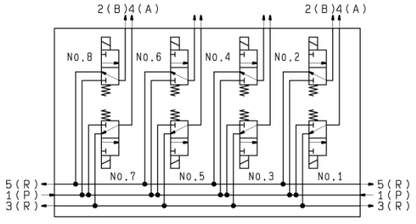
ORIGINAL INSTRUCTIONS

Instruction Manual

CE*

Connector type 3 Port Solenoid Valve V100 Manifolds

Type VV100-49-X134
VV100-49-X226
VV100-49-X227



The intended use of the valve manifold is to control the air at the outlet port of the valve.
Validated according to ISO 13849, see section 2.

1 Safety Instructions

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

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

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- To ensure safety of personnel and equipment the safety instructions in this manual must be observed, along with other relevant safety practices.

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

⚠ Warning

- **The compatibility of pneumatic equipment is the responsibility of the person who designs the equipment or decides its specifications.**
- Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

1 Safety Instructions (continued)

- **Only personnel with appropriate training should operate machinery and equipment.**
  The product specified here may become unsafe if handled incorrectly.
  The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- **Do not service or attempt to remove product and machinery/ equipment until safety is confirmed.**
  1) The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
  2) When the product is to be removed, confirm the safety measures as mentioned above are implemented and the power from any appropriate source is cut and read and understand the specific product precautions of all relevant products carefully.
  4) Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- **Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
  1) Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
  2) Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustions and recreation, or equipment in contact with food or beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the specification described in this document.
  3) An application which could have negative effects on people, property, or animals requiring special safety analysis outside the scope of ISO 13849.
  4) Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.
- **Always ensure compliance with relevant safety laws and standards.**
- All electrical work must be carried out in a safe manner by a qualified person in compliance

⚠ Caution

- **The product is provided for use in manufacturing industries.**
  The product herein described is basically provided for peaceful use in manufacturing industries.
  If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
  If anything is unclear, contact your nearest sales branch.

2 Specifications

2.1 Specifications

Model	V111	
Type	Standard	
Type of actuation	N.C.	
Operating pressure range	0 ~ 0.7 MPa	
Vacuum application	Port 1	-100kPa ~ 0.6 MPa
	Port 3	-100kPa ~ 0 MPa
Fluid	Air	
Ambient and fluid temperature °C	-10 to +50 °C (non-freezing)	
Minimum air quality	5µm filtration. See also section 3.	
Response time [(1)]	ON: 5ms or less/OFF: 4ms or less	
Max. operating frequency	20 Hz	
Manual override	No manual override	
Lubrication	Non required	
Mounting position	Free	
Impact/Vibration resistance [(2)]	150/30 m/s^2	
Enclosure	IP20 [(3)]	
Standards	Complies with the basic and well-tried safety principles of ISO 13849-2:2008	
B_{10}	94 million cycles [(4)]	
B_{10d}	188 million cycles [(4)]	

1) According to dynamic performance test JIS B8374-1981
(Coil temperature 20°C, at rated voltage)

2. Specifications (continued)

2) **Impact resistance:** No malfunction occurred when it was tested with a drop tester in the axial direction and at right angles to the main valve and armature; in both energized and de-energized states and for every time in each condition. (Value in the initial state)
Vibration resistance: No malfunction occurred in one sweep test between 45 and 2000Hz. Test was performed in the axial direction and at the right angles to the main valve and armature in both energized and de-energizes states for each condition. (Value in the initial state)
3) Due to open electrical tracks on the PCB the valve manifold shall be protected of at least IP54.
4) The B10 figure is estimated from SMC life tests. The B10d figure is derived from B10 using the assumption in ISO 13849-1:2008.

