CKD

SM-230796-A

INSTRUCTION MANUAL

ROTARY CLAMP CYLINDER
RCC2

- 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

For Safety Use

To use this product safely, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

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 application, 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 instruction manual carefully for proper operation.

Observe the cautions on handling described in this manual, as well as the following instructions:

⚠ Precautions

- Before performing an overhaul inspection on the actuator, deactivate residual pressure completely.
- While the actuator is operating, do not step into or place hands in the driving mechanism.
- To prevent an electric shock, do not touch the electric wiring connections (exposed live parts) of the actuator equipped with a solenoid valve or switch.
  Perform an overhaul inspection with the power off. Also, do not touch these live parts with wet hands.

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RCC2

Rotary Clamp Cylinder

Manual No. SM-230796-A

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.

Apr.4.1997

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1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Rotary Clamp Cylinder matches the type No. you ordered.
2) Check the appearance for any damage.
3) Store the Rotary Clamp Cylinder in place with the seal attached to prevent any foreign matter from entering inside.

2. INSTALLATION

2.1 Installation Conditions

2.1.1 Ambient temperature

Permissible operating temperature range of the cylinder is -10 - 60 ° C. Do not use the cylinder beyond this range.

2.1.2 Securing the Rotary Clamp Cylinder

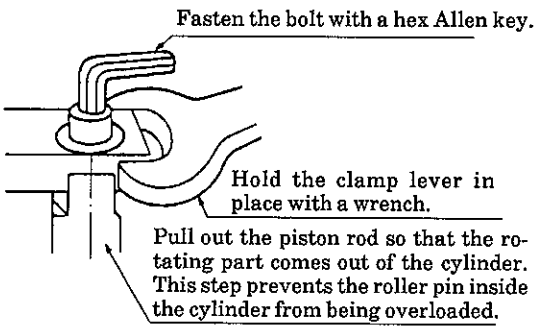
Use the bolts shown in the right table.

Type No.	Bolt diameter		
	00	FA	FB
RCC2-20	M6	M6	M6
RCC2-25	M6	M6	M6
RCC2-32	M6	M5	M5
RCC2-40	M6	M5	M5
RCC2-50	M8	M6	M6
RCC2-63	M10	M8	M8

2.1.3 Securing the clamp lever

Use the bolts shown in the right table.
Fix the clamp lever as shown in Fig. 1.

Type No.	Bolt diameter
RCC2-20	M8
RCC2-25	M8
RCC2-32	M10
RCC2-40	M10
RCC2-50	M12
RCC2-63	M16



(Fig. 1)

2.1.4 Clearance

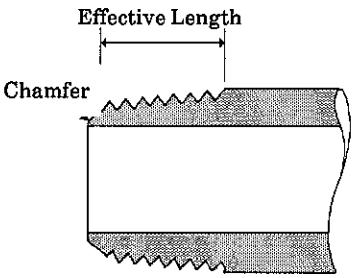
When the cylinder is activated, the piston rod rotates (90 degrees) together with the stroke motion. Make sure that the clamp lever secured in step 2.1.3 above does not interfere with any objects.

2.2 Piping

(1) Installation of an air dryer or filter is recommended for removing water in the piping. In addition, a filter should be installed near the directional control valve (primary side) to remove any rust, foreign matter, or drainage.

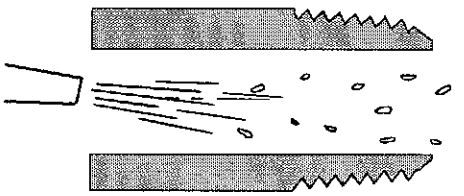
(2) The pipe between the cylinder and the directional control valve must have an effective cross section that allows output of the required piston speed in the cylinder.

(3) The pipes must be corrosive resistant. Use galvanized, stainless, nylon, or rubber pipes. Chamfer about a half pitch of the thread on each pipe end (See Fig. 2.)



(Fig. 2)

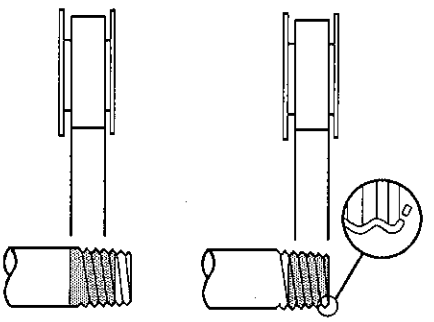
(4) Clean the pipes with an air gun to remove any foreign matter, chips, etc. in the pipes before piping assembly. (See Fig. 3.)



(Fig. 3)

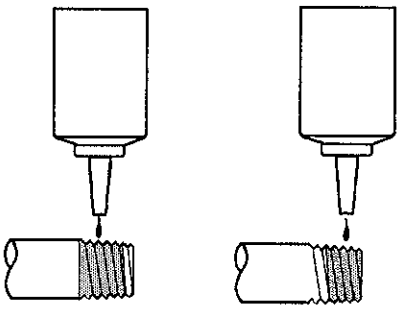
(5) When connecting a pipe to a unit component (filter, directional control valve, or rotary clamp cylinder), do not allow sealing tape or adhesive to enter inside. (See Fig. 4.)

● Seal Tape



(Right) (False)

● Sealant (Paste or liquid)

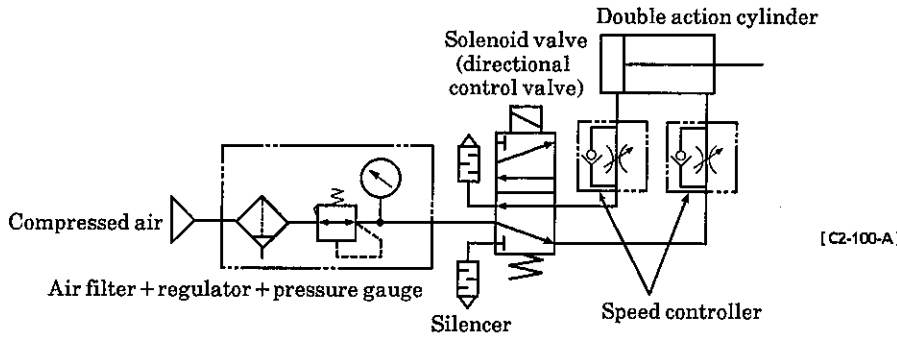


(Right) (False)

(Fig. 4)

2.3 Basic Circuit Diagram

Basic circuit diagram of a double action cylinder (See Fig. 5.)



(Fig. 5)

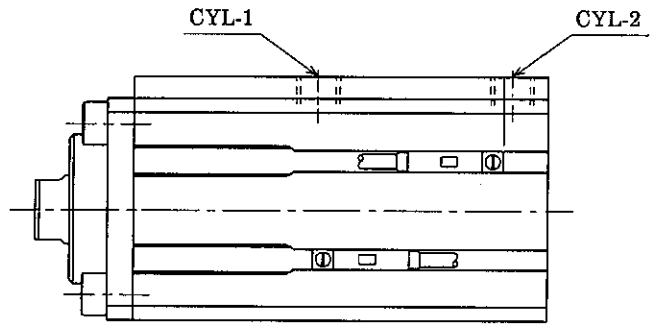
3. INSPECTION (during installation and after piping)

3.1 Appearance Inspection

(1) Make sure that all screws are fastened tightly.
(2) Make sure that the clamp lever does not interfere with the normal cylinder operation.

3.2 Leak Check

(1) Pressurize air into the CYL-1 port and check the CYL-2 port for air leakage.
(2) Pressurize air into the CYL-2 port and check the CYL-1 port for air leakage.
(3) Check the entire piping for air leakage.



