CKD

Linear Slide Hand

LSHM-HP Series (ø10 to ø25)

INSTRUCTION MANUAL

SM-A10931-A/5

- 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 **"LSHM-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

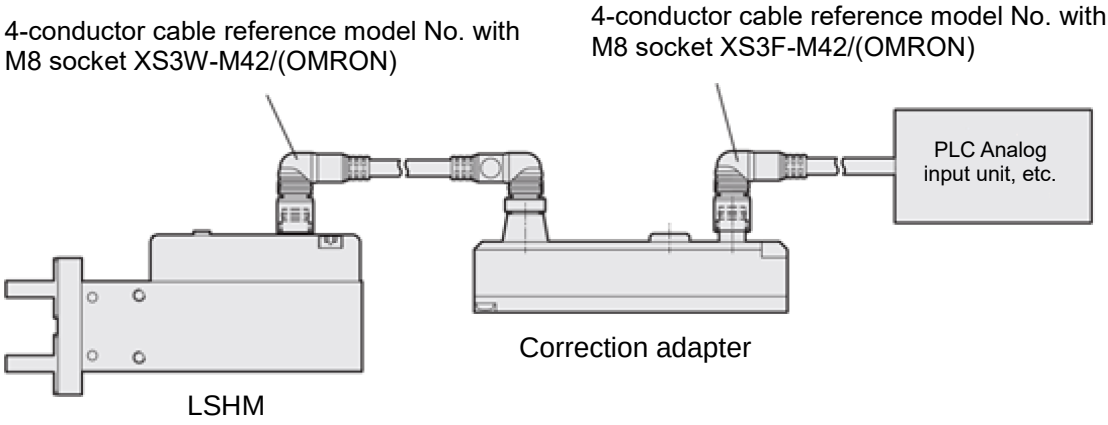
When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

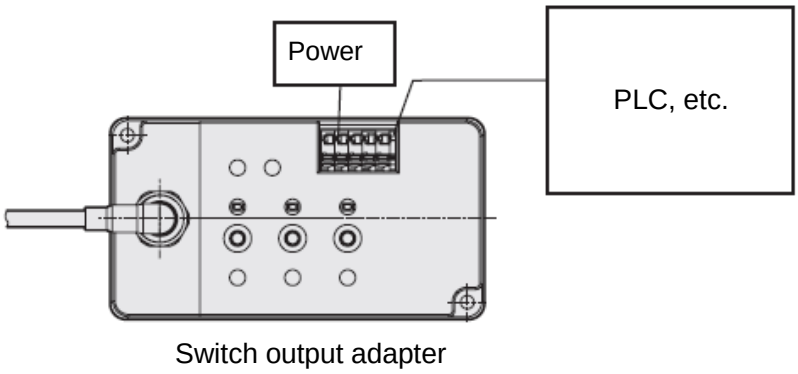
CONTENTS

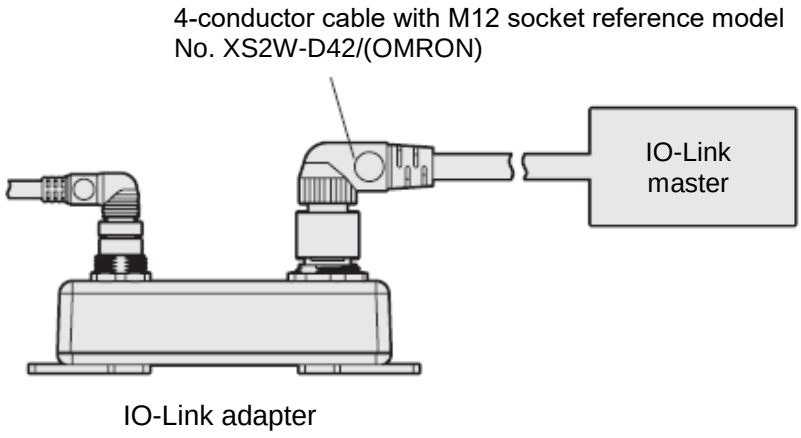
1. PRODUCT OVERVIEW

1.1 System Structure

1.1.1 Each adapter

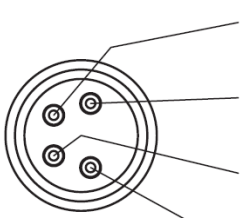






1.1.2 Plug contact array diagram

Without correction adapter



(4) Not in use

(3) Power supply 0 V

(2) 1 to 5 V output

(1) Power supply +24 V

Each adaptor (IN side)

M8 socket pin array

(1) +24VDC

(3) COM

(2) 1-5V output

(4) Not in use

Correction adapter (OUT side)

M8 plug (OUT side) pin array

(3) COM

(1) +24VDC

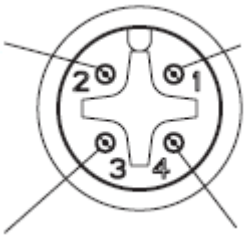
(4) Not in use

(2) 1-5V output

IO-Link adaptor (OUT side)

(2) Not in use

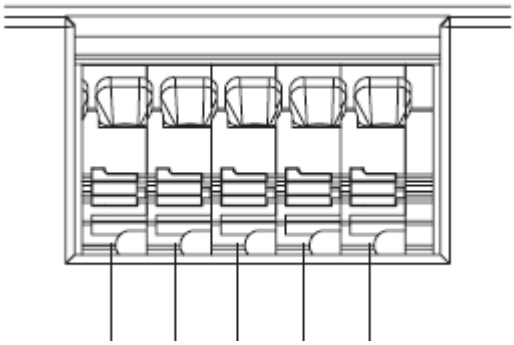
(1) +24VDC



(3) COM

(4)C/Q

Switches output adaptor (terminal block)



+24VDC COM ch1 ch2 ch3

1.2 Model Number Indication

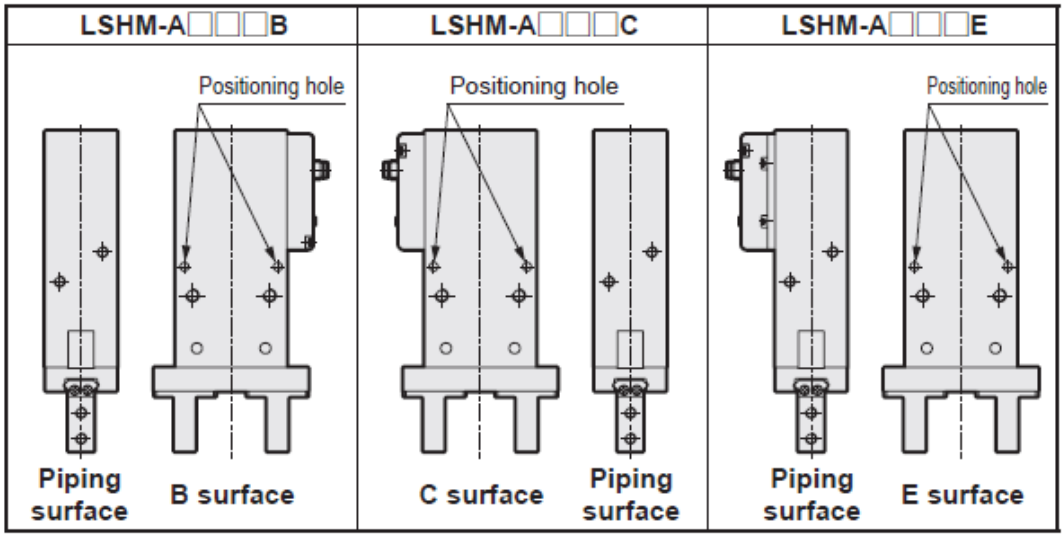
1.2.1 LSHM-A Series

LSHM - A 10 D 2 A - N - HP2

Ⓐ Rubber cover
Ⓑ Bore size
Ⓒ Actuation
Ⓓ Finger
Ⓔ Amp mounting position / grip center reference, high precision positioning hole
Ⓕ Adapter option

