CS-Touch Switch

https://metrol-sensor.com/products/positioning-switch-cs/

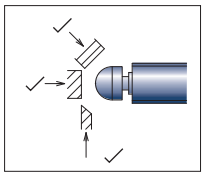
CSH

1-signal plunger type
Sliding and angled touch type (Linear bushing bearing)

《Features》

■A linear bushing bearing makes it optimum for sliding and angled touch contacts.

《Application》



■Standard specification (Standard product No. is marked in light blue)

Standard product No.*1	Output mode	Standard product No. with LED*2
CSH121A-A	NO	CSH121A-AL
CSH121B-A	NC	CSH121B-AL

*1 **-A**: ø10 hemisphere SUS, Hardened HRC45-50
*2 **-L**: LED indicator (approx. 120 mm from the switch)

■Common specification

Contact structure	Dry contact
Movement differential	0
Output mode	NO/NC
Repeatability of operating point*3	5 µm (Both ON→OFF and OFF→ON, axial direction)
Pretravel	Approx. 0.3 mm
Stroke	2.8 mm
Protective structure	IP65
Contact force	1.5 N (axial direction)
Plunger shaft	No rotation stopper
Case material	SUS303
Cable (Refer to P6-5)	Length 2 m, oil resistant, 2 cores, ø4, tensile strength 30 N, bending radius R7, AWG26 equivalent
Operating temperature range	0°C-80°C (no condensation)
Temperature drift*4	0
Vibration	2 hours, 10-55 Hz, total amplitude 1.5 for X, Y, Z each direction
Impact	3 times, 300 m/s^2 for X, Y, Z each direction
Contact rating*4 (Refer to P14-3)	Power supply voltage: DC 5 V-DC 24 V Steady current: 10 mA (max) Inrush current: 20 mA (max)
Standard accessory	2 fixing nuts for threaded type

*2 At operating speed 50-200 mm/min (operating speed slower than 10 mm/min is not recommended).
*3 No temperature drift caused by electronic components because there is no amplifier.
*4 When using the switches with LED, limit the current below 10 mA.

◎The following options are available.

- Transistor output (Refer to P6-3)
  - · Reverse connect protection
  - · Level conversion
  - · Output current is increased to 100 mA
- Shape of contacting part
- LED indicator
- Contact force
- Cable options

■Circuit diagram

Without LED	With LED
NO (Normally open) Brown Blue	NO (Normally open) Brown + Blue - LED normally Off
NC (Normally closed) Brown Blue	NC (Normally closed) Brown + Blue - LED normally On

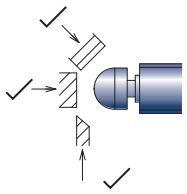
*Electrical specification / circuit diagram (Refer to P6-2)
***When using the switches with LED, limit the current below 10 mA.**
(Refer to P14-3 "Confirmation of switch operation")

■How to use

Suitable for sliding / angled touch.

Action is limited between the contacting part and the edge of the linear bushing case. The end face may deform when the detector is hit, causing the failure in the return.

When sliding, be sure that rotational torque is not applied to the plunger shaft.



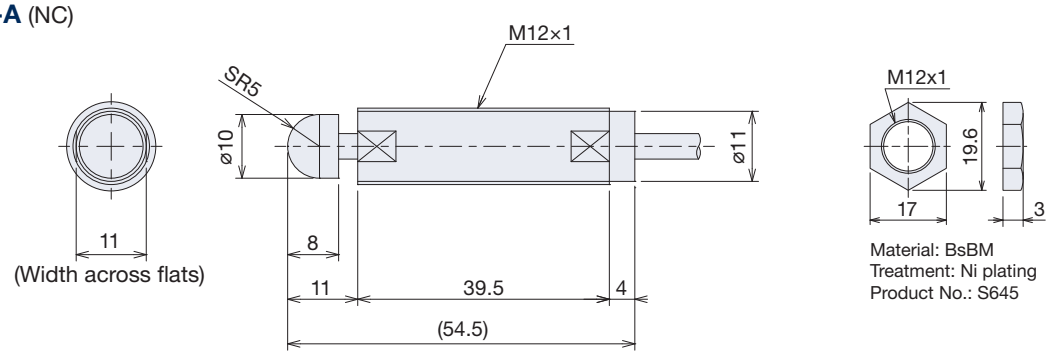
CSH 1-signal plunger type, sliding and angled touch type (linear bushing bearing)

Outer dimension

Unit: mm

ø10 hemisphere SUS, Hardened HRC45-50 (**-A**)

