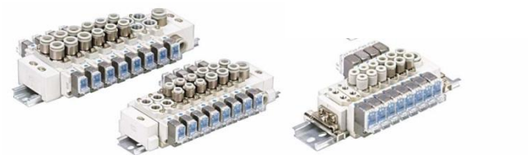
ORIGINAL INSTRUCTIONS

Instruction Manual

Refer to Declaration of Conformity for relevant Directives

5 Port Solenoid Valve – Body Ported
Series SY3000/5000/7000 Type 60



The intended use of the valve is to control the movement of an actuator. Refer to how to order for CE marked and/or validated components.

For validated types according to ISO 13849 refer to section 5 "How to Order". See also section 2 "Specifications".

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: Manipulating industrial robots -Safety.etc.

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.
- To ensure safety of personnel and equipment the safety instructions in this manual must be observed, along with other relevant safety practices.

⚠ **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

- **The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**
- Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

1 Safety Instructions – Continued

- **Only personnel with appropriate training should operate machinery and equipment.**
  The product specified here may become unsafe if handled incorrectly.
  The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- **Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
  1) The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
  2) When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
  3) Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- **Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
  1) Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
  2) Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustions and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specification described in the product catalogue.
  3) An application which could have negative effects on people, property, or animals requiring special safety analysis outside the scope of ISO 13849 described in this document.
  4) Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.
- **Always ensure compliance with relevant safety laws and standards.**
  All electrical work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

⚠ Caution

- **The product is provided for use in manufacturing industries.**
  The product herein described is basically provided for peaceful use in manufacturing industries.
  If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
  If anything is unclear, contact your nearest sales branch.

2 Specifications

2.1 Valve Specifications

Series		SY3000	SY5000	SY7000
Fluid		Air		
Internal pilot Operating pressure range (MPa)	2 position single	0.15 to 0.7		
	2 position double	0.1 to 0.7		
	3 position	0.2 to 0.7		
Ambient and fluid temperature (°C)		-10 to +50 (no freezing)		
Air quality		5 µm filtration or smaller		
Max. operating frequency (Hz)	2 position single, double	10	5	5
	3 position	3	3	3
Min. operating frequency		1 cycle / 30 days		
Manual override (Manual operation)		Non-locking push type, Push-turn locking slotted type, Push-turn locking lever type		
Pilot exhaust method		Common exhaust type for main and pilot valve		
Lubrication		Not required [note1)]		
Mounting position		Unrestricted		
Impact / Vibration resistance (m/s^2) [Note 2)]		150 / 30		

2 Specifications – Continued

Enclosure			Dust proof (DIN terminal, M8 connector: IP65 [Note 3)])
Response time			Refer to 2.3
Flow			Refer to 2.4
Standards [Note 4)]			Complies with the basic and well-tried safety principles of EN ISO 13849-2:2012
B_{10} [Note 5)]	Single, Double, 3 port		47 million cycles
	3 Position		27 million cycles
B_{10D} [Note 5)]	Single, Double, 3 port		94 million cycles
	3 Position		54 million cycles

Table 1

Notes:

Note 1) If lubrication is used in the system, use class 1 turbine oil (no additive), ISO VG32

Note 2) **Impact resistance:** No malfunction occurred when it was tested in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states every once for each condition.
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Test was performed at both energized and de-energized states in the axial direction and at the right angles to the main valve and armature. (Values in the initial stage)

Note 3) Based on IEC60529

Note 4) For validated types refer to section 5 "How to Order".

Note 5) Under SMC test conditions. The B_{10} figure is estimated from SMC life tests. The B_{10D} figure is derived from B_{10} using the assumption in EN ISO 13849-1:2015 Annex C. Contact SMC for details.

2.2 Solenoid Specifications

Electrical entry			Grommet (G), (H) L plug connector (L) M plug connector (M) DIN terminal (D), (Y) M8 connector (W)	
			G, H, L, M, W	D, Y
Coil rated voltage (V)	DC		24, 12, 6, 5, 3	24, 12
	AC (50/ 60 Hz)		100, 110, 200, 220	
Allowable voltage fluctuation			±10% of rated voltage *	
Power consumption (W)	DC	Standard	0.35 [With indicator light: 0.4 (DIN terminal with indicator light: 0.45)]	
		With power saving circuit	0.1 (With indicator light only) [note1)] [Starting 0.4, Holding 0.1]	
Apparent power (VA) [note 2]	AC	100 V (With indicator light)	0.78 (0.81)	0.78 (0.87)
		110 V (With indicator light) [115 V (With indicator light)]	0.86 (0.89) [0.94 (0.97)]	0.86 (0.97) [0.94 (1.07)]
		200 V (With indicator light)	1.18 (1.22)	1.15 (1.30)
		220 V (With indicator light) [230 V (With indicator light)]	1.30 (1.34) [1.42 (1.46)]	1.27 (1.46) [1.39 (1.60)]
Duty cycle			Contact SMC	
Surge voltage suppressor			Diode (Varistor is for DIN terminal and non-polar)	
Indicator light			LED (AC of DIN connector is neon light)	

Table 2

Notes:

Note 1) In common between 110 VAC and 115 VAC, and between 220 VAC and 230 VAC.
* For 115 VAC and 230 VAC, the allowable voltage is -15% to +5% of rated voltage.
* S, Z and T type (with power saving circuit) should be used within the following allowable voltage fluctuation range due to a voltage drop caused by the internal circuit.
  S and Z type: 24 VDC: -7% to +10%
  12 VDC: -4% to +10%
  T type: 24 VDC: -8% to +10%
  12 VDC: -6% to +10%

2 Specifications – Continued

Note 2) DIN terminal and M8 connector with power saving circuit are not available.

