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 SRL3 Series

Design/selection

1. Common

⚠ CAUTION

■ Pay attention when designing the brake control circuit.

A slight amount of external leakage is inherent to the structure of SRL3 and other slit rodless cylinders. Therefore, brake control using a 3-position valve with all ports closed may fail to keep the stop position of the table. Use the control circuit with both sides pressurized with 3-position P/A/B connection valve. However, note that the table may deviate from origin if air pressure is applied in the de-energized state when starting after a pressure drop.
Do not brake with A/B/R connection control: air may leak from both sides, risking popping out when restarting operation, as well as making speed control difficult.

■ Basic circuit diagram

● Horizontal load

When piping is as shown in Fig. 1, equal pressure is applied to both ends of the piston when stopped to prevent the table from popping out when operation is restarted.

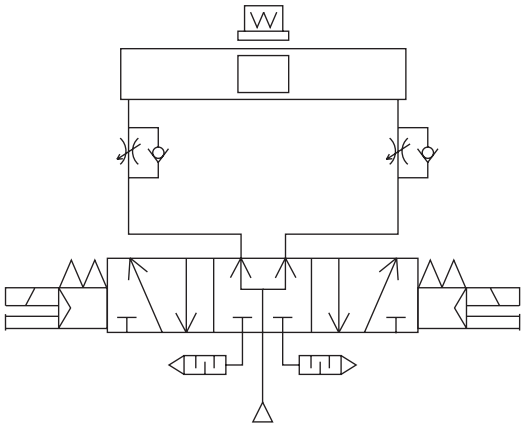


Fig. 1

● Vertical load

● If vertical load works as shown in Figure 2, the table moves in the load direction. Install a regulator with check valve on the top to reduce thrust in the load direction to balance the load.

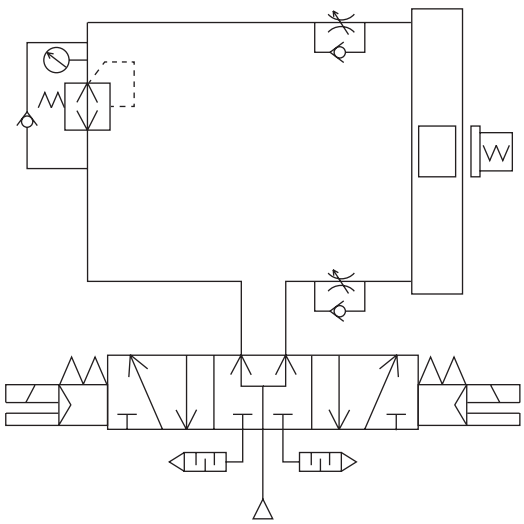


Fig. 2

■ 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.

2. Position locking SRL3-Q

⚠ CAUTION

■ Cylinder load factor must be 50% or less. If the load factor is high, the lock may not be released, or the lock section may be damaged.

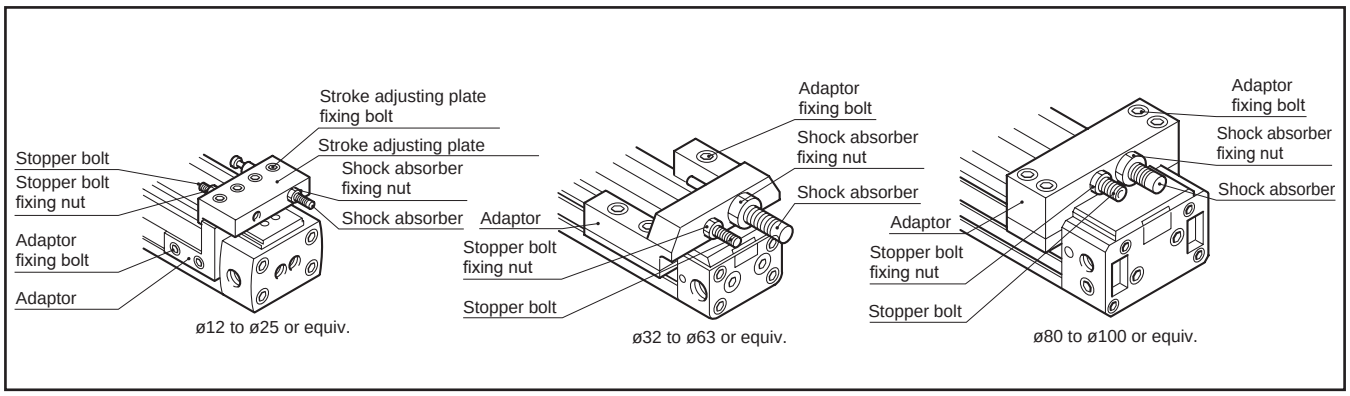
■ To operate the cylinder at 500 mm/s and over, reduce the speed when entering the position locking mechanism to 500 mm/s or less.
To reduce the speed, add an external shock absorber or deceleration circuit.

