

SV1000/2000/3000/4000 Single Valve/Sub-plate Type [IP67 Protection]

How to Order

SV 1 1 00 [] — 5 W1 U D [] []

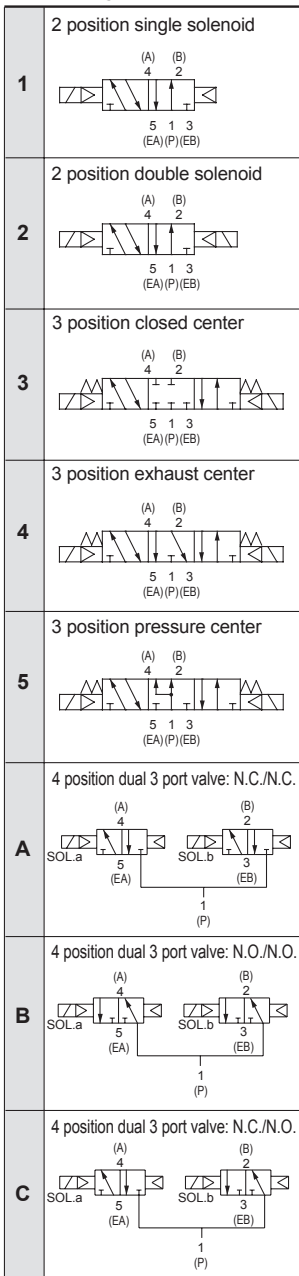
Series

1	SV1000
2	SV2000
3	SV3000
4	SV4000

Thread type

Nil	Rc
F	G
N	NPT
T	NPTF

Type of actuation



Pilot specification

Nil	Internal pilot
R	External pilot

* External pilot specification is not available for 4 position dual 3 port valves.

Rated voltage

5	24VDC
6	12VDC

M12 waterproof connector

Symbol	Cable length (mm)
W1	300
W2	500
W3	1000
W4	2000
W7	5000

Port size

Symbol	Port size	Applicable series
Nil	Without sub-plate	
01	1/8	SV1000
02	1/4	SV2000 SV3000
03	3/8	SV3000 SV4000
04	1/2	SV4000

Manual override

Nil	Non-locking push type
D	Slotted locking type

Light/Surge voltage suppressor

U	With light and surge voltage suppressor
R	With surge voltage suppressor

SV3000 and 4000 are not available with dual 3 port valve.

Series SV Solenoid Valve Specifications



Fluid		Air
Internal pilot operating pressure range MPa	2 position single	0.15 to 0.7
	4 position dual 3 port valve	
	2 position double	0.1 to 0.7
3 position		0.2 to 0.7
External pilot operating pressure range MPa	Operating pressure range	-100kPa to 0.7
	2 position single, double	0.25 to 0.7
	3 position	
Ambient and fluid temperature °C		-10 to 50 (with no freezing)*
Maximum operating frequency Hz	2 position single, double	5
	4 position dual 3 port valve	
	3 position	3
Manual override		Non-locking push type Slotted locking type
Pilot exhaust method	Internal pilot	Main valve/Pilot valve common exhaust
	External pilot	Pilot valve individual exhaust
Lubrication		Not required
Mounting orientation		Unrestricted
Impact/Vibration resistance ms ²		150/30 (8.3 to 2000Hz)
Enclosure		IP67 (based on IEC529)
Electrical entry		M12 waterproof connector
Rated coil voltage		24VDC, 12VDC
Allowable voltage fluctuation		±10% of rated voltage
Power consumption W		0.6 (With light: 0.65)
Surge voltage suppressor		Zener diode
Indicator light		LED

Note) Impact resistance: No malfunction when tested with a drop tester in the axial direction and at a right angle to the main valve and armature, one time each in energized and de-energized states (at initial value).

Vibration resistance: No malfunction when tested with one sweep of 8.3 to 2000Hz in the axial direction and at a right angle to the main valve and armature, in both energized and de-energized states (at initial value).

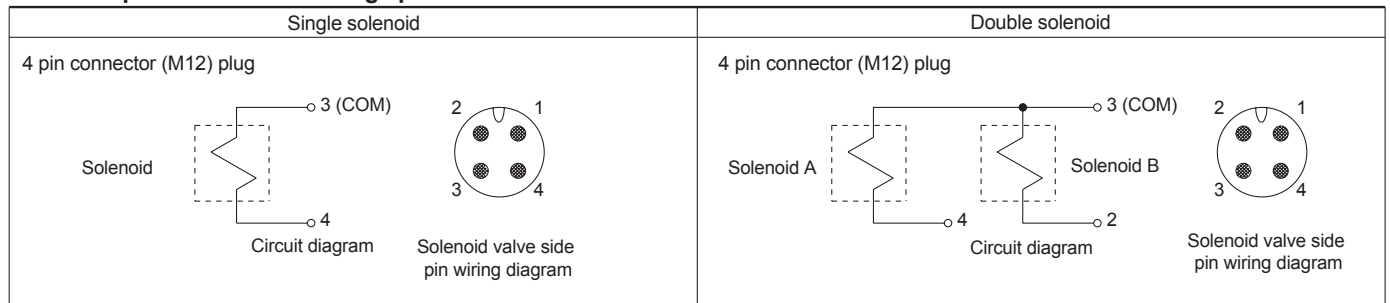
* Refer to page 102.

Response time

Type of actuation	Response time ms (at 0.5MPa)			
	SV1000	SV2000	SV3000	SV4000
2 position single	11 or less	25 or less	28 or less	40 or less
2 position double	10 or less	17 or less	26 or less	40 or less
3 position	18 or less	29 or less	32 or less	82 or less
4 position dual 3 port valve	15 or less	33 or less	—	—

Note) Based on JISB8375-1981 dynamic performance test (with coil temperature of 20°C, at rated voltage).

M12 waterproof connector wiring specifications



Note) Solenoid valves do not have polarity.

Model

Series SV1000

Note) Values inside [] are applicable normal position. Values inside () are applicable without sub-plate.

Valve Model	Type of Actuation		Port size	Flow characteristics		Weight (g) ^{Note)}
				1→4, 2 (P→A, B)	4, 2→5, 3 (A, B→EA, EB)	M12 waterproof connector (cable length 300mm)
				N/min	N/min	
SV1□00-□-01	2 position	Single	Rc 1/8	236	255	123 (88)
		Double				128 (93)
	3 position	Closed centre		177	187	130 (95)
		Exhaust centre		177	236 [157]	
		Pressure centre		285 [137]	236	
	4 position dual	N.C./N.C.		177	285	128 (93)
		N.O./N.O.		226	206	

Series SV2000

Valve Model	Type of Actuation		Port size	Flow characteristics		Weight (g) ^{Note)}
				1→4, 2 (P→A, B)	4, 2→5, 3 (A, B→EA, EB)	M12 waterproof connector (cable length 300mm)
				N/min	N/min	
SV2□00-□-02	2 position	Single	Rc 1/4	628	648	159 (96)
		Double				163 (100)
	3 position	Closed centre		491	461	168 (105)
		Exhaust centre		432	707 [363]	
		Pressure centre		834 [275]	471	
	4 position dual	N.C./N.C.		540	589	163 (100)
		N.O./N.O.		560	530	

Series SV3000

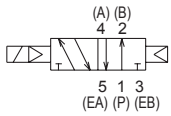
Valve Model	Type of Actuation		Port size	Flow characteristics		Weight (g) ^{Note)}
				1→4, 2 (P→A, B)	4, 2→5, 3 (A, B→EA, EB)	M12 waterproof connector (cable length 300mm)
				N/min	N/min	
SV3□00-□-02	2 position	Single	Rc 1/4	1079	981	250 (121)
		Double				253 (124)
	3 position	Closed centre		785	707	261 (132)
		Exhaust centre		697	1080 [481]	
		Pressure centre		1276 [638]	618	
SV3□00-□-03	2 position	Single	Rc 3/8	1178	1080	235
		Double				238
	3 position	Closed centre		785	717	246
		Exhaust centre		697	1080 [334]	
		Pressure centre		1276 [628]	647	

Series SV4000

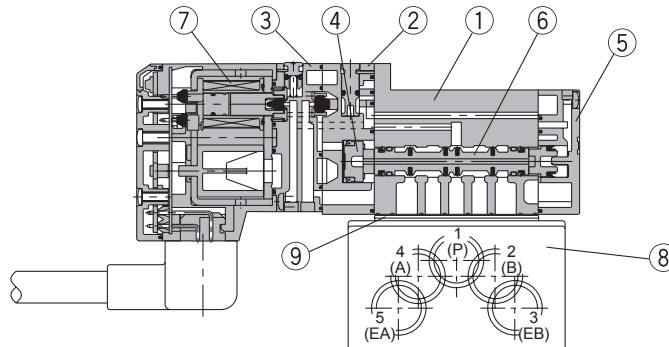
Valve Model	Type of Actuation		Port size	Flow characteristics		Weight (g) ^{Note)}
				1→4, 2 (P→A, B)	4, 2→5, 3 (A, B→EA, EB)	M12 waterproof connector (cable length 300mm)
				N/min	N/min	
SV4□00-□-03	2 position	Single	Rc 3/8	1962	2453	505 (208)
		Double				509 (212)
	3 position	Closed centre		1767	1669	530 (233)
		Exhaust centre		1669	2748 [932]	
		Pressure centre		2748 [825]	1865	
SV4□00-□-04	2 position	Single	Rc 1/2	2158	2453	484
		Double				488
	3 position	Closed centre		1767	1767	509
		Exhaust centre		1963	3533 [2356]	
		Pressure centre		3239 [923]	1865	

