CKD

Cylinder Switch

SW-T Series (2-color display)

INSTRUCTION MANUAL

SM-A17189-A/2

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's for purchasing our cylinder switch **"SW-T Series (2-color display)"**.
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product is intended for users who have basic knowledge about materials, piping, electricity, and mechanisms of pneumatic components. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

Because some series of this product include products subject to the Export Trade Control Order, when exporting products or equipment that includes these products, comply with applicable laws and regulations. Refer to the catalog to see if it is a target product.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To do this, confirm that the safety of the mechanism of the device, each fluid control circuit, and the system that controls these components electrically is secured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

JIS B 8370

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ DANGER	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ WARNING	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ CAUTION	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Do not handle the product or remove pipes and devices until confirming safety.

- Inspect and service the machine and devices after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

⚠ CAUTION

Thoroughly check before use.

・The cylinder may operate unexpectedly depending on the cylinder switch mounting position and wiring.

Always turn the power OFF before carrying out wiring. The charged part is not touched with wet hands.

・There is a risk of electric shock by touching the electrical wiring connections (bare, live parts).

Precautions on Product Disposal

⚠CAUTION

When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

CONTENTS

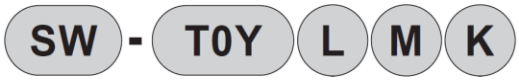
1. PRODUCT OVERVIEW

1.1 Model Number Indication

1.1.1 Product model No.

■ **Example of model No.**

[Reed]



(A) (B) (C) (D)

(A) Model No.		(B) Type of lead wire		(C) Lead wire length, connector specifications		(D). Options	
T0Y	Reed 2-wire	Blank	Oil resistant vinyl cabtyre cable	Blank	Lead wire 1 m	Blank	No option
		L	UL electric wire	3	Lead wire 3 m	K	With cover for anti-spatter adherence
		T	Spatter-resistant wire	5	Lead wire 5 m		
				B	M12 connector (4PIN specifications) 3-4 PIN no polarity		
				M	M12 connector (4PIN specifications) 1-4 PIN no polarity		
				F *1	M8 connector (3-pin specification) 1-4 pin no polarity		

*1: Only lead wire "L" is available for connector specification "F".

[Proximity]

(A) (B) (C) (D) (E) (F)

(A) Model No.	
SW-T	T type cylinder switch

(B) Contact/lead wire		(C) shape shape	(D) switch specification		(E) 2 Lead wire outlet direction		(F) Lead wire length, connector specifications	
2	Proximity 2-wire	Y	Blank	Standard	H	Straight	Blank	1m
3	Proximity 3-wire	W	L *2	Water registant	V	L-shaped	3	3m
							5	5m
							W	M8 connector (4-pin specification) 1-pin(+),4-pin(-)

*2: Only SW-T2W can be selected for the water resistant product "L", and only SW-T2WL can be selected for the connector specification "W".

1.2 Product

1.2.1 Applications

Model No. / Item				Purpose/application
Reed	2-wire	2-color display	T0Y	Dedicated for DC programmable controller
			T0YL	
			T0YT	
Proximity	2-wire	2-color display	T2YH	Dedicated for DC programmable controller
			T2YV	
			T2W(L)H	Dedicated for DC programmable controller
			T2W(L)V	
	3-wire		T3YH	For DC programmable controller, relay
			T3YV	
			T3WH	For DC programmable controller, relay
			T3WV	

(Note) Indicates T※H ... Axial lead wire and T※V ... Radial lead wire.

