CKD

SM－10218－A

INSTRUCTION MANUAL

GUIDELESS CYLINDER

GLC 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

Thank you for adopting CKD's quality product.

For maximum results and the most effective utilization of the CKD products, it is recommended you read and understand this manual prior to installation.

This manual is edited consisting of the following six sections.

- ◇ Installation
- ◇ Caution during operation
- ◇ Maintenance
- ◇ Operational cautions of cylinder switches

It is, of course, desirable that you read this manual through before start using the product. This booklet is so edited that a certain idea will be conveyed by reading the related section only, first of all. For instance, just reading the section of the ◇ Installation, in case that an immediate installation is mandatorily required.

The measuring units shown within this manual are converted on the basis of the following formulae and approximate value is applied :

Pressure unit	$1MPa = 10.2kgf/cm^2$
Torque unit	$1N \cdot m = 0.102kgf \cdot m$
Energy unit	$1J = 0.102kgf \cdot m$

NOTE : Letters & figures enclosed within Gothic style bracket (examples such as [C2-4PP07] · [V2-503-B] etc.) are editorial symbols being unrelated with contents of the book.

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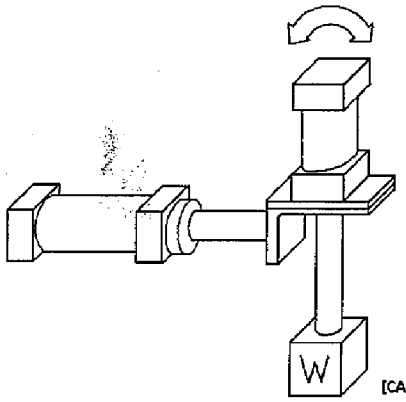
Guideless cylinder
SM 10218-A

1. INSTALLATION

1-1. Installation

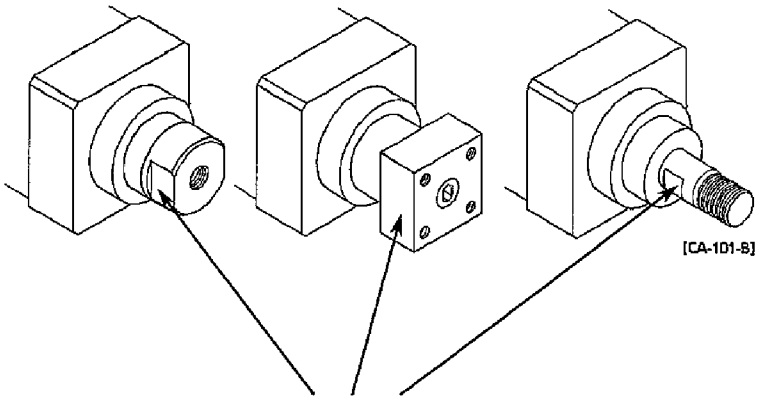
1) GLC-FA & FB

While designing the total system of long stroke, full consideration and measures have to be provided to eliminate sway of load in stroke because both GLC-FA and FB are so designed to have the cylinder mounted at the fore-and-aft ends.



2) Fixing a load

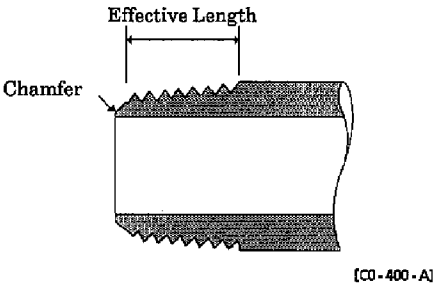
Apply a spanner or a alike at the width across flats (on a pair sides of flange, should it be a flange nose type) on the nose end of piston rod during the course of fixing a load, for the purpose of keeping piston rod from rotating due to the moment of load. An excessive retating moment onto piston rod may grow the play against rotation or sometimes may cause damage of an internal rotation preventive device.



