CKD

SM－350455－A

INSTRUCTION MANUAL

BRAKE CYLINDER

JSK2
JSK2-V(φ20 to φ40)

- 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 3rd 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:

⚠ CAUTION :

- 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.

[SM-350455-A]

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JSK2
BRAKE CYLINDER
Manual No. SM-350455-A

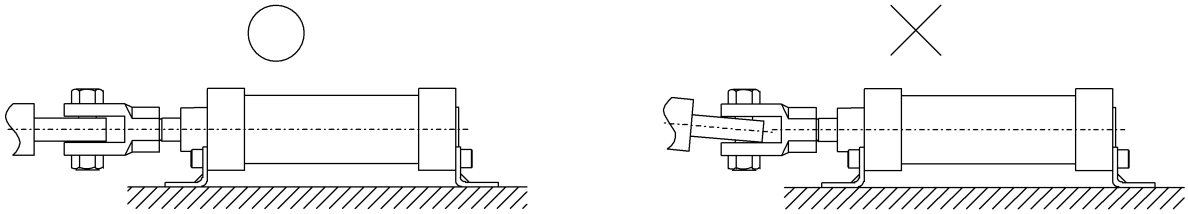
1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Selex 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.

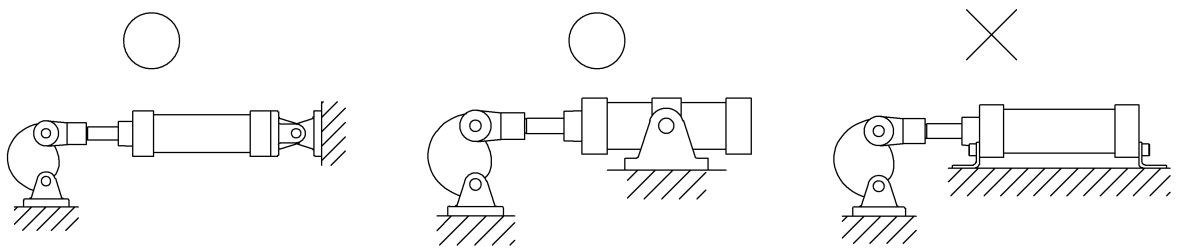
2. INSTALLATION

2.1 Installation

1) Use the cylinder load guide of low coefficient of skin friction and low ratio of volume alternation such as ball bearings or roller bearing for the purpose of securing positioning accuracy.
2) Operate cylinder within an ambient temperature of -10 to 60℃ (-10 to 50℃ for the cylinder with electric solenoid valve).
   At the places where temperature exceeds 60℃, use heat resisting type cylinder (5 to 120℃). Model No. of which are such as JSK2-T. There is no model available for cylinders with solenoid valve.
3) Use cylinder with bellows over its rod within the area with much dust.
4) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
5) 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.
6) 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.

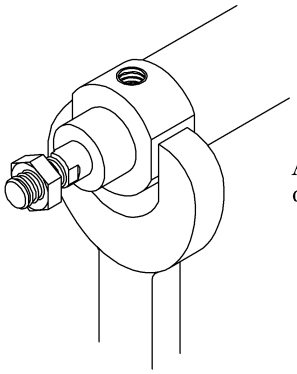


7) When the load acting direction changes with the cylinder operation:
   Use an oscillating cylinder (clevis type or trunnion type) capable of making revolution to a certain angle.



Clevis type　　Trunnion type　　Foot type

8) Assembly of mounting bracket:
Apply an open ended spanner onto double sided machined surface of mounting end cover as shown below when to hold the tube while attaching the mounting metal bracket.

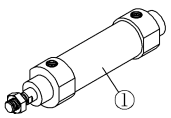


Apply an open ended spanner onto the double sided machined surface.

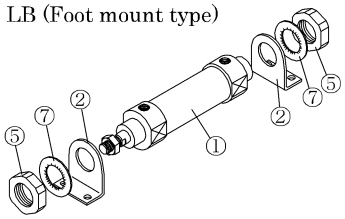
The mounting bracket are supplied with the cylinder at the time of delivery. Install them as shown in the below figures.
Tightening torque of the nut is 23N・m.

Assembly of mounting bracket (same as disassembling)

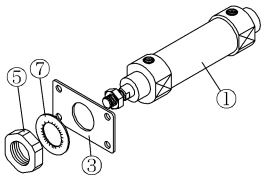
00 (Basic type)



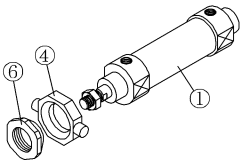
LB (Foot mount type)



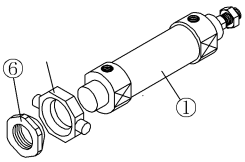
FA (Flange type)



TA
(Rod side trunnion type)



TB
(Head side trunnion type)



No.	Parts name	No.	Parts name
①	Cylinder body	⑥	Nut (for both TA type and TB type)
②	Foot bracket	⑦	Mounting Washer (for LB type and FA type)
③	Flange		
④	Trunnion (Axis type)		
⑤	Nut (for both LB type and FA type)		

2.2 Fundamental Circuit

1) To retain an accurate operation, comply the following fundamentals and design such circuit as illustrated below.
   ① Supply the pressure to both side of piston when piston is stopped. (This is to eliminate the piston from popping out on succeeding start.)
   ② To make thrust balanced (including the load), install a regulator with a check valve within the circuit which provides larger thrust.
   ③ Install the solenoid valve for brake as close to the brake port as possible.

In case of horizontal load

The ray-out per Fig.1 prevents the piston rod from popping out at the moment the brake system is released as the pressure is delivered on both sides of piston when the cylinder motion is stopped by shifting the solenoid valve to its neutral position. Keep balancing by installing a regulator with a check valve to the circuit of cylinder head side.

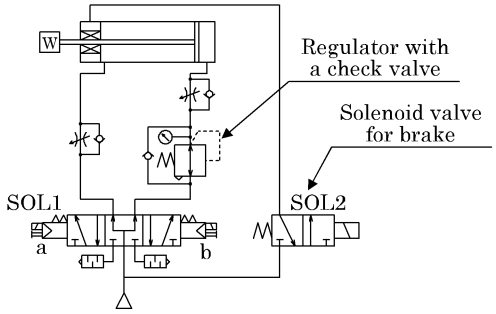


Fig.1

SOL1		SOL2	Actuating
a	b		
OFF	OFF	OFF	Halt
ON	OFF	ON	Retract
OFF	ON	ON	Advance

★ Pressure within the regulator $= \frac{(D^2-d^2)}{D^2} P$

D : Cylinder bore [mm]
d : Diameter of rod [mm]
P : Working pressure [MPa]

In case of downward load

When the lay-out of circuit is as shown in Fig.2, install a reducing valve with a check valve to the circuit of cylinder head side for the purpose of reducing the downward thrust of the rod and keeping a balance because the cylinder rod is apt to be suddenly pulled down due to the load at the moment the brake system is released.

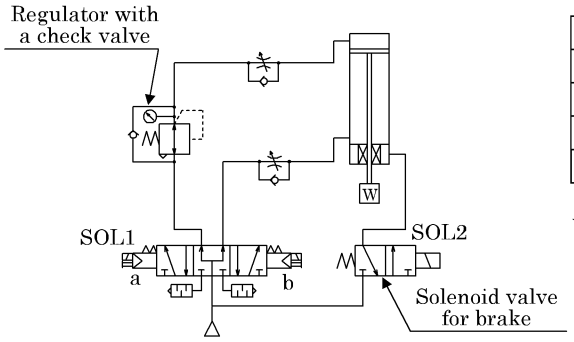


Fig.2

SOL1		SOL2	Actuating
a	b		
OFF	OFF	OFF	Halt
ON	OFF	ON	Advance
OFF	ON	ON	Retract

★ Pressure within the regulator $= \frac{\pi(D^2-d^2)P-4W}{\pi D^2}$

D : Cylinder bore [mm]
d : Diameter of rod [mm]
P : Working pressure [MPa]
W : Load [N]

In case of upward load

When the load is upward as shown in Fig.3, install a reducing valve with a check valve to the circuit of piston rod side for the purpose of reducing reversed thrust of the rod and keeping a balance because the cylinder rod is apt to be pushed backward due to the load at the moment the brake system is released.

