

NACHI

Standard Hydraulic Equipment

Using the NACHI Standard Hydraulic Equipment Catalog

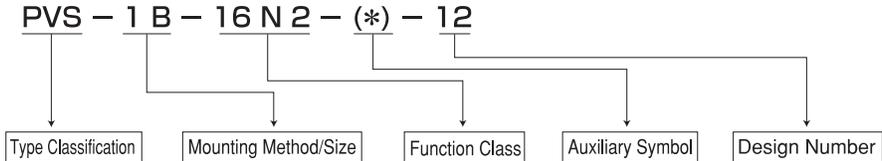
As a comprehensive manufacturer of a full range of hydraulic equipment, Nachi-Fujikoshi manufactures, markets, and provides a wide range of other services for a full lineup of outstanding products.

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



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

■ Using the Model Number Index

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

Hydraulic Equipment and Device Safety Precautions

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

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

 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
- Occupational Safety and Health Law
- Fire Codes

■ Hydraulic Operating Fluid Precautions

- Use of improper hydraulic operating 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 fluid temperature, viscosity, contaminant level, and other factors are all within their prescribed ranges. Using hydraulic operating fluid outside of its prescribed ranges creates the risk of fire due to operational problems, mechanical damage, and fluid leaks.
 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 operating 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 skin irritation.
 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 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 as 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, tip over, or apply excessive force to a product. Doing so creates the risk of malfunction, damage, fluid leaks, etc.
 Caution	Wipe up any hydraulic operating fluid that gets on the product or floor. Failure to do so creates the risk of personal injury due to the product slipping out of your hand and falling, and due to someone slipping on the fluid left on the floor.

3. External Piping

 Caution	<ul style="list-style-type: none">• Be sure to perform sufficient flushing.• Anchor pipe supports to a secure surface.• Use pipe that has sufficient pressure rating. The rated pressure of the pipe should be double 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 are no cracks, etc.
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4. Electrical

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

5. Coupling Alignment

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

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

7. High-pressure Restrictions

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

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

9. Fluid Supply

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

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

1. Hydraulic Pump Operation

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

2. Priming (Air Bleeding)

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

3. Actuator Operation

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

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

All Valves

 Warning	Use valves within their prescribed maximum operating pressures (including surge pressure).
 Warning	Sudden operation of the handle (screw) is dangerous. Be sure to unload the valve before gradually increasing pressure. Never keep a valve at a pressure that is greater than its design specification pressure value.
 Warning	Make sure you understand the hydraulic circuit diagram and switching valve structure, and check the electrical operation circuit and solenoid valve before performing any operation. <ul style="list-style-type: none"> 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 operations. <ul style="list-style-type: none"> 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 fluid temperature, fluid level, and fluid color (for discoloration and deterioration) everyday. Any abnormalities create the risk of malfunction and breakdown.
 Caution	Whiteish fluid indicates that water has contaminated the fluid, and blackish fluid indicates that the fluid has been subjected to high temperatures. Replace the operating fluid whenever these symptoms are noticed.
 Caution	Operating fluid that is below the prescribed level can cause improper pump suction. Keep fluid filled to prescribed level.
 Caution	As it is used for normal operations, operating fluid deteriorates and gradually loses its rust inhibiting, lubrication, and foam inhibiting characteristics. Deteriorated operating fluid creates the risk of malfunction and breakdown. As a general rule, replace operating fluid at least once a year.

2. Hydraulic Pumps

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

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

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

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

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

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

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

 Caution	<p>If the system will not be operated for long periods, be sure to take proper anti-rust measures.</p> <ul style="list-style-type: none">• 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 rust inhibitors creates the risk of malfunction and breakdown.
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■ Disassembly and Inspection Work Precautions

 Warning	Never attempt to modify or reconfigure valves, pumps, or motors. Doing so can cause them to operate at levels that are lower than for which they are designed, and creates the risk of malfunction and breakdown.
 Warning	All disassembly and inspection work should be left up to persons who possess the required special knowledge for such work. Attempting disassembly without the required knowledge creates the risk of unexpected accident. Incorrectly performed disassembly and inspection work creates the risk of malfunction and breakdown.
 Warning	Before starting disassembly or maintenance work, make sure that all electrical breakers are cut off, and use an electroscope to check for the presence of electricity. Failure to do so creates the risk of unexpected accident to actuator free running, electric shock, etc.
 Warning	Performing work while the electrical circuitry is charged creates the risk of unexpected accident due to electric shock.
 Warning	Always make sure to release all residual pressure before starting disassembly work. Performing disassembly work without releasing residual pressure creates the risk of accident due to spurting fluid, actuator free running, or dropping, and also creates the risk of malfunction and breakdown.
 Caution	Always place valves, pumps, and motors on a secure surface, and never place them on top of hydraulic machinery. Doing so creates the risk of damage to the hydraulic machinery.
 Caution	Never strike or drop valves, pumps, or motors, and never subject hydraulic equipment to strong external force.
 Caution	<p>During reassembly, failure to tighten to proper torques and contaminants getting into piping creates the risk of malfunction and breakdown.</p> <ul style="list-style-type: none">• Take care to ensure that the tightening torques of hydraulic equipment are uniform and at prescribed levels.• 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 performing the first operation.

■ Storage Precautions

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

Features

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

Installation and Maintenance

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

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

Uni-pumps

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

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

Management of Hydraulic Operating Fluid

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

Terms Used in This Catalog

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

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

The following shows the standards in Lists of Sealing Parts:

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

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

Calculation Formula Required when Selecting Hydraulic Pumps and Motors

1. Pump Discharge Flow Rate

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

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

N = revolution speed (min⁻¹)

η_v = volume efficiency

2. Power Required for Pump Drive

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

p = discharge pressure (psi)

η = overall efficiency

3. Motor Revolution Speed

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

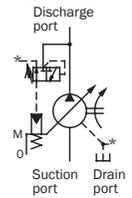
f = frequency (50Hz, 60 Hz)

P = number of motor poles

S = slip rate

Hydraulic Pump Selection Table

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



PVS Series Variable Volume Piston Pumps

.48 to 2.74 cu in/rev
3045 psi

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

Features

Energy-saving Type with Drastically Reduced Loss

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

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

Silent Type That Demonstrates Its Power Quietly

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

Specifications

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

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

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

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

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

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

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

(continued on following page)

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

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

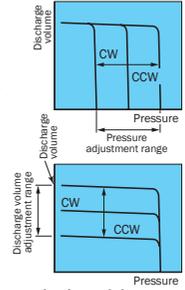
- 2 An unload is required when the motor is started under condition WYE.Delta Start. Consult your agent regarding the circuit.
- 3 Make sure that the pump operates in the direction of rotation the same as that indicated by the arrow on the pump body.

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

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

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

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



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

- Note:
- Variable control mechanism

Standard Type

N* Pressure compensation type (manual mode)

Option type

P* Pressure compensation type (remote control mode)

R Load Sense

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

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

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

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

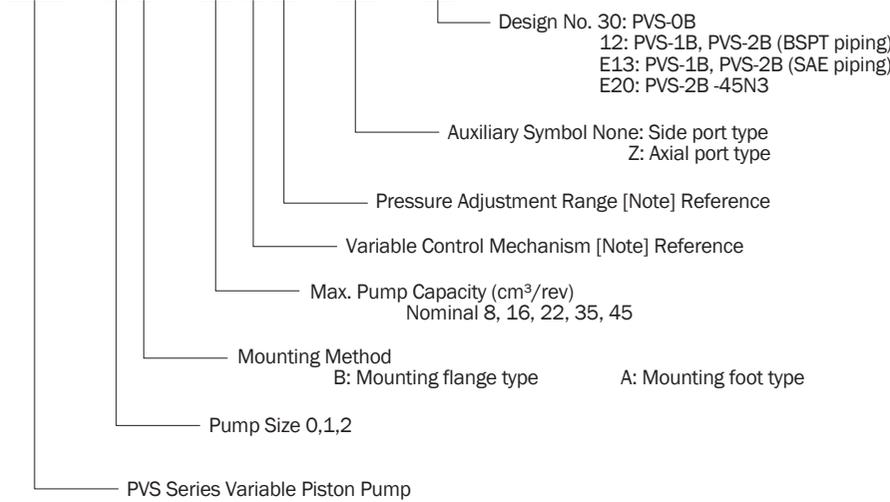
C* $\begin{matrix} A \\ S \end{matrix} \oplus$ 2-cutoff control

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

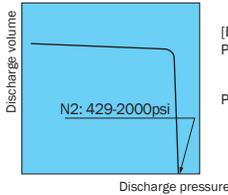
- \oplus : Applicable to solenoid specifications A, S
- A \oplus : SA-G01
- S \oplus : SS-G01
- 1 : 100V 50/60Hz
- 2 : 200V 50/60Hz
- 3 : DC12V
- 4 : DC24V

Explanation of Model No.

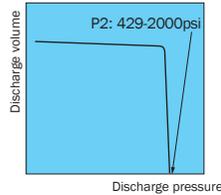
PVS - 1 B - 16 N 2 - (*) - 12



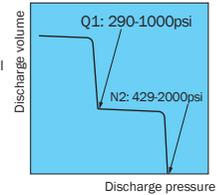
[Example 1]
N* Pressure compensation type (manual mode)
PVS-1B-16N2



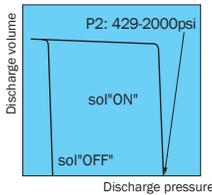
[Example 2]
P* Pressure compensation type (remote control mode)
PVS-1B-16P2



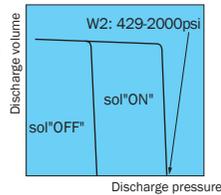
[Example 3]
N*Q* 2-pressure, 2-flow rate control
PVS-1B-16N2Q1



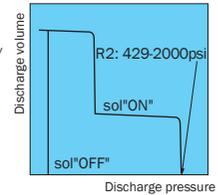
[Example 4]
R*S* Solenoid cutoff control
PVS-1B-16R2S2
Solenoid specifications
120V 50/60Hz
SS-G01



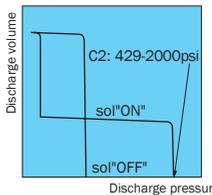
[Example 5]
W*S* 2-pressure control
PVS-1B-16W2S1
Solenoid specifications
120V 50/60Hz
SS-G01



[Example 6]
RQ*S* 2-pressure, 2-flow rate control w/ solenoid cutoff
PVS-1B-16RQ2S1
Solenoid specifications
120V 50/60Hz
SS-G01



[Example 7]
C*S* 2-cutoff control
PVS-1B-16C2S2
Solenoid specifications
120V 50/60Hz
SS-G01



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

Variable Control Mechanisms

Standard type

Option type

Symbol	External View	Characteristics	Hydraulic Circuit	Explanation
N				Pressure compensation type (manual system) When the discharge pressure reaches the preset volume set by the pressure compensator, the discharge volume is automatically reduced to hold the pressure at the set pressure.
P				Pressure compensation type (remote control mode) This mode demonstrates the same characteristics as the manual mode. The discharge pressure can be adjusted by external pilot pressure. The discharge volume can be adjusted manually.
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 output 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.
R				Load sense type This mode demonstrates the same characteristics as the manual mode. The discharge pressure can be adjusted by external pilot pressure. The discharge volume can be adjusted manually. (Note 2)

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

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

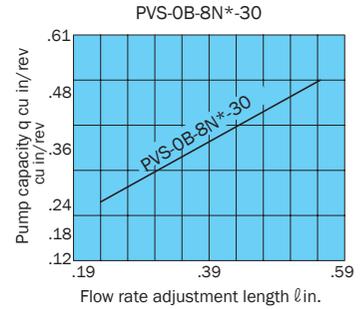
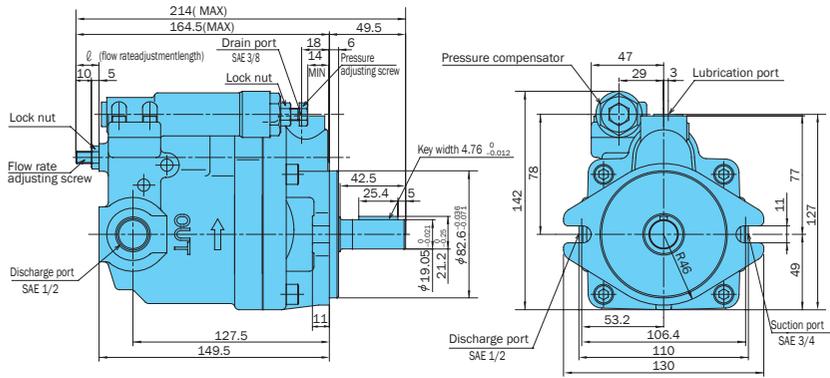
Pressure Compensation Type

Manual Mode: Standard Type

PVS-0B-8N*-30

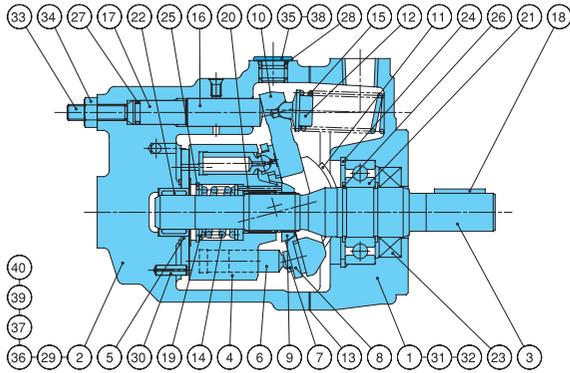
2 Bolt SAE A Mount

Installation Dimension Drawing



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

Cross-Sectional Drawing



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

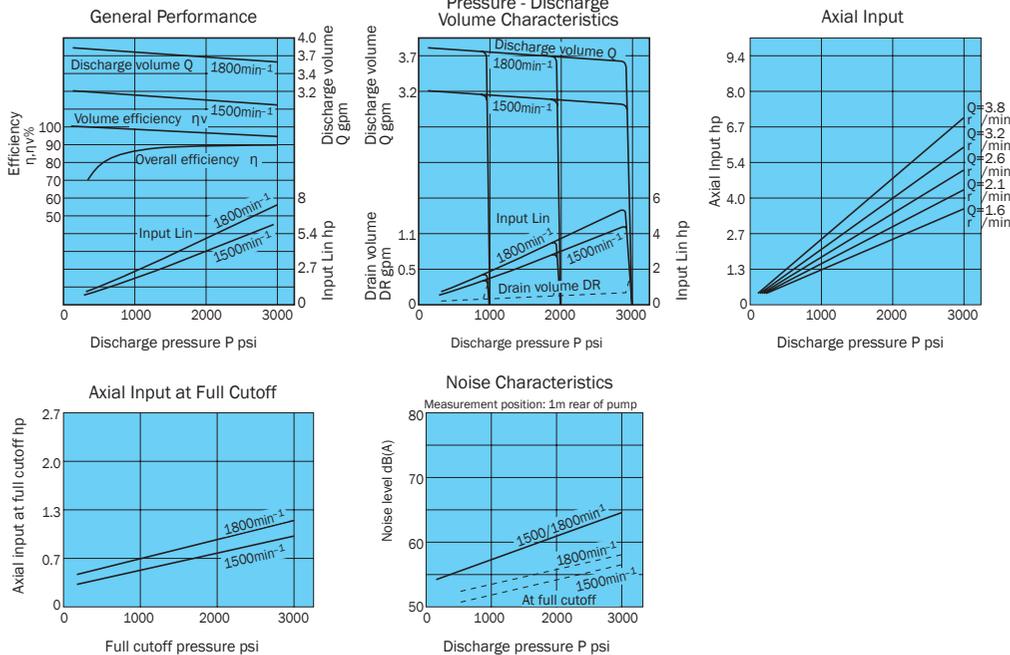
Seal Kit Part No. PSS-100000

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

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

Pressure Compensation Type

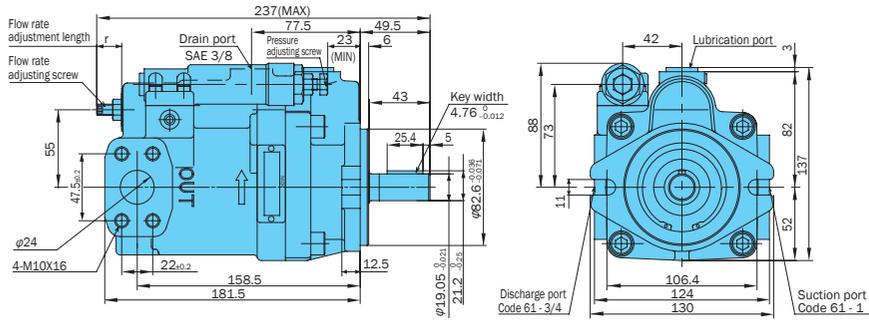
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes



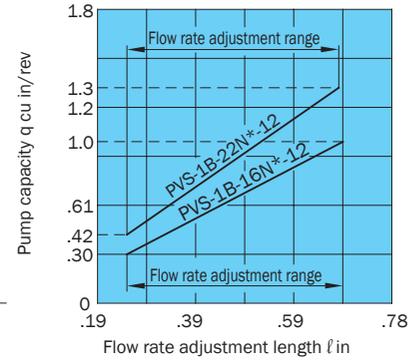
Installation Dimension Drawing

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

SAE A Mount
(side port type)

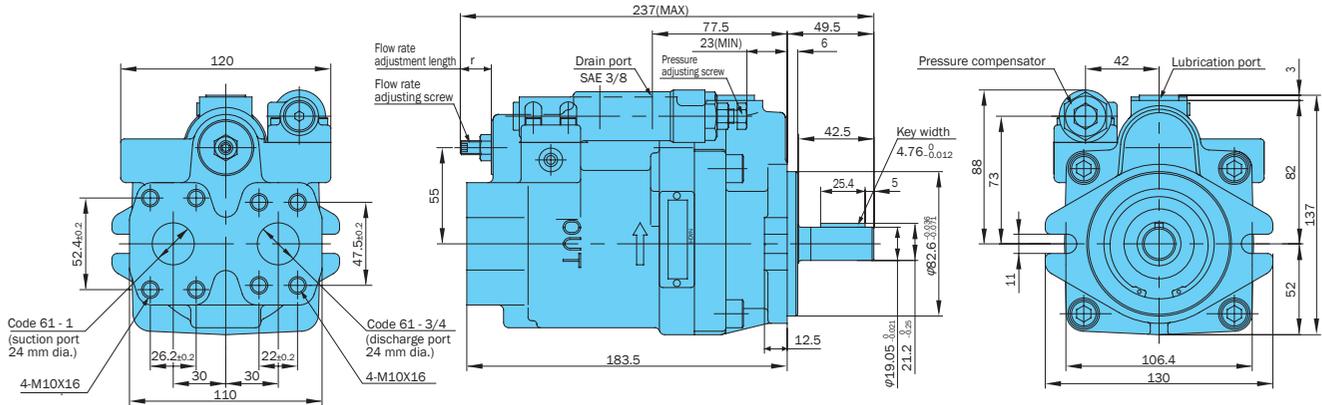


Relationship between flow rate adjustment length (l) and pump capacity (q)

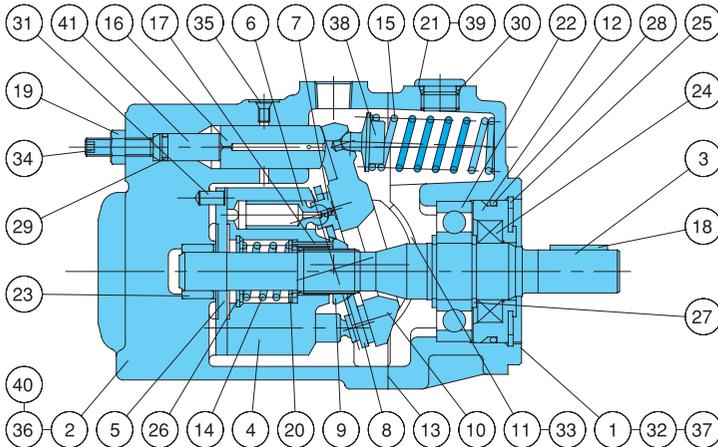


Set a flow rate adjustment length within the above range. Oil will leak if the pump is operated below the adjustment range lower limit.

(Axial Port Type)



Cross-Sectional Drawing



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

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

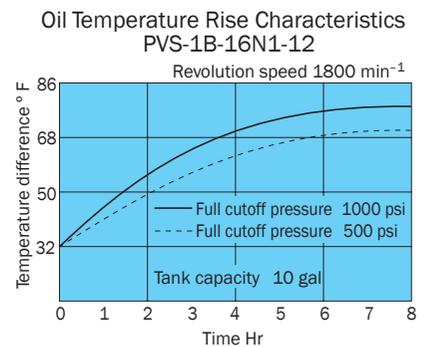
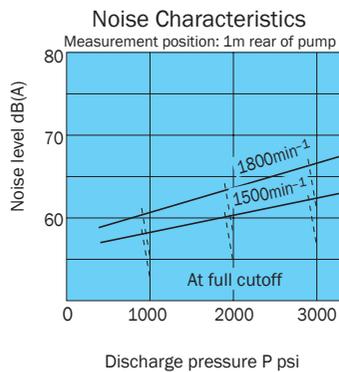
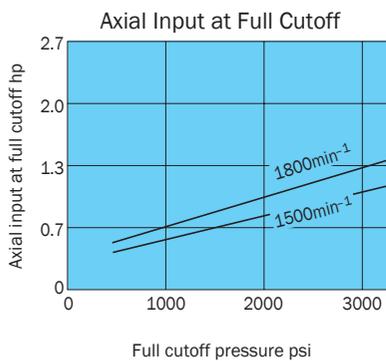
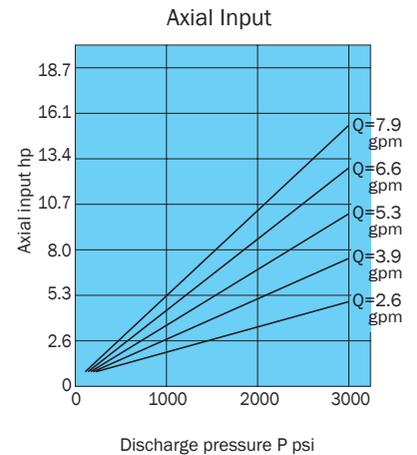
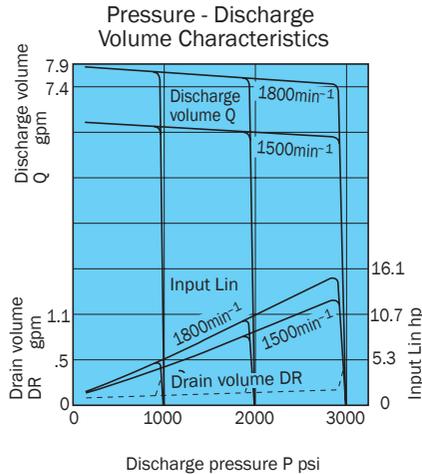
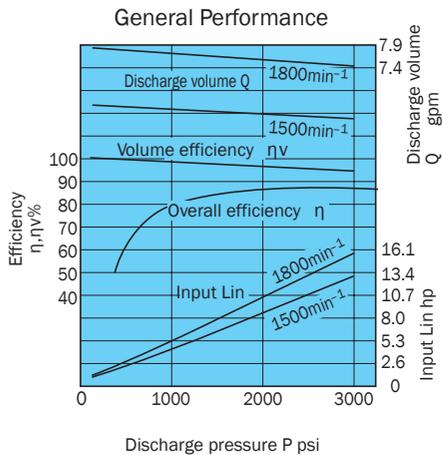
Part No.	Name	Q'ty	Size	Remarks
* 13	Gasket	1	PS46-101000	Nihon Gasket
24	Oil seal	1	TCN-254511	N.O.K
28	O-ring	1	1B-G55	JIS B 2401
29	O-ring	1	1B-P9	JIS B 2401
30	O-ring	1	1B-P14	JIS B 2401

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

Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

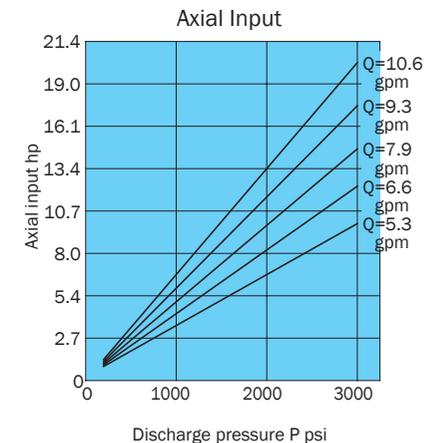
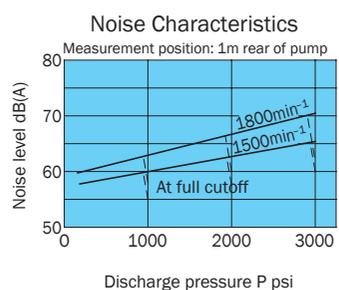
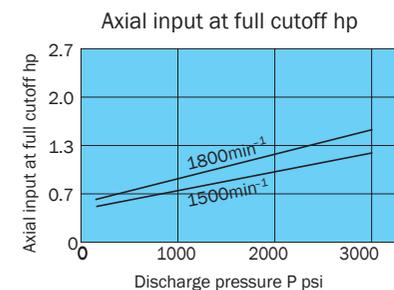
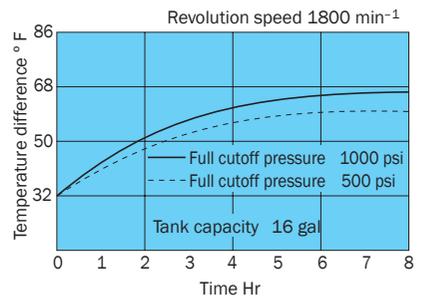
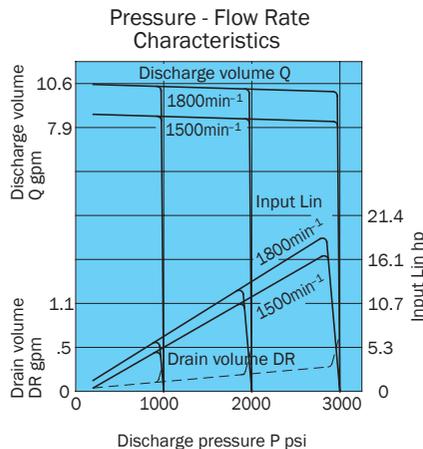
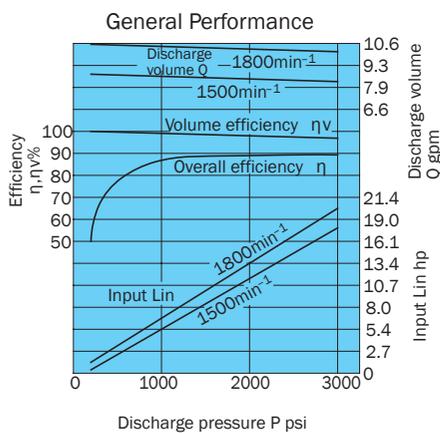
PVS-1B-16N*(Z)-E13



Performance Curves

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

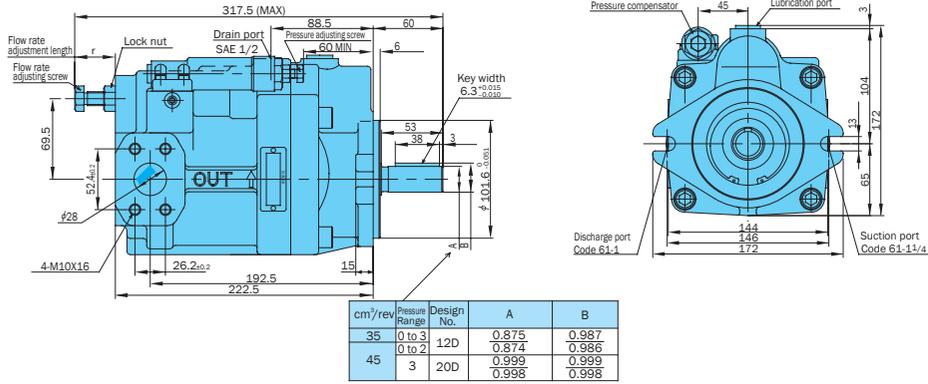
PVS-1B-22N*(Z)-E13



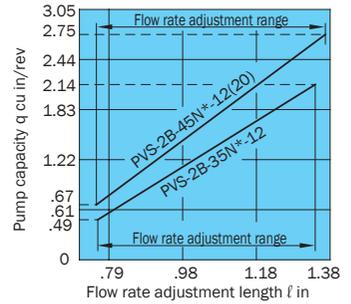
Installation Dimension Drawing

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

SAE B Mount (side port type)

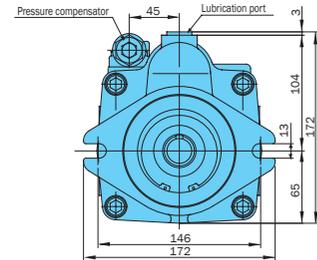
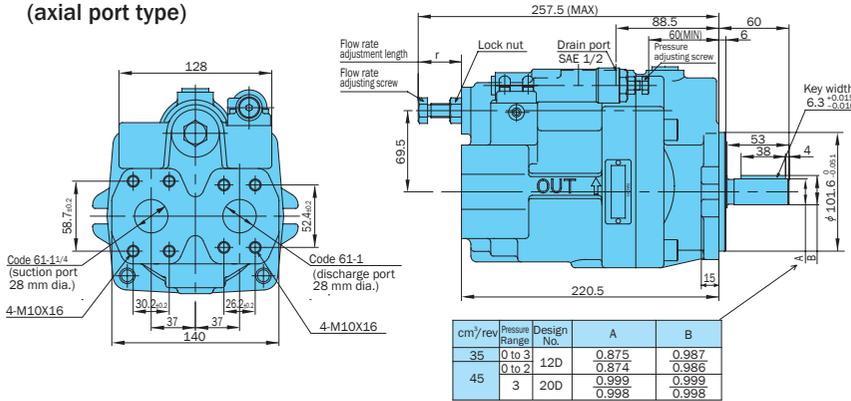


Relationship between flow rate adjustment length (l) and pump capacity (q)



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

(axial port type)

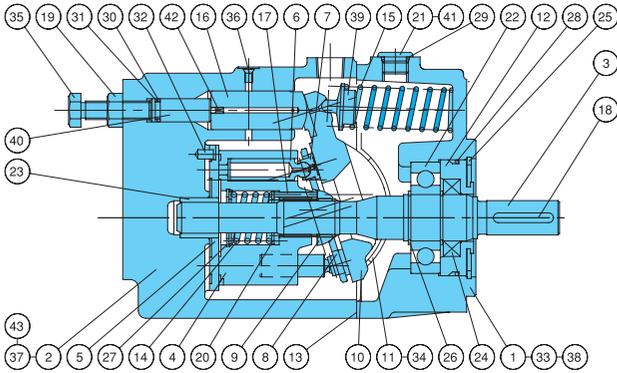


Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	146	Control piston	31	Backup ring
2	Case	172	Needle	32	Pin
3	Shaft	18	Key	33	Hexagon socket head bolt
4	Cylinder barrel	19	Nut	34	Cross-recessed countersunk head screw
5	Valve plate	20	Retainer	35	Flow rate adjusting screw
6	Piston	21	Plug		
7	Shoe	22	Ball bearing		
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

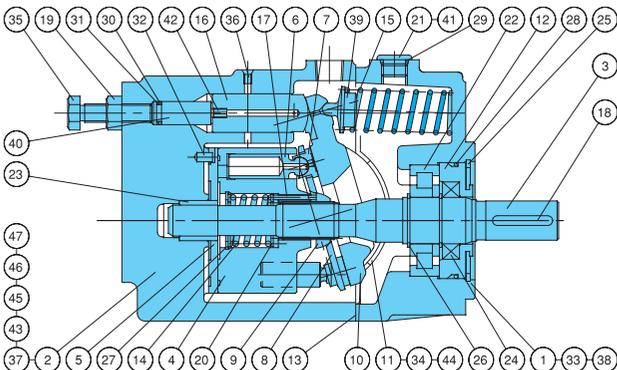
Cross-Sectional Drawing

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

SAE B Mount



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



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

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

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

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	17	Needle	33	Hexagon socket head bolt
2	Case	18	Key	34	Cross-recessed countersunk head screw
3	Shaft	19	Nut	35	Flow rate adjusting screw
4	Cylinder barrel	20	Retainer		
5	Valve plate	21	Plug		
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)

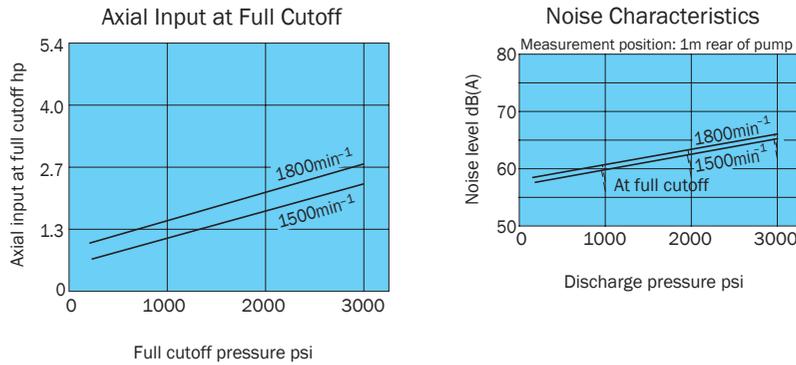
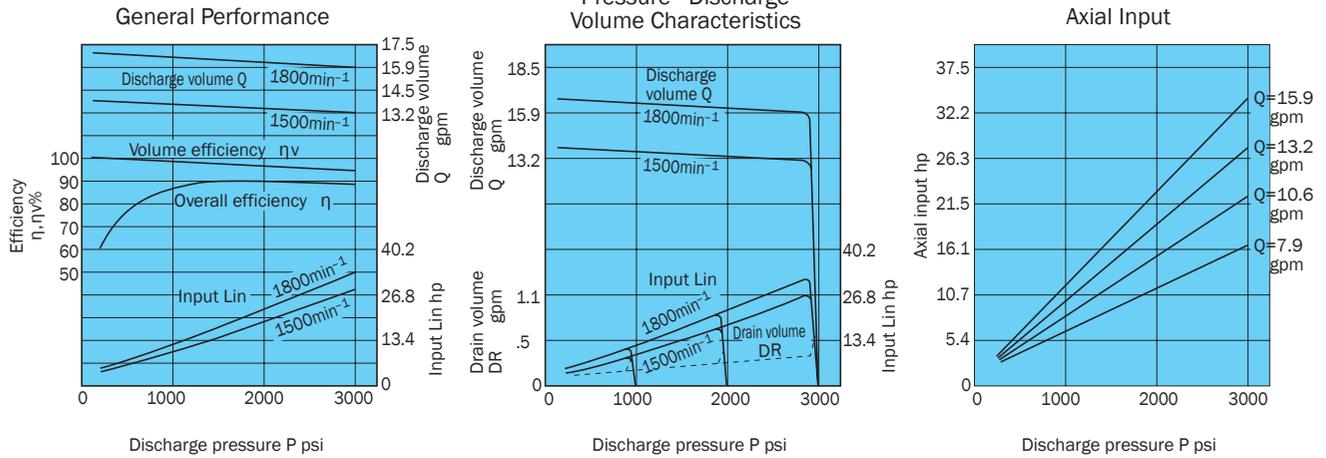
Part No.	Part Name	Q'ty	PVS-2B-45N3	
			Size	Remarks
* 13	Gasket	1	PS46-102000-0A	Nihon Gasket
* 24	Oil seal	1	TCN-305011Z	N.O.K
28	O-ring	1	1B-G70	JIS B 2401
29	O-ring	1	1B-P14	JIS B 2401
30	O-ring	1	1B-P11	JIS B 2401
46	O-ring	2	1B-P5	JIS B 2401
31	Backup ring	1	T2-P11	JIS B 2407

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

Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

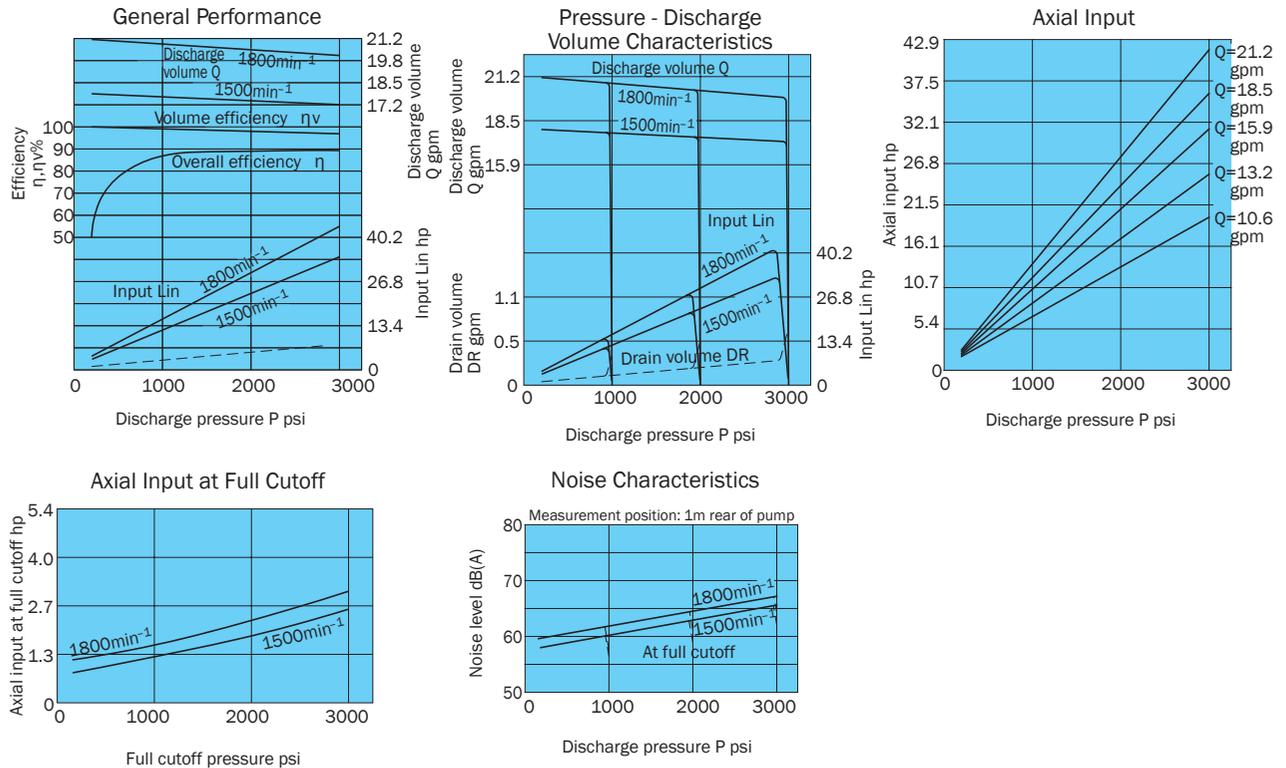
PVS-2B-35N*-(Z)-E13



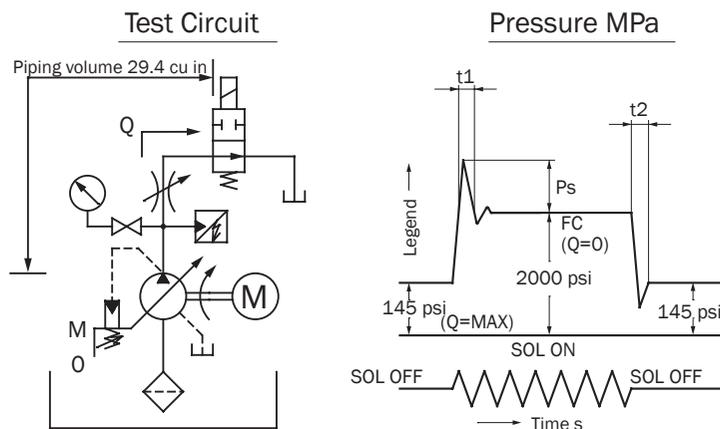
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

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



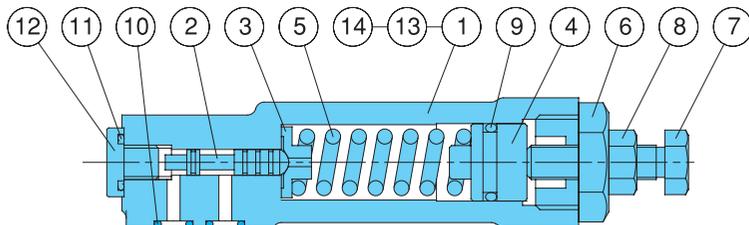
Response Performance



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

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

Pressure Compensator



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

List of Sealing Parts

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

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

Replacement Items

PVS Rotating Group

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

Includes Items 4,5,6 & 7

PVS Thrust Plate Item 11

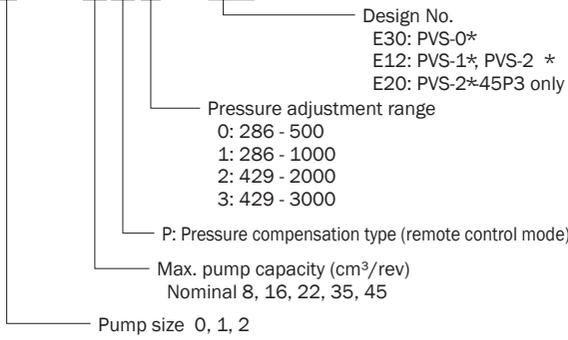
PVS-0B-8*E30	PSC69-100000
PVS-1B-16*E13	PS69-101000
PVS-1B-22*E13	PS69-101000
PVS-2B-35*E13	PS69-102000
PVS-2B-45*E13	PS69-102000

Compensator Part Numbers

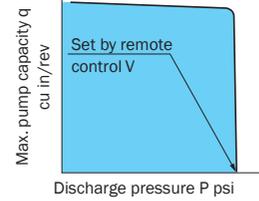
N0 - PSN-101000	P - ZR-G01-P-E2405C
N1 - PSN-101010	R - ZR-G01-R3-E2171B
N2 - PSN-101020	
N3 - PSN-101030	

Pressure Compensation Type (remote control mode)

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



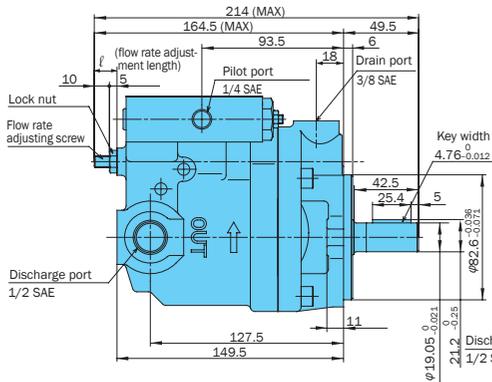
P-Q Characteristics



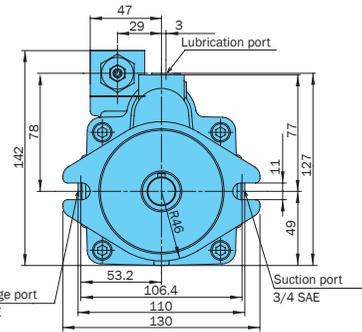
Installation Dimension Drawing

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

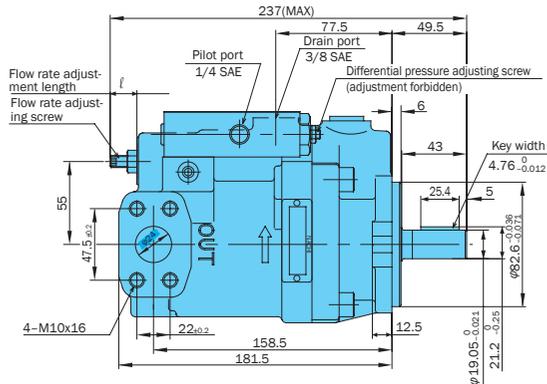
PVS-0B-8P*-E30



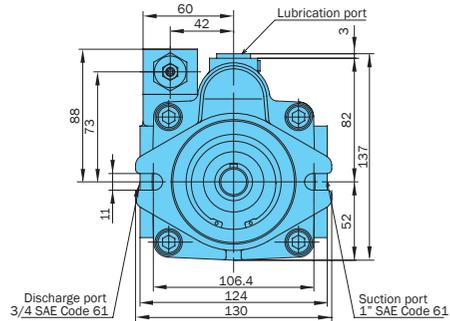
SAE A Mount



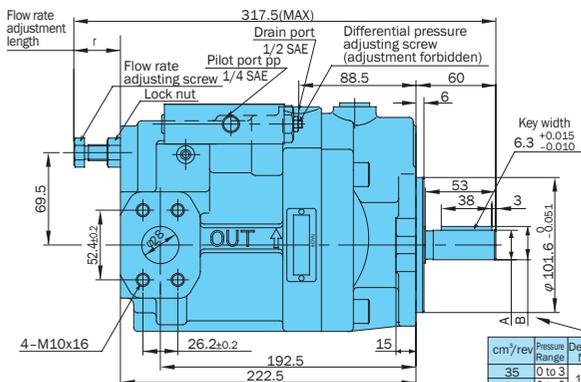
PVS-1B-¹⁶/₂₂ P*-E13



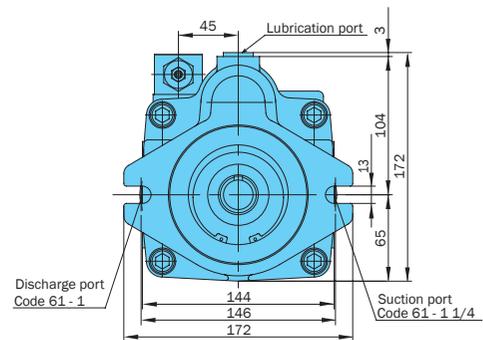
SAE A Mount



PVS-2B-³⁵/₄₅ P*-E13



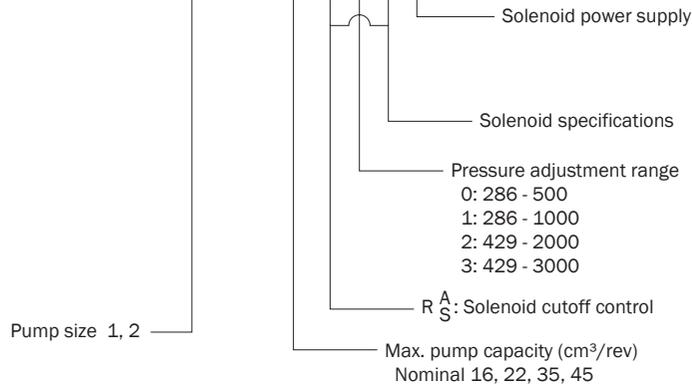
SAE B Mount



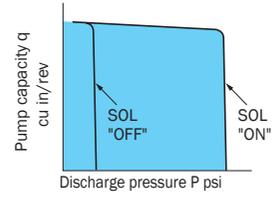
cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	0.875	0.987
	0 to 2		0.874	0.978
45	3	20D	0.999	1.096
			0.998	1.087

Solenoid Cutoff Control Type

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

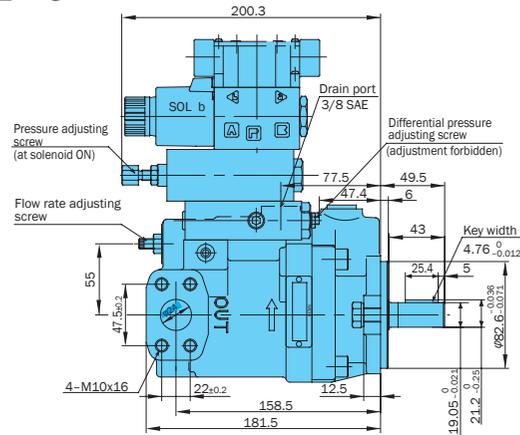


P-Q Characteristics

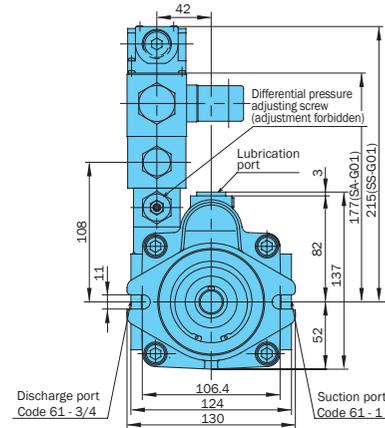


Installation Dimension Drawing

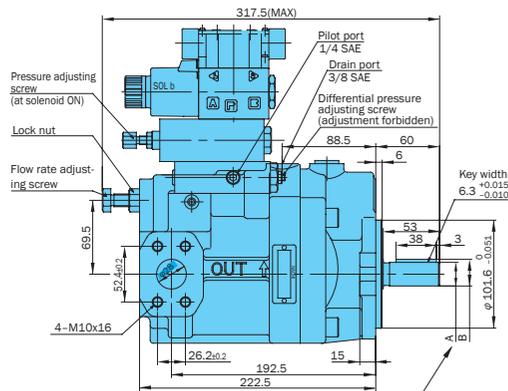
PVS-1B-16 R^A S^{*}-E13



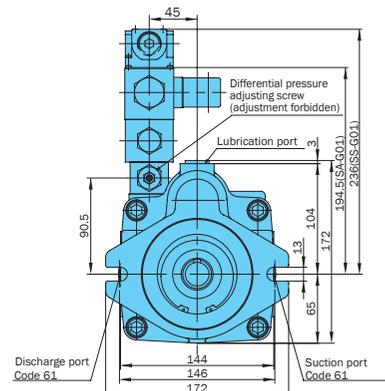
SAE A Mount



PVS-2B-35 R^A S^{*}-E13



SAE B Mount

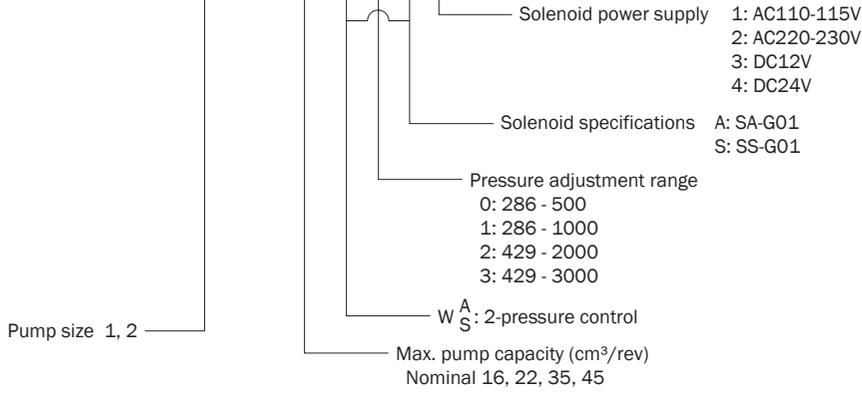


cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	0.875	0.987
	0 to 2		0.874	0.978
45		20D	0.999	1.096
			0.998	1.087

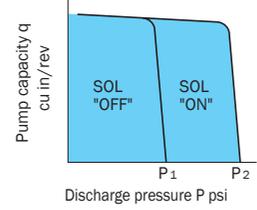
■ The coil surface temperature increases if this pump is kept continuously energized.
Do not touch the surface of the coil directly with your hands.

