CKD

SM－288135－A

INSTRUCTION MANUAL

MAGNET TYPE
SUPER RODLESS CYLINDER

HIGH-PRECISION GUIDE TYPE
MRG2 SERIES

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

CKD Corporation

The 2nd edition

For Safety Use

To use this product safety, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (ISO4414 *1 JIS B 8370 *2).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your applications, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, **read this operation manual carefully for proper operation.**

In this instruction manual, the probable hazards are classified into three ranks, "DANGER", "WARNING", and "CAUTION" as described in the following in order to easily understand the degree of danger or damage.

⚠ DANGER: Failure to pay attention to DANGER notices may cause a situation that results in a fatality or serious injury and that requires urgent addressing.

⚠ WARNING: Failure to pay attention to WARNING notices may result in a fatality or serious injury.

⚠ CAUTION: Failure to pay attention to CAUTION notices may result in minor injury or damage to equipment or facilities.

*1) ISO 4414 : Pneumatic fluid power — General rules relating to systems

*2) JIS B 8370 : Pneumatic fluid power — General rules relating to systems

[SM-288135-A]

⚠ WARNING

Lead wire connections

a) Comply with the color coding specified on the illustrations. Be sure to turn the power off before starting connecting work.
An erroneous wiring or short circuiting of load causes damage to not only switches, but also load side circuit. Wiring work without shutting electricity off may cause damage to the load side circuit.

b) Do not connect the lead wires of the switch to the power supply directly. Always connect the loads in series.

Protection of output circuit

Install some protective circuit as illustrated in Fig.7 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current switch off.

Install some protective circuit as illustrated in Fig.8 when capacitor type load (Capacitor type) are to be used, because these types apt to generate a dash current when turning the switch ON.

Install some protective circuit as illustrated in Fig.9 or 10 (in case of model T2) and Fig.11 (in case of model T3).

Never attempt to disassemble this cylinder since it uses the strong magnet. If any fault, such as air leak occurs, replace the complete cylinder with a new one.

⚠ CAUTION

- Do not unpack the cylinder and remove the dust preventive port seal from the piping port until the piping work is started.
- Doing so may cause foreign matter to enter the inside of the cylinder through the piping port, resulting in damage or malfunction.

a) Do not operate the cylinder with the table fixed.

b) Pay special attention so that your finger is not caught in a clearance between the end plate and table.

a)The supply pressure to the cylinder is described in the section 7.1, Cylinder Specifications. Always operate the cylinder within this pressure range.

b)Do not operate the cylinder at an energy level exceeding the allowable energy absorption range. If the kinetic energy is large, install an external absorbing unit.

c) Install an appropriate speed controller to adjust the working piston speed.

a)Protection of lead wire
Pay consideration to eliminate repeating bending stress or stretching of lead wire while laying the cord.
To the moving portion, use such cord of flexibility as for building a robot.

b)Operating temperature
Do not operate the product at a high temperature(60℃).
Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.

c) Impact
Do not apply a large vibration or impact to the product when transporting the cylinder, or mounting or adjusting the switch.

Contact protective measures
When an inductive load, such as relay is used or the wire length exceeds that stated in Table5, always install a contact protective circuit.

In order to upkeep the cylinder in optimum condition, carry out periodic inspection once or twice a year.

INDEX

MRG2 SERIES

Magnet Type Super Rodless Cylinder
High-precision guide type

Manual No. SM-288135-A

1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Super Rodless Cylinder matches the type No. you ordered.
2) Check the appearance for any damage.

⚠ CAUTION:

- Do not unpack the cylinder and remove the dust preventive port seal from the piping port until the piping work is started.
- Doing so may cause foreign matter to enter the inside of the cylinder through the piping port, resulting in damage or malfunction.

2. INSTALLATION

2.1 Installation

1) Install cylinder body with a hexagon socket head cap screw directly.
2) Mount the end plate on a surface having a high flatness. Failure to do so may cause a malfunction.
(Mount the end plate so that the full-stroke of the table is operated at its minimum operating pressure level.)

⚠ CAUTION:

a) Do not operate the cylinder with the table fixed.
b) Pay special attention so that your finger is not caught in a clearance between the end plate and table.

3) Method of adjustment stroke

Stroke(−)direction ⟷ Stroke(+)direction

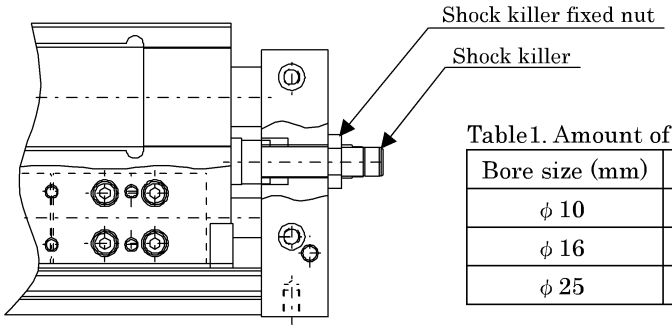
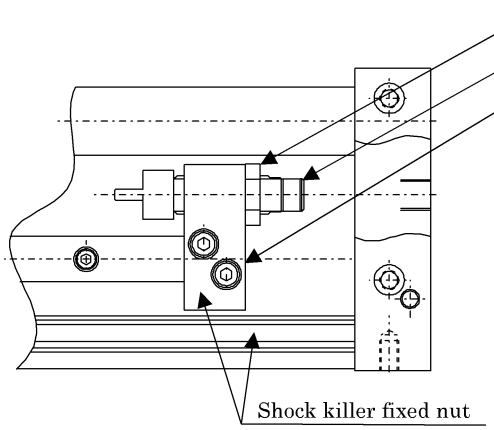


Table1. Amount of stroke adjustment (One side) Unit:mm

Bore size (mm)	Stroke (−)direction	Stroke (+)direction
ϕ 10	5	5
ϕ 16	5	5
ϕ 25	6	4

Loosen the shock killer fixed nut and turn the shock killer. After the slide table's adjustment at the target position, tighten the nut at the torque indicated in Table 3 of the next page.
<Cautions> The stroke in the Table2 of the next page can be adjusted by the shock killer adjustment. When the stroke of (+) direction is adjusted, R side alone cannot detect the switch on the stroke end. Please use it considering it enough.