Construction: SV1000/2000/3000/4000 Single Valve/Sub-plate Type

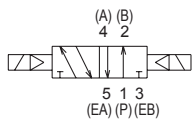
2 position single



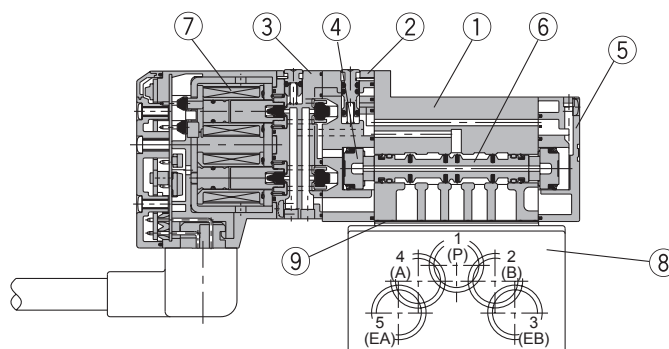
2 position single



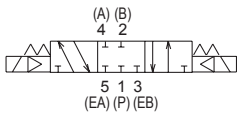
2 position double



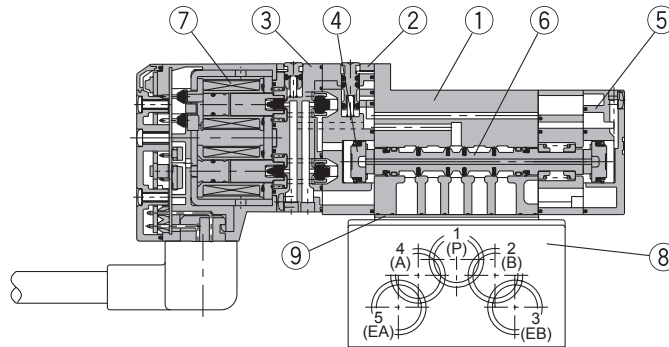
2 position double



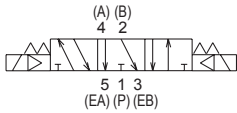
3 position closed centre



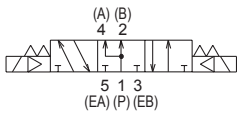
3 position closed centre/exhaust centre/pressure centre



3 position exhaust centre



3 position pressure centre



Parts list

No.	Description	Material	Note
1	Body	Die-cast aluminum (SV1000 is die-cast zinc)	White
2	Adapter plate	Resin	White
3	Pilot body	Resin	White
4	Piston	Resin	—
5	End plate	Resin	White
6	Spool valve assembly	Aluminum/H-NBR	—
7	Molded coil	Resin	Gray

Caution

Mounting screw tightening torques

- M2: 0.15N·m
- M3: 0.6N·m
- M4: 1.4N·m

Replacement parts

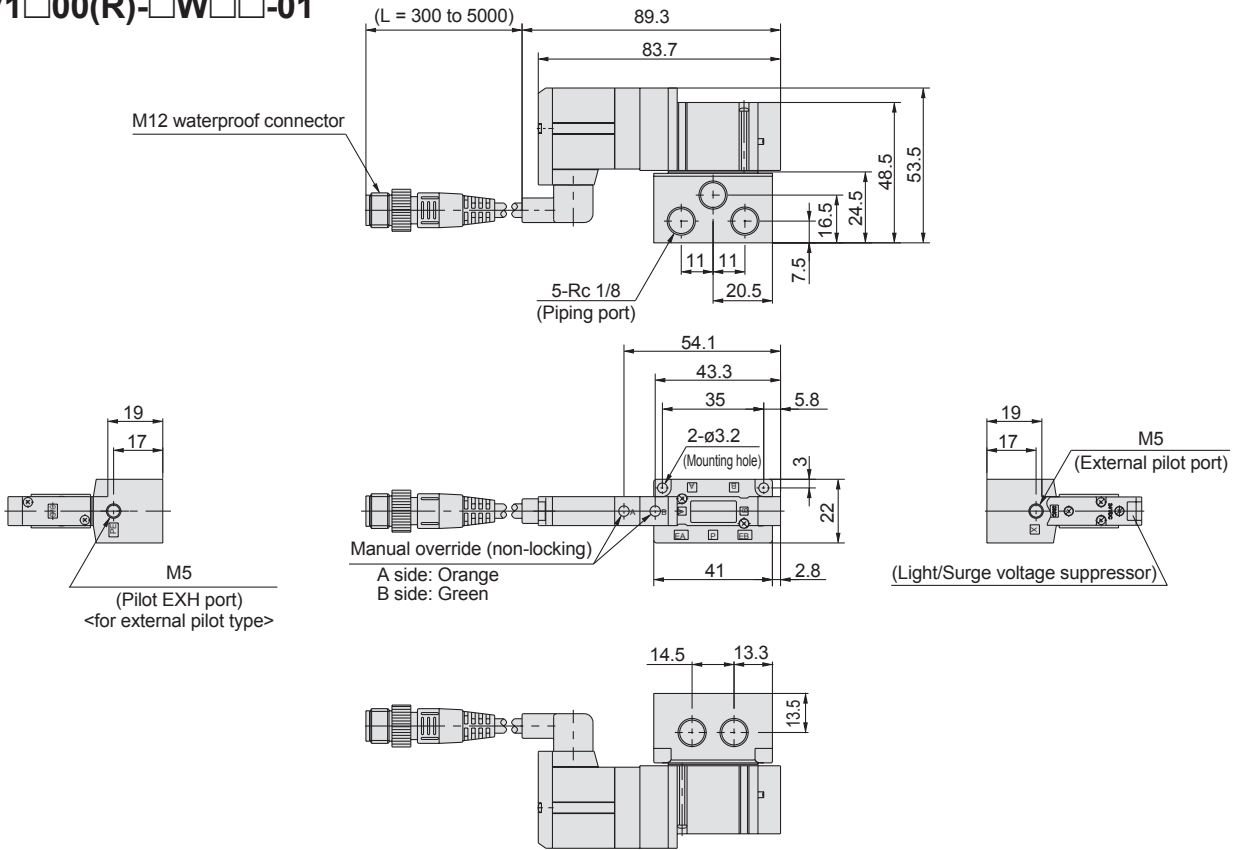
No.	Description	Part number				Note
		SV1□00	SV2□00	SV3□00	SV4□00	
8	Sub-plate	SY3000-27-1□-Q	SY5000-27-1□-Q	1/4: SY7000-27-1□-Q 3/8: SY7000-27-2□-Q	3/8: SY9000-27-1□ 1/2: SY9000-27-2□	Die-cast aluminium See thread types on page 86 for □.
9	Gasket	SY3000-11-25	SY5000-11-18	SY7000-11-14	SY9000-11-2	
—	Round head combination screw	SX3000-22-2 (M2 x 24)	SV2000-21-1 (M3 x 30)	SV3000-21-1 (M4 x 35)	SV2000-21-2 (M3 x 40)	For valve mounting (flat nickel plated)

Series SV

Dimensions: Series SV1000

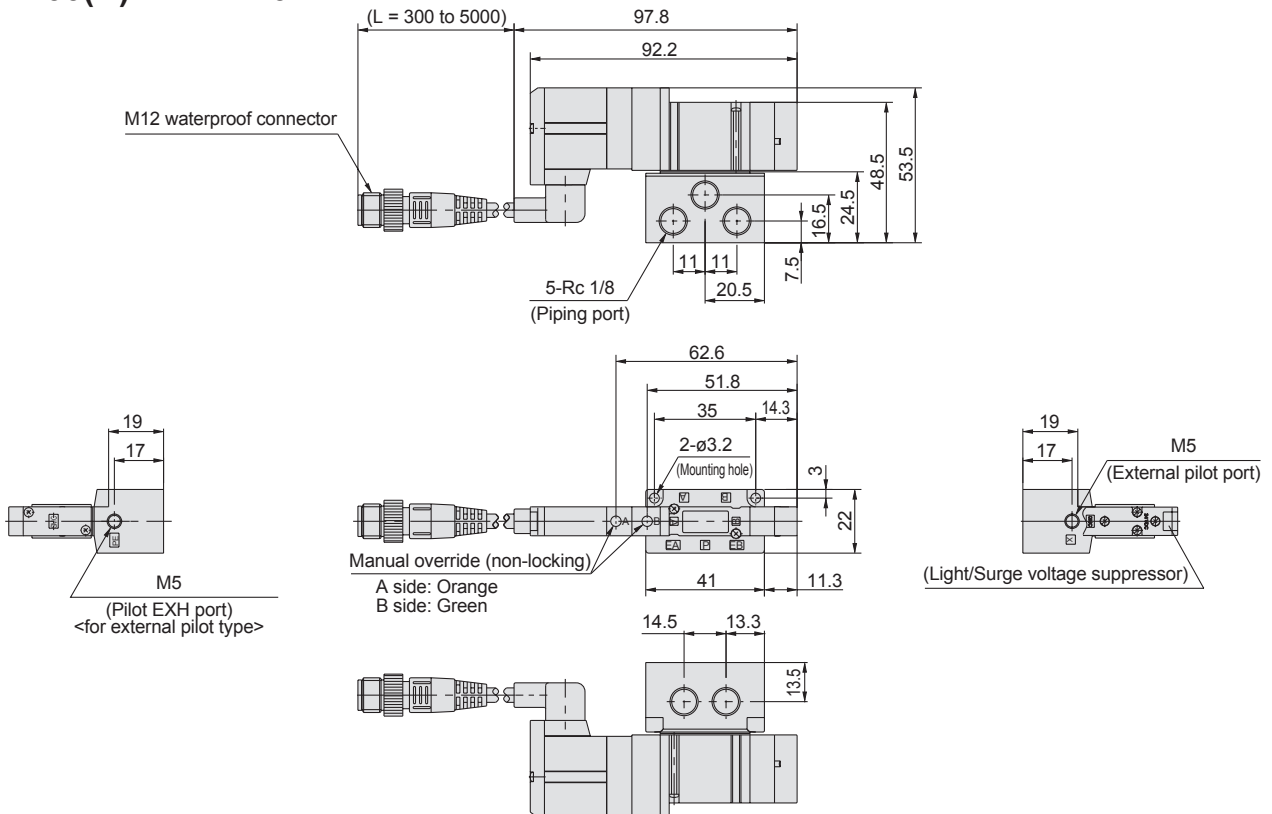
2 position single/double/4 position dual 3 port [M12 waterproof connector type]

