-20																							1½

Performance Curves

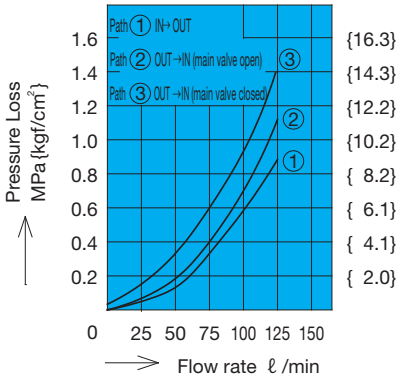
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

(C) G-G03-*-21

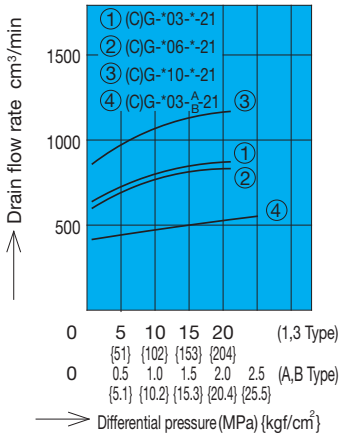


(C) G-G03-*-21

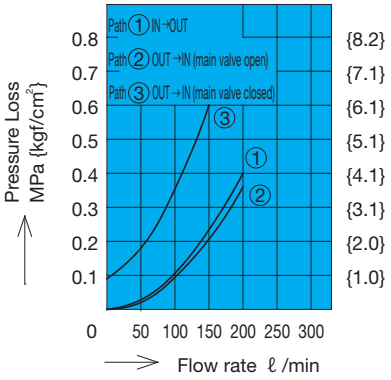


Pressure – Drain Flow Rate Characteristics

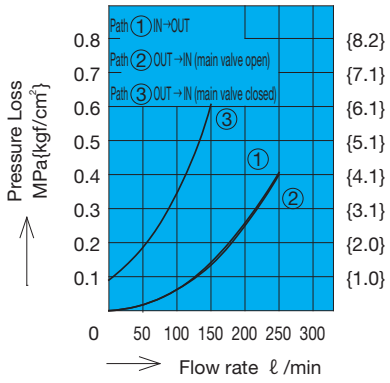
(C) G-***-*-21



(C) G-G06-*-21

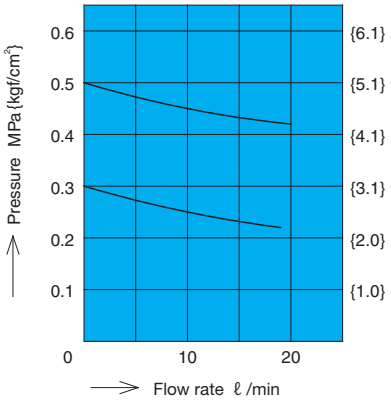


(C) G-T06-*-21

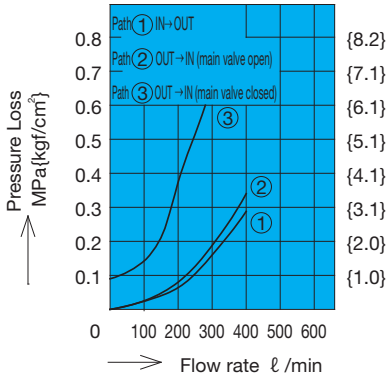


Secondary Pressure – Flow Rate Characteristics

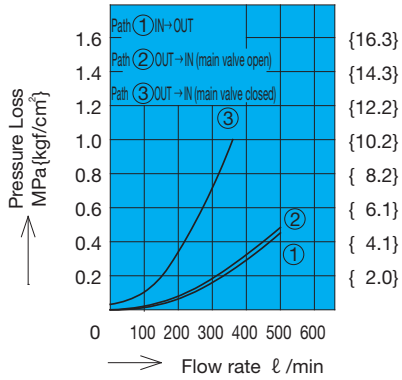
(C) G-*03-$\frac{A}{B}$-21



(C) G-G10-*-21

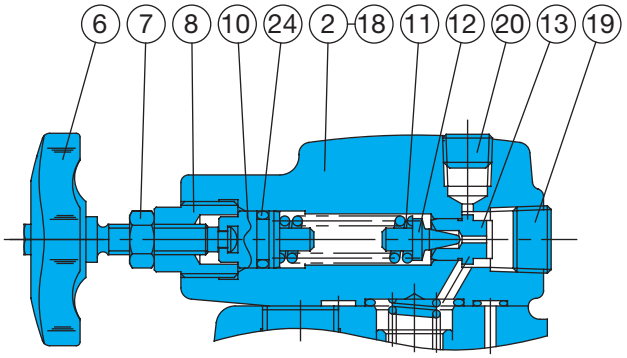


(C) G-T10-*-21

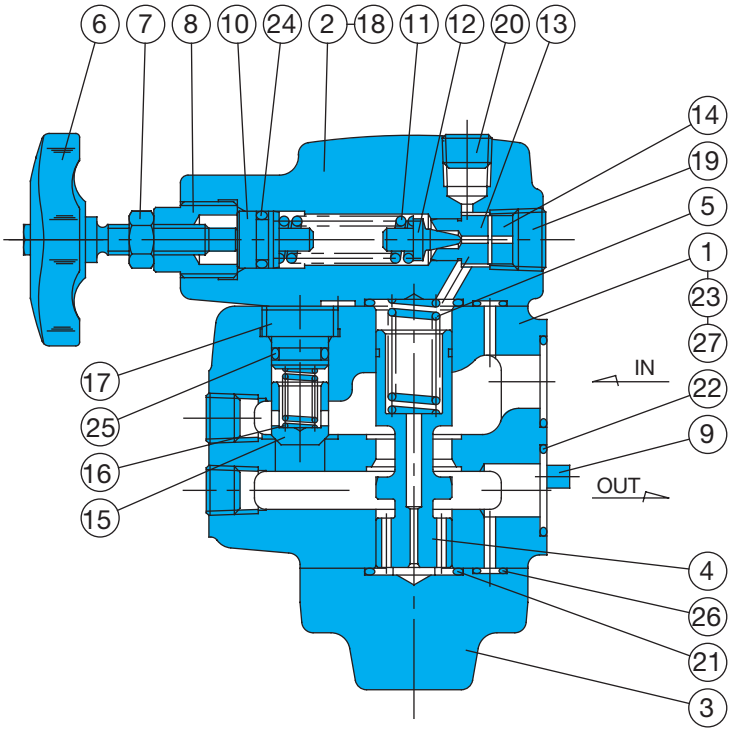


Cross-sectional Drawings

(C) G-G**-$\frac{A}{B}$-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.

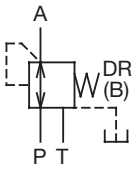
Seal Part List (Kit Model Number RGBS-***(C))

Part No.	Part Name	Type/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	NBR-90 P22	NBR-90 P22	NBR-90 G30	NBR-90 G30	NBR-90 G40	NBR-90 G40	2
22	O-ring	NBR-90 P20	–	NBR-90 P26	–	NBR-90 G35	–	2
23	O-ring	NBR-90 P12	–	NBR-90 P12	–	NBR-90 P12	–	2
24	O-ring	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	1
25	O-ring	NBR-90 P11	NBR-90 P11	NBR-90 P14	NBR-90 P14	NBR-90 P22	NBR-90 P22	1
26	O-ring	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	4

Note) The materials and hardness of the O-ring conforms with JIS B2401.
*** 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)

30 to 50ℓ/min
14MPa



Features

①2-in-1 operation allows a simpler circuit configuration. Combination valve that provides both pressure reducing and counter balance functions.

②Pressure adjustment using a single screw (bolt).

③Compact 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 MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
GR-G01-A1-20 A2	1/8	21 {214} P port	30	0.8 to 7 { 8.2 to 71.4} 3.5 to 14 {35.7 to 143 }	1.5	ISO 4401-03-02-0-05
GR-G03-A1-(B)-20 A2	3/8		50	1.0 to 7 {10.2 to 71.4} 3.5 to 14 {35.7 to 143 }	3.5	ISO 4401-05-04-0-05

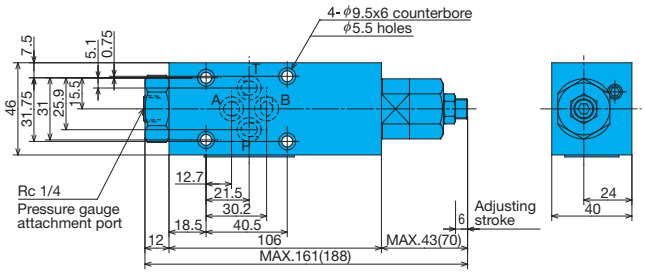
Explanation of model No.

GR – G 03 – A 1 – BK – 20

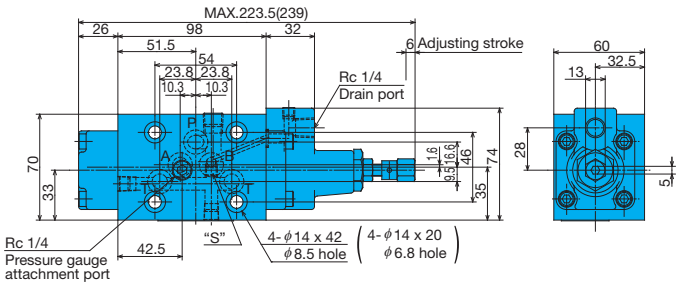
- 20: Design number
  Note: For 03 size, relationship between mounting bolts and design number is indicated as J20: M6, 20: M8.
- BK: Auxiliary symbol
  B: External drain (03 size only)
  K: With handle
- 1: Pressure adjustment range 1, 2
- A: Control port: A port
- 03: Nominal diameter (size)
- G: Mounting method G: Gasket type
- GR: Balancing valve

Installation Dimension Drawings

GR-G01-A*-20



GR-G03-A*-B-20



●Handling

1. 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.
2. For the 01 size, draining is from the gasket side B port.
3. 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 22 to 25N·m {215 to 245kgf·cm} for pipe joints.
4. The drain of 03 size valve that does not have a B auxiliary symbol can be directly from the T port.
5. Make sure that drain back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
6. When an adjustment handle is required for pressure adjustment block, insert K for the type specification.
7. Set the difference between the pressure at the primary circuit (port P) and the secondary circuit (port A) at least 0.5MPa {5 kgf/cm²}.
8. Use the following table for specification when a sub plate is required.

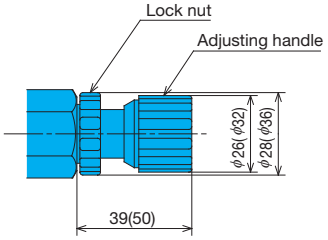
Model No.	Pipe Outlet Size	Weight kg
MSA-01Y-10	3/8	1.2
MS-03-30	3/8	3.8
MS-03X-30	1/2	

9. The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
GR-G01-A*-20	M5×45	4	5 to 7 {51 to 71}
GR-G03-A*-20	M8×30	4	20 to 25 {205 to 255}
GR-G03-A*-J20	M6×50	4	10 to 13 {102 to 133}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Adjusting Handle (Option)



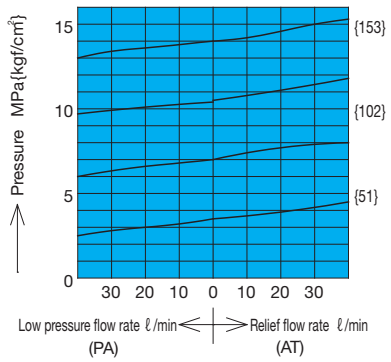
Note) 1. For size 03, an escape valve with piping from the drain discharge port is standard for the drain (GR-G03-A*-B-20).
To change from internal drain to external drain, install a plug (NPTF 1/16) in part S, and remove the drain discharge port plug (RC 1/4).
To change from external drain to internal drain, install a plug (RC 1/4) into the drain discharge port, and remove the S part plug (NPTF 1/15).
In this case, however, the B port cannot be used as the tank port.
2. Dimensions in parentheses show dimensions with handle (K type).

Performance Curves

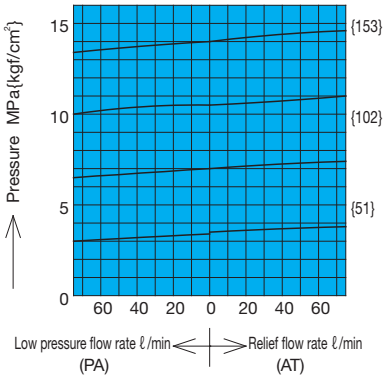
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure – Flow Rate Characteristics

GR-G01-A*-20

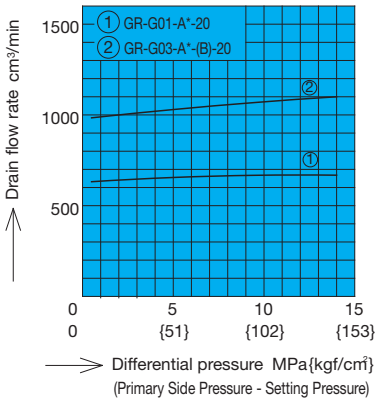


GR-G03-A*-(B)-20



Setting Pressure – Drain Flow Rate Characteristics

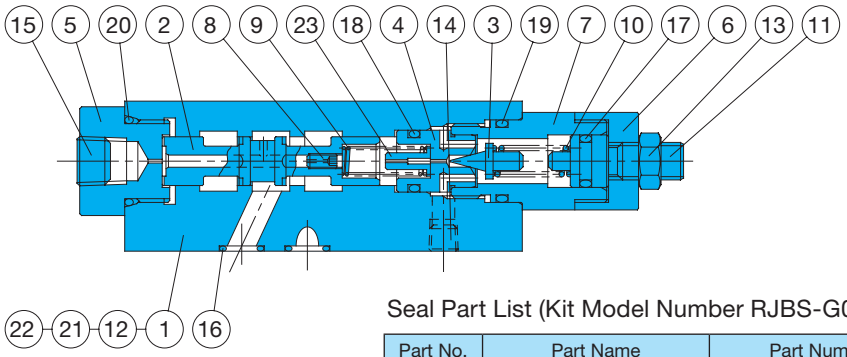
GR-G01-A*-20 ①
GR-G03-A*-(B)-20 ②



Cross-sectional Drawings

Note) The materials and hardness of the O-ring conforms with JIS B2401.

GR-G01-A*-20

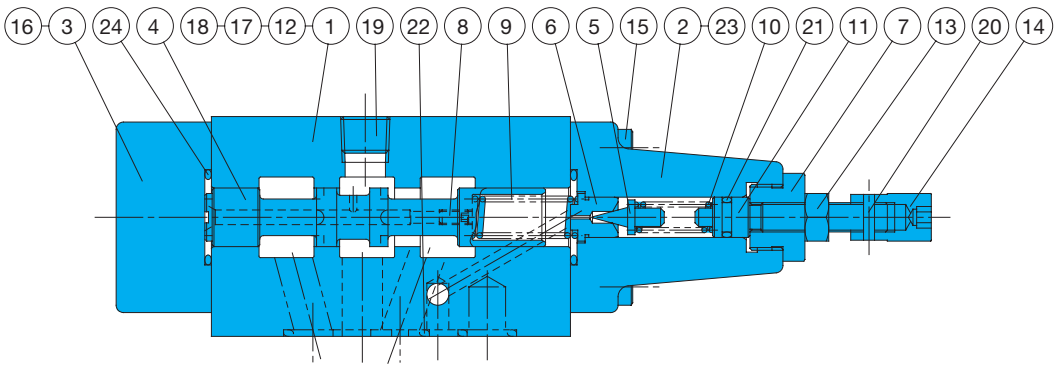


Seal Part List (Kit Model Number RJBS-G01)

Part No.	Part Name	Part Number	Q'ty
16	O-ring	NBR-90 P9	4
17	O-ring	NBR-70-1 P10A	1
18	O-ring	NBR-90 P12.5	1
19	O-ring	NBR-90 P18	1
20	O-ring	NBR-90 P20	1

Part No.	Part Name
1	Body
2	Spool
3	Poppet
4	Seat
5	Bushing
6	Bushing
7	Retainer
8	Choke
9	Spring
10	Spring
11	Screw
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	NBR-70-1 P8	1
22	O-ring	NBR-90 P12	5
23	O-ring	NBR-90 P9	1
24	O-ring	NBR-90 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

50 to 280ℓ/min
14MPa

Features

①This circuit control valve works as a sequence valve, unloading valve, and counter balance valve.

②Maximum operating pressure is 21MPa {214kgf/cm²}.

③Though a direct type valve, there is little pressure override.

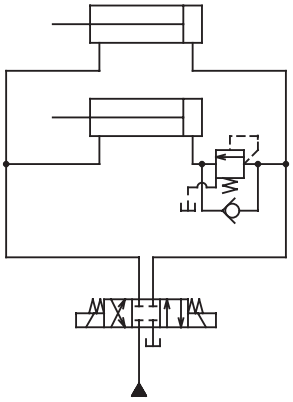
④The mounting surface of the gasket conforms to the ISO standards shown in the table below.

Specifications

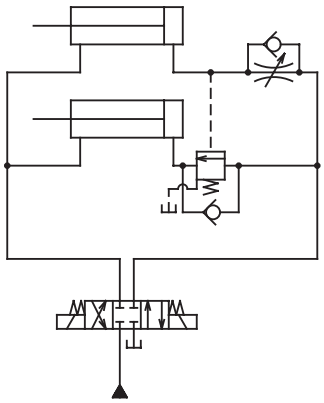
Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm²}	Weight kg		Gasket Surface Dimensions
Screw Mounting	Gasket Mounting					T Type	G Type	
(C) Q-T03-*A-21 B C D E	(C) Q-G03-*A-21 B C D E	3/8	21 {214} IN, OUT, PP Ports	50	Type A 0.25 to 0.85 {2.6 to 8.7} Type B 0.5 to 1.75 {5.1 to 17.9} Type C 0.85 to 3.5 {8.7 to 35.7} Type D 1.75 to 7 {17.9 to 71.4} Type E 3.5 to 14 {35.7 to 143}	2.9 (3.1)	3.5 (3.8)	ISO 5781-06-07-0-00
(C) Q-T06-*A-21 B C D E	(C) Q-G06-*A-21 B C D E	3/4		120		5.0 (5.4)	6.0 (6.5)	ISO 5781-08-10-0-00
(C) Q-T10-*A-21 B C D E	(C) Q-G10-*A-21 B C D E	1¼		280		9.8 (11.1)	11.5 (12.8)	ISO 5781-10-13-0-00

Weight values in parentheses are for when a check valve is included. The cracking pressure of the check valve is 0.1MPa {1.0kgf/cm²}.

Example circuit 1
When using type 2.



Example circuit 2
When using type 3.



Explanation of model No.

(C)Q – G 10 – 1 B – 21

- Design number
- Pressure adjustment range A, B, C, D, E (Note: Type E pressure adjustment is note available for Type 1.)
- Type 1, 2, 3, 4
- Nominal diameter (size)
- Mounting method T: Screw Mounting G: Gasket Mounting
- Pressure control valve
- Pressure control and check valve

●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 1MPa {10.2kgf/cm²}.

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 kg	Applicable Pump Model
MG-03-20	3/8	1.6	(C) Q-G03-**-21
MG-03X-20	1/2		
MG-06-20	3/4	3.9	(C) Q-G06-**-21
MG-06X-20	1		
MG-10-20	1¼	6.7	(C) Q-G10-**-21
MG-10X-20	1½		

Note) These sub plates can also be used for reducing valves.

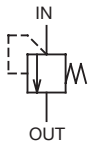
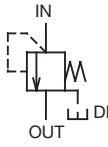
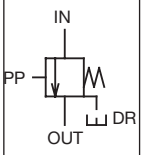
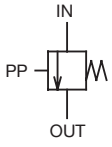
9 The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
(C) Q-G03-**-21	M10×75	4	45 to 55 {460 to 560}
(C) Q-G06-**-21	M10×85	4	
(C) Q-G10-**-21	M10×105	6	

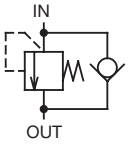
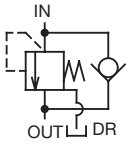
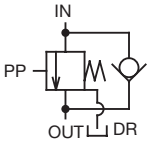
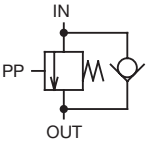
Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

JIS Symbol

Q-***-**-21

Type 1	Type 2	Type 3	Type 4
			

CQ-***-**-21

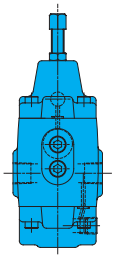
Type 1	Type 2	Type 3	Type 4
			

Type 2 is standard.

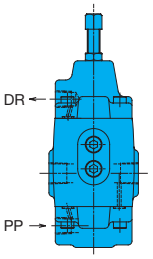
Installation Dimension Drawings

Q-T**-2*-21(Screw Mounting)

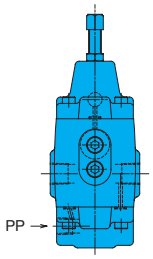
Type 1

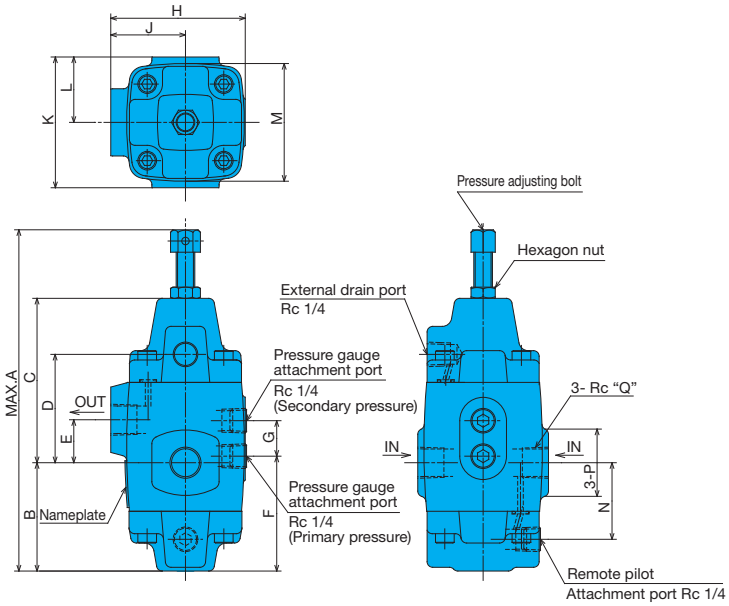


Type 3



Type 4

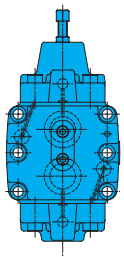




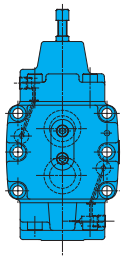
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
(C) Q-T03-**-21	179.5	58	88	58	23	61.5	19	72	40	70	35	63	41	36	3/8
(C) Q-T06-**-21	204.5	69.5	101.5	71.5	27	85	24	87	50	95	47.5	73	52.5	54	3/4
(C) Q-T10-**-21	251	83.5	132.5	87.5	28	89	30	116	68.5	108	54	95	62.5	69	1¼

Q-G**-2*-21 (Gasket Mounting)

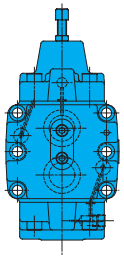
Type 1

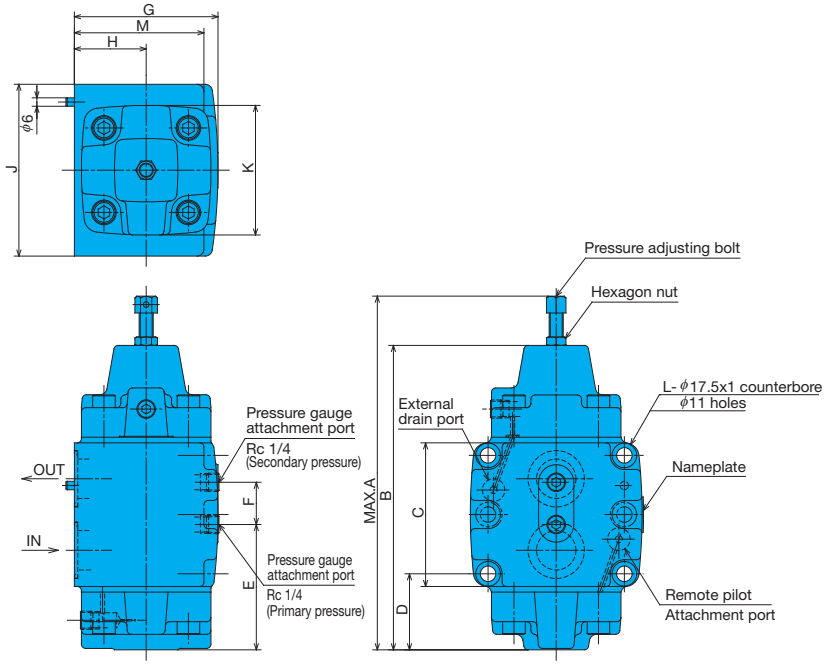


Type 3



Type 4

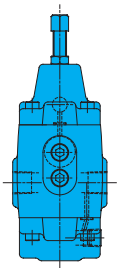




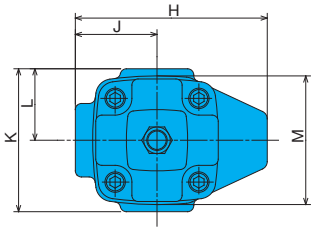
Model No.	A	B	C	D	E	F	G	H	J	K	L	M
Q-G03-**-21	179.5	146	62	45.1	61.5	19	72	35	88	60	4	60
Q-G06-**-21	204.5	171	82	51.4	75	24	80	40	102	70	4	70
Q-G10-**-21	251	216	102	54	89	30	102	51	122	92	6	92

Installation Dimension Drawings

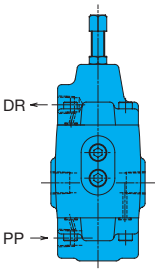
Type 1

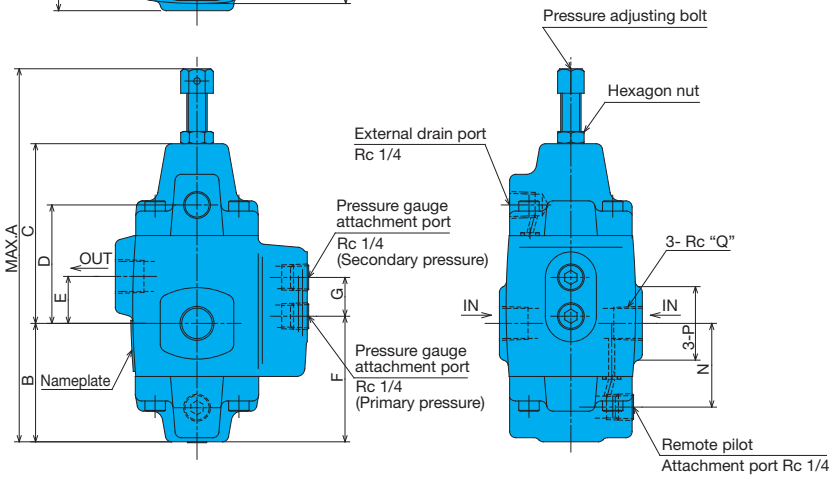


CQ-T**-2*-21 (Screw Mounting)

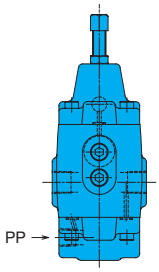


Type 3



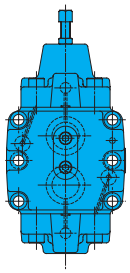


Type 4

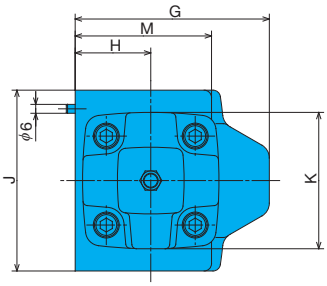


Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
CQ-T03-**-21	179.5	58	88	58	23	61.5	19	94	40	70	35	63	41	36	3/8
CQ-T06-**-21	204.5	69.5	101.5	81.5	27	75	24	110	50	95	47.5	73	52.5	54	3/4
CQ-T10-**-21	251	83.5	132.5	87.5	28	89	30	148.5	68.5	108	54	95	62.5	69	1¼

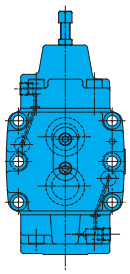
Type 1

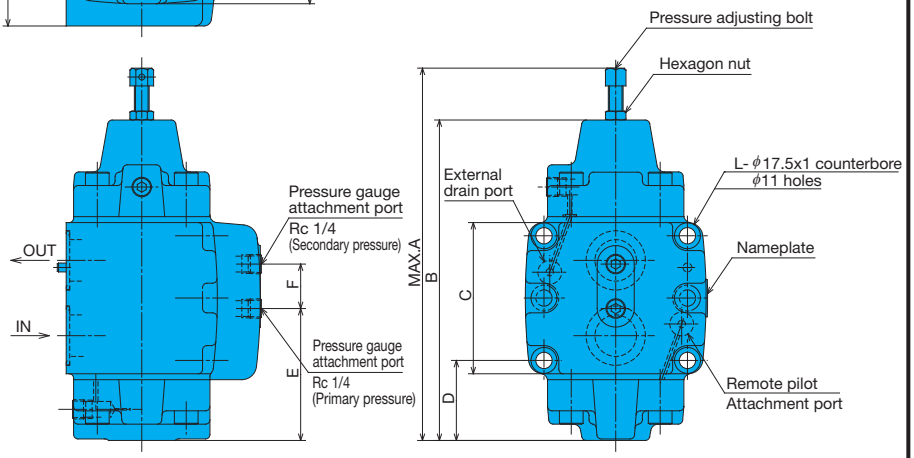


CQ-G**-2*-21 (Gasket Mounting)

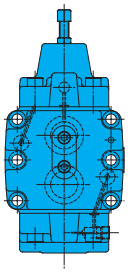


Type 3



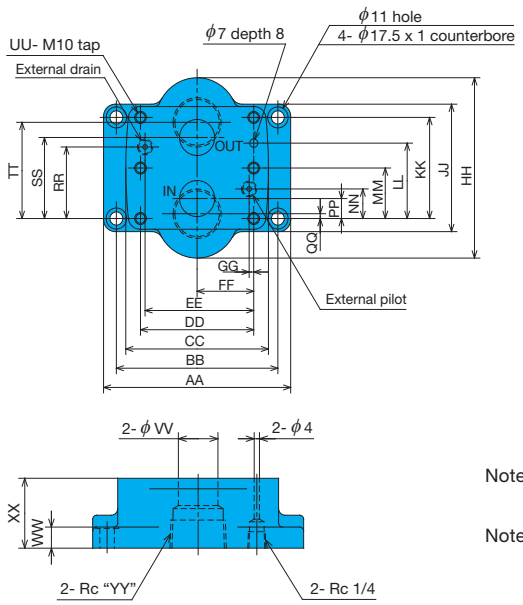


Type 4



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



Note1) The figure shows size 10(X), with four M10 tap holes for size 03(X) and 06(X) valve mounting bolts.
Note2) 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.

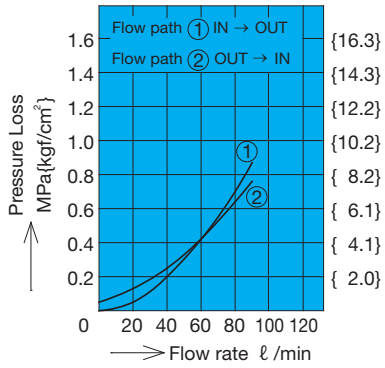
Model No.	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP	QQ	RR	SS	TT	UU	VV	WW	XX	YY
MG-03-20	128	106.4	88	66.6	58.7	33.3	7.9	76	62	42.9	31.8	–	21.4	7.2	3.5	21.4	35.7	39.5	4	14	11	30	3/8
MG-03X-20																							1/2
MG-06-20	160	123.8	102	79.3	72.9	39.7	6.4	110	82	60.3	44.5	–	20.6	11.1	3.7	39.7	49.2	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	1¼
MG-10X-20																							1½

Performance Curves

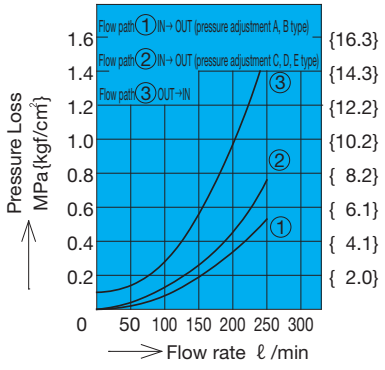
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

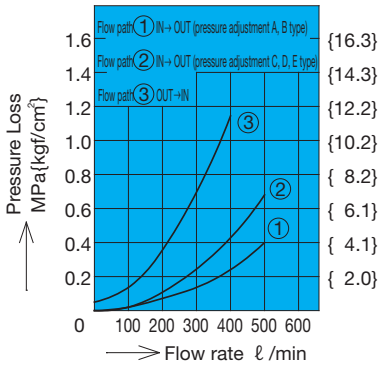
(C) Q-T03-**-21



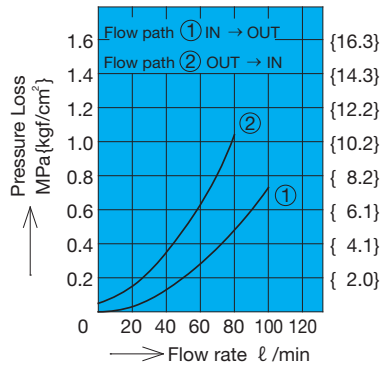
(C) Q-T06-**-21



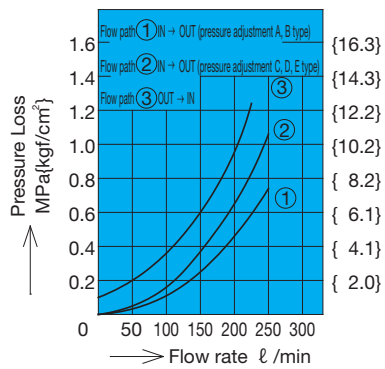
(C) Q-T10-**-21



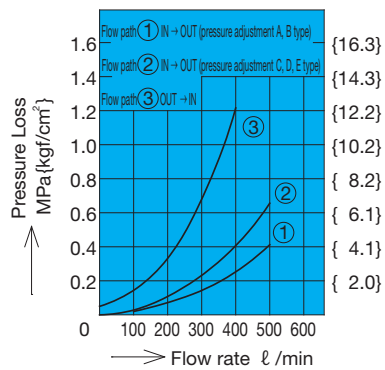
(C) Q-G03-**-21



(C) Q-G06-**-21

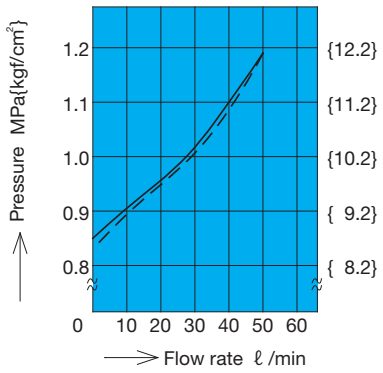


(C) Q-G10-**-21

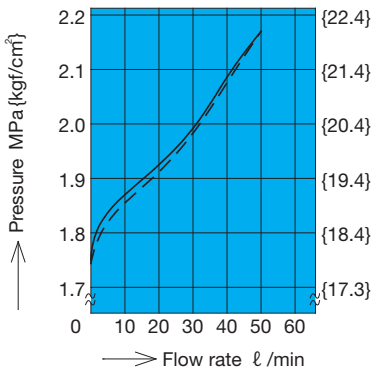


Pressure – Flow Rate Characteristics (—— : Press rise, - - - - - : Pressure drop)

(C) Q-*03-2A-21



(C) Q-*03-2B-21



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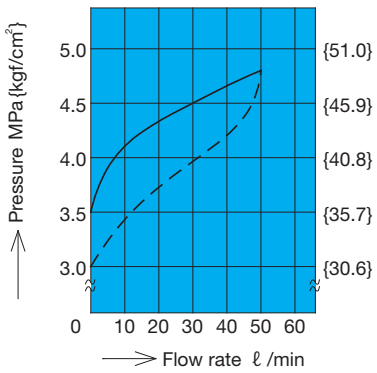

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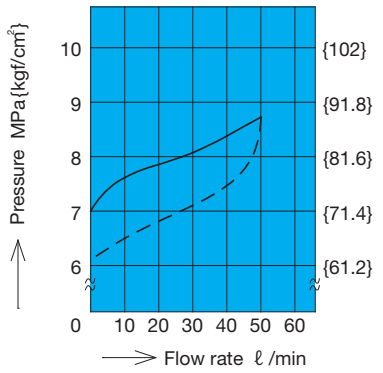

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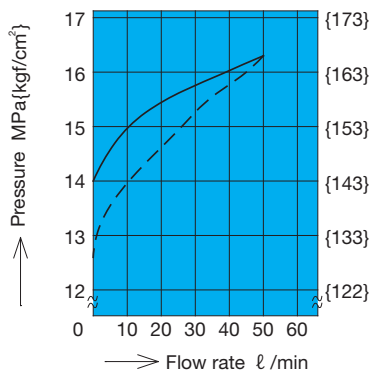

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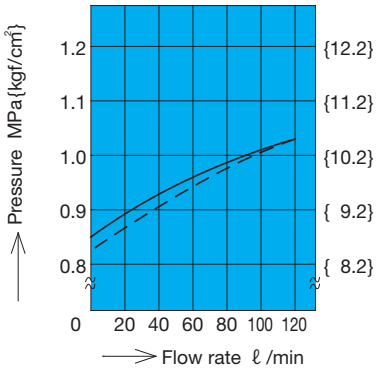

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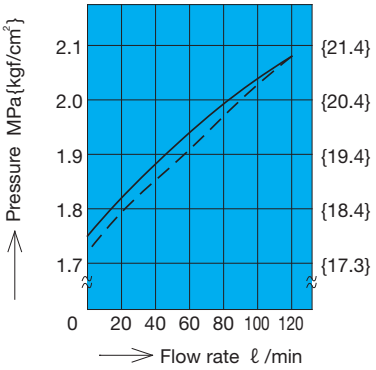

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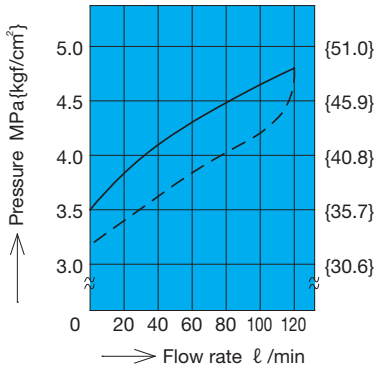
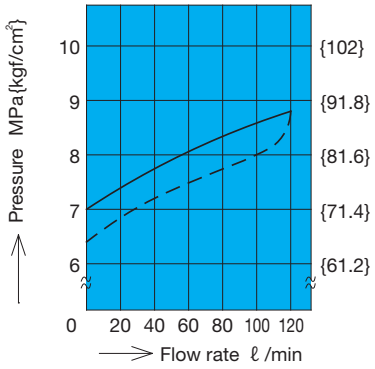


Pressure – Flow Rate Characteristics (—— : Press rise, - - - - - : Pressure drop)

(C) Q-*06-2D-21



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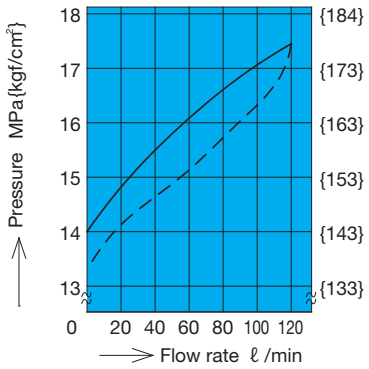

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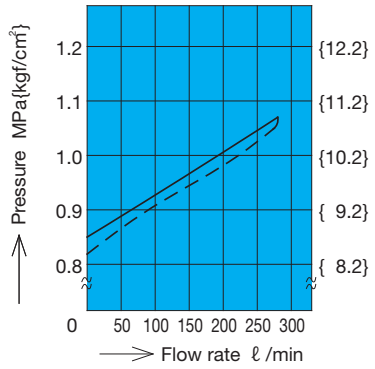

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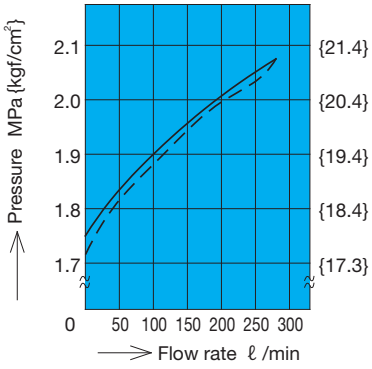

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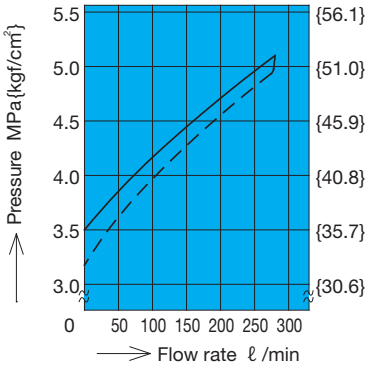

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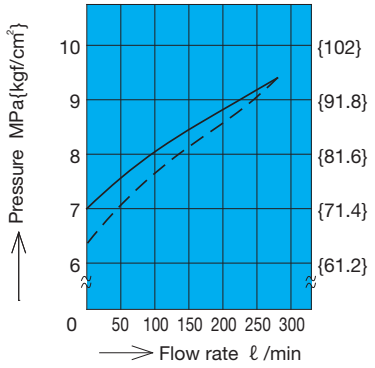

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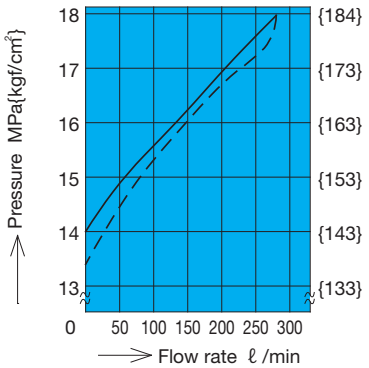
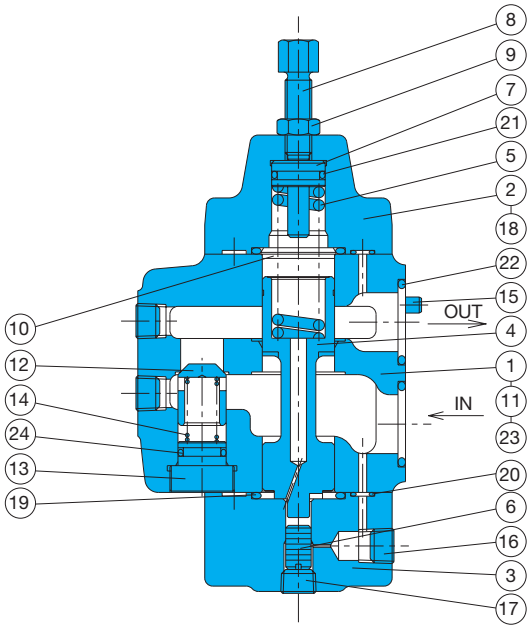


Cross-sectional Drawing

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) Part numbers 12, 13, 14, and 24 are not required when there is no check valve.

Note) The illustration shows the configuration for pressure adjustment ranges Type C, Type D, and Type E. For Type A and Type B, part number 6 plunger is eliminated, and the part number 4 piston, part number 5 spring are different.

Seal Part List (Kit Model Number RQBS-***(C))

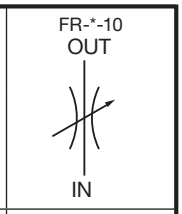
Part No.	Part Name	Type/Part Number						Q'ty
		CQ-G03-**-21	CQ-T03-**-21	CQ-G06-**-21	CQ-T06-**-21	CQ-G10-**-21	CQ-T10-**-21	
19	O-ring	NBR-90 P22	NBR-90 P22	NBR-90 G30	NBR-90 G30	NBR-90 P40	NBR-90 G40	2
20	O-ring	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	4
21	O-ring	NBR-90 P11	NBR-90 P11	NBR-90 P16	NBR-90 P16	NBR-90 P22A	NBR-90 P22A	1
22	O-ring	NBR-90 P20	–	NBR-90 P26	–	NBR-90 G35	–	2
23	O-ring	NBR-90 P12	–	NBR-90 P12	–	NBR-90 P12	–	2
24	O-ring	NBR-90 P11	NBR-90 P11	NBR-90 P14	NBR-90 P14	NBR-90 P22	NBR-90 P22	1

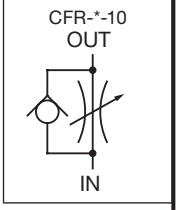
Note) The materials and hardness of the O-ring conforms with JIS B2401.
For the *** part of the kit number, specify the valve size (G03, T06). To specify inclusion of a check valve, add C to the end.

NACHI THROTTLE <AND CHECK> VALVE

Throttle (and Check) Valve

190ℓ/min
21MPa





Features

①Compact and lightweight, requires very little space for installation.
②Special needle valve configuration provides smooth flow rate control.
③Pressure is internally balanced for light handle operation, even at high pressure.

Specifications

Model No.		Nominal Diameter (Size)	Maximum Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm²}	Maximum Working Pressure MPa{kgf/cm²}	Weight kg	
Screw Mounting	Gasket Mounting					T Type	G Type
(C)FR-T03-10	(C)FR-G03-10	3/8	30	0.15{1.5}	21{214}	1.3	1.7
(C)FR-T06-10	(C)FR-G06-10	3/4	75	0.1 {1.0}		3.0	3.7
(C)FR-T10-10	(C)FR-G10-10	1¼	190			5.6	5.8

●Handling

1. The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control handle.
2. The control flow rate does not become zero even if the handle is fully turned.
3. There is no pressure or temperature compensation mechanism.
4. Bi-directional restriction is possible when there is no check valve.
5. Use the table to the right for specification when a sub plate is required.
6. 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 N·m{kgf·cm}
(C)FR-G03-10	M8 × 65ℓ	4	20 to 25{ 205 to 255}
(C)FR-G06-10	M12 × 75ℓ	4	75 to 95{ 765 to 969}
(C)FR-G10-10	M14 × 90ℓ	4	120 to 150{1220 to 1530}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

●Sub Plate

Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg	Applicable Valve Type
MFR-03-10	3/8	30	1.0	(C)FR-G03-10
MFR-06-10	3/4	75	2.2	(C)FR-G06-10
MFR-10-10	1¼	190	4.1	(C)FR-G10-10

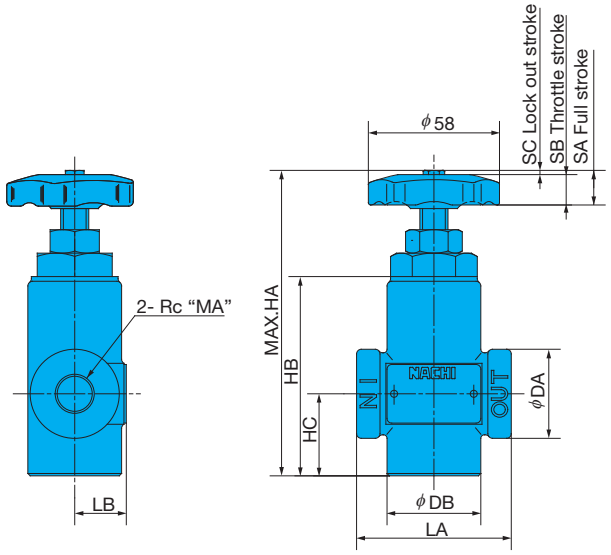
Explanation of model No.

(C)FR – G 03 – 10

- 10 — Design number
- 03 — Nominal diameter (size)
- G — Mounting method (T: Screw Mounting G: Gasket Mounting)
- FR — Throttle valve
- (C)FR — Throttle and check valve

Installation Dimension Drawings

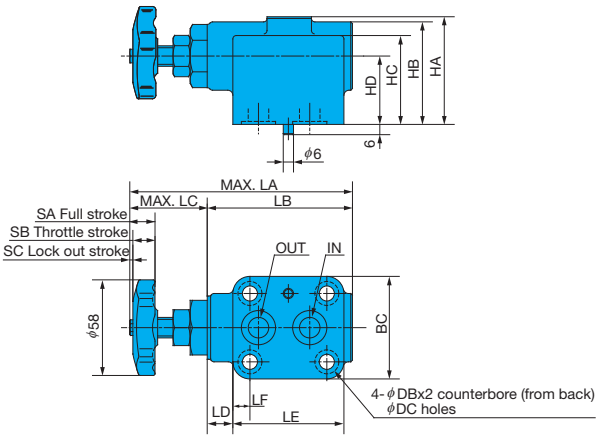
(C)FR-T**-10 (Screw Mounting)



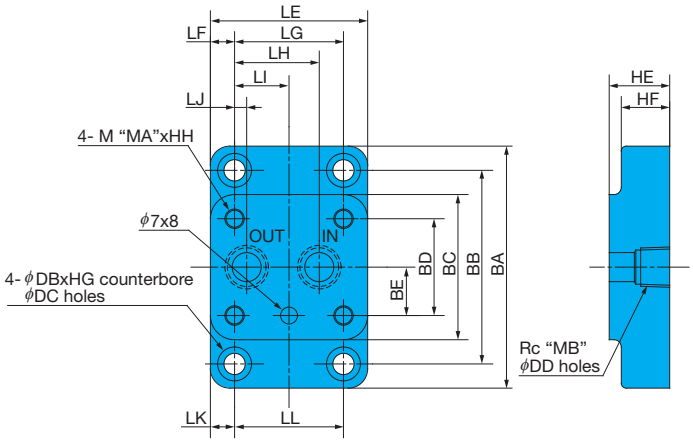
Model No.	LA	LB	DA	DB
(C)FR-T03-10	66	21.5	38	40
(C)FR-T06-10	95	30.5	55	55
(C)FR-T10-10	130	38.5	74	70

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	1¼

(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	1¼	14	12	2

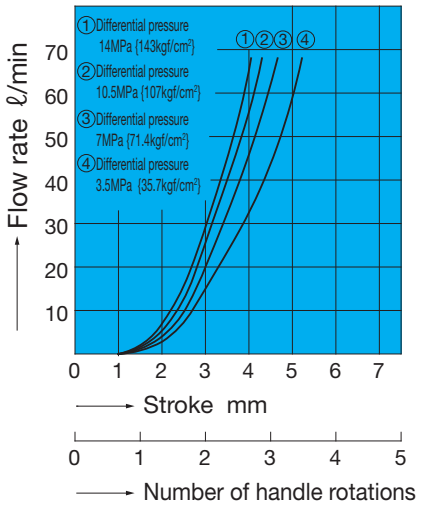
Model Number	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	BA	BB	BC	BD	BE	HA	HB	HC	HD	HE	HF	HG	HH
(C)FR-G03-10	130.5	85	45	15	65	10	45	35	22.5	5	10	45	100	80	60	40	20	63	60	52	40	25	20	8.6	18
(C)FR-G06-10	175.5	123	52	14	96	13	70	55	35	15	14	68	132	106	80	54	27	71	68	57	40	30	25	13	20
(C)FR-G10-10	206.5	150	56	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

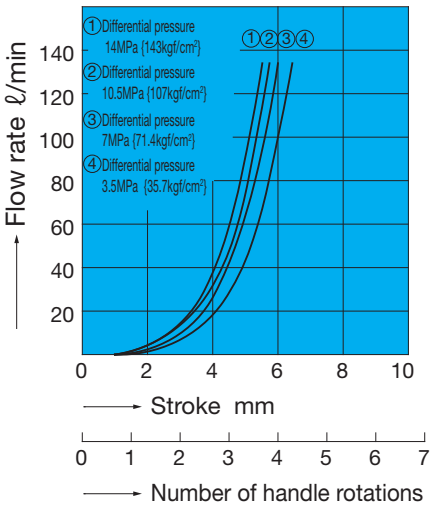
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Stroke – Flow Rate Characteristics

(C)FR-*03-10



(C)FR-*06-10



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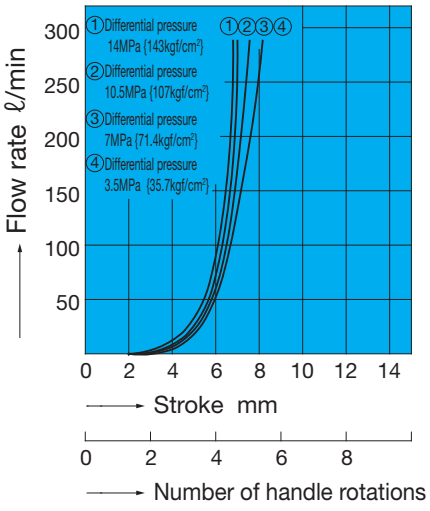
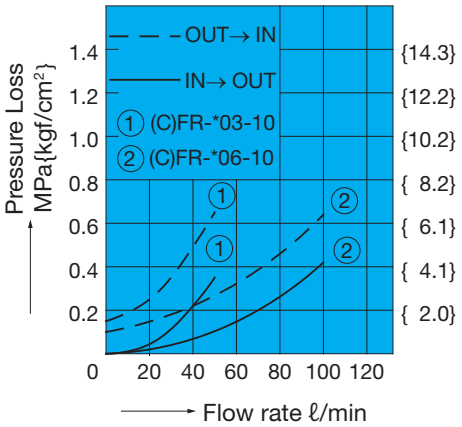
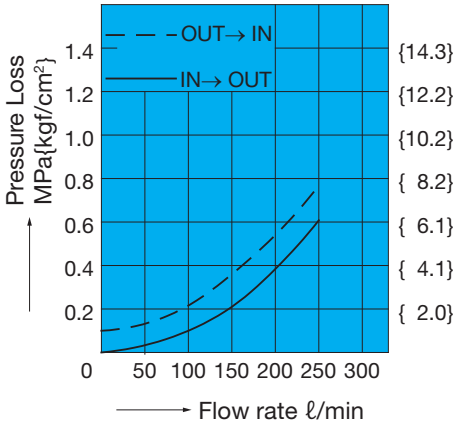


Pressure Loss Characteristics

(C)FR-*03-10
(C)FR-*06-10

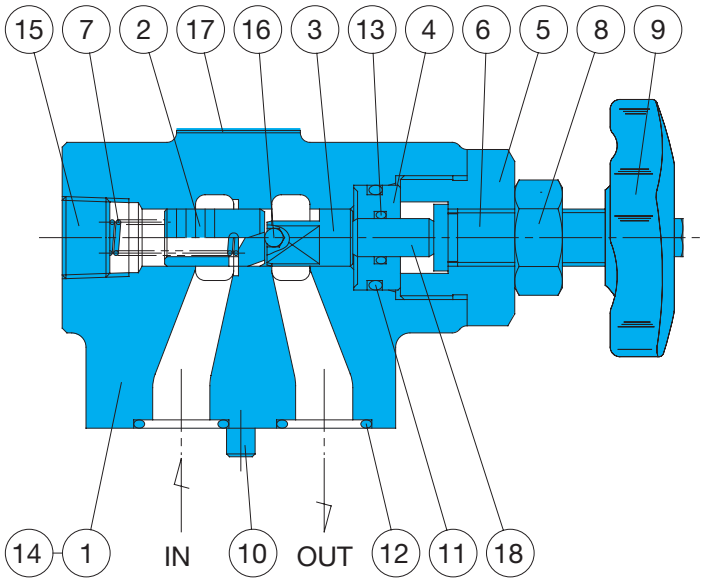


(C)FR-*10-10



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	NBR-90 P18	1	NBR-90 G25	1	NBR-90 G25	1
12	O-ring	NBR-90 P16	2	NBR-90 G25	2	NBR-90 G35	2
13	O-ring	NBR-90 P8	1	NBR-90 P8	1	NBR-90 P8	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.
*** in the kit number is used for specification of the valve size (G03, T06, etc.)

NACHI

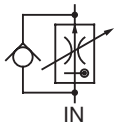
TEMPERATURE COMPENSATED FLOW CONTROL <AND CHECK> VALVE

FT Type Flow Control (and Check) Valve (With Pressure and Temperature Compensation)

0.05 to 106ℓ/min
21MPa

FT-G0*-**-22

CFT-G02-*-22



Features

①Pressure compensation and temperature compensation mechanisms provide a stable control flow rate, even when oil temperature fluctuates.

②A wider control flow rate range as well as easier minute flow rate adjustability than previous products.

Specifications

Model No.	Nominal Diameter (Size)	Volume control flow rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Reverse Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
(C)FT-G02- 8-22 30-22	1/4	0.05 to 8 0.1 to 30	21{214}	50	0.1{1.0}	3.7	ISO 6263-06-05-0-97
FT-G03- 42-22 106-22	3/8	0.1 to 42 0.2 to 106		*120		7.9	ISO 6263-07-09-0-97

Asterisk (*) indicates values for auxiliary plate with check valve.

●Handling

1 In the temperature range of 20°C to 60°C, flow rate fluctuation is within ±5% of the standard flow rate at 40°C.

2 In the pressure range of 1.0 to 21MPa {10.2 to 214kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.

3 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.

4 When controlling flow rates that are less than 0.2ℓ/min, use with a filter that does not exceed 10μm.

5 For flow rate control, make sure that the pressure differential between the input port and output port is at least 1MPa {10.2kgf/cm²}.

6 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 ℓ/min	Weight kg	Applicable Valve Type	Use With Sub Plate
Sub Plate	MF-02X-10	3/8	30	2.2	(C)FT-G02-*-22	—
	MF-02Y-20	1/2	50			
Sub Plate	MF-03-10	3/8	42	3.3	FT-G03-**-22	—
	MF-03Y-20	3/4	75			
	MF-03Z-20	1	120	4.7		
Sub Plate with Check Valve	MF-03Y-C-22	3/4	75	5.7		
	MF-03Z-C-22	1	120	5.6		
Auxiliary Plate A with Check Valve	MCF-03-A-22	φ23	120	3.2		MF-03*-*

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 N·m{kgf·cm}
(G)FT-G02-*-22	M8 × 55ℓ	4	20 to 25{205 to 255}
FT-G03-*-22	M10 × 75ℓ	4	45 to 55{460 to 560}
With FT-G03 Auxiliary Plate	M10 × 110ℓ	4	45 to 55{460 to 560}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Explanation of model No.

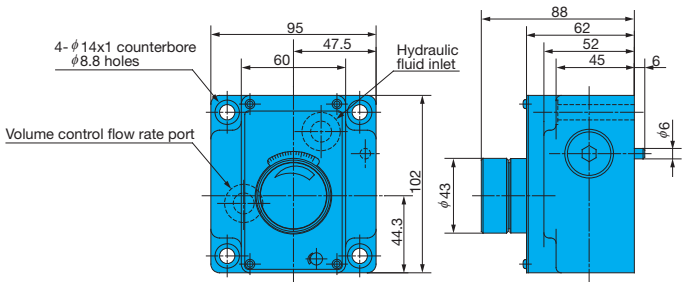
(C) FT – G 02 – 8 – (F) – 22

- 22 — Design number
- (F) — Anti-jumping mechanism (option)
- 8 — Maximum control flow rate
- 02 — Nominal diameter (size)
- G — Mounting method G: Gasket type
- FT — Temperature compensated flow control valve
- (C) — Temperature compensated flow control and check valve

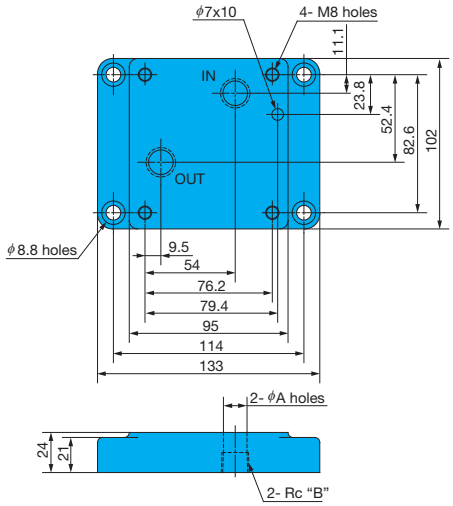
G Flow Control Valve

Installation Dimension Drawings

(C)FT-G02-**-22

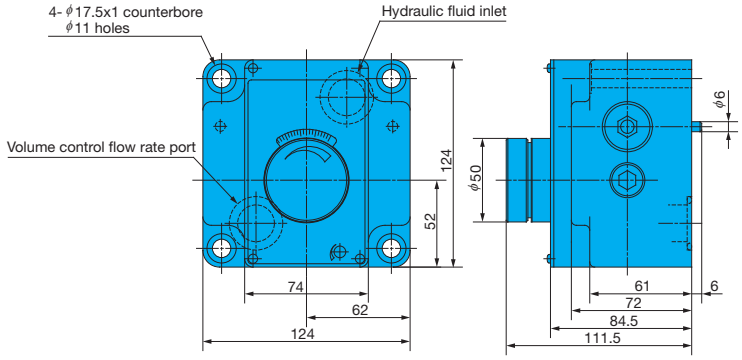


Sub Plate MF-02*-*



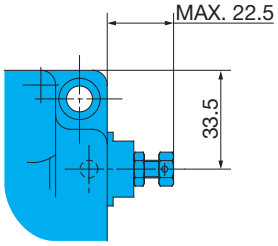
Sub Plate	A	B
MF-02X-10	14.7	3/8
MF-02Y-20	17	1/2

FT-G03-***-22

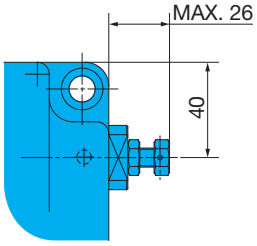


Anti-jumping mechanism

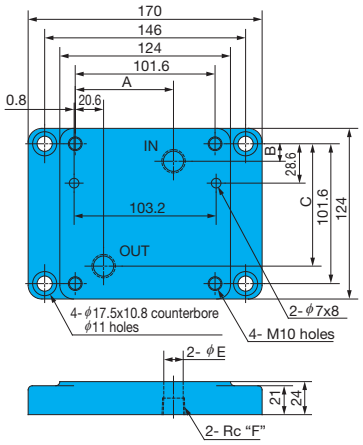
(C)FT-G02-*-F-22



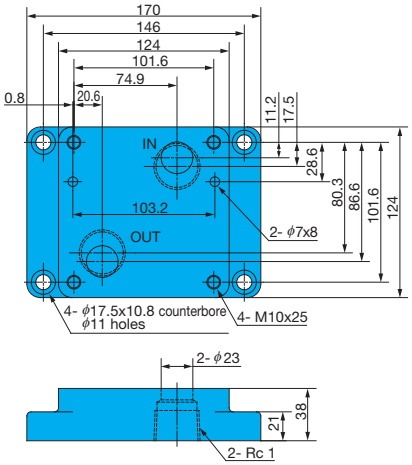
(C)FT-G03-**-F-22



Sub Plate MF-03-10
MF-03Y-20

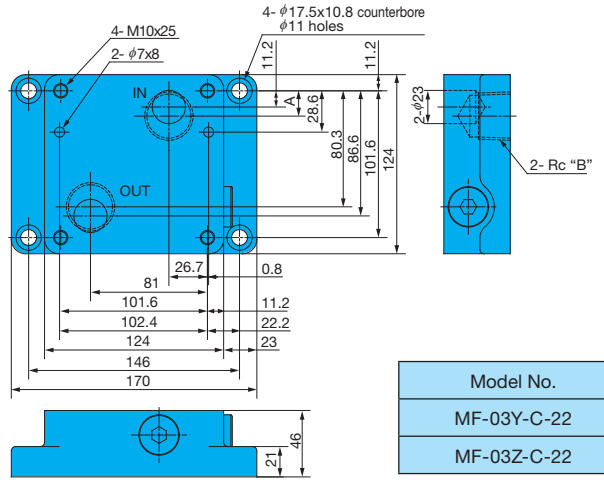


MF-03Z-20



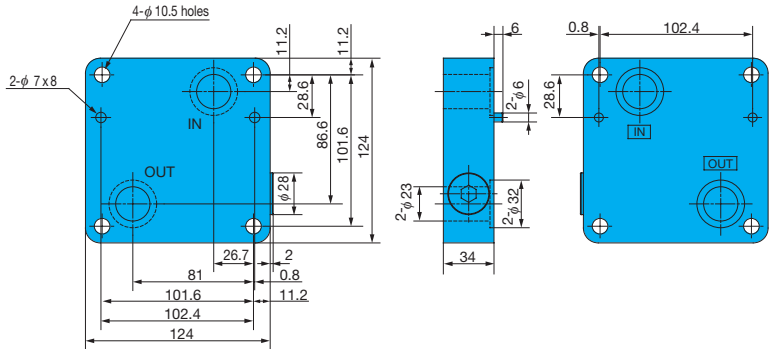
Sub Plate	A	B	C	E	F
MF-03-10	71.4	12.7	88.9	14.7	3/8
MF-03Y-20	74.9	11.2	86.6	23.0	3/4

Sub Plate with Check Valve MF-03*-C-22



Model No.	A	B
MF-03Y-C-22	11.2	3/4
MF-03Z-C-22	17.5	1

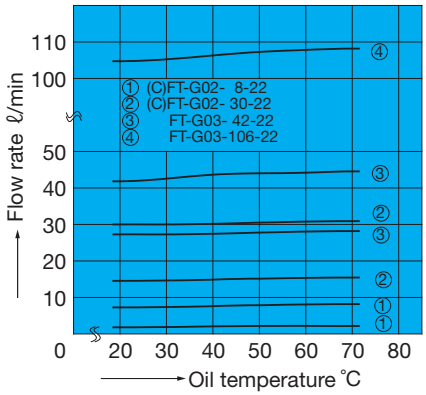
Auxiliary Plate with Check Valve MCF-03-A-22



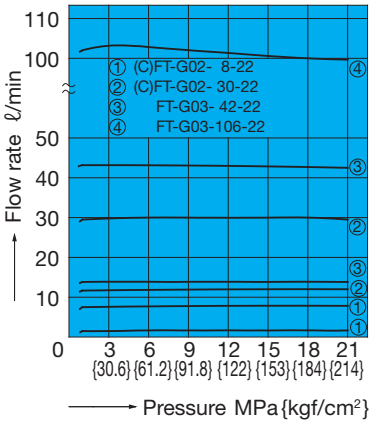
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

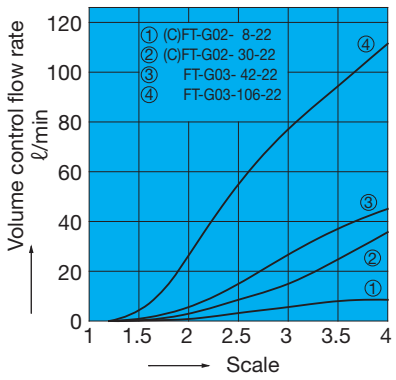
Oil Temperature — Control Flow Rate Characteristics



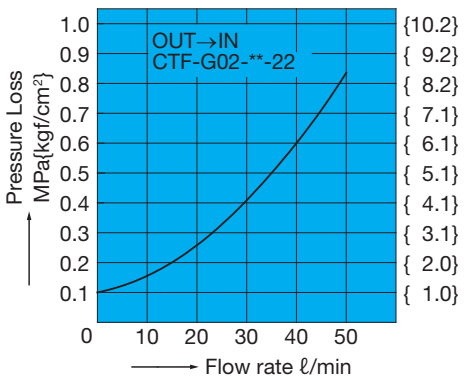
Pressure — Control Flow Rate Characteristics



Scale — Control Flow Rate Characteristics

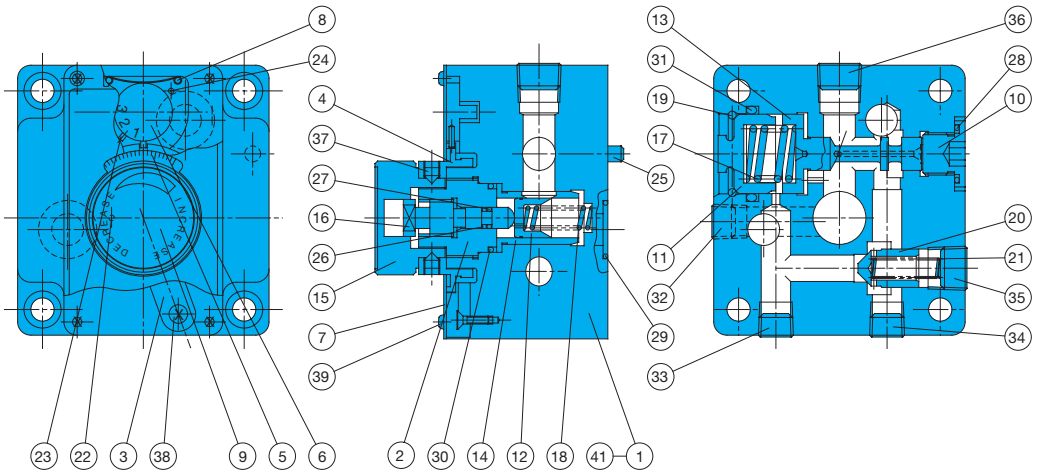


Pressure Loss Characteristics



Cross-sectional Drawings

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		

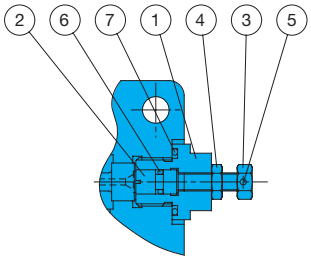
List of Sealing Parts

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	NBR-90 P5	1	NBR-90 P5	1
28	O-ring	NBR-90 P18	1	NBR-90 P20	1
29	O-ring	NBR-90 P18	2	NBR-90 P26	2
30	O-ring	NBR-90 P22	1	NBR-90 P26	1
31	O-ring	NBR-90 P30	1	NBR-90 P38	1
41	O-ring	–	–	NBR-90 P20	1
Seal Kit Number		FBBS-G02-1A		FBBS-G03	

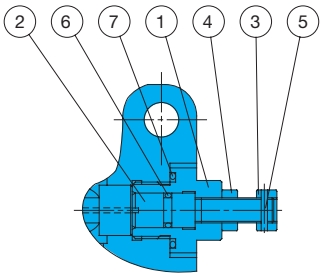
Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. Backup ring indicates JIS B2407-T2**.

Anti-jumping mechanism

(C)FT-G02-*-F-22



(C)FT-G03-*-22



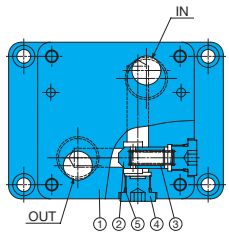
Part No.	Part Name
1	Retainer
2	Bolt
3	Nut
4	Nut
5	Spring pin
6	O-ring
7	O-ring

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	NBR-90 P5	1	NBR-90 P8	1
7	O-ring	NBR-90 P18	1	NBR-90 P20	1

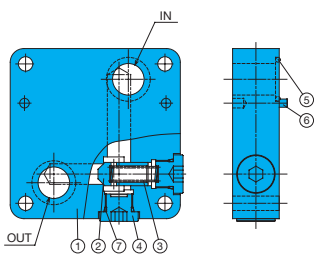
Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. The part number 7 O-ring and part number 28 O-ring are interchangeable.

Sub Plate MF-03*-C-22



Part No.	Part Name	Part No.	Part Name
1	Sub Plate	4	Plug
2	Poppet	5	O-ring
3	Spring		

MCF-03-A-22



Part No.	Part Name
1	Sub Plate
2	Poppet
3	Spring
4	Plug
5	O-ring
6	Pin
7	O-ring
8	Screw

List of Sealing Parts

Part No.	Part Name	Part Number	Q'ty
5	O-ring	NBR-90 P18	2

List of Sealing Parts

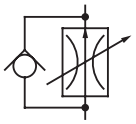
Part No.	Part Name	Part Number	Q'ty
5	O-ring	NBR-90 P26	2
7	O-ring	NBR-90 P18	2

F Type Flow Control (and Check) Valve (With Pressure Compensation)

9 to 373ℓ/min
21MPa

F-G**-*-20
OUT

IN

CF-G**-*-20
OUT

IN

Features

①Wide control flow rate range.
②A 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 ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Cracking pressure MPa{kgf/cm²}	Weight kg	Gasket Surface Dimensions
(C)F-G06-170-20	3/4	9 to 170	21{214}	0.1{1.0}	20.5	ISO 6263-08-13-0-97
(C)F-G10-373-20	1¼	20 to 373			43.1	—

●Handling
1 In the pressure range of 1.0 to 21MPa {10.2 to 214kgf/cm²}, flow rate fluctuation is within ±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 1.0MPa {10.2kgf/cm²}.
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 ℓ/min	Weight kg	Applicable Valve Type
MF-06-20	3/4	106	6.3	(C)F-G06-170-20
MF-06X-20	1	170	9.7	

Applicable Model	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
(C)F-G06	M16 × 100ℓ	4	190 to 235{1940 to 2400}
(C)F-G10	M20 × 115ℓ	4	370 to 460{3770 to 4690}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

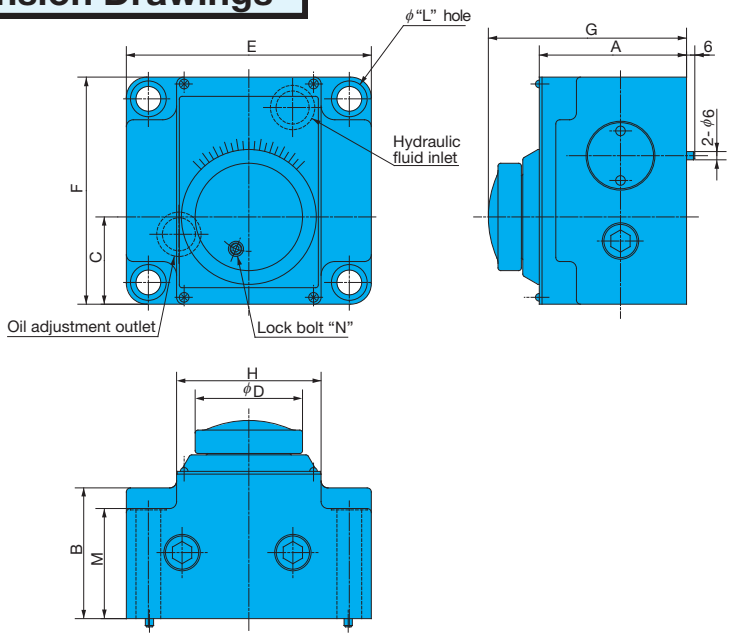
Explanation of model No.

(C) F – G 06 – 170 – 20

- Design number
- Maximum control flow rate
- Nominal diameter (size)
- Mounting method G: Gasket type
- Flow control valve
- Flow control and check valve

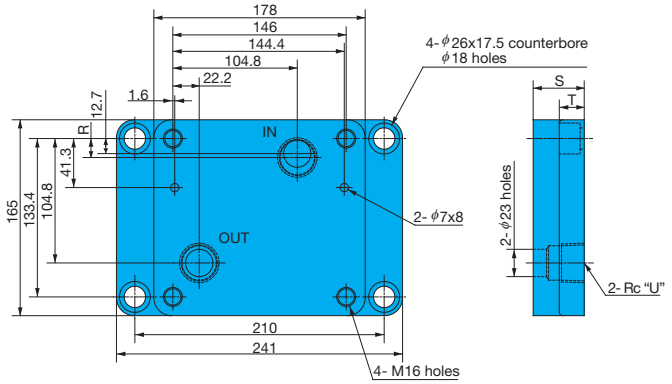
Installation Dimension Drawings

(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

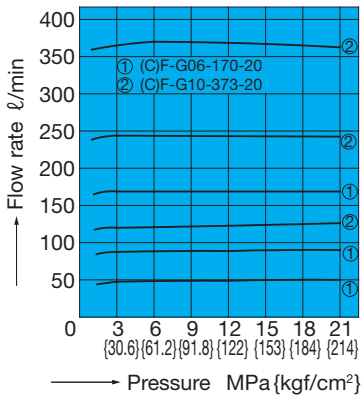


Sub Plate	Dimensions mm			
	R	S	T	U
MF-06-20	12.7	25	22	3/4
MF-06X-20	16	43	21	1

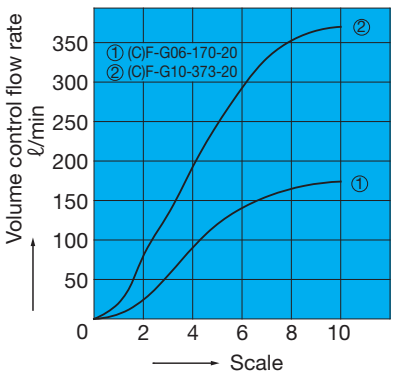
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

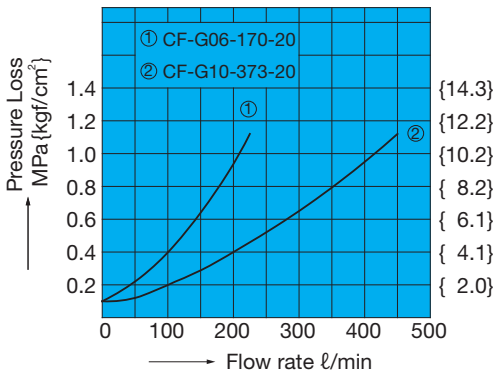
Pressure – Control Flow Rate Characteristics



Scale – Control Flow Rate Characteristics

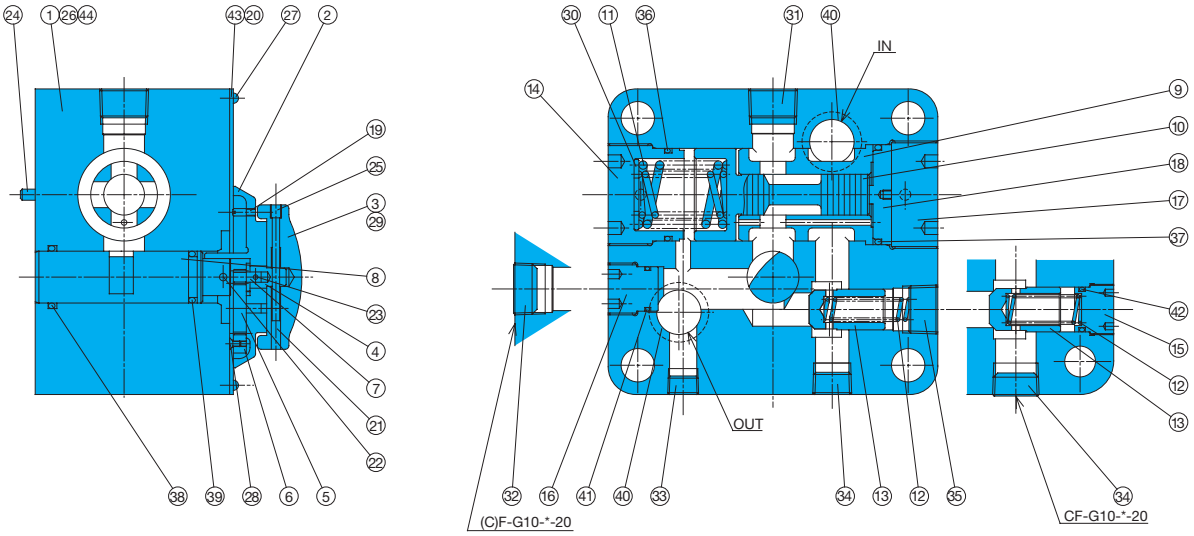


Pressure Loss Characteristics



Cross-sectional Drawing

CF-G**-**-20



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	16	Plug	31	Plug
2	Cover	17	Plug	32	Plug
3	Knob	18	Retainer	33	Plug
4	Gear	19	Stopper	34	Plug
5	Gea	20	Pin	35	Plug
6	Gear	21	Pin	36	O-ring
7	Bushing	22	Pin	37	O-ring
8	Throttle	23	Pin	38	O-ring
9	Sleeve	24	Pin	39	O-ring
10	Piston	25	Screw	40	O-ring
11	Spring	26	Screw	41	O-ring
12	Spring	27	Screw	42	O-ring
13	Poppet	28	Screw	43	Plate
14	Plug	29	Screw	44	Screw
15	Plug	30	Washer		

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	NBR-90 G45	1	NBR-90 G60	1
37	O-ring	NBR-90 P48	1	NBR-90 G65	1
38	O-ring	NBR-90 P28	1	NBR-90 P45	1
39	O-ring	NBR-90 P22A	1	NBR-90 P39	1
40	O-ring	NBR-90 P29	2	NBR-90 P32	2
41	O-ring	NBR-90 P20	1	—	—
42	O-ring	—	—	NBR-90 P26	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.
For the *** part of the kit number, specify the valve size (G06, G10).

