



ORIGINAL INSTRUCTIONS

# Installation & Maintenance Manual

## Solid State Auto Switch

### Series D-G5BA

(Basic Safety Principles according to EN ISO 13849)

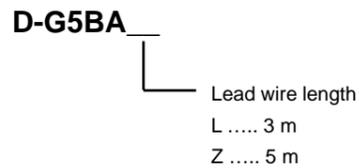


The intended use of the Auto Switch is to detect a position of a magnet in a pneumatic cylinder. The magnet is installed in e.g. a piston, a slide table, etc.

This IMM is only applicable for validated products to ISO 13849. Refer to Doc. No. D-\*S-TDP0002.

This manual should be read in conjunction with the current product catalogue. Keep this manual in a safe place for future reference.

### Model Indication Method



### 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.

### IMPORTANT MESSAGES

Read this manual and follow its instructions. Titles such as DANGER, WARNING and CAUTION will be followed by important safety information which must be carefully followed.

#### **⚠ DANGER**

Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.

#### **⚠ WARNING**

Indicates a hazard with a medium level of risk, which if not avoided, could result in death or serious injury

#### **⚠ CAUTION**

Indicates a hazard with a low level of risk, which if not avoided, could result in minor or moderate injury.

### **⚠ 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.

### Safety Instructions (continued)

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 actuators etc. (Supply air into the system gradually to create backpressure, 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 or recreation equipment.

### Specifications

Model number	D-G5BA
Wiring style	2 wire type
Application	24V DC Relay, PLC
Load voltage	24 VDC (10~28 VDC)
Load current	5~40mA
Internal voltage drop	4V or less
Leak current	0,8 mA or less at 24 VDC
Operating time	1 ms or less
Operating indicator LED*	2 colour
Proof impact	1000 m/s <sup>2</sup>
Vibration resistance	10 to 150 Hz, at the smaller of amplitude 1,5 mm or 20 m/s <sup>2</sup> in X, Y, Z directions for 2 hours each (De-energized)
Insulation resistance	50 MΩ or more at 500 VDC mega
Proof voltage	1500 VAC for 1 minute (lead wire, between cases)
Ambient temperature	-10 to +60°C
Protection structure	IEC 60529 standard IP67, JIS C 0920

\* 2 colour Operating range .....Red LED is ON.  
 Proper operating range .....Green LED is ON.

### Installation

#### **⚠ WARNING**

#### Actuators

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 40 mm 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 too high, it is possible that the load may not operate correctly due to incorrect load specification.

### Installation (continued)

Please confirm the following conditions before operation, and note that the internal voltage drop and leak current have 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 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 investigate 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.

#### **⚠ CAUTION**

Do not subject this product to **any** form of impact or vibration 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).

### Maintenance (continued)

#### **⚠ CAUTION**

If detection failure occurs i.e. LED remains ON, follow the fault finding chart below (Fig. 6).

For applications involving contact with water, elasticity and welding, contact your nearest SMC office. (refer to the end of this Manual).

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

#### Hysteresis

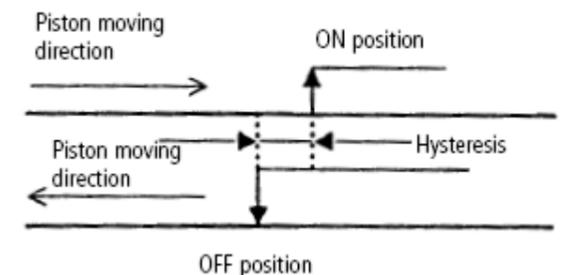


Fig. 1

### Outline dimensions (mm)

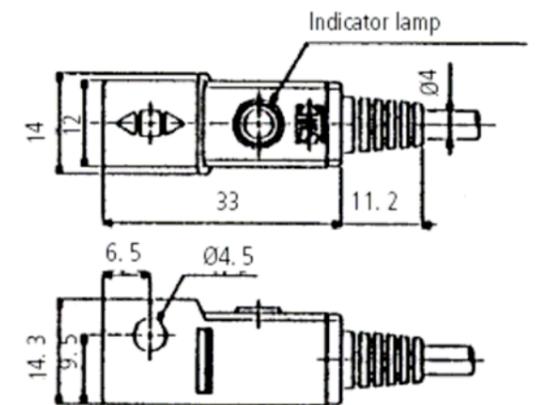


Fig. 2

### Basic wiring

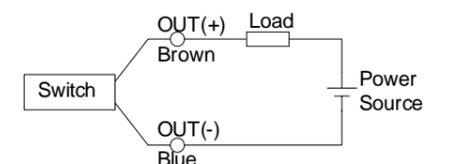
Lead wire colour in brackets indicates products complying with IEC.

