Pneumatic components (electronic pressure switch and sensor)

Safety Precautions

Be sure to read this section before use.
Refer to Intro Page 63 for general precautions regarding pneumatic components and refer to "⚠ Safety precautions" for detailed precautions for individual series.

Design/selection

⚠ WARNING

■ Use this product in accordance with specifications.
- Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■ Do not use oxygen, corrosive or combustible gas, or toxic fluid for this product.

■ Never use this product in an explosive gas atmosphere.
- The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■ Avoid installing this product in a sealed control box or indoors.
- If the fluid should leak due to any trouble, the pressure in the sealed chamber could change and create a hazardous state. Use this product in the control box having safety device to control internal pressure, or indoors with no pressure differential from the outside.

■ Power supply voltage

Do not use this product at levels exceeding the power supply voltage. The product could rupture or burn if voltage exceeding the working range is applied or if an AC power supply (100 VAC) is applied.

■ Load short-circuit

Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■ Incorrect wiring

Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

⚠ CAUTION

■ Applicable fluid

When using applicable fluid other than air; nitrogen gas, etc., oxygen deficiency could be caused. Observe the following instructions.
- Use in well ventilated locations.
- Ventilate the work area when nitrogen gas is being used.
- Inspect nitrogen gas piping regularly to avoid leaks.
- Non-corrosive gas means substances such as nitrogen or carbon dioxide contained in air and inert gases such as argon or neon.
- When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

■ If this product is used for vacuum suction confirmation, care must be taken for following matters.
- When applying positive pressure for vacuum burst onto the product, check that theshould not be used.

■ Working environment
- Avoid using this product where vibration or impact exceeding 100 m/s^2 could be applied.
- Check the temperature of fluid being measured and the environmental temperature in piping.
- When using a type that does not have the corresponding degree of protection, do not use for applications in which water or oil could be applied.

■ Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■ Take care when using this product for an interlock circuit.
- When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against Breakdown. Regularly inspect and confirm that the interlock activates correctly.

[Recommended values]

Model	Degree of protection
PPX/PPR	IP40
PPE(-A)/PPD3(-S)/PPG-C	IP65

■ Response time is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.

■ Take the following countermeasures to prevent malfunction caused by noise.
- AC Install a line filter in the power supply line.
- Do not share power with an inverter or a component causing motor noise, etc.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- When using a device such as a switching regulator or inverter motor that could generate noise near the sensor, be sure to ground the device frame ground (F.G.) terminal.
- Separate wiring to the sensors from strong magnetic fields.
- Connect wiring to the sensors with a shield component.
- Ground the shield wire on the power supply side.

■ When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test under actual working conditions, or contact CKD before using this method.

■ When selecting dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

■ Working conditions for CE compliance

The standard for the immunity for industrial environments applied to CE conforming product is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.

Conditions
- The assessment of this product is performed by using a cable pairing a power supply line and a signal line, assessing this cable as a signal line.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

Mounting, installation and adjustment

⚠ WARNING

■ Avoid incorrect connection.
- Incorrect connection could result in fatal damage not only to the product itself but also to peripheral devices.

■ DC power not insulated from AC primary side may damage the product and power, so an electric shock could occur. Do not use the product in this case.

⚠ CAUTION

■ Do not use the product where the product is exposed to direct sunlight or may come in contact with water, oil, etc.

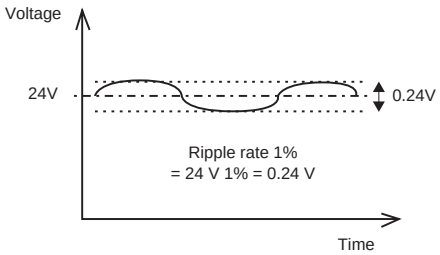
■ Flush with air the piping connected to sensors before connecting. Also, make sure that sealing tape does not enter during piping.

■ Correct pressure control is not possible if the exhaust port is plugged. Release this port into the atmosphere. ■ Tighten pipes with the appropriate torque.
- The purpose is to prevent air leakage and damage to bolts.
- First tighten the bolts by hand to ensure that the threads are not damaged, then use a tool.

Port thread	Tightening torque N·m
M3	0.3 to 0.6
M5	1 to 1.5
Rc1/8	3 to 5
Rc1/8 (resin)	1 to 1.5

■ Care must be taken for protection of body and lead wire.
- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bending resistant material, such as robot wire material for movable sections.

■ Wiring
- Turn power OFF before wiring this product. Discharge static electricity from personnel and tools before and during work.
- Use a stabilized noise-free power supply with a ripple voltage of 1% or less.