Code	Description
Ⓐ Rubber cover	
A	Without rubber cover
Ⓑ Bore size (mm)	
10	ø10
16	ø16
20	ø20
25	ø25
Ⓒ Actuation	
D	Double acting
Ⓓ Finger * Refer to the Dimensions for details.	
1	Basic
2	Side tap
3	Through hole
4	Flat
Ⓔ Amp mounting position / grip center reference, high precision positioning hole *1	
A	Amp side / no positioning hole
B	Amp side / rear with finger below and piping right
C	Amp side / rear with finger below and piping left
D	Amp front / no positioning hole
E	Amp front / rear with finger below and piping right
Ⓕ Adapter option *2	
N	Without adapter
A	Correction adapter
B	Switch output adaptor (NPN)
C	Switch output adaptor (PNP)
D	IO-Link adapter

Note 1: Amp mounting position/grip center reference, high precision positioning hole



Note 2: Shipped with the product.

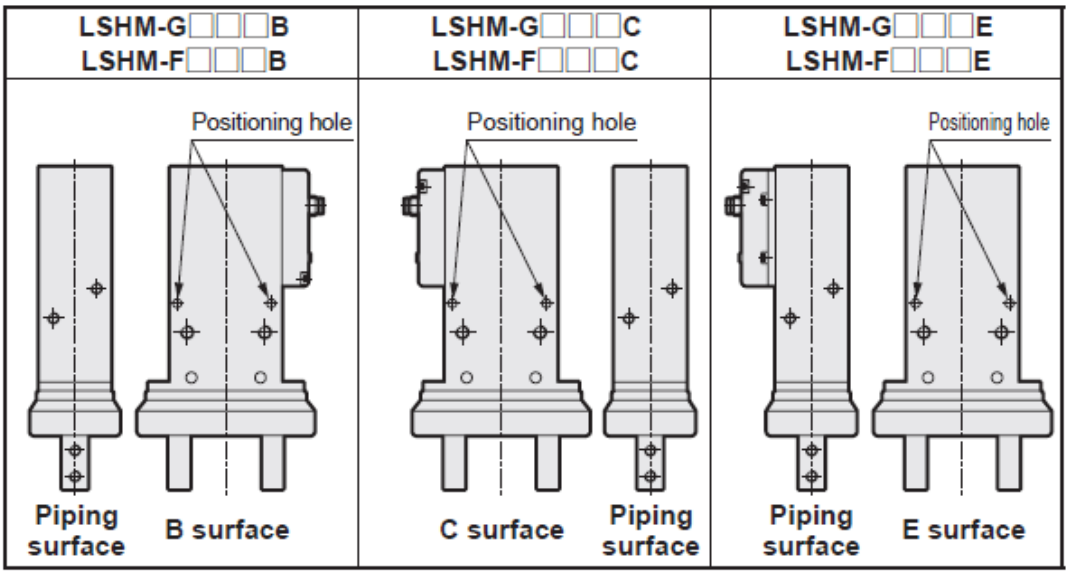
1.2.2 LSHM-G, LSHM-F Series

LSHM - G 10 D 1 A - N - HP2

Ⓐ Rubber cover
Ⓑ Bore size
Ⓒ Actuation
Ⓓ Finger
Ⓔ Amp mounting position / grip center reference, high precision positioning hole
Ⓕ Correction adapter option

Code	Description
Ⓐ Rubber cover	
G	Chloroprene rubber
F	Fluoro rubber
Ⓑ Bore size (mm)	
10	ø10
16	ø16
20	ø20
25	ø25
Ⓒ Actuation	
D	Double acting
Ⓓ Finger	
1	Basic
Ⓔ Amp mounting position / grip center reference, high precision positioning hole *1	
A	Amp side / no positioning hole
B	Amp side / rear with finger below and piping right
C	Amp side / rear with finger below and piping left
D	Amp front / no positioning hole
E	Amp front / rear with finger below and piping right
Ⓕ Adapter option *2	
N	Without correction adapter
A	Correction adapter attached
B	Switch output adaptor (NPN)
C	Switch output adaptor (PNP)
D	IO-Link adapter

Note 1: Amp mounting position/grip center reference, high precision positioning hole



Note 2: Shipped with the product.

1.3 Specifications

1.3.1 Product specifications

■ LSHM-A

Descriptions		LSHM-A							
Size		10		16		20		25	
Bore size mm		ø10		ø16		ø20		ø25	
Actuation		Double acting							
Working fluid		Compressed air							
Max. working pressure MPa		0.7							
Min. working pressure MPa		0.2		0.1		0.1		0.1	
Proof pressure Mpa		1.0							
Port size		M3		M5		M5		M5	
Operating stroke length mm		4		6		10		14	
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	Without correction adaptor	± 3% F.S. or less (at ambient temperature of 25°C)							
	With correction adaptor	± 0.5% F.S. or less (at ambient temperature of 25°C)							
Repeatability of analog output		± 0.02 mm or less (at ambient temperature of 25°C, no deformation or wear of actuator/jig)							
Valid measuring length range mm		4.5		6.5		10		14	
Shock resistance (sensor/amplifier section)		294 m/s²							
Vibration resistance (sensor / amplifier section)		10 to 55 Hz compound amplitude 1.5 mm, 2 hours per 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)							
Amplifier mounting position		Side	Front	Side	Front	Side	Front	Side	Front
Product Weight kg	Finger:1,2,3	0.108	0.120	0.221	0.238	0.437	0.457	0.752	0.773
	Finger:4			0.226	0.243	0.442	0.462	0.782	0.803
Lubrication		Not required							

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

■ LSHM-G, LSHM-F

Descriptions		LSHM-G, LSHM-F							
Size		10		16		20		25	
Bore size	mm	ø10		ø16		ø20		ø25	
Actuation		Double acting							
Working fluid		Compressed air							
Max. working pressure	MPa	0.7							
Min. working pressure	MPa	0.2		0.1		0.1		0.1	
Proof pressure	Mpa	1.0							
Port size		M3		M5		M5		M5	
Operating stroke length	mm	4		6		10		14	
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	Without correction adaptor	± 3% F.S. or less (at ambient temperature of 25°C)							
	With correction adaptor	± 0.5% F.S. or less (at ambient temperature of 25°C)							
Repeatability of analog output		± 0.02 mm or less (at ambient temperature of 25°C, no deformation or wear of actuator/jig)							
Valid measuring length range	mm	4.5		6.5		10		14	
Shock resistance (sensor/amplifier section)		294 m/s²							
Vibration resistance (sensor / amplifier section)		10 to 55 Hz compound amplitude 1.5 mm, 2 hours per 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)							
Amplifier mounting position		Side	Front	Side	Front	Side	Front	Side	Front
Weight	kg	0.113	0.125	0.236	0.253	0.462	0.482	0.792	0.813
Lubrication		Not required							

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

2. INSTALLATION

2.1 Environment

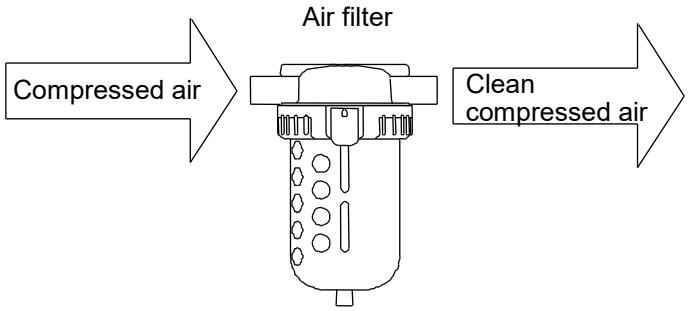
⚠CAUTION

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
- The protection structure of the switch output adapter and IO-Link adapter is equivalent to IP40. Do not install in a place with moisture, salt, dust and cuttings.