1.3 Specifications

1.3.1 Specifications

Item \ Type/model No.	Reed switch		
	T0Y	T0YL	T0YT
Applications	Dedicated for programmable controller		
Switch polarity	No polarity		
Load voltage	24 VDC ±10%		
Load current	5~20mA (*1)		
Internal voltage drop	4.5 V or less		
Display lamp	Red/green LED (Lit when ON)		
Leakage current	0.5 mA or less		
Lead wire length (*2)	1 m, oil resistant vinyl cabtyre cable 2-conductor 0.2mm^2	1 m, flame-resistant cabtyre cable 2-conductor 0.2mm2, UL acquired wire	1 m, flame-resistant vinyl cabtyre cable 2-conductor 0.2mm^2
Shock resistance	294 m/s^2		
Insulation resistance	20MΩ and over at DC500V megger		
Withstand voltage	No failure after 1000 minute of 1 VAC application.		
Ambient temperature	-10 to +60°C		
Degree of protection	IEC standards IP67, JIS C0920 (water-tight)		
Contact protection circuit	None		

Item \ Type/model No.	Proximity switch				
	T2YH/V	T2WH/V	T2WLH/V	T3YH/V	T3WH/V
Applications	Dedicated for programmable controller			Programmable controller, relay	Programmable controller, relay
Output method	—			NPN output	
Power supply voltage	—			DC10~28V	
Load voltage	DC10~30V	24 VDC ±10%		30 VDC or less	
Load current	5~20mA (*1)			50 mA or less	
Current consumption	—			24 mA or less with 10 VDC	
Internal voltage drop	4 V or less			0.5 V or less	
Display lamp	Red/green LED (Lit when ON)				
Leakage current	1 mA or less			10 μA or less	
Lead wire length(*2)	1 m, oil resistant vinyl cabtyre cable 2-conductor 0.2mm^2		1m,PUR code 2-conductor 0.2mm^2	1 m, oil resistant vinyl cabtyre cable 3-conductor 0.3mm^2	
Shock resistance	980 m/s^2				
Insulation resistance	100MΩ and over at DC500V megger	20MΩ and over at DC500V megger		100MΩ and over at DC500V megger	20MΩ and over at DC500V megger
Withstand voltage	No failure after 1000 minute of 1 VAC application.				
Ambient temperature	-10 to +60°C				
Degree of protection	IEC Standard IP67, JIS C0920 (water-tight), oil resistance				

*1: Max. load current: 20mA at 25°C.

The current is lower than 25 mA if the operating ambient temperature around the switch is higher than 20˚C.

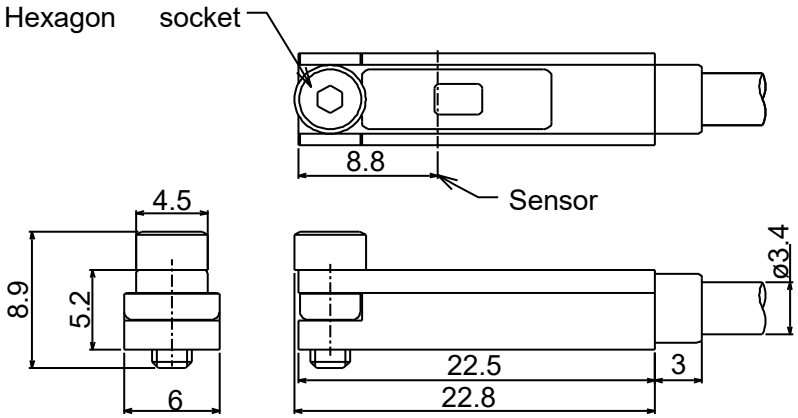
(5~10mA for 60°C)

*2: 3m・5m lead wire is available as an option.