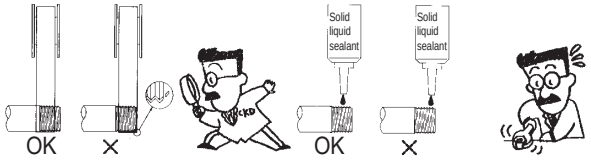


- Turn the power ON and OFF when voltage rises or falls quickly. If the rated voltage is not reached, the sensor could malfunction. In some cases, the sensor may not recover after the rated voltage is reached. Reset the power in that case. Even if the rated voltage drops temporarily, shut down the power once, then turn ON the power again.
- Install this product and wiring as far away as possible from sources of noise such as power distribution wires. Take separate measures against surge generated from inductive loads that enters the power wire.
- Do not start the control unit, machinery and equipment immediately after wiring. Unpredictable signals could be output due to incorrectly set values. First, the plant and equipment are stopped, Conduct test and set the required switch.

■ Stop the machinery and equipment and confirm safety before setting switch outputs.

■ Be sure to operate keys with fingertips. If sharp instruments, such as knives or screwdrivers, are allowed to contact the plastic film on the operation section, they may damage the film and compromise its protective functions.

■ Piping
- For the push-in fitting, use the recommended tube, and perform piping work to the push-in fitting assembly after brushing.
  * Recommended tube: Compatible tube outer diameter 6 mm manufactured by CKD F-1506, U-9506 and others.
- For the screw-in fitting, wind sealing tape or apply a sealant, and screw in without tightening excessively. Apply a wrench to the metal section when tightening. (Resin section for PPE and PPD3-R□D-6 only)
- Wrap sealing tape from threads starting 2 mm inside from the end of piping threads.
  * If sealing tape protrudes from the pipe threads, it could be cut when screwing the bolts in. This could cause the tape to enter the components, causing failures.



- Set the pipe length to approx. 1 m, and take care not to apply tension or impact to the piping. For longer tubes, due to their own weight and vibration/impact, unexpected tensile strength is generation. In order not to apply weight, fix and relay the tube to the machine device in the middle of the piping.

■ Avoid connecting the output for a relay contact, operation switch, or other component output in parallel with the PLC to the product's output, or short-circuit the input terminal of the PLC to which this product is connected with the power supply cable's negative side to test the input device. This product's output circuit could be damaged.

Mounting, installation and adjustment

⚠CAUTION

■ Some models have a push-in fitting for the measured pressure port. Check the perpendicularity of the tube side, and check that there are no scratches, indents, or dirt near the end. Air and compressed air are measured. Check that water and dirt do not enter the tube during piping.

Use/maintenance

⚠WARNING

■ Do not apply overcurrent.

● If overcurrent flows to the pressure switch due to a load short-circuit, etc., the pressure switch will be damaged with a risk of ignition. Provide an overcurrent protection circuit, such as a fuse, for the output wire and power cable as needed.

⚠CAUTION

■ Do not disassemble the products.

● The product could be damaged or its performance compromised if it is disassembled. CKD does not guarantee performance after disassembly. Remove the entire installation section (pressurized port section) when replacing or moving the product.

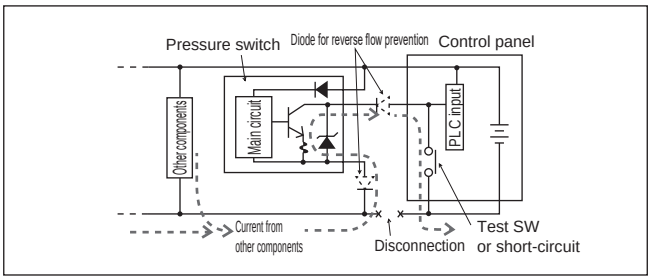
■ Stop machinery and equipment, then check the safety before operating the product.

■ With PPD3, pressure is detected 200 times per second, but this display is updated 4 times a second. and cannot track fast pressure changes. The switch could therefore start operating at a quickly changing pressure even when the display does not indicate the switch setting.

■ The case is made of resin. Do not use solvent, alcohol or detergent in cleaning, since the resin could absorb it. There is a risk of affecting the resin. Wipe off dirt with a rag soaked in a diluted neutral detergent solution and wrung out well.

■ Pay attention to reverse currents caused by disconnected wires and wiring resistance.

When other devices, including pressure switches, are connected to the same power supply as the pressure switch, and the output cable and power cable's minus side are short-circuited or the power supply's minus side is disconnected to check operation of the input device from the control panel, reverse current could flow to the pressure switch's output circuit and cause damage.