- Use the product within the following ambient temperature range.
  10°C to 60°C, RH 85% or less (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

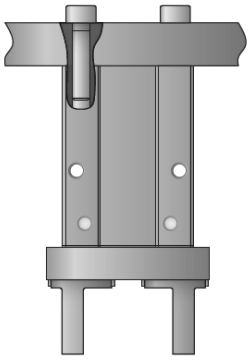
Install a protective cover as a safety measure if the moving workpiece can pose a risk to humans or if human fingers can get caught in the finger and/or the attachment.

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

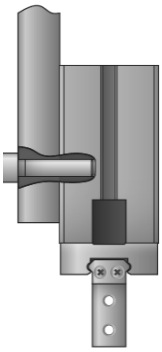
If the circuit pressure drops due to a power failure or a problem with the air source, the gripping power may decrease and the workpiece may fall.

2.3.1 Body

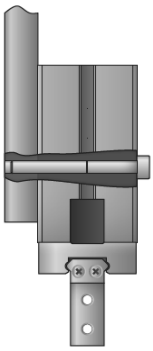
The body can be mounted from three directions. Select the mounting direction appropriate for the application. Do not put any dents and scratches on the body mounting surface or the finger that may affect their flatness and perpendicularity.



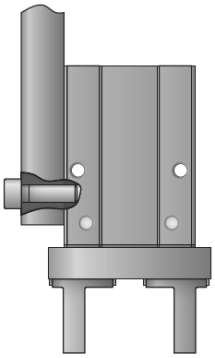
Top mounting



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
LSHM-☐10	M3	0.88	6
LSHM-☐16	M4	2.1	8
LSHM-☐20	M5	4.3	10
LSHM-☐25	M6	7.3	12

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

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

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

■ Allowable load

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

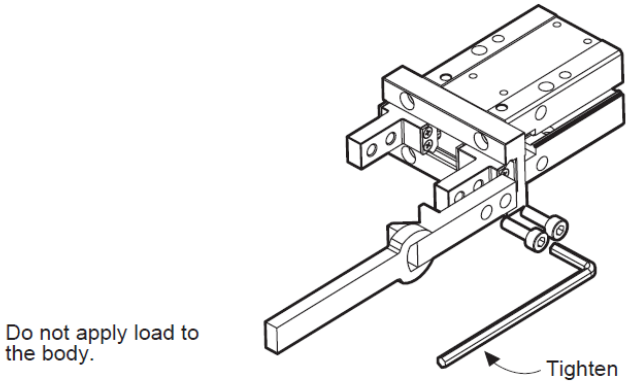
2.3.2 Finger

■ Rigidity of the attachment

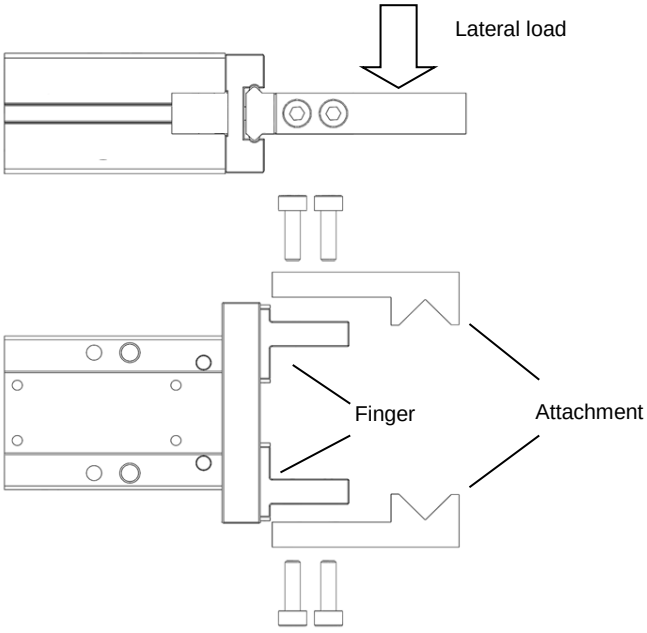
If the attachment is not rigid enough, sagging can result and cause the finger to twist or adversely affect operation.

■ 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.



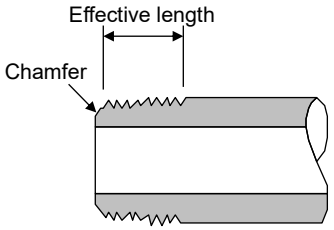
Backlash or damage may occur when an excessive lateral load or an impact load is applied. Use the product so that the external force applied to the finger does not exceed the allowable load described in the catalog.

2.4 Piping

⚠ WARNING

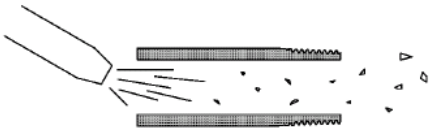
Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

- 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

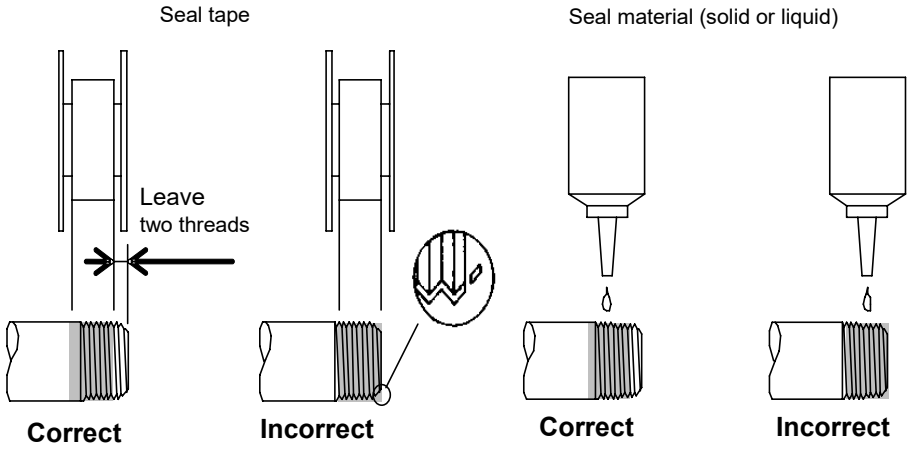
Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ 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/M12 connector is not subjected to a load of 30 N or more.

