Discontinue

CKD

SM－174940－A

INSTRUCTION MANUAL

CLAMP CYLINDER

CAC3, CAFL, CAFR

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

CKD Corporation

The 2nd edition

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

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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) Stop up the piping port with a sealing plug to prevent the entry of foreign substances into the cylinder.
   Remove the sealing plug before piping.

2. INSTALLATION

2.1 Installation

1) The ambient temperature range for this cylinder is 5 to 60°C.
2) Use cylinder with bellows over its rod within the area with much dust.
3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
4) When cylinder is fixed and rod end is guided:
   In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).
5) When cylinder is fixed and rod end is connected with pin joint:
   In case the load acting direction is not parallel with the rod axial center, the rod and tube may get entangled causing seizure, etc. Hence, make sure that the rod axial center and the load transfer direction are aligned to each other.

[SM-174940-A]

2.2 Piping

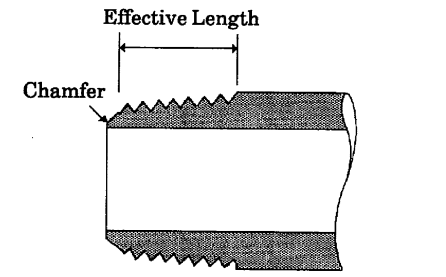
1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.

2) See to it that the pipe connecting cylinder and solenoid valve has an effective sectional area which is needed for the cylinder to drive at the specified speed.

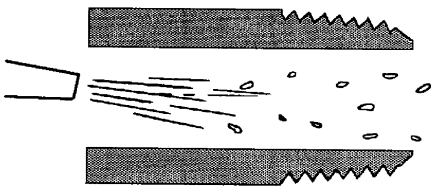
3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust and foreign substances in the drain of the pipe.

4) Be sure to adhere to the effective thread length of gas pipe and make a chamfer of approx. 1/2 pitch from the threaded end.

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

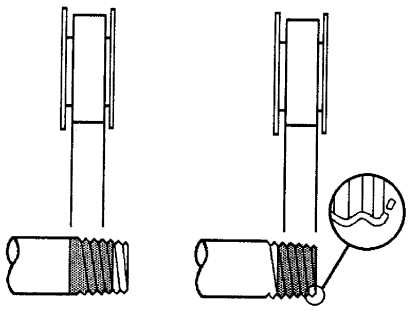


[C0-400-A]

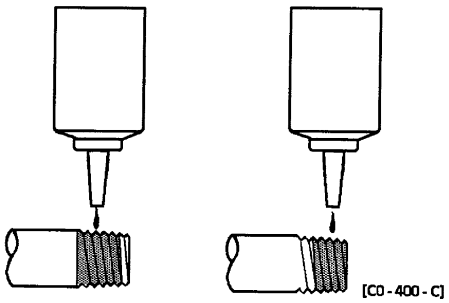

[C0-400-B]

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

● Seal Tape


(Right) (False)

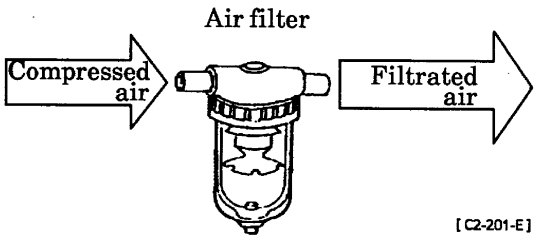
● Sealant (Paste or liquid)


(Right) (False)

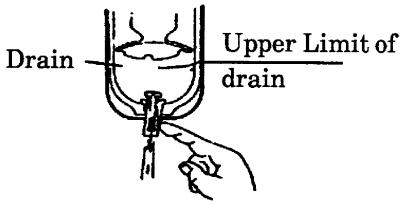
[C0-400-C]

2.3 Fluid

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



[C2-201-E]



[C2-201-F]

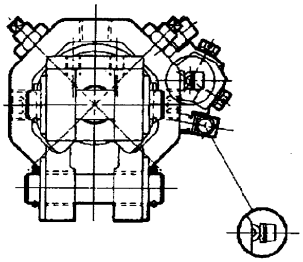
2) Be sure to drain out the accumulation in the filter periodically.

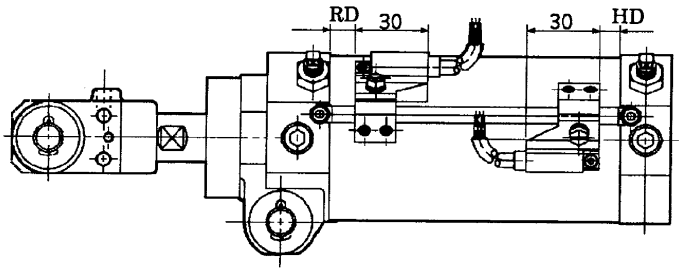
3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

4) This cylinder does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 as a lubricant, if and when lubrication is needed.

2.4 Location of mounting Switch

1) Location





(1) At the stroke end

Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the highest sensitivity.(See Table 1.)

(2) Intermediate of stroke

Move the piston where it is anticipated to stop and fix it tentatively Slide a switch carefully along the side of cylinder over the piston to find out the spot where switch turns on. This type spot shoule be located on both side of piston. The intermediate spot between those points is of the highest sensitivity and where the switch is supposed to be installed.

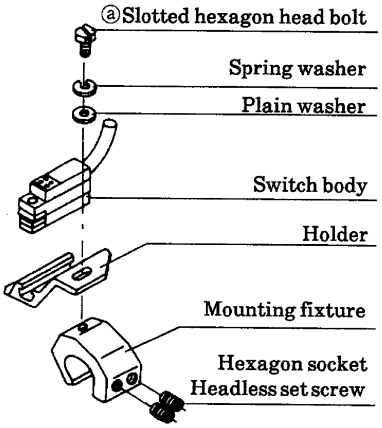
(3) Mounting and adjusting the T-type switch

- Mounting the T-type switch

(a) Pass the spring washer and plain washer through the slotted hexagon head bolt, and then set the switch holder.

(b) Press-fit the mounting fixture into the tie rod of the cylinder. Set the mounting fixture to a desired position and tighten the hexagon socket head cap set screws with a tightening torque of 2.5 - 3.0 N·m.