4. OPERATING PROCEDURE

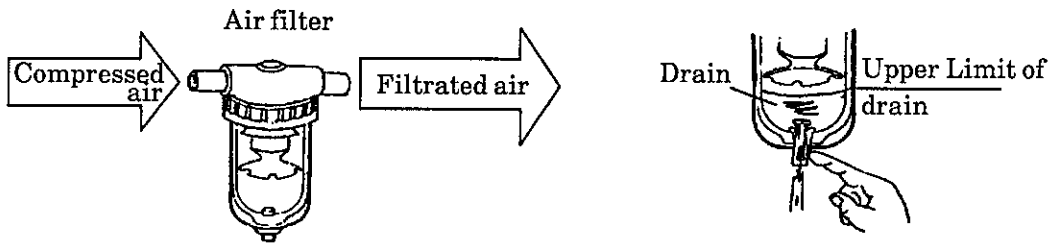
4.1 Fluid Application

(1) The Rotary Clamp Cylinder can operate without lubrication.
If lubricated use turbine oil class 1 ISOVG32 (additive-free oil) lubricant.
Continue lubrication, if lubricated. Otherwise, the life of the cylinder may be shortened if you discontinue lubrication.

CAUTION : Do not use spindle oil or machine oil.
These oils inflate packings and cause other elements to result in a malfunction of the system.

(2) If carbon oxide (carbon or tar substance) contained in the compressor oil enters the pneumatic circuit, or unit components (filter, directional control valve, and Rotary Clamp Cylinder) this may result in a malfunction.
The compressor must be inspected and maintained correctly according to the instructions provided by the manufacturer.

(3) Use clean compressed air having the least water content for driving the Rotary Clamp Cylinder. For the required air quality, install an air filter in the pneumatic circuit.
Check the air filter periodically to remove any drainage before it accumulates beyond the specified level. (See Fig. 1.)



(Fig. 1)

4.2 Handling Instructions

(1) Do not clamp a work piece during the rotation stroke. The clamping force under such conditions may not be sufficient.

Adjust the clamping position to be approx. 3 mm or more before the stroke end position. (See Fig. 2.)

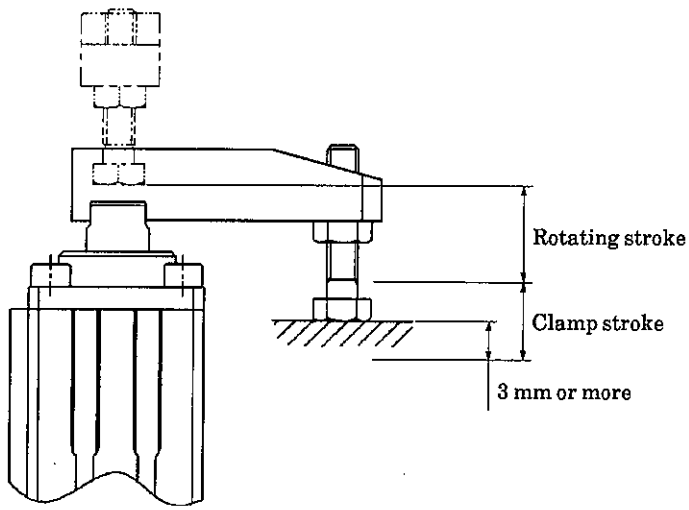
(2) For adjustment of the piston speed, install a speed control valve as shown in the basic circuit diagram in paragraph 2.3. First, close the valve (to low-speed side). Open the valve gradually to the required speed.

Note) The piston speed should be adjusted within a suitable range so that the clamp lever does not bounce at the end of rotation.

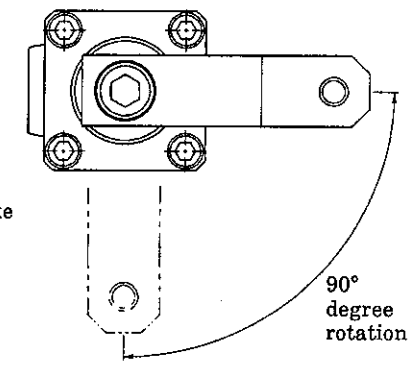
(3) Do not operate the cylinder on the exhaust side of the cylinder at atmospheric pressure. Otherwise, the rod may eject and an accident or damage to the cylinder may occur.

Be sure to start the cylinder operation after pressurizing the cylinder chamber on the exhaust side.

(4) To prevent an accident upon and during cylinder operation, do not enter or place your hand within the cylinder operation range. Since the piston rod of this cylinder system rotates the clamp lever, do not enter or place your hand within the rotation radius of the clamp lever. (See Fig. 3.)



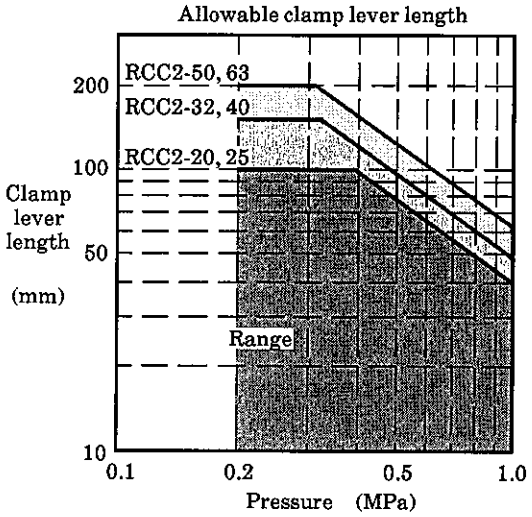
(Fig. 2)

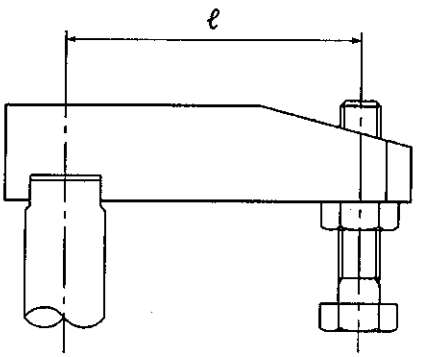


(Fig. 3)

4.3 Clamping Force and Clamp Lever Length

Set the clamping force and clamp lever length within the ranges shown in Fig. 4.

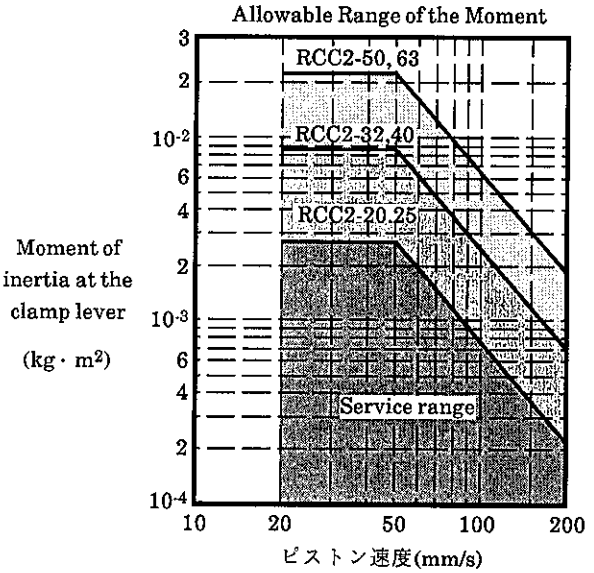




(Fig. 4)

4.4 Cylinder Piston Speed and Moment of Inertia at the Clamp Lever

- Fig. 5 shows the acceptable relationships between the cylinder piston speed and the moment of inertia at the clamp lever. Use the product always in the designated service range.

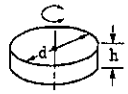
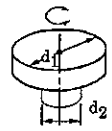
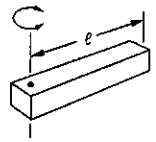
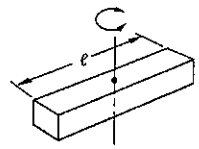
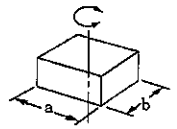
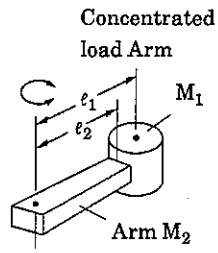


(Fig.5)

Note: The allowable range of the piston speed is between 50 and 200 (mm/s).

