CKD

SM－374428－A

INSTRUCTION MANUAL

TIEROD CYLINDER WITH BRAKE JSG(φ40 to φ100)

- 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.
- The strong spring is assembled into the brake unit.
  Do not disassemble the brake unit, since this may cause a hazardous situation.

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1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Super Compact 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 such bearing of low coefficient of skin friction and of low expansion ratio as ball bearing or roller bearing for the guide of cylinder load for the purpose of retaining positioning accuracy.

2) Use these cylinders within the following range of ambient temperature.

JSG	(Standard)	-10 to 60℃	(No freezing)
JSG-V	(Built-in solenoid valve for brake)	-5 to 50℃	(No freezing)

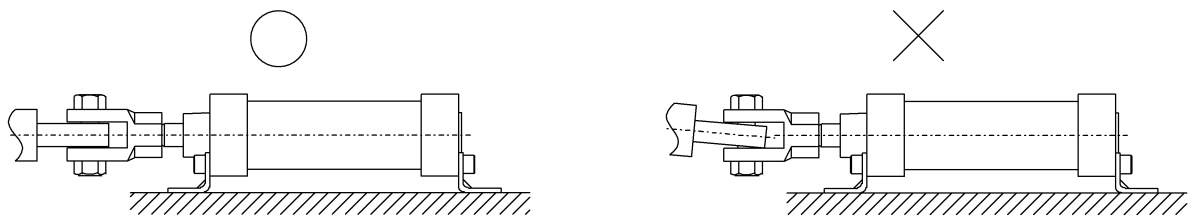
3) Use cylinder with bellows over its rod within the area with much dust.

4) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.

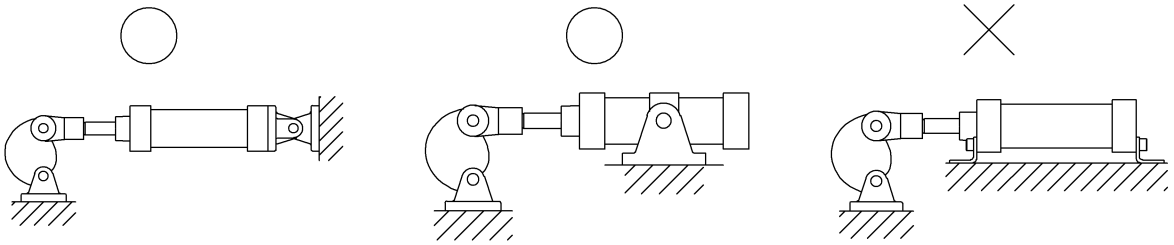
5) For the purpose of retaining improved positioning accuracy within the cushion chamber stroke;
   (1) Avoid to plan to stop position within 40mm from stroke end during coming away stroke from cushion chamber.
   (2) Avoid to plan to make an intermediate stop of piston within the cushion chamber stroke.

6) When cylinder is fixed and rod end is guided:
   In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).

7) 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.



8) 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. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main body does.



Clevis type　　Trunnion type　　Foot type

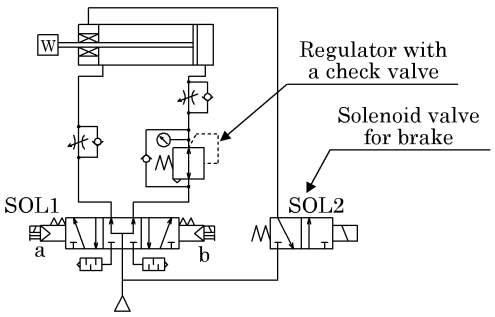
2.2 Fundamental Circuit

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

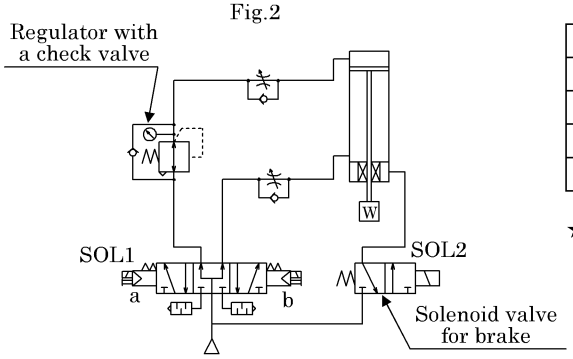
★ Pressure within the regulator $= \frac{(D^2-d^2)}{D^2} P$

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

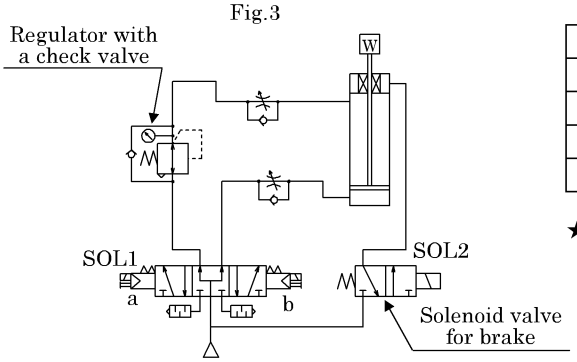
★ Pressure within the regulator $= \frac{\pi(D^2-d^2)P-4W}{\pi D^2}$

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).

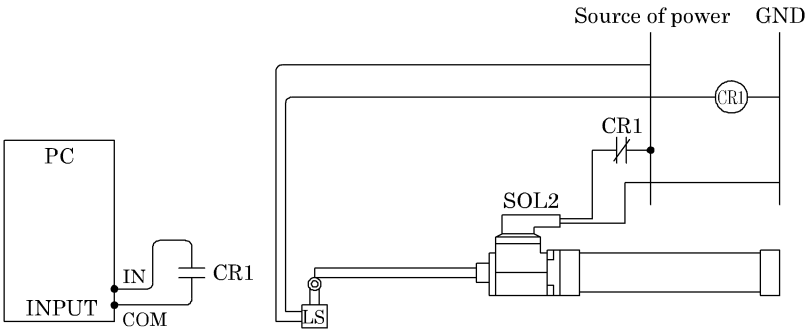
2.3 Electric Control Circuit

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

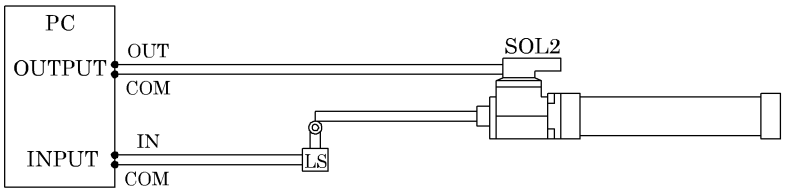
① Select the equipment with a quick response time and high accuracy.
② So design to have brake release signal and cylinder control signal are put out simultaneously or have brake release signal is put out a moment ahead of cylinder control signal to avoid piston rod from popping out.
③ Make the sensor 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).
<u>Design the brake circuit directly through a relay instead of through programmable controller.</u>

