

INSTRUCTION MANUAL HIGH SPEED CYLINDER CAC4

- 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.

For Safety Use

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

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



- 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.

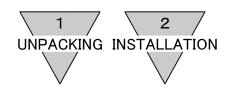
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CAC4

Clamp Cylinder

Manual No. SM-419786-A

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1. UNPACKING

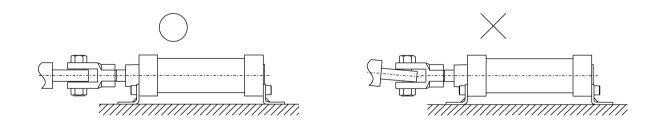
- 1) Make sure that the type No. on the nameplate of the delivered Rotary Clamp Cylinder matches the type No. you ordered.
- 2) Check the appearance for any damage.
- 3) Stop up the piping port with a sealing plug to prevent the entry of foreign substances into the cylinder.

 Remove the sealing plug before piping.

2. INSTALLATION

2.1 Installation

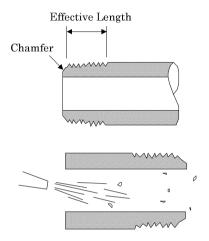
- 1) The Ambient temperature for this cylinder is 5 to 60°C. (No freezing)
- 2) Use cylinder with bellows over its rod within the area with much dust.
- 3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
- 4) When cylinder 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.



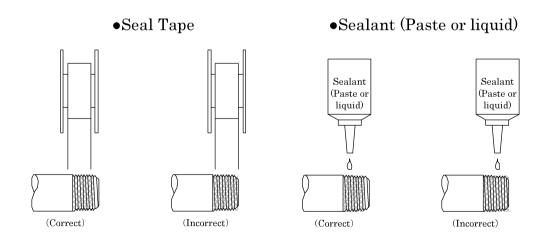


2.2 Piping

- 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 cross-sectional area which is needed for the cylinder to drive at the specified speed.
- 3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust and foreign substance in the drain of the pipe.
- 4) Be sure observe 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.



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

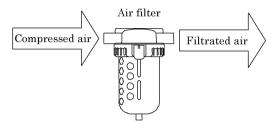


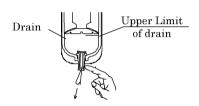
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2.3 Fluid

- 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 5μ m or less), flow rate and its mounting location (as nearest to the directional control valve as possible).
- 2) Be sure to drain out the accumulation in the filter periodically.
- 3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.



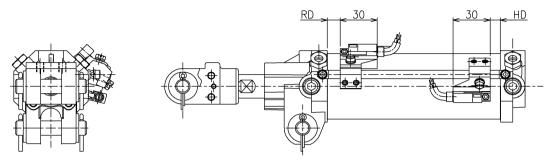


4) This cylinder does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 as a lubricant, if and when lubrication is needed.



2.4 Location of Mounting Switches on a Cylinder

1) Location of mounting switches on a cylinder



(1) At the stroke end

Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the maximum sensitive position. In addition, mount switches with the lead cord inside as the illustration above. (See table 1)

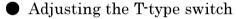
(2) Intermediate of stroke

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 should be located on both side of piston. The intermediate spot between those points is the maximum sensitive position and where the switch is supposed to be installed.

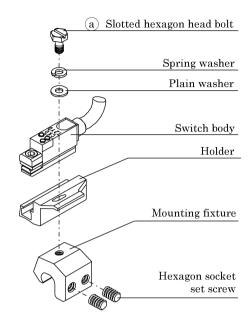
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- (3) Mounting and adjusting the T-type switch
- Mounting the T-type switch
 - ① Pass the spring washer and plain washer through the slotted hexagon head bolt, and then set the switch holder.
 - 2 Press-fit the mounting fixture into the tie rod of the cylinder. Set the mounting fixture to a desired position and tighten the hexagon socket set screws with a tightening torque of 2.5-3.0 N·m.
 - ③ 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.

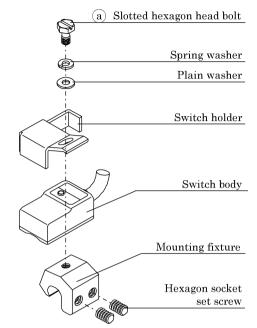


①Loosen all the hexagon socket set screws. Move the switch together with the mounting fixture to a desired position and tighten the hexagon socket set screws with a tightening torque of 2.5-3.0 N⋅m.





- (4) Mounting and adjusting the H-type switch
- Mounting the H-type switch
 - ① Pass the spring washer and plain washer through the slotted hexagon head bolt, and then set the switch holder.
 - 2 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 set screws with a tightening torque of 2.5-3.0 N·m
 - ③ 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
 - ① Loosen all the hexagon socket set screws. Move the switch together with the mounting fixture to a desired position and tighten the hexagon socket set screws with a tightening torque of 2.5-3.0 N·m.



