CKD

SM－9398－A

INSTRUCTION MANUAL

THIN TYPE CHUCK

CKA Series

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

3rd

CKD Corporation

For Safety Use

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

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

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

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

⚠ Precautions

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

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CKA Series
Thin type chuck
Manual No. SM-9398-A

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

1. PURODUCT

1. 1 Specifications

Model code		CKA			
Size		15CS	20CS	25CS	30CS
Tubu Bore	mm	φ16	φ25	φ32	φ40
Aciton		Double acting·Single acting			
Media		Compressed air			
Maximum working pressure	MPa	0.7			
Minimum working pressure	MPa	0.3			
Ambient Temperature	℃	5~60			
Port size		M5			
Stroke	mm	6	5	7	9
Rod Diameteer	mm	φ9	φ10	φ14	φ18
Volume of Piston one cycle	cm^3	1.0	2.2	5.1	10.1
Repeating accuracy(Initial value)	mm	±0.03			
Product mass	kg	0.11	0.25	0.42	0.61
Lubrication		Not required (Use Turbin oil, Class 1、ISO VG32 when required)			

Model code		CKA			
Size		40CS	50CS	60CS	70CS
Tubu Bore	mm	φ50	φ63	φ80	φ100
Aciton		Double acting·Single acting			
Media		Compressed air			
Maximum working pressure	MPa	0.7			
Minimum working pressure	MPa	0.3			
Ambient Temperature	℃	5~60			
Port size		M5		Rc1/8	
Stroke	mm	20	25	30	30
Rod Diameteer	mm	φ20		φ24	φ28
Volume of Piston one cycle	cm^3	36.1	76.9	148.8	294.0
Repeating accuracy(Initial value)	mm	±0.03			
Product mass	kg	1.41	2.6	4.5	6.4
Lubrication		Not required (Use Turbin oil, Class 1、ISO VG32 when required)			

1
PRODUCT

Specification and type of switches

CKA-15CS~40CS

Type & Model / Item	Non Contact Switch	
	T2H/V	T3H/V
Application	For use exclusively with programmable controller	For use with programmable controller, relay.
Voltage of source of power	———	DC10~28V
Load voltage · Current	DC10~30V、5~25mA (※1)	Less than DC30V, Less than 100mA
Lamp	Litwhen LED is on	

CKA-50CS~70CS

Type & Model / Item	Non Contact Switch	
	S2	S3
Application	For use with relay, programmable controller	For use with programmable controller, relay, IC circuit, solenoid valve
Voltage of source of power	———	DC4.5~28V
Load voltage · Current	DC10~30V、5~30mA (※1)	Less than DC30V, Less than 200mA
Lamp	Litwhen LED is on	

Type & Model / Item	Contact Switch	
	S0	S5
Application	For use with relay, programmable controller	For use with programmable controller, relay, IC circuit, without lamp series connection.
Voltage of source of power	———	
Load voltage · Current	5~50mA with DC24V 7~20mA with AC100V	Less than 50mA with DC24V Less than 20mA with AC100V
Lamp	Litwhen LED is on	Without

※1. Each maximum load current shown above is a value at 25℃. The current will be lower than 20 mA when the working ambient temperature of the switch is higher than 25℃ (5~15mA at 60°C).

1.2 Features

1) Powerful yet compact

Body is designed compactly and lightly for easy handling, yet provides powerful gripping force.

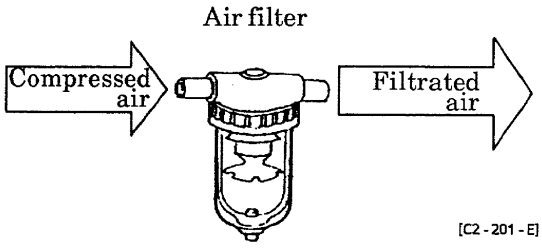
2) Open-close confirming switches

All models of this series are capable to accept up to two switches mounted on.

2. CAUTION

2.1 Fluid

1) Use the compressed air, filtrated and dehumidified. Carefully select a filter of an adequate filtration rate (5μm or lower preferred), flow rate and its mounting location (as closest to directional control valve as possible).

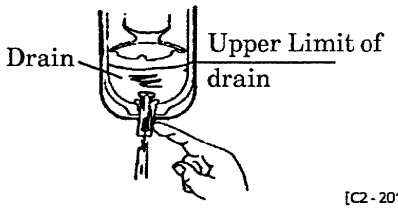


[C2-201-E]

2) Be sure to drain out the accumulation in filter periodically before the level exceeds the mark line.

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

4) This chuck does not require lubrication. It is recommended, however, to use Turbine oil Class 1, ISO VG32 as lubricant if lubrication is preferred.



