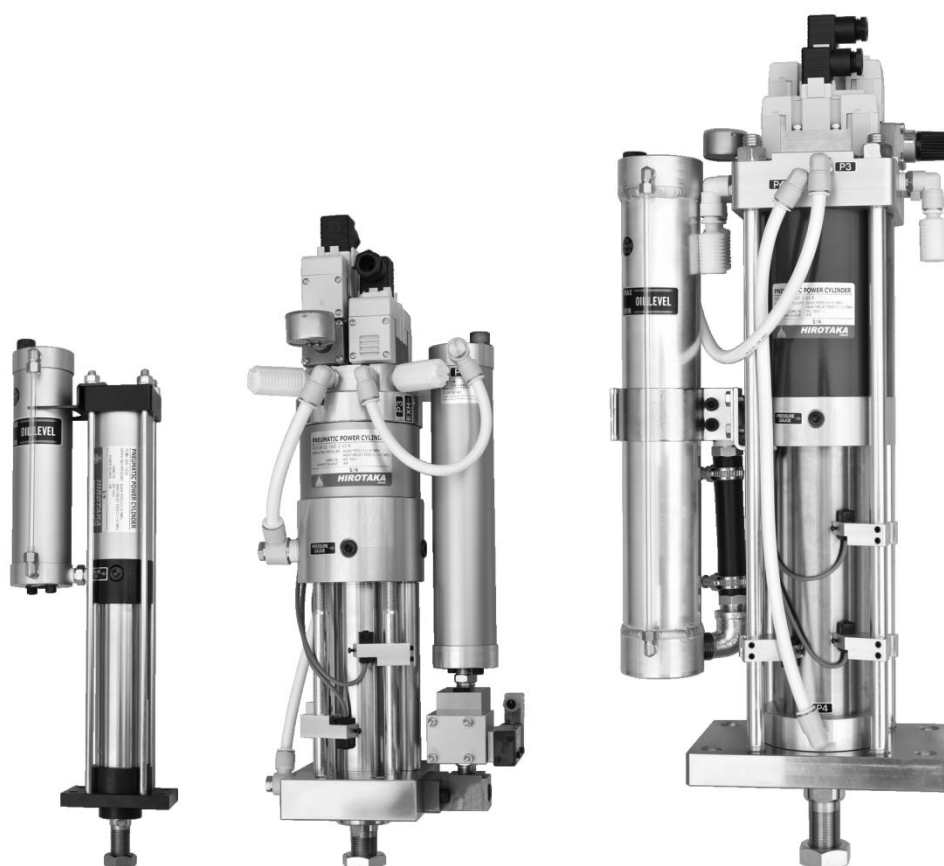




# MANUAL

## PNEUMATIC POWER CYLINDER



**HIROTA MFG. CO., LTD.**



## The notes for Using

Be sure to read this before handling



### CAUTION

#### 1. Piping

Before installing the piping, blow compressed air to prevent dirt from entering the piping. Due to the structure of the pneumatic power cylinder, oil may be discharged from each air port due to wear or damage to the seals. We recommend installing an exhaust cleaner in the exhaust port of the valve.

#### 2. Air supply

Using the compression air with dry via filter. The operating pressure is 0.7 MPa or less.

#### 3. Hydraulic fluid (ISO VG22 Standard mineral hydraulic fluid or VG32)

If the hydraulic fluid has drain or dirt mixed in with it, or if it has deteriorated or discolored, replace it with new hydraulic fluid. Also, use the same old and new hydraulic oil. Recommended to replace once a year.

#### 4. Quantity of oil

There is an oil level tube on the side of the converter, so please replenish the hydraulic oil when the oil level drops. Check the oil level with the cylinder stopped (Piston rod retraction end).

#### 5. Mounting direction

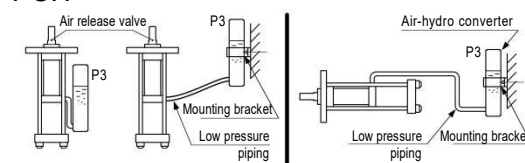
Mount the pneumatic power cylinder so that the piston rod is oriented downward.

If it will mount upward or horizontally, the standard model cannot use it. Please contact us before your order and consideration.

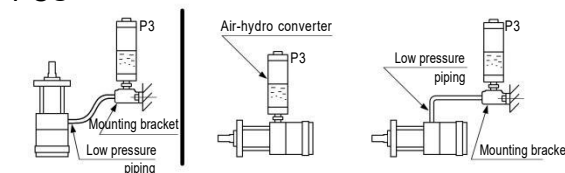
**Attach a plug to P3 port by all means when you carry a cylinder and send it. Don't flow out oil inside the cylinder.**

Carry out an air vent every one or two months in case of the model with air release valve.

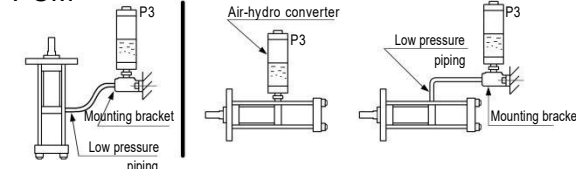
PCH



PCS



PCM



| Capacity of oil |                      |          |                |                      | Unit : liter |  |
|-----------------|----------------------|----------|----------------|----------------------|--------------|--|
| Model           | Type of total stroke | Capacity | Model          | Type of total stroke | Capacity     |  |
| PCM-005, 01     | 05                   | 0.20     | PCH-03, 06, 08 | 15                   | 1.60         |  |
|                 | 10                   | 0.30     |                | 20                   | 1.90         |  |
|                 | 15                   | 0.40     |                | 30                   | 2.50         |  |
|                 | 20                   | 0.45     | PCH-13, 17, 24 | 10                   | 2.70         |  |
|                 | 30                   | 0.55     |                | 15                   | 3.40         |  |
| PCS-02, 04      | 05                   | 0.35     |                | 20                   | 4.10         |  |
|                 | 10                   | 0.45     | PCH-35, 44     | 30                   | 6.20         |  |
|                 | 15                   | 0.55     |                | 10                   | 3.80         |  |
|                 | 20                   | 0.75     |                | 15                   | 4.70         |  |
|                 | 30                   | 0.95     |                | 20                   | 5.60         |  |
| PCH-03, 06, 08  | 10                   | 1.00     |                | 30                   | 7.40         |  |

## Preparations before the use ( All models )

### 1. Return a piston rod to the backward end position.

Place the Pneumatic Power Cylinder on the machine frame, and construct the air piping.

Supply a compressed air to P2 and P4, make situation that returned a piston rod and a booster.

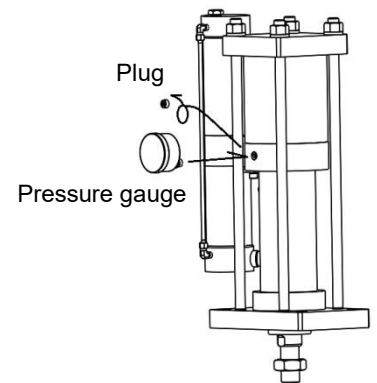
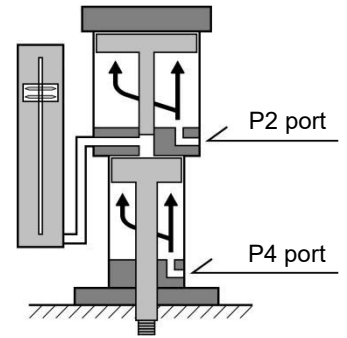
The type with operating valve, when air is supplied to the IN-port, it is supplied to the P2 and P4 port. (Operating valve is OFF)



**CAUTION**

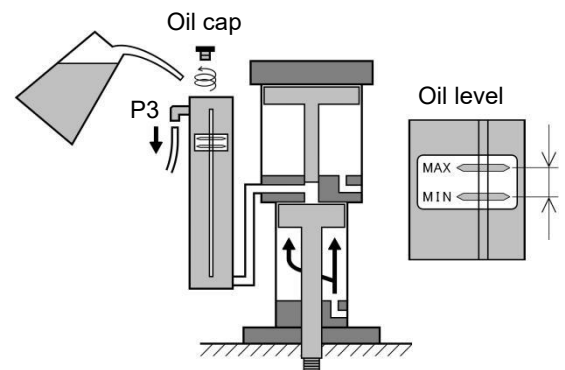
#### The model with pressure gauge (Option)

The pressure gauge of a model with pressure gauge is packed separately, and it is shipped. Remove the R1/4 plug next to the "PRESSURE GAUGE" label before supplying compressed air. Wrap sealing tape around the threads of the pressure gauge and attach it. Oil will not drip if the plug is removed with the pressure gauge port pointing upward, but when the plug is removed with the cylinder upright, a small amount of oil will drip. Remove the plug while receiving oil with a waste cloth, etc., and then attach the pressure gauge. When installing a pressure gauge after supplying air, be sure to do so in the state of 1 above. Please be careful when there is pressure inside the cylinder (P1, P3 port) as oil may flow out or scatter. "The PCM and PCS types are pre-filled with oil. Be careful not to flow out or scatter."