SV1□00(R)-□W□□-01



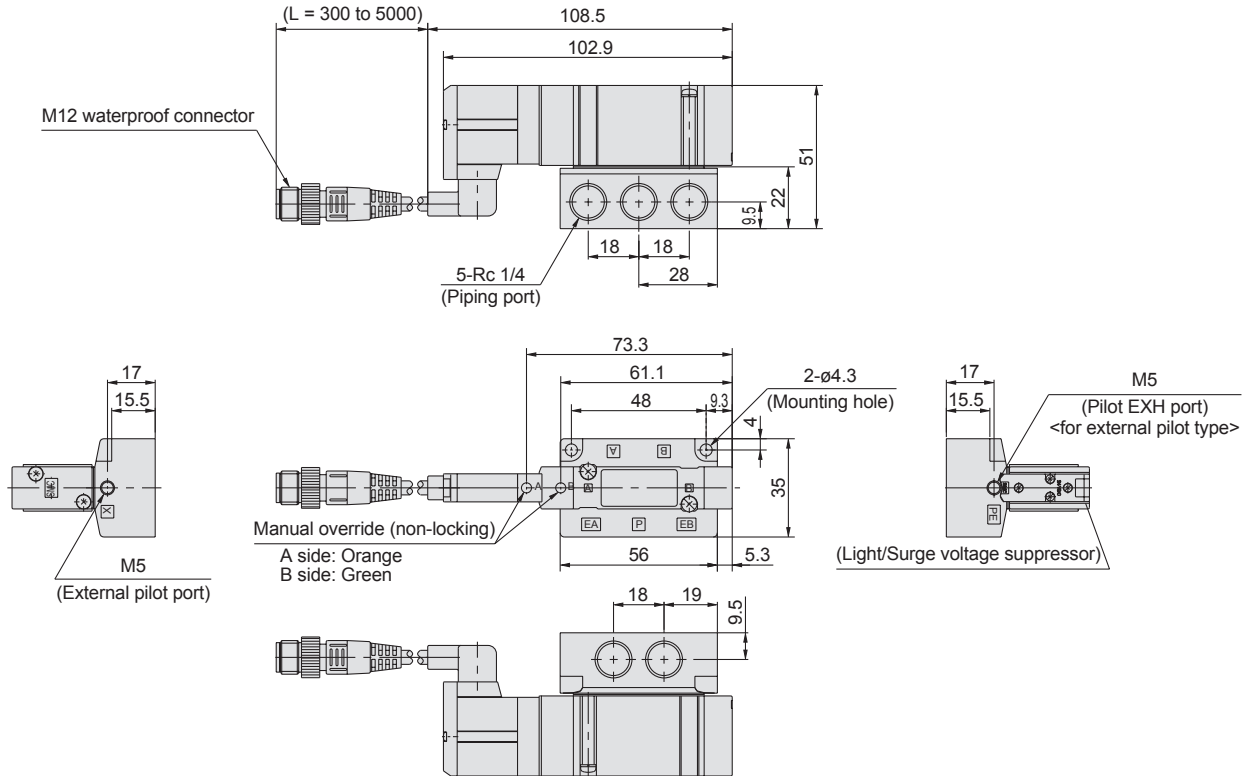
3 position closed centre/exhaust centre/pressure centre [M12 waterproof connector type]