< Remarks >

● Calculation of the moment of inertia

Shape	Skeleton diagram	Calculated from	Inertia moment J kg · m²	Radius of rotation K_1^2	Note
Disk		● Diameter d(m) ● Mass M(kg)	$J=\frac{Md^2}{8}$	$\frac{d^2}{8}$	● Mounting direction: Any ● An additional consideration is needed if the disk is made to slide.
Disk with flange		● Diameter d_1(m) d_2(m) ● Mass d_1 M_1(kg) Mass d_2 M_2(kg)	$J=\frac{1}{8}(M_1d_1^2+M_2d_2^2)$	$\frac{d_1^2+d_2^2}{8}$	● The mass of d_2 can be ignored if it is much smaller than the mass of d_1.
Bar (rotating around the end)		● Bar length ℓ(m) ● Mass M(kg)	$J=\frac{M\ell^2}{3}$	$\frac{\ell^2}{3}$	● Mounting direction: Horizontal ● If the mounting direction is vertical, the rocking time changes.
Bar (rotating around the center)		● Bar length ℓ(m) ● Mass M(kg)	$J=\frac{M\ell^2}{12}$	$\frac{\ell^2}{12}$	● Mounting direction: Any
Rectangular solid		● Lengths of the sides a(m) b(m) ● Mass M(kg)	$J=\frac{M}{12}(a^2+b^2)$	$\frac{a^2+b^2}{12}$	● Mounting direction: Any ● An additional consideration is needed if the rectangular solid is made to slide.
Concentrated load		● Shape of the concentrated load ● Distance between the center of rotation and the center of gravity of the concentrated load ℓ_1(m) ● Arm length ℓ_2(m) ● Mass of the concentrated load M_1(kg) ● Mass of the arm M_2(kg)	$J=M1(\ell_1^2+K_1^2)+\frac{M_2\ell_2^2}{3}$	K_1^2 is determined by the shape of the concentrated load	● Mounting direction: Horizontal ● M_2 can be ignored if it is much smaller than M_1.

5. SWITCH ARRANGEMENT

5.1 Switch Specifications

(1) Types and applications of switches

Item / Type No.			Application
Proximity type	2-core	T2H · T2V	For DC programmable controller, exclusive
	3-core	T3H · T3V	For DC programmable controller or Relay
Contact point type	2-core	T0H · T0V	For AC/DC Relay or programmable controller
		T5H · T5V	for AC/DC programmable controller, relay or IC circuit (not including Lamp), for Series connection
2-color indicating, proximity type	2-core	T2YH · T2YV	For DC programmable controller, exclusive
	3-core	T3YH · T3YV	For DC programmable controller or relay
Proximity type w/prev. maintenance output	3-core	T2YFH · T2YFV	For DC programmable controller, exclusive
	4-core	T3YFH · T3YFV	For DC programmable controller or relay
	3-core	T2YMH · T2YMV	For DC programmable controller, exclusive (self holding)
	4-core	T3YMH · T3YMV	For DC programmable controller or relay (self holding)
Non-contact switch with ferromagnetic field resistance	2-core	T2YD · T2YDT	Only for DC programmable controller
Non-contact switch with cutting oil resistance	2-core	T2YLH · T2YLV	
	3-core	T3YLH · T3YLV	

Note 1: T※H indicates type with a straight lead. T※V indicates type with a L-shaped lead.

(2) Switch specifications

Kind and Model code / Item	Contact point switch	
	T0H · T0V	T5H · T5V
Application	For Relay or Programmable controller	For AC/DC programmable controller, relay or IC circuit (not including Lamp), for Series connection
Voltage of source of power	——	
Load voltage and current	DC12/24V, 5 - 50mA AC100V, 7 - 20mA	DC12/24V, 50mA or less AC100V, 20mA or less
Power consumption	——	
Internal voltage drop	2.4V or lower	0V
Lamp	LED (Lights while power is ON)	——
Current leak	0	
Length of lead cord (※1)	Standard 1m (Oil proof vinyl, Cabtyre cord, 2-core, 0.2mm^2)	
Max. shock	294m/s^2{30G}	
Insuration resistance	20MΩ or more by DC 500V megger	
Insuration voltage	No abnormalities upon charging AC1000V for one minute.	
Ambient temperature	−10 - + 60°C	
Protective structure	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof	

Kind and Model code	Proximity Switch			
Item	T2H · T2V	T2YH · T2YV	T3H · T3V	T3YH · T3YV
Application	For Programmable controller, exclusive		For Programmable controller or Relay	
Voltage of source of power	——		DC10 - 28V	
Load voltage and current	DC10 - 30V 5 - 25mA (※ 2)		DC 30V or lower, 100mA or less	DC 30V or lower, 50mA or less
Power consumption	——		10mA or less at DC24V (While Power is ON)	
Internal voltage drop	4V or less		0.5V or less by 100mA	0.5V or less
Lamp	LED (Lights while power is ON)	LED (Red/Green) (Lights while power is ON)	LED (Lights while power is ON)	LED (Red/Green) (Lights while power is ON)
Current leak	1 mA or less		10μA or less	
Length of lead cord (※1)	Standard 1m (Oil proof vinyl, Cabtyre cord, 2-core, 0.2mm^2)		Standard 1m (Oil proof vinyl, Cabtyre cord, 3-core, 0.2mm^2)	
Max. shock	980m/s^2{100G}			
Insuration resistance	20MΩ or more by DC 500V megger	100MΩ or more by DC 500V megger	20MΩ or more by DC 500V megger	100MΩ or more by DC 500V megger
Insuration voltage	No abnormalities upon charging AC1000V for one minute.			
Ambient temperature	−10 - +60°C			
Protective structure	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof			

Kind and Model code		Proximity 3-core type	Proximity 4-core type	Proximity 3-core type	Proximity 4-core type
Item		T2YFH/V	T3YFH/V	T2YMH/V	T3YMH/V
Application		for Programmable controller	for Programmable controller or Relay	for Programmable controller	for Programmable controller or Relay
Indicator	Mounting position adjustment part	Red/Green LED (Lights while power is ON)			
	Preventive maintenance output part	——		Yellow LED (Lights while power is ON)	
Normal output Segment	Power voltage	——	DC10 - 28V	——	DC10 - 28V
	Load voltage	DC10 - 30V	DC30V or lower	DC10 - 30V	DC30V or lower
	Load current	DC5 - 20mA	DC50mA or less	DC5 - 20mA	DC50mA or less
	Internal voltage drop	4V or lower	0.5V or lower	4V or lower	0.5V or lower
	Current consumption	——	10mA or less	——	10mA or less
	Leak current	1mA or less	10μA or less	1.2mA or less	10A or less
Preventive maintenance Segment	Load voltage	DC30V or lower			
	Load voltage	DC20mA or less	DC50mA or less	DC5 to 20mA or less	DC50mA or less
	Internal voltage drop	0.5V or lower		4V or lower	2.4V or lower
	Leak current	10μA or lower			
	Signal holding (Ton)	——	——	Turns ON (0.4±0.2) seconds after the red LED turns ON at Mounting position adjustment part	
	Signal release (Toff)	——	——	Turns OFF (0.7±0.2) seconds after the red LED turns ON at Mounting position adjustment part	
Length of lead cord (※1)		1m (Oil proof vinyl, Cabtyre cord, 3-core, 0.2m^2)	1m (Oil proof vinyl, Cabtyre cord, 4-core, 0.2m^2)	1m (Oil proof vinyl, Cabtyre cord, 3-core, 0.2m^2)	1m (Oil proof vinyl, Cabtyre cord, 4-core, 0.2m^2)
Insuration resistance		100MΩ or more by DC 500V megger			
Insuration voltage		No abnormalities upon charging AC1000V for one minute.			
Max. shock		980m/s^2{100G}			
Ambient temperature		−10 - +60°C			
Protective structure		JIS C0920 (Intrusion type without water), IP67, Oil proof			

Note 1 : Optional 3m and 5m leads are available.

