



Installation and Maintenance Manual
Series VXE21/22/23 Direct Operated 2 Port
Solenoid Valve for Air, Water, Oil,
Energy Saving Type.



1 Safety Instructions

- This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.
- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of "CAUTION", "WARNING", or "DANGER", followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.
- This product is class A equipment that is intended for use in an industrial environment.

CAUTION	If instructions are not followed there is a possibility of injury or equipment damage.
WARNING	If instructions are not followed there is a possibility of serious injury or loss of life.
DANGER	In extreme conditions, there is a possibility of serious injury or loss of life.

1 Safety Instructions (continued)

- 3) Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
- 4) An application which possibly having negative effects on people, property, or animals, requires special safety analysis.

CAUTION

- Ensure that the air supply system is filtered to 5 microns.

2 Specifications

2.1 General Specifications

VXE21/22/23

Valve specification	Valve construction	Direct operated poppet
	Valve type	N.C.
	Withstand pressure	5.0 MPa
	Body material	Brass, Stainless steel
	Seal material	NBR, FKM, EPDM, PTFE
	Enclosure	Dust tight, Low jet proof (equivalent to IP65)
	Environment	Location without corrosive or explosive gases.
Coil specification	Rated voltage	24 VDC, 12 VDC
	Allowable voltage fluctuation	±10% of rated voltage
	Allowable leakage voltage	±2% or less of rated voltage
	Coil insulation type	Class B
	Surge voltage suppressor	Built-in surge voltage suppressor

2 Specifications (continued)

2.2 Flow Characteristics

Valve VXE Normally Closed (N.C.).

Port size	Orifice size (Ømm)	Model	Flow characteristics		
			Air		
			C[dm³/(s•bar)]	b	Cv
1/8 (6A)	2	VXE2110-01	0.59	0.48	0.18
	3	VXE2120-01	1.20	0.45	0.33
	4.5	VXE2130-01	2.30	0.46	0.61
1/4 (8A)	2	VXE2110-02	0.59	0.48	0.18
	3	VXE2120-02	1.20	0.45	0.33
		VXE2220-02			
		VXE2320-02			
	4.5	VXE2130-02	2.30	0.46	0.61
		VXE2230-02			
		VXE2330-02			
	6	VXE2240-02	4.10	0.30	1.10
		VXE2340-02			
	8	VXE2250-02	6.40	0.30	1.60
		VXE2350-02			
	10	VXE2260-02	8.80	0.30	2.00
		VXE2360-02			
3/8 (10A)	3	VXE2220-03	1.20	0.45	0.33
		VXE2320-03			
		VXE2230-03			
	4.5	VXE2230-03	2.30	0.46	0.61
		VXE2330-03			
	6	VXE2240-03	4.10	0.30	1.10
		VXE2340-03			
	8	VXE2250-03	6.40	0.30	1.60
		VXE2350-03			
	10	VXE2260-03	11.0	0.30	2.20
		VXE2360-03			
	10	VXE2260-04	11.0	0.30	2.20
		VXE2360-04			

Table 1

- The values of Av and Cv are based on JIS B 2005:1995.

Valve VXE Normally Closed (N.C.).

Port size	Orifice size (Ømm)	Model	Flow characteristics	
			Water, Oil	
			Av x 10 ⁻⁶ m ²	Cv converted
1/8 (6A)	2	VXE2110-01	4.1	0.17
	3	VXE2120-01	7.9	0.33
	4.5	VXE2130-01	15.0	0.61
1/4 (8A)	2	VXE2110-02	4.1	0.17
	3	VXE2120-02	7.9	0.33
		VXE2220-02		
		VXE2320-02		
	4.5	VXE2130-02	15.0	0.61
		VXE2230-02		
		VXE2330-02		
	6	VXE2240-02	26.0	1.10
		VXE2340-02		
	8	VXE2250-02	38.0	1.60
		VXE2350-02		
	10	VXE2260-02	46.0	1.90
		VXE2360-02		
3/8 (10A)	3	VXE2220-03	7.9	0.33
		VXE2320-03		
		VXE2230-03		
	4.5	VXE2230-03	15.0	0.61
		VXE2330-03		
	6	VXE2240-03	26.0	1.10
		VXE2340-03		
	8	VXE2250-03	38.0	1.60
		VXE2350-03		
	10	VXE2260-03	53.0	2.20
		VXE2360-03		
	10	VXE2260-04	53.0	2.20
		VXE2360-04		

Table 2

- The values of C and b are based on JIS B 8390:2000.

2 Specifications (continued)

Valve VXE Normally Closed (N.C.)