NACHI

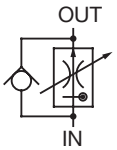
TEMPERATURE COMPENSATED
FLOW CONTROL <AND CHECK> VALVE

TN Type Flow Control (and Check) Valve
(Fine Adjustment Type With Pressure and Temperature Compensation)

0.03 to 8ℓ/min
10.5MPa

TN-G02-*-11

CTN-G02-*-11



Features

①With a very compact, lightweight configuration, the intelligent design of this valve makes it a low-cost option.
②Minute flow rate control from 30cm³.
③Stable control of each setting flow rate, even as pressure and oil temperature are fluctuating.
④Dial markings are proportional to flow rate for simple and accurate control flow rate adjustment.

Specifications

Model No.	Nominal Diameter (Size)	Volume control flow rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Reverse Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm²}	Weight kg
(C)TN-G02-2-11 -8-11	1/4	0.03 to 2 0.05 to 8	10.5{107}	35	0.1{1.0}	2.2

●Handling

1 In the temperature range of 20°C to 60°C, flow rate fluctuation is within ±5% of the standard flow rate at 40°C.
2 In the pressure range of 1.0 to 10.5MPa {10.2 to 107kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.
3 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.
4 When controlling flow rates that are less than 0.2ℓ/min, use with a filter that does not exceed 10μm.
5 Make sure that the pressure differential between the inlet port and outlet is at least 0.6MPa {6.1kgf/cm²} at 4ℓ/min or less, and at least 1.0MPa {10.2kgf/cm²} at 4ℓ/min or greater.
6 The control flow rate is increased by clockwise (rightward) rotation of the adjustment handle.
7 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.
8 Use the following table for specification when a sub plate is required.

Model No	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg
MTL-03-10	3/8	35	1.3

9 Bundled Accessories: Hex Socket Bolts M8 x 60ℓ, (four)

Note) 1. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
2. Tightening torque is 20 to 25N·m {205 to 255kgf·cm}.

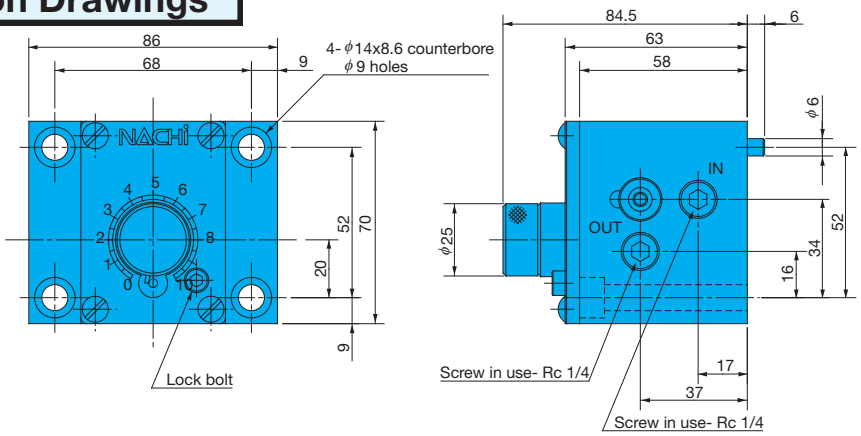
Explanation of model No.

(C) TN – G 02 – 2 – (F) – 11

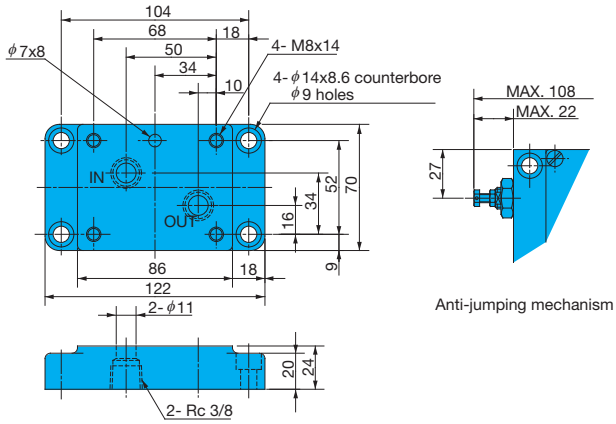
- 11: Design number
- (F): Anti-jumping mechanism (option)
- 2: Maximum control flow rate
- 02: Nominal diameter (size)
- G: Mounting method G: Gasket type
- TN: Flow control valve
- (C): Flow control and check valve

Installation Dimension Drawings

(C)TN-G02-**-11



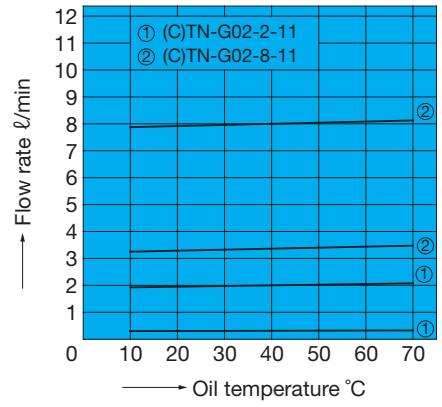
Sub Plate MTL-03-10



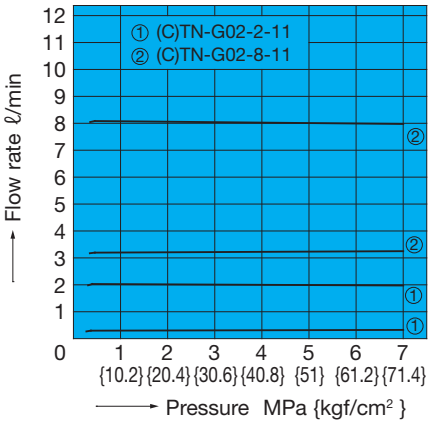
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

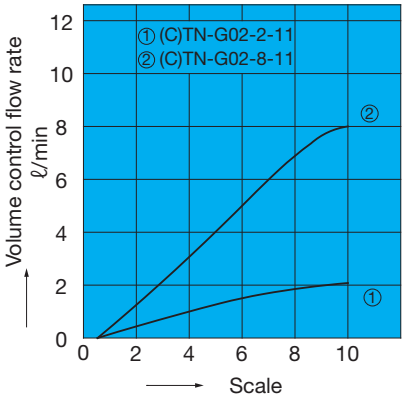
Oil Temperature — Control Flow Rate Characteristics



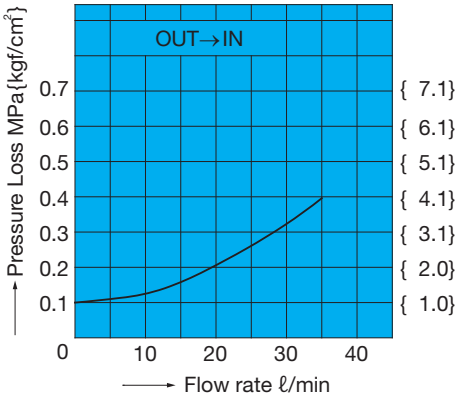
Pressure — Control Flow Rate Characteristics



Scale – Control Flow Rate Characteristics

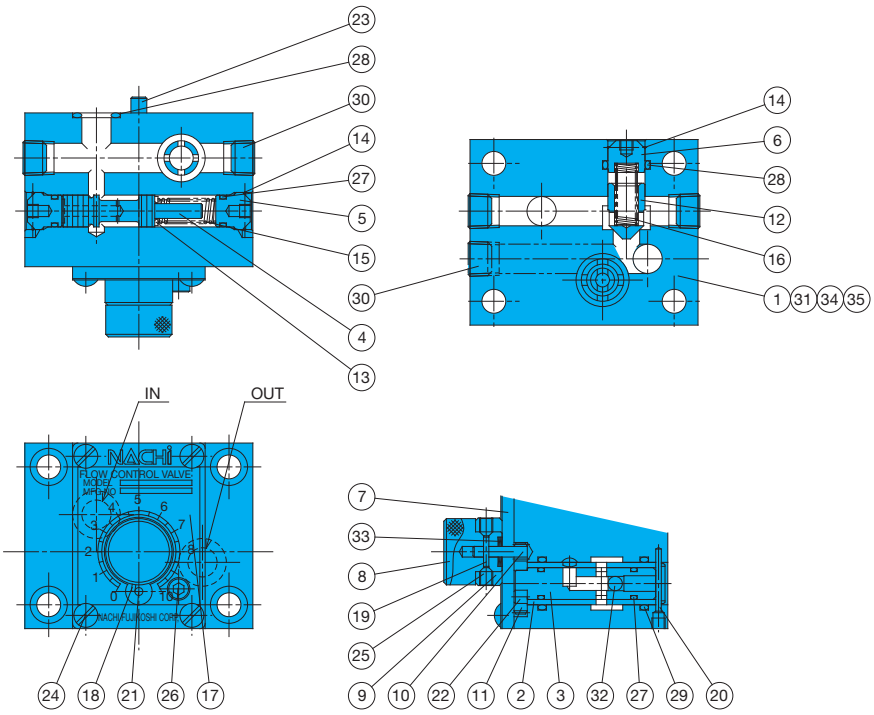


Pressure Loss Characteristics



Cross-sectional Drawings

CTN-G02-*-11



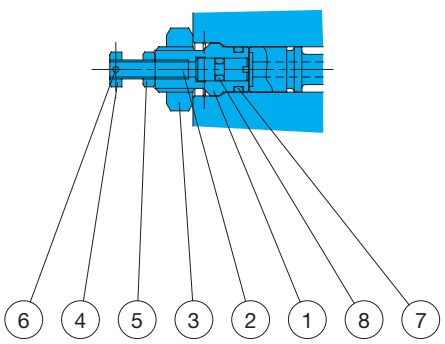
Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	13	Spacer	25	Screw
2	Sleeve	14	Snap ring	26	Screw
3	Spool	15	Spring	27	O-ring
4	Piston	16	Spring	28	O-ring
5	Plug	17	Plate	29	O-ring
6	Plug	18	Pin	30	Plug
7	Plate	19	Pin	31	Ball
8	Knob	20	Pin	32	Ball
9	Ring	21	Pin	33	Washer
10	Gear	22	Pin	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	NBR-70-1 P9	4	NBR-70-1 P9	4
28	O-ring	NBR-70-1 P14	2	NBR-70-1 P14	3
29	O-ring	NBR-70-1 P16	2	NBR-70-1 P16	2

Note) Specify C at the end of the model number for the CTN kit.
Note) The materials and hardness of the O-ring conforms with JIS B2401.

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	NBR-70-1 P9	1
8	O-ring	NBR-70-1 P3	1

Note) Part number 7 O-ring and part number 27 O-ring are interchangeable.

NACHI

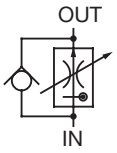
TEMPERATURE COMPENSATED
FLOW CONTROL <AND CHECK> VALVE

TS Type Flow Control (and Check) Valve
(Fine Adjustment Type With Pressure and Temperature Compensation)

0.01 to 2ℓ/min
10.5MPa

TS-G01-2-11

CTS-G01-2-11



Features

①Original compact, lightweight configuration.
②High-precision control up to minute flow rates of 10cm³.
③Design allows large 20ℓ/min reverse flow rate relative to control flow rate, which means there is no need to include an extra valve in the quick return circuit.
④Stable control of each setting flow rate, even as pressure and oil temperature are fluctuating.

Specifications

Model No.	Nominal Diameter (Size)	Volume control flow rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Reverse Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm²}	Weight kg
(C)TS-G01-2-11	1/8	0.01 to 2	10.5{107}	20	0.08{0.8}	0.9

●Handling

1 In the temperature range of 20°C to 60°C, flow rate fluctuation is within ±5% of the standard flow rate at 40°C.
2 In the pressure range of 0.6 to 10.5MPa {6.1 to 107kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.
3 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.
4 When controlling flow rates that are less than 0.2ℓ/min, use with a line filter no greater than 10μm.
5 For flow rate control, make sure that the pressure differential between the input port and output port is at least 0.6MPa {6.1kgf/cm²}.
6 The control flow rate is increased by clockwise (rightward) rotation of the control handle.
7 Use the table to the right for specification when a sub plate is required.

Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg
MTS-01Y-10	3/8	20	0.8

8 Bundled Accessories: Hex Socket Bolts: M4 x 35ℓ (four)

Note) 1. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
2. Tightening torque is 2.6 to 3.3N·m {27 to 255kgf·cm}.

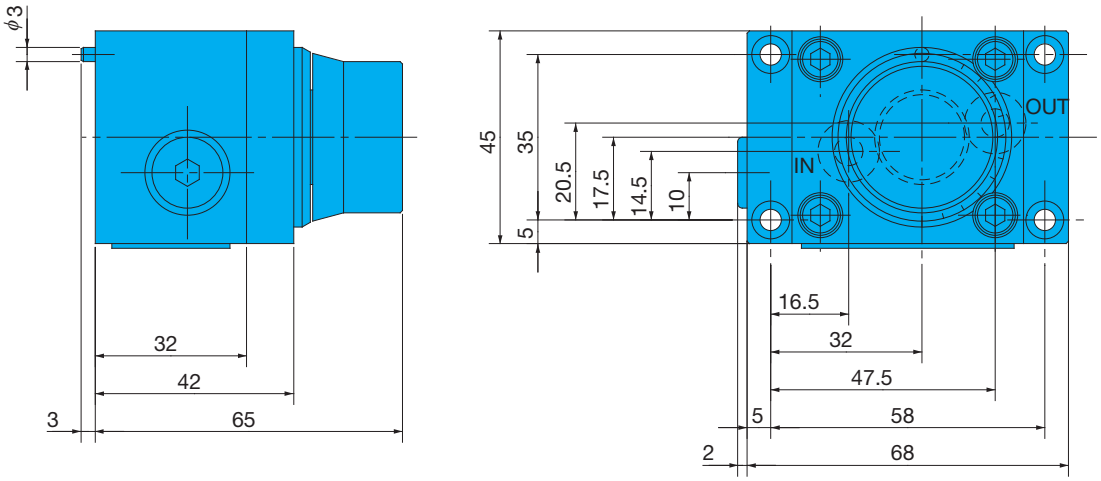
Explanation of model No.

(C) TS – G 01 – 2 – 11

- 11 — Design number
- 2 — Maximum control flow rate
- 01 — Nominal diameter (size)
- G — Mounting method G: Gasket type
- TS — Flow control valve
- (C) — Flow control and check valve

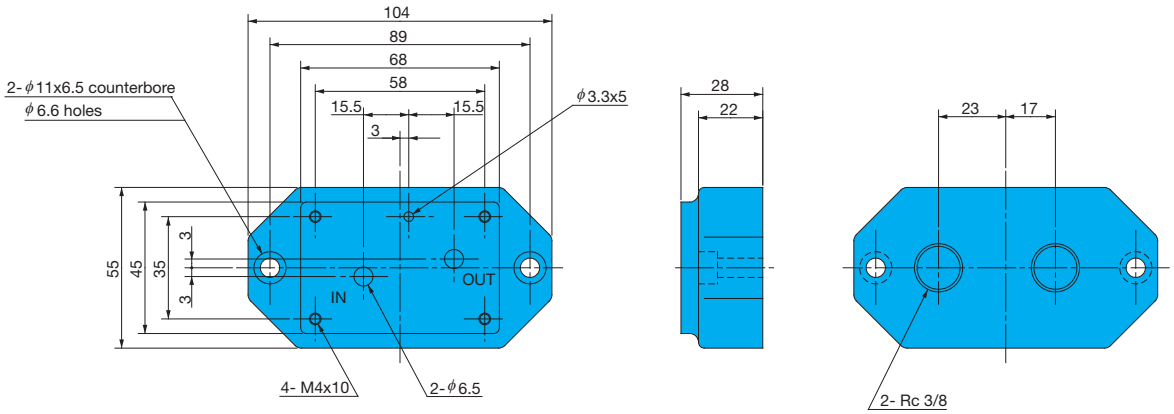
Installation Dimension Drawings

(C)TS-G01-2-11



G
Flow Control Valve

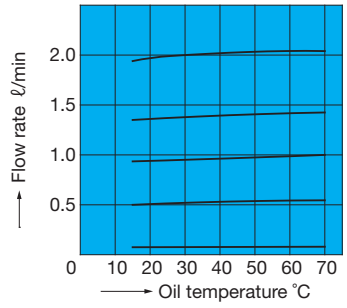
Sub Plate MTS-01Y-10



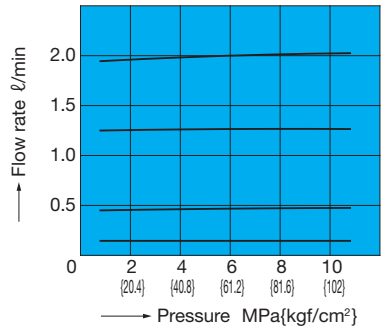
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

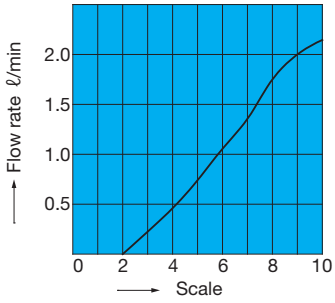
Oil Temperature — Control Flow Rate Characteristics



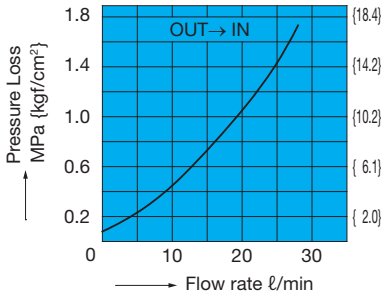
Pressure — Control Flow Rate Characteristics



Scale — Control Flow Rate Characteristics

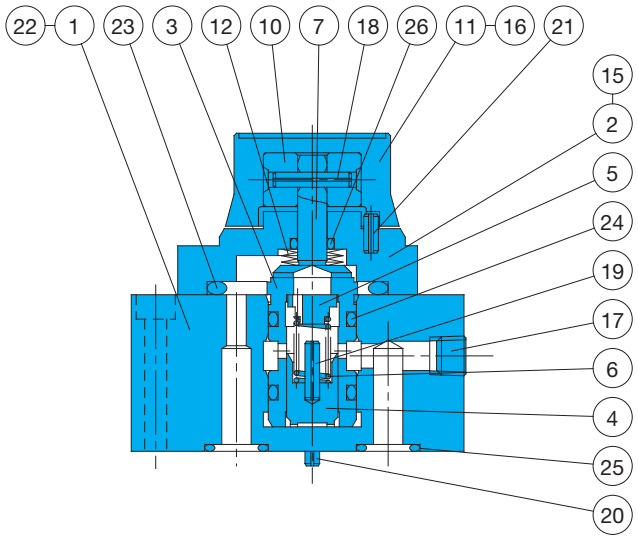


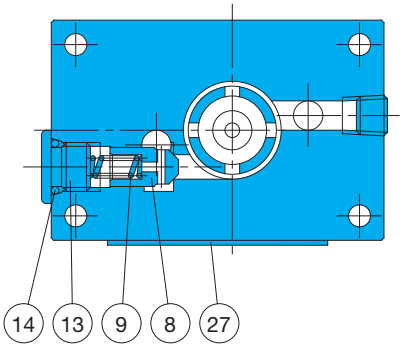
Pressure Loss Characteristics



Cross-sectional Drawing

CTS-G01-2-11





Part No.	Part Name	Part No.	Part Name
1	Body	14	O-ring
2	Cover	15	Screw
3	Sleeve	16	Screw
4	Piston	17	Plug
5	Guide	18	Spring pin
6	Spring	19	Spring pin
7	Throttle	20	Spring pin
8	Poppet	21	Spring pin
9	Spring	22	Spring pin
10	Spacer	23	O-ring
11	Knob	24	O-ring
12	Spring	25	O-ring
13	Plug	26	O-ring
		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	—	—	NBR-90 P8	1
23	O-ring	NBR-90 P31	1	NBR-90 P31	1
24	O-ring	NBR-90 P14	2	NBR-90 P14	2
25	O-ring	NBR-90 P10	2	NBR-90 P10	2
26	O-ring	NBR-90 P6	1	NBR-90 P6	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.
Specify C at the end of the model number for the CTS kit.

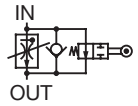
NACHI

RAPID TRAVERSE AND
FEED CONTROL VALVE

TL (TLT) Type Feed Control Valve (Fine Control Type With Pressure Compensation)

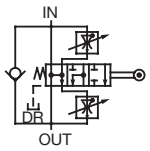
0.08 to 8ℓ/min
7MPa

TL-G0*-*-11



Note: 04 has DR

TLT-G04-*-*-11



Features

①Very compact, lightweight, and economically priced.
②Applicable for control of machine tool table operations.
For example, a single valve provides smooth control of: Fast Feed => Cutting Feed (2 stage) => Fast Return.
③Stable control of each setting flow rate, even as pressure and oil temperature are fluctuating.
④Dial markings are proportional to flow rate for simple control flow rate adjustment.
⑤Sealing the gasket surface allows as-is screw-in connection.

Specifications

Model No	Nominal Diameter (Size)	Volume control flow rate ℓ/min		Reverse Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm²}	Cracking pressure MPa{kgf/cm²}	Weight kg
		Feed 1	Feed 2				
TL-G03-2-11 8-11	3/8	0.08 to 2 0.1 to 8	—	35	7{71.4}	0.1{1.0}	2.2
TL-G04-2-11 8-11	1/2	0.08 to 2 0.1 to 8	—	53			7.0
TLT-G04-2-1.5-11 8-2-11		0.1 to 2 0.1 to 8	0.1 to 1.5 0.1 to 2				

●Handling

1 In the temperature range of 20°C to 60°C, flow rate fluctuation is within ±5% of the standard flow rate at 40°C.
2 In the pressure range of 1.0 to 7.0MPa {10.2 to 71.4kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.
3 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.
4 When controlling flow rates that are less than 0.2ℓ/min, use with a line filter no greater than 10μm.
5 Make sure that the pressure differential between the inlet port and outlet is at least 0.6MPa {6.1kgf/cm²} at 4ℓ/min or less, and at least 1.0MPa {10.2kgf/cm²} at 4ℓ/min or greater.
6 The control flow rate is increased by clockwise (rightward) rotation of the control handle.
7 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.
8 See the table below for installation hex socket bolts.
9 Use the table to the right for specification when a sub plate is required.
10 G03 does not require drain pipe connection. G04 requires drain pipe connection.

Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Applicable Valve Type
MTL-03-10	3/8	35	TL-G03-*-11
MTL-04-10	1/2	53	TL(T)-G04-*-*-11

11 Cam Down Force
TL-G03-11
Cam Down Force
120N {12.2kgf} minimum
TLT-G04-*-*-11
Feed 1 Cam Down Force
140N {14.3kgf} minimum
Feed 2 Cam Down Force
200N {20.4kgf} minimum
12 Make the cam angle no greater than 30 degrees.

Applicable Model	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
TL-G03-*-11	M8 × 60ℓ	4	20 to 25{205 to 255}
TL(T)-G04-*-11	M10 × 75ℓ	4	45 to 55{460 to 560}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Explanation of model No.

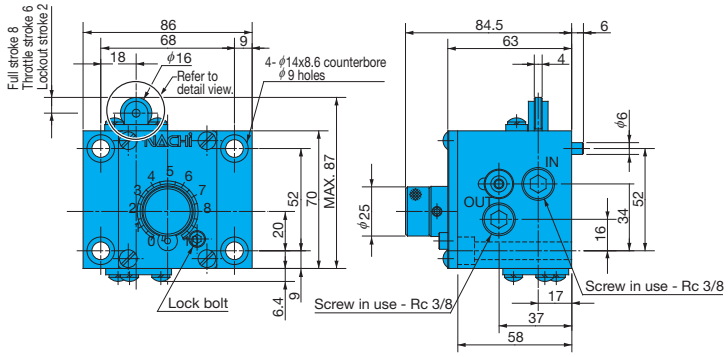
TLT – G 04 – 2 – (1.5) – (F) – 11

- Design number
- Anti-jumping mechanism (option)
- Maximum volume control flow rate (Feed 2)
- Maximum control flow rate
- Nominal diameter (size)
- Mounting method G: Gasket type
- 2-position feed control valve
- 1-position feed control valve

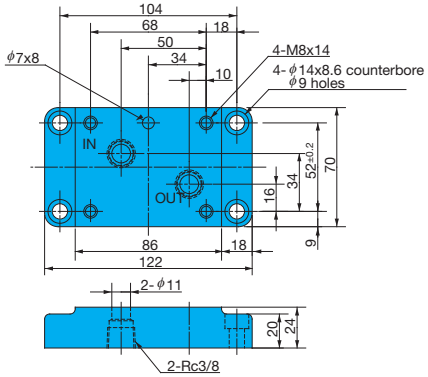
G Flow Control Valve

Installation Dimension Drawings

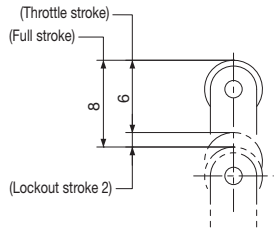
TL-G03-*-11



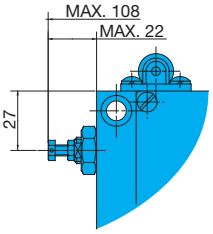
Sub Plate MTL-03-10



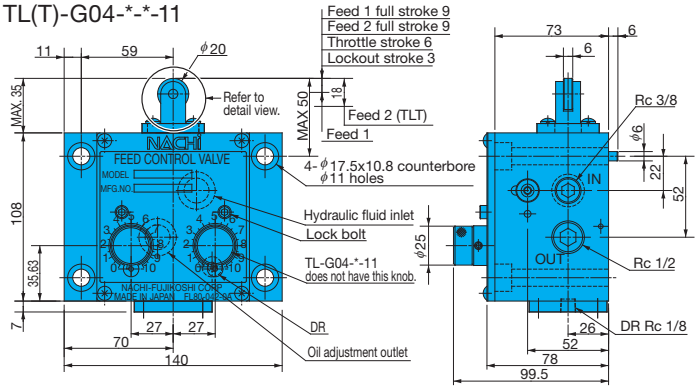
Roller operation range detail view G03



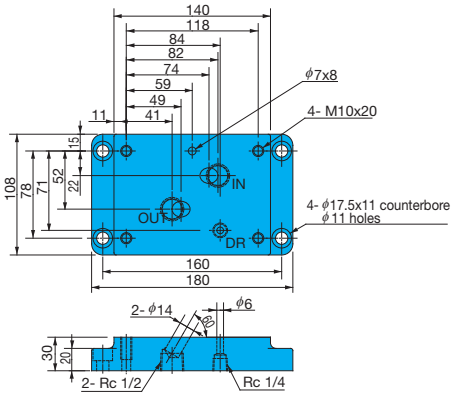
Anti-jumping Mechanism TL-G03-*-F-11



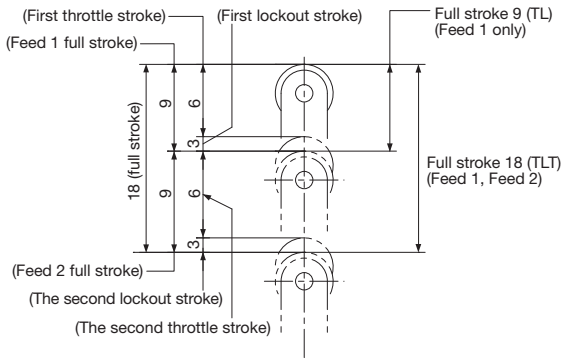
TL(T)-G04-*-*-11



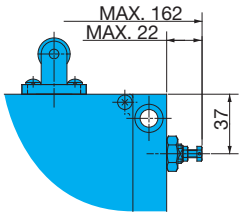
Sub Plate MTL-04-10



Roller operation range detail view G04



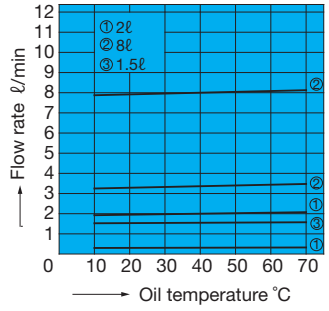
TL(T)-G04-*-*-F-11



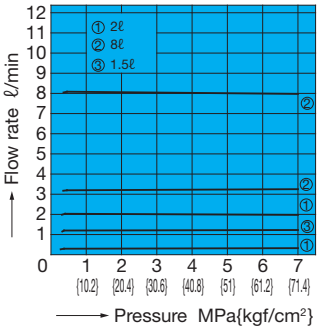
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

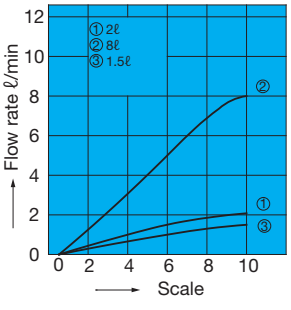
Oil Temperature – Control Flow Rate Characteristics



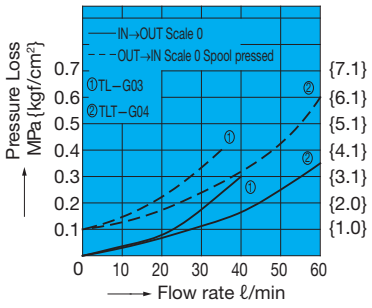
Pressure – Control Flow Rate Characteristics



Scale – Control Flow Rate Characteristics

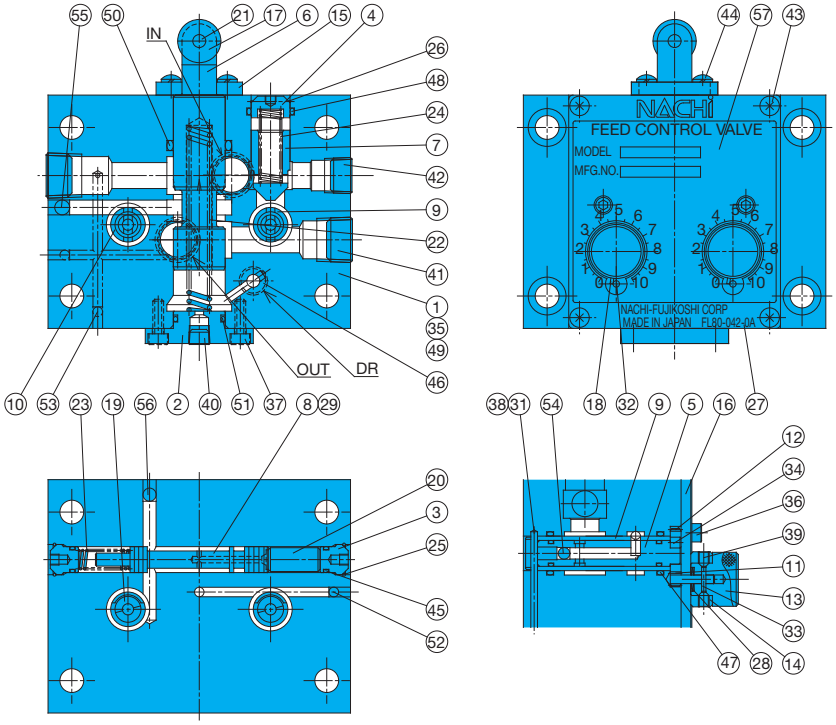


Pressure Loss Characteristics



Cross-sectional Drawings

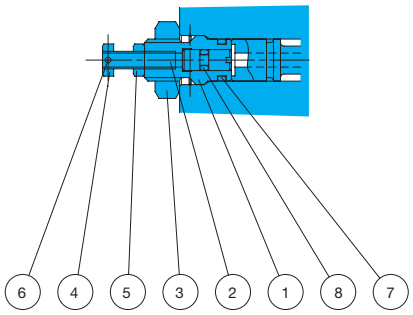
TLT-G04-*-*-11



Note) The drawings on the left are TLT cross sections. In the case of TL, there is no knob on the right side.

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

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	NBR-70-1 P9	1
8	O-ring	NBR-70-1 P3	1

Note) 1. Part number 7 O-ring and part number 45 O-ring are interchangeable.
2. The materials and hardness of the O-ring conforms with JIS B2401.

Seal Part List (Kit Model Number FLS-***(2))

Part No.	Part Name	TL-G03-*-11		TL-G04-*-11		TLT-G04-*-*-11	
		Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty
45	O-ring	NBR-70-1 P9	4	NBR-70-1 P9	4	NBR-70-1 P9	6
46	O-ring	—	—	NBR-70-1 P10	1	NBR-70-1 P10	1
47	O-ring	NBR-70-1 P16	2	NBR-70-1 P16	2	NBR-70-1 P16	4
48	O-ring	NBR-70-1 P14	1	NBR-70-1 P18	1	NBR-70-1 P18	1
49	O-ring	NBR-70-1 P14	2	NBR-70-1 P20	2	NBR-70-1 P20	2
50	O-ring	NBR-70-1 P18	2	NBR-70-1 P24	1	NBR-70-1 P24	1
51	O-ring	—	—	NBR-70-1 P20	1	NBR-70-1 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. The materials and hardness of the O-ring conforms with JIS B2401.

NACHI

RIGHT ANGLE CHECK VALVE
IN-LINE CHECK VALVE

Right Angle Check Valve
In-line Check Valve

320ℓ/min
21MPa

Features

①The right angle type check valve changes the flow direction of fluid 90 degrees, while the in-line check valve allows only axial direction flow.

②The 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 MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Cracking Pressure MPa{kgf/cm²}	Weight kg	
	Screw Mounting	Gasket Mounting					T Type	G Type
Right Angle Check Valve	CA-T03-1-20 2 3	CA-G03-1-20 2 3	3/8	21 {214}	40	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	1.0	1.8
	CA-T06-1-20 2 3	CA-G06-1-20 2 3	3/4		110	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	2.2	3.9
	CA-T10-1-20 2 3	CA-G10-1-20 2 3	1¼		320	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	4.0	6.1
In-line Check Valve	CN-T03-1-11 2 3	–	3/8		30	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	0.4	–
	CN-T06-1-11 2 3		3/4		75	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	0.7	
	CN-T10-1-11 2 3		1¼		190	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	2.2	

●Handling

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

Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg	Applicable Valve Type
MCA-03-20	3/8	40	1.4	CA-G03-*-20
MCA-06-21	3/4	110	3.5	CA-G06-*-20
MCA-10-20	1¼	320	6.1	CA-G10-*-20

2 The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
CA-G03-*-20	M8×45ℓ	4	20 to 25 {205 to 255}
CA-G06-*-20	M16×65ℓ	4	190 to 235 {1940 to 2400}
CA-G10-*-20	M20×75ℓ	4	370 to 460 {3770 to 4690}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

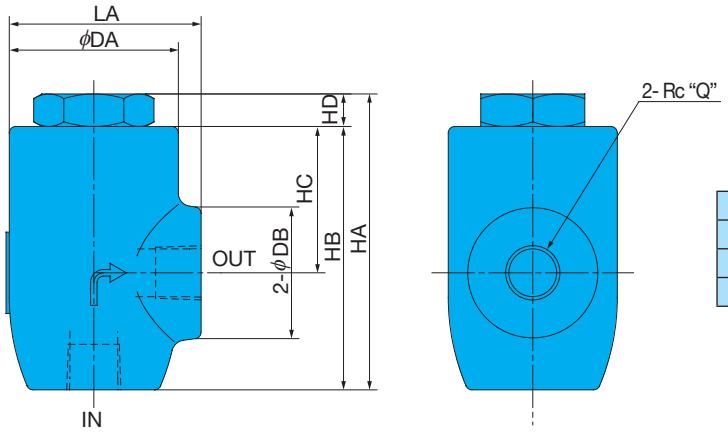
Explanation of model No.

CA – T 03 – 1 – 20

- 20: Design number (11: In-line type, 20: Right angle type)
- 1: Cracking pressure (1, 2, 3)
- 03: Nominal diameter (size)
- T: Mounting method (T: Screw Mounting, G: Gasket Mounting)
- CA: CA: Right angle check valve, CH: In-line check valve

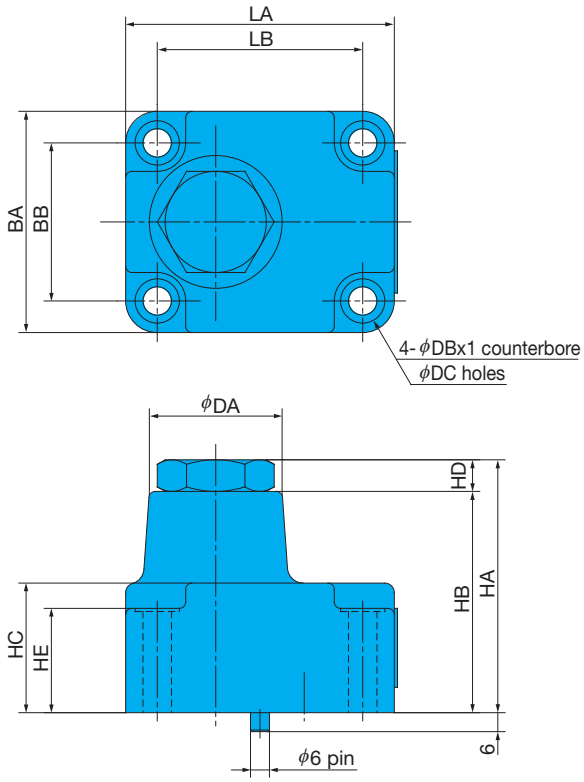
Installation Dimension Drawings

CA-T**-20 (Screw Mounting)

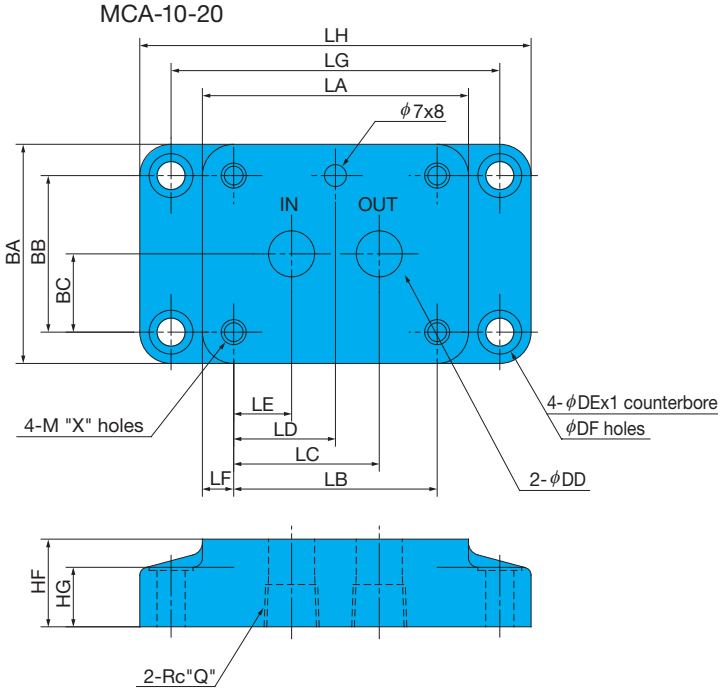


Model No.	LA	HA	HB	HC	HD	DA	DB	Q
CA-T03-*-20	59	91	81	45	10	52	40	3/8
CA-T06-*-20	72	106	96	55	10	60	45	3/4
CA-T10-*-20	96	139	127	70	12	80	62	1¼

CA-G**-*-20 (Gasket Mounting)



Sub Plate MCA-03-20
MCA-06-21
MCA-10-20

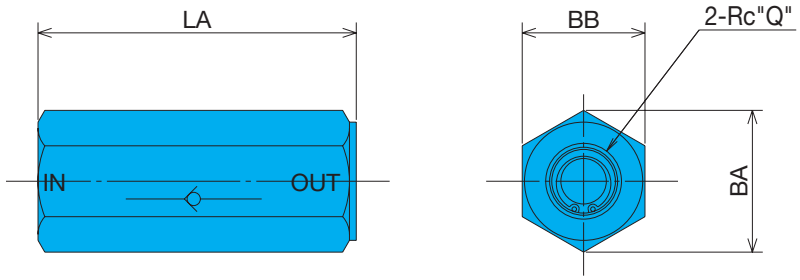


Note) External appearance of the sub-plate is slightly different from the drawing depending on the size.

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)



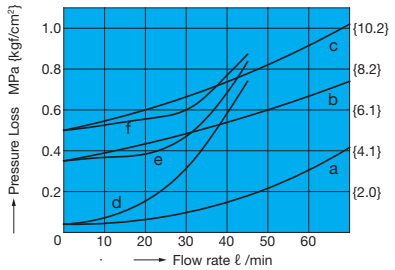
Model No.	LA	BA	BB	D
CN-T03-*-11	70	31.2	27	3/8
CN-T06-*-11	95	43.9	38	3/4
CN-T10-*-11	130	69.3	60	1¼

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

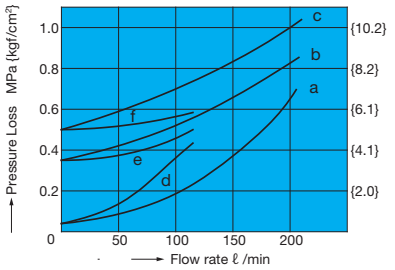
CA-*03 CN-T03



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

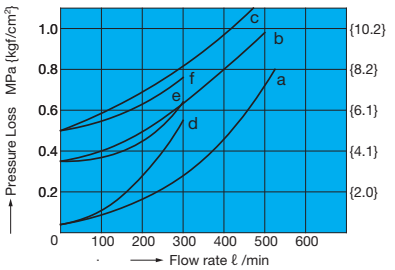
CA-*06 CN-T06



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

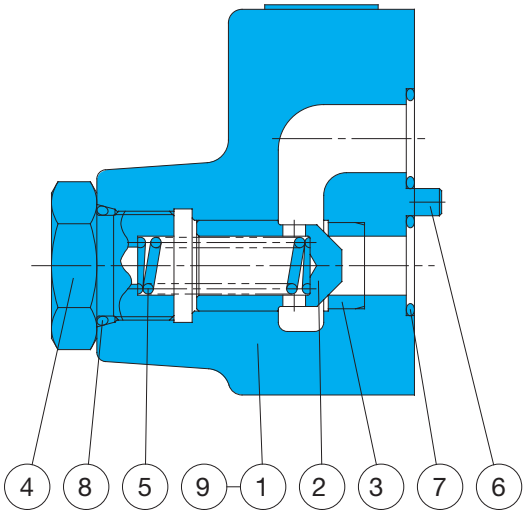


Applicable Valve Type

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			Q'ty
		CA-G03	CA-G06	CA-G10	
7	O-ring	NBR-90 P18	NBR-90 G30	NBR-90 G40	2
8	O-ring	NBR-90 P22	NBR-90 P30	NBR-90 P42	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.
*** in the kit number is used for specification of the valve size (G03, G06, G10, etc.)

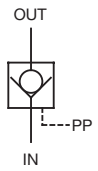
NACHI

PILOT OPERATED CHECK VALVE

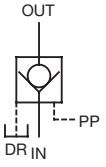
Pilot Check Valves

320ℓ/min
21MPa

Normal form



External drain type



Features

①Normally, 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.
②Very compact configuration.

Specifications

Model No		Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Cracking Pressure MPa{kgf/cm²}	Weight kg		Area Ratio		
Screw Mounting	Gasket Mounting					T Type	G Type	Pilot Piston	Valve	Small Valve
CP-T03-1-*-20 2	CP-G03-1-*-20 2	3/8	21 {214}	40	0.2 {2.0} 0.5 {5.1}	3.8 (4.7)	4.3 (5.2)	1	0.35	0.05
CP-T06-1-*-20 2	CP-G06-1-*-20 2	3/4		110	0.2 {2.0} 0.5 {5.1}	7.0 (8.2)	6.6 (7.8)	1	0.37	0.03
CP-T10-1-*-20 2	CP-G10-1-*-20 2	1¼		320	0.2 {2.0} 0.5 {5.1}	12.0 (14.3)	12.5 (14.8)	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 ℓ/min	Weight kg	Applicable Valve Type
MCP-03-20	3/8	40	1.1	CP-G03-*-20
MCP-06-21	3/4	110	1.7	CP-G06-*-20
MCP-10-20	1¼	320	3.6	CP-G10-*-20

4 The following are the bundled mounting bolts.

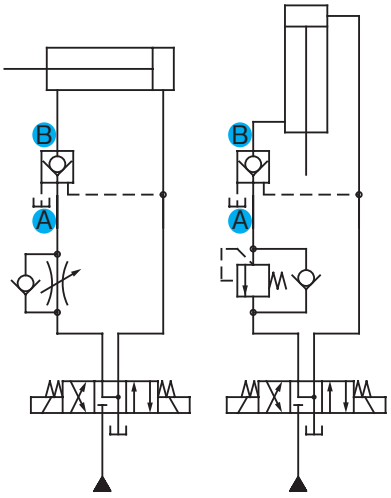
Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
CP-G03-*-*-20	M8×45ℓ	4	20 to 25 {205 to 255}
-G06-	M10×55ℓ	4	45 to 55 {460 to 560}
-G10-	M10×65ℓ	6	45 to 55 {460 to 560}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Explanation of model No.

CP – G 03 – 1 – B – 20

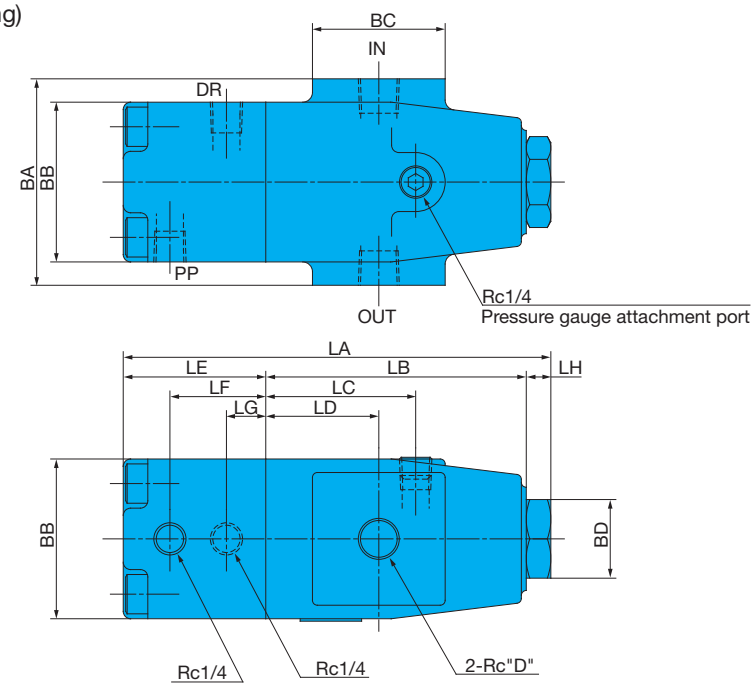
- 20: Design number
- B: Auxiliary symbol
  None: Standard
  B: External drain type
  F: With anti-shock mechanism (decompression type)
  BF: With external drain, with shock-resistant mechanism
- 1: Cracking pressure
  1, 2
- 03: Nominal diameter (size)
- G: Mounting method
  T: Screw Mounting
  G: Gasket Mounting
- CP: Pilot check valve



H Direction Control Valve

Installation Dimension Drawings

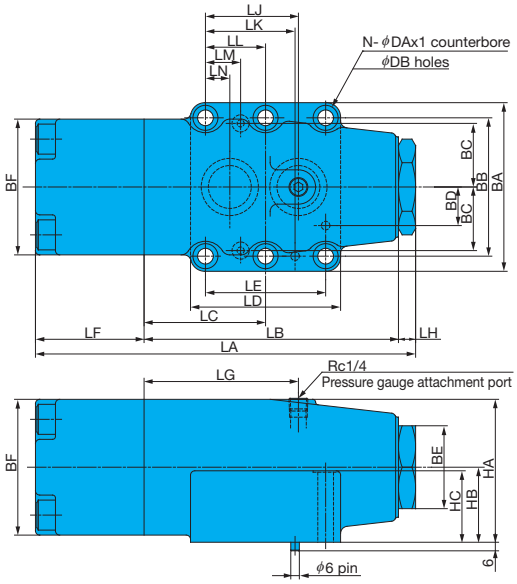
CP-T**-*-*-20 (Screw Mounting)

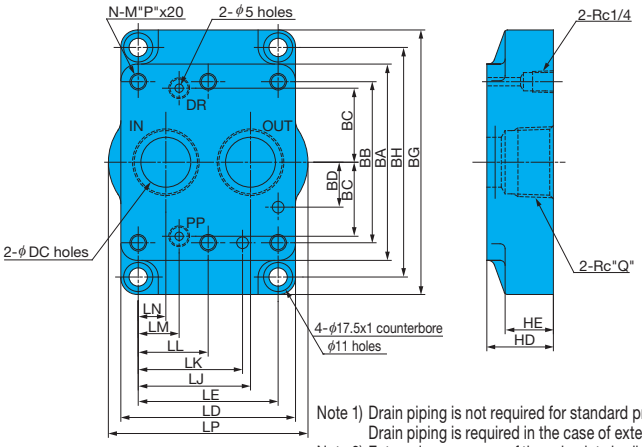


Model No.	LA	LB	LC	LD	LE	LF	LG	LH	BA	BB	BC	BD	D
CP-T03-*-(F)-20	146	106	61	46	30	15	–	10	84	65	54	32	3/8
CP-T03-*-B(F)-20	174				58	39	16						
CP-T06-*-(F)-20	180	140	85	66	30	15	–	10	122	76	64	41	3/4
CP-T06-*-B(F)-20	212				62	43	16						
CP-T10-*-(F)-20	225	178	108	85	35	15	–	12	150	95	85	58	1¼
CP-T10-*-B(F)-20	266				76	57	16						

CP-G**-*-*-20 (Gasket Mounting)

Sub Plate MCP-03-20
MCP-06-21
MCP-10-20





Note 1) Drain piping is not required for standard products.
Drain piping is required in the case of external drain type (B).
Note 2) External appearance of the sub-plate is slightly different from the drawing depending on the size.
Installation dimensions are as shown in the dimension tables.

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	1¼

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															

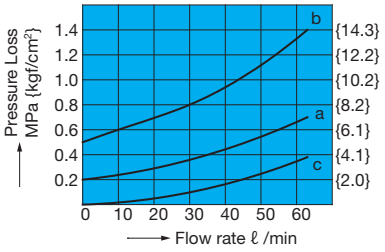
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

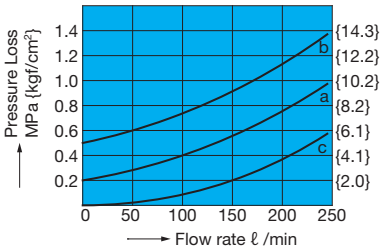
CP-*03

Applicable Valve Type
a. CP-*03-1-*-20 Free Flow
b. CP-*03-2-*-20 〃
c. CP-*03-*-*-20 Reverse Flow



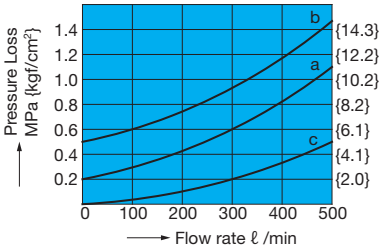
CP-*06

Applicable Valve Type
a. CP-*06-1-*-20 Free Flow
b. CP-*06-2-*-20 〃
c. CP-*06-*-*-20 Reverse Flow

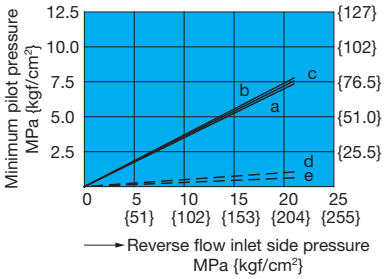


CP-*10

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



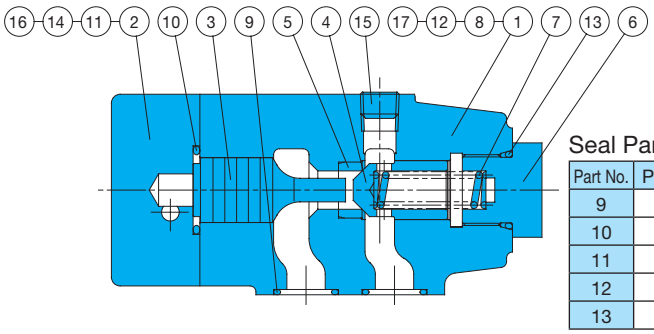
Applicable Valve

Model No.	Valve Open	Small Valve Open
CP-*03	a	d
CP-*06	b	e
CP-*10	c	e

Cross-sectional Drawings

Note) O-ring 1B-** refers to JIS B2401-1B-**.

CP-G**-*-20



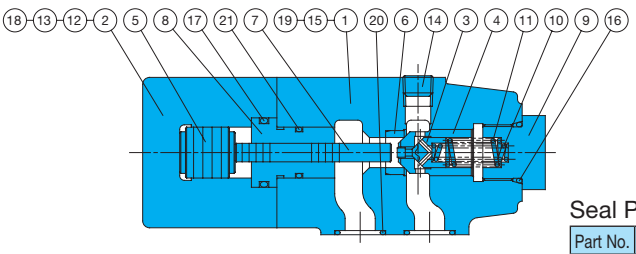
Part No.	Part Name	Part No.	Part Name
1	Body	10	O-ring
2	Cover	11	O-ring
3	Piston	12	O-ring
4	Poppet	13	O-ring
5	Seat	14	Screw
6	Plug	15	Plug
7	Spring	16	Plug
8	Pin	17	Plate
9	O-ring		

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	NBR-90 P18	NBR-90 G25	NBR-90 G35	2
10	O-ring	NBR-90 G25	NBR-90 G40	NBR-90 G55	1
11	O-ring	NBR-90 P7	NBR-90 P9	NBR-90 P9	2
12	O-ring	NBR-90 P9	NBR-90 P9	NBR-90 P9	2
13	O-ring	NBR-90 P22	NBR-90 P30	NBR-90 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		

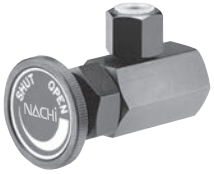
Seal Part List (Kit Model Number DPS-***R)

Part No.	Part Name	CP-G03-*-BF-20	CP-G06-*-BF-20	CP-G10-*-BF-20	Q'ty
16	O-ring	NBR-90 P22	NBR-90 P30	NBR-90 P42	1
17	O-ring	NBR-90 G25	NBR-90 G40	NBR-90 G55	1
18	O-ring	NBR-90 P7	NBR-90 P9	NBR-90 P9	2
19	O-ring	NBR-90 P9	NBR-90 P9	NBR-90 P9	2
20	O-ring	NBR-90 P18	NBR-90 G25	NBR-90 G35	2
21	O-ring	NBR-90 P18	NBR-90 P30	NBR-90 G45	1

***in the kit number is used for specification of the valve size.

Gauge Cock

35MPa



Features

①Ultra-compact configuration requires minimal installation space.
②Intelligent design packs plenty of function into a simple configuration.
③Maximum operating pressure of 35MPa{357kgf/cm²} allows operation across a wide range.

Specifications

Model No.		G "A" (Nominal Dimension)	B mm	C mm	Maximum Working Pressure MPa{kgf/cm²}	Weight kg
Float Type	Flange Type					
K2-T02-11	K2-F02-11	G1/4	10	19	21 {214}	0.35
K2-T03-10	K2-F03-10	G3/8	16	23	35 {357}	
K2-T04-10	K2-F04-10	G1/2	16	26		

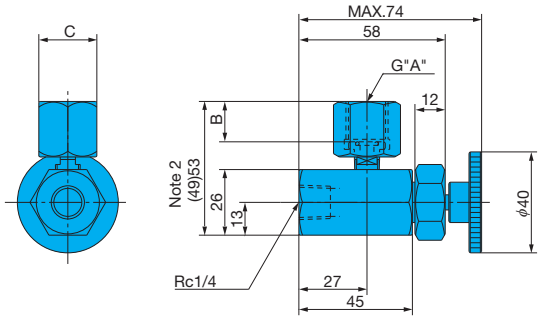
Explanation of model No.

K2 – T 02 – 10(11)

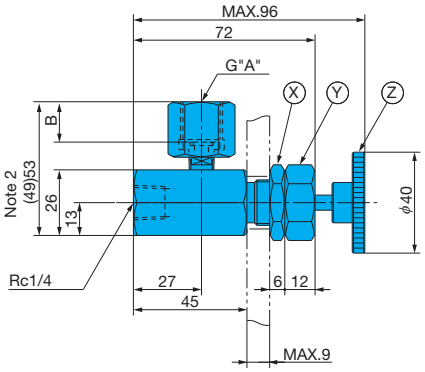
- Design number 11: For K2-T02, F02
- Nominal diameter (size)
- Mounting method T: Float type F: Flange type
- Gauge cock K2: Rotatable pressure gauge attachment.

Installation Dimension Drawings

K2-T**-10 (11)



K2-F**-10 (11)



Note) 1. Maximum iron plate thickness: 9t; Mouting Bolt Hole Diameter: ϕ20 When mounted to panel
Loosen the Ⓧ lock nut and Ⓨ cap nut, and pull out the Ⓩ adjusting screw.
To return to its original position, reverse this process.
2. Dimensions in parentheses are for the 02 size.
3. For information about G "A" and B, see the specifications. The Oring 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

DMA Type Manual Valve

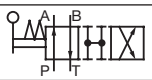
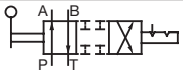
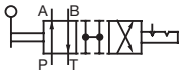
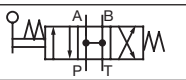
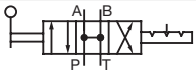
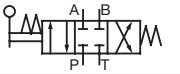
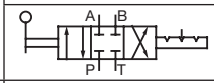
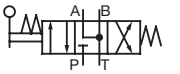
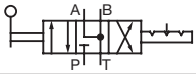
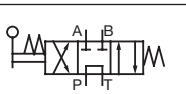
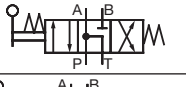
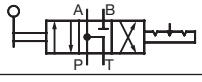
40 to 100ℓ/min
35MPa

Features

①The compact 01 and 03 sizes are perfect for small flow rate control.
②Since a balanced type valve is used, there is no need for drain piping, and use with back pressures up to 16MPa (163kgf/cm²) is possible.
③Mounting methods are the same as SAG01/ 03, and the 01, 03 size modular valve can be used, so circuit configuration is quick and easy.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Tank Port Back Pressure MPa{kgf/cm²}	Maximum Flow Rate ℓ/min	Spool Stroke (mm)		Weight kg
					2-position	3-position	
DMA-G01-***-20	1/8	35(25) {357(255)}	16 {163}	40	4	4×2	1.3
DMA-G03-***-(J)20	3/8			100	6	6×2	3.3

Positions	Type	JIS Symbol	Model No.	Maximum Working Pressure MPa{kgf/cm²}
2-position	Closed Cross		DMA-G01/G03-A3X-20/(J)20	35 {357}
	Open Cross		DMA-G01/G03-A3Z-20/(J)20	
	Closed Cross		DMA-G01/G03-E3X-20/(J)20	
	Open Cross		DMA-G01/G03-E3Z-20/(J)20	
3-position	All Ports Open		DMA-G01/G03-C4-20/(J)20	
			DMA-G01/G03-F4-20/(J)20	
	All Ports Blocked		DMA-G01/G03-C5-20/(J)20	
			DMA-G01/G03-F5-20/(J)20	
	ABT Connection		DMA-G01/G03-C6-20/(J)20	
			DMA-G01/G03-F6-20/(J)20	
	PT Connection: Closed Cross / Restricted Open Cross		DMA-G01/G03-C7X-20/(J)20 DMA-G01/G03-C7Y-20/(J)20	25 {255}
	PT Connection: Closed Cross / Restricted Open Cross		DMA-G01/G03-F7X-20/(J)20 DMA-G01/G03-F7Y-20/(J)20	
	PAT Connection		DMA-G01/G03-C8-20/(J)20	35 {357}
			DMA-G01/G03-F8-20/(J)20	

●Handling

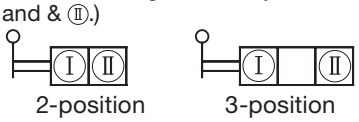
1 The following are the three types of lever operations.
①Spring Offset Type (Type A)
The lever is normally kept in the end position by the spring. Raising the lever performs switching, and the lever returns to its original position when released.
②Spring Center Type (Type C)
The spool is normally in the center of position 3. After switching to either end, the spring returns the lever to its center position when the lever is released.
③Detent Type (Type F, Type E)
A notch at spool position 3 or position 2 acts as a stop.

2 Pressure loss is the same as that for the SA-G01/ G03, so see SA-G01/ G03 for more information.

3 The lever mounting orientation can be positioned at 90° increments by changing the orientation of the lever side cover.

4 For PT connection type DMA-G01/ G03-*7*-(J)20, closed cross DMA-G01/ G03-*7X-(J)20 is the standard type.

5 The relationship between the lever switching positions and JIS symbols is shown below. (See the installation dimension diagrams for symbols & Ⅰ and & Ⅱ.)



2-position 3-position

6 Mounting bolts are not included with the 01 size.

DMA-G01-***-20	M5×45ℓ	4
DMA-G03-***-J20	M6×70ℓ	4
DMA-G03-***-20	M8×70ℓ	4

Note) Use bolts of 12.9 strength classification or equivalent.

7 The following shows the sub plates.

Model No.	Pipe Diameter	Maximum Working Pressure MPa{kgf/cm²}	Recommended Flow Rate (ℓ/min)	Weight (kg)	Applicable Valve Type
MSA-01Y-10	3/8	25 {255}	40	1.2	DMA-G01-***-20
MSA-03-10	3/8		45	2.3	DMA-G03-***-J20
MSA-03X-10	1/2		80		
MS-03-30	3/8		45	2.3	DMA-G03-***-20
MS-03X-30	1/2		80		

These sub plates can also be used with SA (SS)-G01/G03, so see SA (SS)-G01/G03 for mounting methods.

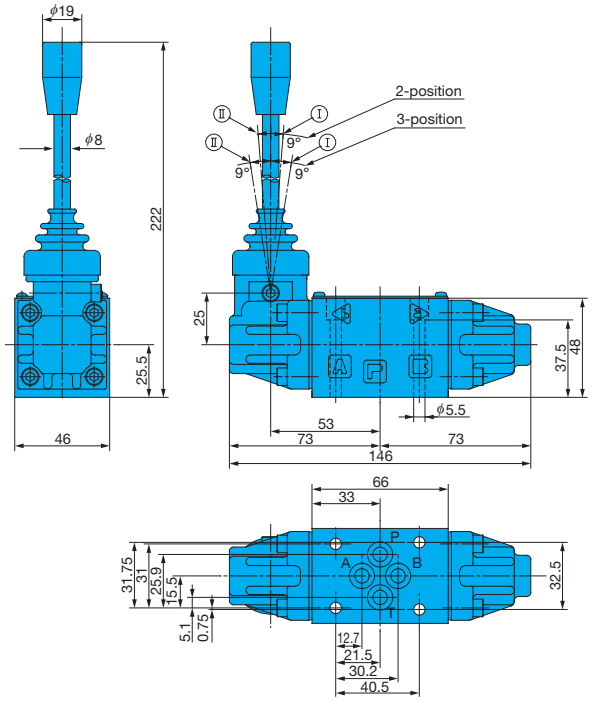
Explanation of model No.

DMA – G 01 – A 3 X – 20

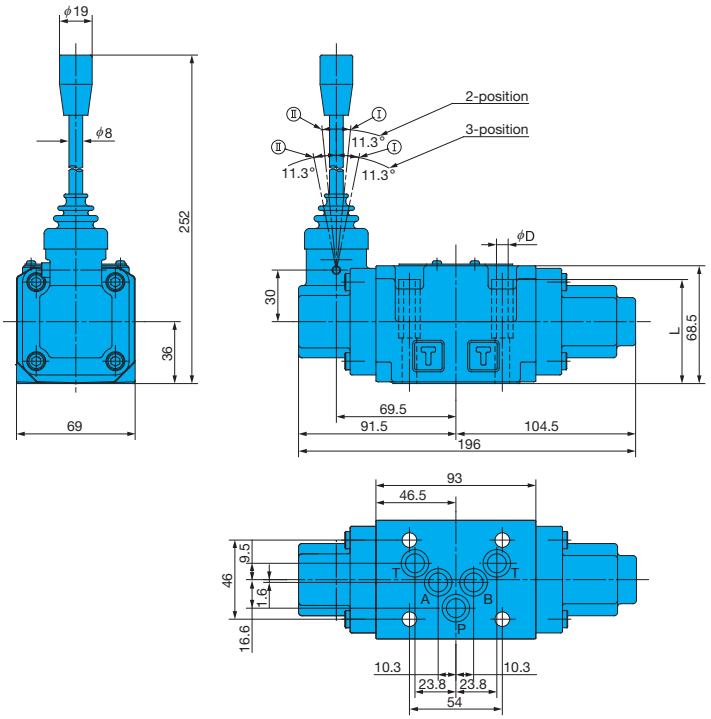
- Design number 20: 01 size and 03 size for M8 mounting bolt
  J20: 03 size for M6 mounting bolt
- Transition flow path (*3*, *7* only) X: Closed Y: Restrictor open Z: Open
- Center valve position flow path 3, 4, 5, 6, 7, 8
- Operation Method A: Spring offset type C: Spring center
  E, F: Detent
- Nominal diameter 01, 03
- Mounting method G: Gasket type
- Manual valve (DMA type)

Installation Dimension Drawings

DMA-G01-***-20
Gasket Surface Dimensions (ISO 4401-03-02-0-05 JIS B8355 D-03-02-0-05)



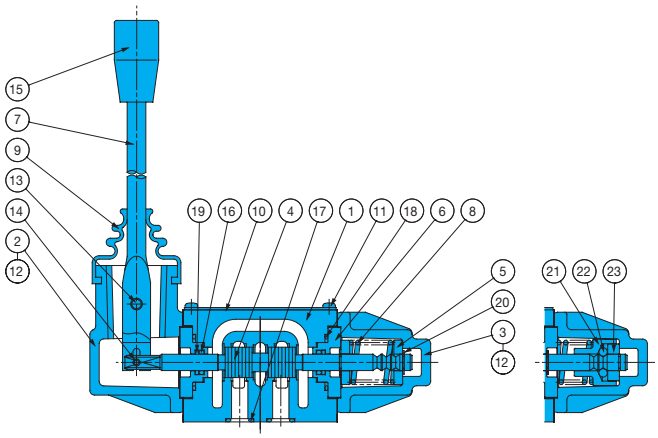
DMA-G03-***-(J)20
Gasket Surface Dimensions (ISO 4401-05-04-0-05 JIS B8355 D-05-04-0-05)



	DMA-G03-**-J20	DMA-G03-**-20
φD	φ6.8	φ8.5
L	60.5	58

Cross-sectional Drawing

DMA-G01-***-20



Part No.	Part Name	Part No.	Part Name
1	Body	13	Screw
2	Cover A	14	Pin
3	Cover B	15	Knob
4	Spool	16	O-ring
5	Ring	17	O-ring
6	Bush	18	O-ring
7	Lever	19	Backup ring
8	Spring	20	Snap ring
9	Rod cover	21	Guide
10	Nameplate	22	Ball
11	Stopper screw	23	Retainer
12	Screw		

Seal Part List

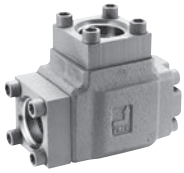
Part No.	Part Name	Model No.			
		DMA-G01	Q'ty	DMA-G03	Q'ty
16	O-ring	NBR-70-1 P7	2	NBR-70-1 P10	2
17	O-ring	AS568-012(NBR-90)	4	AS568-014(NBR-90)	5
18	O-ring	AS568-019(NBR-90)	2	NBR-90 P28	2
19	Backup ring	T2-P7	2	T2-P10	2

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. Backup ring indicates JIS B2407-T2-**.

NACHI

Flange Type
Check Valve/Throttle Valve
Pilot Operated Check Valve

1300ℓ/min
25MPa



Features

①This series provides high capacity and flange connection, as well as compliance with new standards and Japan Oil Hydraulic Standards (JOHS).

②Measurable higher pressure and higher capacity than previous models.

Specifications

Contact your agent for more information about mounting methods, etc.

	Model No. / Flange Mounting	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Rated flow rate ℓ/min	Cracking pressure MPa{kgf/cm²}	Weight kg	Japan Fluid Power Association Standard Number
Right Angle Check Valve	CA-F06-1-30 2 3	3/4	25 {255}	125	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	3.8	JFPS1009
	CA-F10-1-30 2 3	1¼		300	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	7.5	
	CA-F16-1-30 2 3	2		600	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	20.1	
	CA-F24-1-30 2 3	3		1300	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	63	
Pilot Operated Check Valve	CP-F06-1-*-30 2	3/4	25 {255}	125	0.2 {2.0} 0.5 {5.1}	6.4	JFPS1010
	CP-F10-1-*-30 2	1¼		250	0.2 {2.0} 0.5 {5.1}	11.5	
	CP-F16-1-*-30 2	2		600	0.2 {2.0} 0.5 {5.1}	32	

	Model No. / Flange Mounting	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm²}	Rated flow rate ℓ/min	Cracking pressure MPa{kgf/cm²}	Weight kg	Japan Fluid Power Association Standard Number
Slot Valve	(C)FR-F06-30	3/4	25 {255}	85	0.1 {1.0}	4.7	JFPS1012
	(C)FR-F10-30	1¼		230		11.0	
	(C)FR-F16-30	2		500		21.5	

NACHI

ELECTRO-HYDRAULIC
PROPORTIONAL VALVE

Electro-hydraulic Proportional Valve Series

2 to 500ℓ/min
21,25,28,35MPa

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

①Pressure 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.

②Flow Control Valve Series

ES Series — This 2-directional valve provides proportional flow control in accordance with input current.

ESR Series — With a built-in rod 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.

③Direction 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.

④Modular 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.

⑤Power 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.

⑥Compact Power Amplifiers

EBA Series — Amplifier type

The highly efficient PWM control system of this new series ensures high reliability in a compact configuration.

⑦Compact, Multi-function Power Amplifiers

EDA Series — Amplifier type

This compact amplifier can drive two solenoids with a single DC input.

EDC Series — Amplifier controller type

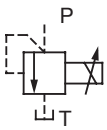
A choice of inputs: 6-contact or DC 2 input/4- contact.

Series List

Name	Maximum Working Pressure MPa {kgf/cm²}	Rated Flow Rate ℓ/min: 1 2 10 50 100 200 300 400 500
Electro-hydraulic Proportional Pilot Relief Valve (EPR)	35 {357}	01 — Size
Electro-hydraulic Proportional Relief Valve (ER)	35 {357}	03, 06
Electro-hydraulic Proportional Relief and Reducing Valve (EGB)	25 {255}	03, 06
Electro-hydraulic Proportional Flow Control Valve (ES)	21 {214}	02, 03, 06, 10
Load Sensitive Electro-hydraulic Proportional Relief and Flow Control Valve (ESR)	25 {255}	03, 06, 10
Electro-hydraulic Proportional Flow Control Valve (ESD)	25 {255}	01, 03, 04, 06
Modular Type Electro-hydraulic Proportional Reducing Valve (EOG)	25 {255}	01
Modular Type Electro-hydraulic Flow Control Valve (EOF)	21 {214}	01
Power Amplifier (EMA) (EMC)		—
Compact Power Amplifier (EBA)		—
Compact, Multi-function Power Amplifier (EDA) (EDC)		—

Electro-hydraulic Proportional Pilot Relief Valve

1.2ℓ/min
0.3 to 35MPa



Features

This DC solenoid relief valve matches the suction 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 Current ℓ/min	1.2
Pressure Control Range MPa{kgf/cm²}	B:0.3 to 2.5{ 3.1 to 25.5} 1:0.7 to 7 { 7.1 to 71 } 2:1.0 to 14 {10 to 143 } 3:1.5 to 21 {15.3 to 214 } 4:1.5 to 28 {15.3 to 286 } 5:2.0 to 35 {20 to 357 }
Rated Current mA	800
Coil Resistance Ω	20 (20°C)
Hysteresis %	3 max. (Note)
Weight kg	1.6

Note) Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

Explanation of model No.

EPR – G 01 – 2 – 00 12 S – 12

- 12 — Design number
- S — Plunger orifice symbol (None: No orifice, S: With orifice)
- 12 — Tank port orifice symbol (Table 1)
- 00 — Pressure port orifice symbol (Table 1)
- 2 — Pressure control range B, 1, 2, 3, 4, 5
- 01 — Nominal diameter 01
- G — Mounting method G: Gasket type
- EPR — Electro-hydraulic proportional pilot relief valve

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 0.2MPa {2kgf/cm²}.

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 (counterclockwise) 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 0.3ℓ/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 40cm³.

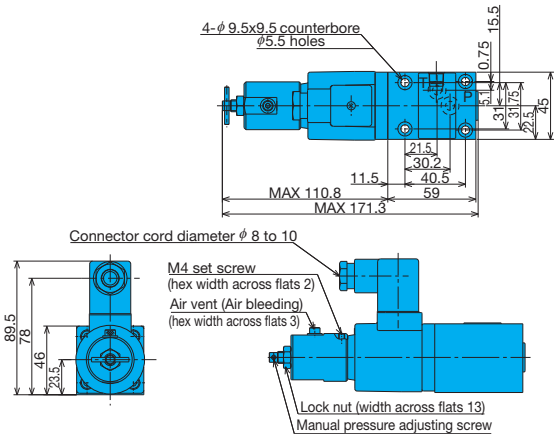
6 Bundled Accessories (Valve Mounting Bolts)
M5 x 45ℓ(four) Tightening torque: 5 to 7N·m {51 to 71kgf·cm}

7 Sub Plate
When a sub plate is required, order using the following model number. MSA-01Y-10 (See the next page for dimensions.)

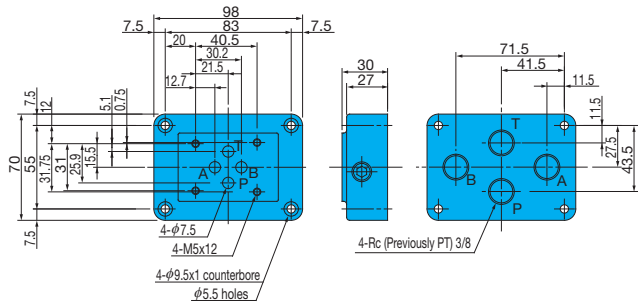
8 Use an operating fluid that conforms to the both of the following. Oil Temperature: –20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

Installation Dimension Drawings

EPR-G01



Sub Plate
MSA-01Y-10

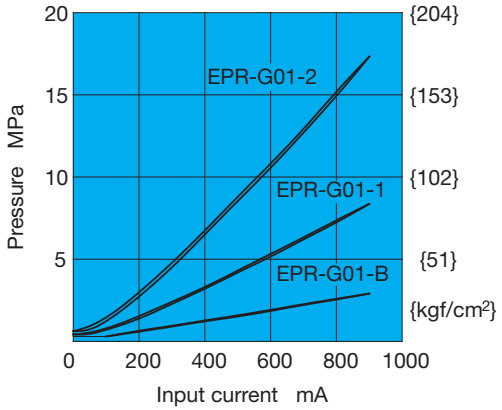


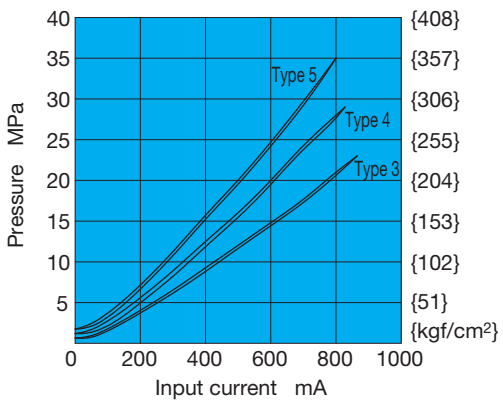
Note) Install the sub plate so the valve's P port is aligned with the sub plate's B port.
The gasket surface dimensions comply with the ISO standard shown below.
ISO 4401-03-02-0-05

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

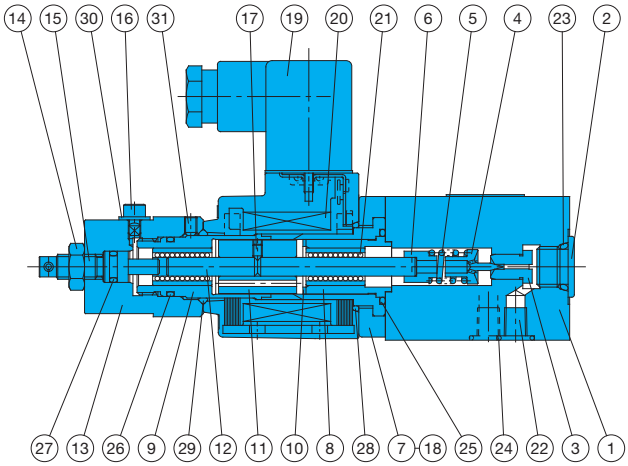
Input Current – Pressure Characteristics





Cross-sectional Drawing

EPR-G01-*-****-12



Part No.	Part Name
1	Body
2	Plug
3	Seat
4	Poppet
5	Spring
6	Retainer
7	Cover
8	Stopper
9	Guide
10	Shim
11	Plunger
12	Rod
13	Cover
14	Nut
15	Screw
16	Screw
17	Screw
18	Screw
19	Connector
20	Coil
21	Ball bush
22	Choke
23	O-ring
24	O-ring
25	O-ring
26	O-ring
27	O-ring
28	O-ring
29	O-ring
30	Seal
31	Screw

Note) Coil model number JD64-D2

Seal Part List (Kit Model NumberJPS-G01-1A)

Part No.	Part Name	Part Number	Q'ty
23	O-ring	NBR-90 P11	1
24	O-ring	NBR-90 P9	2
25	O-ring	NBR-90 P22	1
26	O-ring	AS 568-016 (NBR-90)	1
27	O-ring	NBR-90 P7	1
28	O-ring	S-25 (NBR-70-1)	1
29	O-ring	NBR-70-1 P20	1
30	Seal	WF-4-7.4-1.0	1

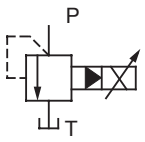
Note) The materials and hardness of the O-ring conforms with JIS B2401.

