

### VDR Design Series Variable Volume Vane Pump

7.9 gpm at 2030 psi  
10.5 gpm at 1000 psi

#### Features

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

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

##### High-precision instantaneous response

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

ensures instantaneous, stable, high-precision operation.

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

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

##### Reduced power loss

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

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

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

#### Specifications

##### Single Pump

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

##### Double Pump

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

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

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

#### • Handling

##### 1 Rotation Direction

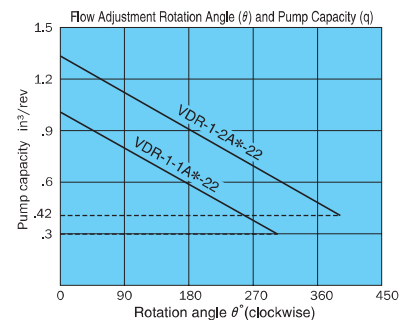
The direction of rotation is always clockwise (rightward) when viewed from the shaft side.

##### 2 Drain

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

##### 3 Discharge Volume Adjustment

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



(continued on following page)

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

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

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

Note:

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

4 Pressure Adjustment

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

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

5 Factory Default P-Q Settings (Standard Model)

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

6 Thrust Screw

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

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

7 Initial Operation

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

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

8 Sub Plate

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

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

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

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

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

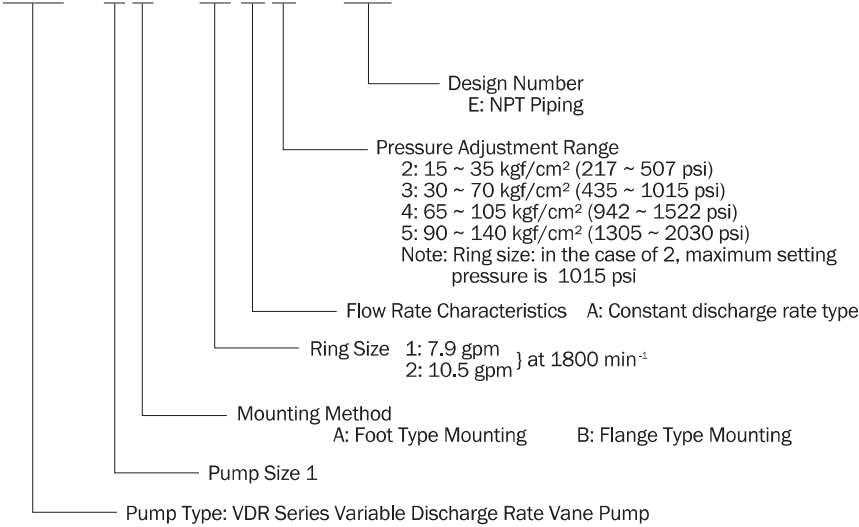
Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.

(Continued on following page)

