







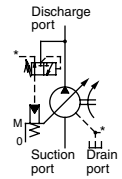
Photo	Type	Series	Description	Main Specifications
	Piston Pumps	PVS	Variable Volume Piston Pump	0.49 - 2.76in ³ /rev, 3000psi
	Piston Pumps	PZS	Variable Volume Piston Pump	4.27 - 6.10in ³ /rev, 4085psi 7.93 - 13.42in ³ /rev, 3642psi
	Vane Pumps	VDR	Variable Volume Vane Pump	7.9gpm, 2000psi 10.5gpm, 1000psi
	Vane Pumps	VDC	High-Pressure Type Variable Volume Vane Pump	7.9 - 31.7gpm, 2000psi
	Vane Pumps	VDS	Small Variable Volume Vane Pump	0.5in ³ /rev, 4.0gpm, 1000psi
	Uni-Pumps	UVN	Variable Volume Vane Pump	7.6gpm, 1160psi

NACHI

PVS SERIES
VARIABLE VOLUME PISTON PUMP

PVS Series Variable Volume Piston Pumps

0.49 to 2.76in³/rev
3000psi



- 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.)

Reliable fast response mechanism

Pressure rate control response is fast. The construction is simple, which improves reliability and eliminates problems.

Sharp cut-off characteristics obtained with simple adjusting mechanism

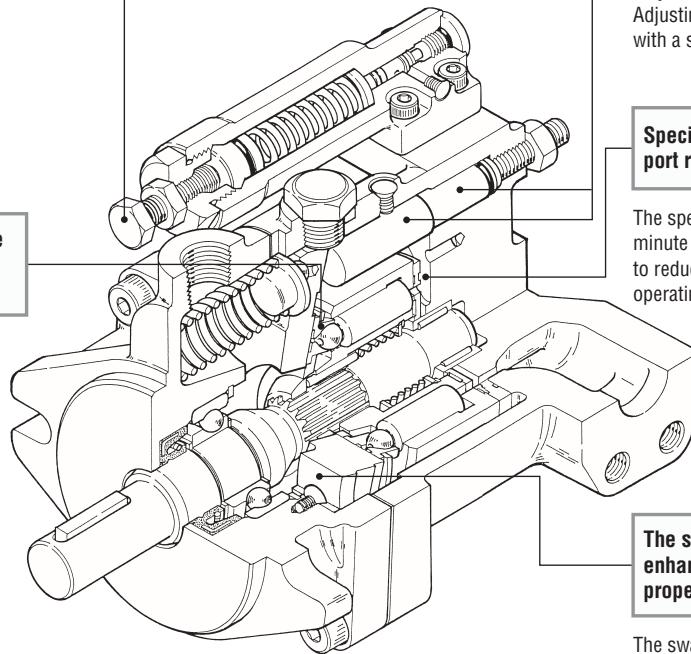
The NACHI flow adjusting mechanism, operating with the action of the semi-cylindrical swash plate, allows very sharp cut-off characteristics. Adjusting operation is easily made with a spanner tool.

Pressure balanced shoe in the lateral direction optimally utilizes the discharged fluid

Pressure balance of the shoe and the swash plate in the lateral direction is accomplished by discharged fluid directed to the cavity of the shoe — For a completely hydraulically balanced assembly. The smooth operation achieved contributes to the features of high efficiency, low noise and extended life.

Special shaped fluid flow port reduces noise

The special shaped fluid flow port and minute grooves have been developed to reduce noise and thus makes the operating sound negligible.



The stable swash plate enhances various operational properties

The swash plate a semi-cylindrical design concept is an advancement to the conventional type. In addition to the innovative form, the swash plate adopts special bearings to control sideways motion. Consequently, power is received directly regardless of changes in the load. Stable operations can be achieved.

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 cm ³ /rev (in ³ /rev)	Discharge volume at no-load ℓ /min (gpm)				Pressure adjustment range MPa (PSI)	Allowable peak pressure MPa (PSI)	Revolution speed min ⁻¹		Weight Lb
		1000min ⁻¹	1200min ⁻¹	1500min ⁻¹	1800min ⁻¹			Min.	Max.	
PVS-0B-8*0-E30	8.0 (0.49)	8.0 (2.1)	9.6 (2.5)	12.0 (3.2)	14.4 (3.8)	2 ~ 3.5 (286 ~ 500)	25 (3643)	500	2000	17.0
1						2 ~ 7 (286 ~ 1000)				
2						3 ~ 14 (429 ~ 2000)				
3						3 ~ 21 (429 ~ 3000)				
PVS-1B-16*0-(*)-E13	16.5 (1.01)	16.5 (4.4)	19.8 (5.2)	24.7 (6.5)	29.7 (7.8)	2 ~ 3.5 (286 ~ 500)	25 (3643)	500	2000	23.0
1						2 ~ 7 (286 ~ 1000)				
2						3 ~ 14 (429 ~ 2000)				
3						3 ~ 21 (429 ~ 3000)				
PVS-1B-22*0-(*)-E13	22.0 (1.34)	22.0 (5.8)	26.4 (7.0)	33.0 (8.7)	39.6 (10.5)	2 ~ 3.5 (286 ~ 500)	25 (3643)	500	2000	23.0
1						2 ~ 7 (286 ~ 1000)				
2						3 ~ 14 (429 ~ 2000)				
3						3 ~ 21 (429 ~ 3000)				
PVS-2B-35*0-(*)-E13	35.0 (2.14)	35.0 (9.2)	42.0 (11.1)	52.5 (13.9)	63.0 (16.6)	2 ~ 3.5 (286 ~ 500)	25 (3643)	500	2000	51.0
1						2 ~ 7 (286 ~ 1000)				
2						3 ~ 14 (429 ~ 2000)				
3						3 ~ 21 (429 ~ 3000)				
PVS-2B-45*0-(*)-E13	45.0 (2.76)	45.0 (11.9)	54.0 (14.3)	67.5 (17.9)	81.0 (21.5)	2 ~ 3.5 (286 ~ 500)	25 (3643)	500	2000	51.0
1						2 ~ 7 (286 ~ 1000)				
2						3 ~ 14 (429 ~ 2000)				
3-(*)-E20						3 ~ 21 (429 ~ 3000)				

Note) 1. The standard direction of rotation is clockwise when viewed from the shaft end. Consult your agent separately for a counterclockwise direction of rotation.
2. A keyed straight shaft is standard. For details on spline shafts, consult your agent separately.

- Handling
- Cautions during Pump Installation and Piping

- 1 Use flexible couplings for connecting the pump shaft to the drive shaft, and prevent a radial or thrust load from being applied on the pump shaft.
- 2 For centering of the pump shaft, limit the eccentricity between the drive shaft and hydraulic pump shaft to 0.05 mm, and keep the angle error within 1°.
- 3 Set the 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 -0.03 MPa or more (suction port flow velocity within 2 m/sec).
- 6 Raise part of the drain piping to above the topmost part of the pump body, and insert the return section of the drain piping into the hydraulic operating fluid. Also, observe the values in the following table to limit the drain back pressure to 0.1 MPa.

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

- Management of Hydraulic Operating Fluid

- 1 Use good-quality hydraulic operating fluid, and use within a kinematic viscosity range of 20 to 200 mm²/sec during operation. Use an R&O type and wear-resistant type of IS-OGV32 to 68 or equivalent.
The optimum kinematic viscosity during operation is 20 to 50 mm²/sec.
- 2 The operating temperature range is 5 to 60°C. When the oil temperature at start-

up is 5°C or less, warm up the hydraulic pump by low-pressure, low-operation speed operation until the oil temperature reaches 5°C.

- 3 Provide a suction strainer with a filtering grade of about 100μm (150 mesh). Be sure to provide a return line filter of grade 20μm or less on the return line to the tank. (When the hydraulic pump is used at a high pressure of 14 MPa or more, we recommend providing a filter of 10μm or less.)
- 4 Manage the hydraulic operating fluid so that contamination is maintained at class NAS10 or lower.
- 5 Use hydraulic operating fluid within an operating ambient temperature of 0 to 60°C.

- Cautions at Startup

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

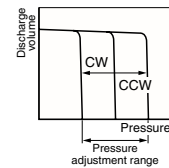
Model No.	Injection amount cm ³
PVS-0B-8	220
PVS-1B-16, 22	300
PVS-2B-35, 45	650

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

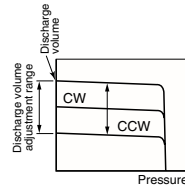
- How to Set Pressure and Discharge Volume

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.

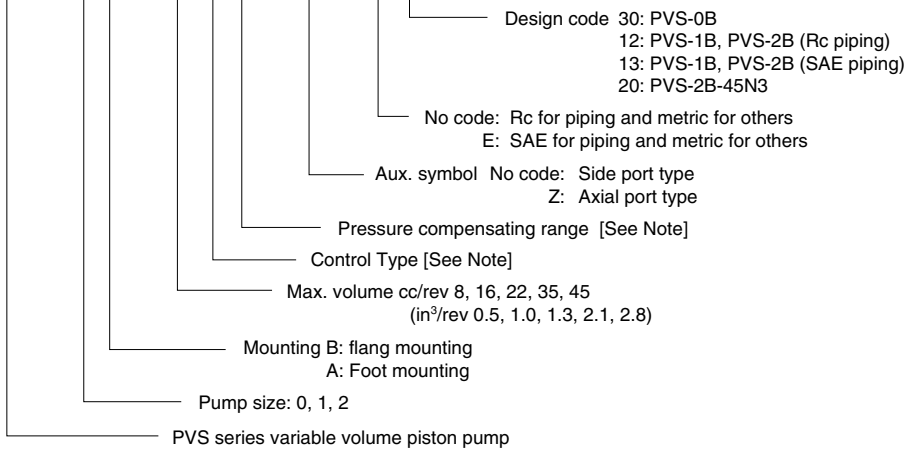


Note)

- 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.

Explanation of model No

PVS - 1 B - 16 N 2 - (*) - * 13



[Note]

● Variable control mechanism

Standard type

N* : Pressure compensation type (manual mode)

Option type

P* : Pressure compensation type (remote control mode)

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

R^A_S⊙ : Solenoid cutoff control

W^A_S⊙ : 2-pressure control

RQ^A_S⊙ : 2-pressure, 2-flow rate control w/ solenoid cutoff

C^A_S⊙ : 2-cutoff control

● * : Pressure adjustment range

0 : 2 ~ 3.5MPa {286 ~ 500psi}

1 : 2 ~ 7MPa {286 ~ 1000psi}

2 : 3 ~ 14MPa {429 ~ 2000psi}

3 : 3 ~ 21MPa {429 ~ 3000psi}

● ⊙ : Applicable to solenoid specifications A, S

A⊙ : SA-G01

S⊙ : SS-G01

1 : 100V 50/60Hz

2 : 200V 50/60Hz

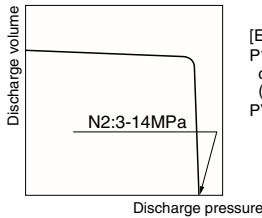
3 : DC12V

4 : DC24V

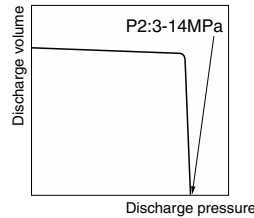
5 : AC115V 60Hz

6 : AC230V 60Hz

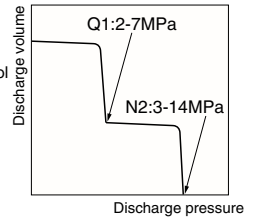
[Example 1]
 N* : Pressure compensation type (manual mode)
 PVS-1B-16N2



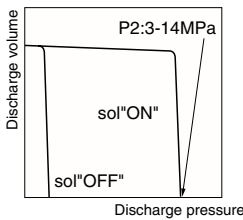
[Example 2]
 P* : Pressure compensation type (remote control mode)
 PVS-1B-16P2



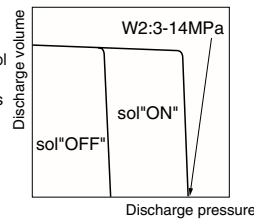
[Example 3]
 N*Q* : 2-pressure, 2-flow rate control
 PVS-1B-16N2Q1



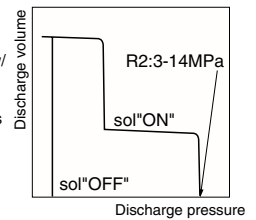
[Example 4]
 R^A_S⊙ : Solenoid cutoff control
 PVS-1B-16R2S2
 Solenoid specifications
 200V 50/60Hz
 SS-G01



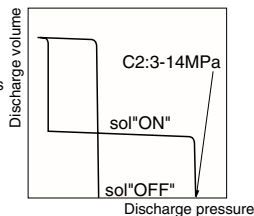
[Example 5]
 W^A_S⊙ : 2-pressure control
 PVS-1B-16W2S1
 Solenoid specifications
 100V 50/60Hz
 SS-G01



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



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



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

Variable Control Mechanisms

Standard type

Symbol	External View	Characteristics	Hydraulic Circuit	Explanation
N				<p>Pressure compensation type (manual system)</p> <p>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>

Option type

P				<p>Pressure compensation type (remote control mode)</p> <p>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)</p>
NQ				<p>2-pressure, 2-flow rate control type</p> <p>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.</p>
RS (RA)				<p>Solenoid cutoff control type</p> <p>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.</p>
WS (WA)				<p>2-pressure control type</p> <p>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.</p>
RQS (RQA)				<p>2-pressure, 2-flow rate control type w/ solenoid cutoff</p> <p>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.</p>
CS (CA)				<p>2-cutoff control type</p> <p>Two types of pressure - flow rate characteristics can be obtained by the solenoid valve and cylinder mounted on the pump.</p>

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

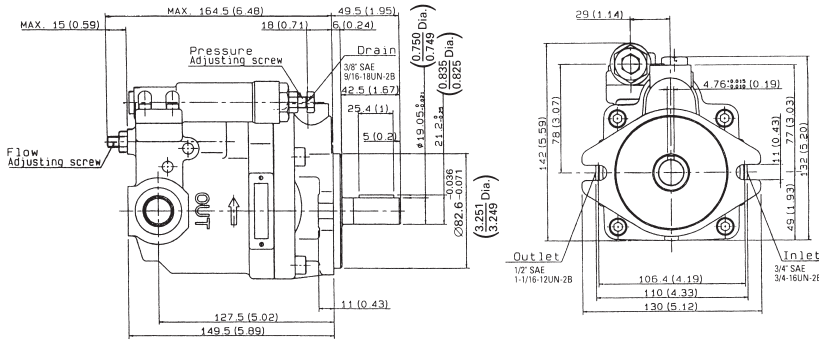
Note 2) We recommend ZR-T02-5895* as the remote control valve. For details, consult your agent. Prevent the pipe volume up to the remote control valve from falling below 150cm³.

Pressure Compensation Type

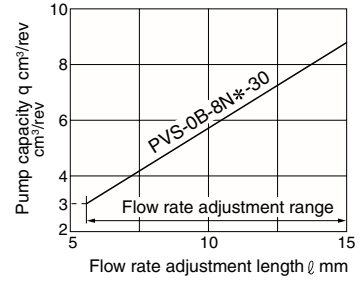
Manual mode: standard type

PVS-0B-8N*-E30

Installation Dimension Drawing

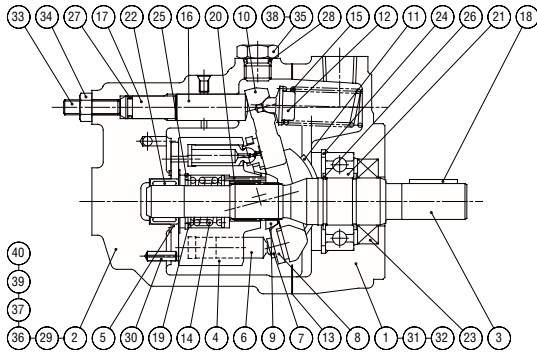


Relationship between flow rate adjustment length (ℓ) and pump capacity (q)



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

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		

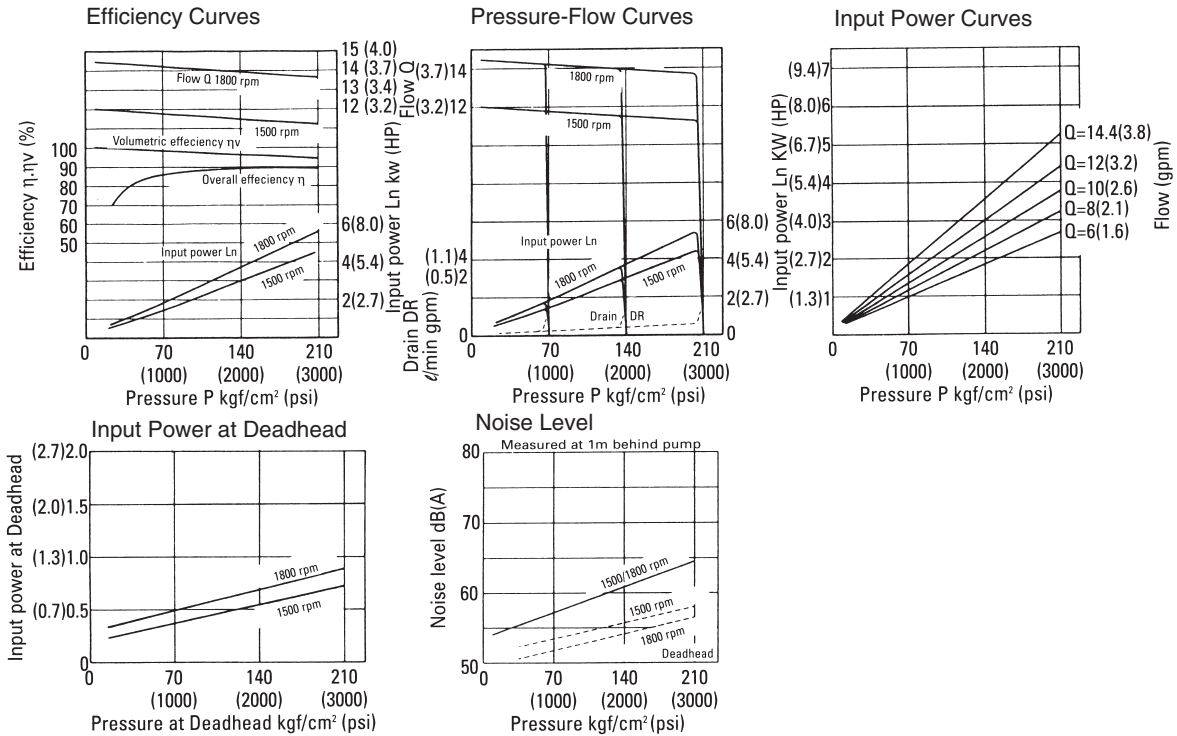
List of Sealing Parts

Part No.	Part Name	Q'ty	PVS-0B-8	
			Size	Remarks
13	Packing	1	PS46-100000	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.

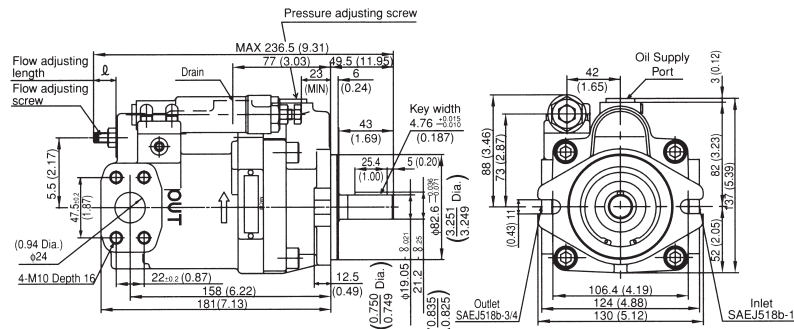
Performance Curves

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

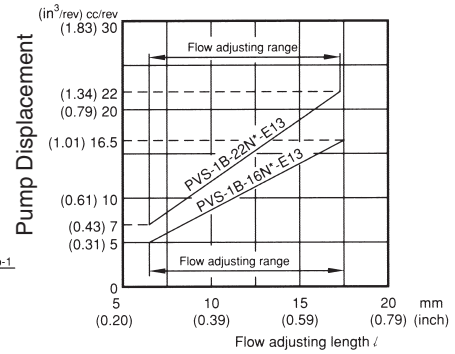


Installation Dimension Drawing

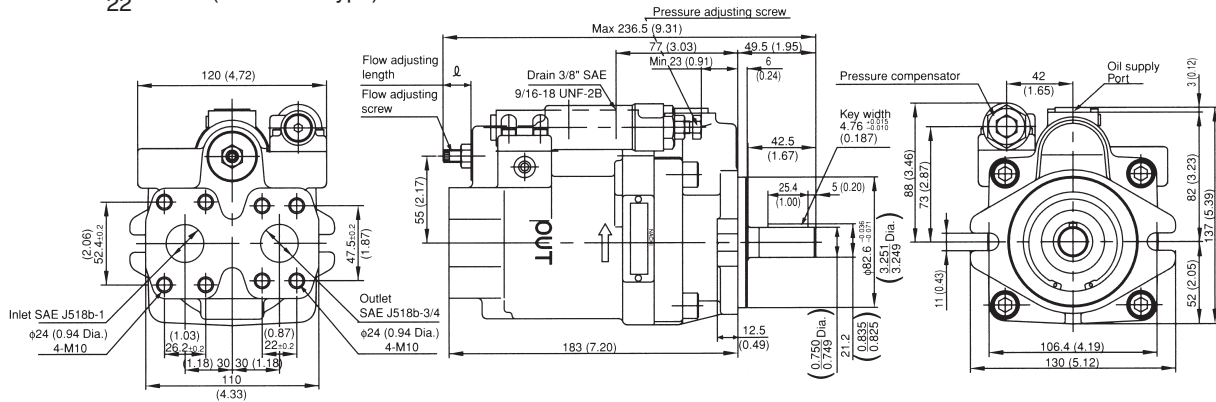
PVS-1B-¹⁶/₂₂N*-E13 (Side Port Type)



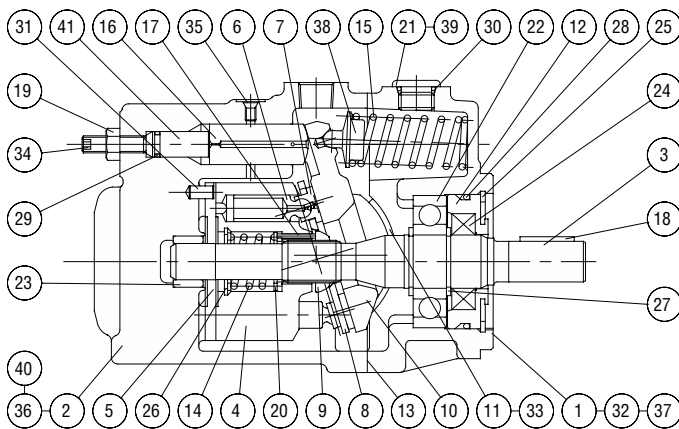
The relation between flow adjusting length (l) and pump displacement (q)



PVS-1B-¹⁶/₂₂N*-Z13 (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

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

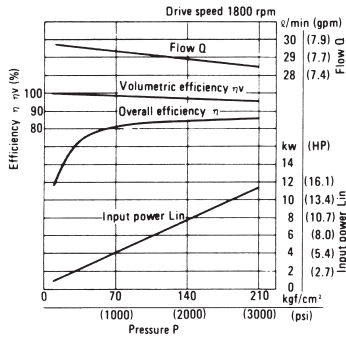
Parts marked by an asterisk "*" are not available on the market. Consult your agent.

Performance Curves

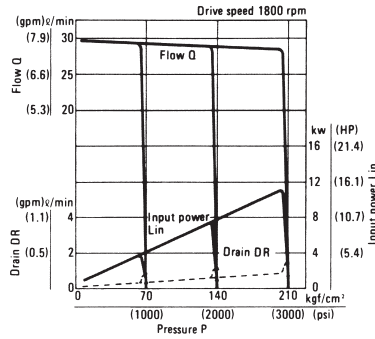
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

PVS-1B-16N⁺-(Z)-E13 Oil ISO VG 32 Oil temp. 50°C (122°F)

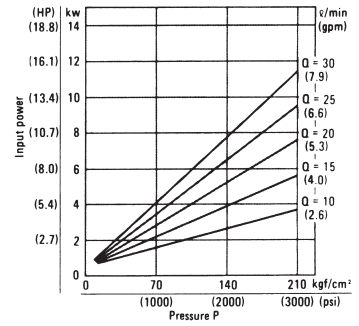
Efficiency Curves



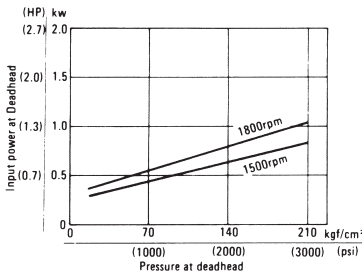
Pressure-Flow Curves



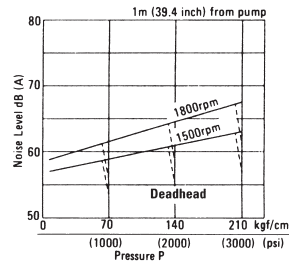
Input Power Curves



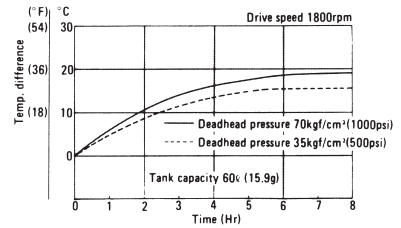
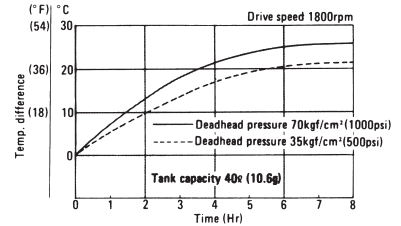
Input Power at Deadhead



Noise Level



Oil Temperature Rise Curves

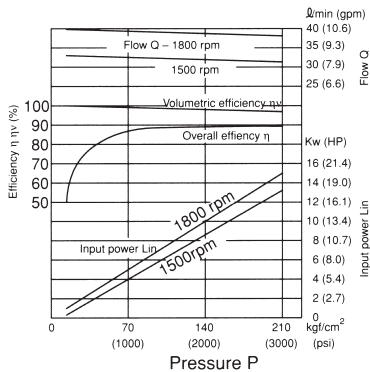


Performance Curves

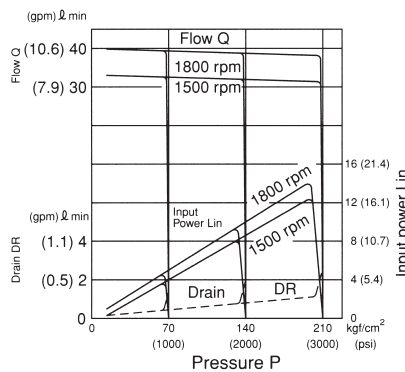
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

PVS-1B-22N⁺-(Z)-E13 Oil ISO VG 32 Oil temp. 50°C (122°F)

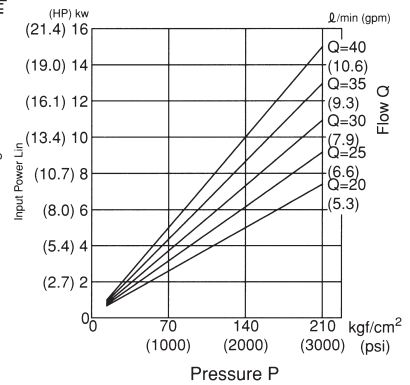
Efficiency Curves



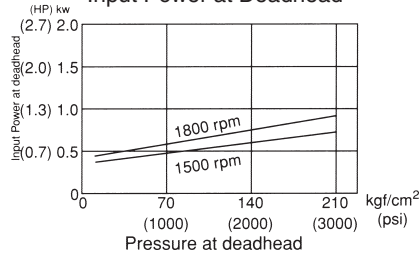
Pressure-Flow Curves



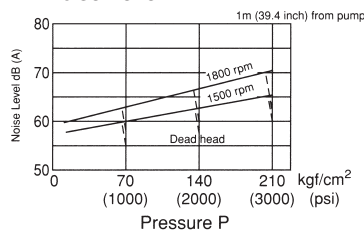
Input Power Curves



Input Power at Deadhead



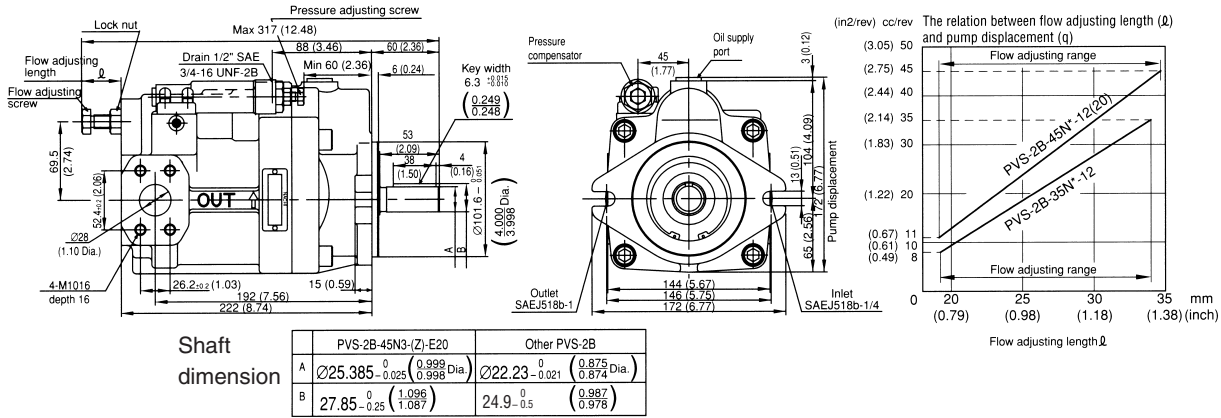
Noise Level



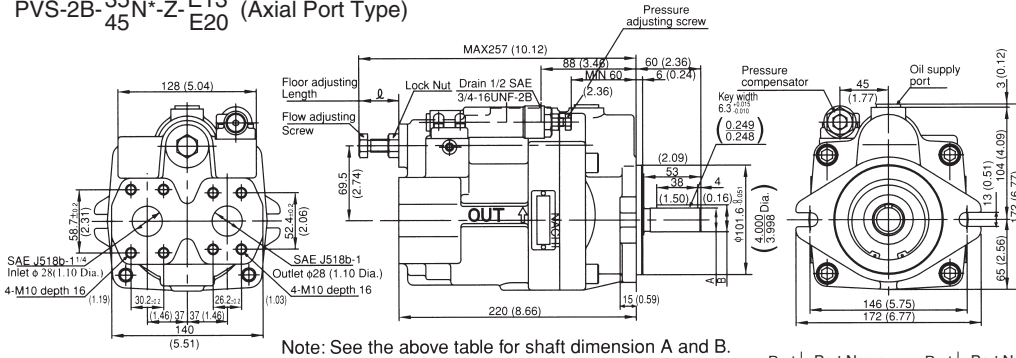
Installation Dimension Drawing

mm (inch)

