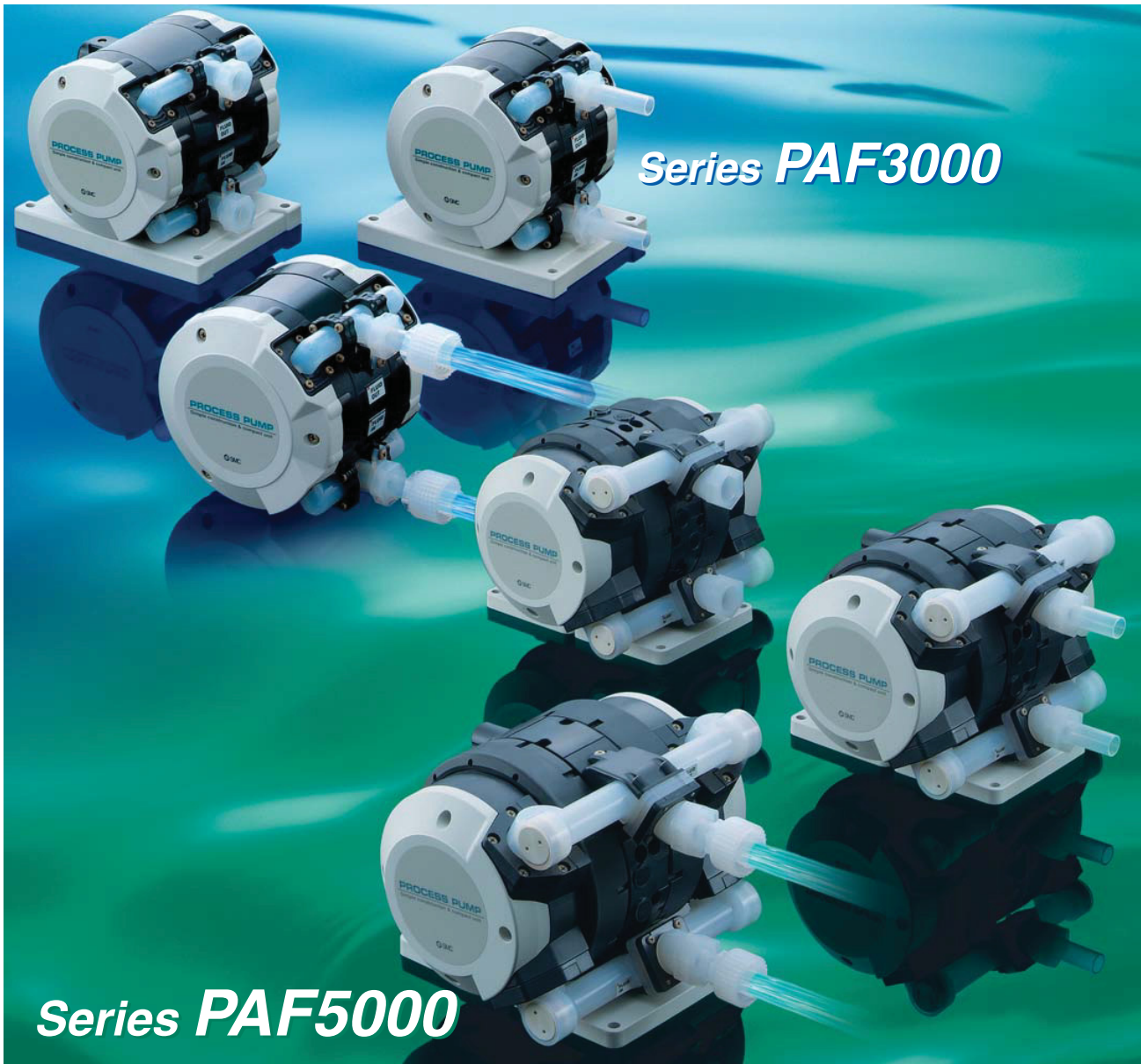


# Process Pump

Clean Wet Series



**New** Flare type (LQ3 fitting) added to the type with nut

The excellent corrosion resistance is achieved due to the **new PFA** wetted material construction!

- **No metallic parts are used** (Metal-free),  
**Pump made of all fluoro resin (PAF5000 Series)**
- **Max. flow rate: 45** ℓ/min (Automatically operated) (PAF5000 Series)
- **Connection: Female threaded/Tube extension/With nut** (Insert bushing type, Flare type)

**Series PAF**



CAT.ES100-59C

# The excellent corrosion resistance is achieved due

Body material

Diaphragm/Seal material

# New PFA

# PTFE

## Excellent corrosion resistance/ withstand various fluids/ pressure

*One pump is compatible with various fluids.*



### Variations

Model		Body material	Diaphragm material	Discharge flow rate (ℓ/min)	Fitting type	Option
Automatically operated	PAF3410	New PFA	Modified PTFE	1 to 20	Female threaded Tube extension With nut	<ul style="list-style-type: none"> <li>• Foot <sup>Note 1)</sup></li> <li>• Silencer <sup>Note 2)</sup></li> </ul>
	PAF5410			5 to 45		
Air operated	PAF3413			1 to 15		
	PAF5413			5 to 38		

Note 1) Equipped with the PAF5000 series as standard equipment. Note 2) Automatically operated only.



Female threaded



Tube extension



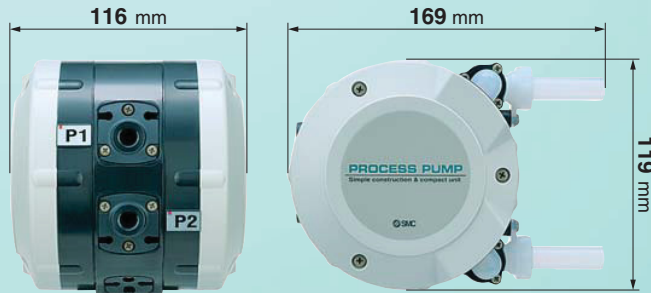
With nut

# to the new PFA wetted material construction!

- **Lightweight and Compact**

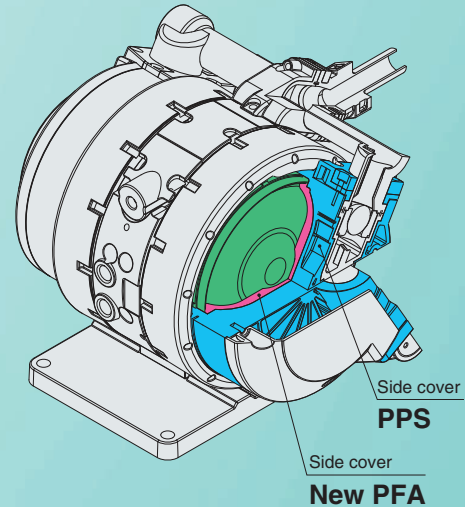
- **Mass: 1.3 kg**

(PAF3000/Air operated, without foot bracket)



- **PPS/PFA dual construction**

Withstand pressure and heat cycle performance have been increased.



- **Clean**

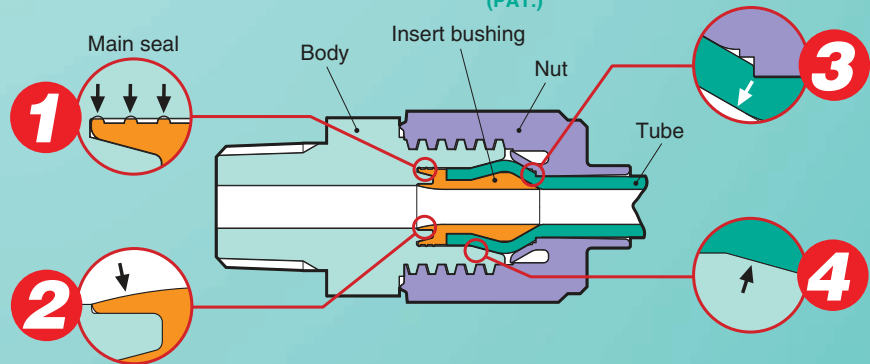
Assembled in a **clean room** and double-packaged.

By using a **molded** side cover and port, it effectively reduces the amount of dust generation.

- **Variations of types with nuts**  
Insert bushing type (LQ1 fitting)



## Quadruple-seal construction (PAT.)

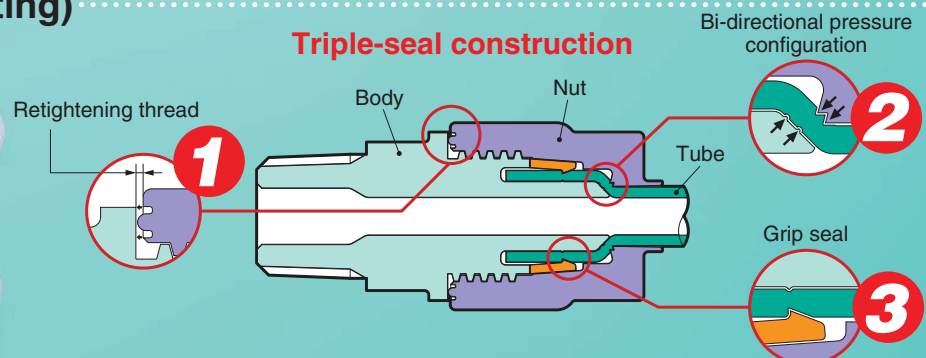


**New**

- **Flare type (LQ3 fitting)**



## Triple-seal construction



# Process Pump

## Automatically Operated Type (Internal Switching Type)

## Air Operated Type (External Switching Type)

# Series PAF3000

### How to Order

#### Female threaded



PAF3410-03-

#### Actuation Note 1)

Symbol	Actuation
0	Automatically operated
3	Air operated

#### Thread type Note 2)

Symbol	Type
Nil	Rc
N	NPT
F	G

#### Option

Symbol	Option	Applicable actuation	
		Automatically operated	Air operated
Nil	None	●	●
B	With foot	●	●
N	With silencer	●	—

\* When more than one option is required, indicate in alphabetical order.

#### Port size

Symbol	Port size
03	3/8"

#### Tube extension



PAF3410-P13-

#### Actuation Note 1)

Symbol	Actuation
0	Automatically operated
3	Air operated

#### Tubing size

Symbol	Main fluid connection size
13	1/2"

#### Option

Symbol	Option	Applicable actuation	
		Automatically operated	Air operated
Nil	None	●	●
B	With foot	●	●
N	With silencer	●	—

\* When more than one option is required, indicate in alphabetical order.

#### Thread type Note 2)

Symbol	Type
Nil	Rc
N	NPT
F	G

#### With nut



PAF3410S-1S13-

#### Actuation Note 1)

Symbol	Actuation
0	Automatically operated
3	Air operated

#### Fitting type

Symbol	Fitting type
1	LQ1
3	LQ3

#### Fitting size

Symbol	IN side	OUT side	Fitting type	
			LQ1	LQ3
13	4		●	●
1319	4	5	●	—
1913	5	4	●	—
19		5	●	—

\* Refer to page 3 for applicable fittings.

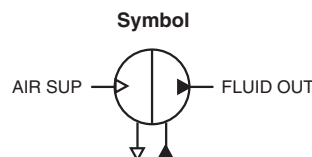
#### Option

Symbol	Option	Applicable actuation	
		Automatically operated	Air operated
Nil	None	●	●
B	With foot	●	●
N	With silencer	●	—

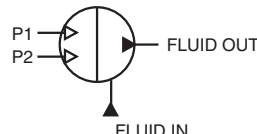
\* When more than one option is required, indicate in alphabetical order.

#### Thread type Note 2)

Symbol	Type
Nil	Rc
N	NPT
F	G



Automatically operated type



Air operated type

Note 1) The pilot port size is as follows. Automatically operated type is 1/4"; Air operated type is 1/8".

Note 2) The thread type is applied to the pilot port and female threaded piping connection.

\*1 Refer to page 23 for "Maintenance Parts."

\*2 Refer to pages 21 and 22 for "Related Products."

# Process Pump

## Automatically Operated Type (Internal Switching Type)

## Air Operated Type (External Switching Type)

# Series PAF5000

### How to Order

#### Female threaded



PAF5410-06-

#### Actuation <sup>Note 1)</sup>

Symbol	Actuation
0	Automatically operated
3	Air operated

#### Thread type <sup>Note 2)</sup>

Symbol	Type
Nil	Rc
N	NPT
F	G

#### Option

Symbol	Option	Applicable actuation	
		Automatically operated	Air operated
Nil	None	●	●
N	With silencer	●	—

#### Port size

Symbol	Port size
06	3/4"

#### Tube extension



PAF5410-P19-

#### Actuation <sup>Note 1)</sup>

Symbol	Actuation
0	Automatically operated
3	Air operated

#### Tubing size

Symbol	Main fluid connection size
19	3/4"

#### Thread type <sup>Note 2)</sup>

Symbol	Type
Nil	Rc
N	NPT
F	G

#### Option

Symbol	Option	Applicable actuation	
		Automatically operated	Air operated
Nil	None	●	●
N	With silencer	●	—

#### With nut



PAF5410S-1S19-

#### Actuation <sup>Note 1)</sup>

Symbol	Actuation
0	Automatically operated
3	Air operated

#### Fitting type

Symbol	Fitting type
1	LQ1
3	LQ3

#### Fitting size

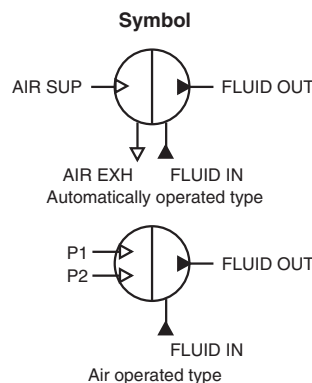
Symbol	IN side	OUT side	Fitting type	
			LQ1	LQ3
19	5		●	●
1925	5	6	●	—
2519	6	5	●	—
25	6		●	—

#### Option

Symbol	Option	Applicable actuation	
		Automatically operated	Air operated
Nil	None	●	●
N	With silencer	●	—

#### Thread type <sup>Note 2)</sup>

Symbol	Type
Nil	Rc
N	NPT
F	G



\* Refer to page 3 for applicable fittings.

Note 1) The pilot port size is 1/4".

Note 2) The thread type is applied to the pilot port and female threaded piping connection.

\*1 Refer to page 23 for "Maintenance Parts."

\*2 Refer to pages 21 and 22 for "Related Products."

# Series PAF

## How to Order Fittings for Products with Nut (PAF341□S, PAF541□S Series)

Fittings compatible for the process pump with nut: PAF341□S, PAF541□S.

Product without nut (insert bushing), 1 piece nut removed, which is not necessary in cases when using the products with nut.