4) Method of adjustment all stroke.
Stroke(−)direction ⟷ Stroke(+)direction



A :All stroke adjustment both sides
A1:All stroke adjustment R side only
A2:All stroke adjustment L side only

Table2. Amount of adjustment all stroke
(Amount of adjustment a piece of all stroke) Unit:mm

Bore size (mm)	A		A1		A2	
	Stroke(−) direction	Stroke(+) direction	Stroke(−) direction	Stroke(+) direction	Stroke(−) direction	Stroke(+) direction
ϕ 10	Stroke	0	Stroke	24	Stroke	24
ϕ 16	Stroke	0	Stroke	24	Stroke	24
ϕ 25	Stroke	15	Stroke	65	Stroke	65

① Movement of adjustment block
Loosen the adjustment block fixed bolt. After the adjustment block movement at the arbitrary position, tighten the bolt at the torque indicated in Table 3.

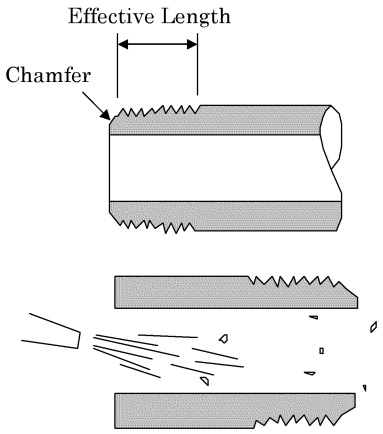
② Adjustment of the shock killer
Loosen the shock killer fixed nut and turn the shock killer. After the slide table's adjustment at the target position, tighten the nut at the torque indicated in Table 3.

Table3

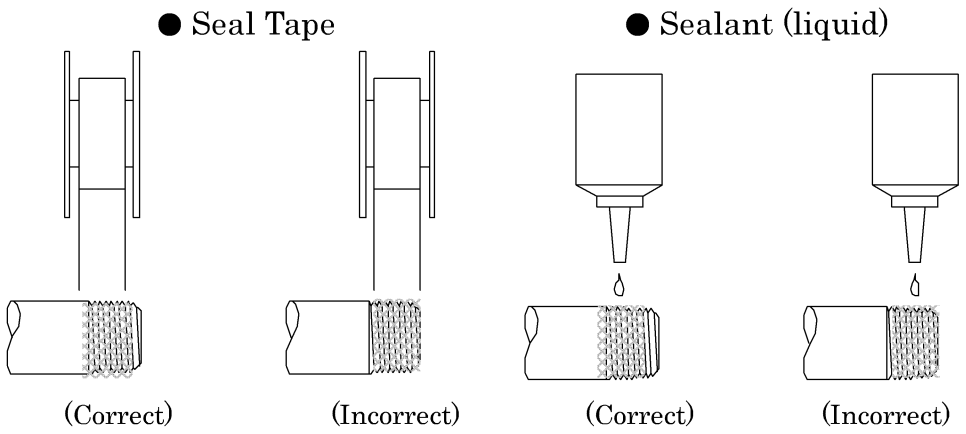
Bore size (mm)	Tightening torque	
	Shock killer fixed nut (N･m)	Adjustment block fixed bolt (N･m)
ϕ 10	12～20	22～30
ϕ 16	30～40	22～30
ϕ 25	45～60	46～63

2.2 Piping

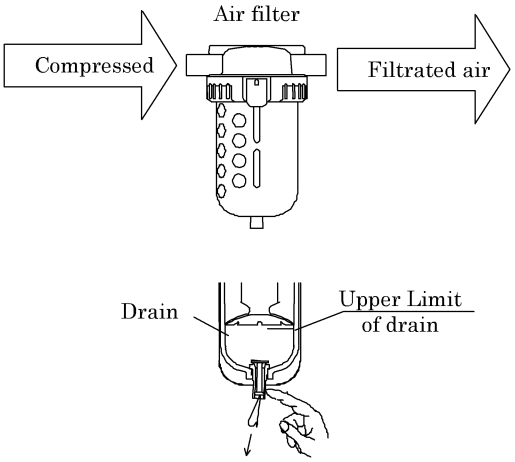
1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.
2) See to it that the pipe connecting cylinder and solenoid valve has effective cross-sectional area, which is needed for the cylinder to drive at the specified speed.
3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust, foreign substance in the drain of the pipe.
4) Be sure observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.
5) Flush air into the pipe to blow out foreign substances and chips before piping.



6) Refrain from applying sealant or sealing tape approx. Two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.



2.3 Fluid



1) It is necessary to use dehumidified air that has been filtered from compressed air. Carefully select an adequate filter that has an adequate filtration rate (preferably 5 μ m or less), flow rate and its mounting location (as nearest to the directional control valve as possible).

2) Be sure to drain out the accumulation in the filter periodically.

3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

4) This cylinder does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 as a lubricant, if and when lubrication is needed. Once the cylinder has been lubricated, it should be lubricated periodically.

2.4 Location of mounting Switches on a Cylinder

1) Location of mounting switches on a cylinder.

(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the maximum sensitive position.
(See the figure and table of page eight)

(2) Intermediate of stroke
To detect a position of the piston on the way of the stroke, secure the piston at the detection position and move the switch above the position in the back and forth direction to find a position where each switch is turned ON first. The middle position between these two positions is the maximum sensitivity position at this piston position and is used as mounting position.

(3) Movement of switch
Slide switch body along cylinder tube after loosening mounting screws or cross recessed head screws and tightens screws when located the maximum sensitive position.

(4) Replacing switch

Take out switch out of groove after loosening mounting screws or cross recessed head screws. Slide new replacing switch into groove and tighten screws upon placing the switch at the maximum sensitive position. (Mounting screws apply tightening torque of 0.1 to 0.2N·m and cross recessed head screws apply tightening torque of 0.5 to 0.7 N·m.)