2-Pressure Control Type

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

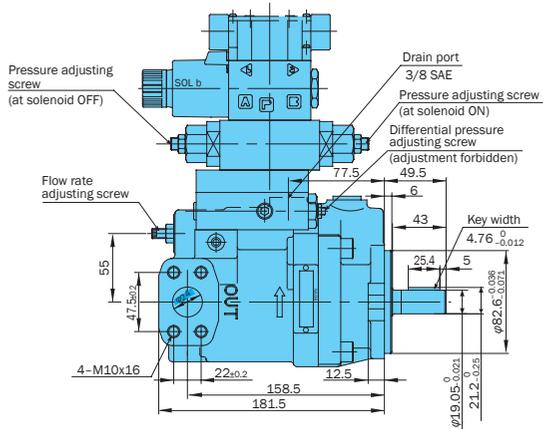


P-Q Characteristics

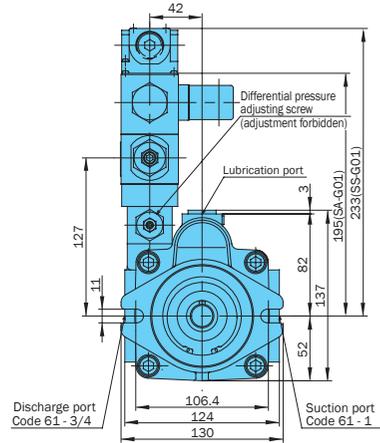


Installation Dimension Drawing

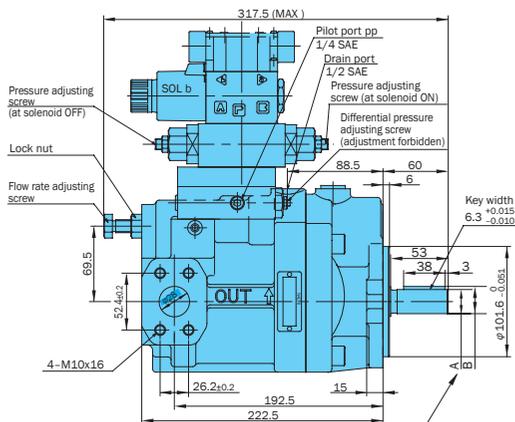
PVS-1B- 16 W^A S * -E13
22



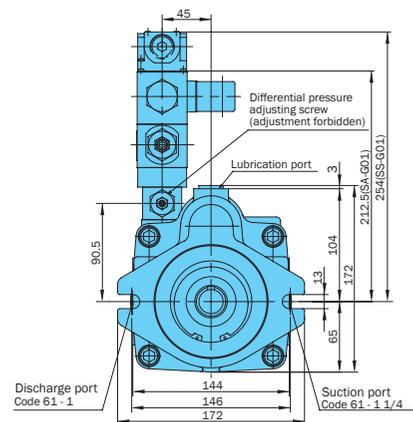
SAE A Mount



PVS-2B- 35 W^A S * -E13
45



SAE B Mount

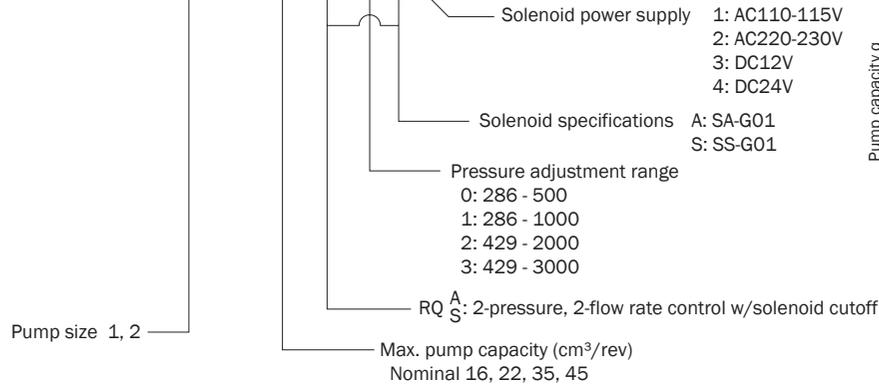


cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	0.875	0.987
	0 to 2		0.874	0.978
45		3	0.999	1.096
		20D	0.998	1.087

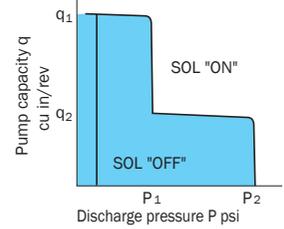
- The coil surface temperature increases if this pump is kept continuously energized. Do not touch the surface of the coil directly with your hands.

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

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

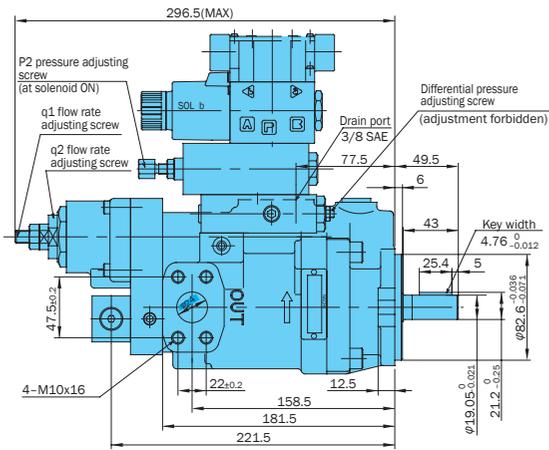


P-Q Characteristics

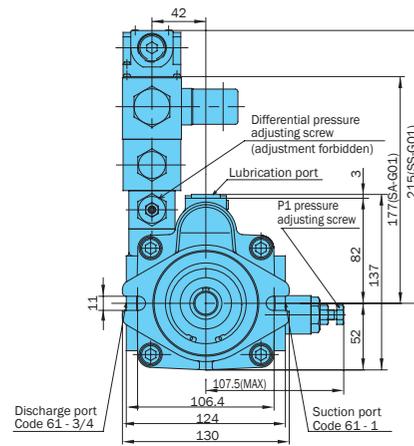


Installation Dimension Drawing

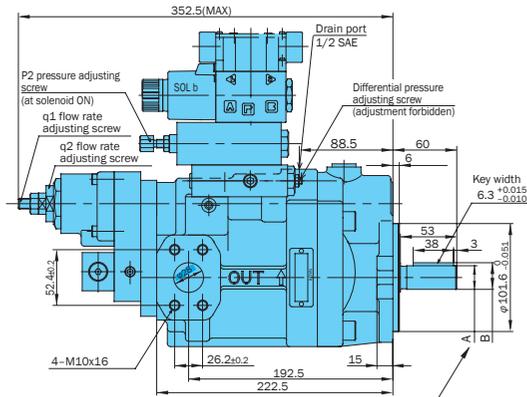
PVS-1B-16 RQ S A E13



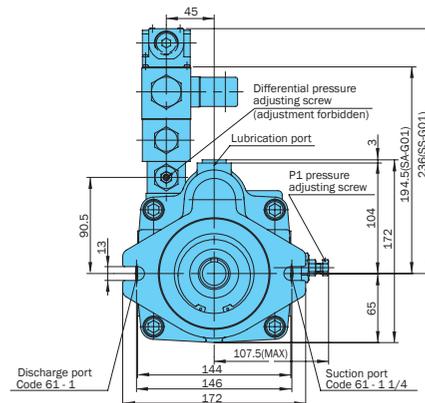
SAE A Mount



PVS-2B-35 RQ S A E20



SAE B Mount

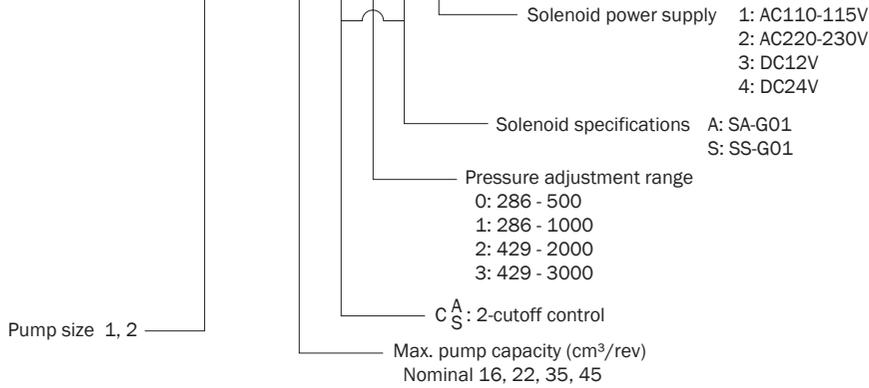


cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	0.875	0.987
			0.874	0.978
45	3	20D	0.999	1.096
			0.998	1.087

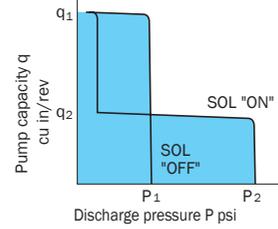
■ The coil surface temperature increases if this pump is kept continuously energized.
 Do not touch the surface of the coil directly with your hands.

2-Cutoff Control Type

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



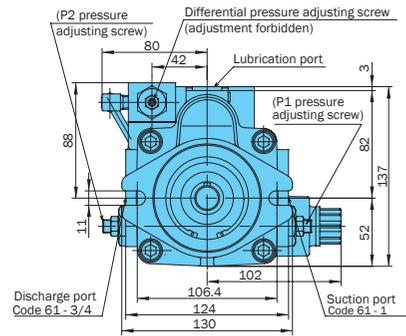
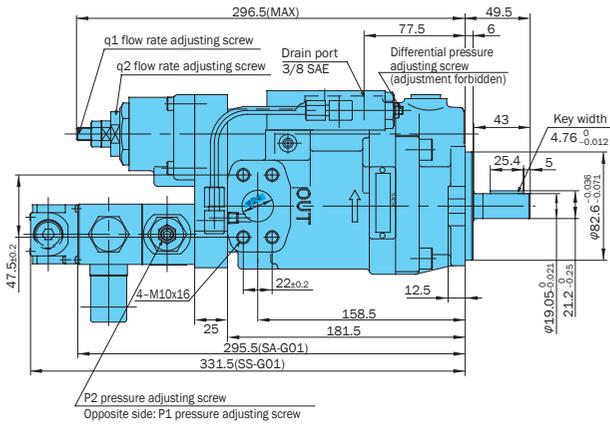
P-Q Characteristics



Installation Dimension Drawing

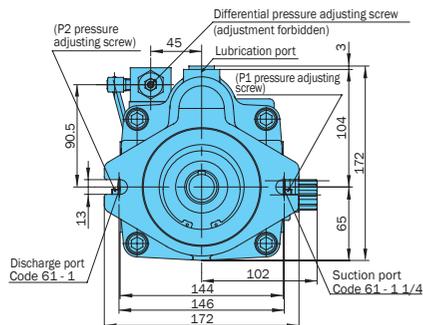
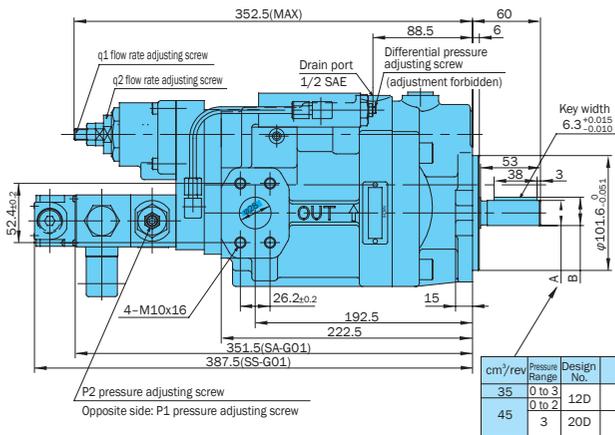
PVS-1B-¹⁶C*^A-E13
22 S

SAE A Mount



PVS-2B-³⁵C*^A-E20
45 S

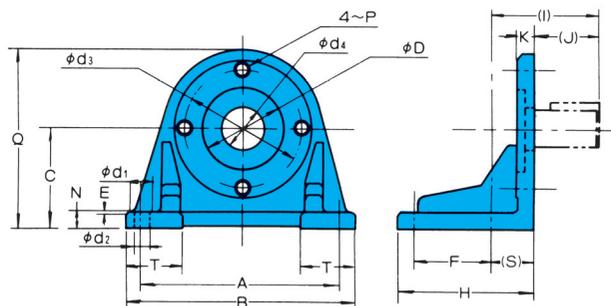
SAE B Mount



cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	0.875	0.987
45	0 to 2		0.874	0.978
	3	20D	0.999	1.036
			0.998	1.087

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

Foot Mounting Kit



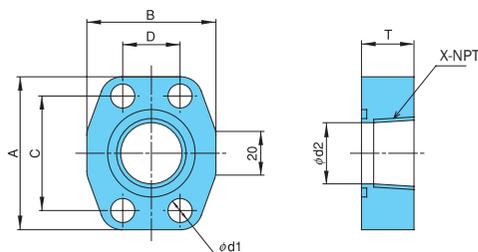
Kit Model No.	Applicable Pump Model No.	Accessories				Dimensions				
		Bolt	Q'ty	Washer	Q'ty	A	B	C	E	F
IHM-2-10	PVS-0B PVS-1B	TB-10 ×30	2	WP-10	2	127	152.5	69.8	1	50.8
IHM-4-10	PVS-2B	TB-12 ×30	2	WP-12	2	220.7	246	107.95	1	114.3

Kit Model No.	Dimensions														Weight kg
	H	(l)	(J)	K	N	P	Q	(S)	T	ϕD	ϕd_1	ϕd_2	ϕd_3	ϕd_4	
IHM-2-10	96	64.5	32	17.5	13	M10	135	32.5	36.5	82.6	22	11	106.4	50	2.0
IHM-4-10	140	56.7	44	16	16	M12	195.5	12.7	53	101.6	22	11	146	40	5.5

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

Piping Flange Kit

For PVS-1B, 2B



Applicable Pump Model No.	PVS-1B-16/22		PVS-2B-35/45	
	PSF-101000		PSF-102000	
Plunger Kit model No.	Suction port	Discharge port	Suction port	Discharge port
A	70	65	79	70
B	59	52	73	59
C	52.4	47.5	58.7	52.4
D	26.2	22.0	30.2	26.2
T	24	24	28	24
ϕd_1	$\phi 11$	$\phi 11$	$\phi 11$	$\phi 11$
ϕd_2	$\phi 28$	$\phi 22$	$\phi 37$	$\phi 28$
X	1	3/4	1-1/4	1
Mounting bolt	TH-10 ×40	TH-10 ×40	TH-10 ×45	TH-10 ×40
Washer	WS-B-10	WS-B-10	WS-B-10	WS-B-10
O-ring	1B-G35	1B-G30	1B-G45	1B-G35
Weight lbs	1.3	1.1	1.6	1.3

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

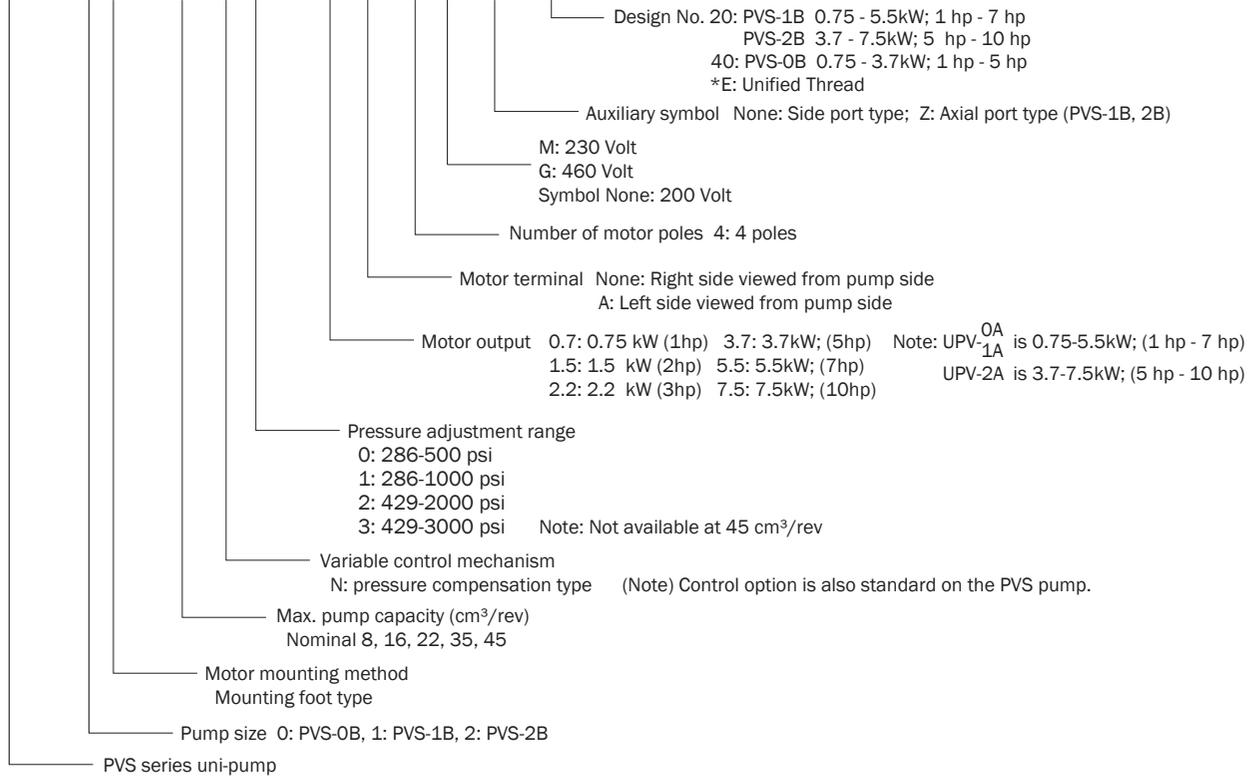
2. O-ring 1B/B-** refers to JIS B2401-1B.

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

Uni-Pump Specifications

Explanation of Model No.:

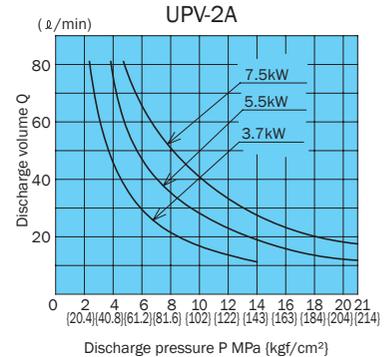
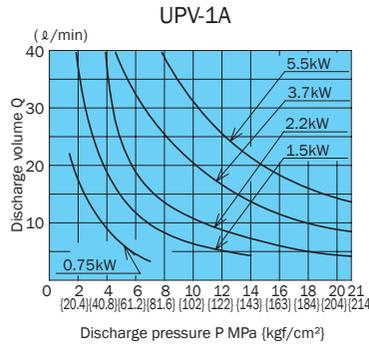
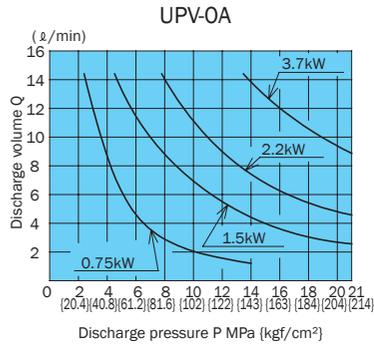
UPV -- 1 A -- 16 N 1 -- 1.5 * -- 4 * * -- *20(40)



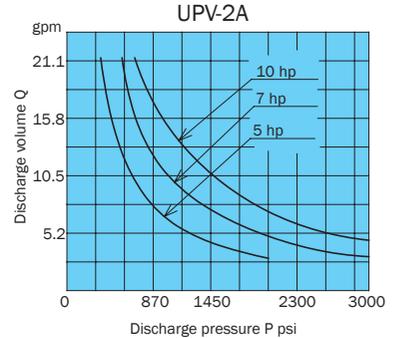
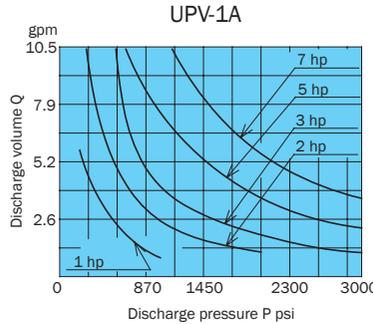
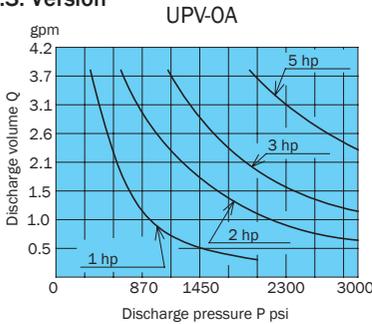
*This Uni-Pump is the metric version from Japan

Motor selection curves

Metric Version



U.S. Version



• How to select the motor

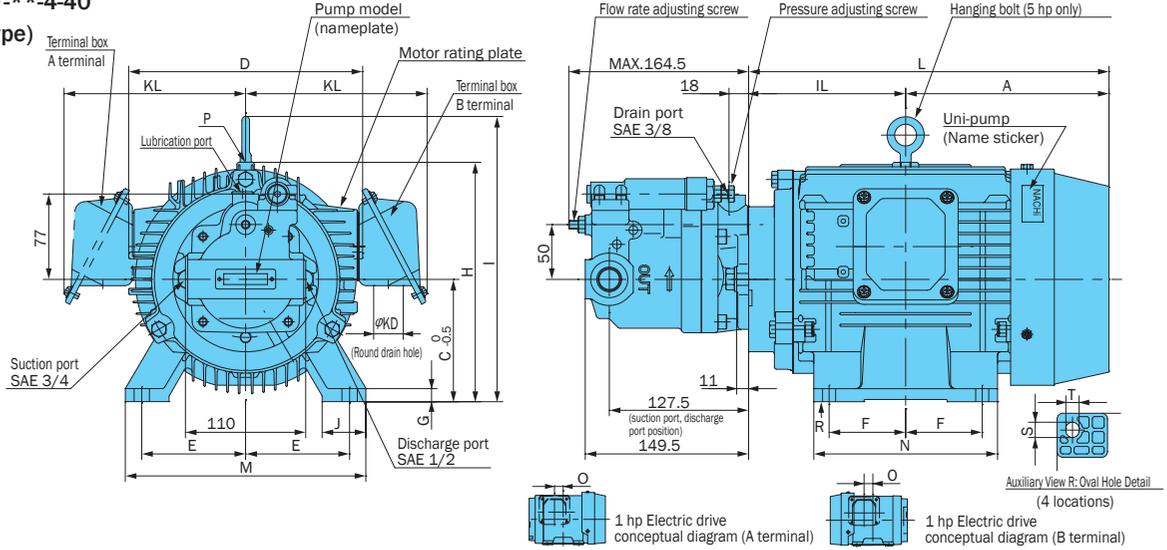
The lower side of the output curves for each of the motors shown above indicates the operating range under rated output for that motor.

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

Installation Dimension Drawings

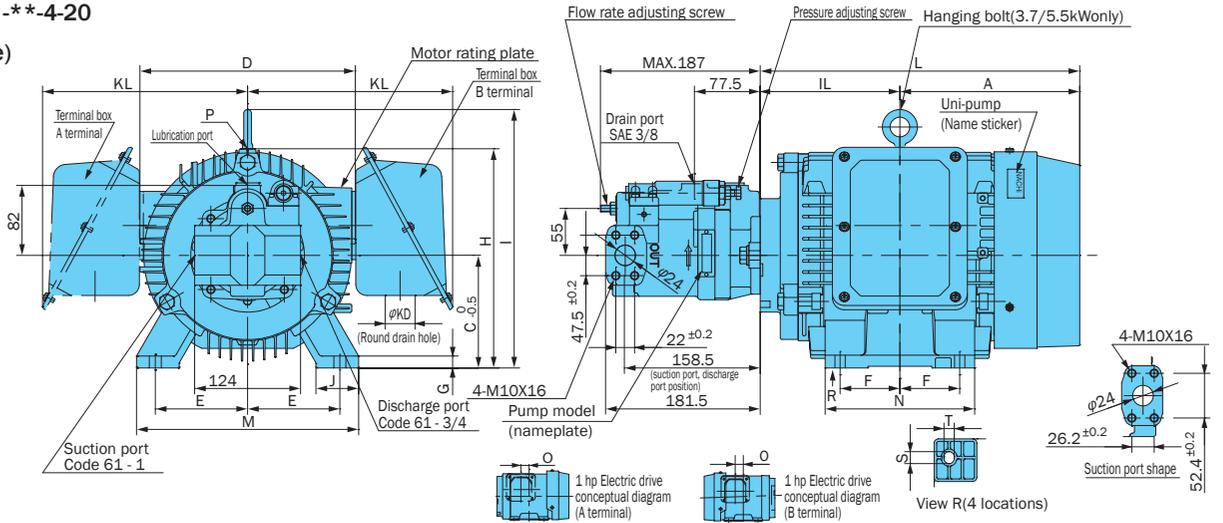
UPV-0A-8**-*-4-40

(side port type)



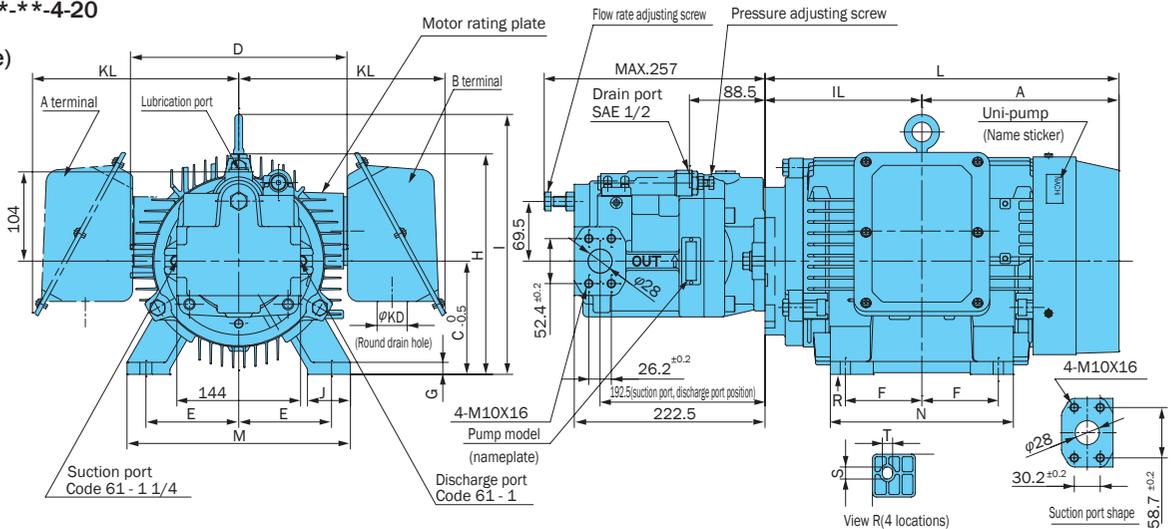
UPV-1A-16**-*-4-20 22

(side port type)



UPV-2A-35**-*-4-20 45

(side port type)



*These Pumps are Metric Versions from Japan

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

Note: A terminal measurements are in parentheses ().

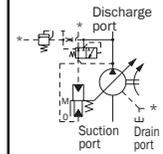
Motor Specifications

Output hp	Motor Dimensions																	Frame No.	Weight lbs
	A	IL	C	D	E	F	G	H	I	J	L	M	N	S×T	KD	KL	O		
1	133	107.5	80	170	62.5	50	4.5	165	-	35	240.5	165	130	18×10	φ27	157	27.5	80M	14.5
2	143	118.5	90	198	70	62.5	10	190	-	40	261	176	150	12×10	φ27	159	-	90L	16
3	157.5	133	100	198	80	70	12	200	-	40	290.5	200	168	14×12	φ27	159	-	100L	21
5	186	143.5	112	214	95	70	12	-	261	40	329.5	220	168	14×12	φ27	166	-	112M	27
7	210.5	163.5	132	252	108	70	15	-	303	50	374	260	175	14×12	φ85	240	-	132S	42
10	229.5	182.5	132	252	108	89	15	-	303	50	412	260	213	14×12	φ85	240	-	132M	48

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

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

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



PZS Series Variable Volume Piston Pumps

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

Features

1 High pressure, high reliability

These pumps deliver the perfect combination of high pressure (4085 psi maximum) and high reliability.

Hydraulic device energy efficiency is ensured because variable volume capabilities provide the means to keep the discharge rate to the desired level.

2 Low noise, low vibration operation

The semi-cylindrical swash plate of

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

3 High reliability, long life

O-ring seals used for mating surfaces eliminate worries about oil leaks. A spherical valve plate maintains optimal

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

4 A wide range of possible applications

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

Specifications

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

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

- Handling
- Cautions during Pump Installation and Piping

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

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

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

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

- Management of Hydraulic Operating Fluid

- Use only good-quality hydraulic operating fluid with a kinematic viscosity during operation within the range of 20 to 200 centistokes. Normally, you should use an R&O type and wear-resistant type of ISOGV32 to 68 or equivalent. The optimum kinematic viscosity during operation is 20 to 50 centistokes.
- The operating temperature range is 40 to 140 °F. When the oil temperature at startup is 5 °C or less, run the pump at low pressure and low speed until the oil temperature reaches 40 °F.
- Provide a suction strainer with a filtering grade of about 100μ (150 mesh).

(continued on following page)

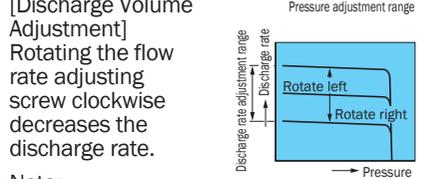
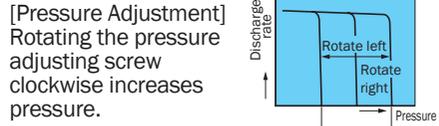
- 4 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower.
- 5 Use hydraulic operating fluid when the operating ambient temperature is in the range of 32 to 140° F.
 - Startup Precautions
- 1 Before starting up the pump, fill the pump body with clean hydraulic operating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

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

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

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

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

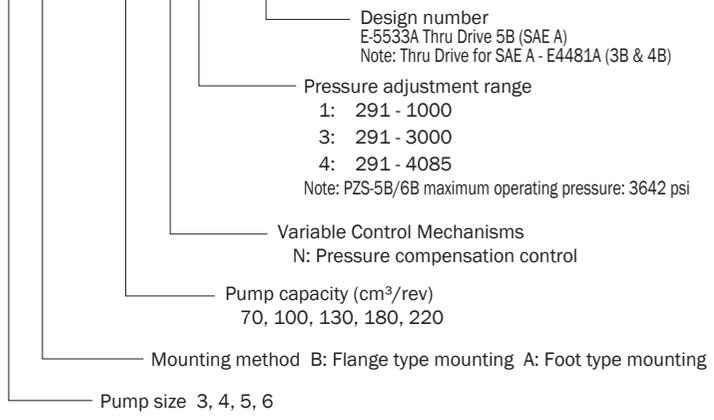


Note: Securely tighten the lock nut after making adjustments.

Understanding Model Numbers

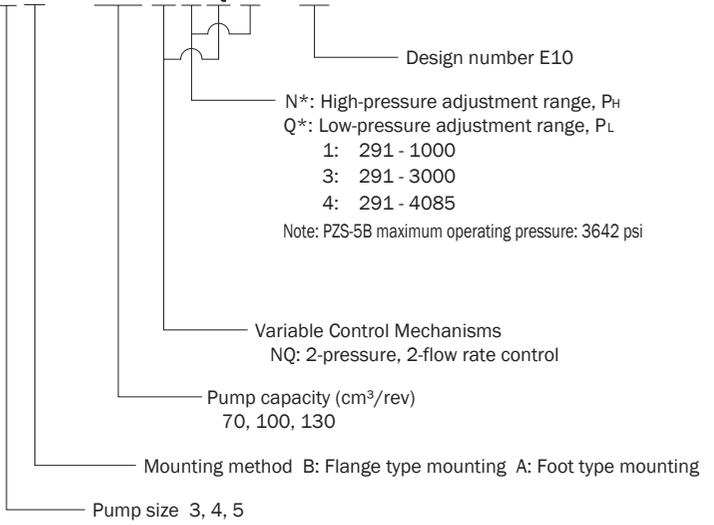
Standard Type, Pressure compensation(N)

PZS - 4 B - 100 N * - E10

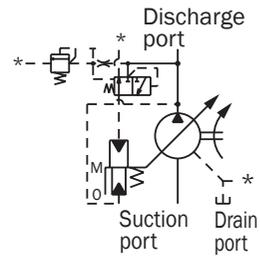
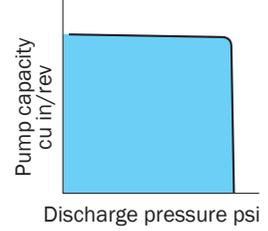


Option type, 2-Pressure, 2-Flow Rate Control Type (NQ)

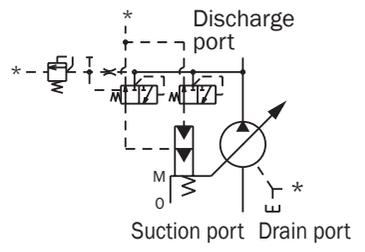
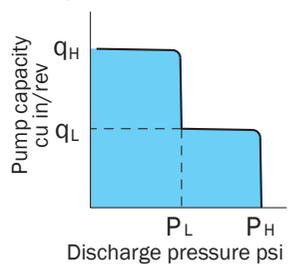
PZS - 4 B - 100 N * Q * - E10



P-Q characteristics



P-Q characteristics



Solenoid Cutoff Control Type (RS)

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

Design Number
E-5533A Thru Drive 5B
Note: Thru Drive for SAE A - E4481A (3B-4B)

Solenoid power supply
1: AC100-115V
2: AC200-230V
3: DC12V
4: DC24V

Pressure adjustment range
1: 291 - 1000
3: 291 - 3000
4: 291 - 4085

Note: PZS-5B/6B maximum operating pressure: 3625 psi

Variable Control Mechanisms
RS: Solenoid cutoff control (S: SS-G01)

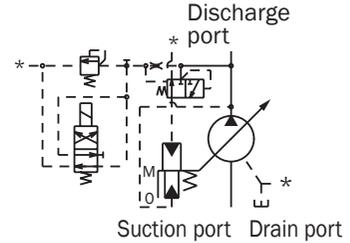
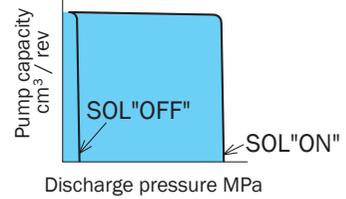
Pump capacity (cu in/rev)
70, 100, 130, 180, 220

Mounting method B: Flange type mounting A: Foot type mounting

Pump size 3, 4, 5, 6

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

P-Q characteristics



2-Pressure Control System (WS)

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

Design Number
E-5533A Thru Drive 5B
Note: Thru Drive for SAE A - E4481A (3B-4B)

Solenoid power supply
1: AC100-115V
2: AC200-230V
3: DC12V
4: DC24V

Pressure adjustment range
1: 2 to 7MPa
3: 2 to 21MPa
4: 2 to 28MPa

Note: PZS-5B/6B maximum operating pressure: 3625 psi

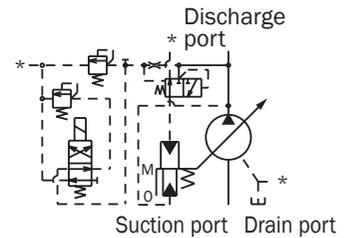
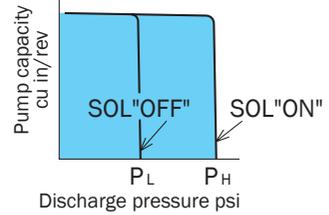
Variable Control Mechanisms
WS: 2-pressure control type (S: SS-G01)

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

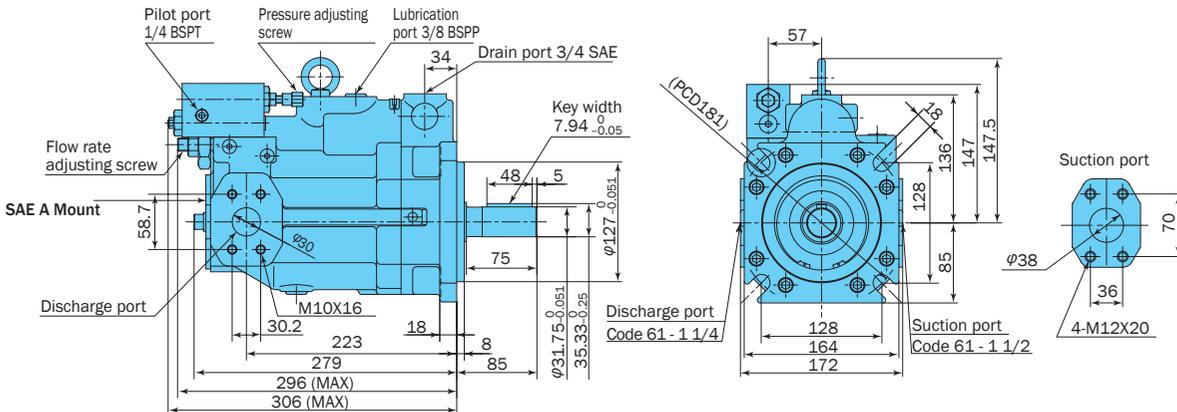
The ZR-T02*-5895* is the recommended remote control valve. Provide piping to the remote control valve at a pipe volume of 9 cu in or less.

Pressure Compensation Type

Installing a remote control relieve valve to the pilot port provides remote control of pressure compensation. (PZS series "P type")

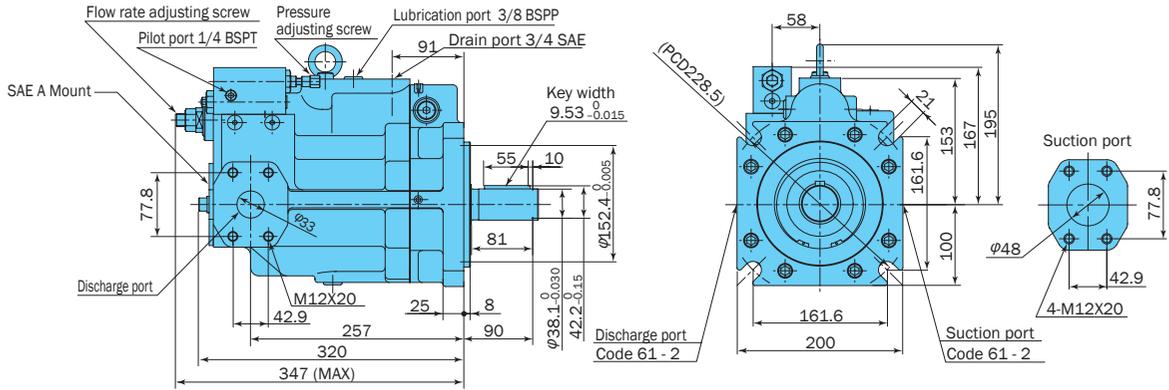
PZS-3B-70N*-E10 (E4481A Thru Drive)

SAE C 2 Bolt Mount (will fit)



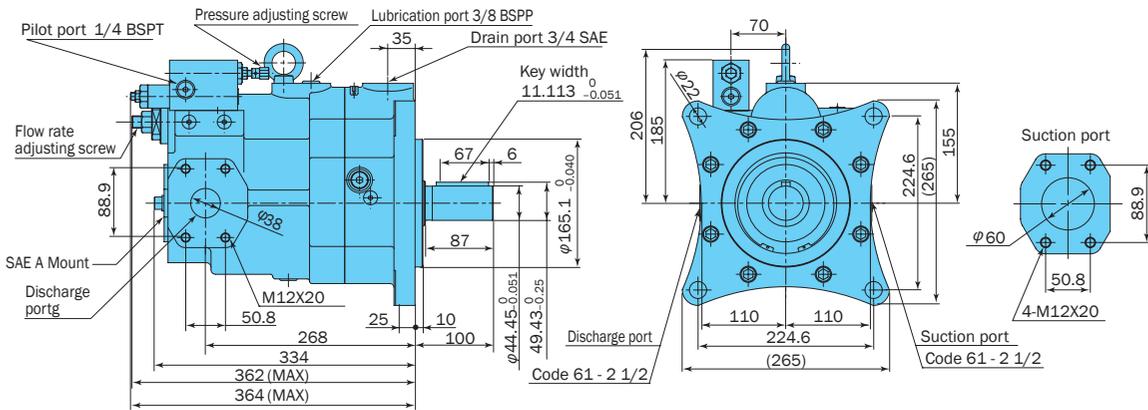
PZS-4B-100N*-10 (E4481A Thru Drive)

4 Bolt SAE D Mount



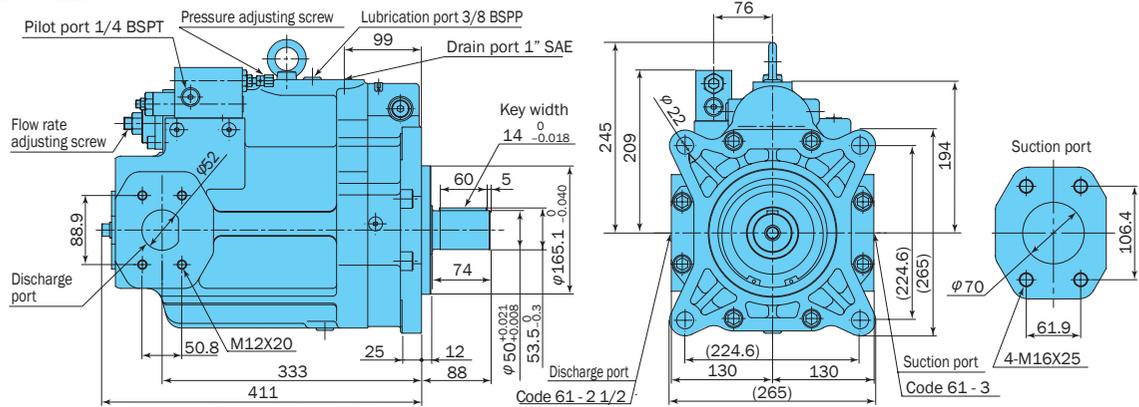
PZS-5B-130N*-E10 (E5533A Thru Drive)

4 Bolt SAE E Mount

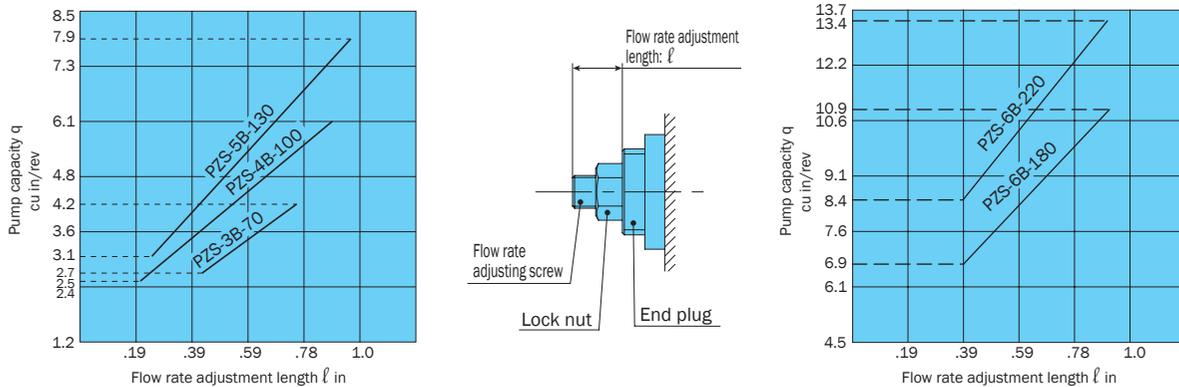


**PZS-6B-180N*-E10
PZS-6B-220N*-E10**

4 Bolt SAE E Mount

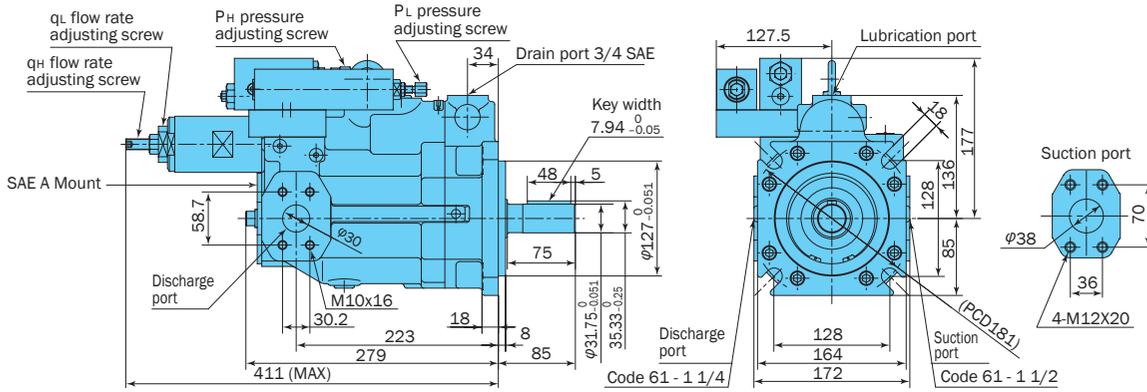


Flow Adjustment Rotation Angle (l) and Pump Capacity (q)

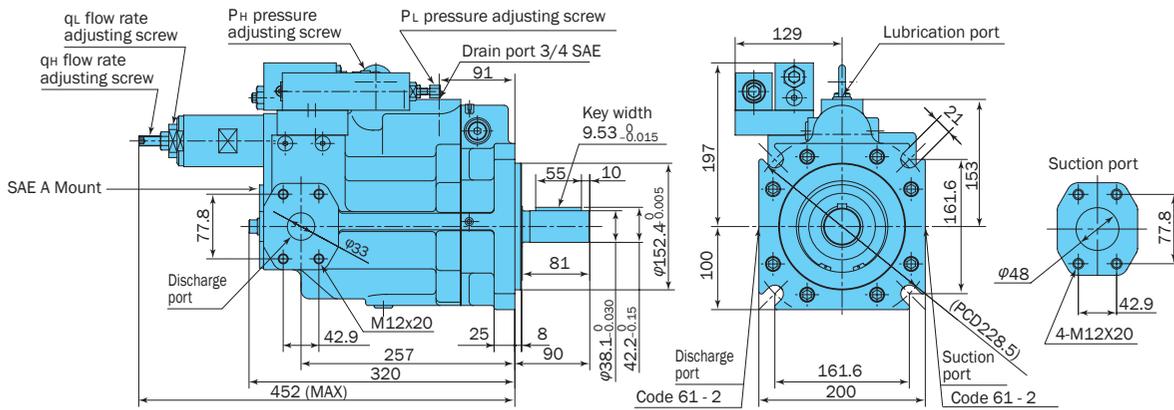


Use a flow adjustment length that is within the range noted in the above chart. Using a length that is outside the lower limit adjustment range can lead to oil leaks.