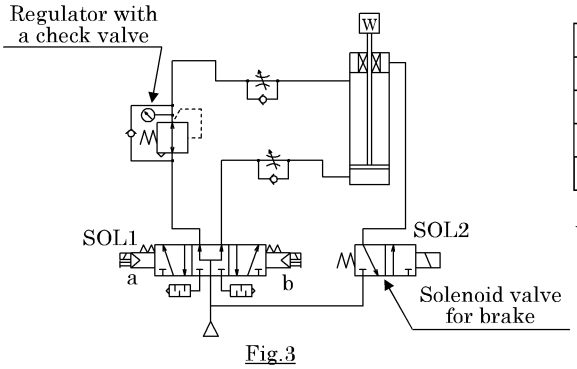


Fig.3

SOL1		SOL2	Actuating
a	b		
OFF	OFF	OFF	Halt
ON	OFF	ON	Retract
OFF	ON	ON	Advance

★ Pressure within the regulator $= \frac{\pi D^2P-4W}{\pi(D^2-d^2)}$

D : Cylinder bore [mm]
d : Diameter of rod [mm]
P : Working pressure [MPa]
W : Load [N]

2) Keeping a balance of propulsion
Keep a balance of propulsion by regulator with check valve as per fundamental circuit diagram posted in "2.2 Fundamental Circuit".
Adjust pressure in the duration of raising it instead of reducing it. Guide line value is calculated out of formulae posted in "2.2 Fundamental Circuit" (★ marked on page 5).

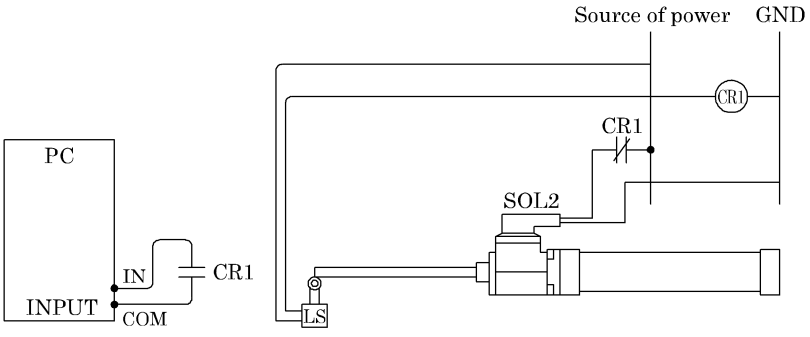
2.3 Electric Control Circuit

Carefully observe the following items as position accuracy is influenced by each control equipment as well as circuit.

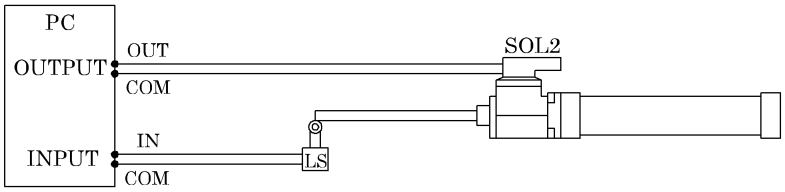
① Select the equipment with a quick response time and high accuracy.
② So design to have brake release signal and cylinder control signal are put out simultaneously or have brake release signal is put out a moment ahead of cylinder control signal to avoid piston rod from popping out.
③ Make the sensor switch of stop signal self-holding circuit.
④ Select sensor switch of stop signal out of either cylinder switch, roller plunger type limit switch, solid state switch or that of photo tube.
⑤ Caution when programmable controller is built in a circuit.
Positioning accuracy is ruined to extent of such as ±3mm to ±5mm when brake circuit is built through a programmable controller because of dispersion of brake release timing due to dispersion of scanning time (±20ms to 30ms).
Design the brake circuit directly through a relay instead of through programmable controller.

※ Scanning time ·····Time requirement a program routine executed one cycle
※ Dispersion ·····Dispersion is ±1.5mm when scanning time is 30ms at the cylinder speed of 100mm/s

○ Example of good circuit which does not go through programmable controller

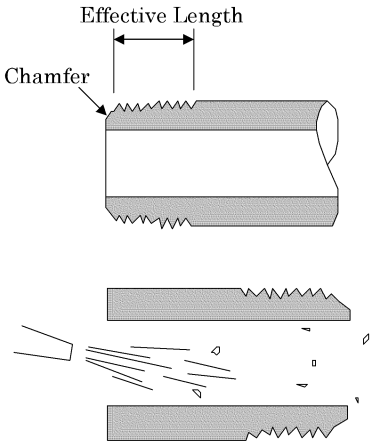


× Example of undesirable circuit which goes through programmable controller



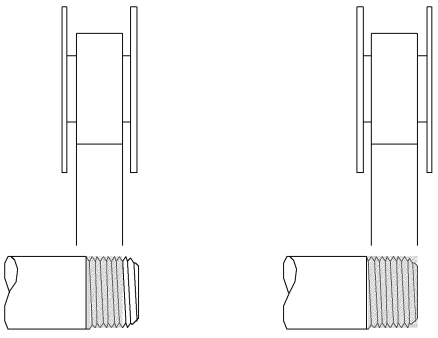
2.4 Piping

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.



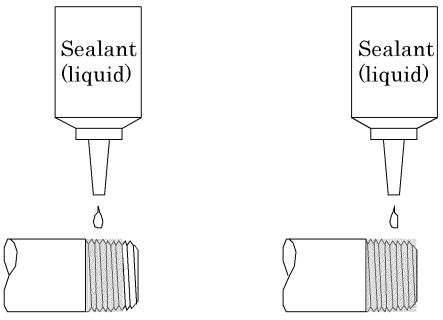
6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

● Seal Tape



(Correct) (Incorrect)

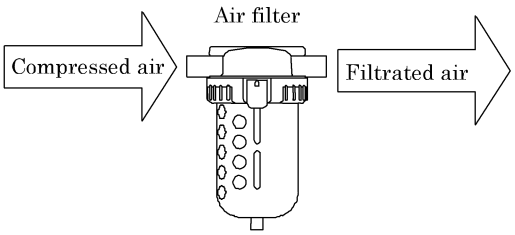
● Sealant (liquid)



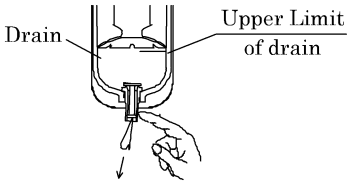
(Correct) (Incorrect)

2.5 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 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.

2.6 Piping capacity and drain

If the piping capacity is larger than the cylinder capacity, the compressed air in the cylinder will not be completely exhausted when changing with the solenoid valve. This compressed air will condense, form water drops, and cause drainage. This drainage will cause lubricant to flow and cause lubrication faults, temporarily block the passage, corrode the inside of the brakes, cause faulty brake operation, obstruct the stopping accuracy, or prevent application or release of the brakes, etc.

Calculate the working compressed air's atmospheric dew point from the piping capacity magnification A in respect to the cylinder capacity. Install a dryer and adjust the air quality so that the value is kept below the following values and drainage is not formed. This can also be done by adjusting the port size and length of the tube from the release port to the solenoid valve to match the working compressed air's atmospheric dew point so that the following conditions are satisfied.

