

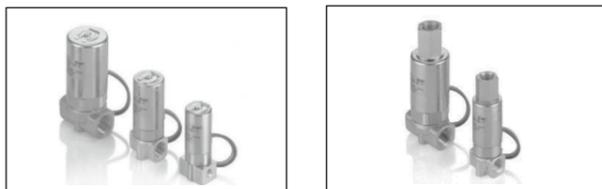


ORIGINAL INSTRUCTIONS

Instruction Manual

Compact Direct Operated 2/3 Port Solenoid Valve for Water and Air

Series VDW10/20/30/200/300



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.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Caution

- The product is provided for use in manufacturing industries only. Do not use in residential premises.

2 Specifications

2.1 Valve specifications

Model	VDW10/20/30	VDW 200/300
Valve type	Direct operated poppet	
Fluid ^{Note 1)}	Water, Air, Low vacuum	
Withstand pressure [MPa]	2	
Operating pressure range [MPa]	0 to 1.0	
Maximum operating pressure differential [MPa] ^{Note 2)}	Refer to catalogue	
Ambient temperature [°C]	-10 to 50 (no freezing)	
Fluid temperature [°C]	1 to 50 (no freezing)	
Environment	Location without corrosive or explosive gases	
Flow characteristics	Refer to catalogue	
Duty cycle	Contact SMC	
Min. operating frequency	1 cycle / 30 days	

2 Specifications - continued

Max. operating frequency [Hz]	Contact SMC
Lubrication	Not required
Impact/Vibration resistance [m/s ²] <small>Note 3)</small>	150/30
Mounting orientation	Restricted
Weight	Refer to catalogue
Valve leakage [cm ³ /min]	0
With water pressure	0
Air	≤1

Table 1.

Note 1) When used with pure water, select "L" (stainless steel, FKM) for the material type.

Note 2) The maximum operating pressure differential differs depending on the flow direction of the fluid. If the pressure differential at each port exceeds the values in the table below, valve leakage may occur.

Note 3) 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 both energized and de-energized states and for every time in each condition. (Values quoted are for a new valve)

Vibration resistance: No malfunction occurred in a one-sweep test between 5 and 200 Hz. Tests are performed at both energized and de-energized states in the axial direction and at right angles to the main valve and armature. (Values quoted are for a new valve).

2.2 Solenoid specifications

Model	VDW 10/20/30	VDW 200/300
Coil rated voltage	DC [VDC] 24, 12, 6, 5, 3 AC [VAC] 100, 110, 200, 220	24, 12
Electrical entry	Grommet, Flat terminal	
Coil insulation class	Class B	
Allowable voltage fluctuation	±10% of rated voltage	
	Grommet / Tape winding	Dust-proof (IP40 equivalent)
Enclosure (based on IEC60529)	Flat terminal / Moulded <small>Note 1)</small>	Dust-tight (IP60 equivalent)
	Grommet / Moulded	Dust-tight / Low jetproof (IP65 equivalent)
Power consumption [W] ^{Note 2)}	2.5 (VDW 10) 3 (VDW 20/30)	3
Surge voltage suppressor	DC None AC Varistor	

Table 2.

Note 1) Since electrical connections are exposed, there is no water resistance.

Note 2) Since the AC coil specifications include a rectifying device, there is no difference in power consumption for starting and holding. In the case of 110/220VAC, VDW 10 is 3W and VDW 20/30 is 3.5W.

2.3 Pneumatic symbol

Refer to catalogue for pneumatic symbols.

2.4 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 enclosures are protected against dust and water, however, these products cannot be used in water.
- Products compliant with IP65 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

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.
- 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.
- Tighten fittings to the specified tightening torque.

Thread	Tightening torque [N·m]
M5	1 to 1.5
Rc / NPT 1/8	7 to 9
Rc / NPT 1/4	12 to 14
Rc / NPT 3/8	22 to 24

Table 3.

- Follow the manufacturer's instructions if using fittings other than SMC or G-thread.

3.3.1 Piping to 3 Port Valve N.O. Port

Caution

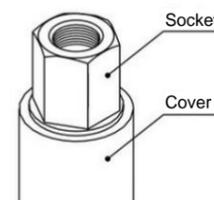


Figure 1.

