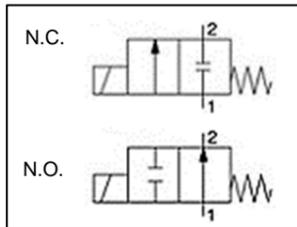




ORIGINAL INSTRUCTIONS

Instruction Manual

2 Port Solenoid Valve with Built-in Y-strainer Series VXK



The intended use of **this product is for the control of 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^{*)}, and other safety regulations.

^{*)} 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: Manipulating industrial robots - Safety, etc.

- 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.

2 Specifications

2.1 General Specifications

Valve construction	Direct operated poppet	
Valve type	Normally closed (N.C.), normally open (N.O.)	
Body material	Brass (C37)	
Seal material	NBR, FKM, EPDM, PTFE	
Enclosure	Dust-tight, water jet-proof type (IP65) ^{Note 1)}	
Fluid	Air, Medium Vacuum (non-leak, oil free) ^{Note 2), Note 3)} , Water, Heated Water, Oil ^{Note 4)} , Steam	
Ambient temperature (°C)	-20 to 60	
Fluid temp. (°C)	Air	-10 ^{Note 5)} to 60
	Medium Vacuum	-10 ^{Note 5)} to 60
	Water	1 to 60
	Heated Water	1 to 99
	Oil	-5 ^{Note 5)} to 60 (Coil insulation B type) -5 ^{Note 5)} to 120 (Coil insulation H type)
Steam	183	
Flow rate characteristics	Refer to catalogue	
Maximum operating Pressure differential	Refer to catalogue	
Maximum system pressure	Refer to catalogue	
Weight	Refer to catalogue (maximum weight <900 g)	
Internal Leakage	Air	NBR, FKM: 1cm ³ /min or less
	Medium vacuum	FKM: 10 ⁻⁶ Pa·m ³ /sec or less
	Water	NBR, EPDM: 0.1cm ³ /min or less

2 Specification - continued

External Leakage	Oil	FKM: 0.1cm ³ /min or less
	Steam	PTFE: 300 cm ³ /min or less
	Air	NBR, FKM: 1cm ³ /min or less
	Medium vacuum	FKM: 10 ⁻⁶ Pa·m ³ /sec or less
	Water	NBR, EPDM: 0.1cm ³ /min or less
	Oil	FKM: 0.1cm ³ /min or less
Steam	PTFE: 1 cm ³ /min or less	

Table 1.

Notes:

- Note 1) Electrical entry: Grommet with surge voltage suppressor (GS) has a rating of IP40.
- Note 2) The leakage amount (10⁻⁶ Pa·m³/s) of the option "V" is a value when the differential pressure is 0.1 MPa.
- Note 3) Option "V" is the oil-free treatment.
- Note 4) The dynamic viscosity of the fluid must not exceed 50 mm²/s. The special construction of the armature adopted in the built-in full-wave rectifier type gives an improvement in OFF response by providing clearance on the absorbed surface when it is switched ON. Select the DC spec. or AC spec. built-in full-wave rectifier type when the dynamic viscosity is higher than water or when the OFF response is prioritized.
- Note 5) Dew point temperature: -10°C or less.

2.2 Coil Specifications ^{Note 6)} ^{Note 7)}

Rated voltage	DC	12, 24
	AC	100, 200, 110, 220, 230, 240, 48
Allowable voltage fluctuation	±10% of rated voltage	
Allowable leakage voltage	AC (Class B, Built-in full wave rectifier type)	10% or less of rated voltage
	AC (Class B/H)	20% or less of rated voltage
	DC (Class B only)	2% or less of rated voltage
Coil insulation type	Class B, Class H	

Table 2.

- Note 6) Coil insulation type Class H: AC specification only.
- Note 7) There is no shading coil attached to the DC or AC specifications with built-in full wave rectifier type.

2.2.1 Normally closed (N.C.)

2.2.1.1 DC Specification

Model	Power Consumption (W)
VXK21	4.5
VXK22	7
VXK23	10.5

Table 3.

