



Installation and Maintenance Manual

Solid State Auto-Switch Series D-F7NT, D-F5NT, D-M5NT, D-G5NT, D-M5PT

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

This manual should be read in conjunction with the current product 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.

1. Product specification

Model number	D-F7NT, D-F5NT, D-G5NT, D-M5NT	D-M5PT
Wiring style	Three wire type	
Output style	NPN type	PNP type
Application	IC, Relay, PLC	
Source voltage	DC5-12-24V (DC4.5-28V)	
Current consumption	10mA or less	12mA or less
Load voltage	DC28V or less	—
Load current	80mA or less	80mA or less
Internal voltage drop	2V or less (0.8V or less at 10mA)	0.8V or less
Leak current	10µA or less at DC24V	
Off-delay time	200-50ms	
Operating time	1ms or less	
Operating indicator lamp*	One colour	
Proof impact	1000m/s ²	
Insulation resistance	50M Ω or more at DC500V mega	
Proof voltage	AC1000V for 1 minute (lead wire, between cases)	
Ambient temperature	-10-60°C	
Protection structure	IEC529 standard IP67, JISC0920	

* One colour: Red diode lights when ON
Two colour: Operating position-----Red diode lights
Optimum operating position-----Green diode lights

Installation

Actuators

WARNING

To eliminate the possibility of magnetic interference between switches, please ensure that, when two or more actuators are used, in parallel, they are kept at least 40mm apart.

Mid-stroke position sensing

Exercise caution when attempting to detect the piston at mid-position, without stopping, as the switch detection time may be too short, particularly at relatively high actuator speeds. Detectable max. piston speed can be obtained by the following formula:

$$V \text{ (mm/s)} = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time (ms)}} \times 1000$$

Where possible keep all wiring as short as possible.

CAUTION

If the 2-wire type solid state auto-switch has a large internal voltage drop, and leakage current is also high, it is possible that the load may not operate correctly due to incorrect load spec. Please confirm the following conditions before operation, and note that the internal voltage

drop and leak current have a considerable influence on the serial and parallel connection of the 2-wire solid state switch.

Leak current influence

I.E Voltage generated to the load when the power is turned off.

Voltage generated = Auto-switch leak current x load resistance. If this voltage exceeds the OFF voltage of the load, it is possible that the load may stay ON. In order to match the condition of the controller-input unit and leak current, then auto-switch leak current must be less than input unit OFF current.

Internal voltage drop

Should an internal voltage drop occur, then the load supply voltage will also drop as the switch operates. (Load supply voltage = Source voltage – Internal voltage drop). When the load supply voltage becomes lower than the switch ON voltage, the load may not operate correctly.

WARNING

Incorrect load voltage

Although the switch will operate correctly, even if the load current is below the limit of the specification, the indicator light will be "dimmed". If the load current falls to 3mA, or lower, the operation may not start.