Mounting, installation and adjustment

1. Common

⚠ WARNING

■ How to adjust the stroke adjusting unit



(1) Moving the stroke adjusting unit
Loosen the adaptor fixing bolt (adaptor fixing bolt and stroke adjusting plate fixing bolt for ø12 to ø25) to move the stroke adjusting unit.

(2) Fixing the stroke adjusting unit
After moving the stroke adjusting unit to the desired position, tighten the adaptor fixing bolt (adaptor fixing bolt and stroke adjusting plate fixing bolt for ø12 to ø25) with the value in Table 8 to fix the unit. Note that if tightened with a value less than that in the table below, the stroke adjusting unit may be displaced.

Table 1 Tightening torque of adaptor fixing bolt and stroke adjusting plate fixing bolt

Tightening torque / Model	Adaptor fixing bolt (N·m)	Stroke adjusting plate fixing bolt (N·m)
SRL3-12/16	1 to 1.2	0.5 to 0.7
SRL3-20	2.5 to 2.7	
SRL3-25	5.2 to 5.6	2.5 to 2.7
SRL3-32	22 to 24	—
SRL3-40	44 to 48	—
SRL3-50/63	77 to 83	—
SRL3-80/100	100 to 110	—

(3) Adjusting the stroke with a stopper bolt

{ In the case of ø12 to ø20, adjust the stroke normally by moving the stroke adjusting unit, since there is a danger that fingers may be caught in a narrow space between the table and the stroke adjusting plate. }

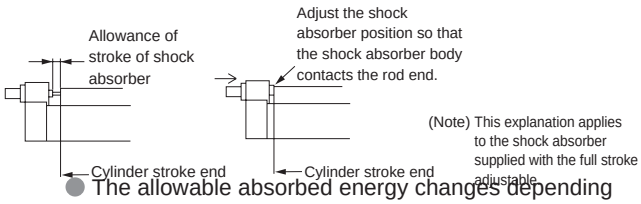
To adjust the stroke, loosen the stopper bolt fixing nut and turn the stopper bolt. After adjustment, tighten the stopper bolt fixing nut with the value in Table 2 to fix the stopper bolt.(4) Adjusting the shock absorber
Change the operational stroke of the shock absorber to adjust its absorbed energy.
To adjust the operational stroke of the shock absorber, loosen the shock absorber fixing nut and turn the shock absorber. After adjustment, tighten the shock absorber fixing nut with the value in Table 2 to fix the shock absorber.
Because the gap between the shock absorber and the stopper bolt is narrow, it is recommended to remove the adapter (stroke adjusting plate) for adjustment.

