ORIGINAL INSTRUCTIONS

Refer to Declaration of Conformity for relevant Directives.

Instruction Manual

5 Port Solenoid Valve - Base Mounted

Series SY3000/5000/7000/9000 Type 40

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.

Validated according to ISO 13849 Note 1), see section 2.

Note 1) Not all variants of this product series are validated. Please refer to "How to Order" section 5 for details.

Refer to product catalogues for additional information.

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.
- **Only personnel with appropriate training should operate machinery and equipment.**

1 Safety Instructions – continued

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	SY9000
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			
External pilot Operating pressure range (MPa)	Operating pressure range		-100 kPa to 0.7			
	Pilot pressure range	2 position single	0.25 to 0.7			
		2 position double	0.25 to 0.7			
		3 position	0.25 to 0.7			
Ambient and fluid temperature (°C)			-10 to +50 (no freezing)			
Max. operating frequency (Hz)	2 position single, double		10	5	5	5
	3 position		3	3	3	3
Min. operating frequency (Hz)			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	Internal pilot		Common exhaust type for main and pilot valve			
	External pilot		Pilot valve individual exhaust			
Lubrication			Not required Note 1)			
Mounting orientation			Unrestricted			
Impact/Vibration resistance (m/s²)			150/30 Note 2)			
Air quality			5 µm filtration or smaller			
Enclosure			Dust proof (DIN terminal and M8 connector: IP65 Note 3))			

2 Specifications – continued

Flow characteristics		See 2.4
Response time		See 2.5
Standards Note 4)		Complies with the basic and well-tried safety principles of ISO 13849-2:2012
B_{10} Note 5)	Single, Double	47 million cycles
	3 Position	27 million cycles
B_{10D} Note 5)	Single, Double	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 is 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. (Values at the initial period)
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 at the initial period)

Note 3) Based on IEC60529

Note 4) For validated variants 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 ISO 13849-1:2015 Annex C. Contact SMC for details.

2.2 Solenoid Specifications

Electrical entry			Grommet (G), (H) DIN terminal (D), (Y) L plug connector (L) M plug connector (M) M8 connector (W), (WA)	
			G, H, L, M, W, WA	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) Note 1) [Starting 0.4, Holding 0.1]	
Apparent power (VA) Note 2)	AC	100 V	0.78 (With indicator light: 0.81)	0.78 (With indicator light: 0.87)
		110 V [115 V]	0.86 (With indicator light: 0.89) [0.94 (With indicator light: 0.97)]	0.86 (With indicator light: 0.97) [0.94 (With indicator light: 1.07)]
		200 V	1.18 (With indicator light: 1.22)	1.15 (With indicator light: 1.30)
		220 V [230 V]	1.30 (With indicator light: 1.34) [1.42 (With indicator light: 1.46)]	1.27 (With indicator light: 1.46) [1.39 (With indicator light: 1.60)]
Duty cycle			Contact SMC	
Surge voltage suppressor			Diode (Varistor is for DIN terminal and Non-polar type.)	
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.

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

* For details, refer to the catalogue.

2 Specifications – continued

2.3 Port Size

Series		SY3000	SY5000	SY7000	SY9000
P, EA, EB Port size	M5	–	–	–	–
	1/8	●	–	–	–
	1/4	–	●	●	–
	3/8	–	–	●	●
	1/2	–	–	–	●
A, B port size	M5	–	–	–	–
	1/8	●	–	–	–
	1/4	–	●	●	–
	3/8	–	–	●	●
	1/2	–	–	–	●

Table 3

2.4 Flow Characteristics

Series	Flow Characteristics		
	C [dm³/(s·bar)]	b	C_V
SY3000	1.0	0.30	0.24
SY5000	2.4	0.41	0.64
SY7000	4.1	0.41	1.1
SY9000	7.9	0.34	2.0

Table 4

Note: The values given in this table vary depending on the different types of actuation and port size.