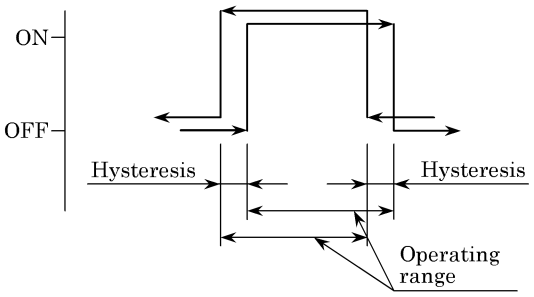
2) Operating range

The switch turns on first and turns off as the piston moves along its stroke. Precise operating range deviate slightly depending upon the direction of piston movement as shown right.

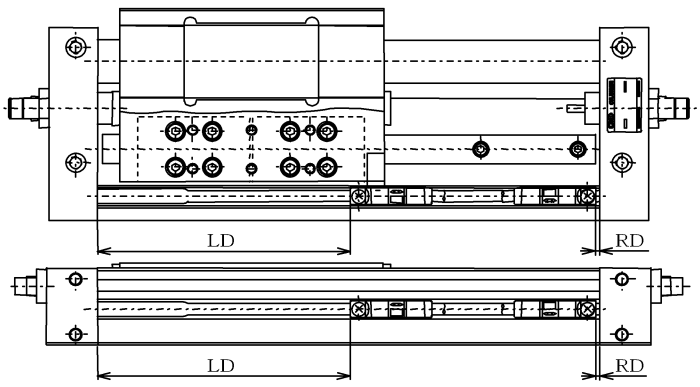
The center of the range is the mostly sensitive position. Setting switch at this point eliminates majority of external disturbance and provides the most stabile actuation of switch.

3) Hysteresis

(1) Precise operating range deviate slightly depending upon the direction of piston movement as shown right.



(2) Switch is apt to be disturbed its accuracy by external effect when piston stops within this range. Carefully avoid designing stop-ping location of piston.



Maximum sensitive position, operating range and hysteresis

Unit : mm

Item		T0H/V, T5H/V				T2H/V,T3H/V			
Bore size (mm)		LD	RD	Operating range	Hysteresis	LD	RD	Operating range	Hysteresis
Basic	ϕ10	75.5	1.5	6～7	2.0 or less	76.5	2.5	2～4	1.0 or less
	ϕ16	103.5	1.5	7～8		104.5	2.5	2～5	
	ϕ25	142.5	0.5	7～8		143.5	1.5	2～5	
A	ϕ10	100.5	26.5	6～7		101.5	27.5	2～4	
	ϕ16	128.5	26.5	7～8		129.5	27.5	2～5	
	ϕ25	192.5	50.5	7～8		193.5	51.5	2～5	
A1	ϕ10	75.5	51.5	6～7		76.5	52.5	2～4	
	ϕ16	103.5	51.5	7～8		104.5	52.5	2～5	
	ϕ25	142.5	100.5	7～8		143.5	101.5	2～5	
A2	ϕ10	125.5	1.5	6～7		126.5	2.5	2～4	
	ϕ16	153.5	1.5	7～8		154.5	2.5	2～5	
	ϕ25	242.5	0.5	7～8		243.5	1.5	2～5	

Maximum sensitive position, operating range and hysteresis

Unit : mm

Item		T2YH/V, T3YH/V				T2Y(M/F)H/V,T3Y(M/F)H/V			
Bore size (mm)		LD	RD	Operating range	Hysteresis	LD	RD	Operating range	Hysteresis
basic	ϕ10	75.5	1.5	6～7	1.0 or less	75.5	1.5	6～7	1.0 or less
	ϕ16	103.5	1.5	6～7		103.5	1.5	6～7	
	ϕ25	142.5	0.5	6～7		142.5	0.5	6～7	
A	ϕ10	100.5	26.5	6～7		100.5	26.5	6～7	
	ϕ16	128.5	26.5	6～7		128.5	26.5	6～7	
	ϕ25	192.5	50.5	6～7		192.5	50.5	6～7	
A1	ϕ10	75.5	51.5	6～7		75.5	51.5	6～7	
	ϕ16	103.5	51.5	6～7		103.5	51.5	6～7	
	ϕ25	142.5	100.5	6～7		142.5	100.5	6～7	
A2	ϕ10	125.5	1.5	6～7		125.5	1.5	6～7	
	ϕ16	153.5	1.5	6～7		153.5	1.5	6～7	
	ϕ25	242.5	0.5	6～7		242.5	0.5	6～7	

※ Switches at ex-factory shipment are positioned at the best operating points (LD and RD) .

3. OPERATION

3.1 Operating the Cylinder

3.1.1 Checking before starting operation

1) Before starting operation, make sure that any load and/or cylinder mounting and tightening parts are not loose or faulty.
2) Do not start operation until it is confirmed that the cylinder functions correctly. After the cylinder has been mounted, connect the compressed air and electric power, and then perform the functional check and air leak check that the cylinder is mounted correctly.

3.1.2 Starting procedures

1) Gradually increase the air pressure while carefully observing that the equipment operation is correct.
2) When starting the operation with the cylinder chamber on the exhaust side put in the atmospheric state, the slider may jump-up, causing a serious accident. Always start the operation with the cylinder chamber on the exhaust side pressurized.
3) When adjusting the speed using the speed controller, gradually open the needle from its close position. If the speed adjustment is started with the needle opened, the slider may jump-up, causing a serious accident.

⚠ CAUTION:

a) The supply pressure to the cylinder is described in the section 7.1, Cylinder Specifications. Always operate the cylinder within this pressure range.

b) Do not operate the cylinder at an energy level exceeding the allowable energy absorption range. If the kinetic energy is large, install an external absorbing unit.

c) Install an appropriate speed controller to adjust the working piston speed.

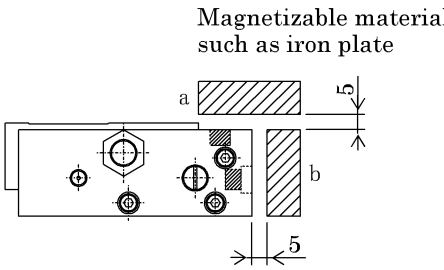
3.2 How to use the Switches

3.2.1 Common items

1) Magnetic environment
Do not operate this product in a place where a strong magnetic field or large current (large magnet or spot welder, etc.) exists. If a cylinder with the switch is installed in parallel to this product or the magnetic substance moves near the cylinder, the mutual interference may occur and affect the detection accuracy.