Port size	Orifice size (Ømm)	Model	Max. operating pressure differential (MPa)		
			Air	Water	Oil
1/8 (6A)	2	VXE2110-01	1.5	1.5	1.5
	3	VXE2120-01	0.6	0.5	0.5
	4.5	VXE2130-01	0.2	0.2	0.15
1/4 (8A)	2	VXE2110-02	1.5	1.5	1.5
	3	VXE2120-02	0.6	0.5	0.5
		VXE2220-02			
		VXE2320-02			
	4.5	VXE2130-02	0.2	0.2	0.15
		VXE2230-02			
		VXE2330-02			
	6	VXE2240-02	0.15	0.15	0.1
		VXE2340-02			
	8	VXE2250-02	0.08	0.08	0.08
		VXE2350-02			
	10	VXE2260-02	0.03	0.03	0.03
		VXE2360-02			
3/8 (10A)	3	VXE2220-03	1.5	1.5	1.2
		VXE2320-03			
		VXE2230-03			
	4.5	VXE2230-03	0.35	0.35	0.3
		VXE2330-03			
	6	VXE2240-03	0.15	0.15	0.1
		VXE2340-03			
	8	VXE2250-03	0.08	0.08	0.08
		VXE2350-03			
	10	VXE2260-03	0.03	0.03	0.03
		VXE2360-03			
	10	VXE2260-04	0.03	0.03	0.03
		VXE2360-04			

Table 3

Valve VXE Normally Closed (N.C.)

Port size	Orifice size (Ømm)	Model	Max. System pressure (MPa)	Weight ⁽¹⁾ (g)	
				Air, Water & Oil	
1/8 (6A)	2	VXE2110-01	3.0	300	300
	3	VXE2120-01			
	4.5	VXE2130-01			
1/4 (8A)	2	VXE2110-02			
	3	VXE2120-02			
		VXE2220-02			
		VXE2320-02			
	4.5	VXE2130-02			
		VXE2230-02			
		VXE2330-02			
	6	VXE2240-02			
		VXE2340-02			
	8	VXE2250-02			
		VXE2350-02			
	10	VXE2260-02			
		VXE2360-02			
3/8 (10A)	3	VXE2220-03	3.0	1.0	470
		VXE2320-03			
		VXE2230-03			
	4.5	VXE2230-03			
		VXE2330-03			
	6	VXE2240-03			
		VXE2340-03			
	8	VXE2250-03			
		VXE2350-03			
	10	VXE2260-03			
		VXE2360-03			
	10	VXE2260-04			
		VXE2360-04			

Table 4

Note 1) Weight of grommet type. Add 10 g for conduit, 30 g for DIN terminal and 60 g for conduit terminal type.

2 Specifications (continued)

Manifold VXE For Air

Orifice size (Ømm)	Model	Flow characteristics		
		Air		
		C[dm³/(s•bar)]	b	Cv
2	VXE2111-00	0.59	0.48	0.18
3	VXE2121-00	1.2	0.45	0.33
	VXE2221-00			
	VXE2321-00			
4.5	VXE2131-00	2.3	0.46	0.61
	VXE2231-00			
	VXE2331-00			
6	VXE2241-00	4.1	0.30	1.10
	VXE2341-00			

Orifice size (Ømm)	Model	Max. operating pressure differential (MPa)	Max. System pressure (MPa)
		Air	
2	VXE2111-00	1.5	3.0
3	VXE2121-00	0.6	
	VXE2221-00	1.5	
	VXE2321-00	3.0	
4.5	VXE2131-00	0.2	
	VXE2231-00	0.35	
	VXE2331-00	0.9	
6	VXE2241-00	0.15	
	VXE2341-00	0.3	

Table 5

Manifold VXE For Water, Oil

Orifice size (Ømm)	Model	Flow characteristics	
		Water, Oil	
		Av x 10 ⁻⁶ m²	Cv converted
2	VXE2111	4.1	0.17
3	VXE2121	7.9	0.33
	VXE2221		
	VXE2321		
4.5	VXE2131	15.0	0.61
	VXE2231		
	VXE2331		
6	VXE2241	26.0	1.10
	VXE2341		

Orifice size size (Ømm)	Model	Max. operating pressure differential (MPa)		Max. system pressure (MPa)
		Water	Oil	Water, Oil
2	VXE2111	1.5	1.5	3.0
3	VXE2121	0.5	0.5	
	VXE2221	1.5	1.2	
	VXE2321	3.0	2.0	
4.5	VXE2131	0.2	0.15	
	VXE2231	0.35	0.3	
	VXE2331	0.9	0.85	
6	VXE2241	0.15	0.1	
	VXE2341	0.3	0.3	

Table 6

3 Installation

3.1 Installation

 **WARNING**

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

VXE Valve Mounting Bracket (Optional)

