

## Operation Manual

Process pump, PAF3410, PAF3413, PAF5410, PAF5413 series

**Please be sure to read this manual carefully before use.**

For construction and specifications of the pump, drawing, catalog and other literatures are available. Also, it should be noted this operation manual is changed without prior announcement.

### 1. Precautions for handling

#### **Warning**

##### **Caution on handling**

When the process pump is installed, do not drop it, hit it to objects or give an excessive impact to prevent a malfunction.

##### **Operating environment**

When dangerous fluid or fluid possibly harmful to human is used, take measure to isolate human from the pump. Should the external leakage of transported fluid come out, the serious damage to human could be caused.

##### **External leakage of transported fluid**

During operation of pump, the transported fluid could leak due to life out of the diaphragm. In this case, take prevention for the leakage to avoid adverse effect to human or facility.

##### **Disassembly**

Do not disassembly the pump.

#### **Caution**

##### **How to open the clean package**

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.

##### **Quality of supplied air**

Install a filter (micro mist separator, AMD or others) whose filtration accuracy is approx. 0.01μm. The use of a super mist separator (AME) is effective to extend the maintenance frequency.

\* Circuit example (See the circuit in No. 5 on Compressed Air Preparation Equipment Catalog)

Compressor HAW(after cooler) AT(air tank) AFF(main line filter) IDF(refrigerating air dryer)

AM(mist separator) AMD(micro mist separator) PAF

##### **Quality of transported fluid**

If it is known solid materials enters the transported fluid, mount the filter with filtration of 0.2mm at least on IN side.

##### **Life and replacement**

Suspend operation and replace the diaphragm before it reaches the end of life. If the diaphragm breaks, the transported fluid leaks inside the pump and exhaust port, and the internal parts of the pump are damaged and the air blows out from secondary side.

Calculation of life of diaphragm

( If water is used, the diaphragm life may vary depending on the application of the process pump. )

##### **<Automatically Operated Type> (PAF3410, PAF5410)**

$$\text{Referential life date} = \frac{A \text{ ( discharge amount per one cycle )} \times 50 \text{ million cycles ( referential life cycle )}}{\text{Flow (ℓ /min )} \times \text{operating time per day ( hour )} \times 60 \text{ ( min. )}}$$

##### **<Air Operated Type > (PAF3413, PAF5413)**

When an air operated process pump is used, the fluid discharged after one cycle of the diaphragms reciprocation varies depending on the piping resistance. Therefore, the life time should be calculated based on the operating frequency of the solenoid valve.

$$\text{Referential life date} = \frac{50 \text{ million cycles ( referential life cycle )}}{\text{Operating frequency of the solenoid valve (Hz)} \times 60 \text{ (sec)} \times \text{operating time per day ( hour )} \times 60 \text{ ( min. )}}$$

Model	Discharge amount per one cycle A	Pump internal capacity ( wetted parts )
PAF3410	0.054ℓ	105mℓ
PAF3413	0.050ℓ	100mℓ
PAF5410	0.130ℓ	600mℓ
PAF5413	0.190ℓ	

The amount of fluid discharged after one cycle of the reciprocation is measured without piping resistance.

**The value might change depending on the individual difference of an individual pump.**

### 2. Precautions for installation

#### **Caution**

##### **Mounting**

Mount the process pump horizontally (keep the mounting face downward), otherwise, the fluid cannot be transferred due to an improper operation of the internal components. Because the pump may possibly be damaged due to vibration, fix it with a bolt firmly.

Model	With or Without foot	Mounting bolt
PAF3410、 PAF3413	Without foot	M5 bolt / 2
	With foot	M6 bolt / 4
PAF5410、 PAF5413	-	M8 bolt / 4

##### **Piping**

Use a flexible piping to prevent an excessive load from applying to the pump. Perform flushing enough for piping to avoid intrusion of cutting chips and sealant debris created by screwing the piping and fitting. If the tape is used for sealing, leave two threads exposed.

##### **Material of fitting**

The threaded part is made of resin. Thus, do not tighten the metal fitting to avoid collapse of the thread.