Keep the width across flats in a fixed position. (arrow marked sides)

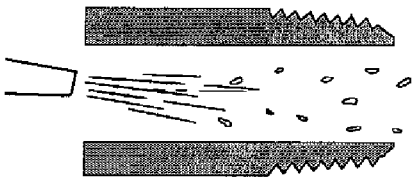
1-2. Piping

1) For piping beyond the filter, use pipes that hardly get corroded such as galvanized pipes, nylon tubes, rubber tubes, etc. (Refer to Selection Guide Table for Related Equipment.)
2) See to it that the pipe connecting cylinder and solenoid valve has effective sectional area needed for the cylinder to drive at specified speed. (Refer to Selection Guide Table for Related Equipment.)
3) Install filter preferably adjacent upper-stream to solenoid valve for eliminating rust, foreign substance and drain in the pipe.
4) Strictly observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.



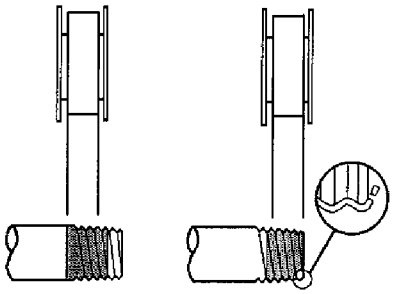
[C0-400-A]

5) Flush air into the pipe to blow out foreign substances and chips before piping.

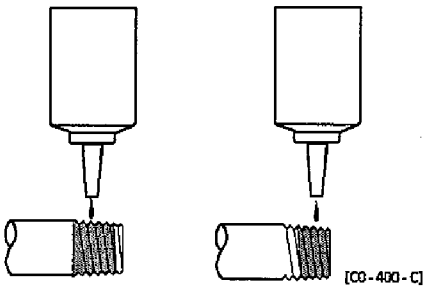

[C0-400-B]

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

● Seal Tape

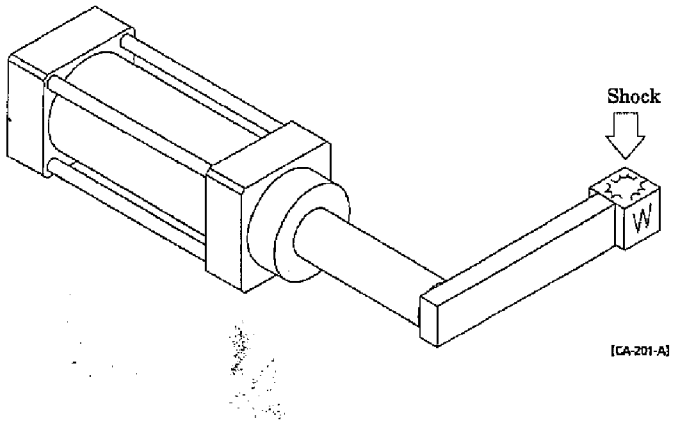

Right False

● Sealant (Paste or liquid)


[C0-400-C]
Right False

2. CAUTIONS DURING OPERATION

In case a load is mounted as per illustrated, particular care is required to prevent the shock in direction of arrow markd.



3. MAINTENANCE

3-1. Periodic Inspection

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

2) Inspection items
   ⓐ Check the bolts and nuts fitting the piston rod end fittings and supporting fittings for slackening.
   ⓑ Check to see that the cylinder operates smoothly.
   ⓒ Check any change of the piston speed and cycle time.
   ⓓ Check for internal and/or external leakage.
   ⓔ Check the piston rod for flaw (scratch) and deformation.
   ⓕ Check the stroke for abnormality.

   See 3-2, "Trouble shooting", should there be any trouble found, also carry out additional tightening if bolts, nuts, etc.are slackened