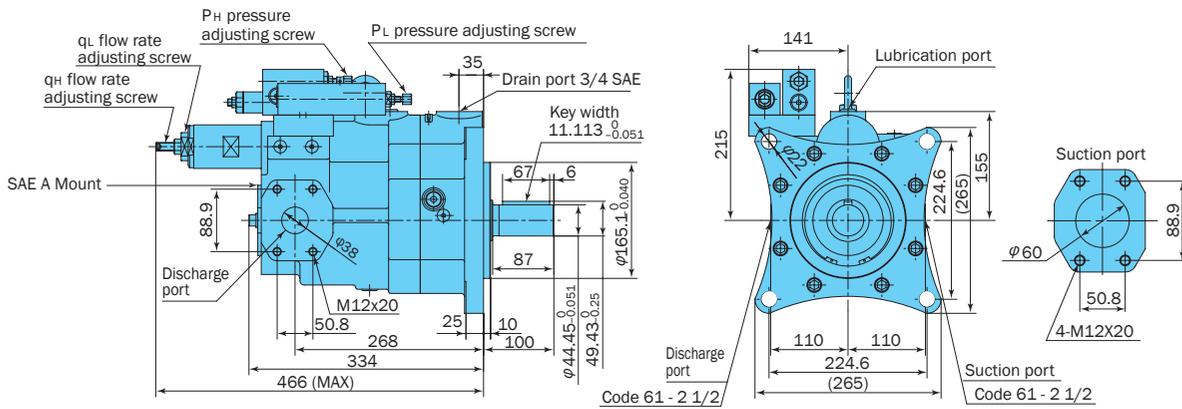
2-Pressure, 2-Flow Rate Control Type
PZS-3B-70N*Q*-10 (E4481A Thru Drive) (will fit) **2 Bolt SAE C Mount**



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



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

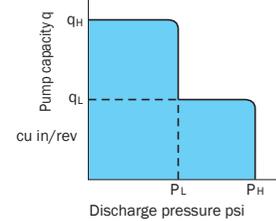


Pump Volume Adjustable Range

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

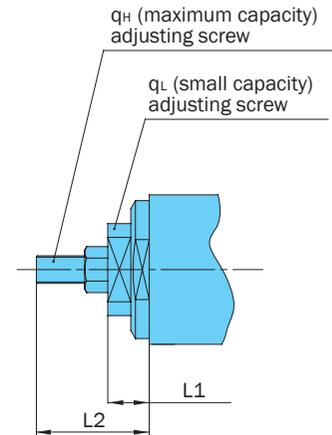
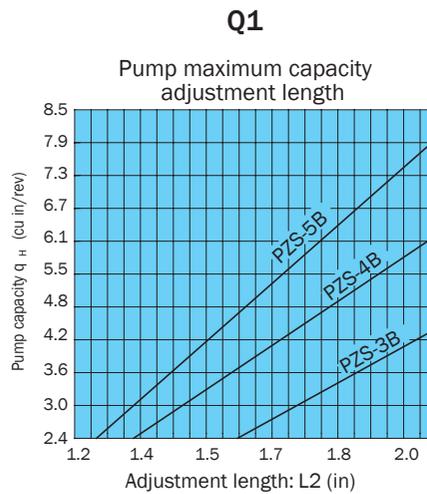
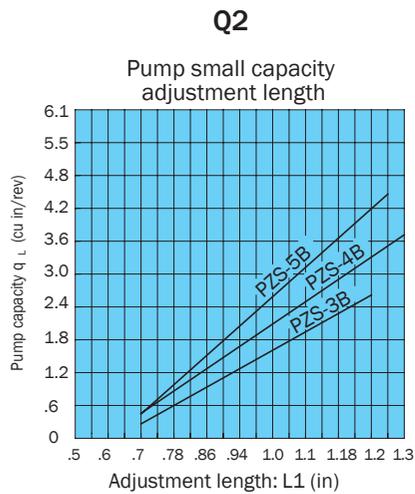
- Note 1: The setting range for pump maximum capacity q_H depends on the q_L setting.
- Note 2: Overall efficiency at a low flow rate is worse than at the maximum flow rate. Keep this in mind when deciding on the drive motor capacity.
- Note 3: P_L is set to 500 psi before shipping. (P_H is the lowest pressure)

P-Q characteristics



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

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



Adapter with coupling for Thru Drive E4481A & E5533A

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

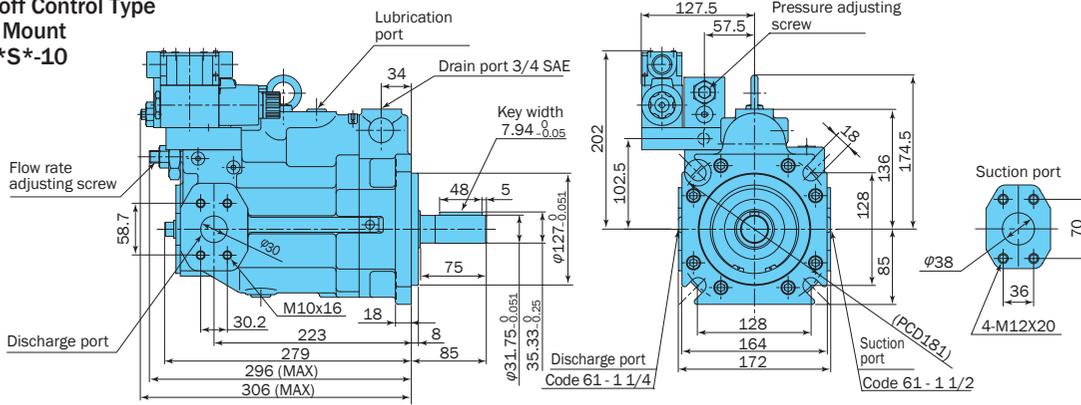
E4481A - PZMK SAE A 5/8 (with 5/8" coupling)

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

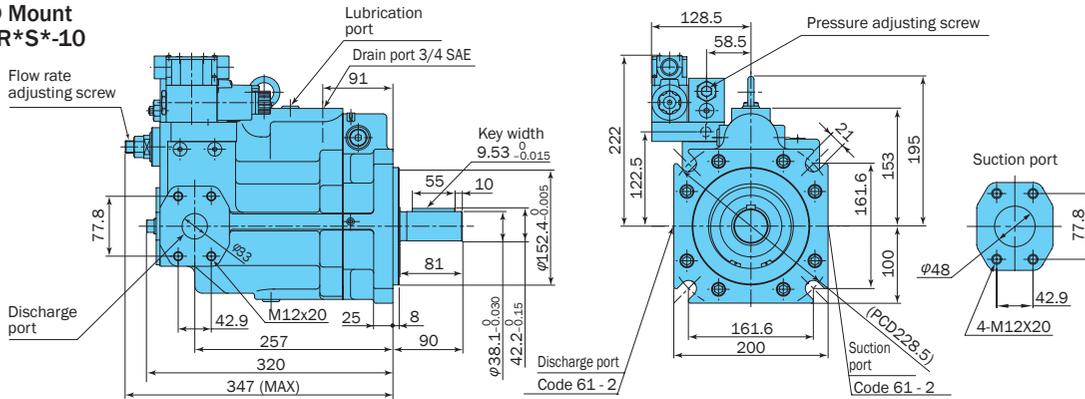
E5533A - JWF-SUB-0186-15-A (SAE A with 3/4" coupling)

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

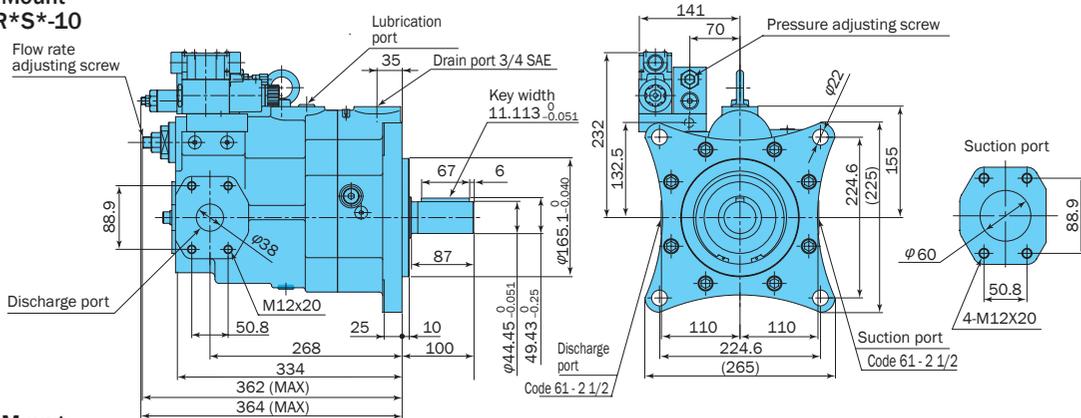
Solenoid Cutoff Control Type
2 Bolt SAE C Mount
PZS-3B-70R*S*-10



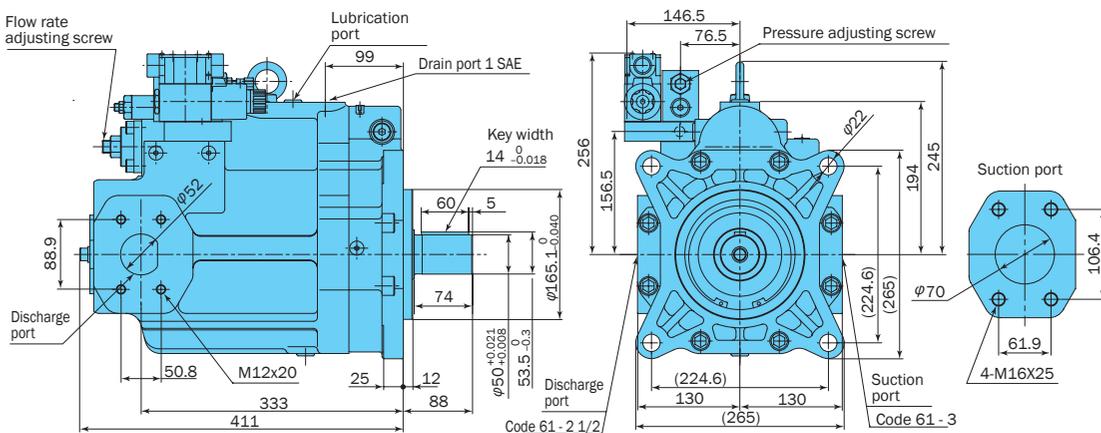
4 Bolt SAE D Mount
PZS-4B-100R*S*-10



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

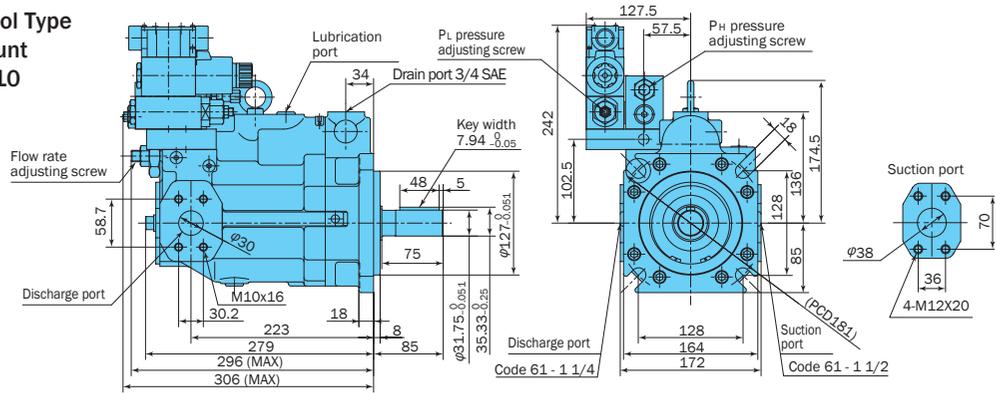


4 Bolt SAE E Mount
PZS-6B-180R*S*-10
PZS-6B-220R*S*-10

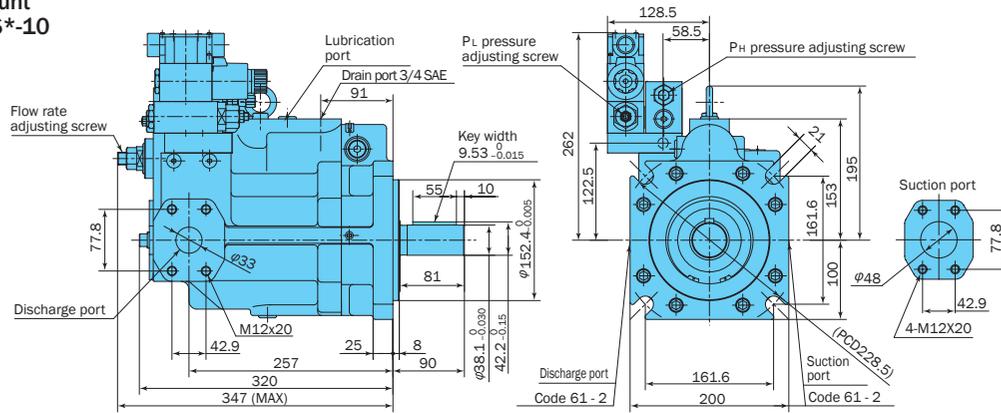


- Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot. Do not touch the surface of the coil directly with your hands.
- Do not use the solenoid valve to release the pressure in the hydraulic circuit

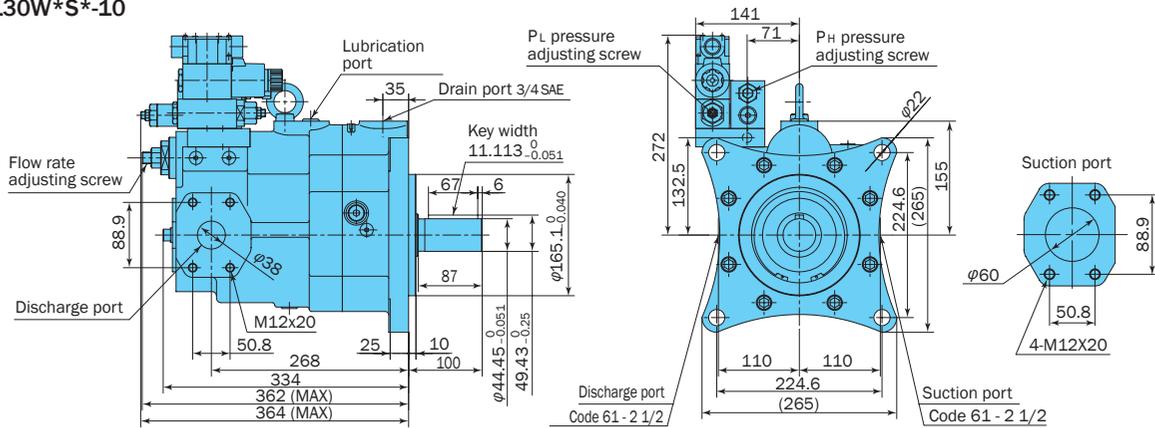
2-Pressure Control Type
2 Bolt SAE C Mount
PZS-3B-70W*S*-10



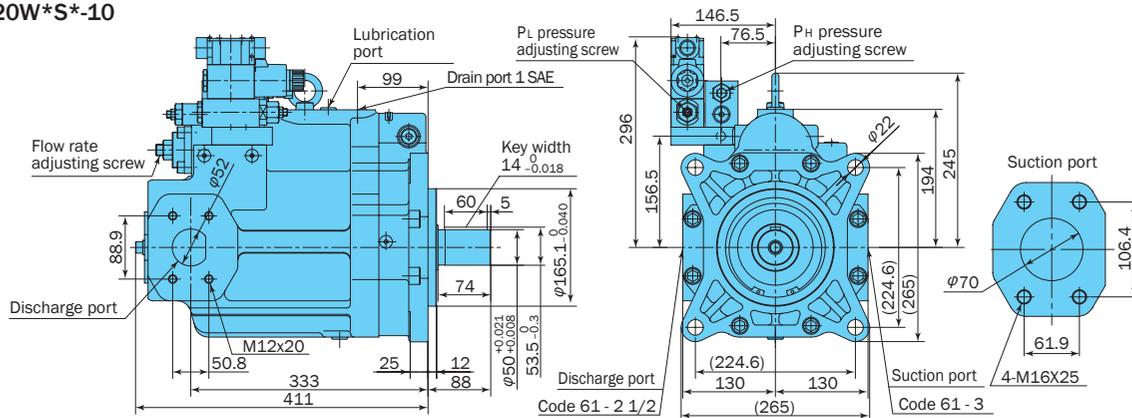
4 Bolt SAE D Mount
PZS-4B-100W*S*-10



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



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

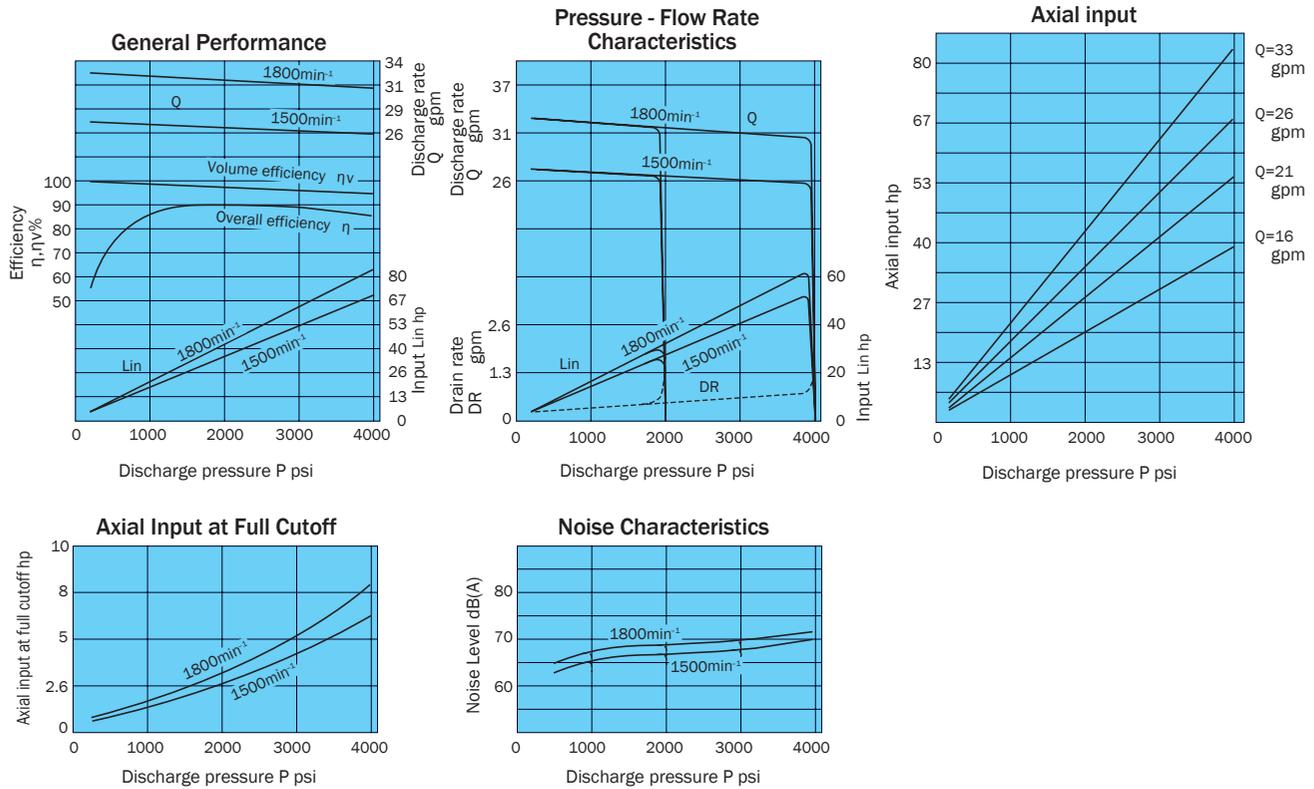


- Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot. Do not touch the surface of the coil directly with your hands.
- Do not use the solenoid valve to release the pressure in the hydraulic circuit

Performance Curves

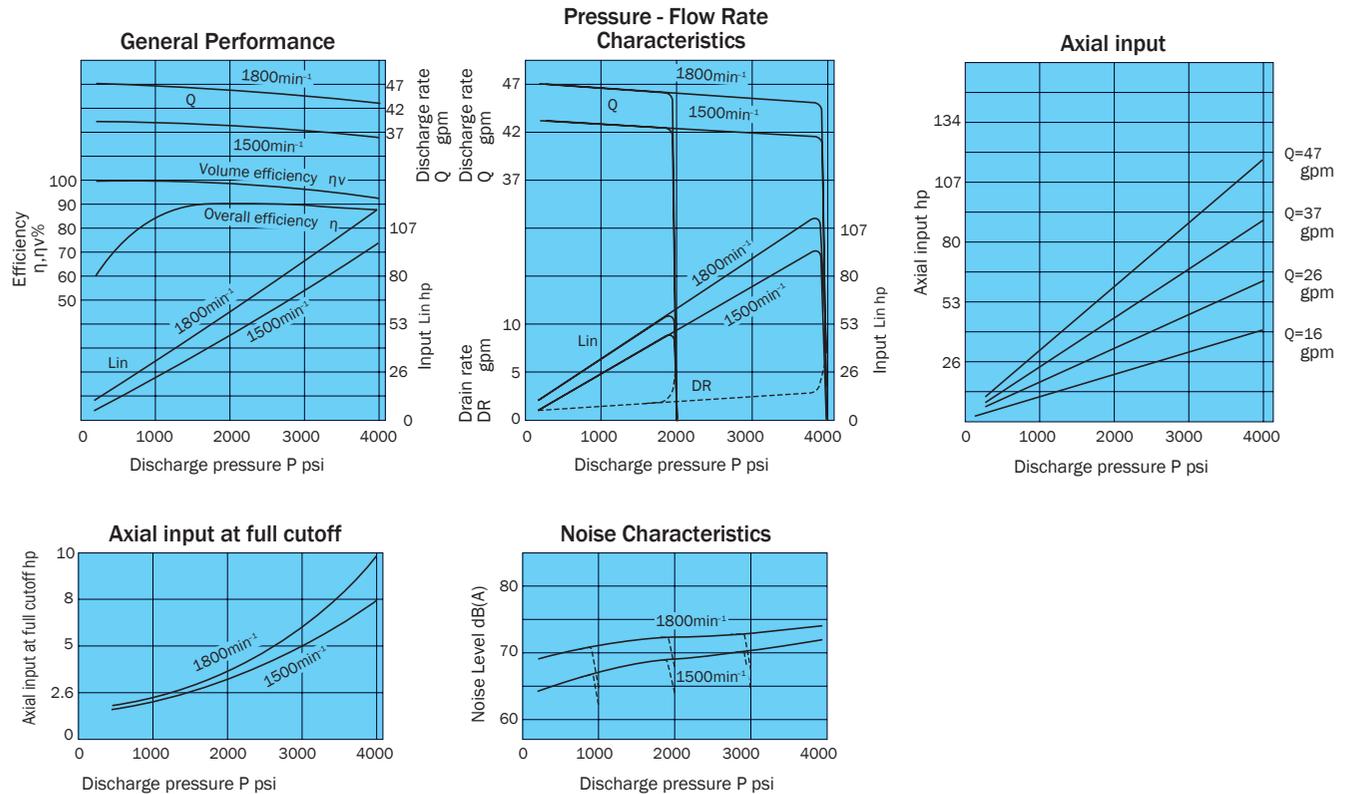
Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 centistokes

PZS-3B-70N*-10



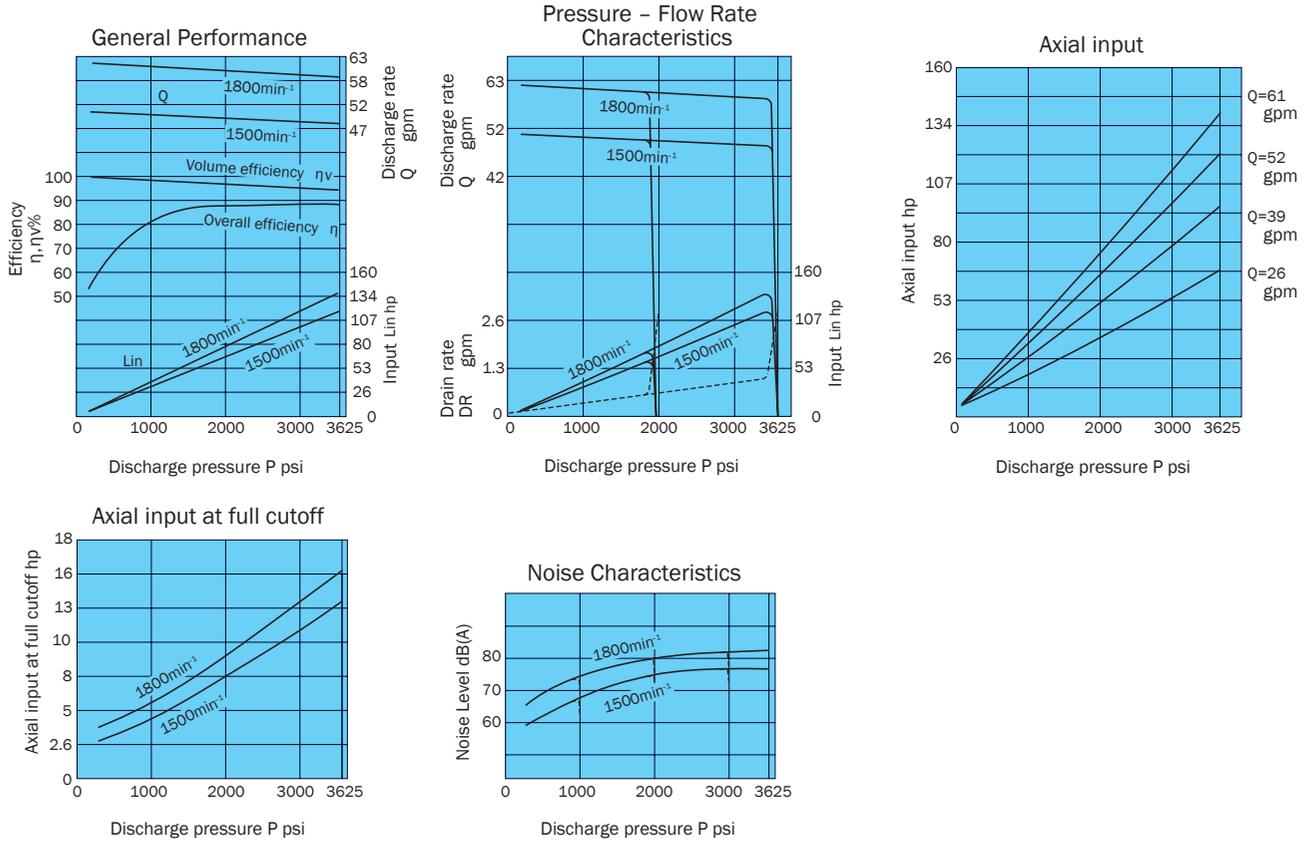
PZS-4B-100N*-10

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



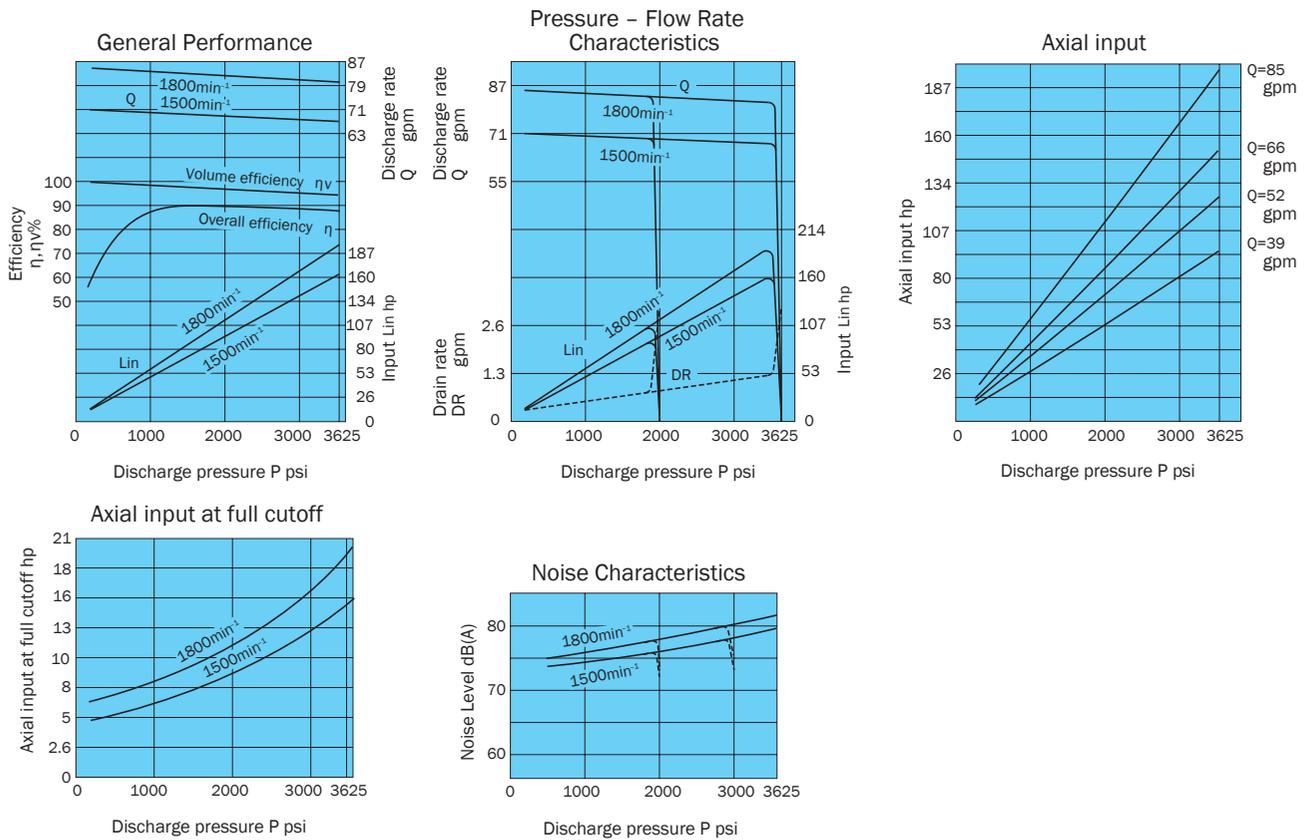
PZS-5B-130N*-10

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



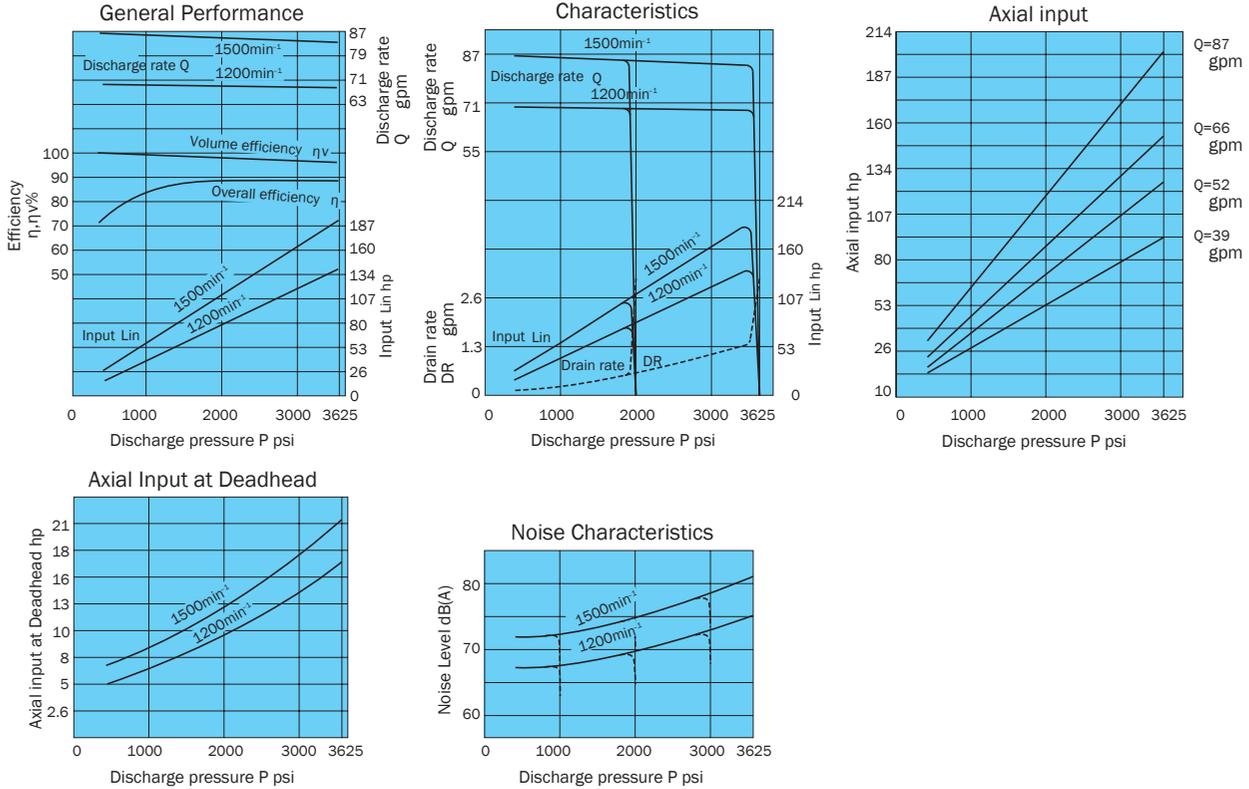
PZS-6B-180N*-10

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



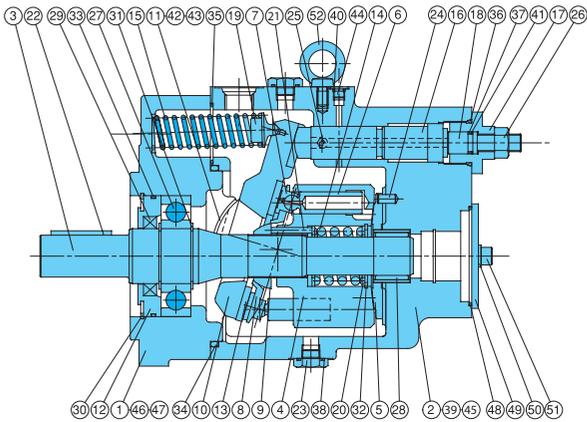
PZS-6B-220N*-10

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



Performance Curves

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



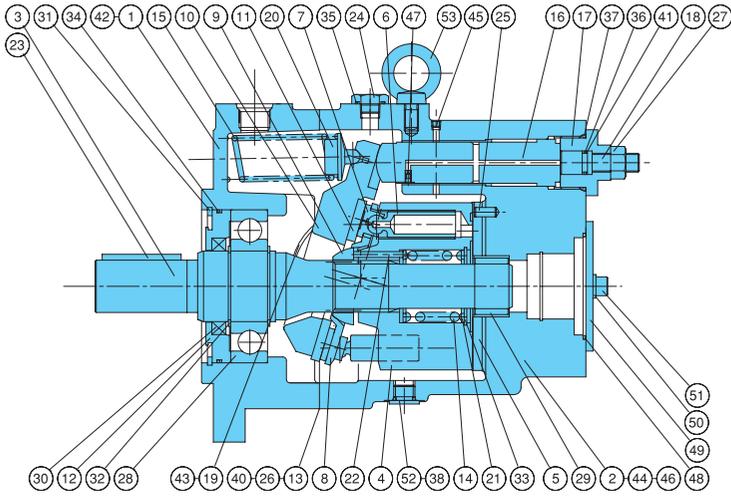
Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	19	Spring holder	37	O-ring
2	Case	20	Retainer	38	O-ring
3	Shaft	21	Needle	39	O-ring
4	Cylinder barrel	22	Key	40	O-ring
5	Valve plate	23	Plug	41	Backup ring
6	Piston	24	Pin	42	Orifice
7	Shoe	25	Orifice	43	Flat philips head screw
8	Shoe holder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

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

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

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

PZS-5B-130N*-10



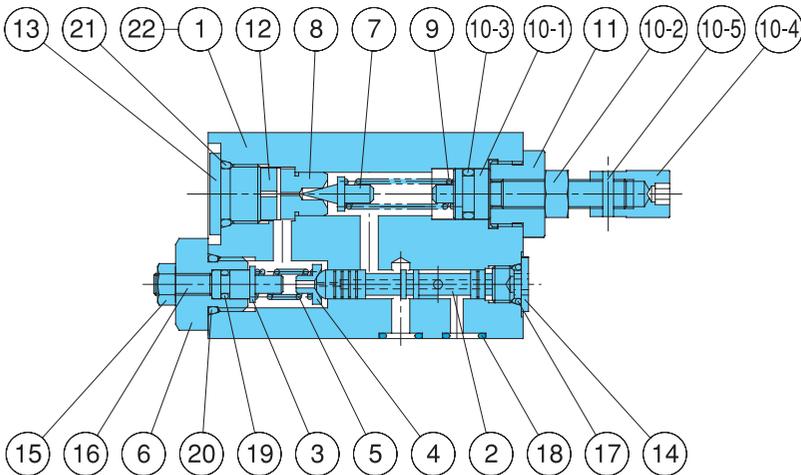
Part No.	Part Name	Part No.	Part Name
1	Body	28	Ball bearing
2	Case	29	Needle bearing
3	Shaft	30	Oil seal
4	Cylinder barrel	31	Snap ring
5	Valve plate	32	Snap ring
6	Piston	33	Snap ring
7	Shoe	34	O-ring
8	Shoe holder	35	O-ring
9	Barrel holder	36	O-ring
10	Swash plate	37	O-ring
11	Thrust plate	38	O-ring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

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

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

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

Pressure Compensator



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

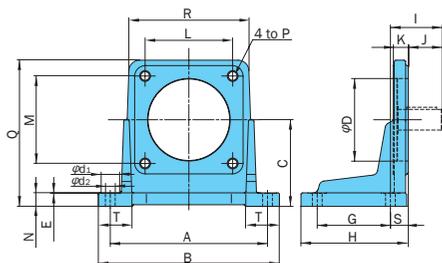
List of Sealing Parts

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

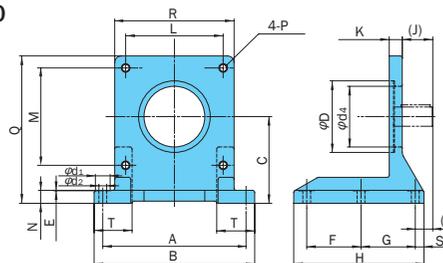
Foot Mounting Kit

Foot Mounting Installation Measurement Chart

PZM *-10



IHM - 55 - 10



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

Foot Mounting Kit Model No.	Measurements (mm)															Weight kg
	(J)	K	L	M	N	P	Q	R	(S)	T	φD	φd ₁	φd ₂	φd ₄		
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 (I) dimension (40) is the value for the PZS-5B. This dimension becomes 28 in the case of the PZS-6B. See the IHM-45-10 on pages B-36 and C-12 to see what the PZM-3-10 looks like.

Piping Flange Kit

Screw In Type

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

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

Welded Type

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

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

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

Replacement Items

PZS Rotating Group

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

Includes Items 4,5,6 & 7

PZS Thrust Plate Item 11 (2 required per pump)

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

PZS Compensator Kit

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



PZ Series Load Sensitive Variable Piston Pump

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

Features

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

Specifications

Pump System Specifications

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

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

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

Note 3: Maximum flow rate depends on the revolution speed. Values in the above table are for a speed of 1800min⁻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**

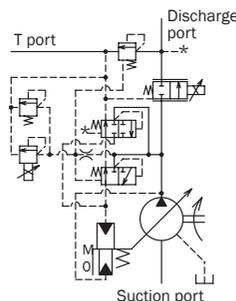
Pressure Control Range psi	.26 to 1000 .26 to 2000 .26 to 3000
Rated Current mA	800
Coil Resistance Ω	20 (20° C)
Hysteresis %	3% max. Note 1

Flow Rate Control System

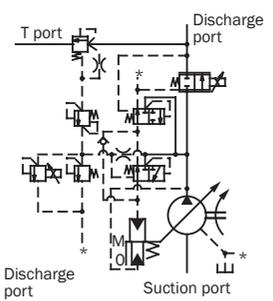
Valve Differential Pressure	145 Note 2
Rated Current mA	800
Coil Resistance Ω	20 (20° C)
Hysteresis %	3% max. Note 1

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

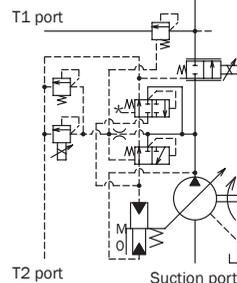
PZ-2B/3B/5B



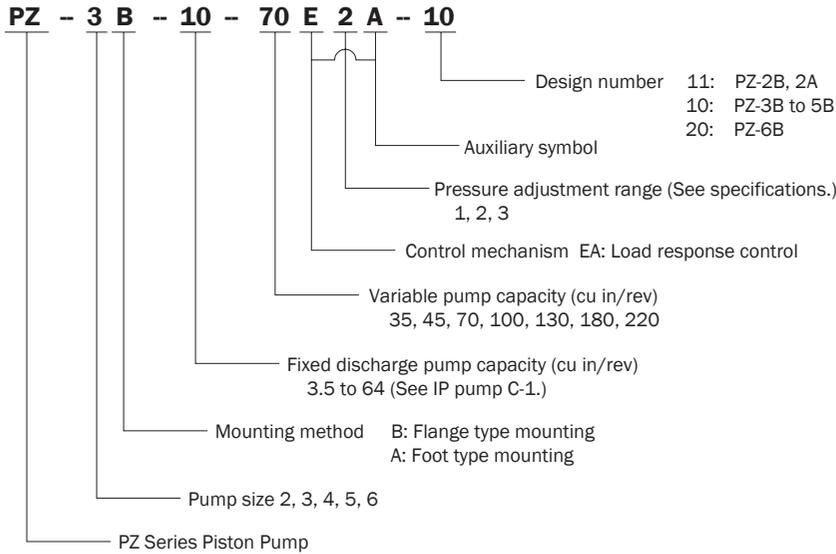
PZ-4B-100



PZ-6B



Understanding Model Numbers



- Handling
- Pump Installation and Piping Precautions

- 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 0.01 in, with an eccentric angle error of 1° or less.
 - 3 Keep the clamping 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 -4 psi or more (suction port flow velocity less than 6 ft/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 14.5 psi.
- | 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. | 1/2" | 5/8" | 7/8" |
| 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 centistokes.
Normally, you should use an R&O type and wear-resistant type of ISOVG32 to 68 or equivalent.
The optimum kinematic viscosity during operation is 20 to 50 centistokes.
- 2 The operating temperature range is 41 to 140°F. When the oil temperature at startup is 41°F or less, run the pump at low pressure until the oil temperature reaches 40°F.
- 3 Provide a suction strainer with a filtering grade of about 100μ (150 mesh). Provide a return line filter of grade 10μm or less on the return line to the tank. (When the pump is used at a high pressure of 2000 psi or greater, a filter of 10μm or less is recommended.)
- 4 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower.
- 5 Use hydraulic operating fluid when the operating ambient temperature is in the range of 32 to 140°F.

- Startup Precautions

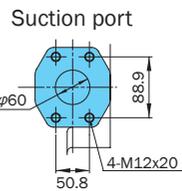
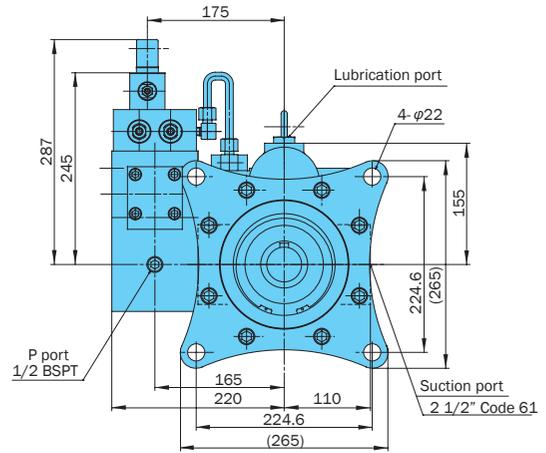
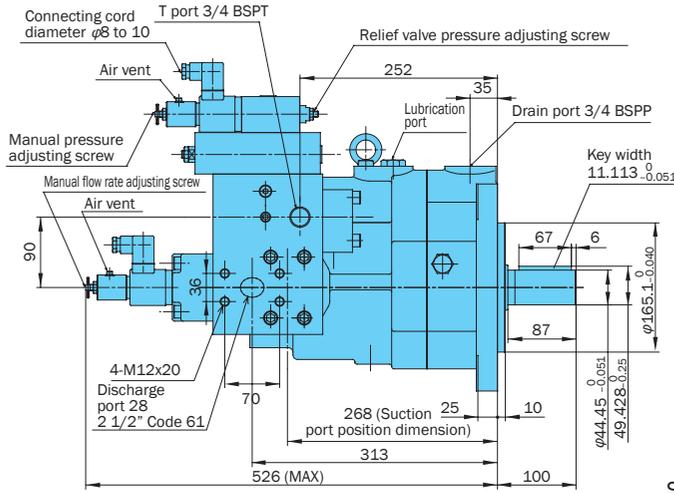
- 1 Before starting up the pump, fill the pump body with clean hydraulic operating fluid through the lubrication port.

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

- 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.

