CKD

SM-459611-A

INSTRUCTION MANUAL

Small Pressure Switch

P1100
P4100
P8100

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

Ver. 1

CKD Corporation

Safety precautions

When designing and manufacturing a device using CKD products, the manufacturer is obligated to manufacture a safe product by confirming safety of the system comprising the following items:

■Device mechanism

■Pneumatic or water control circuit

■Electric control that controls the above

It is important to select, use, handle, and maintain the product appropriately to ensure that the CKD product is used safely.
Observe warnings and precautions to ensure device safety.
Check that device safety is ensured, and manufacture a safe device.

⚠WARNING

1. This product is designed and manufactured as a general industrial machine part
   It must be handled by someone having sufficient knowledge and experience.

2. Use this product within its specifications.
   Consult with CKD for details when using the product beyond the unique specification range, outdoors, or in the following conditions or environment: Additionally, the product must not be modified or machined.
   ① Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
   ② Use for applications where life or assets could be adversely affected, and special safety measures are required.

3. Observe corporate standards and regulations, etc., related to the safety of device design and control, etc.
   ISO4414, JIS B 8370 (pneumatic system rules)
   JFPS2008(principles for pneumatic cylinder selection and use)
   Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, body standards and regulations, etc.

4. Do not handle, pipe, or remove devices before confirming safety.
   ① Inspect and service the machine and devices after confirming safety of the entire system related to this product.
   ② Note that there may be hot or charged sections even after operation is stopped.
   ③ When inspecting or servicing the device, turn off the energy source (air supply or water supply), and turn off power to the facility. Discharge any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
   ④When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.

5. Observe warnings and cautions on the pages below to prevent accidents.

■The safety cautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

⚠ DANGER	: When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, or when there is a high degree of emergency to a warning.
⚠ WARNING	: When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries.
⚠ CAUTION	: When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. In any case, important information that must be observed is explained.

Precautions with regard to guarantee

● Guarantee period

The guarantee period of our product shall be one (1) year after it is delivered to the place specified by the customer.

● Guarantee coverage

If any failure for which CKD CORPORATION is recognized to be responsible occurs within the above warranty period, a substitute or necessary replacement parts shall be provided free of charge, or the product shall be repaired free of charge at the plant of CKD CORPORATION.

However, the guarantee excludes following cases:

① Defects resulting from operation under conditions beyond those stated in the catalogue or specifications.
② Failure resulting from malfunction of the equipment and/or machine manufactured by other companies.
③ Failure resulting from wrong use of the product.
④ Failure resulting from modification or repairing that CKD CORPORATION is not involved in.
Failure resulting from causes that could not be foreseen by the technology available at the time of delivery.
⑥ Failure resulting from disaster that CKD is not responsible of.

Guarantee stated here covers only the delivered products. Any other damage resulting from failure of the delivered products is not covered by this guarantee.

● Confirmation of product compatibility

Our customer shall be responsible of confirming compatibility of our product used in our customer's system, machinery or device.

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1. Unpacking

⚠ CAUTION	To prevent foreign matter from entering the product, unpack the product just before piping starts.

(1) Make sure that the model number indicated on the product matches with what you have ordered.
(2) Check the exterior of the product for damage.
(3) Store the small pressure switch with the transparent bag attached in order to prevent entry of any foreign substances. (Before piping, remove the transparent bag.)

2. Installation

2. 1 Installation environment

⚠ CAUTION	a) Avoid installing this product where it is subject to ultraviolet rays. b) Prevent installation where the product is exposed to a direct sunlight. The plate will become deformed or otherwise damaged, losing water seal ability. c) Avoid installation at places where there is excessive vibration or impact. d) If amount of drain is large Install an air dryer and drain separator before an air filter. If there is a large amount of drain from the compressor ,hot and highly humid air could shorten the device life or result in corrosion. e) If the product is used in a water-lubricated compressor circuit Make sure that chlorine-based substances, etc., do not enter compressed air. f) Do not use the switch in a location where bending stress or tension is applied to the lead wire repeatedly. The wire will break or lose water seal ability. g) Keep the switch away from strong magnetic fields or large current sources (large magnet, spot welder, etc.), or the switch will malfunction.

(1) Avoid using this product under the following conditions.