(c) Finally, adjust the position of the switch main body and tighten the slotted hexagon head bolt with a tightening torque of 1.5 - 1.9 N·m.



- Adjusting the T-type switch

(a) Loosen all the hexagon socket head cap set screws. Move the switch together with the mounting fixture to a desired position and tighten the hexagon socket head cap set screws with a tightening torque of 2.5 - 3.0 N·m.

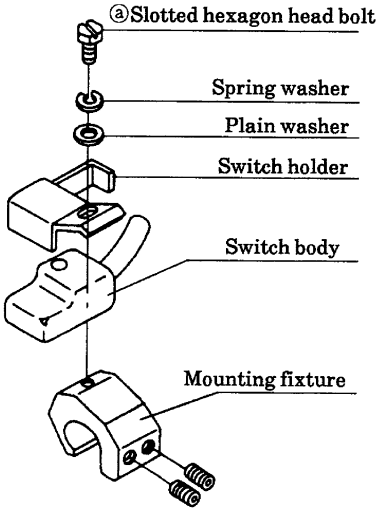
(4) Mounting and adjusting the H-type switch

● Mounting the H-type switch

(a) Pass the spring washer and plain washer through the slotted hexagon head bolt, and then set the switch holder.

(b) Press-fit the mounting fixture into the tie rod of the cylinder. Set the mounting fixture to a desired position and tighten the hexagon socket head cap set screws with a tightening torque of 2.5 - 3.0 N·m.

(c) Finally, adjust the position of the switch main body and tighten the slotted hexagon head bolt with a tightening torque of 1.5 - 1.9 N·m.



● Adjusting the H-type switch

(a) Loosen all the hexagon socket head cap set screws. Move the switch together with the mounting fixture to a desired position and tighten the hexagon socket head cap set screws with a tightening torque of 2.5 - 3.0 N·m.

2) Motion limit

The range where switch turns on first and turns off as the piston moves along its stroke is called motion limit.

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

3) Hysteresis

The distance is called hysteresis between the positions where switch turns ON as piston slides long and where switch turns OFF due to reversing stroke of piston.

Switch is apt to be disturbed its accuracy by external effect when piston stops within this range. Carefully avoid designing stopping location of piston.

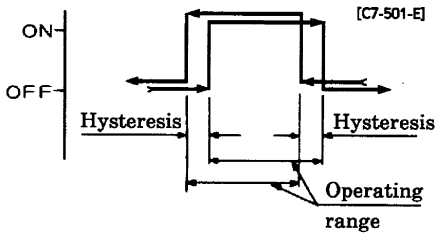


Table 1 (mm)

Model code	Tube bore	Non contact type switch								Contact type switch			
		Maximum sensitive position				Operating range		Hysteresis		Maximum sensitive position		Operating range	Hysteresis
		Head side HD		Rod side RD									
		One color	Two colors	One color	Two colors	One color	Two colors	One color	Two colors	HD	RD		
● One/Two-color indication type (T2H/V、T3H/V、T0H/V、T5H/V)													
CAC3	ϕ40	8.5		10.5		2.2 to 6.8	5.7 to 6.5	1.5 or less	1.0 or less	8.5	10.5	6.7 to 10.8	3 or less
	ϕ50					2.5 to 6.0	5.9 to 6.8					7.8 to 11.3	
	ϕ63					2.8 to 6.5	6.1 to 6.8					8.2 to 11.4	
	ϕ80	19		26		3 to 7.2	7.7 to 8.5			19	26	9 to 10.9	
● Strong magnetic field proof compact type (H0)													
CAC3-L2	ϕ40	—		—		—		—		4	6	4.5 to 7.5	3 or less
	ϕ50											5 to 8	
	ϕ63											5 to 8.5	
	ϕ80									12.5	19.5	6.6 to 7.5	
● Strong magnetic field proof type (T2YD)													
CAC3	ϕ40	8.5		10.5		6 to 9		1.5 or less		—	—	—	—
	ϕ50												
	ϕ63					6.5 to 9.5							
	ϕ80	19		26		6.6 to 7.9							
CAC3-L2	ϕ40	8.5		10.5		6.5 to 9.5							
	ϕ50					7 to 10							
	ϕ63												
	ϕ80	19		26		6.6 to 7.9							

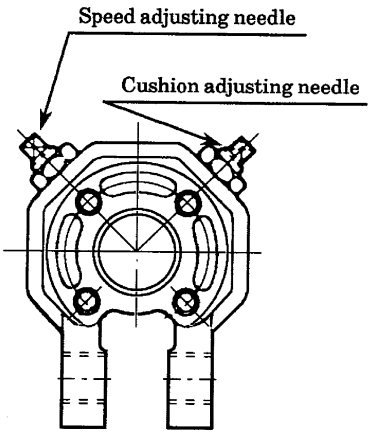
3. OPERATION

3.1 Operating the Cylinder

1) See to it that the air supply pressure to the cylinder is as shown in the "Specification". Operate the cylinder within this pressure range.

2) Both the speed-adjusting and cushion-adjusting needles have been adjusted to no load conditions before delivery. Readjust them as required if different speed and cushioning effects are desired.

Tightening the needle (clockwise) makes cushion more effective. Tighten the needle lock nut all the way after adjustment.



However, if kinetic energy such as load is heavy or speed is too fast, exceeding the values given in Table 1, consider of providing a shock absorber.

Table 2 : Table of cushion characteristics

Tube bore (mm)	Air cushion	
	Effective cushion length (mm)	Allowable energy absorption (J)
ϕ40	13.5	5.14
ϕ50	13.5	6.41
ϕ63	13.5	11.37
ϕ80	15.4	25.4

3.2 Operating the Switches

3.2.1 General Cautions

1) Magnetic environment

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

2) Protection of lead cord

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

3) Service temperature

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

4) Intermediate position sensing

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

5) Shock

Carefully avoid big shock or vibration during transportation of cylinder of mounting and adjusting switch.

6) Changing switch lead wire colors

The colors of the switch lead wires have been changed, as shown in the following table, in response to the revision of the JIS standard and the subsequent revision of the NECA (Nippon Electric Controllers Association) standard.