(5) Precautions for use

Table 2 Tightening torque of stopper bolt fixing nut and shock absorber fixing nut

Tightening torque / Model	Stopper bolt fixing nut (N·m)	Shock absorber fixing nut (N·m)
SRL3-12/16	1.1 to 1.2	1.3 to 1.8
SRL3-20	2.5 to 2.7	2.9 to 3.9
SRL3-25	8.8 to 9.5	4.5 to 6
SRL3-32	22 to 24	7.5 to 10
SRL3-40	44 to 48	22 to 30
SRL3-50	77 to 83	55 to 70
SRL3-63	200 to 216	55 to 70
SRL3-80/100	215 to 235	100 to 130

- A shock absorber can absorb the rated energy at the rated stroke. However, the initial shock absorber position is adjusted to have an stroke allowance at the cylinder's stroke end.
Therefore, the absorbed energy will be less than the allowable absorbed energy of a discrete shock absorber. If the rated absorbed energy is required, adjust the shock absorber so that the full stroke can be used.At the time, adjust so that the table stops with the stopper bolt.
Even at the cylinder stroke end, if the cylinder's thrust is continuously applied, the shock absorber may be damaged.



- The allowable absorbed energy changes depending on the colliding speed. Keep it within 1/3 of the max. energy absorption in Table 3 at 2000 mm/s colliding speed, and within 1/2 at 1000 mm/s colliding speed.

Table 3 Specifications of full stroke adjustable with shock absorber (initial set point)

Type	Absorbed energy (J)	Effective stroke (mm)
For SRL3-12/16	2.4	5.5
For SRL3-20	5.7	7
For SRL3-25	10	9
For SRL3-32	18	13
For SRL3-40	50	16.5
For SRL3-50/63	86	21
For SRL3-80/100	143	25

⚠CAUTION

■ 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.

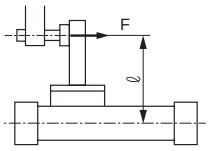
■ The cylinder body may be damaged or may malfunction if a unit with excessive inertia, etc., is moved. Use within the allowable range.

■ 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.

■ Keep moment, including inertia force caused by load transfer or stop, within the allowable load. If this valve is exceeded, it will lead to damage.
(When the overhang load is large)
- 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 workpiece or the closest point to it.

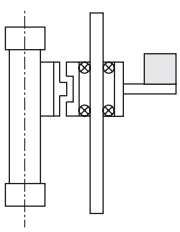
(When an external stopper is used)
- When using an external stopper, make a selection considering bending moment due to the cylinder thrust.
- Moment that operates when the cylinder stops with an external stopper



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

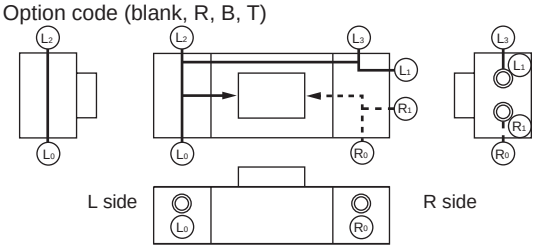
$M1 = F \cdot \ell$

(When an external guide is used)
- 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



■ Piping port position and operating direction
Bore size ø12 to ø20 equiv.

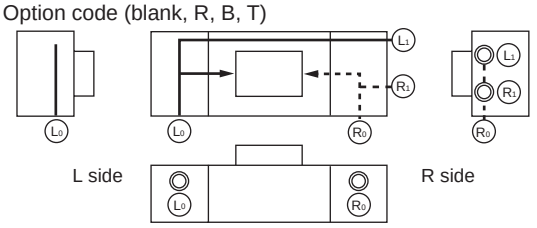
- Option code (blank, R, B, T)



Ⓡ indicates the pressurized ports on R side and Ⓛ indicates the pressurized ports on L side. When the product is shipped from the factory, ports other than one each of Ⓡ and Ⓛ are sealed with plugs. Remove the plugs when piping to the plugged ports. Option codes (D and S) are not available.

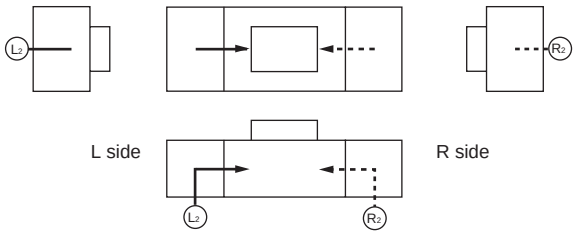
Bore size ø25 to ø63 equiv.

