Process Pump
Automatically Operated Type
(Internal Switching Type)
Series PA3000/5000

PA3000

PA5000

How to Order

PA 3 1 1 0 — □ 03 — □

Body size

3	3/8 standard
5	1/2 standard

Material of body wetted areas

1	ADC12 (Aluminum)
2	SCS14 (Stainless steel)

Diaphragm material

1	PTFE
2	NBR

Automatically operated type

Thread type

Nil	Rc
T*	NPTF
F*	G
N*	NPT

* T, F, N are options.

Port size

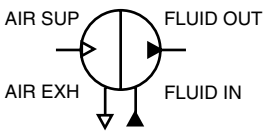
03	3/8 (10A): PA3
04	1/2 (15A): PA5
06	3/4 (20A): PA5

Option

Nil	Body only
N	With silencer *

* For AIR EXH: AN200-02

JIS Symbol



Automatically operated type

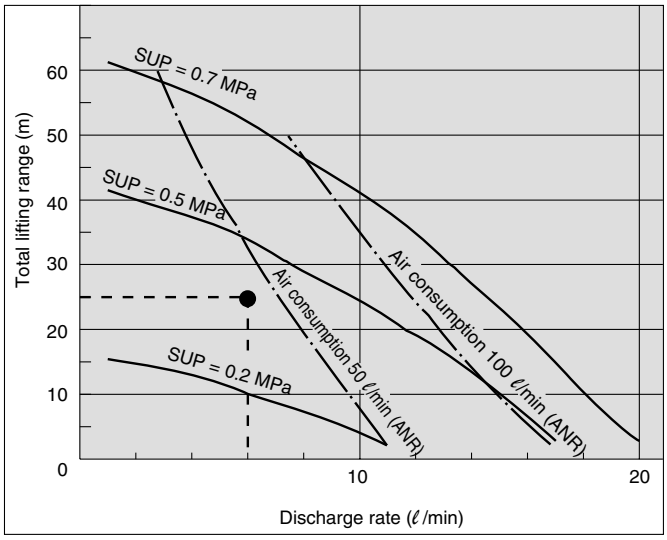
Specifications

Model		Automatically operated type			
		PA31□0	**PA32□0**	**PA51□0**	**PA52□0**
Port size	Main fluid suction discharge port	3/8		1/2, 3/4	
	Pilot air supply/ exhaust port	1/4			
Material	Body wetted areas	ADC12	SCS14	ADC12	SCS14
	Diaphragm	PTFE, NBR			
	Check valve	PTFE, PFA			
Discharge rate		1 to 20 ℓ/min		5 to 45 ℓ/min	
Average discharge pressure		0 to 0.6 MPa			
Pilot air consumption		Max. 200 ℓ/min (ANR)		Max. 300 ℓ/min (ANR)	
Suction lifting range	Dry	1 m (Interior of pump dry)		2 m (Interior of pump dry)	
	Wet	Up to 6 m (liquid inside pump)			
Operating fluid temperature		0 to 60°C (No freezing)			
Ambient temperature		0 to 60°C			
Pilot air pressure		0.2 to 0.7 MPa			
Withstand pressure		1.05 MPa			
Mounting orientation		Horizontal (with mounting foot at bottom)			
Weight		1.7 kg	2.2 kg	3.5 kg	6.5 kg

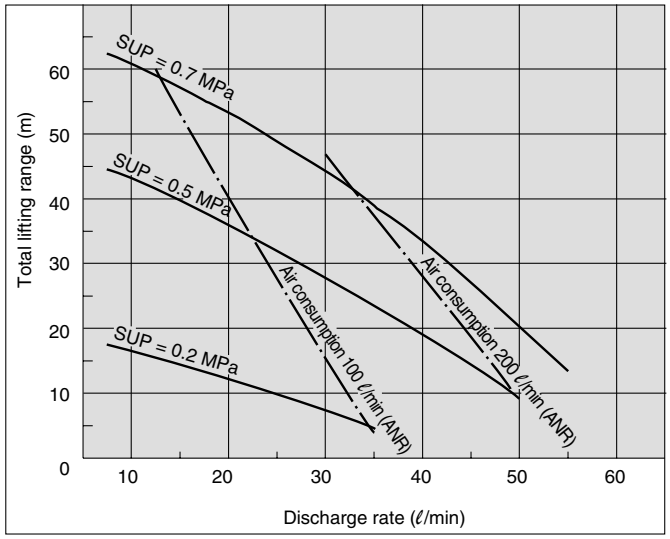
* Each value of above represents at normal temperatures with fresh water.

