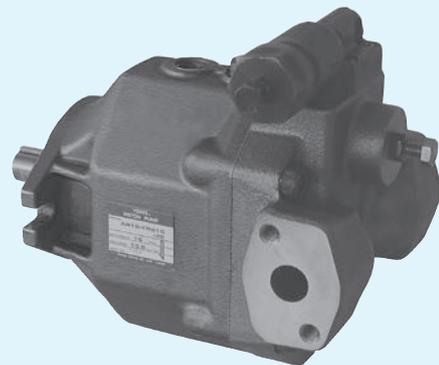
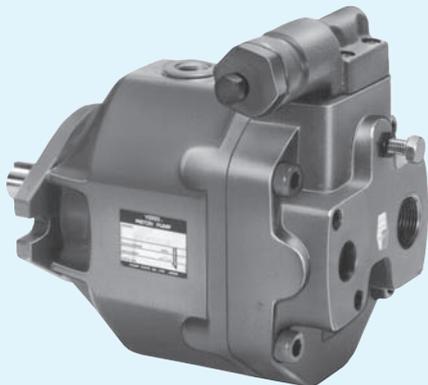


# AR Series Variable Displacement Piston Pumps



■ “AR” Series Variable Displacement Piston Pumps

Pump Type	Graphic Symbol	Geometric Displacement cm <sup>3</sup> /rev						Maximum Operating Pressure MPa	Page	
		1	2	5	10	20	50			100
 AR Series Variable Displacement Piston Pumps					AR16 AR22				16	18

## Hydraulic Fluids

### ■ Hydraulic Fluids

Use petroleum base oils such as anti-wear type hydraulic oils equivalent to ISO VG-32 or 46. The recommended viscosity range is from 20 to 400 mm<sup>2</sup>/s and temperature range is from 0 to 60 °C, both of which have to be satisfied for the use of the above hydraulic oils.

### ■ Control of Contamination

Due caution must be paid to maintaining control over contamination of the operating oil which can otherwise lead to breakdowns and shorten the life of the unit.

Please maintain the degree of contamination within NAS Grade 10.

The suction port must be equipped with at least a 100 μm (150 mesh) reservoir type filter and the return line must have a line type filter of under 10 μm.

## Instructions

### ■ Mounting

When installing the pump the filling port should be positioned upwards.

### ■ Alignment of Shaft

Employ a flexible coupling whenever possible, and avoid any stress from bending or thrust.

Maximum permissible misalignment is less than 0.1 mm TIR and maximum permissible misangular is less than 0.2°.

### ■ Suction Pressure

Permissible suction pressure at inlet port of the pump is between -16.7 and +50 kPa .

For piping to the suction port, use the pipes of the same diameter as that of the specified pipe flange to be used.

Make sure that the height of the pump suction port is within one metre from the oil level in the reservoir.

### ■ Hints on Piping

When using steel pipes for the suction or discharge ports, excessive load from the piping to the pump generates excessive noise.

Whenever there is fear of excessive load, please use rubber hoses.

### ■ Suction Piping

In case the pump is installed above the oil level, the suction piping and suction line filter should be located lower than the pump position to prevent air in the suction line.

### ■ Drain Piping

Install drain piping according to the chart and ensure that pressure within the pump housing should be maintained at a normal pressure of less than 0.1 MPa and surge pressure of less than 0.5 MPa.

Length of piping should be less than 1 m, and the pipe end should be submerged in oil.

In case AR16 and AR22 pump, a screw-in torque of fitting is 40 to 50 Nm. Do not apply bending and thrust torque to the fitting.

[Recommended Drain Piping Size]

Model	Fitting Size	Inside Dia. of Pipe
AR16, AR22	3/8 (Inside Dia. 8.5 mm or more)	10 mm

### ■ Bleeding Air

It may be necessary to bleed air from pump case and outlet line to remove causes of vibration. An air bleed valve (Model Number ST1004-\*-10\*, Page 265) is recommended for this purpose.

## Starting

Before first starting, fill pump case with clean operating oil via the filling port.

In order to avoid air blockage when first starting, adjust the control valves so that the discharged oil from the pump is returned direct to the reservoir or the actuator moves in a free load.

