



# To Use This Product Safely

Be sure to read this before use. For general cylinder information, see Intro 41, and for cylinder switches, see P. 1512.

## Specific Precautions: Brake cylinder JSK2/JSM2 Series

### Design / Selection

#### 1. Common

##### Warning

Structure so that the human body does not directly touch the driven object and the moving parts of the cylinder with brake.

Install a protective cover so that the human body cannot touch it directly. Or, if there is a risk of touching, provide a sensor etc. to make a safe structure such as emergency stop before touching or sounding a warning sound to notify danger.

Use a balanced circuit that accommodates the protrusion of the Piston Rod.

If the brake is operated at any position during the stroke such as intermediate stop, and air pressure is applied to only one side of the cylinder, the Piston Rod will pop out at high speed when the brake is released. In such a case, there is a risk of causing injury to the human body such as pinching hands and feet, and causing damage to the machine, so use a balance circuit like the recommended pneumatic circuit to prevent shooting out.

Please note that holding force is the ability to hold a static load without vibration or shock after the brake is activated under no load.

Therefore, please be careful when using near the upper limit of the holding force at all times.

Do not apply impact load, strong vibration, or rotational force when the brake is operating.

If impact load, strong vibration, or rotational force is applied from the outside, the holding force will decrease and it is dangerous, so please be careful.

When performing intermediate stop, consider the stopping accuracy and overrun amount.

Because it is a mechanical lock, it does not stop instantly in response to the stop signal, but stops with a time delay. The stroke sliding due to this delay is the overrun amount. And the range between the maximum and minimum overrun amount is the stopping accuracy.

- Place the limit switch in front of the desired stop position by the overrun amount.
- The limit switch requires a detection length (dog length) of the overrun amount +  $\alpha$ .
- In the case of our cylinder switch, the operating range is 7 to 16 mm (depending on the switch model). If the overrun amount exceeds this, perform self-holding of the contact on the switch load side.

In order to improve stopping accuracy, ensure that the brake stops the cylinder as soon as possible after receiving the stop signal.

To do so, use a DC type control electric circuit and valve with good response, and place the valve and cylinder as close as possible.

Please note that stopping accuracy is affected by changes in piston speed.

If the piston speed changes due to load fluctuation or disturbance during the reciprocating stroke of the cylinder, the dispersion of the stop position will increase, so consider keeping the piston speed constant immediately before the stop position. Also, during the cushion stroke and while in the acceleration range from the start of operation, the speed change is large, so the dispersion of the stop position becomes large. The stopping accuracy at piston speed 300 mm/s and no load is  $\pm 1.0$  mm (reference value). It varies depending on the equipment used. For details, please refer to the P. on stopping accuracy and overrun.

Do not use multiple cylinders with brakes in synchronization. If a synchronization error occurs, load may concentrate on the cylinder where the brake engaged first, potentially causing reduced lifespan or damage.

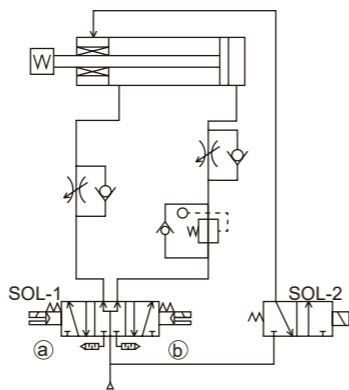
##### Basic circuit

Even when used for fall prevention or emergency stop, be sure to use the following circuit. 2-position valves cannot be used because the cylinder's own thrust acts on the brake part even when stopped. Balance the thrust and load with the following circuit. The brake may not release if a load is applied to the brake.

##### Horizontal load

Piping as shown in Fig. 1 applies equal pressure to both sides of the piston when stopped, preventing rod projection when the brake is released. Also, install a pressure reducing valve with a check valve on the head side to balance the thrust.