CSH121A-A (NO)
CSH121B-A (NC)



Material: BsBM
Treatment: Ni plating
Product No.: S645

Option product No. (Refer to the outer dimension below)

Product No. example 1: **CSH121A-A L** (❶ ❸ ❹) Product No. example 2: **CSH121A TNA-A** (❶ ❷ ❸)

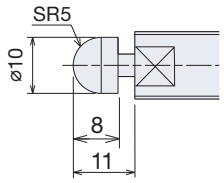
❶ Standard product No.	❷ Transistor output*		❸ Shape of contacting part		❹ LED indicator		❺ Contact force	
CSH121A	**Blank**	Not required	**A**	ø10 hemisphere SUS, Hardened steel	**Blank**	Not required	**Blank**	1.5 N
	TNA	NPN-NO						
	TNB	NPN-NC						
CSH121B	**TPA**	PNP-NO	**AP**	ø10 hemisphere, Plastic	**L**	Approx. 120 mm from the cable end	**J**	0.8 N The rubber scraper is not provided, IP40
	TPB	PNP-NC						

*Refer to P6-3

Outer dimension (Refer to ❸❹ in the above option product No.)

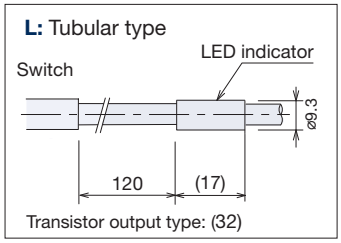
❸ Shape of contacting part

A: SUS, Hardened HRC45-50
AP: Plastic



❹ LED indicator

L: Tubular type



Specification of option

(Refer to ❸❺ in the above option product No.)

❸ Shape of contacting part

Mark	Shape	Shape of detected objects
A	ø10 hemisphere SUS, Hardened steel	Flat (Sliding, rotating objects)
AP	ø10 hemisphere, Plastic	

❺ Contact force

Mark	Contact force (N)	Operating condition
J	0.8	The rubber scraper is not provided, IP40

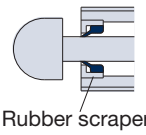
*Refer to P5-2 for low contact force type (0.1 N).

Tightening torque for case screws and nuts

Series	Screw / Nut (mm)	Tightening torque (N·m)	Applicable models
CS-Touch Switch	M12×1	12	**CSH**

