

Evolved low profile linear slide gripper pursuing high rigidity, long life, and high precision

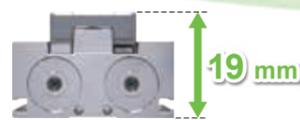


Low profile design with double piston system

Space-saving

Reduced moment of inertia

Reduced height enables space saving and also contributes to reducing the moment of inertia.



*For LST-08

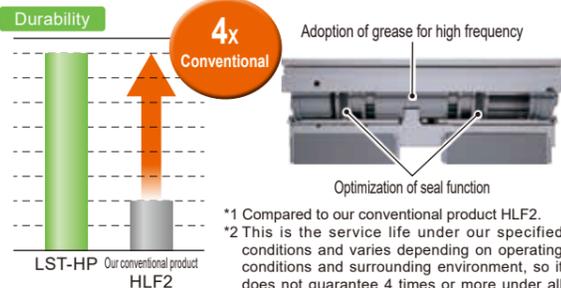
High gripping force

Adopts a double piston system to achieve high gripping force in a compact size.

Long service life

Durability 4 times conventional *1 *2

Mastering sliding technology, achieved 4 times the durability of conventional products.



Usage examples - Reduction of on-site man-hours -

Replacement of main body

Locating holes that guarantee centering accuracy enable highly reproducible mounting without fine adjustment. Contributes to reduction of mounting adjustment man-hours and improvement of reproducibility.

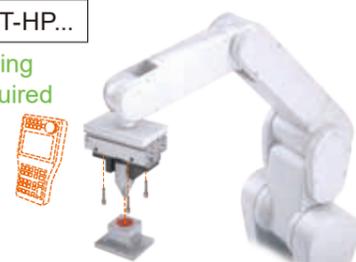
Conventionally...

Teaching



With LST-HP...

Teaching not required



Improved linear guide performance

High rigidity

High precision

Overhang amount UP

Repeatability ± 0.03 mm

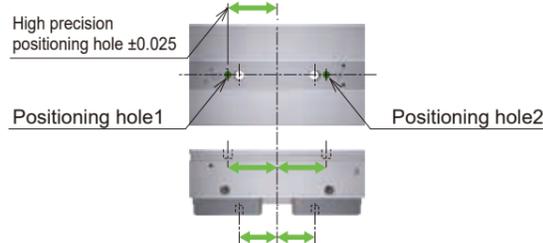
By increasing guide rigidity compared to conventional products, an increase in allowable moment has been achieved.



Reduced on-site man-hours

High-precision positioning hole ± 0.025 mm

Centering accuracy can be easily reproduced by adding a "positioning hole" based on the gripping center.



Flexible lead wire switch selectable

A switch using a highly flexible lead wire that is resistant to disconnection even when used in moving parts can be selected.

Low profile long stroke parallel gripper with built-in LVDT sensor and length measuring function

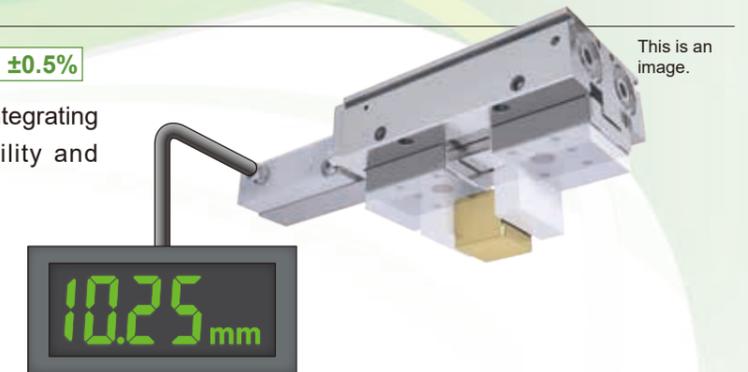


High precision

Repeatability ± 0.04 mm

Linearity F.S. $\pm 0.5\%$

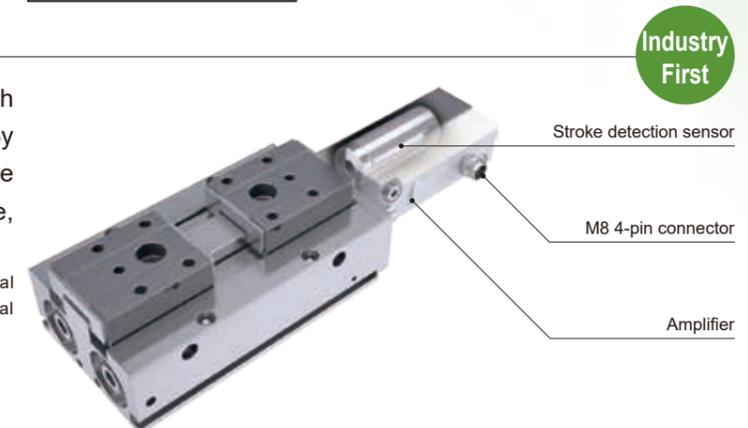
By adopting a new sensor method and integrating it, we have achieved higher repeatability and linearity than ever before.



Integrated structure

Adopts LVDT* method sensor with excellent vibration and shock resistance. By incorporating a displacement sensor into the body and creating an integrated structure, high precision has been achieved.

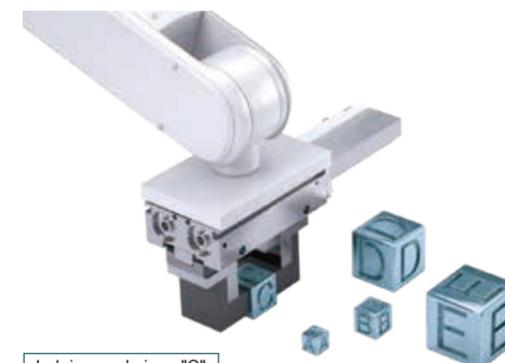
* LVDT is an abbreviation for Linear Variable Differential Transformer, and is a sensor that converts mechanical displacement into an electrical signal and outputs it.



Usage Examples

Workpiece type judgment

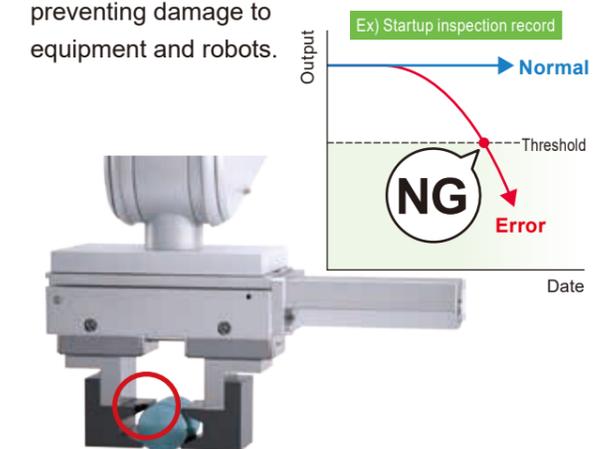
Even minute differences in workpiece type can be judged instantly.



Judging workpiece "C".

Predictive maintenance

Abnormal wear and deformation of gripping fingers and jigs can be monitored from changes in output, preventing damage to equipment and robots.



Hand (Gripper)
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

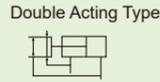
Hand (Gripper)
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending



Low Profile Long Stroke Gripper Double Acting Type (High Durability Equipment)

LST-HP1 Series

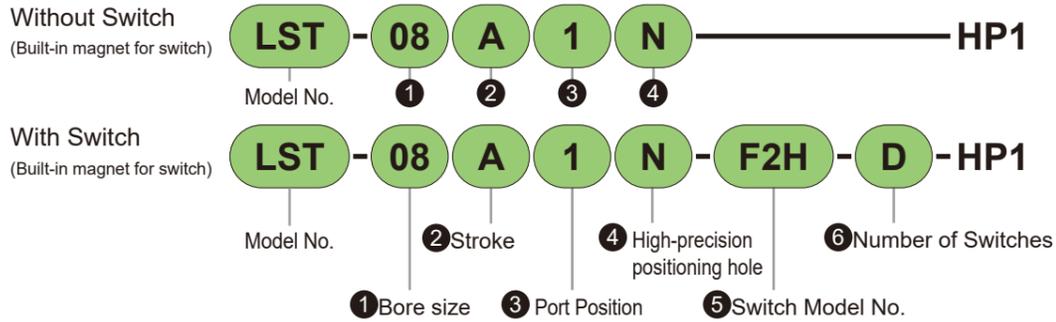
- Operating stroke: Short stroke : 8, 12, 16, 20 mm
- Middle stroke : 16, 24, 32, 40 mm
- Long stroke : 32, 48, 64, 80 mm



LST-HP1 Series

Specifications

Model No. Notation Method



① Bore Size (mm)

Code	Content
08	ø8
12	ø12
16	ø16
20	ø20

② Stroke

Code	Content	Stroke (mm)			
		ø8	ø12	ø16	ø20
A	Short stroke	8	12	16	20
B	Middle stroke	16	24	32	40
C	Long stroke	32	48	64	80

③ Port Position

Code	Content
1	Axial piping
2	Side piping

④ High-precision positioning hole

Code	Content
N	None
A	Available

⑤ Switch Model No.

For switch details, please refer to P. 573. Switches are included with the product and shipped.

Contact	Indicator LED Special Function	Wiring (Output)	Load Voltage (V)		Load Current (mA)		Lead wire *1		Image
			AC	DC	AC	DC	Straight	L-shape	
Solid State	1-Color	2-wire	-	10 to 30	-	5 to 20	-	F2S□	
		3-wire (NPN)	-	30 or less	-	50 or less	-	F3S□	
		2-wire	-	10 to 30	-	5 to 20 *2	F2H□	F2V□	
		3-wire (NPN)	-	30 or less	-	50 or less	F3H□	F3V□	
		3-wire (PNP)	-	30 or less	-	50 or less	F3PH□	F3PV□	

*Lead wire length

Code	Content
Blank	1 m (Standard)
3	3 m (Option)

Example) Lead wire length
1 m F2S
3 m F2S³

*1: For "□" in the switch model number, enter the code selected from the "Lead wire length" table.

*2: The maximum load current value above, 20 mA, is at 25 °C. If the switch operating ambient temperature is higher than 25 °C, it will be lower than 20 mA. (At 60 °C, it will be 5 to 10 mA.)

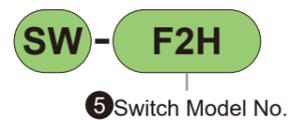
*3: Switches other than the model numbers listed above are also available. (Custom Product) For details, see P. 573.

*4: When installing a 2-color indicator switch, please consult our sales office.

⑥ Number of Switches

Code	Content
R	With 1 pc. on Open Side
H	With 1 pc. on Close Side
D	With 2 pcs

Switch Single Unit Model No. Notation Method



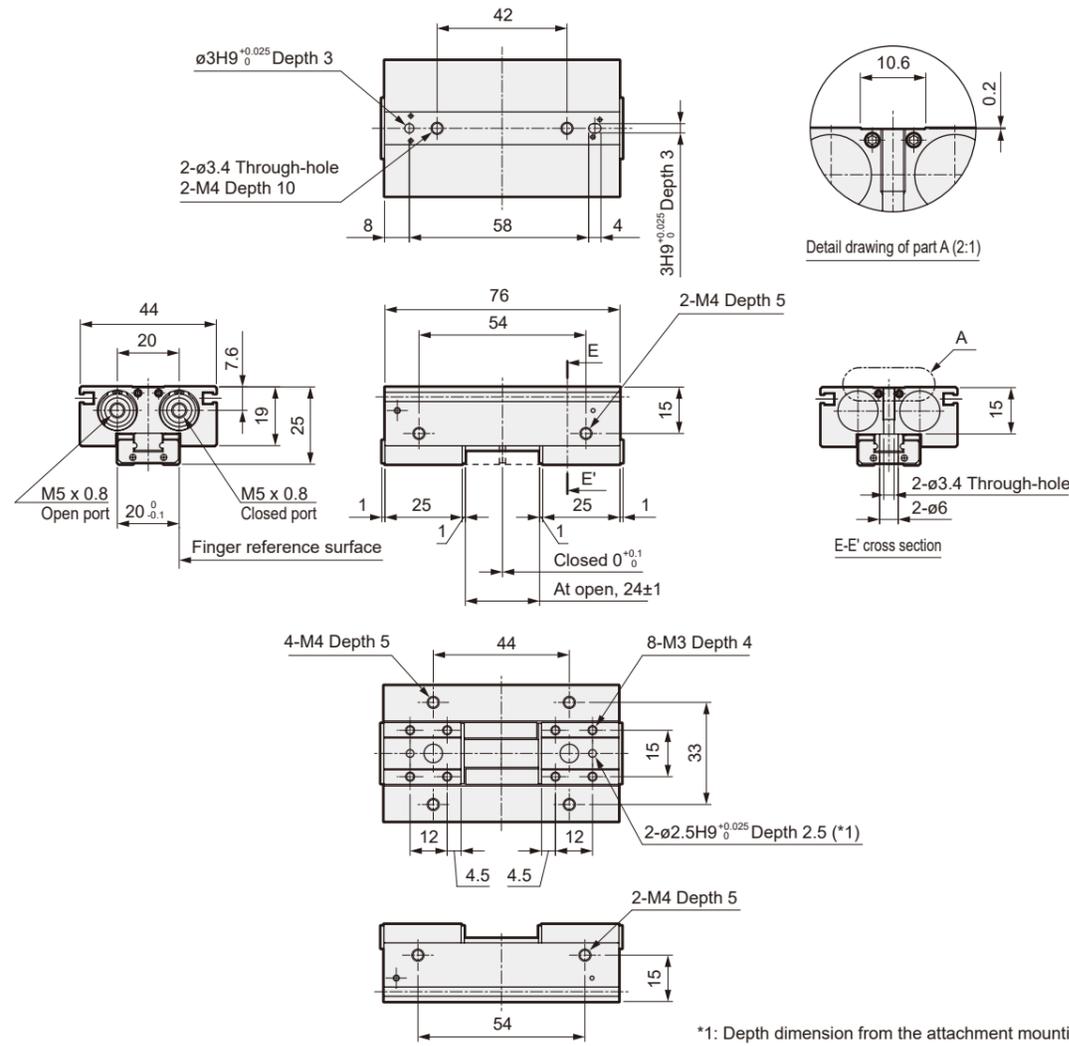
Specifications

Item	LST-08			LST-12			LST-16			LST-20		
	A	B	C	A	B	C	A	B	C	A	B	C
Bore size mm	ø8 x 2			ø12 x 2			ø16 x 2			ø20 x 2		
Actuation method	Double Acting Type											
Operating Fluid	Compressed Air											
Max. Working Pressure MPa	0.7											
Min. Operating Pressure MPa	0.15			0.1								
Ambient Temperature °C	-10 to 60 (No freezing)											
Port Size	M3			M5								
Operating stroke 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											