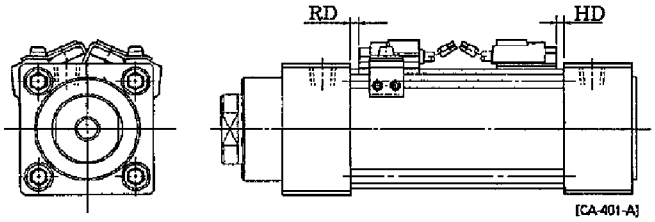
3-2. Trouble shooting and remedies

Symptoms	Possible cause	Remedies
No stroke of piston rod	No signal pulse to the direction control valve	Revise the control circuit.
	Misalignment of mounting	Readjust alignment. Revise supporting type.
	Worn-out piston packing	Replace the piston packing.
Pulsating stroke of piston rod	Misalignment of mounting	Readjust alignment. Revise supporting type.
	Transversal load	Regulate the load and speed withiin specification. Readjust alignment. Revise cylinder supporting type.
	Speed slower than minimum limit	Regulate load fluctuation narrow. Consider adopting low pressure cylinder.
	Excessive load	Raise pressure. Use tubes of larger diameter.
	Speed control valve is connected in the way of 'meter-in'.	Revise its position in the way of 'Meter-out'.
Excessive play at rod nose or play against rotation	Excessive load	Regulate the load and speed within specification.
Damage or transofrmation	Shock impact due to excessively high speed	Reduce the speed. Reduce the load. Install more efficient cushion mechanism. (externally)
	Transversal load	Reduce transversal load moment and rotating moment. Amend mounting condition. Revise cylinder supporting type.

4. OPERATIONAL CAUTIONS OF CYLINDER SWITCHES

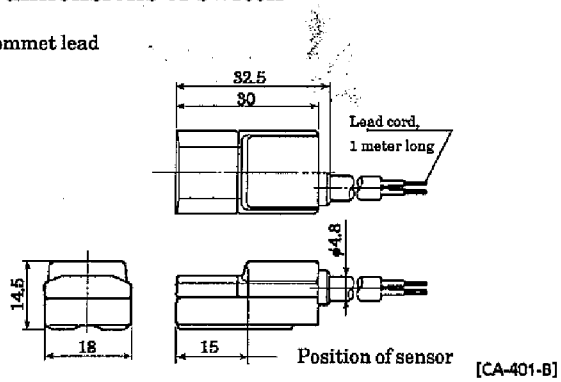
4-1. Cautions for R type switches

Mounting position of switch



External dimensions of switch

- Grommet lead



1) Switch mounting location

- For sensing at the stroke end

Install one switch at the distance of RD away from rod end and the other at the distance of HD away from cylinder head, so as to have each switch function at its most sensitive position. Fix each switch to have its lead cord opposing to the other as illustrated above.

- For sensing at an intermediate point of stroke

At first, fix the piston rod at the point where stopping rod is expected. Then slide a switch along the surface of cylinder longitudinally. Locations where switch turns ON when starts sliding from cylinder head and turning ON position when starts sliding from rod end obviously differs. Select the center between both points to install the switch.
Choose R6 type switch for high speed operation.

- Circumferential location

Once longitudinal location of installation is decided, thecircumferential location over cylinder surface doesn't matter.

2) Switch installation

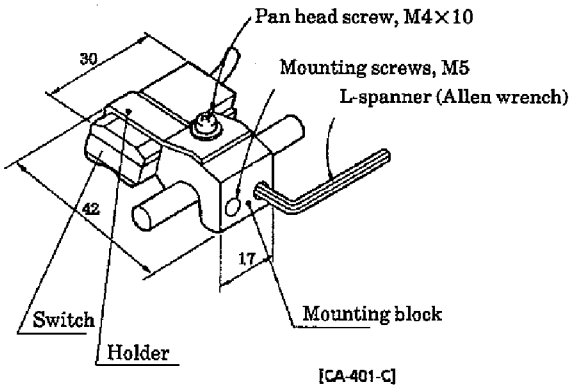
①Fix holder metal onto mounting block with a pan head screw, M4×10, while holding the metal over switch. Apply tightening torque of 1.4~1.9 N-m (14.3~19.4kgf·cm).

②Place the mounting block over tie rod after inserting two socket head screws (mounting screws). Tighten those mounting screws against tie rod while pressing switch lightly to cylinder tube at the locating where switch is to be installed. Apply tightening torque of 1.5~1.9 N·m (15.3~19.4 kgf·cm). As a rule of thumb, it is sufficient torque when L-spanner begins to warp.

3) Relocation of switch

The combination of switch and mounting block slides along tie rod without detached off the rod when two mounting screws are slightly (approx. 1/2~3/4 turn) unscrewed.

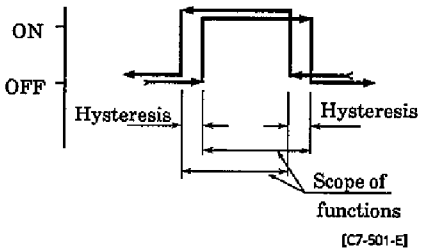
Upon selecting relocating position, tighten those two mounting screws while pressing the switch to cylinder tube. Apply tightening torque of 1.5~1.9N·m (15.3~19.4kgf·cm). As a rule of thumb, it is sufficient torque when L-spanner begins to warp.