[Volume of Pre-fill Oil Required]

Model	Volume cm <sup>3</sup>
AR16 AR22	430

## Setting Discharge Pressure and Delivery

At the time of shipment, the unit has been preset to maximum delivery and minimum discharge pressure.

Adjust the preset delivery and pressure to meet your system requirements.

### Adjustment of Discharge Pressure

Turning the adjustment screw clockwise, increases pressure.

[ Volume adjusted by each full turn of the pressure adjustment screw ]

Model Numbers	Adjustment Volume MPa
AR16/AR22-FR01B	2.9
AR16/AR22-FR01C	5.4

### Adjustment of Delivery

Turning the delivery adjustment screw clockwise, decreases delivery.

[ The minimum adjustable flow and adjustable volume of each full turn of the delivery adjustment screw ]

Model Numbers	Adjustable volume with each full turn of the adjustment screw cm <sup>3</sup> /rev	Minimum adjustable flow cm <sup>3</sup> /rev
AR16	1.5	6
AR22	2.1	8.5

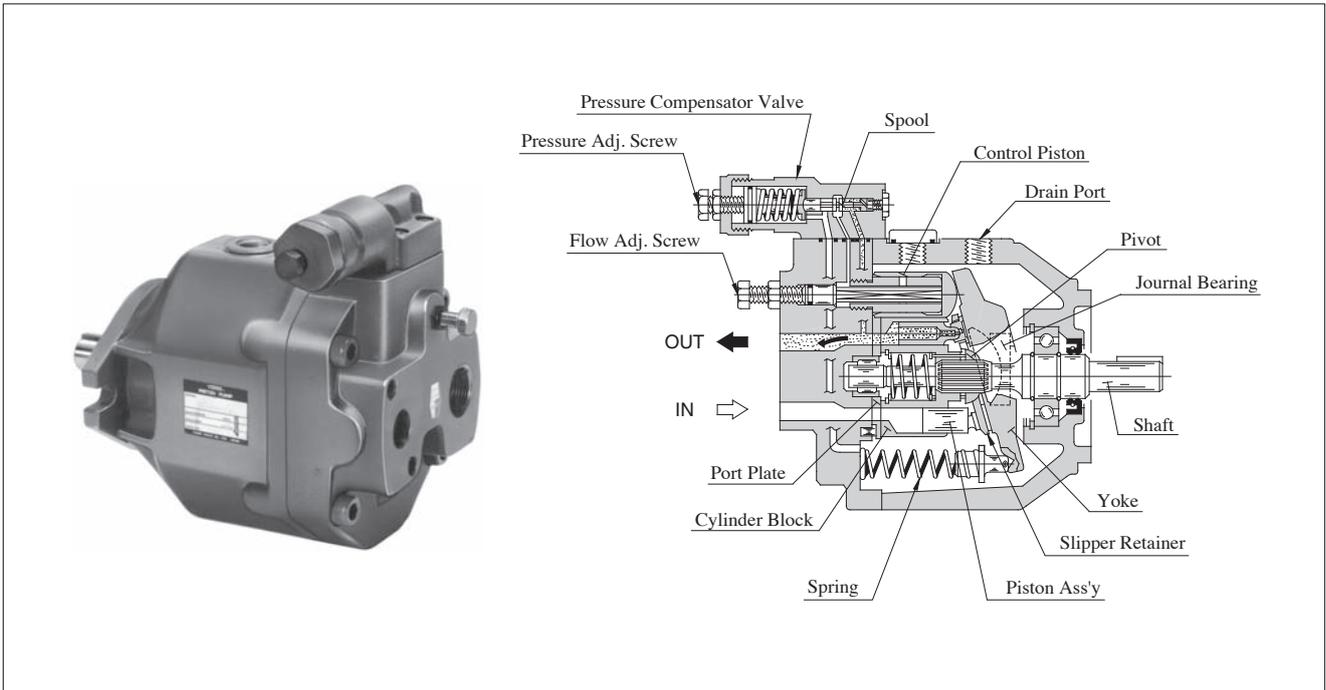
## Interchangeability in Installation between Current and New Design

Model change has been made on the following product.

