Process Pump

Series PA3000/5000/PAX1000
Series PB1000

Air or Solenoid Operated
Self Priming
Long Life
Double or Single Pump Types

Compact, high capacity transfer and recovery of

- **Long life, 2 to 5 times that of conventional pumps**
  Incorporates a new diaphragm material.
  Enlarged bore size and shortened stroke extend life. (compared to series PA2000)
- **High abrasion resistance and low particle generation**
  No sliding parts in wetted areas.
- **Self-priming makes priming unnecessary**

Process Pump

Series PA3000/5000

Automatically operated type/Air operated type

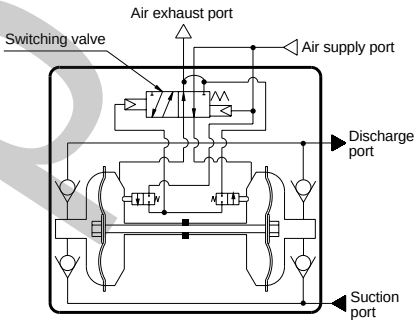
(internal switching type) (external switching type)

New

Automatically operated type

Compatible with a wide variety of fluids

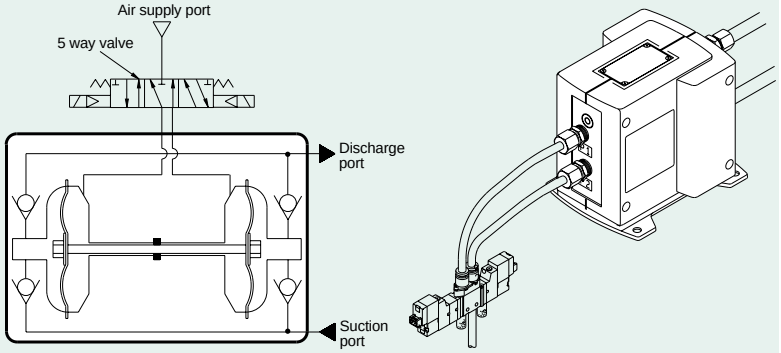
- PA3000: Max. 20//min (0.7SCFM)
- PA5000: Max. 45//min (1.6SCFM)



Air operated type

Control with external switching valve makes constant cycling possible

- **Discharge rate is easily controlled.**
  The flow rate can be easily adjusted by the number of external solenoid valve ON/OFF cycles.
- **Stable operation is possible even with a minimal flow rate, low pressure operation or the entrainment of gases.**
- **Can be used when there is repeated stopping of operation.**
- **Since a switching valve is not contained inside the body, life is longer than the automatically operated type.**



diaphragm pump for a wide variety of fluids

Process Pump Variations

Series PA/Double acting pump

Series	Model	Action		Discharge flow rate //min (SCFM)	Material	
					Body	Diaphragm
PA3000	PA3□□0	Automatically operated type	AIR SUP / AIR EXH — FLUID OUT / FLUID IN	1 to 20 (0.035 to 0.7)	ADC12 (aluminum) SCS14 (stainless steel)	PTFE NBR
	PA5□□0			5 to 45 (0.18 to 1.6)		
PA5000	PA3□13	Air operated type	P1 / P2 — FLUID OUT / FLUID IN	0.1 to 12 (0.003 to 0.42)		PTFE
	PA5□13			1 to 24 (0.03 to 0.84)		
PAX1000	PAX1□12	Automatically operated type with built-in pulsation attenuator	AIR SUP / AIR EXH — FLUID OUT / FLUID IN	0.5 to 10 (0.02 to 0.35)	ADC12 (aluminum) SCS14 (stainless steel)	PTFE

Series PB/Single acting pump

PB1000	PB1011	Built-in solenoid valve	AIR EXH / AIR SUP — FLUID OUT / FLUID IN	0.008 to 2	Polypropylene	PTFE
	PB1013	Air operated type	AIR SUP — FLUID OUT / FLUID IN	0.008 to 0.5		

Built-in pulsation attenuator

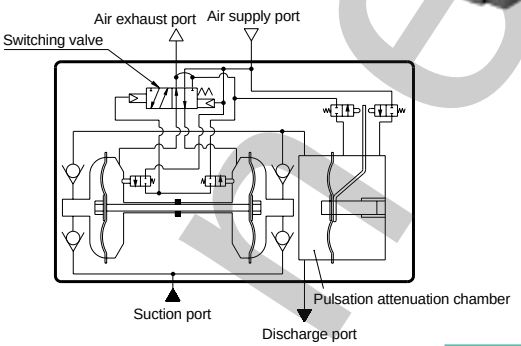
Process Pump

Series PAX1000

Automatically operated type
(internal switching type)

Prevents spraying of discharge and foaming in tank

- Built-in pulsation attenuator saves space and makes separate piping unnecessary



Compact single acting

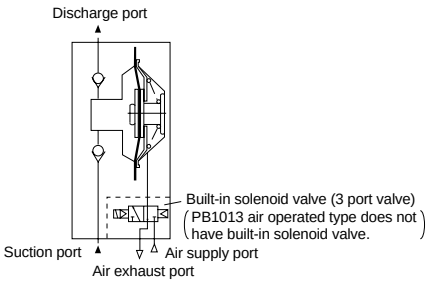
Process Pump

Series PB1000

Built-in solenoid valve/ Air operated type
(external switching type)

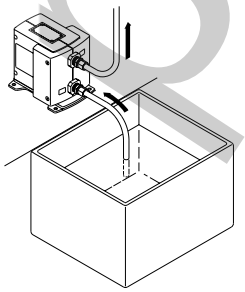
A solenoid valve operated pump that fits in the palm of the hand

- 60 x 60 x 41 (mm), 170g (2.4" x 2.4" x 1.6", 6.0 oz)
- Piping and wiring centralized on one side

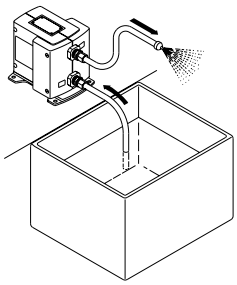


Application examples

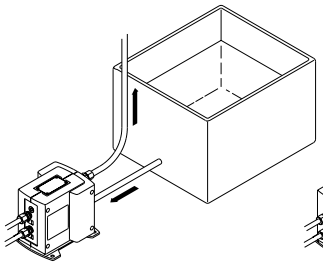
Transfer of liquid by suction



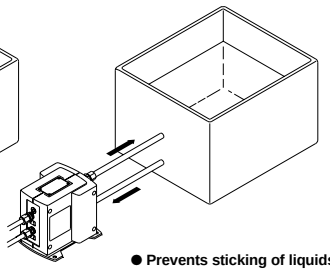
Atomizing of liquid



Transfer of liquid by pressure



Stirring of liquid



● Prevents sticking of liquids

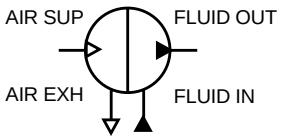
Series PA3000/5000

Process Pump Automatically Operated Type (Internal Switching Type)

PA3000

PA5000

Symbol



Automatically operated type

How to Order

PA 3 1 1 0 — □ 03 — □

Body size

3	3/8 standard
5	1/2 standard

Liquid contact body material

1	ADC12 (aluminum)
2	SCS14 (stainless steel)

Diaphragm material

1	PTFE
2	NBR

Thread type

Nil	Rc
T*	NPTF
F*	G
N*	NPT

* T, F, N are order made specifications.

Automatically operated type

Connection 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

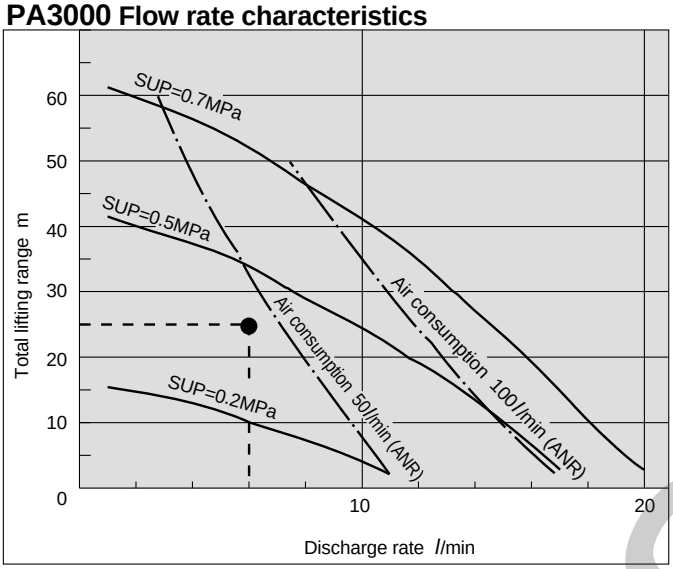
Specifications

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	Liquid contact areas	ADC12	SCS14	ADC12	SCS14
	Diaphragm	PTFE, NBR			
	Check valve	PTFE, PFA			
Discharge rate		1 to 20//min (0.03 to 0.7SCFM)		5 to 45//min (0.2 to 1.6SCFM)	
Average discharge pressure		0 to 0.6MPa (0 to 87psi)			
Pilot air consumption		Maximum 200//min (ANR) (7SCFM)		Maximum 300//min (ANR) (10.5 SCFM)	
Suction lifting range	Dry	1m (3.3ft) (interior of pump dry)		2m (6.6ft) (interior of pump dry)	
	Wet	Up to 6m (19.7ft) (liquid inside pump)			
Fluid temperature		0 to 60°C (32 to140°F) (with no freezing)			
Ambient temperature		0 to 60°C (32 to140°F)			
Pilot air pressure		0.2 to 0.7MPa (29 to 101psi)			
Withstand pressure		1.05MPa (152 psi)			
Mounting position		Horizontal (with mounting foot at bottom)			
Weight		1.7kg (3.7lb)	2.2kg (4.9lb)	3.5kg (7.7lb)	6.5kg (14.3lb)

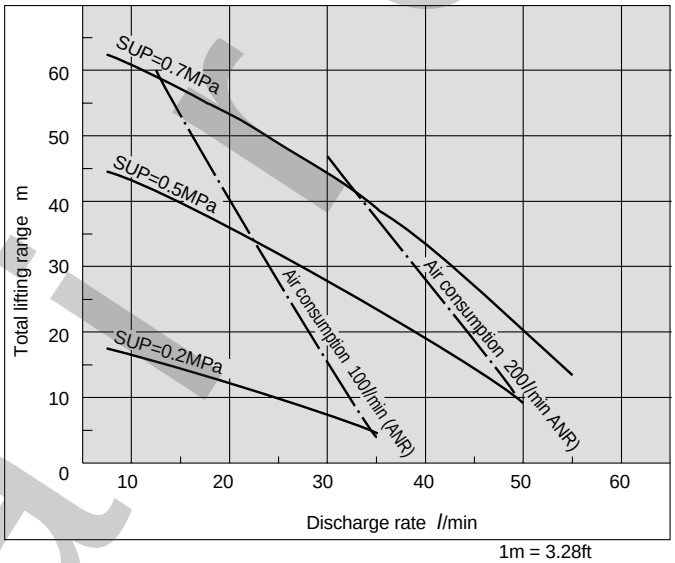
* Each of the values above indicates use at ordinary temperatures with fresh water.

Performance Curves/Automatically Operated Type

PA3000 Flow rate characteristics



PA5000 Flow rate characteristics



1m = 3.28ft
1l/min = 0.035SCFM

Selection from flow rate characteristic graphs (PA3000)

Required specification example:

Find the pilot air pressure and pilot air consumption for a discharge rate of 6l/min and a total lifting range of 25m. [The transfer fluid is fresh water (viscosity 1mPa·S, specific gravity 1.0).]

* If the discharge pressure is required instead of the total lifting height, a total lift of 10m corresponds to discharge pressure of 0.1MPa.