[CA-401-C]

4) Scope of function

It is the distance of two positions where switch turns ON, as piston continues its stroke in one direction, and where switch turns OFF.



[C7-501-E]

5) Hysteresis

It is the differential distance of two points where switch turns ON, as piston travels in one direction until switch turns ON and piston reversing its stroke, until the switch turns OFF.

The most sensitive position (HD & RD), Scope of function and Hysteresis

(unit in mm)

Item / Tube bore (mm)	Proximity switches (R1, R2 & R3)				Contact switches (R0, R4, R5 & R6)			
	The most sensitive position		Scope of function	Hysteresis	The most sensitive position		Scope of function	Hysteresis
	HD	RD			HD2	RD		
ϕ40	3	0	7~17	Less than 1.5	3	0	11.5~16.5	Less than 3
ϕ50	5.5	2.5	9~17		5.5	2.5	13~18	
ϕ63	7	4.5	10~18		7	4.5	15~20	
ϕ80	14.5	7	8~19		14.5	7	15~20	
ϕ100	18.5	8.5	11~20.5		18.5	8.5	13.5~19	

A. Proximity switches (R1, R2 & R4)

1) Connection of lead cord

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 load side circuit. Wiring work while power is ON, even through there would be no erroneous connection, may also cause damage to load side circuit depending on some operational sequence.

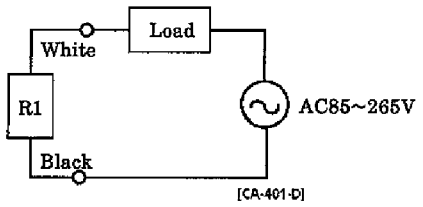


Fig.1 R1 An example of basic circuit

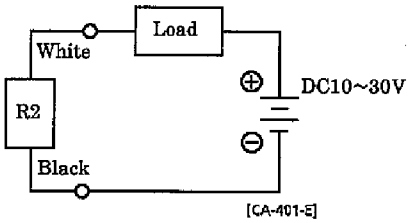


Fig.2 R1 An example of basic circuit

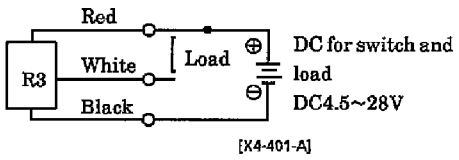


Fig.3 An example of basic circuit (1)(Power for switch and for load is on a common wire.)

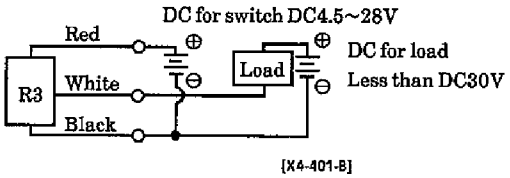
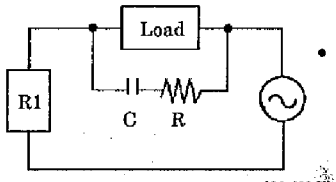


Fig.4 An example of basic circuit (2)(Power for switch and for load is independent.)

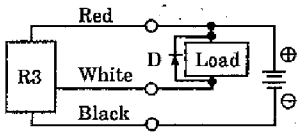
2) Protection of output circuit

- Install some protective circuit as per illustrated in Fig. 1 below when inducing type load (relay or solenoid valve) are to be used because those types are apt to generate surge current at turning switch OFF.
- Install some protective circuit as per illustrated in Fig. 2 below when capacitor type load (condenser) is to be used because this tuype is apt to generate surge current at turning switch ON.
- Install some protective circuit as per illustrated in Figs. 3. 4. or 5 respectively in case lead cord length is longer than 10m.