2) Intermediate position detection
When activating the switch halfway of the stroke, the relay may not respond if the working piston speed is too fast.
Example) Operate cylinder with the speed of less than 500mm/s in case the relay actuation time is 20ms.

Additionally, the operating range of the cylinder switch is determined to the mini-mum value stated in the table4 on the next page.



Avoid the use state where magnetic substance a and b exist at the same time.

3) Magnetizable material such as iron plate near by cylinder switch is apt to cause malfunction of cylinder switches. Keep it
from cylinder surface at least 4mm away (This is applicable for all bore sizes of tube).

4) When using the cylinder or other magnetic sensor adjacent to the switch, put other magnetic sensor at a distance away from the slider surface stated in the table on the right to prevent malfunction caused by the leak magnetic field of the magnet inside the cylinder.

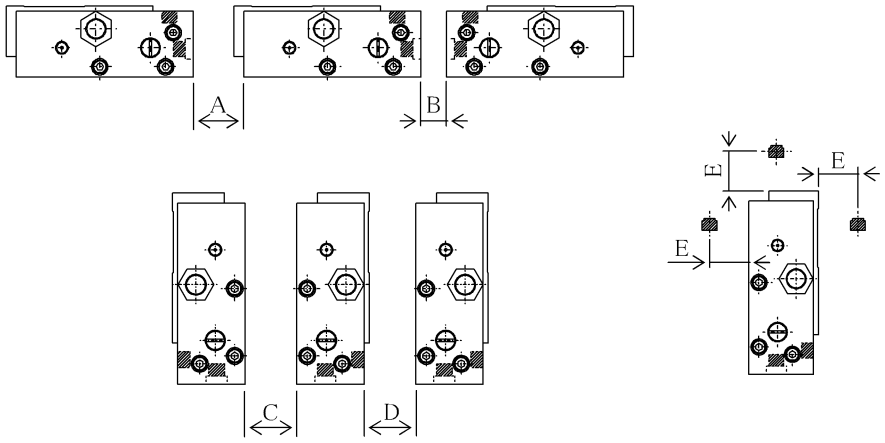


Table 4 Unit:mm

Bore size	A	B	C	D	E
ϕ 10	20	10	10	10	20
ϕ 16	20	10	10	10	20
ϕ 25	50	20	20	20	50

The mis-operation can be prevented by placing the magnetic substance (2mm or more in iron plate) between tables when becoming size E or less.

⚠ CAUTION:

a) Protection of lead wire
Pay consideration to eliminate repeating bending stress or stretching of lead wire while laying the cord.
To the moving portion, use such cord of flexibility as for building a robot.

b) Operating temperature
Do not operate the product at a high temperature(60℃).
Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.

c) Impact
Do not apply a large vibration or impact to the product when transporting the cylinder, or mounting or adjusting the switch.

⚠ WARNING:

Lead wire connections

a) Comply with the color coding specified on the illustrations. Be sure to turn the power off before starting connecting work.
An erroneous wiring or short circuiting of load causes damage to not only switches, but also load side circuit. Wiring work without shutting electricity off may cause damage to the load side circuit.

b) Do not connect the lead wires of the switch to the power supply directly. Always connect the loads in series.

3.2.2 Operational Cautions, Solid state switch (T2, T3)

⚠WARNING:

Protection of output circuit

Install some protective circuit as illustrated in Fig.7 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current switch off.

Install some protective circuit as illustrated in Fig.8 when capacitor type load (Capacitor type) are to be used, because these types apt to generate a dash current when turning the switch ON.

Install some protective circuit as illustrated in Fig.9 or 10 (in case of model T2) and Fig.11 (in case of model T3).

1) How to connection of lead cord (Fundamental circuit Example)

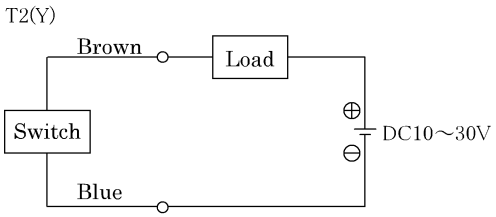


Fig.1 T2(Y) Fundamental circuit Example

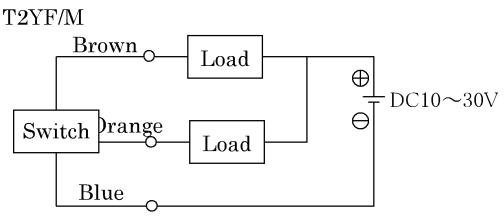


Fig.2 T2YF/M Fundamental circuit Example

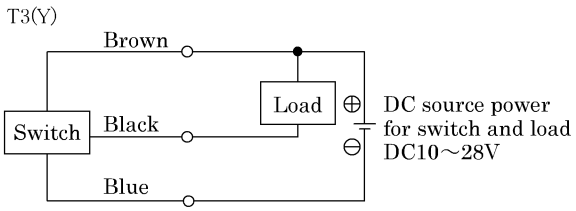


Fig.3 T3(Y) Fundamental circuit Example(1)
(In case the same source of power is used.)

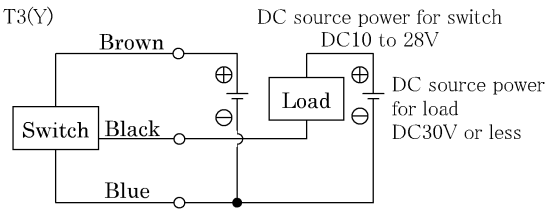


Fig.4 T3(Y) Fundamental circuit Example(2)
(In case individual sources of power are used.)

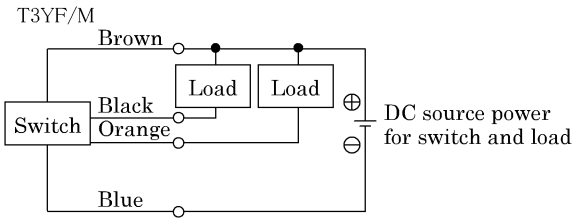


Fig.5 T3YF/M Fundamental circuit Example(1)
(In case the same source of power is used.)

