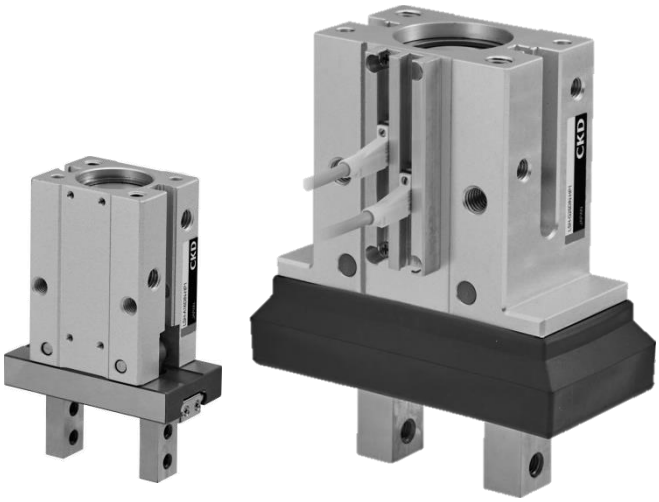
CKD

Linear Slide Hand

LSH-HP Series (ø6 to ø32)
LSHL-HP Series (ø10 to ø25)

INSTRUCTION MANUAL

SM-A10455-A/4



- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's **"LSH-HP Series (ø6 to ø32)/LSHL-HP Series (ø10 to ø25)" linear slide hand**.
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product is intended for users who have basic knowledge about materials, piping, electricity, and mechanisms of pneumatic components. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the fluid control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

JIS B 8370 (the latest edition)

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ **DANGER**	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ **WARNING**	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Do not handle the product or remove pipes and devices until confirming safety.

- Inspect and service the machine and devices after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Precautions on Product Disposal

⚠CAUTION

When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

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1. PRODUCT OVERVIEW

1.1 Model Number Indication

1.1.1 LSH-A Series

Without switch (built-in magnet for switch)

LSH - A 06 D 1 R ——— HP1

With switch (built-in magnet for switch)

LSH - A 06 D 1 R - F2H - D - HP1

Ⓐ Rubber cover

Ⓑ Bore size

Ⓒ Actuation

Ⓓ Finger

Ⓔ Grip center reference, high precision positioning hole

Ⓕ Switch model No.

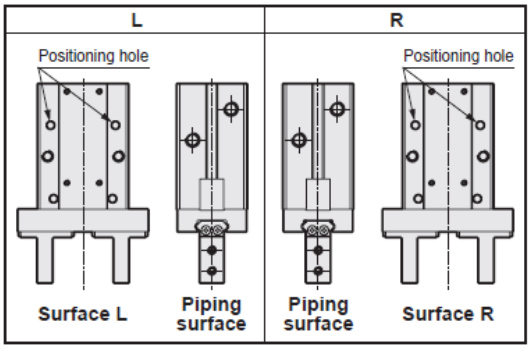
Ⓖ Switch quantity

Code	Content
Ⓐ Rubber cover	
A	Without rubber cover
Ⓑ Bore size (mm)	
06	ø6
10	ø10
16	ø16
20	ø20
25	ø25
32	ø32
Ⓒ Actuation	
D	Double acting
S	Single acting / normally open
C	Single acting / normally closed
Ⓓ Finger	
1	Basic
2	Side tap
3	Through hole
4	Flat
Ⓔ Grip center reference, high precision positioning hole	
N	None
L	Refer to the figure at left.
R	
Ⓕ Switch model No.	
Blank	No switch, with F type switch rail
N	No switch, no switch rail
A	No switch, with T type switch rail (ø32 only)

Axial lead wire	Radial lead wire	Contact	Voltage AC	Voltage DC	Display	Lead wire
–	F2S*	Proximity		●	1-color display	2-wire
–	F3S*			●		3-wire
F2H*	F2V*			●		2-wire
F3H*	F3V*			●		3-wire
F3PH*	F3PV*			●		3-wire
T2H*	T2V*			●		2-wire
T2HR3	T2VR3			●		2-wire
T3H*	T3V*			●		3-wire
T3PH*	T3PV*			●		3-wire

* Lead wire length	
Blank	1 m (standard)
3	3 m (option)
Ⓖ Switch quantity	
R	1 on open side
H	1 on closed side
D	2

Grip center reference, high precision positioning hole position diagram



Note 1: If the one with the switch is selected, the product comes with a rail plate corresponding to the switch.
Note 2: Only ø32 can be selected with the T switch.
Note 3: Refer to Catalog for cylinder switch precautions.

1.1.2 LSH-G/F Series

Without switch (built-in magnet for switch)

LSH - G 06 D 1 R ——— HP1

With switch (built-in magnet for switch)

LSH - G 06 D 1 R - F2H - D - HP1

Ⓐ Rubber cover

Ⓑ Bore size

Ⓒ Actuation

Ⓓ Finger

Ⓔ Grip center reference, high precision positioning hole

Ⓕ Switch model No.

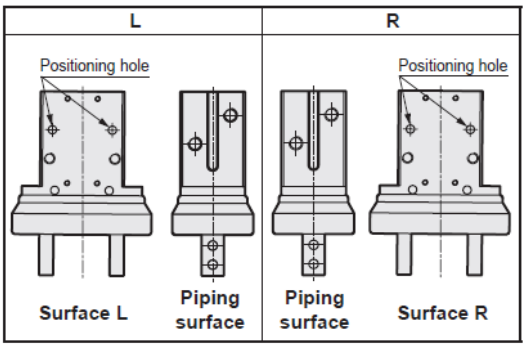
Ⓖ Switch quantity

Code	Content
Ⓐ Rubber cover	
G	Chloroprene rubber
F	Fluoro rubber
Ⓑ Bore size (mm)	
06	ø6
10	ø10
16	ø16
20	ø20
25	ø25
32	ø32
Ⓒ Actuation	
D	Double acting
S	Single acting / normally open (ø32 cannot be selected)
C	Single acting / normally closed (ø32 cannot be selected)
Ⓓ Finger	
1	Basic
Ⓔ Grip center reference, high precision positioning hole	
N	None
L	Refer to the figure at left.
R	
Ⓕ Switch model No.	
Blank	No switch, with F type switch rail
N	No switch, no switch rail
A	No switch, with T type switch rail (ø32 only)

Axial lead wire	Radial lead wire	Contact	Voltage AC	Voltage DC	Display	Lead wire
–	F2S*	Proximity		●	1-color display	2-wire
–	F3S*			●		3-wire
F2H*	F2V*			●		2-wire
F3H*	F3V*			●		3-wire
F3PH*	F3PV*			●		3-wire
T2H*	T2V*			●		2-wire
T2HR3	T2VR3			●		2-wire
T3H*	T3V*			●		3-wire
T3PH*	T3PV*			●		3-wire

* Lead wire length	
Blank	1 m (standard)
3	3 m (option)
Ⓖ Switch quantity	
R	1 on open side
H	1 on closed side
D	2

Grip center reference, high precision positioning hole position diagram



Note 1: If the one with the switch is selected, the product comes with a rail plate corresponding to the switch.
Note 2: Only ø32 can be selected with the T switch.
Note 3: Refer to Catalog for cylinder switch precautions.

