CKD

Electric Actuator

ERL2 Series (Slider Type)
ESD2 Series (Rod Type)

INSTRUCTION MANUAL

SM-612226-A/4

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's "**ERL2 Series/ESD2 Series" electric actuator.**
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product, which uses control valves such as solenoid valves, motor valves, and air operated valves, is intended for users who have basic knowledge about materials, fluids, piping, and electricity. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training with respect to control valves.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device and the electric system that controls such mechanism is ensured.

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ **DANGER**	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ **WARNING**	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ DANGER

Do not use the product for the following applications:

- Medical equipment pertaining to sustainment and management of human life and body
- Mechanism and mechanical device for transferring and transporting people
- Critical parts for securing safety in a mechanical device

⚠ WARNING

Use the product within the specifications.

Precautions on Product Disposal

⚠ CAUTION

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

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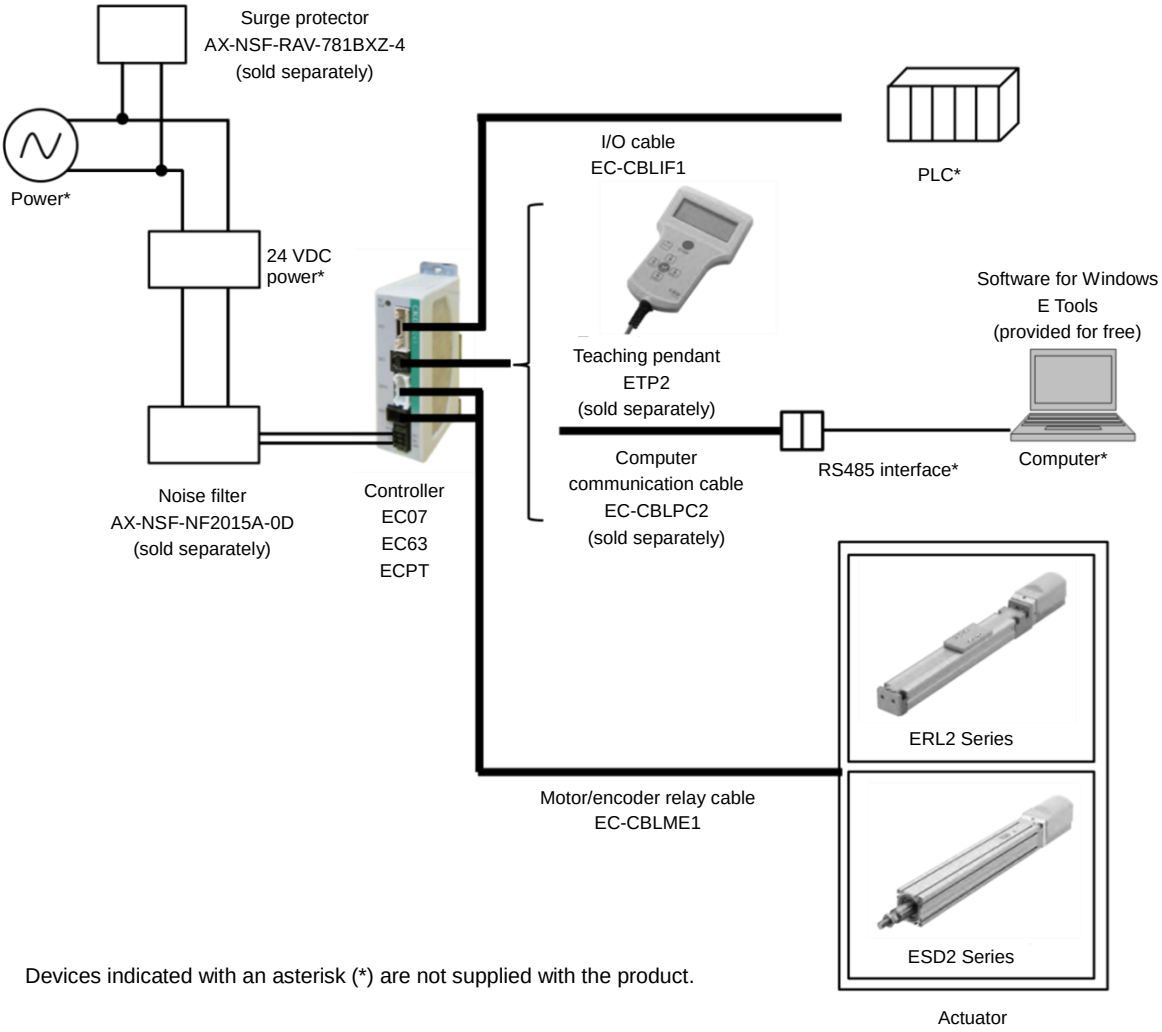
1. PRODUCT OVERVIEW

1.1 System Overview

1.1.1 System structure

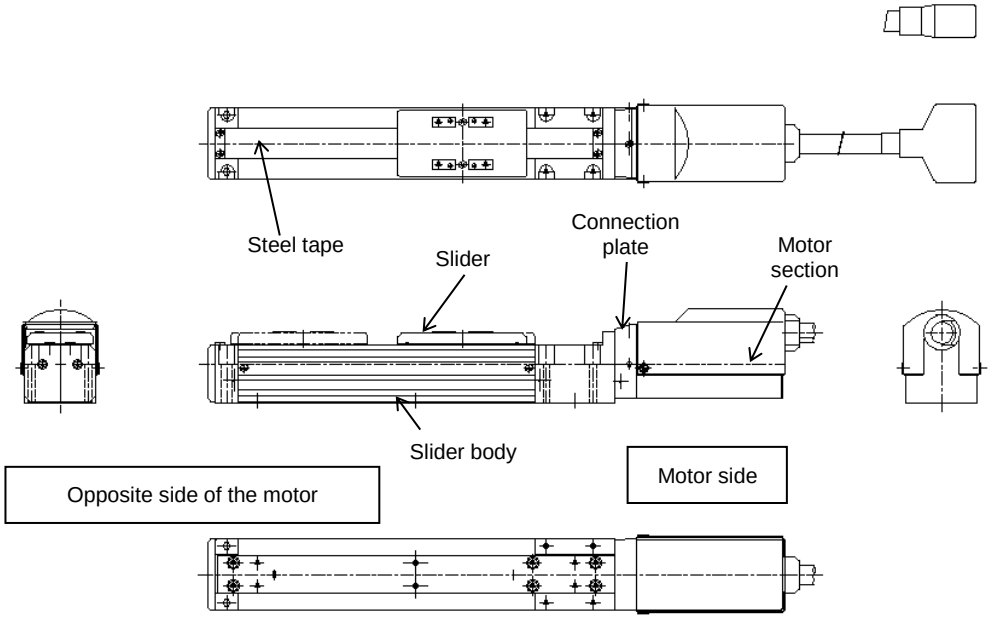


Devices indicated with an asterisk (*) are not supplied with the product.

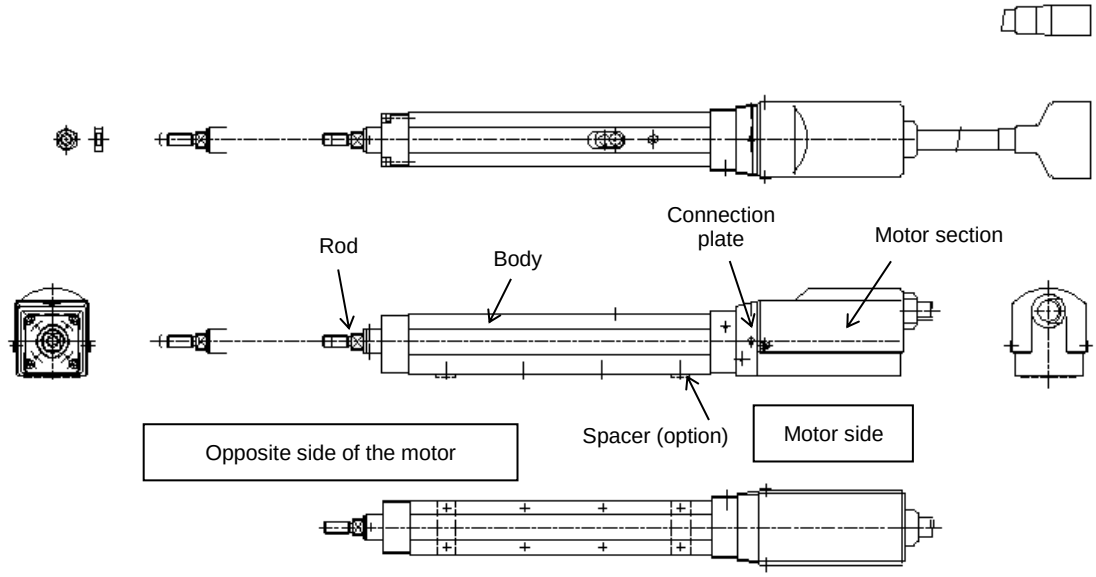
Item	Part name	Product name/Model no.
Standard structure (when a set model number is selected)	Controller	EC07/EC63/ECPT
	Actuator	ERL2/ESD2 Series
	I/O cable	EC-CBLIF1
	Motor/encoder relay cable	EC-CBLME1
Sold separately	Teaching pendant	ETP2
	Computer communication cable	EC-CBLPC2
	Surge protector	AX-NSF-RAV-781BXZ-4
	Noise filter	AX-NSF-NF2015A-0D
Provided for free	Software for Windows	E Tools

1.2 Part Name

1.2.1 ERL2 Series (slider type)

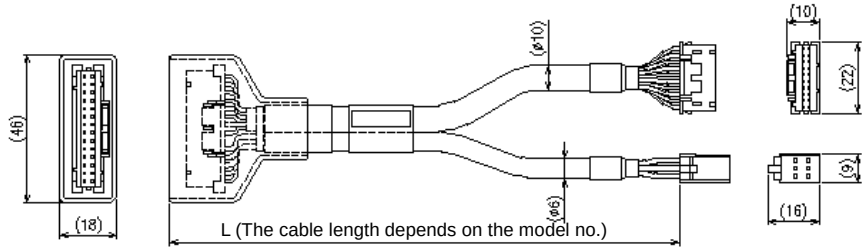


1.2.2 ESD2 Series (rod type)



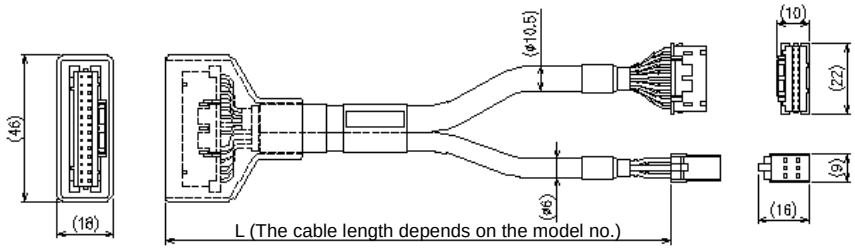
1.2.3 Motor/encoder relay cable (EC-CBLME 1)

■ Fixed type



Model no.	Cable length (L)
EC-CBLME1-S-1	1 m
EC-CBLME1-S-3	3 m
EC-CBLME1-S-5	5 m
EC-CBLME1-S-X	10 m

■ Movable type



Model no.	Cable length (L)
EC-CBLME1-R-1	1 m
EC-CBLME1-R-3	3 m
EC-CBLME1-R-5	5 m
EC-CBLME1-R-X	10 m

1.3 Model Number Indication

1.3.1 ERL2 Series (slider type)

● Set model number (actuator, controller, and cable)

ERL2 - 60 E 06 - 50 B M - RX B 2

Model

[A] Body size

[B] Motor mounting direction

[C] Screw lead

[D] Stroke

[E] Brake

[F] Origin position

[G] Relay cable length

[H] Controller

[I] I/O cable length

Symbol	Description
[A] Body size	
45	Body size 45
60	Body size 60
[B] Motor mounting direction	
E	Standard (straight)
R	Rightward
L	Leftward
D	Downward
[C] Screw lead	
06	6 mm
12	12 mm

[D] Stroke

Symbol	Length	Body size/Motor mounting direction			
		45E/45R/45L	45D	60E/60R/60L	60D
05	50 mm	●		●	
10	100 mm	●		●	
15	150 mm	●	●	●	●
20	200 mm	●	●	●	●
25	250 mm	●	●	●	●
30	300 mm	●	●	●	●
35	350 mm	●	●	●	●
40	400 mm	●	●	●	●
45	450 mm	●	●	●	●
50	500 mm	●	●	●	●
55	550 mm			●	●
60	600 mm			●	●
70	700 mm			●	●

Symbol	Description
[E] Brake	
N	Without brake
B	With brake
[F] Origin position	
M	Motor side
F	Opposite side of the motor
[G] Relay cable length	
N0	None
S1	Fixed cable 1 m
S3	Fixed cable 3 m
S5	Fixed cable 5 m
SX	Fixed cable 10 m
R1	Movable cable 1 m
R3	Movable cable 3 m
R5	Movable cable 5 m
RX	Movable cable 10 m
[H] Controller	
N	None Note 1
A	EC07 Standard mount
B	EC07 DIN rail mount
C	EC63 Standard mount
D	EC63 DIN rail mount
E	ECPT Standard mount Note 2
F	ECPT DIN rail mount Note 2
[I] I/O cable length	
N	None
2	2 m
3	3 m Note 3
5	5 m Note 3

<Example of model number indication>

ERL2-60E06-50BM-RXB2

[A] Body size	: 60
[B] Motor mounting direction	: Standard (straight)
[C] Screw lead	: 6 mm
[D] Stroke	: 500 mm
[E] Brake	: With brake
[F] Origin position	: Motor side
[G] Relay cable length	: Movable cable 10 m
[H] Controller	: EC07 DIN rail mount
[I] I/O cable length	: 2 m

● Actuator model number

ERL2 - 60 E 06 - 50 B M - N0 N N

[A] Body size

[B] Motor mounting direction

[C] Screw lead

[D] Stroke

[E] Brake

[F] Origin position

[I] I/O cable length

Note 1: If selecting "N" for controller, also select "N" for I/O cable length.
Note 2: Use PLC unit which satisfies the ECPT pulse string signal input specifications (refer to pages 5 to 13 in "SM-612271 Controller Instruction Manual").
Note 3: If the controller is E or F, these cables can be used only when the differential system is used as the pulse string signal system.
Only the 2 m cable can be used for the open collector system.

● Controller model number

EC 07 - B

Series

Mounting method

● Cable model number

* Relay cable

EC-CBLME1 - S - 5

Fixed/Movable

Cable length

* I/O cable

EC - CBLIF1 - 07 - 5

Controller series

Cable length

1.3.2 ESD2 Series (rod type)

● Set model number (actuator, controller, and cable)

ESD2 - 55 E 12 - 05 N F - S1 A 2 F

Model

[A] Body size

[B] Motor mounting direction

[C] Screw lead

[D] Stroke

[E] Brake

[F] Origin position

[G] Relay cable length

[H] Controller

[I] I/O cable length

[J] Mounting bracket

Symbol	Description
[A] Body size	
35	Body size 35
45	Body size 45
55	Body size 55
[B] Motor mounting direction	
E	Standard (straight)
R	Rightward
L	Leftward
D	Downward
[C] Screw lead	
06	6 mm
12	12 mm

[D] Stroke

Symbol	Length	Body size 35	45	55
05	50 mm	●	●	●
10	100 mm	●	●	●
15	150 mm	●	●	●
20	200 mm		●	●
25	250 mm			●
30	300 mm			●

[E] Brake	
N	Without brake
B	With brake
[F] Origin position	
M	Motor side
F	Opposite side of the motor
[G] Relay cable length	
N0	None
S1	Fixed cable 1 m
S3	Fixed cable 3 m
S5	Fixed cable 5 m
SX	Fixed cable 10 m
R1	Movable cable 1 m
R3	Movable cable 3 m
R5	Movable cable 5 m
RX	Movable cable 10 m
[H] Controller	
N	None Note 1
A	EC07 Standard mount
B	EC07 DIN rail mount
C	EC63 Standard mount
D	EC63 DIN rail mount
E	ECPT Standard mount Note 2
F	ECPT DIN rail mount Note 2
[I] I/O cable length	
N	None
2	2 m
3	3 m Note 3
5	5 m Note 3
[J] Mounting bracket	
N	None
L	Foot bracket included
F	Flange bracket included
S	Spacer bracket (for body size 35 and 55 only)

<Example of model number indication>

ESD2-55E12-05NF-S1A2F

[A] Body size	: 55
[B] Motor mounting direction	: Standard (straight)
[C] Screw lead	: 12 mm
[D] Stroke	: 50 mm
[E] Brake	: Without brake
[F] Origin position	: Opposite side of the motor
[G] Relay cable length	: Fixed cable 1 m
[H] Controller	: EC07 standard mount
[I] I/O cable length	: 2 m
[J] Mounting bracket	: Flange bracket included

● Actuator model number

ESD2 - 55 E 12 - 05 N F - N0 N N

[A] Body size; [B] Motor mounting direction; [C] Screw lead; [D] Stroke; [E] Brake; [F] Origin position

Note 1: If selecting "N" for controller, also select "N" for I/O cable length.
Note 2: Use PLC unit which satisfies the ECPT pulse string signal input specifications (refer to pages 5 to 13 in "SM-612271 Controller Instruction Manual").
Note 3: If the controller is E or F, these cables can be used only when the differential system is used as the pulse string signal system. Only the 2 m cable can be used for the open collector system.

● Controller model number

EC 07 - B

Series; Mounting method

● Cable model number

・Relay cable

EC-CBLME1 - S - 5

Fixed/Movable; Cable length

・I/O cable

EC - CBLIF1 - 07 - 5

Controller series; Cable length

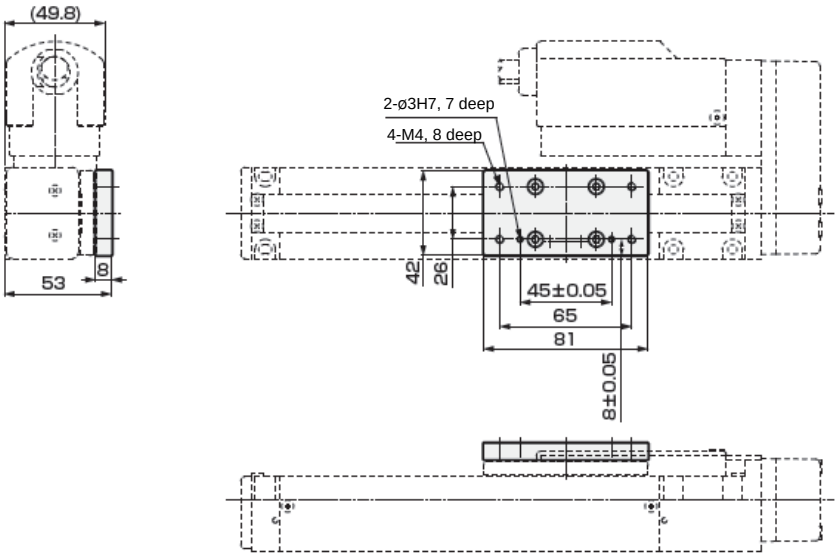
1.3.3 ERL2 Series (slider type) optional parts

If the workpiece to be attached to the slider interferes with the motor section of the ERL2 Series (slider type), use the following slider spacer kit.

● Slider spacer kit: SSP

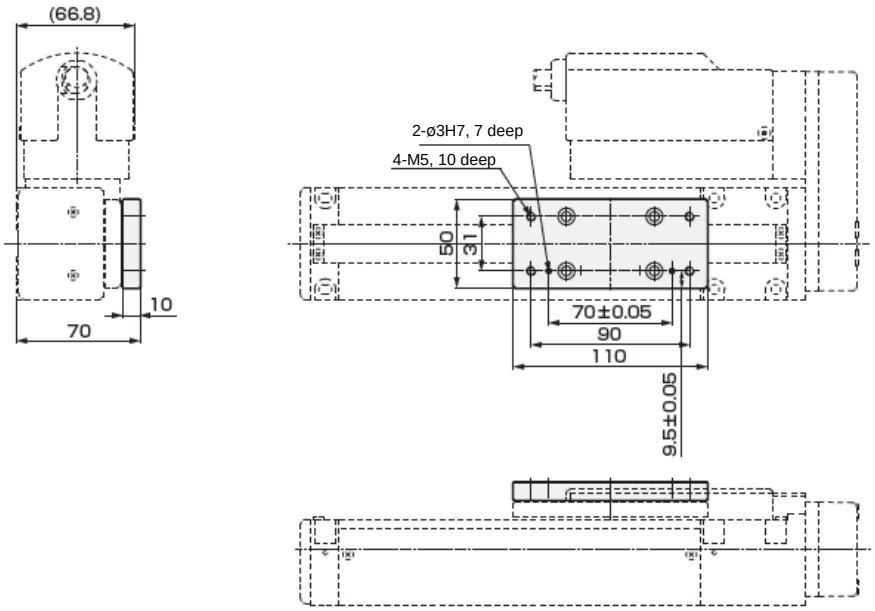
Model number for ERL2-45: EA-45-SSP

Dimensions



Model number for ERL2-60: EA-60-SSP

Dimensions



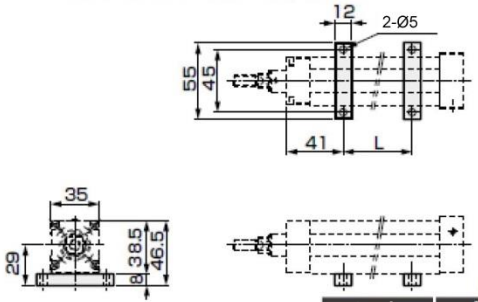
1.3.4 ESD2 Series (rod type) mounting brackets

Following kits are supplied with the product if the mounting bracket option is selected.