2.3 Response Time

Note) Based on dynamic performance test, JIS B 8375-1981. (Coil temperature: 20 °C, at rated voltage)

2.3.1 SY3000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without surge voltage suppressor	With surge voltage suppressor	
		S, Z type	R, U type
2 position single	12 or less	15 or less	12 or less
2 position double	10 or less	13 or less	10 or less
3 position	15 or less	20 or less	16 or less

Table 3

2.3.2 SY5000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without surge voltage suppressor	With surge voltage suppressor	
		S, Z type	R, U type
2 position single	19 or less	26 or less	19 or less
2 position double	18 or less	22 or less	18 or less
3 position	32 or less	38 or less	32 or less

Table 4

2.3.3 SY7000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		S, Z type	R, U type
2 position single	31 or less	38 or less	33 or less
2 position double	27 or less	30 or less	28 or less
3 position	50 or less	56 or less	50 or less

Table 5

2.4 Flow Characteristics (For manifold) and Port Sizes

Series	Port Sizes		1 → 4/2 (P → A/B)		
	1, 5/3 (P, R)	4,2 (A, B)	C [dm^3/(s·bar)]	b	C_V
SY3000	C8	M5	0.55	0.29	0.14
		C4	0.57	0.24	0.14
		C6	0.68	0.28	0.17

Table 6

Series	Port Sizes		4/2 → 5/3 (A/B → R)		
	1, 5/3 (P, R)	4,2 (A, B)	C [dm^3/(s·bar)]	b	C_V
SY3000	C8	M5	0.72	0.24	0.18
		C4	0.71	0.20	0.17
		C6	0.77	0.24	0.19

Table 7

Series	Port Sizes		1 → 4/2 (P → A/B)		
	1, 5/3 (P, R)	4,2 (A, B)	C [dm^3/(s·bar)]	b	C_V
SY5000	C10	1/8	1.8	0.24	0.44
		C6	1.5	0.3	0.37
		C8	1.8	0.2	0.45

Table 8

Series	Port Sizes		4/2 → 5/3 (A/B → R)		
	1, 5/3 (P, R)	4,2 (A, B)	C [dm^3/(s·bar)]	b	C_V
SY5000	C10	1/8	2.1	0.17	0.47
		C6	2	0.16	0.46
		C8	2.2	0.17	0.50

Table 9

Series	Port Sizes		1 → 4/2 (P → A/B)		
	1, 5/3 (P, R)	4,2 (A, B)	C [dm^3/(s·bar)]	b	C_V
SY7000	C12	1/4	3.7	0.25	0.96
		C8	3.2	0.26	0.81
		C10	3.7	0.28	0.98

Table 10

Series	Port Sizes		4/2 → 5/3 (A/B → R)		
	1, 5/3 (P, R)	4,2 (A, B)	C [dm^3/(s·bar)]	b	C_V
SY7000	C12	1/4	3.8	0.19	0.94
		C8	4.0	0.18	0.96
		C10	4.1	0.19	1

Table 11

2 Specifications – Continued

Note 1) The value is for manifold base with 5 stations and individually operated 2 position type.

2.5 Symbol

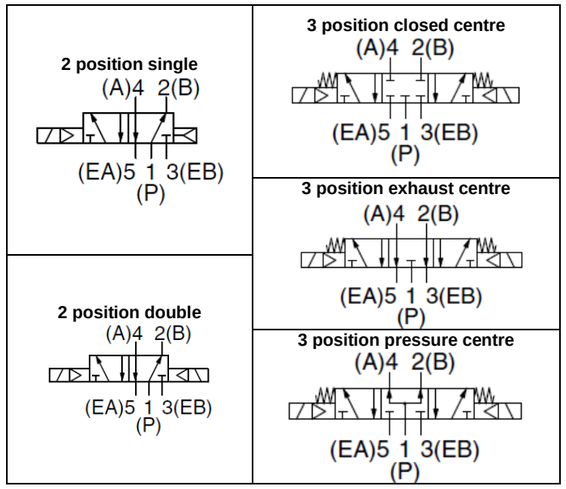


Figure 1

Note) Refer to section "8 Limitations of Use" for valves with air return or combined air/spring return spool

2.6 Energization indication

Option 'Z' and 'U' include LED indication of coil energization.

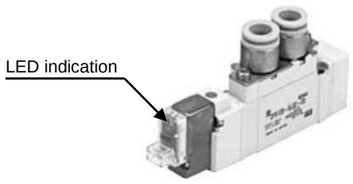


Figure 2

The LED is located on the pilot valve assembly, see Figure 2.
When the solenoid is energized, the valve switched and the LED remains illuminated while the solenoid is energized.

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. Check the product specifications.
- Do not mount in a location exposed to radiant heat.
- Products with IP65 enclosures (based on IEC60529) are protected against dust and water; however, these products cannot be used in water.

