SM-230796-A

CKD

INSTRUCTION MANUAL

ROTARY CLAMP CYLINDER

RCC2
RCC2-G4

- 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.

2nd revision

CKD

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 and fully understand its contents for proper operation.**

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

⚠ CAUTION

- Before performing an overhaul inspection on the actuator, release any residual pressure completely.
- While the actuator is operating, do not step into or place hands in the driving mechanism.
- Touching the electrical wiring connection (bare charging part) of an actuator with solenoid valve, actuator with switch, etc. may cause electric shock. Perform an overhaul inspection with the power off. Also, do not touch the charging part with wet hands.

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Rotary clamp cylinder

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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 to 60°C. Use within this temperature range.
However, do not use it in frozen conditions.

2.1.2 Securing the rotary clamp cylinder

Use the bolts shown in the table on the right.

Table 1: Product fixing

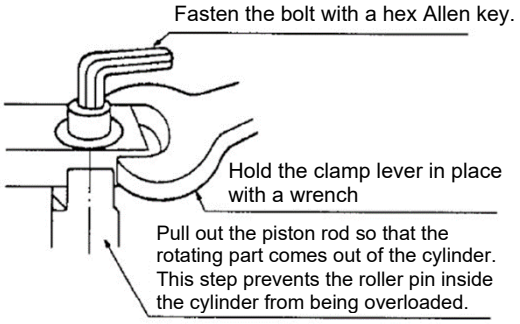
Model	Bolt diameter		
	00	FA	FB
RCC2-20	M6	M6	M6
RCC2-25	M6	M6	M6
RCC2-32	M6	M5	M5
RCC2-40	M6	M5	M5
RCC2-50	M8	M6	M6
RCC2-63	M10	M8	M8

2.1.3 Securing the clamp lever

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

Table 2 Clamp lever fixing bolts

Model	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

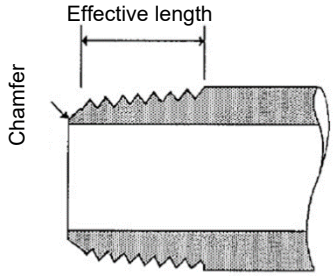
When the cylinder is activated, the piston rod rotates (90°) together with the stroke motion. Make sure that the clamp lever secured in step 2.1.3 above does not interfere with any objects.

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.

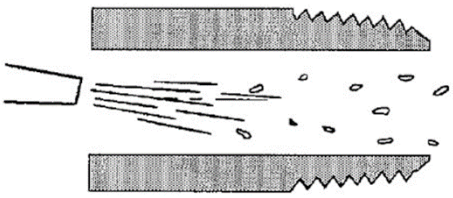
(2) The pipe between the cylinder and the directional control valve must have an effective cross-sectional area large enough to allow output of the required piston speed in the cylinder.

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



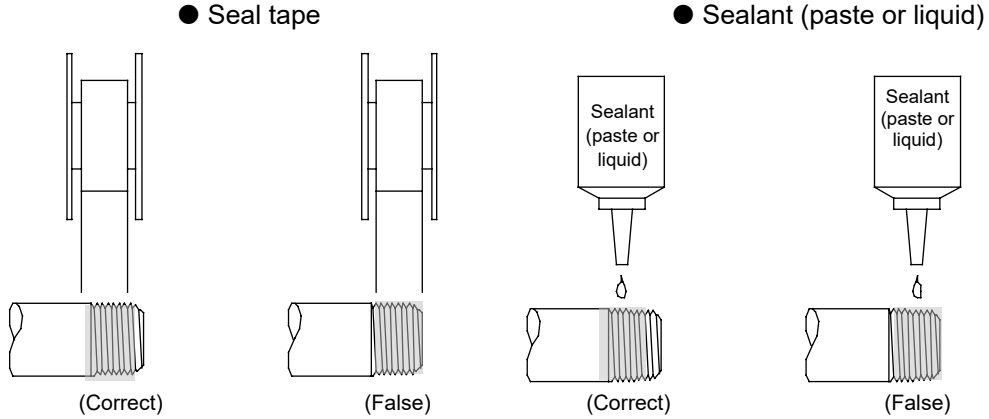
(Fig. 2)

(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)

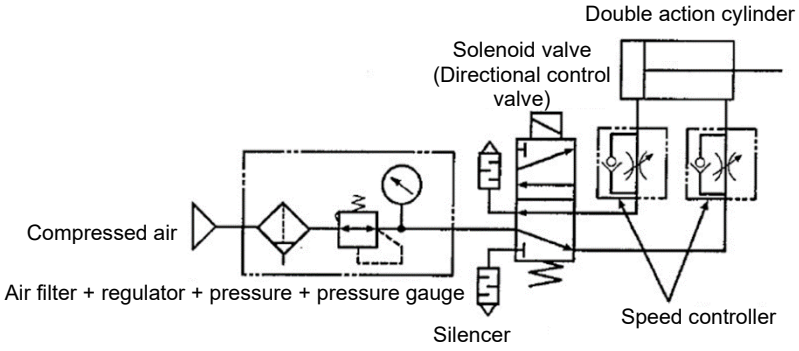
(5) When connecting a pipe to unit components (filter, directional control valve, and rotary clamp cylinder), do not allow sealing tape or adhesive to enter inside. (See Fig. 4.)



(Fig. 4)

2.3 Basic Circuit Diagram

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



(Fig. 5)

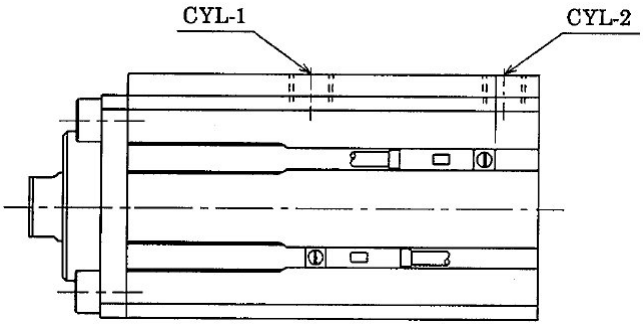
3. INSPECTION (during installation and after piping)

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.