■ Option: LB

Foot kit model number: ESD-[body size]-LB

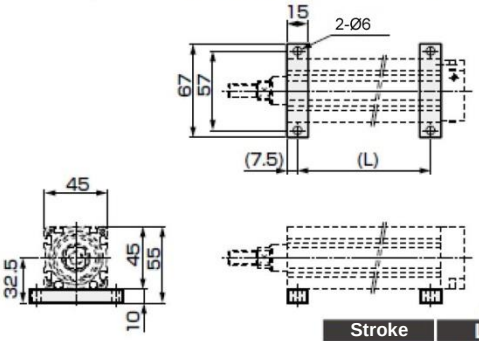
Dimensions with the foot bracket
Set model number : ESD2-35E□-□□□-□□□L



(mm)

Stroke	L
50	100
100	150
150	200

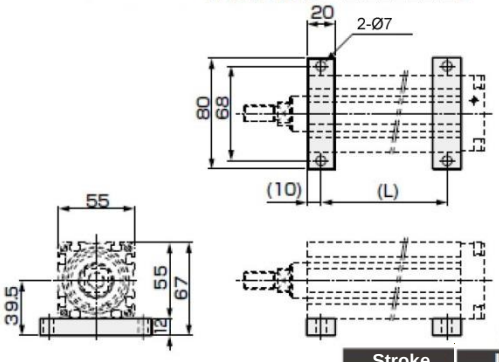
Set model number : ESD2-45E□-□□□-□□□L



(mm)

Stroke	L
50	147.5
100	197.5
150	247.5
200	297.5

Set model number : ESD2-55E□-□□□-□□□L



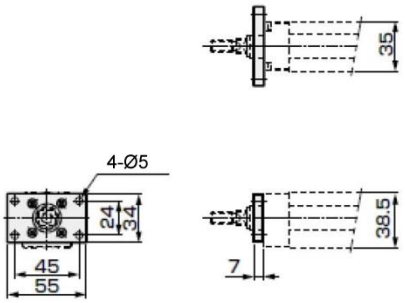
(mm)

Stroke	L
50	163
100	213
150	263
200	313
250	363
300	413

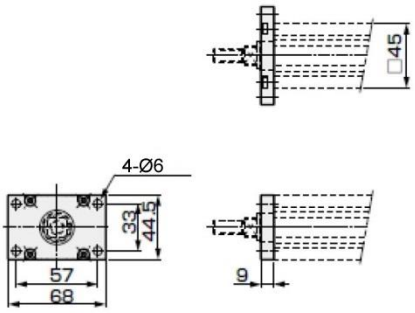
■ Option: FA

Flange kit model number: ESD-[body size]-FA

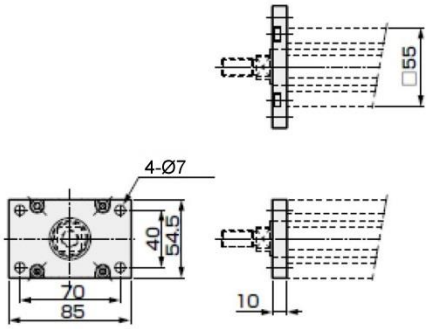
Dimensions with the flange bracket
Set model number : ESD2-35E□-□□□-□□□F



Set model number : ESD2-45E□-□□□-□□□F



Set model number : ESD2-55E□-□□□-□□□F



■ Option: SP

Spacer kit model number : ESD-[35/55]-SP

Set model number : ESD2-[35/55]E□-□□□-□□□S

1.4 Specifications

1.4.1 Product specifications

Descriptions \ Model			ERL2 Series				ESD2 Series					
			ERL2-45		ERL2-60		ESD2-35		ESD2-45		ESD2-55	
Actuator			Slider				Rod					
Motor			Stepping motor									
Encoder			Incremental encoder									
Drive system			Rolling ball screw (outside diameter: 8 mm)		Rolling ball screw (outside diameter: 12 mm)		Rolling ball screw (outside diameter: 8 mm)				Rolling ball screw (outside diameter: 12 mm)	
Motor size		mm	☐42		☐56		☐42				☐56	
Screw lead		mm	6	12	6	12	6	12	6	12	6	12
Stroke		mm	50, 100, 150, 200, 250, 300, 350, 400, 450, 500 (550, 600, 700 Note 1)				50, 100, 150		50, 100, 150, 200		50, 100, 150, 200, 250, 300	
Operation speed range Note 2		mm/s	15 to 300	30 to 600	15 to 200	30 to 400	15 to 300	30 to 600	15 to 300	30 to 600	15 to 200	30 to 400
Repetitive positioning accuracy		mm	± 0.02									
Lost motion		mm	0.1 or less									
Max. load capacity Note 3	Horizontal	kg	10	5	30	16	33	16	33	16	67	34
	Vertical	kg	5	2	11	6.5	10	4	10	4	15	6.5
Max. pressing force		N	220	110	640	320	220	110	220	110	640	320
Motor power supply voltage			24 VDC ± 10%									
Motor section instantaneous maximum current Note 4		A	2.7		4.0		2.7		2.7		4.0	
Brake	Type		Non-excitation operation									
	Power consumption	W	6.1		7.2		6.1				7.2	
	Holding force	N	140	70	610	305	140	70	140	70	610	305
	Power supply voltage		24 VDC ± 10%									
Operating ambient temperature			0°C to 40°C (no freezing)									
Operating ambient humidity			35% to 80% (no condensation)									
Storage ambient temperature			−10°C to 50°C (no freezing)									
Storage ambient humidity			35% to 80% (no condensation)									
Atmosphere			No corrosive gas, explosive gas, and dust									
Degree of protection			Equivalent to IP4X (IEC standard)									

Note 1: Available only for ERL2-60.
Note 2: For information on the operation speed range, refer to “SM-612271 Controller (EC07/EC63/ECPT) Instruction Manual”.
Note 3: When the speed is increased, the maximum load capacity is decreased. Refer to "1.4.2 Correlation between the speed and the load capacity".
The horizontal load capacity values of the ESD2 Series are the values when used with an external guide.
Note 4: Use a power with sufficient capacity for the instantaneous maximum current.

■ Weight of ERL2 Series

(kg)

Body size	Motor mounting direction	Stroke												
		50	100	150	200	250	300	350	400	450	500	550	600	700
ERL2-45	E	1.5 (1.8)	1.6 (1.9)	1.7 (2.0)	1.8 (2.1)	1.9 (2.2)	2.0 (2.3)	2.1 (2.4)	2.2 (2.5)	2.3 (2.6)	2.5 (2.8)	-	-	-
	R/L/D	1.7 (2.0)	1.8 (2.1)	1.9 (2.2)	2.0 (2.3)	2.1 (2.4)	2.2 (2.5)	2.3 (2.6)	2.4 (2.7)	2.5 (2.8)	2.7 (3.0)	-	-	-
ERL2-60	E	3.2 (3.8)	3.4 (4.0)	3.6 (4.2)	3.8 (4.4)	4.0 (4.6)	4.2 (4.8)	4.4 (5.0)	4.6 (5.2)	4.8 (5.4)	5.0 (5.6)	5.2 (5.8)	5.4 (6.0)	5.8 (6.4)
	R/L/D	3.7 (4.3)	3.9 (4.5)	4.1 (4.7)	4.3 (4.9)	4.5 (5.1)	4.7 (5.3)	4.9 (5.5)	5.1 (5.7)	5.3 (5.9)	5.5 (6.1)	5.7 (6.3)	5.9 (6.5)	6.3 (6.9)

* Values in ( ) are weights with the brake.

■ Weight of ESD2 Series

(kg)

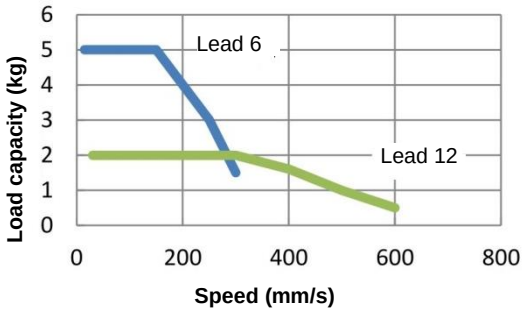
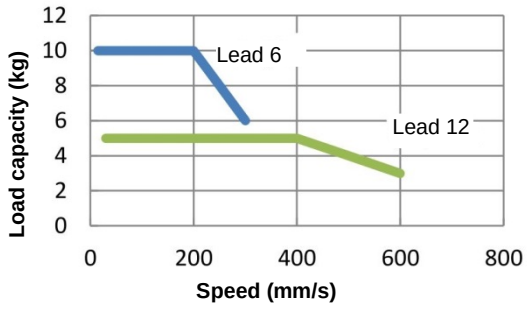
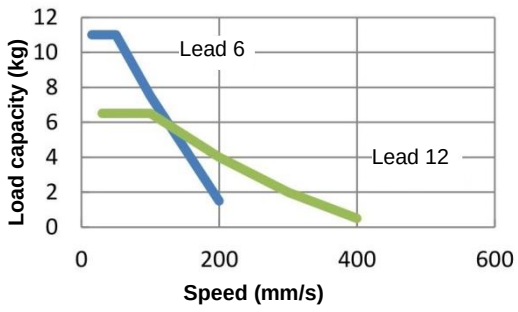
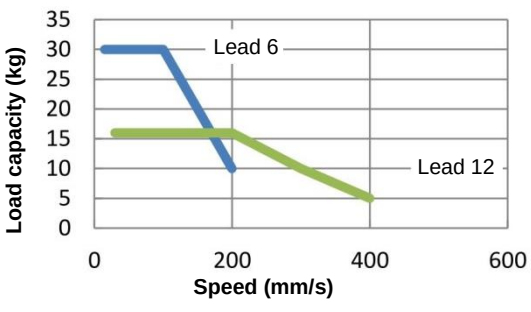
Body size	Motor mounting direction	Stroke					
		50	100	150	200	250	300
ESD2-35	E	1.3 (1.7)	1.5 (1.9)	1.6 (2.0)	-	-	-
	R/L/D	1.5 (1.8)	1.7 (2.0)	1.8 (2.1)	-	-	-
ESD2-45	E	1.7 (2.1)	2.0 (2.4)	2.2 (2.6)	2.5 (2.9)	-	-
	R/L/D	1.9 (2.2)	2.2 (2.5)	2.4 (2.7)	2.7 (3.0)	-	-
ESD2-55	E	3.0 (3.7)	3.4 (4.1)	3.8 (4.5)	4.1 (4.8)	4.5 (5.2)	4.9 (5.6)
	R/L/D	3.5 (4.1)	3.9 (4.5)	4.3 (4.9)	4.6 (5.2)	5.0 (5.6)	5.4 (6.0)

* Values in ( ) are weights with the brake.

1.4.2 Correlation between the speed and the load capacity

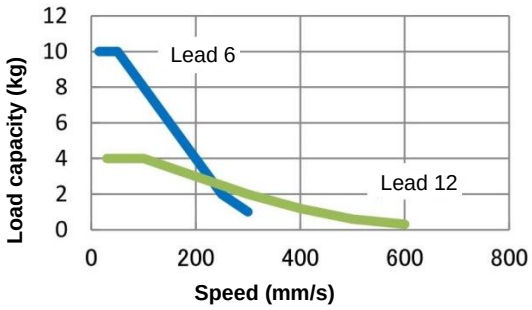
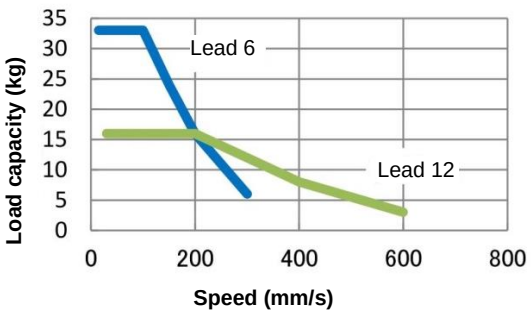
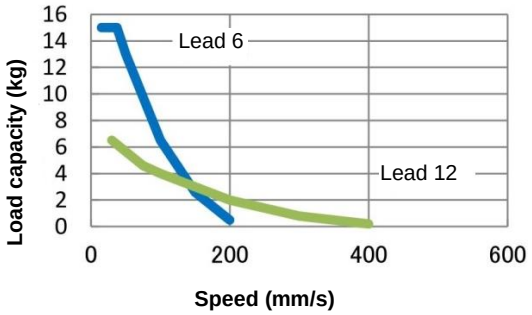
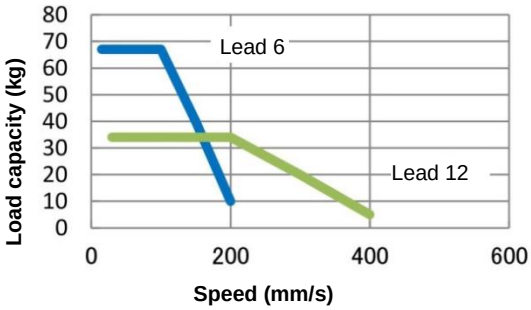
■ ERL2 Series (slider type)

- The operation speed is set by a value determined by the screw lead.
- Since the vertical load capacity depends on the speed, select the motor size and the screw lead carefully.
- When transferring a workpiece, do not apply any shock to the slider, such as hitting it against an external mechanical stopper.
- The set speed may not be reached depending on the stroke and the acceleration.

	Vertical load capacity	Horizontal load capacity (reference)
ERL2-45		
ERL2-60		

■ ESD2 Series (rod type)

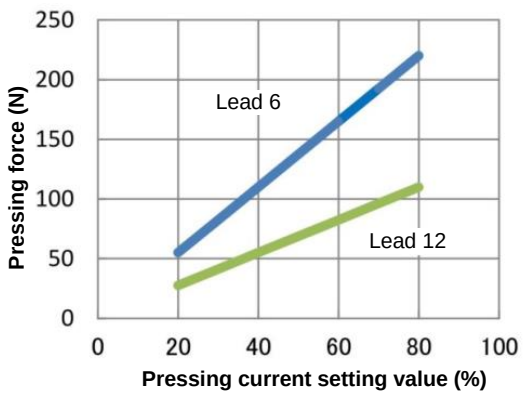
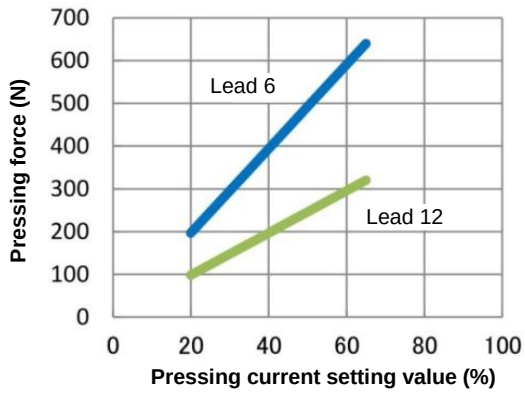
- The operation speed is set by a value determined by the screw lead.
- Since the vertical load capacity depends on the speed, select the motor size and the screw lead carefully.
- Use a system such as a linear guide with the product to prevent the piston rod from being subjected to a lateral load or a rotational force.
- The values (load capacity) in the graphs below depend on the external conditions such as the connection method and the friction resistance of the linear guide.
- When transferring a workpiece, do not apply any shock to the rod, such as hitting it against an external mechanical stopper.
- The set speed may not be reached depending on the stroke and the acceleration.
- The horizontal load capacity values are the values when used with an external guide.

	Vertical load capacity	Horizontal load capacity (reference)
ESD2-35/45		
ESD2-55		

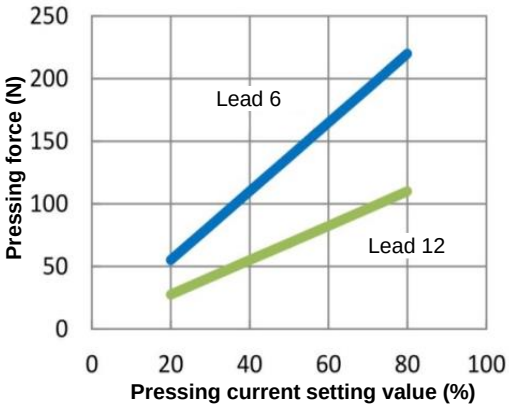
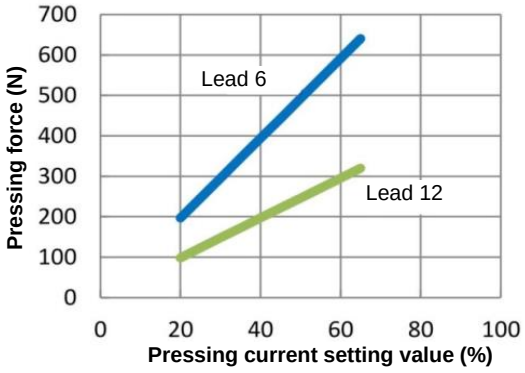
1.4.3 Correlation between the pressing force and the pressing current setting value

The correlations between the pressing force and the pressing current setting value shown in the graphs below are for reference only. Since the values (pressing force) depend on the conditions of use, check the actual pressing force in accordance with the conditions.

■ ERL2 Series (slider type)

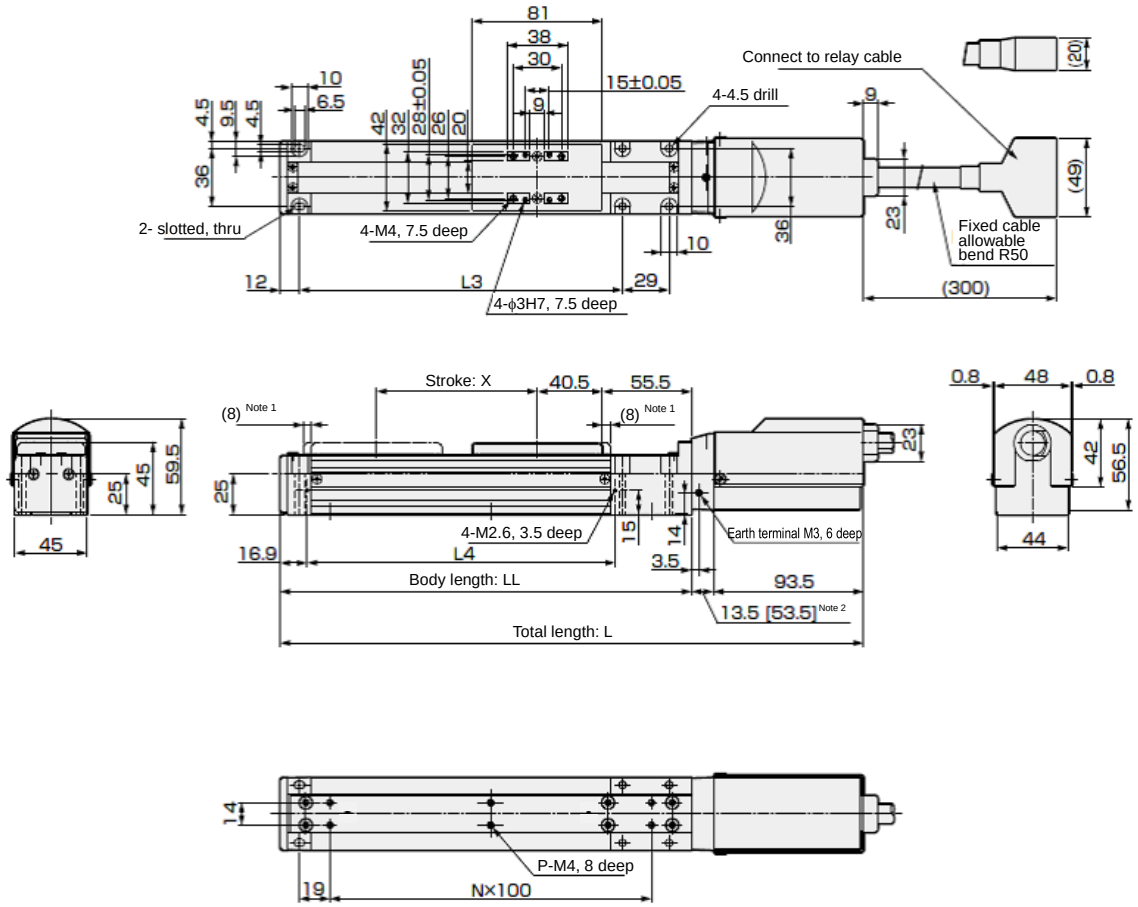
	Pressing force (reference)		Pressing force (reference)
ERL2-45		ERL2-60	

■ ESD2 Series (rod type)

	Pressing force (reference)		Pressing force (reference)
ESD2-35/45		ESD2-55	

1.5 Dimensions

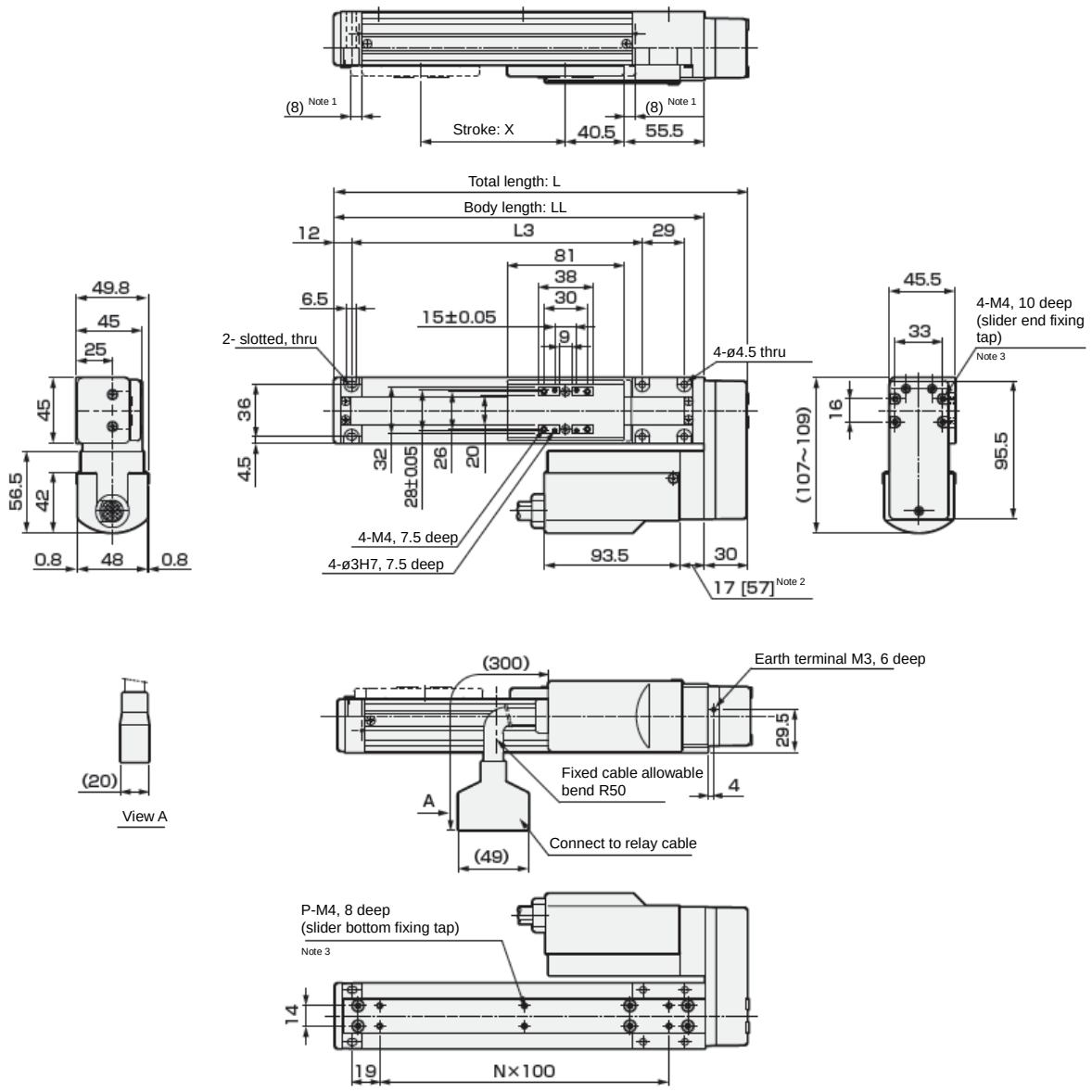
1.5.1 ERL2-45E (Standard (straight))



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.

