



# Operation Manual

PRODUCT NAME

Solid State Auto Switch

MODEL / Series / Product Number

*D-M9##*  
*D-M9#W#*  
*D-M9#E#*

**SMC Corporation**

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# 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 10218-1992: Manipulating industrial robots -Safety.

etc.



## 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

### 1. The compatibility of the product 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 catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### 2. 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.

### 3. 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 that 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.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### 4. 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, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

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.



# Safety Instructions

## Caution

### **1. 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.

## **Limited warranty and Disclaimer/Compliance Requirements**

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

### **Limited warranty and Disclaimer**

#### **1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)**

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

#### **2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.**

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

#### **3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.**

##### **\*2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### **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 regulation 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.**

## Operator

- ◆ This operation manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment. Only those persons are allowed to perform assembly, operation and maintenance.
- ◆ Read and understand this operation manual carefully before assembling, operating or providing maintenance to the product.

### ■ Safety Instructions

#### **Warning**

- Do not disassemble, modify (including changing the printed circuit board) or repair.  
An injury or failure can result.
- Do not operate the product outside of the specifications.  
Do not use for flammable or harmful fluids.  
Fire, malfunction, or damage to the product can result.  
Verify the specifications before use.
- Do not operate in an atmosphere containing flammable or explosive gases.  
Fire or an explosion can result.  
This product is not designed to be explosion proof.
- If using the product in an interlocking circuit:
  - Provide a double interlocking system, for example a mechanical system.
  - Check the product regularly for proper operation.Otherwise malfunction can result, causing an accident.
- The following instructions must be followed during maintenance:
  - Turn off the power supply.
  - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.Otherwise an injury can result.

#### **Caution**

- Do not touch terminals and printed circuit board inside the product.  
Otherwise it can cause electric shock, malfunction or damage to the product can result.
- After maintenance is complete, perform appropriate functional inspections.  
Stop operation if the equipment does not function properly.  
Safety cannot be assured in the case of unexpected malfunction.

Cylinders or actuators include cylinders, air grippers, rotary actuators, and electrical actuators/cylinders.

## Design/Selection

### 1. Confirm the specifications.

If the product is used with excess load applied or beyond the specification range, this may cause the product to break or malfunction. We do not guarantee against any damage if the product is used outside of the specification range.

### 2. Pay attention to the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but the operating time will be short if the speed is too fast. As a result, the load may not operate completely. The maximum detectable piston speed is:

$$V[\text{mm/s}] = \frac{\text{Auto switch operating range [mm]}}{\text{Time load applied [ms]}} \times 1000$$

### 3. Take precautions when multiple cylinders/ actuators are used close together.

When multiple auto switch cylinders/actuators are used in close proximity, magnetic field interference may cause the auto switches to malfunction. Maintain a minimum cylinder separation of 40 mm. (When the allowable interval is specified for each cylinder series, use the indicated value.)

The auto switches may malfunction due to the interference from the magnetic fields.

Use of a magnetic screen plate (MU-S025) or commercially available magnetic screen tape can reduce the interference of magnetic force.

### 4. Ensure sufficient clearance for maintenance activities.

When designing an application, be certain to allow sufficient clearance for maintenance.

### 5. Do not mount the cylinder or actuator with the auto switch on a footing.

If work personnel gets on or puts the work personnel's foot on the footing accidentally, an excessive load is applied to the cylinder or actuator, causing the cylinder or actuator to break.

### 6. Design the circuit so that any back-flow current does not flow in if a short-circuit trouble occurs or forced operation is performed to check the operation.

If a back-flow current occurs, this may cause the switch to malfunction or break.

### 7. When multiple auto switches are required.

"n" indicates the number of auto switches which can be physically mounted on the cylinders/actuators. Detection intervals depends on the auto switch mounting structure and set position, therefore some required interval and set positions may not be available.

### 8. Limitations on detectable position

There are positions or surfaces (bottom surface of the foot bracket, etc.) where the auto switch cannot be mounted due to the physical interference depending on the cylinder or actuator mounting status or mounting bracket. Select an appropriate auto switch setting position where the auto switch does not interfere with the cylinder or actuator mounting bracket (trunnion or reinforcing ring) after checking it sufficiently.

### 9. Keep wiring as short as possible.

Be sure to use a wire length of 100 m or less.

When the wire length is long, we recommend the ferrite core is attached to the both ends of the cable to prevent excess noise. A contact protection box is not necessary for solid state switches due to the nature of this product construction.

### 10. Do not use a load that generates surge voltage.

If driving a load such as a relay that generates a surge voltage, use a built-in surge absorbing element type device.

### 11. Pay attention to the internal voltage drop of the auto switch.

Generally, the internal voltage drop of the solid state auto switch is larger than that of the reed auto switch. When the auto switches ("n" pcs.) are connected in series, the voltage drop is multiplied by "n". In this case, the auto switches operate correctly, but the loads may not operate. Additionally, note that the 12 VDC relay does not apply to the auto switch.

12. Pay attention to leakage current.

<2-wire type>

Current (leakage current) flows to the load to operate the internal circuit when in the OFF state.

Operating current of load (OFF condition) > Leakage current

If the criteria given in the above formula are not met, it will not reset correctly (stays ON).

Use a 3-wire auto switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be “n” times larger when “n” auto switches are connected in parallel.

13. Output operation of the solid state auto switch is not stable for 50 [ms] after powered ON.

In the output operation immediately after powered ON or AND connection operation, the input device (PLC or relay, etc.) may judge the ON position as OFF output or the OFF position as ON output.

So, please make the setting on the equipment so that the input judgement signal is set disabled for 50 [ms] immediately after powered ON or AND connection.

When using SMC's AHC system (Auto Hand Changing System) Series MA, please also make this setting.

## Mounting/Adjustment

1. Do not drop or bump.

Do not drop, bump, or apply an excessive impact (300 m/s<sup>2</sup> or more for reed auto switches, 1000 m/s<sup>2</sup> or more for solid state auto switches) while handling the auto switch. It may cause the auto switch to break or malfunction.

2. Observe the proper tightening torque for mounting an auto switch.

When an auto switch is tightened beyond the range of tightening torque, auto switch mounting screws, auto switch mounting brackets or auto switch may be damaged.

On the other hand, tightening below the range of tightening torque may allow the auto switch to slip out of position.

3. Do not carry a cylinder by the auto switch lead wires.

This may cause disconnection of the lead wire or the internal element to break.

4. Do not use screws other than the set screws installed on the auto switch body to secure the auto switch.

If using other screws, auto switch may be damaged.

5. Mount an auto switch at the center of the operating range.

In the case of 2-color display auto switch, mount it at the center of the green LED illuminating range.

Adjust the mounting position of the auto switch so that the piston stops at the center of the operating range.

(The mounting position shown in the catalog indicates the optimum position at stroke end.)

If mounted at the end of the operating range (around the borderline of ON and OFF), operation will be unstable depending on the operating environment. Also there are some cylinders or actuators with individual setting methods for auto switches. If so, mount it in accordance with the indicated method.

Even if 2-color indication solid state auto switches are fixed at a proper operating range (the green light lights up), the operation may become unstable depending on the installation environment or magnetic field disturbance. (Magnetic body, external magnetic field, proximal installation of cylinders with built-in magnet and actuators, temperature change, other factors for magnetic force fluctuation during operation, etc.)

6. Check the actual actuation status and adjust the auto switch mounting position.

According to the installation environment, the cylinder or actuator may not operate even at its proper mounting position. Even when setting at a midpoint of the stroke, check the actuation status and make the adjustment in the same manner.

## Wiring

### 1. Confirm proper insulation of wiring.

If there is any improper insulation (mixed contact with other circuit, grounding fault, or improper insulation between terminals, etc.) in the wiring, an over-current flows in, causing the auto switch to break.

### 2. Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines.

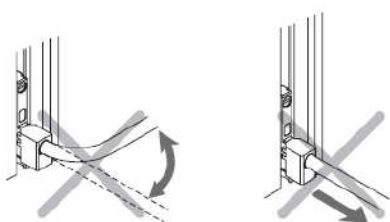
If an inrush current is generated, the noise may cause the auto switch to malfunction.

### 3. Avoid repeatedly bending or stretching lead wires.

Broken lead wires will result from repeatedly applying bending stress or stretching force to the lead wires.

Stress and tensile force applied to the connection between the lead wire and auto switch increases the possibility of disconnection.

Keep the lead wire from moving especially in the area where it connects with the auto switch.



### 4. Be certain to connect the load before power is applied.

<2-wire type>

If the power is turned ON when an auto switch is not connected to a load, the auto switch will be instantly damaged because of excess current (short circuit).

It is the same as when the 2-wire brown lead wire (+, output) is directly connected to the (+) power supply terminal.

### 5. Carry out the wiring work after shutting down the power.

If the wiring work is performed with the power turned ON, this may cause electric shock, malfunction, or damage to the auto switch.

### 6. Do not allow short-circuit of loads.

Otherwise, the protection circuit will be activated and the indicator light will flash.

At the same time, the auto switch will be damaged.

### 7. Avoid incorrect wiring.

1) If connections are reversed on a 2-wire type auto switch, the auto switch will not be damaged if protected by a protection circuit, but the auto switch will always stay in an ON state.

However, it is still necessary to avoid reversed connections, since the auto switch could be damaged by a load short circuit in this condition.

2) If connections are reversed (power supply line + and power supply line –) on a 3-wire type auto switch, the auto switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue wire and the power supply line (–) is connected to the black wire, the auto switch will be damaged.



## Operating Environment

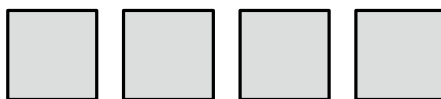
1. Never use in an atmosphere of explosive gases.  
The structure of auto switches is not intended to prevent explosion. This may lead to explosion hazard.  
Contact SMC for information regarding explosion proof compliant product.
2. Do not use in an area where a magnetic field is generated.  
Auto switches will malfunction or magnets inside cylinders/ actuators will become demagnetized. (Please consult with SMC if a magnetic field resistant auto switch can be used.)
3. Do not use in an environment where the auto switch will be continually exposed to water.  
Although auto switches satisfy the IEC standard IP67 specifications, do not use in applications continually exposed to water splashing or spray. This may cause improper insulation or malfunction.
4. Do not use in an environment with oil or chemicals.  
If auto switches are used in an environment containing coolant, cleaning solvent, various oils, or chemicals even for a short period of time, this may adversely affect the auto switches, resulting in improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.
5. Do not use in an environment with temperature cycles.  
If temperature cycles other than normal temperature changes are applied, this may adversely affect the insides of the auto switches.
6. Avoid accumulation of iron waste or close contact with magnetic substances.  
If many iron particles, such as cutting chips or spatters accumulate around a cylinder with the auto switches or an actuator or if a magnetic substance (attracted by a magnet) is put close to a cylinder with the auto switch or an actuator, the magnetic force inside the cylinder or actuator loses, causing the auto switch to malfunction.
7. Do not use in an area where surges are generated.  
If there is an equipment unit (electromagnetic lifter, high-frequency induction furnace, motor, or radio, etc.) that generates large surges or electromagnetic waves around cylinders with solid state auto switches or actuators, this may cause the circuit element inside the auto switch to break.
8. Please contact SMC concerning water resistance, elasticity of lead wires, usage at welding sites, etc.
9. Do not use in direct sunlight.
10. Do not mount the product in locations where it is exposed to radiant heat.
11. Take appropriate measures against the lightning surge on the equipment side as the auto switches do not have any lightning surge resistance specified in the CE marking.

