



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 Equipped Tie-rod Type JSG Series

Design / Selection

Warning

■ Ensure the structure prevents direct human contact with 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 balance circuit that considers Piston Rod projection.

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.

■ Please note that holding force is the ability to hold a static load without vibration or impact after the brake is activated in an unloaded state.

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

■ When the brake is activated, do not apply loads with impact, strong vibrations, or rotational forces.

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 an 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.

- Position the limit switch in front of the desired stop position by the overrun amount.
- The limit switch requires a detection length (dog length) of overrun amount+α.
- 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.

■ 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.

■ To further improve stopping accuracy, shorten the time from the stop signal to when the brake activates and stops as much as possible.

For this purpose, use DC type control electric circuits and valves with good responsiveness, and place the pneumatic piping between 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 piston speed 300 mm/s and no load is ±1.0 mm (reference value). It varies depending on the equipment used. For details, refer to the page on stopping accuracy and overrun.

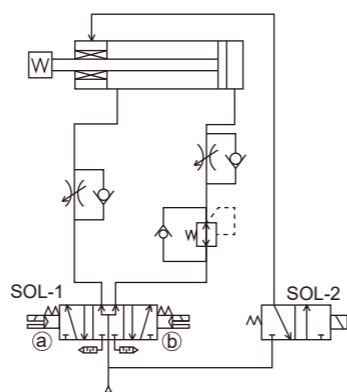
About Basic Circuits

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.

- In case of 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

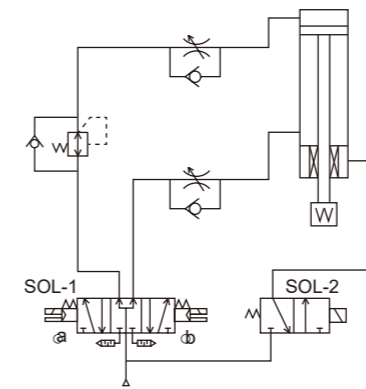


| SOL-1 | SOL-2 | Operating State |
|-------|-------|-----------------|
| OFF | OFF | Stop |
| ON | OFF | Retract |
| OFF | ON | Advance |

- In case of 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

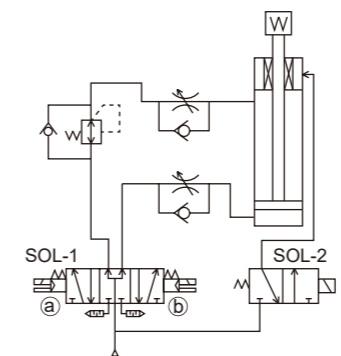


| a SOL-1 | b | SOL-2 | Operating State |
|---------|-----|-------|-----------------|
| OFF | OFF | OFF | Stop |
| ON | OFF | ON | Descend |
| OFF | ON | ON | Ascend |

- In case of 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 |

CAUTION

■ Install a speed controller on the cylinder.

Install a speed controller on the cylinder. Please use within the operating piston speed range of each series.

■ About Stopping Accuracy

- Stopping 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: ±1.0 (300 mm/s at no load)

| Stop Pitch | Load Factor |
|-----------------|---------------|
| | JSG |
| 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 from our company's Selex Valve 4KB2 series by referring to the JSG-V brake valve electrical specifications. Also, connect the valve directly to the brake port to improve stopping accuracy.

- When using PLC (Programmable Logic 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 significantly change the load when the brake is stopped. The stop position may change.

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

CAUTION

■ Cushion mechanisms incorporated in the cylinder include rubber cushion type and air cushion type. The purpose of the air cushion is to absorb the kinetic energy held by the piston by utilizing the compressibility of air, and to prevent the piston and cover from hitting impulsively at the stroke end. Therefore, the cushion is not for low-speed operation (deceleration operation) of the piston speed from near the stroke end. The table below shows the kinetic energy that can be absorbed by the cushion. If the kinetic energy exceeds this value or if you want to avoid bouncing due to air compressibility, please consider a separate shock absorber.