Stroke	Symbol	05	10	15	20	25	30	35	40	45	50
	X (mm)	50	100	150	200	250	300	350	400	450	500
Total length: L (mm)	Without brake	313	363	413	463	513	563	613	663	713	763
	With brake	353	403	453	503	553	603	653	703	753	803
Body length: LL (mm)		206	256	306	356	406	456	506	556	606	656
L3 (mm)		151	201	251	301	351	401	451	501	551	601
L4 (mm)		141.6	191.6	241.6	291.6	341.6	391.6	441.6	491.6	541.6	591.6
Number of mounting holes P		4	6	6	8	8	10	10	12	12	14
Number of intervals between mounting holes N		1	2	2	3	3	4	4	5	5	6
Weight (kg)	Without brake	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.5
	With brake	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.8

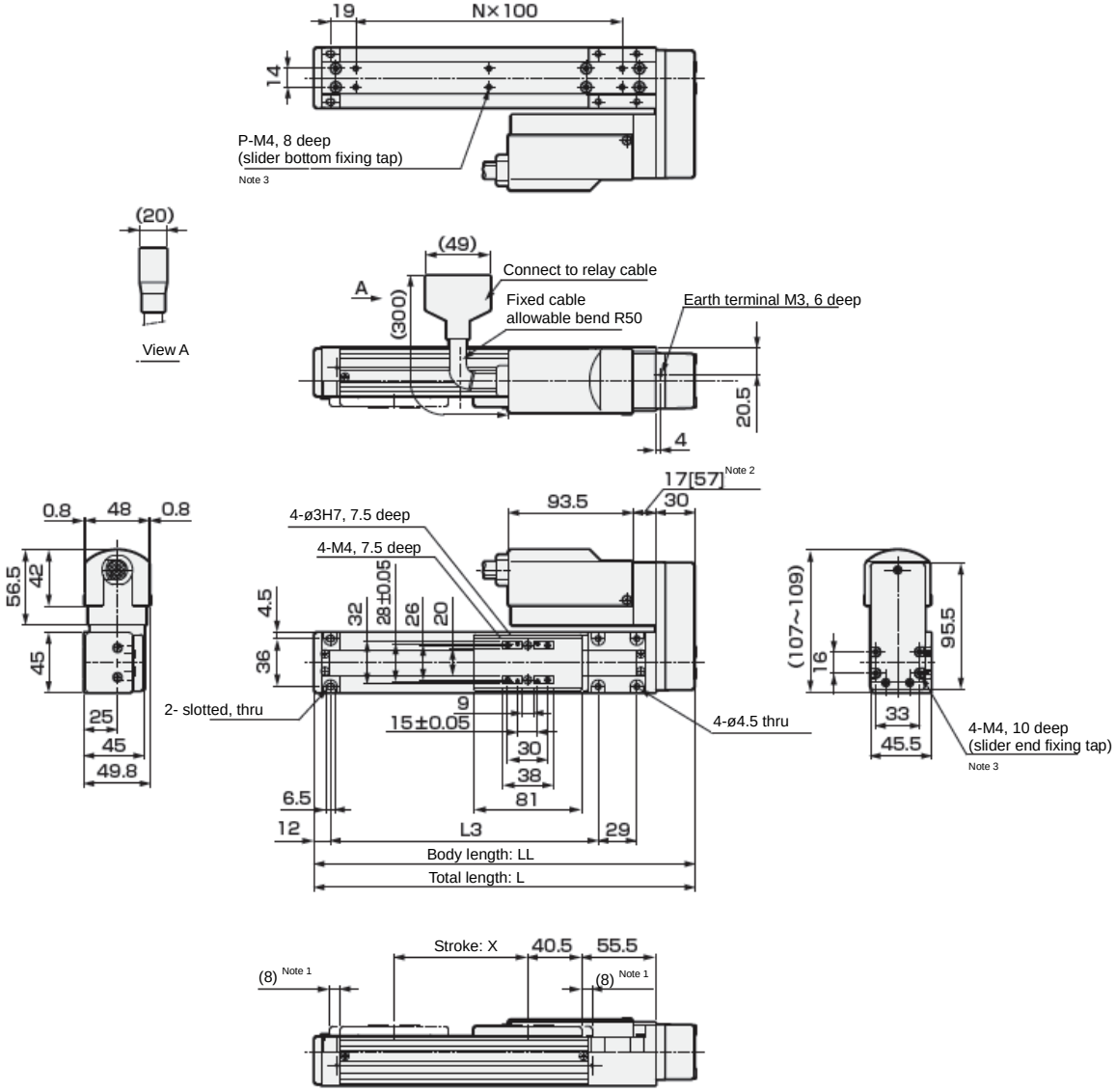
1.5.2 ERL2-45R (Rightward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a slider end fixing tap, make sure to use the slider bottom fixing tap as well.

Stroke	Symbol	05	10	15	20	25	30	35	40	45	50
	X (mm)	50	100	150	200	250	300	350	400	450	500
Total length: L (mm)		236	286	336	386	436	486	536	586	636	686
Body length: LL (mm)		206	256	306	356	406	456	506	556	606	656
L3 (mm)		151	201	251	301	351	401	451	501	551	601
Number of mounting holes P		4	6	6	8	8	10	10	12	12	14
Number of intervals between mounting holes N		1	2	2	3	3	4	4	5	5	6
Weight (kg)	Without brake	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.7
	With brake	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	3.0

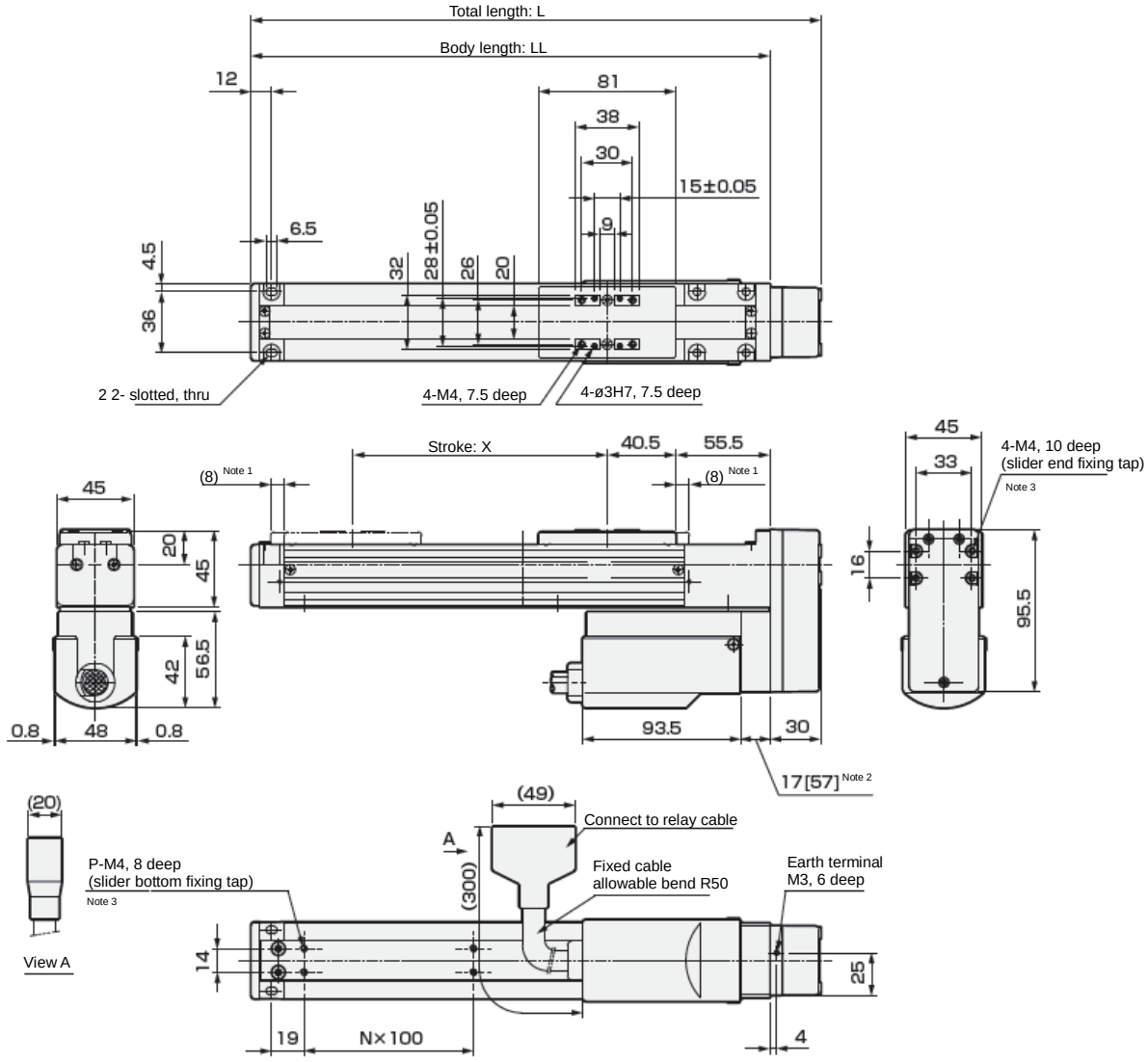
1.5.3 ERL2-45L (Leftward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a slider end fixing tap, make sure to use the slider bottom fixing tap as well.

Stroke	Symbol	05	10	15	20	25	30	35	40	45	50
	X (mm)	50	100	150	200	250	300	350	400	450	500
Total length: L (mm)		236	286	336	386	436	486	536	586	636	686
Body length: LL (mm)		206	256	306	356	406	456	506	556	606	656
L3 (mm)		151	201	251	301	351	401	451	501	551	601
Number of mounting holes P		4	6	6	8	8	10	10	12	12	14
Number of intervals between mounting holes N		1	2	2	3	3	4	4	5	5	6
Weight (kg)	Without brake	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.7
	With brake	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	3.0

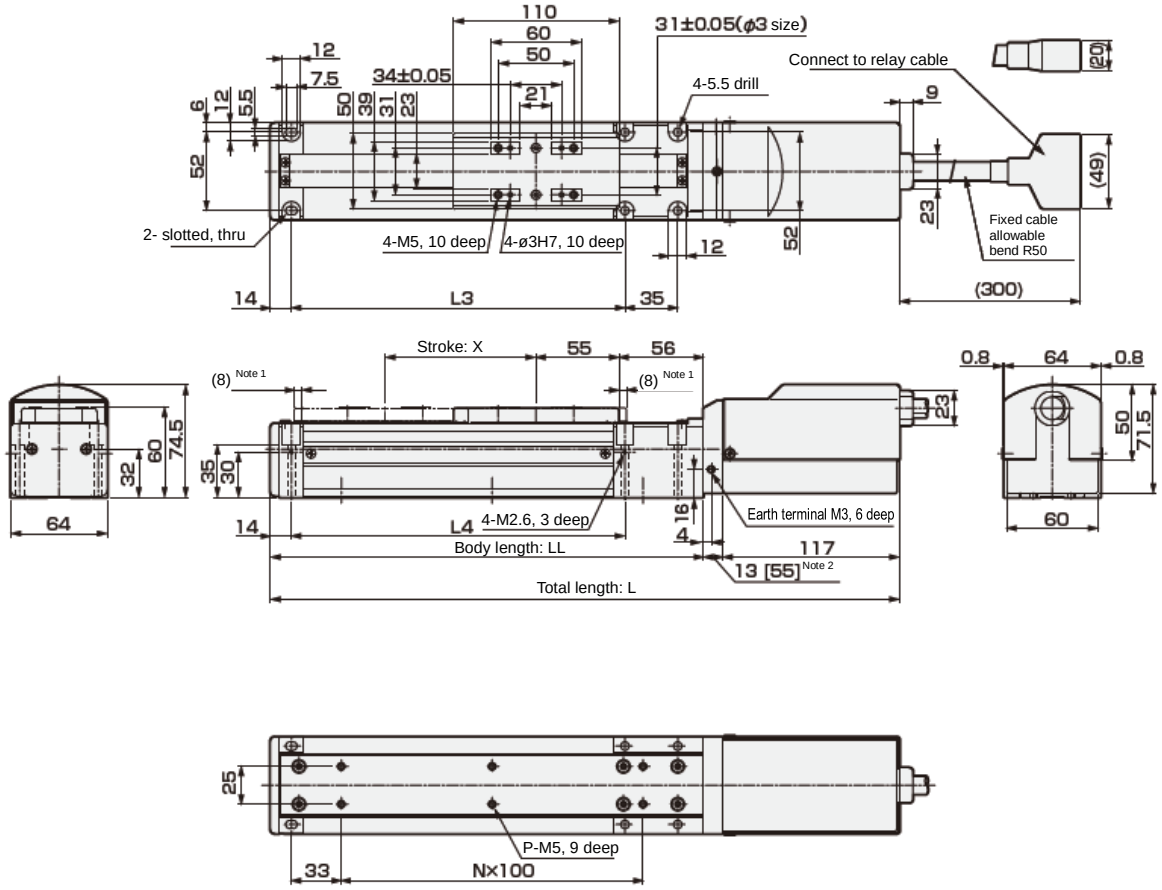
1.5.4 ERL2-45D (Downward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a slider end fixing tap, make sure to use the slider bottom fixing tap as well.

Stroke	Symbol	05	10	15	20	25	30	35	40	45	50
	X (mm)	50	100	150	200	250	300	350	400	450	500
Total length: L (mm)		-	-	336	386	436	486	536	586	636	686
Body length: LL (mm)		-	-	306	356	406	456	506	556	606	656
Number of mounting holes P		-	-	4	4	6	6	8	8	10	10
Number of intervals between mounting holes N		-	-	1	1	2	2	3	3	4	4
Weight (kg)	Without brake	-	-	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.7
	With brake	-	-	2.2	2.3	2.4	2.5	2.6	2.7	2.8	3.0

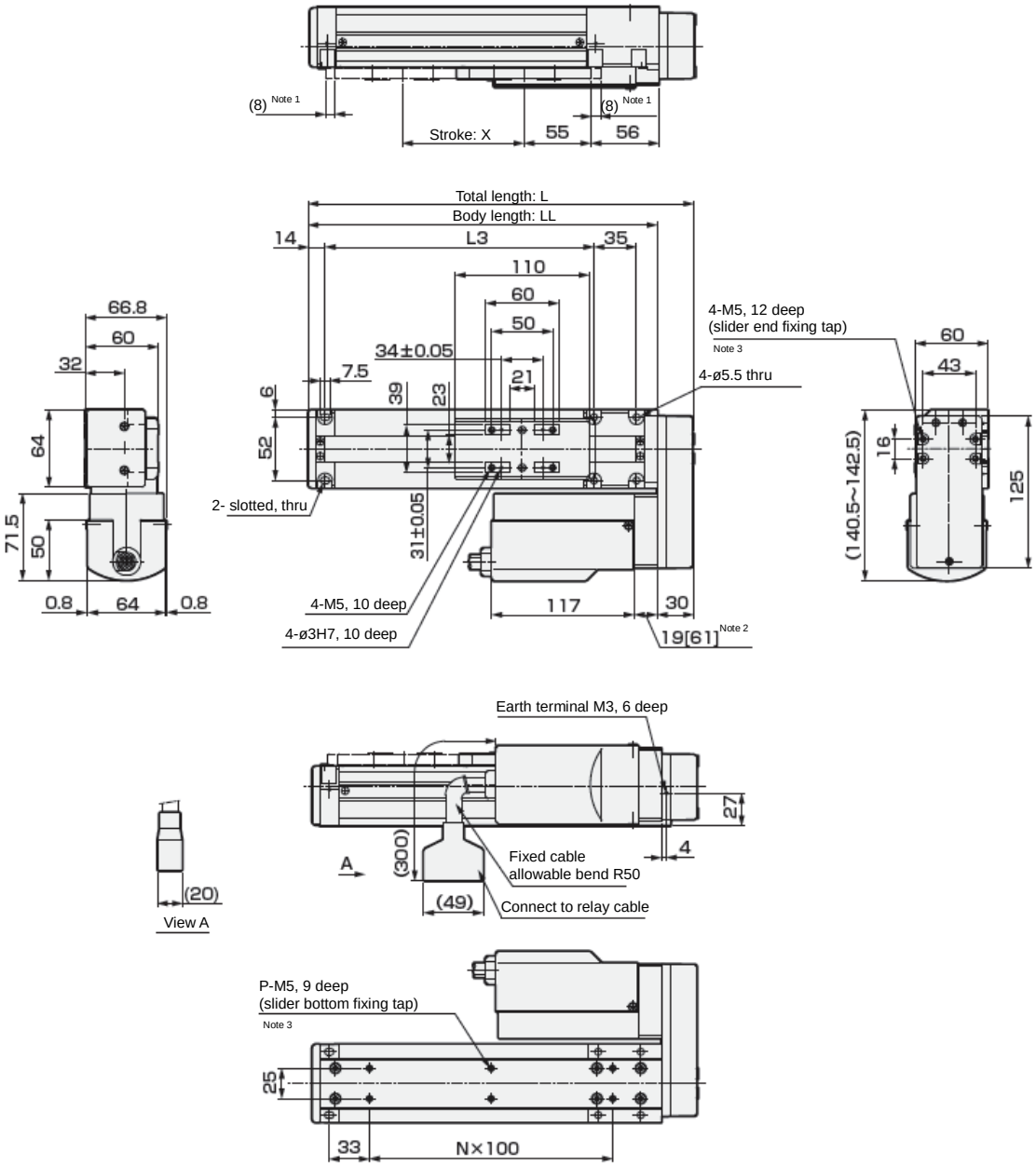
1.5.5 ERL2-60E (Standard (straight))



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.