### 2. Oiling

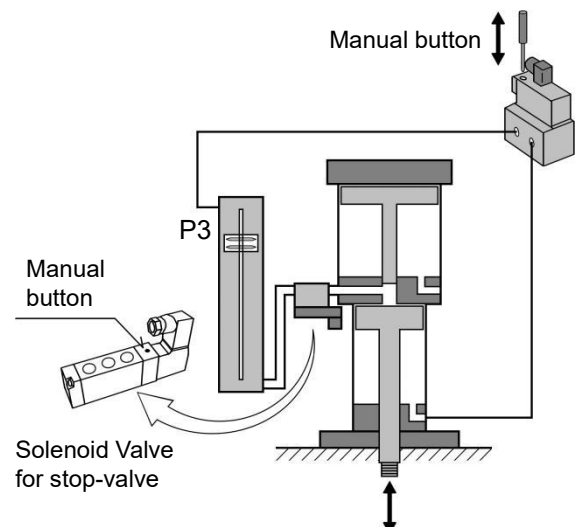
When adding oil, be sure to put oil in the state of 1. Remove the oil cap on the top of the air-hydro converter and add oil. If it remove the P3 port piping, it will be easier for oil to enter. The oil level of air-hydro converter rise speed of the oil gauge is slower than the actual amount of oil, so please add it slowly when it reaches near the oil level. It is recommended to use mineral hydraulic oil with a viscosity equivalent to VG22. After the oil has entered, tighten the oil cap firmly and connect the P3 port piping. "PCM and PCS types are pre-filled with oil. Remove the plug from the P3 port before piping. Also, remove the plug and connect the attached air pipe for the type with operating valve."



### 3. Air releasing "Repeat pneumatic thrust stroke"

By manually operating the pneumatic thrust stroke solenoid valve (SOL-1), release remaining air. Operate the manual button of the solenoid valve to extend the piston rod to the stroke end and then return the piston rod. After returning to the backward end position, wait about 5 seconds to release the air in the oil in the air-hydro converter. Do this action about 5 times. When the air is released and the oil level drops, add oil to the appropriate amount.

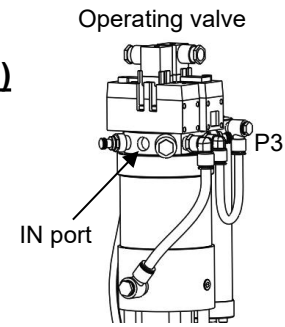
Note: For type with a stop valve, push the manual button on the solenoid valve that comes with the stop valve. Do this with the stop valve open.



## Preparations before the use ( Type with options )

### A. Type with operating valve (Symbol : PCMV\*, PCSV\*, PCHV\*)

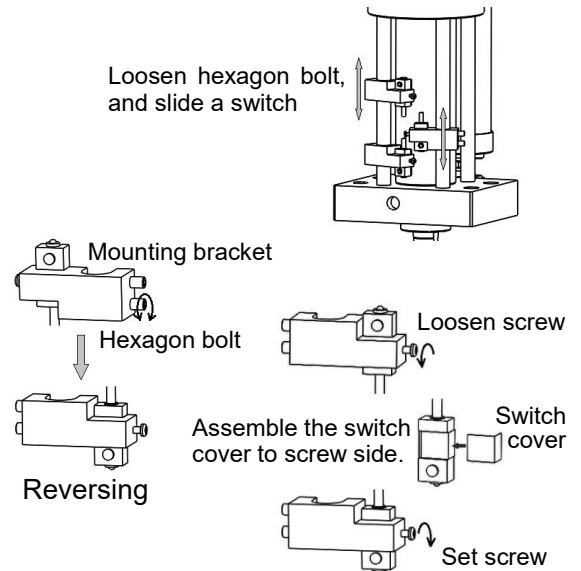
Air piping is for IN port only. Pipe the source pressure directly. The P3 port is delivered with the fitting removed, so mount it in the equipment, remove the plug after standing upright, and then perform piping. The PCSV\* model comes with 3 silencers, so please attach them to each exhaust port.



### B. Type with auto switch (Symbol : PCMW, PCSW, PCHW)

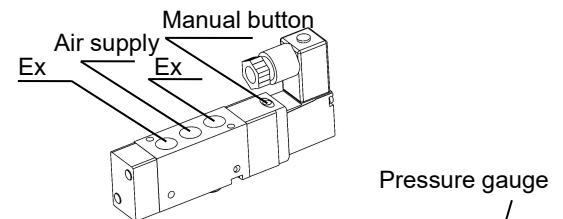
The switch mounting position at the time of shipment is provisional. Adjust to the proper position after the equipment can be operated, such as air piping and electrical wiring. The orientation of the switch can be changed by reversing the mounting bracket or by mounting the switch in the opposite direction. Make sure the switch is in close contact with the cylinder tube.

- (b-1) Piston rod backward end position  
Adjust so that the switch turns ON when the piston rod is completely returned.
- (b-2) Start position of high thrust stroke  
Adjust to the contact position of the JIG and workpiece after the pneumatic thrust stroke operation.
- (b-3) High thrust stroke completion position  
Adjust to the position where the high thrust stroke is completed. It can adjust the position more finely by sliding it upward from the piston rod side and adjusting it to the ON position.



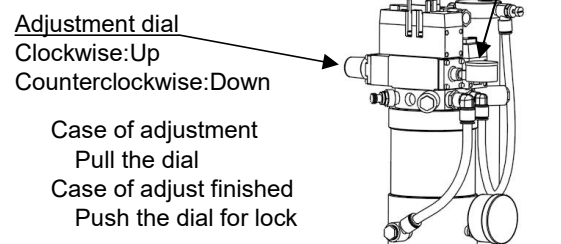
### C. Type with stop valve (Symbol : - V\*)

Connect the air piping to the attached solenoid valve. The center port is the air supply port. Supply the source pressure. The stop valve is open when shipped. When air is supplied, the stop valve closes. A silencer for the exhaust port is not included, so please install an R1/8 silencer.



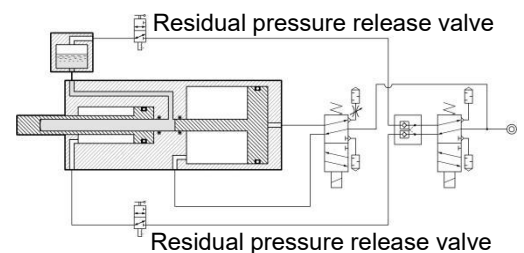
### D. Type with regulator (Symbol : R)

Used to adjust high thrust to a thrust lower than the supply pressure. Refer to the thrust table on page 19 for pressure setting. The regulator pressure increases only when the high thrust solenoid valve is turned ON. Adjust while watching the pressure gauge attached to the regulator during high thrust stroke.



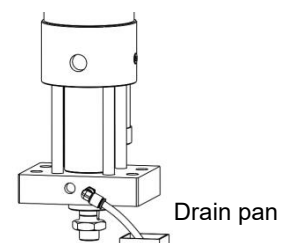
### E. Type with drop prevention valve (Symbol : T)

When the compressed air supplied to the IN port disappears, the air in the pneumatic thrust stroke (inside the P3 and P4 port) is sealed. The piston rod thereby retains the retraction force. To operate the cylinder again, supply air to the IN port. A residual pressure release is not included, so if it is necessary to release the residual pressure, loosen the mounting screw of the pneumatic thrust stroke valve to release the air, or branch the air piping and install a separate residual pressure release.