SV1□00(R)-□W□□-01

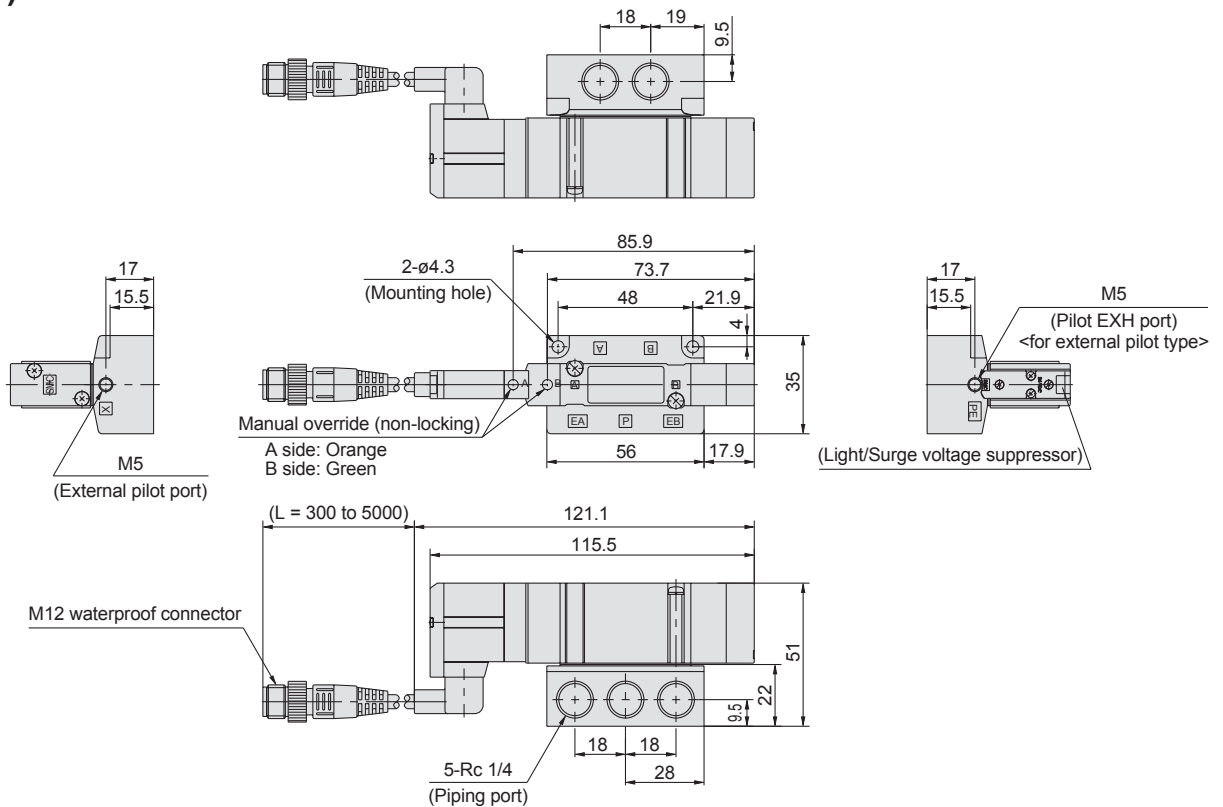


Dimensions: Series SV2000

**2 position single/double/4 position dual 3 port [M12 waterproof connector type]
SV2□00(R)-□W□□-02**

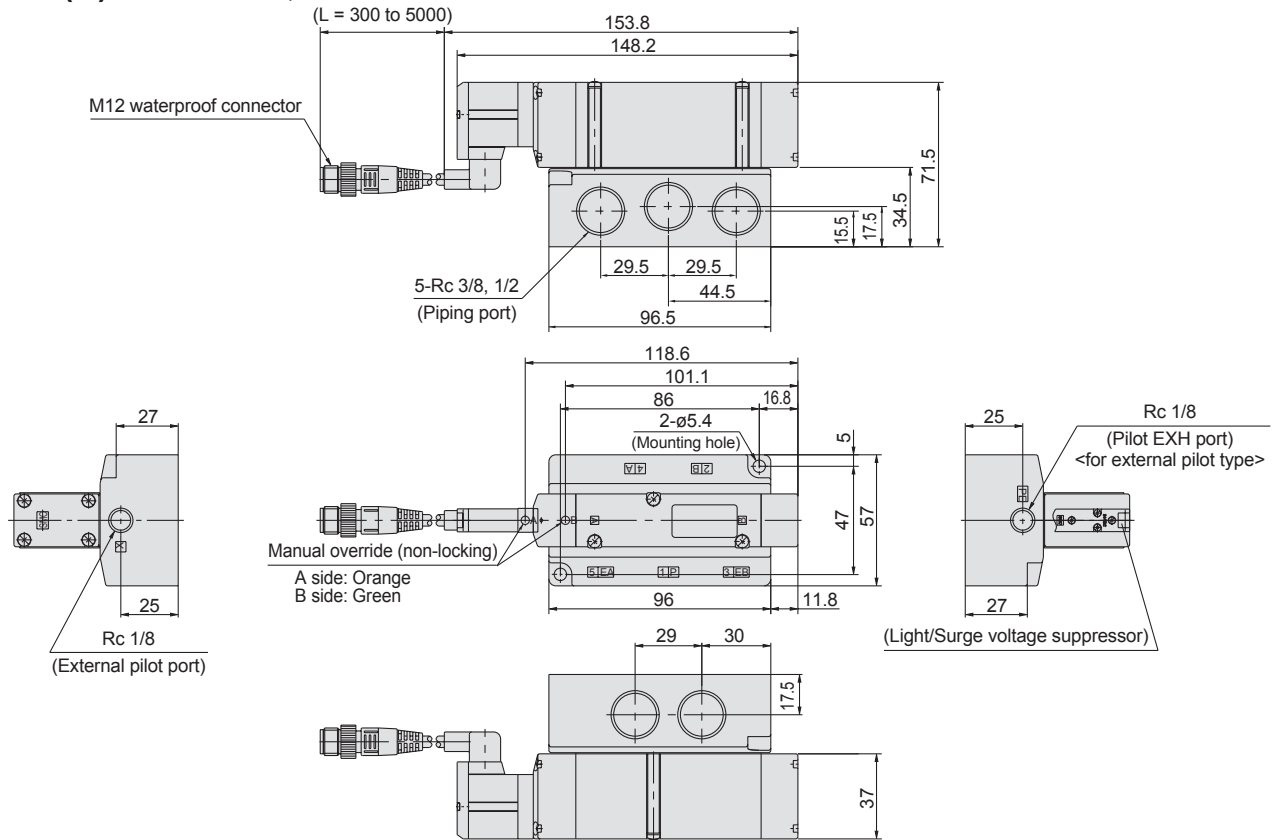


**3 position closed centre/exhaust centre/pressure centre [M12 waterproof connector type]
SV2□00(R)-□W□□-02**

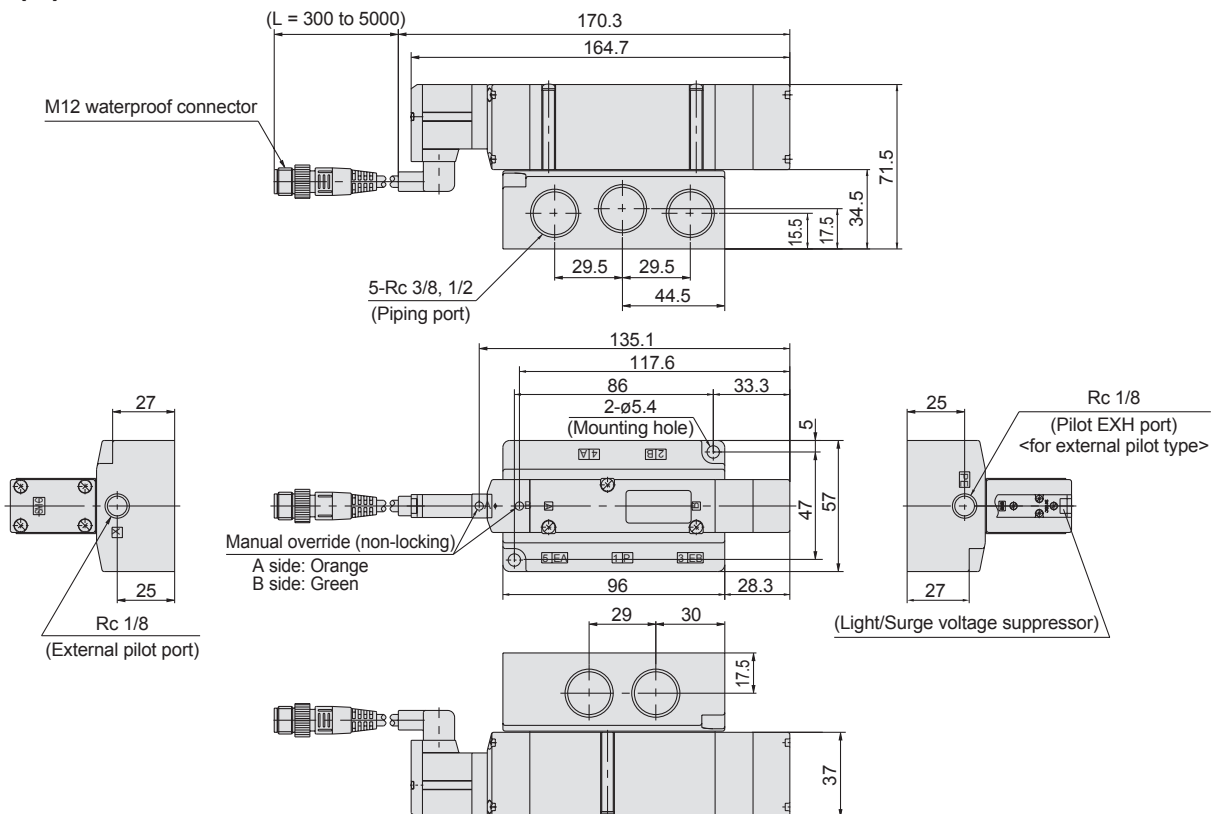


Dimensions: Series SV4000

**2 position single/double [M12 waterproof connector type]
SV4□00(R)-□W□□-03, 04**



**3 position closed centre/exhaust centre/pressure centre [M12 waterproof connector type]
SV4□00(R)-□W□□-03, 04**



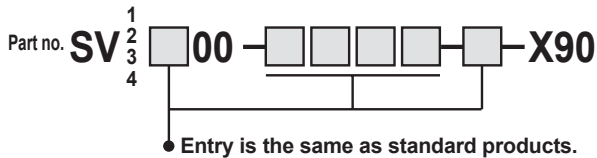


Contact SMC regarding detailed specifications, lead times and pricing.

1 Main Valve Fluoro Rubber Specification Symbol -X90

Fluoro rubber is used for rubber parts of the main valve to allow use in applications such as the following.

1. When using a lubricant other than the recommended turbine oil, and there is a possibility of malfunction due to swelling of the spool valve seals.
2. When ozone enters or is generated in the air supply.



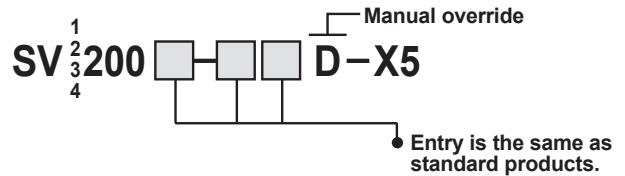
Specifications and performance are the same as standard products.

Note) Because in series-X90 fluoro rubber is used for only main valve, the rubber parts of the application/usage in conditions requiring heat resistance should be avoided.

2 Single, Double Common Type Symbol -X5

Single solenoid and double solenoid can be changed at the installation.

How to order



Specifications

Valve configuration	Pilot type 2 position 5 port solenoid valve		
Type of actuation	Single solenoid, double solenoid common type		
Internal pilot operating pressure range MPa	2 position single	0.15 to 0.7	
	2 position double	0.15 to 0.7	
External pilot operating pressure range MPa	Operating pressure range		-100kPa to 0.7
	Pilot pressure range	2 position single	0.25 to 0.7
		2 position double	0.25 to 0.7
Ambient and fluid temperature °C	-10 to 50 (with no freezing) Note)		
Power consumption W	0.6 (With light: 0.65)		

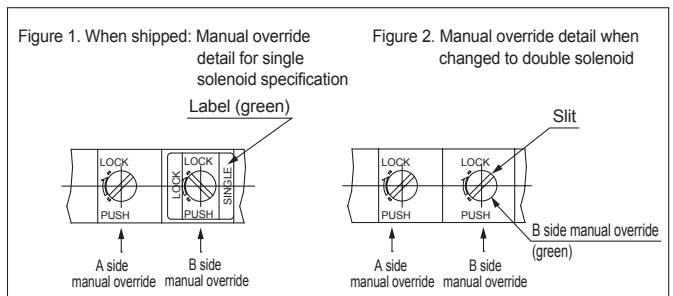
* Other specifications (effective area, response time, etc.) are the same as standard products.

Note) Refer to page 102.

⚠ Caution

Operating precautions

1. The single solenoid specification is applicable when shipped from the factory. (Refer to Figure 1.)
2. For use as a double solenoid, set the manual override and connector assembly as follows.
 - ① Remove the B side manual override (green) label, and turn the slit of the B side manual override with a watchmakers screw driver so that it is positioned as shown in Figure 2.
3. When set for double solenoid, do not apply current to solenoids on both sides at the same time.
4. Refer to page 105 for details on electrical connections and electrical circuits with light and surge voltage suppressor.
5. Dimensions are the same as standard products.



Date:

EX500 Decentralized Serial Type Manifold

Series SV¹000: Tie-rod base
²
³000: Cassette base
⁴

Manifold Specification Sheet

Follow procedures ① through ③.