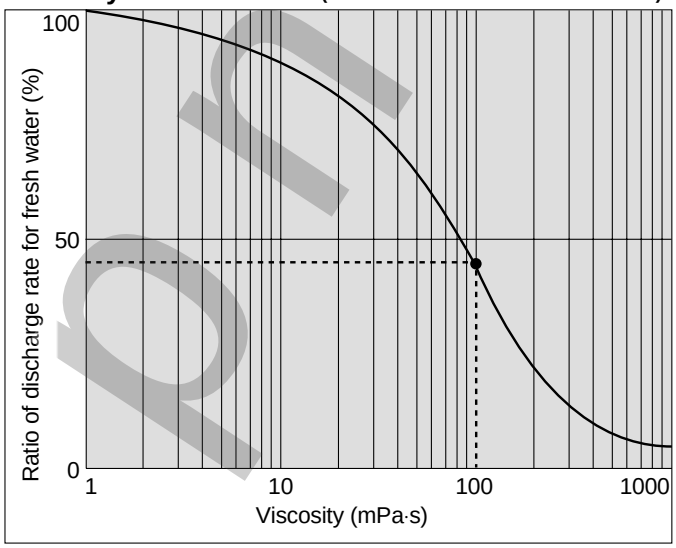
Selection procedures

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

⚠Caution

1. These flow rate characteristics are for fresh water (viscosity 1mPa·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 0.75kW per 100l/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 specification example:

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

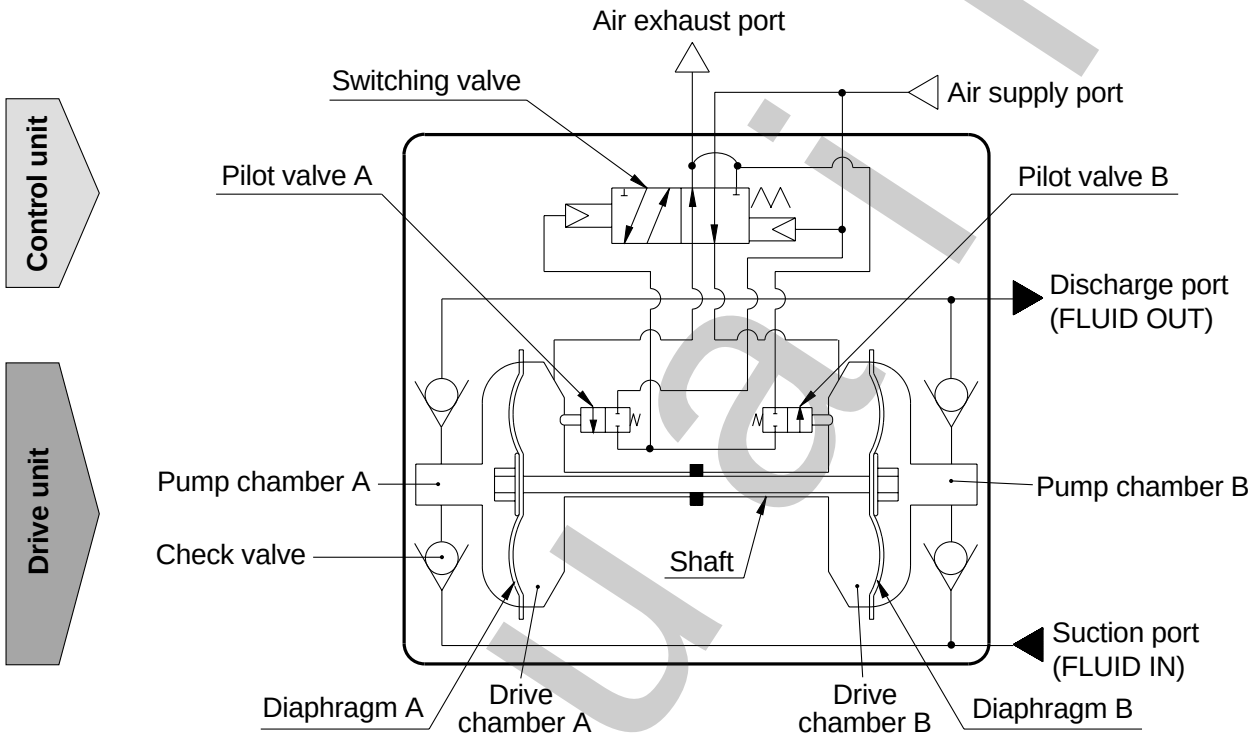
Selection procedures

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

⚠Caution

Viscosities up to 1000mPa·s can be used.

Operating Principle/Automatically Operated Type



Control unit

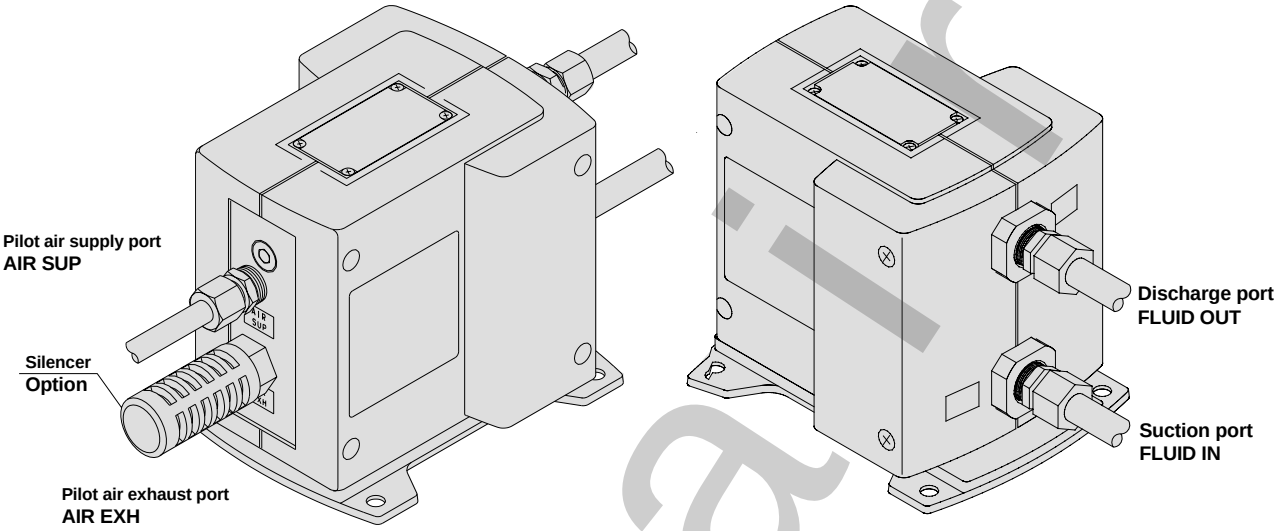
1. When air is supplied, it passes through the switching valve and enters drive chamber B.
2. Diaphragm B moves to the right, and at the same time diaphragm A also moves to the right pushing pilot valve A.
3. When pilot valve A is pushed, air acts upon the switching valve, drive chamber A switches to 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

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 SUP> and connect piping for the fluid to be transferred 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 0.7MPa . 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. 1m) 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.

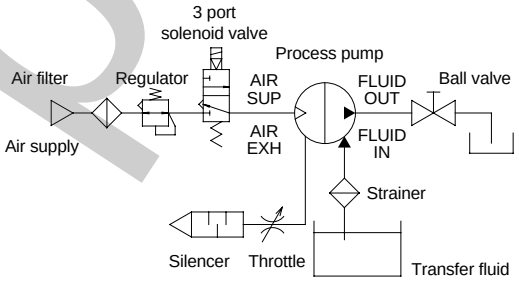
<Discharge Flow Rate Adjustment>

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 1l/min, PA5000 5l/min)

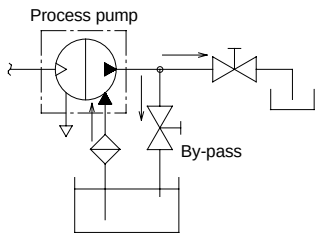
<Reset Button>

1. 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)



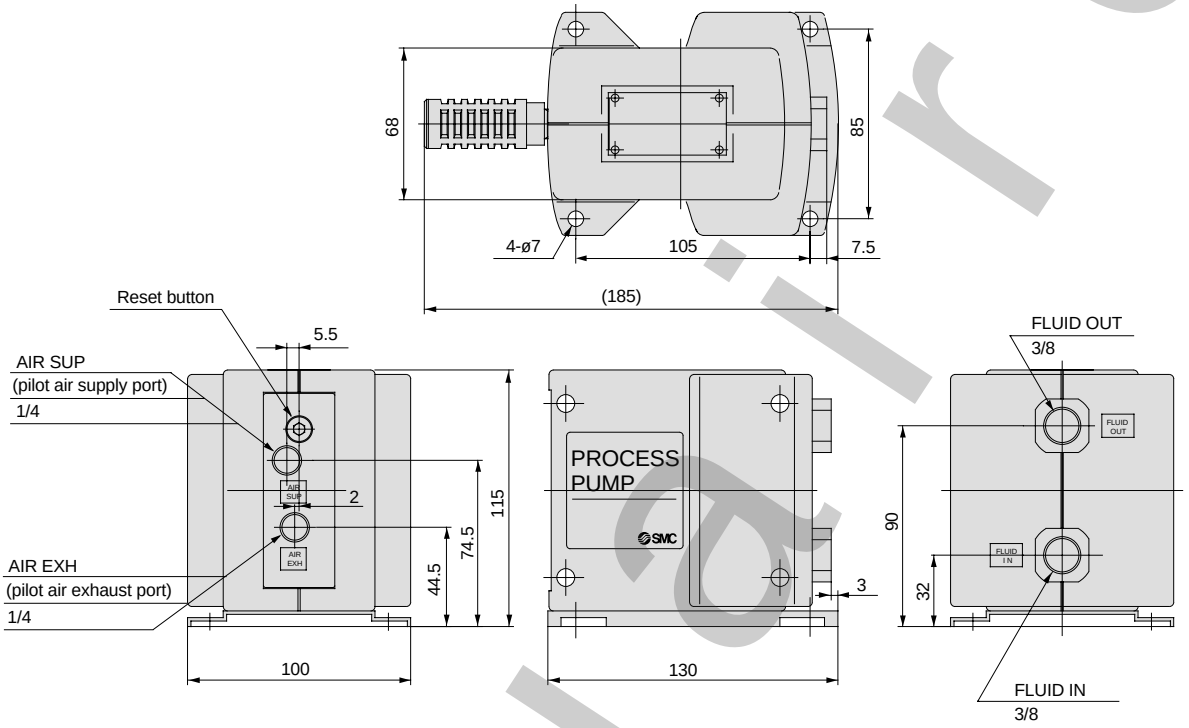
Circuit example (2)



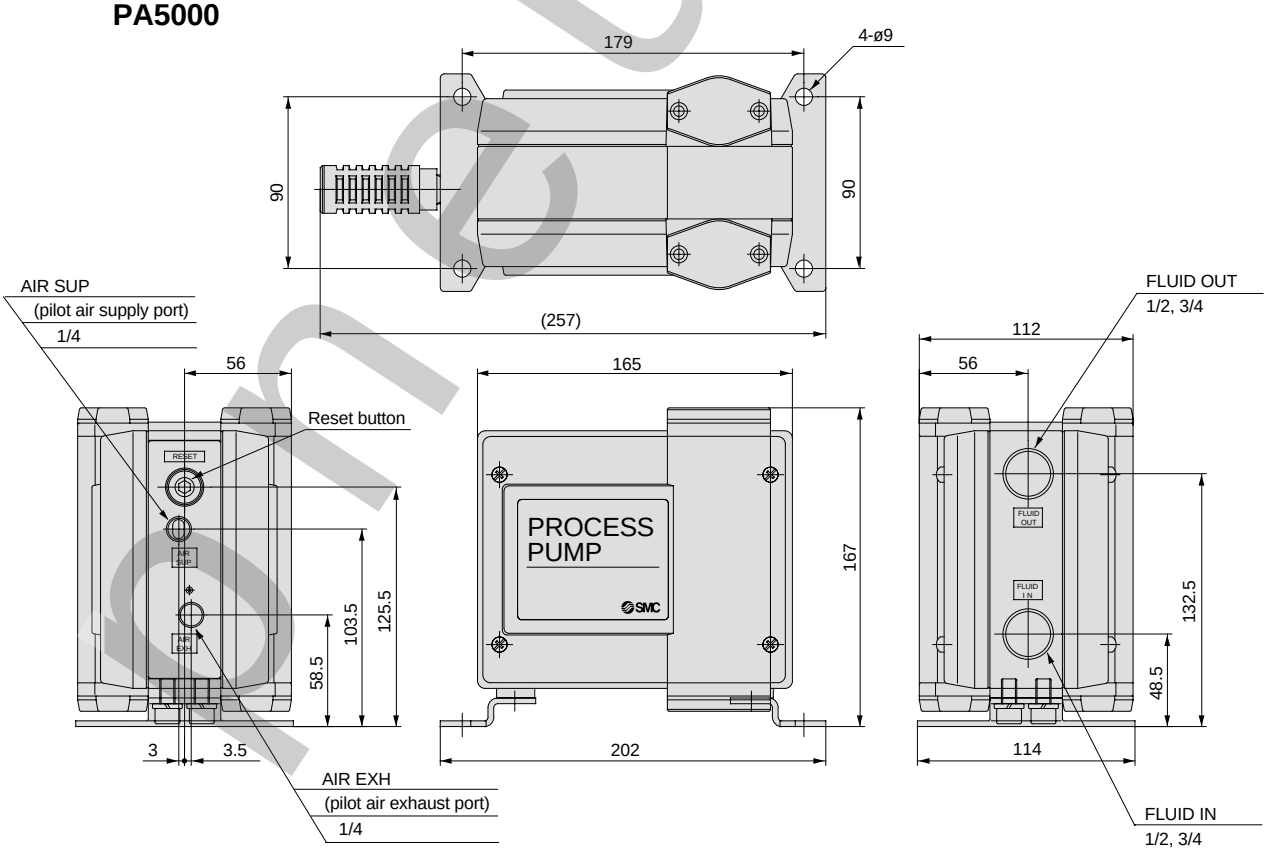
Dimensions/Automatically Operated Type (mm)