| Bore Size (mm) | Rubber Cushion | Air Cushion | |
|----------------|-----------------------------|-----------------------------------|-----------------------------|
| | Allowable Absorbed Energy J | Effective Air Cushion Length (mm) | Allowable Absorbed Energy J |
| ø40 | 0.9 | 8.6 | 3.7 |
| ø50 | 1.6 | 13.4 | 8.0 |
| ø63 | 1.6 | 13.4 | 14.4 |
| ø80 | 3.3 | 15.4 | 25.4 |
| ø100 | 5.8 | 15.4 | 45.6 |

$$\text{Kinetic Energy (J)} = \frac{1}{2} \times \text{Weight (kg)} \times [\text{Speed (m/s)}]^2$$

(Note) How to calculate kinetic energy
The average speed of the cylinder is determined by $V_a = L/T$.
Va: Average speed $\frac{L}{T}$ (m/s)
L: Cylinder Stroke (m)
T: Operating Time (s)

On the other hand, the cylinder speed just before entering the cushion is

It can be obtained by the following simplified formula.

$$V_m = \frac{L}{T} \times (1 + 1.5 \times \frac{\omega}{100})$$

Vm: Speed just before entering cushion (m/s)

ω: Cylinder load factor (%)

For calculating kinetic energy, use this Vm value as the speed.

During Use

Warning

■ Always connect the rod tip and the load with the brake released. 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 only one side of the cylinder is pressurized with air, the Piston Rod will project at high speed, which is very dangerous. When releasing the brake during adjustment work, etc., always observe the following:

- Confirm that there are no people within the load's movement range when the brake is released, or that there is no problem even if the load moves.
- When releasing the brake, prevent the load from falling by
 - Placing the load at the lower end
 - Pressurizing both sides
 - Placing a support
 Implement fall prevention measures such as these.
- When releasing the brake, always confirm that only one side of the cylinder is not pressurized with air.

■ The brake can be released by manual release operation or by pressurizing the brake release port with air. 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.

■ As holding force will decrease and it is dangerous, do not apply rotational force (torque) to the rod when the brake is activated. Also, use with a mechanism that prevents rod rotation.

■ Do not apply force exceeding the brake holding force stated in the catalog to the cylinder.

Warning

■ For the JSG series, when manually releasing the brake, screwing a Hexagon Socket Head Cap Screw into the female thread for brake release on the upper part of the brake will release the brake. However, overtightening will cause brake damage, so follow the appropriate tightening amount for release bolts in the table below.

| Bore Size | Appropriate Tightening Amount |
|-----------|-------------------------------|
| ø40 | 3 rotations or less |
| ø50 | 4 rotations or less |
| ø63 | 4 rotations or less |
| ø80 | 4.5 rotations or less |
| ø100 | 5 rotations or less |

■ If there is play such as backlash in the dog for the brake signal, it will affect stopping accuracy, so fix it securely so there is no backlash, etc.

■ If the piston speed is high, the length of the detection dog must be sufficient to account for the relay response time. Please note that if the dog length is short, a stop signal will not be output, and it will not stop.

■ The brake unit can be removed from the Cylinder Body, but absolutely do not disassemble or inspect the brake unit, as it is dangerous upon reuse.

■ The brake unit is coated with the necessary amount of grease, so avoid applying more grease and do not wipe off the grease.

■ When replacing the brake unit, the necessary amount of grease is applied, so there is no need to apply grease to the rod.

■ As it may cause a malfunctions, always use with the dust cover included, except during manual release.

CAUTION

■ Adjust the air balance of 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 detection units such as cylinder switches.
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 fluctuations during the cylinder's reciprocating stroke cause changes in piston speed, and changes in piston speed increase the variation in 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 zone from the start of operation, the speed change is large, so the variation in the stop position will be large. Therefore, please note that if step operation with a short stroke from the start of operation to the next position is performed, the accuracy in the specification column may not be achieved.

■ Load on Piston Rod
When moving the load, regulate it sufficiently with guides to prevent backlash or twisting.

■ Maintenance of Rod Sliding Part
Be careful not to scratch or dent the Piston Rod sliding part. It causes damage to packings, leading to leakage or brake failure.

■ If the air supply piping is thin or long, stopping accuracy will worsen, so please consider this carefully.

■ If the cylinder has been stopped for a long time, such as first thing in the morning or first thing after lunch, frictional resistance will increase, and piston speed will change, which may worsen stopping accuracy. Perform a break-in operation to obtain stable stopping accuracy.

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