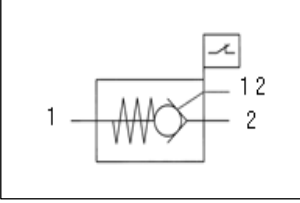




Instruction Manual
Pilot Check Valve with State Detection

Series XT34-303-F##(-X##) (including XT34-303-X2)



The intended use of this product is to stop the flow of pressurized air in one direction and to detect the safe state of the check valve for diagnostics in safety related circuits.

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)^{*)}, and other safety regulations.

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

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

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

Warning

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

Caution

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

2 Specifications

2.1 Pilot check valve specifications

Series		XT34-303					
		-M5	-X2	-F01 (-X##)	-F02 (-X##)	-F03 (-X##)	-F04
Fluid		Air					
Max. operating pressure [MPa] <small>Note 1)</small>		0.7					
Min. operating pressure [MPa]		0.1					
Pilot pressure range [MPa]		More than 60% of the operating pressure (0.35 MPa or more)					
Ambient and fluid temperature [°C]		-5 to 60 (no freezing)					
Max. operating frequency [Hz]		1					
Min. operating frequency		1 cycle / 30 days					
Port size		M5	G1/8	G1/8	G1/4	G3/8	G1/2
Response time [s]		0.1					
Lubrication		Not required (Refer to 3.4)					
Sonic conductance[C]	Free flow	0.08	0.69	0.5	1.1	1.7	3.8
	Controlled flow	0.2	0.95	0.8	1.5	2.7	3.2

2 Specifications – continued

Impact resistance [m/s ²] ^{Note 2)}	1000
Vibration resistance [m/s ²] ^{Note 3)}	50 (0.35mm)
Mounting orientation	Unrestricted

Table 1.

Note 1) Please use caution regarding the max. operating pressure when soft nylon or polyurethane tubing is used.

Note 2) Two axes (horizontal and vertical) and two directions were tested and no malfunction of the regulator occurred (pulse shape: sin shape, axial direction and rectangular to the product, 3 times for each condition (pilot valve ON and OFF, test sample mounted with bracket).

Note 3) No malfunction occurred in a sweep cycle test between 10 to 150 Hz at vibration sweep 0.35mm. The test was performed in the two axes and two directions, 7 min per cycle (20 cycles) 20 times for each condition (pilot valve ON and OFF).

2.2 Auto switch specifications

Refer to the IM of D-M9#A# for auto switch specifications.

2.3 Special products

Warning

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

3 Installation

3.1 Installation

Warning

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

3.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in

temperatures in excess of the product's specifications.

- Do not use in high humidity environment where condensation can occur.
- Contact SMC for altitude limitations.

3.3 Piping

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.
- Excessive tightening through the flats of the body could damage the product. First tighten it by hands and then use a proper wrench to tighten it further at a wrench tightening angle of A°. The reference value for the tightening torque is B N·m.

Model	A	B
	Further tightening angle	Tightening torque [N·m]
XT34-303-M5	60° to 90°	1 to 1.5
XT34-303-F01(-X##), X2	10° to 20°	3 to 4
XT34-303-F02(-X##)	15° to 35°	4 to 5
XT34-303-F03(-X##)	15° to 35°	8 to 9
XT34-303-F04	15° to 35°	14 to 15

Table 2.

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 class 1 turbine oil (no additive), ISO VG32.

3 Installation – continued

3.5 Air supply

Warning

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

Caution

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

3.6 Auto switch

Caution

- **Provide sufficient space for maintenance.**
When designing an application, allow sufficient clearance for maintenance and inspection.
- **Design the circuit to prevent reverse current during open circuit conditions or when the product is forced to operate for functional checks.**
Reverse current can cause product damage or malfunction.
- **Do not use a load which generates a surge voltage.**
Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly.
- **Pay attention to the leakage current.**
- **The solid state auto switch output will be unstable for 50 ms after power is supplied.**

During the time after supplying power, the input device (e.g. PLC, relay) may consider the ON position as OFF output or the OFF position as ON output.

Please set up the application to consider the signals will be invalid within 50 ms after power is supplied.

Perform a similar setting when using the SMC AHC system (Auto Hand Changing system) MA series.

3.7 Mounting and adjustment

Caution

- **Do not drop or apply impact.**
The auto switch may be damaged or may malfunction if it is dropped, bumped or applied with excessive impact (over 1000 m/s²).