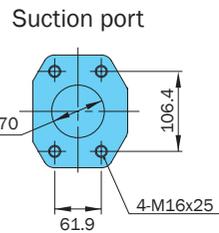
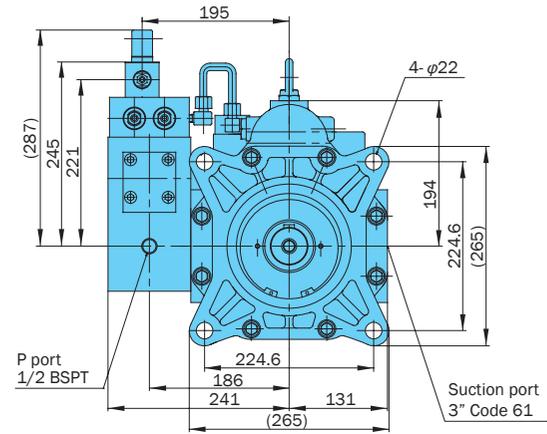
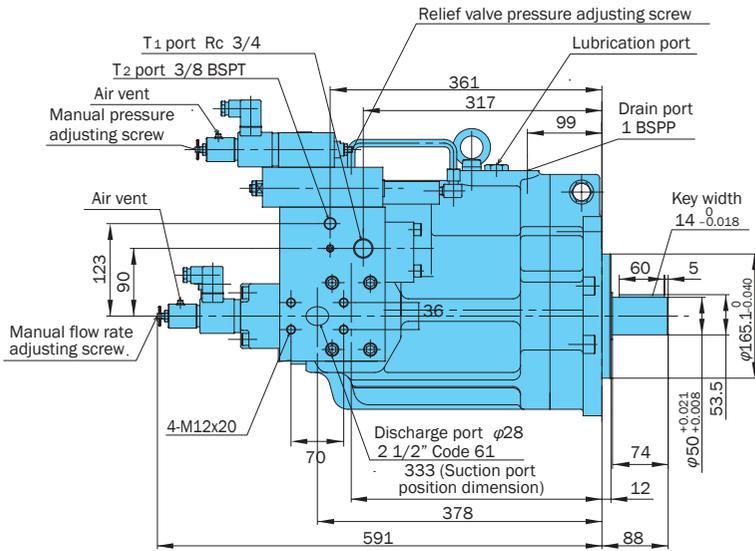
PZ-5B-130

4 Bolt SAE E Mount



PZ-6B-180
220

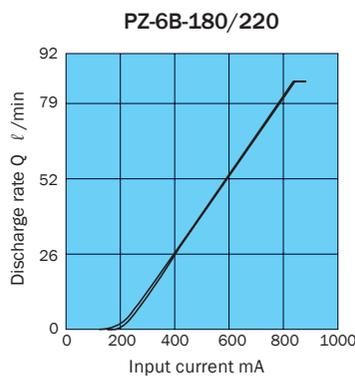
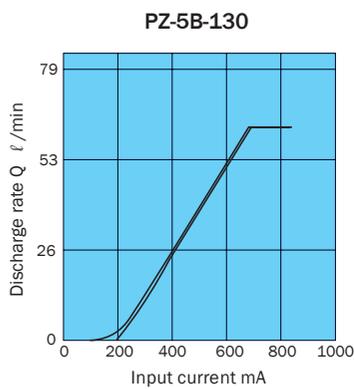
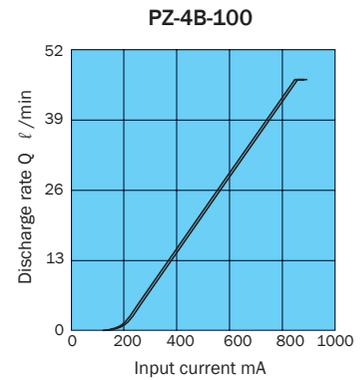
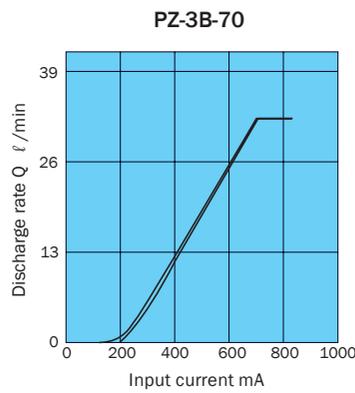
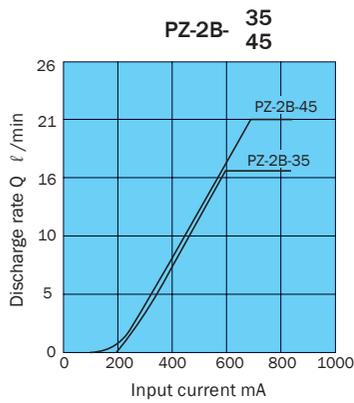
4 Bolt SAE E Mount



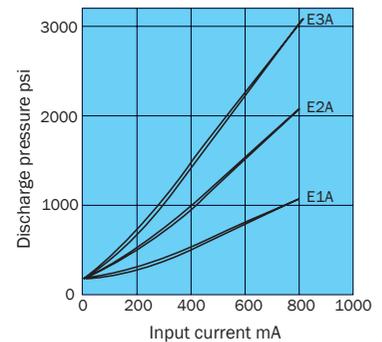
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes

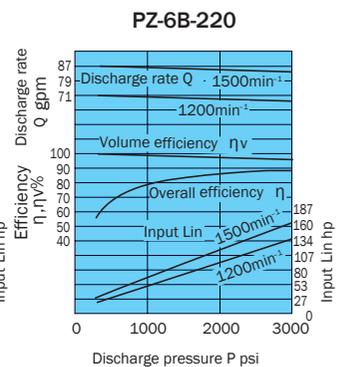
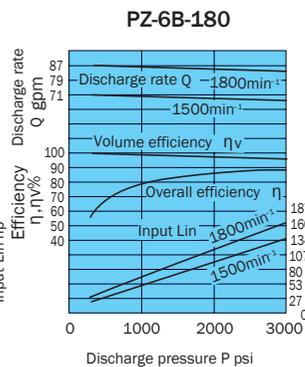
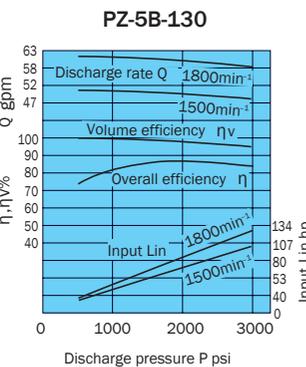
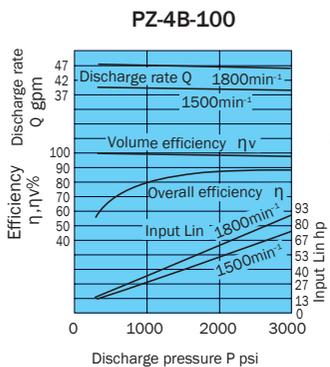
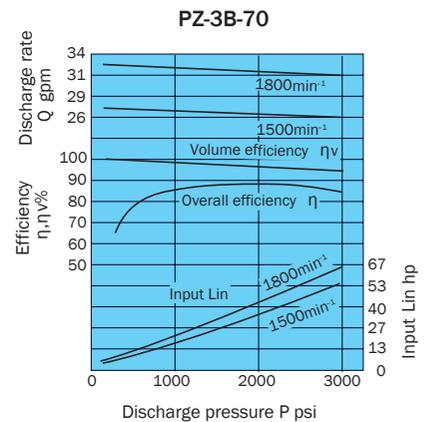
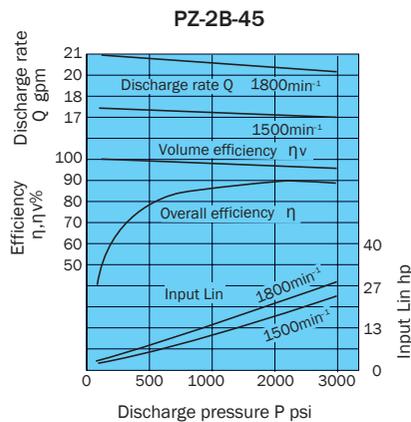
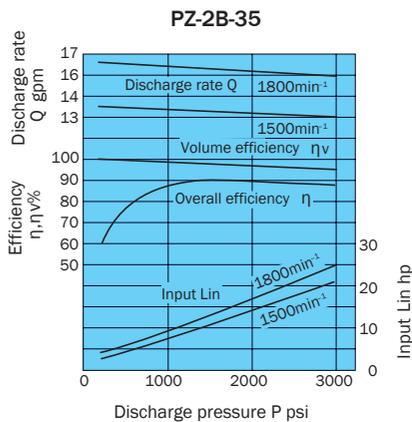
Input Current - Discharge Rate Characteristics



Input Current - Discharge Pressure Characteristics

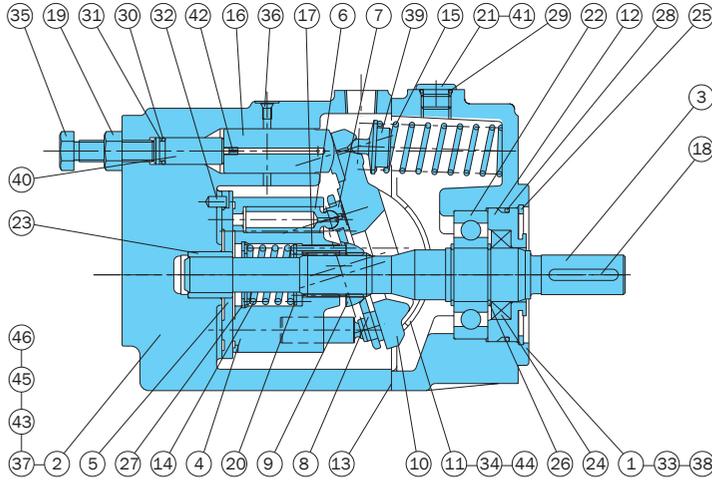


General Performance



Cross-Sectional Drawing

PZ-2B-³⁵/₄₅E*A-11



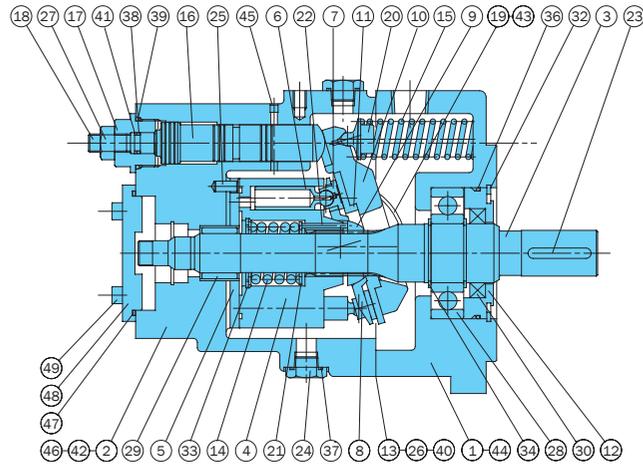
Part No.	Part Name	Part No.	Part Name
1	Body	24	Oil seal
2	Case	25	Snap ring
3	Shaft	26	Snap ring
4	Cylinder barrel	27	Snap ring
5	Valve plate	28	O-ring
6	Piston	29	O-ring
7	Shoe	30	O-ring
8	Shoe holder	31	Backup ring
9	Barrel holder	32	Pin
10	Swash plate	33	Screw
11	Thrust bush	34	Screw
12	Seal holder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

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

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

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

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



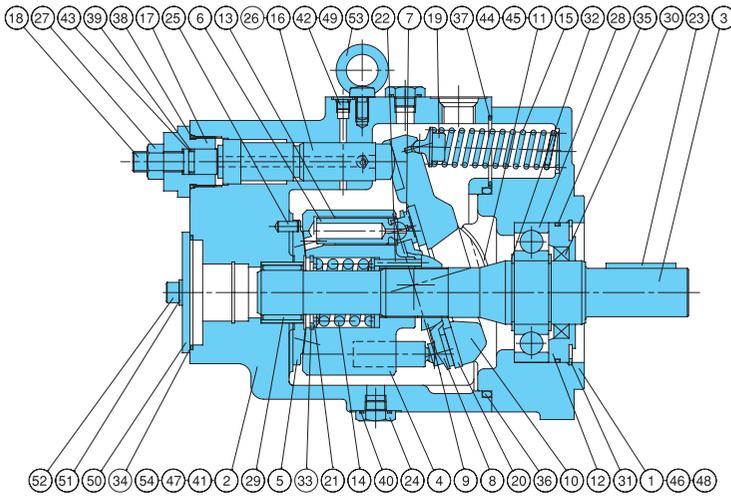
Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	18	Guide screw	37	O-ring
2	Case	19	Thrust bush	38	O-ring
3	Shaft	20	Spring holder	39	O-ring
4	Cylinder barrel	21	Retainer	40	O-ring
5	Valve plate	22	Needle	41	Backup ring
6	Piston	23	Key	42	Bolt
7	Shoe	24	Plug	43	Screw
8	Shoe holder	25	Pin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

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

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

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

PZ-4/6B-*



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

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

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

Foot Mounting Kit

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

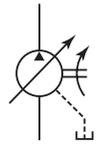
Note: See pages C-12 and A-34 for information about mounting methods.

Piping Flange Kit

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

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

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



VDS Series Small Variable Volume Vane Pump

0.5 in³/rev
3.94 gpm
1015 psi

Features

High efficiency operation with minimal power loss

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

Quiet operation

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

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

Compact and simple design, easy operation

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

Precise characteristics, prompt response

Prompt response at both ON-OFF

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

Solidly built for high efficiency and long life

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

Specifications

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

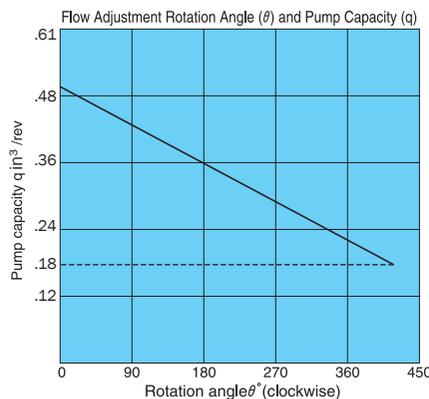
• Handling

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

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

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

Q: No-load Discharge Rate (gpm)
q: Capacity (in³/rev)



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

6 Thrust Screw

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

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

7 Initial Operation

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

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

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

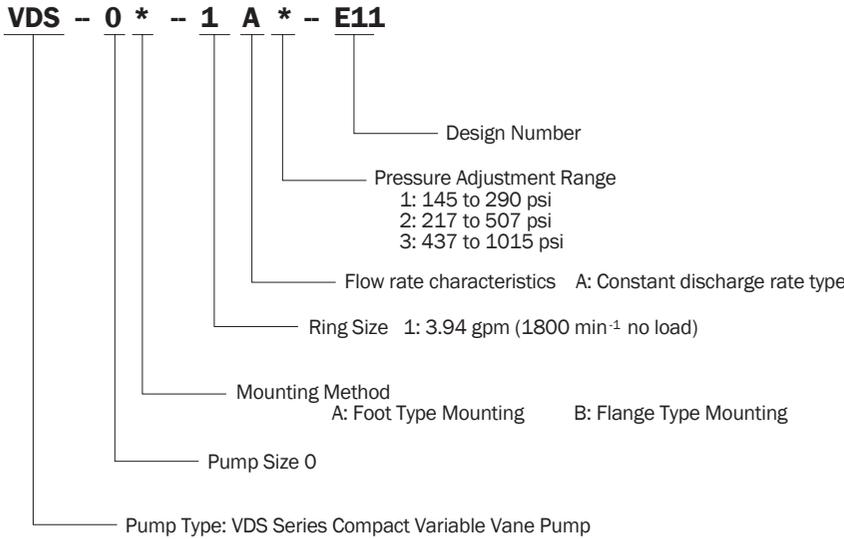
(continued on following page)

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

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

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

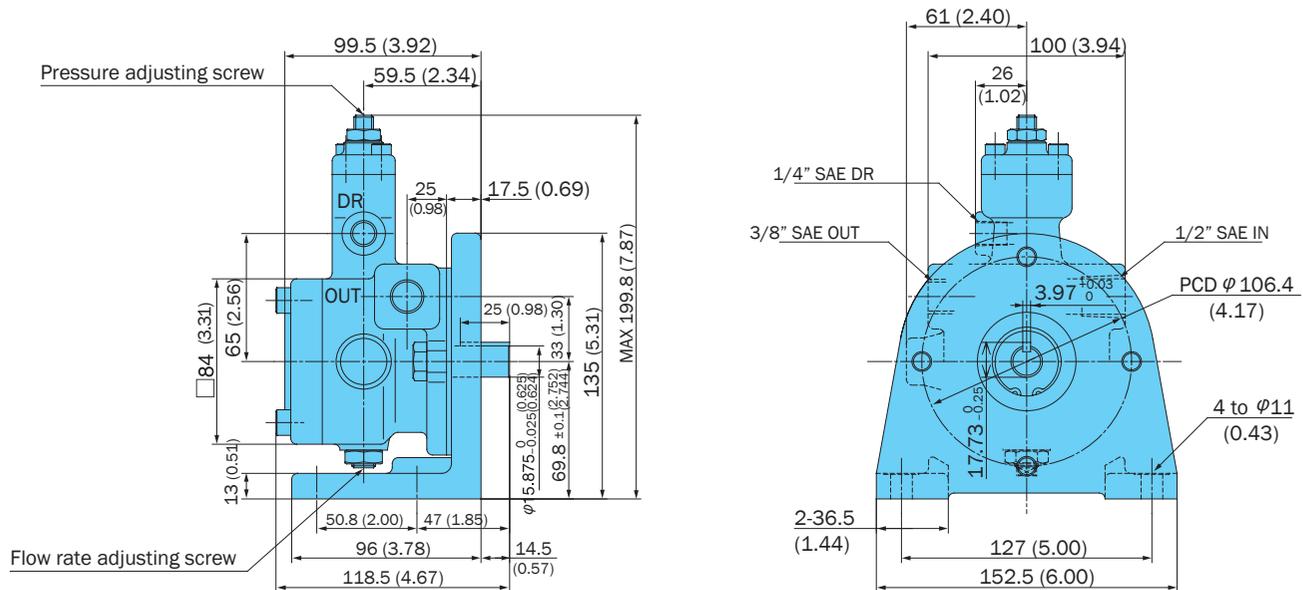
Understanding Model Numbers



Installation Dimension Drawings

VDS-0A-1A-*-10

Foot Mounting Type mm (inch)

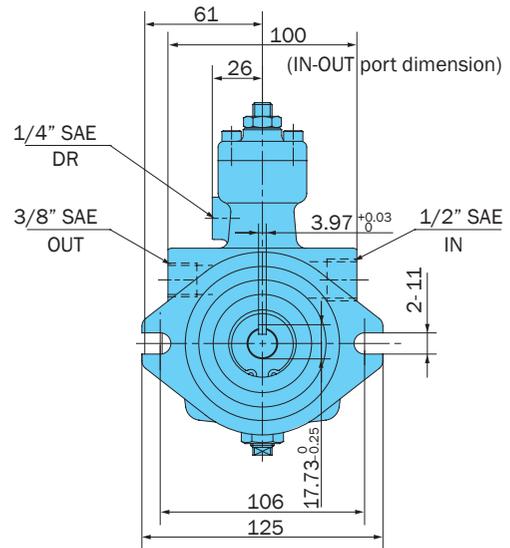
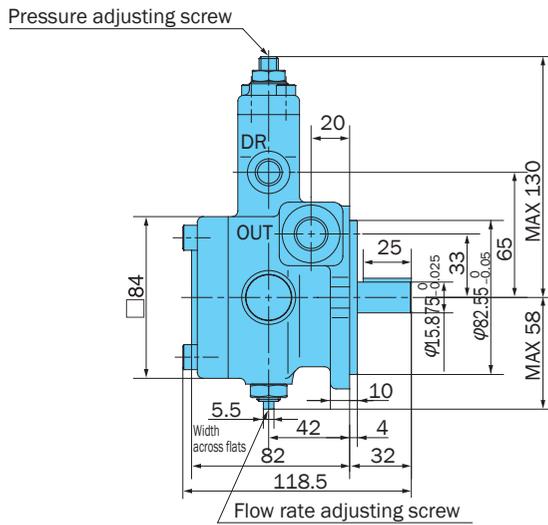


Note: Foot Mounting Kit: IHM-2-10

VDS-0B-1A-*-10

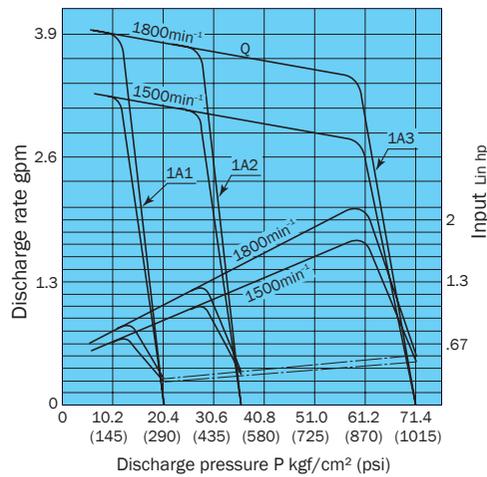
SAE A Mount

Flange Mounting

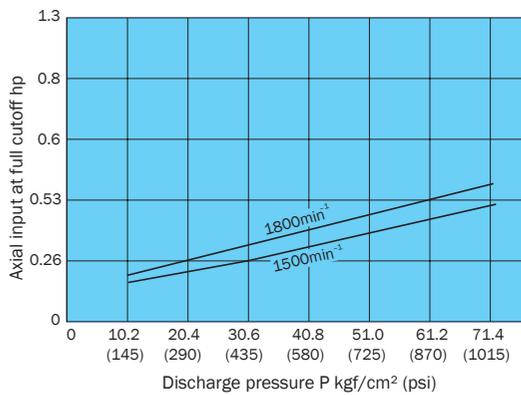


Specifications

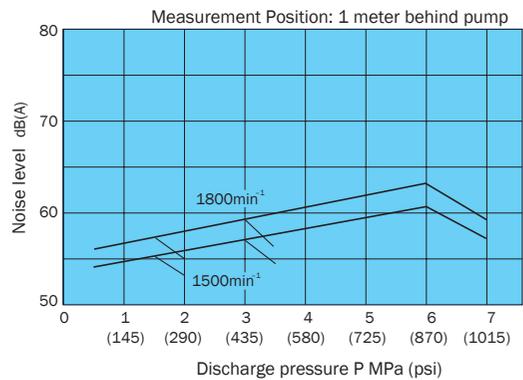
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes



Axial Input at Full Cutoff

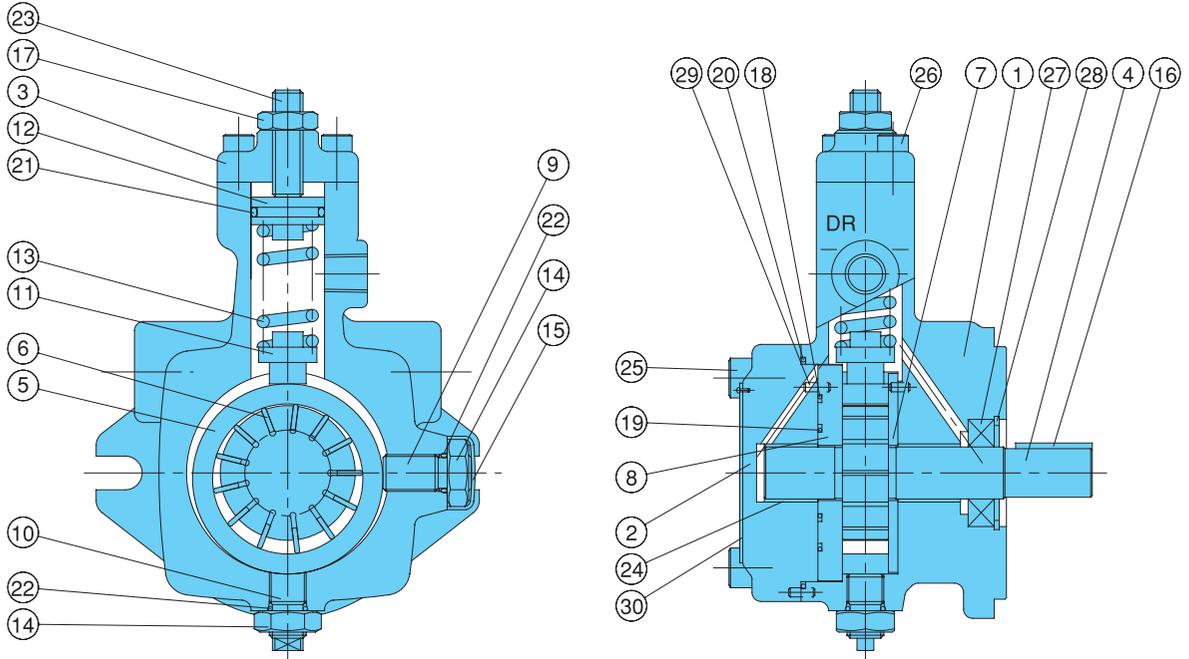


Noise Characteristics



Cross-Sectional Drawing

VDS-0B-1A*-10



List of Sealing Parts

Seal Kit: VBAS-100B00

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

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

Note:

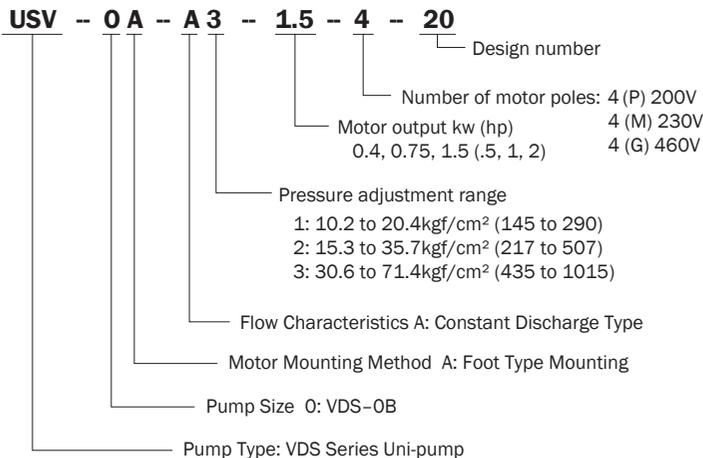
1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
2. O-ring 1A/B-** refers to JIS B2401-1A.

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

Uni-Pump Specifications

(CE mark standard compliant)

Understanding Model Numbers



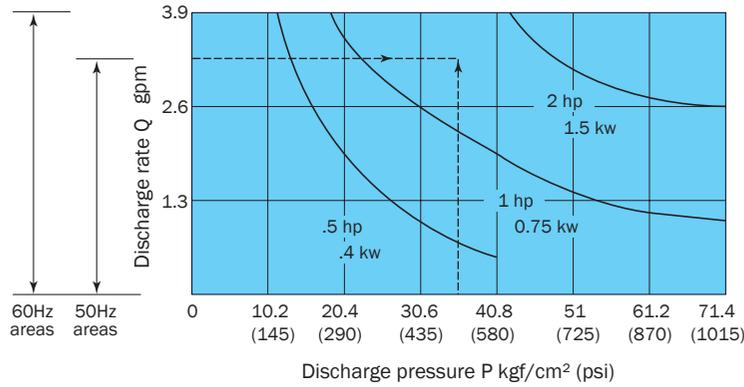
Cartridge Kit:
VBAC-100*A*

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

Maximum Working Pressure kgf/cm (psi)	Maximum Flow Rate gpm	
	50Hz	60Hz
71.4 (1015)	3.30	3.94

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

Motor Selection Curves



• How to select a motor

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

Example:

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

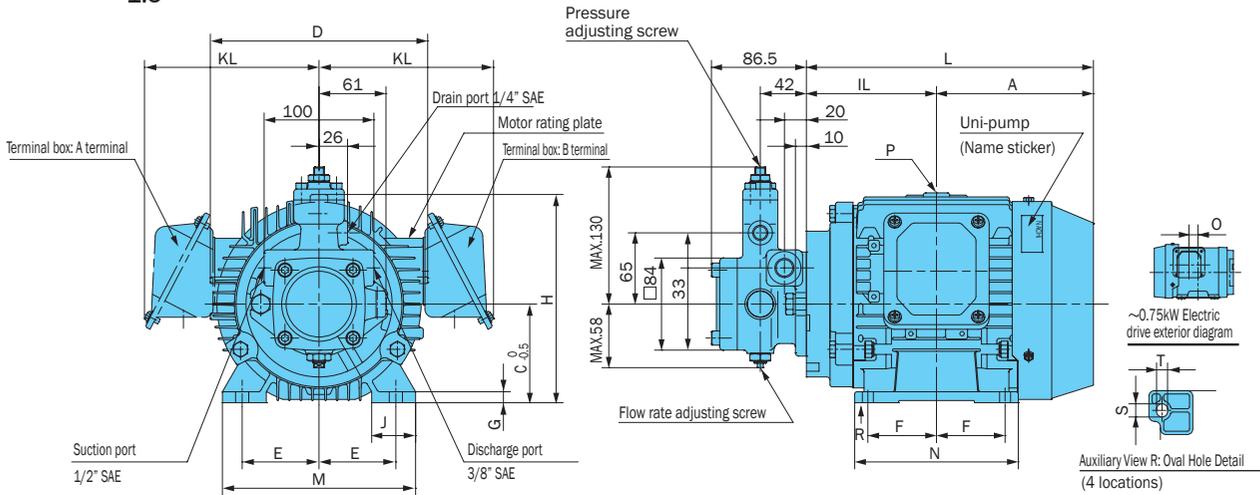
Selection Process:

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

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

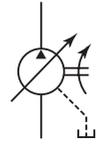
Installation Dimension Drawings

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



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

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



VDR Design Series Variable Volume Vane Pump

7.9 gpm at 2030 psi
10.5 gpm at 1000 psi

Features

Stable, highly efficient operation up to 2030 psi

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

High-precision instantaneous response

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

ensures instantaneous, stable, high-precision operation.

Silent operation, even in the high pressure range

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

Reduced power loss

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

Solid construction stands up to harsh operating conditions

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

Specifications

Single Pump

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

Double Pump

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

Note: 1. The discharge rate is the value at 1800min⁻¹ no load.

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

• Handling

1 Rotation Direction

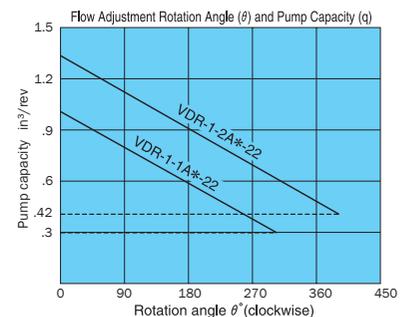
The direction of rotation is always clockwise (rightward) when viewed from the shaft side.

2 Drain

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

3 Discharge Volume Adjustment

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



(continued on following page)

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

Q: No-load Discharge Rate Q r/min
 q: Volume cm³/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

6 Thrust Screw

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

Factory Default Pressure Settings kgf/cm ² (psi)
2 : 35.7 (507)
3 : 30.6 (435)
4 : 66.3 (942)
5 : 91.8 (1305)

7 Initial Operation

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

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

8 Sub Plate

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

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

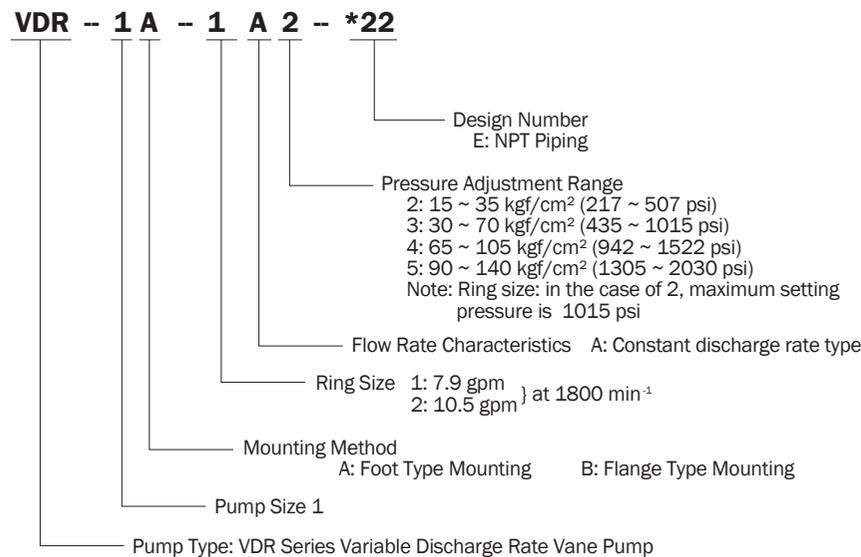
Pump Model No.	Sub Plate Number	Motor(hp)
VDR-1A-1A*-22	MVD-1-115-10	1 ~ 2
	MVD-1-135-10	3 ~ 5
VDR-1A-2A*-22	MVD-1-115Y-10	1 ~ 2
	MVD-1-135Y-10	3 ~ 5
VDR-11A-*A* -*A*-22	MVD-11-135-10	2 ~ 5
	MVD-11-135X-10	

- 10 The operating temperature range is 59 to 140 °F. When the oil temperature at startup is 59 °F or less, perform a warm-up operation at low pressure until the oil temperature reaches 59 °F. Use the pump in an area where the temperature is within the range of 32 to 140 °F.
- 11 Suction pressure is 4.35 psi, and the suction port flow rate should be to greater than 6 ft/sec. Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.

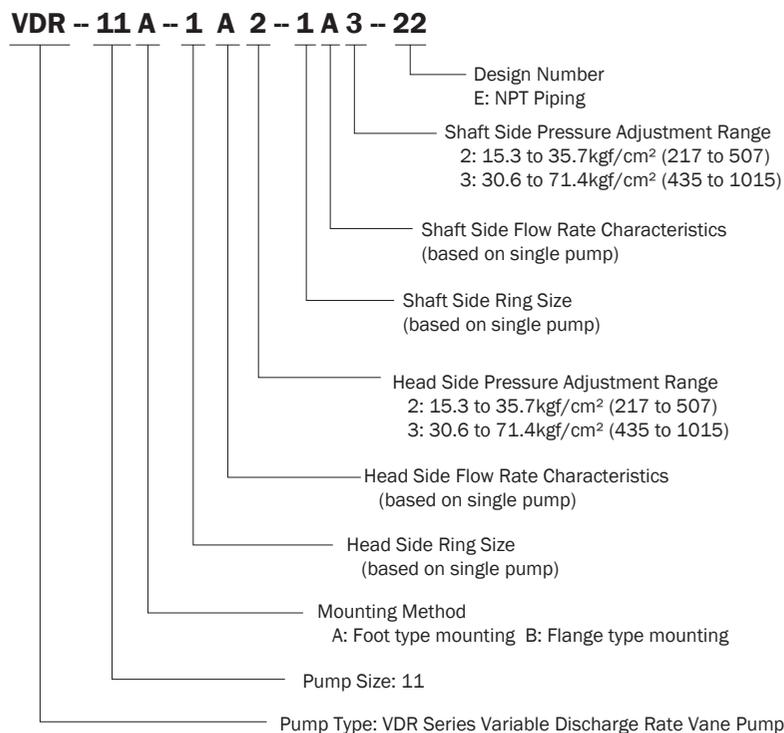
(Continued on following page)

Understanding Model Numbers

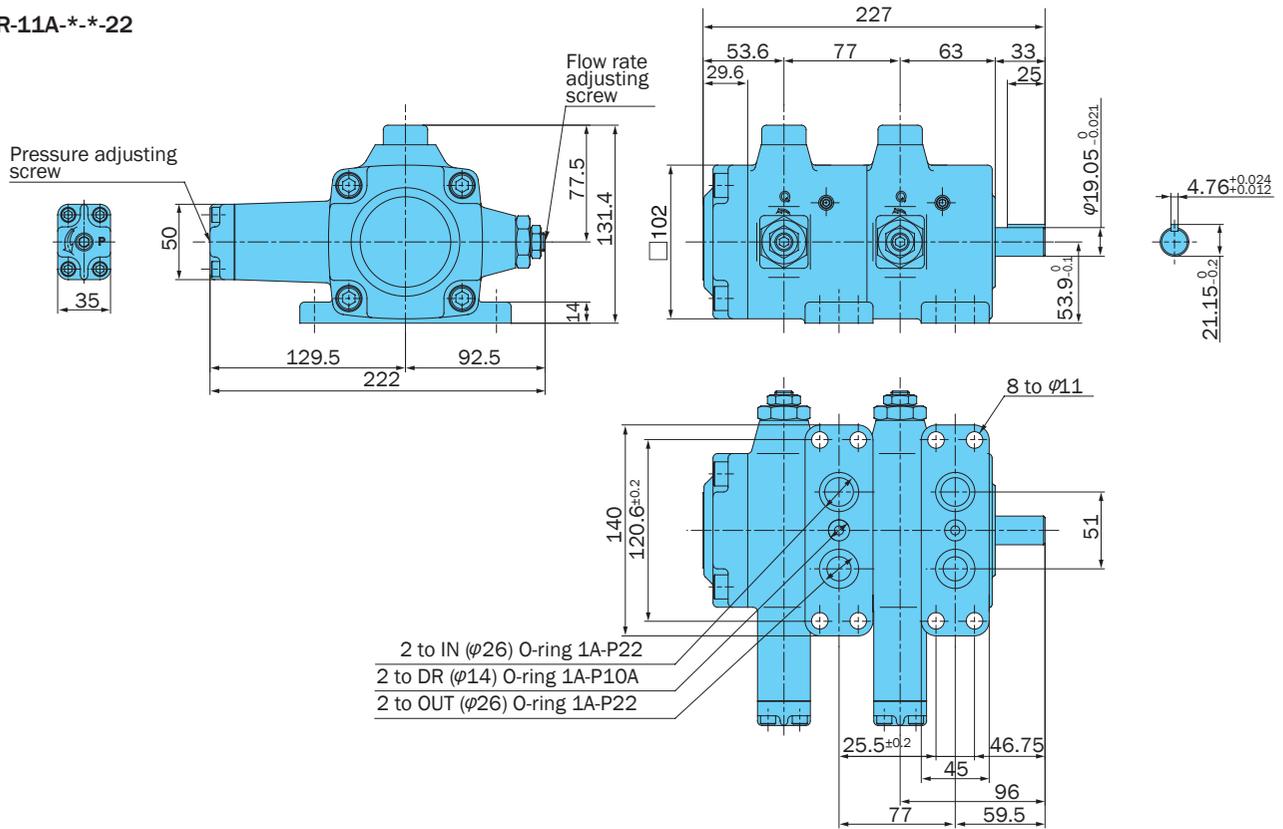
Single Pump



Double pump

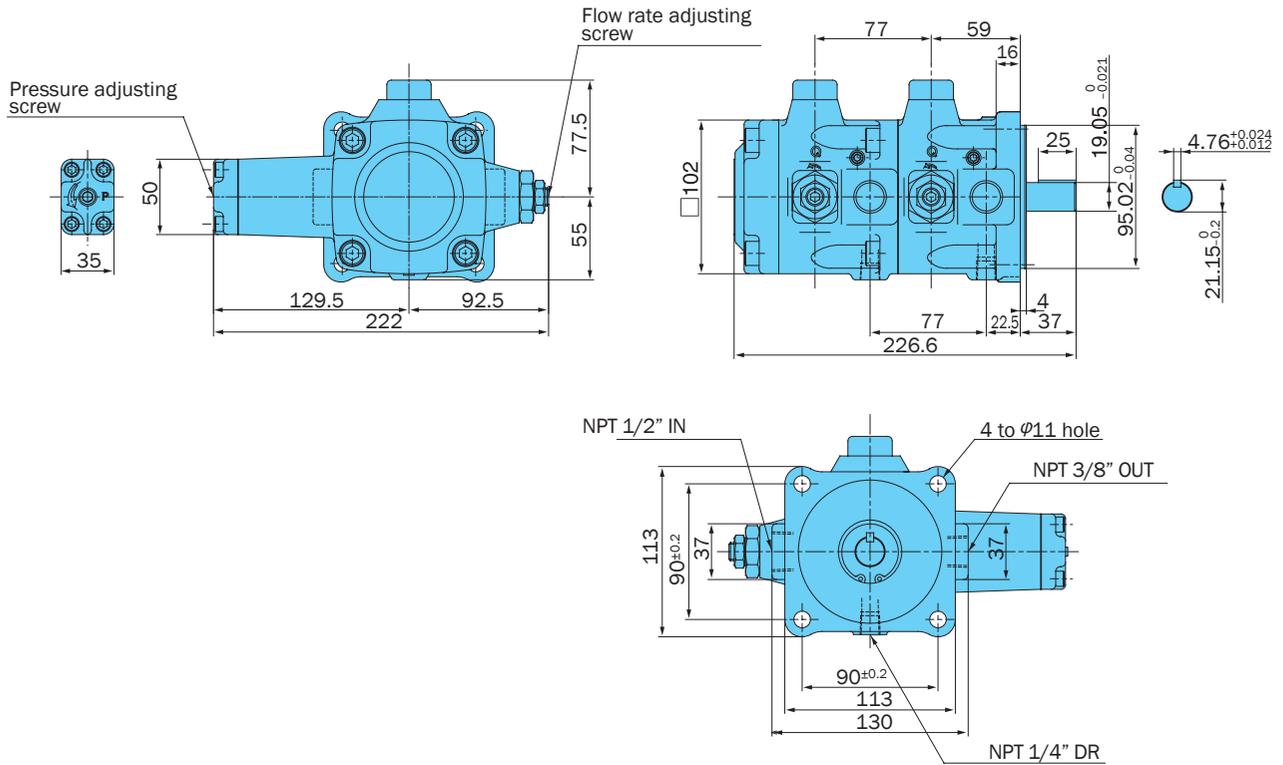


VDR-11A-*-22



VDR-11B-*-22

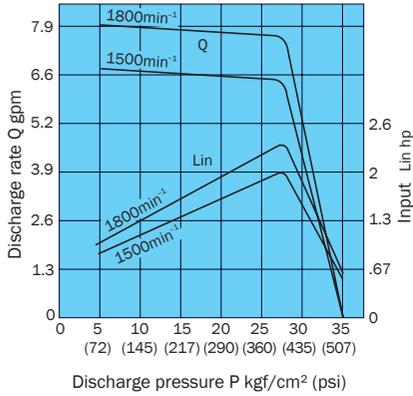
Not SAE Mount



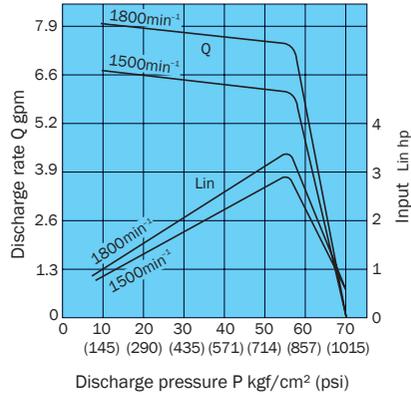
Performance Curves

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

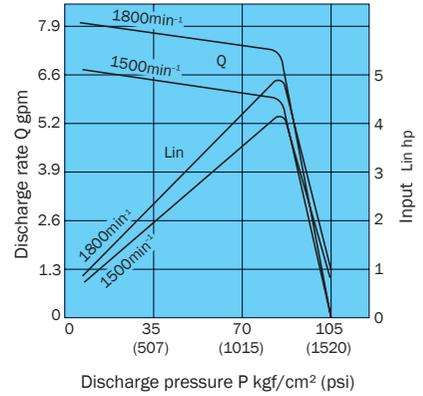
VDR-1*-1A2-22



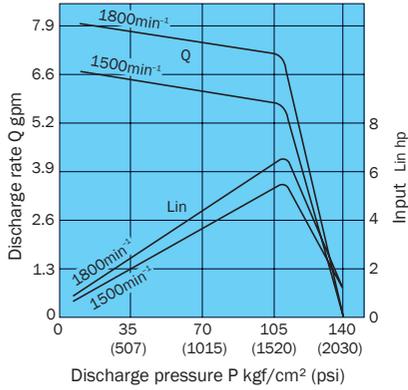
VDR-1*-1A3-22



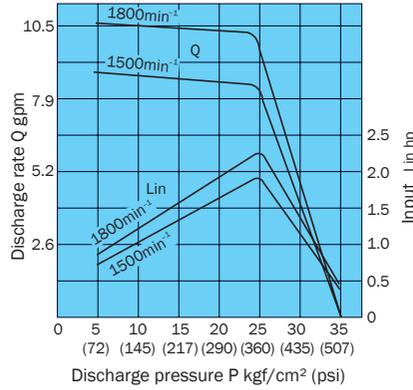
VDR-1*-1A4-22



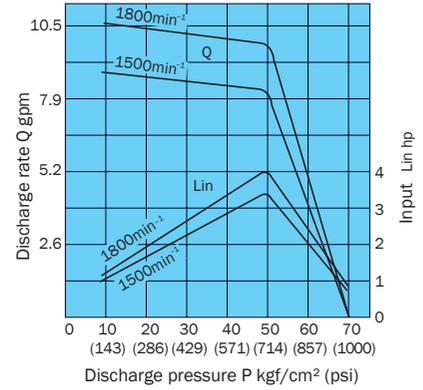
VDR-1*-1A5-22



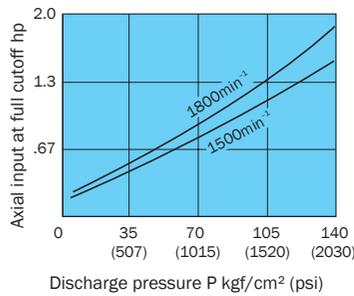
VDR-1*-2A2-22



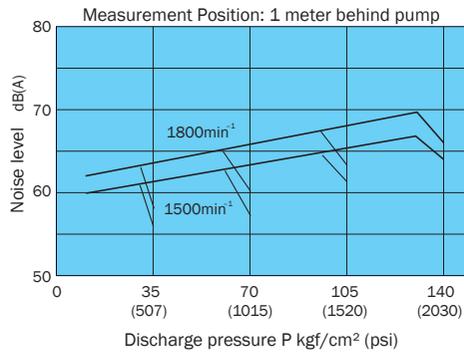
VDR-1*-2A3-22



Axial Input At Full Cutoff

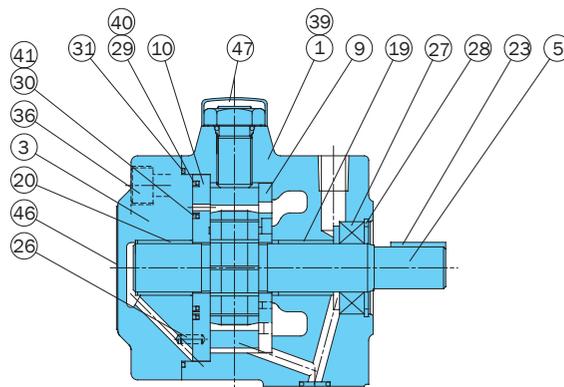
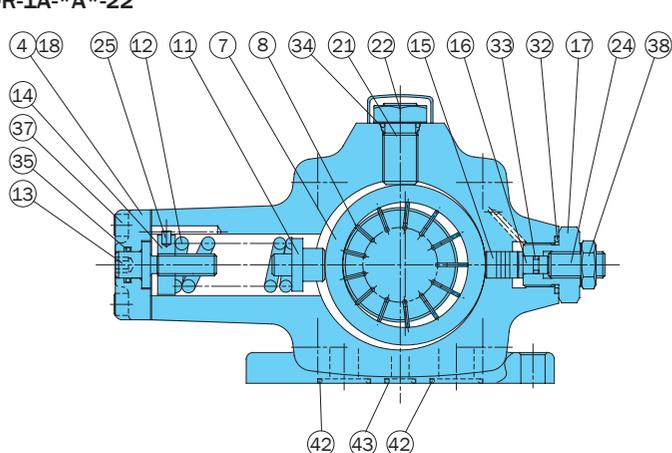


Noise Characteristics



Cross-Sectional Drawing

VDR-1A-*A*-22



List of Sealing Parts

Single Pump

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

Note:

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

Double Pump

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

Note:

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

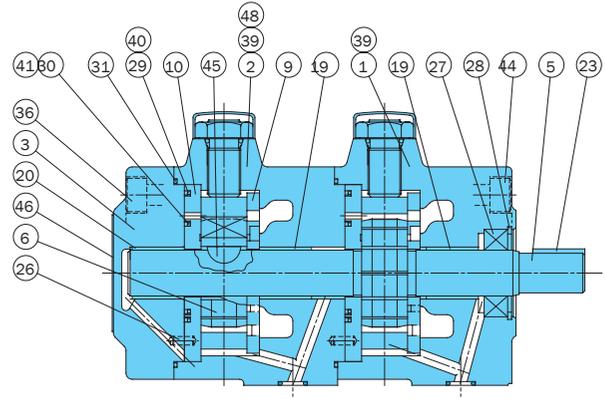
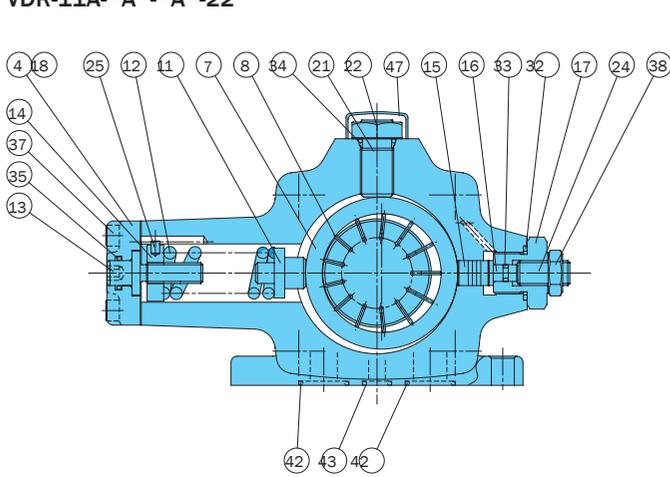
Part No.	Part Name	Part No.	Part Name
1	Body (A)	25	Pin
2	Body (B)	26	Spring pin
3	Cover	27	Oil seal
4	Cover	28	Snap ring
5	Shaft	29	Backup ring
6	Rotor	30	Backup ring
7	Ring	31	O-ring
8	Vane	32	O-ring
9	Plate (S)	33	O-ring
10	Plate (H)	34	O-ring
11	Piston	35	O-ring
12	Spring	36	Screw
13	Screw	37	Screw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

Cartridge Kit:

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

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

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

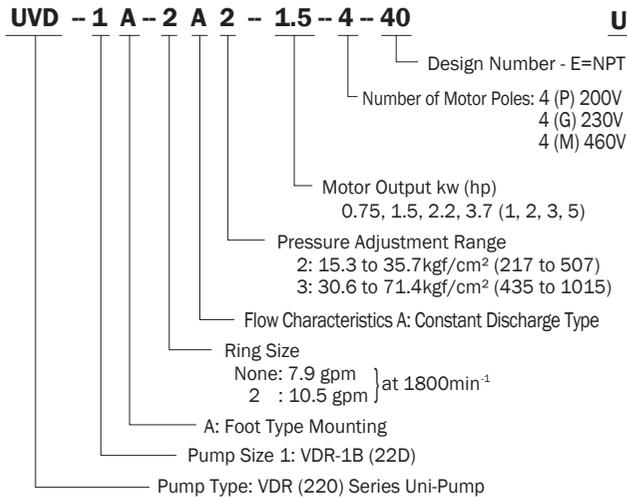


Uni-Pump Specifications

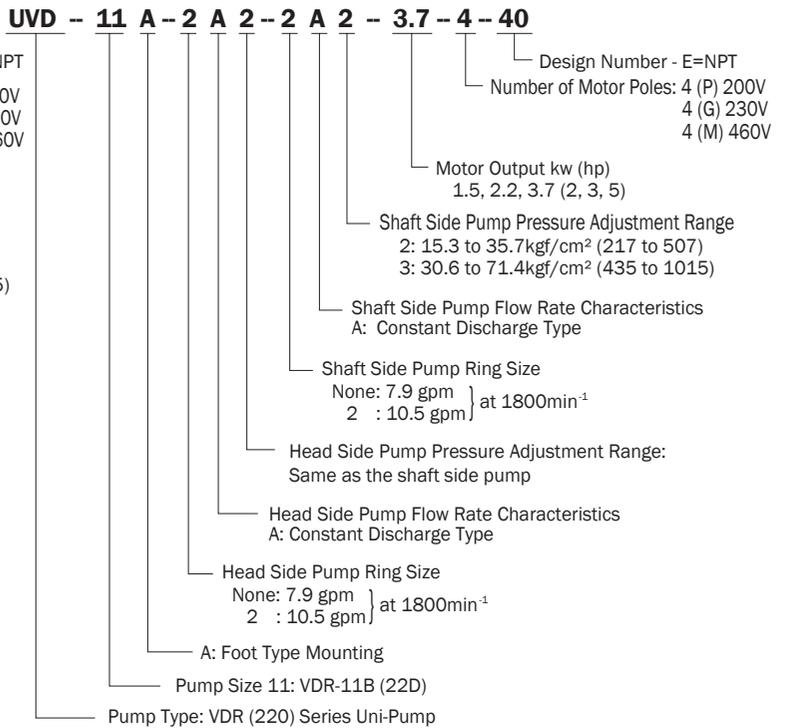
(CE mark standard compliant)

Understanding Model Numbers

Single Pump



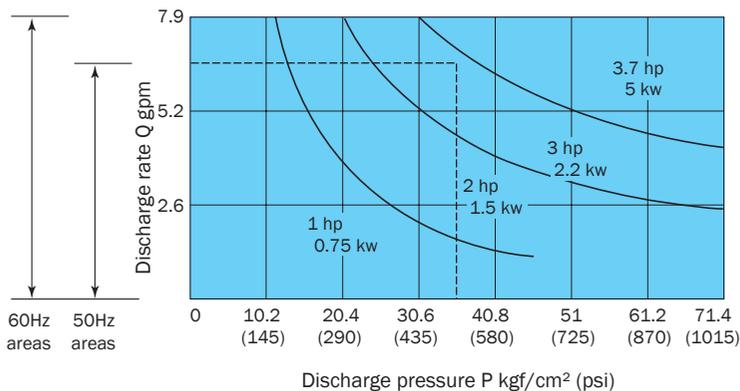
Double Pump



Specifications

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

Motor Selection Curves



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

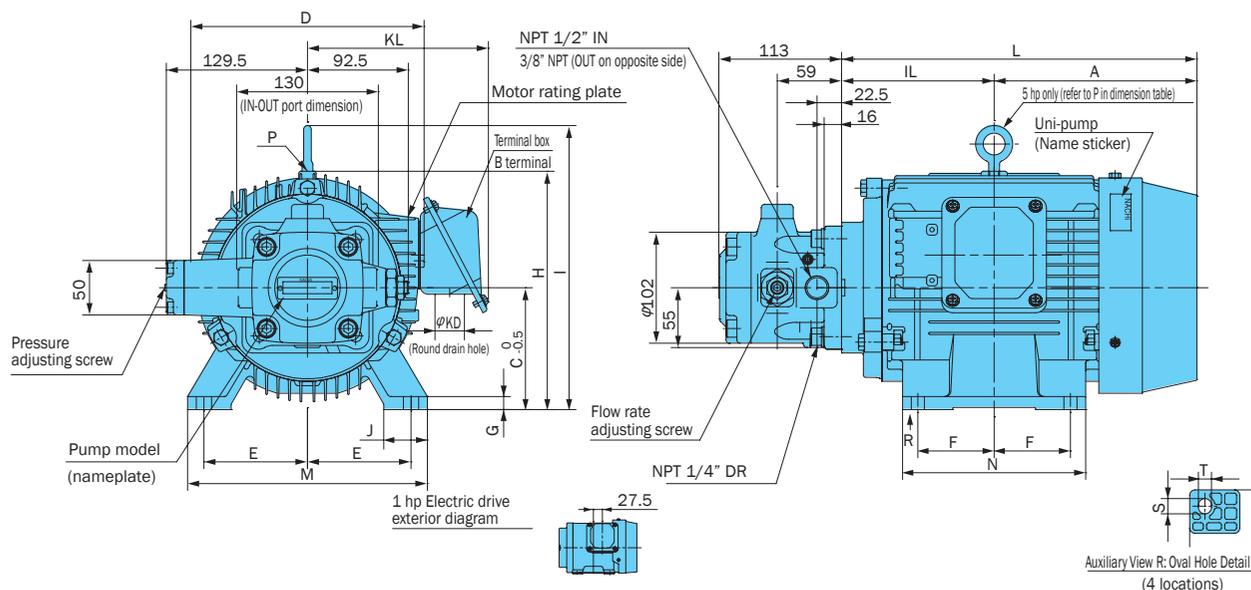
• **Selecting a motor**
The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.

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

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

Installation Dimension Drawings

UVD-1A



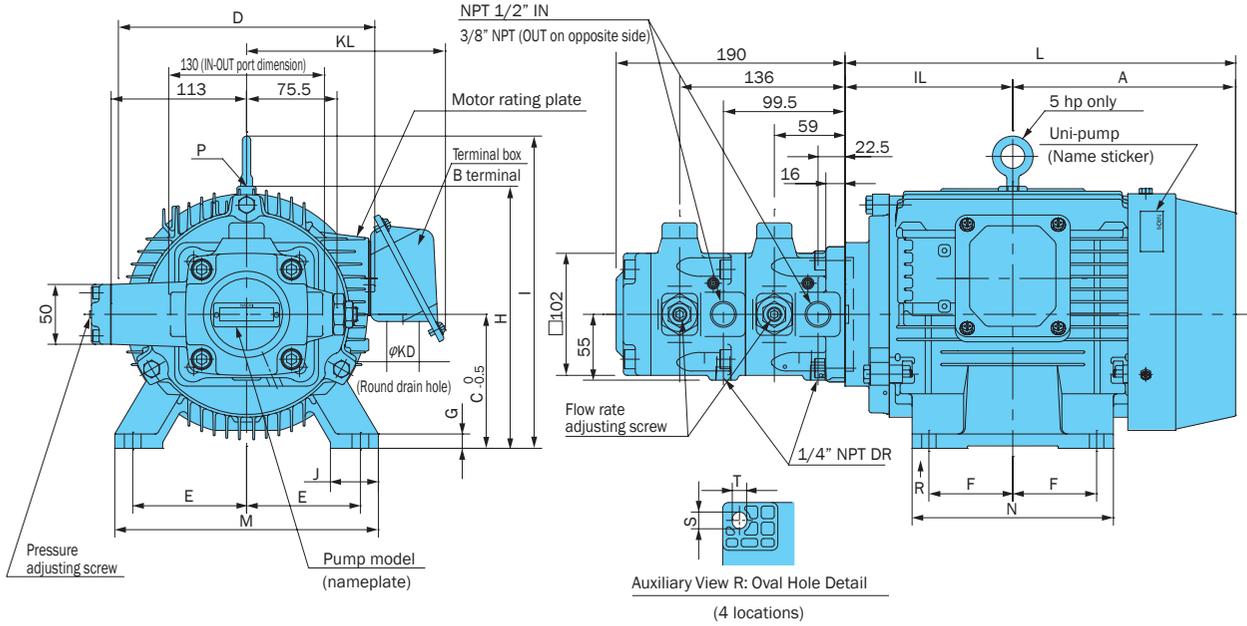
Uni-pump	Motor Dimensions mm																Frame No.	Output hp (4 poles)	Weight lbs	
	A	IL	C	D	E	F	G	H	I	J	L	M	N	S × T	KD	KL				O
UVD-1A-A2-0.75-4-40	133	105	80	170	62.5	50	4.5	165	-	35	238	165	130	18×10	φ27	157	27.5	80M	1	53
UVD-1A-A2-1.5-4-40	143	118.5	90	198	70	62.5	10	190	-	40	261.5	176	150	12×10	φ27	159	-	90L	2	55
UVD-1A-2A2-1.5-4-40																				
UVD-1A-A2-2.2-4-40	157.5	133	100	198	80	70	12	200	-	40	290.5	200	168	14×12	φ27	159	-	100L	3	66
UVD-1A-A3-2.2-4-40																				
UVD-1A-2A2-2.2-4-40																				
UVD-1A-A3-3.7-4-40	186	140	112	214	95	70	12	-	261	40	326	220	168	14×12	φ27	166	-	112M	5	80
UVD-1A-2A2-3.7-4-40																				
UVD-1A-2A3-3.7-4-40																				

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

UVD-11A

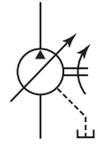
B

Vane Pumps



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

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



VDR13 Design Series Variable Volume Vane Pump

5.2 to 11.8 gpm
870 psi

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

Features

Energy efficient, economical operation

Built-in high-precision temperature compensation mechanism

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

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

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

New design for lower noise and improved durability

• Handling

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

Specifications

Single Pump

Model No.	Capacity in ³ /rev	No-load Discharge Rate (gpm)				Pressure Adjustment Range kgf/cm ² (psi)	Allowable Peak Pressure kgf/cm ² (psi)	Revolution Speed min ⁻¹		Weight lbs
		1000min ⁻¹	1200min ⁻¹	1500min ⁻¹	1800min ⁻¹			Min.	Max.	
VDR-1A(B) -1A1-13 -1A2- -1A3-	.84	3.6	4.3	5.5	6.6	10.2 ~ 20.6 (145 ~ 290)	143 (2030)	800	1800	17.6
	.84	3.6	4.3	5.5	6.6	15.3 ~ 35.7 (217 ~ 507)				
	.67	2.9	3.9	4.5	5.2	30.6 ~ 61.2 (435 ~ 870)				
VDR-2A(B) -1A1-13 -1A2- -1A3-	1.5	6.6	7.9	10	11.8	10.2 ~ 20.6 (145 ~ 290)	143 (2030)	800	1800	46
	1.5	6.6	7.9	10	11.8	15.3 ~ 35.7 (217 ~ 507)				
	1.3	5.8	7.0	8.9	10.5	30.6 ~ 61.2 (435 ~ 870)				

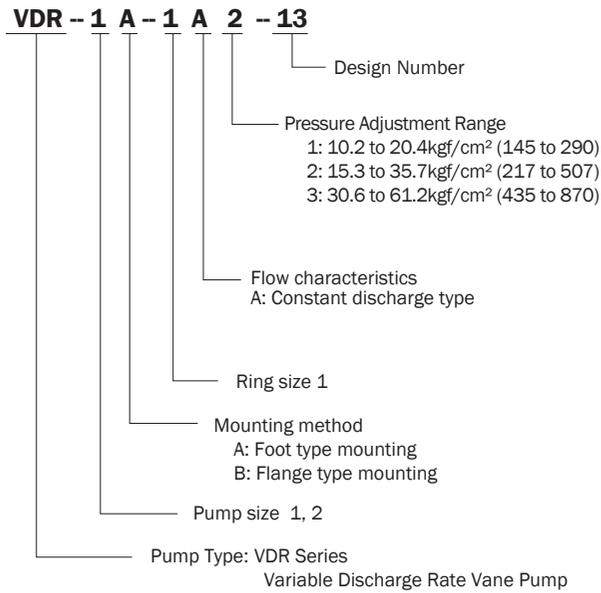
Double Pump

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

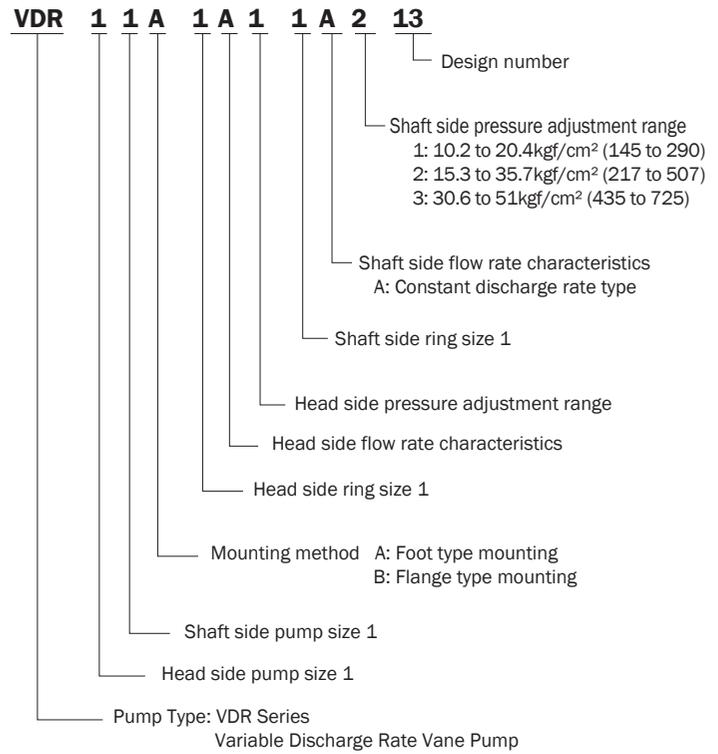
- Note:
1. The discharge rate is the value at 1800min⁻¹ no-load.
 2. In addition to this model, the VDC Series (maximum working pressure: 2030 psi) high-pressure variable vane pump is also available. See page B-25 for more information.
 3. The change from VDR-1 Series design number 11 to design number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

Understanding Model Numbers

Single Pump



Double Pump

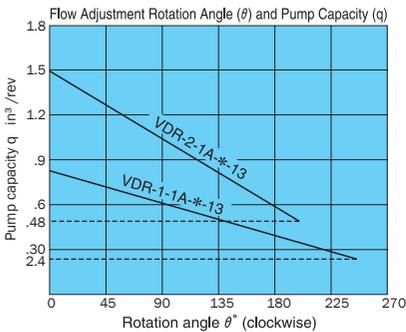


3 Discharge Volume Adjustment
The discharge flow rate is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation. Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut. The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

However:

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

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



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

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

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

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.

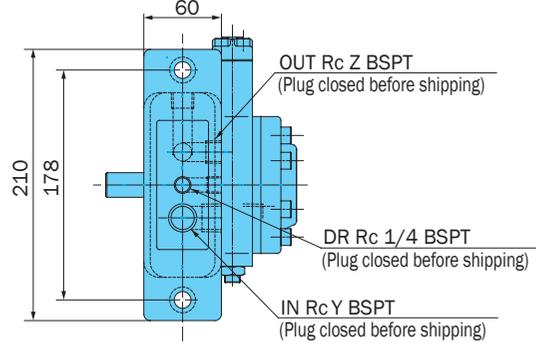
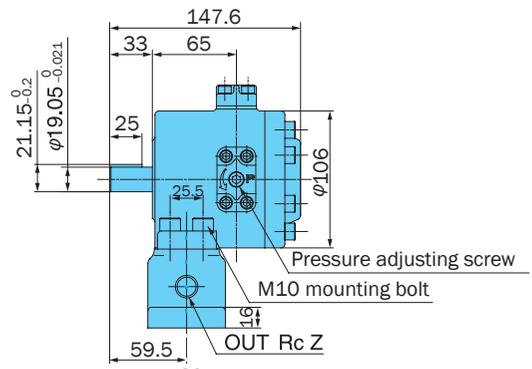
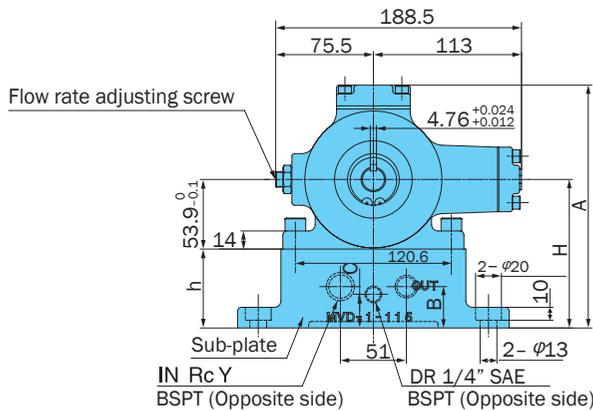
- 11 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.
- 12 Provide a suction strainer with a filtering grade of about 100µm (150 mesh). For the return line to the tank, use a 10µm line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

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

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

Installation Dimension Drawings

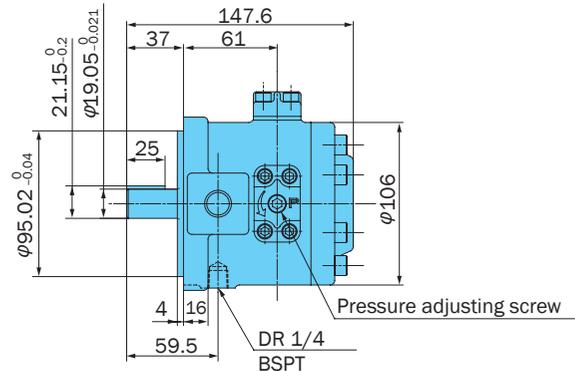
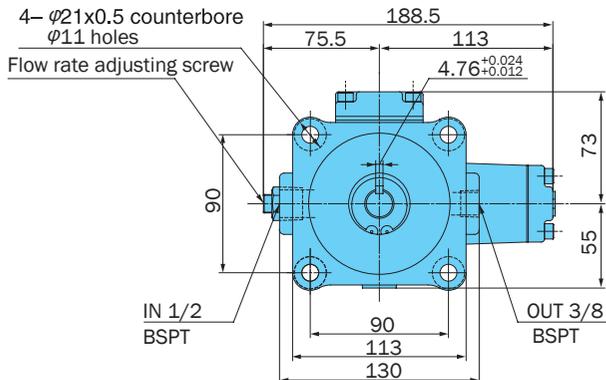
VDR-1A-*-13 (Foot Mounting)



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

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

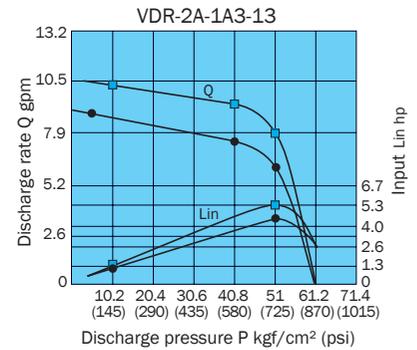
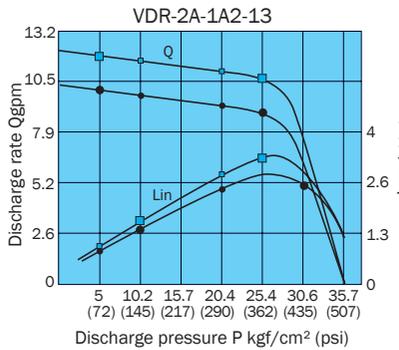
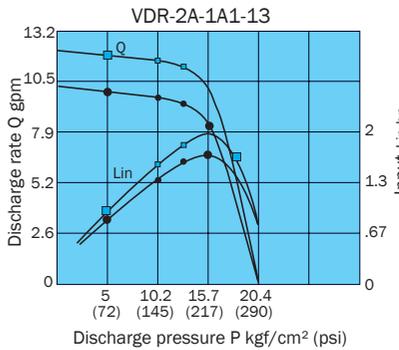
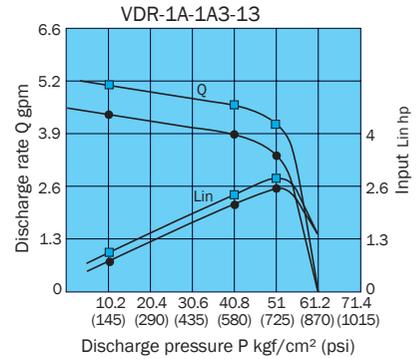
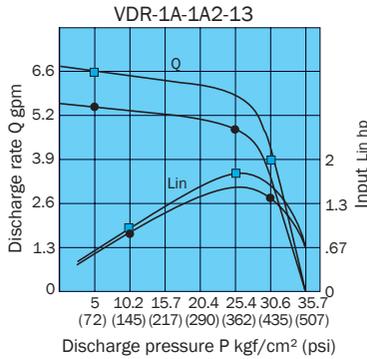
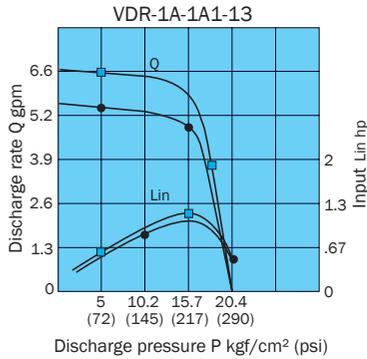
VDR-1B-*-13 (Flange Mounting) Not SAE Mount



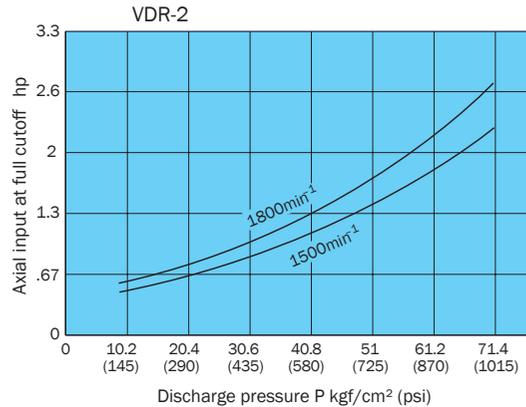
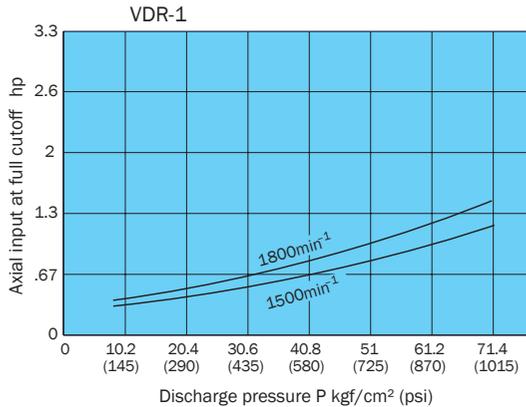
Performance Curves

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

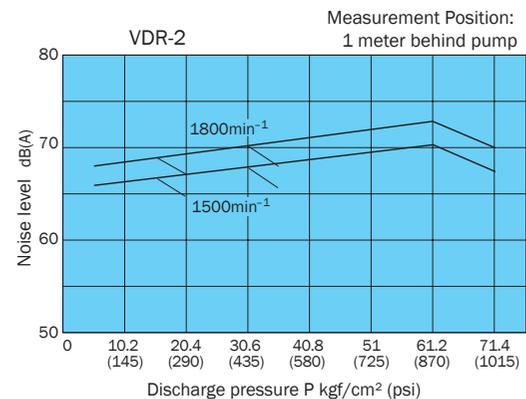
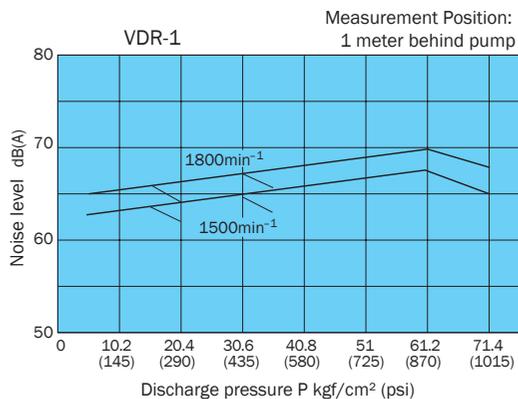
Revolution Speed 1500min^{-1} —●—
 1800min^{-1} —□—



Axial Input At Full Cutoff

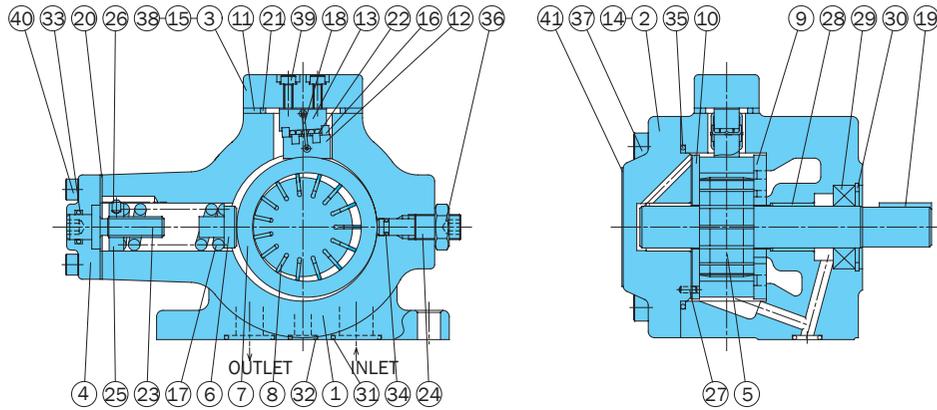


Noise Characteristics



Cross-sectional Drawing

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



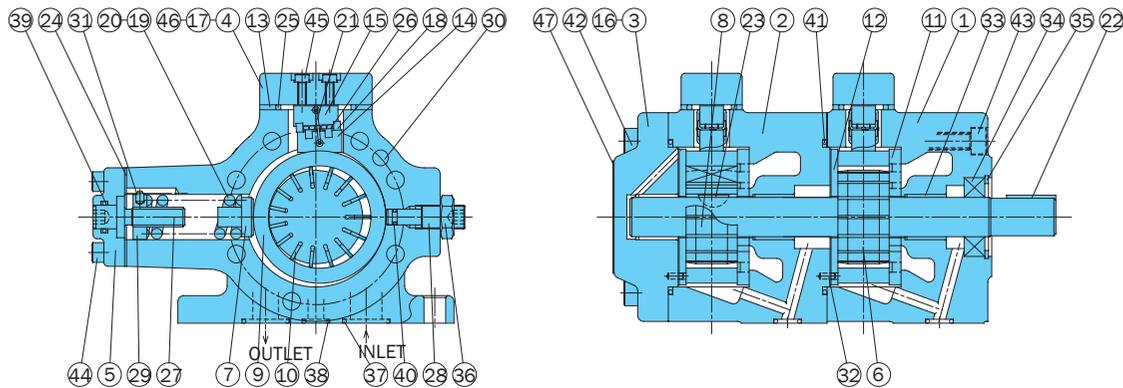
List of Sealing Parts

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

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

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

VDR-11A-*-13



List of Sealing Parts

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

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

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

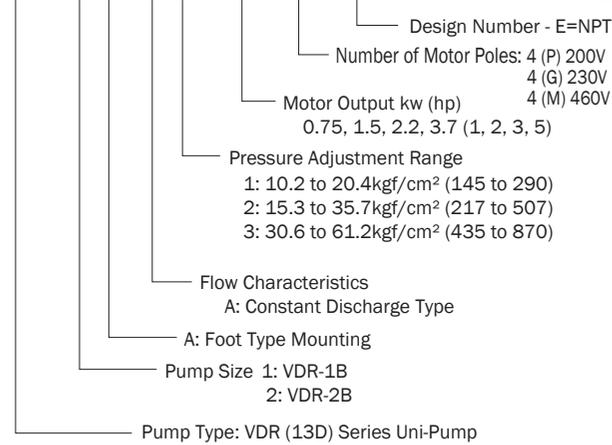
Performance Curves

(CE mark standard compliant)

Understanding Model Numbers

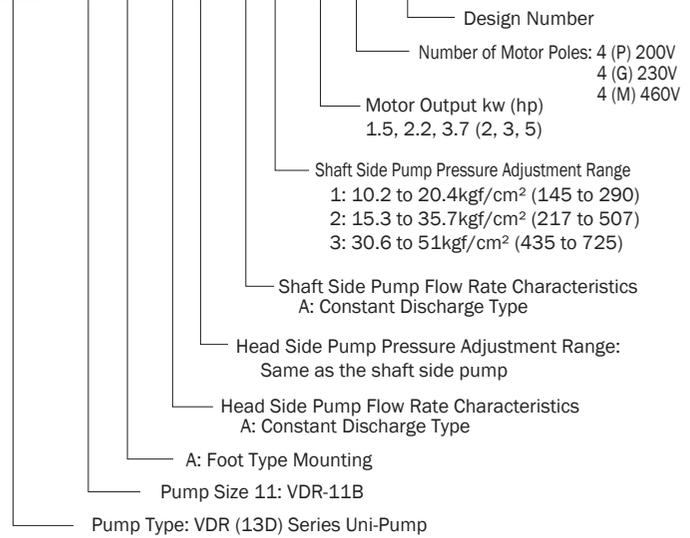
Single Pump

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



Double Pump

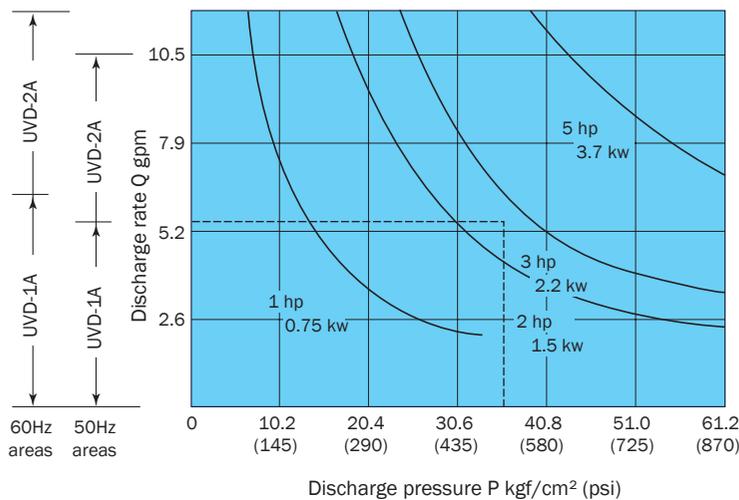
UVD - 11 A - A * - A * - * - 4 - 30



Specifications

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

Motor Selection Curves

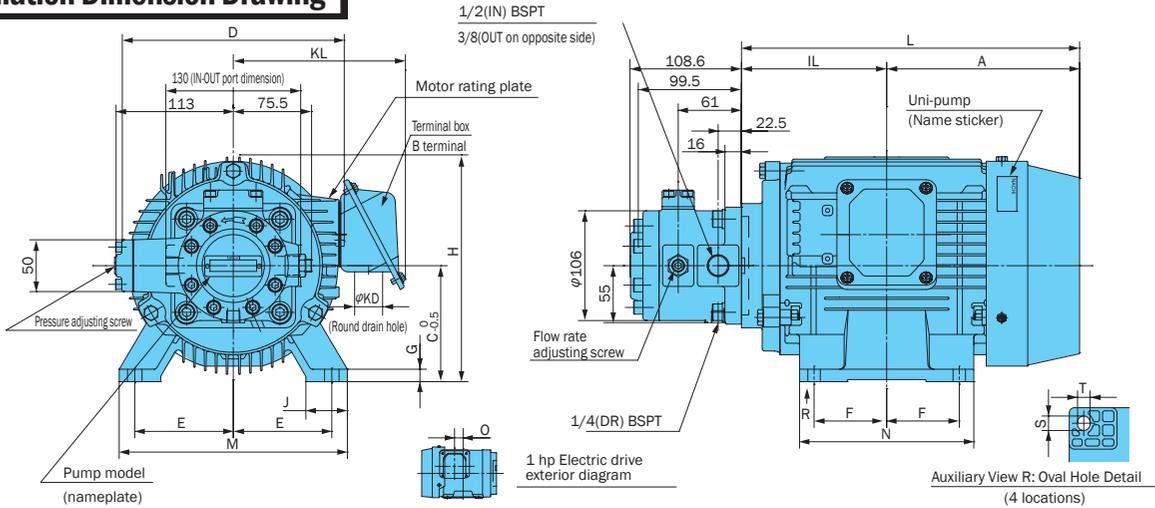


- Selecting a motor
The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.
Example:
To find the motor that can produce pressure of 507 psi and a discharge rate of 5.5 gpm.
Selection Process:
Since the intersection of the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

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

Installation Dimension Drawing

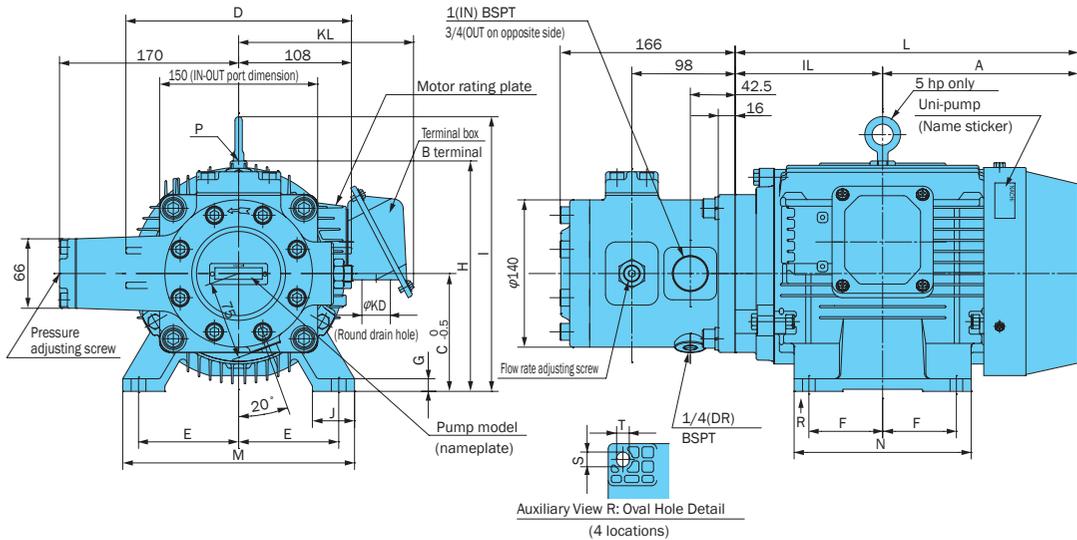
UVD-1A



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

- No hanger.
 1. Standard drive motor is the fully enclosed fan-cooled B type.
 2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
 3. Standard terminal box is B terminal (right side viewed from pump).
 4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

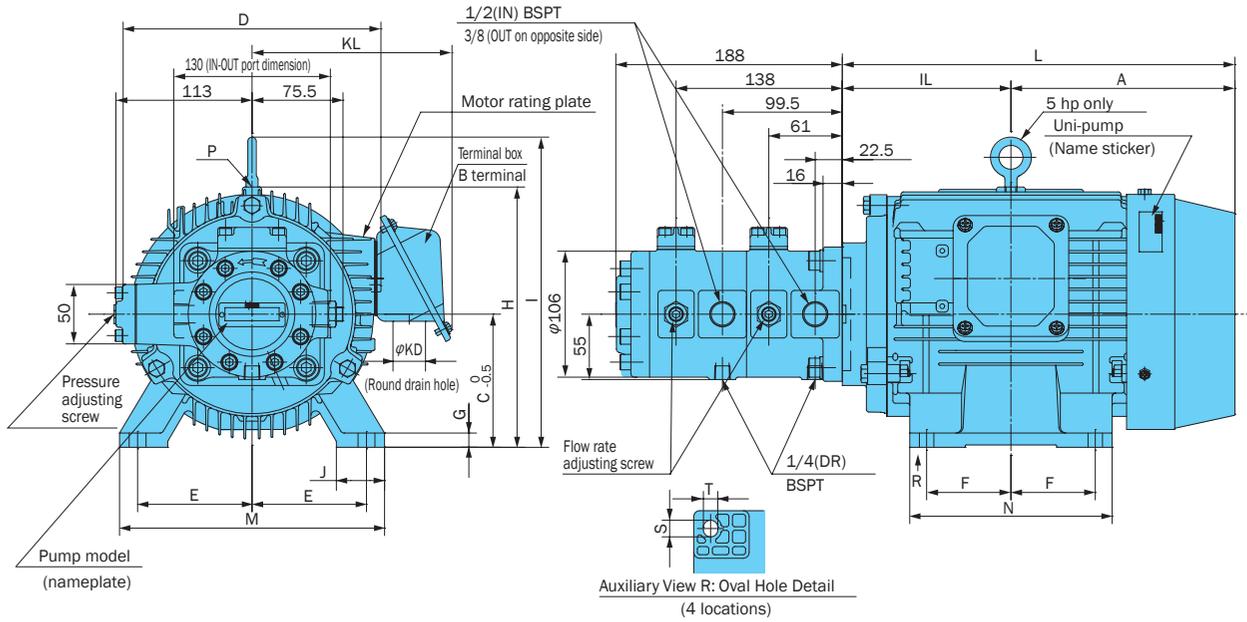
UVD-2A



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

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

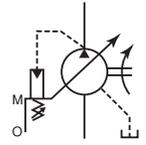
UVD-11A



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

No hanger on 2 and 3 hp models.

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



VDC Series High Pressure Type Variable Volume Vane Pump

7.9 to 31.7 gpm
2000 psi

B

Vane Pumps

Features

Highly efficient and stable high-pressure operation

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

Low vibration and noise

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

stability. This minimizes ring vibration and delivers quiet operation.

Outstanding response, high-precision operation

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

Precise characteristics for a stable discharge rate

A revolutionary new pressure compensator type pressure control mechanism

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

High efficiency operation with minimal power loss

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

Simplified maintenance and handling

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

Specifications

Single Pump

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

Double Pump

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

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

• Handling

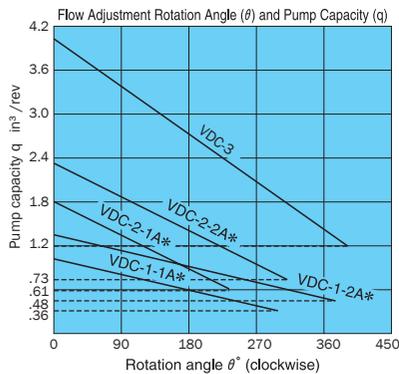
- 1 Rotation Direction The direction of rotation is always clockwise (rightward) when viewed from the shaft side.
- 2 Drain Drain piping must be direct piping up to a point that is below the tank fluid level, and piping should comply with the conditions shown in the table below to ensure that back pressure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

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

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

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

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



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

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

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

Sub Plate Number

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

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

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

(Continued on following page)

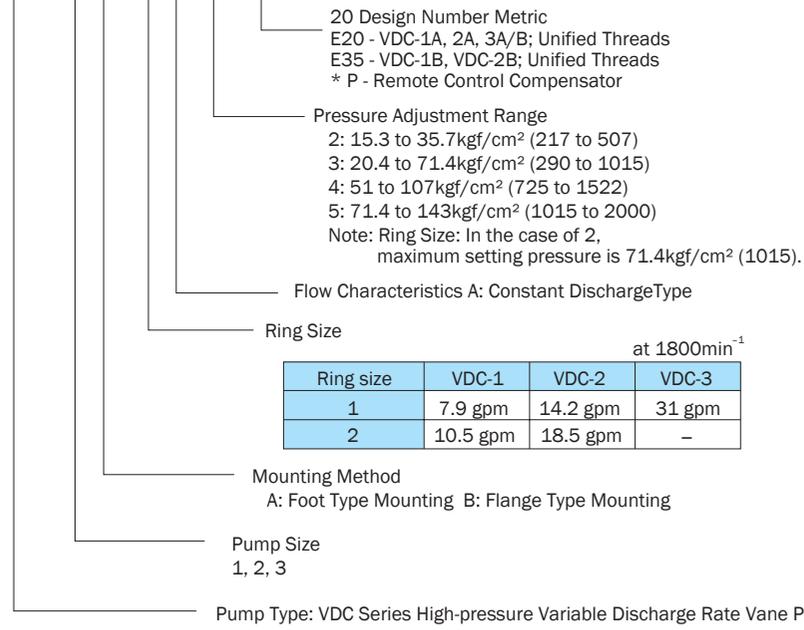
- 19 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.
- 20 To ensure proper lubrication of the pump's rubbing surfaces, supply oil to the interior of the pump before starting operation.