Magnification A < 1 : atmospheric dew point -20℃ or less
1 ≦ magnification A < 2 : atmospheric dew point -25℃ or less
Magnification A ≧ 2 : atmospheric dew point -30℃ or less

Calculation of magnification A of piping volume for cylinder volume

$$A = \frac{Vt + V_1}{V_0 (10P + 1)}$$

Vt: Piping volume
V_0: Brake release cylinder volume
V_1: Brake release cylinder blank volume
P: Working pressure (MPa)

	V_0 (mm^3)	V_1 (mm^3)
JSK2-20	754	754
JSK2-30	1963	1865
JSK2-40	4021	3860

Ex.) Piping bore size up to JSK2-20, brake release port ϕ 4 / length 1.5m
working pressure 0.5MPa

Piping volume Vt = cross section × length = $4 \times 4 \times \pi / 4 \times 1500 \fallingdotseq 18850 mm^3$

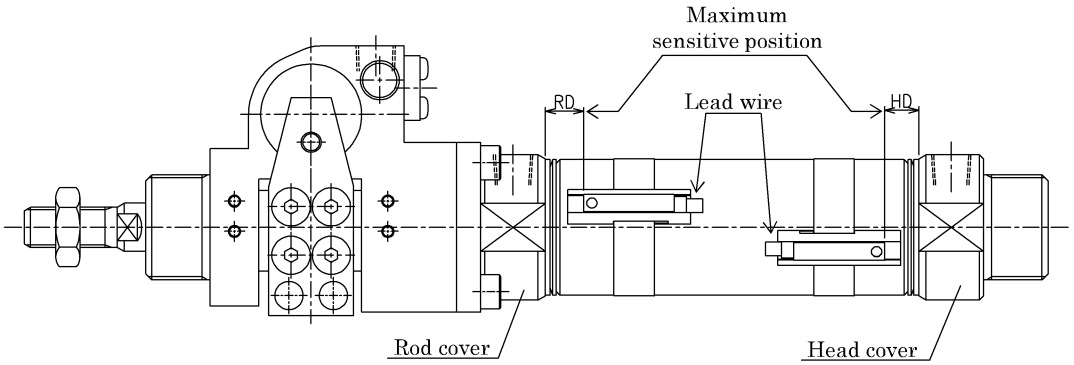
$$A = \frac{18850 + 754}{754 \times (10 \times 0.5 + 1)} = 4.3$$

Adjust the air quality so that the atmospheric pressure dew point is -30℃ or less.

●If adjustments are difficult, consider using a cylinder with valve (JSK2-V).

2.7 Location of mounting Switches on a Cylinder

1) Location of mounting switches on a cylinder



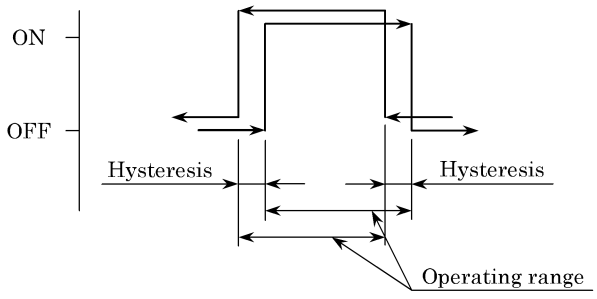
(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the maximum sensitive position.

(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 posits is of the maximum sensitive position and where the switch is supposed to be installed.

(3) Location around the circumference of cylinder
There is no restriction. Install switch(es) wherever easy to utilize it.

2) Operating range
The switch turns on first and turns off as the piston moves along its stroke.

3) Hysteresis
Precise operating range deviate slightly depending upon the direction of piston movement as shown right.



4) Maximum sensitive position, operating range and hysteresis

(Unit : mm)

Item / Bore size (mm)	Solid state (T2□, T3□, T3P□, T2J□, T2Y□, T3Y□, T2YD)							
	Maximum sensitive position				Operating range (reference value)		Hysteresis	
	HD		RD					
	1 color	2 color	1 color	2 color	1 color	2 color	1 color	2 color
ϕ20	7.0	6.0	8.0	7.0	2.5 to 5.5	3.5 to 7.5	1.5 or less	1.0 or less
ϕ25	8.5	7.5	9.5	8.5	2.5 to 5.5	3.5 to 7.5		
ϕ30	8.5	7.5	9.5	8.5	2.5 to 6	3.5 to 8		
ϕ40	10.5	9.5	11.5	10.5	3 to 7	4 to 9		

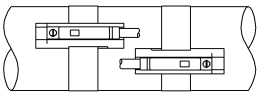
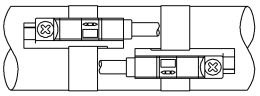
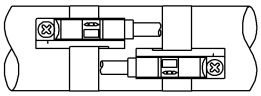
Item / Bore size (mm)	Solid state (T1□)			
	Maximum sensitive position		Operating range (reference value)	Hysteresis
	HD	RD		
ϕ20	6.0	7.0	2.5 to 5.5	1.5 or less
ϕ25	7.5	8.5	2.5 to 5.5	
ϕ30	7.5	8.5	2.5 to 6	
ϕ40	9.5	10.5	3 to 7	

Item / Bore size (mm)	Reed (T0□, T5□)				Reed (T8□)			
	Maximum sensitive position		Operating range (reference value)	Hysteresis	Maximum sensitive position		Operating range (reference value)	Hysteresis
	HD	RD			HD	RD		
ϕ20	7.0	8.0	6.5 to 11	3.0 or less	1.0	2.0	6.5 to 11	3.0 or less
ϕ25	8.5	9.5	7.5 to 12		2.5	3.5	7.5 to 12	
ϕ30	8.5	9.5	6.5 to 11.5		2.5	3.5	6.5 to 11.5	
ϕ40	10.5	11.5	7.5 to 13.5		4.5	5.5	7.5 to 13.5	

5) Location of switches mounted at ex-factory

Switches are mounted at the maximum sensitive position on cylinder. Minimum stroke length of types with switch refers the table below.

●Min. stroke length of type with switch

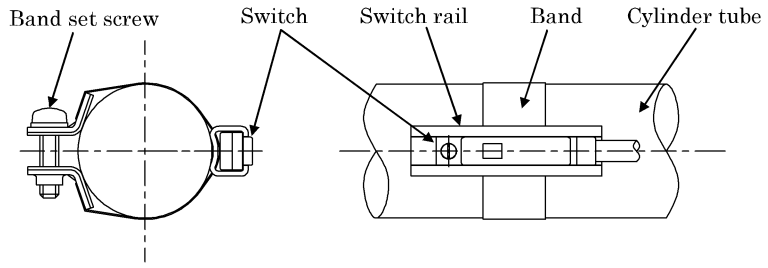
Switch			T0H/V※·T5H/V※ T2H/V※·T3H/V※	T2YH/V※·T3YH/V※	
Stroke	Switch quantity	1	10mm	10mm	
		2	25mm	25mm or more and 35mm or less	35mm
Figure					

6) Relocation of Switch and Replacement

(1) Moving the switch position in the stroke direction
The 1-color indicator switch is line-tuned by ±3 mm from the default. If the adjustment range exceeds ±3 mm, or when adjusting the 2-color indicator switch, move the band position.
The switch bracket rail has a mark 4 mm from the rail end. Use this as a guide to the mounting position when replacing the switch.
Switch rail markings are set to the default switch maximum sensitive position. The maximum sensitive position will change when the switch type is changed or when the band is moved. Adjust the position accordingly in this case.