**LQ1 fitting**

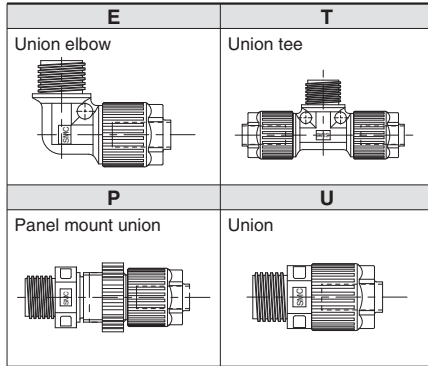
**LQ1E**

**41**

**-S**

Fitting type

Nut (including insert bushing), 1 location removed



Applicable tubing size  
Metric Size

Class	No.	Applicable tubing size (mm)	Reducing*	Applicable process pump	
				PAF341□S	PAF541□S
4	1	12 x 10	○	■	—
4	2	10 x 8	●	■	—
5	1	19 x 16	○	■	■
5	2	12 x 10	●	■	■
6	1	25 x 22	○	—	■
6	2	19 x 16	●	—	■

Inch Size

Class	Symbol	Applicable tubing size (inch)	Reducing*	Applicable process pump	
				PAF341□S	PAF541□S
4	A	1/2" x 3/8"	○	■	—
4	B	3/8" x 1/4"	●	■	—
5	A	3/4" x 5/8"	○	■	■
5	B	1/2" x 3/8"	●	■	■
6	A	1" x 7/8"	○	—	■
6	B	3/4" x 5/8"	●	—	■

\* ○: Basic size ●: With reducer

\* ○: Basic size ●: With reducer

Note) Select the fitting after confirming the IN/OUT side fitting size and fitting type.

**LQ3 fitting**

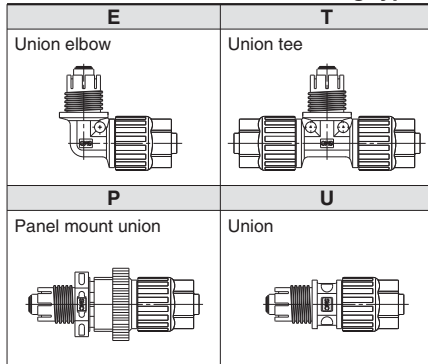
**LQ3E**

**4A**

**-S**

Fitting type

Nut, 1 location removed



Applicable tubing size

Class	Symbol	Applicable tubing size (inch)	Applicable process pump	
			PAF341□S	PAF541□S
4	A	1/2" x 3/8"	■	—
5	A	3/4" x 5/8"	—	■

Note) Select the fitting after confirming the IN/OUT side fitting size and fitting type.

### Ordering Example

**PAF3410S-1S13-B**  
Process pump

Tubing size 12 x 10

**LQ1E41-S**  
Union elbow

OUT side

**LQ1U4B-S**  
Union

IN side

Tubing size 3/8" x 1/4"

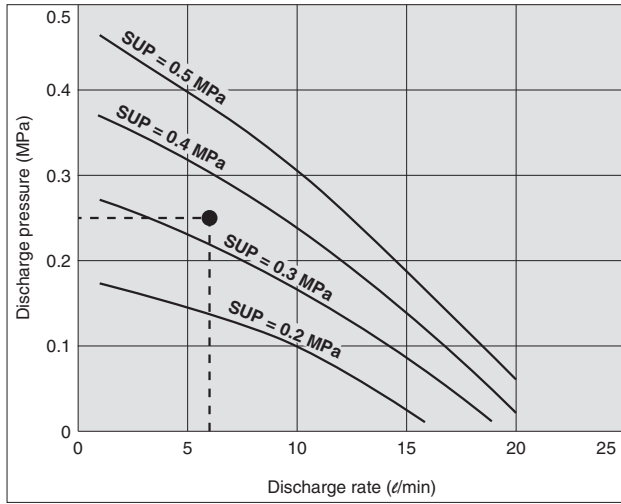
**PAF3410S-1S13-B** 1  
**LQ1E41-S** (Union elbow) 1  
**LQ1U4B-S** (Union) 1

Note) Fittings which are ordered with the process pump at the same time will be shipped in a separate package.

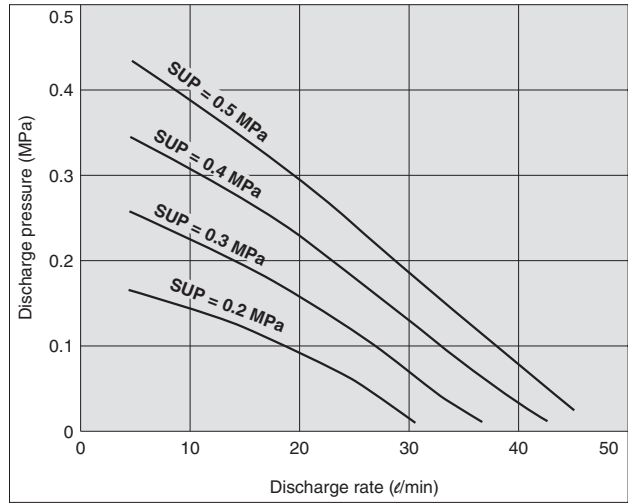
# Series PAF

## Performance Curve: Automatically Operated Type

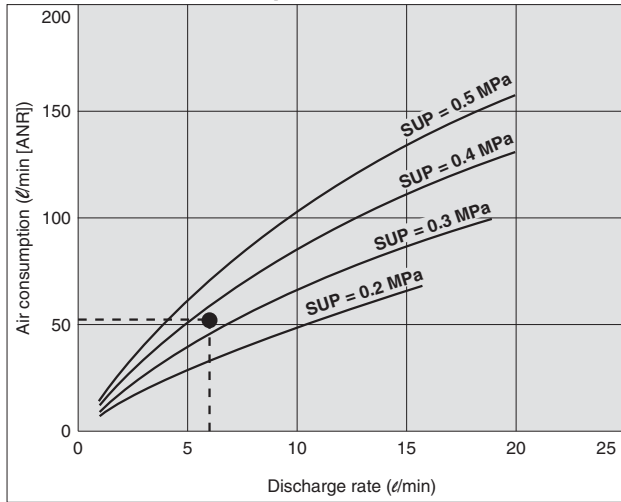
**PAF3410 Flow Characteristics**



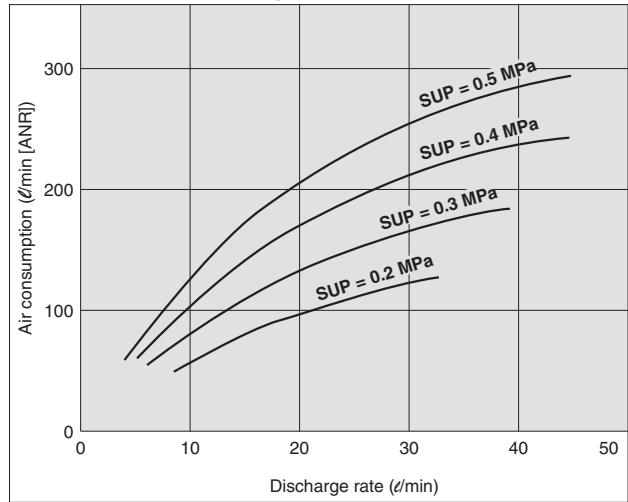
**PAF5410 Flow Characteristics**



**PAF3410 Air Consumption**



**PAF5410 Air Consumption**



### Selection from Flow Characteristic Graph (PAF3410)

Required specifications example:

Find the pilot air pressure and pilot air consumption for a discharge rate of 6 l/min and discharge pressure of 0.25 MPa. <The transfer fluid is tap water (viscosity 1 mPa·s, specific gravity 1.0).>

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

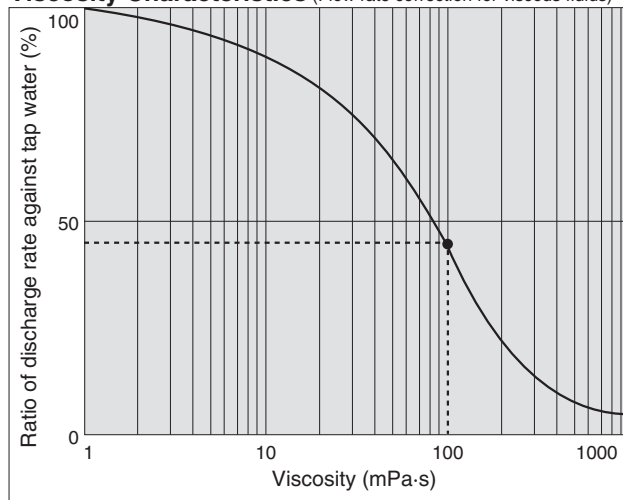
Selection procedures:

1. First mark the intersection point for a discharge rate of 6 l/min and discharge pressure of 0.25 MPa.
2. Find the pilot air pressure for the marked point. In this case, the point is between the discharge curves for SUP = 0.3 MPa and SUP = 0.4 MPa, and based on the proportional relationship to these lines, the pilot air pressure for this point is approx. 0.35 MPa.
3. Next, find the air consumption rate. Trace the discharge rate, 6 l/min, up to the point between the discharge curves for SUP = 0.35 MPa, then trace to the Y-axis, finding the air consumption to be around 55 l/min (ANR).

### ⚠ Caution

- ① These flow characteristics are for tap 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 between the air consumption and 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, discharge pressure of 0.25 MPa, and a viscosity of 100 mPa·s.

Selection procedures:

1. First find the ratio of the discharge rate for tap water when viscosity is 100 mPa·s from the graph on the left. 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 tap water,  $2.7 \text{ l/min} \div 0.45 = 6 \text{ l/min}$ , indicating that a discharge rate of 6 l/min is required for tap 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  $\nu = \text{Viscosity } \mu / \text{Density } \rho$ .

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

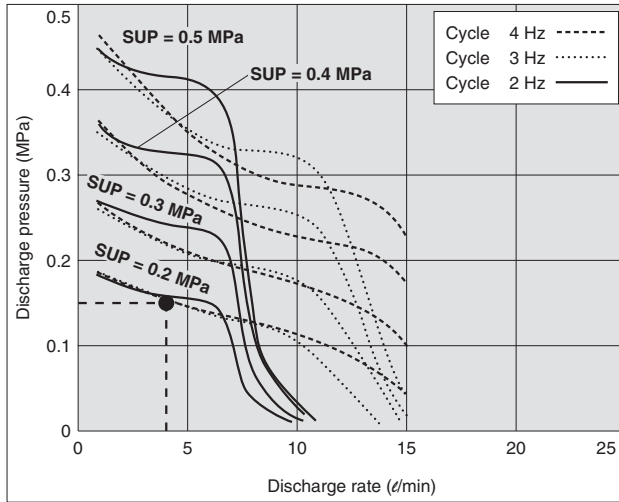
$$\nu(10^{-3} \text{ m}^2/\text{s}) = \mu(\text{mPa}\cdot\text{s})/\rho(\text{kg}/\text{m}^3)$$



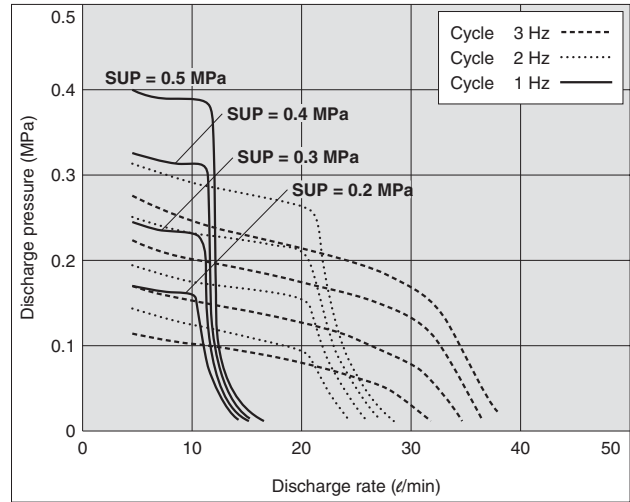
# Series PAF

## Performance Curve: Air Operated Type

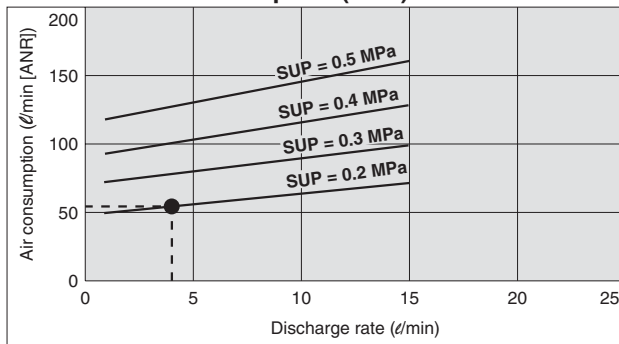
**PAF3413 Flow Characteristics**



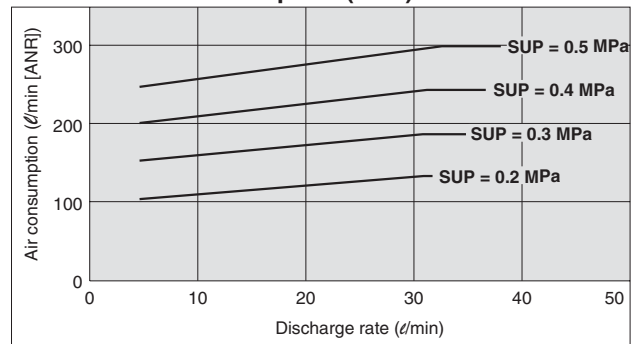
**PAF5413 Flow Characteristics**



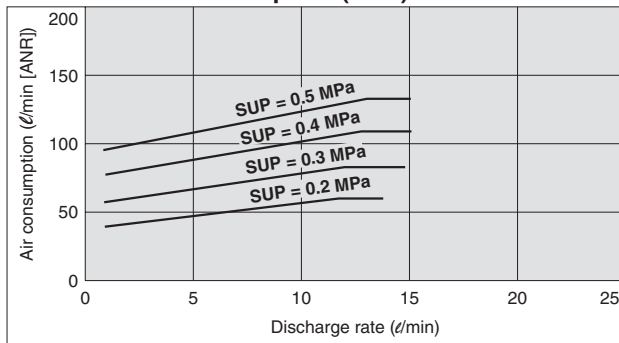
**PAF3413 Air Consumption (4 Hz)**



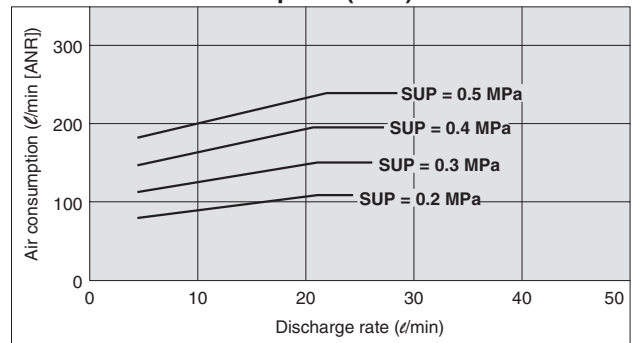
**PAF5413 Air Consumption (3 Hz)**



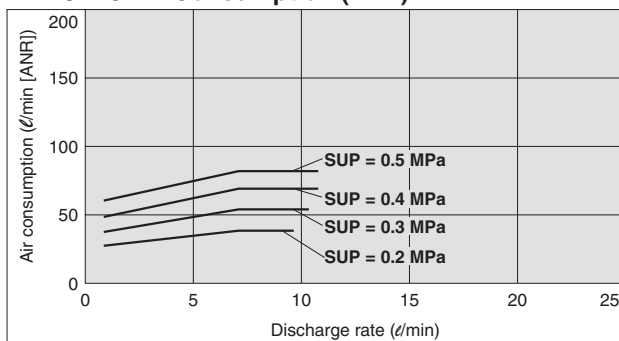
**PAF3413 Air Consumption (3 Hz)**



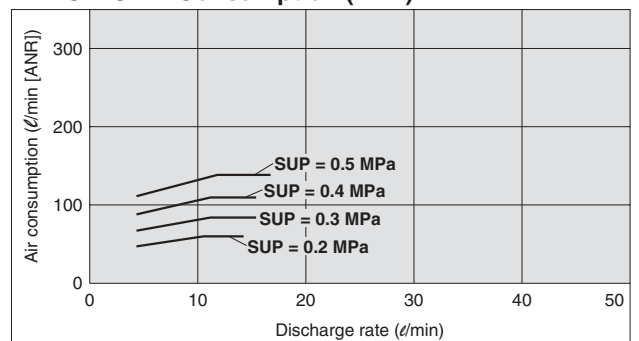
**PAF5413 Air Consumption (2 Hz)**



**PAF3413 Air Consumption (2 Hz)**



**PAF5413 Air Consumption (1 Hz)**



### Selection from Flow Characteristic Graph (PAF3413)

Required specification example:

Find the pilot air pressure for a discharge rate of 4 ℓ/min and discharge pressure of 0.15 MPa. <The transfer fluid is tap water (viscosity 1 mPa·s, specific gravity 1.0).>

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

Note 2) Discharge per cycle: Approx. 50 ml

Selection procedures:

1. First mark the intersection point for a discharge rate of 4 ℓ/min and discharge pressure of 0.15 MPa.
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 the pilot air pressure for this point is approx. 0.2 MPa.