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

Understanding Model Numbers

Single Pump

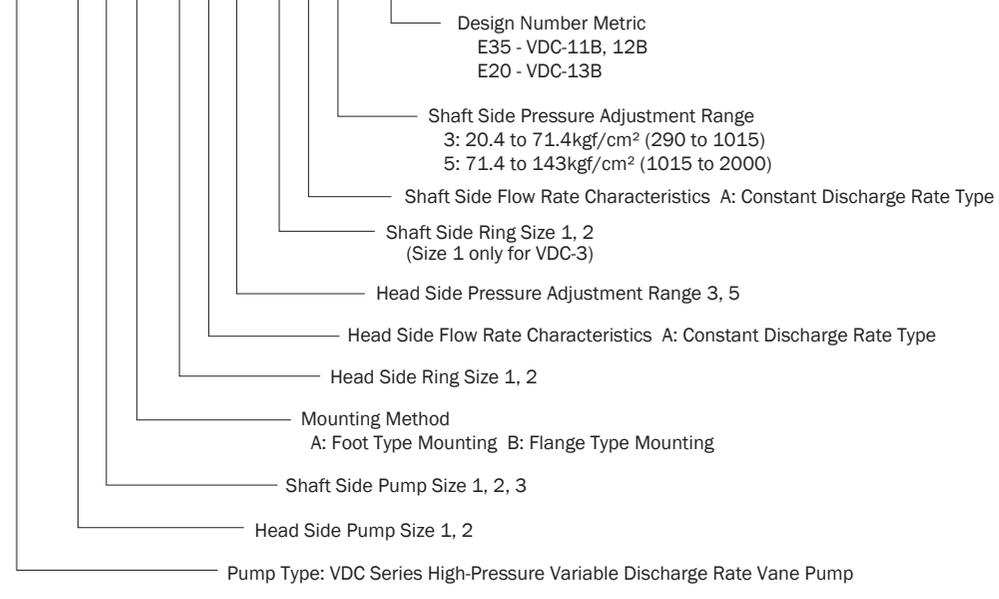
VDC - 2 A - 1 A 2 * 20



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

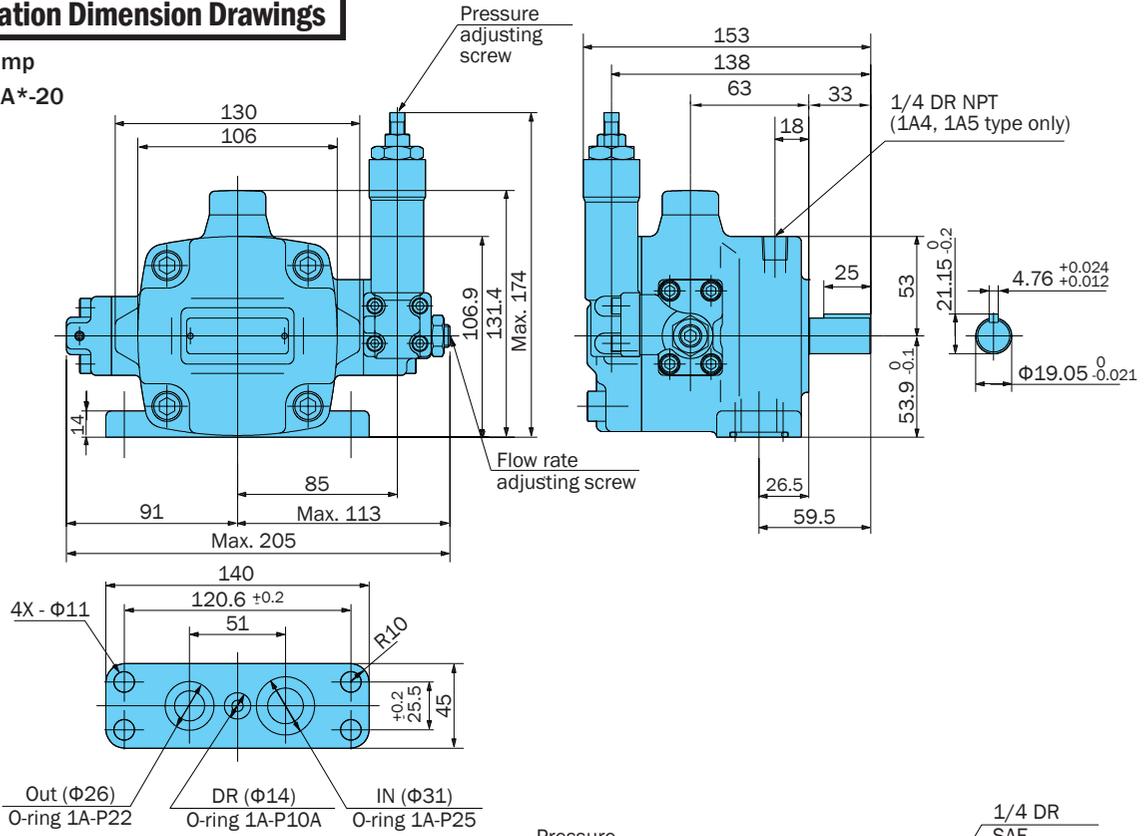
Double Pump

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

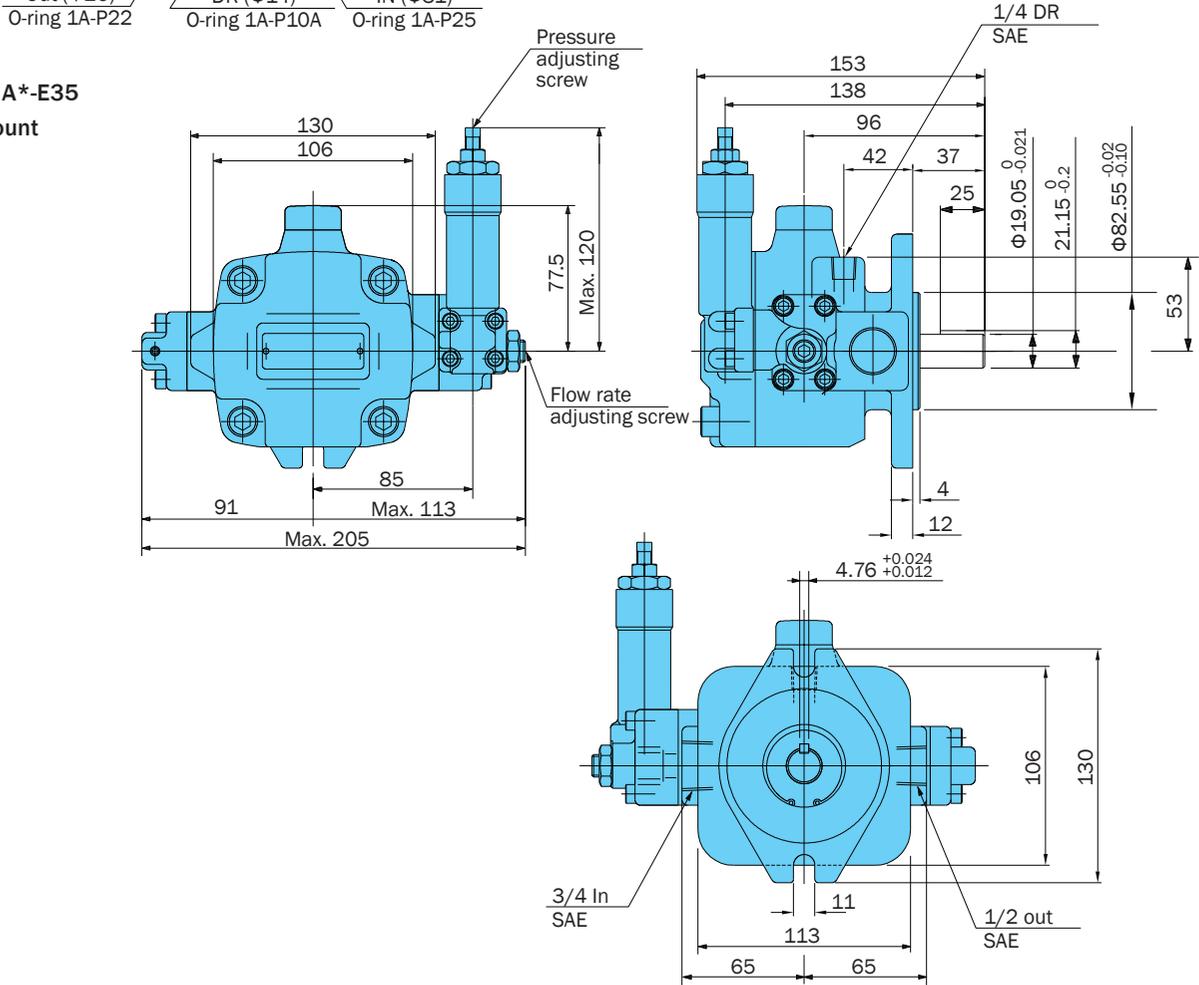


Installation Dimension Drawings

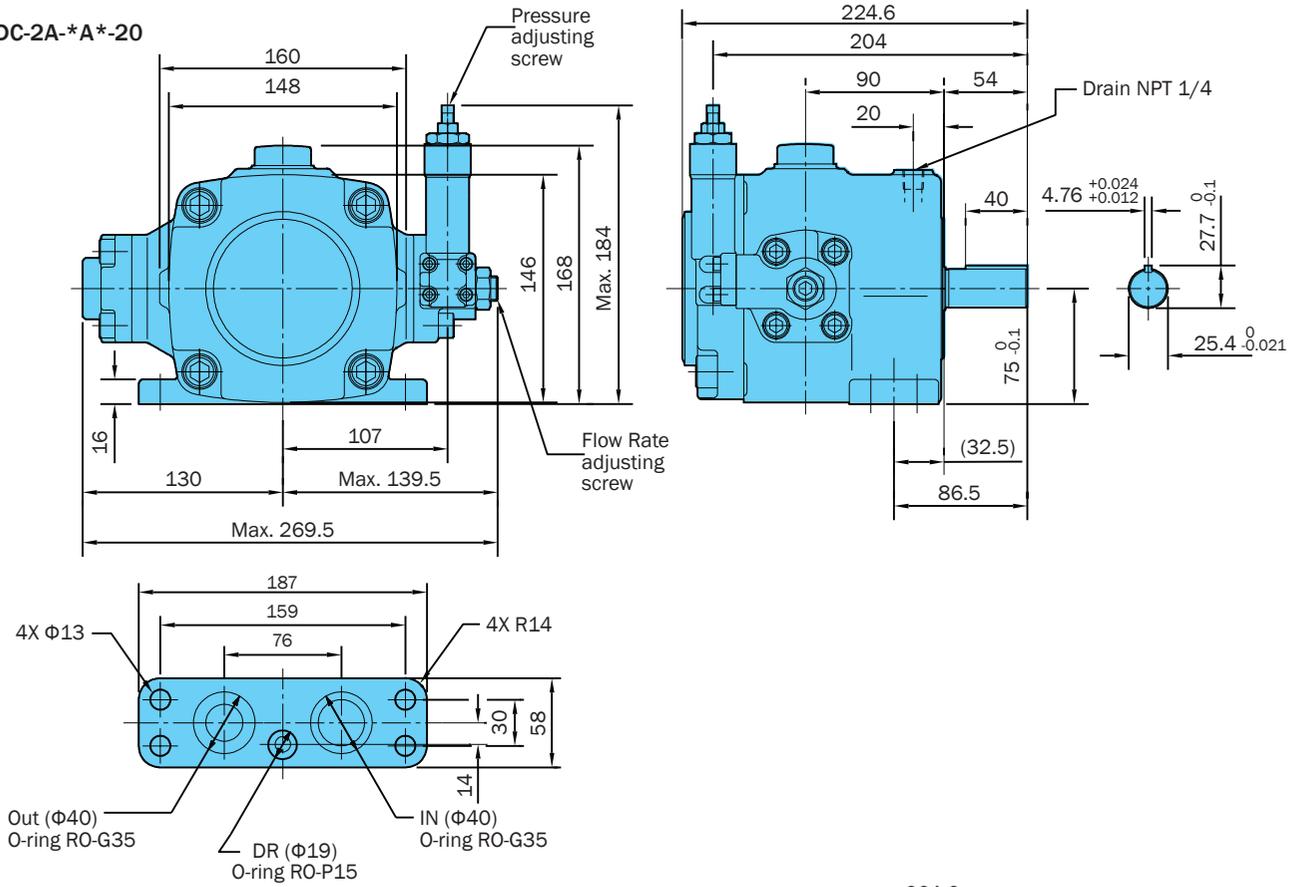
Single Pump
VDC-1A-*A*-20



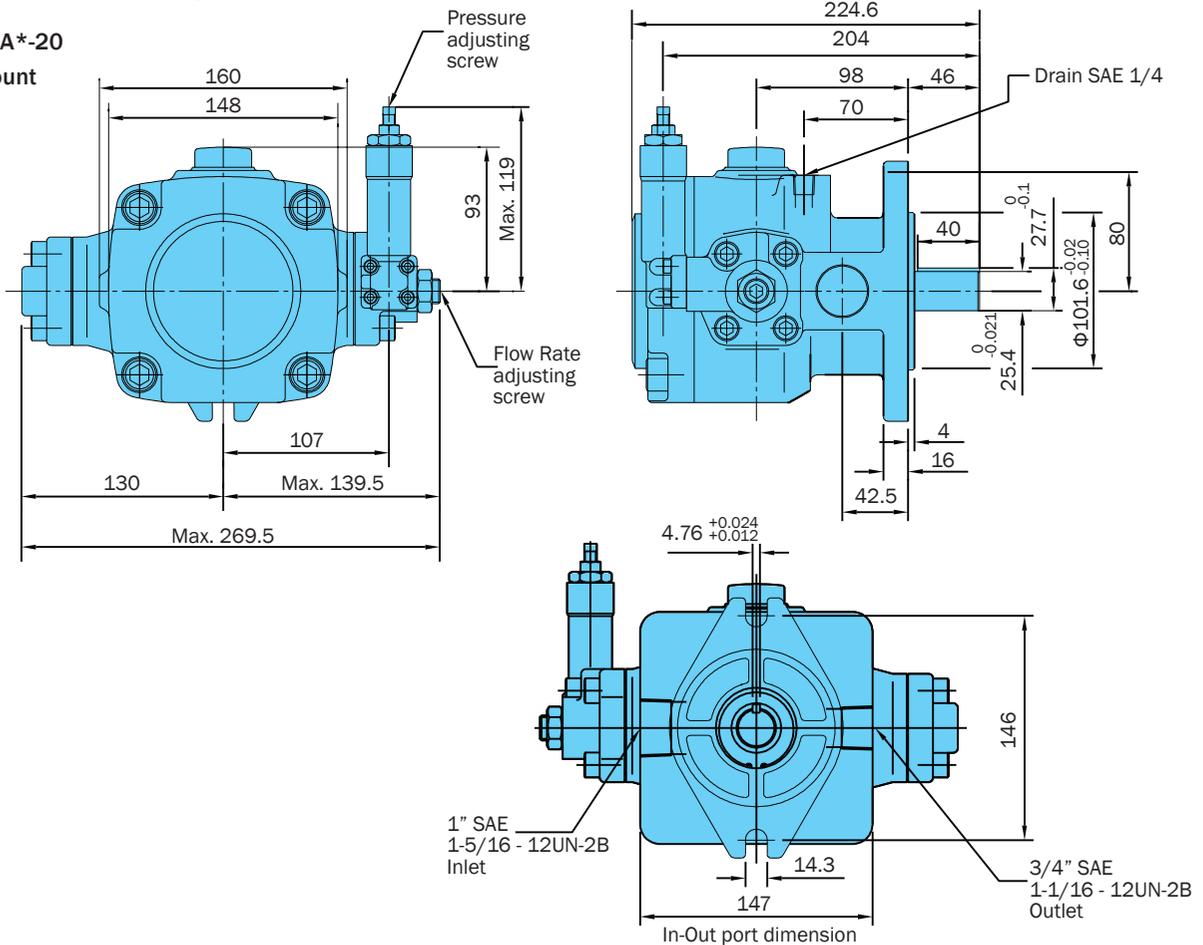
VDC-1B-*A*-E35
SAE A Mount



VDC-2A-*A*-20

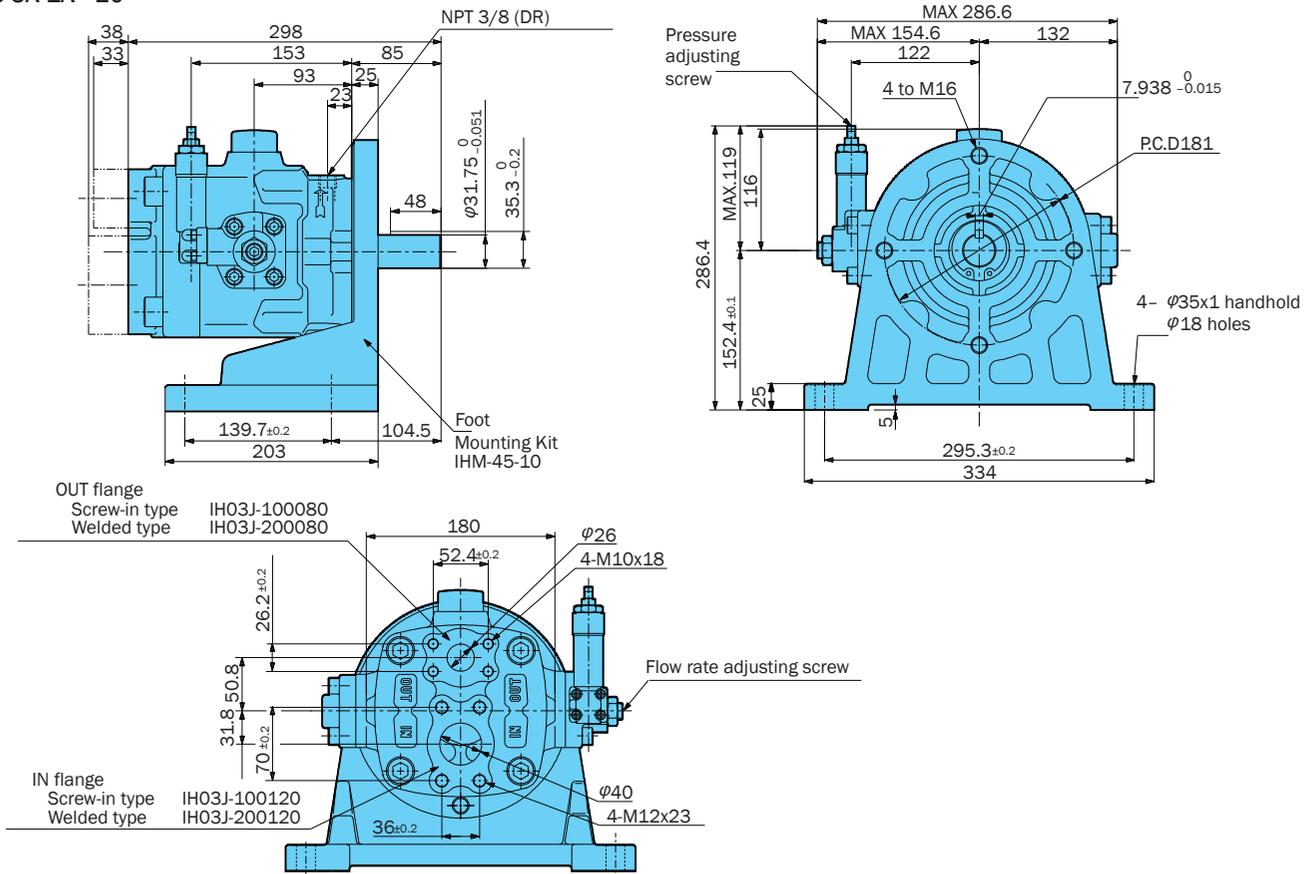


VDC-2B-*A*-20
SAE B Mount



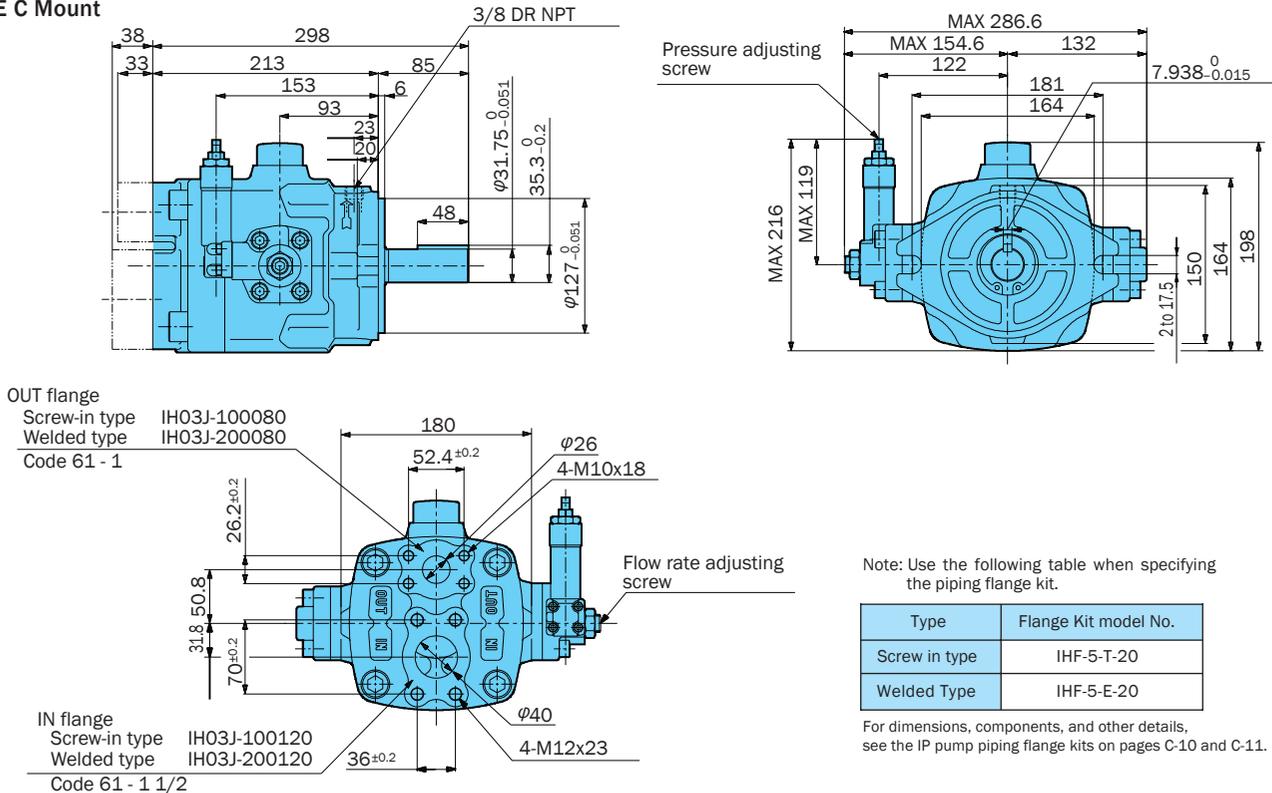
Installation Dimension Drawings

VDC-3A-1A*-20



VDC-3B-1A*-E35

SAE C Mount

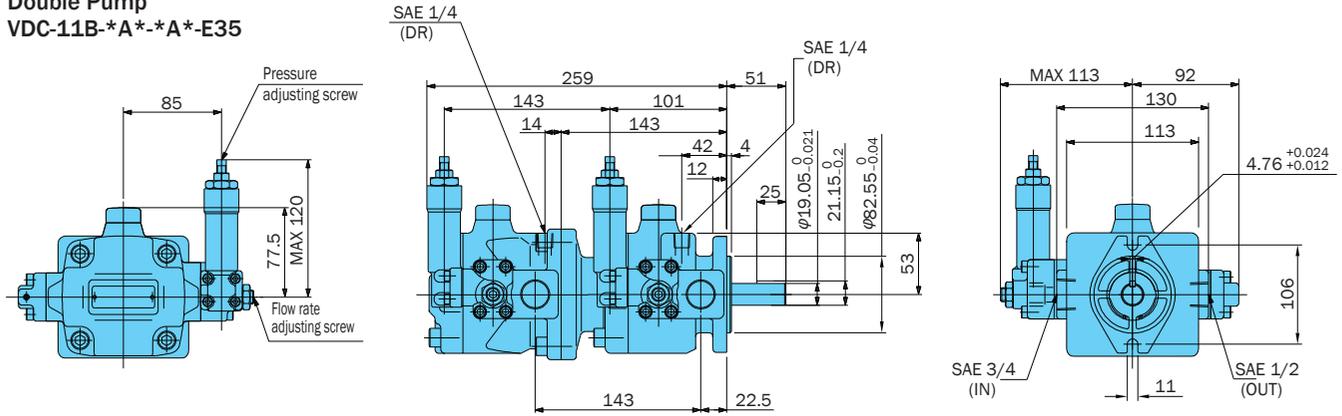


Note: Use the following table when specifying the piping flange kit.

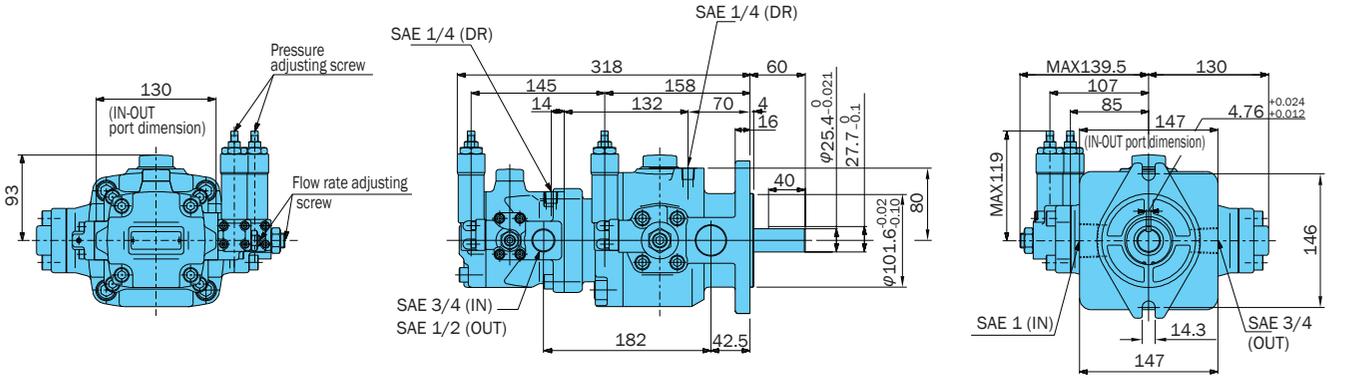
Type	Flange Kit model No.
Screw in type	IHF-5-T-20
Welded Type	IHF-5-E-20

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

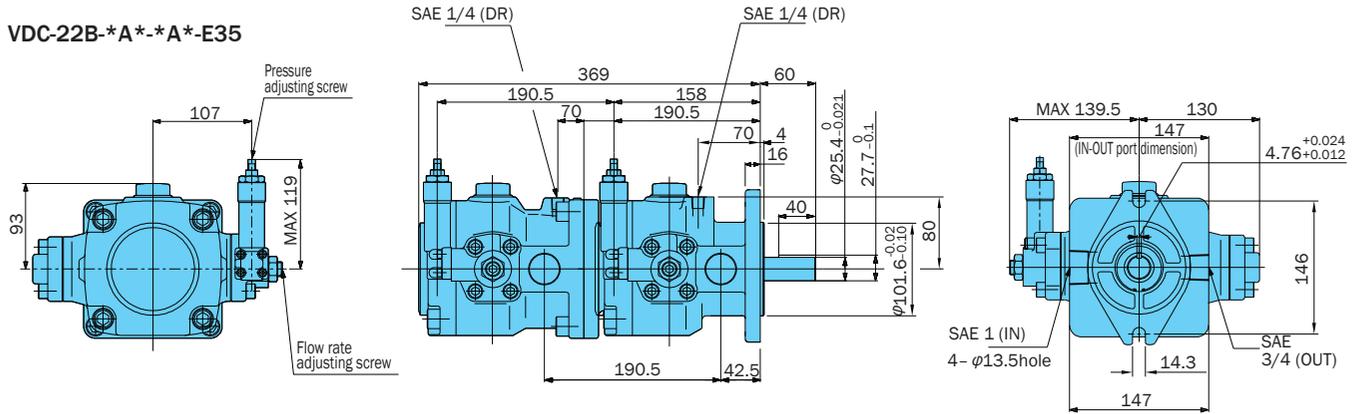
**Double Pump
VDC-11B-*A*-*A*-E35**



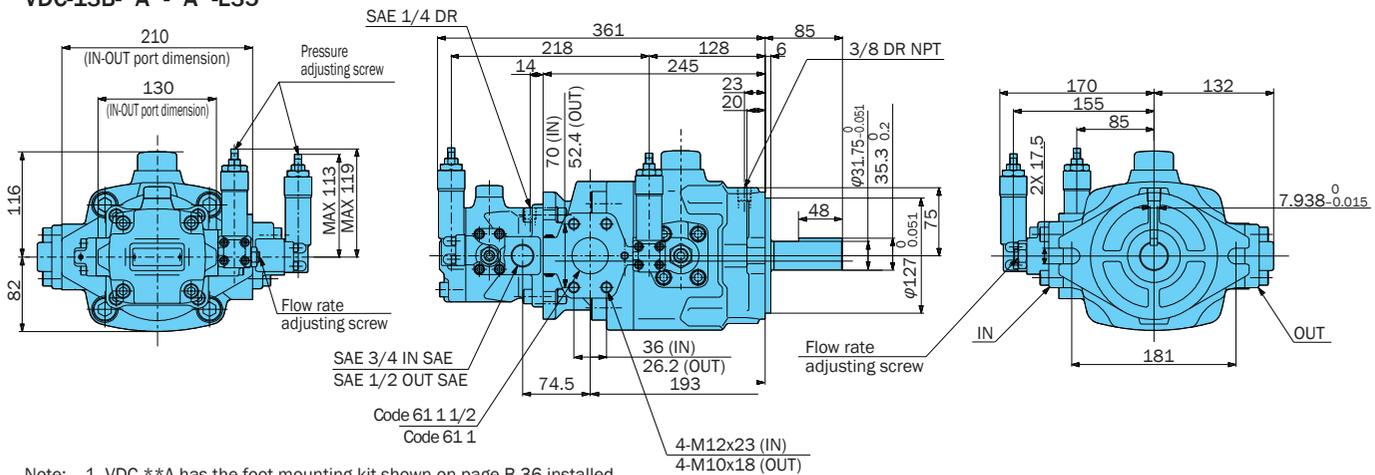
VDC-12B-*A*-*A*-E35



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



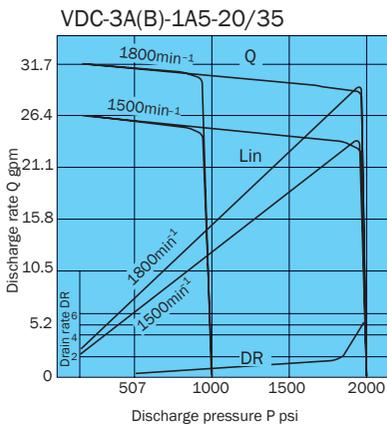
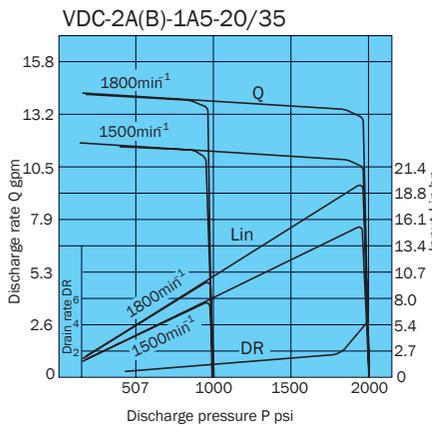
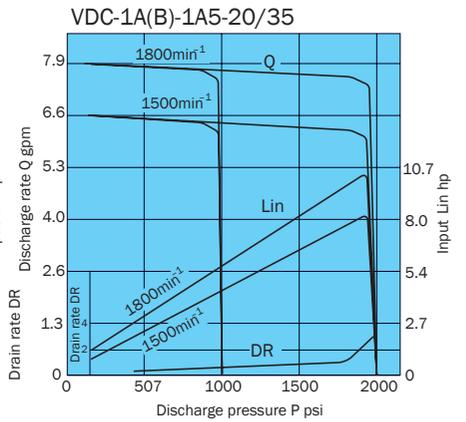
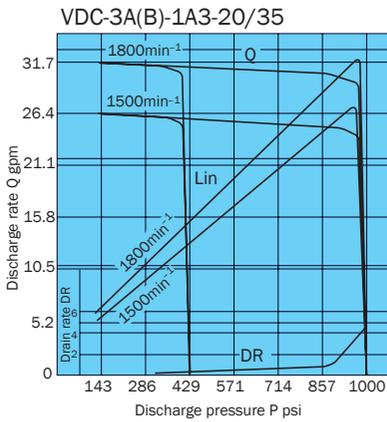
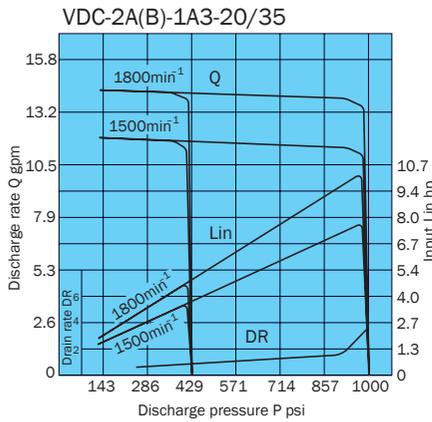
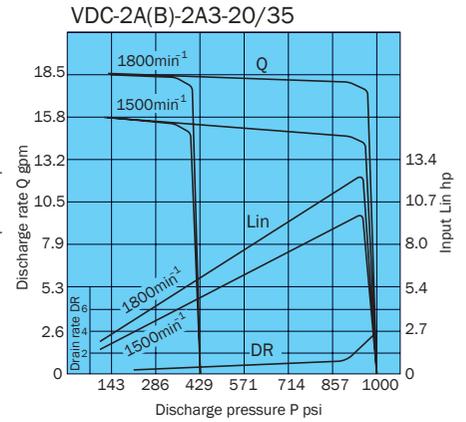
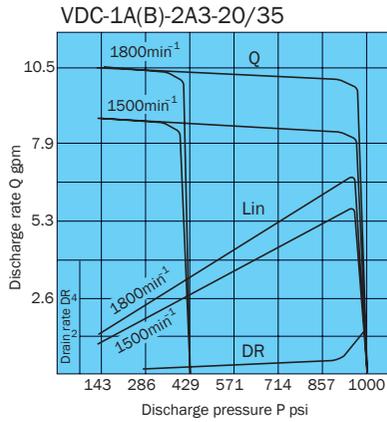
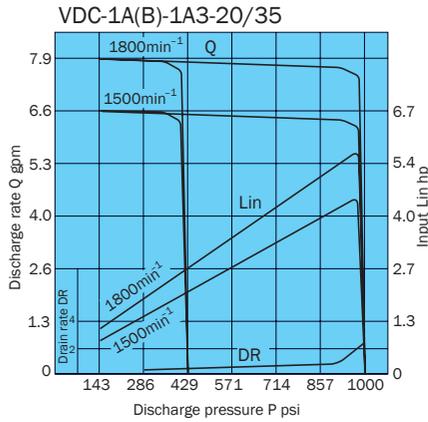
VDC-13B-*A*-*A*-E35



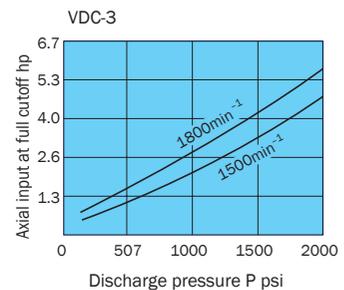
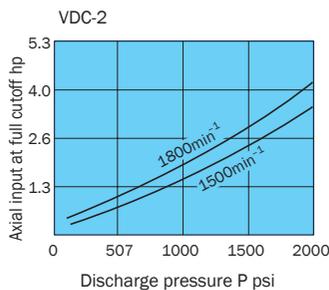
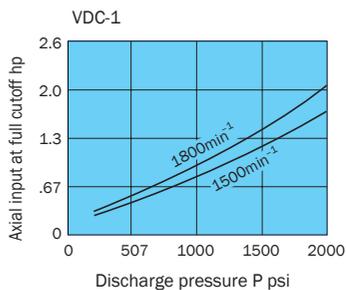
Note: 1. VDC-*A* has the foot mounting kit shown on page B-36 installed.

Performance Curves

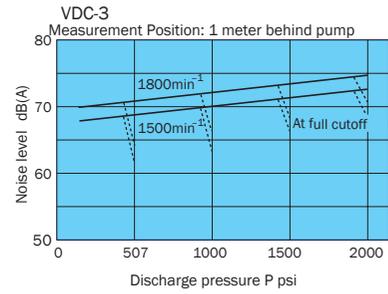
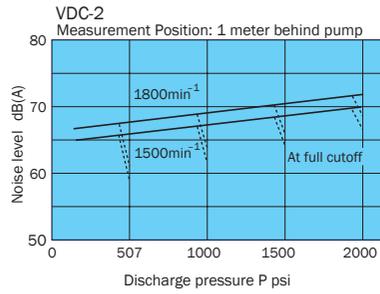
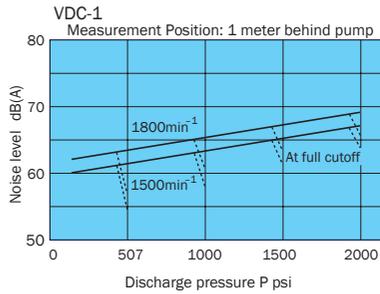
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 centistokes



Axial input at full cutoff



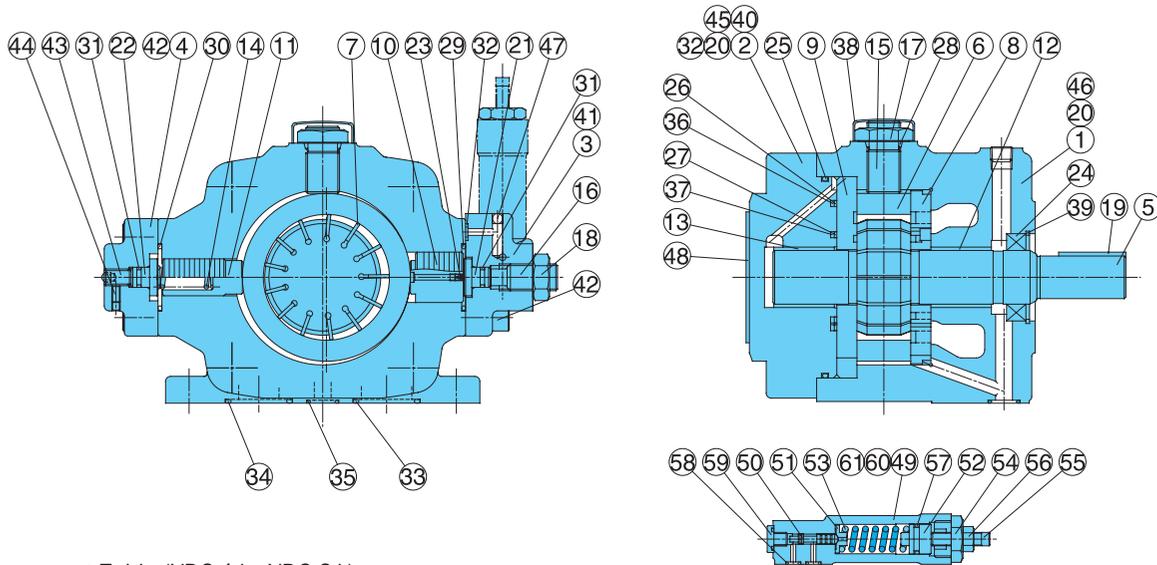
Noise Characteristics



Cross-sectional Drawing

VDC-1A-*A*-20

VDC-2A-*A*-20



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

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

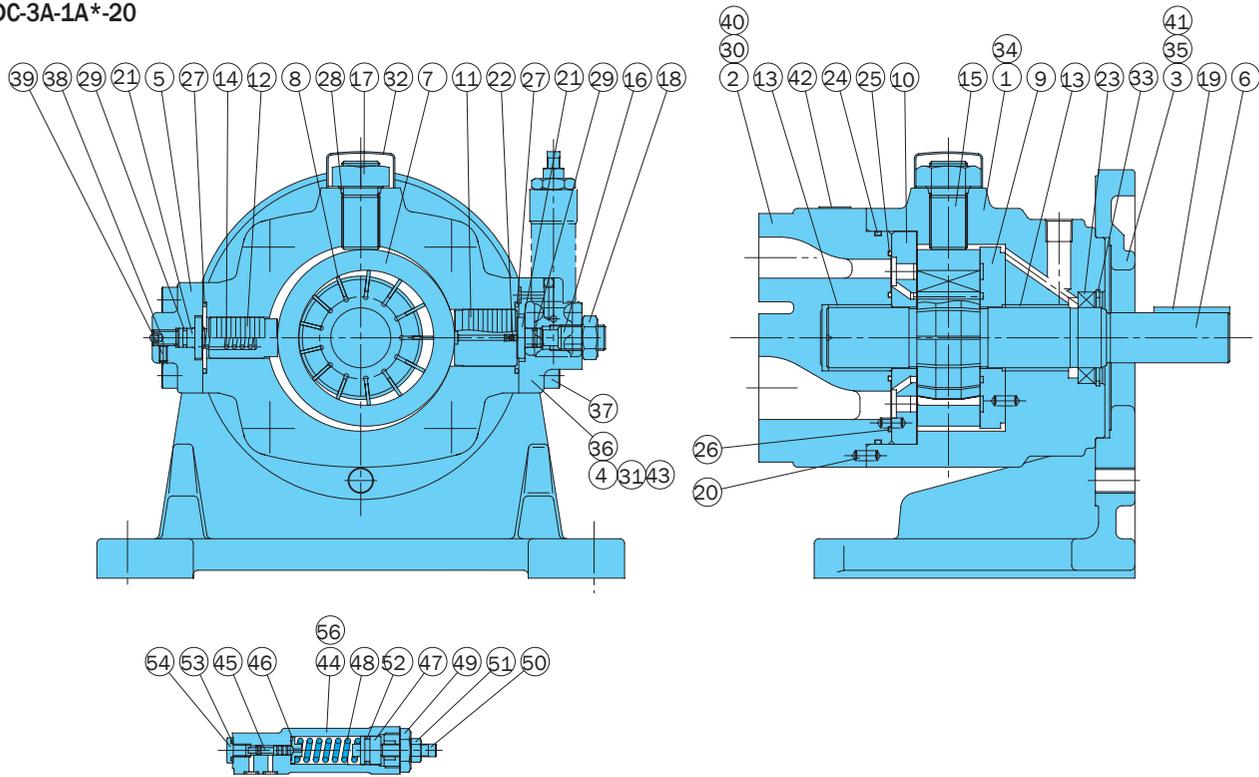
Note: 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
 2. O-ring 1A-** refers to JIS B2401-1A-**.
 3. For VDR-*B*-20, the seal kit number becomes VDBS-10*B00, without the 33, 24, and 35 O-rings.

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

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

Performance Curves

VDC-3A-1A*-20



Seal Component Table (VDC-3*)

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

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

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

Compensator Kits:

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

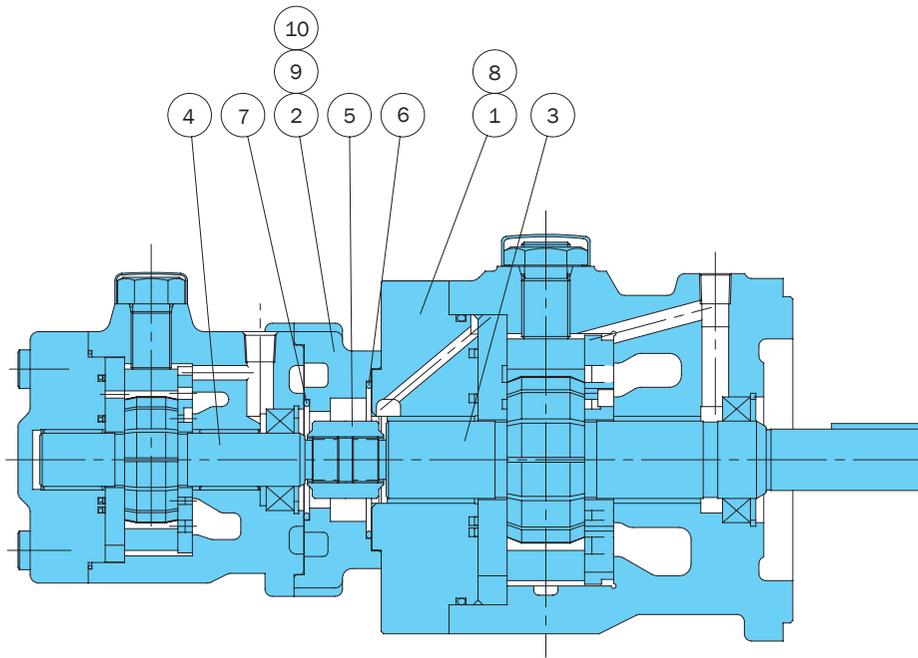
Cartridge Kits:

VDC-1-20/35
VCBC-1011A2 (A2,A3)
VCBC-1011A4 (A4,A5)
VCBC-1012A2 (2A2,2A3)
VDC-2-20/35
VCBC-1021A2 (A2,A3)
VCBC-1021A4 (A4,A5)
VCBC-1022A2 (2A2,2A3)

VDC-3-20/35
VCBC-1031A2 (A2,A3)
VCBC-1031A4 (A4,A5)

Includes Items: 6, 7, 8, 9, 10, 19, 20

VDC Series
Double Pump



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

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

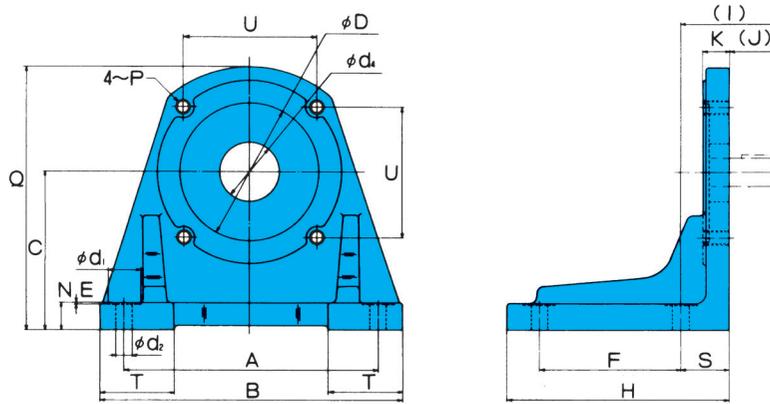
List of Sealing Parts

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

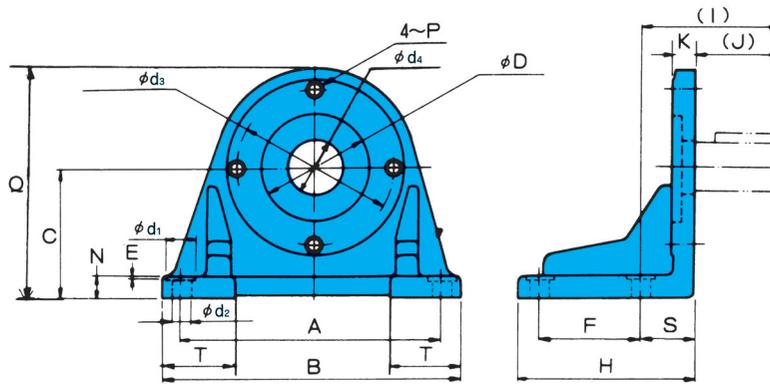
Note: 1. See the description of the single pump for seal parts that are not included in the list.
2. O-ring 1A-** refers to JIS B2401-1A-**.

Foot Mounting Installation Measurement Chart

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



For VDC-3A and VDC-13A



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

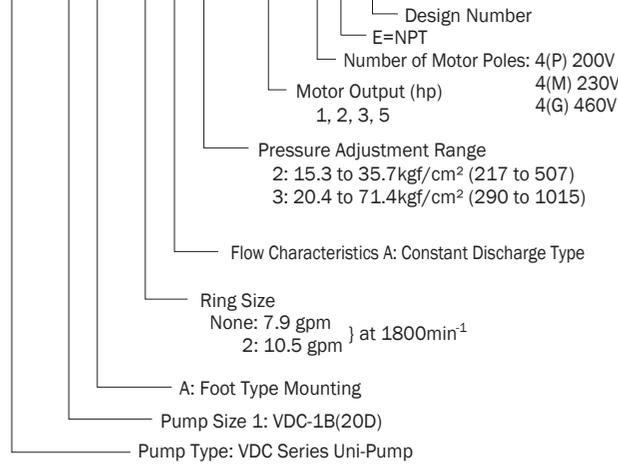
Foot Mounting Kit Model No.	Dimensions (mm)														Weight lbs
	(I)	(J)	K	N	P	Q	S	T	U	φ D	φ d ₁	φ d ₂	φ d ₃	φ d ₄	
VCM-11-20	66.5	33	18	18	M10	180	32.5	50	90	95.02	22	11		40	14.3
VCM-22-20	84.5	40	20	20	M12	232	44.5	57.5	124	135	22	14		40	26.4
IHM-45-10	104.5	60	25	25	M16	259	44.5	61		127	35	18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

Uni-Pump Specifications

(CE mark standard compliant)

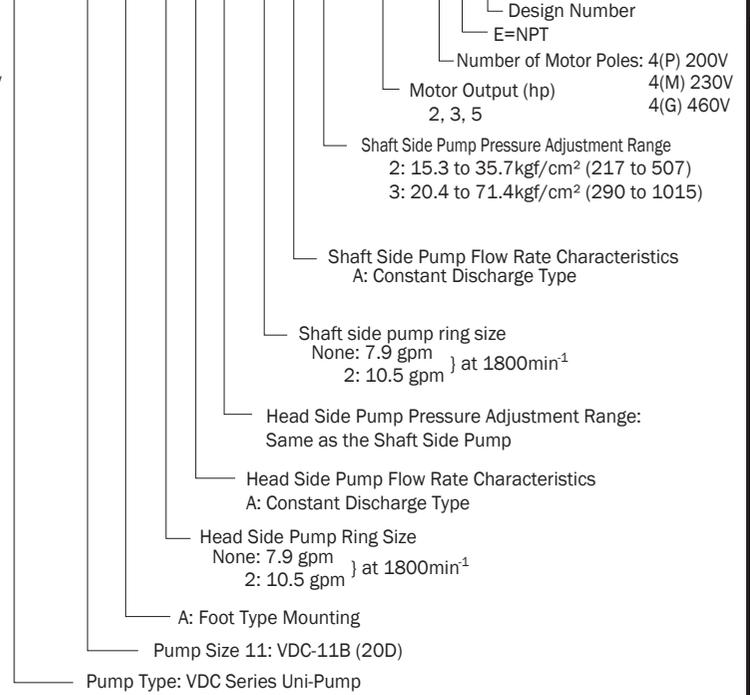
Single Pump

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



Double Pump

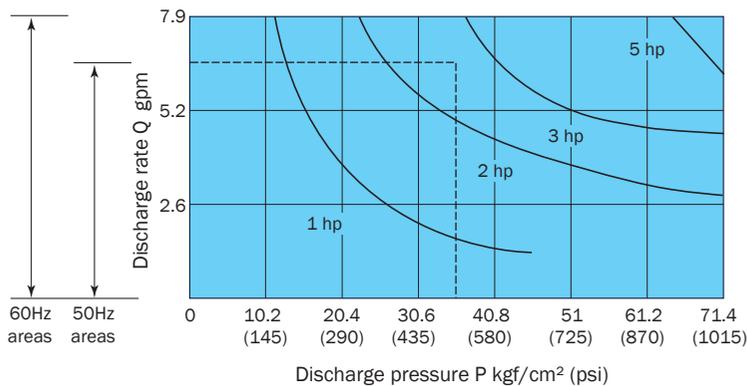
UVC - 11 A - 2 A 2 - 2 A 2 - 3.7 - 4 * 30



Specifications

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

Motor selection curves



• Selecting a motor

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

Example:

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

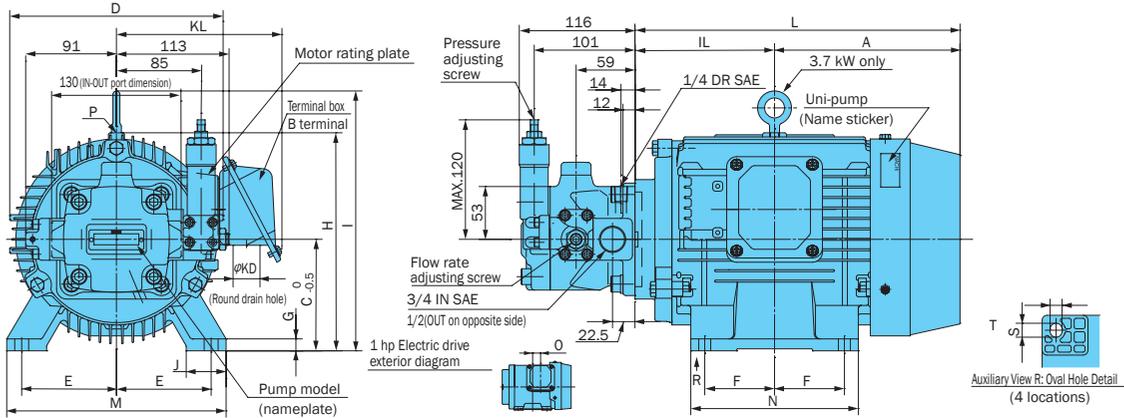
Selection Process:

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

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

Installation Dimension Drawings

UVC-1A

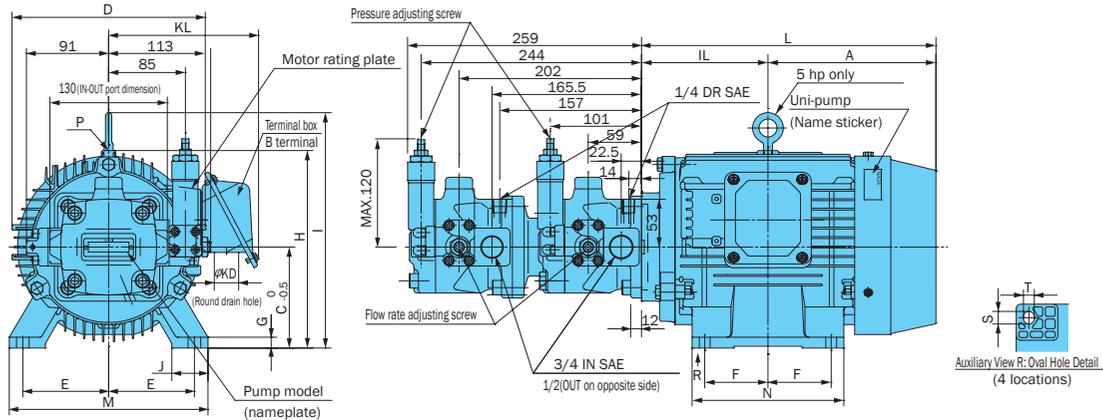


Uni-pump	Motor Dimensions mm																	Frame No.	Output hp (4 poles)	Weight lbs
	A	IL	C	D	E	F	G	H	I	J	L	M	N	S * T	KD	KL	O			
UVC-1A-A2-0.75-4-30	133	105	80	170	62.5	50	4.5	165	-	35	238	165	130	18 * 10	ø27	157	27.5	80M	1	53
UVC-1A-A2-1.5-4-30	143	118.5	90	198	70	62.5	10	190	-	40	261.5	176	150	12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

0.75 to 2.2kW model does not have hangers.