The difference between current and new design has been described on the paragraph of “Interchangeability in Installation between Current and New Design.” Refer to relevant pages on each series.

Name	Model Numbers	Design Number		Interchangeability in Installation	Major Changes
		Current	New		
AR Series Variable Displacement Piston Pumps	AR *-FR01 * *	20	22	Yes	<ul style="list-style-type: none"> <li>Mass Increase by The Change of Materials. 9.8 kg → 11.8 kg, 12.5 kg</li> </ul>

# AR Series Variable Displacement Piston Pumps



## Features

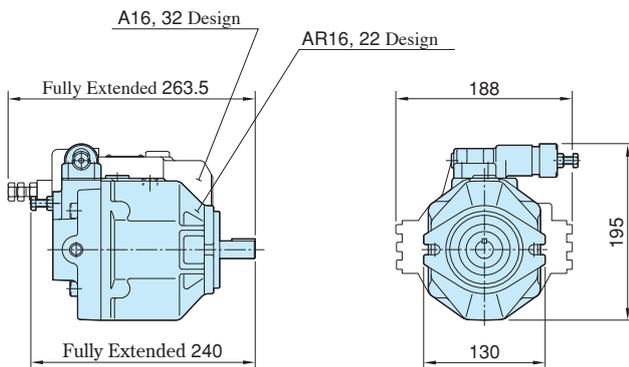
### Smaller in Size and Lighter in Mass

As indicated in the dimensional comparison presented below, the AR16 is smaller than the A16 (32 design). Also, the mass of AR16 is substantially lighter than the A16.

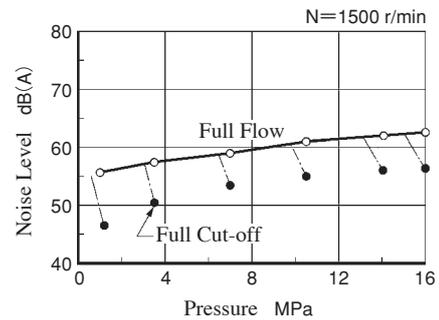
### Low Noise

The noise level of AR16 has been reduced at full flow and full cut-off compared with that of the excellent A16 quiet pump.

[Comparison of "AR16" with "A16"]



"AR16" type noise level characteristics (Example)



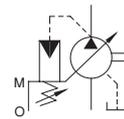
### High Reliability

Since it uses the internal parts of "A" series piston pumps that it belongs to abundant experience in sales performance with high reliability.

**AR Series Variable Displacement Piston Pumps, Pressure Compensator Type**



Graphic Symbol



**Specifications**

Model Numbers	Geometric Displacement cm <sup>3</sup> /rev	Min. Adj. Flow cm <sup>3</sup> /rev	Operating Pressure MPa		Shaft Speed Range r/min		Approx. Mass kg
			Rated	Intermittent <sup>★</sup>	Max.	Min.	
AR16-FR01 * * -22	15.8	6.0	16		1800	600	11.8
AR22-FR01 * * -22	22.2	8.5					12.5

★ When setting the pressure, make sure the full cut-off pressure never exceeds the maximum intermittent pressure.

**Model Number Designation**

AR16	-F	R	01	B	S	-22
Series Number	Mounting	Direction of Rotation	Control Type	Pres. Adj. Range	Port Position	Design Number
AR16 (15.8 cm <sup>3</sup> /rev)	F : Flange Mtg.	[Viewed from Shaft End]	01 : Pressure Compensator Type	B : 1.2~7 C : 2.0~16	None : Axial Port S : Side Port	22
AR22 (22.2 cm <sup>3</sup> /rev)		R : Clockwise (Normal)				22

**■ Pipe Flange Kits**

Pipe flange kits are available. When ordering, specify the kit number from table blow.

Pump Model Number	Name of Port	Pipe Flange Kit Numbers	
		Threaded Connection	Socket Welding
AR16-FR01	Suction	F5-06-A-1021	F5-06-B-1021
AR22-FR01	Discharge	— ★	— ★

★ Discharge port is available only for the threaded connections.