※ 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

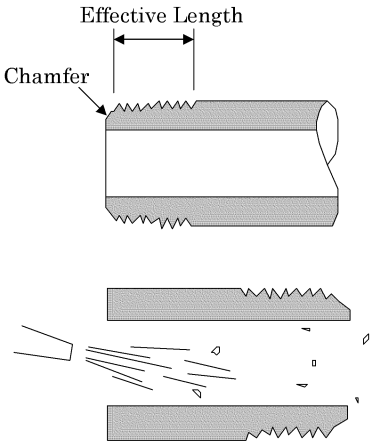


× Example of undesirable circuit which goes through programmable controller



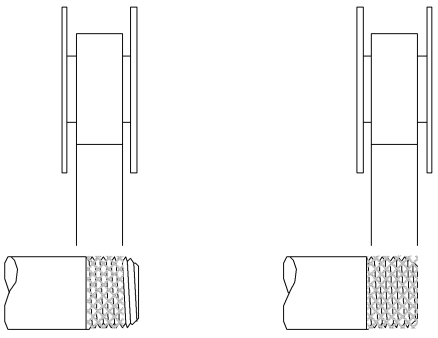
2.4 Piping

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.



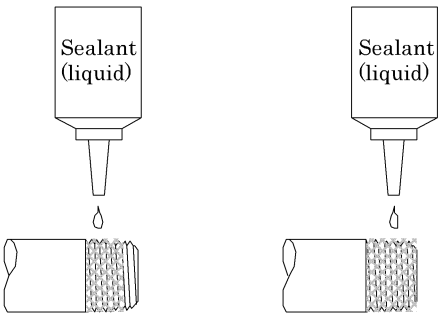
6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

● Seal Tape



(Correct) (Incorrect)

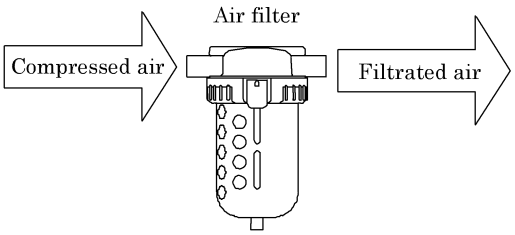
● Sealant (liquid)



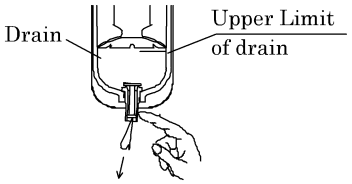
(Correct) (Incorrect)

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.

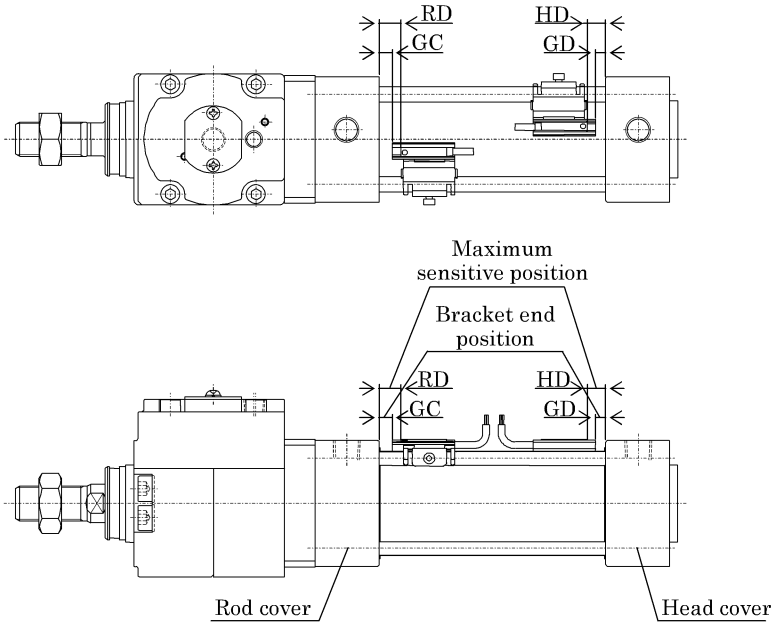


3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

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 Location of mounting Switches on a Cylinder

1) Location of mounting switches on a cylinder.



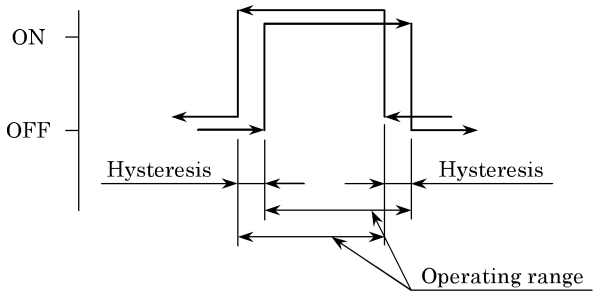
(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the maximum sensitive position.

(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

1 color indicator

(Unit:mm)

Bore size (mm)	Solid state switch (T2H/T2V,T3H/T3V)						Reed switch (T0H/T0V,T5H/T5V)					
	Maximum sensitive position				Operating range (reference value)	Hysteresis	Maximum sensitive position				Operating range (reference value)	Hysteresis
	GC	GD	RD	HD			GC	GD	RD	HD		
ϕ40	1(4)	1(4)	5(8)	5(8)	2～7	1.5 or less	1(4)	1(4)	5(8)	5(8)	7～12	3 or less
ϕ50	2.5(6.5)	1(5)	6.5(10.5)	5(9)			2.5(6.5)	1(5)	6.5(10.5)	5(9)	7.5～12	
ϕ63					2～7.5		8.5(13.5)	2(7)	12.5(17.5)	6(11)	8.5～13	
ϕ80	8.5(13.5)	2(7)	12.5(17.5)	6(11)	2.5～8						9～13.5	
ϕ100	8(13)	2.5(7.5)	12(17)	6.5(11.5)			8(13)	2.5(7.5)	12(17)	6.5(11.5)	9～14	

Bore size (mm)	Solid state switch (T1)				Reed switch (T8)			
	Maximum sensitive position		Operating range (reference value)	Hysteresis	Maximum sensitive position		Operating range (reference value)	Hysteresis
	GC/RD	GD/HD			GC/RD	GD/HD		
ϕ40	4(7)	4(7)	2～7	1.5 or less	0(2)	0(2)	7～12	3 or less
ϕ50	5.5(9.5)	4(8)	2～7		0.5(4.5)	0(3)	7.5～12	
ϕ63	5.5(9.5)	4(8)	2～7.5		0.5(4.5)	0(3)	8.5～13	
ϕ80	11.5(16.5)	5(10)	2.5～8		6.5(11.5)	0(5)	9～13.5	
ϕ100	11(16)	5.5(10.5)	2.5～8		6(11)	0.5(5.5)	9～14	