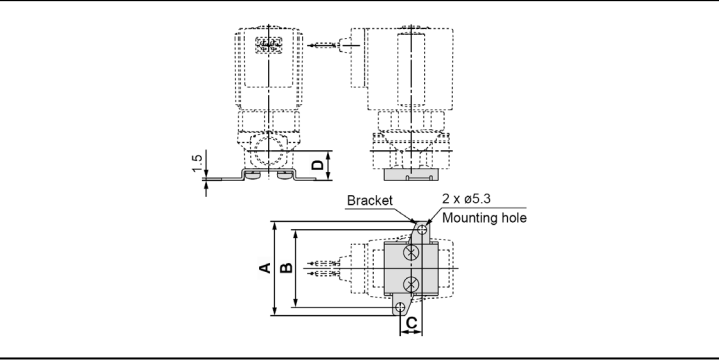


Figure 1

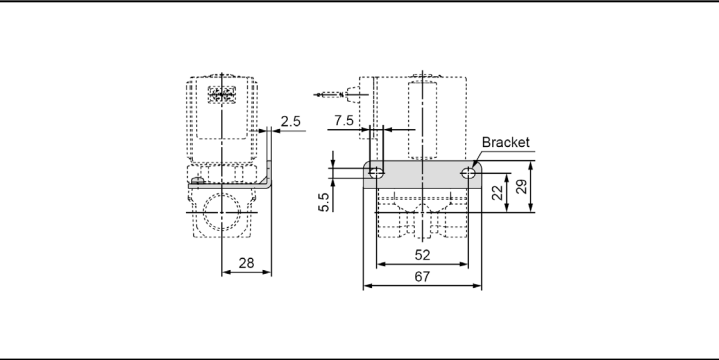


Figure 2

Model	Orifice diameter	Bracket Mounting (mm)			
		A	B	C	D
N.C.					
VXE21#0	Ø2, Ø3, Ø4.5	46	36	11	15
VXE22#0	Ø3, Ø4.5, Ø6	56	46	13	17.5
VXE22#0	Ø8, Ø10	See Figure 2 ⁽¹⁾			
VXE23#0	Ø3, Ø4.5, Ø6	56	46	13	17.5
VXE23#0	Ø8, Ø10	See Figure 2 ⁽¹⁾			

Table 7

Note 1) Bracket supplied assembled to valve.

VXE Manifold

- Aluminium (for fluid Air)

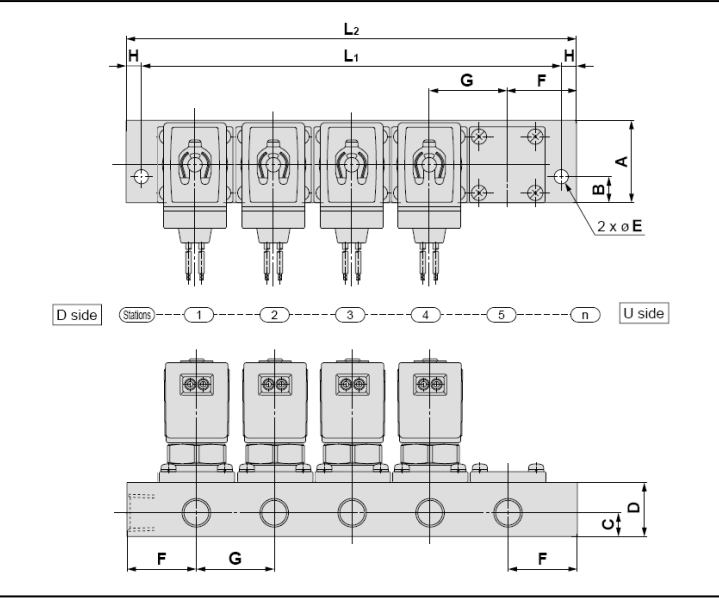


Figure 3

3 Installation (continued)

Model	Manifold Mounting (mm)							
	A	B	C	D	E	F	G	H
VVXE21	38	12	11	25	6.5	32	36	7
VVXE22	49	15	13	30	8.5	40	46	9
VVXE23	49	15	13	30	8.5	40	46	9

Table 8

Model	Dimn (mm)	n Stations									
		2	3	4	5	6	7	8	9	10	
VVXE21	L1	86	122	158	194	230	266	302	338	374	
	L2	100	136	172	208	244	280	316	352	388	
VVXE22	L1	108	154	200	246	292	338	384	430	476	
VVXE23	L2	126	172	218	264	310	356	402	448	494	

Table 9

- Brass, Stainless steel (for fluid Water or Oil)