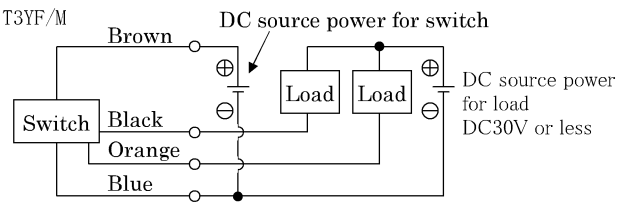


Fig.6 T3YF/M Fundamental circuit Example(2)
(In case individual sources of power are used.)

2) Protection of output circuit

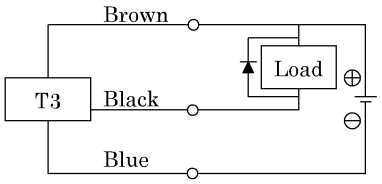


Fig.7 An example of using inducing load together with surge absorptive element (diode). (Hitach Mfg. made diode). (Hitach Mfg. made diode V06C or equivalent is recommended.) made

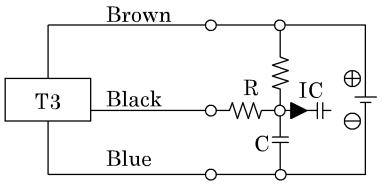


Fig.8 An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R.

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

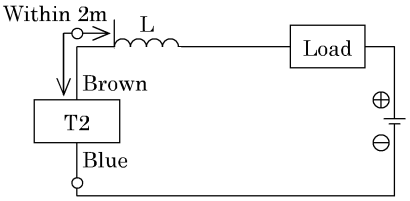


Fig.9 Choke coil
L = a couple hundred μH to a couple mH surpassing high frequency characteristic.
・Install it near by a switch (within 2m).

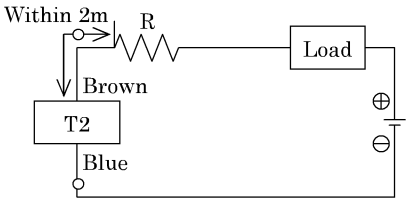


Fig.10 ・Dash current restriction resister.
R= As much large resister as the load circuit can afford.
・Install it near by a switch (With in 2m).

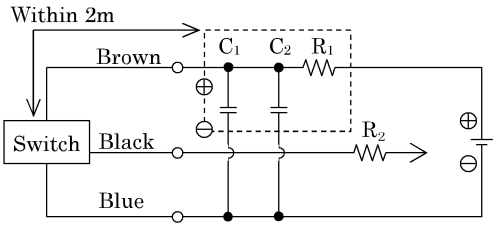


Fig.11 ・Electric power noise absorptive circuit.
C_1= 20 to 50 μF electrolytic capacitor (Withstand voltage 50V or more)
C_2= 0.01 to 0.1 μF ceramic capacitor
・Dash current restriction resister.
R_1 = 20 to 30 Ω
R_2 = As much large resister as the load circuit can afford.
・Install it near by a switch. (Within 2m)

3) Connection to a programmable controller (Sequencer).

Type of connection varies depending upon the model of the programmable controller. Refer to the following Fig. 12 to 18 respectively.

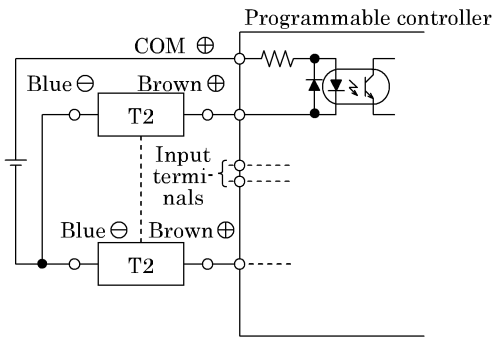


Fig.12 An example of T2 connection to source input type (an external power source)

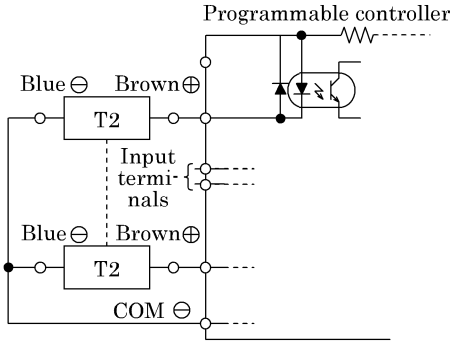


Fig.13 An example of T2 connection to source input type (an internal power source)

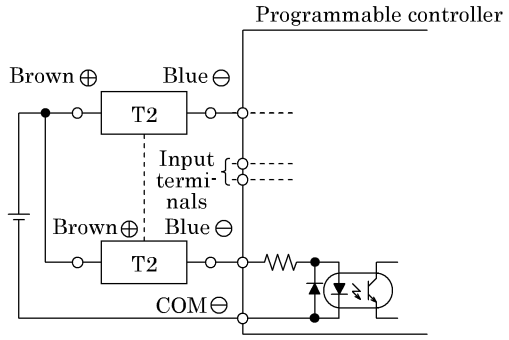


Fig.14 An example of T2 connection to sink input type (an external power source)

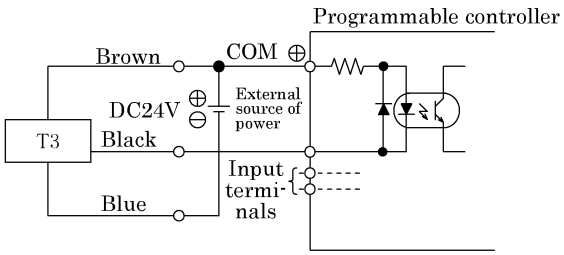


Fig.15 An example of T3 connection to source input type (an external power source)

