Installation and Maintenance Manual
SJ2000/3000 Cassette Type
Manifold Solenoid Valves

Read this manual before using this product

- The information within this document is to be used by pneumatically trained personnel only.
- For future reference, please keep manual in a safe place.
- This manual should be read in conjunction with the current catalogue.

1 SAFETY

1.1 General recommendation

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO4414 (Note1), JIS B 8370 (Note2) and other safety practices.

Note 1:ISO 4414:Pneumatic fluid power - General rules relating to systems.
Note 2:JIS B 8370:Pneumatic system axiom.

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.

WARNING:

- **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.
- **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.
- **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
  - Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
  - When equipment is to be removed, confirm the safety process as mentioned above. Switch off air and electrical supplies and exhaust all residual compressed air in the system.
  - Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Bleed air into the system gradually to create backpressure, i.e. incorporate a soft-start valve).
- **Contact SMC if the product is to be used in any of the following conditions:**
  - Conditions and environments beyond the given specifications, or if product is used outdoors.
  - Installations on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
  - An application, which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

CAUTION:

- Ensure that the air supply system is filtered to 5 micron.

1.2 Conformity to standard

This product is certified to and complies with the following standards:

EMC Directive 89/336/EEC, 92/31/EEC, 93/68/EEC, 93/68/EEC,EMVG	EN 61000-6-2, EN 55011

2 INTENDED CONDITIONS OF USE

2.1 Valve Specifications

Type			SJ2000/3000
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
	4 Position dual 3 port		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
		3 position	0.25 to 0.7
Ambient and fluid temp °C			Max. 50
Max. operating frequency Hz	2 Position Single, Double		10
	4 position dual 3 port		
	3 Position		3
Manual override			Non-locking push type, push & turn locking slotted type
Pilot Exhaust	Internal pilot		Common exhaust type for main and pilot valve
	External pilot		Pilot valve individual exhaust
Lubrication			Non required
Mounting position			Unrestricted
Impact/Vibration resistance m/s²			150/30 *Note 2)
Protection Structure			IP40

(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 both energized and de-energized status. (initial value)

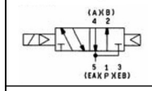
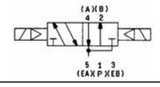
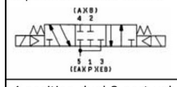
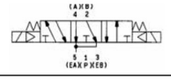
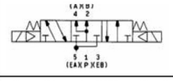
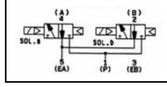
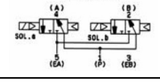
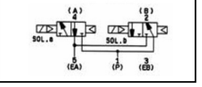
Vibration resistance: No malfunction when tested with one sweep of 8.3 to 2000Hz in the axial direction and at a right angle to the main valve and armature, one time each in both energized and de-energized states. (initial valve)

Solenoid Specification

Rated coil voltage Note.1)			24,12DC
Allowable voltage fluctuation			±10% rated voltage
Power consumption (W)	Standard	SJ2000	0.55
		SJ3000	0.4
	Power saving type (Extended periods continuously energized)	SJ2000	0.23
		SJ3000	0.15
Surge voltage suppressor			Diode
Indicator light			LED

Note: The following voltage range must be kept for T type (with power saving circuit) as voltage drop may occur due to the internal circuit.
24VDC: -5~+10%
12VDC: -6~+10%

2.2 Circuit Symbols

2 Position single 	2 Position double 	
3 position closed centre 	3 position exhaust centre 	3 position pressure centre 
4 position dual 3 port valve N.C./N.C. 	4 position dual 3 port valve N.O./N.O. 	4 position dual 3 port valve N.C./N.O. 

3 INSTALLATION

WARNING:

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

3.1 Environment

WARNING:

- Do not use in an environment where the product is directly exposed to corrosive gases, chemicals, salt water, water or steam.
- Do not use in an explosive atmosphere.
- The product should not be exposed to prolonged sunlight. Use a protective cover.
- Do not mount the product in a location where it is subject to strong vibrations and/or shock. Check the product specifications for above ratings.
- Do not mount the product in a location where it is exposed to radiant heat.

3.2 Piping

CAUTION:

- Before piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fitting into a port, ensure that sealant material does not enter the port inside. When using seal tape, leave 1.5 to 2 threads exposed on the end of pipe/fitting.