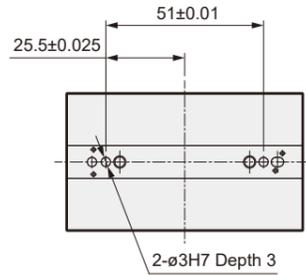
Hand (Gripper)
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

Hand (Gripper)
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

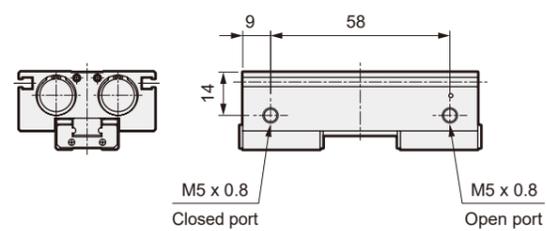
●LST-12B1N



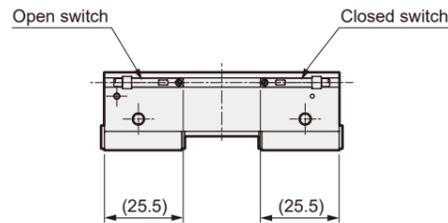
●LST-12B□A



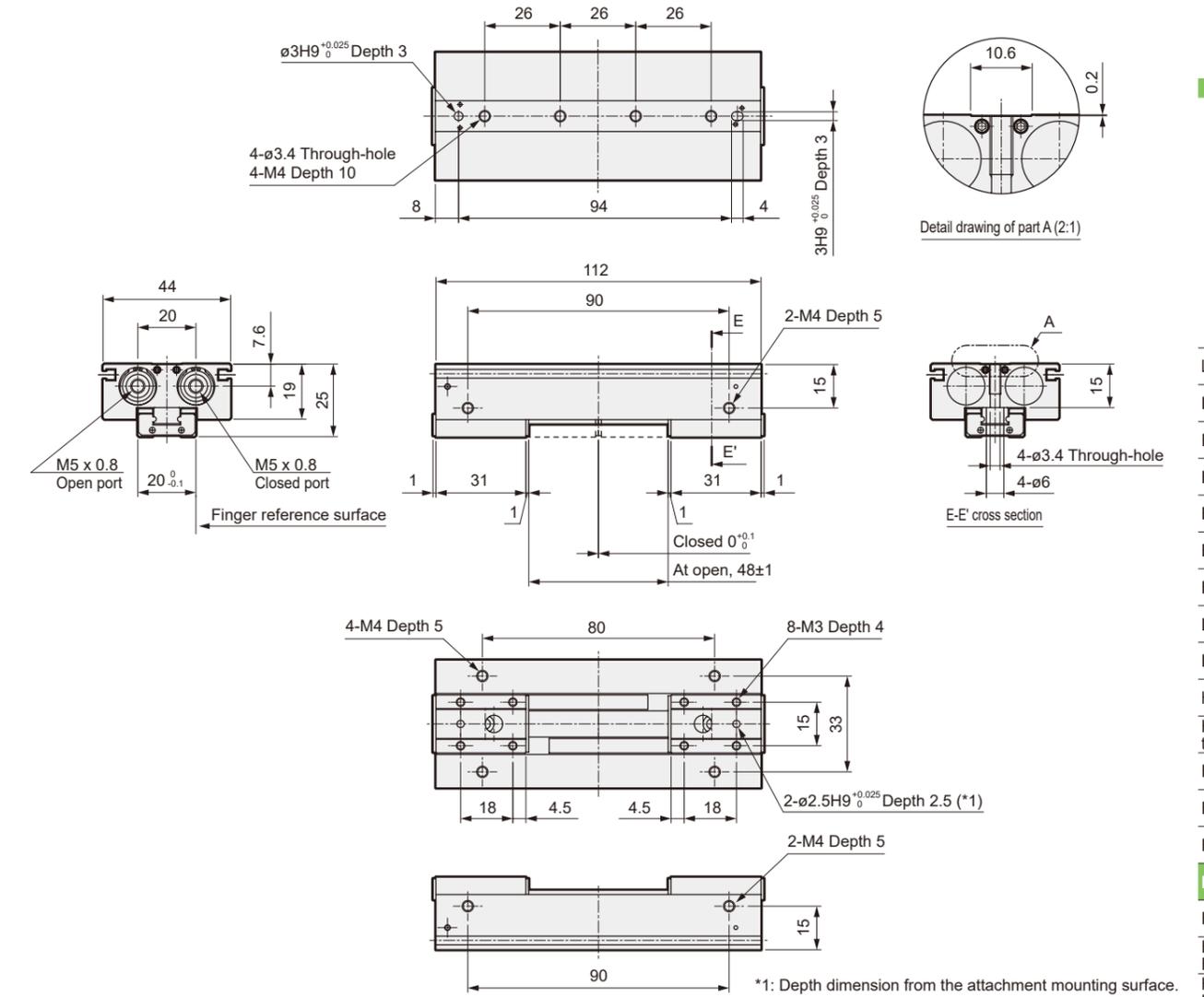
●LST-12B2□



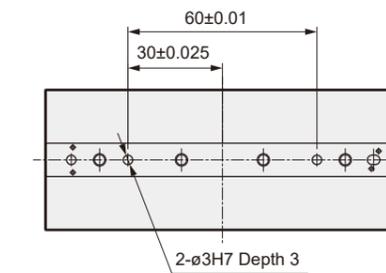
●With Switch



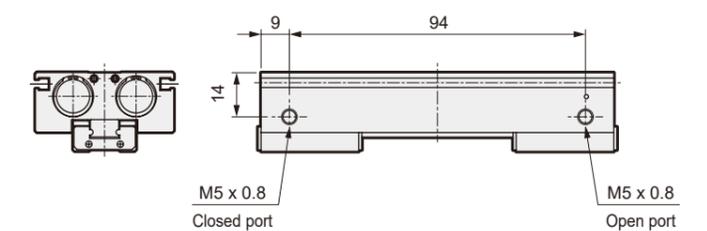
●LST-12C1N



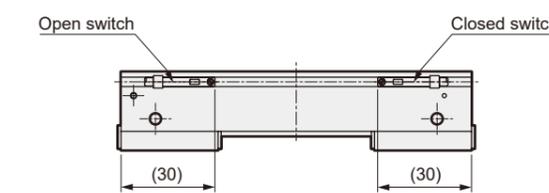
●LST-12C□A



●LST-12C2□



●With Switch



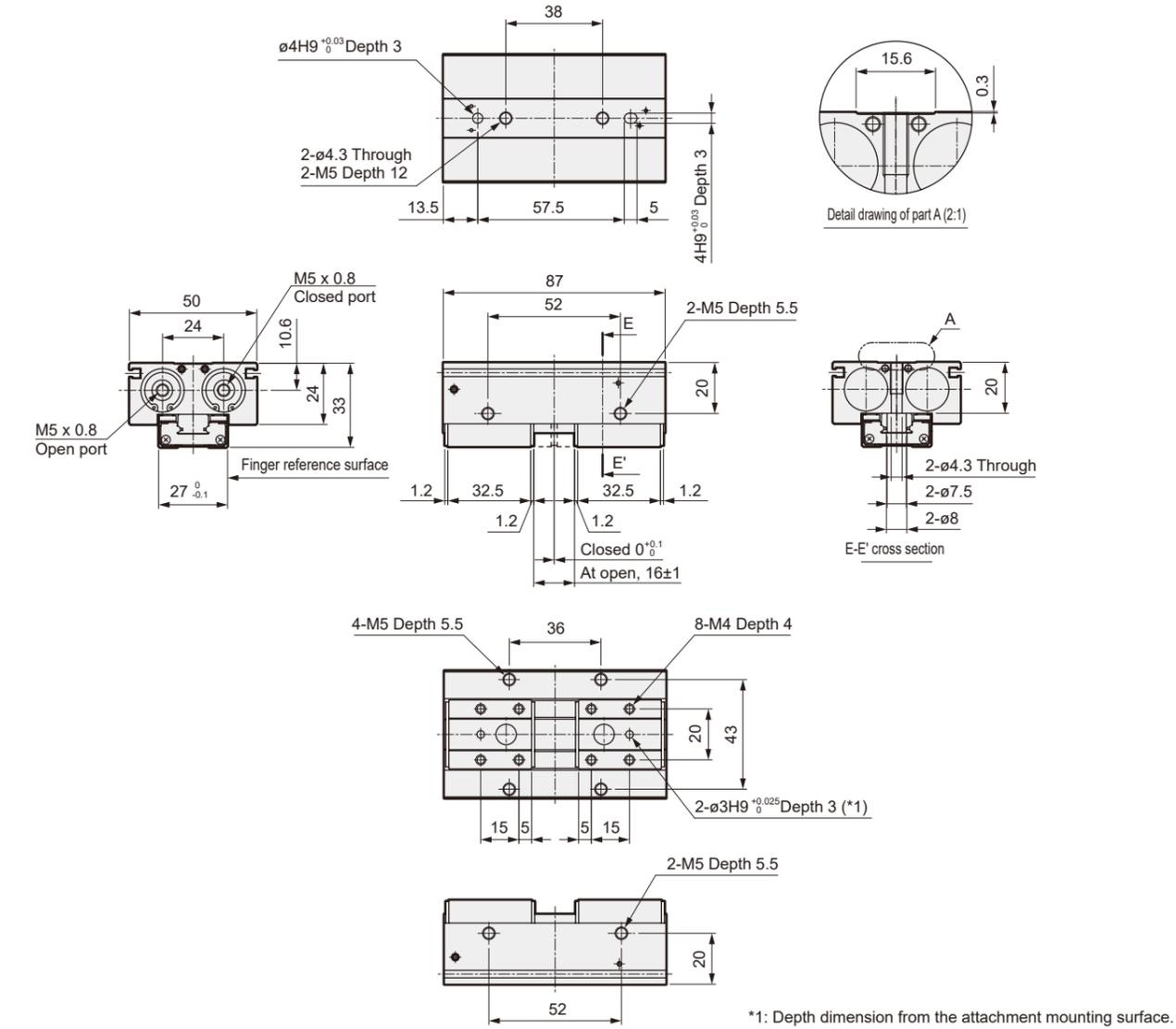
Hand (Gripper)

- LSH-HP
- LSH
- FH100
- BSA2
- BHA
- BHG
- BHE
- LHA
- LHAG
- HAP-1C
- HAP-2 to 4CS
- HKP
- HCP
- HGP
- LST-HP**
- HLF2
- HLA/HLB
- HLAG/HLBG
- HLC
- HLD
- HMC-HP
- HMF
- HMF-G
- HMFB
- HFP
- FH500
- HBL
- HJL
- HMD
- HDL
- HJD
- Cylinder Switch
- Ending

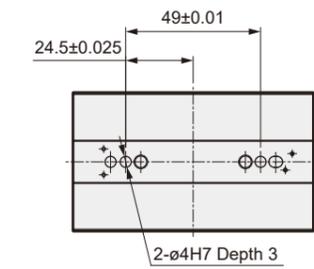
Hand (Gripper)

- LSH-HP
- LSH
- FH100
- BSA2
- BHA
- BHG
- BHE
- LHA
- LHAG
- HAP-1C
- HAP-2 to 4CS
- HKP
- HCP
- HGP
- LST-HP**
- HLF2
- HLA/HLB
- HLAG/HLBG
- HLC
- HLD
- HMC-HP
- HMF
- HMF-G
- HMFB
- HFP
- FH500
- HBL
- HJL
- HMD
- HDL
- HJD
- Cylinder Switch
- Ending