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2) Operating range

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 maximum 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.

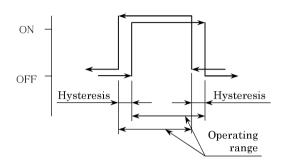


Table 1 Maximum sensitive position (HD, RD), Operating range and Hysteresis

(Unit:mm)

		Solid state (T2 \square , T3 \square , T3P \square , T2J \square , T2Y \square , T3Y \square , Reed (T0 \square ,					□、T5□、H0	□、T5□、H0□)					
Model	Tube	Maximum sensitive position			Operatir	ng range	TT4	eresis	Maximum sensitive				
code	bore	Н	D	RD		(Referen	ce value)	nysu	eresis		itive tion	Operating	Hyste resis
		One color	Two colors	One color	Two colors	One color	Two colors	One color	Two colors	HD	RD	range	resis
● One/Tw	70-color i	ndicatio	n type	(T2H/\	V, T3H	V, T0H/V,	T5H/V)						
	ϕ 40					2.2 to 6.8	5.7 to 6.5					6.7 to 10.8	
CAC4	ϕ 50	8.	8.5		10.5		5.9 to 6.8	1.5 or	1.0 or		10.5	7.8 to 11.3	3 or
CAC4	φ 63						6.1 to 6.8	less	less			8.2 to 11.4	less
	ϕ 80	1	9	26		3 to 7.2	7.7 to 8.5			19	26	9 to 10.9	
• Strong	magneti	c field p	roof con	npact ty	pe (H0)								
(H0)													
	ϕ 40											4.5 to 7.5	
CAC4-L2	φ 50	_		_	_ -	_	_ _	_	4	6	5 to 8	3 or	
	φ 63									10.5	10.5	5 to 8.5	less
Strong	ϕ 80 12.5 19.5 6.6 to magnetic field proof type (T2YD)						6.6 to 7.5						
• Strong	φ 40	l Heiu p	roor typ	6(1211	<i>)</i>	6 t	n 9						
a.a.	φ 50	8.	.5	10	0.5	6.5 to							
CAC4	φ 63					6.5 te	0 9.5						
	φ 80	1	9	2	26	6.6 t	o 7.9	150	r less	_	_	_	
	ϕ 40					6.5 to	o 9 .5	1.50	i iess				
CAC4-L2	ϕ 50	8.	.5	10	0.5	7 to							
	φ 63					7 to							
	ϕ 80	1	9	2	26	6.6 t	o 7.9						

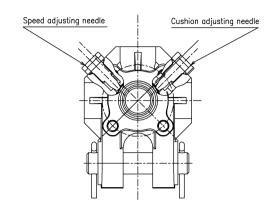
[%] Switches are mounted at the most sensitive locations (HD,RD) ex-factory.



3. OPERATION

3.1 Operating the Cylinder

- 1) The working pressure for this type of cylinder is specified in "Product Specifications". Operate the system within this 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 cushion 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 2, consider of providing a shock absorber.

Table 2: Table of cushion characteristics

D :	Effective air	Allowable energy absorption (J)		
Bore size (mm)	cushion length (mm)	Air cushion	Without cushion	
φ 40	13.5	5.14	0.137	
ϕ 50	13.5	6.41	0.137	
φ 63	13.5	11.37	0.205	
φ 80	15.4	25.4	0.36	

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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 exists (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 repeating 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 response of relay when working piston speed is excessive in the event of intending actuation of switch in the way of piston stroke. (Example) Operate cylinder with the speed of less than 500mm/s in case the relay actuation time is 20ms.

5) Shock

Carefully avoid big shock or vibration during transportation of cylinder or 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
	2-wire	White (+)	Brown (+)
MCDAT	type	Black (—)	Blue (—)
M, S, R, A, T, K, V, H Series		Red (+)	Brown (+)
II, V, II BEILES	3-wire type	White (output)	Black (output)
	бурс	Black (—)	Blue (—)
		White (+)	Brown (+)
	3-wire type	Yellow (preventive maintenance output)	Orange (preventive maintenance output)
T, K Series		Black (-)	Blue (-)
(equipped with preventive		Red (+)	Brown (+)
maintenance output)	4-wire	White (regular output)	Black (regular output)
	type	Yellow (preventive maintenance output)	Orange (preventive maintenance output)
		Black (-)	Blue (–)



3.2.2 Operational Cautions, Solid state switch (T1, 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.

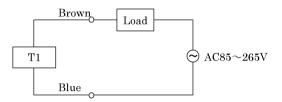


Fig.1 T1 Fundamental circuit Example

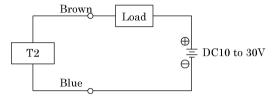


Fig.2 Basic circuit Example of T2

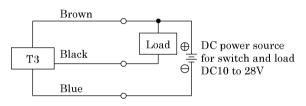


Fig. 3 Basic circuit Example (1) of T3
(The same power source is used for switch and Load)

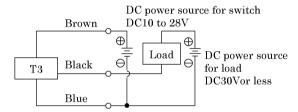


Fig. 4 Basic circuit Example (2) of T3 (Different power sources are used for switch and load)

2) Protection of output circuit

Install some protective circuit as illustrated in Fig. 5 or 6 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current when turning the switch OFF.