1.1.3 LSHL-A Series

Without switch (built-in magnet for switch)

LSHL - A 10 D 1 R ——— HP1

With switch (built-in magnet for switch)

LSHL - A 10 D 1 R - F2H - D - HP1

Ⓐ Rubber cover

Ⓑ Bore size

Ⓒ Actuation

Ⓓ Finger

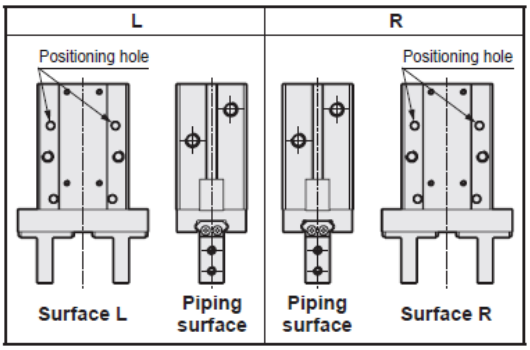
Ⓔ Grip center reference, high precision positioning hole

Ⓕ Switch model No.

Ⓖ Switch quantity

Code	Content
Ⓐ Rubber cover	
A	Without rubber cover
Ⓑ Bore size (mm)	
10	ø10
16	ø16
20	ø20
25	ø25
Ⓒ Actuation	
D	Double acting
S	Single acting/normally open
C	Single acting/normally closed
Ⓓ Finger	
1	Basic
2	Side tap
3	Through hole
4	Flat
Ⓔ Grip center reference, high precision positioning hole	
N	None
L	Refer to the figure at left.
R	

Grip center reference, high precision positioning hole position diagram



Ⓕ Switch model No.						
Blank	Without switch, rail plate attached					
N	Without switch or rail plate					
Axial lead wire	Radial lead wire	Contact	Voltage AC	Voltage DC	Display	Lead wire
–	F2S*	Proximity		●	1-color display	2-wire
–	F3S*			●		3-wire
F2H*	F2V*			●		2-wire
F3H*	F3V*			●		3-wire
F3PH*	F3PV*			●		3-wire
*** Lead wire length**						
Blank	1 m (standard)					
3	3 m (option)					

Ⓖ Switch quantity	
R	1 on open side
H	1 on closed side
D	2

Note 1: A rail plate is supplied with the product if a switch is selected for Ⓕ.
Note 2: Refer to Catalog for cylinder switch precautions.

1.1.4 LSHL-G/F Series

Without switch (built-in magnet for switch)

LSHL - G 10 D 1 R ——— HP1

With switch (built-in magnet for switch)

LSHL - G 10 D 1 R - F2H - D - HP1

Ⓐ Rubber cover

Ⓑ Bore size

Ⓒ Actuation

Ⓓ Finger

Ⓔ Grip center reference, high precision positioning hole

Ⓕ Switch model No.

Ⓖ Switch quantity

Code	Content
Ⓐ Rubber cover	
G	Chloroprene rubber
F	Fluoro rubber
Ⓑ Bore size (mm)	
10	ø10
16	ø16
20	ø20
Ⓒ Actuation	
D	Double acting
Ⓓ Finger	
1	Basic
Ⓔ Grip center reference, high precision positioning hole	
N	None
L	Refer to the figure at left.
R	

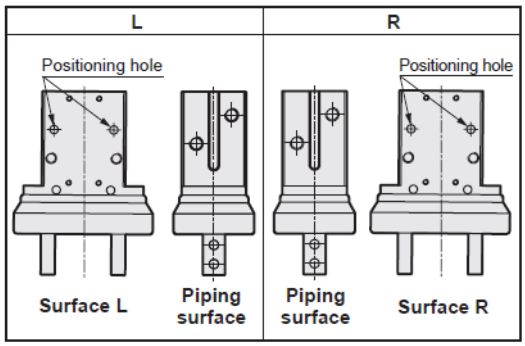
Ⓕ Switch model No.

Blank	Without switch, rail plate attached					
N	Without switch or rail plate					
Axial lead wire	Radial lead wire	Contact	Voltage AC	Voltage DC	Display	Lead wire
F2S*	F2S*	Proximity		●	1-color display	2-wire
F3S*	F3S*			●		3-wire
F2H*	F2V*			●		2-wire
F3H*	F3V*			●		3-wire
F3PH*	F3PV*			●		3-wire

* Lead wire length	
Blank	1 m (standard)
3	3 m (option)

Ⓖ Switch quantity	
R	1 on open side
H	1 on closed side
D	2

Grip center reference, high precision positioning hole position diagram



Note 1: A rail plate is supplied with the product if a switch is selected for Ⓕ.
Note 2: Refer to Catalog for cylinder switch precautions.

1.2 Specifications

1.2.1 Product specifications

Descriptions \ Model			LSH-HP					
Size			06	10	16	20	25	32
Bore size		mm	φ6	φ10	φ16	φ20	φ25	φ32
Actuation			Double acting/single acting					
Working fluid			Compressed air					
Max. working pressure		MPa	0.7					
Min. working pressure		Double acting	0.15	0.2	0.1			
	MPa	Single acting	0.3	0.35	0.25			
Proof pressure		MPa	1.0					
Ambient temperature		°C	-10 to 60 (no freezing)					
Port size			M3		M5			
Operating stroke length		mm	4	4	6	10	14	22
Repeatability		mm	±0.01					
Lubrication			Not required					
Product weight Note 1		Finger :1,2,3	0.032	0.06	0.135	0.275(0.28)	0.49(0.495)	0.73(0.78)
Standard type	kg	Finger :4			0.14	0.28(0.285)	0.495(0.5)	0.76(0.81)
Product weight Note 1 With rubber cover	kg	Finger :1	0.033	0.07	0.15	0.03(0.035)	0.53(0.535)	0.81

Descriptions \ Model			LSHL-HP			
Size			10	16	20	25
Bore size		mm	φ10	φ16	φ20	φ25
Actuation			Double acting/single acting			
Working fluid			Compressed air			
Max. working pressure		MPa	0.7			
Min. working pressure		Double acting	0.2	0.1		
	MPa	Single acting	0.35	0.25		
Proof pressure		MPa	1.0			
Ambient temperature		°C	-10 to 60 (no freezing)			
Port size			M3	M5		
Operating stroke length		mm	8	12	18	22
Repeatability		mm	±0.01			
Lubrication			Not required			
Product weight Note 1		Finger :1,2,3	0.065(0.075)	0.155(0.165)	0.315(0.335)	0.54(0.585)
Standard type	kg	Finger :4		0.16(0.17)	0.32(0.34)	0.545(0.59)
Product weight Note 1 With rubber cover	kg	Finger :1	0.09	0.18	0.39	—

Note 1 : Indicates the weight when double acting type is selected. Refer to the weight in ( ) when single acting type is selected.