		Before change	After change
M, S, R A, T, K V, H Series	2-wire type	White (+)	Brown (+)
		Black (−)	Blue (−)
	3-wire type	Red (+)	Brown (+)
		White (output)	Black (output)
		Black (−)	Blue (−)
T, K Series (equipped with preventive maintenance output)	3-wire type	White (+)	Brown (+)
		Yellow(preventive maintenance output)	Orange(preventive maintenance output)
		Black (−)	Blue (−)
	4-wire type	Red (+)	Brown (+)
		White (regular output)	Black (regular output)
		Yellow(preventive maintenance output)	Orange(preventive maintenance output)
		Black (−)	Blue (−)

3.2.2 Operational Cautions, Non contact type switch (T2, T3)

1) Connection of lead cord

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

An erroneous wiring or short circuiting of load causes damage to not only switches, but also load side circuit. Wiring work without shutting electricity off may cause damage to the load side circuit.

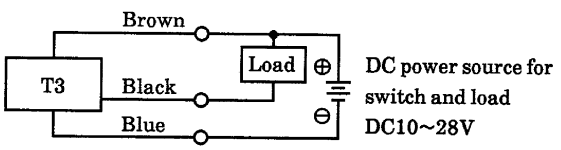


Fig.1 Basic Circuit Example (1)
(The same power source is used for switch and load.)

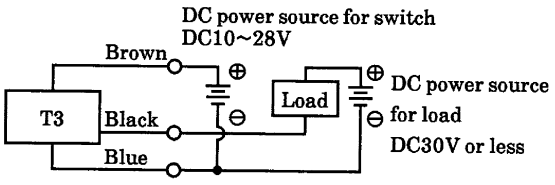


Fig.3 Basic Circuit Example (3) (Different power sources are used for switch and load.)

2) Protection of output circuit

Install some protective circuit as illustrated in Fig. 3 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. 4 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. 5 or 6 (in case of model T2) and Fig 7 (in case of model T3).

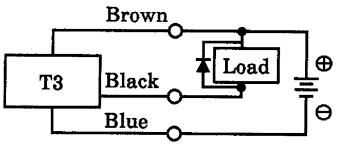


Fig.3 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)

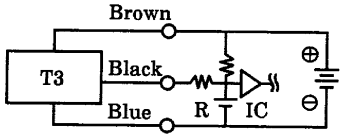


Fig.4 An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R. $\frac{V}{0.10} = R\,(\Omega)$

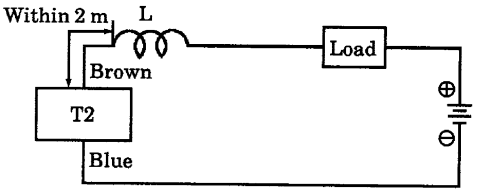


Fig.5 • Choke coil
L= a couple hundred μH ~ a couple mH surpassing high frequency characteristic
• Install it nearby the switch (within 2 m).

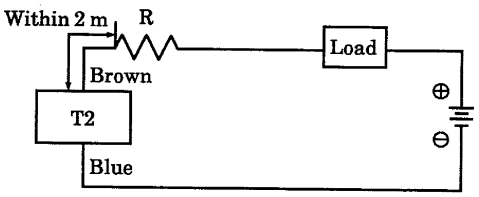


Fig.6 • Dash current restriction resister
R= As much large resister as the load circuit can afford.
• Install it nearby the switch (within 2 m).

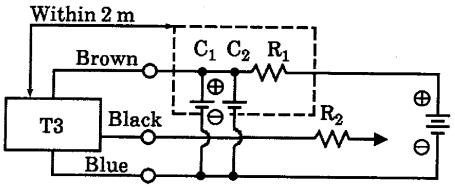


Fig.7

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

3) Connection to a programmable controller (Sequencer)

Type of connection varies depending upon the model of the programmable controller. Refer to the following Fig. 8~12 respectively.

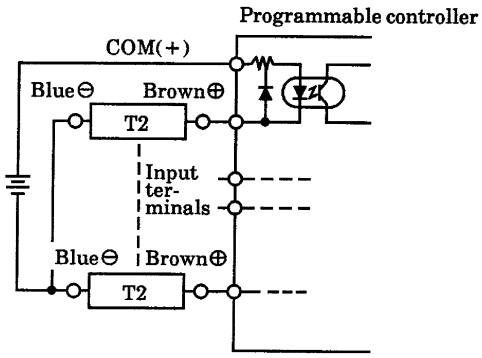


Fig.8 An example of T2 connection to source input type (an external power source)

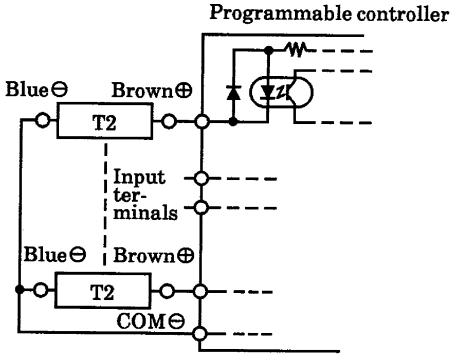


Fig.9 An example of T2 connection to source input type (an internal power source)

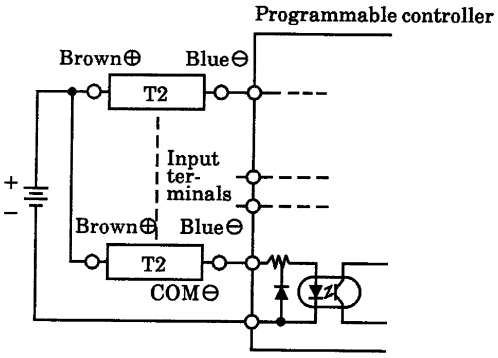


Fig.10An example of T2 connection to sink input type

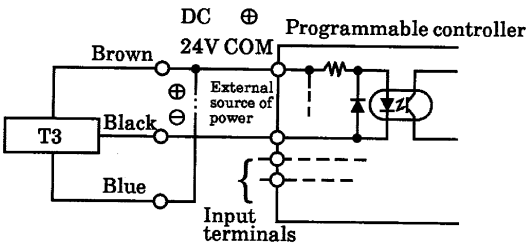


Fig.11An example of T3 connection to source input type (an external power source)

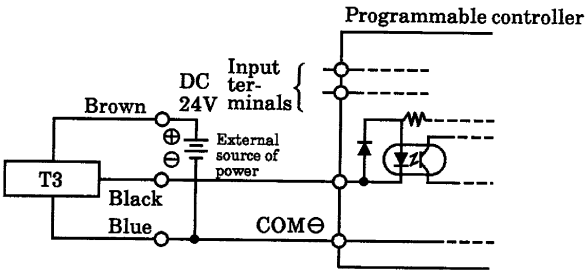


Fig.14An example of T3 connection to source input type (an internal power source)

4) Series connection

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

T3 switches hardly ever leak. When less than 10μA, then leakage may occur. Usually dimming and failure of the lamp do not occur.