Performance Curve: Automatically Operated Type

PA3000 Flow Characteristics



PA5000 Flow Characteristics



Selection from Flow Characteristic Graph (PA3000)

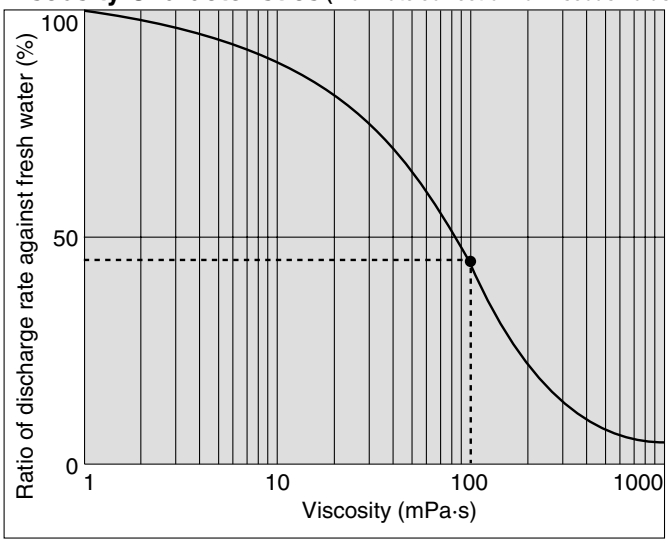
Required specifications example:
Find the pilot air pressure and pilot air consumption for a discharge rate of 6 ℓ/min and a total lifting range of 25 m. <The transfer fluid is fresh water (viscosity 1 mPa·s, specific gravity 1.0).
∗ If the discharge pressure is required instead of the total lifting height, a total lift of 10 m corresponds to discharge pressure of 0.1 MPa.
Selection procedures:

1. First mark the intersection point for a discharge rate of 6 ℓ/min and a lifting range of 25 m.
2. Find the pilot air pressure for the marked point. In this case, the point is between the discharge curves (solid lines) for SUP = 0.2 MPa and SUP = 0.5 MPa, and based on the proportional relationship to these lines, the pilot air pressure for this point is approximately 0.38 MPa.
3. Next find the air consumption rate. Since the marked point is below the curve for 50 ℓ/min (ANR), the maximum rate will be about 50 ℓ/min (ANR).

⚠ Caution

1. These flow characteristics are for fresh water (viscosity 1 mPa·s, specific gravity 1.0).
2. The discharge rate differs greatly depending on properties (viscosity, specific gravity) of the fluid being transferred and operating conditions (lifting range, transfer distance), etc.
3. Use 0.75 kW per 100 ℓ/min of air consumption as a guide for the relationship of the air consumption to the compressor.

Viscosity Characteristics (Flow rate correction for viscous fluids)



Selection from Viscosity Characteristic Graph

Required specifications example:
Find the pilot air pressure and pilot air consumption for a discharge rate of 2.7 ℓ/min, a total lifting range of 25 m, and a viscosity of 100 mPa·s.
Selection procedures:

1. First find the ratio of the discharge rate for fresh water when viscosity is 100 mPa·s from the graph below. It is determined to be 45%.
2. Next, in the required specification example, the viscosity is 100 mPa·s and the discharge rate is 2.7 ℓ/min. Since this is equivalent to 45% of the discharge rate for fresh water, 2.7 ℓ/min ÷ 0.45 = 6 ℓ/min, indicating that a discharge rate of 6 ℓ/min is required for fresh water.
3. Finally, find the pilot air pressure and pilot air consumption based on selection from the flow characteristic graphs.

