

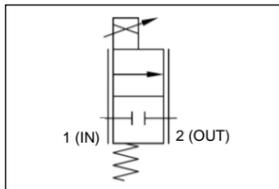


ORIGINAL INSTRUCTIONS

Instruction Manual

Proportional Control Valve

Series JSP



The intended use of this product is to control the downstream fluid supply.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)¹⁾, and other safety regulations.

¹⁾ ISO 4414: Pneumatic fluid power - General rules relating to systems.
ISO 4413: Hydraulic fluid power - General rules relating to systems.
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference

Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

- Always ensure compliance with relevant safety laws and standards.
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

Caution

- The product is provided for use in manufacturing industries only. This product must not be used in residential areas.

2 Specifications

2.1 Valve specifications

Fluid	Air, Water	
Withstand pressure [MPa]	0.6	
Allowable outlet pressure	Refer to catalogue	
Maximum system pressure [MPa]	1	
Fluid temperature [°C]	Air	0 to 50
	Water	1 to 50 (no freezing)
Ambient temperature [°C]	0 to 50	
Flow characteristics	Contact SMC	
Valve leakage/external leakage <small>Note 1)</small> [cm ³ /min (ANR)]	1 or less	
Response time [ms]	Contact SMC	
Duty cycle	Contact SMC	
Min. operating frequency	1 cycle / 30 days	
Max. operating frequency [Hz]	Contact SMC	
Lubrication	Not required	
Impact/Vibration resistance <small>Note 2)</small> [m/s ²]	150/30	
Mounting orientation <small>Note 3)</small>	Free	

2 Specifications – continued

Enclosure (based on IEC60529) <small>Note 4)</small>	IP67 (IP65 for DIN terminal)
Body material	SUS, Brass
Seal material	FKM
Weight	Refer to catalogue

Table 1

Note 1) The valve leakage above shows the value at a pressure difference of 0.05 MPa or higher and an ambient temperature of 20°C with the solenoid facing upwards. This product has leakage and is not suitable for holding pressure in a pressure vessel.

Note 2) Impact resistance: No malfunction occurred when it was tested with a drop tester in the axial direction and at right angles to the main valve and armature, in energized states and for one time in each condition. (Values quoted are for a new valve).

Vibration resistance: No malfunction occurred in a one-sweep test between 67 and 2000 Hz. Tests are performed in energized states in the axial direction and at right angles to the main valve and armature. (Values quoted are for a new valve).

Valve malfunction occurs when an armature is adsorbed, and proportional control becomes impossible.

If there is impact or vibration, be careful as the flow rate fluctuates.

Note 3) It is recommended to mount the solenoid facing upwards, which prevents the accumulation of foreign matter.

Note 4) The enclosure is IP67-rated, but water ingress into the coil may result in malfunction or product damage.

2.1 Solenoid specifications

Size	10	20	
Rated current [mA] <small>Note 1)</small>	12 VDC	400	520
	24 VDC	200	260
Electrical entry	Grommet, Conduit, DIN terminal, DIN terminal without connector		
Coil insulation class	Contact SMC		
Temperature rise [°C] <small>Note 2)</small>	80		
Power consumption [W]	4	5.6	
Surge voltage suppressor	Varistor		

Table 2

Note 1) Use this product with current control by setting the supply voltage to the rated voltage. If voltage is controlled, flow will not be controlled due to a current change caused by an increase in coil temperature.

Note 2) The temperature rise above shows the value when current is controlled with the rated current.

2.2 Special products

Warning

Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

3 Installation

3.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.

3.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Products compliant with IP65 and IP67 enclosures are protected against dust and water, however, these products cannot be used in water.
- Products compliant with IP65 and IP67 enclosures satisfy the specifications by mounting each product properly. Be sure to read the Specific Product Precautions for each product.

3 Installation - continued

3.3 Piping

Caution

- For the handling of our fittings, please refer to Fittings and Tubing Precautions in the Handling Precautions for SMC products.
- When using fittings other than SMC fittings, follow the instructions given by the fitting manufacturer.
- Tightening torque for steel pipe piping.
- When piping to the valve, tighten with the following appropriate torque.

Thread	Tightening torque [N·m]
1/8	7 to 9
1/4	12 to 14
3/8	22 to 24

Table 3

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.
- Avoid connecting ground lines to piping, as this may cause electric corrosion of the system.
- When connecting piping to the product, avoid mistakes regarding the supply ports etc.
- When connecting tubes using the one-touch fitting, provide tube length with sufficient margin. Refer to Specific Precautions in the catalogue for more details.
- When connecting piping/fitting to the valve, clamp the side of the body with a vise, etc. See figure 1.