- The ambient temperature is beyond 5-60℃.
- The air may be frozen.
- The water drop or coolant is splashed onto the product.
- The humidity is high and the temperature changes largely, causing dew condensation.
- Sea breeze or seawater is splashed onto the product.
- Atmosphere contains corrosive gas, corrosive fluid or chemicals.

2. 2 Installation

⚠ CAUTION	a) Although the switch is equivalent to the IP65, install it vertically. b) The lead wire is also of protection structure. The end of the lead wire, however, is not waterproofed.

(1) Whenever water enters the switch from the air pressure lead-in port at the bottom, connect an M3 joint to the port, and lead the tube to a place where it is not exposed to water.
Do not plug up the air pressure lead-in port. The switch will malfunction. The switch is not for outdoor use.

(2) The lead wire is also of protection structure. The end of the lead wire, however, is not waterproofed. (See Fig.1.) If water is expected to enter from the lead wire end, do no use the switch. The break down will occur.

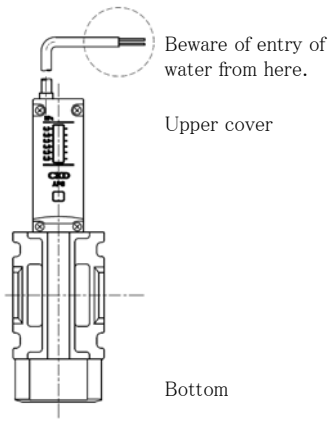


Fig.1

2. 3 Piping

⚠ CAUTION

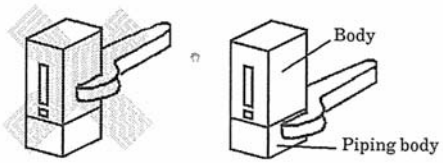
a) Flush the air piping to be used sufficiently before connecting the regulator. If dust or sealant enters the product during piping work, this may cause the product to malfunction or operate incorrectly.

b) If dust or sealant enters the product during piping work, this may cause the product to decline in performance.

c) When connecting the piping, tighten with proper tightening torque.

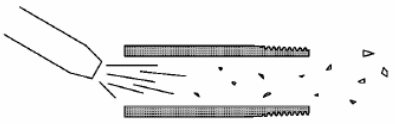
d) Carefully connect the piping so that no bending moment caused by the piping load is applied to the product main body and piping.

e) Hold the piping body firmly during piping work. (See Fig. 2.)
Do not perform piping with a spanner (wrench) set on the body. The switch will be damaged.



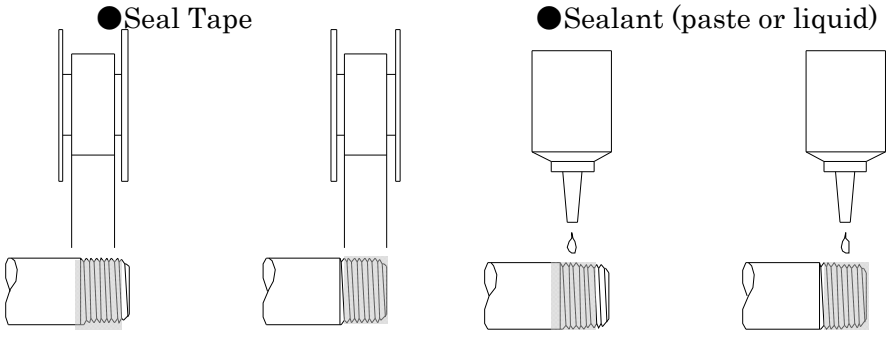
(Bad) (Good)
Fig.2

(1) Flush air into the pipe to blow out foreign substances and chips before piping.



(2) Do not apply sealant or sealing tape for two pitches of thread from the tip of the pipe to avoid residual substances from falling into the piping system.

●Seal Tape ●Sealant (paste or liquid)


(Good) (Bad) (Good) (Bad)

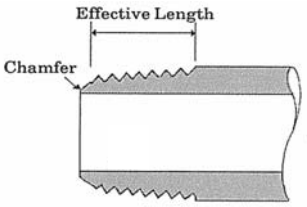
(3) Be sure to adhere to the effective thread length of gas pipe and make a chamfer of approx.1/2 pitch from the threaded end.

(4) Make sure that excessive torque is not applied on the body and piping when piping.

(5) Take care not to drop or impose impact on the switch during piping or installation.