## Maintenance

1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.
  - 1) Secure and tighten auto switch mounting screws.  
If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.
  - 2) Confirm that there is no damage to lead wires.  
To prevent faulty insulation, replace auto switches or repair lead wires, etc., if damage is discovered.
  - 3) Confirm the detection setting position.
    - Red light of 1-color display auto switch  
Confirm that the set position stops at the center of the operating range (red display area).
    - Confirm the green light and position of the 2-color display auto switch.  
Confirm that the set position stops at the center of the appropriate operating range (green display area).  
If the auto switch shows a red LED while in the ON/OFF position, the mounting position is not correct. Re-adjust the auto switch to the optimum position at the center of the operating range.Some cylinders or actuators indicate the individual setting procedures for the auto switch. If so, set the mounting position using the individual setting procedures.
2. Do not use solvents such as benzene, thinner etc. to clean the product.  
They could damage the surface of the body and erase the markings on the body. For heavy stains, use a cloth lightly dampened with diluted neutral detergent, then wipe up any residue with a dry cloth.

## Model Indication and How to Order

# D-M9



Output type

Symbol	Specification
N	3-wire, NPN
P	3-wire, PNP
B	2-wire

Indication light/Contact type

Symbol	Specification	
	Indication light	Contact type
Nil	1-colour display	Normally open
W	2-colour display	Normally open
E	1-colour display	Normally closed

\*: The combination of 2-color display and normally closed is not available.

Lead wire length/  
Connector pin assignment

Symbol	Specification
Nil	500 mm (Half strip)
M	1000 mm (Half strip)
L	3000 mm (Half strip)
Z	5000 mm (Half strip)
SAPC	500 mm (M8-3 pin pre-wired)
SBPC	500 mm (M8-4 pin pre-wired)
SDPC	500 mm (M12-4 pin pre-wired)
MAPC	1000 mm (M8-3 pin pre-wired)
MBPC	1000 mm (M8-4 pin pre-wired)
MDPC	1000 mm (M8-3 pin pre-wired)

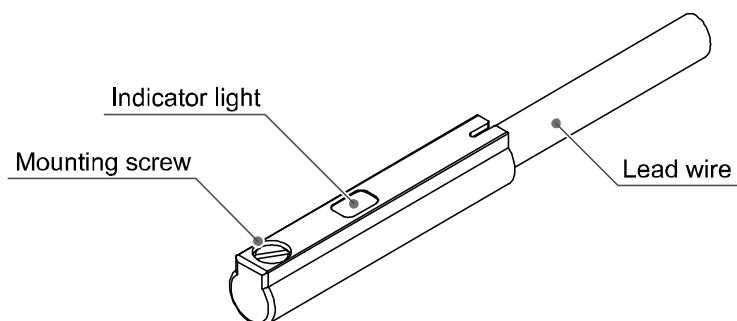
Electric entry

Symbol	Specification
Nil	In line
V	Perpendicular

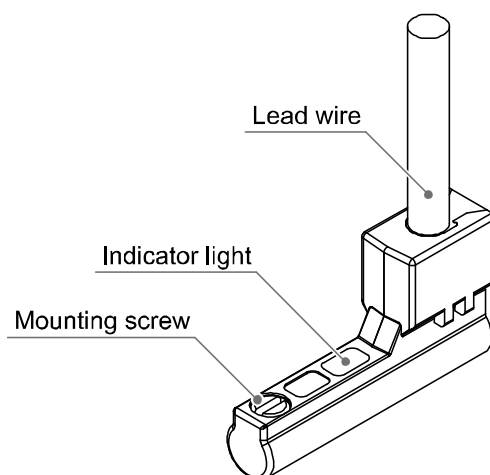
## Summary of Product parts

- Summary of Product parts


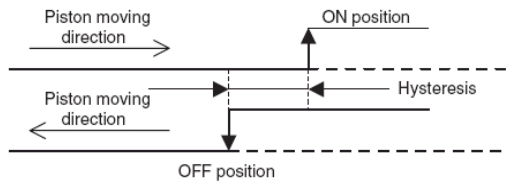
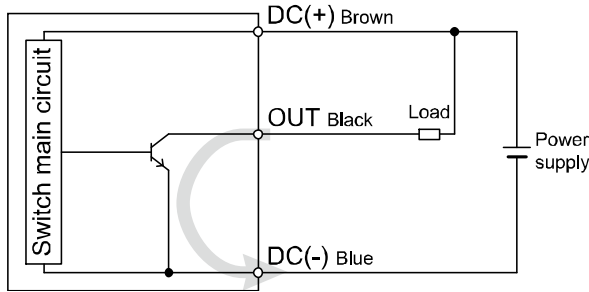
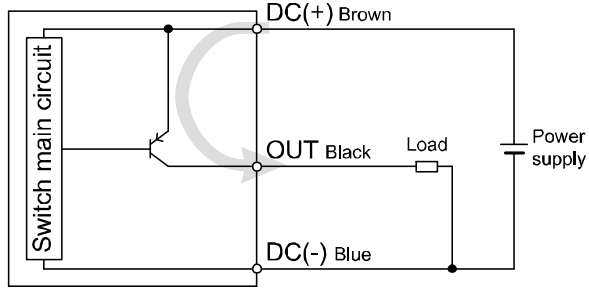
- D-M9B(W/E)/D-M9N(W/E)/D-M9P(W/E)



- D-M9B(W/E)V/D-M9N(W/E)V/D-M9P(W/E)V



## ■ Definition and terminology

	Term	Meaning and definition
2	2-color indication	<p>A type of indicating methods which lights up the Red LED light up when the Auto switch comes to the operating position, and lights up the Green LED when the Auto switch comes to the optimum operating position.</p> 
	2-wire Auto switch	Auto switch which has only signal line and COM line.
C	Current leakage	The current flowing to the load when the Auto switch turns off.
H	Hysteresis	<p>The difference between the points when the Auto switch turns on and off, which is provided to prevent chattering.</p> 
I	Internal voltage drop	The voltage applied between the COM and signal line when the Auto switch turns on.
L	Load current	The current flowing to the load when the Auto switch turns on.
M	Most sensitive position	The center position of the sensor unit (which gets the strongest reaction of the sensor unit), which means the center position of an operating range as well.
N	NPN output	<p>Auto switch which sinks current from the signal line when turning on.</p> <p>*: This circuit diagram is a sample.</p> 
	Normally open (normal direction) output	When magnetic force is detected, the output signal turns ON.
	Normally closed (inverted) output	When magnetic force is not detected, the output signal turns ON.
P	PNP output	<p>Auto switch which sources current from the signal line when turning on.</p> <p>*: This circuit diagram is a sample.</p> 
R	Reed Auto switch	Auto switch which generates on and off outputs with a mechanical contact.
S	Sequence controller (PLC)	The device to perform sequence control, which performs controlling such as receipt of inputs from the Auto switch along with programming and sending of the output to other machines.
	Solid state Auto switch	Auto switch which generates on and off outputs with or without mechanical contact such as a transistor.

## Mounting and Installation

### ■ Installation

When mounting the Auto switch to the actuator, the appropriate mounting bracket should be used.

"How to mount" depends on the actuator type and bore size.

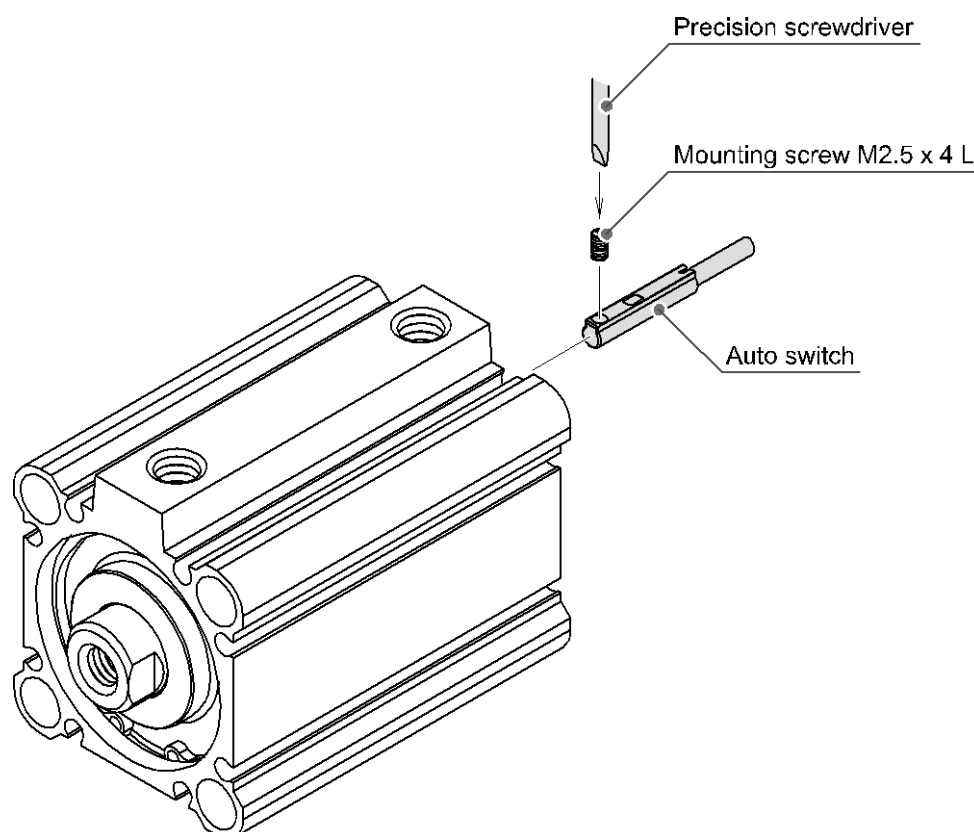
Please refer to the actuator catalogue.

For new Auto switch applications, confirm that the actuator includes a magnet before assembling the Auto switch and bracket.

#### • Tightening torque

Use a watchmaker driver whose grip diameter is 5 to 6 mm when tightening the mounting screw.

M2.5 mount screw tightening torque shall be 0.05 to 0.15 Nm (0.5 to 1.5 kgf•cm)



#### • Setting the detection position

Position the actuator at the end of the stroke.

Set the Auto switch in the position where the Auto switch Green light is ON.

#### (Detecting actuator end)

Based on A and B dimensions in the actuator catalogue, set the Auto switch position.

