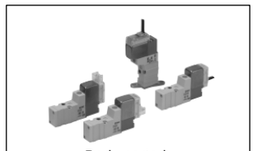
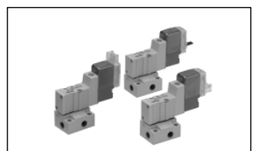
ORIGINAL INSTRUCTIONS

Instruction Manual
3 Port Solenoid Valve
SYJ300/500/700


Body ported


Base mounted

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

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) [*1)], and other safety regulations.

[*1)] ISO 4414: Pneumatic fluid power - General rules relating to systems.
ISO 4413: Hydraulic fluid power - General rules relating to systems.
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Caution

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

2 Specifications

2.1 Valve specifications

Model		SYJ300	SYJ500	SYJ700
Fluid		Air		
Operating Pressure [MPa]		0.15 to 0.7		
External operating Pressure [MPa]	Main pressure	-100 kPa to 0.7		
	Pilot pressure	0.15 to 0.7		
Ambient and fluid temperature [°C]		-10 to 50 (No freezing.)		
Flow characteristics		Refer to catalogue		
Response time [ms] Note 1)		15 or less	25 or less	30 or less
Maximum operating frequency [Hz]		10	5	5
Minimum operating frequency [Hz]		1 cycle/30 days		
Manual override		Non-locking push type, push-turn locking slotted type, push-turn locking lever type		

2 Specifications - continued

Pilot exhaust method	Individual exhaust for pilot valve, common exhaust for pilot and main valve
Lubrication	Not required
Mounting orientation	Unrestricted
Impact/vibration resistance [m/s^2] Note 2)	150/30
Enclosure (based on IEC60529)	IP40 (M8 connector conforms to IP65)
Duty cycle	Contact SMC
Weight	Refer to catalogue

Table 1.

Note 1) At 0.5 MPa. Based on dynamic performance test, JIS B 8419: 2010. (Coil temperature: 20°C, at rated voltage, without surge voltage suppressor)

Note 2) Impact resistance: No malfunction resulted from the impact test using a drop impact tester. Test was performed one time each in the axial and right-angle directions of the main valve and armature for both energized and de-energized states. (Values quoted are for a new valve)
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Test was performed in the axial and right-angle directions of the main valve and armature for both energized and de-energized states. (Values quoted are for a new valve)

2.2 Solenoid specifications

Model			SYJ300	SYJ500 / SYJ700	
Electrical entry			Grommet (G,H), L/M plug connector (L, M), M8 connector (W)	Grommet (G,H), L/M plug connector (L,M), M8 connector (W), DIN connector (D,Y)	
			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 Note 1)			±10% of rated voltage		
Coil insulation class			Class B		
Power consumption [W]	DC	Standard	0.35 (with light: 0.4)	0.35 {with light: 0.4(DIN terminal with light:0.45)}	
		With power saving circuit	0.1 (with light only) (Starting 0.4, holding 0.1)		
Apparent power [VA] Note 2)	AC	100V	0.78 (with light: 0.81)	0.78 (with light: 0.87)	
		110V	0.86 (with light: 0.89)	0.86 (with light: 0.97)	
		115V	0.94 (with light: 0.97)	0.94 (with light: 1.07)	
		200V	1.18 (with light: 1.22)	1.15 (with light: 1.30)	
		220V	1.30 (with light: 1.34)	1.27 (with light: 1.46)	
		230V	1.42 (with light: 1.46)	1.39 (with light: 1.60)	
Surge voltage suppressor			Diode (varistor when non-polar types)		
Indicator light			LED (Neon light when AC with DIN terminal)		

Table 2.

Note 1) For 115 VAC and 230 VAC, the allowable voltage is -15% to +5% of rated voltage.

Note 2) Common solenoid between 110 VAC and 115 VAC, and between 220 VAC and 230 VAC.

2.3 Manifold specification

Refer to catalogue for additional details such as flow characteristics, A and B porting specifications and port sizes.