2 color indicator

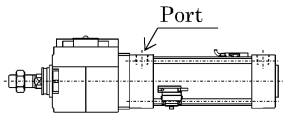
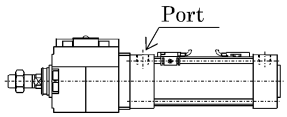
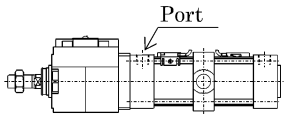
(Unit:mm)

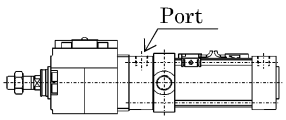
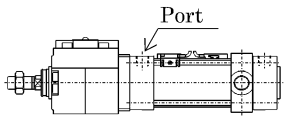
Bore size (mm)	Solid state switch (T2YH/T2YV,T3YH/T3YV,T2YD,T2J)			
	Maximum sensitive position		Operating range (reference value)	Hysteresis
	GC/RD	GD/HD		
ϕ40	4(7)	4(7)	6.5～9	1.0 or less
ϕ50	5.5(9.5)	4(8)	7～10	
ϕ63				
ϕ80	11.5(16.5)	5(10)	7.5～10.5	
ϕ100	11(16)	5.5(10.5)	8～11	

Note : Dimension shown in parentheses are for the rubber cushion type.

5) Location of switches mounted at ex-factory
Switches are mounted at the maximum sensitive position on cylinder. The location along circumference of cylinder differs in accordance with stroke. Refer the table below.

(Unit : mm)

Item	Different surface installation				Same surface installation				Center trunnion installation			
Rough sketch												
Switch Q'ty / Bore size (mm)	1	2	3	4	1	2	3	4	1	2	3	4
ϕ 40	10	25	30	35	10	40	75	120	68	68	98	98
ϕ 50	10	25	30	35	10	25	40	45	68	68	98	98
ϕ 63	10	25	30	35	10	25	40	45	74	74	98	98
ϕ 80	10	25	30	35	10	25	40	45	86	86	101	101
ϕ 100	10	25	30	35	10	25	40	45	92	92	107	107

Item	Rod side trunnion installation	Head side trunnion installation
Rough sketch		
Switch Q'ty / Bore size (mm)	1	1
ϕ 40	42	42
ϕ 50	42	42
ϕ 63	48	48
ϕ 80	54	54
ϕ 100	60	60

Note1 : When stroke length is not greater than 15mm, two switches could turn ON at the same time. In this case, adjust the distance between switches as far as possible.

6) Relocation of switch

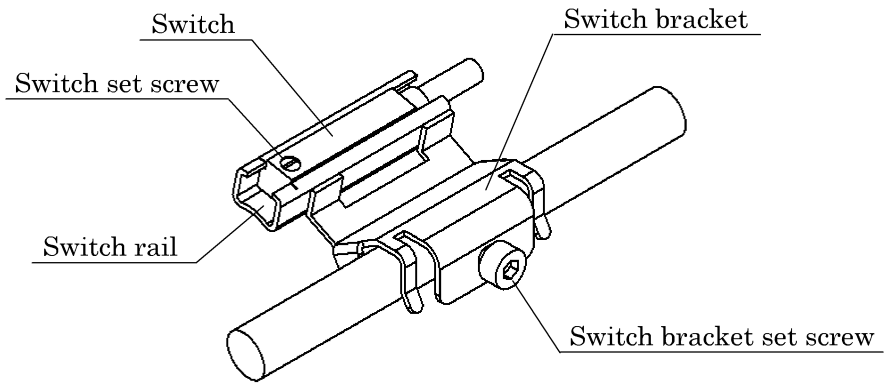
The cylinder with switch is set at the factory default so that the maximum sensitive position is at the stroke end. If it is desirable not to make detection at the stroke end, adjust the position of the switch in the following way.

(1) Fine adjustment of ±3 mm or less (one color solid state cylinder switch only)

Fine adjustment of ±3 mm can be made for the one color solid state cylinder switch (T□H/V) by loosening the switch fixing screw. After the adjustment is complete, tighten the fixing screw as mentioned in "7) Installation of switch".

(2) Relocation of one color solid state cylinder switch of more than ±3 mm and relocation of bi-color solid state cylinder switch

To relocate the one color solid state cylinder switch (T□H/V) by more than ±3 mm or relocate the bi-color solid state cylinder switch, loosen the switch bracket fixing screw, move the switch together with the switch bracket. In case of relocation of several mm, let the switch bracket slide. In case of relocation of more than several mm or in case that a tie rod is to be changed, remove the switch bracket once and fit it at a desired position. After the adjustment, tighten the switch bracket fixing screw as mentioned in "7) Installation of switch".



7) Installation of switch

The switch may be installed either before or after the installation of the switch bracket.

(1) Installation of switch bracket

Fit the switch bracket on the tie rod and adjust it to a desired position. Tighten the hexagon socket head cap screw by pressing the bracket slightly so that the switch rail comes in close contact with the cylinder tube. The tightening torque is 0.6 to 0.9 Nm

(2) Installation of switch

Insert the switch into the bracket rail, adjust it to a desired position and tighten the switch fixing screw.

When securing the switches T2, T3, T0, and T5, use a standard driver with a grip diameter of 5 to 6 mm, end form width 2.4 mm or less and thickness 0.3 mm or less (micro screwdriver, precision screwdriver, etc.) to tighten the screw. Tighten the screw at the tightening torque 0.1 to 0.2 Nm.

For tightening T2J, T2Y, T3Y, T1, T8 tighten them at the tightening torque 0.5 to 0.7 Nm.

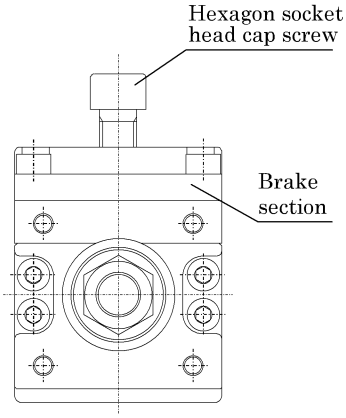
3. OPERATION

3.1 Operating the Cylinder

1) Range of working pressure
Operate the system within following range of air pressure.