3.2.3 Operational Cautions, Contact type switch (T0, T5)

1) 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 the following precautions.

Ⓐ For DC connection, use such polarities of cords as white ⊕ and black ⊖. 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.

2) Capacity of contact points

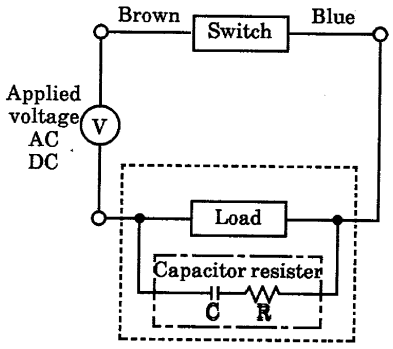
Avoid using a load exceeding the max. capacity of contact points. On the other hand, in case of T0 model, switch lamp may not be lit sometimes when current is lower than the rated current.

3) Protection of contact point

Install such a protective circuit as illustrated in either Fig 1 or 2, as follows, when inducing a type load such as a relay is to be used.

Provide a contact protection circuit as shown in Figs. 3 and 4 if the wiring length exceeds the length shown in below table.

Voltage	Wire length
DC	100m
AC	10m

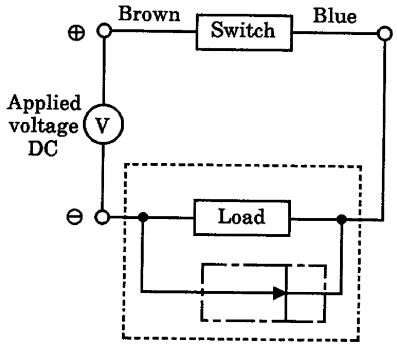


User circuit

Protective circuit (Spark absorbing circuit)

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

Fig.1 When capacitor resister is used.

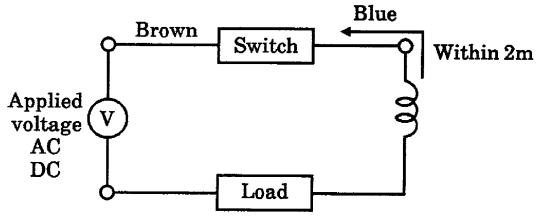


User circuit

Protective circuit

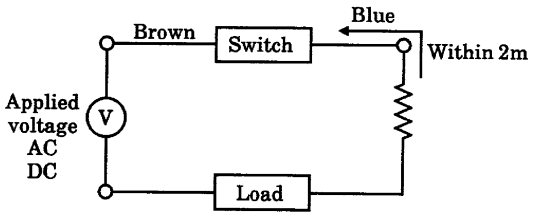
Rectifying diode, general use
Hitachi Mfg. product V06C or equivalent

Fig.2 When diode is used.



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

Fig.3



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

Fig.4

4) Relay

Use such products as specified below or equivalent.

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

5) Serial connection

Total voltage loss, when connected T0 switches in series, equals to the sum of respective voltage loss of each switch.

The total voltage loss becomes equivalent to one T0 (approx. 2.4V) when connecting the combination of one T0 for actuation confirming and rest of T5 switches.

Lamp is lit only when all switches turn on.

6) Parallel connection

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

3.2.4 Operational Cautions, Strong magnetic field proof switch (H0)

Please refer to Instruction manual (SM-10418-A).

3.2.5 Operational Cautions, Strong magnetic field proof switch (T2YD)

Please refer to Specification (KS-236269-A).

4. MAINTENANCE

4.1 Periodical Inspection

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

2) Inspection items

ⓐ Check the bolts and nuts fitting the piston rod end fittings and supporting fittings for slackening.

ⓑ Check to see that the cylinder operates smoothly.

ⓒ Check any change of the piston speed and cycle time.

ⓓ Check for internal and/or external leakage.

ⓔ Check the piston rod for flaw (scratch) and deformation.

ⓕ Check the stroke for abnormality.

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

4.2 Disassembly Procedure

This cylinder is able to be disassembled.

1) Replace component parts listed in Expendable parts List by disassembling cylinder referring to internal structure diagram when air leakage is ever occurred.

(1) Shut off the fluid and remove the residual pressure.

(2) Disconnect cylinder from piping and load.

(3) Tuck a cover, either head cover ⑮ or rod cover ⑤, onto a pair of vise.

(4) Remove the cover by holding the unfixed width across the flats of the cover with a spanner or monkey wrench.
For tools required to remove the cover, see Table 3.

Table 3

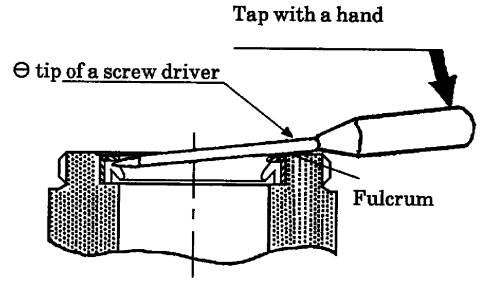
Tube bore (mm)	Pair face of cover	Recommended hand tools			
φ40	68	Adjustable wrench	375	Pipe wrench	900
φ50	68			〃	900
φ63	72			〃	900
φ80	86			〃	1200

Note
- Pipe wrench may sometimes give defects to cover.
- Fairly large torque (350N · m or more) is required for φ80, φ100. Using rigid enough vise to fix the cylinder, also apply a piece of pipe of approx. 1.5monto the handle of spanner, adjustable wrench or pipe wrench to loosen cylinder cover.

(5) Remove rod packing ③, piston packing ⑩, cylinder gasket ⑥ & wear ring ⑬ using sharp pointed tool such as ⊖ tip screw driver or bodkin.

(6) To replace cushion packing on the cover with cushion which was not disassembled, tuck pair face of the cover onto a pair of vise and loosen the tube by applying pipe wrench to OD of the tube as near to the cover as possible. (Beware that cylinder tube may be scratched by pipe wrench.)