Fig. 1

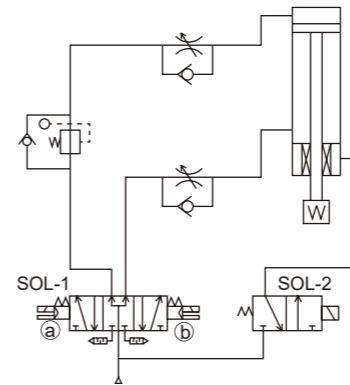


a) SOL-1(b)		SOL-2	Operating State
OFF	OFF	OFF	Stop
ON	OFF	ON	Retract
OFF	ON	ON	Advance

##### For downward vertical load

As shown in Fig. 2, if the load is downward, the rod will malfunction in the Load Direction when the brake is released. Therefore, install a pressure reducing valve with a check valve on the head side, reduce the thrust in the Load Direction, and balance the load.

Fig. 2

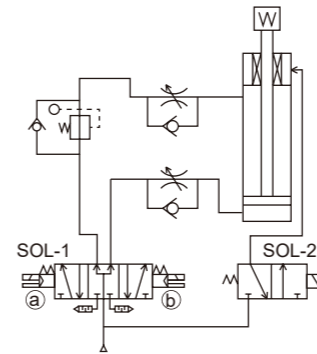


a) SOL-1 (b)		SOL-2	Operating State
OFF	OFF	OFF	Stop
ON	OFF	ON	Descend
OFF	ON	ON	Ascend

##### For upward vertical load

As shown in Fig. 3, if the load is upward, the rod will malfunction in the Load Direction when the brake is released. Therefore, install a pressure reducing valve with a check valve on the rod side, reduce the thrust in the Load Direction, and balance the load.

Fig. 3



a) SOL-1 (b)		SOL-2	Operating State
OFF	OFF	OFF	Stop
ON	OFF	ON	Descend
OFF	ON	ON	Ascend

##### Warning

##### Drain

If the piping capacity is large relative to the cylinder volume for brake release, compressed air may not be completely exhausted when the solenoid valve switches, and water droplets condensed by adiabatic expansion may accumulate and become drain. Drain can wash away lubricating oil, causing poor lubrication, momentarily blocking flow paths, corroding the brake internals, etc., leading to brake malfunction and potentially causing problems such as poor stopping accuracy, brake failure, or failure to release.

To prevent drain generation, based on the ratio A of piping volume to cylinder volume, install a dryer and adjust the air quality so that the atmospheric pressure dew point of the compressed air used is as shown below. Alternatively, adjust the Bore Size and length so that the piping volume from the release port to the solenoid valve meets the conditions below, according to the atmospheric pressure dew point of the compressed air used.

## JSK2, JSM2 Series

### Specific Precautions

- Magnification A < 1: Atmospheric dew point -20°C or less
- 1 ≤ Ratio A < 2: Atmospheric pressure dew point -25°C or less
- Magnification A ≥ 2: Atmospheric dew point -30°C or less

#### Calculation of Ratio A of Piping Volume to Cylinder Volume

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

$V_i$ : Piping volume (mm<sup>3</sup>)  
 $V_0$ : Brake release cylinder volume (mm<sup>3</sup>)  
 $V_1$ : Brake release cylinder blank volume (mm<sup>3</sup>)  
 $P$ : Operating Pressure (MPa)

	V <sub>0</sub> (mm <sup>3</sup> )	V <sub>1</sub> (mm <sup>3</sup> )
JSK2-20 JSM2-20	754	754
JSK2-25 JSK2-32 JSM2-30	1963	1865
JSK2-40 JSM2-40	4021	3860

Example) JSK2-20, Piping to the brake release port, Bore Size  $\phi 4$ /length 1.5 m Operating Pressure 0.5 MPa  
 Piping volume  $V_i$  = cross-sectional area  $\times$  length =  
 $4 \times 4 \times \pi / 4 \times 1500 \approx 18850$  mm<sup>3</sup>

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

Therefore, adjust the air quality so that the atmospheric pressure dew point is -30°C or less.

If adjustments are difficult, consider using a cylinder with valve (JSK2-V, JSM2-V).

When releasing the brake, make sure to release the brake earlier than the cylinder operation. If the cylinder operation is faster, the brake may not release.

If back pressure is applied to the locking mechanism, the brakes may be released. Use a discrete valve, or use a check valve on the side with an individual exhaust manifold.