1.2.2 Switch specifications

Type/Model no.	Proximity 2-wire type	Proximity 3-wire type	
Descriptions	F2H/V, F2S	F3H/V, F3S	F3PH/V
Applications	Only for programmable controller	For programmable controller, relay	
Output method	-	NPN	PNP
Power supply voltage	-	10 VDC to 28 VDC	4.5 VDC to 28 VDC
Load voltage	10 VDC to 30 VDC	30 VDC or less	
Load current	5 mA to 20 mA Note 2	50 mA or less	
Current consumption	-	10 mA or less at 24 VDC	
Internal voltage drop	4 V or less	0.5 V or less	30 mA or less at 0.5 VDC
Indicator	Yellow LED (Lights up when turned on) Note3,4		Yellow LED (Lights up when turned on)
Leakage current	1 mA or less	10 μA or less	
Lead wire length Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.15 mm^2)	Standard is 1 m (Oil-resistant vinyl cabtyre 3 core cord, 0.15 mm^2)	
Shock resistance	980 m/s^2		
Insulation resistance	20 MΩ or more with 500 VDC megger		
Withstand voltage	No abnormality after applying 1000 VAC for one minute		
Ambient temperature	−10°C to 60°C		
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant		

Type/Model no.	Proximity 2-wire type		Proximity 3-wire type	
Descriptions	T2H/V	T2HR3,T2VR3	T3H/V	T3PH/V
Applications	Only for programmable controller		For programmable controller, relay	
Output method	-		NPN	PNP
Power supply voltage	-		10 VDC to 28 VDC	
Load voltage	10 VDC to 30 VDC		30 VDC or less	
Load current	5 mA to 20 mA Note 2		100 mA or less	
Current consumption	-		10 mA or less at 24 VDC	12 mA or less at 24 VDC
Internal voltage drop	4 V or less		0.5 V or less	
Indicator	Red LED (Lights up when turned on)			Yellow LED (Lights up when turned on)
Leakage current	1 mA or less		10 μA or less	
Lead wire length Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.2 mm^2)	Standard is 3 m (Elasticity, Oil-resistant vinyl cabtyre 2 core cord, 0.2 mm^2)	Standard is 1 m (Oil-resistant vinyl cabtyre 3 core cord, 0.2 mm^2)	
Shock resistance	980m/s^2			
Insulation resistance	20 MΩ or more with 500 VDC megger			
Withstand voltage	No abnormality after applying 1000 VAC for one minute			
Ambient temperature	−10°C to 60°C			
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant			

Note 1: 3 m and 5 m lead wires are available as options.
Note 2: The maximum load current of 20 mA is the value when the ambient temperature is 25°C.
The current will be lower than 20 mA when the ambient temperature of the switch is higher than 25°C (5 mA to 10 mA at 60°C).
Note 3: The indicator is red LED for F2S and F3S.
Note 4: When mounting two F2S or F3S switches to one groove to detect both ends, mount the switches so that their set screws face outward.
※ "T□H" / "F□H" show Lead wire straight type, as well as "T□V" / "F□V" show Lead wire angled type.

2. INSTALLATION

2.1 Environment

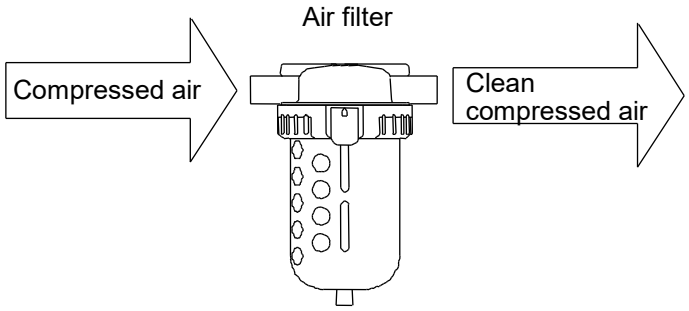
⚠CAUTION

When using the product in a cutting, casting, or welding plant, install a cover to prevent foreign matters such as cutting fluid, chips, powder, and dust from entering.

Do not use the equipment in the following environments.

- Where cutting oil can splash onto the product (abrasives and polishing powder in the oil can abrade the sliding section)
- Where organic solvents, chemicals, acids, alkalis, and kerosene are present
- Where water can splash onto the product

- Use the product within the following ambient temperature range.
  −10°C to 60°C (no freezing)
- For compressed air, use clean and dry air that has been passed through an air filter.
  Use an air filter in the circuit and be careful with the filtration rate (a filter that removes particles exceeding 5 μm is desirable), flow rate, and mounting position (install the filter near the directional control valve).



2.2 Unpacking

- Check that the model number ordered and the model number indicated on the product are the same.
- Check the exterior of the product for any damage.
- When storing the product, take proper measures to prevent foreign matters from entering the cylinder.

2.3 Mounting

⚠WARNING

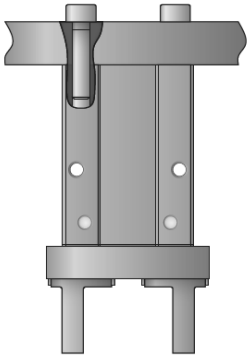
Install a protective cover as a safety measure if the moving workpiece can pose a risk to humans or if human fingers can get caught in the finger and/or the attachment.

Take proper measures to prevent the workpiece from falling so that people are not injured and machines and devices are not damaged.

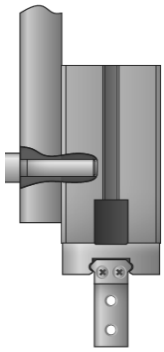
If the circuit pressure drops due to a power failure or a problem with the air source, the gripping power may decrease and the workpiece may fall.

2.3.1 Mounting the Body

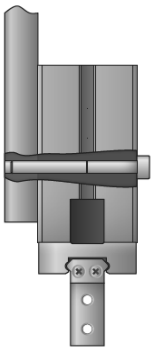
The body can be mounted from three directions (for ø6, from two directions). Select the mounting direction appropriate for the application. Do not put any dents and scratches on the body mounting surface or the finger that may affect their flatness and perpendicularity.



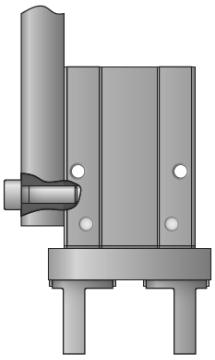
Top mounting



Front mounting



Front mounting using through holes



Side mounting

■ Tightening Torque

When mounting the product where vibrations may occur, take measures (such as installing a spring washer or applying an adhesive) to prevent the bolt from loosening.