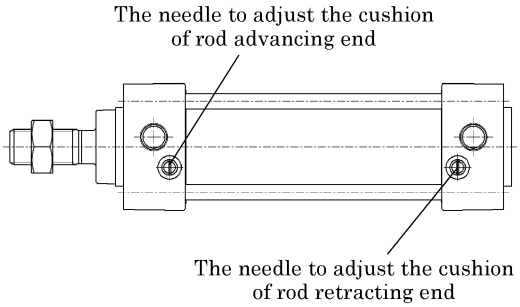
Model	Pressure range for brake	Pressure range for cylinder
JSG	0.3 to 1.0MPa	0.1 to 1.0MPa
JSG-V	0.3 to 0.7MPa	

2) Manual release of brake
The brake is released if the bolt is inserted to the manual release port (female screw on the brake top).
If the bolt is inserted excessively, the brake fails. Refer to the insertion amount in the attached sheet. Remove the release bolt for normal use.



Bore size	Nominal size	Bolt length		Appropriate tightening amount
		JSG	JSG-V	
ϕ40	M12×1.75	16 or more	40 or more	3 turns or less
ϕ50	M12×1.75	16 or more	40 or more	4 turns or less
ϕ63	M14×2	16 or more	40 or more	4 turns or less
ϕ80	M16×2	20 or more	40 or more	4.5 turns or less
ϕ100	M18×2.5	20 or more	50 or more	5 turns or less

3) Though the cushion has been adjusted at no load when delivered, adjust the cushion needle when the change of cushion effect is required.
Tightening the needle (clockwise) makes cushion more effective. Tighten the needle lock nut all the way after adjustment.



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

Table1. Cushion characteristic chart

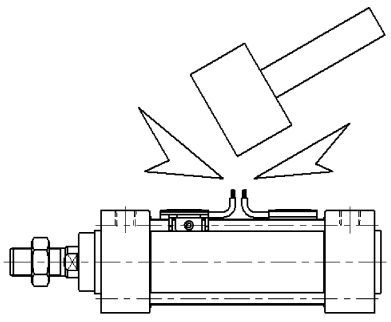
Bore size (mm)	Effective air cushion length (mm)	Allowable energy absorption (J)	
		With air cushion	With rubber cushion
ϕ40	8.6	3.7	0.9
ϕ50	13.4	8.0	1.6
ϕ63	13.4	14.4	1.6
ϕ80	15.4	25.4	3.3
ϕ100	15.4	45.6	5.8

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

3.2 How to use the Switches

3.2.1 Common items

1) 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.
2) Protection of lead cord
   Pay consideration to eliminate repeating bending stress or stretching of lead cord while laying the cord.
   To the moving portion, use such cord of flexibility as for building a robot.
3) Operating temperature
   Do not operate the product at a high temperature (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.
   (Example) Operate cylinder with the speed of less than 500mm/s in case the relay actuation time is 20ms.
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 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.

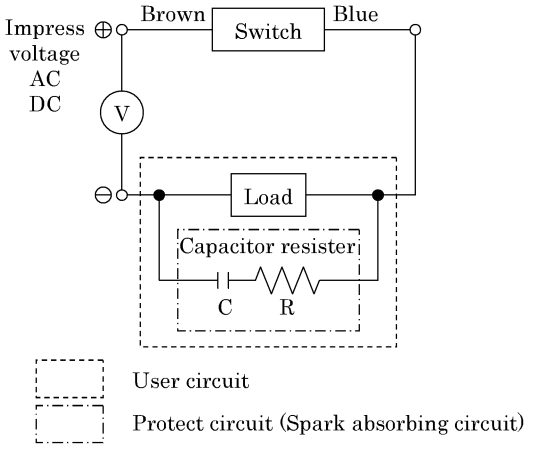
(2) When the switch is connected to an AC relay or a programmable controller input, the indicator light on the switch is not lit if the half-wave rectification is performed in the connected circuit. If this occurs, reverse the polarities of the switch lead wire connection. The indicator light may then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

2) Contact protective measures
When an inductive load, such as relay is used or the wire length exceeds that stated in Table 1, always install a contact protective circuit.

Table1

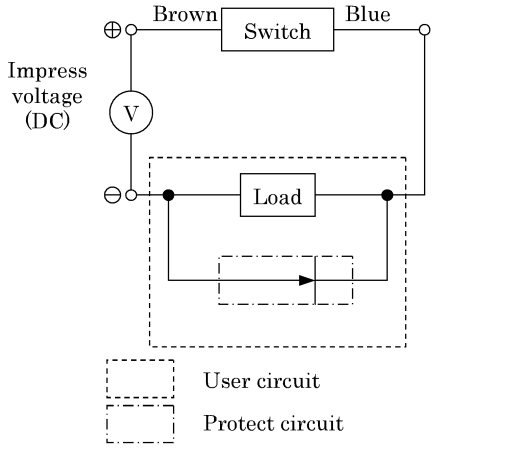
Electric power	Length of wire
DC	50m
AC	10m

(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

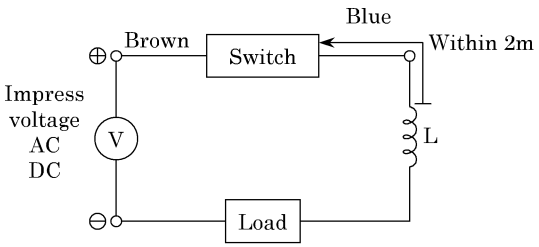
Fig.1 When capacitor resister
(In case the same source of power is used.)



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

Fig.2 When diode is used.

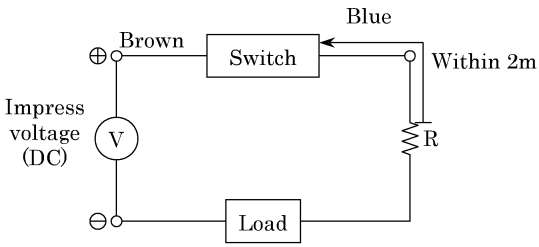
(2) Protective circuit when the wire length exceeds that stated Table 1.



・ 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 or T8 switches in series, equals to the sum of respective voltage loss of each switch.
The total voltage loss becomes equivalent to one T0 (approx. 2.4V) when connecting the combination of one T0 for actuation confirming and rest of T5 switches. Indicator light is lit only when all switches turn on.