NACHI

ELECTRO-HYDRAULIC
PROPORTIONAL RELIEF VALVE

Electro-hydraulic Proportional Relief Valve

150 to 320ℓ/min
0.3 to 35MPa



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 oil temperature fluctuation has little effect on control pressure, so this valve provides open loop control of even complex pressures (forces).

Specifications

Item \ Model No.	ER-G03-*-21	ER-G06-*-21
Maximum Flow Rate ℓ/min	150	320
Pressure Control Range MPa{kgf/cm²}	B:0.3 to 2.5{ 3.1 to 25.5}(Note 1) 1:0.7 to 7 { 7.1 to 71 } 2:1.0 to 14 {10 to 143 } 3:1.5 to 21 {15.3 to 214 } 4:1.5 to 28 {15.3 to 286 } 5:2.0 to 35 {20 to 357 }	
Rated Current mA	800	
Coil Resistance Ω	20 (20°C)	
Hysteresis %	3 max. (Note 2)	
Minimum Relief Flow Rate ℓ/min	5	8
Weight kg	6.0	7.1

Note) 1. G03 type only Flow rate: 40ℓ/min
2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

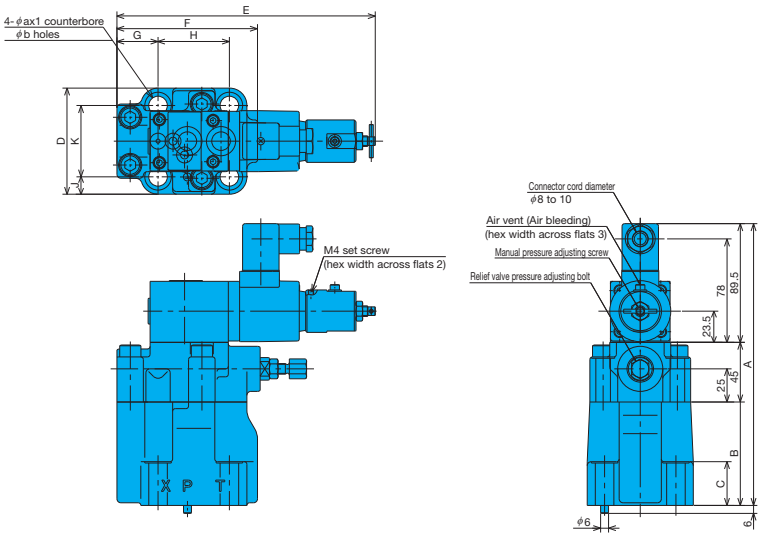
Explanation of model No.

ER – G 03 – 3 – 21

- Design number
- Pressure control range B, 1, 2, 3, 4, 5
- Nominal diameter 03, 06
- Mounting method G: Gasket type
- Electro-hydraulic proportional relief valve

Installation Dimension Drawings

ER-G**-*-21



The gasket surface dimensions comply with the ISO standard shown below.
G03…ISO 6264-06-09-0-97
G06…ISO 6264-08-13-0-97

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

●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.

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 0.2MPa {2kgf/cm²}.

4 Safety Valve Setting Pressure
The safety valve is set to maximum adjustment pressure plus 1.5 to 2.0MPa {15.3 to 20.4kgf/cm²}. When actually using the valve, adjust in accordance with actual pressure.

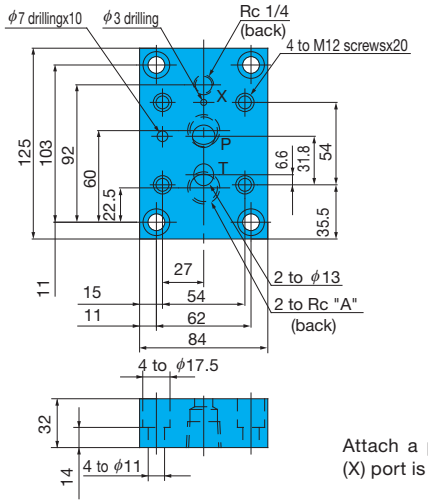
5 Bundled Accessories (Valve Mounting Bolts)

Model No.	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
ER-G03	M12×50ℓ	4	75 to 95{ 765 to 970}
ER-G06	M16×60ℓ	4	190 to 235{1940 to 2400}

6 Use an operating fluid that conforms to the both of the following. Oil Temperature: –20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

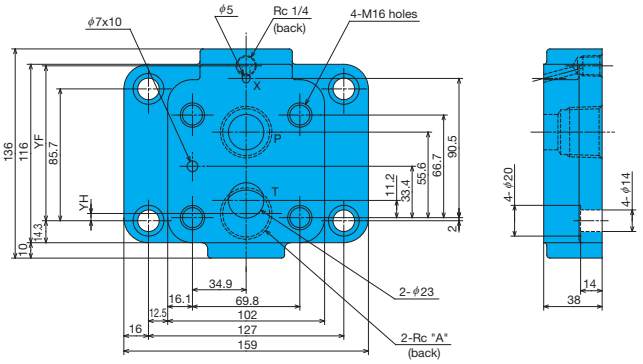
Sub Plate (Maximum Operating Pressure: 25MPa)

MRI-03*-10



Attach a plug when the vent (X) port is not used.

MRI-06*-10



Model No.	A
MRI-03-10	3/8
MRI-03X-10	1/2
MRI-06-10	3/4
MRI-06X-10	1

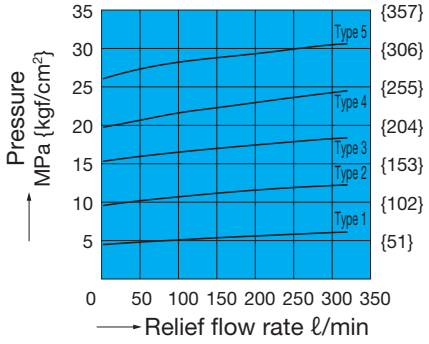
Model No.	YF	YH
MRI-06-10	92.5	13.2
MRI-06X-10	100.7	4.7

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

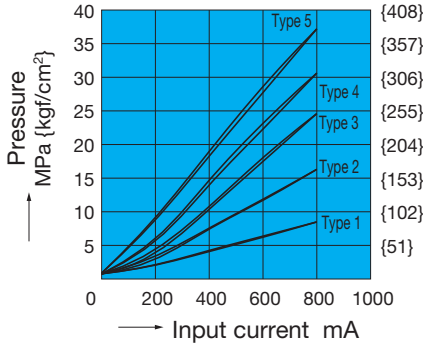
Flow Rate – Pressure Characteristics

ER-G06-*-21



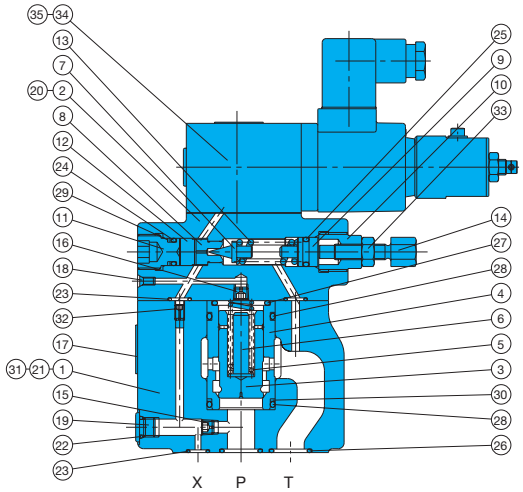
Input Current – Pressure Characteristics

ER-G06-*-21



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 REBS-**)

Part No.	Part Name	Nominal Diameter/Part Number		Q'ty
		G03	G06	
22	O-ring	NBR-90 P8	NBR-90 P8	1
23	O-ring	NBR-90 P9	NBR-90 P9	3
24	O-ring	NBR-90 P10A	NBR-90 P10A	1
25	O-ring	NBR-70-1 P11	NBR-70-1 P11	1
26	O-ring	NBR-90 P18	NBR-90 P28	2
27	O-ring	NBR-90 G25	NBR-90 P28	1
28	O-ring	NBR-90 G30	NBR-90 P32	2
29	Backup ring	T2-P10A	T2-P10A	1
30	Backup ring	T2-G30	T2-P32	1

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
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 I-3 for more information.

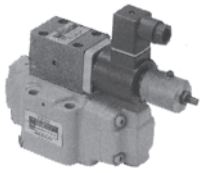
Part No.	Part Name	Part No.	Part Name
1	Body	18	Plug
2	Cover	19	Plug
3	Poppet	20	Screw
4	Sleeve	21	Pin
5	Spring	22	O-ring
6	Spacer	23	O-ring
7	Poppet	24	O-ring
8	Seat	25	O-ring
9	Plunger	26	O-ring
10	Retainer	27	O-ring
11	Plug	28	O-ring
12	Collar	29	Backup ring
13	Spring	30	Backup ring
14	Handle	31	Screw
15	Orifice	32	Choke
16	Orifice	33	Nut
17	Plate	34	Pilot relief valve
		35	Screw

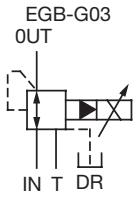
NACHI

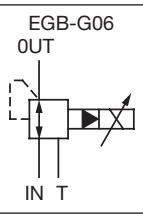
ELECTRO-HYDRAULIC PROPORTIONAL REDUCING AND RELIEF VALVE

Electro-hydraulic Proportional Relief and Reducing Valve

50 to 100ℓ/min
0.3 to 25MPa







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 MPa{kgf/cm²}	25{255}	
Maximum Flow Rate ℓ/min	50	100
Pressure Control Range MPa{kgf/cm²}	B:0.3 to 2.5{3.1 to 25.5 }(Note 1) 1:0.7 to 7 {7.1 to 71 } 2:1.0 to 14 {10 to 143 } 3:1.5 to 21 {15.3 to 214}	
Rated Current mA	800	
Coil Resistance Ω	20 (20°C)	
Hysteresis %	3 max. (Note 2)	
Weight kg	5.5	7.8

Note) 1. G03 type only Rated flow rate: 20ℓ/min
2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

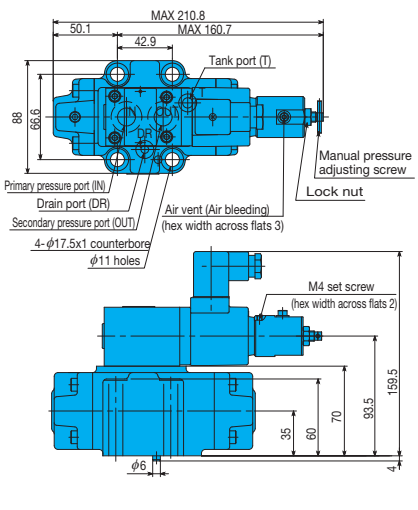
Explanation of model No.

EGB – G 03 – 2 – 11

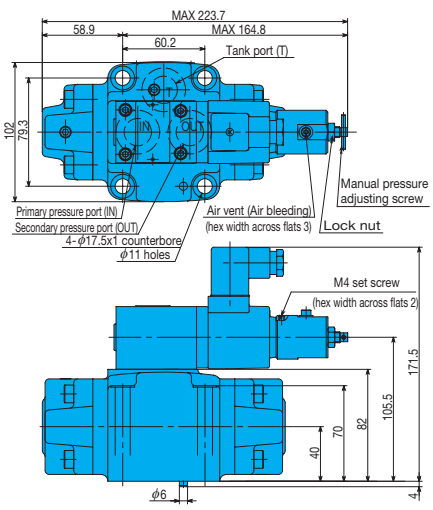
- 11 — Design number
- 2 — Pressure control range B, 1, 2, 3
- 03 — Nominal diameter 03, 06
- G — Mounting method G: Gasket type
- EGB — Electro-hydraulic proportional relief and reducing valve

Installation Dimension Drawings

EGB-G03-*-11



EGB-G06-*-11



●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.

2 DR Port Piping
When configuring piping, ensure that the DR port (T port for the G06 size) is filled with operating fluid.

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 (counterclockwise) and secured with the lock nut.

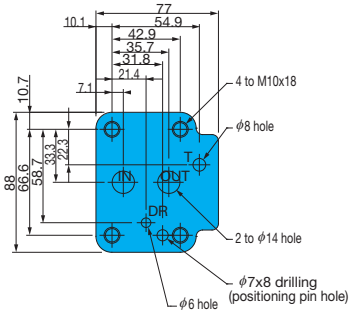
4 Load Capacity
The G03 load capacity (valve OUT side volume) is at least 2ℓ, while the G06 load capacity is at least 5ℓ.

5 Bundled Accessories (Valve Mounting Bolts)

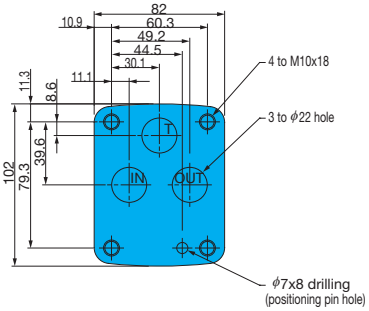
Model No.	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
EGB-G03	M10×75ℓ	4	45 to 55{460 to 560}
EGB-G06	M10×85ℓ	4	45 to 55{460 to 560}

6 Use an operating fluid that conforms to the both of the following. Oil temperature: –20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

Mounding Gasket Dimensions
EGB-G03-*-11



Mounding Gasket Dimensions
EGB-G06-*-11



I

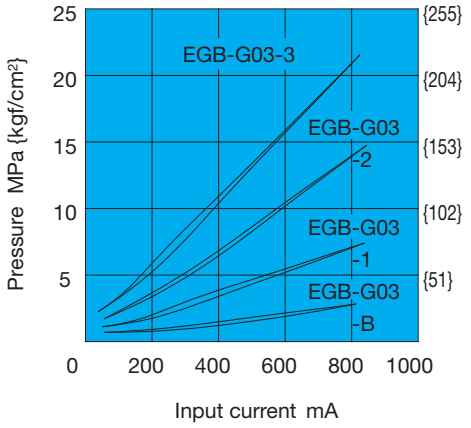
Electro-hydraulic control valve

Performance Curves

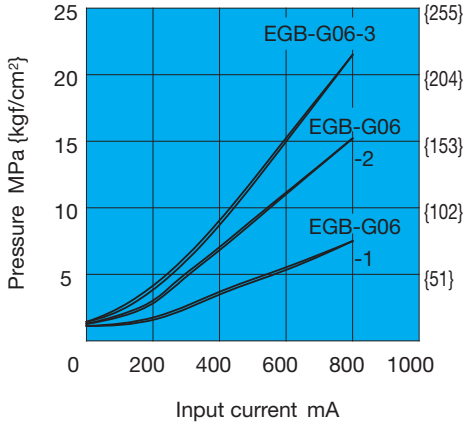
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Input Current – Pressure Characteristics

EGB-G03

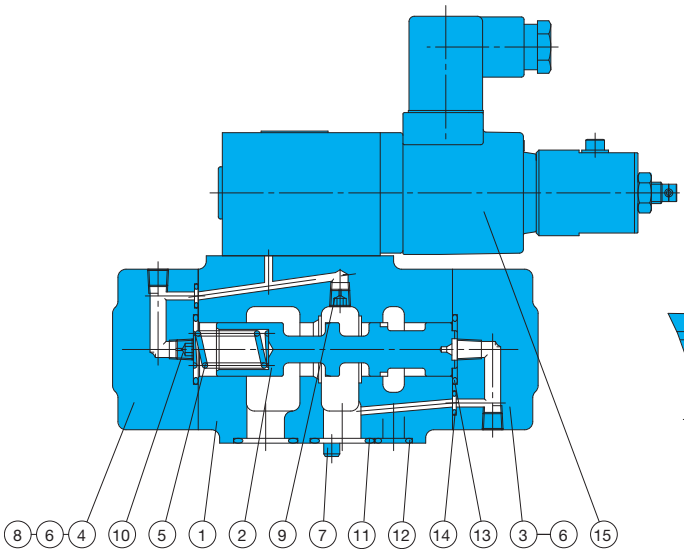


EGB-G06

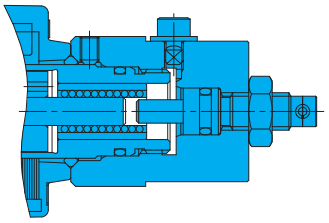


Cross-sectional Drawing

EGB-G**-*-11



Manual adjustment section



EGB Valve Built-in Pilot Relief Valve List

Model No.	Built-in Pilot Relief Valve
EGB-G03-B-11	EPR-GO1-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

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

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	NBR-90 P20	2	NBR-90 P26	3
12	O-ring	NBR-90 P10A	2	–	–
13	O-ring	NBR-90 P22	2	NBR-90 G30	2
14	O-ring	NBR-90 P6	2	NBR-90 P6	2

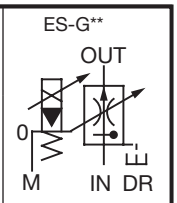
Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. For the ** part of the kit number, specify the valve size (G03, G06).
3. EPR-G01 pilot valve seal is available separately. See page I-3 for more information.

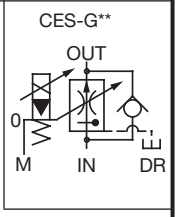
NACHI

ELECTRO-HYDRAULIC PROPORTIONAL FLOW CONTROL VALVE

Electro-hydraulic Proportional Flow Control Valve

0.5 to 500ℓ/min
21MPa





Features

This valve controls actuator speed in response to the size of input current. Pressure and control oil 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.	(C)ES-G02-10 30-(F)-12	ES-G03-60 125-(F)-12	(C)ES-G06-250-11	ES-G10-500-(F)-11
Maximum Operating Pressure MPa{kgf/cm²}	21{214}	21{214}	21{214}	21{214}
Flow Rate Control Range ℓ/min	0.5 to 10/0.5 to 30	2 to 60/2 to 125	5 to 250	15 to 500
Minimum Allowable Valve Pressure Differential MPa{kgf/cm²}	1.0{10}(Note1)	1.3{13.3}(Note1)	1.5{15.3}(Note1)	2{20.4}(Note1)
Reverse Flow Rate ℓ/min (With check valve only)	50	(125)(Note3)	200	–
Hysteresis %	3 max. (Note 2)	3 max. (Note 2)	3 max. (Note 2)	3 max. (Note 2)
Rated Current mA	800	800	800	800
Coil Resistance Ω	20 (20°C)	20 (20°C)	20 (20°C)	20 (20°C)
Weight kg	8.5	13	25	55

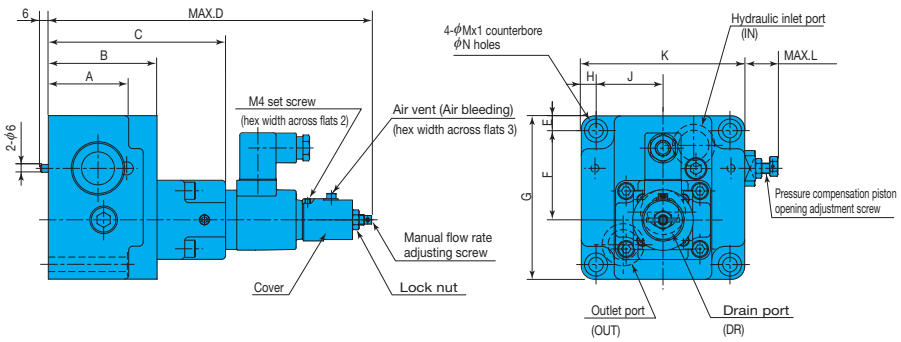
Note) 1. Control valve inlet and outlet pressure differential required to obtain favorable pressure compensation.
2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).
3. ES-G03 does not have a built-in check valve, but a sub plate with check valve (Model No. MCF-03-D-22) is available for it.

Explanation of model No.

(C)ES – G 02 – 30 – (F) – 12

- 12: Design number
- (F): Auxiliary symbol F: With pressure compensation piston opening adjustment screw. Note: Nominal diameters 02, 03, 10 only available
- 30: Rated flow rate
- 02: Nominal diameter: 02, 03, 06, 10
- G: Mounting method G: Gasket type
- (C)ES: Pump type CES: Electro-hydraulic proportional flow control valve with check valve 02, 06 only; ES: Electro-hydraulic proportional flow control valve

Installation Dimension Drawings



Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N
(C)ES-G02	66	80	132	242.8	9.7	48	102	9.4	38.1	95	22.5	14	8.8
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

● 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 0.2MPa {2kgf/cm²}, and that his port is connected directly to the fluid tank at a point that is below the oil surface.

Model No.	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
(C)ES-G02	M 8× 80ℓ	4	20 to 25{ 205 to 255}
ES-G03	M10× 75ℓ	4	45 to 55{ 460 to 560}
(C)ES-G06	M16×140ℓ	4	190 to 235{1940 to 2400}
ES-G10	M20×160ℓ	4	370 to 460{3770 to 4690}

4 Bundled Accessories (Valve Mounting Bolts)

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: –20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

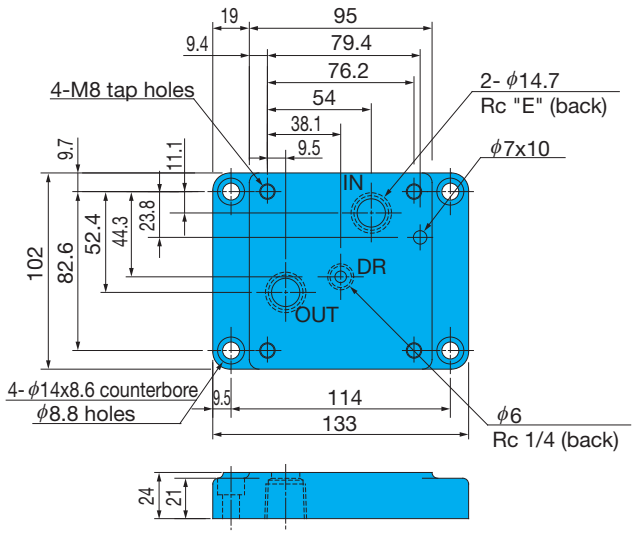
8 Since this valve has a built-in pressure compensation valve, changing of the inertial load (using a high inertial oil motor, etc.) can create the risk of hunching under certain conditions. Contact your sales agent before changing the inertial load.

Note) Use a hex wrench that has a width across flats of 8 to adjust the aperture adjustment screw of nominal diameter 10.

· The gasket surface dimensions comply with the ISO standard shown below.
(C) ES-G02…ISO 6263-06-05-0-97
ES-G03…ISO 6263-07-09-0-97
(C) ES-G06…ISO 6263-08-13-0-97

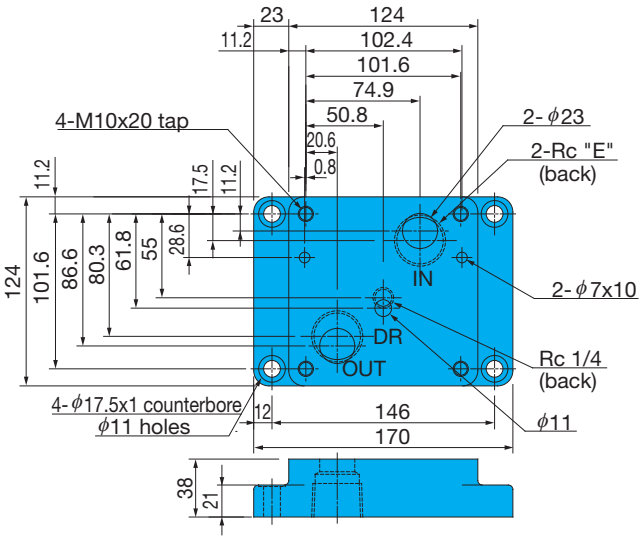
Sub Plate

MES-02*-10



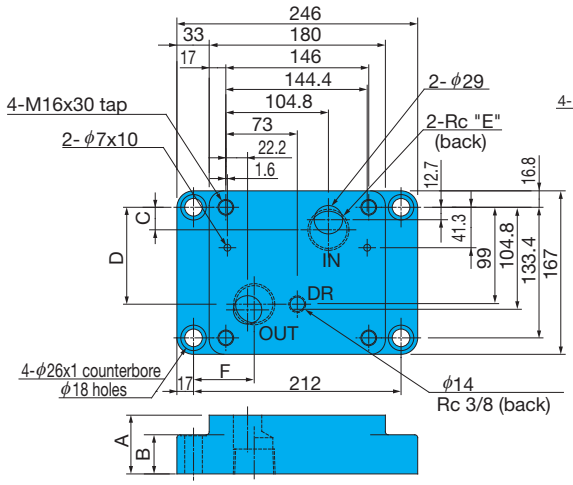
Model No.	E
MES-02X-10	3/8
MES-02Y-10	1/2

MES-03*-10



Model No.	E
MES-03Y-10	3/4
MES-03Z-10	1

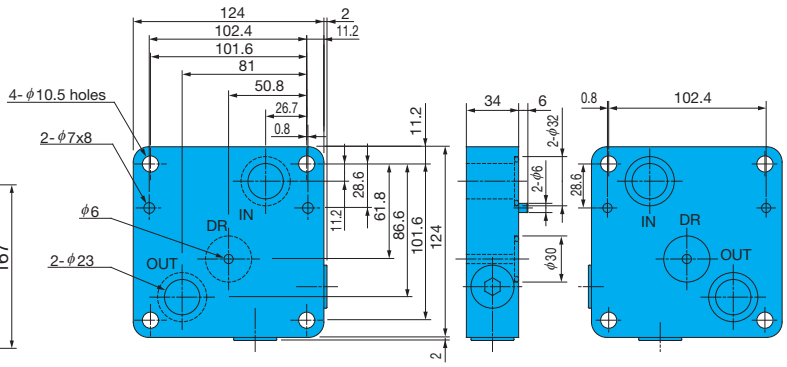
MES-06*-10



Model No.	A	B	C	D	E	F
MES-06X-10	45	25	16	104.8	1	55.2
MES-06Y-10	60	40	23	99	1¼	62

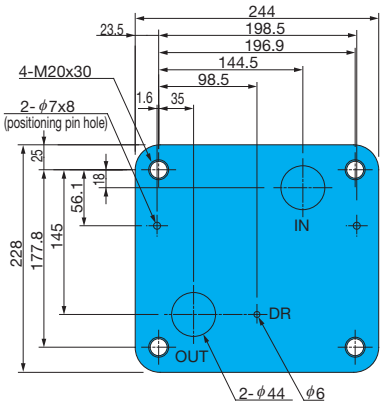
Auxiliary Plate with Check Valve

MCF-03-D-22



Bundled Items (Mounting Bolts) M10 x 110ℓ (Four)

ES-G10 Mounting Gasket Surface Dimensions

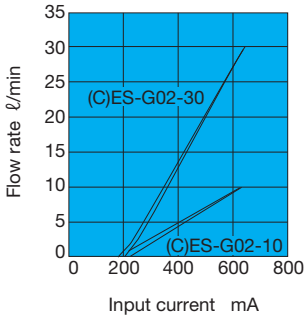


Performance Curves

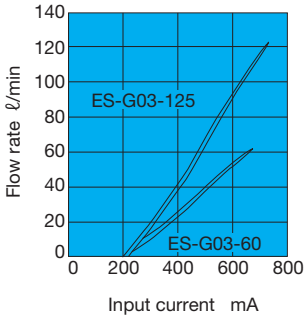
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Input Current – Flow Rate Characteristics

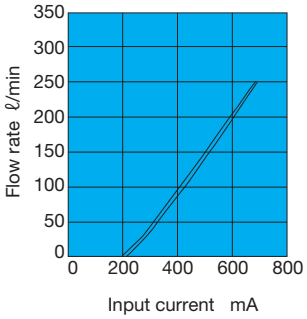
(C) ES-G02



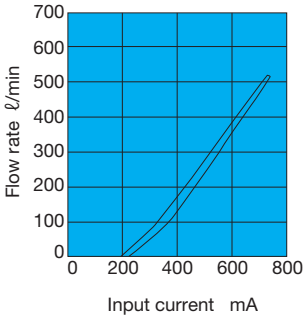
ES-G03



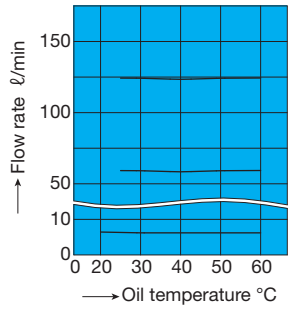
(C) ES-G06



ES-G10

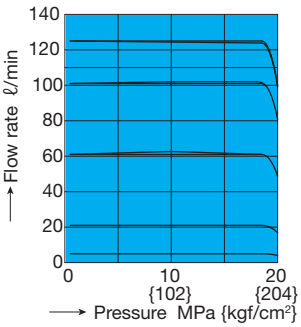


Oil Temperature – Control Flow Rate Characteristics



Supply Pressure 14MPa
Load Pressure 10MPa
Operating Fluid VG32
Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

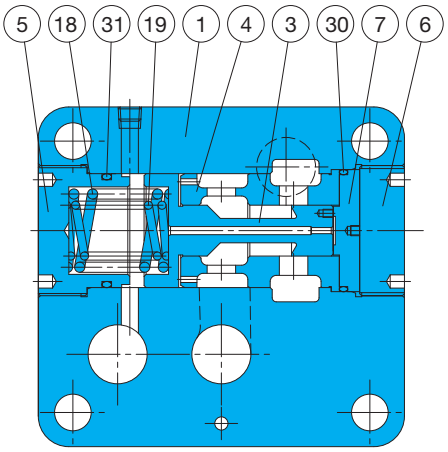
Pressure – Control Flow Rate Characteristics

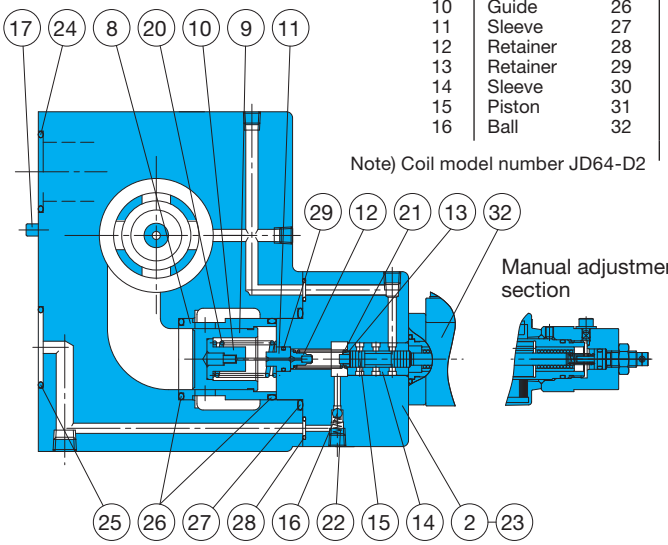


Supply Pressure 21MPa
Operating Fluid VG32
Oil Temperature 40°C
Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

Cross-sectional Drawing

ES-G**-*-11 (12)





Manual adjustment section

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

Note) Coil model number JD64-D2

List of Sealing Parts

Part No.	Part Name	(C) ES-G02		ES-G03		(C) ES-G06		ES-G10	
		Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty
24	O-ring	NBR-90 P18	2	NBR-90 P26	2	NBR-90 G35	2	NBR-90 P48	2
25	O-ring	NBR-90 P24	1	NBR-90 P28	1	NBR-90 G35	1	NBR-90 P48	1
26	O-ring	–	–	–	–	NBR-90 G35	2	NBR-90 G50	2
27	O-ring	NBR-90 P29	1	NBR-90 P29	1	NBR-90 G45	1	NBR-90 G60	1
28	O-ring	NBR-90 P5	4	NBR-90 P5	4	NBR-90 P8	3	NBR-90 P9	3
29	O-ring	NBR-90 P9	1	NBR-90 P9	1	NBR-90 P9	1	NBR-90 P9	1
30	O-ring	NBR-90 P18	1	NBR-90 P20	1	NBR-90 G55	1	NBR-90 G75	2
31	O-ring	NBR-90 P30	1	NBR-90 P38	1	NBR-90 P50	1	NBR-90 G75	1
Seal Kit Number		JFS-G02		JFS-G03		JFS-G06		JFS-G10	

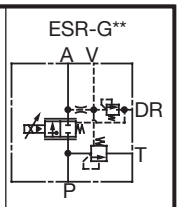
Note) The materials and hardness of the O-ring conforms with JIS B2401.

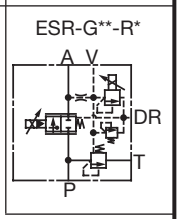
NACHI

ELECTRO-HYDRAULIC PROPORTIONAL RELIEF AND FLOW CONTROL VALVE

Load Response Electro-hydraulic Proportional Relief and Flow Control Valve

1 to 500ℓ/min
25MPa





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.

Specifications

Item \ Model No.		ESR-G03-125 (R*)-12	ESR-G06-250 (R*)-12	ESR-G10-500 R*-11
Maximum Operating Pressure MPa{kgf/cm²}		25{255}	25{255}	25{255}
Rated Flow Rate ℓ/min		125	250	500
Flow Rate Control System	Flow Rate Control Range ℓ/min	2 to 125	5 to 250	15 to 500
	Valve Differential Pressure MPa{kgf/cm²}	0.5{5.1}(Note1)	0.7{7.1}(Note1)	0.9{9.2}(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(20°C)	20(20°C)	20(20°C)
Pressure Control System (Note 3)	Pressure Control Range MPa{kgf/cm²}	R1 : 1.2 to 7{12.2 to 71} R2 : 1.4 to 14{14.3 to 143} R3 : 1.6 to 21{16.3 to 214} R4 : 1.6 to 25{16.3 to 255}	R1 : 1.2 to 7{12.2 to 71} R2 : 1.4 to 14{14.3 to 143} R3 : 1.6 to 21{16.3 to 214} R4 : 1.6 to 25{16.3 to 255}	R1 : 1.2 to 7{12.2 to 71} R2 : 1.4 to 14{14.3 to 143} R3 : 1.6 to 21{16.3 to 214} R4 : 1.6 to 25{16.3 to 255}
	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 (20°C)	20 (20°C)	20 (20°C)
Weight kg		14	28	60

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 25MPa {255kgf/cm²} for a valve that does not include an electro-hydraulic proportional pilot relief valve. Factory default is minimum output (3.5MPa max.) Set this value in accordance with the pressure of the hydraulic circuit being used.

Explanation of model No.

ESR – G 06 – 250 (**) – 12

- Design number
  - 12: For 03, 06 size
  - 11: For 10 size
- Pressure control function
  - None: Without electro-hydraulic proportional pilot relief valve (available with G03, G06)
  - R * : With electro-hydraulic proportional pilot relief valve
- Rated flow rate
- Nominal diameter 03, 06, 10
- Mounting method G: Gasket type
- Pump type ESR: Load sensitive electro-hydraulic proportional relief and flow control valve

●Handling

1 Air Bleeding
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 (3.5MPa max.) 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 1.5MPa. 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 least10ℓ/min with a nominal diameter of 03 or 06, and a relief flow rate of at least 20ℓ/min with a nominal diameter of 10.

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.

Model No.	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
ESR-G03	M10× 75ℓ M10× 90ℓ	2 2	45 to 55{ 460 to 560}
ESR-G06	M16×100ℓ M16×135ℓ	2 2	190 to 235{1940 to 2400}
ESR-G10	M20×130ℓ	6	370 to 460{3770 to 4690}

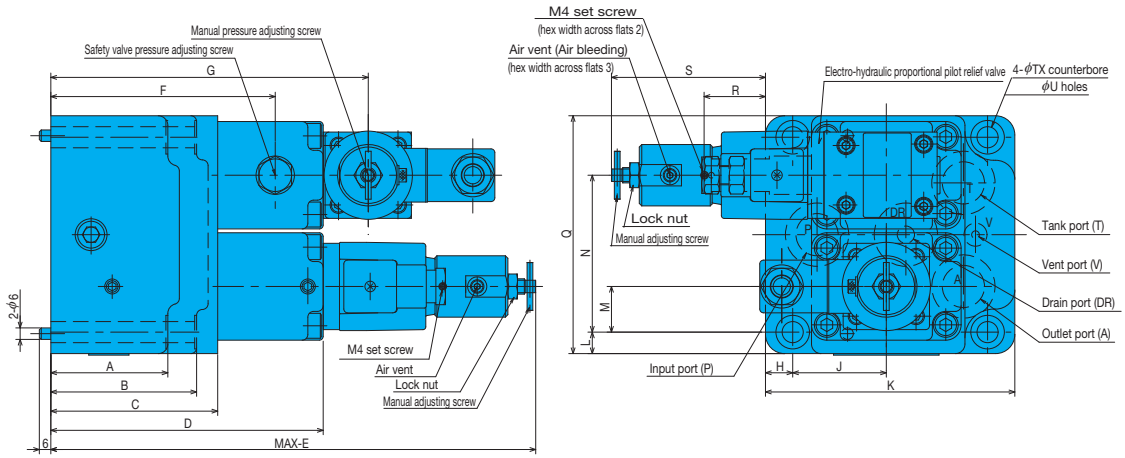
7 Bundled Accessories (Valve Mounting Bolts)

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: – 20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

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.

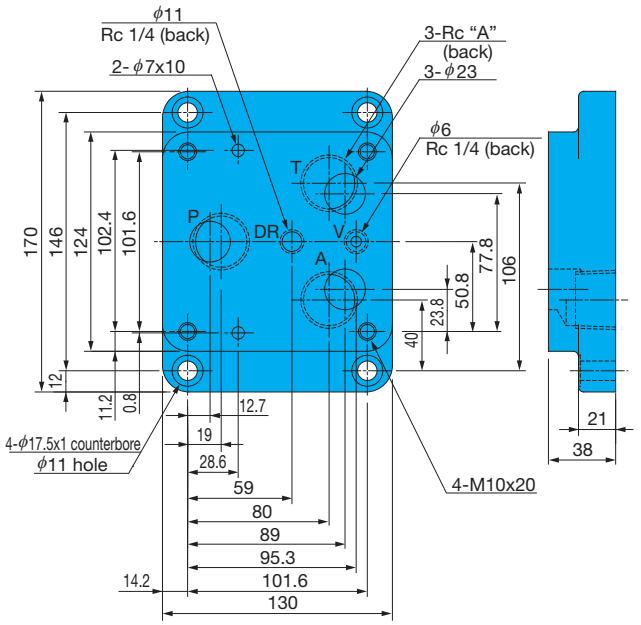
Installation Dimension Drawings



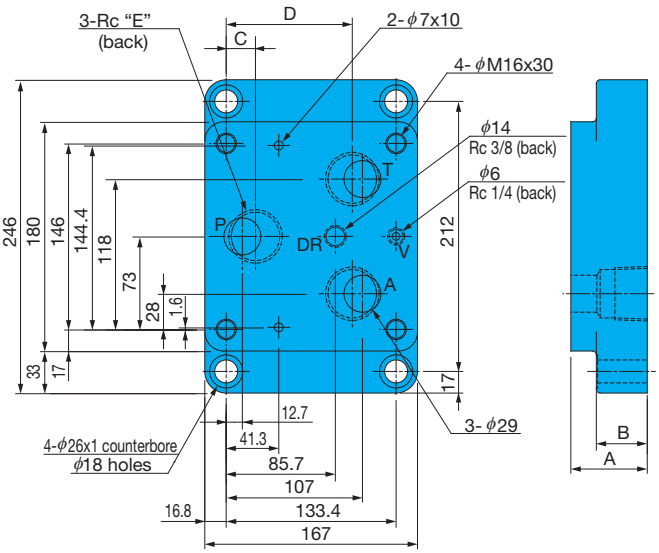
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	T	U
ESR-G03	61	76	87	142	252.8	117	165.5	14.2	48.8	130	11.2	23.8	81.8	124	32	80.3	17.5	11
ESR-G06	76	110	120	172	282.8	154	195.5	16.8	57.2	167	17	28	118	180	21	68.3	26	18
ESR-G10	107	107	150	205	317.3	183	228.5	25	76	228	23.5	35	162	244	-3	35.3	32	22

Sub Plate

MSR-03*-10



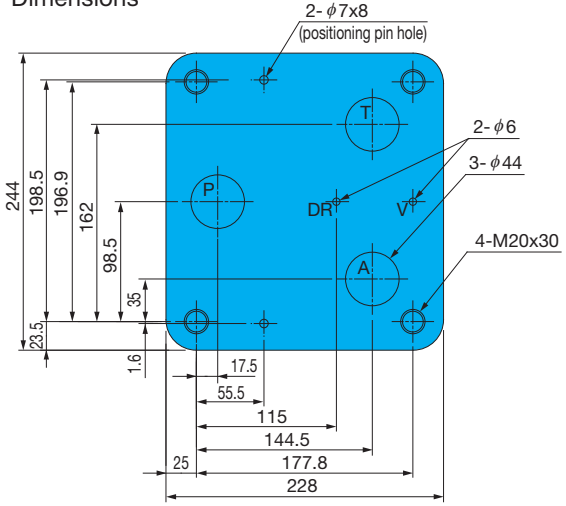
MSR-06*-10



Model No.	A
MSR-03Y-10	3/4
MSR-03Z-10	1

Model No.	A	B	C	D	E
MSR-06X-10	95	25	16	107	1
MSR-06Y-10	60	40	23	99	1 1/4

ESR-G10 Mounting Gasket Surface Dimensions



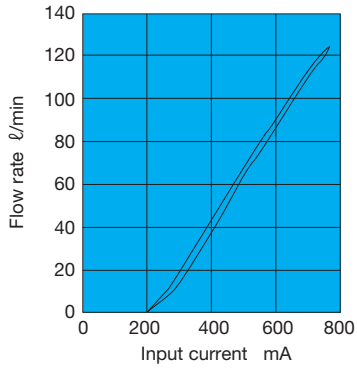
· The gasket surface dimensions comply with the ISO standards shown below.
ESR-G03···ISO 6263-07-11-1-97
ESR-G06···ISO 6263-08-15-1-97

Performance Curves

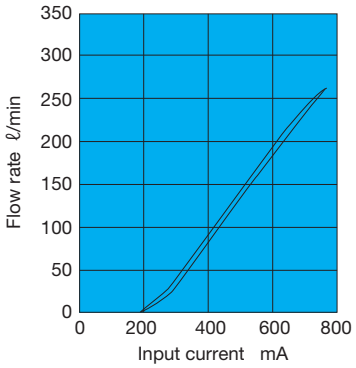
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Input Current – Flow Rate Characteristics

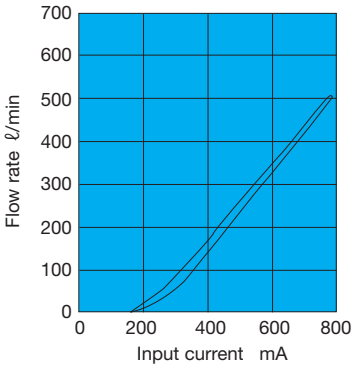
ESR-G03



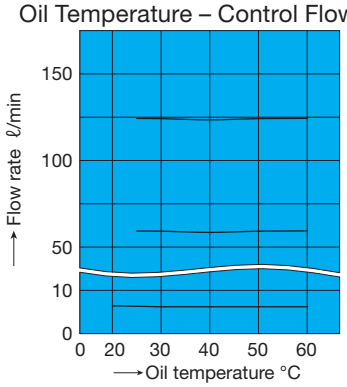
ESR-G06



ESR-G10

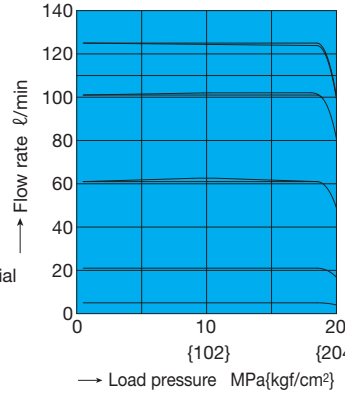


Oil Temperature – Control Flow Rate Characteristics



Load Pressure: 10MPa
Operating Fluid: VG32
Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

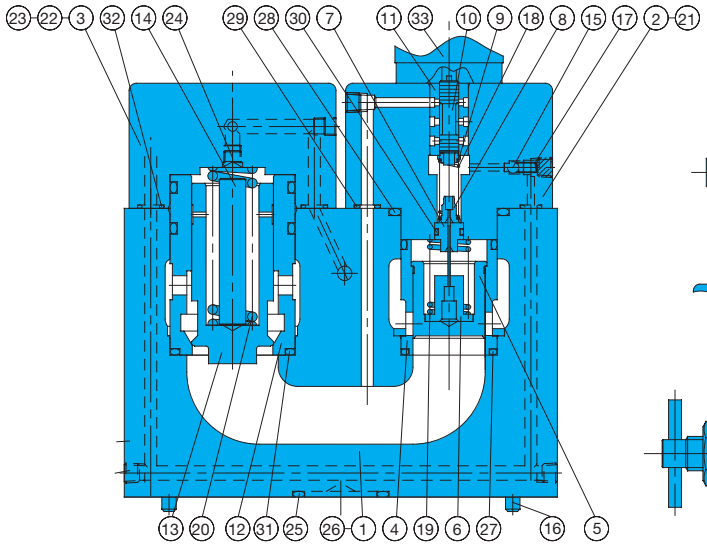
Pressure – Control Flow Rate Characteristics

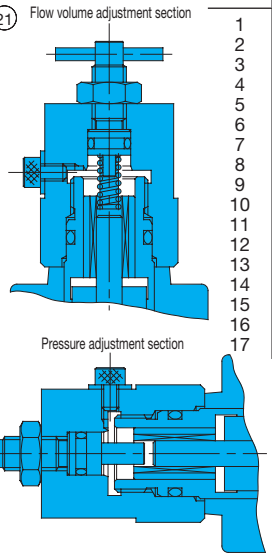


Electro-hydraulic Proportional Pilot Relief Valve Setting Pressure 21MPa
Operating Fluid: VG32
Oil Temperature: 40°C
Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

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

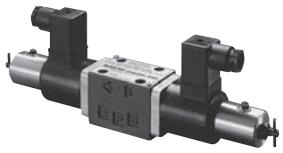
List of Sealing Parts

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	NBR-90 P26	4	NBR-90 G35	4	NBR-90 P48	4
26	O-ring	NBR-90 P9	1	NBR-90 P9	1	NBR-90 P9	1
27	O-ring	NBR-90 G25	2	NBR-90 G35	2	NBR-90 G50	2
28	O-ring	NBR-90 G35	1	NBR-90 G45	1	NBR-90 G60	1
29	O-ring	NBR-90 P6	3	NBR-90 P8	3	NBR-90 P9	3
30	O-ring	NBR-90 P9	1	NBR-90 P9	1	NBR-90 P9	1
31	O-ring	NBR-90 G35	3	NBR-90 P46	3	NBR-90 G65	3
32	O-ring	NBR-90 P6	2	NBR-90 P8	2	NBR-90 P9	2
Seal Kit Number		JLS-G03R		JLS-G06R		JLS-G10R	

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. EPR-G01 seal is available separately. See page I-3 for more information.

Electro-hydraulic Proportional Flow and Direction Control Valve

10 to 250ℓ/min
25MPa



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 highspeed control. The lineup consists of the direct system 01 size and the pilot system 03, 04, and 06 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

Item \ Model No.	ESD-G01-** 10 20 -12	ESD-G03-** 40 80-(**)-12	ESD-G04-**140-(**)-12	ESD-G06-**250-(**)-13
Maximum Operating Pressure MPa{kgf/cm²}	25{255}			
Rated Flow Rate ℓ/min	10/20(Note 1)	40/80(Note 1)	140(Note 1)	250(Note 1)
Maximum Flow Rate ℓ/min	25(Note 2)	100(Note 2)	140(Note 2)	250(Note 2)
Pilot Pressure MPa{kgf/cm²}	–	At least 1.0{10}(Note 3)		
Pilot Flow Rate ℓ/min	–	At least 2(Note 4)	At least 3(Note 4)	At least 5(Note 4)
T Port Allowable Back Pressure MPa{kgf/cm²}	2.5{25.5}	Internal Drain: 2.5 {25.5}		
		External Drain: 21 {214}		
Rated Current mA	850			
Coil Resistance Ω	20(20°C)			
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 kg	2.2	7	9.2	15

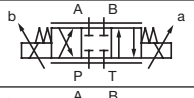
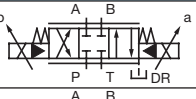
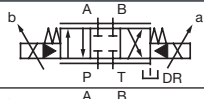
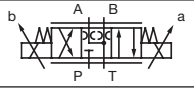
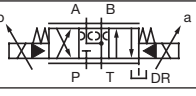
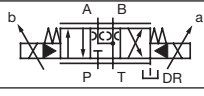
Note) 1. Value when pressure drop volume to P→A and P→B is ΔP = 1.0MPa {10kgf/cm²}.
2. Indicates maximum throughput volume value between each port.
3. Indicates differential between the pilot port and tank port, or drain port.
4. Value when 0.1 second is assumed for the response time from zero to the rated flow volume.
5. Value when a Nachi-Fujikoshi special amplifier is used.
6. Response time is typical value for a supply pressure of 14MPa {143kgf/cm²} and oil temperature of 40°C (kinematic viscosity: 40mm²/s).

Explanation of model No.

ESD – G 03 – C5 80 – (***) – 12

- 12: Design number
- (***): Auxiliary symbol (Can be combined in alphabetic sequence.) (For G03, G04, G06 size only)
  None: Internal pilot, external drain (standard)
  A : Internal pilot, internal drain
  E : External pilot, external drain
  A E : External pilot, internal drain
  G : Modular pilot
  With pressure reducing valve (OG-G01-P1-21)
  (See Note 6 under "Handling.")
- 80: Rated flow rate (See the rated flow rate item in the specifications.)
- C5: Spool type (See Table 1.)
- 03: Nominal diameter: 01, 03, 04, 06
- G: Mounting method G: Gasket type
- ESD: Pump type ESD: Electro-hydraulic proportional flow and directional control valve

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 I-20.

6 If pilot pressure (ESD-G03, G04, G06) exceeds 9MPa {92kgf/cm²} use a modular type P port reduction valve (OG-G01-P1-21) at a setting of 2MPa {20kgf/cm²}.

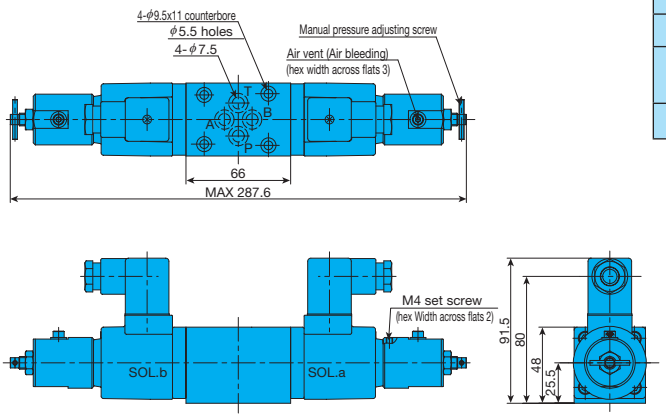
7 On a system that requires large brake pressure during deceleration or a system that uses a vertical cylinder, equip a counter balance valve.
Use a single rod, if the rod exit is not slowed sufficiently, use a counter balance valve on the rod.

8 Maintain hydraulic operating fluid contamination so it is at least Class 9. Use of a G01 modular filter (Absolute: 8μm) is also helpful.
(Example: Taisei Kogyo Co., Ltd. MVF-01-8C-1)

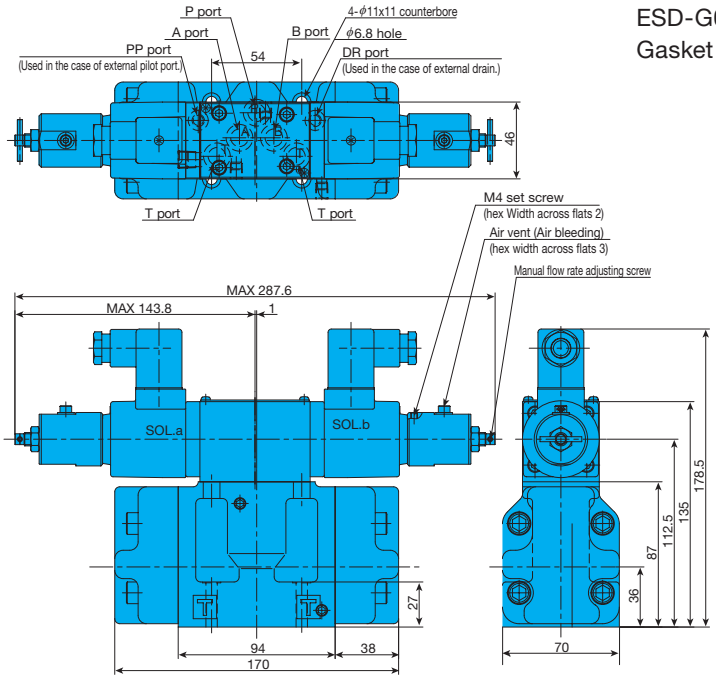
(Continued on next page)

Installation Dimension Drawings

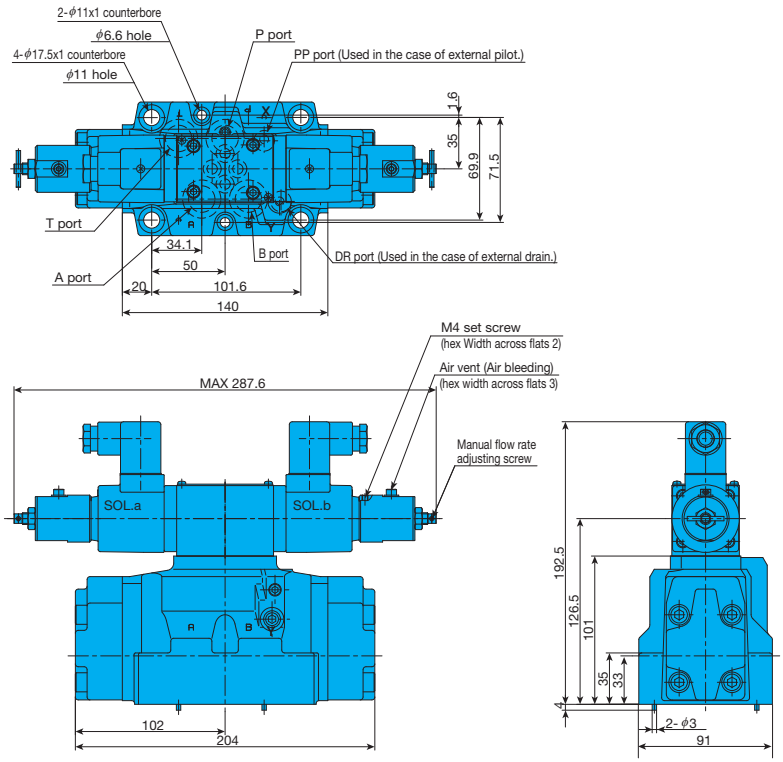
ESD-G01



ESD-G03



ESD-G04



9 Bundled Accessories (Valve Mounting Bolts)

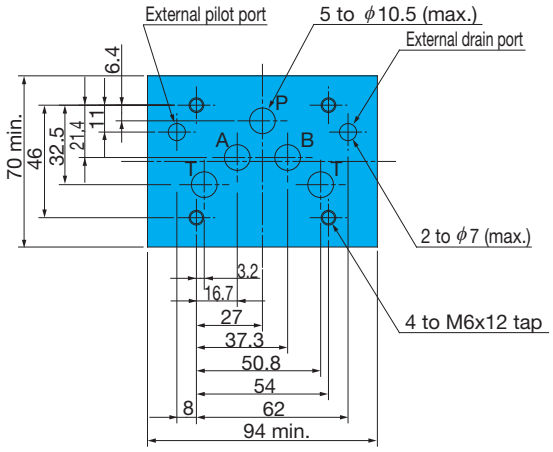
Model No.	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
ESD-G01	M 5×45ℓ	4	5 to 7{ 51 to 71}
ESD-G03	M 6×35ℓ	4	10 to 13{ 102 to 133}
ESD-G04	M 6×45ℓ	2	10 to 13{ 102 to 133}
	M10×50ℓ	4	45 to 55{ 460 to 560}
ESD-G06	M12×60ℓ	6	60 to 70{ 610 to 715}

For information about sub plates, see MSA-01Y-10 on page I-3.

Gasket Surface Dimensions
(ISO 4401-03-02-0-94)

10 Use an operating fluid that conforms to the both of the following. Oil temperature: –20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

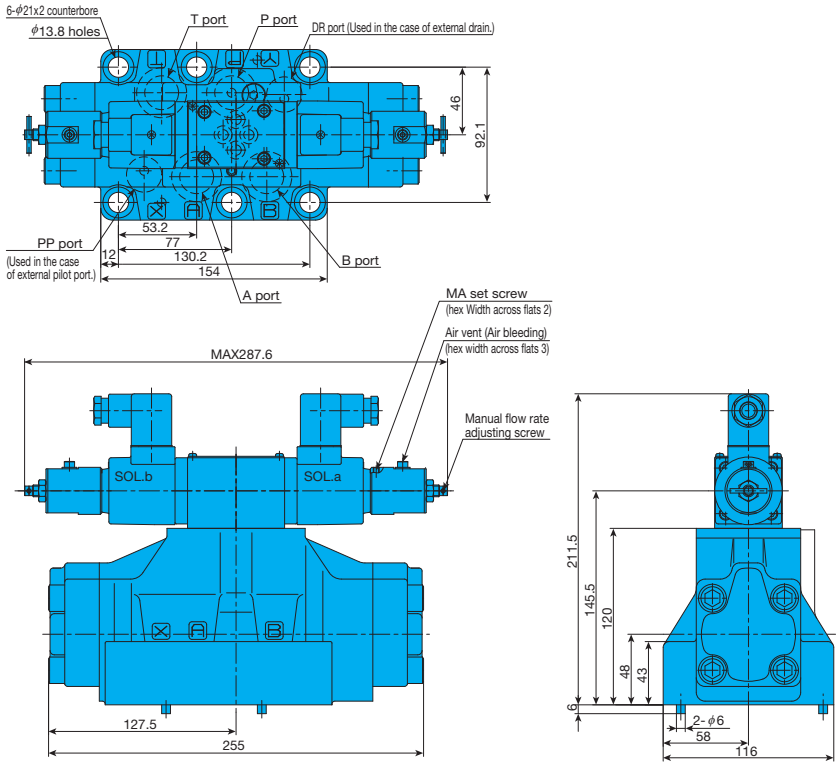
ESD-G03 Mounting Gasket Surface Dimensions
Gasket Surface Mounting Dimensions (ISO4401-05-0-05)



· Auxiliary symbol G: Equipping a modular type pilot reduction valve increases the height by 40mm.
· The gasket surface dimensions comply with the ISO standards shown below.
ESD-G04…ISO 4401-07-06-0-05
ESD-G06…ISO 4401-08-07-0-05
ESD-G10…ISO 4401-10-08-0-05

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

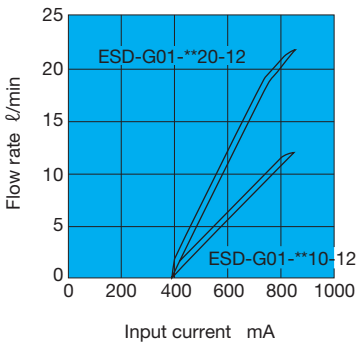
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Input Current – Flow Rate Characteristics are characteristic when the P→A or P→B pressure drop is ΔP = 1.0MPa {10kgf/cm²}.

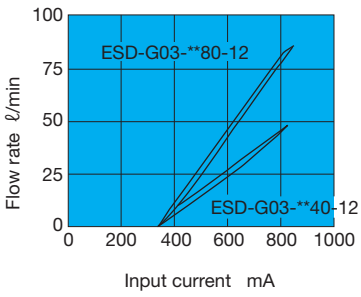
For Pressure – Flow Rate Characteristics, the horizontal shaft valve differential pressure indicates the pressure drop volume of the entire control valve (between P, A, B, T), and flow rate is measured at the oil motor.

Input Current – Flow Rate Characteristics

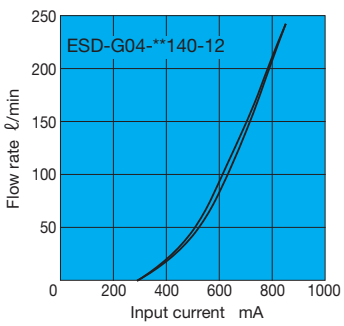
ESD-G01



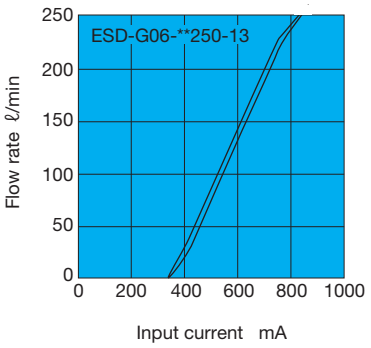
ESD-G03



ESD-G04

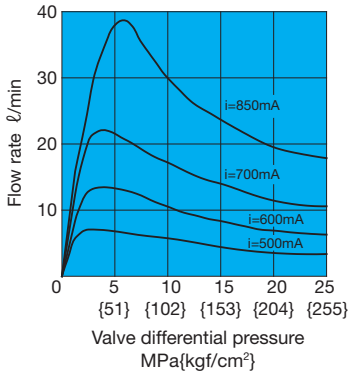


ESD-G06

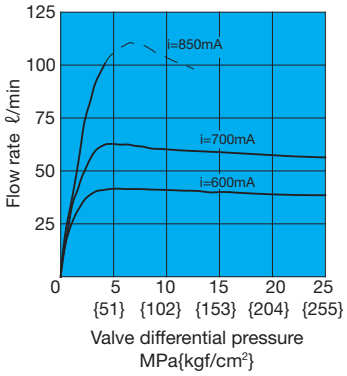


Pressure – Flow Rate Characteristics

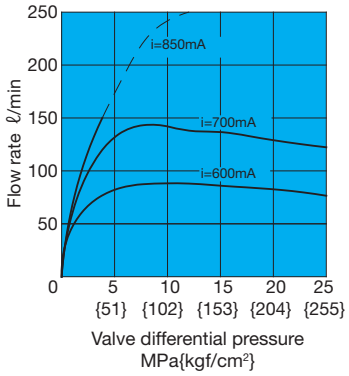
ESD-G01-C520-12



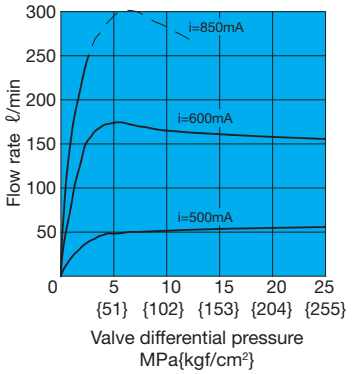
ESD-G03-C580-12



ESD-G04-C5140-12

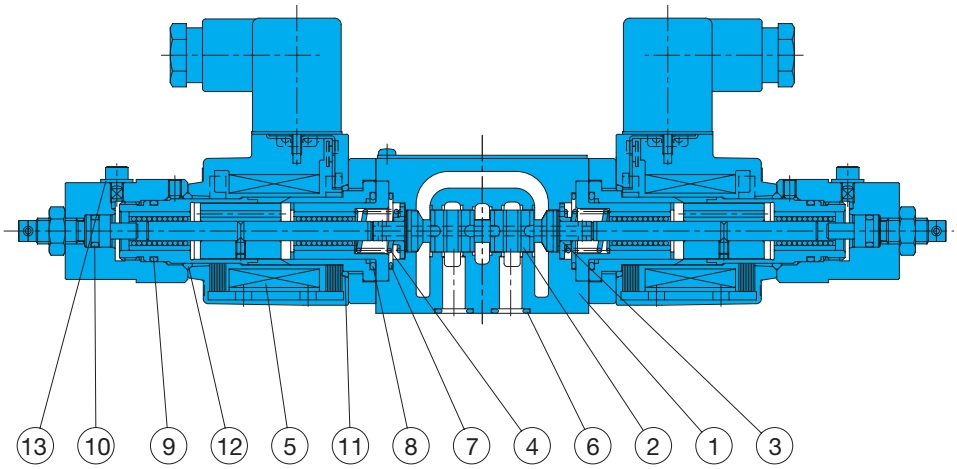


ESD-G06-C5250-13



Cross-sectional Drawings

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

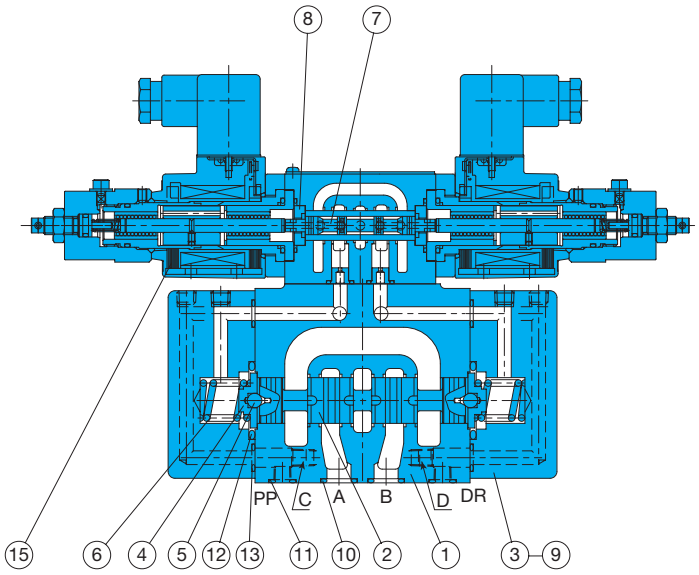
Note) Coil model number JD64-D2

Seal Part List (Kit Model Number JDS-G01-1A)

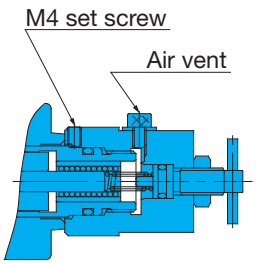
Part No.	Part Name	Part Number	Q'ty
6	O-ring	AS 568-012(NBR-90)	4
7	O-ring	AS 568-019(NBR-90)	2
8	O-ring	NBR-90 P22	2
9	O-ring	AS 568-016(NBR-90)	2
10	O-ring	NBR-90 P7	2
11	O-ring	S-25(NBR-70-1)	2
12	O-ring	NBR-70-1 P20	2
13	Seal	CW1000F0	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

ESD-G03-****-(**)-12



Manual adjustment section
(ESD-G03, G04, G06, G10)

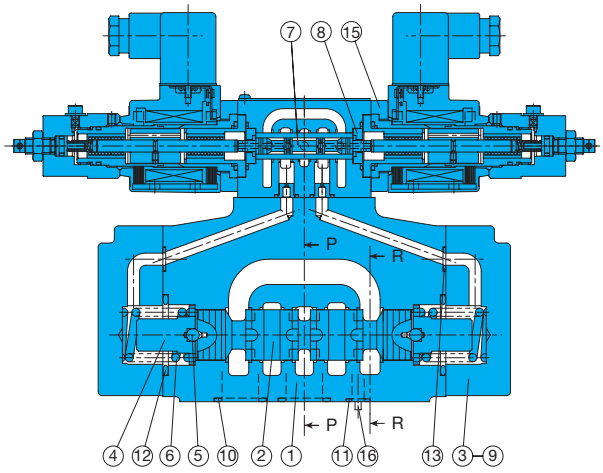


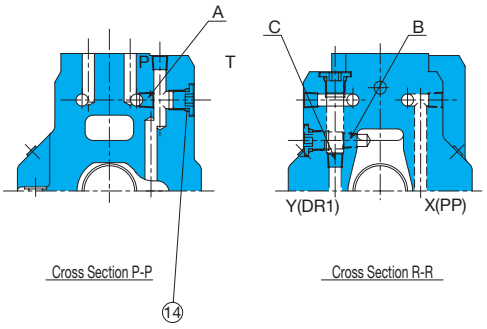
Note) The coil cover has an M4 set screw. When changing the orientation of the air vent, loosen the M4 screw and rotate the cover. Retighten after bleeding the air.

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





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

Methods for Changing the Pilot/Drain System

After Change		Hexagon Socket Head Plug
Pilot	Internal	Remove from Ⓐ
	External	Insert from Ⓐ
Drain	Internal	Change from Ⓑ to Ⓒ
	External	Change from Ⓒ to Ⓑ

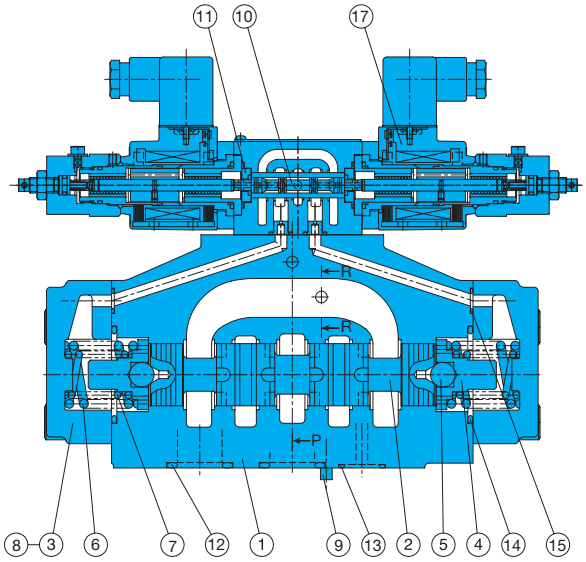
Note) A single hex head plug (NPTF 1/16) is required when changing to external pilot.
Hex Head Plug: TPUA-1/16

Seal Part List (Kit Model Number JHS-**)

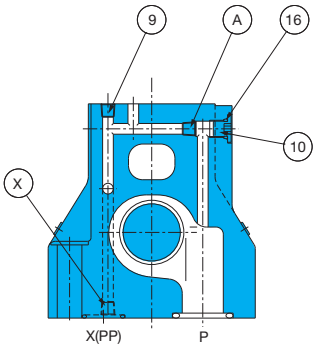
Part-No.	Part Name	ESD-G03		ESD-G04	
		Part Number	Q'ty	Part Number	Q'ty
10	O-ring	NBR-90 P12	5	NBR-90 P22	4
11	O-ring	NBR-90 P9	2	NBR-90 P10A	2
12	O-ring	NBR-90 P28	2	NBR-90 P34	2
13	O-ring	NBR-90 P9	6	NBR-90 P9	2
14	O-ring	——	–	NBR-90 P8	3
Kit Model No.		JHS·G03		JHS·G04	

Note) The materials and hardness of the O-ring conforms with JIS B2401.

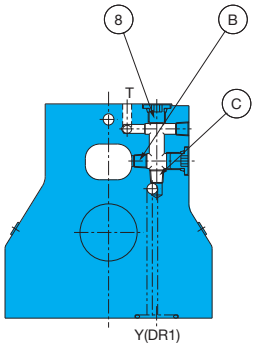
ESD-G06-****-(***)-13



Pilot, Drain System Change



Cross-sectional P-P



Cross-sectional R-R

Changing the Pilot and Drain Connections

After Change		Hexagon Socket Head Plug
Pilot	Internal	Switch from Ⓐ to Ⓧ.
	External	Switch from Ⓧ to Ⓐ.
Drain	Internal	Switch from Ⓑ to Ⓒ.
	External	Switch from Ⓒ to Ⓑ.

Seal Part List (Kit Model Number JHS-G06)

Part No.	Part Name	Part Number	Q'ty
12	O-ring	NBR-90 P28	4
13	O-ring	NBR-90 P20	2
14	O-ring	NBR-90 G45	2
15	O-ring	NBR-90 P10	2
16	O-ring	NBR-90 P8	3

Note) The materials and hardness of the O-ring conforms with JIS B2401.

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 MPa{kgf/cm²}	21{214}	25{255}	25{255}	21{214}
Pressure Compensation Differential Pressure MPa{kgf/cm²}	1.0{10}	0.6{6}	1.4{14}	0.8{8}
Maximum Flow Rate ℓ/min	27	40	80	170
Weight kg	1.5	4.7	5.0	12

Explanation of model No.

JHF – 03 040 (E)

- (E): Auxiliary symbol (See "Handling.")
  None : Internal pilot
  E : External pilot
- 040: Maximum Flow Rate (ℓ/min)
- 03: Nominal diameter 01, 03, 06
- JHF: Pressure compensation valve kit

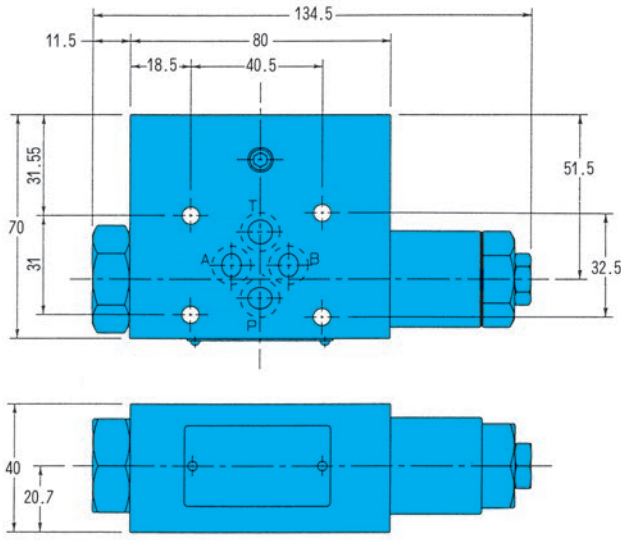
●Handling

1 When using the pressure compensation kit, use an external pilot type for the ESD valve (G03, 06).

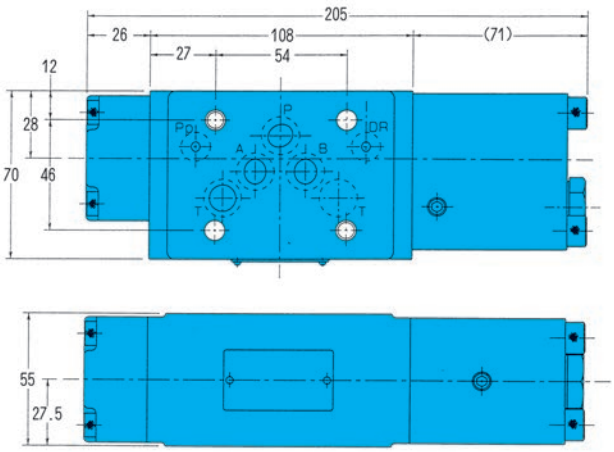
2 An internal pilot type pressure compensation valve kit is used when the pilot flow rate is supplied from the P port, without an eternal pilot port (Pp port) on the manifold. An external pilot type pressure compensation valve kit is used when there is an external pilot port (Pp port) on the manifold.

Installation Dimension Drawings

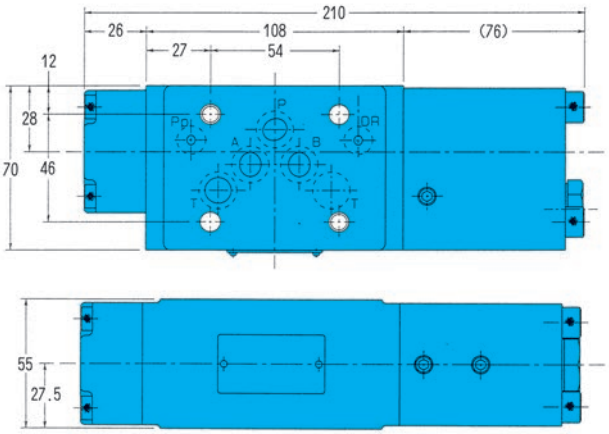
Pressure compensation valve kit
JHF-01027



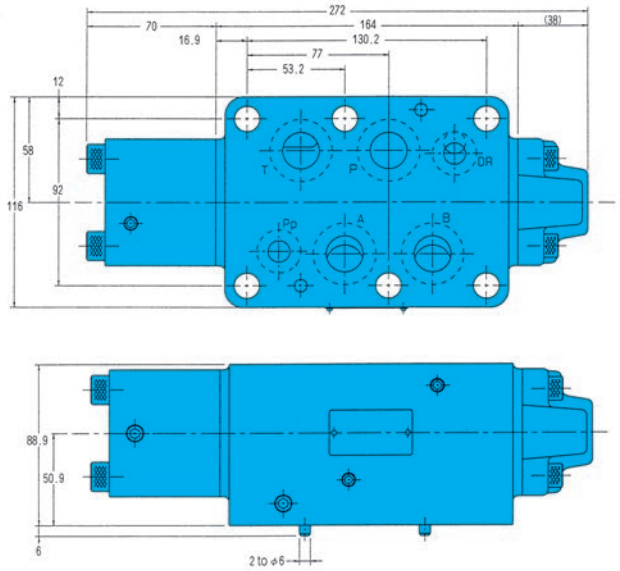
JHF-03040(E)



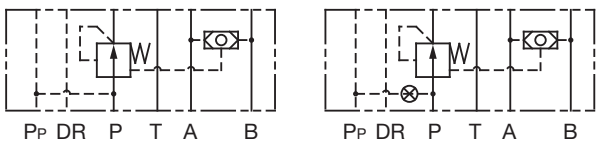
JHF-03080(E)



JHF-06170(E)



Note) Mounting bolts are not included with the pressure compensation kit.
Use the valve mounting bolt lists on pages D-93 through D-95 to select mounting bolts.