Stroke	Symbol	05	10	15	20	25	30	35	40	45	50	55	60	70
	X (mm)	50	100	150	200	250	300	350	400	450	500	550	600	700
Total length: L (mm)	Without brake	367	417	467	517	567	617	667	717	767	817	867	917	1017
	With brake	409	459	509	559	609	659	709	759	809	859	909	959	1059
Body length: LL (mm)		237	287	337	387	437	487	537	587	637	687	737	787	887
L3 (mm)		171	221	271	321	371	421	471	521	571	621	671	721	821
L4 (mm)		171	221	271	321	371	421	471	521	571	621	671	721	821
Number of mounting holes P		4	6	6	8	8	10	10	12	12	14	14	16	18
Number of intervals between mounting holes N		1	2	2	3	3	4	4	5	5	6	6	7	8
Weight (kg)	Without brake	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.8
	With brake	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.4

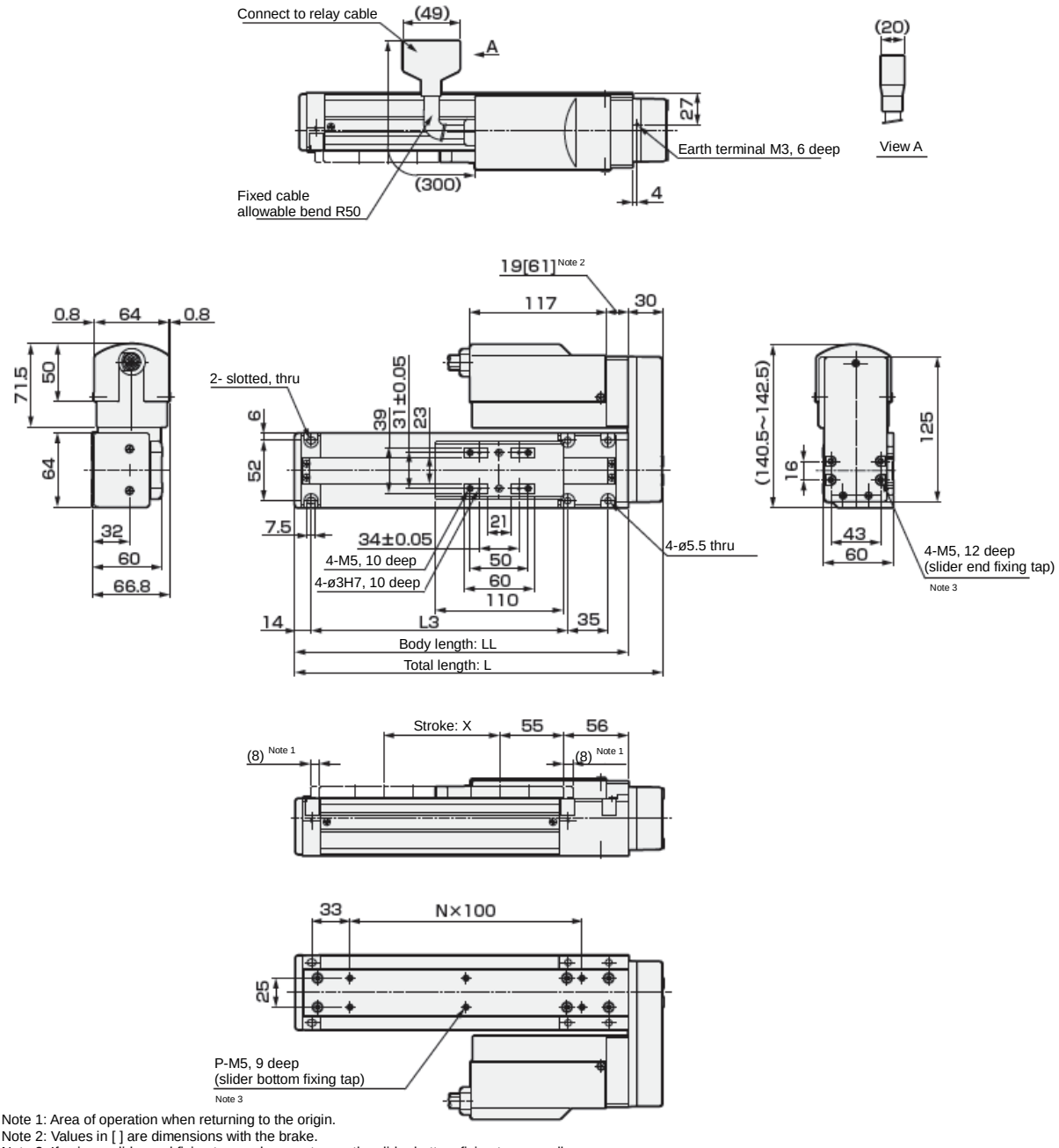
1.5.6 ERL2-60R (Rightward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a slider end fixing tap, make sure to use the slider bottom fixing tap as well.

Stroke	Symbol	05	10	15	20	25	30	35	40	45	50	55	60	70
	X (mm)	50	100	150	200	250	300	350	400	450	500	550	600	700
Total length: L (mm)		267	317	367	417	467	517	567	617	667	717	767	817	917
Body length: LL (mm)		237	287	337	387	437	487	537	587	637	687	737	787	887
L3 (mm)		171	221	271	321	371	421	471	521	571	621	671	721	821
Number of mounting holes P		4	6	6	8	8	10	10	12	12	14	14	16	18
Number of intervals between mounting holes N		1	2	2	3	3	4	4	5	5	6	6	7	8
Weight (kg)	Without brake	3.7	3.9	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.3
	With brake	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.9

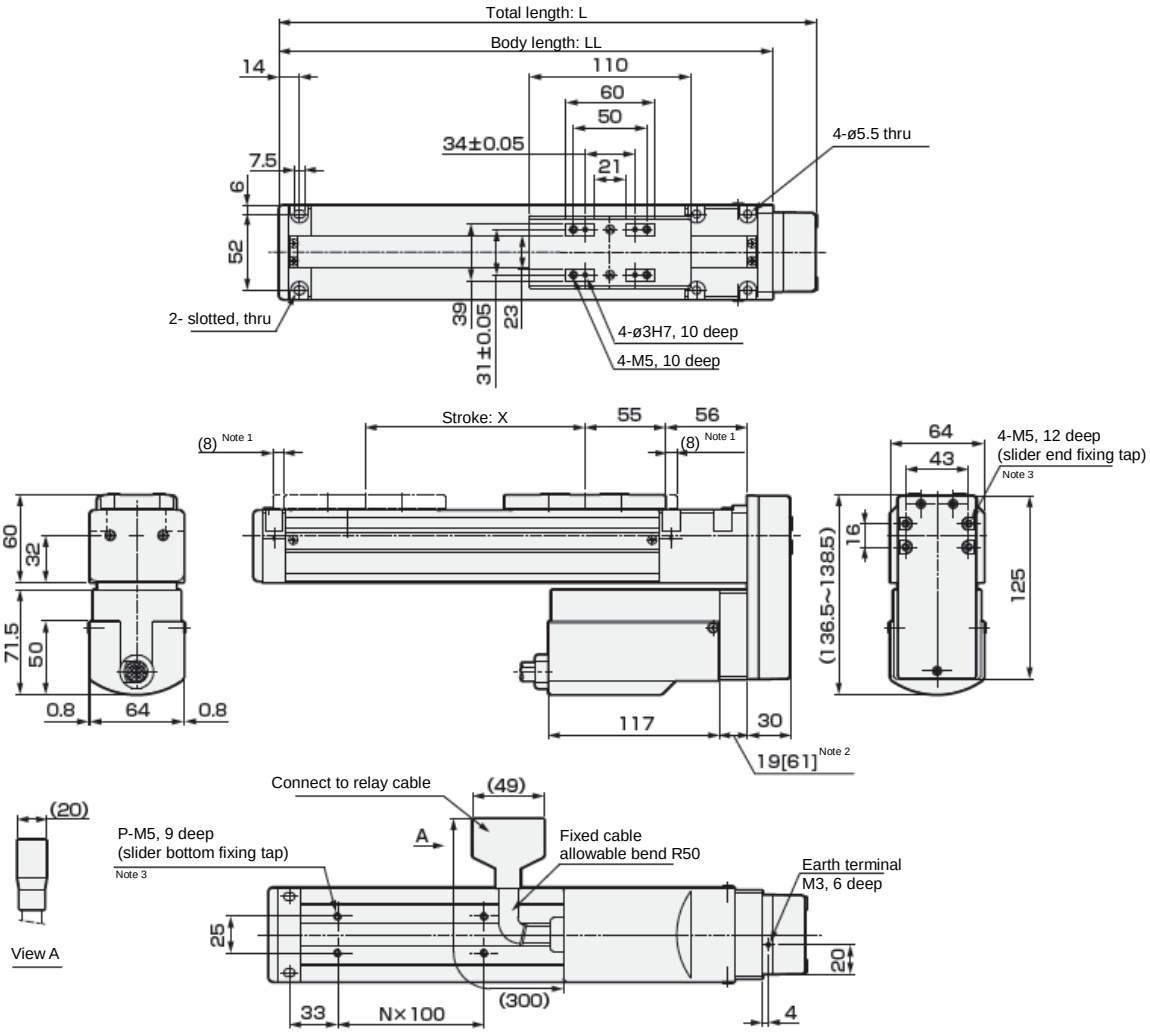
1.5.7 ERL2-60L (Leftward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a slider end fixing tap, make sure to use the slider bottom fixing tap as well.

Stroke	Symbol	05	10	15	20	25	30	35	40	45	50	55	60	70
	X (mm)	50	100	150	200	250	300	350	400	450	500	550	600	700
Total length: L (mm)		267	317	367	417	467	517	567	617	667	717	767	817	917
Body length: LL (mm)		237	287	337	387	437	487	537	587	637	687	737	787	887
L3 (mm)		171	221	271	321	371	421	471	521	571	621	671	721	821
Number of mounting holes P		4	6	6	8	8	10	10	12	12	14	14	16	18
Number of intervals between mounting holes N		1	2	2	3	3	4	4	5	5	6	6	7	8
Weight (kg)	Without brake	3.7	3.9	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.3
	With brake	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.9

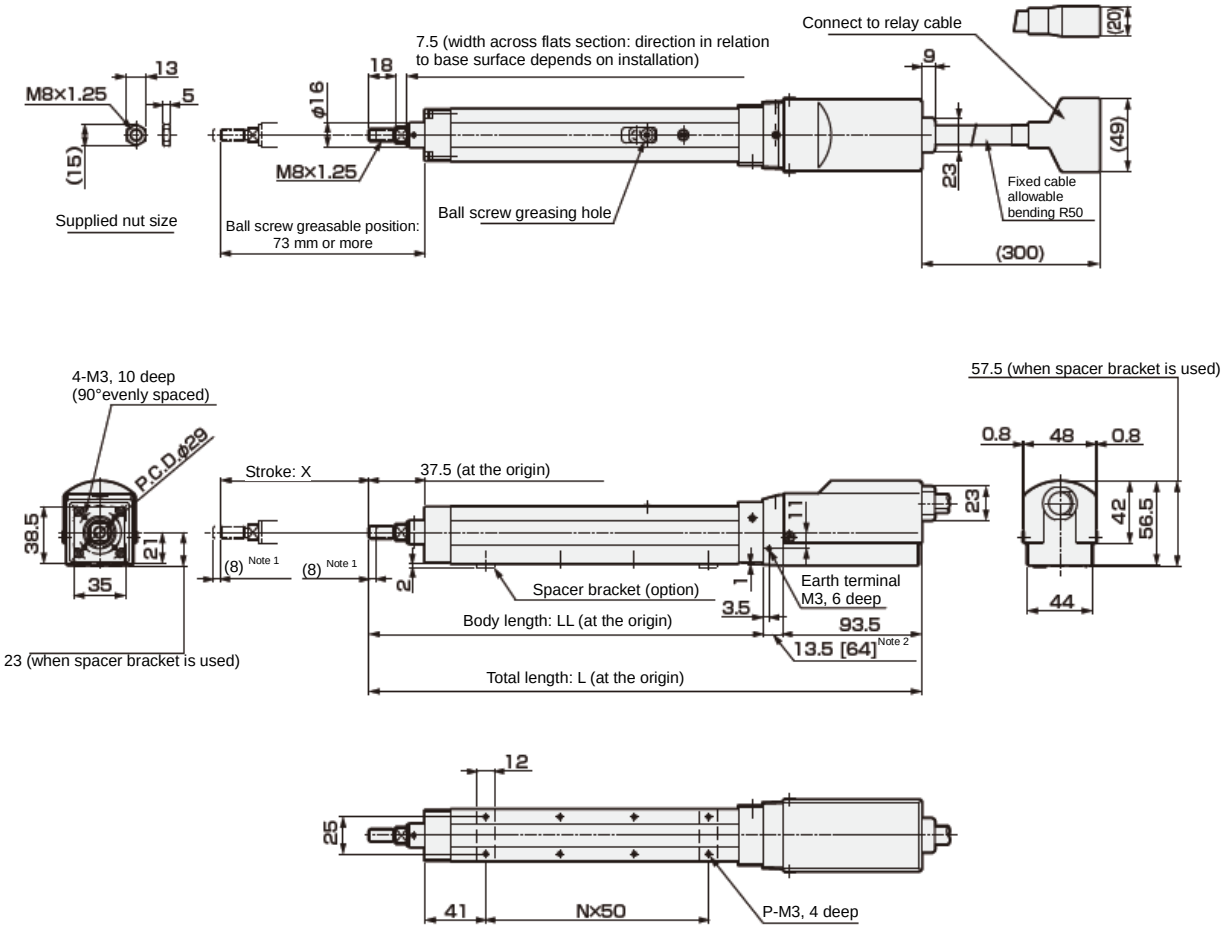
1.5.8 ERL2-60D (Downward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a slider end fixing tap, make sure to use the slider bottom fixing tap as well.

Stroke	Symbol	05	10	15	20	25	30	35	40	45	50	55	60	70
	X (mm)	50	100	150	200	250	300	350	400	450	500	550	600	700
Total length: L (mm)		-	-	367	417	467	517	567	617	667	717	767	817	917
Body length: LL (mm)		-	-	337	387	437	487	537	587	637	687	737	787	887
Number of mounting holes P		-	-	4	4	6	6	8	8	10	10	12	12	14
Number of intervals between mounting holes N		-	-	1	1	2	2	3	3	4	4	5	5	6
Weight (kg)	Without brake	-	-	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.3
	With brake	-	-	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.9

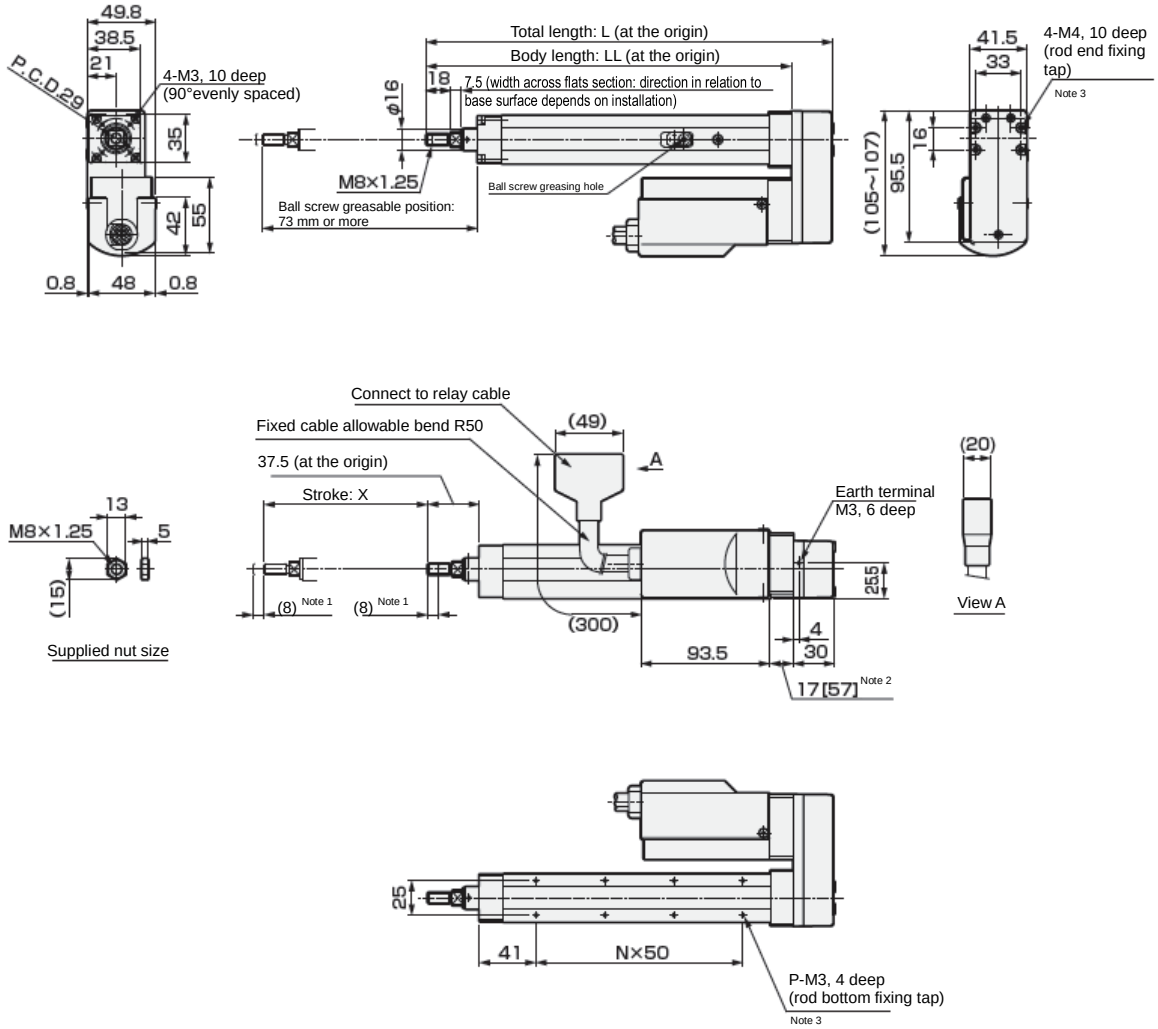
1.5.9 ESD2-35E (Standard (straight))



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.

Stroke	Symbol	05	10	15
	X (mm)	50	100	150
Total length: L (mm)	Without brake	322	372	422
	With brake	372.5	422.5	472.5
Body length: LL (mm)		215	265	315
Number of mounting holes P		6	8	10
Number of intervals between mounting holes N		2	3	4
Weight (kg)	Without brake	1.3	1.5	1.6
	With brake	1.7	1.9	2.0

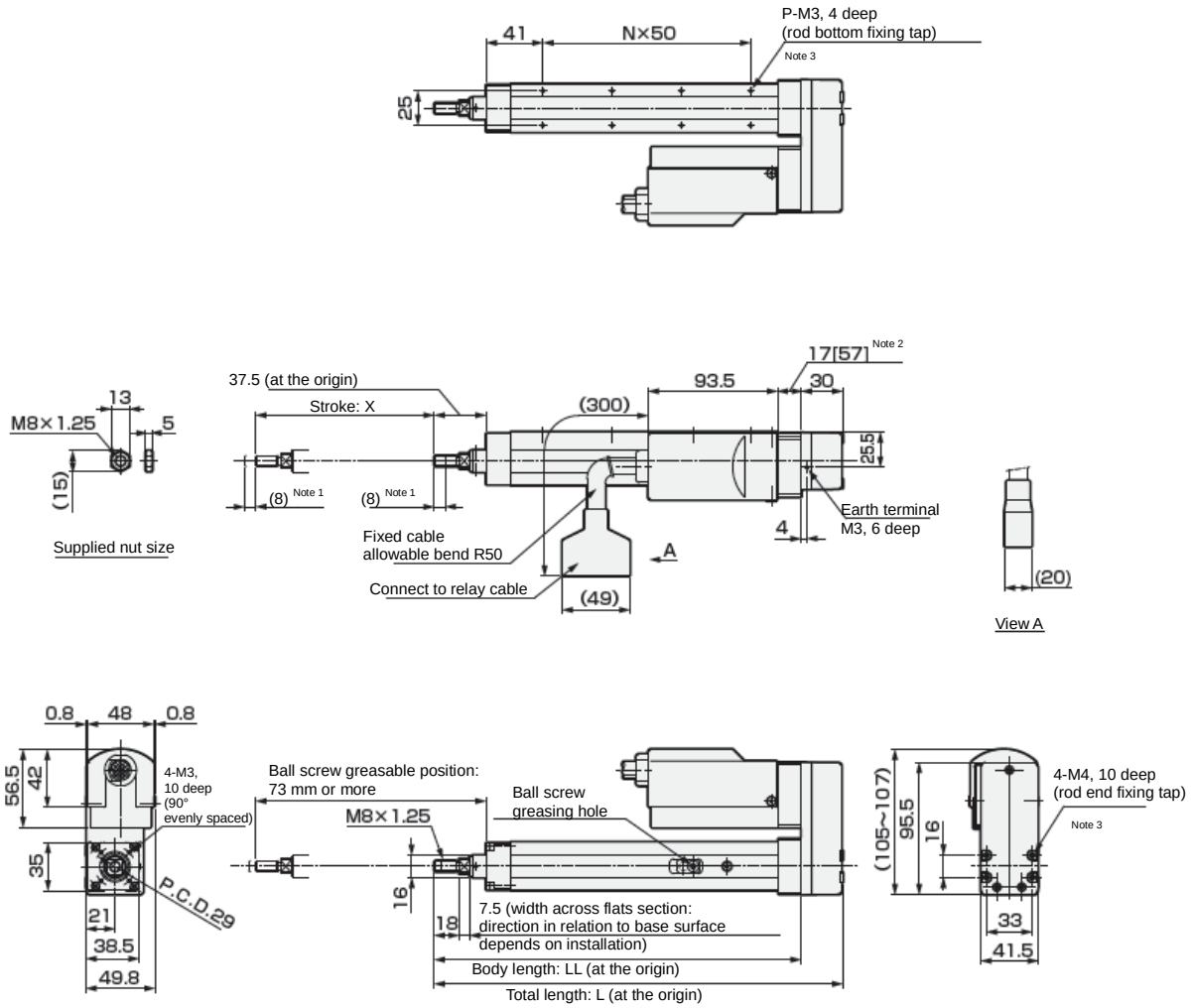
1.5.10 ESD2-35R (Rightward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the rod bottom fixing tap as well.