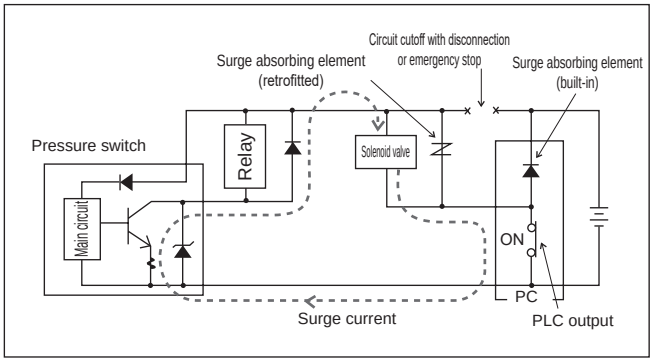


Take the following measures to prevent damage caused by reverse current:

(1) Avoid centralizing current at the power cable, especially the negative side power cable, and use as thick a cable as possible.
(2) Limit the number of devices connected to the same power supply as the pressure switch.
(3) Insert a diode in serial with the pressure switch's output cable to prevent reverse current.
(4) Insert a diode in serial with the pressure switch's power cable negative side to prevent reverse current.

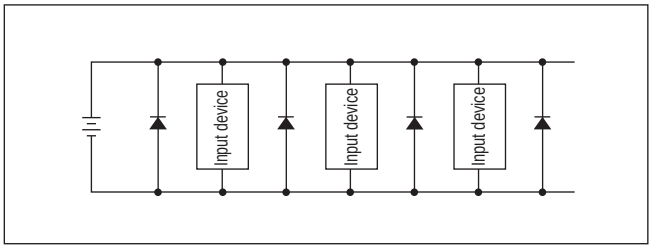
■ Pay attention to surge current flow-around.

When pressure switch power is shared with an inductive load that generates surges, such as a solenoid valve or relay, if the circuit is cut off while the inductive load is functioning, surge current could enter the output circuit and cause damage depending on where the surge absorbing element is installed.



Take the measures below to prevent damage from sneak surge current.

(1) Separate the power supply for the output system comprising the inductive load, such as the solenoid valve and relay, and the input system, such as the pressure switch.
(2) If a separate power supply cannot be used, directly install a surge absorption element for all inductive loads. Consider that the surge absorption element connected to the PLC, etc., protects only the individual device.
(3) Connect a surge absorption element to places on the power wiring shown in the figure below, as a measure against disconnections in unspecified areas.



When the devices are connected to a connector, the output circuit could be damaged by the above phenomenon if the connector is disconnected while the power is ON. Turn power OFF before connecting or disconnecting the connector.

Product-specific cautions: Electronic pressure switch/PPE Series

Design/selection

⚠WARNING

■The main body and fitting connection rotate, but this section should not repeatedly rotate during use.

■The degree of protection is equivalent to IP65, but this product must not be used in an environment where it could come in contact with water. Check that coolant does not come in contact.

■Be careful of internal voltage drop.

● When using with a voltage less than the specified voltage, the pressure switch may be activated correctly, but the load may not function correctly. Check the load working voltage to see that the following expression is satisfied:

Power supply voltage - internal voltage drop > load working voltage

■Pay attention to the leakage current.

● Even when the 2-wire pressure switch is OFF, the current (leakage current) flows to operate the internal circuit. (1 mA or less)

Load working current > leakage current

If the above expression is not satisfied, the switch may be interpreted as ON even when it is OFF, and operation fail. Use the 3-wire PPD if specifications are not met. If n units are connected in parallel, the current that flows to the load increases n-fold.

■The customer is responsible for checking safety and taking appropriate countermeasures for using fluids other than applicable fluids. Do not use this product for corrosive or flammable gases or for oxygen.

Mounting, installation and adjustment

⚠CAUTION

■Handling the product

● When installing the product, hold the body section so that impact is not applied to the body and excessive stress is not applied to the lead wire.

● Do not disassemble or dismantle the product. The product could be damaged or its performance compromised if it is disassembled. CKD does not guarantee performance after disassembly.

■Load short circuit protection circuit

● If the load is inadvertently short-circuited, the internal load short-circuit protection circuit is activated and the switch remains OFF. Fix wiring, then turn power OFF, or short-circuit the PPE's brown and blue wires to recover normal switch operations.

[Precautions for installation]

■Driver

Use a flathead screwdriver corresponding to the trimmer groove (0.5 W x 2.3 L x 0.5 D) or a Phillips screwdriver for 1 bit to set the trimmer.