2.2.1.2 AC Specification

Model	Frequency (Hz)	Apparent Power (VA)	
		Inrush	Energized
VXK21	50	19	10
	60	16	8
VXK22	50	43	20
	60	35	17
VXK23	50	62	32
	60	52	27

Table 4.

2.2.1.3 AC Specification (Class B, Built-in full-wave rectifier type)

Model	Apparent Power (VA) ^{Note 1)}
VXK21	7
VXK22	9.5
VXK23	12

Table 5.

Notes:

- Note 1) There is no difference in the frequency and the inrush and energized apparent power because a rectifying circuit is used in the AC (Class B, Built-in full-wave rectifier type).

2.2.2 Normally Open (N.O.)

2.2.2.1 DC Specification

Model	Power Consumption (W)
VXK21	4.5
VXK22	7
VXK23	10.5

Table 6.

2.2.2.2 AC Specification

Model	Frequency (Hz)	Apparent Power (VA)	
		Inrush	Energized
VXK21	50	22	11
	60	18	8
VXK22	50	46	20
	60	38	18
VXK23	50	64	32
	60	54	27

Table 7.

2 Specification - continued

2.2.2.3 AC Specification (Class B, Built-in full-wave rectifier type)

Model	Apparent Power (VA) ^{Note 1)}
VXK21	7
VXK22	9.5
VXK23	12

Table 8.

Notes:

- Note 1) There is no difference in the frequency and the inrush and energized apparent power because a rectifying circuit is used in the AC (Class B, Built-in full-wave rectifier type).

2.3 Strainer specifications

Mesh	100
Material	Stainless steel

Table 9.

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 environment stated below:
 - Atmosphere having corrosive gases, chemicals, sea water or steam or where there is direct contact with any of these.
 - Explosive atmosphere.
 - Location exposed to direct sunlight.
 - Location subject to vibration or impact.
 - Location exposed to radiant heat.
- Do not use in water. Moisture may enter through microscopic gaps and possibly result in short-circuiting, burning out or ignition of coil. Take appropriate protective measures in environments where exposed to constant water splash or condensation caused by high humidity.
- This valve is for indoor use only.
- For low temperature operation, take appropriate measures to prevent solidification or freezing of drainage and moisture, etc.
- In case of use in environments such as cold regions, high dew point temperature with low ambient temperature and high flow rates:
 - Drain water from pipeline.
 - Apply thermal insulating material such as heater etc (avoid on coil portion).
 - Installation of a dryer.
- Employ suitable protective measures in locations where there is contact with oil or welding splatter, etc.

3.3 Piping

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.

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- During use, deterioration of the tubing or damage to the fittings could cause tubes to come loose from their fittings and thrash about. To prevent uncontrolled tube movement, install protective covers or fasten tubes securely in place.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1.5 to 2 thread exposed on the end of the pipe/fitting.
- When using non-SMC brand tubes and fittings, refer to the Specific Precautions in the catalogue.
- When connecting piping to the product, avoid mistakes regarding the supply ports etc.
- Avoid connecting ground lines to piping, as this may cause electric corrosion of the system.
- Refer to the tightening torque in the table below for connecting steel fittings. Lower tightening torque can lead to fluid leakage. For mounting fittings, refer to the specified tightening torque.

Thread Size	Proper Tightening Torque (N·m)
Rc1/8	7 to 9
Rc1/4	12 to 14
Rc3/8	22 to 24

Table 10.

3 Installation - continued

- In applications such as vacuum and non-leak specifications, use caution specifically against the contamination of foreign objects or airtightness of the fittings.

3.4 Mounting

Warning

- 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.
- After installation, 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.
- Valve becomes hot during and after energization. Do not touch it with bare hands as it may cause burns.
- Secure with the mounting holes firmly, except in the case of steel piping and copper fittings.