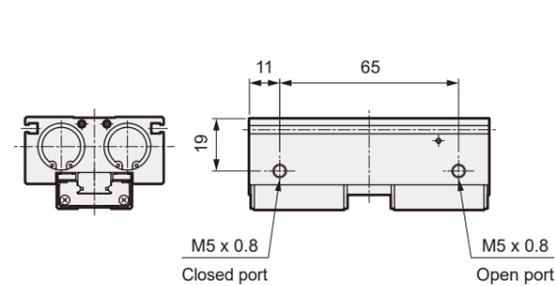
●LST-16A1N



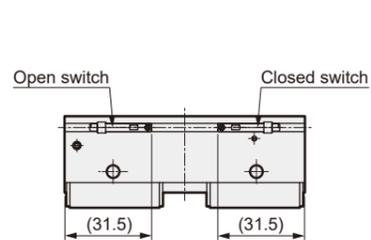
●LST-16A□A



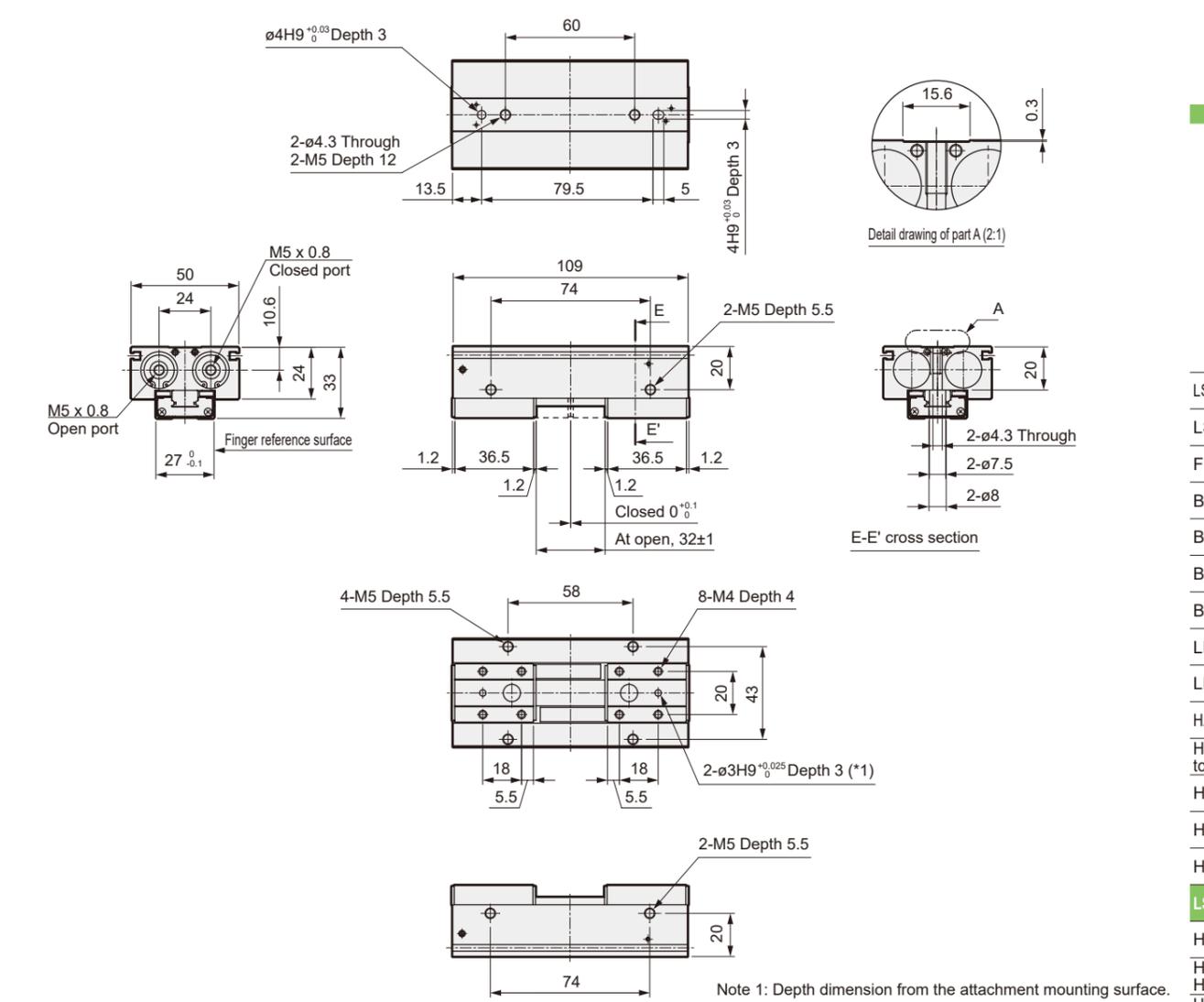
●LST-16A2□



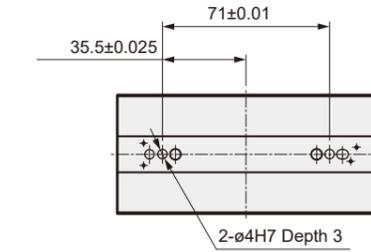
●With Switch



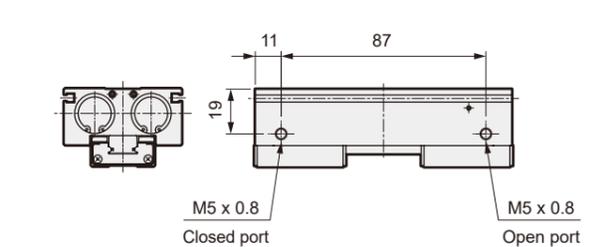
●LST-16B1N



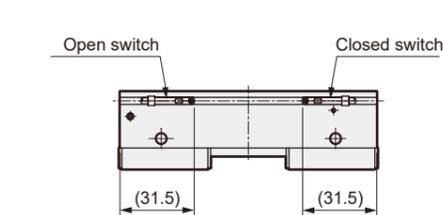
●LST-16B□A



●LST-16B2□



●With Switch



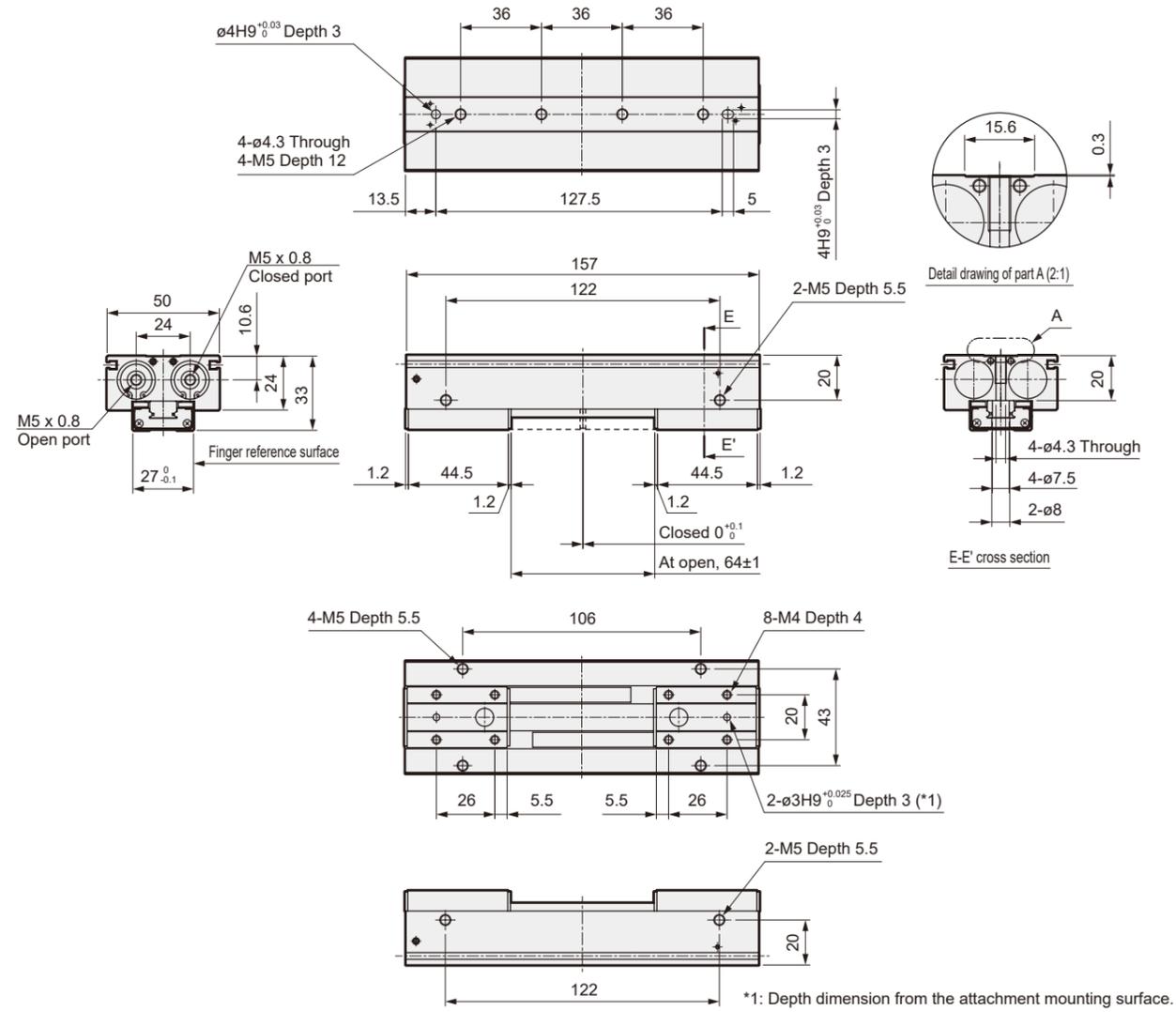
Hand (Gripper)

LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

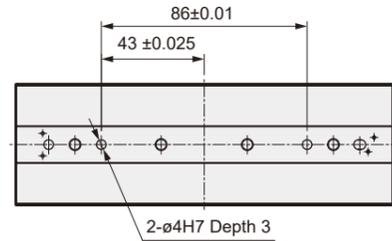
Hand (Gripper)

LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

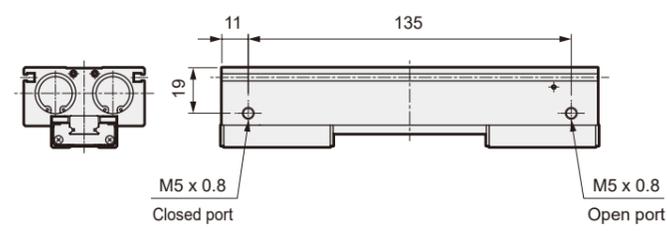
●LST-16C1N



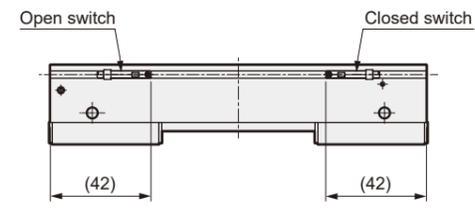
●LST-16C□A



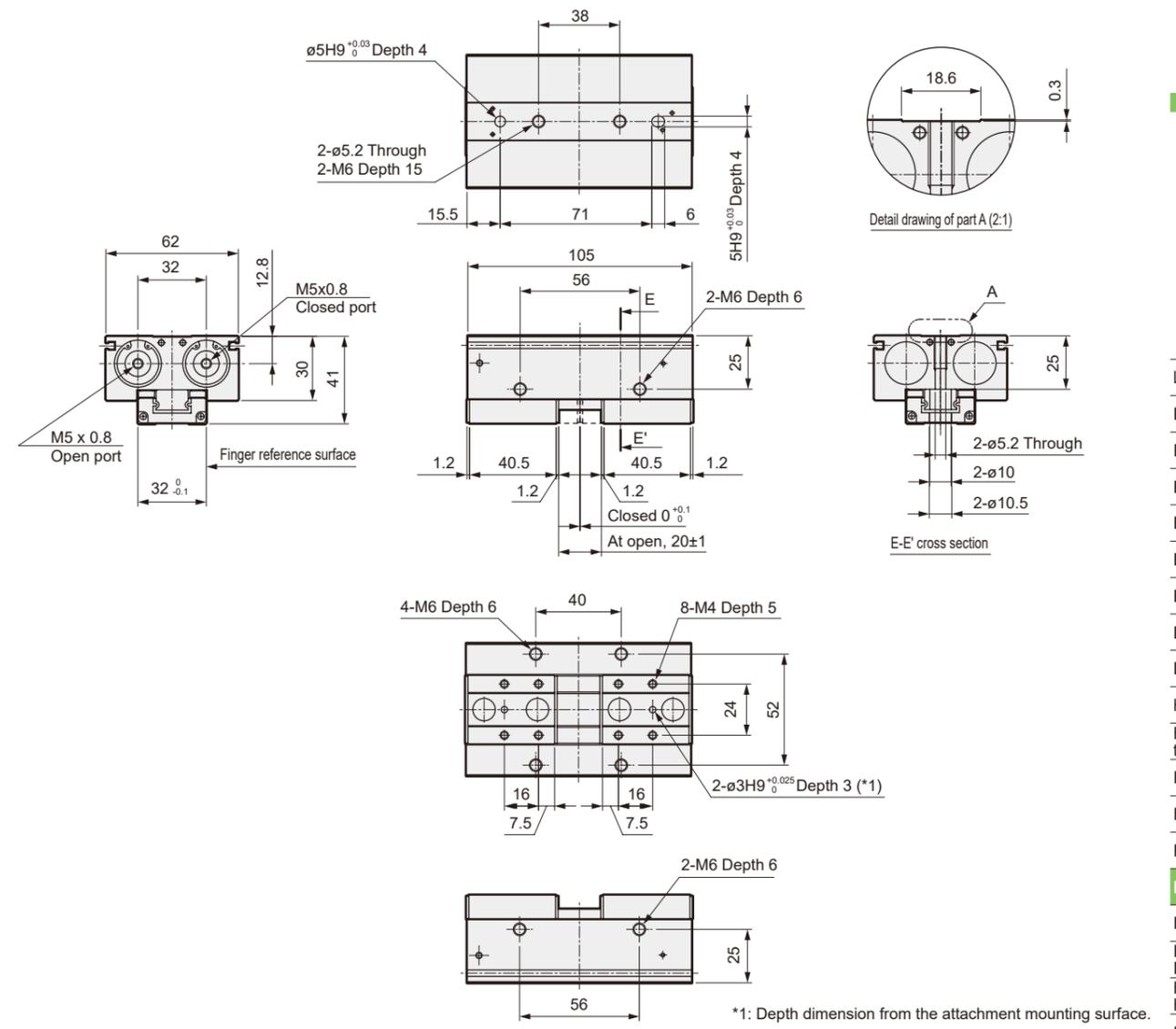
●LST-16C2□



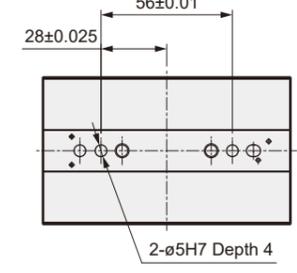
●With Switch



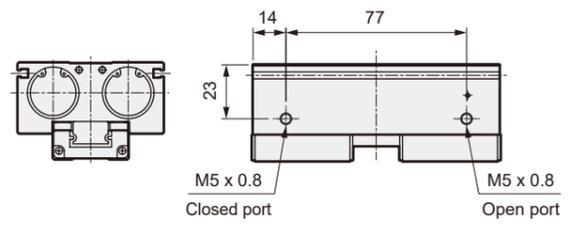
●LST-20A1N



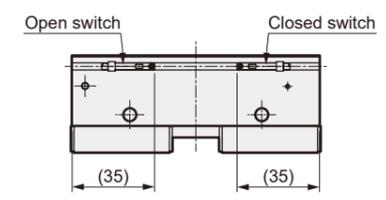
●LST-20A□A



●LST-20A2□



●With Switch



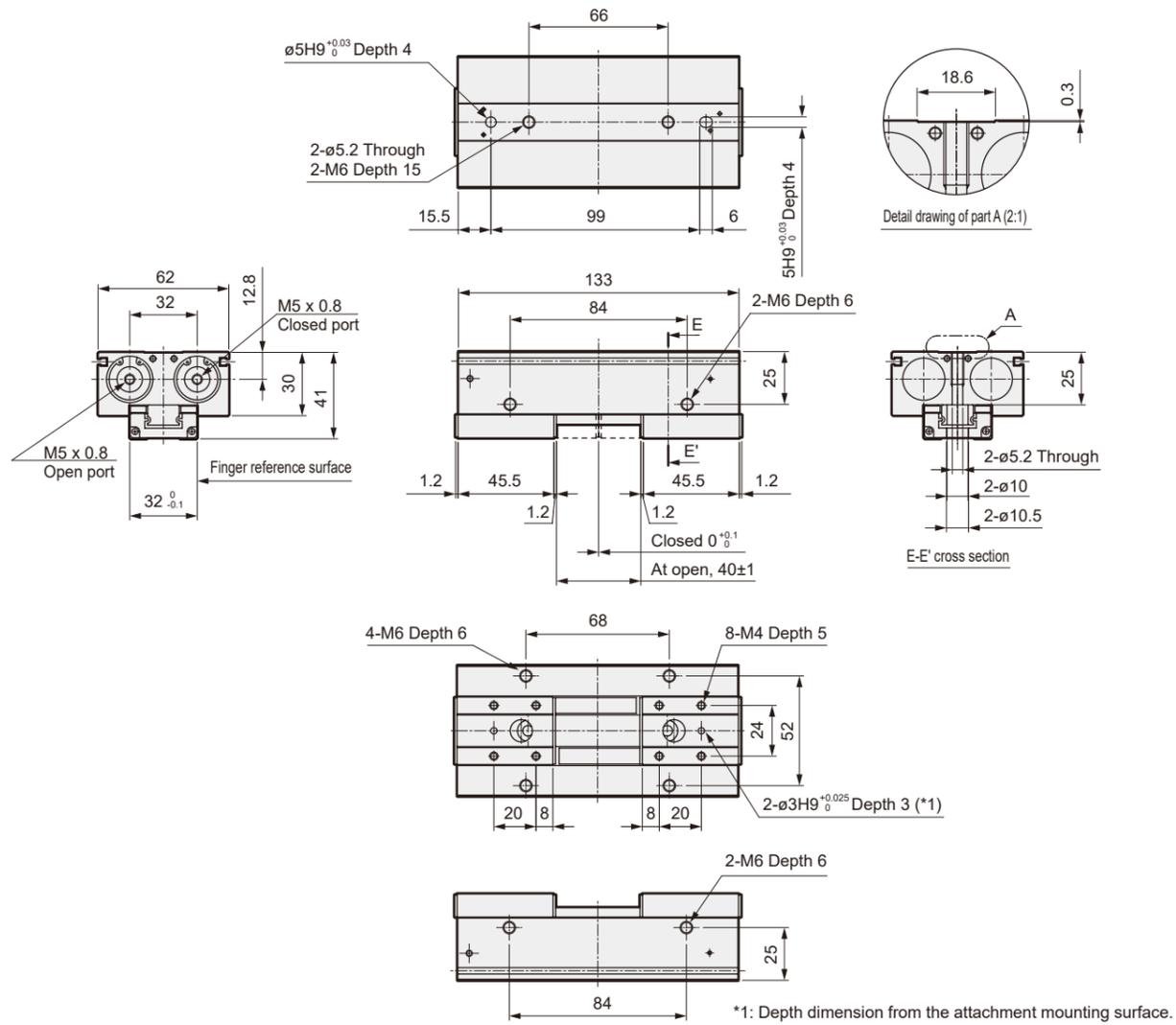
Hand (Gripper)

- LSH-HP
- LSH
- FH100
- BSA2
- BHA
- BHG
- BHE
- LHA
- LHAG
- HAP-1C
- HAP-2 to 4CS
- HKP
- HCP
- HGP
- LST-HP**
- HLF2
- HLA/HLB
- HLAG/HLBG
- HLC
- HLD
- HMC-HP
- HMF
- HMF-G
- HMFB
- HFP
- FH500
- HBL
- HJL
- HMD
- HDL
- HJD
- Cylinder Switch
- Ending

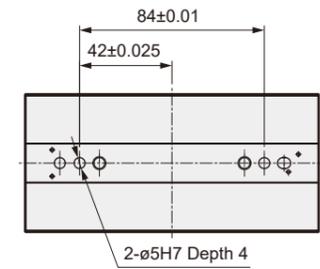
Hand (Gripper)

- LSH-HP
- LSH
- FH100
- BSA2
- BHA
- BHG
- BHE
- LHA
- LHAG
- HAP-1C
- HAP-2 to 4CS
- HKP
- HCP
- HGP
- LST-HP**
- HLF2
- HLA/HLB
- HLAG/HLBG
- HLC
- HLD
- HMC-HP
- HMF
- HMF-G
- HMFB
- HFP
- FH500
- HBL
- HJL
- HMD
- HDL
- HJD
- Cylinder Switch
- Ending

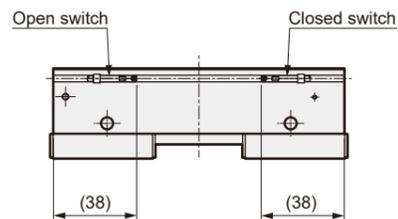
●LST-20B1N



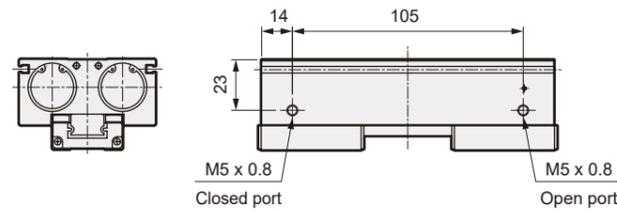
●LST-20B□A



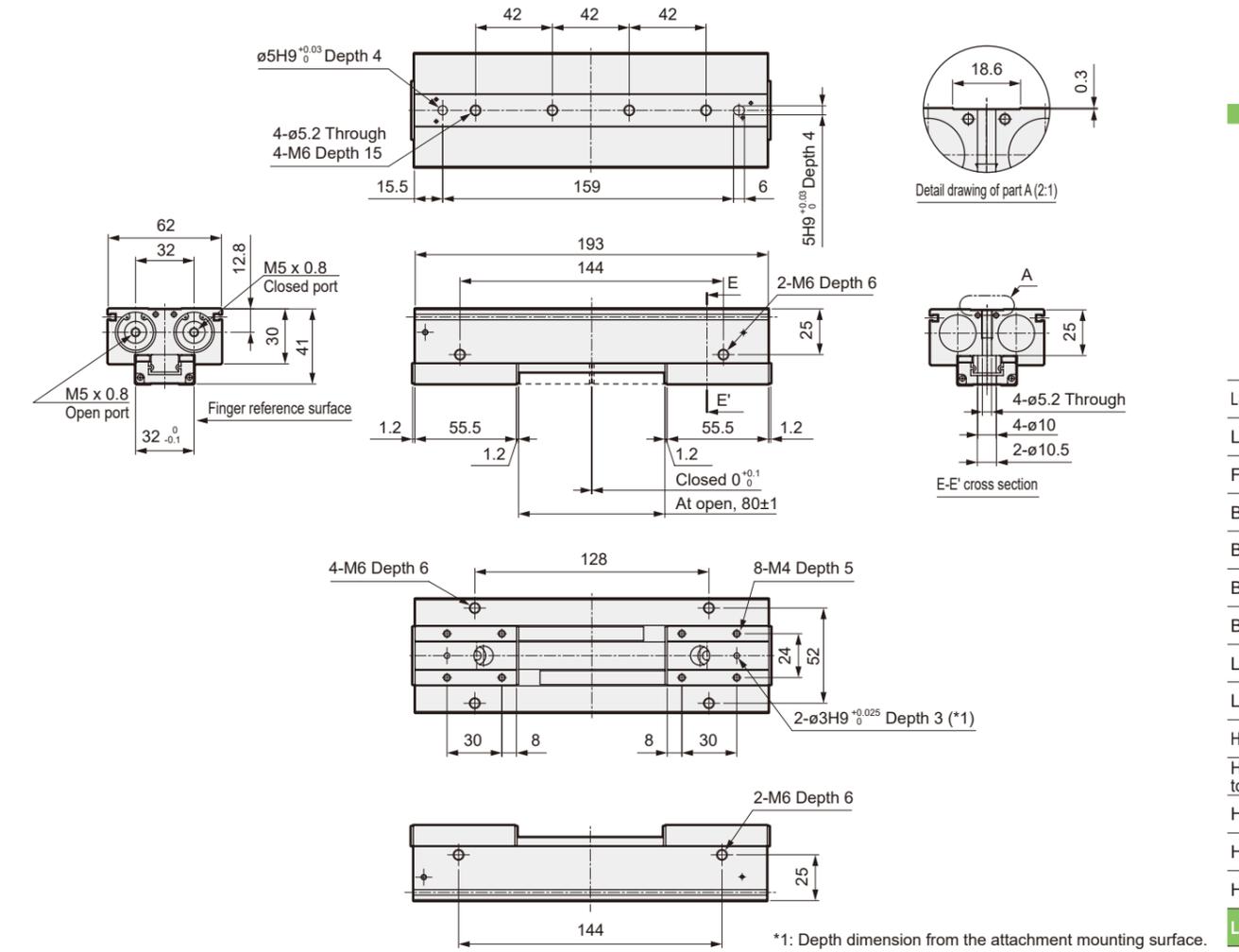
●With Switch



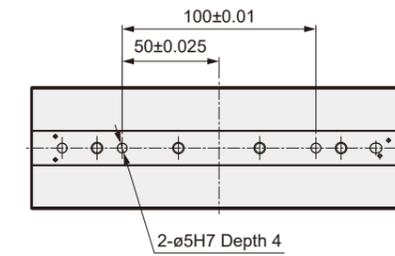
●LST-20B2□



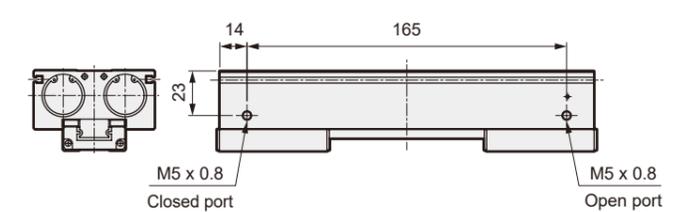
●LST-20C1N



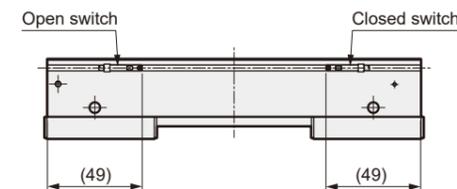
●LST-20C□A



●LST-20C2□



●With Switch



Hand (Gripper)

LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP

LST-HP

HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

Hand (Gripper)

LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP

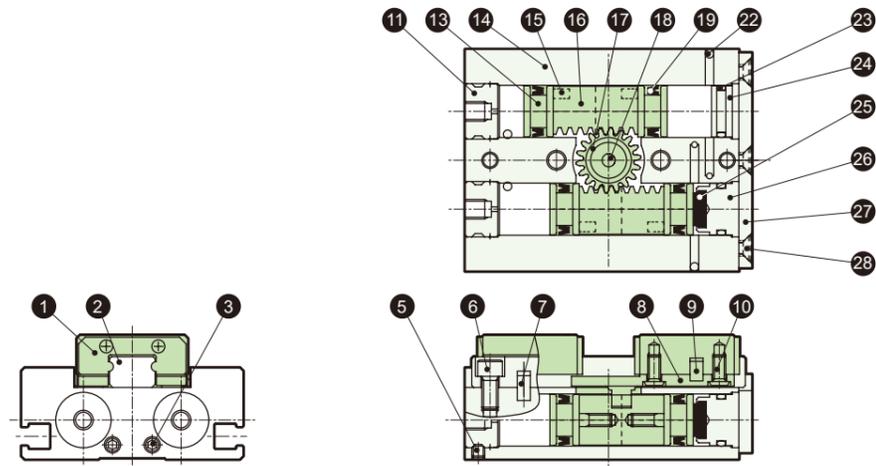
LST-HP

HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

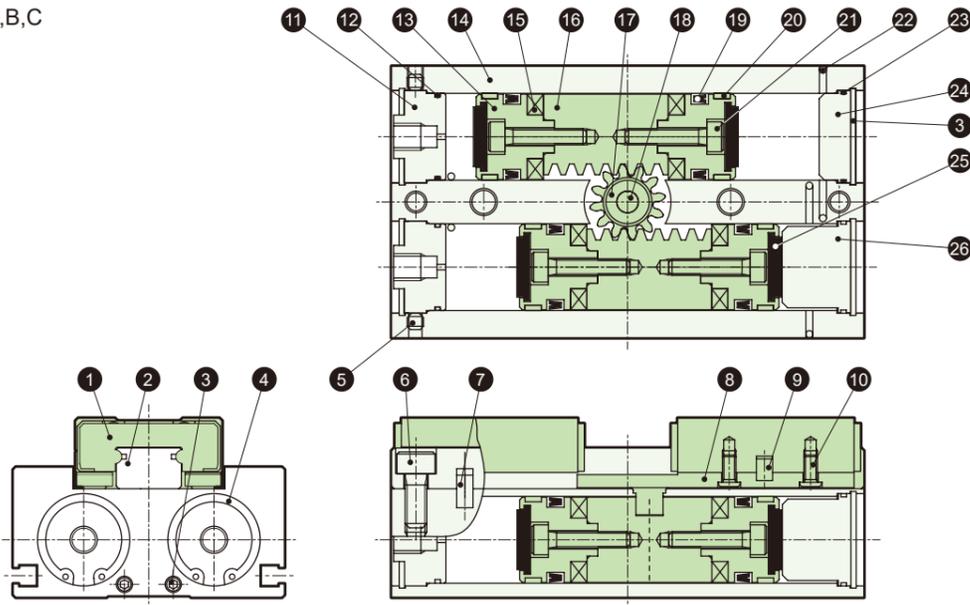
LST-HP1 Series

Internal Structure Diagram/Material

●LST-08A,B,C



●LST-12 to 20A,B,C



Part No.	Part Name	Material	Remarks	Part No.	Part Name	Material	Remarks
1	Finger	Stainless Steel		14	Body	Aluminum Alloy	Hard Anodized
2	Linear Guide	Stainless Steel		15	Magnet	-	
3	Hexagon socket head set screw	Stainless Steel		16	Rack	Stainless Steel	
4	Round R type retaining ring (ø12) C type retaining ring (ø16 to ø20)	Steel		17	Pinion	Alloy Steel	
5	Hexagon socket head set screw	Stainless Steel		18	Pin	Stainless Steel	
6	Hexagon Socket Head Cap Screw	Stainless Steel		19	Piston Packing	Nitrile Rubber	
7	Pin	Stainless Steel		20	Wear Ring	Polyacetal	Excludes ø8A,B
8	Rack joint	Stainless Steel		21	Hexagon Socket Head Cap Screw	Stainless Steel	
9	Pin	Stainless Steel		22	Steel ball	Stainless Steel	
10	Pan Head Screw	Stainless Steel		23	O-ring	Nitrile Rubber	
11	Port cover	Aluminum Alloy	Chromate	24	Cover 1	Aluminum Alloy	Chromate
12	O-ring	Nitrile Rubber		25	Cushion Rubber	Urethane Rubber	
13	Piston	ø8: Stainless steel ø12 to ø20: Aluminum alloy		26	Cover 2	Aluminum Alloy	Chromate
				27	Cover 3	Stainless Steel	ø8 only
				28	Phillips flat head screw	Stainless Steel	ø8 only

MEMO

For maintenance parts, please visit the CKD Equipment Product Site
[\(https://www.ckd.co.jp/kiki/en/\)](https://www.ckd.co.jp/kiki/en/) → "model No." → Maintenance Parts



Low Profile Long Stroke Gripper with Length Measuring Function (High Durability Equipment)

LSTM-HP2 Series

● Operating stroke: 12, 16, 20 mm

Double Acting



For suitable detailed model numbers, please see our website.

LSTM-HP2 Series

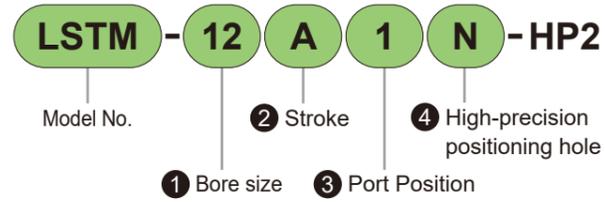
Specifications

Specifications

Item	LSTM			
	ø12 x 2	ø16 x 2	ø20 x 2	
Bore size	mm	ø12 x 2	ø16 x 2	ø20 x 2
Actuation method	Double Acting Type			
Operating Fluid	Compressed Air			
Max. Working Pressure	MPa	0.7		
Min. Operating Pressure	MPa	0.1		
Port Size	M5			
Operating stroke	mm	12	16	20
Power supply voltage	24 VDC ±10 %			
Current consumption	25 mA or less			
Indicator LED	Green LED lights up when power is applied			
Analog Output	Finger closed 1 V - open 5 V *1 Connected load 100 kΩ or more			
Analog Output Linearity	±0.5 % F.S. or less (Ambient temperature 25°C)			
Repeatability of analog output	±0.04 mm or less (Ambient temperature 25°C, no deformation or wear of actuator/jig)			
Effective length measurement range	mm	12	16	20
Shock resistance (sensor/amplifier section)	294 m/s ²			
Vibration Resistance (Sensor/Amplifier Unit)	10 to 55 Hz Double amplitude 1.5 mm X, Y, Z directions for 2 hours each			
Protection Structure (Sensor/Amplifier Unit)	IEC Standard IP65			
Ambient Temperature, Humidity	10 to 60 °C, 85 %RH or less (However, no freezing)			
Weight	kg	0.26	0.50	0.90
Lubrication	Not Required			

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

Model No. Notation Method



① Bore Size (mm)

Code	Content
12	ø12
16	ø16
20	ø20

② Stroke

Code	Content	Stroke (mm)		
		ø12	ø16	ø20
A	Short stroke	12	16	20

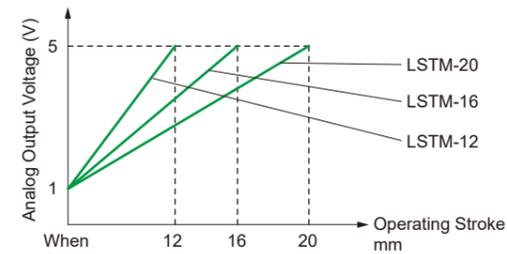
③ Port Position

Code	Content
1	Axial piping

④ High-precision positioning hole

Code	Content
N	None
A	Available

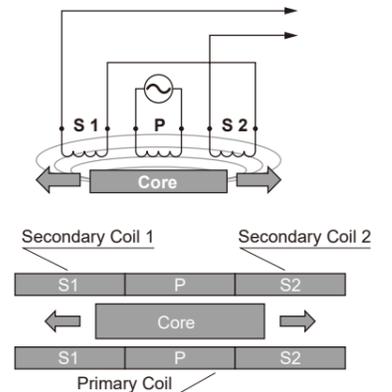
Analog Output Characteristics



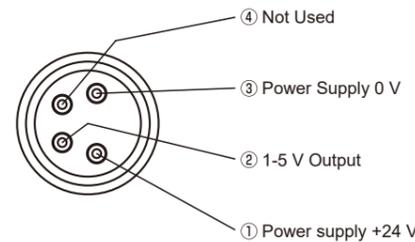
* Analog output voltage at shipment is 1 V on the close side and 5 V on the open side with the close port pressurized.

LVDT Type Displacement Sensor Operating Principle

When the primary coil (P) is excited, an induced voltage is generated in the two secondary coils (S1 and S2) by electromagnetic induction. When the gripper is driven, the position of the core changes, creating a difference in the induced voltages of S1 and S2. This difference is used to output the core position as an electrical signal.



Plug Contact Arrangement Diagram



Hand (Gripper)

LSH-HP

LSH

FH100

BSA2

BHA

BHG

BHE

LHA

LHAG

HAP-1C

HAP-2 to 4CS

HKP

HCP

HGP

LST-HP

HLF2

HLA/HLB

HLAG/HLBG

HLC

HLD

HMC-HP

HMF

HMF-G

HMFB

HFP

FH500

HBL

HJL

HMD

HDL

HJD

Cylinder Switch

Ending

LSH-HP

LSH

FH100

BSA2

BHA

BHG

BHE

LHA

LHAG

HAP-1C

HAP-2 to 4CS

HKP

HCP

HGP

LST-HP

HLF2

HLA/HLB

HLAG/HLBG

HLC

HLD

HMC-HP

HMF

HMF-G

HMFB

HFP

FH500

HBL

HJL

HMD

HDL

HJD

Cylinder Switch

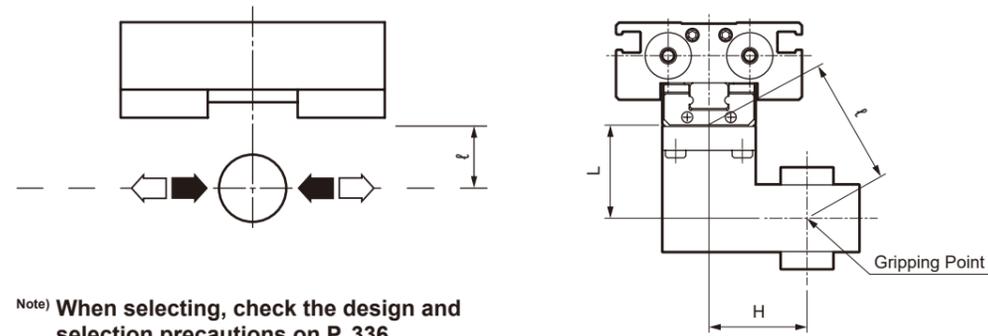
Ending

LST-HP1, LSTM-HP2 Series

Gripping Force Performance Data

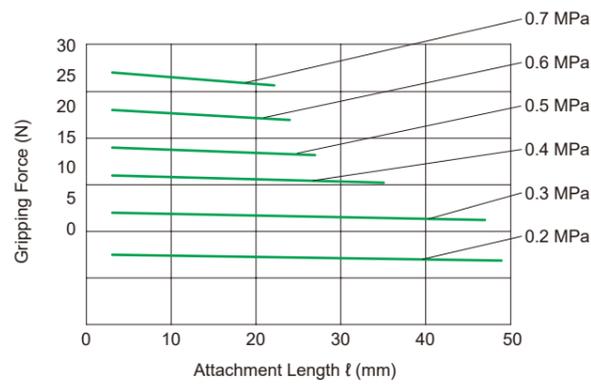
- Gripping force represents the thrust (for one finger) in the direction of the arrow shown in the figure.
- Indicates the gripping force at finger length l of the gripper when the supply pressure is up to 0.7 MPa.

- Opening direction (←)
- Closing direction (→)

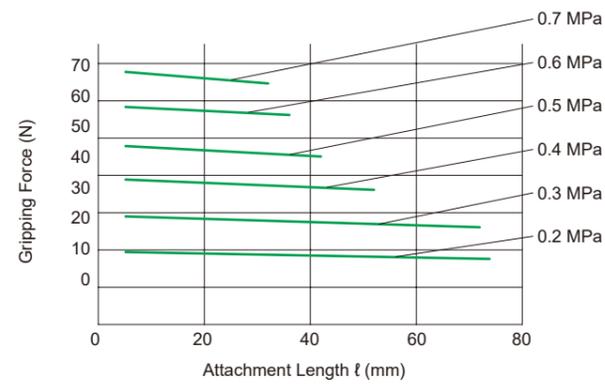


Note) When selecting, check the design and selection precautions on P. 336.