- When piping to an N.O. port, be sure to perform piping work while securing the socket by using a wrench or other tools.

3.4 Lubrication

Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, refer to catalogue for details.

3.5 Fluid supply

Warning

- The use of a fluid that contains foreign objects 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 of the valve. Select a filter with a filtration size of 5 µm or smaller for air, and 100 mesh for water.

3.5.1 Air

- 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.
- 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 mesh separators upstream of the valves to eliminate it.

3.5.2 Water

- Corrosion resulting from rust stains, chloride, etc., from the piping may cause malfunction, seal failure, or damage. 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.

3 Installation - continued

3.6 Mounting

Warning

- Do not mount 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 apply external force to the coil when holding it to connect piping, as the tube may deform.
- 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.

3.7 Electrical circuits

Caution

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

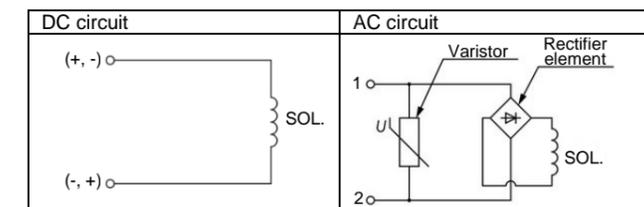


Table 4.

3.8 Electrical connectors

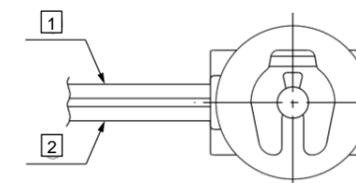


Figure 2.

Rated voltage	Lead wire colour	
	1	2
DC	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Grey	Grey

Table 5.

3.9 Residual voltage

Caution

- If a varistor voltage suppressor is used, the suppressor arrests the back EMF voltage from the coil to a level in proportion to the rated voltage.
- Ensure the transient voltage is within the specification of the host controller.
- Contact SMC for the varistor residual voltage.
- Valve response time is dependent on surge suppression method selected.

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-energized state to switch.
- When installing a breaker circuit to isolate the power, consider a valve with polarity (with polarity protection diode), or 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 Installation - continued

3.12 Effect of back pressure when using a manifold

Warning

- Use caution when valves are used on a manifold, because an actuator may malfunction due to back-pressure.

4 How to Order

Refer to catalogue for 'How to Order'.

5 Outline Dimensions

Refer to catalogue 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 air can be dangerous.
- 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 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.
- In the case of long-term storage, thoroughly remove all moisture to prevent rust and deterioration of rubber materials, etc.

6.2 Manifold mounting

	Tightening torque [N·m]
Connecting plate assembly screw	0.9 ± 0.1 N·m
Bracket assembly screw	0.9 ± 0.1 N·m

Table 6.

- Install a passage pipe assembly in between the manifold bases to be added.
- Connect the respective manifold bases with a connecting plate assembly.
- Attach brackets to the manifold bases (when equipped with brackets).

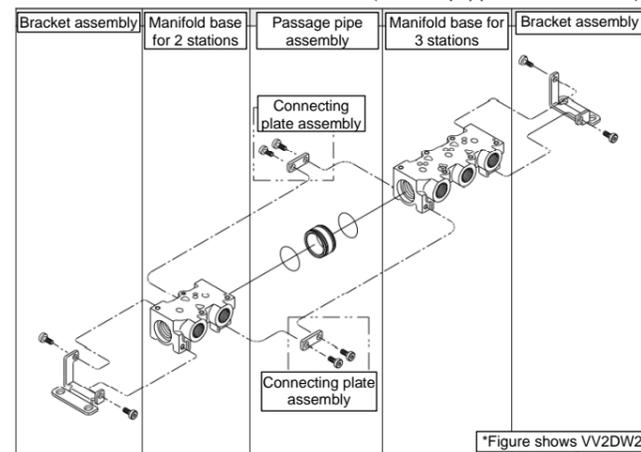


Figure 3.

6.3 Replacement parts

Caution

Refer to catalogue for additional information.