Valve series		SYJ300	SYJ500	SYJ700
Model	Internal pilot	Type 20, 41, S41, 42, S42	Type 20, 40, 41	Type 20, 21, 40, 41, 42
	External pilot	20R, 42R, S42R	21R, 40R, 41R	21R, 41R, 42R
Manifold Type		Single base / base mounted		
P (SUP), R (EXH)		Common SUP./ EXH.		
Valve Stations		2 to 20		

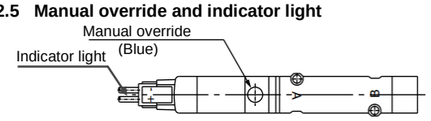
Table 3.

2.4 Pneumatic symbols

Refer to catalogue for pneumatic symbols.

2 Specifications – continued

2.5 Manual override and indicator light



2.6 Special products

Warning

Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

3 Installation

3.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.

3.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product’s specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product’s specifications.
- Products compliant with IP65 and IP67 enclosures are protected against dust and water, however, these products cannot be used in water.
- Products compliant with IP65 and IP67 enclosures satisfy the specifications by mounting each product properly. Be sure to read the Specific Product Precautions for each product.

3.3 Piping

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

Connection thread size (R, NPT)	Tightening torque [N·m]
M3	0.4 to 0.5
M5	1 to 1.5
1/8	3 to 5
1/4	8 to 12

Table 4.

3.4 One-touch fittings

3.4.1 Tube attachment and detachment

Caution

Refer to the specific precautions in the catalogue.

3.4.2 Precautions on other tube brands

Caution

When using non-SMC brand tubes, refer to the specific precautions in the catalogue.

3.5 Lubrication

Caution

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

3.6 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 an air filter upstream of the valve. Select an air filter with a filtration size of 5 µm or smaller.

3 Installation – continued

3.7 Manual override

Warning

- Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation.
- Locked manual overrides might prevent the valve responding to being electrically de-energised or cause unexpected movement in the equipment. When operating the locking type manual override with a screwdriver, turn it gently using a watchmaker screwdriver. [Torque less than 0.1 N·m].
- Refer to the catalogue for details of manual override operation.

3.8 Mounting

Caution

- Use caution to the assembly orientation for solenoid valves, gasket, and optional parts.
- Ensure gaskets are in good condition, not deformed and are dust and debris free.
- When mounting valves ensure gaskets are present, aligned and securely in place and tighten screws to a torque as per table below.

Series	Thread size	Tightening torque [N·m]
SYJ300	M1.7	0.12
SYJ500	M2.5	0.45
SYJ700	M3	0.8

Table 5.

3.8.1 Bracket mounting

Caution

For SYJ300 types ordered with bracket, do not use it without it.

3.9 Effect of back pressure when using a manifold

Warning

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

3.10 Electrical circuits

Caution

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

3.10.1 For DC

3.10.1.1 Grommet, L/M plug connector

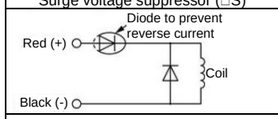
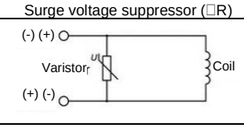
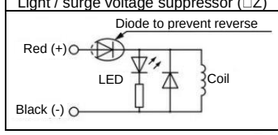
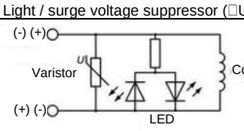
Standard type (with polarity)	Non-polar type
Surge voltage suppressor (□S)	Surge voltage suppressor (□R)
	
Light / surge voltage suppressor (□Z)	Light / surge voltage suppressor (□U)
	

Table 6.

3.10.1.2 With power saving circuit

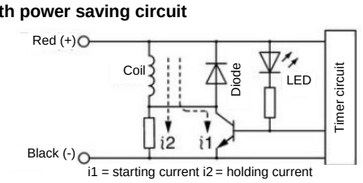


Figure 1.