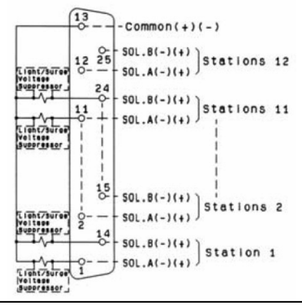
Thread	Appropriate tightening torque (Nm)
M3	By hand + ¼ turn with the wrench
M5	By hand + 1/6 turn with the wrench (1/4 turn for miniature fittings)

3.3 Electrical connection

CAUTION:

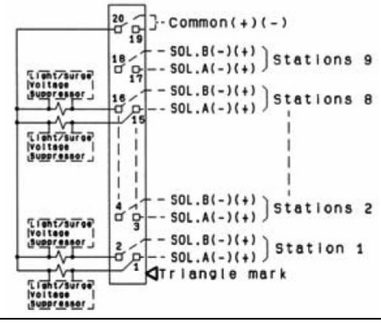
- When DC power is connected to a solenoid valve equipped with light and/or surge voltage suppressor, check for polarity indications.
- For polarity indications:
  - o No diode to protect polarity: if polarity connection is wrong, the diode in the valve or switching device at control equipment or power supply may be damaged.
  - o With diode to protect polarity: if polarity connection is wrong, the valve does not switch.

Type 60F D-sub connector type (25 pin)



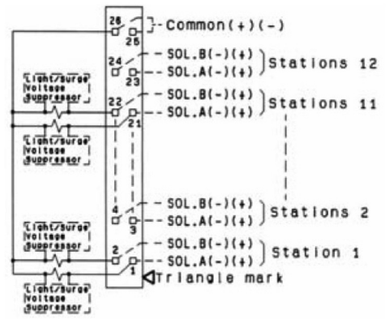
(Note) This circuit shows 2 position double, 3 position, 4 position dual 3-port valve up to 12 stations. The valves are connected in order of 1 → 14 → 2 → 15 so that there will be no extra terminal.

Type 60P Flat ribbon cable type (26 pin)



(Note) This circuit shows 2 position double, 3 position, 4 position dual 3-port valve up to 12 stations. The valves are connected in order of 1 → 2 → 3 → 4 so that there will be no extra terminal.

Type 60PG Flat ribbon cable type (20 pin)

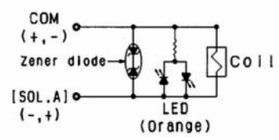


(Note) This circuit shows 2 position double, 3 position, 4 position dual 3-port valve up to 9 stations. The valves are connected in order of 1 → 2 → 3 → 4 so that there will be no extra terminal.

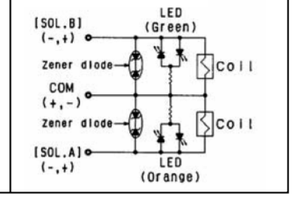
Light/surge voltage suppressor

- **Non-polar type**
  When the solenoid valve has no polarity.

Single solenoid

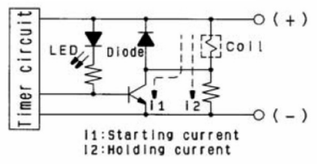


Double solenoid



- **With power saving**
  Power consumption is decreased by 1/3 (SJ3□60T) by reducing the wattage required to hold the valve in an energized state. (Effective energizing time is over 62ms at 24VDC.)

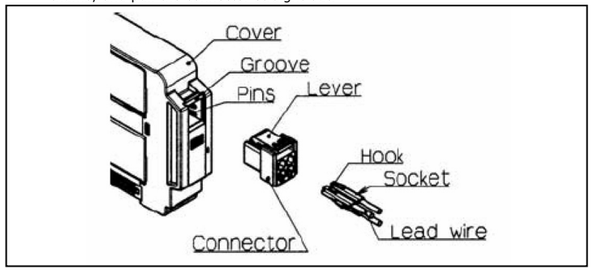
With power saving circuit



How to use plug connectors

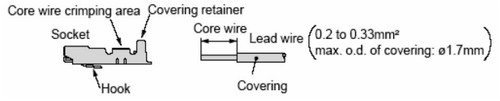
When attaching and detaching a connector, first shut off the electric power and the air supply. Also, crimp the lead wires and sockets securely.