- Option code (blank, R, B, T)



Ⓡ indicates the pressurized ports on R side and Ⓛ indicates the pressurized ports on L side. When the product is shipped from the factory, ports other than one each of Ⓡ and Ⓛ are sealed with plugs. Remove the plugs when piping to the plugged ports. Bottom piping is not possible. If bottom piping is necessary, select the option (D or S).

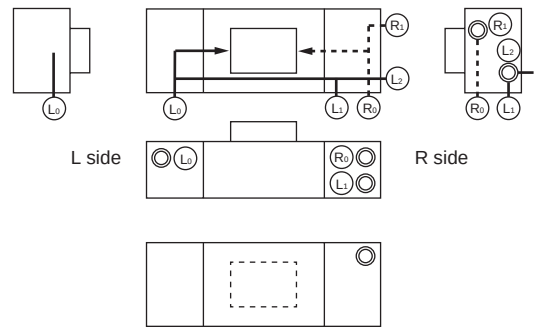
- Option code (D, S) (bottom piping)



Ⓡ indicates the pressurized ports on R side and Ⓛ indicates the pressurized ports on L side.
There are no ports for piping other than Ⓡ₂ Ⓛ₂.

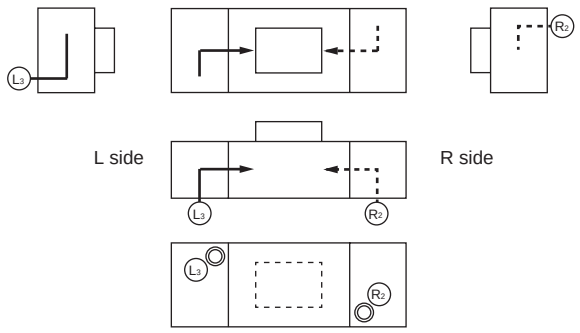
Bore size ø80/ø100 equiv.

● Option code (blank, R, B, T)



Ⓡ indicates the pressurized ports on R side and Ⓛ indicates the pressurized ports on L side. When the product is shipped from the factory, ports other than one each of Ⓡ and Ⓛ are sealed with plugs. Remove the plugs when piping to the plugged ports.

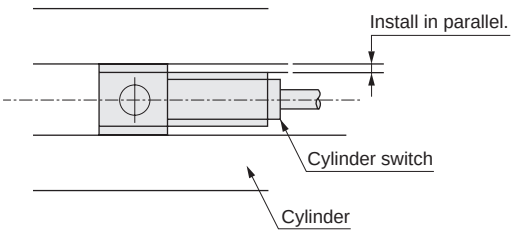
● Option code (D, S) (bottom piping)



There are no ports for piping other than Ⓡ₂ Ⓛ₃.

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

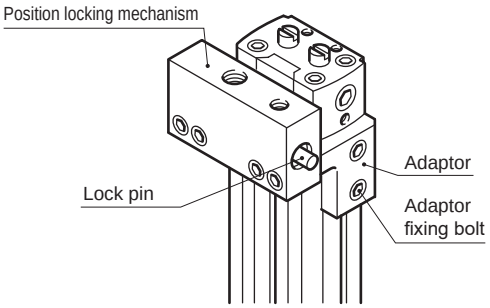
■ Install the switch in parallel with the mounting groove and do not apply force to the lead wire.



2. Position locking SRL3-Q

⚠ WARNING

■ How to adjust the stroke adjusting unit



● Loosen the adaptor fixing bolt to move the position locking mechanism.
The type with shock absorber (A or A1) should be used in this case. Using the shock absorber for fine adjustment of the stroke will displace the position locking mechanism, which prevents secure locking. Therefore, use the adaptor fixing bolt for fine adjustment.

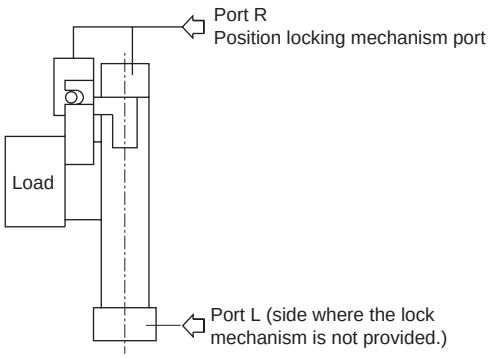
● After moving it to the desired position, tighten the adaptor fixing bolt with the value in the table below. If tightened with a value less than that in the table below, the position locking mechanism may be displaced.