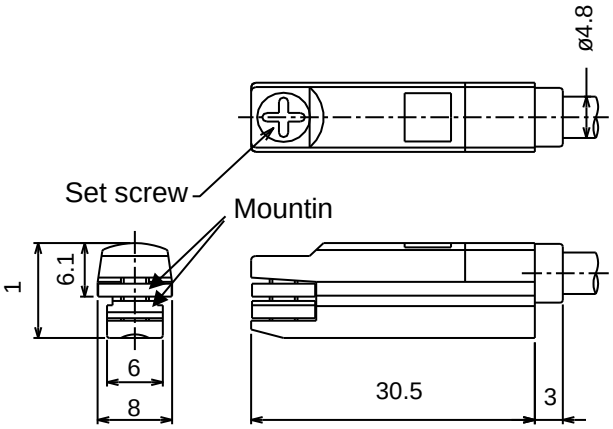
1.4 Dimensions

1.4.1 Dimensions

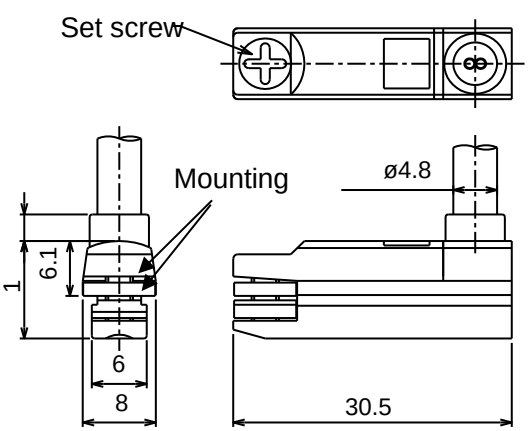
●T0Y



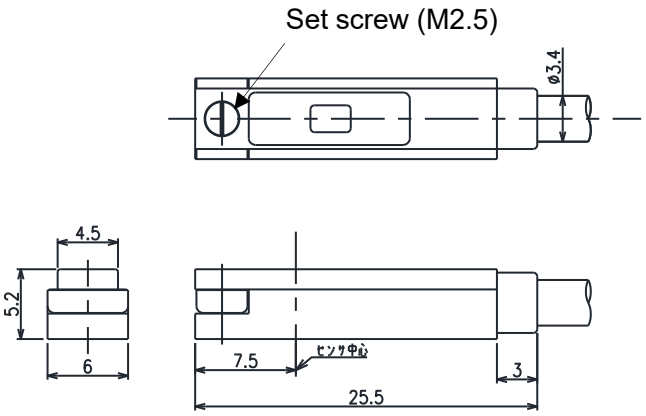
●T※YH



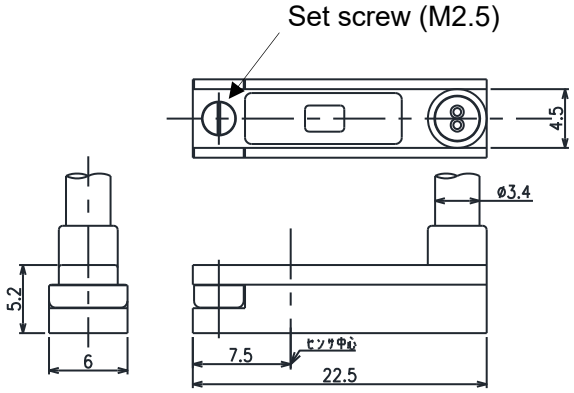
●T※YV



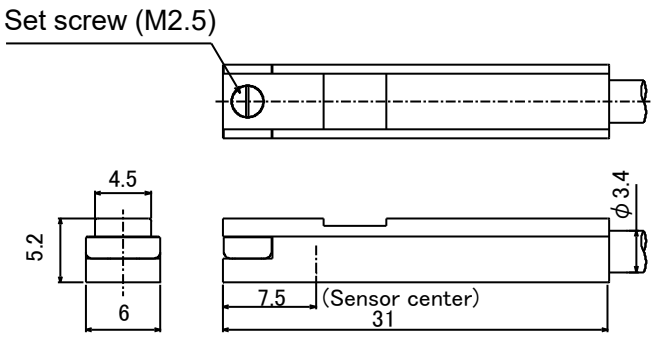
●T※WH



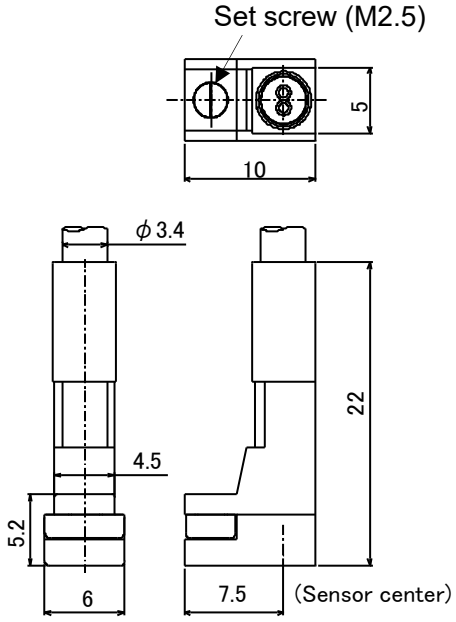
●T※WV



●T2WLH


Set screw (M2.5)
4.5
5.2
6
ϕ3.4
7.5
(Sensor center)
31

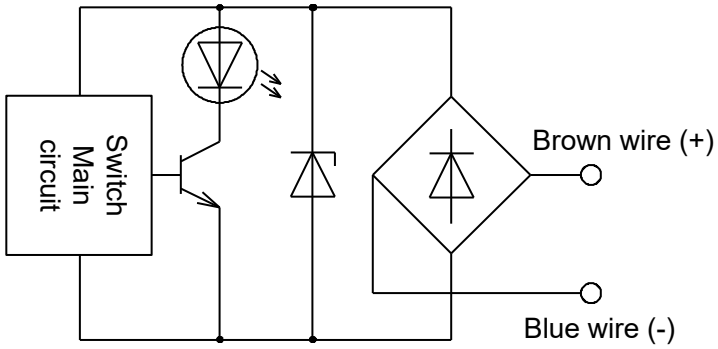
●T2WLV


Set screw (M2.5)
5
10
ϕ3.4
4.5
5.2
6
22
7.5
(Sensor center)

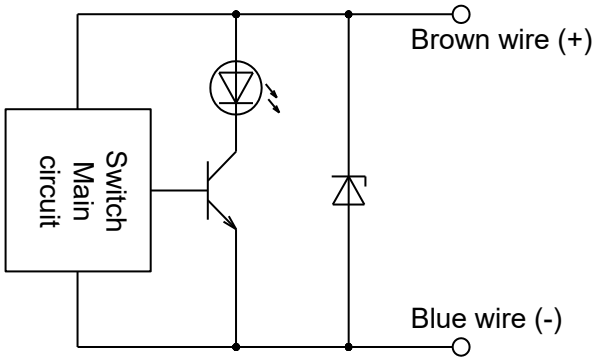
1.5 Internal circuit diagram

1.5.1 Internal circuit diagram