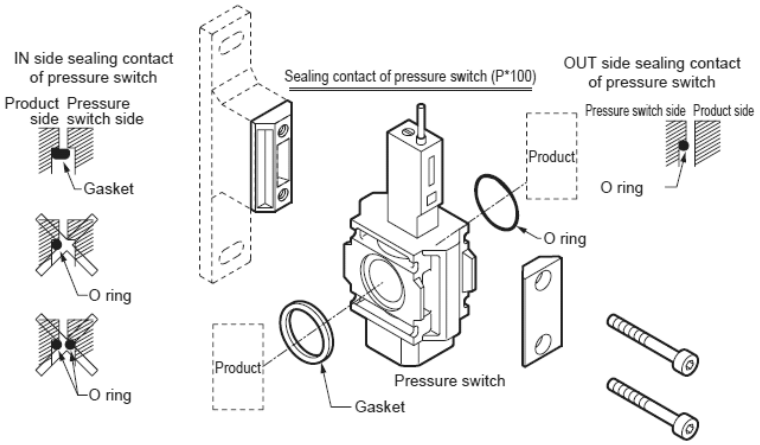
(6) Use galvanized iron pipes, nylon tubes, rubber tubes, and other corrosion-resistant pipes after the filter.

(7) Modulear design with F.R.L.



Pressure Switch	Max. torque (N·m)
P1100	15
P4100	30
P8100	70

Pressure Switch	Modulear design with F.R.L.
P1100	1000 Series
P4100	2000, 3000, 4000 Series
P8100	6000, 8000 Series



2. 4 Wiring

2.4.1 Connection of the lead wire

⚠ CAUTION

a) Connect the lead wire of the switch in series to the load. Do not connect it directly to the power source. The lamp will blow out, or the contact will melt.

b) To use the switch with DC voltage, connect the brown wire to the positive terminal and the blue wire to the negative terminal. Although the switch operates with reverse connection, the lamp does not light.

c) The switch lamp may not light if the switch is connected to an AC relay or PC input whose circuit performs half-wave rectification. In such a case, reverse the polarity of the lead wire. The lamp will light.

2.4.2 Contact capacity

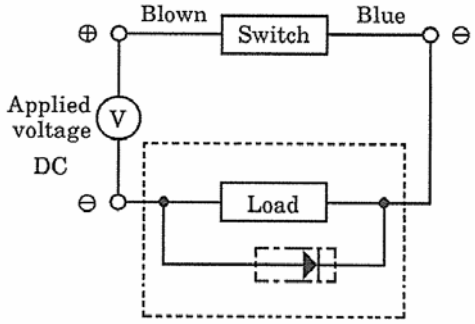
⚠ CAUTION

Use the switch with the specified load voltage and current. Otherwise, the lamp will blow out, the contact will melt, or the switch will malfunction.
If the current is below the rated value, the lamp may not light.

2.4.3 Contact protection

⚠ CAUTION

a) Add either of the following contact protective circuits when using the switch with an inductive load, such as a relay.
The contact will melt without a protective circuit.



Load User circuit

Protective circuit

Rectifying diode, general use

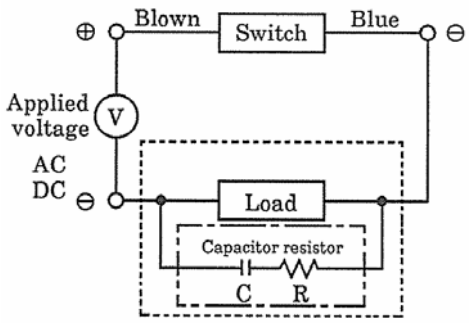
Recommended values –

Forward current: 1A or more

Acyclic peak inverse voltage: 200V or more

Hitachi Mfg. product VO6C or equivalent

Fig.3 When diode is used.



Load User circuit

Protective circuit

(Spark absorbing circuit)

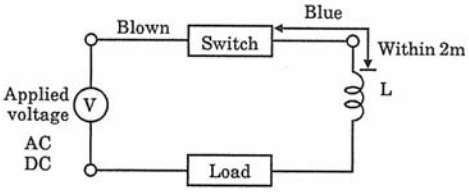
Recommended figure

c: 0.033 to 0.1 μF

R: 1 to 3 kΩ

Fig.4 When capacitor resister is used.

b) If the wiring is longer than 50m when the DC voltage is applied or 10m when the AC voltage is applied, the distributed capacitance will exceed the limit and a rush current will flow, resulting in damage o the switch or to a decrease in its life. To connect wiring exceeding the specified length, add a contact protective circuit.