Install some protective circuit as illustrated in Fig. 7 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. 8 or 9 (in case of model T2) and Fig 10 (in case of model T3) if the lead wire length is over 10m.

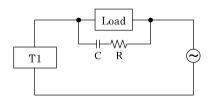


Fig. 5 An example of protective circuit at CR circuit
Capacitor volume: 0.03 to 0.1Mf

Resister: 1 to $3k \Omega$

Brown

T3

Black

Blue

Fig.6 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



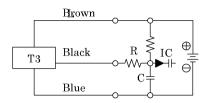


Fig.7 An example of using capacitor type load together with current restriction resister R. Comply with the following formula to figure out required R.

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

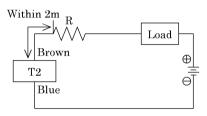


Fig.9 $\, \cdot \,$ Dash current restriction resister R= As much large resister as the load circuit can

·Install it nearby the switch (within 2 m)

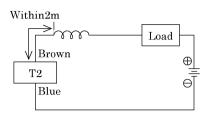


Fig.8 ·Choke coil

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

·Install it nearby the switch (within 2 m)

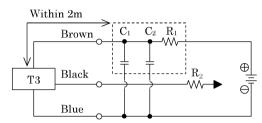


Fig. 10 •Electric power noise absorptive circuit

 $C_1 = 20$ to 50μ F electrolytic capacitor (Withstand voltage 50V or more)

C₂= 0.01 to 0.1 μ F ceramic capacitor

·Dash current restriction resister

 $R_1 = 20$ to 30Ω

R₂ = 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. 11 to 15 respectively.

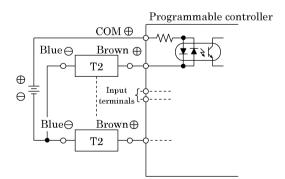


Fig.11 An example of T2 connection to source input type (an external power source)

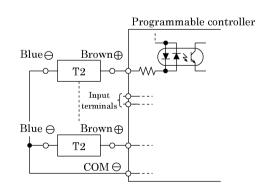


Fig.12 An example of T2 connection to source input type (an internal power source)



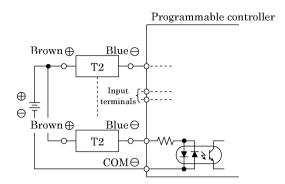


Fig.13 An example of T2 connection to sink input type (an external power source)

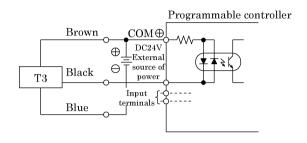


Fig.14 An example of T3 connection to source input type (an external power source)

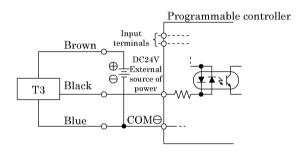


Fig.15 An example of T3 connection to source input type (an internal power source)

4) Series connection

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

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

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3.2.3 Operational Cautions, Reed switch (T0, T5, T8)

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 of (1), (2).

- (1) For DC connection, use such polarities of cords as brown \oplus and black \ominus . The switch still functions right with reversed polarities but indicator light is not lit.
- (2) For AC connection to either relay or input terminal to programmable controller, Switch indicator light sometimes is not lit in case when half-wave rectification is being carried out. Indicator light is lit, in this occasion, when polarities of cords for switch is reversed.

2) 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.

Install such a protective circuit as illustrated in Figs. 3 and 4 if the wire length exceeds the length shown in below table.

Voltage	Wire length
DC	100m
AC	10m

(1) Protective circuit when connecting an inductive type load

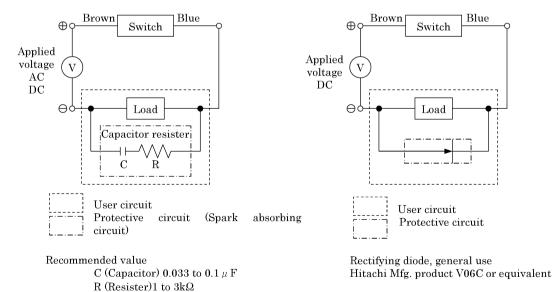


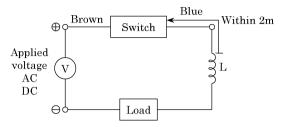
Fig.1 When capacitor resister is used

XEB1K1 Okaya Denki Mfg or equivalent

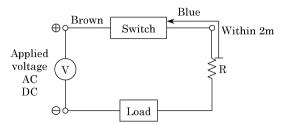
Fig.2 When diode is used



(2) Protective circuit when the wire length exceeds that stated Table 3.