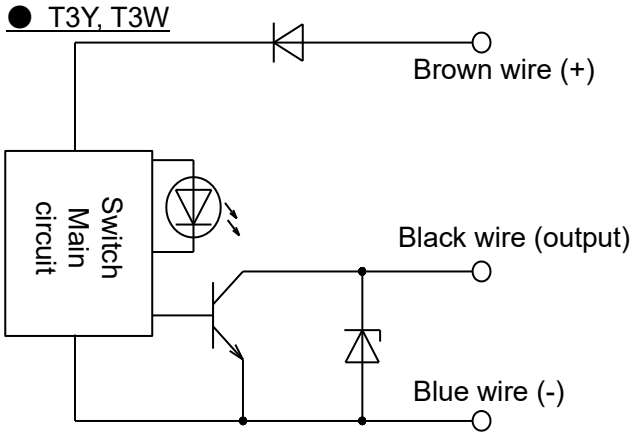
● T0Y



● T2Y, T2W(L)



● T3Y, T3W



2. INSTALLATION

2.1 Environment

- Application, load current, voltage, temperature, impact, environment, etc., outside the specifications will result in damage or operation faults. Use the device as instructed in the specifications
- Never use this product in an explosive gas atmosphere. The cylinder switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

2.2 Unpacking

- Confirm that the product model No. in the order is the same as the model No. on the product.
- Check that there is no damage to the exterior of the product.