Use a 3-position P/A/B connection (pressurization on both sides) solenoid valve for the cylinder drive to prevent the piston from popping out when starting.

To maintain balance of the thrust, including the load, the side with the larger thrust should have a Regulators with a check valve.

##### CAUTION

##### Precautions Regarding Stopping Accuracy

##### Stop Pitch and Load Factor

Stopping accuracy varies depending on stopping pitch and load factor. To obtain stopping accuracy, the load factors in the table below are recommended.

\*Stopping accuracy reference value:  $\pm 1.0$  (300 mm/s at no load)

Stop Pitch	Load Factor
50 mm or less	20% of Thrust
50 mm to 100 mm	40% of Thrust
100 mm or more	60% of Thrust

##### Selection of Brake Valve

Stopping accuracy and overrun amount vary depending on the response of the brake valve. Select by referring to the JSK2-V, JSM2-V brake valve electrical specifications. Also, connect the valve directly to the brake port to improve stopping accuracy.

- When using a PLC (programmable controller) If a PLC (Programmable Logic Controller) is used for the electrical control device of the brake valve, the stopping accuracy will deteriorate due to the scan time (calculation processing time). When using a PLC, do not incorporate only the brake valve into the PLC circuit.

- Do not change the load weight significantly when the brake is stopped. The stop position may change.

- For mounting type TA, the brake unit cover and double yoke bracket interfere, so they cannot be selected simultaneously.

- Although the contact service life of the reed switch varies depending on usage conditions, it will generally last several million cycles. If the equipment used operates continuously day and night or at high frequency, the contact life region will be reached in a short period, so use solid state switches without contact parts.

## During Use

### Warning

- Release brakes before coupling the load to the end of the rod. If performed with the brake activated, a load exceeding the rotational force or holding force will act on the Piston Rod, causing damage to the brake mechanism.

- If the brake is released while air is applied to only one side of the cylinder, the Piston Rod can pop out at high speed, creating a dangerous situation. When releasing the brake during adjustment work, etc., always observe the following:

- Check that no one is in the movable range of the load and that no problems will arise if the load moves when brakes are released.
- When releasing the brake, perform position locking or take other measures:
  - Placing the load at the lower end
  - Pressurizing both sides
  - Placing a support
 Implement fall prevention measures such as these.
- Confirm that air is not pressurized on only one side of the cylinder when releasing brakes.

- Brakes are released manually or by pressurizing the brake release port. During load installation, if the brake is left released by this operation, the load may fall. Therefore, always return the manual release operation to its initial state, or confirm that the brake is effective with no air in the brake release port before installation.

- Do not apply torque to the rod when braking, as the holding force will decrease, creating hazardous conditions. Also, use with a mechanism that prevents rod rotation.

- Do not apply force exceeding the brake holding force listed in the catalog to the cylinder.

- With the JSM2 Series, the brakes can be manually released by screwing a Hexagon Socket head cap bolt into the brake release female thread on the side or top of the brakes. However, the brakes may be damaged if the bolt is screwed in too far; use the bolts attached with the product, or if using commercially available bolts, use the appropriate screw insertion depth for the release bolt shown in the table below.

I.D.	Bolt Rotation Count
ø20	8 to 9 rotations
ø25	11 to 12 rotations
ø30	
ø32	
ø40	14 to 15 rotations

ø20 to ø40 : Use bolt M5x15 or longer

- If there is any play, such as looseness, in the brake signal dog, stopping accuracy is affected. Securely fix to eliminate play, etc.

- If the piston speed is fast, the detection dog must be long enough to match relay response time. Note that if the dog length is short, the stop signal will not be output and it will not stop.

### CAUTION

- Adjust the air balance in the cylinder. With the brake released, attach the load to the cylinder and balance the load by adjusting the air pressure on the rod side and head side of the cylinder. By ensuring this load balance, problems such as the Piston Rod popping out when the brake is released or the brake not releasing normally can be prevented.

- Adjust the mounting position of the detection part such as the cylinder switch. When performing intermediate stop, adjust the mounting position of the detection part such as the cylinder switch considering the overrun amount with respect to the desired stop position.