**Pipe Flange Kit for Suction Port : F5-06-<sup>A</sup>/<sub>B</sub>-1021**

**F5-06-A-1021**

**F5-06-B-1021**

Soc. Hd. Cap Screw (2 Pcs.) M10×45 Lg.

Soc. Hd. Cap Screw (2 Pcs.) M10×30 Lg.

Approx. Mass: 0.5 kg

Approx. Mass: 0.3 kg

**■ Mounting Bracket Kits**

Mounting bracket available on separate order.

Pump Model Numbers	Mtg. Bracket Kit Numbers	Approx. Mass kg
AR16-FR01 AR22-FR01	LP-1A-10	2.2

Note : The mounting bracket kit consists of a mounting bracket, two hex. bolts and two plain washers.

**Mtg. Bracket Kit : LP-1A-10**

Mtg. Bracket

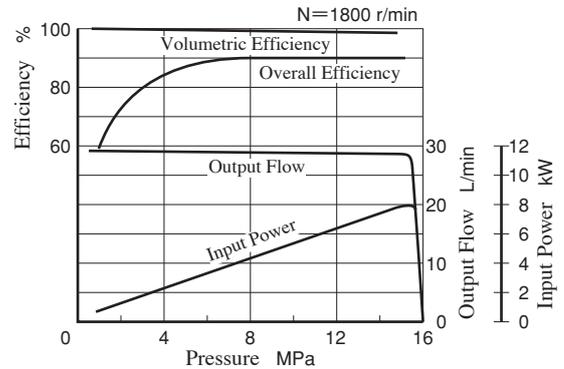
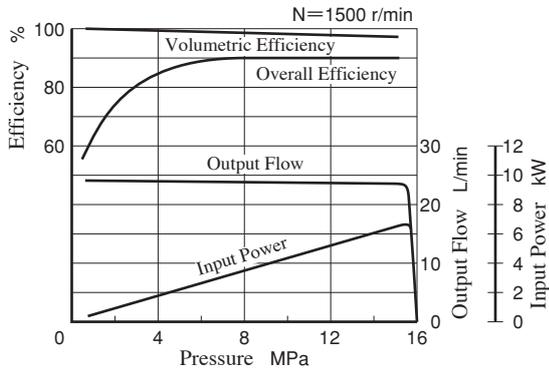
Hex. Bolt (2 Pcs.) M10×25 Lg.

Plain Washer (2 Pcs.)

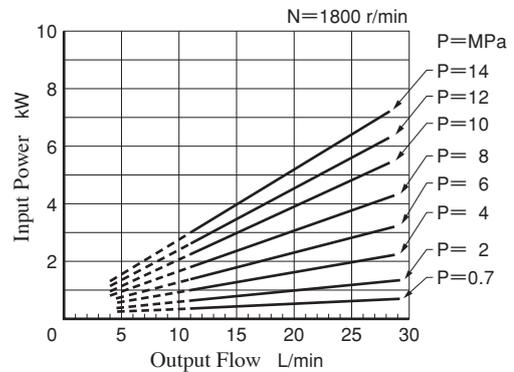
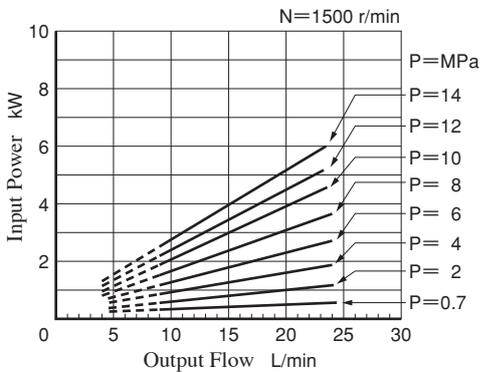
12 Dia. Through  
24 Dia. Spotface 4 Places