##### **Tightening torque**

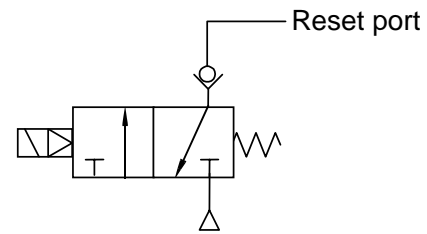
Insufficient tightening torque could cause external leakage and excessive one could damage threaded part and parts. Keep adequate value for tightening.

Thread size	Adequate tightening torque ( N-m )
Rc, NPT, G 1/8	0.4 to 0.5
Rc, NPT, G 1/4	0.8 to 1.0
Rc, NPT, G 3/8	2.0 to 2.5
Rc, NPT, G 3/4	4.0 to 5.0

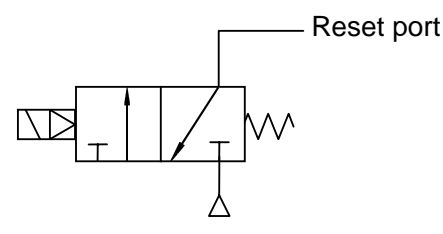
< Description and function of individual port >

Port description	Role	Applicable model
Suction port ( FLUID IN )	To suck transported fluid. Connect suction piping.	All models
Discharge port ( FLUID OUT )	To discharge fluid sucked inside the pump. Connect discharge piping.	All models
Pilot air supply port ( AIR SUP )	Supplying pressure set by regulator. Use clean air.	PAF3410 PAF5410
Pilot air exhaust port ( AIR EXH )	Exhausting pilot air.	PAF3410 PAF5410
AIR OPERATE RESET	For resuming of normal operation after momentary stoppage. If the dust or particles are caught and the process pump stops, press the reset button with a thin stick to eliminate them. To reset the process pump remotely, mount a 3-port solenoid valve and supply and exhaust the air.	PAF3410 PAF5410
Air supply and exhaust port (P1,P2)	Supply and exhaust the air whose pressure is set. Then connect an air piping.	PAF3413 PAF5413

< Reset circuit example >



PAF3410



PAF5410

### 3. How to use

#### ⚠ Cautions Start and stop

##### 【PAF3410, PAF5410】

- 1) Connect air piping to the port "AIR SUP", and transported fluid piping to the suction port "FLUID IN" and the discharge port "FLUID OUT" respectively. (Refer to circuit example (1))
- 2) Set pilot air pressure in the range of 0.2MPa and 0.5MPa by using regulator. Keep ball valve open on the discharge side. When air is supplied to the port "AIR SUP", the pump will operate and exhaust noise will start to come out of the port "AIR EXH". Fluid flows from the suction port "FLUID IN" to the discharge port "FLUID OUT".
- 3) To stop the pump, cut off the supply of air and exhaust the air inside the pump.

##### 【PAF3413, PAF5413】

- 4) Connect the supply and exhaust port "P1", "P2" with air piping and suction port "FLUID IN" and discharge port "FLUID OUT" with transported fluid piping respectively. If it is concerned molecular of transported fluid permeates PTFE diaphragm and gives adverse effect on the solenoid valve, mount compatible quick exhaust valve before the solenoid valve to prevent exposure to exhausted fluid.
- 5) Set pilot air pressure in a range from 0.2 to 0.5MPa.  
Keep the valve at discharge side open. When the solenoid valve at air supply side is energized, the air is supplied for "P1" and "P2" and the pump starts. Be sure to set the frequency cycle of the solenoid valve in accordance with the recommended cycle (PAF3413 : 2 to 4Hz, PAF5413 : 1 to 3Hz). Then, after a while, the fluid starts flowing from suction port "FLUID IN" to "FLUID OUT".
- 6) To stop the pump, cut off the supply of air and exhaust the air inside the pump.