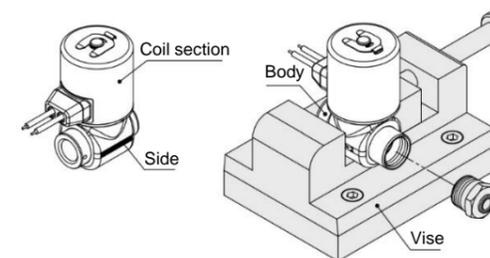


Figure 1. Example of clamp area of valve

- When using Size 20 (orifice $\phi 2$) with water, ensure that the inner diameter of outlet piping is $\phi 6.5$ mm or more.
- When attaching a nozzle to the end of piping, choose a nozzle of which diameter is the same or larger than the orifice diameter. A smaller nozzle diameter may not provide a stable flow control. Perform testing under your operating conditions to ensure that flow control is adequate.

Caution

- Mount the fitting before the bracket is fixed in place. Tightening the fitting with the bracket fixed to the valve may cause damage to the bracket.

Warning

- To prevent uncontrolled tube movement, install protective covers or fasten tubes securely in place.
- If using tube piping, secure the product to a permanent fixture. Do not suspend it by the tubing.

3.4 Lubrication

Caution

- This product does not require lubrication in service.

3 Installation - continued

3.5 Fluid supply

Warning

- The use of a fluid that contains foreign matter can cause problems, such as malfunction and seal failure by promoting the wear of the valve seat and armature, by sticking to the sliding parts of the armature, etc. Install a suitable filter (strainer) immediately upstream of the valve. Select a filter with a filtration size of 5 μ m or smaller for air, and 100 mesh for water.

3.5.1 Air

Warning

- Use clean air. If the compressed air supply includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas etc., it can lead to damage or malfunction.

Caution

- Compressed air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer or after cooler, etc.
- If excessive carbon powder is generated by the compressor, it may adhere to the inside of the valves and cause a malfunction. Install mist separators upstream of the valves to eliminate it.
- When operating fluid air with a dew point of -70°C or lower, the inside of the valve may wear and the product life will be shortened.

3.5.2 Water

Warning

- Be aware that rust stains, chloride separation, etc., from the piping may cause malfunction, leakage, or, in worse case scenarios, damage due to corrosion. Also, such damage may result in the spraying of fluids or scattering of parts. Please be sure to have protective measures in place in case such incidents should occur.
- In the case that water contains substances such as calcium and magnesium, which generate hard scale and sludge, install water softening equipment and a filter (strainer) directly upstream from the valve to remove these substances, as this scale and sludge can cause

the valve to malfunction.

- The water pressure of tap water is usually 0.4 MPa or less, but the pressure can sometimes increase to 1.0 MPa in tall buildings. Therefore, pay attention to the max. operating pressure differential.

3.6 Mounting

Warning

- Do not install with the coil downwards. If a valve is mounted with the coil positioned downwards, foreign objects in the fluid will adhere to the core/armature leading to a malfunction.
- Ensure sufficient space for maintenance activities.
- Avoid sources of vibration or adjust the distance from the body to a minimum length so that resonance will not occur.
- Do not apply external force to the coil section: When tightening fittings, apply a wrench or other tool to the outside of the piping connection parts.
- Do not warm the coil assembly with a heat insulator, etc. Use tape, heaters, etc. for freeze prevention on the piping and body only. They can cause the coil to burn out.
- Valve becomes hot during and after energization. Do not touch it with bare hands as it may cause burns.

Caution

- Painting and coating: Warnings or specifications printed or labelled on the product should not be erased, removed, or covered up.

3.6.1 Bracket installation

3.6.1.1 Body material: Stainless steel (port sizes; 1/8), Brass

- How to assemble
 - Mount the bracket ① to the bottom of the valve using mounting screws ②.
 - Tightening torque
JSP10: 0.6 N·m \pm 5%
JSP20: 1.5 N·m \pm 5%

3 Installation - continued

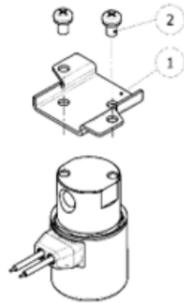


Figure 2. Bracket installation

Size	Body material	Port size	Thread type	Bracket assembly part no.	Bracket material
10	Brass, stainless steel	1/8	Rc, NPT,	JSX021-12A-3	Stainless steel
20	Brass	1/4, 3/8	G	JSX20-12A-4	steel

Table 4

3.6.1.2 Body material: Stainless steel (port sizes 1/4, 3/8)

- How to assemble
 - 1) Insert bracket ① to the IN port side of the valve.
 - 2) Secure it with the hexagon socket set screw ②.