### F. Type with oil film removal specification for rod (Symbol : B)

Pipe the drain port (Rc1/8) and install a drain pan near the cylinder. The leaked oil will drain to the exhaust of the solenoid valve.



## Operation adjustment method

Adjust the operation of the cylinder by adjusting or installing parts as shown below.

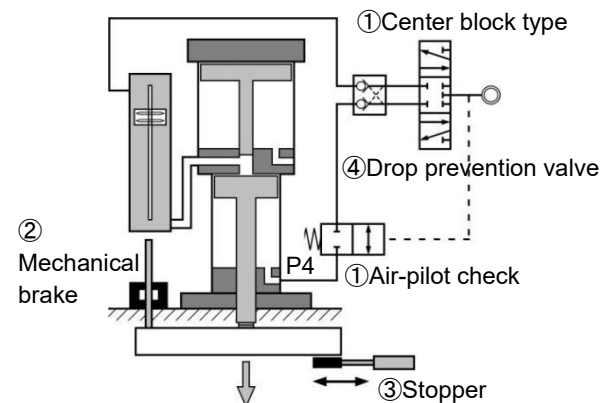
| Motion   | Adjustment method  |
|--|--|
| Adjustment of pneumatic thrust stroke speed  | Install speed controller of the meter out in P4.   |
| Adjustment of high thrust stroke speed   | Install speed controller of the meter out in P2.   |
| Adjustment of high thrust stroke return speed  | Install speed controller of the meter out in P1.<br>Adjust silencer with speed controller.<br>(Type with operating valve)  |
| Adjustment of backward speed   | Install speed controller of the meter out in P3.   |
| Adjustment of high thrust  | Install regulator with backflow function in P1.<br>Adjust regulator.<br>(Type with operating valve and regulator)  |
| Adjustment of pneumatic thrust stroke thrust   | Install regulator with backflow function in P3.  |
| Add top dead center to mid-stroke position<br>(Switching of top dead center, Emergency stop) | After adjusting the auto switch to the new top dead center, off the stop valve while the piston rod is returning.<br>Increase supply air pressure. (Booster regulator) |
| Speed up   | Install quick exhaust valve in P4 or P2. (But the life of seal shortens.)  |
|  | Make the air piping thicker and shorter. Also consider the size of the pneumatic equipment.  |
|  | Use supporting air cylinder. (Backward stroke speed)   |
|  |  |

## Drop prevention

When the compressed air inside the cylinder(P4) runs out, the load may drop due to its weight. In that case the following method can be dealt with. The same applies to the type with stop valve. However, ① and ④ may not be retained for a long time.

### Method of drop prevention

- ① Use a pneumatic thrust stroke solenoid valve of a closed center type (Perfect type) to seal the air in the P4 port.  
Or install a pilot check valve on the P4 port piping.
- ② Attach a mechanical brake to the jig guide.
- ③ Provide a mechanical stopper at the upward end (effective only when waiting for the upward end).
- ④ For models with an operation valve, install the optional drop prevention valve.

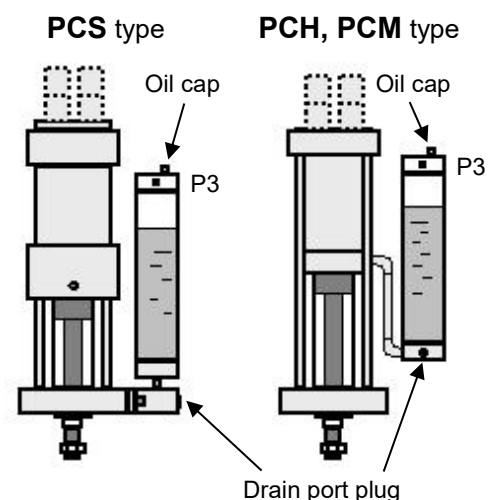


## Oil maintenance

Hydraulic oil deteriorates and turns black with repeated use. Hydraulic oil is also used as a lubricant, so replace the deteriorated or blackened hydraulic oil.  
(Recommended replacement period : One year)

### Replacement method (with air supplied)

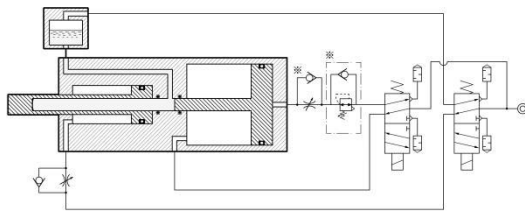
- ① Set the piston rod back as shown in the illustration.
- ② Remove the P3 port piping.
- ③ Remove the plug from the drain port at the bottom of the air-hydro converter and drain the oil. Hydraulic oil will come out vigorously, so use a cylindrical plastic bag to prevent scattering.
- ④ After draining the oil, apply a sealing material to the plug and attach it to the drain port.
- ⑤ Add new hydraulic oil from the oil cap to the appropriate amount within the oil level.
- ⑥ Connect the oil cap, piping and bleed the air (see page 14).



Note: For the type with a stop valve, drain the oil with the solenoid valve of the stop valve turned on.

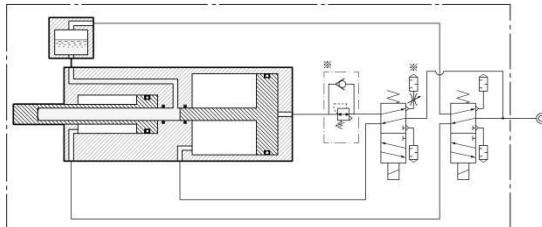
## Example for air circuit

PCM  
PCS  
PCH



The type with operating valve

PCMV\*  
PCSV\*  
PCHV\*



Install the regulator when adjusting high thrust. The position shown in the figure or the primary side of SOL-2 (For SOL-2 primary side, use a pressure reducing valve without backflow function). Speed controller (P1) should be installed in the direction shown in the illustration to prevent negative pressure in the oil. Be sure to install it. For speed adjustment, install a speed controller on each port. (see page 16)

Supply air to the IN port.  
The regulator (option) is for high thrust adjustment.  
Speed controller (optional) for each port can be retrofitted in-line.

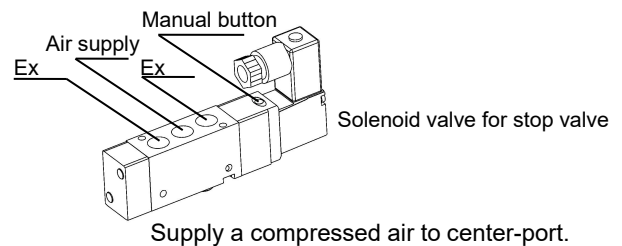
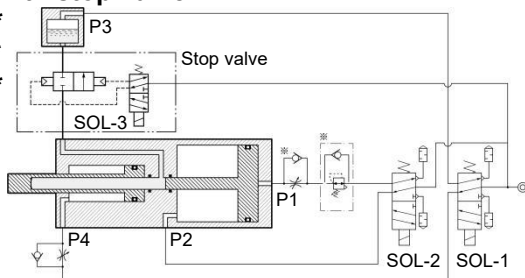
"circle mark" indicates supply, "cross mark" indicates exhaust.

| Operating condition     | SOL-1 | SOL-2 | P1 | P2 | P3 | P4 | Progress condition        |
|-------------------------|-------|-------|----|----|----|----|---------------------------|
| Stop                    | OFF   | OFF   | ×  | ○  | ×  | ○  | Condition of illustration |
| Pneumatic thrust stroke | ON    | OFF   | ×  | ○  | ○  | ×  | Forward at fast speed     |
| High thrust stroke      | ON    | ON    | ○  | ×  | ○  | ×  | Forward at high thrust    |
| Backward drive          | OFF   | OFF   | ×  | ○  | ×  | ○  | Return at fast speed      |

## Example for air circuit

The type with stop valve

PCM...V\*  
PCS...V\*  
PCH...V\*



### How to intermediate stop (Emergency stop, Inching)

"circle mark" indicates supply, "cross mark" indicates exhaust.

| Operating condition     | SOL-1 | SOL-2 | SOL-3 | P1 | P2 | P3 | P4 | Progress Condition        |
|-------------------------|-------|-------|-------|----|----|----|----|---------------------------|
| Stop                    | OFF   | OFF   | OFF   | ×  | ○  | ×  | ○  | Condition of illustration |
| Pneumatic thrust stroke | ON    | OFF   | ON    | ×  | ○  | ○  | ×  | Forward at fast speed     |
| Intermediate stop       | OFF   | OFF   | OFF   | ×  | ○  | ×  | ○  | Intermediate stop         |
| High thrust stroke      | ON    | ON    | ON    | ○  | ×  | ○  | ×  | Forward at high thrust    |
| Backward drive          | OFF   | OFF   | ON    | ×  | ○  | ×  | ○  | Return at fast speed      |

It does not stop during the high thrust stroke, stop after the high thrust stroke returns.