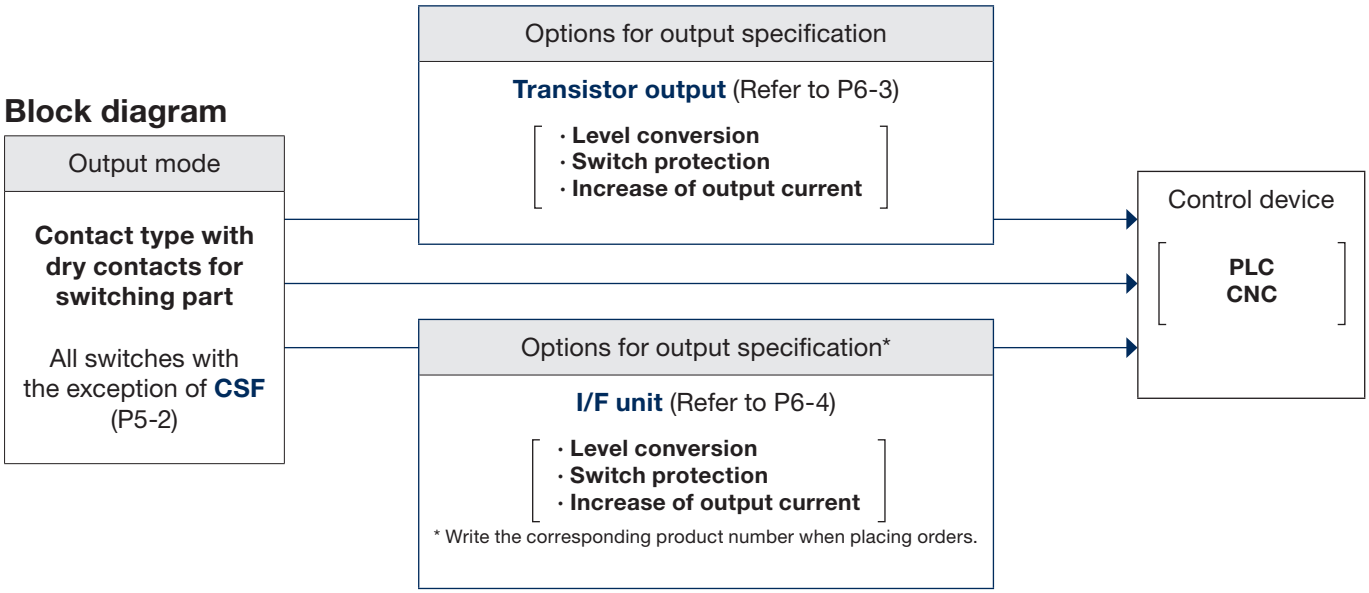
Protective structure

Rubber scraper is applied to the plunger. When the lip of the scraper is damaged by cuttings, the water resistance becomes impaired.



■Contact type with dry contacts for switching part

Block diagram



Specification

Contact rating	Power supply voltage: DC 5 V-DC 24 V Steady current: 10 mA (max) Inrush current: 20 mA (max) (DC1 V-24 V possible for switch without LED)
Insulation resistance	More than 100 MΩ with DC250 V Megger
Output mode	NO (Normally open) or NC (Normally closed)

Refer to P14-3 about how to use switches under the condition of AC100 V-200 V.

Precautions for connection

Limit the current below 20 mA when I/F unit is not used.

Circuit diagram

High-precision MT-Touch Switch 1 signal type

Without LED	With LED
NO (Normally open) Brown Blue	NO (Normally open) Brown + Blue - LED normally Off
NC (Normally closed) Brown Blue	NC (Normally closed) Brown + Blue - LED normally On

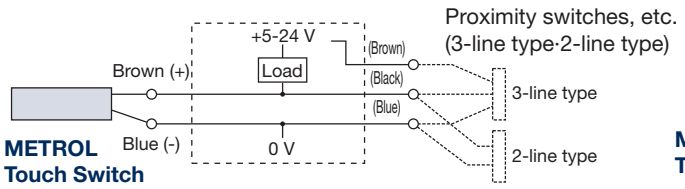
CS-Touch Switch and others (Other than High-precision MT-Touch Switch 1-signal types)

Without LED	With LED
NO (Normally open) Brown Blue	NO (Normally open) Brown + Blue - LED normally Off
NC (Normally closed) Brown Blue	NC (Normally closed) Brown + Blue - LED normally On

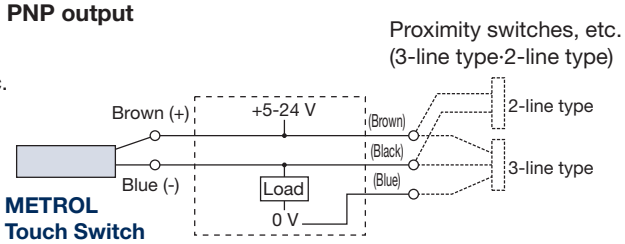
· When using the switches with LED, limit the LED forward current below 10 mA. (Refer to P14-3 "Confirmation of switch operation")

■How to replace currently used proximity switches (3-line and 2-line type) with METROL (2-line type)

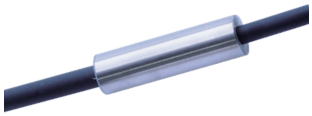
NPN output



PNP output



Transistor output



Transistor output specification

Transistor output type*	Output mode
TNA	NPN-NO
TNB	NPN-NC
TPA	PNP-NO
TPB	PNP-NC

Product No. example: P085DB TNA

* Added to the applicable product No. of touch switch

Specification

Power supply voltage	DC 12 V-DC 24 V
Consumption current	10 mA (max)
Output rating	DC 12 V-DC 24 V 100 mA (max) resistive load
Output mode	NO (Normally open) /NC (Normally closed)
Output	NPN open collector or PNP open collector
Remaining voltage	1 V (max) *At 50 mA
Leakage current	0.8 mA (max)
Insulation resistance	More than 100 MΩ with DC250 V Megger
Protection circuit	Reversed power connection protection, output line short circuit protection

Features

1) Increase the output current to 100 mA (Resistive load)

Enable to drive a relay (max 100 mA) or similar devices directly. *

* When driving a relay by this unit, the repeatability would be lowered due to delay of the relay.

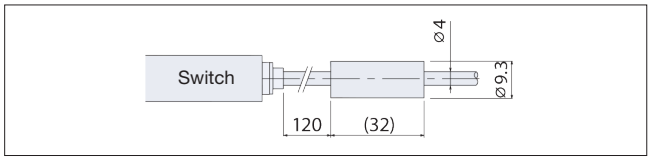
2) Protection circuit in case of reverse connection

No breakdown even when the switch is connected wrongly (between + and - terminals).

