Positioning Switch - Contact Type

Overview

Do not use this product as a detection device for human body protection.
(For human body protection, use products compliant with the local laws and regulations such as OSHA, ANSI and IEC.)

Switch Type		Signal Point Repeatability *1	Contact Point Accuracy Life *2	Operating Temp. Range	Page
Compact		0.003mm	3,000,000 times	*3 0~80°C	P2097
High Precision		0.0005mm			P2098
Standard		0.005mm	10,000,000 times		P2099~P2102
With Stopper		0.01mm (except Flat Type)	10,000,000 times		P2103~P2106
Plunger					P2108
Heat Resistant		At Ambient Temperature 0.01mm	500,000 times	0~200°C	P2107

*1 Operating Speed 50 ~ 200mm/min.
*2 When used at rated voltage and rated current without failure of switch caused by vibration.
*3 The encapsulated structure of the IP67 Type may cause delay in returning under low temperatures (5°C or less).

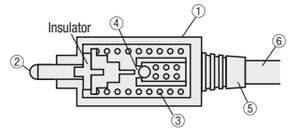
■Feafures

Contacting switch that can detect position highly accurately without being affected by materials, shapes, magnetism, luminosity of the detected objects.

■Basic Structure

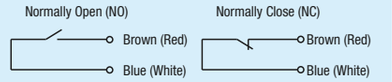
Designed to open/close with high repeatability in sync. with the contact point.

①Switch Enclosure
②Contact Part
③Spring
④Switch Contact
⑤Cord Protector
⑥Cable

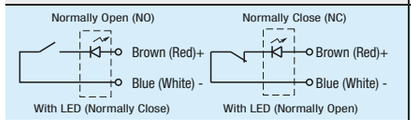


■Schematics

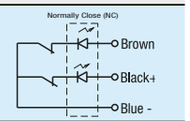
All Types



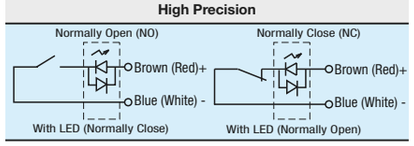
Common to all LED types



Common to all types



High Precision



■Mechanical Specifications

Vibration	10 ~ 55Hz, Full Wave Amplitude 1.5mm in Respective X, Y, Z Direction
Impact	300m/s² in Respective X, Y, Z Direction
Allowable Operating Speed	10mm~5m/min.
Cable Tensile Strength	30N or less
Cable Min. Bending Radius	R7mm

■Electrical Specifications

Contact Rating	DC5 ~ 24V 20mA (MAX) Resistive Load (10mA with LED)
Dielectric Strength	100MΩ or more DC250V Megohm-meter
Withstand Voltage	AC500V 50/60Hz, 1 min. between each Terminal and Case

Use within the contact ratings. Using at over contact ratings may cause failures.

■Others

These switches are designed for low voltage and low current, and are not applicable to Export Trade Control Ordinance, CE Marking and China Compulsory Certification.

■Hazards and Warnings

1. Accident may occur with circuit damages due to abnormal generation of heat, smoke and fire in the following conditions.
   a. When switch ratings, cycle life, environment conditions and others exceed the operating range
   b. When electric wire and connectors are used over the allowable operating current capacity
   c. When cables are exposed near to the heat generating objects
2. Safety measures such as redundant circuits are necessary to avoid a serious accidents resulting in injury or death or further damage caused by the failures in operation.
3. When signal output failure may cause the damage of equipment or machine, install an emergency stop.

■Design Precautions

• Protection Structure

・Note that sealing ability may be affected by operational conditions or environment, such as cutting oil, chemicals, or existence of dust. Select machine types referring to the IP codes.
・Do not use the switches with exposed rubber boots under the environment where metal chips may fall on products, as rubber boots will be damaged.

• Contact Angle

・Contacting angle of the switch to objects should be within ±3° (±1° for Deceleration Signal Type). (Excluding: Wide Contact Angle Type, Ball Contact Type, Ball Plunger Type). (Fig. 1)

• Stroke

・Detected subjects should not collide with the switch housing (except switches with stoppers). Install a stopper if the risk of collision exists. (Fig. 2)
(Please confirm the impact resistance of switches with stopper, referring to each catalog page.)

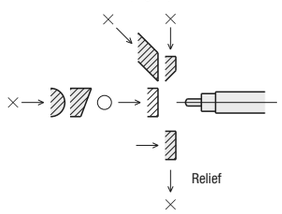
• Contact Speed

・Do not use at low speed contact (10mm/min. or less). That will cause prolonged operational instability and resultant deterioration of the switch contacts.