2.5 Response Time

SY3000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		Type S, Z	Type R, U
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 5

SY5000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		Type S, Z	Type R, U
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 6

SY7000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		Type S, Z	Type R, U
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 7

SY9000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		Type S, Z	Type R, U
2 position single	35 or less	41 or less	35 or less
2 position double	35 or less	41 or less	35 or less
3 position	62 or less	64 or less	62 or less

Table 8

2 Specifications – continued

2.6 Symbol

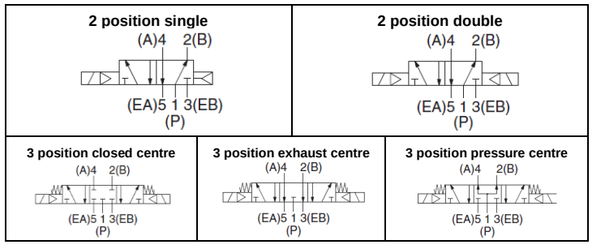


Figure 1

Note) Refer to section 8.2 Limitations of Use for valves with air return or combined air/spring return spool.

⚠ Caution

Special products might have specifications different from those shown in this section. Contact SMC for specific drawings. These drawings will give the appropriate specification details and compliance with the safety principles of ISO 13849, if applicable.

2.7 Energization indication

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

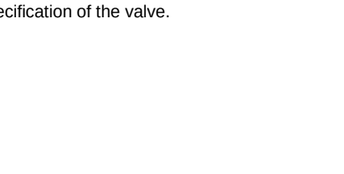


Figure 2

The LED is located on the pilot valve assembly, see Figure 2.
When the solenoid is energized, the valve switches 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.
- The solenoid valve is an electrical product. For safety, install an appropriate fuse and circuit breaker before use.

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.
- 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 Installation – continued

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.

⚠ Warning

- If the lubrication amount is excessive, the oil may accumulate inside the pilot valve, causing malfunction or response delay. So, do not apply a large amount of oil. When a large amount of oil needs to be applied, use an external pilot type to put the supply air on the pilot valve side in the non-lube state. This prevents accumulation of oil inside the pilot valve.

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.
- Tighten fittings to the specified tightening torque.

Thread (R)	Tightening Torque (N•m)
1/8	3 to 5
1/4	8 to 12
3/8	15 to 20
1/2	20 to 25

Table 9

3.6 Indicator Light/Surge Voltage Suppressor

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

▪ **Standard type (With polarity)**

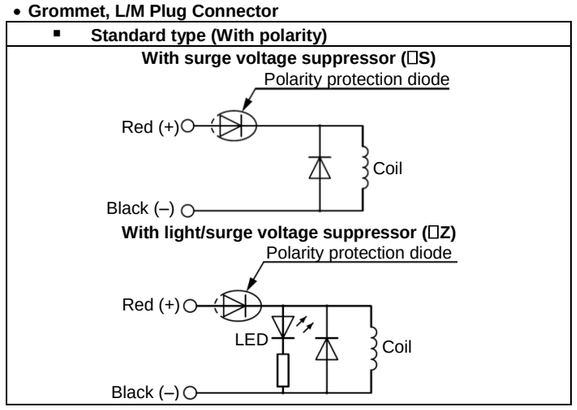


Figure 3

3 Installation – continued

▪ **Non-polar type**

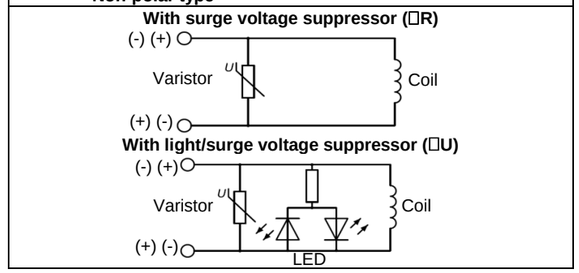
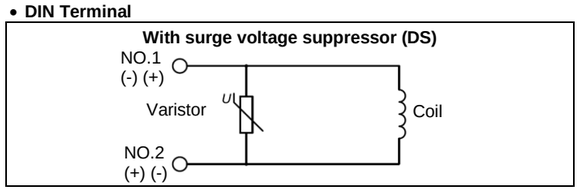