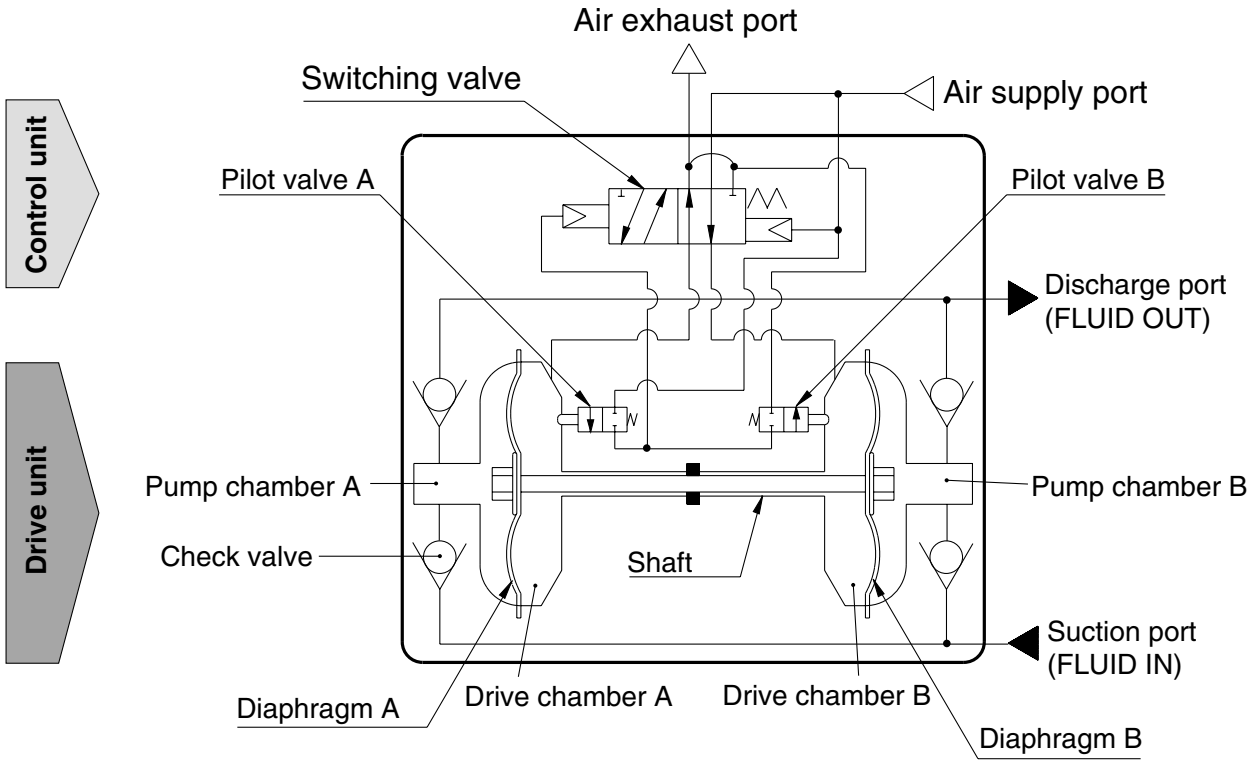
⚠ Caution

Viscosities up to 1000 mPa·s can be used.
Dynamic viscosity ν = Viscosity μ/Density ρ.

$$\nu = \frac{\mu}{\rho}$$

$\nu(10^{-3}\ m^2/s) = \mu(mPa{\cdot}s)/\rho(kg/m^3)$

Working Principle: Automatically Operated Type



Control unit

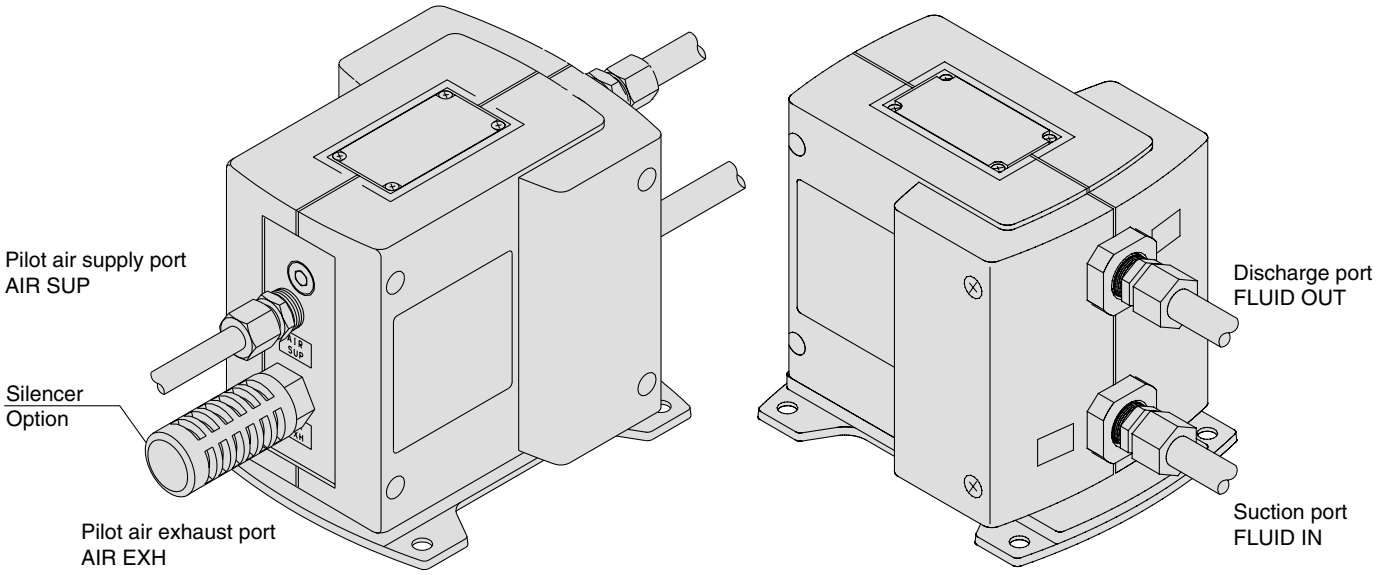
1. When air is supplied, it passes through the switching valve and enters drive chamber B.
2. Diaphragm B moves to the right, and at the same time diaphragm A also moves to the right pushing pilot valve A.
3. When pilot valve A is pushed, air acts upon the switching valve, drive chamber A switches to a supply state, and the air which was in drive chamber B is exhausted to the outside.
4. When air enters drive chamber A, diaphragm B moves to the left pushing pilot valve B.
5. When pilot valve B is pushed, the air which was acting upon the switching valve is exhausted, and drive chamber B once again switches to a supply state. A continuous reciprocal motion is generated by this repetition.

