Safety Precautions

Be sure to read this section before use.
Refer to Intro Page 73 for general information of the cylinder, and to Intro Page 80 for general information of the cylinder switch.

Product-specific cautions: Rodless cylinder with brake SRT3 Series

Design/selection

⚠WARNING

■ Design a structure that prevents person(s) from coming into contact with the driven workpiece as well as the moving parts of the cylinder with brakes.
Provide a protective cover so that no one can directly touch the unit. In case of possible contact, provide safety measures such as a sensor for emergency stop before making contact and a buzzer to warn of danger.

■ Use a balanced circuit that accommodates the protrusion of the cylinder.
If pneumatic pressure is applied to only one side of the cylinder via operating the cylinder in any mid-stroke position (such as by braking), the piston pops out at high speed when the brake is released. This could cause physical harm, such as pinched hands or feet, or mechanical damage. Use a balance circuit, such as the recommended pneumatic pressure circuit, to prevent popping out.

■ As the rodless cylinder with brake requires no lubrication, never lubricate it. Otherwise, the brake may malfunction.

■ The holding force 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.
Take care when constantly using near the upper limit of the holding force.

■ Do not apply loads with impact, strong vibration, or torque while brakes are activated.
If load is externally applied with impact, or if strong vibration or rotational force is externally applied, the holding force can be reduced, creating a dangerous situation.

■ Consider the stopping accuracy and overrun distance during the braking.
Because a mechanical lock is applied, the cylinder does not stop instantly when the stop signal is issued, but stops with a time-wise delay. The stroke at which the cylinder slides due to this delay is the overrun distance. The max. and min. width of the overrun distance is the stopping accuracy.
- To achieve the required stop position, move the limit switch forward by the overrun distance.
- The limit switch must have a detection length (dog length) of the overrun distance + α.
- The operating range of CKD cylinder switches is 7 to 16 mm, depending on the switch model. If overrun distance exceeds this, provide self-holding of the contact at the switch load.

■ Do not use multiple synchronized cylinders with brakes.
If the synchronization deviates, an excess moment load or load concentration is applied to the cylinder where the brake was applied first, risking brake release defects, shortened service life, or damage.

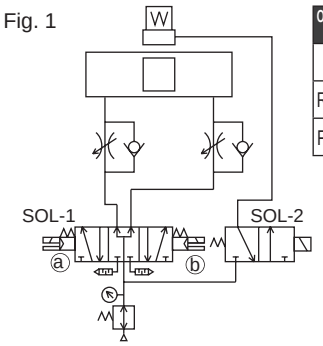
■ In order to improve stopping accuracy, ensure that the brake stops the cylinder as soon as possible after receiving the stop signal.
Use a high response DC control electricity circuit or valve, and set the valve as close to the cylinder as possible.

■ The stopping accuracy is susceptible to fluctuations in piston speed.
If the piston speed changes due to load fluctuations or by some disturbance while the cylinder is moving, the stopping position may vary sharply. Make sure that the piston speed stays the same up to just before the stop position. As well, since the speed changes significantly in the cushioned range and in the acceleration range after starting operation, the variability of the stopping position will increase.
The stopping accuracy at piston speed of 300 mm/s with no load is ±1.5 mm (reference value).

■ Notes for basic circuits

● Horizontal load
Pipe as shown in Figure 1. A rodless cylinder does not require a pressure balancing regulator since it has the same sectional area on both sides of the piston.

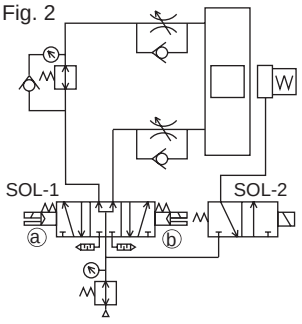
Fig. 1



Operational status	ⓐSOL-1ⓑ		SOL-2
Stop	OFF	OFF	OFF
Reverse	ON	OFF	ON
Forward	OFF	ON	ON

● Vertical load
If the load is facing downward as shown in Figure 2, the table moves incorrectly in the load direction when brakes are released. Install a regulator with a check valve on the upper side to reduce thrust in the load direction and balance the load.