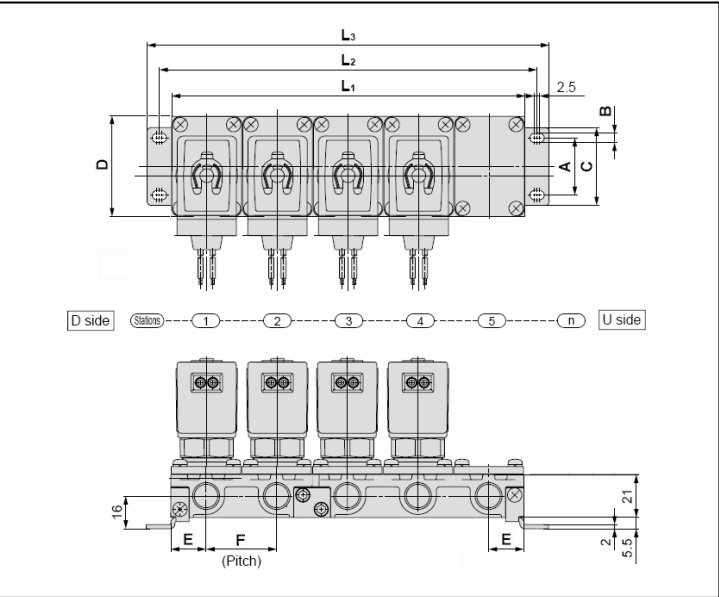


Figure 4

Model	Manifold Mounting (mm)					
	A	B	C	D	E	F
VXE21	28	4.5	38	49	17.3	34.5
VXE22	30	5.5	42	57	19.3	38.5
VXE23	30	5.5	42	57	20.8	41.5

Table 10

3 Installation (continued)

Model	Dimn (mm)	n Stations				
		2	3	4	5	6
VXE21	L1	69	103.5	138	172.5	207
	L2	81	115.5	150	184.5	219
	L3	93	127.5	162	196.5	231
VXE22	L1	77	115.5	154	192.5	231
	L2	89	127.5	166	204.5	243
	L3	101	139.5	178	216.5	255
VXE23	L1	83	124.5	166	207.5	249
	L2	95	136.5	178	219.5	261
	L3	107	148.5	190	231.5	273
Manifold construction		2 station	3 station	2 station x 2	2 station + 3 station	3 station x 2

Model	Dimn (mm)	n Stations			
		7	8	9	10
VXE21	L1	241.5	276	310.5	345
	L2	253.5	288	322.5	357
	L3	265.5	300	334.5	369
VXE22	L1	269.5	308	346.5	385
	L2	281.5	320	358.5	397
	L3	293.5	332	370.5	409
VXE23	L1	290.5	332	373.5	415
	L2	302.5	344	385.5	427
	L3	314.5	356	397.5	439
Manifold construction		2 station x 2 + 3 station	3 station x 2 + 2 station	3 station x 3	2 station x 2 + 3 station x 2

Table 11

- To assemble valve to manifold, ensure the valve is correctly positioned and gaskets are present.
- The solenoid valve is attached with 2 mounting screws.
- Tighten mounting screws to appropriate tightening torque shown in Table 12

Valve	Appropriate tightening torque (N•m)	
	Aluminium manifold	Brass/ Stainless Steel manifold
VXE21	1.5 to 2.0	1.5 to 2.0
VXE22	1.5 to 2.0	1.5 to 2.0
VXE23	1.5 to 2.0	1.5 to 2.0

Table 12

3.2 Environment

 **WARNING**

- Do not use in an environment where the product is directly exposed to corrosive gases, chemicals, salt water, water or steam.
- Do not use in an explosive atmosphere.
- The product should not be exposed to prolonged sunlight. Use a protective cover.
- Do not mount the product in a location where it is subject to excessive vibrations and/or impacts.
- Do not mount the product in a location exposed to radiant heat.
- Employ suitable protective measures in locations where there is contact with water droplets, oil or welding splatter, etc.
- Low temperature operation;
 - The valve can be used in an ambient temperature of between -10 to -20°C. However, take measures to prevent the water from freezing or solidification of impurities.
- When using valves for water application in cold environments, take appropriate measures to prevent water freezing in the system, after the water supply from the pump is cut off, by draining the water, etc.
- When warming by heater, etc, be careful not to expose the coil assembly to the heater.
- For air, installation of a drier and heat retaining of the body is recommended to prevent a freezing condition in which the dew point temperature is higher than the ambient temperature.

3 Installation (continued)

3.3 Piping

CAUTION

- Before 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.
- Install piping so that it does not apply pulling, pressing, bending or other forces on the valve body.
- In applications such as vacuum and non-leak specifications, use caution against contamination of foreign objects and air tightness of fittings.
- Steam generated by a boiler contains a large amount of water vapour, ensure to operate with a drain trap installed.

Valve

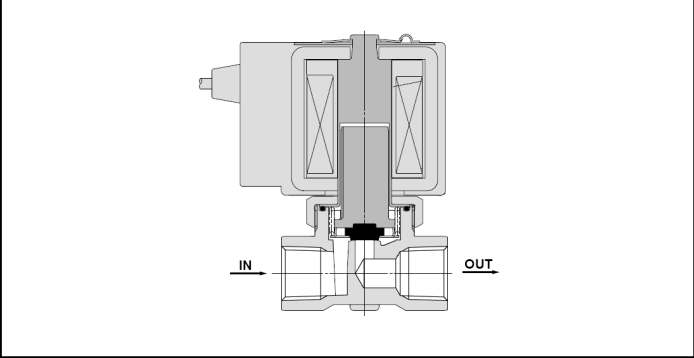


Figure 5

Model	Port Size
VXE21	Rc. G, NPT, NPTF 1/8, 1/4
VXE22	Rc, G, NPT, NPTF 1/4, 3/8, 1/2
VXE23	Rc, G, NPT, NPTF 1/4, 3/8, 1/2