Model	Top mounting		
	Bolt size	Tightening torque (N·m)	Max. screw-in depth
LSH-☐06	M3	0.59	4.5
LSH☐-☐10	M3	0.88	6
LSH☐-☐16	M4	2.1	8
LSH☐-☐20	M5	4.3	10
LSH☐-☐25	M6	7.3	12
LSH-☐32	M6	7.3	13

Model	Front mounting		
	Bolt size	Tightening torque (N·m)	Max. screw-in depth
LSH-☐06	M3	0.88	10
LSH☐-☐10	M3	0.69	5
LSH☐-☐16	M4	2.1	8
LSH☐-☐20	M5	4.3	10
LSH☐-☐25	M6	7.3	12
LSH-☐32	M6	7.3	13

Model	Side mounting		
	Bolt size	Tightening torque (N·m)	Max. screw-in depth
LSH-☐10	M3	0.88	6
LSHL-☐10	M3	0.78	5.5
LSH☐-☐16	M4	1.6	4.5
LSH☐-☐20	M5	3.3	8
LSH☐-☐25	M6	5.9	10
LSH-☐32	M6	5.9	10

Model	Front mounting using through holes		
	Bolt size	Tightening torque (N·m)	Max. screw-in depth
LSH-☐06	M2.5	0.32	-
LSH☐-☐10	M2.5	0.32	-
LSH☐-☐16	M3	0.88	-
LSH☐-☐20	M4	2.1	-
LSH☐-☐25	M5	4.3	-
LSH-☐32	M5	4.3	-

■ Allowable load

For details, refer to the "Model selection" pages in the catalog.

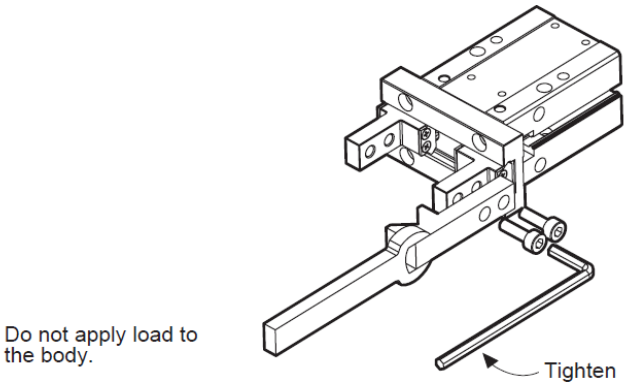
2.3.2 Mounting the attachment

■ Rigidity of the attachment

If the attachment is not rigid enough, sagging can result and cause the finger to twist or adversely affect operation.

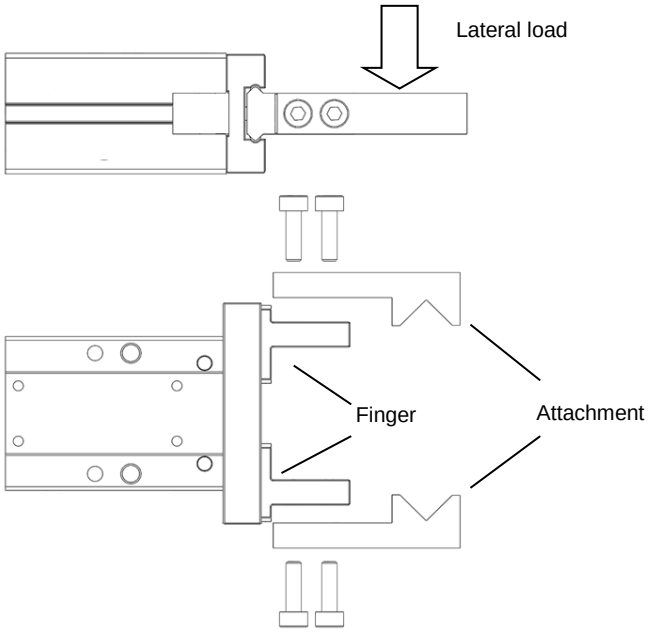
■ Mounting method

The effect on the hand body must be taken into consideration when mounting the attachment to the finger. Support the attachment with a wrench when tightening it so as not to twist the finger.



Model	Bolt size	Tightening torque (N·m)
LSH☐-☐06	M2.5 × 0.45	0.32
LSH☐-☐10	M2.5 × 0.45	0.32
LSH☐-☐16	M3 × 0.5	0.59
LSH☐-☐20	M4 × 0.7	1.4
LSH☐-☐25	M5 × 0.8	2.8
LSH-☐32	M6 × 1.0	4.9

Be careful not to apply a lateral load to the finger when mounting the attachment.

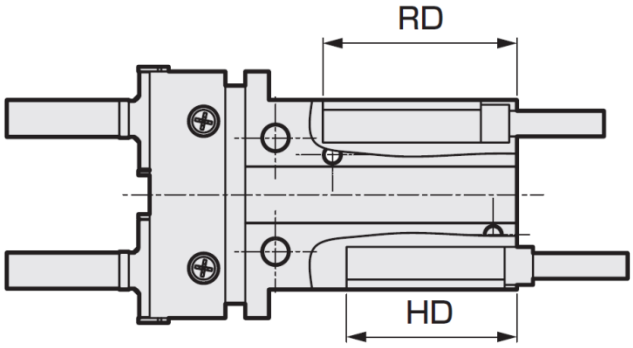


Backlash or damage may occur when an excessive lateral load or an impact load is applied. Use the product so that the external force applied to the finger does not exceed the allowable load described in the catalog.

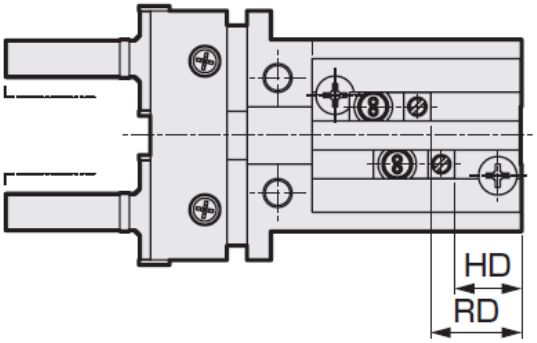
2.3.3 Mounting the switch

■ Mounting position

<Mounting the switch at the open-side end position and/or the closed-side end position>
For the switch to function at maximum sensitivity, mount the switch at the RD dimension on the open-side end position and/or at the HD dimension on the closed-side end position (refer to the catalog).



Mounting the switch to the groove on the side



Mounting the switch on the rail plate

<Mounting the switch at the intermediate position of the stroke>
For the switch to function at an intermediate position of the stroke, secure the piston at the position where the switch needs to function and then slide the switch on the piston back and forth to find the positions where the switch turns on when slid forward and when slid backward. The intermediate point between these two positions is where the switch functions at maximum sensitivity for that piston position and where the switch is to be mounted.

<Mounting the switch on the side of the body>
When mounting the switch to the groove on the side of the body, if there is no groove because of the through hole for fixing the body, mount the switch in the reverse direction or use the rail plate mounting.

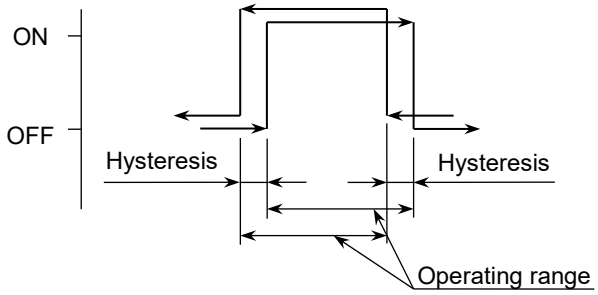
<Mounting the rail plate>
When mounting the rail plate to the body, the tightening torque for the machine screw is 0.14 N·m.

