



# Installation and Maintenance Manual

## VXD21/22/23 Direct Operated 2 Port Solenoid Valve For Water, Oil and Air



Read this manual before using this product

- The information within this document is to be used by pneumatically trained personnel only.
- For future reference, please keep manual in a safe place.
- This manual should be read in conjunction with the current catalogue.

### 1 SAFETY RECOMMENDATION

#### 1.1 General recommendation

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO4414 (noted), JIS B 8370 (noted) and other safety practices.

Note 1:ISO 4414:Pneumatic fluid power - General rules relating to systems.  
 Note 2:JIS B 8370:Pneumatic system axiom.

**CAUTION:** Operator error could result in injury or equipment damage.

**WARNING:** Operator error could result in serious injury or loss of life.

**DANGER:** In extreme conditions, there is a possible result of serious injury or loss of life.

- WARNING:**
- The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**
    - Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.
  - Only trained personnel should operate pneumatically operated machinery and equipment.**
    - Compressed air can be dangerous if an operator is unfamiliar with it Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
  - Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
    - Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
    - When equipment is to be removed, confirm the safety process as mentioned above. Switch off air and electrical supplies and exhaust all residual compressed air in the system.
    - Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Bleed air into the system gradually to create backpressure, i.e. incorporate a soft-start valve).
  - Contact SMC if the product is to be used in any of the following conditions:**
    - Conditions and environments beyond the given specifications, or if product is used outdoors.
    - Installations on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
    - An application, which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

- CAUTION:**
- Ensure that the air supply system is filtered to 5 micron.

#### 1.2 Conformity to standard

This product is certified to and complies with the following standards:

EMC Directive 89/336/EEC	EN 50082-2, EN 55011
Low Voltage Directive 93/68/EEC	DIN VDE 0580

### 2 INTENDED CONDITIONS OF USE

#### 2.1 Specifications

##### Standard Specifications

Valve specification	Valve construction				Pilot style 2 port diaphragm type			
	Proof pressure MPa	5.0				C37, SUS, CAC407		
Body material	NBR, FKM, EPDM				Dust tight, Low jet proof (equivalent to IP65)*1			
Seal material	Location without corrosive or explosive gases				24 VDC, 12 VDC			
Protective construction	Within 10% of rated voltage				Within 10% of rated voltage			
Ambient air	Within 20% of rated voltage				Within 2% of rated voltage			
Rated voltage	AC (type B full wave rectifier type)				Class B, class H			
	AC (type B/H)*2							
	DC (type B only)							
Allowable voltage fluctuation	AC (type B full wave rectifier type)							
Allowable leakage voltage	AC (type B/H)*2							
	DC (type B only)							
Coil insulation type								

\*1 Electrical entry grommet surge voltage suppressor: IP40  
 \*2 VXD2130 AC (type B): only full wave rectifier type can be selected.

#### Normally Closed (N.C.)

Port size	Orifice size (mmØ)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)				Flow characteristics						Max. system pressure (MPa)	Weight (g)*			
				Water		Oil		Air		Water, Oil			Air					
				AC	DC	AC	DC	AC	DC	Av x 10 <sup>-6</sup> m <sup>2</sup>	Cv converted	C	b			Cv	Effective area mm <sup>2</sup>	
Screw	1/4 (8A)	10	VXD2130-02	0.02	0.7	0.5	0.5	0.4	0.9	0.7	46	1.9	8.5	0.35	2.0	-	1.5	420
	3/8(10A)	10	VXD2130-03		1.0	1.0	0.7	0.7	1.0	1.0	58	2.4	9.2		2.4	-		
		15	VXD2140-03		0.7	0.5	0.5	0.4	0.9	0.7	110	4.5	18.0		5.0	-		
	1/2(15A)	10	VXD2130-04		1.0	1.0	0.7	0.7	1.0	1.0	58	2.4	9.2		2.4	-		
		15	VXD2140-04		1.0	1.0	0.7	0.7	1.0	1.0	130	5.5	20.0		5.5	-		
	3/4(20A)	20	VXD2150-06		1.0	1.0	0.7	0.7	1.0	1.0	230	9.5	38.0		0.30	9.5		
Flange	1.1/4(32A)	35	VXD2270-32	0.03							310	13	-	-	-	225	1650	
		40	VXD2380-40									550	23	-	-	-	415	5400
		40	VXD2380-40									740	31	-	-	-	560	6800
		50	VXD2390-50									1200	49	-	-	-	880	8400

\* These figures are for grommet type. Add 10g for conduit, 30g for DIN terminal, 60g for terminal.  
 See terminology guide for details of max. operating pressure differential, max. system pressure.