Stroke	Symbol	05	10	15
	X (mm)	50	100	150
Total length: L (mm)		245	295	345
Body length: LL (mm)		215	265	315
Number of mounting holes P		6	8	10
Number of intervals between mounting holes N		2	3	4
Weight (kg)	Without brake	1.5	1.7	1.8
	With brake	1.8	2.0	2.1

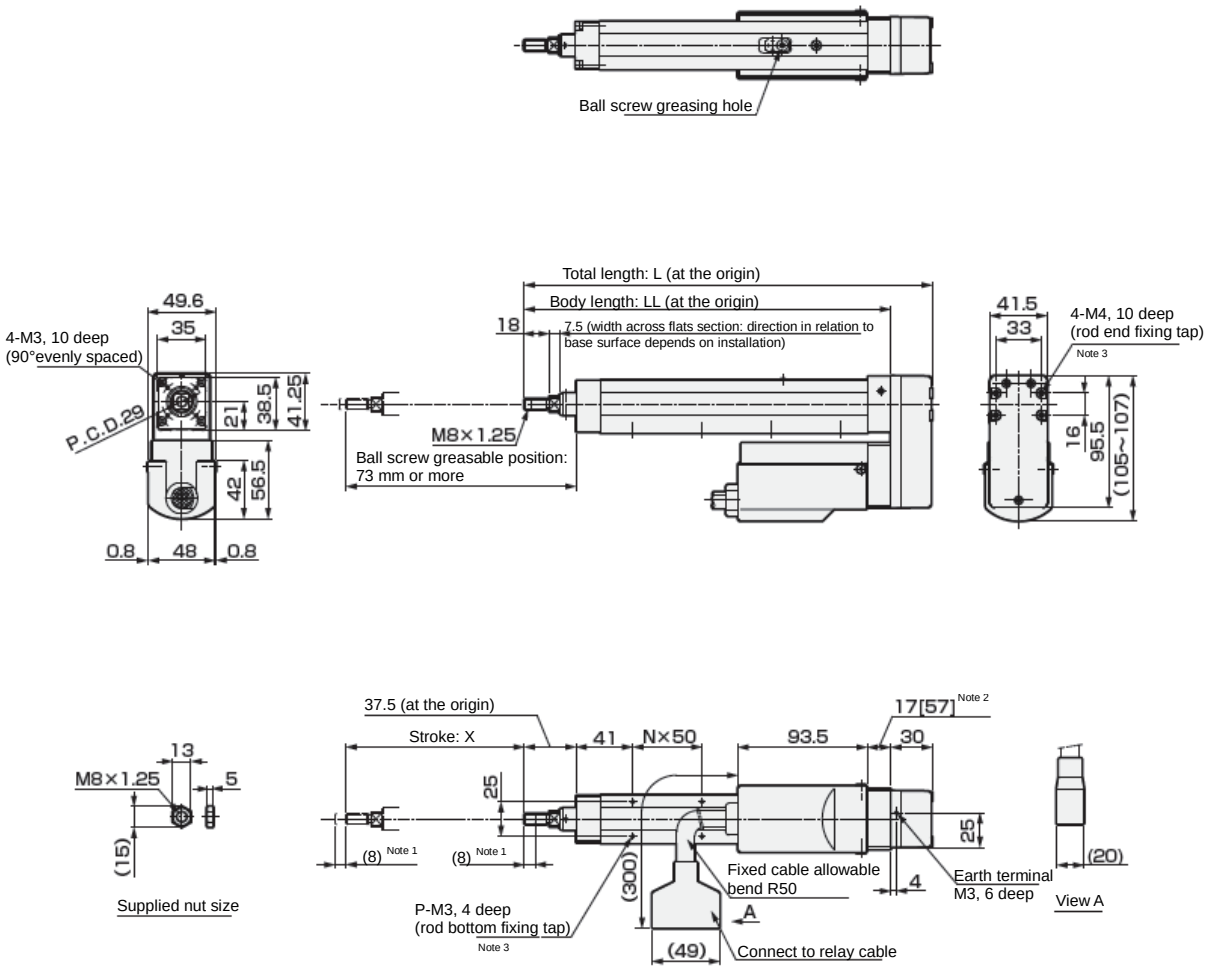
1.5.11 ESD2-35L (Leftward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the rod bottom fixing tap as well.

Stroke	Symbol	05	10	15
	X (mm)	50	100	150
Total length: L (mm)		245	295	345
Body length: LL (mm)		215	265	315
Number of mounting holes P		6	8	10
Number of intervals between mounting holes N		2	3	4
Weight (kg)	Without brake	1.5	1.7	1.8
	With brake	1.8	2.0	2.1

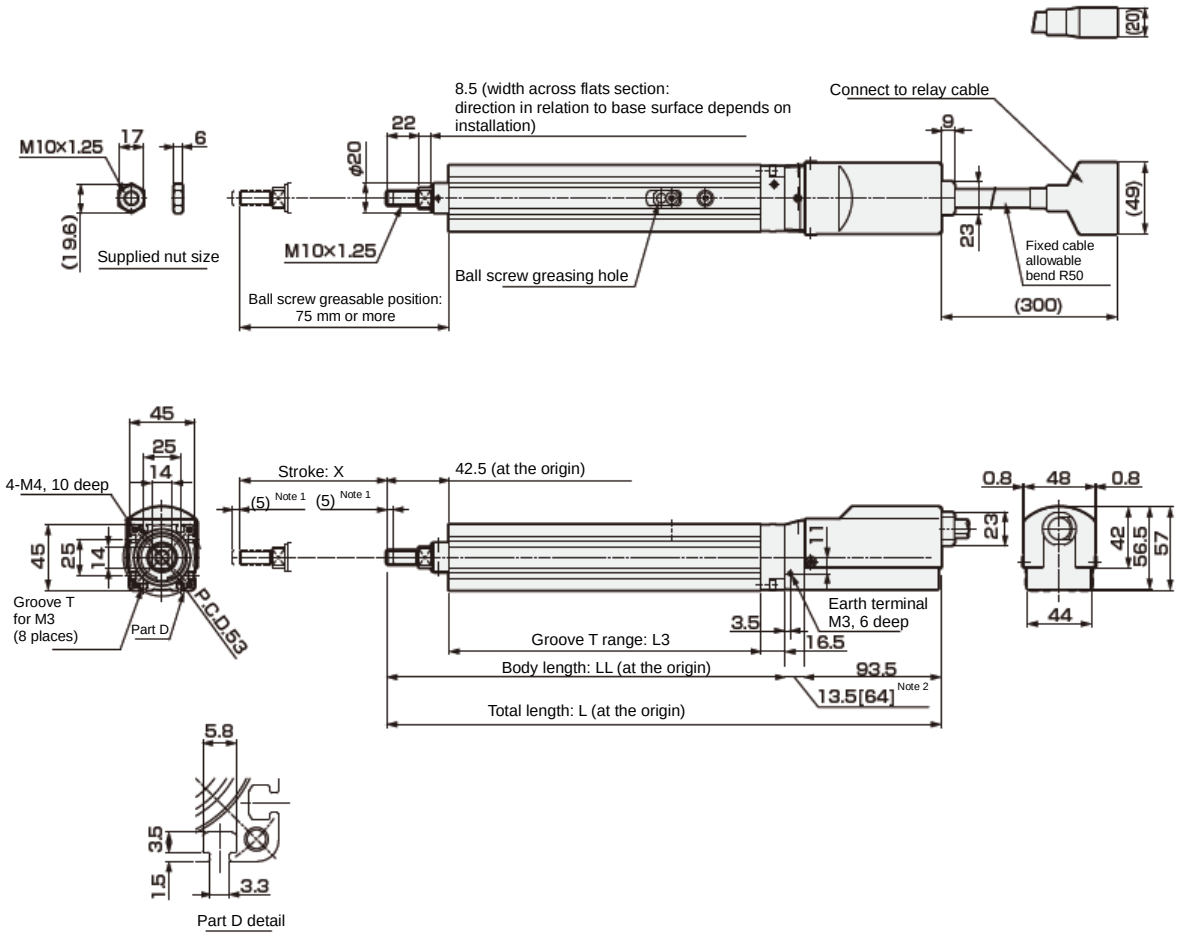
1.5.12 ESD2-35D (Downward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the rod bottom fixing tap as well.

Stroke	Symbol	05	10	15
	X (mm)	50	100	150
Total length: L (mm)		245	295	345
Body length: LL (mm)		215	265	315
Number of mounting holes P	Without brake	2	4	6
	With brake	0	2	4
Number of intervals between mounting holes N	Without brake	0	1	2
	With brake	0	0	1
Weight (kg)	Without brake	1.5	1.7	1.8
	With brake	1.8	2.0	2.1

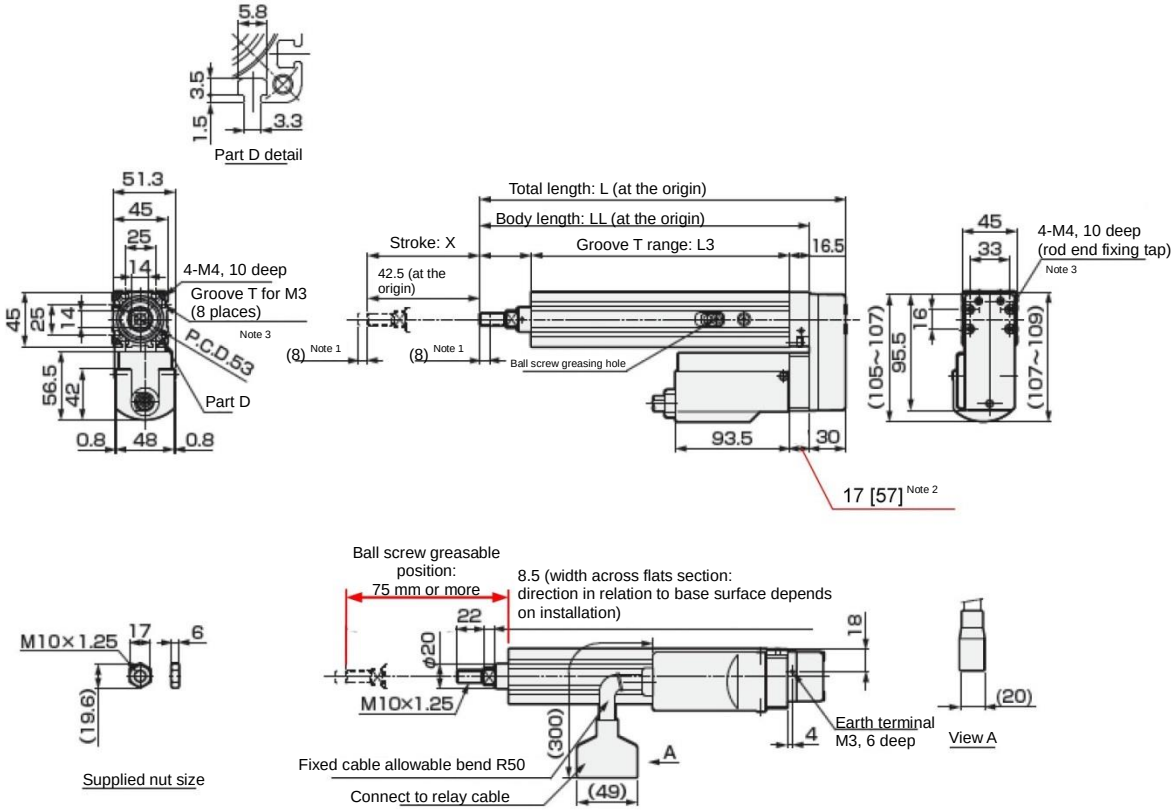
1.5.13 ESD2-45E (Standard (straight))



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.

Stroke	Symbol	05	10	15	20
	X (mm)	50	100	150	200
Total length: L (mm)	Without brake	328.5	378.5	428.5	478.5
	With brake	379	429	479	529
Body length: LL (mm)		221.5	271.5	321.5	371.5
Groove T range L3 (mm)		162.5	212.5	262.5	312.5
Weight (kg)	Without brake	1.7	2.0	2.2	2.5
	With brake	2.1	2.4	2.6	2.9

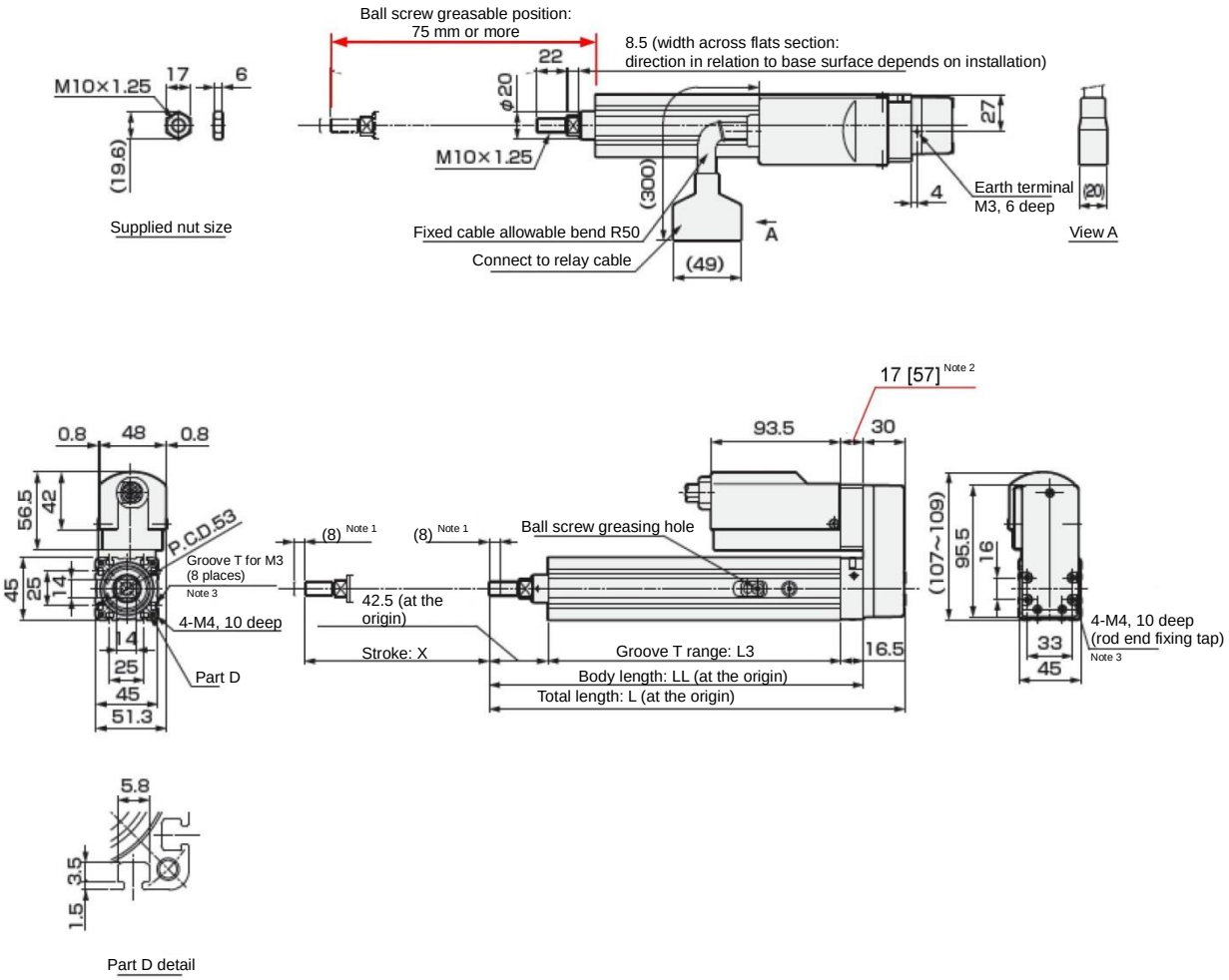
1.5.14 ESD2-45R (Rightward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the groove T for M3 as well.

Stroke	Symbol	05	10	15	20
	X (mm)	50	100	150	200
Total length: L (mm)		251.5	301.5	351.5	401.5
Body length: LL (mm)		221.5	271.5	321.5	371.5
Groove T range L3 (mm)		162.5	212.5	262.5	312.5
Weight (kg)	Without brake	1.9	2.2	2.4	2.7
	With brake	2.2	2.5	2.7	3.0

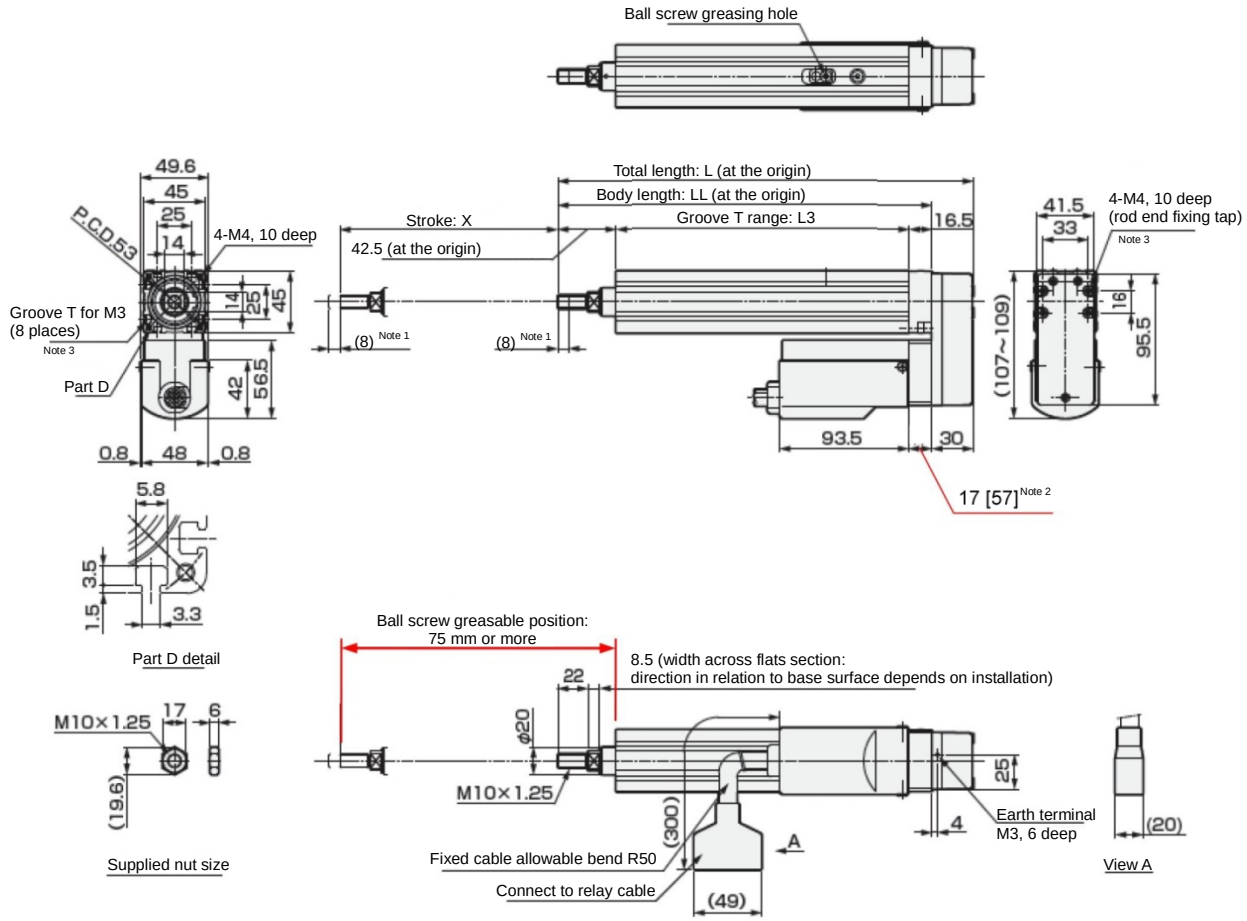
1.5.15 ESD2-45L (Leftward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the groove T for M3 as well.

Stroke	Symbol	05	10	15	20
	X (mm)	50	100	150	200
Total length: L (mm)		251.5	301.5	351.5	401.5
Body length: LL (mm)		221.5	271.5	321.5	371.5
Groove T range: L3 (mm)		162.5	212.5	262.5	312.5
Weight (kg)	Without brake	1.9	2.2	2.4	2.7
	With brake	2.2	2.5	2.7	3.0

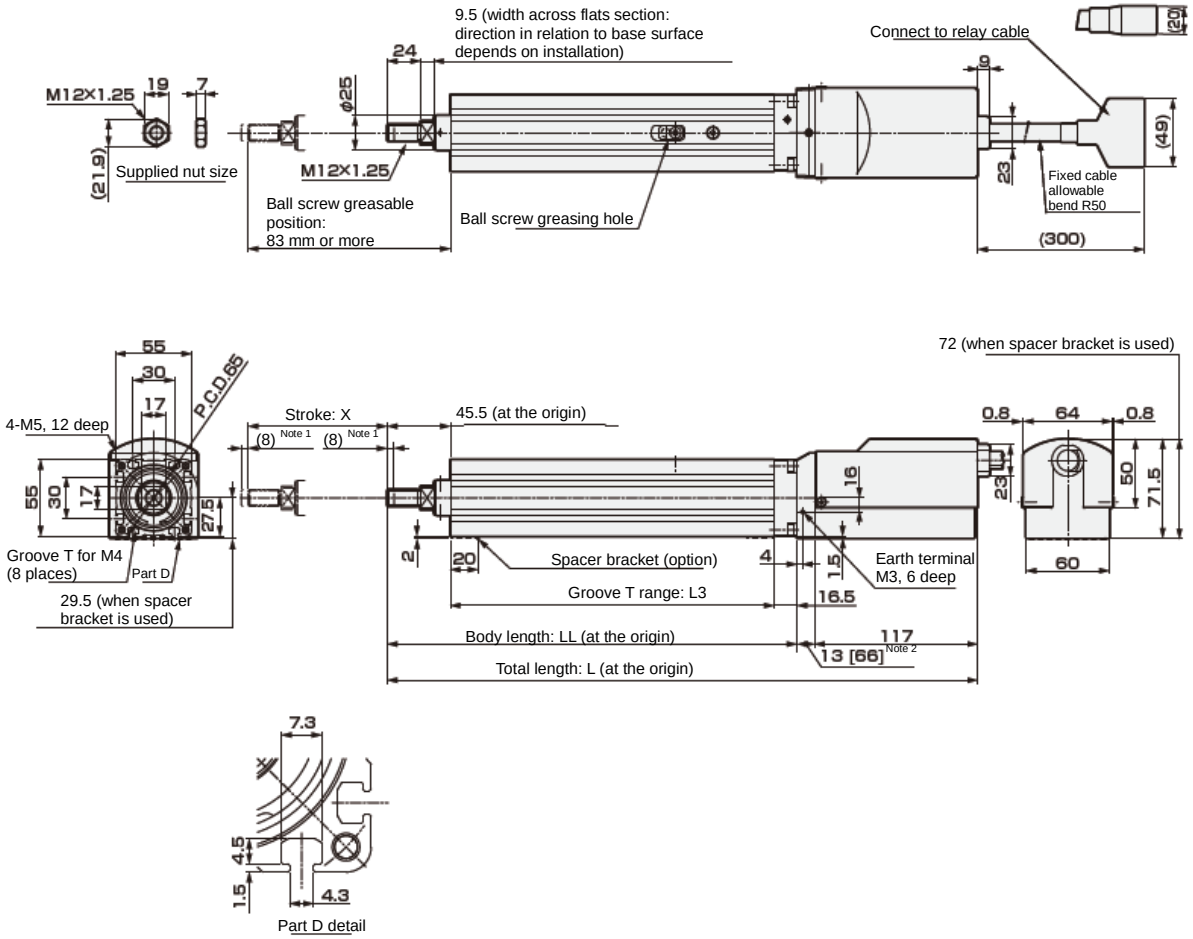
1.5.16 ESD2-45D (Downward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the groove T for M3 as well.