### Calculating Air Consumption (PAF3413)

Find the air consumption for operation with a discharge rate of 4 ℓ/min, a 4 Hz switching cycle and pilot air pressure of 0.2 MPa from the air consumption graph.

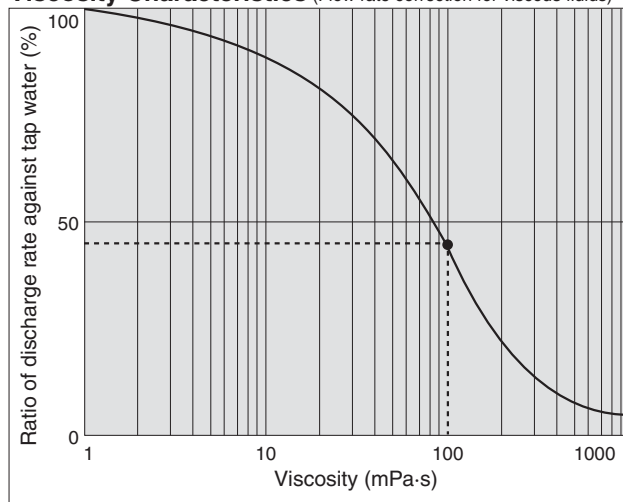
Selection procedures:

1. Look up from the discharge rate of 4 ℓ/min to find the intersection with SUP = 0.2 MPa.
2. From the point just found, draw a line to the Y-axis to find the air consumption. The result is approx. 54 ℓ/min (ANR).

### ⚠ Caution

- ① These flow characteristics are for tap 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).

### Viscosity Characteristics (Flow rate correction for viscous fluids)



### Selection from Viscosity Characteristic Graph

Required specification example: Find the pilot air pressure for a discharge rate of 2.7 ℓ/min, discharge pressure of 0.25 MPa, and a viscosity of 100 mPa·s.

Selection procedures:

1. First find the ratio of the discharge rate for tap water when viscosity is 100 mPa·s from the graph on the left. 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 tap water,  $2.7 \text{ ℓ/min} \div 0.45 = 6 \text{ ℓ/min}$ , indicating that a discharge rate of 6 ℓ/min is required for tap water.
3. Finally, find the pilot air pressure based on selection from the flow characteristic graphs.

### ⚠ Caution

Viscosities up to 1000 mPa·s can be used.  
Dynamic viscosity  $\nu$  = Viscosity  $\mu$  / Density  $\rho$ .

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

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

# Series PAF

## Specifications

### PAF3000 Series

Model		PAF3410	PAF3413
<b>Actuation</b>		Automatically operated	Air operated
<b>Port size</b>	<b>Main fluid: Suction/Discharge port</b>	Rc, NPT, G 3/8" female threaded, 1/2" tube extension, with nut (size 4, 5)	
	<b>Pilot air: Supply/Exhaust port</b>	Rc, NPT, G 1/4" female threaded	Rc, NPT, G 1/8" female threaded
<b>Discharge flow rate</b>		1 to 20 ℓ/min	1 to 15 ℓ/min
<b>Average discharge pressure</b>		0 to 0.4 MPa	
<b>Pilot air pressure</b>		0.2 to 0.5 MPa (for 0 to 60°C)	
<b>Air consumption</b>		230 ℓ/min (ANR) or less	
<b>Suction lift</b>	<b>Dry</b>	Up to 1 m (dry state inside the pump)	
	<b>Wet</b>	Up to 4 m (with fluid inside the pump)	
<b>Noise</b>		80 dB (A) or less (Option: with silencer, AN200)	80 dB (A) or less (not including the noise from the quick exhaust and solenoid valve)
<b>Withstand pressure</b>		0.75 MPa	
<b>Service life</b>		50 million cycles (for water)	
<b>Fluid temperature</b>		0 to 90°C (with no freezing)	
<b>Ambient temperature</b>		0 to 70°C (with no freezing)	
<b>Recommended operation cycle</b>		—	2 to 4 Hz
<b>Mass (without foot bracket)</b>		1.6 kg	1.3 kg
<b>Mounting</b>		Horizontal (bottom mounting)	
<b>Packaging</b>		Clean double packaging	

Note) Values in the table are measured at room temperature using tap water.

### PAF5000 Series

Model		PAF5410	PAF5413
<b>Actuation</b>		Automatically operated	Air operated
<b>Port size</b>	<b>Main fluid: Suction/Discharge port</b>	Rc, NPT, G 3/4" female threaded, 3/4" tube extension, with nut (size 5, 6)	
	<b>Pilot air: Supply/Exhaust port</b>	Rc, NPT, G 1/4" female threaded	
<b>Discharge flow rate</b>		5 to 45 ℓ/min	5 to 38 ℓ/min
<b>Average discharge pressure</b>		0 to 0.4 MPa	
<b>Pilot air pressure</b>		0.2 to 0.5 MPa (for 0 to 60°C)	
<b>Air consumption</b>		300 ℓ/min (ANR) or less	
<b>Suction lift</b>	<b>Dry</b>	Up to 1 m (dry state inside the pump)	
	<b>Wet</b>	Up to 4 m (with fluid inside the pump)	
<b>Noise</b>		80 dB (A) or less (Option: with silencer, AN200)	80 dB (A) or less (not including the noise from the quick exhaust and solenoid valve)
<b>Withstand pressure</b>		0.75 MPa	
<b>Service life</b>		50 million cycles (for water)	
<b>Fluid temperature</b>		0 to 90°C (with no freezing)	
<b>Ambient temperature</b>		0 to 70°C (with no freezing)	
<b>Recommended operation cycle</b>		—	1 to 3 Hz
<b>Mass</b>		6 kg	
<b>Mounting</b>		Horizontal (bottom mounting)	
<b>Packaging</b>		Clean double packaging	

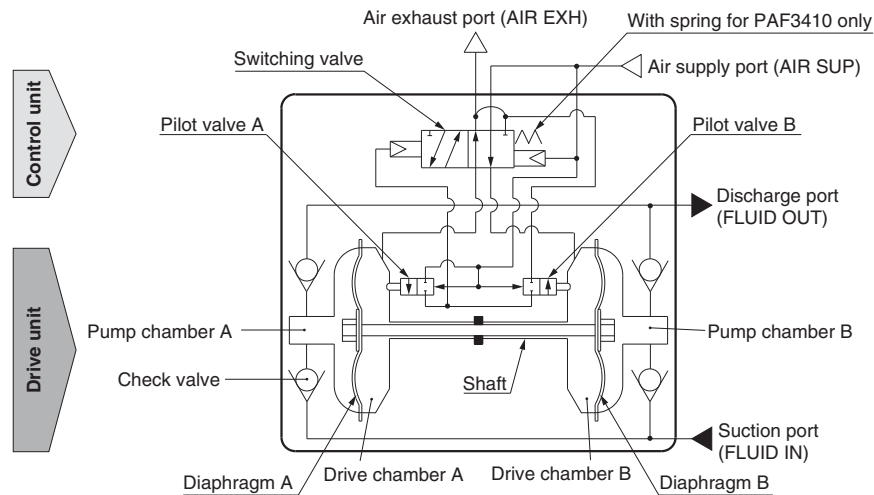
Note) Values in the table are measured at room temperature using tap water.

### Tube Size Applicable for Nut Size

(Tubing size can be altered, using a reducer even within the same nut size.)

Size	Applicable tubing size
4	10 x 8, 12 x 10, 3/8" x 1/4", 1/2" x 3/8"
5	12 x 10, 19 x 16, 1/2" x 3/8", 3/4" x 5/8"
6	19 x 16, 25 x 22, 3/4" x 5/8", 1" x 7/8"

## Working Principle: Automatically Operated Type (PAF3410, 5410)



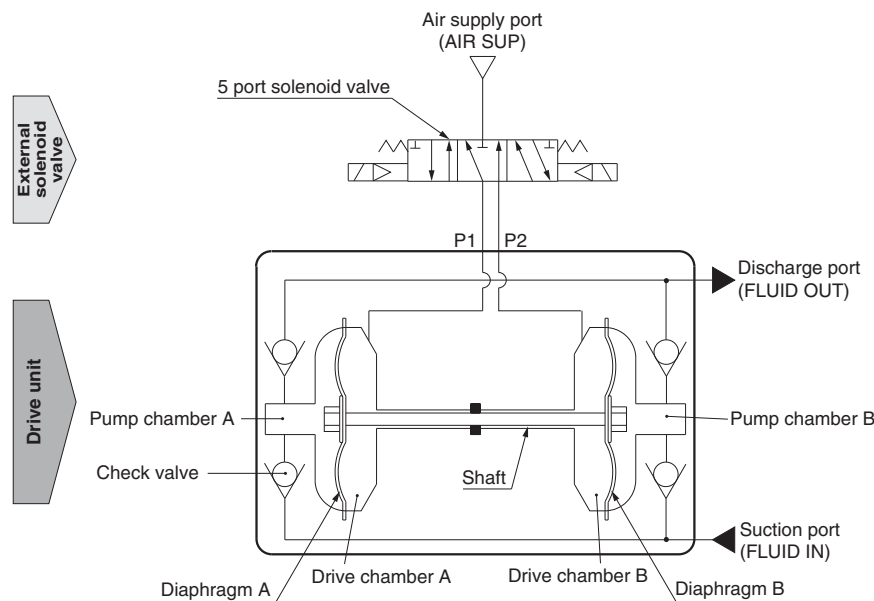
### Control unit

- ① When air is supplied, it passes through the switching valve and enters the drive chamber B.
- ② The diaphragm B moves to the right, and the diaphragm A also moves to the right simultaneously to push the pilot valve A.
- ③ When the pilot valve A is pushed, air acts upon the switching valve, the drive chamber A switches to a supply state, and the air which was in the drive chamber B is exhausted to the outside.
- ④ When air enters the drive chamber A, the diaphragm B moves to the left to push the pilot valve B.
- ⑤ When the pilot valve B is pushed, the air which was acting upon the switching valve is exhausted, and the 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 the drive chamber B, the fluid in the pump chamber B is forced out, and at the same time fluid is sucked into the pump chamber A.
- ② When the diaphragm moves in the opposite direction, the fluid in the pump chamber A is forced out, and fluid is sucked into the pump chamber B.
- ③ Continuous suction and discharge is performed by the reciprocal motion of the diaphragm.

## Working Principle: Air Operated Type (PAF3413, 5413)

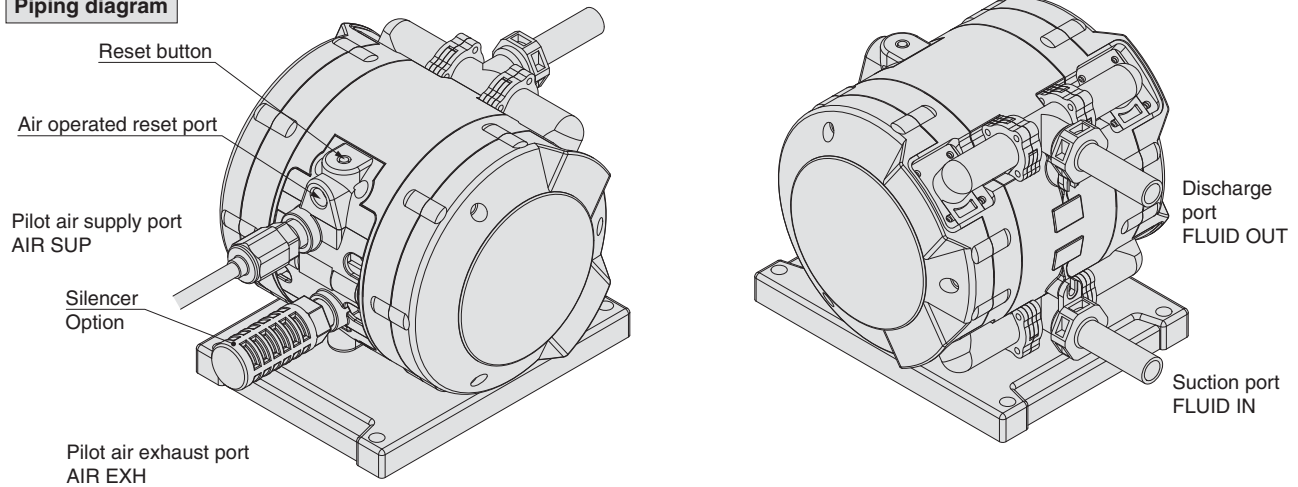


- ① When air is supplied to P1 port, it enters the drive chamber A.
- ② The diaphragm A moves to the left, and the diaphragm B also moves to the left simultaneously.
- ③ The fluid in the pump chamber A is forced out to the discharge port, and the fluid is sucked into the pump chamber B from the suction 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).