- **Do not carry a valve by the auto switch lead wire.**
This may cause a broken lead wire or damage to the auto switch internal elements.

3.8 Wiring

Caution

- **Check the insulation of the wiring.**
Check that there is no faulty wiring insulation (short circuits, faulty ground connections, improper insulation between terminals, etc.) as this may damage the auto switch due to over current.
- **Do not route the auto switch wiring in the same place as power cables or high voltage cables.**
Otherwise auto switch malfunction may result due to noise and inrush current.
- **Avoid repeatedly bending or stretching the lead wire.**
Broken lead wires will result if bending stresses or tensile forces are applied to the lead wires.
Stress and tensile forces applied to the connection between the lead wire and auto switch increases the possibility of disconnection.
The standard of bending radius becomes R20 to 40 mm.
- **Be sure to confirm the load condition (e.g. connection and current value) before power is supplied.**
- **Wiring should be kept as short as possible.**
Do not use a cable longer than 100 m.
For long wire lengths, we recommend that a ferrite core should be attached to both ends of the cable, to reduce noise.
- **Do not short-circuit the load.**
The auto switch will be damaged if the load is short-circuited.
- **Avoid incorrect wiring**
If connections are reversed (power supply wire + and -) on a 3-wire type auto switch, the switch will be protected by a protection circuit. However, if the blue wire is connected to the power supply(+) and the black wire is connected to the power supply (-), the auto switch will be damaged.

Caution

- **Do not use in a location where magnetic fields are generated.**
Auto switches will malfunction or the magnets inside actuators will become demagnetized.

3 Installation – continued

- **Do not use in an environment where the auto switch will be continually exposed to water.**
Although auto switches satisfy the IEC standard IP67 construction, do not use in applications continually exposed to water splashes or spray. Otherwise, insulation failure or malfunction may result.
- **Do not use in an environment where oil or chemical splashes can occur.**

If auto switches are used in an environment with coolants, cleaning solvents, oils or chemicals for even a short time, they may be adversely affected by insulation failure, malfunction due to swelling of the potting resin, or hardening of the lead wires.

- **Do not use in an environment where there are cyclic temperature changes.**

Temperature cycles other than normal temperature changes can adversely affect the auto switch internally.

- **Avoid accumulation of iron debris or close contact with magnetic substances.**

When a large amount of iron waste such as machining chips or spatter has accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with the check valve, it may cause the auto switch to malfunction due to a weakening of the magnetic force inside the check valve.

- **Do not use in a location where surges are generated.**
When there are units (solenoid lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around the check valve with a solid state auto switch, this may cause damage to the auto switch internal circuit.

4 Settings

4.1 Setting details

This check valve is not adjustable. The switch state is ON when the valve is closed, and the switch state is OFF when the valve is open.

Explanation of the check valve ports is shown in Figure 1.

4.2 Connections description

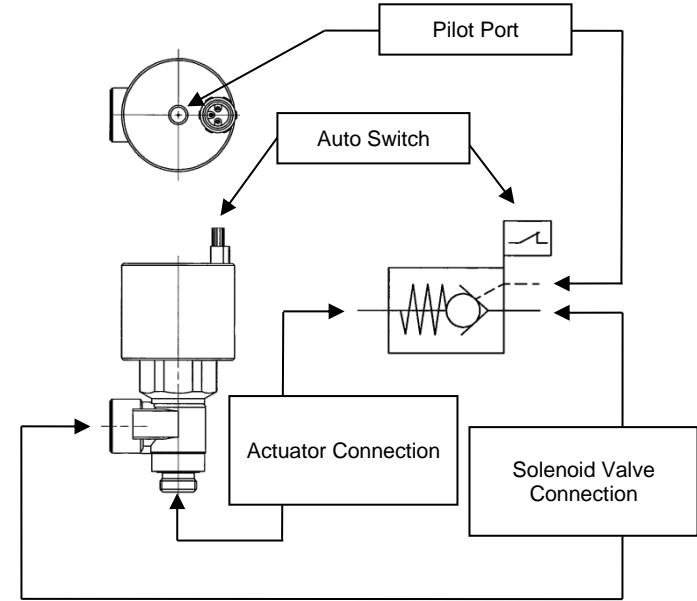


Figure 1.