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

2.5.1 Cable connection

⚠CAUTION

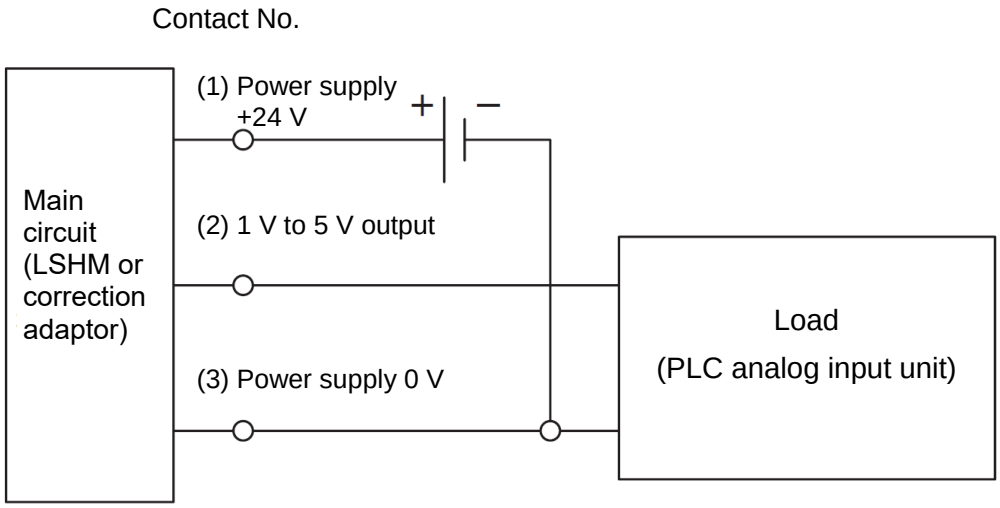
Turn off the power before wiring the product.

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.

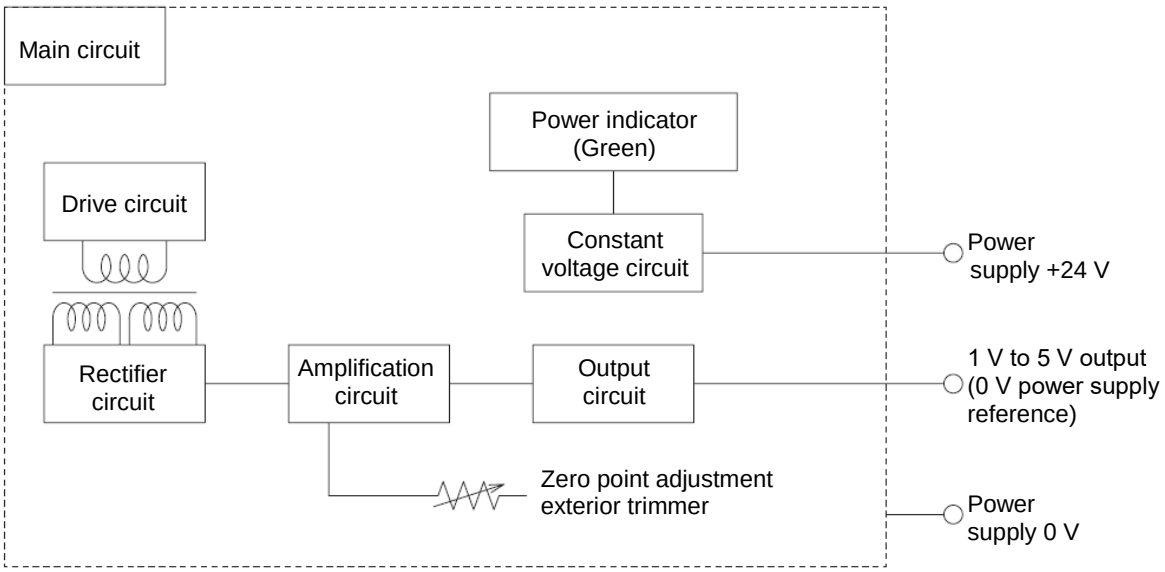
■ Connecting the lead wire



* Use the correction adaptor that was shipped together with LSHM.

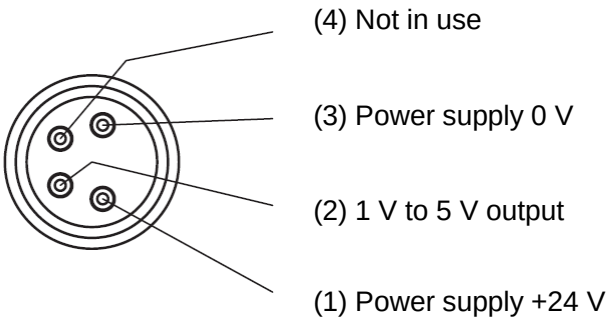
2.5.2 Internal circuit and plug contact

■ Internal circuit (LSHM)

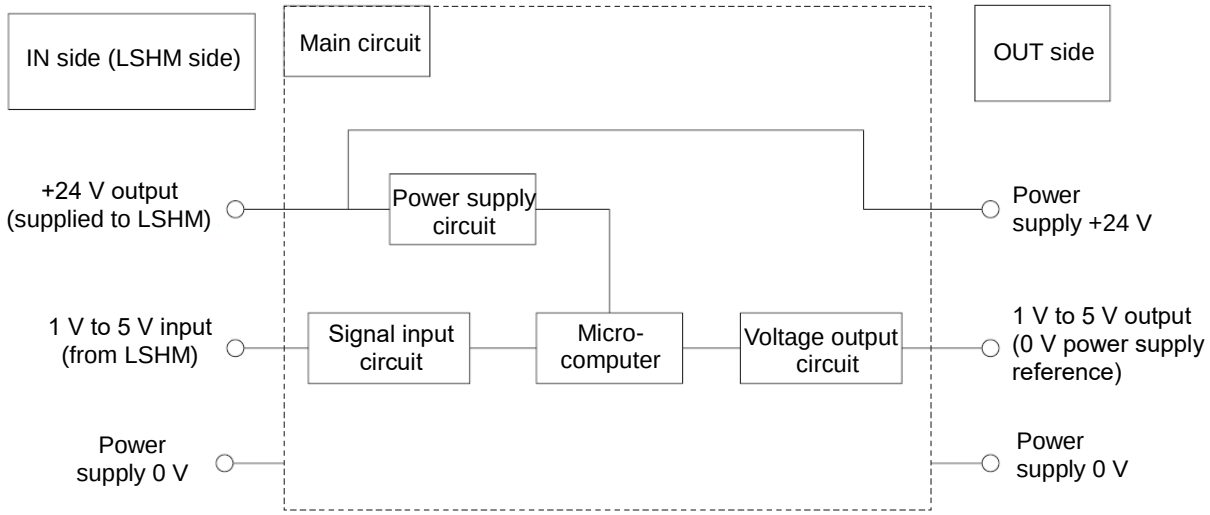


■ Plug contact array diagram (LSHM)

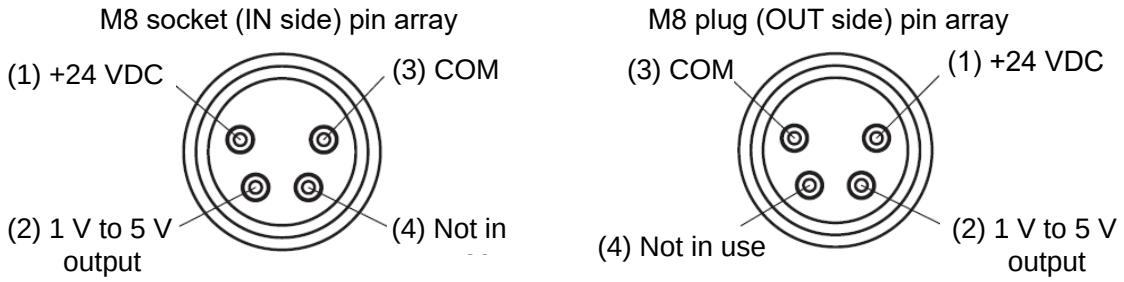
<Without correction adaptor>



■ Internal circuit (correction adaptor)