6 Maintenance - continued

6.3.1 Replacing the solenoid coil – 3 port valve

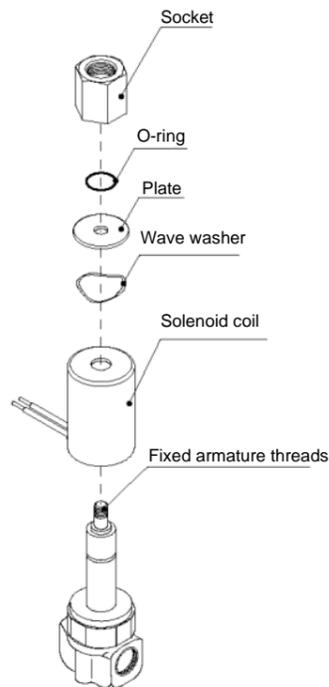


Figure 4.

- After removing the socket with a wrench, etc., lift off the plate, wave washer and cover, and replace the coil assembly. After replacing the coil, first tighten the socket by hand while holding down the plate and wave washer, and then tighten it further with a torque of 0.8 to 1 N·m.

Caution

- Be careful that the O-ring installed on the bottom (plate side) of the socket does not fall out or become chewed up, etc.
- Be sure to secure the body by wrench, etc., and tighten the socket within the tightening torque range given above. If the torque is applied excessively, there is a danger of damaging the threads.

6.3.2 Replacing the solenoid coil – 2 port valve

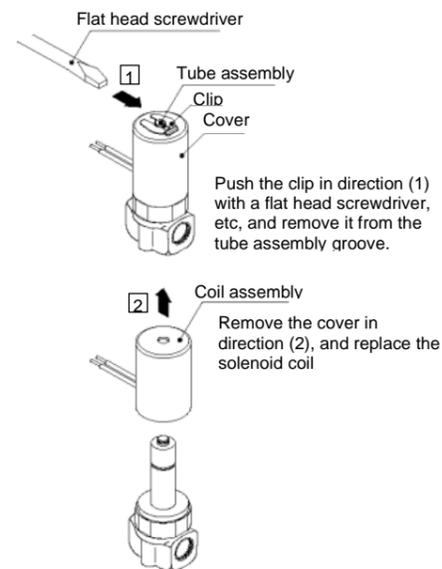


Figure 5.

6 Maintenance - continued

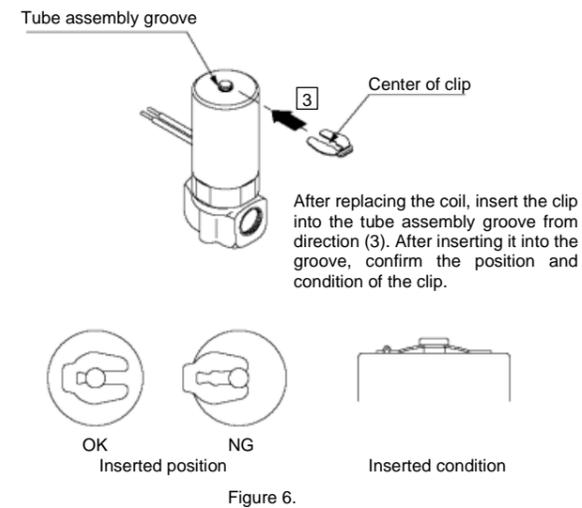


Figure 6.

6.4 Storage

Caution

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

6.5 Filter and strainer

Caution

- Replace filter element every 1 year or when the pressure drop becomes 0.1MPa, whichever comes first.
- Wash strainer when the pressure drop becomes 0.1MPa.

7 Limitations of Use

7.1 Limited warranty and disclaimer/compliance requirements

Caution

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 OFF position by spring force.
Electrical supply present, air supply cut	Valve remains in the ON position.

Table 7.

7.3 Low temperature operation

- The valve can be used in an ambient temperature as low as -10 °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.

7.4 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.

7.5 Effect of back pressure

When operating the product with flow direction 2 → 1 with pressure supplied to port 2, there is a risk of the valve opening momentarily and fluid leaking to the downstream side due to a rapid increase of the upstream pressure.

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 Limitations of Use – continued

7.7 Closed 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.), or use a SMC water hammer relief valve (e.g. VXR series).

7.9 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.

Caution

7.10 Leakage voltage

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes ≤ 2% (for DC coils) or ≤ 10% (for AC coils) of the rated voltage across the valve.

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 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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