3 Installation - Continued

- Products compliant to IP65 satisfy the specifications through mounting.
- If using in an atmosphere where there is possible contact with water drop-lets, oil, weld spatter, etc., take suitable preventive measures.
- When the solenoid valve is mounted in a control panel or it is energized for a long time, make sure that the ambient temperature is within the specification of the valve.

3.3 Air supply

⚠ Caution

- **When extremely dry air is used as the fluid, degradation of the lubrication properties inside the equipment may occur, resulting in reduced reliability (or reduced service life) of the equipment.**
  Please contact SMC.
- **Install an air filter**
  Install an air filter upstream near the valve. Select an air filter with a filtration size of 5 µm or smaller.
- **Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.**
  Compressed air that contains a large amount of drainage can cause malfunction of pneumatic equipment such as valves. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer or water separator.

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, 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.

3.5 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 thread exposed on the end of the pipe/fitting.
- For the fitting with sealant R or NPT, first tighten it by hand, then use a wrench appropriate for the hexagon flats of the body to tighten it a further two or three turns. For M5, tighten an additional 1/6 to ¼ turn. For tightening torque guide, refer to the table below.

Thread	Tightening Torque (N.m)
1/8	3 to 5
1/4	8 to 12
M5	1 to 1.5

Table 12

3.6 Tubing attachment / detachment for One-touch fittings

Tube attachment

- Take a tube having no flaws on its periphery and cut it off at a right angle. When cutting the tube, use tube cutters TK-1, 2 or 3. Do not use pincers, nippers or scissors etc. If cutting is done with tools other than tube cutters, the tube may be cut diagonally or become flattened. This makes a secure installation impossible and causes problems such as air leakage or the tube being pulled out after installation. Allow some extra length in the tube.
- Grasp the tube and push it in slowly, inserting it securely all the way into the fitting.
- After inserting the tube, pull on it lightly to confirm that it will not come out. Problems such as air leakage or the tube being pulled out can occur if the tube is not inserted securely all the way into the fittings

Tube detachment

- Push in the release bushing and the collar at the same time.

3 Installation - Continued

- Pull out the tube while holding down the release bushing so that it does not come out. If the release bushing is not pressed down sufficiently there will be increased bite on the tube and it will become more difficult to pull out.
- When the removed tube is to be used again, cut off the portion which has been chewed before reusing it. If this is not done then the chewed portion of the tube can cause problems such as air leakage or difficulty in removing the tube from the fitting.

3.7 Precautions on other Tubing Brands

⚠ Caution

- When using other than SMC brand tubing, confirm that the following specifications are satisfied with respect to the outside diameter tolerance of the tubing.
  1. Nylon tubing — within ±0.1 mm
  2. Soft nylon tubing — within ±0.1 mm
  3. Polyurethane tubing — within +0.15 mm, within -0.2 mm

  Do not use tubing which does not meet these outside diameter tolerances. It may not be possible to connect them, or they may cause other trouble, such as air leakage or the tubing pulling out after connection.

3.8 Indicator light /Surge Voltage Suppressor

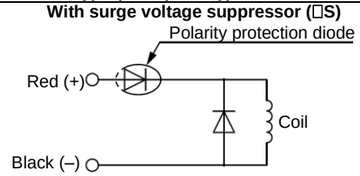
⚠ Caution

<For DC>

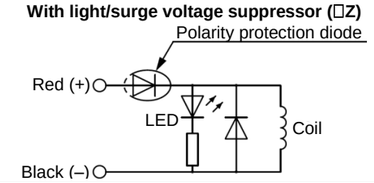
- **Grommet, L/M Plug Connector**

▪ **Standard type (With polarity)**

With surge voltage suppressor (□S)

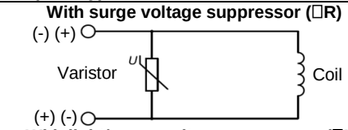


With light/surge voltage suppressor (□Z)



▪ **Non-polar type**

With surge voltage suppressor (□R)



With light/surge voltage suppressor (□U)

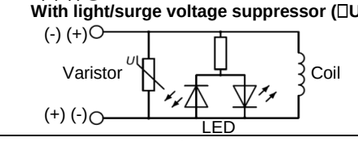


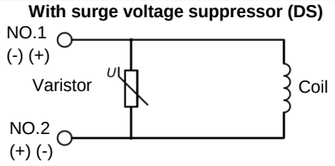
Figure 3

- Connect the standard type in accordance with the +, - polarity indication. (The non-polar type can be used with the connections made either way.)
- Since voltage specifications other than standard 24 VDC and 12 VDC do not have diodes for polarity protection, be careful not to make errors in the polarity.
- Please use caution regarding the allowable fluctuation because there is about a 1 volt drop for a valve with polarity protection. (For details, refer to the solenoid specification.)

3 Installation – Continued

- When wiring is done at the factory, positive (+) is red and negative (-) is black.
- **DIN Terminal**

With surge voltage suppressor (DS)



With light/surge voltage suppressor (DZ)

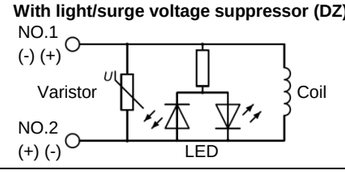


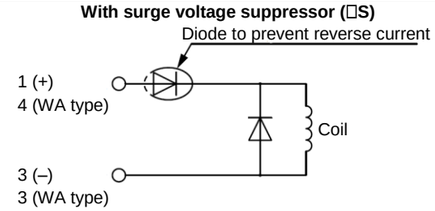
Figure 4

* DIN terminal has no polarity.