1. **Attaching and detaching connectors**
- **Attaching**
  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.
- **Detaching**
  Remove the pawl from the groove by pushing the lever downward with your thumb, and pull the connector straight out.



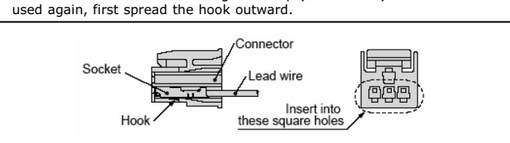
2. Crimping of lead wires and sockets

Strip 3.2 to 3.7mm at the end of the lead wires, insert the ends of the core wires evenly into the sockets, and then crimp with a crimping tool. When this is done, take care that the coverings of the lead wires do not enter the core wire crimping area.
(crimping tool: model no. DXT170-75-1)



3. Attaching and detaching lead wires with sockets

- **Attaching**
  Insert the sockets into the square holes of the connector (with (+), (-) indication), and continue to push the sockets all the way in until they 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 (about 1mm). If the socket will be used again, first spread the hook outward.



3.4 Lubrication

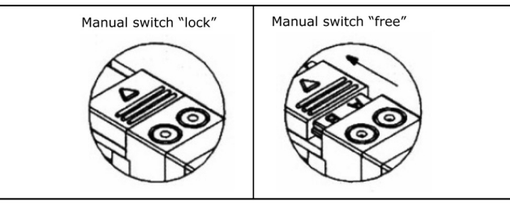
⚠ CAUTION:

- 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.

4 SETTINGS AND PROGRAMMING

⚠ CAUTION:

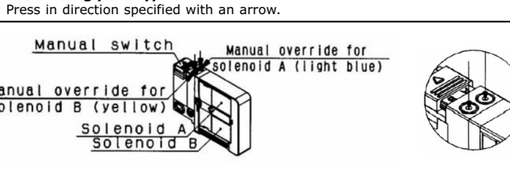
Manual switch operation
When the valve is operated manually, move the switch to the position where the letters A and B becomes visible. [Manual switch freed condition (refer to below).]
If the valve is operated manually with the switch locked, the switch may break or air leakage may occur. Therefore, be sure to free the manual switch before operation.
After manual operation, re-lock the switch. (The manual switch cannot be operated if push and turn locking slotted manual override [D type] is locked.)



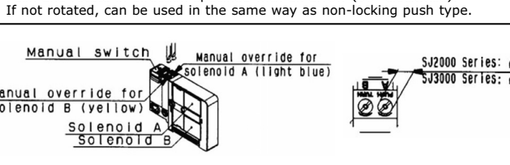
⚠ WARNING:

Manual override operation
Use extreme CAUTION when operating the manual override as connected equipment will commence operation. Ensure all safety measures are in place.

- **Non locking push type**
  Press in direction specified with an arrow.



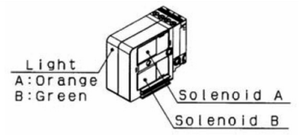
- **Push-turn locking slotted type**
  Push and rotate in direction specified with an arrow (90° clockwise).
  If not rotated, can be used in the same way as non-locking push type.



With D type, use a precision driver (flat blade) and rotate lightly. [Torque: Less than 0.1Nm] When D type is locked, be sure to push before rotating. Rotating withoutpushing may break manual override and cause failure such as air leakage.

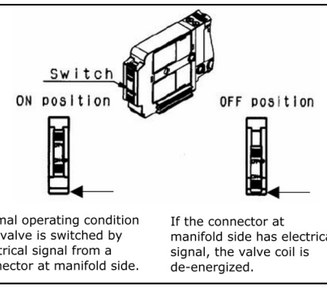
⚠ CAUTION:

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



⚠ WARNING:

When the valve is turned off by operating a switch, be sure to move it to the lock position. Turning off in the improper position may cause connected equipment to start.



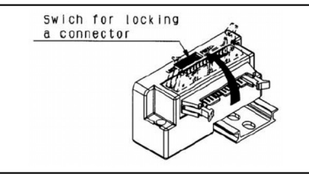
5 MAINTENANCE

⚠ WARNING:

- Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.
- If handled improperly, compressed air can be dangerous. Assembly, handling and repair of pneumatic system should be performed by qualified personnel only.
- Drain: remove condensate from the filter bowl on a regular basis.
- Before removing the positioner for maintenance or replacing unit parts after installation, make sure the supply pressure is shut off and all residual air pressure is released from piping.
- Shut-down before maintenance: before attempting any kind of maintenance make sure the supply pressure is shut off and all residual air pressure is released from the system to be worked on.
- Start-up after maintenance: apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, please verify product set-up parameters.
- Do not make any modification to the product
- Do not disassemble the product, unless required by installation or maintenance instructions.