(2) Shifting the switch position in the circumference direction
Loosen the band fixing screw, shift the switch rail in the circumference direction, then tighten at the specified position.
Tightening torque is 0.6 to 0.8 N・m.

(3) Shifting the band position
Loosen the band fixing screw, shift the switch rail and band along the cylinder tube, and tighten at the specified position. Tightening torque is 0.6 to 0.8N・m.



(4) Replacement of Switch
Take Switch body out of switch groove after loosening setscrew. Fix new switch to former switch groove and tighten set screw upon determination of required location. (Apply tightening torque of 0.1 to 0.2N・m to tighten the screw.)

3. OPERATION

3.1 Operating the Cylinder

1) Range of working pressure

Table 1 (Unit:MPa)

Item / Model	Max. working pressure	Min. working pressure
JSK2	1.0	0.35
JSK2-V	0.6	

2) The cushion of the cylinder of this type is unadjustable its cushion effect because of being made of rubber.
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

Bore size (mm)	Allowable energy absorption (J)
ϕ 20	0.166
ϕ 25	0.308
ϕ 32	0.424
ϕ 40	0.639

3) Adjust the working piston speed with the speed controller mounted.

4) Manual release of brake

(1) Manual release of brake
(When there is no air pressure or power supply)
Brake is released when socket headed bolts (M5) are screwed into the female threaded holes, on both sides, stop of brake section.
Screw then in evenly on both sides until piston rod is manually turned. Refrain excessive tightening so long as the brake is released.
As for the guide line of approximate length to screw in, depending upon the diameter, before releasing brake is presented on the following table.
Always remove the screws before starting normal operation.

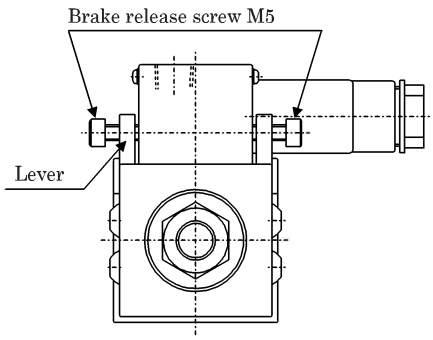
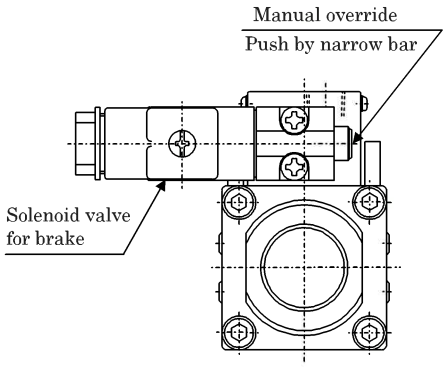


Table 3

Bore size	ϕ 20	ϕ 30	ϕ 40
Depth of screw	8mm	10mm	11mm

(2) Manual operate the solenoid valve for brakes
(When there is air pressure)
The brakes will be released when the manual device on the solenoid valve is pushed with a thin rod.
Note that a non-locking method is incorporated, so the brakes will be applied when the manual device is released.



3.2 How to use the Switches

3.2.1 Common items

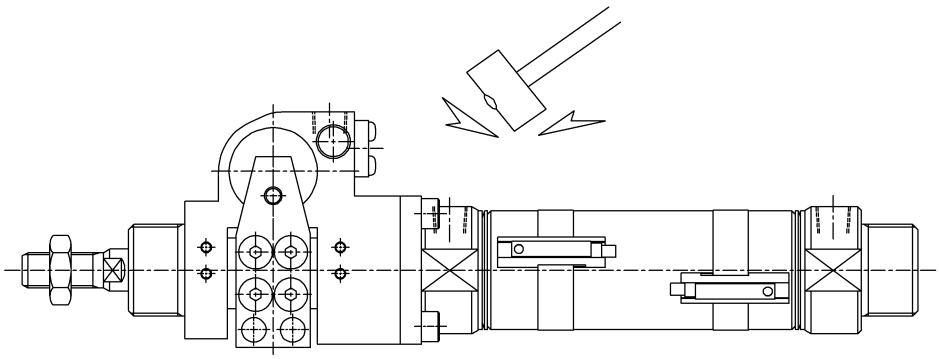
1) Magnetic environment
Avoid installation of switches within the area where strong magnetic field or large current (such as large magnet or spot welding equipment) exist. There may be a certain influence over sensing accuracy due to the interference of each magnetic field in case of parallel connection of cylinders with switch or when a magnetized article very much closely passes by the cylinder switch.

2) Lead wire wiring
Carefully perform the wiring so that a bending stress or tensile strength does not apply to the lead wire repeatedly.
Additionally, connect wires for robot having the bending resistance to movable parts.

3) Operating temperature
Do not operate the product at a high temperature (Over than 60℃).
Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.

4) Intermediate position detection
When activating the switch halfway of the stroke, the relay may not respond if the working piston speed is too fast.
When the operation time of the relay is 20 ms, operate the product at a working piston speed of 500 mm/s or less.

5) Impact
Do not apply a large vibration or impact to the product when transporting the cylinder, or mounting or adjusting the switch.



3.2.2 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.

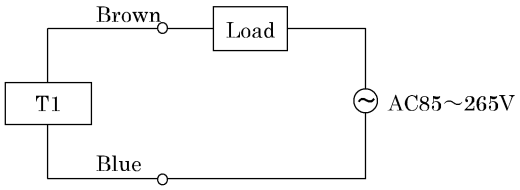


Fig.1 T1 Fundamental circuit Example

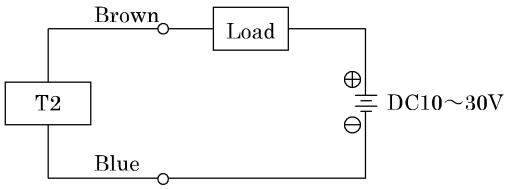


Fig.2 T2 Fundamental circuit Example

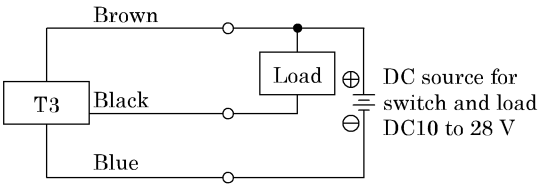


Fig. 3 T3 Fundamental circuit Example (1)
(In case the same source of power is used.)

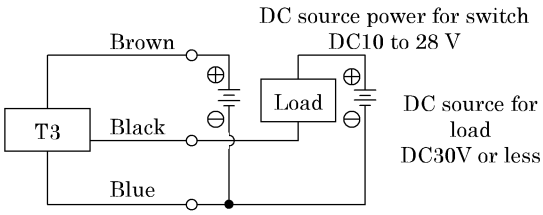


Fig. 4 T3 Fundamental circuit Example (2)
(In case individual sources of power are used.)

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 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).

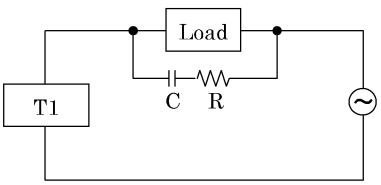


Fig. 5 An example of protective circuit at CR circuit
Capacitor volume : 0.03 to 0.1Mf
Resister : 1 to 3kΩ

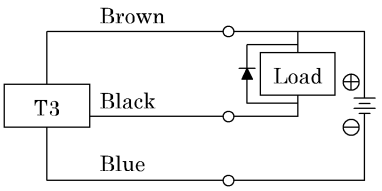


Fig. 6 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)

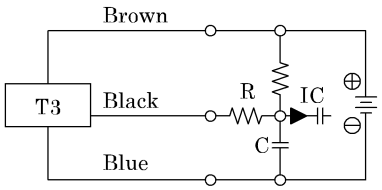


Fig. 7 An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R.

