

## Low-Profile Long Stroke Hand LST-HP Series





## Double piston thin design

## Space saving Reduced moment of inertia

Reduces the height and space, contributing to reduced moment of inertia.



## High gripping power

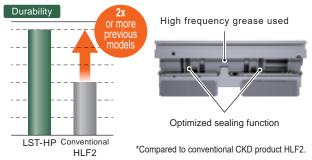
Adopting the double piston system realizes a compact body with high gripping power.



## Long service life

## Twice the durability compared with conventional models\*

Highly advanced sliding technology has enabled durability twice that of conventional models.



Case Study- Reduces worksite processes -

## Increased linear guide performance

High rigidity High precision

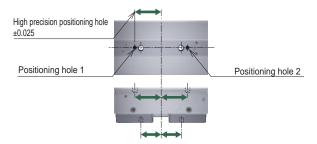
Increased amount of overhang | Repeatability ±0.03 mm



## Reduced processes on site

## High precision positioning hole ±0.025mm

The addition of "positioning holes" with the grip center as reference allows the centering precision to be easily reproduced.



## Switch with bending resistant lead wire can be selected

A switch can be selected that uses a bend-resistant lead wire that does not easily break even when used in moving parts.

## Replacement of body

Positioning holes that guarantee centering precision enable highly reproducible mounting, with no fine adjustment required. This contributes to reduced mounting adjustment work-hours and improved reproducibility.



## Low-profile long stroke hand with length measuring function LSTM-HP2 Series

## **High precision**

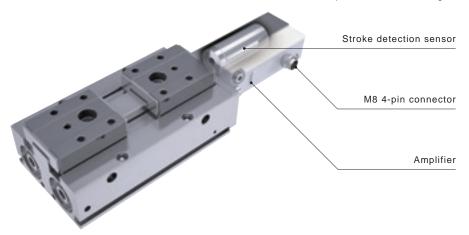


## Integrated structure

Adopts an LVDT\* sensor highly resistant to vibration and impact.

A displacement sensor is built into the body, achieving a high-precision integrated structure.

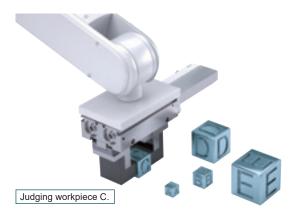
\* LVDT is short for Linear Variable Differential Transformer, a sensor that converts mechanical displacement into electric signals for output.



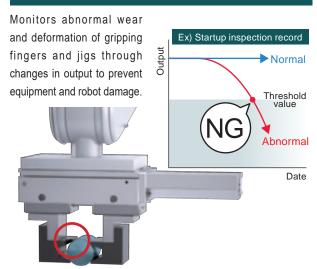
## Case Study

## Workpiece model judgment

Capable of instantaneously judging minute differences in workpiece models.



## **Predictive maintenance**





Low-profile long stroke hand Double acting

## LST-HP1 Series

Operating stroke length: Short stroke: 8, 12, 16, 20mm

Middle stroke: 16, 24, 32, 40mm Long stroke: 32, 48, 64, 80mm





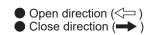
Double acting

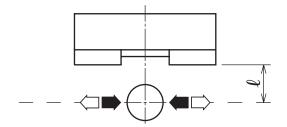
## Specifications

Item		LST-08			LST-12			LST-16			LST-20	
item	Α	В	С	Α	В	С	Α	В	С	Α	В	С
Bore size mm		ø8 x 2			ø12 x 2			ø16 x 2	ø16 x 2			
Actuation		Double acting										
Working fluid		Compressed air										
Max. working pressure MPa				0.7								
Min. working pressure MPa		0.15	0.1									
Ambient temperature °C				-10 to 60 (no freezing)								
Port size		M3		M5								
Operating stroke length mm	8	16	32	12	24	48	16	32	64	20	40	80
Repeatability mm				±0.03								
Weight kg	0.09	0.12	0.16	0.19	0.24	0.34	0.42	0.54	0.79	0.78	1.03	1.49
Lubrication			Not required									

## Gripping power

·Gripping power is the thrust (one finger) in the direction of the arrow shown in the figure.





Unit: N

Bore size (mm)	Double acting
ø8	19
ø12	48
ø16	90
ø20	141

<sup>\*</sup> At supply pressure of 0.5 MPa,  $\ell$  = 15 mm, value at stroke center



## Switch specifications

## Switch specifications

ltom	Proximity 2-wire	Proximity 3-wire	Proximity 2-wire	Proximit	ty 3-wire	
Item	F2S	F3S	F2H·F2V	F3H·F3V	F3PH·F3PV	
Applications For dedicated programmable controller		For programmable controller, relay  For dedicated programmable controller		For programmable controller, relay		
Output method	utput method - NPN o		-	NPN output	PNP output	
Power supply voltage	· · · · ·		-	10 to 28 VDC	4.5 to 28 VDC	
Load voltage/	10 to 30 VDC	30 VDC or less 10 to 30 VDC		30 VDC or less		
current	current 5 to 20mA		5 to 20mA	50 mA	or less	
Display lamp	Red LED (L	it when ON)	)	ellow LED (Lit when ON	)	
Leakage current 1 mA or less 10 µA or less		10 μA or less	1 mA or less	10 μΑ	or less	
Shock resistance	980m/s²					
Weight g	1 m: 10 3 m: 29					

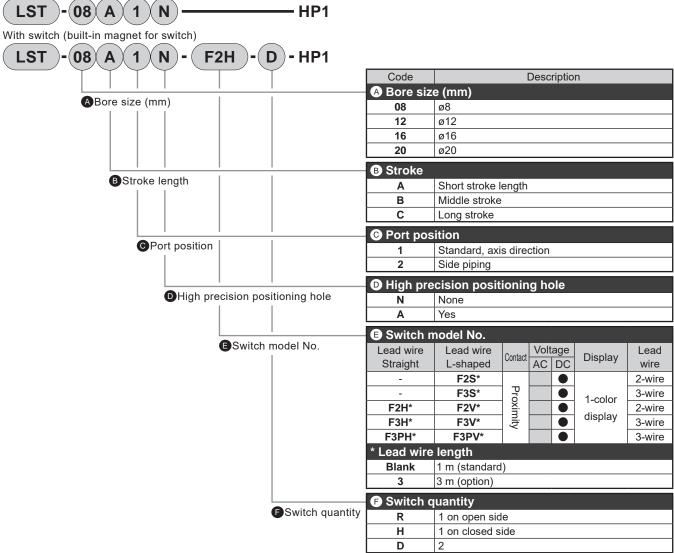
<sup>\*1:</sup> The F type switch uses a bend-resistant lead wire as standard.

## LST-HP1 Series

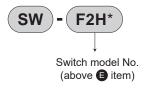
## How to order

Without switch (built-in magnet for switch)





## How to order switch



## [Example of model No.]

## LST-16B2A-F2H3-D-HP1

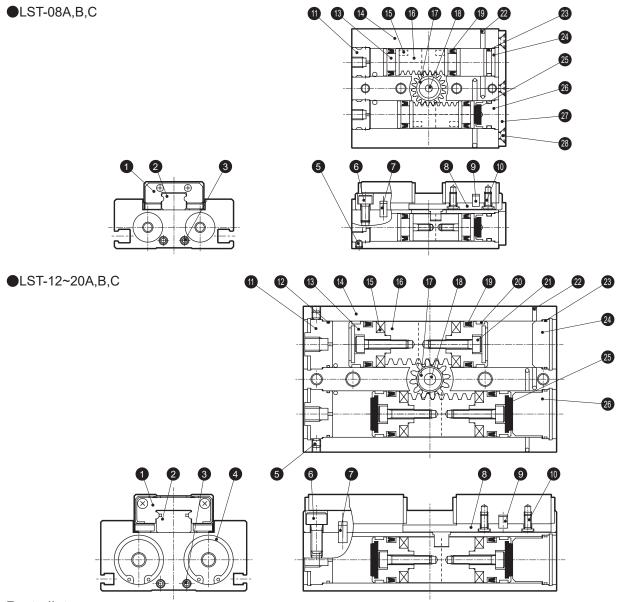
Model: Low-profile long stroke hand ABore size (mm) :ø16