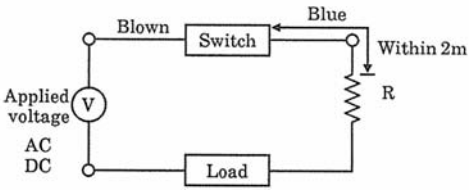


Choke coil L

L=a couple hundred μH ～ a couple mH

surpassing high frequency characteristic

Fig. 5 When a choke coil is used



Dash current restriction resister R

As much large resister as the load circuit can afford.

Fig.6 When a resistor is used

2.4.4 Relay

Use such products as specified below or equivalent.

OMRON Corporation ・・・・・・・・・・・・・・Model MY

FUJI ELECTRIC CORP ・・・・・・・・・・・・Model HH

Panasonic Electric Works Ltd. ・・・・・・・ Model HC

3. Proper operation

3. 1 Caution for use

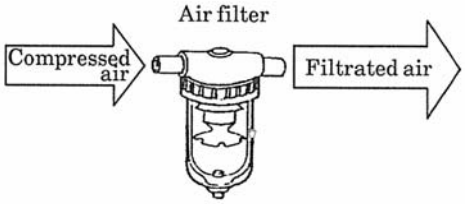
⚠ WARNING	a) Operate the product always within its specifications. b) This product is intended for use as a general-purpose industrial device or part. Do not use this product for medical devices or circuits, or devices or circuits that affect human lives.

⚠ CAUTION	Confirm the circuit and the working fluid. Flowing fluids that contain solid particles or those outside of specification may cause the product to malfunction. To prevent solid particles from entering, connect a filter to the primary side of the product.

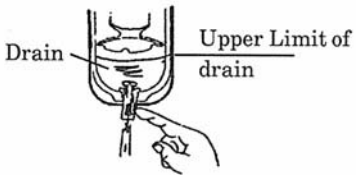
3. 2 Operation fluid

⚠ CAUTION	Only use compressed air as the medium. Maintain the pressure of the medium within the specified range. Failure to follow this instruction may cause malfunction.

(1) It is necessary to use dehumidified air that has been filtered from compressed air. Carefully select an adequate filter that has an adequate filtration rate (preferably 5 μ m or less), flow rate and its mounting location (as nearest to the directional control valve as possible).



(2) It is necessary to use dehumidified air that has been filtered from Be sure to drain out the accumulation in the filter periodically. If the drain exceeds the upper limit, it will flow to the OUT side and cause malfunction.



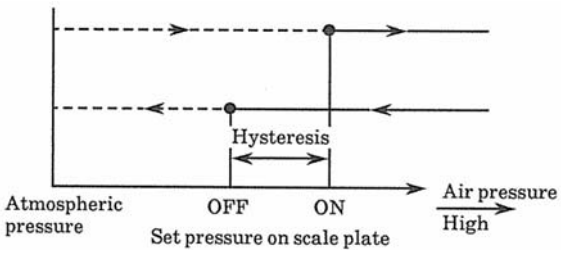
(3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

(4) Since the switch is intended to operate with compressed air, do not use it with a corrosive gas or liquid. Malfunction will result.

3. 3 Setting pressure

(1) Pressure displayed on the scale plate is used as the reference. When setting pressure, refer to the separate pressure gauge.

(2) Pressure displayed on the scale plate is the value when the contact is off. To set the value when the contact is on, set the pressure displayed on the scale plate to a value smaller than that from which hysteresis has been subtracted. (refer to the chart below) If not set, operation may not take place at the set value.



(Hysteresis means a pressure range in which the switch is turned ON at the set pressure and turned OFF when the pressure drops below the set pressure.)

3. 4 Operation check

(1) Confirm that the switch operates under pressure higher than the set pressure plus hysteresis (0.08 MPa). (The operation indicator lamp will light with the applied voltage.)

(2) Confirm that the switch is turned OFF under pressure below the set pressure. (The operation indicator lamp will go off with the applied voltage.)

4. Maintenance

4. 1 Inspection

1) Daily inspection

· Before operating the product, confirm proper operation.