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

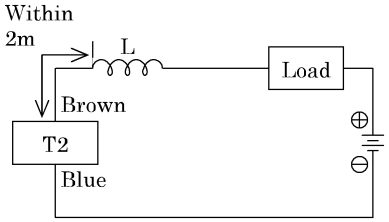


Fig. 8 ・Choke coil
L= a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

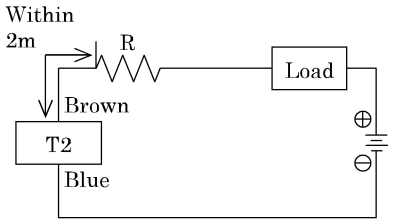


Fig. 9 ・Dash current restriction resister.
R= As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

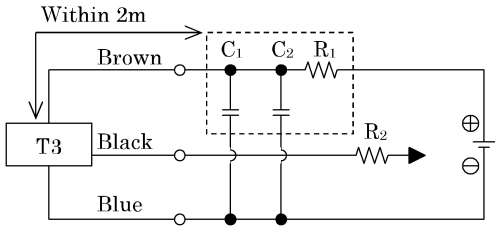


Fig. 10 ・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30Ω
・Dash current restriction resister.
R_2=As much large resister as the load circuit can afford.
・Install it nearby the switch (Within 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. 11 to 15 respectively.

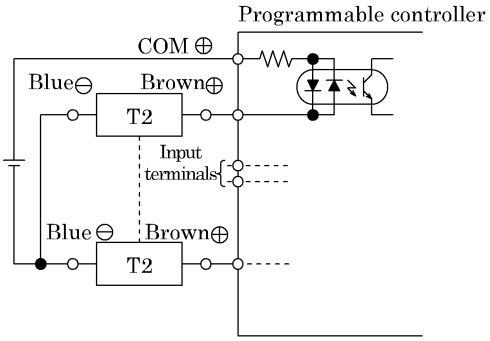


Fig.11 An example of T2 connection to source input type (an external power source)

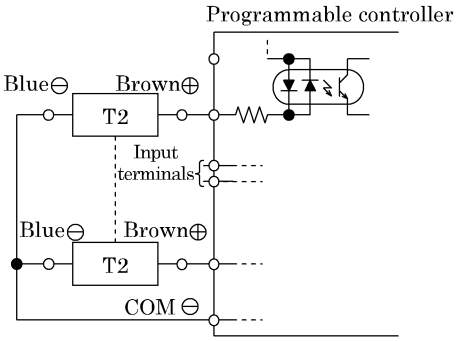


Fig.12 An example of T2 connection to source input type (an internal power source)

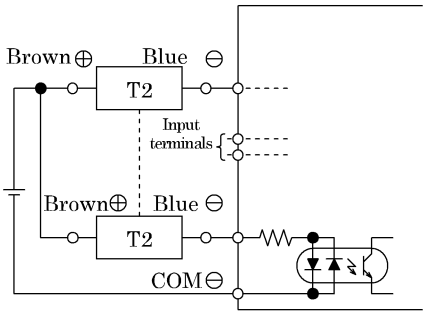


Fig.13 An example of T2 connection to source input type

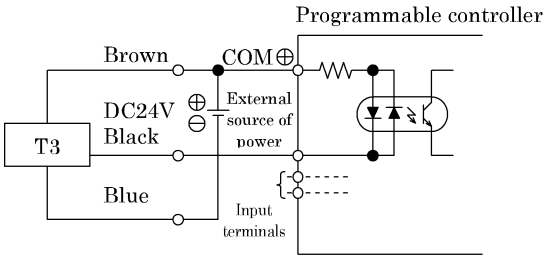


Fig.14 An example of T3 connection to source input type (an internal power source)

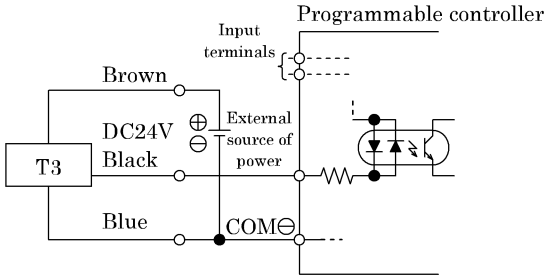


Fig.15 An example of T3 connection to source input type (an internal power source)

4) Parallel 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.

3.2.3 Reed switch (T0, T5, T8)

1) Lead wire connections
Do not connect the lead wires of the switch to the power supply directly. Always connect the loads in series. For T0 switch, carefully check following items (1), (2).

(1) When using the switch for DC power supply, connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversely, the switch is activated, but the indicator light is not lit.

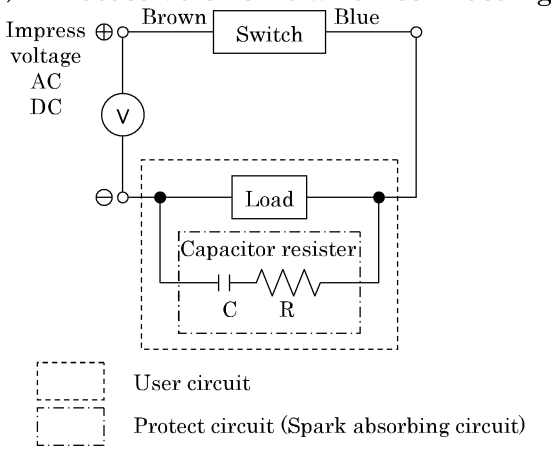
(2) When the switch is connected to an AC relay or a programmable controller input, the indicator light on the switch is not lit if the half-wave rectification is performed in the connected circuit. If this occurs, reverse the polarities of the switch lead wire connection. The indicator light may then be lit.

2) Contact protective measures
When an inductive load, such as relay is used or the wire length exceeds that stated in Table 4, always install a contact protective circuit.

Table 4

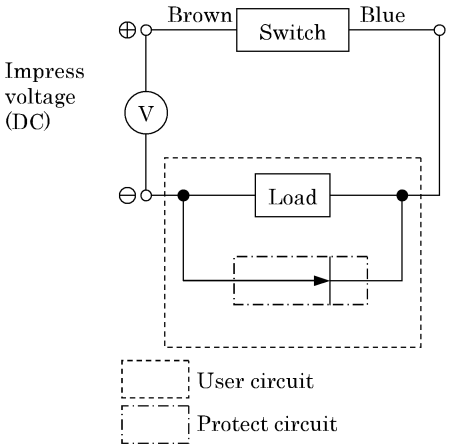
Electric power	Length of wire
DC	100m
AC	10m

(1) Protective circuit when connecting an inductive type load.



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

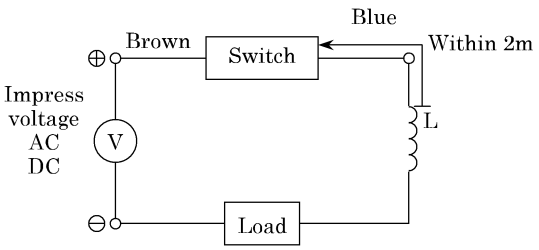
Fig.1 When capacitor resister is used.



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

Fig.2 When diode is used.

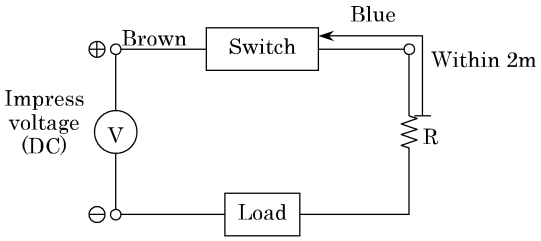
(2) Protective circuit when the wire length exceeds that stated Table 1



・ Choke coil
L=a couple hundred μH 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) Contact capacity
Do not use a load exceeding the maximum contact capacity of the switch. Additionally, if the current is lower than the rated current value, the indicator light may not be lit.