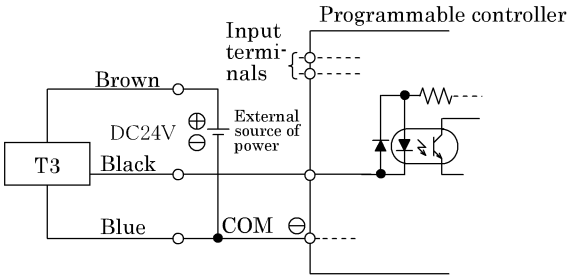


Fig.16 An example of T3 connection to source input type (an internal power source)

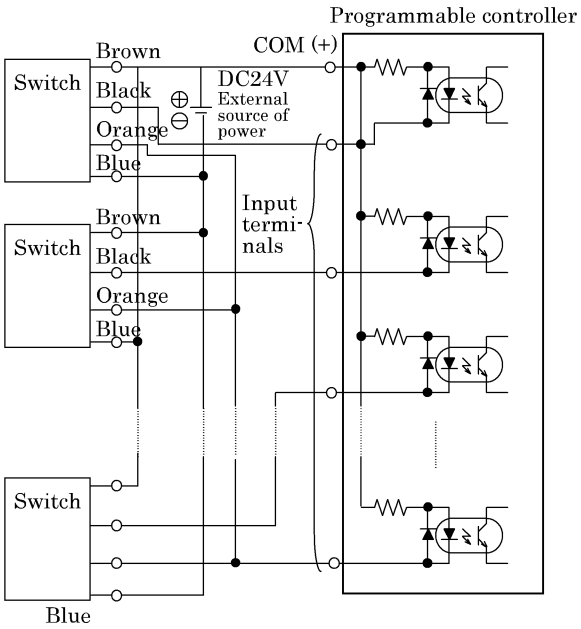


Fig.17 An example of T3YF connection to source input type (an external power source)

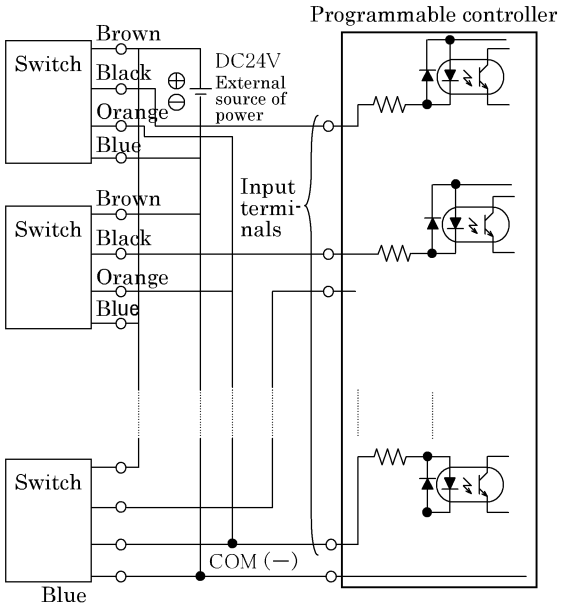


Fig.18 An example of T3 connection to source input type (an internal power source)

4) Series connection

The total voltage will decrease when the T2 switches connections have a leak. Therefore, confirm the input specifications for the programmable controllers, which are the connecting load. However, dimming or total failure of the indicator light may exist.

T3 switches hardly ever leak. When less than 10 μ A, then leakage may occur. Usually dimming and failure of the indicator light do not occur

3.2.2 Reed switch (T0, T5)

1) Lead wire connections

Do not connect the lead wires of the switch to the power supply directly. Always connect the loads in series. For T0 switch, carefully check following items (1), (2).

(1) When using the switch for DC power supply, connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversely, the switch is activated, but the indicator light is not lit.

(2) When the switch is connected to an AC relay or a programmable controller input, the indicator light on the switch is not lit if the half-wave rectification is performed in the connected circuit. If this occurs, reverse the polarities of the switch lead wire connection. The indicator light may then be lit.

Note that the R4 and R5 switches have no polarities.

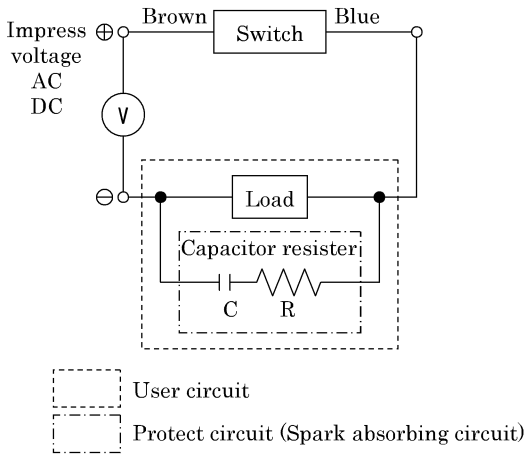
2) Contact protective measures

⚠ CAUTION: When an inductive load, such as relay is used or the wire length exceeds that stated in Table5, always install a contact protective circuit.

Table 5

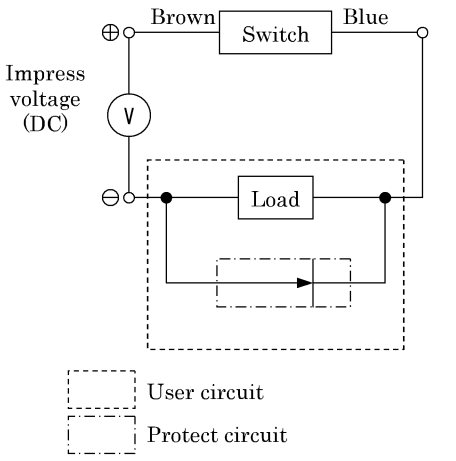
Electric power	Length of wire
DC	100m
AC	10m

(1) Protective circuit when connecting an inductive type load.



Recommended value
C (Capacitor) 0.033 to 0.1μF
R (Resister)1 to 3kΩ
XEB1K1 Okaya Denki Mfg or equivalent

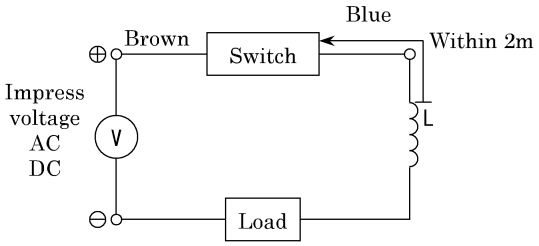
Fig.1 When capacitor resister is used.