■ Plug contact array diagram (correction adaptor)



2.6 Correction adaptor specifications

Descriptions	Correction adaptor
Power supply voltage	24 VDC ±10%
Current consumption	35 mA or less
Indicator	Red LED lights up when power is applied
Analog input	1 V to 5 V (LSHM Series output voltage)
Analog output	1 V to 5 V, connection load 50 kΩ or more
Analog output linearity	± 0.5%F.S. or less (at ambient temperature of 25°C, connected to LSHM Series, measuring method provided by CKD)
Repeatability of analog output	± 0.02 mm or less (at ambient temperature of 25°C, no deformation or wear of actuator/jig)
Input connector	M8 waterproof round 4-pin connector socket
Output connector	M8 waterproof round 4-pin connector plug
Shock resistance	294 m/s²
Degree of protection	IEC standards IP65
Ambient temperature, humidity	10°C to 60°C, 85% RH or less
Mounting method	Direct mounting
Weight	40 g

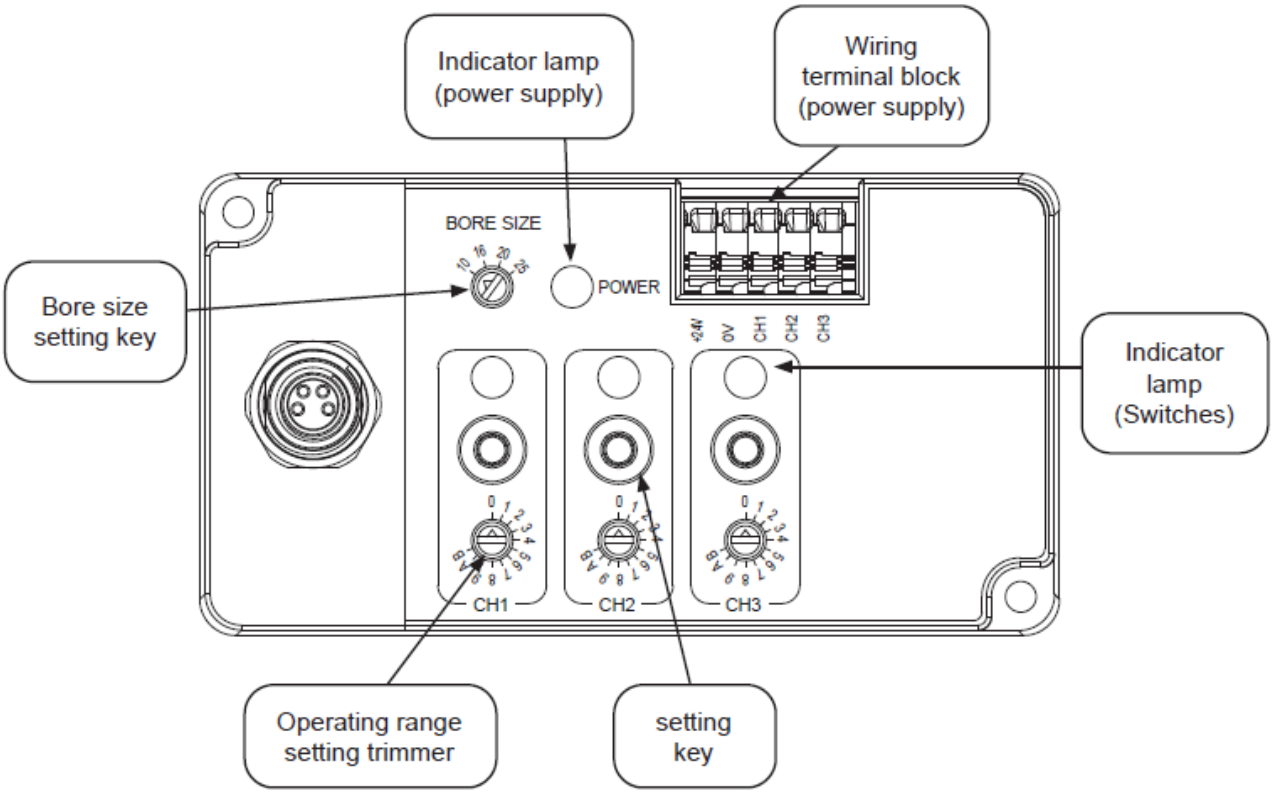
* Use the correction adaptor that was shipped together with LSHM.

2.7 Switch output adapter

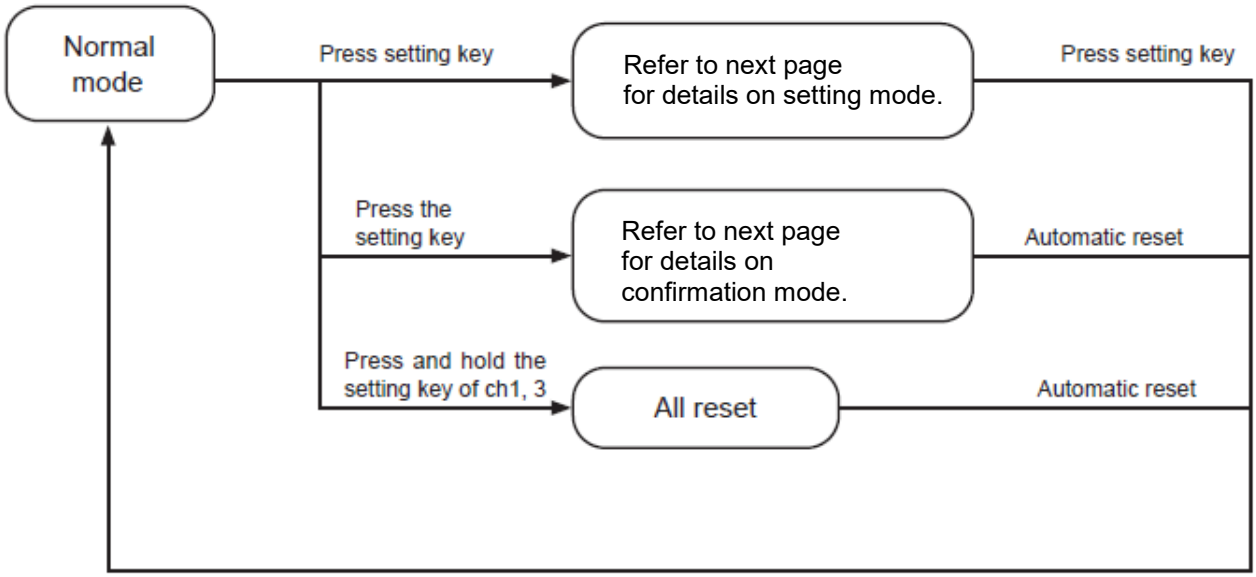
Descriptions	Switches output adaptor (NPN) option code: B	Switches output adaptor (PNP) option code: C
Power supply voltage	24 VDC ±10%	
Current consumption	35 mA or less	
Power indicator lamp	Green LED ON when power applied	
Switch indicator lamp	Red LED lights up when power is applied	
Switch output point	3	
Switches output (per channel)	NPN: Open collector Max. power supply voltage:24VDC Max. load current: 50mA Internal voltage drop: 1.2V or less	PNP: Open collector Max. power supply voltage:24VDC Max. load current: 50mA (Note1) Internal voltage drop: 1.5V or less
Operating range	0.2 / 0.5 / 1.0 mm (Note2)	
Analog input	1 to 5 V (LSHM Series output voltage)	
Input connector	M8 connector 4-pin (socket)	
Shock resistance	294m/s^2	
Degree of protection	IEC Standards IP40	
Ambient temperature,humidity	10 to 60°C, 85% RH or less	
Mounting method	Direct mounting	
Insulation resistance	500 MΩ and over with 20 VDC megger	
Withstand voltage	No failure after 1 minute of 1,000 VAC application	
Vibration resistance	10Hz-55Hz compound amplitude 1.5mm, X, Y, Z, 2 hours each in two directions	
Weight	65g	

Note1:The total of all channels should be 100mA or less.
Note2:There is a hysteresis of 0.04 mm on one side.