Figure 4

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

- **DIN Terminal**



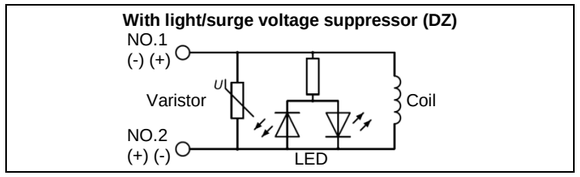
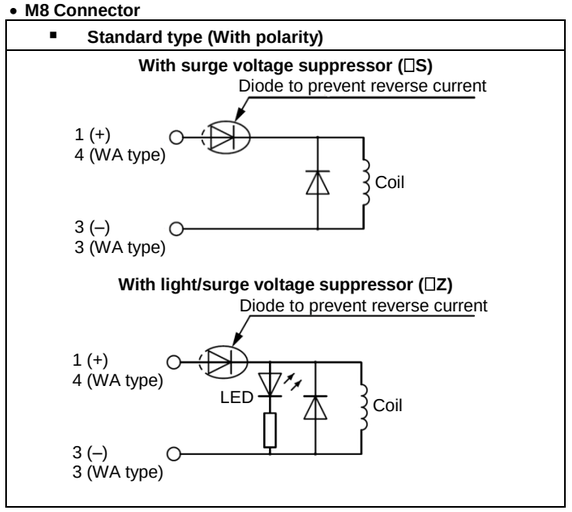


Figure 5

* DIN terminal has no polarity.

- **M8 Connector**

▪ **Standard type (With polarity)**



3 Installation – continued

▪ **Non-polar type**

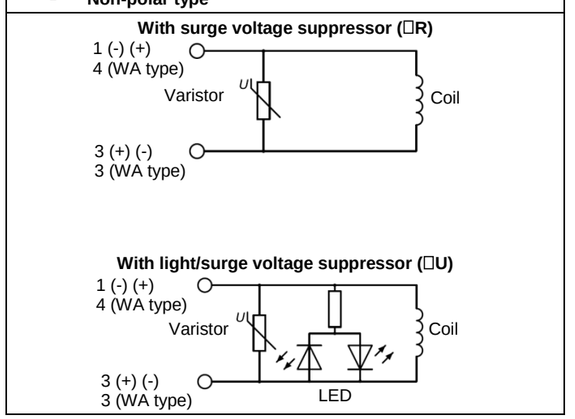


Figure 6

Solenoid valve side pin wiring diagram

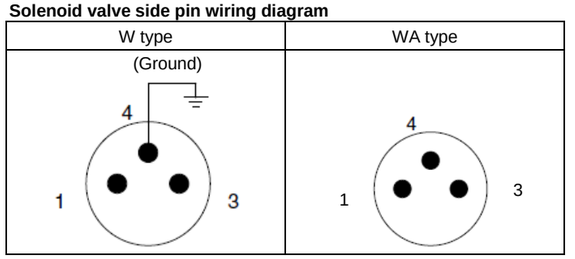


Figure 7

- 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.
- 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**

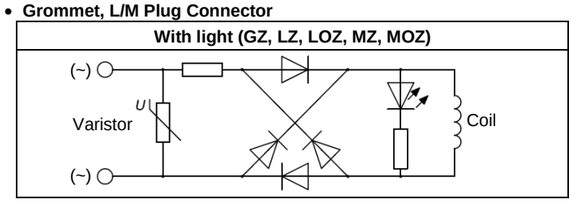


Figure 8

- **DIN Terminal**

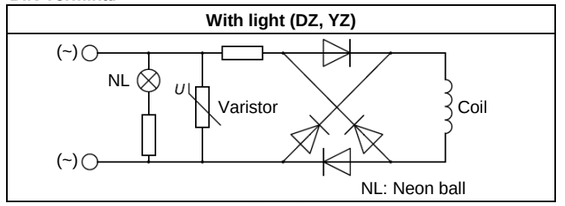


Figure 9

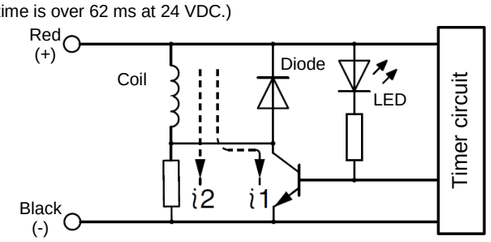
3 Installation – continued

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.

3.7 With power saving circuit

▪ With power saving circuit

Power consumption is decreased to 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.)



i1: Starting current i2: Holding current

Figure 10

The above circuit reduces the current consumption when holding in order to save energy. Refer to the electrical power waveform as shown below.