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

3.2.3 Operational Cautions, Solid state switch (T1, T2, T3)

1) Connection of lead cord

Comply with the color coding specified on the illustrations. Be sure to turn the power off before starting connecting work.
An erroneous wiring or short circuiting of load causes damage to not only switches, but also load side circuit. Wiring work without shutting electricity off may cause damage to the load side circuit

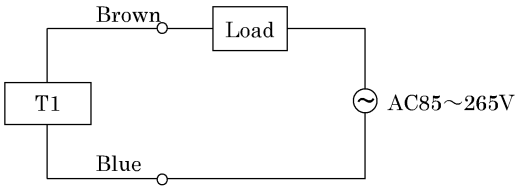


Fig.1 T1 Fundamental circuit Example

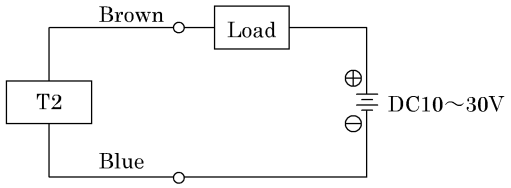


Fig.2 Fundamental circuit Example of T2

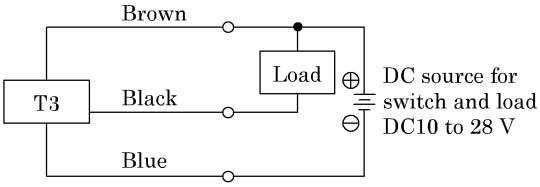


Fig.3 Fundamental circuit Example of T3 (1)
(In case the same source of power is used.)

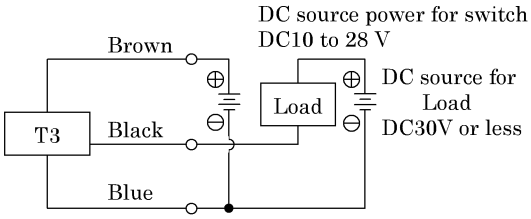


Fig.4 Fundamental circuit Example of T3 (2)
(In case individual sources of power are used.)

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).

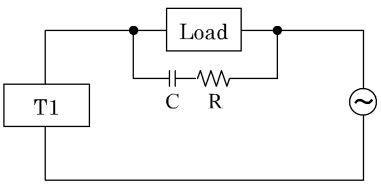


Fig. 5 An example of protective circuit at CR circuit
Capacitor volume: 0.03 to 0.1Mf
Resister: 1 to 3kΩ

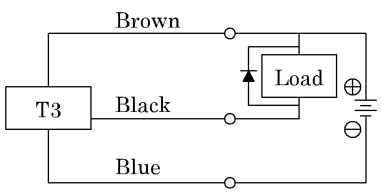
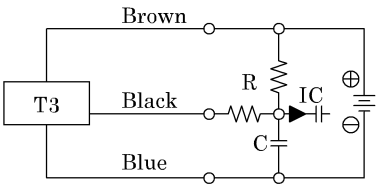


Fig.6 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



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

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

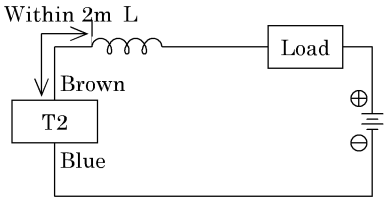


Fig.8 ・Choke coil
L = a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

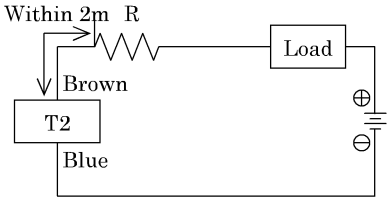


Fig.9 ・Dash current restriction resister.
R = As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

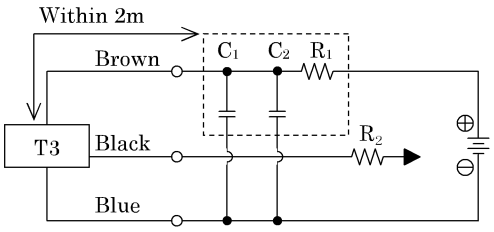


Fig10・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30Ω
・Dash current restriction resister.
R_2=As much large resister as the load circuit can afford.
・Install it nearby the switch (Within 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.

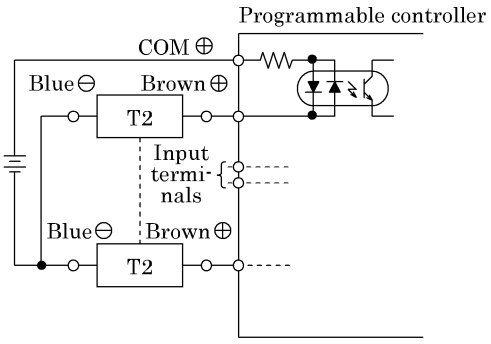


Fig.11 An example of T2 connection to source input type (an external power source)

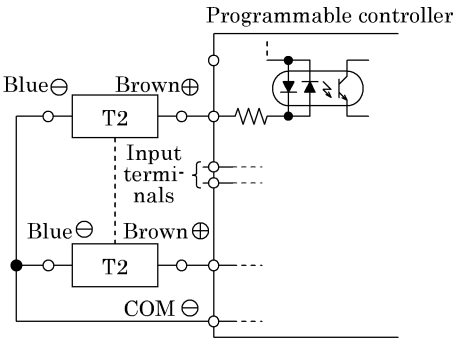


Fig.12 An example of T2 connection to source input type (an internal power source)

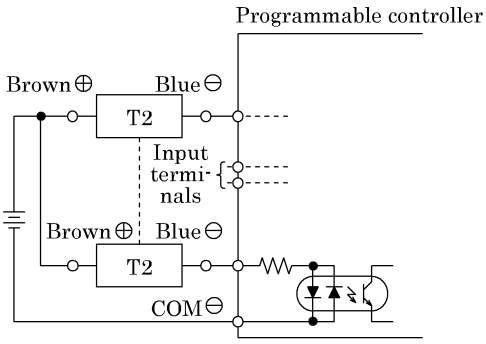


Fig.13 An example of T2 connection to source input type

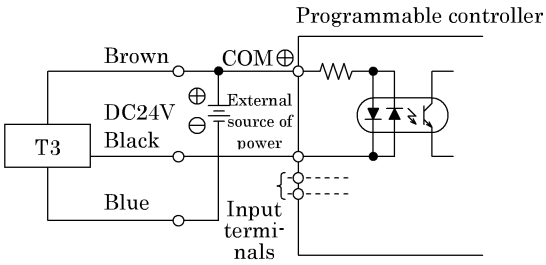


Fig.14 An example of T3 connection to source input type (an internal power source)

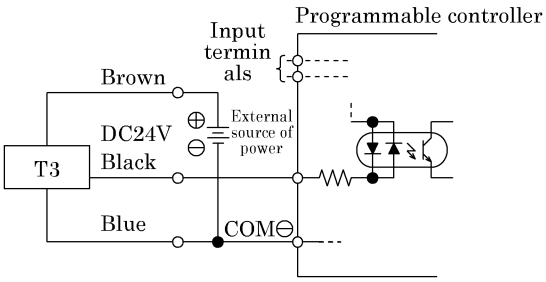


Fig.15 An example of T3 connection to source input type (an internal power source)

4) Series connection

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

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

5) Strong magnetic field proof switch (T2YD)

● External magnetic field proof performance (at welding current of AC14000A)

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

Note: If this switch is used at a welding current of more than AC14000A, the welding cable must be made 35 mm or more apart from the cylinder tube surface.
(Testing conditions: Outside diameter of the cable is ϕ 36.)