■ Operating range

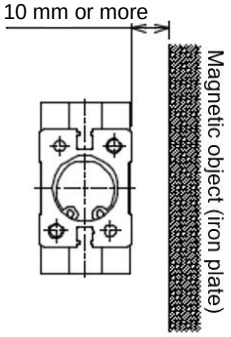
This is the range from where the switch is turned on when the piston moves and to where the switch is turned off when the piston moves farther in the same direction.
The center of the operating range is the maximum sensitivity position.
When the piston stop position is set at the maximum sensitivity position, disturbances are not easily received and the switch operation will be stable.

■ Hysteresis

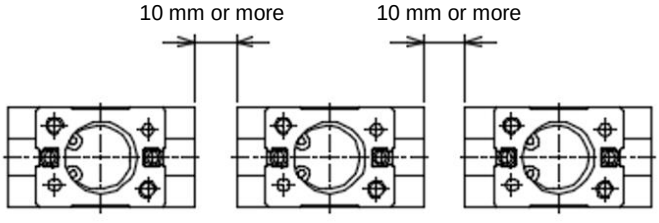
This is the distance from where the switch is turned on when the piston moves and to where the switch is turned off when the piston moves in the opposite direction.
If the piston stops within this distance, the switch operation will become unstable and disturbances are easily received.

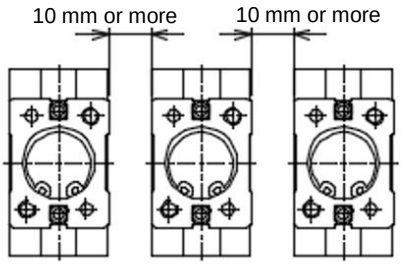


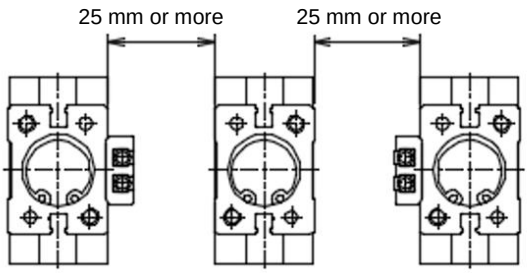
The cylinder switch may malfunction if there is a magnetic object such as a steel plate installed nearby. Make sure that there is a distance of at least 10 mm between the magnetic object and the surface of the hand.



The cylinder switch may malfunction if the hand units are placed adjacently. Make sure to provide the following distance between each unit.







2.3.4 Changing the position of the switch

1. Loosen the fastening screw (set screw).
2. Move the switch body along the groove on the side of the body or the rail plate and then tighten the screw at the predetermined position.

2.3.5 Replacing the switch

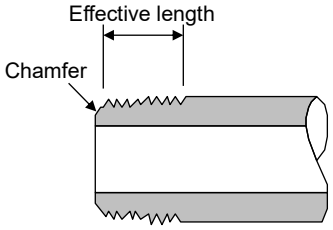
1. Loosen the fastening screw (set screw) and remove the switch body from the groove.
2. Put the replacement switch into the groove.
3. Determine where to position the switch and tighten the screw.
   (The tightening torque for the fastening screw is 0.03N·m to 0.08 N·m for F2 and F3 switches,0.10 N·m to 0.20 N·m for T2 and T3 switches.)

2.4 Piping

⚠ WARNING

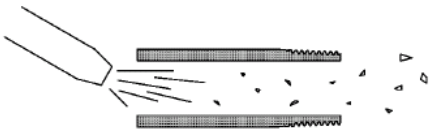
Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

- Use pipes that are made of corrosion-resistant materials after the filter such as zinc-plated pipes, nylon tubes, and rubber tubes.
- Use pipes with an effective cross-sectional area that allows the cylinder to achieve the predetermined piston speed.
- Install the filter for removing rust, foreign matters, and drainage from the piping as close as possible to the solenoid valve.
- Observe the effective thread length for the gas pipes.
- In addition, chamfer the threaded end of the pipes by about a 1/2 pitch.



■ Pipe cleaning

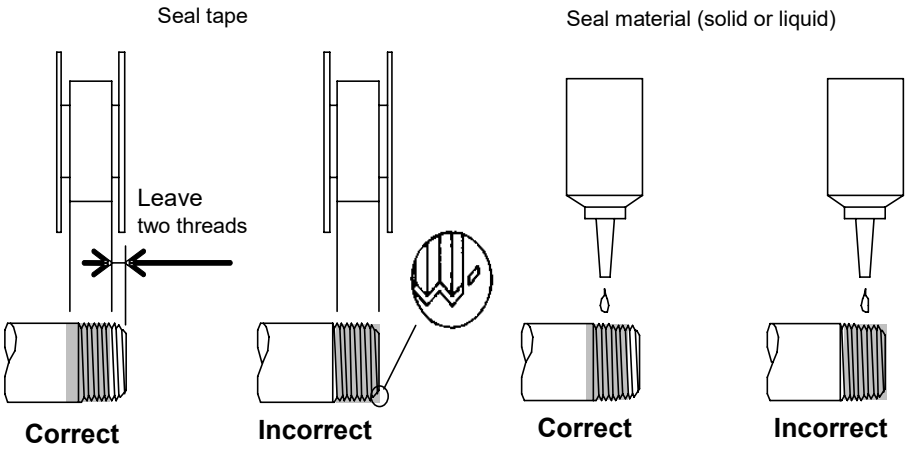
Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ Seal material

Use a seal tape or a seal material to stop leakage from piping.
Apply a seal tape or seal material to the screw threads leaving two or more threads at the pipe end uncovered or uncoated. If the pipe end is fully covered or coated, a shred of seal tape or residue of seal material may enter inside of the pipes or device and cause a failure.

When using a seal tape, wind it around the screw threads in the direction opposite from the screw threads and press it down with your fingers to attach it firmly.
When using a liquid seal material, be careful not to apply it to resin parts. The resin parts can become damaged and this may lead to a failure or malfunction.
Also, do not apply seal material to the internal threads.

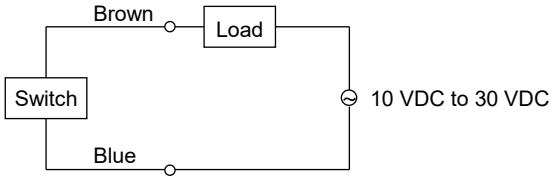


2.5 Wiring

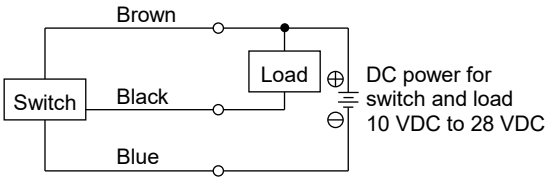
2.5.1 Proximity switch

■ Connection of lead wires

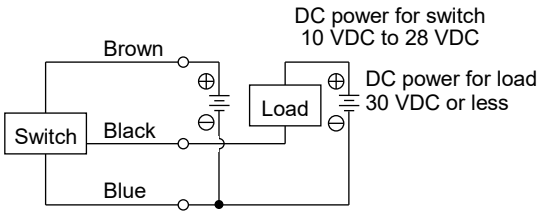
Turn off the power to the device in the electric circuit to which the switch is to be connected and connect the lead wires according to their color. Not turning off the power may cause damage to the electric circuit of the switch load.
If the switch is not wired correctly or the load is short-circuited, it may cause damage not only to the switch but also to the electric circuit on the load side.