3) Level conversion unit

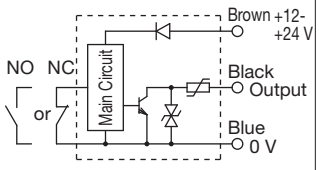
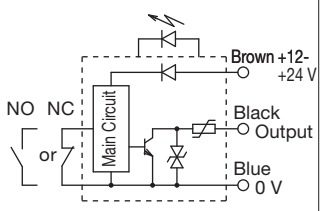
Level conversion (normally open to normally closed, normally closed to normally open)

Outer dimension

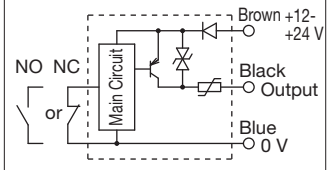
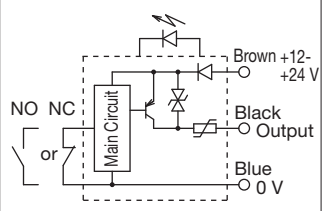


Circuit diagram

NPN Open collector

Without LED	With LED
	

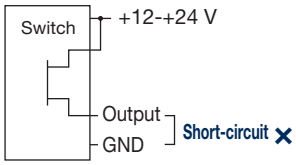
PNP Open collector

Without LED	With LED
	

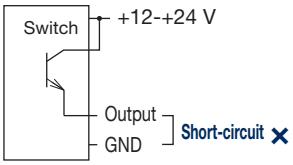
Precautions for switch connection

Always make sure to turn off the power before installing or removing switches. This is to prevent damage to the device caused by improper wiring or short-circuits of output lines.

●Photo MOS Output Type

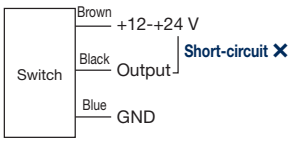


●NPN Transistor Output Type

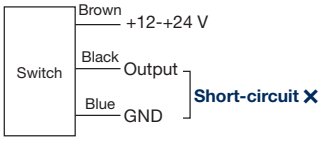


Improper Connections

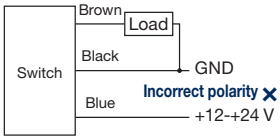
NPN Output Switches



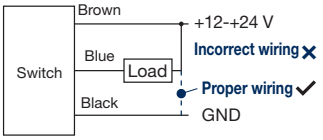
PNP Output Switches



NPN Output Switches

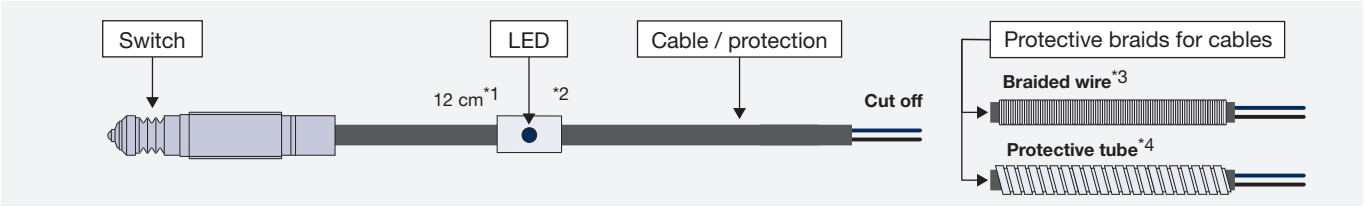


PNP Output Switches



Cable option format

The following cable related options are available.



*1 Cable protection cannot be fitted to the 12 cm section.
*2 Cable protection cannot be fixed on the LED side.
*3 Refer to the diagram below.
*4 Not applicable to cables having a diameter smaller than ø5, referring to the diagram below (except for cartridge type)

Type of cable

Cabtyre cable (except for heat resistance cable)

Cabtyre cables are used as robot cables without any safety compromise since the working voltage and current are low, though cabtyre cables are not applicable to UL, CSA, EN or other safety standards.