- **M8 Connector**

▪ **Standard type (With polarity)**

With surge voltage suppressor (□S)



With light/surge voltage suppressor (□Z)

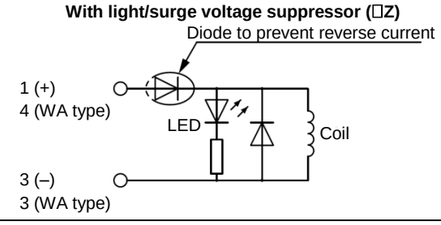
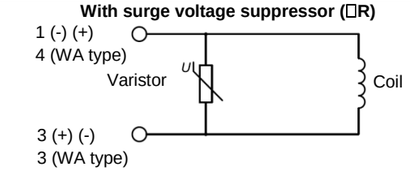


Figure 5

▪ **Non-polar type**

With surge voltage suppressor (□R)



With light/surge voltage suppressor (□U)

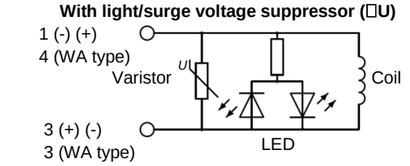


Figure 6

3 Installation – Continued

Solenoid valve side pin wiring diagram

W type	WA type
(Ground) 4 1 3	4 1 3

Figure 7

- For the standard type, connect + to 1 and – to 3 for Type W according to polarity, while + to 4 and – to 3 for Type WA.
- For DC voltages other than 12 V and 24 V, incorrect wiring will cause damage to the surge suppressor circuit.
- Please use caution regarding the allowable voltage fluctuation because there is about a 1 Volt drop for a valve with polarity protection. (For details, refer to the solenoid specifications.)
- The WA-type valve cannot be grounded.

<For AC>

(There is no "S" option, because the generation of surge voltage is prevented by a rectifier.)

- **Grommet, L/M Plug Connector**

With light (GZ, LZ, LOZ, MZ, MOZ)

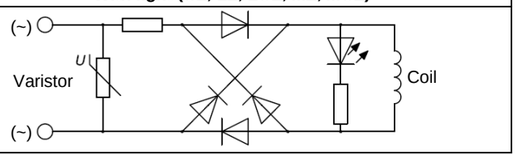


Figure 8

- **DIN Terminal**

With light (DZ, YZ)

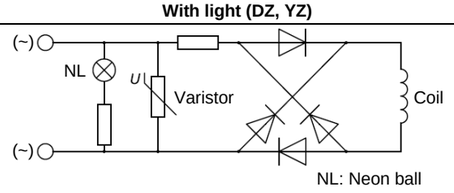


Figure 9

Note) Surge voltage suppressor of varistor has residual voltage corresponding to the protective element and rated voltage; therefore, protect the controller side from the surge voltage. The residual voltage of the diode is approximately 1 V.

3.9 With power saving circuit

▪ **With power saving circuit**

Power consumption is reduced to by 1/4 by reducing the wattage required to hold the valve in an energized state. (Effective energizing time is over 62 ms at 24 VDC.)

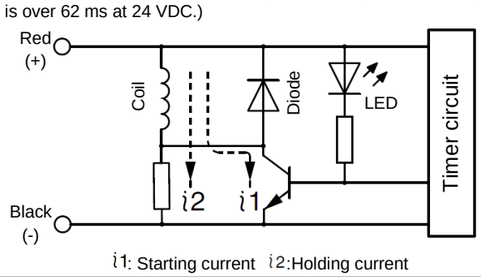


Figure 10

3 Installation – Continued

< Electrical power waveform with power saving circuit>

With the above circuit, the current consumption when holding is reduced to save energy. Please refer to the electric wave data below.

- Please be careful not to reverse the polarity, since a diode to prevent the reversed current is not provided for the power saving circuit.
- Please use caution regarding the allowable voltage fluctuation because there is about a 0.5 volt drop due to the transistor. (For details, refer to the solenoid specifications for the individual valve.)

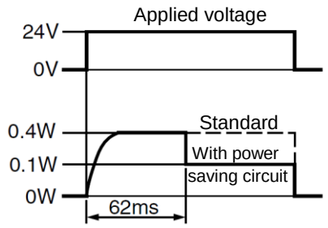


Figure 11

3.10 Residual voltage of the surge voltage suppressor

If a varistor or diode surge voltage suppressor is used, there is some residual voltage to the protection element and rated voltage.

3.11 Extended periods of continuous energization

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. This will likely adversely affect the performance of the solenoid valve and nearby peripheral equipment. Therefore, when it is continuously energized for an extended period of time or when the energized period per day is longer than the de-energized period, use SY series DC specifications or power saving circuit.

3.12 Wiring

Warning

The solenoid valve is an electrical product. For safety, install an appropriate fuse and circuit breaker before use.

3.13 Manual override

Warning

Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Connected actuator is started by manual operation. Use the manual override after confirming that there is no danger.

▪ **Non-locking push type [Standard]**

Press in the direction of the arrow

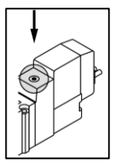


Figure 12

▪ **Push-turn locking slotted type [Type D]**

Push down on the manual override with a small flat head screwdriver until it stops. Turn it clockwise by 90° to lock it.