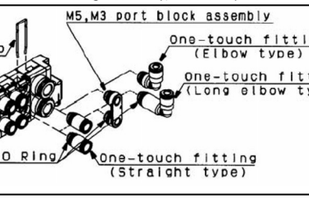
⚠ CAUTION:

Changing the connector entry direction
When changing the connector entry direction, move the switch on the top of the connector block to the FREE position and then rotate the connector. Be sure to return the switch to the LOCK position before connecting the connector. (If the switch cannot be slid smoothly, move the connector slightly.)
Forcible operation of the connector in the LOCK position or allowing the connector to move in the FREE position may break the connector block or lead wire respectively.



⚠ CAUTION:

Fitting Assembly replacement
By replacing a valve's fitting assembly, it is possible to change the connection diameter of the 4(A), 2(B), 1(P) and 3/5(E) ports.
When replacing, pull out the fitting assembly after removing the clip with a flat head screwdriver. To mount a new fitting assembly, insert in place and reinsert the clip.



Note 1, When changing the connection diameters for port 1(P) and 3/5(E), indicate on the manifold specification sheet.

Note 2, Be careful to avoid damage or contamination of O-rings, as this can cause air leakage.

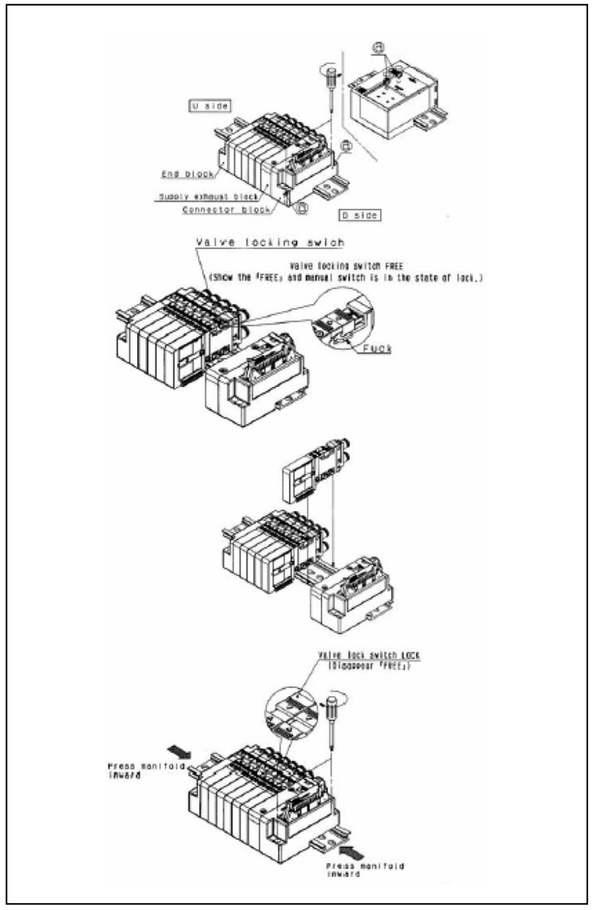
Note 3, When removing a straight type fitting assembly from the valve, after removing the clip, connect a tube or plug (KJP-02, KQ2P-□□) to the One-touch fitting and pull it out by holding the tube (or plug).
If the fitting assembly is pulled out by holding its release button (resin part), the release bushing may be damaged.

Note 4, Be sure to shut off the power and air supplies before disassembly. Furthermore, since air may remain inside the actuator, piping and manifold, confirm that the air is completely exhausted before performing any work.

Note 5, When inserting tubing into an elbow type fitting assembly, insert the tubing while holding the elbow fitting assembly body with your hand. If the tubing is inserted without holding the elbow, excessive force can be applied to the valve and fitting assembly, causing air leakage or damage.