Tightening torque : 0.4 N·m ± 5%

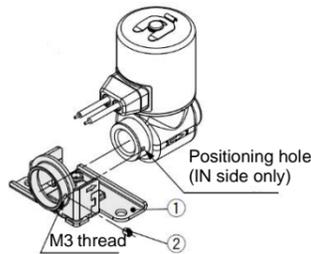


Figure 3. Bracket installation

Caution on assembly

- 1) Pay attention to the bracket inserting direction. The positioning hole is on the IN port side only. The bracket cannot be mounted to the OUT port side.
- 2) The bracket should be mounted after connecting the fitting. (Refer to the "Piping" in the Specific Product Precautions.)
* The bracket is shipped together with the product.

• Bracket assembly part numbers (With set screw)

Size	Port size	Thread type	Bracket assembly part no. (With set screw)	Bracket material
20	1/4	Rc, NPT, G	JSX022-12A-2-1	Stainless steel
	3/8	Rc, NPT	JSX022-12A-2-1	
		G	JSX022-12A-2-2	

Table 5

3.7 Electrical connectors

Warning

- The solenoid valve is an electrical product. For safety, install an appropriate fuse and circuit breaker before use according to local regulations. When using a number of solenoid valves, installing one fuse on the primary side is not enough. To protect the device more safely, select and install a fuse for each circuit.

Caution

- Avoid mis-wiring, as this can cause malfunction and damage to the product.
- Use electrical wire with cross sectional area 0.5 to 1.25 mm².
- Use electrical circuits that do not generate chattering in their contacts.
- When a surge from the solenoid affects the electrical circuitry, install a surge absorber, etc., in parallel with the solenoid or use the product with a surge voltage suppressor.
- Use voltage that is within ±10% of the rated voltage.
- Do not bend or pull lead wires and cables repeatedly.
- Do not apply more than 10 N of force to the lead wires or damage may occur.

3 Installation - continued

- Do not bend the lead wires beyond 90° with a radius of less than 20mm or damage may occur. See figure 4.

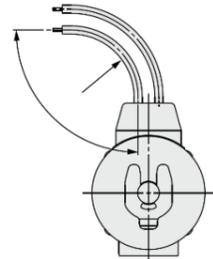


Figure 4. Lead wire bending

3.7.1 Grommet

Lead wire AWG20, outer diameter 2.6 mm.

Voltage type	Lead wire colour	
	1	2
DC (12,24 V)	Black	Red

Table 6

Note) There is no polarity for standard type

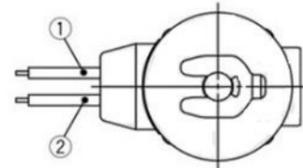


Figure 5. Grommet

3.7.2 Conduit

Lead wire AWG18, outer diameter 2.8 mm.

Voltage type	Conduit wire colour		
	1	2	3 (ground wire)
Standard type	Black	Red	Green / Yellow

Table 7

Note) There is no polarity for standard type

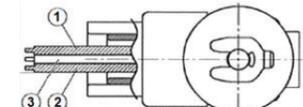


Figure 6. Conduit

3.7.3 DIN terminal

- Use a cord with an outside cable diameter of Ø6 to Ø12 mm. For JSP10, use a cord with an outside cable diameter of Ø3.5 to Ø7 mm.
- Tighten screws and fittings according to Figure 7 or 8.
- If an outside cable diameter of Ø9 to Ø12 mm is used on JSP20, remove the internal parts of the rubber seal before using.