# Series PAF

## Piping and Operation: Automatically Operated Type (PAF3410, 5410)

### Piping diagram



### ⚠ Caution

Mounting posture of the pump is set with the mounting bracket facing downward. Air to be supplied to the air supply port <AIR SUP> should be cleaned and filtered through a filter, or a mist separator etc. Air with foreign matter or drainage etc. will have negative effects on the built-in solenoid valve and will lead to malfunction. 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 0.5 MPa. Then, the pump operates when power is applied to the 3 port solenoid valve of the air supply port <AIR SUP>, the exhaust noise 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 the 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 stops even when the ball valve on the discharge side is closed. But the pressure supply to the pump should be exhausted quickly.

<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 needle valve restrictor 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 bypass 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: PAF3000 1 ℓ/min, PAF5000 5 ℓ/min)

<Reset Button>

Press the reset button by 3 to 4 mm when the pump does not start even though air is supplied.

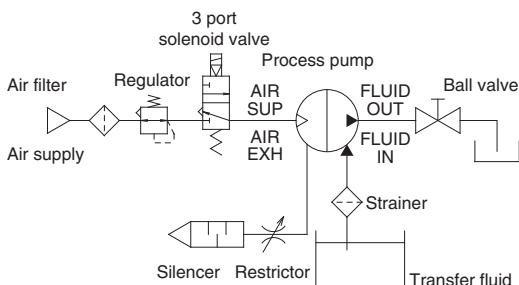
<Air-operated Reset Port>

It is possible to restart by supplying air to the air-operated reset port by remote control, without pressing the reset button directly. Reset air requires equal or greater pressure (less than 0.5 MPa, however) than pilot air. Refer to air-operated reset circuit examples (1) (2).

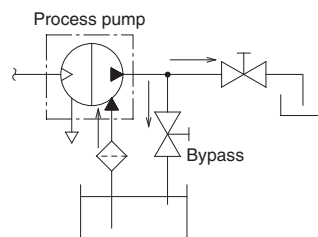
<Operation Count: PAF3000 only>

It is possible to keep track of the number of times the pump has been operated by connecting a pressure switch to the air-operated reset port. The distance between the pressure switch and the air-operated reset port should not exceed 50 mm. Refer to the air-operated reset circuit example (1).

### Circuit example (1)

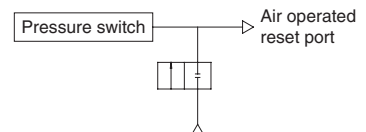


### Circuit example (2)

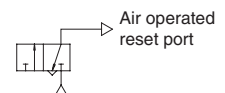


### Air operated reset

#### Circuit example (1) [PAF3000]



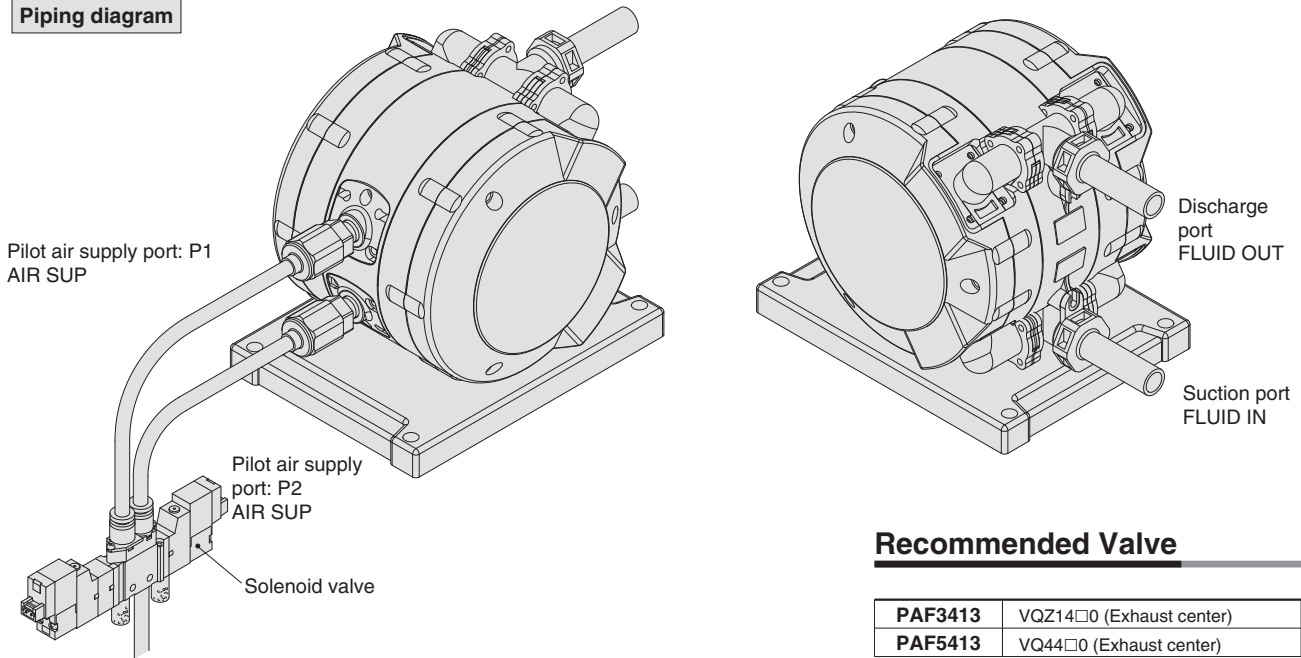
#### Circuit example (2) [PAF5000]



For the related products, refer to pages 21, 22.

## Piping and Operation: Air Operated Type (PAF3413, 5413)

### Piping diagram



### Recommended Valve

<b>PAF3413</b>	VQZ14□0 (Exhaust center)
<b>PAF5413</b>	VQ44□0 (Exhaust center)

Refer to page 21 for further details.

### ⚠ 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 examples.

1. Connect air piping <sup>Note 1)</sup> to the pilot air supply port <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 0.2 to 0.5 MPa. Then, the pump operates when power is applied to the solenoid valve <sup>Note 2)</sup> 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. <sup>Note 3)</sup> (Dry state suction lifting range: Max. 1 m) To restrict the 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.

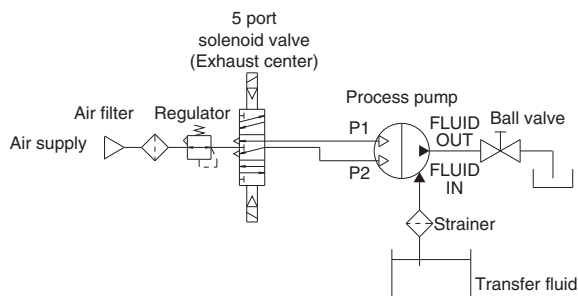
Note 2) For the solenoid valve, use an exhaust center 5 port valve, or a combination of residual exhaust 3 port valve and a pump drive 4 port valve. If air in the drive chamber is not released when the pump is stopped, the diaphragm will be subjected to pressure and its life will be shortened.

Note 3) When the pump is dry, operate the solenoid valve at a switching cycle of 2 to 4 Hz for the PAF3000, 1 to 3 Hz for the PAF5000. If operated outside of this range, the suction lifting height may not reach the prescribed value.

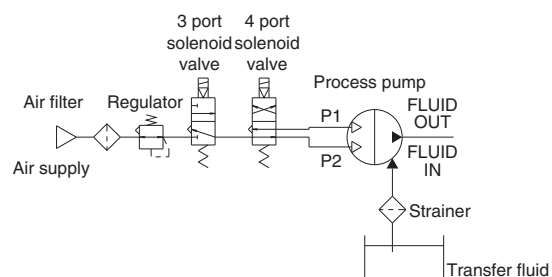
<Discharge Flow Rate Adjustment>

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)

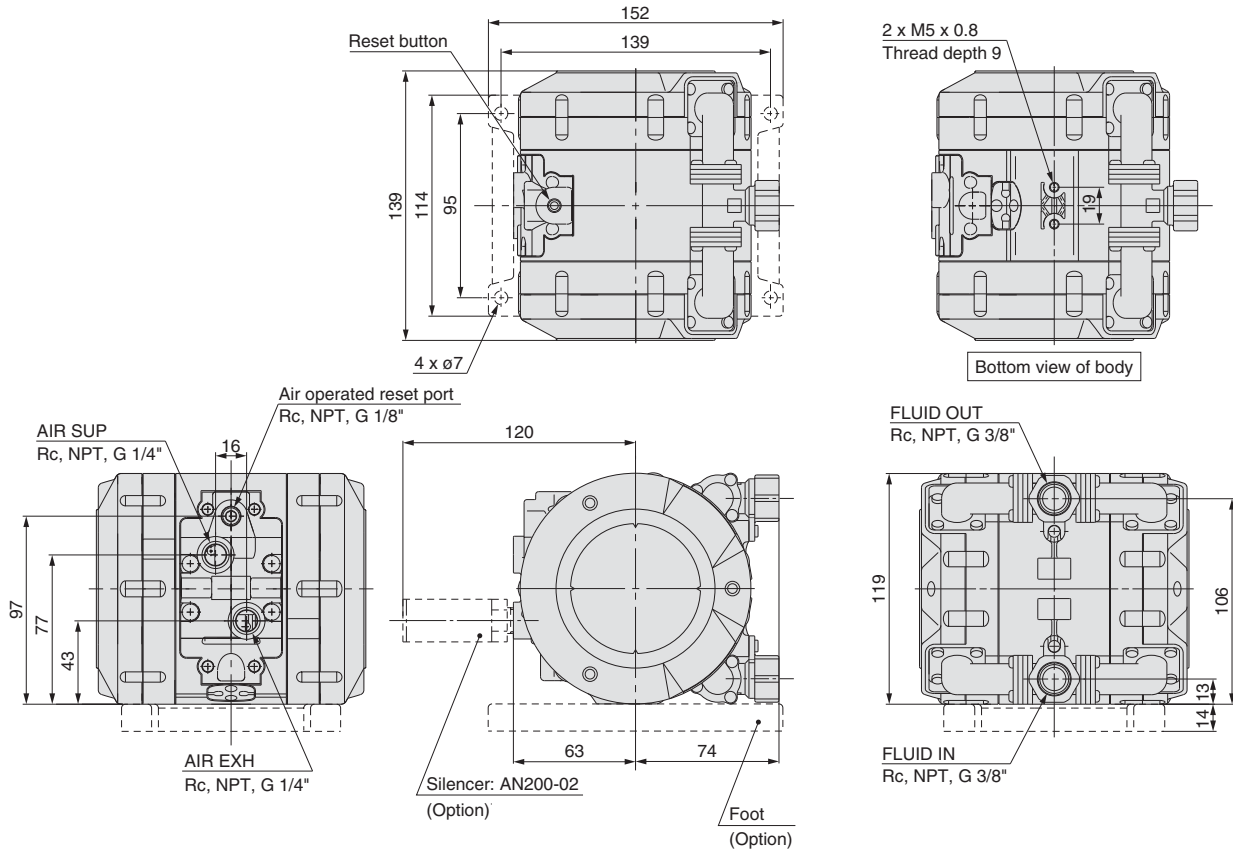


For the related products, refer to pages 21, 22.