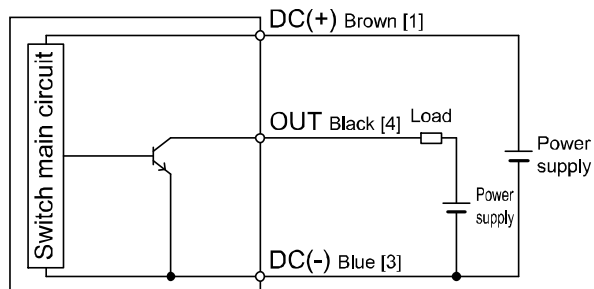
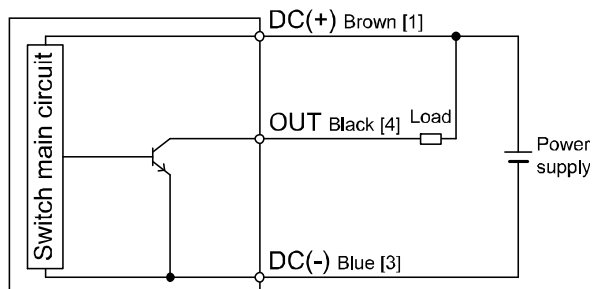
During installation, perform adjustment while checking the operating conditions of the Auto switch.

Air grippers and rotary actuators have their own setting method.

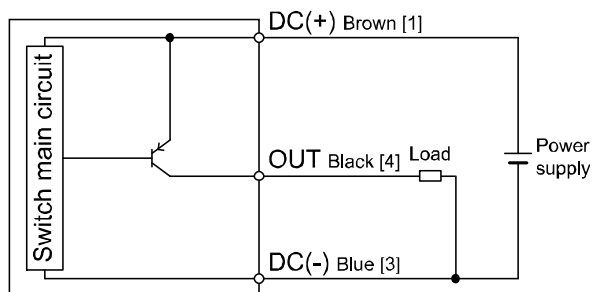
Follow the instructions in the relevant manual.

•Internal circuit  
D-M9N(W/E)(V)

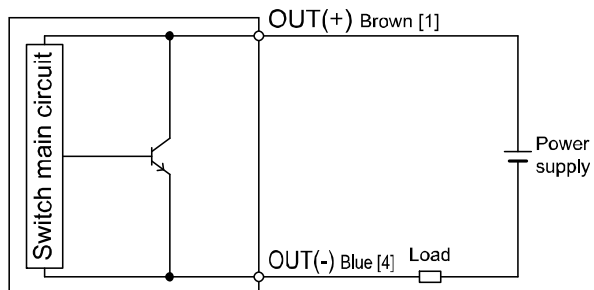
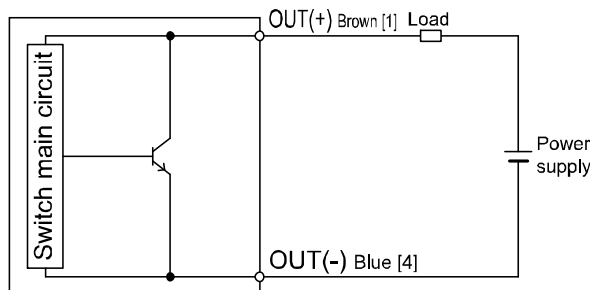
(When switch power supply and load power supply are separated.)



D-M9P(W/E)(V)

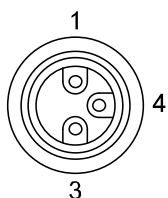


D-M9B(W/E)(V)

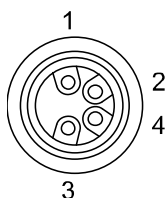


\*: The number marked on each lead wire color shows the pin number of pre-wired connector.

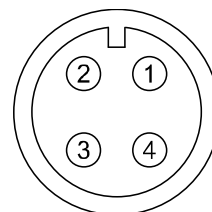
•Connection with PLC (sequence controller)



M8-3 pin connector



M8-4 pin connector



M12-4 pin connector

## Maintenance

After the power has been disconnected, please observe the following precautions:-

Regarding the actuator operation set up, the contents of the program may be maintained by the customer's application system.

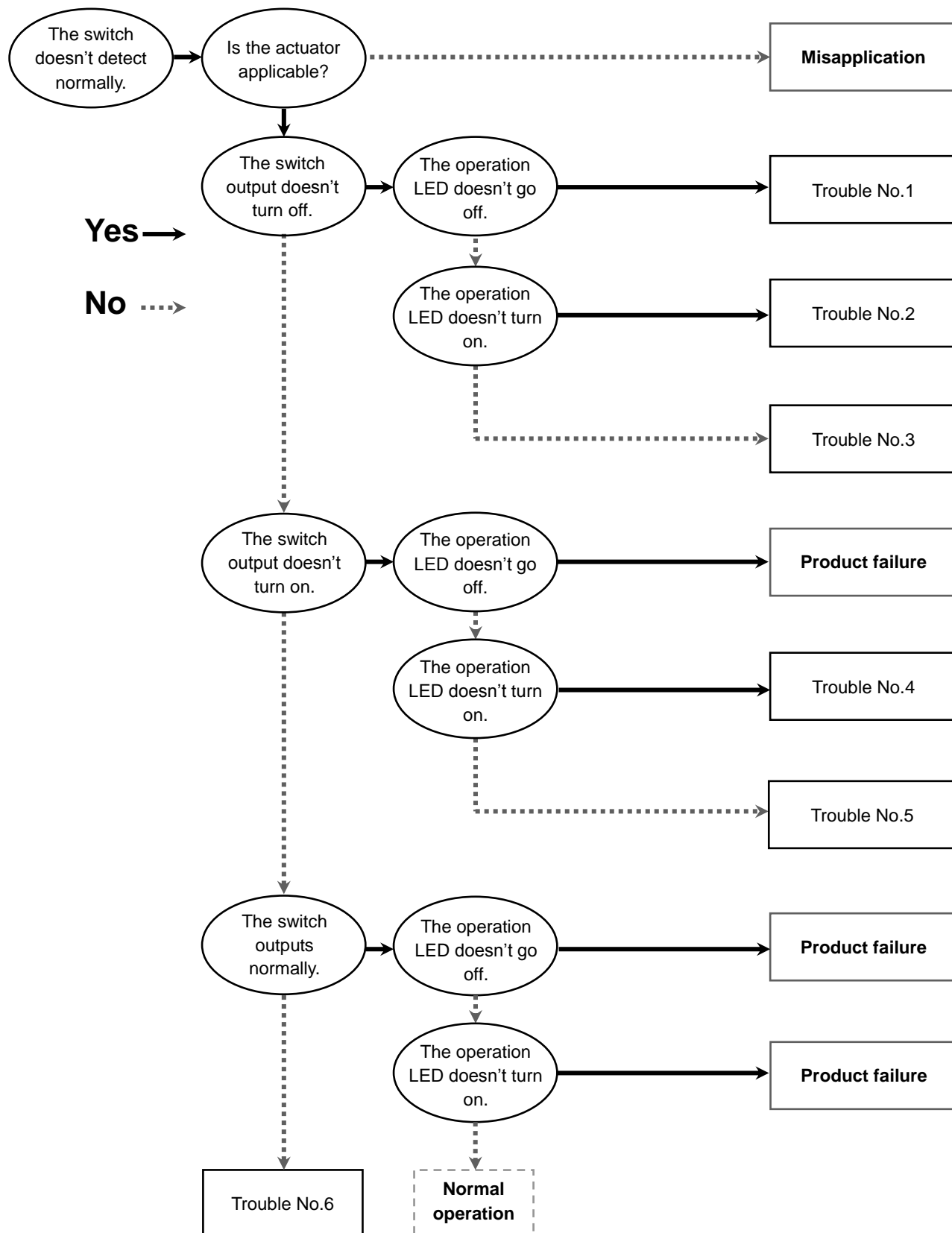
Take care to confirm safety when the power is re-connected, and the actuator operation is resumed, because the operation may have stopped in an unstable condition.

## Troubleshooting

When the Auto switch falls in operation failure, identify the trouble with the following flow chart.

A failure of the Auto switch might depend on operating environment (application etc.) and needs to be given a measure by contacting to us separately.

Contact type: Normally open (normal direction) output





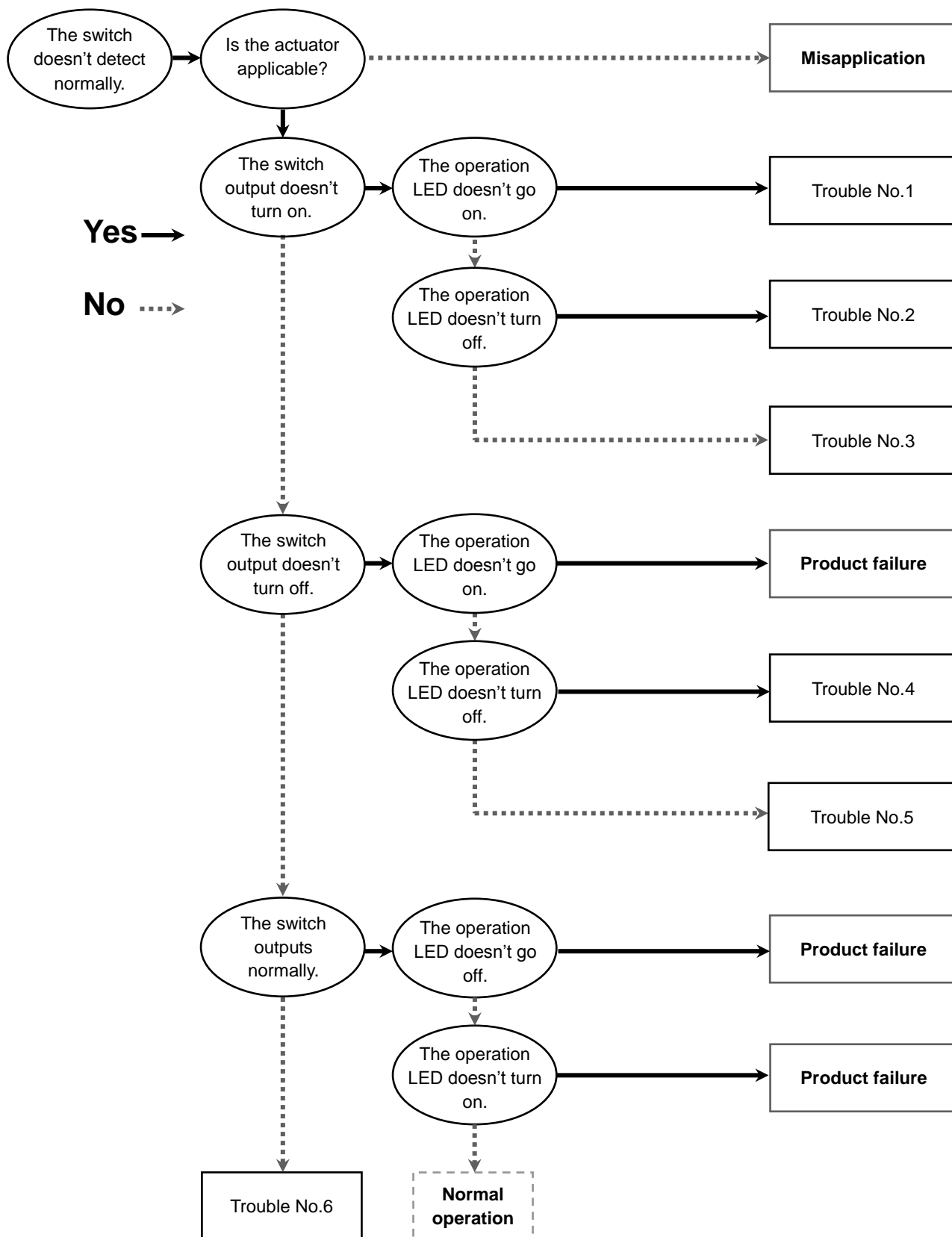
•Trouble list

Trouble No.	Trouble	Possible cause	Investigation to find possible cause	Countermeasure
1	The switch output doesn't turn off. The operation LED doesn't go off.	Malfunction due to disturbance magnetic field	The effect of magnetic field generated by adjacent actuator	Place a magnetic shield plate to the actuator.
		Improper setting (mounting) position *Narrow angle	The presence of the following conditions Switch operating range >Actuator operating stroke	Displace the Auto switch set position from the center of the actuator operating range.
2	The switch output doesn't turn off. The operation LED doesn't turn on.	Product failure		Replace the product.
3	The switch output doesn't turn off. The operation LED operates properly.	Mismatch the load current specification (2-wire)	Satisfaction of the following relations by the load current specification Load voltage is "ON" level > (Current leakage x n) x load resistance or Load current is "OFF" level > (Current leakage x n) n: The number of parallel connecting switches	Select 3-wire Auto switch or reed Auto switch.  Reduce the number of switches.
		Incorrect wiring (3-wire)	Reverse connection of wiring (black and blue)	Correct wiring. (Refer to "Internal circuit" on page 13.)