(Fig. 6)

4. OPERATING PROCEDURE

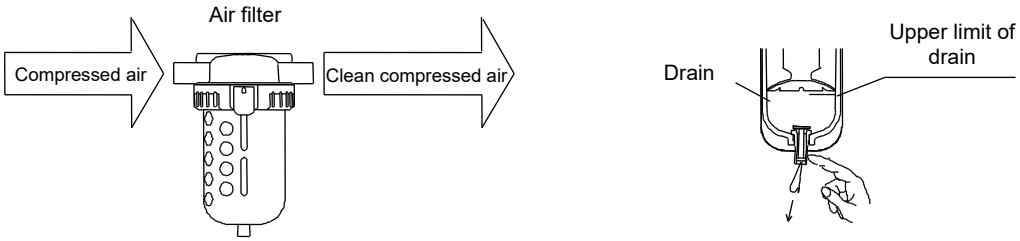
4.1 Fluid Application

(1) The Rotary Clamp Cylinder can operate without lubrication.
If lubricating, 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, this may cause malfunctions in unit components (filter, directional control valve, and Rotary Clamp Cylinder).
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 this reason, use 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. 7.)



(Fig. 7)

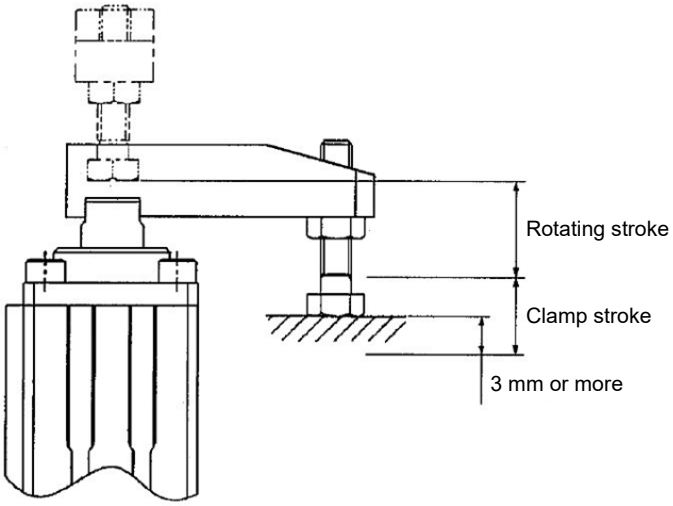
4.2 Handling Instruction

(1) Do not clamp 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. 8.)

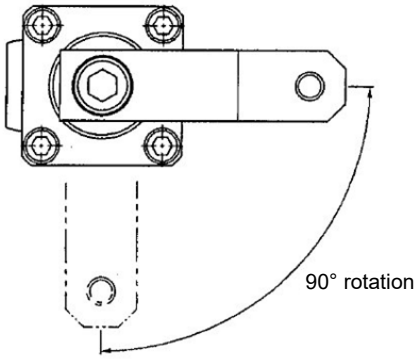
(2) For adjustment of the piston speed, install a speed control valve as shown in the basic circuit diagram in paragraph 2.3. First, close the valve (to low-speed side). Open the valve gradually to the required speed.
Note) The piston speed should be adjusted within a suitable range so that the clamp 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. 9.)



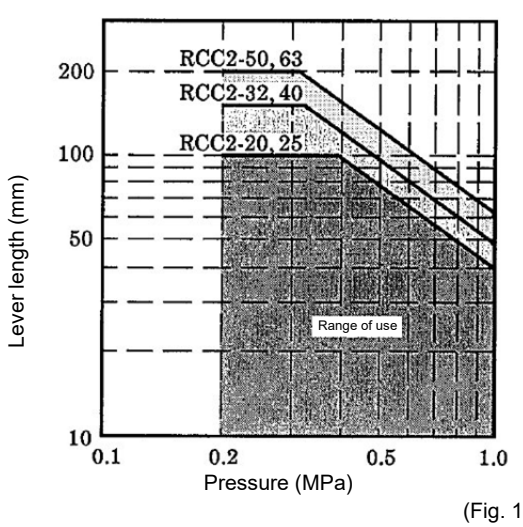
(Fig. 8)

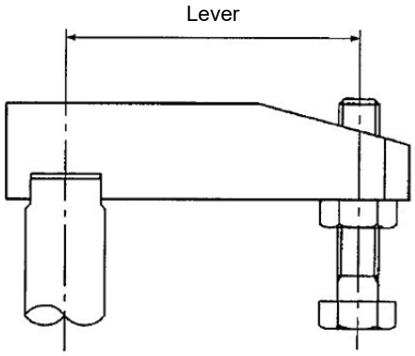


(Fig. 9)

4.3 Clamping Force and Clamp Lever Length

Use the clamping force and clamp lever length within the ranges shown in Fig. 10.

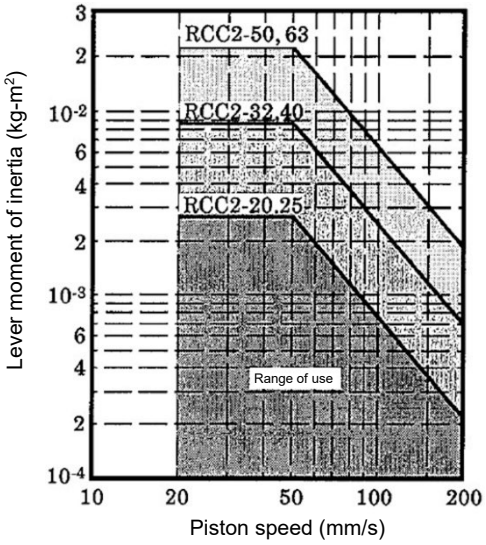




(Fig. 10)

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

Piston speed and clamp lever moment of inertia should be used within the ranges shown in Figure 11.

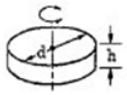
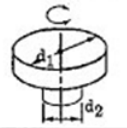
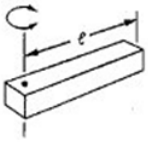
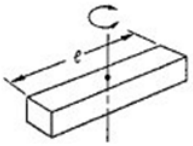
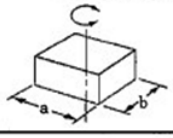
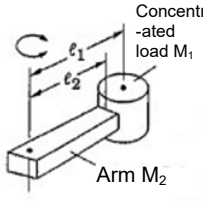


(Note) Specifications: The allowable piston speed is between 50 to 200 mm/s.