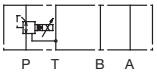


Internal pilot

External pilot

Modular Type Electro-hydraulic Proportional Reducing Valve

30ℓ/min
0.3 to 14MPa



Features

This valve incorporates the ease-ofuse 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	MPa{kgf/cm²}	25{255}
Maximum Flow Rate	ℓ/min	30
Pressure Control Range	MPa{kgf/cm²}	B : 0.3 to 2.5{3.1 to 25.5} 1 : 0.4 to 7 {4 to 71 } 2 : 0.6 to 14 {6 to 143 }
T Port Allowable Back Pressure	MPa{kgf/cm²}	2.5{25.5}max
Rated Current	mA	850
Coil Resistance	Ω	20 (20°C)
Hysteresis	%	3 max. (Note 1)
Weight	kg	3.6

Note) Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

Explanation of model No.

EOG – G 01 – P 1 – 11

- 11 — Design number
- 1 — Pressure control range: B, 1, 2
- P — Control port: P port
- 01 — Nominal diameter 01
- G — Mounting method G: Gasket type
- EOG — Modular type electro-hydraulic proportional reducing valve

●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

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.

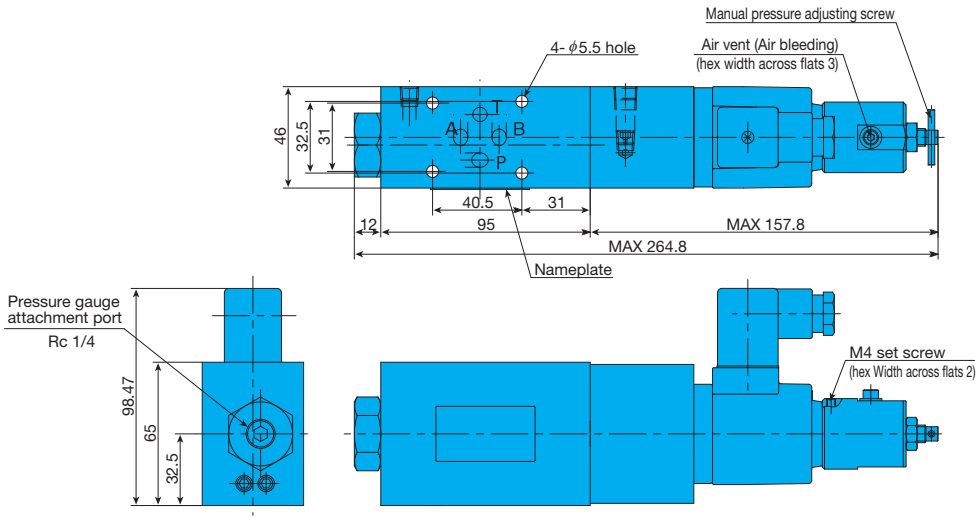
3 Minimum Control Pressure
Since this valve has an internal drain system, T port back pressure has an effect on minimum control pressure.

4 Load Capacity
Make load capacity (valve OUT side capacity) at least 0.5ℓ.

5 Use an operating fluid that conforms to the both of the following. Oil temperature : –20 to 70°C Kinematic Viscosity : 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

Installation Dimension Drawings

EOG-G01-P*-11

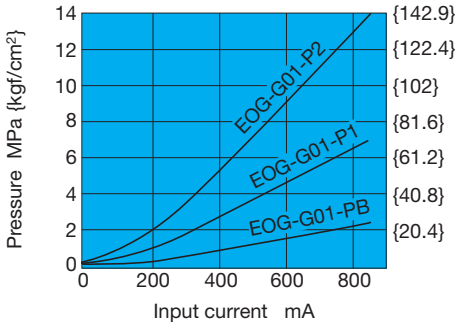


Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

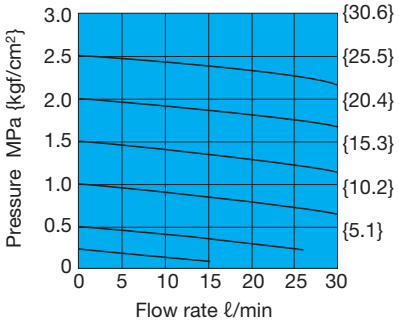
Input Current — Pressure Characteristics

EOG-G01

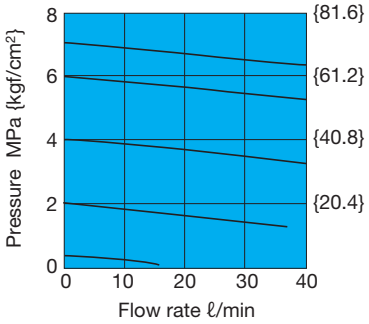


Flow Rate — Pressure Characteristics

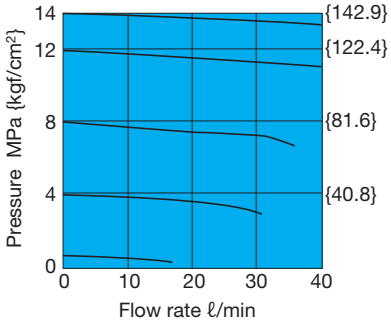
EOG-G01-PB



EOG-G01-P1

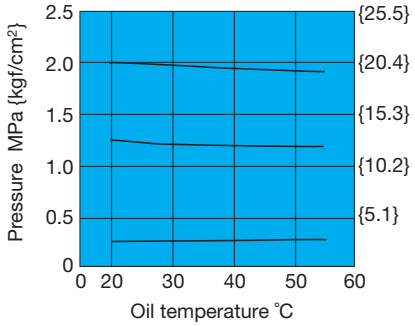


EOG-G01-P2

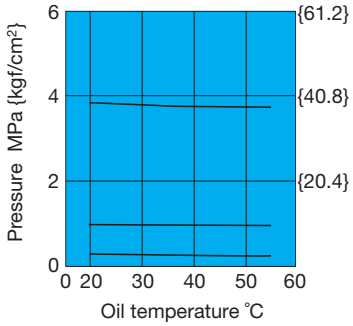


Oil Temperature Characteristics

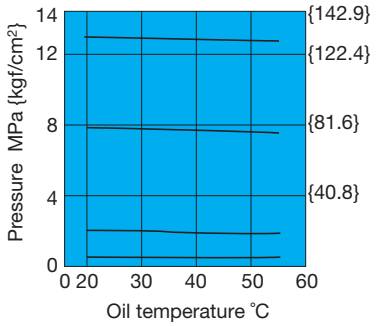
EOG-G01-PB



EOG-G01-P1

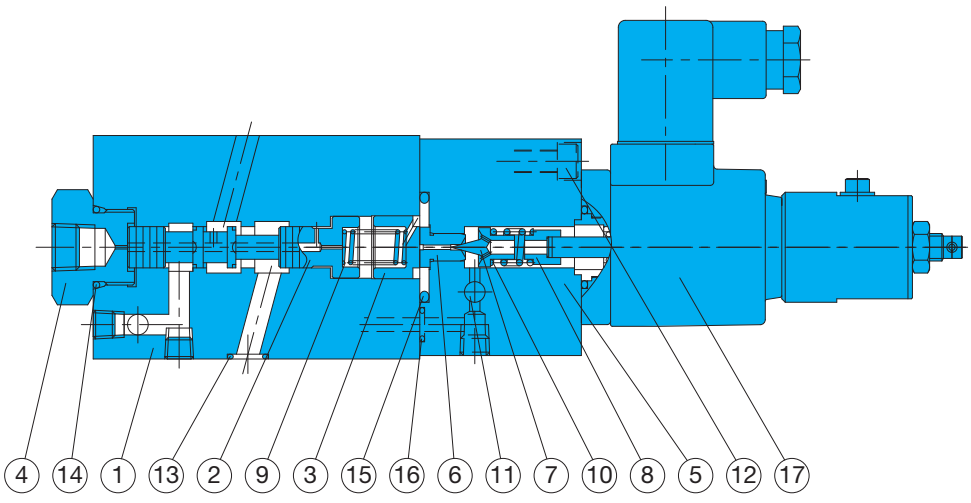


EOG-G01-P2



Cross-sectional Drawing

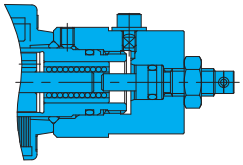
EOG-G01-P*-11



Part No.	Part Name
1	Body
2	Spool
3	Retainer
4	Plug
5	Cover
6	Seat
7	Poppet
8	Retainer
9	Spring
10	Spring
11	Choke
12	Screw
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Proportional solenoid

Note) Coil model number JD64-D2

Manual adjustment section



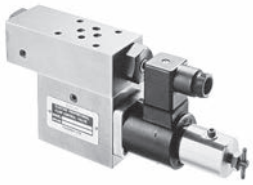
Seal Part List (Kit Model Number JBS-G01)

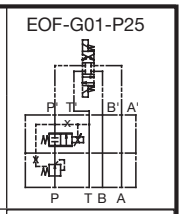
Part No.	Part Name	Part Number	Q'ty
13	O-ring	AS568-012(NBR-90)	4
14	O-ring	NBR-90 P20	1
15	O-ring	NBR-90 P26	1
16	O-ring	NBR-90 P7	1

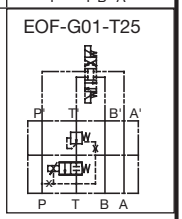
Note) The materials and hardness of the O-ring conforms with JIS B2401.

Modular Type Electro-hydraulic Proportional Flow Control Valve

0.3 to 25ℓ/min
21MPa







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.

Specifications

Item \ Model No.	EOF-G01-$\frac{P}{T}$ 25-11
Maximum Operating Pressure MPa{kgf/cm²}	21{214}
Flow Rate Control Range ℓ/min	0.3 to 25
Flow Rate Control Port	EOF-G01-P : P port EOF-G01-T : T Port
T Port Allowable Back Pressure MPa{kgf/cm²}	2.5 {25.5} max.
Hysteresis %	3 max. (Note 1)
Response Speed S	0.05
Rated Current mA	800
Coil Resistance Ω	20 (20°C)
Weight kg	3.7

Note) Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

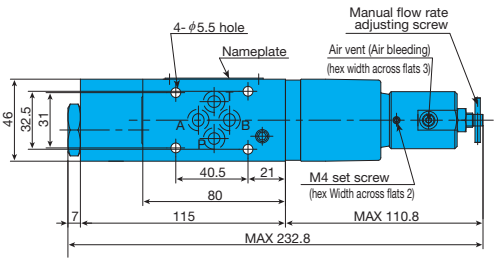
Explanation of model No.

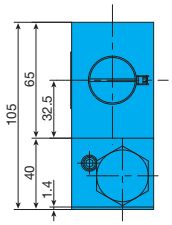
EOF – G 01 – P 25 – 11

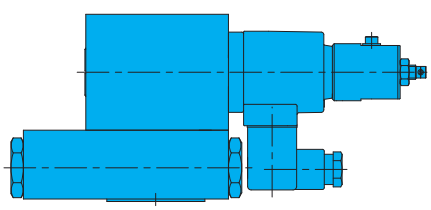
- 11: Design number
- 25: Rated flow rate
- P: Control port: P, T
- 01: Nominal diameter 01
- G: Mounting method G: Gasket type
- EOF: Modular type electro-hydraulic proportional flow control valve

Installation Dimension Drawings

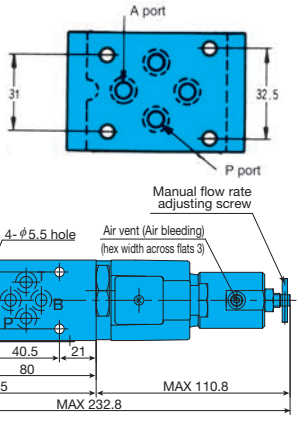
EOF-G01-P25-11

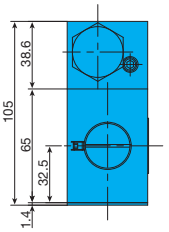


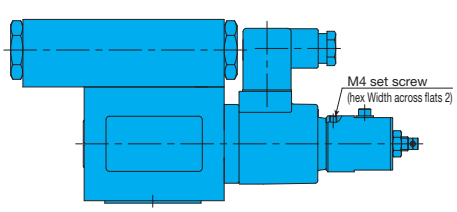




EOF-G01-T25-11







●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 2.5MPa {25.5kgf/cm²}.

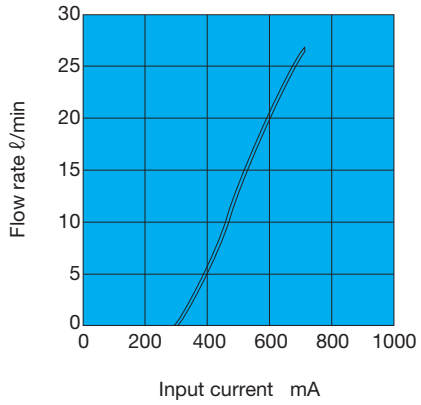
4 Use an operating fluid that conforms to the both of the following. Oil temperature: –20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

5 O-ring Plate Orientation
①The port nearest the nameplate surface is the P port.
②The port with a mounting pitch width of 31 (narrow pitch width) is the A port.
③The cutout on the O-ring plate is on the A port side.

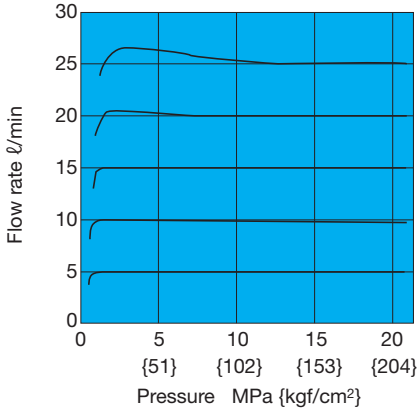
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

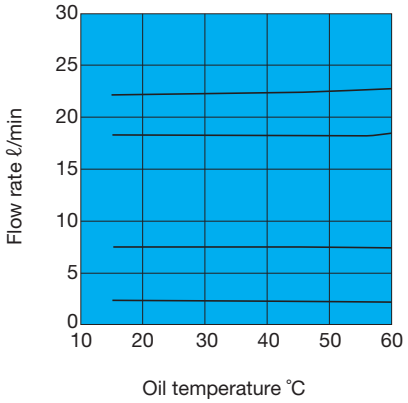
Input Current - Flow Rate Characteristics



Pressure - Flow Rate Characteristics

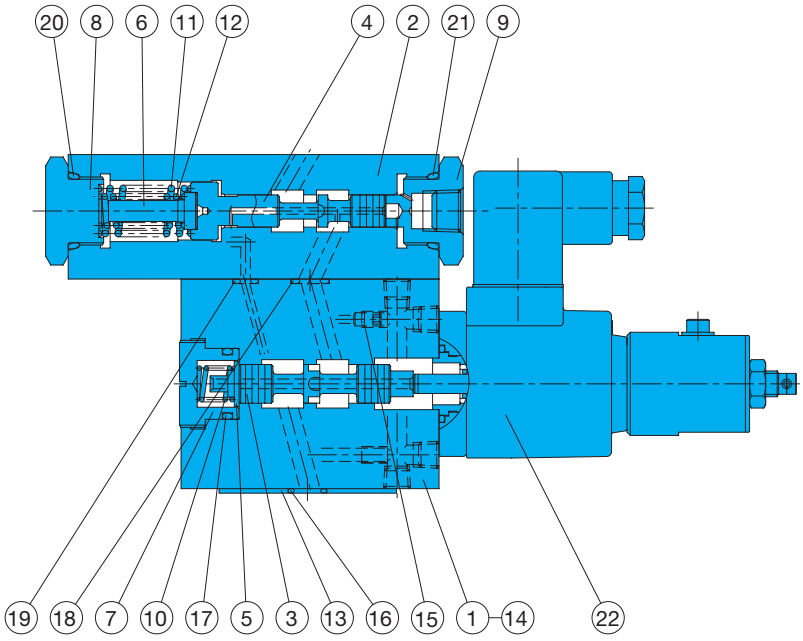


Oil Temperature Characteristics



Cross-sectional Drawing

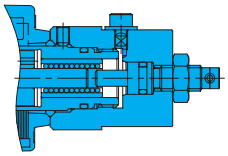
EOF-G01-T25



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

Manual adjustment section



Seal Part List (Kit Model Number JMS-G01)

Part No.	Part Name	Part Number	Q'ty
16	O-ring	AS568-012(NBR-90)	4
17	O-ring	NBR-90 P18	1
18	O-ring	NBR-90 P9	4
19	O-ring	NBR-90 P5	1
20	O-ring	NBR-90 P20	1
21	O-ring	NBR-90 P20	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Power Amplifier Series for Electrohydraulic Proportional Valve Drive

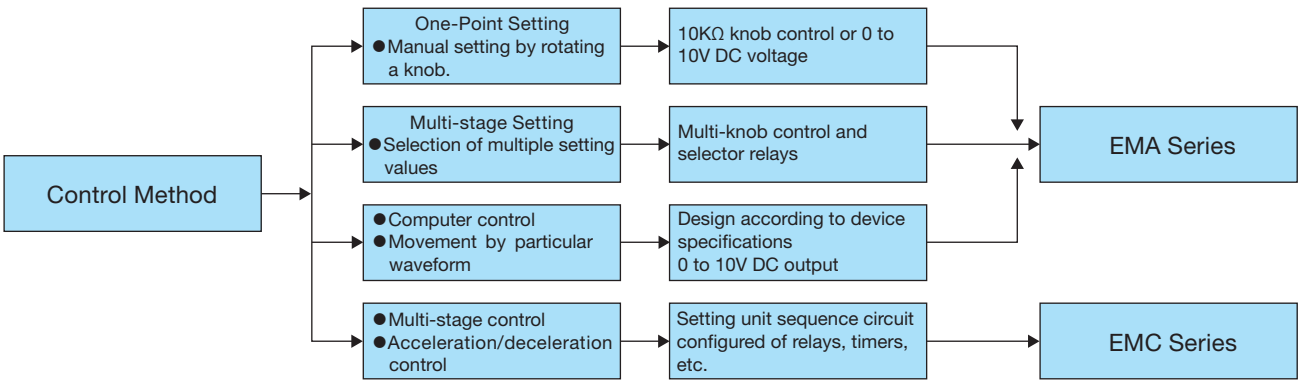
Overview

This special amplifier is for driving electro-hydraulic 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 Flow Control Valves 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) 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)	$\frac{900mA}{10V_{DC}}$ to $\frac{900mA}{1.5V}$	0 to $\frac{900mA}{80\%\ channel\ setting}$
External power supply	$+10V_{DC}$(10mA)	–
External Contact Resistance	–	10Ω max. when closed
Dither (Internal, semi-fixed)	Level: 0 to 500mAp-p Frequency: 50 to 220Hz	Level: 0 to 500mAp-p Frequency: 50 to 220Hz
Channel Time Lag (TIME)	–	0.3 to 3 seconds 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	0 to 50°C	0 to 50°C
Temperature Drift	0.2mA/°C max.	0.2mA/°C max.
Weight	3.5kg	3.5kg

Explanation of model No.

EMA– P D5 –N – □□□□□ – 20

- 20: Design number
- □□□□□: Auxiliary symbol (Up to six characters can be combined in alphabetic sequence.)
- N: Input amplifier
- D5: D5, DC 5 input
- P: Mounting method: Panel type
- EMA: Electro-hydraulic proportional valve amplifier

(Auxiliary Symbol List)

C	4-20mA input (R1, RT3) 1-5V input (R2, RT4)
D	Adjustment by 10-rotation potentiometer
K	Moisture resistance
T1	T-UP,T-DOWN 0.1-1sec
T5	0.5-5sec
T10	1-10sec

EMC – P C6 –A – □□□□□ – 20

- 20: Design number
- □□□□□: Auxiliary symbol (Up to five characters can be combined in alphabetic sequence.)
- A: Externally variable channel time lag
- C6: C6, 6 channel
- P: Mounting method: Panel type
- EMC: Electro-hydraulic proportional valve controller

(Auxiliary Symbol List)

D	Adjustment by 10-rotation potentiometer
K	Moisture resistance
T1	T-UP,T-DOWN 0.1-1sec
T5	0.5-5sec
T10	1-10sec

Note: T-UP, DOWN, and TIMER all become 0.3-3 sec when there is no signal for T1, T5, and T10.

●Handling

1 Power supply voltage can be either 100V or 200V.

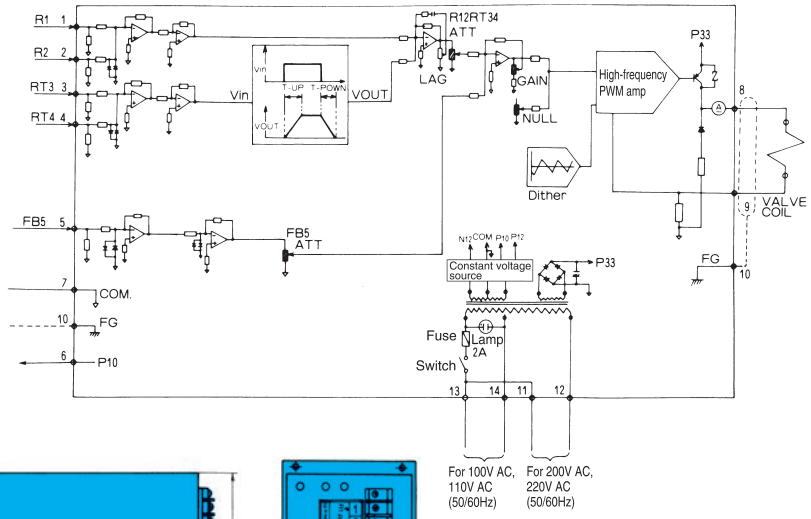
2 When selecting a location, avoid areas subject to high temperatures and high humidity, and select an area where there is little vibration and dust.

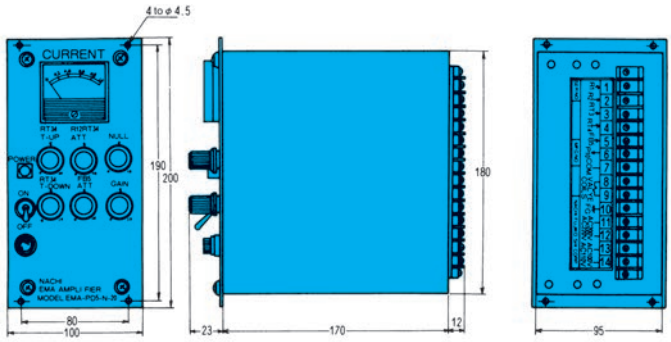
3 Use shielded wire for the analog signal and valve output signal wires.

4 When performing valve output signal line ON-OFF switching with a relay, connect a surge absorber or varistor parallel with the relay.

Power Amplifier Series for Electro-hydraulic Proportional Valve Drive
EMA-PD5-N-20

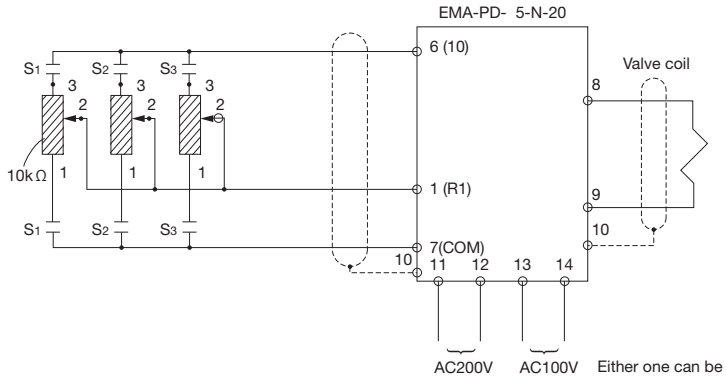
No.	Name	No.	Name
1	R1, Input	8	Output terminal to
2	R2, Input	9	VALVE COIL valve
3	RT3, delay input	10	FG, case ground
4	RT4, delay input	11	AC200, 220V
5	FB5, feedback input	12	
6	P10, external power supply	13	AC100, 110V
7	COM, signal land	14	

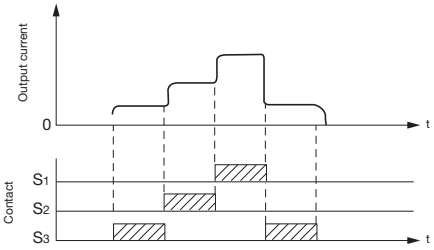




Application Examples

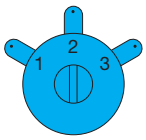
①Multi-stage Setting Using Multiple Potentiometers





(1) Wiring the amp and external potentiometer

A potentiometer has three terminals numbered 1, 2, and 3.

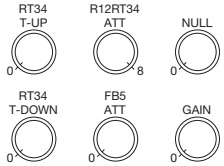


(2) Setting the adjusting knobs

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.



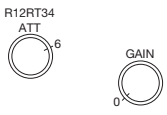
The manual setting unit provides output current control in the range of 0 to 900mA as it is rotated from full counterclockwise to full clockwise.

Wiring

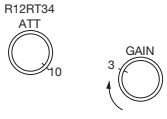
Amp terminal 7 (0V)
Potentiometer terminal 1
Amp terminal 6 (10V)
Potentiometer terminal 3
Amp terminal 1 (R1)
Potentiometer terminal 2

With this wiring, rotating the potentiometer clockwise causes the output current to increase.

①If 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.



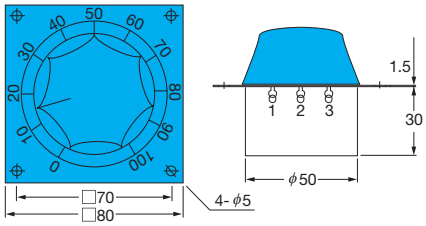
②When the level deceleration ratio and other factors limit the effective use of the manual setting unit to only 150°of the 300°, use GAIN to adjust the output current to 900mA.



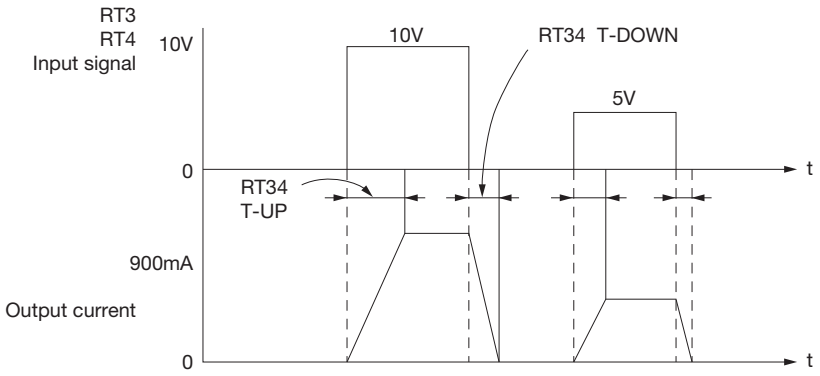
Note) 1. A range of 5KΩ to 10KΩ is recommended for external knobs and potentiometers.
2. In order to prevent current loss across terminals 6 and 7, insert relays between terminal 6 and the potentiometers and terminal 7 and the potentiometers.
3. Do not enable more than one potentiometer at the same time.

(3) The following is available for the external setting knob.

Model No. FZS-6350-101



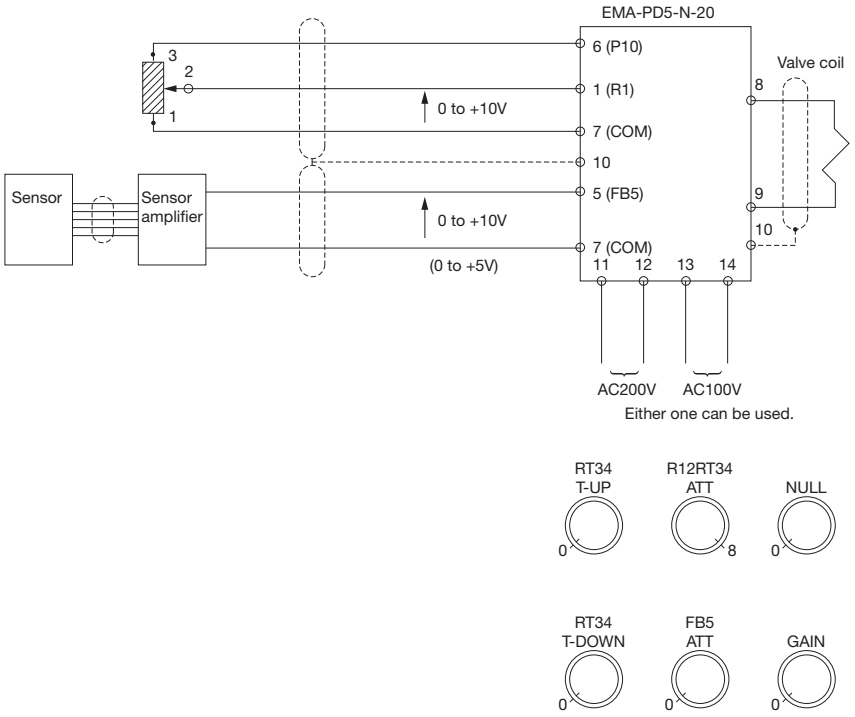
(4) Acceleration time adjustment (RT34T-UP) and deceleration time adjustment (RT34T-DOWN)



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.

②Feedback Control.

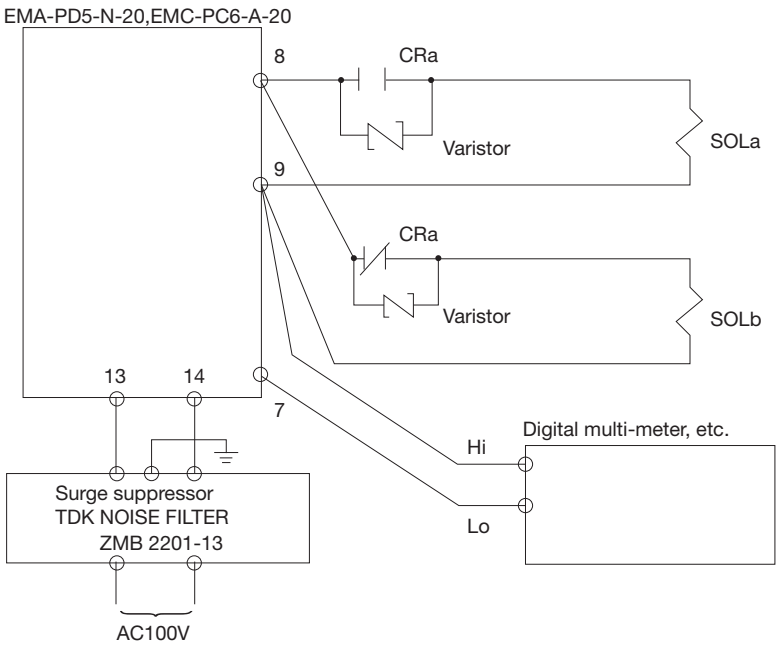


Note)
Using terminal 3 (RT3) and terminal 4 (RT4) in place of terminal 1 (R1) enables T-UP and T-DOWN, which allows feedback control without overshooting or undershooting, even when input signal voltage is stepped.

Adjustment Method
①Initially, set FB5ATT to 0 as shown in the illustration to the left, and check to see if open look control is possible.
②Next, set FB5ATT 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)

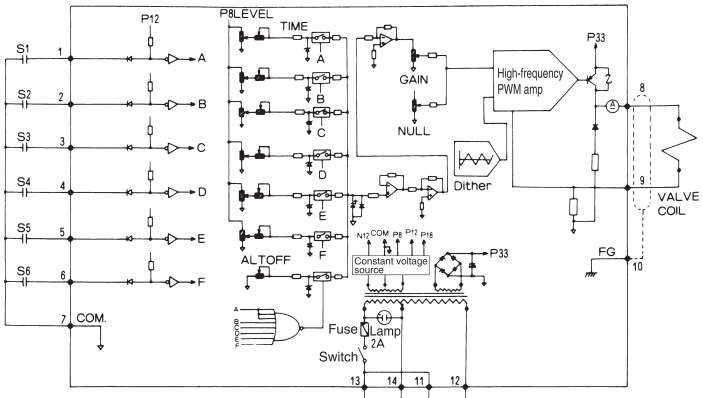
Note)
1. To measure current, measure the voltage at terminal 9, using terminal 7 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Use a measurement device with an input impedance of at least 1MΩ.
2. Switch the terminal 8 line using a relay. Make sure that both relays are not on at the same time.
3. To absorb surge voltage, include 82V varistors in parallel with the relay contacts.
   Recommended Varistor
   KOA NVD10SCD082
   Panasonic ERZV10D820
4. For relays, use OMRON LY type power relays or the equivalent.
5. Too much noise in the 100V AC or 200V 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

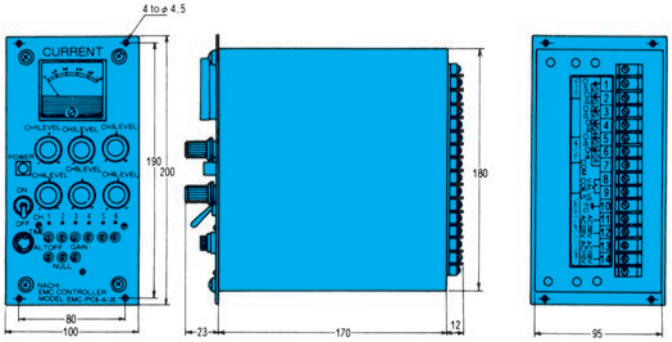
③Direction Control Valve (ESD) Drive



Power Amplifier Series for Electrohydraulic Proportional Valve Drive
EMC-PC6-A-20

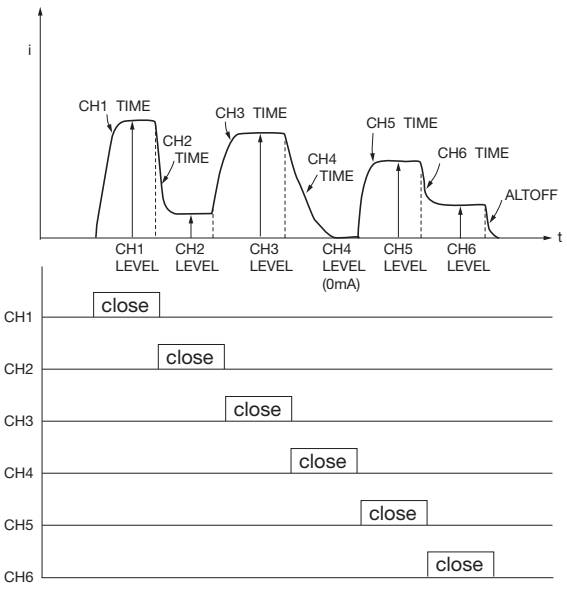
No.	Name	No.	Name
1	CH1Input command contact	8	Output terminal to valve
2	CH2 〃	9	VALVE COIL
3	CH3 〃	10	FG, case ground
4	CH4 〃	11	AC200 220V
5	CH5 〃	12	
6	CH6 〃	13	AC100 110V
7	Common COM input contact	14	





Note) When external contacts S1 through S6 are closed, use a non-voltage contact no greater than 10Ω.

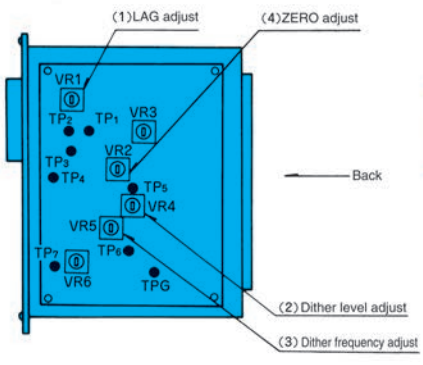
Application

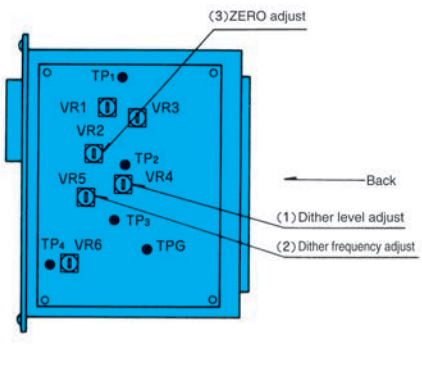


- LEDs are provided to indicate channel selection.
- The TIME knob of each channel adjusts the time until the selected channel's level is reached, as shown to the left. Make sure that the lap time (or time when channel is not selected) when changing the channel selection is 30msec maximum.
- Use independent 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 400mAp-p, 100Hz.)
(1) EMA-PD5-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.

①If piping or other items vibrate in response to the dither, raise the dither frequency by rotating the trimmer clockwise.

②When 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.

③When 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	0 to 900mA	0 to 900mA	0 to 900mA	0 to 900mA
Gain Adjustment	0 to $\frac{900mA}{5V\ input}$	0 to $\frac{900mA}{5V\ input}$	0 to $\frac{900mA}{5V\ input}$	0 to $\frac{900mA}{5V\ input}$
External power supply	+5V DC (5mA)	+5V DC (5mA) –5V DC (5mA)	+5V DC (5mA)	+5V DC (5mA) –5V DC (5mA)
Dither Frequency	Variable: 80 to 220Hz	Variable: 80 to 220Hz	Variable: 80 to 220Hz	Variable: 80 to 220Hz
Time Lag	Internally Variable: 0.05 to 2 seconds	Internally Variable: 0.05 to 2 seconds	Internally Variable: 0.05 to 2 seconds	Internally Variable: 0.05 to 2 seconds
Power Supply Voltage	AC100 · 110V±10% (50/60Hz)	AC100 · 110V±10% (50/60Hz)	DC24V (DC24 to 30V)	DC24V (DC24 to 30V)
Power Consumption	30VA	30VA	30VA	30VA
Allowable Ambient Temperature	0 to 50°C	0 to 50°C	0 to 50°C	0 to 50°C
Temperature Drift	0.2mA/°C max.	0.2mA/°C max.	0.2mA/°C max.	0.2mA/°C max.
Weight	2.2kg	2.2kg	0.14kg (0.6kg with Z)	1.14kg (0.6kg with Z)
Driven Valve	Pressure Control Valves Flow Control Valves	Direction Control Valve	Pressure Control Valves Flow Control Valves	Direction Control Valve

●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.

3 The brightness of the LED changes in accordance with the size of the output current.

Explanation of model No.

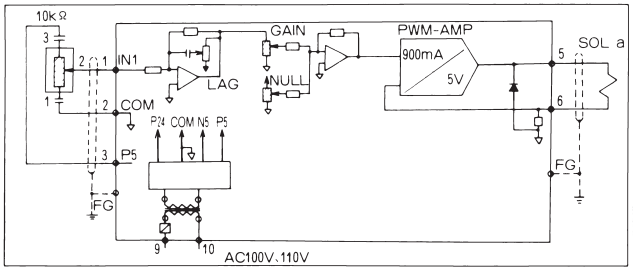
EBA – PD1 – NWZ – D2 – 10

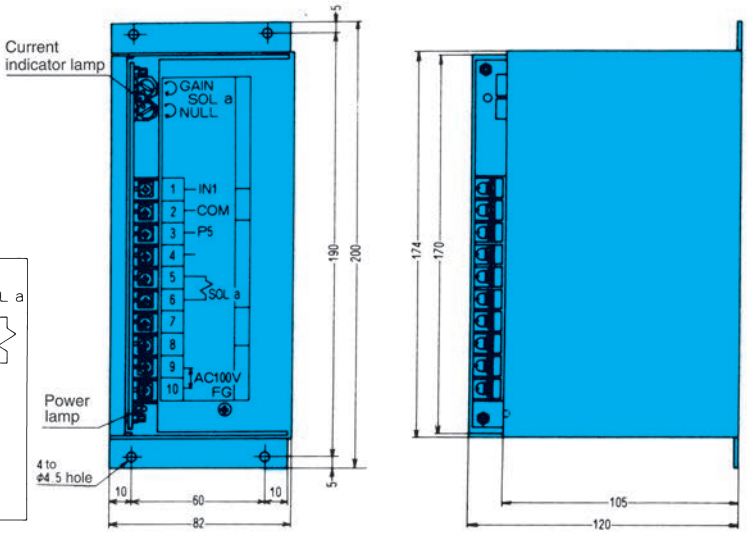
- 10 : Design number
- D2 : Voltage symbol
  - C1 : AC100,110V±10%(50/60Hz)
  - D2 : DC24V
- NWZ : Auxiliary symbol
  - N : Open loop with one output (SOL a)
  - NW : Open loop with two outputs (SOL a, SOL b)
  - Z : With case (Can be used with voltage symbol D2 only.)
- PD1 : Type Classification
  - D1, DC 1 input
- EBA : Small type power amplifier

Installation Dimension Drawings

EBA-PD1-N-C1-10

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	AC100 · 110V
		10	

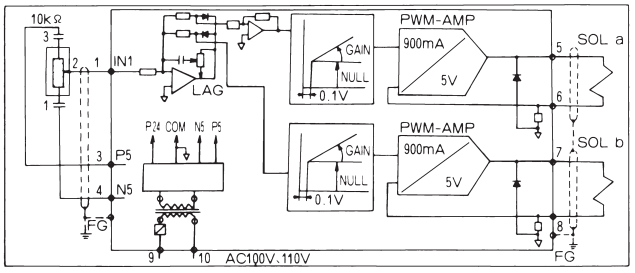


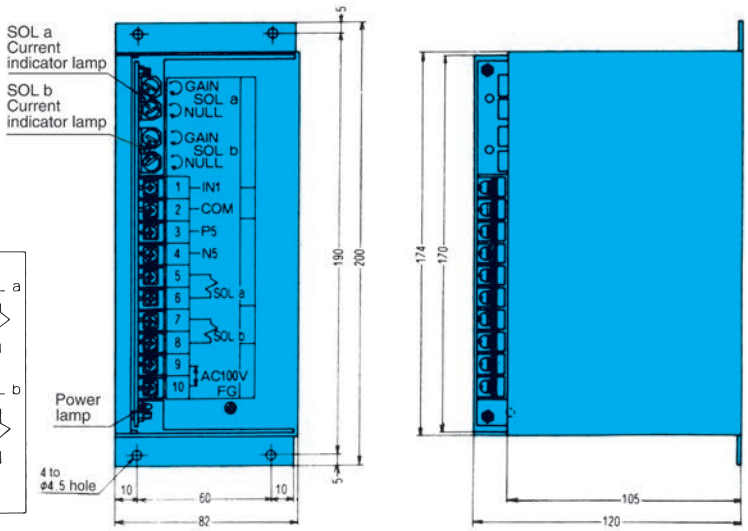


- With EBA-PD1-N (Z), current is supplied to the control valve in proportion to input signal voltage in the range of 0 to +10V.
- To measure current, measure the voltage at terminal 6, using terminal 2 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Input impedance 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 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	AC100 · 110V
		10	

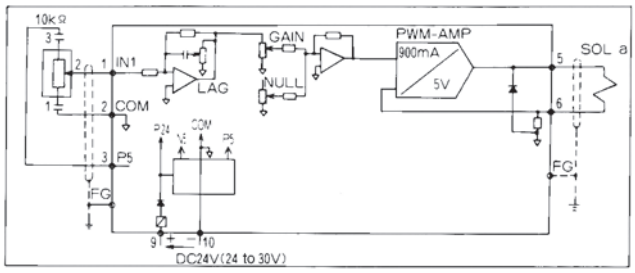


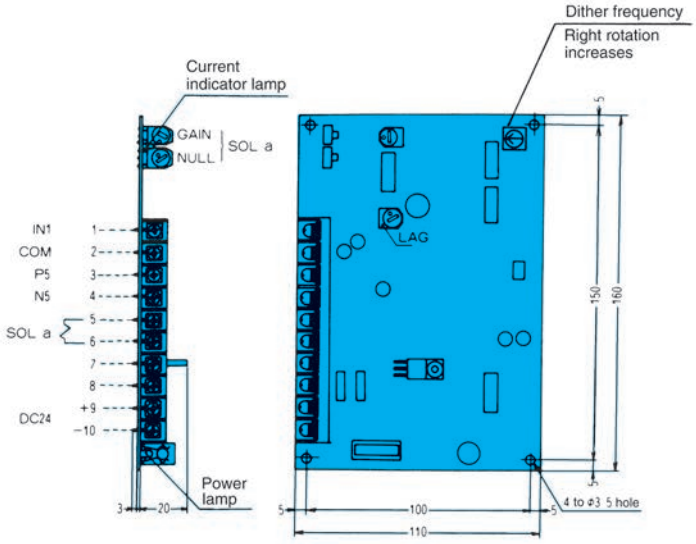


- To measure current, measure the voltage at SOLa terminal 6 and SOLb terminal 6, using terminal 2 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Input impedance of the measurement device should be at least 1MΩ.

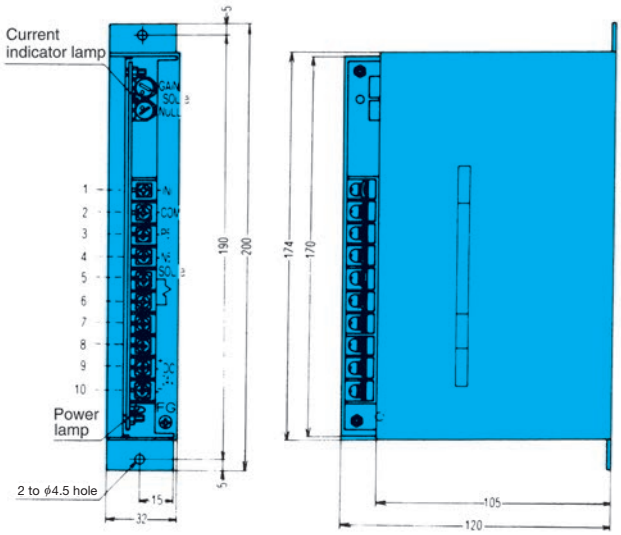
EBA-PD1-N(Z)-D2-10

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	−





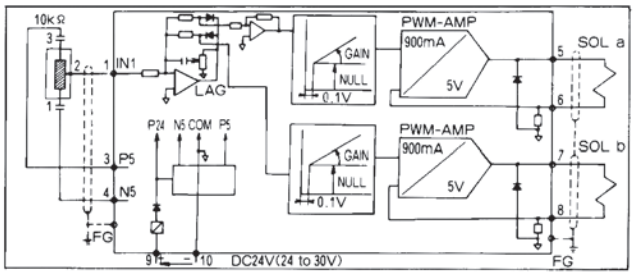
EBA-PD1-N-D2-10

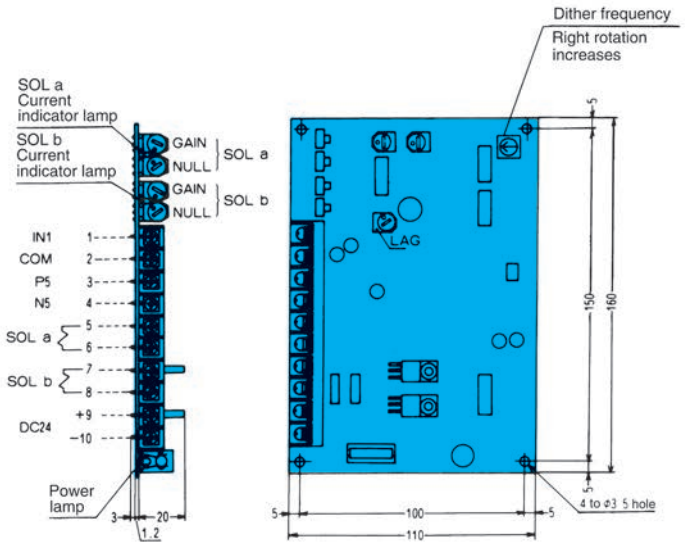


EBA-PD1-NZ-D2-10

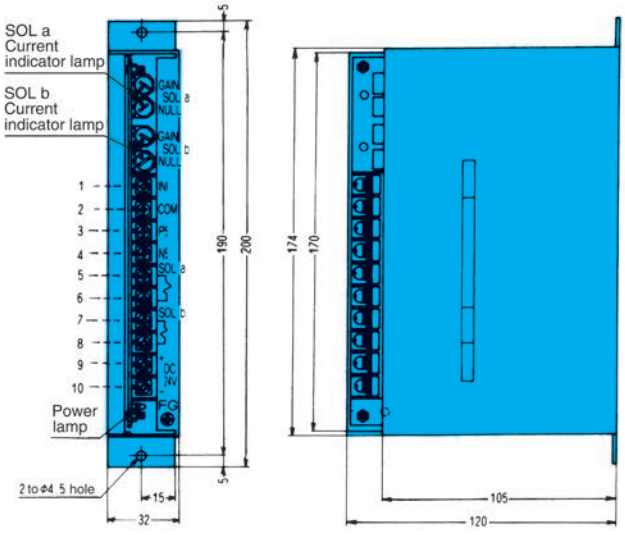
EBA-PD1-NW(Z)-D2-10

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	−





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

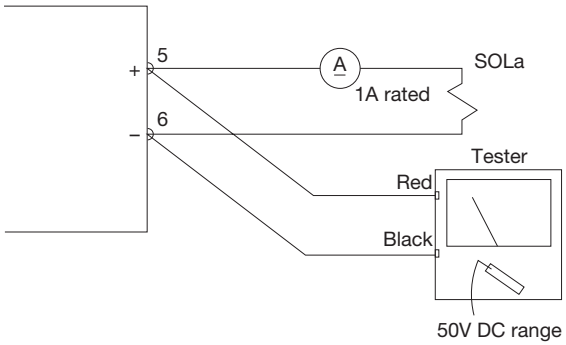
●General Precautions

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.
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 2.0mm².
Type VCTF (Rated Voltage: 300V vinyl cab tire cord.
Wiring between the command voltage generator and amplifier should be VCTF 0.75m² 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.

Voltage (V)	Current (mA)
0	0
4	200
8	400
12	600
16	800



Power Amplifier Operation and Terminology

①Zero Adjust (NULL)

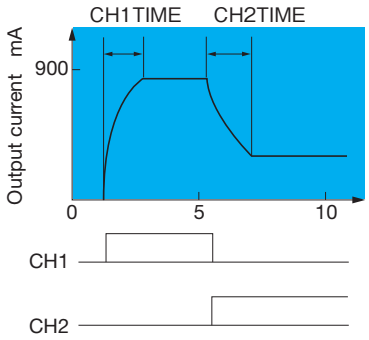
This knob sets the lower limit of the operating pressure and flow rate.
Rotating it clockwise increases the output current. This knob is also used for manual control while checking valve operation.

②Gain 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.

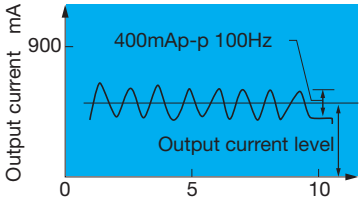
③Channel Time Lag (TIME)

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 leg.

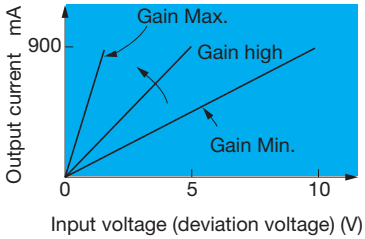


④Dither

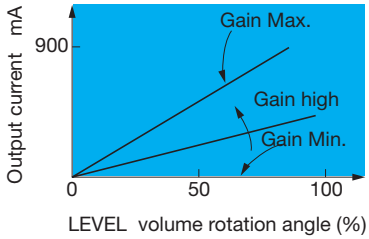
Dither plays a role in improving control valve hysteresis, response, stability, etc.



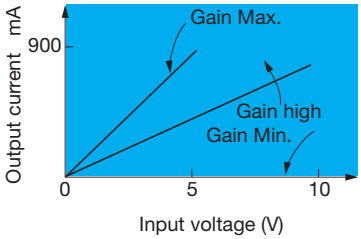
EMA-PD5-N-20



EMC-PC6-A-20



EBA-PD1-N(WZ)- D2 C1 -10



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) - 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 (DC22 to 30V)	DC24V (DC22 to 30V)
Power Consumption	30VA	60VA
Allowable Ambient Temperature	0 to 50°C	0 to 50°C
Temperature Drift	0.2mA/°C max.	0.2mA/°C max.
Weight	0.3kg	0.4kg
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 I-33 for general precautions.

3 The brightness of the LED changes in accordance with the size of the output current.

Explanation of model No.

(1) Amp Type

ED A – P D 1 – N W Z – (□) – D2 – 11

- 11: Design number
- D2: Voltage symbol D2 : DC24V
- (□): Auxiliary symbol

None	1-rotation adjustor knob
D	3-rotation adjustor knob (1-rotation trimmer for dither)

- Z: With case
- W: 4-direction valve drive possible
- N: Standard type
- 1: Number of inputs 1: 1 input
- D: Amp DC input
- P: Panel type
- A: Amp type
- ED: Small type, multi-function power amp

(2) Amp/Controller Type

ED C – P C 6 – A W Z – (□□□) – D2 – 20

- 20: Design number
- D2: Voltage symbol D2 : DC24V
- (□□□): Auxiliary symbol (Up to four characters can be combined in alphabetic sequence.)

None	1-rotation adjustor knob Variable TIMER Range: 0.1 to 2 seconds
D	3-rotation trimmer for controller block LEVEL, TIME, TOFF only
E	3-rotation for amp block GAIN, NULL, OFFSET, LAG only
F	3-rotation trimmer for controller/amp block LEVEL, TIME, TOFF, GAIN, NULL, OFFSET, LAG
T5	Variable TIMER Range: 0.5 to 5 seconds
T10	Variable TIMER Range: 1 to 10 seconds.

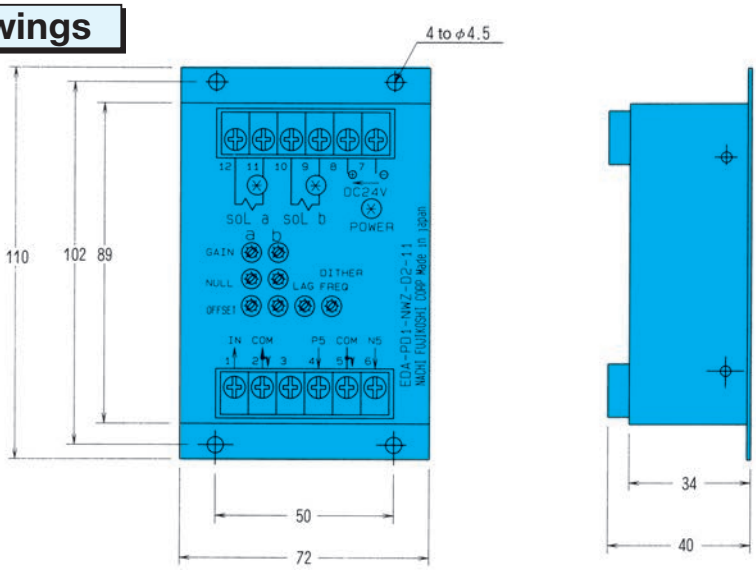
Note) D, E, F designs all have 1-rotation trimmer.

- Z: With case
- W: 4-direction valve drive possible
- A: With acceleration timer
- 6: Number of inputs 6: 6 input
- C: Controller type contact input
- P: Panel type
- C: Controller type
- ED: Small type, multi-function power amp

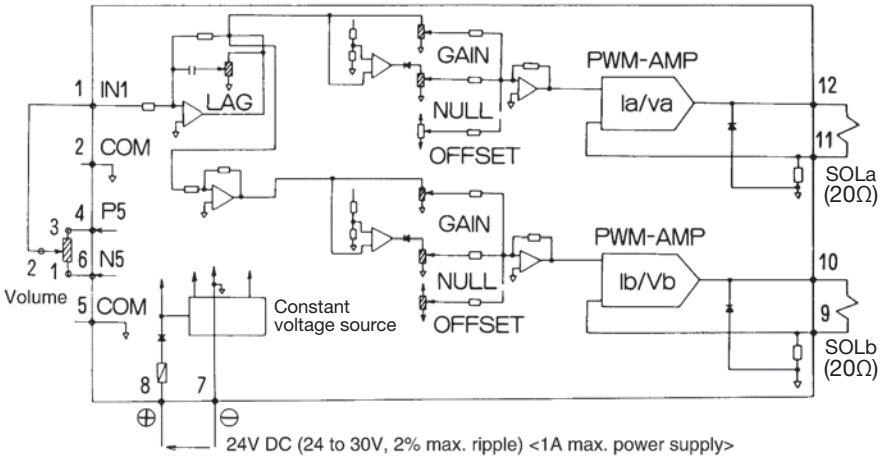
Installation Dimension Drawings

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



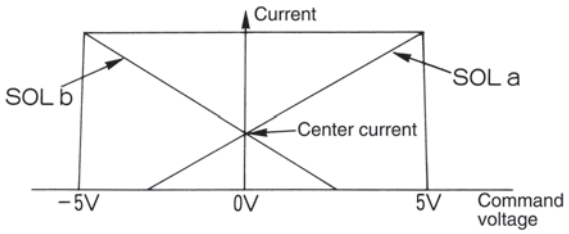
- Current is supplied to SOL a when input signal voltage polarity is positive, and to SOL b when negative. Either SOL a or SOL b can be driven at any one time.
- Push-pull drive is also supported.
- To measure current, measure the voltage at SOL a terminal 11 and SOL b terminal 9, using terminal 5 as 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

1 Adjusting Push-pull Drive for a Special Proportional Valve (Special Specification Direction Control Valve)

a) Overlap Type Proportional Valve ESD-G01-C5$^{10}_{20}$-6333D…300mA(Center Current)

b) Zero-Lap Type Proportional Valve ESD-G01-C5$^{10}_{20}$-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

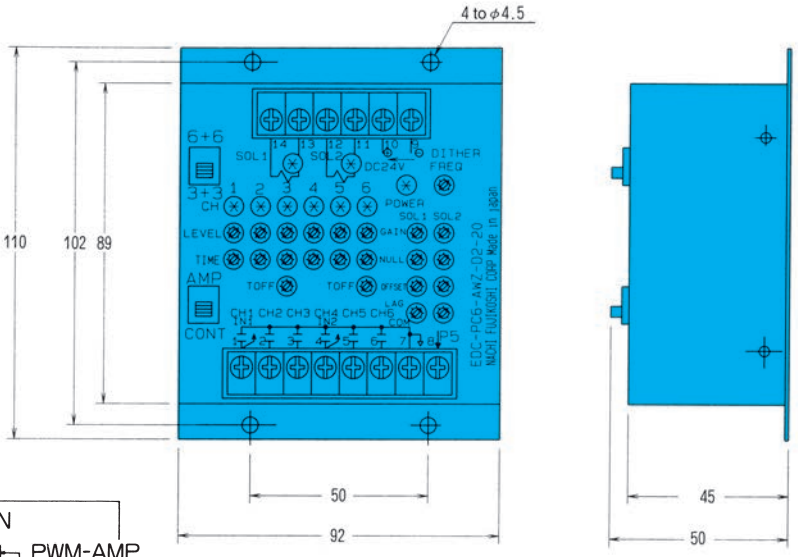
1) NULL, GAIN, OFFSET, LAG
   Rotate all seven knobs counterclockwise as far as they will go.
2) Without any connection between terminals ① and ②, use the OFFSET knob to simultaneously energize SOL a and SOL b as follows.
   SOL a 300mA (200mA)
   SOL b 300mA (200mA)
3) Next, apply +5V to terminal ① (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.
4) 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.

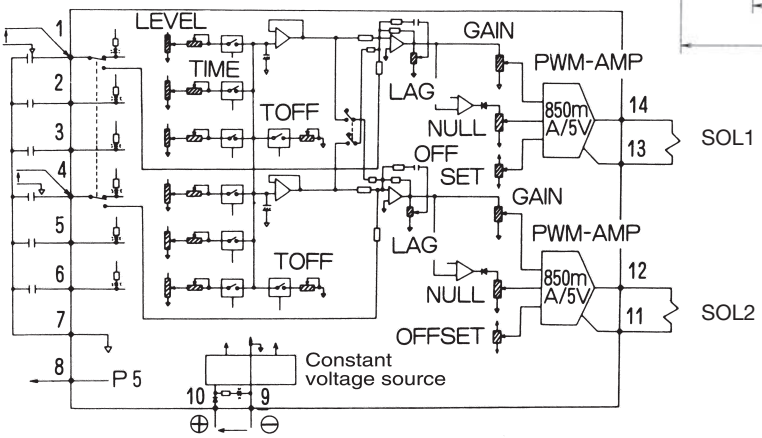
- The three LAG and NULL knobs should be left rotated fully counterclockwise. There is no need to change their settings.
- EDA-PD1-NWZ-D2-11 is configured with a feedback system, so it does not have a feedback gain adjustment function. In this case, use EDA-PD1-NWZ-D2-11 in combination with the EA-PD4-D10-*-10 NACHI servo amp.

EDC-PC6-AWZ-D2-20

No.	Name	No.	Name
1	CH1 select terminal / Input signal terminal	7	COM
		8	External power supply P5
2	CH2 select terminal	9	- DC24V
3	CH3 select terminal	10	+ DC24V
4	CH4 select terminal / Input signal terminal	11	Output terminal to valve SOL 2
		12	
5	CH5 select terminal	13	Output terminal to valve SOL 1
6	CH6 select terminal	14	



Block Diagram

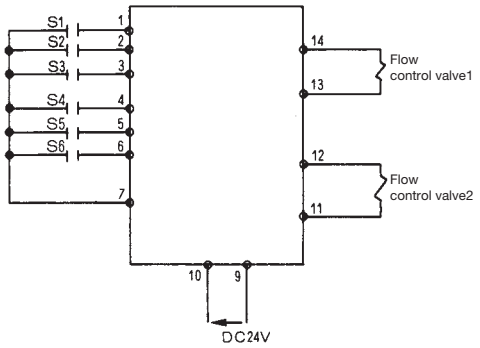


24V DC (24 to 30V, 2% max. ripple) <2A max. power supply>

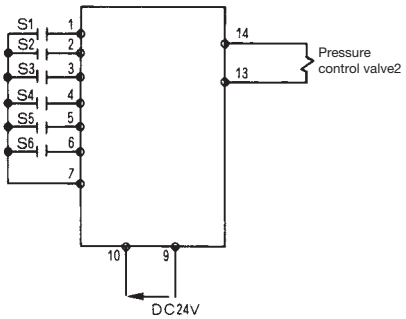
- Dual simultaneous output to SOL 1 and SOL 2 is supported.
- To measure current, measure the voltage at SOL a terminal 13 and SOL b terminal 1, using terminal 7 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Use a measurement device with an input impedance of at least 1MΩ.

Application Examples

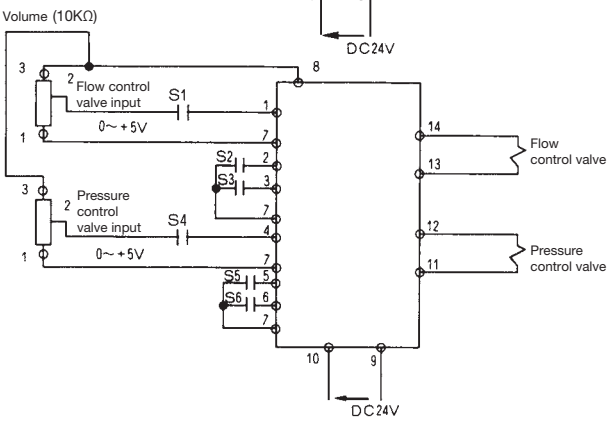
1) Switch Position
- CONT
- 3+3



2) Switch Position
- CONT
- 6+6



3) Switch Position
- AMP
- 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 thorough CH6.
- 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.

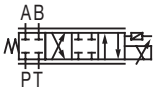
  Minimum pressure at this time is in accordance with the setting of the OFFSET knob. The NULL knob cannot be used to configure settings unless a channel is selected.
- 2-output amplifier for simultaneous control of load-sensitive system pressure and flow rate

  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

10 to 50ℓ/min
32MPa



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

Item \ Model No.		ESH-G01-H510A-10	ESH-G01-H520A-10	ESH-G01-H540A-10
Maximum Operating Pressure P, A, B MPa{kgf/cm²}		32 {327}		
T Port Allowable Back Pressure MPa{kgf/cm²}		2.5 {25.5} max.		
Rated Flow Rate ℓ/min (Valve pressure drop 7MPa{71kgf/cm²})		10	20	35
Maximum Flow Rate ℓ/min		22	35	50
Limit Valve Pressure Drop MPa{kgf/cm²}		32 {327}	21 {214}	14 {143}
Hysteresis %		0.5 max.		
Step Response ms (0→100% Displacement)		16 max. (Note 1)		
Frequency Response Hz (90° Phase Delay ±10% Displacement)		At least 80 (Note 1)		
Center Drift	Supply Pressure	0.5% max/FS (Δp=25MPa{255kgf/cm²})		
	Oil Temperature	1.5% max/FS (Δt=40°C)		
Filtration		Class NAS9 max.		
Operating Oil Temperature Range °C (Recommended Oil Temperature Range °C)		0 to 60 (30 to 60)		
Water and Dust Resistance		IP53		
Weight kg		2.3		

Note) 1. Step response is typical value for a supply pressure of 7MPa {71kgf/cm²} and oil temperature of 40°C (kinematic viscosity: 40mm²/s).

Explanation of model No.

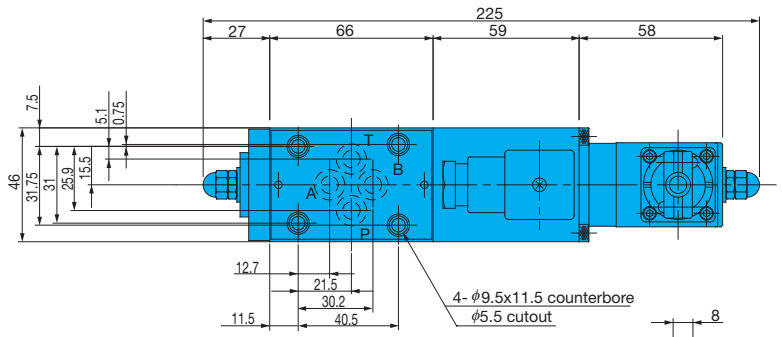
ESH – G 01 – H 5 20 A – 10

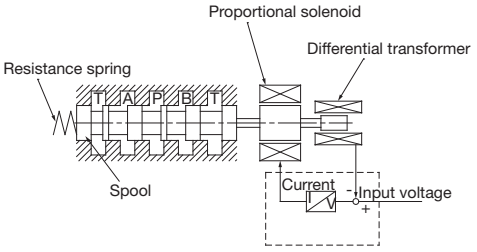
- 10 — Design number
- A — Center valve position lap value A: 0.5% max. (zero lap)
- 20 — Rated flow rate : 10, 20, 35ℓ/min (Value pressure drop 7 MPa {71kgf/cm²})
- 5 — Relieve position flow path : 5 (all ports blocked)
- H — Operation method: H (spring offset type)
- G 01 — Mounting method G: Gasket type, Nominal diameter : 01 (01 size)
- ESH — High-response proportional flow control valve

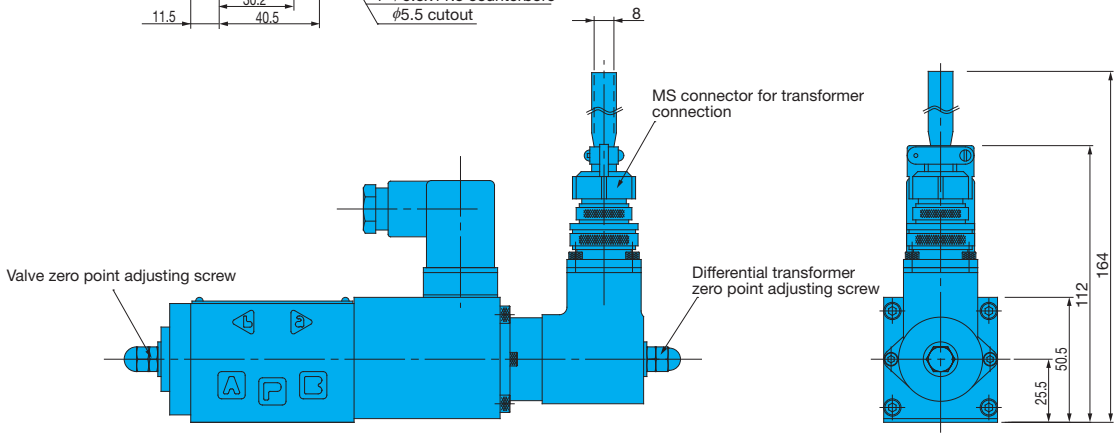
● Handling

1. The amp and valve are adjusted to match at the factory, so be sure to use items that have the same MFG No.
2. 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).
3. Install the valve so the spool axis line is horizontal.
4. 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.
5. Be sure to perform sufficient flushing before a test run.
6. Use steel piping for this valve and the main actuator, and keep piping as short as possible.
7. There is no air bleeding.
8. Mineral oil hydraulic operating fluid is standard. Use an R&O type and wearresistant type of ISO VG32, 46, or 68 or equivalent.
9. Use an operating fluid that conforms to the both of the following.
   Kinematic viscosity : 20 to 140mm²/s
   Oil temperature : 30 to 60°C
10. Filtration
    Maintain hydraulic operating fluid contamination so it is at least NAS Class 9.
11. 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.
12. After disassembling the valve, be sure to fill the inside of the guide with operating fluid before reassembling.
13. Bundled Accessories (Valve Mounting Bolts)
    M5 x 45ℓ, (four)
    Tightening Torque :
    5 to 7N·m{51 to 71kgf·cm}

Installation Dimension Drawings





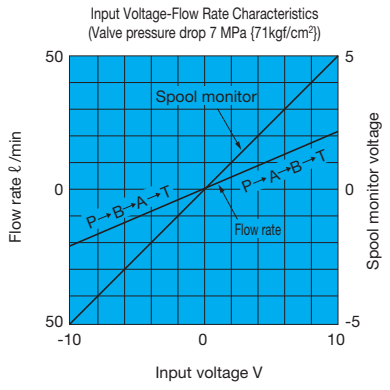


The gasket mounting method conforms to ISO4401-03-02-0-05.

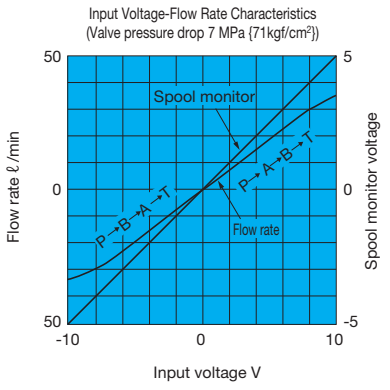
Operational Principle

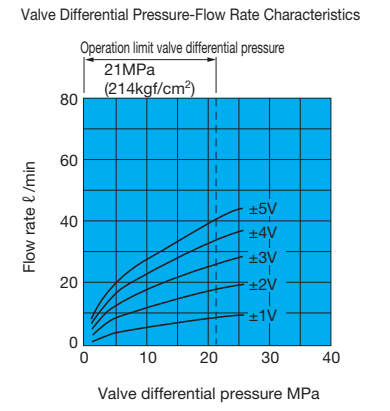
Performance Curves

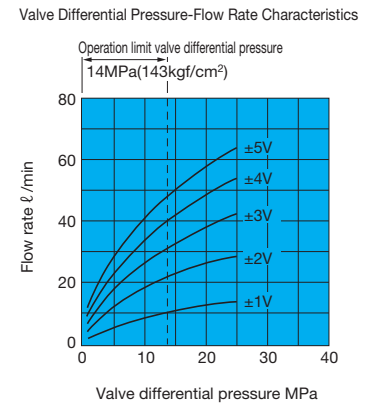
ESH-G01-H520A-10



ESH-G01-H540A-10







Note) ±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(ΔP_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 7MPa {71kgf/cm²}.

- 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

$$Q_x = Q_{rate} \times \sqrt{\frac{\Delta P_x}{7}}$$

Qrate : Rated flow rate
$\Delta P_X=P_S-P_L-P_T$

- Calculation example

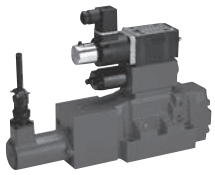
When ESH-G01-H520A-10 is used under the following conditions:
P_S=10MPa{102kgf/cm²}
P_L=6MPa{61kgf/cm²}
P_T=1MPa{10kgf/cm²}
Maximum control flow rate Q_X is as shown below:

$$Q_x = Q_{rate} \times \sqrt{\frac{P_S - P_L - P_T}{7}}$$

$$= 20 \times \sqrt{\frac{10-6-1}{7}} = 13\ell/\min$$

High-response proportional flow control valve ESH-G03,04,06

80 to 600ℓ/min
28,32MPa



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 MPa{kgf/cm²}	P,A,B Ports	External Pilot	28 {286}	32 {327}	32 {327}
		Internal Pilo	25 {255}	25 {255}	25 {255}
	T Port		21 {214}	21 {214}	21 {214}
	Pp Port		25 {255}	25 {255}	25 {255}
Minimum Pilot Pressure MPa{kgf/cm²}			1.5 {15}	1.5 {15}	2.0 {20}
Rated Flow Rate ℓ/min (Rated stroke, P→A pressure drop of 1MPa {10kgf/cm²} flow rate)			80	180	350
Maximum Flow Rate ℓ/min			140	300	600
Pilot Pressure Reducing Valve Set Pressure MPa{kgf/cm²}			2.0 {20}	2.0 {20}	4.0 {40}
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 ℓ/min			4	8	12
Y (DR1), L (DR2) allowable back pressure MPa{kgf/cm²}			0.2 {2}	0.2 {2}	0.2 {2}
Weight kg			8	12	18

Note) 1. Step response is typical value for a supply pressure of 7MPa {71kgf/cm²} and oil temperature of 40°C (kinematic viscosity: 40mm²/s).

Explanation of model No.

ESH – G 04 – D 5 180 S1 – (*) – 11

- Design number
- Auxiliary symbol
  None: Internal pilot, external drain
  E : External pilot, external drain
- Contraction ratio

S1 (Normal)	P→A : B→T=1 : 1 P→B : A→T=1 : 1
S2 (Single rod/cylinder)	P→A : B→T=1 : 0.5 P→B : A→T=0.5 : 1

- Rated flow rate (See the rated flow rate item in the specifications.)
  Indicated through flow rate at rated stroke when pressure drop to P→A is ΔP=1.0MPa{10kgf/cm²}. Through flow rate for P→B, A→T, B→T pressure drop at 1.0MPa{10kgf/cm²} is determined by contraction ratio.
- Center valve position flow path

5		20% Center Position
6S		20% Center Position

- Operation method D: Pressure center
- Nominal diameter 03, 04, 06
- Mounting method G: Gasket type
- ESH: High response proportional flow valve

●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 0.2MPa {2kgf/cm²}.

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 140mm²/s
Oil temperature: 30 to 60°C

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)

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.

Model No.	Bolt Size	Q'ty	Tightening Torque N·m {kgf·cm}
ESH-G03	M 6×35ℓ	4	10 to 13 {102 to 133}
ESH-G04	M10×50ℓ	4	45 to 55 {460 to 561}
	M 6×45ℓ	2	10 to 13 {102 to 133}
ESH-G06	M12×60ℓ	6	60 to 70 {610 to 715}

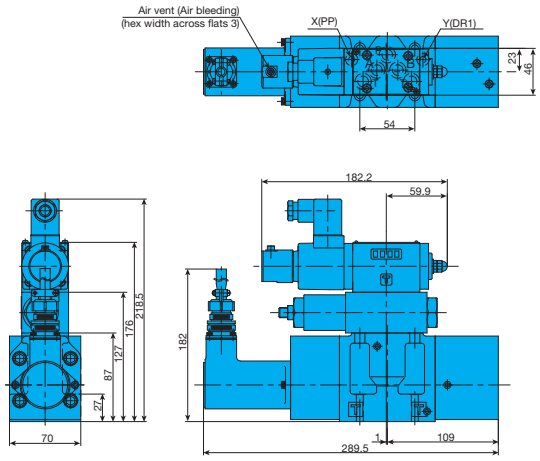
12 For G03 and G04, connect the ports and actuator to achieve a working of P→A→B→T. For G06, connect for a working of P→B→A→T.

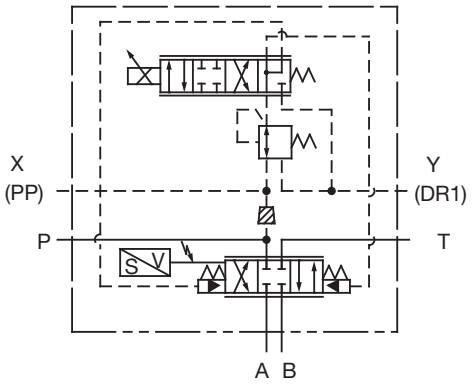
13 Contact your agent for a contraction ratio S2 with the G06 size.

Installation Dimension Drawings

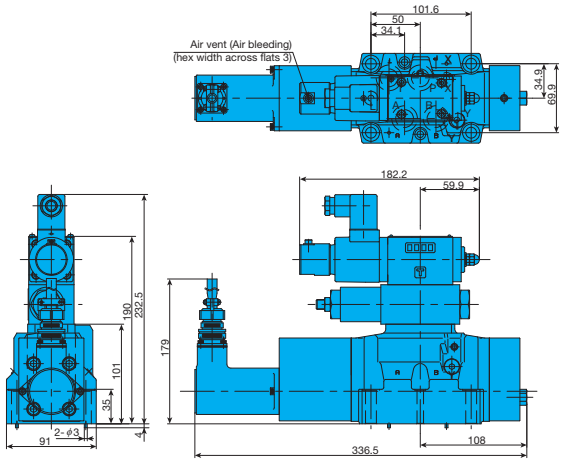
JIS Symbol

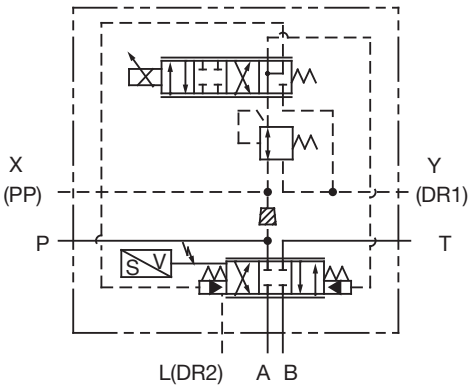
ESH-G03



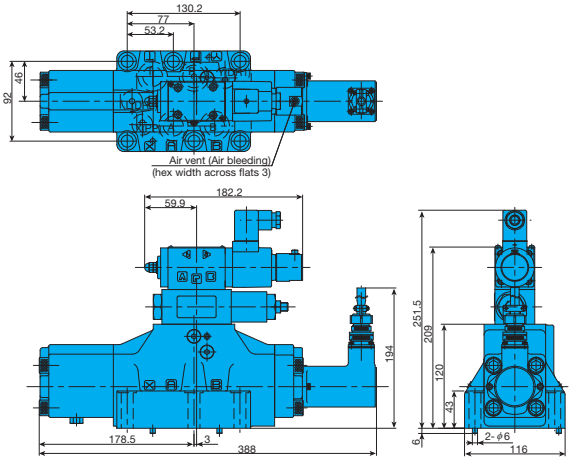


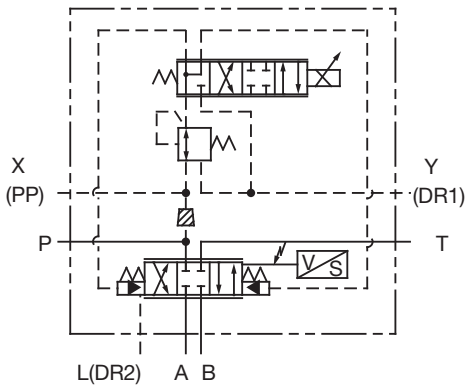
ESH-G04





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 4401-05-04-0-05

G04 : ISO 4401-07-07-0-05

G06 : ISO 4401-08-08-0-05

NACHI

POWER AMPLIFIER FOR HIGH RESPONSE PROPORTIONAL FLOW AND DIRECTIONAL CONTROL VALVE

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) Lip Noise: 150mVp-p max.
Power Supply Capacity	At leas 2.1A (COSEL R50A-24 equivalent switching regulator)
Ambient Temperature	0 to 50°C
Ambient humidity	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	0.9kg
External Supply Voltage	+5V : (10mA maximum supply possible) −5V : (10mA maximum supply possible)
Drive Coil	2.5Ω; max. 2.7A or 5Ω; 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

Explanation of model No.