2.2 Solenoid specifications

Series	V111BT-5FZ-X175
Electrical entry	F-Type Plug In
Coil rated voltage	24 V DC
Allowable voltage	± 10 % of rated voltage
Power consumption [(4)]	0.35 W
Surge voltage suppressor	Diode
Indicator light	LED

4) At rated voltage

2.3 Manifold specifications

Model	Special
Manifold type	Single base style, B mount
P(SUP)/R(EXH) Type	Common SUP / Common EXH
A porting	Bottom
Port size	1 (C6), 2 + 4 (C4), 3 + 5 (C6)

2.4 Flow specifications

Flow paths	C[dm^3/(s.bar)]	b	Cv
1→2	0.050	0.038	0.011
2→3	0.089	0.315	0.022

3 Installation

3.1 Installation

⚠ Warning

- **Do not install the product unless the safety instructions have been read and understood.**
- **Do not modify the product.**
  Do not disassemble, modify (including changing the printed circuit board) or repair the product. An injury or failure can result.
- **The product should be mounted correctly.**
  If the product is not mounted correctly, malfunction, failure or damage may occur.
- **Do not apply vibration, impact or loads.**
  If vibration, impact or loads are applied, malfunction, failure or damage may occur.
- **Do not use fluids other than applicable fluids.**
  If fluids other than applicable fluids are used, malfunction, failure or breakage may occur.
  If the compressed air includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas, etc., it may lead to damage or malfunction.
- **Do not use for flammable or poisonous fluids.**
  If flammable or poisonous fluids are used, an explosion or fire may occur.
- **Do not let foreign matter or condensate get inside the piping of the product.**
  If foreign matter or condensate enters the product, malfunction, failure or damage may occur.
  Mount an appropriate filter on the fluid inlet side (IN side).
- **Use the product within the specified operating pressure range.**
  If the product is used outside of the rated pressure range, malfunction may occur.
- **Do not apply pressure which exceeds the proof pressure.**
  If pressure exceeding the proof pressure is applied, malfunction, failure or damage may occur.

Installation (continued)

⚠ Caution

- **Ensure sufficient space for installation and maintenance.**

3.2 Environment

⚠ Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact. Check the product specifications.
- Do not mount in a location exposed to radiant heat.
- If using in an atmosphere where there is possible contact with water drop-lets, oil, weld spatter, etc., take suitable preventative measures.
- When the solenoid valve is mounted in a control panel or it is energized for a long time, make sure that the ambient temperature is within the valve’s specified range.
- **Do not use the product in an environment where the product may be corroded.**
  If the product is used in a corrosive environment, malfunction, failure or damage may occur.
  Check the product materials before use.
- **Ensure that the product is used within the enclosure specifications.**
  If the product is used outside of the specifications, malfunction or failure may occur.
  Use the product in accordance with the protection level with reference to IEC 60529.
  Refer to 2.1 Specifications Enclosure
- **Use the product within the operating temperature, humidity and fluid temperature.**
  Do not use the product outside of these specifications.
  Even when the product is used within the specifications, do not use in a location where there are rapid temperature changes, or in a location where there are heating/cooling cycles, or in a location where there is freezing or condensation. It may result in malfunction or failure.
  If the product is to be used at low temperature, protection against freezing is necessary.
- **Do not use in an area where surges are generated.**
  If the product is used in an environment where surges are generated (solenoid lifter, high frequency induction furnace, motor, etc.), malfunction or failure may occur.
  Take appropriate measures before using the product.
- **Do not use the product in a place where static electricity is a problem.**
  It may result in system failure or malfunction.

3.3 Piping

⚠ Caution

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

⚠ Caution

- **Stop using the equipment immediately when an audible air leak is detectable, or when the equipment does not operate properly. If possible perform an appropriate function test and leakage test.**
- **Periodically check that piping is not loosened and that there is no air leakage.**
- **Regularly check that there is no external damage.**
- **Install the cable in such a way that a shortcut cannot be caused by any mechanical damage.**

3.3.1 Piping

For SMC M5 fittings, after tightening by hand, use a wrench to tighten the fitting an additional 1/6 to ¼ turn. A reference value for the tightening torque is shown below.