4. MAINTENANCE

4.1 Periodic Inspection

1) In order to upkeep the cylinder in optimum condition, carry out periodic inspection once or twice a year.
Before starting an inspection, take appropriate measures separately to prevent a load from falling down under its own weight.

2) Inspection items
① The brake holding force is proper. (note1)
② Check the mounting bolts and nuts of brake mechanism.
③ Check of release operation of brake. (Check whether brake release operates by minimum working pressure 0.3MPa.)
④ Check the mounting bolts and nuts of cylinder.
⑤ Check the mounting bolts and nuts to the piston rod end brackets and supporting fittings for slackening.
⑥ Check that the cylinder operates smoothly.
⑦ Check any change of the working piston speed and cycle time.
⑧ Check for internal and /or external leakage.
⑨ Check the piston rod for flaw(scratch) and deformation.
⑩ Check the stroke for abnormality.
⑪ Check whether overrun length of piston rod is large.
⑫ Check any corrosion inside of each port.

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

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

Note1 : The brake holding force gradually lowers due to wear of parts. Check that the holding force is as specified in the periodic inspection.

4.2 Disassembling ・Assembling

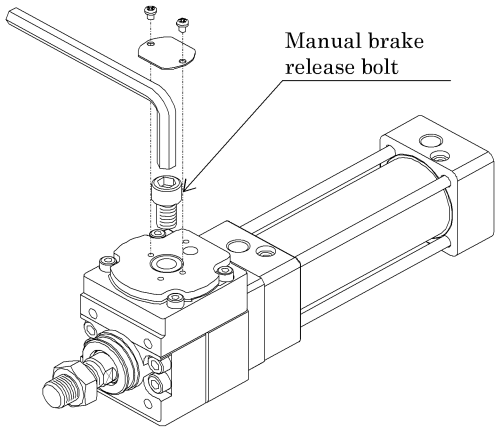
Should any air leakage occur, take the following corrective actions.

1) Dismounting of the brake unit

(1) Remove the dust cover on the brake unit by taking out 2 each of dust cover mounting screws (Cross headed pan).
Manually release brake by screwing hexagon socket head cap screw into flame threaded hole (side of the break release port). (Refrain from over tightening it than necessary.)

Refer the table below as for the size of hexagon socket head cap screw.

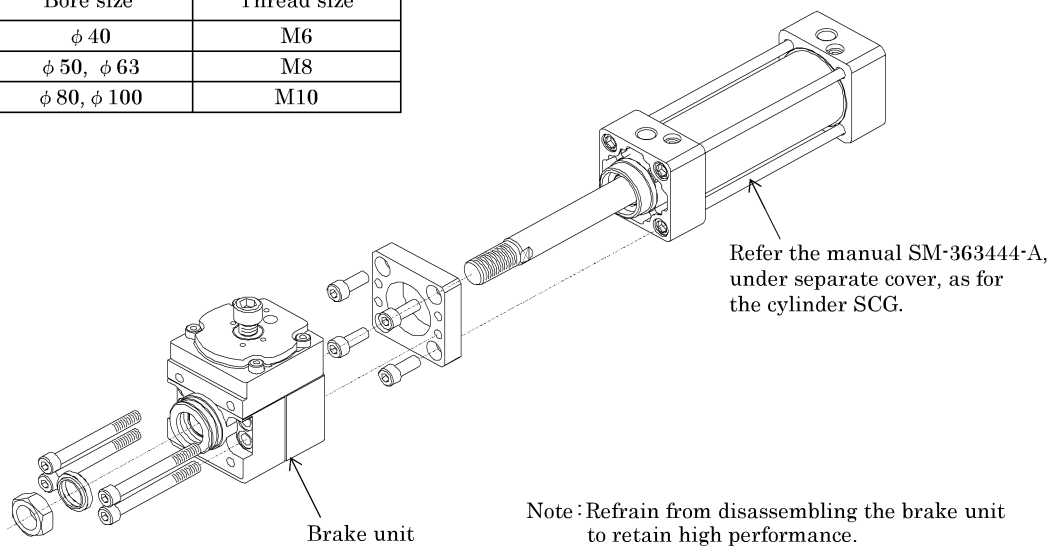
Bore size	Thread size
φ40, φ50	M12×1.75
φ63	M14×2
φ80	M16×2
φ100	M18×2.5



(2) Take the brake unit away by removing mounting hexagon nuts.

Refer the table below as for the size of hexagon nut.

Bore size	Thread size
φ40	M6
φ50, φ63	M8
φ80, φ100	M10



Note : Refrain from disassembling the brake unit to retain high performance.

2) Mounting the brake unit
Take reverse procedure (2) to (1) as per described in paragraph 4.2 1) to mount the unit back to cylinder.

Pay attention on the following items during the course of assembling.

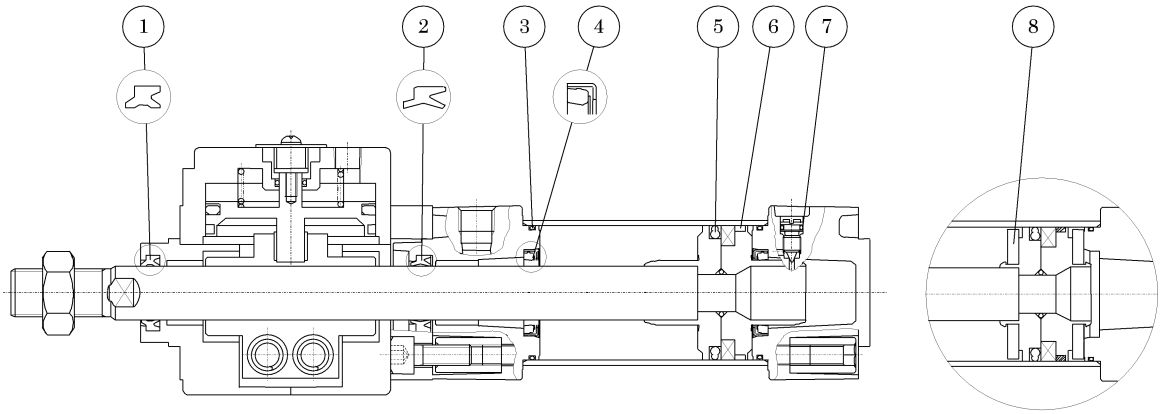
① Do not apply grease to piston rods. (Applying grease may result in a drop in holding force of brake.)
② Wipe the grease off the piston rod should there be any grease over it. After the brake unit with the brake released is assembled and the piston rod is pulled out from the drawing side by 20 mm or more, apply the brake and tighten the fixing bolts in the diagonal order.
③ Note that the bolts are tightened without twisting them. After tightening them, release the brake and confirm that the piston rod moves smoothly.
④ Keep the bolt for manual release of brake removed except when required.