Table 13

Manifold

- Aluminium

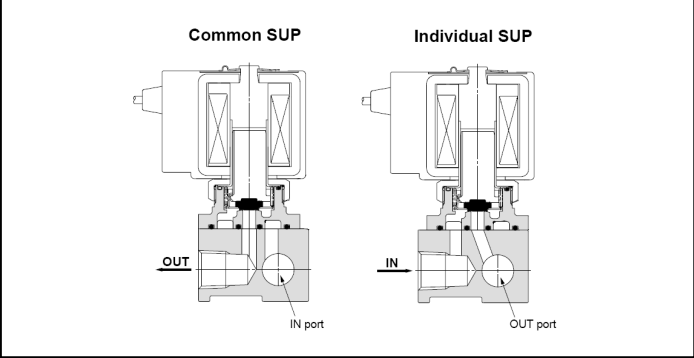


Figure 6

- Brass/Stainless steel

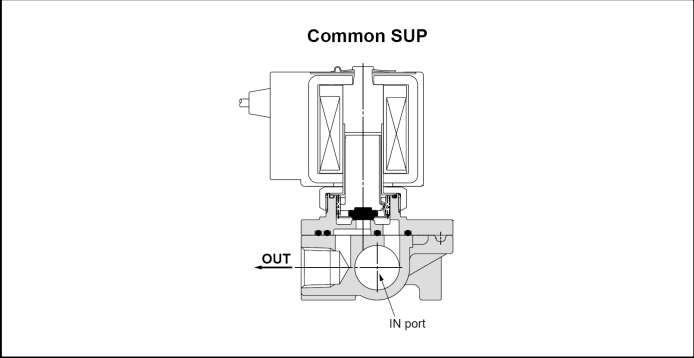


Figure 7

3 Installation (continued)

Model	Port Size	
	Common	Individual
VXE21	Rc, G, NPT, NPTF 3/8	Rc, G, NPT, NPTF 1/8, 1/4
VXE22	Rc, G, NPT, NPTF 3/8	Rc, G, NPT, NPTF 1/8, 1/4
VXE23	Rc, G, NPT, NPTF 3/8	Rc, G, NPT, NPTF 1/8, 1/4

Table 14

- Tighten fittings to torque shown in Table 15

Thread	Appropriate tightening torque (N•m)
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24
Rc 1/2	28 to 30

