Installation and Maintenance Manual
Series VFS4000 5 Port Metal Seal Type Solenoid Valves

For future reference, please keep this manual in a safe place

This manual should be read in conjunction with the current catalogue

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 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 – Recommendations for the application of equipment to transmission and control 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

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 component 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. Switch off air and electrical supplies and exhaust all residual compressed air in the system.
   3) 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 back-pressure, i.e. incorporate a soft-start valve).
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) Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, 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.

⚠ CAUTION

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

Standard specifications

Valve	Fluid		Air and inert gas
	Max. operating pressure		9.9 kgf/cm² (990kPa)
	Min. operating pressure	2 position	1.0 kgf/cm² (100kPa)
		3 position	1.5 kgf/cm² (150kPa)
	Ambient and fluid temperature		Note 1: -10~+60°C
	Lubrication		Note 2: Not required
	Pilot operator manual override		Non-locking push type (flush type)
	Protection structure		Dust proof
Electricity	Rated voltage	AC	100, 200V (50/60Hz)
		DC	24V
	Allowance voltage range		-15~+10% rated voltage
	Coil insulation		Class B or equivalent
	Apparent power (Power consumption) AC	Inrush	5.0VA/60Hz, 5.6VA/50Hz
		Holding	2.3VA (1.5W)/60Hz, 3.4VA (2.1W)/50Hz
	Power consumption DC		1.8W
	Electrical entry		Grommet, Grommet terminal
			Conduit terminal, DIN connector

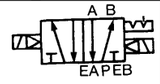
Note 1: Use dry-air at low temperature.
Note 2: Use turbine oil No. 1 (ISO VG 32), if lubricated.

Installation

⚠ WARNING

Ensure all air and power supplies are ISOLATED before commencing installation.
Do not install these valves in explosive atmospheres.
If these valves are exposed to water or oil droplets, ensure that they are protected.
If it is intended to energise a valve for an extended period please consult SMC.
If air leakage causes associated equipment to malfunction cease using valve and inspect for cause.
Check fixings while pressure and power are applied. Initial function and leakage tests should be performed after installation.
Only install once safety instructions have been read and understood.

Symbol

2 position	3 position
Single	Closed centre
	
Double	Exhaust centre
	
	Pressure centre
	

Construction and parts (Fig 1)

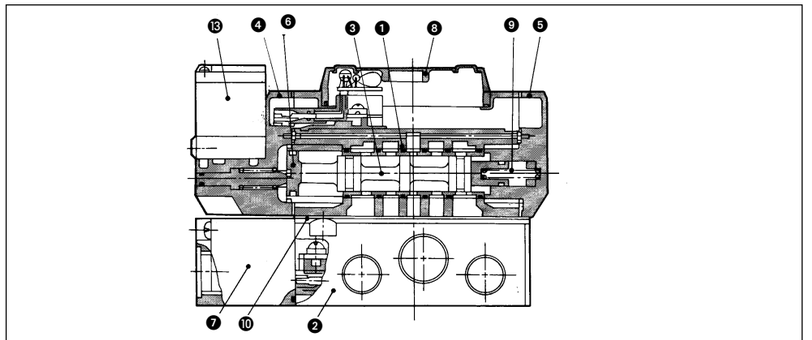


Fig 1

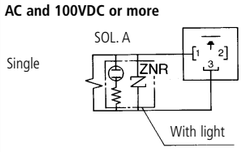
Main parts

No.	Description	Material	Note
❶	Body	Aluminum die-cast	Platinum silver
❷	Sub plate	Aluminum die-cast	Platinum silver
❸	Spool/sleeve	Stainless steel	-
❹	Adapter plate	Aluminum die-cast	Black
❺	End plate	Aluminum die-cast	Black -
❻	Piston	Resin	-
❼	Junction cover	Resin	-
❽	Light cover	Resin	-

Electrical connection

Lamp and surge voltage suppressor (Fig 2)