EH A – P D 2 – 10 01 – D2 – 10

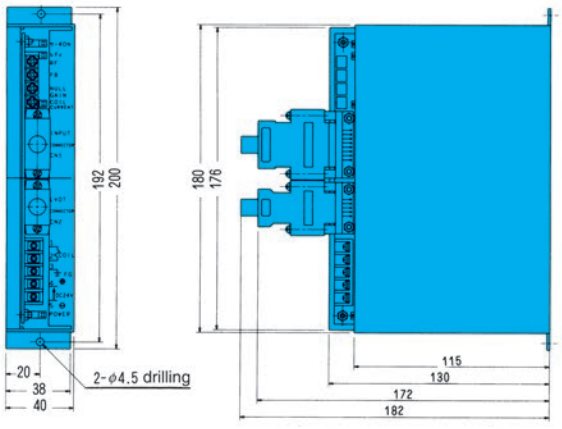
- Design number
- Amp power supply voltage symbol
  D2: DC24V
- Driver valve size
  01: Nominal diameter 01
  03: Nominal diameter 03
  04: Nominal diameter 04
  06: Nominal diameter 06
- Input voltage

05	0 to ±5V
10	0 to ±10V

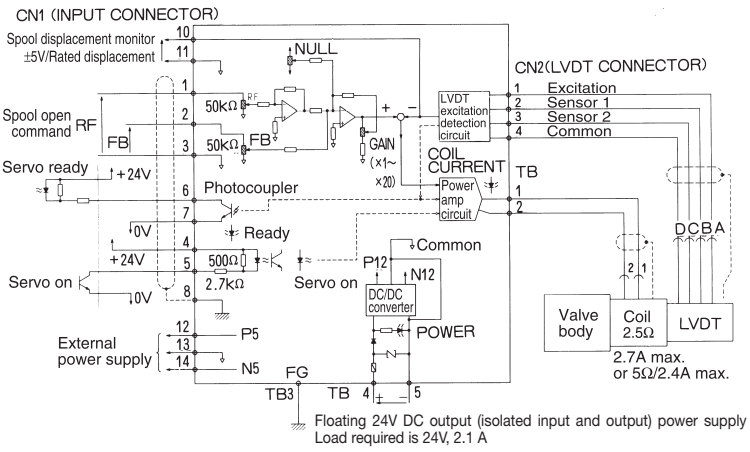
- Number of input terminals
  2: 2 inputs
- Input type
  D: DC voltage
- Mounting method
  P: Panel type
- Ambient humidity
  A: Amp
- High-response proportional valve digital device

Note) Select an amp that matches the valve size.

Installation Dimension Drawings



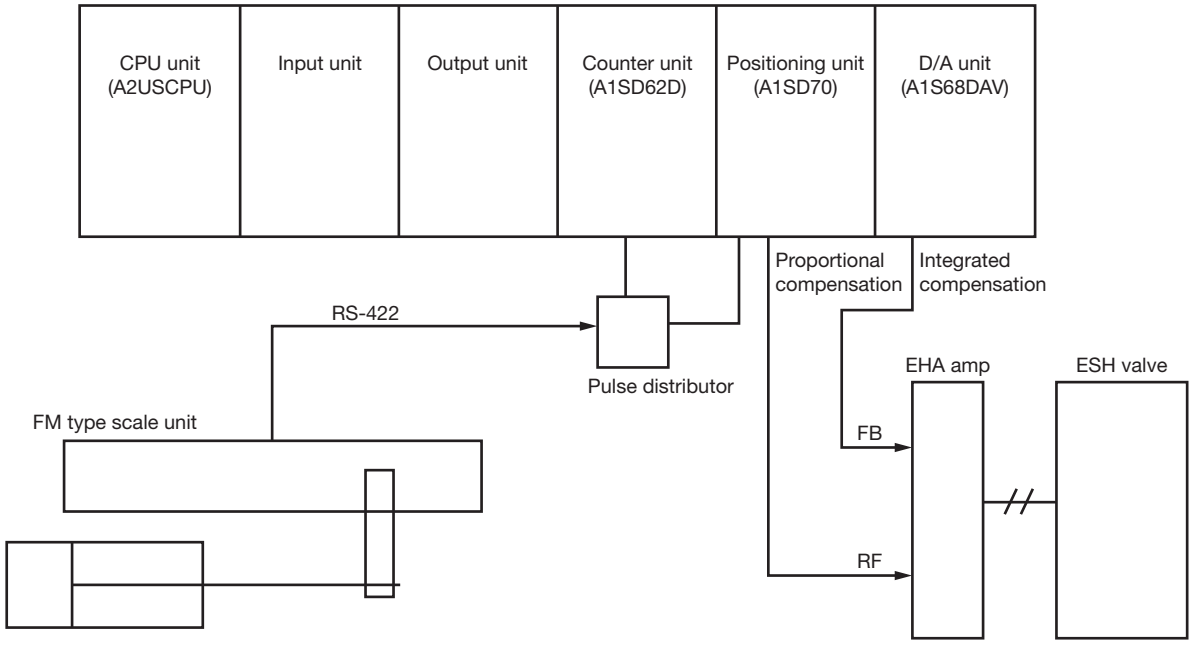
Block Diagram



Note) Since G03, G04, and G06 are pilot operation types, there is an LVDT on the main spool, but connection is identical.

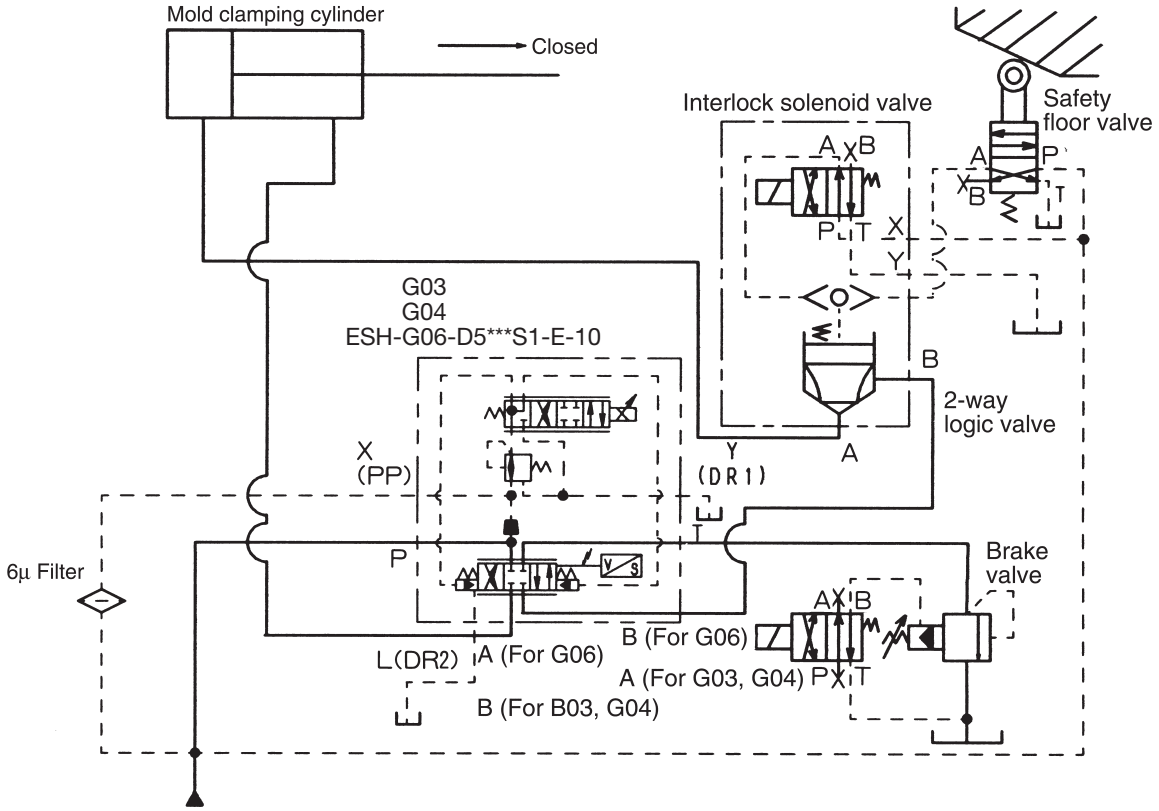
(1) Example Application in ESH-G01 Positioning Circuit

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 Servo Amplifier

Features

①Compact design.
②Capable of driving virtually all NACHI-MOOG servo valve series.
③Power 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	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) –15V (200mA)
Allowable Ambient Temperature	0 to 50°C
Temperature Drift	50μV/°C max.
Weight	3kg
Servo Valve Coil Drive Current	± 15mA(100Ω) ± 40mA(40Ω) ±100mA(14Ω) ±150mA(14Ω) It is possible to switch the output voltage ±10V for the four types noted above. Resistance values in parentheses indicate resistance in the case of parallel wiring of the servo valve coil.

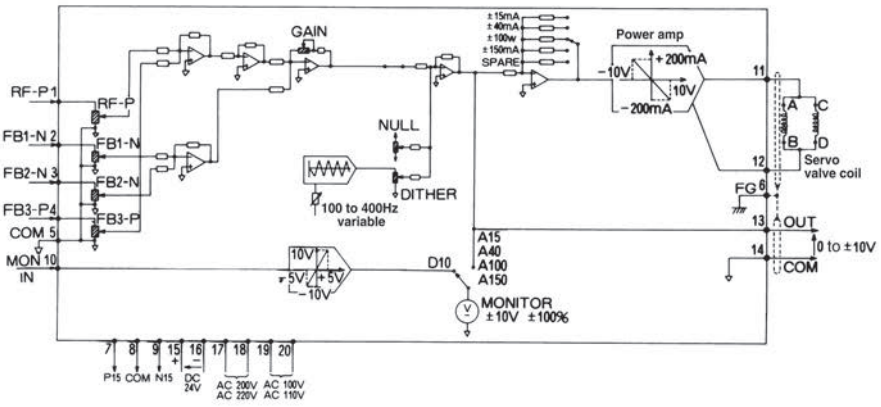
No.	Name	No.	Name
1	RF-P input	11	Control current
2	FB1-N- feedback input	12	Output terminal
3	FB2-N- feedback input	13	Control voltage
4	FB3-P- feedback input	14	Output terminal
5	COM signal land	15	+ DC24V
6	FG case ground	16	–
7	P15 external power supply	17	AC200, 220V
8	COM signal land	18	
9	N15 external power supply	19	AC100, 110V
10	MON/IN monitor in	20	

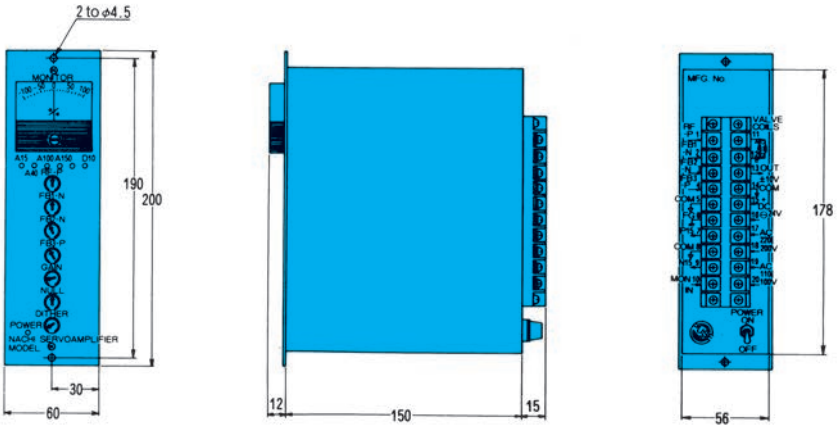
Explanation of model No.

EA – P D4 – A100 – ** – 10

- 10: Design number
- **: Power supply voltage: No signal: 100, 110, 220, 220V AC ±10%; D2 : DC24V
- A100: Output A100 : ±100mA; A150 : ±150mA; A15 : ±15mA; A40 : ±40mA; D10 : ±10V
- D4: Number of inputs D4: DC 4 inputs
- P: Mounting method: Panel type
- EA: Power amplifier for NACHI-MOOG servo valve drive

Note: 24V DC only can be used in the case of power supply voltage signal D2. 100V, 200V AC cannot be used.



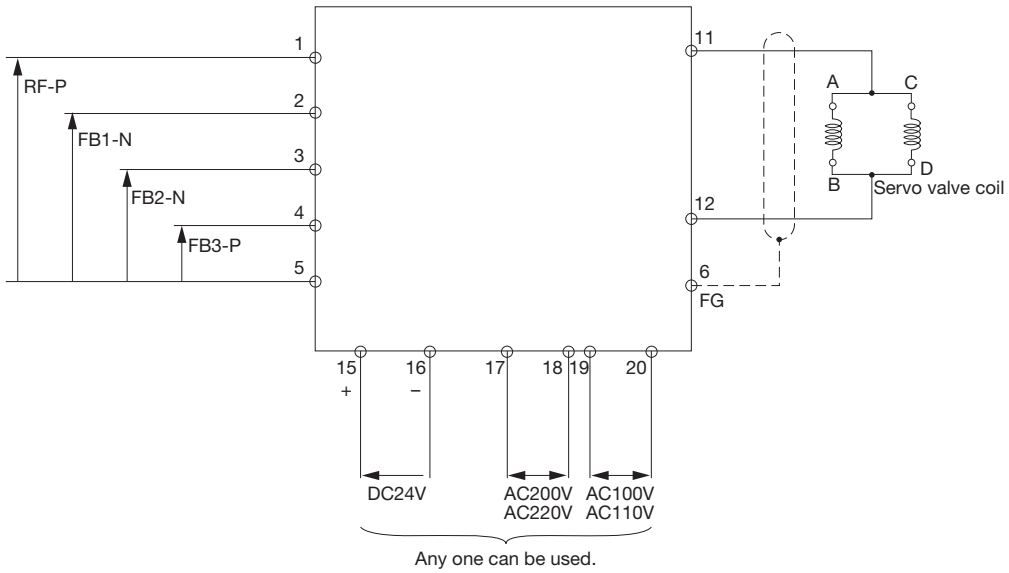


Servo Valve and Applicable Servo Amplifier Models

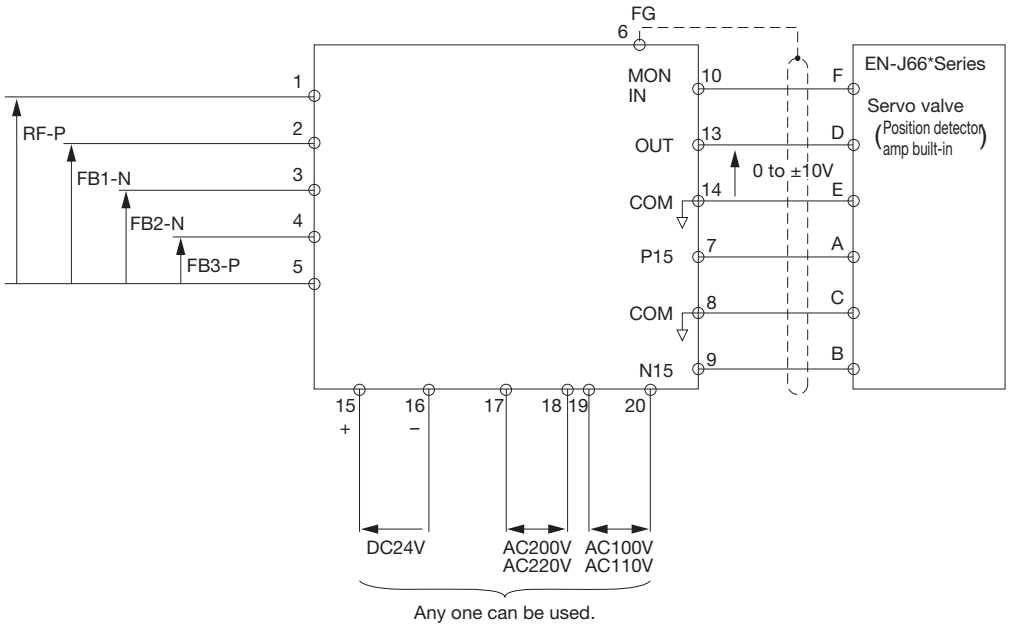
Servo Model Number	Rated Output	Applicable Servo Amplifier Model Number
EN-J631 Series	±100mA (parallel wiring)	EA-PD4-A100
EN-J631 Series Center Flow 75 ℓ/min Rated Models	±150mA(parallel wiring)	EA-PD4-A150
EN-J072-401, EN-J072-402, EN-J073-401, EN-J073-402, EN-J073-403, EN-J073-404, EN-J073-405, EN-J076-401, EN-J076-402, EN-J076-403, EN-J076-404, EN-J076-405	±15mA(parallel wiring)	EA-PD4-A15
EN-J072-403, EN-J770, EN-J073-406, EN-J076-406	±40mA(parallel wiring)	EA-PD4-A40
EN-J661 EN-J662 (Main Valve Position Detector or AmP Built In) EN-J663	±10V	EA-PD4-D10

Wiring Diagram

EN-J631, J072, J073, J076, J770 Series



EN-J661, J662, J663 Series



NACHI

HYDRO-LOGIC VALVE

Composite Valve Series Logic Valve

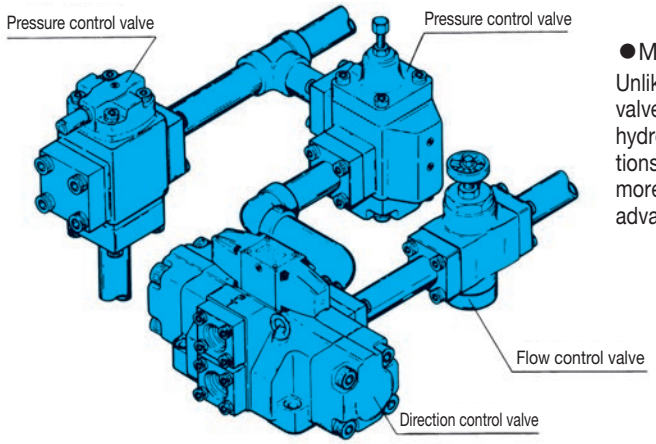
200 to 2300ℓ/min
28,32MPa

Overview

HYDRO-LOGIC composite valves revolutionize the structure of hydraulic control valves in a way that makes it possible to control multiple functions with a single valve. Unlike contemporary valves that limit each valve to a single function, the HYDROLOGIC control valve allows a tremendous reduction in overall equipment size and energy savings as well. In addition, a poppet structure delivers high response, low leakage, and outstanding power.

These valves are made possible by fully applying technology of the proven cartridge logic valve. A gasket type and flange type logic valve series can be used with total confidence in a wide variety of hydraulic applications.

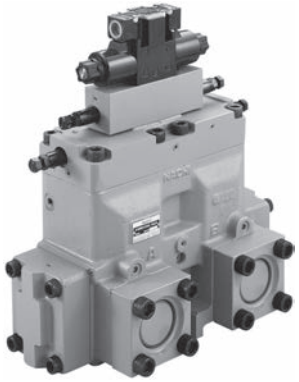
(For details, see catalog number 9244-2.)



●Multi-function in a compact design

Unlike single-valve systems where each valve performs a particular function, the hydro-logic valve provides multiple functions in a very compact configuration. The more complex a circuit is, the greater the advantages of using this type of valve.

Hydro-logic valve



Features

①Multi-function composite valve to meet high-level hydraulic needs

A single multi-function composite valve controls direction, pressure and flow.

②Makes hydraulic equipment more compact

Since a single valve performs multiple functions, the number of required valves is reduced, which simplifies the hydraulic circuit and makes the overall design of the equipment more compact.

③Fast switching with less shock

A poppet valve is used for the basic structure, which eliminates overrun and reduces mass for very fast switching. A restrictor valve built into the pilot line makes it possible to freely set the open/close timing of each port and easily reduce shock.

④Less internal leaking than spool type valves

Poppet seal construction minimizes seat leaks, while a long slide length ensures much less internal leaking than a spool type valve.

⑤Dramatically reduced hydraulic equipment production cost

A fewer valves not only means more compact designs, it also translates into much lower production costs.

⑥Dimensions conform to international ISO standards

The 06, 10 sizes gasket type valve mounting dimensions conform to ISO standards for easy interchangeability with existing valves (except for 3-direction valves).

⑦Simple mounting, without modification

Unlike cartridge type valves that require drilling of holes in the block, gasket installation and flange connection of this type of valve is quick and simple.

⑧A wide selection of valve models

An extensive selection of models includes Size 13 2-direction valves and size 2000 3-direction and 4-direction valves to meet a wide range of needs.

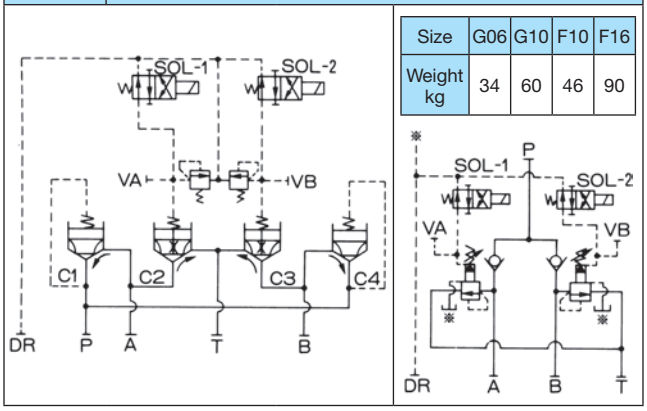
Main Specifications

2-Direction Valves	3-Direction Valves	4-Direction Valves		Pipe Diameter	Maximum Working Pressure	Maximum Flow Rate
Gasket Mounting			Flange Mounting	(Nominal Diameter)	MPa{kgf/cm²}	ℓ/min
HT(S)-G06	HY(S)-G06	HF(S)-G06	—	3/4B	28{286} (32{326})Note 2	200(*120)
HT(S)-G10	HY(S)-G10	HF(S)-G10	HF(S)-F10	1 1/4B		500(*300)
HT(S)-G16	—	—	HF(S)-F16	2B		1000(*600)
—	—	—	HF(S)-F24	3B(4B)	32{326}	2300

Note) 1. Flow rates marked with an asterisk (*) apply to 2-direction model number 2G* (pressure reducing valve).
2. The maximum operating pressure for 3-direction valves is 32MPa {326kgf/cm²}.
Contact your agent for details.

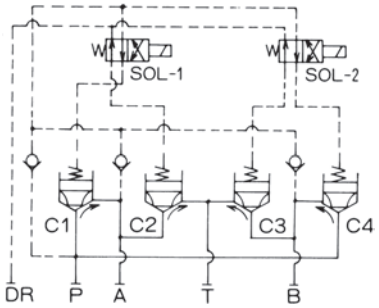
Main Circuit Symbol Examples

Function Symbol	PLR	Model No.	HF(S)–***–PLR**–**–12
Function	Double pump pressure control, with unloading circuit		

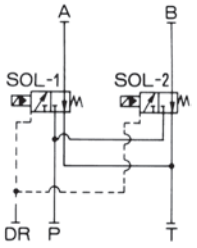


Size	G06	G10	F10	F16
Weight kg	34	60	46	90

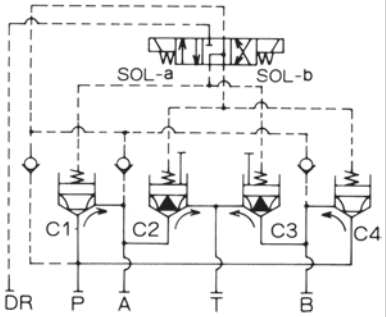
Function Symbol	H	Model No.	HF(S)–***–H–**–12
Function	Operation switching basic circuit		



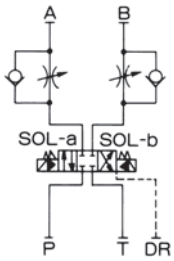
Size	G06	G10	F10	F16
Weight kg	36	61	47	91



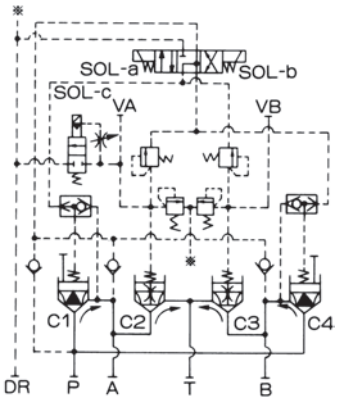
Function Symbol	DY	Model No.	HF(S)–***–DY–**–12
Function	A, B port meter out restrictor		



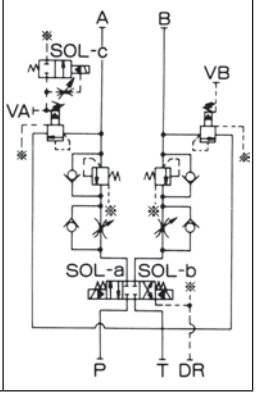
Size	G06	G10	F10	F16
Weight kg	37	63	49	95



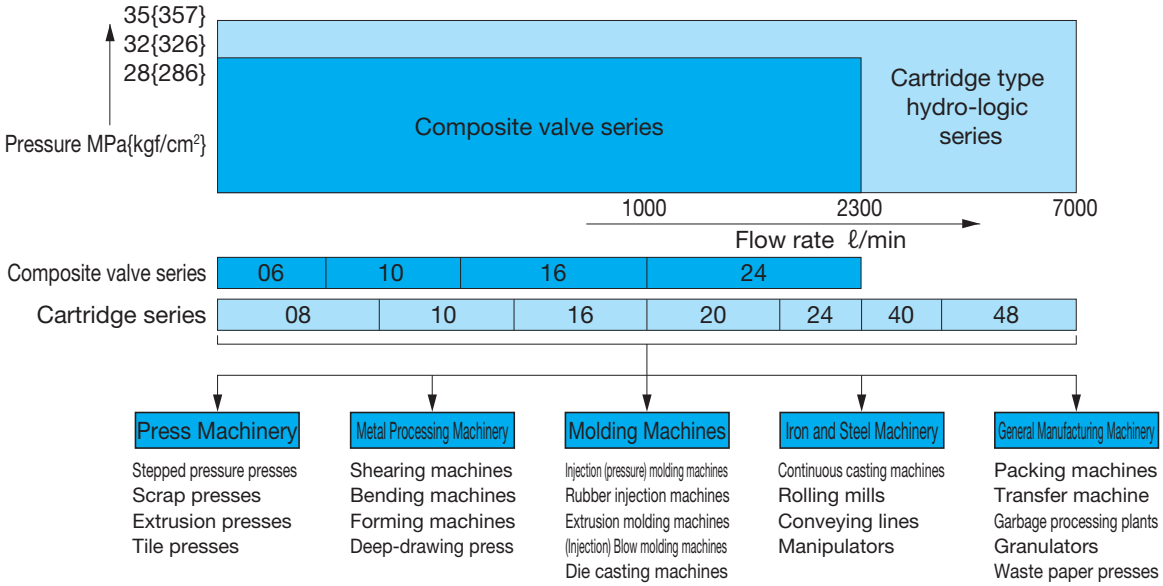
Function Symbol	CXZ	Model No.	HF(S)–***–CXZ**–**–12
Function	A, B port meter in restrictor, counterbalance, overload and P port pressure release		



Size	G06	G10	F10	F16
Weight kg	40	64	50	94

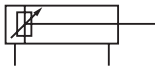


Applications



FJ Series
General Purpose Hydraulic Cylinder

ϕ30 to 250×1000ST
7, 14MPa



Features

①General purpose FJ series hydraulic cylinders have a high level of compatibility and interchangeability, plus very stable performance and quality.

②All component parts are completely standardized for quick delivery and easy parts replacement, maintenance, and inspection.

③Specially selected materials used in tubes, rods, packing, bolts and all other parts ensures durability. In a tough environment.

Specifications

Item	7MPa{71.4kgf/cm²}Series	14MPa{143kgf/cm²}Series	Remarks
Maximum Working Pressure	7MPa{71.4kgf/cm²}	14MPa{143kgf/cm²}	When using a meter out inhibitor, take care that pressure generated in the rod side cylinder chamber does not exceed the limits shown to the left.
Withstand Pressure	10.5MPa{107kgf/cm²}	21MPa{214kgf/cm²}	
Minimum Operating Pressure	0.3MPa{3.06kgf/cm²}	0.3MPa{3.06kgf/cm²}	
Load Pressure Coefficient	At least 95%		
Allowable Maximum Speed	18m/min		
Allowable Minimum Speed	0.3m/min		
Cylinder Inside Diameter (mm)	30, 40, 50, 63, 80, 100, 125, 140 150, 160, 180, 200, 224, 250		
Stroke	Standard up to 1000mm.		See page K-2 for strokes greater than 1000mm.
Rod Diameter	Rod B and Rod C		
Operating Fluid and Oil Temperature	Operating Fluid : Oil-based operating fluid Oil Temperature : –10°C to 80°C		Fire resistant hydraulic fluid is also handled as standard products. Contact your agent for more information.
Paint Color	Mancel No. 5B 6/3 Melamin No. 51		Or red rust-resistant paint

Note) Contact your agent for non-standard requirements.
The following series are also available.
FH Series (21MPa)
FL Series (3.5MPa)
FLS Series (with switch)

Cylinder Specifications (Major Characteristics Calculated Values)

Major Characteristics \ Cylinder Inside Diameter mm				30	40	50	63	80	100	125	140	150	160	180	200	224	250
Port Diameter Rc (Prevuously PT)				3/8	3/8	1/2	1/2	3/4	3/4	1	1	1	1	1¼	1½	1½	2
Head Side Area (cm²)				7	12.5	19.6	31.1	50.2	78.5	122.7	153.9	176.7	201	254.4	314.1	394	490.8
Rod Diameter Rod B	Rod Diameter (mm)			18	22.4	28	35.5	45	56	71	80	85	90	100	112	125	140
	Rod Side Area (cm²)			4.5	8.6	13.5	21.3	34.3	53.9	83.2	103.7	120	137.4	175.9	215.6	271.3	336.9
	Rod Area (cm²)			2.5	3.9	6.1	9.8	15.9	24.6	39.5	50.2	56.7	63.6	78.5	98.5	122.7	153.9
	Speed Ratio		Forward	1	1	1	1	1	1	1	1	1	1	1	1	1	1
			Reverse	1.55	1.45	1.45	1.46	1.46	1.45	1.47	1.48	1.47	1.46	1.44	1.45	1.45	1.45
	Output kN {kgf}	7MPa {71.4kgf/cm²}	Forward	4.90 {500}	8.75 {893}	13.72 {1400}	21.77 {2221}	35.14 {3584}	54.95 {5605}	85.89 {8761}	107.73 {10988}	123.69 {12616}	140.70 {14351}	178.08 {18164}	219.87 {22427}	275.80 {28132}	343.56 {35043}
			Reverse	3.15 {321}	6.02 {614}	9.45 {964}	14.91 {1521}	24.01 {2449}	37.73 {3848}	58.24 {5940}	72.59 {7404}	84.00 {8568}	96.18 {9810}	123.13 {12559}	150.92 {15394}	189.91 {19371}	235.83 {24055}
		14MPa {143kgf/cm²}	Forward	9.80 {1001}	17.50 {1788}	27.44 {2803}	43.54 {4447}	70.28 {7179}	109.90 {11226}	171.78 {17546}	215.46 {22008}	247.38 {25268}	281.40 {28743}	356.16 {36379}	439.74 {44916}	551.60 {56342}	687.12 {70184}
			Reverse	6.30 {644}	12.04 {1230}	18.90 {1931}	29.82 {3046}	48.02 {4905}	75.46 {7708}	116.48 {11898}	145.18 {14829}	168.00 {17160}	192.36 {19648}	246.26 {25154}	301.84 {30831}	379.82 {38796}	471.66 {48177}
Rod Diameter Rod C	Rod Diameter (mm)			—	18	22.4	28	35.5	45	56	63	67	—	—	—	—	—
	Rod Side Area (cm²)			—	10	15.7	25	40.4	62.6	98.1	122.8	141.5	—	—	—	—	—
	Rod Area (cm²)			—	2.5	3.9	6.1	9.8	15.9	24.6	31.1	35.2	—	—	—	—	—
	Speed Ratio		Forward	—	1	1	1	1	1	1	1	1	—	—	—	—	—
			Reverse	—	1.25	1.24	1.24	1.24	1.25	1.25	1.25	1.24	—	—	—	—	—
	Output kN {kgf}	7MPa {71.4kgf/cm²}	Forward	—	8.75 {893}	13.72 {1400}	21.77 {2221}	35.14 {3584}	54.95 {5605}	85.89 {8761}	107.73 {10988}	123.69 {12616}	—	—	—	—	—
			Reverse	—	7.00 {714}	10.99 {1121}	17.50 {1785}	28.28 {2885}	43.82 {4470}	68.67 {7004}	85.96 {8768}	99.05 {10103}	—	—	—	—	—
		14MPa {143kgf/cm²}	Forward	—	17.50 {1788}	27.44 {2803}	43.54 {4447}	70.28 {7179}	109.90 {11226}	171.78 {17546}	215.46 {22008}	247.38 {25268}	—	—	—	—	—
			Reverse	—	14.00 {1430}	21.98 {2245}	35.00 {3575}	56.56 {5777}	87.64 {8952}	137.34 {14028}	171.92 {17560}	198.10 {20235}	—	—	—	—	—
Cushion Stroke (mm)				—	20			25						30			35

Note) 1.Non-cushion (N) is standard for inside diameter ϕ30. Contact your agent for information about cushions.
2.Speed ratio and out output specifications are theoretical values based on a rod diameter.

●Product not covered by IS09001 registration

Explanation of model No.

FJ – FA N 1 J 100 B 1000 T R – 21

Cylinder name

Mounting

LA Type	Axial right-angle foot Type	
* LB Type	Axial foot Type	
* FA Type FY Type	Rod side flange Type	
* FB Type FZ Type	Head side flange Type	
CA Type	Rear clevis Type	
TA Type	Rod side trunnion Type	
TC Type	Intermediate trunnion Type	

* LB, FA, and FB types are for 7Mpa {71.4kgf/cm2} high operating pressure types. For flange types under higher pressures, use FY or FZ.

Cushioning

N	None
H	Head side cushioning
R	Rod side cushioning
B	Both side cushioning

Pressure classification

1	Maximum operating pressure: 7MPa{71.4kgf/cm^2}
2	Maximum operating pressure: 14MPa{143kgf/cm^2}

Bellows

A	Conex
C	Silicon
J	Nylon/tarpaulin (standard)
K	Neoprene
None	None

Cylinder I.D.

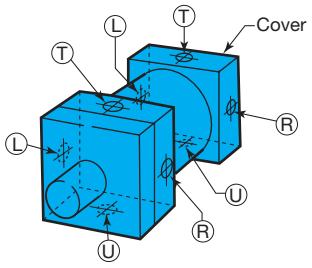
Rod diameter (Rod B and Rod C)

Cylinder stroke

Design number

Cushion, air bleeder position

Port position



- Standard port position is Ⓣ.
- Cushion screw and air bleed position is Ⓡ. which is located 90° clockwise from the port when viewed from the rod side. Specify when a different position is required. The TA type has a port 180° opposite the port side only.

Stroke up to 1000mm is standard. See the following table for strokes greater than 1000mm.

Series / Inside diameter	30·40	50 to 150	180 to 250	
7MPa{71.4kgf/cm^2}	1500	2000	1500	1501 to 2000
14MPa{143kgf/cm^2}	1500	2000	800	801 to 2000
Cover Fixing System	Tie Rod			Screw In Flange

Note) 1.Use a Nomograph to determine rod buckling.
2.With the screw in flange system, the tube and flange are fixed by being screwed in.

●Handling

Note the following installation and handling precautions to get the most out of cylinder performance and to obtain the long service life for which cylinders are designed.

1 Cylinders are designed for rigidity. Be sure to secure them in place with bolts.

2 Install cylinders in a location that allows their easy removal, maintenance, and inspection.

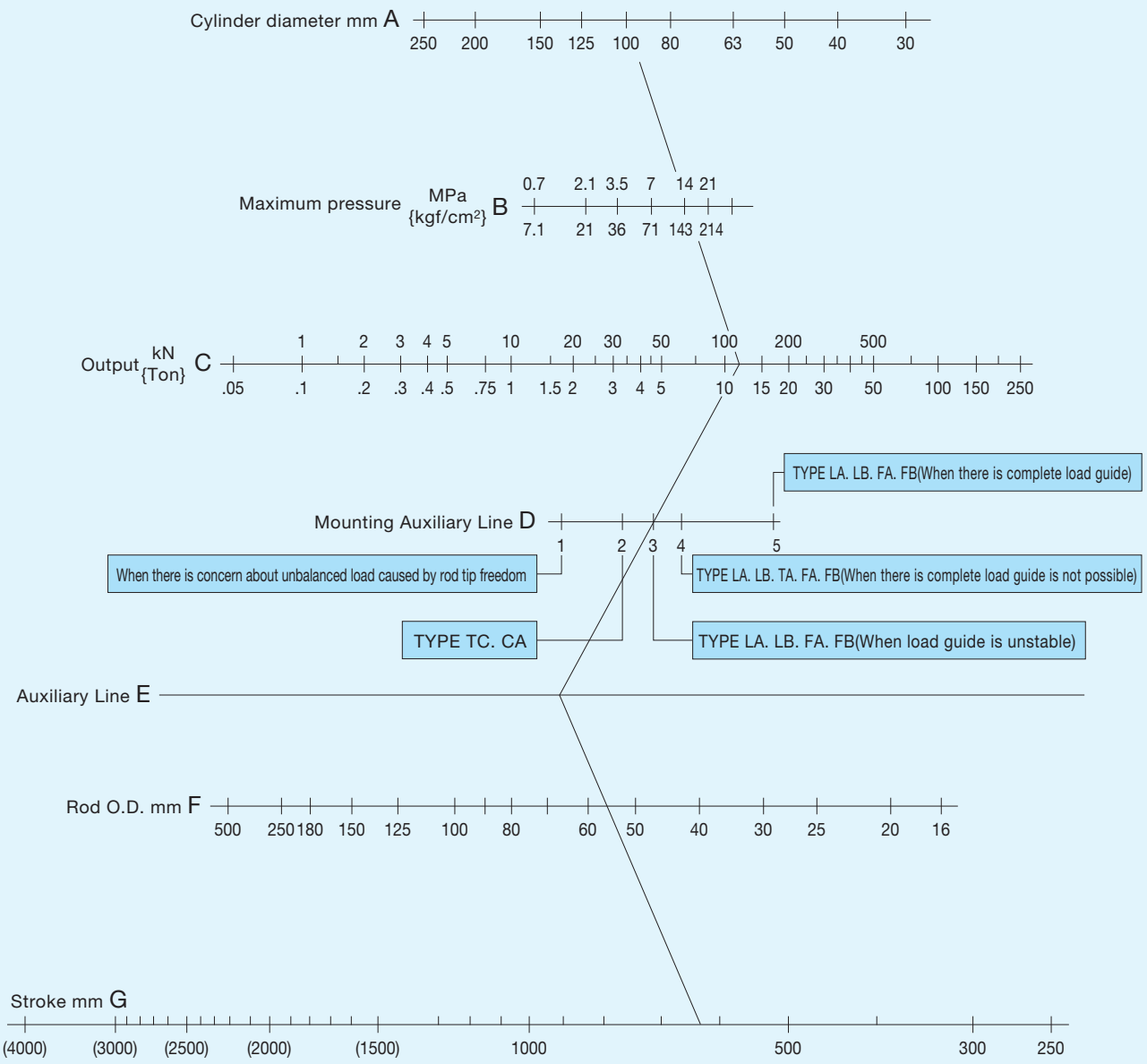
3 When installing a cylinder in a location where the air quality is poor, or where there are large amounts of dust, metal powder, or other contaminants, install dust covers on the rod and shell to protect them.

4 When installing a cylinder, align it with the center of the slide, and make sure it is not subjected to lateral or rotational force by the piston or rod. When lateral force is unavoidable, make sure it does not exceed 1/100 of cylinder maximum output.

5 When coupling the piston rod and machinery, adjust so there is no unnecessary force applied to the piston rod sliding bush.

Nomograph (Operation Conditions, Load, Rod, Stroke)

●Back Ring Safety Factor 4 According to Euler Equation



Note) TC type is intermediate trunnion type

●Nomograph Application Example
●Determining Maximum Stroke
The maximum stroke under the following operating conditions can be easily determined as shown below.

Operating Environment

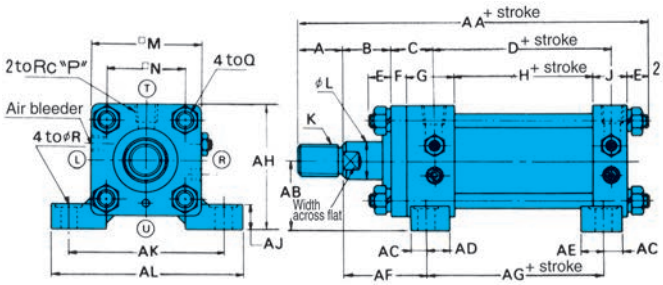
- ●Cylinder I.D. : ϕ100mm
- ●Maximum Working Pressure: 14MPa{143kgf/cm²}
- ●Mounting Method : FA type (Rod Side Flange)
- ●Load Guide Condition : Unstable
- ●Piston Rod Diameter : 56mm

Determining Maximum Stroke

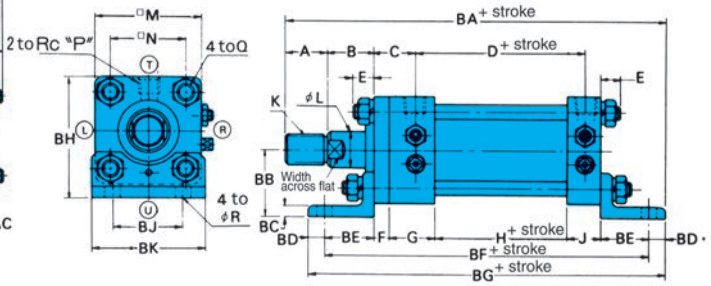
1. Draw a line through 100mm on Line A (Cylinder I.D.) and 14 on Line B (Maximum Pressure), and extend it to Line C (Output). The point of intersection on Line C is at 110kN.
2. Draw a line from 100kN on Line C to point 3 (FA type, unstable load guide) on Line D (Mounting Type Auxiliary Line), and then extend the line until it intersects with Line E.
3. Draw a line from the point of intersection on Line E to 56mm on Line F (Rod Diameter) and then extend the line until it intersects with Line G (Stroke). This indicates a maximum stroke of about 630mm.

Installation Dimension Drawings

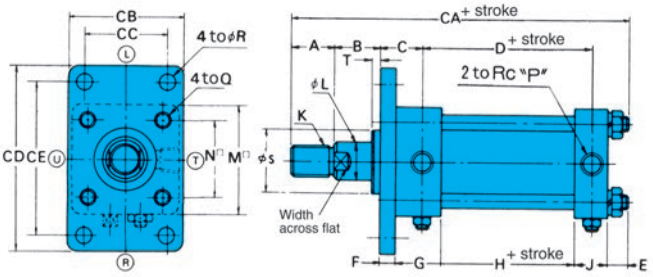
LA Type 7MPa{71.4kgf/cm²}·14MPa{143kgf/cm²}



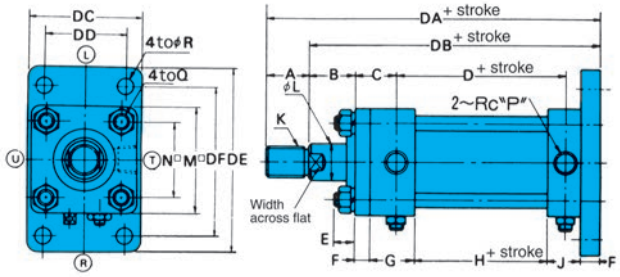
LB Type 7MPa{71.4kgf/cm²}



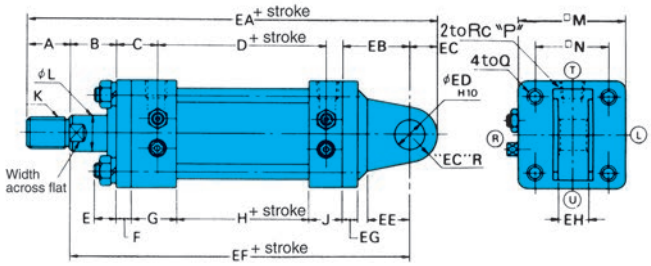
FA Type 7MPa{71.4kgf/cm²}



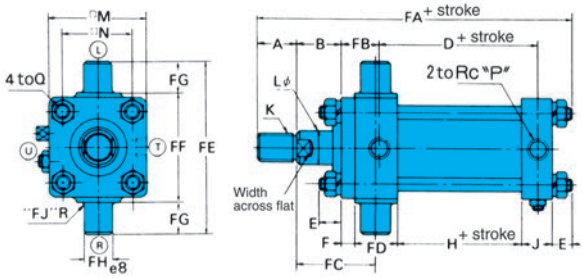
FB Type 7MPa{71.4kgf/cm²}



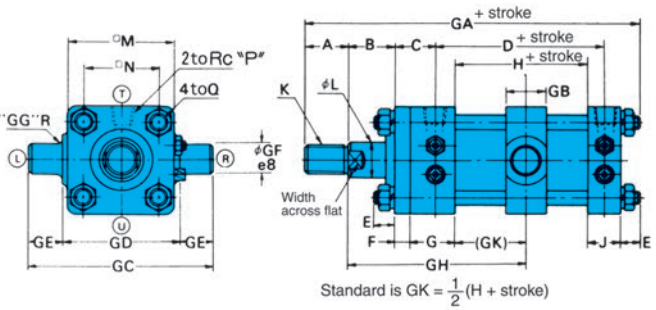
CA Type 7MPa{71.4kgf/cm²}·14MPa{143kgf/cm²}



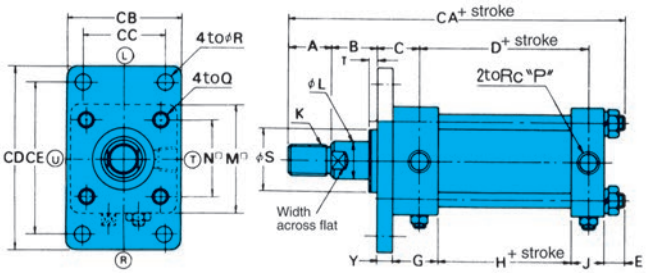
TA Type 7MPa{71.4kgf/cm²}·14MPa{143kgf/cm²}



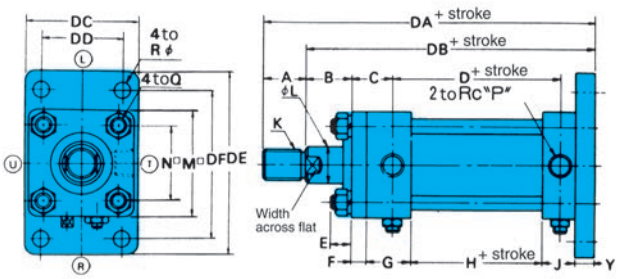
TC Type 7MPa{71.4kgf/cm²}·14MPa{143kgf/cm²}



FY Type 7MPa{71.4kgf/cm²}·14MPa{143kgf/cm²}



FZ Type 7MPa{71.4kgf/cm²}·14MPa{143kgf/cm²}



K Hydraulic Cylinder

Unit : mm

Symbol			Inside diameter	30	40	50	63	80	100	125	140	150	160	180	200	224	250
Common	Rod diameter	Rod B	A	25	30	35	45	60	75	95	110	115	120	140	150	180	195
			※ S	36	40	46	55	65	80	95	105	110	115	125	140	150	170
			※ T	10	10	10	10	10	10	10	10	10	10	10	10	10	10
			K	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M64 P2	M72 P2	M76 P2	M80 P2	M95 P2	M100 P2	M120 P2	M130 P2
			L	18	22.4	28	35.5	45	56	71	80	85	90	100	112	125	140
			Width across flat	14	19	24	30	41	50	65	75	80	85	95	105	115	130
		Rod C	A	—	25	30	35	45	60	75	80	85	—	—	—	—	—
			※ S	—	36	40	46	55	65	80	85	90	—	—	—	—	—
			※ T	—	10	10	10	10	10	10	10	10	—	—	—	—	—
			K	—	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M56 P2	M60 P2	—	—	—	—	—
			L	—	18	22.4	28	35.5	45	56	63	67	—	—	—	—	—
			Width across flat	—	14	19	24	30	41	50	55	60	—	—	—	—	—
	B			30	30	30	35	35	40	45	50	50	55	55	55	60	65
	C			38	38	42	46	56	58	67	69	71	74	75	85	89	106
	C(FY Type only)			40	40	47	51	62	66	76	80	82	84	88	99	106	125
	D			90	90	98	102	110	116	130	138	146	156	172	184	184	200
	E			11	13	13	16	20	24	26	28	31	31	34	38	45	50
	H			60	60	64	68	70	76	80	88	96	104	86	90	90	90
	J			28	28	32	32	38	38	48	48	48	49	71	79	79	95
	M			55	65	75	90	110	135	165	185	196	210	235	262	292	325
	N			40	46	54	66	82	100	126	138	150	160	182	200	225	250
	P			3/8	3/8	1/2	1/2	3/4	3/4	1	1	1	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	2
	Q			M8 P1.25	M10 P1.5	M10 P1.5	M12 P1.5	M16 P1.5	M18 P1.5	M22 P1.5	M24 P1.5	M27 P1.5	M24 P1.5	M30 P1.5	M33 P1.5	M39 P1.5	M42 P1.5
	F			11	11	13	15	18	20	24	26	28	31	33	37	41	46
	G			42	42	46	48	58	58	68	68	68	69	85	95	95	115
	R			11	11	14	18	18	22	26	26	30	33	33	36	42	45
	Y			13	13	18	20	24	28	33	37	39	41	46	51	58	65
LA Type	AA			207	214	233	259	299	331	386	418	436	459	504	544	590	656
	AB			35	37.5	45	50	60	71	85	95	106	112	125	140	150	170
	AC			13	13	14	18	18	22	25	25	28	31	35	39	39	47
	AD			31	31	34	32	42	38	41	41	38	40	50	56	56	68
	AE			31	31	34	32	42	38	41	41	38	40	36	40	40	48
	AF			57	57	60	71	74	85	99	106	111	122	123	131	140	158
	AG			98	98	108	106	124	122	136	144	146	150	172	186	186	206
	AH			62.5	70	82.5	95	115	138.5	167.5	187.5	204	217	242.5	271	296	332.5
	AJ			14	14	17	19	25	27	32	35	37	42	47	52	52	57
	AK			88	95	115	132	155	190	224	250	270	285	315	355	395	425
	AL			109	118	145	165	190	230	272	300	320	345	375	425	475	515
LB Type	BA			241	246	270	303	349	385	455	490	510	538	595	644	705	786
	BB			40	43	50	60	72	85	105	115	123	132	148	165	185	208
	BC			8	8	8	10	12	12	15	18	18	18	20	25	30	35
	BD			13	13	15	18	20	23	29	30	30	35	40	40	45	50
	BE			32	32	35	42	50	55	66	70	75	75	85	98	115	130
	BF			205	205	225	247	284	302	352	370	390	403	445	497	535	606
	BG			231	231	255	283	324	248	410	430	450	473	525	577	625	706
	BH			67.5	75.5	87.5	105	127	152.5	187.5	207.5	221	237	265.5	296	331	370.5
	BJ			40	46	58	65	87	109	130	145	155	170	185	206	230	250
	BK			63	69	85	98	118	150	175	195	210	225	243	272	310	335
FA FY Type	CA(FA Type)			207	214	233	259	299	331	386	418	436	459	504	544	590	656
	CA(FY Type)			209	216	238	264	305	339	395	429	447	469	517	558	607	675
	CB			63	69	85	98	118	150	175	195	210	225	243	272	310	335
	CC			40	46	58	65	87	109	130	145	155	170	185	206	230	250
	CD			109	118	145	165	190	230	272	300	320	345	375	425	475	515
	CE			88	95	115	132	155	190	224	250	270	285	315	355	395	425
FB FZ Type	DA(FB Type)			207	212	233	258	297	327	384	416	433	459	503	543	586	652
	DA(FZ Type)			209	214	238	263	303	335	393	427	444	469	516	557	603	671
	DB(FB Type)			182	182	198	213	237	252	289	306	318	339	363	393	406	457
	DB(FZ Type)			184	184	203	218	243	260	298	317	329	349	376	407	423	476
	DC			63	69	85	98	118	150	175	195	210	225	243	272	310	335
	DD			40	46	58	65	87	109	130	145	155	170	185	206	230	250
	DE			109	118	145	165	190	230	272	300	320	345	375	425	475	515
	DF			88	95	115	132	155	190	224	250	270	285	315	355	395	425

Unit : mm

Symbol \ Inside diameter		30	40	50	63	80	100	125	140	150	160	180	200	224	250
CA Type	EA	250	255	285	337.5	382.5	431	510	573	590	636	700	766	830	891
	EB	38	38	45	63	72	84	100	120	122	137	150	170	185	185
	EC	16	16	20	31.5	31.5	40	50	63	63	71	80	90	100	100
	ED	16	16	20	31.5	31.5	40	50	63	63	71	80	90	100	100
	EE	20	20	25	40	40	50	63	80	80	90	100	115	125	125
	EF	209	209	230	261	291	316	365	400	412	445	480	526	550	596
	EG	12	12	14	17	20	23	27	25	32	33	35	37	41	45
	EH	$25^{-0.1}_{-0.4}$	$25^{-0.1}_{-0.4}$	$31.5^{-0.1}_{-0.4}$	$40^{-0.1}_{-0.4}$	$40^{-0.1}_{-0.4}$	$50^{-0.1}_{-0.4}$	$63^{-0.1}_{-0.4}$	$80^{-0.1}_{-0.6}$	$80^{-0.1}_{-0.6}$	$80^{-0.1}_{-0.6}$	$100^{-0.1}_{-0.6}$	$125^{-0.1}_{-0.6}$	$125^{-0.1}_{-0.6}$	$125^{-0.1}_{-0.6}$
TA Type	FA	207	214	233	259	299	331	386	418	436	469	504	544	600	656
	FB	38	38	42	46	56	58	67	69	71	84	75	85	99	106
	FC	62	62	66	74	82	89	103	112	112	126	130.5	139.5	153.5	168.5
	FD	42	42	46	48	58	58	68	68	68	79	85	95	105	115
	FE	98	109	135	161	181	225	275	321	332	360	403	452	500	535
	FF	$58^{0}_{-0.5}$	$69^{0}_{-0.5}$	$85^{0}_{-0.5}$	$98^{0}_{-0.5}$	$118^{0}_{-0.5}$	$145^{0}_{-0.5}$	$175^{0}_{-0.5}$	$195^{0}_{-0.5}$	$206^{0}_{-0.5}$	$218^{0}_{-0.5}$	$243^{0}_{-0.5}$	$272^{0}_{-0.5}$	$300^{0}_{-0.5}$	$335^{0}_{-0.5}$
	FG	20	20	25	31.5	31.5	40	50	63	63	71	80	90	100	100
	FH	$20^{-0.040}_{-0.073}$	$20^{-0.040}_{-0.073}$	$25^{-0.040}_{-0.073}$	$31.5^{-0.050}_{-0.089}$	$31.5^{-0.050}_{-0.089}$	$40^{-0.050}_{-0.089}$	$50^{-0.050}_{-0.089}$	$63^{-0.060}_{-0.106}$	$63^{-0.060}_{-0.106}$	$71^{-0.060}_{-0.106}$	$80^{-0.060}_{-0.106}$	$90^{-0.072}_{-0.126}$	$100^{-0.072}_{-0.126}$	$100^{-0.072}_{-0.126}$
	FJ	2	2	2.5	2.5	2.5	3	3	4	4	4	4	5	5	5
TC Type	GA	207	214	233	259	299	331	386	418	436	459	504	544	590	656
	GB	28	28	33	43	43	53	58	78	78	88	98	108	117	117
	GC	98	109	135	161	181	225	275	321	332	360	403	452	500	535
	GD	$58^{0}_{-0.5}$	$69^{0}_{-0.5}$	$85^{0}_{-0.5}$	$98^{0}_{-0.5}$	$118^{0}_{-0.5}$	$145^{0}_{-0.5}$	$175^{0}_{-0.5}$	$195^{0}_{-0.5}$	$206^{0}_{-0.5}$	$218^{0}_{-0.5}$	$243^{0}_{-0.5}$	$272^{0}_{-0.5}$	$300^{0}_{-0.8}$	$335^{0}_{-0.8}$
	GE	20	20	25	31.5	31.5	40	50	63	63	71	80	90	100	100
	GF	$20^{-0.040}_{-0.073}$	$20^{-0.040}_{-0.073}$	$25^{-0.040}_{-0.073}$	$31.5^{-0.050}_{-0.089}$	$31.5^{-0.050}_{-0.089}$	$40^{-0.050}_{-0.089}$	$50^{-0.050}_{-0.089}$	$63^{-0.060}_{-0.106}$	$63^{-0.060}_{-0.106}$	$71^{-0.060}_{-0.106}$	$80^{-0.060}_{-0.106}$	$90^{-0.072}_{-0.126}$	$100^{-0.072}_{-0.126}$	$100^{-0.072}_{-0.126}$
	GG	2	2	2.5	2.5	2.5	3	3	4	4	4	4	5	5	5
	☆ GH	$113+\frac{ST}{2}$	$113+\frac{ST}{2}$	$121+\frac{ST}{2}$	$132+\frac{ST}{2}$	$146+\frac{ST}{2}$	$156+\frac{ST}{2}$	$177+\frac{ST}{2}$	$188+\frac{ST}{2}$	$194+\frac{ST}{2}$	$207+\frac{ST}{2}$	$216+\frac{ST}{2}$	$232+\frac{ST}{2}$	$241+\frac{ST}{2}$	$271+\frac{ST}{2}$

☆: Specify when GH dimensions are different from those shown above.
Note) 1. ST is stroke.
2. The overall length dimensions are B Rod dimensions. For Rod C, Dimension A is different, so overall length is also different.
3. S and T rows marked with an asterisk (*) are FY type typical values. See FY Type for other types of mounting.

●Weight Table

Unit : kg

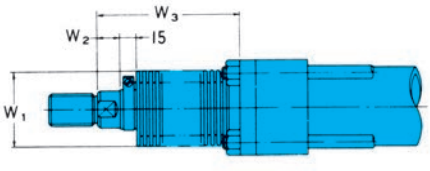
Model No. \ Cylinder I.D.			30	40	50	63	80	100	125	140	150	160	180	200	224	250
Rod diameter Rod B	Weight at Zero Stroke	LA	3.8	4.2	6.0	9.3	17.8	27.7	46.7	67.3	75.3	94.7	122.8	168.2	229.5	304.2
		LB	4	4.4	6.3	9.9	18.2	29.0	49.7	69.2	80.6	98.3	126.7	171.3	232.0	309.2
		FA	3.7	4.1	6.3	9.6	17.0	26.7	48.4	66.4	74.2	94	122.6	163.3	207.5	284.0
		FY	3.8	4.2	6.8	10.3	18.0	28.9	51.8	71.4	80.0	100.1	131.9	176.0	227.2	309.8
		FB	4.1	4.5	6.9	10.6	18.6	29.4	53.2	73.7	82.5	105.33	136.3	182.7	243.0	322.2
		FZ	4.2	4.6	7.4	11.3	19.6	31.6	56.6	78.7	88.3	111.4	145.6	195.4	262.7	348.0
		CA	4.2	4.6	7.0	11.1	18.9	31.1	56.5	78.6	88.0	110.8	151.0	203.6	267.3	339.2
		TA	3.6	4.0	6.2	9.4	16.6	26.3	48.0	66.2	73.7	92.9	121.9	162.7	206.0	281.5
		TC	4.1	4.5	6.6	10.6	18.0	28.5	51.3	74	79.8	103.7	133.8	180.2	236.0	309.2
	Weight at 100mm Stroke		0.8	1.1	1.4	2.2	3.4	4.9	7.9	10	12.2	13.1	17.4	21.4	27.2	33.6
Rod diameter Rod C	Weight at Zero Stroke	LA	—	4.1	5.8	8.8	16.9	26.3	43.8	63.3	70.7	—	—	—	—	—
		LB	—	4.3	6.1	9.4	17.3	27.6	46.8	65.2	76	—	—	—	—	—
		FA	—	4.0	6.1	9.1	16.1	25.3	45.5	62.4	69.6	—	—	—	—	—
		FY	—	4.1	6.6	9.8	17.1	27.5	48.9	77.4	75.4	—	—	—	—	—
		FB	—	4.4	6.7	10.1	17.7	28	50.3	69.7	77.9	—	—	—	—	—
		FZ	—	4.5	7.2	10.8	18.7	30.2	53.7	74.7	83.7	—	—	—	—	—
		CA	—	4.5	6.8	10.6	18	29.7	53.6	74.6	83.4	—	—	—	—	—
		TA	—	3.9	6.0	8.9	15.7	24.9	45.1	62.2	69.1	—	—	—	—	—
		TC	—	4.4	6.4	10.1	17.1	27.1	48.4	70	75.2	—	—	—	—	—
	Weight at 100mm Stroke		—	1.0	1.2	1.9	2.9	4.2	6.7	8.5	10.5	—	—	—	—	—

Note) Cylinder weight is the total of the zero stroke weight plus the stroke weight.

●Rod Cover Mounting Method

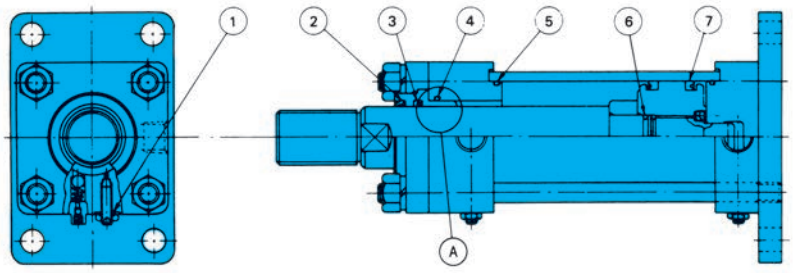
Symbol \ Inside diameter			30	40	50	63	80	100	125	140	150	160	180	200	224	250
W_1	Rod diameter	B	50	50	60	70	80	100	120	130	140	140	150	170	180	200
		C	—	50	50	60	70	80	100	120	130	—	—	—	—	—
W_2			20	20	20	30	30	30	40	40	40	40	40	40	50	50
W_3			$45+\frac{ST}{3.5}$	$45+\frac{ST}{3.5}$	$45+\frac{ST}{3.5}$	$55+\frac{ST}{4}$	$55+\frac{ST}{4}$	$55+\frac{ST}{4}$	$65+\frac{ST}{5}$	$65+\frac{ST}{5}$	$65+\frac{ST}{5}$	$65+\frac{ST}{5}$	$65+\frac{ST}{5}$	$65+\frac{ST}{5}$	$80+\frac{ST}{6}$	$80+\frac{ST}{6}$

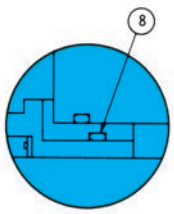
ST is stroke.



Note) 1. The decimal part of the W_3 dimension is rounded down.
2. This diagram shows dimensions for nylon tarpaulin (Standard: 80°C max. heat resistance), neoprene (130°C max. heat resistance), silicon (220°C max. heat resistance), and conex (300°C max. heat resistance), which are used with the standard FJ cylinder. Heat resistance does not indicate constant temperature, but maximum temperature within a short period. Asbestos/aluminum (400°C max. heat resistance) and other materials are also available, and using such materials changes the W3 dimension. Contact your agent for more information.
3. Use a heat wall when there is particularly intense heat radiation due to ambient temperature. Also avoid high temperatures due to heat conduction.
4. When a rod cover is required, specify with the symbol described in the section that explains model numbers.

●Packing Type List





Detail of rod diameter Rod C part Ⓐ (I.D. ϕ63 to ϕ150)

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

Rod Diameter Rod B

Part No.	1	2	3	4	5	6	7
Cylinder I.D.	Cushion Valve Nominal Diameter Screw Seat Packing (Fujikoshi)(Qty: 2)	Dust Seal SDR Type I.D.×O.D.×Height (Qty: 1)	Gland Packing SKY Type I.D.×O.D.×Height (Qty: 1)	Gland Bush Nominal Diameter (Qty: 1)	Cover Nominal Diameter (Qty: 2)	Piston I.D. Nominal Diameter (Qty: 1)	Piston Packing SKY Type I.D.×O.D.×Height (Qty: 2)
30	M10P1.5×3.5	18×26×4.5×6	18×26×5	1A-G30	1B-G25	1A-P14	22.4×30×5
40	M10P1.5×3.5	22.4×30.4×4.5×6	22.4×30×5	1A-G30	1B-G35	1A-P15	30×40×6
50	M10P1.5×3.5	28×36×4.5×6	28×35.5×5	1A-G35	1B-G45	1A-P20	40×50×6
63	M10P1.5×3.5	35.5×43.5×5×6.5	35.5×45×6	1A-G45	1B-G58	1A-G25	53×63×6
80	M10P1.5×3.5	45×53×5×6.5	45×55×6	1A-G55	1B-G75	1A-P32	71×80×6
100	M10P1.5×3.5	56×64×5×6.5	56×66×6	1A-G65	1B-G95	1A-G35	85×100×9
125	M10P1.5×3.5	71×81×6×8	71×80×6	1A-G80	1B-G120	1A-G45	112×125×8.5
140	M10P1.5×3.5	80×90×6×8	80×90×6	1A-G90	1B-G135	1A-G50	125×140×9
150	M10P1.5×3.5	85×95×6×8	85×100×9	1A-G95	1B-G145	1A-G55	136×150×8.5
160	M16P1.5×4.5	90×100×6×8	90×105×9	1A-G105	1B-G150	1A-G60	145×160×9
180	M16P1.5×4.5	100×110×6×8	100×115×9	1A-G115	1B-G170	1A-G70	165×180×9
200	M16P1.5×4.5	112×122×6×8	112×125×8.5	1A-G125	1B-G190	1A-G80	180×200×12
224	M16P1.5×4.5	125×138×7×9.5	125×140×9	1A-G140	1B-G214	1A-G90	204×224×12
250	M16P1.5×4.5	140×153×7×9.5	140×155×9	1A-G155	1B-G240	1A-G100	230×250×12

Rod Diameter Rod C

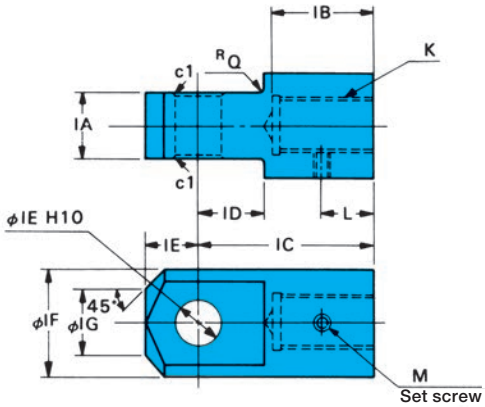
Part No.	1	2	3	4	5	6	7	8
Cylinder I.D.	Cushion Valve Nominal Diameter Screw Seat Packing (Fujikoshi)(Qty: 2)	Dust Seal SDR Type I.D.×O.D.×Height (Qty: 1)	Gland Packing SKY Type I.D.×O.D.×Height (Qty: 1)	Gland Bush Nominal Diameter (Qty: 1)	Cover Nominal Diameter (Qty: 2)	Piston I.D. Nominal Diameter (Qty: 1)	Piston Packing SKY Type I.D.×O.D.×Height (Qty: 2)	Bush Nominal Diameter (Qty: 1)
40	M10P1.5×3.5	18×26×4.5×6	18×26×5	1A-G30	1B-35	1A-P15	30×40×6	—
50	M10P1.5×3.5	22.4×30.4×4.5×6	22.4×30×5	1A-G35	1B-45	1A-P20	40×50×6	—
63	M10P1.5×3.5	28×36×4.5×6	28×35.5×5	1A-G45	1B-58	1A-G25	53×63×6	1A-G35
80	M10P1.5×3.5	35.5×43.5×5×6.5	35.5×45×6	1A-G55	1B-75	1A-P32	71×80×6	1A-G45
100	M10P1.5×3.5	45×53×5×6.5	45×55×6	1A-G65	1B-95	1A-G35	85×100×9	1A-G55
125	M10P1.5×3.5	56×64×5×6.5	56×66×6	1A-G80	1B-120	1A-G45	112×125×8.5	1A-G65
140	M10P1.5×3.5	63×71×5×6.5	63×73×6	1A-G90	1B-135	1A-G50	125×140×9	1A-G75
150	M10P1.5×3.5	67×75×5×6.5	67×77×6	1A-G95	1B-145	1A-G55	136×150×8.5	1A-G80

●Tip Cap

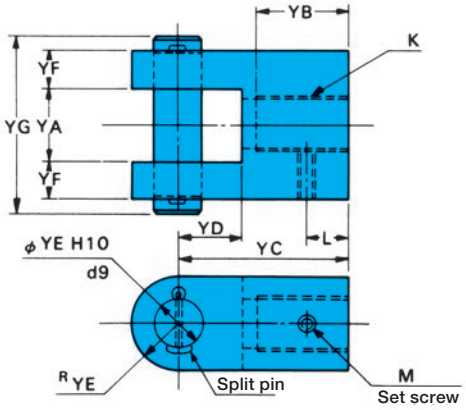
FJI — 40 — B — 10

- 10: Design number
- B: Rod sequence
- 40: Inside diameter
- FJI: Tip fitting
  - 1 thread: FJI
  - 2 thread: FJY

1-Fork Tip Cap



2-Fork Tip Cap(With Pin)



1-Fork Tip Cap

Symbol \ Inside diameter		30	40	50	63	80	100	125	140	150
Common	IA	25 $^{-0.1}_{-0.4}$	25 $^{-0.1}_{-0.4}$	31.5 $^{-0.1}_{-0.4}$	40 $^{-0.1}_{-0.4}$	40 $^{-0.1}_{-0.4}$	50 $^{-0.1}_{-0.4}$	63 $^{-0.1}_{-0.4}$	80 $^{-0.1}_{-0.6}$	80 $^{-0.1}_{-0.6}$
	IC	50	55	65	92	107	135	168	210	215
	ID	20	20	25	40	40	50	63	80	80
	IE	16	16	20	31.5	31.5	40	50	63	63
	IF	35	35	45	65	65	85	105	130	130
	IG	25	25	32	40	40	55	68	85	85
	L	15	15	15	15	15	20	20	20	20
	M	M8	M8	M8	M8	M8	M10	M10	M10	M10
	Q	2	2	2.5	2.5	2.5	3	3	4	4
Rod diameter Rod B	IB	27	32	37	47	62	78	98	113	118
	K	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M64 P2	M72 P2	M76 P2
Rod diameter Rod C	IB	—	27	32	37	47	62	78	83	88
	K	—	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M56 P2	M60 P2

2-Fork Tip Cap

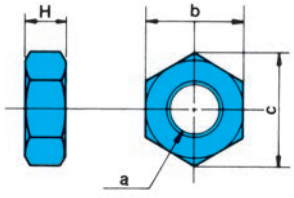
Symbol \ Inside diameter		30	40	50	63	80	100	125	140	150
Common	YA	25 $^{+0.4}_{+0.1}$	25 $^{+0.4}_{+0.1}$	31.5 $^{+0.4}_{+0.1}$	40 $^{+0.4}_{+0.1}$	40 $^{+0.4}_{+0.1}$	50 $^{+0.4}_{+0.1}$	63 $^{+0.4}_{+0.1}$	80 $^{+0.6}_{+0.1}$	80 $^{+0.6}_{+0.1}$
	YC	50	55	65	92	107	135	168	210	215
	YD	20	20	25	40	40	50	63	80	80
	YE	16	16	20	31.5	31.5	40	50	63	63
	YF	12.5	12.5	16	20	20	25	31.5	40	40
	YG	66	66	80	101	101	126	153	192	192
	L	15	15	15	15	15	20	20	20	20
	M	M8	M8	M8	M8	M8	M10	M10	M10	M10
Rod diameter Rod B	YB	27	32	37	47	62	78	98	113	118
	K	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M64 P2	M72 P2	M76 P2
Rod diameter Rod C	YB	—	27	32	37	47	62	78	83	88
	K	—	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M56 P2	M60 P2

Locknut Type Description (Example)

FJN — 28 — 10

- 10: Design number
- 28: Rod diameter
- FJN: Tip lock nut

Locknut (For FJ)



Symbol \ Rod diameter	18	22.4	28	35.5	45	56	63	67	71	80	85
a	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M56 P2	M60 P2	M64 P2	M72 P2	M76 P2
b	24	30	36	46	60	75	85	90	95	105	110
c	27.7	34.6	41.6	53.1	69.3	86.5	98.1	104	110	121	127
H	10	12	14	18	23	29	34	36	38	42	46

NCP Series
Standard Variable Pump Unit

NCP Series is a compact, low-cost standard unit that includes a variable vane pump (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 30ℓ to 650ℓ.

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 Rotation Direction	Pump type	
		VDC · PVS · PZS	VDR
Pressure	Clockwise	Increase	Decrease
	Counterclockwise	Decrease	Increase
Discharge rate	Clockwise	Decrease	
	Counterclockwise	Increase	

Specifications

Note) ①For direct connect type, use a Nachi Uni-pump.
②Oil temperature limit is room temperature +25°C setting conditions are full cutoff continual operation, tank located in a well-ventilated area.
③An unload circuit is required when the motor is started under condition λ–Δ. Contact your agent about the unload circuit.
④Unless 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.	Connection	Motor (All External) kW, 4P	Tank Capacity ℓ	Full Cutoff Pressure at Tank Oil Temperature Limit Note 3) MPa{kgf/cm²} No Fan Cooler	With Standard Fan Cooler	With Highpower Fan Cooler	Approximate Weight kg
(VC1A2) NCP-40-0.7VD1A2-□-13(22)	(VDC-1B-1A*-20) VDR-1B-1A*-22	Direct	0.75	40	3.0 (30.6)	8.0 (81.6)	—	75
(VC1A*) NCP-60-**VD1A*-□-13(22)	(VDC-1B-1A*-20) VDR-1B-1A*-22	Direct	1.5 2.2 3.7	60	4.5 (45.9)	9.0 (91.8)	—	95 110 130
(VC①A3) NCP-100-3.7VD①A3-C-13(22)	(VDC-1B-2A3-20) VDR-1B-2A3-22	Direct	3.7	100	7.0 (71.4)	—	—	165
2A* NCP-160-**VC②A*-□-13	VDC-2A-1A*-20 2A*	Coupling	5.5 7.5 11	160	3.5 (35.7)	6.5 (66.3)	8.5 (86.7)	255 265 315
2A* NCP-250-**VC②A*-□-13	VDC-2A-1A*-20 2A*	Coupling	7.5 11 15	250	4.5 (45.9)	7.0 (71.4)	9.5 (96.9)	315 365 395
NCP-400-**VC3A*-□-13	VDC-3A-1A*-20	Coupling	7.5 11 15 (18.5 22)	400	4.5 (45.9)	7.0 (71.4)	8.5 (86.7)	490 520 545 615 645
NCP-650-**VC3A*-□-13	VDC-3A-1A*-20	Coupling	11 15 (18.5 22 30)	650	6.0 (61.2)	8.5 (86.7)	10.0 (102.0)	615 640 715 740 805

Note) 1.Contact your agent when mounting motors enclosed in parentheses. These motors require special handing 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 100ℓ type.

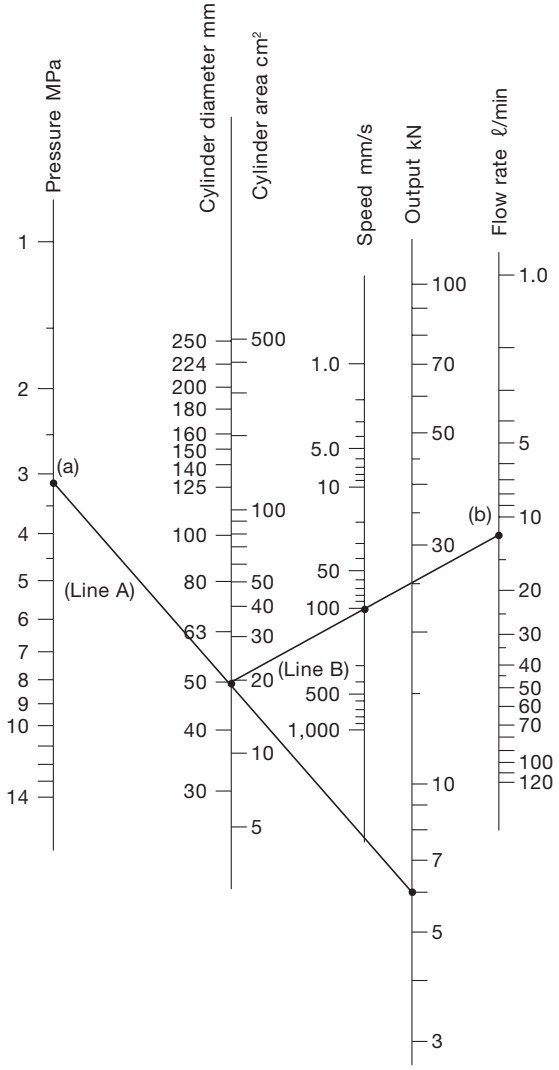
Variable Piston Pump Series

Power supply for all types is 200V AC.