PA3000

1in = 25.4mm



PA5000



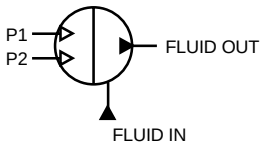
Series PA3000/5000

Process Pump Air Operated Type (External Switching Type)

PA3000

PA5000

Symbol



Air operated type

How to Order

PA 3 1 1 3 — □ 03

Body size

3	3/8 standard
5	1/2 standard

Liquid contact body material

1	ADC12 (aluminum)
2	SCS14 (stainless steel)

Diaphragm material

1	PTFE

Air operated type

Thread type

Nil	Rc
T*	NPTF
F*	G
N*	NPT

* T, F, N are order made specifications.

Connection port size

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

Specifications

Model		Air operated type			
		PA3113	PA3213	PA5113	PA5213
Port size	Main fluid suction/ discharge port	3/8		1/2, 3/4	
	Pilot air supply/ exhaust port	1/4			
Material	Liquid contact areas	ADC12	SCS14	ADC12	SCS14
	Diaphragm	PTFE			
	Check valve	PTFE, PFA			
Discharge rate		0.1 to 12//min (0.003 to 0.4SCFM)		1 to 24//min (0.03 to 0.85SCFM)	
Average discharge pressure		0 to 0.4MPa (0 to 58psi)			
Pilot air consumption rate		Maximum 150//min (ANR) (5.3SCFM)		Maximum 250//min (ANR) (8.8SCFM)	
Suction lifting range Note1)	Dry	Up to 1m (3.3ft) (interior of pump dry)		Up to 0.5m (1.6ft) (interior of pump dry)	
	Wet	Up to 6m (19.7ft) (liquid inside pump)			
Fluid temperature		0 to 60°C (32 to 140°F) (with no freezing)			
Ambient temperature		0 to 60°C (32 to 140°F)			
Pilot air pressure		0.1 to 0.5MPa (14 to 72psi)			
Withstand pressure		0.75MPa (109psi)			
Mounting position		Horizontal (with mounting foot at bottom)			
Weight		1.7kg (3.7lb)	2.2kg (4.9lb)	3.5kg (7.7lb)	6.5kg (14.3lb)
Recommended operating cycles		1 to 7Hz (0.2 to 1Hz also possible depending on conditions Note 2))			
Pilot air solenoid valve recommended Cv factor Note 3)		0.20		0.45	

* Each of the values above indicates use at ordinary temperatures with fresh water.

Note 1) With cycles at 2Hz or more

Note 2) After initial suction of liquid operating at 1 to 7Hz, it can be used with operation at lower cycles. Since a large quantity of liquid will be pumped out, use a suitable throttle in the discharge port if problems occur.

Note 3) With a low number of operating cycles, even a valve with a small Cv factor can be operated.

Recommended Valve

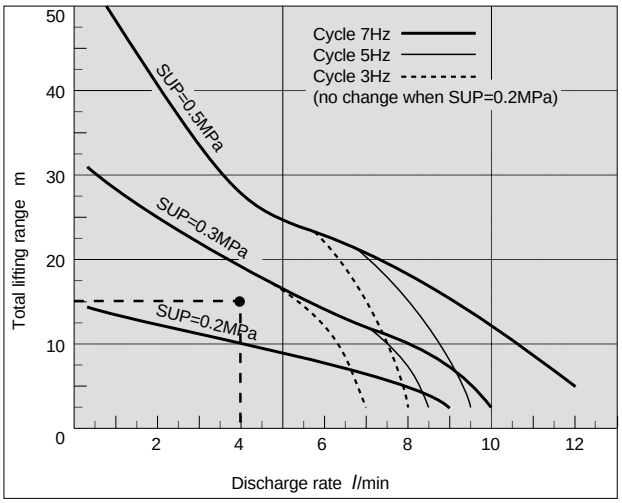
PA3000	VQZ14□0 (exhaust center)
PA5000	VQZ24□0 (exhaust center)

Refer to page 21 for further details.

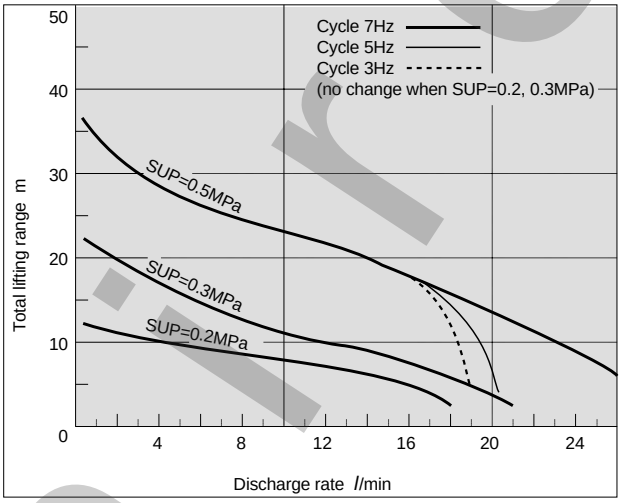
1//min = 0.035SCFM
1m = 3.28ft
1MPa = 145psi

Performance Curves/Air Operated Type

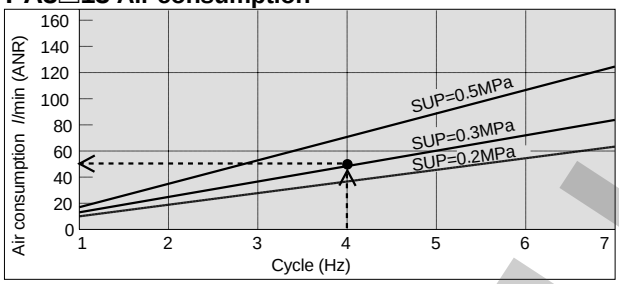
PA3□13 Flow rate characteristics



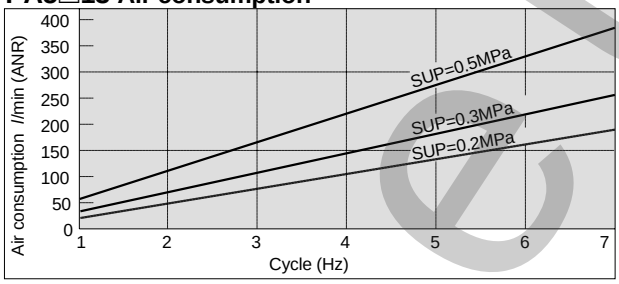
PA5□13 Flow rate characteristics



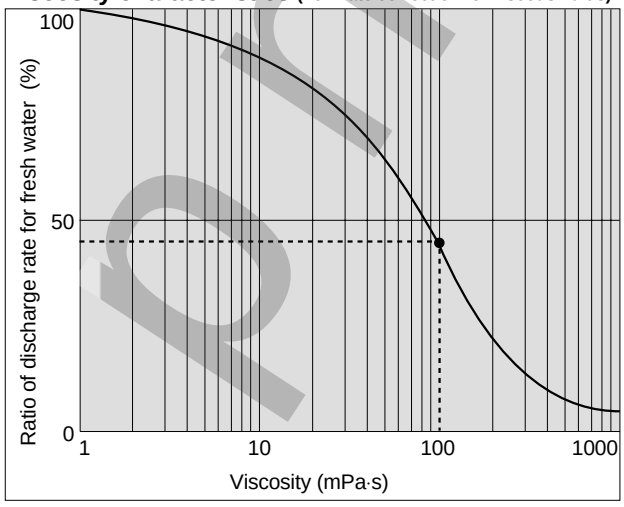
PA3□13 Air consumption



PA5□13 Air consumption



Viscosity characteristics (flow rate correction for viscous fluids)



Selection from flow rate characteristic graphs (for PA3000)

Required specification example:

Find the pilot air pressure for a discharge rate of 4//min and a total lifting range of 15m. <The transferred fluid is clean water (viscosity 1mPa·s, specific gravity 1.0).>

Note 1) If the discharge pressure is required instead of the total lifting height, a total lift of 10m corresponds to a discharge pressure of 0.1MPa.

Note 2) 1 cycle discharge rate PA3000: Approx. 22m/ PA5000: Approx. 100m/

Selection procedure

1. First mark the intersection point for a discharge rate of 4//min and a lifting range of 15m.
2. Find the pilot air pressure for the marked point. In this case, the point is between the discharge curves (solid lines) for SUP=0.2MPa and SUP=0.3MPa, and based on the proportional relationship to these lines, the pilot air pressure for this point is approximately 0.25MPa.

Note 1) Even when switching cycles are changed for PA3000 with SUP=0.2MPa or PA5000 with SUP=0.2MPa or 0.3MPa, there is almost no change in the lifting height.

Calculating air consumption (for PA3000)

Find the air consumption for operation with a 4Hz switching cycle and pilot air pressure of 0.3MPa from the air consumption graph.

Selection procedure

1. Look up from the 4Hz switching cycle to find the intersection with SUP=0.3MPa.
2. From the point just found, draw a line to the Y-axis to find the air consumption. The result is approximately 50//min.

⚠Caution

1. These flow rate characteristics are for fresh water (viscosity 1mPa·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.

Selection from viscosity characteristic graph

Required specification example:

Find the pilot air pressure for a discharge rate of 2.7//min, a total lifting range of 25m, and a viscosity of 100mPa·s.