Note 2 : The max. load current value 25 mA shown above is measured at 25°C. If ambient temperature during the use of the switch is higher than 25°C, the current value is lower than 25mA (5 - 10mA at 60°C)

Kind and Model code / Item	Proximity Switch	
	T2YLH · T2YLV	T3YLH · T3YLV
Application	For Programmable controller, exclusive	For Programmable controller or Relay
Voltage of source of power	——	DC10 - 28V
Load voltage and current	DC10 - 30V 5 - 20mA	DC 30V or lower, 50mA or less
Power consumption	——	10mA or less at DC24V (While Power is ON)
Internal voltage drop	4V or less	0.5V
Current leak	1 mA or less	10μA or less
Lamp	Red/Green LED (Lights while power is ON)	
Length of lead cord (※1)	Standard 1 m (Oil proof vinyl, Cabtyre cord, 2-core, 0.3 mm²)	Standard 1 m (Oil proof vinyl, Cabtyre cord, 3-core, 0.2 mm²)
Insuration resistance	100MΩ or more by DC 500V megger	
Insuration voltage	No abnormalities upon charging AC1000V for one minute.	
Max. shock	980m/s² {100G} 4.5 - 9.5mm (SCM-ϕ20 - ϕ40)	
Operating range	5.5 to 11.5mm (SCM-ϕ50 - ϕ100) 3 - 8mm (SSD-ϕ12 - ϕ32)、5 - 10mm (SSD-ϕ40 - ϕ100)	
Hysteresis	1.5mm or less	
Ambient temperature	−10 - 60°C	
Storage ambient temperature	−20 - 80°C	
Protective structure	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof	

Note 1 : The standard length is 1 m. Optional 3m and 5m leads are available. Refer to "Type No. Coding System".

Kind and Model code / Item	Proximity Switch
	T2YD
Application	For Programmable controller, exclusive
Lamp	Red/Green LED (Lights while power is ON)
Load voltage	DC24±10%
Load current	5 - 20mA
Internal voltage drop	6V or less
Current leak	1.2mA or less
Output delay time (Note 1) (ON delay and OFF delay)	30 - 60ms
Length of lead cord (standard) (※2)	Standard 1m (Oil proof vinyl, Cabtyre cord, 2-core,0.5mm²)
Insuration resistance	100MΩ or more by DC 500V megger
Insuration voltage	No abnormalities upon charging AC1000V for one minute.
Max. shock	980m/s² {100G}
Ambient temperature	−10 - +60°C
Protective structure	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof

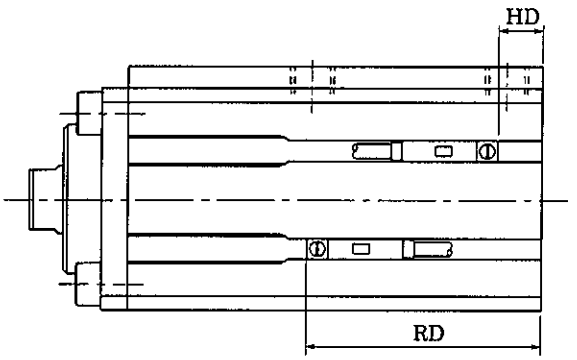
Note 1 : Indicates the time between the detection of piston magnet by magnetic sensor and the switch output.
Note 2 : An optional flame-resistant cabtyre cable is also available.

5.2 Switch Installation Position

(1) Switch installation position

① Installation at stroke ends

For activation of the switch at max. sensitivity positions, install the switches by measuring the RD dimension on the rod side and the HD dimension on the head side. (See Table 1.)



- How to change a switch position

  Loosen the set screw and slide the switch along the cylinder tube. Fasten the set screw to fix the switch in position.

- How to replace a switch

  Loosen the set screw and pull the switch out of the groove. Insert a new switch in the groove and determine the position as specified. Then, fasten the set screw.(Refer to Table 1 for the fastening torque of the set screw.)

(2) Operating range

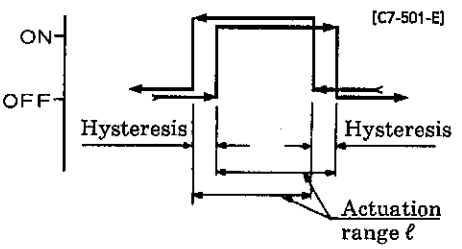
① Operating range is the positional range between ON and OFF of a switch actuated by the piston moving in the same direction.

② The center position of the operating range provides a switch with the max. sensitivity. Setting this position as the piston-stop point stabilizes the function of the switch with the least disturbance.

(3) Hysteresis

① Hysteresis is the distance between a switch ON position where the piston activates the switch and a switch OFF position where the piston moves in the opposite direction to deactivate the switch.

② Note that if the piston stops within this gap, the function of the switch becomes unstable under the influence of disturbance.



Max. Sensitivity Position (HD and RD) and Fastening Torque of Set Screw

(Unit in mm)

Item / Tube bore (mm)	T0H/V※, T5H/V※			T2H/V※, T3H/V※		
	Maximum sensitive position		Tightening torque (N·m)	Maximum sensitive position		Tightening torque (N·m)
	HD	RD		HD	RD	
ϕ20	5.5	26.5+ST	0.1 - 0.2	6.5	25.5+ST	0.1 - 0.2
ϕ25	5.0	26.0+ST		6.0	25.0+ST	
ϕ32	8.0	29.0+ST		9.0	28.0+ST	
ϕ40	9.0	30.0+ST		10.0	29.0+ST	
ϕ50	10.0	31.0+ST		11.0	30.0+ST	
ϕ63	18.0	38.0+ST		19.0	37.0+ST	

Item / Tube bore (mm)	T2YH/V※, T3YH/V※			T2YFH/V※, T3YFH/V※		
	Maximum sensitive position		Tightening torque (N·m)	Maximum sensitive position		Tightening torque (N·m)
	HD	RD		HD	RD	
ϕ20	5.5	26.5+ST	0.5 - 0.7	5.5	26.5+ST	0.5 - 0.7
ϕ25	5.0	26.0+ST		5.0	26.0+ST	
ϕ32	8.0	29.0+ST		8.0	29.0+ST	
ϕ40	9.0	30.0+ST		9.0	30.0+ST	
ϕ50	10.0	31.0+ST		10.0	31.0+ST	
ϕ63	18.0	38.0+ST		18.0	38.0+ST	

Item / Tube bore (mm)	T2YMH/V※, T3YMH/V※			T2YD※		
	Maximum sensitive position		Tightening torque (N·m)	Maximum sensitive position		Tightening torque (N·m)
	HD	RD		HD	RD	
ϕ20	5.5	26.5+ST	0.5 - 0.7	5.5	26.5+ST	0.5 - 0.7
ϕ25	5.0	26.0+ST		5.0	26.0+ST	
ϕ32	8.0	29.0+ST		8.0	29.0+ST	
ϕ40	9.0	30.0+ST		9.0	30.0+ST	
ϕ50	10.0	31.0+ST		10.0	31.0+ST	
ϕ63	18.0	38.0+ST		18.0	38.0+ST	

(Table 1)

5.3 OPERATIONAL CAUTIONS OF SWITCHES

5.3.1 General Cautions

(1) Magnetic environment

Ferromagnetic-resistant switches are recommended if there is a strong magnetic field or a large current (such as a large magnet or spot welding machine) near the system installation position. Note that if several cylinders with switches are installed in parallel close to each other or if there is a magnetic object traveling near the cylinder, the detection accuracy of the switches may be affected due to magnetic interference.

(2) Protection of lead cord

Pay consideration to eliminate bending stress or stretching of the lead cord while laying the cord. For the moving portion, use a cord of flexibility as for building a robot.

(3) Service temperature

It is unsuitable to operate in high temperatures (above 60°C) due to thermal characteristics of magnetic parts and electronic parts. Eliminate operation in such high temperatures.

(4) Intermediate position sensing

Beware of unstable responses of relay when piston speed is excessive in the event of intending actuation of switch in the way of piston stroke.

