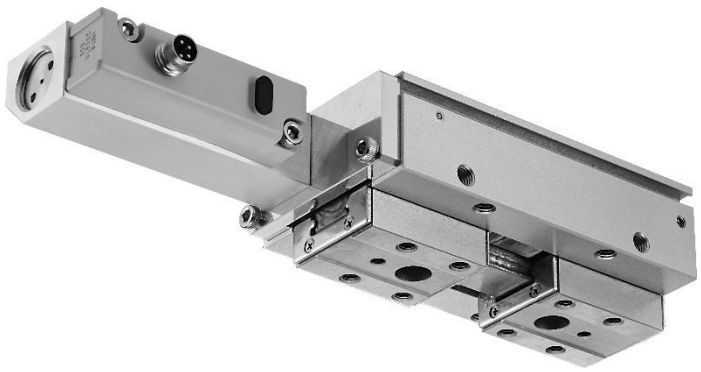
CKD

With length measuring function Thin Long Stroke Hand

LSTM-HP2 Series

INSTRUCTION MANUAL

SM-A46867-A



- 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 **"LSTM-HP2 Series" With length measuring function Thin long stroke 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), the High Pressure Gas Safety Act, the Industrial Safety and Health Act, other safety rules, organization standards, relevant laws and regulations

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 Design and Selection

⚠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.

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.

CONTENTS

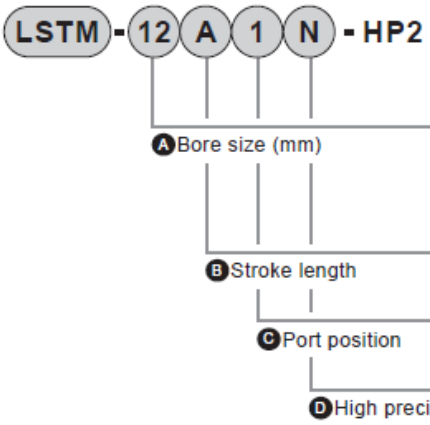
PREFACE ..... **i**
SAFETY INFORMATION ..... **ii**
Precautions on Product Use iii
Precautions on Design and Selection iii
Precautions on Product Disposal iv
CONTENTS ..... **v**
1. PRODUCT OVERVIEW **1**
1.1 Model Number Indication 1
1.1.1 LSTM-HP2 Series 1
1.2 Specifications 2
1.2.1 Product specifications 2
2. INSTALLATION **3**
2.1 Environment 3
2.2 Unpacking 4
2.3 Mounting 4
2.3.1 Mounting the body 4
2.3.2 Finger 7
2.4 Piping 8
2.5 Wiring 10
2.5.1 Cable connection 11
2.5.2 Internal circuit and plug contact 12
3. USAGE **13**
3.1 Using the Hand 13
4. MAINTENANCE AND INSPECTION **14**
4.1 Periodic Inspection 15
4.1.1 Inspection item 15
4.1.2 Maintenance of the product 15
4.1.3 Maintenance of the circuit 15
4.1.4 Consumable parts 16
5. TROUBLESHOOTING **18**
5.1 Problems, Causes, and Solutions 18
5.1.1 Finger (cylinder) 18
5.1.2 Sensor 19
6. WARRANTY PROVISIONS **20**
6.1 Warranty Conditions 20
6.2 Warranty Period 20

1. PRODUCT OVERVIEW

1.1 Model Number Indication

1.1.1 LSTM-HP2 Series

■ **Example of model number indication**



Code	Description
A Bore size (mm)	
12	ø12
16	ø16
20	ø20
B Stroke	
A	Short stroke length
C Port position	
1	Standard, axis direction
D High precision positioning hole	
N	None
A	Yes