**B**Stroke : Middle stroke ©Port position : Side piping DHigh precision positioning hole: Yes

Switch model No. : Proximity F2H, lead wire 3 m

**B**Switch quantity

## Internal structure diagram and parts list



## Parts list

Part number	Part name	Material	Remarks	Part number	Part name	Material	Remarks
1	Finger	Stainless steel		15	Magnet	-	
2	Linear guide	Stainless steel		16	Rack	Stainless steel	
3	Hexagon socket set screw	Stainless steel		17	Pinion	Steel alloy	
4	Round R type snap ring	Steel	ø12	18	Pin	Stainless steel	
4	C-snap ring	Steel	ø16~20	19	Piston packing	Nitrile rubber	
5	Hexagon socket set screw	Stainless steel		20	Wear ring	Acetal resin	Excluding ø8A, E
6	Hexagon socket head cap screw	Stainless steel		21	Hexagon socket head cap screw	Stainless steel	
7	Pin	Stainless steel		22	Steel ball	Stainless steel	
8	Rack joint	Stainless steel		23	O-ring	Nitrile rubber	
9	Pin	Stainless steel		24	Cover 1	Aluminum alloy	Chromate
10	Pan head machine screw	Stainless steel		25	Cushion rubber	Urethane rubber	
11	Port cover	Aluminum alloy	Chromate	26	Cover 2	Aluminum alloy	Chromate
12	O-ring	Nitrile rubber		27	Cover 3	Stainless steel	ø8 only
13	Piston	Aluminum alloy	ø8 is stainless steel	28	Cross-recessed flat head machine screw	Stainless steel	ø8 only
14	Body	Aluminum allov	Hard alumite				

## Consumable parts list

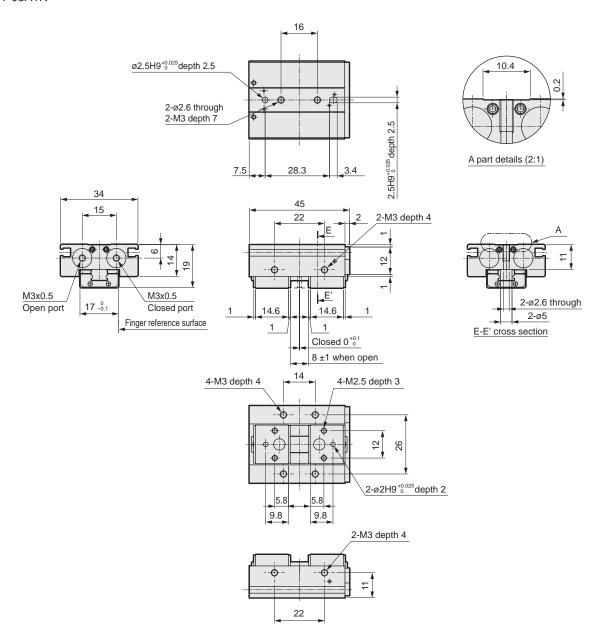
Bore size	Kit No.	Consumable parts No.
ø8	LST-08K-HP1	
ø12	LST-12K-HP1	12 (19 (20 (23 (25)
ø16	LST-16K-HP1	
ø20	LST-20K-HP1	

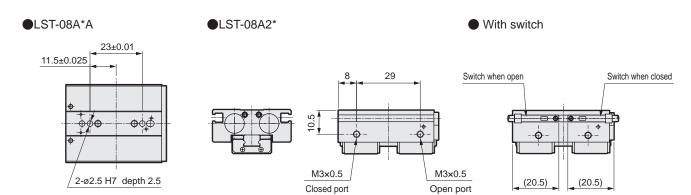
## LST-HP1 Series

## Dimensions (bore size: Ø8, short stroke)



## ●LST-08A1N

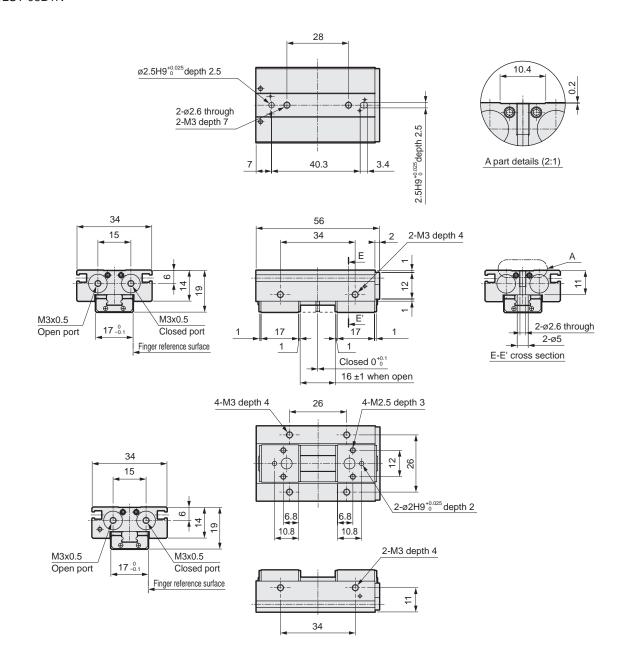


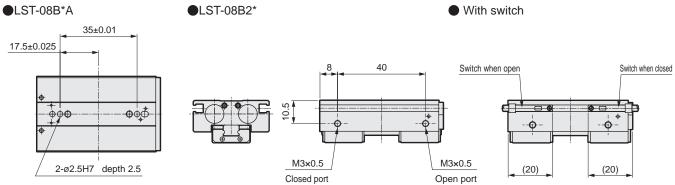


## Dimensions (bore size: Ø8, middle stroke)



## ●LST-08B1N



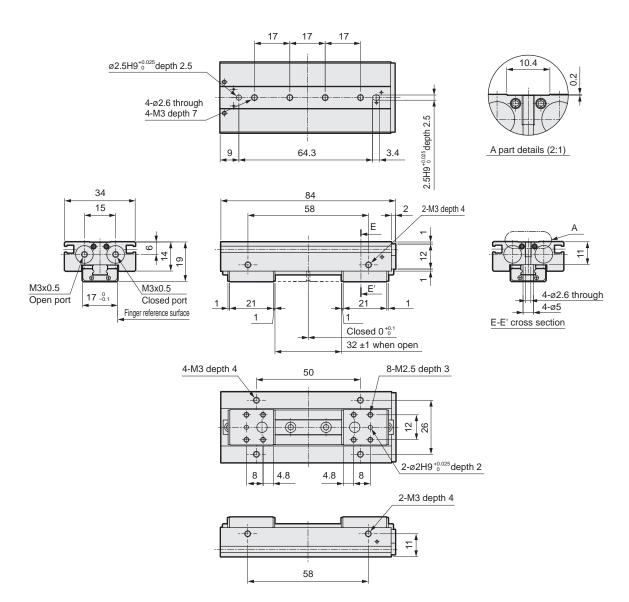


## LST-HP1 Series

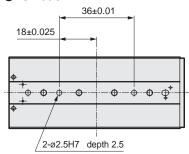
## Dimensions (bore size: Ø8, long stroke)