Customer name			
Contact person			
Specification sheet no.			
Purchase order no.			
Equipment name			
Quantity	set(s)	Required date	

Valve Manifold
Common
Specifications

EX500

EX250

EX120

Circular
Connector

D-sub
Connector

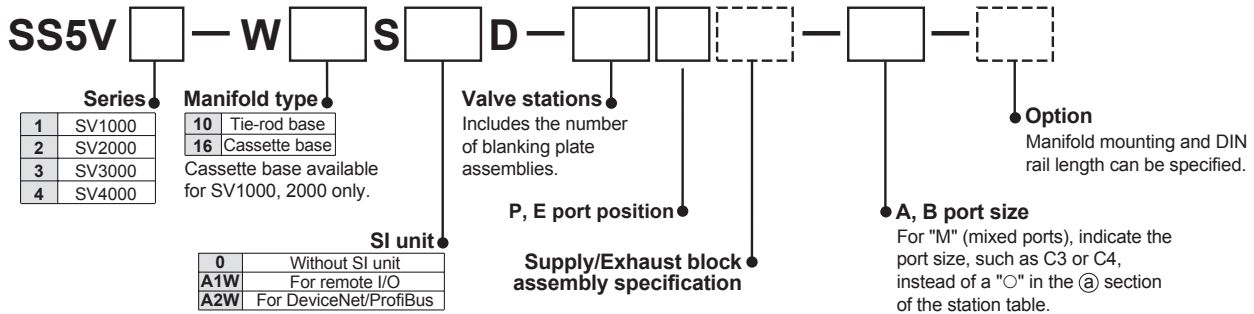
Flat Ribbon Cable

Valve Manifold
Specifications

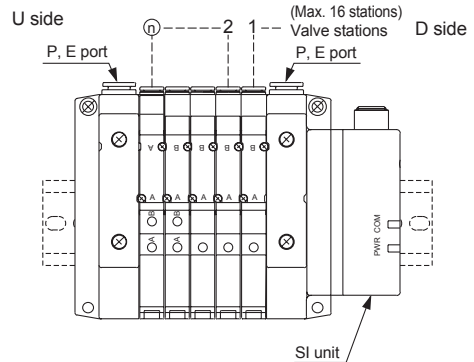
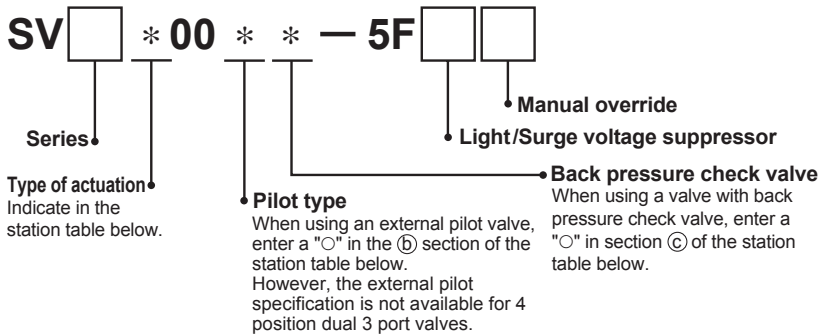
Single Valve
Sub-plate

Manifold
Specification Sheets

① Manifolds Refer to page 8 for appropriate specification symbols to fill in the blanks below.



② Valves Refer to page 9 for appropriate specification symbols to fill in the blanks below.



③ Stations

Indicate the layout of valves, etc., with a "O".

Valve stations		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Quantity
2 position	Single solenoid																	
	Double solenoid																	
3 position	Closed center																	
	Exhaust center																	
	Pressure center																	
4 position dual	N.C./N.C.																	
	N.O./N.O.																	
3 port valve	N.C./N.O.																	
	Relay output module																	
	1 output																	
	2 outputs																	
Blanking plate assembly																		
②	External pilot specification (enter only for external pilot)																	
③	With back pressure check valve (enter only for back pressure check valve)																	
④	Supply																	
	Exhaust																	
⑤	SUP block plate assembly																	
	EXH block plate assembly																	
⑥	Wiring specifications																	
	Single wiring																	
	Double wiring																	

Enter only when specifying the wiring.

Enter ordered part numbers.

For SMC use only

Part no.	Qty.

Part no.	Qty.

Order no.	
Clerk (code no.)	
Dept. code	

Date:

EX250 Integrated Input/Output Serial Type Manifold

Series SV¹/₂000: Tie-rod base

Manifold Specification Sheet

Follow procedures ① through ③.

Customer name			
Contact person			
Specification sheet no.			
Purchase order no.			
Equipment name			
Quantity	set(s)	Required date	

① Manifolds Refer to page 24 for appropriate specification symbols to fill in the blanks below.

SS5V — **W10S1** **D** — — —

Series

1	SV1000
2	SV2000
3	SV3000

SI unit

0	Without SI unit
NW	For ProfiBus-DP
QW	For DeviceNet

Input block

Nil	Without input block
1	M12: 2 inputs
2	M12: 4 inputs
3	M8: 4 inputs (3 pins)

Valve stations

Includes the number of blanking plate assemblies.

P, E port position

Option

Manifold mounting and DIN rail length can be specified.

Input block common specification

Nil	Positive COM
N	Negative COM

Supply/Exhaust block assembly specification

A, B port size

For mixed mounting, indicate the port size, such as C3 or C4, instead of a "O" in the ① section of the station table.

② Valves Refer to page 25 for appropriate specification symbols to fill in the blanks below.

SV * **00** * * — **5F**

Series

Type of actuation
Indicate in the station table below.

Pilot type
When using an external pilot valve, enter a "O" in the ① section of the station table below. However, the external pilot specification is not available for 4 position dual 3 port valves.

Manual override

Light/Surge voltage suppressor

Back pressure check valve
When using a valve with back pressure check valve, enter a "O" in section ③ of the station table below.

③ Stations

Indicate the layout of valves, etc., with a "O".

Valve stations		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Quantity	
①	2 position	Single solenoid																	
		Double solenoid																	
	3 position	Closed center																	
		Exhaust center																	
		Pressure center																	
	4 position dual	N.C./N.C.																	
N.O./N.O.																			
3 port valve	N.C./N.O.																		
	Relay output module	1 output																	
		2 outputs																	
	Blanking plate assembly																		
②	External pilot specification (enter only for external pilot)																		
③	With back pressure check valve (enter only for back pressure check valve)																		
④	Supply																		
	Exhaust																		
⑤	SUP block plate assembly																		
	EXH block plate assembly																		
⑥	Wiring specifications	Single wiring																	
		Double wiring																	

Enter only when specifying the wiring.

For SMC use only

Enter ordered part numbers.

Part no.	Qty.

Part no.	Qty.

Order no.	
Clerk (code no.)	
Dept. code	

Date:

EX120 Dedicated Output Serial Type Manifold

Series SV¹₂³₄000: Tie-rod base
Cassette base

Manifold Specification Sheet

Follow procedures ① through ③.

Customer name		
Contact person		
Specification sheet no.		
Purchase order no.		
Equipment name		
Quantity	set(s)	Required date

Valve Manifold
Common
Specifications

EX500

EX250

EX120

Circular
Connector

D-sub
Connector

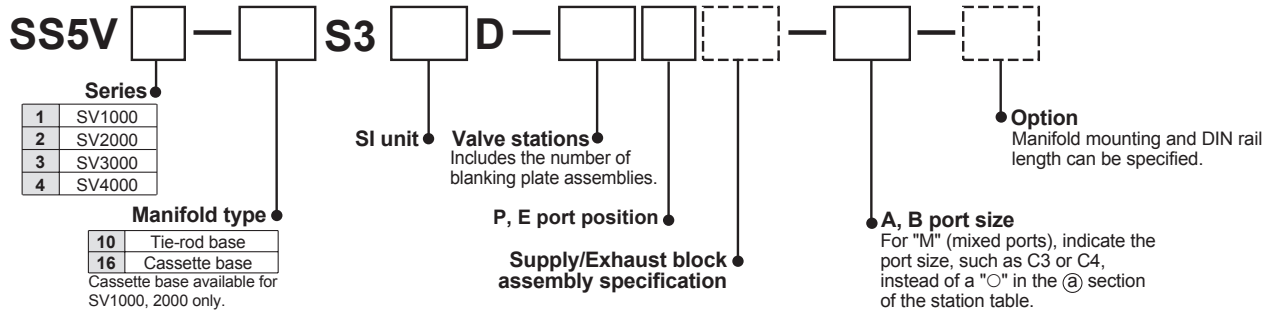
Flat Ribbon Cable

Valve Manifold
Specifications

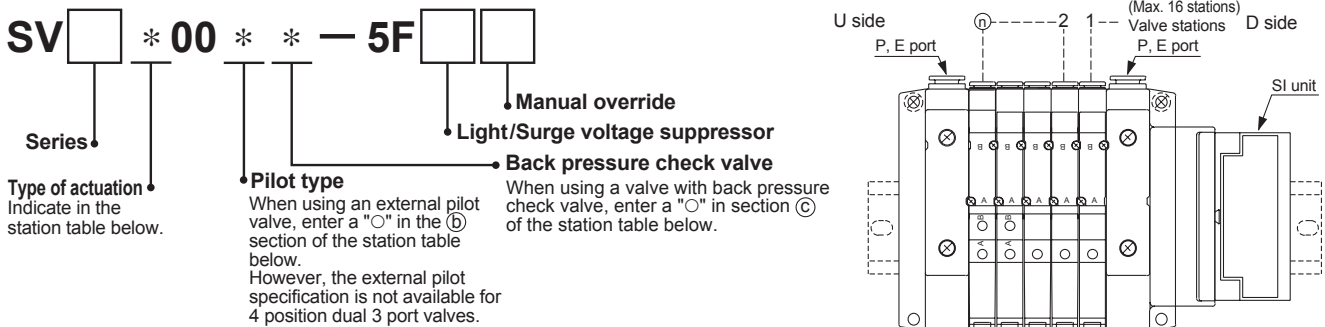
Single Valve
Sub-plate

Manifold
Specification Sheets

① Manifolds Refer to page 32 for appropriate specification symbols to fill in the blanks below.