Thread	Appropriate tightening torque N·m
M5	1 to 1.5

Installation (continued)

Note) If tightened excessively, the thread of the product may break or the gasket may deform. If tightened insufficiently, the thread of the product may become loose. In either case, air leakage can occur.

Caution

When using a fitting other than SMC fitting, follow the instructions given by the relevant fitting manufacturer.

3.3.2 One-touch fitting

Caution

Tube attachment

- 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 pincers, nippers or scissors etc. If cutting is done with tools other than tube cutters, the tube may be cut diagonally or become flattened. This makes a secure installation impossible, and causes problems such as air leakage or the tube being pulled out after installation. Allow some extra length in the tube.
- Grasp the tube and push it in slowly, inserting it securely all the way into the fitting.
- After inserting the tube, pull on it lightly to confirm that it will not come out. Problems such as air leakage or the tube being pulled out can occur if the tube is not inserted securely all the way into the fittings.

Tube detachment

- Push in the release bushing and the collar at the same time.
- Pull out the tube while holding down the release bushing so that it does not come out. If the release bushing is not pressed down sufficiently there will be increased bite on the tube and it will become more difficult to pull out.
- When the removed tube is to be used again, cut off the portion which has been chewed before reusing it. If this is not done then the chewed portion of the tube can cause problems such as air leakage or difficulty in removing the tube from the fitting.

3.3.3 Precautions on other tube brands

Caution

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

Nylon tube	±0.1mm
Soft nylon tube	±0.1mm
Polyurethane tube	-0.2mm / +0.15mm

Do not use tubes that do not meet these outside diameter tolerances. It may not be possible to connect them, or they may cause other problems, such as air leakage or the tube pulling out after connection.

3.4 Supply air

Warning

- Use clean air.

If the compressed air supply includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas, etc., it can lead to damage or malfunction.

Caution

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

3.5 Wiring

Warning

- **Ensure that the product is used within the power supply specifications.**
  If the product is used outside of the specifications, malfunction or failure may occur, leading to an electric shock or fire.
- **Do not use a load exceeding the maximum load voltage or current.**
  If the product is used outside of the specifications, it may cause malfunction or damage, leading to a reduction in the life of the product.
- **Wire the product correctly.**
  Incorrect wiring could cause malfunction or failure, leading to an electric shock or fire.

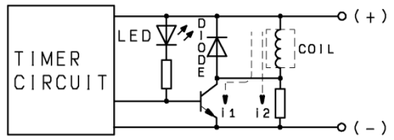
3 Installation (continued)

- **Do not perform wiring while the power is ON.**
  Touching the terminal or connector while the power is ON may cause an electric shock.
  Performing wiring while the power is ON may result in malfunction or failure.

3.5.1 Wiring

Refer to the drawings VV100-49-X134, VV100-49-X226 and VV100-49-X227 for the Pin Layout of the D-Sub Connectors

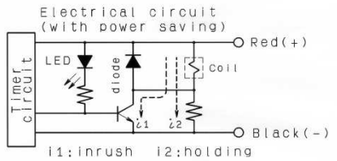
3.6 Indicator light and surge voltage suppressor



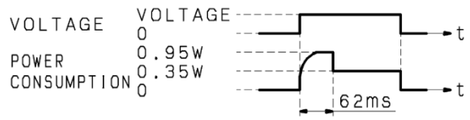
- Connect + (positive) and - (negative) pins correctly onto the connector.
- For DC voltages other than 24VDC, incorrect wiring will cause damage to the surge voltage suppressor circuit. (Wrong polarity will cause malfunction or failure).

3.6.1 Energy saving circuit

Provided that 24 VDC is applied and that the energized period is >62ms, the energy consumption will be approximately reduced to 0,35 W.



Operating principle:
The electrical circuit shown above, allows reduced holding current consumption and measures power saving. Refer to the electric waveform below.