3.7.3.1 DIN connector for JSP10

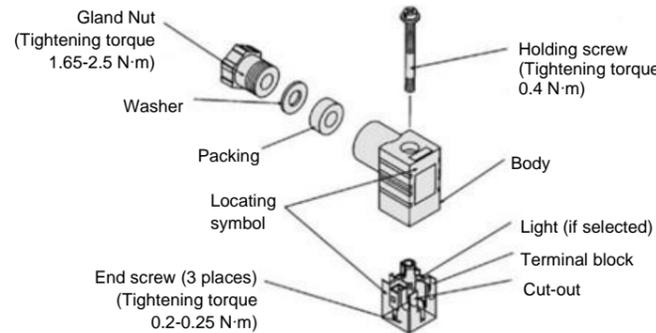


Figure 7. JSP10 DIN connector construction

3 Installation - continued

3.7.3.2 DIN connector for JSP20

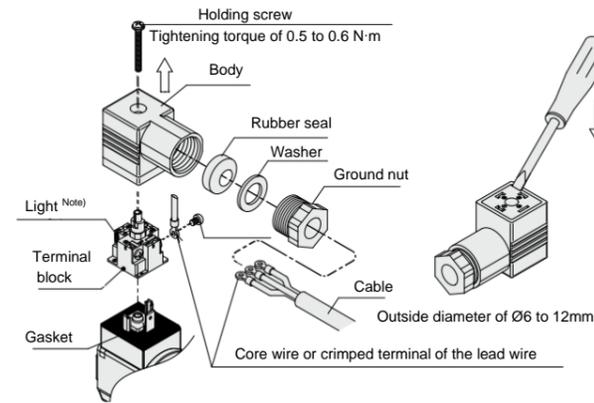


Figure 8. JSP20 DIN connector construction

Note) The position is fixed regardless of the electrical entry direction.

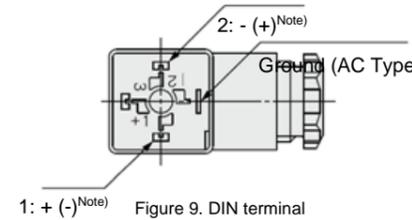


Figure 9. DIN terminal

Contact	1		2	
	DIN Terminal	Standard type	+ (-)	- (+)

Table 8

Note) There is no polarity for Standard type.

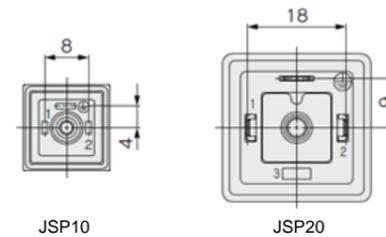


Figure 10. DIN terminal type (conforming to DIN EN 175301-803)

3.8 Electrical circuits

Caution

Surge suppression should be specified by using the appropriate part number. If a valve type without suppression (Type 'G') is used, suppression must be provided by the host controller as close as possible to the valve.

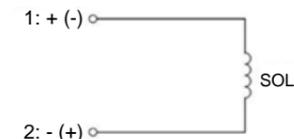


Figure 11. Grommet without electrical option

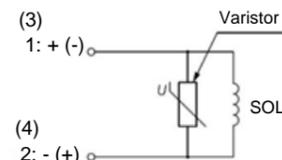


Figure 12. DIN terminal / Conduit with surge voltage suppressor

3 Installation - continued

3.9 Residual voltage

Caution

- If a varistor or diode surge voltage suppressor is used, the suppressor arrests the back EMF voltage from the coil to approximately 60 V (DC type).
- Ensure the transient voltage is within the specification of the host controller.

3.10 Countermeasure for surge voltage

Caution

- At times of sudden interruption of the power supply, the energy stored in a large inductive device may cause non-polar type valves in a de-energised state to switch.
- When installing a breaker circuit to isolate the power install a surge absorption diode across the output of the breaker.

3.11 Extended period of continuous energization

Warning

- The solenoid coil will generate heat when continuously energized so avoid installing in an enclosed space. Install the valve in a well-ventilated area.
- Do not touch the coil while it is being energized or immediately after energization.

3.12 Effect of back pressure

Warning

If there is a possibility that back pressure may occur, take countermeasures by installing a check valve, etc., on the downstream of the valve.

4 How to Order

Refer to catalogue for 'How to Order' or to product drawings for special products.

5 Outline Dimensions

Refer to catalogue and special drawings for outline dimensions.

6 Maintenance

6.1 General maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed fluids can be dangerous. Shut off the fluid supply and release the fluid pressure in the system.
- Make sure that temperature of the valve has reduced sufficiently before removing the valve.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly. If leakage increases or equipment does not operate properly, stop operation.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- Periodic maintenance of filter and strainer:
 - Replace filter element every 1 year or when the pressure drop becomes 0.1 MPa, whichever comes first.
 - Wash strainer when the pressure drop becomes 0.1 MPa.
- Exhaust the drainage from the air filters periodically. If the drainage overflows and enters the air line, this may cause malfunction of pneumatic equipment.
- Switch valves at least once every 30 days to prevent malfunction. Also, in order to use it under the optimum state, conduct a regular inspection once every 6 months.