[CA-401-F]

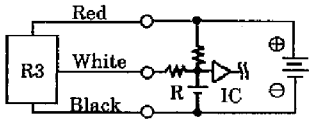
• Condenser
C=0.03~0.1μF
Resister R=1~3KΩ
Recommended : XEB1K1
Okaya Mfg. or equivalent



[X4-401-C]

• Diode
D=V06C Hitachi Mfg.
or equivalent

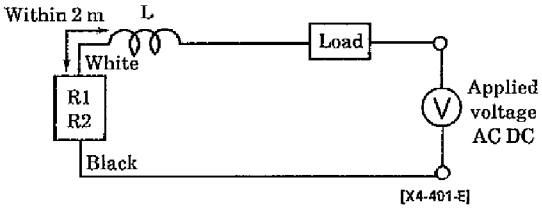
Fig.5 An example of installing a surge absorbing element.



[X4-401-D]

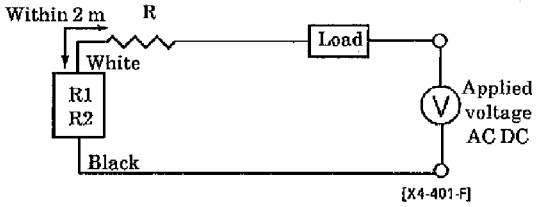
Fig. 6 An example of installing a current regulating resister R.
Compute out the value R based on the following formula.

$$\frac{V}{0.2}=R(\Omega)$$



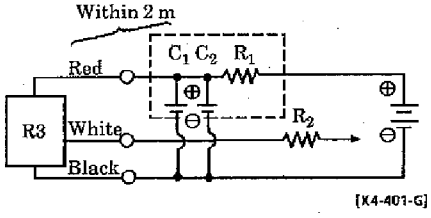
[X4-401-E]

Fig. 7 • Choke coil L
L = a couple hundred μH~a couple mH
surpassing high frequency characteristic
• Install it near by a switch (within 2 m).



[X4-401-F]

Fig.8 • Surge current restricting resistor R
R= As much large resistor as the load circuit can afford.
• Install it near by a switch. (within 2 m)



[X4-401-G]

Fig.9 • Power noise absorbing circuit
C1 = 0.01~0.1 μF
C1 = 0.01~0.1 μF ceramic condenser
R1 = 20~30Ω
• Surge current restricting condenser R2
R2 = As much large resister as the load circuit can afford.
• Install it near by a switch. (within 2 m)

3) Connection to a programmable controller (sequencer)

Type of the connection varies depending upon the model of the programmable controller. Refer to the following Figs.10~15 respectively.

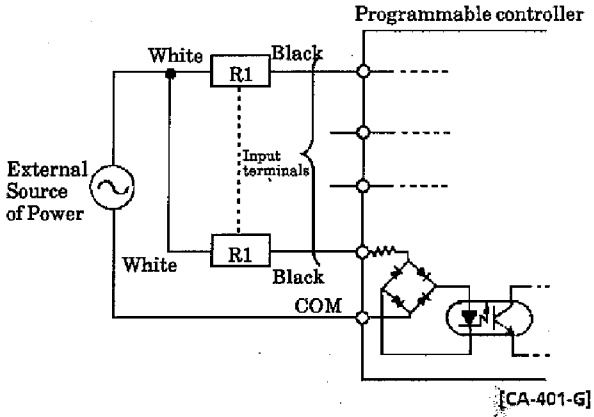


Fig. 10 An example of R1 connection to AC power input type

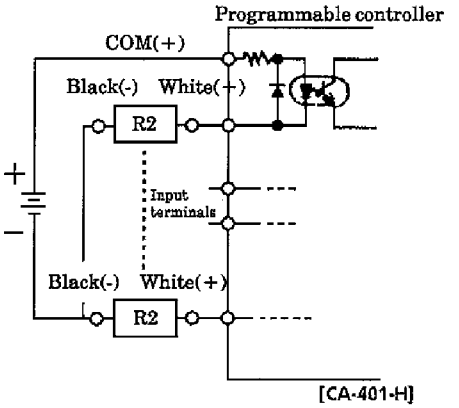


Fig. 11 An example of R2 connection to source input type (external source of power)