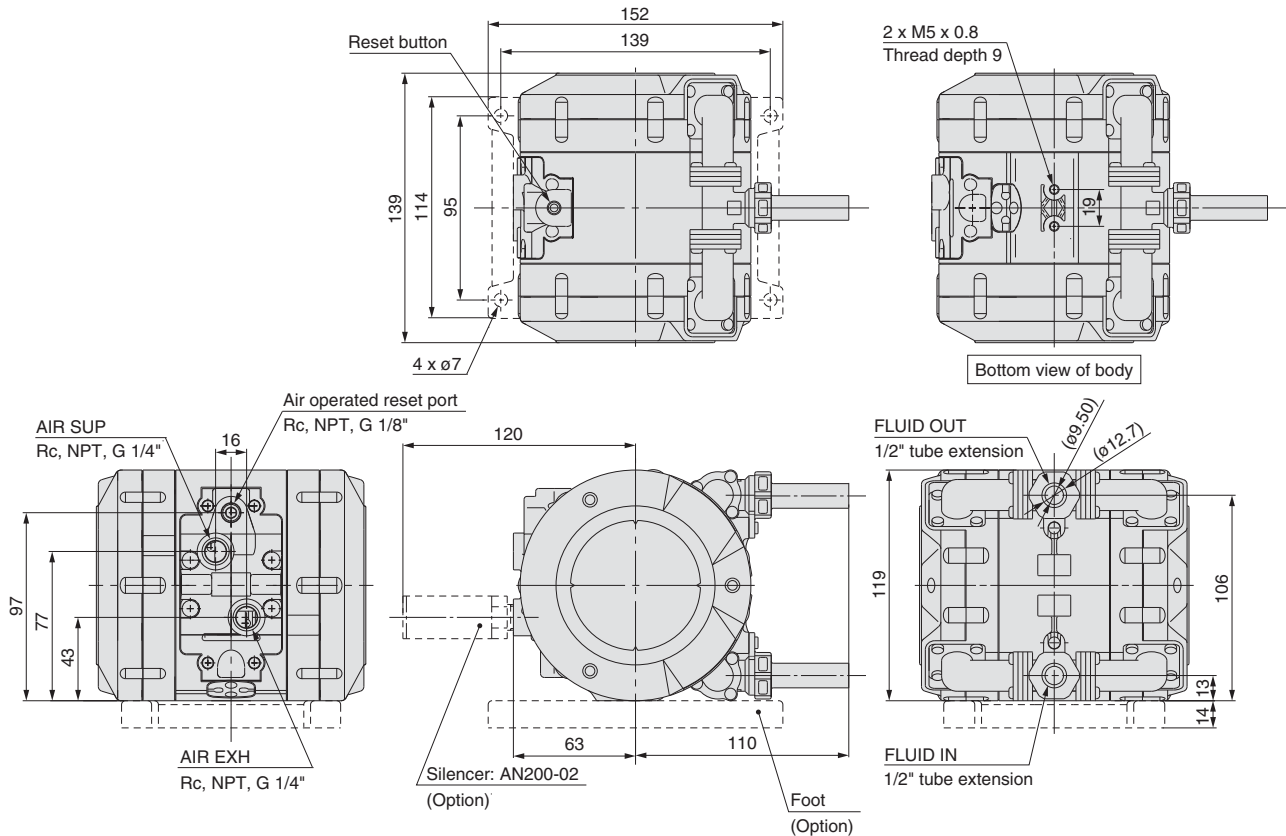
# Series PAF

## Dimensions: Automatically Operated Type (PAF3000 Series)

Female threaded: PAF3410-<sup>03</sup>  
N03  
F03

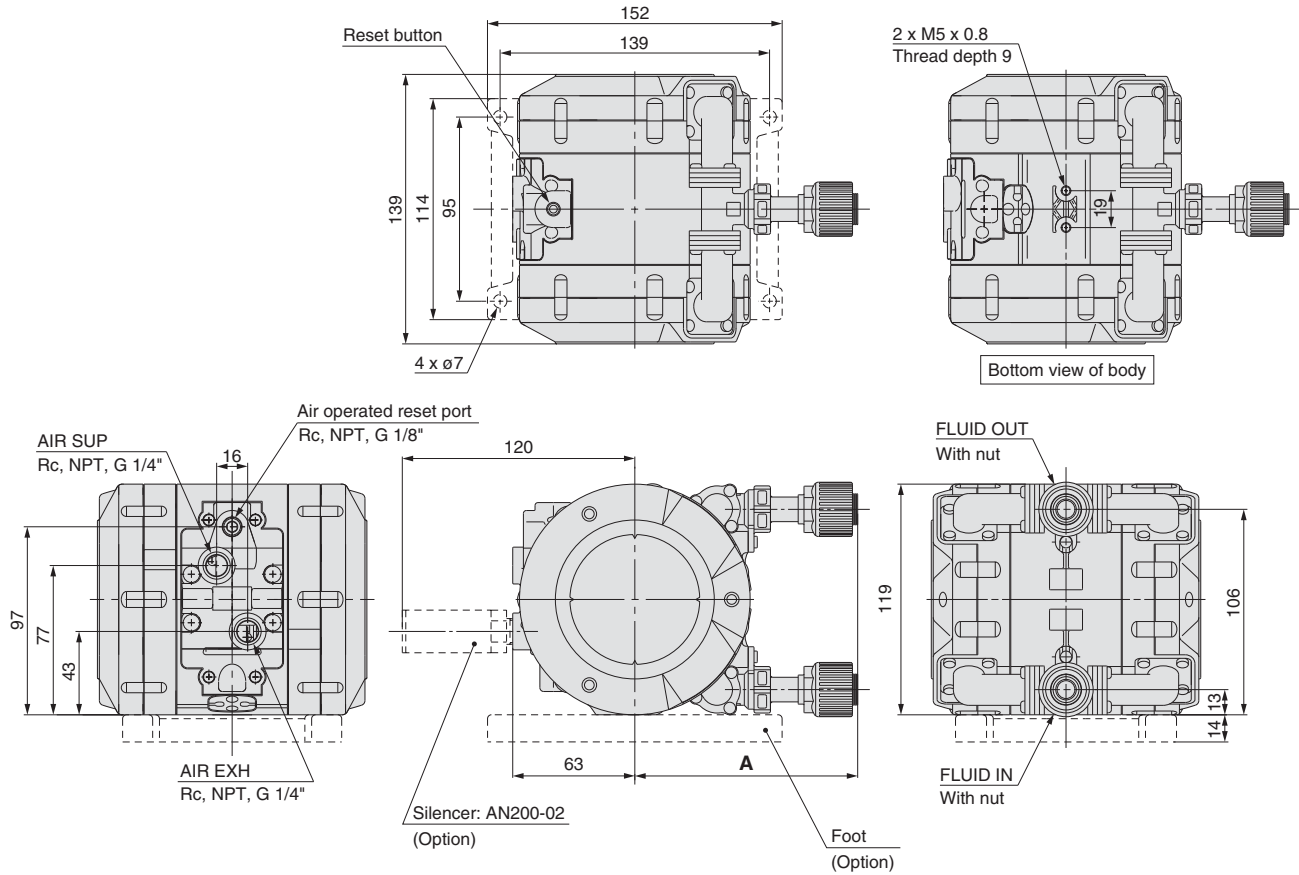


Tube extension: PAF3410-<sup>P13</sup>  
P13N  
P13F



**Dimensions: Automatically Operated Type (PAF3000 Series)**

With nut (with LQ1 fitting): PAF3410S-1S13□  
PAF3410S-1S19□



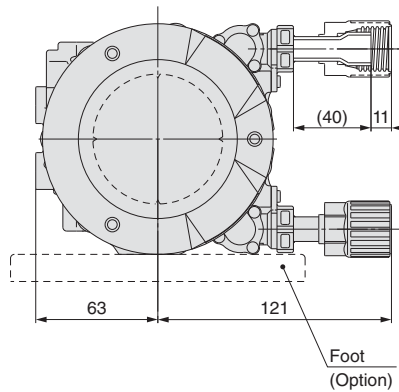
**Tubing Size Applicable for Nut Size**

(Tubing size can be altered, using a reducer even within the same nut size.)

Model	A (mm)
PAF3410S-1S13□	115
PAF3410S-1S19□	118

Size	Applicable tubing size
4	10 x 8, 12 x 10, 3/8" x 1/4", 1/2" x 3/8"
5	12 x 10, 19 x 16, 1/2" x 3/8", 3/4" x 5/8"

With nut (with LQ3 fitting): PAF3410S-3S13□

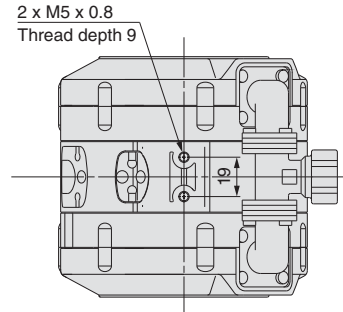
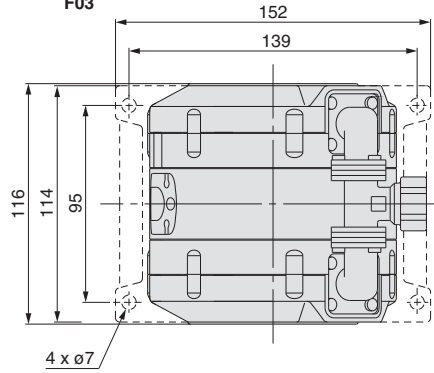




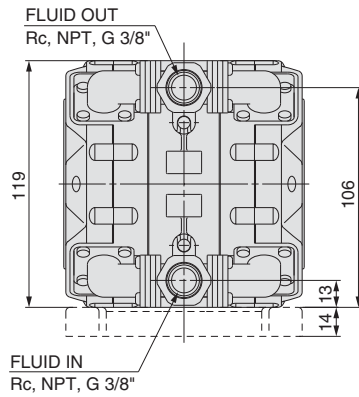
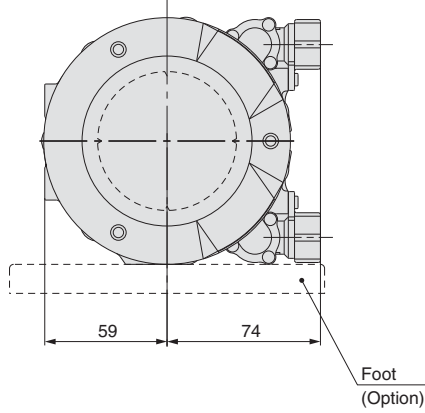
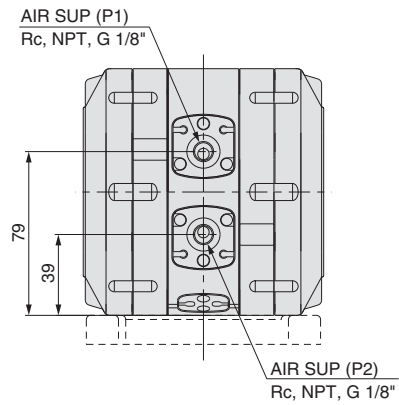
# Series PAF

## Dimensions: Air Operated Type (PAF3000 Series)

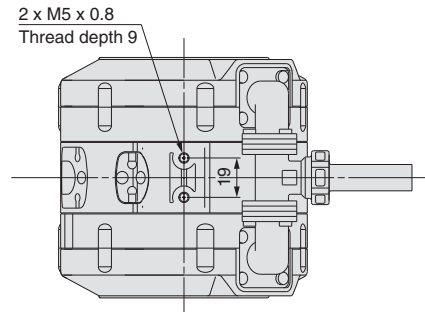
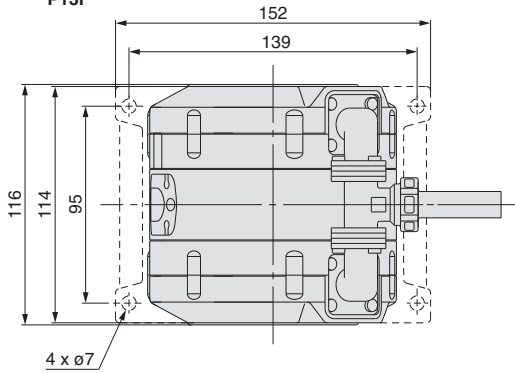
Female threaded: PAF3413-<sup>03</sup>  
N03  
F03



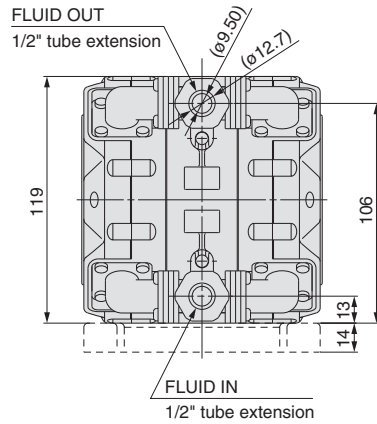
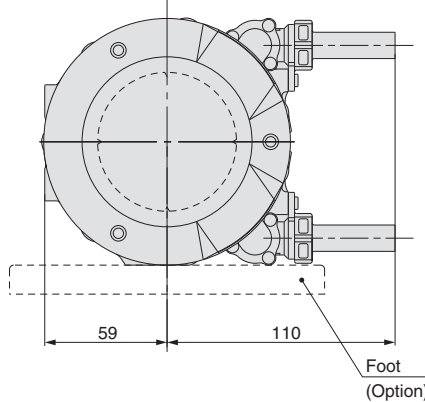
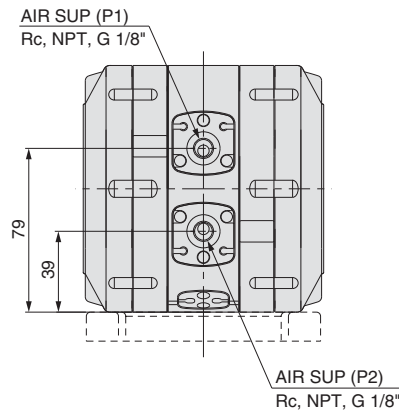
Bottom view of body



Tube extension: PAF3413-<sup>P13</sup>  
P13N  
P13F

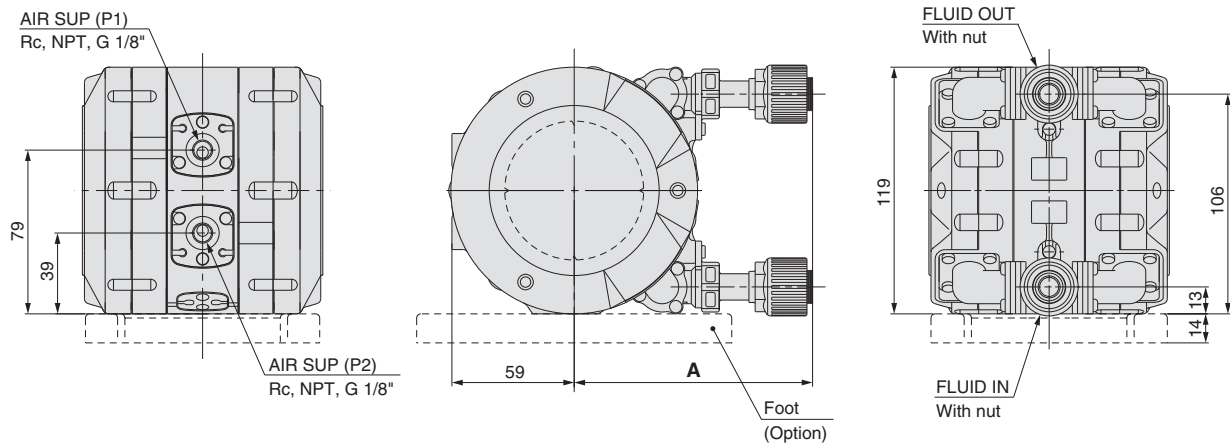
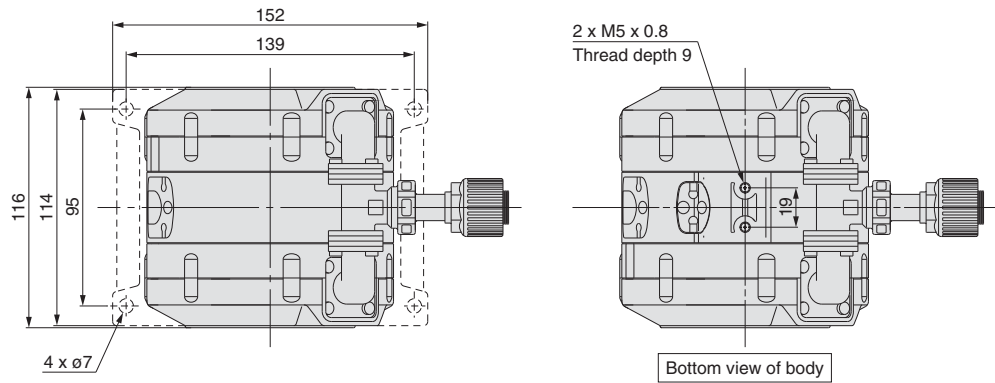


Bottom view of body



**Dimensions: Air Operated Type (PAF3000 Series)**

With nut (with LQ1 fitting): PAF3413S-1S13□  
PAF3413S-1S19□



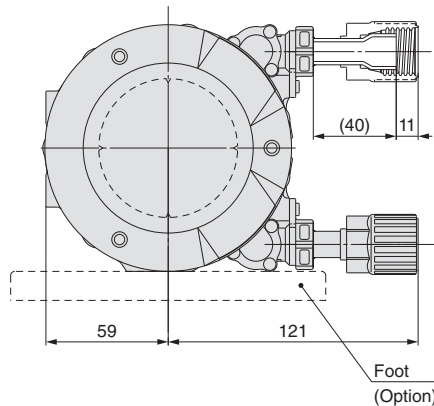
**Tubing Size Applicable for Nut Size**

(Tubing size can be altered, using a reducer even within the same nut size.)