PVS-2B-35^{N*}-E13 (Side Port Type)
45^{E20}

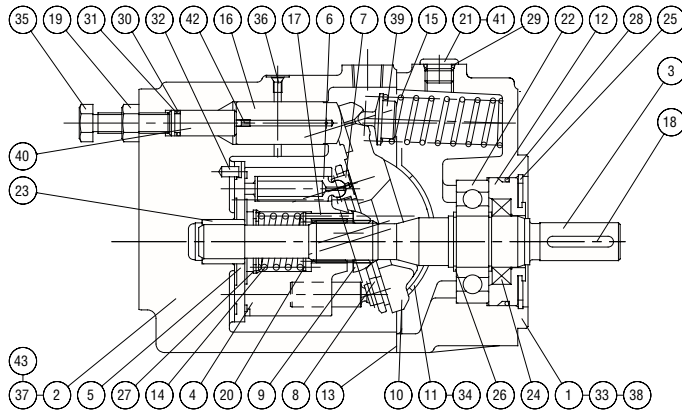


PVS-2B-35^{N*}-Z-E13 (Axial Port Type)
45^{E20}

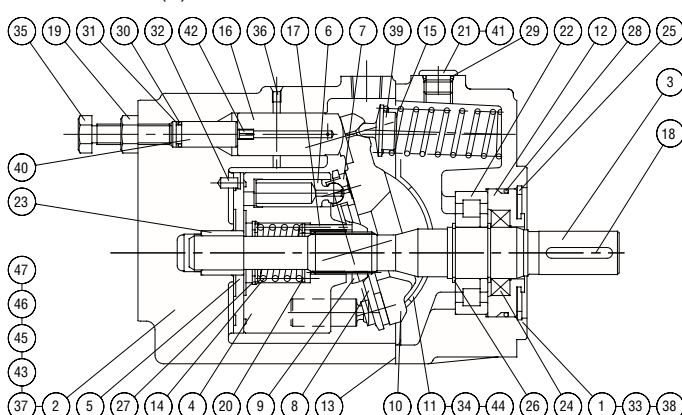


Cross-sectional Drawing

PVS-2B-35^{N*}-(Z)-E13
45^{E20}



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



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

List of Sealing Parts

Part No.	Part Name	Q'ty	PVS-2B-35/45	
			Size	Remarks
13	Gasket	1	-	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	36	Metal plug
5	Valve plate	21	Plug	37	Nameplate
6	Piston	22	Roller bearing	38	CAUTION plate
7	Shoe	23	Needle bearing	39	Spring holder
8	Shoe holder	24	Oil seal	40	Guide
9	Barrel holder	25	Snap ring	41	Lubrication port plate
10	Swash plate	26	Snap ring	42	Orifice
11	Thrust bush	27	Snap ring	43	Rivet
12	Seal holder	28	O-ring	44	Orifice
13	Gasket	29	O-ring	45	Pin
14	Spring C	30	O-ring	46	O-ring
15	Spring S	31	Backup ring	47	Pin
16	Control piston	32	Pin		

List of Sealing Parts

Part No.	Part Name	Q'ty	PVS-2B-45N3	
			Size	Remarks
13	Gasket	1	-	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

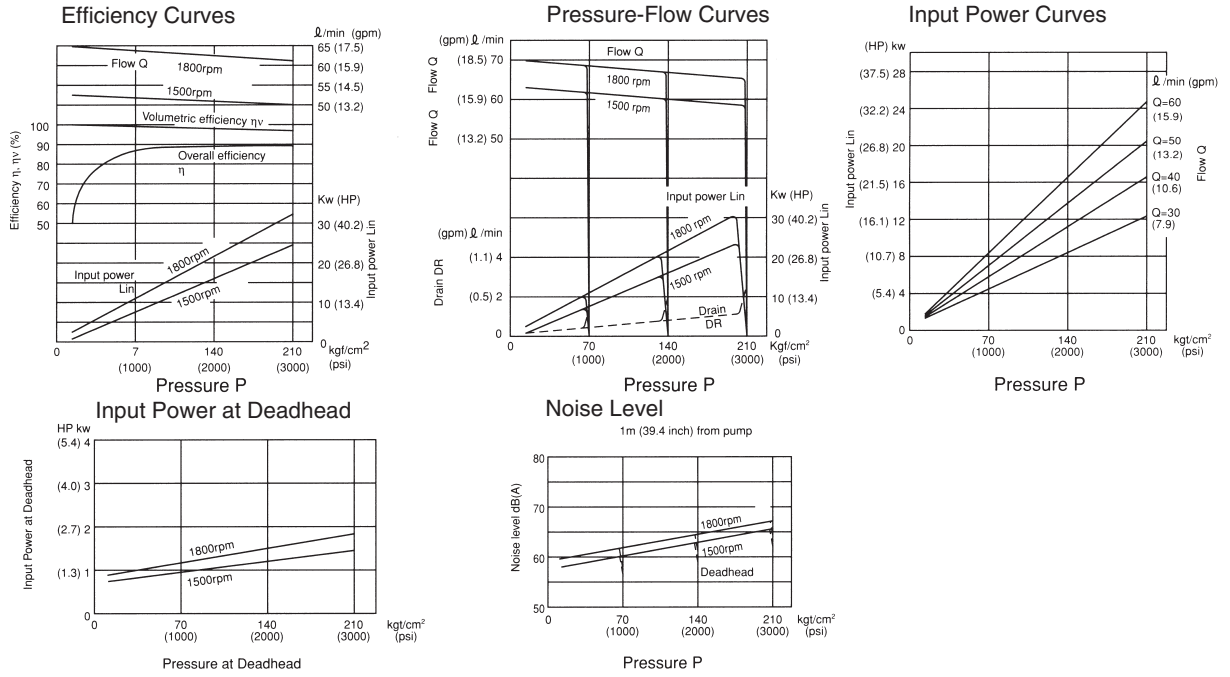
Parts marked by an asterisk *** are not available on the market. Consult your agent.

Performance Curves

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

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

Oil ISO VG 32 Oil temp. 50°C (122°F)

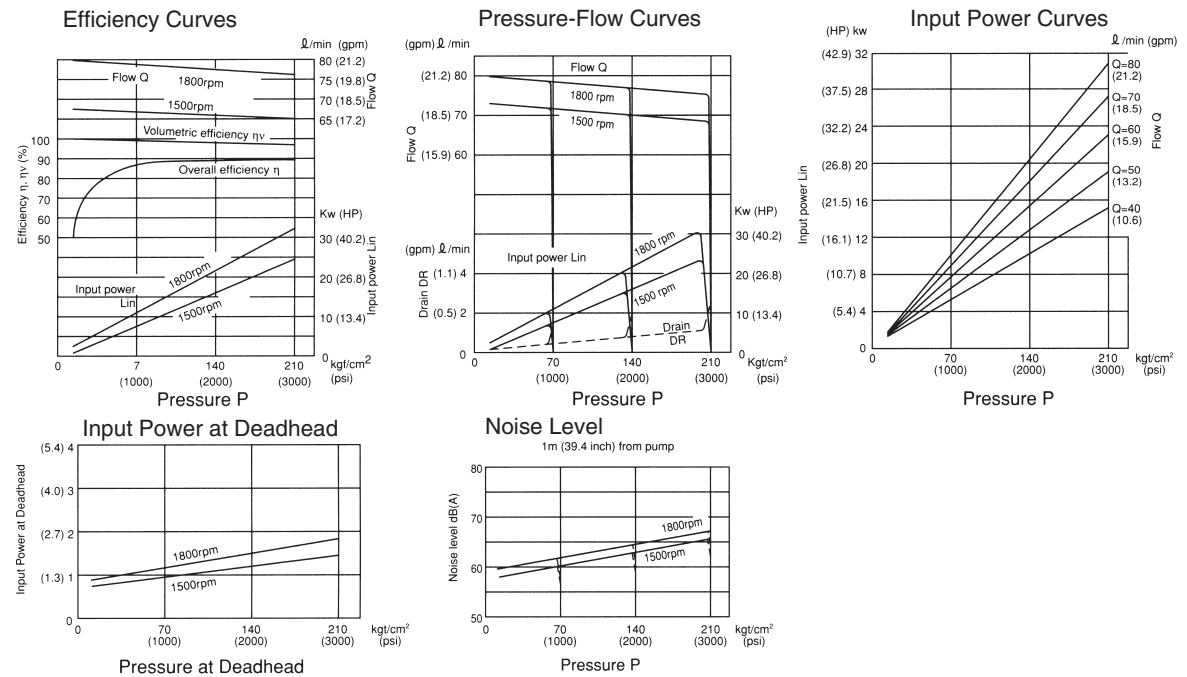


Performance Curves

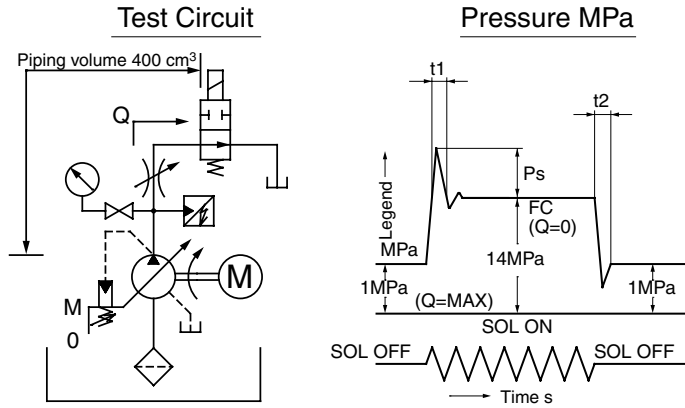
PVS-2B-45N*-(Z)-E13, E20

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

Oil ISO VG 32 Oil temp. 50°C (122°F)



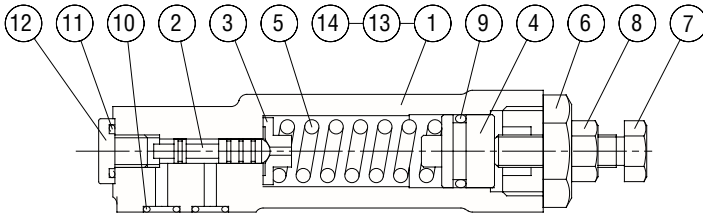
Response Performance



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

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

Pressure Compensator



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

List of Sealing Parts

Part No.	Name	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.

Pressure Compensation Type

remote control mode

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

Design No.
 E30: PVS-0*
 E13: PVS-1*, PVS-2*
 E20: PVS-2*-45P3 only

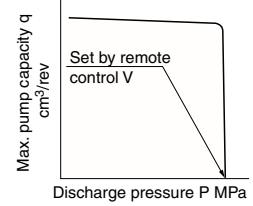
Pressure adjustment range
 0: 2- 3.5MPa {286-500psi}
 1: 2- 7MPa {286-1000psi}
 2: 3-14MPa {429-2000psi}
 3: 3-21MPa {429-3000psi}

P: Pressure compensation type (remote control mode)

Max. pump capacity (cm³/rev)
 Nominal 8, 16, 22, 35, 45 (in³/rev 0.5, 1.0, 1.3, 2.1, 2.8)

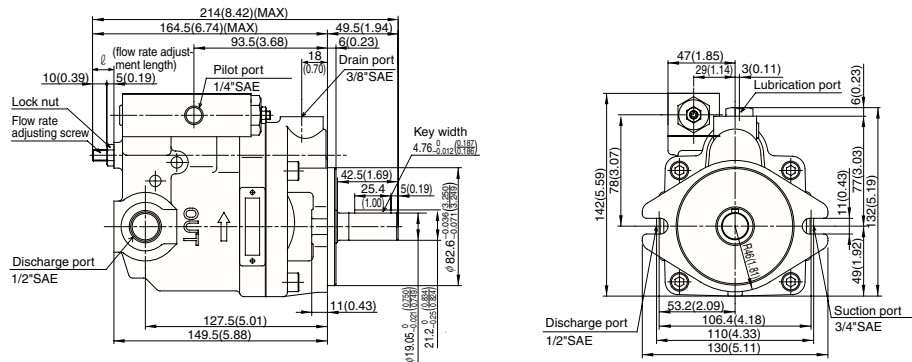
Pump size 0, 1, 2

P-Q Characteristics

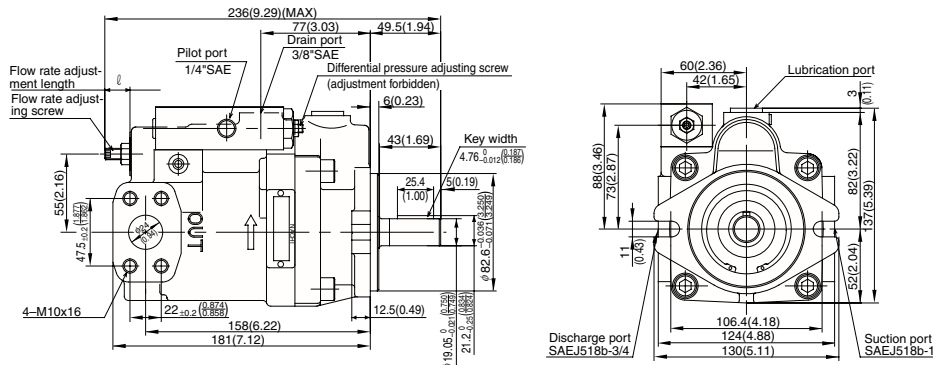


Installation Dimension Drawing

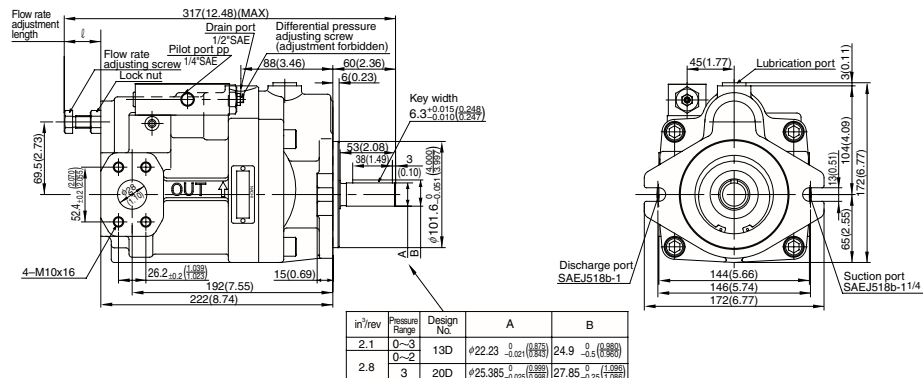
PVS-0B-8P*-E30



PVS-1B-¹⁶/₂₂P*-E13

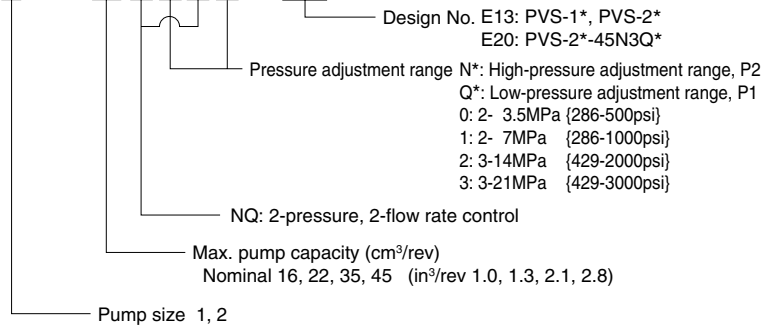


PVS-2B-³⁵/₄₅P*-E13, E20



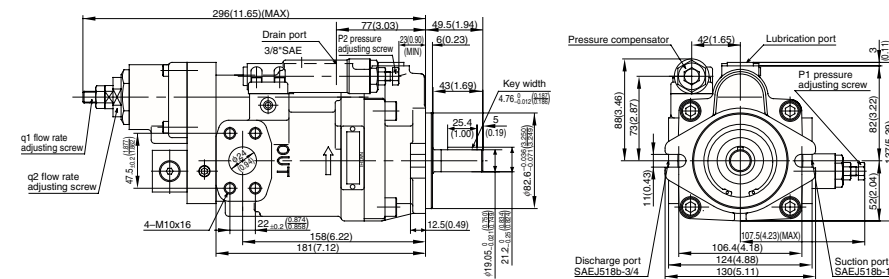
2-pressure, 2-flow Rate Control Type

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

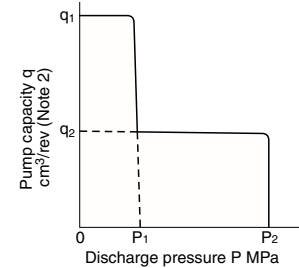


Installation Dimension Drawing

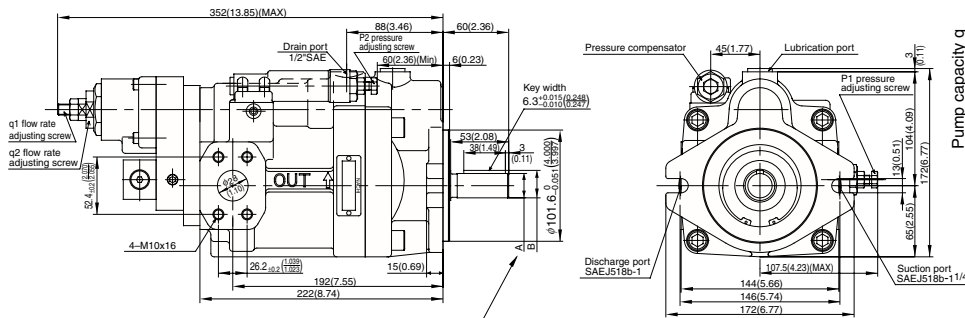
PVS-1B-¹⁶/₂₂N*Q*-E13



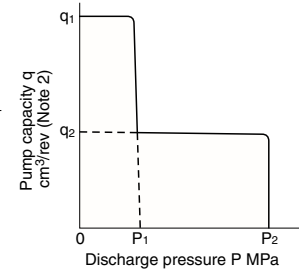
P-Q Characteristics



PVS-2B-³⁵/₄₅N*Q*-E13, E20



P-Q Characteristics



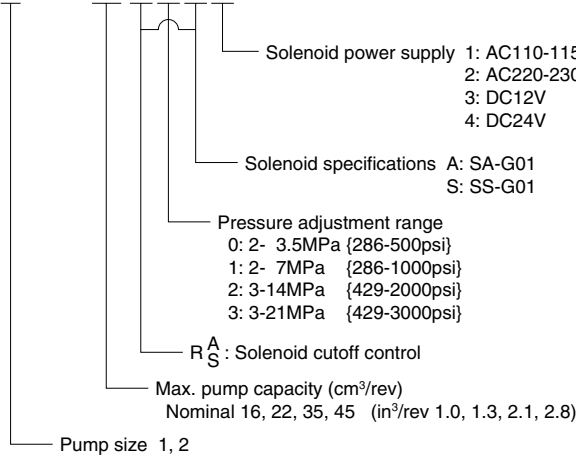
in ³ /rev	Pressure Range	Design No.	A	B
2.1	0~3	13D	#22.23 ⁰ / _{-0.021(0.843)}	24.9 ⁰ / _{-0.3(0.980)}
2.8	0~2	20D	#25.385 ⁰ / _{-0.025(0.984)}	27.85 ⁰ / _{-0.25(1.000)}

Pump Model No.	q ₂ Adjustment Range (in ³ /rev)	Default q ₂ (Setting in ³ /rev)
PVS-1B-16	0 ~ 0.6	0.20
PVS-1B-22	0 ~ 0.8	0.26
PVS-2B-35	0 ~ 1.1	0.42
PVS-2B-45	0 ~ 1.4	0.54

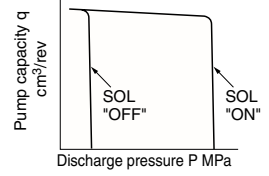
Note 1) The setting range of maximum pump capacity q₁ varies according to the setting of q₂.
 Note 2) Overall efficiency at a low flow rate is worse than at the maximum flow rate. Pay attention to this when selecting the motor capacity for the drive.

Solenoid Cutoff Control Type

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

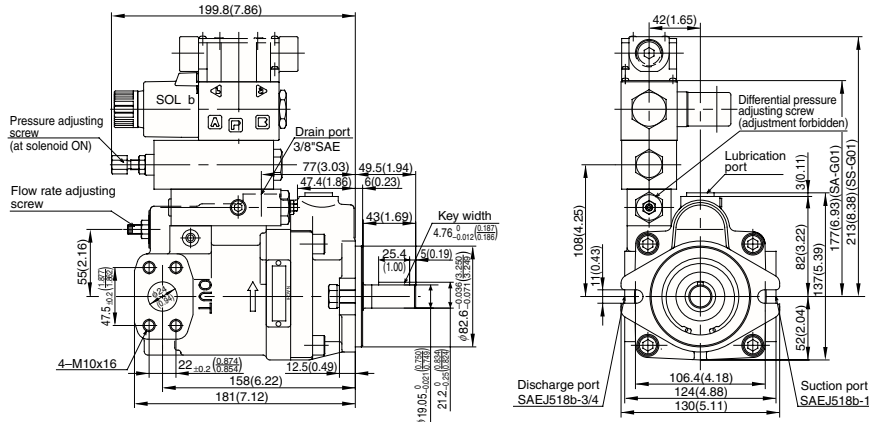


P-Q Characteristics

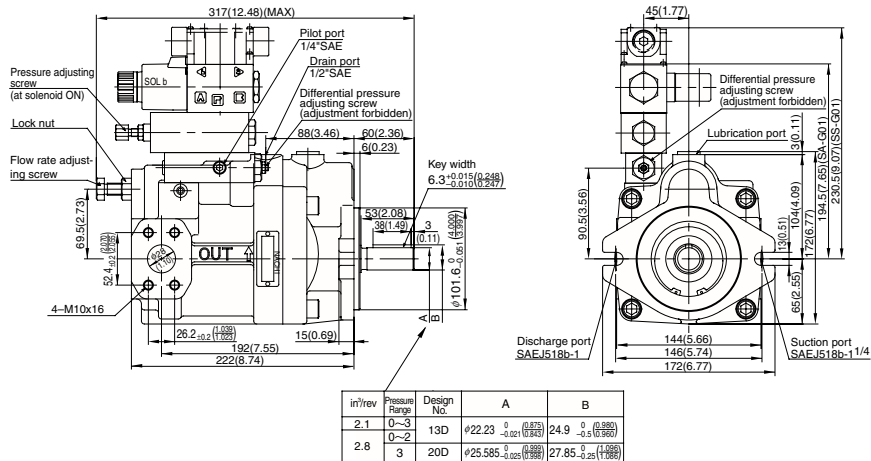


Installation Dimension Drawing

PVS-1B-16R^AS^{*}-E13



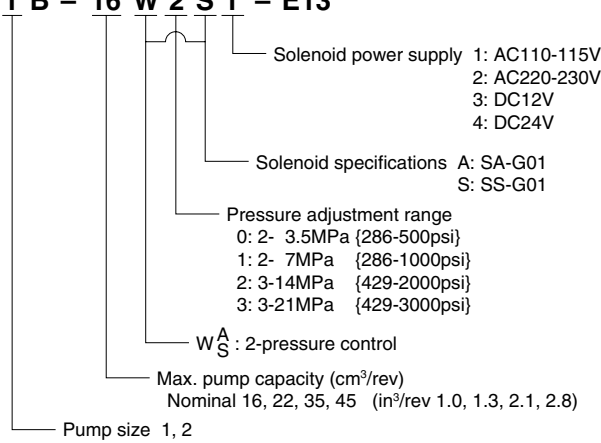
PVS-2B-35R^AS^{*}-E13, E20



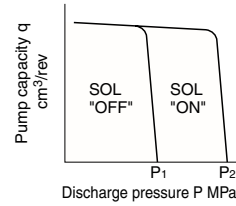
■ The coil surface temperature increases if this pump is kept continuously energized.
 Do not touch the surface of the coil directly with your hands.

2-pressure Control Type

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

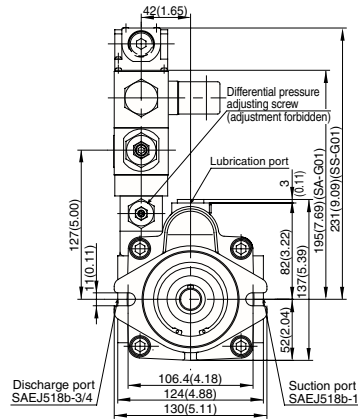
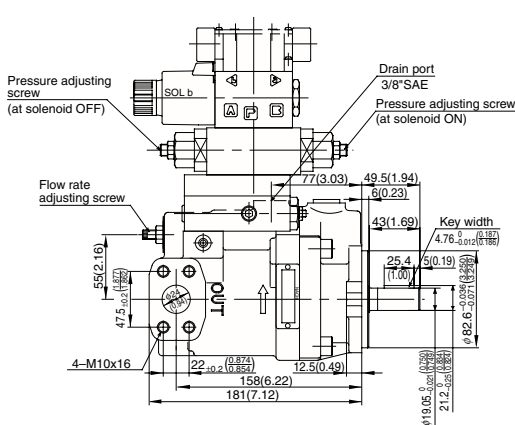


P-Q Characteristics

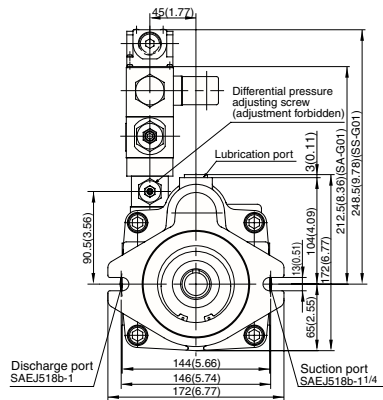
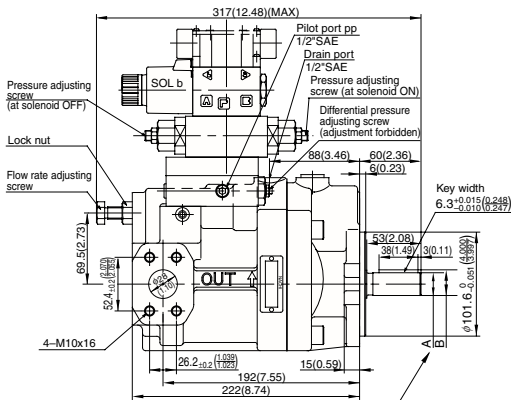


Installation Dimension Drawing

PVS-1B-16W^A_S-E13



PVS-2B-35W^A_S-E13, E20

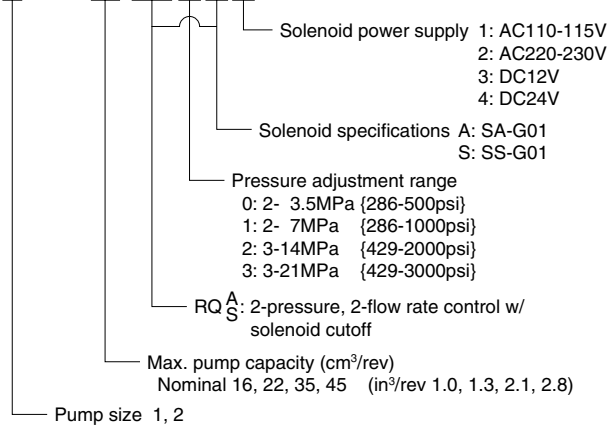


in ³ /rev	Pressure Range	Design No.	A	B
2.1	0-3	13D	22.23 ^{+0.021} _{-0.021}	24.9 ^{+0.030} _{-0.030}
2.8	0-2	20D	25.585 ^{+0.025} _{-0.025}	27.85 ^{+0.025} _{-0.025}

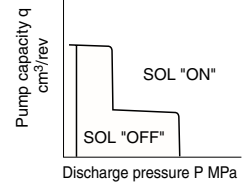
■ The coil surface temperature increases if this pump is kept continuously energized.
Do not touch the surface of the coil directly with your hands.