Rectifying diode, general use
Hitachi Mfg. product V06C or equivalent

Fig.2 When diode is used.

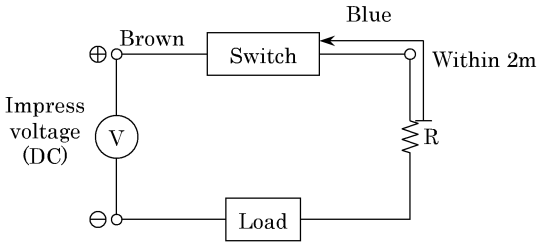
(2) Protective circuit when the wire length exceeds that stated Table 5.



・ Choke coil
L=a couple hundred μH to a couple mH
surpassing high frequency characteristic

・ Install it near by a switch (within 2m).

Fig.3



・ Dash current restriction resister
R=As much large resister as the load circuit can afford.

・ Install it near by a switch (within 2m).

Fig.4

3) Contact capacity
Do not use a load exceeding the maximum contact capacity of the switch. Additionally, if the current is lower than the rated current value, the indicator light may not be lit.

4) Relay
Always use the relays listed below.
Omron Corporation ····· MY type
Fuji Electric Co., Ltd. ····· HH5 type
Panasonic, Ltd. ····· HC type

5) Serial connection
Total voltage loss, when connected T0 switches in series, equals to the sum of respective voltage loss of each switch.
The total voltage loss becomes equivalent to one T0 (approx. 2.4V) when connecting the combination of one T0 for actuation confirming and rest of T5 switches. Indicator light is lit only when all switches turn on.

6) Parallel connection
There is no restriction in parallel connection number of switches of these types. Multi number connection of model T0, sometimes, cause a dimmed indicator light or complete indicator light failure.

4. MAINTENANCE

4.1 Periodical Inspection

> **⚠ CAUTION:** In order to upkeep the cylinder in optimum condition, carry out periodic inspection once or twice a year.

1) Inspection items
   (1) Check the bolts and nuts fitting the piston rod end brackets and mounting brackets for slackening.
   (2) Check to see that the cylinder operates smoothly.
   (3) Check any change of the working piston speed and cycle time.
   (4) Check for internal and/or external leakage.
   (5) Check the piston rod for flaw (scratch) and deformation.
   (6) Check the stroke for abnormality.
   (7) Check the displacement of a table doesn't quantity change.
   (8) Check if the shock killer functions incorrectly.

   See "Trouble shooting", 5 should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

4.2 Disassembly

> **⚠ WARNING:** Never attempt to disassemble this cylinder since it uses the strong magnet. If any fault, such as air leak occurs, replace the complete cylinder with a new one.

5. TROUBLE SHOOTING

1) Cylinder

Trouble	Causes	Remedies
Does not operate.	No pressure or inadequate pressure.	Provide an adequate pressure source.
	Signal is not transmitted to direction control valve.	Correct the control circuit.
	Improper or misalignment of installation.	Correct the installation state.
	Broken piston packing	Replace the cylinder.
Does not function smoothly.	Speed is below the low speed limit	Turn the speed up and/or limit the load variation.
	Improper or misalignment of installation.	Correct the installation state.
	Exertion of transverse load.	Carries out to below a permissible value.
	Excessive load.	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of "Meter in" circuit.	Change the meter-out circuit of the speed control valve.
Breakage and / or deformation.	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or exchange for the cylinder with shock absorber. (e.g. MRL2-G or MRL2-W).
	Exertion of transverse load.	Carries out to below a permissible value.
Piston comes off.	The pressure is too high.	Decrease the pressure itself.
	The speed is too fast.	Turn the speed down. Install the shock absorber the outside.
	Excessive load.	Install the shock absorber the outside.

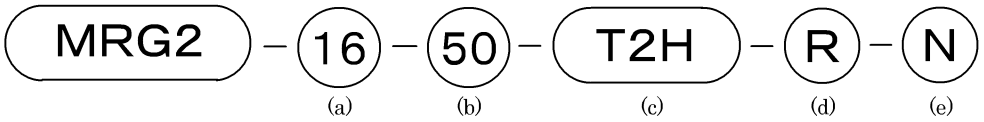
2) Switch

Troubles	Causes	Remedies
Indicator light is not lit.	Deposited contact point	Replace the switch.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Damaged indicator light	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.
Switch does not function right.	Broken circuit	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.
	Improper voltage	Correct voltage to specified.
	Incorrect location of switch	Correct its location.
	Aberrant position of switch	Readjusts to LD, RD positions of the maximum sensitive position.
	Incorrect direction of switch mounting	Correct the direction of the switch mounting.
	Relay cannot be answered at the time of the detection in the middle of a stroke.	Turn the speed down. Replace the relay with a recommended one.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
Switch does not return.	Piston is not moving	Make the piston move.
	Deposited contact point	Replace the switch
	Excessive load (relay) than rated capacity	Replace the relay with a recommended one or replace the switch.
	The ambient temperature is out of the specification range	Adjust the ambient temperature within the range of -10 to 60℃
	Existence of a foreign magnetic field	Shield the magnetic field.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.

6. HOW TO ORDER

6.1 Product Number Coding

Example of displaying model

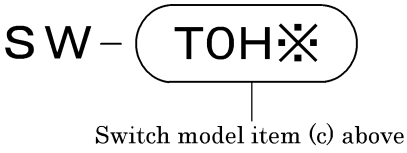


	(a) Bore size (mm)			(c) Switch model				
(b) stroke (mm)	ϕ 10	ϕ 16	ϕ 20	Lead wire		Switch type	Indicator light	Lead wire
				Straight type	L-shaped type			
50	●	●	●	T0H※	T2V※	Reed	1-color	2-wire
100	●	●	●	T5H※	T3V※			
150	●	●	●	T2H※	T2YV※	Solid state		
200	●	●	●	T3H※	T3YV※			3-wire
300	●	●	●	T2YH※	T2YFV※		2-color	2-wire
400	—	●	●	T3YH※	T3YFV※			3-wire
500	—	●	●	T2YFH※	T2YFV※		Equipped with preventive maintenance output	3-wire
600	—	—	●	T3YFH※	T3YFV※			4-wire
700	—	—	●	T2YMH※	T2YMV※			3-wire
				T3YMH※	T3YMV※			4-wire

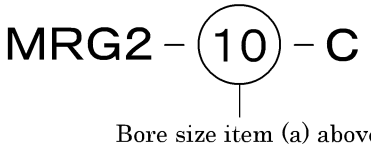
※ Lead wire length		(d) Qty. of switch		(e) Option	
No code	1m (Standard)	R	R side, 1ea.	A	All stroke adjustment both sides
3	3m (Option)	L	L side, 1ea.	A1	All stroke adjustment R side only
5	5m (Option)	D	2ea.	A2	All stroke adjustment L side only
		T	3ea.		
		4	4ea.		