(Fig. 11) Allowable lever moment of inertia

<Reference>

●Calculation of the moment of inertia

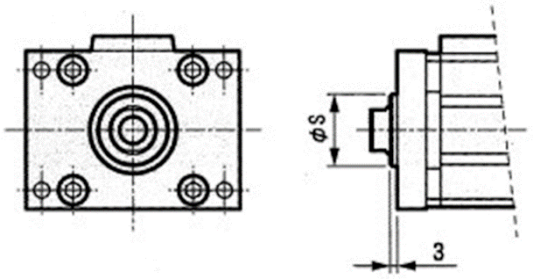
Shape	Skeleton diagram	Calculated from	Inertia moment J Kg•m²	Radius of rotation K_1^2	Note
Disk		• Diameter d(m) • Weight M(kg)	$J=\frac{Md^2}{8}$	$\frac{d^2}{8}$	• Mounting direction: Any • An additional consideration is needed if the disk is made to slide.
Disk with flange		• Diameter d_1(m), d_2(m) • Mass d_1 M_1(kg), 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) • Weight 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 of gravity)		• Bar length ℓ(m) • Weight 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) • Weight 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), ℓ_2(m) • Arm length • 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 (M_2=0) if it is much smaller than M_1

5. SPATTER ADHESION PREVENTION TYPE (G4 specification)

(1) The G4 specification has improved durability in a spatter scattering atmosphere compared to the standard type cylinder. When used in an atmosphere other than that of spatter scattering, the durability may be inferior to that of the standard type cylinder. Do not use in any atmosphere other than the spatter scattering atmosphere.

(2) Since the spatter prevention agent is volatile, when the spatter prevention agent on the rod surface begins to dry, apply it to the rod surface to replenish it.

(3) Note that in the case of support type FA (rod side flange), the holder protrudes from the flange end face.
(See Figure 12.)



Symbol tube inside diameter	S
φ20	20
φ25	20
φ32	24
φ40	24
φ50	30
φ63	36

(Fig. 12)

6. SWITCH ARRANGEMENT

6.1 Switch Specifications

(1) Types and applications of switches

Model			Purpose and Application
Non-contact 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
	3-core	T5H•T5V	For AC/DC programmable controller, relay or IC circuit (not including lamp), series connection
2-color indicating, non-contact type	2-core	T2YH•T2YV	For DC programmable controller, exclusive
	3-core	T3YH•T3YV	For DC programmable controller or relay
Non-contact type with preventive 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	For DC programmable controller, exclusive
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

Type	Contact point switch	
Model	T0H•T0V	T5H•T5V
Application	For programmable controller or relay	For programmable controller, relay or IC circuit (not including lamp), series connection
Power supply voltage	--------	
Load voltage and current	12/24 VDC, 5 - 50 mA 100 VAC, 7 - 20 mA	12/24 VDC, 50 mA or less 100 VAC, 20 mA or less
Current consumption	--------	
Internal voltage drop	3 V or less	0 V
Lamp	LED (Lights while power is ON)	--------
Leak current	0 mA	
Length of lead cord (Note 1)	Standard 1 m (oil proof vinyl, Cabtyre cord, 2-core, 0.2 mm^2)	
Max. shock	294 m/s^2{30G}	
Insulation resistance	20 MΩ or more by 500 VDC megger	
Insulation resistance	No abnormalities upon applying 1000 VAC for one minute.	
Ambient temperature	-10 - +60°C	
Degree of protection	IEC Standard IP67, JIS C0920 (enclosure protection type), Oil proof	

Type	Non-contact switch			
Model	T2H•T2V	T2YH•T2YV	T3H•T3V	T3YH•T3YV
Application	For programmable controller, exclusive		For programmable controller or relay	
Power supply voltage	--------		10 - 28 VDC	
Load voltage and current	10 - 30 VDC 5 - 20 mA (Note 2)		30 VDC or less 100 mA or less	30 VDC or less 50 mA or less
Current consumption	--------		10 mA or less at 24 VDC (while power is ON)	
Internal voltage drop	4 V or less		0.5 V or less at 100 mA	0.5 V 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)
Leak current	1 mA or less		10 μA or less	
Length of lead cord (Note 1)	Standard 1 m (oil proof vinyl, Cabtyre cord, 2-core, 0.2 mm^2)		Standard 1 m (oil proof vinyl, Cabtyre cord, 3-core, 0.2 mm^2)	
Max. shock	980 m/s^2 { 100G }			
Insulation resistance	20 MΩ or more by 500 VDC megger	100 MΩ or more by 500 VDC megger	20 MΩ or more by 500 VDC megger	100 MΩ or more by 500 VDC megger
Insulation resistance	No abnormalities upon applying 1000 VAC for one minute.			
Ambient temperature	-10 to +60°C			
Degree of protection	IEC Standard IP67, JIS C0920 (enclosure protection type), oil proof			

Note 1: Standard is 1 m. Optional 3 m and 5 m are available. Refer to the model number coding

Note 2: The above maximum load current value: 20 mA is at 25°C. If the ambient temperature at which the switch is used is higher than 25°C, the current will be lower than 20 mA. (5 to 10 mA at 60°C)

Type		Non-contact 3-core type	Non-contact 4-core type	Non-contact 3-core type	Non-contact 4-core type
Model		T2YFH/V	T3YFH/V	T2YMH/V	T3YMH/V
Application		For programmable controller, exclusive	For programmable controller or relay	For programmable controller, exclusive	For programmable controller or relay
Indicator lamps	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 supply voltage	--------	10 - 28 VDC	--------	10 - 28 VDC
	Load voltage	10 - 30 VDC	30 VDC or less	10 - 30 VDC	30 VDC or less
	Load current	5 - 20 mA DC	50 mA DC or less	5 - 20 mA DC	50 mA DC or less
	Internal voltage drop	4 V or less	0.5 V or less	4 V or less	0.5 V or less
	Current consumption	-	10 mA or less	--------	10 mA or less
	Leak current	1 mA or less	10 μA or less	1.2 mA or less	10 A or less
Preventive maintenance output part	Load voltage	30 VDC or less			
	Load current	20 mA DC or less	50 mA DC or less	5 to 20 mA DC or less	50 mA DC or less
	Internal voltage drop	0.5 V or less		4 V or less	2.4 V or less
	Leak current	10 μA or less			
	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 (Note 1)		1 m (oil proof vinyl, Cabtyre cord, 3-core, 0.2 mm^2)	1 m (oil proof vinyl, Cabtyre cord, 4-core, 0.2 mm^2)	1 m (oil proof vinyl, Cabtyre cord, 3-core, 0.2 mm^2)	1 m (oil proof vinyl, Cabtyre cord, 4-core, 0.2 mm^2)
Insulation resistance		100 MΩ or more by 500 VDC megger			
Insulation resistance		No abnormalities upon applying 1000 VAC for one minute.			
Max. shock		980 m/s^2 {100G}			
Ambient temperature		-10 - +60°C			
Degree of protection		JIS C 0920 (enclosure protection type), IP67, oil proof			