4.3 Circuit diagram auto switch

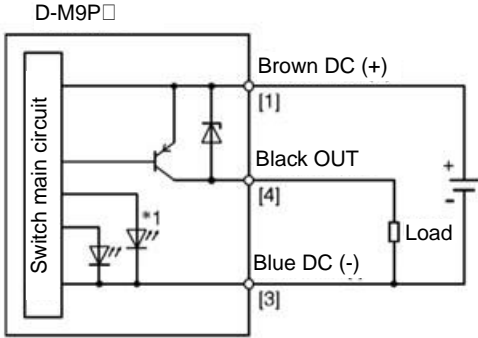


Figure 2.

Note) The numbers shown in brackets [] indicates the connector pin number.

4 Settings – continued

4.4 M8 3-pin connector

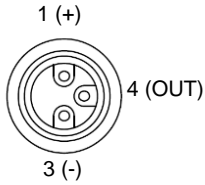


Figure 3. M8 3-pin connector

5 How to Order

Refer to drawings and information (SP173X-020EU-UK) for 'How to Order'.

6 Outline Dimensions

Refer to drawings and information (SP173X-020EU-UK) for outline dimensions.

7 Maintenance

7.1 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.

7.2 Auto Switch



Warning

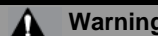
- **Removal of equipment and exhausting the compressed air.**
When equipment is to be removed, first confirm that measures are in place to prevent losing control of the equipment or workpieces from falling, etc. Turn off the power supply, stop the air supply and exhaust all compressed air from the system. Before restarting the equipment, confirm that measures are taken to prevent sudden movement.
- **Never touch the terminals while the power is on.**
Otherwise electric shock, malfunction and damage to the product can result.



Caution

- **Check that there is no damage to the lead wire.**
If damage to the lead wire is found, replace the pilot check valve. Do not replace the auto switch from the pilot check valve.
- **Do not use solvents such as benzene, thinner, alcohol etc. to clean the auto switch.**
This may damage the surface of the body or erase the markings on the body.
For heavy stains, use small amount of diluted neutral detergent on a cloth to wipe the stains and then dry with a dry cloth.

8 Limitations of Use



Warning

The system designer should determine the effect of the possible failure modes of the product on the system.

8.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.



Warning

- **This product cannot be used for accurate and precise intermediate stops of an actuator.**
Due to compressibility of air as a fluid, the actuator will continue to move until it reaches a position of pressure balance, even though the pilot check valve closes with an intermediate stop signal.

8 Limitations of Use - continued

- **This product cannot be used to hold a stop position for an extended period of time.**
Pilot check valves and actuators are not guaranteed for zero air leakage. Therefore, it is sometimes not possible to hold a stop position for an extended period of time. In the event that holding for an extended time is necessary, a mechanical means for holding should be devised.
- **Consider the release of residual pressure.**
Actuators may move suddenly due to residual pressure, which can be dangerous during maintenance procedures.
- **When used in a balance control circuit, there are instances in which the check valve cannot release, even though the pilot pressure is 50% of the operating pressure. In this case, the pilot pressure should be the same as the operating pressure.**
- **The check valve has a construction, in which it is closed by the differential pressure generated when the inlet pressure (IN side) or outlet pressure (OUT side) solenoid valve is switched. Be aware that the check valve does not close completely and the outlet pressure (OUT side) may drop when the inlet pressure (IN side) drops gently and the differential pressure becomes smaller than the minimum operating pressure or cracking pressure.**
- **In the XT34-303-series, the valve does not close by load pressure alone.**
- **If the spring used to close the valve has broken, the cylinder cannot be stopped.**
The design of the system must take into account such behaviour.

8.2 Low temperature operation

The valve can be used in an ambient temperature down to -5°C. However, take measures to prevent freezing or solidification of impurities, etc.

8.3 Holding of pressure

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

8.4 Cannot be used as an emergency shut-off valve

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

9 Failure modes

Failure mode	Cause	Solution
The actuator is not moving, even though pressure is being applied to the pilot port.	Insufficient pressure.	Pressure supplied should at least be 60% of the product's operating pressure and 0.35MPa or above.
	The seal, etc. inside the actuator is damaged.	Please replace the product.
Actuator does not perform intermediate stop.	Air is leaking from the piping.	Please fix any areas in the piping that are leaking.
	The seal, etc. inside the actuator is damaged.	Please replace the product.
There is no signal from the auto switch.	The connector is loose or not installed properly.	Check that the connector is properly inserted up to the base.
	PCB failure.	Please replace the product.

Table 3.

10 Product Disposal

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

11 Contacts

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

SMC Corporation

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