Model	A (mm)
PAF3413S-1S13□	115
PAF3413S-1S19□	118

Size	Applicable tubing size
4	10 x 8, 12 x 10, 3/8" x 1/4", 1/2" x 3/8"
5	12 x 10, 19 x 16, 1/2" x 3/8", 3/4" x 5/8"

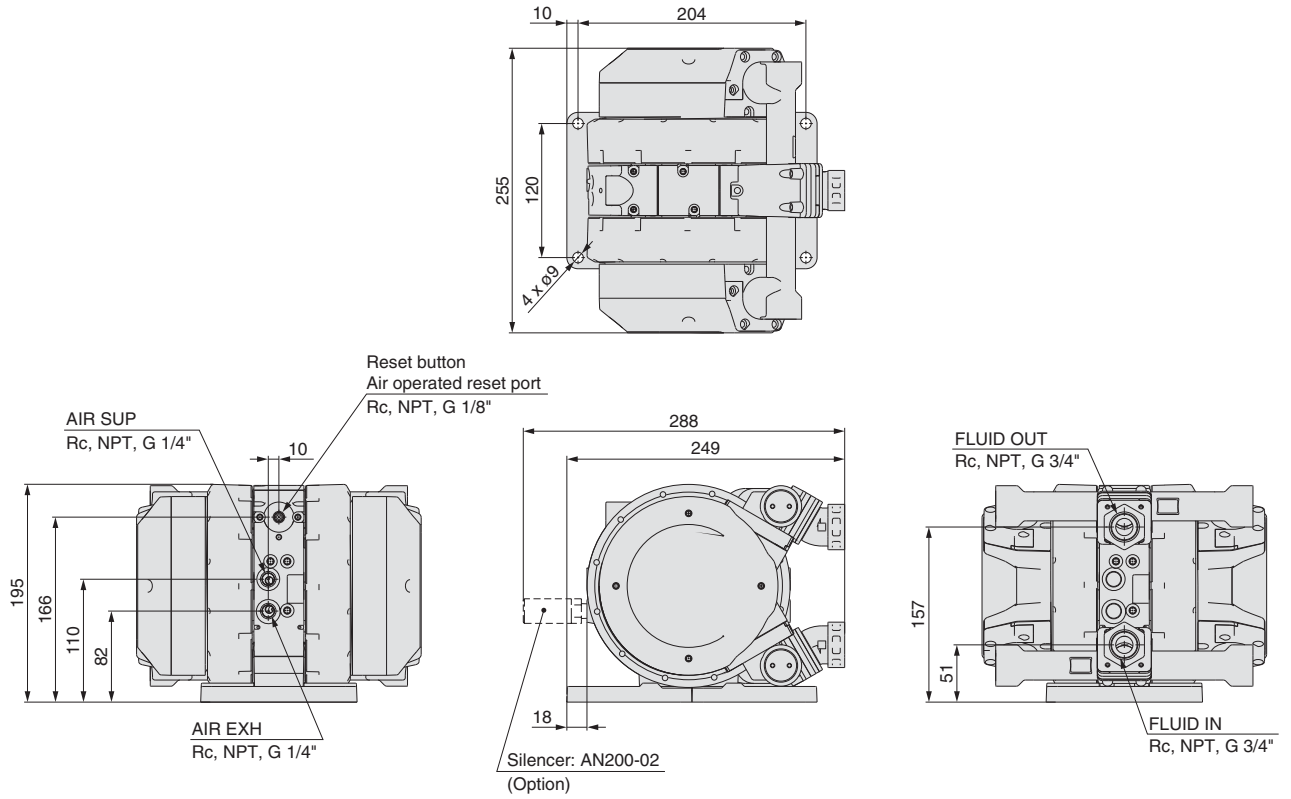
With nut (with LQ3 fitting): PAF3413S-3S13□



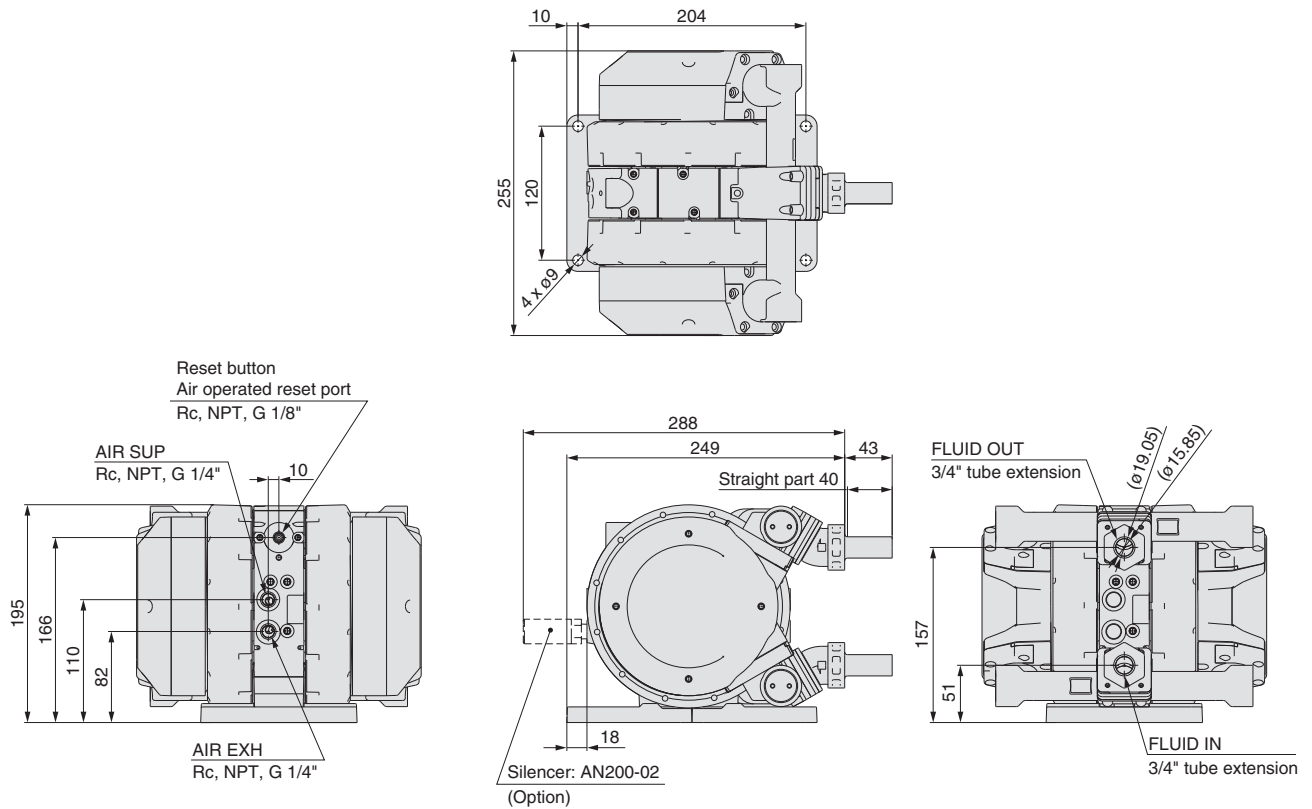
# Series PAF

## Dimensions: Automatically Operated Type (PAF5000 Series)

Female threaded: PAF5410-<sup>06</sup>  
N06  
F06

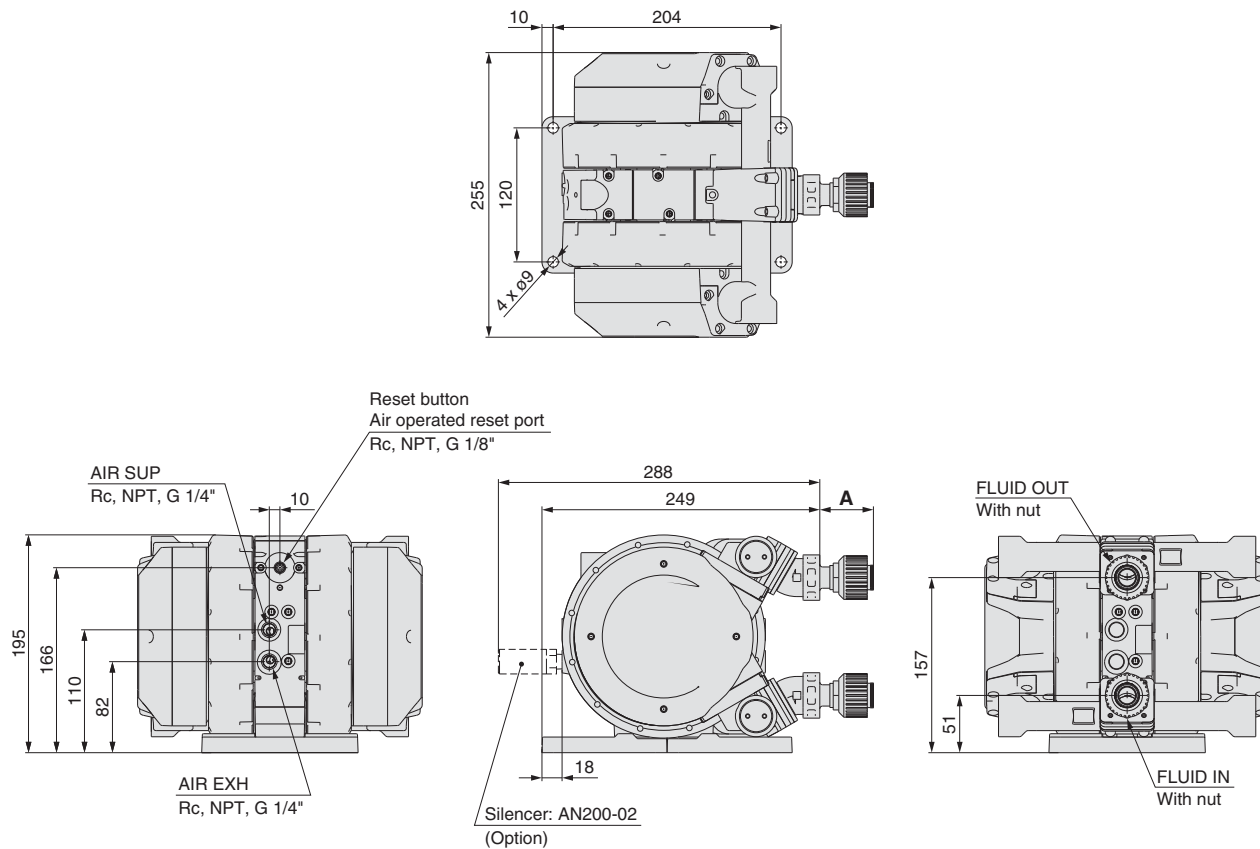


Tube extension: PAF5410-<sup>P19</sup>  
P19N  
P19F



**Dimensions: Automatically Operated Type (PAF5000 Series)**

With nut (with LQ1 fitting): PAF5410S-<sup>1S19</sup><sub>1S25</sub>



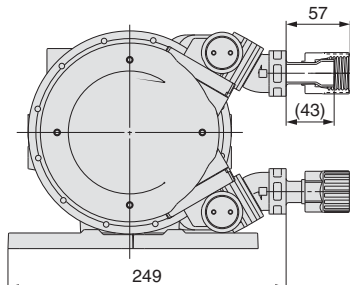
**Tubing Size Applicable for Nut Size**

(Tubing size can be altered, using a reducer even within the same nut size.)

Model	(mm)
PAF5410S-1S19	48
PAF5410S-1S25	55

Size	Applicable tubing size
5	12 x 10, 19 x 16, 1/2" x 3/8", 3/4" x 5/8"
6	19 x 16, 25 x 22, 3/4" x 5/8", 1" x 7/8"

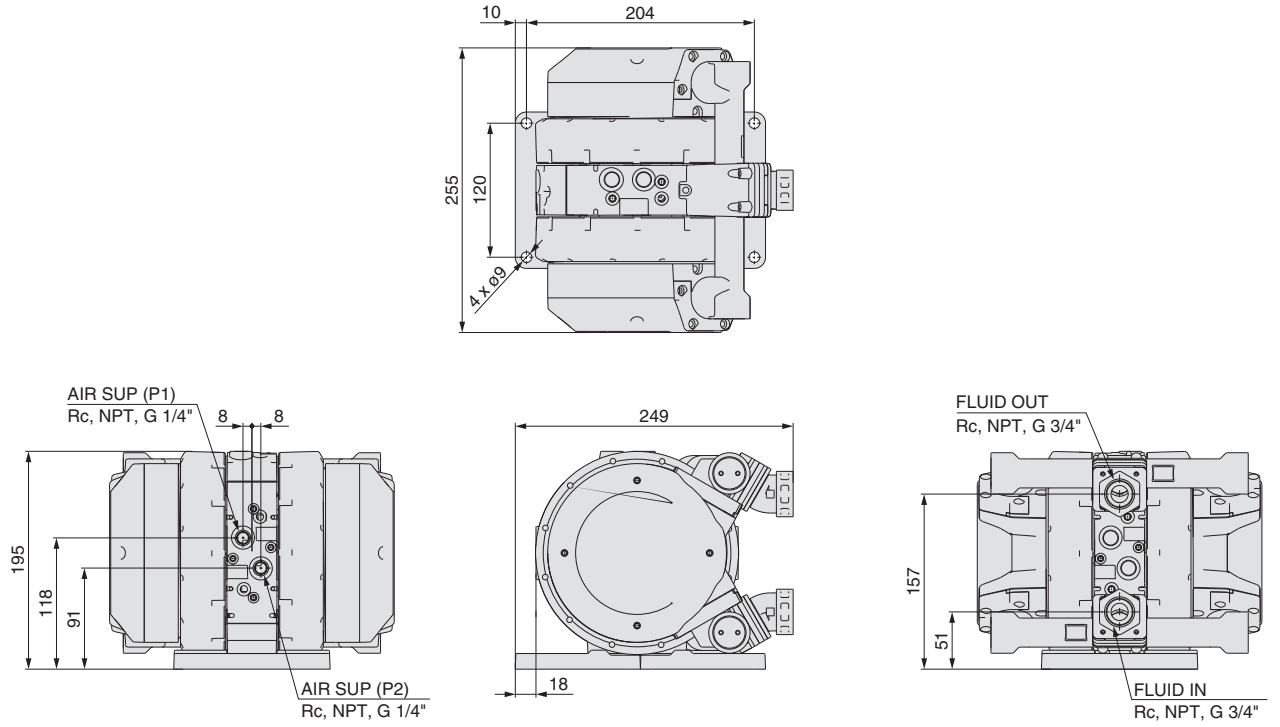
With nut (with LQ3 fitting): PAF5410S-3S19