(7) To remove cushion packing, tuck the pair face of cover with a pair of vise, then ply it out with a ⊖ tip of screw driver by tapping the handle of screw driver with a hand upon inserting the tip under the loin of packing while making the corner edge of cover a fulcrum.



4.3 Assembly Procedure

1) Clean each component parts.

2) Take reversed sequence of disassembly to assemble cylinder after cleaning parts. Carefully avoid giving damage to packings to prevent malfunction or air leakage.

3) Assembling cushion packings.

To prevent a damage to packing also a tilt of it, use a jig and carefully press it in the place. Make sure to press it down so as the upper edge of its metal ring sink about 0.5mm below the top surface of the cover.

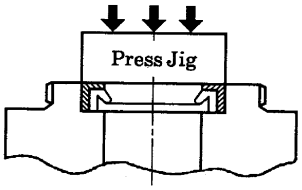
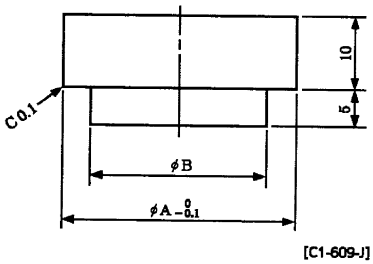


Table 1 and the illustration is an example of the jig. Make it a reference of jig fabrication.

Tube bore (mm)	A	B
ϕ40	32	24
ϕ50, ϕ63	32	24
ϕ80	45	35

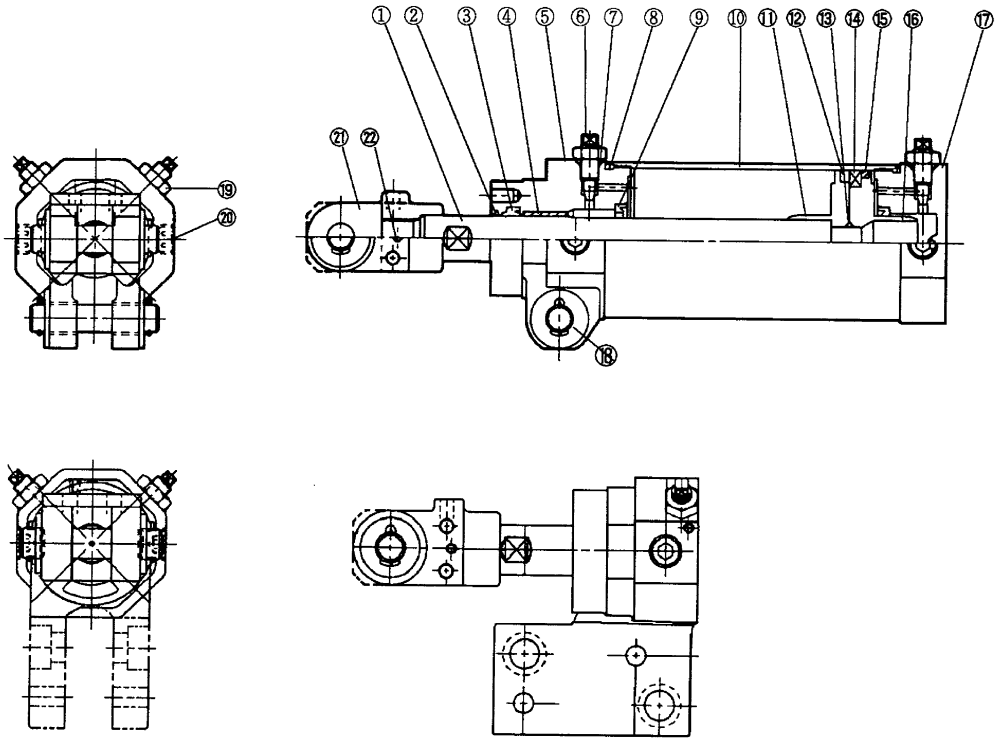


4) Apply a film of high grade grease (Litium alkali base) over the inner surface of cylinder tube, outer surface of piston and packings.

5) When tightly assembling rod cover and head cover onto tube, make sure, for tight finishing, to turn the cover approx. 2° beyond former position before disassembling. (As for both foot mounting type, carefully select tight finishing position so as to have both mounting faces of bracket become flat.)

4.4 Internal structure drawings and Expendable parts list

1) Double acting, single rod type : Internal structure and parts list



Discontinue

No.	Parts name	Material	Remarks
1	Piston rod	Steel	Industrial chromium plating
2	Metallic scraper	Copper alloy	
3	Rod packing	Nitril rubber	
4	Metal	Copper alloy	
5	Rod cover	Aluminum alloy, die casted	Chromate
6	Needle	Copper alloy	
7	Needle gasket	Nitril rubber	
8	Cylinder gasket	Nitril rubber	
9	Cushion packing	Nitril rubber	
10	Cylinder tube	Aluminum alloy	Hard almite
11	Piston R	Aluminum alloy, die casted	Chromate
12	Piston packing	Nitril rubber	Packing standard PSD
13	Piston gasket	Nitril rubber	
14	Piston magnet	Magnet	
15	Wear ring	Polyacetal	
16	Piston H	Aluminum alloy, die casted	Chromate
17	Head cover	Aluminum alloy, die casted	Chromate
18	Bushing for clevis	PTFE impregnated alloy	
19	Hex. nut	Copper alloy	
20	Socket headed plug bolt	Steel	Black oxide finish
21	Rod clevis	Cast iron	Phosphate coating
22	Spring pin	Copper alloy	

Expendable parts list

Tube bore (mm) \ No. / Parts name / Kit No.	2	3	7	8
	Metallic scraper	Rod packing	Needle gasket	Cylinder gasket
ϕ 40	CAC3-40K	MDH-20	PDU-20	P-8	AS568-128
ϕ 50	CAC3-50K				AS568-135
ϕ 63	CAC3-63K				AS568-143
ϕ 80	CAC3-80K	MDH-25	PDU-25		G-75

Tube bore (mm) \ No. / Parts name / Kit No.	9	12	15
	Cushion packing	Piston packing	Wear ring
ϕ 40	CAC3-40K	F4-650637	PSD-40	F4-650239
ϕ 50	CAC3-50K		PSD-50	F4-650240
ϕ 63	CAC3-63K		PSD-63	F4-650241
ϕ 80	CAC3-80K	F4-650638	PSD-80	F4-650242

Note : Specify the kit No. on your purchase order.