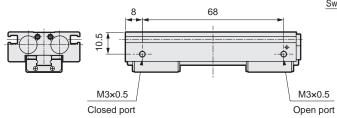
## ●LST-08C1N

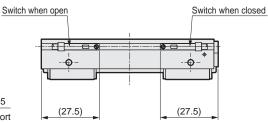


## ●LST-08C\*A



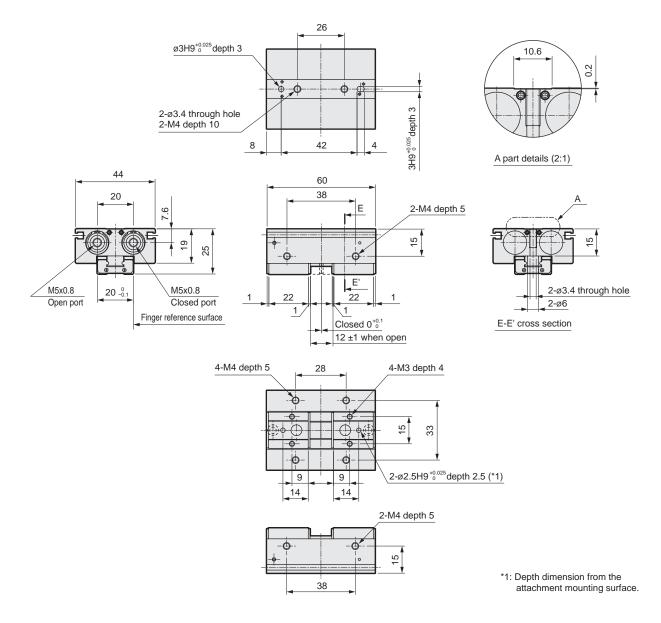
## ●LST-08C2\*

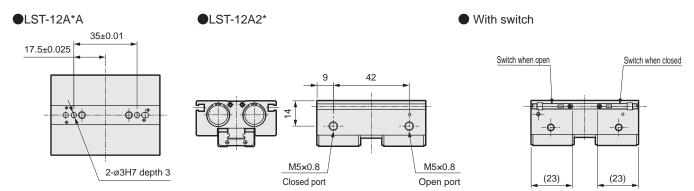






## ●LST-12A1N



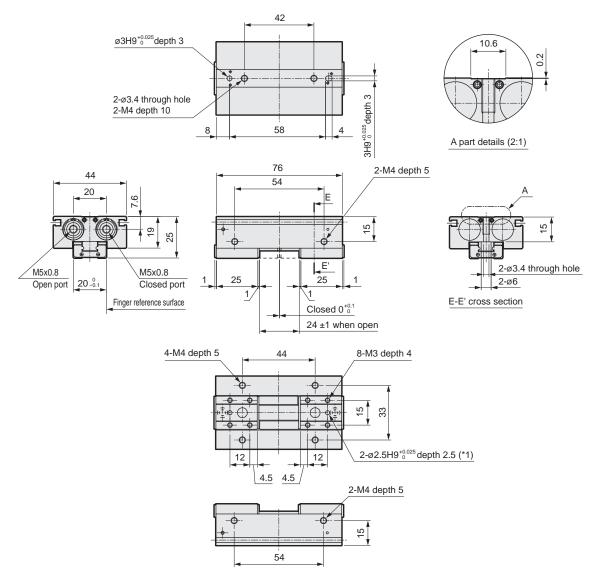


## LST-HP1 Series

## Dimensions (bore size: ø12, middle stroke)

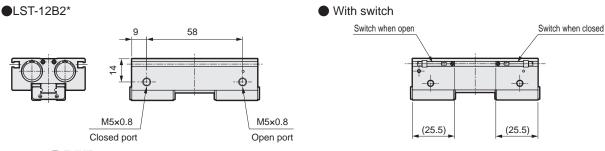


## ●LST-12B1N



## \*1: Depth dimension from the attachment mounting surface.

# ©LST-12B\*A 51±0.01 25.5±0.025 2-ø3H7 depth 3

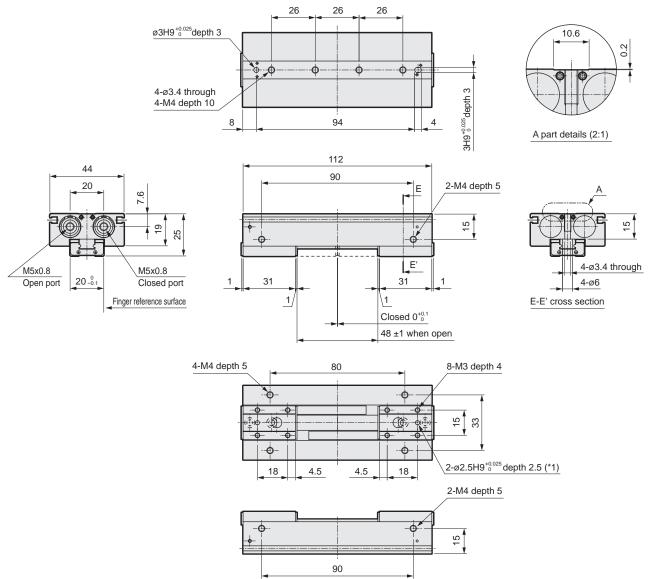


9

## Dimensions (bore size: ø12, long stroke)

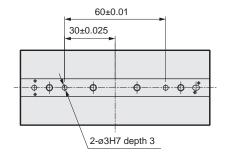


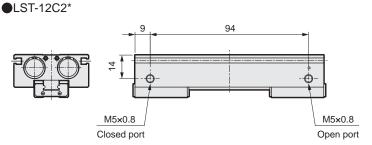
## ●LST-12C1N

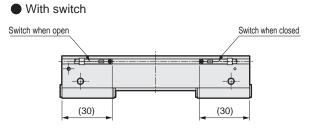


## ●LST-12C\*A

\*1: Depth dimension from the attachment mounting surface.





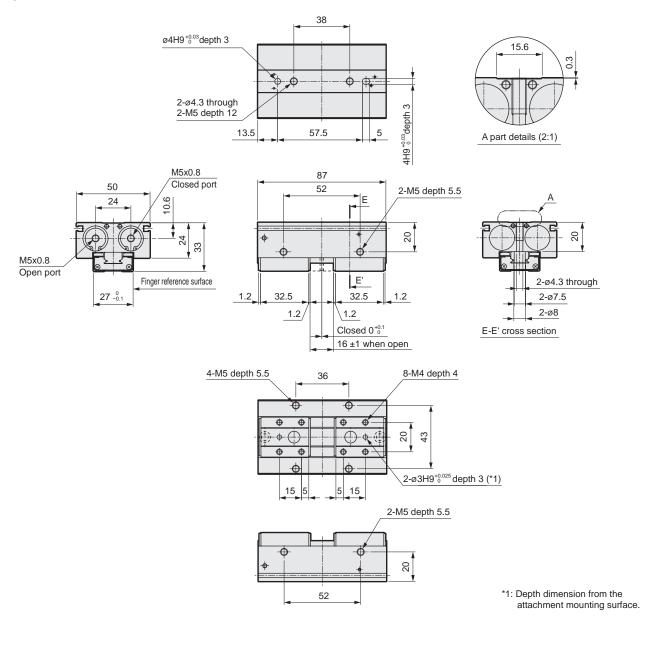


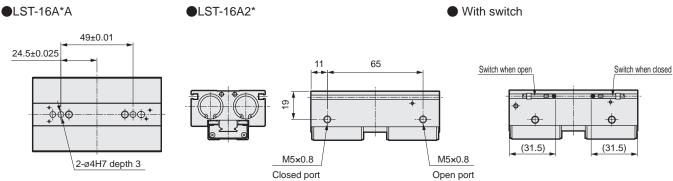
## LST-HP1 Series

## Dimensions (bore size: ø16, short stroke)



## ●LST-16A1N

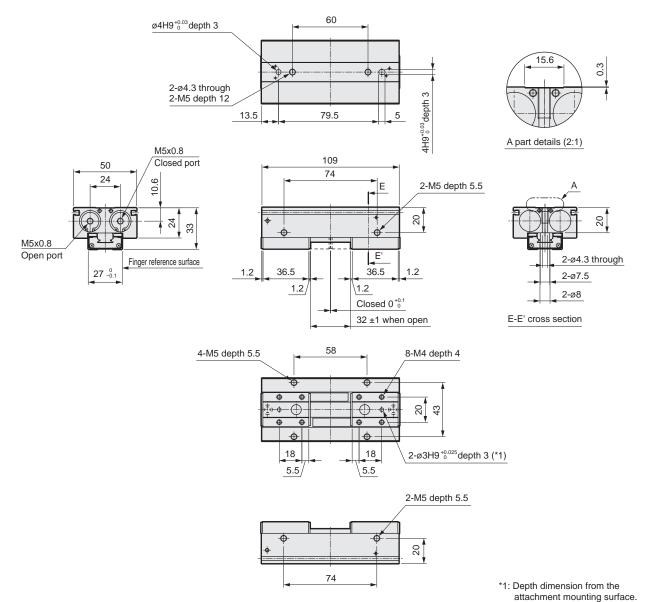




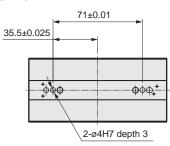
## Dimensions (bore size: Ø16, middle stroke) [CAD]



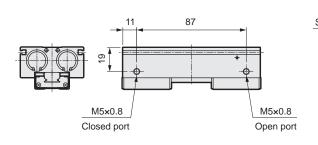
## ●LST-16B1N

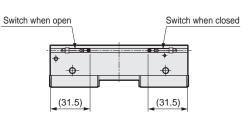


## ●LST-16B\*A



## ●LST-16B2\*



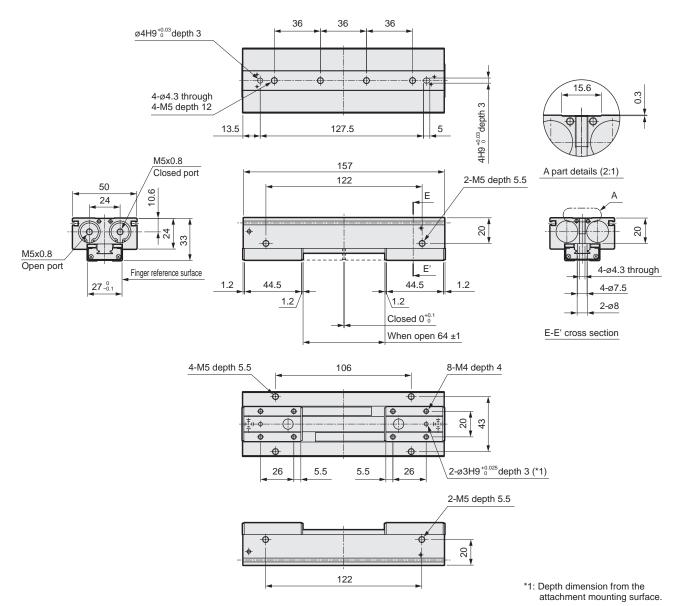


## LST-HP1 Series

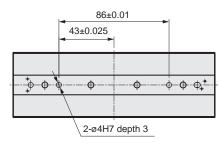
## Dimensions (bore size: ø16, long stroke)