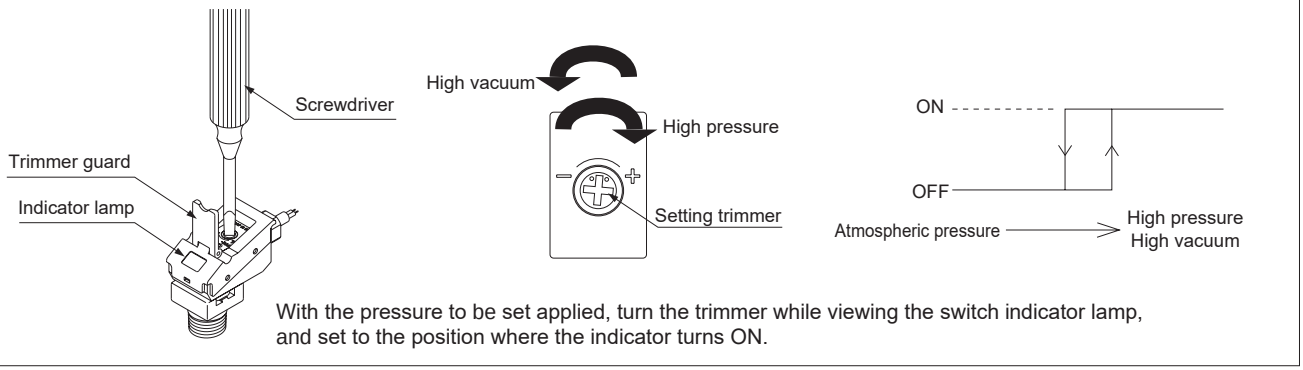
■Trimmer

The rotation range of the trimmer is 240 degrees. The trimmer could be damaged if turned any further or if turned forcibly.

■Opening and closing the trimmer guard

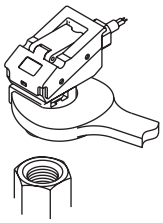
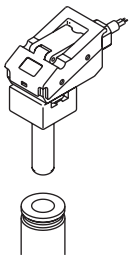
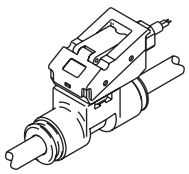
Use a flathead screwdriver to open the trimmer guard and set the trimmer. After setting, press the trimmer guard with a finger and completely close it. The degree of protection (IP65) is not satisfied if the cover is not completely closed.

Setting pressure and switch operations



With the pressure to be set applied, turn the trimmer while viewing the switch indicator lamp, and set to the position where the indicator turns ON.

Piping method

PPE-□-6	PPE-□-H6-B	PPE-□-H6
		
Use sealing tape or sealant, and catch a wrench against the width across flats (13 mm) of the R1/8 fitting to install. (Precautions) · The tightening torque is 1.0 to 1.5 N·m or less. Resin parts may be damaged if tightened too far.	Insert the CKD 6 mm tube push-in fitting and use. (Precautions) · Securely insert the plug section, and check that the plug is not dislocated. If the plug is not fully inserted, it could be dislocated or air could leak. · Use the applicable push-in fitting. GW Series GWJ Series	Insert the 6 mm tube into the two push-in fittings and use. (Precautions) · Use the designated tube and plastic plug. Tube outer diameter accuracy Nylon, soft nylon tube : Within ±0.1 mm Polyurethane tube : Within +0.1 mm New urethane tube : -0.2 mm and with hardness of 93° and over. · Securely insert the tube to the tube end, and make sure that the tube cannot be pulled off. If the tube is not fully inserted, it could be dislocated or air could leak. · Cut the tube with a dedicated cutter and always at a right angle.

Product-specific cautions: Electronic pressure sensor analog output PPE-□A Series

Design/selection

⚠ WARNING

■ Wiring

Turn power OFF before wiring this product. Discharge static electricity charged in the human body, tool or equipment before and during operation. Connect and wire bending-resistant material, such as robot wire material, for the movable sections.

■ Installation:

Install this product and wiring as far away as possible from sources of noise such as power distribution wires. Take separate countermeasures against surge that enter the power wire.

■ Power supply voltage

Do not use this product at levels exceeding the power supply voltage. The product could rupture or burn if voltage exceeding the working range is applied or if an AC power supply (100 VAC) is applied.

■ Load short-circuit

Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■ Incorrect wiring

Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

■ Connecting load

When connecting an inductive load such as relay or solenoid valve, a surge voltage is generated when the switch is turned OFF. Directly connect a flywheel diode onto all inductive loads in the same power circuit.

■ Connecting load

The output impedance of the analog output section is 1 kΩ . If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using.

Example of calculation

(PPE-□A output impedance : Ro = 1 kΩ
Load internal impedance : Rx = 1 MΩ

$$\text{Output value} = \left(1 - \frac{Ro}{Ro+Rx}\right) \times 100\%$$

$$= \left(1 - \frac{1\ k\Omega}{1\ k\Omega+1M\Omega}\right) \times 100\%$$

Output value error ⇨approx. 0.1%

Mounting, installation and adjustment

⚠ CAUTION

■ When installing the product, hold the body section so that impact is not applied to the body and excessive stress is not applied to the lead wire.