Note 1: Standard is 1 m. Optional 3 m and 5 m are available. Refer to the model number coding

Type	Non-contact switch	
Model	T2YLH•T2YLV	T3YLH•T3YLV
Application	For programmable controller, exclusive	For programmable controller or relay
Power supply voltage	--------	10 - 28 VDC
Load voltage and current	10 - 30 VDC 5 - 20 mA	30 VDC or less 50 mA or less
Current consumption	-	10 mA or less at 24 VDC (while power is ON)
Internal voltage drop	4 V or less	0.5 V or less
Leak current	1 mA or less	10 μA or less
Lamp	Red/Green LED (Lights while power is ON)	
Length of lead cord (Note 1)	1 m (oil proof vinyl, Cabtyre cord, 2-core, 0.3 mm^2)	1 m (oil proof vinyl, Cabtyre cord, 3-core, 0.2 mm^2)
Insulation resistance	100 MΩ or more by 500 VDC megger	
Insulation resistance	No abnormalities upon applying 1000 VAC for one minute.	
Max. shock	980 m/s^2{100G}	
Hysteresis	1.5 mm or less	
Ambient temperature	-10°C to 60°C	
Degree of protection	IEC Standard IP67, JIS C0920 (enclosure protection type), oil proof	

Note 1: Standard is 1 m. Optional 3 m and 5 m are available. Refer to the model number coding

Type	Non-contact switch
Model	T2YD
Application	For programmable controller, exclusive
Lamp	Red/Green LED (Lights while power is ON)
Load voltage	24 VDC ± 10%
Load current	5 - 20 mA
Internal voltage drop	6 V or less
Leak current	1.2 mA or less
Output delay time (Note 1) (ON delay and OFF delay)	30 - 60 ms
Length of lead code (standard) (Note 2)	1 m (oil proof vinyl, Cabtyre cord, 2-core, 0.5 mm^2)
Insulation resistance	100 MΩ or more by 500 VDC megger
Insulation resistance	No abnormalities upon applying 1000 VAC for one minute.
Max. shock	980 m/s^2{100G}
Ambient temperature	-10°C to 60°C
Degree of protection	IEC Standard IP67, JIS C0920 (enclosure protection type), oil proof

Note 1: Indicates the time between the detection of piston magnet by magnetic sensor and the switch output.

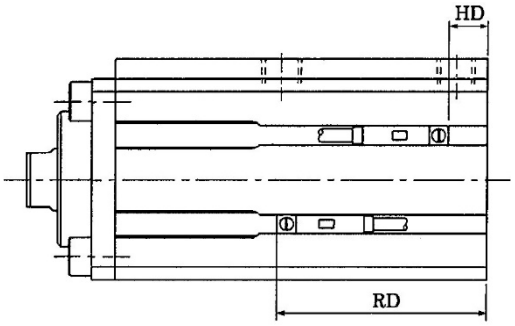
Note 2: An optional flame-resistant Cabtyre cable is also available.

6.2 Switch Installation Position

(1) Switch installation position

[1] Installation at stroke ends

For activation of the switch at the max. sensitivity positions, install the switches at the RD dimension on the rod side and at the HD dimension on the head side respectively. (See Fig. 13 and Table 3.)



(Fig. 13)

- How to change a switch position

  Loosen the set screw and slide the switch body 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 body out of the groove. Next, insert a new switch in the groove and determine the position as specified, and then, fasten the set screw. (Refer to Table 3 for the fastening torque of the set screw.)

(2) Operating range

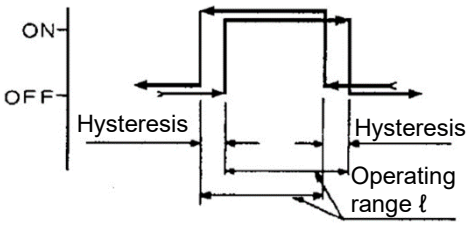
[1] The operating range is the positional range from where the piston moves and the switch turns ON to where it moves further in the same direction and turns OFF.

[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 the piston travels from the position where the switch is turned on to the position where it moves in the opposite direction and the switch is turned off.

[2] Note that if the piston stops within this range, the switch operation becomes unstable and is susceptible to external disturbances.



(Fig. 14)

Table 3: Max. sensitivity position (HD and RD) and fastening torque of set screw

Model	T0H/V*, T5H/V*			T2H/V*, T3H/V*		
Tube Inside diameter (mm)	Maximum sensitive position (mm)		Tightening torque N·m	Maximum sensitive position (mm)		Tightening torque N·m
	HD	RD		HD	RD	
φ20	5.5	26.5+ST	0.1 to 0.2	6.5	25.5+ST	0.1 to 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	

Model	T2YH/V*, T3YH/V*			T2YFH/V*, T3YFH/V*		
Tube Inside diameter (mm)	Maximum sensitive position (mm)		Tightening torque N·m	Maximum sensitive position (mm)		Tightening torque N·m
	HD	RD		HD	RD	
φ20	5.5	26.5+ST	0.5 to 0.7	5.5	26.5+ST	0.5 to 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	

Model	T2YMH/V*, T3YMH/V*			T2YD*		
Tube Inside diameter (mm)	Maximum sensitive position (mm)		Tightening torque N·m	Maximum sensitive position (mm)		Tightening torque N·m
	HD	RD		HD	RD	
φ20	5.5	26.5+ST	0.5 to 0.7	5.5	26.5+ST	0.5 to 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	

6.3 Operational Cautions of Switches

6.3.1 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 multiple cylinders with switches are installed in close proximity to each other in parallel, or if there is a magnetic object traveling near the cylinder, they may interfere with each other, affecting detection accuracy.

(2) Protection of lead cord
Pay consideration to eliminate bending stress or stretching of the lead cord while laying the cord. This may cause cord breakage. Use flexible wires such as robot cables to connect to the moving parts.