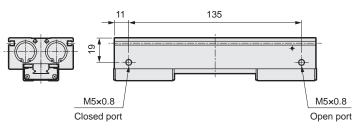
## ●LST-16C1N

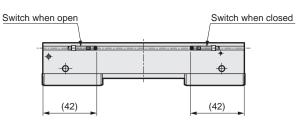


## ●LST-16C\*A



## ●LST-16C2\*

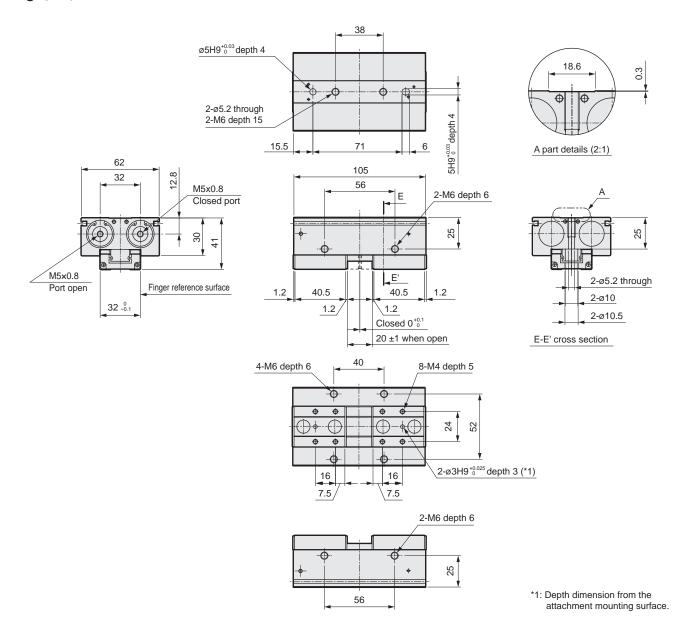




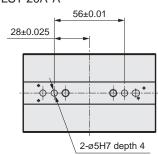
## Dimensions (bore size: ø20, short stroke)



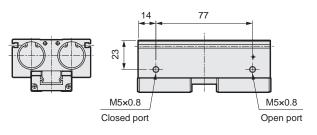
### ●LST-20A1N

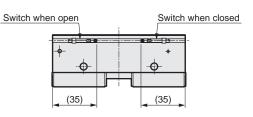


## ●LST-20A\*A



## ●LST-20A2\*



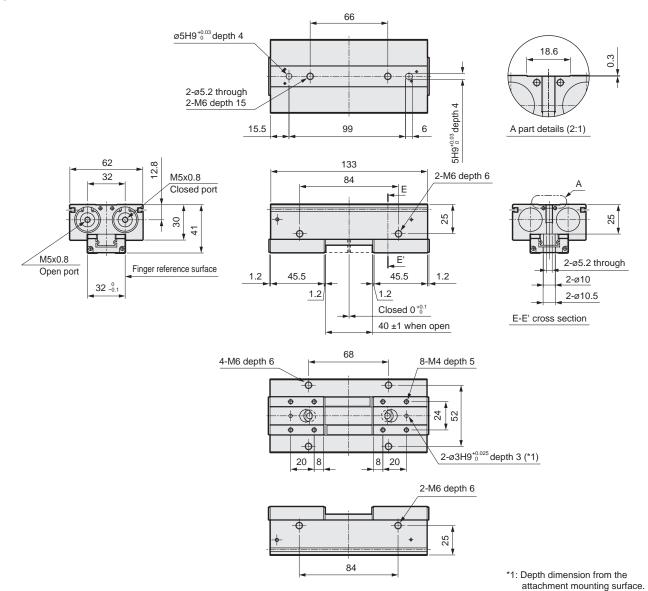


## LST-HP1 Series

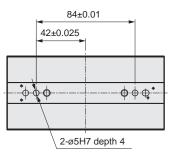
## Dimensions (bore size: ø20, middle stroke)



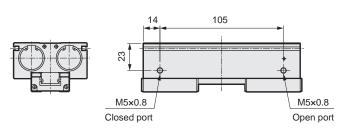
## ●LST-20B1N

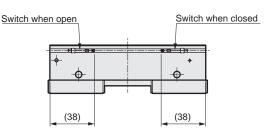


### ●LST-20B\*A



## ●LST-20B2\*

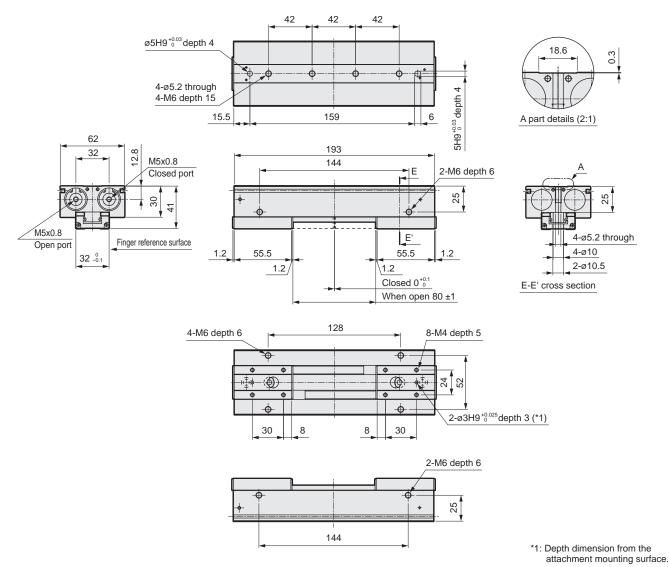




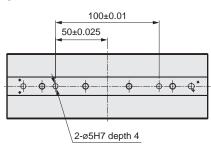
## Dimensions (bore size: ø20, long stroke)



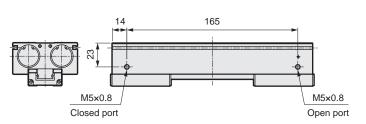
## ●LST-20C1N

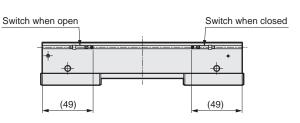


### ●LST-20C\*A



### ●LST-20C2\*







Low-profile long stroke hand with length measuring function

## LSTM-HP2 Series

Operating stroke length: 12, 16, 20 mm

Double acting







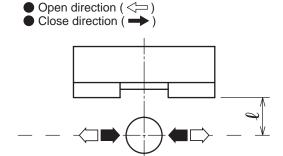
## **Specifications**

Item		LSTM			
Bore size	mm	ø12 x 2	ø16 x 2	ø20 x 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			
Display lamp		Green LED ON when power applied			
Analog output		1 V when finger is closed - $5V*1$ when open, connection load $100k\Omega$ or more			
Analog output linearity		±0.5% F.S. or less (ambient temperature 25°C)			
Repeatability of analog output		(No deformation or wear	±0.04 mm or less of the actuator / jig when ambi	ent temperature is 25°C)	
Valid measured range length	mm	12	16	20	
Shock resistance (sensor/amplifier	section)		294m/s <sup>2</sup>		
Vibration resistance (sensor / ampl	ifier section)	10 to 55Hz double amplitude 1.5mm, 2 hours in each X, Y, Z direction			
Degree of protection (sensor/amplifier section)			IEC Standard IP65		
Ambient temperature, humidity  10 to 60°C, 85% RH or less (no freezing)					
Weight	kg	0.26	0.50	0.90	
Lubrication		Not required			

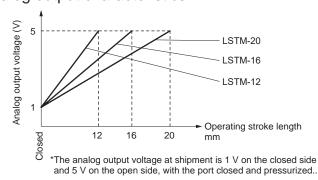
<sup>\*1:</sup> There is output fluctuation of 1 mV/°C.

## Gripping power

Gripping power is the thrust (one finger) in the direction of the arrow shown in the figure.



## Analog output characteristics



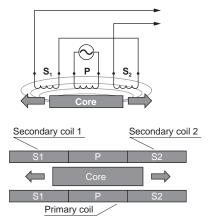
Unit: N

	Onic. 14
Bore size (mm)	Double acting
ø12	48
ø16	90
ø20	141

<sup>\*</sup>Supply pressure: 0.5 MPa, L = 15 mm, value at stroke center

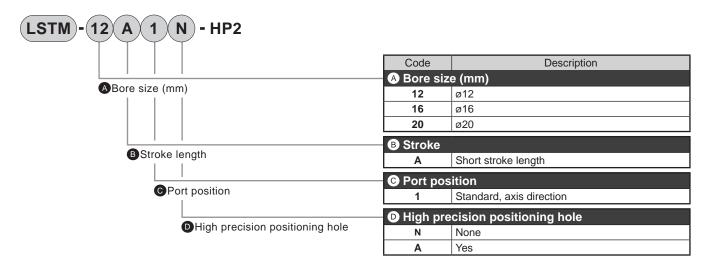
## LVDT displacement sensor operation principle

When exciting the primary coil (P), induced voltage is generated in the two secondary coils (S1/S2) by electromagnetic induction. When the Hand is driven, the core position changes and a difference in induced voltage occurs between S1 and S2. This difference is used to output the position of the core as electric signals.