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

3.7 Circuit diagrams

For details refer to the drawings VV100-49-X134, VV100-49-X226 and VV100-49-X227

3.8 Long period continuous energization

When the valves are energized for a long period, coil-generated heat might shorten the life and lower the performance of the solenoid valve. It may also cause connected devices to malfunction. If the application has a long period of continuous energization or the energized period is longer than non-energized period per day, use a DC specification valve, or a valve with an energy saving circuit.
It is also possible to have a shorter energized period by choosing a Normally Open valve. Consult SMC regarding this matter. This countermeasure may not have to be strictly followed, as it depends on the application.
In the case of valves installed on a control board, take countermeasures in order to keep the temperature inside the specified range.
Manifold mounted valves are close to each other. When valves are energized for a long time and the manifold has more than three stations, the temperature rise must be considered. Be cautious.

Caution

3 Installation (continued)

3.9 Polarity

When DC power is connected to a solenoid valve equipped with light and/or surge voltage suppressor, check for polarity indications.
For polarity indications: 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.

3.10 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.

3.11 Suitable Power Unit

Warning

Use only power units which guarantee reliable electrical isolation of the operating voltage as per IEC 60204-1. Observe also the general requirements for PELV power circuits as per IEC 60204-1.

4 How to Order

Quantity of valves	Order number
24	VV100-49-X134
16	VV100-49-X226
8	VV100-49-X227

5 Outline Dimensions (mm)

For details refer to the drawings
VV100-49-X134
VV100-49-X226
VV100-49-X227

6 Maintenance

6.1 General Maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous. Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

Warning

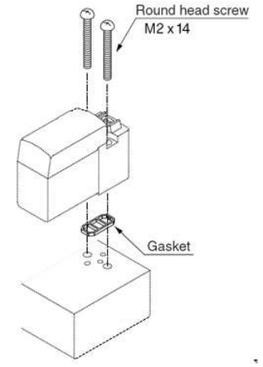
- **Perform regular maintenance and confirm normal operation.**
  If maintenance is not performed correctly and regularly, malfunction or failure may occur.
- Wear safety glasses when conducting periodic inspections
- Safety cannot be assured in the case of unexpected malfunction.
  Cut off the power supply and stop supplying fluid if the equipment does not function properly or there is leakage of fluid.
- **Removal of equipment.**
  When components are removed, first confirm that measures are in place to prevent workpieces from dropping, run-away equipment, etc.
  Turn off the power supply and stop the fluid supply before performing maintenance. Otherwise, it may cause an injury.

6 Maintenance (continued)

After maintenance is complete, perform appropriate functional inspections and leak tests.

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

6.2 Gasket Assembly



7 Limitations of Use

7.1 Compliance Requirements

- **The product used is subject to the following “Compliance Requirements”. Read and accept them before using the product**.

- **Compliance Requirements**
  1) The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
  2) The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Caution

- **SMC products are not intended for use as instruments for legal metrology.**
  Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.
  Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

Danger

- **Do not exceed any of the specifications laid out in section 2 of this document or the specific product catalogue.**
- **Any use in an ISO 13849 system must be within the specified limits and application condition. The user is responsible for the specification, design, implementation, validation and maintenance of the safety system (SRP/CS).**

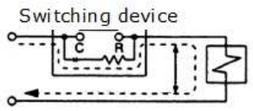
Caution

- **Voltage leakage.**

When C-R device (surge voltage suppressor) is used for the protection of switching device, note that 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

7 Limitations of use (continued)



- **Surge voltage suppressor.**

If a surge protection circuit contains non-ordinary diodes such as Zener diodes or Varistor, 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.

- **Use in low temperature environments**

Unless otherwise indicated in the specifications for each valve, operation is possible to -10°C, but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

Please use an appropriate dryer.

- **Mounting orientation.**

Mounting orientation is universal.

8 Contacts

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Specifications are subject to change without prior notice from the manufacturer.