Trouble No.	Trouble	Possible cause	Investigation to find possible cause	Countermeasure
4	The switch output doesn't turn on. The operation LED doesn't turn on.	Power supply failure	Power supply voltage (zero or extremely low)	Adjust power supply voltage to a given value. (Refer to "Power supply voltage or Load voltage" in Specifications on page 23.)
		Incorrect wiring	Voltage (load) applied to the Auto switch	Correct wiring. (Refer to "Internal circuit" on page 13.)
			Reverse connection of wiring (black and blue)	
		Improper setting (mounting) position	Detection close to the limit of operating range	Move the Auto switch to proper position (near the center of the switch operating angle).
		Displacement from set position	Looseness of the switch unit or switch mounting screw	Fix to proper position at appropriate torque. (Tightening torque: 0.05 to 0.15 Nm)
		Displacement of the actuator stopping angle	Deviation of the actuator stopping angle (position)	Stabilize stop position.
		Lowering of magnetic force for detection (demagnetization)	The presence of magnetic filed source near the actuator (electric welding machine conductor and strong magnet, etc.)	Place a magnetic shield plate between magnetic filed source and the actuator.
			The effect of magnetic field generated by adjacent actuator (placed within 20 mm)	Separate the actuator (by 40 mm or more). Place a magnetic shield plate.
			The presence of deposit of magnetic material (cutting chip) on the actuator	Remove the magnetic deposit.
		Breakage of lead wire	The presence of repeated bending stress to a part of lead wire (bending radius, tensile force to the lead wire)	Correct wiring. (Adjust tensile force and enlarge bending radius.)

Trouble No.	Trouble	Possible cause	Investigation to find possible cause	Countermeasure
5	The switch output doesn't turn on. The operation LED operates properly.	Mismatch the load current specification (2-wire)	Satisfaction of the following relations by the load current specification Load voltage is "ON" level $> \text{Load voltage} - (\text{Internal voltage drop} \times n)$ n: The number of series connecting switches	Select 3-wire Auto switch or reed Auto switch.  Reduce the number of switches.
		Incorrect wiring (output line) (3-wire)	Condition of connected part (connector contact pin and crimping terminal)	Correct wiring. (Perform wiring of connected part again.)
		Breakage of lead wire (black) (3-wire)	The presence of repeated bending stress to a part of lead wire (bending radius, tensile force to the lead wire)	Correct wiring. (Adjust tensile force and enlarge bending radius.)
6	The operation is unstable. (chattering)	Improper setting (mounting) position	Detection close to the limit of switch operating angle	Move the switch to proper position (near the center of the switch operating angle).
		Displacement from set position	Looseness of the switch unit or switch mounting screw	Fix to proper position at appropriate torque. (Tightening torque: 0.05 to 0.15 Nm)
		Incorrect wiring	Condition of connected part (connector contact pin and crimping terminal)	Correct wiring. (Perform wiring of connected part again.)
			Check if the load has a short circuit (not connected).	Correct wiring. (Refer to "Internal circuit" on page 13.)
		Breakage of lead wire	The presence of repeated bending stress to a part of lead wire (bending radius, tensile force to the lead wire)	Correct wiring. (Adjust tensile force and enlarge bending radius.)
		Malfunction due to disturbance magnetic field	The presence of magnetic field source near the actuator (cylinder, electric welding machine conductor, motor, magnet etc.)	Place a magnetic shield plate between magnetic field source and the actuator, or separate magnetic field source from the actuator.
	The switch operates at multiple points.	Malfunction due to disturbance magnetic field	The effect of magnetic field generated by adjacent actuator	Place a magnetic shield plate to the actuator.
	The load doesn't work.	Operating angle range Detection at intermediate position	Satisfaction of the following relations by the actuator rotation speed Load operating time [s] $< \text{Auto switch operating range [mm]} / \text{Actuation operating speed [mm/s]}$	Decrease the actuating driving speed until specified relations can be satisfied.

Contact type: Normally closed (inverted) output



•Trouble list

Trouble No.	Trouble	Possible cause	Investigation to find possible cause	Countermeasure
1	The switch output doesn't turn on. The operation LED doesn't go on.	Malfunction due to disturbance magnetic field	The effect of magnetic field generated by adjacent actuator	Place a magnetic shield plate to the actuator.
		Improper setting (mounting) position *Narrow angle	The presence of the following conditions Switch operating range >Actuator operating stroke	Displace the Auto switch set position from the center of the actuator operating range.
2	The switch output doesn't turn on. The operation LED doesn't turn off.	Product failure		Replace the product.
3	The switch output doesn't turn on. The operation LED operates properly.	Mismatch the load current specification (2-wire)	Satisfaction of the following relations by the load current specification Load voltage is "ON" level > (Current leakage x n) x load resistance or Load current is "OFF" level > (Current leakage x n) n: The number of parallel connecting switches	Select 3-wire Auto switch or reed Auto switch.  Reduce the number of switches.
		Incorrect wiring (3-wire)	Reverse connection of wiring (black and blue)	Correct wiring. (Refer to "Internal circuit" on page 13.)

Trouble No.	Trouble	Possible cause	Investigation to find possible cause	Countermeasure
4	The switch output doesn't turn off. The operation LED doesn't turn off.	Power supply failure	Power supply voltage (zero or extremely low)	Adjust power supply voltage to a given value. (Refer to "Power supply voltage or Load voltage" in Specifications on page 23.)
		Incorrect wiring	Voltage (load) applied to the Auto switch	Correct wiring. (Refer to "Internal circuit" on page 13.)
			Reverse connection of wiring (black and blue)	
		Improper setting (mounting) position	Detection close to the limit of operating range	Move the Auto switch to proper position (near the center of the switch operating angle).
		Displacement from set position	Looseness of the switch unit or switch mounting screw	Fix to proper position at appropriate torque. (Tightening torque: 0.05 to 0.15 Nm)
		Displacement of the actuator stopping angle	Deviation of the actuator stopping angle (position)	Stabilize stop position.
		Lowering of magnetic force for detection (demagnetization)	The presence of magnetic filed source near the actuator (electric welding machine conductor and strong magnet, etc.)	Place a magnetic shield plate between magnetic filed source and the actuator.
			The effect of magnetic field generated by adjacent actuator (placed within 20 mm)	Separate the actuator (by 40 mm or more). Place a magnetic shield plate.
			The presence of deposit of magnetic material (cutting chip) on the actuator	Remove the magnetic deposit.
		Breakage of lead wire	The presence of repeated bending stress to a part of lead wire (bending radius, tensile force to the lead wire)	Correct wiring. (Adjust tensile force and enlarge bending radius.)

Trouble No.	Trouble	Possible cause	Investigation to find possible cause	Countermeasure
5	The switch output doesn't turn off. The operation LED operates properly.	Mismatch the load current specification (2-wire)	Satisfaction of the following relations by the load current specification Load voltage is "ON" level $> \text{Load voltage} - (\text{Internal voltage drop} \times n)$ n: The number of series connecting switches	Select 3-wire Auto switch or reed Auto switch.  Reduce the number of switches.
		Incorrect wiring (output line) (3-wire)	Condition of connected part (connector contact pin and crimping terminal)	Correct wiring. (Perform wiring of connected part again.)
		Breakage of lead wire (black) (3-wire)	The presence of repeated bending stress to a part of lead wire (bending radius, tensile force to the lead wire)	Correct wiring. (Adjust tensile force and enlarge bending radius.)
6	The operation is unstable. (chattering)	Improper setting (mounting) position	Detection close to the limit of switch operating angle	Move the switch to proper position (near the center of the switch operating angle).
		Displacement from set position	Looseness of the switch unit or switch mounting screw	Fix to proper position at appropriate torque. (Tightening torque: 0.05 to 0.15 Nm)
		Incorrect wiring	Condition of connected part (connector contact pin and crimping terminal)	Correct wiring. (Perform wiring of connected part again.)
			Check if the load has a short circuit (not connected).	Correct wiring. (Refer to "Internal circuit" on page 14.)
		Breakage of lead wire	The presence of repeated bending stress to a part of lead wire (bending radius, tensile force to the lead wire)	Correct wiring. (Adjust tensile force and enlarge bending radius.)
		Malfunction due to disturbance magnetic field	The presence of magnetic field source near the actuator (cylinder, electric welding machine conductor, motor, magnet etc.)	Place a magnetic shield plate between magnetic field source and the actuator, or separate magnetic field source from the actuator.
	The switch operates at multiple points.	Malfunction due to disturbance magnetic field	The effect of magnetic field generated by adjacent actuator	Place a magnetic shield plate to the actuator.
	The load doesn't work.	Operating angle range Detection at intermediate position	Satisfaction of the following relations by the actuator rotation speed Load operating time [s] $< \text{Auto switch operating range [mm]} / \text{Actuation operating speed [mm/s]}$	Decrease the actuating driving speed until specified relations can be satisfied.