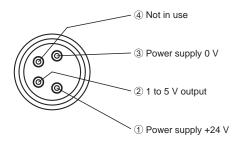


How to order

## How to order



## Plug contact array diagram



## [Example of model No.]

## LSTM-16A1A-HP2

Model: Low-profile long stroke hand with length measuring function

ABore size (mm) : ø16

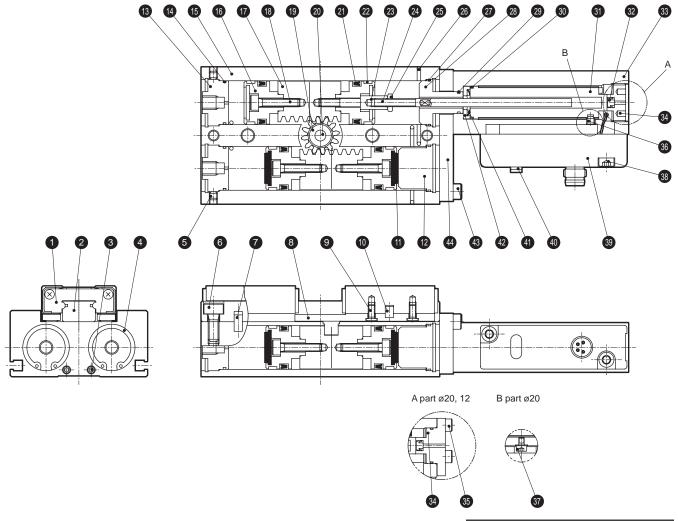
BStroke : Short stroke length
Port position : Standard, axis direction

DHigh precision positioning hole: Yes

## LSTM-HP2 Series

## Internal structure diagram and parts list

## ●LSTM-12~20A



## Cannot be disassembled

## Parts list

Part number	Part name	Material	Remarks	Part number	Part name	Material	Remarks
1	Finger	Stainless steel		23	Fixed rod	Stainless steel	
2	Linear guide	Stainless steel		24	Core shaft	Steel	
3	Hexagon socket set screw	Stainless steel		25	Nut	Stainless steel	
4	Round R type snap ring	Steel	ø12	26	Steel ball	Stainless steel	
4	C-snap ring	Steel	ø16~20	27	O-ring	Nitrile rubber	
5	Hexagon socket set screw	Stainless steel		28	Cover 2	Aluminum alloy	Chromate
6	Hexagon socket head cap screw	Stainless steel		29	O-ring	Nitrile rubber	
7	Pin	Stainless steel		30	O-ring	Nitrile rubber	
8	Rack joint	Stainless steel		31	Sensor body	-	
9	Pan head machine screw	Stainless steel		32	Check valve	Nitrile rubber	
10	Pin	Stainless steel		33	Sensor adaptor	Aluminum alloy	Chromate
11	Cushion rubber	Urethane rubber		34	Head cover	Chromate	
12	Cover 1	Aluminum alloy	Chromate	35	Hexagon socket head cap screw	Stainless steel	
13	Port cover	Aluminum alloy	Chromate	36	Hexagon socket set screw	Stainless steel	
14	O-ring	Nitrile rubber		37	Hexagon socket head cap screw	Stainless steel	
15	Body	Aluminum alloy	Hard alumite	38	Hexagon socket head cap screw	Stainless steel	
16	Piston	Aluminum alloy	Chromate	39	Amplifier	-	
17	Rack	Stainless steel		40	Plug	Nitrile rubber	
18	Hexagon socket head cap screw	Stainless steel		41	Wave washer	Stainless steel	
19	Pinion	Steel alloy		42	Washer retainer	Aluminum alloy	
20	Pin	Stainless steel		43	Hexagon socket head cap screw	Stainless steel	
21	Piston packing	Nitrile rubber		44	Mounting plate	Aluminum alloy	
22	Wear ring	Acetal resin					

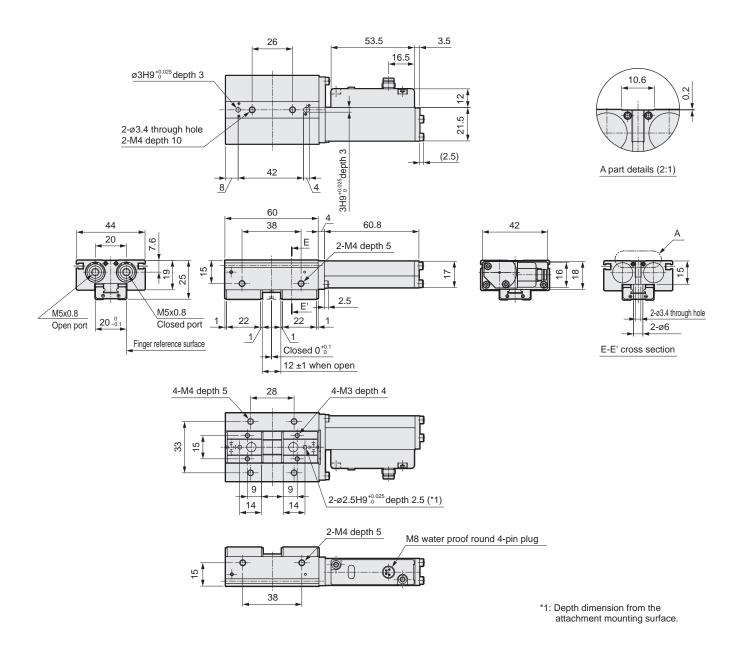
MEMO

## LSTM-HP2 Series

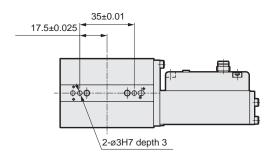
## Dimensions (bore size: ø12)



## ●LSTM-12A1N



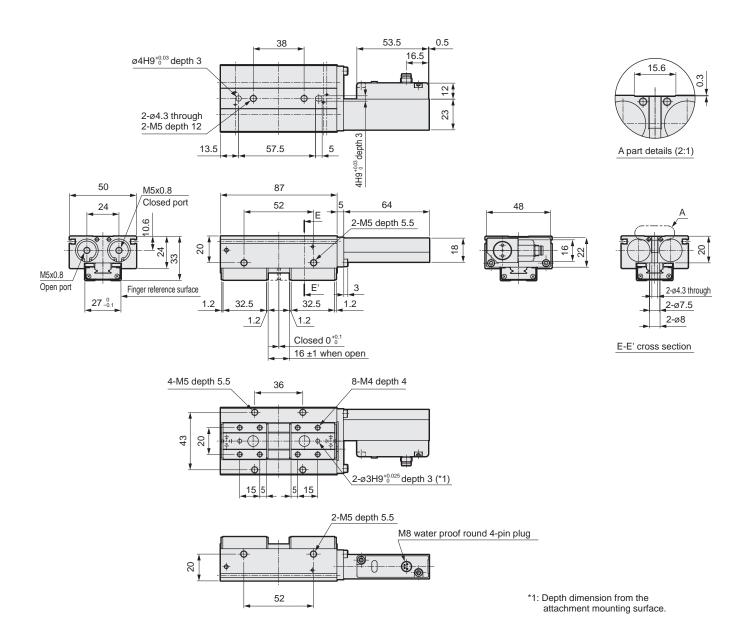
## ●LSTM-12A1A



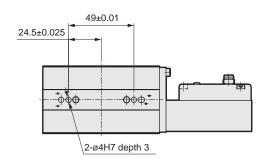
## Dimensions (bore size: Ø16)



### ●LSTM-16A1N



## ●LSTM-16A1A

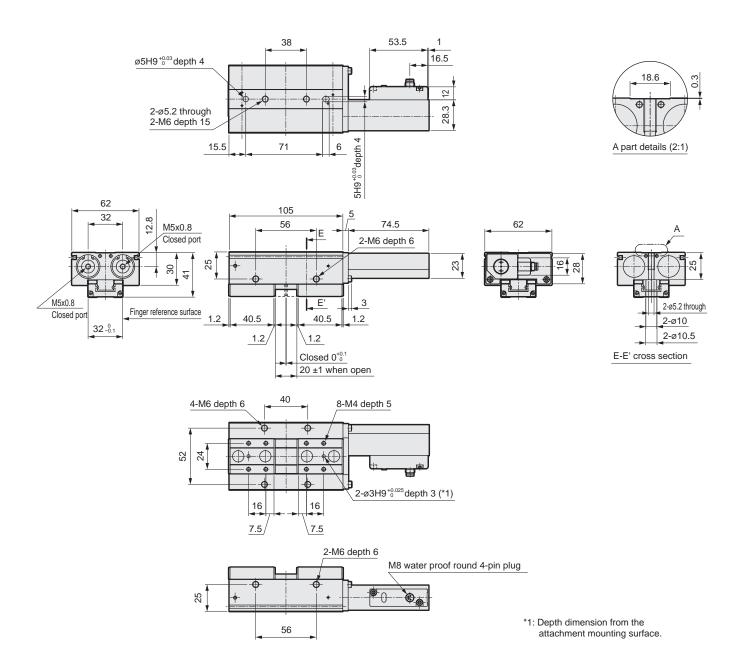


## LSTM-HP2 Series

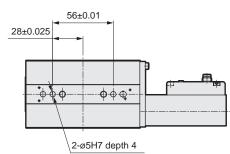
## Dimensions (bore size: ø20)



## ●LSTM-20A1N



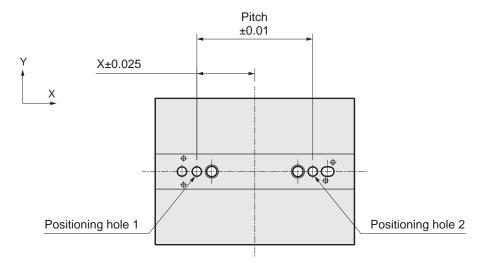
## ●LSTM-20A1A

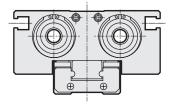


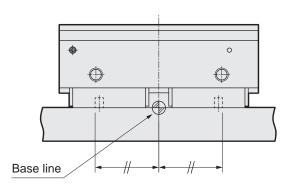
Base line of positioning hole

## Base line of positioning hole

Grip center reference, high precision positioning hole Positioning can be performed with reference to the gripping center.