## Typical Pump Characteristics of Type AR16 at Viscosity 20 mm<sup>2</sup>/s [ISO VG32 Oils, 50°C]

### Performance Characteristic Curve

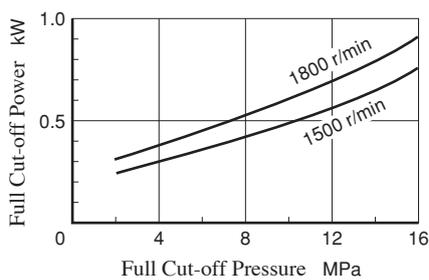


### Input Power

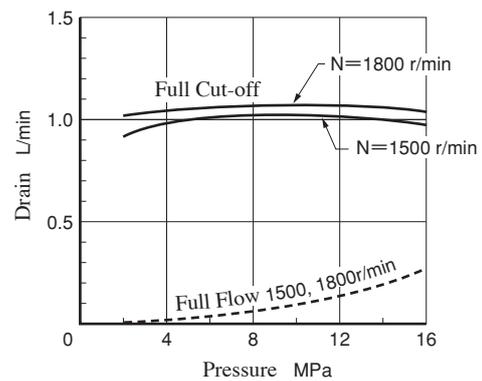


Note) The dotted line in the graph indicates less than minimum adjustable flow.

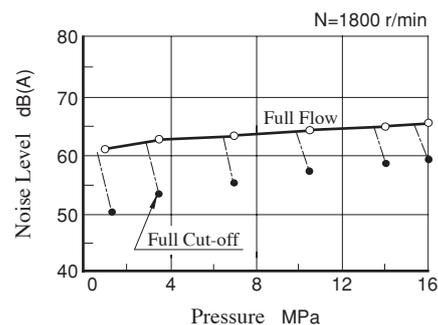
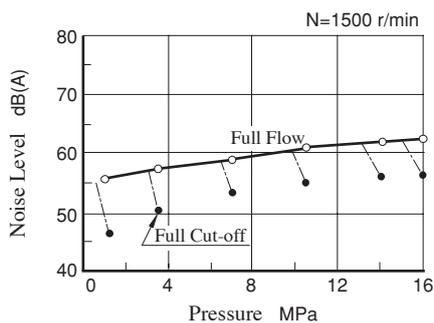
### Full Cut-off Power



### Drain

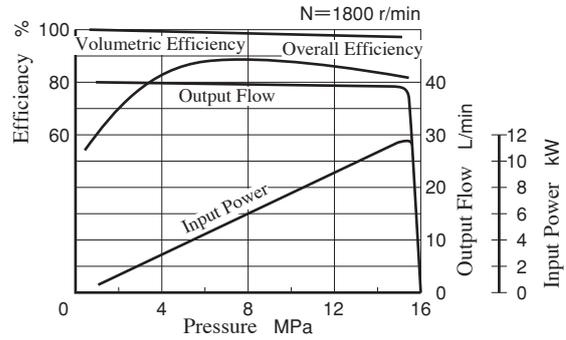
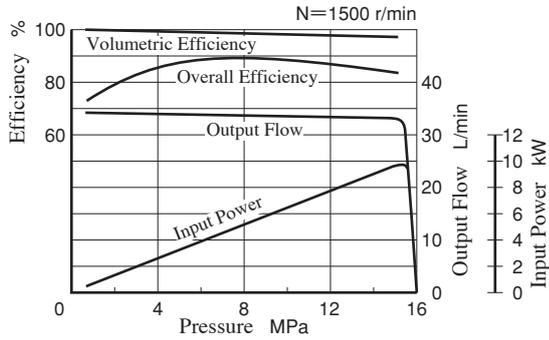


### Noise Level [One metre horizontally away from pump head cover]

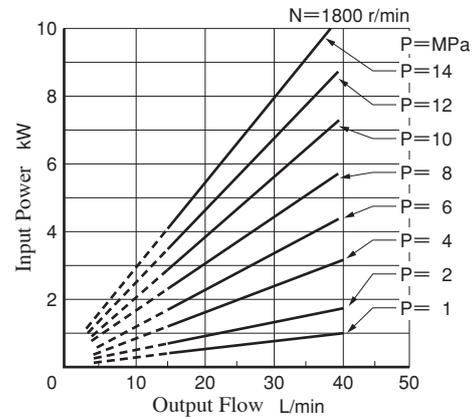
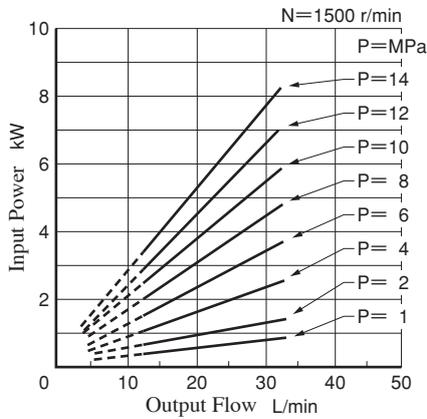