## Specifications

•D-M9B(E)(V)/D-M9N(E)(V)/D-M9P(E)(V)

PLC: Programmable Logic Controller

Switch part no.	D-M9N(E)	D-M9N(E)V	D-M9P(E)	D-M9P(E)V	D-M9B(E)	D-M9B(E)V
Wiring	3-wire				2-wire	
Output	NPN		PNP		-	
Lead wire orientation	In line	Perpendicular	In line	Perpendicular	In line	Perpendicular
Applicable load	IC circuit/Relay/PLC				24 VDC Relay/PLC	
Power supply voltage	5/12/24 VDC (4.5 to 28 VDC)				-	
Current consumption	10 mA or less				-	
Load voltage	28 VDC or less		-		24 VDC (10 to 28 VDC)	
Load current	40 mA or less				2.5 to 40 mA	
Internal voltage drop	0.8 V or less at load current of 10 mA (2 V or less at load current of 40 mA)				4 V or less	
Current leakage	100 μA or less at 24 VDC				0.8 mA or less	
Operating time	1 ms or less					
Indication light	Normally open (normal direction) output: When magnetic force is detected The Red LED turns ON Normally closed (inverted) output: When magnetic force is not detected					
Electrical entry	Grommet					
Lead wire	Vinyl sheath cable φ2.6, 0.15 mm <sup>2</sup> , 2-wire (D-M9B(E)(V)), 3-wire (D-M9N(E)(V),D-M9P(E)(V))					
Impact proof	1000 m/s <sup>2</sup>					
Insulation resistance	50 MΩ or more under the test voltage 500 VDC (between case and cable)					
Withstand voltage	1000 VAC 1 min. (between case and cable)					
Ambient temperature	-10 to 60 °C					
Enclosure	IEC 60529 criteria IP67, JISC0920 watertight construction					



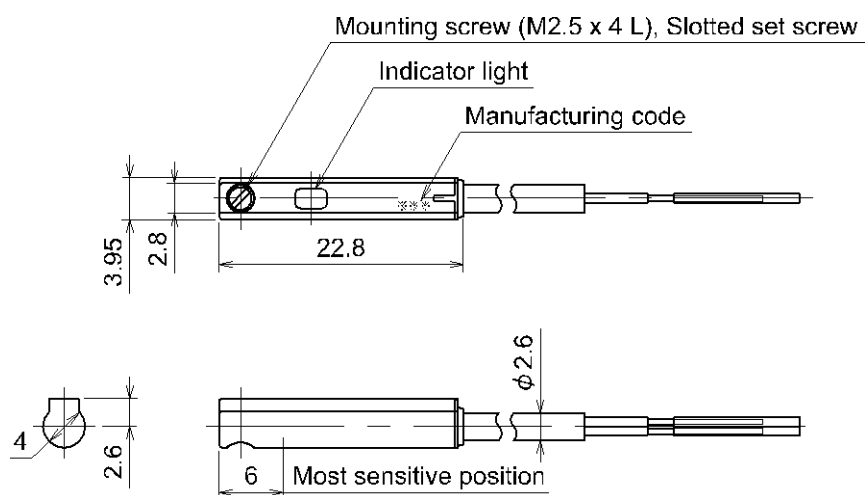
•D-M9BW(V)/D-M9NW(V)/D-M9PW(V)

PLC: Programmable Logic Controller

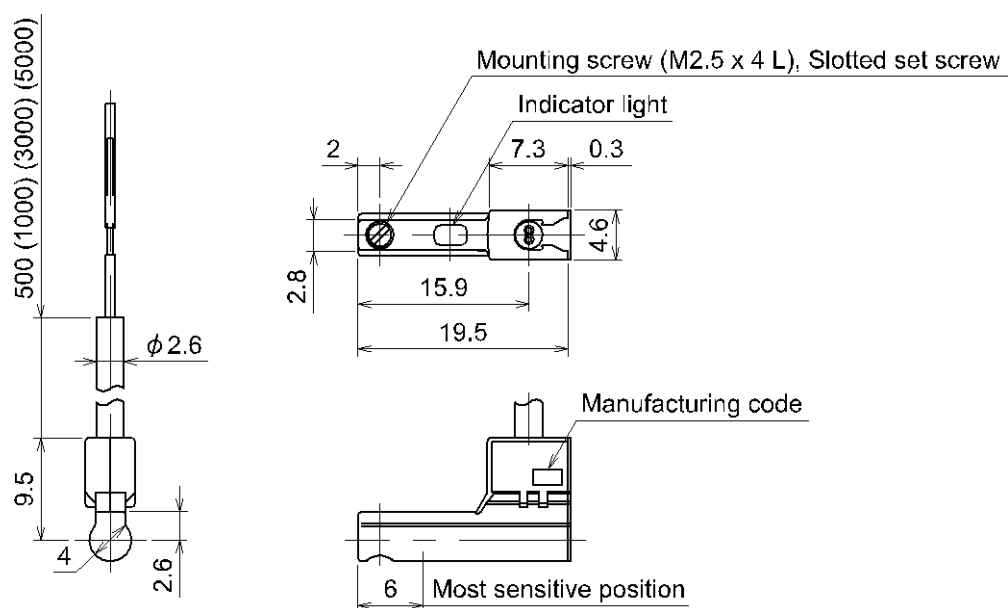
Switch part no.	D-M9NW	D-M9NWV	D-M9PW	D-M9PWV	D-M9BW	D-M9BWV
Wiring	3-wire				2-wire	
Output	NPN		PNP		-	
Lead wire orientation	In line	Perpendicular	In line	Perpendicular	In line	Perpendicular
Applicable load	IC circuit/Relay/PLC				24 VDC Relay/PLC	
Power supply voltage	5/12/24 VDC (4.5 to 28 VDC)				-	
Current consumption	10 mA or less				-	
Load voltage	28 VDC or less		-		24 VDC (10 to 28 VDC)	
Load current	40 mA or less				2.5 to 40 mA	
Internal voltage drop	0.8 V or less at load current of 10 mA (2 V or less at load current of 40 mA)				4 V or less	
Current leakage	100 μA or less at 24 VDC				0.8 mA or less	
Operating time	1 ms or less					
Indication light	Operating position: The Red LED turns ON Optimum operating position: The Green LED turns ON					
Electrical entry	Grommet					
Lead wire	Vinyl sheath cable φ2.6, 0.15 mm <sup>2</sup> , 2-wire (D-M9BW(V)), 3-wire (D-M9NW(V),D-M9PW(V))					
Impact proof	1000 m/s <sup>2</sup>					
Insulation resistance	50 MΩ or more under the test voltage 500 VDC (between case and cable)					
Withstand voltage	1000 VAC 1 min. (between case and cable)					
Ambient temperature	-10 to 60 °C					
Enclosure	IEC 60529 criteria IP67, JISC0920 watertight construction					

## ■ Dimensions

### •D-M9B(W/E)/D-M9N(W/E)/D-M9P(W/E)

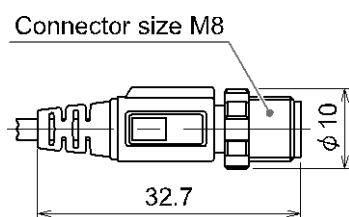


### •D-M9B(W/E)V/D-M9N(W/E)V/D-M9P(W/E)V

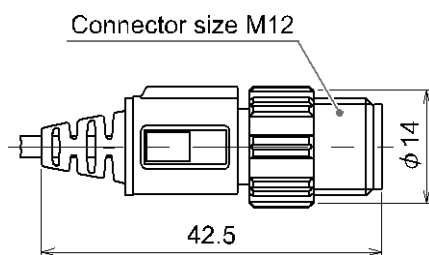


•Pre-wired connector

•D-M9□□□<sup>A</sup><sub>B</sub> PC



•D-M9□□□DPC



#### Revision history

A: Standardize each contents for series D-M9.  
B: Modify the contents.  
C: Limited warranty and Disclaimer are added.  
D: Solid state auto switch changed.  
    D-M9\*\* added  
E: Solid state auto switch changed.  
    D-M9\*E(V) added [June 2018]  
F: Contents revised in several places  
    [March 2019]

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.  
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No.D-※S-OMJ0004-F

## Technical Specification

Solid State Auto Switch

D-M9B Series

D-M9N Series

D-M9P Series

D-M9\*V\* Series

## Contents

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## 1.Safety

The Solid-state Auto Switch and this manual contain essential information for the protection of users and others from possible injury and damage to property and to ensure correct handling.

Please check that you fully understand the definition of the following messages (signs) before going on to read the text, and always follow the instructions.

Also read carefully the instruction manual of relevant equipment or apparatus before use.

### • Indications

IMPORTANT MESSAGES	
Read this manual and follow its instructions. Signal words such as WARNING, CAUTION and NOTE, will be followed by important safety information that must be carefully reviewed.	
<b>⚠ WARNING</b>	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
<b>⚠ CAUTION</b>	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
<b>NOTE</b>	Gives you helpful information.

### • Operator

This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.

Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the Auto switch.

## • Usage Restrictions

- This product is designed for use in general equipment for factory automation. Never use this product with equipment or apparatus that directly concerns human lives<sup>\*1</sup>, or which malfunction or failure can cause a huge loss.

\*1: Equipment or apparatus that directly matters human lives means the following:

- Medical equipment such as life support systems or equipment used in operating rooms
- Compulsory equipment required by law such as the Fire Prevention Law, Construction Law and etc.
- Equipment or apparatus that conforms with those mentioned above

- Contact our sales department when plans are made for the product to be used for the system<sup>\*2</sup> including equipment that concerns itself with the safety of persons or that seriously affects the public. This usage needs special consideration<sup>\*3</sup>.

\*2: The system including equipment that concerns itself with the safety of persons or that seriously affects the public means the following:

- Nuclear reactor control systems in nuclear power plants, safety protection systems or other systems important for safety in nuclear power facilities
- Driving control systems of mass transportation systems, and flight control systems
- Equipment or apparatus that comes into contact with foods or beverages

\*3: Special consideration means discussing usage with our engineers to establish a safe system designed as fool-proof, fail-safe, redundant and etc.

- Special consideration of safety or maintainability should be taken to prevent hazard or loss caused by a failure or malfunction that is likely to occur in certain probability due to environmental stress (deterioration).

\* The special consideration means to fully review the equipment or apparatus in design stage and to establish a backup system in advance such as a redundant system or fail-safe system.

- Use for an interlocking circuit.

When using the Auto switch as a sensor for interlock, adopt a double interlocking method such as equipping the mechanical protection function in order to deal with a AUTO switch failure.

Check the Auto switch regularly to ensure proper operation.



## **⚠ WARNING**

- Do not disassemble, modify (including change of printed circuit board) or repair.  
An injury or failure can result.
- Do not operate the Auto switch beyond specification range.  
Operation at a range that exceeds the specifications can cause a fire, malfunction, or damage to the Auto switch.  
Verify the specifications before use.
- Do not use the Auto switch in an atmosphere containing combustible or explosive gas.  
A fire or explosion can result.  
This Auto switch is not an explosion-proof type.
- These instructions must be followed when using the Auto switch in an interlocking circuit:
  - Provide double interlocking by another system such as mechanical protection
  - Check the Auto switch regularly to ensure proper operationOtherwise malfunction can cause an accident.

## **⚠ CAUTION**

- Do not touch terminals and printed circuit board inside the switch  
Otherwise it can cause electric shock, malfunction or damage to the unit.

## **NOTE**

- Follow the instructions given below when designing, selecting and handling your Auto switch:
- The instructions on design and selection (installation, wiring, environment of use, adjustment, operation, maintenance and etc.) described below must also be followed.
  - Do not place two or more actuators close together.  
When using more than two Auto switches mounted parallel with each other, keep 40 mm or more between actuator tubes to prevent influence (malfunction) due to magnetic interference. (Keep the allowable displacement for each Auto switch if specified)
  - Detection of a piston by Auto switch mounted in the middle part of a cylinder stroke depends on the speed of the piston. Satisfy the conditional equation below.  
Where the maximum detectable piston speed = V[mm/s]  
$$V[\text{mm/s}] = \frac{\text{Travel of Auto switch [mm]}}{\text{Change over time of load [ms]}} \times 1000$$
  - Reserve a space for maintenance.  
Remember to leave space for maintenance when installing the product.