5. TROUBLE SHOOTING

1) Cylinder

Trouble	Cause	Countermeasure
Does not operate	No pressure or inadequate pressure	Provide an adequate pressure source.
	Signal is not transmitted to direction control valve	Correct the control circuit.
	Improper or misalignment of installation	Correct the installation state and/or change the supporting system.
	Broken piston packing	Replace the cylinder.
Does not function smoothly	Speed is below the low speed limit	Reduce the load.
	Improper or misalignment of installation	Correct the installation state and/or change the supporting system.
	Exertion of transverse (lateral) load	Install a guide. Revise the installation state and/or change the supporting system.
	Excessive load	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of "Meter in" circuit	Change the installation direction of the speed control valve.
Breakage and/or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or install a mechanism with more secured cushion effect (e.g. external cushion mechanism).
	Exertion of transverse load	Install a guide. Reverse the installation state and/or change the supporting system.

2) Switch

Trouble	Cause	Countermeasure
Lamp is not lit.	Deposited contact point	Replace switch.
	Excessive load than rated capacity	Replace the relay w/recommended one or replace the switch
	Damage to the lamp	Replace the lamp.
	Inadequate incoming signal	Review the external signal circuit and remove the causes
Switch does not function right.	Broken circuit	Replace the switch
	Inadequate incoming signal	Review the external signal circuit and remove the causes
	Improper voltage	Correct voltage to specified.
	Incorrect location of switch	Correct its location
	Aberrant position of switch	Set it back to original position
	Incorrect direction of switch mounting	Correct the direction of the switch.
	Relay is unable to respond properly within the piston stroke	Adjust speed slow Replace the relay
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch
Switch does not return.	Piston is not moving	Correct to have piston move.
	Deposited contact point	Replace the switch
	Excessive load (relay) than rated capacity	Replace the relay with a recommended one or replace the switch
	Improper ambient temperature	Adjust the ambient temperature within the range of −10 to 60°C
	Existence of a foreign magnetic field	Shield the magnetic field.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.

Discontinue

6. HOW TO ORDER

6.1 Product Number Coding

6.1.1 CAC3

● ϕ40 to ϕ63

● Cylinder without switch and Cylinder with switch

CAC3 — A — B C — D E — F — G H — I

● Strong magnetic field proof (H0/H0Y) Cylinder with switch

CAC3-L2 — A — B C — D E — F — G H — I

Ⓐ Clevis width (mm)		Ⓑ Tube bore(mm)		Ⓒ Cushion		Ⓓ Stroke(mm)	Ⓔ Speed adjusting needle	
A	16.5 $^{+0.2}_{+0.1}$	40	ϕ40	No code	Both ends cushion	50	No code	Both ends needle
		50	ϕ50	R	Rod end cushion	75	R	Rod end needle
B	19..5 $^{+0.2}_{+0.1}$	63	ϕ63	H	Head end cushion	100	H	Head end needle
				N	No cushion	125	N	No needle
AL	16 .5 $^{+0.2}_{+0.1}$ (Foot mounting type)					150		
BL	19.5 $^{+0.2}_{+0.1}$ (Foot mounting type)							

※ A, B, AL, and BL types are supplied with clevis pin, split pin, and plain washer.
※ Clevis width and two mountain knuckle width are equal width.

Ⓕ Switch model				
Lead wire straight type	Lead wire L-shaped type			Function
T0H※	T0V※	Contact type	2-core	AC/DC Relay, for PC
T5H※	T5V※			AC/DC Relay, for PC, IC circuit, without lamp
T2H※	T2V※	Non contact type		DC, PC exclusively
T3H※	T3V※		3-core	DC, Relay, PC exclusively, for IC circuit
T2YH※	T2YV※	2-color indicating, non contact type	2-core	DC, PC exclusively
T3YH※	T3YV※		3-core	DC, Relay, PC exclusively, for IC circuit
T2YD※	—			DC,PC exclusively
T2YDT※	—			DC,PC exclusively Flame-resistant type
H0※	—	Contact type	2-core	AC/DC,Relay,forPC
H0Y※	—	2-color indicating, contact type		DC, PC exclusively

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

※ mark specifies the length of lead cord.

Ⓖ Number of switches	
R	1 ea.,Rod end
H	1 ea.,Head end
D	2 ea.

Ⓗ Installation of switches	
No code	B / C / No code (A)
B	
C	

Ⓘ Accessories		
Y	Rod clevis(FCD400)※1	Standard
Y1	Rod clevis(SS400)※1	
No code	Without bracket	
I	Rod eye(SS400)	Options
K	Bellows(Neoprene)	
N	Changed piston rod extending length and rod end(screw)	
D	With dog	Limit switch mouting base
D1	Without dog	
Q	Toggle accessory ※2	

※1 : Pin, Splitpin, P;ain washer
※2 : The toggle accessory cannot be installed to the standard type because it requires a different piston rod projection length.

[SM-174940-A]

Discontinue

6 HOW TO ORDER

- ϕ80

  - Cylinder without switch

CAC3 — A B — C D ——————— H

  - Cylinder with switch

CAC3 — A B — C D — E — F G — H

  - Strong magnetic field proof (H0/H0Y) Cylinder with switch

CAC3-L2 — A B — C D — E — F G — H

Ⓐ Tube bore		Ⓑ Cushion		Ⓒ Stroke		Ⓓ Speed adjusting needle	
80	ϕ80	No code	Both ends cushion	50	50	No code	Both ends needle
		R	Rod end cushion	75	75	R	Rod end needle
		H	Head end cushion	100	100	H	Head end needle
		N	No cushion	125	125	N	No needle
				150	150		

Ⓔ Switch model				
Lead wire straight type	Lead wire L-shaped type			Function
T0H※	T0V※	Contact type	2-core	AC/DC Relay, for PC
T5H※	T5V※			AC/DC Relay, for PC, IC circuit, without lamp
T2H※	T2V※	Non contact type		DC, PC exclusively
T3H※	T3V※		3-core	DC, Relay, PC exclusively, for IC circuit
T2YH※	T2YV※	2-color indicating,non contact type	2-core	DC, PC exclusively
T3YH※	T3YV※		3-core	DC, Relay, PC exclusively, for IC circuit
T2YD※	—		2-core	DC, PC exclusively
T2YDT※	—			DC, PC exclusively Flame-resistant type
H0※	—	Contact type	2-core	AC/DC Relay, for PC
H0Y※	—	2- colors indicating, contact type		DC, PC exclusively

※ mark specifies the length of lead cord.