6.2 Component parts Model coding

Switch unit



Shock killer unit



7. SPECIFICATION

7.1 Cylinder Specifications

Item		MRG2		
Bore size	mm	φ10	φ16	φ25
Actuation		Double-acting type		
Working fluid		Compressed Air		
Max. working pressure	MPa	0.7		
Min. working pressure	MPa	0.3	0.2	
Proof pressure	MPa	1.05		
Ambient temperature	℃	5～60		
Port size		M5		Rc1/8
Stroke tolerance	mm	$^{+1.5}_{0}$		
Working piston speed	mm/s	50～1000		
Cushion		Shock killer		
Lubrication		Not required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is Preferred)		
Magnet holding power	N	63	166	350
Allowable energy absorption	J	2.1	5.3	8.7

7.2 Switch Specification

Type & Model	Reed switch			
Item	T0H, T0V		T5H, T5V	
Applications	For use with relay, programmable controller		For use with programmable controller relay, IC circuit (without indicator light), series connection	
Load Voltage	DC24V	AC100V	DC24V	AC100V
Load Current	5 to 50mA	7 to 20mA	50mA or less	20mA or less
Internal voltage drop	2.4V or lower		0V	
Indicator light	LED (ON lighting)		—	
Leakage current	0mA			
Lead wire length (Note 1)	Standard 1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.2mm²)			
Shock resistance	294m/s²			
Insulation resistance	20 MΩ or more measuring with DC500V megger tester			
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute			
Ambient temperature	-10 to 60℃			
Degree of protection IP	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance			

Note 1: 3m or 5m long lead wire is optionally available.

7 SPECIFICATION

Type & Model / Item	Solid state switch			
	T2H, T2V	T2YH, T2YV	T3H, T3V	T3YH, T3YV
Applications	For use with programmable controller		For use with programmable controller, relay	
Power supply voltage	—		DC10 to 28V	
Load voltage, current	DC10V to 30V 5～20mA (Note2)		DC30V or less 100mA or less	
Current consumption	—		10mA or less at DC24V (ON lighting)	
Internal voltage drop	4V or less		0.5V or less at 100mA	
Indicator light	LED (ON lighting)	LED (Red/Green) (ON lighting)	LED (ON lighting)	LED (Red/Green) (ON lighting)
Leakage current	1mA or less		10 μA or less	
Lead wire length (Note1)	Standard 1m (Oil-proof vinyl cabtyre code, 2-wire, 0.2mm²)	Standard 1m (Oil-proof vinyl cabtyre code, 2-wire, 0.3mm²)	Standard 1m (Oil-proof vinyl cabtyre code, 3-wire, 0.2mm²)	
Shock resistance	980m/s²			
Insulation resistance	20MΩ or more measuring with DC500V megger tester	10MΩ or more measuring with DC500V megger tester	20MΩ or more measuring with DC500V megger tester	10MΩ or more measuring with DC500V megger tester
Withstand voltage	No abnormalities should occur after applying AC1000V for 1 minute			
Ambient temperature	−10 to 60℃			
Degree of protection	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance			

Type & Model / Item	Solid state switch			
	T2YFH, T2YFV	T3YFH, T3YFV	T2YMH, T2YMV	T3YMH, T3YMV
Applications	For use with programmable controller	For use with programmable controller, relay	For use with programmable controller	For use with programmable controller, relay
Indicator light: Mounting position adjustment part	LED (Red/Green) (ON lighting)			
Indicator light: preventive maintenance output part	—		LED (Yellow) (ON lighting)	
Power supply voltage	—	DC10 to 28	—	DC10 to 28V
Load voltage, current	DC10V to 30V 5 to 20mA (Note2)	DC30V or less 50mA or less	DC10V to 30V 5 to 20mA (Note2)	DC30V or less 50mA or less
Current consumption	—	10mA or less	—	10mA or less
Internal voltage drop	4V or less	0.5V or less	4V or less	0.5V or less
Leakage current	1mA or less	10 μA or less	1. 2mA or less	10 μA or less
Load voltage, current	DC30V or less 20mA or less	DC30V or less 50mA or less	DC30V or less 5 to 20mA	DC30V or less 50mA or less
Internal voltage drop	0.5V or less		4V or less	2. 4V or less
Leakage current	10 μA or less			
Signal holding (T on)	—	—	Turns ON(0. 4±0. 2) seconds after the red LED turns ON at Mounting position adjustment part	
Signal release (T off)	—	—	Turns OFF(0. 7±0. 2) seconds after the red LED turns ON at Mounting position adjustment part	
Lead wire length (Note1)	Standard 1m (Oil-proof vinyl cabtyre code, 3-wire, 0.2mm²)	Standard 1m (Oil-proof vinyl cabtyre code, 4-wire, 0.2mm²)	Standard 1m (Oil-proof vinyl cabtyre code, 3-wire, 0.2mm²)	Standard 1m (Oil-proof vinyl cabtyre code, 4-wire, 0.2mm²)
Shock resistance	980m/s²			
Insulation resistance	100MΩ or more measuring with DC500V megger tester			
Withstand voltage	No abnormalities should occur after applying AC1000V for 1 minute			
Ambient temperature	−10 to 60℃			
Degree of protection	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance			

Note1 : 3m or 5m long lead wire is optionally available.