Typical Pump Characteristics of Type **AR22** at Viscosity 20 mm<sup>2</sup>/s [ISO VG32 Oils, 50°C]

**Performance Characteristic Curve**

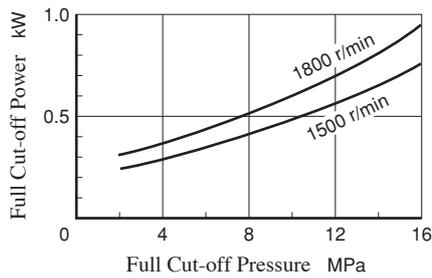


**Input Power**

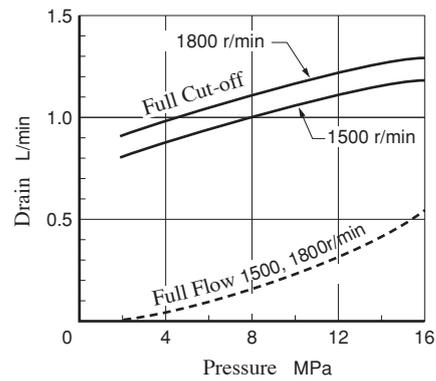


Note) The dotted line in the graph indicates less than minimum adjustable flow.

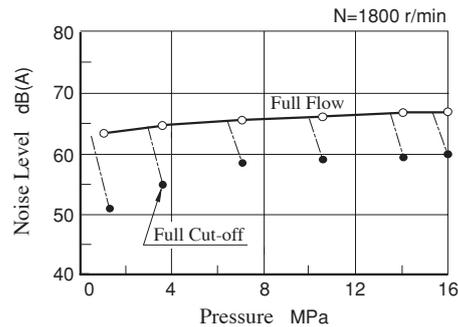
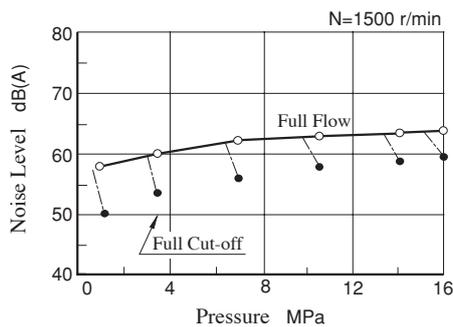
**Full Cut-off Power**



**Drain**



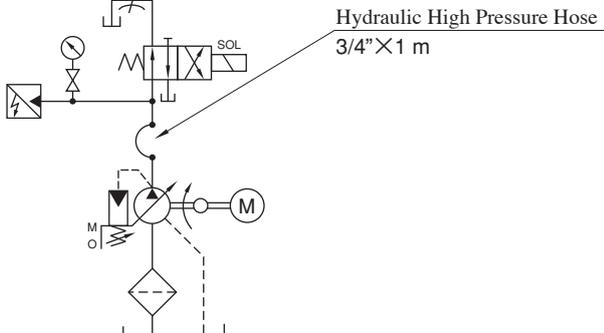
**Noise Level** [One metre horizontally away from pump head cover]



## Response Characteristics Change in Accordance with Circuits and Operating Conditions.

### Test Circuit Conditions

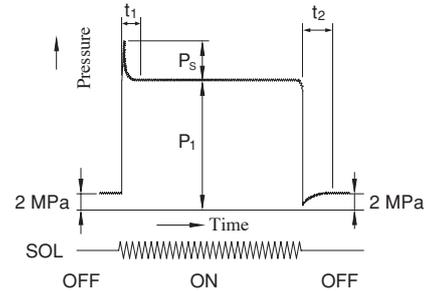
#### Circuit



#### Conditions

Shaft Speed : 1500 r/min  
Hydraulic Fluid : ISO VG32 Oil  
Oil Temperature : 40 °C  
Viscosity : 32 mm<sup>2</sup>/s