Fig. 2



Operational status	ⓐ SOL-1ⓑ		SOL-2
Stop	OFF	OFF	OFF
Drop	ON	OFF	ON
Rise	OFF	ON	ON

(*1) When pressure fluctuates due to any other pneumatic component, install a special regulator to stabilize the operation.

■ Release brakes before cylinder operation. The brake may not be released when the cylinder is operating at high speeds.

■ If back pressure is applied to the locking mechanism, the lock may be released. Use the brake release valve as a single unit, or use an individual exhaust manifold.

■ 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 regulator with a check valve.

⚠ CAUTION

■ Avoid environments where the cylinder is exposed to welding spatters.

■ Do not use the cylinder in places where it is directly exposed to coolant, oil mist, etc.
Be sure to provide a protective cover, etc., if the cylinder must be installed in such a place.

■ Do not use this product where foreign matter such as cutting chips, dust, or spatter, etc., will contact or enter the cylinders.
Provide a protective cover, etc., if the cylinder must be installed in such a place.
Be sure to consult with CKD for use in these environments.

■ Although the structure of SRL3 and other slit rodless cylinders has a slight amount of external air leakage, it does not affect the speed control performance.

■ Prevent negative pressure from occurring inside the cylinder tube. Using the cylinder as an air balancer or operating the table with external force or inertia force with all ports closed may cause negative pressure inside the cylinder, resulting in air leakage if the seal belt comes off. Do not use external force or inertia force, otherwise negative pressure will occur inside the cylinder.

■ Notes for stopping accuracy

● Stopping pitch and load factor
Stopping accuracy differs with stopping pitch and load factor. The load factor below is recommended for achieving specified stopping accuracy.

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 valve kit for brake
The stopping accuracy and overrun distance will change according to the responsiveness of the brake valve. Connect the valve directly to the brake port to improve stopping accuracy.

● When using PC (programmable controller)
If a PC (programmable controller) is used as the electric control unit for the valve for brake, stopping accuracy drops due to scan time (computing time). When using a PC, do not assemble the valve for brake into the PC circuit.

■ Do not make major changes in applied load when stopped with brakes, or the stopping position may change.

■ Wear powder may be generated when the cableveyor slides against the protective tape. Be especially careful in environments that should be free from dust.

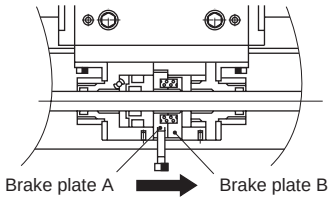
Mounting, installation and adjustment

⚠ WARNING

■ If the brake is released while air is applied to only one side of the cylinder, the piston can pop out at high speed, creating a dangerous situation. When releasing the brake during adjustment or other maintenance, 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
  ·Place the load to the bottom end
  ·Pressurize both sides
  ·Place a strut
  to prevent the load from falling.
- Confirm that air is not pressured on only one side of the cylinder when releasing brakes.

■ How to manually release the brake



- Remove the cover, screw the hexagon socket head cap screw into the brake plate A and turn it in the direction of the arrow. The brake plates A and B become horizontal and the piston rod is released.
  Note that the two brake plates should be turned completely. Otherwise the piston rod is released in one direction only.

Bore size	Thread size of brake plate A
ø12,ø16 ø20,ø25	M3
ø32,ø40 ø50,ø63	M4

- If no air pressure is supplied in vertical mounting, etc., brake force may not be sufficient when the lock is manually released. This may cause the table to move (drop) with the load's weight.
  For safety, take the following measures before manually releasing the lock:
  · Move the load to the bottom end
  · Provide a stopper to the load
  · Apply air pressure to the rodless cylinder to balance the load
- Remove the manual release bolt during normal use.

■ Brakes are released manually or by pressurizing the brake release port. When mounting the load, the brake release operation may cause the load to fall; make sure that the brake works in a state where the manual release operation is in its initial state or where there is no air in the brake release port.