Model No.	Pump Model No.	Connection	Motor (All External) kW, 4P	Tank Capacity ℓ	Full Cutoff Pressure at Tank Oil Temperature Limit Note 3) MPa{kgf/cm²} No Fan Cooler	With Standard Fan Cooler	With Highpower Fan Cooler	Approximate Weight kg
NCP-30-**PV8N*-R-13	PVS-0B-8N*-30	Direct	0.75 1.5	30	5.0 (51.0)	—	—	50 55
NCP-40-**PV8N*-R-13	PVS-0B-8N*-30	Direct	0.75 1.5	40	5.0 (51.0)	21.0 (214.1)	—	80 85
NCP-60-**PV8N*-R-13	PVS-0B-8N*-30	Direct	1.5 2.2 3.7	60	7.0 (71.4)	21.0 (214.1)	—	95 110 130
NCP-40-**PV16N*-R-13(22)	PVS-1B-16N*-12	Direct	0.75 1.5	40	4.5 (45.9)	21.0 (214.1)	—	80 85
NCP-60-**PV16N*-R-13(22)	PVS-1B-16N*-12	Direct	1.5 2.2 3.7	60	7.0 (71.4)	21.0 (214.1)	—	95 110 130
NCP-100-**PV$^{16}_{22}$N*-R-13(22)	PVS-1B-$^{16}_{22}$N*-12	Coupling	3.7 5.5 7.5	100	8.5 (86.7) 7.0 (71.4)	21.0 (214.1) 21.0 (214.1)	— —	155 185 200
NCP-160-**PV35N*-R-13	PVS-2B-35N*-12	Coupling	5.5 7.5 11	160	7.0 (71.4)	14.0 (142.7)	21.0 (214.1)	250 260 310
NCP-250-**PV$^{35}_{45}$N*-R-13	PVS-2B-$^{35}_{45}$N*-12	Coupling	7.5 11 15	250	9.5 (96.9) 7.0 (71.4)	17.0 (173.3) 14.0 (142.7)	21.0 (214.1) 21.0 (214.1)	310 360 390
NCP-400-**PV70N*-R-13	PZS-3B-70N*-10	Coupling	7.5 11 15 18.5 22	400	5.5 (56.1)	14.0 (142.7)	16.0 (163.1)	505 540 565 635 660
NCP-650-**PV70N*-R-13	PZS-3B-70N*-10	Coupling	11 15 18.5 22 30	650	8.5 (86.7)	16.0 (163.1)	18.0 (183.5)	635 660 735 760 825

Note) All models in this series are equipped with a return filter as standard.

NCP Series Selection Chart



Flow rate ℓ/min	Area	Pressure MPa	NCP Series Model	
			Variable Vane Pump Series	Variable Piston Pump Series
5	50/60Hz	3.5 to 5.0		NCP-30-0.7V8N1-R-13
10		4.5 to 8.0 8.0 to 14.0		NCP-40-1.5PV16N2-CR-13(22) -60-2.2PV16N2-CR-13(22)
15		1.0 to 3.0 3.0 to 4.5 4.5 to 7.0 7.0 to 14.0	NCP-40-0.7V*1A2-13(22) -60-1.5V*1A3-13(22)	 NCP-60-2.2PV16N1-R-13(22) -60-3.7PV16N2-CR-13(22)
20		1.0 to 3.0 3.0 to 5.0 5.0 to 10.0 10.0 to 14.0	NCP-40-0.7V*1A2-13(22) -60-1.5V*1A3-13(22)	 NCP-60-3.7PV16N2-(C)R-13(22) NCP-100-5.5PV16N2-CR-13(22)
25	50Hz	1.0 to 3.0 3.0 to 5.0 5.0 to 12.0 12.0 to 14.0	NCP-60-1.5V*①A2-13(22) -100-3.7V*①A3-C-13(22)	 NCP-100-5.5PV22N2-(C)R-13(22) -100-7.5PV22N2-CR-13(22) ★
	60Hz	1.0 to 3.5 3.5 to 5.0 5.0 to 12.0 12.0 to 14.0	NCP-60-1.5V*1A2-13(22) -60-2.2V*1A3-C-13(22)	 NCP-100-5.5PV16N2-(C)R-13(22) -100-7.5PV16N2-CR-13(22)
30	50/60Hz	1.0 to 3.5 3.5 to 5.0 5.0 to 8.0 8.0 to 14.0	NCP-60-2.2V*①A2-13(22) -100-3.7V*①A3-C-13(22)	 NCP-100-5.5PV22N2-(C)R-13(22) -100-7.5PV22N2-CR-13(22) ★
35	50Hz	2.0 to 7.0 7.0 to 10.5 10.5 to 14.0	NCP-160-5.5VC2A3-(C)-13	 NCP-160-7.5PV35N2-CR-13 -160-11PV35N2-CR-13 ★
	60Hz	2.0 to 6.0 6.0 to 10.5 10.5 to 14.0	NCP-100-3.7V*①A3-C-13(22)	 NCP-100-7.5PV22N2-CR-13(22)
40	50/60Hz	2.0 to 7.0 7.0 to 10.0 10.0 to 14.0	NCP-160-5.5VC2A3-(C)-13	 NCP-160-7.5PV35N2-CR-13 -160-11PV35N2-CR-13 ★
50		2.0 to 5.0 5.0 to 7.0 7.0 to 11.5 11.5 to 14.0	NCP-160-5.5VC②A3-(C)-13 -160-7.5VC②A3-C-13	 NCP-160-11PV35N2-CR-13 -250-15PV45N2-CR-13
60	50Hz	2.0 to 7.0 7.0 to 10.0 10.0 to 14.0		NCP-250-7.5PV45N2-R-13 -250-11PV45N2-CR-13 -250-15PV45N2-CR-13 ★
	60Hz	2.0 to 4.5 4.5 to 7.0 7.0 to 10.0 10.0 to 13.5	NCP-250-5.5VC②A3-13 -250-7.5VC②A3-C-13	 NCP-250-11PV35N2-CR-13 -250-15PV35N2-CR-13
75	50Hz	2.0 to 4.5 4.5 to 7.0 7.0 to 10.0 10.0 to 13.0	NCP-400-7.5VC3A3-13 -400-11VC3A3-C-13	 NCP-400-15PV70N3-CR-13 -400-18.5PV70N3-CR-13 ★
	60Hz	2.0 to 5.5 5.5 to 8.0 8.0 to 11.0 11.0 to 13.5		NCP-250-7.5PV45N1-R-13 -250-11PV45N2-(C)R-13 -250-15PV45N2-CR-13 -250-18.5PV45N2-CR-13 ★
90	50/60Hz	2.0 to 4.0 4.0 to 6.5 6.5 to 9.0 9.0 to 11.5 11.5 to 13.5	NCP-400-7.5VC3A3-13 -400-11VC3A3-C-13	 NCP-400-15PV70N3-CR-13 -400-18.5PV70N3-CR-13 -400-22PV70N3-CR-13 ★
100	50Hz	2.0 to 6.0 6.0 to 8.0 8.0 to 10.0 10.0 to 12.0 12.0 to 14.0		NCP-650-11PV70N1-R-13 -650-15PV70N3-R-13 -650-18.5PV70N3-CR-13 -650-22PV70N3-CR-13 -650-30PV70N3-CR-13
	60Hz	2.0 to 6.0 6.0 to 8.0 8.0 to 10.0 10.0 to 12.0 12.0 to 14.0	NCP-650-11VC3A3-13	 NCP-650-15PV70N3-R-13 -650-18.5PV70N3-CR-13 -650-22PV70N3-CR-13 -650-30PV70N3-CR-13
110	60Hz	2.0 to 5.5 5.5 to 7.0 7.0 to 9.0 9.0 to 11.0 11.0 to 14.0	NCP-650-11VC3A3-13 -650-15VC3A3-(C)-13	 NCP-650-18.5PV70N3(C)R-13 -650-22PV70N3-CR-13 -650-30PV70N3-CR-13
120	60Hz	2.0 to 5.0 5.0 to 7.0 7.0 to 8.5 8.5 to 10.0 10.0 to 13.5		NCP-650-11PV70N1-R-13 -650-15PV70N3-R-13 -650-18.5PV70N3-R-13 -650-22PV70N3-CR-13 -650-30PV70N3-CR-13

[Example]

To determin the NCP Series model that drives a ϕ50 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 ϕ 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 ϕ 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-60-1.5VD1A3-13. Next, select the required option from Table 1 on the following page.

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, oil 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.

Explanation of model No.

NCP – 100 – 3.7 *** – □ – 13(22)**

- NCP Series (standard variable pump unit)
- 100: Tank volume (30, 40, 60, 100, 160, 250, 400, 650)ℓ
- 3.7: Motor capacity (0.75 to 30) kW, 4P (0.75kW only indicated as 0.7)
- *****: Pump type
  VC, VD: Variable vane
  PV: Variable piston
- Pump function
- □: Option (Table 1)
- 13(22): Design number
  22: Additional base block type

For variable vane pump

Capacity \ Pressure	3.5 MPa	7 MPa	10.5 MPa	14 MPa
8.3cm³/rev	0A2	0A3		
16.7cm³/rev	1A2	1A3	1A4	(1A5)
22.0cm³/rev	①A2	①A3		
30.0cm³/rev	2A2	2A3	2A4	(2A5)
38.9cm³/rev	②A2	②A3		
66.7cm³/rev	3A2	3A3	3A4	(3A5)

For variable piston pump

Capacity \ Pressure	2 to 7MPa	7 to 14MPa
8.0cm³/rev	8N1	8N2
16.5cm³/rev	16N1	16N2
22.0cm³/rev	22N1	22N2
35.0cm³/rev	35N1	35N2
45.0cm³/rev	45N1	45N2
70.0cm³/rev	70N1	70N3

Table 1: Option Symbols

Symbol	Description	Model Number and Description	30L	40 to 100L	160, 250L	400, 650L
B	Base Block (Design No. 13 Only)	MPU Series built-in	○Note 2	○	○	○
C	Radiator	N13F-001-1050	○	○		
C1	General-purpose Fan Cooler	3A92-001-0000 16/15W Single-phase 200V AC 50/60Hz		○	○	○
C2	High-power Fan Cooler	3A92-002-0000 35/30W 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	TMG-1S(to100L), TMG-2ZS(160L to)	○	○	○	○
N	Noise Control	Motor 6P specifications				○
P	Oil pan	See oil pan specifications.		○	○	○
R	Return Filter	WS-20-20-V(20μ paper)	○			
R1	Return Filter	CF-0*(10μ paper)		○Note 3	○Note 3	
		FRS-**-20P***(20μ paper)			○Note 4	○
R2	Return Filter	FPL-**(10μ paper)		○	○	
T	Temperature Gauge (With Fluid Level Gauge)	ϕ6 × 80L (0 to 100°C) with guard ϕ8 × 120L (-20 to 100°C) with guard	○	○	○	○
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 oil temperature detection: Contact a)	TNS-C1070C (Contact on: 65°C and above)		○	○	○
PS	Pressure Switch (Abnormal pressure detection: Contact a)	CE** 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)	MAR**-**P-S				
L	Anchor Hole Outer Side	Anchor hole set on outer side				
	Motor Voltage Overseas	Reference Voltage Other than 200V AC 50/60Hz; 220V AC 60Hz	Supported for Design Number 5100*			
	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 13 when option symbol B is selected. (Base block additional 22 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 01 × 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 45cm³/rev type.
5.Contact Nachi for information about design number 5100*.

Table 2 The upper and lower limit of the NCP series tank hydraulic fluid level

Tank capacity [L]	Upper limit of hydraulic fluid level [L]	Lower limit of hydraulic fluid level [L]
30	30	24
40	40	31
60	60	49
100	100	80
160	160	111
250	250	184
400	400	306
650	650	522

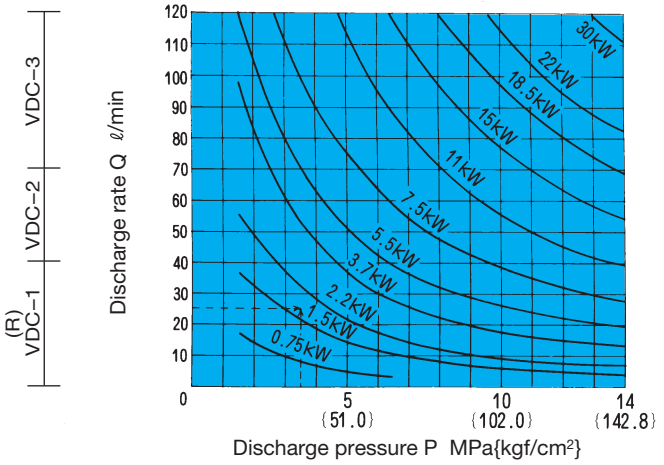
Selecting a Motor

- 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.

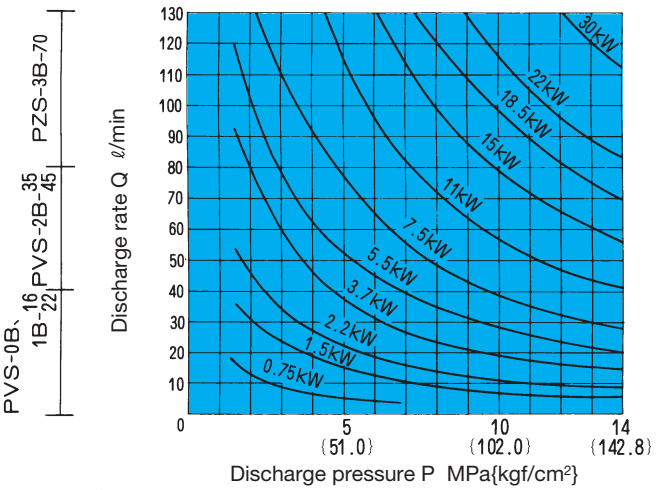
Example: To find the motor that can produce pressure of 3.5MPa {35.7kgf/cm²} and a discharge rate of 25ℓ/min.

Since the intersection of the two broken lines from a pressure of 3.5MPa {35.7kgf/cm²} and discharge rate of 25ℓ/min intersect in the area under the 2.2kW curve, it means that a 2.2kW motor should be used.

For variable vane pump



For variable piston pump



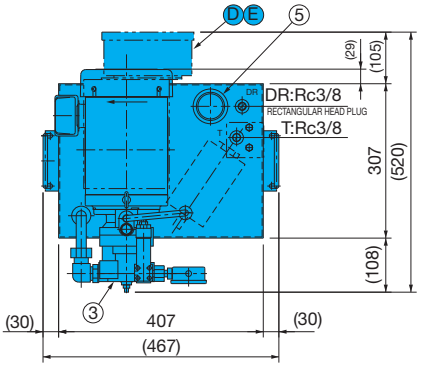
Installation Dimension Drawings

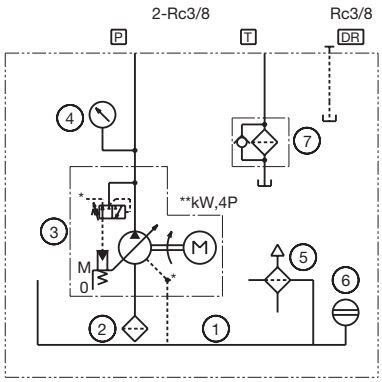
(Note) Catalog dimensions, layout, and used devices are subject to change without notice. In particular, be sure to check in cases where dimensions are limited.

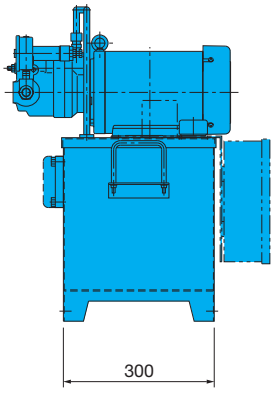
●Option item numbers are colored.

●Mini NCP Series

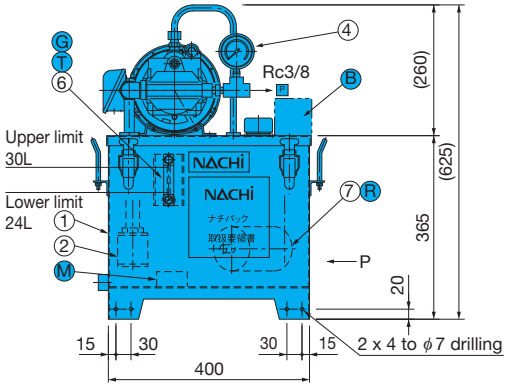
NCP-30-**PV8N*-*-13







Auxiliary View P

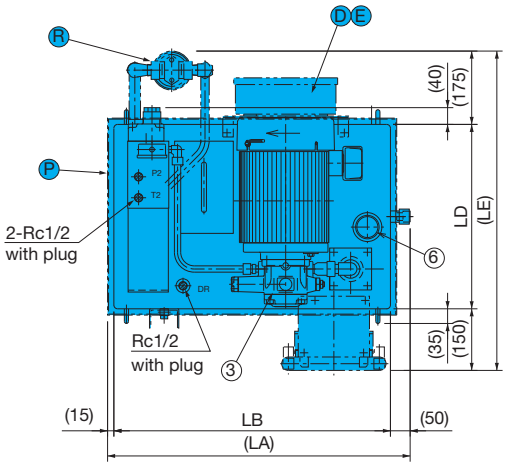


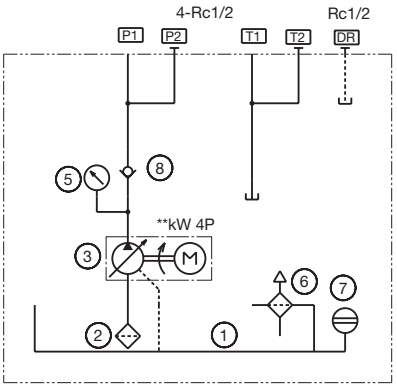
Part No.	Name	Model No.	Q'ty
1	Tank	30ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-0A-8N*-**A-4-50	1
4	Pressure gauge	GV50-173×**MPA	1
5	Fluid supply port/air breather	MSA-V30	1
6	Fluid level gauge	ϕ6×80L	1
7	Return filter	WS-20-20-V	1

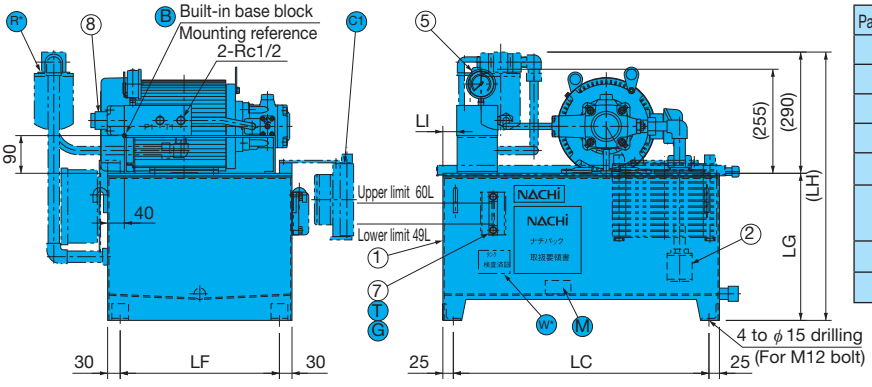
NCP-40-0.7V$^{0}_{D}$1A2-*-13

NCP-60-**V$^{0}_{D}$1A*-*-13

Symbol	Dimensions (mm)	
	40ℓ	60ℓ
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

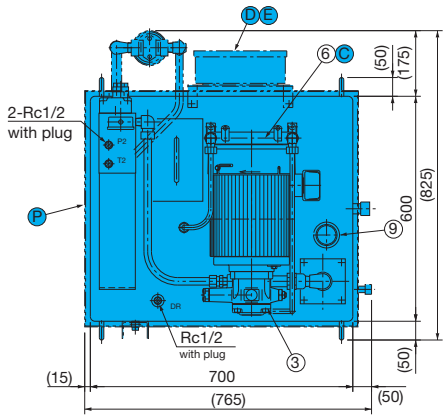


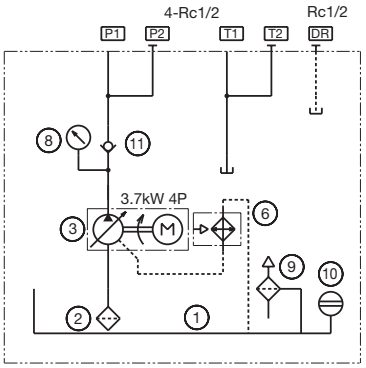


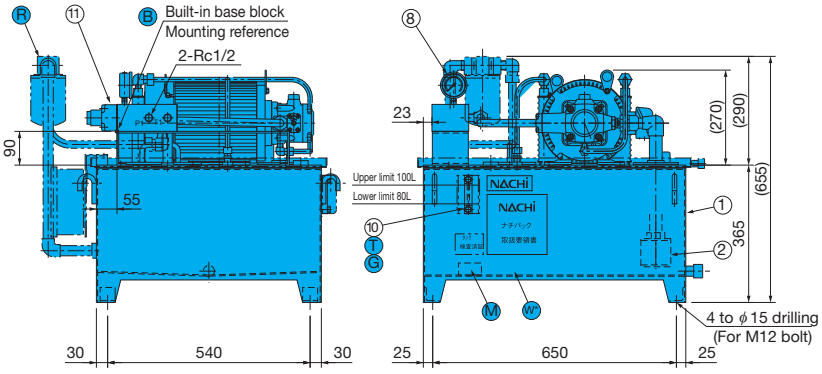


Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UVC(D)-1A-A*-**-4-40(60)	1
4			
5	Pressure gauge	GV50-173×**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	ϕ6×80L	1
8	Check valve	CA-G03-1-20	1

NCP-100-3.7V$^{0}_{D}$1A3-C-13



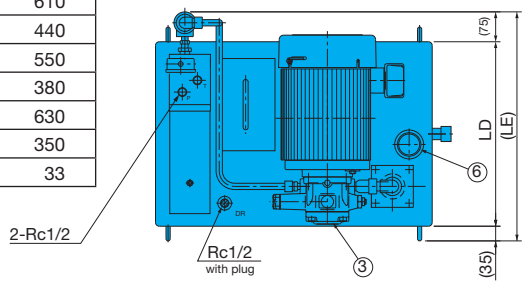


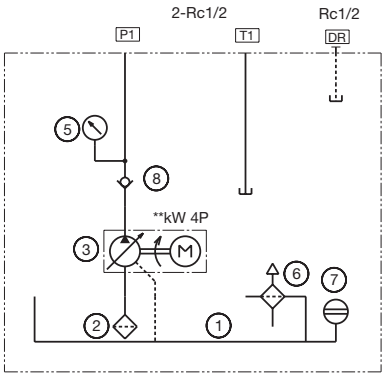


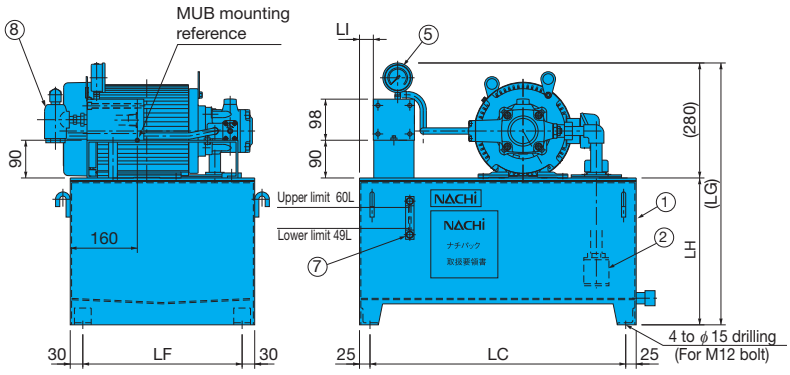
Part No.	Name	Model No.	Q'ty
1	Tank	100ℓ	1
2	Strainer	CS-08(150 mesh)	1
3	Uni-pump	UVC(D)-1A-2A3-3.7-4-40(60)	1
4			
5			
6	Radiator	3A92-001-1050	1
7			
8	Pressure gauge	GV50-173×**MPA	1
9	Fluid supply port/air breather	MSA-V30	1
10	Fluid level gauge	ϕ6×80L	1
11	Check valve	CA-G03-1-20	1

NCP-40-0.7VD1A2-*-22
NCP-60-**VD1A*-*-22

Symbol	Dimensions (mm)	
	40ℓ	60ℓ
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

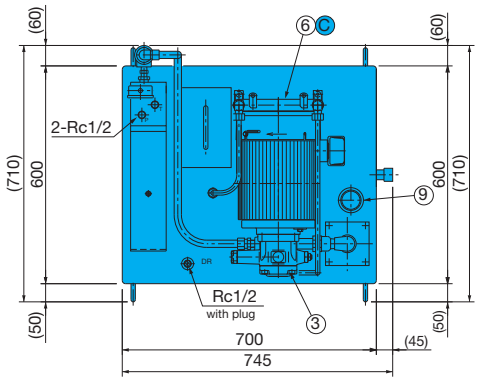


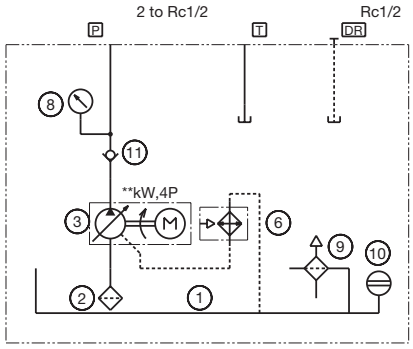


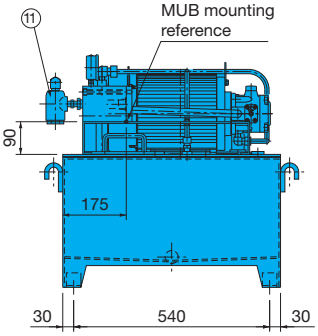


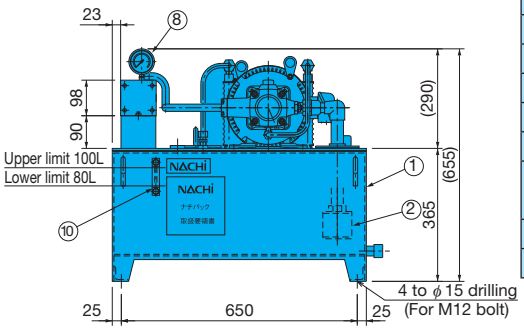
Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UVD-1A-A*-**-4-40(60)	1
4			
5	Pressure gauge	GV50-173×**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	ϕ6×80L	1
8	Check valve	CA-T03-1-20	1

NCP-100-3.7VD1A3-C-22





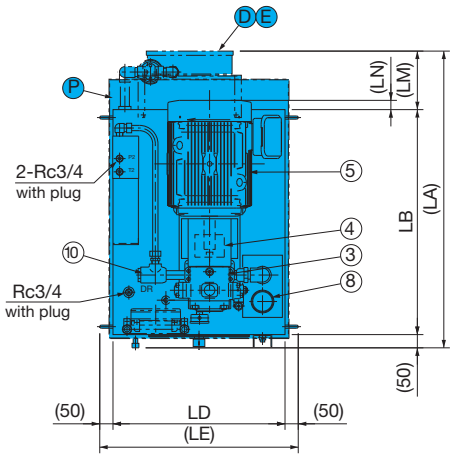


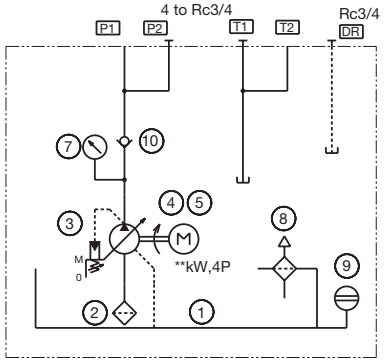


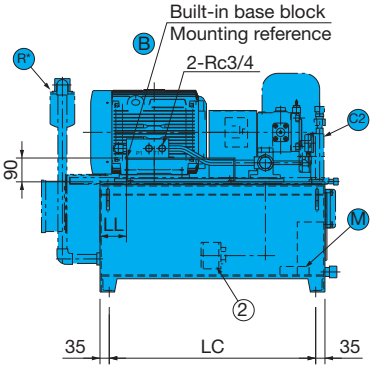
Part No.	Name	Model No.	Q'ty
1	Tank	100ℓ	1
2	Strainer	CS-08(150 mesh)	1
3	Uni-pump	UVD-1A-2A3-3.7-4-60	1
4			
5			
6	Radiator	3A92-001-1050	1
7			
8	Pressure gauge	GV50-173×**MPA	1
9	Fluid supply port/air breather	MSA-V30	1
10	Fluid level gauge	ϕ6×80L	1
11	Check valve	CA-T03-1-20	1

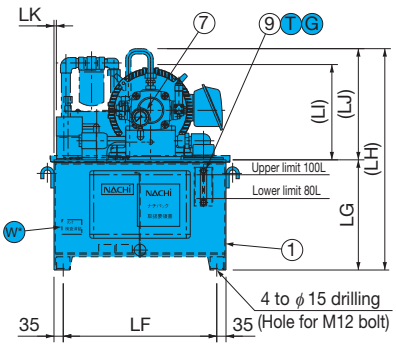
NCP-160-**VC2A*-*-13
NCP-250-**VC2A*-*-13

Symbol	Dimensions (mm)	
	160ℓ	250ℓ
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





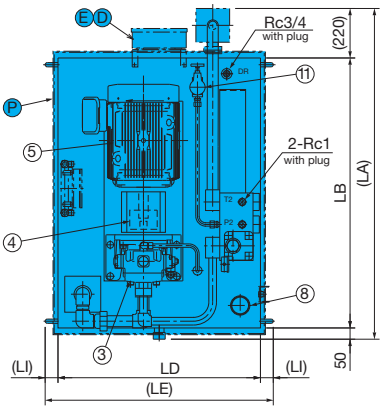


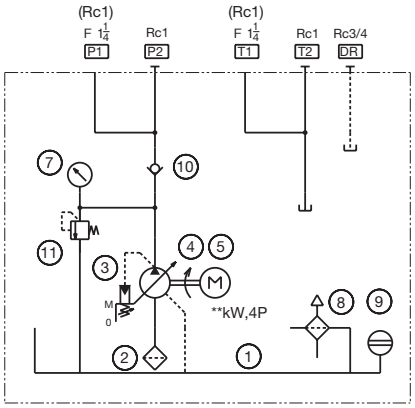


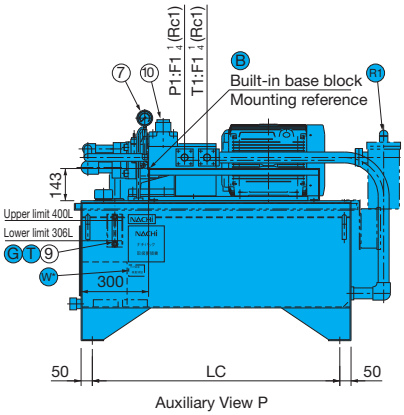
Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-10(150 mesh)	1
3	Pump	VDC-2A*A*-20	1
4	Coupling	CR-****J	1
5	Motor	Fully closed external fan Terminal B *kW-4P	1
6			
7	Pressure gauge	GV50-173×**MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	ϕ8×120L	1
10	Check valve	CA-T06-1-20	1

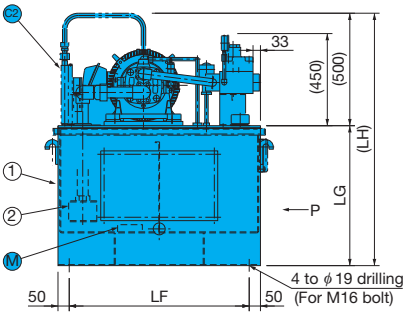
NCP-400-**VC3A*-*-13
NCP-650-**VC3A*-*-13

Symbol	Dimensions (mm)	
	400ℓ	650ℓ
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



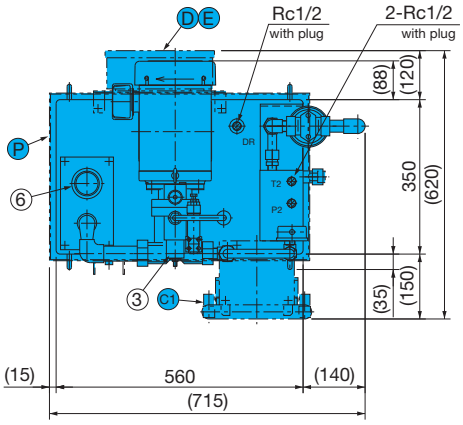


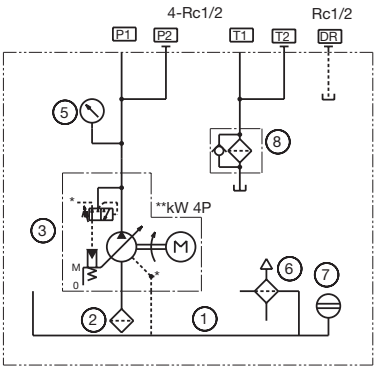


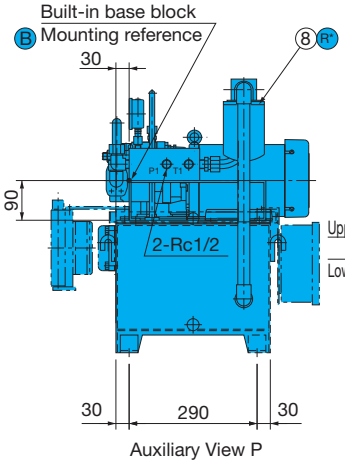


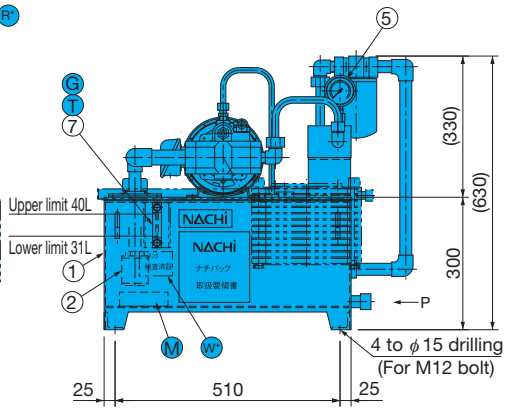
Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-12(150 mesh)	1
3	Pump	VDC-3A-1A*-20	1
4	Coupling	CR-****J	1
5	Motor	Fully closed external fan A terminal *kW-4P	1
6			
7	Pressure gauge	GV50-173×**MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	ϕ8×120L	1
10	Check valve	CA-G10-1-20	1
11	Relief valve	R-T03-3-12	1

●Variable Piston Pump Series
NCP-40-**PV$^{8}_{16}$N*-R-13



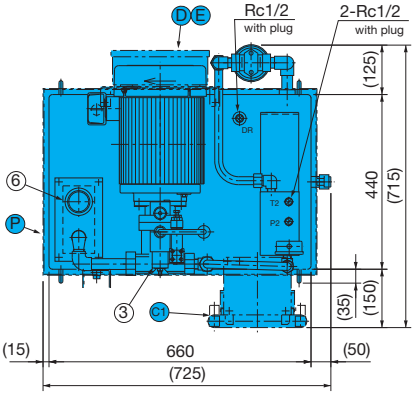


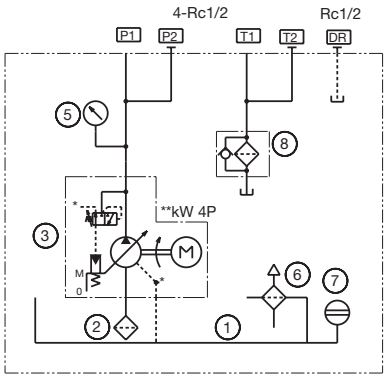


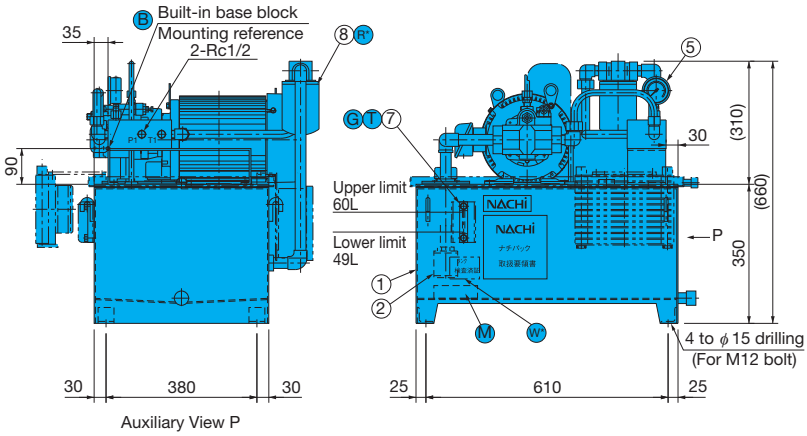


Part No.	Name	Model No.	Q'ty
1	Tank	40ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-*A-**N*-**A-4-30(50)	1
4			
5	Pressure gauge	GV50-173×**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	ϕ6×80L	1
8	Return filter	(FPL-06)CF-06 10μ paper	1

NCP-60-**PV16N*-R-13

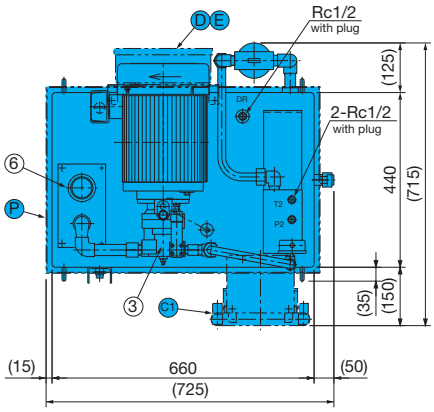


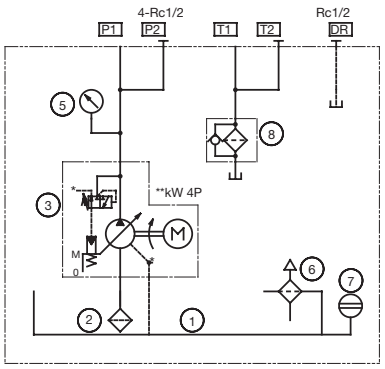


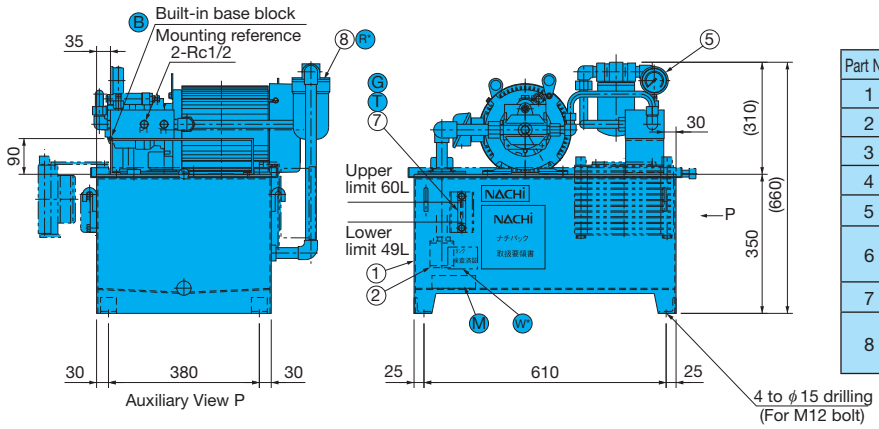


Part No.	Name	Model No.	Q'ty
1	Tank	60ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-1A-16N*-**A-4-30	1
4			
5	Pressure gauge	GV50-173×**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	ϕ6×80L	1
8	Return filter	(FPL-06)CF-06 10μ paper	1

NCP-60-**PV8N*-*-13

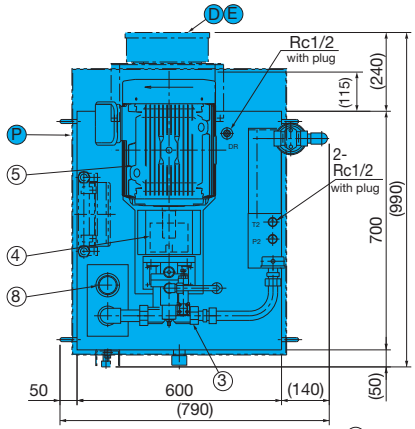


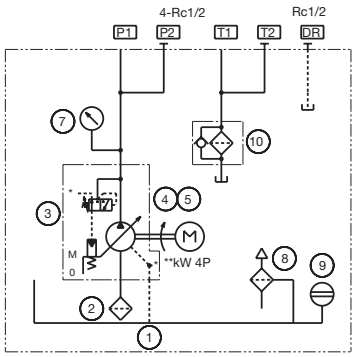


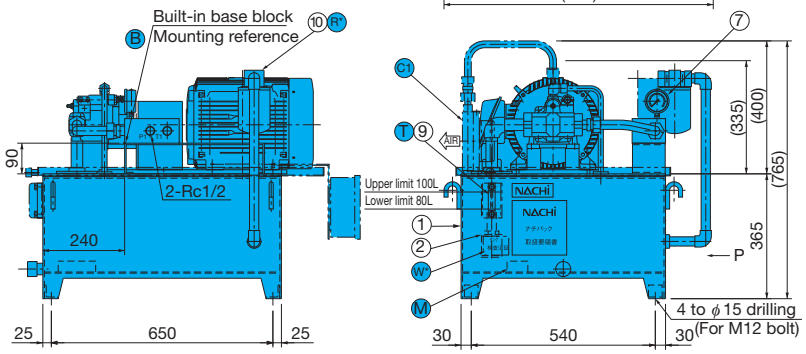


Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-0A-8N*-**A-4-50	1
4			
5	Pressure gauge	GV50-173×**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	ϕ6×80L	1
8	Return filter	(FPL-06)CF-06 10μ paper	1

NCP-100-**PV$^{16}_{22}$N*-*-13





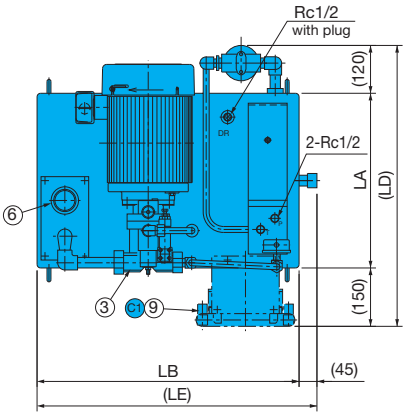


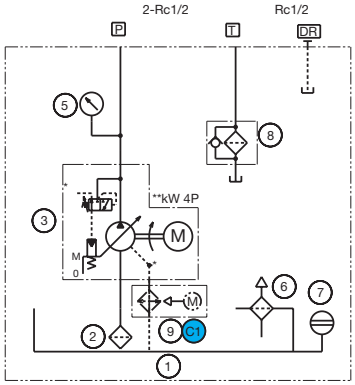
Auxiliary View P

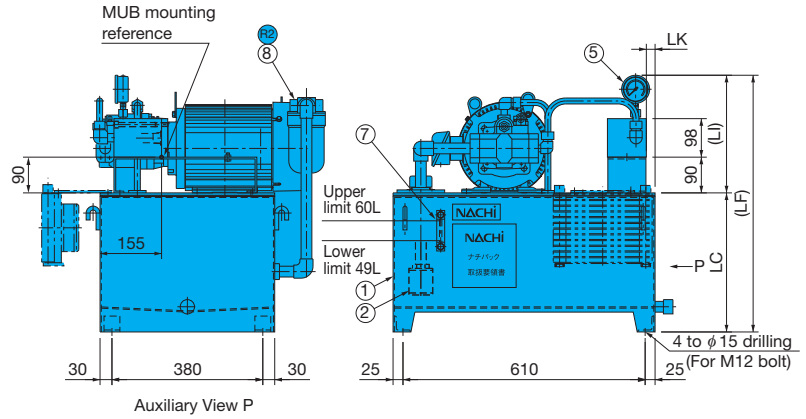
Part No.	Name	Model No.	Q'ty
1	Tank	100ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Pump	PVS-1A-**N*-12	1
4	Coupling	CR-****J	1
5	Motor	Fully closed external fan A terminal **kW-4P	1
6			
7	Pressure gauge	GV50-173×**MPA	1
8	Fluid supply port/air breather	MSA-V30	1
9	Fluid level gauge	ϕ6×80L	1
10	Return filter	(FPL-06)CF-06 10μ paper	1

NCP-40-**PV16N*-(C1)R2-22
NCP-60-**PV16N*-(C1)R2-22

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



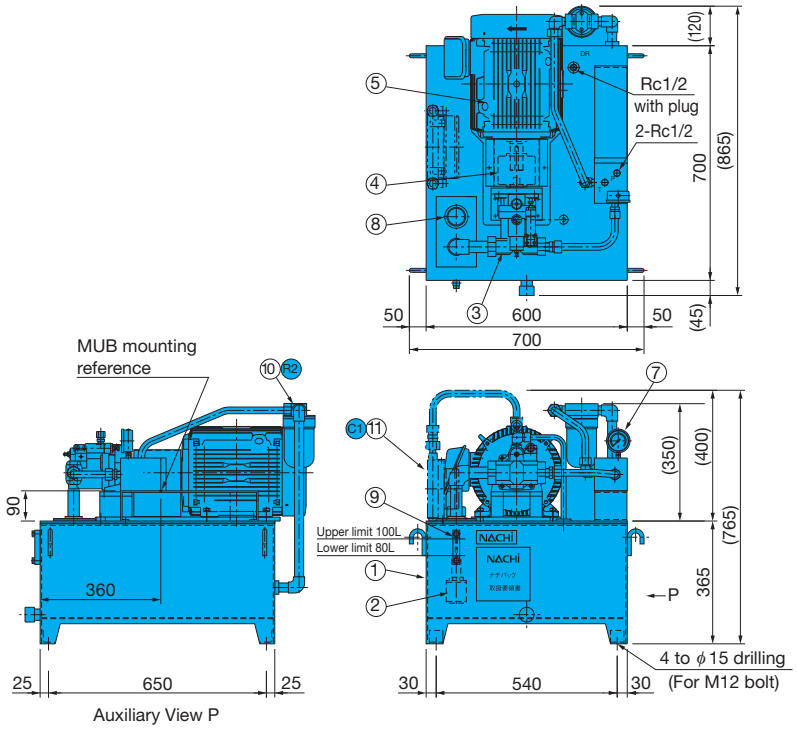


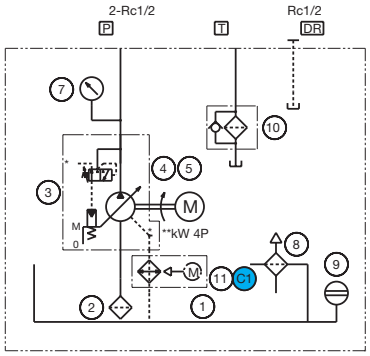


Auxiliary View P

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-4-30	1
4			
5	Pressure gauge	GV50-173×**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	ϕ6×80L	1
8	Return filter	FPL-06(10μ paper)	1
9	Fan cooler	3A92-001-0000	1

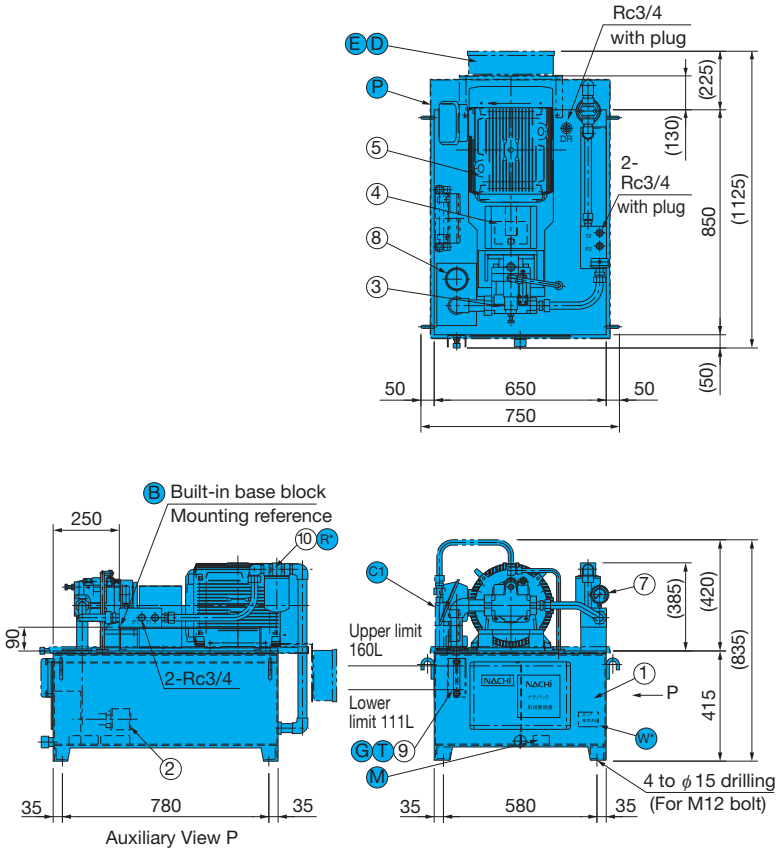
NCP-100-**PV$^{16}_{22}$N*-(C1)R2-22

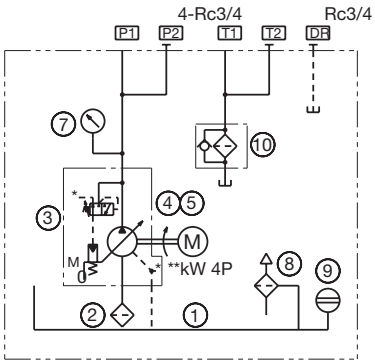




Part No.	Name	Model No.	Q'ty
1	Tank	100ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Pump	PVS-1A-$^{16}_{22}$N*-12	1
4	Coupling	CR-****J	1
5	Motor	Fully closed external fan A terminal *kW-4P	1
6			
7	Pressure gauge	GV50-173×**MPA	1
8	Fluid supply port/air breather	MSA-V30	1
9	Fluid level gauge	ϕ6×80L	1
10	Return filter	FPL-06(10μ paper)	1
11	Fan cooler	3A92-001-0000	1

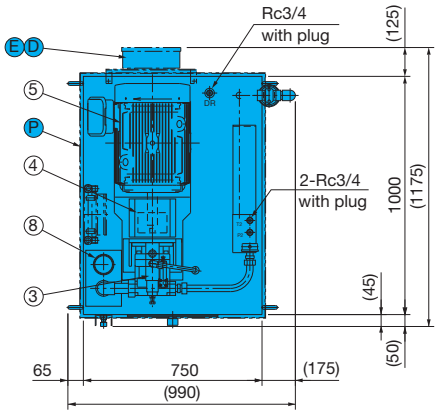
NCP-160-**PV35N*-R*-13

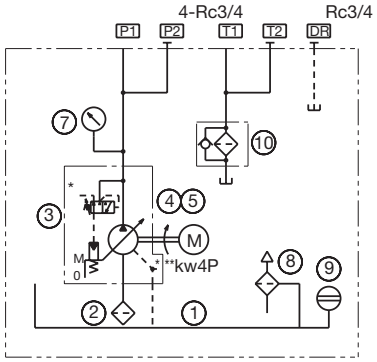


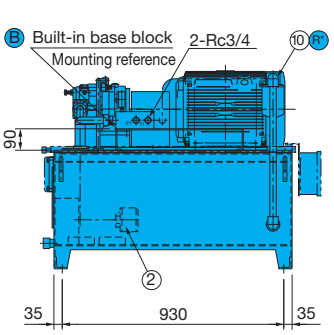


Part No.	Name	Model No.	Q'ty
1	Tank	160ℓ	1
2	Strainer	CS-10(150 mesh)	1
3	Pump	PVS-2A-35N*-12	1
4	Coupling	CR-****J	
5	Motor	Fully closed external fan A terminal *kW-4P	1
6			
7	Pressure gauge	GV50-173×**MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	ϕ8×120L	1
10	Return filter	(FPL-08)CF-08 10μ paper	1

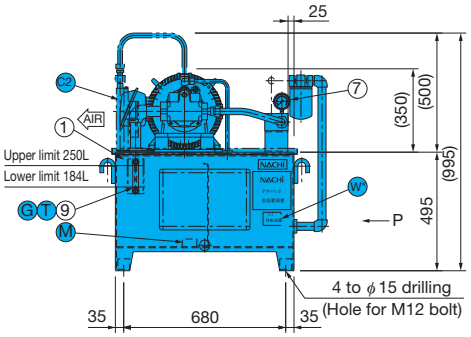
NCP-250-**PV$^{35}_{45}$N*-R*-13







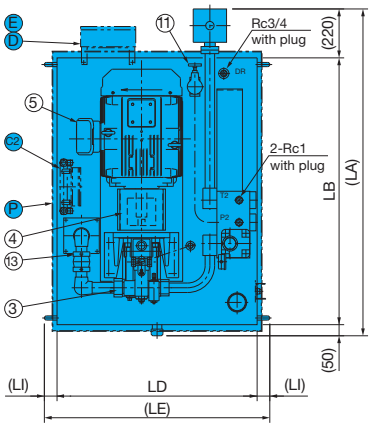
Auxiliary View P

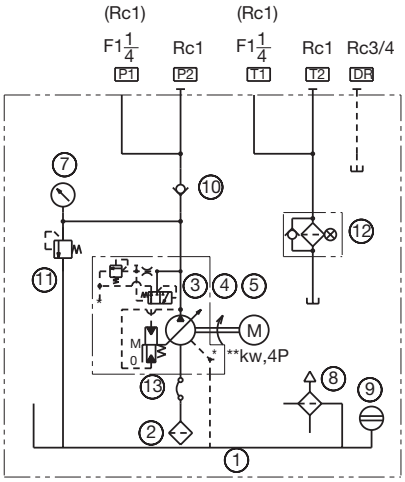


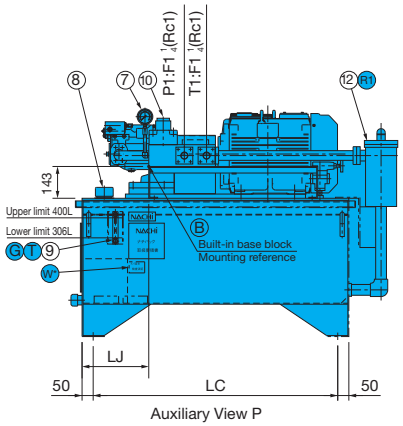
Part No.	Name	Model No.	Q'ty
1	Tank	250ℓ	1
2	Strainer	CS-10(150 mesh)	1
3	Pump	PVS-2A-**N*-12	1
4	Coupling	CR-****J	1
5	Motor	Fully closed external fan A terminal **kW-4P	1
6			
7	Pressure gauge	GV50-173×**MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	ϕ8×120L	1
10	Return filter	FRS08-20P08T(20μ) (FPL-08)CF-08 10μ paper	1

NCP-400-**PV70N*-R1*-13
NCP-650-**PV70N*-R1*-13

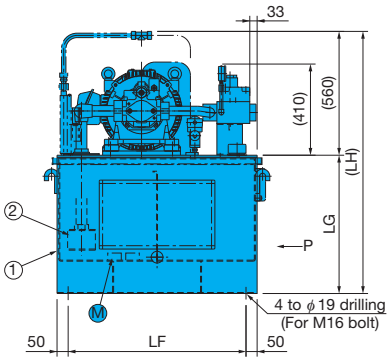
Symbol	Dimensions (mm)	
	400ℓ	650ℓ
LA	1470	1790
LB	1200	1520
LC	1100	1420
LD	900	1010
LE	1014	1164
LF	800	910
LG	620	670
LH	1180	1230
LI	57	77
LJ	300	450







Auxiliary View P

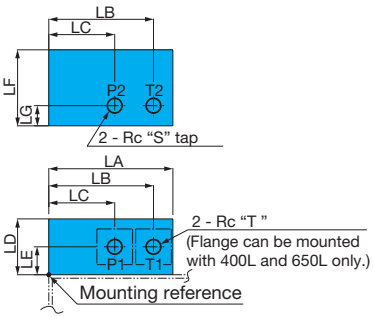


Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-12(150 mesh)	1
3	Pump	PZS-3A-70N*-10	1
4	Coupling	CR-****J	
5	Motor	Fully closed external fan A terminal **kW-4P	1
6			
7	Pressure gauge	GV50-173×**MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	ϕ8×120L	1
10	Check valve	CA-G10-1-20	1
11	Relief valve	R-T03-3-12	1
12	Return filter	FRS12-20P-12F	1
13	Flexmaster joint	M1600-150-0350	1

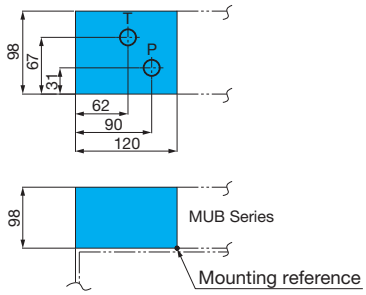
Note) Set ⑪ relief valve setting pressure so it is equivalent to pump setting pressure plus 1.0MPa {10.2kgf/cm²}.

Outlet Block Specifications

Design number 13
Outlet Block Dimensions

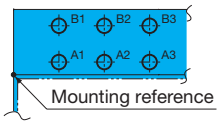


Design number 22
Outlet Block Dimensions



Tank Capacity	Dimensions (mm)							Outlet Size	
	LA	LB	LC	LD	LE	LF	LG	S	T
40L 60L 100L	160	135	85	72	36	98	26	1/2	1/2
160L 250L								3/4	3/4
400L 650L	300	260	160	98	49	148	48	1	JIS B 2291 SSA-32 (Rcl)

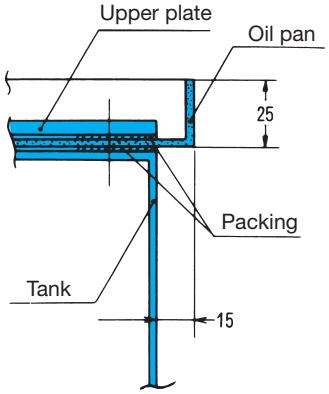
Option B
MPU Series Built-in
(See base block specifications for dimensions.)



Oil Pan Specifications

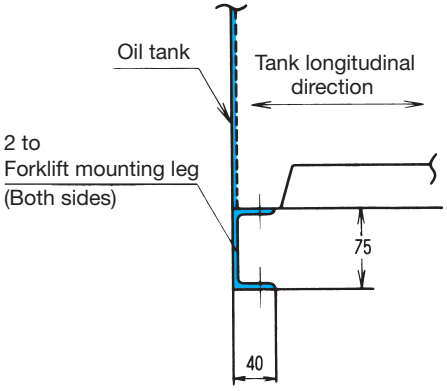
A "headband type" oil pan is standard, and an oil pan drain is provided at one location (Rc3/8).

Structural Diagram



Forklift Mounting Leg Specifications

Forklift Mounting Leg Specifications



Standard Specifications

1.Paint Color: Mancel No. 5B6/3 (lacquer)

2.Motor Specifications:

		Wiring	Color Coding	Terminal number	Terminal	Terminal box specifications
Control System	SA SS	VCT-1.25mm²	Single SOL White, Black Double SOL Red, White, Black, Green	1.2.··· Consecutive numbers (Common: C)	Y Type Solderless	Inner : Mancel No. 2.5Y8/2 Dust-tight type, cover fastened by screws Outer : Mancel No 5B6/3 (Lacquer)
Drive System	to 3.7kW	VCT	Red, White, Black, Green	U, V, W, E	Round Solderless	
	5.5kW to	IV + PF	Black (3) + Green			
Fan cooler	3A92	VCT-1.25mm²	White, Black	U2, V2	Round Solderless	

Base Block Specifications

Explanation of model No.

M * * – □□□□□□ – □

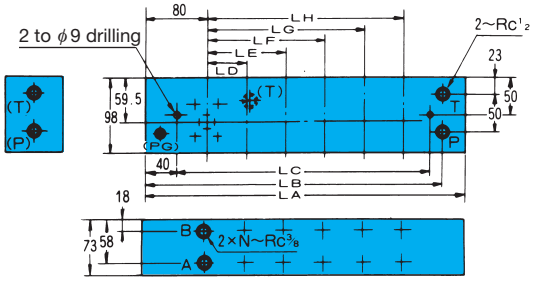
- Design number
  - 10: 01 size and 03 size for M8 mounting
  - J10: 03 size for M6 mounting
- 1 to MAX 6 control circuit size symbol
  - 1: 01 size
  - 3: 03 size
- Multiple base block
  - MPU: Built-in type
  - MUB: Bass block added type
  - MBS: Single removable type for unit assembly
  - MBW: Double removable type for unit assembly

●MPU Series (Unit Built-in)

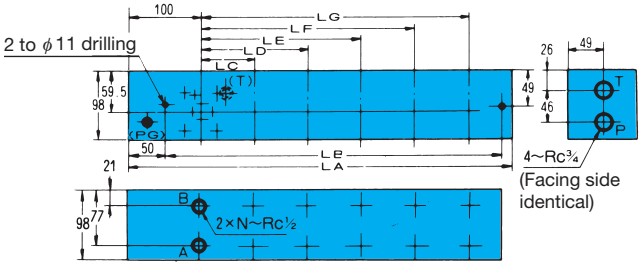
This base block is a special type built into the NCP Series.

Block Model Numbers, Appearance, Dimensions

01 size



03 size



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) 1. 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
2. When using the 01/03 combination type
a)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.
b)In the case of MPU-313131-J10, for example, valve installation locations 1, 3, and 5 counting from the left are 03 size, while 2, 4, 6 are 01 size.

Other

Space is limited in accordance with tank capacity, so use the basic data in the following table when designing the circuit.

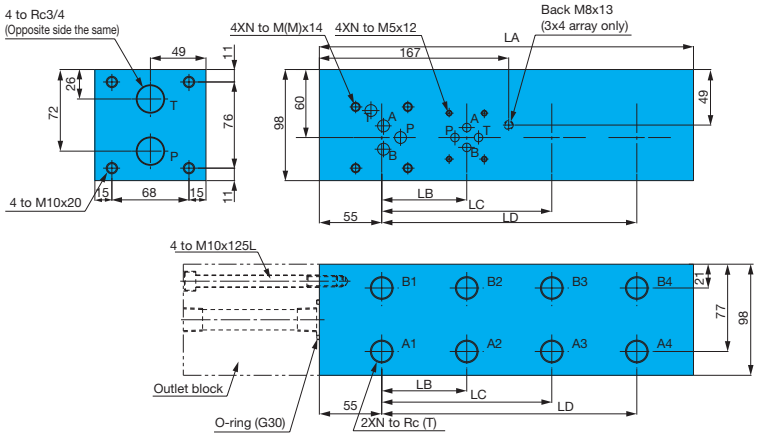
	Tank Capacity		01 Space Block	03 Space Block
VD* Series	40ℓ		Up to 4	Up to 3
	60ℓ		Up to 5	Up to 3
	100ℓ		Up to 6	Up to 5
	160ℓ		Up to 6	Up to 5
	250ℓ		Up to 6	Up to 6
	400, 650ℓ			Up to (2, 4, 6) + Up to (3, 2, 1)
PVS Series	30ℓ		Up to 3	
	40ℓ		Up to 4	Up to 3
	60ℓ		Up to 5	Up to 3
		Z	Up to 6	Up to 4
	100ℓ		Up to 6	Up to 4
	160, 250ℓ		Up to 6	Up to 4
	400, 650ℓ			Up to (2, 4, 6) + Up to (3, 2, 1)

Note)Note that 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 22.

Block Model Numbers, Appearance, Dimensions



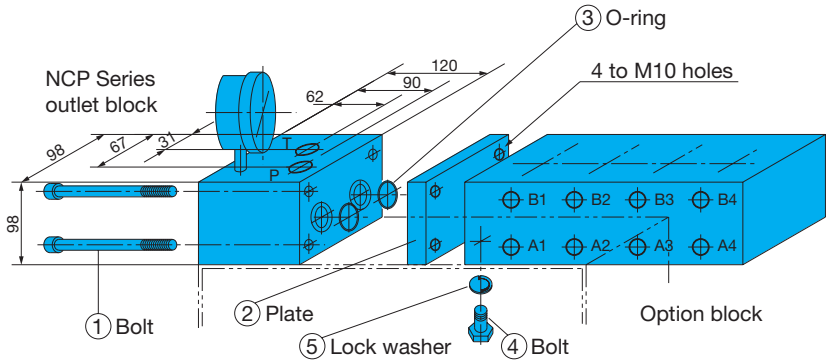
Model No.	Dimensions (mm)							Weight kg
	LA	LB	LC	LD	N	M	T	
MUB-1-10	105				1	—	3/8	7.6
MUB-3-J10(10)	105				1	6(8)	1/2	7.6
MUB-11-10	180	75			2	—	3/8	12.8
MUB-33-J10(10)	180	75			2	6(8)	1/2	12.8
MUB-111-10	255	75	150		3	—	3/8	18.0
MUB-333-J10(10)	255	75	150		3	6(8)	1/2	18.0
MUB-1111-10	330	75	150	225	4	—	3/8	23.2
MUB-3333-J10(10)	330	75	150	225	4	6(8)	1/2	23.2

Note) 1. 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
2. When using the 01/03 combination type
a)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.
b)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.
3. 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.

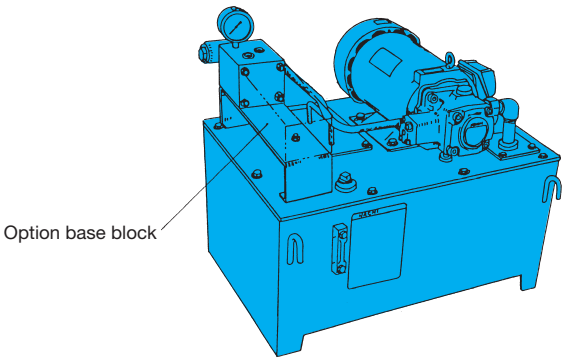


22 Design Series Scope

This series consists of a total of six best-seller piston and vane types with 40, 60, and 100ℓ 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
40ℓ	Up to 2	Up to 2
60ℓ	Up to 3	Up to 3
100ℓ	Up to 4	Up to 4



Part No.	Name	Model No.
1	Hexagon Socket Head Bolt	M10 × 125
2	Plate	98 × 98 × 15t
3	O-ring	1B-G30
4	Hex bolt	M8 × 25
5	Lock washer	For M8

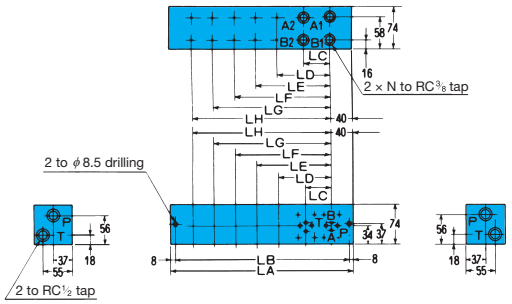
●MBS, MBW Series (Unit Assembly Type)

This base block is used to install the valve unit only around machinery.

Block Model Numbers, Appearance, Dimensions

MBS Series (Single Ejection Multi Block)

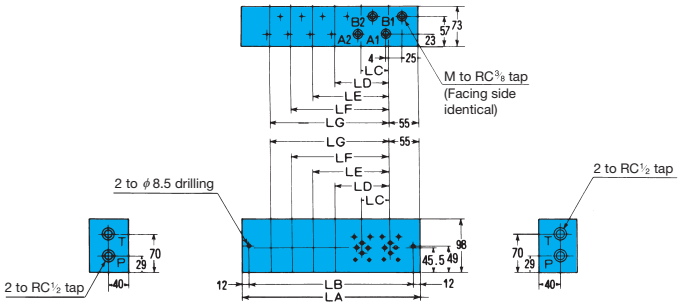
01 size



Model No.	Dimensions (mm)									Weight 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

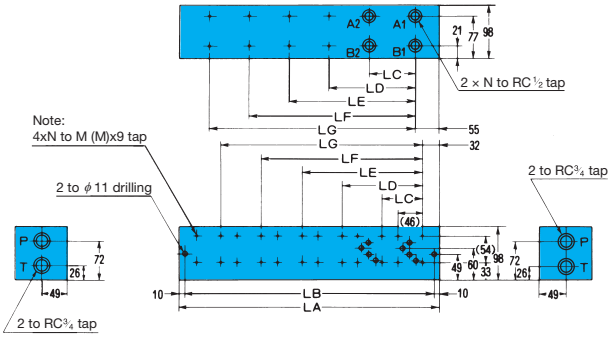
MBW Series (Double Ejection Multi Block)

01 size



Model No.	Dimensions (mm)									Weight kg
	LA	LB	LC	LD	LE	LF	LG	M	N	
MBW -1-10	110	86						2×2	1	5.7
-11-10	160	136	50					4×2	2	8.3
-111-10	210	186	50	100				6×2	3	10.9
-1111-10	260	236	50	100	150			8×2	4	13.4
-11111-10	310	286	50	100	150	200		10×2	5	16
-111111-10	360	336	50	100	150	200	250	12×2	6	18.6

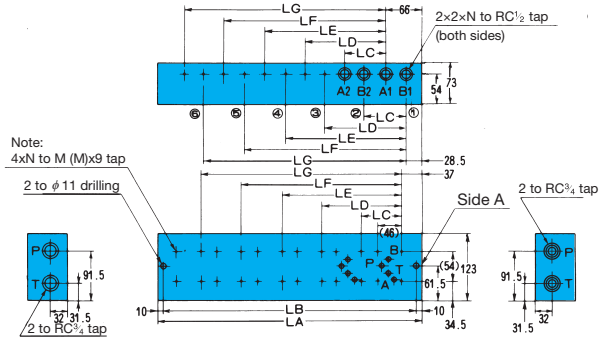
03 Size (01, 03 Connection Type)



Model No.	Dimensions (mm)								Weight kg
	LA	LB	LC	LD	LE	LF	LG	M(Note 1)	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 03 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 01/03 combination type
a)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.
b)In the case of MBS-313131-J10, for example, valve installation locations 1, 3, 5 counting from the right are 03 size, while 2, 4, 6 are 01 size.

03 Size (01, 03 Connection Type)



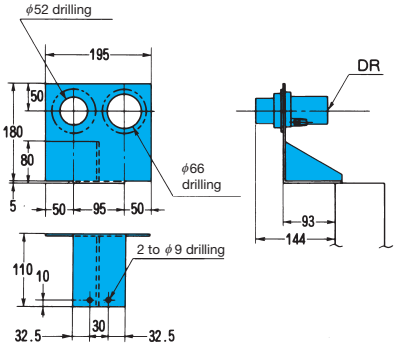
Model No.	Dimensions (mm)								Weight kg
	LA	LB	LC	LD	LE	LF	LG	M(Note 1)	N	
MBW-3 -J10(10)	120	100						6(8)	1	8.4
-**-J10(10)	195	175	75					6(8)	2	13.6
-***-J10(10)	270	250	75	150				6(8)	3	18.9
-****-J10(10)	345	325	75	150	225			6(8)	4	24.1
-*****-J10(10)	420	400	75	150	225	300		6(8)	5	29.4
-******-J10(10)	495	475	75	150	225	300	375	6(8)	6	34.6

Note) 1. There are two types of mounting bolts available for the 03 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 01/03 combination type
a)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.
b)In the case of MBS-313131-J10, for example, valve installation locations 1, 3, and 5 counting from the right are 03 size, while 2, 4, 6 are 01 size.

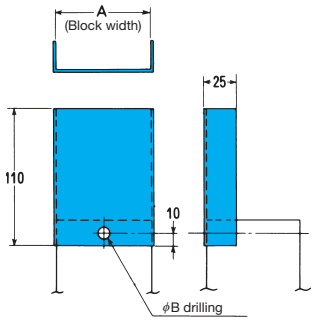
Note that the plugs in the base blocks of the MBS and MBW series are not closed following July 2005.

Control Circuit Option Specifications

Option G (Pressure Gauge Panel Dimension Diagram)



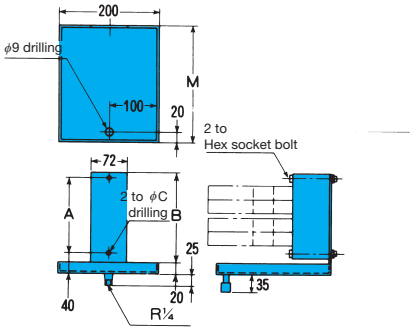
Option N (Nameplate Panel Dimension Diagram)



Model No.	A	B
MBS-01	74	9
MBS-03	98	11
MBW-01	98	9
MBW-03	123	11

Note) The nameplate panel is separate from the base block when shipped, so fasten them together during installation.

Option P (Oil Pan Dimension Diagram)



Number of Modules	M	
	For 01	For 03
0	145	165
1	185	225
2	225	265
3	265	330
4	305	385

Note) When shipped, the oil pan is fastened from the back by the same nut as the block.

Option P Dimension Table

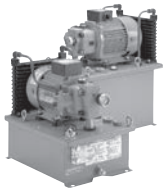
Model No.	A	B	C	Applicable
P-S1-1	64	92	9	MBS-1
-2	114	142	9	11
-3	164	192	9	111
-4	214	242	9	1111
-5	264	292	9	11111
-6	314	342	9	111111
-7	364	392	9	1111111

Model No.	A	B	C	Applicable
P-W1-1	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
P-S3-1	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
P-W3-1	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



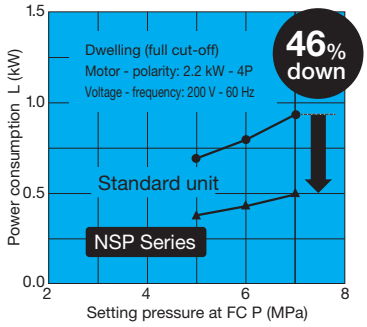
Compact hydraulic units are widely used as a power source in such machine tool applications as NC lathe check opening and closing, tool rotation, machining center spindle raise and lower operations, etc.

During pressure holding, the NSP unit enables high machine efficiency that delivers energy savings of approximately 46% compared to standard Nachi units (in-house comparison), all in a compact, lightweight hydraulic unit.

Features

Increased energy savings

Support for using an efficient IE3 premium motor provides 46% energy savings compared to standard unit (in-house comparison while dwelling)



Space-saving

Variable vane pump has integrated motor so installations in compact spaces are easy in a compact and streamlined layout.

Easy Operation and Maintenance

Simple construction and highly reliable pump controls mean excellent maintenance and handling.

Conserve Resources

Hydraulic fluid in a low-volume tank helps conserve the world's resources.

Compliant with UL and EISA in the US

Lineup of models use UL certified electric motors and comply with the US Energy Independence and Security Act.

High Efficiency for Low Heat Output

Motor efficiency is high and heat output is low, particularly when the pump is dwelling, to support high accuracy for the parent machine.

Specifications

Item \ Model No.		NSP-*-*VOA*	NSP-*-*V1A*	NSP-*-*V2A*
Pump Capacity	cm^3/rev	8.0	16.0	26.0
Maximum Pressure	MPa	8.0 (81.6kgf/cm^2) (Full Cutoff Pressure)		7.0 (Full Cutoff Pressure) * Allowed peak pressure is 13.0
Motor Output	kW	0.75, 1.5	1.5, 2.2	2.2, 3.7
Tank Capacity	ℓ	10, 20		30, 40
Installation Space	mm	300 × 400		340 × 450
Approximate Weight	kg	39 (10ℓ, 1.5kW, excluding options)		81 (30ℓ, 2.2kW, excluding options)

Explanation of model No.

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.

8.0, 16.0cm³/rev Series

NSP– 10– 07 V 0A2– F2T– 14(U)

- Design number
  - 14: Standard product
  - 14U: Product compliant with UL and EISA in the US
- Option (Indicate in alphabetic sequence.)
  - F*, R* : Built-in block (See page L-23 for details.)
  - T : Thermometer installed on oil level gauge
- Pressure adjustment range (A : Constant discharge type)
  - A2 : 1.5 to 4.0MPa(3.5MPa) Pressure gauge Scale 16MPa
  - A3 : 3.5 to 6.0MPa(5.0MPa) Pressure gauge Scale 25MPa
  - A4 : 5.5 to 8.0MPa(7.0MPa) Pressure gauge Scale 25MPa
  - Note : Figures in parentheses show factory default full cutoff set values.
- Flow rate adjustment range (Maximum capacity)
  - 0 : 8cm³ /rev
  - 1 : 16cm³ /rev
  - Note : Factory defaults are maximum values shown above.
- Pump type : Variable vane pump
- Motor capacity : 07 : 0.75kW
  - 15 : 1.5kW
  - 22 : 2.2kW
- Tank volume : 10,20ℓ
  - (Special specification 30ℓ type also available.)
- NSP Series compact variable pump unit

26.0cm³/rev Series

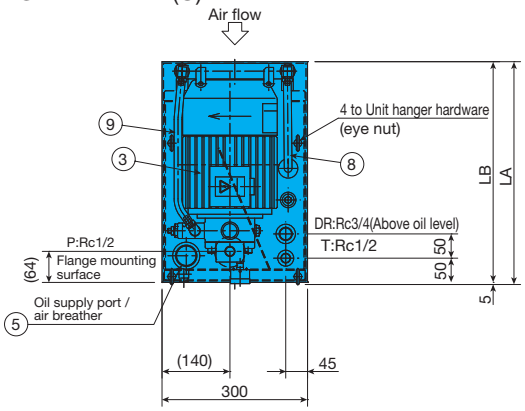
NSP – 30 – 22 V 2A2 – F22T – 14(U)

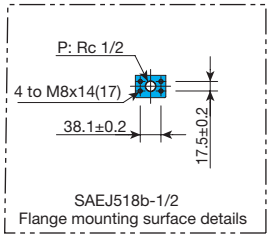
- Design number
  - 14: Standard product
  - 14U: Product compliant with UL and EISA in the US
- Option (Indicate in alphabetic sequence.)
  - F*, R* : Built-in block
  - T : Thermometer installed on oil level gauge
- Pressure adjustment range (A : Constant discharge type)
  - A2 : 2.0 to 4.0MPa(3.5MPa)
  - A3 : 3.5 to 6.0MPa(5.0MPa)
  - A4 : 5.5 to 7.0MPa(7.0MPa)
  - Note : Figures in parentheses show factory default full cutoff set values.
- Flow rate adjustment range (Maximum capacity)
  - 2 : 26cm³ /rev
- Pump type : Variable vane pump
- Motor capacity 22 : 2.2kW
  - 37 : 3.7kW
- Tank volume : 30ℓ 40ℓ
- NSP Series compact variable pump unit

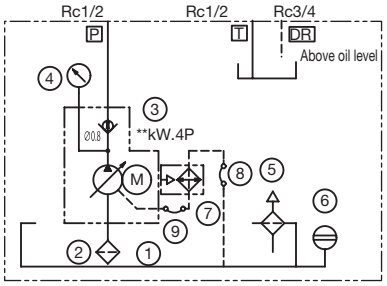
Design Drawings, Dimension Tables

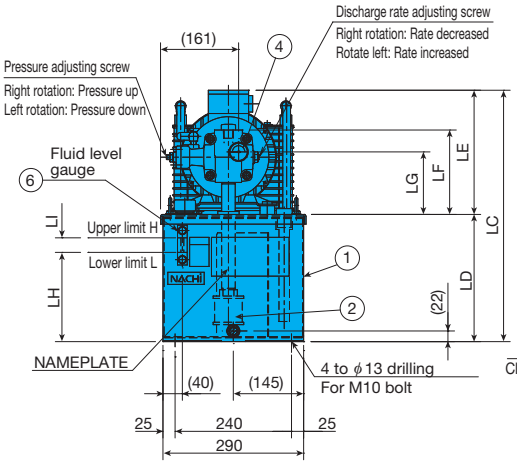
Note: See the following page for dimensions.