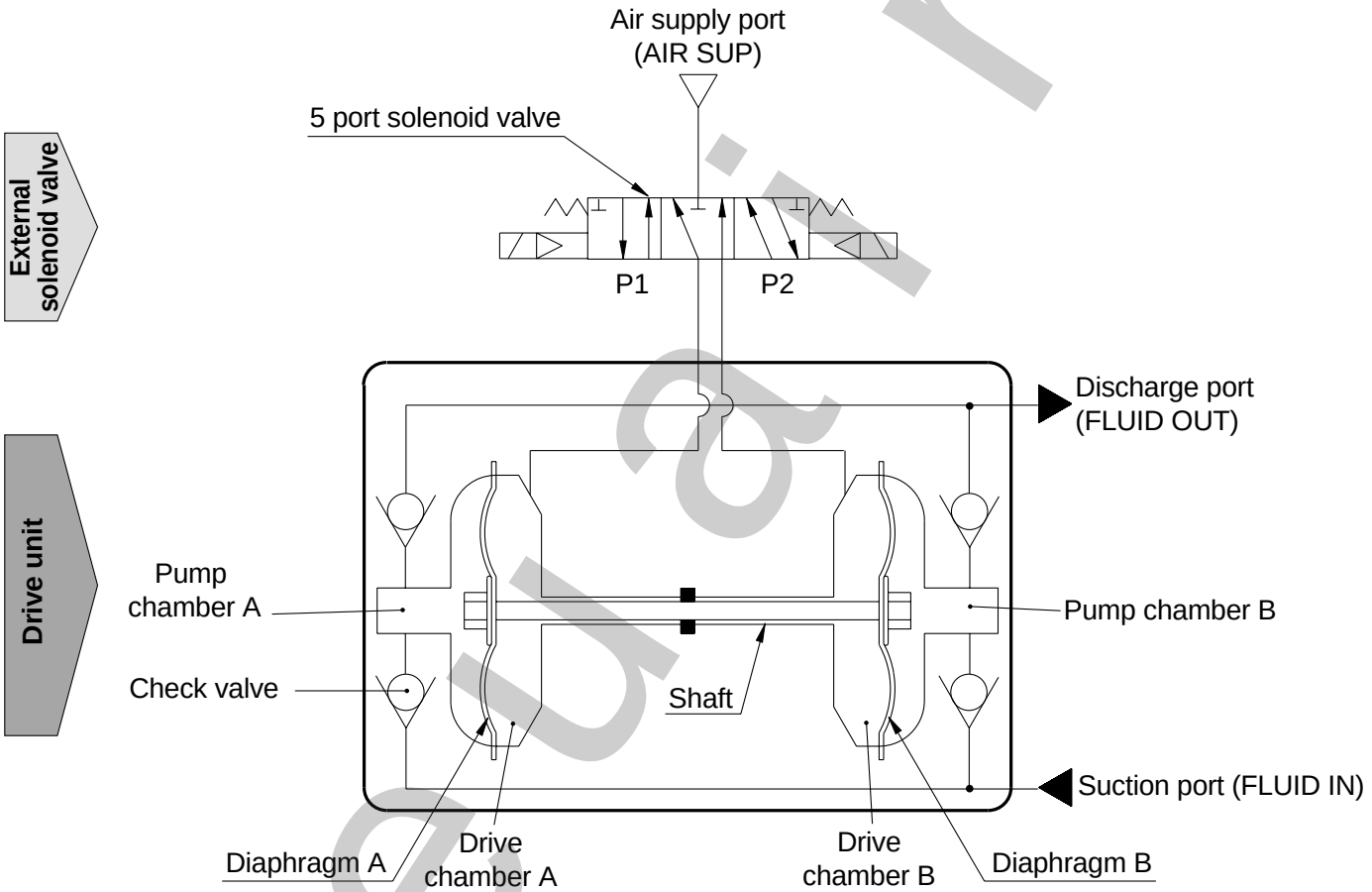
Selection procedure

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

⚠Caution

Viscosities up to 1000mPa·s can be used.

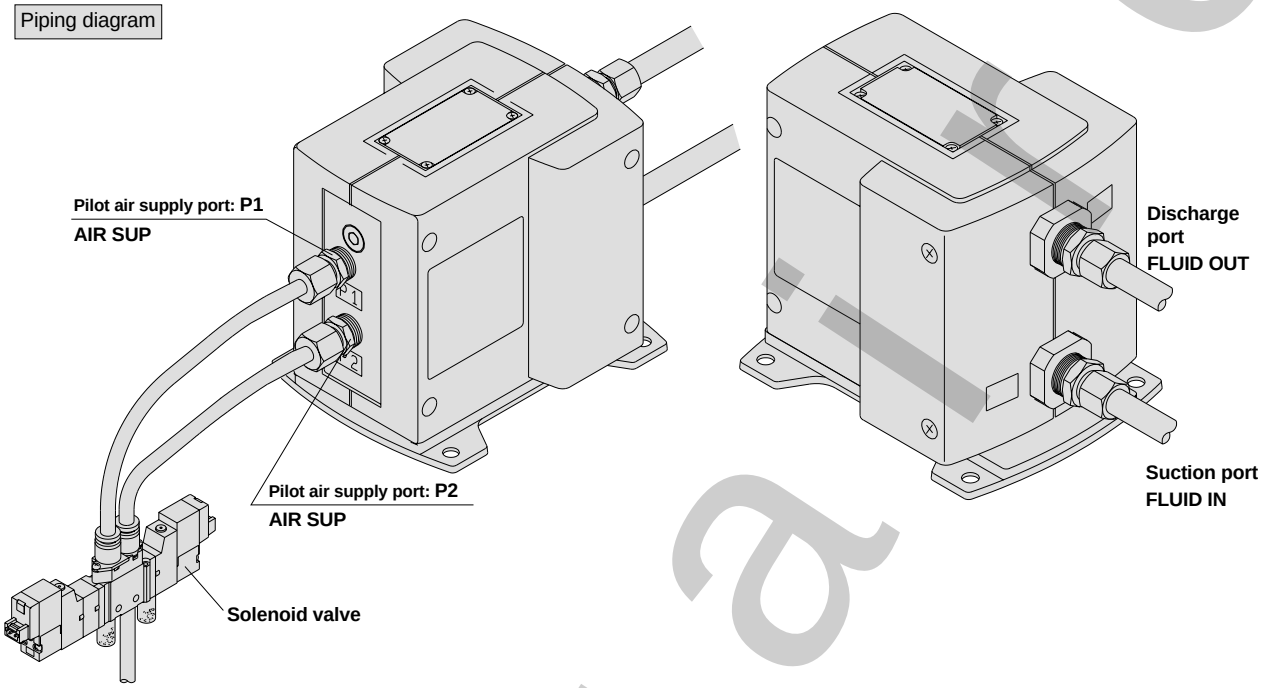
Operating Principle/Air Operated Type



1. When air is supplied to P1 port, it enters drive chamber A.
2. Diaphragm A moves to the left, and at the same time diaphragm B also moves to the left.
3. The fluid in pump chamber A is forced out to the discharge port, and the fluid is sucked into pump chamber B from the suction port.
4. If air is supplied to the P2 port, the opposite will occur. Continuous suction and discharge of fluid is performed by repeating this process with the control of an external solenoid valve (5 port valve).

Piping and Operation/Air Operated Type

Piping diagram



⚠Caution

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. Connect air piping Note 1) to the pilot air supply ports <P1>, <P2> and connect piping for the fluid to be transferred 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 0.1 to 0.5MPa. Then, the pump operates when power is applied to the solenoid valve Note 2) of the pilot air supply port 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. (Note 3) Dry state suction lifting range: PA3 1m, PA5 up to 0.5m) To restrict exhaust noise, attach a silencer to the solenoid valve air exhaust port.
3. To stop the pump, exhaust the air pressure being supplied to the pump with the solenoid valve of the air supply port.

Note 1) When used for highly permeable fluids, the solenoid valve may malfunction due to the gas contained in the exhaust. Implement measures to keep the exhaust from going to the solenoid valve side.

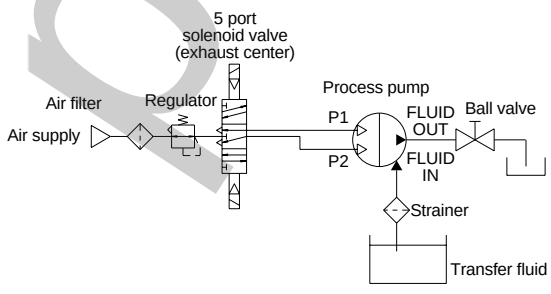
Note 2) For the solenoid valve, use an exhaust center 5 port valve, or a combination of residual exhaust 3 port valve and a pump drive 4 port valve. If air in the drive chamber is not released when the pump is stopped, the diaphragm will be subjected to pressure and its life will be shortened.

Note 3) When the pump is dry, operate the solenoid valve at a switching cycle of 1 to 7Hz. If operated outside of this range, the suction lifting height may not reach the prescribed value.

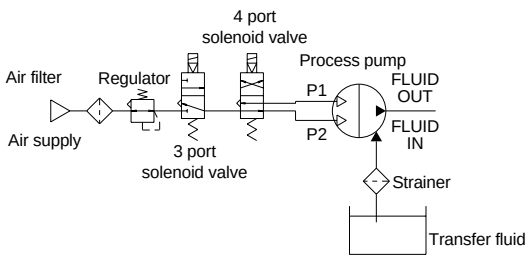
<Discharge Flow Rate Adjustment>

1. The flow rate from the discharge port <FLUID OUT> can be adjusted easily by changing the switching cycle of the solenoid valve on the air supply port.

Circuit example (1)



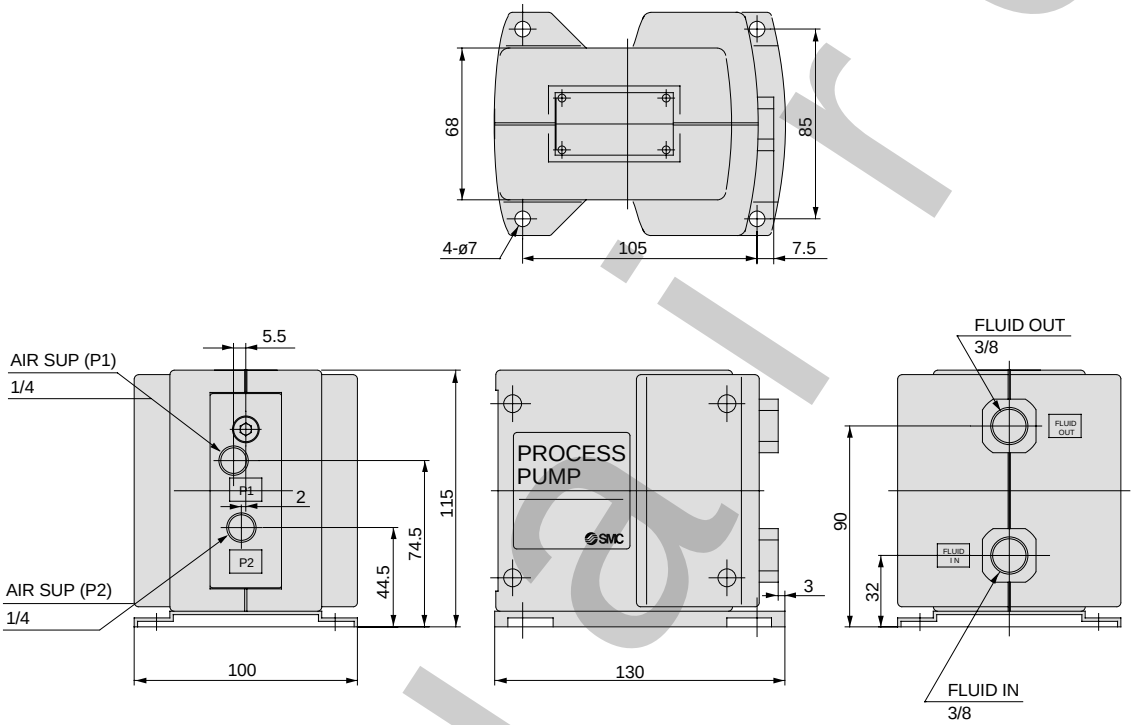
Circuit example (2)