## Understanding Model Numbers

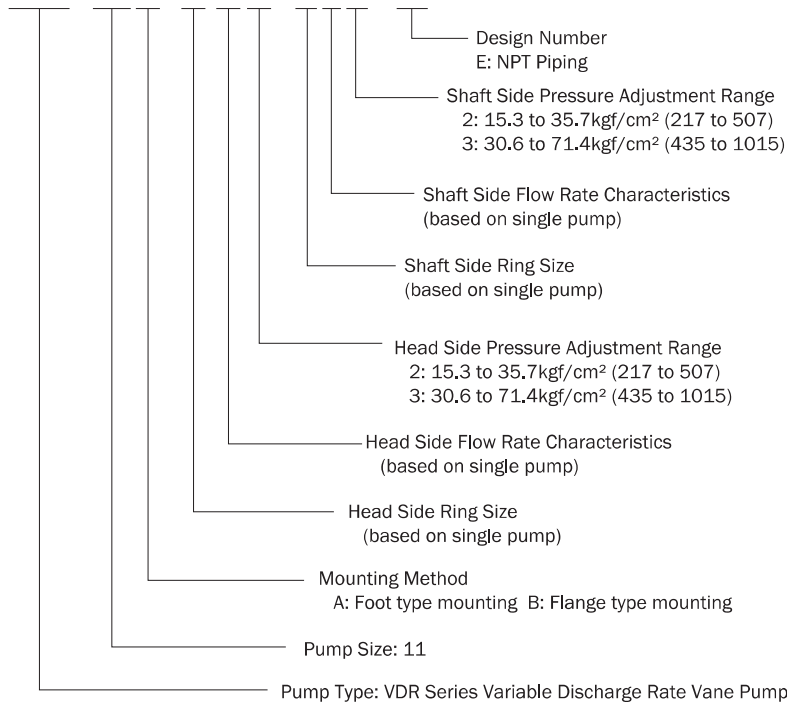
### Single Pump

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



### Double pump

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



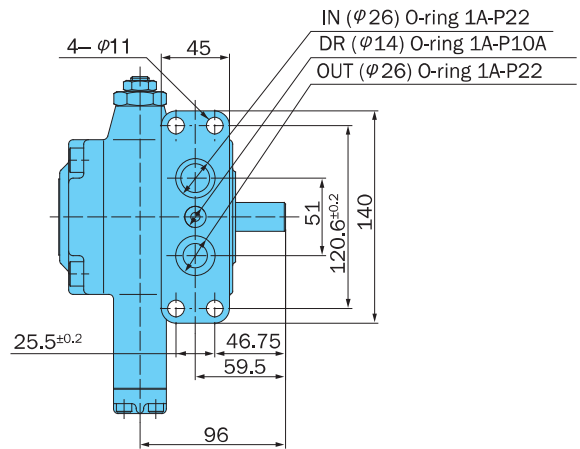
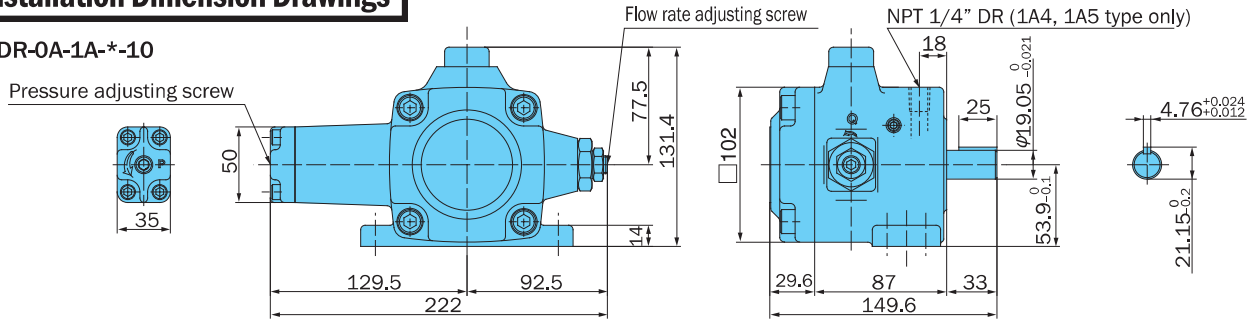
- 13 Provide a suction strainer with a filtering grade of about 100 μm (150 mesh). For the return line to the tank, use a 10μm line filter.
- 14 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water or other foreign matter, 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. See page C-13 for more information.

- 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 0.001 in. Use a pump mounting base of sufficient rigidity. The angle error should be no greater than 1°.