#### Connection with PLC (sequence controller)

Depending on the PLC input specification, the output design of switches differ (See below).

PLC Input specification	2 wire connection type
Sink input	Sink output mode
Source input	Source output mode

#### 2 wire type (Sink output)



## Basic wiring (continued)

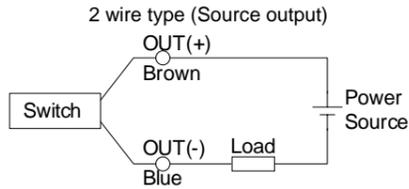


Fig. 3

### Auto Switch Internal Circuit

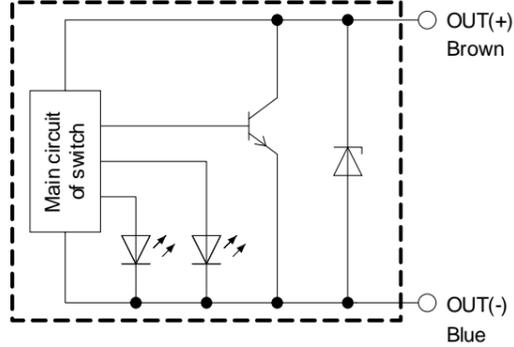


Fig. 4

## 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.

M4 mounting screw required tightening torque is 1,0 ~ 1,2 Nm.

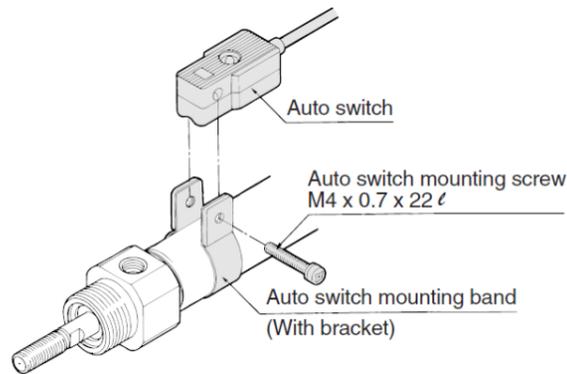


Fig. 5

## Setting the switch detection position

Position the actuator at its stroke end. Refer to dimensions A & B in the relevant actuator catalogue for further details.

### 2 colour display

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

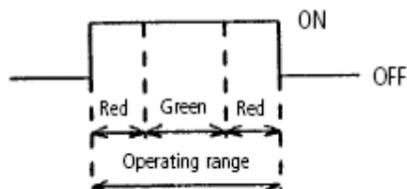


Fig. 6

## Setting the switch detection position

### CAUTION

D-G5BA is a water resistant type autoswitch. 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.