- Load fluctuation during the reciprocating stroke of the cylinder causes changes in piston speed, and changes in piston speed increase the dispersion of the stop position. Adjust the mounting so that there is no load fluctuation during the cylinder reciprocating stroke, especially immediately before stopping.

- During the cushion stroke and while in the acceleration range from the start of operation, the speed change is large, so the dispersion of the stop position becomes large. For this reason, when performing step operation with a short stroke from the start of operation to the next position, stopping accuracy may worsen, so please be careful.

- Load to Piston Rod More strictly than in the case of general pneumatic cylinders, use with the load on the Piston Rod always applied axially. Furthermore, when moving the load, regulate it sufficiently with a guide so that there is no backlash or twisting.

- Maintaining the rod sliding parts Be careful not to scratch or dent the Piston Rod sliding part. It causes damage to packings, leading to leakage or brake failure.

- Downward) when shipped to prevent damage. Change to the orientation to be used when wiring the terminal box.

## 1. Common

### Warning

- The brake section can be removed from the Cylinder Body. Do not disassemble or inspect brakes or hazards may result when brakes are used again.

- The required amount of grease is applied to the brake part, so avoid applying more grease and do not wipe off the grease.

- The required grease is applied when brakes are replaced, so there is no need to apply grease to rods.

- Please always use with the dust cover attached except during manual release, as it may cause a malfunction.

### CAUTION

- Air supply pipes that are too narrow or too long can reduce stopping accuracy.

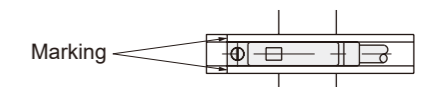
- If the cylinder has been stopped for a long time, such as first thing in the morning or afternoon, the frictional resistance increases and the piston speed changes, so the stopping accuracy may deteriorate. Perform a break-in operation to obtain stable stopping accuracy.

## 2. Common (With T-type Switch)

### CAUTION

- When Moving the Switch Position in the Stroke Direction

- The 1-color indicator switch can be finely adjusted by about ±3 mm from the mounting position at the time of shipment. If the adjustment range exceeds ±3 mm, or if fine-tuning the position of a 2-color indicator switch, move the band position.
- Loosen the switch mounting screw, move the switch along the rail, and tighten at the specified position. For T2, T3, T0, T5, use a flat-head screwdriver (watchmaker's screwdriver, precision screwdriver, etc.) with a grip diameter of 5 to 6 mm, tip shape width of 2.4 mm or less, and thickness of 0.3 mm or less to tighten the switch fixing screw with a tightening torque of 0.1 to 0.2 N·m. For T□C, T1, T2J, T2Y, T3Y, T8, tighten with a tightening torque of 0.5 to 0.7 N·m.
- The switch rail has a marking 4 mm from the end face of the rail. Use it as a guide for mounting position when replacing the switch. The switch rail marking is set to the switch maximum sensitivity position at factory shipment. If the switch type changes or the band is moved, the maximum sensitivity position changes, so adjust the position each time.

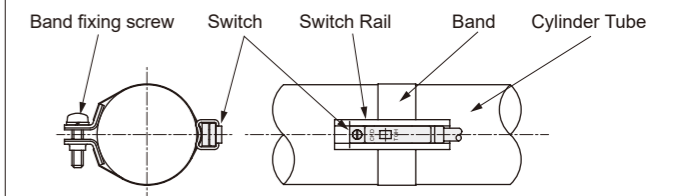


- When Moving the Switch Position in the Circumferential Direction

- Loosen the band fixing screw, move the switch rail circumferentially, and tighten it at the specified position. The tightening torque is 0.6 to 0.8 N·m.

- When Moving the Band Position

- Loosen the band fixing screw, move the switch rail and band along the cylinder tube, and tighten them at the specified position. The tightening torque is 0.6 to 0.8 N·m.



For precautions during installation, adjustment, use, and maintenance, please refer to "During Use" in this catalog and the Instruction Manual on the CKD Component Product Site (<https://www.ckd.co.jp/kiki/en/>) -> "Model Number".