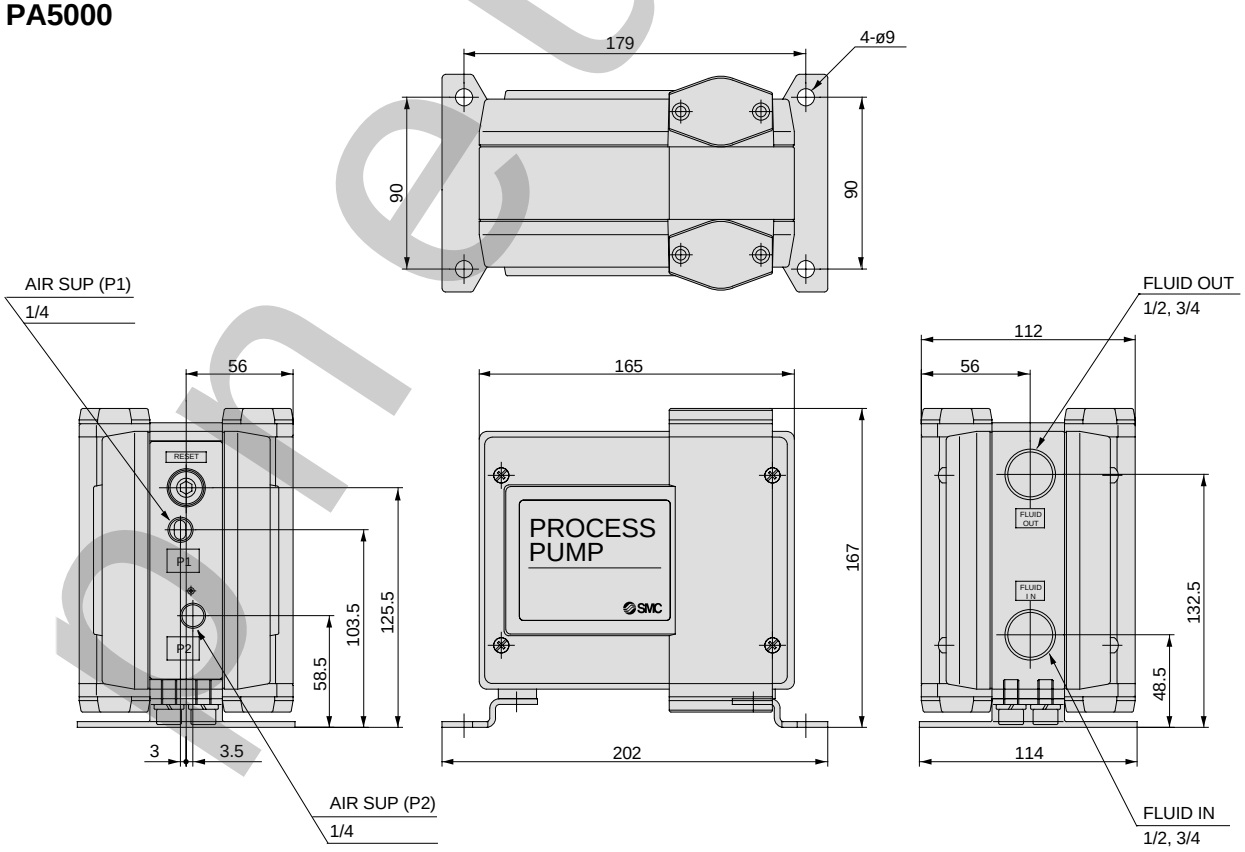
Dimensions/Air Operated Type (mm)

1in = 25.4mm

PA3000



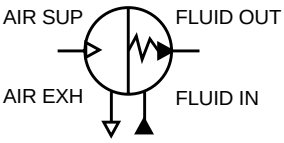
PA5000



Series PAX1000

Process Pump Automatically Operated Type with Built-in Pulsation Attenuator (Internal Switching Type)

Symbol



Built-in pulsation attenuator
Automatically operated type

How to Order

PAX1 [1] 1 2 — [ ] [02] — [ ]

Body material

1	ADC12 (aluminum)
2	SCS14 (stainless steel)

Diaphragm material

1	PTFE (fluororesin)

Type of operation

2	Automatically operated type with built-in pulsation attenuator

Thread type

Nil	Rc
T*	NPTF
F*	G
N*	NPT

* T, F, N are order made specifications.

Connection port size

02	1/4 (8A)
03	3/8 (10A)

Option

Nil	Body only
N	With silencer *

* For AIR EXH: AN200-02

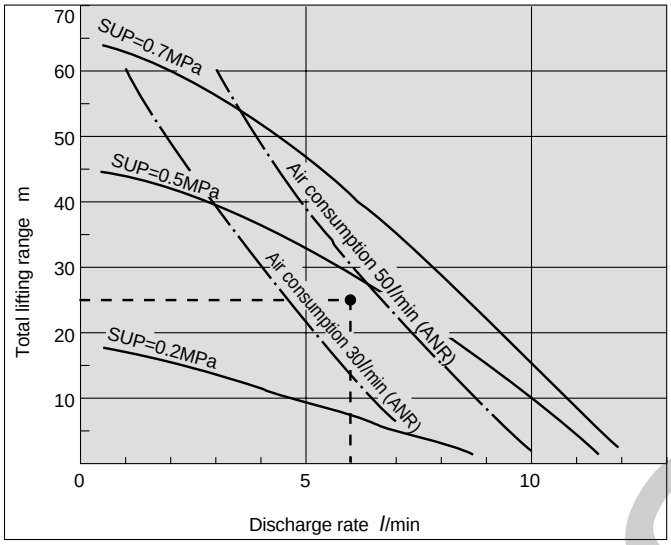
Specifications

Model		PAX1112	PAX1212
Port size	Main fluid suction/ discharge port	1/4, 3/8	
	Pilot air supply/ exhaust port	1/4	
Material	Fluid contact areas	ADC12	SCS14
	Diaphragm	PTFE	
	Check valve	PTFE, SCS14	
Discharge rate		0.5 to 10//min (0.02 to 0.35SCFM)	
Average discharge pressure		0 to 0.6MPa (0 to 87psi)	
Pilot air consumption		Maximum 150//min (ANR) (5.3SCFM)	
Suction lifting range	Dry	Up to 2m (16.6ft) (interior of pump dry)	
	Wet	Up to 6m (19.7ft) (liquid inside pump)	
Discharge pulsation attenuating capacity		30% or less of maximum discharge pressure	
Fluid temperature		0 to 60°C (32 to 140°F) (with no freezing)	
Ambient temperature		0 to 60°C (32 to 140°F)	
Pilot air pressure		0.2 to 0.7MPa (29 to 101psi)	
Withstand pressure		1.05MPa (152psi)	
Mounting position		Horizontal (bottom facing down)	
Weight		2.0kg (4.4lb)	3.5kg (7.7lb)

* Each of the values above indicates use at ordinary temperatures with fresh water.

Performance Curves/Automatically Operated Type with Built-in Pulsation Attenuator

PAX1000 Flow rate characteristics



Selection from flow rate characteristic graph

Required specification example:

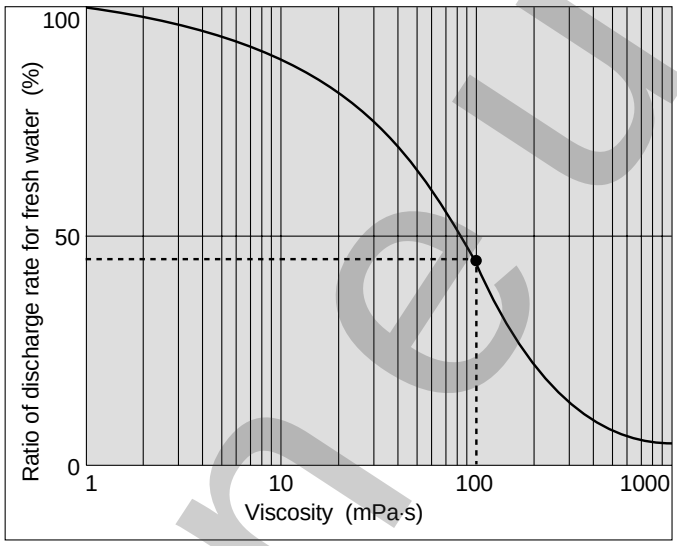
Find the pilot air pressure and pilot air consumption for a discharge rate of 6l/min and a total lifting range of 25m. [The transfer fluid is fresh water (viscosity 1mPa·S, specific gravity 1.0).]

∗ If the discharge pressure is required instead of the total lifting height, a total lift of 10m corresponds to discharge pressure of 0.1MPa.

Selection procedures

1. First mark the intersection point for a discharge rate of 6l/min and a lifting range of 25m.
2. Find the pilot air pressure for the marked point. In this case, the point is between the discharge curves (solid lines) for SUP=0.2MPa and SUP=0.5MPa, and based on the proportional relationship to these lines, the pilot air pressure for this point is approximately 0.45MPa.
3. Next find the air consumption. Since the marked point is below the curve for 50l/min (ANR), the maximum rate will be about 50l/min (ANR).

Viscosity characteristics (flow rate correction for viscous fluids)



1MPa = 145psi
1m = 0.3048ft
1l/min = 0.035SCFM

Selection from viscosity characteristic graph

Required specification example:

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

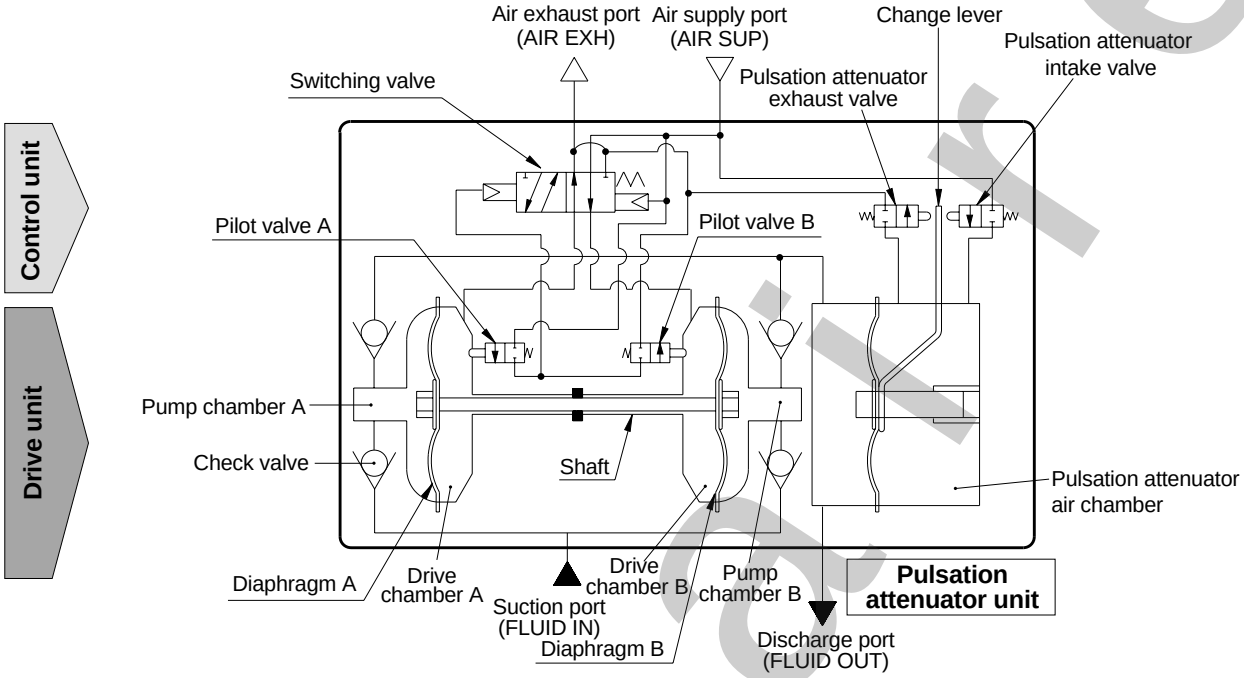
Selection procedure

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

⚠Caution

Viscosities up to 1000mPa·s can be used.

Operating Principle/Automatically Operated Type with Built-in Pulsation Attenuator



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 is switched 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 pressing 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.

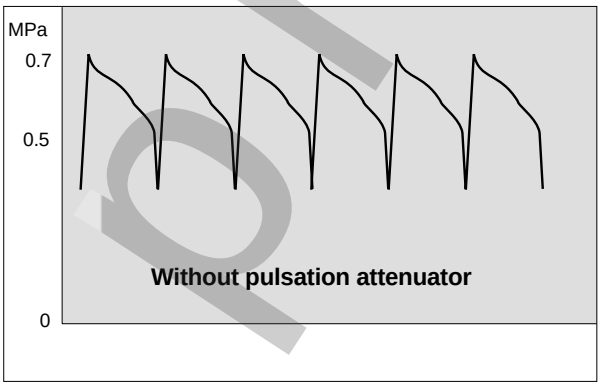
Drive unit

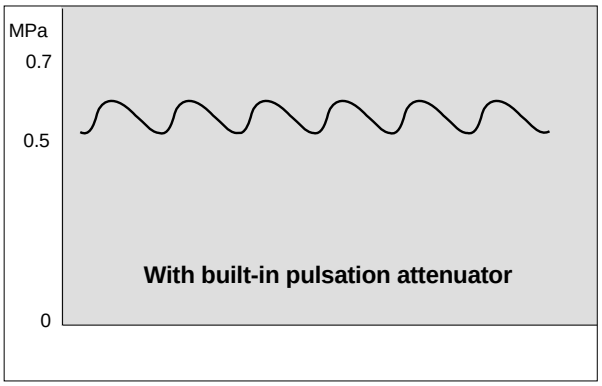
1. When air enters drive chamber B, the fluid in pump chamber B is forced out, and at the same time fluid is sucked into pump chamber A.
2. When the diaphragm moves in the opposite direction, the fluid in pump chamber A is pushed out, and fluid is sucked into pump chamber B.
3. The pressure of the fluid that is forced out of the pump chamber is adjusted in the pulsation attenuation chamber and is then exhausted.
4. Continuous suction/discharge is performed by the reciprocal motion of the diaphragm.