<Electrical power waveform with power saving circuit>

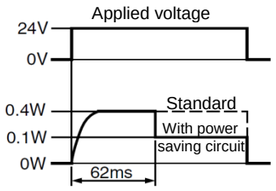


Figure 11

- Please be careful not to reverse the polarity, since a diode to prevent the reversed current is not provided for the power saving circuit.

3.8 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.

3.9 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 type.

3.10 Valve Mounting

⚠ Caution

Mount it so that there is no slippage or deformation in gaskets, and tighten with the tightening torque as shown below.

Model	Thread size	Tightening torque (N·m)
SY3000	M2	0.16
SY5000	M3	0.8
SY7000	M4	1.4
SY9000	M3	0.8

Table 10

3 Installation – continued

3.11 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.

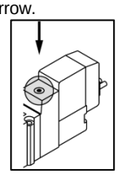


Figure 12

■Push-turn locking slotted type [Type D] Note 1)

⚠ Caution

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 counterclockwise 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 [0.1 N·m]. 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.

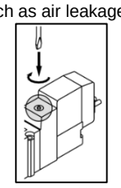


Figure 13

■Push-turn locking lever type [Type E] Note 1)

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 counterclockwise. If it is not turned, it can be operated the same way as the non-locking type.

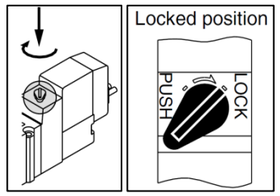


Figure 14

Note 1) Locking type is not allowed in safety applications.

⚠ 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.

3.12 Solenoid Valve for 200, 220 VAC Specifications

⚠ Warning

Solenoid valves with DIN-Terminal 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 Installation – continued

3.13 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.

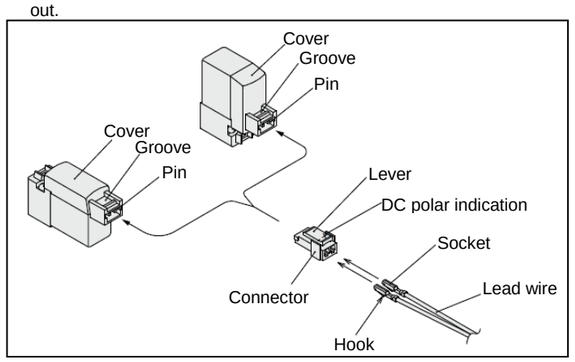


Figure 15

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.)

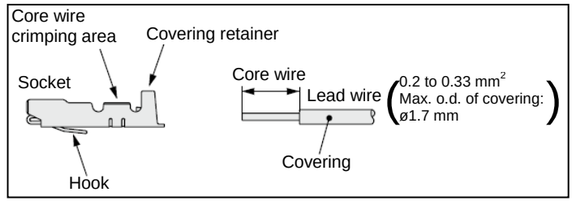


Figure 16

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.

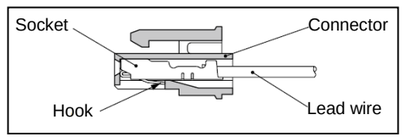


Figure 17

3 Installation – continued

3.14 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. 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 mm², 2-core or 3-core, equivalent to JIS C 3306

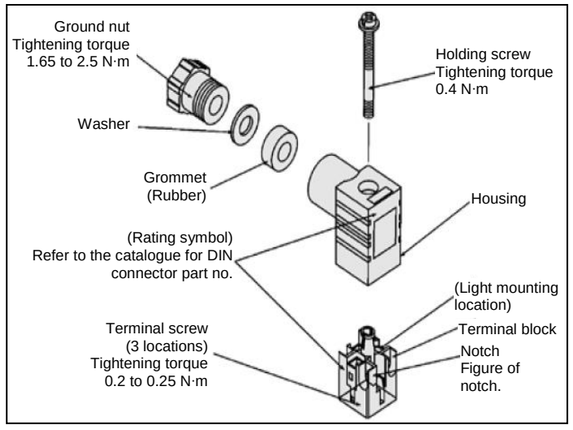


Figure 18

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.
- 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.
- When exchanging the pilot valve assembly only, "V115-□D" is interchangeable with "V115-□Y". Do not replace V111 (G, L, M) to V115-□D/□Y (DIN terminal), and vice versa.