Turn it counter clockwise to release it.

If it is not turned, it can be operated the same way as the non-locking type. Do not apply excessive torque when turning the manual override [0.1N.m].

3 Installation – Continued

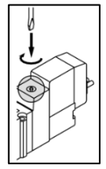


Figure 13

Caution

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

▪ **Push-turn locking lever type [Type E]**

Push down on the manual override by finger until it stops, and then turn it 60° clockwise. The manual override is then locked. To release it, turn it counter clockwise. If it is not turned, it can be operated the same way as the non-locking type.

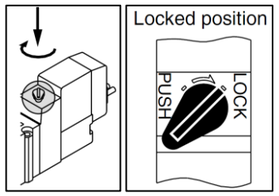


Figure 14

Caution

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

3.14 Solenoid Valve for 200, 220 VAC Specifications

Warning

Solenoid valves with grommet and L/M type plug connector AC specifications have a built-in rectifier circuit in the pilot section to operate the DC coil.

With 200 V, 220 VAC specification pilot valves, this built-in rectifier generates heat when energized. The surface may become hot depending on the energized condition; therefore, do not touch the solenoid valves.

3.15 How to Use Plug Connector

Caution

1. **Attaching and detaching connectors**
   - To attach a connector, hold the lever and connector unit between your fingers and insert straight onto the pins of the solenoid valve so that the lever's pawl is pushed into the groove and locks.
   - To detach a connector, remove the pawl from the groove by pushing the lever downward with your thumb, and pull the connector straight out.

3 Installation – Continued

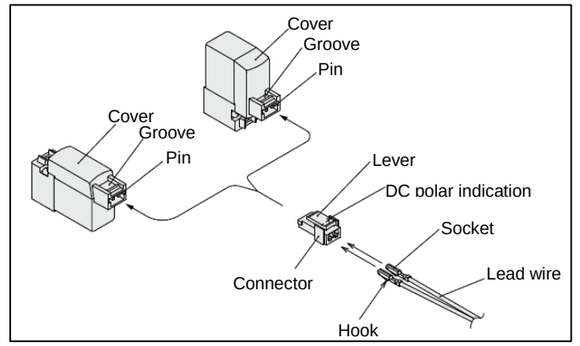


Figure 16

2. **Crimping connection of lead wire and socket**
   Strip 3.2 to 3.7 mm at the end of lead wires, insert the end of the core wires evenly into the sockets, and then crimp it by a crimping tool. When this is done, take care that the coverings of the lead wires do not enter the core wire crimping area. (Please contact SMC for the dedicated crimping tools.)

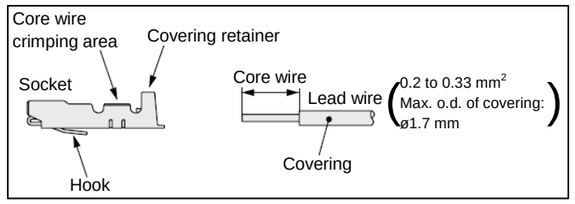


Figure 17

3. **Attaching and detaching lead wires with sockets**
   - **Attaching**
   - Insert the sockets into the square holes of the connector (+, - indication), and continue to push the sockets all the way in until the lock by hooking into the seats in the connector. (When they are pushed in, their hooks open and they are locked automatically.) Then confirm that they are locked by pulling lightly on the lead wires.

   - **Detaching**
     To detach a socket from a connector, pull out the lead wire while pressing the socket's hook with a stick having a thin tip (approx. 1 mm).

     If the socket will be used again, first spread the hook outward.

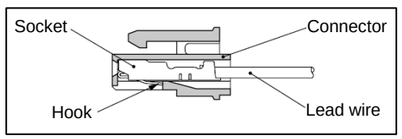


Figure 18

3.16 How to Use DIN Terminal

Caution

Connection

1. Loosen the holding screw and pull the connector out of the solenoid valve terminal block.
2. After removing the holding screw insert a flat head screwdriver, etc. into the notch on the bottom of the terminal block and pry it open, separating the terminal block and the housing.

3 Installation – Continued

3. Loosen the terminal screws (slotted screws) on the terminal block, insert the cores of the lead wires into the terminals according to the connection method, and fasten them securely with the terminal screws.
4. Secure the cord by fastening the ground nut.

⚠ Caution

When making connections, take note that using other than the supported size (ø3.5 to ø7) heavy duty cord will not satisfy IP 65 (enclosure) standards. Also, be sure to tighten the ground nut and holding screw within their specified torque ranges.

Changing the entry direction

After separating the terminal block and housing, the cord entry can be changed by attaching the housing in the desired direction (4 directions at 90° intervals).

* When equipped with a light, be careful not to damage the light with the cord's lead wires.

Precautions

Plug in and pull out the connector vertically without tilting to one side.