4) Relay
Always use the relays listed below.
Omron Corporation ····· MY type
Fuji Electric Co., Ltd. ····· HH5 type
Panasonic, Ltd. ····· HC type

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.

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
   ① Check the mounting bolts and nuts of brake mechanism.
   ② Check of release operation of brake. (Check whether brake release operates by minimum working pressure 0.35MPa.)
   ③ Check the mounting bolts and nuts of cylinder.
   ④ Check the mounting bolts and nuts to the piston rod end brackets and mounting brackets for slackening.
   ⑤ Check that the cylinder operates smoothly.
   ⑥ Check any change of the working piston speed and cycle time.
   ⑦ Check for internal and /or external leakage.
   ⑧ Check the piston rod for flaw(scratch) and deformation.
   ⑨ Check the stroke for abnormality.
   ⑩ Check whether overrun length of piston rod is large.
   ⑪ Check any corrosion inside of each port.

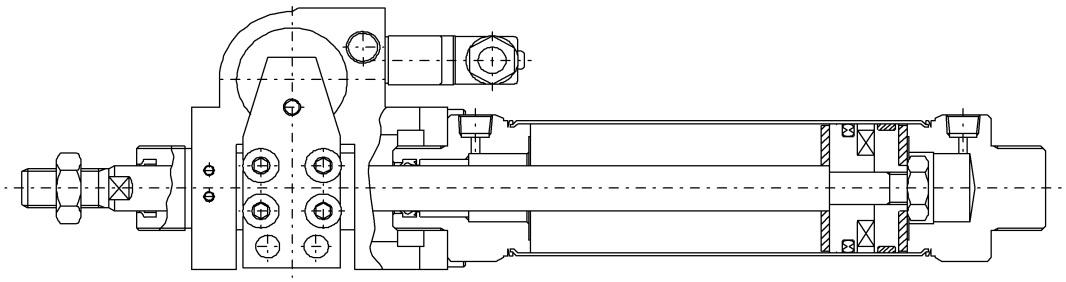
See "5. TROUBLE SHOOTING", should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

Because it is very important section, the brake section should not be disassembled. When inspecting the inside of brake, it takes over and inspects by our company. Consult with CKD.

4.2 Disassembling・Assembling

1) Internal structure

Remove brake unit in accordance with Article 4. 2) 2) to disassemble the cylinder.



※This type of brake unit hardly suffers from mechanical trouble. Should there be any difficulties occurs, replace in its entirety as a unit. Model No. of brake unit is JSK2-20 to 40-BRAKE-UNIT.

2) Dismounting of the brake unit

(1) Remove the dust cover mounting screws with plus head screw driver. Refer to Fig.1.

Note : It is unnecessary trying removal of the cover when the model is without cover.

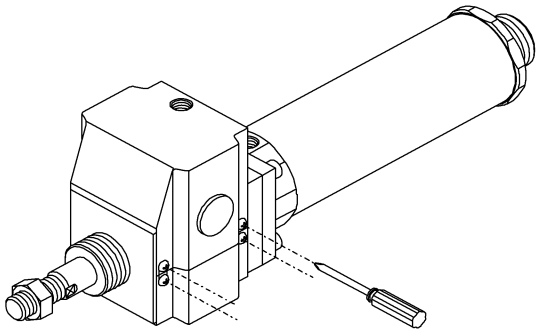


Fig.1

(2) Screw in socket head bolts (M5) from both sides of braking device to release the system from manual control.
Screw bolts in only to the extent that piston rod is turnable by hands. Remember that excessive screwing in may cause possible damage to braking device.
Refer to Fig. 2.

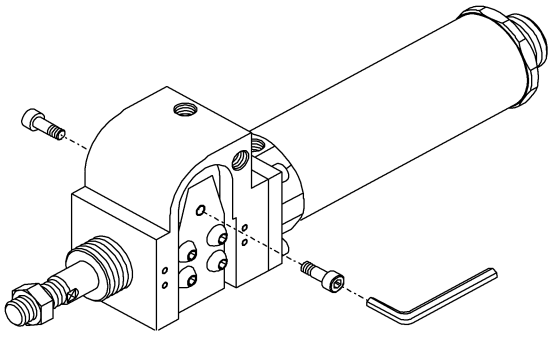


Fig.2

A guide line of length to screw in is shown in the table below.

Bore size	ϕ 20	ϕ 30	ϕ 40
Depth of screw	8mm	10mm	11mm

(3) Remove mounting bolts (4 ea) of brake unit using a spanner.
Refer to Fig.3.

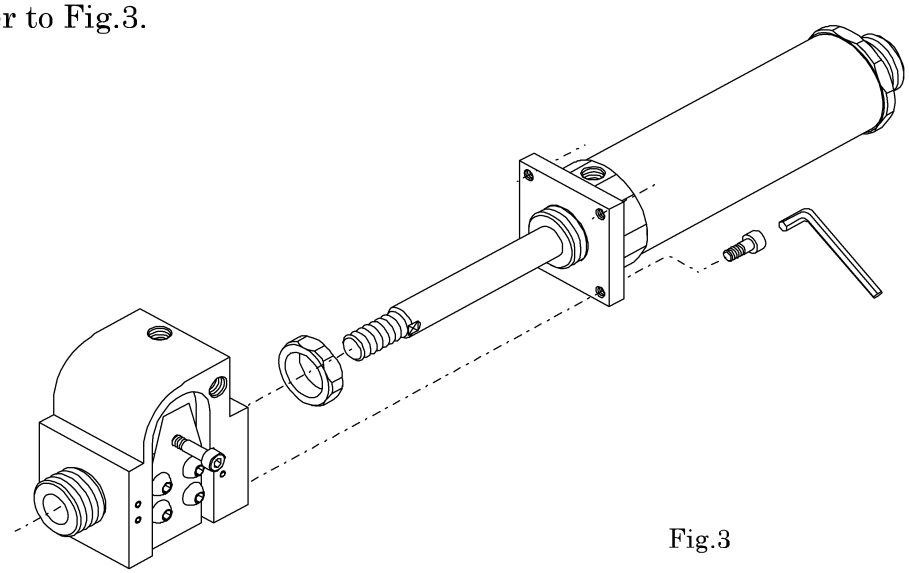


Fig.3

3) Mounting the brake unit

Take reverse procedure (3) to (1) as per described in paragraph 4.2 2) for mounting the unit back to cylinder. Pay attention on the following items during the course of assembling.

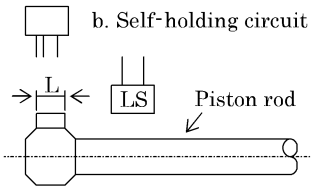
① Wipe the grease off the piston rod should there be any grease over it. (Holding force of brake is reduced.)

② While tightening the mounting bolts over brake unit, tighten the pair of bolts diagonally to avoid unit from twisting.
Confirm after tightening that the piston rod moves smoothly.

③ Keep the socket headed bolts for manual release of brake removed during normal operation.