- Product handling

- Installation

- Follow the specified tightening torque. ( 0.1 to 0.2N·m )

Excessive tightening torque can break the mounting screws, mounting bracket or Auto switch.

Insufficient tightening torque can displace the Auto switch from the original position. (Refer to the installation manual)

- Connect frame-ground terminal (FG terminal) to the ground when using a switching power supply.
- Do not drop, hit or apply excessive shock (larger than 1000 m/s<sup>2</sup>) to the Auto switch. Otherwise it can result in damage to the Auto switch causing failure or malfunction.

- Wiring

- Do not pull the lead wires.

Especially never lift actuator equipped with Auto switch by holding the lead wires.

It can result in damage to inside of Auto switch causing malfunction.

- Do not bend or apply tensile stress to lead wires repeatedly.

Wiring with repetitive bending stress or tensile stress can cause breakage of lead wires.

A bend radius of about 40 to 80 mm is recommended. Contact us for the details.

- Connect wires and cables correctly.

Miswiring can break the Auto switch depending on the miswired circuit.

- Do not connect wires while the power is on.

Otherwise it can break the circuit inside the Auto switch causing malfunction.

- Do not lay wires or cables with power cable or high-voltage cable in the same wiring route.

Lay the wires to the Auto switch to a wire duct or in a protective tube other than those for power cables or high-voltage cables to prevent contamination with noise or induced surge voltage from power lines or high-voltage lines.

- Verify the insulation of wiring.

Poor insulation (interference with other circuit, poor insulation between terminals and etc.) can introduce excess voltage or current to the Auto switch causing damage.

- Keep wiring as short as possible to prevent contamination from noise and induced surge voltage. Do not use a cable longer than 100 m.

- When stripping the cable envelope, please pay attention to the stripping direction.

Insulator might be split or hurt depending on the directions.



- Environment

- Never use the product for a corrosive gas or liquid.

It can cause failure or malfunction.

- Do not use the product in a place where strong magnetic field exists.

It can cause a malfunction of the Auto switch, or demagnetization of a magnet inside actuator.

- Do not use the Auto switch in an environment where the Auto switch is always splashed with water drips.

It can cause poor insulation or malfunction due to swelling of a resin filled inside the Auto switch.

- Do not use the product in an atmosphere containing oils or chemicals.

Use of the Auto switch in an atmosphere containing various oils or chemicals such as coolant or detergent can result in giving bad influence (poor insulation, malfunction due to swelling of a resin filled inside the Auto switch, or hardening of lead wires) even if in a short operating period.

- Do not use the product in an atmosphere where steel dusts accumulate or magnetic bodies are gathered closely.

When an amount of steel chips or steel dusts such as sputters of welding accumulate around an actuator equipped with Auto switch, or magnetic bodies (those attracted by magnet) are gathered closely to the actuator, they can weaken a magnet inside the actuator causing inoperativeness of the Auto switch.

- Do not use the product in an environment where heat cycle exists.

Heat cycles other than ordinary change of the temperature can affect the inside of Auto switch.

- Do not use the Auto switch nearby a place where electric surges are generated.

Internal circuit elements of Auto switch can deteriorate or break when equipment generating a large surge (electromagnetic lifter, high frequency induction furnace, motor, etc.) is located near the Auto switch. Provide surge preventives, and avoid interference.

- Do not use a load generating surge voltage.

Use Auto switch equipped with surge absorber when a surge-generating load such as a relay or solenoid valve is driven directly.

- Adjustment and Operation

- Adjust an Auto switch in the middle of operating area and then fix it.

Adjust the position of Auto switch in a way that a piston stops at about the middle of operating area (where switch is in ON status).

Mounting the Auto switch close to the end of operating area can cause instability of operation.

Air chucking rotary actuators have their own setting method. Follow their instructions.

- Turn the power on after connecting a load.

Otherwise it can cause excess current causing instantaneous breakage of the Auto switch.

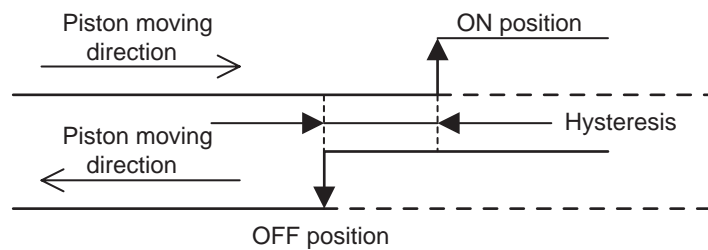
- Maintenance

- Perform maintenance and check regularly.  
Otherwise safety is not assured due to an unexpected malfunction or misoperation.
- Do not touch terminals or printed circuit board inside the switch while the power is on.  
Otherwise it can cause in malfunction or damage to AUTO switch.

- Others

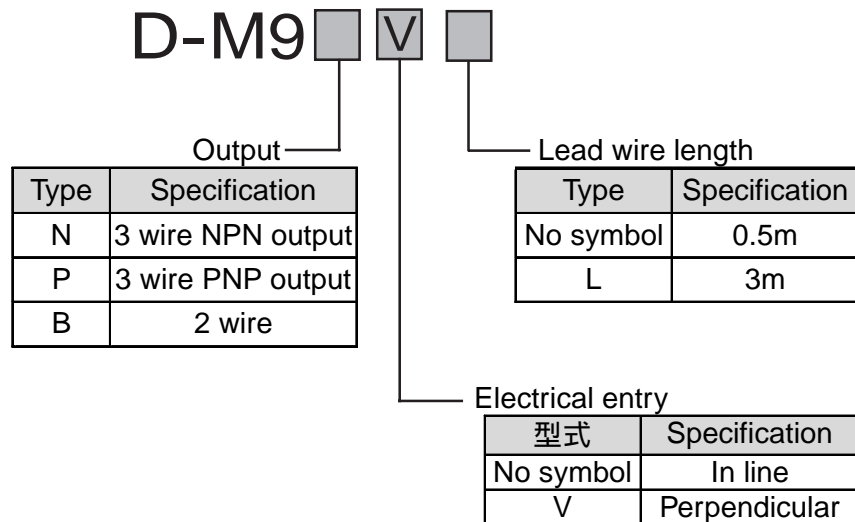
- Contact SMC for water-proof capability, endurance of wire bending or use at welding shop.
- Contact SMC when there is a problem of switch's ON/OFF positions (hysteresis).

### Hysteresis



## 2.Model Indication Method and Specification

### 2 - 1 How to order



### 2 - 2 Product Specification

PLC : Programmable Logic Controller

Switch model number	D-M9N	D-M9NV	D-M9P	D-M9PV	D-M9B	D-M9BV
Wiring	3 wire				2 wire	
Output	NPN		PNP		-	
Extraction type	In line	Perpendicular	In line	Perpendicular	In line	Perpendicular
Application	IC circuit/Relay/PLC				24V DC Relay/PLC	
Power voltage	5/12/24V DC (4.5 to 28V DC)				-	
Current consumption	10mA or less				-	
Load voltage	28V DC or less		-		24V DC (DC10 to 28VDC)	
Load current	40mA or less				2.5 to 40mA	
Internal voltage drop	0.8V or less				4V or less	
Current leakage	100μA or less at 24V DC				0.8mA or less	
Operating time	1ms or less					
Indication light	ON: Red light emitting diode					
Electrical entry system	Grommet					
Lead wire	Vinyl sheath cable 2.7 × 3.2 oval, 0.15mm <sup>2</sup> , 2 wire (D-M9B), 3 wire (D-M9N,D-M9P)					
Impact proof	1000m/s <sup>2</sup>					
Insulation resistance	50MΩ or more under the test voltage 500V DC (between case and cable)					
Withstand voltage	1000V AC 1min (between case and cable)					
Ambient temperature	-10 to 60°C					
Enclosure	IEC529 criteria IP67, JISC0920 watertight construction					

## 2 - 3 Applicable actuator and operation range

Unit: Operation range[mm] , Operation angle[ ° ]

Series	Section	Bore diameter																
		6	8	10	12	15	16	20	25	30	32	40	50	63	70	80	100	200
CU	Operation range	2.5	-	2.5	-	-	3.5	5	5	-	5	-	-	-	-	-	-	-
CQS	Operation range	-	-	-	2	-	2.5	3.5	3.5	-	-	-	-	-	-	-	-	-
CQ2	Operation range	-	-	-	-	-	-	-	-	-	4	4	4	5	-	5	5.5	-
RQ	Operation range	-	-	-	-	-	-	4	4	-	4	4	4.5	-	-	-	-	-
MXH	Operation range	2	-	2	-	-	3	3.5	-	-	-	-	-	-	-	-	-	-
MXU	Operation range	2	-	2	-	-	3	-	-	-	-	-	-	-	-	-	-	-
MXS	Operation range	2	2	-	2.5	-	3	3.5	3.5	-	-	-	-	-	-	-	-	-
MXS L	Operation range	2	2	-	2.5	-	3	3.5	3.5	-	-	-	-	-	-	-	-	-
MXQ	Operation range	2.5	2.5	-	3	-	3	3.5	3.5	-	-	-	-	-	-	-	-	-
MXF	Operation range	-	2	-	2	-	3.5	4	-	-	-	-	-	-	-	-	-	-
MXW	Operation range	-	2	-	3	-	3	4	4	-	-	-	-	-	-	-	-	-
MXP	Operation range	2.5	-	2.5	2.5	-	2.5	-	-	-	-	-	-	-	-	-	-	-
MY1B	Operation range	-	-	2.5	-	-	3	3.5	-	-	-	-	-	-	-	-	-	-
MY1M	Operation range	-	-	-	-	-	6.5	7	-	-	-	-	-	-	-	-	-	-
MY1C	Operation range	-	-	-	-	-	6.5	7	-	-	-	-	-	-	-	-	-	-
MY1H	Operation range	-	-	2	-	-	3	3.5	-	-	-	-	-	-	-	-	-	-
MY1 W	Operation range	-	-	-	-	-	6.5	7	-	-	-	-	-	-	-	-	-	-
CXT	Operation range	-	-	-	2.5	-	3	4	4	-	4	4	-	-	-	-	-	-
CLQ	Operation range	-	-	-	-	-	-	2.5	3.5	-	4	4	4.5	4.5	-	5	5.5	-
REBR	Operation range	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
MK	Operation range	-	-	-	2	-	2.5	-	-	-	4.5	4	4.5	5	-	-	-	-
MK2	Operation range	-	-	-	-	-	-	-	-	-	4.5	4.5	5	5	-	-	-	-
RSQ	Operation range	-	-	-	2	-	-	-	-	-	3.5	3.5	4.5	-	-	-	-	-
CEP1	Operation range	-	-	-	2.5	-	-	3	-	-	-	-	-	-	-	-	-	-
CE1	Operation range	-	-	-	-	-	-	-	-	-	4.5	4.5	4.5	4.5	-	-	-	-
MY2H	Operation range	-	-	-	-	-	3.5	-	4	-	-	4.5	-	-	-	-	-	-
MY2HT	Operation range	-	-	-	-	-	3.5	-	3.5	-	-	3	-	-	-	-	-	-
MY2C	Operation range	-	-	-	-	-	3	-	3.5	-	-	5	-	-	-	-	-	-
CY3R	Operation range	-	-	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-