Ensure that, if using a load that can generate a surge voltage ie. Relay

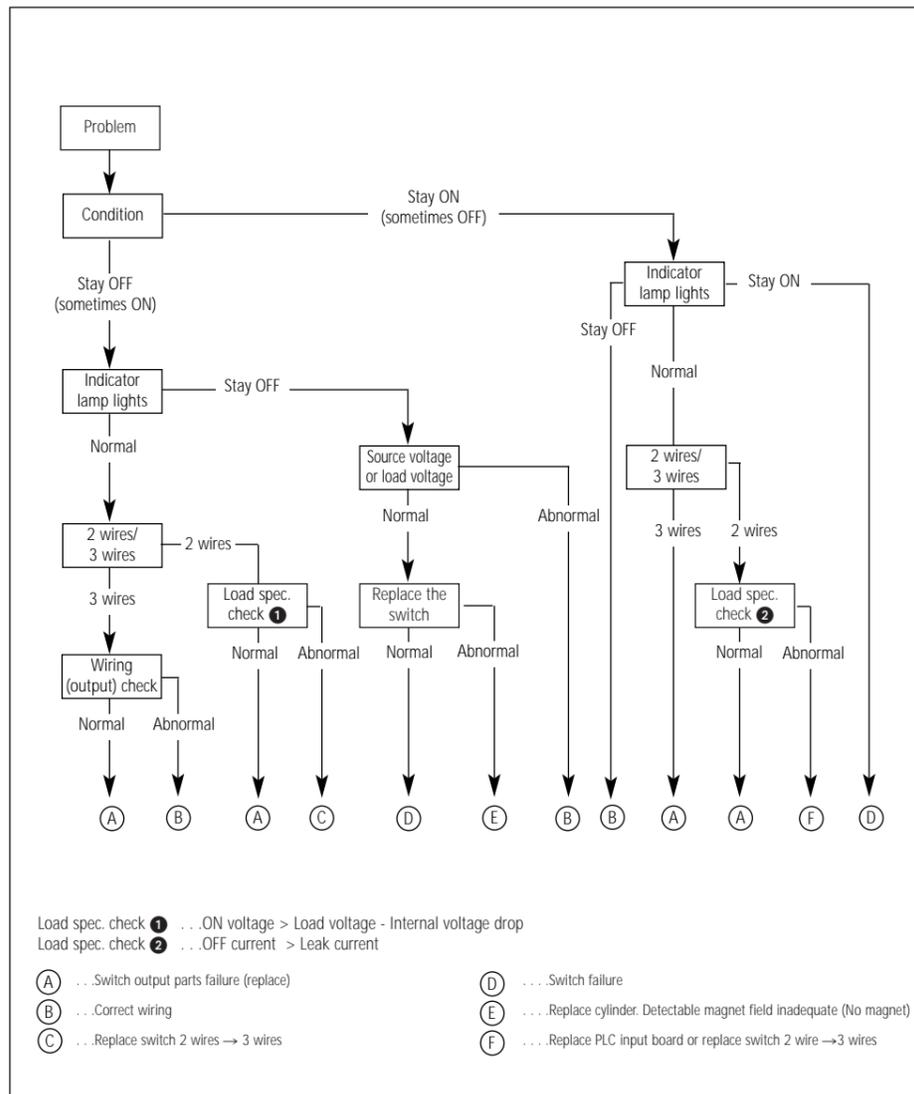


Fig 1

or Solenoid valve, a built-in surge protection circuit is installed.

If an auto-switch is to be used to generate an inter-lock signal, which requires high reliability, then instigate mechanical protection, or place another switch, double inter-lock style, together. Ensure the correct operation of this Inter-lock frequently.

Ensure, when installing this product, that enough space is available for maintenance to be carried out.

CAUTION

Do not subject this product to any form of impact damage. Do not lift an actuator, fitted with an auto-switch, by the switch lead, as stress may be applied to the inside of the switch. Ensure auto-switch mounting screw is tightened to the correct torque (see Mounting of switch bracket).

Adjust the auto-switch so that the ON position coincides with the centre of the operating area. If the switch is set to one side or the other of this centre position then inconsistent operation will occur.

Wiring

Do not apply repeated bending or tensile forces to the connecting wiring as this may cause disconnection. Bend radius is approximately R40mm or more.

Connect the load before applying power to the switch, failure to do so may cause excess current to damage the switch. Ensure wiring is carried out correctly. Not all wiring modes have protection and the switch may be damaged. Separate signal lines from power/high voltage lines to prevent 'noise'. Ensure all wiring is correctly and fully insulated.

WARNING

DO NOT USE THIS SWITCH IN AN EXPLOSIVE ATMOSPHERE.

Do not use this switch in high magnetic fields, as this will damage the switch and actuator magnet.

Do not use this switch in water-laden atmospheres, oil or chemical laden atmospheres.

Do not use this switch in conditions where temperatures are outside

of the switch operating Spec. Protect the switch from weld spatter and accumulation of iron dust etc.

Maintenance

To avoid incorrect operation periodic maintenance should be carried out.

- Check tightness of mounting screw regularly to prevent possible movement of the switch from its set position.
- Regularly check condition of the wiring. Repair insulation damage immediately or replace the switch.
- If a red LED is showing this indicates that the switch is within the operating range. If there is no LED showing the switch will require re-adjusting to bring on the LED.

CAUTION

If detection failure occurs i.e. LED remains ON follow the faultfinding chart above (Fig 1).

For applications involving contact with water, elasticity, and welding, contact your nearest SMC Office. (See at the end of this Manual.)

If the hysteresis, between the ON and OFF position of the switch is incorrect please consult SMC.

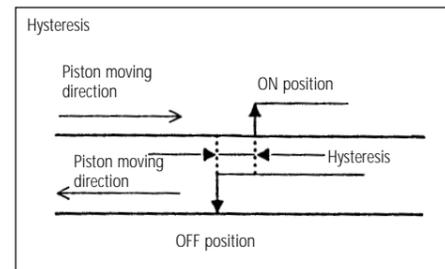


Fig 2

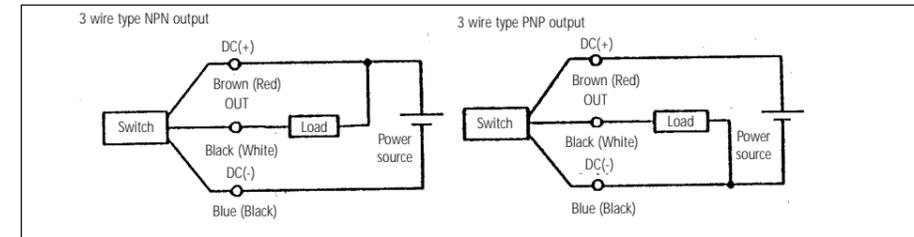
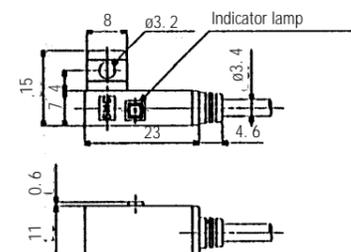