Pulsation attenuation chamber

1. Pulsation is attenuated by the elastic force of the diaphragm and air in the pulsation attenuation chamber.
2. When the pressure in the pulsation attenuation chamber rises, the change lever presses the pulsation attenuator intake valve, and air enters the pulsation attenuator air chamber.
3. Conversely, when pressure drops, the change lever presses the pulsation attenuator exhaust valve, exhausting the air from the air chamber and keeping the diaphragm in a constant position. Note that some time is required for the pulsation attenuator to operate normally.

Pulsation Attenuating Capacity

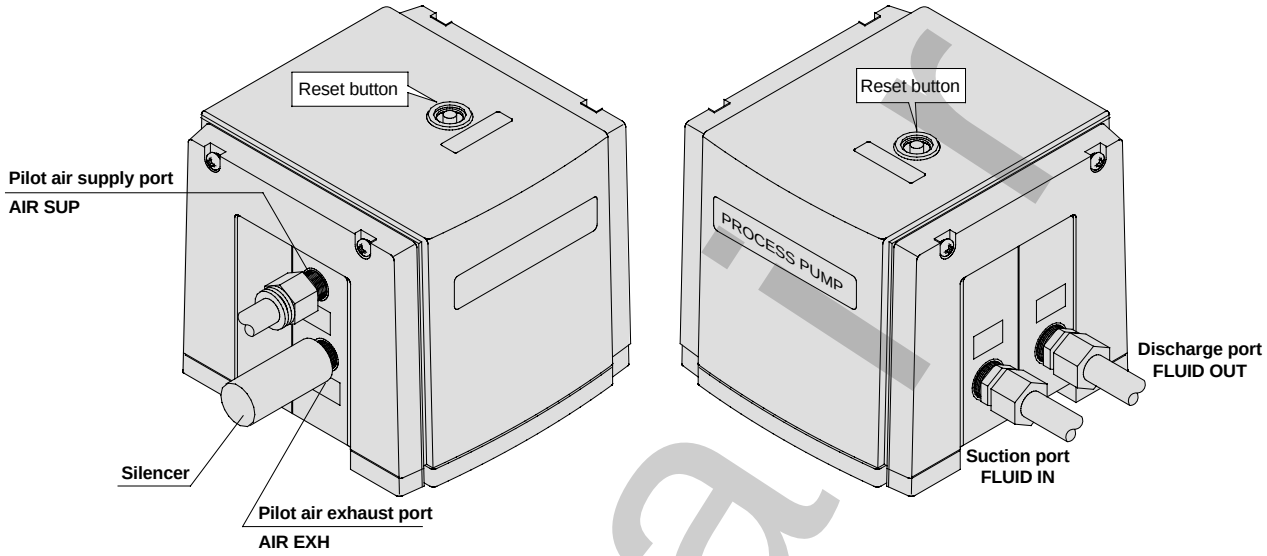




The process pump generates pulsation because it discharges a liquid using two diaphragms. The pulsation attenuator absorbs pressure when discharge pressure increases, and compensates the pressure when discharge pressure decreases. By this means pulsation is controlled.

Piping/Automatically Operated Type with Built-in Pulsation Attenuator

Piping diagram



⚠ Caution
Maintain the proper tightening torque for fittings and mounting bolts, etc. Looseness can cause problems such as fluid leakage, 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 SUP> and connect piping for the fluid to be transferred 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 0.7MPa. 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. 2m) 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 with 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.

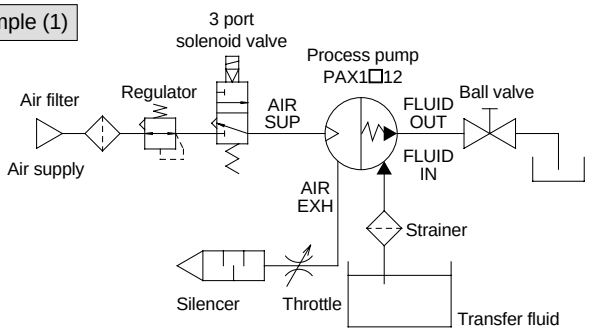
<Discharge Flow Rate Adjustment>

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. (Minimum flow rate: PAX1000 0.5l/min)

<Reset Button>

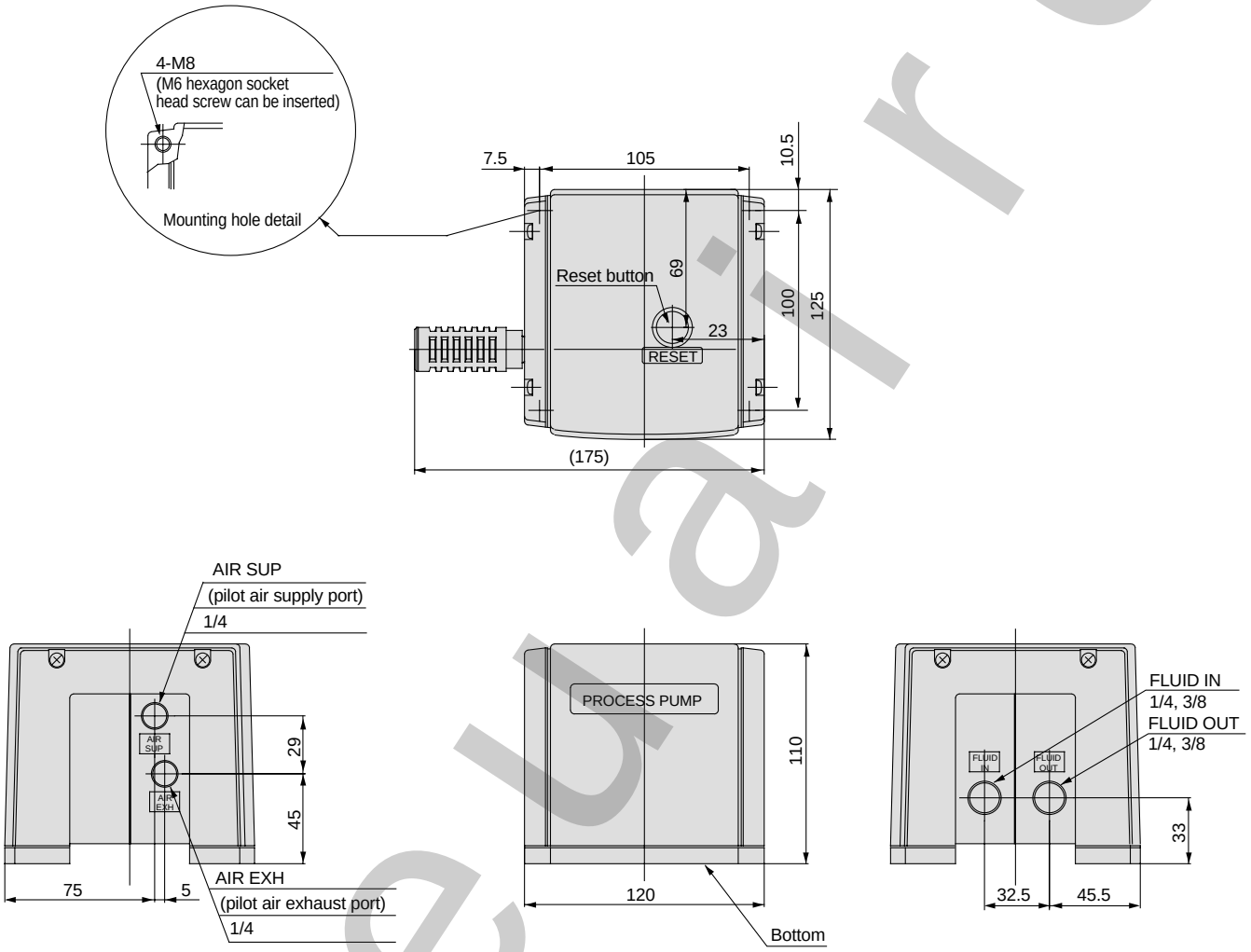
1. When the pump stops during operation, press the reset button. This makes it possible to restore operation in case the switching valve becomes clogged due to foreign matter in the supply air.

Circuit example (1)



Dimensions (mm)

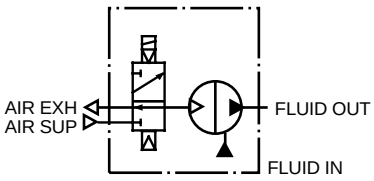
1in = 25.4mm



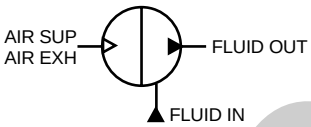
Series PB1000

Process Pump Built-in Solenoid Valve Type/Air operated Type (External Switching Type)

Symbol



Built-in solenoid valve type



Air operated type

How to Order

PB1 0 1 1 — □ 01 — □

Body size

1	1/8 standard

Body material

0	Polypropylene

Diaphragm material

1	PTFE (fluororesin)

Type of operation

1	Built-in solenoid valve
3	Air operated

Thread type

Nil	Rc
T*	NPTF
F*	G
N*	NPT

* T, F, N are order made specifications.

Connection port size

01	1/8 (6A)

Option/Part no.

Nil	Pump only
B	With foot (bolts included) KT-PB1-3
N*	With silencer AN120-M5

* For AIR EXH
Air operated type is not available with silencer (symbol N).

Specifications

Model			PB1011	PB1013
Port size	Main fluid suction/discharge port		1/8	
	Pilot air	Supply port	1/8	
		Exhaust port	M5 x 0.8 (10 - 32 NOMINAL)	
Material	Fluid contact areas		Polypropylene PP, Stainless steel (SUS316)	
	Diaphragm		PTFE	
	Check valve		PTFE	
	Liquid contact seals		FKM	
Discharge rate			8 to 2000ml/min (0.3 to 70.6SCFM)	8 to 500ml/min (0.3 to 17.6SCFM)
Average discharge pressure			0 to 0.6MPa (0 to 87psi)	
Suction lifting range			Up to 2.5m (8.2ft) (dry: interior of pump dry)	
Fluid temperature			0 to 50°C (32 to 122°F) (with no freezing)	
Ambient temperature			0 to 50°C (32 to 122°F)	
Pilot air pressure			0.2 to 0.7MPa (29 to 101psi)	
Withstand pressure			1.05MPa (152psi)	
Recommended operating cycle			1 to 10Hz (0.03 to 1Hz also possible depending on conditions Note 2)	
Lubrication			Not required	
Voltage			24VDC	—
Weight			0.17kg (0.37lb)	0.15kg (0.33lb)
Mounting position			OUT port at top (indication on name plate)	
Pilot air solenoid valve recommended Cv factor Note 1)			—	0.2

* Each of the values above indicates use at ordinary temperatures with fresh water.

Note on the transfer of slurry:

Slurry transfer is not possible with Series PB1000 because of deterioration and wear of the check valve seat and the accumulation of particles, which will render the pump inoperable.

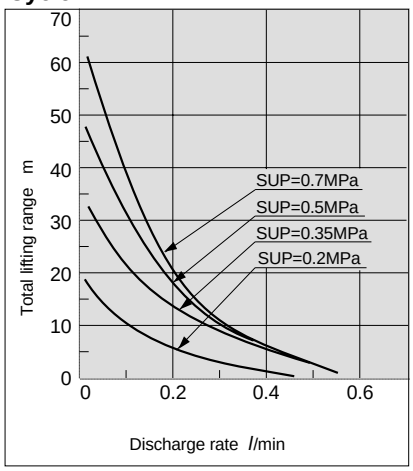
Note 1) With low operating cycles, even a valve with a small Cv factor can be operated.
Recommended valve/for PB1013 air operated type: SYJ3□4

Note 2) After initial suction of liquid operating at 1 to 7Hz, it can be used with operation at lower cycles. Since a large quantity of liquid will be pumped out, use a suitable throttle in the discharge port if problems occur.