AC and 100VDC or more



24VDC or less

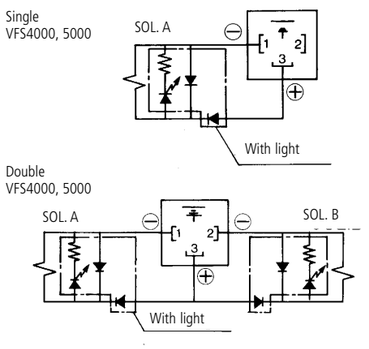


Fig 2

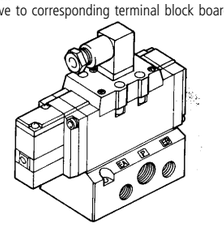
Wiring (Fig 3)

⚠ CAUTION

Isolate both power and air supplies before removing/replacing connector.

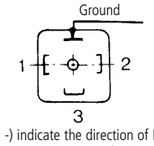
In the case of DIN connector and terminal block (with lamp and surge voltage suppressor), the internal wiring is shown in Fig 3.

DIN connector type
Male pin terminal of DIN connector block board of solenoid valves are wires as shown below.
Please connect each valve to corresponding terminal block board on connector.



DIN connector (wiring)

1	A side -
2	B side -
3	COM +
⏚	Ground



(+, -) indicate the direction of DC solenoid valve with light, surge voltage suppressor, and VFS 3000 can be made negative (-) COM.

Fig 3

Applicable terminals : 1.25-3.5S, 1.25Y-3L or 1.24-4M. Not required for DIN connector board.
1. Loosen the top screw and remove the connector housing from the terminal spades on the solenoid.
2. Remove the housing screw and insert a screwdriver into the slot on the underside of the DIN cap and carefully remove the block.
3. Loosen the terminal screws on the block and insert the stripped leads. Secure each lead by re-tightening the appropriate terminal screw.
4. Tighten the housing grommet nut to secure the cable.

⚠ CAUTION

Pull connector out vertically, never at an angle.

Wiring plug-in type (Fig 4)

Lamp and surge voltage suppressor
Remove cover ❶ (Fig 4) on subplate to expose terminal block ❷ (Fig 4)

Designation	Solenoid A side	Solenoid B side
Terminal block board	A	B
Marking	+ -	+ -

Note: Non polar applicable terminals : 1.25-3,5M, 1.25Y-3L and 1.25Y-3M.

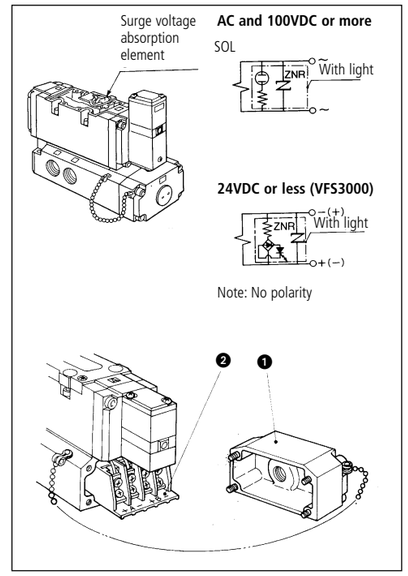


Fig 4

Leakage voltage (Fig 5)

Note: When using a C-R device (surge voltage suppressor) for contact protection, the voltage leakage may increase due to the current leakage flowing through the C-R device.

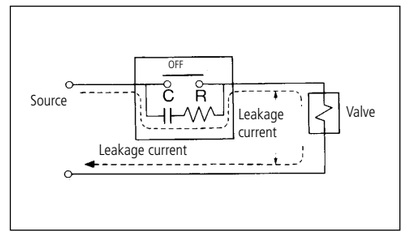


Fig 5

Suppress residual voltage leakage as follows:
DC Coil 3% or less of rated voltage
AC Coil 20% or less of rated voltage

Lubrication

These valves have been lubricated for life during manufacture and as such require no further lubrication.