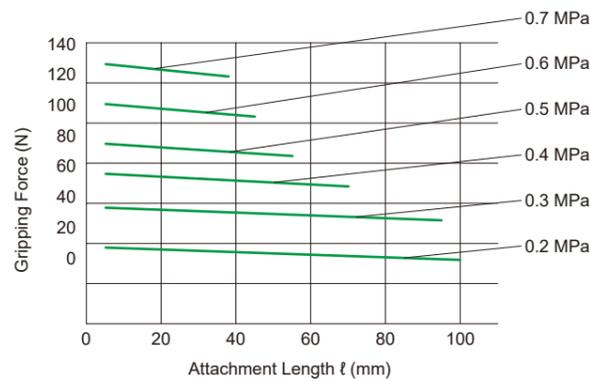
LST-8



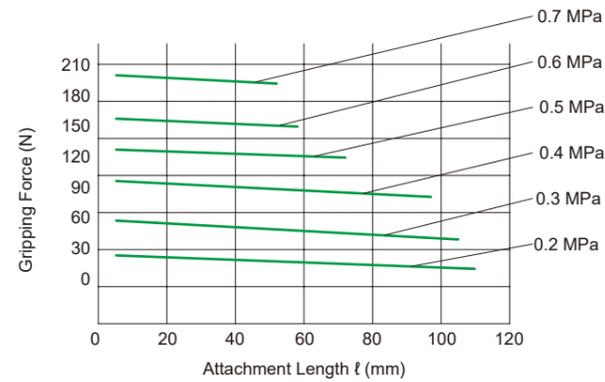
LST□-12



LST□-16

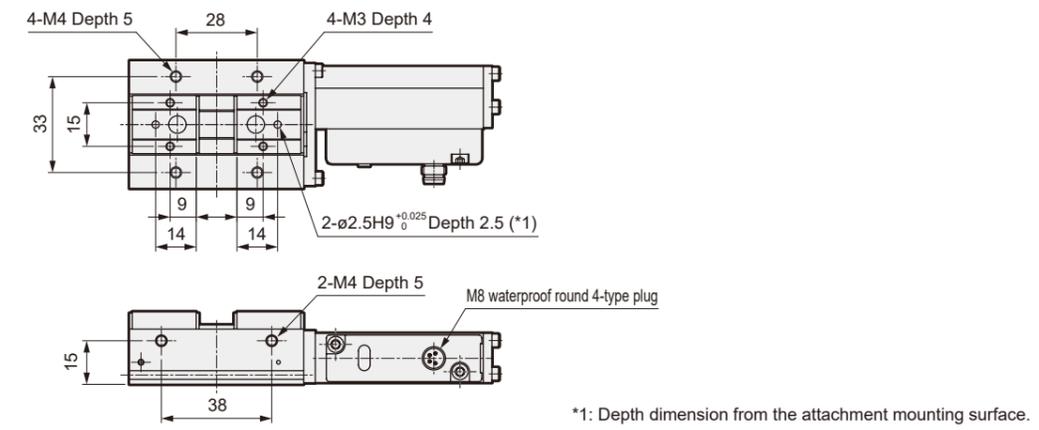
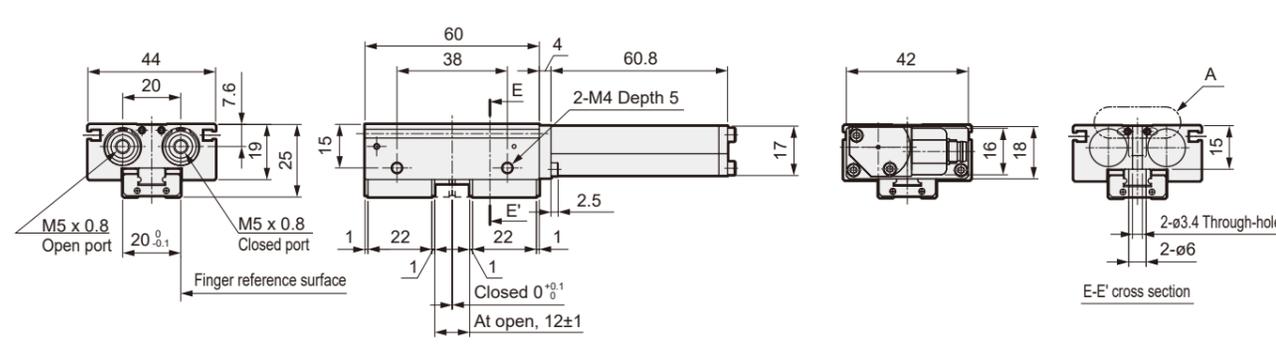
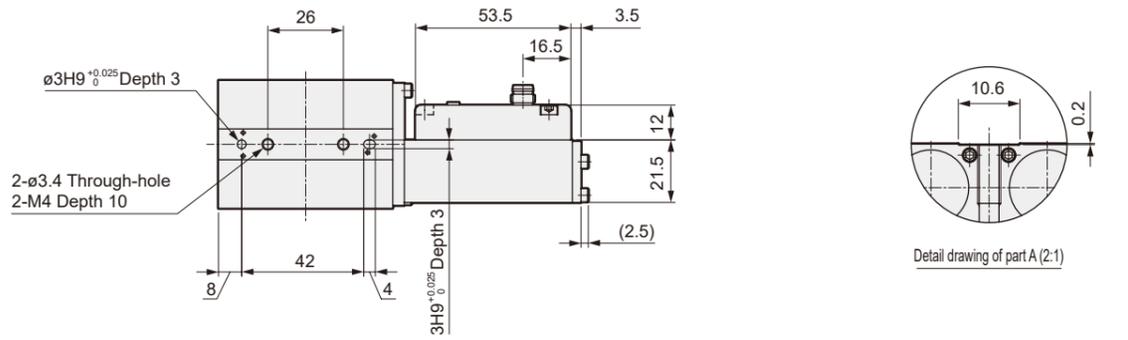


LST□-20

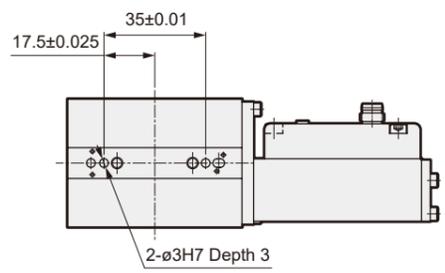


MEMO

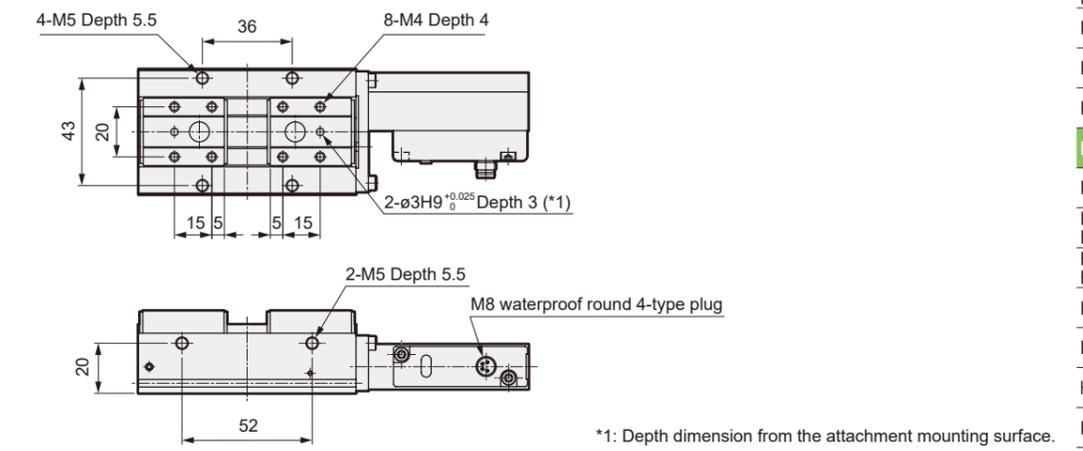
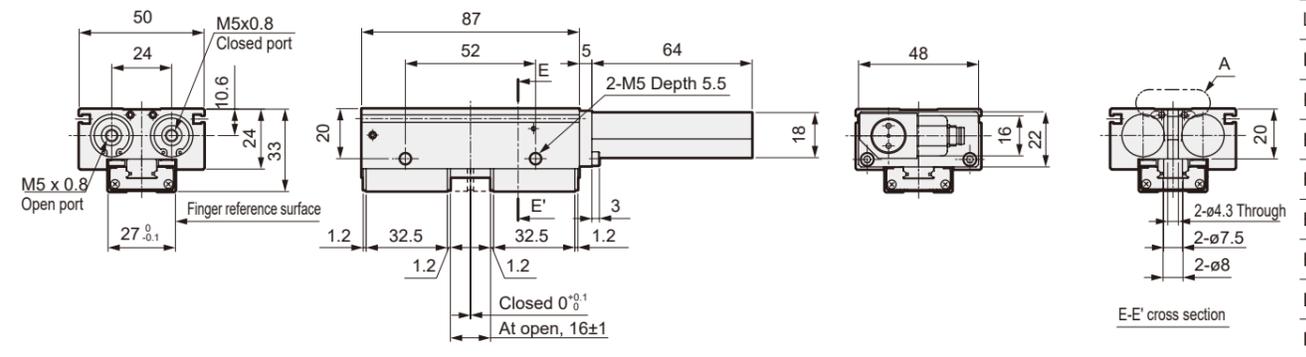
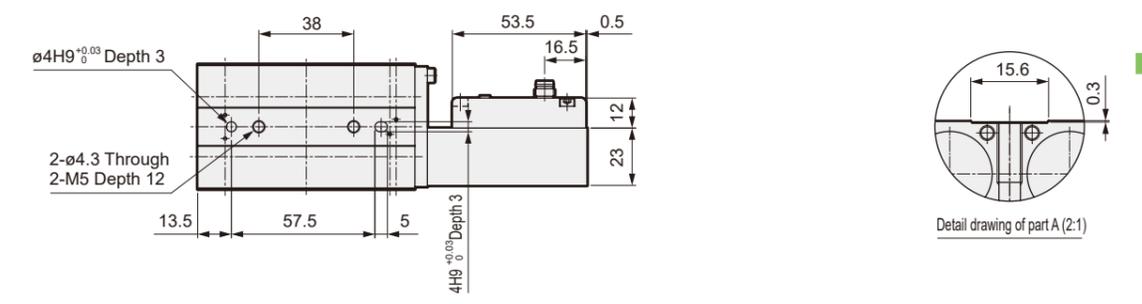
●LSTM-12A1N



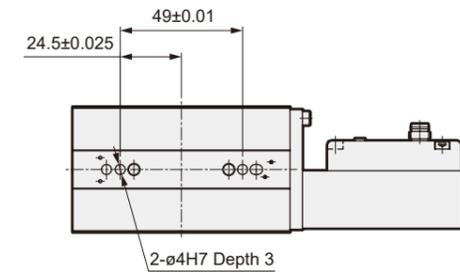
●LSTM-12A1A



●LSTM-16A1N



●LSTM-16A1A



Hand (Gripper)

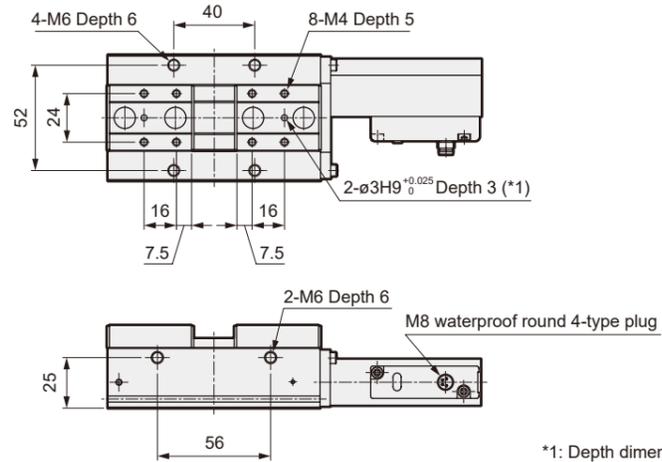
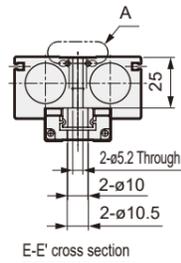
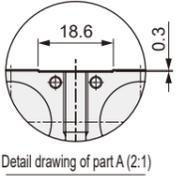
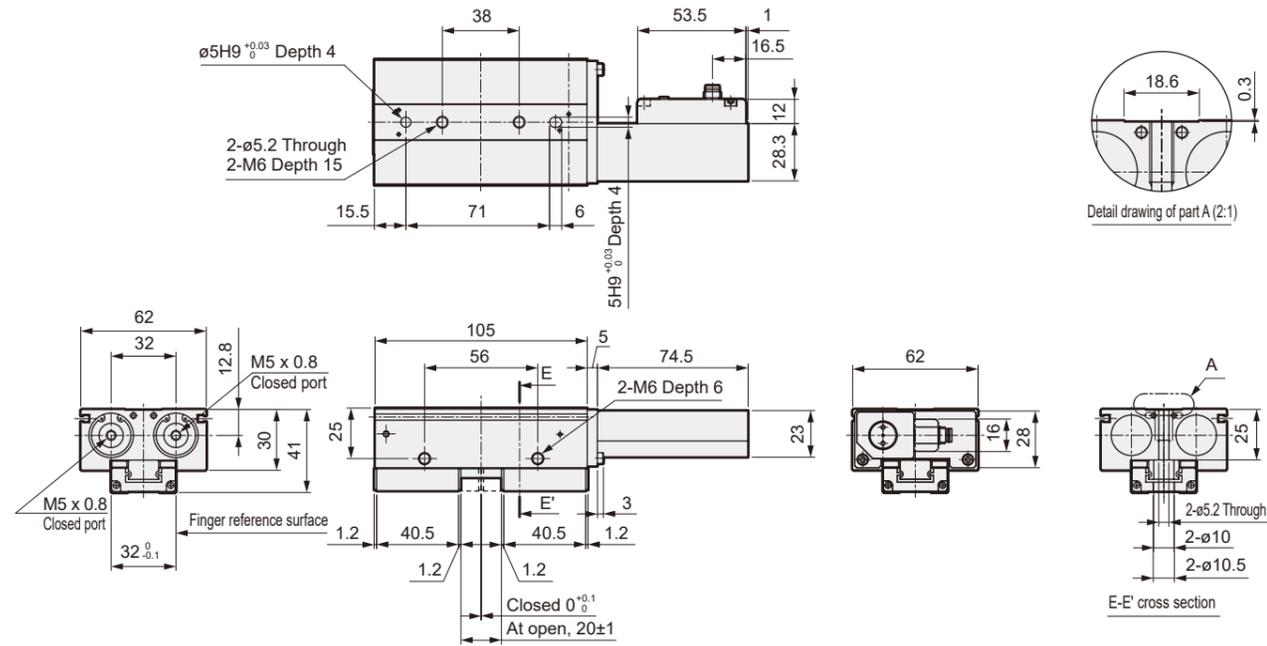
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