■ Operating section and parts



■ Setting



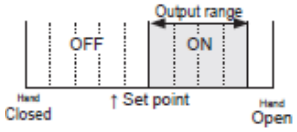
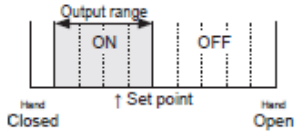
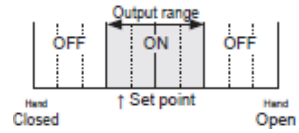
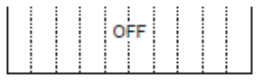
■ Setting mode

For the first time, each Switches channel must be configured.

[Setting method] (Example) When setting ch1	Status of the indicator lamp (ch1)
(1) ch1: Hold down the setting key for 3 seconds or longer to shift to the setting mode.	Blinking state (setting)
(2) Move the LSHM to the operating position.	Blinking state (setting)
(3) From the pattern table below, select the pattern that you want to output and shift the operation setting trimmer to the symbol position.	Blinking state (setting)
(4) Ch1: Hold down the setting key for 3 seconds or longer to complete the setting. Before deciding (by holding down), make sure that the bore size key is correct. Automatically enters normal mode.	Setting completed when ON

When changing the settings and output patterns of other channels, perform the same operation for each channel.

■ Pattern table

Output judgment pattern		Output range				
		0.2mm	0.5mm	1.0mm	Normally ON	Reset
(1)		1	4	7	A	—
(2)		2	5	8	B	—
(3)		3	6	9	—	—
(4)		—	—	—	—	0

■ Confirmation mode

The setting Status of each ch can be confirmed.
(1) Press any setting key during normal mode.
(2) Automatically enters confirmation mode.The indicator lamp turns ON for ch already set.
If not set, blinks when pattern 0 or when the current state and internal bore size keys do not match.
(3) In 3 seconds, the normal mode is automatically returned.

■ Other

1. Cancellation in setting mode
   If you press the ch1 setting key while ch1 is in the setting mode, the setting will be canceled and the operation mode will be restored.
   The settings are not updated.
2. About other channels being set
   When ch1 is set, the other ch is in the operation mode.
3. About operations other than when the setting is completed
   Even if the operating range trimmer is changed other than when the setting is completed, the internal setting will not be changed.

2.8 IO-Link adapter

Descriptions	IO-Link adapter
Power supply voltage	24 VDC ±10%
Current consumption	35 mA or less
Display lamp	Green LED ON when power applied
Analog input	1 to 5 V (LSHM Series output voltage)
Input connector	M8 connector 4-pin (socket)
Output connector	M12 connector 4-pin (plug)
Non-linearity	±0.5%F.S. or less (ambient temperature 25°C, LSHM Series connection, CKD provided measuring method)
Insulation resistance	500 MΩ and over with 20 VDC megger
Withstand voltage	No failure after 1 minute of 1,000 VAC application
Shock resistance	294m/s^2
Degree of protection	IEC Standards IP40
Ambient temperature, humidity	10 to 60°C, 85% RH or less
Mounting method	Direct mounting
Vibration resistance	10Hz-55Hz compound amplitude 1.5mm, X, Y, Z, 2 hours each in two directions
Weight	70g

2.8.1 General

Descriptions	IO-Link communication specifications
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM3(230.4kbps)
Port	Class A
Process data length (input)	4byte
Process data length (output)	0byte
Minimum cycle time	1ms
Data storage	1kbyte
SIO mode support	No

■ Device ID

Device ID (decimal number)	Device ID (hexadecimal number)	Model number	Remarks
2228226	0x220002	LSHM-10	Diameter: ϕ10
2228227	0x220003	LSHM-16	Diameter: ϕ16
2228228	0x220004	LSHM-20	Diameter: ϕ20
2228229	0x220005	LSHM-25	Diameter: ϕ25

2.8.2 On demanda data

■ Identification

Vendor ID: 855 (decimal number)/357 (hexadecimal number)

Index	Sub-index	Item	Value	Access *1	Data length	Format
0x0010	0	Vendor Name	CKD Corporation	R	64byte	String
0x0011	0	Vendor Text	http://www.ckd.co.jp/	R	64byte	String
0x0012	0	Product Name	LSHM-A20D1N-C-HP2 Note 1	R	40byte	String
0x0013	0	Product ID	LSHM-20 Note 1	R	64byte	String
0x0014	0	Product Text	Linear slide hand with Length measuring function,bore20 Note 1	R	64byte	String
0x0015	0	Serial- Number	****-***	R	16byte	String
0x0016	0	Hardware Revision	V1.0	R	4byte	String
0x0017	0	Firmware Revision	V1.0	R	4byte	String
0x0018	0	Application Specific Tag	***	R/W	32byte	String
0x0019	0	Function Tag	***	R/W	32byte	String
0x001A	0	Location Tag	***	R/W	32byte	String

*1. R：reading,R/W：reading/writing

Note1：Reference examples are provided.

2.8.3 Parameter and commands

■ Common specifications

Index	Sub-index	Item	Value	Access *1	Data length	Format
0x0002	0	System Command	See the next section	W	1byte	UInteger8
0x000C	0	Device Access Locks	0x0000：No lock 0x0001：Parameter lock	R/W	2byte	Record
0x0020	0	Error Count	0	R	2byte	UInteger16
0x0024	0	Device Status	0	R	1byte	UInteger8
0x0025	0	Detailed Devices Status	See Diagnosis.	R	*	ArrayT of 3OctetString

*1. R：reading, W：writing, R/W：reading/writing

System Command

Value	Command	Description
0x82	Restore Factory Settings	Restore the setting values to the factory default.
0xa0	Back-to-box	Put the operation stopped state and IO-Link communication stopped state. Starts by turning the power on again.