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

Ⓕ Number of switches	
R	1 ea.,Rod end
H	1 ea.,Head end
D	2 ea.

Ⓖ Installation of switches		
No code	B C No code	
B		
C		

Ⓗ Accessories	
Y1	Rod clevis(SS400)

Discontinue

6.1.2 CAFL / CAFR

● ϕ50, ϕ63

● Cylinder without switch and Cylinder with switch

CAFL — A — B C — D E — F — G H

CAFR — A — B C — D E — F — G H

●Strong magnetic field proof(H0/H0Y) Cylinder with switch

CAFL-L2 — A — B C — D E — F — G H

CAFR-L2 — A — B C — D E — F — G H

Ⓐ Thickness of flange (mm)		· Width of Knuckle (mm)	Ⓑ Tube bore(mm)	
A	8	· 16.5 $^{+0.2}_{+0.1}$	50	ϕ50
B	9.5	· 19.5 $^{+0.2}_{+0.1}$	63	ϕ63

Ⓒ Cushion	
No code	Both ends cushion
R	Rod end cushion
H	Head end cushion
N	No cushion

Ⓓ Stroke(mm)
50
75
100
125
150

Ⓔ Speed adjusting needle	
No code	Both ends needle
R	Rod end needle
H	Head end needle
N	No needle

Ⓕ Switch model				
Lead wire straight type	Lead wire L-shaped type			Function
T0H※	T0V※	Contact type	2-core	AC/DC Relay, for PC
T5H※	T5V※			AC/DC Relay, for PC, IC circuit, without lamp
T2H※	T2V※	Non contact type		DC, PC exclusively
T3H※	T3V※		3-core	DC, Relay, PC exclusively, for IC circuit
T2YH※	T2YV※	2-color indicating,non contact type	2-core	DC, PC exclusively
T3YH※	T3YV※		3-core	DC, Relay, PC exclusively, for IC circuit
T2YD※	—		2-core	DC, PC exclusively
T2YDT※	—			DC, PC exclusively Flame-resistant type
H0※	—	Contact type		AC/DC Relay, for PC
H0Y※	—	2-color indicating, contact type		DC, PC exclusively

※ mark specifies the length of lead cord.

Ⓖ Number of switches	
R	1 ea.,Rod end
H	1 ea.,Head end
D	2 ea.

Ⓗ Installation of switches	
No code	B C No code (A)
B	
C	

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

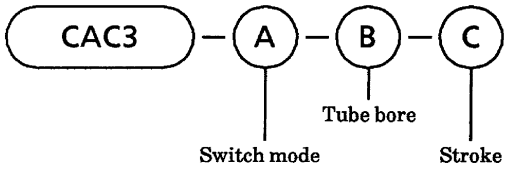
※ mark specifies the length of lead cord.

Discontinue

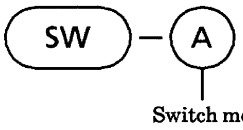
6.2 Component parts Model coding

1) Switch (T※H · T※V)

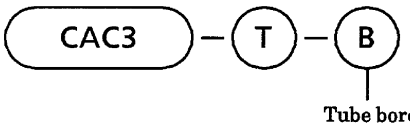
(1) Switch + CAC3 set of Mounting bracket and others



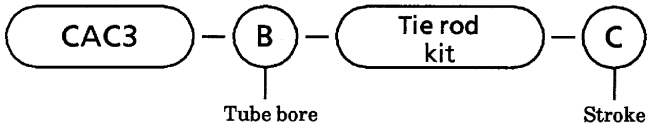
(2) Switch it self



(3) CAC3 set of Mounting bracket and others



(4) Tie rod kit for CAC3



Ⓐ Switch model				
Lead wire straight type	Lead wire L-shaped type			Function
T0H※	T0V※	Contact type	2-core	AC/DC Relay, for PC
T5H※	T5V※			AC/DC Relay, for PC, IC circuit, without lamp
T2H※	T2V※	Non contact type		DC, PC exclusively
T3H※	T3V※		3-core	DC, Relay, PC exclusively, for IC circuit
T2YH※	T2YV※	2-color indicating,	2-core	DC, PC exclusively
T3YH※	T3YV※	non contact type	3-core	DC, Relay, PC exclusively, for IC circuit

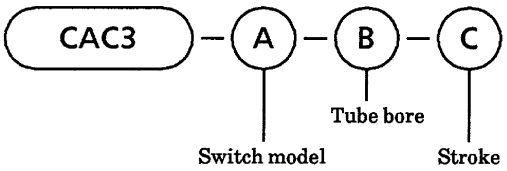
※ mark specifies the length of lead cord.

Ⓑ Tube bore		Ⓒ Stroke	
40	ϕ40	50	50
50	ϕ50	75	75
63	ϕ63	100	100
80	ϕ80	125	125
		150	150

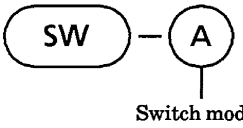
※ Lead cord length	
No code	1m (Standard)
3	3m (Optional)
5	5m (Optional)

2) Switch (T2YD)

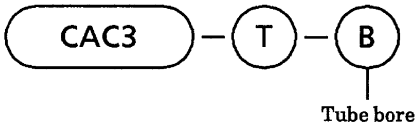
(1) Switch + CAC3 set of Mounting bracket and others



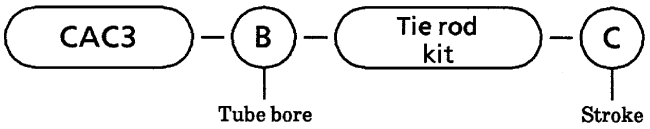
(2) Switch it self



(3) CAC3 set of Mounting bracket and others



(4) Tie rod kit for CAC3



Ⓐ Switch model			
Lead wire straight type			Function
T2YD※	2-color indicating, non contact type	2-core	DC, PC exclusively
T2YDT※			DC, PC exclusively Flame-resistant type

※ mark specifies the length of lead cord.