Drive unit

1. When air enters drive chamber B, the fluid in pump chamber B is forced out, and at the same time fluid is sucked into pump chamber A.
2. When the diaphragm moves in the opposite direction, the fluid in pump chamber A is forced out, and fluid is sucked into pump chamber B.
3. Continuous suction and discharge is performed by the reciprocal motion of the diaphragm.

Piping and Operation: Automatically Operated Type

Piping diagram



⚠ Caution

Mounting posture of the pump is set with the mounting bracket facing downward. Air to be supplied to the SUP port should be cleaned and filtered through AF filter, etc. Air with foreign matter or drainage etc. will have negative effects on the built-in solenoid valve and will lead to malfunction. When air needs additional purification, use a filter (Series AF), and a mist separator (Series AM) together.
Maintain the proper tightening torque for fittings and mounting bolts, etc. Looseness can cause problems such as fluid and air leaks, while over tightening can cause damage to threads and parts, etc.

Operation

<Starting and Stopping> Refer to circuit example (1)

1. Connect air piping to the air supply port <AIR SUR> and connect piping for the fluid to be transfered to the suction port <FLUID IN> and the discharge port <FLUID OUT>.

2. Using a regulator, set the pilot air pressure within the range of 0.2 to 0.7 MPa. Then, the pump operates when power is applied to the 3 port solenoid valve of the air supply port <AIR SUP>, the sound of exhaust begins from the air exhaust port <AIR EXH> and fluid flows from the suction port <FLUID IN> to the discharge port <FLUID OUT>.
At this time, the ball valve on the discharge side is in an open state. The pump performs suction with its own power even without priming. (Dry state suction lifting range: max. 1 m) To restrict exhaust noise, attach a silencer (AN200-02: option) to the air exhaust port <AIR EXH>.

3. To stop the pump, exhaust the air pressure being supplied to the pump by the 3 port solenoid valve of the air supply port <AIR SUP>. The pump will also stop if the ball valve on the discharge side is closed.

<Discharge Flow Rate Adjustment>

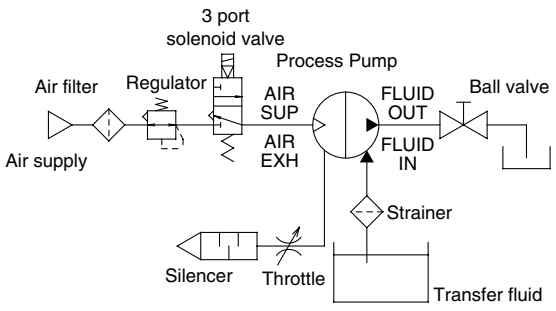
1. Adjustment of the flow rate from the discharge port <FLUID OUT> is performed with the ball valve connected on the discharge side or the throttle connected on the air exhaust side. For adjustment from the air side, use of the silencer with throttle ASN2 (port size 1/4) connected to the air exhaust port <AIR EXH> is effective. Refer to circuit example (1).