### How to continuous operation for high thrust stroke drive only

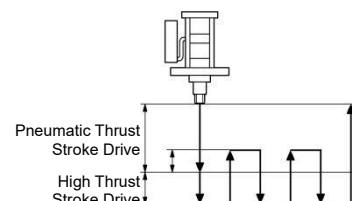
"circle mark" indicates supply, "cross mark" indicates exhaust.

| Operating condition               | SOL-1 | SOL-2 | SOL-3 | P1 | P2 | P3 | P4 | Progress Condition                          |
|-----------------------------------|-------|-------|-------|----|----|----|----|---|
| ① Stop                            | OFF   | OFF   | OFF   | ×  | ○  | ×  | ○  | Condition of illustration                   |
| ② Pneumatic thrust stroke         | ON    | OFF   | ON    | ×  | ○  | ○  | ×  | Forward at fast speed                       |
| ③ High thrust stroke              | ON    | ON    | ON    | ○  | ×  | ○  | ×  | Forward at high thrust                      |
| ④ High thrust stroke return drive | OFF   | OFF   | OFF   | ×  | ○  | ×  | ○  | Return at (High thrust + $\alpha$ ) stroke  |
| ⑤ High thrust stroke              | OFF   | ON    | OFF   | ○  | ×  | ×  | ○  | Forward at ( $\alpha$ + high thrust) stroke |
| ⑥ Backward drive                  | OFF   | OFF   | ON    | ×  | ○  | ×  | ○  | Return at condition of illustration         |

(Note1) The  $\alpha$  stroke is a stroke that returns by  $\alpha$  mm from the position at the start of high thrust stroke drive.

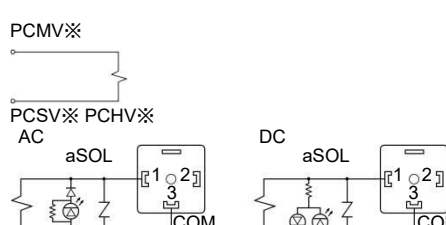
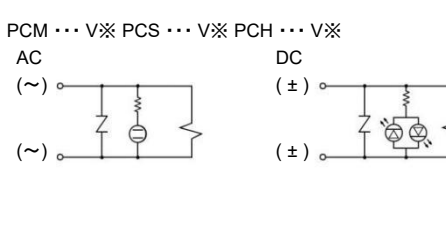
There is no high thrust during  $\alpha$  stroke advancement. The  $\alpha$  stroke of each model is shown in the table below.

| Model     | $\alpha$ stroke (mm) | Model     | $\alpha$ stroke (mm) |
|-----------|----------------------|-----------|----------------------|
| PCS-02-V* | About 5.5            | PCH-13-V* | About 2.0            |
| PCS-04-V* | About 3.1            | PCH-17-V* | About 1.8            |
| PCH-03-V* | About 2.1            | PCH-24-V* | About 1.4            |
| PCH-06-V* | About 3.6            | PCH-35-V* | About 4.5            |
| PCH-08-V* | About 2.8            | PCH-44-V* | About 1.8            |



(Note1)  
(Note1)

## Solenoid valve, Auto switch

| Operating valve (PCSV*, PCHV*)   | Stop valve (PCS-----V*, PCH-----V*)  |
|--|--|
| <p>Improper connection of terminals can lead to problems such as the malfunctioning of solenoid valves. Carefully study the following diagram before connection.</p> <p>Electric connection circuit diagram</p> <p>Single solenoid</p>  | <p>Improper connection of terminals can lead to problems such as the malfunctioning of solenoid valves. Carefully study the following diagram before connection.</p> <p>Electric connection circuit diagram</p> <p>Single solenoid</p>  |

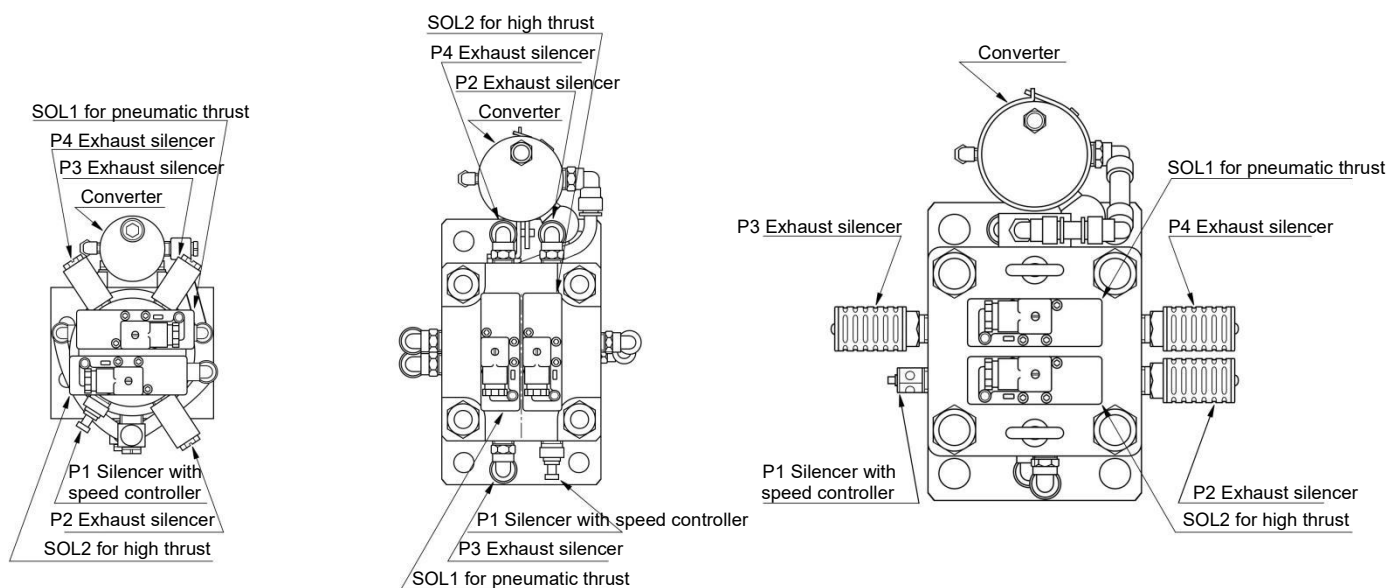
### Auto switch

| Read auto switch          |  |                  |
|---------------------------|--|------------------|
| Model No.                 | RS-6   | Internal circuit |
| Voltage                   | 24 VDC                                       | 100 V / 200 VAC  |
| Max. switching current    | 20 mA  | 20 mA            |
| Max. switching capacity   | 5 W  | 5 VA             |
| Average operating time    | 1 mSEC                                       |                  |
| Insulation resistance     | 100 MΩ or more (500 VDC measured via megger) |                  |
| Impact resistance         | 30 G   |                  |
| Working temperature range | -10 to 60°C (Non-freezing)                   |                  |
| Lead wire                 | Two - core cable, 1 m                        |                  |
| Indicating lamp           | Red LED illuminates when turned ON           |                  |

| Solid state auto switch   |  |                  |
|---------------------------|--|------------------|
| Model No.                 | H2ME   | Internal circuit |
| Output type               | NPN  |                  |
| Voltage                   | 5, 12, 24 VDC                                |                  |
| Max. Load current         | 5 mA (5 VDC), 10 mA (12 VDC), 20 mA (24 VDC) |                  |
| Max. switching current    | 100 mA (5 VDC), 200 mA (24 VDC)              |                  |
| Internal voltage drop     | 0.6 V or less (24 VDC)                       |                  |
| Max. Leakage current      | 0.1 mA or less (24 VDC)                      |                  |
| Impact resistance         | 30 G   |                  |
| Working temperature range | -10 to 60°C (Non-freezing)                   |                  |
| Lead wire                 | Three - core cable, 1 m                      |                  |
| Indicating lamp           | Red LED illuminates when turned ON           |                  |