- · Choke coil
- L=a couple hundred $\,\mu\,H$ to a couple mH surpassing high frequency characteristic
- · Install it near by a switch (within 2m). Fig.3



- Dash current restriction resister R=As much large resister as the load circuit can afford.
- · Install it near by a switch (within 2m). Fig.4

3) Capacity of contact points

Avoid using a load exceeding the max. capacity of contact points. Indicator light may not be lit sometimes when current is lower than the rated current.

4) Relay

Use such products as specified below or equivalent.

- OMRON Corporation ·······Model MY
- FUJI ELECTRIC CORP ·······Model HH5
- O Panasonic, 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.

Indicator light is lit only when all switches turn on.

6) Parallel connection

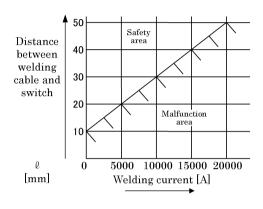
There is no restriction in parallel connection number of switches of these types. Multi number connection of model T0 and T8, sometimes, cause a dimmed indicator light or complete indicator light failure.



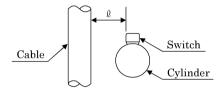
3.2.4 Strong magnetic field proof switch

External magnetic field proof performance
 (spot welding current – switch output malfunction distance characteristics)

In case of H0

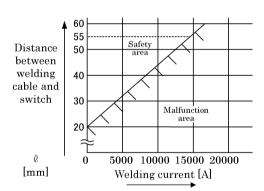


 The characteristics shown on the left may vary depending on the following layout between the cable and switch.
 (Outside diameter of cable: φ 36 mm)



- The external magnetic field proof characteristics of H0 are obtained when the switch is mounted in an area of maximum sensitive position ± 1 mm.
- The external magnetic field proof characteristics of H0Y are obtained when the switch is mounted in its optimal mounting area (green LED lit range).
- For both H0 and H0Y, if two or more welding cables exist and the power is supplied to these cables at the same time, the magnetic flux may increase. Therefore, the characteristics shown on the left may not apply. Additionally, if the switch is located within the loop of the welding cable, the characteristics shown on the left cannot be used.
- The minimum mounting stroke shall be designed to 25 mm or more. If the minimum mounting stroke is 25 mm or less, the performance shown on the left is not satisfied.

In case of H0Y





3.2.5 Strong magnetic field proof switch (T2YD)

• External magnetic field proof performance (at welding current of AC14000A) This strong magnetic field proof switch can be used for all T-type strong magnetic field solid state switch (T2YD) built-in cylinder models or operated in a status that the welding cable is in contact with the cylinder or switch. However, this switch cannot be used for two or more welding cables or within the loop of the cable.

Note: If this switch is used at a welding current of more than AC14000A, the welding cable must be made 35 mm or more apart from the cylinder tube surface.

(Testing conditions: Outside diameter of the cable is ϕ 36.)

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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
 - ①Check the bolts and nuts fitting the piston rod end brackets and mounting brackets for slackening.
 - 2 Check to see that the cylinder operates smoothly.
 - 3 Check any change of the working piston speed and cycle time.
 - (4) Check for internal and/or external leakage.
 - (5) Check the piston rod for flaw (scratch) and deformation.
 - 6 Check the stroke for abnormality.
 - See "5. TROUBLE SHOOTING" should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.



4.2 Disassembly Procedure

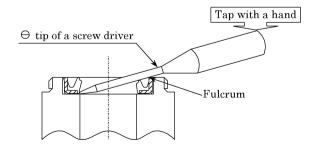
- This cylinder is able to be disassembled.
 Replace component parts listed in Expendable parts List by disassembling cylinder referring to internal structure diagram when air leakage is ever occurred.
 - (1) Shut off the fluid and remove the residual pressure.
 - (2) Disconnect cylinder from piping and load.
 - (3) Tuck a cover, either head cover ⑤ 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 4.

Table 4

Bore size (mm)	Pair face of cover (mm)	Recommended hand tools			
φ 40	68	Adjustable wrench 375	Pipe wrench 900		
φ 50	68	"	Pipe wrench 900		
φ 63	72	"	Pipe wrench 900		
φ 80	86	"	Pipe wrench 900		

Note · Pipe wrench may sometimes give defects to cover.

- Fairly large torque (350N·m or more) is required for ϕ 80, ϕ 100. Using rigid enough vise to fix the cylinder, also apply a piece of pipe of approx. 1.5m onto 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 ③ 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.



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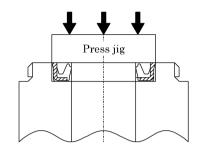


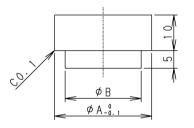
4.3 Assembly Procedure

- 1) Clean each component parts.
- 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 5 and the illustration is an example of the jig. Make it a reference of jig fabrication.