3) Inspect the following items.

① Scratch marks on the boar surface of the tube
② Scratch marks on the surface of piston rod, peel-off of plating and rusting
③ Scratch marks and wear inside of the bush
④ Scratch marks, wear and crack of the surface of piston
⑤ Loosened connection of piston and rod
⑥ Crack of both end covers
⑦ Scratch marks and wear of packing in sliding part. (Dust wiper, rod packing, cushion packing and piston packing)

Check all of above items. If any abnormality is found, repair it or replace the parts, when defective.

4) Followings are expendable parts.
Specify the kit No. when ordering.



※ This type of brake unit hardly suffers from mechanical trouble. Should there be any difficulties occurs, replace in its entirety as a unit.

Expendable Parts List

(a) JSG(with air cushion)

Bore size (mm)	φ 40	φ 50	φ 63	φ 80	φ 100
Kit No.	JSG-40BK	JSG-50BK	JSG-63BK	JSG-80BK	JSG-100BK
Parts No.	① ② ③ ④ ⑤ ⑥ ⑦				

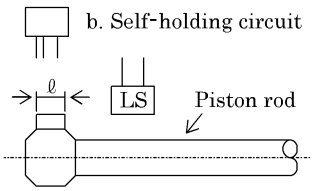
(b) JSG(with rubber cushion)

Bore size (mm)	φ 40	φ 50	φ 63	φ 80	φ 100
Kit No.	JSG-40DK	JSG-50DK	JSG-63DK	JSG-80DK	JSG-100DK
Parts No.	① ② ③ ⑤ ⑥ ⑦ ⑧				

Note : Specify kit No. on your purchase order, but brake unit is excluded. Specify JSG- bore size - BRAKE - UNIT for ordering brake unit.

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	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.
	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. 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 piston packing.
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. Use the cylinder of larger bore.
	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

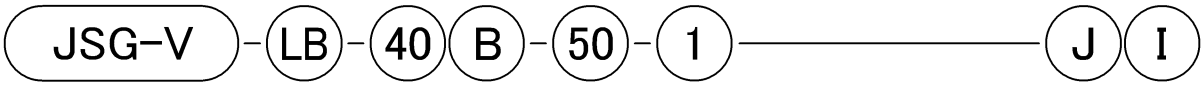
Troubles	Causes	Remedies
Indicator light is not lit.	Deposited contact point	Replace the switch.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Damaged indicator light	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit 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. Tightening torque is 1.5 to 1.9 N·m.
	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 “2.6 Location of mounting Switches on a Cylinder” as for replacing a switch and correcting its location.

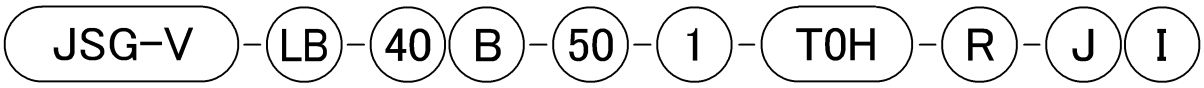
6. HOW TO ORDER

6.1 How to order product

Without switch



With switch



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

(a) Model	
JSG	Double acting
JSG-V	With solenoid valve for brake

(b) Mounting style (Note1)	
00	Basic type
LB	Axial foot type
FA	Rod side flange type
FB	Head side flange type
CA	Eye bracket type
CB	Clevis bracket type
TA	Rod side trunnion type
TB	Head side trunnion type
TC	Center trunnion type

(c) Bore size (mm)	
40	ϕ 40
50	ϕ 50
63	ϕ 63
80	ϕ 80
100	ϕ 100

(d) Cushion	
B	Both side (air cushions)
D	Both side (rubber cushion)

Note: The entire length of the rubber cushion type is larger than that of the air cushion type.

(e) Stroke(mm) (Note2)	
25	250
50	300
75	350
100	400
150	450
200	500

(f) Valve voltage	
1	AC100V
2	AC200V
3	DC24V
4	DC12V

※ Lead wire length	
Blank	1m (standard)
3	3m (option)
5	5m (option)

(g) Switch model No. (Note3)				
Lead wire		Switch type	Indicator light	Lead wire
Axial lead wire	Radial lead wire			
T0H※	T0V※	Reed	1 color indicator	2 wire
T5H※	T5V※		Without indicator light	
T8H※	T8V※	Solid state	1 color indicator	
T1H※	T1V※			
T2H※	T2V※			
T3H※	T3V※			3 wire
T2YH※	T2YV※		2 color indicator	2 wire
T3YH※	T3YV※			3 wire
T2YD※	—		Strong magnetic field proof switch	2 wire
T2YDT※	—			
T2JH※	T2JV※		Off-deray type	

※ mark indicates the length of lead wire.

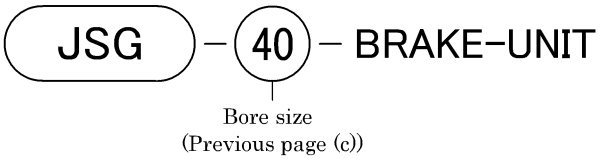
(h) Switch quantity	
R	One on rod side
H	One on head side
D	Two
T	Three

(i) Option			
		Max. ambient	Instant. max.
J	Bellows	60℃	100℃
M	Piston rod material change (stainless steel)		

(j) Accessory	
I	Rod eye
Y	Rod clevis (pin and split pin attached)
B1	Eye bracket
B2	Clevis bracket (pin and split pin attached)
B3	Eye bracket
B4	Trunnion type No.2 bracket

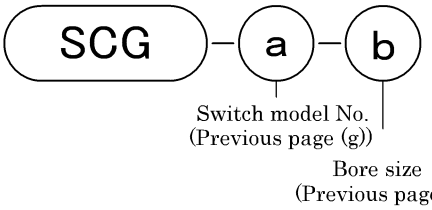
Note1 : Mounting bracket is attached to the product at shipment. (The trunnion mounting types excluded.)
Note2 : Refer to catalog as for cylinder exceeding max. stroke.
Note3 : Refer to “How to order switch” on the next page.