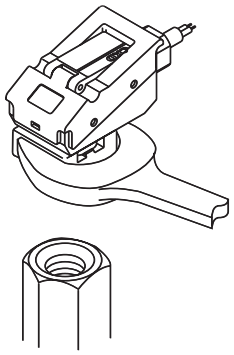
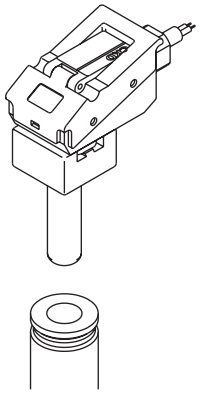
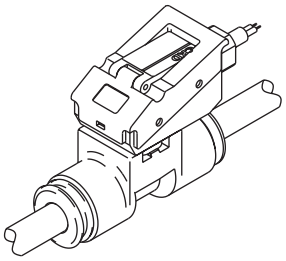
■ When applying positive pressure for vacuum burst to the product to check vacuum suction, check that it does not exceed the specified proof pressure.

■ Do not disassemble or dismantle the product. The product could be damaged or its performance compromised if it is disassembled.CKD does not guarantee performance after disassembly.

■ The main body and fitting connection rotate, but this section should not repeatedly rotate during use.

■ The degree of protection is equivalent to IP65, but this product must not be used in an environment where it could come in contact with water. Check that coolant does not come in contact.

[Piping method]

PPE-□A-6	PPE-□A-H6-B	PPE-□A-H6
		
Use sealing tape or sealant, and catch a wrench against the width across flats (13 mm) of the R1/8 fitting to install. (Precautions) · The tightening torque is 1.0 to 1.5 N·m or less. Resin parts may be damaged if tightened too far.	Insert the CKD 6 mm tube push-in fitting and use. (Precautions) · Securely insert the plug section, and check that the plug is not dislocated. If the plug is not fully inserted, it could be dislocated or air could leak. · Use the applicable push-in fitting. GW Series GWJ Series	Insert the 6 mm tube into the two push-in fittings and use. (Precautions) · Use the designated tube and plastic plug. Tube outer diameter accuracy Nylon, soft nylon tube : Within ±0.1 mm Polyurethane tube : Within +0.1 mm New urethane tube : -0.2 mm and with hardness of 93° and over. · Securely insert the tube to the tube end, and make sure that the tube cannot be pulled off. If the tube is not fully inserted, it could be dislocated or air could leak. · Cut the tube with a dedicated cutter and always at a right angle.

Product-specific cautions: Electronic pressure switch PSW Series

Mounting, installation and adjustment

⚠ CAUTION

- When connecting an inductive load, install a surge suppressor within 0.5 m of the load, and eliminate noise at the source.
- Load impedance of analog output must be 10 kΩ and over.

Product-specific cautions: Electronic pressure sensor with digital display PPG-D Series

Design/selection

⚠ CAUTION

- Environment inspection is only available for “RoHS certificate” and “REACH certificate”. Detailed data at the parts level is not supported.

Mounting, installation and adjustment

⚠ CAUTION

- As degree of protection IP65 is used, be sure to assemble the protector (parts) attached with the product for use. When constantly exposed to water, introduce normal atmosphere with a long tube.

Product-specific cautions: Digital pressure sensor PPX Series

Design/selection

⚠ CAUTION

■ Working conditions for CE compliance

● The PPX Series is a CE-compliant product following EMC Directives. EN61000-6-2; regulation matched to immunity applies to this product. Conditions below are necessary to comply with these standards.

Conditions

● The power cable connected to the sensor must be less than 10 m long.

Mounting, installation and adjustment

⚠ WARNING

■ When using a commercially available switching regulator on the power supply, be sure to ground the power supply frame ground (F.G.) terminal.

⚠ CAUTION

■ Avoid use in high steam and dirt environments.

■ Care must be taken to avoid product contact with organic solvents such as thinner, water, oil and fat.

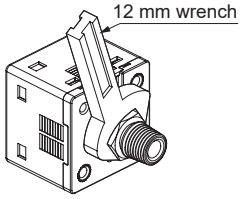
■ Do not put a wire, etc., into the pressure port. The diaphragm may be damaged, resulting in malfunction.

■ The expected performance may not be obtained in a strong electromagnetic field.

■ Flush with air the piping connected to sensors before connecting.
Prevent pipe from catching tips of sealing tape when piping.

Piping

■ When connecting a commercially available fitting to the pressure port, attach a 12 mm wrench (14 mm for PPX-6G) to the hexagon section of the pressure port and install with a tightening torque of 9.8 N·m or less. A fitting or the pressure port section could break if too much torque is applied.
Use seal tape to connect fittings to prevent air leak.

