Gripper
LEHF Series
Model Selection

LEHF□E Series ▶ p. 849

Selection Procedure

Step 1 Check the gripping force. → **Step 2** Check the gripping point and overhang. → **Step 3** Check the external force on fingers.

Step 1 Check the gripping force.

Check the conditions. → Calculate the required gripping force. → Select the model from gripping force graph. → Select the pushing speed.

Example

Workpiece mass: 0.5 kg

Guidelines for the selection of the gripper with respect to workpiece mass

- Although conditions differ according to the workpiece shape and the coefficient of friction between the attachments and the workpiece, select a model that can provide a gripping force of 10 to 20 times*1 the workpiece weight, or more.

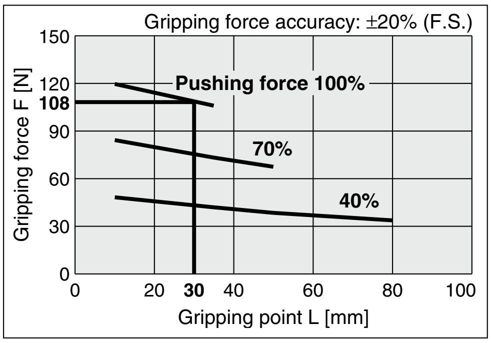
*1 For details, refer to the model selection illustration.

- If high acceleration or impact forces are encountered during motion, a further margin of safety should be considered.

Example) When it is desired to set the gripping force at 20 times or more above the workpiece weight.

Required gripping force
= 0.5 kg x 20 x 9.8 m/s^2 ≈ 98 N or more

LEHF32



Pushing force: 100%

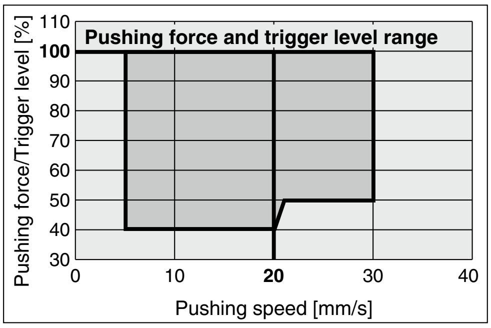
Gripping point distance: 30 mm

When the LEHF32 is selected.

- Gripping force can be found to be 108 N from the intersection point of gripping point distance L = 30 mm and pushing force of 100%.
- Gripping force is 22 times greater than the workpiece weight, and therefore satisfies a gripping force setting value of 20 times or more.

Pushing speed: 20 mm/s

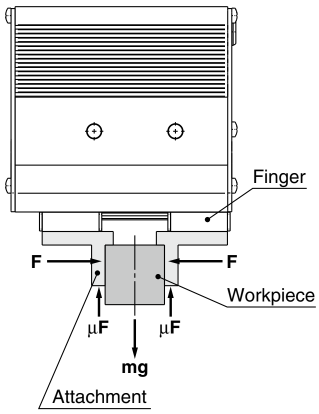
LEHF32



- Pushing speed is satisfied at the point where 100% of the pushing force and 20 mm/s of the pushing speed cross.

* Confirm the pushing speed range from the determined pushing force [%].

Calculation of required gripping force



When gripping a workpiece as in the figure to the left, and with the following definitions,

F: Gripping force [N]
μ: Coefficient of friction between the attachments and the workpiece
m: Workpiece mass [kg]
g: Gravitational acceleration (= 9.8 m/s^2)
mg: Workpiece weight [N]

the conditions under which the workpiece will not drop are

$2 \times \mu F > mg$

Number of fingers

and therefore, $F > \dfrac{mg}{2 \times \mu}$

With "a" representing the margin, "F" is determined by the following formula:

$$F = \frac{mg}{2 \times \mu} \times a$$

"Gripping force at least 10 to 20 times the workpiece weight"

- The "10 to 20 times or more of the workpiece weight" recommended by SMC is calculated with a margin of "a" = 4, which allows for impacts that occur during normal transportation, etc.

When μ = 0.2	When μ = 0.1
$F = \dfrac{mg}{2 \times 0.2} \times 4 = 10 \times mg$	$F = \dfrac{mg}{2 \times 0.1} \times 4 = 20 \times mg$
10 x Workpiece weight	20 x Workpiece weight

<Reference> Coefficient of friction μ (depends on the operating environment, contact pressure, etc.)

Coefficient of friction μ	Attachment – Material of workpieces (guideline)
0.1	Metal (surface roughness Rz3.2 or less)
0.2	Metal
0.2 or more	Rubber, Resin, etc.

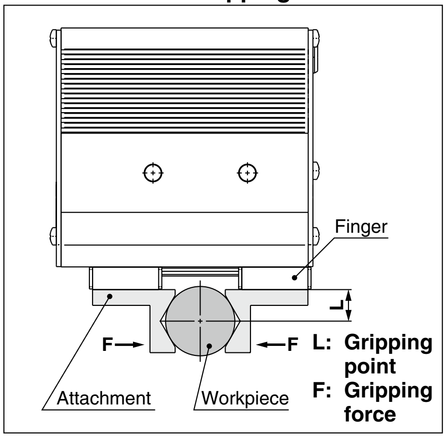
* • Even in cases where the coefficient of friction is greater than μ = 0.2, for reasons of safety, select a gripping force which is at least 10 to 20 times greater than the workpiece weight, as recommended by SMC.
• If high acceleration or impact forces are encountered during motion, a further margin should be considered.

Selection Procedure

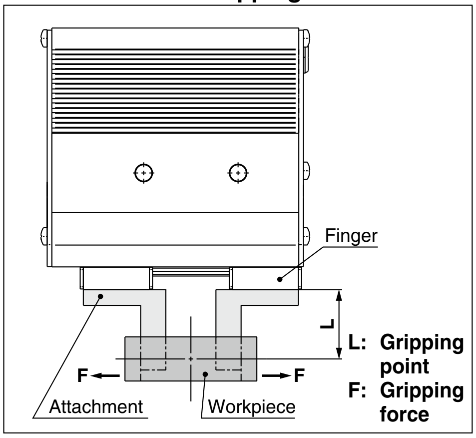
Step 1 Check the gripping force: LEHF Series

- **Indication of gripping force**
  Gripping force shown in the graphs below is expressed as “F”, which is the gripping force of one finger, when both fingers and attachments are in full contact with the workpiece as shown in the figure below.
- Set the workpiece gripping point “L” so that it is within the range shown in the figure below.

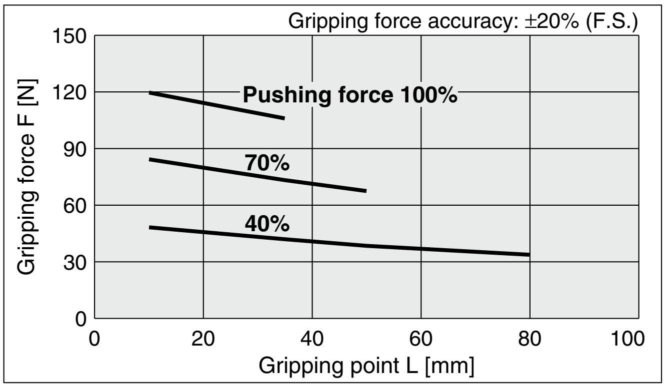
External Gripping State



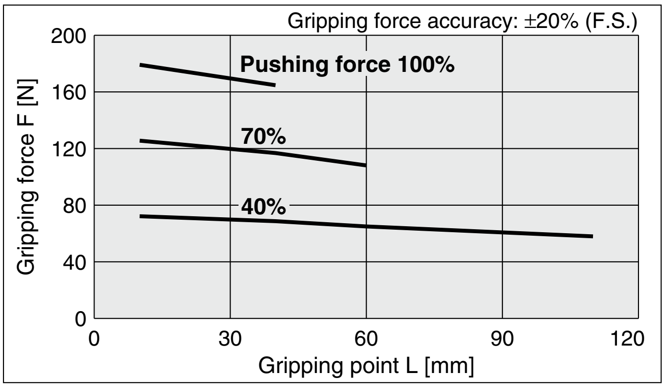
Internal Gripping State



LEHF32



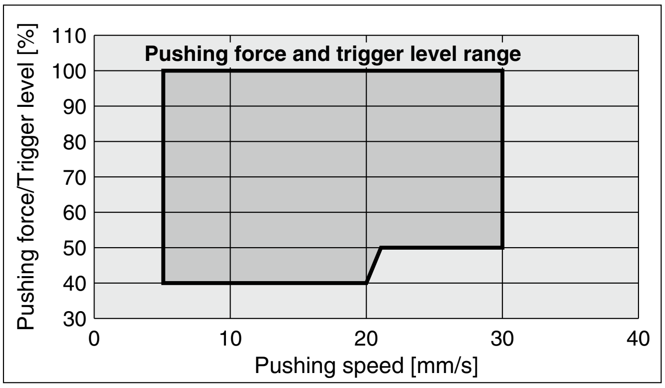
LEHF40



∗ Pushing force is one of the values of step data that is input into the controller.

Selection of Pushing Speed

- Set the [Pushing force] and the [Trigger LV] within the range shown in the figure below.

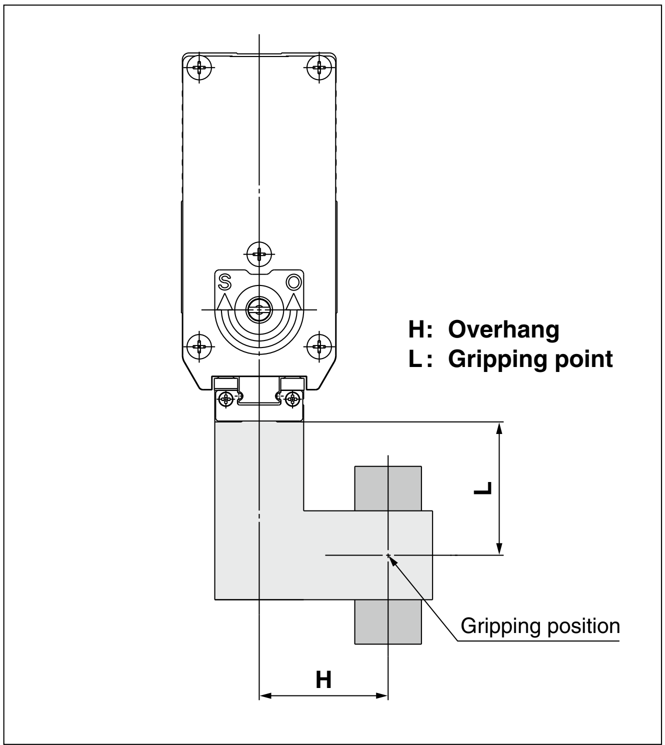


Selection Procedure

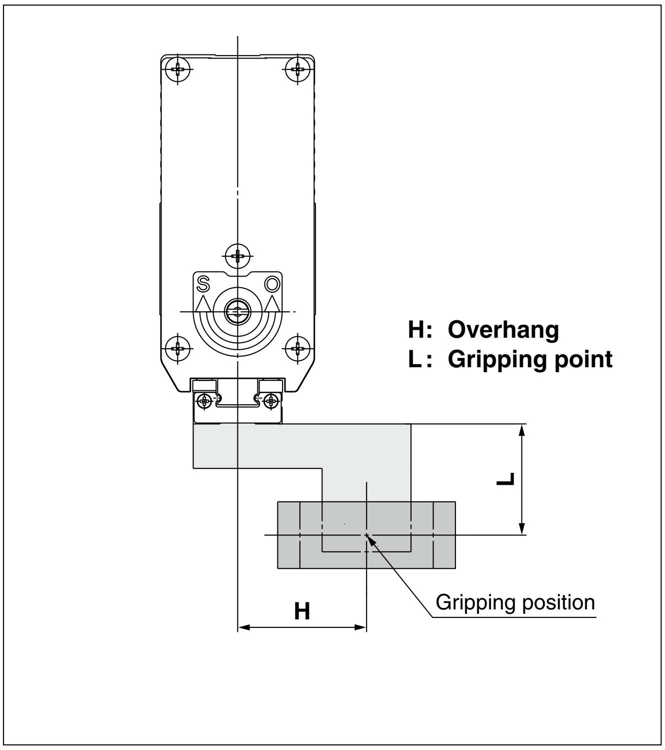
Step 2 Check the gripping point and overhang: LEHF Series

- Decide the gripping position of the workpiece so that the amount of overhang "H" stays within the range shown in the figure below.
- If the gripping position is out of the limit, it may shorten the life of the electric gripper.

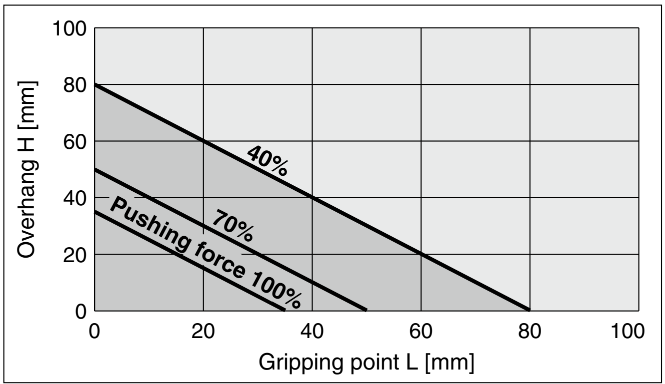
External Gripping State



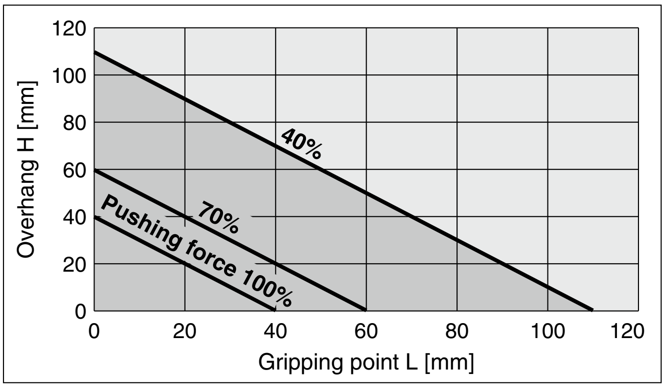
Internal Gripping State



LEHF32



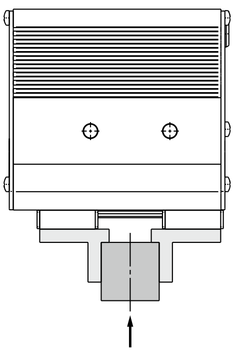
LEHF40



∗ Pushing force is one of the values of step data that is input into the controller.

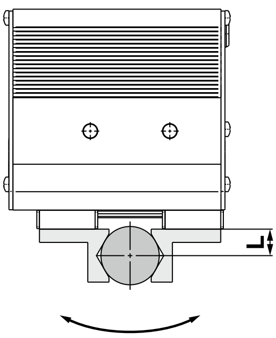
Selection Procedure

Step 3 Check the external force on fingers: LEHF Series



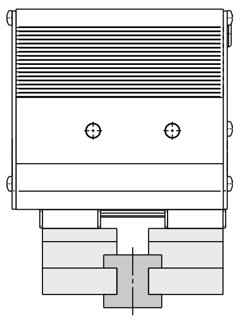
Fv

Fv: Allowable vertical load



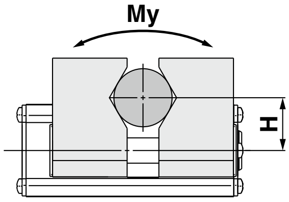
Mp

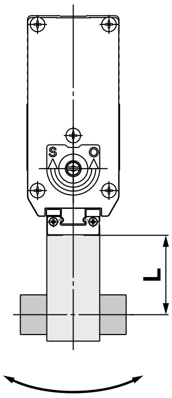
Mp: Pitch moment



My: Yaw moment

My





Mr

Mr: Roll moment

H, L: Distance to the point at which the load is applied [mm]

Model	Allowable vertical load Fv [N]	Static allowable moment		
		Pitch moment: Mp [N·m]	Yaw moment: My [N·m]	Roll moment: Mr [N·m]
LEHF32EK2-□	176	1.4	1.4	2.8
LEHF40EK2-□	294	2	2	4

∗ Values for load in the table indicate static values.

Calculation of allowable external force (when moment load is applied)	Calculation example
Allowable load F [N] = $\dfrac{\textbf{M (Static allowable moment) [N·m]}}{\textbf{L x 10}^{-3}\ {}^{*1}}$ (∗1 Constant for unit conversion)	When a static load of f = 10 N is operating, which applies pitch moment to point L = 30 mm from the LEHF20K2-□ guide. Therefore, it can be used. **Allowable load F=** $\dfrac{0.68}{30 \times 10^{-3}}$ **= 22.7 [N]** **Load f = 10 [N] < 22.7 [N]**

Battery-less Absolute (Step Motor 24 VDC)

Gripper

LEHF Series LEHF32, 40

∗ For details, refer to page 1343 and onward.

How to Order

LEHF 32 E K 2 – 64 [ ] – R1 CD17T

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽

For details on controllers, refer to the next page.

❶ Size

32
40

❷ Motor type

Symbol	Type	Compatible controllers/drivers		
E	Battery-less absolute (Step motor 24 VDC)	JXC51	JXCP1	JXCEF
		JXC61	JXCD1	JXC9F
		JXCE1	JXCL1	JXCPF
		JXC91	JXCM1	JXCLF

❸ Lead

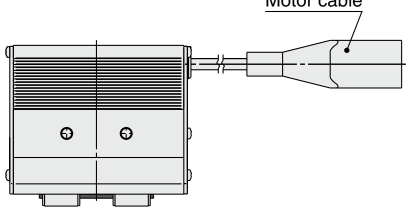
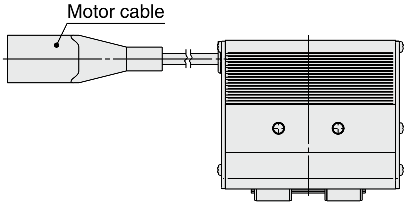
K	Basic

❹ 2-finger type

❺ Stroke [mm]

Stroke/both sides		Size
Basic	Long stroke	
32	**64**	32
40	**80**	40

❻ Motor cable entry

Nil	Basic (Entry on the right side) 
L	Entry on the left side 

❼ Actuator cable type/length

Robotic cable [m]

Nil	None	**R8**	8∗1
R1	1.5	**RA**	10∗1
R3	3	**RB**	15∗1
R5	5	**RC**	20∗1

⑧ Controller

Nil	Without controller
C□1□□	With controller

C D 1 7 T

Interface (Communication protocol/Input/Output)

Symbol	Type	Number of axes, Special specification: Standard	Number of axes, Special specification: With STO sub-function
5	Parallel input (NPN)	●	
6	Parallel input (PNP)	●	
E	EtherCAT	●	●
9	EtherNet/IP™	●	●
P	PROFINET	●	●
D	DeviceNet®	●	
L	IO-Link	●	●
M	CC-Link	●	

Mounting

7	Screw mounting
8*2	DIN rail

Number of axes, Special specification

Symbol	Number of axes	Specification
1	Single axis	Standard
F	Single axis	With STO sub-function

Communication plug connector, I/O cable*3

Symbol	Type	Applicable interface
Nil	Without accessory	—
S	Straight type communication plug connector	DeviceNet® CC-Link Ver. 1.10
T	T-branch type communication plug connector	
1	I/O cable (1.5 m)	Parallel input (NPN) Parallel input (PNP)
3	I/O cable (3 m)	
5	I/O cable (5 m)	

*1 Produced upon receipt of order
*2 The DIN rail is not included. It must be ordered separately.

*3 Select “Nil” for anything other than DeviceNet®, CC-Link, or parallel input.
Select “Nil,” “S,” or “T” for DeviceNett® or CC-Link.
Select “Nil,” “1,” “3,” or “5” for parallel input.

⚠Caution

[CE/UKCA-compliant products]
EMC compliance was tested by combining the electric actuator LEH series and the controller JXC series.
The EMC depends on the configuration of the customer’s control panel and the relationship with other electrical equipment and wiring. Therefore, compliance with the EMC directive cannot be certified for SMC components incorporated into the customer’s equipment under actual operating conditions. As a result, it is necessary for the customer to verify compliance with the EMC directive for the machinery and equipment as a whole.

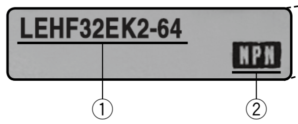
[Precautions relating to differences in controller versions]
When the JXC series is to be used in combination with the battery-less absolute encoder, use a controller that is version V3.4 or S3.4 or higher. For details, refer to pages 1077 and 1078.

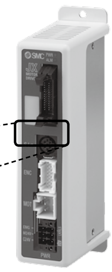
[UL certification]
The JXC series controllers used in combination with electric actuators are UL certified.

The actuator and controller are sold as a package.

Confirm that the combination of the controller and actuator is correct.

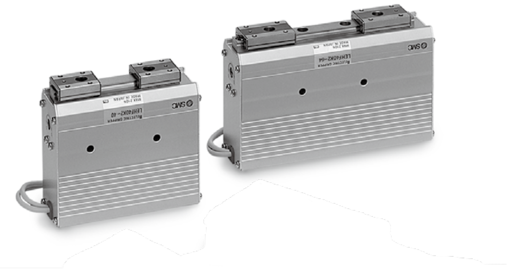
<Check the following before use.>
① Check the actuator label for the model number. This number should match that of the controller.
② Check that the Parallel I/O configuration matches (NPN or PNP).





* Refer to the Operation Manual for using the products.
Please download it via our website: https://www.smcworld.com

	Step data input type	EtherCAT direct input type	EtherCAT direct input type with STO sub-function	EtherNet/IP™ direct input type	EtherNet/IP™ direct input type with STO sub-function	PROFINET direct input type	PROFINET direct input type with STO sub-function	DeviceNet® direct input type	IO-Link direct input type	IO-Link direct input type with STO sub-function	CC-Link direct input type
Type											
Series	JXC51 JXC61	JXCE1	JXCEF	JXC91	JXC9F	JXCP1	JXCPF	JXCD1	JXCL1	JXCLF	JXCM1
Features	Parallel I/O	EtherCAT direct input	EtherCAT direct input with STO sub-function	EtherNet/IP™ direct input	EtherNet/IP™ direct input with STO sub-function	PROFINET direct input	PROFINET direct input with STO sub-function	DeviceNet® direct input	IO-Link direct input	IO-Link direct input with STO sub-function	CC-Link direct input
Compatible motor	Battery-less absolute (Step motor 24 VDC)										
Max. number of step data	64 points										
Power supply voltage	24 VDC										
Reference page	1017	1063									



Specifications

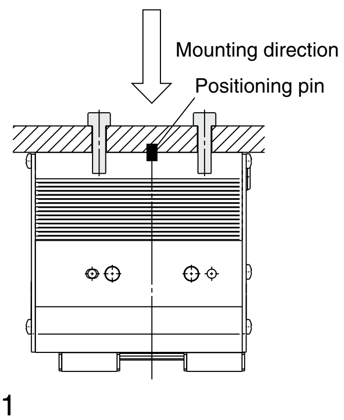
Battery-less Absolute (Step Motor 24 VDC)

	Model		LEHF32E	LEHF40E
Actuator specifications	Open and close stroke/both sides [mm]	Basic	32	40
		Long stroke	64	80
	Lead [mm]		70/16 (4.375)	70/16 (4.375)
	Gripping force [N]*1 *3		48 to 120	72 to 180
	Open and close speed/Pushing speed [mm/s]*2 *3		5 to 100/5 to 30	
	Drive method		Slide screw + Belt	
	Finger guide type		Linear guide (No circulation)	
	Repeated length measurement accuracy [mm]*4		±0.05	
	Finger backlash/one side [mm]*5		0.5 or less	
	Repeatability [mm]*6		±0.05	
	Positioning repeatability/one side [mm]		±0.1	
	Lost motion/one side [mm]*7		0.3 or less	
	Impact/Vibration resistance [m/s²]*8		150/30	
	Max. operating frequency [C.P.M]		60	
	Operating temperature range [°C]		5 to 40	
	Operating humidity range [%RH]		90 or less (No condensation)	
	Weight [g]	Basic	1625	1980
		Long stroke	1970	2500
Electric specifications	Motor size		□42	
	Motor type		Battery-less absolute (Step motor 24 VDC)	
	Encoder		Battery-less absolute	
	Power supply voltage [V]		24 VDC ±10%	
	Power [W]*9		Max. power 57	Max. power 61

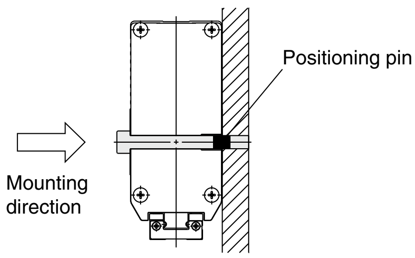
*1 Gripping force should be from 10 to 20 times the workpiece weight. Moving force should be 150% when releasing the workpiece. Gripping force accuracy should be ±20% (F.S.) for LEHF32/40. Gripping with heavy attachment and fast pushing speed, may not reach the product specification. In this case, decrease the weight and lower the pushing speed.
*2 Pushing speed should be set within the range during pushing (gripping) operations. Otherwise, it may cause a malfunction. The open/close speed and pushing speed are for both fingers. The speed for one finger is half this value.
*3 The speed and force may change depending on the cable length, load, and mounting conditions.
Furthermore, if the cable length exceeds 5 m, then it will decrease by up to 10% for each 5 m. (At 15 m: Reduced by up to 20%)
*4 Repeated length measurement accuracy means dispersion (value on the controller monitor) when the workpiece is repeatedly held in the same position.
*5 There will be no influence of backlash during pushing (gripping) operations. Make the stroke longer for the amount of backlash when opening.
*6 Repeatability means the variation of the gripping position (workpiece position) when gripping operations are repeatedly performed by the same sequence for the same workpiece.
*7 A reference value for correcting errors in reciprocal operation which occur during positioning operations
*8 Impact resistance: No malfunction occurred when the gripper was tested with a drop tester in both an axial direction and a perpendicular direction to the lead screw. (The test was performed with the gripper in the initial state.)
Vibration resistance: No malfunction occurred in a test ranging between 45 to 2000 Hz. The test was performed in both an axial direction and a perpendicular direction to the lead screw. (The test was performed with the gripper in the initial state.)
*9 Indicates the max. power during operation (including the controller)
This value can be used for the selection of the power supply.

How to Mount

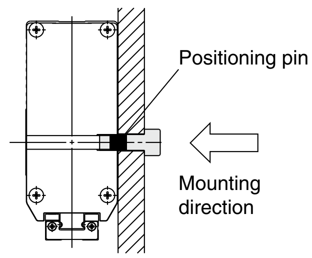
a) When using the thread on the body



b) When using the thread on the mounting plate

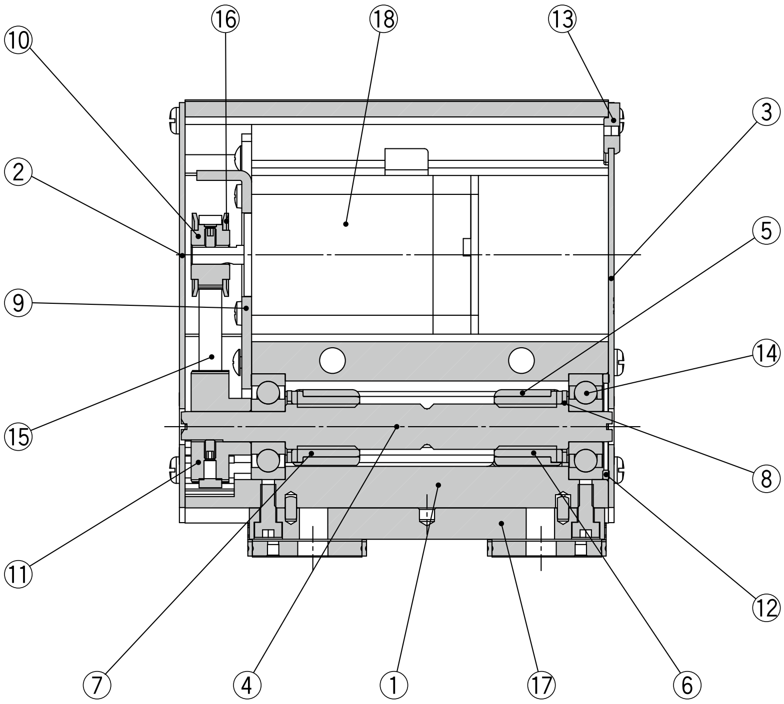


c) When using the thread on the back of the body



Construction

LEHF Series

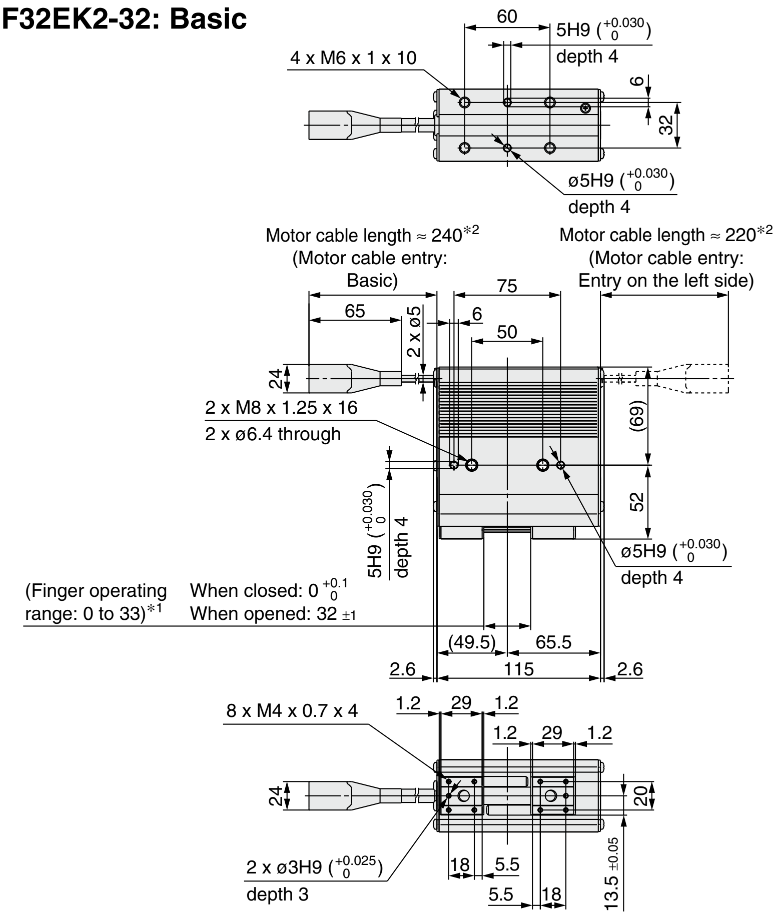


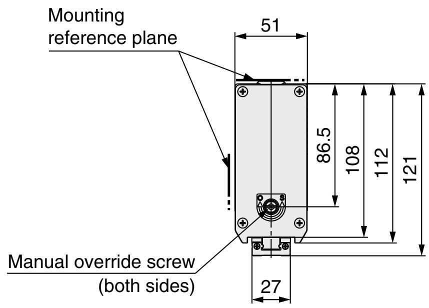
Component Parts

No.	Description	Material	Note
1	**Body**	Aluminum alloy	Anodized
2	**Side plate A**	Aluminum alloy	Anodized
3	**Side plate B**	Aluminum alloy	Anodized
4	**Slide shaft**	Stainless steel	Heat treatment + Special treatment
5	**Slide bushing**	Stainless steel	
6	**Slide nut**	Stainless steel	Heat treatment + Special treatment
7	**Slide nut**	Stainless steel	Heat treatment + Special treatment
8	**Fixed plate**	Stainless steel	
9	**Motor plate**	Carbon steel	
10	**Pulley A**	Aluminum alloy	
11	**Pulley B**	Aluminum alloy	
12	**Bearing stopper**	Aluminum alloy	
13	**Rubber bushing**	NBR	
14	**Bearing**	—	
15	**Belt**	—	
16	**Flange**	—	
17	**Finger assembly**	—	
18	**Battery-less absolute (Step motor 24 VDC)**	—	

Dimensions

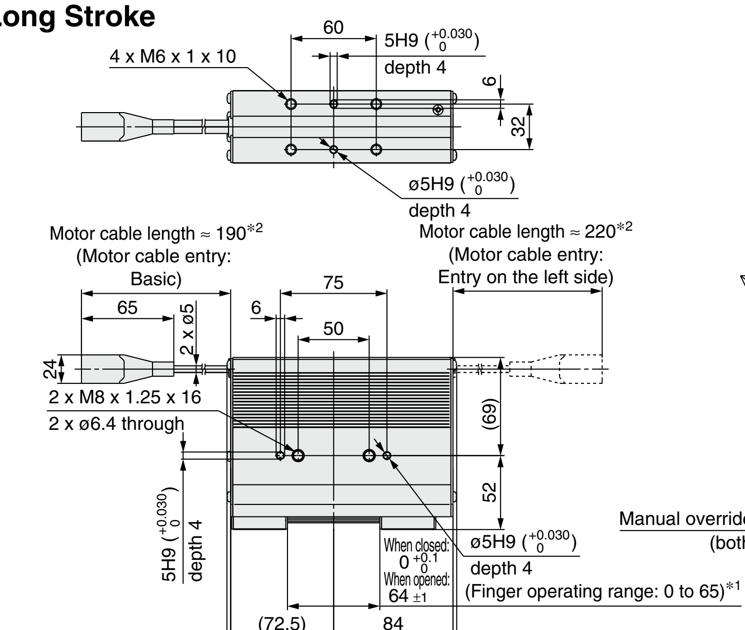
LEHF32EK2-32: Basic

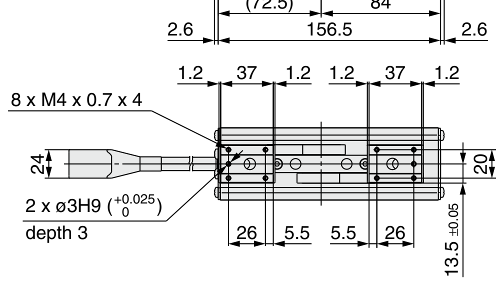


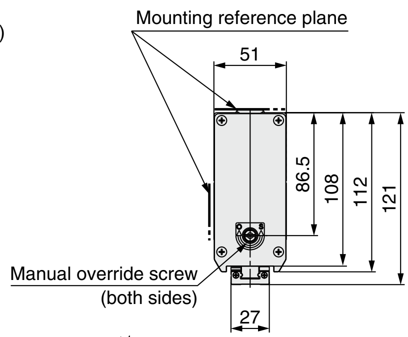


*1 This is the range within which the fingers can move when it returns to origin. Make sure that workpieces mounted on the fingers do not interfere with other workpieces or the facilities around the fingers.
*2 Secure the motor cable so that the cable is not repeatedly bent.

LEHF32EK2-64: Long Stroke



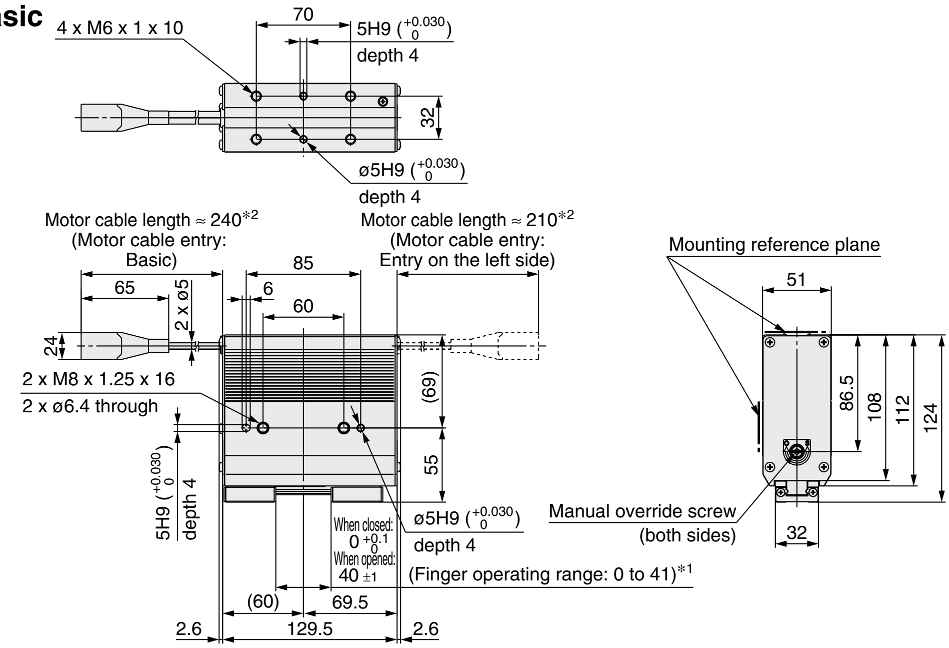


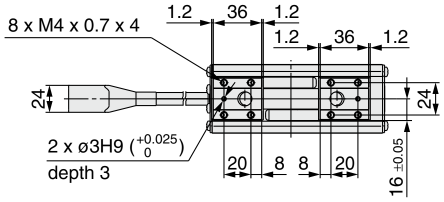


*1 This is the range within which the fingers can move when it returns to origin. Make sure that workpieces mounted on the fingers do not interfere with other workpieces or the facilities around the fingers.
*2 Secure the motor cable so that the cable is not repeatedly bent.

Dimensions

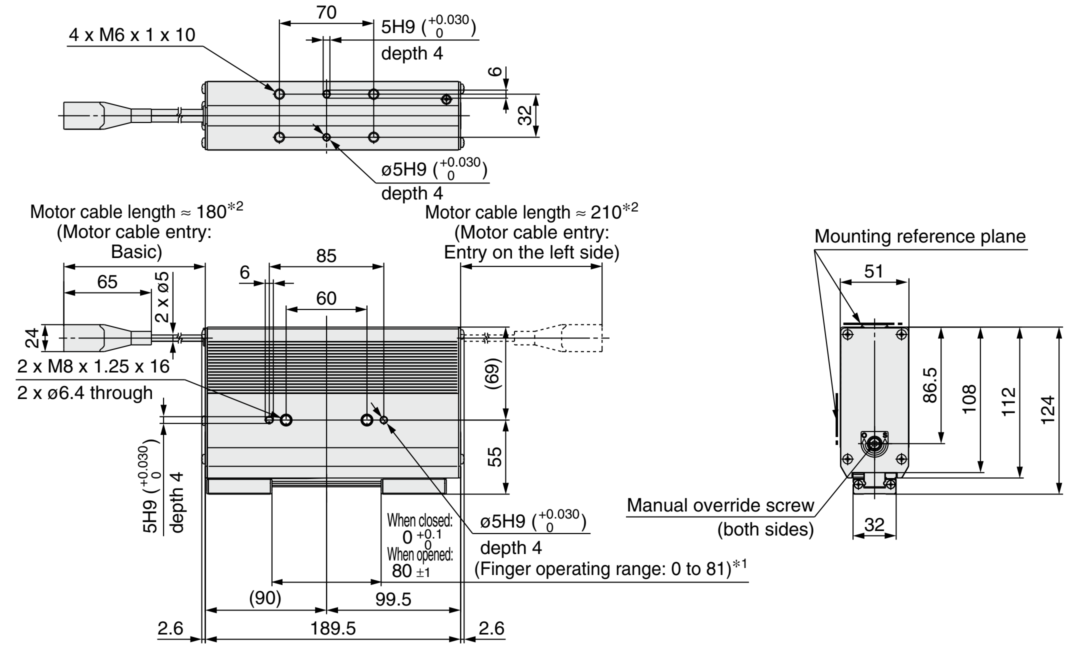
LEHF40EK2-40: Basic

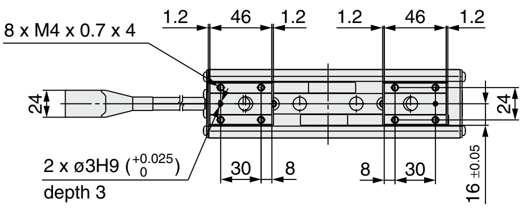




*1 This is the range within which the fingers can move when it returns to origin. Make sure that workpieces mounted on the fingers do not interfere with other workpieces or the facilities around the fingers.
*2 Secure the motor cable so that the cable is not repeatedly bent.

LEHF40EK2-80: Long Stroke





*1 This is the range within which the fingers can move when it returns to origin. Make sure that workpieces mounted on the fingers do not interfere with other workpieces or the facilities around the fingers.
*2 Secure the motor cable so that the cable is not repeatedly bent.

LEH Series
Battery-less Absolute Encoder Type Specific Product Precautions

Be sure to read this before handling the products. Refer to page 1351 for safety instructions and pages 1352 to 1357 for electric actuator precautions.

Handling

⚠Caution

1. Absolute encoder ID mismatch error at the first connection

In the following cases, an "ID mismatch error" alarm occurs after the power is turned ON. Perform a return to origin operation after resetting the alarm before use.

· When an electric actuator is connected and the power is turned ON for the first time after purchase*1
· When the actuator or motor is replaced
· When the controller is replaced

*1 If you have purchased an electric actuator and controller with the set part number, the pairing may have already been completed and the alarm may not be generated.

"ID mismatch error"

Operation is enabled by matching the encoder ID on the electric actuator side with the ID registered in the controller. This alarm occurs when the encoder ID is different from the registered contents of the controller. By resetting this alarm, the encoder ID is registered (paired) to the controller again.

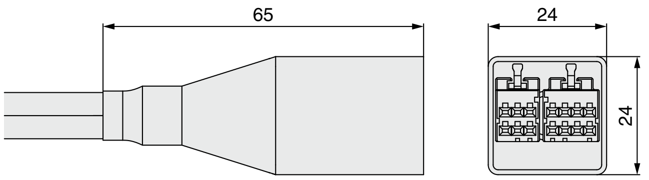
When a controller is changed after pairing is completed				
	Encoder ID no. (* Numbers below are examples.)			
Actuator	17623	17623	17623	17623
Controller	17623	17699	17699	17623
ID mismatch error occurred?	No	Yes	Error reset ⇒ No	

2. In environments where strong magnetic fields are present, use may be limited.

A magnetic sensor is used in the encoder. Therefore, if the actuator motor is used in an environment where strong magnetic fields are present, malfunction or failure may occur.
Do not expose the actuator motor to magnetic fields with a magnetic flux density of 1 mT or more.
When installing an electric actuator and an air cylinder with an auto switch (ex. CDQ2 series) or multiple electric actuators side by side, maintain a space of 40 mm or more around the motor. Refer to the construction drawing of the actuator motor.

3. The connector size of the motor cable is different from that of the electric actuator with an incremental encoder.

The motor cable connector of an electric actuator with a battery-less absolute encoder is different from that of an electric actuator with an incremental encoder. As the connector cover dimensions are different, take the dimensions below into consideration during the design process.



Battery-less absolute encoder connector cover dimensions