⚠ CAUTION

However, if a lubricant is to be used with a rubber seal type, a turbine oil type #1, (ISO VG32) should be used, continuous lubrication must be carried out as the original lubricant will be washed away.

Manual override operation (Fig 6)

⚠ WARNING

Exercise EXTREME CAUTION when operating a solenoid manual override, as connected equipment will commence operation.
Ensure all safety measures are in place.

Manual override/classification

Non-locking push type (flush type)	*A-Non-locking push type (extended type)	*B-Lock type (tool type)	*C-Lock type (lever type)
			
6	**6a**	**6b**	**6c**

* Special order

Fig 6 6a, 6b, 6c

Non-locking push type (Fig 6)
1. Push down the manual override button (Orange), until it stops, using a small-bladed screwdriver.
2. Hold this position for the duration of the check (ON position).
3. Release the button and the override will re-set to the off position.

Slotted locking type (Fig 6b)
To lock
1. Insert a small-bladed screwdriver into the slot.
2. Turn the override through 90° (ON position).
3. Remove screwdriver.

⚠ WARNING

In this position the manual override is in the locked 'ON' position.

To Unlock
1. Insert small-bladed screwdriver into the slot of the manual override.
2. Turn the screwdriver 90° in the reverse direction.
3. Remove the screwdriver, the manual override will re-set to the 'OFF' position.

Lever locking type (Fig 5c)
As above but lever can be turned without tool.

Maintenance

⚠ WARNING

Ensure air and electrical supplies are isolated before commencing any maintenance work.

1. The ingress of carbon and oil present in the air supply (mostly from the compressor) into the valve can sometimes lead to increased resistance between the spool and sleeve. In the worst case it can lead to the spool adhering to the sleeve. Therefore it is important to check the quality of the air often.
   In order to minimise the risk of the above, it is recommended that a Mist Separator (Series AM) is installed upstream of the valve after a Standard Filter (Series AF). Also selecting a compressor oil with minimal oxidisation characteristics would elevate any such problems.
2. Should the valve and sleeve adhere to each other then disassemble the valve and clean the assembly in a solvent based chemical taking care not to contaminate any O-rings with cleaning agent.

Mounting

When disassembling and reassembling ensure that all components are in their proper positions. Prevent gaskets from moving and torque screws down equally.

Pilot operator assembly: SF4-◯-◯

Set screw	Correct clamping torque kgf-cm (N-m)
M3	4.5~6(0.45~0.6)

Solenoid valve body

Set screw	Correct clamping torque kgf-cm (N-m)
M3	6~10(0.6~1)
M4	14~25(1.4~2.5)
M5	28~50(2.8~5)

Single solenoid operated valves may be mounted in any attitude. However, in environments that subject the valves to vibration double solenoid operated valves should be aligned perpendicular to the vibration.
Never use in conditions where vibrations exceed 5G.

Accessories

Individual supply spacer
An individual supply spacer complete with gasket may be fixed between valve and subplate so as to provide an individual pressure supply to any valve.

VVFS4000-P-03-1 (plug-in type)
VVFS4000-P-03-2 (non plug-in type)

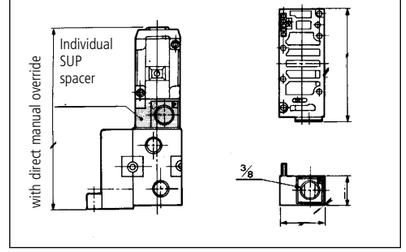


Fig 7

Individual exhaust spacer
An individual exhaust spacer complete with gasket may be fixed between valve and subplate so as to provide an individual exhaust for any valve.