Table 5 Dimens	sions of Press	jig (mm)
Bore size (mm)	A	В
ϕ 40	32	24
ϕ 50, ϕ 63	32	24
$\phi80$	45	35



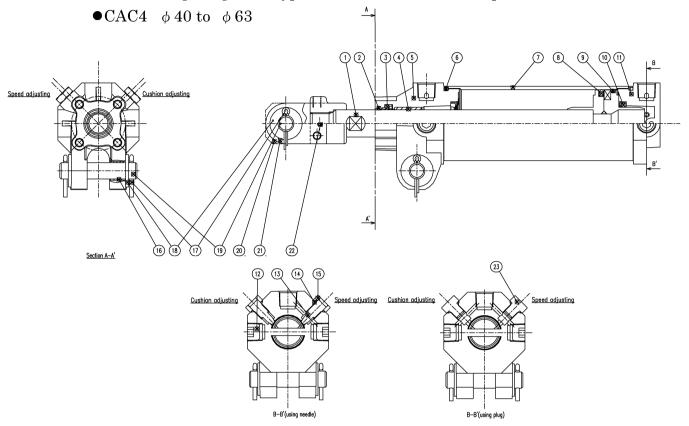


- 4) Apply a film of high grade grease (Lithium alkali base) over the inner surface of cylinder tube, outer surface of piston and packings.
- 5) When tightly assembling rod cover and head cover onto tube, make sure, for tight finishing, to turn the cover approx. 2° beyond former position before disassembling.



4.4 Internal structure drawings and Expendable parts list

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



No.	Parts name	Material	No.	Parts name	Material
1	Piston rod	Steel	13	Needle	Copper alloy
2	Metallic scraper	Copper alloy	14	Needle gasket	Nitril rubber
3	Rod packing	Nitril rubber	15	Hex nut 3	Steel
4	Bush	Copper alloy	16	Bushing for clevis	Steel, Copper
5	Rod cover	Aluminium alloy, die casted	17	Polished plain washer (old)	Steel
6	Cylinder gasket	Nitril rubber	18	Split pin(flat point)	Steel
7	Cylinder tube	Aluminium alloy	19	Clevis pin	Steel
8	Piston packing	Nitril rubber	20	Rod clevis (Y)	Cast iron
9	Wear ring	Polyacetal	21	Rod clevis (Y1)	Cast iron
10	Cushion packing	Nitril rubber, Copper	22	Spring pin	Steel
11	Head cover	Aluminium alloy, die casted	23	Plug	Steel
12	Sunk plug with sealant				

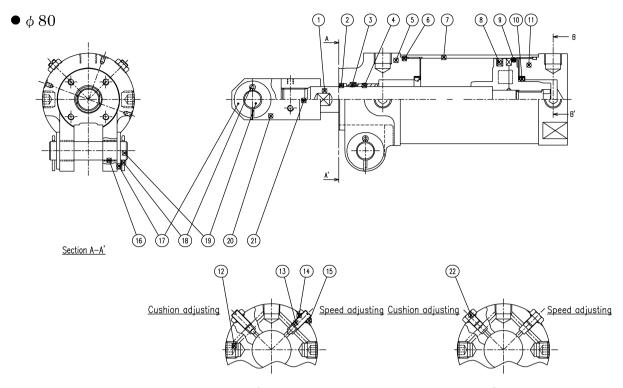
Expendable parts list (Specify the kit No. on your purchase order.)

	No.	2	3	6	8
	Parts name Kit No.	Metallic	Rod packing	Cylinder gasket	Piston packing
φ 40 φ 50 φ 63	CAC4-40K CAC4-50K CAC4-63K	scraper	nou packing	Cymraer gasker	r iston packing

	No.	9	10	(14)
Bore size (mm)	Parts name Kit No.		Cushion	
φ 40	CAC4-40K	Wear ring	packing	Needle gasket
$\phi 50$	CAC4-50K			
ϕ 63	CAC4-63K			

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B-B' (using needle)

B-B' (using plug)

No.	Parts name	Material	No.	Parts name	Material
1	Piston rod	Steel	12	Sunk plug with sealant	
2	Metallic scraper	Copper alloy	13	Needle	Copper alloy
3	Rod packing	Nitril rubber	14	Needle gasket	Nitril rubber
4	Bush	Copper alloy	15	Hex nut 3	Steel
5	Rod cover	Aluminium alloy, die casted	16	Bushing for clevis	Steel, copper
6	Cylinder gasket	Nitril rubber	17	Polished plain washer (old)	Steel
7	Cylinder tube	Aluminium alloy	18	Split pin (flat point)	Steel
8	Piston packing	Nitril rubber	19	Clevis pin	Steel
9	Wear ring	Polyacetal	20	Rod clevis (Y)	Cast iron
10	Cushion packing	Nitril rubber, Copper	21	Spring pin	Steel
11	Head cover	Aluminium alloy, die casted	22	Plug	

Expendable parts list (Specify the kit No. on your purchase order.)