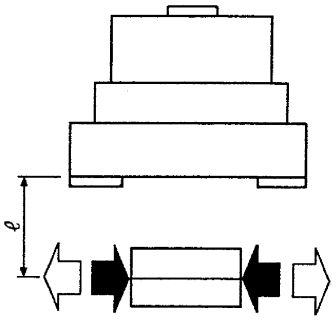
[C2-201-F]

3. GRIPPING POWER

3.1 Gripping Power and Mass of Load

1) The table of Gripping Power on the next page represents the force with Claw length of ℓ at either Opening motion or Closing motion and does not represent max. mass of load to be gripped.

2) Required gripping power varies remarkably depending on numerous elements.



[M1-306-A]

- Friction coefficient between Load and Claws.
- Moment of inertia of Load during transference.
- Relative position between center of gravity of Load and Clamp location, also width of Claws.
- Structure and configuration of Claws.

3.2 Guide line of Selecting appropriate model (required gripping power) comparing with mass of Load

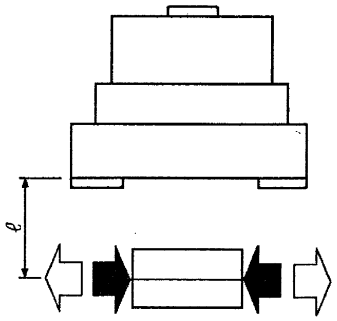
Safety coefficients for holding power against mass of Load are set as follows although it varies depending on Coefficient between Load and Claw, Shape of Load and Claws, transferring condition etc. Make those brief guide line for selecting models.

- Holding only 5 times or More
- Normal transference 10 times or More
- Transference with high acceleration 20 times or More

3.3 Data of Gripping Power

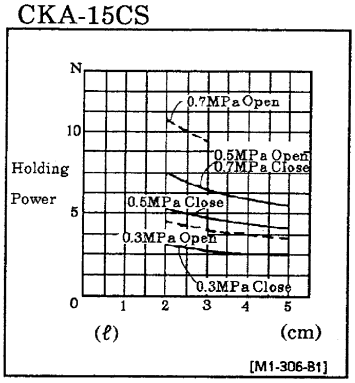
The following Tables represent the Gripping power in either opening motion or closing motion with Claw length ℓ of hand at 0.3, 0.5 & 0.7 MPa of Supplying pressure.

- Opening Motion(⇦) ·····Broken line
- Closing Motion (➡) —— Full line

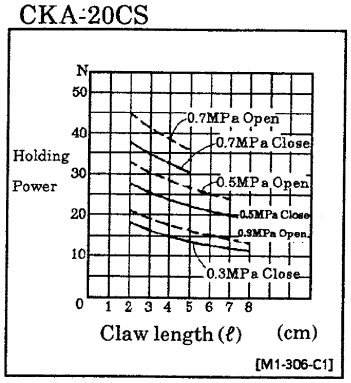


[M1-306-A]

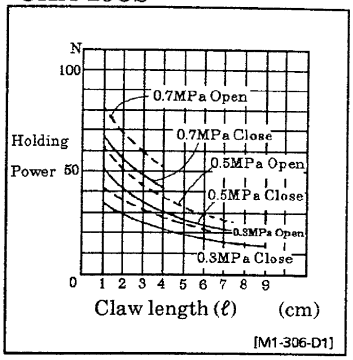
CKA-15CS



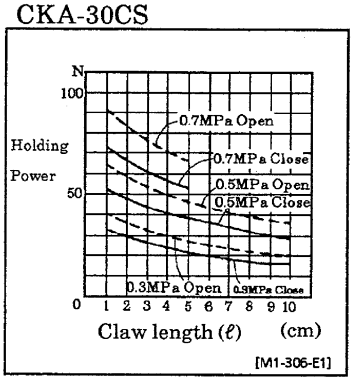
CKA-20CS



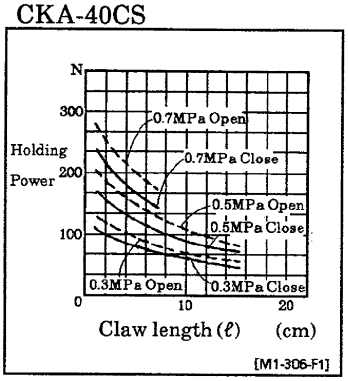
CKA-25CS



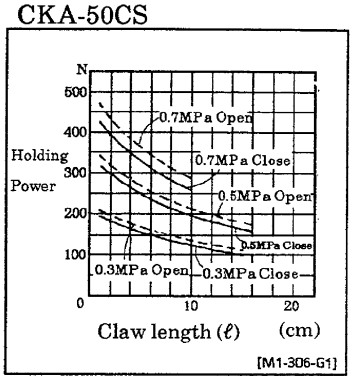
CKA-30CS



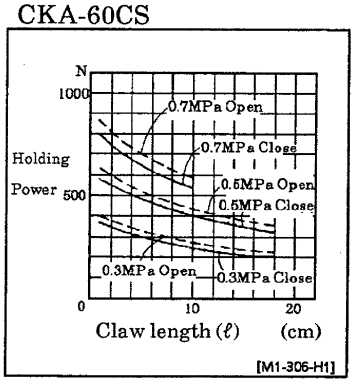
CKA-40CS



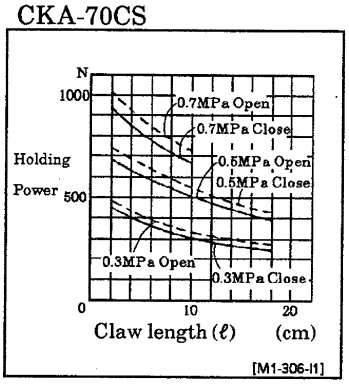
CKA-50CS



CKA-60CS



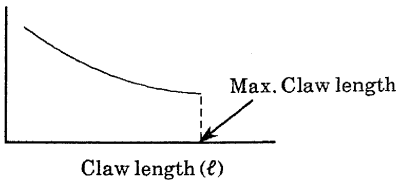
CKA-70CS



Note: Holding power of O type hand drops approx. 20~30% to that of double acting type.
Holding power of C type hand drops approx. 10~20% to that of double acting type.

3.4 Length and Weight of Claws

1) Make it short and light as much as possible because abrasion wear of moving parts of Master Jaw will be accelerated if claws are long and heavy.
2) Keep the claw length within the range of Tables.



[M1-301-G]

3) The weight of the claws affects thelife of the chuck. Use claws which meet the following weight requirement.

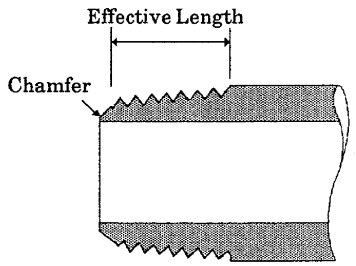
$W < 1/4\ H$ (for one piece)

W : Weight of claws
H : Weight of CKA

4. INSTALLATION

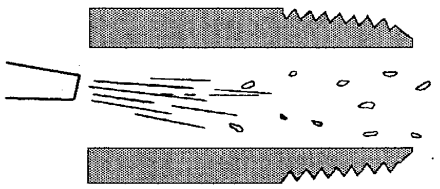
4.1 Piping

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

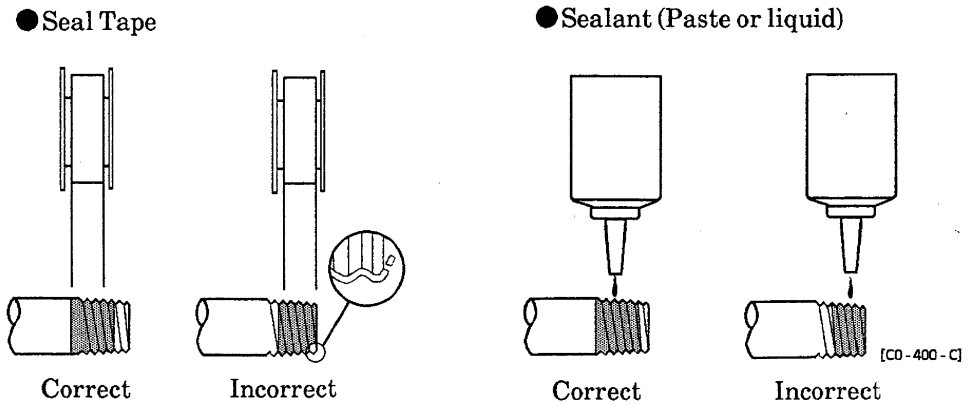


[C0-400-A]

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


[C0-400-B]

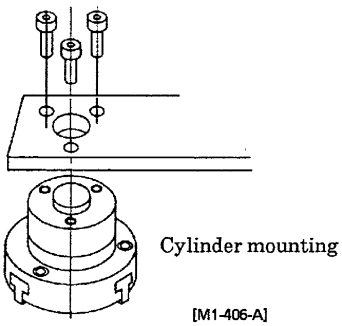
6) Refrain applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.



4.2 Installation

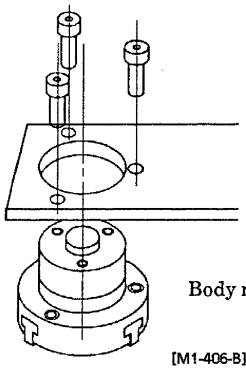
1) Ambient Temperature
   - The range of temperature is 5~60°C where the hand of this type is serviceable.
2) Environmental Condition
   - Provide some protection to the system with such as cover etc in the environment where much dusts exist and splash of water or oil is foreseen.
3) Mounting type is selectable out of two different types

   It makes mounting work easy due to choice of either cylinder mounting or body mounting. For models CKA-15CS ~ CKA-30CS, however, cylinder mounting type only is available.



Cylinder mounting

[M1-406-A]



Body mounting

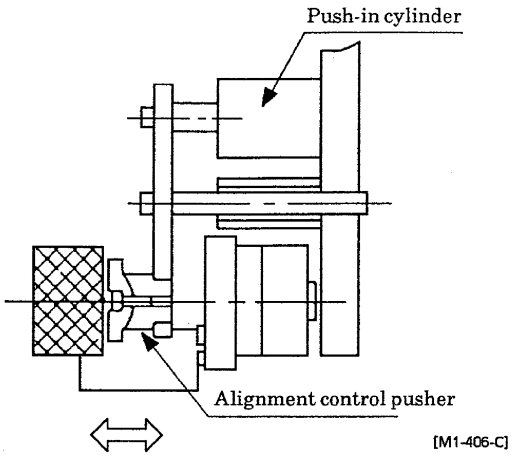
[M1-406-B]

4) Thread diameter and depth of Body mounting bolt hole

Model	Diameter and Depth of threaded hole	
	Cylinder mounting	Body mounting
CKA-15CS	M3, Depth 10	—
CKA-20CS	M5, Depth 12	—
CKA-25CS	M5, Depth 12	—
CKA-30CS	M5, Depth 12	—
CKA-40CS	M6, Depth 12	M6, Depth 12
CKA-50CS	M6, Depth 15	M6, Depth 15
CKA-60CS	M8, Depth 20	M8, Depth 20
CKA-70CS	M8, Depth 20	M8, Depth 20

5) In case a Push-in cylinder is put in use.

Note : It will shorten service life of small claw tremendously as work slides over claw. Pay consideration to design appropriate configuration of small claw.



6) Others

Consult us prior to start additional machining work on unit to prevent such troubles as malfunction or air leakage etc.

5. MAINTENANCE

5.1 Periodic Inspection

In order to upkeep the Hand chuck in optimum condition, carry out periodic inspection every half a year or at every 500,000 times of actuation.

1) Inspection items
   (1) Apply grease to sliding portion.
   (2) Check whether its operation is smooth.
   (3) Check for any air leakage.
   (4) Check for any slackened bolts.
   (5) Check for any play to master jaws.
   (6) Check if there is any abnormal strokes.

See 5.2, "Trouble shooting", should there be any trouble found, also carry out additional tightening if bolts, nuts, etc.are slackened.

5.2 Trouble Shooting

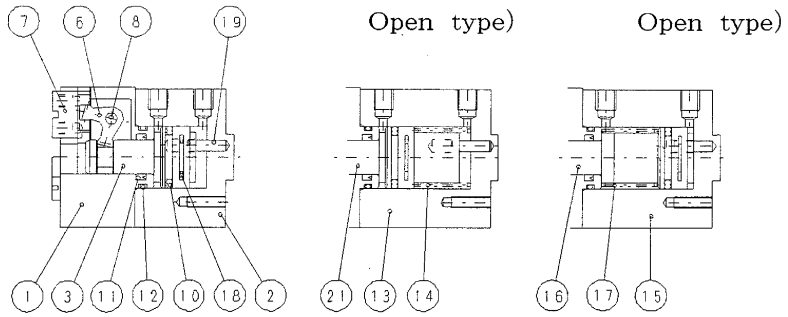
Trouble	Possible Causes	Countermeasures
Does not operate	No pressure or inadequate pressure	Provide an adequate pressure source.
	Signal is not transmitted to direction control valve	Correct the control circuit
	Broken parts	Refer to Table of Damage or Deformation
	Broken packing	Replace packing. (maintenance by manufacturer)
Does not function smoothly	Insufficient pressure	Increase the pressure .
	Chip or foreign particles caught	Clean and remove chips or particles.
	Broken packing	Replace packing. (maintenance by manufacturer)
Breakage and/or deformation	Too heavy Claws	Make claws light.
	Too long Claws	Make Claws short.
	Excessive working pressure	Reduce the pressure.
	External load is charged	1) Take some remedy to remove charging external load. 2) Review the model and the way using it. Correct the mis-usage.

5. 3 Interrnal Structure and Lists of Parts

1) Internal Structure

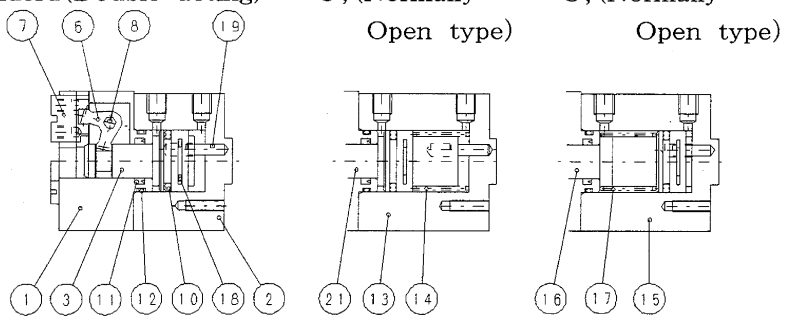
●CKA−15CS

Standerd(Double acting) O; (Normally Open type) C; (Normally Open type)



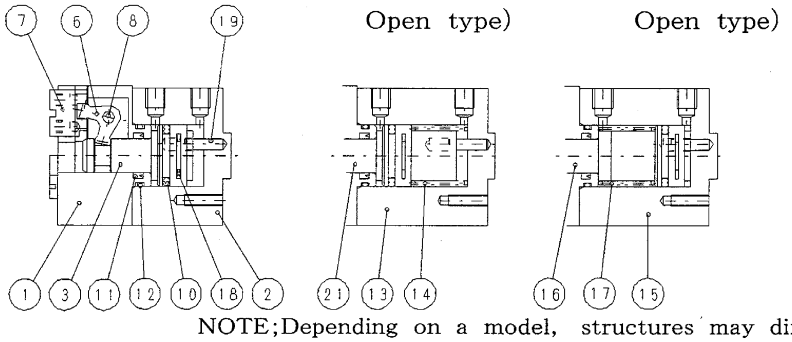
●CKA−20CS～40CS

Standerd(Double acting) O; (Normally Open type) C; (Normally Open type)



●CKA−50CS～70CS

Standerd(Double acting) O; (Normally Open type) C; (Normally Open type)



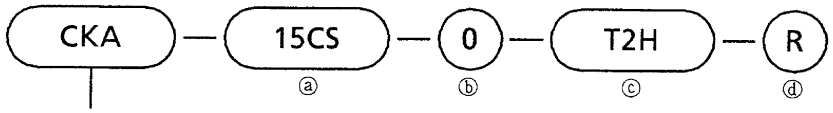
NOTE;Depending on a model, structures may differ somewhat.

2) Parts List

No.	Parts	No.	Parts	No.	Parts
1	Body	11	Rod packing	21	O Piston B
2	Cylinder	12	Cylinder gasket	22	Cylinder cover
3	Piston A	13	O Cylinder	23	Snap ring
4	Piston B	14	O Spring	24	O·C Body
5	Piston C	15	C Cylinder	25	Piston
6	Arm	16	C Piston		
7	Master Jaws	17	C Spring		
8	Fulcrum pin	18	Magnet		
9	Center cover	19	Whirl stopping pin		
10	Piston packing	20	Chuck cover		

6. MODEL CODE

6.1 Model Code of Product itself



Thin type chuck

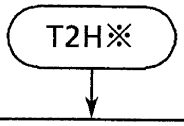
ⓐ Size	ⓑ Option		ⓒ Model code of Switches				ⓓ Qty of Switches	
15CS	O	Single action (Normally Open)	Straight lead cord type	L shape lead cord type			R	1 ea. for opening
20CS	C	Single action (Normally Closed)					H	1 ea. for closing
25CS	Y_{11}	Small claws, (material S50C)					D	2 each
30CS		for OD chuck (Claw No. 520~540)	T2H※	T2V※	Non-contact	2-core		
40CS	Y_{12}	Small claws, (material S50C)	T3H※	T3V※		3-core		
50CS		for I D chuck (Claw No. 610~6300)						
60CS	Y_{21}	Small claws, (material MC Nylon)	※ Length of Lead cord					
70CS		for OD chuck (Claw No. 520~540)						
	Y_{22}	Small claws, (material MC Nylon)	No mark	1m (Standard)				
		for I D chuck (Claw No. 610~630)	3	3m (Option)				
			5	5m (Option)				

Remarks 1. Available options are as follows. but none is available beyond CKA-50CS
Y_{11} & Y_{21} for CKA-15CS, Y_{11}, Y_{12}, Y_{21} & Y_{22} for CKA-20CS~30CS, Y_{12} & Y_{22} for CKA40CS

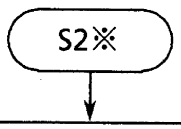
2. Refer to catalog as for OD dimensions of small claws and their coresponding machine model. Claws, when ordereed together with chuck, will be delivered with chuck Minimum requirement for later additional option order are 3 pieces.

Example of Model coding	CKA-15CS-T2H-R It designates that it is Thin type chuck, with 1 ea. of non-contact switch TH2, for opening.

6.2 Model Code of Switch



Model code of Switch			
Straight lead cord type	L shape lead cord type		
T2H※	T2V※	Non-contact	2-core
T3H※	T3V※		3-core



Model code of Switch			
S2※	for PC	Non-contact	2-core
S3※	for Relay, PC, IC circuit. compact solenoid valve		3-core
S0※	for Relay, for PC	Contact	2-core
S5※	for Relay, PC, IC circuit, series connection		

※ Mark specifies the length of Lead cord.

※ Length of Lead cord	
No mark	1m (Standard)
3	3m (Option)
5	5m (Option)

7. OPEN-CLOSE CONFIRMATION SWITCH

7.1 Operational Cautions, Proximity switch, Model T2H/V, T3H/V, S2 and S3

1) Connections of lead cord

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

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

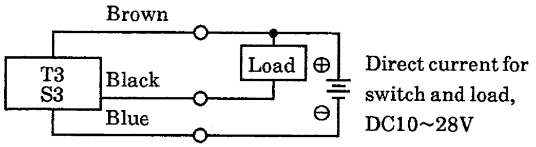


Fig.1 An example of the power for switch and load is the same.

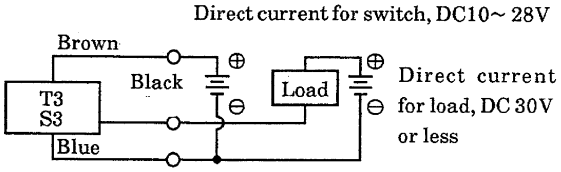


Fig.2 An example when the power for switch and load is independent.

2) Protection of output circuit

Install some protective circuit as per illustrated in Fig. 3 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current at turning switch off.

Install some protective circuit as per illustrated in Fig. 4 when capacitor type load (Capacitor type) are to be used because those types apt to generate dash current at turning switch ON.

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

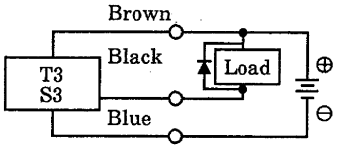


Fig.3 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.

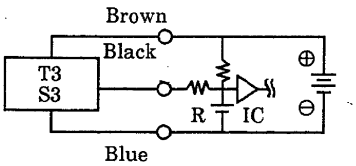


Fig. 4An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R.

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

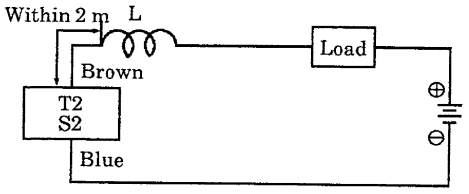


Fig. • Choke coil L
L= a couple hundred μH ~ a couple mH surpassing high frequency characteristic
• Install it near by a switch (within 2 m).

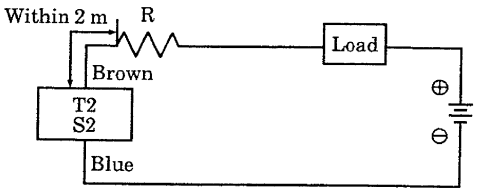


Fig. 6• Dash current restriction resister R
R= As much large resister as the load circuit can afford.
• Install it near by a switch (within 2 m).

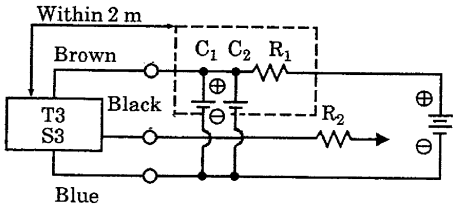


Fig. 7

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

3) Connection to a programmable controller (Sequencer)

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

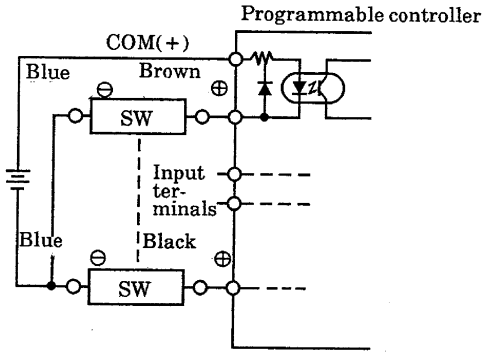


Fig. 8 T2, S2 model connection to source load input type (an external power of source)

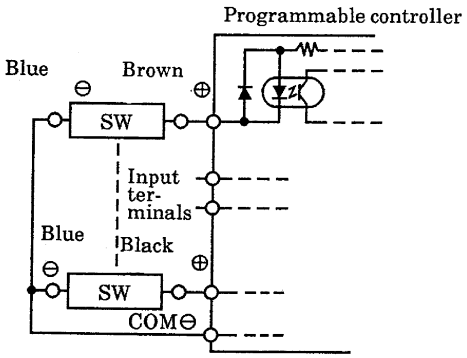


Fig. 9 An example of T2, S2 model connection to source load input type (an internal power of source)

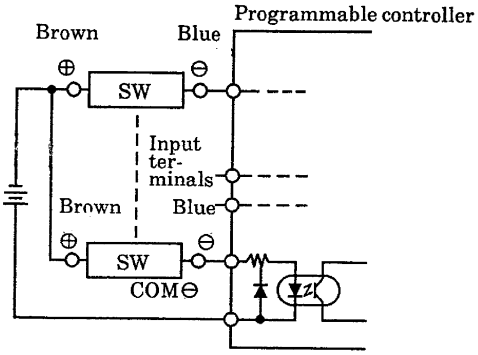


Fig. 10 An example of T2, S2 model connection to sink load input type.

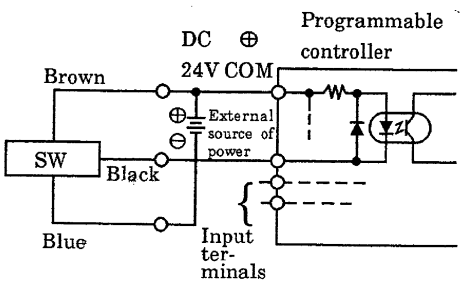


Fig. 11 An example of T3, S3 model connection to source load input type (an external power of source).

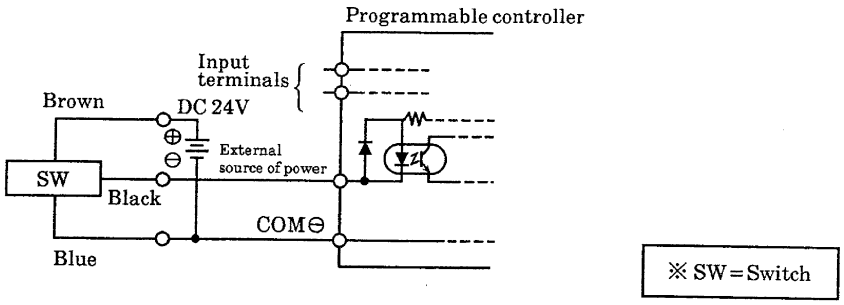


Fig. 12 An example of T3, S3 model connection to source load input type (an internal power of source). T3, S3 switch is, however, unable to be connected to the sink load input sequencer.

4) Series connection

The total voltage loss when series connected T2, S2 switches equals to the sum of respective voltage loss of each switch. Load side voltage is only the residual after total voltage loss. Therefore, confirm the required voltage to the programmable contoroller input befor deciding the number of switches connected in series. It is recommended of consulting us prior to have plural number of T3, S3 switches connected.

5) Parallel connection

When connecting T2 or S2 switches in parallel, leak current multiplies by the number connected. Also, the other switches tentatively become incapable to turn ON while one switch within the parallel connection is turned ON due to the voltage drop. Therefore, confirm the required courrent to the programmable controller input before deciding the number of switches as connected load.

T3 or S3 on the contrary, connection of these switches creates very rare problem of multiplied leakage due to almost neglifible leakage (less than 10 μA) or individual switch. It sometimes causes dimmed lamp or no lamp lit.

6) Magnetic environment

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

7) Protection of lead cord

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

7.2 Operational Cautions, Contact point switch, Model S0 and S5

1) Connections of lead cord

Instead of connecting a cord to the power source directly, always connect to the load in series. In case of model S0 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.

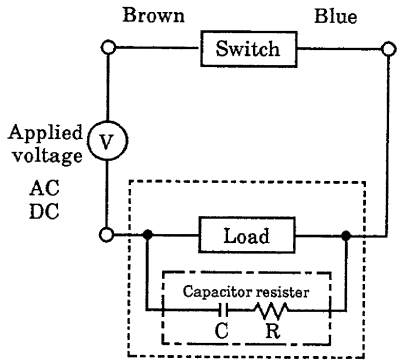
2) Capacity of contact points

Avoid using a load exceeding the max. capacity of contact points. On the other hand, 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.

Furthermore, install such protective circuits as illustrated in either Fig. 3 or 4, on the following page, in case the cord length exceeds the length per following table.

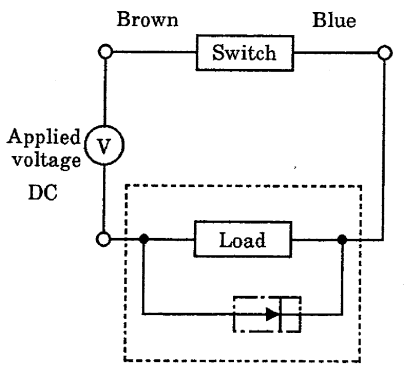


User circuit

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.

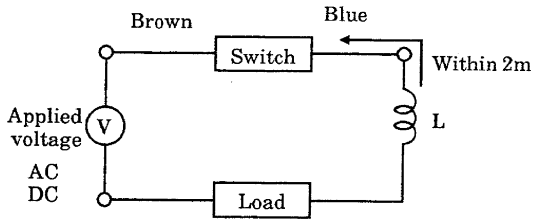


User circuit

Protective circuit

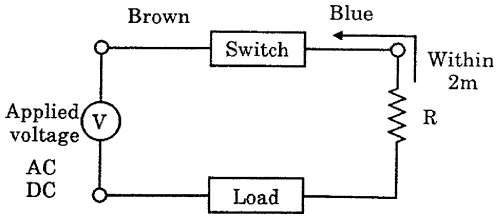
Rectifying diode, general use
Hitachi Mfg. product V06C or equivalent

Fig.2 When diode is used.



- Choke coil L
  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
  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 Mfg. ..... model MY
- ○ Fuji Denki Mfg. ..... model HH5
- ○ Matsushita Denko Mfg. .. model HC

5) Series connection

Total voltage loss, when connected S0 switches in series, equals to the sum of respective voltage loss of each switch. The total voltage loss becomes equivalent to one S0 (approx. 2.4V) when connecting the combination of one S0 for actuation confirming and rest of switches T5 and S5. 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, sometimes, cause dimmed lamp or no lamp lit.

7) Magnetic environment

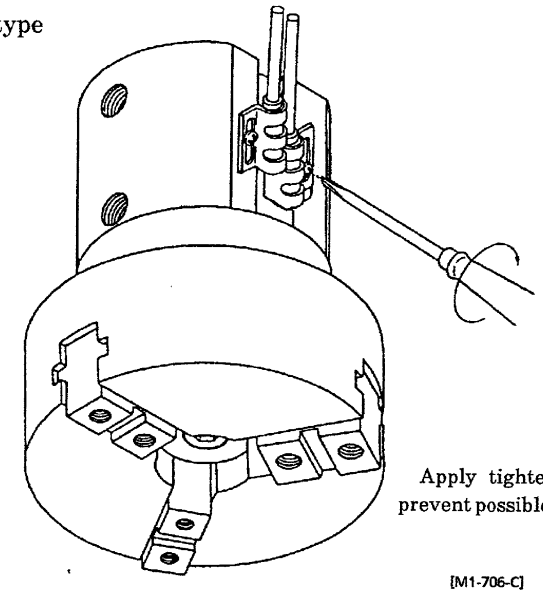
Avoid usage of these switches within the area where strong magnetic field or large current exists. (such as a large magnet or spot welding equipment) Position censoring errors will be resulted when installing many cylinders with switch in parallel or magnetized piece come across the cylinder due to intervention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

8) 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.

7.3 Switch Adjustment

S type

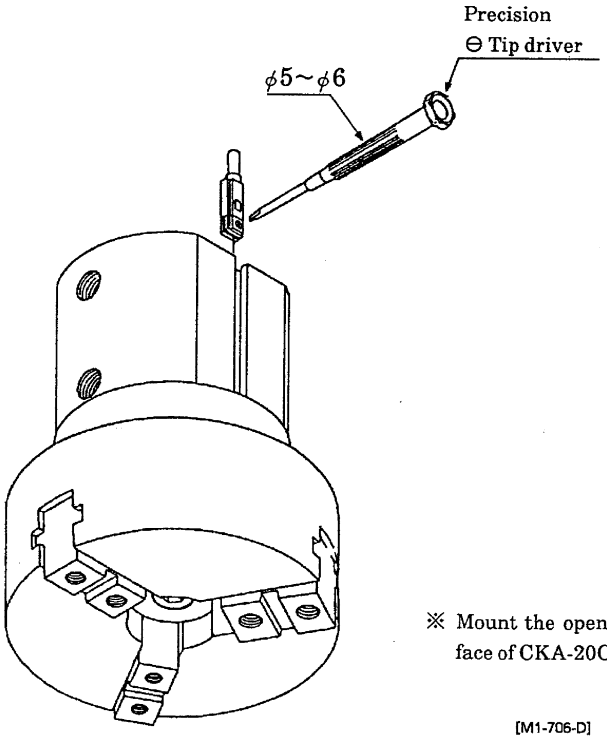


Apply tightening torque approx. 50~70N·cm to prevent possible damage to switch.

[M1-706-C]

T type

To fix the switch position, slide it in through a groove for switch from the position illustrated and tighten it with a precision screw driver, minus tip, after sensing its mounting position.



※ Mount the opening and closing switches on the same face of CKA-20CS~40CS.

[M1-706-D]

Note : Use a precision screw driver, minus tip, of handle diam. appox. 5mm to tighten set screw of switch, applying tightening torque of 10~20N·cm.