5. TROUBLE SHOOTING

1) Cylinder

Trouble	Cause	Correction
Brake does not release.	Insufficient pressure to the brake mechanism.	Secure ample pressure.
	No signal to brake solenoid valve. (In case NO type-Electric signal is there.)	Reaffirm the circuit to receive a signal. (Reaffirm the circuit to shut off a signal.)
	Solenoid valve for brake does not function.	Check the circuit and repair the matter as is required. Repair or replace solenoid valve as is required.
	Damage to packing for brake piston.	Replace the brake unit.
Rod does not stop	Electric signal is there. (In case NO type- No signal to brake solenoid.)	Reaffirm the circuit to shut off a signal. (Reaffirm the circuit to receive a signal.)
	Solenoid valve for brake does not function.	Check the circuit and repair the matter as is required. Repair or replace solenoid valve as is required.
	Damage to packing for brake piston.	Replace the brake unit.
	Left manual release of brake.	Release the manually open status.
	Skips off the dog for brake signal a. Excessive cylinder speed b. Circuit is not self-holding circuit 	a. Either slow down the speed or increase the dog length (L). b. Revise the circuit to that of self-holding.
	Cylinder switch does not function.	Correct or remove the cause of malfunction.
Inaccurate positioning.	Effective cross-sectional area of solenoid valve for brake is not large enough.	Replace the solenoid valve with the one of large effective cross-sectional area.
	Either too fine or too long tubing of connecting solenoid valve for brake and brake port.	Either replace tubing with the one of large diameter or shorten it if possible. As an alternative, connect the solenoid valve directly.
	Too low response of solenoid valve for brake.	Replace the solenoid valve with the one of high response.
	Too low response of signal sensor switch to solenoid valve for brake.	Replace the sensor switch with the one of high response.
	Relays within signal circuit of brake control are actuated sequentially.	Revise the signal circuit. (Carefully review the response time, particularly when using programmable controller.
	There is a slackening of mounting a dog for brake signal.	Correct and remove the play.
	Remarkable wear and tear on the shape of the dog. a. Slant angle is to be maintained less than 30° when using roller plunger type limit switch. b. More length of dog than over run length is required when making an interlocking by means of dog.	a. The larger angle cause load variation and results inaccurate positioning. 〔The slant angle can be up to 60° when using roller lever.〕 b. When relay is used for self-holding circuit, dog length is required to provide an appropriate time length of relay actuating.

Trouble	Cause	Correction
Inaccurate positioning.	Fluctuation of cylinder speed. a. Misalignment of the center lines between piston rod and load guide. b. The momentum inertia of load is excessive in comparison with thrust to cylinder. (Particularly when the positioning pitch is too small) c. See if the stopping position is within the cushion chamber or just after piston comes out of cushion chamber.	 a. Eliminate misalignment by using free joint or equivalent parts. b. Either use larger bore cylinder or revise to hydraulic oil cylinder of low pressure range. c. Install a check valve to cushion in the event that stopping piston just when getting out of cushion chamber.
	Piston rod is apt to pop out. a. Incorrect setting of pressure balancing regulator. b. Delayed timing of stop release.	 a. Reset the pressure regulator. b. Shorten the timing of stop release. (See if supply line is chalked, also.)
	Fluctuation of load a. Feeding load change along curvature variation of copying profile. (Steady change) b. Remarkable change of load due to perpendicular load (Step change)	 a. Revise the specification to adopt hydraulic cylinder of low pressure range. b. Revise the circuit by building plural number of regulators for pressure balancing in the event that the range of load variation is relatively small or load changes stepping trend.
Piston rod does not move.	No signal to direction control solenoid valve.	Correct the control circuit.
	Misalignment of center lines at mounting cylinder.	Correct the installation state and/or change the mounting style.
	Damage to piston packing.	Replace the cylinder.
Unsteady motion of rod	Misalignment of center lines at mounting.	Correct the installation state and/or change the mounting style.
	Exertion of transverse (lateral) load.	Install guide, correct the installation state and/or change the mounting style.
	Speed is less than the low speed limit.	Relieve the load change. Consider of using low pressure hydraulic oil cylinder.
	Excessive load.	Raise the pressure. Use the cylinder of larger bore.
	Speed control valve is built in the way of "Mater in" circuit.	Revise the installation direction of speed control valve.
Damage or distortion	Shock due to high speed operation	Raise the cushion effect. Lower the speed. Reduce the load. Improve cushion mechanism. (Such as adopting external cushion mechanism.)
	Exertion of transverse load.	Install guide, correct the installation state and/or change the mounting style.

2) Switch

Troubles	Causes	Remedies
Indicator light is not lit.	Deposited contact point	Replace the switch.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Damaged indicator light	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.
Switch does not function right.	Broken circuit	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.
	Improper voltage	Correct voltage to specified.
	Incorrect location of switch	Correct its location.
	Aberrant position of switch	Set it back to original position and tighten the mounting device.
	Incorrect direction of switch mounting	Correct the direction of the switch mounting.
	Relay is unable to respond properly	Replace the relay with a recommended one.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Excessive speed of piston if it is to sense an intermediate point of stroke	Reduce the speed of piston.
Switch does not return.	Piston is not moving	Make the 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..
	The ambient temperature is out of the specification range	Adjust the ambient temperature within the range of -10 to 60℃.
	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 “2.7 Location of mounting Switches on a Cylinder” as for replacing a switch and correcting its location.

6. HOW TO ORDER

6.1 Product Number Coding

● Without switch

JSK2-V – LB – 20 NN – 50 – 1 ———— J I

● With switch

JSK2-V – LB – 20 NN – 50 – 1 – T0H – R – J I

(a) (b) (c) (d) (e) (f) (g) (h) (i) (j)

(a) Model code (Note1)		(b) Mounting style		(c) Bore size (mm)	
JSK2	Double acting	00	Basic type	20	ϕ 20
JSK2-V	With solenoid valve	LB	Axial foot type	25	ϕ 25
		FA	Rod side flange type	32	ϕ 32
		CA	Eye bracket type	40	ϕ 40
		CC	Fixed eye		
		TA	Rod side trunnion type		
		TB	Head side trunnion type		

(d) Port thread type		(e) Stroke (mm) (Note 2)		(f) Voltage of solenoid valve	
No code	Rc thread	ϕ 20	5 to 700	1	AC100V (50/60Hz)
NN	NPT thread (ϕ 25 or more) (custom order)	ϕ 25		2	AC200V (50/60Hz)
GN	G thread (ϕ 25 or more) (custom order)	ϕ 32		3	DC24V
		ϕ 40			

(g) Switch model No.					(h) Switch quantity	
Axial lead wire	Radial lead wire	Switch type	Indicator light	Lead wire	R	One on rod side
					H	One on head side
T0H※	T0V※	Reed	1 color indicator	2 wire	D	Two
T5H※	T5V※		Without indicator light		T	Three
T8H※	T8V※		1 color indicator		4	Four (Note 3)
T1H※	T1V※	Solid state				
T2H※	T2V※					
T3H※	T3V※			3 wire	※Lead wire length	
T2YH※	T2YV※		2 color indicator	2 wire	Blank	1m (Standard)
T3YH※	T3YV※			3 wire	3	3m (Option)
T2JH※	T2JV※		Off-deray type	2 wire	5	5m (Option)

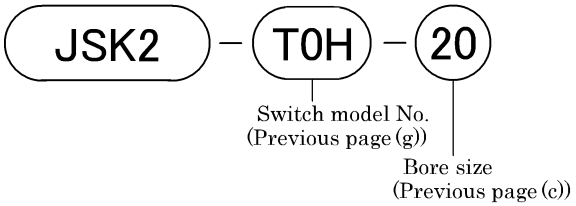
※ mark indicates lead wire length.