### Part name for type with operating valves (Top view)



Model : PCSV\*-02, 04

Model : PCHV\*-03, 06, 08

Model : PCHV\*-13, 17, 24

## Thrust Table

Unit : kN (Theoretical Value)

| Air Pressure (MPa) | Model | PCM 005 | PCM 01 | PCS 02 | PCS 04 | PCH 03 | PCH 06 | PCH 08 | PCH 13 | PCH 17 | PCH 24 | PCH 35 | PCH 44 |
|--------------------|-------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                    |       |         |        |        |        |        |        |        |        |        |        |        |        |
| High Thrust        | 0.1   | 0.78    | 1.60   | 3.14   | 6.06   | 4.90   | 8.72   | 12.56  | 19.63  | 24.85  | 34.39  | 49.52  | 63.61  |
|                    | 0.2   | 1.57    | 3.20   | 6.28   | 12.12  | 9.81   | 17.45  | 25.13  | 39.26  | 49.70  | 68.79  | 99.05  | 127.23 |
|                    | 0.3   | 2.35    | 4.80   | 9.42   | 18.18  | 14.72  | 26.17  | 37.69  | 58.90  | 74.55  | 103.18 | 148.58 | 190.85 |
|                    | 0.4   | 3.14    | 6.41   | 12.56  | 24.24  | 19.63  | 34.90  | 50.26  | 78.53  | 99.40  | 137.58 | 198.11 | 254.46 |
|                    | 0.5   | 3.92    | 8.01   | 15.70  | 30.30  | 24.54  | 43.63  | 62.83  | 98.17  | 124.25 | 171.97 | 247.64 | 318.08 |
|                    | 0.6   | 4.71    | 9.61   | 18.84  | 36.36  | 29.45  | 52.35  | 75.39  | 117.80 | 149.10 | 206.37 | 297.17 | 381.70 |
|                    | 0.7   | 5.49    | 11.21  | 21.99  | 42.42  | 34.36  | 61.08  | 87.96  | 137.44 | 173.95 | 240.76 | 346.70 | 445.32 |
| Pneumatic Thrust   | 0.3   | 0.37    | 0.37   | 0.58   | 0.58   | 1.50   | 1.50   | 1.50   | 3.68   | 3.68   | 3.68   | 5.30   | 5.30   |
|                    | 0.4   | 0.50    | 0.50   | 0.78   | 0.78   | 2.01   | 2.01   | 2.01   | 4.90   | 4.90   | 4.90   | 7.06   | 7.06   |
|                    | 0.5   | 0.62    | 0.62   | 0.98   | 0.98   | 2.51   | 2.51   | 2.51   | 6.13   | 6.13   | 6.13   | 8.83   | 8.83   |
|                    | 0.6   | 0.75    | 0.75   | 1.17   | 1.17   | 3.01   | 3.01   | 3.01   | 7.36   | 7.36   | 7.36   | 10.60  | 10.60  |
|                    | 0.7   | 0.87    | 0.87   | 1.37   | 1.37   | 3.51   | 3.51   | 3.51   | 8.59   | 8.59   | 8.59   | 12.37  | 12.37  |
| Return             | 0.3   | 0.28    | 0.28   | 0.44   | 0.44   | 1.13   | 1.13   | 1.13   | 2.83   | 2.83   | 2.83   | 3.39   | 3.39   |
|                    | 0.4   | 0.37    | 0.37   | 0.58   | 0.58   | 1.50   | 1.50   | 1.50   | 3.77   | 3.77   | 3.77   | 4.52   | 4.52   |
|                    | 0.5   | 0.47    | 0.47   | 0.73   | 0.73   | 1.88   | 1.88   | 1.88   | 4.72   | 4.72   | 4.72   | 5.65   | 5.65   |
|                    | 0.6   | 0.56    | 0.56   | 0.88   | 0.88   | 2.26   | 2.26   | 2.26   | 5.66   | 5.66   | 5.66   | 6.78   | 6.78   |
|                    | 0.7   | 0.65    | 0.65   | 1.03   | 1.03   | 2.63   | 2.63   | 2.63   | 6.61   | 6.61   | 6.61   | 7.91   | 7.91   |

## Oil leakage

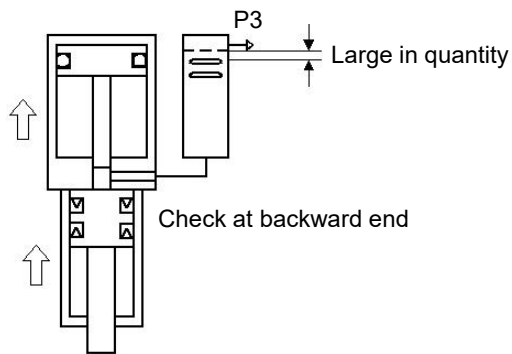


Illustration 1

### CAUTION

#### Cause of issue

Too much oil will leak from the P3 port.

#### Countermeasures

Drain excess oil and adjust to proper level.

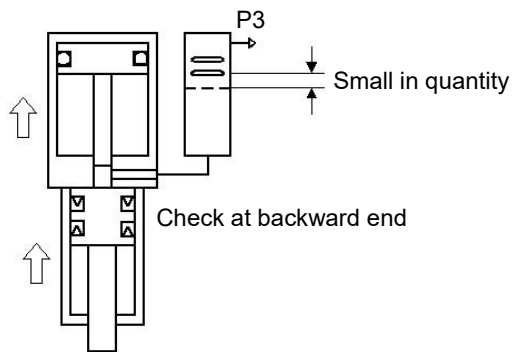


Illustration 2

### CAUTION

#### Cause of issue

If there is not enough oil, air will enter the oil during operation and air bubbles will appear.

It will leak out of the P3 port due to the increased amount of oil it looks like.

Also, since the ability is used to crush air bubbles during high thrust stroke, insufficient high thrust or insufficient stroke may occur.

#### Countermeasures

Add oil and adjust to proper level.



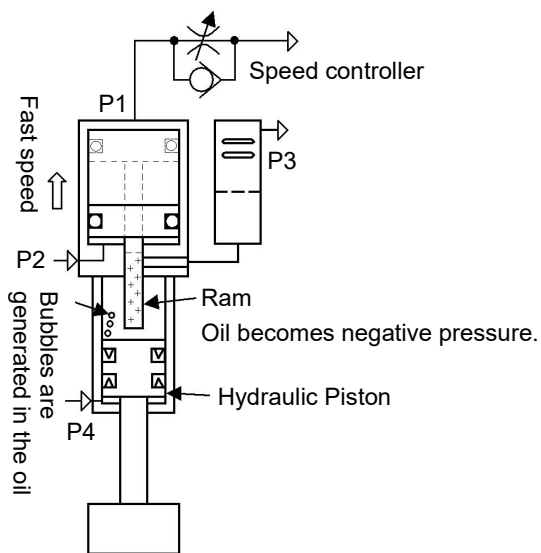


Illustration 3

#### Cause of issue

At the start of ascent, high thrust retraction and pneumatic thrust retraction are performed at the same time. At that time, if the exhaust from the P1 port is fast, the Ram rises quickly and the hydraulic piston cannot keep up with the rise, causing negative pressure in the oil. In this state, small bubbles are generated in the oil, and the apparent amount of oil increases and may leak from the P3 port. Also, since the ability is used to crush air bubbles during high thrust strokes, insufficient high thrust or insufficient stroke may occur.

#### Countermeasures (Return stroke)

When the speed controller of P1 is throttled, the initial backward the high-thrust stroke backwards slowly, and when it ends, it becomes a quick-backward stroke. Gradually open the speed controller and adjust the overall speed to the same speed as fast return. Do not open the speed controller any further. If you open it any further, the oil will become negative pressure, so squeeze it as much as possible before use.