1.2 Specifications

1.2.1 Product specifications

Descriptions	LSTM-HP2		
	LSTM-12	LSTM-16	LSTM-20
Bore size mm	φ12 × 2	φ16 × 2	φ20 × 2
Actuation	Double acting		
Working fluid	Compressed air		
Max. working pressure MPa	0.7		
Min. working pressure MPa	0.1		
Port size	M5		
Operating stroke length mm	12	16	20
Power supply voltage	24 VDC ±10%		
Current consumption	25 mA or less		
Indicator	Green LED lights up when power is applied		
Analog output	When fingers are closed, 1 V; opened, 5 V [Note1], connection load: 100 kΩ or more		
Analog output linearity	± 0.5% F.S. or less (at ambient temperature of 25°C)		
Repeatability of analog output	± 0.04 mm or less (at ambient temperature of 25°C, no deformation or wear of actuator/jig)		
Valid measuring length range mm	12	16	20
Shock resistance (sensor/amplifier section)	294m/s^2		
Vibration resistance (sensor/amplifier section)	10 to 55Hz double amplitude 1.5mm, 2 hours in each X, Y, Z direction		
Degree of protection (sensor/amplifier section)	IEC standards IP65		
Ambient temperature, humidity	10°C to 60°C, 85% RH or less (no freezing)		
Product Weight kg	0.26	0.50	0.90
Lubrication	Not required		

Note 1: There is output fluctuation of 1 mV/°C.

2. INSTALLATION

2.1 Environment

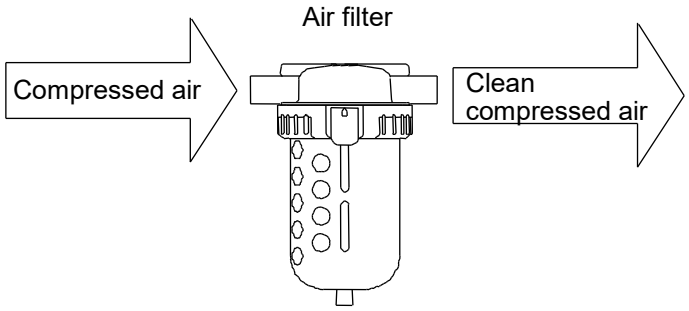
⚠CAUTION

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, RH 85% or less
- 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.

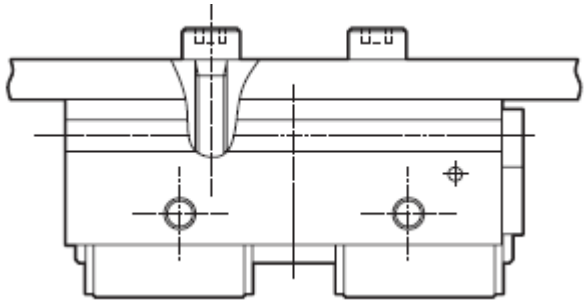
2.3.1 Mounting the body

The body can be mounted from four mounting surfaces with tap holes and one surface with through holes.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.

■ Tightening Torque

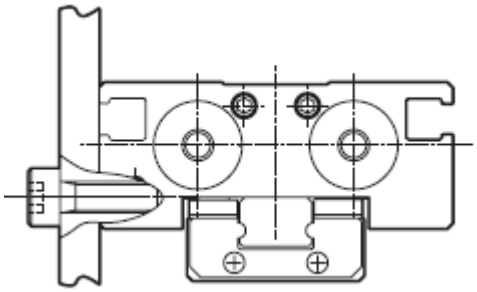
When mounting the product where vibrations may occur, take measures (such as installing a spring washer or applying an adhesive) to prevent the bolt from loosening.