2.3 Wiring

2.3.1 Reed switch

■ Connecting the lead wire

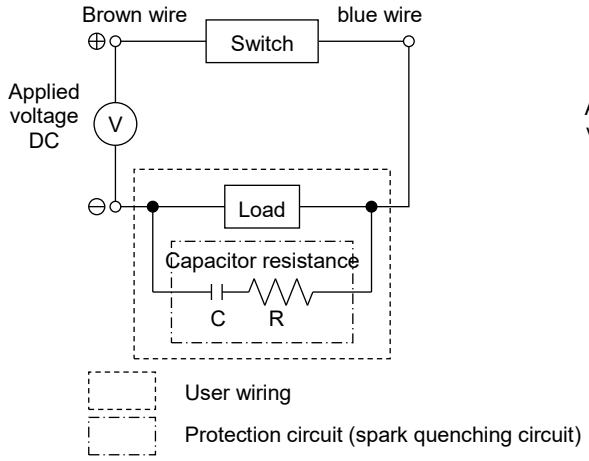
Do not connect the switch lead wire directly to the power supply. Connect the load serially.

■ Contact protective measures

Be sure to provide a contact protection circuit when using the product with an inductive load such as a relay, or when the wiring length exceeds the values in the table at right.

Power	Wiring length
DC	50m

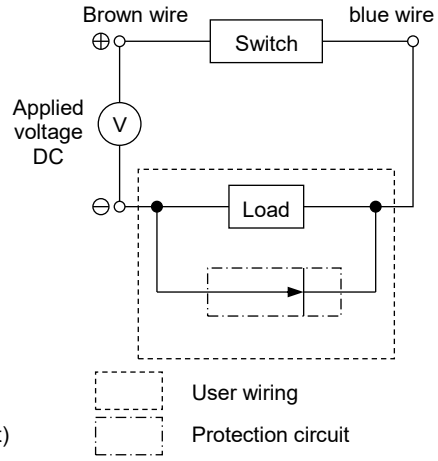
[Protection when connecting an inductive load]



Recommended values

C capacitor 0.033 to 0.1 μF
R resistance 1 to 3 kΩ
Okaya Electric XEB1K1 or equivalent

Capacitor and resistance used

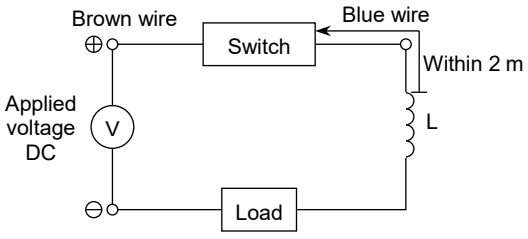


General rectifying diode

HITACHI Ltd. V06C or equivalent

When using a diode

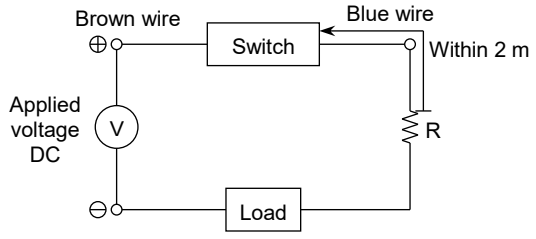
[Protection when wire length exceeds the value in the table above]



・Choke coil

L = Several hundred μH to several mH
with excellent high frequency characteristics

・ Wire near the switch (within 2 m)



・ Rush current limit resistance
R = Largest resistor allowed for the load circuit

・ Wire near the switch (within 2 m)

■ Contact capacity

Avoid using a load that exceeds the switch's max. contact capacity. The indicator lamp may not come on if the current is less than the rated current.