3 Installation – continued

- Power consumption is decreased by ¼ by reducing the wattage required to hold the valve in an energized state. (Effective energizing time is over 62 ms at 24 VDC).
- Be careful not to reverse the polarity, since a diode to prevent reversed current is not provided for the power saving circuit.

3.10.1.3 DIN terminal

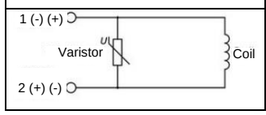
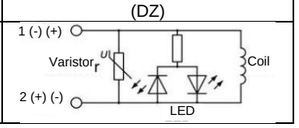
Surge voltage suppressor (DS)	Light / surge voltage suppressor (DZ)
	

Table 7.

3.10.1.4 M8 Connector

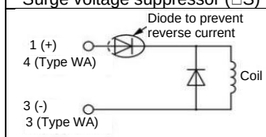
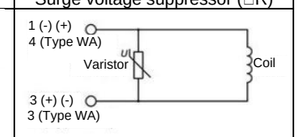
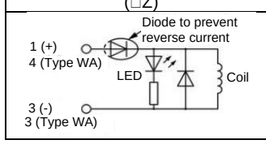
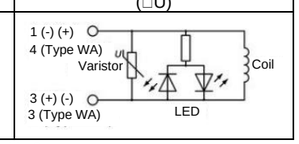
Standard type (with polarity)	Non-polar type
Surge voltage suppressor (□S)	Surge voltage suppressor (□R)
	
Light / surge voltage suppressor (□Z)	Light / surge voltage suppressor (□U)
	

Table 8.

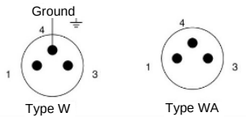


Figure 2.

- For the standard type (with polarity), connect + to 1 and – to 3 for type W, while + to 4 and – to 3 for type WA.

Caution

- Please be careful not to reverse the polarity, since a diode to prevent the reversed current is not provided for DC voltages other than 24 and 12 VDC.
- The WA-type valve cannot be grounded.

3.10.2 For AC

There is no "S" type because the generation of surge voltage is prevented by a rectifier.

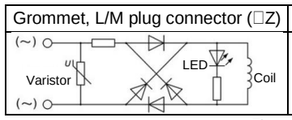
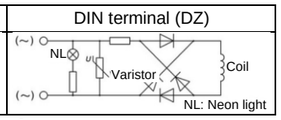
Grommet, L/M plug connector (□Z)	DIN terminal (DZ)
	

Figure 9.

3.11 Residual voltage

Caution

- If a Zener diode or varistor voltage suppressor is used, the suppressor arrests the back EMF voltage from the coil to a level in proportion to the rated voltage.
- Ensure the transient voltage is within the specification of the host controller.
- Contact SMC for the Zener diode or varistor residual voltage.
- In the case of a diode, the residual voltage is approximately 1 V.
- Valve response time is dependent on surge suppression method selected.

3 Installation – continued

3.12 Countermeasure for surge voltage

Caution

- At times of sudden interruption of the power supply, the energy stored in a large inductive device may cause non-polar type valves in a de-energised state to switch.
- When installing a breaker circuit to isolate the power, consider a valve with polarity (with polarity protection diode), or install a surge absorption diode across the output of the breaker.

3.13 How to use plug connector

Caution

Refer to the specific product precautions in the catalogue.

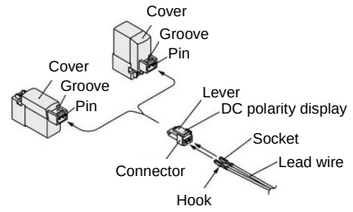


Figure 5.

3.13.1 Crimping of lead wires and sockets

Refer to the specific product precautions in the catalogue.

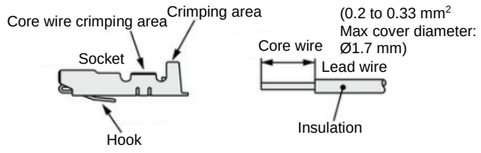


Figure 6.