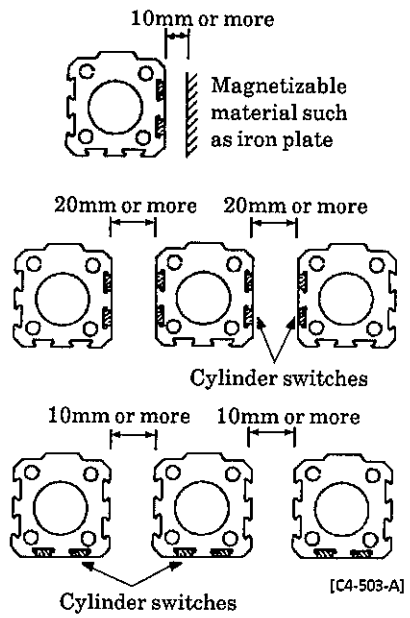
(Example) Operate cylinder with a speed of less than 500mm/s in case the relay actuation time is 20ms.

(5) Shock

Carefully avoid big shocks or vibrations during transportation of the cylinder or mounting and adjusting the switch.

(6) Magnetizable material such as an iron plate nearby the cylinder switch is apt to cause malfunction of the cylinder switches. Keep it at least 10mm away from the cylinder surface.
(This is applicable for all bore sizes of tube.)

(7) It usually causes malfunction of the cylinder switches when plural cylinders are laid adjacent. Keep a space between them as illustrated to the right.
(This is applicable for all bore sizes of tube)



5.3.2 Operational Cautions, Proximity switch

(T2H/V, T2YH/V, T2YF/M H/V, T3H/V, T3YH/V, T3YF/M H/V, T2YLH/V, T3YLH/V, T2YD)

(1) Modified colors of leads

As a result of revision in the JIS Standards related with the proximity switches, colors of wires of cylinder switches together with signals have been modified. Before wiring, refer to the relevant document to ensure correct matching between the colors of wires and signals. In this instruction manual, color designations in the old standard are indicated in parenthesis in addition to the new designations.

(2) Connection of lead cord

Comply with the color coding specified on the illustrations. Be sure to turn the power off before starting connecting work.

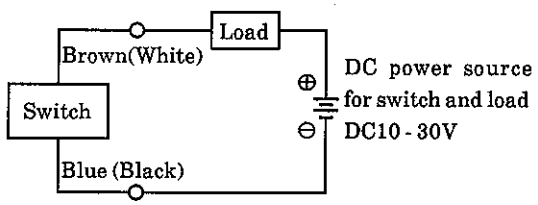


Fig. 1 T2(Y) Basic Circuit Example

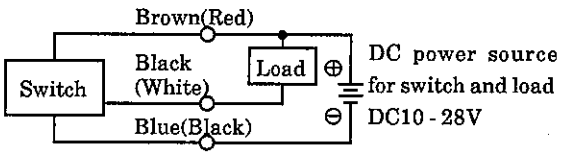


Fig. 2 T3(Y) Basic Circuit Example (1)
(The same power source is used for switch and load.)

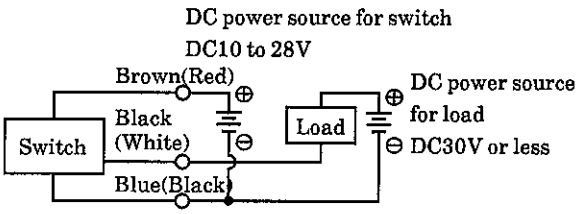


Fig. 3 T3(Y) Basic Circuit Example (2)
(Different power sources are used for switch and load.)

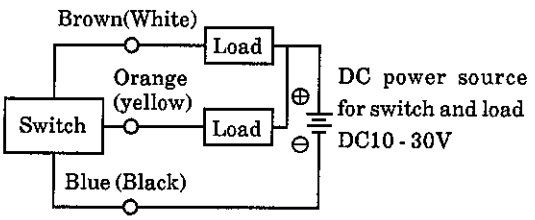


Fig. 4 T2YF/M Basic Circuit Example

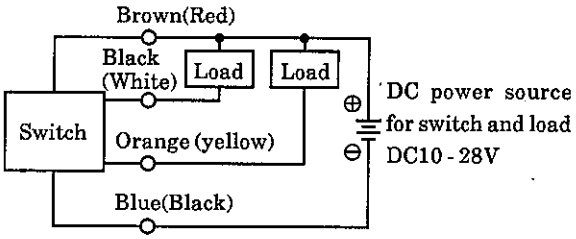


Fig. 5 T3YF/M Basic Circuit Example (1)
(The same power source is used for switch and load.)

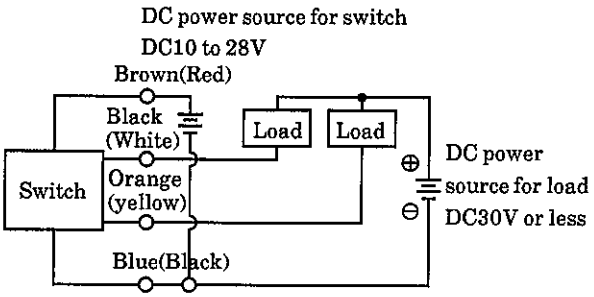


Fig. 6 T3YF/M Basic Circuit Example (1)
(Different power sources are used for switch and load.)

(3) Protection of output circuit

Provide a contact protection circuit in any of the following cases to prevent damage to switches and to protect the service life of switches.

- 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(Y)) and Fig 11 (in case of model T3(Y))

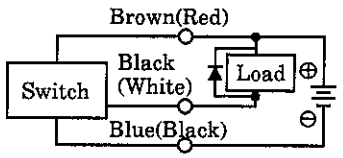


Fig. 7 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.

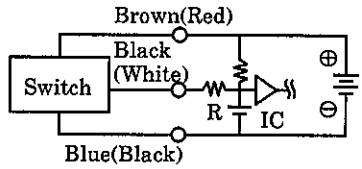


Fig. 8 An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R.

$$\frac{V}{0.10} = R(\Omega)$$

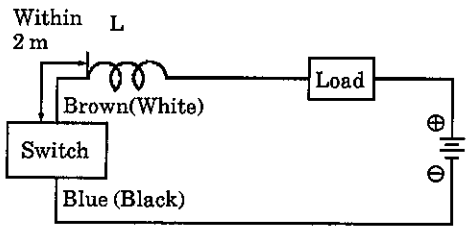


Fig. 9 • Choke coil L

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

• Install it nearby the switch (within 2 m).

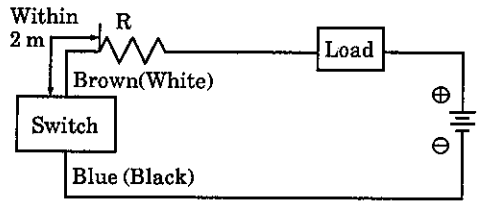


Fig. 10 • Dash current restriction resister R

R = As much large resister as the load circuit can afford.

• Install it nearby the switch (within 2 m).

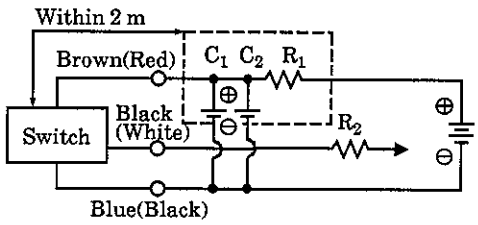


Fig. 11

- Electric power noise absorptive circuit C1
  C_1 = 20 to 50μF electrolytic capacitor (withstanding 50V or more)
  C_2 = 0.01 to 0.1μF ceramic capacitor
  R_1 = 20 to 30Ω
- Dash current restriction resister R2
  R_2 = As much large resister as the load circuit can afford.
- Install it nearby the switch (within 2 m).

(4) 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.