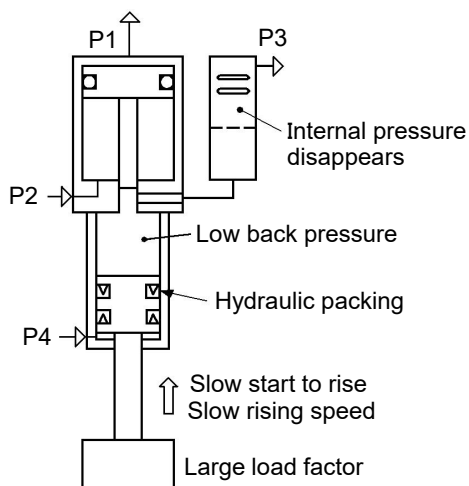


Illustration 4

### CAUTION

#### Cause of issue

If the load factor is large, the rise start will be slow and the rise speed will be slow. In this case, the pressure in the P3 port disappears (lowers) and the oil back pressure drops. At this time, the tension of the hydraulic packing is reduced and oil leakage may occur on the P4 side.

#### Countermeasures (Illustration 5)

1. Lower the load factor.
2. Pull up with a spring, auxiliary cylinder, etc..
3. Increase air pressure.
4. Install a pressure controller in the P3 port and hold the pressure in the P3 port a little.

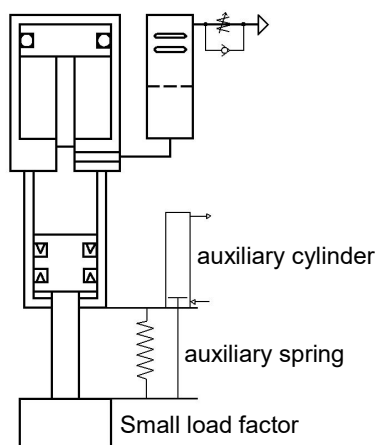
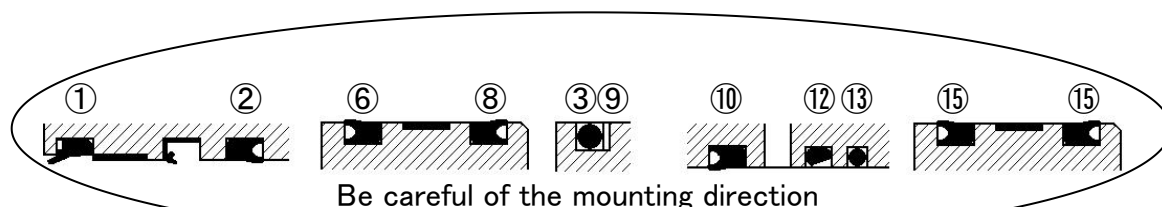
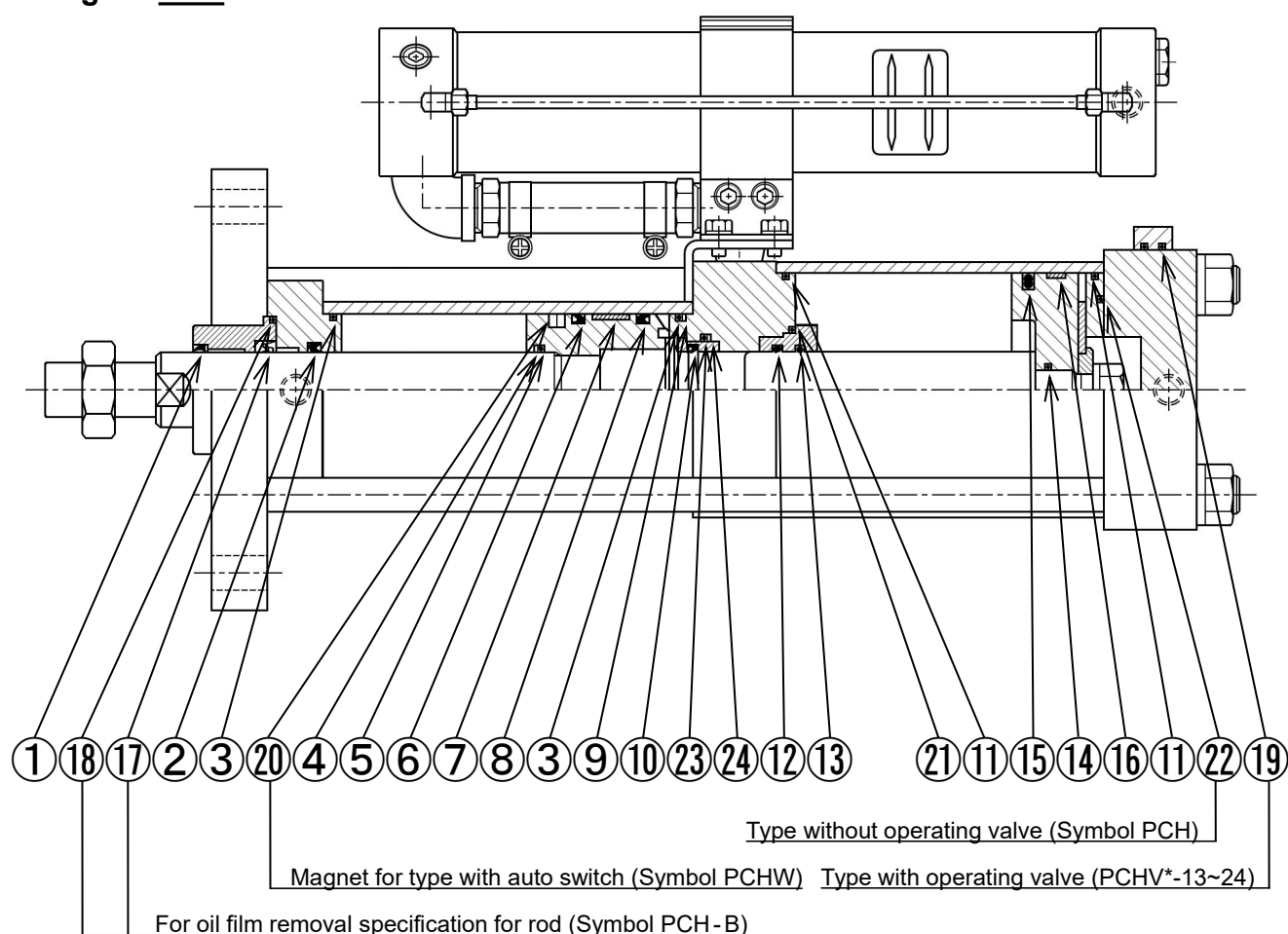