	No.	2	3	6	8
Bore size (mm)	Parts name Kit No.	Metallic scraper	Rod packing	Cylinder gasket	Piston packing
φ 80	CAC4-80K				

	No.	9	10	14
Bore size (mm)	Parts name Kit No.	Wear ring	Cushion packing	Needle gasket
φ 80	CAC4-80K			



5. TROUBLE SHOOTING

1) Cylinder

Trouble	Cause	Countermeasure			
	No pressure or inadequate pressure	Provide an adequate pressure source.			
Does not operate	Signal is not transmitted to direction control valve	Correct the control circuit.			
Does not operate	Improper or misalignment of installation	Correct the installation state and/or change the mounting style.			
	Broken piston packing	Replace the cylinder.			
	Speed is below the low speed limit	Reduce the load and consider the adoption of low pressure cylinder.			
	Improper or misalignment of installation	Correct the installation state and/or change the mounting style.			
Does not function smoothly	Exertion of transverse (lateral) load	Install a guide. Correct the installation state and/or change the mounting style.			
	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)			
deformation	Exertion of transverse load	Install a guide. Correct the installation state and/or change the mounting style.			

2) Switch

Trouble	Causes	Countermeasure			
	Deposited contact point	Replace the switch.			
Indicator light is not lit.	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.			
indicator fight is not fit.	Damaged to the indicator light	Replace the switch.			
	Inadequate incoming signal	Review the external signal circuit and remove the causes.			
	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.			
Switch does not function right.	Aberrant position of switch	Set it back to original position and tighten the mounting device.			
right.	Incorrect direction of switch mounting	Correct the direction of the switch.			
	Relay is unable to respond properly	Adjust speed slow.			
	within the piston stroke	Replace the relay with a recommended one.			
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.			
	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.			
Switch does not return.	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.			

Note 1: Refer "2.4 Location of mounting Switches" as for replacing a switch and correcting its location.

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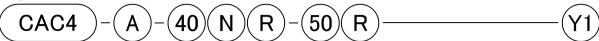


6. MODEL NO. CLASSIFICATION

6.1 Product Number Coding

6.1.1 CAC4

●Cylinder without switch



●Cylinder with switch

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

•With tie rod, Cylinder without switch

(a) Clevis width (mm) (Note 1)				(b) Bore size (mm)		(c) Port thread type			
	Bore size (ϕ)	$\phi 40$	ϕ 50	φ 63	φ 80	40	ϕ 40	No code	Rc thread
A	16.5	•	•	•		50	ϕ 50	N	NPT thread (custom order)
В	19.5	•	•	•		63	ϕ 63	G	G thread (custom order)
AL	16.5 (Foot mounting type)	•	•	•		80	ϕ 80		
BL	19.5 (Foot mounting type)	•	•	•				,	

(d) Cushion (Note 2)		(e) Stroke (mm)	(f) Speed adjusting needle		
No code / H	Head ends cushion	50, 75, 100, 125, 150	No code	Both ends needle	
В	Both end cushion		R	Rod end needle	
N	No cushion		Н	Head end needle	
			N	No needle	

(g) Switch model					
Lead wire straight type	Lead wire L-shaped type	Switch type	Indicator light	Lead wire	
тонж	T0V*		1 color		
T5H%	T5V ※	Reed	Without indicator light	2-wire	
Т8НЖ	T8V※		1 color		
T1H*	T1V*			2-wire	
T2H**	T2V*		1 color	Z-wire	
ТЗНЖ	T3V※			3 wire	
Т2ҮНЖ	T2YV*	Solid	2 color	2-wire	
ТЗҮНЖ	T3YV※	state	2 color	3-wire	
T2YD	_		Strong magnetic	2-wire	
T2YDT ※	_		field proof	z-wire	
T2JH※	T2JV※		Off delay type	2-wire	
Н0%		Reed	Strong magnetic field proof	2-wine	
Н0ҮЖ	_	neea	Strong magnetic field proof 2 color	2-wire	

X mark specifies the Lead wire length.

(h) Number of switches				
R	1 ea., Rod end			
Н	1 ea., Head end			
D	2 ea.			

Note 1: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.

Note 2: "No code" is with head end cushion in (d)

Cushion if you select "No code" in (c) Port
thread type. "H" is with head end cushion
in (d) Cushion if you select an another type
in (c) Port thread type.

Note 3:Y and Y1 types are supplied with pin, split pin, and plain washer.

Note 4:Q type cannot be installed to the standard type because it requires a different piston rod projection length.

Note 5:(a) Clevis width can be selected only "A" if you select "Q".

Note 6: "K bellows" cannot be installed if clevis width is AL or BL.