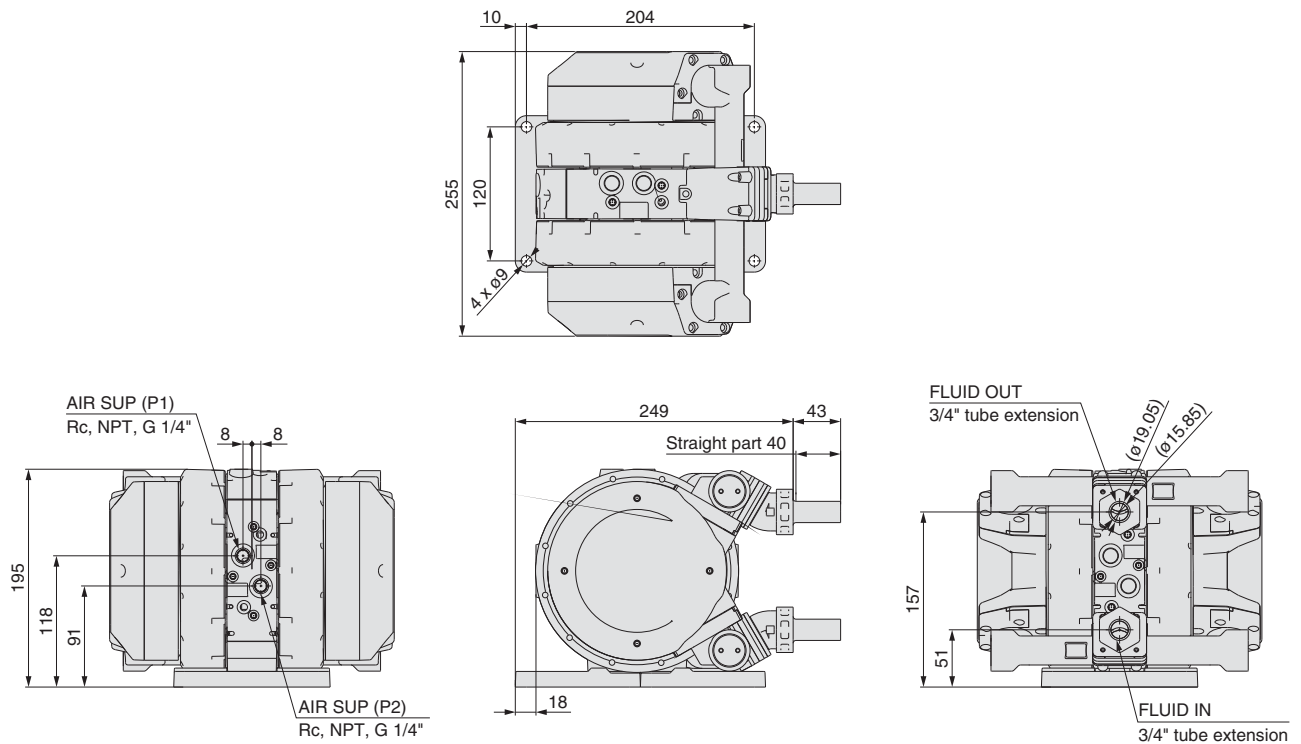
# Series PAF

## Dimensions: Air Operated Type (PAF5000 Series)

Female threaded: PAF5413-<sup>06</sup><sub>N06</sub>  
F06

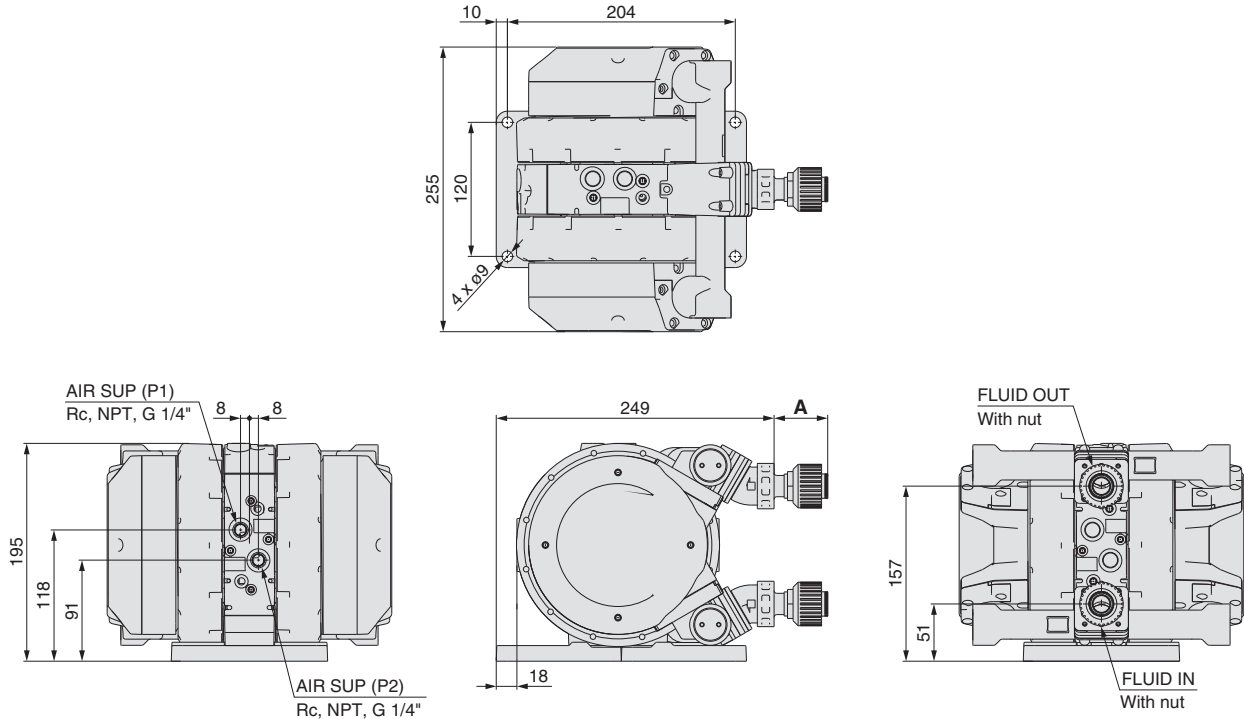


Tube extension: PAF5413-<sup>P19</sup><sub>P19N</sub>  
P19F



**Dimensions: Air Operated Type (PAF5000 Series)**

With nut (with LQ1 fitting): PAF5413S-<sup>1S19</sup><sub>1S25</sub>



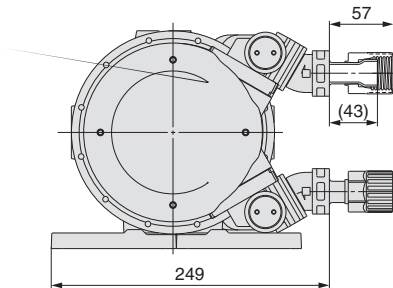
**Tubing Size Applicable for Nut Size**

(Tubing size can be altered, using a reducer even within the same nut size.)

Model	(mm) A
PAF5413S-1S19	48
PAF5413S-1S25	55

Size	Applicable tubing size
5	12 x 10, 19 x 16, 1/2" x 3/8", 3/4" x 5/8"
6	19 x 16, 25 x 22, 3/4" x 5/8", 1" x 7/8"

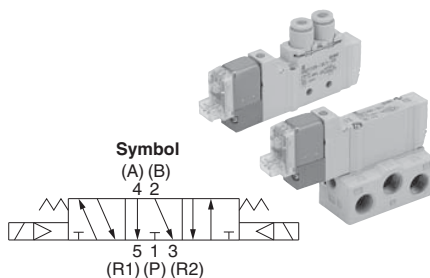
With nut (with LQ3 fitting): PAF5413S-3S19



# Related Products

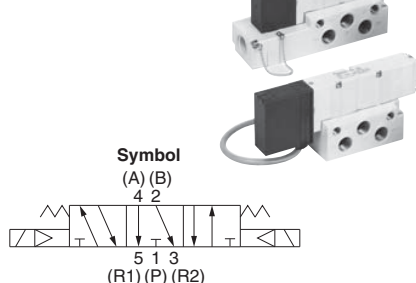
<For driving the PAF3413 series>

## 5 Port Solenoid Valve VQZ14□0/24□0 (Exhaust center)



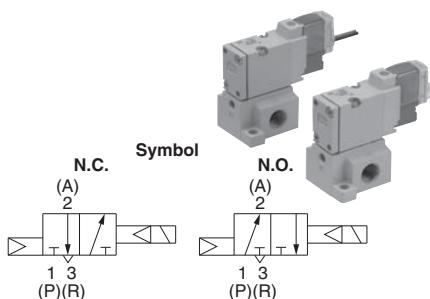
<For driving the PAF5413 series>

## 5 Port Solenoid Valve VQ44<sup>0</sup><sub>50</sub> (Exhaust center)



<For driving the PAF3413 series>

## 3 Port Solenoid Valve SYJ514/714



<For extending the maintenance cycle>

## Micro Mist Separator Series AMD

The AMD series can separate and remove aerosol state oil mist in compressed air and remove carbon or dust of more than 0.01 μm.



### Specifications

Model		VQZ1420	VQZ2420	VQZ1450	VQZ2450	
Piping		Body ported		Base mounted		
Valve construction		Metal seal				
Type of actuation		3 position exhaust center				
Max. operating pressure		0.7 MPa (High-pressure type 1.0 MPa)				
Min. operating pressure		0.1 MPa				
Flow characteristics	1→4/2 (P→A/B)	C[dm <sup>3</sup> /(s·bar)]	0.55	1.1	0.56	1.5
		b	0.28	0.23	0.2	0.16
		Cv	0.13	0.28	0.13	0.35
	4/2→5/3 (A/B→EA/EB)	C[dm <sup>3</sup> /(s·bar)]	0.54	1.4	0.7	1.9
		b	0.26	0.2	0.21	0.16
		Cv	0.13	0.32	0.17	0.4
Max. operating frequency		10 Hz				



Refer to CAT.ES11-89 for further details.

### Specifications

Model		VQ44 <sup>0</sup> <sub>50</sub>	
Piping		Base mounted	
Valve construction		Metal seal	
Type of actuation		3 position exhaust center	
Max. operating pressure		1.0 MPa (0.7 MPa)	
Min. operating pressure		0.15 MPa	
Flow characteristics	1→4/2 (P→A/B)	C[dm <sup>3</sup> /(s·bar)]	6.2
		b	0.18
		Cv	1.5
	4/2→5/3 (A/B→EA/EB)	C[dm <sup>3</sup> /(s·bar)]	6.9
		b	0.17
		Cv	1.7

Note) ( ): Low wattage (0.5 W) specifications



Refer to "Best Pneumatics" catalog for further details.

### Specifications

Model		SYJ314	SYJ514	SYJ714	
Piping		Base mounted			
Valve construction		Rubber seal			
Type of actuation		N.C.			
Max. operating pressure		0.7 MPa			
Min. operating pressure		0.15 MPa			
Flow characteristics	1→2 (P→A)	C[dm <sup>3</sup> /(s·bar)]	0.41	1.2	2.9
		b	0.18	0.41	0.32
		Cv	0.086	0.32	0.71
	2→3 (A→R)	C[dm <sup>3</sup> /(s·bar)]	0.35	1.1	2.7
		b	0.33	0.46	0.34
		Cv	0.086	0.32	0.69

Note) Two 3-port valves are needed to drive a double acting pump.



Refer to CAT.ES11-86 for further details.

### Model

Model	AMD250C	AMD350C
Rated flow (Note) (L/min (ANR))	500	1000
Port size (Nominal size B)	1/4, 3/8	3/8, 1/2
Mass (kg)	0.55	0.9

Note) Maximum flow rate at pressure 0.7 MPa  
Maximum flow rate varies depending on the operating pressure.



Refer to CAT.ES30-11 for further details.

### Specifications

Fluid	Compressed air
Max. operating pressure	1.0 MPa
Min. operating pressure (Note 1)	0.05 MPa
Proof pressure	1.5 MPa
Ambient and fluid temperature	5 to 60°C
Nominal filtration rating	0.01 μm (99.9% filtered particle diameter)
Downstream oil mist concentration	Max. 0.1 mg/m <sup>3</sup> (ANR) (Note 2) (Before saturated with oil, less than 0.01 mg/m <sup>3</sup> (ANR) = 0.008 ppm)
Element service life	When 2 years passed, or pressure drop reached 0.1 MPa.

Note 1) With auto drain is 0.1 MPa (N.O. type), 0.15 MPa (N.C. type).

Note 2) When compressor discharge oil mist concentration is 30 mg/m<sup>3</sup> (ANR).

<For extending the maintenance cycle>

## Mist Separator Series AM

The AM series separates and removes the oil mist in compressed air and removes fine particles of rust and carbon, etc., of 0.3 μm or larger.



### Model

Model	AM150C	AM250C
Rated flow (ℓ/min (ANR))	300	750
Port size (Nominal size B)	1/8, 1/4	1/4, 3/8
Mass (kg)	0.38	0.55

Refer to CAT.ES30-11 for further details.

### Specifications

Fluid	Compressed air
Max. operating pressure	1.0 MPa
Min. operating pressure <sup>Note 1)</sup>	0.05 MPa
Proof pressure	1.5 MPa
Ambient and fluid temperature	5 to 60°C
Nominal filtration rating	0.3 μm (99.9% filtered particle diameter)
Downstream oil mist concentration	Max. 1.0 mg/m <sup>3</sup> (ANR)(= 0.8 ppm) <sup>Note 2)</sup>
Element service life	When 2 years passed, or pressure drop reached 0.1 MPa.

Note 1) With auto drain is 0.15 MPa.

Note 2) When compressor discharge oil mist concentration is 30 mg/m<sup>3</sup> (ANR).

<For supplying air for regulating pressure>

## Filter Regulator + Mist Separator Air Combination

## Series AC20D/30D/40D



### Model

Model	AC20D	AC30D
Component devices	Filter regulator Mist separator	AW20 AW30 AFM20 AFM30
Port size Rc	1/8 1/4	1/4 3/8
Pressure gauge port size Rc	1/8	1/8

Refer to "Best Pneumatics" catalog for further details.

Note 1) Conditions: Upstream pressure 0.7 MPa, set pressure 0.5 MPa. The rated flow rate varies depending on the set pressure.

Note 2) When compressor discharge concentration is 30 mg/N·m<sup>3</sup>.

### Specifications

Model	AC20D	AC30D	AC40D	AC40D-06
Proof pressure	1.5 MPa			
Max. operating pressure	1.0 MPa			
Min. operating pressure	0.05 MPa			
Set pressure range	0.05 to 0.85 MPa			
Rated flow rate (ℓ/min (ANR)) <sup>Note 1)</sup>	150	330	800	800
Ambient and fluid temperature	-5 to 60°C (No freezing)			
Nominal filtration rating	AW: 5 μm, AFM: 0.3 μm (99.9% filtered particle diameter)			
Downstream oil mist concentration	Max. 1.0 mgf/N·m <sup>3</sup> (= 0.8 ppm) <sup>Note 2)</sup>			
Bowl material	Polycarbonate			
Construction/Filter regulator	Relieving type			
Mass (kg)	0.57	0.74	1.38	1.43

<When it is desired to easily remove water droplets from system.>

## Water Separator Series AMG

The AMG series is installed in air pressure lines to remove water droplets from compressed air. Use it when it is necessary to remove water, but when air as dry as that from an air dryer is not necessary.



### Model

Model	AMG150C	AMG250C
Rated flow <sup>Note)</sup> (ℓ/min (ANR))	300	750
Port size (Nominal size B)	1/8, 1/4	1/4, 3/8
Mass (kg)	0.38	0.55

Note) Maximum flow rate at pressure 0.7 MPa

Refer to CAT.ES30-11 for further details.

### Specifications

Fluid	Compressed air
Max. operating pressure	1.0 MPa
Min. operating pressure <sup>Note)</sup>	0.05 MPa
Proof pressure	1.5 MPa
Ambient and fluid temperature	5 to 60°C
Dehumidification rate	99%
Element service life	When 2 years passed, or pressure drop reached 0.1 MPa.

Note) With auto drain is 0.15 MPa.

<When it is desired to easily remove moisture from system.>

## Membrane Dryer Series IDG

Macromolecular membrane dryers that act like filters. It is possible to achieve a low dew point at -20°C simply by mounting a dryer to the air pressure line. A power supply is not required.



Note 1) No freezing

Note 2) ANR represents the flow rate converted to the value under 20°C at atmospheric pressure.

