ORIGINAL INSTRUCTIONS

Instruction Manual
3 Port 3 Position Valve
VEX3 Series

The intended use of this valve is to control the movement of an actuator.

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	Body ported	VEX312#	VEX332#
	Base mounted	VEX322#	VEX342#
Fluid		Air	
Internal pilot operating pressure range [MPa]		0.2 to 0.7	
External pilot operating pressure range [MPa]	Operating pressure range	-101.2 kPa to 1.0	
	Pilot pressure range	0.2 to 0.7	
Ambient and fluid temperature [°C]		0 to 50	
Flow characteristics		Refer to catalogue	
Response time [ms] (Pilot pressure 0.5 MPa)		≤40	≤60
Duty cycle		Contact SMC	
Min. operating frequency		1 cycle / 30 days	

2 Specification - continued

Max. operating frequency [Hz]	3
Manual override	Non-locking push type, Locking type (slotted/ push-turn slotted/push turn lever)
Lubrication	Not required
Impact/Vibration resistance [m/s^2] Note 1)	150/30
Enclosure (based on IEC60529)	IP40
Mounting orientation	Unrestricted
Weight	Refer to catalogue

Table 1.

Note 1) 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-energised 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 45 and 2000 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

Pilot valve		V114#-####	V115#-###
Coil rated voltage	DC [VDC]	3, 5, 6, 12, 24	12, 24
	AC [VAC]	-	100, 110, 200, 220
Electrical entry		Grommet, L plug connector, M plug connector	DIN terminal
Coil insulation class		Class B	
Allowable voltage fluctuation		-10 to +10% of rated voltage Note 1)	
Power consumption (DC) [W]		1.0 (1.1 with indicator light)	
Apparent power (AC) [VA] Note 2)	100 VAC	-	0.78 (0.87)
	110 VAC		0.86 (0.97)
	200 VAC		1.15 (1.30)
	220 VAC		1.27 (1.46)
Surge voltage suppressor		Varistor	
Indicator light	DC	LED	
	AC	Neon light	

Table 2.

Note 1) Allowable voltage fluctuation for S and Z types:
24 VDC: -7% to +10%
12 VDC: -4% to +10%
Note 2) Bracket values are apparent power with indicator light.

2.3 Manifold specifications

Model		VVEX2	VVEX4		
Applicable valve		VEX322#	VEX342#		
Valve stations Note 1)		2 to 8	2 to 6		
Port specification		Common SUP, EXH			
Manifold pilot type		Internal, common external pilot, Individual external pilot Note 2)			
Common external pilot port size		M5 x 0.8 (length of thread 5)			
Port size	1(P)	1/4	3/8	3/8	1/2
	3(R)				
	2(A)		1/4		3/8
Applicable blanking plate		VEX1-17-3A (With gasket, screw)	VEX4-5-3A (With gasket, screw)		

Table 3.

Note 1) When the VVEX2 series is used with 5 stations or more, or the VVEX4 series is used with 4 stations or more, apply pressure to the port P on both ends and exhaust from the port R on both ends.
Note 2) The only applicable valve is the VEX3221.

2 Specification - continued

2.4 Pneumatic symbol

Refer to catalogue for pneumatic symbol.

2.5 Indicator light

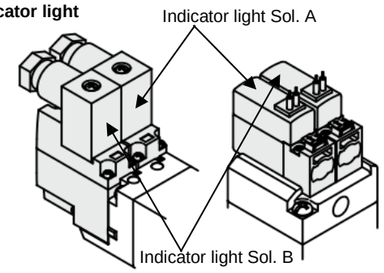

Figure 1.

2.6 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.

3.3 Piping

⚠ 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 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

Port	Thread	Tightening torque [N·m]
Pilot exhaust	M5	1 to 1.5
External pilot	1/8	3 to 5
1(P), 2(A), 3(R)	1/4	8 to 12
	3/8	15 to 20
	1/2	20 to 25

Table 4.

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 Air supply

⚠ 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

3 Installation - continued

3.6 Manual override

⚠ Warning

- Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation.
- Locked manual overrides might prevent the valve responding to being electrically de-energised or cause unexpected movement in the equipment.
- To operate non-locking push type manual override, push the manual override until it stops.