6 Maintenance - continued

- In the case of long-term storage after use, thoroughly remove all moisture to prevent rust and deterioration of rubber materials, etc.

7 Limitations of Use

Warning

The system designer should determine the effect of possible failure modes of the product on the system.

7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

Warning

7.2 Effect of energy loss on valve switching

Air supply present, electrical supply cut	Valve returns to the initial de-energized position by spring force.
Electrical supply present, air supply cut	Valve remains in the energized position.

Table 9

7.3 Safety relay or PLC

If a safe output from a safety relay or PLC is used to operate this valve, ensure that any output test pulse duration is shorter than 1 ms to avoid the valve solenoid responding.

7.4 Low temperature operation

- The valve can be used in an ambient temperature of 0°C. However, take measures to prevent freezing or solidification of impurities, etc.
- When using valves for water application in cold climates, take appropriate countermeasures to prevent the water from freezing in tubing after cutting the water supply from the pump, by draining the water, etc. When warming by a heater, etc., be careful not to expose the coil portion to a heater. Installation of a dryer, heat retaining of the body is recommended to prevent freezing condition in which the dew point temperature is high and the ambient temperature is low, and the high flow runs.

7.5 Holding of pressure

Since valves are subject to air leakage, they cannot be used for applications such as holding pressure (including vacuum) in a system.

7.6 Cannot be used as an emergency shut-off valve

This product is not designed for safety applications such as an emergency shut-off valve. If the valves are used in this type of system, other reliable safety assurance measures should be adopted.

7.7 Closed liquid circuit

In a closed circuit, when liquid is static, pressure could rise due to changes in temperature. This pressure rise could cause malfunction and damage to components such as valves. To prevent this, install a relief valve in the system.

7.8 Impact by rapid pressure fluctuation

When an impact caused by the rapid pressure fluctuation, such as water hammer etc., is applied, the solenoid valve may be damaged. Install water hammer relief equipment (accumulator, etc.).

7.9 Normally closed valves

Although the valves are normally closed (IN and OUT port blocked), and flow is blocked from Port 1 to Port 2, the fluid will not be blocked if Port 2 pressure is greater than Port 1 pressure, and fluid will flow from Port 2 to Port 1.

7.10 Calibration

- This product has been calibrated to each specification at the factory before shipment.
- Do not attempt to loosen the nut on the top of the product and turn the adjustment screw.
- Turning the adjustment screw may cause a malfunction.

Caution

7.11 Leakage voltage

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes $\leq 2\%$ of the rated voltage across the valve for DC coil.

7 Limitations of Use – continued

7.12 Fluids

- The compatibility of the components of this product with the fluid used may vary depending on the type of fluid, additives, concentration, temperature, etc. Check the compatibility with the actual machine before use.
- Take measures to prevent static electricity since some fluids can cause static electricity.
- Do not use the product with the fluids listed below:
 - Fluids that are harmful to the human body.
 - Combustible or flammable fluids.
 - Corrosive gas and fluid.
 - Sea water, saline.

- When water or hot water is used, the product may experience malfunction or leakage due to dezincification, erosion, or corrosion.
- A valve with a SUS body is also available for increased corrosion resistance. Select a valve that is suitable for your application.

7.13 EMC restrictions

7.13.1 Class and group description

- This product is group 1, class A equipment according to EN55011.
- Group 1 equipment does not intentionally generate radio-frequency energy in the range 9kHz to 400 GHz.
- Class A equipment is equipment suitable for use in all locations other than those allocated in residential environments and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.
- This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

8 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

9 Return of Product

If the product to be returned is contaminated or is possibly contaminated with substances that are harmful to humans, for safety reasons, please

contact SMC beforehand and then employ a specialist cleaning company to decontaminate the product. After the decontamination prescribed above has been carried out, submit a Product Return Request Sheet or the Detoxification/Decontamination Certificate to SMC and await SMC's approval and further instructions before attempting to return the item. Please refer to the International Chemical Safety Cards (ICSC) for a list of harmful substances. If you have any further questions, please don't hesitate to contact your SMC sales representative.

10 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
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