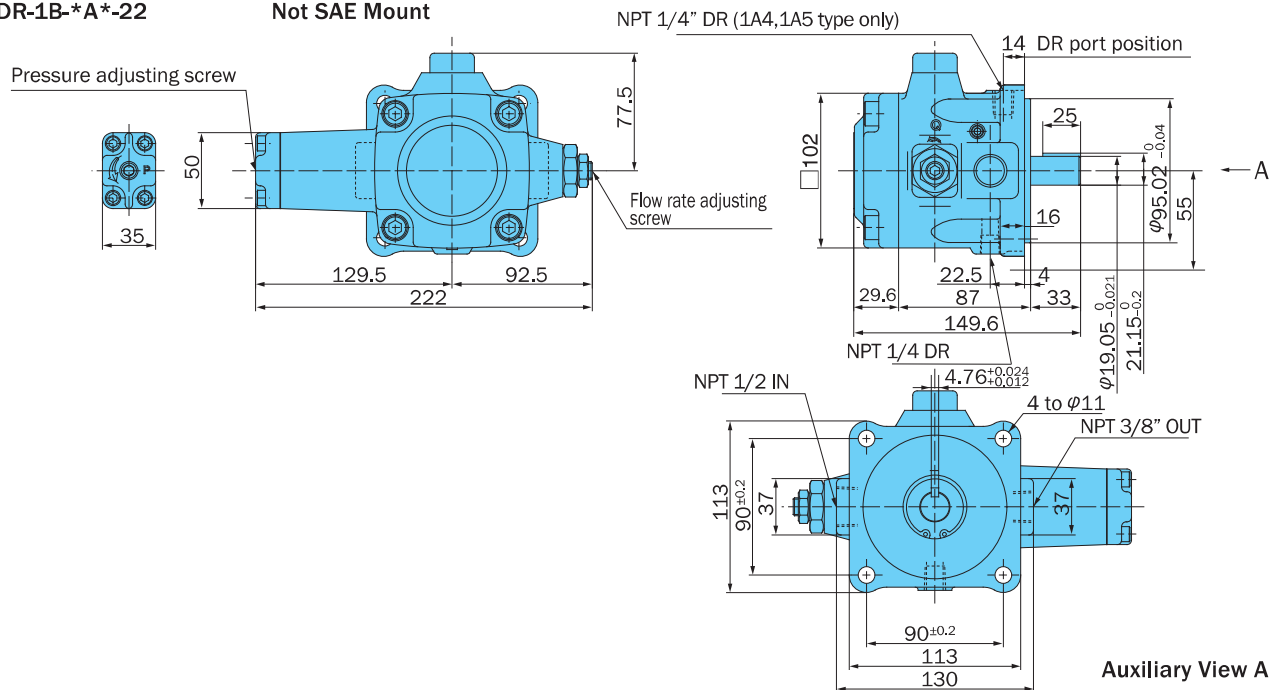
**Installation Dimension Drawings**

VDR-0A-1A-\* -10

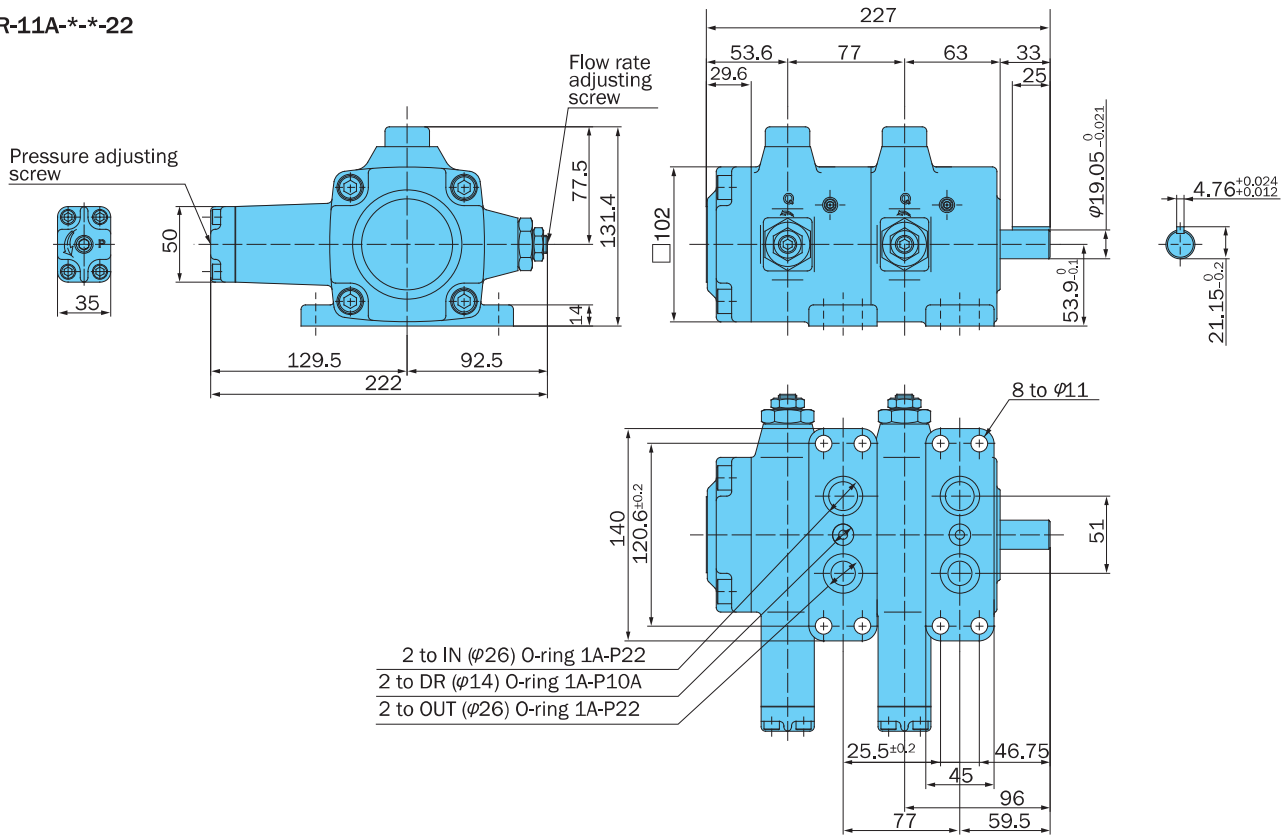


VDR-1B-\*A\* -22

Not SAE Mount

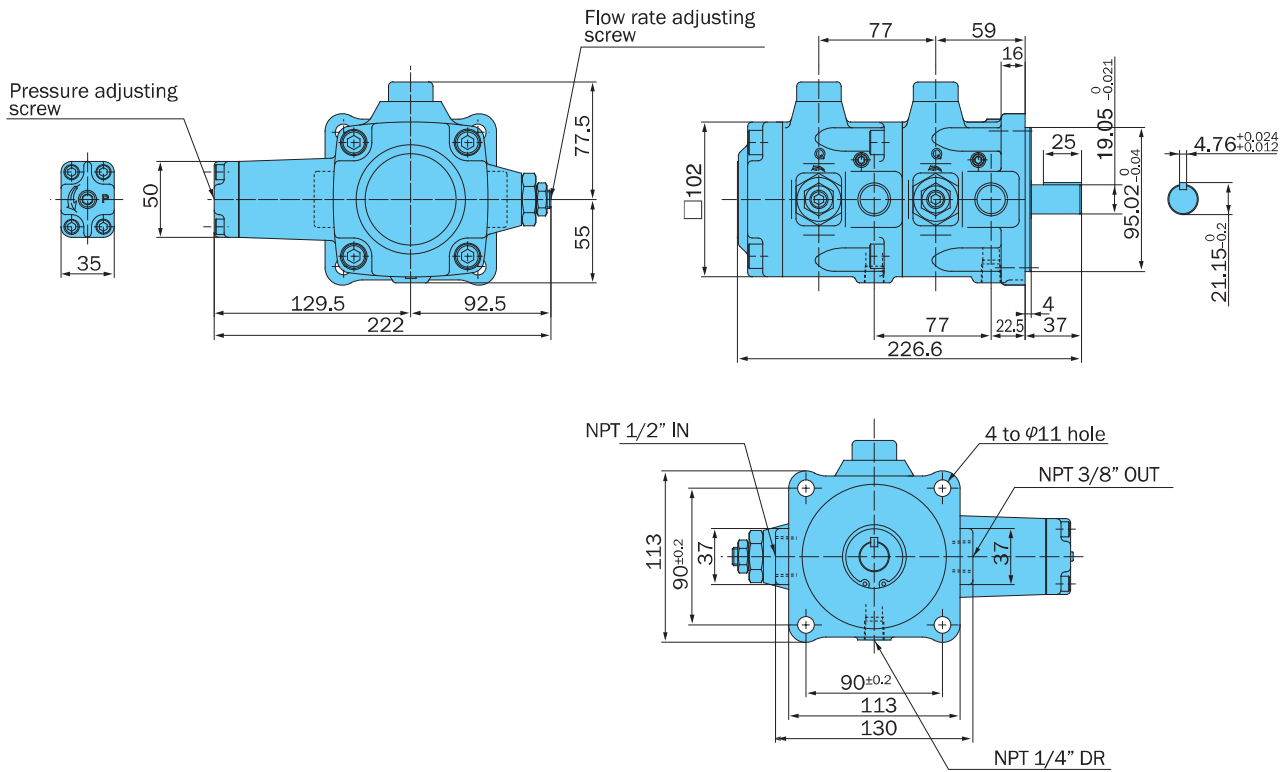


VDR-11A-\*. \*-22



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

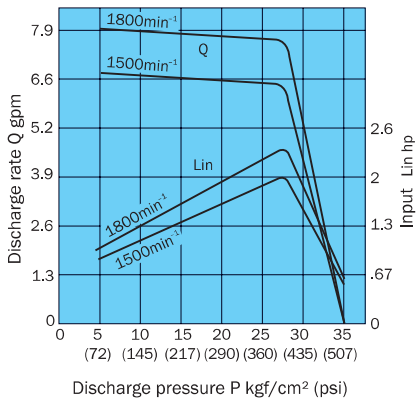
Not SAE Mount



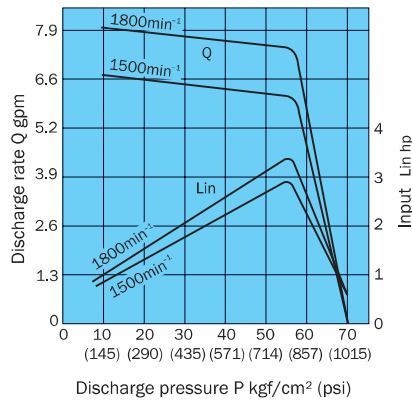
# Performance Curves

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