■ Do not apply to the cylinder any force that exceeds the brake holding force listed in the catalog.

■ 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 cylinder speed is fast, the detection dog must be long enough to match relay response time. If the dog is short, the stop signal is not output and operation does not stop.

⚠ CAUTION

■ Do not apply strong impact or excessive moment to the table.

■ Carefully match the centers when connecting a load with an external guide mechanism.

- Displacement of the shaft center increases as the stroke becomes longer. Consider the connection method (floating) so that the displacement can be absorbed.

■ Adjust the air balance in the cylinder.
With brakes released, place a load on the cylinder and balance the load by adjusting pneumatic pressure applied to the cylinder rod side and head side. Malfunctions such as cylinder popping out during brake release or abnormal brake release can be prevented by accurately balancing the load.

■ Adjust the installation position of the detector parts, including the cylinder switch.
When braking, consider the overrun distance with respect to the desired stop position and adjust the installation positions for detector parts, including the cylinder switch.

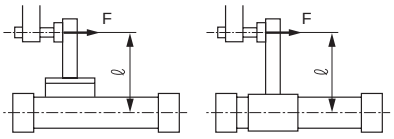
■ Load fluctuations during the reciprocating stroke of the cylinder can cause inconsistent piston speed, leading to greater variation in the stop position. Adjust the mounting of the load so as to prevent any load fluctuations during the reciprocating stroke of the cylinder, especially before the stop position.

■ Since the speed changes significantly in the cushioned range and in the acceleration range after starting operation, the variability of the stopping position will increase. For this reason, the accuracy described in the specifications may not be obtained when the stroke to the next point just after the start of operation is short.

■ Wear powder may be generated when the cableveyor slides against the protective tape. Be especially careful in environments that should be free from dust.

■ Keep the moment, including inertia force caused by load transfer or stop, within the allowable load. If this value is exceeded, it will lead to damage.

- When the overhang load is large and the cylinder is stopped at both ends by the piston, load inertia causes bending moment even if the energy is within the allowable absorbed energy of the internal cushion.
  If the kinetic energy is large and an external cushion is used, adjust so that the cylinder contacts with the center of gravity of the workpiece or the closest point to it.
- When using an external stopper, make a selection considering bending moment due to the cylinder thrust.
- Moment that operates when the cylinder stops with an external stopper

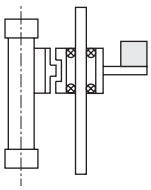


M1 = F· ℓ

M3 = F· ℓ
F : Cylinder thrust
ℓ : Length from the center of the cylinder to the stopper

- If the centers are not coincident when an external guide is attached, movement will not be smooth and resistance due to interference will operate as moment. Design the connection part so that it can accept non-coincidence of the centers.

- Example of guide use



■ Do not perform electric welding after installing the rodless cylinder. Otherwise electric current passes into the cylinder and causes sparks between the dust-proof belt and cylinder tube, which will damage the dust-proof belt.

■ The cylinder body may be damaged or may malfunction if a unit with excessive inertia, etc., is moved. Use within the allowable range.

■ Prevent scratches or dents on the cylinder body. Otherwise, malfunctions may result.

■ If external or inertia forces cause negative pressure inside the cylinder, the seal belt may come off and air may leak or malfunctions may occur.

■ CKD's shock absorber is a consumable part. Replace when the energy absorption performance has degraded or the operation is not smooth.

Use/maintenance

⚠ WARNING

■ For safety purposes, prevent the load from falling under its own weight during maintenance.

■ Do not disassemble the brake section for inspection, or a hazardous situation may occur during use thereafter.

■ The required grease is already applied to the brakes and so do not wipe it off. Do not apply extra grease.

■ The brake section cannot be replaced.

■ Always use the product with the dust cover on, except for when performing manual release, in order to prevent failure or malfunction.

⚠ CAUTION

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

■ Frictional resistance increases and causes the piston speed to change when the cylinder has been stopped for a long time, such as when using first thing in the morning or afternoon. This may impair stopping accuracy. Conduct conditioning operations to obtain a stable stopping accuracy.