Base line of positioning hole

Center of guide positioning hole with custom stroke length

## LST-HP1·LSTM-HP2 selection guide

## STEP-1 Select a suitable model from required gripping power

## 1 Calculation of required gripping power

Gripping power Fw satisfying the following equation is required to transport the workpiece (weight WL).

 $Fw > \frac{W_L \times g \times K}{n}$ 

Fw: Required gripping power [N] n: Number of attachments = 2

WL: Weight of workpiece [kg]

g: Gravitational acceleration = 9.8[m/s<sup>2</sup>]

K : Transport coefficient

5 [holding only]

10 [normal transport]

20 [sudden accelerated transport]

## Transport coefficient K

Calculation example: When decelerating and stopping in 0.1 second from transport speed of V = 0.75m/s with friction coefficient  $\mu$  of workpiece and finger as 0.1, see below.

Obtain the transport coefficient K from the force applied to the workpiece

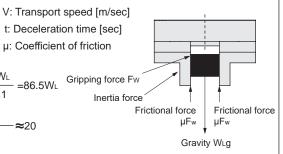
· Inertia force = W<sub>L</sub> (V/t)

· Gravity = W∟g

 $\cdot \text{ Required gripping power Fw} > \frac{\text{W}_{\text{L}} \text{ (V/t) +W}_{\text{L}} \text{g}}{\text{n}\mu} = \frac{\text{W}_{\text{L}} \text{ (V/t+g)}}{\text{n}\mu} = \frac{17.3 \text{ W}_{\text{L}}}{2 \times 0.1} = 86.5 \text{ W}_{\text{L}} \text{ (V/t+g)}$ 

∴Here, the transport coefficient K is calculated from the above equation:

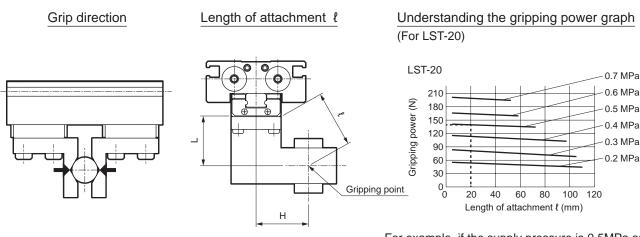
 $\frac{V/t+g}{\mu g} = \frac{0.75/0.1+9.8}{0.1 \times 9.8} \approx 20$ 



Note) Allowance is required for transport coefficient K due to impacts during transportation, etc. Even when the coefficient of friction  $\mu$  is higher than  $\mu$ =0.1, set transport coefficient K from 10 to 20 or more for safety.

## ② Model selection by required gripping power

Gripping power varies with "gripping direction", "attachment length" and "supply pressure". Confirm on the gripping power graph that sufficient force can be obtained under the usage conditions. Refer to page 27 for the gripping force graph.



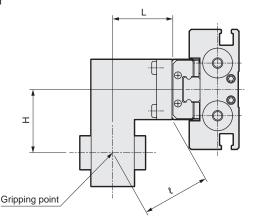
For example, if the supply pressure is 0.5MPa and the attachment length is 20mm, the obtained gripping power is 140N.

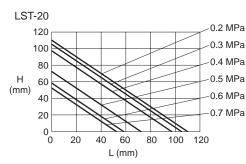
Close direction (

## STEP-2 Confirmation of attachment shape

Use the attachment within the range shown on page 28.

Example) L: 40 mm, H: 20 mm





When LST-20 is selected, the intersecting point of L: 40mm and H: 20mm will be inside the supply pressure line of 0.5MPa, and so it can be used.

Use attachments as short and lightweight as possible.

If the attachment is long and heavy, inertia increases when opening and closing. This may cause play in the finger, and adversely affect durability.

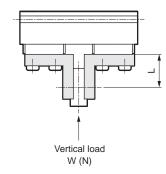
- ■Even if the attachment shape is within the performance data, by making it as small as possible enables the product to have a longer service life. Also, if ℓ is long, unexpected vibration, etc., could cause erroneous gripping and falling during transport.
- With "Cylinder diameter ×1.3/working pressure" as a guide, if ℓ is longer than that, set the transport coefficient of STEP-1 to a high value (Guideline: Transport coefficient 20 or more)
- ■The weight of the attachment affects the service life, so check that the weight is less than the following value.

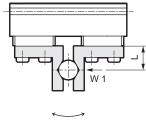
W<1/4H (1 pc.) W: Weight of attachment

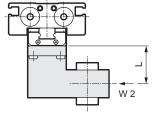
H: Weight of Hand product

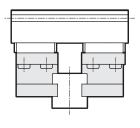
## STEP-3 Confirmation of external forces applied to finger

When an external force is applied to a finger such as when conveying and inserting workpieces, use it within [Table 1] parameters. \*When used during conveyance, consider the impact at the end.







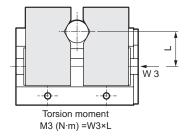


Bending moment M1 (N·m) =W1×L

Radial moment M2 (N·m) =W2×L

[Table 1] Allowable load value

Bore size	Vertical load Wmax (N)	Bending moment M1max (N⋅m)	Radial moment M2max (N·m)	Torsion moment M3max (N·m)
ø8	75	0.34	0.34	0.69
ø12	127	0.88	0.88	1.82
ø16	229	1.8	1.8	3.6
ø20	382	2.6	2.6	5.2



Note: Ø8 is not available for LSTM.

L: Distance to the point where load is applied

If multiple external forces are applied, the resultant external forces (formula below) must be less than 1.

WT=W/Wmax+M1/M1max+M2/M2max+M3/M3max<1

Sample calculation ①: When conveying a workpiece

Model No.: LST-16, attachment (weight  $m_k$ : 0.06kg, center of gravity distance  $L_k$ =30mm) when gripping and conveying workpiece (weight m=0.8kg, center of gravity L=60mm)

(g: Gravity acceleration  $9.8\text{m/s}^2$ ,  $\alpha$ : Impact coefficient generated at the end = 3)

 $M_1 = \alpha \times W_1 \times L = \alpha \times (m_k \times g \times L_k \times 2 + m \times g \times L)$ 

= 3 × (0.06 × 9.8 × 30 ×  $10^{-3}$ ×2 + 0.8 × 9.8 ×60 × $10^{-3}$ ) ≈ 1.5N·m and since M1max=1.8N·m or less, it can be used.

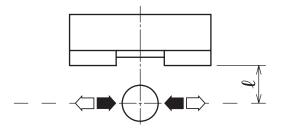
Sample calculation 2: When inserting a workpiece

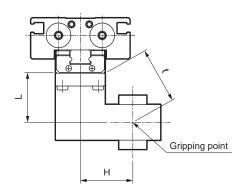
Model No.: LST-16, L=40mm, when load W<sub>1</sub>:40N is applied

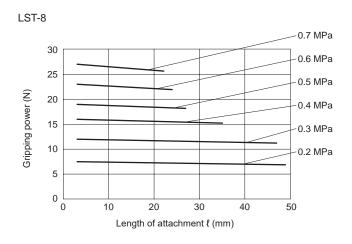
 $M_1=W_1\times L=40\times 40\times 10^{-3}$ = 1.6N·m and since M1max= 1.8N·m or less, it can be used.