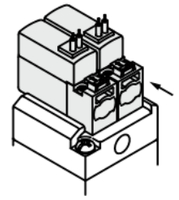

Figure 2. Non-locking push type (Grommet (L/M) plug connector)

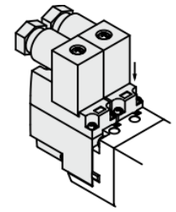

Figure 3. Non-locking push type (DIN terminal)

- To operate the locking slotted manual override, use a tool to turn the manual override 90° clockwise, the valve will turn on and lock. To release it, turn it counterclockwise 90° and check that it is in the OFF position.

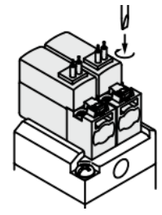

Figure 4. Locking slotted type (Grommet/ (L/M) plug connector)

- To operate the push-turn locking manual override, press the manual override down using a tool (slotted type) or by hand (lever type), then to turn the manual override 90° clockwise, the valve will turn on and lock. To release it, turn it counterclockwise 90° and check that it is in the OFF position.
- If the push-turn locking manual override is not turned, it can be operated the same was as non-locking push type.

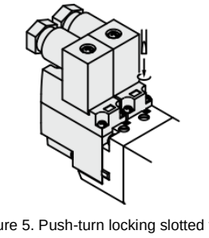

Figure 5. Push-turn locking slotted type (Din terminal)

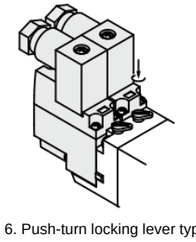

Figure 6. Push-turn locking lever type (DIN terminal)

⚠ Caution

- When locking the manual override on the push-turn locking types, be sure to push it down before turning. Turning without first pushing it down can cause damage to the manual override and issues such as air leakage etc.

3 Installation - continued

Caution

Do not press this button as this is not a manual override, and it can result in damage to the product. This applies to body sizes 1 and 2.

Figure 7.

3.7 Mounting

Caution

- Ensure gaskets are in good condition, not deformed and are dust and debris free.
- When mounting valves to manifold or sub-plate ensure gaskets are present, aligned and securely in place and tighten the mounting screws to a torque of 1.35-1.65 N·m (VEX322*)(M4), 2.7-3.3 N·m (VEX342*)(M5).

3.8 Electrical circuits

Caution

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

3.8.1 DC

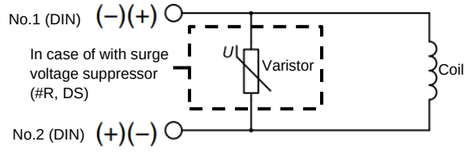

Figure 8. With surge voltage suppressor (#R, DS) /
Without surge voltage suppressor (Nil) - (DIN, Grommet, L/M Plug connector)

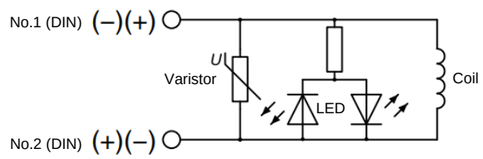

Figure 9. With light/surge voltage suppressor (#U, DZ) - (DIN, Grommet, L/M Plug connector)

Note) DIN terminal has no polarity.

3.8.2 AC

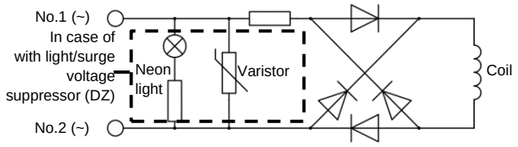

Figure 10. With light/surge voltage suppressor (DZ) /
Without surge voltage suppressor (Nil) - (DIN)

3.9 Electrical connectors

3.9.1 Plug connector

Caution

Refer to catalogue for attaching/detaching connectors, crimping of lead wires and sockets and attaching/detaching sockets with lead wires.

