



Installation and Maintenance Manual

Solid State Auto-Switch Series D-F59, D-F59W, D-F5BA, D-F5P, D-F5PW, D-J59, D-J59W

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-F59	D-F59W	D-F5P	D-F5PW	D-J59	D-J59W D-F5BA
Wiring style	Three wire type				Two wire type	
Output style	NPN type		PNP type			
Application	IC, Relay, PLC				24V DC Relay, PLC	
Source voltage	DC5-12-24V (DC4.5~28V)				—	
Current consumption	10mA or less				—	
Load voltage	DC28V or less		—		DC24V (DC10~28V)	
Load current	40mA or less		80mA or less		5~40mA or less	
Internal voltage drop	1.5V or less		0.8V or less		4V or less	
Leak current	100µA or less at DC24V				0.8mA or less at DC24V	
Operating time	1ms or less					
Operating indicator lamp*	One colour	Two colour	One colour	Two colour	One colour	Two 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:

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

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 i.e. Relay

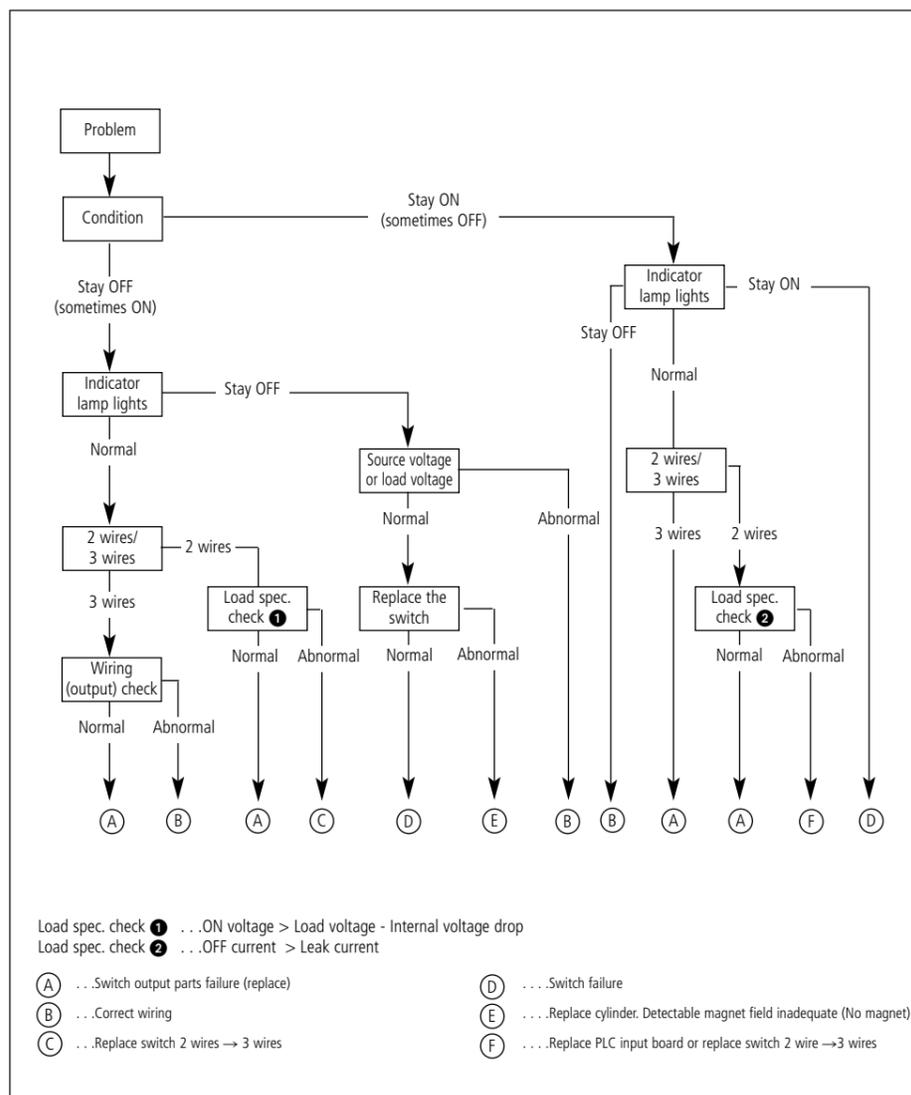


Fig 1

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 has moved from the set position. Re-adjust the switch until the green LED is showing (this is the optimum position).

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.