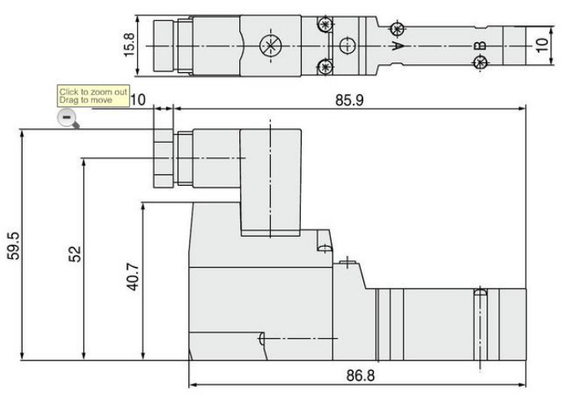
3 Installation – continued

3.14.1 Series SY3000

Caution

- SMC can provide a DIN style terminal connector for the series SY3000. This cannot be assembled to a standard manifold and sub-plate since the DIN connector width (15.8 mm) exceeds that of the valve body (10 mm). Contact SMC if you wish to use with a manifold and sub-plate.

* The DIN style terminal connector and single manifold unit have no external pilot specifications.



3.15 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.

3.15.1 Connector cable mounting

Figure 19

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

The SY series 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 SY3000/5000/7000/9000 can be used as normally closed (N.C.) or normally open (N.O.) 3-port 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.

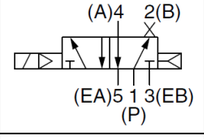
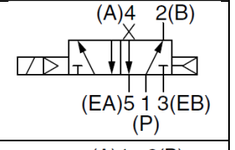
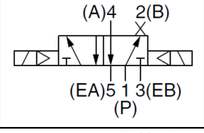
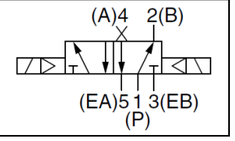
Plug position		B port	A port
Configuration		N.C.	N.O
Number of solenoids	Single		
	Double		

Table 11

5 How to Order

SY 5 2 40 □ □ – 5 L □ □ – □ □ – □ – Q

Series

		Validated ✧
3	SY3000	☑
5	SY5000	☑
7	SY7000	☑
9	SY9000	☑

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)	☑

Note) For details about Symbol of the 3 position type of series SY9000, refer to the catalogue.

Pilot type

		Validated ✧
–	Internal pilot	☑
R	External pilot	☑

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, W□ or WA□ 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]	☐

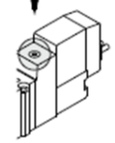
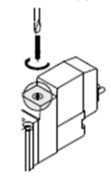
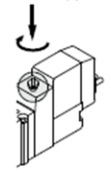
* DC specifications of type D, Y, DO and YO is only available with 12 and 24 VDC.
* For Type W□/WA□, DC voltage is only available.
Note) AC-type models that are CE-compliant have DIN terminals only.

✧ Validated according to ISO 13849

Legend

☑	Validated
☐	Not validated

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.
* For “R” and “U”, DC voltage is only available
* Power saving circuit is only available in the “Z” type.

Electrical entry for D, Y

		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.

Thread type

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

Made to Order

		Validated ✧
–	–	☑
X90	Main valve fluoro rubber Note)	☑

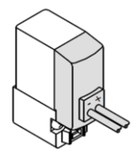
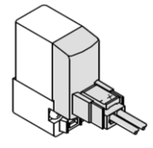
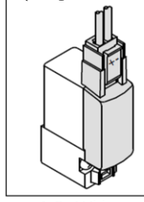
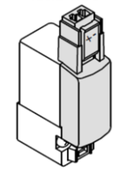
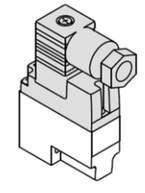
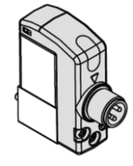
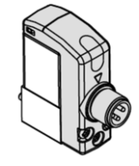
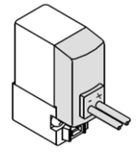
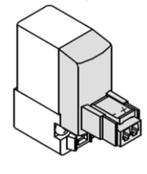
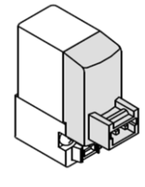
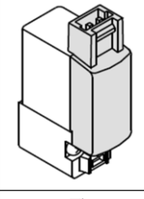
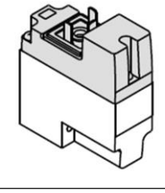
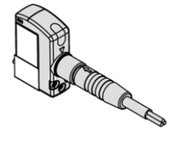
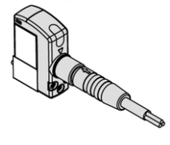
Note) Refer to the catalogue.