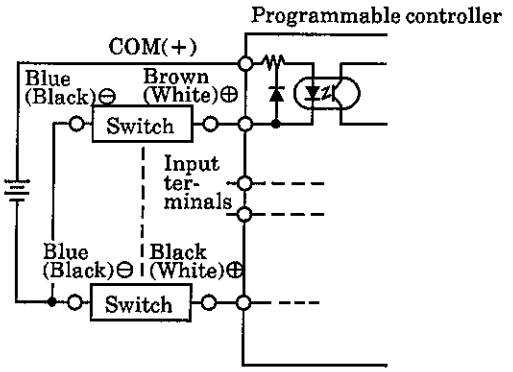


Fig. 12 An example of T2 connection to source input type (an external power source)

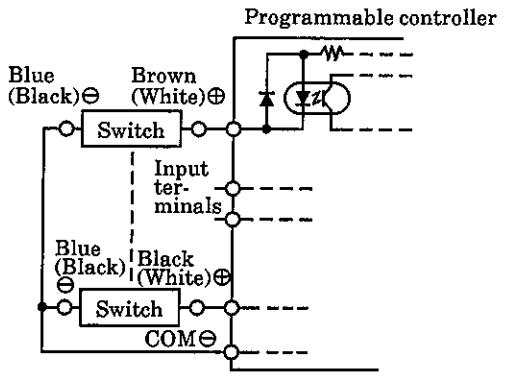


Fig. 13 An example of T2 connection to source input type (an internal power source)

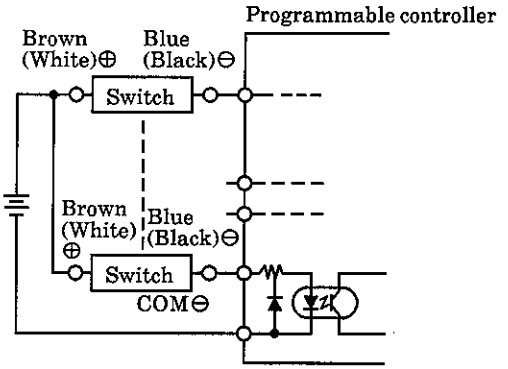


Fig. 14 An example of T2 connection to sink input type (an internal power source)

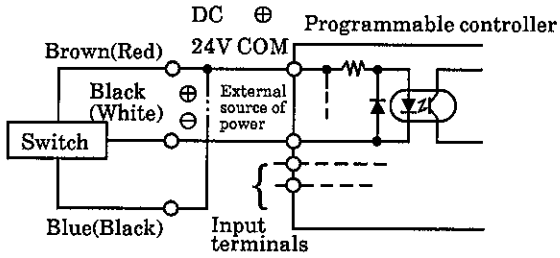


Fig. 15 An example of T3 connection to source input type (an external power source)

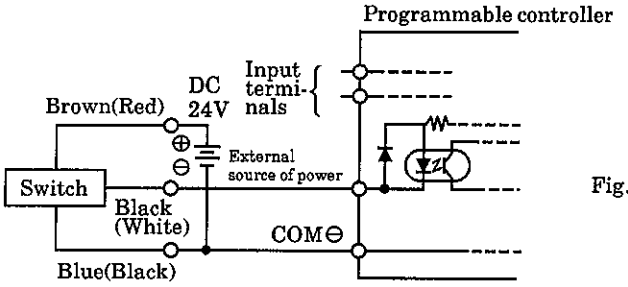


Fig. 16 An example of T3 connection to source input type (an internal power source)
A T3 switch cannot be connected with a sink input type programmable controller.

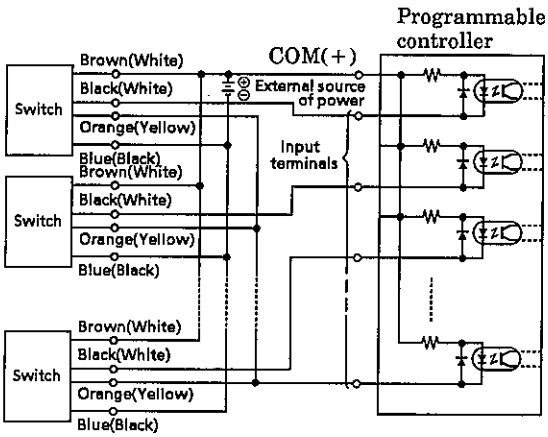


Fig. 17 Connection of T3YF/M with a source input type programmable controller (with an external power source)

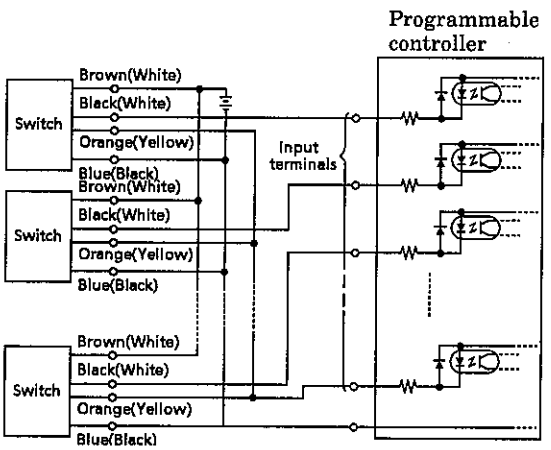


Fig. 18 Connection of T3YF/M with a source input type programmable controller (with a built-in power source)

(5) Series connection

① In a series connection of several 2-wire type switches, the voltage drop from the switches is the total of the voltage drop caused by the respective switches that are connected. The voltage applied to the load side is the source voltage minus the voltage drop from the switches. Determine the number of switches by checking the input specifications of the programmable controller as a load in the circuit.

② In a series connection of several 3-wire type switches, the voltage drop from the switches is the total of the voltage drop of the respective switches connected as in the case of 2-wire type switches. The current that flows through the switches is the current consumption of all the connected switches plus the load current as shown below. Check the specifications of the load and determine the number of switches so that the total current will not exceed the max. load current of the switches. The lamps will illuminate only when all switches are turned on.

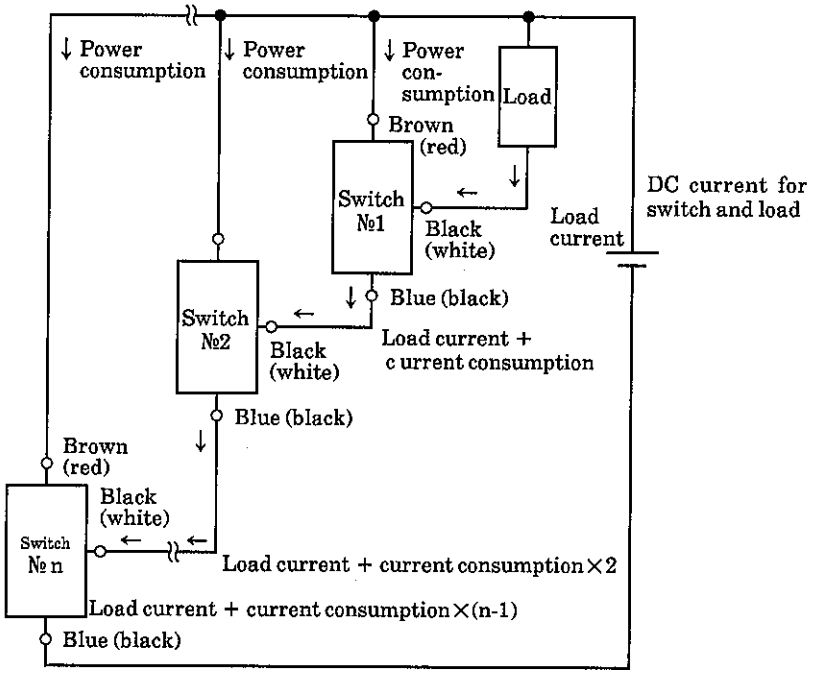


Fig. 19

(6) Parallel connection

In the case of 2-wire type switches, leakage current increases with the number of connected switches. Check the input specifications of the programmable controller as a load in the circuit to determine the number of switches. Occasionally the lamps may become dimmed or may not illuminate at all. During the period from ON to OFF of the switch, the voltage on both ends of the switches connected in parallel decreases to the internal voltage drop level that is lower than the load voltage range. As a result, other switches are not turned on. Check the input specifications of the programmable controller as a load in the circuit. In the case of 3-wire type switches, leakage current increases with the number of connected switches. However, since the level of leakage current is extremely low (10 μA or less), the leakage is not a problem under normal use. A 3-wire type switch is free from lamp failure including dimming.