Specification

Conductor material	Copper alloy
Conductor resistance	0.4 Ω/m or less (per 1 core)
Sheath material	Vinyl chloride (heat resistance, oil resistance)
Minimum bending radius	7 mm
Sheath color*	**Black:** 2-core for B: NC (Normally closed) 3-core for transistor output, CSF **Gray:** 2-core for A: NO (Normally open)

* Excludes High-Precision MT-Touch Switch series and Air Gap Sensor series

Cable size / mass (Including sheath / 1 m)

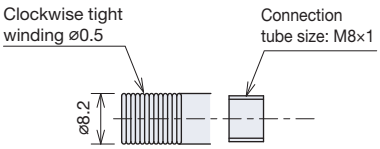
Outer diameter (mm)	Core number	Size	Mass (g)
ø2.8	2	AWG 26 (0.15 mm²)	10
ø4	2		18
ø4	3		19
ø5	2		27
ø5	4		29
ø5.5	16	AWG 28 (0.08 mm²)	36

Protective braids for cables

(Refer to P14-5 Protective structure)

Braided wire

Material: Steel wire, Clockwise tight winding
Minimum bending radius: 7 mm
Mark: **W**

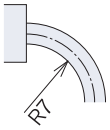


Precautions

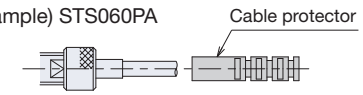
1) Switch side is fastened with screws and machine side is simply cut. When extension is needed, use threaded connection tube.
2) Since gaps are formed at bend section (especially at the attachment end) of the braided wire, make sure the intrusion of cuttings does not damage the cable.
3) Be careful not to damage the cable sheath as a result of crushing it during clamping.
4) When binding it up and clamping with other cables, make sure not to apply excessive force to the attachment end.
5) Fabricate the braided wire a little shorter than the cable length, since it extends with its own weight.

Precautions:

1) Do not subject cable sheath or core wire cable to excessive pulling or twisting of 30 N (3 kgf) or more.
2) Precautions for waterproofing (Refer to P14-5 Protective structure)
3) When extending cable length, use the cabtyre cable with the cross-sectional area of 0.2 mm² or more.
4) The minimum bending radius is R7.
5) The cable protector is detachable.



Disassembly Drawing
Example) STS060PA



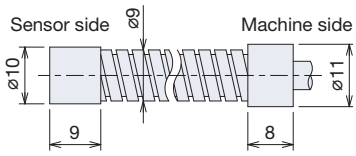
Core-wire cable

Specification

Series	Outer diameter (mm)	Core number	Size	Tensile strength (N)
PT-Touch Switch Core-wire cable type	ø0.54	2	AWG 30 (0.035 mm²)	15
CS-Touch Switch CSM core-wire type				
Mini Stopper Switch STM short type				
Ball Plunger Switch BP4S/BP5M	ø0.66		AWG 27 (0.079 mm²)	
High-vacuum resistance Switch GN series / PT-Touch Switch				

Protective tube (flexible braid)

Used mainly in machining environment (Protection for cuttings). Suitable for preventing damages to cables caused by heavy load falling on.
Not applicable to cables having a diameter smaller than ø5.
Dimension: outer diameter ø9
Minimum bending radius: 25 mm
Mark: **P**



Precautions

1) Switch side is screwed in and metal ring is attached to machine side.
2) Because protective tube is not flexible, clamp it to fix so as not to apply excessive force to the cable end or switch.
3) When binding it up and clamping with other cables, make sure not to apply excessive force to the attachment end.
4) The cable doesn't have water-resistant feature.

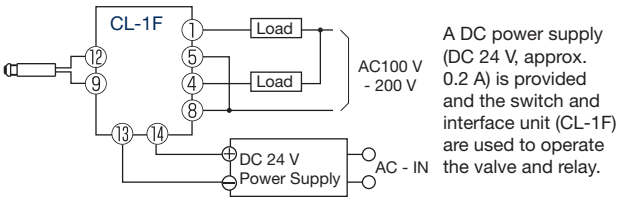
■Conditions of use

Use under the specified contact rating in the case of contact types, and use under the specified output rating in the case of non-contact type.

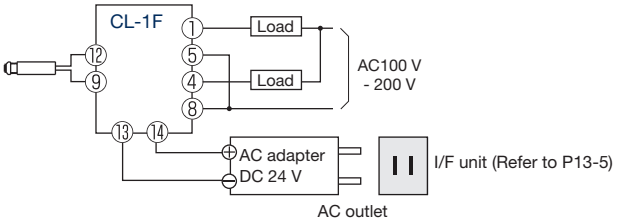
1. Use with AC 100 V-200 V

· These switches cannot be directly controlled with AC 100 V-200 V.