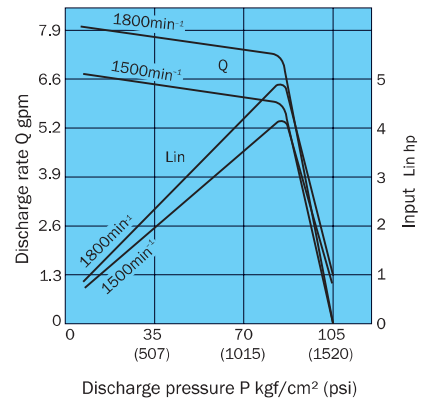
VDR-1\*-1A2-22



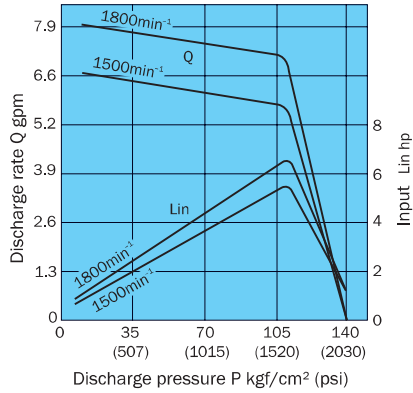
VDR-1\*-1A3-22



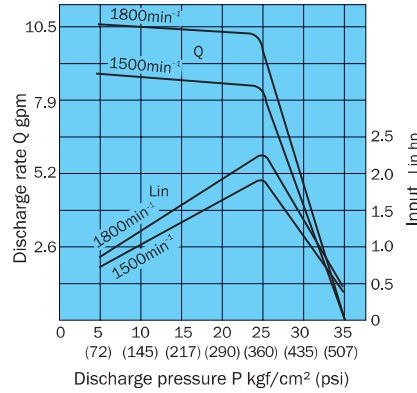
VDR-1\*-1A4-22



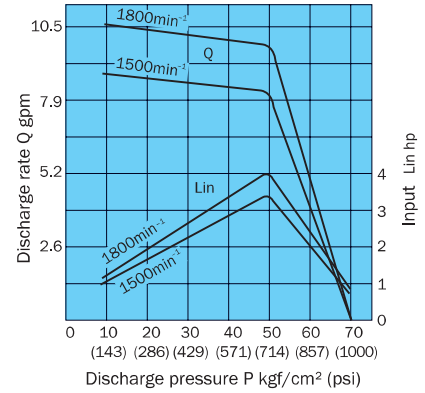
VDR-1\*-1A5-22



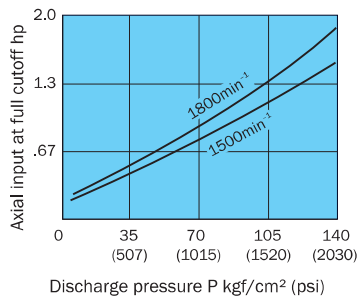
VDR-1\*-2A2-22



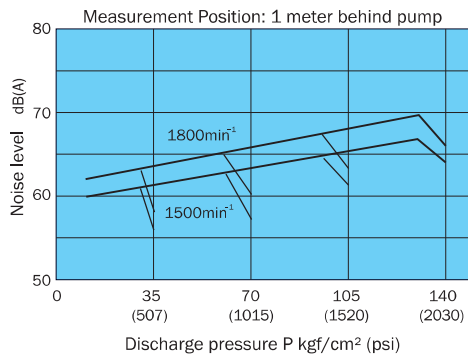
VDR-1\*-2A3-22



Axial Input At Full Cutoff

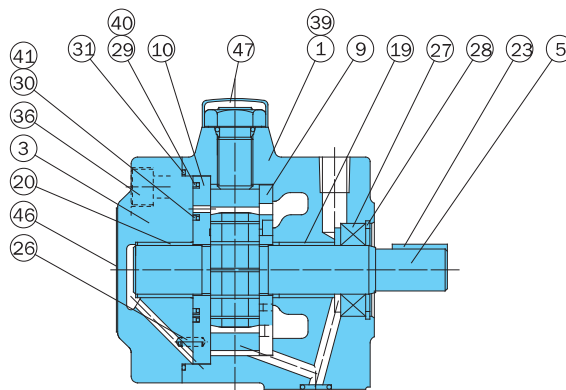