Port size

Symbol	Port size	Applicable series	Validated ✧
–	Without sub-plate		☑
01	1/8 With sub-plate	SY3000	☑
02	1/4 With sub-plate	SY5000 SY7000	☑
03	3/8 With sub-plate	SY7000 SY9000	☑
04	1/2 With sub-plate	SY9000	☑

Note) When ordering single unit of the base mounted type solenoid valve, the mounting screws and gaskets for the manifold are included.

Electrical entry

24, 12, 6, 5, 3 VDC				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	**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)	**WA□**: With connector cable Note)
						

Validated ✧						
DC	☑	☑	☑	☑	☑	
AC	☐	☐	☐	☐	☐	

* LN, MN type: with 2 sockets
* The DIN terminal of series SY3000 cannot be mounted on the standard sub-plate. For details, refer to the catalogue.
* “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.
Note) Enter the cable length symbols in □. Please be sure to fill in the blank referring to the catalogue.
Note) When ordering single unit of the cassette type solenoid valve, the bushing assembly is included.

6 Outline Dimensions (mm)

For details 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.
- 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.
- **Low frequency operation**
  Valves should be operated at least once every 30 days to prevent malfunction. (Use caution regarding the air supply.)

7.2 Exhaust Throttle

- The pilot valve and the main valve share exhausts, therefore care must be taken to ensure that the piping does not become restricted.

7.3 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

Install air filter
Install an air filter at the upper streamside of the valve. Filtration degree should be 5 μm or less.

8 Limitations of Use

8.1 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.

8 Limitations of Use – continued

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.
  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.

8.2 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.
- **Leakage voltage**
  When using a resistor in parallel with the switching element or using a C-R element (surge voltage suppressor) for protection of the switching element, note that leakage voltage will increase due to leakage current flowing through the resistor or C-R element. Limit the amount of residual leakage voltage to the following values.

DC coil: Should be 3% or less of the rated voltage.
AC coil: Should be 8% or less of the rated voltage.

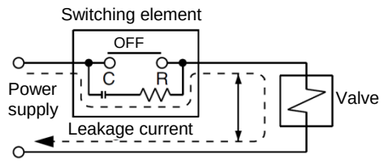


Figure 3

- **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 and 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.

8 Limitations of Use – continued

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).

- Valves with pilot air returned spools or combined pilot air/spring returned spools.
  The use of these valves need 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 2.6 Symbols for applicable products.

8.3 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.

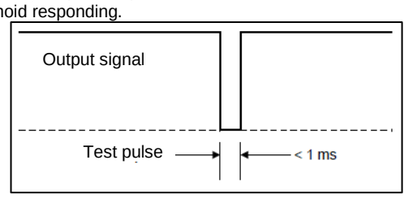


Figure 24

9 Contacts

AUSTRIA	SMC Pneumatik GmbH, Girakstrasse 8, AT-2100 Korneuburg, Austria
BELGIUM	SMC Pneumatics N.V. / S.A. Nijverheidsstraat 20, B-2160 Wommelgem, Belgium
BULGARIA	SMC Industrial Automation Bulgaria EOOD, Business Park Sofia, Building 8-6th floor, BG-1715 Sofia, Bulgaria
CROATIA	SMC Industrijska Automatika d.o.o. Zagrebačka Avenija 104,10 000 Zagreb
CZECH REP.	SMC Industrial Automation CZ s.r.o. Hudcova 78a, CZ-61200 Brno, Czech Republic
DENMARK	SMC Pneumatik A/S, Egeskovvej 1, DK-8700 Horsens, Denmark
ESTONIA	SMC Pneumatics Estonia Oü,Laki 12, EE-10621 Tallinn, Estonia
FINLAND	SMC Pneumatics Finland Oy, PL72, Tiistinniityntie 4, SF-02031 Espoo, Finland
FRANCE	SMC France, 1, Boulevard de Strasbourg, Parc Gustave Eiffel, Bussy Saint Georges, F-77607 Marne La Vallee Cedex 3, France
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