



# 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.

## Individual 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 cases, there is a risk of personal injury, such as getting hands or feet caught, and damage to machinery. Therefore, use a balance circuit like the basic circuit to prevent projection.

When using a low hydraulic pressure type Brake Cylinder, always operate the brake unit by pneumatic pressure.

The holding force (Max static load) is the ability to hold static load that is not accompanied by vibration or shock, in a state where the brake is operating 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 +  $\alpha$ .

The operating range of CKD cylinder switches 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 fluctuations or disturbances during cylinder operation, the variation in the stop position will increase. Therefore, ensure that the piston speed is constant just before the stop position. Also, during operation in the cushion region and while in the acceleration zone from the start of operation, the speed change is large, so the variation in the stop position will be large.

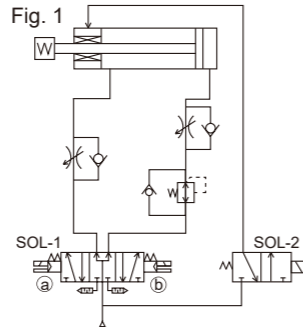
The stopping accuracy at a piston speed of 300 mm/s under no load is  $\pm 1.0$  mm (reference value). It varies depending on the equipment used. For details, refer to the page on stopping accuracy and overrun.

##### 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.

For Horizontal Load

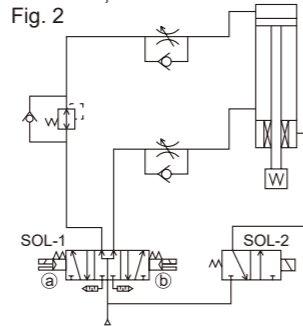
Piping as shown in Fig. 1 applies equal pressure to both sides of the piston when stopped, preventing rod projection when the brake is released. Also, install a pressure reducing valve with a check valve on the head side to balance the thrust.



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

For downward vertical load

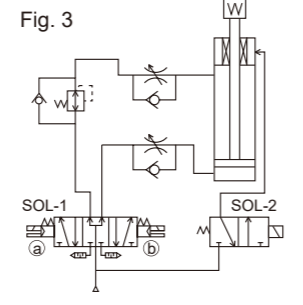
As shown in Fig. 2, if the load is downward, the rod will malfunction in the Load Direction when the brake is released. Therefore, install a pressure reducing valve with a check valve on the head side, reduce the thrust in the Load Direction, and balance the load.



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

For upward vertical load

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



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

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.

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.

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

##### CAUTION

##### Stopping accuracy

Stop Pitch and Load Factor

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

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

Stop Pitch	Load Factor	
	JSC3-□	JSC3-S□
50 mm or less	20% of Thrust	15% of thrust
50 mm to 100 mm	40% of Thrust	30% of thrust
100 mm or more	60% of Thrust	45% of thrust

Selection of Brake Valve

Stopping accuracy and overrun amount vary depending on the response of the brake valve. Select from our company's Selex Valve 4GB2 Series by referring to the JSC3-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.

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, the stop position will be large, so please be careful.

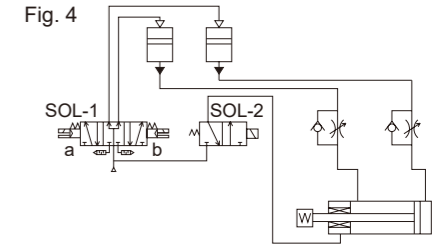
##### Load to Piston Rod

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.

## 2. Low hydraulic JSC3-H, JSC4-H

##### WARNING

If the load fluctuates during the stroke, use the JSC3-H and a converter.



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 during locking, the lock may be released, so use a single valve or an individual exhaust type manifold for the brake release valve.

Use a 3-position P/A/B connection (pressurization on both sides) 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

This product is a pneumatic cylinder that can use hydraulic operating fluid as the operating fluid. Does not comply with JIS standards for hydraulic cylinders regarding operation and leakage inspection.

## 3. Low pressure release JSC3-S

##### CAUTION

Due to release pressure reduction, care must be taken because brake holding force is also reduced.

With Brake / With Lock

ULK□

JSK2/ JSM2

JSG

JSC3, JSC4

USSD

UFCD

USC

Cylinders Switch

Ending

With Brake / With Lock

ULK□

JSK2/ JSM2

JSG

JSC3, JSC4

USSD

UFCD

USC

Cylinders Switch

Ending

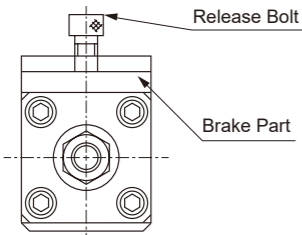
During Use

1. Common

Warning

- Release brakes before coupling the load to the end of the rod. If done with the brake activated, rotational force or load exceeding the 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
  - etc.
  - Confirm that air is not pressurized on only one side of the cylinder when releasing brakes.

How to manually release the brake



Note: Brake release method

- The brakes are released by completely screwing the release bolt (attached with product) into the female threads (brake release port) on the top of the brakes. (For ø125 or more, screwing it in 2 to 3 rotations releases the brake.) (Always remove the release bolt during normal use.)
- When releasing the brake manually, be sure to use the release bolt attached to the product. Using other bolts may cause brake damage due to overtightening, so when using general bolts, follow the appropriate tightening amount in the table below.

Bore Size	Size		Appropriate Tightening Amount
	JSC3	JSC3-V	
ø40 / ø50	M10x8	M10x29	4 rotations or less
ø63	M12x9	M12x30	
ø80	M14x10	M14x31	
ø100	M16x12	M16x40	
ø125	M24x16 or more		2 to 3 rotations
ø140	M24x20 or more		
ø160	M24x20 or more		
ø180	M24x24 or more		

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

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.
- 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.

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.
- If the manual release bolt is removed while the Piston Rod is pulled out, the bolt cannot be screwed in. If removed, supply air from the brake release port and screw in the manual release bolt.

Inspection of Type 2 pressure vessels

Based on the Ordinance of the Ministry of Health, Labour and Welfare, cylinders falling under the following categories must undergo inspection by the Japan Boiler Association.

- Cylinders with a rated pressure exceeding 0.2 MPa and cylinder capacity exceeding 0.04 m<sup>3</sup>
- Cylinders with a rated pressure exceeding 0.2 MPa, an inner diameter of the cylinder tube of 200 mm or more, and a body length (cylinder tube length) of 1000 mm or more

$$V = \frac{D^2 \times S \times 3.14}{4 \times 10^9}$$

V: Cylinders capacity (m<sup>3</sup>)  
D: Bore Size (mm)  
S: Body length (cylinder tube length) (mm)

Stroke subject to Type 2 pressure vessel inspection

Bore Size	Stroke
ø160	1948 or more
ø180	1526 or more

With cushion section check valve (C2)

If the load is large, the delay in cylinder starting time will increase. If you want to reduce the starting time, please use the model with a check valve in the cushion part (C2).

For precautions during mounting, installation, adjustment, use, and maintenance, refer to "During Use" in this catalog and the CKD Components Product website (<https://www.ckd.co.jp/kiki/en/>) -> "Model No." -> [Instruction Manual](#).

With Brake / With Lock

ULK□

JSK2/  
JSM2

JSG

JSC3,  
JSC4

USSD

UFCD

USC

Cylinders  
Switch

Ending

With Brake / With Lock

ULK□

JSK2/  
JSM2

JSG

JSC3,  
JSC4

USSD

UFCD

USC

Cylinders  
Switch

Ending