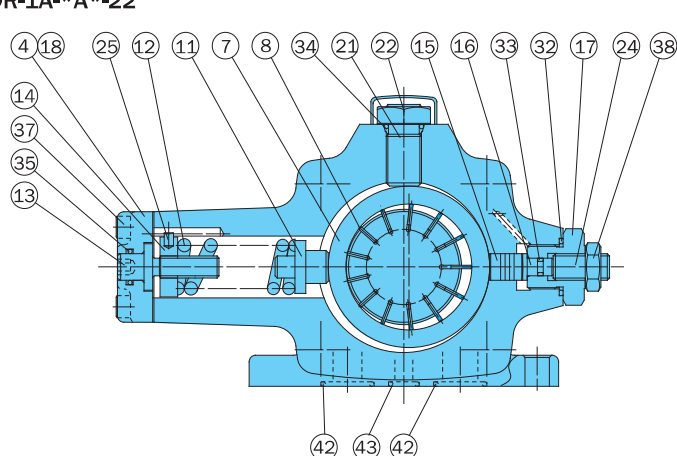


Noise Characteristics



## Cross-Sectional Drawing

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



### List of Sealing Parts

#### Single Pump

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

Note:

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

#### Double Pump

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

Note:

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

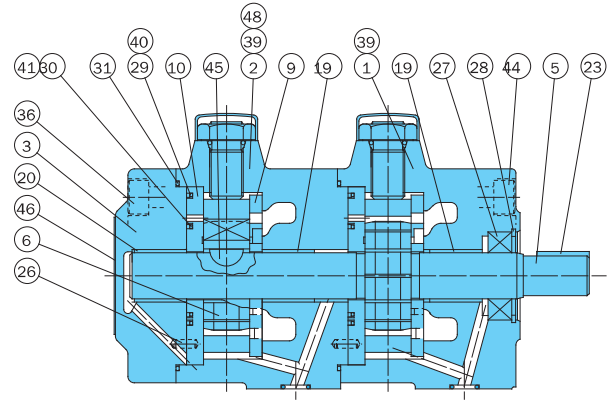
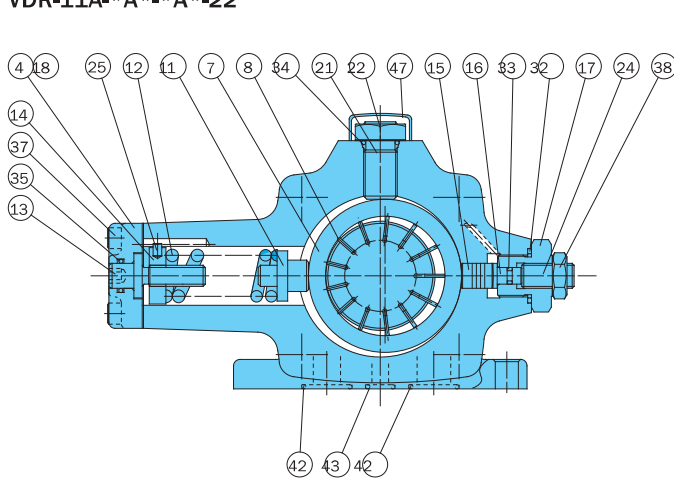
Part No.	Part Name	Part No.	Part Name
1	Body (A)	25	Pin
2	Body (B)	26	Spring pin
3	Cover	27	Oil seal
4	Cover	28	Snap ring
5	Shaft	29	Backup ring
6	Rotor	30	Backup ring
7	Ring	31	O-ring
8	Vane	32	O-ring
9	Plate (S)	33	O-ring
10	Plate (H)	34	O-ring
11	Piston	35	O-ring
12	Spring	36	Screw
13	Screw	37	Screw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

Cartridge Kit:

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

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

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

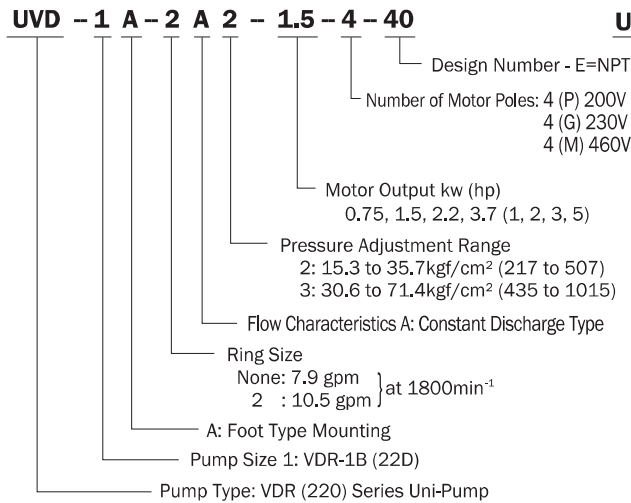


**Uni-Pump Specifications**

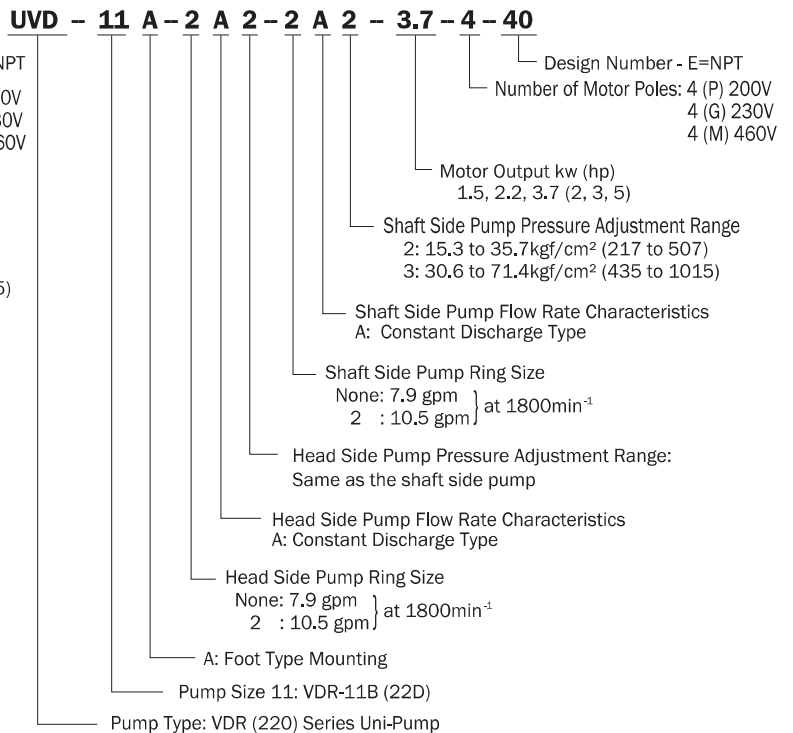
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**Understanding Model Numbers**

**Single Pump**



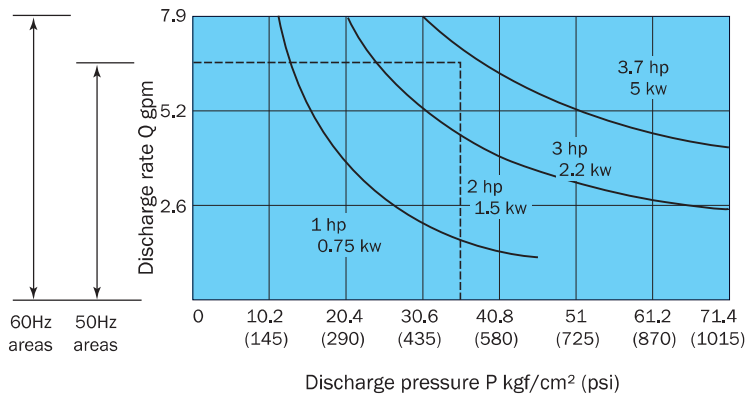
**Double Pump**



**Specifications**

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

**Motor Selection Curves**



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

**• Selecting a motor**

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

Example:

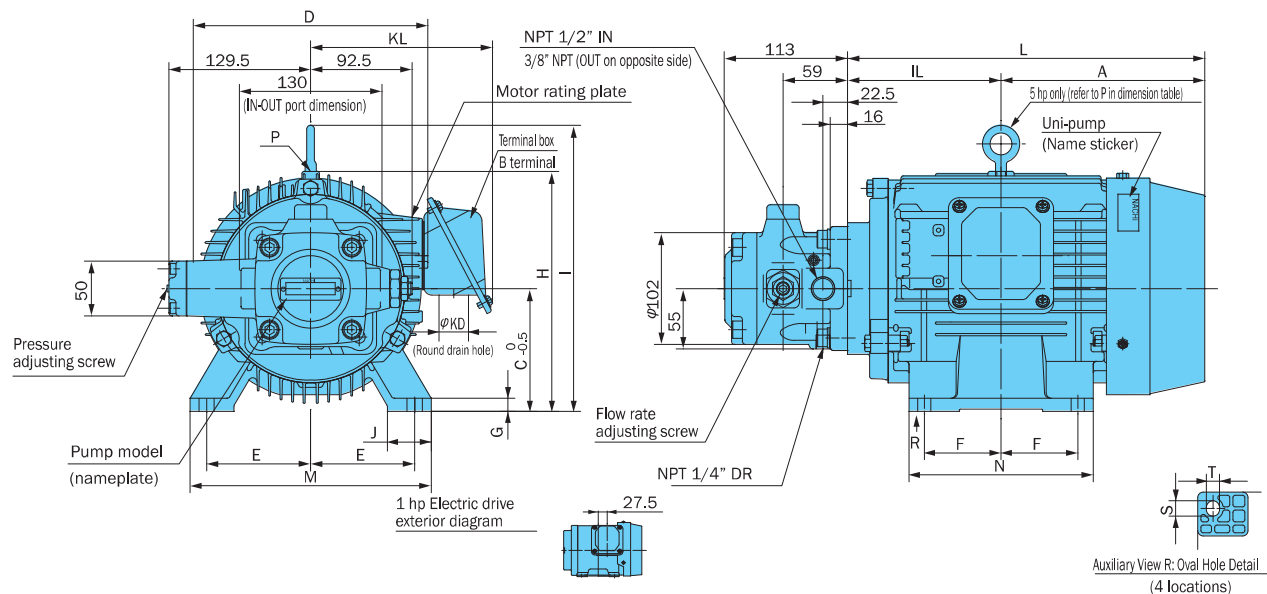
To find the motor that can produce pressure of 435 psi and a discharge rate of 6.6 gpm.

Selection Process:

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

**Installation Dimension Drawings**

**UVD-1A**



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

1 - 3 hp model does not have hangers.

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

2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.

3. Standard terminal box is B terminal (right side viewed from pump).

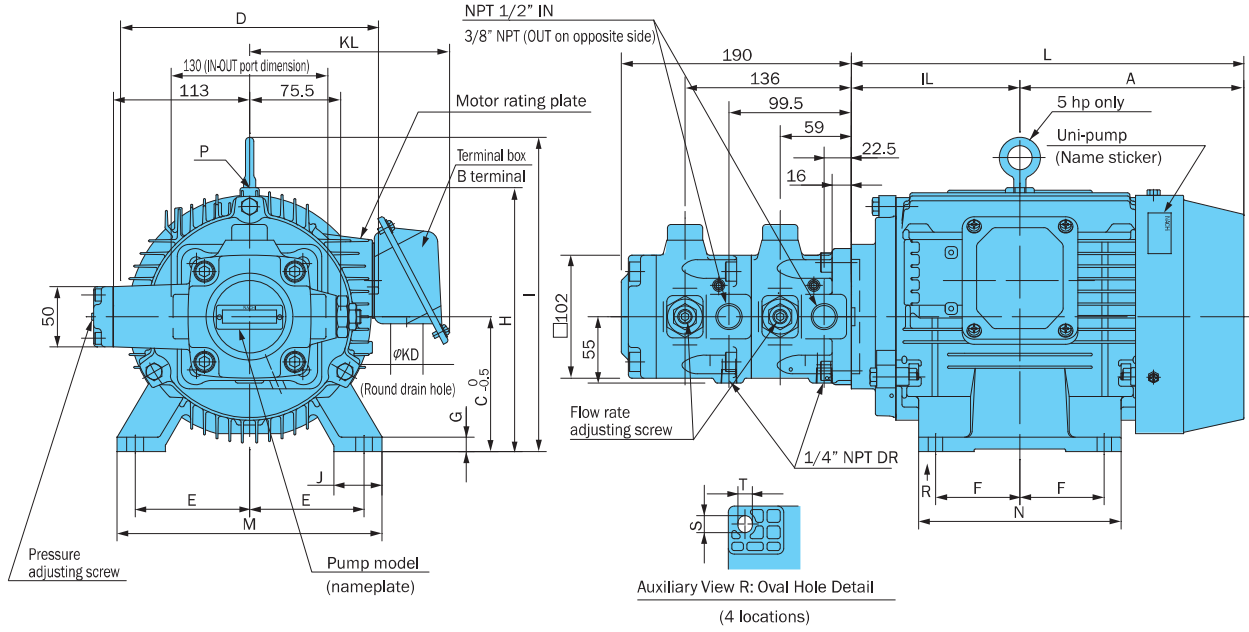
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).



UVD-11A

B

Vane Pumps



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

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