· Set a pressure gauge for inspection and apply pressure higher than the set pressure plus hysteresis (0.08 MPa) to confirm that the switch operates (the operation indicator lamp will light with the applied voltage). Then, reduce the pressure below the set pressure to confirm that the switch deactivates (the operation indicator lamp will go off with the applied voltage).

2) Periodic inspection

·To operate the product in its optimal operating state, carry out the periodic inspection normally once every six months.

· Inspect the switch for external and internal leakage.

4. 2 Disassembly

⚠ CAUTION	a) Do not disassemble the product. The disassembled unit will lose the setting balance and fail to operate at the set pressure, or the hysteresis will vary. b) Before starting the maintenance work, turn OFF the power, shut down the supply pressure, and make sure that no residual pressure remains.

5. Troubleshooting

Trouble symptom	Cause	Correction
The switch does not operate under the set pressure.	The air pressure is not supplied or is insufficient.	Apply pressure higher than the set pressure plus hysteresis.
	The wiring is disconnected.	Repair the wiring, or replace the small pressure switch.
The switch is not deactivated under pressure below the set pressure.	The air pressure is high.	Reduce the air pressure below the set pressure.
	The switch contact has melted.	Change the load and the wiring length, then replace the small pressure switch.
	The external magnetic field is strong.	Keep the magnetic field source away from the small pressure switch, or install the switch far from the source.

6. Product specifications and designation

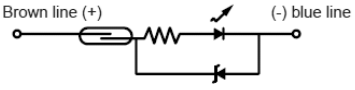
6. 1 Product specifications

Descriptions	P*100-W
Working fluid	Compressed air
Max. working pressure MPa	1.0
Set pressure range MPa	0.1 to 0.6
Hysteresis MPa	0.08 or less
Repeatability MPa	±0.02 or less
Contact configuration	1a Note 1
Wiring	Lead wire (2-conductor oil resistant vinyl cap tire code 0.2m^2)
Ambient and fluid temperature	5 to 60 ℃
Protective structure Note 2	IP20 or equivalent

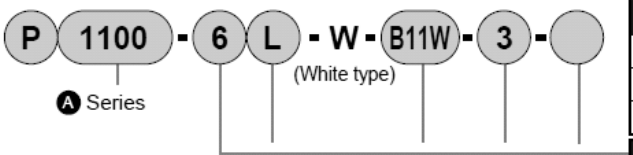
Note 1: When the scale set pressure is reached, the contact turns ON.
Note 2: When water entrains from the bleed port , connect an optional joint, and extend the tube until water does not entrain. This port can not be used outdoors.

Electric specifications		
Load voltage	12/24 VDC	100 VAC
Load current	5 to 50mA	7 to 20mA
Internal voltage drop	3V or less	
Light	LED (ON lighting)	
Maximum shock resistance	294m/S^2	
Insulation resistance	20MΩ and over at 500 VDC megger	
Withstand voltage	No abnormality when 1000 VAC is applied for one minute	

Internal circuit diagram



6. 2 Product designation



Symbol	Descriptions
Ⓐ Model no.	
1100	1000-W series modular design
4100	2500-W, 3000-W, 4000-W modular design series
8100	6000-W, 8000-W modular design series

Ⓑ Port size		1100	4100	8100
6	Rc1/8	●		
8	Rc1/4	●	●	
10	Rc3/8		●	
15	Rc1/2		●	
20	Rc3/4			●
25	Rc1			●

Ⓒ Branch direction Note 1			
Blank Note 2	L	R	
			

Ⓓ Attachment (attached)		1100	4100	8100
Blank	Joiner set and gasket	●	●	●
B11W	T type bracket and gasket	●		
B31W	T type bracket and gasket		●	
B41W	T type bracket and gasket		●	
B81W	T type bracket and gasket			●
4	Joint for atmospheric release port attached (M3 elbow)	●	●	●