●Top mounting



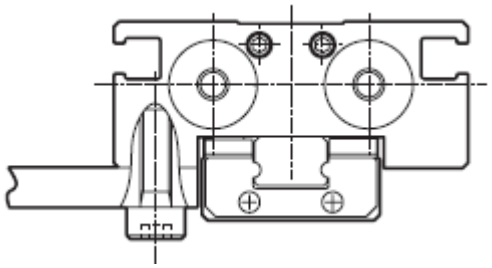
Model	Bolt size	Tightening torque (N·m)	Max. screw-in depth
LSTM-12	M4×0.7	2.1	10
LSTM-16	M5×0.8	4.3	12
LSTM-20	M6×1.0	7.3	15

●Front mounting



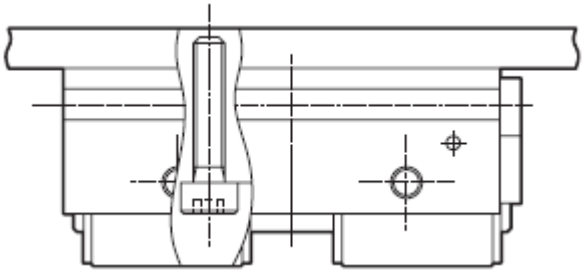
Model	Bolt size	Tightening torque (N·m)	Max. screw-in depth
LSTM-12	M4×0.7	1.6	5
LSTM-16	M5×0.8	3.3	5.5
LSTM-20	M6×1.0	5.8	6

●Bottom mounting



Model	Bolt size	Tightening torque (N·m)	Max. screw-in depth
LSTM-12	M4×0.7	1.6	5
LSTM-16	M5×0.8	3.3	5.5
LSTM-20	M6×1.0	5.8	6

●Using through holes



Model	Bolt size	Tightening torque (N·m)
LSTM-12	M3×0.5	0.88
LSTM-16	M4×0.7	2.1
LSTM-20	M5×0.8	4.3

■ Allowable load

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

2.3.2 Finger

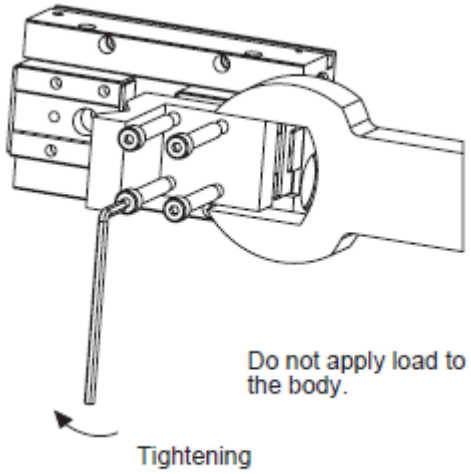
■ Rigidity of the attachment

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

■ Mounting the attachment

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.
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.

Tighten with the following tightening torque when mounting.



Model	Bolt size	Tightening torque (N·m)
LSTM-12	M3×0.5	0.59
LSTM-16	M4×0.7	1.4
LSTM-20	M4×0.7	1.4

■ Clamping operation

Clamping operation is accurate when performed as softly as possible at a low speed. Repeatability is also stable.

■ Attachment

Use attachments as short and lightweight as possible.If the attachments is long and heavy, inertia increases when opening and closing. This may cause play in the finger, and adversely affect durability.

- Refer to the catalog's "Model selection" page for length of attachment.

- The weight of the attachment affects durability, so check that the weight is less than the following value.

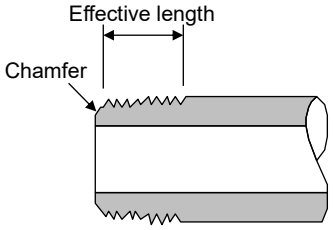
W < 1/4 H (1 pc.)
W: Weight of attachment
H : Product weight of Hand

2.4 Piping

⚠ WARNING

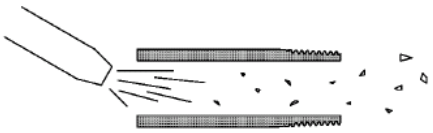
Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