Caution

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

3.5 Electrical connection

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 a cross sectional area of 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 voltage suppressor etc., in parallel with the solenoid. Or, adopt an option that comes with the surge voltage protection circuit. (However, a surge voltage occurs even if the surge voltage protection circuit is used. For details, please consult with SMC).
- Use voltage which is within ±10% of the rated voltage. In cases with a DC power supply where importance is placed on responsiveness, stay within ±5% of the rated value. The voltage drop is the value in the lead wire section connecting the coil.
- Ensure that any leakage voltage caused by the leakage current when the switching element is OFF is ≤2% (DC) or ≤5% (AC) of the rated voltage across the valve.
- Do not bend or pull lead wires and cables repeatedly.
- Do not apply more than 30N of force to the lead wires or damage may occur.
- Do not bend the lead wires beyond 90° with a radius of less than 20mm or damage may occur.

3.5.1 Grommet

Class H coil: Lead wire AWG18, outer diameter 2.2 mm.

Class B coil: Lead wire AWG20, outer diameter 2.5 mm.

Voltage Type	Lead Wire Colour	
	1	2
DC	Black	Red
AC 100V	Blue	Blue
AC 200V	Red	Red
Other AC	Grey	Grey

Table 11.

Note: There is no polarity

3 Installation - continued

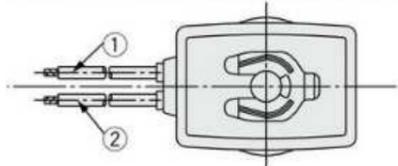


Figure 1. Grommet type

3.5.2 DIN Terminal

- Internal connections are as shown in Figure 2. Make connections to the power supply accordingly.

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

Table 12.

Note: There is no polarity

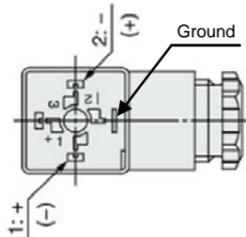


Figure 2. DIN terminal polarity

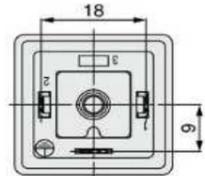


Figure 3. DIN type (EN175301-803B compliant)

- DIN terminal corresponds to the Form A DIN connector with an 18 mm terminal pitch, which complies with EN175301-803B.

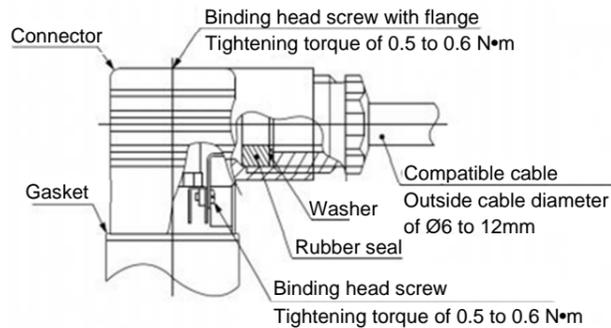


Figure 4. DIN connector construction

3.5.3 Conduit terminal

Make connections according to the marks shown in Figure 6.

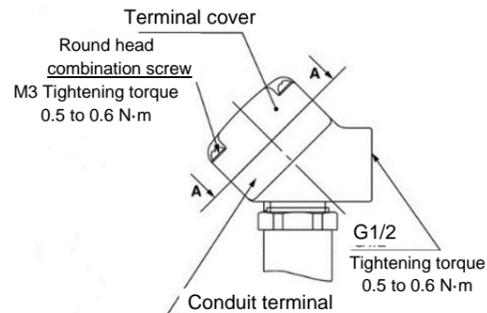


Figure 5. Conduit terminal

3 Installation - continued

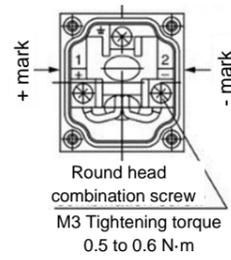


Figure 6. Conduit terminal internal connection

3.5.4 Conduit

Class H coil: Lead wire AWG18, outer diameter 2.2 mm.
Class B coil: Lead wire AWG20, outer diameter 2.5 mm.