■ Individual Specifications

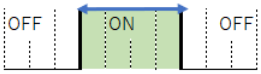
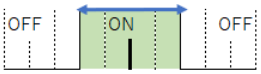
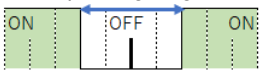
Index	Sub-index	Item	Value	Access *1	Data length	Data storage target	Format
0x101	1	SW1 set point setting 1	Voltage/mV	R/W	2byte	Y	UInteger16
	2	SW1 set point setting 2	Voltage/mV	R/W	2byte	Y	UInteger16
	3	SW1 mode selection (See Table 1)	0:OFF 1: Pattern1 (NO) 1: Pattern1 (NC) 3: Pattern2 (NO) 4: Pattern2 (NC) 5: Pattern3 (NO) 6: Pattern3 (NC)	R/W	1byte	Y	UInteger8
	4	SW1 operating range setting	Value/(mm)	R/W	2byte	Y	UInteger16
0x102	1	SW2 set point setting 1	Voltage/mV	R/W	2byte	Y	UInteger16
	2	SW2 set point setting 2	Voltage/mV	R/W	2byte	Y	UInteger16
	3	SW2 mode selection (See Table 1)	0:OFF 1: Pattern 1 (NO) 1: Pattern 1 (NC) 3: Pattern 2 (NO) 4: Pattern 2 (NC) 5: Pattern 3 (NO) 6: Pattern 3 (NC)	R/W	1byte	Y	UInteger8
	4	SW2 operating range setting	Value/(mm)	R/W	2byte	Y	UInteger16

*1. R/W : reading/writing

Index	Sub-index	Item	Value	Access *1	Data length	Data storage target	Format
0x103	1	SW3 set point setting 1	Voltage/mV	R/W	2byte	Y	UInteger16
	2	SW3 set point setting 2	Voltage/mV	R/W	2byte	Y	UInteger16
	3	SW3 mode selection (See Table 1)	0:OFF 1: Pattern1 (NO) 1: Pattern1 (NC) 3: Pattern2 (NO) 4: Pattern2 (NC) 5: Pattern3 (NO) 6: Pattern3 (NC)	R/W	1byte	Y	UInteger8
	4	SW3 operating range setting	Value/(mm)	R/W	2byte	Y	UInteger16
0x104	1	SW4 set point setting 1	Voltage/mV	R/W	2byte	Y	UInteger16
	2	SW4 set point setting 2	Voltage/mV	R/W	2byte	Y	UInteger16
	3	SW4 mode selection (See Table 1)	0:OFF 1: Pattern1 (NO) 1: Pattern1 (NC) 3: Pattern 2 (NO) 4: Pattern 2 (NC) 5: Pattern 3 (NO) 6: Pattern 3 (NC)	R/W	1byte	Y	UInteger8
	4	SW4 operating range setting	Value/(mm)	R/W	2byte	Y	UInteger16

*1. R/W : reading/writing

Table 1. Switch modes

	Pattern 1	Pattern 2	Pattern 3
NO	Voltage: Low Voltage: High Operating range  Set point1	 Set point2 Set point1	Operating range  Set point1
NC	 Set point1	 Set point2 Set point1	Operating range  Set point1
Set point 1	Used	Used	Used
Set point 2	Not used	Used	Not used
Operating range	Used	Not used	Used
Remarks	ON output/OFF under the operating range setting value based on set point 1	ON output/OFF between set points 1 and 2	ON output/OFF under the operating range set value with set point 1 as a center value

2.8.4 Process data IN

Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Output voltage															
Data range	2byte															
Format	UInteger16															

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Error	Warning	-	-	Switch output				Unused							
					4	3	2	1								
Data range	True/False															
Format	Boolean															

※Download the IODD file from our company website.

2.8.5 Observation

Index	Sub-index	Item	Value	Access *1	Data length	Format
0x0450	0	Voltage	0～6500	R	2byte	UInteger16
0x0451	0	Number of operations (times)	0～999999999	R	4byte	UInteger32
0x0452	0	Operating time (sec)	0～999999999	R	4byte	UInteger32
0x0531	0	Threshold of the number of operations (times)	0～999999999	R/W	4byte	UInteger32
0x0532	0	Threshold of operating time (sec)	0～999999999	R/W	4byte	UInteger32

2.8.6 Diagnosis

Event code	Type	Device status	Cause	Action
0x5000	Error	Failure	Memory Trouble (ROM・RAM・EEPROM)	Turn the power back on.
0x5111	Warning	Out of specification	Power Supply Voltage Descent (18V below)	Check the power supply voltage.
0x1802	Warning	Failure	The cumulative number of times of movement has exceeded the threshold.	After implementing maintenance, reset the threshold.
0x1803	Warning	Failure	The cumulative number of times of movement has exceeded the threshold.	After implementing maintenance, reset the threshold.

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.

■ 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.

■ Fine adjustment of analog output voltage

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

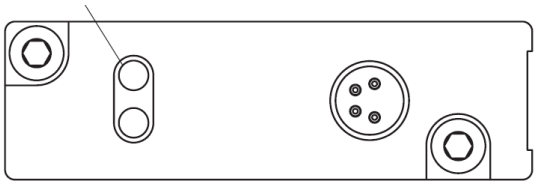
1 Remove the attachment.

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.

For models with adaptor option, keep the adaptor connected while performing adjustment.

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

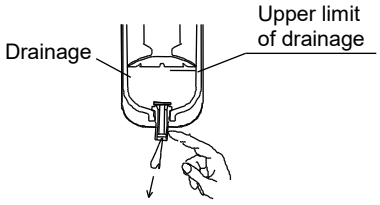
- Regularly grease the sliding section of the finger with grease. Regular greasing can extend service life further.

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.

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.