VVFS4000-R-04-1 (plug-in type
VVFS4000-R-04-2 (non plug-in type)

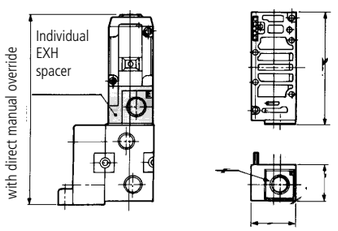
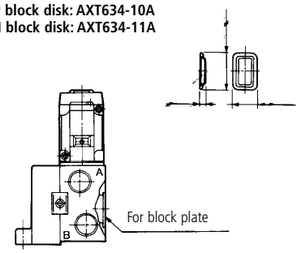


Fig 8

Exhaust block disk
If valve exhaust affects the function of other valves on the manifold then an exhaust block disk may be fitted between the sub plates so as to occlude exhaust galleries.

SUP block disk: AXT634-10A
EXH block disk: AXT634-11A



Note: Special manifold block < >: EXH block disk

Fig 9

Perfect spacer
When fixed between a valve with built in double check valves and subplate the perfect spacer can hold an actuator in a desired position anywhere along it's stroke for a considerable period of time.

VVFS4000-22A-1 (plug-in type)
VVFS4000-22A-2 (non plug-in type)

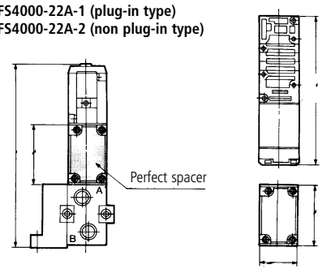


Fig 10

Environment

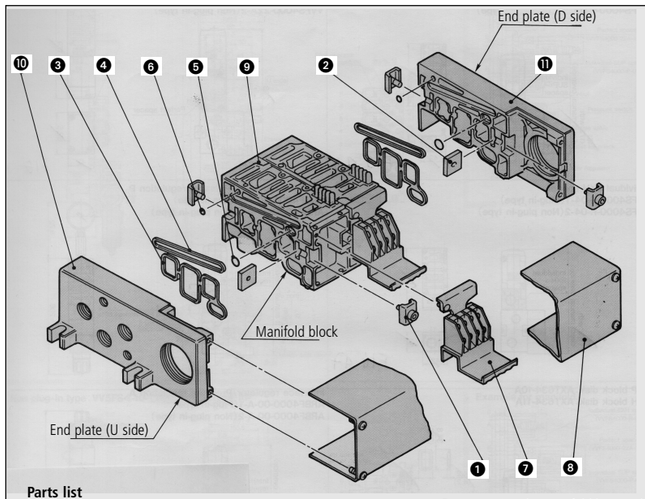
When valve is mounted in a control panel or is energised for long periods of time, make sure the ambient temperature is within the specified range.

When used in temperatures higher than 60° please contact SMC.

When you enquire about the product, please contact the following
SMC Corporation:

ENGLAND	Phone 01908-563888	**GERMANY**	Phone 6103-402-0
ITALY	Phone 02-92711	**FRANCE**	Phone 1-64-76-10-00
HOLLAND	Phone 020-5318880	**SWEDEN**	Phone 08-603-07-00
SWITZERLAND	Phone 052-34-0022	**AUSTRIA**	Phone 02262-62-280
SPAIN	Phone 945-290600	**IRELAND**	Phone 01-4501822
GREECE	Phone 01-3426076	**DENMARK**	Phone 8738-0800
FINLAND	Phone 9-68-10-21	**NORWAY**	Phone 67-12-90-20
BELGIUM	Phone 03-3551464	**POLAND**	Phone 48-22-6131847
TURKEY	Phone 212-2211512		

Manifold construction (Fig 11)



Parts list

No.	Description	Material
❶	Metal joint A	Steel plate
❷	Metal joint B	Steel plate
❸	Gasket	NBR
❹	Gasket	NBR
❺	O-ring	NBR
❻	O-ring	NBR
❼	Terminal assembly	-
❽	Junction cover assembly	-

For increasing the manifold bases, please prepare the manifold block assembly No. of the principal part assembly ❿.
Plug-in type: The manifold base with terminal stand (integral type with a junction cover) is required with the ❾ junction cover assembly.
Note: Manifold base/construction: Plug-in type with terminal block board.

Fig 11