(i) Option (Note 4)				(j) Accessory	
		Max. ambient	Instant. max.	I	Rod eye
J	Bellows	100℃	200℃	Y	Rod clevis (pin, washer and split pin attached)
L	Bellows	250℃	400℃	B2	Clevis bracket (pin and snap ring attached)
M	Piston rod material change (stainless steel)				
V	Boss cut off				
U	Brake with cover				

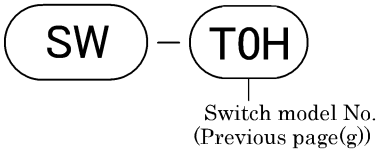
Note 1: Low hydraulic type is available as custom order. In model no., JSK2-H and JSK2-VH are provided.
Note 2: Custom stroke length is available per 1 mm increment.
Note 3: Specify the number of switches if four or more switches are to be used.
Note 4: Instantaneous max. temperature is the temperature when spark and spatter etc., instantaneously contacts to bellows.

6. 2 Switch Model coding

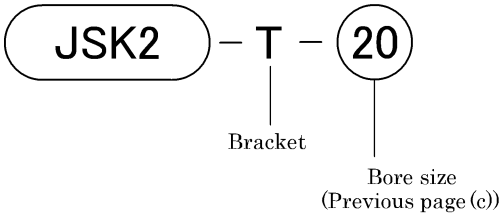
(1) Switch main body + Mounting bracket



(2) Switch only

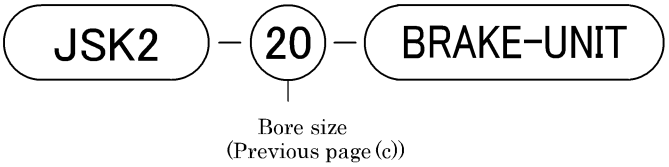


(3) Mounting bracket



6. 3 How to order valve for brake

6. 4 How to order brake unit



6. 5 How to order mounting bracket

Bore size(mm) / Mounting bracket	ϕ 20	ϕ 25	ϕ 32	ϕ 40
Axial foot type (LB)	M1- LB -20	M1- LB -30	M1- LB -30	M1- LB -30
Flange type (FA)	M1- FA -20	M1- FA -30	M1- FA -30	M1- FA -30
Eye bracket type (CA)	M1- CA -20	M1- CA -30	M1- CA -30	M1- CA -30
Trunnion type (TA/TB)	M1- TA -20	M1- TA -30	M1- TA -30	M1- TA -40

Note 1: Mounting nut and toothed washer are attached to each mounting bracket.
Note 2: The foot type mounting bracket is supplied as a one-piece set.

7. SPECIFICATION

7.1 Product Specifications

Model / Item			JSK2				JSK2-V			
Bore size		mm	φ20	φ25	φ32	φ40	φ20	φ25	φ32	φ40
Actuation			Double acting (Option)				Double acting (Standard)・With solenoid valve for brake			
Working fluid			Compressed air							
Max. working pressure		MPa	1.0				0.6			
Min. working pressure		MPa	0.35				0.35			
Proof pressure		MPa	1.6							
Ambient temperature		℃	-10 to 60 (No freezing)				-10 to 50 (No freezing)			
Port size	Brake section		M5	Rc1/8			M5	Rc1/8		
	Cylinder section		Rc1/8							
Stroke tolerance		mm	$^{+2.0}_{0}$ (to 200)、$^{+2.4}_{0}$ (200 or more)							
Working piston speed		mm/s	50 to 500							
Cushion			Rubber cushion							
Lubrication			Not required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is preferred)							
Stoppage accuracy		mm	±1.0 (300mm/s at no load)							
Holding force		N	186	431	431	765	186	431	431	765

7.2 Switch Specifications

Descriptions / Applications	Reed 2 wire			
	T0H, T0V		T5H, T5V	
	Programmable controller, relay		Programmable controller, relay, IC circuit (without indicator light), series connection	
Load voltage	DC12/24V	AC110V	DC5/12/24V	AC110V
Load current	5 to 50mA	7 to 20mA	50mA or less	20mA or less
Current consumption	—			
Internal voltage drop	3V or less		0V	
Indicator light	LED (ON lighting)		Without indicator light	
Leakage current	0mA			
Lead wire length (Note 1)	Standard 1m (oil resistant vinyl cabtire code 2-core, 0.2mm²)			
Shock resistance	294m/s²			
Insulation resistance	20MΩ over at DC500V megger			
Withstand voltage	No failure at AC1000V impressed for one minute			
Ambient temperature	−10 to 60℃			
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance			

Descriptions / Applications	Reed 2 wire		
	T8H, T8V		
	Programmable controller, relay		
Load voltage	DC12/24V	AC110V	AC220V
Load current	5 to 50mA	7 to 20mA	7 to 10mA
Current consumption	—		
Internal voltage drop	3V or less		
Indicator light	LED (ON lighting)		
Leakage current	0mA		
Lead wire length (Note 1)	Standard 1m (oil resistant vinyl cabtire code 2-core, 0.3mm²)		
Shock resistance	294m/s²		
Insulation resistance	100MΩ over at DC500V megger		
Withstand voltage	No failure at AC1500V impressed for one minute		
Ambient temperature	−10 to 60℃		
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance		

Descriptions / Applications	Solid state 2 wire	
	T2H, T2V	T2YH, T2YV
	Programmable controller	
Load voltage	DC10 to 30V	
Load current	5 to 20mA (Note 2)	
Current consumption	—	
Internal voltage drop	4V or less	
Indicator light	LED (ON lighting)	Red/Green LED (ON lighting)
Leakage current	1mA or less	
Lead wire length (Note 1)	Standard 1m (oil resistant vinyl cabtire code 2-core, 0.2mm²)	Standard 1m (oil resistant vinyl cabtire code 2-core, 0.3mm²)
Shock resistance	980m/s²	
Insulation resistance	20MΩ over at DC500V megger	100MΩ over at DC500V megger
Withstand voltage	No failure at AC1000V impressed for one minute	
Ambient temperature	−10 to 60℃	
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance	

Descriptions	Solid state 2 wire	
	T2JH, T2JV	T1H, T1V
Applications	Programmable controller	Programmable controller, relay, compact solenoid valve
Load voltage	DC10 to 30V	AC85 to 265V
Load current	5 to 20mA (Note 2)	5 to 100mA
Current consumption	—	—
Internal voltage drop	4V or less	7V or less
Delay hour off	200±50ms	—
Indicator light	LED (ON lighting)	
Leakage current	1mA or less	1mA or less at AC100V 2mA or less at AC200V
Lead wire length (Note 1)	Standard 1m (oil resistant cabtire code 2-core, 0.3mm²)	Standard 1m (oil resistant vinyl cabtire code 2-core, 0.3mm²)
Shock resistance	980m/s²	
Insulation resistance	100MΩ over at DC500V megger	
Withstand voltage	No failure at AC1000V impressed for one minute	No failure at AC1500V impressed for one minute
Ambient temperature	−10 to 60℃	
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance	

Descriptions	Solid state 3 wire	
	T3H, T3V	T3YH, T3YV
Applications	Programmable controller, relay	
Load voltage	DC10 to 28V	
Load current	DC30V or less	
Current consumption	100mA or less	50mA or less
Internal voltage drop	10mA or less at DC24V	
Load voltage	0.5V or less	
Indicator light	LED (ON lighting)	Red/green LED (ON lighting)
Leakage current	10μA or less	
Lead wire length (Note 1)	Standard 1m (oil resistant vinyl cabtire code 3-core, 0.2mm²)	
Shock resistance	980m/s²	
Insulation resistance	20MΩ over at DC500V megger	100MΩ over at DC500V megger
Withstand voltage	No failure at AC1000V impressed for one minute	
Ambient temperature	−10 to 60℃	
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance	

Note 1: 3m or 5m long lead wire is optionally available.

Note 2: Maximum value, 20mA is at 25℃ of ambient temperature. Load current decreases less than 20mA when the ambient temperature exceeds 25℃. For example: it may be 5 to 10mA at 60℃.