- 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

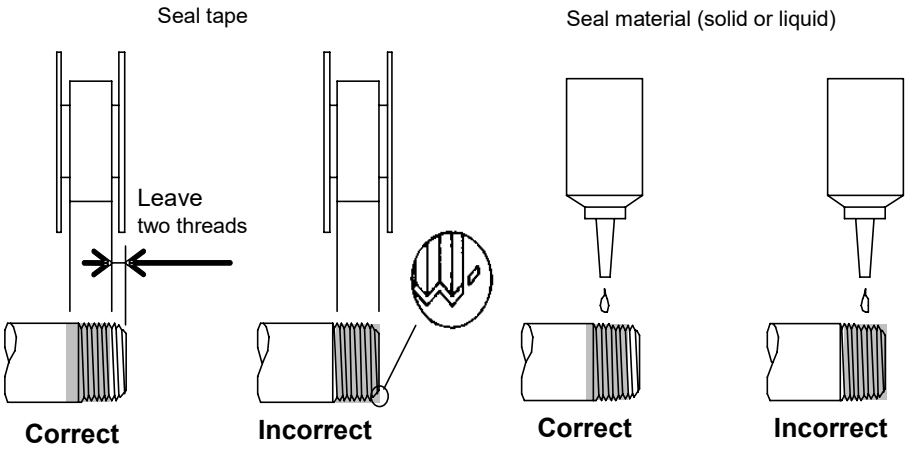
Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ 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

⚠WARNING

Use a DC stabilized power supply for the product.
Do not connect noise-generating devices such as motors and valves to the power supply used for this product.

⚠CAUTION

Install the wiring so that no induction noise is applied to the sensor/amplifier section.

- Do not pipe or wire the product in the same piping or wiring (with multi-conductor cables) as the power lines for motors.
- Do not pipe or wire the product in the same piping or wiring as the power supplies and wires for inverter power supply and its wiring.
- Frame ground the inverter power supply correctly so that noise is released.

Use caution when using a cable that is longer than 5 m.
Noise resistance performance may be adversely affected if the cable is too long.

Wire the cable so as not to apply concentrated bending and tension.

Make sure that the cable is not subjected to repeated bending.

Make sure that the M8 connector is not subjected to a load of 30 N or more.

This product cannot be used outdoors or in an atmosphere containing corrosive elements.

Securely tighten the M8 threaded connection of the cable to ensure water resistance.

2.5.1 Cable connection

⚠CAUTION

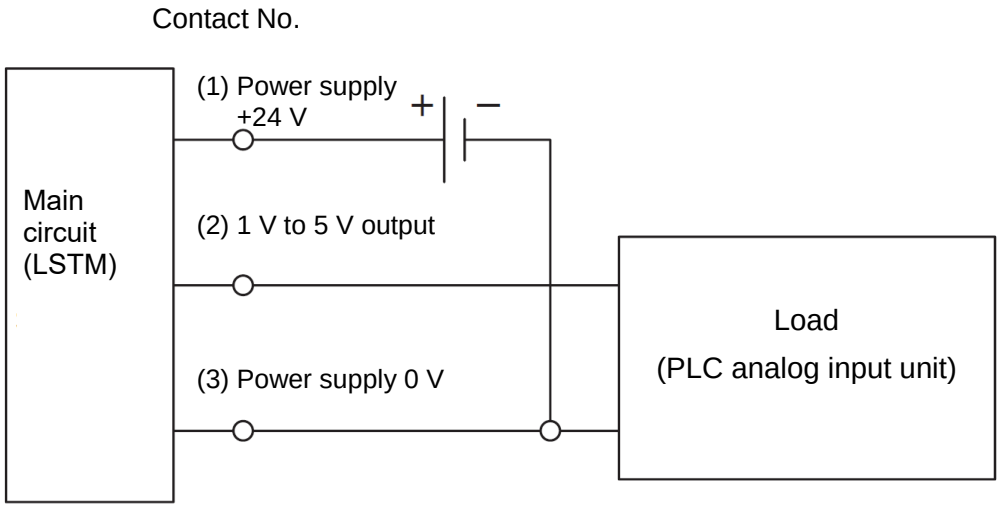
Turn off the power before wiring the product.

Do not touch the mating faces of the connectors with wet hands.
Wipe off any moisture on the connectors and peripheral parts before wiring. Insulation failure may occur if there is moisture.