Note 3) Including the dew point indicator purge air flow rate of 1 ℓ/min (ANR) (inlet air pressure at 0.7 MPa) (Except IDG1, IDG5)

Refer to "Best Pneumatics" catalog for further details.

### Standard Specifications/Single Unit (Standard Dew Point -20°C)

Model	Standard dew point: -20°C						
	IDG5	IDG10	IDG20	IDG30	IDG50		
Range of operating conditions	Fluid						
	Compressed air						
	Inlet air pressure (MPa)		0.3 to 0.85		0.3 to 1.0		
	Inlet air temperature (°C) <sup>Note 1)</sup>		-5 to 55		-5 to 50		
Standard performance conditions	Ambient temperature (°C)		-5 to 55		-5 to 50		
	Outlet air atmospheric pressure dew point (°C)						
	-20						
	Inlet air flow rate (ℓ/min (ANR)) <sup>Note 2)</sup>		62	125	250	375	625
	Outlet air flow rate (ℓ/min (ANR))		50	100	200	300	500
	Purge air flow rate (ℓ/min (ANR)) <sup>Note 3)</sup>		12	25	50	75	125
	Inlet air pressure (MPa)		0.7				
Inlet air temperature (°C)		25					
Inlet air saturation temperature (°C)		25					
Ambient temperature (°C)		25					
Dew point indicator purge air flow rate		-	1 ℓ/min (ANR)				
Port size (Nominal size B)		1/8, 1/4		1/4, 3/8			
Mass (kg) (with bracket)		0.25 (0.31)	0.43 (0.51)	0.66 (0.76)	0.74 (0.87)	0.77 (0.90)	

## <For strainers> Industrial Filter Vessel type Series FGD



### Specifications

Model	Port size Rc	Set pressure	Set temperature	Number of elements	Element size	Main material			
						Cover	Case	Gasket O-ring	Seal
FGDCA	3/8	0.7 MPa	80°C	1	Ø65 x ℓ 250	Aluminum	SPCD	NBR	Nylon
FGDTA	3/8	1 MPa	80°C	1	Ø65 x ℓ 250	SCS 14	Stainless steel 316L	Fluororesin	Fluororesin

Note) Consult SMC for wetted material compatibility.

Refer to CAT.E90 for further details.



# Maintenance Parts

## PAF3000/5000 Series

Content	PAF3000 series		PAF5000 series	
	PAF3410	PAF3413	PAF5410	PAF5413
Diaphragm kit	KT-PAF3-31		KT-PAF5-31	
Check valve kit	KT-PAF3-36		KT-PAF5-36	
Switching valve parts kit	KT-PAF3-37□	—	KT-PAF5-37□	—
Pilot valve kit	KT-PAF3-38	—	KT-PAF5-38	—
Foot set	KT-PAF3-40		—	
Water leakage sensor	KT-PAF3-47		KT-PAF5-47	
Stroke sensor	—	KT-PAF3-48	—	KT-PAF5-48



# Applicable Fluids

## Material and Fluid Compatibility Check List for Process Pumps

- The data below is based on the information presented by the material manufacturers.
- SMC is not responsible for its accuracy and any damage happened because of this data.
- The material and fluid compatibility check list provides reference values for reference only, therefore we do not guarantee the application to our product.

### ⚠ Caution

1. Select models by choosing wetted materials suitable for fluid to be transferred.
  - Use fluids which will not corrode the wetted materials.
2. These products are not suitable for use in medical applications or with food products.
3. Possible applications will change depending on additive agents. Take note of additives.
4. Possible applications will change depending on impurities. Take note of impurities.
5. Some examples of transfer fluids are shown below. As the applicability of various fluids can change according to the conditions of usage, confirm these with experimental trials.
6. Compatibility is indicated for fluid temperatures of 90°C or less.

Table symbols ○: Can be used. X: Cannot be used.

### PAF3000/5000 Series

—: Since the possible applications will change depending on operating conditions, consult SMC.

Model		PAF3410	PAF3413
		PAF5410	PAF5413
Body material		New PFA	
Diaphragm material		PTFE	
Chemical	Acetone	○	Note 1, 2)
	Ammonium hydroxide	○	Note 2)
	Isobutyl alcohol	○	Note 1, 2)
	Isopropyl alcohol	○	Note 1, 2)
	Hydrochloric acid	○	
	Ozone	○	
	Hydrogen peroxide	○	Concentration 5% or less 50°C or less
	Ethyl acetate	○	Note 1, 2)
	Butyl acetate	○	Note 1, 2)
	Nitric acid (Except fuming nitric acid)	○	Note 2)
	Pure water	○	
	Sodium hydroxide	○	Concentration 50% or less
	Super pure water	○	
	Toluene	○	Note 1, 2)
	Hydrofluoric acid (Except fuming sulfuric acid)	○	Note 2)
	Sulfuric acid	○	Note 2)
Phosphoric acid	○	Concentration 80% or less	

Note 1) Take measures against the static electricity, since the static electricity may occur.


Note 2) Fluid may be permeated, affecting other material parts.





# Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC), Japan Industrial Standards (JIS)\*<sup>1)</sup> and other safety regulations\*<sup>2)</sup>.

- \* 1) ISO 4414: Pneumatic fluid power – General rules relating to systems.  
ISO 4413: Hydraulic fluid power – General rules relating to systems.  
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)  
ISO 10218-1992: Manipulating industrial robots -Safety.  
JIS B 8370: General rules for pneumatic equipment.  
JIS B 8361: General rules for hydraulic equipment.  
JIS B 9960-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)  
JIS B 8433-1993: Manipulating industrial robots - Safety.  
etc.
- \* 2) Labor Safety and Sanitation Law, etc.

 **Caution:** Operator error could result in injury or equipment damage.

 **Warning:** Operator error could result in serious injury or loss of life.

 **Danger :** In extreme conditions, there is a possibility of serious injury or loss of life.

## Warning

### **1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### **2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

### **3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### **4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



# Safety Instructions

## Caution

### **The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

## Limited Warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited Warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

### Limited Warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.\*3)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

\* 3) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### Compliance Requirements

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).



# Process Pump Precautions 1

Be sure to read this before handling.  
Refer to the main catalog sections for detailed precautions on each series.

## Design

### Warning

#### 1. Check the specifications.

Give careful consideration to operating conditions such as the application, fluid and environment, and use within the specified ranges in this catalog.

#### 2. Fluid

Regarding the component parts material and the fluid compatibility, check the applicable fluid check list (see page 24) prior to use. Consult with SMC for fluids other than the check list. Also, use within the fluid temperature range.

#### 3. Maintenance space

The installation should allow sufficient space for maintenance activities. Use the product, considering the liquid leakage from the product.

#### 4. Fluid pressure

Do not apply and/or reduce pressure to the operating fluid.

#### 5. Ambient environment

Operate within the ambient temperature range. After confirming the compatibility of the product's component materials with the ambient environment, operate so that fluid does not adhere to the product's exterior surfaces.

#### 6. Liquid rings

In cases with a flowing liquid, provide a bypass valve in the system to prevent the liquid from entering the liquid seal circuit.

#### 7. Measures against the static electricity

Take measures against the static electricity as the static electricity may occur depending on a fluid.

#### 8. Suspension of the pump operation

As for the automatic operation type, use a 3-port solenoid valve when the process pump is started or stopped by the pilot air. If the pump should stop while consuming the residual pressure, the integral switch part of the pilot air may not be stabilized or cannot be restarted. If it should not restart, press the reset button.

#### 9. Cannot be used as the gaseous transfer.

When used as the gaseous transfer, sufficient transfer volume cannot be gained due to the nature of compression. Besides, as the operational cycle is too fast, unexpected malfunctions may occur within short periods of time.

#### 10. Use the constant pilot air pressure.

The pump may cause malfunction and stop when the pilot air pressure fluctuation exceeds 50 kPa because the automatically operated type adopts an air spring for the in-built air control circuit.

#### 11. Use a design which prevents reverse pressure and reverse flow.

If reverse pressure or flow occurs, this can cause equipment damage or malfunction, etc. Take measures in designing the circuit diagram.

### Warning

#### 12. Condensation and freeze of the pilot port

The location around the switching valve of the automatically operated type and the exhaust port for air are cooled down quickly due to expansion of supply air, which may cause the pipes to freeze. Take measures that water droplets should not be splashed to any electric parts or equipment.

## Mounting

### Caution

#### 1. The sealed package should only be opened inside a clean room.

This product is double packed inside a clean room. We recommend that the inner package should be opened inside a clean room or clean environment.

#### 2. Confirm the mounting orientation of the product.

Mount the product, with its bottom surface facing downward. Fix all the mounting locations prior to use.

## Piping

### Caution

#### 1. Flush the pipes.

Connect the product after flushing and washing the pipes. If any foreign matter is left in the pipes, malfunction or failure may occur.

#### 2. Use the fittings with a resin thread when piping to the pilot port.

Using fittings with metal threads may result in damage to the pilot port.

#### 3. Always tighten threads with the proper tightening torque.

When screwing fittings into valves, tighten with the proper tightening torque shown below.

Connection thread	Proper tightening torque (N·m)
Rc, NPT, G 1/8"	0.4 to 0.5
Rc, NPT, G 1/4"	0.8 to 1
Rc, NPT, G 3/8"	2 to 2.5
Rc, NPT, G 3/4"	4 to 5



# Process Pump Precautions 2

Be sure to read this before handling.  
Refer to the main catalog sections for detailed precautions on each series.

## Air Supply

### Warning

#### 1. Use clean air.

If the compressed air includes synthetic oil containing chemicals, organic solvents, salt, corrosive gas, etc., this may cause damage to the product resulting in malfunction.

#### 2. Quality of operating air

Be sure to use only air filtrated by a micro mist separator (AMD series). However, if you would like to extend the products service life, we recommend that our super mist separator (AME series) should be used.

#### 3. When operating this product in low temperatures, please pay special attention to avoid freezing.

The equipment operates while expanding the compressed air. During this, the temperature inside the product decreases due to adiabatic expansion. If compressed air containing a high moisture content is used, this will cause freezing. In this case, take freeze prevention measures by using a membrane air dryer. (IDG series)

#### 4. Compressed air at low dew points

When extremely dry air is used with a fluid, reduction of lubrication properties can affect the reliability (service life) of the equipment. Consult SMC before using.

## Operating Environment

### Warning

#### 1. Do not use in the following environments, as this can cause failure.

- 1) Locations with an atmosphere of corrosive gases, organic solvents or chemical solutions, and where there may be contact with the same.
- 2) Locations where there is contact with sea spray, water or steam.
- 3) Locations where there is contact with direct sunlight. (Sunlight should be blocked to prevent deterioration of resin from ultra violet rays and over heating, etc.)
- 4) Locations near heat sources with poor ventilation. (Heat sources should be blocked off.)
- 5) Locations with impact or vibration.
- 6) Locations with high moisture and dust.

#### 2. Do not use the product under water.

Do not use the product under water. Otherwise, liquid will enter the inside of the product, resulting in malfunction.

## Maintenance

### Warning

#### 1. Only undertake maintenance after consulting the operating manual.

When undertaking maintenance, you should refer to the equipment's operating manual supplied by SMC or our Distributor. Incorrect handling may cause damage to the product resulting in malfunction.

#### 2. Only undertake maintenance once the system has been confirmed as safe.

Turn off the compressed air and the power supply voltage and exhaust any remaining compressed air in the pipes before removing or attaching the equipment or removing the compressed air supply/exhaust equipment. Exhaust any residual liquid as considered necessary. Also, when the equipment is mounted again or restarted after replacement, check that it's safe and then confirm that the product runs normally.

#### 3. Do not disassemble the product, as disassembly will invalidate the products warranty.

When disassembly is necessary, consult with SMC or our Distributor.

#### 4. Drain discharge

If drain accumulates in equipment, in piping or other areas, this can cause malfunction of the equipment or unexpected trouble due to splash over into the downstream side, etc. Exhaust the drain from air filter, etc. periodically.

#### 5. Caution for transferring a high-temperature fluid

This product will become hot due to its high-temperature operation. Touching the product directly may cause burns. Before transferring a high-temperature fluid, please allow sufficient time for the fluid to cool slightly. We also recommend that the system is safe prior to fluid transfer by detecting the product's temperature.

#### 6. Caution when a thermal heat cycle is applied.

When a heat cycle is applied, the resin thread may extend. Additionally tighten with the specified torque (M3: 0.11 to 0.12 N·m) to prevent liquid leakage.



# Process Pump Precautions 3

Be sure to read this before handling.  
Refer to the main catalog sections for detailed precautions on each series.

## Maintenance

### ⚠ Caution

**1. Caution for transferring a highly permeable liquid**  
Compared with the fluoro-resin, when a highly permeable liquid is transferred, the ingredient of the transfer liquid may ingress to the slit of the equipment. Additionally, it may be attached to the external surface on the equipment. In this case, take the same measures as handling the transfer liquid.

**2. Service life**  
When the process pump exceeds the diaphragm service life, the diaphragm may be degraded or damaged. Furthermore, the internal pilot air circuit will not be able to work, making operation impossible. We recommend that the diaphragm should be replaced before its service life has expired.

#### [Reference life expectancy days]

<Automatically operated type>

$$\text{Reference life expectancy} = \frac{\text{A (amount of discharge per cycle)} \times 50 \text{ million times (reference life expectancy)}}{\text{Flow (}\ell/\text{min)} \times \text{Running time per day (hour)} \times 60 \text{ (min.)}}$$

Model	Amount of discharge <b>A</b> per cycle	Volume inside the pump (wetted parts)
<b>PAF3410</b>	Approx. 0.054 ℓ	Approx. 105 mℓ
<b>PAF3413</b>	Approx. 0.050 ℓ*	Approx. 100 mℓ
<b>PAF5410</b>	Approx. 0.130 ℓ	Approx. 600 mℓ
<b>PAF5413</b>	Approx. 0.190 ℓ*	

\* The amount of discharge A per cycle for the air-operated type is the case where there is no piping resistance.

<Air operated type>  
The amount of discharge per cycle for the air-operated type varies depending on the piping resistance. Thus, calculate the life expectancy, beginning with the operating frequency of a solenoid valve.

$$\text{Reference life expectancy} = \frac{50 \text{ million times (reference life expectancy)}}{60 \text{ (sec.)} \times \text{Solenoid valve's operating frequency (Hz)} \times \text{Running time per day (hour)} \times 60 \text{ (min.)}}$$

## Handling

### ⚠ Warning

**1. If unused for long periods of time, perform a trial run prior to operation.**



#### Record of changes

<b>B edition</b>	* Addition of Process Pump PAF5000 Series. * Page 20 Related Products Change from Mist Separator AM Series to Micro Mist Separator AMD Series * Number of pages from 24 to 28.	KV
<b>C edition</b>	* Addition of Flare Type (LQ3 Fitting) to the type with nut. * Number of pages from 28 to 36.	MR

## SMC Corporation

Akihabara UDX 15F,  
4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN  
Phone: 03-5207-8249 Fax: 03-5298-5362  
URL <http://www.smcworld.com>  
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