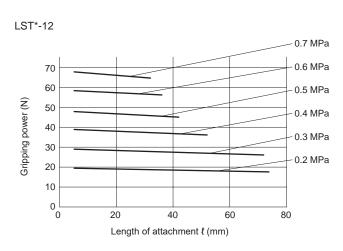
## Gripping power performance data

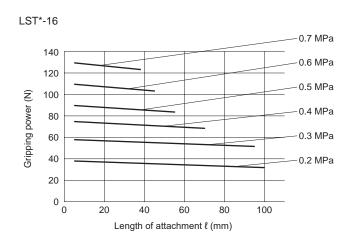
- The gripping force represents the thrust in the direction of the arrow shown in the figure (for one finger).
- · The gripping power at attachment length ℓ at a supply pressure up to 0.7MPa is shown.
- Open direction (<□)
- Close direction (→)

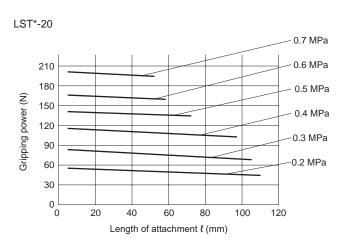










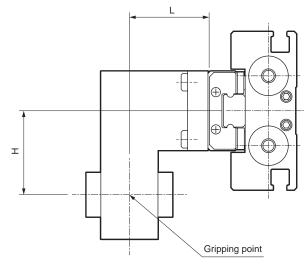


Attachment length

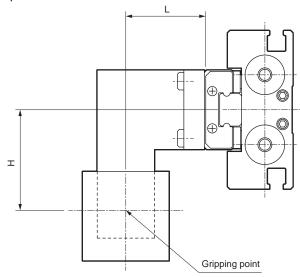
## Attachment length

When mounting an L-shaped attachment, use within the range given in the figure below.

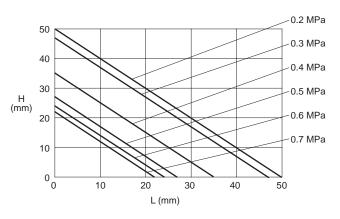
## Close direction



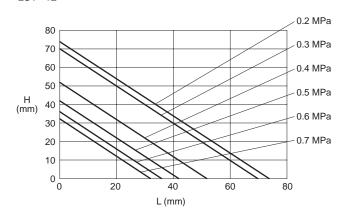
## Open direction



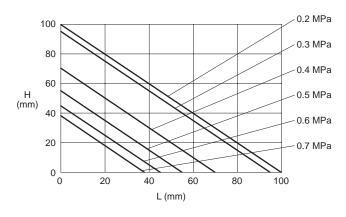
LST-8



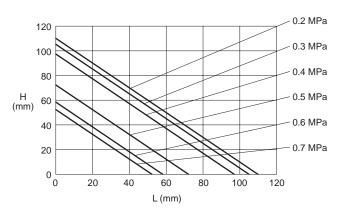
LST\*-12



LST\*-16



LST\*-20





## Safety Precautions

Be sure to read this section before use.

When designing and manufacturing a device using CKD products, the manufacturer is obligated to check that device safety mechanism, pneumatic control circuit, or water control circuit and the system operated by electrical control that controls the devices is secured.

It is important to select, use, handle and maintain the product appropriately to ensure that the CKD product is used safely. Observe warnings and precautions to ensure device safety.

Check that device safety is ensured, and manufacture a safe device.



## WARNING

- 1 This product is designed and manufactured as a general industrial machine part. It must be handled by an operator having sufficient knowledge and experience.
- 2 Use this product in accordance with specifications.

This product must be used within its stated specifications. In addition, never modify or additionally machine this product. This product is intended for use in general industrial machinery equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments. (Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)

- 1 Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
- Use for applications where life or assets could be significantly affected, and special safety measures are required.
- 3 Observe organization standards and regulations, etc., related to the safety of device design and control, etc. ISO4414, JIS B 8370 (Pneumatics fluid power - General rules and safety requirements for systems and their components) JFPS2008 (Principles for pneumatic cylinder selection and use) Including the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.
- 4 Do not handle, pipe, or remove devices before confirming safety.
  - Inspect and service the machine and devices after confirming safety of all systems related to this product.
  - 2 Note that there may be hot or charged sections even after operation is stopped.
  - 3 When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility. Discharge any compressed air from the system, and pay attention to possible water leakage and leakage of electricity.
  - When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.
- 5 Observe warnings and cautions in the following pages to prevent accidents.
- The precautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.



DANGER. When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, and when there is a high degree of emergency to a warning.



A WARNING: If handled incorrectly, a dangerous situation may occur, resulting in death or serious injury.



CAUTION: When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. Every item provides important information and must be observed.

### Warranty

1 Warranty period

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

2 Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified above, 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:

- 1) 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 the Instruction Manual.
- 2) Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
- 3) Failure not caused by the product.
- 4) Failure caused by use not intended for the product.
- 5) Failure caused by modifications/alterations or repairs not carried out by CKD.
- 6) Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- 7) 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.

Note: For details on the durability and consumable parts, contact your nearest CKD sales office.

3 Compatibility check

The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines





## Pneumatic control systems

## **Safety Precautions**

Be sure to read this section before use.

Refer to Pneumatic Cylinders II (CB-030SA) for general information of the cylinder and cylinder switches.

Product-specific cautions: Low-pro

Low-profile long stroke hand LST Series

Low-profile long stroke hand with length measuring function LSTM Series

## Design/selection

## 1. Common

## **WARNING**

- If a moving workpiece poses a danger to the human body, or if there is a possibility of human fingers being pinched by the fingers or the attachments, take safety precautions such as by installing a protective cover.
- If the circuit pressure drops due to power failure or air source trouble, the gripping power may decrease and the workpiece may fall.Provide position locking measures, etc., so that personnel are not injured or machines damaged.

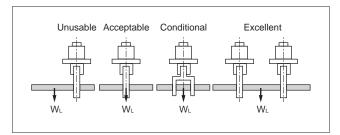
## **A**CAUTION

Working environment

At cutting, casting, or welding plants, there is a risk of foreign matter, such as cutting fluid, chips, powder and dust, entering the equipment. Use covers and such to prevent this as much as possible.

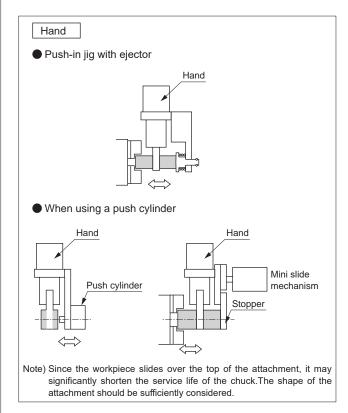
Do not use the equipment under the following environments.

- Cutting fluid is applied (because the sliding portion will be scraped by the abrasive or abrasive powder in the fluid)
- When the atmosphere contains organic solvents, chemicals, acids, alkalis, kerosene, etc.
- Exposed to water
- When gripping long or large workpieces, stable gripping requires a grip on the center of gravity. Stability is a must when using larger or multiple workpieces as well.



- Select a model that has sufficient power to grip the workpiece weight.
- Select a model that has sufficient opening/closing width for the workpiece size.
- If the attachment is not rigid enough, the fingers may twist due to deflection, which may have a negative impact on operation.

■ When inserting the workpiece directly to the jig using a hand, take the clearance into consideration during design. The hand could be damaged.



- Adjust the gripper opening/closing speed using the speed controller (sold separately). When used at high speed, backlash may occur sooner. In addition, the workpiece may vibrate due to shocks in opening/closing, which may lead to erroneous chucking, erroneous insertion of workpieces and poor repeatability.
- If a small-diameter or short-stroke actuator operates at a high frequency, condensation (water droplets) may form inside the piping in certain conditions. Take steps to prevent condensation such as by using a quick exhaust valve.

## 2. LSTM Series

## **A**CAUTION

- Use only a DC safety power supply.Do not connect motors, valves, etc., that generate noise to the power supply used in this device.
- While wiring, ensure that inductive noise is not applied to the sensor and amplifier and that power lines such as motors do not use the same piping and wiring (through multi-core cables, etc.). Use caution with the inverter power supply and its wiring section as well.

(Check that the inverter power frame ground is correctly grounded and noise is released.)

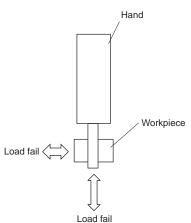
- Note that noise resistance performance may be adversely affected if the length of the cable is 5 m or greater.
- Make sure that the cable is wired so that it is free of local bends and tension.
  - Also make sure that the lead wire is free of repeated bends.
- Make sure that force of 30 N or over is not applied to the M8 connector section.
- This product cannot be used outdoors or in an atmosphere containing corrosive elements.

## Mounting, installation and adjustment

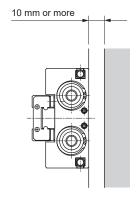
## 1. Common

## **A**CAUTION

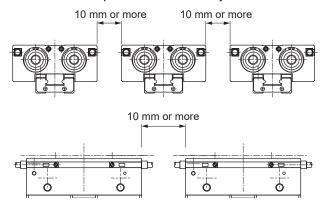
■ Be sure not to apply an excessive load to the fingers and attachment when attaching and detaching or conveying workpieces. The linear guide rolling contact surface of the fingers may be scratched or dented, resulting in a malfunction.



■ The cylinder switch may malfunction if there is a magnetic substance such as a metal plate installed adjacently. Check that a distance of 10 mm is provided from the surface of the cylinders.