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

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

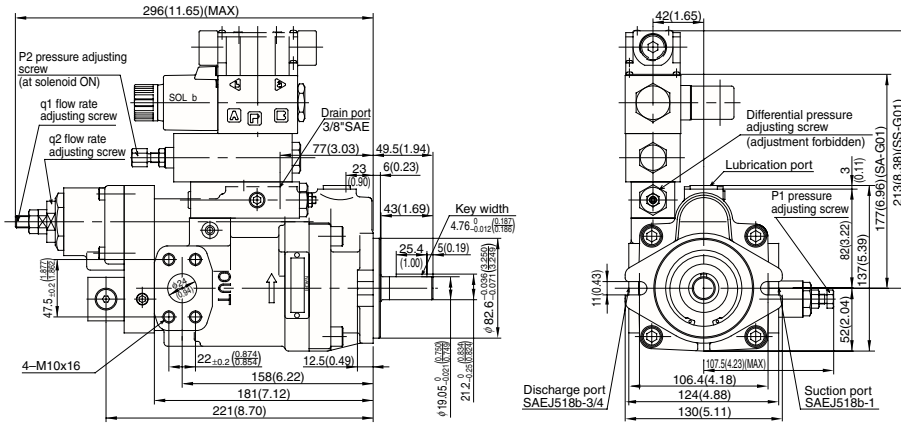


P-Q Characteristics

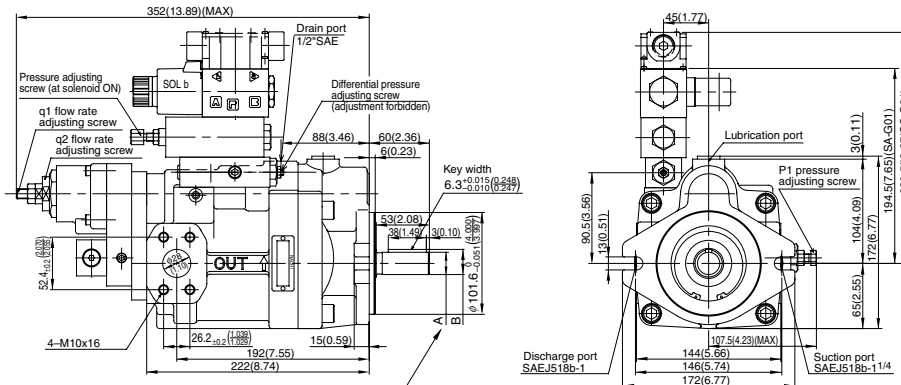


Installation Dimension Drawing

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



PVS-2B-35 RQ^A S^{*}-E13(E20)

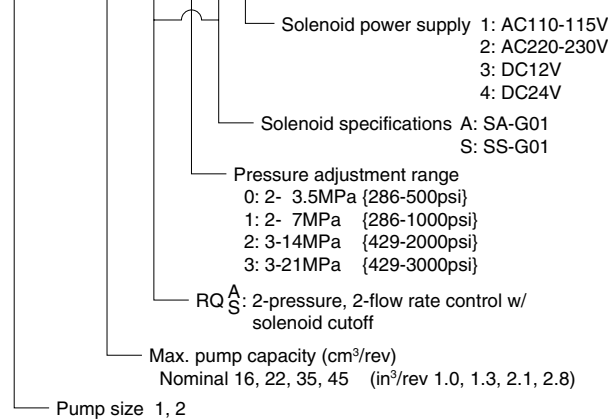


in ³ /rev	Pressure Range	Design No.	A	B
2.1	0~3	12D	±22.23 ⁰ _{-0.021} (0.875) _(0.84)	24.9 ⁰ _{-0.5} (0.980)
2.8	0~2	3	±25.585 ⁰ _{-0.05} (1.006) _(0.98)	27.85 ⁰ _{-0.25} (1.093)

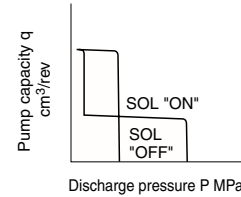
■ The coil surface temperature increases if this pump is kept continuously energized.
 Do not touch the surface of the coil directly with your hands.

2-cutoff Control Type

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

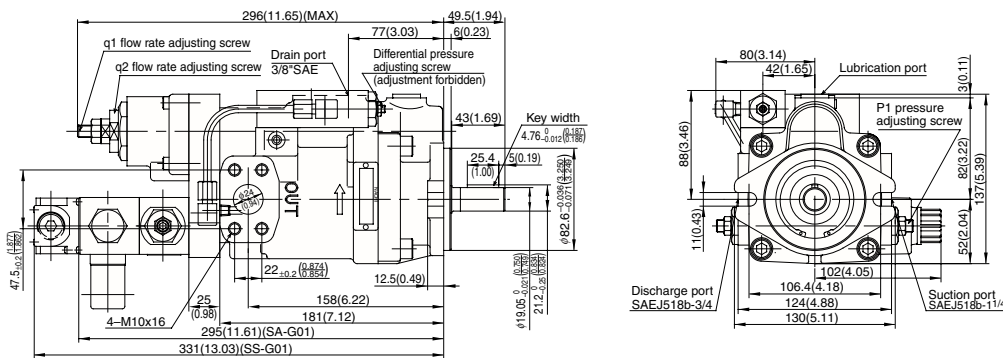


P-Q Characteristics

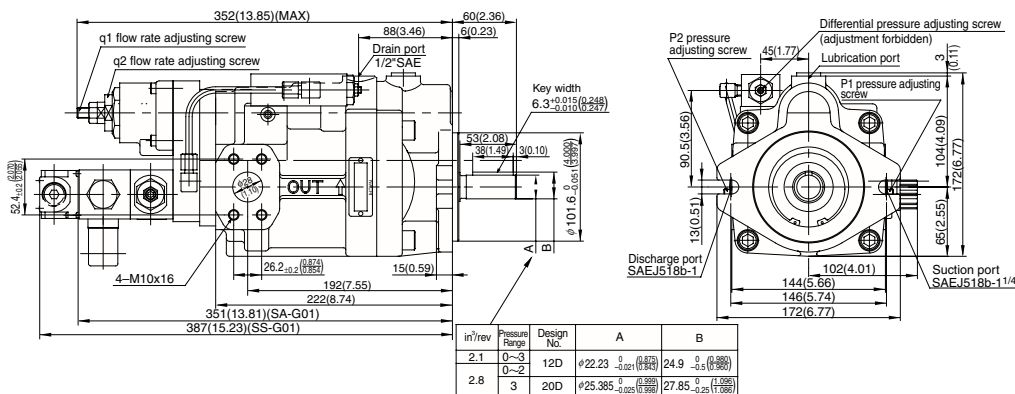


Installation Dimension Drawing

PVS-1B-¹⁶C*₂₂A*_S-E13



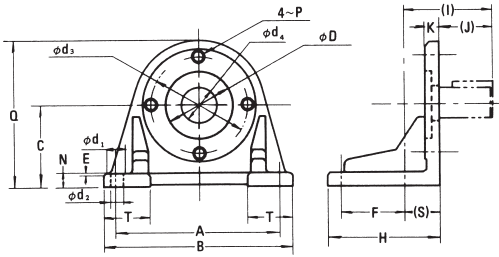
PVS-2B-³⁵C*₄₅A*_S-E13(E20)



■ 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

SAE 2 BOLT MOUNTING

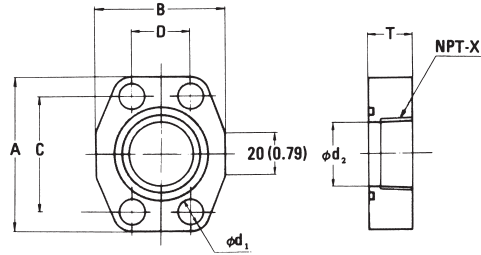


Foot mounting kit model	Applicable pump model	Name of part				Dimension mm (inch)				
		Screw	Qty.	Washer	Qty.	A	B	C	E	F
IHM-2-10	PVS-0B-8 PVS-1B-16, 22	TB-10 x 30	2	WP-10	2	127 (5.00)	152.5 (6.00)	69.8 (2.75)	1 (0.04)	50.8 (2.00)
IHM-4-10	PVS-2B-35, 45	TB-12 x 30	2	WP-12	2	220.7 (8.69)	246 (9.69)	107.95 (4.25)	1 (0.04)	114.3 (4.50)

Foot Mounting kit model	Dimensions mm (inch)														Weight kg (lbs.)
	H	I	(J)	K	N	P	Q	(S)	T	∅D	∅d1	∅d2	∅d4		
IHM-2-10	96 (3.78)	66 (2.60)	33.5 (1.32)	17.5 (0.69)	13 (0.51)	M10	135 (5.31)	32.5 (1.28)	36.5 (1.44)	82.6 (3.25)	22 (0.87)	11 (0.43)	106.4 (4.19)	50 (1.97)	2.0 (4.41)
IHM-4-10	140 (5.51)	56.7 (2.23)	44 (1.73)	16 (0.63)	16 (0.63)	M12	195.5 (7.70)	12.7 (0.50)	53 (2.09)	101.6 (4.00)	22 (0.87)	11 (0.43)	146 (5.75)	40 (1.57)	5.5 (12.1)

Flange kit

For PVS-1B, 2B



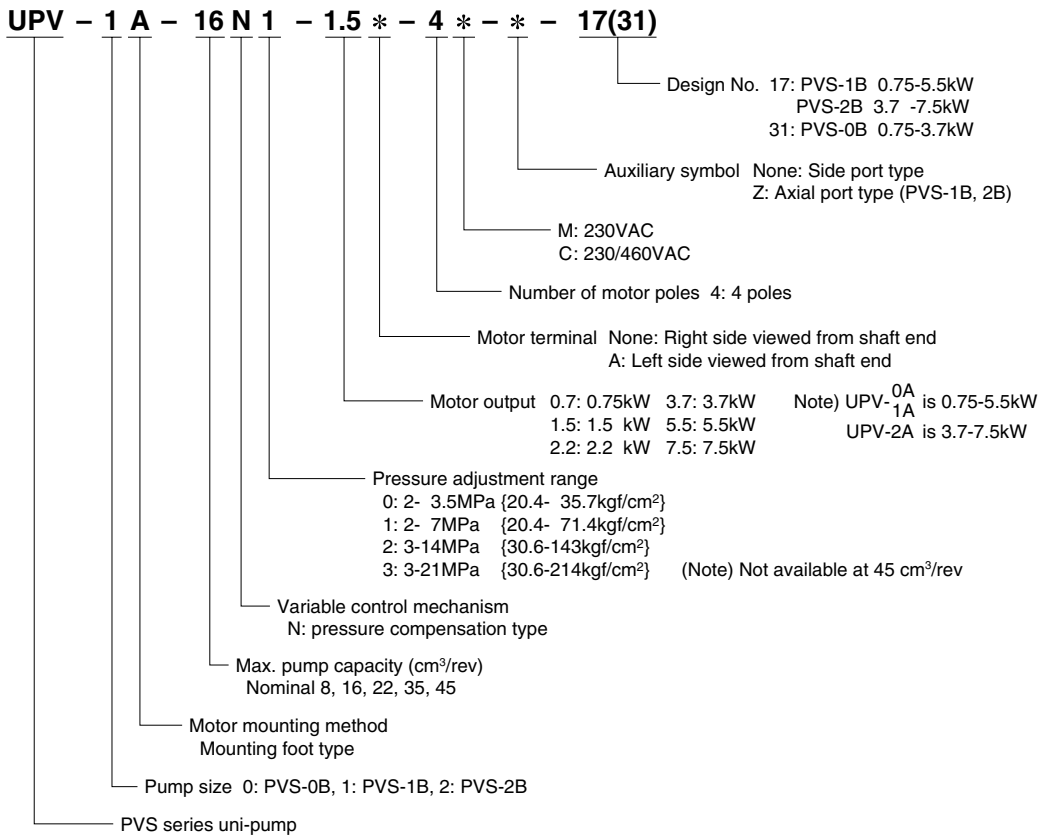
Unit = mm (inch)

Applicable pump model	PVS-1B-16, 22		PVS-2B-35, 45	
	PSF-101000E		PSF-102000E	
Flange kit model	IN port	OUT port	IN port	OUT port
A	70(2.76)	65(2.56)	79(3.11)	70(2.76)
B	59(2.32)	52(2.05)	73(2.87)	59(2.32)
C	52.4(2.06)	47.5(1.87)	58.7(2.31)	52.4(2.06)
D	26.2(1.03)	22.0(0.87)	30.2(1.19)	26.2(1.03)
T	24(0.94)	24(0.94)	28(1.10)	24(0.94)
∅d ₁	11(0.43)	11(0.43)	11(0.43)	11(0.43)
∅d ₂	28(1.10)	22(0.87)	37(1.46)	28(1.10)
X	1	3/4	1-1/4	1
Screw	TH-10 x 40	TH-10 x 40	TH-10x45	TH-10 x 40
Washer	WS-B-10	WS-B-10	WS-B-10	WS-B-10
O ring	RO-G35-90	RO-G30-90	RO-G45-90	RO-G35-90
Weight kg (lbs.)	0.6(1.32)	0.5(1.10)	0.75(1.66)	0.6(1.32)

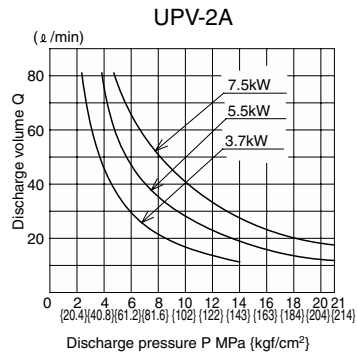
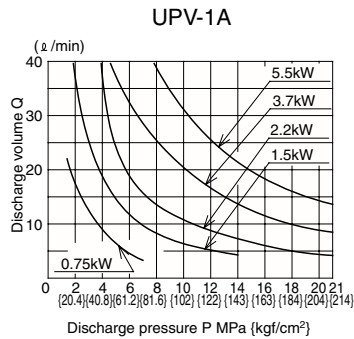
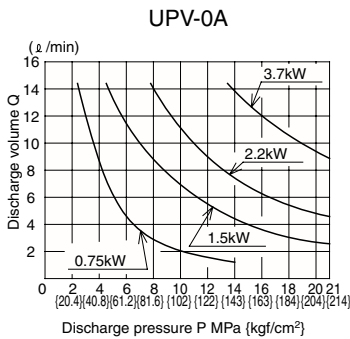
❖ To improve reliability, design Nos. 17 and 31 were adopted due to remodeling of the grease injection system connecting section.

Uni-pump Specifications

Explanation of model No.



Motor selection curves

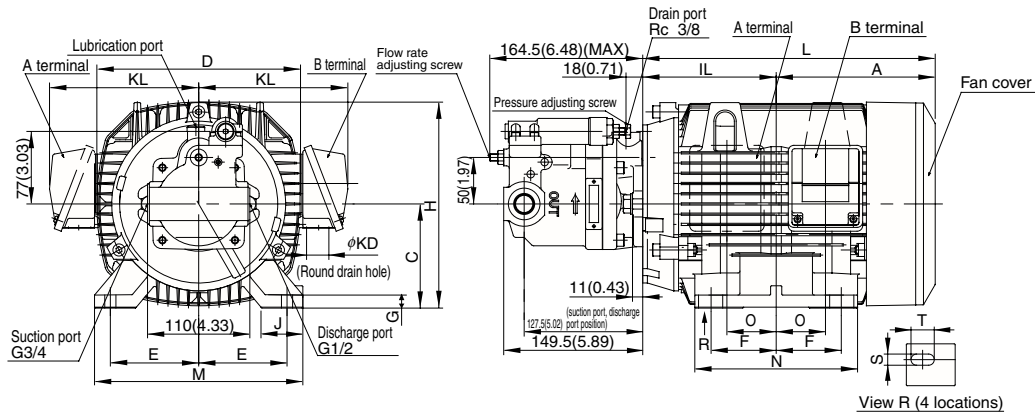


● How to select the motor

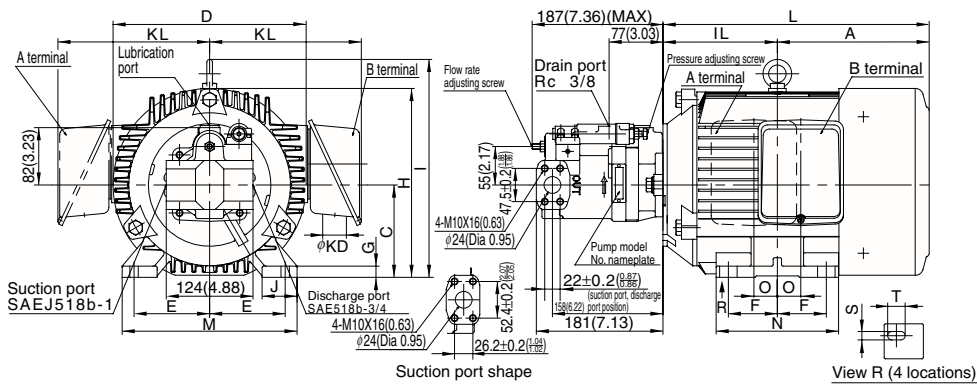
The lower side of the output curves for each of the motors shown above indicates the operating range under rated output for that motor.

Installation Dimension Drawings

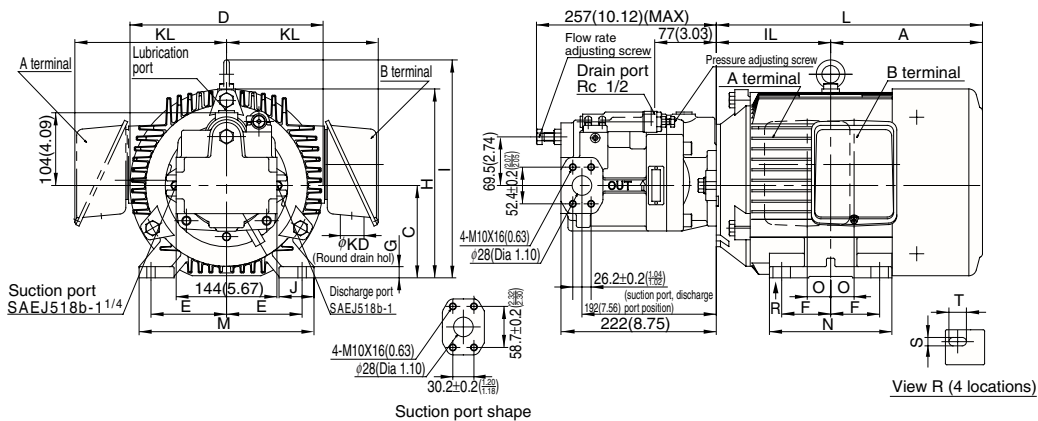
UPV-0A-8**.-**.-4-31
(side port type)



UPV-1A-16**.-**.-4-17
22
(side port type)



UPV-2A-35**.-**.-4-17
45
(side port type)



Note: A terminal measurements are in parentheses ().

1. A class E totally enclosed fan-cooled type is used as the reference motor.
2. 200 V/220 V, 60 Hz and 200 V, 50 Hz are used as the reference motor voltages.
3. Viewed from the pump side, the suction port on the left side and the discharge port on the right side are used as the reference port locations.
4. Broken lines indicate instances for the A terminal. Broken lines pass through to the other side of the pump along its center.

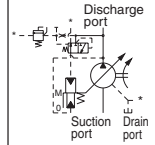
Motor Specifications

*Unit = inch

Output kW (HP)	Motor Dimensions																	Frame No.	Weight kg
	A	IL	C	D	E	F	G	H	I	J	L	M	N	S×T	KD	KL	O		
0.75 (1.0)	4.88	4.23	80 ^(3.15) _(3.15)	6.30	2.46	1.97	0.39	6.30	-	1.34	9.11	6.10	5.31	0.39×0.98	φ0.87	4.96	0.83	80M	12
1.5 (2.0)	5.61	4.67	90 ^(3.54) _(3.52)	7.01	2.76	2.46	0.39	7.05	-	1.38	10.28	6.69	6.10	0.39×0.63	φ0.87	5.35	5.35	90L	16
2.2 (3.0)	6.32	5.35	100 ^(3.94) _(3.92)	7.68	3.14	2.76	0.51	7.78	-	1.77	11.67	7.68	6.89	0.47×0.98	φ0.87	5.91	1.79	100L	20
3.7 (5.0)	6.73	5.65	112 ^(4.41) _(4.39)	8.62	3.74	2.76	0.55	8.72	-	1.77	12.38	8.82	6.89	0.47×0.98	φ0.87	6.34	2.09	112M	29
5.5 (7.5)	8.54	6.44	132 ^(5.20) _(5.18)	10.87	4.25	2.76	0.63	10.63	12.26	1.97	14.98	9.84	6.89	0.47×0.98	φ1.34	8.54	1.32	132S	48
7.5 (10.2)	8.54	6.44	132 ^(5.20) _(5.18)	10.87	4.25	2.76	0.63	10.63	12.26	1.97	14.98	9.84	6.89	0.47×0.98	φ1.34	8.54	1.32	132S	54

PZS Series Variable Volume Piston Pump

4.27 to 13.47in³/rev
4.27 to 6.10in³/rev 4085psi
7.93 to 13.42in³/rev 3642psi



Features

① High pressure and high efficiency.

These pumps are available in high pressure ranges (up to 28 MPa) with a high operational efficiency.

② Low noise and low pulsation.

These pumps have been developed for low noise and low pulsation operation using the semi-cylindrical swash plate and an increased number of pis-

tons (from 9 to 11 units).

③ High reliability and long service life.

Optimum pressure balance provided by the spherical valve plate and the use of copper alloy bushings on the piston sliding surface of the cylinder barrel ensure stable operation for a wider operational range.

④ Applicable for multiple-pump layout.

In addition to a single pump layout, PZS Series pumps are applicable for double-pump layout for combination with an IP pump (constant discharge pump) for wider range of applications. Additionally, an adapter kit is available to make a double pump with other pumps (ex. PVS-1B, VDC-1B).

Specifications

Model No.	Pump Capacity in ³ /rev (Adjustment Range)	Rated Pressure MPa (psi)	Maximum Working Pressure MPa (psi)	Pressure Adjustment Range MPa (psi)	Revolution Speed min ⁻¹		Weight kg	Fixed Discharge Pump (Note 1)	
					Min.	Max.		Capacity in ³ /rev	Pressure MPa (psi)
PZS-3B-* 70* 1-E4481A 3-E4481A 4-E10	4.27 (2.74 to 4.27)	21 {3000}	28 {4085}	2 to 7 {291 to 1000} 2 to 21 {291 to 3000} 2 to 28 {291 to 4085}	500	1800	37	0.22 to 0.50	21 {3000}
PZS-4B-* 100* 1-E4481A 3-E4481A 4-E10	6.10 (2.44 to 6.10)	21 {3000}	28 {4085}	2 to 7 {291 to 1000} 2 to 21 {291 to 3000} 2 to 28 {291 to 4085}	500	1800	58	0.22 to 0.96	21 {3000}
PZS-5B-* 130* 1-E10 3 4	7.93 (3.11 to 7.93)	21 {3000}	25 {3642}	2 to 7 {291 to 1000} 2 to 21 {291 to 3000} 2 to 25 {291 to 3642}	500	1800	86	0.22 to 1.97	21 {3000}
PZS-6B-* 180* 1-E10 3 4	10.98 (6.16 to 10.98)	21 {3000}	25 {3642}	2 to 7 {291 to 1000} 2 to 21 {291 to 3000} 2 to 25 {291 to 3642}	500	1800	123	0.22 to 3.90	21 {3000}
PZS-6B-* 220* 1-E10 3 4	13.42 (7.56 to 13.42)	21 {3000}	25 {3642}	2 to 7 {291 to 1000} 2 to 21 {291 to 3000} 2 to 25 {291 to 3642}	500	1500	126	0.22 to 3.90	21 {3000}

- Note 1. Fixed discharge pump can be configured by combining with an IP pump.
 2. Pump capacity adjustment ranges are for control codes N, RS, and WS. For information about control code NQ, see page P-26.
 3. The standard direction of rotation is clockwise when viewed from the shaft end. Contact your agent for information about counterclockwise rotation.
 4. A keyed straight shaft is standard. Contact your agent for information about spline shafts.

● Handling
 ● Pump Installation and Piping Precautions

- Use flexible couplings for connecting the pump shaft to the drive shaft, and prevent radial or thrust load from being applied to the pump shaft.
- Eccentricity between the drive shaft and pump shaft should be no greater than 0.05mm, with an eccentric angle error of 1° or less.
- Keep the clamping length of couplings and pump shafts at least 2/3 the length of the coupling width.
- Use a sufficiently rigid pump mounting base.
- Set pump suction side pressure to -0.03 MPa or more (suction port flow velocity less than 2 m/sec).

- Raise part of the drain piping so it is above the topmost part of the pump body, and insert the return section of the drain piping into the hydraulic operating fluid. Also, observe the values in the following table in order to limit the drain back pressure to 0.1 MPa.

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

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

● Management of Hydraulic Operating Fluid

- Use only good-quality hydraulic operating fluid with a kinematic viscosity during operation within the range of 20 to 200 mm²/sec. Normally, you should use an R&O type and wear-resistant type of IS-OGV32 to 68 or equivalent. The optimum kinematic viscosity during operation is 20 to 50 mm²/sec.
- The operating temperature range is 5 to 60°C. When the oil temperature at startup is 5°C or less, run the pump at low pressure and low speed until the oil temperature reaches 5°C.
- 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 0 to 60°C.

● Startup Precautions

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

Model No.	Oil Amount cm ³
PZS-3B	1000
PZS-4B	1800
PZS-5B	2200
PZS-6B	3000

- 2] An unload circuit is required when the motor is started under

condition $\lambda-\Delta$. 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.

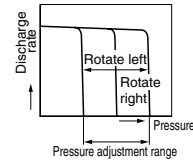
● Configuring Pressure and Discharge Rate Settings

The factory default pump discharge rate setting is the setting's maximum value, while the default dis-

charge pressure is the settings minimum value. Change the discharge rate and discharge pressure settings in accordance with your particular operating conditions.

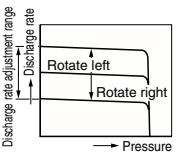
[Pressure Adjustment]

Rotating the pressure adjusting screw clockwise increases pressure.



[Discharge Volume Adjustment]

Rotating the flow rate adjusting screw clockwise decreases the discharge rate.



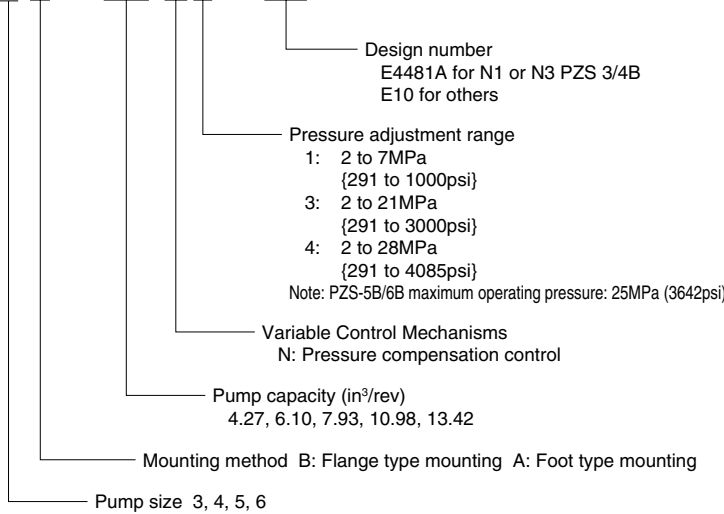
Note: Securely tighten the lock nut after making adjustments.