Hand (Gripper)

LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

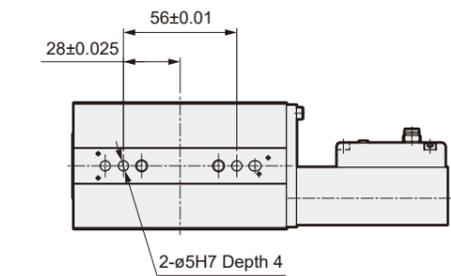
Outline dimension drawing (Bore size: $\phi 20$)

●LSTM-20A1N



*1: Depth dimension from the attachment mounting surface.

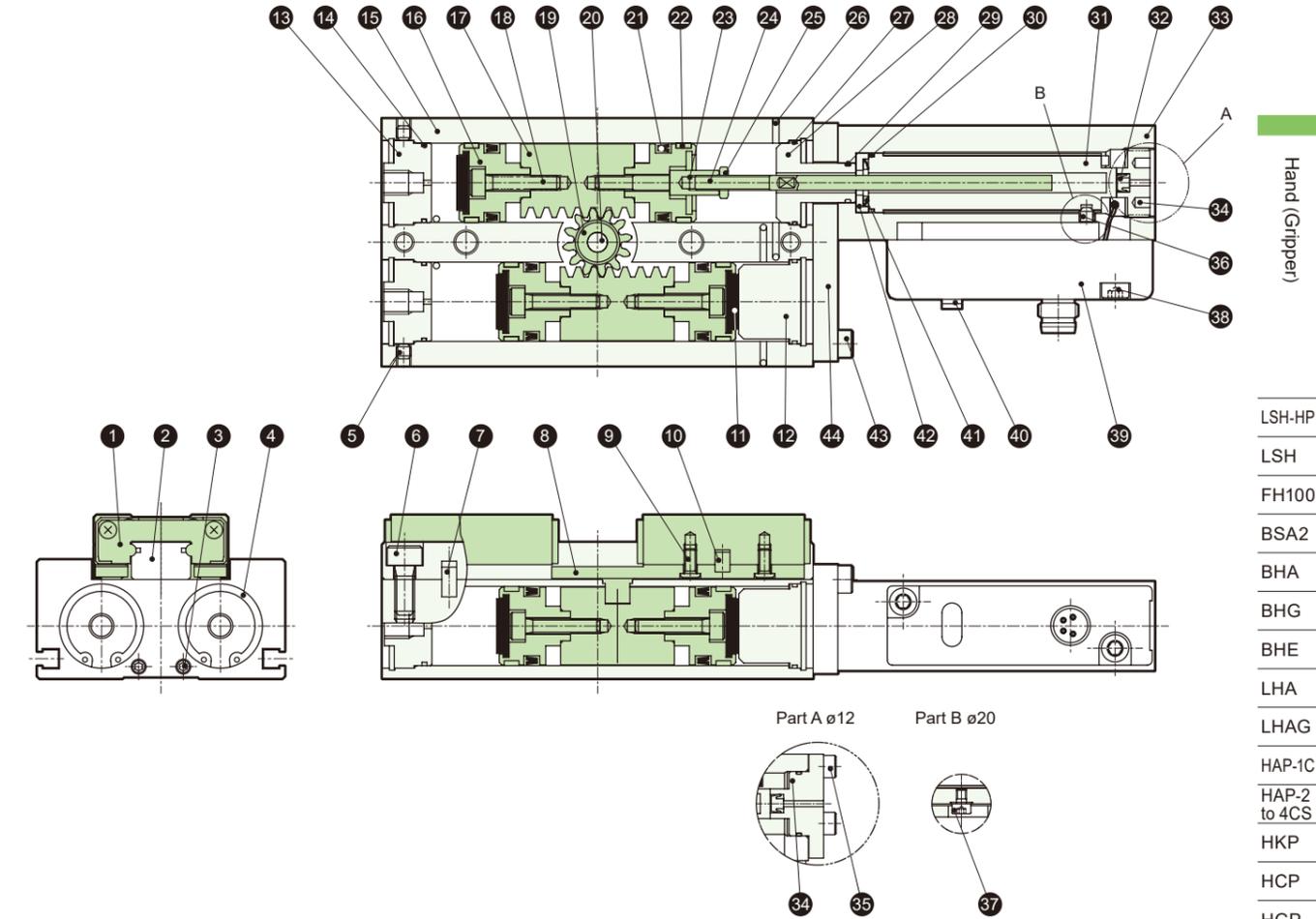
●LSTM-20A1A



Internal Structure Diagram/Material

Internal Structure Diagram/Material

●LSTM-12 to 20A



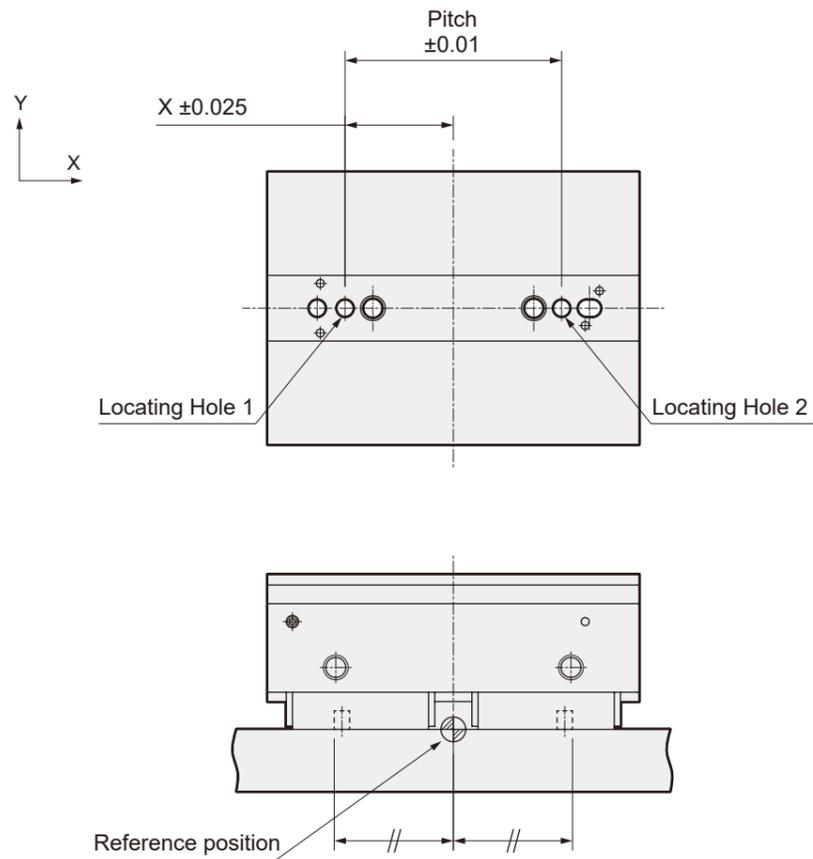
Part No.	Part Name	Material	Remarks	Part No.	Part Name	Material	Remarks
1	Finger	Stainless Steel		23	Fixed rod	Stainless Steel	
2	Linear Guide	Stainless Steel		24	Core Shaft	Steel	
3	Hexagon socket head set screw	Stainless Steel		25	Nut	Stainless Steel	
4	Round R type retaining ring ($\phi 12$)	Steel		26	Steel ball	Stainless Steel	
	C type retaining ring ($\phi 16$ to $\phi 20$)	Steel		27	O-ring	Nitrile Rubber	
5	Hexagon socket head 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 Screw	Stainless Steel		32	Check Valve	Nitrile Rubber	
10	Pin	Stainless Steel		33	Sensor adapter	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 head set screw	Stainless Steel	
14	O-ring	Nitrile Rubber		37	Hexagon Socket Head Cap Screw	Stainless Steel	
15	Body	Aluminum Alloy	Hard Anodized	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	Alloy Steel		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	Polyacetal					

Hand (Gripper)
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

Hand (Gripper)
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

Reference Position of Locating Hole

- Gripping center reference, high-precision positioning hole. Positioning can be done based on the gripping center.



Reference Position of Locating Hole:
Center of guide positioning hole at intermediate stroke

LST-HP1-LSTM-HP2 Selection Guide

STEP-1 Select appropriate model from required gripping force

① Calculation of Required Gripping Force

To transport a workpiece (weight W_L), a gripping force F_W that satisfies the following formula is required.

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

- F_W : Required Gripping Force [N]
- n : Number of Fingers = 2
- W_L : Workpiece Weight [kg]
- g : Gravitational acceleration = 9.8 [m/s²]
- K : Conveyance Factor
 - 5 [Holding only]
 - 10 [Normal transport]
 - 20 [Rapid acceleration transport]

About Conveyance Factor K

Calculation Example) When decelerating from a conveyance speed $V = 0.75$ m/s to stop in 0.1 seconds, with a friction coefficient μ of 0.1 between the workpiece and finger, it is as follows.

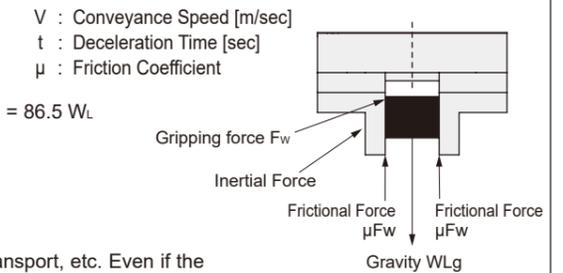
Determine the transport coefficient K from the force applied to the workpiece

- Inertial force = $W_L(V/t)$
- Gravity = $W_L g$

$$\text{Required gripping force } F_W > \frac{W_L(V/t) + W_L g}{n\mu} = \frac{W_L(V/t + g)}{n\mu} = \frac{17.3 W_L}{2 \times 0.1} = 86.5 W_L$$

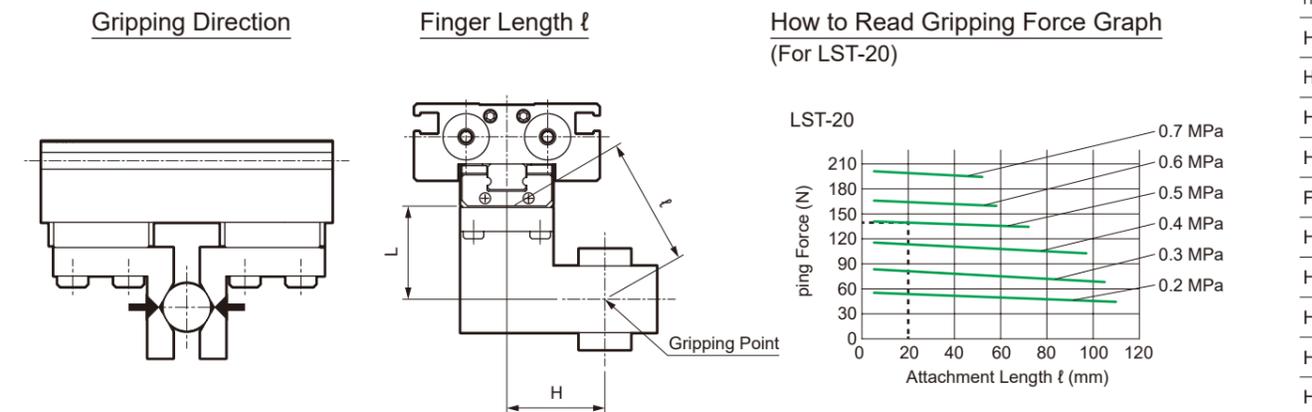
$$\therefore \text{The transport coefficient K at this time is, from the above formula } \frac{V/t + g}{\mu g} = \frac{0.75/0.1 + 9.8}{0.1 \times 9.8} \approx 20$$

Note) The transport coefficient K needs to allow a margin for impacts during transport, etc. Even if the friction coefficient μ is higher than $\mu=0.1$, set the conveyance factor K to 10 to 20 or more for safety.