Table 15

3.4 Electrical Connection

CAUTION

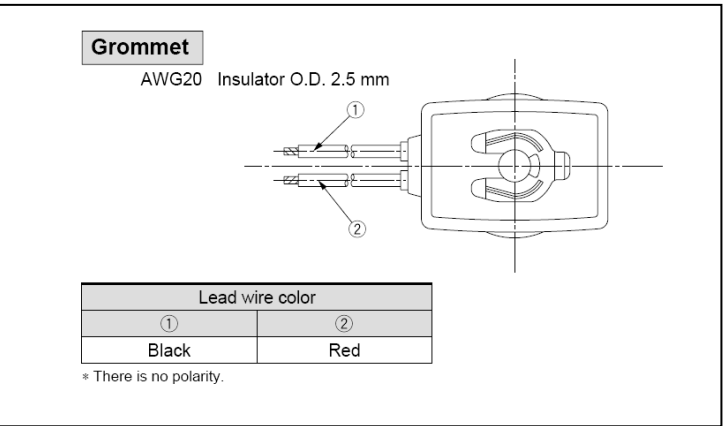


Figure 8

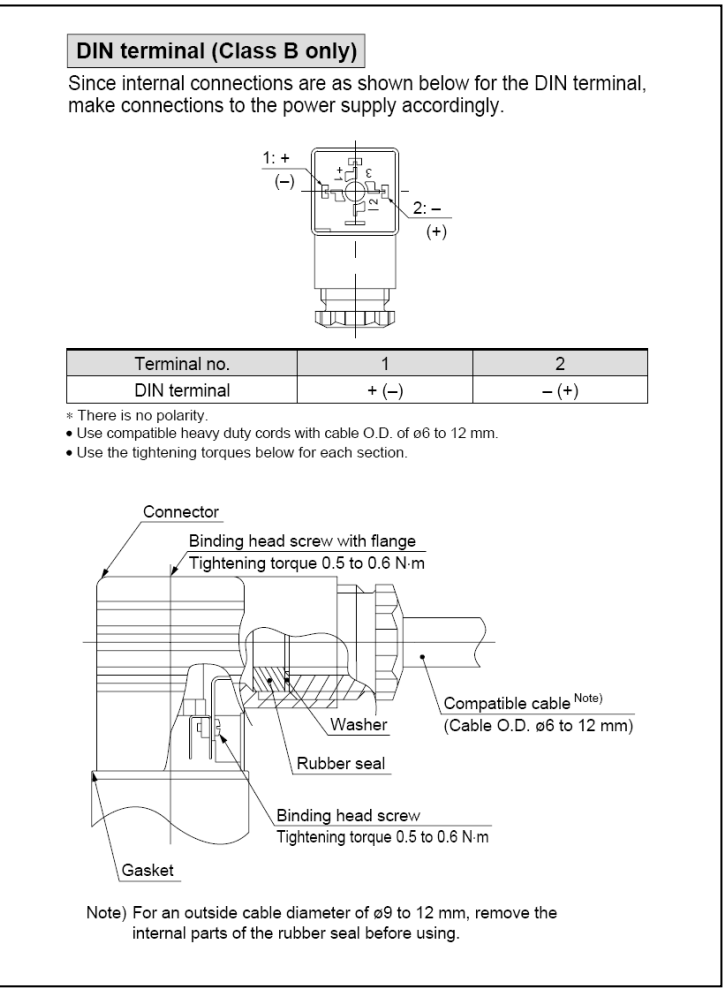


Figure 9

3 Installation (continued)

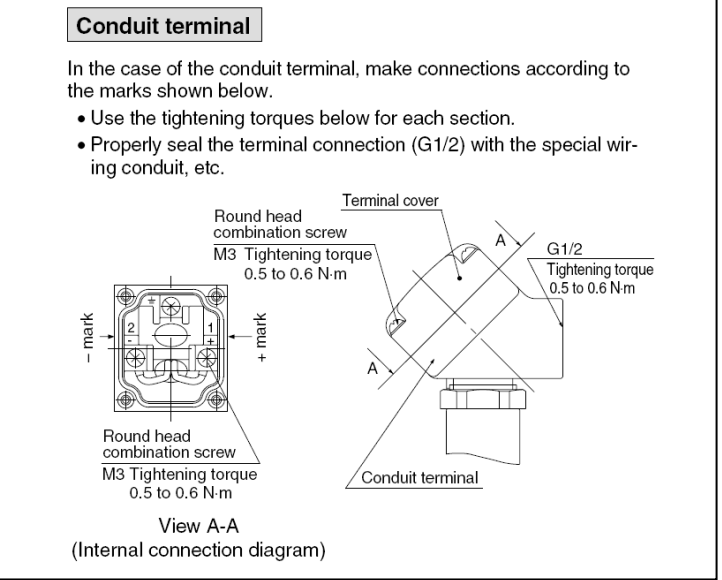


Figure 10

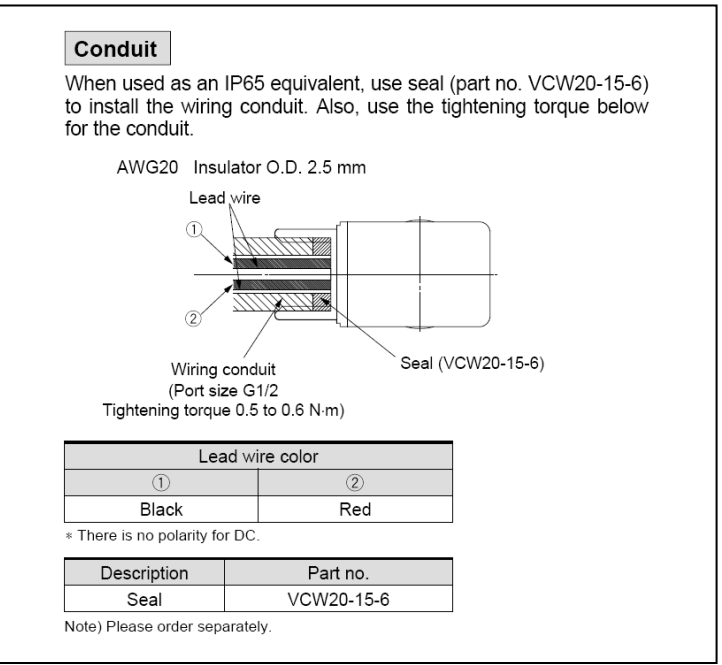


Figure 11

3 Installation (continued)

- Generally use electrical wire with cross sectional area 0.5 to 1.25 mm².
- When a surge from the solenoid affects the electrical circuitry, install a surge absorber, etc., in parallel with the solenoid. Or, adopt an option that comes with the surge voltage protection circuit.
- Use electrical circuits that do not generate chattering in their contacts.
- Use voltage that is within ±10% of the rated voltage. In cases with a DC power supply where responsiveness is important, stay within ±5% of the rated value. (The voltage drop is the value in the lead wire section connecting the coil).
- Do not bend or pull cables repeatedly.
- Connect the wires so that an external force greater than 10 N is not applied to the lead wire, otherwise the coil will burn.
- When the conduit type is used as an equivalent to an IP65 enclosure, install a wiring conduit, etc.
- When connecting C-R element parallel to switching element, leakage current flows through C-R element and the leakage voltage increases.

