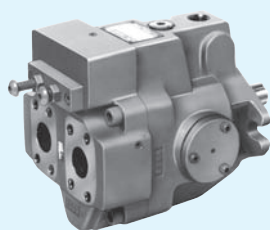


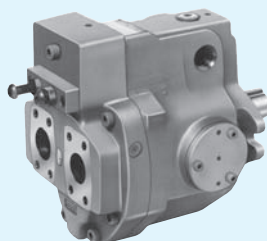
# Series Variable Displacement Piston Pumps



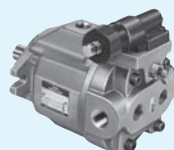
A37



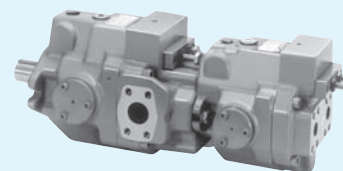
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A56


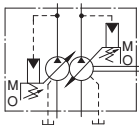
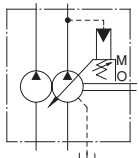


A10



A1637

■ “A” 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	200	300			
Single Pumps ★ <sup>1</sup>													28
		A10										21	
		A16										16	
		A22										21	
		A37										16	
		A45										21	
		A56										28	
		A70										21	
		A90										28	
Double Pumps													110
		A16 A37 A56 A70 A90 A145 A220										28 ★ <sup>2</sup>	
Variable/Fixed Double Pumps													112
		PV2R1 PV2R2 A16 A37 A56 A70 A90 A145 A220										28 ★ <sup>2</sup>	

★<sup>1</sup> Various control types are available such as pressure compensator type. Refer to page 29 and 30.

★<sup>2</sup> The maximum operating pressure for each double pump depends on its combination of pumps. Contact us for details.

## Hydraulic Fluids

### Hydraulic Fluids

Use petroleum based 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.

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.

### 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.

[Recommended Drain Piping Size]

Model	Fitting Size	Inside Dia. of Pipe
A10, A16, A22	3/8 [Inside Dia. 8.5 mm or more]	10 mm or more
A37, A45	1/2 [Inside Dia. 12 mm or more]	12 mm or more
A56, A70, A90, A100, A145	3/4 [Inside Dia. 16 mm or more]	19 mm or more

### 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>
A10	370
A16/A22	600
A37/A45/A56	1200
A70	2100
A90/A100	2500
A145	3300

## 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
A10-FR01B	2.9
A10-FR01C/H	5.4
A16/A22/A37/A56- *-R-01-B	3.5
A16/A22/A37/A56- *-R-01-C	6.5
A16/A37/A56- *-R-01-H	7.9
A70/A90/A100/A145- *-R01B	2.3
A70/A90/A100/A145- *-R01C	3.2
A70/A90/A100/A145- *-R01H	4.0
A70/A90/A100/A145- *-R01K	4.7

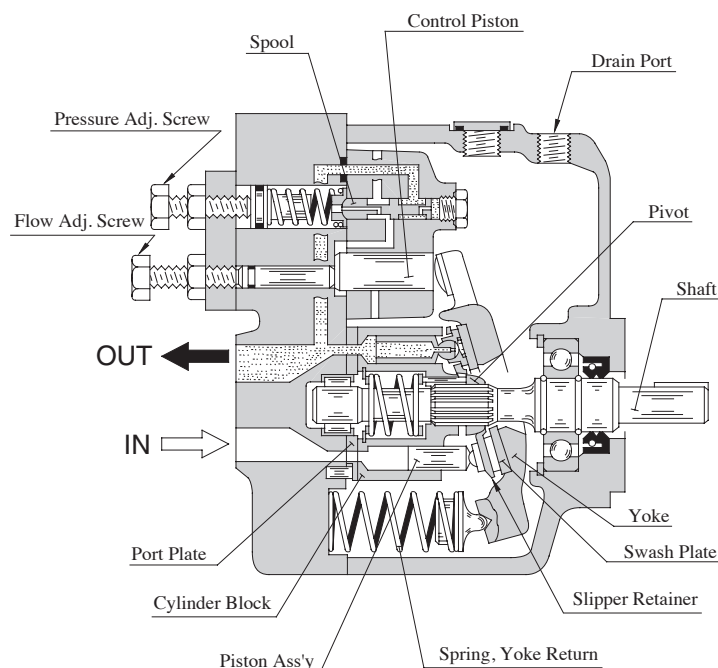
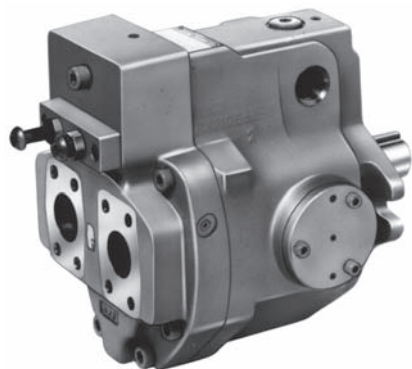
### Adjustment of Delivery

Turning the flow adjustment screw clockwise, decreases delivery.