5.3.3 Operational Cautions, Contact point switch (Model T0H/V & T5H/V)

(1) Modified colors of leads

As a result of revision in the JIS Standards related with the proximity switches, colors of wires of cylinder switches together with signals have been modified. Before wiring, refer to the relevant document to ensure correct matching between the colors of wires and signals. In this instruction manual, color designations in the old standard are indicated in parenthesis in addition to the new designations.

(2) Connection of lead cord

Instead of connecting the cord to the power source directly, always connect to the load in series. In case of model T0 connection, pay attention to the following items Ⓐ and Ⓑ.

Ⓐ For DC connection, use such polarities of cords as Brown ⊕ and Blue⊖. The switch still functions right with reversed polarities but lamp is not lit.

Ⓑ For AC connection to either relay or input terminal to programmable controller, Switch lamp sometimes is not lit in case when half-wave rectification is being carried out. Lamp is lit, in this occasion, when polarities of cords for switch is reversed.

(3) Capacity of contact points

Avoid using a load exceeding the max. capacity of contact points. On the other hand, in case of T0 model, switch lamp may not be lit sometimes when current is lower than the rated current.

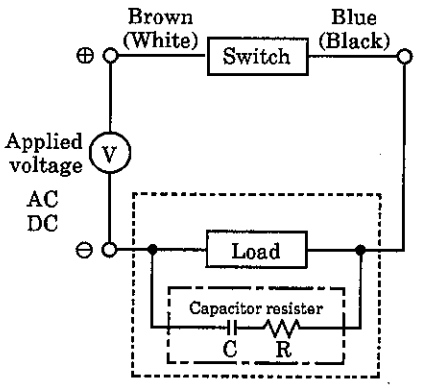
(4) Protection of contact point

Install such a protective circuit as illustrated in either Fig 20 or 21, as follows, when inducing a type load such as a relay is to be used.

Provide a contact protection circuit as shown in Figs. 22 and 23 if the wiring length exceeds the length shown in Table 2.

Table 2

Voltage	Wire length
DC	50m
AC	10m

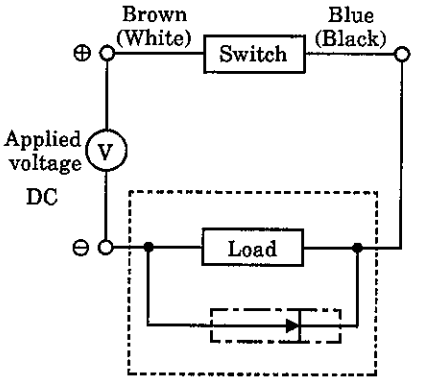


User circuit

Protective circuit (Spark absorbing circuit)

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

Fig. 20 When capacitor resister is used.

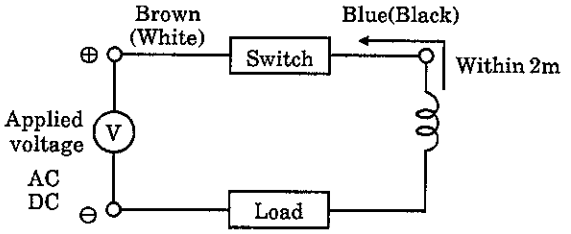


User circuit

Protective circuit

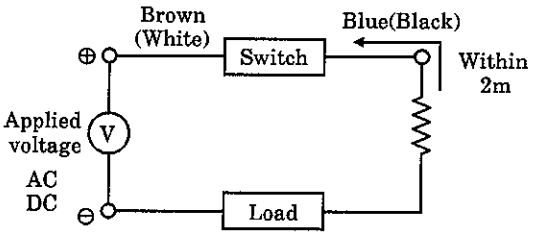
Rectifying diode, general use
Hitachi Mfg. product V06C or equivalent

Fig.21 When diode is used.



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

Fig. 22



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

Fig. 23

(5) Relay

Use such products as specified below or equivalent.

- ◦ OMRON Corporation ..... Model MY
- ◦ FUJI ELECTRIC CORP ..... Model HH5
- ◦ Matsushita Electric Works Ltd. Model HC

(6) Series 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. Lamp is lit only when all switches turn on.

(7) 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 lamp or complete lamp failure.

6. MAINTENANCE

6.1 Maintenance and Inspection

6.1.1 Daily inspection

(1) Confirm whether drainage accumulates in the air filter.
Draw the drainage off if any.
(2) Using a pressure gauge, confirm that the regulator pressure is proper.
Correct the set pressure value if it is not proper.

6.1.2 Periodical inspection

Perform periodical inspection once or twice a year to ensure the best performance of the cylinder.

(1) Confirm that the piston rod end fixture and the mounting bracket fixing bolt and nut are tightened firmly.
(2) Confirm that the piston moves smoothly.
(3) Confirm that the piston speed and the cycle time remain unchanged.
(4) Inspect the cylinder for any external or internal leakage.
(5) Inspect the piston rod for any damage or deformation.
(6) Confirm that the stroke is proper.
(7) Check the sliding parts (rod cover guide groove, bearing, etc.) for excessive wear.

If something wrong is discovered with any of the parts described in (2) - (7) above, overhaul and repair it.

Parts to be subject to overhaul

- Inside of the cylinder tube for flaws, peeling of metallic coating or rust
- Surface of the piston rod for flaws, peeling of metallic coating or rust
- Joint between the piston and the piston rod for looseness
- Piston packing and rod packing for flaws or wear
- All sliding parts (rod cover guide groove, bearing, etc.) for flaws or wear

If any of the parts are not repairable, replace them.

6.2 Consumable Parts

Tube bore (mm) / Part name / Kit No.	Part No.	①	②	③	④
		Coil scraper	Rod packing	Piston packing	Cylinder gasket
ϕ20	RCC2-20K	MDH-12	PDU-12Z	PPD-20	AS568-018
ϕ25	RCC2-25K	MDH-12	PDU-12Z	PPD-25	AS568-020
ϕ32	RCC2-32K	MDH-16	PDU-16Z	PPD-32	AS568-025
ϕ40	RCC2-40K	MDH-16	PDU-16Z	PPD-40	AS568-029
ϕ50	RCC2-50K	MDH-20	PDU-20Z	PPD-50	AS568-032
ϕ63	RCC2-63K	MDH-25	PDU-25Z	PPD-63	AS568-036

Tube bore (mm) / Part name / Kit No.	Part No.	⑤	⑥	⑦
		Cushion rubber (R)	Cushion rubber (H)	Wear ring
ϕ20	RCC2-20K	F4-116102	F4-659112	F4-125610
ϕ25	RCC2-25K	F4-116103	F4-659113	F4-161716
ϕ32	RCC2-32K	F4-659049	F4-659049	F4-654960
ϕ40	RCC2-40K	F4-659039	F4-659039	F4-650239
ϕ50	RCC2-50K	F4-659026	F4-659026	F4-650240
ϕ63	RCC2-63K	F4-659069	F4-659069	F4-650241

7. DISASSEMBLY AND ASSEMBLY

7.1 Disassembly Procedure

Referring to the inside structure drawing shown in 7.3 and following the procedure below, disassemble the cylinder.

(1) Cut off the air supply, and release the residual air in the pneumatic circuit by means of a residual pressure release valve.

(2) Disconnect the air piping, and unfasten the mounting bolts to remove the cylinder.

(3) Unfasten the four hexagon socket bolts ①. The rod cover assembly ⑥, the piston assembly ② and the cylinder body assembly ⑩ can be removed.

(4) Remove the packings and the O-rings.
Because they are of an inset type, remove them with care so as not to damage them.