· Please refer to the diagrams below in the case of desiring to operate a solenoid valve or AC 100 V-200 V relay with the switch signal in the absence of a DC power supply within the device.



A DC power supply (DC 24 V, approx. 0.2 A) is provided and the switch and interface unit (CL-1F) are used to operate the valve and relay.



I/F unit (Refer to P13-5)

2. Use with micro load

· Use the switch within the range of DC 24 V, 0.2 mA - 10 mA (max.)

3. Effect on accuracy due to electrical delay

· If there is a difference in the sampling times of the sensor signal and positioning data, large variations occur in repeatability when the measuring speed is increased.

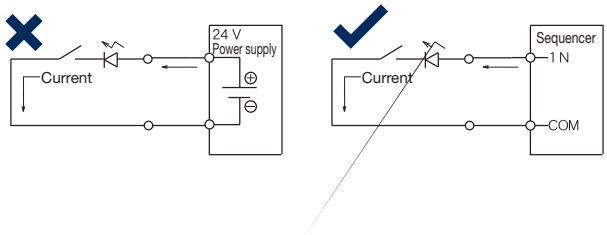
4. Connecting to a load

· Do not attempt to drive an inductive load directly with these switches. Direct driving can damage the switching parts and semiconductors of the internal circuitry.

· In case of driving an inductive load, connect a surge absorber in parallel with the load, and connect an external load such as a relay or transistor allowing an adequate flow of current for load driving.

5. In the case of using a switch with LED

· The LED can be damaged if the sensor is connected directly to the power supply (DC 24 V).
In case of using a sequencer, a resistor is not required if the outflow current of the sequencer is about 7 mA.



■Confirmation of Switch Operation

1. Dry contact type

Connect the sensor in the manner shown in the diagram below.

· Limit the LED forward current to about 10 mA by inserting a resistor.

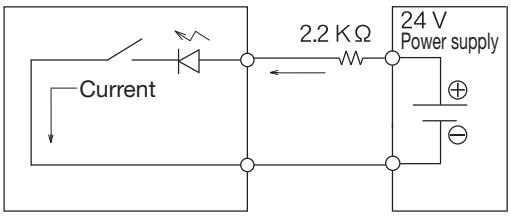
· Resistance value = (power supply voltage - LED forward voltage) ÷ current = (24-2) ÷ 0.01=2 KΩ The LED forward voltage is about 2 V.

· The resistor may be installed on the DC 24 V or 0 V side.

· If the contact is closed and LED glows, the switch operation is normal.

· In case of using a sequencer, a resistor is not required if the outflow current of the sequencer is about 7 mA.

· Operation might not be properly confirmed using a digital tester (multi-meter).



2. Non-contact type

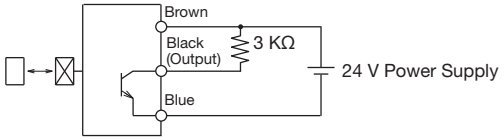
Connect the sensor in the manner shown in the diagram below.

· Please note that output circuit will be damaged by over current, when switch output of NPN output type is directly connected to +24 V. Please insert a resistor with resistance around 3 kΩ or more so that a current of about 10 mA will flow between +24 V and output in the output circuit.

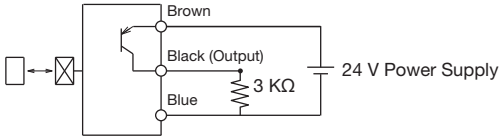
· Please note that output circuit will be damaged by over current, when switch output of PNP output type is directly connected to 0 V. Please insert a resistor with resistance around 3 kΩ or more so that a current of about 10 mA will flow between 0 V and output in the output circuit.

· In case of using a sequencer, a resistor is not required if the outflow current of the sequencer is about 7 mA.

NPN Output Type



PNP Output Type



3. Confirming operation by using resistance

· Set the tester to a resistance range of X10, and connect the minus lead of the tester to the switch output (brown), and connect the plus lead of the tester to the switch 0 V (blue).

· The deflection of the tester needle indicates around 0 Ω when the switch tip is pushed in and roughly infinity (∞) when switch tip is returned.

· For switches with LED, note that the tester may not swing.

4. Confirming operation by using voltage

· Set the tester to a voltage range of 50 V and measure the voltage between the switch output (black) and 0 V (blue).

· For NPN output type, when the tip of the switch is pressed, the indicator of the tester changes from 24 V down close to 0 V.

· For PNP output type, when the tip of the switch is pressed, the indicator of the tester changes from 0 V up close to 24 V.