Stroke	Symbol	05	10	15	20
	X (mm)	50	100	150	200
Total length: L (mm)		251.5	301.5	351.5	401.5
Body length: LL (mm)		221.5	271.5	321.5	371.5
Groove T range: L3 (mm)		162.5	212.5	262.5	312.5
Weight (kg)	Without brake	1.9	2.2	2.4	2.7
	With brake	2.2	2.5	2.7	3.0

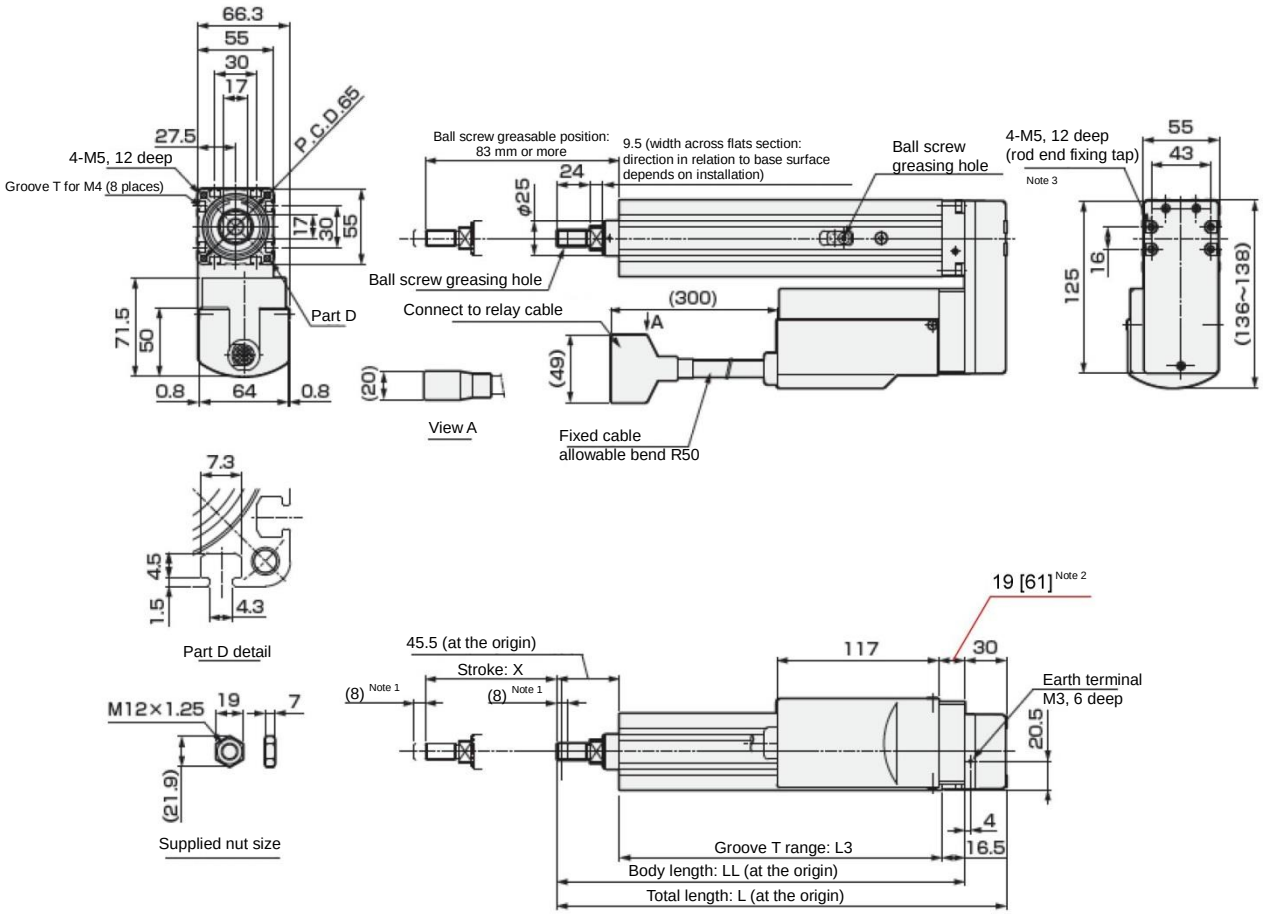
1.5.17 ESD2-55E (Standard (straight))



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.

Stroke	Symbol	05	10	15	20	25	30
	X (mm)	50	100	150	200	250	300
Total length: L (mm)	Without brake	375	425	475	525	575	625
	With brake	428	478	528	578	628	678
Body length: LL (mm)		245	295	345	395	445	495
Groove T range: L3 (mm)		183	233	283	333	383	433
Weight (kg)	Without brake	3.0	3.4	3.8	4.1	4.5	4.9
	With brake	3.7	4.1	4.5	4.8	5.2	5.6

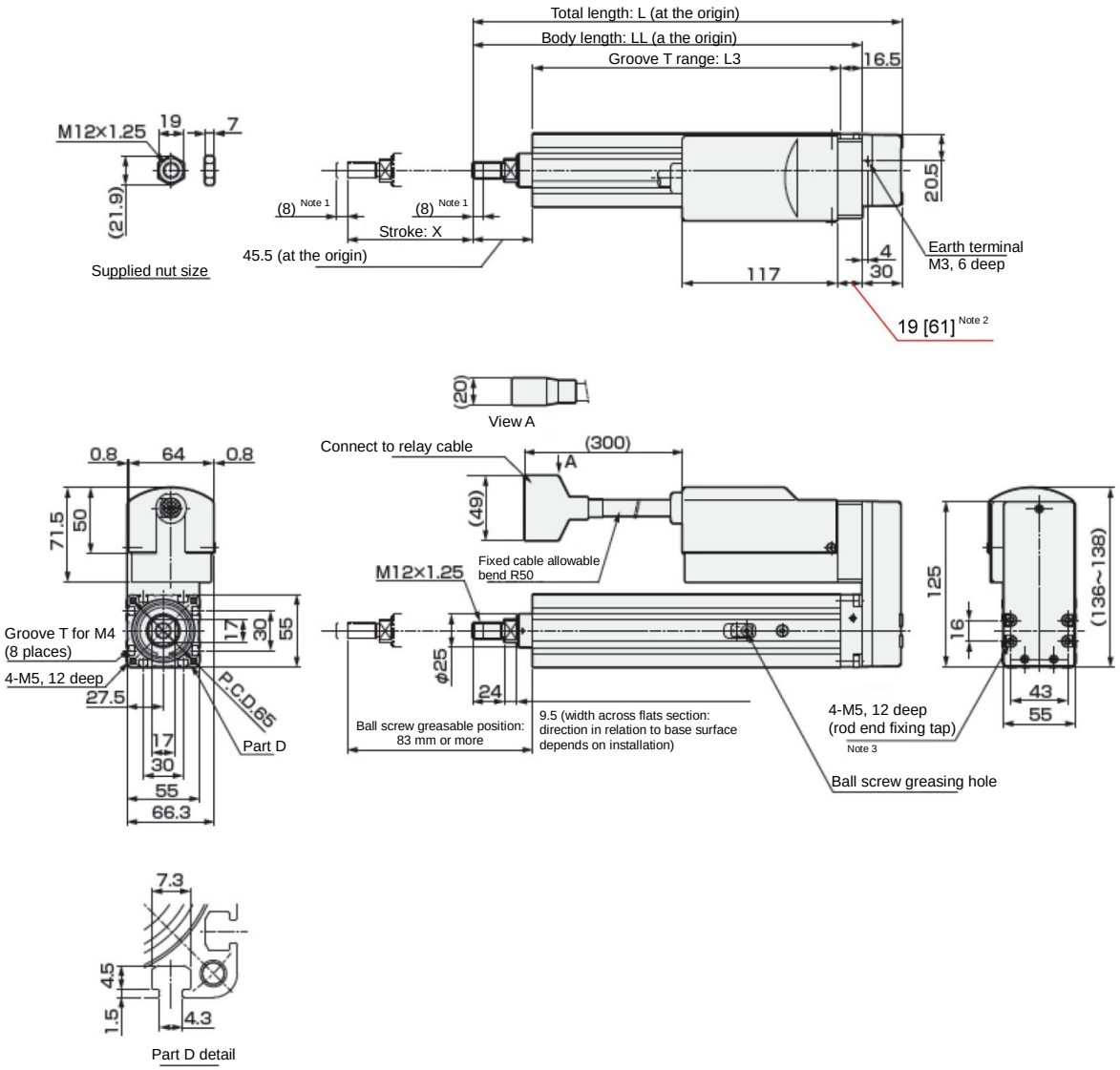
1.5.18 ESD2-55R (Rightward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the groove T for M4 as well.

Stroke	Symbol	05	10	15	20	25	30
	X (mm)	50	100	150	200	250	300
Total length: L (mm)		275	325	375	425	475	525
Body length: LL (mm)		245	295	345	395	445	495
Groove T range: L3 (mm)		183	233	283	333	383	433
Weight (kg)	Without brake	3.5	3.9	4.3	4.6	5.0	5.4
	With brake	4.1	4.5	4.9	5.2	5.6	6.0

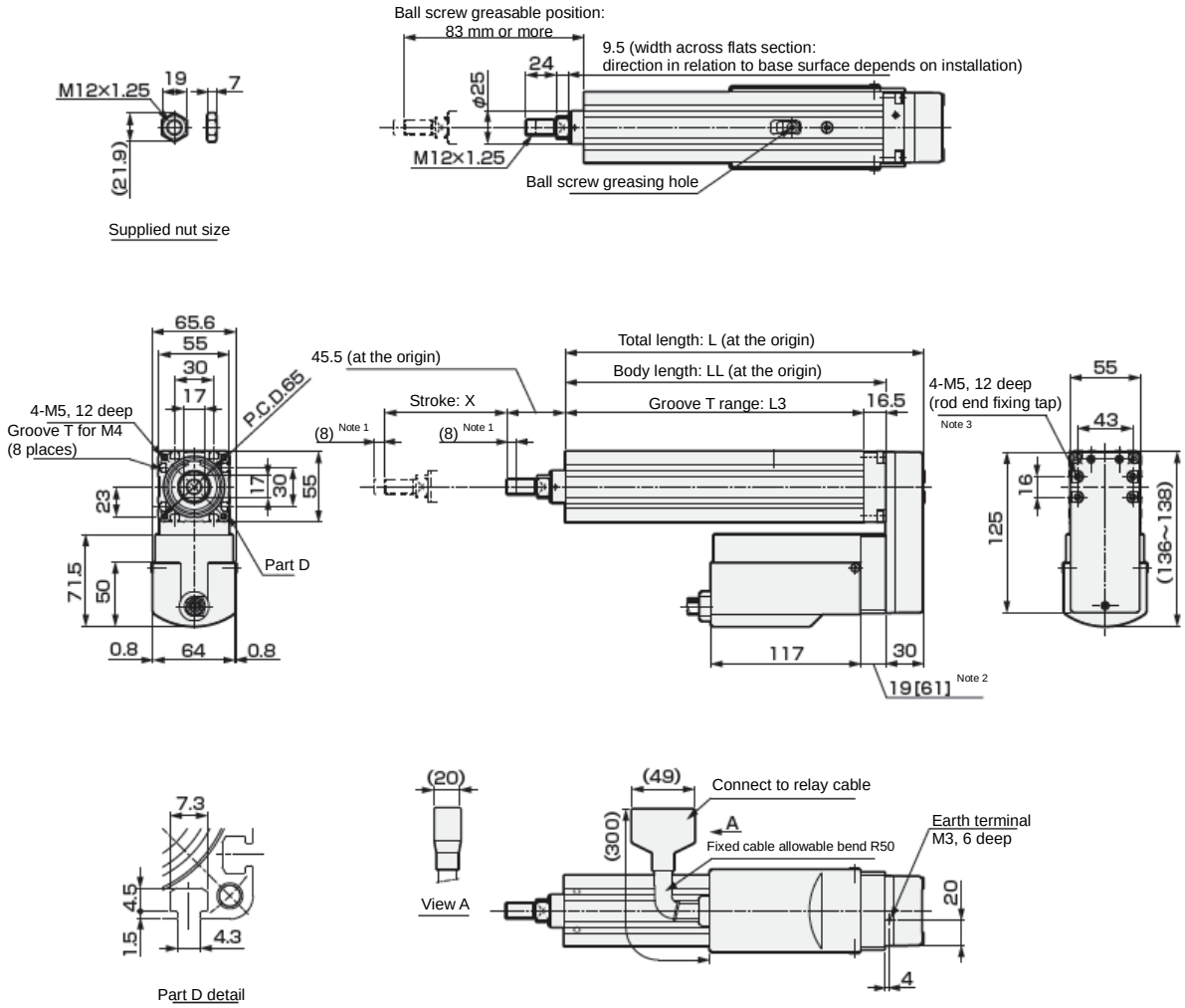
1.5.19 ESD2-55L (Leftward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the groove T for M4 as well.

Stroke	Symbol	05	10	15	20	25	30
	X (mm)	50	100	150	200	250	300
Total length: L (mm)		275	325	375	425	475	525
Body length: LL (mm)		245	295	345	395	445	495
Groove T range: L3 (mm)		183	233	283	333	383	433
Weight (kg)	Without brake	3.5	3.9	4.3	4.6	5.0	5.4
	With brake	4.1	4.5	4.9	5.2	5.6	6.0

1.5.20 ESD2-55D (Downward)



Note 1: Area of operation when returning to the origin.
Note 2: Values in [ ] are dimensions with the brake.
Note 3: If using a rod end fixing tap, make sure to use the groove T for M4 as well.

Stroke	Symbol	05	10	15	20	25	30
	X (mm)	50	100	150	200	250	300
Total length: L (mm)		275	325	375	425	475	525
Body length: LL (mm)		245	295	345	395	445	495
Groove T range: L3 (mm)		183	233	283	333	383	433
Weight (kg)	Without brake	3.5	3.9	4.3	4.6	5.0	5.4
	With brake	4.1	4.5	4.9	5.2	5.6	6.0

2. INSTALLATION

⚠ DANGER

Do not use the product in a place where dangerous substances such as ignitable, inflammable, or explosive materials are present.
Ignition, inflammation, or explosion may occur.

Prevent water and oil from splashing onto the product.
A fire, electric leakage, or failure may occur. Even oil drops and oil mists are prohibited.

Make sure to hold and secure the product (including the workpiece) while installing the product.
An injury may occur if the product falls down, falls off, or operates abnormally.

Use a DC stabilized power supply (24 VDC ± 10%) with sufficient capacity as a power supply for the controller and the input/output circuit.
If the product is directly connected to an AC power supply, a fire, burst or damage may occur.

Install overcurrent protective equipment (such as a breaker for wiring and a circuit protector) on the primary side of the power supply when wiring in accordance with "JIS B 9960-1:2008 Safety of machinery - Electrical equipment of machines - Part 1: General requirements".

> Description from "7.2.1 General" of JIS B 9960-1:
> Overcurrent protection shall be provided where the current in a machine (equipment) circuit can exceed either the rating of any component or the currenty carrying capacity of the conductors, whichever is the lesser value. The ratings or settings to be selected are detailed in 7.2.10.

⚠ WARNING

Do not install the product to a combustible material.
If the product is installed directly to or near a combustible material, a fire may result.

If the system is such that the machine stops in the event of a system failure such as an emergency stop or a power failure, design and implement a safety circuit or a safety device to prevent damages to the devices and injuries to people.

Install the product indoors and in a dry place.
In a place where water can splash onto the product or where humidity is high (80% or more and with condensation), an electric leakage or fire accident may occur.

Perform class D grounding (ground resistance: 100 Ω or less) for the product.
An electric leakage may occur and cause an electric shock or malfunction.

When wiring the product, refer to this Instruction Manual to make sure that the wires are properly connected, the connectors are firmly connected, and the wires are properly insulated.
Make sure that the wires do not contact other circuits and there is no ground fault and insulation failure between terminals. Otherwise, an overcurrent may flow into the product and cause damage. This may result in an abnormal operation or fire.

Insulate unused wires.
A malfunction, failure, or electric shock may occur.

Do not damage or pinch the cables, apply unnecessary stress to the cables, or place heavy objects on the cables.
A conduction failure or electric shock may occur.

When installing and using the actuator in an orientation other than the horizontal, use an actuator equipped with a brake.
If using an actuator without a brake, the movable section may fall during servo off (including emergency stop and alarm) or while the power is turned off. This may result in an injury or damage to the workpiece.

Do not carry or install the product by holding the movable section or the cable.
An injury or cable disconnection may occur.

⚠ CAUTION

Install the wiring so that no induction noise is applied.

- Avoid using the product in a place where a large current or strong magnetic field occurs.
- Do not pipe or wire the product in the same piping or wiring (with multi-conductor cables) as the power lines for other large motors.
- Do not pipe or wire the product in the same piping or wiring as the power supplies and wires for inverters used in robots. Frame ground the power supply and insert a filter into the output section.

Do not use the product in an environment where a strong magnetic field occurs.
A malfunction may occur.

Separate the power for the output section of the product from the power for inductive loads (such as a solenoid valve and a relay) that generate surge currents.
If the power is shared, a surge current will flow into the output section and cause damage.
If the power cannot be separated, connect the surge absorption elements in parallel directly to all the inductive loads.

Do not perform a withstand voltage test or an insulation resistance test in a device with the product installed.
A capacitor is connected between the circuit of the control board in the product and the metal body to prevent damages from static electricity. Therefore, performing the tests above will damage the product. If these tests are required for the device, remove the product beforehand.

Remove all the FG (frame ground) connections of the product before performing electric welding on the device to which the product is installed.
If electric welding is performed without removing the FG connections, the product may become damaged due to a welding current or excessive high voltage and surge voltage from welding.

Select a power that has sufficient capacity for the number of products installed.
If the capacity is not sufficient, a malfunction may occur.

Do not disassemble the product.

Do not bend the fixed cable repeatedly.
If repetitive bending is unavoidable, use a movable cable.

Secure the movable cable so that it will not move easily. When securing the movable cable, do not bend it to an acute angle (a bending radius of 68 mm or less).

When installing an external stopper or a holding mechanism (such as a brake), place it at a position where it does not affect the detection of the origin position.
The origin position is detected when the power is turned on. If the detection is interfered by an external stopper or a holding mechanism, an unintended position may be recognized as the origin position.

Do not use the product in a place exposed to ultraviolet rays or in an atmosphere where corrosive gas and salt are present.
A performance degradation, abnormal operation, or strength deterioration due to rust formation may occur.

Do not install the product in a place subjected to strong vibrations or shocks.
If the product is subjected to strong vibrations or shocks, a malfunction may occur.

Do not use the product in a place where condensation occurs due to a sudden change in the ambient temperature.

The customer is responsible for checking the compatibility of the product with the customer's system, machinery, and device.

Connect only cables designed for the product.
A failure of the product or unexpected accident may occur.

2.1 Environment

- Check the environment temperature and atmosphere before using and storing the product.
- Use the product at an ambient temperature between 0°C and 40°C. Ventilate if heat can become trapped.
- Install the product where it is not subjected to direct sunlight and away from a heating element. Also, avoid dust, corrosive gas, explosive gas, inflammable gas, and combustible material.
  Chemical resistance has not been considered for the product.
- Install the actuator on a smooth and flat surface.
- In order to avoid operation fault and damage, do not install the actuator on a surface with dents.
- The controller is set using a teaching pendant. Leave a space of 70 mm or more in front of the controller so that the connector of the teaching pendant can be connected and disconnected.

2.2 Unpacking

- When carrying and handling the product, use extreme care not to apply impact to the product (for example, do not drop the product).
- Do not carry heavy products alone.
- Place the product horizontally when not in use.
- Do not stand on the package.
- In order to prevent deforming the package, do not place heavy objects and objects of which their load concentrates.
- When taking the actuator out of the package, hold the actuator body.
- Do not apply unnecessary force to any part of the actuator.

- Check that the model number ordered and the model number indicated on the product are the same.
- Check the exterior of the product for any damage.

2.2.1 Parts of the product

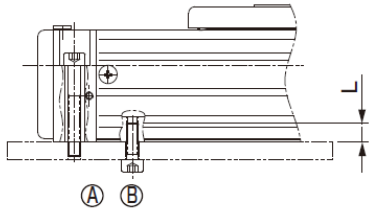
Parts of the product	Quantity
Actuator	1
Controller	1
Relay cable	1
I/O cable	1

2.3 Installing

2.3.1 ERL2 Series (slider type)

- Do not apply an excessive shock or moment to the slider.
  A malfunction or damage may occur.
- The flatness of the workpiece mounting surface should be 0.05 mm or less. Do not apply twisting or bending force to the product.
  An operation fault or damage may occur.