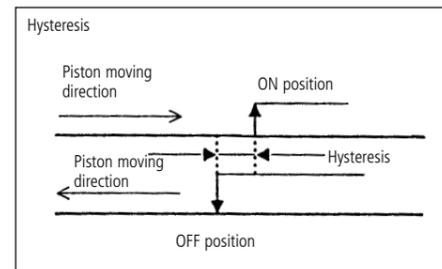


Fig 2

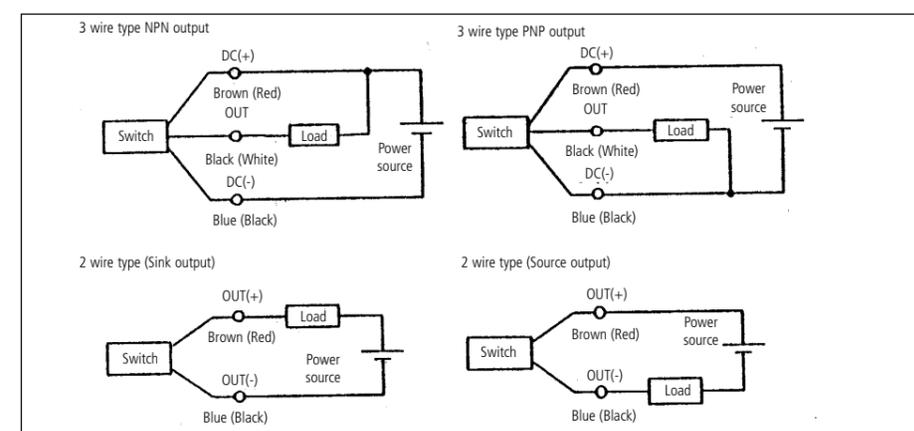
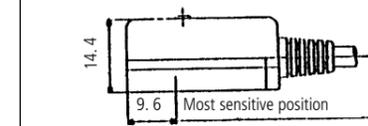
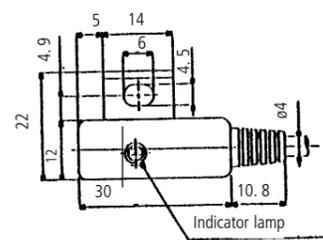


Fig 4

Exterior dimensions

D-F59/J59/F5P



D-F59W/J59W/F5PW/F5BA

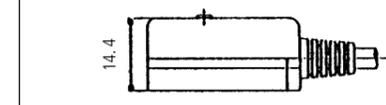
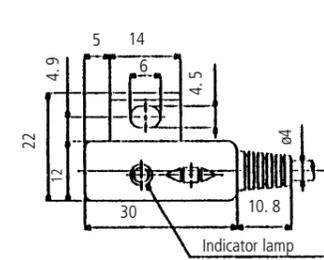


Fig 3

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.)

PLC input specification	3 wire output type	2 wire connecting type
Sink input	NPN output	Sink output mode
Source input	PNP output	Source output mode

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.

Appropriate tightening torque

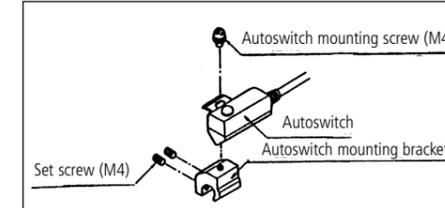


Fig 5

M3 mounting screw correct tightening torque is 1.0~1.2 Nm (10.2~12.2 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.

Two colour display

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

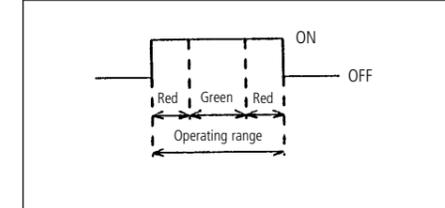


Fig 6

Detecting actuator stroke end

Refer to dimensions A & B in the actuator catalogue.

CAUTION

D-F5BA (Improved water resistant type)

Although this switch has improved properties with regard to oil and water resistance, it should not be exposed to cutting oil, which contains additives, high-pressure water jets or extremes of temperature.

CAUTION

In all cases do not clean with a solvent solution.

When you enquire about the product, please contact the following

SMC Corporation:		SMC Corporation:	
ENGLAND	Phone 01908-563888	TURKEY	Phone 212-2211512
ITALY	Phone 02-927111	GERMANY	Phone 6103-402-0
HOLLAND	Phone 020-5318888	FRANCE	Phone 01-64-76-10-00
SWITZERLAND	Phone 052-34-0022	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 8738-0800
FINLAND	Phone 09-68 10 21	NORWAY	Phone 67-12 90 20
BELGIUM	Phone 03-3551464	POLAND	Phone 48-22-6131847