Example of 2-wire basic circuit



Example of 3-wire basic circuit (1)
(When same power is used for switch and load)

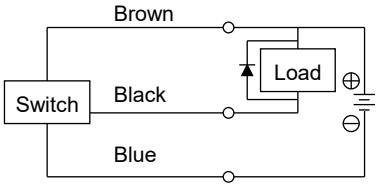


Example of 3-wire basic circuit (2)
(When separate power is used for switch and load)

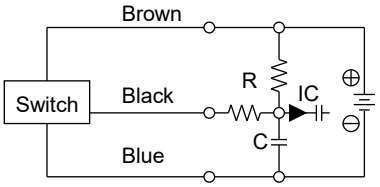
■ Protection of the output circuit

For the following cases, refer to the figures below and install a protection circuit:

- When an inductive load (relay or solenoid valve) is connected and used: See Ex. 1
  Use a surge absorption element since a surge voltage is generated when the switch is turned off.
- When a capacious load (capacitor) is connected and used: See Ex. 2
  Use a current regulating resistor since a starting current is generated when the switch is turned on.
- When the lead wire length exceeds 10 m: See Ex. 3 and 4 (2-wire type), Ex. 5 (3-wire type)

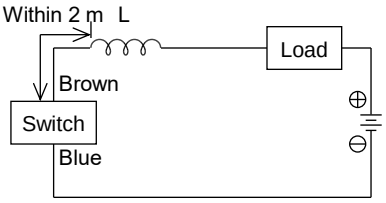


Ex. 1 Using inductive load with surge absorption element (diode). (For diode, use V06C manufactured by Hitachi or equivalent.)



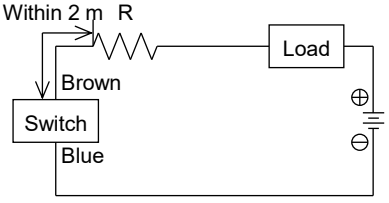
Ex. 2 Using capacious load with current regulating resistor R.
Use the following formula to figure out resistance R (Ω).

$$\frac{V}{0.05} = R\ (\Omega)$$



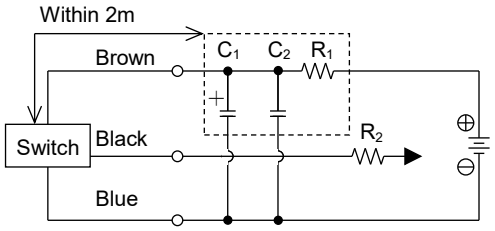
Ex. 3 - Choke coil
L = Several hundred μH to several mH
Excellent high frequency characteristic

- Wire near the switch (within 2 m).



Ex. 4 - Starting current restriction resistor
R = Highest possible resistance for the load circuit.

- Wire near the switch (within 2 m).



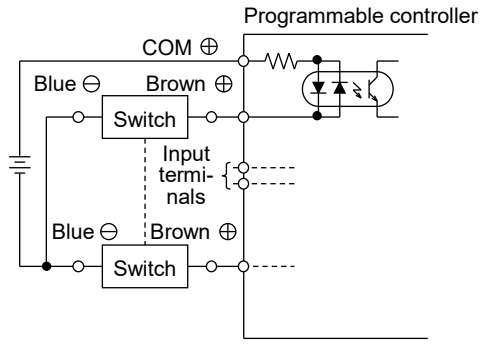
Ex. 5 - Power supply noise absorption circuit
C_1=20 μF to 50 μF electrolytic capacitor
(withstand voltage 50V or more)
C_2=0.01 μF to 0.1 μF ceramic capacitor
R_1=20 Ω to 30 Ω

- Starting current restriction resistor
R_2= Highest possible resistance for the load circuit.

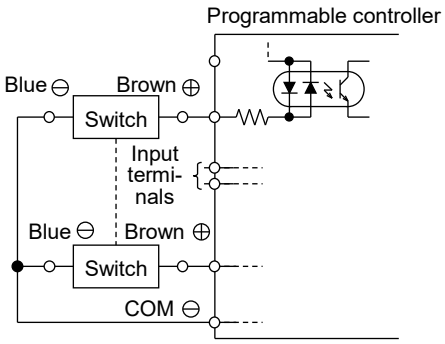
- Wire near the switch (within 2 m)

■ Connection to the programmable controller

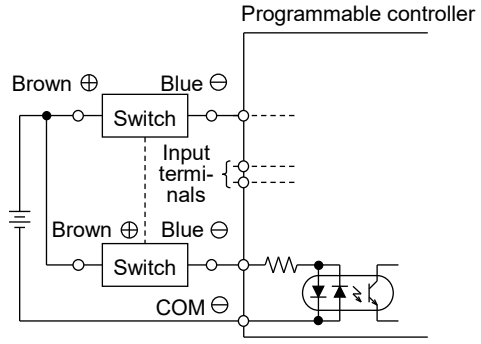
The connection method depends on the type of the programmable controller. Connect as shown below.



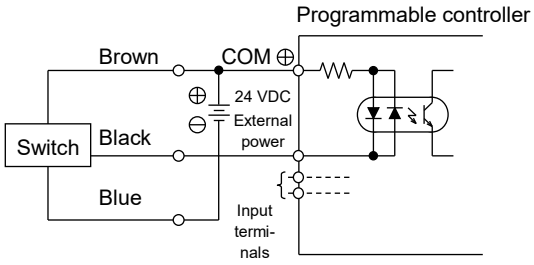
2-wire connection to source input
(external power)



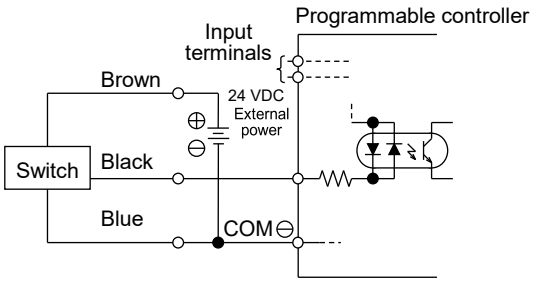
2-wire connection to source input
(internal power)



2-wire connection to sink input
(external power)



3-wire connection to source input
(external power)



3-wire connection to source input
(internal power)

■ Parallel connection

Since the leakage current of a 2-wire type switch increases according to the number of connected units, check the input specifications of the programmable controller, which is a connected load, to determine the number of switches to connect. For the 2-wire type switch, the indicator may become dim or not light up.