Make sure that metal chips and powder do not enter the mating faces of the connectors.

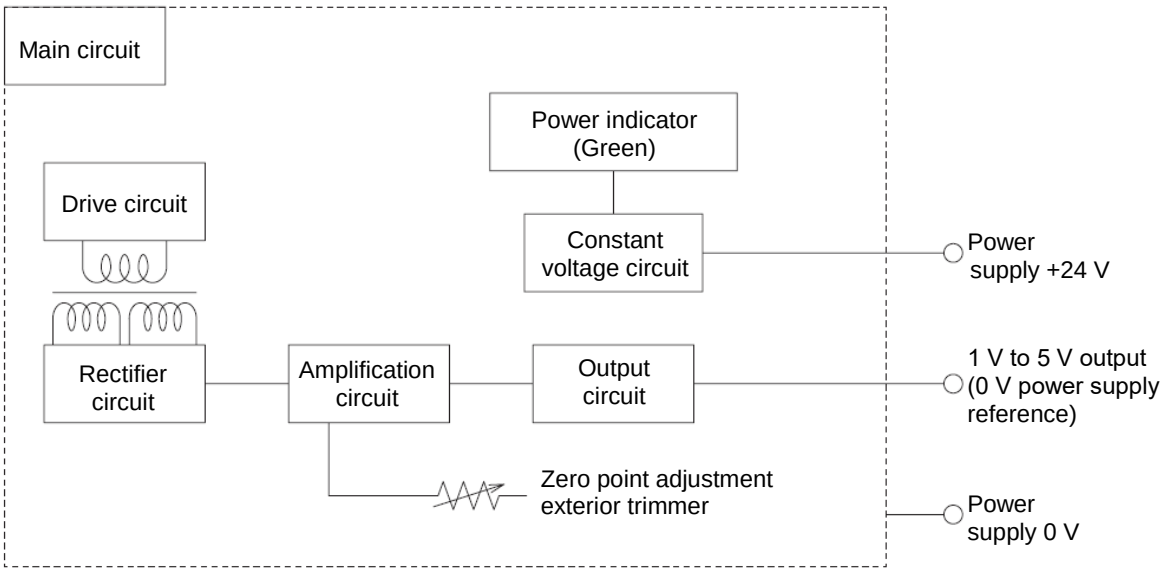
Tighten the connector fixture (M8) by hand (proper tightening torque: 0.2 N·m).
Using a tool such as pliers may cause damage due to excessive load.
If the tightening force is insufficient, the degree of protection may not be maintained and loosening may occur due to vibration.

■ Connecting the lead wire

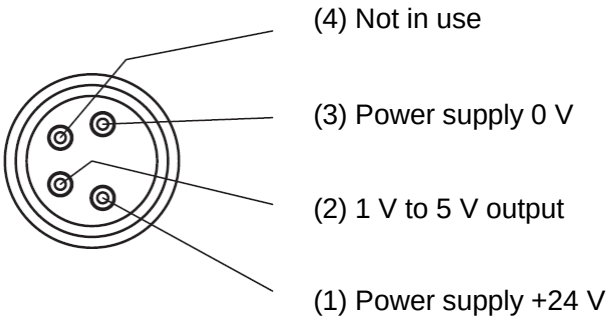


2.5.2 Internal circuit and plug contact

■ Internal circuit (LSTM)



■ Plug contact array diagram (LSTM)



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.

Be careful of the fluctuation of the analog output voltage caused by jig deformation and abrasion due to use over time.

The analog output voltage corresponds to the cylinder piston position.
For the hand, fluctuation is caused by a backlash in the finger opening and closing direction and deformation and abrasion of the attachement.
If the analog output voltage fluctuates, perform fine adjustment using the zero point adjustment exterior trimmer.

When measuring the length on a full scale, add a backlash amount of 0.15 mm.