■ Relay

Use the following or equivalent relays.
- OMRON Corporation MY type
- Fuji Electric Co., Ltd. HH5
- Panasonic Corporation HC

■ Serial connection

When serially connecting several switches, the switch voltage drop is the total voltage drop of all connected switches.
The indicator lamp turns ON only when all switches are ON.

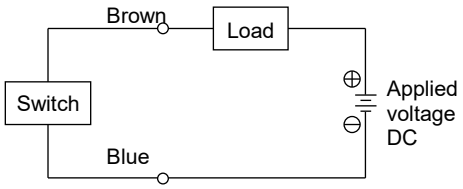
■ Parallel connection

Since leakage current increases in proportion to the number of connected units, determine the number of connections after checking the input specifications of the programmable controller that is the connected load. Note that the indicator lamp could dim or may not turn ON.

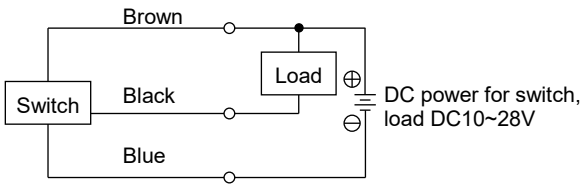
2.3.2 Proximity switch

■ Connecting the lead wire

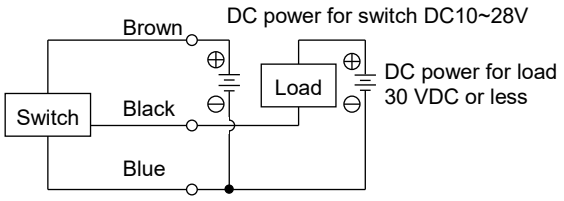
Correctly connect the lead wires based on the color coding. At this time, be sure to turn OFF the power to the device in the electric circuit to be connected. Energized work may lead to damage of the switch load electric circuit.
Incorrect wiring or a short-circuit in the load may damage the switch and load electric circuit.



2-wire basic circuit example



Example of 3-wire basic circuit (1)
(when switch power supply and load power supply are the same)

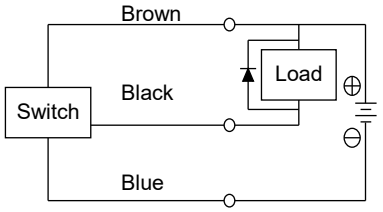


Example of 3-wire basic circuit (2)
(when switch power supply and load power supply are different)

■ Output circuit protection

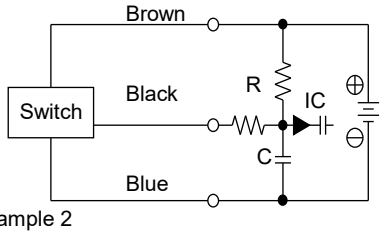
In the following cases, refer to the figure and be sure to provide a protection circuit.

- When connecting inductive load (relay, solenoid valve) for use: Example 1
  A surge voltage is generated when the switch is turned OFF. Use a surge absorption element.
- When connecting capacious load (capacitor): Example 2
  As starting current is generated when the switch is turned ON, use a current limiting resistor.
- When the lead wire length exceeds 10 m: Example 3, 4 (2-wire), Example 5 (3-wire)



Example 1

An example of using a surge absorbing element (diode) for an inductive load. Use HITACHI Ltd. V06C or equivalent diode.

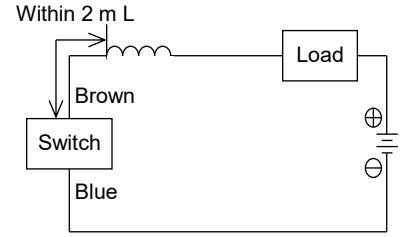


Example 2

Example of capacitance load including current limiting resistor R.