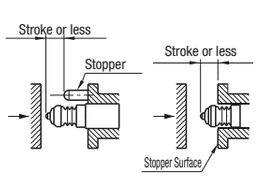
• Effects of Micro-Vibration

・Do not use the switch in an environment where chattering arises from micro-vibrations.

(Fig. 1)



(Fig. 2)



■Installation Precautions

• Cable Damages

・Excessive force on cable inlet and sensor body may cause wire breakage. Do not pull or twist the loose wires with 15N or more. Also do not pull or twist the cab tire cords with 30N or more.
・Bending radius is to be R7 or more.
・When clamping the cable to stop from moving around, ensure to avoid excessive force on cable inlet and sensor body. When clamping cables in a bundle, take special care not to apply excessive force on switches.

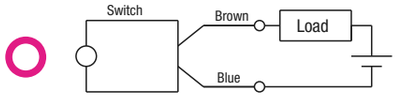
•Clamping of Knurled Head

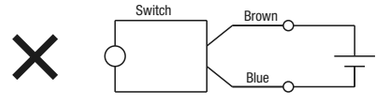
・Clamping with tools, such as long nose pliers, may cause damages. Tighten firmly with fingers.

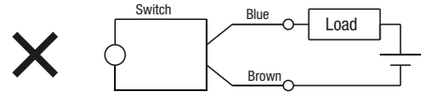
■Precautions on Electrical Wiring

• Connecting to Power

・Direct connection to the power will damage the switch and the internal element.
・Install correctly noting the polarity.



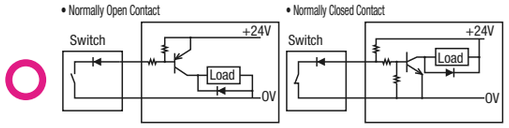




• Connection with Inductive Load

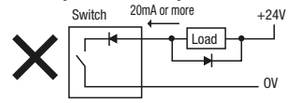
・Direct connection to an inductive load will damage the switch.
・If the switch is to be connected to an inductive load, include a drive circuit for the load.

Good Example



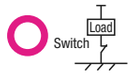
Bad Example

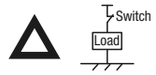
Connecting as shown will damage the switch.



• Grounding

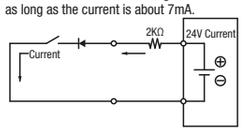
・When grounded the machine's DC power 0V, ensure to connect the switch on the GND side. (If the switch is connected on (+) side, the switch may be damaged at the moment the (–) side of switch touches the body.)





• About Wiring of Switch with LED

・To prevent damage to the LED due to unexpected over current, insert a current limiting resistor.
・For load within the switch rating or installation onto a PLC, current limiting resistors are not necessary as long as the current is about 7mA.



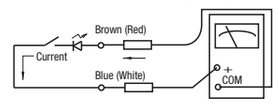
・The type with LED has polarity. The brown cable is positive (+), while the blue one is negative (-). Install correctly.

• Wiring

1. Use within the contact ratings.
2. Do not pull or twist the cable and conductor wire with excessive force. Bending radius is to be R7 or more.
3. When the machine is grounded, connect the switch to the grounded side.
4. Noises and surges may induce the over rated current and damage the switch contact. Switch wiring should be located away from power sources or noise sources.
5. When the cord is extended, use cabtyre cable with sectional areas of 0.3mm² or more.
6. When the switch drives the relay etc., use the coil current of around 10mA.

■Confirmation of Switch Action

• Correct Circuit Check Method Using Analog Multimeter



LED lights when the contact is closed.

Analog Multimeter: Confirm in Ohms Range x10

⚠Measurement of Contact Resistance Using Digital Multimeter.

Switches with LEDs cannot be measured correctly in ohms range.

Only when there is a voltage output terminal, LED ON state can be confirmed.

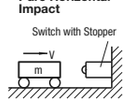
■Calculation of Impact Energy

Please confirm the impact resistance of switches with stoppers, referring to each catalog page.

E=1/2mv²
E: Energy J
m: Mass kg
v: Velocity m/s

E=mgh
E: Energy J
g: Gravitational Acceleration 9.8m/s²
h: Drop Height m

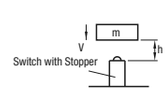
Pure Horizontal Impact



Calculation Example

m	v	1/2mv²[J]
4	0.3	0.18
5	0.4	0.4
20	0.2	0.4

Vertical Free Fall



m	h	v=√2gh	mgh[J]
0.4	0.05	1	0.2
0.4	0.1	1.4	0.4