Understanding Model Numbers

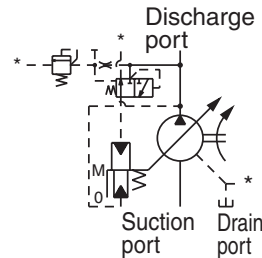
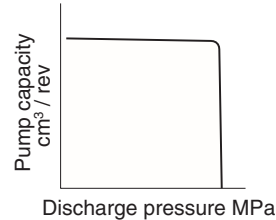
Standard type

Pressure compensation(N)

PZS - 4 B - 100 N * - E10



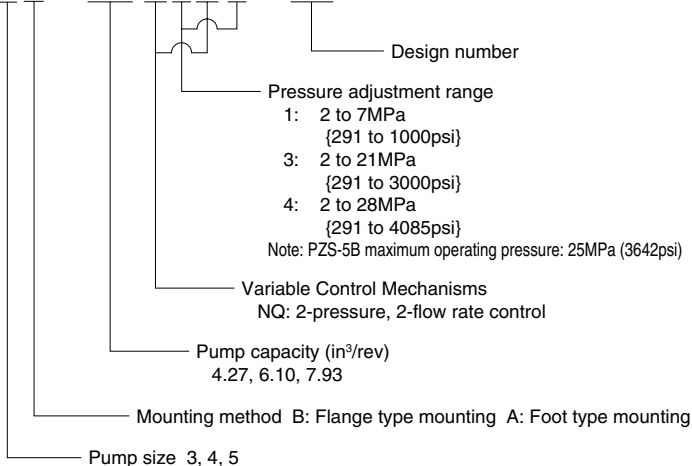
P-Q characteristics



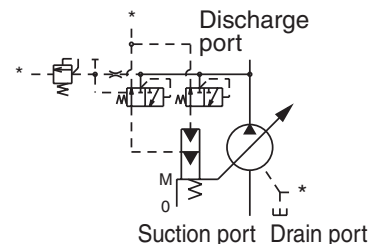
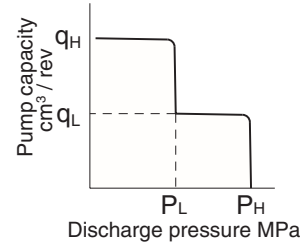
Option type

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

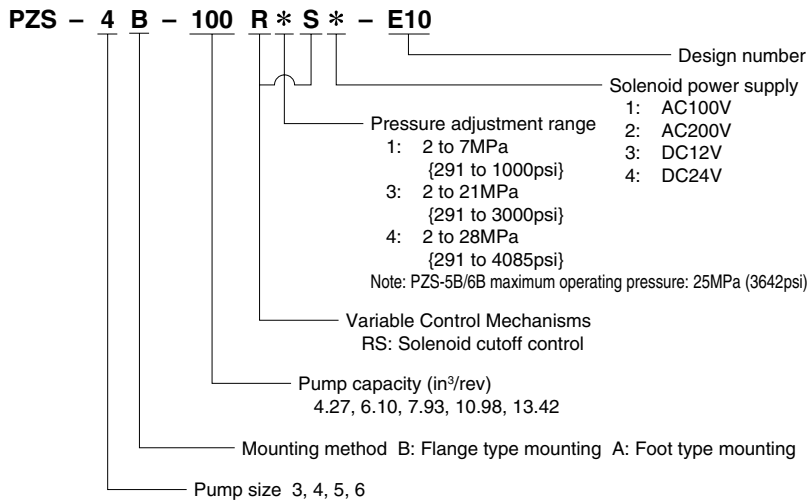
PZS - 4 B - 100 N * Q * - E10



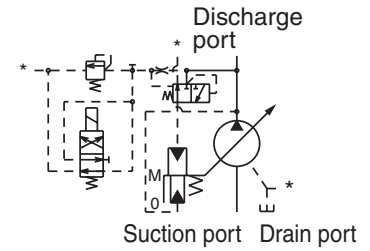
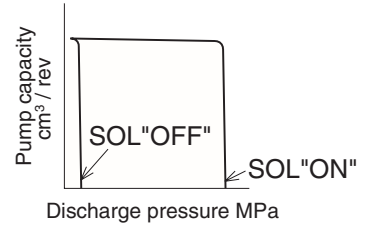
P-Q characteristics



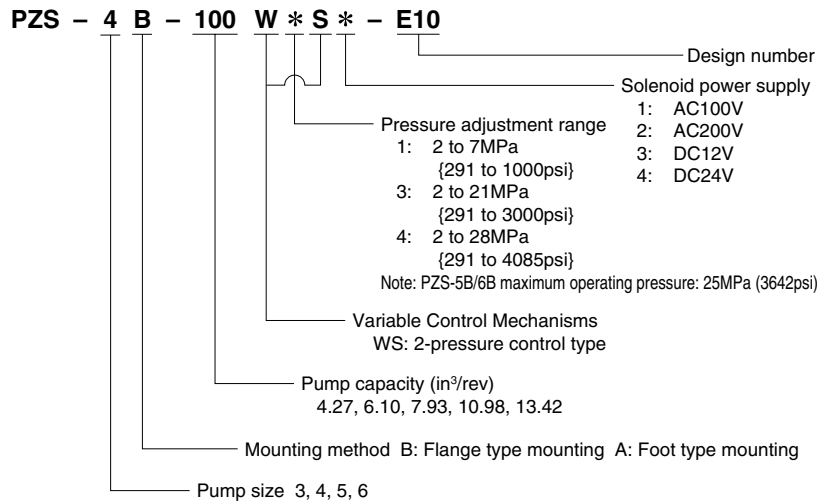
Solenoid Cutoff Control Type (RS)



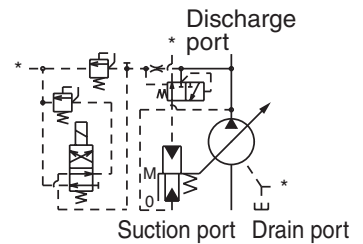
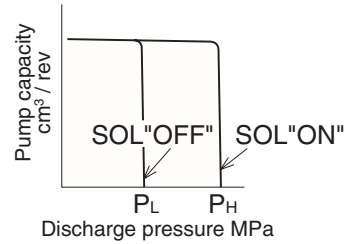
P-Q characteristics



2-Pressure Control System (WS)



P-Q characteristics

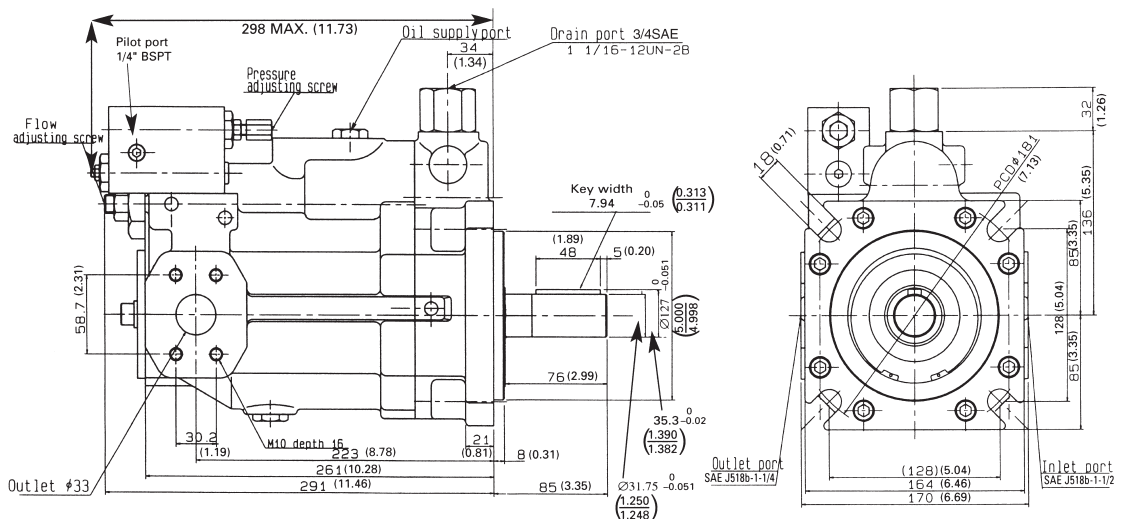


Installation Dimension Drawings

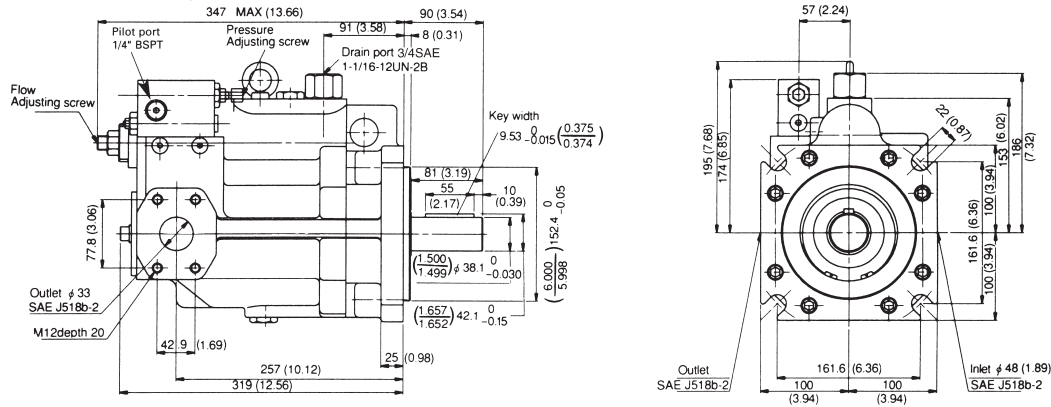
Pressure Compensation Type

Installing a remote control relieve valve to the pilot port provides remote control of pressure compensation.

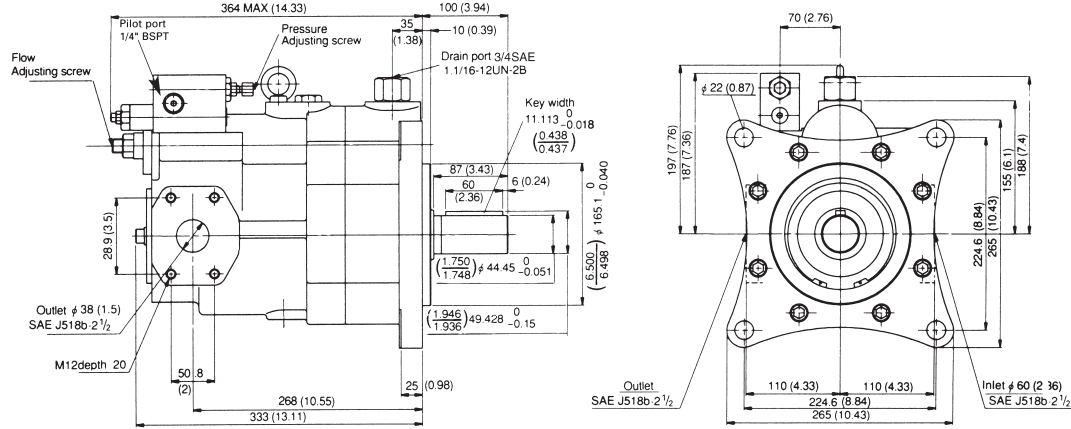
PZS-3B-70N*-E10, E4481A



PZS-4B-100N*-E10, E4481A

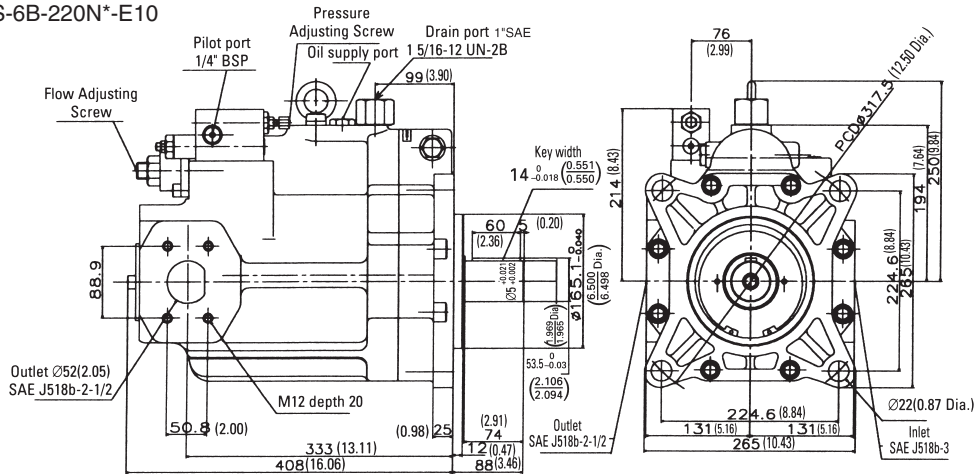


PZS-5B-130N*-E10

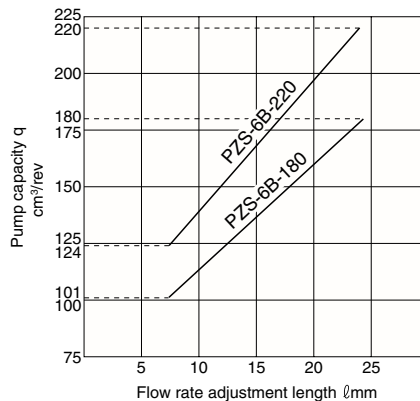
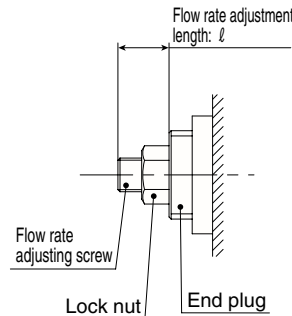
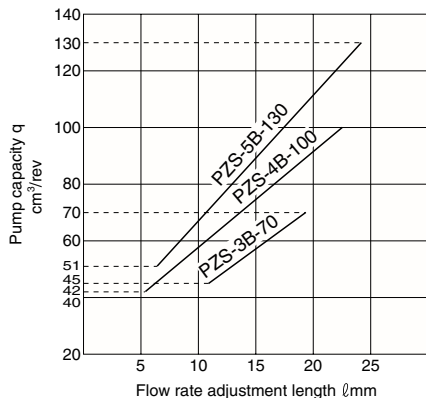


PZS-6B-180N*-E10

PZS-6B-220N*-E10



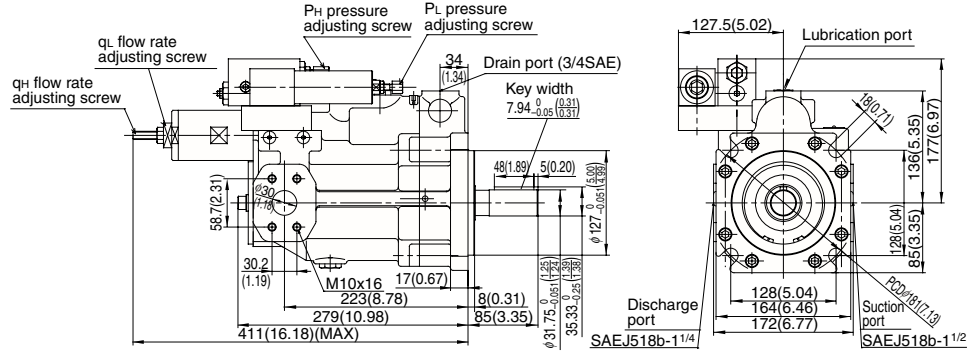
Flow Adjustment Rotation Angle (ℓ) and Pump Capacity (q)



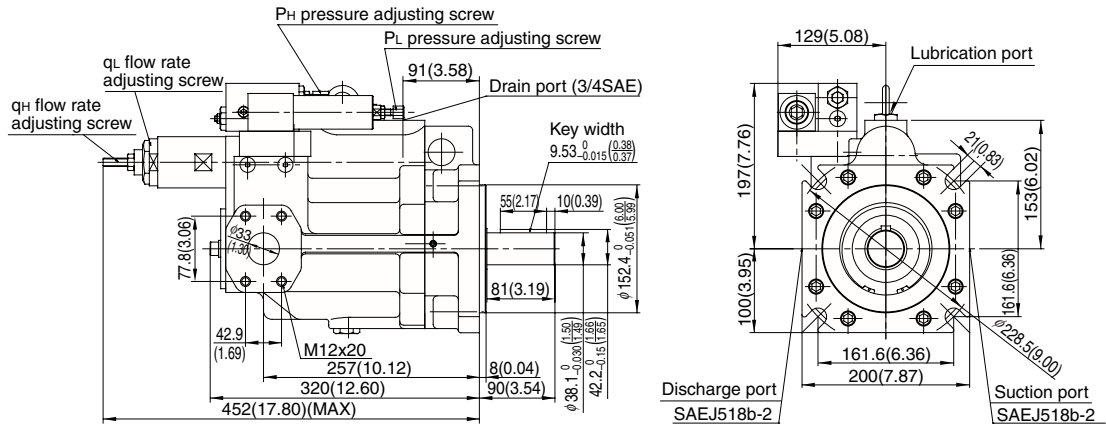
Use a flow adjustment length that is within the range noted in the above chart. Using a length that is outside the lower limit adjustment range can lead to oil leaks.

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

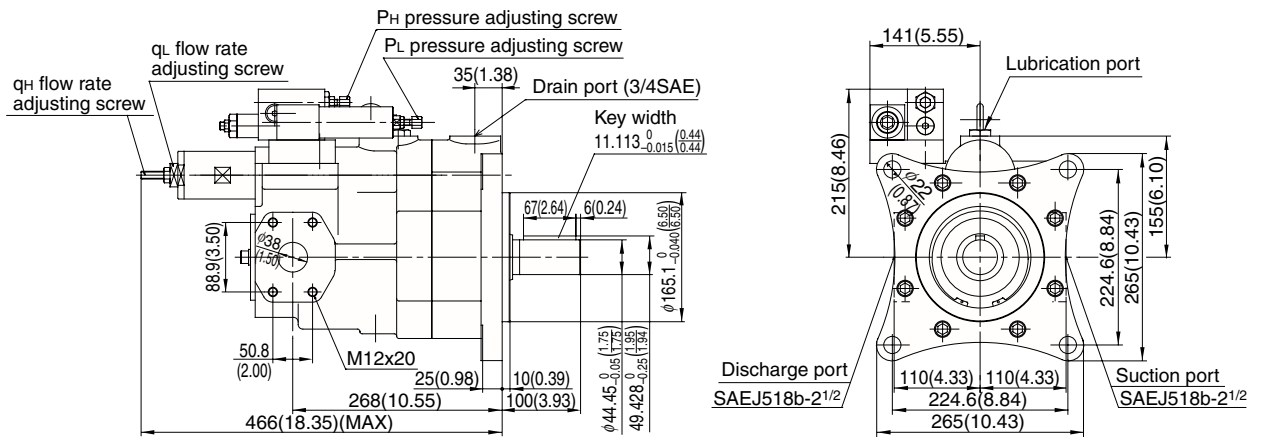
2-Pressure, 2-Flow Rate Control Type
PZS-3B-70N*Q*-10



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



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

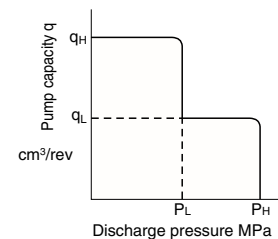


Pump Volume Adjustable Range

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

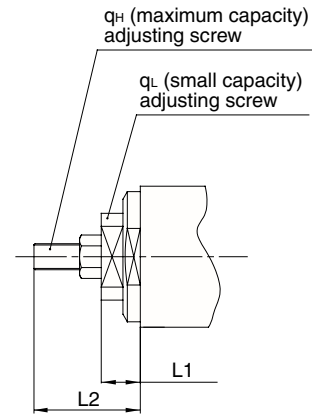
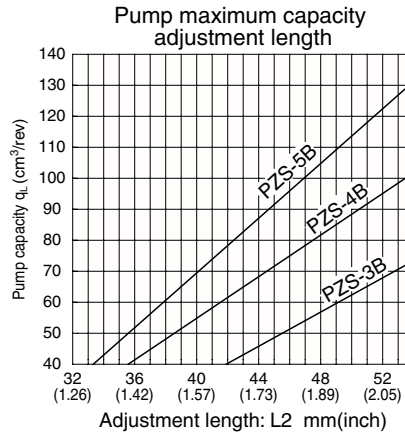
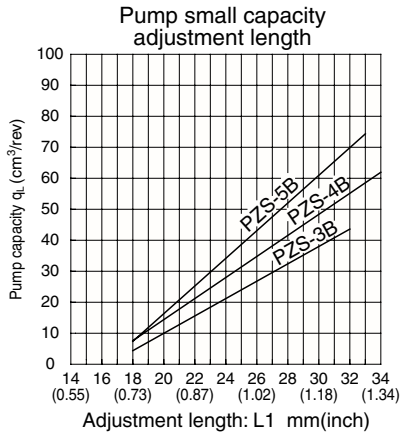
Note1: The setting range for pump maximum capacity q_H depends on the q_i setting.
Note2: Overall efficiency at a low flow rate is worse than at the maximum flow rate. Keep this in mind when deciding on the drive motor capacity.

P-Q characteristics

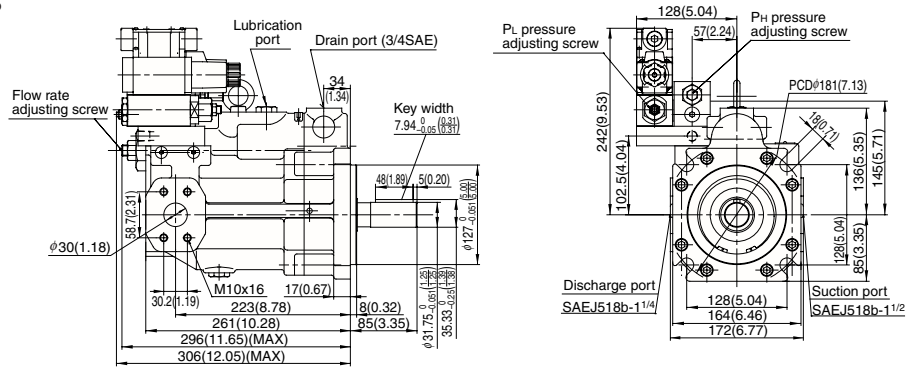


PZS Pump 2-Pressure 2-Flow Rate Control Flow Rate Adjustment Graph

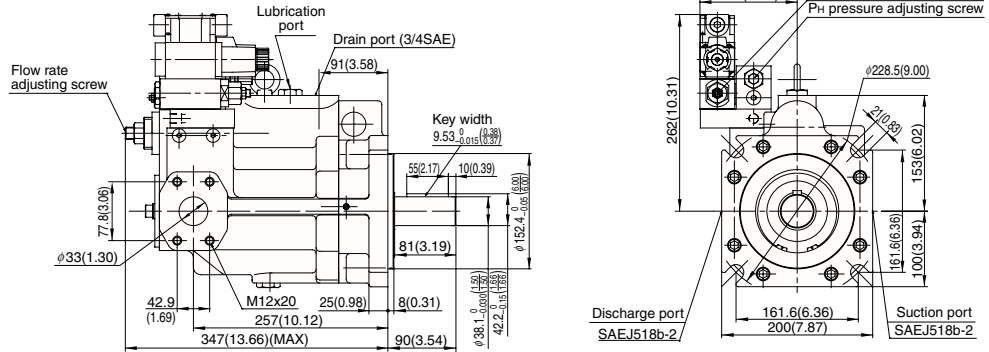
- Be sure to adjust the low flow rate first, and then adjust the maximum flow rate.
- Remember that the maximum flow rate adjustment range (lower limit) changes in accordance with the low flow rate adjustment. The maximum flow rate adjustment lower limit is equivalent to the low flow rate adjustment length (L1) plus 11mm.
- Pump efficiency at a low flow rate is worse than at the maximum flow rate. Keep this in mind when deciding on the drive motor capacity.



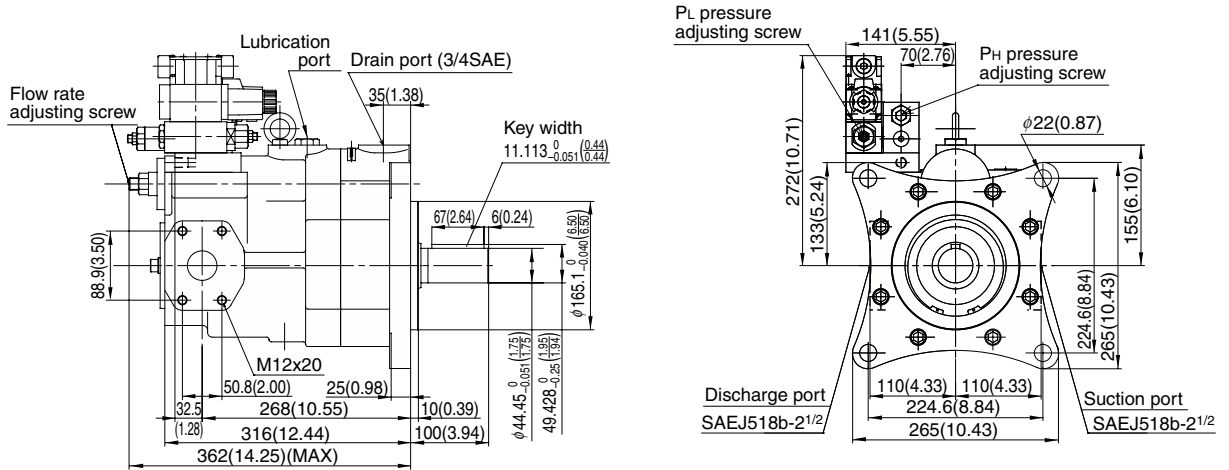
2-Pressure Control Type
PZS-3B-70W*S



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

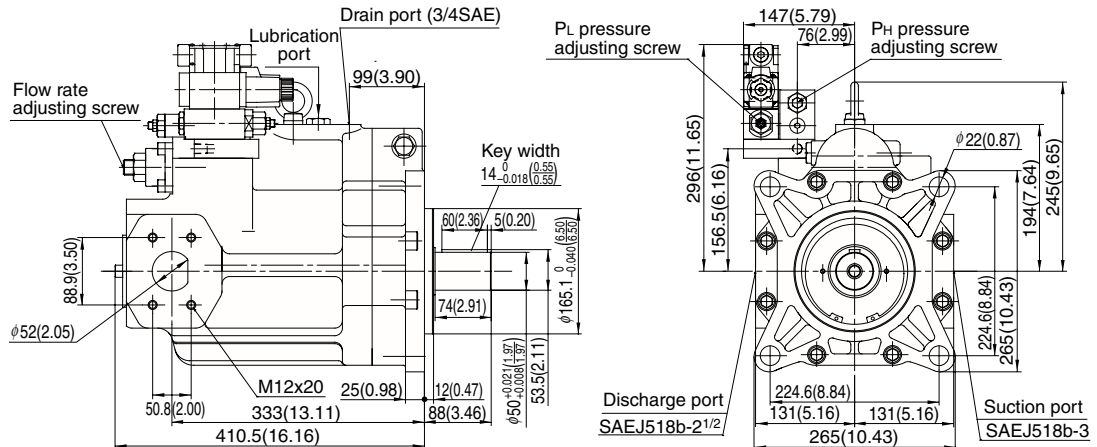


PZS-5B-130W*S*-10



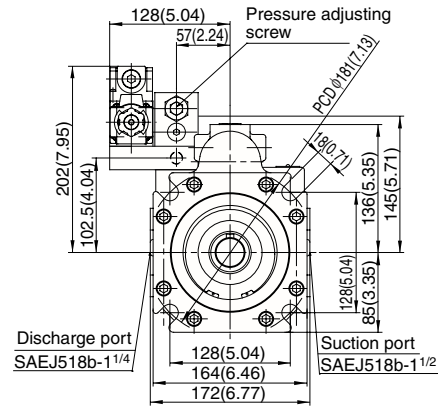
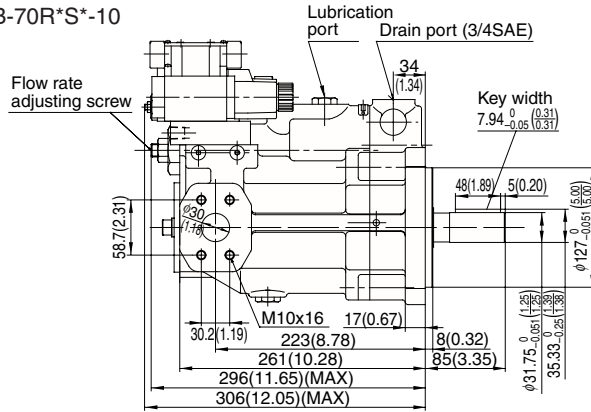
PZS-6B-180W*S*-10

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

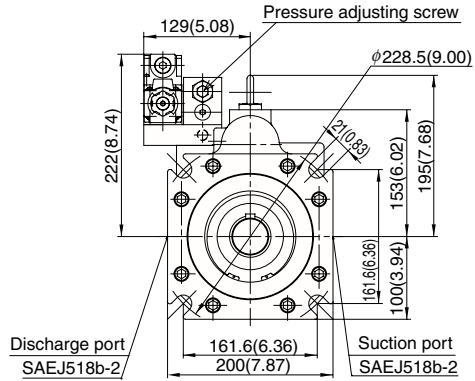
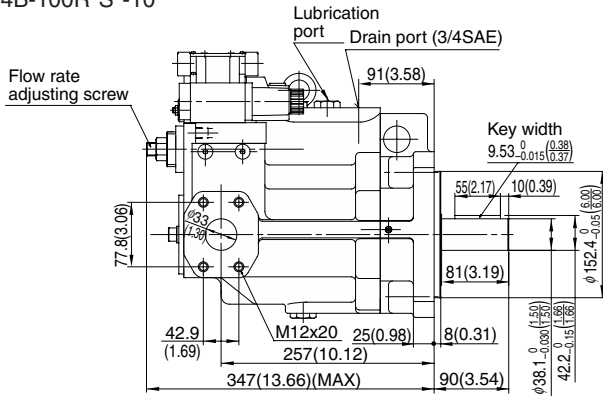


■ Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot.
Do not touch the surface of the coil directly with your hands.