### Result of Measurement

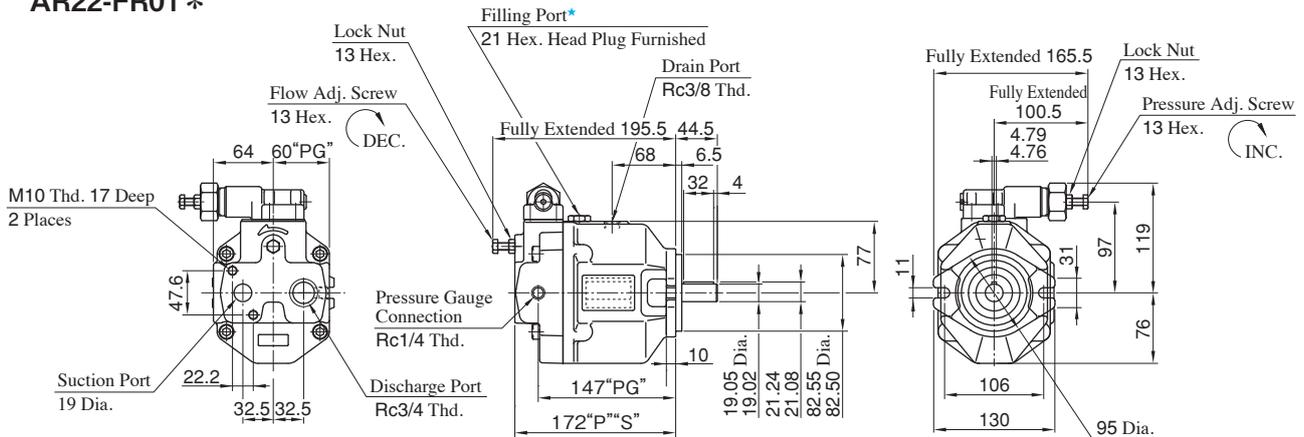


Model	Full Cut-off Pressure P <sub>1</sub> MPa	Response Time ms		Overshoot Pressure P <sub>s</sub> MPa
		t <sub>1</sub>	t <sub>2</sub>	
AR16	16	120	90	3.6
AR22		90	100	

## Axial Port Type

AR16-FR01 \*

AR22-FR01 \*

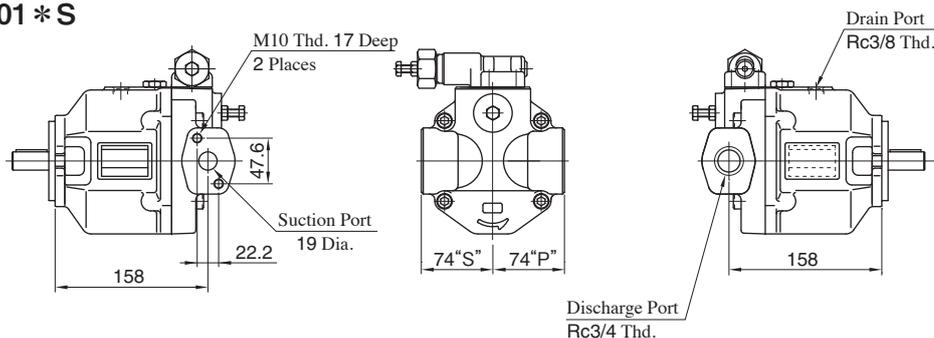


★ Install the pump so that the "Filling Port" is at the top.