■ 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

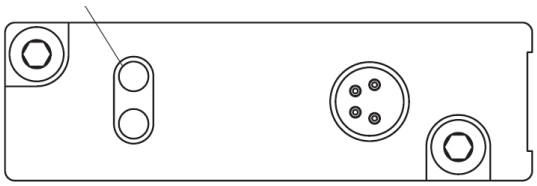
Condensation (water drops) may occur in the piping under certain conditions if an actuator with small bore size or short stroke is operated at high frequency. Use a quick exhaust valve to prevent condensation.

■ Fine adjustment of analog output voltage

In order to adjust the analog output voltage, follow the procedure shown below.

1 Remove the attachment.
2 Move the finger to the closed position.
3 Remove the rubber stopper from the zero point adjustment exterior trimmer.
4 Rotate the trimmer and perform fine adjustment so that the output voltage is 1 V.

Zero point adjustment exterior trimmer



5 Put the rubber plug back the way it was.
Make sure to put it back so that water and foreign matter do not enter.

4. MAINTENANCE AND INSPECTION

⚠WARNING

Do not disassemble the product.

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

Check the items above and refer to "5. TROUBLESHOOTING" to correct any abnormality found. If there are loose threaded connections, tighten them.

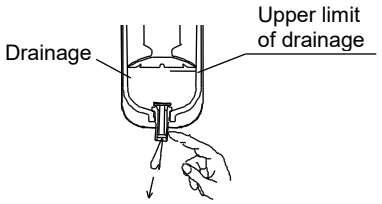
4.1.2 Maintenance of the product

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

Manufacturer	Model
THK	AFF grease

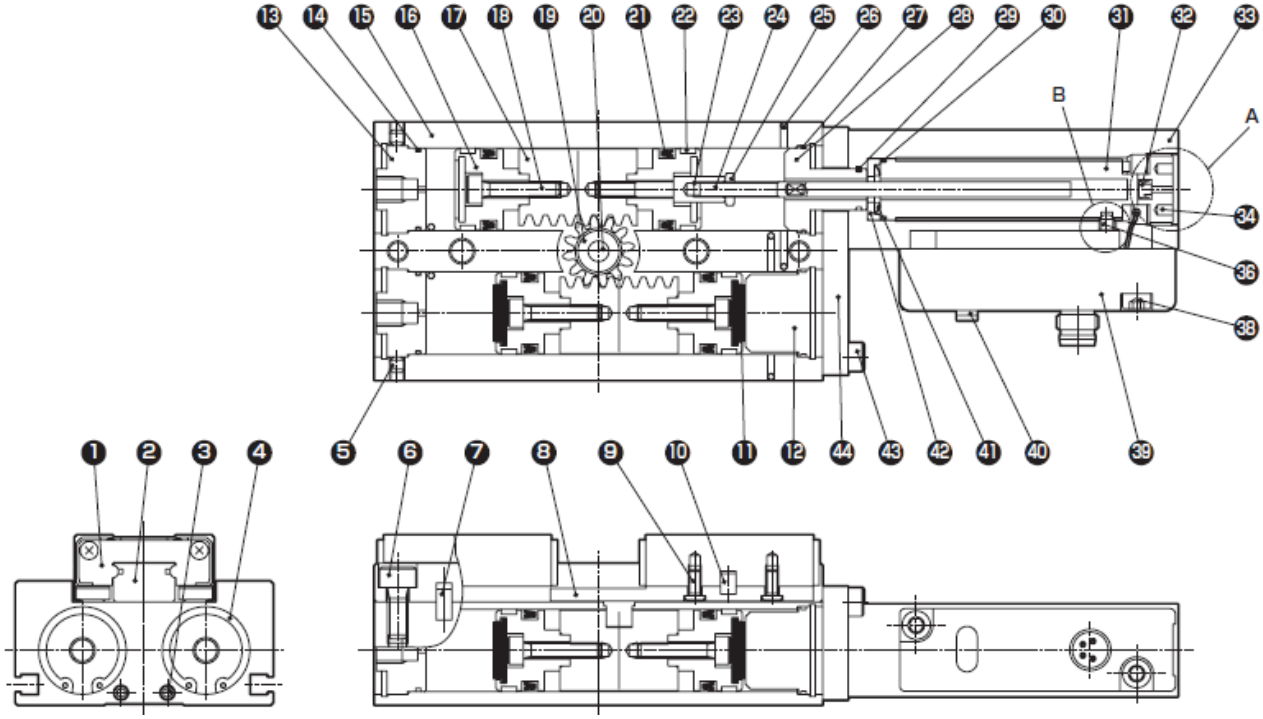
4.1.3 Maintenance of the circuit

- 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.