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

Model	Adjustable volume with each full turn of the adjustment screw cm <sup>3</sup> /rev	Minimum adjustment flow cm <sup>3</sup> /rev
A10	1.1	2.0
A16	1.4	4.0
A22	2.0	6.0
A37	2.9	10
A56	3.9	12
A70	4.4	36
A90	4.8	56
A100	5.2	62
A145	7.2	83

## Series Variable Displacement Piston Pumps



### ■ Features

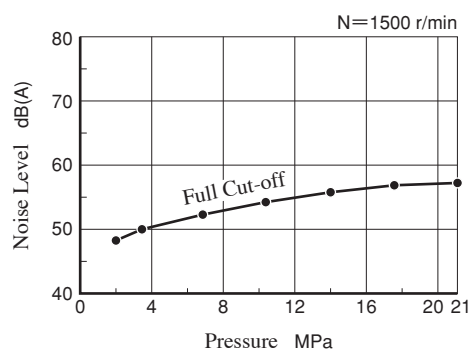
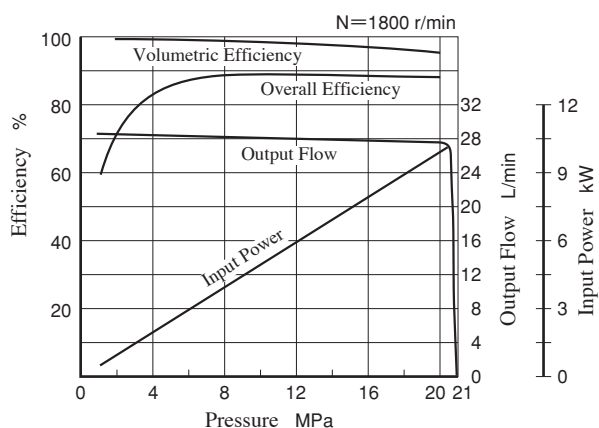
#### ● High efficiency

The efficiency properties in case of “A16” from are high efficiencies to be shown below.

#### ● Low noise level

In the “A16” pump, the noise level is as low as 57.3 dB(A) [at the full cut-off pressure 21 MPa with speed 1500 r/min one metre horizontally away from pump head cover.]

“A16” type performance characteristics




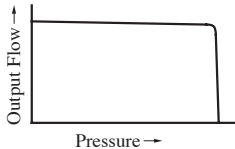
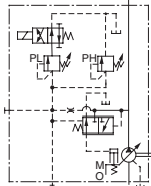
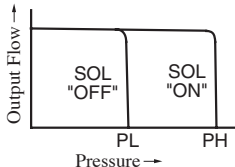
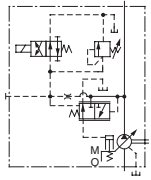
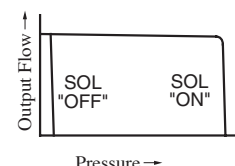
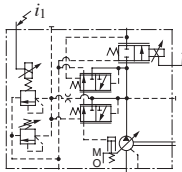
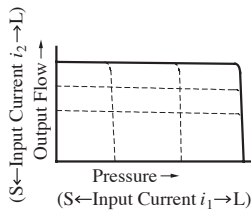
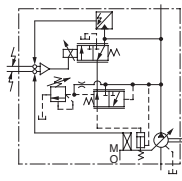
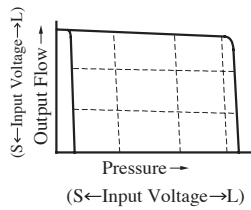
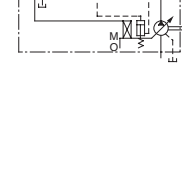
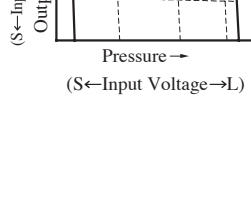
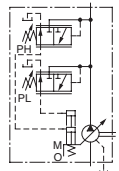
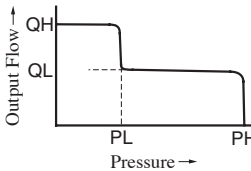
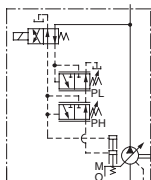
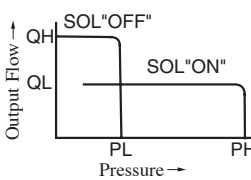
#### ● Accomplishment of energy-saving

Because the overall efficiency is high and the cut-off characteristics is sharp, thus the input power may be saved.