#### Normally Open (N.O.)

Port size	Orifice size (mmØ)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)				Flow characteristics						Max. system pressure (MPa)	Weight (g)*					
				Water		Oil		Air		Water, Oil			Air							
				AC	DC	AC	DC	AC	DC	Av x 10 <sup>-6</sup> m <sup>2</sup>	Cv converted	C	b			Cv	Effective area mm <sup>2</sup>			
Screw	3/8(10A)	15	VXD2142-03	0.02	0.7	0.7	0.6	0.6	0.7	0.7	110	4.5	18.0	0.35	5.0	-	1.5	690		
		VXD2142-04	130								5.5	20.0	5.5						-	
	20	VXD2152-06	230								9.5	38.0	0.30						9.5	-
	25	VXD2262-10	310								13	-	-						-	225
Flange	1.1/4(32A)	35	VXD2272-32	0.03							550	23	-	-	-	415	5400			
		40	VXD2382-40									740	31	-	-	-	560	6800		
		50	VXD2392-50									1200	49	-	-	-	880	8400		

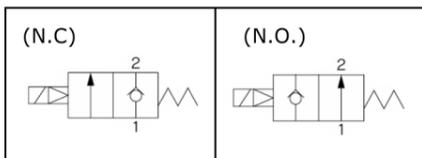
\* These figures are for grommet type. Add 10g for conduit, 30g for DIN terminal, 60g for terminal.  
 See terminology guide for details of max. operating pressure differential, max. system pressure.

#### Operating Fluid and Ambient Temperature

Power Source	Operating fluid temperature (°C)					Ambient temperature (°C)	
	Solenoid valve option (symbol)					Water, Oil	Air
AC	Nil, G, L	E, P	A, H	D, N	Nil, G	-10 to 60	-10 to 60
DC	1 to 60	1 to 99	-5 to 60	-5 to 100	-10 to 60	-10 to 60	-10 to 60
DC	1 to 60	-	-5 to 60	-	-10 to 60	-10 to 60	-

\*1 No freezing.

#### 2.2 Circuit Symbols



### 3 INSTALLATION

- WARNING:**
- Do not install unless the safety instructions have been read and understood.

#### 3.1 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 strong vibrations and/or shock. Check the product specifications for above ratings.
  - Do not mount the product in a location where it is exposed to radiant heat.

#### 3.2 Piping

- CAUTION:**
- Before piping make sure to clean up chips, cutting oil, dust etc.
  - When installing piping or fitting into a port, ensure that sealant material does not enter the port inside. When using seal tape, leave 1.5 to 2 threads exposed on the end of pipe/fitting.

Thread	Appropriate tightening torque (Nm)
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24
Rc 1/2	28 to 30
Rc 3/4	28 to 30
Rc 1	36 to 38

#### 3.3 Electrical connection

- CAUTION:**
- When DC power is connected to a solenoid valve equipped with light and/or surge voltage suppressor, check for polarity indications.
  - For polarity indications:
    - No diode to protect polarity: if polarity connection is wrong, the diode in the valve or switching device at control equipment or power supply may be damaged.
    - With diode to protect polarity: if polarity connection is wrong, the valve does not switch.
  - As a rule, use electrical wire with a cross sectional area of 0.5 to 1.25mm<sup>2</sup> for wiring. Furthermore, do not allow excessive force to be applied to the lines.
  - Use electrical circuits which do not generate chattering in their contacts.
  - 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.
  - 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. (However, a surge voltage occurs even if the surge voltage protection circuit is used. For details, please consult SMC.)