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

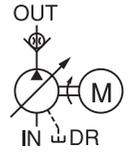
UVC-11A



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

No hanger on 2 and 3 hp models.

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



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

7.9 to 31.7 gpm
2000 psi

Features

Energy efficient high performance

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

mother machine, as well as to process precision.

Lightweight, compact design

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

Low noise, long life

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

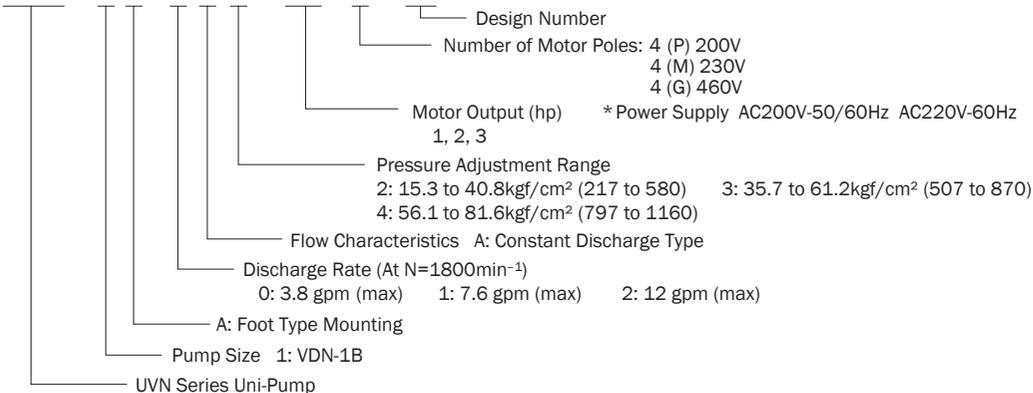
Specifications

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

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

Understanding Model Numbers

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



• Handling

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

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

2. Running Precautions

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

startup.

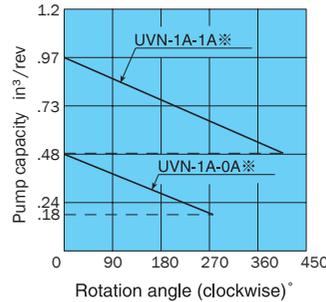
- 4 Make sure the maximum peak pressure (setting pressure + surge pressure) during operation does not exceed 2000 psi. Refer to the following piping conditions as a guideline to keep the maximum peak pressure below 2000 psi. 1/2" x 2 m rubber hose (for 2000 psi) (pipe volume: approximately 15 in³)
- 5 Install a relief valve to cut surges in the circuit if pressure exceeds 2000 psi.

3. Management of Hydraulic Operating Fluid

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

4. Setting the Pressure and Discharge Rate

- 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.
- Turn adjustment screw right to decrease or left to increase volume of discharge. Refer to guidelines in the following diagram for the relationship of the non-load volume of discharge and the position of the flow adjustment screw.



After adjustment is complete, securely tighten the lock nut.

- 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

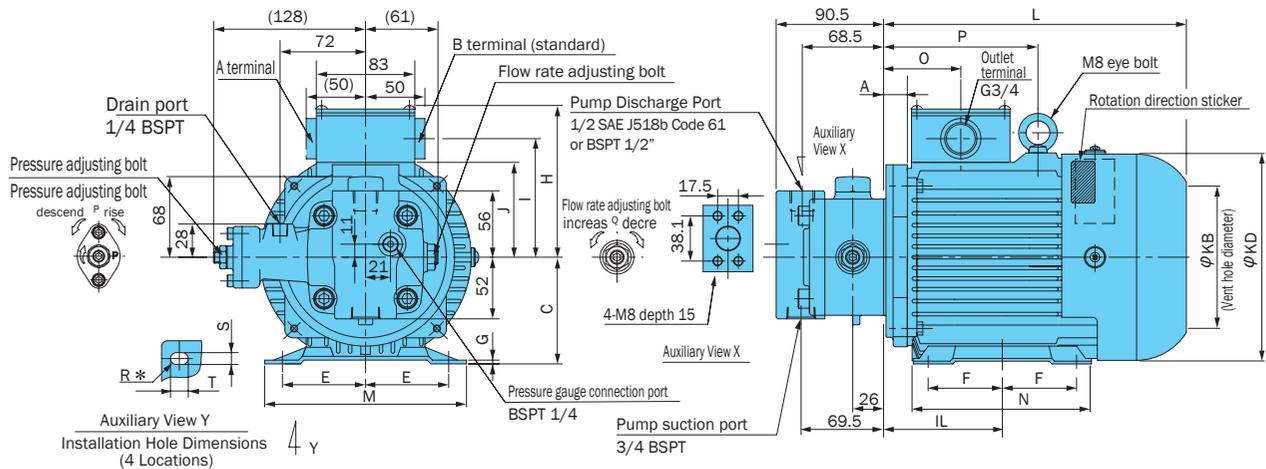
Factory Default Pressure Settings
2: 35.7 (507)
3: 51.0 (725)
4: 71.4 (1015)

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

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

Installation Dimensions

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



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

No hanger.

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

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

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

Performance Curves

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

Motor selection curves

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

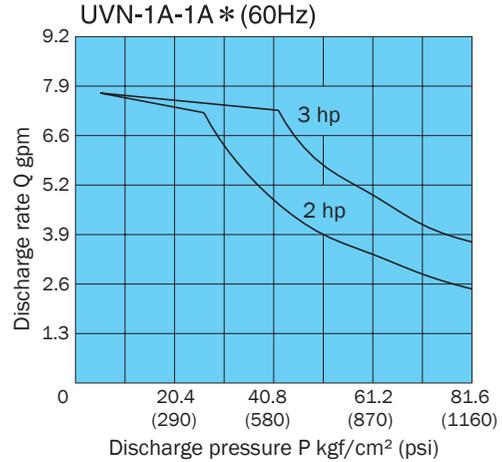
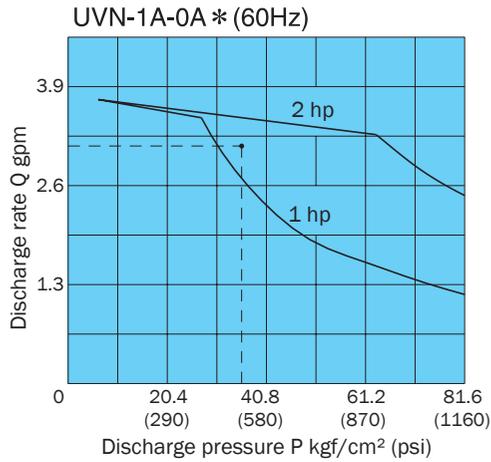
Example:
 To find the motor that can produce pressure of 507 psi and a discharge rate of 3.1 gpm.

Selection Process

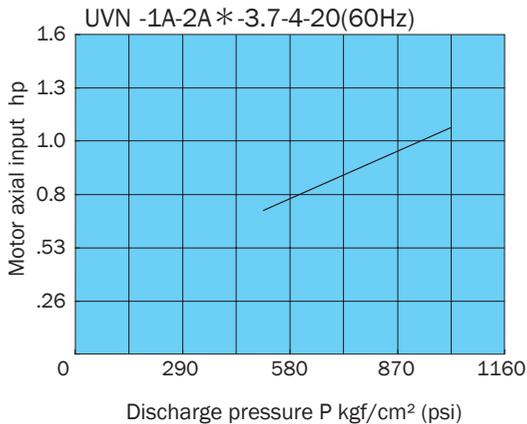
Since the intersection of the two broken lines from a pressure of 507 psi and discharge rate of 3.1 gpm intersect in

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

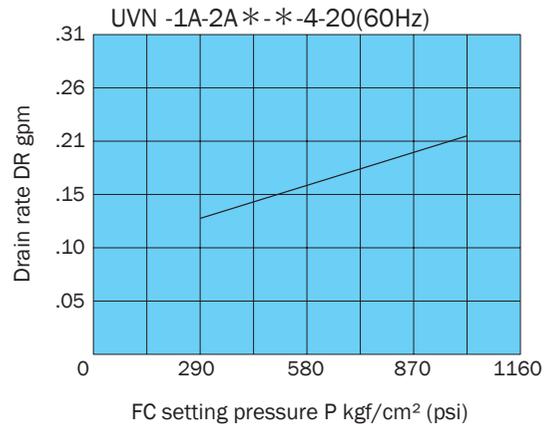
* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.



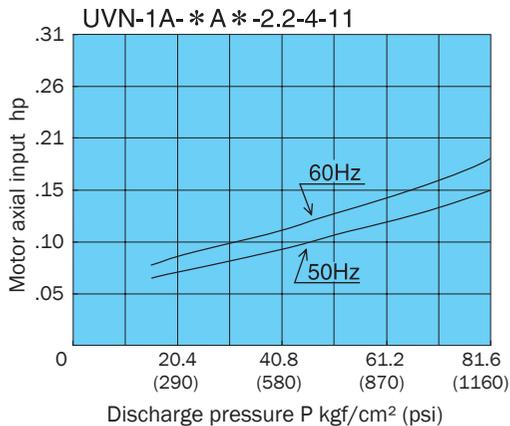
Motor Power Loss at Full Cutoff



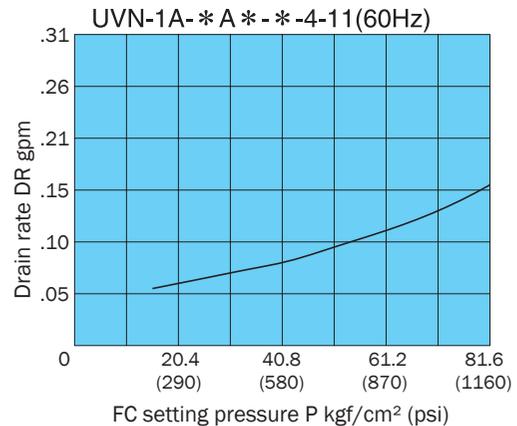
DR Volume at Full Cutoff

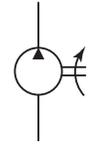


Motor Power Loss at Full Cutoff



DR Volume at Full Cutoff





IPH Series IP Pump

.21 to 7.68 in³/rev
4350 psi

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

Features

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

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

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

Specifications

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

Note:

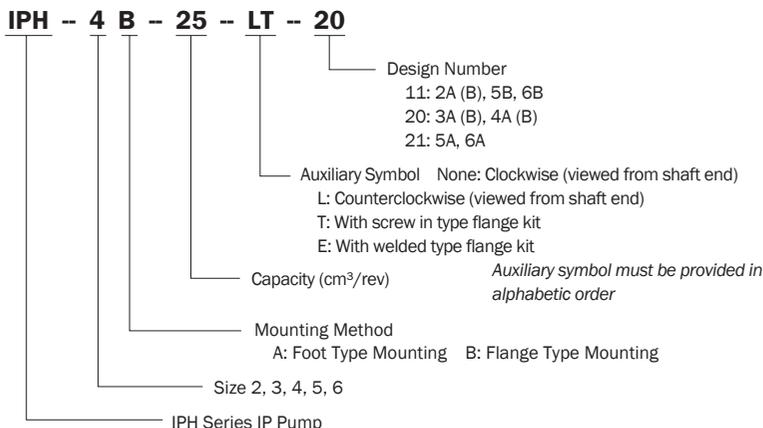
1. Suction Pressure: 3.6 psi.
2. Maximum working pressure shown here is the pressure limit when there are frequent pressure changes.
3. Avoid installation with the suction port towards the bottom of the pump.
4. Specify using the model number format shown below when pipe flanges are required.

- 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 150 centistokes.
 - 2 The operating temperature range is 40 to 149°F. When the oil temperature at

- startup is 40°F or less, perform a warm-up operation at low pressure until the oil temperature reaches 40°F. Use the pump in an area where the temperature is within the range of 32 to 140°F.
- 3 Suction pressure 3.6 psi, and the suction port flow rate should be to greater than 5 ft/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 10µm 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.

(continued on following page)

Understanding Model Numbers



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

Discharge Rate and Required Input for Each Pump Speed

Speed	Pressure psi		Discharge Rate gpm					Required Input hp						
	Model No.		100	1015	2030	3045	3625	4350	100	1015	2030	3045	3625	4350
1200 min ⁻¹	IPH-2A(B)- 3.5-11 5 6.5 8	1.1	1.1	1.0	1.0	1.0	1.0	.14	.68	1.6	2.4	2.8	3.5	3.5
		1.6	1.6	1.5	1.5	1.5	1.4	.20	1.2	2.3	3.5	4.1	5.0	5.0
		2.0	2.0	1.9	1.9	1.8	1.8	.25	1.5	2.9	4.3	5.1	6.2	6.2
		2.5	2.5	2.4	2.4	2.3	2.3	.30	1.9	3.6	5.3	6.3	7.6	7.6
	IPH-3A(B)- 10-20 13 16	3.2	3.1	3.0	3.0	2.9	2.9	.40	2.4	4.3	6.6	7.9	9.6	9.6
4.2		4.2	4.0	3.9	3.9	3.8	.52	3.1	5.7	8.6	10.1	12.4	12.4	
4.9		4.8	4.8	4.7	4.6	4.5	.60	3.7	6.8	10.2	12	14.8	14.8	
IPH-4A(B)- 20-20 25 32	6.5	6.7	6.28	6.1	6.1	6.0	.83	5.0	8.9	13.2	15.8	19.0	19.0	
	8.1	8.0	7.8	7.7	7.6	7.5	1.0	6.1	11.0	16.4	19.7	23.4	23.4	
	10.2	10.0	9.8	9.7	9.5	9.4	1.2	7.5	13.9	20.7	24.6	29.5	29.5	
IPH-5A(B)- 40-21(11) 50 64	12.9	12.6	12.4	12.1	12.0	11.8	1.6	9.9	17.2	26.1	30.9	38.0	38.0	
	15.9	15.6	15.4	15.1	14.9	14.7	1.9	11.9	21.7	32.1	38.3	45.9	45.9	
	20.2	19.8	19.5	19.2	19.0	18.8	2.4	15.0	27.6	40.9	48.6	58.3	58.3	
IPH-6A(B)- 80-21(11) 100 125	25.7	25.2	24.7	24.2	24.0	23.8	3.2	19.1	35.1	51.8	61.9	75.2	75.2	
	32.2	31.6	31.0	30.5	30.2	30.2	3.9	23.4	43.3	64.9	77.3	92.7	92.7	
	39.8	39.2	38.5	37.8	37.4	37.0	4.8	28.8	53.7	86.5	96.0	115.1	115.1	
1800 min ⁻¹	IPH-2A(B)- 3.5-11 5 6.5 8	1.7	1.6	1.6	1.5	1.5	1.5	.22	1.5	2.7	3.9	4.6	5.5	5.5
		2.4	2.4	2.3	2.3	2.2	2.2	.32	1.9	3.5	4.6	6.1	7.5	7.5
		3.0	3.0	2.9	2.9	2.8	2.8	.40	2.3	4.3	6.5	7.6	9.2	9.2
		3.8	3.8	3.7	3.6	3.5	3.5	.49	2.9	5.4	8.1	9.4	11.4	11.4
	IPH-3A(B)- 10-20 13 16	4.8	4.7	4.6	4.5	4.5	4.4	.65	3.8	6.7	10.0	11.9	14.4	14.4
6.3		6.2	6.1	5.9	5.9	5.8	.83	4.9	8.8	12.9	15.1	18.6	18.6	
7.3		7.3	7.2	7.1	7.0	6.9	.96	5.7	10.4	15.2	18.1	22.1	22.1	
IPH-4A(B)- 20-20 25 32	9.8	9.6	9.5	9.3	9.2	9.1	1.3	7.5	13.4	19.9	23.6	28.4	28.4	
	12.2	12.0	11.8	11.7	11.5	11.4	1.6	9.1	16.6	24.8	29.0	35.2	35.2	
	15.3	15.1	14.9	14.6	14.5	14.3	1.9	11.3	20.9	30.9	36.8	44.2	44.2	
IPH-5A(B)- 40-21(11) 50 64	19.3	19.0	18.7	18.4	18.2	17.9	2.6	15.6	27.0	40.2	47.7	58.6	58.6	
	23.9	23.5	23.2	22.8	22.6	22.4	3.1	18.9	33.0	49.4	58.7	70.5	70.5	
	30.3	29.9	29.4	29.0	28.8	28.5	3.9	23.6	42.3	62.7	74.6	89.7	89.7	
IPH-6A(B)- 80-21(11) 100 125	38.6	37.9	37.3	36.7	36.3	35.8	5.2	30.0	53.9	79.9	95.0	115	115	
	46.2	47.6	46.9	46.2	45.8	45.3	6.3	37.1	67.4	99.7	118	142	142	
	59.8	58.9	58.1	57.3	56.8	56.1	7.4	45.3	83.4	123.7	147	176	176	

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

Parts for IPH Pump (Standard)

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

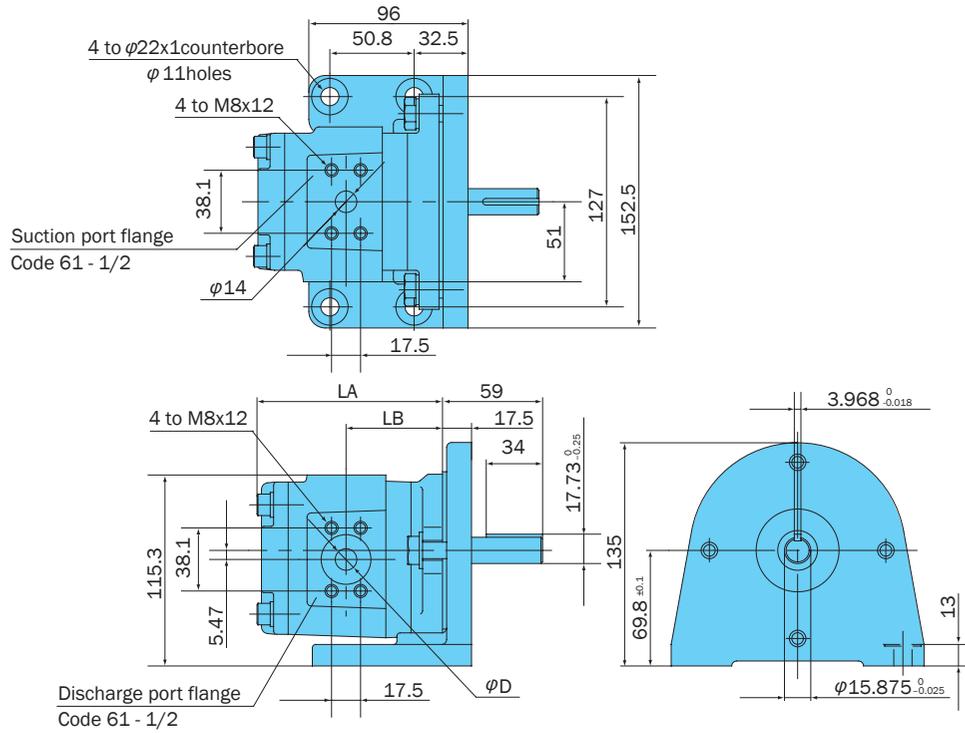
*Najimi set includes: Stopper-pin, axial plate-1, axial plate-2, feeler piece, axial backup ring, O-ring; **Radial Piston Kit includes: Radial piston, radial backup ring, backup ring, O-ring and washer
***Axial Plate Kit includes: Axial plate-1, axial plate-2, axial backup ring and O-ring

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

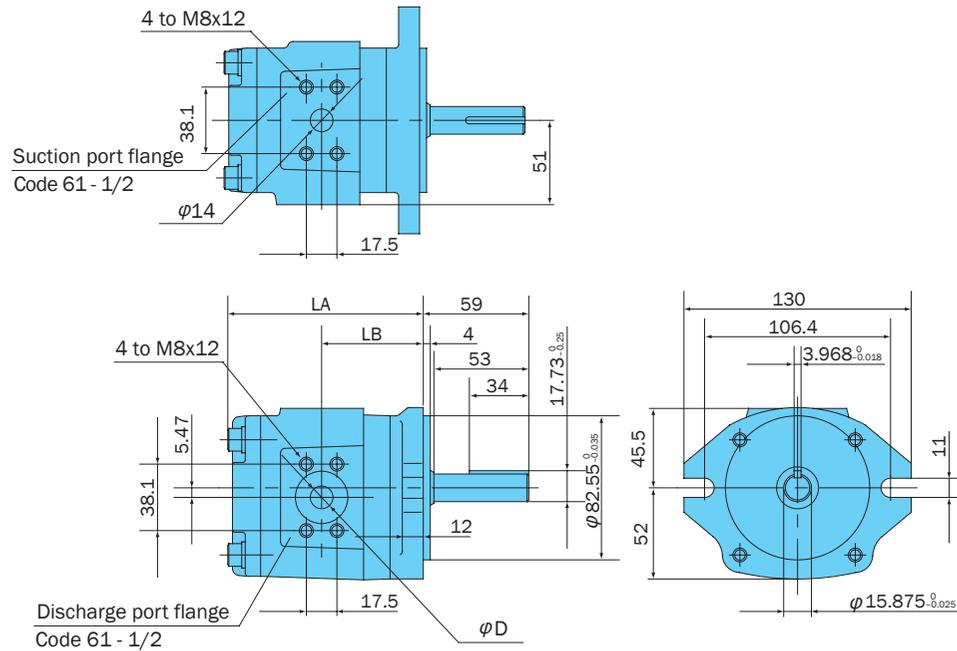
*Regarding Shaft side pump: H, F means the way of the bolt - H: 2-Bolt type, F: 4-Bolt type

Installation Dimension Drawings

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



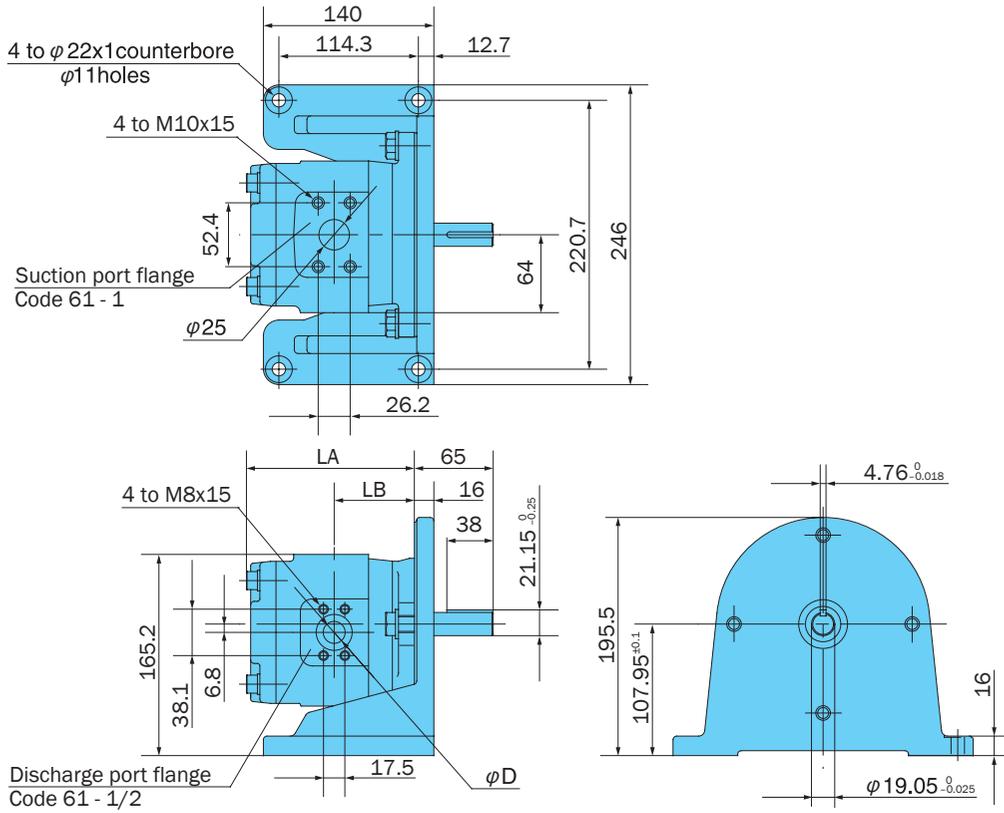
IPH-2B-*-11 (Flange Mounting, Clockwise Rotation) SAE A Mount



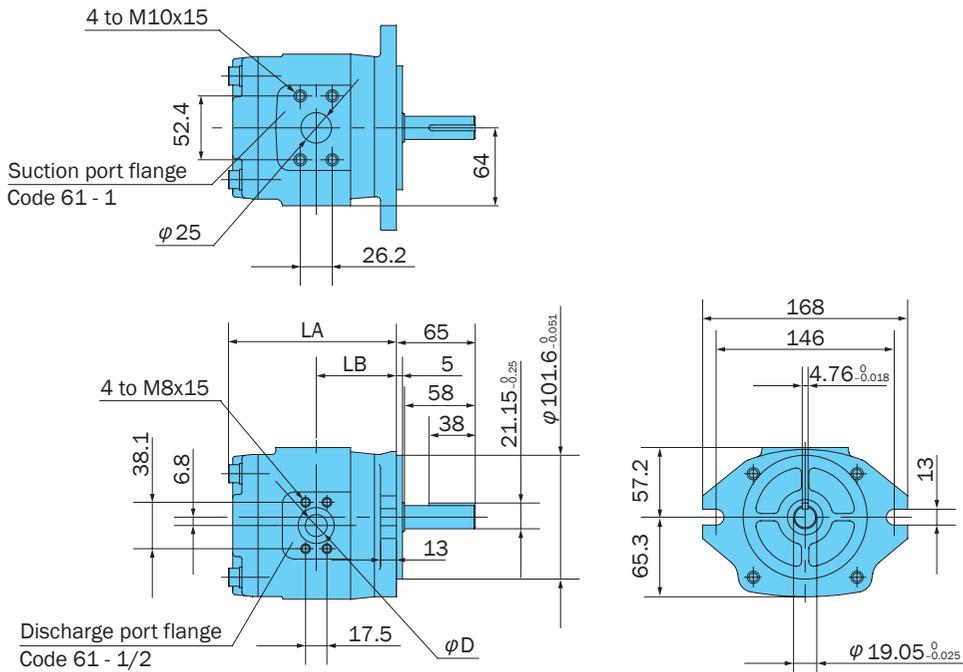
Model No.	Dimensions (mm)		
	LA	LB	$\varnothing D$
IPH-2*-3.5-*-11	107	51.0	8.9
IPH-2*-5-*-11	112	53.5	11
IPH-2*-6.5-*-11	116	55.5	12
IPH-2*-8-*-11	121	58.0	13

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

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



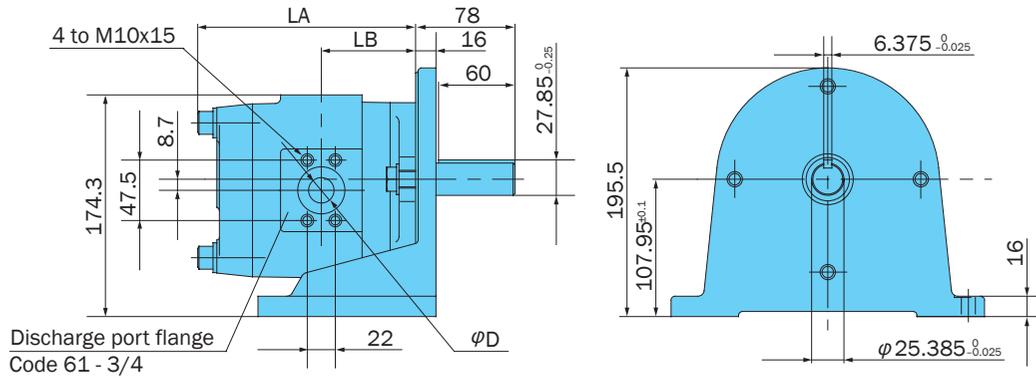
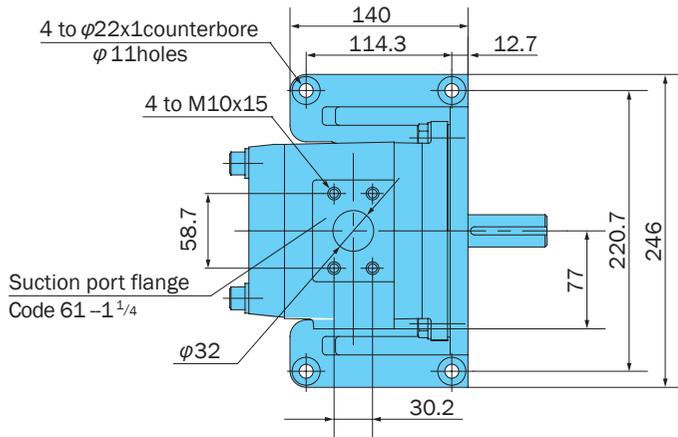
IPH-3B-*-20 (Flange Mounting, Clockwise Rotation) SAE B Mount 3/4 Shaft



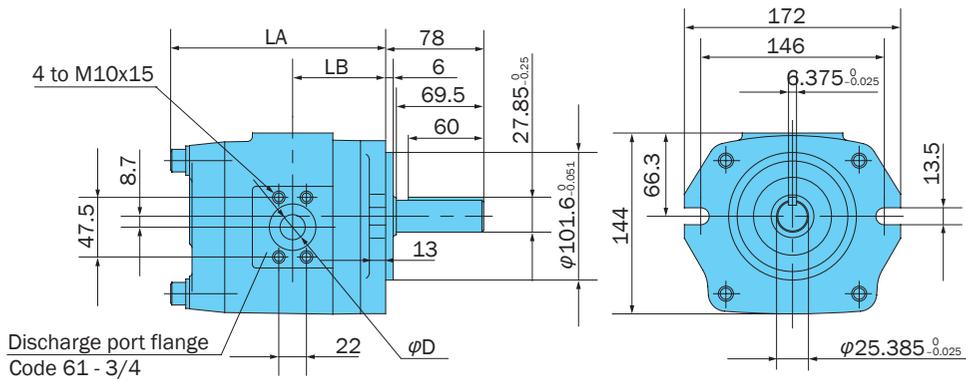
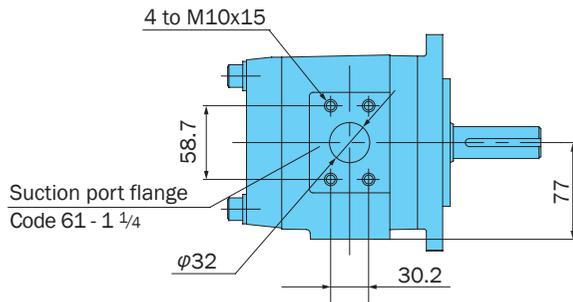
Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-3*-10-*-20	128.5	60.0	14
IPH-3*-13-*-20	134.5	63.0	17
IPH-3*-16-*-20	139.5	65.5	18

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)



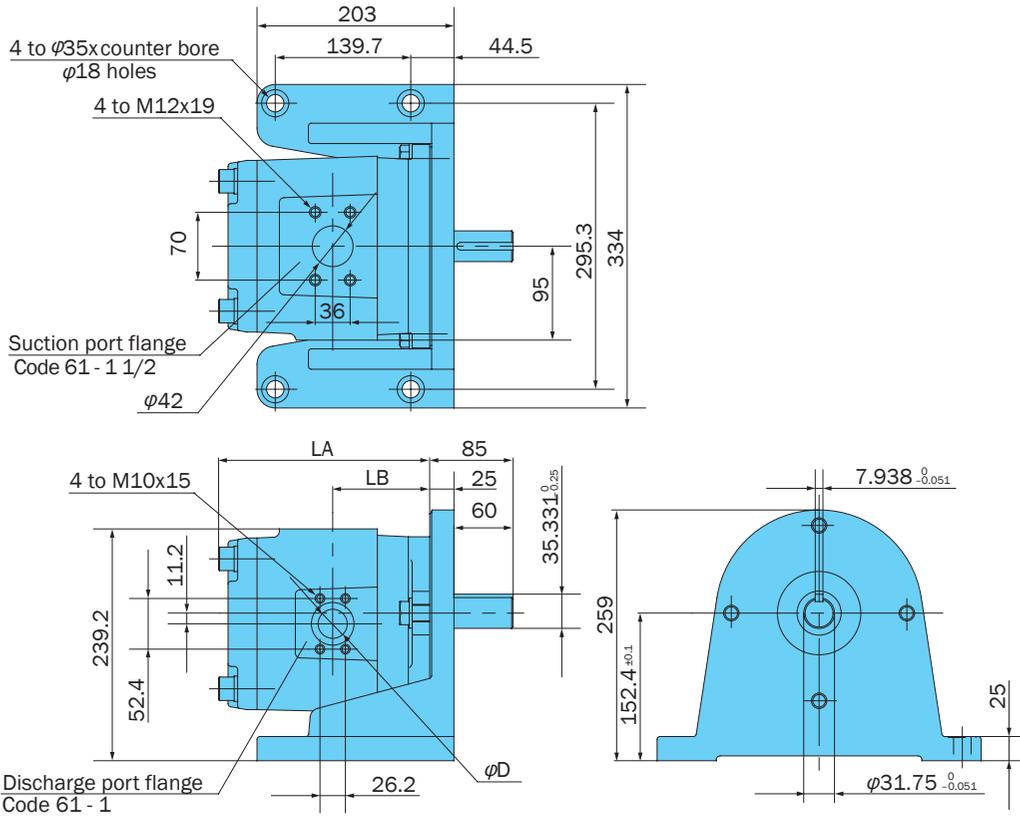
IPH-4B-*-20 (Flange Mounting, Clockwise Rotation) SAE BB Mount



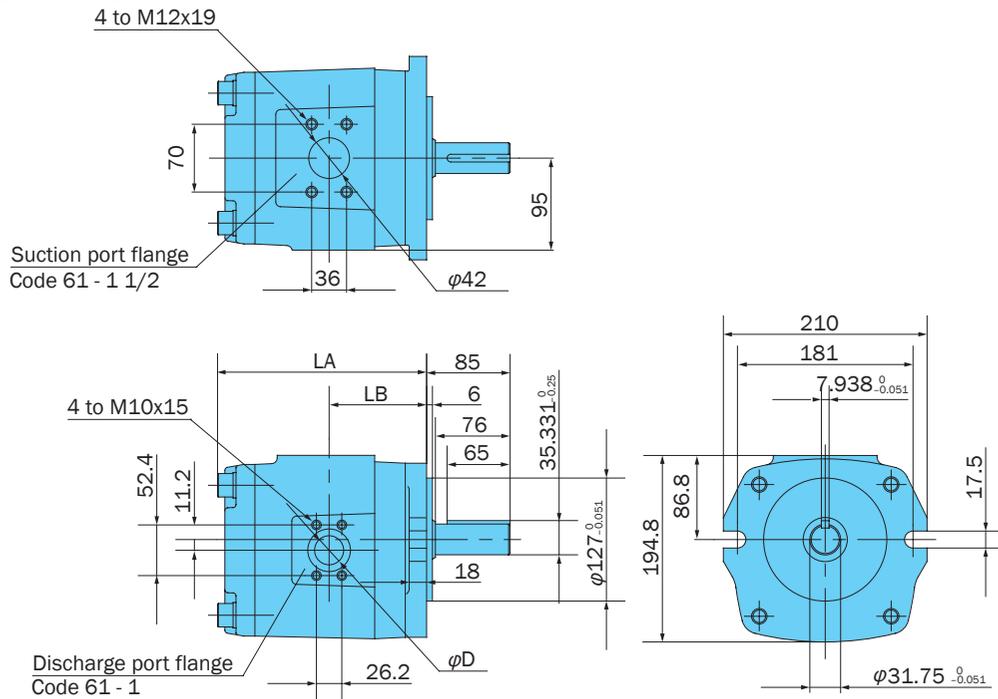
Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-4*-20*-20	164.5	71	18
IPH-4*-25*-20	170.5	74	20
IPH-4*-32*-20	178.5	78	24

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)

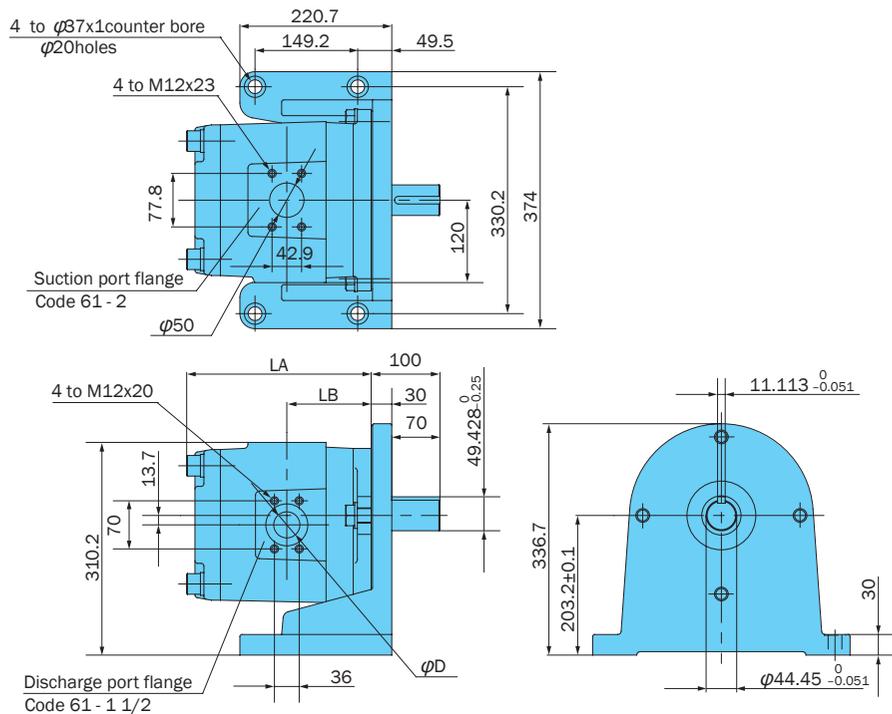
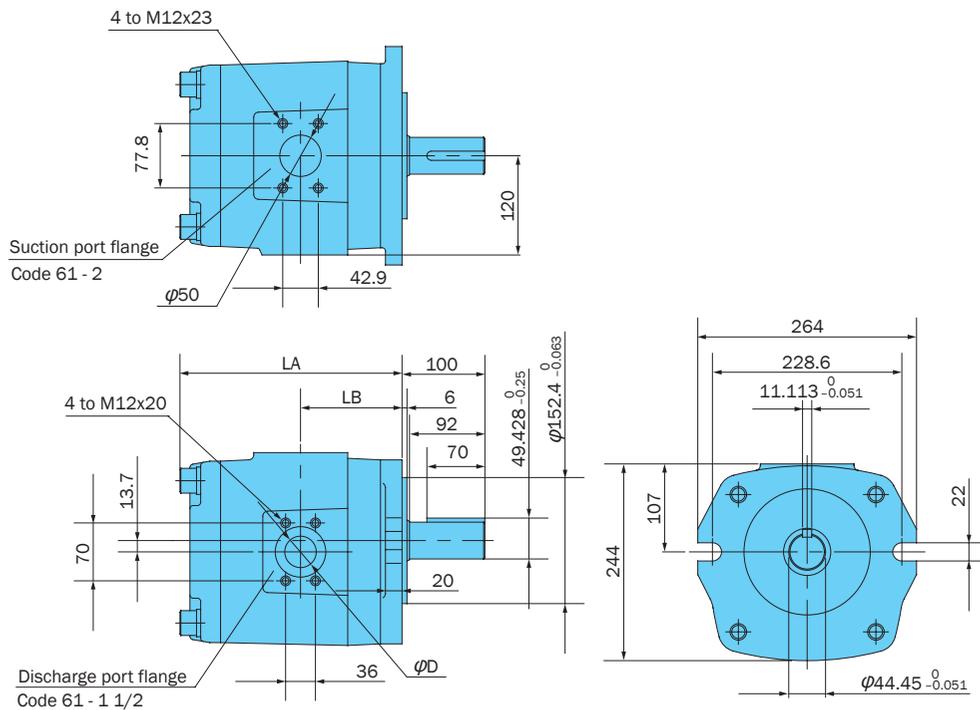


IPH-5B-*-11 (Flange Mounting, Clockwise Rotation) SAE C Mount



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.

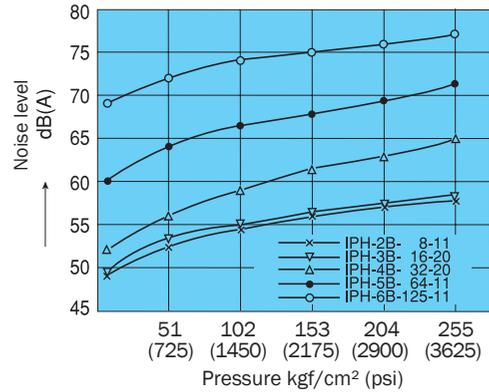
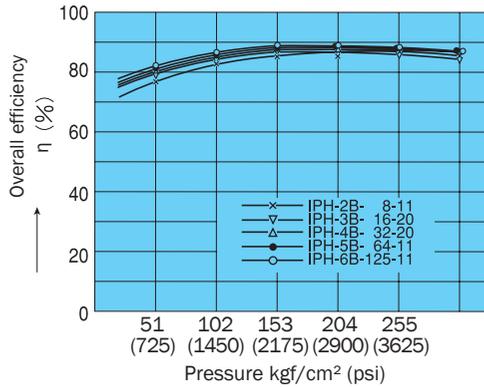
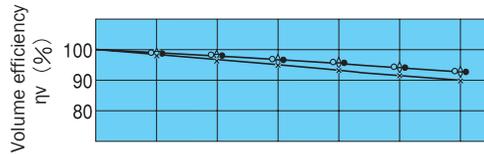
IPH-6A-*-21 (Foot Mounting, Clockwise Rotation)

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


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.

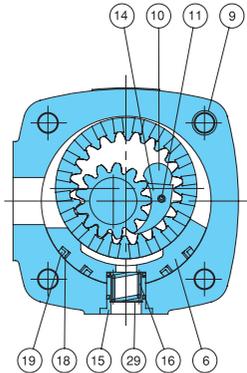
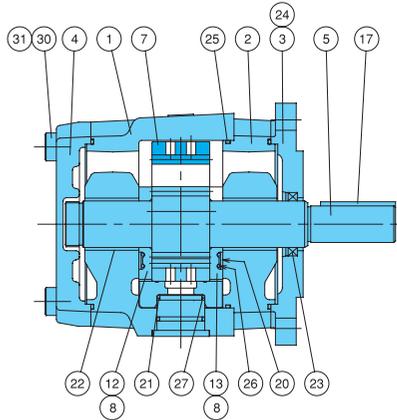
Performance Curves

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

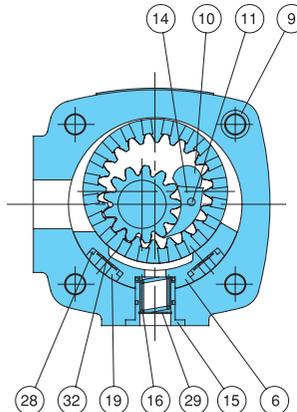
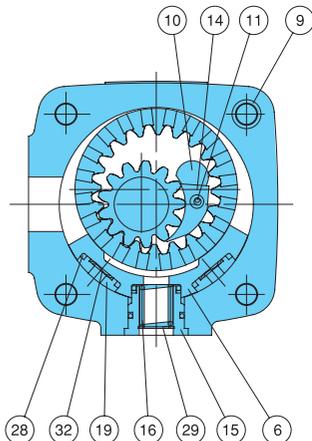


Cross-sectional Drawing

IPH-*B-*-**



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

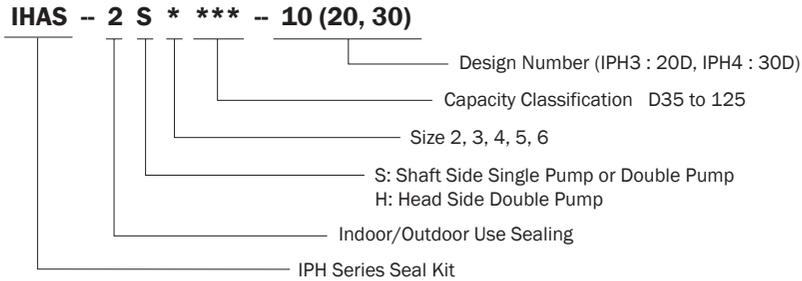


Part No.	Part Name
1	Body -1
2	Body -2
3	Mounting
4	Rear cover
5	Pinion shaft
6	Radial piston
7	Internal gear
8	Bushing
9	Knock pin
10	Stopper pin
11	Spring pin (guide pin)
12	Axial plate -1
13	Axial plate -2
14	Feeler piece
15	Spring holder
16	Spring
17	Key
18	Radial seal
19	Radial backup ring
20	Axial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

*Note: See page C2 for Parts/Kit Numbers

IPH Series Seal Kit

Understanding Seal Kit Model Numbers :



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

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

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

IPH Series Pipe Flange Kit

Understanding Flange Kit Model Numbers :

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

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

IHF - 3 - T - 20

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

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

IPH Series Flange Kit

Note: O-ring 1B-* *

refers to JIS B2401-1B-* *

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

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

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

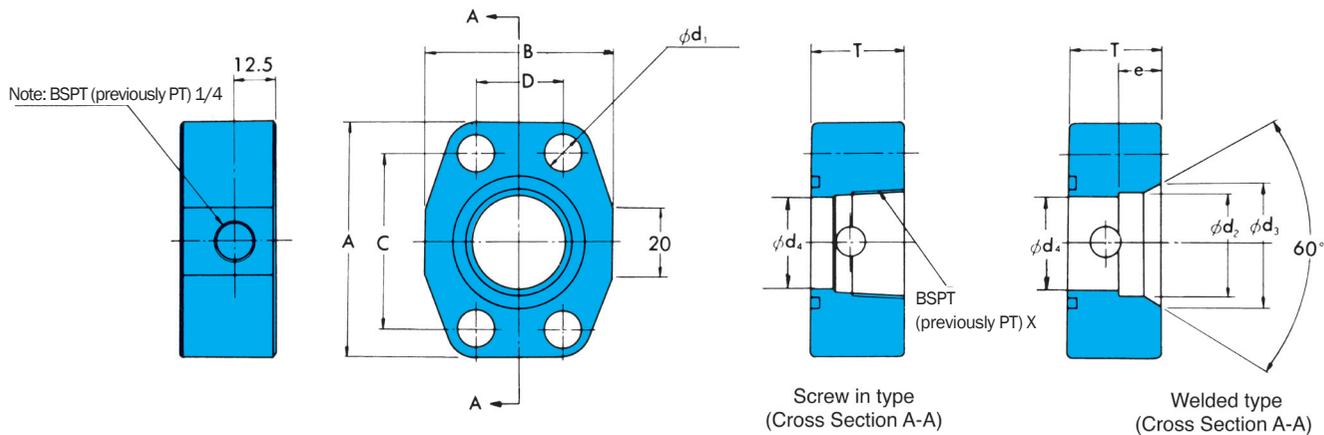
Note: 2. There is no common IN port in the case of the double pump models IPH-55, IPH-56, and IPH-66, or a single IN port is used.

Screw in type 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	IB-G30	1	
IHF-23-T-20	23	IH03J-100080	1	"	4	"	4	IB-G35	1	
IHF-24-T-20	24	IH03J-100120	1	TH-12 × 55	4	WS-B-12	4	IB-G50	1	
IHF-25-T-20	25	IH03J-100160	1	TH-12 × 60	4	"	4	IB-G60	1	
IHF-26-T-20	26	IH03J-100200	1	TH-12 × 65	4	"	4	IB-G75	1	
IHF-33-T-20	IPH- 33B-*-*-11	IH03J-100100	1	TH-10 × 55	4	WS-B-10	4	IB-G40	1	
IHF-34-T-20	34	IH03J-100120	1	TH-12 × 55	4	WS-B-12	4	IB-G50	1	
IHF-35-T-20	35	IH03J-100160	1	TH-12 × 60	4	"	4	IB-G60	1	
IHF-36-T-20	36	IH03J-100200	1	TH-12 × 60	4	"	4	IB-G75	1	
IHF-44-T-20	IPH- 44B-*-*-11	IH03J-100120	1	TH-12 × 55	4	"	4	IB-G50	1	
IHF-45-T-20	45	IH03J-100200	1	TH-12 × 65	4	"	4	IB-G75	1	
IHF-46-T-20	46	IH03J-100240	1	TH-16 × 75	4	WS-B-16	4	IB-G85	1	

*IPH Numbers include both Inlet and Outlet Flange Kits

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

Pipe Flange Installation Dimension Diagram



Screw in type

Pipe Flange Kit Part Number	SAE Standard Code 61	Nominal Diameter	Dimensions (mm)							Weight lbs
			A	B	C	D	T	ϕd_1	ϕd_4	
IH03J -100040	SAE J518b 1/2	1/2	54	46	38.1	17.5	33	9	12.7	.88
-100060	SAE J518b 3/4	3/4	65	52	47.5	22.0	33	11	20	1.3
-100080	SAE J518b 1	1	70	59	52.4	26.2	33	11	27	1.3
☆ -100100	SAE J518b 1 1/4	1 1/4	79	73	58.7	30.2	38	11	33	2.2
-100120	SAE J518b 1 1/2	1 1/2	94	83	70.0	36.0	38	13	37.5	3.0
☆ -100160	SAE J518b 2	2	102	97	77.8	42.9	38	13	50	3.7
☆ -100200	SAE J518b 2 1/2	2 1/2	114	109	88.9	50.8	43	13	60	4.6
☆ -100240	SAE J518b 3	3	135	131	106.4	61.9	48	17.5	71	7.2

Welded Type

Pipe Flange Kit Part Number	SAE Standard Code 61	Pipe Diameter	Dimensions (mm)										Weight lbs
			A	B	C	D	T	e	ϕd_1	ϕd_2	ϕd_3	ϕd_4	
IH03J -200040	SAE J518b 1/2	1/2	54	46	38.1	17.5	33	11	9	22.2	27	12.7	.88
-200060	SAE J518b 3/4	3/4	65	52	47.5	22.0	33	12	11	27.7	35	20	1.3
-200080	SAE J518b 1	1	70	59	52.4	26.2	33	14	11	34.5	42	27	1.3
☆ -200100	SAE J518b 1 1/4	1 1/4	79	73	58.7	30.2	38	16	11	43.2	48	33	2.2
-200120	SAE J518b 1 1/2	1 1/2	94	83	70.0	36.0	38	18	13	49.1	58	37.5	3.0
☆ -200160	SAE J518b 2	2	102	97	77.8	42.9	38	19	13	61.1	68	50	3.7
☆ -200200	SAE J518b 2 1/2	2 1/2	114	109	88.9	50.8	43	22	13	77.1	82	60	4.6
☆ -200240	SAE J518b 3	3	135	131	106.4	61.9	48	25	17.5	90.0	97	71	7.2

Recommended Tightening Torque for Flange Installation Bolts

For aluminum body

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

For cast body (shared IN port)

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

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

IPH Series Pipe Flange Kit

Understanding Foot Mounting Kit Numbers:

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

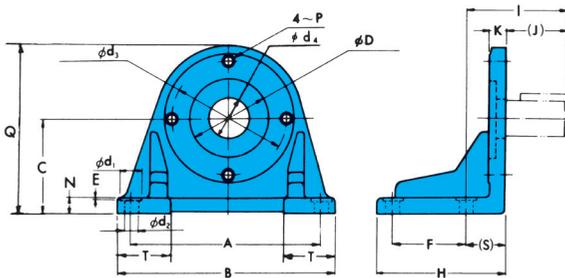
IHM - 2 - 10

Design Number

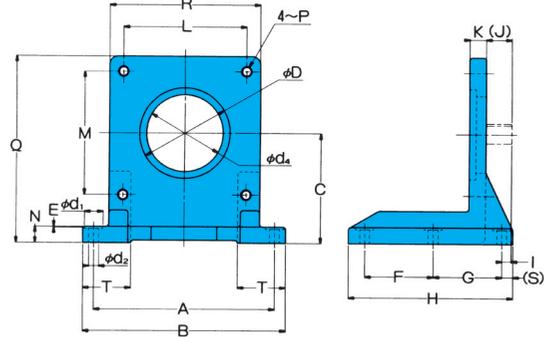
Pump Size: Single Pump 2 to 6
: Double Pump 22 to 66

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 lbs
	I	(J)	K	N	P	Q	(S)	T	φD	φd ₁	φd ₂	φd ₃	φd ₄	
IHM-2-10	74	41.5	17.5	13	M10	135	32.5	36.5	82.55	22	11	106.4	50	4.4
IHM-4-10	61.7	49	16	16	M12	195.5	12.7	53	101.6	22	11	146	40	12.1
IHM-4-10	74.7	62	16	16	M12	195.5	12.7	53	101.6	22	11	146	40	12.1
IHM-22-10	73.5	41	18	18	M10	180	32.5	50	82.55	22	11	106.4	40	14.3
IHM-44-10	89.5	45	20	20	M12	232	44.5	57.5	101.6	22	14	146	40	26.4
IHM-44-10	102.5	58	20	20	M12	232	44.5	57.5	101.6	22	14	146	40	26.4
IHM-45-10	104.5	60	25	25	M16	259	44.5	61	127	35	18	181	86	29.7
IHM-46-10	119.5	70	30	30	M20	337	49.5	64	152.4	37	20	228.6	100	48.5

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

SAE-4BOLT-MOUNTING

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

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

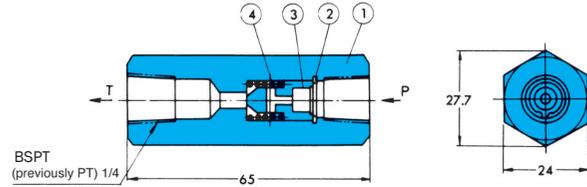
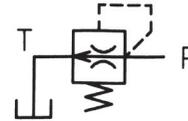
Air Bleed-off Valve

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

Specifications

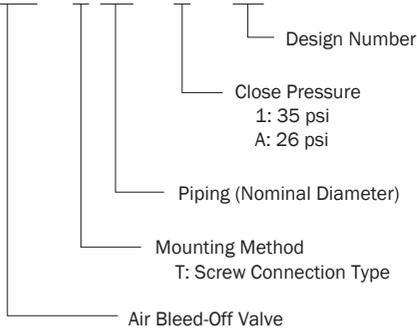
Air inside the pump and the suction pipe is exhausted rapidly when the pump is started up. When discharge pressure reaches 29 psi or greater after the pump intakes oil, a valve closes to prevent oil from leaking. Maximum operating pressure: 4350 psi. Provide piping to ensure that the tank port is under the oil level surface.

JIS symbol



Understanding Model Numbers

CAB - T 02 - 1 - 11



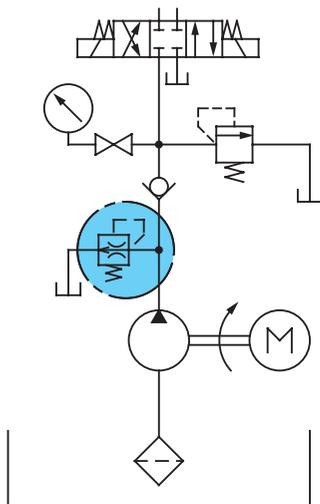
Part No.	Part Name	Q'ty
1	Valve body	1
2	Snap ring	1
3	Valve	1
4	Spring	1

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

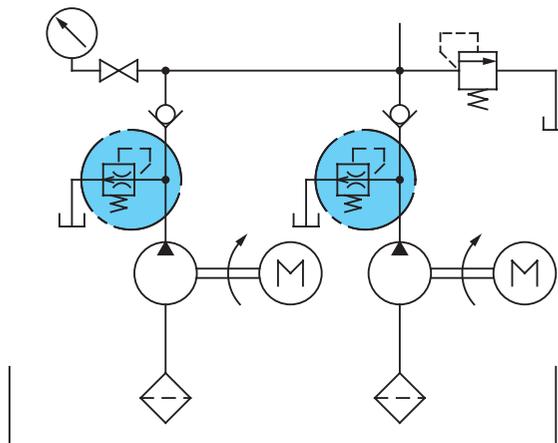
Application Examples

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

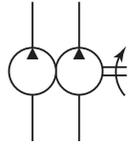
- 1) When using a Type 2 or Type 3 check valve (Sample Circuit A)
- 2) When unload circuit function cannot be achieved (Sample Circuit A)
- 3) When the discharge sides of multiple pumps run together (Sample Circuit B)



Circuit Diagram A



Circuit Diagram B



IPH Series Double IP Pump

.21 to 7.68 in³/rev
4350 psi

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

Features

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

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

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

Specifications

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

Note:

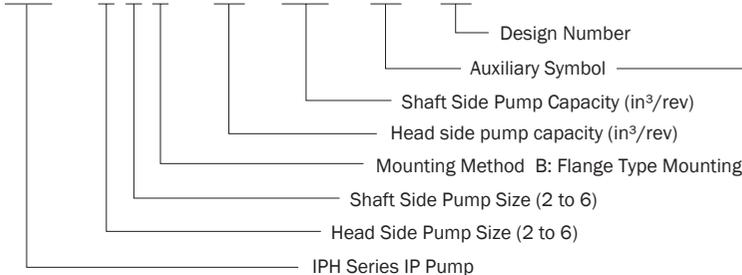
- Maximum Pressure: Maximum pressure limit when there are frequent pressure changes. However, maximum pressure is the same as rated pressure when load is applied to the head side and shaft side simultaneously.
- Suction Pressure: 4.3 psi
- Avoid installation with the suction port towards the bottom of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

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

- combinations that provide "the maximum capacity for each model number" are IPH-22B-8-8-11 for IPH-22b, and IPH-46B-32- 125-11 for IPH-46B.
- Handling
- 1 Handling is in accordance with procedures for the IPH pump. See page C-1 for more information.

Understanding Model Numbers

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



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

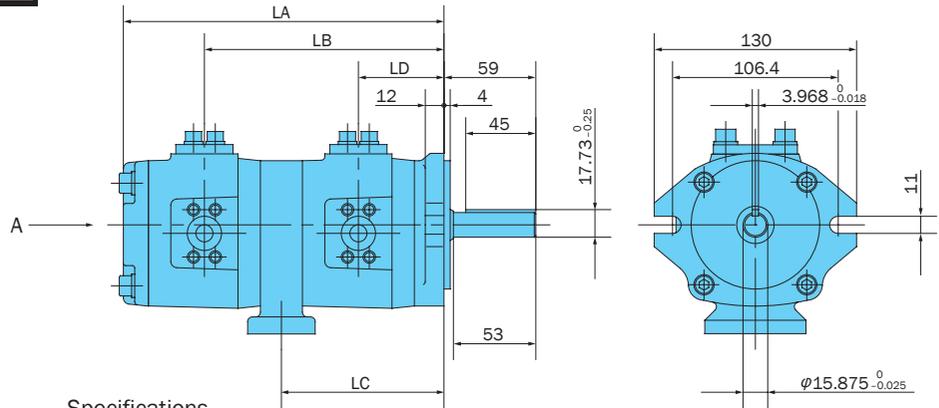
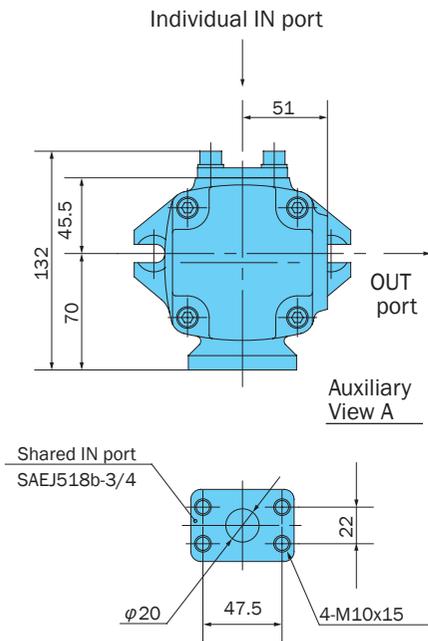
Auxiliary symbol must be provided in alphabetic order.

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

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

Installation Dimension Drawings

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

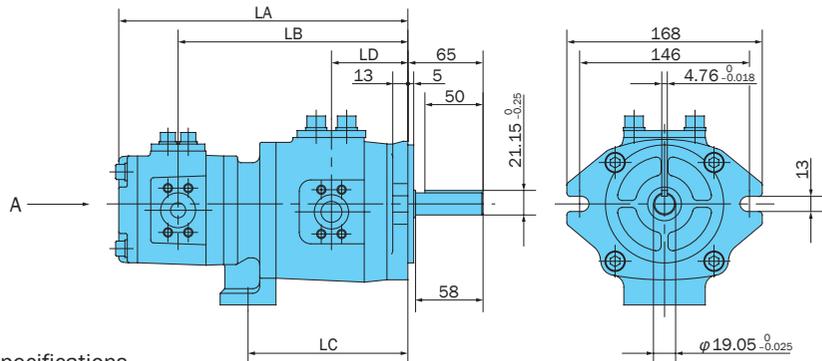
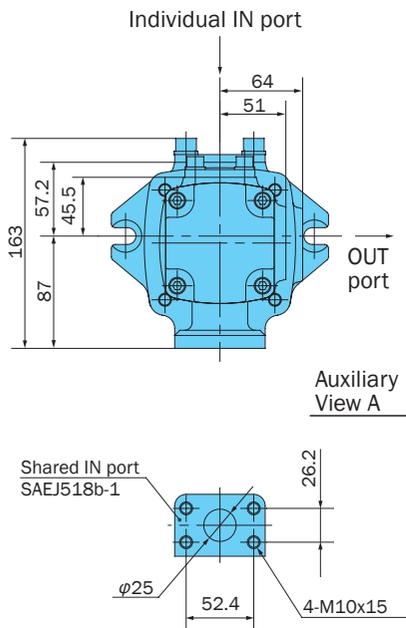


Specifications

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

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

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

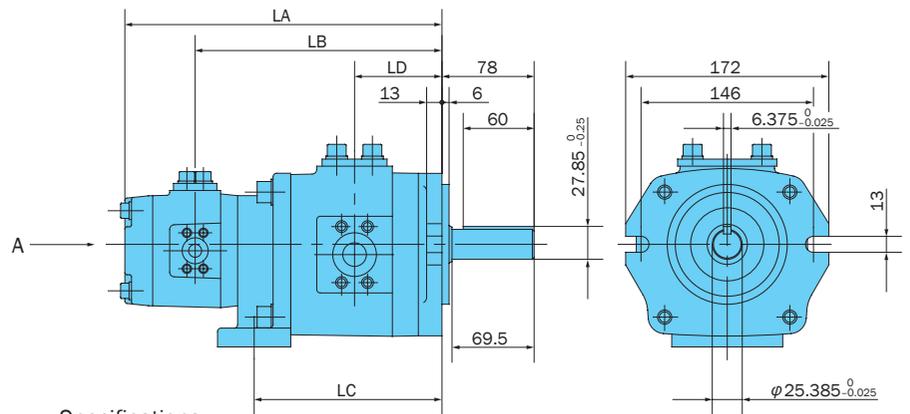
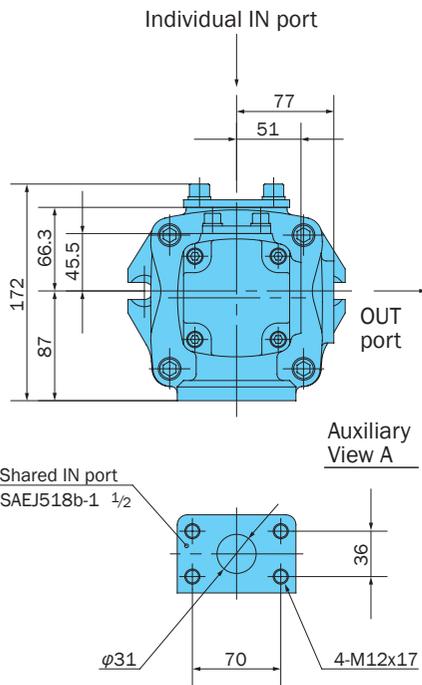


Specifications

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

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

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

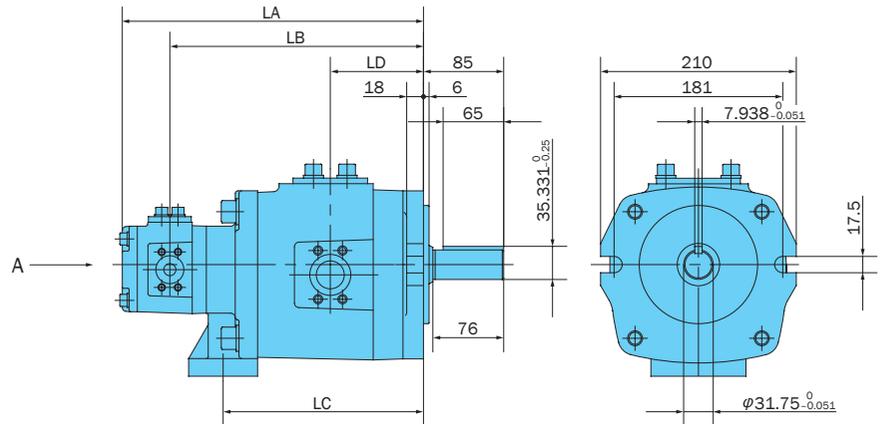
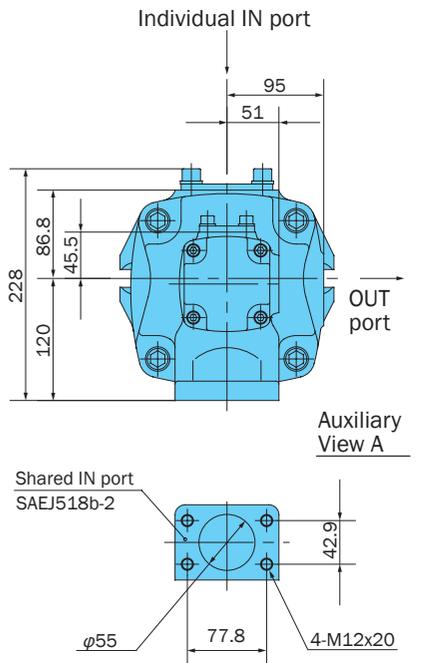


Specifications

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

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

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

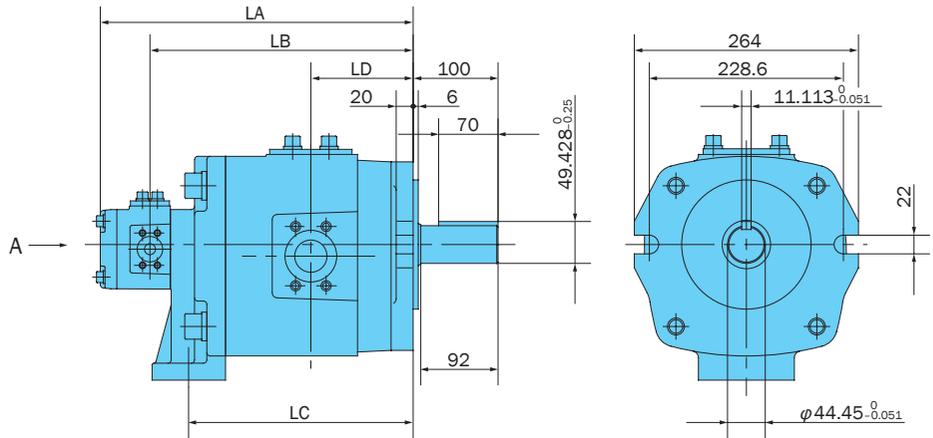
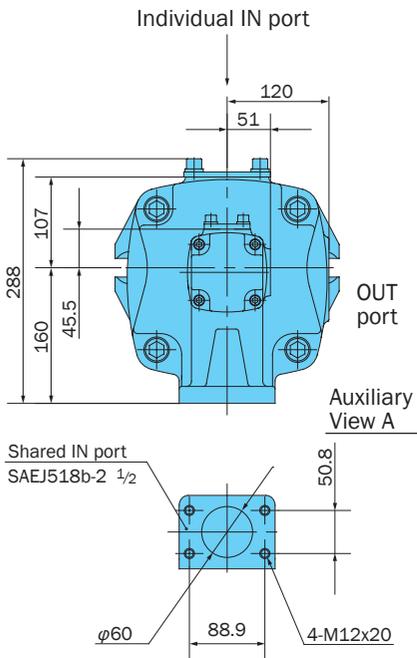


Specifications

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

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

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

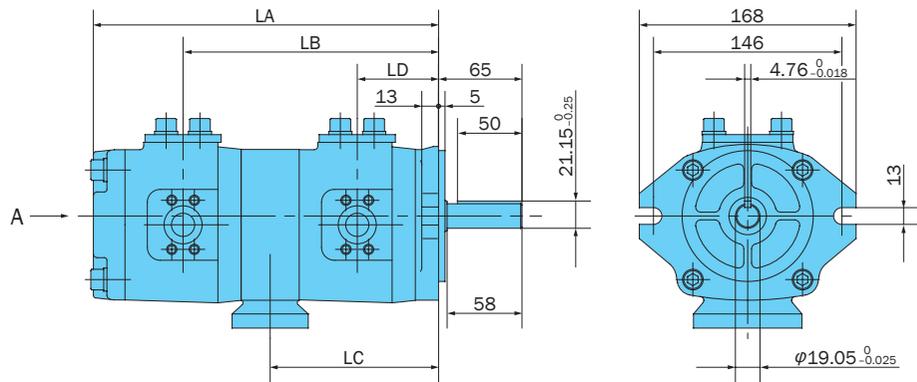
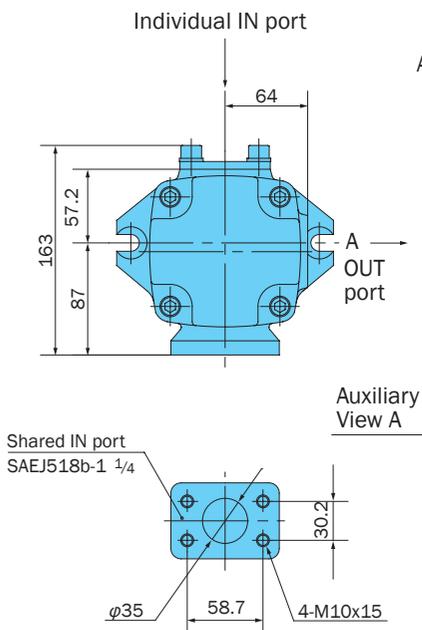


Specifications

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

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

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

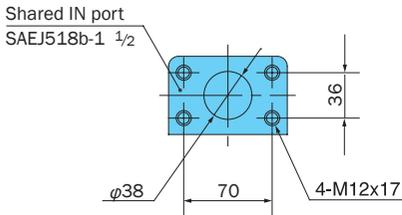
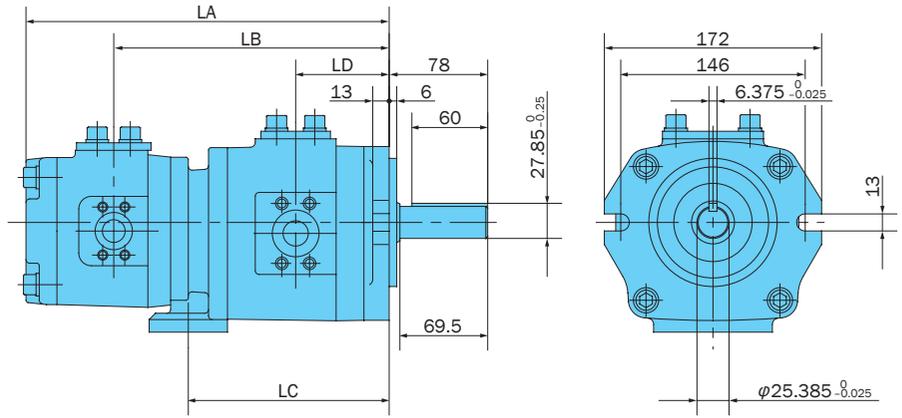
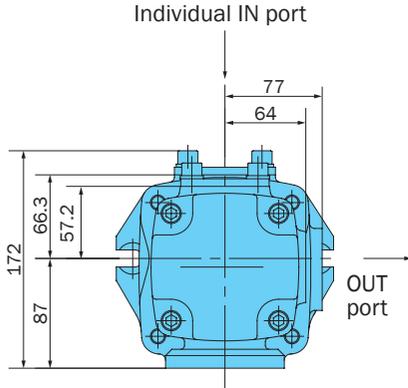


Specifications

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

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

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

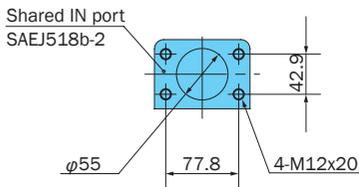
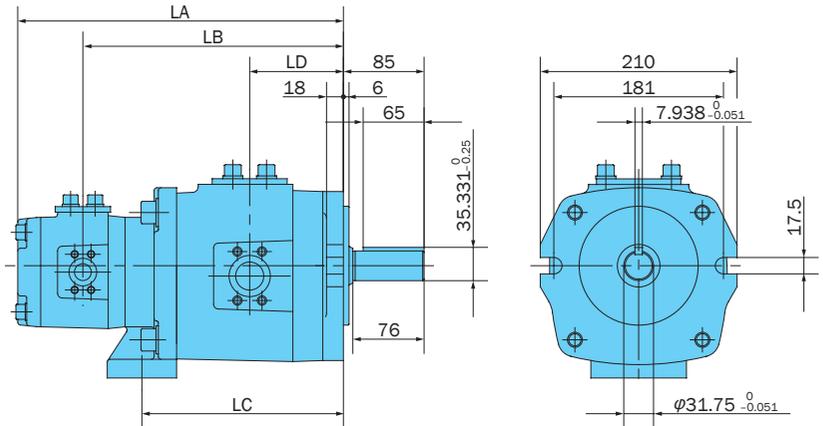
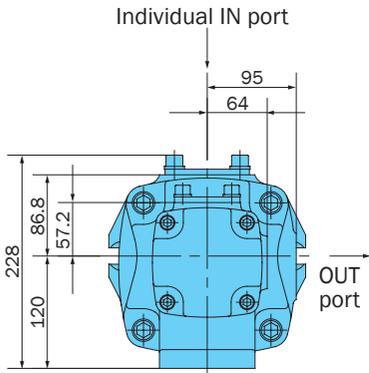


Specifications

Model No.	Volume in ³		Weight lbs	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-34B-10 -20-11	.62	1.26	32.8	272	209	153	71
-25		1.56	33.9	278	215	159	74
-32		1.97	35.0	286	223	167	78
IPH-34B-13 -20-11	.81	1.26	33.2	278	212	153	71
-25		1.56	34.3	284	218	159	74
-32		1.97	35.5	292	226	167	78
IPH-34B-16 -20-11	.96	1.26	33.9	283	214.5	153	71
-25		1.56	35.0	289	220.5	159	74
-32		1.97	36.1	297	228.5	167	78

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

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

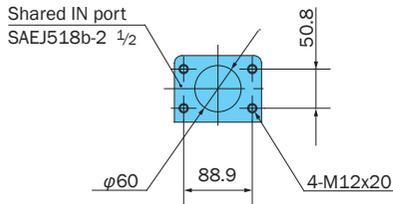
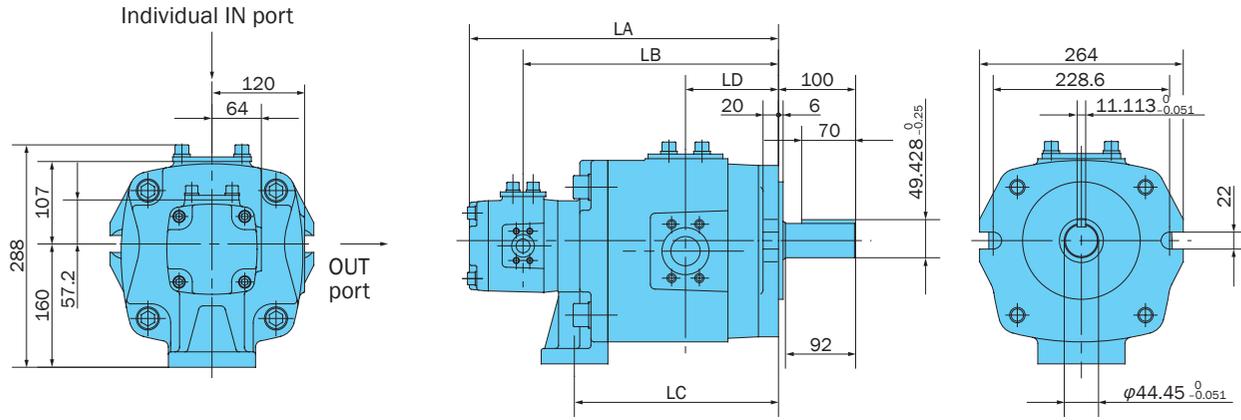


Specifications

Model No.	Volume in ³		Weight lbs	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-35B-10 -40-11	.62	2.48	58.2	323.5	257	197	91
-50		3.06	60.4	330.5	264	204	94.5
-64		3.89	62.6	340.5	274	214	99.5
IPH-35B-13 -40-11	.81	2.48	58.6	329.5	260	197	91
-50		3.06	60.8	336.5	267	204	94.5
-64		3.89	63.0	346.5	277	214	99.5
IPH-35B-16 -40-11	.96	2.48	59.3	334.5	262.5	197	91
-50		3.06	61.5	341.5	269.5	204	94.5
-64		3.89	62.7	351.5	279.5	214	99.5

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

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

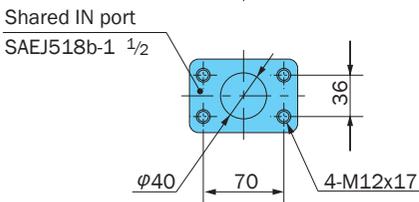
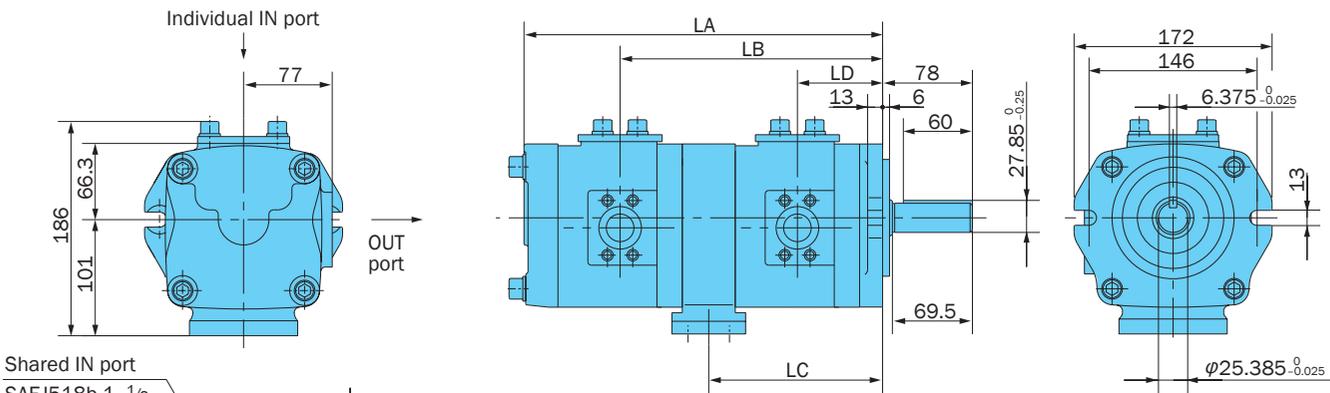


Specifications

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

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

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

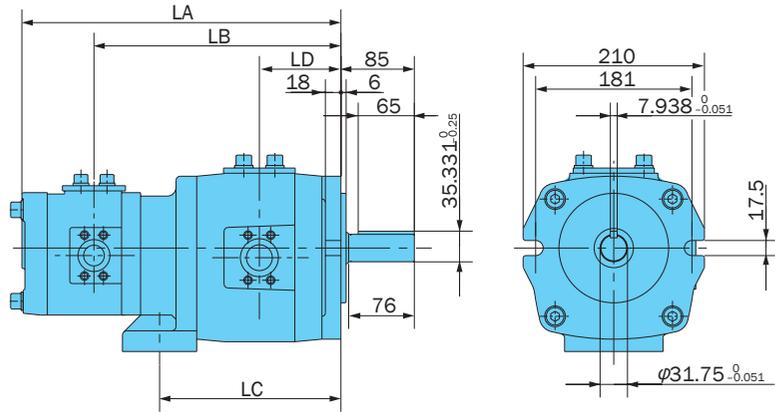
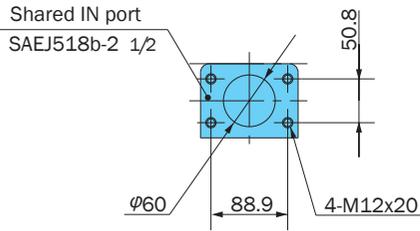
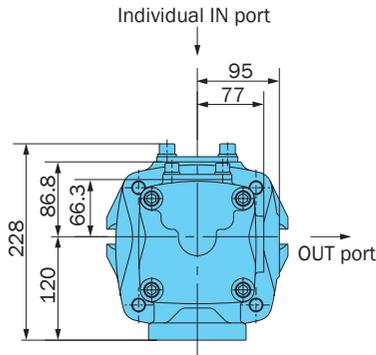


Specifications

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

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

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

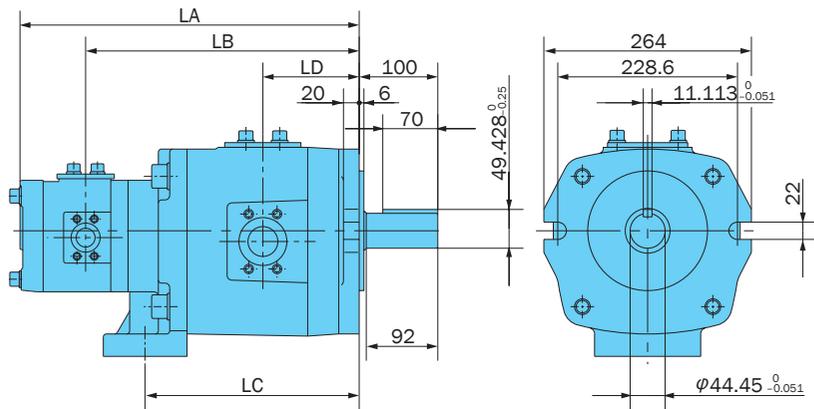
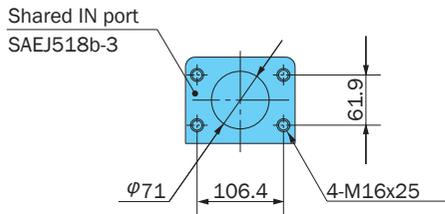
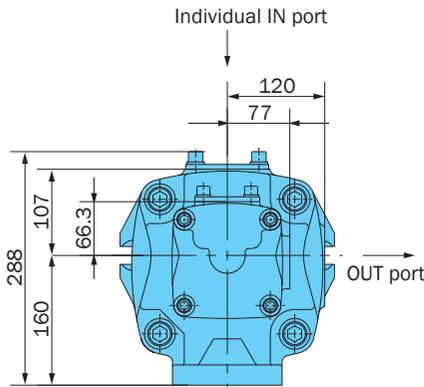


Specifications

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

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

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



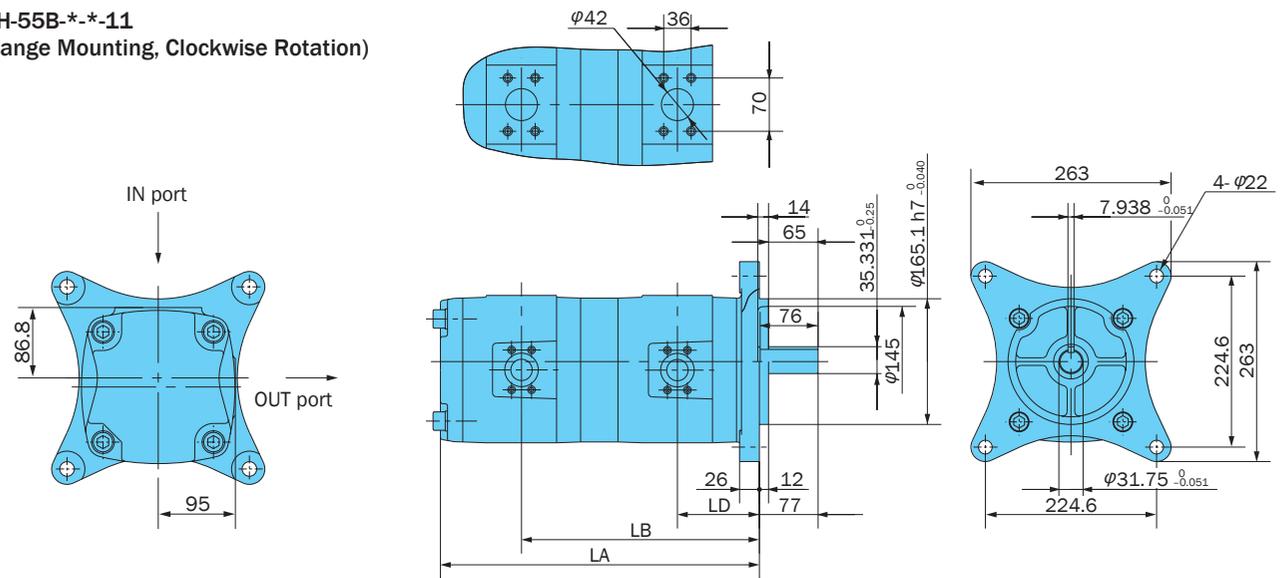
Specifications

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

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

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

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

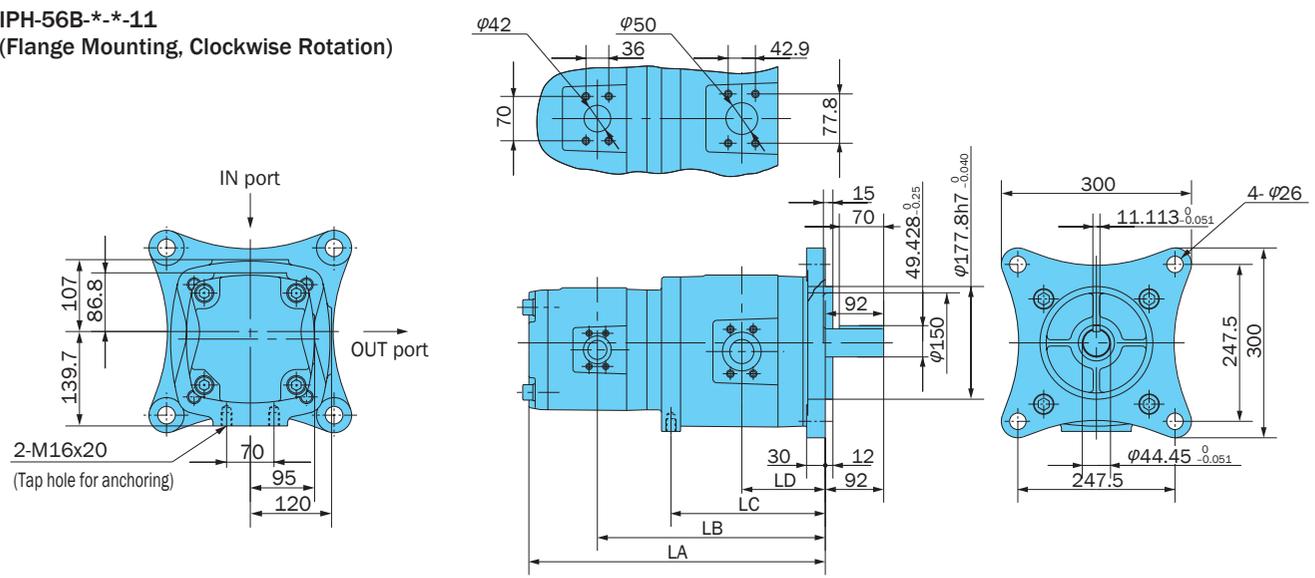


Specifications

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

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

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



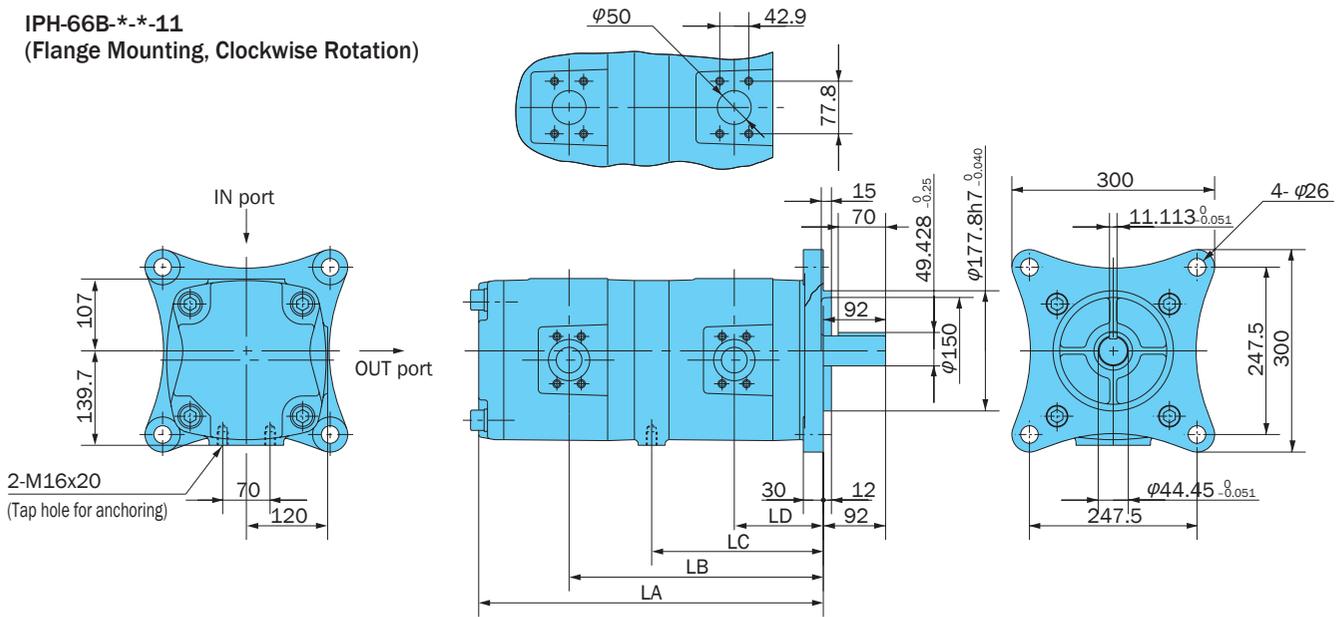
Specifications

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

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

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

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



Specifications

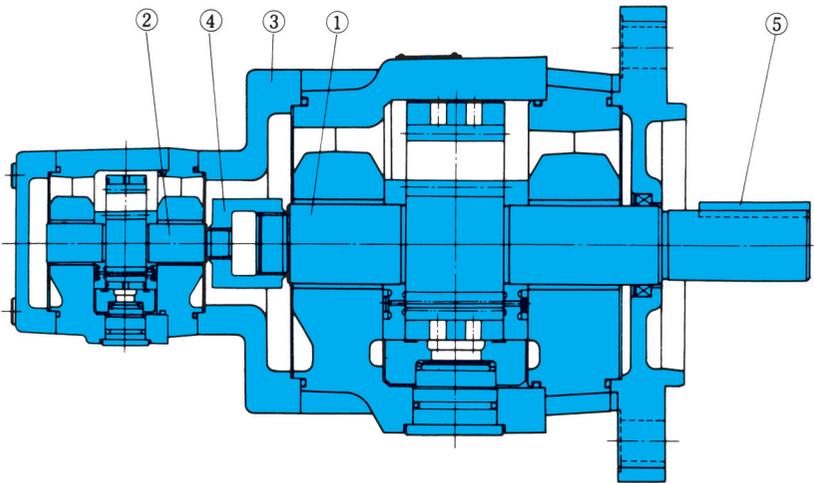
Model No.	Volume in ³		Weight lbs	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-66B- 80- 80-11	4.96	4.96	196	470	347.5	234	120.5
-100		6.19	201	480	357.5	244	125.5
-125		7.68	205	492	369.5	256	131.5
IPH-66B-100-100-11	6.19	4.96	205	490	362.5	244	125.5
-125		7.68	209	502	374.5	256	131.5
IPH-66B-125-125-11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

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

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

Cross-sectional Drawing

IPH Series Double IP Pump



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

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

• **IPS Series Double IP Pump Seal Kit**
The double pump seal kit combines a shaft side pump seal kit with a head 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.