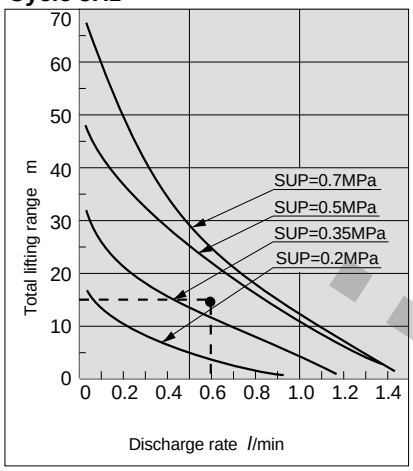
1//min = 0.035SCFM
1MPa = 145psi

Performance Curves/Built-in Solenoid Type/Air Operated Type

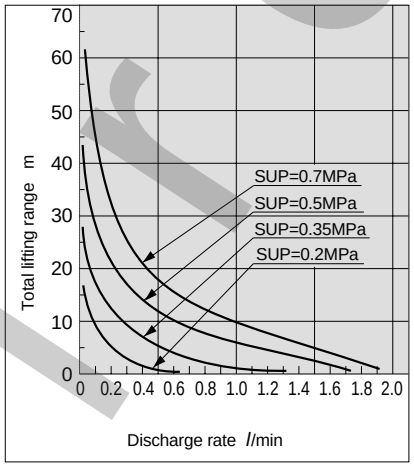
Cycle 1Hz



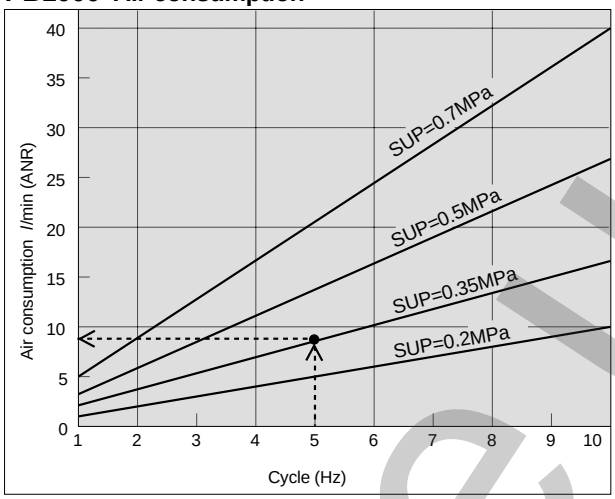
Cycle 5Hz



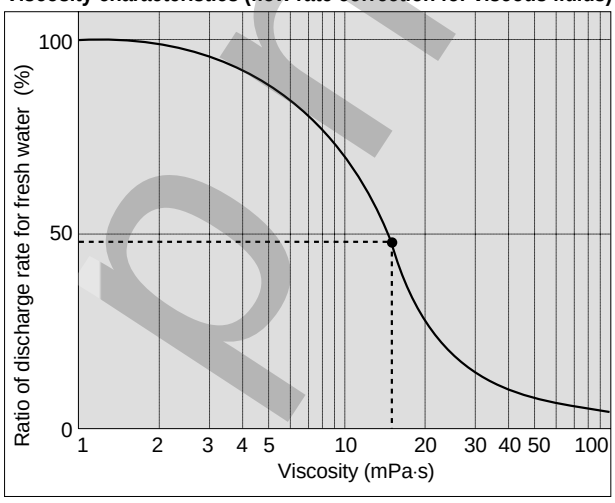
Cycle 10Hz



PB1000 Air consumption



Viscosity characteristics (flow rate correction for viscous fluids)



Selection from flow rate characteristic graphs

Required specification example:
Find the pilot air pressure and pilot air consumption for a discharge rate of 600m//min and a total lifting range of 15m.
<The transferred fluid is clean water (viscosity 1mPa·s, specific gravity 1.0) solenoid valve cycle 5Hz>

* If the discharge pressure is required instead of the total lifting height, a total lift of 10m corresponds to a discharge pressure of 0.1MPa.

Selection procedure

1. First mark the intersection point for a discharge rate of 600m//min and a lifting range of 15m.
2. Find the pilot air pressure for the marked point. In this case, the point is between the discharge curves (solid lines) for 0.35MPa and 0.5MPa, and based on the proportional relationship to these lines, the pilot air pressure for this point is approximately 0.4MPa.

Calculating air consumption

Find the air consumption for operation with a 5Hz switching cycle and pilot air pressure of 0.35MPa from the air consumption graph.

Selection procedure

1. Look up from the 5Hz switching cycle to find the intersection with SUP=0.35MPa.
2. From the point just found, draw a line to the Y-axis to find the air consumption. The result is approximately 9//min (ANR).

⚠ Caution

1. These flow rate characteristics are for fresh water (viscosity 1mPa·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 (density, lifting range, transfer distance), etc.
3. If operated continuously at 10Hz, the diaphragm will reach its service life of 20 million cycles in approximately one month.

Selection from viscosity characteristic graph

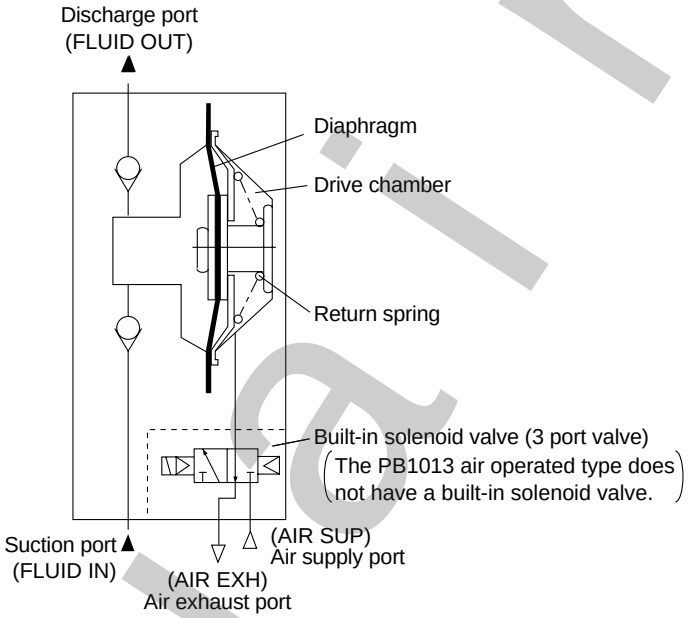
Required specification example:
Find the pilot air pressure and pilot air consumption for a discharge rate of 200m//min, a total lifting range of 10m, and a viscosity of 15mPa·s.

Selection procedure

1. First find the ratio of the discharge rate for fresh water when viscosity is 15mPa· s from the graph to the left. It is determined to be 48%.
2. Next, the viscosity of 15mPa· s and the discharge rate of 200//min in the required specification example are converted to the discharge rate for fresh water. Since 48% of the fresh water discharge rate is equivalent to 200m//min in the required specifications, 200m//min ÷ 0.48 = approximately 420m//min, indicating that a discharge rate of 420m//min is required for fresh water.
3. Finally, find the pilot air pressure and pilot air consumption based on viewing of the flow rate characteristics.

Viscosity: Transfer is possible up to about 100mPa· s.

Operating Principle/Built-in Solenoid Valve Type/Air Operated Type



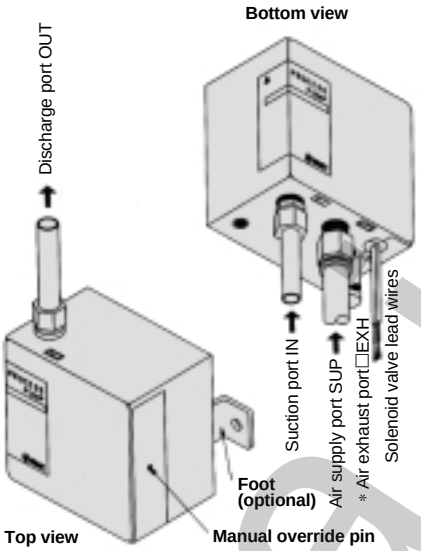
When air is supplied and the built-in solenoid valve is turned ON, air enters the drive chamber and the diaphragm moves to the left. Due to this movement, the fluid in the pump chamber passes through the upper check valve and is discharged to the OUT side.

When the solenoid valve is turned OFF, the air inside the drive chamber is evacuated to EXH, and the diaphragm is moved to the right by the return force of the return spring. Due to this movement, the fluid on the FLUID IN side passes through the lower check valve and is sucked into the pump chamber.

The PB1011 repeats this suction and discharge with the repetition of the built-in solenoid valve's ON/OFF operation. The PB1013 air operated type is operated by the ON/OFF operation of an external solenoid valve.

Piping and Operation/Built-in Solenoid Valve Type/Air Operated Type

Piping



∗ The PB1013 air operated type has a plug in the air exhaust port EXH.

⚠ Caution

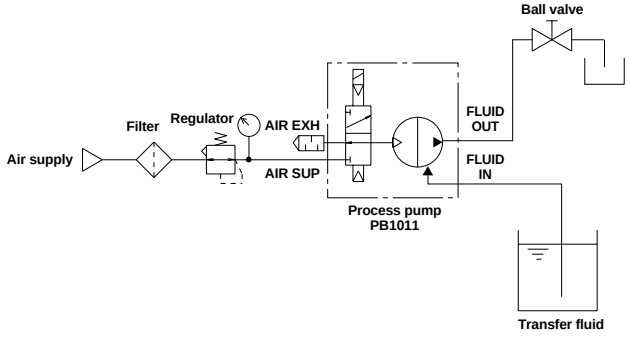
Be sure that the discharge side OUT is on top when the pump is mounted. Supply clean air that has passed through an AF filter, etc., to the air supply port SUP. Air that contains debris or drainage, etc., will have an adverse effect on the built-in solenoid valve, and will cause malfunction of the pump. In cases that particularly require air cleaning, use a filter (Series AF) together with a mist separator (Series AM).

Maintain the proper tightening torque for fittings and mounting bolts, etc. Looseness can cause problems such as fluid and air leakage, while over tightening can cause damage to threads and parts, etc.

Operation

1. Connect air piping to the air supply port SUP, and connect piping for the transfer fluid to the suction port IN and the discharge port OUT.
2. Connect the solenoid valve lead wires to a 24VDC power supply. Red is (+) and Black is (–). (The PB1013 air operated type must be equipped with a separate solenoid valve.)
3. Using a regulator, set the pilot air pressure within the range of 0.2 to 0.7MPa. By continuously turning the 24VDC power ON/OFF the fluid flows from the suction port IN to the discharge port OUT. The pump performs suction with its own power even without priming.
4. To stop the pump turn OFF the 24VDC power. Also be sure to turn OFF the power when the discharge side is closed. The manual override pin is used for manual operation when there is no electric power. Each time it is pressed, there is one reciprocal operation.