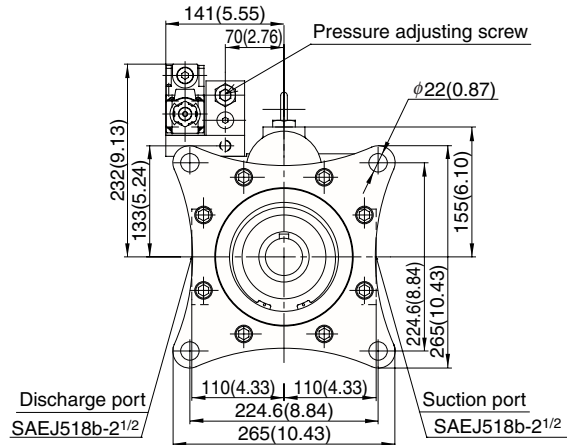
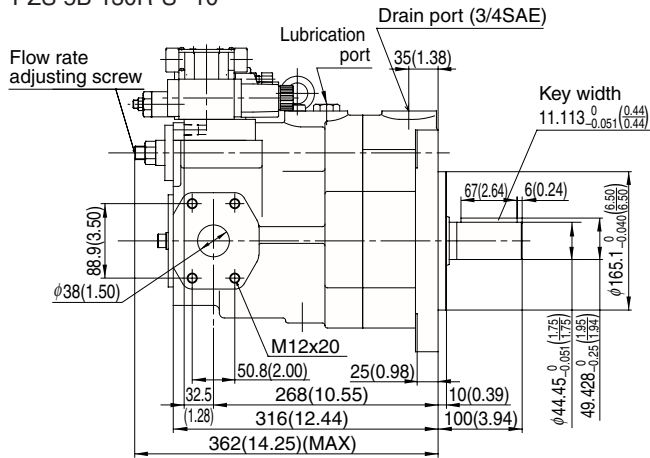
Solenoid Cutoff Control Type
PZS-3B-70R*S*-10



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

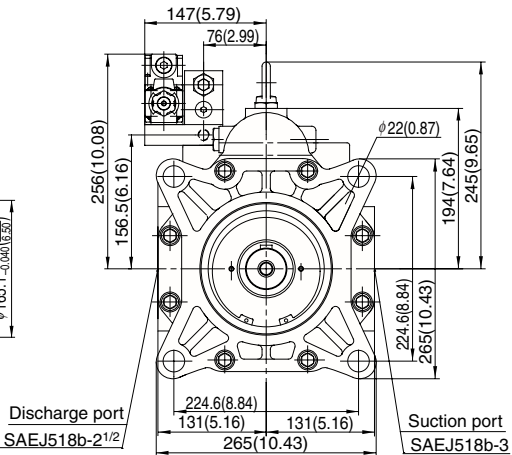
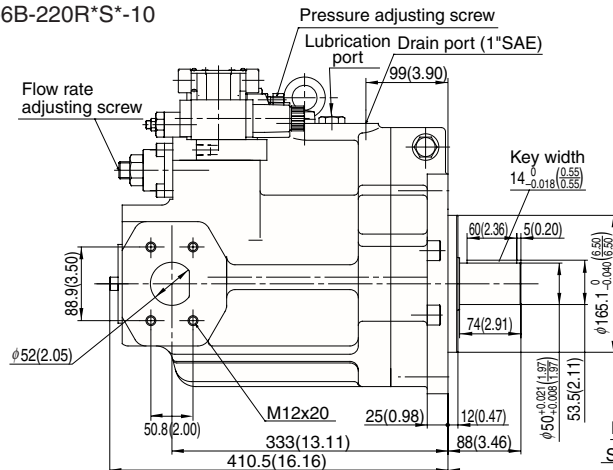


PZS-5B-130R*S*-10



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

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

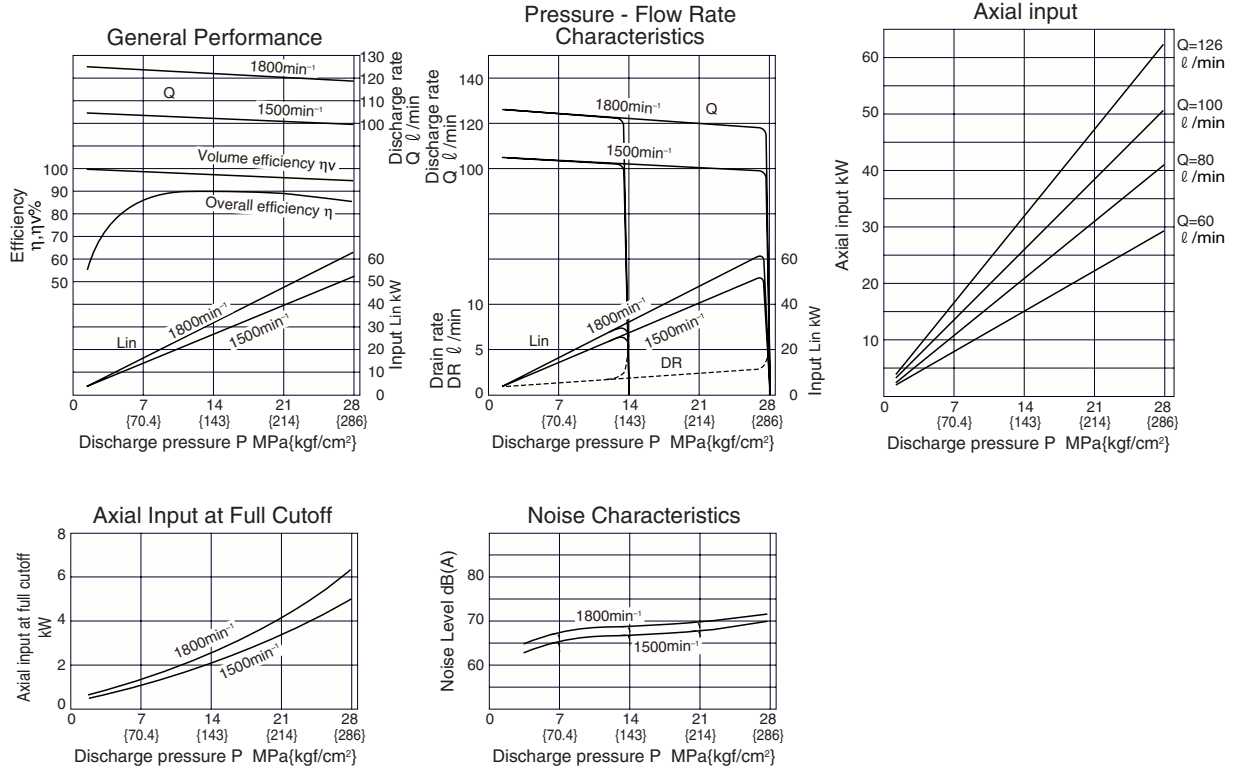


■ Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot.
Do not touch the surface of the coil directly with your hands.

Performance Curves

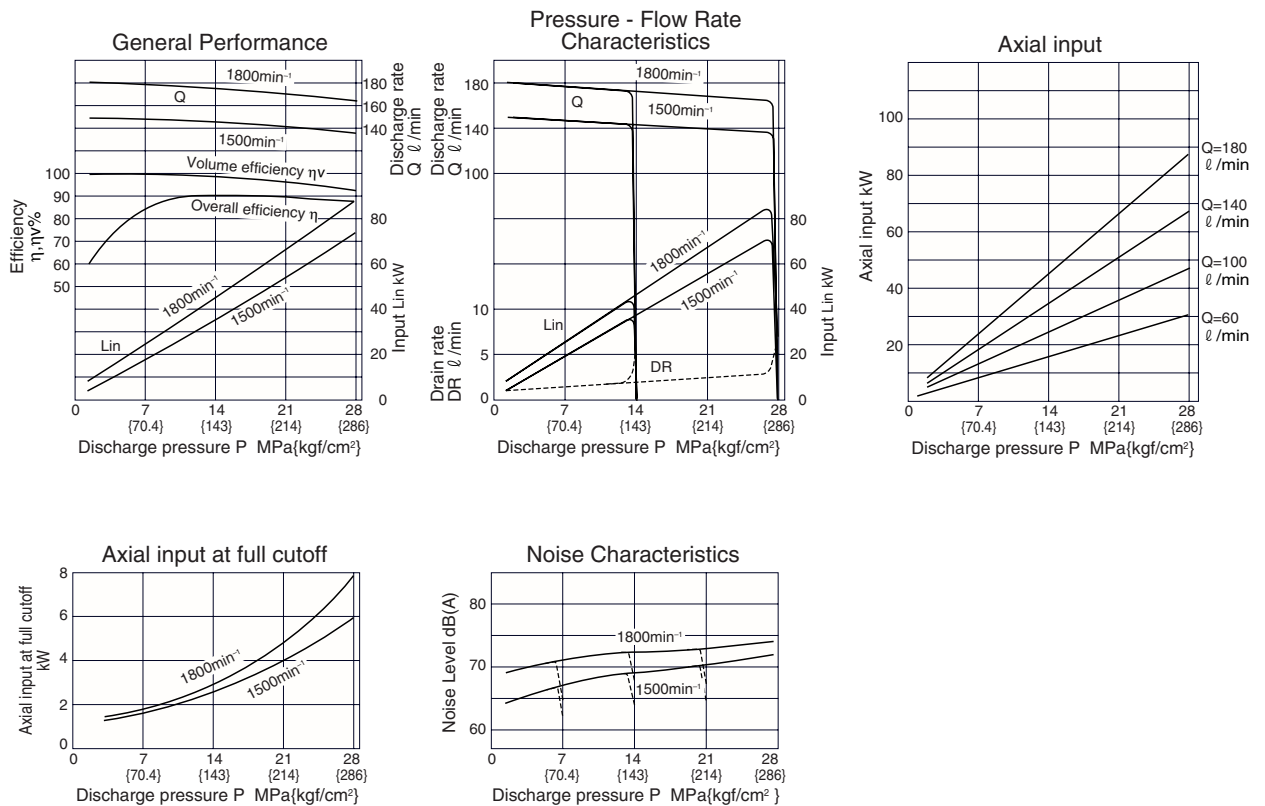
Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s

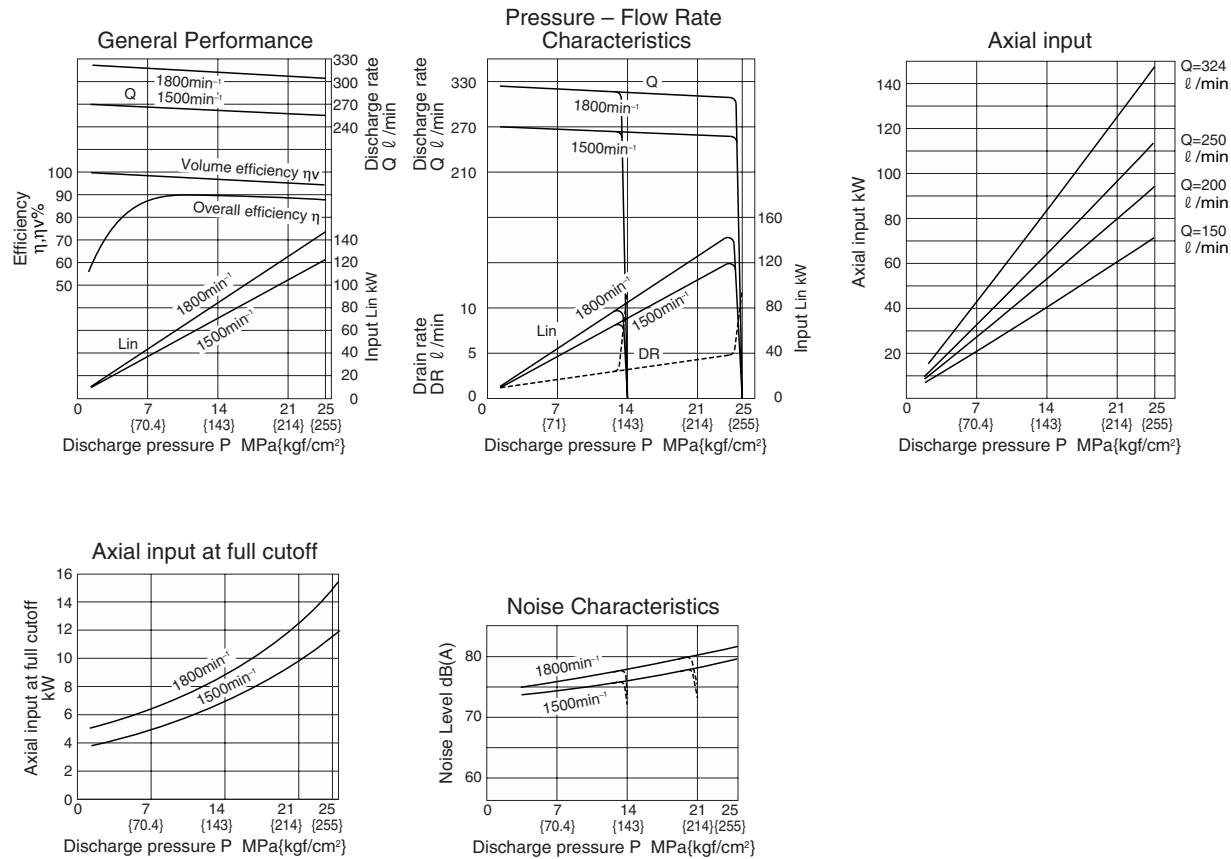
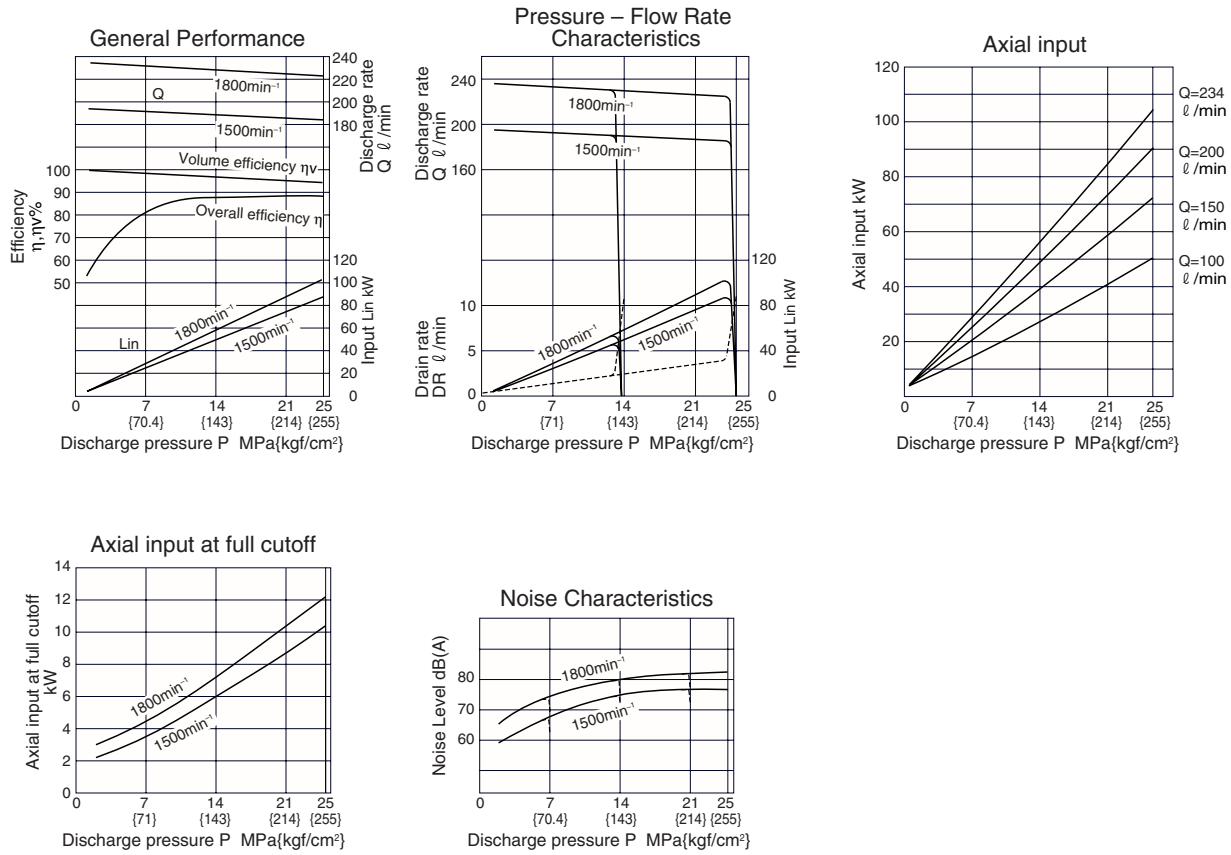
PZS-3B-70N*-10

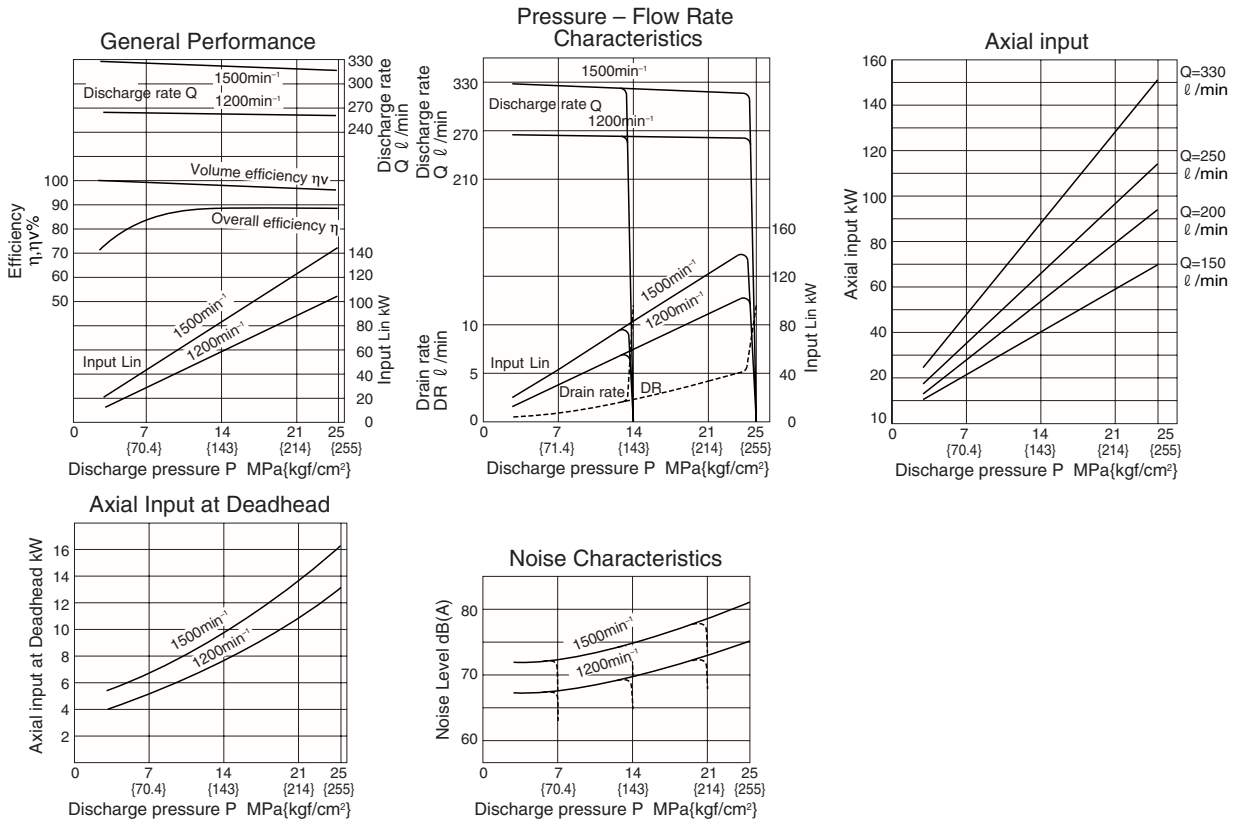


PZS-4B-100N*-10

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

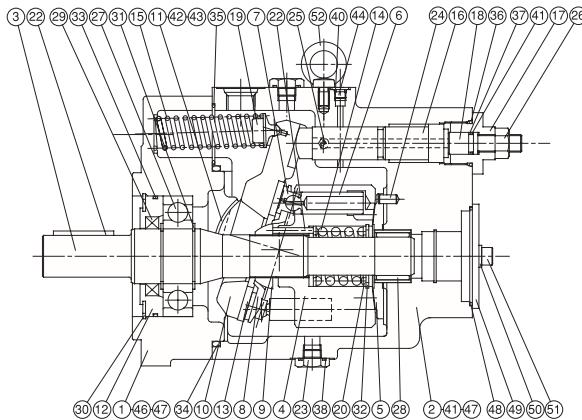






Cross-sectional Drawing

PZS-3B-70N*-E4481, E10
 PZS-4B-100N*-E4481, E10
 PZS-6B-***N*-E10



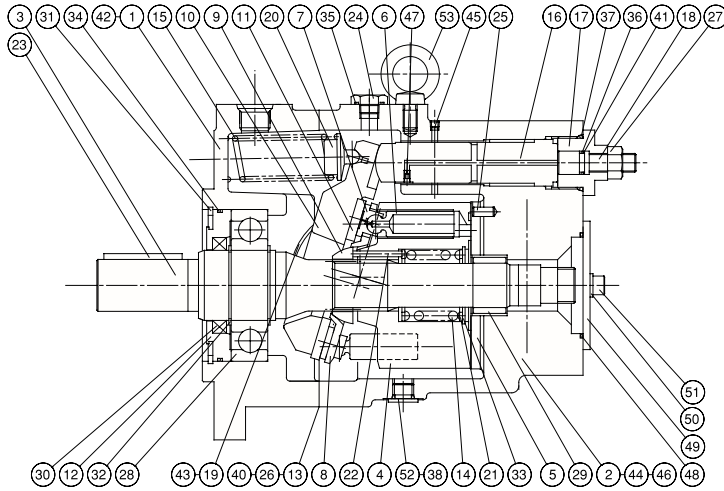
Part No.	Part Name	Part No.	Part Name
1	Body	28	Needle bearing
2	Case	29	Oil seal
3	Shaft	30	Snap ring
4	Cylinder barrel	31	Snap ring
5	Valve plate	32	Snap ring
6	Piston	33	O-ring
7	Shoe	34	O-ring
8	Shoe holder	35	O-ring
9	Barrel holder	36	O-ring
10	Swash plate	37	O-ring
11	Thrust bush	38	O-ring
12	Seal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

List of Sealing Parts

Part No.	Name	Product Number				Remarks		
		PZS-3B	Q'ty	PZS-4B	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-P21	2	1B-P21	3	1B-P21	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*-E10



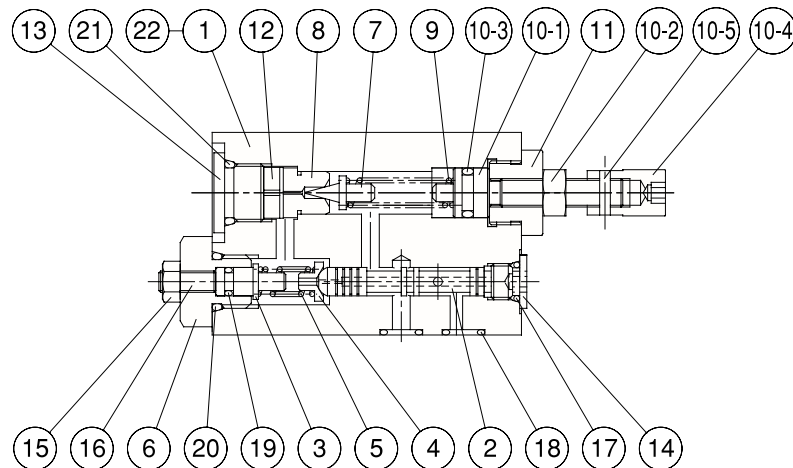
Part No.	Part Name	Part No.	Part Name
1	Body	28	Ball bearing
2	Case	29	Needle bearing
3	Shaft	30	Oil seal
4	Cylinder barrel	31	Snap ring
5	Valve plate	32	Snap ring
6	Piston	33	Snap ring
7	Shoe	34	O-ring
8	Shoe holder	35	O-ring
9	Barrel holder	36	O-ring
10	Swash plate	37	O-ring
11	Thrust plate	38	O-ring
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

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



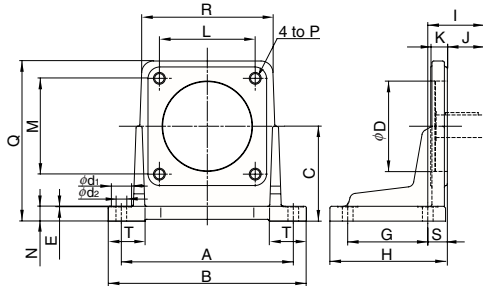
Part No.	Part Name	Part No.	Part Name
1	Valve body	12	Collar
2	Spool	13	Plug
3	Spring guide	14	Plug
4	Spring bearing	15	Nut
5	Spring	16	Socket head screw
6	Retainer	17	O-ring
7	Needle valve	18	O-ring
8	Valve seat	19	O-ring
9	Spring	20	O-ring
10	Adjustment screw kit	21	O-ring
10-1	Adjustment screw	22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

List of Sealing Parts

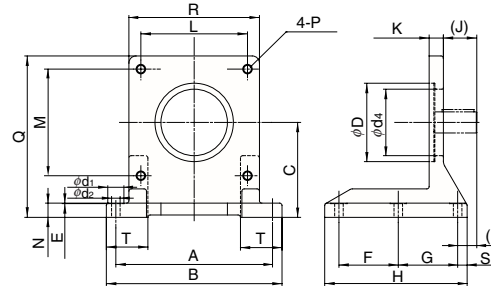
Part No.	Name	Part Number				Remarks
		PZS-3B, 4B	Q'ty	PZS-5B, 6B	Q'ty	
10-3	O-ring	1B-P10A	1	1B-P10A	1	JIS B 2401
17	O-ring	1B-P8	1	1B-P11	2	"
18	O-ring	1B-P9	4	1B-P9	5	"
19	O-ring	1B-P5	1	1B-P14	1	"
20	O-ring	1B-P12	1	1B-P22	1	"
21	O-ring	1B-P14	1	1B-P14	1	"

Foot Mounting Kit

PZM-*-10



Foot Mounting Installation Measurement Chart
IHM-55-10



Foot Mounting Kit Model No.	Applicable Pump Model No.	Accessories				Measurements (inch)							
		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	11.63	13.15	6.00	0.04	-	5.50	7.99	4.11
PZM-4-10	PZS-4B	TB-20×45	4	WP-20	4	11.42	13.15	6.30	0.04	-	5.31	7.79	3.74
IHM-55-10	PZS-5B, 6B	TH-20×50	4	WS-B-20	4	13.00	14.57	7.87	0.04	4.92	4.92	11.81	1.57

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	2.36	0.98	5.04	5.04	0.98	M16	10.20	-	1.75	2.40	5.00	1.38	0.71	3.39	13.5
PZM-4-10	2.44	1.10	6.36	6.36	0.98	M20	10.63	8.66	1.30	2.44	6.00	1.34	0.71	6.00	18.0
IHM-55-10	2.76 ^(Note)	1.18	8.84	8.84	1.18	M20	13.39	10.83	0.79	3.54	6.50	1.34	0.71	5.51	32.0

Note The IHM-55-10 (J) dimension (2.76) is the value for the PZS-5B. This dimension becomes 2.28 in the case of the PZS-6B.
The IHM-55-10 (I) dimension (1.57) is the value for the PZS-5B. This dimension becomes 1.10 in the case of the PZS-6B.

Piping Flange Kit

Screw In Type

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

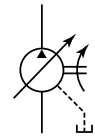
OUT Flange								Plug	
Flange Part No.	Bolt	Washer	O-ring						
IH03J-100100	1	TH-10×55	4	WS-B-10	4	1B-G40	1	TPHA-1/4	1
IH03J-100160	1	TH-12×60	4	WS-B-12	4	1B-G60	1	-	
IH03J-100200	1	TH-12×65	4	WS-B-12	4	1B-G75	1	-	
IH03J-100200	1	TH-12×65	4	WS-B-12	4	1B-G75	1	-	

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								Plug	
Flange Part No.	Bolt	Washer	O-ring						
IH03J-200100	1	TH-10×55	4	WS-B-10	4	1B-G40	1	TPHA-1/4	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	-	

• O-ring 1B-** refers to JIS B2401-1B-**.



Features

① 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 cut-off.

② 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.

③ 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.

④ Precise characteristics, prompt response

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

⑤ 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		Delivery (ℓ/min (gpm) at No-Load)		Pressure Adjust Range kgf/cm ² (psi)	Drive Speed (rpm)		Max. Setting Pressure kgf/cm ² (psi)	Weight kgf (lbs)
Foot Mounting	Flange Mounting	1800rpm	1500rpm		Minimum	Maximum		
VDS-OA-1A1-E11	VDS-OB-1A1-E11	15 (4.0)	12.5 (3.3)	10 ~ 20 (143 ~ 286)	800	1800	20 (286)	A-type 6.5 (14.3) B-type 4.5 (9.9)
VDS-OA-1A2-E11	VDS-OB-1A2-E11			15 ~ 35 (214 ~ 500)			35 (500)	
VDS-OA-1A3-E11	VDS-OB-1A3-E11			30 ~ 70 (429 ~ 1000)			70 (1000)	

● 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 0.03MPa.
- 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

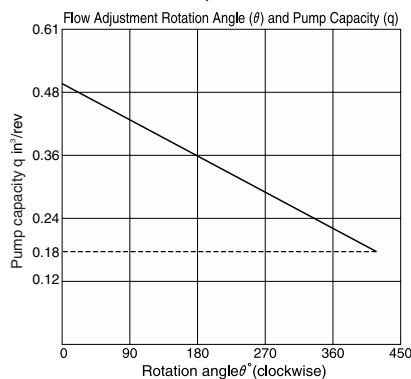
Factory Default Pressure Settings MPa(psi)	
1	: 2.0 {286}
2	: 3.5 {500}
3	: 7.0 {1000}

However: $Q=q \times n \times 10^{-3}$

Q : No-load Discharge Rate (ℓ/min)

q : Capacity (cm³/rev)

N : Revolution Speed min⁻¹



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

⑥ Thrust Screw

The thrust screw is precision adjusted at the factory during assembly. Never touch the thrust screw. See callout 9 in the cross-section diagram on page V-4.

⑦ Initial Operation

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

⑧ For the hydraulic operating fluid, use an R&O type and wear-resistant type of ISO VG32 to 68 or equivalent (viscosity index of at least 90). Use hydraulic operating fluid that provides kinematic viscosity during operation in the range of 20 to 150mm²/s.