3.13.2 Attaching and detaching sockets with lead wires

Refer to the specific product precautions in the catalogue.

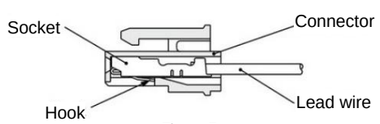


Figure 7.

3.14 How to use DIN terminal

Caution

- Refer to catalogue for additional information
- Cable O.D. Ø3.5 mm to Ø7 mm
- (Reference) 0.5mm², 2-core or 3-core, equivalent to JIS C 3306

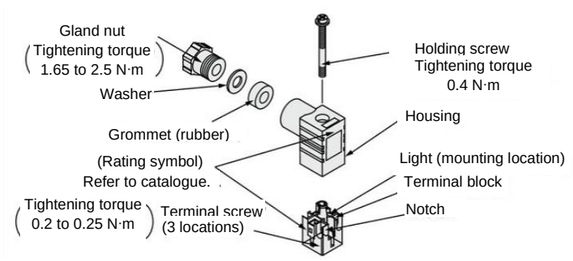


Figure 8.

3.14.1 Type "Y"

- DIN connector type Y is a DIN connector that conforms 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 connector

3 Installation – continued

- 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.

3.14.2 Circuit diagram with light

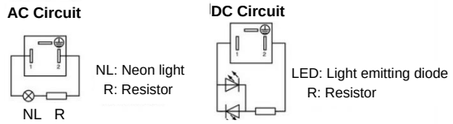


Figure 9.

3.14.3 Changing connector entry direction

Caution

Refer to the Specific Product Precautions in the catalogue.

3.15 M8 connector

Caution

- 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.
- Refer to catalogue for additional information.

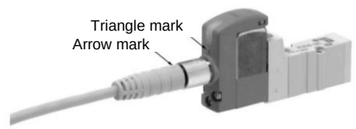


Figure 10.

3.16 Solenoid valve for 200, 220 VAC specification

Warning

Valves with grommet and L/M type plug connector AC specifications have built-in rectifier circuit in the pilot section to operate the DC coil. With 200,220 VAC, this built-in rectifier generates heat when energized. The surface may become hot depending on the energized condition; therefore, do not touch the surface of these solenoid valves.

3.17 Extended periods of continuous energization

Warning

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

4 How to Order

Refer to catalogue for 'How to Order'.

5 Outline Dimensions

Refer to catalogue for outline dimensions.

6 Maintenance

6.1 General maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.

6 Maintenance - continued

- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly, and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

6.2 Replacement parts

Caution

- Pay attention to the assembly orientation for solenoid valves, gasket and optional parts and refer to section 3.8 for tightening torques.
- Refer to catalogue for details regarding replacement parts, such as pilot valve assembly, blanking plate assembly, electrical connectors.

7 Limitations of Use

7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

Warning

7.2 Air returned or air/spring returned spool valves

- The use of 2-position single valves with air returned or air/spring returned spools has to be carefully considered.
- The return of the valve spool into the de-energized position depends on the pilot pressure. If the pilot pressure drops below the specified operating pressure the position of the spool cannot be defined.
- The design of the 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.

Energy source status	SYJ300 / SYJ500 / SYJ700
Air supply present, electricity cut	Spool returns to the off position by air force
Air supply cut before electricity cut	Spool stops moving after air pressure cut (Position cannot be defined)

Table 9.

7.3 Holding of pressure

Since the valves are subject to air leakage, they cannot be used for applications such as holding pressure (including vacuum) in a system.

7.4 Cannot be used as an emergency shut-off valve

This product is not designed for safety applications such as an emergency shut-off valve. If the valves are used in this type of system, other reliable safety assurance measures should be adopted.

Caution

7.5 Leakage voltage

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

7.6 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.

7.7 Bracket

For SYJ300 types ordered with bracket, the bracket cannot be retrofitted, and the valve should not be used without it.

8 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

9 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : https:// www.smcworld.com (Global) https:// www.smc.eu (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan

Template DKP50047-F-085M