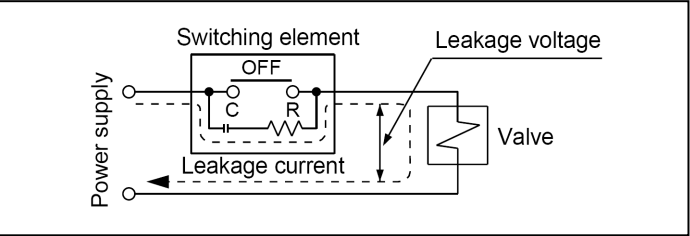


Figure 12

Ensure that the voltage leakage across the coil is as follows:
DC coil: 2% or less of rated voltage.

3.5 Mounting

- If air leakage increases or equipment does not operate properly, stop operation. After mounting is completed, confirm that it has been done correctly by performing a suitable function test.
- Do not apply external force to the coil section.
When tightening fittings, apply a wrench or other tool to the outside of the piping connecting parts.

- Do not mount valve with coil downwards.
If a valve is mounted with the coil positioned downwards, foreign objects in the fluid will adhere to the iron core leading to a malfunction.
- Do not warm the coil assembly with a heat insulator etc. Use tape, heaters etc. to prevent freezing, on the piping and valve body only.
- Secure with brackets, except when using steel pipe and copper fittings.
- Avoid sources of vibration, or adjust the distance from the body to a minimum length so that resonance will not occur.
- Painting and coating:
Warnings or specifications printed or labelled on the product should not be erased, removed or covered up.

3.6 Lubrication

CAUTION

- This valve can be operated without lubrication.
- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, use turbine oil Class 1(no additive), ISO VG32. But do not lubricate a valve with EPDM seal.
- Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.

4 Circuit Symbols

Valve

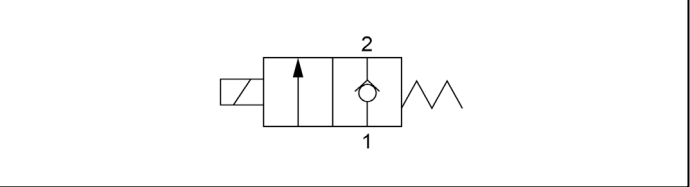


Figure 13

4 Circuit Symbols (continued)

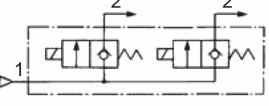
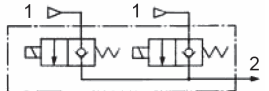
Manifold	Circuit Symbol
Common SUP	
Individual SUP	

Table 16

5 Internal Circuit & Wiring

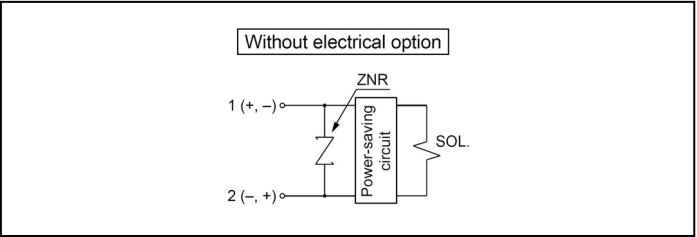


Figure 14

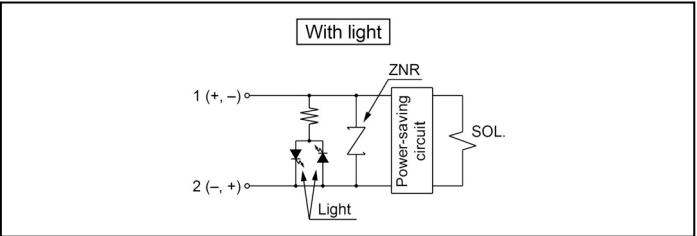


Figure 15

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 air can be dangerous. Maintenance of pneumatic systems should be performed by qualified personnel only.
- Drain: remove condensate from the filter bowl on regular basis.
- Before performing maintenance ensure the supply pressure is shut off and all residual air pressure is released from the system.
- After maintenance apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, verify product set-up parameters.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- In case of long term storage after use with heated water, thoroughly remove all moisture to prevent rust and deterioration of rubber materials etc.
- Low frequency operation:
Switch valves at least once every 30 days to prevent malfunction. Also, in order to use it under optimum state, conduct a regular inspection once every 6 months.
- Filters and strainers:
 - a. Be careful regarding clogging of filters and strainers
 - b. Replace filter elements after one year of use, or earlier if the pressure drop reaches 0.1 MPa.
 - c. Clean strainers when the pressure drop reaches 0.1 MPa.

6.2 Valve Removal

WARNING

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

6 Maintenance (continued)

- Shut off the fluid supply and release the fluid pressure in the system.
- Shut off the power supply and disconnect the leads.
- Remove the valve, ensuring any O-rings/gaskets are retained.