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

(Continued on following page)

- 10 Suction pressure is -0.03 to $+0.03$ MPa (-4.3 to $+4.3$ psi), and the suction port flow rate should be no greater than 2m/sec.
- 11 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft.
Mount the pump so its pump shaft is oriented horizontally.
- 12 Provide a suction strainer with a filtering grade of about 100 μ m (150 mesh). For the return line to the tank, use a 25 μ m line filter.
- 13 Manage hydraulic operating

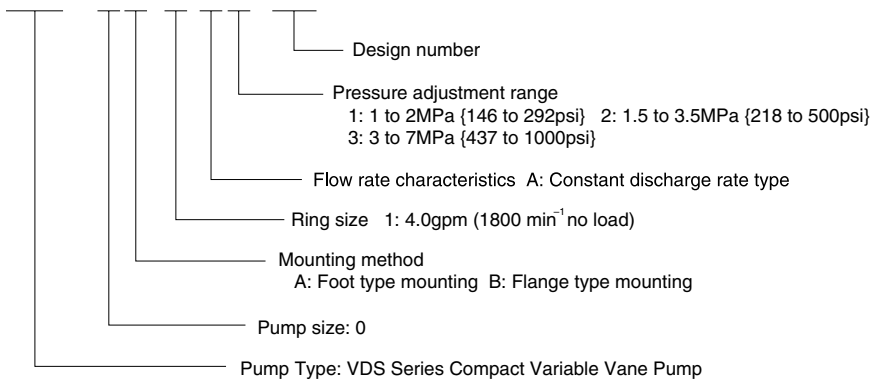
fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water or other foreign matter, and watch for discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.

- 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.
- 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 0.05mm.
The angle error should be no greater than 1° .

Understanding Model Numbers

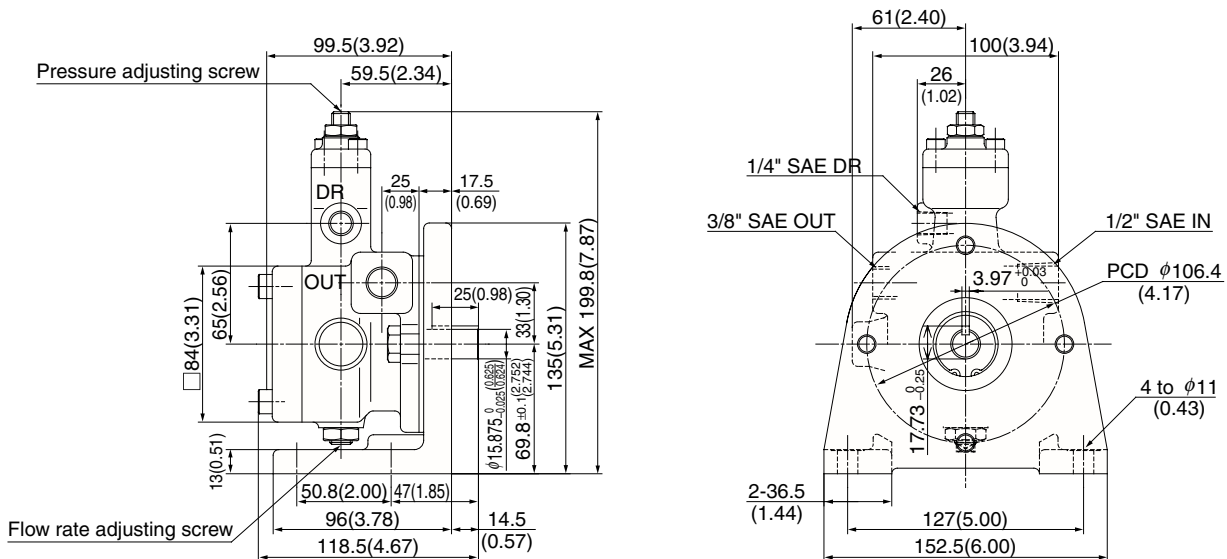
VDS - O * - 1 A * - E11



Installation Dimension Drawings

VDS-0A-1A*-E11

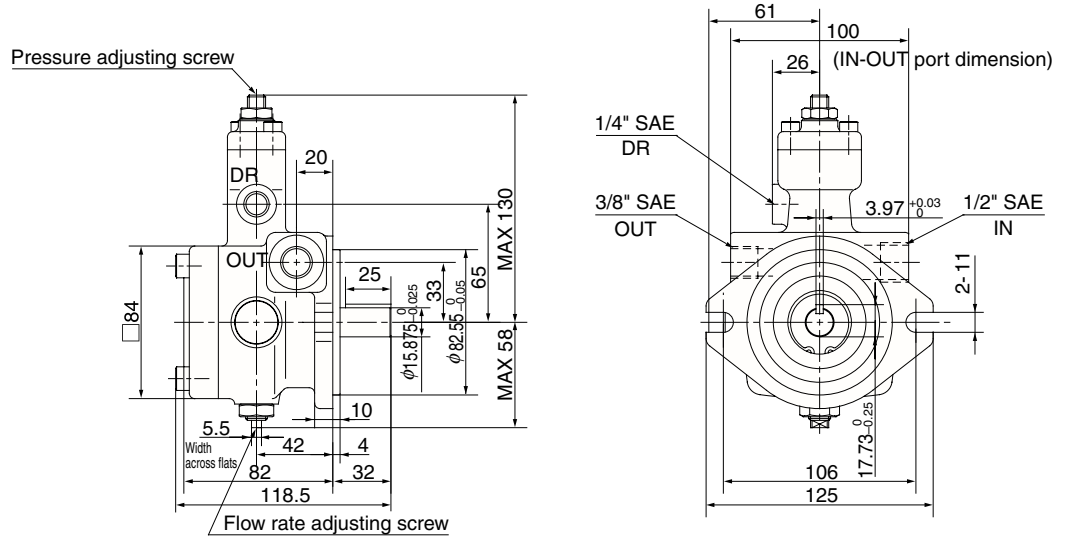
Foot Mounting Type mm (inch)



Note) Foot Mounting Kit: IHM-2-10

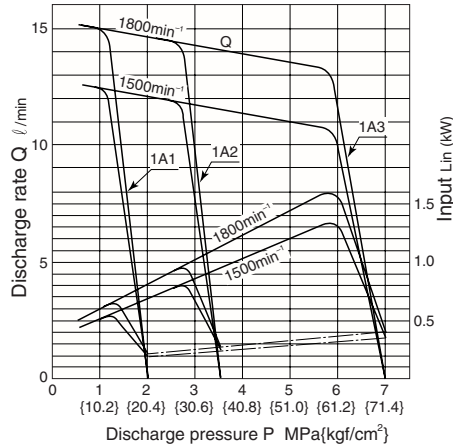
VDS-0B-1A*-E11

Flange Mounting

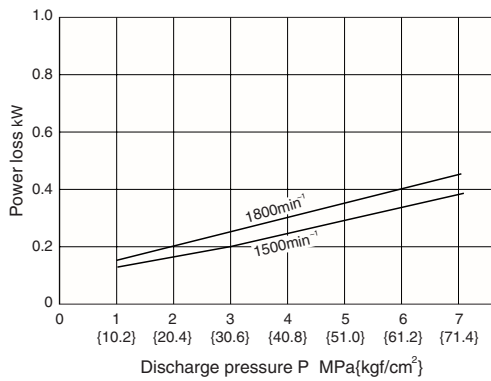


Performance Curves

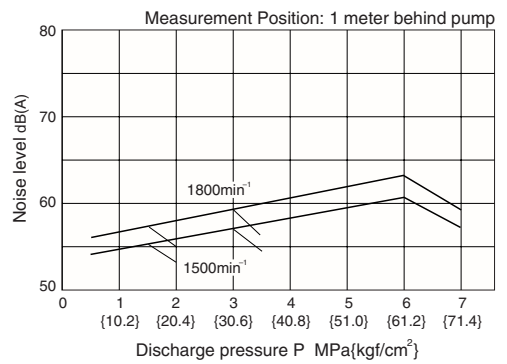
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s



Power Loss Curve – At Full Cutoff

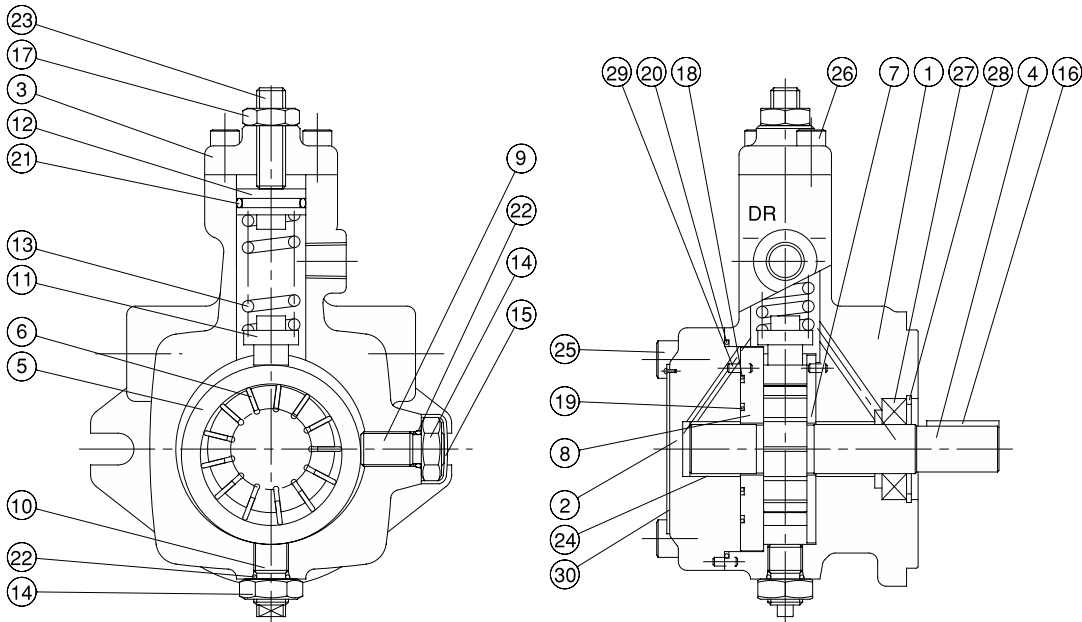


Noise Characteristics



Cross-sectional Drawing

VDS-0B-1A*-E11



List of Sealing Parts

Seal Kit: VBAS-200B00

Applicable Pump Model: VDS-0A/B-1A*-E11

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	TCN-17358	1

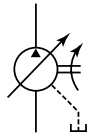
Note)

- 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

VDR22 Design Series Variable Volume Vane Pump

7.9gpm at 2000psi
10.5gpm at 1000psi



Features

① Stable, highly efficient operation up to 14MPa

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 14MPa.

② 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.

③ Silent operation, even in the high pressure range

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

④ Reduced power loss

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

⑤ 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		Delivery at no load ℓ/min (gpm)			Pressure adjusting range kgf/cm ² (psi)	Drive speed rpm		Max. setting pressure kgf/cm ² (psi)	Weight kg (lbs)
Foot Mounting	Flange Mounting	1800 r.p.m.	1500 r.p.m.	1200 r.p.m.		Max.	Min.		
VDR-1A-1A2-*22	VDR-1B-1A2-*22	30 (7.9)	25 (6.6)	20 (5.3)	15 ~ 35 (214 ~ 500)	1800	800	35 (500)	9 (19.9)
VDR-1A-1A3-*22	VDR-1B-1A3-*22				30 ~ 70 (429 ~ 1000)			70 (1000)	
VDR-1A-1A4-*22	VDR-1B-1A4-*22				65 ~ 105 (929 ~ 1500)			105 (1500)	
VDR-1A-1A5-*22	VDR-1B-1A5-*22				90 ~ 140 (1286 ~ 2000)			140 (2000)	
VDR-1A-2A2-*22	VDR-1B-2A2-*22	40 (10.6)	33 (8.7)	27 (7.1)	15 ~ 35 (214 ~ 500)	1800	800	35 (500)	9 (19.9)
VDR-1A-2A3-*22	VDR-1B-2A3-*22				30 ~ 70 (429 ~ 1000)			70 (1000)	

● Handling

① Rotation Direction

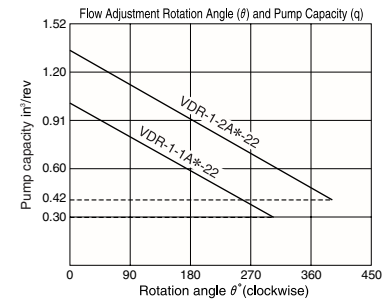
The direction of rotation is always clockwise (rightward) when viewed from the shaft side.

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 0.03MPa. When using a pump that has drain ports at two locations, use the drain port that is higher after the pump is installed.

③ Discharge Volume Adjustment

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



(Continued on following page)

However: $Q=q \times n \times 10^{-3}$

Q :No-load Discharge Rate l/min

q :Volume cm^3/rev

N :Revolution Speed min^{-1}

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

Note)

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

4 Pressure Adjustment

Pressure is decreased by clockwise (rightward) rotation of the

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

5 Factory Default P-Q Settings (Standard Model)

- Flow Rate Setting = Maximum flow rate for model as indicated in the catalog

- Pressure Setting = Pressure shown in table to the right

6 Thrust Screw

The thrust screw is precision adjusted at the factory during assembly. Never touch the thrust screw. See callout ② in

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

the cross-section diagram on page V-9.

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.

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

For detailed dimensions, see pages.

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

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

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

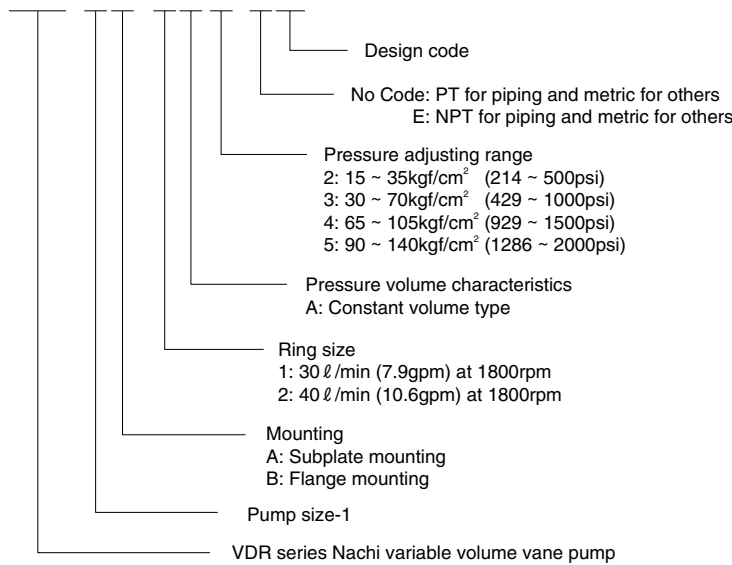
12 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.

(Continued on following page)

Understanding Model Numbers

Single pump

VDR-1 A-1 A 5-* 22



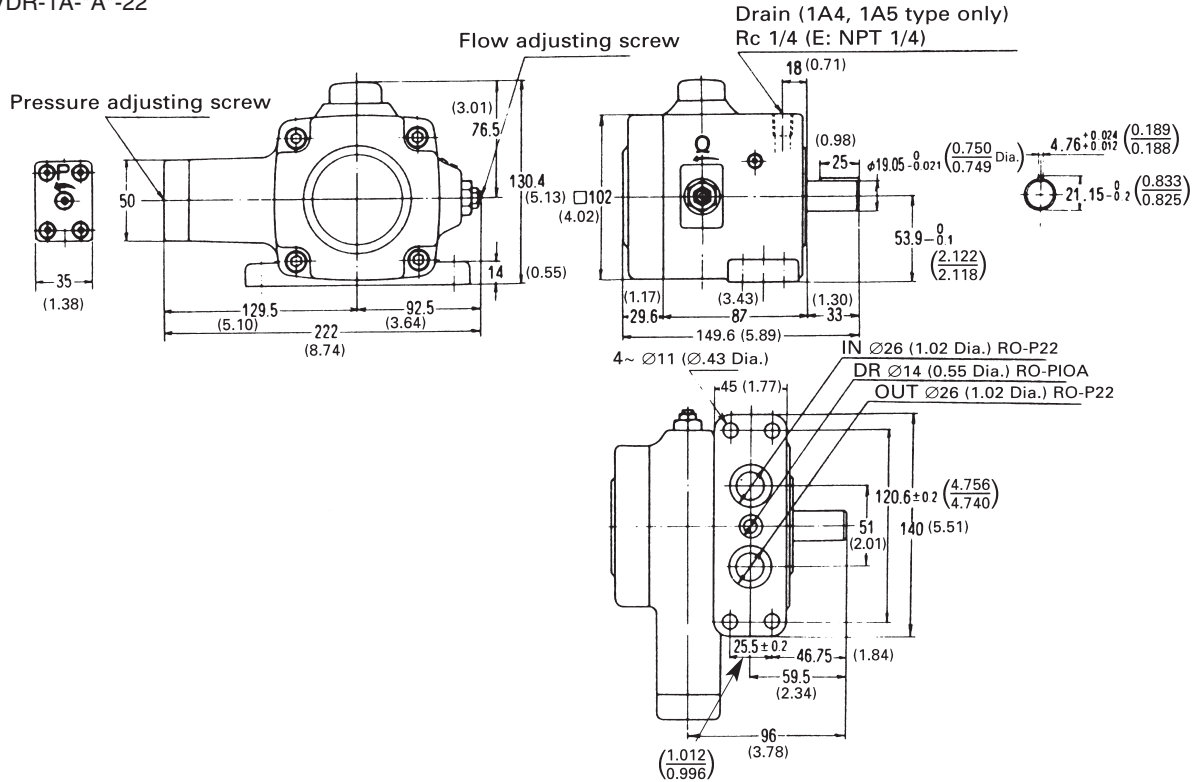
- 13 Provide a suction strainer with a filtering grade of about 100 μm (150 mesh). For the return line to the tank, use a 25μm line filter.
- 14 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water or other foreign matter, and watch out for discoloration. Whitish fluid indicates that air has contaminated the

- fluid, and brownish fluid indicates the fluid is dirty.
- 15 Contact your agent about using water- and glycol-based hydraulic operating fluids.
- 16 At startup, repeat the inching operation (start-stop) to bleed air from the pump and pipes.
- 17 Equip an air bleed valve in circuits where it is difficult to bleed air before startup.

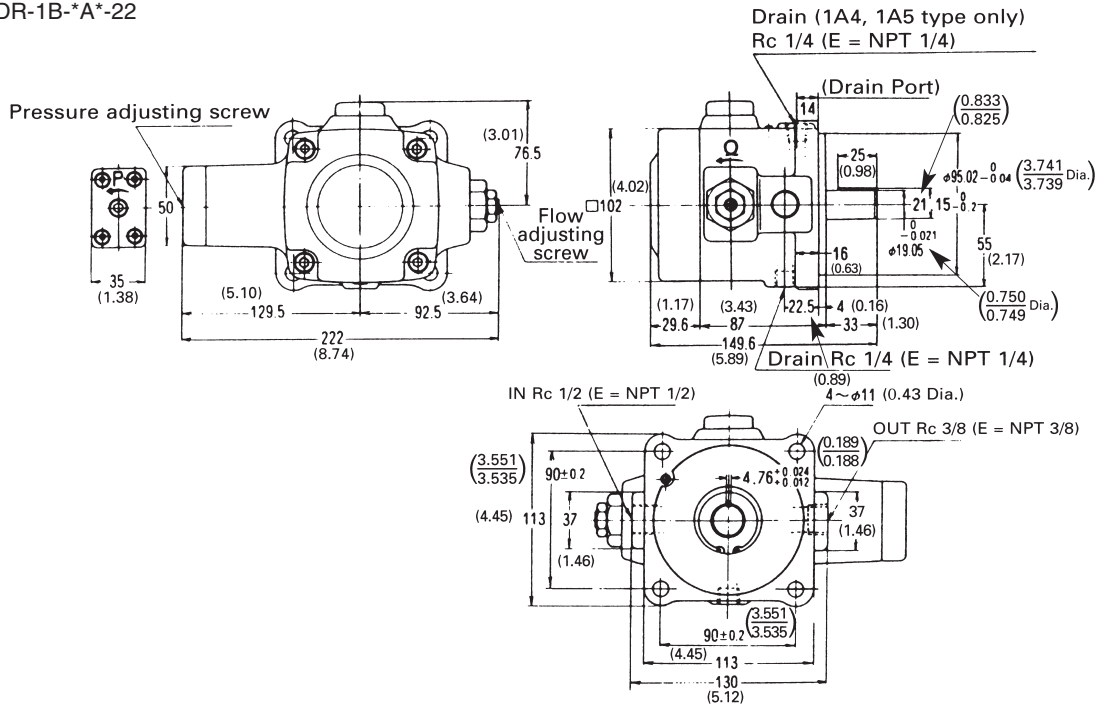
- 18 To ensure proper lubrication of the pump's rubbing surfaces, supply oil to the interior of the pump before starting operation.
- 19 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.05mm. Use a pump mounting base of sufficient rigidity. The angle error should be no greater than 1°.

Installation Dimension Drawings

VDR-1A-*A*-22

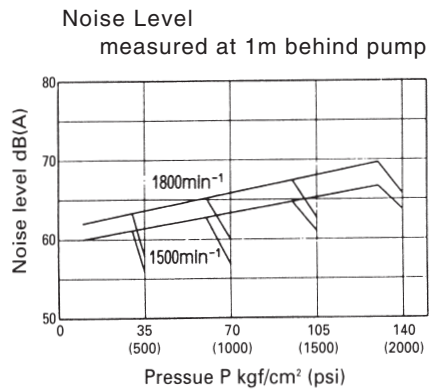
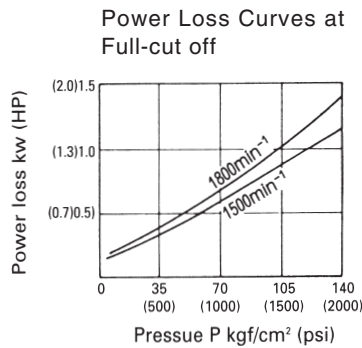
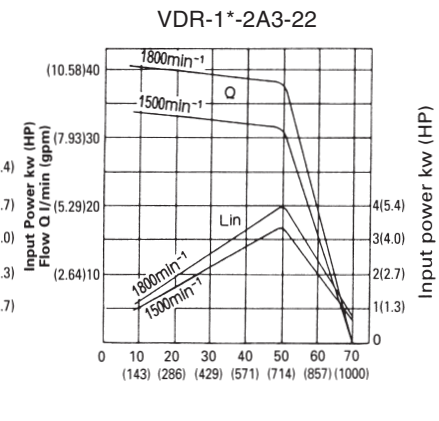
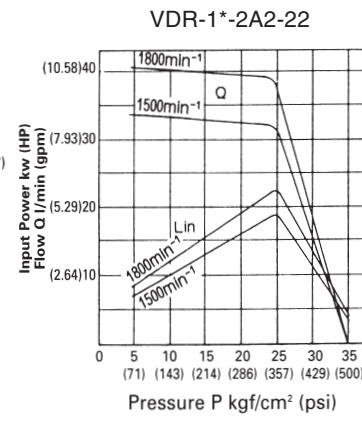
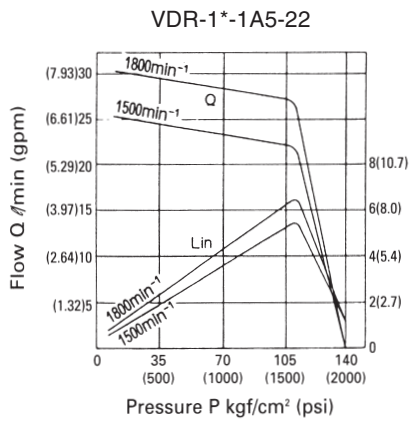
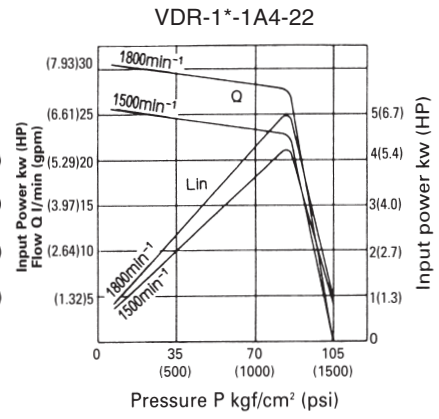
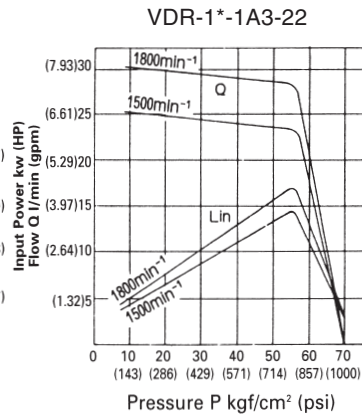
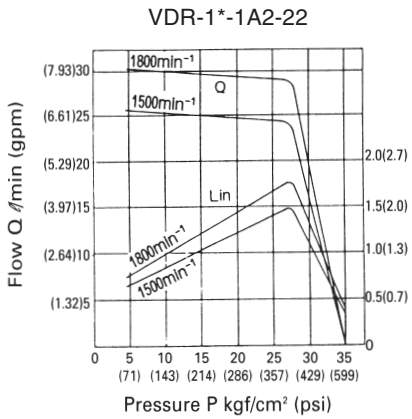


VDR-1B-*A*-22



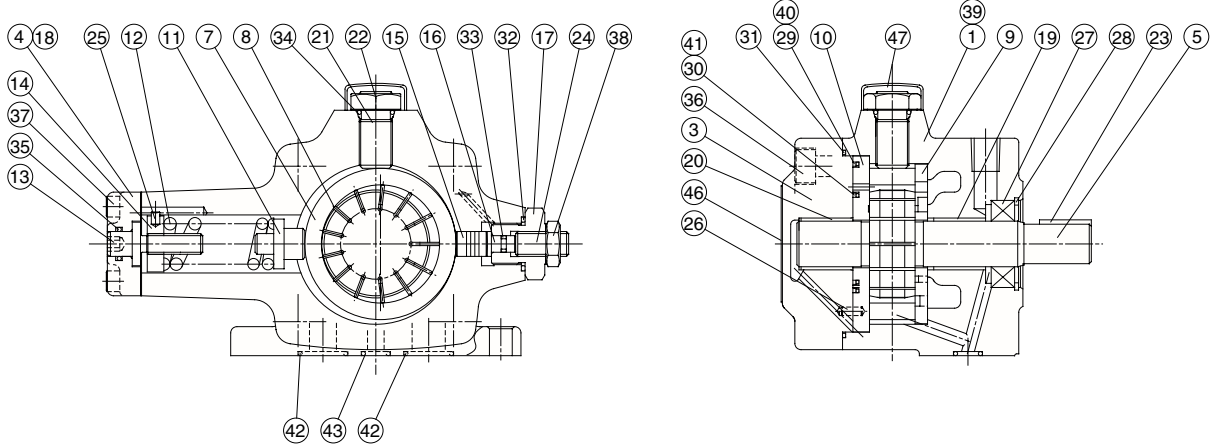
Performance Curves

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



Cross-sectional Drawing

VDR-1A-*A*-22



List of Sealing Parts Single Pump

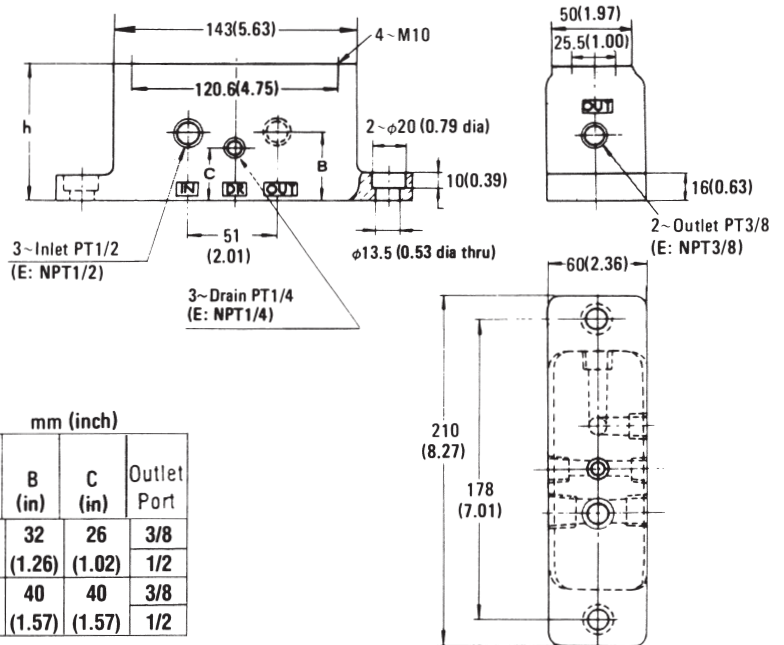
Part No.	Applicable Pump Model No.		Q'ty
	VDR-1A-*A*-22		
	Seal Kit Number VDBS-101A00		
Part Name	Part Number		
18	Packing	VDB32-101000	1
27	Oil seal	ISRD-224211	1
29	Backup ring	VDB34-101000	1
30	Backup ring	VDB34-201000	1
31	O-ring	S85(NOK)	1
32	O-ring	1A-P22	1
33	O-ring	1A-P5	1
34	O-ring	1A-P14	1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

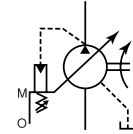
- Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
- O-ring 1A-** refers to JIS B2401-1A-**.
- For VDR-1B-*A*-22, the seal kit number becomes VDBS-101B00, without the 42 and 43 O-rings.