Unit : Operation range[mm], Operation angle[° ]

Series	Section	Bore diameter																		
		0.5	1	6	8	10	12	15	16	20	25	30	32	40	50	63	70	80	100	200
MTS	Operation range	-	-	-	2.5	-	3.5	-	3.5	3.5	4	-	3.5	4	-	-	-	-	-	-
RSQ	Operation range	-	-	-	-	-	2	-	-	-	-	-	3.5	3.5	4.5	-	-	-	-	-
CXSJ	Operation range	-	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MIS	Operation range	-	-	-	2	-	2	-	-	2.5	4	-	5	-	-	-	-	-	-	-
MIW	Operation range	-	-	-	2	-	3	-	-	3.5	4	-	5	-	-	-	-	-	-	-
MHF2	Operation range	-	-	-	1.5	-	1.5	-	1.5	1.5	-	-	-	-	-	-	-	-	-	-
MGZ	Operation range	-	-	-	-	-	-	-	-	3	3	-	3.5	-	-	-	-	-	-	-
RZQ	Operation range	-	-	-	-	-	-	-	-	-	-	-	4	4	4.5	4.5	-	-	-	-
MY3	Operation range	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-
CRQ2	Operation angle	-	-	-	-	41	-	32	-	25	-	20	-	17	-	-	-	-	-	-
MSQ	Operation angle	-	-	-	-	31	-	-	-	25	-	23	-	-	19	-	16	-	14	10
CRJ	Operation angle	35	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MRHQ	Operation angle	-	-	-	-	15	-	-	15	15	15	-	-	-	-	-	-	-	-	-

Note1) It is not for guarantee but measure including hysteresis. (Dispersion is approx.  $\pm 30\%$ )  
It might be changed drastically depending on the ambient.

Unit : Histeresis[mm]

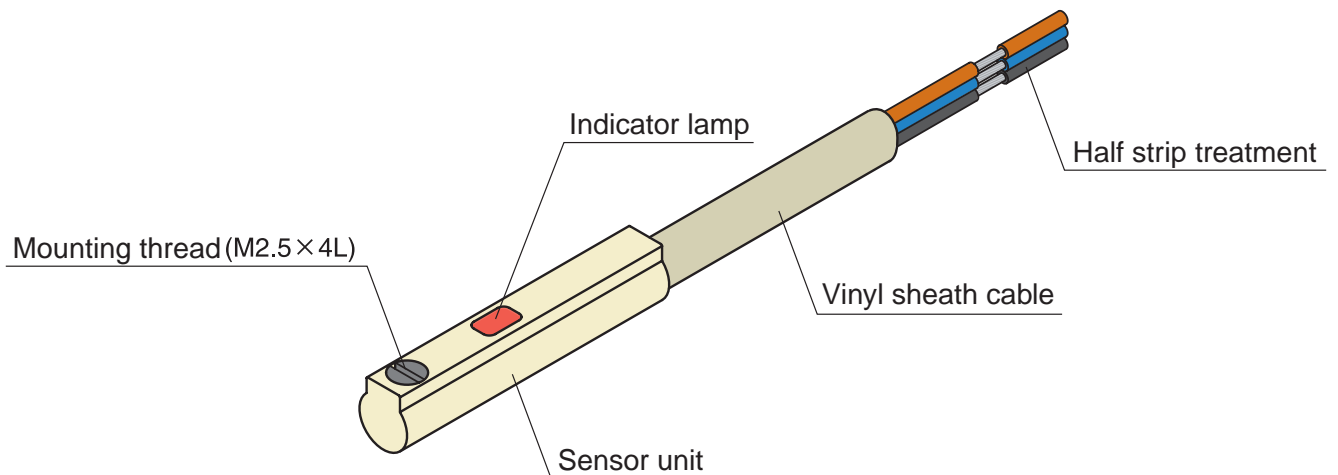
Series	Section	Bore diameter																
		6	8	10	12	15	16	20	25	30	32	40	50	63	70	80	100	200
MHZ2	Histeresis	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MHZL2	Histeresis	-	-	0.5	-	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-
MHZJ2	Histeresis	0.5	-	0.5	-	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-
MHQ2	Histeresis	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MHQJ2	Histeresis	-	-	0.5	-	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-
MHR2	Histeresis	-	-	1	-	1	-	1	-	1	-	-	-	-	-	-	-	-
MHR3	Histeresis	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
MHK2	Histeresis	-	-	-	0.5	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-
MHS2	Histeresis	-	-	-	-	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-
MHS3	Histeresis	-	-	-	-	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-
MHSJ3	Histeresis	-	-	-	-	-	0.5	0.5	0.5	-	1	1	1	1	-	1	-	-
MHSH3	Histeresis	-	-	-	-	-	0.5	0.5	0.5	-	1	1	1	1	-	1	-	-
MHSL3	Histeresis	-	-	-	-	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-
MHS4	Histeresis	-	-	-	-	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-
MHT2	Histeresis	-	-	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-
MHY2	Histeresis	-	-	1	-	-	1	1	1	-	-	-	-	-	-	-	-	-
MHC2	Histeresis	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note1) It is not for guarantee but measure including hysteresis. (Dispersion is approx.  $\pm 30\%$ )  
It might be changed drastically depending on the ambient.

Note2) Please contact SMC sales division regarding another models.

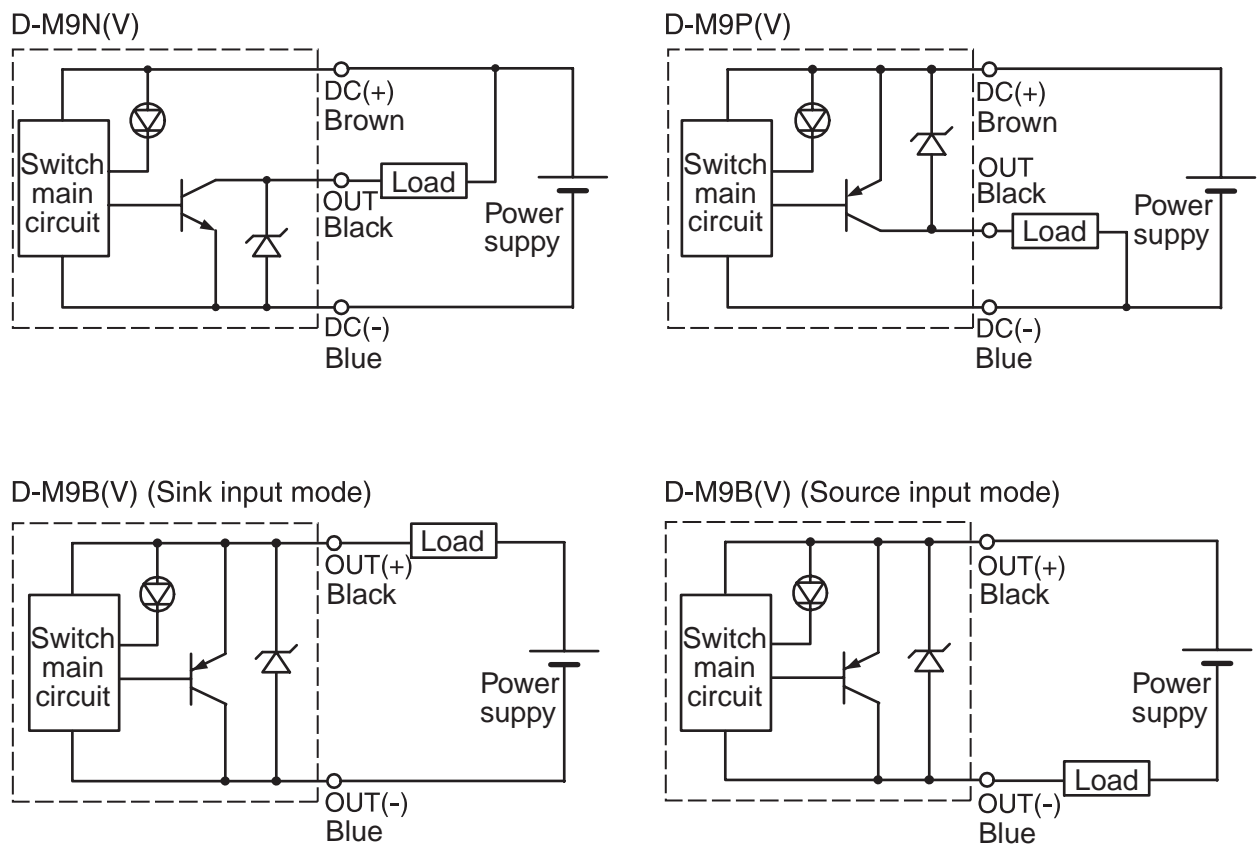


### 3.Names and Functions of Individual Parts



### 4.Internal Circuit and Setting

#### 4 - 1 Circuit diagram



## 4 - 2 Mounting method

When mounting auto-switch to actuator it should be done with clamp for actuator.

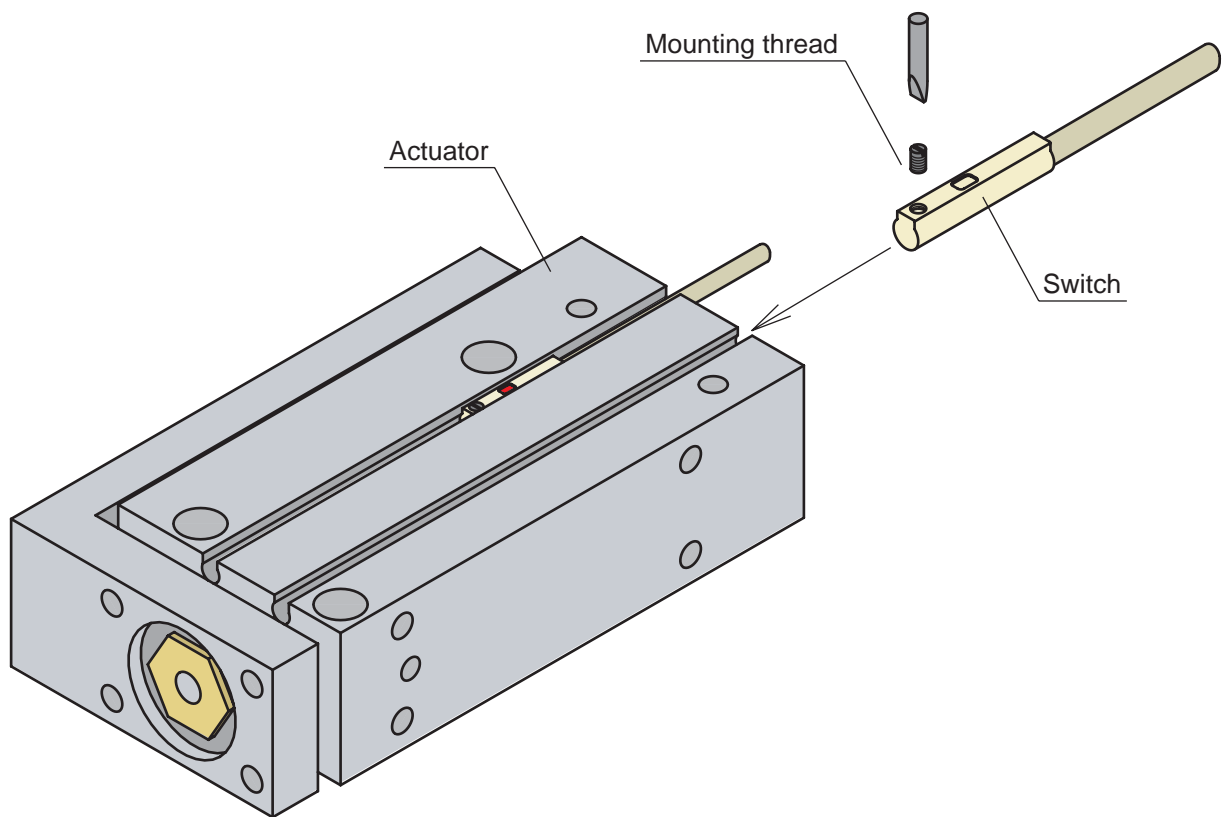
“How to mount” depends on actuator type and tube I.D. Please refer the actuator catalogue.