7.2 Assembly Procedure

(1) Clean each part.
Inspect the packings and the O-rings for breakage or damage.

(2) After cleaning, assemble the parts by reversing the disassembly procedure exercising proper care.
A damaged packing or O-ring will cause a malfunction or air leakage. Apply a lithium base grease to the packings, O-rings, rod cover guide groove and rollers.

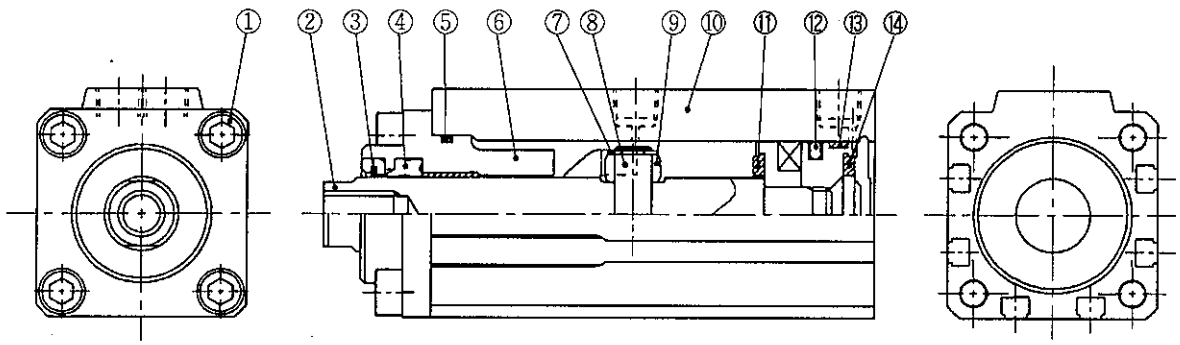
(3) Uniformly tighten the bolts and the nuts in order of the bolts and the nuts facing diagonally.

(4) Tighten the hexagon socket bolts ①, then retighten them to the torque specified in Table 1.

Table 1

Model	Tightening torque
RCC2-20 - 40	4.3 - 5.3 N·m
RCC2-50	10.8 - 13.2 N·m
RCC2-63	21.6 - 26.4 N·m

7.3 Inside Structure Drawing



Part No.	Part name	Qty	Part No.	Part name	Qty
1	Hexagon socket bolt	4	8	Pin	1
2	Piston assembly	1	9	Roller ※1	2
3	Coil scraper	1	10	Cylinder body assembly	1
4	Rod packing	1	11	Cushion rubber (R)	1
5	Cylinder gasket	1	12	Piston packing	1
6	Rod cover assembly	1	13	Wear ring	1
7	Snap ring ※1	2	14	Cushion rubber (H)	1

※1 : Not equipped with the RCC2-20 and the RCC2-25.

8. TROUBLESHOOTING

(1) Cylinder

Problem	Cause	Measure
The piston does not move.	Pressure is not supplied, or pressure is insufficient.	Ensure a pressure source.
	The directional control valve does not receive any signal.	Correct the control circuit.
	The piston packing is damaged.	Replace the packing.
The piston does not move smoothly.	The set speed is below the minimum speed limit.	Consider using a low hydraulic pressure cylinder.
	Transverse load is applied.	Mount the cylinder properly. Change the mounting style.
	Load is large.	Increase the pressure. Use a tube of a larger inner diameter.
	The speed control valve functions as a meter-in circuit.	Mount the speed control valve in a different direction.
Damage, deformation	Impact attributable to high-speed operation.	Reduce the speed. Reduce the load. Use a cylinder with a more reliable cushion mechanism (external cushion mechanism).
	Transverse load is applied.	Mount the cylinder properly. Change the mounting style.

(2) Switch

Problem	Cause	Measure
The lamp does not blink.	The contact is melted.	Replace the switch.
	The load exceeds the rating.	Replace the relay with a recommended one or replace the switch.
	The lamp is damaged.	Replace the switch.
	An external signal error occurs.	Recheck the external circuit.
The switch does not operate.	The wiring is disconnected.	Replace the switch.
	An external signal error occurs.	Recheck the external circuit.
	The voltage is not proper.	Apply the specified voltage.
	The switch is not installed in the proper position.	Install the switch in the proper position.
	The switch is dislocated.	Replace the switch in the proper position, and retighten the mounting screws.
	The switch is not installed in the proper direction.	Install the switch in the proper direction.
	The load (relay) cannot respond during detection in the middle of the stroke.	Reduce the speed. Replace the relay with a recommended one.
	The load exceeds the rating.	Replace the relay with a recommended one or replace the switch.
The switch cannot be reset.	The piston does not move.	Move the piston.
	The contact is melted.	Replace the switch.
	The relay exceeds the rating.	Replace the relay with a recommended one or replace the switch.
	The ambient temperature is out of the specified range.	Keep the ambient temperature within the range of −10°C and 60°C.
	There is a magnetic field near the switch.	Shield the switch from magnetism.
	An external signal error occurs.	Recheck the external circuit.

9. MODEL NUMBER CODING AND PRODUCT SPECIFICATIONS

9.1 Product Number Coding

- Without switch

RCC2 — 00 — 20 — 21 — R

- With switch

RRC2 — 00 — 20 — 21 — R — T0H — R

ⓐ ⓑ ⓒ ⓓ ⓔ ⓕ

Rotary clamp cylinder double acting type

ⓐ Mounting style		ⓑ Tube bore (mm)	
00	Standard type	20	φ20
FA	Rod side flange mount type	25	φ25
		32	φ32
FB	Head side flange mount type	40	φ40
		50	φ50
		63	φ63

ⓒ Stroke (mm)			
Tube bore	Stroke	Rotating portion	Clamping portion
φ20	21	11	10
	31		20
φ25	21	11	10
	31		20
φ32	25	15	10
	35		20
φ40	25	15	10
	35		20
φ50	40	20	20
	70		50
φ63	40	20	20
	70		50

ⓓ Rotating direction	
R	Rotate 90 degrees clockwise for clamping (pulling) when viewed from rod side
L	Rotate 90 degrees counterclockwise for clamping (pulling) when viewed from rod side

ⓔ Switch model No.	
Axial lead wire type	L lead wire type
T0H※	T0V※
T5H※	T5V※
T2H※	T2V※
T3H※	T3V※
T2YH※	T2YV※
T3YH※	T3YV※
T2YFH※	T2YFV※
T3YFH※	T3YFV※
T2YMH※	T2YMV※
T3YMH※	T3YMV※
T2YD※	—
T2YDT※	—

ⓕ Qty of switch	
R	Rod end, 1 ea.
H	Head end, 1 ea.
D	Switches, 2 ea.

The mark ※ represents the lead wire length.

※ Lead cord length	
No code	1m (Standard)
3	3m (Optional)
5	5m (Optional)

9.2 Product Specifications

Model / Item		RCC2-20		RCC2-25		RCC2-32		RCC2-40		RCC2-50		RCC2-63	
Tube bore	mm	φ20		φ25		φ32		φ40		φ50		φ63	
Stroke	mm	21	31	21	31	25	35	25	35	40	70	40	70
Rotating stroke	mm	11				15				20		20	
Clamp stroke	mm	10	20	10	20	10	20	10	20	20	50	20	50
Rotating angle		90 degrees											
Rotating direction		Clockwise and counterclockwise											
Media		Compressed air											
Lubrication		Not necessary. (Use turbine oil class 1 ISO VG32 for lubrication.)											
Max. working pressure	MPa	1.0											
Min. working pressure	MPa	0.2											
Withstanding pressure	MPa	1.6											
Ambient temperature range	°C	−10 - 60 (Dew formation is not permissible.)											
Port size		M5×0.8				Rc1/8				Rc1/4			
Working piston speed	(mm/s)	50 - 200											
Cushion		With rubber cushion											
Pressure borne area mm^2	Rod side	201		377		603		1055		1649		2626	
	Head side	314		490		804		1256		1963		3117	

※ RCC2-63 : Custom order