② Valves Refer to page 33 for appropriate specification symbols to fill in the blanks below.



③ Stations

Indicate the layout of valves, etc., with a "O".

Valve stations		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Quantity
2 position	Single solenoid																	
	Double solenoid																	
3 position	Closed center																	
	Exhaust center																	
	Pressure center																	
4 position dual 3 port valve	N.C./N.C.																	
	N.O./N.O.																	
Relay output module	1 output																	
	2 outputs																	
Blanking plate assembly																		
② External pilot specification (enter only for external pilot)																		
③ With back pressure check valve (enter only for back pressure check valve)																		
④ Supply																		
Exhaust																		
⑤ SUP block plate assembly																		
EXH block plate assembly																		
⑥ Wiring specifications	Single wiring																	
	Double wiring																	

Enter only when specifying the wiring.

For SMC use only

Enter ordered part numbers.

Part no.	Qty.

Part no.	Qty.

Order no.	
Clerk (code no.)	
Dept. code	

Date:

Circular Connector Type Manifold

Series SV¹₂³₃000: Tie-rod base
Cassette base

Manifold Specification Sheet

Follow procedures ① through ③.

Customer name			
Contact person			
Specification sheet no.			
Purchase order no.			
Equipment name			
Quantity	set(s)	Required date	

① Manifolds Refer to page 44 for appropriate specification symbols to fill in the blanks below.

SS5V — W CD — — —

Series

1	SV1000
2	SV2000
3	SV3000
4	SV4000

Manifold type

10	Tie-rod base
16	Cassette base

Cassette base available for SV1000, 2000 only.

Valve stations
Includes the number of blanking plate assemblies.

P, E port position

Supply/Exhaust block assembly specification

A, B port size
For "M" (mixed ports), indicate the port size, such as C3 or C4, instead of a "O" in the (a) section of the station table.

Option
Manifold mounting and DIN rail length can be specified.

② Valves Refer to page 45 for appropriate specification symbols to fill in the blanks below.

SV * 00 * * — ⁵/₆F

Series

Type of actuation
Indicate in the station table below.

Pilot type
When using an external pilot valve, enter a "O" in the (b) section of the station table below. However, the external pilot specification is not available for 4 position dual 3 port valves.

Manual override

Light/Surge voltage suppressor

Back pressure check valve
When using a valve with back pressure check valve, enter a "O" in section (c) of the station table below.

③ Stations

Indicate the layout of valves, etc., with a "O".

Valve stations		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Quantity	
①	2 position	Single solenoid																	
		Double solenoid																	
	3 position	Closed center																	
		Exhaust center																	
		Pressure center																	
	4 position dual 3 port valve	N.C./N.C.																	
		N.O./N.O.																	
Relay output module	1 output																		
	2 outputs																		
Blanking plate assembly																			
②	External pilot specification (enter only for external pilot)																		
③	With back pressure check valve (enter only for back pressure check valve)																		
④	Supply																		
	Exhaust																		
⑤	SUP block plate assembly																		
	EXH block plate assembly																		
⑥	Wiring specifications	Single wiring																	
		Double wiring																	

Enter only when specifying the wiring.

For SMC use only

Enter ordered part numbers.

Part no.	Qty.

Part no.	Qty.

Order no.	
Clerk (code no.)	
Dept. code	

Date:

D-sub Connector
Flat Ribbon Cable Connector **Type Manifold**

Series SV¹₂³₄000: **Tie-rod base**
Cassette base

Customer name		
Contact person		
Specification sheet no.		
Purchase order no.		
Equipment name		
Quantity	set(s)	Required date

Manifold Specification Sheet

Follow procedures ① through ③.

① Manifolds Refer to page 54 for appropriate specification symbols to fill in the blanks below.

SS5V [] — [] [] **D** [] — [] [] [] — [] [] — [] []

Series

1	SV1000
2	SV2000
3	SV3000
4	SV4000

Manifold type

10	Tie-rod base
16	Cassette base

Cassette base available for SV1000, 2000 only.

Connector type

F	D-sub connector 25 pins
P	Flat ribbon cable connector 26 pins
PG	Flat ribbon cable connector 20 pins
PH	Flat ribbon cable connector 10 pins

Valve stations
Includes the number of blanking plate assemblies.

Connector entry direction

1	Upward
2	Lateral

Option
Manifold mounting and DIN rail length can be specified.

A, B port size
For "M" (mixed ports), indicate the port size, such as C3 or C4, instead of a "O" in the (a) section of the station table.

Supply/Exhaust block assembly specification

P, E port position

② Valves Refer to page 55 for appropriate specification symbols to fill in the blanks below.

SV [] * **00** * * — **5** **F** [] []

Series

Type of actuation
Indicate in the station table below.

Pilot type
When using an external pilot valve, enter a "O" in the (b) section of the station table below. However, the external pilot specification is not available for 4 position dual 3 port valves.

Manual override

Light/Surge voltage suppressor

Back pressure check valve
When using a valve with back pressure check valve, enter a "O" in section (c) of the station table below.

③ Stations

Indicate the layout of valves, etc., with a "O".

Valve stations		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Quantity	
①	2 position	Single solenoid																	
		Double solenoid																	
	3 position	Closed center																	
		Exhaust center																	
		Pressure center																	
②	4 position dual 3 port valve	N.C./N.C.																	
		N.O./N.O.																	
③	Relay output module	1 output																	
		2 outputs																	
Blanking plate assembly																			
④	External pilot specification (enter only for external pilot)																		
⑤	With back pressure check valve (enter only for back pressure check valve)																		
⑥	Supply																		
	Exhaust																		
⑦	SUP block plate assembly																		
	EXH block plate assembly																		
⑧	Wiring specifications	Single wiring																	
		Double wiring																	

Enter only when specifying the wiring.

Enter ordered part numbers.

Part no.	Qty.

For SMC use only


Part no.	Qty.


Order no.	
Clerk (code no.)	
Dept. code	




Series SV Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

 **Caution** : Operator error could result in injury or equipment damage.

 **Warning** : Operator error could result in serious injury or loss of life.

 **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back-pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.



Series SV 5 Port Solenoid Valve Precautions 1

Be sure to read before handling.

Design

⚠ Warning

1. Actuator drive

When an actuator, such as a cylinder, is to be driven using a valve, take appropriate measures to prevent potential danger caused by actuator operation.

2. Intermediate stopping

When a 3 position closed center valve is used to stop a cylinder at an intermediate position, accurate stopping of the piston in a predetermined position is not possible due to the compressibility of air.

Furthermore, since valves and cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended length of time. Contact SMC if it is necessary to hold a stopped position for an extended time.

3. Effect of back pressure when using a manifold

Use caution when valves are used on a common exhaust manifold, as actuator malfunction due to back pressure may occur.

Special caution is necessary when driving an air operated valve or single acting cylinder, or when using a 3 position exhaust center valve. Since there is a possibility of malfunction due to exhaust from other actuators, use EXH block plates to divide the exhaust, or take other measures, when there may be an adverse effect from back pressure.

4. Holding of pressure (including vacuum)

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

5. Cannot be used as an emergency shutoff valve, etc.

The valves presented in this catalog are not designed for safety applications such as an emergency shutoff valve. If the valves are used in this type of system, other reliable safety assurance measures should also be adopted.

6. Maintenance space

The installation should allow sufficient space for maintenance activities (removal of valve, etc.).

7. Release of residual pressure

Provide a residual pressure release function for maintenance purposes. Special consideration should be given to the release of residual pressure between the valve and cylinder in the case of a 3 position closed center type valve.

8. Vacuum applications

When a valve is used for vacuum switching, etc., take measures against the suction of external dust or other contaminants from vacuum pads and exhaust ports, etc. Moreover, an external pilot type valve should be used in this case. Contact SMC in the case of an internal pilot type valve.

9. Double solenoid applications

When first using a double solenoid type, the actuator may operate in an unexpected direction depending on the valve's switch position. Take appropriate measures to prevent potential danger caused by actuator operation.

10. Ventilation

When using valves in a sealed control panel, install a vent so that the pressure inside the control panel will not rise due to exhaust air, and heat generated by the valves will not be trapped.

Selection

⚠ Warning

1. Confirm the specifications.

The products presented in this catalog are designed only for use in compressed air systems (including vacuum). Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to specifications.)

Contact SMC when using a fluid other than compressed air (including vacuum).

2. Extended periods of continuous energization

Contact SMC if valves will be continuously energized for extended periods of time, or the energized time exceeds the de-energized time.

⚠ Caution

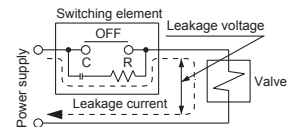
1. Momentary energization

If a double solenoid valve will be operated with momentary energization, it should be energized for at least 0.1 second.

However, depending on the secondary load conditions, it should be energized until the cylinder reaches the stroke end position, as there is a possibility of malfunction otherwise.