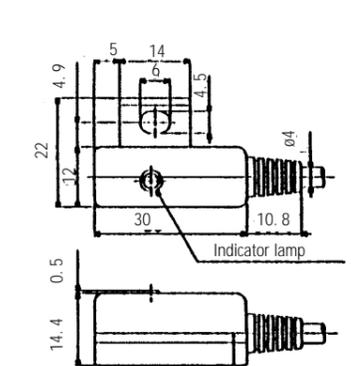
Fig 4

Exterior dimensions

D-F7NT



D-F5NT



D-M5NT/M5PT

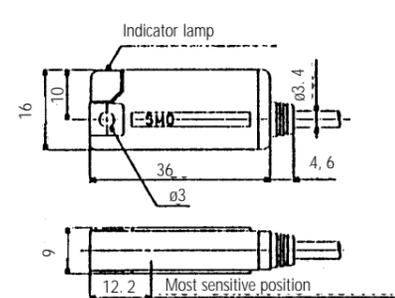


Fig 3

Basic wiring (Fig 4)

Lead wire colour in brackets indicates products complying with IEC.

Connection with PLC (sequence controller)

Depending on the PLC input specification, the output design of 3 wire type switches and 2 wire type switches differ. (See below) The output signal, from a timer equipped auto-switch, is held ON for 200m sec. after the detection is completed. This signal can input directly to a PLC, for immediate position detection.

PLC input specification	3 wire output type
Sink input	NPN output
Source input	PNP output

Mounting of switch bracket

Each actuator has a specified mounting bracket to mount the switch to the actuator. The type of bracket depends on the following:

- Type of actuator, and tube O.D. Please consult the current actuator catalogue for details.

When fitting an auto-switch for the first time please ensure that the actuator is fitted with a magnet and that the brackets are correct for the actuator type.

Mounting screw appropriate tightening torque figures are given in the chart shown below:

Applicable model number	Fixing screw	Tightening torque
D-F5NT	M4	1-1.2 N-m (10.2-12.2 kgf-cm)
D-F7NT	M3	0.5-0.7 N-m (5.1-7.1 kgf-cm)
D-G5NT	M4	1-1.2 N-m (10.2-12.2 kgf-cm)
D-M5NT, D-M5PT	M2.5	0.1-0.2 N-m (1.0-2.0 kgf-cm)

Setting the switch detection position

Position the actuator at its stroke end.

Single colour display

Move the auto-switch into the centre of the operating range and ensure that the red LED is ON.

A timer equipped auto-switch is used to detect a specified position during actuator stroke. The set target position depends on the timing of the next process. It is still possible to detect end of stroke, in the normal way, using OFF delay operation.

CAUTION

Detection, via a PLC, may produce deflection of 'max. actuator speed x t' depending on the PLC input scan time (t m.sec) to which the switch is connected.

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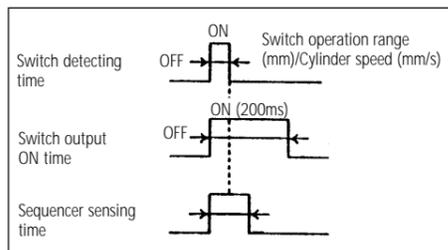


Fig 5

CAUTION

To use the auto-switch as an intermediate stop signal, the position of the switch must be adjusted to take into account the speed of the actuator, i.e. over travel of the stopping position during braking applications.

WARNING

A switch signal is NOT available in the stopped position.

Detecting actuator stroke end

Refer to dimensions A & B in the actuator catalogue.

CAUTION

In all cases do not clean with a solvent solution.

When you enquire about the product, please contact the following

SMC Corporation:

ENGLAND	Phone 01908-563888	TURKEY	Phone 212-2211512
ITALY	Phone 02-92711	GERMANY	Phone 6103-402-0
HOLLAND	Phone 020-5318888	FRANCE	Phone 01-64-76-10-00
SWITZERLAND	Phone 052-396 31 31	SWEDEN	Phone 08-603 07 00
SPAIN	Phone 945-184100	AUSTRIA	Phone 02262-62-280
	Phone 902-255255	IRELAND	Phone 01-4501822
GREECE	Phone 01-3426076	DENMARK	Phone 70 25 29 00
FINLAND	Phone 09-68 10 21	NORWAY	Phone 67-12 90 20
BELGIUM	Phone 03-3551464	POLAND	Phone 48-22-6131847
		PORTUGAL	Phone 02-610 8922