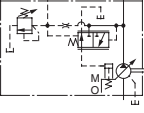
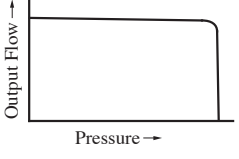
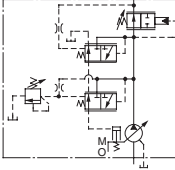
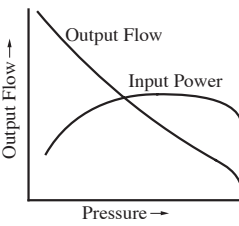
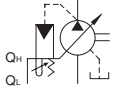
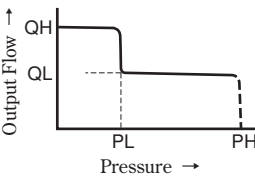
#### ● Low heat generation

Because of small power loss, it is possible to reduce the rise in oil temperature. Accordingly, capacity of a reservoir can be reduced.

## Control Type

Control Type	Graphic Symbols	Performance Characteristics	Explanation	Page
"01" Pressure Compensator Type			When the system pressure increases and comes close to the preset cut-off pressure, the pump flow decreases automatically while maintaining the set pressure as it is.	31
"02" Solenoid-two Pressure Control Type			This type of control is ideal for an application where the output power of the actuator has to be controlled in two different load pressures while keeping the actuator speed nearly constant.	53
"03" Pressure Compensator with Unloading Type			It is suitable for a situation where a long unloading time is required and heat generation and noise have to be kept at their lowest levels. <ul style="list-style-type: none"><li>The pump can be used in combination with the multistage pressure control valve.</li></ul>	61
"04" Proportional Electro-Hydraulic Load Sensing Type			This is an energy-saving type control which regulates the pump flow and load pressure to be at absolute minimum necessary level to operate the actuator. Pump flow rate and cut-off pressure are controlled proportional to the input current to the control device on the pump and the input current is regulated by the specific amplifier.	62
"04E" Electro-Hydraulic Proportional Pressure & Flow Control Type			This type of control has the pressure sensor and tilt angle sensor in the pump. The pump is used with the external amplifier (amplifier is integrated into pump in case of "04EH"). Flow and pressure can be controlled in proportion to input voltage by only one control valve. The features has been greatly improved by electrical feedback of swash plate tilt angle correspond to flow rate and load pressure to control valve.	72
"04EH" Electro-Hydraulic Proportional Pressure & Flow Control Type (OBE Type)			<ul style="list-style-type: none"><li>Linearity of input characteristics is excellent and easy to set.</li><li>Hysteresis is lower, repeatability and reproducibility are fine.</li></ul>	82
"05" Two-Pressure Two-Flow Control Type by System Pres.			This type of control is suitable for an application like "Presses" where the changeover from rapid advance to feed is required just when the pressing (pressurizing) starts.	91
"06" Two-Pressure Two-Flow Control Type by Solenoid Valve			This pump control is suitable for machining found on machine tool, where machining starts after the changeover from rapid advance, to feed has been made.	92

## Control Type

Control Type	Graphic Symbols	Performance Characteristics	Explanation	Page
"07" Pilot Pressure Control Type Pressure Compensator			The pump is used in combination with the pilot relief valve or multistage pressure control valve. By controlling the pilot pressure, the full cut-off pressure can be remote-controlled according to your requirements.	93
"09" Constant Power Control Type			<ul style="list-style-type: none"> <li>Pump input power can be controlled in accordance with the motor output.</li> <li>When the discharge pressure rise, the output flow decreases corresponding to the preset input power.</li> <li>The pump can act for function of two pumps, low-pressure large-flow and high-pressure small-flow. Therefore, the motor capacity can be reduced.</li> </ul>	101
"00- Z500" Simple Two- Pressure Two-Flow Control Type			<ul style="list-style-type: none"> <li>This type of control enables one pump to act as two pumps (low-pressure and large-flow/high-pressure and small-flow-rate). Therefore, the motor capacity can be reduced.</li> <li>When the system pressure increases near the preset "PL" pressure due to the load increase, the pump flow automatically decreases to "QL."</li> <li>This type of control is suitable for an application like the press, where switching from rapid advance to feed is required just when the press (pressurizing) starts.</li> <li>The PH pressure can be remote-controlled with a separately located relief valve. With this type of control, it is easy to change the applied pressure setting when materials or shapes of the press are changed.</li> </ul>	109

## Availability of Control Type

Mark "○" in the table below refers to standard model.

Model Numbers	Geometric Displacement cm <sup>3</sup> /rev	Control Type										
		01	02	03	04	04E	04EH	05	06	07	09	00-Z500
A10	10.0	○								○		
A16	15.8	○	○	○	○	○	○	○	○	○	○	○
A22	22.2	○	○	○	○	○	○		○	○		
A37	36.9	○	○	○	○	○	○	○	○	○	○	○
A45	45.0	○				○						
A56	56.2	○	○	○	○	○	○	○	○	○	○	○
A70	70.0	○	○	○	○	○	○		○	○	○	○
A90	91.0	○	○	○	○	○	○		○	○		○
A100	100	○			○	○						
A145	145	○	○	○	○	○	○		○	○	○	○
A220	219	○		○	○					○		