2. Leakage voltage

Particularly when using a C-R element (surge voltage suppressor) for the protection of a switching element, take note that leakage voltage will increase due to leakage current flowing through the C-R element. Therefore, select circuits and elements to limit the amount of residual leakage voltage to the following value. Also, when there is a reset malfunction due to leakage voltage, installation of a bleeder resistor is recommended. Contact SMC for details on bleeder resistors.



Therefore, select circuits and elements to limit the amount of residual leakage voltage to the following value. Also, when there is a reset malfunction due to leakage voltage, installation of a bleeder resistor is recommended. Contact SMC for details on bleeder resistors.

With DC coil: 3% or less of rated voltage

3. Low temperature operation

Appropriate measures should be taken to avoid solidification or freezing of drainage and moisture at low temperatures.

4. Operation for air blowing

When using a solenoid valve for air blow, use an external pilot type. Take note that when internal pilots and external pilots are used on the same manifold, the pressure drop caused by the air blowing can have an effect on the internal pilot type valves.

Moreover, when compressed air within the pressure range of the established specifications is supplied to the external pilot port, and a double solenoid valve is used for air blowing, the solenoids should normally be energized when air is being blown.

5. Mounting orientation

The mounting orientation is unrestricted.



Series SV 5 Port Solenoid Valve Precautions 2

Be sure to read before handling.

Mounting

⚠ Warning

1. If air leakage increases or equipment does not operate properly, stop operation of the valve.

At the time of mounting and maintenance, etc., connect the compressed air and power supplies, and perform appropriate function and leakage tests to confirm that the unit is mounted properly.

2. Instruction manual

Mount and operate the product after reading the manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

3. Painting and coating

Warnings or specifications printed or pasted on the product should not be erased, removed or covered up.

Consult SMC if paint is to be applied to resinous parts, as this may have an adverse effect due to the paint solvent.

Wiring

⚠ Caution

1. Applied voltage

When electric power is connected to the solenoid valve, be careful to apply the proper voltage. Improper voltage may cause malfunction or coil damage.

2. Confirm the connections.

After completing the wiring, confirm that the connections are correct.

Lubrication

⚠ Caution

1. Lubrication

1) The valve has been lubricated for life at the factory, and does not require any further lubrication.

2) In the event that it is lubricated, use Class 1 turbine oil (without additives), ISO VG32.

However, once lubrication is applied it must be continued, as the original lubricant may be lost leading to malfunction.

Piping

⚠ Caution

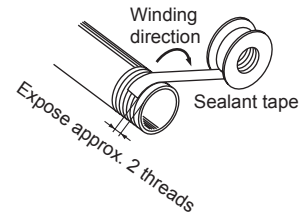
1. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

2. Wrapping of sealant tape

When connecting pipes and fittings, etc., be sure that chips from the pipe threads and sealing material do not get inside the valve.

Furthermore, when sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



3. When using closed centre valves

When using closed centre type valves, check carefully to be sure there are no air leaks from the piping between the valves and cylinders.

4. Tightening of fittings

When connecting fittings, etc., to valves, tighten as indicated below.

1) M5 type

1. When using SMC fittings, follow the guidelines below.

M5: After tightening by hand, tighten an additional 1/6 turn with a tightening tool. However, if miniature fittings are used, tighten an additional 1/4 turn with a tightening tool after tightening by hand. For fittings with gaskets in 2 locations, e.g., universal elbow or universal tee, tighten an additional 1/2 turn.

Note) If fittings are over-tightened, air leakage may result due to breaking of fitting threads or deformation of the gaskets. However, if fittings are not tightened sufficiently, loosening of the threads and air leakage may occur.

2. When fittings other than SMC fittings are used, follow the instructions of the respective fitting manufacturer.

2) Rc threads

Follow the provided tightening torque levels below.

Connection thread	Proper tightening torque N·m
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24
Rc 1/2	28 to 30

5. Connection of piping to products

When connecting piping to a product, refer to its instruction manual to avoid mistakes regarding the supply port, etc.



Series SV 5 Port Solenoid Valve Precautions 3

Be sure to read before handling.

Air Supply

Warning

1. Use clean air.

Do not use compressed air which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as this can cause damage or malfunction.

Caution

1. Install air filters.

Install air filters close to valves at their upstream side. A filtration degree of 5µm or less should be selected.

2. Install an air dryer, after-cooler or water separator, etc.

Air that contains excessive drainage may cause malfunction of valves and other pneumatic equipment. Take measures by installing an air dryer, after-cooler or water separator, etc.

3. If excessive carbon powder is generated, eliminate it by installing mist separators at the upstream side of valves.

If excessive carbon powder is generated by the compressor, it may adhere to the inside of valves and cause malfunction.

Refer to SMC's "Air Cleaning Equipment" catalog for further details on compressed air quality mentioned above.

Operating Environment

Warning

1. Do not use valves in atmospheres of corrosive gases, chemicals, salt water, water, steam, or where there is direct contact with any of these.

2. Products with IP65 and IP67 enclosures (based on IEC529) are protected against dust and water, however, these products cannot be used in the water.

3. When using built-in silencer type manifold with an IP67 enclosure, keep the exhaust port of the silencer from coming in direct contact with water or other liquids. Liquid filtration through the exhaust port of the silencer can cause damage to the valve.

4. Do not use in an explosive atmosphere.

5. Do not use in locations subject to vibration or impact. Confirm the specifications in the main section of this catalog.

6. Use a protective cover, etc., to shield valves from direct sunlight.

7. Shield valves from radiated heat generated by nearby heat sources.

8. Employ suitable protective measures in locations where there is contact with oil or welding spatter, etc.

Operating Environment

9. When solenoid valves are mounted in a control panel or are energized for extended periods of time, employ measures to radiate excess heat, so that temperatures remain within the valve specification range.

Maintenance

Warning

1. Perform maintenance procedures as shown in the instruction manual.

If handled improperly, malfunction or damage of machinery or equipment may occur.

2. Removal of equipment and supply/exhaust of compressed air

When equipment is serviced, first confirm that measures are in place to prevent dropping of work pieces and run-away of equipment, etc. Then cut the supply pressure and power, and exhaust all compressed air from the system using its residual pressure release function.

Furthermore, in the case of 3 position closed center type valves, compressed air will remain between valves and cylinders, and must be exhausted similarly.

When the equipment is to be started again after remounting or replacement, first confirm that measures are in place to prevent lurching of actuators, etc., and then confirm that the equipment is operating normally.

3. Low frequency operation

Switch valves at least once every 30 days to prevent malfunction. (Use caution regarding the air supply.)

4. Manual override operation

When the manual override is operated, connected equipment will be actuated. Confirm safety before operating.

Caution

1. Drain flushing

Remove drainage from air filters regularly. (Refer to specifications.)

How to Find the Flow Rate (at air temperature of 20°C)

Subsonic flow when $P_1 + 0.1013 < 1.89 (P_2 + 0.1013)$

$$Q = 226S \sqrt{\Delta P (P_2 + 0.1013)}$$

Sonic flow when $P_1 + 0.1013 \geq 1.89 (P_2 + 0.1013)$

$$Q = 113S (P_1 + 0.1013)$$

Q: Air flow rate [L/min(ANR)]

S: Effective area (mm²)

ΔP : Pressure drop (P₁ - P₂) [MPa]

P₁: Upstream pressure [MPa]

P₂: Downstream pressure [MPa]

* Correction for different air temperatures

Multiply the flow rate calculated with the above formula by a coefficient from the table below.

Air temperature (°C)	-20	-10	0	10	30	40	50	60
Correction coefficient	1.08	1.06	1.04	1.02	0.98	0.97	0.95	0.94



Series SV Specific Product Precautions 1

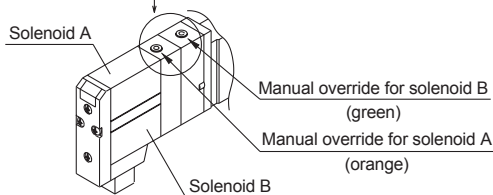
Be sure to read before handling.
Refer to pages 101 through 104 for safety instructions and common precautions.

Warning

Manual override operation

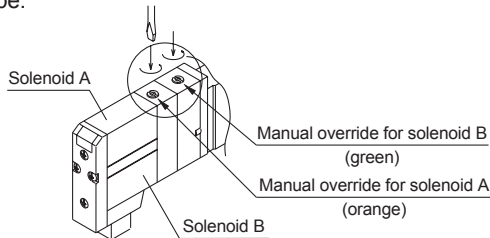
Handle carefully, as connected equipment can be actuated through manual override operation.

Non-locking push type



Slotted locking type (screwdriver operated)

After pushing down, turn in the direction of the arrow.
If it is not turned, it can be operated the same way as the non-locking type.



Caution

When locking the manual override on the screwdriver operated slotted locking type, 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.

Caution

Exhaust restriction

Since the series SV is a type in which the pilot valve exhaust joins the main valve exhaust inside the valve, care must be taken so that the piping from the exhaust port is not restricted.

Caution

Series SV used as a 3 port valve

Using a 5 port valve as a 3 port valve

Series SV valves 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. They are convenient at times when a double solenoid type 3 port valve is required.