Illustration 5

## Troubleshooting guide

| Situation  |   |  | Cause of issue   | Countermeasures   |
|--|---|--|--|---|
| Movements  | Slow speed                                      | Overall                                      | Fittings, piping size are small or long  | Make thicker and shorter  |
|  |   |  | Solenoid valves, silencer are small size   | Make larger size  |
|  |   |  | Insufficient air supply<br>(Large drop in pressure during operation)                   | Increase the size of the air piping from the air source to the device<br>Install a reservoir tank<br>Increase compressor capacity |
|  |   |  |  |   |
|  |   | Backward side                                | Heavy JIG weight   | Increase air pressure<br>Add a auxiliary equipent (see page 20)<br>Lighten the JIG  |
|  |   |  | The speed controller at the P1 and the P3 are excessively closed                       | Open or remove the speed controller   |
|  |   |  | Regulator for high thrust adjustment   | Replace the type with backflow function   |
|  |   |  | Misalignment   | Check the guide, slide bush and die   |
|  |   |  | Resistance due to seal wear  | Replace the seal  |
|  |   |  | Switching delay of drop prevention valve due to insufficient supply air flow rate      | Delay SOL-2 OFF at start of rising<br>Increase the supply air flow rate   |
|  |   |  |  |   |
|  | Piston rod stop on the way of stroke            | Forward side                                 | The high thrust valve is turned on first<br>Insufficient high thrust stroke            | Turn on the pneumatic thrust valve first<br>Reconsider the cylinder type  |
|  |   | Backward side                                | Misalignment of device and cylinder  | Check the guide, slide bush and die.  |
|  |   |  | Resistance due to seal wear  | Replace the seal  |
|  |   | Go forward once after starting backward      |  | Booster backward speed is fast<br>The high thrust valve is turned off first<br>High load factor                                   |
|  | Intermediate stop is not possible               |  | Stop valve seal is broken<br>SOL of stop valve is broken                               | Replace the stop valve<br>Replace the stop valve SOL  |
|  | Raises slightly at intermediate stop and stops  |  | The workpieace is heavy  | Add a timer, delay only stop valve SOL OFF by about 0.2 sec   |
|  | The cylinder does not move at all.              |  | The defective control circuit, no air supply   | Check control circuit, air supply   |
|  |   |  | The malfunctions of pneumatic control equipment  | Check the solenoid valve, speed controller, etc   |
|  |   |  | Stop valve is broken   | Replace the stop valve or SOL   |
|  |   |  | Pneumatic Power Cylinder is broken   | Inquire with us or our distributor  |
|  | High thrust                                     | No high thrust                               | Compressed air is not supplied to P1   | Check the regulator, high thrust valve  |
|  |   |  | The high thrust valve is turned on first   | Turn on the pneumatic thrust valve first  |
|  |   |  | Oil is not contained, or insufficient  | Add oil and adjust to proper level  |
|  |   |  | High thrust operation at a position where there is no repulsive force                  | Check high thrust operation at a position with repulsive force  |
| High thrust is unstable<br>Can't be fully pressed with high thrust |   | Compression loss due to air mixed in oil     | Slow the return of the booster by adjusting a speed controller in P1                   |   |
|  |   | Struts stretch, or frames bend               | Design change, or parts exchange   |   |
|  |   | High thrust start is too early               | Adjust the position of high thrust start switch  |   |
|  |   | Ability lack of the cylinder                 | Increase the air pressure, or reconsider of the cylinder type                          |   |
|  |   | Seal failure due to seal wear                | Replace the seal   |   |
|  |   |  |  |   |
| Oil leakage  | Oil leakage from solenoid valve's exhaust ports | From all exhaust ports                       | There is a lot of drain in the supplied air  | Remove drain with a filter, etc   |
|  |   | From P2                                      | Worn seal in intermediate cover  | Replace the seal (Penta seal)   |
|  |   | From P3                                      | Too much or too little oil   | Adjust to proper level  |
|  |   |  | The oil becomes foam and is discharged   | Slow the return of the booster by adjusting a speed controller in P1  |
|  |   |  | Discharge of oil contained in exhaust air  | Install the exhaust filter  |
|  |   |  | Negative pressure generation of oil due to self-weight dropping (with stop valve type) | Keep a stop valve ON when supply air stops, or drop prevention measures   |
|  |   | From P4                                      | Seal failure due to seal wear  | Replace the seal (Piston packing)   |
|  |   |  | Normal leakage by packing sliding  | Install the exhaust filter  |
|  |   |  | High load factor   | Increase supply air pressure  |
|  |   | Oil leakage from connection part of cylinder |  | Seal failure due to seal wear   |
|  | Oil color turned black                          |  | Initial wear of seals<br>Deterioration of oil, or drain mixed                          | Continue to use<br>Exchange the oil   |

## Packing for PCH series



### Packing List

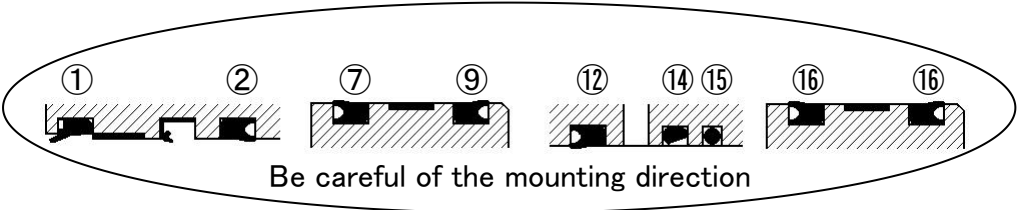
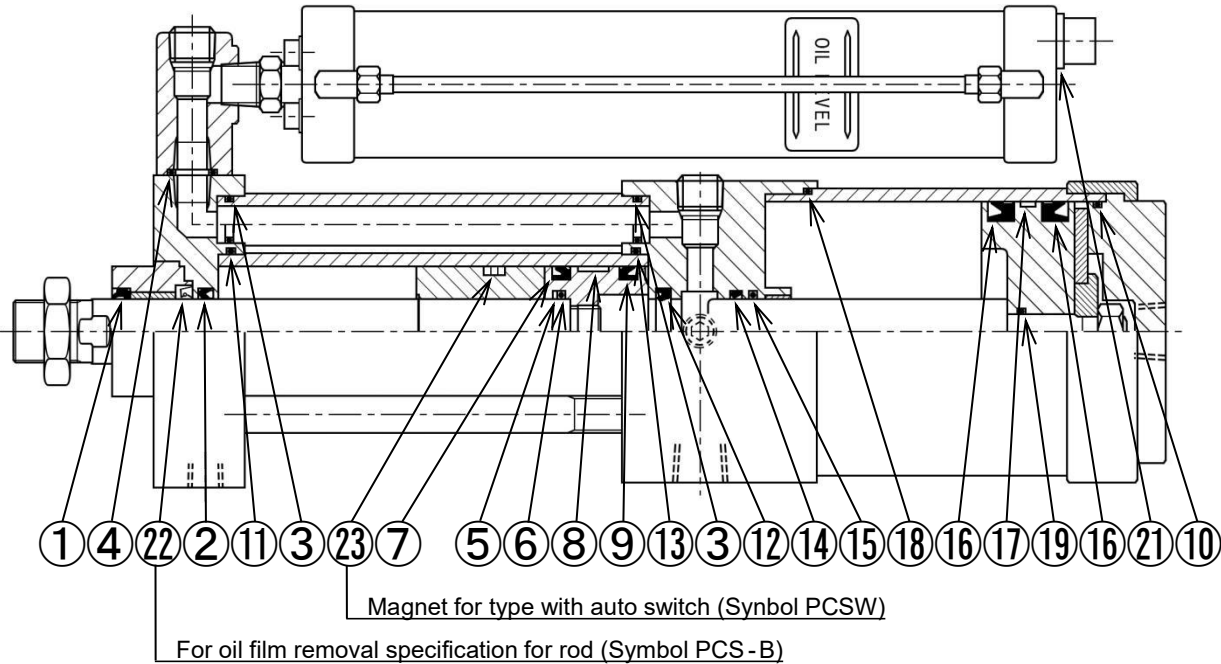
| No.    | 1            | 2            | 3      | 4       | 5      | 6         | 7         | 8         | 9       | 10           | 11       | 12         | 13     | 14     | 15        | 16        | 17            | 18     | 19     | 20     | 21     | 22     | 23     | 24      |
|--------|--------------|--------------|--------|---------|--------|-----------|-----------|-----------|---------|--------------|----------|------------|--------|--------|-----------|-----------|---------------|--------|--------|--------|--------|--------|--------|---------|
| Model  | Dust seal    | Y packing    | O ring | Back up | O ring | Y packing | Wear ring | Y packing | Back up | Y packing    | O ring   | Penta seal | O ring | O ring | Y packing | Wear ring | Oil seal      | O ring | O ring | Magnet | O ring | O ring | O ring | Back up |
| PCH-03 |              |              |        |         |        |           |           |           |         | ISI 40 50 6  |          | PS40       | P40    |        |           |           |               |        |        |        |        |        | —      | —       |
| PCH-06 | LBI 40       | ISI 40 50 6  | G75    | P40     | P40    | PGY 80    | SW80      | UHP 80    | G75     | ISI 30 40 6  | G120     | PS30       | P30    | P20    | PSD 125   | SWA 125   | TB4 40 55 9   | G75    | —      | —      | G60    | G70    | P44    | BR44    |
| PCH-08 |              |              |        |         |        |           |           |           |         | IDI 25 40 10 |          | PS25       | P25    |        |           |           |               |        |        |        |        |        |        |         |
| PCH-13 |              |              |        |         |        |           |           |           |         | ISI 45 55 6  |          | PS45       | P45    |        |           |           |               |        |        |        |        |        |        |         |
| PCH-17 | DR 60        | ISI 60 70 6  | G120   | G60     | G60    | PGY 125   | SW 125    | UHP 125   | G120    | IDI 40 56 12 | 1517 #39 | PS40       | P40    | P20    | PGY 180   | SWA 180   | TB4 60 78 9   | G110   | P18    | —      | —      | —      | —      | —       |
| PCH-24 |              |              |        |         |        |           |           |           |         | IDI 34 50 12 |          | PS34       | P34    |        |           |           |               |        |        |        |        |        |        |         |
| PCH-35 | DSI 90 100 6 | ISI 90 105 9 | P140   | G90     | G90    | PGY 150   | SW 150    | UHP 150   | G140    | IDI 34 50 12 | 1517 #39 | PS34       | P34    | P20    | PGY 180   | SWA 180   | TB4 90 115 14 | G125   | —      | —      | —      | —      | —      | —       |
| PCH-44 |              |              |        |         |        |           |           |           |         | IDI 30 45 10 |          | PS30       | P30    |        |           |           |               |        |        |        |        |        |        |         |
| Q'ty   | 1            | 1            | 2      | 1       | 1      | 1         | 1         | 1         | 1       | 1            | 2        | 1          | 1      | 1      | 2         | 1         | 1             | 1      | 2      | —      | 1      | 1      | 1      | 1       |