Ⓑ Tube bore		Ⓒ Stroke	
40	ϕ40	50	50
50	ϕ50	75	75
63	ϕ63	100	100
80	ϕ80	125	125
		150	150

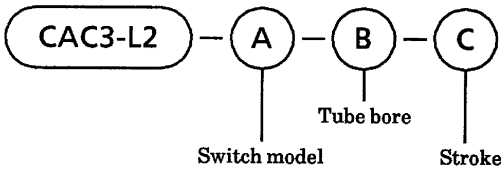
※ Lead cord length	
No code	1m (Standard)
3	3m (Optional)
5	5m (Optional)

Discontinue

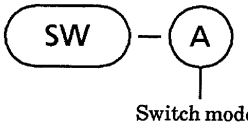
6
MODEL NO.

3) Switch (H0)

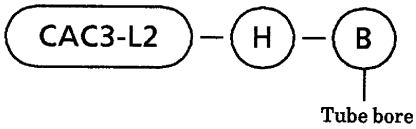
(1) Switch + CAC3-L2 set of Mounting bracket and others



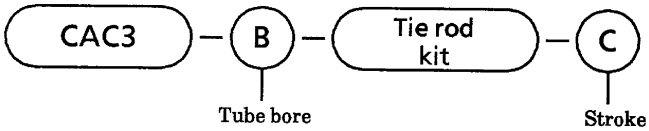
(2) Switch it self



(3) CAC3-L2 set of Mounting bracket and others



(4) Tie rod kit for CAC3



Ⓐ Switch model			
Lead wire straight type			Function
H0※	Contact type	2-core	AC/DC Relay, for PC
H0Y※	2-color indicating, contact type		DC, PC exclusively

※ mark specifies the length of lead cord.

Ⓑ Tube bore		Ⓒ Stroke	
40	ϕ40	50	50
50	ϕ50	75	75
63	ϕ63	100	100
80	ϕ80	125	125
		150	150

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

7. SPECIFICATION

7.1 Specifications

Model code / Item		CAC3, CAFL, CAFR			
Media		Compressed Air			
Type of motion		Double acting type			
Maximum working pressure	MPa	1.0			
Minimum working pressure	MPa	0.1			
Proof pressure	MPa	1.6			
Tube bore	mm	φ40	φ50	φ63	φ80
Port size	Rc	1/4			3/8
Standard stroke	mm	50, 75, 100, 125, 150			
Ambient temperature	℃	5 to 60			
Working piston speed ※	mm/s	50 to 500	50 to 400	50 to 300	
Cushioning		With or without air cushion (optional)			
Lubrication		Not required (Use Turbine oil Class 1, ISO, VG32 if and when lubrication is needed)			
Mounting type		Cap clevis			

※ Please use cylinder with limit of allowable energy absorption.

7.2 Switch Specifications

Kind and Model code / Item	Proximity Switch			
	T2H · T2V	T2YH · T2YV	T3H · T3V	T3YH · T3YV
Application	For Programmable controller, exclusive		For Programmable controller or Relay	
Voltage of source of power	——		DC10 to 28V	
Load voltage, current	DC10 to 30V		DC30V or less	
Load current	5 to 20mA (※1)		100mA or less	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, 0.2mm²)		Standard 1m (Oil proof vinyl, Cabtyre cord, 3-core, 0.2mm²)	
Max. shock	980m/s²			
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 to +60℃			
Protective structure	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof			

Discontinue

7 SPECIFICATION

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	DC12/24V, 5 to 50mA	DC12/24V, 50mA or less
Load current	AC100V, 7 to 20mA	AC100V, 20mA or less
Power consumption	——	
Internal voltage drop	2.4V or lower	0V
Lamp	LED (Lights while power is ON)	——
Current leak	0mA	
Length of lead cord (※1)	Standard 1m (Oil proof vinyl, Cabtyre cord, 2-core, 0.2mm²)	
Max. shock	294m/s²	
Insuration resistance	20MΩ or more by DC 500V megger	
Insuration voltage	No abnormalities upon charging AC1000V for one minute.	
Ambient temperature	−10 to + 60°C	
Protective structure	IIEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof	

Kind and Model code / Item	Non contact type switch 2 colors
	T2YD
Application	Programmabple ccontroller
Lamp	LED (Red/Green)(Lights while power is ON)
Load voltage	DC24V ± 10%
Load current	DC5 to 20mA
Internal voltage drop	6V or less
Current leak	1.2mA or less
Output delay (※ 3) (ON/OFF delay)	30 to 60mS
Length of lead cord (※4)	Standard 1m (Oil proof vinyl, Cabtyre cord, 2-core, 0.2mm²)(※5)
Insuration resistance	20MΩ or more by DC 500V megger
Insuration voltage	No abnormalities upon charging AC1000V for one minute.
Max. shock	980m/s²
Ambient temperature	−10 to + 60°C
Protective structure	IEC Standard IP67,JIS C0920 (Intrusion type without water), Oil proof

Note1 : Max. Load Current (25mA) is at 25°C. It may drop lower than 25mA when ambient temperature rises higher than 25°C. for example : it may be 5~10mA at 60°C)
Note2 : 3m, 5m optional lead wires are available beside standard length.
Note3 : Time to the generation of switch output through detection of piston magnet by magnetic sensor
Note4 : 3m, 5m optional lead wires are available beside standard length.
Note5 : Flame-resistant lead wires are optionally available.

7.3 Strong magnetic field proof switch Specifications

Kind and Model code	Contact point switch		
Item	H0		H0Y(2 colors)
Application	For Programmable controller or Relay		For Programmable controller
Lamp	LED (Green) (Lights while power is ON)		LED (Red/Green) (Lights while power is ON)
Load voltage	DC12/24V	AC100V	DC24V
Load current	5 to 50mA	7 to 50mA	5 to 20mA
Internal voltage drop	5V or less		6V or less
Current leak	10μA or less		
Length of lead cord	Standard 1m (Non flammable cabtyre cord, 2-core, 0.5mm^2)		
Insuration resistance	100MΩ or more by DC 500V megger		
Insuration voltage	No abnormalities upon charging AC1000V for one minute.		
Max. shock	294m/s^2		
Ambient temperature	−10 to + 60°C		
Protective structure	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof		