CKD

SM－423772－A

INSTRUCTION MANUAL

THIN TYPE CHUCK

CKS 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.

CKD Corporation

The 2nd edition

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:

⚠ DANGER : Failure to pay attention to DANGER notices may cause a situation that results in a fatality or serious injury and that requires urgent addressing.

⚠ WARNING : Failure to pay attention to WARNING notices may result in a fatality or serious injury.

⚠ CAUTION : Failure to pay attention to CAUTION notices may result in injury or damage to equipment or facilities.

*1) ISO 4414 : Pneumatic fluid power … Recommendations for the applications of equipment to transmission and control systems.

*2) JIS B 8370 : General rule for pneumatic systems

[SM-423772-A]

Design & Selection

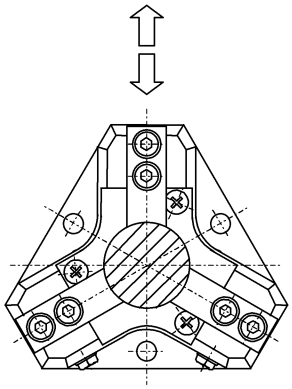
⚠ WARNING

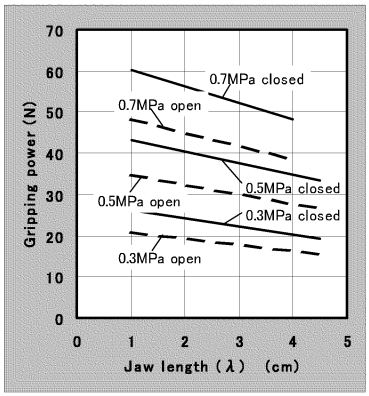
1) If the moving work piece poses a possible rise to personnel or if fingers could be caught in the master jaw, etc., install a protective cover, etc.
2) If circuit pressure drops due to a service interruption or problems in the air source, gripping power drops and the work piece could drop.
   Provide position locking measures, etc., so that personnel are not injured or machines damaged.

⚠ CAUTION

1) Precautions regarding gripping power

- Gripping power indicates the power that functions in opening and closing at jaw length λ .
- Performance date indicates the gripping power at hand jaw length at a supply pressure of 0.2 to 0.7 MPa.



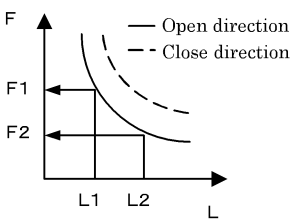


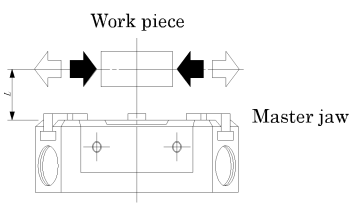
- To obtain gripping power from performance date, if the distance to the work piece's center of gravity is when manufacturing the small jaw, gripping power F is expressed as follows.

  When λ = λ 1 then F=F1
  When λ = λ 2 then F=F2
  Refer to the following diagram.

- The jaw's working maximum length can be used within performance data.
- When N is used to express the number of jaws as reference for the coefficient for transferring work piece weight W, then

  W × 9.8 : (F × N) = 1 : 5 (only gripping)
  W × 9.8 : (F × N) = 1 : 10 (normal transfer)
  W × 9.8 : (F × N) = 1 : 15 (sudden acceleration transfer)



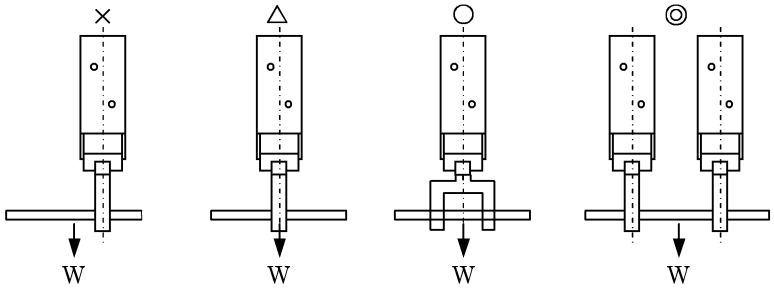


⚠ CAUTION

2) Use as short and light a small jaw as possible.

If the small jaw is long and heavy, inertia increases when opening and closing. This causes play in the master jaw, and may adversely affect life.

3) When gripping a long object or large work piece, the center of gravity must be gripped to provide stable prehension. It is also necessary to stabilize perhension by increasing the size or using multiple jaws.



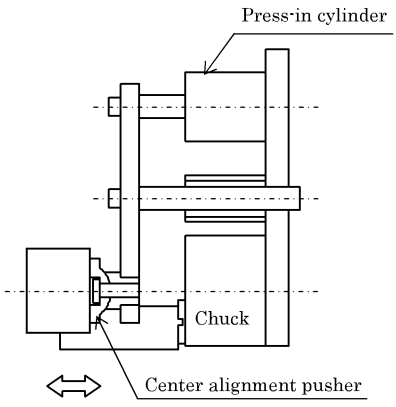
4) Select a model that has sufficient power to grip the work piece weight.

5) Select a model that has sufficient opening/closing width for the work piece size.

6) If directly inserting the work piece into the jig with the chuck, consider clearance during design, or the hand could be damaged.

・Using a press-in cylinder

Note: The work piece is side along the top of the small jaw, so chuck life could drop markedly. Sufficient consideration should be made for the shape of the small jaw.

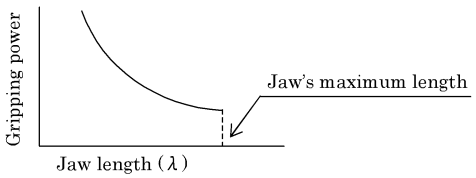


Design & Selection

⚠ CAUTION

7) Small jaw length and weight

- If the small jaw is long and heavy, the master jaw's sliding section wears quickly. Thus, use as short and light a small jaw as possible.
- The small jaw's length must be within performance data.



- The weight of the small jaw affects life, so check that it is within the following value :

W＜1／4H(one piece)　　W : small jaw weight

H : chuck product weight

Installation & Adjustment

⚠ CAUTION

1) Adjust check not to external force apply to master jaw's, since clattering and damage are caused.

2) Accuracy increases to be clamp can be operated software and low speed by. Also, repeatability is stabilized.

3) Sliding section of master jaw replenishes grease regularly. Service life can be extended by replenish regularly still more.

4) When small jaw installation, multiply lateral load master jaw, be careful to that no is available.

5) When installation, tighten by next tightening torque.

Nominal size of screw	M3	M4	M5	M6	M8
Recommended tightening torque (N・m)	0.59	1.4	2.8	4.8	12.0

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CKS Series
Thin Type Chuck
Manual No. SM-423772-A

1. PRODUCT

1.1 Specifications

Item			CKS					
Size			08CS	12CS	16CS	20CS	25CS	32CS
Cylinder bore size mm	Opening Motion		φ6×3	φ10×3	φ12×3	φ16×3	φ20×3	φ25×3
	Closing Motion		φ8×3	φ12×3	φ16×3	φ20×3	φ25×3	φ32×3
Actuation			Double acting					
Working fluid			Compressed air					
Max. working pressure		MPa	0.7					
Min. working pressure		MPa	0.2					
Ambient temperature		℃	5 to 60					
Port size			M5					
Operational stroke length		mm	10	12	16	20	28	32
Volumetric capacity (reciprocating)		cm^3	1.2	3.5	7.6	15.5	33.8	62.2
Repeatability		mm	±0.01					
Product weight		kg	0.16	0.26	0.40	0.63	1.14	1.8
Lubrication			Not required (For lubrication, use turbine oil class ISO VG32)					

1.2 Characteristics of Unit

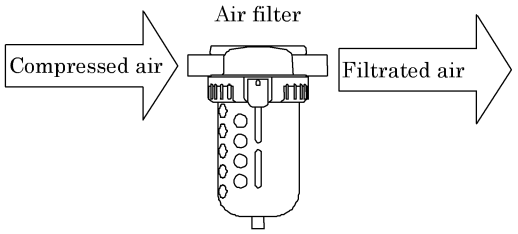
1) Because of the cylinder lie down , the master jaw can move long stroke

2) In a direct drive , this chuck work efficiently , and advantage at the environment running out the griss.

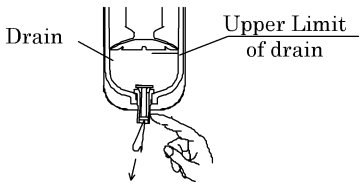
2. CAUTION

2.1 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 5 μ 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.



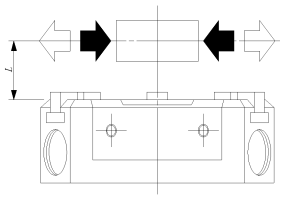
3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

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

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 Jaw length of λ at either Opening motion or Closing motion and does not represent max. mass of load capable to grip.



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

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

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

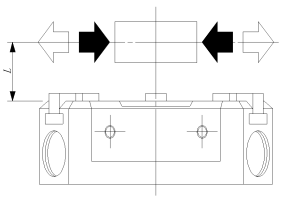
Safety coefficients for holding power against mass of Load are set as follows although it varies depending on Coefficient between Load and Jaw, Shape of Load and Jaws, transferring condition etc. Make that brief guideline for selecting models.

- Holding only $W \times 9.8 : (F \times N) = 1 : 5$
- Normal transference $W \times 9.8 : (F \times N) = 1 : 10$
- Transference with high acceleration $W \times 9.8 : (F \times N) = 1 : 20$

W	=	Work piece weight [kg]
F	:	Gripping force (See also the gripping force performance data.) [N]
N	:	Number of jaws [piece]

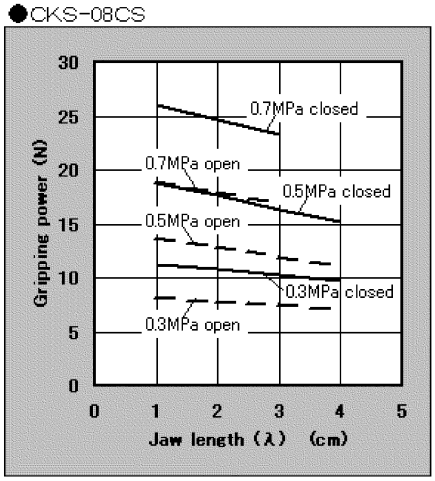
3.3 Data of Clumping Power

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

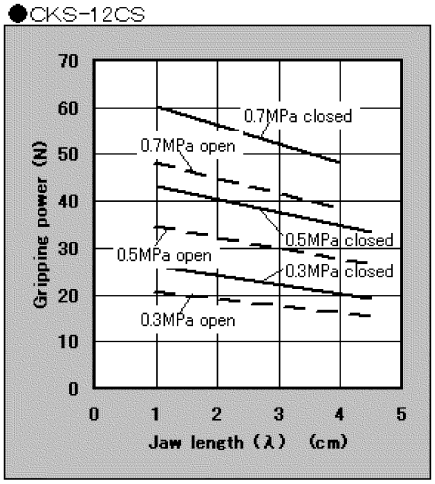


- Opening Motion (⇦) ---------- (Broken line)
- Closing Motion (➡) _____ (Full line)

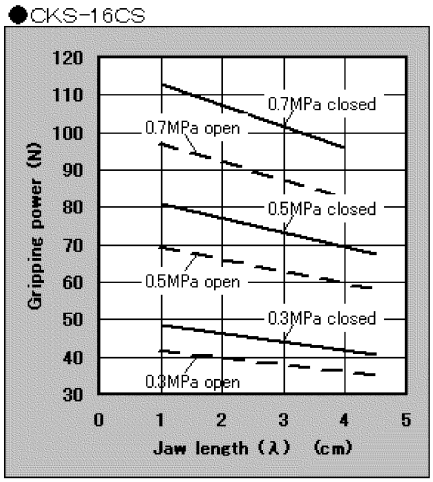
●CKS-08CS



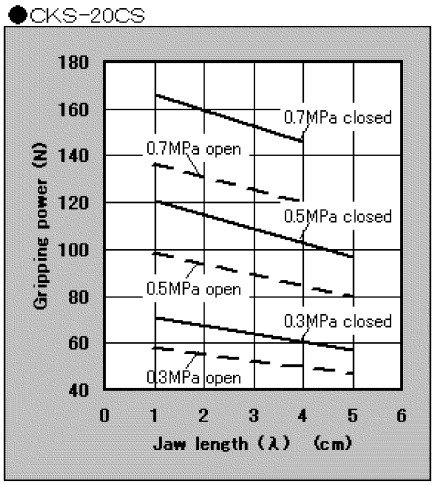
●CKS-12CS



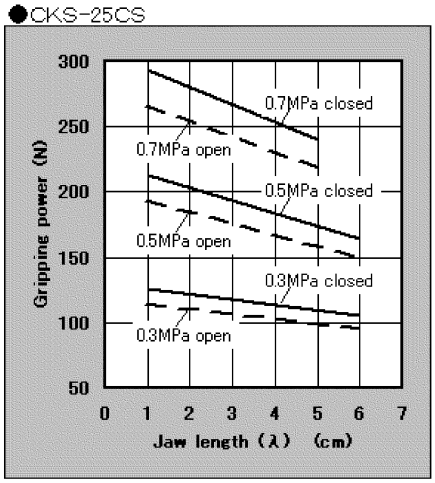
●CKS-16CS



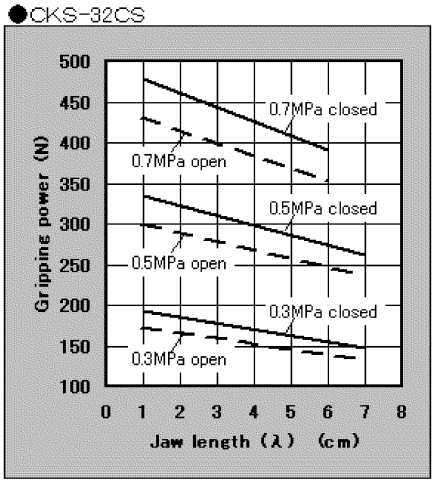
●CKS-20CS



●CKS-25CS



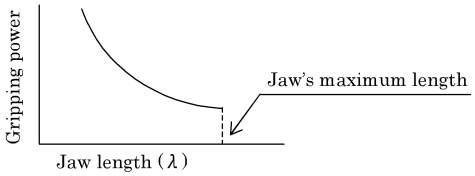
●CKS-32CS



3.4 Length of Jaws

1) If the small jaw is long and heavy, the master jaw's sliding section wears quickly. Thus, use as short and light a small jaw as possible.

2) The small jaw's length must be within performance data.



4. INSTALLATION

4.1 Piping

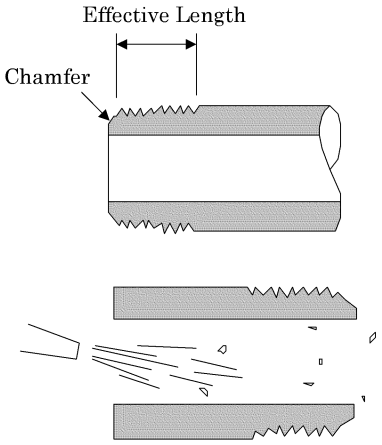
1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.

2) See to it that the pipe connecting cylinder and solenoid valve has 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, foreign substance in the drain of the pipe.

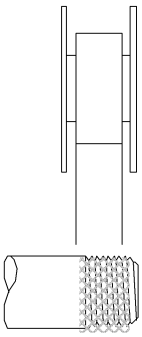
4) Be sure observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.

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.

●Seal Tape



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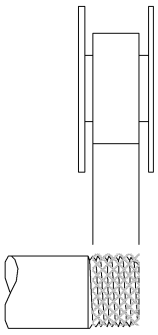

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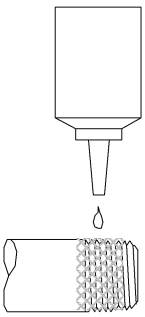
●Sealant (Paste or liquid)



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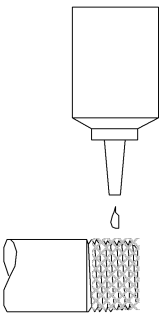


(Incorrect)

4.2 Installation

1) Ambient Temperature
   - The range of temperature is 5 to 60℃ where the chuck of this type is serviceable.

2) Ambient Temperature 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) Installation of Body
   - The range of temperature is 5 to 60℃ where the chuck of this type is serviceable.

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 stroke.

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

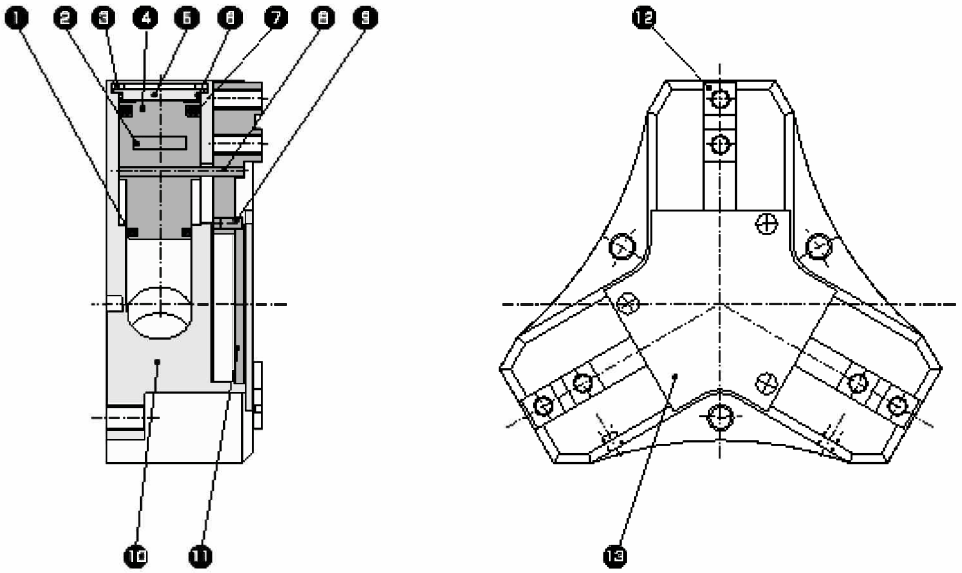
5.2 Trouble Shooting

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 manufacture)
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 manufacture)
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.

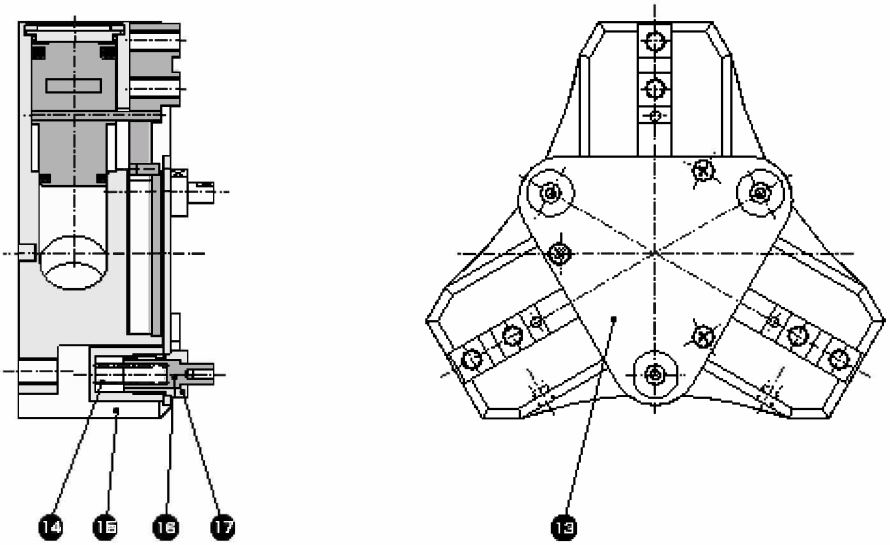
5.3 Internal Structure and Lists of Parts and Packings

1) Internal Structure

Standard type



W (with push out function)



2) Parts list

No.	Parts name	Material	Note	No.	Parts name	Material	Note
①	Piston packing seal B	Nitrile rubber		⑩	Body	Aluminum alloy	
②	Magnet			⑪	Link	Steel	
③	C type snap ring	Stainless steel		⑫	Master jaw	Steel	
④	Piston	Aluminum alloy		⑬	Center cover	Stainless steel	
⑤	Cylinder cover	Aluminum alloy		⑭	Spring	Steel	
⑥	Cylinder gasket	Nitrile rubber		⑮	Case	Stainless steel	
⑦	Piston packing seal A	Nitrile rubber		⑯	Pin	Stainless steel	
⑧	Operating shaft A	Carbon steel		⑰	Nut	Stainless steel	
⑨	Operating shaft B	Carbon steel					

6. OPEN-CLOSE CONFIRMATION SWITCH

6.1 Features

1) Solid state type switch
   Service life is almost infinite, also Open-close load capacity is large.
2) Indicator light
   It makes confirmation of actuation or maintenance inspection easy.
3) No restriction regarding its mounting location
   Its relocation is also carried out easily by just loosening fixing screw.

6.2 Specifications

Model code / Item	T2H-T2V	T3H-T3V
Type	Solid state type switch	
Applications	Exclusively for Programmable controller	For Programmable controller or Relay
Power supply voltage	—	DC10V to DC28V
Load voltage	DC10V to DC30V	DC30V or lower
Load current	5 to 20mA (Note 1)	100mA or lower
Indicator light	Red LED is lit while source of power is ON	
Kind of lead wire	Oil-resistant PVC insulated and cabtyre cable, 2-cord 0.2mm²	Oil-resistant PVC insulated and cabtyre cable, 3-cord 0.2mm²
Ambient temperature	-10 to 60℃	
Current consumption	—	10mA or lower at DC24V (ON lighting)
Leakage current	1mA or lower	10μA or lower
Degree of protection	IEC Standard IP67 JISC0920 (water tight type), Oil resistance	
Shock resistance	980m/s²	
Insulation resistance	20MΩ on DC500V megger tester	
Withstand voltage	Should withstand for 1 minute under AC1000V	
Hysteresis (Single jaw)	1.0mm or less	
Product weight	20g	

Note1:Maximum value of load current specified as above is at 25℃. The value falls lower when ambient temperature of switch raises higher than 25℃.
(Example: 5mA to 10mA at 60℃ for T2 type.)

1) Hysteresis
   There is hysteresis to cylinder switch as well as it is to micro switch.

(It is a distance between where switch turns ON while piston moves a certain direction and where the said switch turns OFF as piston reverses its stroke.)

6.3 Internal Structure of Switch and Wire Connection

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

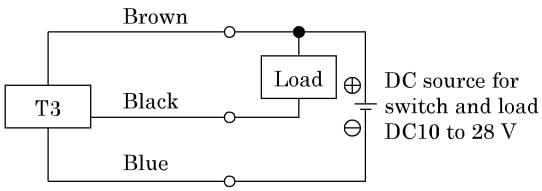


Fig.1 Fundamental circuit Example (1)
(In case the same source of power is used.)

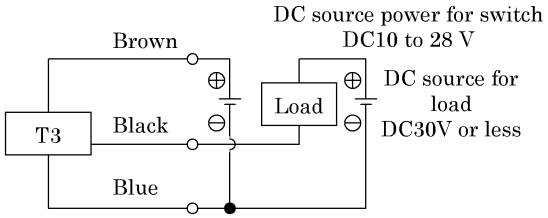


Fig.2 Fundamental circuit Example (2)
(In case individual sources of power are

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).

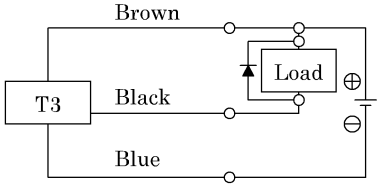
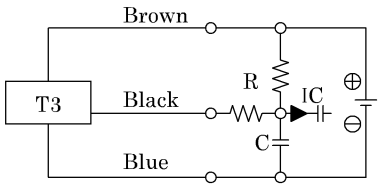


Fig.3 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



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

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

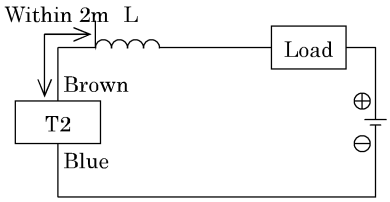


Fig.5 ・Choke coil
L= a couple hundred μ H to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

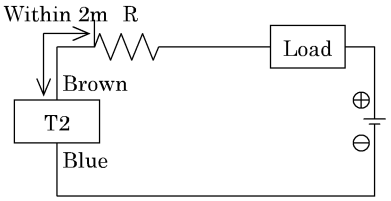


Fig.6 ・Dash current restriction resister.
R= As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

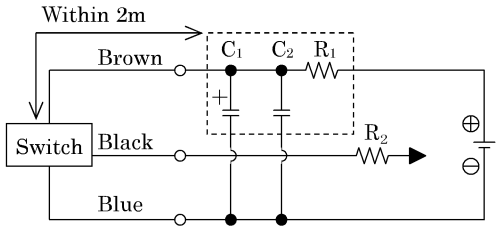


Fig7・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30 Ω

・Dash current restriction resister.
R_2=As much large resister as the load circuit can afford.
・Install it nearby the switch (Within 2m)

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 to 12 respectively.

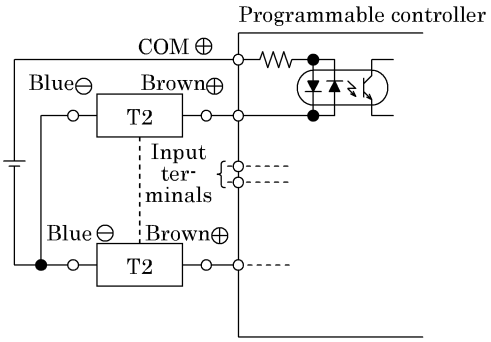


Fig.8 An example of T2 connection to source input type (an external power source)

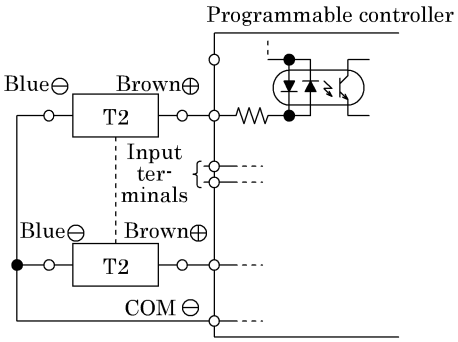


Fig.9 An example of T2 connection to source input type (an internal power source)

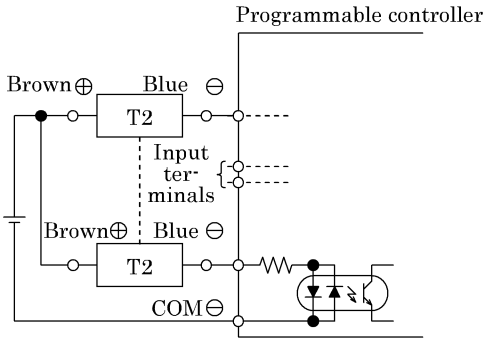


Fig.10 An example of T2 connection to source input type

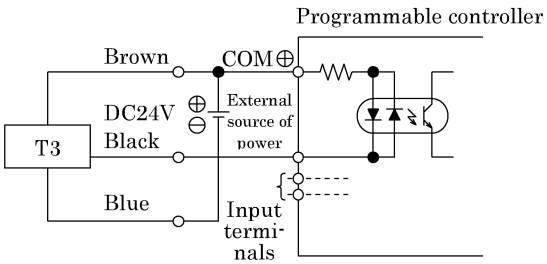


Fig.11 An example of T3 connection to source input type (an internal power source)

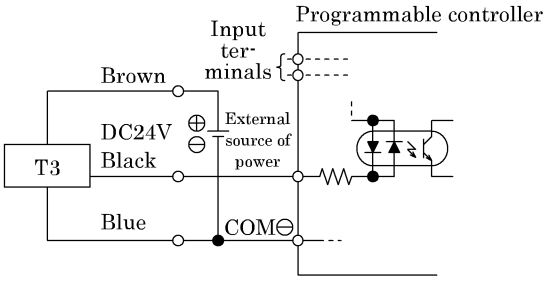


Fig.12 An example of T3 connection to source input type (an internal power source)

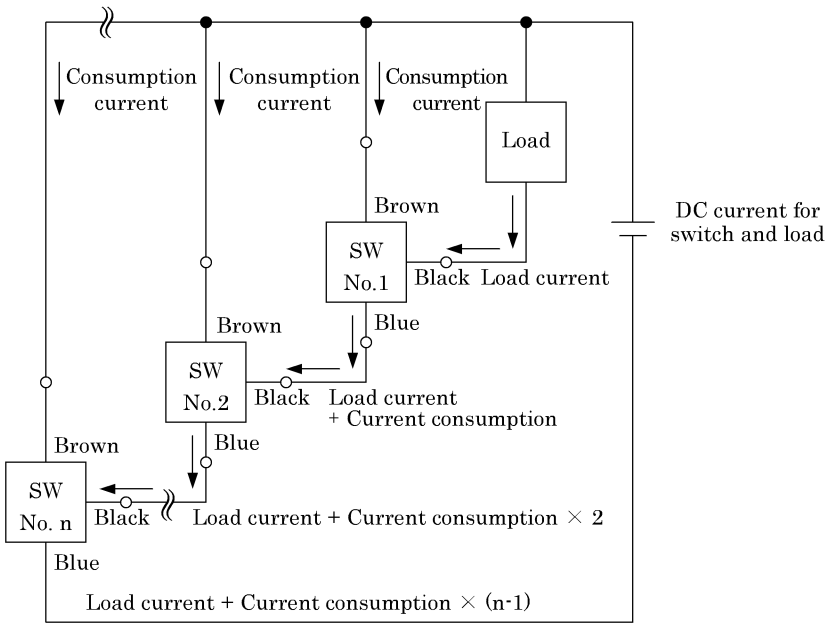
4) Magnetic environment
Do not operate this product in a place where a strong magnetic field or large current (large magnet or spot welder, etc.) exists. If a cylinder with the switch is installed in parallel to this product or the magnetic substance moves near the cylinder, the mutual interference may occur and affect the detection accuracy.

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

6) 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 10μA, then leakage may occur. Usually dimming and failure of the indicator light do not occur.

7) Series connection

When connecting multiple T2 switches in series, the voltage drop at the switch becomes the sum of voltage drop levels of all connected switches.
The voltage applied to the load side is that the voltage drop at the switch is subtracted from the power supply voltage. Therefore, the number of switches to be connected is determined while carefully checking the load specifications.
When connecting multiple T3 switches in series, the voltage drop at the switch becomes the sum of voltage drop levels of all connected switches in the same manner as described for the T2 switch.
Additionally, the current flowing through the switch is the sum of the current consumption and load current of the connected switches as shown in the Fig. below.
Therefore, the number of switches to be connected is determined while carefully checking the load specifications so that the current does not exceed the maximum load current of the switch.

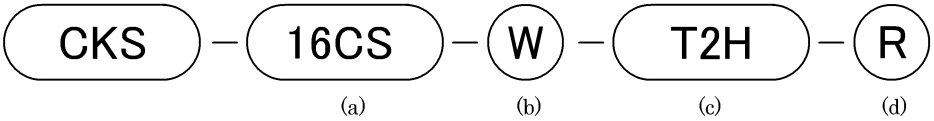


6.4 Switch Adjustment

To adjust the Open-close confirmation Switch, side the switch first to find the location where Indicator light turns ON. Keep sliding the switch for further 0.3 to 0.5mm further away, and then fix the switch at that position.

7. HOW TO ORDER

7.1 Model Code of Product itself

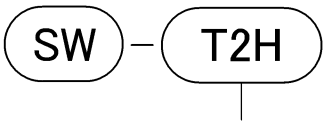


(a) Size	(b) Option	
08CS	Blank	Standard
12CS	W	With push out function
16CS	Y1	With Sm all jaw, material (S50C)
20CS		
25CS	Y2	With Sm all jaw, material (MC Nylon)
32CS		

(c) Switch model No.					※Lead wire length	
Lead wire straight type	Lead wire L-shaped type	Switch type	Indicator light	Lead wire	Blank	1m (standard)
					3	3m (option)
T2H※	T2V※	Solid state	1 color indicator	2 wire	5	5m (option)
T3H※	T3V※			3 wire	※mark shows lead wire length.	

(d) Q'ty of switches	
R	Open side, 1ea on
H	Close side, 1ea on
D	2ea

7.2 How to order switch



Switch model No. (c)