Although the leakage current of a 3-wire type switch increases according to the number of connected units, the leakage current is very small (10 μA or less) and can generally be ignored. For the 3-wire type switch, the indicator will light up without dimming.

3. USAGE

3.1 Using the Hand

⚠CAUTION

Do not apply excessive load to the finger when attaching, removing, or transferring the workpiece.
Scratches and dents may occur on the rolling surface of the finger linear guide and possibly cause a malfunction.

■ Precautions for linear guide

Since this product uses a linear guide with a finite track, the steel ball may shift due to the usage conditions and the individual product, and the sliding resistance may increase and the gripping force may decrease. In such a case, it can be corrected by increasing the working pressure, or by inserting a full stroke operation between the gripping operations.

■ Adjustment of the piston speed

Adjust the opening and closing speeds of the chuck with the speed controller (sold separately).
When used at a high speed, backlash may occur sooner than expected. In addition, the workpiece may vibrate due to shocks from opening or closing and this may lead to erroneous chucking, erroneous insertion of workpiece, and poor repeatability.

■ Prevention of condensation

Condensation (water drops) may occur in the piping under certain conditions if an actuator with small bore size or short stroke is operated at high frequency. Use a quick exhaust valve to prevent condensation.

■ Sealability of rubber cover

The rubber cover does not ensure reliable air tightness.
Due to the structure, there may be a gap between the rubber cover, and the body/fingers. If this raises an issue, please contact us.

■ Precautions for single acting type

The single acting type has minimum gripping power near the stroke end (S: closed end, C: open end). Additionally, due to the spring structure, it may not return when operating with a short stroke; therefore, give consideration to a small jaw shape that clamps the workpiece with a sufficient stroke.

3.2 Using the Switch

■ Magnetic environment

Do not use the switch in a place where there is a strong magnetic field or large current (such as a large magnet or welding machine). If switch mounted cylinders are installed close to each other and in parallel or if magnetic substances are moving close to the cylinder, the magnetic forces may interfere with each other and affect the detection accuracy.

■ Wiring of lead wires

When wiring, be careful not to apply bending stress and tension repeatedly to lead wires.
For movable sections, use wiring material with the same level of bending resistance as the robot wire.

■ Ambient temperature

Do not use the switch in a high temperature environment (60°C or more).
Using the switch in a high temperature environment may affect its performance due to the temperature characteristics of magnetic parts and electronic parts.

■ Shock

Do not subject the product to strong vibrations and shocks when transporting the cylinder and mounting and adjusting the switch.

4. MAINTENANCE AND INSPECTION

⚠WARNING

Do not touch electrical wiring connections (bare live parts) of actuators equipped with solenoid valves, actuators equipped with switches, and other such actuators.

Do not touch live parts with bare hands.
An electric shock may occur.

Turn off the power, release the residual pressure and make sure that there is no residual pressure before disassembling or inspecting the actuator.

⚠CAUTION

Plan and perform daily and periodic inspections so that maintenance can be managed properly.
If maintenance is not properly managed, the product's functions may deteriorate significantly and this may lead to faults (such as short service life, damage, and malfunction) or accidents.

4.1 Periodic Inspection

In order to use the product under optimum conditions, perform a periodic inspection every six months or when the operation count reaches 5 hundred thousand times.

4.1.1 Inspection item

- Actuation state
- Air leakage
- Looseness of screws and bolts
- Backlash in the finger
- Stroke abnormality

4.1.2 Maintenance of the product

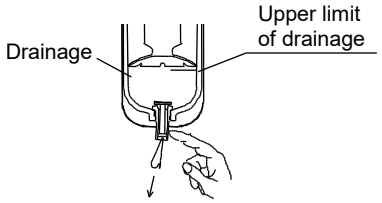
- Regularly grease the sliding section of the finger with lithium grease. Regular greasing can extend service life further.

Manufacturer	Model
THK	AFF grease

- Replace the rubber cover if there are scratches and cracks. The rubber cover is a consumable part.
- When replacing the rubber cover, since there may be abrasion powder on the parts covered by the rubber cover, do not remove it over the workpiece. Wipe off any abrasion powder on the hand unit before mounting a new rubber cover. Make sure that the rubber cover is securely fitted on the finger and the clearance between the body and the linear guide.
- This product can be disassembled (excluding ø6 model).
- If a problem such as an air leakage occurs, disassemble the product referring to “Internal structure” page in the catalog and then replace the parts listed as consumable parts. When replacing, secure the finger to the linear guide with adhesive tape. Otherwise, the finger may come off.

4.1.3 Maintenance of the circuit

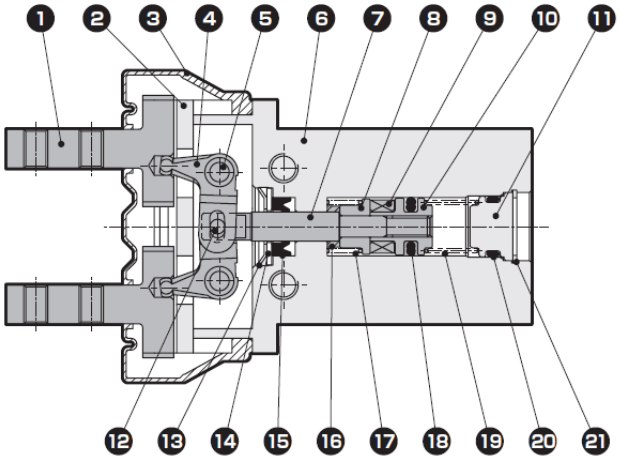
- Discharge the drainage accumulated in the air filter periodically before it exceeds the specified line.
- Since foreign matters such as carbide (carbon or tar substance) from the compressor oil may contaminate the circuit and cause an operation fault of the solenoid valve or the cylinder, be careful when performing maintenance or inspection of the compressor.