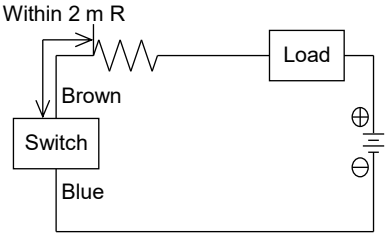
Resistance R (Ω) must be larger than the following equation.

$$\frac{V}{0.05} = R\ (\Omega)$$



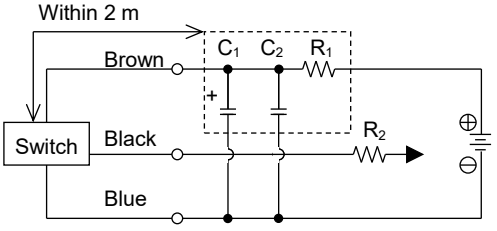
Example 3

- Choke coil
  L = Several hundred μH to several mH
  with excellent high frequency characteristics
- Wire near the switch (within 2 m)



Example 4

- Rush current limit resistance
  R = Largest resistor allowed for the load circuit
- Wire near the switch (within 2 m)

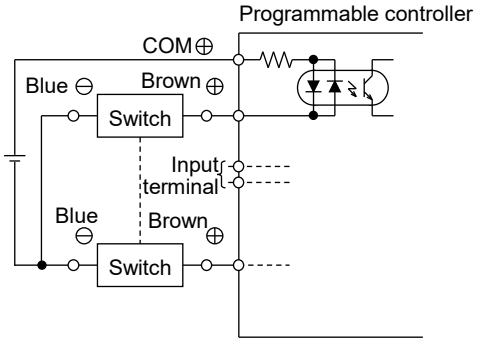


Example 5

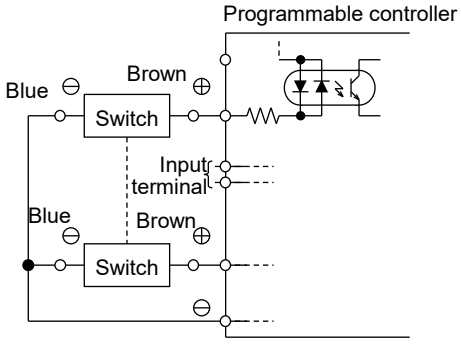
- Power supply noise absorption circuit
  C_1 = 20 to 50 μF electrolytic capacitor
  (withstand voltage 50 V or more)
  C_2 = 0.01 to 0.1 μF Ceramic capacitor
  R_1 = 20 to 30 Ω
- Rush current limit resistance
  R_2 = Largest resistor allowed for the load circuit
- Wire near the switch (within 2 m)

■ Connection to programmable controller

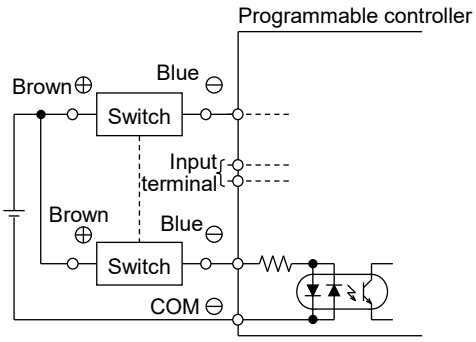
Connection direction differs depending on the type of programmable controller. Connect as shown in the figure below.



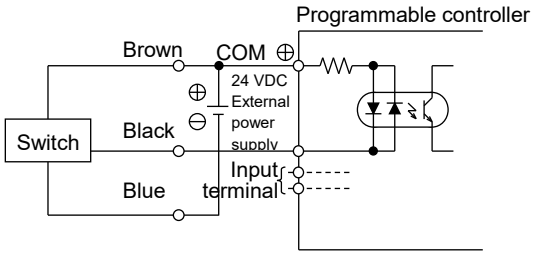
Example of 2-wire connection to source load input (external power supply) type