#### Adjustment of discharged flow rate

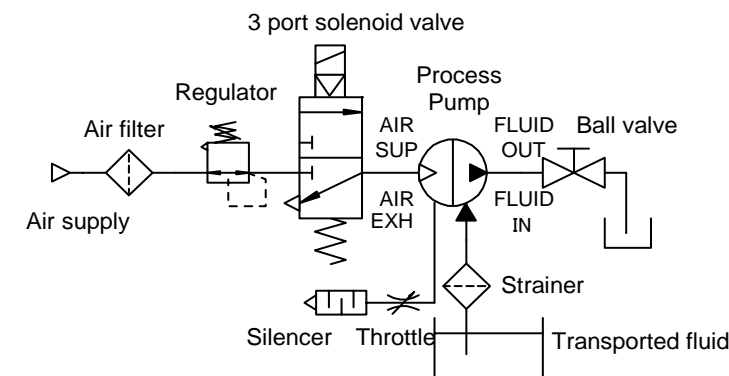
##### 【PAF3410, PAF5410】

- 1) Pump also stops when valve (restriction) is closed on the discharge side. Avoid stopping the pump for long hours as this may prevent restart of the pump. Closing valve abruptly can generate surge, that considerably shortens the life of the pump.  
(Refer to circuit example (1))
- 2) When the pump is operated with discharge below the specification range, use bypass circuit from the discharge side to suction side for keeping the minimum flow inside the process pump. (Refer to circuit example (2)) The pump may stop due to unstable operation with discharge flow less than the minimum discharge flow.

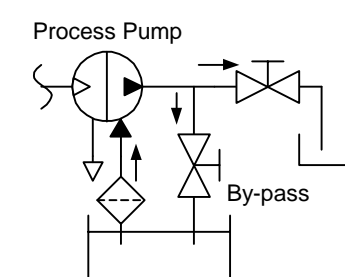
##### 【PAF3413, PAF5413】

- 3) The discharged flow rate is adjusted by switch of the valve connected at discharge side or solenoid valve. Sudden close of these valves could cause surge and shorten the life of pump remarkably, and so must be avoided. (Refer to circuit example (3))

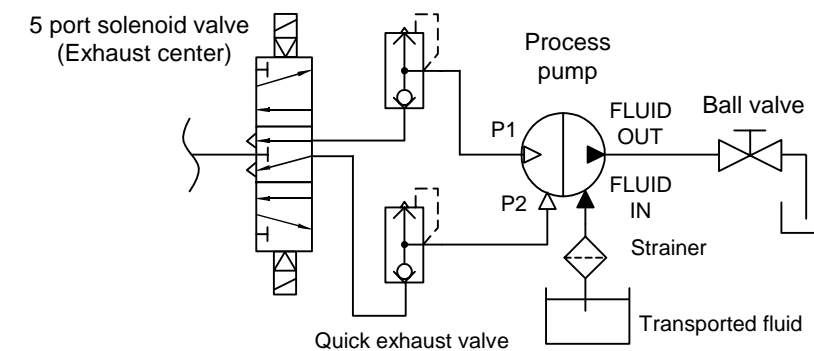
Circuit example (1)



Circuit example (2)



Circuit example (3)



### 4. Maintenance and check

#### ⚠ Caution During operation

- 1) During operation of pump, it is necessary to check leakage of fluid and air and operating condition periodically. If any abnormality or concern is seen, stop the pump immediately and contact local supplier or SMC.
- 2) When touching the pump for maintenance, put the protective tool such as glove, which isn't affected by transported fluid to prevent burn.

#### During stop

- 1) If the pump is stopped for a few hours, exhaust the air at supply side.
- 2) If the pump is left unused for extended period, clean inside of the pump to prevent adherence and sticking of transported fluid over the time which could cause abnormal operation.

#### Check and repair

- 1) During operation of pump, it is necessary to check air leakage and operating condition periodically. If any abnormality or concern is seen, stop the pump immediately and contact local supplier or SMC.
- 2) Replace the diaphragm before it reaches referential life cycles (specified cycles).  
If the pump is continued after the life of diaphragm, the check valve of wetted part as well as the diaphragm is deteriorated and operating failure could be caused.

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