## Side Port Type

AR16-FR01 \* S

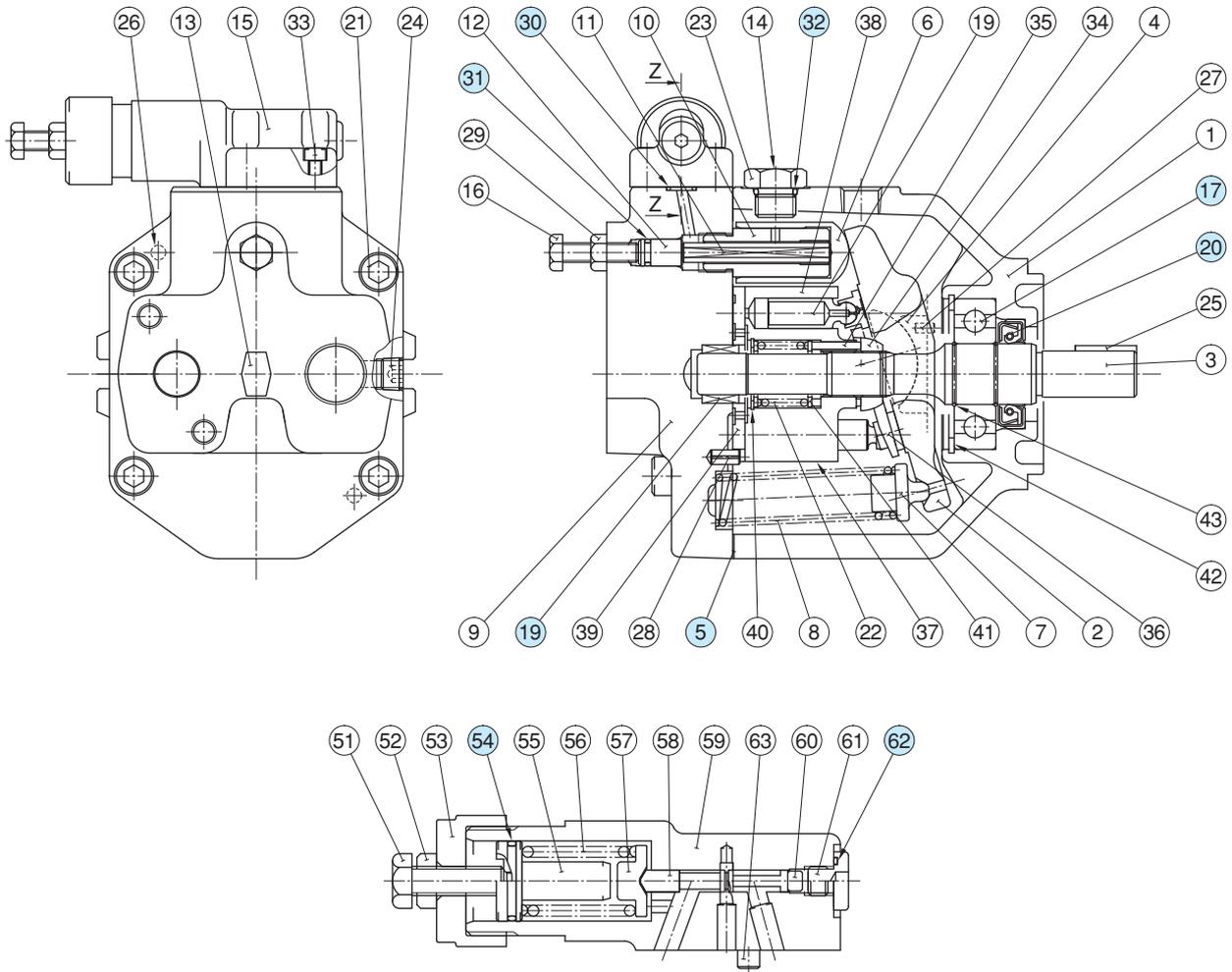
AR22-FR01 \* S



● For other dimensions, refer to "Axial port Type".

**Spare Parts List**

**AR16-FR01  
AR22-FR01**



**Section Z-Z**

● **List of Seals and Bearings**

Item	Name of Part	Part Numbers		Qty.
		AR16-FR01	AR22-FR01	
5	Gasket	1302-PK314545-5		1
17	Bearing	6305		1
19	Bearing	HMK 1715 V2	Z30-1303-PK410300-8	1
20	Oil Seal	TCN 254511		1
30	O-Ring	SO-NB-P9		3
31	O-Ring	SO-NB-P8		1
32	O-Ring	SO-NB-P14		1
54	O-Ring	AS 568-018 (NBR-70)		1
62	O-Ring	SO-NB-P10		1