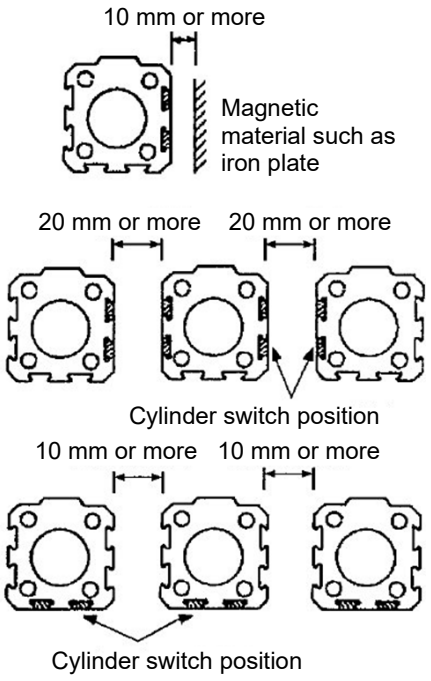
(3) Service temperature
It cannot be used at high temperatures (60°C or higher).
Avoid use in high temperature environments due to thermal characteristics of magnetic and electronic parts.

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

(5) Shock
Carefully avoid large shocks or vibrations during transportation of the cylinder or mounting and adjusting the switch.

(6) Magnetic material such as an iron plate nearby the cylinder switch is apt to cause malfunction of the cylinder switches. Keep it at least 10 mm away from the cylinder surface. (See Fig. 15) (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 the distance shown on the right from the cylinder surface. (See Fig. 15) (This is applicable for all bore sizes of tube)



(Fig. 15)

6.3.2 Operational cautions, non-contact 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

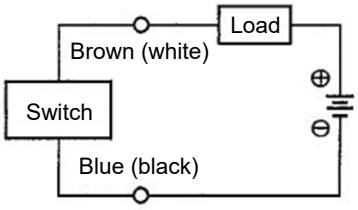
According to the revision in JIS Standards related with the proximity switches, colors of wires of cylinder switches and signal correspondence have been modified.

Before wiring, refer to the relevant document to ensure correct matching between the colors of wires and signals.

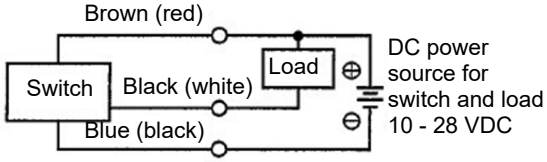
In this instruction manual, color designations in the old standard are indicated in parenthesis in addition to the new designations.

(2) Connection of lead cord

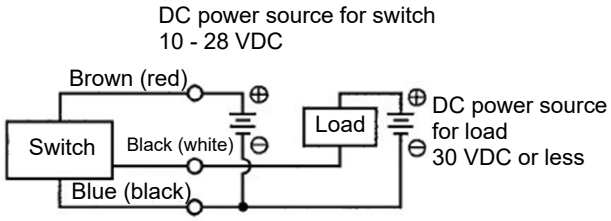
Connect correctly according to the color coding of the lead cords. Be sure to turn off the power to the electrical circuit device on the connection side before performing the work.



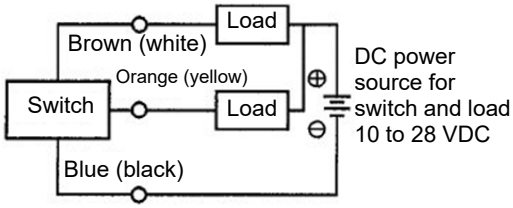
T2(Y) basic circuit example



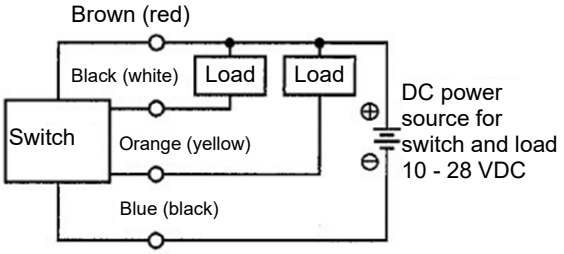
T3(Y) basic circuit example (1)
(The same power source is used for switch and load)



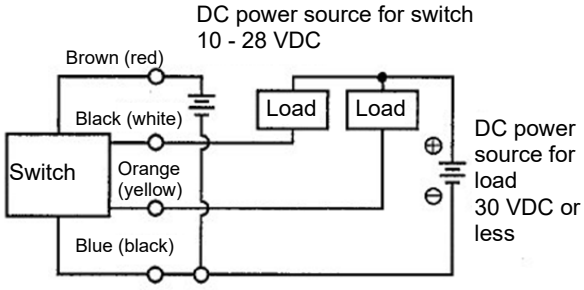
T3(Y) basic circuit example (2)
(Different power sources are used for switch and load.)



T2YF/M basic circuit example



T3YF/M basic circuit example (1)
(The same power source is used for switch and load)



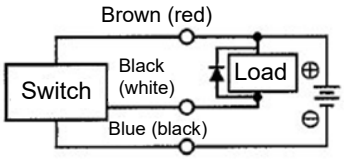
T3YF/M basic circuit example (1)
(Different power sources are used for switch and load.)

Fig. 16 Basic circuit example of each switch

(3) Protection of output circuit

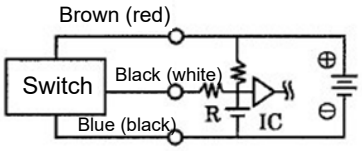
Provide a contact protection circuit in any of the following cases to prevent damage to switches and to protect the service life of switches.

- Install the protective circuit as illustrated in Fig. 17 when an inductive load (relay or solenoid valve) is to be used because it generates surge voltage when the switch is turned off.
- Install the protective circuit as illustrated in Fig. 18 when a capacitive load (capacitor) is to be used, because it generates an inrush current when the switch is turned on.
- Install the protective circuit as illustrated in Fig. 19 or 20 (in case of model T2(Y)) and Fig. 21 (in case of model T3(Y)) when the lead cord length exceeds 10 m.



An example of using inductive load with surge absorptive element (diode). Use Hitachi V06C or equivalent diodes.

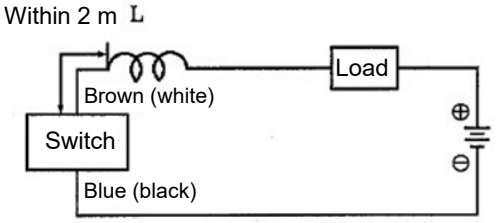
Fig. 17



An example of a capacitive load with a current limiting resistor R. Use the following formula result or higher for the resistance R (Ω) at this time.