6.3 Solenoid Coil Replacement (see Figure 16)

WARNING

- The valve will reach high temperature when used with high temperature fluids. Confirm that the valve temperature has dropped sufficiently before performing work. If valve is touched inadvertently, there is danger of being burned.
- Shut off the fluid supply and release the fluid pressure in the system.
- Shut off the power supply and disconnect the leads.
- Carefully remove the clip using a flat bladed screwdriver, try not to damage name plate.
- Remove name plate.
- Slide off coil from tube assembly.
- Assembly is the reverse of removal, replace name plate if damaged.

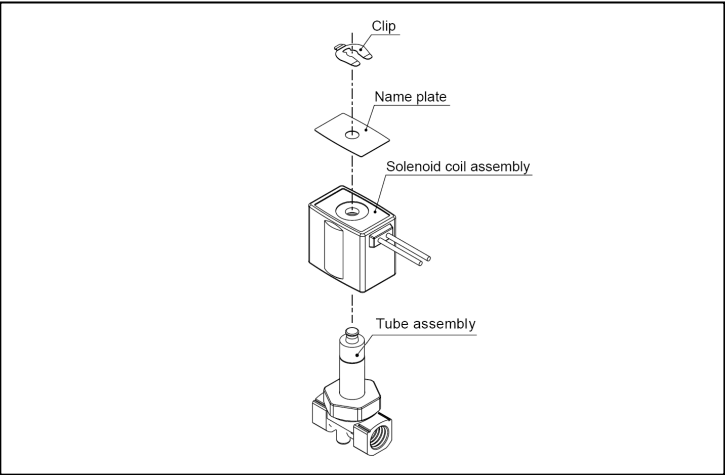


Figure 16

7 Limitations of Use

WARNING

- Do not exceed any of the specifications in section 2 of this document or the specific product catalogue.

7.1 Confirm the specifications

- Give careful consideration to the operating conditions such as the application, fluid and environment and use within the operating ranges specified in the catalogue.

7.2 Fluid

- Type of fluid;
Before using a fluid, confirm whether it is compatible with the materials for each model by referring to the fluids listed in the catalogue. Use a fluid with a dynamic viscosity of 50 mm²/s or less.
- Flammable oil, Gas;
Confirm the specification for leakage in the interior and/or exterior area.
- Corrosive gas;
Cannot be used since it will cause cracks by stress corrosion or result in other incidents.
- Use an oil-free specification when any oily particles must not enter the system.
- Applicable fluid in the catalogue list may not be suitable depending on the operating conditions. Give adequate consideration and then determine a suitable model, as the compatibility list is for general case.

7.3 Fluid quality

- The use of a fluid what contains foreign matter can cause problems such as malfunction and seal failure by promoting wear of the valve seat and armature, and by sticking to the sliding parts of the armature, etc.
- Install a suitable filter (strainer) immediately upstream from the valve. As a general rule, use 80 to 100 mesh.
- When the valve is used to supply water to boilers, substances such as calcium and magnesium, which generate hard scale and sludge, are present. Since this scale and sludge can cause the valve to malfunction, install water softening equipment and a filter (strainer) directly upstream from the valve to remove these substances.

7 Limitations of Use (continued)

7.4 Air quality

- 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.
- Install air filters;
Install air filters upstream, close to the valves. A filtration of 5 µm or less should be selected.
- Install an air drier or after cooler;
Compressed air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air drier or after cooler, etc.
- If excessive carbon powder is generated, eliminate it by installing mist separators upstream of the valves. If excessive carbon powder is generated by the compressor, it may adhere to the inside of the valves and cause a malfunction.

7.5 Maintenance space

- The installation should allow sufficient space for maintenance activities.

7.6 Fluid pressure range

- Fluid pressure should be within the allowable pressure range.

7.7 Ambient environment

- Use within the allowable ambient temperature range. Confirm the compatibility between the products composition materials and the ambient atmosphere.
- Ensure that the fluid does not touch the external surface of the product.

7.8 Static electricity

- Take measures against static electricity, since some fluids can cause static electricity.

7.9 Cannot be used as an emergency shut-off valve etc.

- 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 also be adopted.

7.10 Extended periods of continuous energization

- The solenoid coil will generate heat when continuously energized, so avoid installing in an enclosed space. Install in a well-ventilated area.
- Do not touch the coil while it is being energized or immediately after energization.
- Be especially careful when using three or more adjacent valves with manifolds and keeping them continuously energized for extended periods, as this may result in dramatic increases in temperature.

7.11 Pressure (including vacuum) holding

- Do not use for applications such as holding the pressure (including vacuum) inside a pressure vessel because of air leakage in the valve.

7.12 Impact precautions

- When impacts, such as water hammer (caused by rapid pressure fluctuations), etc. are detected, the solenoid valve may be damaged. Please carry out inspection of valve and take preventive measures.

8 Contacts

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