Voltage Type	Lead Wire Colour	
	1	2
DC	Black	Red
AC 100	Blue	Blue
AC 200	Red	Red
Other AC	Grey	Grey

Table 13.

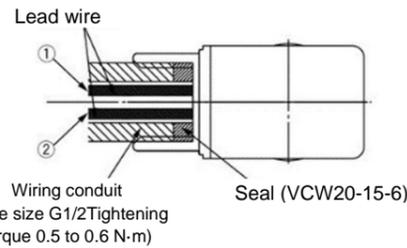
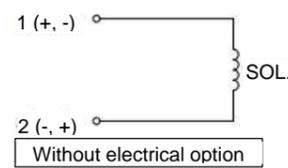


Figure 7. Conduit

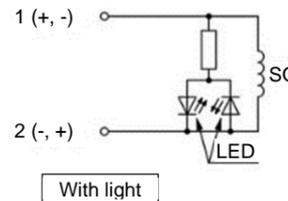
3.6 Electrical circuit

3.6.1 DC Circuit

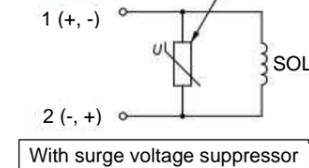
Grommet, Conduit, Conduit terminal, DIN type



Conduit terminal, DIN type



Grommet, Conduit terminal, DIN type



Conduit terminal, DIN type

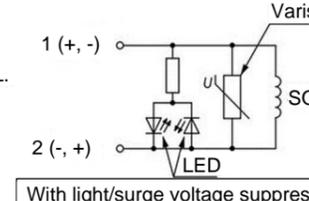
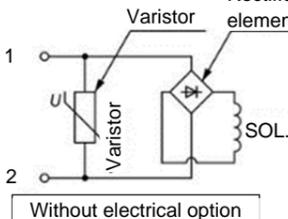


Figure 8.

3.6.2 AC, Class B (Built-in full wave rectifier type) Circuit

Grommet, Conduit, Conduit terminal, DIN type



Grommet, Conduit terminal, DIN type

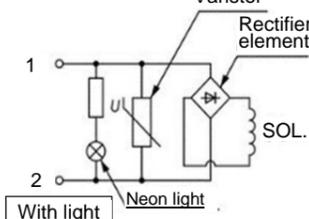
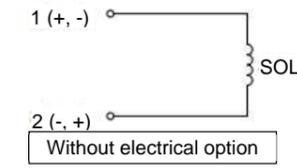


Figure 9.

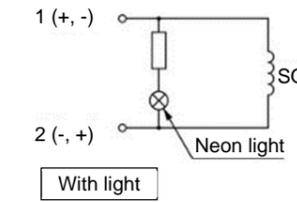
3 Installation - continued

3.6.3 AC, Class B/H Circuit

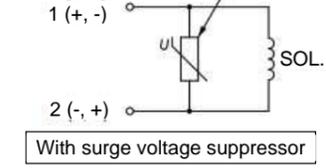
Grommet, Conduit, Conduit terminal



Conduit terminal



Grommet, Conduit terminal



Conduit terminal

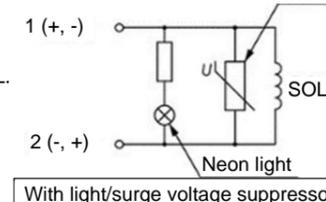


Figure 10.

Warning

The ground terminal is linked to the coil assembly only and does not provide protective earth for the valve body.

4 How to Order

4.1 Standard products

Refer to product catalogue or SMC website (URL <https://www.smcworld.com>) to obtain more detail information for 'How to Order'.

5 Outline Dimensions (mm)

Refer to catalogue product catalogue or SMC website (URL <https://www.smcworld.com>) to obtain more detail information for outline dimensions.