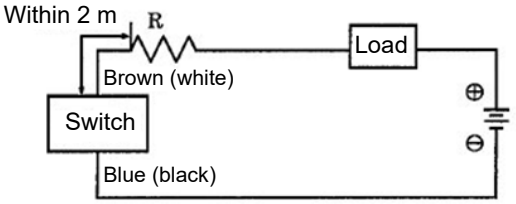
$$\frac{V}{0.10} = R\,(\Omega)$$

Fig. 18



- Choke coil
  L = several hundred μH to several mH
  Surpassing high-frequency characteristic
- Wire nearby the switch (within 2 m)

Fig. 19



- Inrush current limiting resistor
  R = Resistor as large as the load circuit side allows
- Wire nearby the switch (within 2 m)

Fig. 20

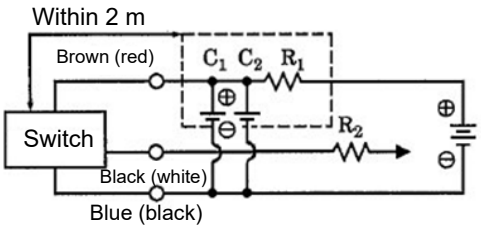


Fig. 21

- Power source noise absorptive circuit
  C_1 = 20 to 50 μF electrolytic capacitor
  (Withstand voltage 50 V or more)
  C_2 = 0.01 to 0.1 μF ceramic capacitor
  R_1 = 20 to 30 Ω
- Inrush current limiting resistor
  R_2 = Use as large a resistor as the load side circuit allows.
- Wire nearby the switch.
  (Within 2 m)

(4) Connection to a programmable controller (sequencer)

The connection method varies depending on the type of programmable controller. Refer to the following Fig. 22 to 28 respectively.

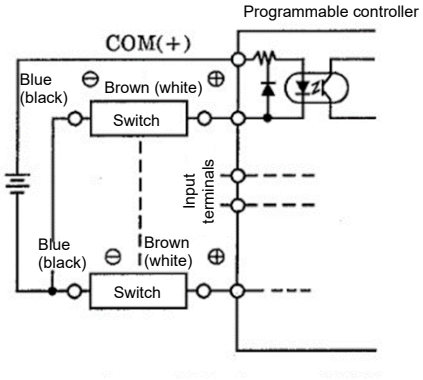


Fig. 22 An example of T2 connection to source input type (an external power source)

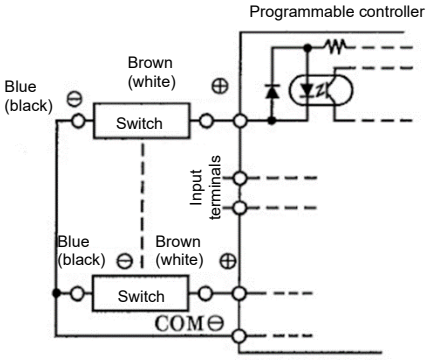


Fig. 23 An example of T2 connection to source input type (a built-in power source)

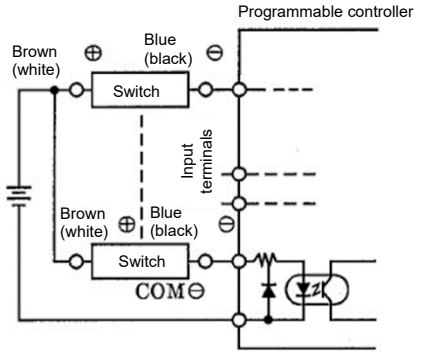


Fig. 24 An example of T2 connection to sink input type

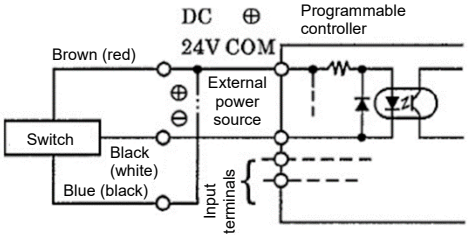


Fig. 25 An example of T3 connection to source input type (an external power source)

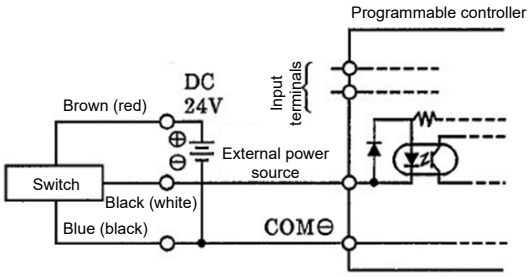


Fig. 26 An example of T3 connection to source input type (a built-in power source)
Note that the T3 switch cannot be connected to a sink input sequencer.

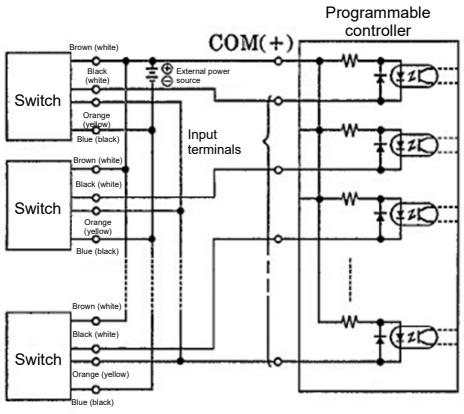


Fig. 27 An example of T3YF/M connection to source input type (an external power source)

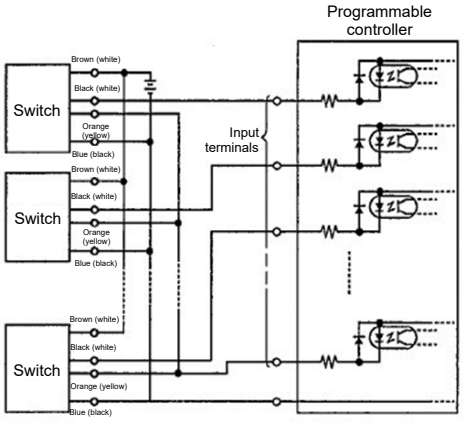
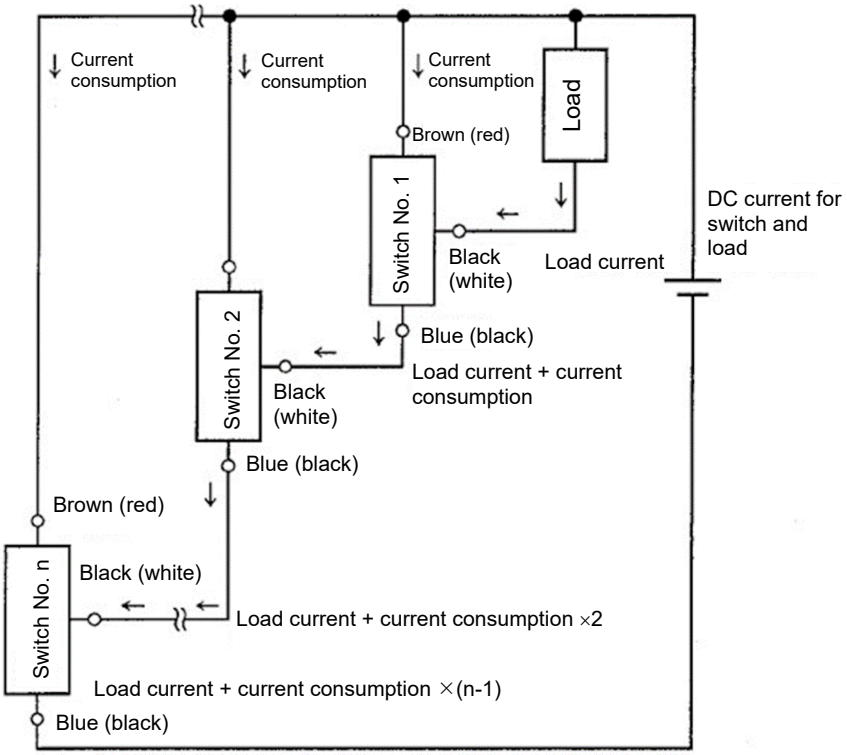