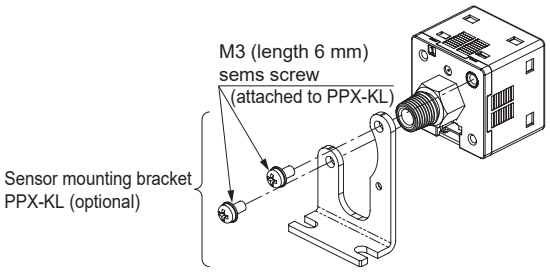


■ The piping port has been degreased and washed. Handle carefully when unpacking. (PPX-P12)

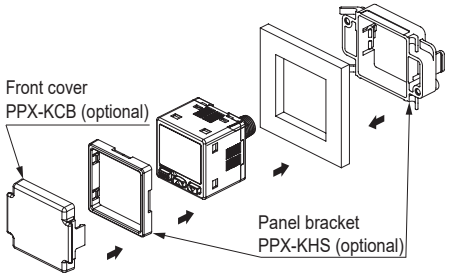
Installation

⚠ WARNING

■ Sensor mounting bracket PPX-KL is available.
If a sensor is installed with a mounting bracket, etc., tightening torque must be 0.5 N·m or less.



■ Panel mounting bracket PPX-KHS (optional) and front cover PPX-KCB (optional) are also available.

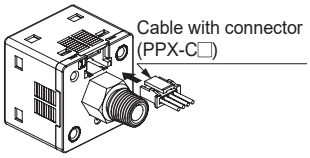


Mounting, installation and adjustment

⚠CAUTION

■Care must be taken to protect the body and lead wire.

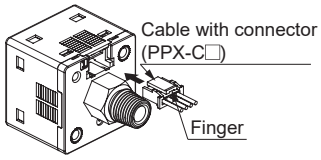
- Check that stress is not directly applied to cable lead outs or connectors.



- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bending-resistant material, such as robot wire material, for the movable sections.

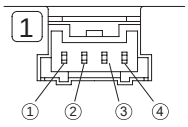
■Connector wiring

- Connect by inserting the cable with connector PPX-C□ into the product connection connector as shown at right.
- To remove, press down on the fingers of the cable with a connector and pull out the connector.
- Do not pull on the cable without pressing down on fingers. The cable could break or the connector could be damaged.



[Connector]
Contact: SPHD-001T-P0.5
Housing: PAP-04V-S
(manufactured by J.S.T. Mfg. Co., Ltd.)

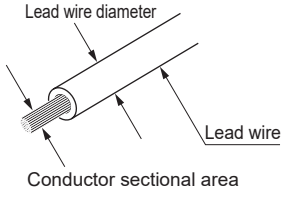
[Connector pin layout drawing]



Connector pin No.	Terminal name
①	+V
②	Comparison output 1
③	Standard: Comparison output 2 High-function: Analog voltage/current output or external input
④	0 V

- When wiring with a connector set (PPX-CN), be sure to use a compatible cable and crimp tool specialized for housing and contacts.

[Conforming cable]

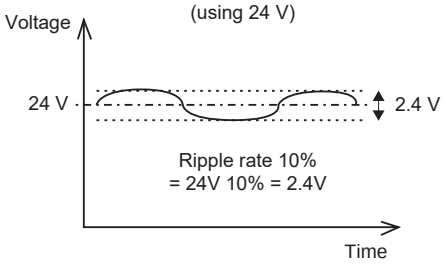


Conduct X-sect area	0.12 to 0.32 mm²(AWG26 to 22)
Lead wire diameter	ø1.0 to ø1.5 mm
Wire material	Annealed copper twisted wire

Housing	J.S.T. Mfg. Co., Ltd. PAP-04V-S
Contact	J.S.T. Mfg. Co., Ltd. SPHD-001T-P0.5
Recommended crimping tools	J.S.T. Mfg. Co., Ltd. YC-610R (AWG26 to 24)
	J.S.T. Mfg. Co., Ltd. YC-611R (AWG22)

■Wiring

- Turn power OFF before wiring this product. Discharge static electricity from personnel and tools before and during work.
- Use stabilized noise-free power with a ripple voltage of 10% or less for the power supply.

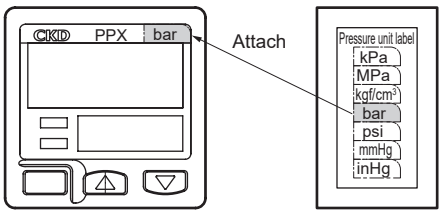


- Turn the power ON and OFF when voltage rises or falls quickly. If the rated voltage is not reached, the sensor could malfunction. In some cases, the sensor may not recover after the rated voltage is reached. Reset the power in that case. Even if the rated voltage drops temporarily, shut down the power once, then turn ON the power again.
- Avoid using in a transient state continuing 0.5 s after power is turned ON.
- Install this product and wiring as far away as possible from sources of noise such as power distribution wires. Take separate measures against surge generated from inductive loads that enters the power wire.
- Do not start the control unit, machinery and equipment immediately after wiring. Unpredictable signals could be output due to incorrectly set values. Conduct a power ON test with the control unit, machinery and equipment stopped, and set required switches.
- Do not turn the power OFF during or immediately after key operation setting.
- Cable extension is possible up to a length of 100 m using a cable with 0.3 mm² and over. However, when using this product as a CE conforming product, the power cable connected to this product must be less than 30 m long.