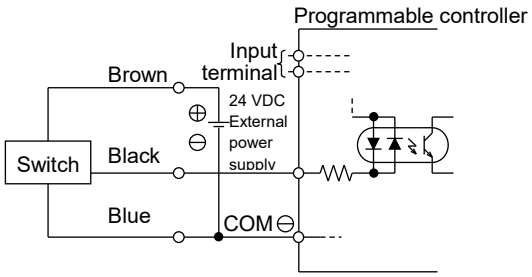
Example of 2-wire connection to source input (internal power supply) type



Example of 2-wire connection to sink input (external power supply) type



Example of 3-wire connection to source load input (external power supply) type



Example of 3-wire connection to source input (internal power supply) type

■ Parallel connection

With the 2-wire switch, since leakage current increases in proportion to the number of connected units, determine the number of connections after checking the input specifications of the programmable controller that is the connected load. Note that the indicator lamp could dim or may not turn ON. Although leakage current increases for the number of connected units in a 3-wire switch, it is not usually a problem since the leakage current value is very small (10 μA or less). In addition, the indicator lamp will not become dark or will not turn ON.

3. USAGE

3.1 How to use switch

■ Magnetic environment (reed switch)

When using the product in a welding process where a disturbing magnetic field is generated, control to cancel the welding signal on the load side is necessary.
When installing the cylinder with switch nearby in parallel, or if a magnetic object is moved close to the cylinder, mutual interference may occur and adversely affect detection accuracy.

■ Magnetic environment (proximity switch)

Avoid using this product near a strong magnetic field or large current (large magnet, welding machine, etc.).
When installing the cylinder with switch nearby in parallel, or if a magnetic object is moved close to the cylinder, mutual interference may occur and adversely affect detection accuracy.

■ Lead wire wiring

Wire the lead wires so that repeated bending or tension are not applied.
Connect and wire bending-resistant material, such as robot wire material, for the movable sections.

■ Ambient temperature

Do not use this product in a high temperature (60°C or higher) environment.
The temperature characteristics of magnetic and electronic parts may affect performance.

■ Intermediate position detection

When operating the switch at the middle of the stroke, note that the relay will not respond if the piston speed is too fast.
When the relay operation time is 20 ms, use the piston speed of 500mm/s or less.

■ Shock

When transporting the cylinder, installing a switch, or adjusting the cylinder, do not apply great vibration or impact.

4. TROUBLESHOOTING

4.1 Problems, Causes, and Solutions

If the product does not operate as intended, check the table below for a possible solution.

Problem	Cause	Solution
The switch operates but the indicator lamp does not blink	The switch contact is welded	Replace the switch
	The load exceeds the rating	Replace the recommended relay or replace the switch
	The indicator lamp is damaged	Replace the switch
	The external signal is faulty.	Reconfirm the external circuit
Switch does not turn ON	broken	Replace the switch
	The external signal is faulty.	Reconfirm the external circuit
	The voltage is different	Set to the indicated voltage
	Incorrect installation position	put ~ in a normal position
	The installation position is displaced	Correct the displacement and tighten with a tightening torque of 0.5 to 0.7 N･m
	The switch direction is reversed	put ~ in a normal direction
	The load (relay) cannot respond	Replace with the recommended relay
	The load exceeds the rating	Replace the recommended relay or replace the switch
	Cylinder speed is fast due to detection on the way of stroke	slow down
Switch does not turn OFF	The piston is not moving.	Move the piston
	The switch contact is welded	Replace the switch
	The relay exceeds the rating	Replace the recommended relay or replace the switch
	The ambient temperature is not adequate	Keep within the range of -10 to 60°C
	There is a magnetic field nearby	use a magnetic shield
	The external signal is faulty.	Reconfirm the external circuit

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

5. WARRANTY PROVISIONS

5.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

5.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.

5.3 Remarks

As an exception under Item 5.2, the warranty period for a reed switch is one year after delivery to the customer's designated site or within 70 million operations, whichever comes first.

- 70 million cycles above include the number of cylinder switch ON operations caused by welding field.