2. When operating with a discharge flow rate below the specification range, provide a by-pass circuit from the discharge side to the suction side to ensure the minimum flow rate inside the process pump. With a discharge flow rate below the minimum flow rate, the process pump may stop due to unstable operation. Refer to circuit example (2). (Minimum flow rates: PA3000 1 ℓ/min, PA5000 5 ℓ/min)

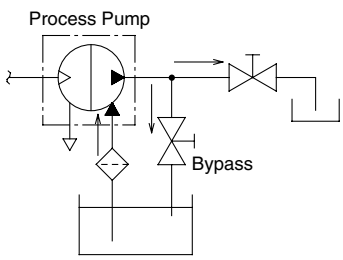
<Reset Button>

When the pump stops during operation, press the reset button. This makes it possible to restore operation in case the switching valve becomes clogged due to foreign matter in the supply air.

Circuit example (1)

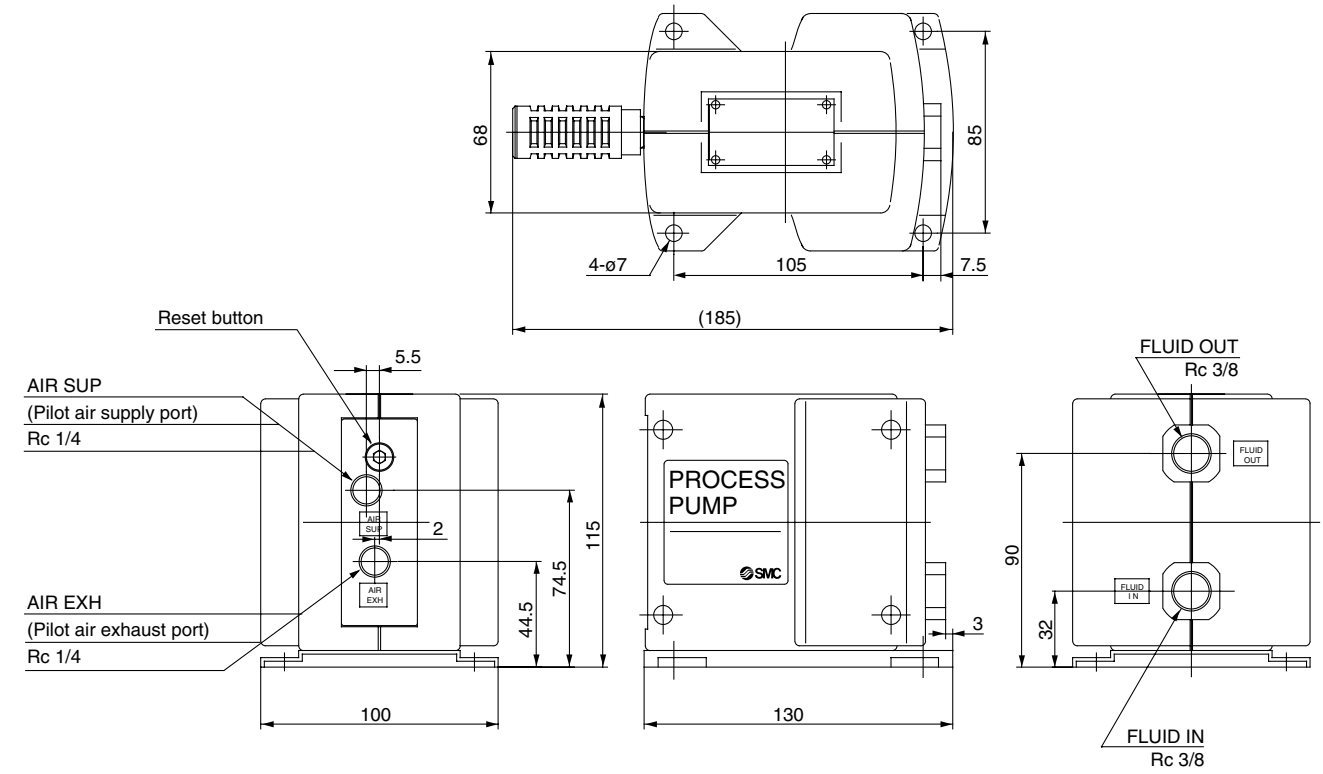


Circuit example (2)



Dimensions: Automatically Operated Type

PA3000



PA5000