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

(i) Mountin	(i) Mounting orientation of switches							
No code	B							
В	C O No code							
C								
	osition that can be selected only the case switch not selected							
No code	Without tie rod							
A	В							
В	$C \bigcirc A$							
C								

	Bore size (ϕ)	ϕ 40	φ 50	φ 63	$\phi 80$		Bore size (¢	')	φ 40	φ 50	ϕ 63	φ80
	Rod clevis cast iron	_				K	Bellows (Neo	prene)100℃	•	•	•	
Y	(with pin, split pin, and plain washer)	•	•	•		N	Changed extending le	piston rod ngth and rod	•	•	•	
	Rod clevis steel						end (screw)					
Y1	(with pin, split pin, and plain washer)	•	•	•		D	With dog	Limit switch	•	•	•	
No code	Without bracket	•	•	•	•	D1	Without dog	mounting base	•	•	•	
I	Rod eye steel	•	•	•		Q	Toggle access	ory	•	•	•	

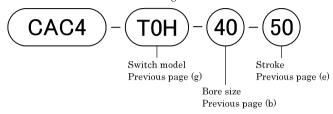
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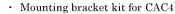
6.2 Component Parts Model Coding

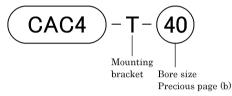
● Switch (T※H·T※V)

Switch + CAC4 set of Mounting bracket and others

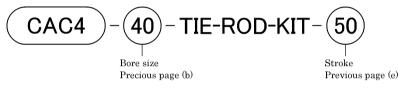


Switch itself Switch model Previous page (g)



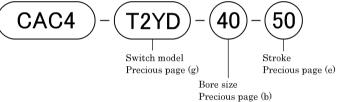


· Tie rod kid for CAC4

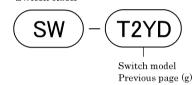


Switch (T2YD)

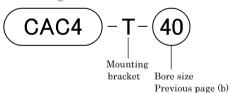
· Switch + CAC4 set of Mounting bracket and others



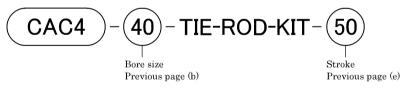
Switch itself



· Mounting bracket kit for CAC4

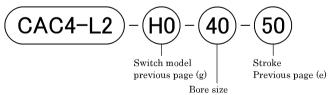


· Tie rod kid for CAC4



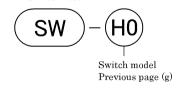
Switch (H0)

Switch + CAC4 set of Mounting bracket and others

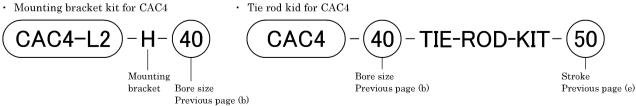


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Switch itself



· Mounting bracket kit for CAC4



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7. SPECIFICATION

7.1 Product Specifications

Model code				CA CA			
Item			'	CAC4			
Bore size	mm	ϕ 40	φ 50	φ 63	φ 80		
Actuation		Double acting type					
Working fluid		Compressed Air					
Max. working pressure	MPa	1.0					
Min. working pressure	MPa	0.1					
Proof pressure	MPa	1.6					
Ambient temperature	$^{\circ}$		5 to 60 ((No freezing)			
Port size			Rc1/4		Rc3/8		
Working piston speed	mm/s	50 to 500	50 to 400	50 to	o 300		
Cushion		Head ends With air cushion					
Lubrication		Not required (Use Turbine oil Class 1 ISOVG32 if and when lubrication is needed)					
Mounting style			Clev	is bracket			

^{**}Please use cylinder with limit of allowable energy absorption.

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7.2 Switch Specifications

Kind and Model code	Reed 2-wire									
Item	T0H,	T0V	T5H,	T5H, T5V			T8H, T8V			
Applications	Programmak rel	le controller, ay	rela; circuit(with	le controller, y, IC out indicator l connection	Prograr	nmable cor relay	ntroller,			
Load voltage	DC12/24V	AC110V	DC5/12/24V	AC110V	DC12/24 V	AC110V	AC220V			
Load current	5 to 50mA	7 to 20mA	50mA or less	20mA or less	5 to 50mA	7 to 20mA	7 to 10mA			
Current consumption	_									
Internal voltage drop	2.4V (or less	0	V	3V or less					
Indicator light	LED (ON	lighting)	-	_	LED	LED (ON lighting)				
Leakage current			0n	nА						
Lead wire length (Note 1)	1m (Oil pı	oof vinyl, Cabt	yre cord, 2-wire	, 0.2mm²)		oroof vinyl, 2-wire, 0.3				
Shock resistance			294	$ m m/s^2$						
Insulation resistance	20	MΩ or more by	DC 500V megg	ger	$100 { m M}\Omega$ о	r more by megger	DC 500V			
Withstand voltage	No abnormalities upon charging AC1000V for one minute No abnormalities upon charging AC1500V for one minute minute									
Ambient temperature			-10 to	o 60°C						
Degree of protection	IEC S	standard IP67,	ЛЅ C0920(Intr	usion type with	out water), Oil proo	f			