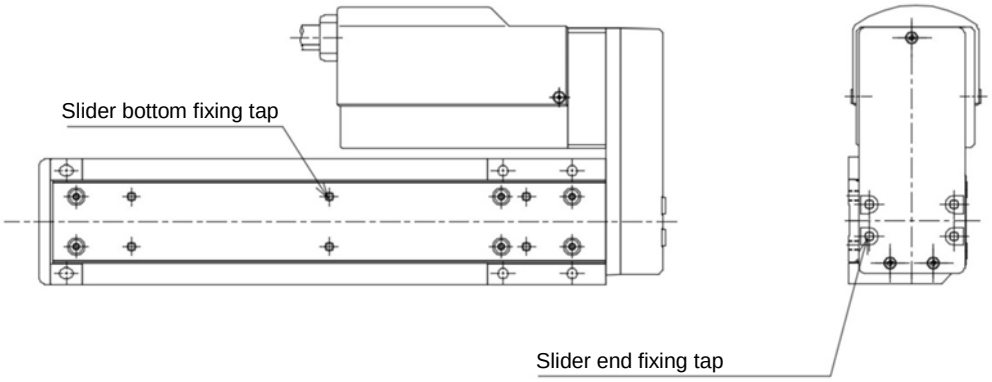
- For the size and tightening torque of screws for installing the body, refer to the following table.



	Ⓐ		Ⓑ		Max. screw-in depth L (mm)
	Bolt	Tightening torque (N·m)	Bolt	Tightening torque (N·m)	
ERL2-45	M4 x 0.7	1.5	M4 x 0.7	1.5	8
ERL2-60	M5 x 0.8	3	M5 x 0.8	3	9

- When installing the flexible motor mounting type using a slider end fixing tap, make sure to use the slider bottom fixing tap as well. For the tightening torque, refer to the following table.

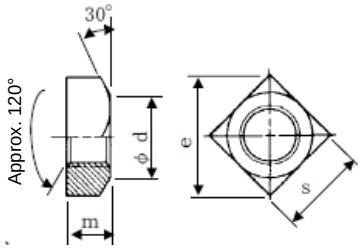
	Bolt	Tightening torque (N·m)	Max. screw-in depth L (mm)
ERL2-45	M4 x 0.7	1.5	10
ERL2-60	M5 x 0.8	3	12



2.3.2 ESD2 Series (rod type)

- Make sure to connect the center of the rod shaft and the center of the transfer load so that the direction of movement is aligned.
  Feed screws may become worn or damaged.
- Do not apply a load in the rotational direction to the rod end.
  The product may become damaged.

- When using an external guide, check that it can operate smoothly throughout the product stroke before installing it.
- When installing the product, firmly secure the body with hexagon socket head bolts.
  When using the actuator installation surface, insert the supplied square nuts (conforming to JIS B 1163:2001) to the two grooves on the side installation surface of the body and securely fasten them at four or more places.
  (Since ESD2-35 has M3 tapped mounting holes, no square nuts are supplied.)

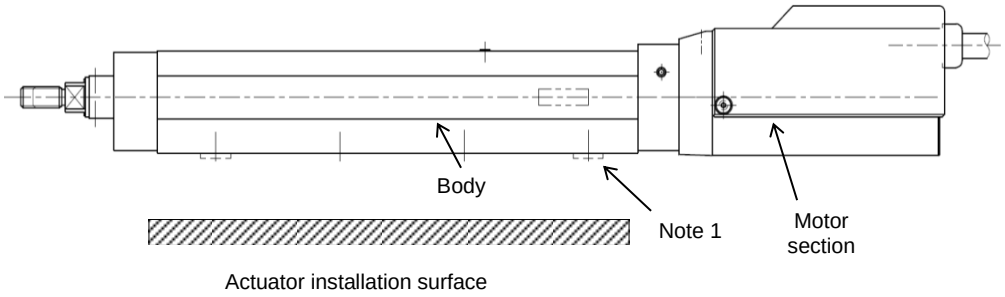


Supplied square nut (conforming to JIS B 1163:2001)

(mm)

	For M3	For M4
s	5.5	7
e	7.8	9.9
d	5.3	6.8
m	2.4	3.2

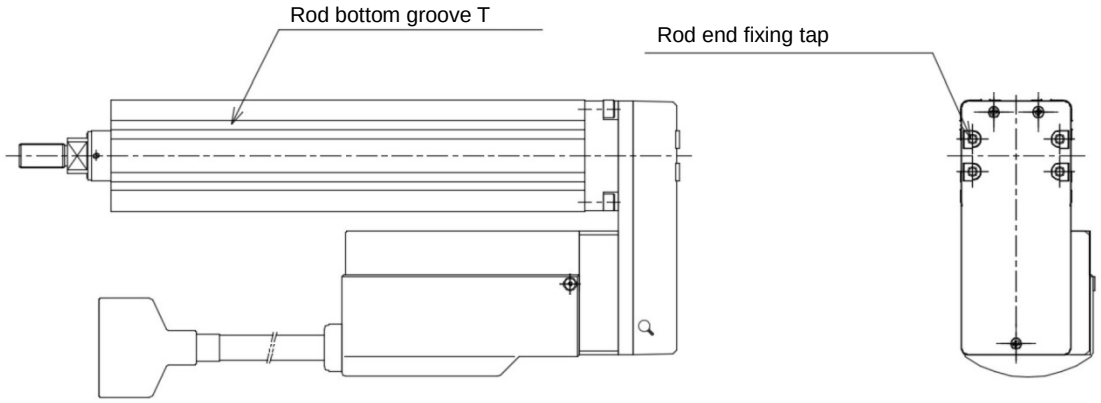
<When using the actuator installation surface>



Note 1: For ESD2-35/55, there is a difference in the body dimension and the motor section dimension. Use the actuator installation surface (the hatched area). Use an optional spacer as necessary.

- When installing the flexible motor mounting type using the rod end fixing tap, make sure to use the rod bottom groove T (for ESD2-35, the rod bottom fixing tap) as well. For the tightening torque, refer to the following table.

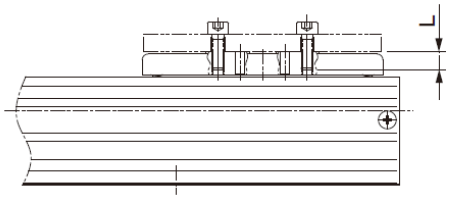
	Bolt	Tightening torque (N·m)	Max. screw-in depth L (mm)
ESD2-35/45	M4 x 0.7	1.5	10
ESD2-55	M5 x 0.8	3	12



2.3.3 Objects Transferred

For the slider type, the flatness of the workpiece attached to the slider should be 0.02 mm or less. Do not apply twisting or bending force to the product.
Damage may occur.

- When attaching a jig to the slider, observe the following values for the bolt screw-in depth and the tightening torque.



	Bolt	Tightening torque (N·m)	Max. screw-in depth L (mm)
ERL2-45	M4 x 0.7	1.5	7.5
ERL2-60	M5 x 0.8	3	10

- When attaching a workpiece to the slider surface, consider the moment load.
  For details, refer to the "Selection guide" page in the catalog.
- When using the flexible motor mounting type of the slider type, make sure that the workpiece attached to the slider does not interfere with the motor section. If the workpiece interferes, use the slider spacer kit shown on page 6.

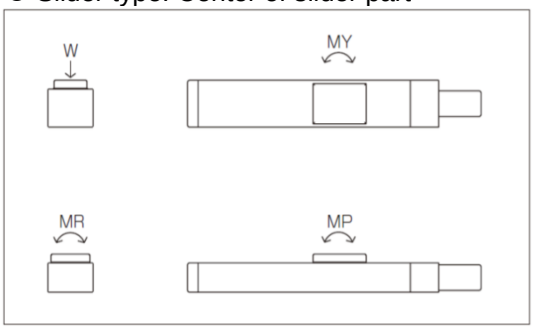
■ Checking the static allowable moment

Check that the static allowable moment is not exceeded (satisfies the following expression).

$$M'_T = \frac{W'}{W'max} + \frac{MR'}{MR'max} + \frac{MP'}{MP'max} + \frac{MY'}{MY'max} < 1$$

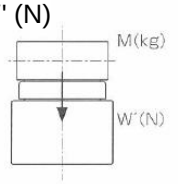
M'_T : Composition of moments (should be lower than 1)
W' : Vertical load (N)
MR' : Rolling moment (N·m)
MP' : Pitching moment (N·m)
MY' : Yawing moment (N·m)

● Slider type: Center of slider part



		W'max (N)	MR'max (N·m)	MP'max (N·m)	MY'max (N·m)
Allowable static load	ERL2-45	1450	31	12	12
	ERL2-60	2000	58	25.7	25.7

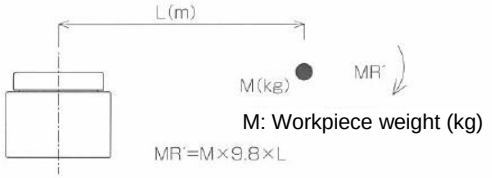
●Vertical load W' (N)



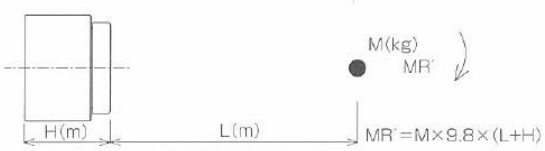
M: Workpiece weight (kg)
W'=M×9.8

	H (m)
ERL2-45	0.045
ERL2-60	0.060

● Rolling moment MR' (N·m)

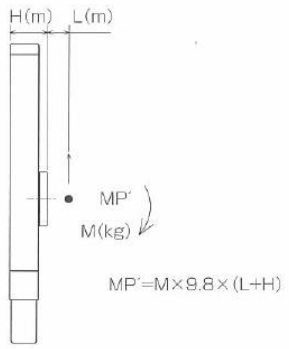


M: Workpiece weight (kg)
MR'=M×9.8×L



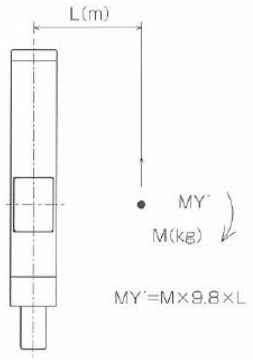
MR'=M×9.8×(L+H)

● Pitching moment MP' (N·m)



MP'=M×9.8×(L+H)

● Yawing moment MY' (N·m)



MY'=M×9.8×L

■ Checking the allowable moment during operation

Check that the allowable moment during operation is not exceeded (satisfies the following expression), when the values specified for acceleration “a” and deceleration “d” (m/s^2) are applied.

$$M_T = \frac{W}{Wmax} + \frac{MR_1 + MR_2}{MRmax} + \frac{MP_1 + MP_2 + MP_3}{MPmax} + \frac{MY_1 + MY_2 + MY_3}{MYmax} < 1$$

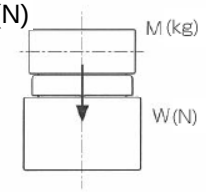
M_T : Composition of moments (should be lower than 1)
W : Vertical load (N)
MR : Rolling moment (N·m)
MP : Pitching moment (N·m)
MY : Yawing moment (N·m)

* For the moment load during operation, consider all moments which act according to the circumstances.

Allowable load during operation

	Installation orientation	Wmax (N)	MRmax (N·m)	MPmax (N·m)	MYmax (N·m)
ERL2-45	Horizontal	98	11.1	4.4	4.4
	Vertical	-	12.3	4.9	4.9
ERL2-60	Horizontal	294	27.5	8	8
	Vertical	-	33.7	9.8	9.8

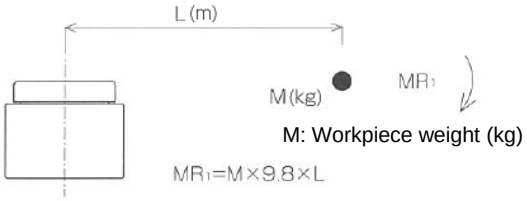
● Vertical load W (N)



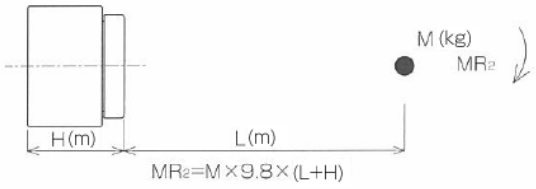
M: Workpiece weight (kg)
W=M×9.8

	H (m)
ERL2-45	0.045
ERL2-60	0.060

● Rolling moment MR (N·m)

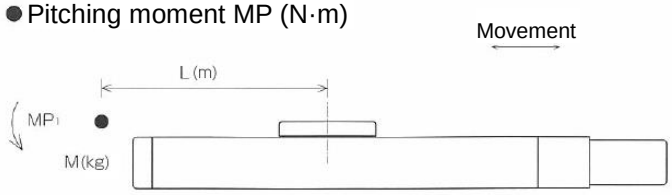


M: Workpiece weight (kg)
MR1=M×9.8×L

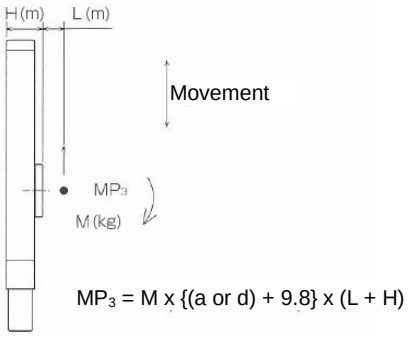


MR2=M×9.8×(L+H)

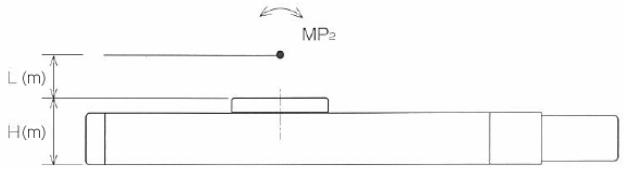
● Pitching moment MP (N·m)



M: Workpiece weight (kg)
$MP_1 = M \times 9.8 \times L$



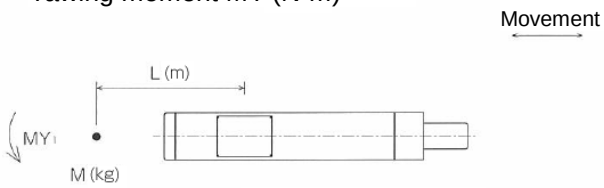
MP_3 = M x {(a or d) + 9.8} x (L + H)



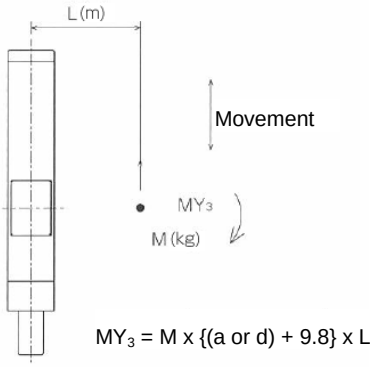
M: Workpiece weight (kg)
a: Set acceleration (m/s^2)
d: Set deceleration (m/s^2)
MP_2 = M x (a or d) x (L + H)

	H (m)
ERL2-45	0.045
ERL2-60	0.060

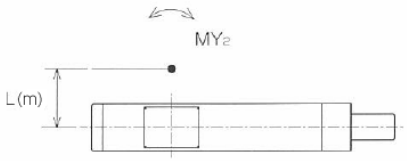
● Yawing moment MY (N·m)



M: Workpiece weight (kg)
$MY_1 = M \times 9.8 \times L$



MY_3 = M x {(a or d) + 9.8} x L



M: Workpiece weight (kg)
a: Set acceleration (m/s^2)
d: Set deceleration (m/s^2)
MY_2 = M x (a or d) x L

* Select and use the greater value of “a” or “d” when selecting the product.

3. USAGE

3.1 Safety Instructions

⚠ WARNING

Before supplying electricity to the product, check that the operation area of the device is safe.
If electricity is supplied without checking safety, an electric shock or injury may occur.

Turn off the power immediately if the LED on the product does not blink even when the power is turned on.

Do not enter the operating area of the device when the product is in an operational state.
The product may operate unexpectedly and an injury may occur.
When using the ERL2 Series, your fingers may get caught between the motor section and the slider.

Do not touch the product body during or immediately after operation.
A burn injury may occur.

Do not stand or put an object on the product.
A fall accident, injury due to the product falling down or off, or malfunction and runaway due to the product becoming damaged may occur.

Take measures to prevent damage to the human body and the device in case of power failures.

Before controlling the actuator from a position where it cannot be seen, check that it is safe for the actuator to operate.

Before setting the movable section of the product manually (direct teaching), use the teaching pendant to confirm that the servo is turned off.

Do not give commands that are smaller than the minimum resolution and the repetitive positioning accuracy of the encoder.
The positioning control may not be performed properly.

When there is an abnormality with the timing belt, stop operating the product immediately and replace the timing belt. The timing belt must be replaced as soon as possible especially for the case where the timing belt breaks when the product is used vertically since it may cause a significant risk.
Check the timing belt for abrasion and tear on its tooth and side surfaces, for vertical rip on its teeth, and for crack, softening, and partially cut sections on its back surface.

⚠ CAUTION

Do not move the movable section of the product with external force and do not use the product in an application that requires the movable section to decelerate suddenly.
A malfunction or damage may occur due to regenerative currents.

Except when returning to the origin or when clamping, do not allow the piston rod and the table to hit a part such as the mechanical stopper.
The feed screw may become damaged due to impact and an operation fault may occur.

Do not put dents and scratches on the movable section.
An operation fault may occur.

Leave a margin for the transfer load since the product life changes depending on the transfer load and the environment.

Do not subject the movable section to impact.

Do not subject the product to external force when returning to the origin.
The origin may not be recognized correctly.

Do not turn off the servo while gravity or force of inertia is applied.
The slider or the rod may continue to move or fall off if the servo is turned off. Turn off the servo in an equilibrium state where no gravity and force of inertia are applied or after safety is ensured.

⚠ CAUTION

Do not stop the product while it is accelerating or decelerating.
It may lead to a change in speed (acceleration) and cause a risk.

After completing the pressing operation of the ECPT controller, clear the deviation or turn off the servo.
An excessive deviation may develop during the pressing operation.

If vibrations are generated during a belt-driven operation, change the set speed and use the product at a speed that does not generate vibrations.
Depending on the conditions of use, vibrations may be generated during an operation even when the product is used within the operation speed range.

4. MAINTENANCE AND INSPECTION

⚠ WARNING

Install the product before wiring.
An electric shock may occur.

Do not work with wet hands.
An electric shock may occur.

Before performing wiring and inspection, wait five minutes or longer after turning off the power and check the voltage with a tester.
An electric shock may occur.

Do not attach or remove wires and connectors with the power turned on.
A malfunction, failure, or electric shock may occur.

Do not disassemble or modify the product.
An injury, accident, malfunction, or failure may occur.

⚠ CAUTION

Wiring and inspection must be performed by specialists.

For the lead wires used for the power cable, use wires with a sufficient diameter that can allow the instantaneous maximum current to flow.
A heat generation or damage may occur during operation.

Perform periodic inspections (two to three times a year) to confirm that the product operates properly.

Generally, grease the product every 100 km.
Since the greasing interval depends on the conditions of use, determine the appropriate interval when performing initial inspection.

Turn off the power immediately if abnormal heat, smoke, odor, sound, or vibration occurs in the product.
The product may become damaged or the continuous flow of currents may cause a fire.

Stop supplying power to the product before performing maintenance, inspection, and repair.
Take measures to prevent a third person from turning on the power unexpectedly.

4.1 Periodic Inspection

In order to use the product under optimum conditions, perform a periodic inspection two to three times a year.
Inspect the timing belt every 500 km.

4.1.1 Inspection item

Turn off the power before performing items 1, 2, 3, and 4 below.

No.	Inspection item	Inspection method	Action
1	Check that the mounting bolts on the product, the screws on the terminal block, and the connectors are not loose.	Looseness check	Tighten the loose parts.
2	Check that there are no scratches and cracks on the cables.	Visual inspection	Replace the cable.
3	Check that foreign matters are not accumulating or are not stuck in between the movable section.	Visual inspection	Clean the parts. Note 1 After cleaning, apply grease. Recommended grease: Lithium grease AFF grease (THK Co., Ltd.)
4	Check that there are no scratches, cracks, and tears on the timing belt.	Visual inspection	Replace the timing belt.
5	Check that there are no vibrations or abnormal sounds while the product is stopped or operated.	Noise inspection	Contact your dealer.
6	Check that the power supply voltage is normal.	Tester	Check the power system and use the product within the power supply voltage range described in the Specifications.

Note 1: Use a soft cloth for cleaning and make sure not to leave foreign matters on the movable section.

4.1.2 Recommended grease

■ Recommended grease: AFF grease manufactured by THK

High-grade synthetic oil, lithium-based consistency enhancer, and additives are used for this grease. It has a stable rolling resistance which is not found in conventional vacuum grease and low dust generating grease.

<Features>

- Since the viscosity resistance and the fluctuation of the rolling resistance are low, the conformity at low speeds is excellent.
- Since it has an excellent low dust generation characteristic, it is suitable for use in a cleanroom.
- Since it has excellent wear resistance against microvibrations, the greasing intervals can be extended.