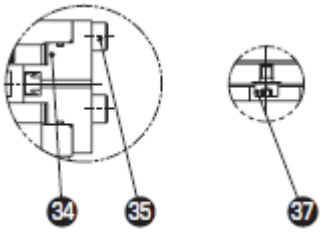


4.1.4 Consumable parts

LSTM-12 to 20A



Section A φ12 Section B φ20



Parts list * Cannot be disassembled

No.	Part name	Material	Quantity
1	Finger	Stainless steel	
2	Linear guide	Stainless steel	
3	Hexagon socket set screw	Stainless steel	
4	Round R-type stop ring	Steel	ϕ12
	C-type stop ring	Steel	ϕ16 to 20
5	Hexagon socket set screw	Stainless steel	
6	Hexagon socket head cap screw	Stainless steel	
7	Pin	Stainless steel	
8	Rack joint	Stainless steel	
9	Pan head machine screw	Stainless steel	
10	Pin	Stainless steel	
11	Cushion rubber	Urethane rubber	
12	Cover 1	Aluminum alloy	Chromate
13	Port cover	Aluminum alloy	Chromate
14	O-ring	NBR	
15	Body	Aluminum alloy	Hard alumite
16	Piston	Aluminum alloy	Chromate
17	Rack	Stainless steel	
18	Hexagon socket head cap screw	Stainless steel	
19	Pinion	Steel alloy	
20	Pin	Stainless steel	
21	Piston packing	NBR	
22	Wear ring	Acetal resin	
23	Fixed rod	Stainless steel	
24	Core shaft	Steel	
25	Nut	Stainless steel	
26	Steel ball	Stainless steel	
27	O-ring	NBR	
28	Cover 2	Aluminum alloy	Chromate
29	O-ring	NBR	
30	O-ring	NBR	
31	Sensor body	—	
32	Check valve	NBR	
33	Sensor adaptor	Aluminum alloy	Chromate
34	Head cover	Chromate	
35	Hexagon socket head cap screw	Stainless steel	
36	Hexagon socket set screw	Stainless steel	
37	Hexagon socket head cap screw	Stainless steel	
38	Hexagon socket head cap screw	Stainless steel	
39	Amplifier	—	
40	Plug	NBR	
41	Wave washer	Stainless steel	
42	Washer retainer	Aluminum alloy	
43	Hexagon socket head cap screw	Stainless steel	
44	Mounting plate	Aluminum alloy	

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 cylinder.
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 Sensor

Problem	Cause	Solution
Indicator does not light up.	Wiring is not correct.	Refer to “2.5 Wiring” and correct the wiring.
	Power supply voltage is too low.	Set the power supply voltage range to 24 VDC ± 10%.
Analog output does not work.	Wiring is not correct.	Refer to “2.5 Wiring” and correct the wiring.
Analog output works but the value is small.	Load impedance does not match.	Set the connected load impedance to 100 kΩ or more.
Analog output fluctuates when piston or finger is stopped.	Noise is applied.	Suppress the generation of noise.
		Separate the wiring and piping of the product from the piping and wiring of the power lines and inverters so that no induction noise is applied.
Zero point of analog output voltage fluctuates.	There is deformation or abrasion of attachment.	Refer to “3.1 Using the Hand” and perform fine adjustment using the zero point adjustment external trimmer.
	Air pressure fluctuates.	Keep the air pressure constant.

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.