#### Grommet

Class H coil. AWG18 Insulator O.D. 2.2 mm  
 Class B coil. AWG20 Insulator O.D. 2.5 mm

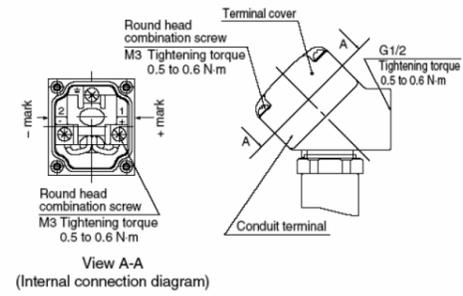
Rated voltage	Lead wire color	
	①	②
DC (Class B only)	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Gray	Gray

\* There is no polarity. (For the low power consumption type, there is polarity.)

### Conduit terminal

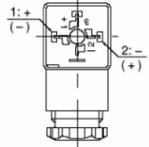
In the case of the conduit terminal, make connections according to the marks shown below.

- Use the tightening torques below for each section.
- Properly seal the terminal connection (G1/2) with the special wiring conduit, etc.



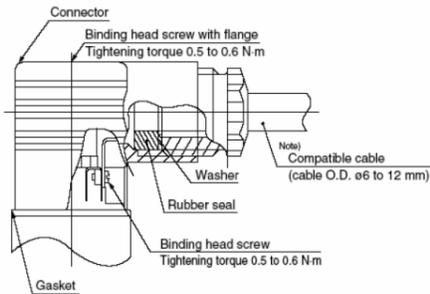
### Din connector (Class B only)

Since internal connections are as shown below for the DIN connector, make connections to the power supply accordingly.



Terminal no.	1	2
DIN terminal	+ (-)	- (+)

- \* There is no polarity.
- Use compatible heavy duty cords with cable O.D. of ø6 to 12.
- Use the tightening torques below for each section.

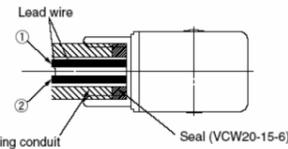


Note) For an outside cable diameter of ø9 to 12 mm, remove the internal parts of the rubber seal before using.

### Conduit

When used as an IP65 equivalent, use seal (part no. VCW20-15-6) to install the wiring conduit. Also, use the tightening torque below for the conduit.

Class H coil: AWG18 Insulator O.D. 2.2 mm  
Class B coil: AWG20 Insulator O.D. 2.4 mm



Bore size G1/2 Tightening torque 0.5 to 0.6 N·m

Rated voltage	Lead wire color	
	①	②
DC	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Gray	Gray

\* There is no polarity for DC. (For the low power consumption type, there is polarity.)

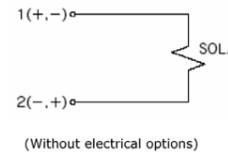
Description	Part no.
Seal	VCW20-15-6

Note) Please order separately.

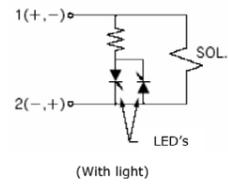
### 3.4 Electrical Circuits

#### DC Circuit

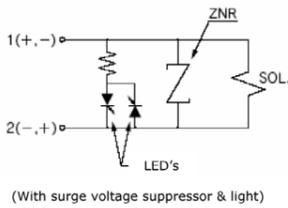
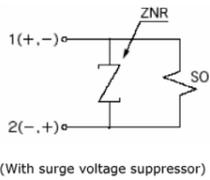
Grommet, Conduit, Conduit terminal, DIN terminal type



Conduit terminal, DIN terminal type



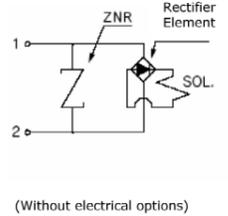
Grommet, Conduit terminal, DIN terminal type



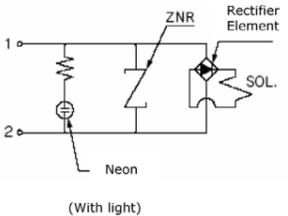
#### AC Circuit/Type B

\*AC/Type B is standard product with surge voltage suppressor

Grommet, Conduit, Conduit terminal, DIN terminal type

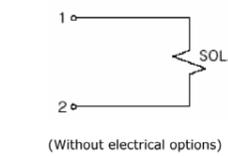


Conduit terminal, DIN terminal type

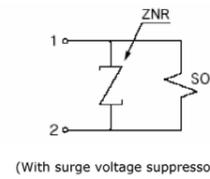


#### AC Circuit/Type H

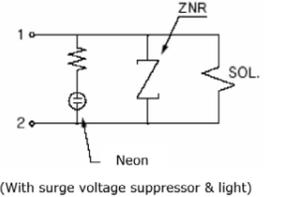
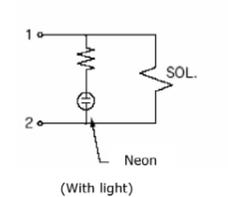
Grommet, Conduit, Conduit terminal