■Do not turn the power OFF during or immediately after key operation setting. The set value may not be updated.

■When using the unit change function

- If using export models (for outside Japan), when changing the units other than MPa or kPa, make sure to attach the unit seal enclosed and attached to the product to the unit indication section on the operation section.



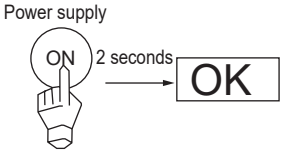
[Unit seal label]

Product-specific cautions: Electronic pressure switch and sensor PPD3 (-S)

Design/selection

⚠ CAUTION

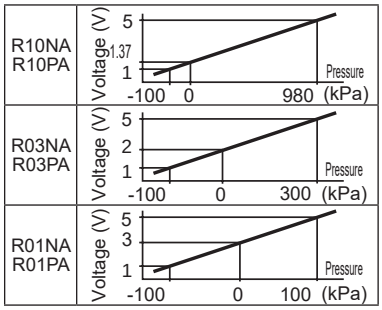
■ This product self-diagnoses the internal circuit immediately after power is turned ON, so pressure is not detected immediately. Set the control circuit so signals are ignored for 2 seconds after power is turned ON.



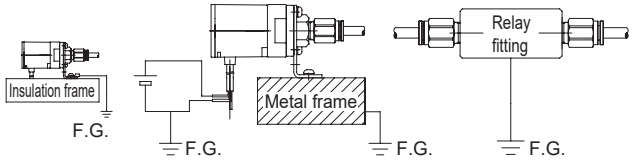
■ This product's overcurrent protection turns the output OFF when overcurrent is detected. However, the output is repeatedly turned ON for a short time at a set cycle. This causes power supply voltage to fluctuate and may adversely affect peripheral devices. We ask for your understanding in this matter.

■ When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

[Analog output voltage waveform]

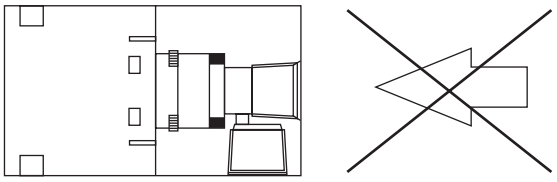


■ Install the PPD3-S on a frame or panel connected to the frame ground (F.G.) and, if necessary, directly connect from the PPD3-S port to the F.G. When leading fluids in from an external device, connect via a relay fitting connected to the F.G. (To provide safety when using conductive fluids)



■ PPD3-S power supply is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. A varistor (voltage limit approx. 40 V) is connected between the internal power circuit and port installation section of this PPD3-S to prevent dielectric breakdown of the sensor. Avoid withstand voltage and insulation resistance tests between the PPD3-S internal power supply circuit and port installation section. Disconnect PPD3-S wiring first if this testing is required. An excessive potential difference between the PPD3-S power supply and port installation section could burn internal parts.
After installing, connecting and wiring the PPD3-S, electrical welding of the device/frame, short-circuit accidents, etc., could cause welding current, excessively high voltage caused by welding, or surge voltage, etc., to run through the wiring, ground wire, or fluid path connected between the above devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the F.G.

■ Care must be taken for entry of water and drainage.
The PPD3-S has a stainless steel diaphragm pressure sensor that cannot be damaged by water. However, when the vacuum bursts after checking the vacuum suction, drainage including water and air could collide with the pressure sensor. The water's inertia could damage the pressure sensor and prevent the correct pressure from being indicated.
If water or drainage can enter, connect a thin pipe to the PPD3, or install an orifice midway. Take special care when using the back ports on the PPD3-S 6B port. In addition, this type has a ø1 built-in orifice inside the pressure port.



Take special care when using the back ports of the 6B if water or drainage could enter.

Mounting, installation and adjustment

⚠CAUTION

■Check the pressure range.

If the pressure switch for low pressure range is incorrectly used for high pressure applications, this product could be ruptured or damaged, and a large amount of air could leak, creating a hazard.

High pressure	P10>P01>V01 R10>R03>R01	Vacuum

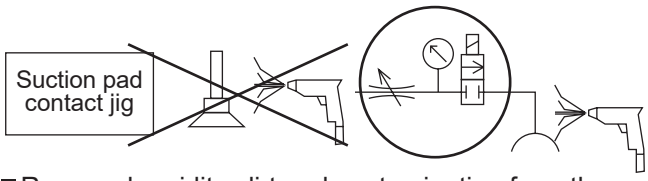
■Switch data can be set to values that exceed the rating range, or to unrealistic values, but operation and accuracy at such values are not guaranteed. Confirm that settings enable the target operation. Ensure the following difference between data A and B to stabilize operation:

Operation mode	Difference of min. digit
Hysteresis operation	1% F.S.
Window operation	3% F.S.