Fig. 28 An example of T3YF/M connection to source input type (a built-in power source)

(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 non-contact 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. 29)

(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 when the switch is ON, lowering below the load voltage range. As a result, other switches are not turned on. Therefore, check the input specifications of the programmable controller as a load in the circuit before use. 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. The lamp will not dim or fail to illuminate.

6.3.3 Operational cautions, contact point switch (Model T0H/V & T5H/V)

(1) Modified colors of switch leads

According to the revision in JIS Standards related with the proximity switches, colors of wires of cylinder switches and signal correspondence 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 Ⓑ.

Ⓐ When using for DC connection, connect the brown cord to the + side and the blue cord to the - side. The switch still functions right with reversed polarities but lamp is not lit.

Ⓑ When connecting to an AC relay or programmable controller input, the switch lamp may not be 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, the switch lamp may not be lit when current is lower than the rated current.

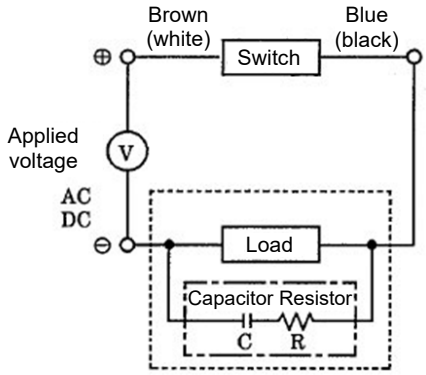
(4) Protection of contact point

Install such a protective circuit as illustrated in either Fig. 30 or 31, as follows, when an inductive load such as a relay is to be used.

Provide a contact protection circuit as shown in Figs. 32 and 33 if the wiring length exceeds the length shown in Table 4.

Table 4.

Voltage	Wire length
DC	50 m
AC	10 m

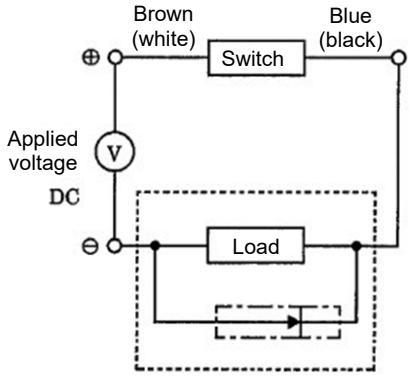


User circuit

Protective circuit (spark absorbing circuit)

Recommended value C capacitor 0.033 to 0.1 μF
R resistor 1 to 3 kΩ
XEB1KI Okaya Denki Mfg. or equivalent

Fig. 30 When capacitor and resistor are used

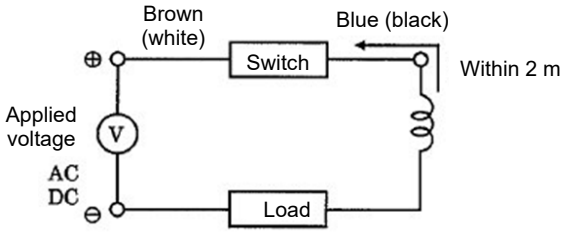


User circuit

Protective circuit

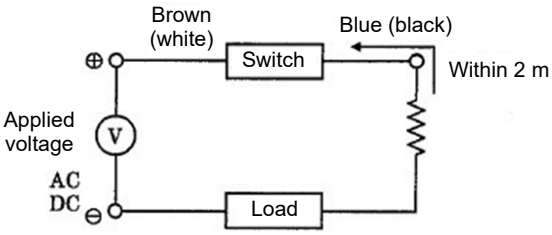
Rectifying diode, general use
Hitachi Mfg. product V06C or
equivalent

Fig. 31 When diode is used



- Choke coil
  L = several hundred μH to several mH
  Surpassing high-frequency characteristic
- Wire nearby the switch (within 2 m)

Fig. 32



- Inrush current limiting resistor
  R = Resistor as large as the load
  circuit side allows
- Wire nearby the switch (within 2 m)

Fig. 33

(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 drop, when connecting T0 switches in series, equals to the sum of voltage drops of all connected switches. When connecting one T0 switch to check operation, and t5 switches for the others, the voltage drop will be about that of one T0 (approximately 2.4 V). The lamps will illuminate only when all switches are turned on.

(7) Parallel connection

There is no restriction to the number of switches in parallel. In the case of T0, the switch lamp may become dim or may not light up.

7. MAINTENANCE

7.1 Maintenance and Inspection

7.1.1 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.

7.1.2 Periodic 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 have not changed.
(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 plating or rust
- Surface of the piston rod for flaws, peeling of plating or rust
- Joint between the piston and the piston rod for looseness
- Piston packing and rod packing for flaws or wear

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

7.2 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

*Consumable parts for G4 specifications are the same as standard.

8. DISASSEMBLY and ASSEMBLY

8.1 Disassembly Procedure

8.3 Referring to the inside structure drawing 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 an inset type, remove them with care so as not to damage them.