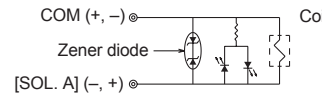
Number of solenoids	Actuation	Port B	Port A
		N.C.	N.O.
Single	Single		
	Double		

Caution

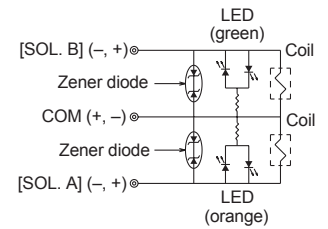
Light/Surge voltage suppressor

Solenoid valves have no polarity.
Light/surge voltage suppressor

Single solenoid type

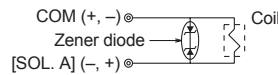


Double solenoid, 3 position type

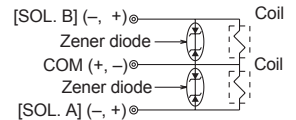


Surge voltage suppressor

Single solenoid type



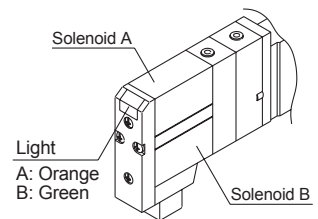
Double solenoid, 3 position type



Caution

Light indication

When equipped with light and surge voltage suppressor, the indicator light window turns orange when solenoid A is energized, and it turns green when solenoid B is energized.





Series SV Specific Product Precautions 2

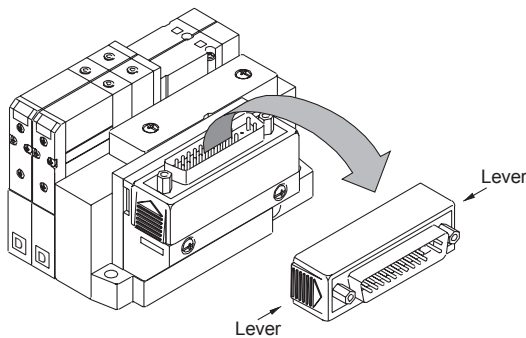
Be sure to read before handling.

Refer to pages 101 through 104 for safety instructions and common precautions.

⚠ Caution

Connector entry directions

Connector entry directions for D-sub connectors and flat ribbon cables can be changed. To change the connector's entry direction, press the levers on both sides of the connector, take it off, and change the direction as shown in the drawing. Since lead wire assemblies are attached to the connector, excessive pulling or twisting can cause broken wires or other trouble. Also, take precautions so that lead wires are not caught and pinched when installing the connector.

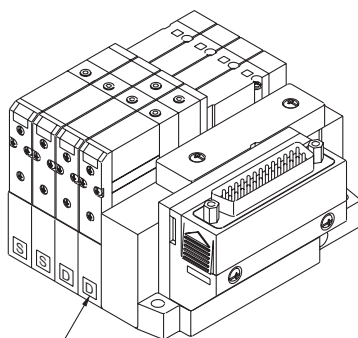


⚠ Caution

How to order manifolds

The letter "S" or "D" is indicated on manifold blocks for series SV as shown below. This indication refers to the type substrate assembly (single wiring or double wiring) inside the manifold blocks.

When the manifold specification sheet does not include a wiring specification, all stations will be double wiring specification (D). In this case, single and double valves can be mounted in any position, but when a single valve is used, there will be an unused control signal. To avoid this, indicate positions of manifold blocks for single wiring specification (S) and double wiring specification (D) on a manifold specification sheet. (Note that double, 3 or 4 position valves cannot be used for manifold blocks with single wiring specification (S).)



⚠ Caution

One-touch fittings

1. Tube attachment/detachment for One-touch fittings

1) Attaching of tube

- ① 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 pinchers, nippers or scissors, etc. If cutting is done with tools other than tube cutters, there is the danger that the tube may be cut diagonally or become flattened, etc., making a secure installation impossible, and causing problems such as the tube pulling out after installation or air leakage. Also allow some extra length in the tube.
- ② Grasp the tube and push it in slowly, inserting it securely all the way into the fitting.
- ③ After inserting the tube, pull on it lightly to confirm that it will not come out. If it is not installed securely all the way into the fitting, this can cause problems such as air leakage or the tube pulling out.

2) Detaching of tube

- ① Push in the release button sufficiently, and push the collar evenly at the same time.
- ② Pull out the tube while holding down the release button so that it does not come out. If the release button is not pressed down sufficiently, there will be increased bite on the tube and it will become more difficult to pull it out.
- ③ When the removed tube is to be used again, cut off the end or portion that was connected before reusing it as it may have become worn. If the grabbing or connecting portion of the tube is used as is, this can cause trouble such as air leakage or difficulty in removing the tube.

⚠ Caution

Other tube brands

1. When using other than SMC brand tubes, confirm that the following specifications are satisfied with respect to the outside diameter tolerance of the tube.

- | | |
|----------------------|---|
| 1) Nylon tube | within $\pm 0.1\text{mm}$ |
| 2) Soft nylon tube | within $\pm 0.1\text{mm}$ |
| 3) Polyurethane tube | within $+0.15\text{mm}$ or less
within -0.2mm or less |

Do not use tubes which do 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 tube pulling out after connection.

⚠ Caution

Substrate assemblies inside manifolds

Substrate assemblies inside of manifolds cannot be taken apart. Attempting to do so may damage parts.



Series SV Specific Product Precautions 3

Be sure to read before handling.
Refer to pages 101 to 104 for safety instructions and common precautions.

Serial wiring EX500/EX250/EX120 Precautions

⚠ Warning

1. These products are intended for use in general factory automation equipment.
Avoid using these products in machinery/equipment which affects human safety, and in cases where malfunction or failure can result in extensive damage.
2. Do not use in explosive atmospheres, environments with inflammable gases, or corrosive environments.
This can cause injury or fire, etc.
3. Work such as transporting, installing, piping, wiring, operation, control and maintenance should be performed by personnel with specialized knowledge.
There is a danger of electrocution, injury or fire, etc.
4. Install an external emergency stop circuit that can promptly stop operation and shut off the power supply.
5. Do not rebuild these products, as there is a danger of injury and damage.

⚠ Caution

1. Read the instruction manual carefully, strictly observe the precautions and operate within the range of the specifications.
2. Do not drop these products or submit them to strong impacts. This can cause damage, failure or malfunction, etc.
3. In locations with poor electrical conditions, take steps to ensure a steady flow of the rated power supply. Use of a voltage outside of the specifications can cause malfunction, damage to the unit, electrocution or fire, etc.
4. Do not touch connector terminals or internal substrates when current is being supplied. There is a danger of malfunction, damage to the unit or electrocution if connector terminals or internal substrates are touched when current is being supplied.
Be sure that the power supply is OFF when adding or removing manifold valves or input blocks, etc., or when connecting or disconnecting connectors.
5. Operate at an ambient temperature that is within the specifications. Even when the ambient temperature range is within the specifications, do not use in locations where there are rapid temperature changes.
6. Keep wire scraps and other extraneous material from getting inside these products. This can cause fire, failure or malfunction, etc.
7. Give consideration to the operating environment depending on the type of enclosure being used.
To achieve IP65 protection, provide appropriate wiring between all units using electrical wiring cables, communication connectors and cables with M12 connectors. Also, provide waterproof caps when there are unused ports, and perform proper mounting of input units, input blocks, SI units and manifold valves, etc. Provide a cover or other protection for applications in which there is constant exposure to water.
8. Use the proper tightening torques.
There is a possibility of damaging threads if tightening exceeds the tightening torque range.

⚠ Caution

9. Provide adequate protection when operating in locations such as the following:
 - Where noise is generated by static electricity, etc.
 - Where there is a strong electric field
 - Where there is a danger of exposure to radiation
 - When in close proximity to power supply lines
10. When these products are installed in equipment, provide adequate protection against noise by using noise filters, etc.
11. Since these products are components that are used after installation in other equipment, the customer should confirm conformity to EMC directives for the finished product.
12. Do not remove the name plate.
13. Perform periodic inspections and confirm normal operation. It may otherwise be impossible to guarantee safety due to unexpected malfunction or erroneous operation.

Power Supply Safety Instructions

⚠ Caution

1. Operation is possible with a single power supply or a separate power supply. However, be sure to provide two wiring systems (one for solenoid valves, and one for input and control units).
2. Use the following UL approved products for DC power supply combinations.
 - (1) Controlled voltage current circuit conforming to UL508
Circuit uses the secondary coil of an isolated transformer as the power supply, satisfying the following conditions.
 - Max. voltage (with no load): 30Vrms (42.4V peak) or less
 - Max. current: ① 8A or less (including shorts), and
② When controlled by a circuit protector (fuse, etc.) with the following rating

No-load voltage (V peak)	Max. current rating
0 to 20 [V]	5.0
Over 20 [V] to 30 [V]	100
	Peak voltage value

- (2) A circuit (class 2 circuit) with maximum 30Vrms (42.4V peak) or less, and a power supply consisting of a class 2 power supply unit conforming to UL1310, or a class 2 transformer conforming to UL1585

Cable Safety Instructions

⚠ Caution

1. Be careful of mis-wiring. This can cause malfunction, damage and fire in the unit.
2. To prevent noise and surge in signal lines, keep all wiring separate from power lines and high voltage lines. Otherwise, this can cause malfunction.
3. Check wiring insulation, as defective insulation can cause damage to the unit due to excessive voltage or current.
4. Do not bend or pull cables repeatedly, and do not place heavy objects on them or allow them to be pinched. This can cause broken lines.