6 Maintenance

6.1 General Maintenance

Caution

- Perform maintenance inspection according to the procedures indicated in the operation manual. If handled improperly, malfunction and damage of machinery or equipment may occur. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- Exhaust drainage from the air filters periodically. If drainage overflows and enters the air line, this may cause malfunction of pneumatic equipment.
- Perform appropriate functional and leakage tests periodically to confirm the operating condition. If leakage increases or equipment does not operate properly, stop operation.
- Removing the product

Warning

The valve will reach a high temperature when used with high temperature fluids. Confirm that the valve temperature has dropped sufficiently before performing work. If touched inadvertently, there is a danger of being burned.

- Shut off the fluid supply and release the fluid pressure in the system.
- Shut off the power supply.
- Dismount the product.

- Replacement of solenoid coil

Warning

When replacing the solenoid coil, turn off the power supply. Be careful of possible high temperature of the solenoid coil due to the fluid temperature and operating conditions. Check the type of the solenoid coil (size, rated voltage, voltage specification, insulation specification).

6 Maintenance - continued

Caution

Refer to catalogue for more details.

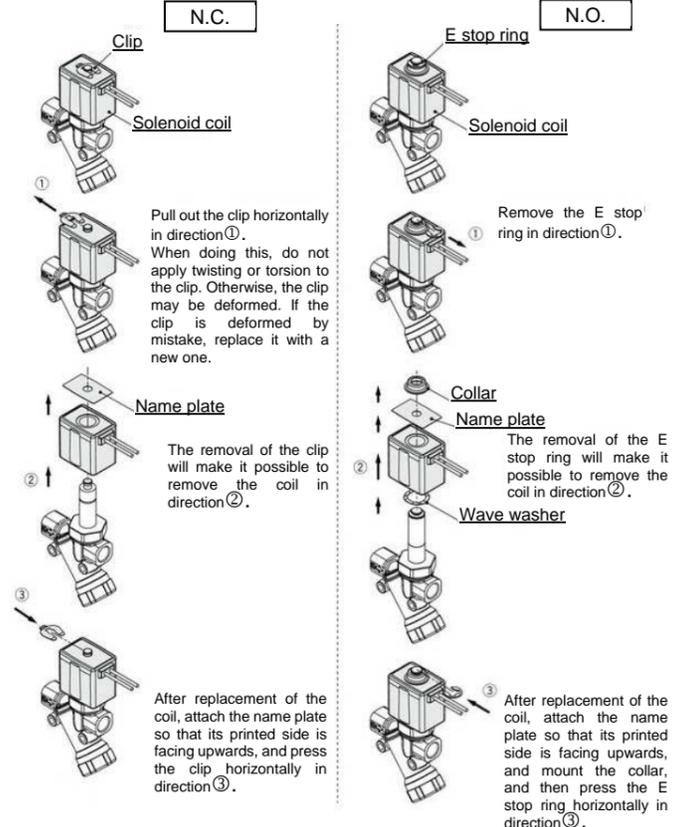


Figure 11.

- Replacement of strainer

Warning

The valve will reach high temperatures from high temperature fluids such as steam. Confirm that the valve has cooled sufficiently before performing works. If touched inadvertently, there is a danger of being burned.

Shut off the fluid supply and release the fluid pressure in the system.

Shut off the power supply.

Caution

Be careful regarding clogging of strainers. Clean strainers when the pressure drop reaches 0.1 MPa.

- Turn and remove the plug (width across flats of 27 mm).
- Remove the strainer, and clean or replace it.
- Mount the O-ring on the plug and insert the strainer to the end of the plug.
- Screw the plug into the body. (Recommended tightening torque: 23 to 27 N·m).

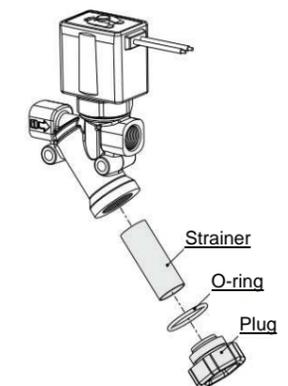


Figure 12.