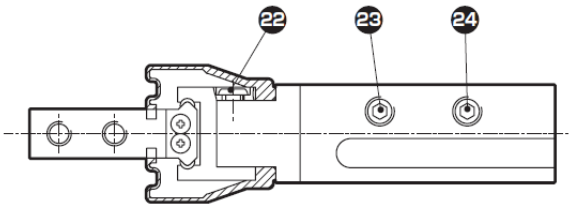


4.1.4 Consumable parts

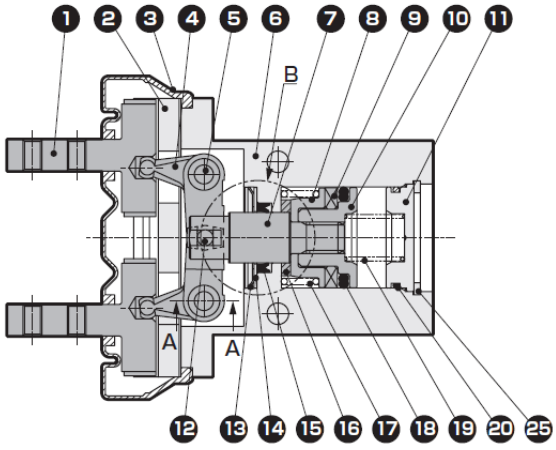
Internal structure

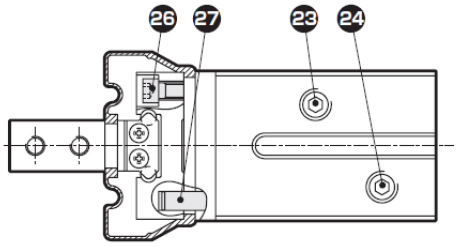
LSH☐-06



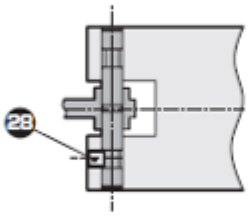


LSH☐-☐10 to 25
LSH-☐32

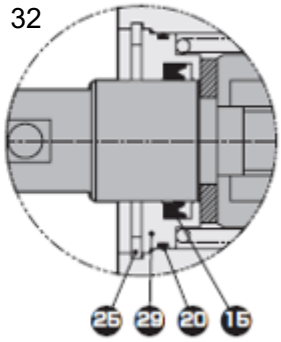




Cross-section A-A



Section B ø 20, 25, 32



Parts list

No.	Part name	Material	Quantity	Remarks
1	Finger	Stainless steel	1	
2	Linear guide	Stainless steel	1	
3	Rubber cover	LSH□-G: Chloroprene rubber LSH□-F: Fluoro rubber	1	LSH□-A: Without rubber cover
4	Lever	Stainless steel	2	
5	Fulcrum axis	Steel	2	
6	Body	Aluminum alloy	1	
7	Piston rod	Stainless steel	1	
8	Spring retainer	Aluminum alloy	1	
9	Magnet		1	
10	Piston	Aluminum alloy	1	
11	Head cover	Aluminum alloy	1	
12	Operation shaft	Alloy steel	1	
13	CR ring	Stainless steel	1	
14	Cap	Stainless steel	1	
15	Rod packing	NBR	1	
16	Cushion rubber	Urethane rubber	1	
17	Cylindrical spring	Piano wire	1	Single acting C
18	Piston packing	NBR	1	
19	Cylindrical spring	Piano wire	1	Single acting S
20	O-ring	NBR	1	For ø 20 ,ø 25 and ø 32 the quantity is 2.
21	C-type stop ring	Steel	1	
22	Pan head machine screw	Stainless steel	4	
23	Plug	Stainless steel	1	Single acting C
24	Plug	Stainless steel	1	Single acting S
25	C-type stop ring	Stainless steel	1	For ø 20 ,ø 25 and ø 32 the quantity is 2
26	Hexagon socket head bolt	Stainless steel (φ06 to φ25) Steel (φ32)	4	
27	Pin	Steel	2	
28	Hexagon socket head screw	Stainless steel	2	
29	Rod metal	Aluminum alloy	1	

Consumable parts list

<CR ring,Rod packing,Piston packing, O-ring>

Model	Bore size (mm)	Kit no.	Remarks
LSH	φ06	-	Cannot be disassembled
	φ10	LSH-10K-HP	Part no.13, 15, 18, 20
	φ16	LSH-16K-HP	
	φ20	LSH-20K-HP	Part no.15, 18, 20
	φ25	LSH-25K-HP	
	φ32	LSH-32K-HP	
LSHL	φ10	LSHL-10K-HP	Part no.13, 15, 18, 20
	φ16	LSHL-16K-HP	
	φ20 Note 1	LSH-20K-HP	Part no.15, 18, 20
	φ25 Note 1	LSH-25K-HP	

Note 1: Kit no. for ø 20 and ø 25 are the same for LSH and LSHL.

<Chloroprene rubber cover>

Model	Bore size (mm)	Kit no.	Remarks
LSH-G	φ06	LSH-G06K	Part no.3
	φ10	LSH-G10K	
	φ16	LSH-G16K	
	φ20	LSH-G20K	
	φ25	LSH-G25K	
	φ32	LSH-G32K	
LSHL-G	φ10	LSHL-G10K	
	φ16	LSHL-G16K	
	φ20	LSHL-G20K	

<Fluoro rubber cover>

Model	Bore size (mm)	Kit no.	Remarks
LSH-F	φ06	LSH-F06K	Part no.3
	φ10	LSH-F10K	
	φ16	LSH-F16K	
	φ20	LSH-F20K	
	φ25	LSH-F25K	
	φ32	LSH-F32K	
LSHL-F	φ10	LSHL-F10K	
	φ16	LSHL-F16K	
	φ20	LSHL-F20K	

5. TROUBLESHOOTING

5.1 Problems, Causes, and Solutions

If the product does not operate properly, check the table below for a possible solution.

5.1.1 Finger (cylinder)

Problem	Cause	Solution
Finger does not operate.	No pressure or insufficient pressure is applied.	Secure sufficient pressure.
	No signal is input to directional control valve.	Repair the control circuit.
	Centers were not aligned when mounted.	Correct the way the cylinder is mounted. Change the mounting style.
	Piston packing is damaged.	Replace the packing.
Finger does not operate smoothly.	Speed is lower than minimum working piston speed.	Mitigate load fluctuation.
	Centers were not aligned when mounted.	Correct the way the cylinder is mounted. Change the mounting style.
	Lateral load is applied.	Install a guide. Correct the way the cylinder is mounted. Change the mounting style.
	Load is too large.	Increase the pressure. Enlarge the bore size.
	Speed control valve has meter-in circuit.	Change the mounting direction of the speed control valve.
Finger is damaged or deformed.	Force of shock due to high-speed actuation is excessive.	Decrease the speed. Lighten the load. Install a more effective cushion mechanism (external cushion mechanism).
	Lateral load is applied.	Install a guide. Correct the way the cylinder is mounted. Change the mounting style.

5.1.2 Switch

Problem	Cause	Solution
Switch turns on but indicator does not blink.	Contact is welded.	Replace the switch.
	Rating of load is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
	Indicator is damaged.	Replace the switch.
	External signal is faulty.	Check the external circuit.
Switch does not turn on.	Cables are disconnected.	Replace the switch.
	External signal is faulty.	Check the external circuit.
	Voltage is wrong.	Use specified voltage.
	Switch is not mounted in right place.	Mount the switch in right place.
	Switch is not positioned correctly.	Position and tighten the switch correctly.
	Switch is facing opposite direction.	Mount the switch so that it faces the correct direction.
	Load (relay) cannot respond for intermediate position detection.	Lower the speed. Replace the relay with one recommended by CKD.
	Rating of load is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
Switch does not turn off.	Piston is not moving.	Move the piston.
	Contact is welded.	Replace the switch.
	Rating of relay is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
	Ambient temperature is too high or too low.	Use the switch at an ambient temperature of −10°C to 60°C.
	Magnetic field is nearby.	Install a magnetic shield.
	External signal is faulty.	Check the external circuit.

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

6. WARRANTY PROVISIONS

6.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

6.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.