⚠ CAUTION:

Plug-in manifold station expansion



1. Loosen screws a fixed to DIN rail (2pcs at one side)
2. Slide the valve and valve lock switch of each block to which the station is to be added in the direction toward the coil and release the linkage. (If the linkage of the blocks is released without the valve lock switch released firmly, a hook of the valve locking switch might deform or break.)
3. Mount added valve or SUP./EXH. block assembly on DIN rail.
4. The valves and block assembly can be linked and remounted to the DIN rail except for EX180 series. (In the case of EX180 series, the connector block needs to be mounted independently beforehand. After that, other valves and block assembly can be mounted linked.
5. Link the valve and each block by pressing and pushing down the valve locking switch in the direction toward the cylinder port.Tighten the screws a to fix on DIN rail.
6. To improve sealing performance, hold the end block by hand lightly after fixing the connector block and tighten fixing screws.

Connector block assembly for D-sub and flat ribbon cable, End block assembly
M3: 0.6Nm
Connector block assembly for serial M4: 1.4Nm

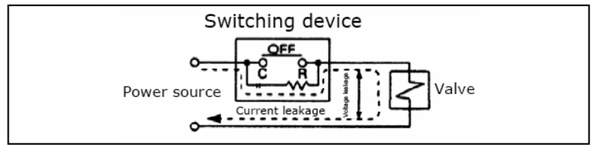
⚠ CAUTION:

1. If 10 stations or less are made into 11 stations or more, add SUP./EXH. block assembly.
2. Be sure to shut off the power and air supplies before disassembly. Furthermore, since air may remain inside the actuator, piping and manifold, confirm that the air is completely exhausted before performing any work.
3. When disassembly and assembly are performed, air leakage may result if connections between blocks and tightening of the end block's holding screw, is inadequate. Before supplying air, confirm that there are no gaps, etc. between blocks, and that manifold blocks are securely fastened to the DIN rail. Then supply air and confirm that there is no air leakage before operating.

6 LIMITATIONS OF USE

⚠ WARNING:

- Do not exceed any of the specifications laid out in section 2 of this document or the specific product catalogue.



1. **Voltage Leakage**
   When C-R device (surge voltage suppressor) Is used for the protection of switching device, note that the voltage leakage will be increased by passing voltage leakage through C-R device. Suppressor residual voltage leakage should be as follows: DC coil: 3% or less of rated voltage.
2. **Drive the solenoid valve for AC with SSR or triac output.**
   - **Leak current:**
     When C-R device (surge voltage suppressor) Is used for the protection of switching device, note that the voltage leakage will be increased by passing voltage leakage through C-R device. Suppressor residual voltage leakage should be as follows: DC coil: 3% or less of rated voltage.
   - **Minimum load capacity (minimum load current)**
     When valve's consumption current is less than minimum load capacity of output element, or when the margin is small, output element sometimes can not change itself. Please consult SMC.
3. **Surge voltage suppressor**
   If a surge protection circuit contains non-ordinary diodes such as Zener diodes or ZNRs, a residual voltage that is in proportion to the protective elements and the rated voltage will remain, Therefore, give consideration to surge voltage protection of the controller. In the case of diodes, the residual voltage is approximately 1V.
4. **Use in low temperature environments**
   Valve use in possible to temperature extremes to -10 C. Take appropriate measures to avoid freezing of drainage, moisture etc.
5. **Mounting direction.**
   All mounting postures are available

7 EUROPEAN CONTACT LIST

7.1 SMC Corporation

Country	Telephone	Country	Telephone
Austria	(43) 2262-62 280	**Italy**	(39) 02-92711
Belgium	(32) 3-355 1464	**Netherlands**	(31) 20-531 8888
Czech Republic	(420) 5-414 24611	**Norway**	(47) 67 12 90 20
Denmark	(45) 70 25 29 00	**Poland**	(48) 22-548 50 85
Finland	(358) 9-859 580	**Portugal**	(351) 22 610 89 22
France	(33) 1-64 76 1000	**Spain**	(34) 945-18 4100
Germany	(49) 6103 4020	**Sweden**	(46) 8 603 12 00
Greece	(30) 1- 342 6076	**Switzerland**	(41) 52-396 3131
Hungary	(36) 23 511 390	**Turkey**	(90) 212 221 1512
Ireland	(353) 1-403 9000	**United Kingdom**	(44) 1908-56 3888

7.2 Websites

SMC Corporation	www.smcworld.com
SMC Europe	www.smceu.com