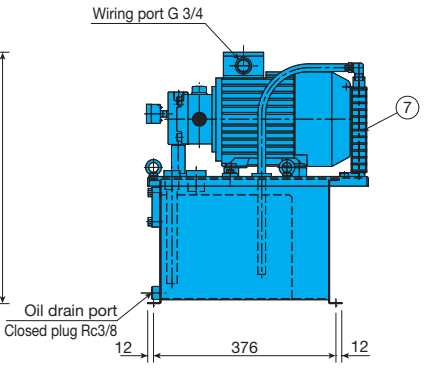
8.0, 16.0cm³/rev Series
NSP-*-**V*A*-14(U)





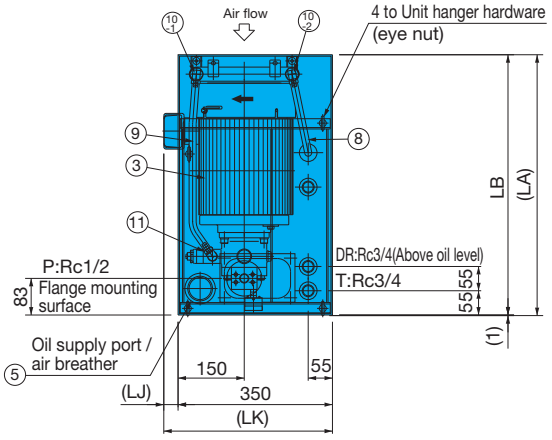


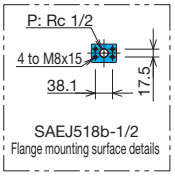


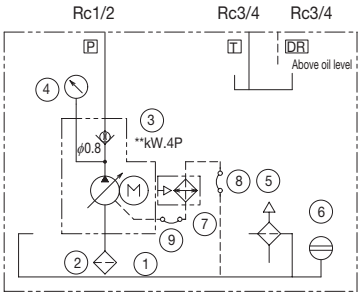


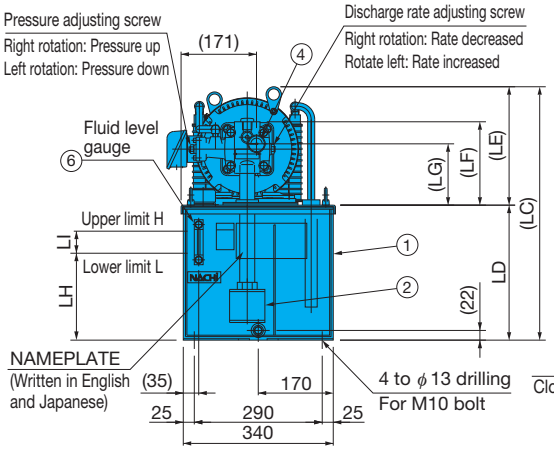
Part No.	Part Name
1	Oil tank
2	Suction strainer
3	Uni-pump
4	Pressure gauge
5	Fluid supply port/air breather
6	Fluid level gauge
7	Radiator
8	Flexible hose
9	Flexible hose

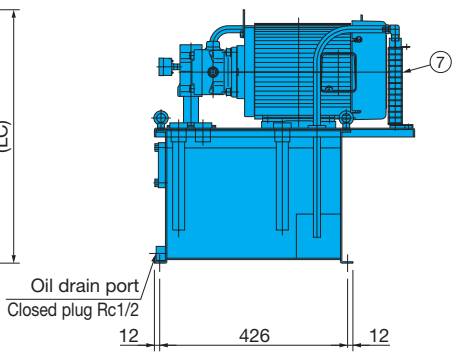
26.0cm³/rev Series
NSP-*-**V2A*-14(U)











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

L
Hydraulic Unit

8.0, 16.0cm³/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*-*-14(U)	0.75—4	405	400	394	160	234	154	109	102	10	10L	9L	35
NSP-10-15V*A*-*-14(U)	1.5 —4	430	425	396		236	164	119					39
NSP-10-22V*A*-*-14(U)	2.2 —4	460	455	422		256	174	129					46
NSP-20-07V*A*-*-14(U)	0.75—4	405	400	496	262	234	154	109	185	30	20L	17L	37
NSP-20-15V*A*-*-14(U)	1.5 —4	430	425	498		236	164	119					41
NSP-20-22V*A*-*-14(U)	2.2 —4	460	455	518		256	174	129					48

(Excluding operating fluid)

26.0cm³/rev Series

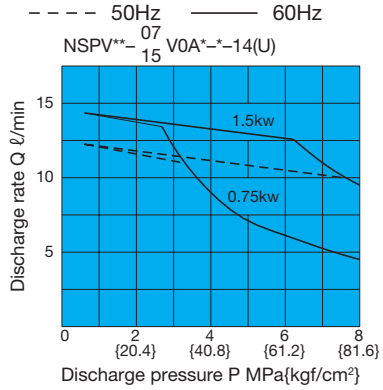
Model No.	Motor (kW-P)	Dimensions													Approximate Weight (kg)
		LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	H	L	
NSP-30-22V2A*-*-14(U)	2.2 —4	566	565	547	306	241	177	127	197	50	3	353	30L	23L	80
NSP-30-37V2A*-*-14(U)	3.7 —4	591	590	574		268	189	139			32	382			86
NSP-40-22V2A*-*-14(U)	2.2 —4	566	565	626	385	241	177	127	256	70	3	353	40L	31L	84
NSP-40-37V2A*-*-14(U)	3.7 —4	591	590	653		268	189	139			32	382			90

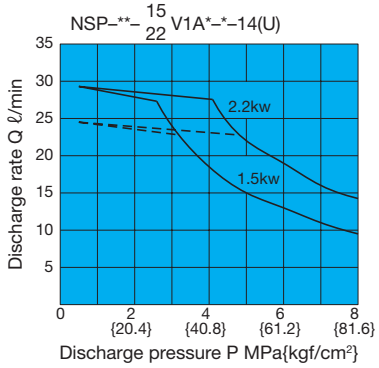
(Excluding operating fluid)

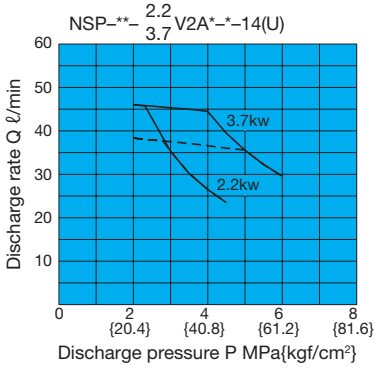
Selecting a Motor

NSP Motor Selection Curves (Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.)

– – – – 50Hz ——— 60Hz

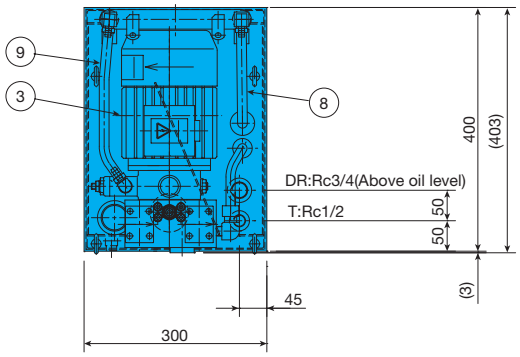




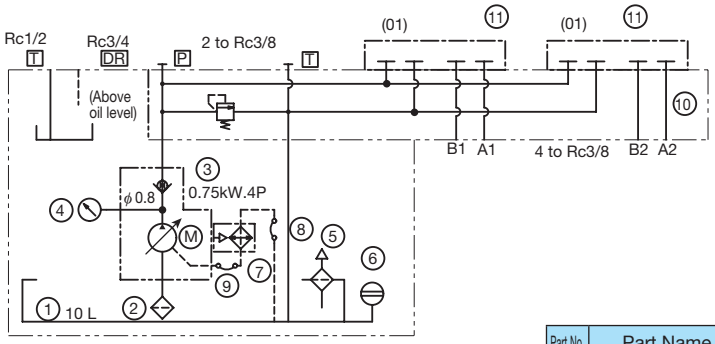


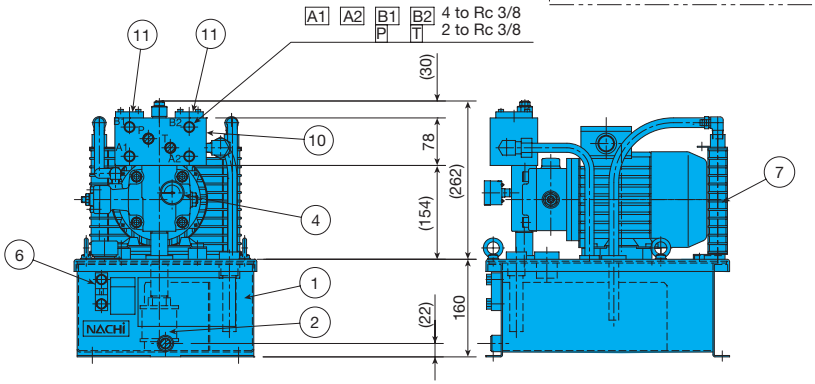
* See page B-43 for the characteristics of the drive motor.

[Block Addition Example]
NSP-10-07V0 A2-F2-14(U)



NSP—10—07V0A2—F2—14(U)



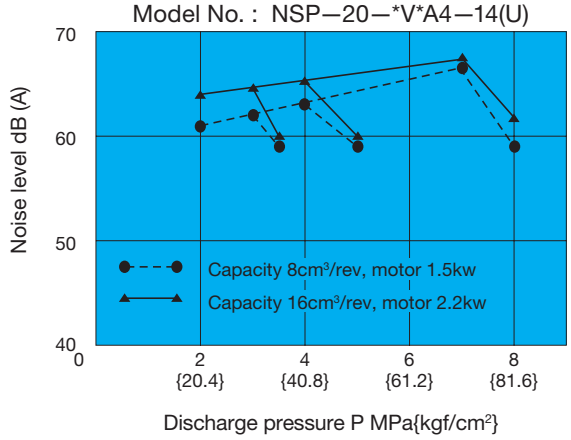


Part No.	Part Name
1	Oil tank
2	Suction strainer
3	Uni-pump
4	Pressure gauge
5	Fluid supply port/air breather
6	Fluid level gauge
7	Radiator
8	Flexible hose
9	Flexible hose
☆ 10	Base Blocks
☆ 11	End Plates

☆: Part numbers 10 and 11 are options. Part number 11 is standard when a block is equipped.

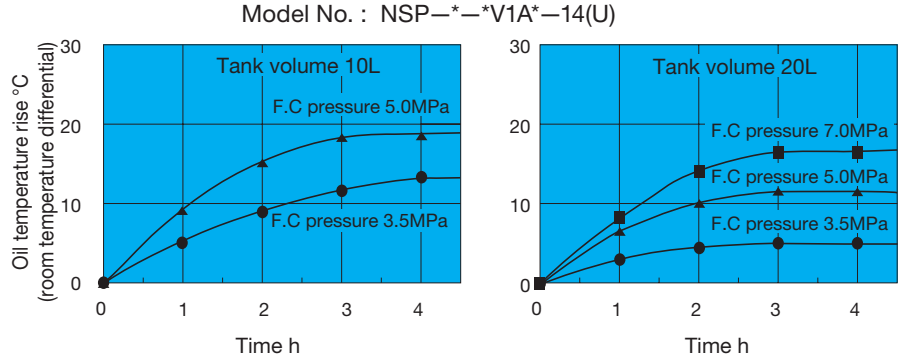
Performance Characteristics

①Noise Characteristics



Conditions
(The values shown in the graph to the left are typical characteristics under the following conditions.)
Operating Fluid: ISO VG32 equivalent
Oil Temperature: 40±5°C
Revolution Speed: 1800min^{-1}
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.

②Oil 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^{-1}
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 10ℓ tank cause a large rise in oil temperature. A 20ℓ tank is recommended in this case.
2.Rises in oil 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-43.

L
Hydraulic Unit

Selection Precautions

●Model Combinations

1 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				○

2 A 30ℓ tank capacities with 8.0 or 16.0 cm^3/rev are special specifications.

3 A model equipped with a block comes with a stopper plate on the block.

●Circuit Configuration

1 The basic configuration is a standard NSP-** plus an external manifold (circuit).

2 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^3) pump operating conditions: 1MPa→7MPa, full cutoff

■ At pressures in excess of 14MPa, equip a circuit side surge cutoff relief valve.

Note) The maximum peak pressure of a pump capacity of 26 cm^3/rev is 13 MPa.

●Built-in Manifold Block

1 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	F1·R1	F2·R2	F3
Block Weight (kg)	4.5	6.5	8.5
Allowable Additional Weight (kg)	10.5	8.5	6.5

2 Contact your agent for information about equipping a circuit.

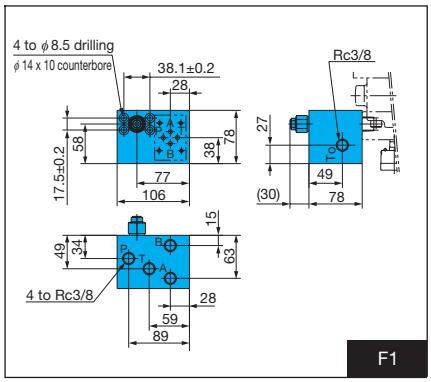
3 The 26 cm^3/rev series blocks are different, contact us for information.

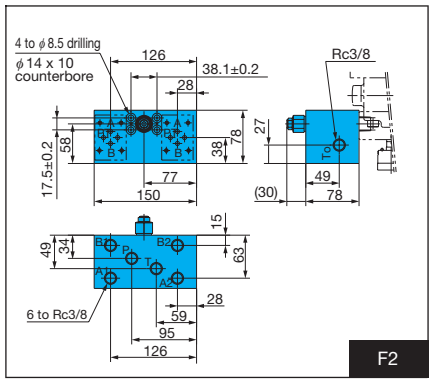
●Paint Specifications

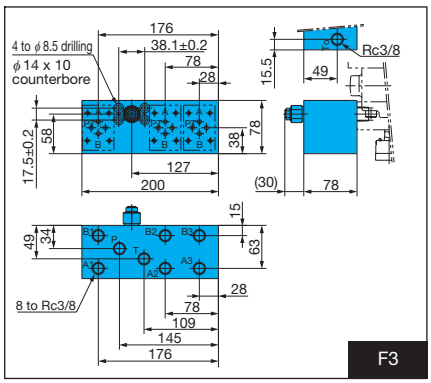
1 The interior and exterior of the tank are coated with a melamine baked-on resin coating, the motor is coated with cation electrodeposition coating, while the pump is spray painted with a lacquer finish. Color is Nachi standard color (Munsell No.N-1 70% gloss).

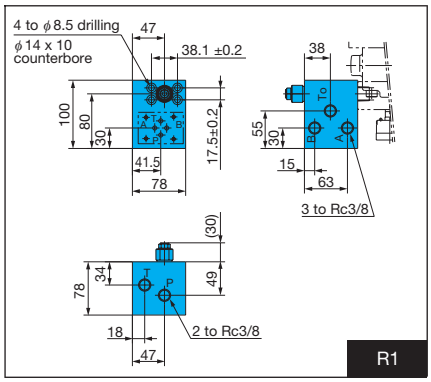
2 Contact your agent about specifying external paint colors.

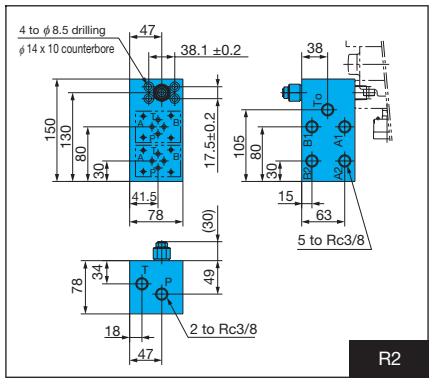
Option Details

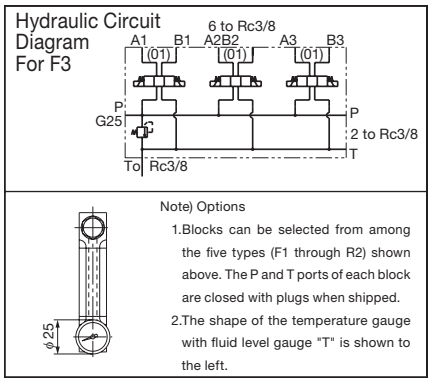












Note) Options

1. 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.
2. The shape of the temperature gauge with fluid level gauge "T" is shown to the left.

Handling Overview

●Startup Precautions

1 Check to make sure that the operating fluid in the tank is at the prescribed level.

A Upper Limit Mark (Yellow):Prescribed fluid level (nominal capacity)

B Lower Limit Mark (Red):Minimum fluid level

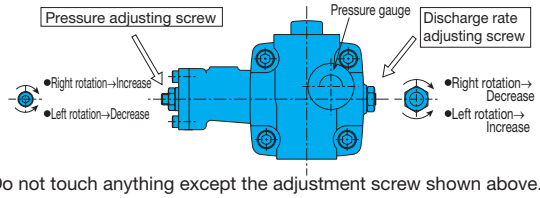
Hydraulic Operating Fluid:General oil-based operating fluid equivalent to ISO VG32

2 Perform electrical wiring exactly as shown below.

Motor and Power Supply Polarity		If wiring is performed incorrectly...
R→U S→V T→W	⇨	· Electric pump rotates in reverse, fluid is not discharged Continued operation can damage the pump. · Attach a pressure gauge to the discharge side and check for pressure rise.

3 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

1 Oil Temperature: Use in an area where the temperature is 15°C to 60°C.

2 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.

3 Radiator Fin Cleaning and Fin Strainer Cleaning: Every six months or 4,000 hours of operation, whichever comes first.

●Environment

1 Temperature: 10 to 35°C

2 Avoid areas exposed to mist of water-soluble coolant.

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 69% (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 oil 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-22V1A4-15
- 6.0MPa maintained while dwelling

Quiet operation at only 53dB (A)

- NSP-20E-22V1A4-15
- 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.
- The suspension of production lines will be minimized 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 Rated Input Current	3ϕ AC200 to 220V, 50/60Hz 9.7A/1.5kW, 13.4A/2.2kW 22.4A/3.7kW	
2. Pressure Adjustment Range	8, 16cm³/rev series A2: 1.5 to 4.0MPa A3: 3.5 to 6.0MPa A4: 5.5 to 8.0MPa	26cm³/rev series A2: 2.0 to 4.0MPa A3: 3.5 to 6.0MPa A4: 5.5 to 7.0MPa
3. Output Flow (at No-load)	0A*: 14ℓ/min, 1A*: 28ℓ/min 2A*: 46ℓ/min	
4. Hydraulic Fluid	Standard mineral-based hydraulic fluid (equivalent to ISO VG32)	
5. Hydraulic Oil Temperature	10 to 60°C	
6. Color of Paint	Munsell No.N-1 70% gloss	
7. Ambient Temperature/ Humidity	0 to 35°C/ 20 to 85%RH (non-condensation) (Keep the unit away from water-soluble cutting fluid mist.)	

Explanation of model No.

8.0, 16.0cm³/rev Series

NSP – 20 E – 15 V 0 A2 – 15

- Pressure adjustment range (A : Constant discharge type)
  - A2: 1.5 to 4.0MPa (3.5MPa) Pressure gauge Scale 16MPa
  - A3: 3.5 to 6.0MPa (5.0MPa) Pressure gauge Scale 25MPa
  - A4: 5.5 to 8.0MPa (7.0MPa) Pressure gauge Scale 25MPa
  - Note: Figures in parentheses show factory default full cutoff set values.
- Discharge rate (No-load)
  - 0: 14ℓ/min (1.5kW only)
  - 1: 28ℓ/min
- Motor capacity
  - 15: 1.5kW, 22: 2.2kW
- E: Inverter drive
- Tank capacity: 20ℓ, 30ℓ

26.0cm³/rev Series

NSP – 30 E – 22 V 2 A2 – 15

- Pressure adjustment range (A : Constant discharge type)
  - A2: 2.0 to 4.0MPa (3.5MPa)
  - A3: 3.5 to 6.0MPa (5.0MPa)
  - A4: 5.5 to 7.0MPa (7.0MPa)
  - Note: Figures in parentheses show factory default full cutoff set values.
- Discharge rate (No-load)
  - 2: 46ℓ/min
- Motor capacity
  - 22: 2.2kW, 37: 3.7kW
- E: Inverter drive
- Tank capacity: 30ℓ, 40ℓ

Inverter Control Box Kit Specifications

EBK – 20 – 22 – 1 K – 21

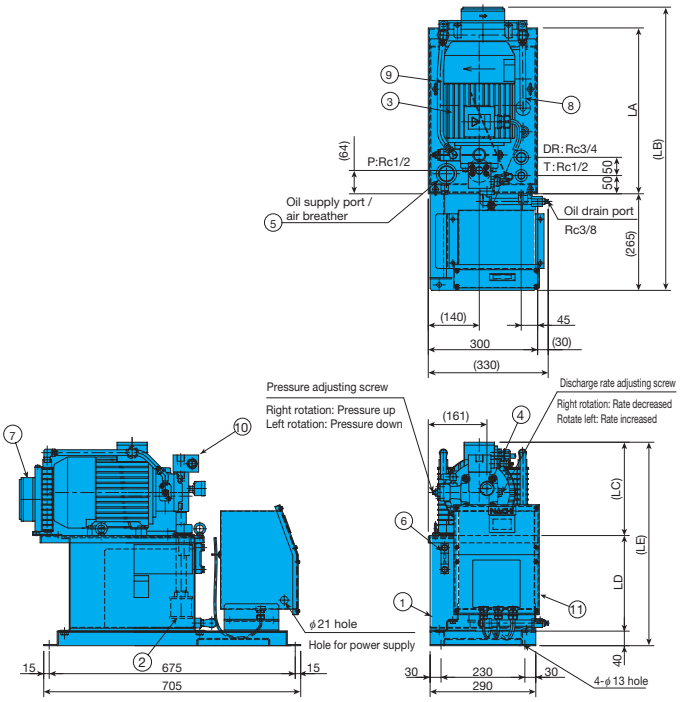
- Accessories No symbol: none
  - K: Pedestal, hydraulic fluid drain, pipes, fittings
- Applicable pump capacity 1: 8,16cm³/rev
  - 2: 26cm³/rev
- Applicable size of electric motor
  - 15: 1.5kW, 22: 2.2kW, 37: 3.7kW
- Applicable tank size
  - 20: 20ℓ, 30: 30ℓ, 40: 40ℓ
  - Note) 10ℓ is not available

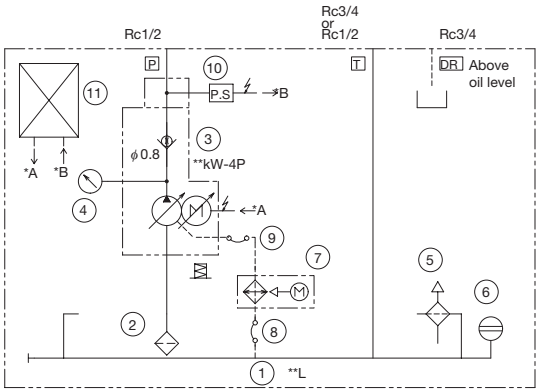
Design Drawings, Dimension Tables

Note) See the following page for dimensions.

8.0, 16.0cm³/rev Series

NSP-$\frac{20}{30}$E-**V*A*-15

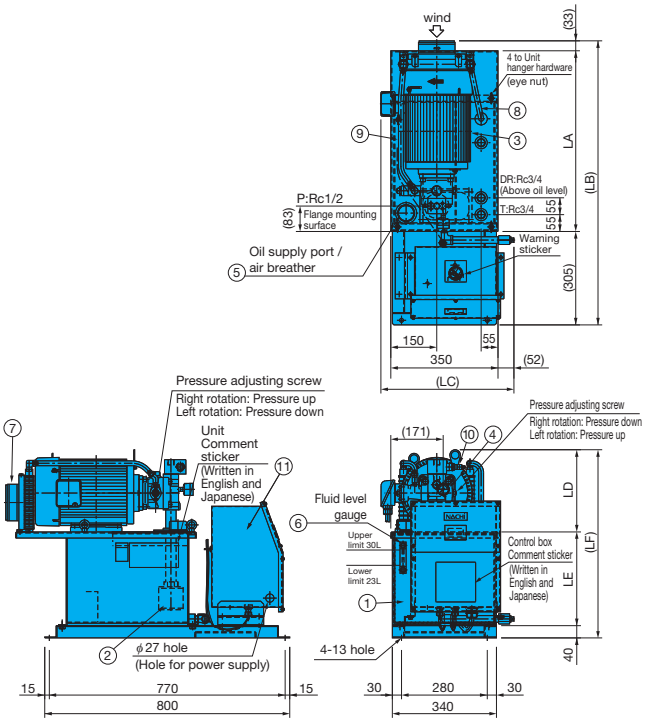




Part No.	Part Name	Part No.	Part Name
1	Oil tank	7	Fan cooler
2	Suction strainer	8	Flexible hose
3	Uni-pump	9	Flexible hose
4	Pressure gauge	10	Pressure sensor
5	Fluid supply port/air breather	11	Inverter control box
6	Fluid level gauge		

26.0cm³/rev Series

NSP-$\frac{30}{40}$E-**V2A*-15



8.0, 16.0cm³/rev Series

Model No.	Dimensions					Approximate Weight (kg)
	LA	LB	LC	LD	LE	
NSP-20E-15V*A*-15	425	750	243	262	545	66
NSP-20E-22V1A*-15	455	780	256		558	74
NSP-30E-15V*A*-15	425	750	236	364	647	71
NSP-30E-22V1A*-15	455	780	256		666	79

26.0cm³/rev Series

Model No.	Dimensions							Approximate Weight (kg)
	LA	LB	LC	LD	LE	LF	Z	
NSP-30E-22V2A*-15	565	903	405	234	306	581	21	101
NSP-30E-37V2A*-15	590	928	434	268		614	27	110
NSP-40E-22V2A*-15	565	903	405	234	385	660	21	106
NSP-40E-37V2A*-15	590	928	434	268		693	27	115

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.
- Use only the wiring methods described in the user documentation.
- Do not change any settings, regarding the inverter parameters, except the parameters described in the setting procedures in the user documentation.
- Maximum peak pressure (set pressure + surge pressure) must be 14MPa or below for the 8 and 16cm³/rev series, and 13MPa or below for the 26cm³/rev series.
  Install a relief valve to cut surges in the circuit if the maximum peak pressure exceeds these figures.
  If the maximum peak pressure is high, the inverter's alarm may sound and the motor may stop.

NNP Series (Low-noise Standard Variable Pump Unit)

Features

Newly developed compact variable pump unit has environmentally friendly low hydraulic oil temperature for cutting and manufacturing equipment hydraulic units. Extensive lineup in the series to handle requirements exactly.

Low hydraulic oil temperature = room temperature + 7°C

(NNP-20-22P16 N1-21
60Hz, 7MPa Full cut-off in
continuous operation)

Fan to cool pump drain is standard equipment, hydraulic oil temperature are kept low using tank construction focused on anti-foaming.

A wide selection of models from which to choose

(Basic Series: 10 types
Pump Variable Controllers: 5 types
Options: 8 types)

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 cm³/rev	Motor capacity kW-P	Maximum Pressure {Full Cutoff Pressure} MPa{kgf/cm²}	Tank Capacity ℓ	Fan Cooler Motor Input W{at50/60Hz}	Standard Weight kg
NNP-20-22P8N*-**-21	8.0	2.2—4	21{214}	20	16/15W Single-phase	80(Note)
NNP-20-37P8N*-**-21		3.7—4		20		88(Note)
NNP-20-22P16N*-**-21	16.5	2.2—4		20		85(Note)
NNP-30-37P16N*-**-21		3.7—4		30		93(Note)
NNP-20-22P22N*-**-21	22.0	2.2—4	14{143}	20		85(Note)
NNP-30-37P22N*-**-21		3.7—4		30		93(Note)
NNP-40-37P35N*-**-21	35.0	3.7—4	21{214}	40	35/33W Single-phase	115(Note)
NNP-60-55P35N*-**-21		5.5—4		60		135(Note)
NNP-80-37P45N*-**-21	45.0	3.7—4	14{143}	80		133(Note)
NNP-80-55P45N*-**-21		5.5—4		80		140(Note)

Note) Operating fluid is not included in options

Explanation of model No.

NNP – 20 – 22 P 16 N2 – ** – 21

- Design number
- Option (Table 1)
- Pressure adjustment range (N: Pressure compensation type)
  - N0 : 2.0 to 3.5MPa
  - N1 : 2.0 to 7.0MPa
  - N2 : 3.0 to 14.0MPa
  - N3 : 3.0 to 21.0MPa
- Flow rate adjustment range (Maximum capacity)
  - 8 : 8cm³/rev
  - 16 : 16.5cm³/rev
  - 22 : 22cm³/rev
  - 35 : 35cm³/rev
  - 45 : 45cm³/rev
- Pump type: Variable piston pump
- Motor capacity: 22: 2.2kW, 37: 3.7kW, 55: 5.5kW
- Tank volume: 20, 30, 40, 60, 80ℓ
- NNP Series (Low-noise Standard Variable Pump Unit)

Note) N3 is not available for flow rate adjustment ranges 22 and 45.

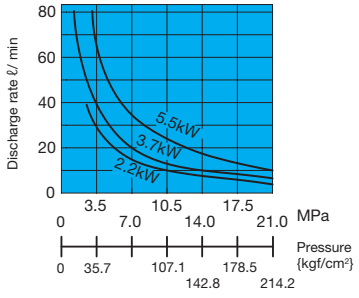
Table 1: Option Symbols (Specify in alphabetic sequence.)

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 oil 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.

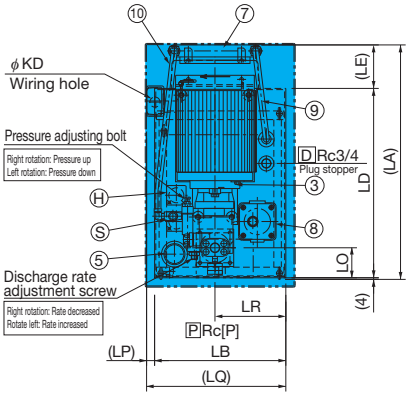


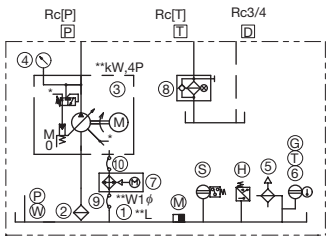
Tank Capacity and Motor/Pump Combinations

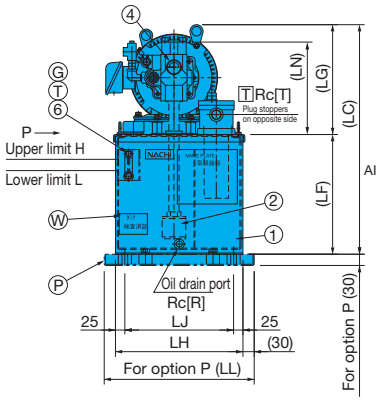
Tank Capacity (ℓ) \ Motor capacity (kW-P)	2.2 – 4			3.7 – 4					5.5 – 4	
Pump Capacity (cm³/rev)	8	16	22	8	16	22	35	45	35	45
20ℓ	○	○	○	○						
30ℓ					○	○				
40ℓ							○			
60ℓ									○	
80ℓ								○		○

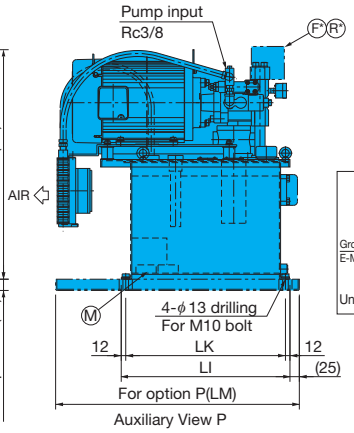
Design Drawings, Dimension Tables

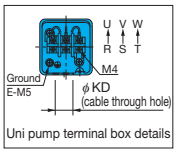
Model No.	Dimensions																					
	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	LM	LN	LO	LP	LQ	LR	KD	H	L	P	T	R
NNP-20-22P 8N*-**-21	575	350	506	505	66	240	266	340	450	290	426	400	600	231	80	–	350	189	φ27	20L	16L	1/2	3/4	3/8
NNP-20-22P16N*-**-21														235								3/4		
NNP-20-22P22N*-**-21																								
NNP-20-37P 8N*-**-21	625		533		116	319	293							233		21	371			30L	26	1/2		
NNP-30-37P16N*-**-21			612											247								3/4		
NNP-30-37P22N*-**-21																								
NNP-40-37P35N*-**-21	743	450	560	620	119	267	339	440	560	390	536	500	770	248	132	17	467	257	φ33	40L	30	1	1-1/4	1/2
NNP-60-55P35N*-**-21			697			358								268		19	469		φ33	60L	50L			
NNP-80-37P45N*-**-21			747			454	293							248		17	467		φ27	80L	70L			
NNP-80-55P45N*-**-21			793				339							268		19			φ33					











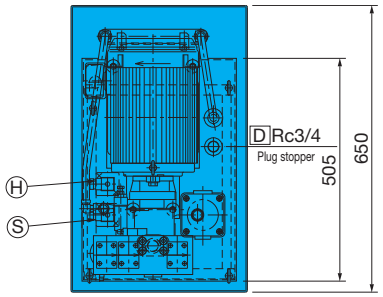
Part No.	Part Name
1	Fluid tank
2	Suction strainer
3	Uni-pump
4	Pressure gauge
5	Fluid supply port/air breather
6	Fluid level gauge
7	Fan cooler
8	Return filter
9	Flexible hose
10	Flexible hose

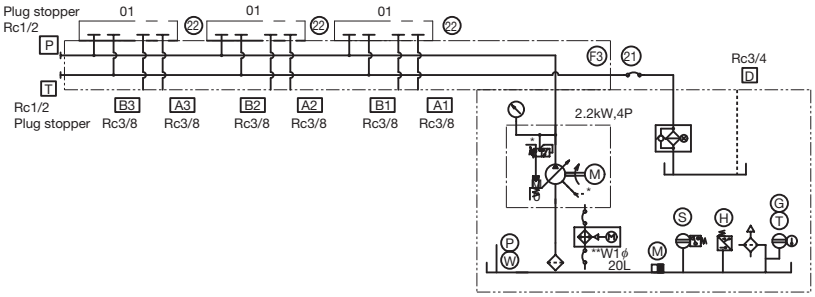
Options

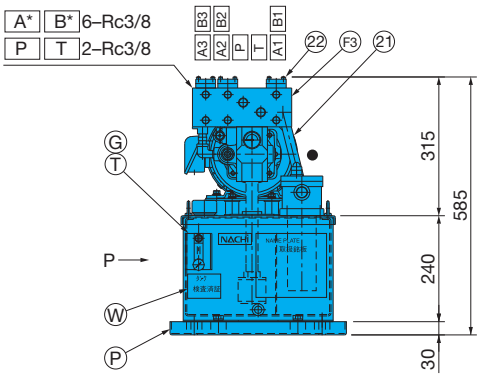
Part No.	Part Name
F*	Built-in block (F Type)
R*	Built-in block (R Type)
G	Fluid level gauge with guard
H	Temperature switch
M	Microseparator
P	Bottom oil pan
S	Float switch
T	Fluid level gauge with temperature gauge (with guard)
W	Self leak test

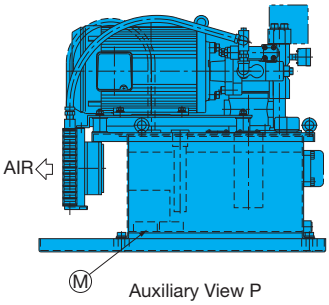
Option Installation Example

Model No. : NNP-20-22P16N2-F3HMPSTW-21









Symbol	Name
21	Flexible hose
22	End Plates

Note) Part numbers 21 and 22 are standard with a built-in block.

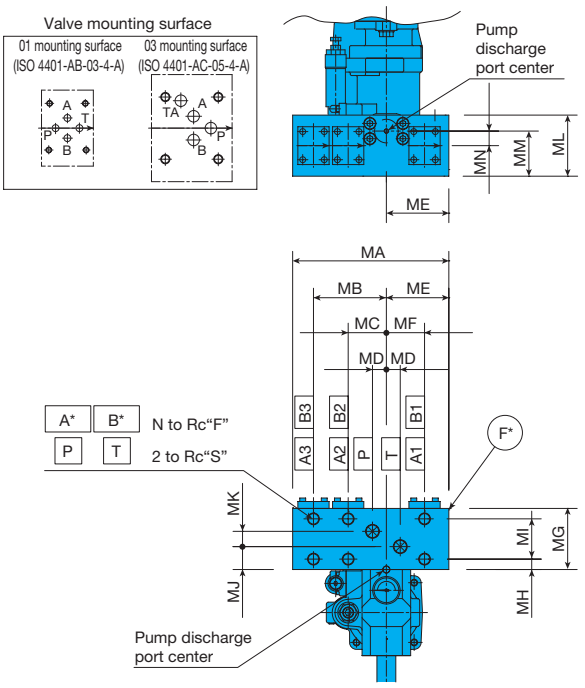
F* and R* Block Specifications

Note) Note that there are certain restrictions on block-equipped combinations. See the Selection Precautions on page L-32.

Options F1, F2, F3, F6

Symbol	Description	Model No.	
		Tank Capacity20, 30ℓ	Tank Capacity40, 60, 80ℓ
F1	F1 Type Block (01 x 1)	F1-1A	F1-2A
F2	F2 Type Block (01 x 2)	F2-1A	F2-2A
F3	F3 Type Block (01 x 3)	F3-1A	F3-2A
F6	F6 Type Block (03 x 1 - M6)	F6-1A-M6 (Standard M6)	F6-2A-M6 (Standard M6)

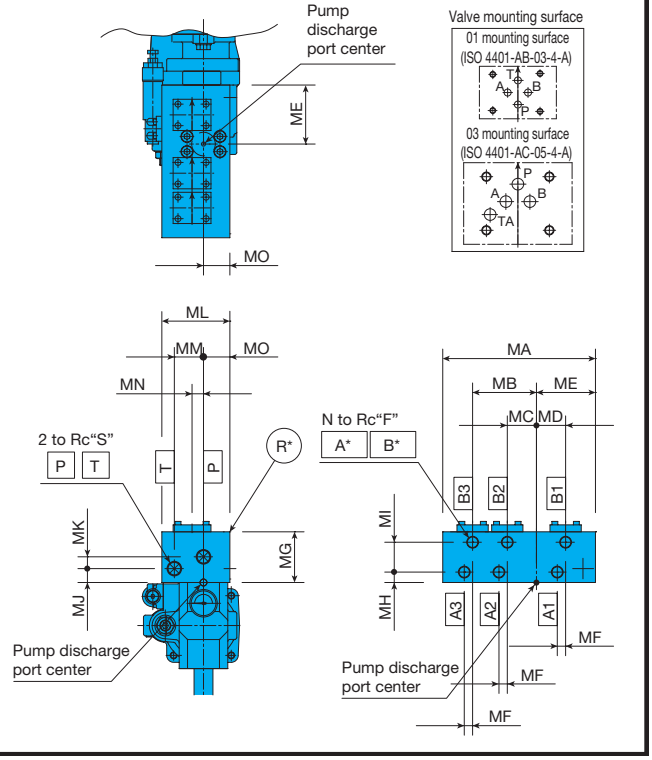
Tank Capacity	Options	Dimensions																
		MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	N	F	S
20ℓ 30ℓ	F1	133	–	–	20	90	55	88	15	58	33	22	88	65	21	2	3/8	1/2
	F2	175	–	55												4		
	F3	225	105													6		
	F6	152	–	–	25	102	67	103	18	67	39	25	103	80	26	2	1/2	3/4
40ℓ 60ℓ 80ℓ	F1	143	–	–	20	96	58	88	15	58	33	22	98	68	24	2	3/8	1/2
	F2	183	–	58												4		
	F3	233	108													6		
	F6	155	–	–	25	105	70	103	18	67	39	25	103	73		2	1/2	3/4



Options R1, R2, R3, R6

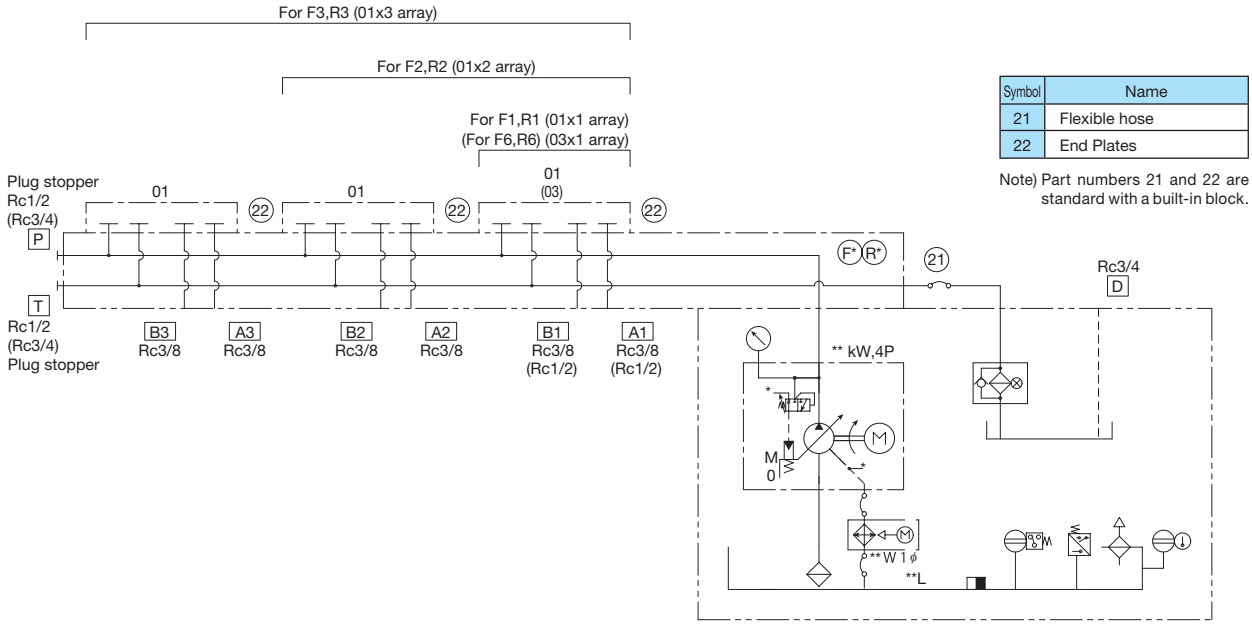
Symbol	Description	Model No.	
		Tank Capacity20, 30ℓ	Tank Capacity40, 60, 80ℓ
R1	R1 Type Block (01 x 1)	R1-1A	R1-2A
R2	R2 Type Block (01 x 2)	R2-1A	R2-2A
R3	R3 Type Block (01 x 3)	R3-1A	R3-2A
R6	R6 Type Block (03 x 1 - M6)	R6-1A-M6 (Standard M6)	R6-2A-M6 (Standard M6)

Tank Capacity	Options	Dimensions																	
		MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	MO	N	F	S
20ℓ 30ℓ	R1	123	–	–	42	85	12	73	15	43	20	17	98	42	16.5	38	2	3/8	1/2
	R2	170	–	42													4		
	R3	220	92														6		
	R6	160	–	–	54	119	0	98	18	62	49	0	108	47	9		2	1/2	3/4
40ℓ 60ℓ 80ℓ	R1	132	–	–	45	92	13	73	15	43	23	14	103	45	16.5	40	2	3/8	1/2
	R2	180	–	45													4		
	R3	230	95														6		
	R6	167	–	–	57	122	0	98	18	62	49	0	110	47	9		2	1/2	3/4



Note) Each block is shipped with plug stoppers in the P and T ports.

Hydraulic Circuit Diagram



Symbol	Name
21	Flexible hose
22	End Plates

Note) Part numbers 21 and 22 are standard with a built-in block.

Typical Performance Characteristics

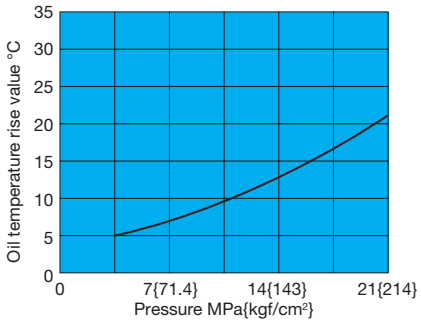
Oil Temperature Rise Characteristics - Full Cutoff

These graphs show oil temperature rise during continuous operation.

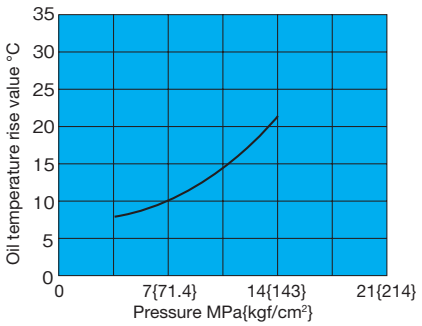
- Tank Fluid Pressure = Room Temperature + Oil Temperature Rise Value
- Operating Fluid: ISO VG32 equivalent
- Revolution Speed: 1800min^{-1} (60Hz)

Note) The oil temperature rise value depends on actual operating conditions, and so actual temperatures may be different from those indicated above.

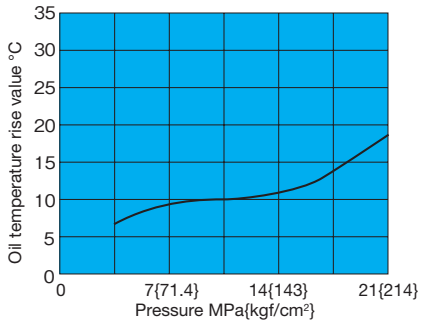
NNP-20-22P16N*-21



NNP-30-37P22N*-21



NNP-60-55P35N*-21



Noise Characteristics - Measurement Position

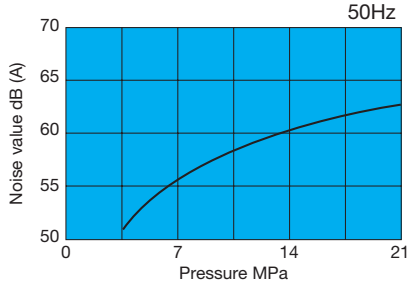
These graphs show noise values at locations one meter in front of and behind the pump.

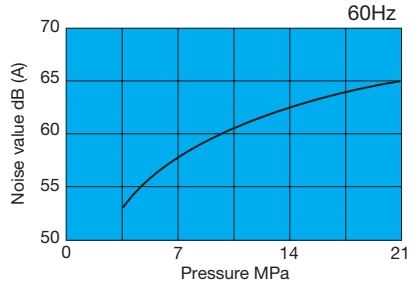
- ISO VG32 equivalent
- Oil Temperature: 40±5°C

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 cutoff

NNP-20-22P16N*-21





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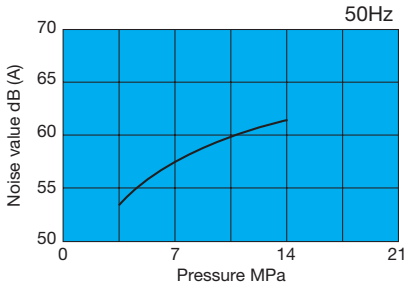
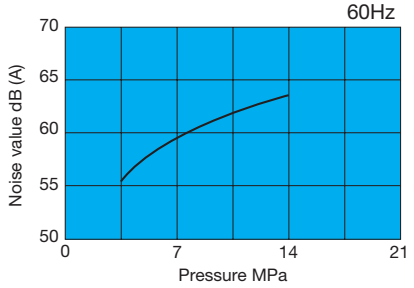
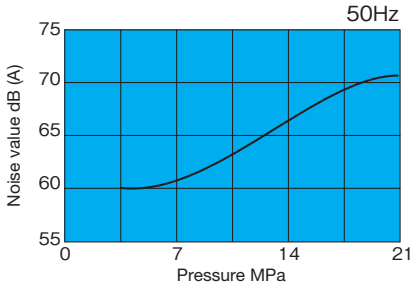
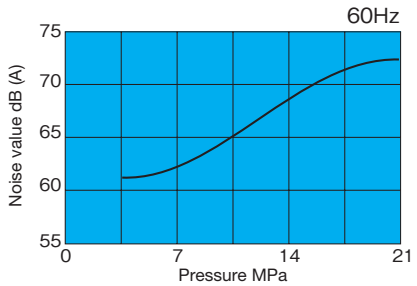




NNP-60-55P35N*-21





Selection Precautions

●Standard Accessories

A return filter with visual clogging inspection tool, and a fan cooler are equipped as standard.

●Options

1 Options F* and R* cannot be selected for inclusion with an 8N* pump (NNP-**-**P8N* Type).

2 For optional F* and R* blocks, up to three blocks can be specified for 01 size, and only one block can be specified for 03 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 03 size.

3 01, 03 size solenoid valves and modular valves can be selected.

4 With option F* and R*, block and cylinder piping is hoses, configured by Nachi.

5 Contact your agent for information about equipping a circuit.

6 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.

7 Option W is a leak test performed by Nachi.

●Circuit Configuration

1 Allow for sufficient flexibility in the piping between the NN pack, external manifold, and actuator.
(Hose with a length of 1 m or more is recommended.)

●Paint

1 Nachi-Fujikoshi standard color: Mancel No. 5B6/3 (lacquer)
However, the electric drive is Munsell No. N7.

2 Contact your agent about specifying external paint colors.

Handling Overview

●Hydraulic Operating Fluid

1 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

2 Contaminated operating fluid can lead to malfunction and shortened pump life. Manage operating fluid so that contamination is maintained at class NAS10 or lower.

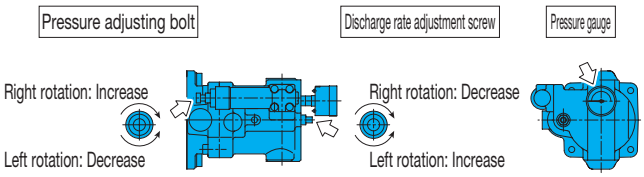
●Startup Precautions

1 Before starting the pump, inch the electric drive to make sure there is hydraulic fluid being sucked up.

2 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

3 Do not touch the surface of the pump while it is operating, it is very hot.

●Adjusting the Pressure and Discharge Rate



●Electrical Wiring

1 Perform electrical wiring exactly as shown below.

Motor and Power Supply	⇨	If wiring is performed incorrectly...
R—U S—V T—W		· Electric pump rotates in reverse, fluid is not discharged · Attach a pressure gauge to the discharge side and check for pressure rise.

· 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.

2 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

1 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 an well-ventilated area where heat will not build up.

●Transport and Installation

1 Use the hangers when transporting the pump.

2 Since this is a stationary type pump, secure it with bolts on a vibration-free, level surface.

●Maintenance and Inspection

1 Oil Temperature: Use the pump in an area where the temperature is 10°C to 60°C.

2 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.

3 Strainer and Tank Internal Inspection and Cleaning: Every three months

4 Return Filter Element Inspection: Every three months (replace as required)

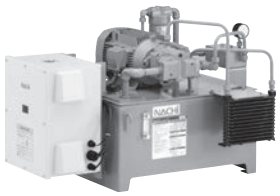
5 Fan Cooler Fin Inspection and Cleaning: Every six months

●Environment

1 Temperature: 10 to 35°C

2 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 oil temperature

Maintained at room temperature +2.5°C.

- NNP-60E-55P35N1-21
- 7MPa maintained while dwelling

40% energy savings compared to the NCP unitt

- NCP-60E-3.7PV16N3-C1R2-13
- 21MPa while dwelling (in contrast to standard unit)

Quiet

Sound level is 52dB (A).

- NNP-20E-22P16N1-21
- 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.

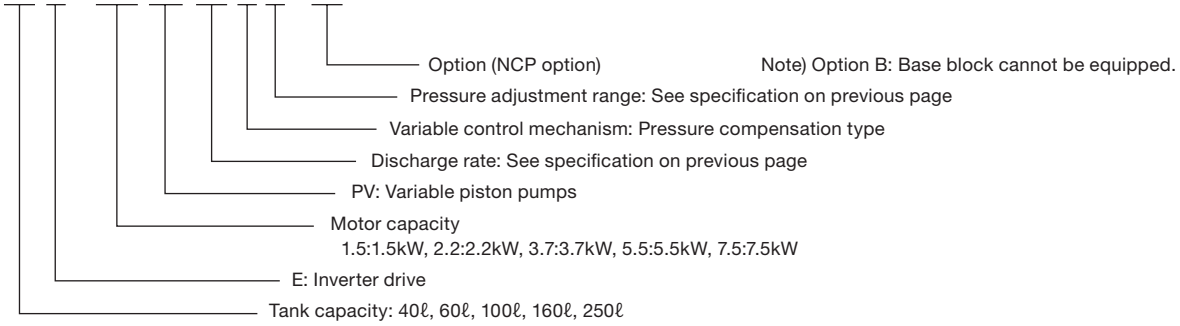
Specifications

1. Power Supply Rated Input Current	3ϕ AC200 to 220V, 50/60Hz 9.8A/1.5kW (NCP series only) 13.5A/2.2kW 22.5A/3.7kW 21.4A/5.5kW 29.1A/7.5kW (NCP series only)
2. Pressure Adjustment Range	N0: 2.0 to 3.5MPa N1: 2.0 to 7.0MPa N2: 3.0 to 14.0MPa N3: 3.0 to 21.0MPa
3. Output Flow (Theoretical Value at No-load)	8: 14.4ℓ/min 16: 29.7ℓ/min 22: 39.6ℓ/min 35: 63.0ℓ/min 45: 81.0ℓ/min
4. Hydraulic Fluid	Standard mineral-based hydraulic fluid ISO VG32 or 46
5. Hydraulic Oil Temperature	0 to 60°C
6. Ambient Temperature/Humidity	10 to 35°C/20 to 85%RH (non-condensation)
7. Color of Inverter Box	Munsell No. 2.5Y9/1 (cream)

Explanation of model No.

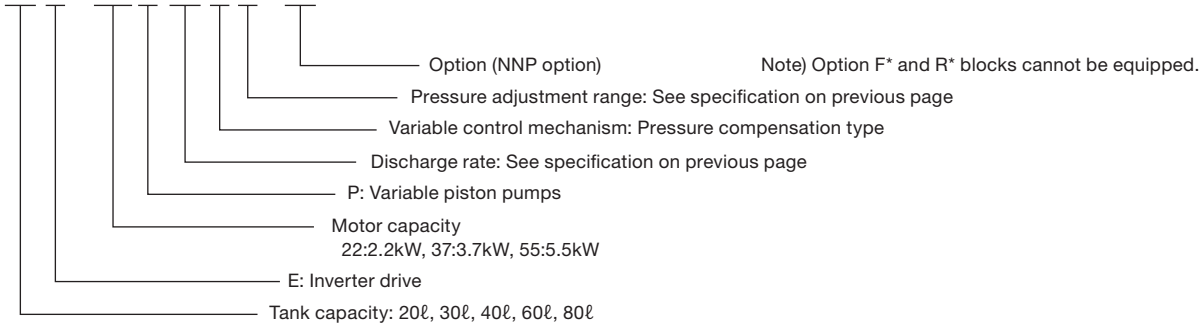
Inverter Drive NCP Series

NCP – 60 E – 3.7 PV 16 N 2 – ** – 13



Inverter Drive NNP Series

NNP – 20 E – 22 P 16 N 2 – ** – 21



Design Drawings, Dimension Tables

Contact us for more information.

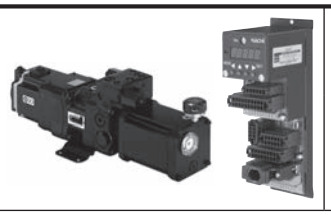
Precautions

- 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.
- Use only the wiring methods described in the user documentation.
- Do not change any settings, regarding the inverter parameters, except the parameters described in the setting procedures in the user documentation.
- Allow for sufficient flexibility in the piping between the inverter-driven hydraulic unit and external manifolds or actuators.
  (Recommended) Flexible hose that is at least 1 meter long and has the following inside diameters.

Pump Capacity	Inside diameter
8cm³/rev	3/8 or 1/2 inch
16 or 22cm³/rev	3/4 inch
35 or 45cm³/rev	1 inch

  *If the piping has a low capacity, the inverter's alarm may sound when the load fluctuates and the motor may stop.
- 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



AC servo motor controls hydraulic pump speed and direction.
Generate pressure and flow to match the operating cycle of machinery and to stop during idle times.

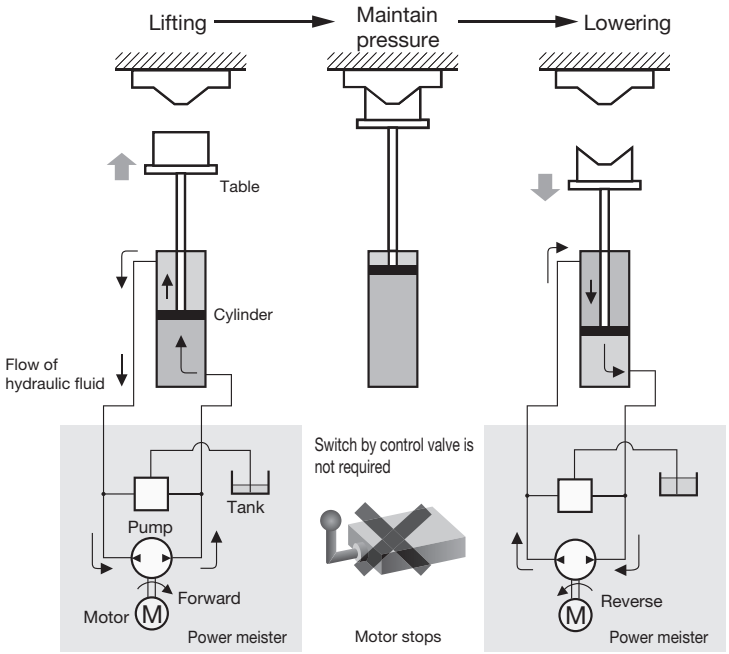
Incredible energy savings by only operating when necessary.
Also, position, speed, and pressure are controlled with great precision by using a high-speed digital processing servo controller.

Features

High power with 30MPa maximum pressure.
Designed so pump operates only when necessary for energy savings and low noise.
Great energy savings compared to conventional hydraulic systems.
High-speed processing of the servo controller makes positioning on the order of μm possible.
Compact all-in-one design saves space.
(select either vertical or horizontal setup)

Principle of operation

Rotating the motor forward brings hydraulic fluid to the head side of the cylinder which lifts the cylinder. Reversing the motor pushes hydraulic fluid to the rod side and pushes the cylinder down. The direction the pump rotates controls the direction of the cylinder, and the speed of rotation controls the speed.



System Configuration (Standard Configuration)

Signals to operate the cylinder (position, speed, and pressure) are sent from the control equipment to the servo controller and the hydraulic unit responds according to the signals. The servo controller receives feedback from sensors and accurately controls the cylinder so the deviation from the signals is 0. A feedback system using position and pressure sensors makes it possible to accurately control position, speed, and thrust (pressure).
About Power Meister
①Hydraulic unit (UPS)
②Servo controller (EPD)
③Servo amp
(compatible with motor mounted on item ①)
④Motor cable
(select from 3, 5, or 10 meters)
⑤Encoder cable
(select from 3, 5, or 10 meters)
⑥Fan cable
(select from 3, 5, or 10 meters)
...For 11kW motor
(⑦Cable to computer (3 m))
It becomes offers.
Note) Customers must provide piping, wiring, hydraulic cylinder, sensors, control panel, and other equipment.
(Contact us for information about cylinders and sensors.)

Specifications

Hydraulic Unit

Motor	AC servo motor (0.75 to 11kW (servo amp drive)) Power supply 3-phase 200 to 230VAC, 50/60Hz (servo amp power supply) For 11kW only : Fan motor power supply Single-phase 200 to 230VAC 50/60Hz is required
Pump	Piston pump (2.0 to 15.8cm^3/rev)
Operating Ambient Temperature/Humidity	0 to +40°C/20 to 90%RH (non-condensation)
Temperature Range of Hydraulic Fluid (°C)	5 to 60°C (Note7)
Recommended Hydraulic Fluid	Wear resistant hydraulic fluid ISO VG32 to 68 (VG46 recommended)
Operating Viscosity Range	20 to 200mm^2/s {cSt}
Degree of Contamination	NAS 10 or better
Safety Valve Pressure Adjustment Range	UPS-00A : 3.5 to 32MPa UPS-0A/1A : 3.5 to 30MPa
Maximum Working Pressure	30MPa (for hydraulic pump) (maximum operating pressure varies according to motor performance and options)
Color of Paint	Black

●UPS-00A

Model No.	Motor Output kW	Pump Capacity cm^3/rev	Maximum RPM min^{-1} (Note 1)	Maximum Flow Rate ℓ/min (Note 2)	Pressure Rating MPa (Continuous (Note 3))	Maximum Working Pressure MPa (Short term (Note 3))	Tank Size Lit. (nominal)	Hydraulic Fluid Level Range Lit. (estimate (Note 4))
UPS-00A-2*07	0.75	2.0	3000	6.0	6.4	9.6	V:0.75 H:0.65 L:No tanks (Note 5)	V:0.3 H:0.2
UPS-00A-2*10	1.0	2.0	3000	6.0	8.5	12.7		
UPS-00A-3*10		3.0		9.0	5.7	8.5		
UPS-00A-2*15	1.5	2.0	3000	6.0	19.2	28.8		
UPS-00A-3*15		3.0		9.0	12.8	19.2		
UPS-00A-4*15		4.0		12.0	9.6	14.4		

●UPS-0A

Model No.	Motor Output kW	Pump Capacity cm^3/rev	Maximum RPM min^{-1} (Note 1)	Maximum Flow Rate ℓ/min (Note 2)	Pressure Rating MPa (Continuous (Note 3))	Maximum Working Pressure MPa (Short term (Note 3))	Tank Size Lit. (nominal)	Hydraulic Fluid Level Range Lit. (estimate (Note 4))
UPS-0A-2*12	1.2	2.0	3000	6.0	15.2	22.8	V:1.9 H:1.5	V:0.6 H:0.3
UPS-0A-4*12		4.0		12.0	7.6	11.4		
UPS-0A-2*20	2.0	2.0	3000	6.0	25.4	30.0		
UPS-0A-4*20		4.0		12.0	12.7	19.0		

●UPS-1A

Model No.	Motor Output kW	Pump Capacity cm^3/rev	Maximum RPM min^{-1} (Note 1)	Maximum Flow Rate ℓ/min (Note 2)	Pressure Rating MPa (Continuous (Note 3))	Maximum Working Pressure MPa (Short term (Note 3))	Tank Size Lit. (nominal)	Hydraulic Fluid Level Range Lit. (estimate (Note 4))
UPS-1A-5*35	3.5	4.7	2500	11.8	21.1	30.0	No symbol:4.5 A:3.0 B:6.0	Tank capacity:No symbol V:1.2, H:0.6 Tank capacity:A V:0.6, H:0.4 Tank capacity:B V:2.8, H:0.8
UPS-1A-7*35		6.7		16.8	14.8	22.2		
UPS-1A-9*35		9.0		22.5	11.7	17.5		
UPS-1A-11*35		11.0		27.5	9.6	14.3		
UPS-1A-13*35		12.9		32.3	8.2	12.2		
UPS-1A-16*35		15.8		39.5	6.7	10.0		
UPS-1A-5*45	4.5	4.7	2500	11.8	30.0	30.0		
UPS-1A-7*45		6.7		16.8	22.6	30.0		
UPS-1A-9*45		9.0		22.5	17.8	26.8		
UPS-1A-11*45		11.0		27.5	14.6	21.9		
UPS-1A-13*45		12.9		32.3	12.4	18.7		
UPS-1A-16*45		15.8		39.5	10.2	15.2		
UPS-1A-7*55	5.5	6.7	2500	16.8	27.9	30.0		
UPS-1A-9*55		9.0		22.5	22.0	30.0		
UPS-1A-11*55		11.0		27.5	18.0	27.0		
UPS-1A-13*55		12.9		32.3	15.3	23.0		
UPS-1A-16*55		15.8		39.5	12.5	18.8		
UPS-1A-9*75	7.5	9.0	2500	22.5	30.0	30.0		
UPS-1A-11*75		11.0		27.5	24.7	30.0		
UPS-1A-13*75		12.9		32.3	21.0	30.0		
UPS-1A-16*75		15.8		39.5	17.2	25.8		
UPS-1A-13*11K	11.0	12.9	2500	32.3	30.0	30.0		
UPS-1A-16*11K		15.8		39.5	25.1	30.0		

<Selection Precautions>
The Power Meister is a hydraulic system that directly drives the hydraulic cylinder by accelerating, decelerating, or stopping a motor. Because torque, separate from the motor torque needed to generate pressure, is needed to accelerate and decelerate, the maximum flow rate and maximum pressure may be lower than in the above table due to restrictions caused by the machinery's operating conditions.
When you select a product, you first need to clarify the operating cycle and load of your machinery (the hydraulic cylinders that the Power Meister will drive) in advance and then consult with us.
(Note 1) There is a limit to the operating pressure at maximum RPMs due to the low torque that is characteristic of this motor's output at high RPMs.
(Note 2) Theoretical flow under no load. Actual flow varies according to load pressure.
(Note 3) Rated pressure is rated torque of the motor, maximum operating pressure is pressure output at 150% torque. However, if this pressure exceeds 30 MPa, the maximum operating pressure of the hydraulic unit is below 30 MPa. Also, the maximum RPM and operating pressure may be limited depending on the acceleration, deceleration, and load conditions. Clarify your machinery's operating conditions first, and contact us for more information.
(Note 4) If the fluctuation in oil volume is greater than the allowed values an auxiliary tank can be connected to resolve this. Contact us for more information.
(Note 5) If your selection does not include a tank, then a separate oil tank is required. We can also manufacture oil tanks, so contact us for more information if you are interested.
(Note 6) The temperature of the hydraulic fluid is affected by many factors, such as the hydraulic unit's operating environment, operating methods, and load conditions. The customer must confirm the unit's actual continuous operating conditions. Also, long-term, continuous operation under pressure or high-frequency reciprocal operation may result in increased oil temperatures. Therefore, operating pressure limits or installation of a cooling system may be necessary. Contact us for more information.

Servo Controller

Model No.: EPD-PD3-10-D2-20

Power Supply/Consumption		24VDC ±15%/less than 10W	Separate power supply for sensor is needed
Operating Ambient Temperature/Humidity		0 to +55;/90% RH or less (no condensation)	
Controlled Parameters		Cylinder position, speed, pressure	Control mode automatic switching function available
Command Input	Speed Command	Analog voltage DC ±10V/maximum cylinder speed (*1), cylinder extended by positive voltage, cylinder retracted by negative voltage	(*1) Parameter setting
	Pressure Command	Analog voltage DC ±10V/maximum control pressure (*2), positive voltage adds pressure to head side, negative voltage adds pressure to rod side	(*2) Trimmer setting
	Position Command	Position selection contact signal (4 contacts), target position selected by bit pattern of 4 contacts, acceleration function generated in controller moves cylinder to target position	Target position, maximum speed, and acceleration set using internal parameters
Input Signals (Contact Signals)		Servo on, alarm reset, control mode external switching, start point search start, start point retraction end point LS, start point proximity LS	
Output Signals		Alarm, servo ready, control mode monitor, start point search end/in position (also output), pressure consistency	
Pressure Sensor Input		Analog voltage 0.5 to 4.5V, or 1 to 5V (2ch)	Uses pressure sensor with response time of 1 ms or less.
Position Sensor Input		90° phase difference biphasic pulse, start point pulse (line receiver input) or analog voltage 0 to 10V (only with -A option)	If using pulse output position sensor, start point search is necessary once after turning on the power Pulse output positioning sensor: Uses sensor with resolution of 1 μm or less Analog voltage output positioning sensor: Uses sensor with response time of 2 ms or less
Servo Amp I/F		Output: Motor revolve command (analog voltage ±10VDC), servo amp, servo alarm reset Input: Servo alarm, servo ready	
Control Panel		5 digits with symbol, 4 key input, selecter switch	data setting/display, test run function

- Connector for controller, pins are attached.
- When you use the spacer for the servo controller (Option:FZV-8676-02A-01), the installation dimension becomes the same as the old design [EPD-PD2-10(-A)-D2-10]and the height from the mounding surface to the connector becomes almost the same.

Servo Amp

Hydraulic Unit Model (UPS Series)	Motor Output kW	Compatible Servo Amp Model	Remarks
UPS-00A-**07	0.75	EPA-PD1-10-R075-20	Regenerative resistor built in
UPS-00A-**10	1.0	EPA-PD1-10-R100-20	
UPS-00A-**15	1.5	EPA-PD1-10-R150-20	
UPS-0A-**12	1.2	EPA-PD1-10-R120-20	
UPS-0A-**20	2.0	EPA-PD1-10-R200-20	
UPS-1A-***35	3.5	EPA-PD1-10-R350-20	
UPS-1A-***45	4.5	EPA-PD1-10-R450-20	
UPS-1A-***55	5.5	EPA-PD1-10-R550-20	
UPS-1A-***75	7.5	EPA-PD1-10-R750-20	External regenerative resistor included
UPS-1A-***11K	11.0	EPA-PD1-10-R11K-20	

Note 1) Power: 3-phase 200 to 230VAC, 50/60Hz
Note 2) Separate motor cable and encoder cable are needed to connect the servo motor on the hydraulic unit.
Note 3) An auxiliary external regenerative resistor may need to be added in some operating conditions if the built-in or external regenerative resistor is not sufficient.
For more details contact us with information about your operating conditions (load motion diagram).
Note 4) A cable connector is included.

Explanation of model No.

Hydraulic Unit

●UPS-00A

UPS – 00 A – 2 H 07 C 1 – 20

- Power Meister/integrated unit
- Pump size
  - 00: Variable pump capacity 2, 3, 4
- Mounting method
  - A: Foot type mounting
- Variable pump capacity
  - 2: 2.0cm³/rev
  - 3: 3.0cm³/rev
  - 4: 4.0cm³/rev
- Installation orientation (shape)
  - V: Vertical installation
  - H: Horizontal installation
  - L: No tanks
- Servo motor output
  - 07: 0.75kW
  - 10: 1.0kW
  - 15: 1.5kW
- Circuit option symbols
  - No symbol: No circuit options
  - C: With differential pressure valve
- Differential pressure valve pressure adjustment range
  - 1: 0 to 7MPa {0 to 71.4kgf/cm²}
- Design number

●UPS-0A/UPS-1A

UPS – 1 A – 9 V 75 C 1 S 4 – B HS – 20

- Power Meister/integrated unit
- Pump size
  - 0: Variable pump capacity 2, 4
  - 1: Variable pump capacity 5, 7, 9, 11, 13, 16
- Mounting method
  - A: Foot type mounting
- Variable pump capacity
  - 9: 9.0cm³/rev
  - (Note: see the Hydraulic unit specifications for other sizes)
- Installation orientation
  - V: Vertical installation
  - H: Horizontal installation
- Servo motor output
  - 75: 7.5kW
  - (Note: see the Hydraulic unit specifications for other sizes)
- Circuit option symbols
  - No symbol: No circuit options
  - C: With differential pressure valve
  - S: With shut-off valve
- Differential pressure valve pressure adjustment range
  - 1: 0.8 to 7MPa {8.2 to 71.4kgf/cm²}
- Shut-off valve power supply
  - 4: DC24V
- Tank capacity
  - (The tank capacity can be selected when using UPS-1A)
  - No symbol: 4.5Lit.
  - A: 3.0Lit.
  - B: 6.0Lit.
- Alarm switch options
  - No symbol: No options
  - H: With temperature switch
  - S: With float switch
- Design number

Cable Kit Specification

●Motor Cable Kit

JAQ – 03 ACM – R 150 – L – 20

- Cable length 03: 3m, 05: 5m, 10: 10m
- Motor cable
- Applicable motor type R: R2 series servo motor
- Applicable motor size
  - 075: 0.75kW, 100: 1.0kW, 150: 1.5kW
  - 120: 1.2kW, 200: 2.0kW, 350: 3.5kW
  - 450: 4.5kW, 550: 5.5kW, 750: 7.5kW, 11K: 11kW
- Connector shape
  - No symbol: Straight plug
  - L: L-shaped plug
  - (There is no symbol when the motor capacity is 0.75kW or 1.0kW.)
- Design number

●Fan Cable Kit

JAQ – 03 ACF – L – 20

- Cable length
  - 03: 3m, 05: 5m, 10: 10m
- Fan Cable Kit
- Connector shape
  - No symbol: Straight plug
  - L: L-shaped plug
- Design number

●Encoder Cable Kit

JAQ – 03 ACE – R A – L – 20

- Cable length 03: 3m, 05: 5m, 10: 10m
- Encoder cable
- Applicable motor type R: R2 series servo motor
- Connector types
  - A : Cannon connector (For 1.2kW to 11 kW)
  - B : Screw connector (For 0.75kW to 1.0 kW)
- Connector shape
  - No symbol: Straight plug
  - L: L-shaped plug
  - (There is no symbol when the connector type is B.)
- Design number

●Cable to computer Kit

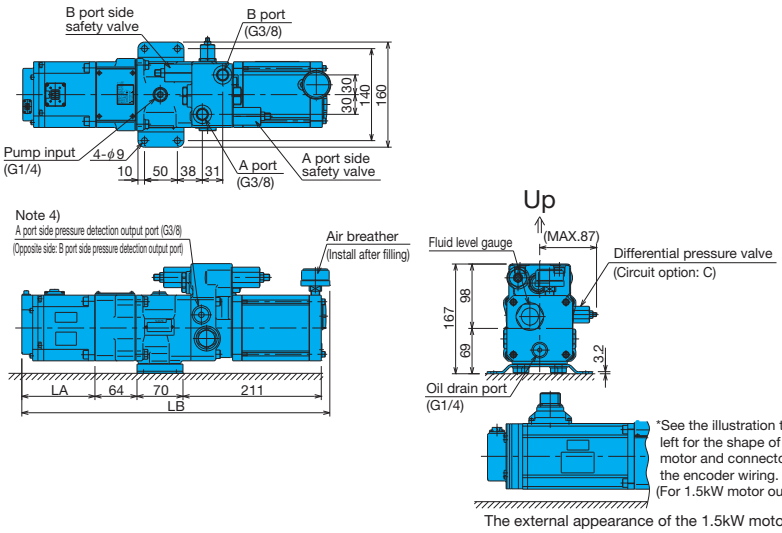
JAQ – 03 PMC – 8654A

- Cable length
  - 03: 3m
- Cable to computer

Installation Dimension Drawings

●UPS-00A Series Integrated Unit

UPS-00A-*H****(Horizontal Installation)

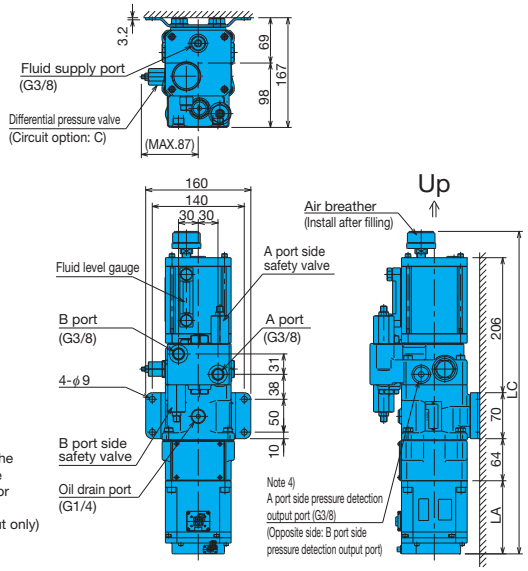


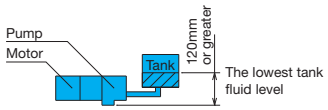
The external appearance of the 1.5kW motor

UPS Model No.	LA	LB	LC	Approximate Weight
UPS-00A-*$^{V}_{H}$07	111	469	491	16kg
UPS-00A-*$^{V}_{H}$10	128	486	508	17kg
UPS-00A-*$^{V}_{H}$15	224	582	604	20kg

Note 1) Dimensions in (parentheses) and two-dot chain lines are for circuit options C.
Note 2) The air breather is included in the unit as a separate item. After filling the tank with oil, install the air breather.
Note 3) Install the unit in a mounting orientation prescribed by Model No. (H: Horizontal installation, V: Vertical installation)
Note 4) The B port side pressure detection output port can only be used when there are no "C" circuit options.