② Model selection from required gripping force

Gripping force changes depending on "gripping direction," "attachment length," and "supply pressure." Confirm from the gripping force graph that sufficient gripping force can be obtained under your operating conditions. For the gripping force graph, refer to P. 204.



For example, if the supply pressure is 0.5 MPa and the attachment length is 20 mm, the resulting gripping force will be 140 N.

● Closing direction (➡)

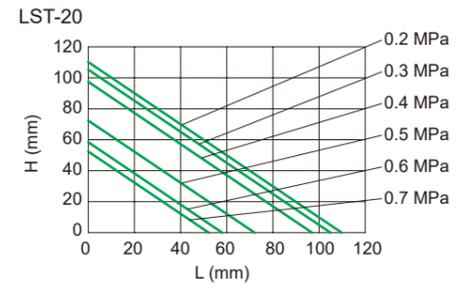
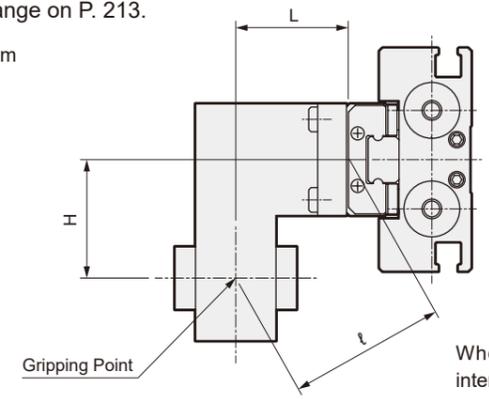
Hand (Gripper)
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

Hand (Gripper)
LSH-HP
LSH
FH100
BSA2
BHA
BHG
BHE
LHA
LHAG
HAP-1C
HAP-2 to 4CS
HKP
HCP
HGP
LST-HP
HLF2
HLA/HLB
HLAG/HLBG
HLC
HLD
HMC-HP
HMF
HMF-G
HMF-B
HFP
FH500
HBL
HJL
HMD
HDL
HJD
Cylinder Switch
Ending

STEP-2 Confirmation of Attachment Shape

Use fingers within the range on P. 213.

Ex) L: 40 mm H: 20 mm

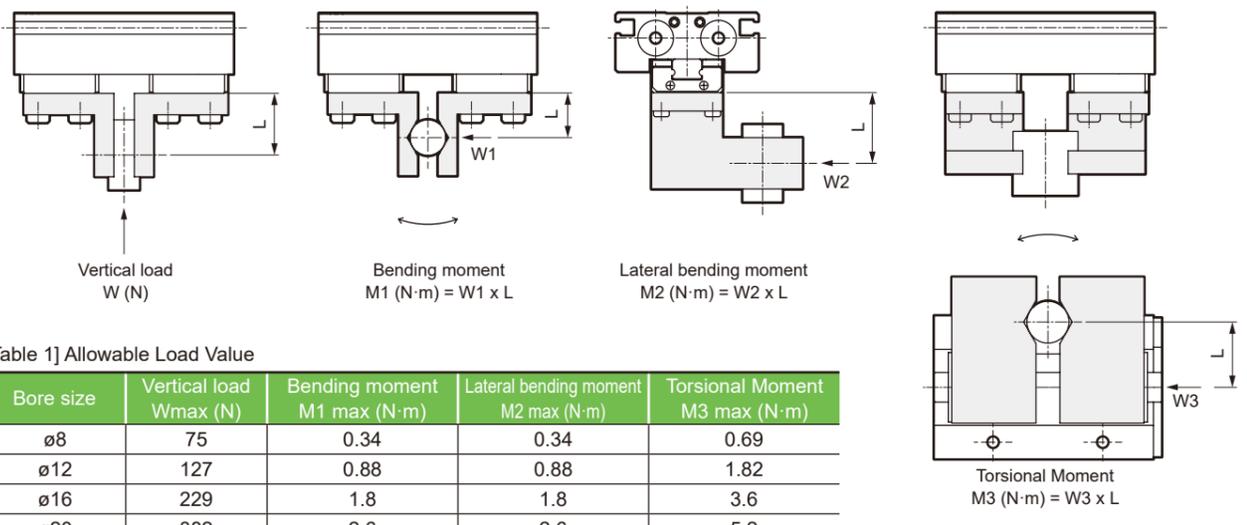


When LST-20 is selected, L: 40mm, H: 20 mm: The intersection of 20 mm is located inside the supply pressure line of 0.5 MPa, so it can be used.

- Use fingers that are as lightweight and short as possible. If they are long and heavy, the inertial force during opening and closing becomes large, which may cause backlash in the fingers or accelerate wear of the finger sliding parts, adversely affecting the service life.
- Even if the finger shape is within the performance data, making it as small as possible will allow the product to be used for a long time. Also, if l is long, there is a risk of gripping errors, dropping during transport, etc., due to unexpected vibrations. As a guideline, use "Cylinder bore x 1.3 / Operating pressure". If l is longer than that, set a higher transport coefficient in STEP-1 (Guideline: Transport coefficient of 20 or more).
- The weight of the fingers affects the service life, so please keep it below the following.
 - $W < 1/4H$ (1 piece)
 - W : Weight of finger
 - H : Gripper Product Weight

STEP-3 Confirmation of external force applied to fingers

When external force is applied to the fingers, such as when transporting or inserting a workpiece, use within the range shown in [Table 1].
* When using for transport, consider the impact at the end of the stroke.



[Table 1] Allowable Load Value

Bore size	Vertical load Wmax (N)	Bending moment M1 max (N·m)	Lateral bending moment M2 max (N·m)	Torsional Moment M3 max (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) LSTM cannot select ø8.

When multiple external forces are applied, the sum of the external forces (formula below) must be less than 1.

$$W/W_{max} + M1/M1_{max} + M2/M2_{max} + M3/M3_{max} < 1$$

Calculation Example①: When conveying workpieces
Model No.: LST-16, attachment (weight m_a : When a workpiece (weight: $m = 0.8$ kg, center of gravity: $L = 60$ mm) is gripped and transported at 0.06 kg with center of gravity: $L_g = 30$ mm
(g: Gravity acceleration 9.8m/s^2 , α : Assuming an impact factor of 3 at the end of the stroke)

$$M_1 = \alpha W_1 x L = \alpha (m_a x g x L_g x 2 + m x g x L) = 3 \times (0.06 \times 9.8 \times 30 \times 10^{-3} \times 2 + 0.8 \times 9.8 \times 60 \times 10^{-3}) \approx 1.5 \text{ N}\cdot\text{m}, \text{ which is } M1_{max} = 1.8 \text{ N}\cdot\text{m} \text{ or less, so it can be used.}$$

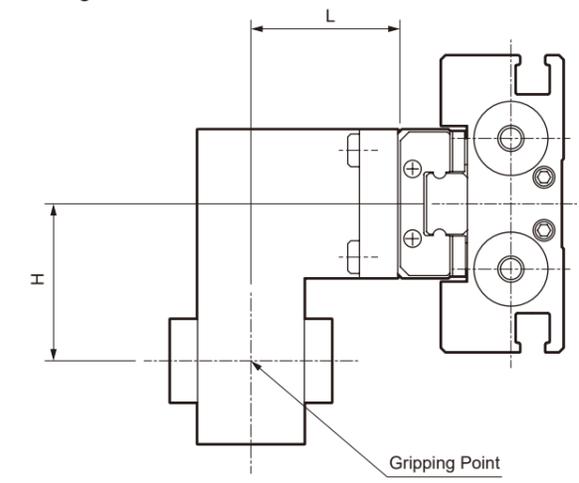
Calculation Example②: When inserting a workpiece
Model No.: When load W_1 : 40 N is applied to LST-16, $L = 40$ mm

$$M_1 = W_1 \times L = 40 \times 40 \times 10^{-3} = 1.6 \text{ N}\cdot\text{m}, \text{ which is } M1_{max} = 1.8 \text{ N}\cdot\text{m} \text{ or less, so it can be used.}$$

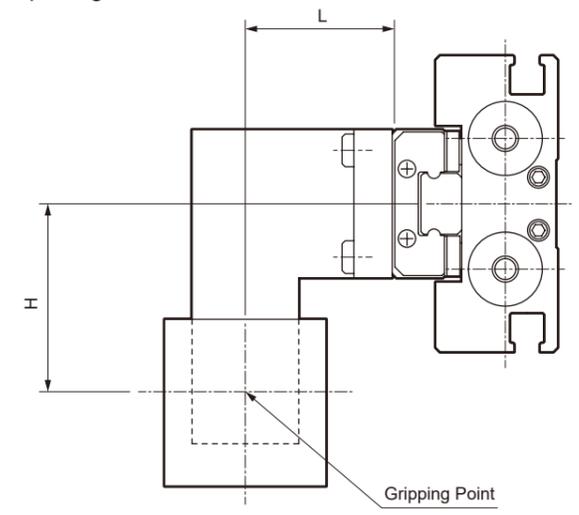
Finger length

When installing L-shaped attachments, use them within the range shown in the figure below.

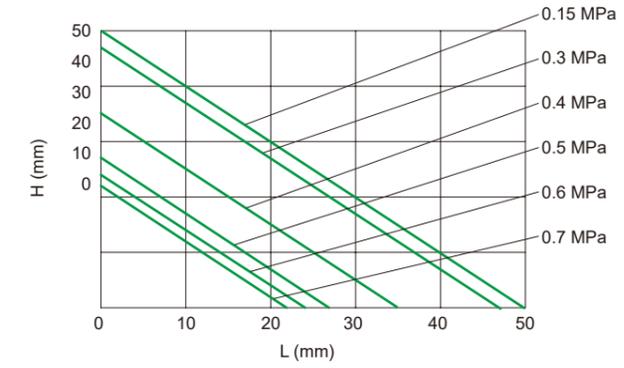
Closing direction



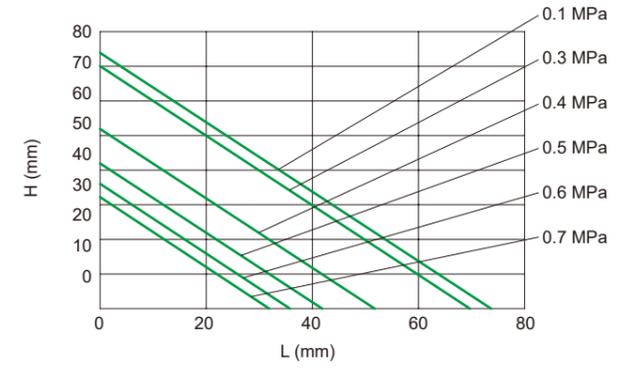
Opening direction



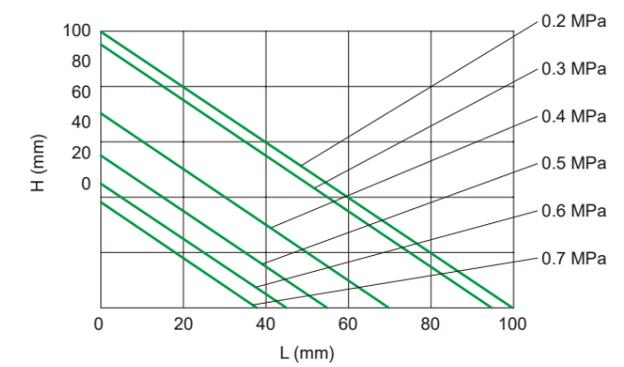
LST-8



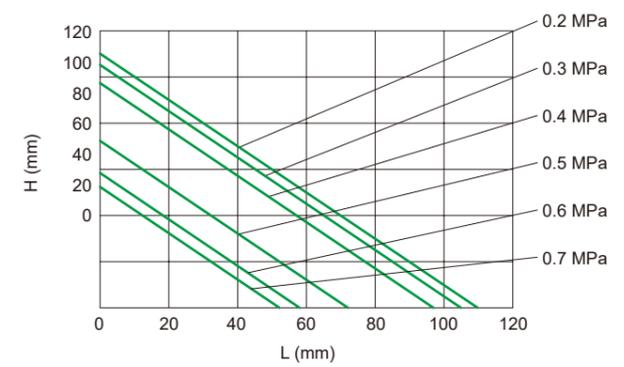
LST□-12



LST□-16



LST□-20



Hand (Gripper)

LSH-HP

LSH

FH100

BSA2

BHA

BHG

BHE

LHA

LHAG

HAP-1C

HAP-2 to 4CS

HKP

HCP

HGP

LST-HP

HLF2

HLA/HLB

HLAG/HLBG

HLC

HLD

HMC-HP

HMF

HMF-G

HMF-B

HFP

FH500

HBL

HJL

HMD

HDL

HJD

Cylinder Switch

Ending

Hand (Gripper)

LSH-HP

LSH

FH100

BSA2

BHA

BHG

BHE

LHA

LHAG

HAP-1C

HAP-2 to 4CS

HKP

HCP

HGP

LST-HP

HLF2

HLA/HLB

HLAG/HLBG

HLC

HLD

HMC-HP

HMF

HMF-G

HMF-B

HFP

FH500

HBL

HJL

HMD

HDL

HJD

Cylinder Switch

Ending