PCH-03 to 08 type uses one No.15 packing. PCH-35 and PCH-44 of all use the No.18 O-ring.

Note) Standard seal kit is No.1 to No.16 (without No.4 and No.5). No.17 to No.24 are sold separately.

How to order : Seal kit for PCH - ※※

Packing for PCS series

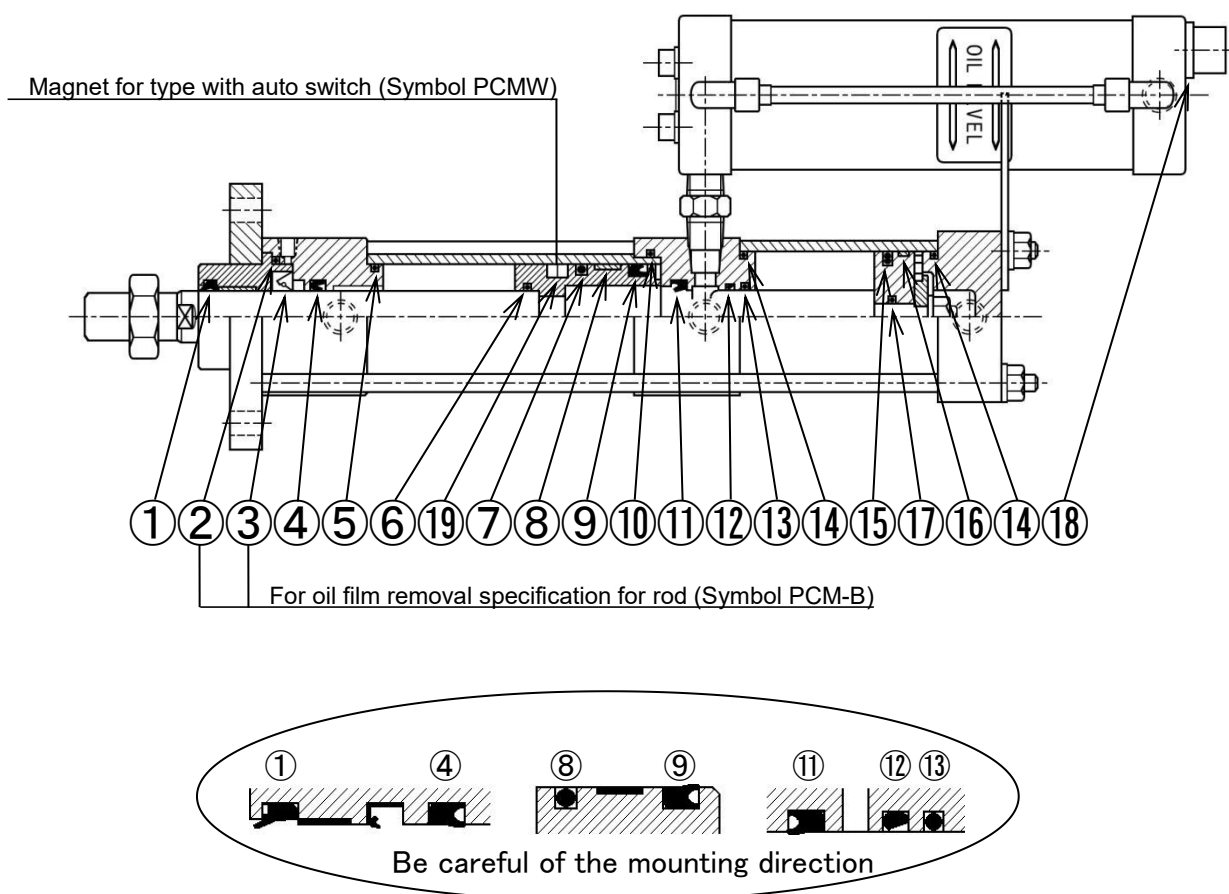


Packing List

| No.    | 1         | 2           | 3      | 4      | 5       | 6      | 7         | 8         | 9         | 10     | 11     | 12          | 13      | 14         | 15     | 16        | 17        | 18     | 19     | 21          | 22          | 23     |
|--------|-----------|-------------|--------|--------|---------|--------|-----------|-----------|-----------|--------|--------|-------------|---------|------------|--------|-----------|-----------|--------|--------|-------------|-------------|--------|
| Model  | Dust seal | Y packing   | O ring | O ring | Back up | O ring | Y packing | Wear ring | Y packing | O ring | O ring | Y packing   | O ring  | Penta seal | O ring | Y packing | Wear ring | O ring | O ring | Seal washer | Oil seal    | Magnet |
| PCS 02 | SFR 25    | ISI 25 33 5 | P14    | P14    | P25     | P25    | PGY 50    | SW 50     | UHP 50    | S95    | G60    | ISI 25 33 5 | G60 90° | PS 25      | P25    | PGY 100   | SWB 100   | S 105  | P14    | TSW 12      | TB4 25 40 8 | —      |
| PCS 04 |           |             |        |        |         |        |           |           |           |        |        | ISI 18 26 5 |         | PS 18      | P18    |           |           |        |        |             |             |        |
| Q'ty   | 1         | 1           | 2      | 1      | 1       | 1      | 1         | 1         | 1         | 1      | 1      | 1           | 1       | 1          | 1      | 2         | 1         | 1      | 1      | 1           | 1           | —      |

Note) Standard seal kit is No.1 to No.19 (without No.5 and No.6). No.21 and No.22 are sold separately.  
How to order : Seal kit for PCS -※※

## Packing for PCM series



### Packing List

| No.     | 1         | 2      | 3           | 4         | 5      | 6      | 7      | 8         | 9           | 10     | 11          | 12         | 13     | 14     | 15             | 16        | 17     | 18          | 19     |
|---------|-----------|--------|-------------|-----------|--------|--------|--------|-----------|-------------|--------|-------------|------------|--------|--------|----------------|-----------|--------|-------------|--------|
| Model   | Dust seal | O ring | Oil seal    | Y packing | O ring | O ring | O ring | Wear ring | Y packing   | O ring | Y packing   | Penta seal | O ring | O ring | Piston packing | Wear ring | O ring | Seal washer | Magnet |
| PCM 005 | SDR 20    | S40    | TB4 20 35 7 | PNY 20    | S36    | P20    | P34    | SW 40     | OSI 40 30 6 | G45    | ISI 20 28 5 | PS 20      | P20    | S46    | PSD 50         | SWB 50    | P 10A  | TSW 12      | —      |
| PCM 01  |           |        |             |           |        |        |        |           |             |        | ISI 14 22 5 | PS 14      | P14    |        |                |           |        |             |        |
| Q'ty    | 1         | 1      | 1           | 1         | 1      | 1      | 1      | 1         | 1           | 1      | 1           | 1          | 1      | 2      | 1              | 1         | 1      | 1           | —      |

Note) Standard seal kit is No.1 to No.17 (without No.2, 3 and No.6). No.18 is sold separately.

How to order : Seal kit for PCM -※※



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