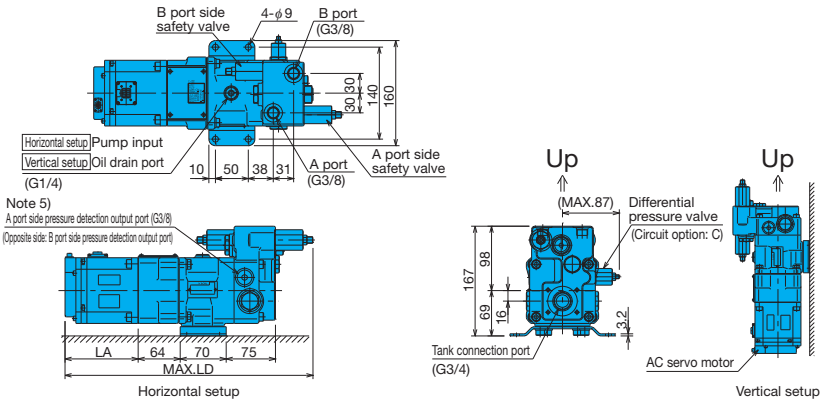
UPS-00A-*V****(Vertical Installation)





Mounting layout for the oil tank (Horizontal setup)

UPS-00A-*L****(No tanks)



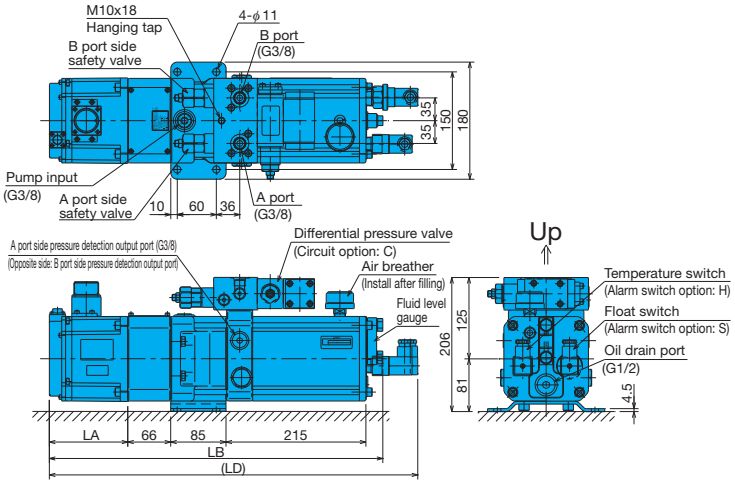
UPS Model No.	LA	LD	Approximate Weight
UPS-00A-*L07	111	377	14kg
UPS-00A-*L10	128	394	15kg
UPS-00A-*L15	224	490	18kg

Note 1) Dimensions in (parentheses) and two-dot chain lines are for circuit options C.
Note 2) An Oil tank will be required separately. We can also produce oil tanks. Contact us for requests for oil tanks.
Note 3) Install horizontally or vertically. For vertical installation, install the servo motor facing down.
Note 4) When installing the oil tank horizontally, make sure the lowest fluid level position during the cylinder operation is always 120mm or greater from the bottom of the unit. (See illustration on the upper right: Mounting layout for the oil tank)
Note 5) The B port side pressure detection output port can only be used when there are no "C" circuit options.

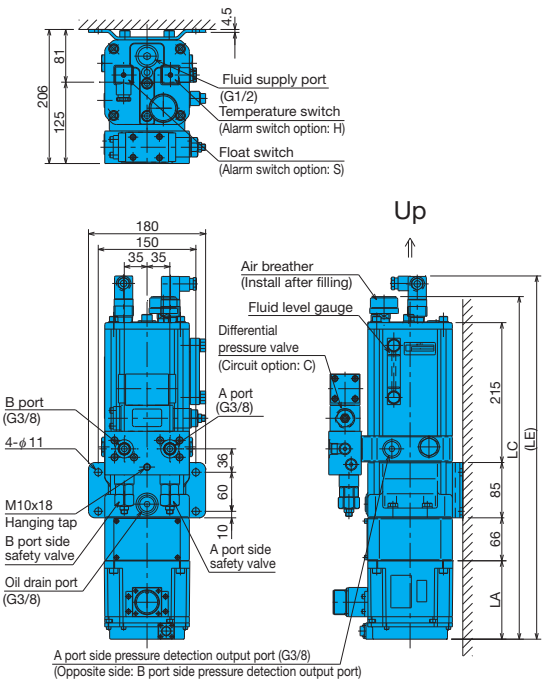
● UPS-0A Series Integrated Unit

Circuit options: S (shut off valve) none

UPS-0A-*H****(Horizontal Installation)



UPS-0A-*V****(Vertical Installation)

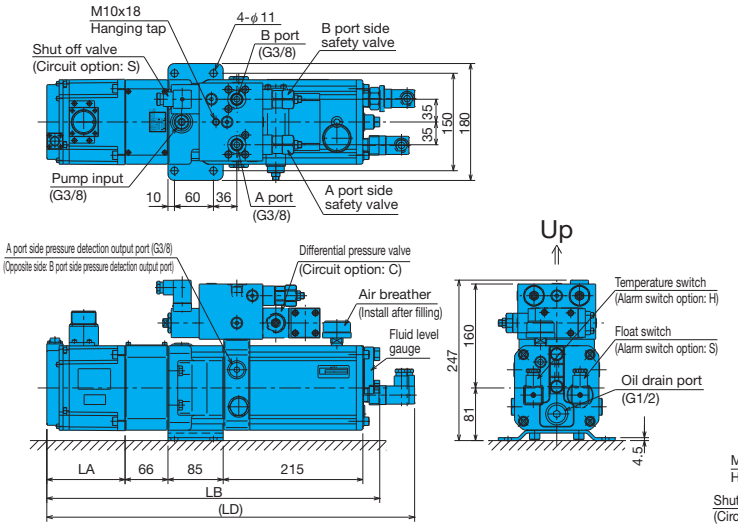


UPS Model No.	LA	LB	LC	LD	LE	Approximate Weight Note 2)
UPS-0A-*$^{V}_{H}$12	121	513	527	567	559	30kg
UPS-0A-*$^{V}_{H}$20	160	552	566	606	598	33kg

Note 1) Dimensions in (parentheses) and two-dot chain lines are for circuit options C and alarm switch options H and S.
Note 2) Does not include circuit or alarm switch options or weight of hydraulic fluid.
Note 3) The air breather is included in the unit as a separate item. After filling the tank with oil, install the air breather.
Note 4) Install the unit in a mounting orientation prescribed by Model No. (H: Horizontal installation, V: Vertical installation)

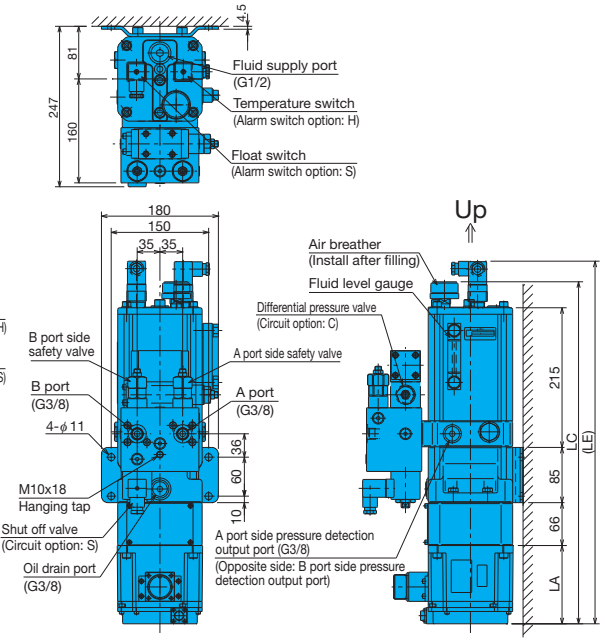
Circuit options: S (shut off valve) attached

UPS-0A-*H****S4(Horizontal Installation)



*The dimension table and Notes 1 to 4 are in common with when there is no circuit option:S (Shut off valve)

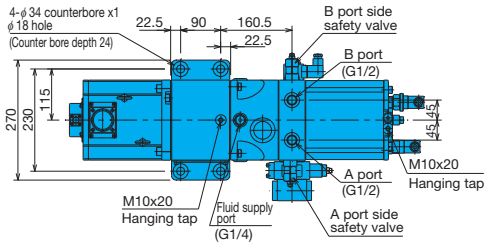
UPS-0A-*V****S4(Vertical Installation)

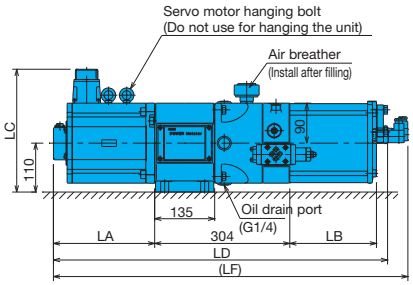


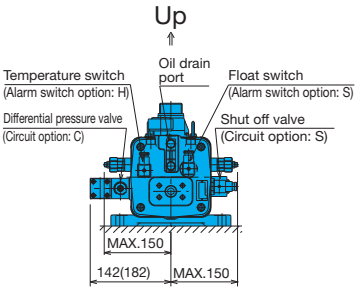
L Hydraulic Unit

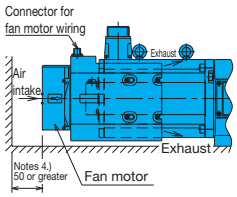
●UPS-1A Series Integrated Unit

UPS-1A-**H****(Horizontal Installation)



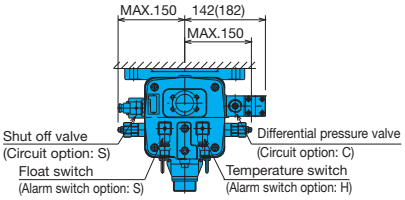


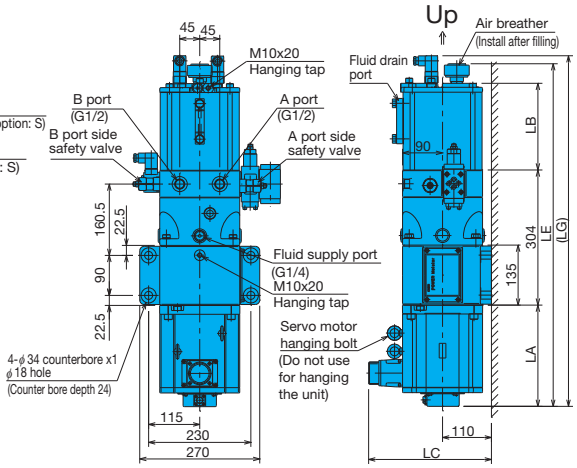




The external appearance of a 11kW motor
*For 11kW motor output only, the fan motor is provided.

UPS-1A-**V****(Vertical Installation)

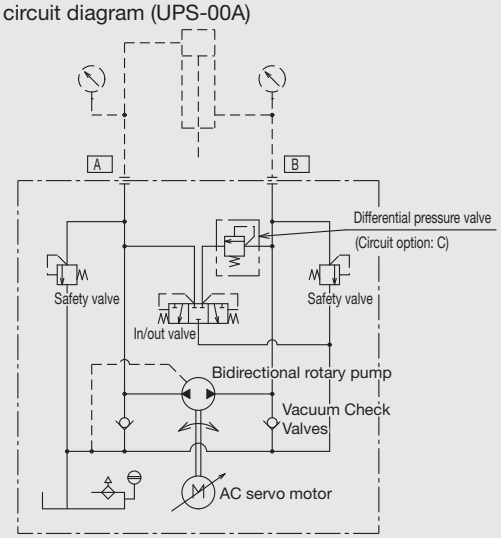




UPS Model No.	LA	LB	LC	LD	LE	LF	LG	Approximate Weight (Note 2)
UPS-1A-** V/H 35****-A	159	120	254	608	627	654	645	60kg
UPS-1A-** V/H 35****		195		683	702	729	720	61kg
UPS-1A-** V/H 35****-B		275		763	782	809	800	63kg
UPS-1A-** V/H 45****-A	176	120	254	625	644	671	662	64kg
UPS-1A-** V/H 45****		195		700	719	746	737	65kg
UPS-1A-** V/H 45****-B		275		780	799	826	817	67kg
UPS-1A-** V/H 55****-A	228	120	276	677	696	723	714	70kg
UPS-1A-** V/H 55****		195		752	771	798	789	71kg
UPS-1A-** V/H 55****-B		275		832	851	878	869	73kg
UPS-1A-** V/H 75****-A	273	120	276	722	741	768	759	78kg
UPS-1A-** V/H 75****		195		797	816	843	834	79kg
UPS-1A-** V/H 75****-B		275		877	896	923	914	81kg
UPS-1A-** V/H 11K****-A	395	120	276	844	863	890	881	85kg
UPS-1A-** V/H 11K****		195		919	938	965	956	86kg
UPS-1A-** V/H 11K****-B		275		999	1018	1045	1036	88kg

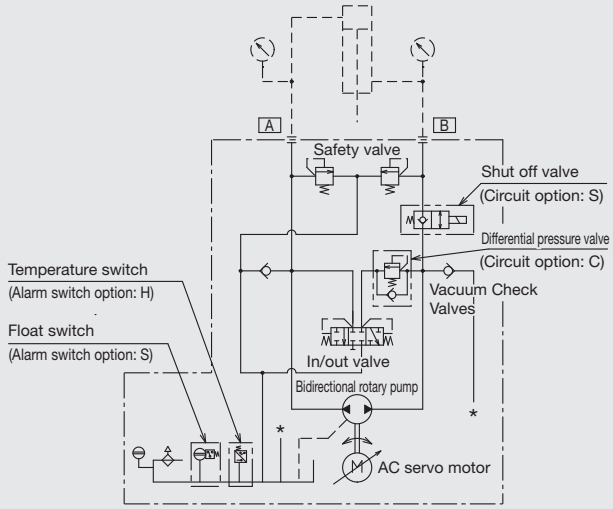
Note 1) Dimensions in (parentheses) and two-dot chain lines are for circuit options C and S and alarm switch options H and S.
Note 2) Does not include circuit or alarm switch options or weight of hydraulic fluid.
Note 3) The air breather is included in the unit as a separate item. After filling the tank with oil, install the air breather.
Note 4) For 11kW motor output only, the fan motor is provided. When installing the unit, provide space of 50mm or greater for air intake of the fan motor.
Note 5) Install the unit in a mounting orientation prescribed by Model No. (H: Horizontal installation, V: Vertical installation)

Hydraulic circuit diagram (UPS-00A)



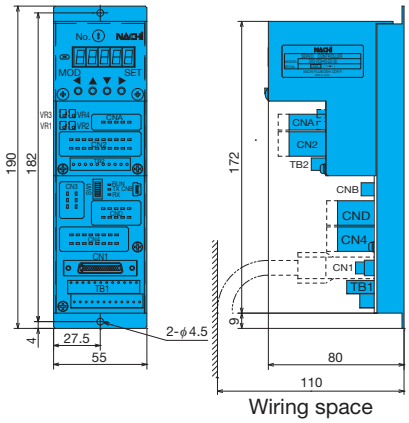
When maintaining the position of the cylinder during servo off is required (for example when preventing the cylinder from self-weight falling), additional circuits (for example shut-off valve) will be required. Contact us for more information.

Hydraulic circuit diagram (UPS-0A, 1A)



●Servo Controller

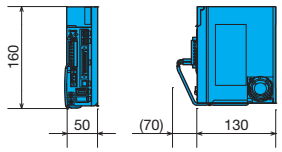
EPD-PD3-10-D2-20



Approximate Weight: 0.5kg

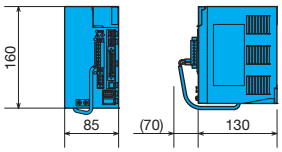
●Servo Amp

0.75kW
1.0kW
Motor



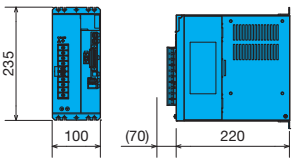
Approximate Weight: 1.0kg

1.2kW
1.5kW
Motor



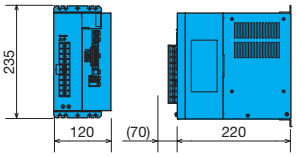
Approximate Weight: 1.7kg

2.0kW Motor



Approximate Weight: 5.0kg

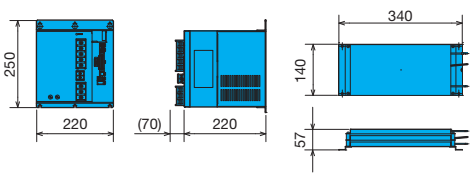
3.5kW
4.5kW
5.5kW
Motor



Approximate Weight: 5.3kg

7.5kW
11kW
Motor

Regenerative resistor

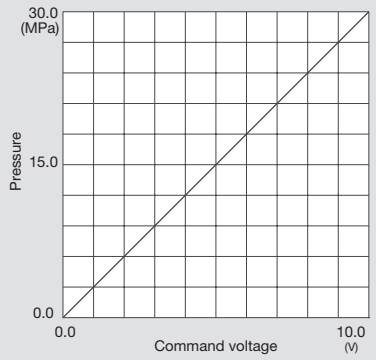


Approximate Weight: 9.6kg

Approximate Weight: 3.0kg

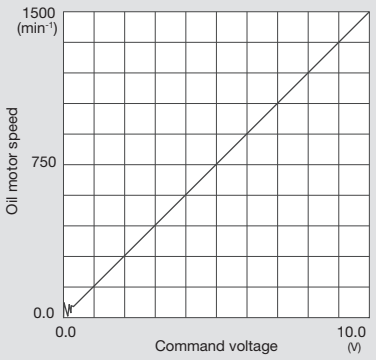
Performance Characteristics

● Pressure Command Voltage - Pressure Characteristics (0 to 100%)



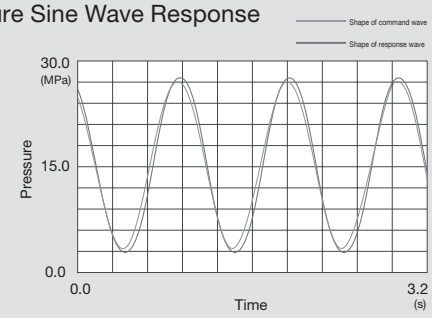
Command 10V for 30MPa
0V → 10V → 0V command
From low pressure 0.15MPa
To high pressure 30MPa

● Speed Command Voltage - Speed Characteristics (0 to 100%)



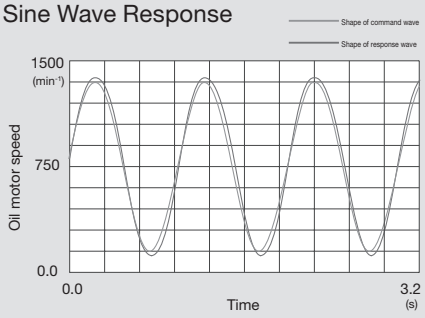
Command 10V to 1500min-1
0V → 10V → 0V command
(If oil motor is running as actuator)
From low speed 50min-1
To high-speed 1500min-1

● Pressure Sine Wave Response



Command 1Hz sine wave, amplitude 10 to 90%

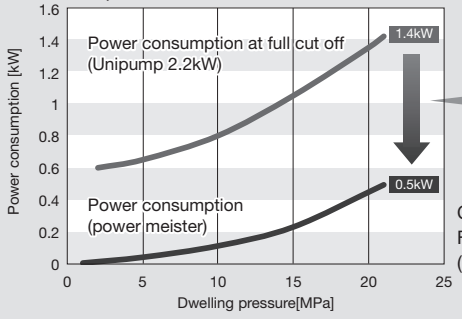
● Speed Sine Wave Response



Command 1Hz sine wave, amplitude 10 to 90%
(If oil motor is running as actuator)

● Dwelling Pressure - Power Consumption Characteristics

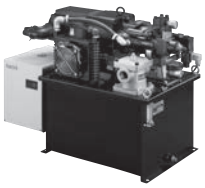
Hydraulic unit (UPS)
Pump 4.0cm³/rev, Motor 2.0kW



Energy savings
0.9kW (Approximately 65%)
At 21 MPa dwelling pressure

Control equipment: Unipump 2.2kW (variable piston pump)
Full cut off power consumption (N=1800min-1)
(Note) Characteristics vary depending on operating conditions.

Power Fit



❖ **Power fit is an energy-saving hydraulic unit that operates the variable piston pump with two capacities using an AC servo motor.**

Features

①Energy-saving, low-noise

Energy-savings and low noise are achieved by rotating the pump for the required number of times only when it is necessary by the AC servo motor .

②High pressure, large flow rate

By using the variable piston pump with two capacities, the two pump capacities switch between the low pressure large flow rate and high pressure small flow rate to control.

③Easy control of multi-stage pressure and flow rate

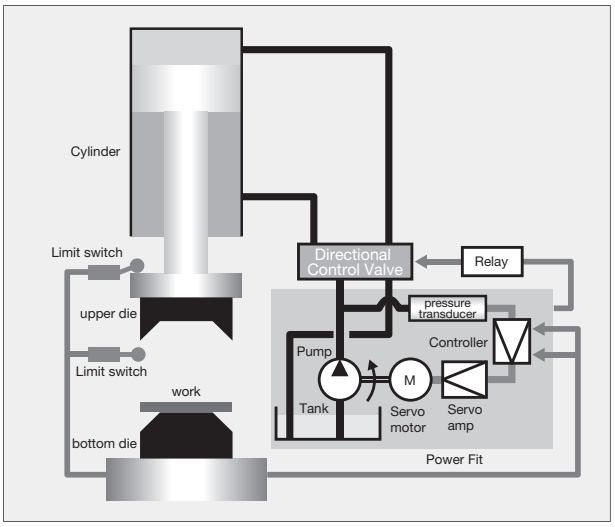
By using external signals, 16 patterns of changeover controls are possible. The pressure and flow rate can be freely set with the operation panel inside the control box.

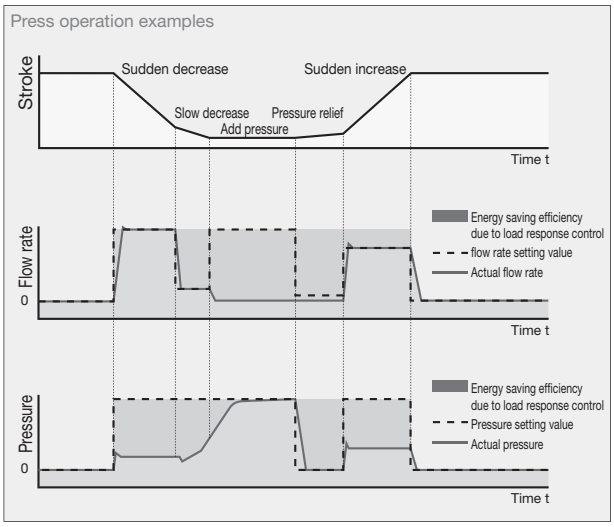
④Compact

By making the Power Fit energy-saving, the oil quantity will be reduced.

Overview

- Power Fit can be used to replace the existing hydraulic unit.
- The operating direction of the cylinder can be switched by the external directional control valve.
- Cylinder speed (flow rate) and load (pressure) can be controlled freely by the controller. (Valves for controlling speed and pressure are unnecessary.)
- The controller automatically switches the flow rate control and pressure control according to the loaded condition.
- External signals (Open Collector signals) can be output in conjunction with the flow rate and pressure command. The directional control valve can be switched in conjunction with the commands.





Specifications

Model No.		NPQ-60*-55PV 45N3A2-6161B	NPQ-80*-75PZ 70N4A2-6161B	NPQ-100-11KPZ 70N4A2-6161B	NPQ-120-15KPZ 70N4A2-6161B
Motor capacity kW		5.5	7.5	11.0	15.0
Pump		PVS-2B-45	PZS-3B-70		
Max. pump capacity	cm^3/rev	45	70		
Pump adjustment range high volume	cm^3/rev	20 to 45(Note 1) (Factory default : 45)	5 to 70(Note 1) (Factory default : 70)		
Pump adjustment range small volume	cm^3/rev	3 to 24(Note 1) (Factory default : 12)	5 to 40(Note 1) (Factory default : 17)		
Maximum RPM	min^{-1}	2000			
Maximum flow rate	ℓ/min	90	140		
Pressure Rating	MPa	21			
Maximum Working Pressure	MPa	25	28		
Tank Size	Lit.	60	80	100	120
Power supply	Main circuit	3φ AC200 to 220V, 50/60Hz			
	control circuit	1φ AC200 to 220V, 50/60Hz			
Power Supply Capacity	KVA	8.4	12.6	15.7	21.4
Ambient Temperature/Humidity		10 to 35°C/20 to 90%PH(non-condensation)			
Temperature Range of Hydraulic Fluid		10 to 60°C			
Recommended Hydraulic Fluid		Standard mineral-based hydraulic fluid (equivalent to ISO VG46s)			

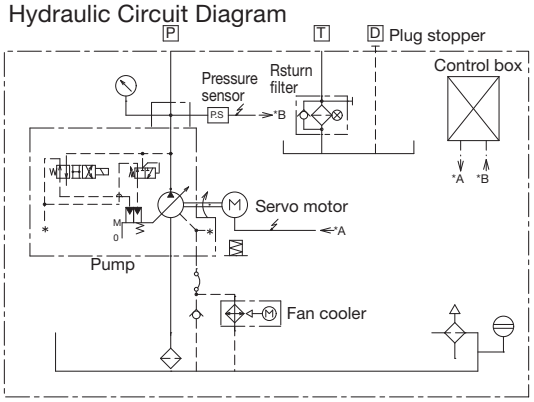
Note 1) The adjustment range of the pump high volume changes according to the setting of the small volume. For details see the user documentation.

Explanation of model No.

NPQ—80 E—75 PZ 70 N 4 A 2——6161B**

- Design number
- Option (Note 1)
- Solenoid power supply 2:AC200V
- Cutoff pressure adjustment range 3:3 to 25MPa/4:2 to 28MPa
- Variable control mechanism NA:Control two capacities
- Max. pump capacity 45:45cm^3/rev(PVS) 70:70cm^3/rev(PZS)
- Pump type PV:PVS/PZ:PZS
- Motor Capacity 55:5.5kW/75:7.5kW 11K:11.0kW/15K:15.0kW
- Control box E : Equipped on the hydraulic unit No symbol: none (Set inside the control panel, or separately positioned control box)
- Tank capacity 60/80/100/120Lit.
- Power Fit

Hydraulic Circuit Diagram

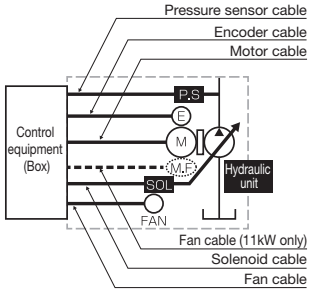


Note 1) G:Fluid Level Gauge With Guard, H:With Thermostat, M:With Microseparator, P:With Oil Pan
S:Float Switch (Low fluid level detection), T:Fluid Level Gauge With Temperature Gauge (with guard)
W:Self Leak Test (The return filter is standard equipment)

Hydraulic unit (Control box non-equipped type), Control equipment, Cable Kit Combinations List

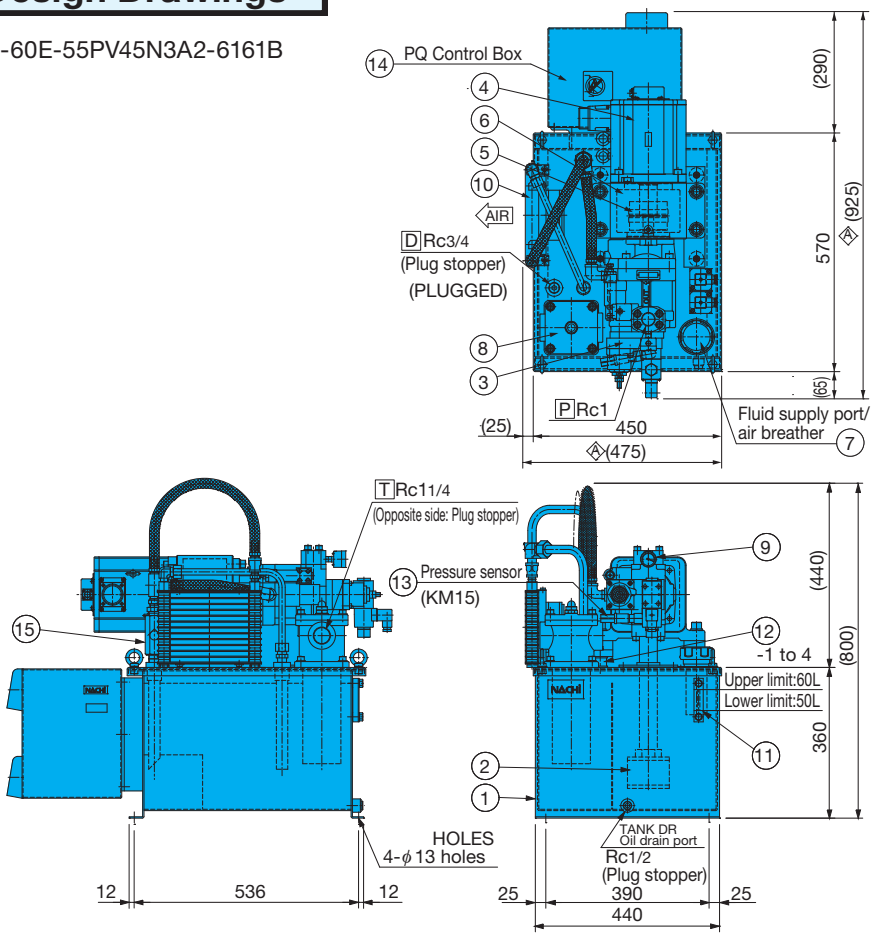
Hydraulic unit (Control box non-equipped type) Model No. (PQ Bellmount pump Model No.)	Motor capacity (kW)	Control equipment Select from the following ①PQ Amplifier unit ②Separately positioned control box	Cable Kit (Note 1) (Select from 3m or 5m)
NPQ-60-55PV45N3A2-6161B (UPQ-2A-45N3A2-55PV-6331B)	5.5	① EPQ-55R-8671A	JAQ-03PQR-55-8682(3m)
		② EPQ-B55R-8685A	JAQ-05PQR-55-8682(5m)
NPQ-80-75PZ70N4A2-6161B (UPQ-3A-70N4A2-75PZ-6331B)	7.5	① EPQ-75R-8671A	JAQ-03PQR-75-8682(3m)
		② EPQ-B75R-8685A	JAQ-05PQR-75-8682(5m)
NPQ-100-11KPZ70N4A2-6161B (UPQ-3A-70N4A2-11KPZ-6331B)	11.0	① EPQ-11KR-8671A	JAQ-03PQR-11K-8682(3m)
		② EPQ-B11KR-8685A	JAQ-05PQR-11K-8682(5m)
NPQ-120-15KPZ70N4A2-6161B (UPQ-3A-70N4A2-15KPZ-6331B)	15.0	① EPQ-15KR-8671A	JAQ-03PQR-15K-8682(3m)
		② EPQ-B15KR-8685A	JAQ-05PQR-15K-8682(5m)

Note 1) Cable Kit details



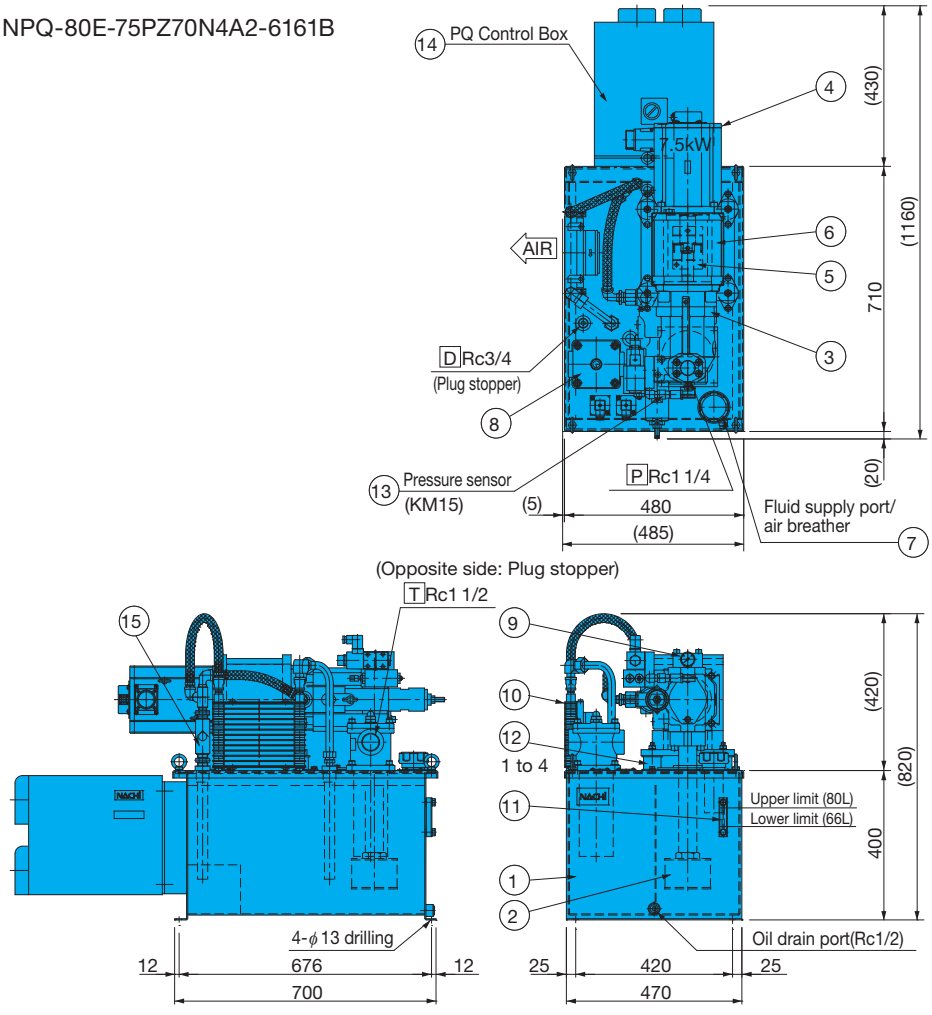
Design Drawings

NPQ-60E-55PV45N3A2-6161B



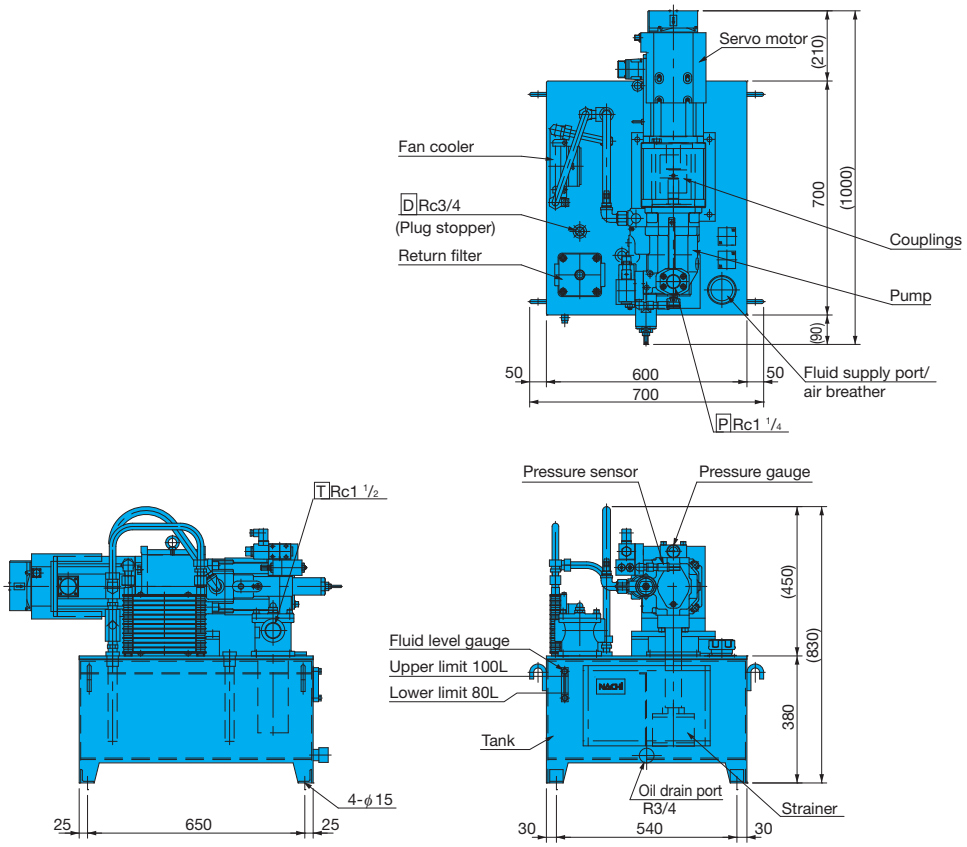
Part No.	Part Name	Q'ty
1	Tank	1
2	Strainer	1
3	Uni-pump	1
4	Servo motor	1
5	Coupling	1
6	Bracket	1
7	Fluid supply port/air breather	1
8	Return filter	1
9	Pressure gauge	1
10	Fan cooler	1
11	Fluid level gauge	1
12	Anti-vibration rubber	4
13	Pressure sensor	1
14	Servo control box	1
15	Check valve	1

NPQ-80E-75PZ70N4A2-6161B

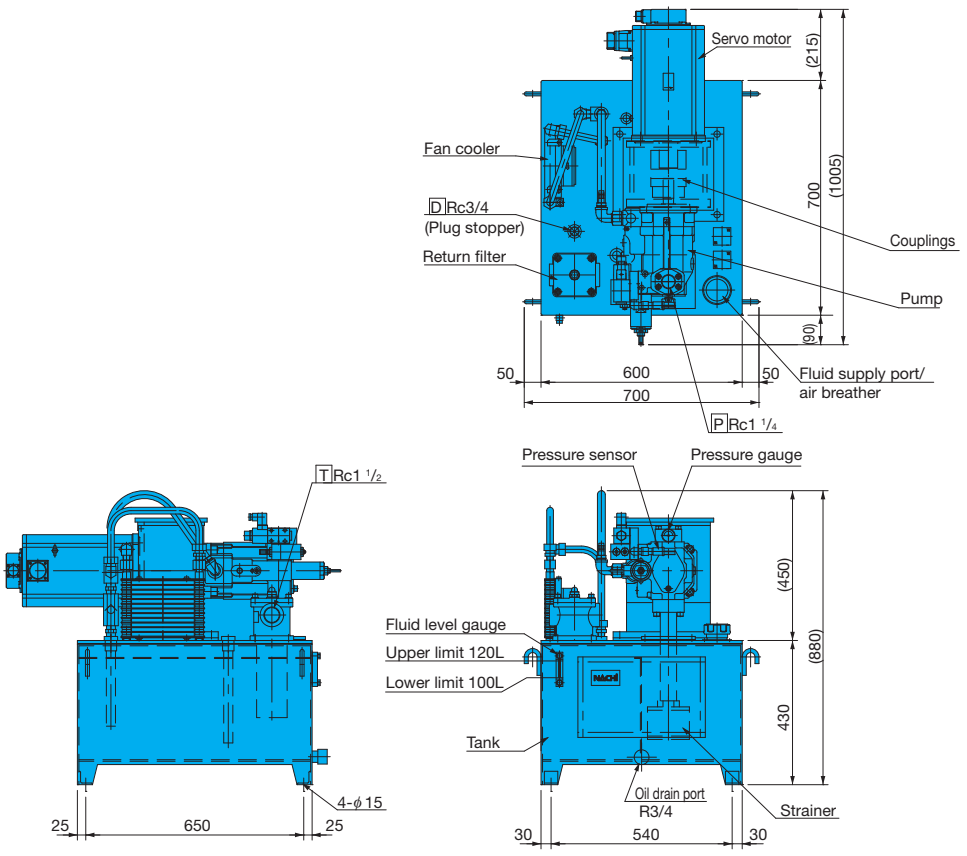


Part No.	Part Name	Q'ty
1	Tank	1
2	strainer	1
3	Uni-pump	1
4	Servo motor	1
5	Coupling	1
6	Bracket	1
7	Fluid supply port/air breather	1
8	Return filter	1
9	Pressure gauge	1
10	Fan cooler	1
11	Fluid level gauge	1
12	Anti-vibration rubber	4
13	Pressure sensor	1
14	PQ Control Box	1
15	Check valve	1

NPQ-100-11KPZ70N4A2-6161B



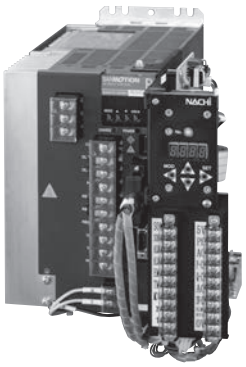
NPQ-120-15KPZ70N4A2-6161B

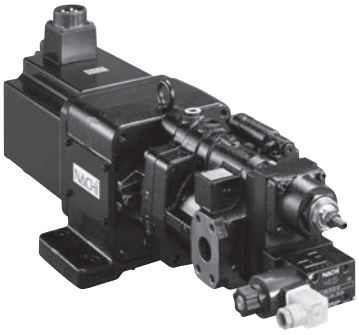


PQ Bellmount pump, PQ Amplifier unit

PQ Bellmount pumps, PQ Amplifier units of Power Fit are also available.
Please contact our sales agent.

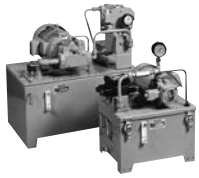
PQ Amplifier unit for setting inside the control panel





PQ Bellmount pump made by combining a pump and servo motor.

Hydraulic Accessories



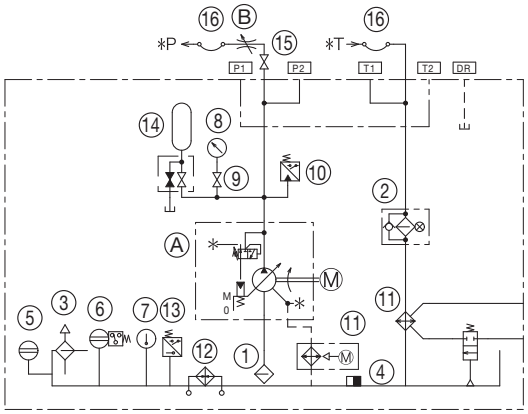
Nachi hydraulic accessories are made possible through a long history of accumulated know-how, and provide you with the tools you need to configure the hydraulic circuits and systems you need.

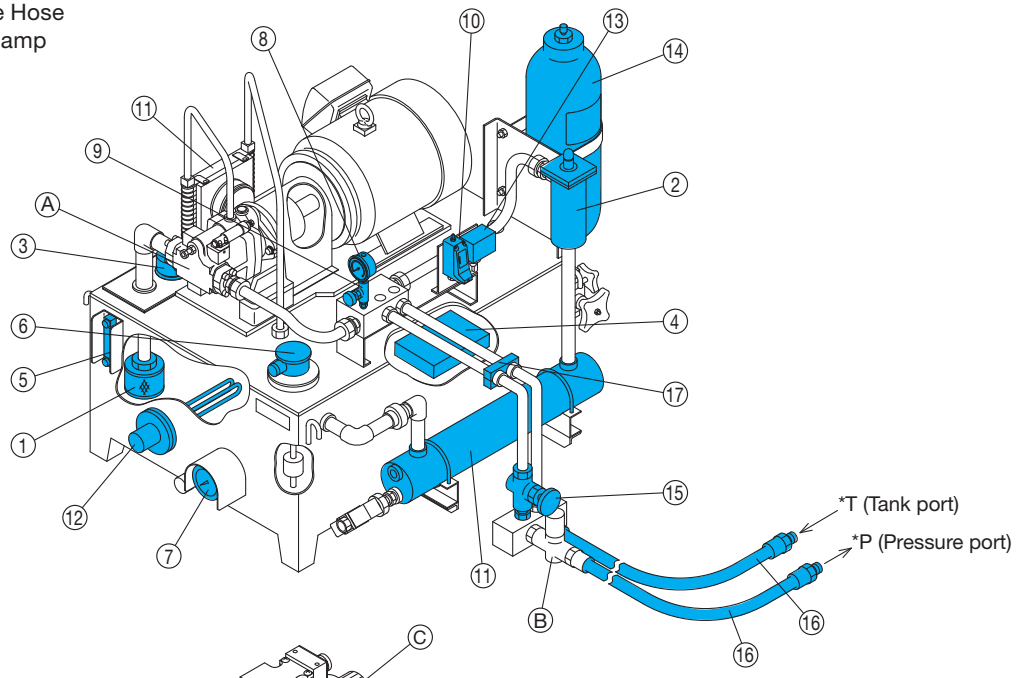
Nachi accessories not only maximize the performance of your hydraulic system, they also provide you with the versatility to configure the simplest, most economical solution for virtually any type of system imaginable.

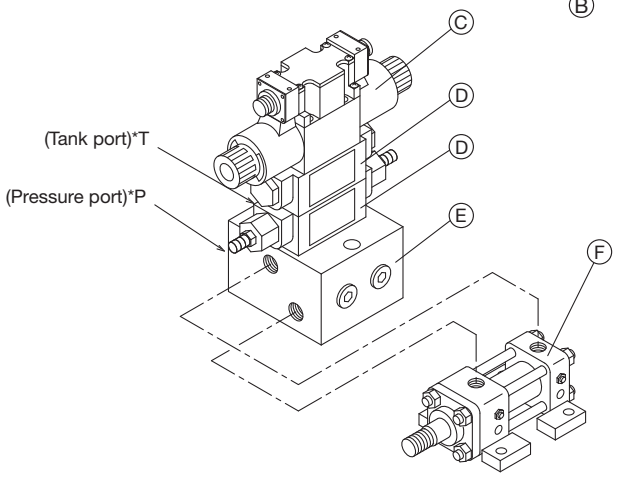
Use the illustration below to select the Nachi hydraulic accessories that best suit your needs.

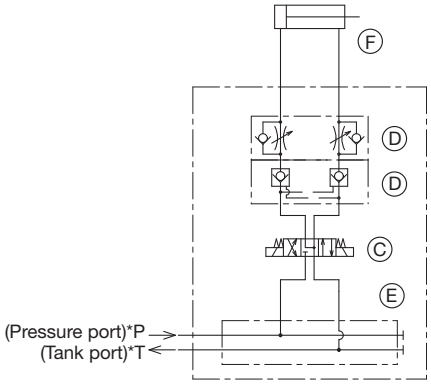
①Strainer
②Filter
③Air Breather
④Magnet Separator
⑤Fluid Level Gauge
⑥Fluid Switch
⑦Temperature Gauge
⑧Pressure Gauge
⑨Gauge Valve
⑩Pressure Switch
⑪Oil Cooler
⑫Heater
⑬Thermostat
⑭Accumulator
⑮Valves
⑯Frexible Hose
⑰Multi Clamp

Ⓐ Pump
Ⓑ Throttle Valve
Ⓒ Solenoid Valve
Ⓓ Control Valve
Ⓔ Base Block
Ⓕ Hydraulic Cylinder









- For detailed specifications and dimensions of hydraulic accessories, see the "Hydraulic Accessories Catalog."
- Product not covered by ISO9001 registration

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 tasks as lubrication, rust prevention, sealing, and cooling. Because of the vital contributions hydraulic operating fluid makes to the operation, efficiency, and reliability of hydraulic equipment, it is important to exercise sufficient care when selecting the correct type for your needs and when storing fluid.

●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 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: watercontaining 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 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 findout if a fire-resistant hydraulic fluid can be used with a particular device.

Fire-resistant Hydraulic Fluid Seal Material Compatibility

Fluid / Sea Material	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 / Paint	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 Compa-tibility (△indicates partial problem.)

Fluid / Metal	Water In Oil Emulsion	Water-glycol	Phosphate Ester	Fatty Acid Ester
Aluminum	○	×	△	○
Cast Iron	○	○	○	○
Steel	○	○	○	○
Brass	○	○	○	○
Copper	△	○	○	○
Magnesium	○	×	△	○
Cadmium	△	×	△	△
Zinc	△	×	○	△

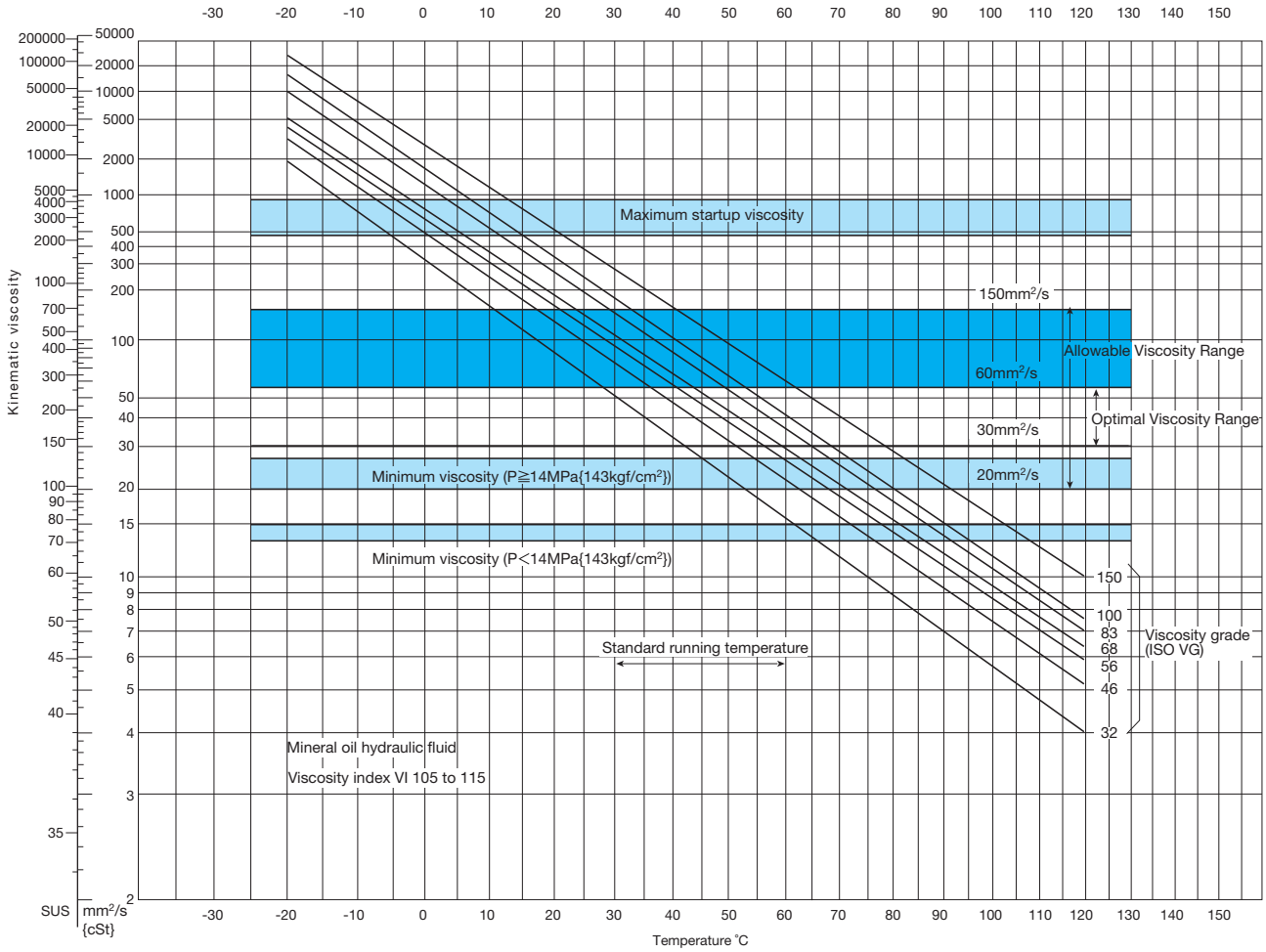
Note) The △symbol indicates items that may have problems. For details, consult your agent or a hydraulic operating fluid manufacturer.
○symbol indicates items that may be used. ×symbol indicates not ok.

●General Properties of Hydraulic Fluid (Typical)

Item / Type		Oil-based operating fluid	Water-glycol	Water In Oil Emulsion	Phosphate Ester	Fatty Acid Ester
Specific Gravity 15/4°C		0.876	1.072	0.890	1.152	0.900
Fire Point °C		242	None	None	262	257
Viscosity mm^2/s	40°C	45.8	45.5	67.9	36.4	43.6
	100°C	6.86	9.09	12.0	4.72	8.00
Viscosity index		105	206	146	110	165
Pour Point °C		–30	–40	–12.5	–20	–10 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/mℓ
Larger than 6μm (C) 300 particles/mℓ
Larger than 14μm (C) 40 particles/mℓ

The cleanliness code looks like: 17/15/12

Allowable Number of Particles in Hydraulic Fluid–NAS-1638 (100mℓ)

Particle Size / Class	5 to 15μm	15 to 25μm	25 to 50μm	50 to 100 μm	100 μm or larger	Device	Filter	Remarks
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 0.8μm to absolute 3μm	
7	32,000	5,700	1,012	180	32	↕Electric–Hydraulic Servo Device		↕Clean oil
8	64,000	11,400	2,025	360	64			↕NC hydraulic fluid
9	128,000	22,800	4,050	720	128	↕Electric–Hydraulic Pulse Motor	← From nominal 10μm to absolute 40μm	↕In drum General hydraulic fluid (new)
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 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

Water-Glycol Type Operating Fluid Hydraulic Pump Specifications

Use the following tables to select the appropriate type of pump when using a water-glycol type hydraulic operating fluid.

1. PVS, PZS Series Variable Piston Pump

W/G Pump Type	Rated Voltage MPa{kgf/cm²}	Maximum Working Pressure MPa{kgf/cm²}	Maximum Revolution Speed min⁻¹	Suction Pressure MPa{kgf/cm²}
W-PVS-0B - 8N*-30	14 {143}	14 {143}	1200	-0.01{-0.1} or larger
W-PVS-1B - 16N*-12 - 22N*-	14 {143} 10.5{107}	14 {143} 10.5{107}	1200	-0.01{-0.1} or larger
W-PVS-2B - 35N*-12 - 45N*-	14 {143} 10.5{107}	14 {143} 10.5{107}	1200	-0.01{-0.1} or larger
W-PZS-3B - 70N*-10	14 {143}	14 {143}	1200	-0.01{-0.1} or larger
W-PZS-4B -100N*-10	14 {143}	14 {143}	1200	-0.01{-0.1} or larger
W-PZS-5B -130N*-10	14 {143}	14 {143}	1200	-0.01{-0.1} or larger

Note 1) Keep oil temperature between 10 and 50°C when operating.
Note 2) We recommend periodic maintenance of the PVS, PZS Series Variable Piston Pump.
Water- or glycol-based hydraulic operating fluids lack in lubricity compared to general mineral oils, which makes the life of the pump (the life of the rolling-element bearing) short.

2. VDR22 Design Series Variable Vane Pump

W/G Pump Type	Rated Voltage MPa{kgf/cm²}	Maximum Working Pressure MPa{kgf/cm²}	Maximum Revolution Speed min⁻¹	Suction Pressure MPa{kgf/cm²}
W-VDR-1*-1A2-22 -1A3- -2A2- -2A3-	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	1800	-0.015 to +0.03 {-0.15 to +0.3}

Note) Keep oil temperature between 15 and 55°C when operating.

3. VDC Series Variable Vane Pump

W/G Pump Type	Rated Voltage MPa{kgf/cm²}	Maximum Working Pressure MPa{kgf/cm²}	Maximum Revolution Speed min⁻¹	Suction Pressure MPa{kgf/cm²}
W-VDC-1*-1A2-20 -1A3- -2A2- -2A3-	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	1800	-0.015 to +0.03 {-0.15 to +0.3}
W-VDC-2*-1A2-20 -1A3- -2A2- -2A3-	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	1800	-0.015 to +0.03 {-0.15 to +0.3}
W-VDC-3*-1A2-20 -1A3-	3.5{35.7} 7 {71.4}	3.5{35.7} 7 {71.4}	1800	-0.015 to +0.03 {-0.15 to +0.3}

Note) Keep oil temperature between 15 and 55°C when operating.

4. IPH Series IP Pump

W/G Pump Type	Rated Voltage MPa{kgf/cm²}	Maximum Working Pressure MPa{kgf/cm²}	Maximum Revolution Speed min⁻¹	Suction Pressure MPa{kgf/cm²}
W-IPH-2*-*-11	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}
W-IPH-3*-*-20	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}
W-IPH-4*-*-20	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}
W-IPH-5*-*-21(11)	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}
W-IPH-6*-*-21(11)	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}

Note) • Use the air bleed off valve to bleed air during test running.
CAB-T02-*-11 maximum operating pressure 25MPa (255kgf/cm²)
• Keep oil temperature between 15 and 55°C when operating.

Water-Glycol Type Operating Fluid Hydraulic Valve Specifications

Use the following tables to select the appropriate type of hydraulic valves when using a water-glycol type hydraulic operating fluid.

1. Pressure Control Valves

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Relief valve	R-⊛03-*-12 R-⊛06-*-20 R-⊛10-*-20	21MPa{214kgf/cm²}	(Note) 30(20)ℓ/min 150 340
Relief valve	RI-G03-*-20 RI-G06-*-20	21MPa{214kgf/cm²}	(Note) 120(30)ℓ/min 260
Remote Control Relief Valve	RCD-T02-*-11 RC-T02-*-12 RC-G02-*-21	21MPa{214kgf/cm²}	15ℓ/min 2 2
Solenoid Controlled Relief Valve	RSA-⊛03-***-**-15 RSA-⊛06-***-**-23 RSA-⊛00-***-**-23 RSS-⊛03-***-**-15 RSS-⊛06-***-**-23 RSS-⊛10-***-**-23	21MPa{214kgf/cm²}	30ℓ/min 150 340 30 150 340
Solenoid Controlled Relief Valve	RIS-G03-***-**-21 RIS-G06-***-**-21	21MPa{214kgf/cm²}	120ℓ/min 260
Pressure Reducing (and Check) Valve	W-(C)G-⊛03-*-21 W-(C)G-⊛06-*-21 W-(C)G-⊛10-*-21	21MPa{214kgf/cm²}	(Note) 40(20)ℓ/min 100 250
Balancing Valve	GR-G01-A*-20 GR-G03-A*(B)-20	14MPa{143kgf/cm²}	20ℓ/min 40
Pressure Control (and Check) Valve	(C)Q-⊛03-**-21 (C)Q-⊛06-**-21 (C)Q-⊛10-**-21	21MPa{214kgf/cm²}	40ℓ/min 100 250

Note) Flow rate values in parentheses are for when the pressure adjusting range field indicated by the asterisk (*) is A, B, or C.

2. Direction Control Valves

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Right Angle Check Valve	CA-⊛03-*-20 CA-⊛06-*-20 CA-⊛10-*-20	21MPa{214kgf/cm²}	40ℓ/min 110 320
In-line Check Valve	CN-T03-*-11 CN-T06-*-11 CN-T10-*-11	21MPa{214kgf/cm²}	30ℓ/min 75 190
Pilot Check Valve	CP-⊛03-*-20 CP-⊛06-*-20 CP-⊛10-*-20	21MPa{214kgf/cm²}	40ℓ/min 110 320
DMA Type Manual Valve	W-DMA-G01-***-20 W-DMA-G03-***-20	21MPa{214kgf/cm²}	35ℓ/min 65
SA Wet Type Solenoid Valve	SA-G01-**-**-31 SA-G03-**-**(J)21 DSA-G04-**-**-22 DSA-G06-**-**-22	28MPa{286kgf/cm²}	Note1) 85ℓ/min 250 500
SS Wet Type Solenoid Valve	SS-G01-**-**-31 SS-G03-**-**-(J)22 DSS-G04-**-**-22 DSS-G06-**-**-22	28MPa{286kgf/cm²}	Note1) 85ℓ/min 110 250 500
	SS-G01-**-FR-**-31 SS-G03-**-FR-**-(J)22	21MPa{214kgf/cm²}	Note1) 45ℓ/min 65
Fine Solenoid Valve	W-SF-G01-**-**-10	14MPa{143kgf/cm²}	Note1) 34ℓ/min
Non-leak Type Solenoid Valve	SNH-G01-**-**-11 SNH-G03-**-**-10 SNH-G04-**-**-10 SNH-G06-**-**-10	31.5MPa{321kgf/cm²}	Note1) 17ℓ/min 34 50 85
Gauge cock	K2-⊛02-10 K2-⊛03/04-10	21MPa{214kgf/cm²} 35MPa{357kgf/cm²}	— —

Note) 1.Maximum flow rate depends on the flow path. Use a maximum flow rate that is within 85% of the standard valve.
2.Wet type solenoid valves other than those noted above cannot be used with W/G.

3. Flow Control Valves

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Throttle (and Check) Valve	(C)FR-⊙03-10 (C)FR-⊙06-10 (C)FR-⊙10-10	21MPa{214kgf/cm²}	30ℓ/min 75 190
FT Type Flow Control (and Check) Valve	(C)FT-G02-**-22 FT-G03-**-22	21MPa{214kgf/cm²}	(Note)
F Type Flow Control (and Check) Valve	(C)F-G06-170-20 (C)F-G10-373-20	21MPa{214kgf/cm²}	
TN Type Flow Control (and Check) Valve	(C)TN-G02-2-11 (C)TN-G02-8-11	10.5MPa{107kgf/cm²}	
TS Type Flow Control (and Check) Valve	(C)TS-G01-2-11	10.5MPa{107kgf/cm²}	
TL (TLT) Type Feed Control Valve	W-TL-G03-*-11 W-TL-G04-*-11 W-TLT-G04-*-*-11	7MPa{71kgf/cm²}	

Note) Due to the hydraulic fluid gravity differential, maximum flow rate is about 15% less than standard.

4. Modular Valve

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Modular Type Relief Valve	OR-G01-**-20(21) OR-G03-**-(J)50	21MPa{214kgf/cm²}	30ℓ/min 65
Brake Modulator Valve	ORO-G01-**-20 ORO-G03-**-(J)50	21MPa{214kgf/cm²}	20ℓ/min 30
Direct Relief Modular Valve	ORD-G01-**-20 ORD-G03-*-(J)50	21MPa{214kgf/cm²}	20ℓ/min 30
Pressure Reducing Modular Valve	OG-G01-P*-21 OGB-G01-P*-20 W-OG-G03-P*-(J)51 W-OG-G03-PC-(J)51	21MPa{214kgf/cm²}	30ℓ/min 30 65 45
	OGS-G01-P*C-22	21MPa{214kgf/cm²}	30ℓ/min
Pressure Reducing (and Check) Modular Valve	OG-G01-**-21 OGB-G01-**-20 W-OG-G03-**-(J)51 OG-G03-*C-(J)51	21MPa{214kgf/cm²}	30ℓ/min 30 65 45
Sequence Modular Valve	OQ-G01-P2-20 OQ-G03-P2*-(J)50	21MPa{214kgf/cm²}	30ℓ/min 65
Counter Balance Modular Valve	OCQ-G01-*1*-20 OCQ-G03-*1*-(J)50	21MPa{214kgf/cm²}	30ℓ/min 65
Flow Regulator Modular Valve	OY-G01-*-20 OCY-G01-P-20 OCY-G03-P-(J)50 OCY-G01-*-X/Y-20 OCY-G03-*-X/Y-(J)51	21MPa{214kgf/cm²}	30ℓ/min 30 85 30 85
Flow Control Modular Valve	OF-G01-P20-20 OF-G03-P60-J50 OCF-G01-*40-X/Y-30 OCF-G03-*60-X/Y-(J)50	21MPa{214kgf/cm²}	(Note)
Check Modular Valve	OC-G01-**-20(21) OC-G03-**-(J)50	21MPa{214kgf/cm²}	30ℓ/min 85
Vacuum Check Modular Valve	OCV-G01-W-20 OCV-G03-W-(J)-50	21MPa{214kgf/cm²}	30ℓ/min 65
Pilot Operated Check Modular Valve	OCP-G01-**-(F)-21 OCP-G03-**-(J)50	21MPa{214kgf/cm²}	30ℓ/min 85
04 Series Relief Modular Valve	ORH-G04-P*-10	31.5MPa{321kgf/cm²}	250ℓ/min
04 Series Direct Relief Modular Valve	ORH-G04-D*-10	31.5MPa{321kgf/cm²}	40ℓ/min
04 Series Reducing Modular Valve	OGH-G04-**-10	31.5MPa{321kgf/cm²}	250ℓ/min
04 Series Counter Balance Modular Valve	OQH-G04-**-10	31.5MPa{321kgf/cm²}	250ℓ/min
04 Series Flow Regulator Modular Valve	OYH-G04-**-10	31.5MPa{321kgf/cm²}	250ℓ/min
04 Series Flow Control Modular Valve	OFH-G04-*200-X/Y-10	31.5MPa{321kgf/cm²}	(Note)
04 Series Check Modular Valve	OCH-G04-**-10	31.5MPa{321kgf/cm²}	250ℓ/min
04 Series Vacuum Check Modular Valve	OVH-G04-W-10	31.5MPa{321kgf/cm²}	250ℓ/min
04 Series Pilot Check Modular Valve	OPH-G04-**-10	31.5MPa{321kgf/cm²}	250ℓ/min

Note) Due to the hydraulic fluid gravity differential, maximum flow rate is about 15% less than standard.

5. Electro-hydraulic Control Valves

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Pilot Relief Valve	EPR-G01-*-12	28MPa{286kgf/cm²}	1ℓ/min
Relief Valve	ER-G03-*-21 ER-G06-*-21	25MPa{255kgf/cm²}	120ℓ/min 260
Relief and Reducing Valve	W-EGB-G03-*-11 W-EGB-G06-*-11	25MPa{255kgf/cm²}	40ℓ/min 80
Flow Control Valve	(C)ES-G02-*-(F)-12 ES-G03-*-(F)-12 (C)ES-G06-250-11 ES-G10-500-(F)-11	21MPa{214kgf/cm²}	(Note)
Load Sensing Flow Control Valve	ESR-G03-125-12 ESR-G03-125R*-12 ESR-G06-250-12 ESR-G06-250R*-12 ESR-G10-500-11 ESR-G10-500R*-11	25MPa{255kgf/cm²}	(Note)
Flow Direction Control Valve	ESD-G01-***-12 ESD-G03-***-12 ESD-G04-***-12 ESD-G06-***-13	25MPa{255kgf/cm²}	(Note)
Modular type reducing valve	EOG-G01-P*-11	25MPa{255kgf/cm²}	25ℓ/min
Modular Type Flow Control Valve	EOF-G01-*25-11	21MPa{214kgf/cm²}	(Note)

Note) 1. Due to the hydraulic fluid gravity differential, maximum flow rate is about 15% less than standard.
2. The ESH series high-speed response proportional valve does not support water or glycol-based hydraulic operating fluid.

SI Units and Conversion Formulas

Table 1: SI Base Units

Quantity	Name	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric Current	ampere	A
Thermodynamic Temperature	kelvin	K
Amount of Substance	mole	mol
Luminous Intensity	candela	cd

Table 2 : SI Derived Units

Quantity	Name	Symbol
Plane Angle	radian	rad
Solid Angle	steradian	sr

Table 3: Derived SI Units with Special Names and Symbols

Quantity	Name	Symbol
Frequency	hertz	Hz
Force	newton	N
Pressure, stress	pascal	Pa
Energy, Work, Quantity of Heat	joule	J
Power, Radiant Flux	watt	W
Electric Charge, Quantity of Electricity	coulomb	C
Electric Potential Difference, Electromotive Force	volt	V
Capacitance	farad	F
Electric Resistance	ohm	Ω
Electric Conductance	siemens	S
Magnetic Flux	weber	Wb
Magnetic Flux Density	tesla	T
Inductance	henry	H
Celsius Temperature	degree Celsius*	°C
Luminous Flux	lumen	lm

*t°C=(t+273.15)K

Table 4: SI Prefixes

Factor	Name	Symbol
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10^{1}	deka	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a

Table 5: SI Derived Units whose Names and Symbols Include SI Derived Units with Special Names and Symbols

Quantity	Name	Symbol
Dynamic Viscosity	pascal second	Pa·s
Moment of Force	newton meter	N·m
Surface Tension	newton per meter	N/m
Heat Flux Density, Irradiance	watt per square meter	W/m^2
Heat Capacity, Entropy	joule per kelvin	J/K
Specific Heat Capacity,Specific Entropy*	joule per kilogram kelvin	J/(kg·K)
Thermal Conductivity	watt per meter kelvin	W/(m·K)
Permittivity	farad per meter	F/m
Permeability	henry per meter	H/m

*Also called weight entropy.

Table 6: Units Outside the SI but Accepted for Use with the SI

Name	Symbol	Value in SI Units
Minute (Time)	min	1min=60s
Hour	h	1h=60min=3,600s
Day	d	1d=24h=86,400s
Degree	°	1°=(π/180)rad
Minute (Angle)	'	1'=(1/60)°=(π/10,800)rad
Second (Angle)	"	1"=(1/60)'=(π/648,000)rad
Liter	ℓ	$1ℓ=1dm^3=10^{-3}m^3$
Ton	t	$1t=10^3kg$

Force

N	dyn	kgf
1	1×10^{5}	1.020×10^{-1}
1×10^{-5}	1	1.020×10^{-6}
9.807	9.807×10^{5}	1

(Note) $1dyn=10^{-5}N$

Torque

N·m	kgf·m	gf·cm
1	1.020×10^{-1}	1.020×10^{4}
9.807	1	1×10^{5}
9.807×10^{-5}	1×10^{-5}	1

Pressure

Pa	MPa	bar	kgf/cm²	atm	mHg	mH_2O
1	1×10^{-6}	1×10^{-5}	1.019×10^{-5}	9.869×10^{-6}	7.501×10^{-6}	1.020×10^{-4}
1×10^{6}	1	1×10	1.019×10	9.869	7.501	1.020×10^{2}
1×10^{5}	1×10^{-1}	1	1.020	9.869×10^{-1}	7.501×10^{-1}	1.020×10
9.807×10^{4}	9.807×10^{-2}	9.807×10^{-1}	1	9.678×10^{-1}	7.356×10^{-1}	1×10
1.013×10^{5}	1.013×10^{-1}	1.013	1.033	1	7.60×10^{-1}	1.033×10
1.333×10^{5}	1.333×10^{-1}	1.333	1.360	1.316	1	1.360×10
9.807×10^{3}	9.807×10^{-3}	9.807×10^{-2}	1×10^{-1}	9.678×10^{-2}	7.355×10^{-2}	1

(Note) $1Pa=1N/m^3$

Work, Energy, Quantity of Heat

J	kgf·m	kW·h	kcal
1	1.02×10^{-1}	2.778×10^{-7}	2.389×10^{-4}
9.807	1	2.724×10^{-6}	2.343×10^{-3}
3.60×10^{6}	3.671×10^{5}	1	8.60×10^{2}
4.186×10^{3}	4.269×10^{2}	1.163×1^{-3}	1

(Note) 1J=1W·s. 1kgf·m=9.807J. 1W·h=3600W·s. 1cal=4.186J

Power, Radiant Flux

W	kW	kgf·m/s	kcal/s
1	1×10^{-3}	1.020×10^{-1}	2.389×10^{-4}
1×10^{3}	1	1.020×10^{2}	2.389×10^{-1}
9.807	9.807×10^{-3}	1	2.343×10^{-3}
4.186×10^{3}	4.186	4.269×10^{2}	1

(Note) W=1J/s. 1kgf·m/s=9.807W

Flow rate

m³/s	m³/h	ℓ/min	gal(US)/min
1	3.6×10^{3}	6×10^{4}	1.585×10^{4}
2.778×10^{-4}	1	1.667×10	4.403
1.667×10^{-5}	6×10^{-2}	1	2.642×10^{-1}
6.304×10^{-5}	2.271×10^{-1}	3.782	1

Heat Transfer Coefficient

W/m²·K	kcal/m²·h·°C	cal/cm²·s·°C
1	8.60×10^{-1}	2.389×10^{-5}
1.163	1	2.778×10^{-5}
4.186×10^{4}	3.60×10^{4}	1

Thermal Conductivity

W/m·K	kcal/m·h·°C	J/cm·s·°C
1	8.60×10^{-1}	1×10^{-2}
1.163	1	1.163×10^{-2}
1×10^{2}	8.60×10	1

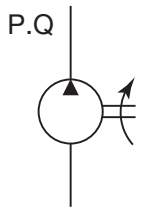
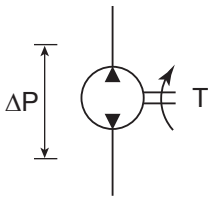
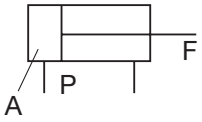
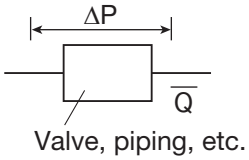
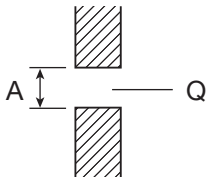
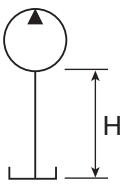
Dynamic Viscosity

Pa·s	P (Poise)	cP
1	1×10	1×10^{3}
1×10^{-1}	1	1×10^{2}
1×10^{-3}	1×10^{-2}	1

Kinematic viscosity

m²/s	St	cSt
1	1×10^{4}	1×10^{6}
1×10^{-4}	1	1×10^{2}
1×10^{-6}	1×10^{-2}	1

(Note) $1cSt=1mm^2/s$

Item		SI units	Power (engineering) units
Requirement		$L = \frac{P \cdot Q}{60 \times \eta}$ L : Power Requiement [kW] P : Discharge Pressure [MPa] Q : Discharge Rate [ℓ/min] η : Pump Efficiency	$L = \frac{P \cdot Q}{612 \times \eta}$ L : Power Requirement [kW] P : Discharge Pressure [kgf/cm²] Q : Discharge Rate [ℓ/min] η : Pump Efficiency
Oil Motor Output Torque		$L = \frac{\Delta P \cdot q}{2\pi} \times \eta$ T : Output Torque [N·m] ΔP: Inlet/Outlet Pressure Differential [MPa] q : Volume per Oil Motor Turn [cm³] η : Torque Efficiency	$L = \frac{\Delta P \cdot q}{200 \times \pi} \times \eta$ T : Output Torque [kgf·m] ΔP: Inlet/Outlet Pressure Differential [kgf/cm²] q : Volume per Oil Motor Turn [cm³] η : Torque Efficiency
Cylinder Output		$F = 100 \times P \times A \times \eta$ F : Cylinder Output [N] P : Working Presure [MPa] A : Cylinder Contact Area [cm²] η : Cylinder Efficiency	$F = P \times A \times \eta$ F : Cylinder Output [kgf] P : Working Presure [kgf/cm²] A : Cylinder Contact Area [cm²] η : Cylinder Efficiency
Pressur Loss Conversion Energy		$H = 60 \times P \times Q$ H : Heat Release [kJ/h] P : Pressure Loss [MPa] Q : Flow Rate [ℓ/min]	$H = 1.4 \times P \times Q$ H : Heat Release [kcal/h] P : Pressure Loss [kgf/cm²] Q : Flow Rate [ℓ/min]
Orifice Flow		$Q = CA\sqrt{\frac{2\Delta P}{\rho}} \times 6000$ Q : Flow Rate [ℓ/min] C : Compressibile Flow Coefficient [Dimensionless] A : Passage Area [cm²] ΔP: Pressure Differential [MPa] ρ : Density [kg/m³]	$Q = CA\sqrt{\frac{2g \cdot \Delta P}{\gamma}} \times 0.06$ Q : Flow Rate [ℓ/min] C : Compressibile Flow Coefficient [Dimensionless] (≒0.6) A : Passage Area [cm²] g : Gravitational Acceleration [980cm/s²] ΔP: Pressure Differential [kgf/cm²] γ : Specific Gravity [kgf/cm³] (≒0.87×10^{-3})
Pressure Loss		$\Delta P = \rho \times g \times H \times 10^{-6}$ ΔP: Pressure Loss [MPa] ρ : Density [kg/m³] g : Gravitational Acceleration [9.8m/s²] H : Height [m]	$\Delta P = \gamma \times g \times H \times 10^{-4}$ ΔP: Pressure Loss [kg/m²] γ : Specific Gravity [kgf/cm³] H : Height [m]

(Note) When performing calculations, make sure that you first convert values correctly.
Cutting off and rounding up values can cause differences in calculation results.

Model No. Index

(alphabetic sequence)

Note) *Indicates value and symbol entries, but due to the amount of model numbers, they have been eliminated from this item. See the items in the catalog for specific details.

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3rd Floor, Plot No.6, Siddhartha House, Sector-44, Gurgaon 122003, Haryana, INDIA
Tel: +91-(0)12-4450-2900
Fax: +91-(0)12-4450-2910

● NACHI (AUSTRALIA) PTY. LTD.
Unit 1, 23-29 South Street, Rydalmere, N.S.W, 2116, AUSTRALIA
Tel: +61-(0)2-9898-1511 Fax: +61-(0)2-9898-1678
URL: http://www.nachi.com.au/

Manufacturing

● NACHI INDUSTRIES PTE. LTD.
No.2 Joo Koon Way, Jurong Town, Singapore 628943, SINGAPORE
Tel: +65-68613944 Fax: +65-68611153
URL: http://www.nachinip.com.sg/

● NACHI TECHNOLOGY (THAILAND) CO., LTD.
5/5 M, 2, Rojana Industrial PARK Nongbua, Ban Khai, Rayong, 21120, THAILAND
Tel: +66-38-961-682 Fax: +66-38-961-683
http://www.nachi.co.th/

● NACHI PILIPINAS INDUSTRIES, INC.
1st Avenue, Manalac Compound, Sta. Maria Industrial Estate, Bagumbayan, Taguig, Metro Manila, PHILIPPINES
Tel: +63-(0)2-838-3620 Fax: +63-(0)2-838-3623

● 建越工業股份有限公司
NACHI C.Y. CORP.
No.109, Kao Young North Rd, Lung-Tan Hsin, Tao-Yuan Hsien, TAIWAN
Tel: +886-(0)3-471-7651 Fax: +886-(0)3-471-8402

● 东莞建越精密轴承有限公司
DONGGUAN NACHI C.Y. CORPORATION
Dangyong Village, Hongmei Town Dongguan City, Guangdong 523160, CHINA
Tel: +86-(0)769-8843-1300 Fax: +86-(0)769-8843-1330

● 上海不二越精密轴承有限公司
SHANGHAI NACHI BEARINGS CO.,LTD.
Yitong Industry Zone 258, Fengmao Rd. Malu Town, Jiading, Shanghai 201801, CHINA
Tel: +86-(0)21-6915-6200 Fax: +86-(0)21-6915-6202

● 耐锯(上海)精密刀具有限公司
SHANGHAI NACHI SAW CO., LTD.
1F, 5 Building, 33 Forward Road, Malu Town, Jiading, Shanghai 201818, CHINA
Tel: +86(0)21-6915-5899 Fax: +86(0)21-6915-5898

● 那智不二越(江苏)精密机械有限公司
NACHI (JIANGSU) INDUSTRIES CO., LTD.
39 Nanyuan Road, Economic and Technological Development Zone (south), Zhangjiagang, Jiangsu, 215618, CHINA
Tel: +86-512-3500-7616 Fax: +86-512-3500-7615

● 대성나찌 유압공업(주)
DAESUNG-NACHI HYDRAULICS CO., LTD.
289-22, Yusan-Dong, Yangsan-Si,GyeongNam 626-230, KOREA
Tel: +82-(0)55-371-9700 Fax: +82-(0)55-384-3270

● NACHI MOTHERSON TOOL TECHNOLOGY LTD.
D-59-60, Sector-6, Noida-201301, Distt. Gautam Budh Nagar, U.P. INDIA
Tel: +91-120-425-8372 Fax: +91-120-425-8374

● NACHI MOTHERSON PRECISION PVT. LTD.
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● NACHI TECHNOLOGY INDIA PVT. LTD.
NEEMRANA FACTORY
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