Kind and Model code	Solid state 2-wire			
Item	T1H, T1V	T2H, T2V	T2YH, T2YV	T2JH, T2JV
Applications	Programmable controller, relay, compact solenoid valve	Programmable controller		
Power supply voltage		_	_	
Load voltage	AC85 to 265V	DC10 to 30V		
Load current	5 to 100mA	5 to 20mA (Note 2)		
Current consumption		_	_	
Internal voltage drop	7V or less	4V or less		
Delay hour off		— 200±50ms		
Indicator light	LED (ON lighting)	LED (ON lighting)	LED(Red/Green) (ON lighting)	LED (ON lighting)
Leakage current	1mA or less at AC100V 2mA or less at AC200V	1mA or less		
Lead wire length (Note 1)	1m (Oil proof vinyl, Cabtyre cord, 2-wire, 0.3mm ²)	1m (Oil proof vinyl, Cabtyre cord, 2-wire, 0.2mm ²)	1m (Oil proof vinyl, Cabtyre cord, 2-wire, 0.3mm²)	
Shock resistance	$980\mathrm{m/s^2}$			
Insulation resistance	$100 \mathrm{M}\Omega$ or more by DC 500V megger	$20 { m M}\Omega$ or more by DC 500V megger	$100 { m M}\Omega$ or more by DC 500V megger	
Withstand voltage	No abnormalities upon charging AC1500V for one minute	No abnormalities upon charging AC1000V for one minute		
Ambient temperature	-10 to 60°C			
Degree of protection	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof			

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Kind and model code	Solid state 3-wire			
Item	Т3Н, Т3V	ТЗҮН, ТЗҮV		
Applications	Programmable controller, relay			
Power supply voltage	DC10 to 28V			
Load voltage	DC30V or less			
Load current	100mA or less 50mA or less			
Current consumption	10mA or less at DC24V			
Internal voltage drop	0.5 m V~or~less			
Delay hour off	_			
Indicator light	LED LED(Red/Green) (ON lighting) (ON lighting)			
Leakage current	$10\mu\mathrm{A}\mathrm{or}\mathrm{less}$			
Lead wire length (Note 1)	1m (Oil proof vinyl, Cabtyre cord, 3-wire, 0.2mm²)			
Shock resistance	$980\mathrm{m/s^2}$			
Insulation resistance	$20 \mathrm{M}\Omega$ or more by DC 500V megger $100 \mathrm{M}\Omega$ or more by DC 500V meg			
Withstand voltage	No abnormalities upon charging AC1000V for one minute			
Ambient temperature	−10 to 60°C			
Degree of protection	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof			

Type & Model	Solid state 2-wire		
Item	T2YD	T2YDT	
Applications	Programmable controller		
Load voltage	DC24V±10%		
Load current	5 to 20mA		
Internal voltage drop	6V or less		
Indicator light	LED(Red/Green) (ON lighting)		
Leakage current	1.0mA or less		
Output delay time (Note3) (ON delay, OFF delay)	30 to 60ms		
Lead wire length (Note 1)	1m (Oil proof vinyl, Cabtyre cord, 2-wire, 0.5mm²) (Standard) 1m (Non flammable vinyl cabtire cord, 2-wire, 0.5mm²) (Standard)		
Shock resistance	$980\mathrm{m/s^2}$		
Insulation resistance	$100 \mathrm{M}\Omega$ or more at DC500V megger		
Withstand voltage	No abnormalities upon charging AC1000V for one minute		
Ambient temperature	−10 to 60°C		
Degree of protection	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof		

Kind and model code	Reed 2-wire			
Item	Но		H0Y(2 colors)	
Applications	Programmable controller, relay		Programmable controller	
Load voltage	$\mathrm{DC}12/24\mathrm{V}$	AC110V	DC24V	
Load current	5 to 50mA	7 to 20mA	5 to 20mA	
Internal voltage drop	5V or less		6V or less	
Indicator light	LED(Green) (ON lighting)		LED(Red/Green) (ON lighting)	
Leakage current	$10\mu\mathrm{A}\mathrm{or}\mathrm{less}$			
Lead wire length (Note 1)	1m (Non flammable cabtyre cord, 2-wire, 0.5mm²)			
Shock resistance	$294\mathrm{m/s^2}$			
Insulation resistance	$100 \mathrm{M}\Omega$ or more by DC 500V megger			
Withstand voltage	No abnormalities upon charging AC1000V for one minute			
Ambient temperature	−10 to 60°C			
Degree of protection	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof			

Note 1:3m, 5m optional lead wires are available beside standard length.

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Note 2: Max. Load Current (20mA) is at 25°C. It may drop lower than 20mA when ambient temperature rises higher than 25°C. (for example: it may be 5 to 10mA at 60°C.)

Note 3: Time to the generation of switch output through detection of piston magnet by magnetic sensor.