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

VDR-1A
VDC-1A



Model		Weight kg (lbs)	h (in)	B (in)	C (in)	Outlet Port
Domestic	E Series					
MVD-1-115-10	MVD-1-115-E10	3.7 (8.2)	61.1 (2.41)	32 (1.26)	26 (1.02)	3/8 1/2
MVD-1-135-10	MVD-1-135-E10	4.9 (10.8)	81.1 (3.19)	40 (1.57)	40 (1.57)	3/8 1/2



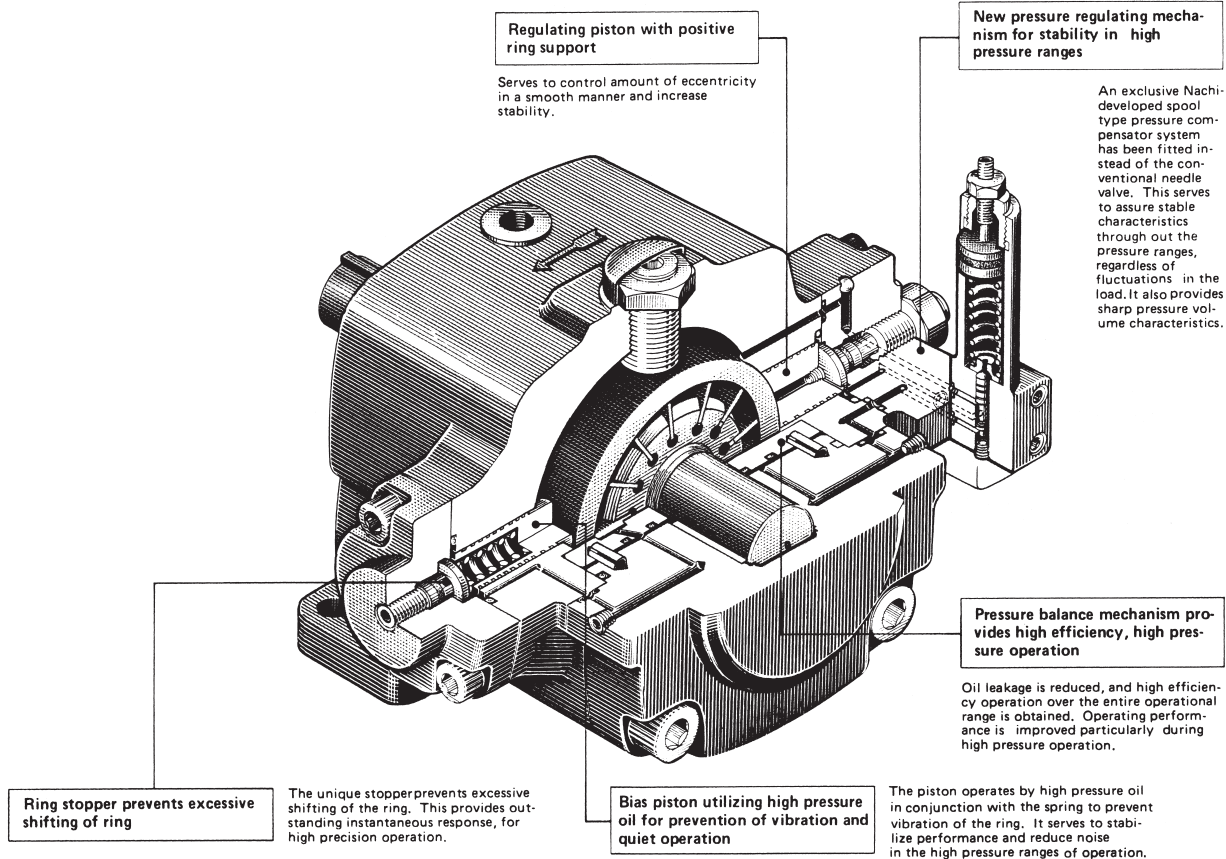
Overview

The VDC series high pressure variable volume vane pumps are a new series of pumps. In addition to Nachi's three exclusive mechanisms (pressure control; pressure balance; ring

stopper mechanism), a unique and exclusive three-point ring support system which makes maximum utilization of high pressure oil has been adopted to provide stable high pressure and

quiet operation.

The new series of hydraulic pumps are ideal for applications, such as: machine tools, industrial machinery and vehicles.



Features

① High efficiency, high pressure operation

The unique pressure regulator and pressure balance mechanism, plus the exclusive three-point ring support system has improved performance during high pressure operation. The pump operates with high efficiency and stable performance up to a maximum of 140kgf/cm² (2000 psi).

② Low vibration and noise levels

The new mechanisms reduces vibration and noise levels. Of particular note is the unique and exclusive three-point support system which uses, a regulating piston and a bias piston to eliminate vibration. The mechanism,

together with improvements to the shape of the inlet and outlet ports and high performance journal bearings, has reduced the noise level during operation.

③ Fast response

The ring stopper mechanism serves to allow swift response whether in starting, stopping, or with load fluctuations, for high precision operation.

④ Stable discharge with sharp cut-off characteristics

A revolutionary pressure compensator type pressure regulation mechanism provides, stable sharp cut-off characteristics. The compensator serves to provide stable

and constant volume through our the pressure ranges.

⑤ High efficiency operation with reduced power loss

Efficiency has been improved with the new mechanisms and Nachi's high precision machining technology. Power loss has been reduced, especially during dead-heading.

⑥ Easy adjusting in maintenance and handling

Maintenance is easier due to the positioning of the pressure adjusting mechanism and the volume adjusting mechanism on the same side of the pump.

Specifications

Single Pump

Model type		Flow at no load ℓ/min (gpm)		Pressure adjust- ing range kgf/cm ² (psi)	Drive speed rpm		Max setting pressure kgf/cm ² (psi)	Weight kgf (lbs)
		1800 rpm	1500 rpm		Max.	Min.		
VDC-1A-1A2-※20	VDC-1B-1A2-※20/35	30 (7.9)	25 (6.6)	15 ~ 35 (214 ~ 500)	1800	800	35 (500)	9.5 (20.9)
VDC-1A-1A3-※20	VDC-1B-1A3-※20/35			20 ~ 70 (286 ~ 1000)			70 (1000)	
VDC-1A-1A4-※20	VDC-1B-1A4-※20/35			50 ~ 105 (714 ~ 1500)			105 (1500)	
VDC-1A-1A5-※20	VDC-1B-1A5-※20/35			70 ~ 140 (1000 ~ 2000)			140 (2000)	
VDC-1A-2A2-※20	VDC-1B-2A2-※20/35	40 (10.5)	33 (8.7)	15 ~ 35 (214 ~ 500)	1800	800	35 (500)	9.5 (20.9)
VDC-1A-2A3-※20	VDC-1B-2A3-※20/35			20 ~ 70 (286 ~ 1000)			70 (1000)	
VDC-2A-1A2-※20	VDC-2B-1A2-※20/35	54 (14.2)	45 (11.8)	15 ~ 35 (214 ~ 500)	1800	800	35 (500)	25 (55.1)
VDC-2A-1A3-※20	VDC-2B-1A3-※20/35			20 ~ 70 (286 ~ 1000)			70 (1000)	
VDC-2A-1A4-※20	VDC-2B-1A4-※20/35			50 ~ 105 (714 ~ 1500)			105 (1500)	
VDC-2A-1A5-※20	VDC-2B-1A5-※20/35			70 ~ 140 (1000 ~ 2000)			140 (2000)	
VDC-2A-2A2-※20	VDC-2B-2A2-※20/35	70 (18.4)	58 (15.3)	15 ~ 35 (214 ~ 500)	1800	800	35 (500)	25 (55.1)
VDC-2A-2A3-※20	VDC-2B-2A3-※20/35			20 ~ 70 (286 ~ 1000)			70 (1000)	
VDC-3A-1A2-※20	VDC-3B-1A2-※20	120 (31.7)	100 (26.4)	15 ~ 35 (214 ~ 500)	1800	800	35 (500)	A type 47 (103.6) B type 33 (72.7)
VDC-3A-1A3-※20	VDC-3B-1A3-※20			20 ~ 70 (286 ~ 1000)			70 (1000)	
VDC-3A-1A4-※20	VDC-3B-1A4-※20			50 ~ 105 (714 ~ 1500)			105 (1500)	
VDC-3A-1A5-※20	VDC-3B-1A5-※20			70 ~ 140 (1000 ~ 2000)			140 (2000)	

Double Pump

Model type	Head end pump			Shaft end pump			Drive speed rpm		Weight kgf (lbs)
	Flow at no load ℓ/min (gpm)		Pressure adjust- ing range kgf/cm ² (psi)	Flow at no load ℓ/min (gpm)		Pressure adjust- ing range kgf/cm ² (psi)	Max.	Min.	
	1800 rpm	1500 rpm		1800 rpm	1500 rpm				
VDC-11B-2A3-2A3-※20/35	40 (10.5)	33 (8.7)	20 ~ 70 (286 ~ 1000)	40 (10.5)	33 (8.7)	20 ~ 70 (286 ~ 1000)	1800	800	20 (44.1)
VDC-11B-2A3-1A5-※20/35				30 (7.9)	25 (6.6)	70 ~ 140 (1000 ~ 2000)			
VDC-12B-2A3-2A3-※20/35	40 (10.5)	33 (8.7)	20 ~ 70 (286 ~ 1000)	70 (18.4)	58 (15.3)	20 ~ 70 (286 ~ 1000)	1800	800	35 (77.2)
VDC-12B-2A3-1A5-※20/35				54 (14.2)	45 (11.8)	70 ~ 140 (1000 ~ 2000)			
VDC-12B-1A5-2A3-※20/35	30 (7.9)	25 (6.6)	70 ~ 140 (1000 ~ 2000)	70 (18.4)	58 (15.3)	20 ~ 70 (286 ~ 1000)			
VDC-12B-1A5-1A5-※20/35				54 (14.2)	45 (11.8)	70 ~ 140 (1000 ~ 2000)			
VDC-22B-2A3-2A3-※20/35	70 (18.4)	58 (15.3)	20 ~ 70 (286 ~ 1000)	70 (18.4)	58 (15.3)	20 ~ 70 (286 ~ 1000)	1800	800	50 (110.3)
VDC-22B-2A3-1A5-※20/35				54 (14.2)	45 (11.8)	70 ~ 140 (1000 ~ 2000)			
VDC-13B-2A3-1A3-※20	40 (10.5)	33 (8.7)	20 ~ 70 (286 ~ 1000)	120 (31.7)	100 (26.4)	20 ~ 70 (286 ~ 1000)	1800	800	48 (105.3)
VDC-13B-2A3-1A5-※20						70 ~ 140 (1000 ~ 2000)			
VDC-13B-1A5-1A3-※20	30 (7.9)	25 (6.6)	70 ~ 140 (1000 ~ 2000)			20 ~ 70 (286 ~ 1000)			
VDC-13B-1A5-1A5-※20						70 ~ 140 (1000 ~ 2000)			

● Handling

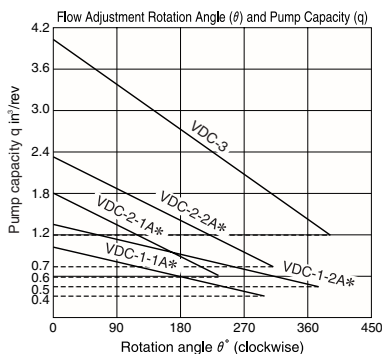
- 1 The rotation is clockwise as viewed from the shaft side.
- 2 Drain Drain piping must be direct piping up to a point that is below the tank fluid level, and piping should comply with the conditions shown in the table below to ensure that back pressure due to pipe resistance does not exceed 0.1MPa. When using a pump that has drain ports at two locations, use the drain port that is higher after the pump is installed. In the case of a double pump, run separate pipes from both the shaft side and the head side drains directly connect to the tank, so the drain pipe is below the surface of the oil.

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 φ7.6	At least φ7.6	At least φ9.6
Pipe Length	1m or less	1m or less	1m or less

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

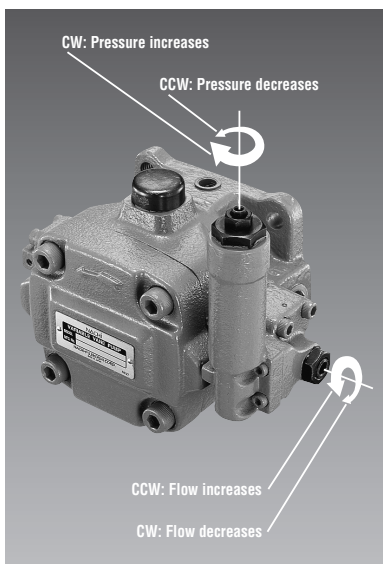
However: $Q = q \times N \times 10^{-3}$

Q : No-load Discharge Rate ℓ / min
 q : Volume cm^3 / rev
 N : Revolution Speed min^{-1}



Note)

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



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

Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut.

- 5 P-Q adjustment at time of shipment from plant
 - Flow adjustment: Has already been adjusted to maximum flow indicated for the model type in the catalog.
 - Pressure adjustment: Has already been adjusted to preset pressures given in Table below:

Pump pressure adjusting range	Preset pressure when shipped from plant
2: 15~35 kgf/cm ² (214~500 psi)	35 kgf/cm ² (500 psi)
3: 20~70 kgf/cm ² (286~1000 psi)	35 kgf/cm ² (500 psi)
4: 50~105 kgf/cm ² (714~1500 psi)	50 kgf/cm ² (714 psi)
5: 70~140 kgf/cm ² (1000~2000 psi)	70 kgf/cm ² (1000 psi)

- 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 V-19 and V-20.

- 7 An unload circuit is required when the motor is started under condition λ - Δ. 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.

(Continued on following page)

Sub Plate Number

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

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.

11 Hydraulic oil: When the pump is to be used at pressures of less than 70kgf/cm² (1000 psi), use good quality petroleum base hydraulic oil with a rating of 30~50cSt (141~232 SUS) (equivalent to ISO VG32) at 40°C (104°F). Operation at pressure exceeding 70kgf/cm² (1000 psi), use oil with a rating of 50~70cSt (232~324 SUS) (equivalent to ISO VG68) at 40°C (104°F).

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

13 Suction pressure is -0.03 to +0.03MPa (-4.3 to +4.3psi), and the suction port flow rate should be no greater than 2m/sec.

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

Mount the pump so its pump shaft is oriented horizontally.

15 Provide a suction strainer with a

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

16 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water and other foreign matter, and watch out for discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.

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

18 At startup, repeat the inching operation (start-stop) to bleed air from the pump and pipes.

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

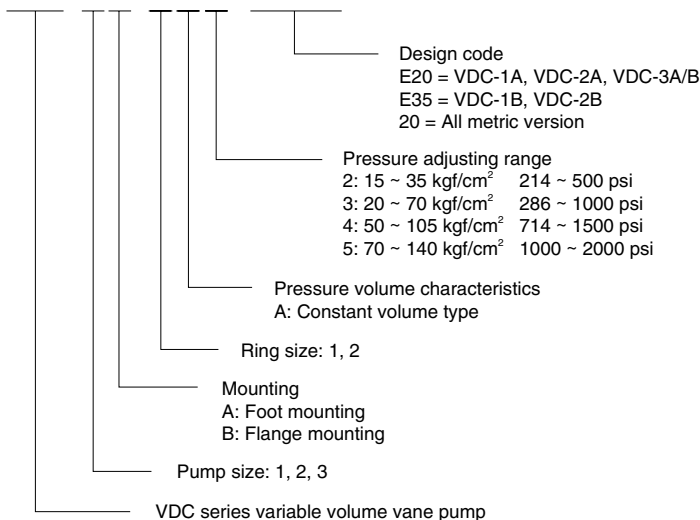
20 To ensure proper lubrication of the pump's rubbing surfaces, supply oil to the interior of the pump before starting operation.

21 Alignment: Alignment between the pump shaft and the motor shaft should be parallel within 0.05mm (0.002 inch), and within 1° for the angle between the two shafts. Use a pump mounting base of sufficient rigidity.

Understanding Model Numbers

Single Pump

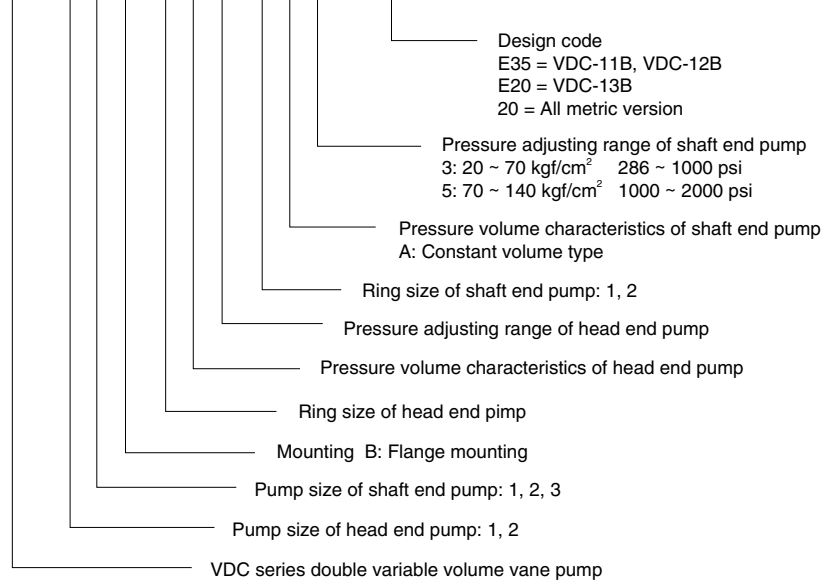
VDC-2 A-1 A 4-* 20/35



Note: Remote control pressure compensating type is available. Please check with factory.

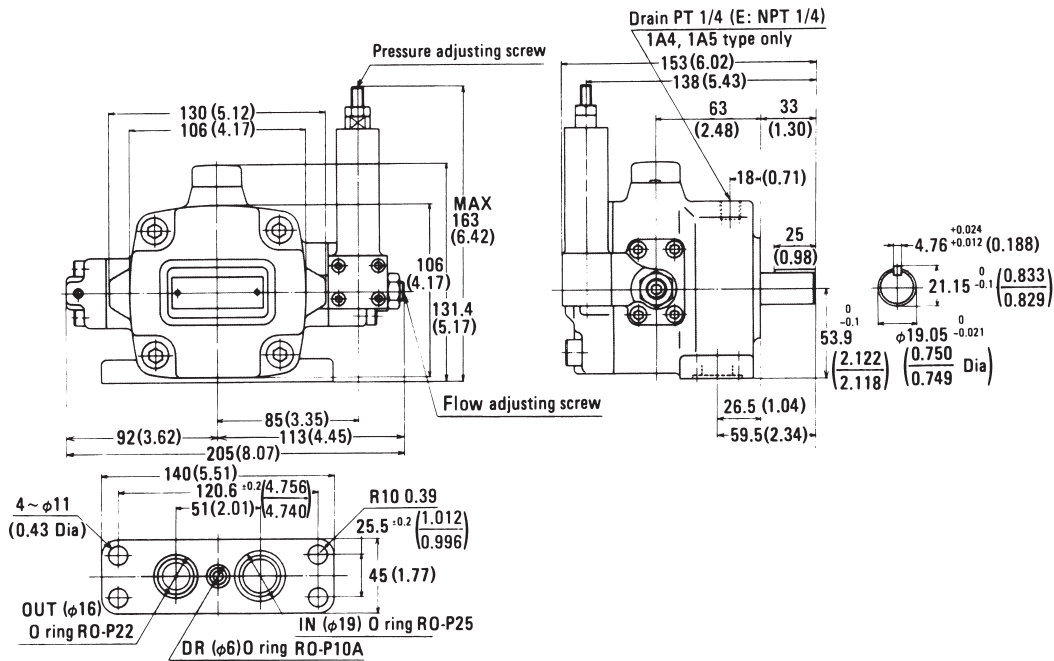
Double Pump

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

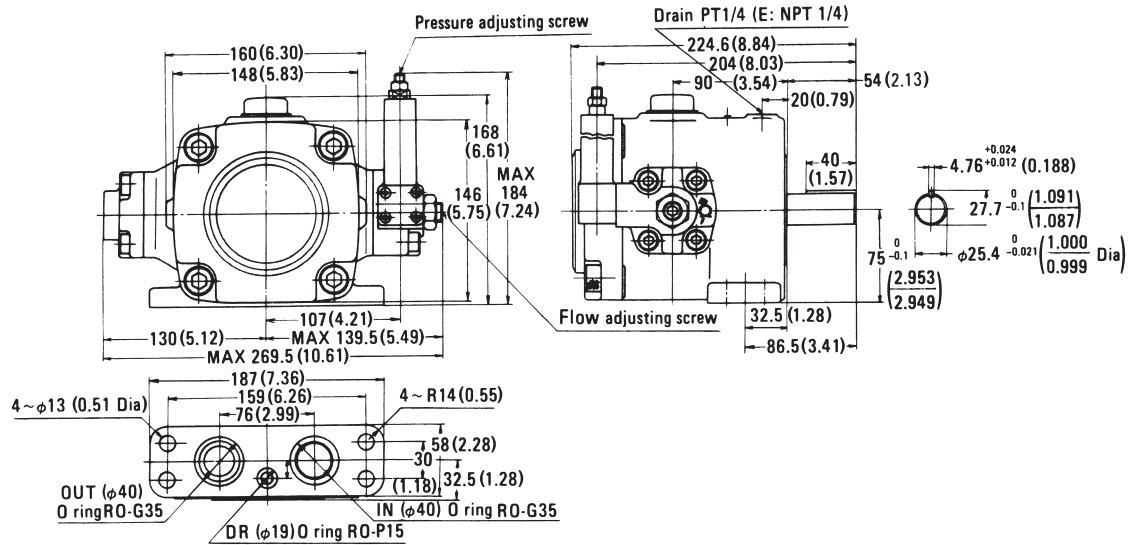


Installation Dimension Drawings

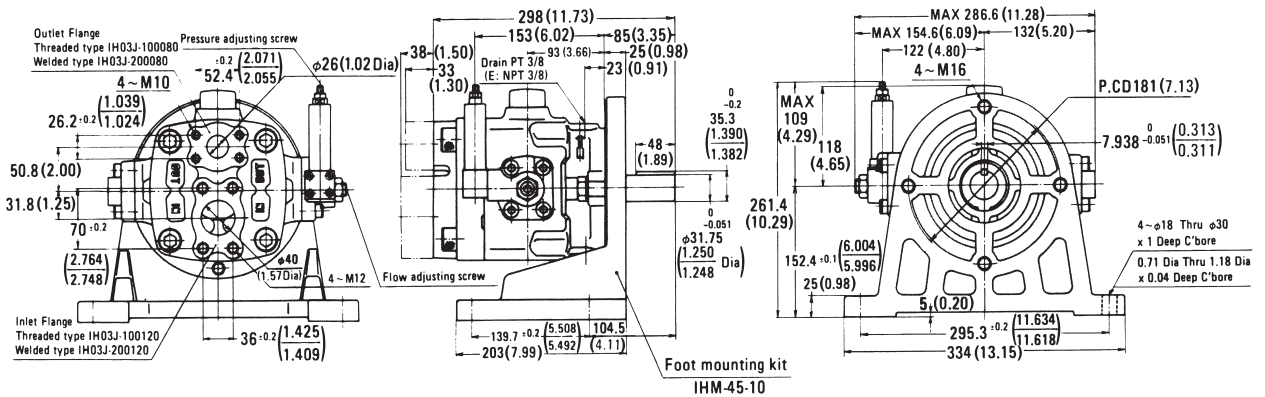
VDC-1A-*A*-*20 mm(inch)



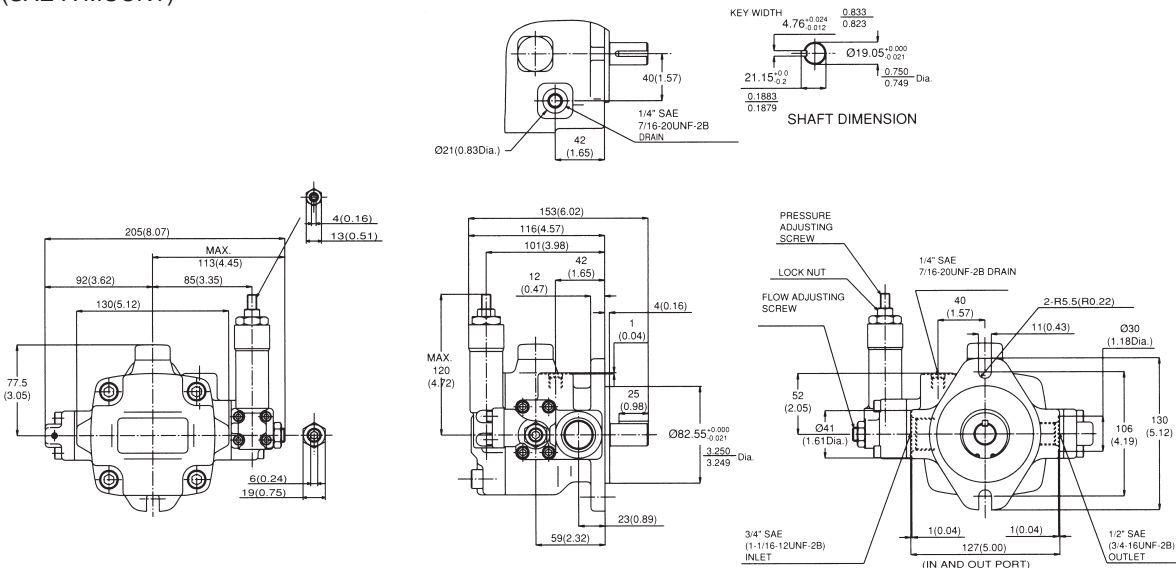
VDC-2A-*A*-*20 mm(inch)



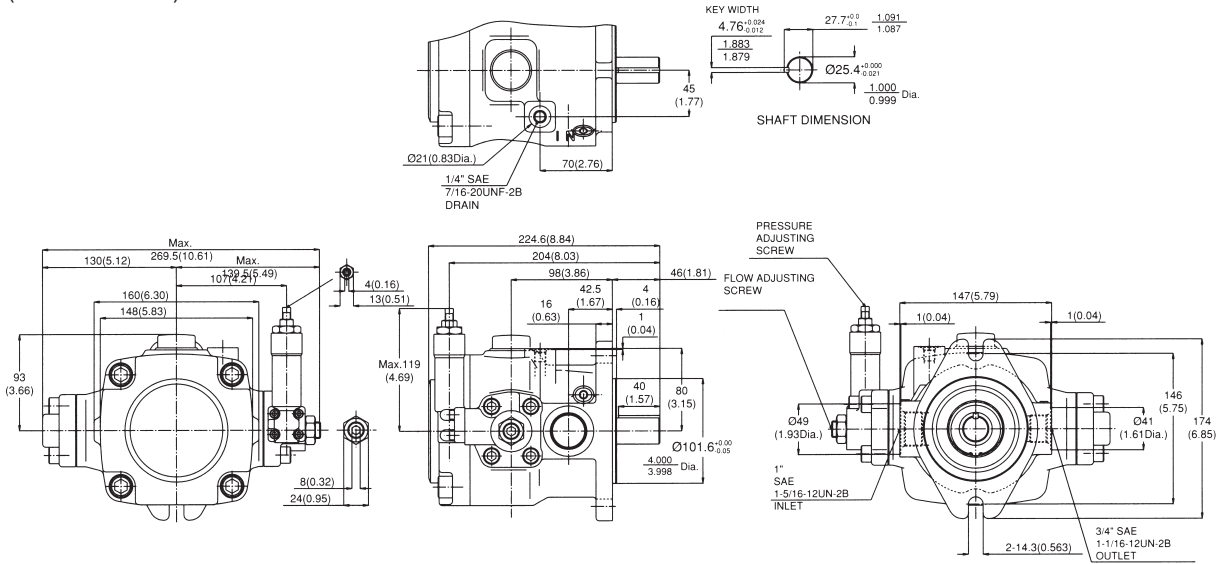
VDC-3A-1A*-*20 mm(inch)



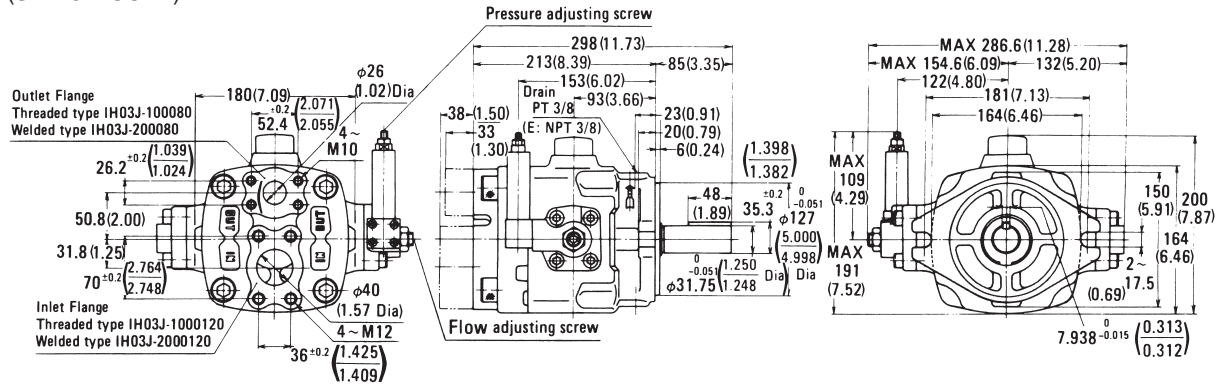
VDC-1B-*A*-*E35 (SAE-A MOUNT)



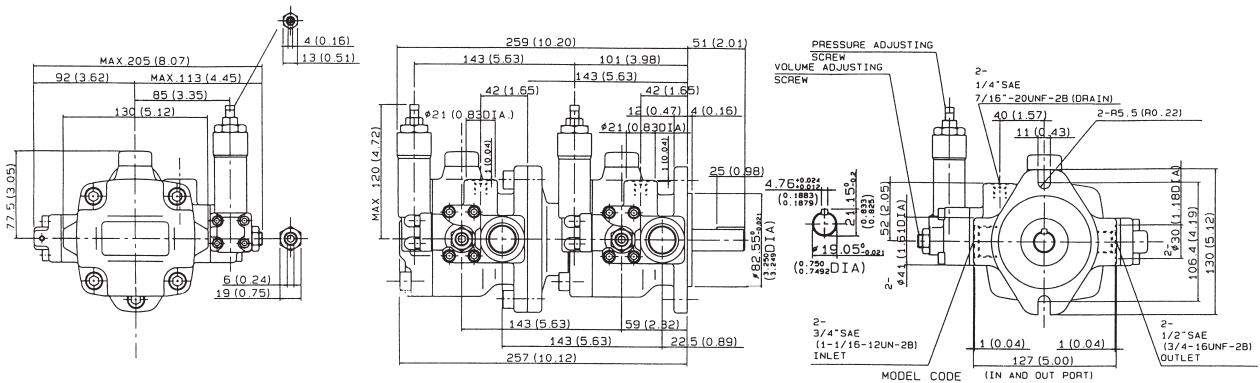
VDC-2B-*A*-E35
(SAE-B MOUNT)



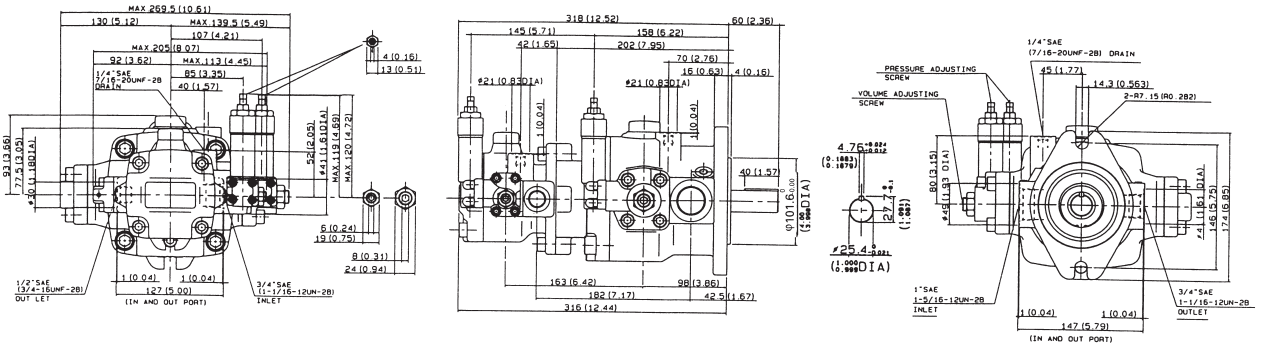
VDC-3B-A*-20 mm(inch)
(SAE-C MOUNT)



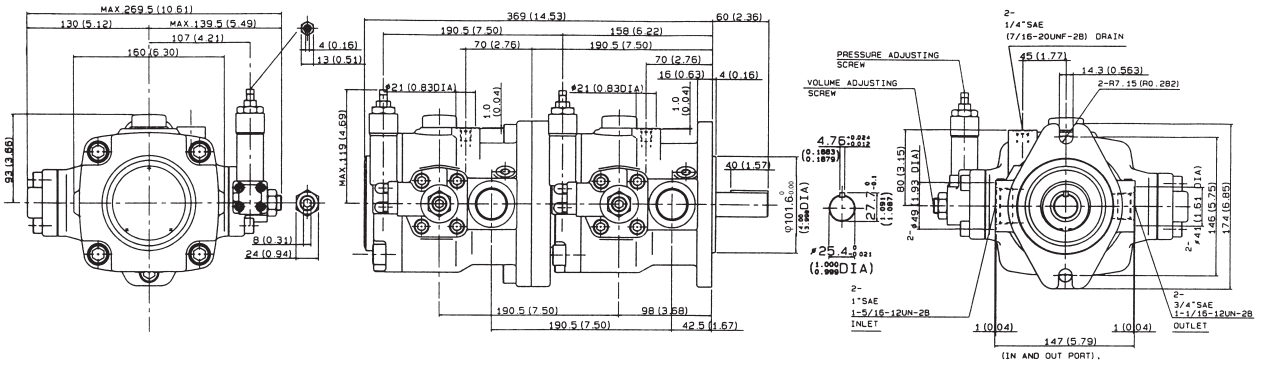
VDC-11B-*A*-*A*-E35 mm(inch)



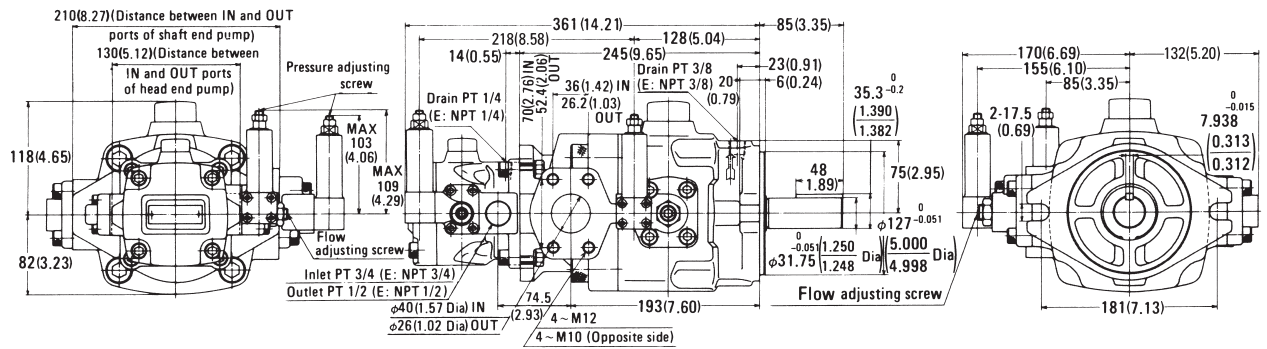
VDC-12B-*A*-*A*-E35 mm(inch)



VDC-22B-*A*-*A*-E35 mm(inch)

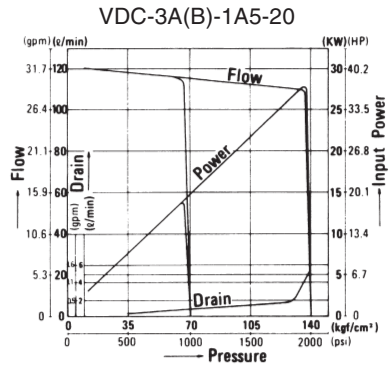
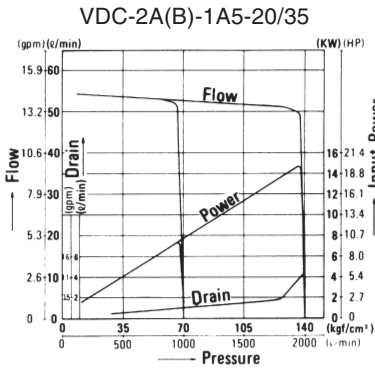
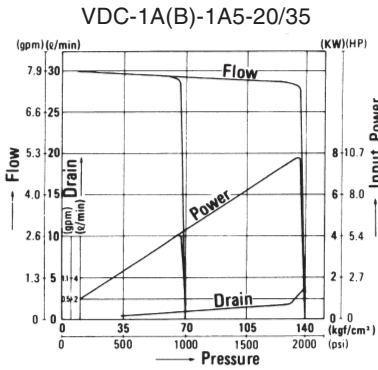
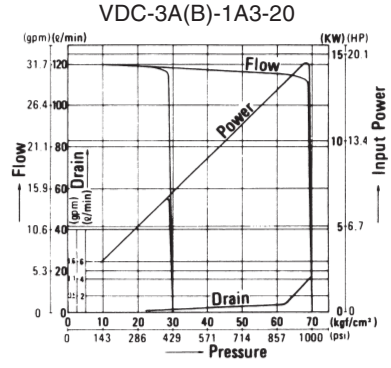
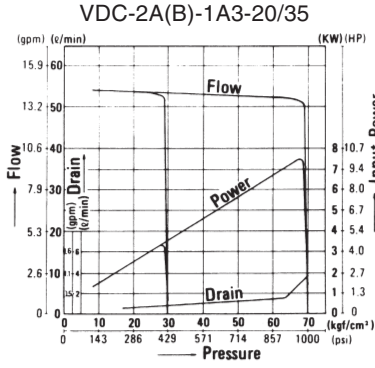
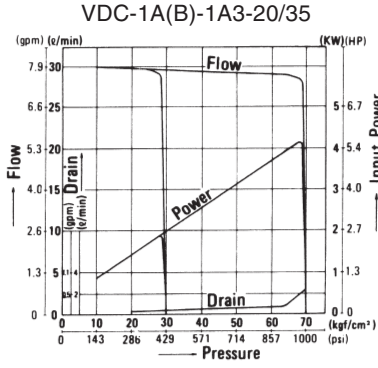


VDC-13B-*A*-*A*-*20 mm(inch)

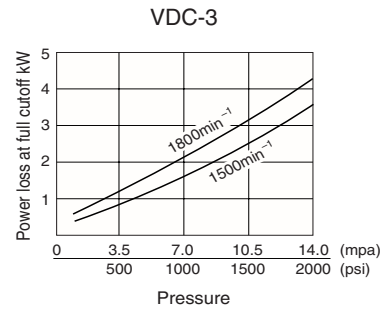
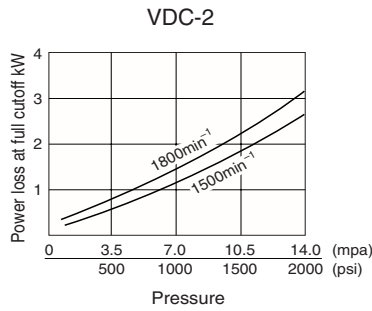
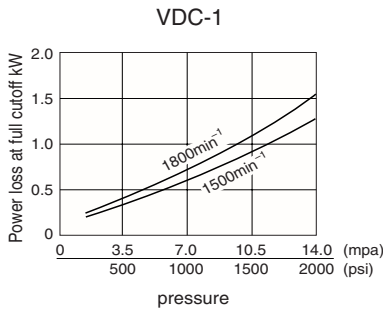


Performance Curves

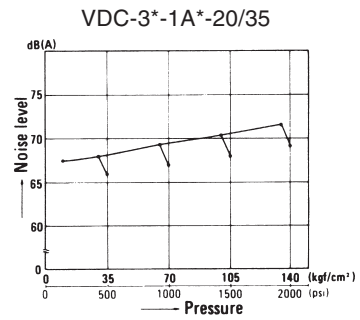
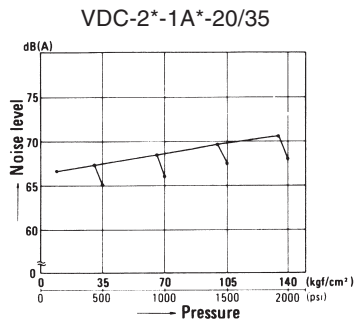
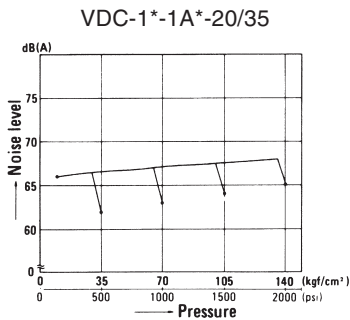
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s



Power loss



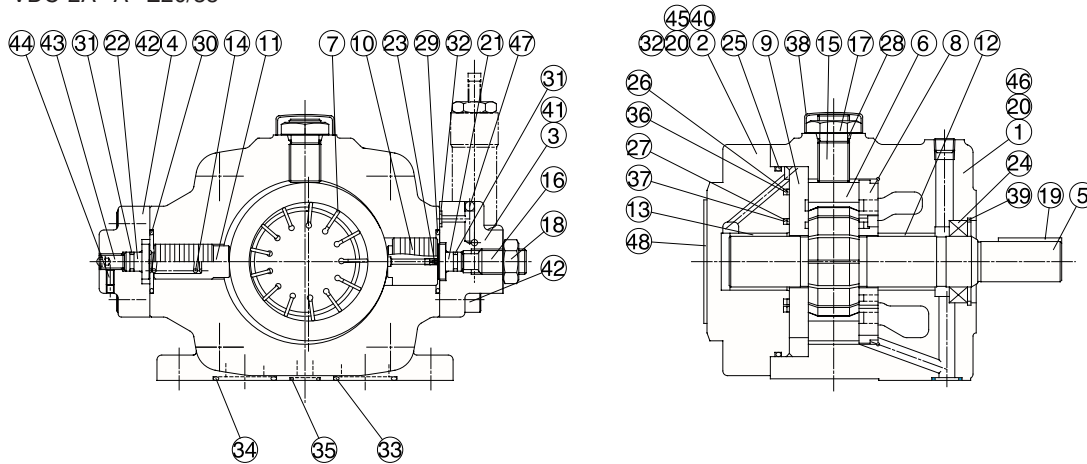
Noise Characteristics



Cross-sectional Drawing

VDC-1A-*A*-E20/35

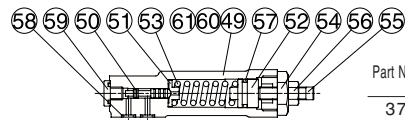
VDC-2A-*A*-E20/35



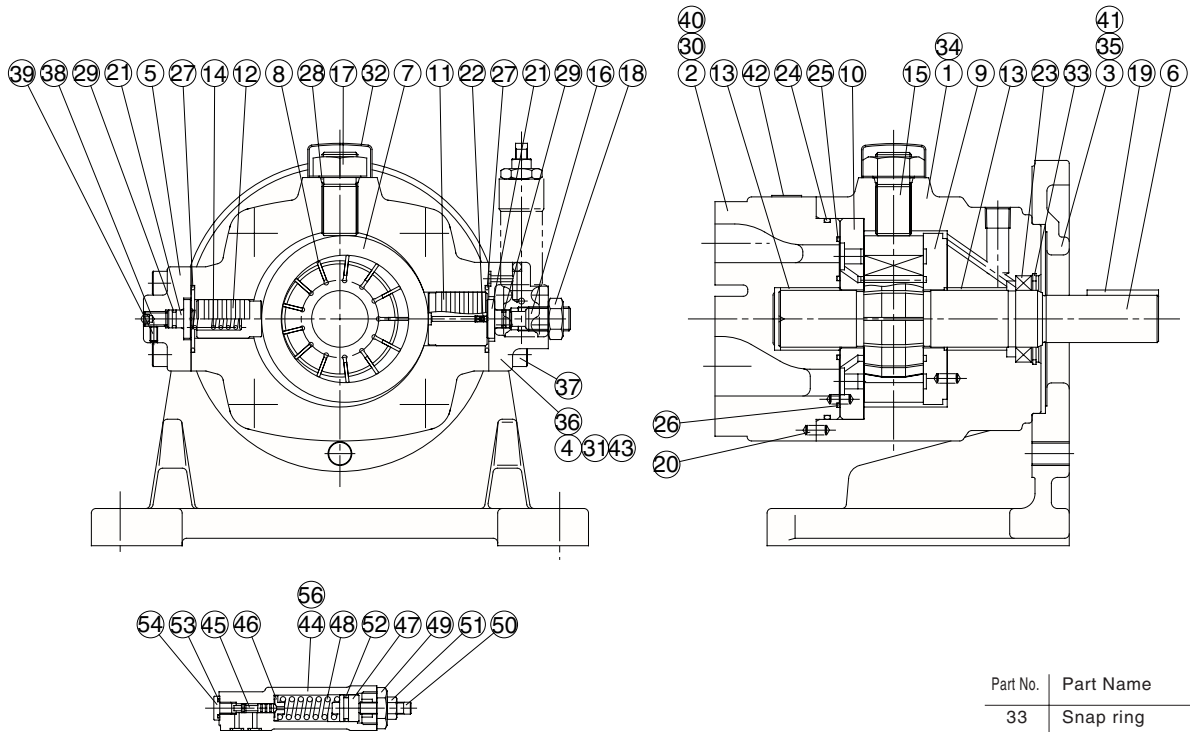
Seal Component Table (VDC-1*, VDC-2*)

Part No.	Applicable Pump Model No.	VDC-1A*-20		VDC-2A*-20	
	Seal Kit Number	VCBS-101A00		VCBS-102A00	
	Part Name	Part Number	Q'ty	Part Number	Q'ty
24	Oil seal	TCV-224211	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) Seal kit = VCBS-101A00 (VDC-1A)
 VCBS-101B00 (VDC-1B)
 VCBS-102A00 (VDC-2A)
 VCBS-102B00 (VDC-2B)



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



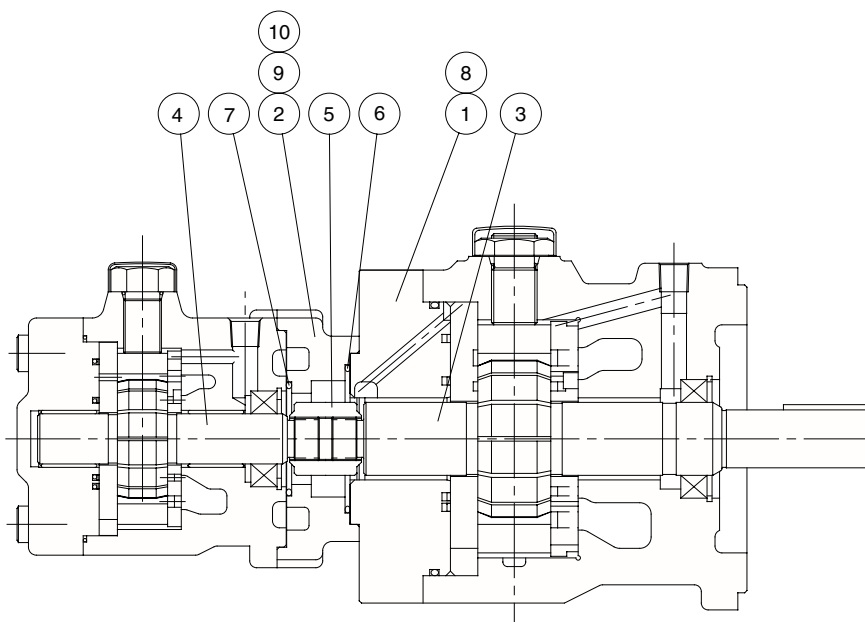
Seal Component Table (VDC-3*)

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) Seal kit = VCBS-103B00

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

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: Other parts are same as single pump.

List of Sealing Parts

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

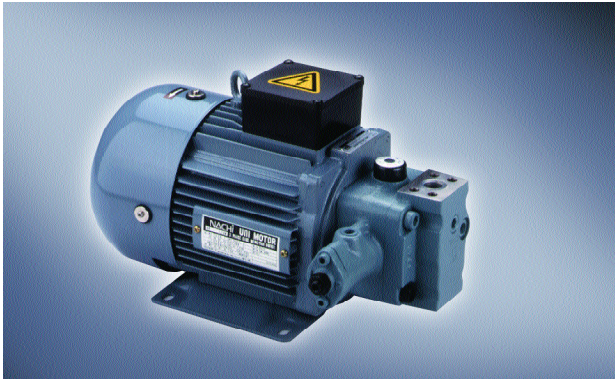
Note)

- See the description of the single pump for seal parts that are not included in the list.



UVN Series

Variable Volume Vane Uni-Pump



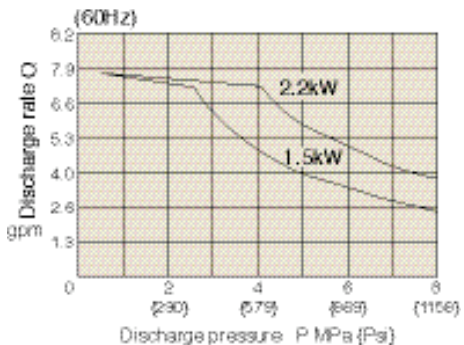
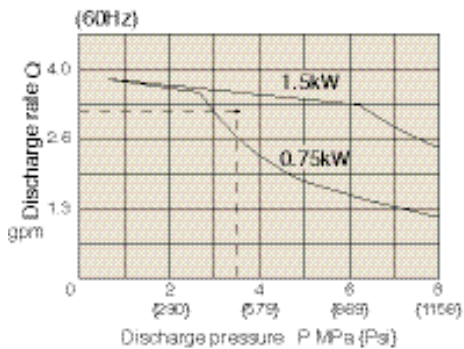
The New Uni-Pump All-in-One Pump and Motor

Get all of the power and almost none of the noise with our new Uni-Pump integrated variable vane pump and motor. Featuring our original pump and electromotor shaft connection, the Uni-Pump produces limited noise.

This compact, all-in-one type even consumes 40% less energy than standard models. Pump capacities up to 7.6gpm with 1160psi. Low heat generation results in a longer operation life.

Specifications

Model	Vane pump side		Motor side AC230V	Weight lbs.
	Delivery gpm at no load	Pressure Adjustment Range psi		
UVN-1A-0A2-0.7E-4M-11	3.8	219~562	1HPX4p	41.9
UVN-1A-0A2-1.5E-4M-11			2HPX4p	48.5
UVN-1A-0A3-0.7E-4M-11		510~872	1HPX4p	41.9
UVN-1A-0A3-1.5E-4M-11			2HPX4p	48.5
UVN-1A-0A4-0.7E-4M-11		802~1165	1HPX4p	41.9
UVN-1A-0A4-1.5E-4M-11			2HPX4p	48.5
UVN-1A-1A2-1.5E-4M-11	7.6	219~582	2HPX4p	48.5
UVN-1A-1A2-2.2E-4M-11			3HPX4p	58.4
UVN-1A-1A3-1.5E-4M-11		510~872	2HPX4p	48.5
UVN-1A-1A3-2.2E-4M-11			3HPX4p	68.4
UVN-1A-1A4-1.5E-4M-11		802~1165	2HPX4p	48.5
UVN-1A-1A4-2.2E-4M-11			3HPX4p	68.4



Motor Selection Method

The available range in the the rated output of each motor is shown below the output curve of each motor in the graph.

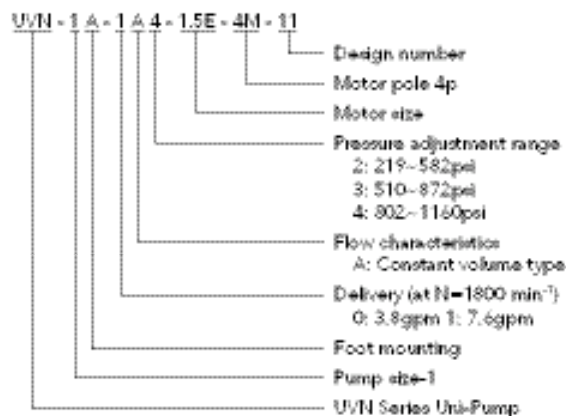
(Example)

Find the motor to be used at a pressure of 3.5MPa (507psi) discharge rate of 3.2gpm and frequency of 60Hz.

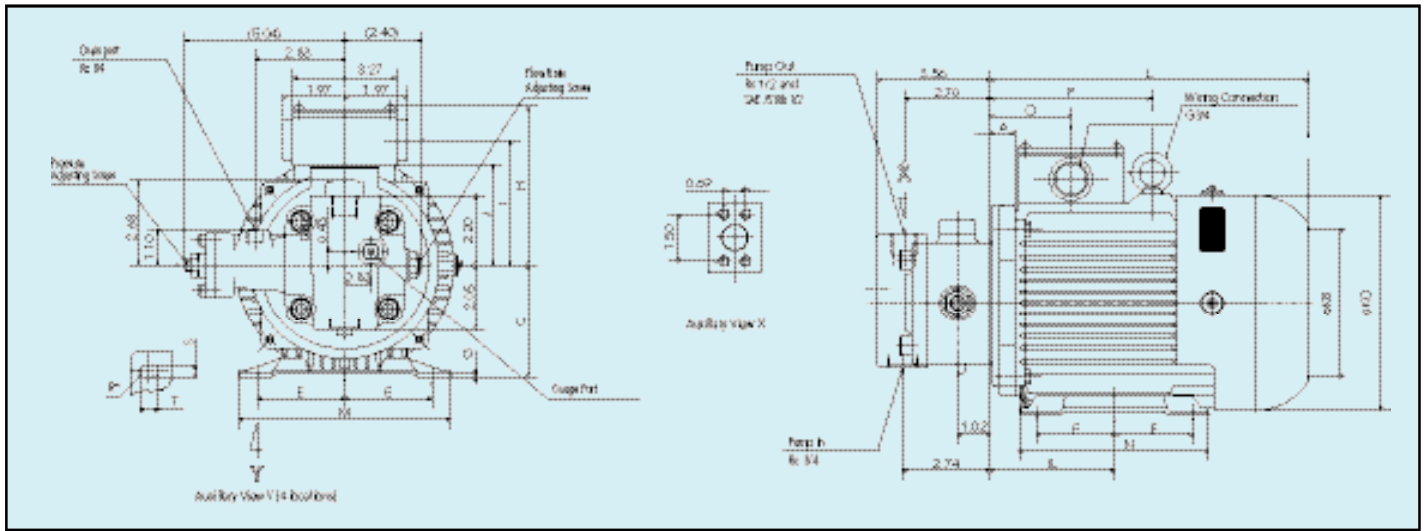
(Solution)

As illustrated by the broken line in the graph, you are looking for the motor located above the crossing port between the pressure of 3.5MPa (507psi) and discharge rate of 3.2gpm.

Model Code



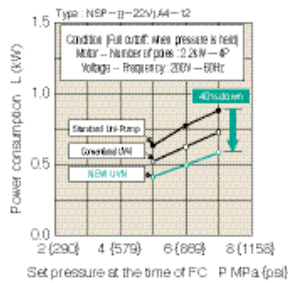
Dimensional Drawings



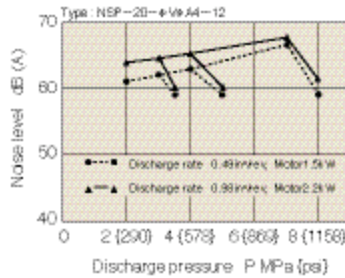
Model	Dimensions (Inch)																	
	A	IL	C	KD	E	F	G	H	J	L	M	N	TXS	R*	KB	O	P	I
UVN-1A-*A*-0.7E-4M-11	0.79	3.54	3.15	6.18	2.46	1.97	0.09	4.72	2.80	9.06	6.10	4.72	0.59X0.39	0.20	4.33	2.56	5.12	3.62
UVN-1A-*A*-1.5E-4M-11	0.79	3.94	3.54	6.89	2.76	2.46	0.13	5.04	3.07	10.04	6.69	5.91	0.59X0.39	0.20	4.72	2.56	5.12	3.94
UVN-1A-*A*-2.2E-4M-11	0.79	4.33	3.94	7.68	3.15	2.76	0.13	5.43	3.46	11.22	7.87	6.50	0.67X0.47	0.24	5.28	2.56	5.31	4.33

Performance Characteristics - When being used as NSP power unit with radiator

Power Consumption



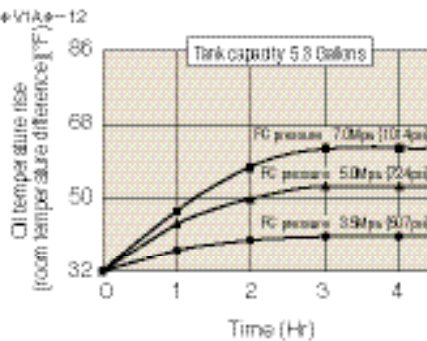
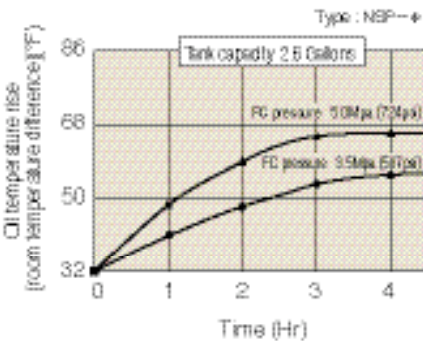
Noise Characteristics



Conditions

The value in the left-hand drawing represents typical characteristics under the following conditions:
 Oil used: ISO VG32 or its equivalent
 Oil temperature: 104 +/- 41°F
 Measuring distance: 3.3 feet around the unit
 Note:
 The noise characteristics depend on the installation floor base conditions and the presence of the surrounding substance reflecting the sound, and so may be different from the above description in some cases.

Oil Temperature Characteristics



Conditions

The value on the left-hand drawing represents typical characteristics under the following conditions:
 Oil used: ISO VG32 or its equivalent
 Speed: 1800 min⁻¹
 Room temperature: 84°F
 Motor: 0.75~2.2kW
 Notes:
 1. For 5.0MPa (724psi) of a 2.6 gallon tank. It should be noted that there is a big rise in oil temperature under continuous operation. In this case, we recommend use of a 5.3 gallon tank.
 2. Rise of oil temperature depends on the conditions of using an actual machine, and so may be different from the above description in some cases.



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