● When setting a load, make sure to check that the lock mechanism functions before installing the product.

Model	Adaptor fixing bolt tightening torque (N·m)
SRL3-Q-12/16	1 to 1.2
SRL3-Q-20	2.5 to 2.8
SRL3-Q-25	5.2 to 5.6
SRL3-Q-32	22 to 24
SRL3-Q-40	44 to 48
SRL3-Q-50/63	77 to 83
SRL3-Q-80/100	100 to 110

■ Piping

● Piping to the position locking mechanism is necessary.



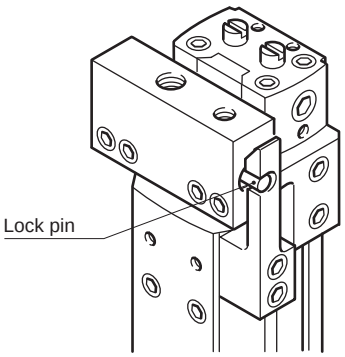
● Divide the piping to R side of the rodless cylinder using a tee fitting, etc., and with the same kind of pipe, connect the piping to the position locking mechanism.

● When the piping to the position locking mechanism is long and thin, or when the speed controller is far away from the cylinder port, note that it takes time to engage the lock. Clogging in the silencer mounted on the EXH port of the valve may cause the same result.

■ Supply pressure equal to or higher than the min. working pressure to the position locking mechanism port.

■ Manual release

- Push in the lock pin of position locking mechanism using a stick. At this time, make sure to supply pressure to port L, and before unlocking, check that load is not applied to the lock mechanism.
  If pressure is supplied to port R when both ports R and L are exhausted and the piston is locked, the lock may be unlocked and the table may pop out. This can be extremely hazardous.



■ Valves

- Keeping the cylinder with pressure applied to the lock mechanism may cause the lock pin to come off, which is very dangerous. Do not use 3-position closed center and 3-position P/A/B connection valves.
- If back pressure is applied to the locking mechanism, the lock may be released. Use a discrete valve, or use an individual exhaust manifold.
- For usage where the drop rate is increased using the quick exhaust valve, the lock may not release normally because the cylinder body starts operating before the lock pin.
  For the position locking cylinder, do not use the quick exhaust valve.

Use/maintenance

1. Position locking SRL3-Q

⚠ WARNING

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

- In the case of the cylinder with air cushion, if the air cushion needle at the lock mechanism side is tightened excessively, the piston bounds at the stroke end, the lock lever contacts the lock pin violently and the lock mechanism may be damaged. Also, if the air cushion needle is opened too much, the piston bounces off at the stroke end, which may similarly damage the mechanism. Adjust the needle of the air cushion so that there is no bound.
  When stopping the piston with an external buffer device (shock absorber, etc.), adjust it similarly so that there is no bound.
  Inspect the piston once or twice per year to make sure there is no damage to the retainer caused by this phenomenon.

⚠ CAUTION

- After the lock mechanism is manually operated, make sure to confirm manual operation and return the mechanism to the original state before use. Do not perform manual operation except for adjustment, as it is dangerous.

- When mounting or adjusting the cylinder, release the lock. If mounting work, etc., is done while the lock is engaged, the lock part may be damaged.

- Do not use multiple synchronized cylinders. Do not use so that 1 workpiece is moved by synchronizing 2 or more position locking cylinders. Lock release may fail for one of the cylinders.

- Use the speed controller with meter-out. If the meter-in control is used, the lock may not be able to be released.

- At the side where the lock mechanism is attached, be sure to use the cylinder from the stroke end. If the cylinder piston does not reach the stroke end, the lock may not be engaged or the lock may not be able to be released.

- Apply grease regularly to the sliding part of the lock lever.