Ⓔ Lead wire length	
Blank	1m
3	3m
5	5m

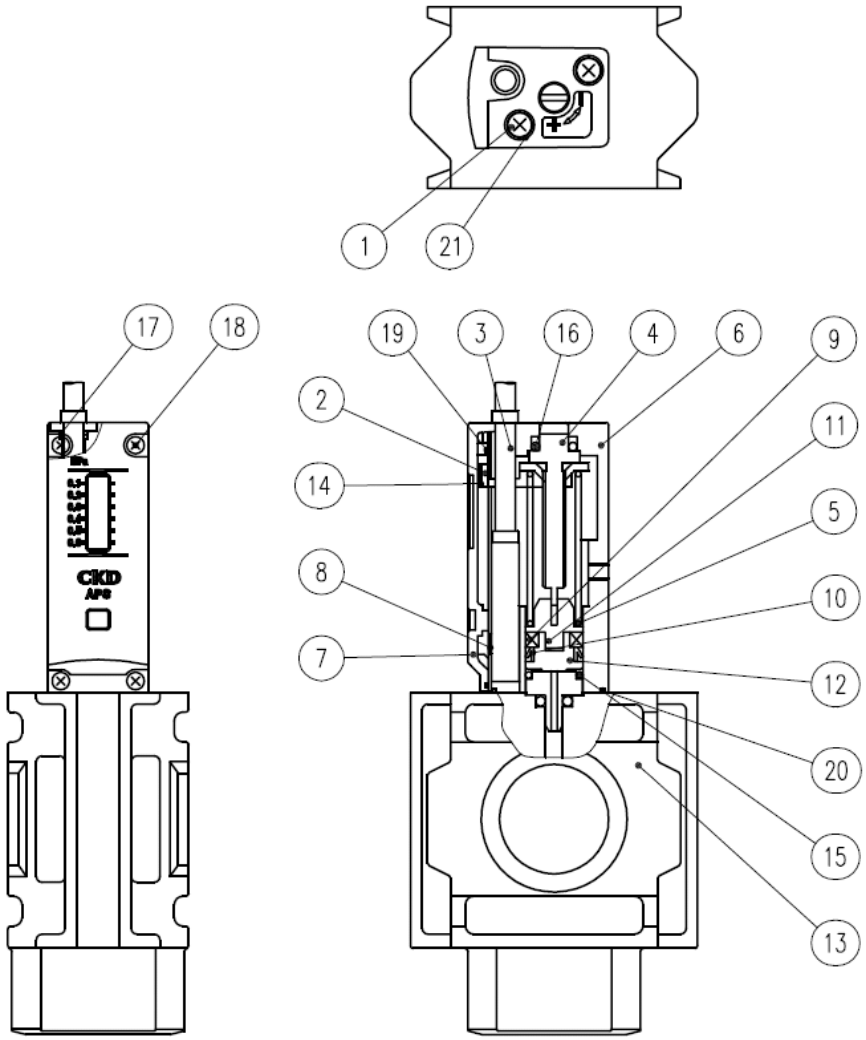
Ⓕ Option	
Blank	None
P6	Copper and PTFE free (custom order)

⚠ Note on model no. selection

Note 1: This is used for intermediate connection of the module series so the module connection section is not threaded.
Note 2: Masking plug is attached according to port size.
Note 3: When piping the isolated P*100-W unit, use piping adapter A*00-W.
(There are no threads on the horizontal direction port.)

6. 3 Internal structure and parts list

(Fig. 9) shows the internal structure of the switch, and (Table 1) shows the materials and quantities of the part



No.	Part Name	Material	Qty	No.	Part Name	Material	Qty
①	Cross recessed head screw	Steel	2	⑫	Piston	Polyacetal	1
				⑬	Piping body	*1	1
②	Scale plate	Steel	1	⑭	Scale plate seal	Paper	1
③	Cylinder switch		1	⑮	0-ring	Nitrile butadiene rubber	1
④	Screw	Steel	1	⑯	0-ring	Nitrile butadiene rubber	1
⑤	Spring	Steel	1	⑰	0-ring	Nitrile butadiene rubber	1
⑥	Body	Aluminum alloy die casting	1	⑱	Cross recessed self tapping screw	Steel	4
⑦	Plate	Polyamide Steel	1				
⑧	Shield plate	Steel	1	⑲	Plate gasket	Nitrile butadiene rubber	1
⑨	Magnet	Samarium cobalt	1	⑳	Body gasket	Nitrile butadiene rubber	1
⑩	Packing	Nitrile butadiene rubber	1	㉑	Gasket	Steel + Nitrile butadiene rubber	2
⑪	Stopper	Polyacetal	1				

*1: P1100: Polyamide, Brass, Steel

P4100: Aluminum alloy die casting, Brass, Nitrile butadiene rubber

P8100: Aluminum alloy die casting, Brass, Nitrile butadiene rubber