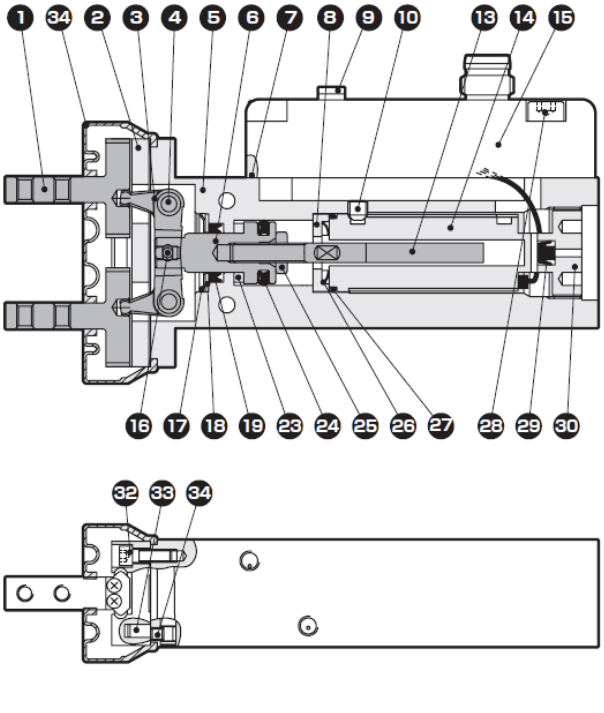


4.1.4 Consumable parts

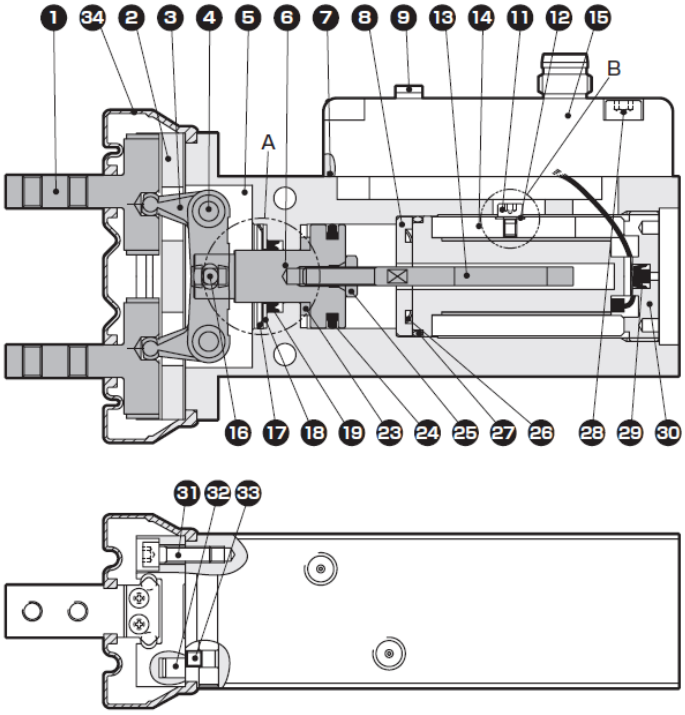
■ Amplifier mounted on side

Internal structure

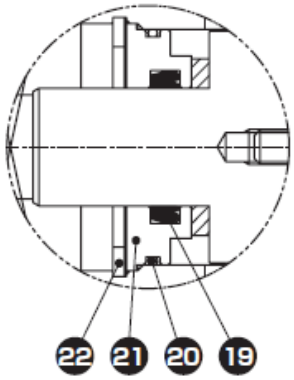
ø10



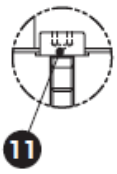
ø16 to ø25



Section A ø20, ø 25



Section B ø20, ø25



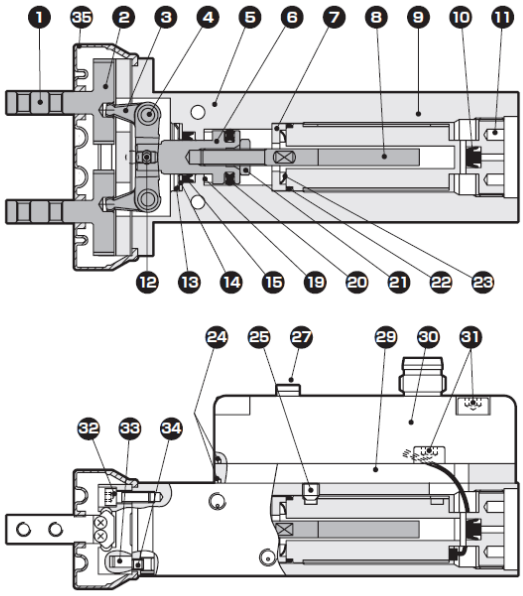
Parts list * Cannot be disassembled

No.	Part name	Material	Quantity
1	Finger	Stainless steel	
2	Linear guide	Stainless steel	
3	Lever	Stainless steel	
4	Fulcrum axis	Steel	
5	Body	Aluminum alloy	
6	Piston rod	Stainless steel	
7	Gasket	NBR	
8	Washer retainer	Aluminum alloy	
9	Plug	NBR	
10	Hexagon socket head screw	Stainless steel	ø10
11	Hexagon socket head bolt	Stainless steel	ø16 to ø25
12	Flat washer	Stainless steel	ø16
13	Core shaft	Steel	
14	Sensor body		
15	Amplifier		
16	Operation shaft	Steel	
17	CR ring	Stainless steel	
18	Cap	Stainless steel	
19	Rod packing	NBR	
20	O-ring	NBR	
21	Rod metal	Aluminum alloy	
22	C-type stop ring	Steel	
23	Cushion rubber	Urethane rubber	
24	Piston packing	NBR	
25	Nut	Stainless steel	
26	Wave washer	Stainless steel	
27	O-ring	NBR	
28	Hexagon socket head bolt	Stainless steel	
29	Check valve	NBR	
30	Head cover	Aluminum alloy	
31	Hexagon socket head bolt	Stainless steel	
32	Pin	Steel	
33	Hexagon socket head screw	Stainless steel	
34	Rubber cover	LSHM-G: Chloroprene rubber LSHM-F: Fluoro rubber	

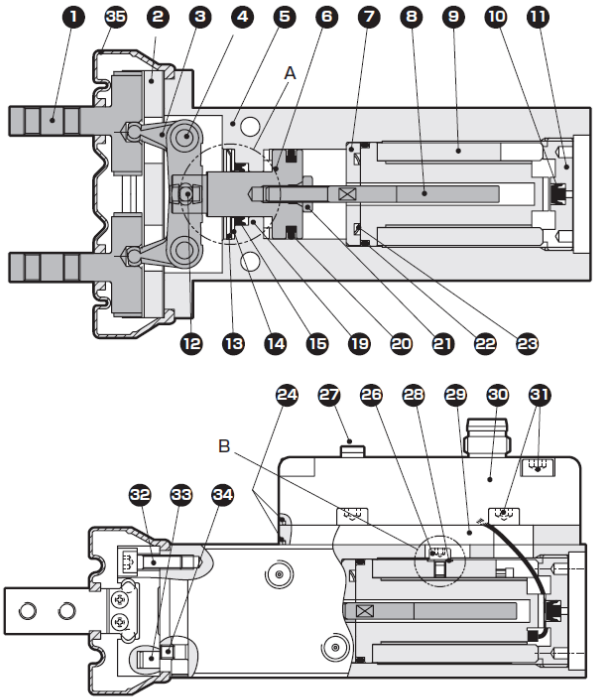
■ Amplifier mounted on front

Internal structure

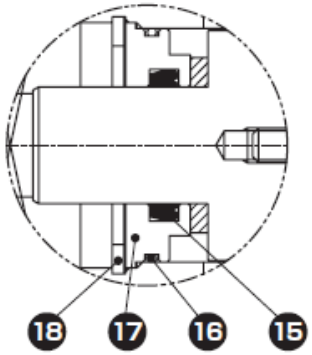
ø10



ø16 to ø25



Section A ø20, ø25



Section B ø20, ø25

Parts list * Cannot be disassembled

No.	Part name	Material	Quantity
1	Finger	Stainless steel	
2	Linear guide	Stainless steel	
3	Lever	Stainless steel	
4	Fulcrum axis	Steel	
5	Body	Aluminum alloy	
6	Piston rod	Stainless steel	
7	Washer retainer	Aluminum alloy	
8	Core shaft	Steel	
9	Sensor body		
10	Check valve	NBR	
11	Head cover	Aluminum alloy	
12	Operation shaft	Steel	
13	CR ring	Stainless steel	
14	Cap	Stainless steel	
15	Rod packing	NBR	
16	O-ring	NBR	
17	Rod metal	Aluminum alloy	
18	C-type stop ring	Steel	
19	Cushion rubber	Urethane rubber	
20	Piston packing	NBR	
21	Nut	Stainless steel	
22	O-ring	NBR	
23	Wave washer	Stainless steel	
24	Gasket	NBR	
25	Hexagon socket head screw	Stainless steel	ø10
26	Hexagon socket head bolt	Stainless steel	ø16 to ø25
27	Plug	NBR	
28	Flat washer	Stainless steel	ø16
29	Amplifier adaptor	Aluminum alloy	
30	Amplifier	-	
31	Hexagon socket head bolt	Stainless steel	
32	Hexagon socket head bolt	Stainless steel	
33	Pin	Steel	
34	Hexagon socket head screw	Stainless steel	
35	Rubber cover	LSHM-G: Chloroprene rubber LSHM-F: Fluoro rubber	

■ Consumable parts list

<Chloroprene rubber cover>

Model	Bore size (mm)	Kit no.	Remarks
LSHM-G	ø10	LSH-G10K	–
	ø16	LSH-G16K	
	ø20	LSH-G20K	
	ø25	LSH-G25K	

<Fluoro rubber cover>

Model	Bore size (mm)	Kit no.	Remarks
LSHM-F	ø10	LSH-F10K	–
	ø16	LSH-F16K	
	ø20	LSH-F20K	
	ø25	LSH-F25K	

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 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.