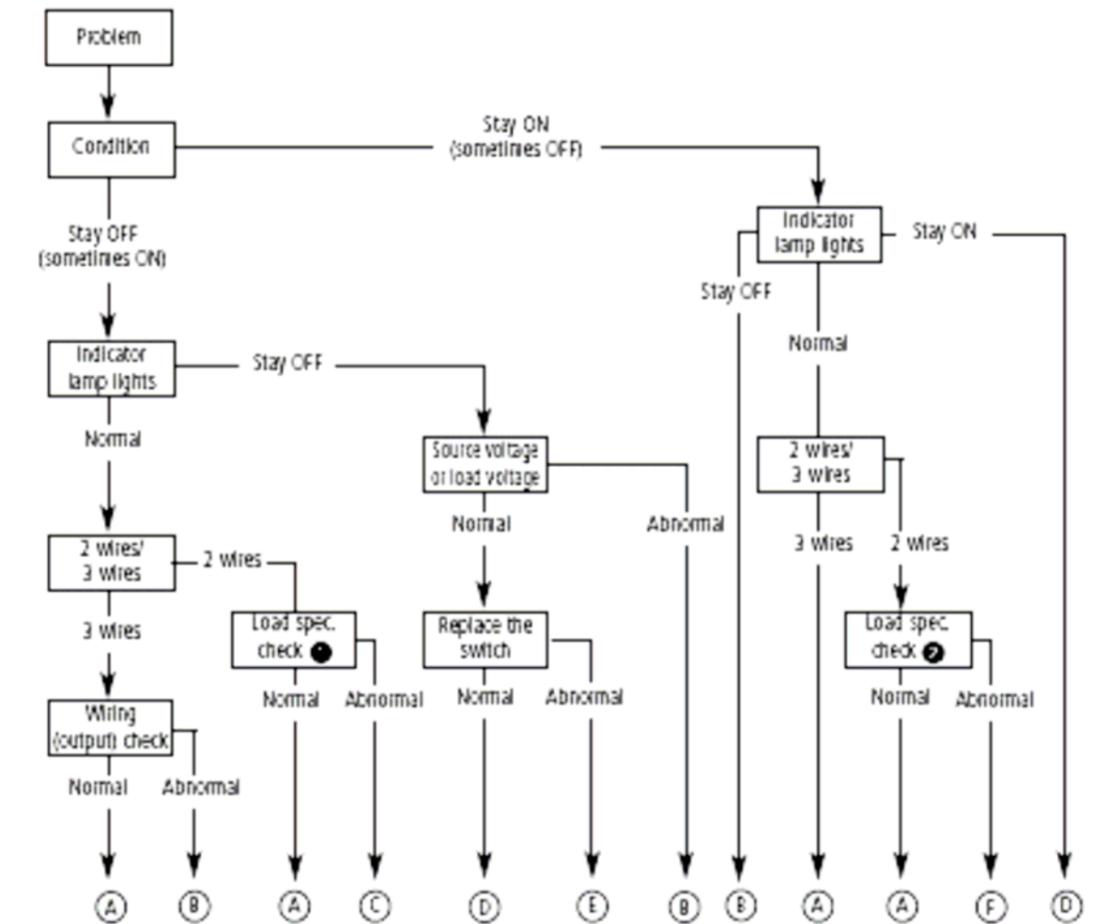
### CAUTION

In all cases do not clean with a solvent solution.

## Limitations of use

Any use in an EN 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).

## Troubleshooting



Load spec. check 1 ... ON voltage > Load voltage - Internal voltage drop  
Load spec. check 2 ... OFF current > Leak current

- (A) ... Switch output parts failure (replace)
- (B) ... Correct wiring
- (C) ... Replace switch 2 wires → 3 wires

- (D) ... Switch failure
- (E) ... Replace cylinder. Detectable magnet field inadequate (No magnet)
- (F) ... Replace PLC input board or replace switch 2 wires → 3 wires

Fig. 7

## Contacts

AUSTRIA	(43) 2262 62280-0	LATVIA	(371) 781 77 00
BELGIUM	(32) 3 355 1464	LITHUANIA	(370) 5 264 8126
BULGARIA	(359) 2 974 4492	NETHERLANDS	(31) 20 531 8888
CZECH REP.	(420) 541 424 611	NORWAY	(47) 67 12 90 20
DENMARK	(45) 7025 2900	POLAND	(48) 22 211 9600
ESTONIA	(372) 651 0370	PORTUGAL	(351) 21 471 1880
FINLAND	(358) 207 513513	ROMANIA	(40) 21 320 5111
FRANCE	(33) 1 6476 1000	SLOVAKIA	(421) 2 444 56725
GERMANY	(49) 6103 4020	SLOVENIA	(386) 73 885 412
GREECE	(30) 210 271 7265	SPAIN	(34) 945 184 100
HUNGARY	(36) 23 511 390	SWEDEN	(46) 8 603 1200
IRELAND	(353) 1 403 9000	SWITZERLAND	(41) 52 396 3131
ITALY	(39) 02 92711	UNITED KINGDOM	(44) 1908 563888

## SMC Corporation

URL : [http:// www.smcworld.com](http://www.smcworld.com) (Global) <http:// www.smceu.com> (Europe)

SMC Corporation, Akihabara UDX15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021 JAPAN

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