3 Installation - continued

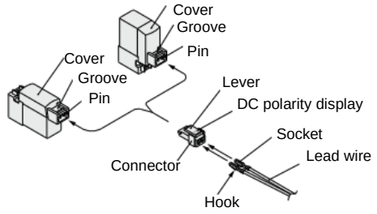

Figure 11. Attaching and detaching connectors

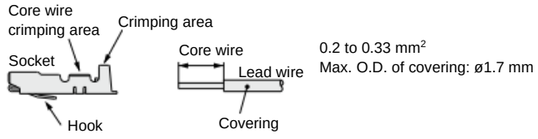

Figure 12. Crimping of lead wires and sockets

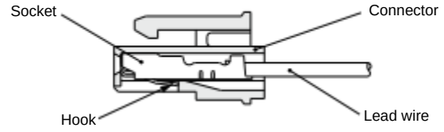

Figure 13. Attaching and detaching sockets with lead wires

3.10 DIN terminal connector

Caution

- Refer to catalogue for how to use DIN terminal connector.
- Refer to catalogue for how to change electrical entry direction.
- Compatible cable: cord O.D.: ø3.5 mm to ø7.mm.
  (Reference) 0.5 mm², 2-core or 3-core, equivalent to JIS C 3306.

Ground nut
Tightening torque:
1.65 to 2.5 N·m.

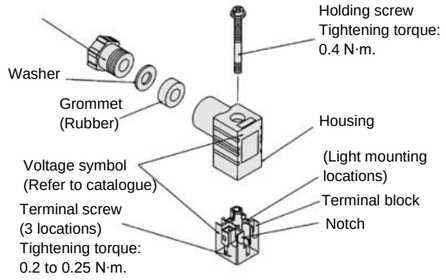

Figure 14. DIN connector diagram

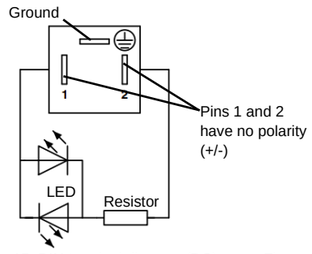

Figure 15. DIN terminal diagram (DC)

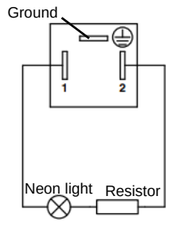

Figure 16. DIN terminal diagram (AC)

3 Installation - continued

3.11 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.

3.12 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, consider a valve with polarity (with polarity protection diode), or install a surge absorption diode across the output of the breaker.

3.13 Extended period of continuous energization

Warning

- If a valve will be continuously energized for an extended period of time, the temperature of the valve will increase due to the heat generated by the coil assembly. This will likely adversely affect the performance of the valve and any nearby peripheral equipment. Therefore, if the valve is to be energized for periods of longer than 30 minutes at a time, or if during the hours of operation the energized period per day is longer than the de-energized period, we advise using a valve with specifications listed below.
- Pilot operated: A 0.4 W or lower valve, such as the SY series, or a valve with a power-saving circuit

3.14 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.

6.2 Mounting

Caution

Refer to 3.7 Mounting for how to mount valve to sub-plate or manifold.

6 Maintenance - continued

6.3 Replacement parts

Caution

- Refer to catalogue for how to order replacement pilot valve. Recommended tightening torque for pilot valve M2 mounting screws is 0.14 to 0.17 N·m.
- Refer to catalogue for how to order replacement sub-plates, gaskets, brackets, pilot exhaust silencer and connector assemblies.

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

In the event of loss of air supply or electrical supply, the spool returns to the OFF position by spring force.

7.3 Intermediate stopping

Refer to Handling Precautions for 3/4/5 port Solenoid Valves.

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 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.

Caution

7.6 Leakage voltage

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes ≤ 3% (for DC coils) or ≤ 8% (for AC coils) of the rated voltage across the valve.

7.7 Low temperature operation

Unless otherwise indicated in the specifications for each valve, operation is possible to 0˚C, but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

7.8 Momentary energization

If a double solenoid valve is operated with momentary energization, it should be energized for at least 0.1 second. However, depending on the secondary load conditions, it should be energized until the cylinder reaches the stroke end position, as there is a possibility of malfunction otherwise.

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)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan

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