8.2 Assembly Procedure

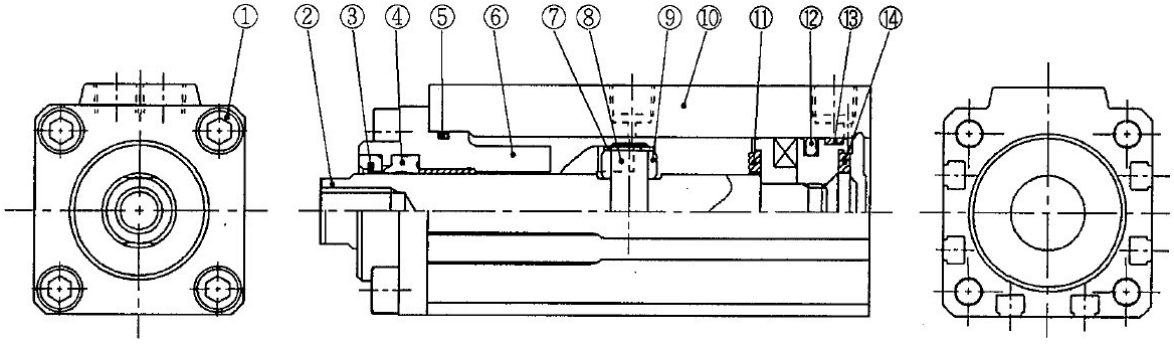
(1) Clean each part.
Inspect the packings and the O-rings for breakage or damage.
(2) After cleaning, carefully assemble them in the reverse order of disassembly.
A damaged packing or O-ring will cause a malfunction or air leakage. Apply a lithium base grease to the packings, O-rings, rod cover guide groove and rollers.
(3) Evenly tighten the bolts and the nuts in order of them facing diagonally.
(4) Tighten the hexagon socket bolts [1], then retighten them to the torque specified in Table 5.

Table 5 Tightening torque

Model	Tightening torque
RCC2-20 - 40 RCC2-G4-20 - 40	4.3 - 5.3 N·m
RCC2-50 RCC2-G4-50	10.8 - 13.2 N·m
RCC2-63 RCC2-G4-63	21.6 - 26.4 N·m

8.3 Inside Structure Drawing

(1) Standard specification

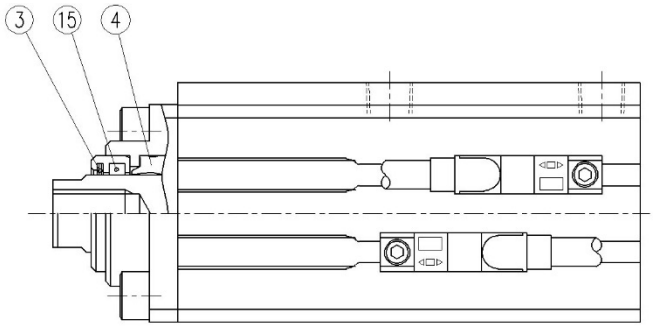


Part No.	Part name	Quantity
1	Hexagon socket bolt	4
2	Piston assembly	1
3	Coil scraper	1
4	Rod packing	1
5	Cylinder gasket	1
6	Rod cover assembly	1
7	E-type snap ring *1	2

Part No.	Part name	Quantity
8	Pin	1
9	Roller *1	2
10	Cylinder body assembly	1
11	Cushion rubber (R)	1
12	Piston packing	1
13	Wear ring	1
14	Cushion rubber (H)	1

*1: Not equipped with RCC2-20 and RCC2-25.

(2) Spatter adhesion prevention specification (G4 type)



Part No.	Part name	Quantity
15	Lub-keeper	1

*Same as standard except for Lub-keeper.

9. TROUBLESHOOTING

(1) Cylinder

Problem	Cause	Countermeasure
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 force due 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.

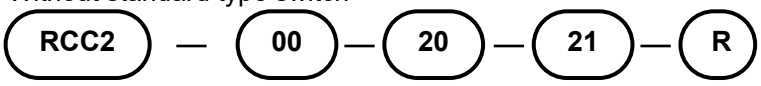
(2) Switch

Problem	Cause	Countermeasure
The lamp does not blink.	The contact is melted and stuck	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.	Make the indicated voltage
	An external signal error occurs.	Recheck the external circuit.
	The voltage is not proper.	Make the indicated 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 and stuck	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 to 60°C
	There is a magnetic field near the switch.	Provide magnetic shielding
	An external signal error occurs.	Recheck the external circuit.

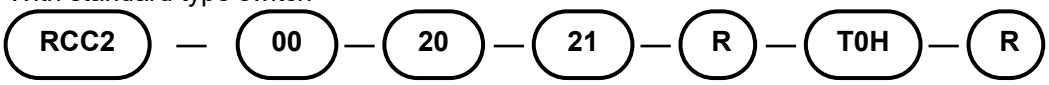
10. MODEL NUMBER CODING AND PRODUCT SPECIFICATIONS

10.1 Product Number Coding

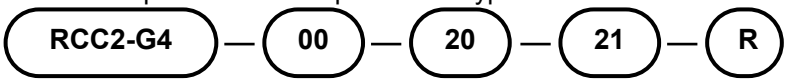
- Without standard type switch



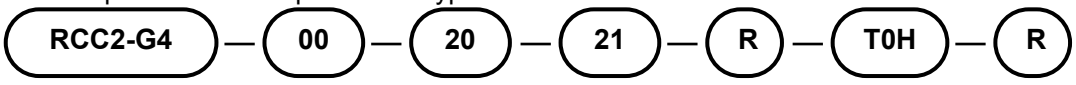
- With standard type switch



- Without spatter adhesion prevention type switch



- With spatter adhesion prevention type switch



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

(c) Stroke (mm)			
Tube bore.	Stroke length	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

(d) 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

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

(f) Qty of switch	
R	With 1 switch at rod end
H	With 1 switch at head end
D	With 2 switches

*Switch lead cord length	
No symbol	1 m (standard)
3	3 m (optional)
5	5 m (optional)

The mark "*" represents the lead wire length.

10.2 Product Specifications

Model		RCC2-20 RCC2-G4-20		RCC2-25 RCC2-G4-25		RCC2-32 RCC2-G4-32		RCC2-40 RCC2-G4-40		RCC2-50 RCC2-G4-50		RCC2-63 RCC2-G4-63	
Tube bore.	mm	φ20		φ25		φ32		φ40		φ50		φ63	
Stroke length	mm	21	31	21	31	25	35	25	35	40	70	40	70
Rotating stroke	mm	11				15				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	ºC	-10 to 60°C (No freezing)											
Port size		M5 × 0.8				Rc1/8				Rc1/4			
Working piston speed	mm/s	50 to 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	