Compatible cable

Cord O.D.: ø3.5 to ø7

(Reference) 0.5 mm^2, 2-core or 3-core, equivalent to JIS C 3306

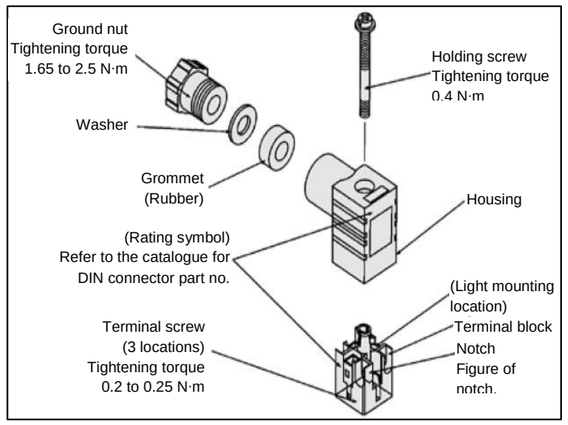


Figure 15

Type "Y"

DIN connector type Y is a DIN connector that confirms to the DIN pitch 8-mm standard.

- D type DIN connector with 9.4 mm pitch between terminals is not interchangeable.

3 Installation – Continued

- To distinguish from the D type DIN connector, "N" is listed at the end of voltage symbol. (For connector parts without lights, "N" is not indicated. Please refer to the name plate to distinguish.)
- Dimensions are completely the same as D type DIN connector.

3.17 Connector Assembly with Cover

⚠ Caution

Connector assembly with dust proof protective cover.

- Effective to prevention of short circuit failure due to the entry of foreign matter into the connector.
- Chloroprene rubber for electrical use, which provides outstanding weather resistance and electrical insulation, is used for the cover material. However, do not allow contact with cutting oil, etc.
- Simple and unencumbered appearance by adopting round-shaped cord.

3.18 DIN Rail for Series SY7000

⚠ Caution

The DIN rail used with Series SY7000 is stronger than that used with Series SY3000 and SY5000. Use this exclusive DIN rail with Series SY7000. Furthermore, if using a DIN rail other than that supplied by SMC, refer to the manifold mounting section below, and mount using the same method as prescribed for side facing and rear facing, regardless of the mounting orientation.

3.19 Manifold Mounting

⚠ Caution

For Type 60 DIN rail mounting, when attaching a manifold to a mounting surface, etc., with bolts, if the entire bottom surface of the DIN rail contacts the mounting surface in a horizontal mounting, it can be used by simply securing both ends of the DIN rail. However, for any other mounting method or for side facing and rear facing, etc., secure the DIN rail with bolds at uniform intervals using the following as a guide: 2 to 5 stations at 2 locations, 6 to 10 stations at 3 locations, 11 to 15 stations at 4 locations, 16 to 20 stations at 5 locations. In addition, even in the case of a horizontal mounting, if the mounting surface is subject to vibration, etc., take the same measures indicated above. If secured at fewer than the specified number of locations, warping or twisting may occur in the DIN rail and manifold, causing trouble such as air leakage.

Also when using mounting screws for the DIN rail on the bottom side of the manifold valve body, the height of the screw head has to be as follows. See also Figure 12.

For type 60:

SY3000: 4.7 mm or less

SY5000: 5.8 mm or less

SY7000: 8 mm or less

3 Installation – Continued

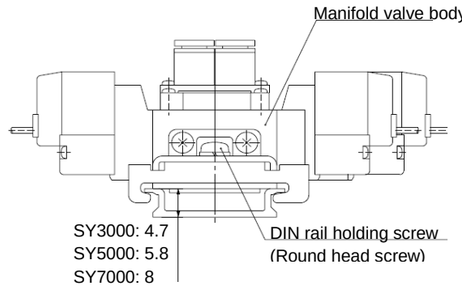


Figure 16

Tightening torque for DIN rail holding screw is as shown below.

Model	Tightening torque
SY3000	1 N·m
SY5000	1.4 N·m
SY7000	1.4 N·m

Table 13

3.20 M8 Connector

⚠ Caution

- M8 connector types have an IP65 (enclosure) rating, offering protection from dust and water. However please note: these products are not intended for use in water.
  Select a SMC connector cable (V100-49-1-□) or a FA sensor type connector, with M8 threaded 3 pin specifications conforming to Nippon Electric Control Equipment Association Standard, NECA4202 (IEC60947-5-2). Make sure the connector O.D. is 10.5 mm or less when used with the Series SY3000 manifold. If more than 10.5 mm, it cannot be mounted due to the size.
- Do not use a tool to mount the connector, as this may cause damage. Only tighten by hand. (0.4 to 0.6 N·m)
- The excessive stress on the cable connector will not be able to satisfy the IP65 rating. Please use caution and do not apply a stress of 30 N or greater.

⚠ Caution

Failure to meet IP65 performance may result if using alternative connectors than those shown above, or when insufficiently tightened.



Figure 20

Note) Connector cable should be mounted in the correct direction. Make sure that the arrow symbol on the connector is facing the triangle symbol on the valve when using SMC connector cable (V100-49-1-□).
Be careful not to squeeze it in the wrong direction, as problems such as pin damage may occur.

4 Settings

4.1 Manual Override

⚠ Warning

Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation.

4.2 Exhaust Throttle

⚠ Caution

With series SY, the pilot valve and main valve share a common exhaust inside the valve. Therefore, do not block the exhaust port when arranging the piping.

4.3 Use as a 3-Port Valve

⚠ Caution

In case of using a 5-port valve as a 3-port valve

Series SY3000/5000/7000 can be used as normally closed (N.C.) or normally open (N.O.) 3-port valves by closing one of the cylinder ports (A or B) with a plug. However, they should be used with the exhaust ports kept open.