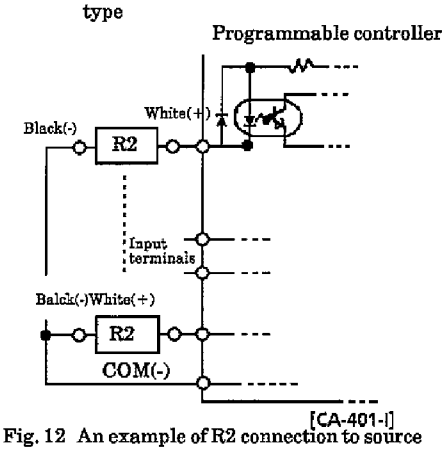


Fig. 12 An example of R2 connection to source input type (internal source of power)

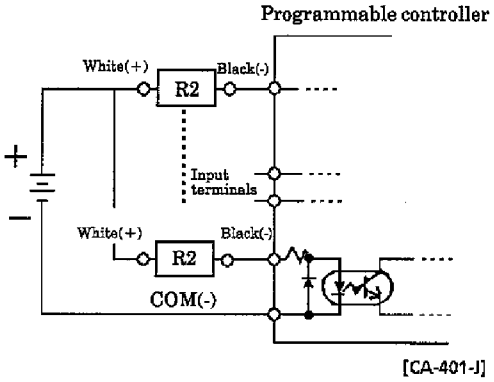


Fig. 13 An example of R2 connection to sink input type

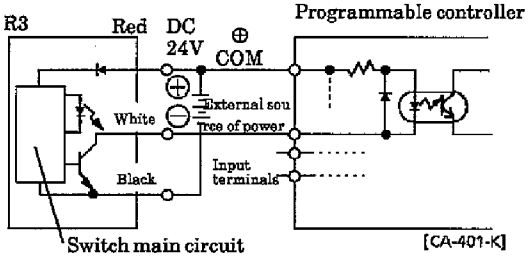


Fig.14 An example of R3 connection to source input type (external power)

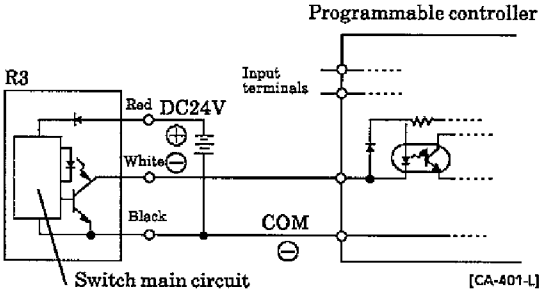


Fig.15 An example of R3 connection to source input type (internal power)

4) Series connection

Total voltage drop, in case of R1 and R2 switches connection, sums up drops of every switch . Therefore, confirm the specification of load to decide the number of switch connectable because the voltage to load side becomes the residual voltage of source of power less sum of drops. Consult us when the connection of plural number of R3 switches in series is planned.

5) Parallel connection

As for R1 and R2 switches, leak current multiplies by the number of switches. Also, once a switch in parallel connection is turned ON the rest of switches becomes incapable to turn ON until the first switch is turned OFF because voltage at both end of parallel connection drops below the required load voltage due to internal drop of the switch. It is, therefore, mandatory to confirm the input voltage of programmable controller (connected load) before deicding the operable number of switches.R3 switches, on the contrary, leak current is usually very minimal (less than 10ΩA). It does not cause any trouble so far as it is normal operation, even though leakage multiplies by the number of switches in line. Therefore, there is no incident of dim light nor no lighting lamps.

Contact switches (R0, R4, R5 &R6)

1) Lead cord connection

Make sure to connect load in series, instead of connecting lead cord for switch directly to source of power. Also, pay attention to items Ⓐ and Ⓑ below in case it is R0.

Ⓐ In the event R0 is used for DC, connect white wire to ⊕ terminal and black wire to ⊖ terminal as well. Reverse connection still makes switch function but does not light the lamp.

Ⓑ When half-wave rectification is being carried out in case it is connected to AC relay (programmable controller input), it sometimes happens no lighting the lamp. Should it be the case, lamp is lit upon reversing connection of switch lead cord.

2) Capacity of contact point

Eliminate connecting load which is excessive than the maximum contact capacity of switch. Also, there is a case of no lamp lit when electric current is below rated.

3) Protrection of lead cord

Make sure to install some contact point protective circuit as per illustrated in Fig. 1 or Fig. 2 when it is to be used with inducing type load (such as relay).