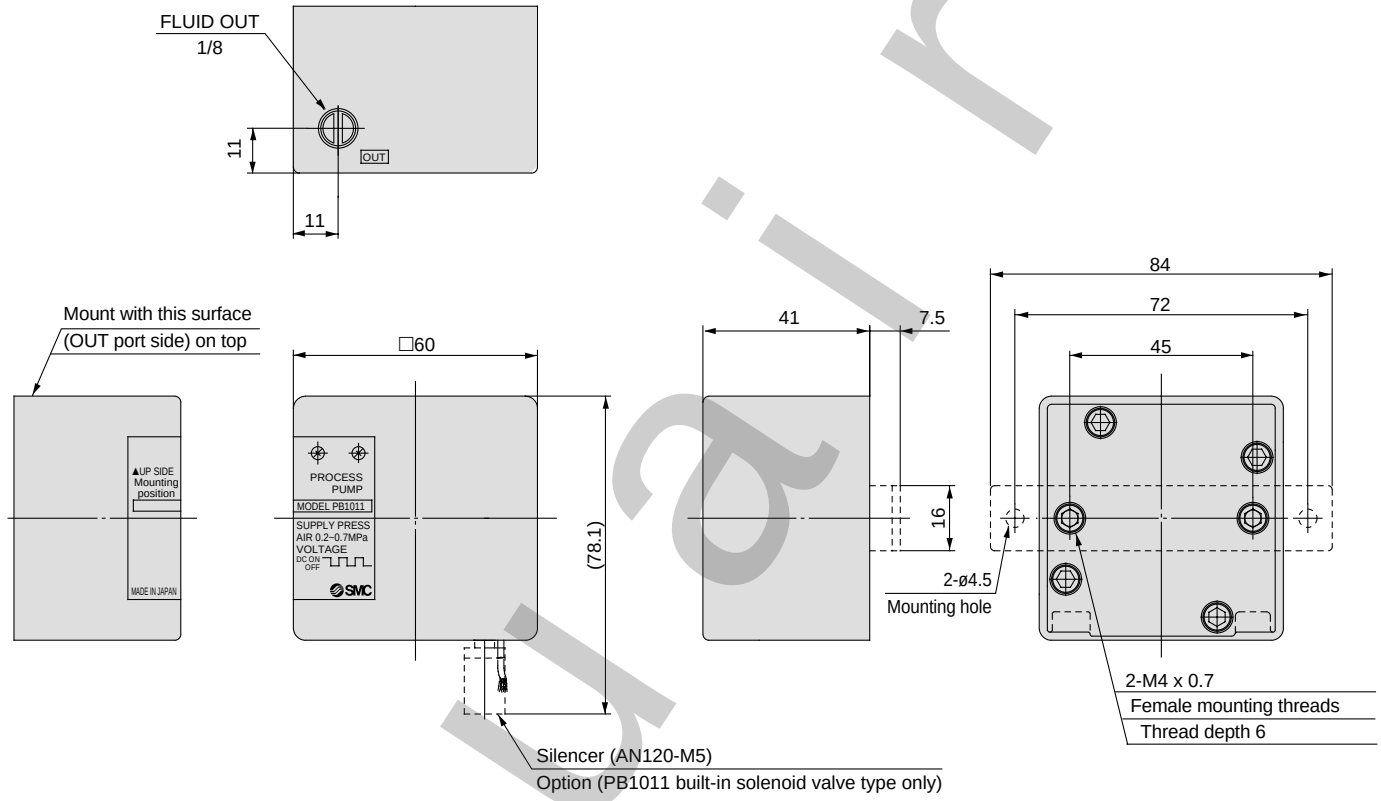
Circuit example/Built-in solenoid valve

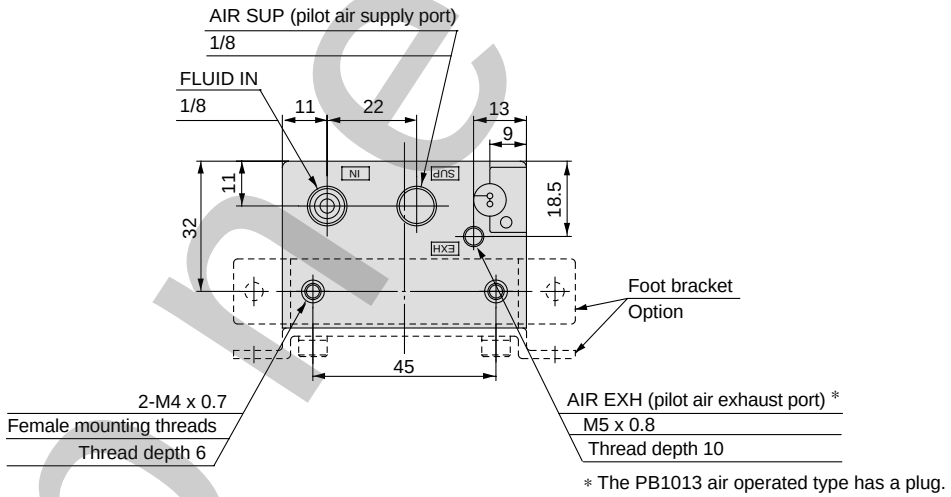


Dimensions/Built-in Solenoid Valve Type/Air Operated Type (mm)

PB1000

1in = 25.4mm



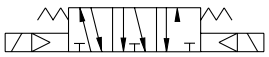


* The PB1013 air operated type has a plug.

Related Products (Refer to the individual product catalogs for further details.)

5 port solenoid valve
VQZ14□0/24□0
(exhaust center)

Symbol



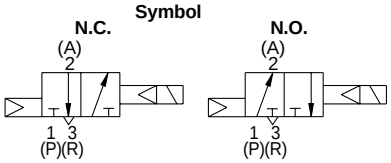
Specifications

Model	VQZ1420	VQZ1440	VQZ2420	VQZ2440
Piping	Body ported		Base mounted	
Valve construction	Metal seal			
Type of actuation	3 position exhaust center			
Maximum operating pressure	0.7MPa (101psi) (high pressure type 1.0MPa) (145psi)			
Minimum operating pressure	0.1MPa (14psi)			
Effective area (Cv factor)	2.7 (0.15)	8.1 (0.45)	3.6 (0.2)	10.0 (0.55)
Maximum operating frequency	10Hz			

Refer to Best Pneumatics (1) Page 1.12-1

3 port solenoid valve
SYJ3□4

Symbol



Specifications

Model	SYJ314	SYJ324
Piping	Base mounted	
Valve construction	Rubber seal	
Type of actuation	N.C.	N.O.
Maximum operating pressure	0.7MPa (101psi)	
Minimum operating pressure	0.15MPa (22psi)	
Effective area (Cv factor)	1.8 (0.1)	
Maximum operating frequency	10HZ	

Refer to Best Pneumatics (1) Page 2.2-1

Mist Separator
Series AM

Series AM separates and removes the oil mist in compressed air which is troublesome for ordinary filters, and removes fine particles of rust and carbon, etc., of 0.3μm or larger. Should be used as the air supply for driving pilot type and metal type solenoid valves.

Models

Model	AM150	AM250
Rated flow rate (ANR)	300//min (10.5SCFM)	750 //min (26.5SCFM)
Port size (nominal size B)	1/8, 1/4, 3/8	1/4, 3/8, 1/2
Weight	0.38kg (0.84lb)	0.55kg (1.21lb)

Specifications

Fluid	Compressed air
Maximum operating pressure	1.0MPa (145psi)
Min. operating pressure Note 1)	0.05MPa (7psi)
Proof pressure	1.5MPa (217psi)
Ambient and fluid temperature	5 to 60°C (41 to 140°F)
Filtration degree	0.3μm (95% filtered particle diameter)
Downstream oil mist concentration	Max.1.0mg/m³ (ANR) (approx. 0.8ppm) Note 2)
Element life	2 years, or when pressure drop reaches 0.1MPa

Note 1) With auto drain is 0.15MPa
Note 2) When compressor discharge oil mist concentration is 30mg/m³ (ANR)

Filter Regulator + Mist Separator
Air Combination
Series AC2040/3040

Models

Model		AC2040	AC3040
Component devices	Filter regulator	AW2000	AW3000
	Mist separator	AFM2000	AFM3000
Port size Rc		1/8 1/4	1/4 3/8
Pressure gauge port size Rc		1/8	1/8

Specifications

Model	AC2040	AC3040	AC4040	AC4040-06
Proof pressure	1.5MPa (217psi)			
Maximum operating pressure	1.0MPa (145psi)			
Minimum operating pressure	0.05MPa (7psi)			
Regulating pressure range	0.05 to 0.85MPa (7 to 123psi)			
Rated flow rate l/min (ANR) (SCFM) Note 1)	150 (5.3)	330 (11.7)	800 (28.5)	800 (28.5)
Ambient and fluid temperature	– 5 to 60°C (with no freezing) (23 to 140°F)			
Filtration degree	AW: 5μm, AFM: 0.3μm (95% filtered particle diameter)			
Downstream oil mist concentration	Max 1.0mgf/Nm³ (approx. 0.8ppm) Note 2)			
Case material	Polycarbonate			
Construction/Filter regulator	Relief type			
Weight (kg) (lb)	0.63 (1.4)	0.97 (2.1)	1.91 (4.2)	1.99 (4.4)

Note 1) Conditions: Upstream pressure 0.7MPa, Set pressure 0.5MPa
The rated flow rate varies depending on the set pressure.
Note 2) When compressor discharge concentration is 30mg/Nm³

Drain Catch
Series AMG

The AMG series is installed in air pressure lines to remove water droplets from compressed air. Use it when you want to remove water but air as dry as that from an air dryer is not necessary, or when a power supply for an air dryer is not available, etc.

Models

Model	AMG150	AMG250
Rated flow rate Note) //min (ANR)	300	750
Port size (nominal size B)	1/8, 1/4, 3/8	1/4, 3/8, 1/2
Weight (kg) (lb)	0.38 (0.84)	0.55 (1.21)

Note) Maximum flow rate at pressure 0.7MPa

Specifications

Fluid	Compressed air
Maximum operating pressure	1.0MPa (145psi)
Min. operating pressure Note)	0.05MPa (7psi)
Proof pressure	1.5MPa (217psi)
Ambient and fluid temperature	5 to 60°C (41 to 140°F)
Dehumidification rate	99%
Element life	2 years, or when pressure drop reaches 0.1MPa (14psi)

Note) With auto drain is 0.15MPa

Related Products (Refer to the individual product catalogs for further details.)

Membrane Dyer
Series IDG

Macromolecular membrane dryers that act like filters

Standard specifications/Single style (standard dew point –20°C (–4°F))

Model		Standard dew point –20°C				
		IDG5	IDG10	IDG20	IDG30	IDG50
Range of operating conditions	Fluid	Compressed air				
	Inlet air pressure MPa (psi)	0.3 to 0.85 (43 to 123)			0.3 to 1.0 (43 to 145)	
	Inlet air temperature °C (°F) Note 1)	–5 to 55 (23 to 131)			–5 to 50 (23 to 122)	
	Ambient temperature °C (°F)	–5 to 55 (23 to 131)			–5 to 50 (23 to 122)	
Standard performance	Outlet air atmospheric pressure dew point °C (°F)	–20 (-4)				
Standard performance conditions	Inlet air flow rate //min (ANR) (SCFM) Note 2)	62 (2.19)	125 (4.41)	250 (8.82)	375 (13.24)	625 (22.0)
	Outlet air flow rate //min (ANR) (SCFM)	50 (1.8)	100 (3.5)	200 (7.1)	300 (10.6)	500 (1.77)
	Purge air flow rate //min (ANR) (SCFM) Note 3)	12 (0.42)	25 (0.88)	50 (1.8)	75 (2.6)	125 (44)
	Inlet air pressure MPa (psi)	0.7 (101)				
	Inlet air temperature °C (°F)	25 (77)				
	Inlet air saturation temperature °C (°F)	25 (77)				
	Ambient temperature °C (°F)	25 (77)				
Dew point indicator purge air flow rate		—	1//min (ANR) (0.03SCFM) {inlet air pressure at 0.7MPa} (101psi)			
Port size (nominal size B)		1/8, 1/4	1/4, 3/8			
Weight kg [(lb)] (with bracket)		0.25 [(.55)] (0.31) [(.68)]	0.43 [(.95)] (0.51) [(1.24)]	0.66 [(1.46)] (0.76) [(1.68)]	0.74 [(1.63)] (0.87) [(1.91)]	0.77 [(1.70)] (0.90) [(1.98)]

Note 1) With no freezing

Note 2) ANR indicates the flow rate converted to the value for 20°C (-4°F) at atmospheric pressure.

Note 3) Includes dew point indicator purge air flow rate of 1//min (ANR) (inlet air pressure at 0.7MPa). (except IDG1, IDG5)

Maintenance Part Lists

PAX1000

Diaphragm kit (PTFE)	KT-PAX1-31
Check valve kit	KT-PAX1-36
Switching valve parts kit	KT-PAX1-37
Pilot valve kit	KT-PA5-38
Pulsation attenuator control valve kit	KT-PAX1-39

PB1000

Diaphragm kit	KT-PB1-2
Check valve kit	KT-PB1-1
Built-in solenoid valve kit	VJ314MY-5H

PA3000/Automatically operated type

Diaphragm kit (PTFE)	KT-PA3-31
Diaphragm kit (NBR)	KT-PA3-32
Check valve kit	KT-PA3-36
Switching valve assembly kit	KT-PA3-37
Pilot valve kit	KT-PA5-38

PA3000/Air operated type

Diaphragm kit (PTFE)	KT-PA3-31
Check valve kit	KT-PA3-36

PA5000/Automatically operated type

Diaphragm kit (PTFE)	KT-PA5-31
Diaphragm kit (NBR)	KT-PA5-32
Check valve kit	KT-PA5-36
Switching valve parts kit	KT-PA5-37
Pilot valve kit	KT-PA5-38

PA5000/Air operated type

Diaphragm kit (PTFE)	KT-PA5-31
Check valve kit	KT-PA5-36