Do not set as follows: {Data A = Data B / ON point = OFF point}

■Avoid air blow.

The high pressure near the nozzle could back flow and exceed the product proof pressure. This could result in rupture or damage. Lower the pressure of compressed air to less than the proof pressure, or shield the flow path when blowing air.



■Remove humidity, dirt and contamination from the installation location. Select a flat installation surface. Any warping or bumps on the installation surface could damage the case or compromise protective functions. Excessive tightening of installation screws can result in similar damage.

- After installation, do not bump the case or use the case as a step. Even if there is no apparent external damage, this remains as a stress that will gradually form cracks and further damage.

■Precautions for PPD3 (sensor integrated) Series

- The product may be prone to damage when in a state of being unpacked or being installed. The protective functions are effective when the product is correctly installed, wired and piped. Provide protection so that water and other substances do not come in contact until installation is completed.
- Wire and pipe the product after fixing it at the installation site. Check surrounding safety and that water and other substances do not come in contact before starting wiring. Continue to provide protection after the product is connected. (The current could leak at the connection section, and water could run along the cable and enter the case.)
- The atmospheric introduction port for atmospheric pressure is treated as a key point in ensuring this product's protective performance. Use the following tube, and release the end into the atmosphere in a dry environment with no barometric pressure differences.

Recommended tube: Soft nylon tube Model No. FH-3224
Urethane tube Model No. U-9532, U-9504

[IMPORTANT] Never apply pressure to the atmosphere inlet port!

■If the inlet port for the atmosphere introduction port pressure is pressurized, protective performance could be lost, and the case could rupture or pop off. Set as atmospheric pressure. Leave this port set at atmospheric pressure. Separate piping for atmospheric release port from other pressurized air piping by using different tube diameters or colors. Take sufficient countermeasures to prevent pressurized air from being applied.

- Even when protective performance is not required, if this product is installed in a humid environment with large temperature variations, condensation in the case is prevented by taking these measures. (Condensation is fatal to the electric circuits.)
- If this product is in a control panel, pressurized to a positive pressure or negative pressure within a dry environment, the pressure difference could affect display accuracy. Please be careful.
- This product is intended to protect city water. Protection performance cannot be guaranteed for hot water, oil, coolant (non-water soluble/water soluble), solvents, acids, alkalines, or chemicals, etc. These substances could cause solvent cracks to form on in the case's resin parts, the gasket to swell, the adhesive to melt and separate, and other problems. Note that if water that gets on the product freezes, the case could be damaged and protective performance could be lost. Please be careful.

■The sensor-separated display section and sensor section are adjusted as a set. The pressure value could deviate more than accuracy if parts from different lot numbers are used together.

■The main body and fitting connection of PPD3-R□D rotate, but this section should not repeatedly rotate during use.

■The degree of protection is equivalent to IP65, but this product must not be used in an environment where it could come in contact with water. Check that coolant does not come in contact.

Use/maintenance

⚠ CAUTION

■ This product has O-ring seals and threaded fittings. A slight amount of air leakage (1 cm^3/min. ANR or less) is tolerated.
When using applicable fluid other than air; nitrogen gas, etc., oxygen deficiency could be caused. Observe the following instructions.
- Use in well-ventilated locations.
- Ventilate the work area when nitrogen gas is being used.
- Inspect nitrogen gas piping regularly to avoid leaks.

■ Fluids that could corrode the gas contact section materials (*1) or flammable, explosive, or toxic fluids could damage the sensor or body.

■ Confirm that fluid being measured does not freeze (resulting in expansion or contraction of volume), contents do not solidify and stick due to drying, solid contents do not form sediments or accumulate, accumulated fluid does not decompose and that the product is not clogged by dirt. When using inductive fluids, if fluid stays in the middle of the piping at low pressure ranges, negative pressure is generated, preventing proper measurement. Fluids such as water or oil drainage could result in a water hammer caused by the fluid's inertial pressure, or a sudden pressure rise such as a surge pressure when the valve is turned ON and OFF, etc. Before installing, use a highly responsive pressure sensor and check that these do not exceed the proof pressure even for a moment. Pressure exceeding the proof pressure could damage the sensor or body.

■ For safety, be sure to turn the power OFF before connecting the sensor separated sensor.

*1 Wetted section materials

Model	Material
PPD3-S	SUS 630, FKM, aluminum

Note: The fitting material is included for models with push-in fittings (PPD3-S-6HD, PPD3-S-6HT).

Fitting	NBR, copper alloy (nickeling)