When auto-switch is mounted newly, please prepare the clamp for actuator after confirms that the actuator built in magnet.

- Proper tightening torque

Use a watchmaker driver whose grip dia, is 5 to 6mm when tightening the mounting screw.

M2.5 mount biss tightening torque shall be 0.1 to 0.2N • m (1.0 to 2.0kgf • cm)



- Setting the detecting position

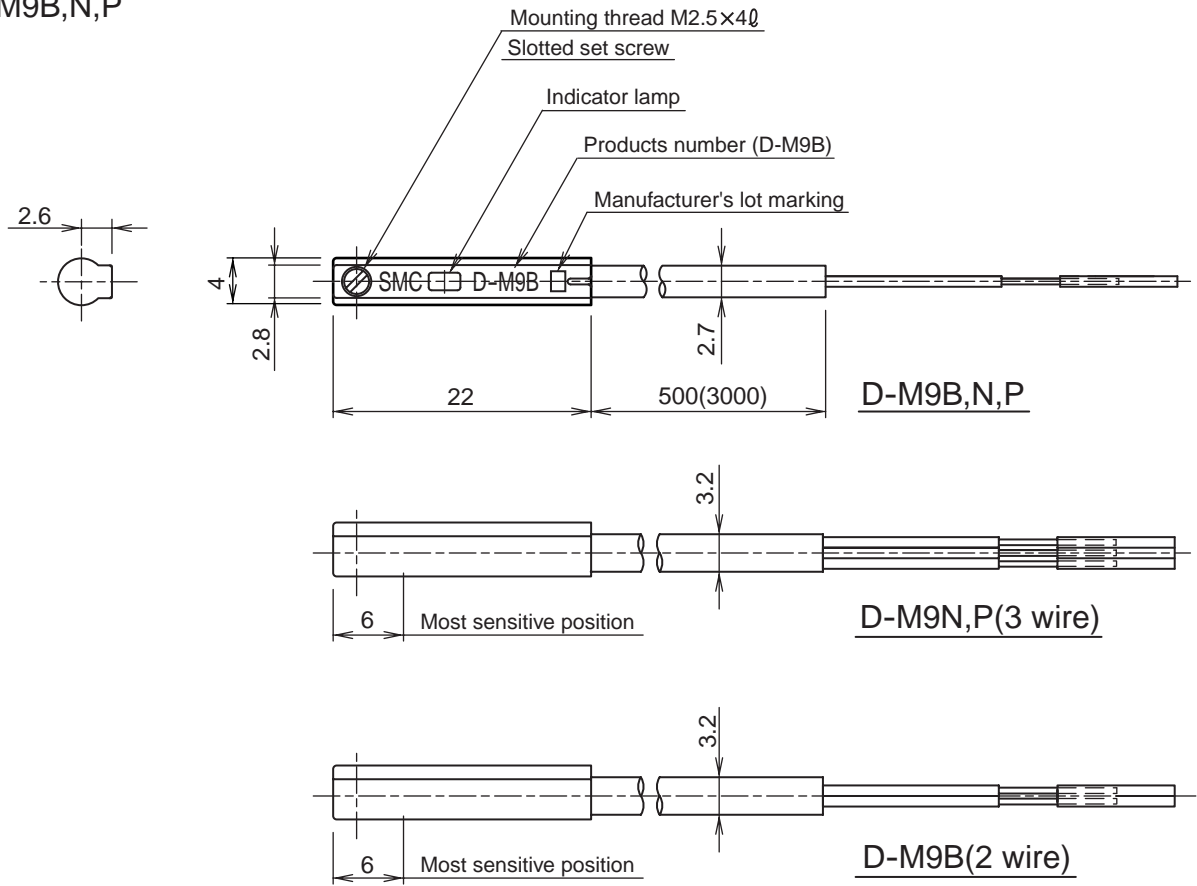
Set the actuator at the stroke end. Set the switch in the area to where the auto switch red lamp light.

(Detecting actuator end)

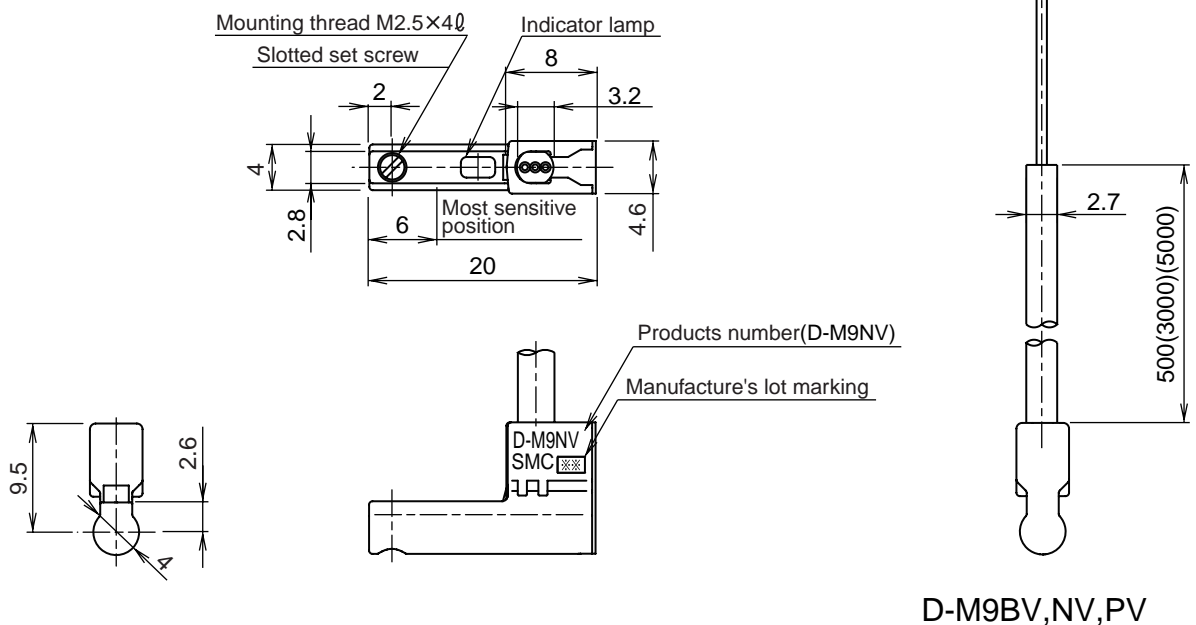
Based on A and B dimensions in the actuator catalogue, set the switch.

## 5.Full View with Dimensions

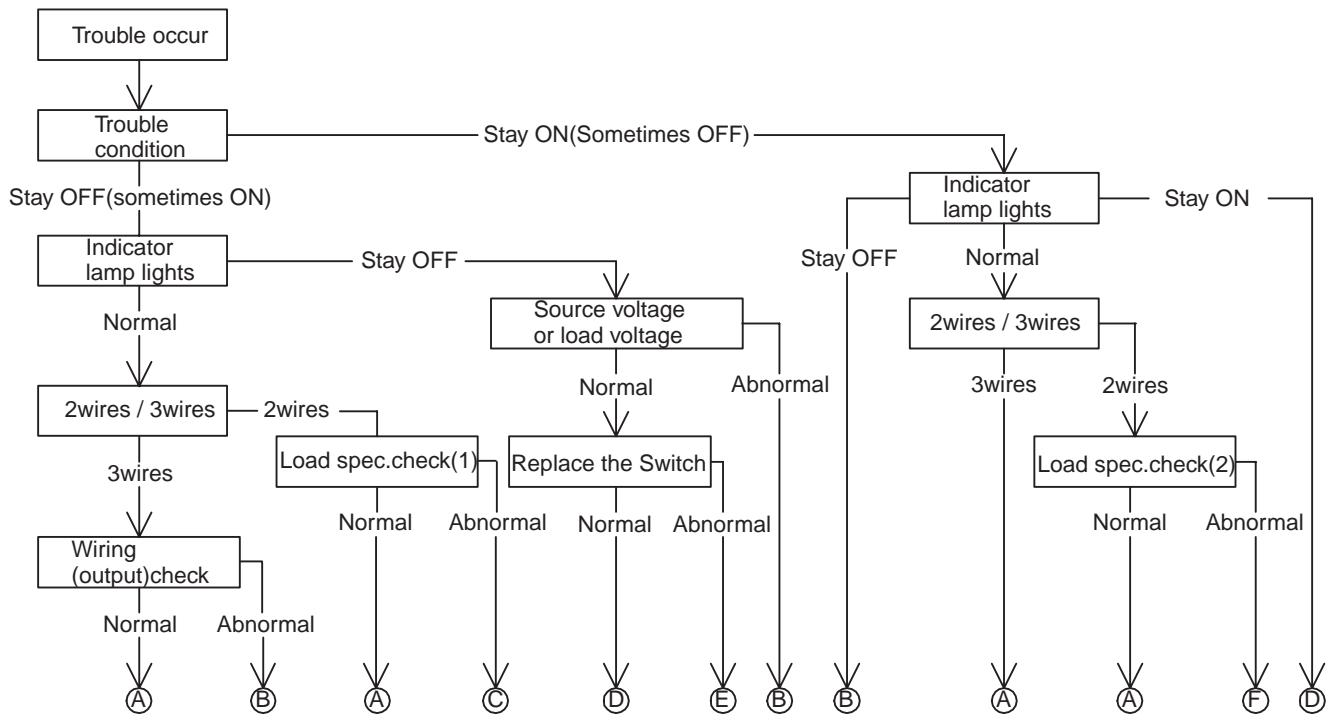
### ○ D-M9B,N,P



### ○ D-M9BV,NV,PV



## 6. Trouble shooting



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 in adequate (No magnet)
- (F) --- Replace PLC input board or replace switch 2 wires --> 3 wires