Grommet, Conduit terminal



Conduit terminal



### 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 is performed, apply a wrench or other tool to the outside of the piping connection parts.
- **Be sure not to position the coil downwards.**  
When mounting a valve with its 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., for freeze prevention on the piping and body only. They can cause the coil to burn out.
- **Secure with brackets, except in the case of steel piping and copper fittings.**
- **Avoid sources of vibration, or adjust the arm from the body to the minimum length so that resonance will not occur.**
- **Painting and coating.**  
Warnings or specifications printed or labeled on the product should not be erased, removed or covered up.

### 3.6 Lubrication

- **CAUTION:**  
SMC products have been lubricated for life at manufacturer, and do not require lubrication in service.
- If a lubricant is used in the system, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.
- Do not lubricate a valve with EPDM seal, damage may occur.

### 4 MAINTENANCE

- **WARNING:**  
Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.
- If handled improperly, compressed air can be dangerous. Assembly, handling and repair of pneumatic system should be performed by qualified personnel only.
- Drain: remove condensate from the filter bowl on a regular basis.
- Shut-down before maintenance: before attempting any kind of maintenance make sure the supply pressure is shut off and all residual air pressure is released from the system to be worked on.
- Start-up after maintenance: apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, please 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.

#### Removing the product

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.

1. Shut off the fluid supply and release the fluid pressure in the system.
2. Shut off the power supply.
3. Disconnect the product.

#### 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.

#### Filters and strainers

1. Be careful regarding clogging of filters and strainers.
2. Replace filter elements after one year of use, or earlier if the pressure drop reaches 0.1 Mpa.
3. Clean strainers when the pressure drop reaches 0.1 Mpa.

#### Lubrication

- When using after lubricating, never forget to lubricate continuously.

#### Storage

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

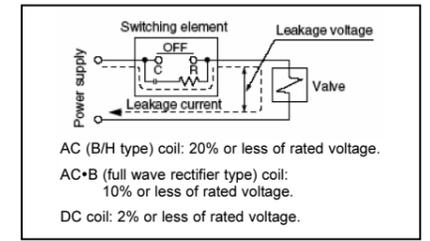
#### Exhaust the drain from an air filter periodically.

### 5 LIMITATIONS OF USE

- **WARNING:**  
Do not exceed any of the specifications laid out in section 2 of this document or the specific product catalogue.

#### Leakage voltage

- Particularly when using a resistor in parallel with a switching element and using a C-R element (surge voltage suppressor) to protect the switching element, take note that leakage current will flow through the resistor, C-R element, etc., creating a possible danger that the valve may not turn off.



#### Low temperature operation

1. The valve can be used in an ambient temperature down to -20°C, however take measures to prevent freezing or solidification of impurities, etc.
2. When using valves for water application in cold climates, take appropriate measures to prevent the water from freezing in tubing after cutting the water supply.

### 6 EUROPEAN CONTACT LIST

#### 6.1 SMC Corporation

Country	Telephone	Country	Telephone
Austria	(43) 2262-62 280	Italy	(39) 02-92711
Belgium	(32) 3-355 1464	Netherlands	(31) 20-531 8888
Czech Republic	(420) 5-414 24611	Norway	(47) 67 12 90 20
Denmark	(45) 70 25 29 00	Poland	(48) 22-548 50 85
Finland	(358) 9-859 580	Portugal	(351) 22 610 89 22
France	(33) 1-64 76 1000	Spain	(34) 945-18 4100
Germany	(49) 6103 4020	Sweden	(46) 8 603 12 00
Greece	(30) 1- 342 6076	Switzerland	(41) 52-396 3131
Hungary	(36) 23 511 390	Turkey	(90) 212 221 1512
Ireland	(353) 1-403 9000	United Kingdom	(44) 1908-56 3888

#### 6.2 Websites

SMC Corporation	www.smcworld.com
SMC Europe	www.smceu.com