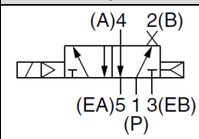
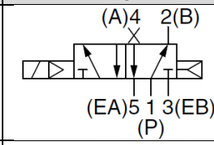
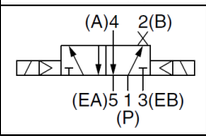
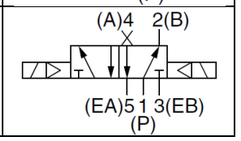
Plug position		B port	A port
Configuration		N.C.	N.O
Number of solenoids	Single		
	Double		

Table 14

5 How to Order

SY 3 1 60 □ – 5 L □ □ – C6 □ – □ – Q

Series

		Validated ✧
3	SY3000	☑
5	SY5000	☑
7	SY7000	☑

Type of actuation

		Validated ✧
1	2 position single (A)4 2(B) (EA)5 1 3(EB) (P)	☑
2	2 position double (A)4 2(B) (EA)5 1 3(EB) (P)	
3	3 position closed centre (A)4 2(B) (EA)5 1 3(EB) (P)	☑
4	3 position exhaust centre (A)4 2(B) (EA)5 1 3(EB) (P)	☑
5	3 position pressure centre (A)4 2(B) (EA)5 1 3(EB) (P)	☑

Coil specifications

		Validated ✧
–	Standard	☑
T	With power saving circuit (24 VCD, 12 VDC only)	☑

* Power saving circuit is not available in the case of D, Y, DO, YO or W□ type.

Rated voltage

For DC

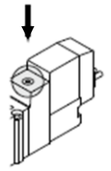
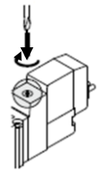
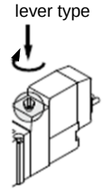
		Validated ✧
5	24 VDC	☑
6	12 VDC	☑
V	6 VDC	☑
S	5 VDC	☑
R	3 VDC	☑

For AC (50/60 Hz)

		Validated ✧
1	100 VAC	☐
2	200 VAC	☐
3	110 VAC [115 VAC]	☐
4	220 VAC [230 VAC]	☐

* DC specifications of type D, Y, DO and YO is only available with 12 and 24 VDC.
* D, Y, DO, YO only available for SY5000, SY7000.
* For Type W□, DC voltage is only available.
Note) AC-type models that are CE-compliant have DIN terminals only.

Manual override

–	D	E
Non-locking push type	Push-turn locking slotted type	Push-turn locking lever type
		
Validated ✧ ☑	☐	☐

Light/surge voltage suppressor
Electrical entry for G, H, L, M, W

		Validated ✧
–	Without light/surge voltage suppressor	☑
S	With surge voltage suppressor	☑
Z	With light/surge voltage suppressor	☑
R	With surge voltage suppressor (Non-polar type)	☑
U	With light/surge voltage suppressor (Non-polar type)	☑

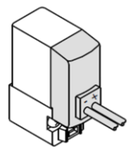
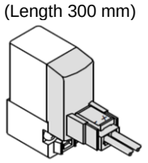
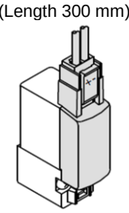
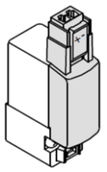
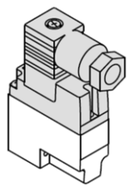
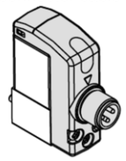
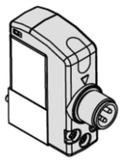
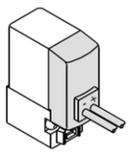
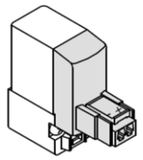
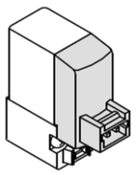
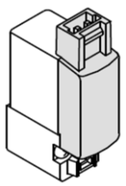
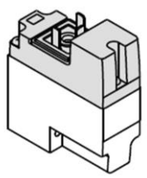
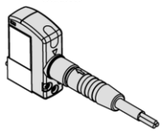
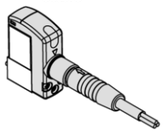
* For AC voltage valves there is no “S” option. It is already built-in to the rectifier circuit.
* Power saving circuit is only available in the “Z” type.

Electrical entry for D, Y (SY5000/7000 only)

		Validated ✧
–	Without light/surge voltage suppressor	☑
S	With surge voltage suppressor (Non-polar type)	☑
Z	With light/surge voltage suppressor (Non-polar type)	☑

* DOZ and YOZ are not available.
* For AC voltage valves there is no “S” option. It is already built-in to the rectifier circuit.