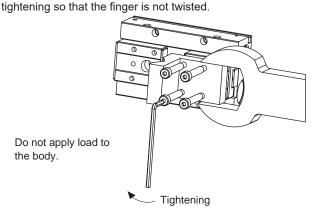


■ The cylinder switch may malfunction if cylinders are installed adjacently. Check that the following distances are provided between cylinders.



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

  When mounting the attachment to the finger, to prevent any effect on the hand, support with a wrench, etc., when



Item	Bolt used	Tightening torque (N⋅m)
LST-08	M 2.5 x 0.45	0.32
LST*-12	M 3 x 0.5	0.59
LST*-16	M 4 x 0.7	1.4
LST*-20	M 4 x 0.7	1.4

■ Do not cause dents or scratches that may damage flatness or perpendicularity on the body mounting surface and finger.

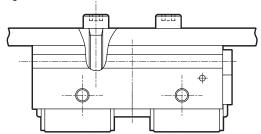
Product-specific cautions

- Do not retighten or disassemble, other than the screws used for fixing the body and finger. This could lead to malfunction.
- Regularly grease the sliding section of the finger. Regular replenishment can further extend service life.

III C.	
Manufacturer	Model No.
THK	AFF grease

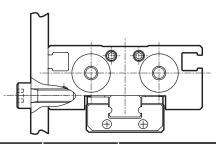
## ■ Refer to the following section for body mounting.

### Top mounting



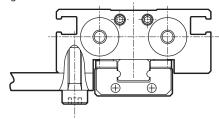
Item	Bolt used	Tightening torque (N⋅m)	Max. screw insertion depth L (mm)
LST-08	M 3 x 0.5	0.88	7
LST*-12	M 4 x 0.7	2.1	10
LST*-16	M 5 x 0.8	4.3	12
LST*-20	M 6 x 1.0	7.3	15

### Front mounting



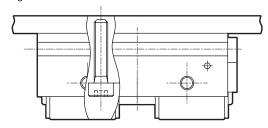
Item	Bolt used	Tightening torque (N⋅m)	Max. screw insertion depth L (mm)
LST-08	M 3 x 0.5	0.59	4
LST*-12	M 4 x 0.7	1.6	5
LST*-16	M 5 x 0.8	3.3	5.5
LST*-20	M 6 x 1.0	5.8	6

### Bottom mounting



Item	Bolt used	Tightening torque (N⋅m)	Max. screw insertion depth L (mm)
LST-08	M 3 x 0.5	0.59	4
LST*-12	M 4 x 0.7	1.6	5
LST*-16	M 5 x 0.8	3.3	5.5
LST*-20	M 6 x 1.0	5.8	6

### Use of through hole



Item	Bolt used	Tightening torque (N·m)
LST-08	M 2.5 x 0.45	0.32
LST*-12	M 3 x 0.5	0.88
LST*-16	M 4 x 0.7	2.1
LST*-20	M 5 x 0.8	4.3

## 2. LSTM Series

## **A**CAUTION

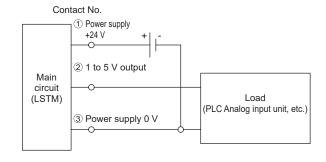
- Rubber plugs are attached to the external zero point adjusting trimmers to maintain water resistance. Fit these plugs in after adjusting.
- The M8 screw of the cable should be securely tightened to maintain water resistance.
- Connecting the cable
  - 1. Turn power OFF before wiring this product.
  - 2.Do not touch the connector fitting surface with wet hands.

When wiring, wipe off any moisture adhered to connectors and peripheral parts. Failure to do so may result in insulation failure.

- 3.Ensure that metal pieces or powder do not enter the connector fitting section.
- 4.Make sure to manually tighten the connector fixing bracket (M8) (recommended 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/maintenance**

## 1. Common

## CAUTION

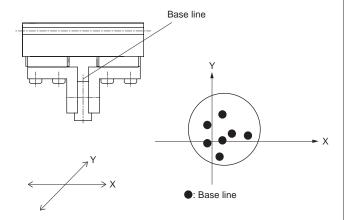
## ■ Repeatability

The repeatability here indicates the displacement of the finger in the case of repeated clamping and unclamping in the same conditions (hand fixed, same attachment used: see below).

Shock during opening and closing may lead to position misalignment of the workpiece and deterioration of repeatability. Note as well that attachment wear or insufficient rigidity may lead to deterioration of accuracy.

### Conditions

- ·Attachment dimensions, shape, weight
- ·Attachment workpiece gripping position
- ·Clamp method, length
- ·Attachment and workpiece contact area resistance
- ·Shock-free opening and closing with speed controller
- Fluctuation of gripping power (air pressure), etc.



## 2. LSTM Series

## **A**CAUTION

Analog output voltage corresponds to the cylinder piston position. The value may fluctuate because of jig deformation and wear, etc., due to use over time. (For the hand, fluctuation is caused by finger opening and closing direction backlash and attachment deformation and wear.)

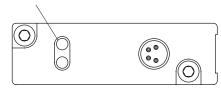
If the analog output voltage fluctuates, perform fine adjustment using the zero point adjustment exterior trimmer.

## Operating procedure

Remove the attachment or the like, close the fingers, remove the rubber stopper of the zero point adjustment exterior trimmer and rotate the trimmer for fine adjustment so that the output voltage is 1 V.

Be sure to reinstall the rubber plug correctly after operation. At this time, make sure water or foreign matter does not enter.

Zero point adjustment exterior trimmer



## ■ Repeatability of analog output

The repeatability here indicates the displacement of the analog output converted to length in the case of repeated clamping and unclamping in the same conditions (hand fixed, same workpiece used: see below).

### Conditions

- ·Workpiece dimensions, shape, weight
- ·Attachment workpiece gripping position
- ·Clamp method, length
- ·Attachment and workpiece contact area resistance
- ·Fluctuation of gripping power (air pressure)
- When measuring with a full scale, take the backlash amount of 0.15 mm into account.

MEMO

## MEMO

Related products

## **Related products**

## Linear Slide Hand LSH-HP Series

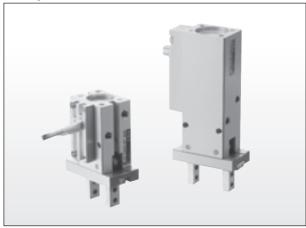
### LSH-HP1 Series

- Increased linear guide performance
- Increased flexibility in design
- Long service life
- Reduced processes on site

### LSH-HP2 Series

- High precision repeatability ±0.02mm, linearity FS±0.5%
- A high structure is realized by an integrated structure with a displacement sensor built into the body
- Environment-resistant IP65 equivalent amplifier and rubber cover

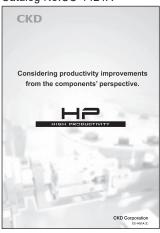
### Catalog No.CC-1419A



## **HP Series General Catalog**

- For high frequency use (HP1) Optimized sliding technology for longer service life with the same dimensions as conventional products (more than 2-fold compared to conventional products)
- For dusty environments (G-HP1)
  Rubber scraper and lube keeping structure improves durability in dusty environments (2x or more compared to conventional models)

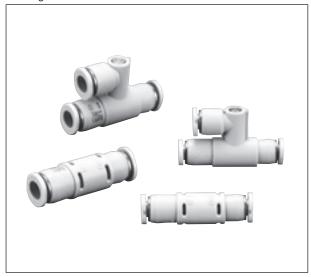
### Catalog No.CC-1421A



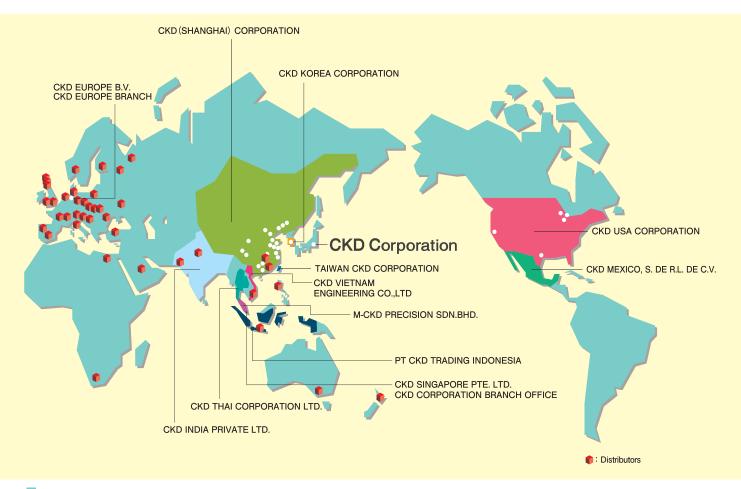
## Quick exhaust valve QEL Series

- Compact / space saving inline Ozone-proof materials for degradation prevention are used as standard for the valve.
- Reducer that can be connected to piping (made-to-order product)
   Quick exhaust can be performed near the actuator. Helps reduce adiabatic expansion.

Catalog No. CB-024SA



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· Corrections to dimensions/clerical errors.

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