Also install some contact point protective circuit as per illustrated in Fig. 3 or Fig. 4 when lead cord exceeds the length specified in the Table 1, below.

Table1

Switch	Voltage	Length of cord
R0、5、6	DC	100m
R0、5	AC	10mm
R4	AC	50mm

4) Relays

The following models of relays are recommended.

- ○ Omron Mfg. ..... MY
- ○ Fuji Denki Mfg. HH15
- ○ Tokyo Denki Mfg. ..... MPM
- ○ Matsushita Denki Mfg. ..... HC

5) Series connection

The total voltage drop due to series connected switches sums up the voltage drop of every switch.

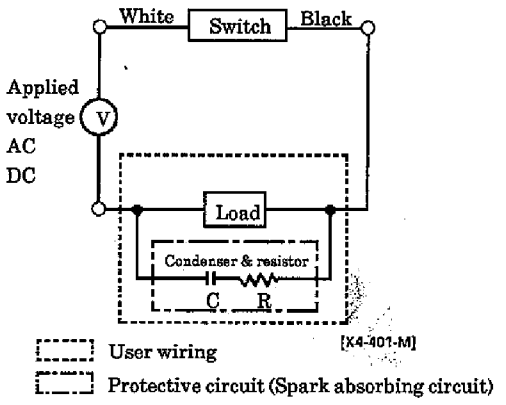
While one R0 and a couple of R5 are combined , total voltage drop falls almost eqivalent to one R0 (approx. 2.4V).

Lamp is litonly when all switches are turned ON.

6) Parallel connection

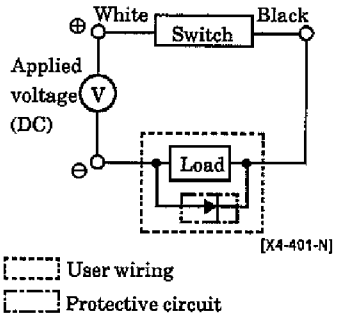
The leak current, in case of parallel connection of switches, multiplies by the number of switches. Refer load specification to deciede the number of switches the circuit is affordable.

However, it sometimes dims the light of switch or lights no lamps.



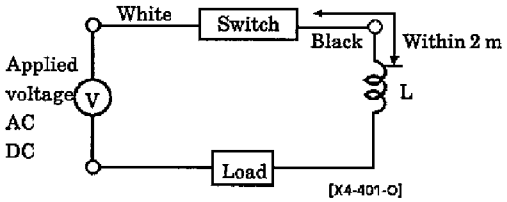
Recommended capacity
C Condenser 0.033~0.1μF
Resistor 1~3kΩ
Recommended condenser and resistor;
XEB1K1 Okaya Denki Mfg. or equivalent

Fig. 1 When condenser and resistor are connected



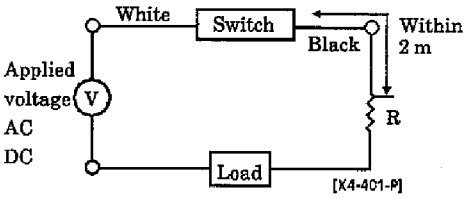
Rectifying diode, general use
V06C Hitachi Mfg. or equivalent

Fig. 2 When a diode is connected



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

Fig. 3



- Surge current restricting resistor
  R= As much large resistor as the load circuit
  can afford.
- Install it near by a switch (within 2m)

Fig. 4

Cautions common to either Contact switches or Proximity switches

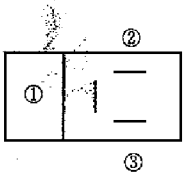
1) Magnetic environment

Avoid usage of these switches within the area where strong magnetic field or large current exists. (such as a large magnet or spot welding equipment) Position sensoring errors will be resulted when installing many cylinders with switches in parallel or magnetized piece come across the cylinder, due to intervention among each other.

2) Protection of lead cord

Pay consideration to eliminate repetitive bending stress or stretching of lead cord when installing the cord. To the moving portion, use such cord of flexibility as for building robots.

3) Wiring of terminal box



Terminal / Models	①	②	③
R0(DC)、R2、R6		+	−
R0(AC)、R1、R4、R5		±	±
R3	OUT	+	−