Electrical entry

24, 12, 6, 5, 3 VDC / 100, 110, 200, 220 VAC				24, 12 VDC / 100, 110, 200, 220 VAC	24, 12, 6, 5, 3 VDC	
Grommet	L plug connector	M plug connector		DIN terminal	M8 connector	
G: Lead wire length 300 mm	**L:** With lead wire (Length 300 mm)	**M**: With lead wire (Length 300 mm)	**MN**: Without lead wire	**(SY5000, 7000) D, Y**: With connector	**WO**: Without connector cable	**WAO**: Without connector cable
						
H: Lead wire length 600 mm	**LN**: Without lead wire	**LO:** Without connector	**MO**: Without connector	**DO, YO**: Without connector	**W□**: With connector cable Note 1)	**WA□**: With connector cable Note 1)
						
Validated ✧ DC	☑	☑	☑	☑	☑	☑	☑
AC	☐	☐	☐	☐	☐	☐	☐

* LN, MN type: with 2 sockets
* “Y” type is a DIN terminal conforming to EN-175301-803C (former DIN43650C). For details, refer to the catalogue.
* For connector cable of M8 connector, refer to the catalogue.
* M8 connector conforming to IEC60947-5-2 standard is also available. Refer to the catalogue for details.
* Refer to the catalogue for the lead wire length of L and M plug connectors.
* Refer to the catalogue for the connector assembly with cover for L and M plug connectors.

✧ Validated according to ISO 13849

Legend

☑	Validated
☐	Not validated

Made to Order

		Validated ✧
-	-	☑
X20	Body ported external pilot Note)	☑
X90	Main valve fluoro rubber Note)	☑

Note) Refer to the catalogue.

Thread type

		Validated ✧
-	Rc	☑
F	G	☑
N	NPT	☑
T	NPTF	☑

* Except for M5

A, B port size
Thread piping

Symbol	Port size	Applicable series	Validated ✧
M5	M5 x 0.8	SY3000	☑
01	1/8	SY5000	☑
02	1/4	SY7000	☑

One-touch fitting (Metric size)

Symbol	Port size	Applicable series	Validated ✧
C4	One-touch fitting for ø4	SY3000	☑
C6	One-touch fitting for ø6		☑
C4	One-touch fitting for ø4	SY5000	☑
C6	One-touch fitting for ø6		☑
C8	One-touch fitting for ø8		☑
C8	One-touch fitting for ø8	SY7000	☑
C10	One-touch fitting for ø10		☑

One-touch fitting (Inch size)

Symbol	Port size	Applicable series	Validated ✧
N3	One-touch fitting for ø5/32”	SY3000	☑
N7	One-touch fitting for ø1/4”		☑
N3	One-touch fitting for ø5/32”	SY5000	☑
N7	One-touch fitting for ø1/4”		☑
N9	One-touch fitting for ø5/16”		☑
N9	One-touch fitting for ø5/16”	SY7000	☑
N11	One-touch fitting for ø3/8”		☑

6 Outline Dimensions (mm)

Refer to the catalogue.

7 Maintenance

7.1 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.
- 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.
- When the 3-position closed centre type is in its rest position, air can be trapped between the valve and the cylinder. Exhaust this air pressure before removing piping or performing any maintenance.
- When the equipment is operated after remounting or replacement, first confirm that measures are in place to prevent lurching of actuators, etc. Then, confirm that the equipment is operating normally.

8 Limitations of Use

8.2 Limited warranty and Disclaimer/Compliance Requirements

- **The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements". Read and accept them before using the product**.

- **Limited warranty and Disclaimer**

  1) The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first(1). Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

  2) For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

  This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

  3) Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

  (1) Vacuum pads are excluded from this 1 year warranty.

  A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

- **Compliance Requirements**

  1) The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

8 Limitations of Use – continued

  2) The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

8.3 Limitations

Caution

- **SMC products are not intended for use as instruments for legal metrology.**
  Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.
  Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.
- **Surge voltage suppressor**
  If a surge protection circuit contains non-ordinary diodes such as zener diodes or varistor, a residual voltage will remain that is in proportion to the protective elements & the rated voltage. Therefore, give consideration to surge voltage protection of the controller. In the case of diodes, the residual voltage is approximately 1 V.

- **Low temperature operation**

Unless otherwise indicated in the specifications for each valve, operation is possible to -10°C, but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

- **Mounting orientation**

Mounting orientation is universal.

Warning

Any use in an ISO 13849 system must be within the specified limits and application conditions. The user is responsible for the specification, design, implementation, validation and maintenance of the safety system (SRP/CS).

Warning

- **Valves with pilot air returned spools or combined pilot air/spring returned spools.**

The use of these valves needs to be carefully considered.
The return of the main spool into the safe position depends on the pilot air pressure being present.
Take measures to ensure, that the operating pressure (for internal pilot type) and external pilot pressure (for external pilot type), is applied for the return of the spool into the safe position.

If the pilot air pressure drops below the specified minimum operating pressure the following might occur:
• unexpected movement of the actuator when the pilot air pressure is restored.
• prevention or delay of a stopping or reversing of movement
• an uncommanded change of the original position (without an input signal).

The design of the safety system must take into account such behaviour.

Additional measures might be necessary. For example, the installation of an additional air tank to maintain the pilot pressure. Such measures must be evaluated by risk assessment within the validation process."

Refer to Section 2.5 Symbols for applicable products.

8.4 Safety relays

Warning

If a safe output from a safety relay or PLC is used to operate this valve, ensure that any output test pulse duration is shorter than 1 ms to avoid the valve solenoid responding.

8 Limitations of Use – continued

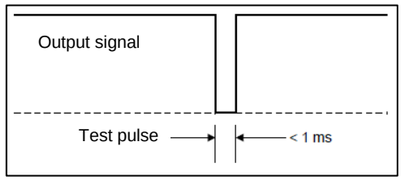


Figure 16

9 Contacts

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