6.2 How to order brake unit

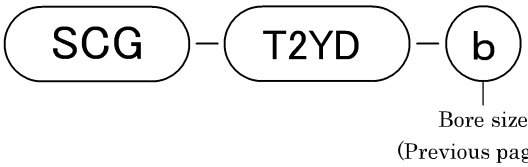


6.3 How to order switch

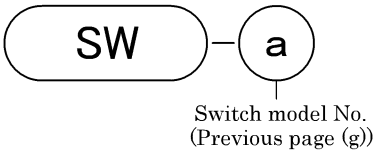
(1) Switch body + Mounting bracket



※ When T2YD

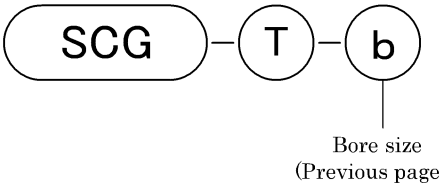


(2) Switch alone



Note: Please contact us when the use of an environmentally-friendly T-type switch is desired.

(3) Set of mounting bracket



7. SPECIFICATION

7.1 Product Specifications

Model / Item			JSG (With switch)					JSG-V (With switch)				
Bore size		mm	φ40	φ50	φ63	φ80	φ100	φ40	φ50	φ63	φ80	φ100
Actuation			Double acting					Double acting/With solenoid valve for brake				
Working fluid			Compressed air									
Max. working pressure		MPa	1.0					0.7				
Min. working pressure		MPa	0.3									
Proof pressure		MPa	1.6									
Ambient temperature		℃	-10 to 60 (No freezing)									
Port size	Brake section		Rc1/8		Rc1/4		Rc3/8	Rc1/8		Rc1/4		
	Cylinder section		Rc1/4		Rc3/8		Rc1/2	Rc1/4		Rc3/8		Rc1/2
Stroke tolerance	Rubber cushioned	mm	$^{+1.4}_{0}$ (to 1000), $^{+1.8}_{0}$ (to 1500)									
	Air cushioned		$^{+1.0}_{0}$ (to 360), $^{+1.4}_{0}$ (to 1000), $^{+1.8}_{0}$ (to 1500)									
Working piston speed		mm/s	50 to 1000 (use within the range of allowable energy absorption)									
Cushion			Rubber cushion/air cushion can be selected.									
Effective air cushion length		mm	8.6	13.4	13.4	15.4	15.4	8.6	13.4	13.4	15.4	15.4
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	980	1569	2451	3922	6178	980	1569	2451	3922	6178
Allowable energy absorption	Rubber cushioned	J	0.9	1.6	1.6	3.3	5.8	0.9	1.6	1.6	3.3	5.8
	Air cushioned		3.7	8.0	14.4	25.4	45.6	3.7	8.0	14.4	25.4	45.6

7.2 Switch Specifications

Descriptions	Read 2 wire						
	T0H, T0V		T5H, T5V		T8H, T8V		
Applications	Programmable controller, relay		Programmable controller, relay, IC circuit (without indicator light), serial connection		Programmable controller, relay		
Power supply voltage	—						
Load voltage	DC12/24V	AC110V	DC5/12/24 V	AC110V	DC12/24V	AC110V	AC220V
Load current	5 to 50mA	7 to 20mA	50mA to	20mA or less	5～50mA	7～20mA	7～10mA
Current consumption	—						
Internal voltage drop	3V or less		0V		3V or less		
Indicator light	LED (ON lighting)		Without indicator light		LED (ON lighting)		
Leakage current	0mA						
Lead wire length (note 1)	1m (oil resistant vinyl cabtire code 2 conductor 0.2mm²)				1m (oil resistant vinyl cabtire code 2 conductor 0.3mm²)		
Shock resistance	294m/s²						
Insulation resistance	20MΩ over at DC500V megger				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 2 wire			
	T1H, T1V	T2H, T2V	T2JH, T2JV	T2YH, T2YV
Applications	Programmable controller, relay, compact solenoid valve	Programmable controller		
Power supply voltage	—			
Load voltage	AC85 to 265V	DC10 to 30V		
Load current	5 to 100mA	5 to 20mA (note 2)		
Current consumption	—			
Internal voltage drop	7V or less	4V or less		
Delay hour off	—		200±50ms	—
Indicator light	LED (ON lighting)			Red / green LED (ON lighting)
Leakage current	1mA or less at AC100V 2mA or less at AC200V	1mA or less		
Lead wire length (note 1)	1m (oil resistant vinyl cabtire code 2 conductor 0.3mm²)	1m (oil resistant cabtire code 2 conductor 0.2mm²)	1m (oil resistant cabtire code 2 conductor 0.3mm²)	1m (oil resistant vinyl cabtire code 2 conductor 0.3mm²)
Shock resistance	980m/s²			
Insulation resistance	100MΩ over at DC500V megger	20MΩ over at DC500V megger	100MΩ over at DC500V megger	
Withstand voltage	No failure at AC1500V impressed for one minute	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 3 wire	
	T3H, T3V	T3YH, T3YV
Applications	Programmable controller, relay	
Power supply voltage	DC10 to 28V	
Load voltage	DC30V or less	
Load current	100mA or less	50mA or less
Current consumption	10mA or less at DC24V	
Internal voltage drop	0.5V or less	
Indicator light	LED (ON lighting)	Red/green LED (ON lighting)
Leakage current	10 μ A or less	
Lead wire length (note 1)	1m (oil resistant vinyl cabtire code 3 conductor, 0.2mm^2)	
Shock resistance	980m/s^2	
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	
	T2YD	T2YDT
Applications	Programmable controller	
Load voltage	DC24V±10%	
Load current	5 to 20mA	
Internal voltage drop	6V or less	
Indicator light	Red/green LED (ON lighting)	
Leakage current	1.0mA or less	
Output delay time (Note3) (ON delay, OFF delay)	30 to 60ms	
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.5mm)	Option 1m (Flame resistant vinyl cabtire cord 2 conductor 0.5mm)
Shock resistance	980m/s^2	
Insulation resistance	100MΩ over at DC500V megger	
Withstand voltage	No failure impressed at AC1000V 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, 25mA is at 25℃ of ambient temperature. Load current decreases less than 25mA when the ambient temperature exceeds 25℃. For example: it may be 5 to 10mA at 60℃.
Note 3: This shows a period of time between detection of the magnet by the magnetic sensor and sending of switch output.
Note 4: T2YD※ is not available in direct-current magnetic field.