6 Maintenance - continued

- Low frequency operation

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.

- Storage

In 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

Do not exceed any of the specifications laid out in section 2 of this document or the specific product catalogue, as this can cause damage or malfunction. We do not guarantee against any damage if the product is used outside of the specification range.

7.1 Cannot be used as an emergency shutoff valve etc.

These valves are not designed for safety applications such as an emergency shutoff valve. If the valves are used in this type of system, other reliable safety assurance measures should also be adopted.

7.2 Pressure (including vacuum) holding

It is not usable for an application such as holding the pressure (including vacuum) inside of a pressure vessel because air leakage is entailed in a valve.

7.3 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.

7.4 Extended periods of continuous energization

- The solenoid coil will generate heat when continuously energized. Avoid using in a tightly shut container. Install it in a well ventilated area.
- Furthermore, do not touch it while it is being energized or right after it is energized.

7.5 Impact by rapid pressure fluctuation

When problems are caused by a water hammer, install water hammer relief equipment (accumulator etc.), or use an SMC water hammer relief

valve (VXR series). For details, please consult with SMC.

7.6 Back pressure

If there is a possibility of back pressure being applied to the valve, take countermeasures such as mounting a check valve on the downstream side of the valve.

7.7 Do not disassemble or modify

- Do not disassemble or make any modification, including additional machining, to the product and replacement parts. It may cause an accident and/or injury to persons.

7.8 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.
- The kinematic viscosity of fluid must not exceed 50 mm²/s.
- 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.
- Take measures to prevent static electricity since some fluids can cause static electricity.
- Use an oil-free specification when any oily particle must not enter the passage.

7.8.1 Air

- Use clean air. Do not use compressed air which includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction of the valve.
- 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.

7 Limitations of Use - continued

7.8.2 Vacuum

- Please be aware that there is a range of pressure that can be used.
- Vacuum piping direction: if the system uses a vacuum pump, we ask that you install the vacuum pump on the secondary side.
- Please replace the valve after operating the device approximately 300,000 times.

7.8.3 Water

- The supply water includes materials that generate hard sediment or sludge such as calcium and magnesium. Since such scale and sludge can cause the valve to malfunction, install water softening equipment to remove these substances.
- Tap water pressure: The water pressure for tap water is normally 0.4 MPa or less. However, in places like a high-rise building, the pressure may be 1.0 MPa. When selecting tap water, be careful of the maximum operating pressure differential.

7.8.4 Oil

- Generally, FKM is used as seal material, as it is resistant to oil.
- The resistance of the seal material may deteriorate depending on the type of oil, manufacturer or additives. Check the resistance before using.
- The kinematic viscosity must not exceed 50 mm²/s.

7.8.5 Steam

- The supply water to a boiler includes materials that create a hard sediment or sludge such as calcium and magnesium. Sediment and sludge from steam can cause the valve to not operate properly. Install a water softening device, which removes these materials.
- Do not use operation steam which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as these can cause damage or deterioration

7.9 Low temperature operation

- The valves can be used up to an ambient temperature of –20°C. However, take measures to prevent solidification of impurities or freezing, etc.
- When using valves for water applications 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 the heater. The installation of a dryer, retaining the heat of the body, etc., is recommended to prevent a freezing condition in which the dew point temperature is high and the ambient temperature is low, or the high flow is running.

7.10 Conduit type equivalent to IP65

When the conduit type is used as equivalent to an IP65 enclosure, install a wiring conduit etc.

8 Product disposal

This product should 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 Contacts

Refer to www.smcworld.com or www.smc.eu for contacts.

SMC Corporation

URL : <http://www.smcworld.com> (Global) <http://www.smc.eu> (Europe)
 SMC Corporation, Akihabara UDX15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101 0021
 Specifications are subject to change without prior notice from the manufacturer.
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