<Appearances of the grease tube and the package>

Typical physical properties

Item		Values	Test method
Consistency enhancer		Lithium-based	
Base oil		High-grade synthetic oil	
Base oil kinematic viscosity: mm2/s (40°C)		100	JIS K 2220 23
Worked penetration (25°C, 60 W)		315	JIS K 2220 7
Mixing stability (100,000 W)		345	JIS K 2220 15
Dropping point °C		220	JIS K 2220 8
Evaporation amount: mass% (99°C, 22 h)		0.7	JIS K 2220 10
Oil separation: mass% (100°C, 24 h)		2.6	JIS K 2220 11
Copper plate corrosion (Method B, 100°C, 24 h)		Accepted	JIS K 2220 9
Low temperature torque: mN·m (−20°C)	Starting	220	JIS K 2220 18
	Rotating	60	
4 ball test (fusion load): N		1236	ASTM D2596
Working temperature range °C		−40 to 120	
Appearance color		Reddish brown	

4.1.3 Recommended grease gun

■ Recommended grease gun: MG70 grease gun unit manufactured by THK

- The MG70 grease gun unit can be used to apply grease to the product by replacing the nozzle as necessary.
- The grease gun has a slit window for checking the remaining amount of grease.
- It is equipped with a bellows cartridge that can be replaced without getting your hands dirty.

Specifications of grease gun

Discharge pressure	20 MPa max.
Discharge rate	0.6 cm^3/stroke
Grease	70 g in bellows cartridge
Total length	235 mm (excluding nozzle)
Weight	480 g (including nozzle, excluding grease)

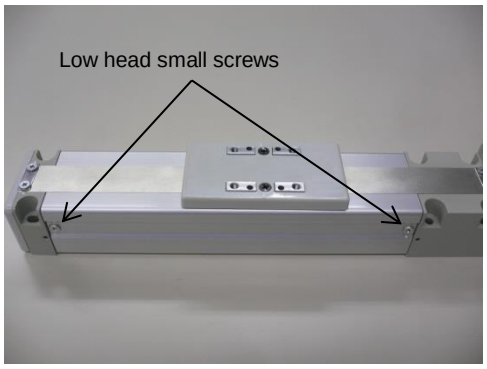
4.1.4 ERL2 Series (slider type) greasing procedure

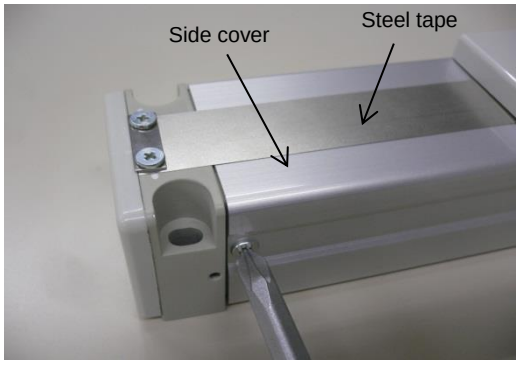
■ Removing the side cover

- Do not bend the removed side cover.
- Be careful not to strip the screw head.

- **Screw: Low head small screw (M3) x 2 pieces**
- **Tool: Philips screwdriver**

1 Remove two screws and remove the side cover from one side.

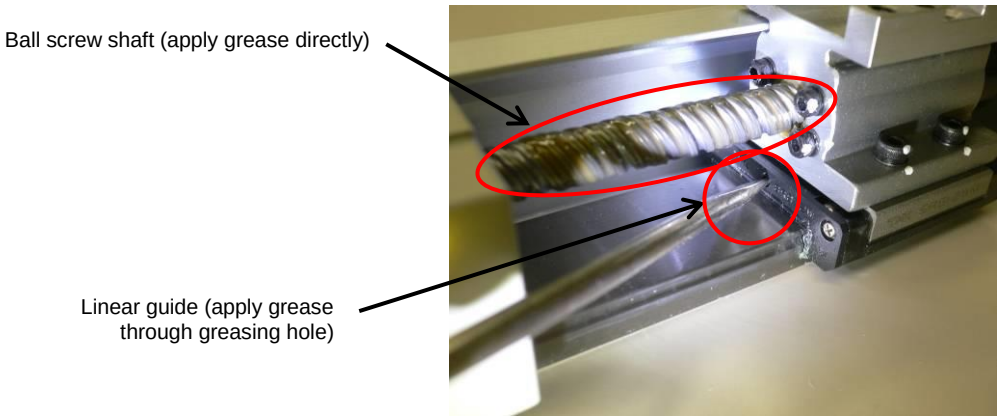




■ Applying grease to the ball screw and the linear guide

1 Wipe off old grease and dirt with a clean waste cloth.

2 For the ball screw, apply grease directly to the rolling surface of the shaft.
For the linear guide, apply grease using the MG70 grease gun unit (with P-type attachment) or apply grease directly to the linear rail rolling groove.



3 Move the table to spread the grease thoroughly.

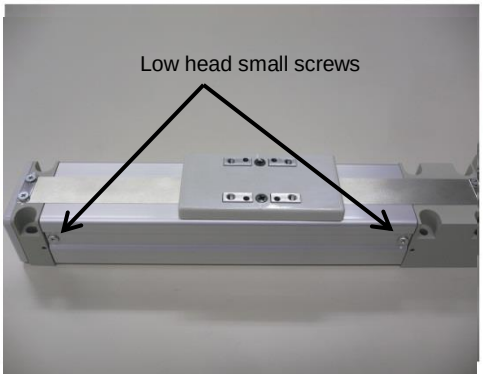
4 Wipe off extra grease that has leaked out or accumulated on the edges.

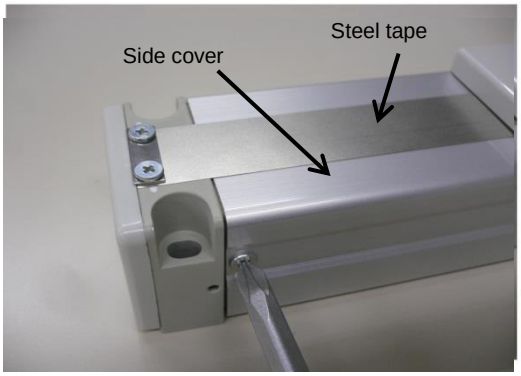
■ Attaching the side cover

- Be careful not to damage the steel tape when attaching the side cover.
- Be careful not to strip the screw head.

- **Screw: Low head small screw (M3) x 2 pieces**
- **Tool: Philips screwdriver**
- **Tightening torque: 0.75 N·m**

1 Tighten two screws with the specified tightening torque (0.75 N·m) and attach the side cover.

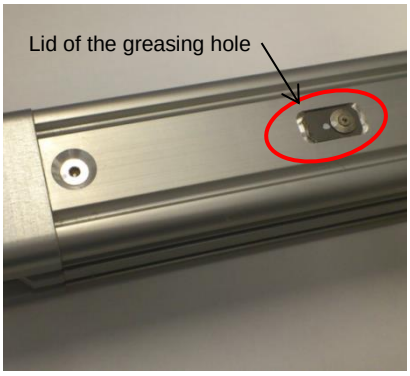




4.1.5 ESD2 Series (rod type) greasing procedure

■ Removing the lid of the greasing hole

- **Screw: Thin head small screw TP type (M3)**
- **Tool: Hex key (across flats: 1.5 mm)**



1 Remove the screw and remove the lid.

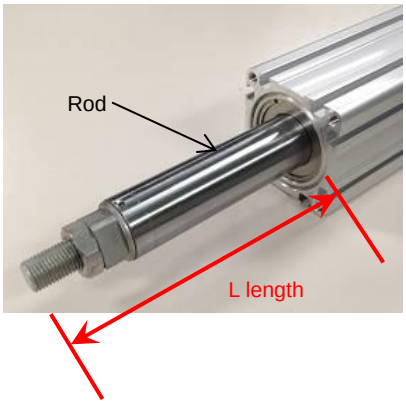
■ Applying grease to the ball screw

1 Pull out the rod to a position where the ball screw can be greased (by at least L length).

2 Insert the tip of the MG70 grease gun unit (with P-type attachment) into the greasing hole and apply grease directly to the rolling surface of the shaft.

3 Move the rod to spread the grease thoroughly.

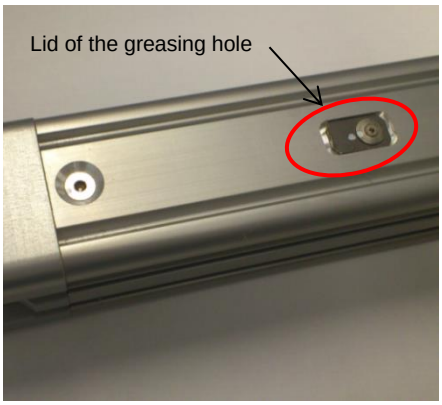
Model	L length
ESD2-35	73 mm
ESD2-45	75 mm
ESD2-55	83 mm



■ Attaching the lid of the greasing hole

- **Screw: Thin head small screw TP type (M3)**
- **Tool: Hex key (across flats: 1.5 mm)**
- **Tightening torque: 0.65 N·m**

1 Tighten the screw with the specified tightening torque (0.65 N·m) and attach the lid.

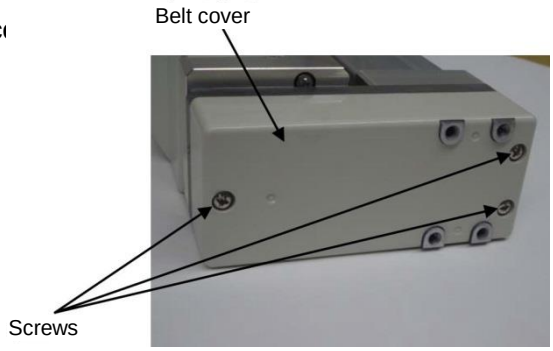


4.1.6 Replacement and adjustment procedures for the timing belt

Replacing the timing belt misaligns the origin position. Check the origin position before starting operation. If it has become misaligned, change the origin offset value in the user parameters and adjust the origin position.

■ Removing the belt cover

- **Screw: Cross recessed pan head screw (M3 x 25L) x 3 piec**
- **Tool: Philips screwdriver**



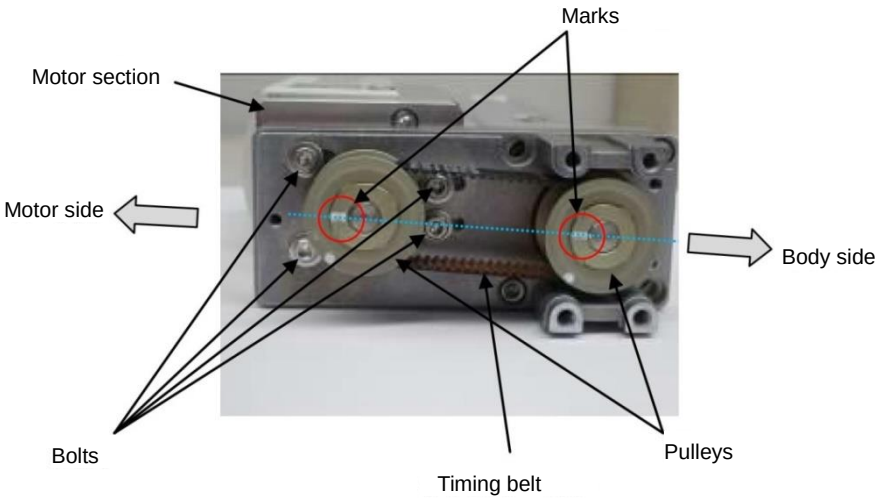
1 Remove three screws and remove the belt cover.

■ Replacing the timing belt

- **Bolt:**
  Hexagon socket head bolt (ERL2-45, ESD2-35/45: M3 x 16L, ERL2-60, ESD2-55: M4 x 20L) x 4 pieces
- **Tool: Hex key for M3 (across flats: 2.5 mm), for M4 (across flats: 3 mm)**
- **Timing belt model number:**
  ERL2-45, ESD2-35/45: EA-164GB-BELT
  ERL2-60, ESD2-55: EA-222GB-BELT

1 Loosen four bolts to some degree (so that the motor section can slide without rattling), slide the motor section toward the body, and remove the timing belt from the pulleys.

2 Attach a new timing belt to the pulleys.
Apply tension to the timing belt and adjust it so that the marks on the pulleys are aligned and facing the motor side.

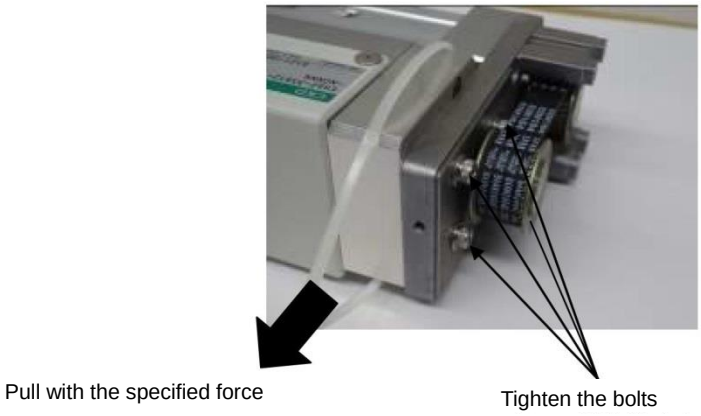


■ Adjusting the tension on the timing belt

- **Bolt:**
  Hexagon socket head bolt (ERL2-45, ESD2-35/45: M3 x 16L, ERL2-60, ESD2-55: M4 x 20L) x 4 pieces
- **Tool: Hex key for M3 (across flats: 2.5 mm), for M4 (across flats: 3 mm)**

1 Put a cord or a cable tie around the base of the motor section.

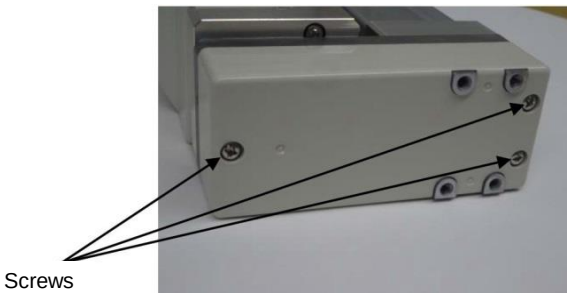
2 While pulling the cord or the cable tie with the specified force (ERL2-45, ESD2-35/45: 20 N; ERL2-60, ESD2-55: 40 N), tighten four bolts with the specified tightening torque (ERL2-45, ESD2-35/45: 0.3 N·m; ERL2-60, ESD2-55: 0.7 N·m).



■ Attaching the belt cover

- **Screw: Cross recessed pan head screw (M3 x 25L) x 3 pieces**
- **Tool: Philips screwdriver**
- **Tightening torque: 0.3 N·m**

1 Tighten three screws with the specified tightening torque (0.3 N·m) and attach the belt cover.



5. TROUBLESHOOTING

5.1 Items to Check When a Problem Occurs

When a problem occurs, ensure safety and follow the procedure below.

1	Check the LED indicator on the controller. Green light: Motor energized (servo on), brake energized (brake released) Green blinking: Motor de-energized (servo off), brake de-energized (brake locked) Red light: Critical alarm issued Red blinking: Releasable alarm issued Off: Control power turned off
2	Check if there is an abnormality with the higher-level controller.
3	Check the voltage of the 24 VDC control power.
4	Check the details of the alarm. The details of the alarm can be checked with the teaching pendant (ETP2) or the setting software (E Tools).
5	Check the state of the I/O. The state of the I/O can be checked with the teaching pendant (ETP2) or the setting software (E Tools).
6	Check that there is no disconnection or pinching of the cables and that they are connected correctly. Before checking the continuity, turn off the power and remove the cables to prevent an electric shock.
7	Check that measures (such as connecting the ground wire and attaching the surge suppressor) have been taken against noise.
8	Check the course of events and the operating conditions at the time the problem occurred.
9	Check the serial number of the product.

If the problem persists, refer also to ”5.2 Problems, Causes, and Solutions”.

5.2 Problems, Causes, and Solutions

If the problem does not operate as intended, check the table below for a possible solution.

Problem	Cause	Solution
Even when power is turned on, LED indicator on controller does not light up.	Wiring is not correct.	Check the wiring to the power.
	Wiring is disconnected.	Check for pinching and disconnection of cables and check the connection of connectors and terminals.
	Product is malfunctioning or is damaged.	Repair or replace the product. Refer to "5.1 Items to Check When a Problem Occurs" and contact CKD.
LED indicator on controller remains lit in red.	Alarm has been issued.	Refer to "5.3 Alarm Code" to find and remove the cause of the alarm.
	There is an abnormality in system.	Repair or replace the product. Refer to "5.1 Items to Check When a Problem Occurs" and contact CKD.
No operation standby completion signal is output.	Return to origin has not been performed.	Perform return to origin.
	Wiring for emergency stop signal is NO contact connection.	Change the wiring for emergency stop (EMG) to NC contact connection.
	Wiring is not correct.	Refer to Chapter 5 in “SM-612271 Controller Instruction Manual” and check the wiring.
Product does not operate as intended with PLC signal.	Input signal is unstable.	Input from the higher system may be causing chattering. Maintain the input signal for 20 msec or more.
	Return to origin cannot be completed or performed.	Transfer load may be too large. Check the Specifications.
	Setting of position, speed, acceleration, or pressing force is not correct.	Check the details of the point data.
	Setting of PIO mode is not correct.	Check the setting of the PIO mode in the parameter data.
	Wiring is not correct.	Refer to Chapter 5 in “SM-612271 Controller Instruction Manual” and check the wiring.
	Friction load is too large.	Check the friction load during transfer. Check that there is no jamming with the workpiece.
	Workpiece is in contact with an object on slider or rod.	Check how the device is assembled and set up.
	Internal resistance of product has increased.	Check the environment conditions and the conditions of use. Check how long the product has been in use (operation distance).
	Actuator body is damaged.	Repair or replace the product. Refer to "5.1 Items to Check When a Problem Occurs" and contact CKD.
Product itself vibrates.	Connection to actuator is loose.	Tighten the bolts.

Problem	Cause	Solution	
Product cannot be operated with PLC.	Mode is set to SIO mode.	Change the mode to the PIO mode using the setting tool.	
	Wiring is not correct.	Refer to Chapter 5 in “SM-612271 Controller Instruction Manual” and check the wiring.	
	Wiring is disconnected.	Check for pinching and disconnection of cables and check the connection of connectors and terminals.	
	Overload error occurs.	Check the transfer load and the speed.	
	Power capacity is insufficient.	Check that the power capacity satisfies the required voltage and current.	
Workpiece moves due to its own weight during an emergency stop.	Brake is not equipped with product or brake is released forcibly. (Servo turns off at emergency stop.)	When a type without brake is used	Use a type equipped with a brake.
		When the brake is released forcibly	Turn off the function that forcibly released the brake.
	Load exceeding holding force is applied.	Check whether an external force greater than the holding force is applied. Check the setting of the "Current during stop" in the parameter data.	
Positioning completion output does not turn off.	Positioning completion output width is too large for movement distance.	Check the "Positioning width" in the point data.	
Pressing operation cannot be performed.	Mode is not set to pressing operation.	Check the "Mode" in the point data.	
Device is out of step.	Load or speed has exceeded limit.	Check that the workpiece weight and the operation speed satisfy the specified values.	
Product cannot achieve desired speed (it is very slow).	Mode is set to pressing operation instead of general transfer movement.	Check the "Mode" in the point data.	
Overshoot occurs.	Both transfer weight and amount of deceleration are large.	Check that the workpiece weight and the operation speed satisfy the specified values. Decrease the amount of deceleration.	
Product cannot reach target takt time.	Setting of acceleration or speed is not correct.	Check the "Acceleration" and the "Speed" in the point data.	

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

5.3 Alarm Code

Alarm code	Alarm item	Description	Solution	Reset
10 to 1F	Memory (read)	Indicates that an error has been detected in reading data from memory when turning on the power.	"13" indicates that there is an error in the parameter data. Initialize the parameter data and turn on the power again. "15" indicates that there is an error in the point data. Initialize the point data and turn on the power again. "17" indicates that there is an error in the alarm data. Input the alarm reset signal and turn on the power again. Other codes indicate that there is an error in the data inside. If the error reoccurs even after turning on the power again, contact CKD.	Impossible
20 to 2F	Memory (write)	Indicates that an error has been detected in writing data into memory when changing data.	If the error reoccurs even after turning on the power again, contact CKD.	Impossible
30	Temperature	Indicates that the temperature in the controller is high.	Check the ambient temperature. If the error reoccurs even after turning on the power again, contact CKD.	Impossible
31	Current	Indicates that an overcurrent has flowed into the motor.	If the error reoccurs even after turning on the power again, contact CKD.	Impossible
32	No encoder connection	Indicates that there is an abnormality in the connection between the controller and the actuator.	Check the connection between the cable and the connector. If the error reoccurs even after turning on the power again, contact CKD.	Impossible
38	No SIO connection	Indicates that there is an abnormality in the connection of the connector when the teaching pendant is connected and used in the TP mode (SIO mode).	Check the connection between the teaching pendant cable and the connector. If the connector is disconnected, connecting it will return the mode to the PIO mode. Reset the alarm while in this mode.	Possible
40	Parameter data	Indicates that there is an abnormality in the parameter data when turning on the power.	Configure the settings for the "Software limit +", "Software limit -", "Origin return speed", "Origin offset amount", and "Current during stop" parameters again and turn on the power again.	Impossible
41	Point data (position)	Indicates that there is an abnormality in the point data of a point number when inputting a move command to that point.	The final target position has exceeded the range of the software limit. Configure the settings for the "Position" and "Pressing distance" in the point data again and reset the alarm.	Possible
42	Point data (speed)	Indicates that there is an abnormality in the point data of a point number when inputting a move command to that point.	The pressing speed is higher than the speed or the speed is higher than the set range. Configure the settings for the "Speed", "Acceleration", "Deceleration", and "Pressing speed" in the point data again and reset the alarm.	Possible
43	Point data (pressing)	Indicates that there is an abnormality in the point data of a point number when inputting a move command to that point.	The point data is exceeded. Configure the setting for the "Pressing current" in the point data again and reset the alarm.	Possible
60	Servo on	Indicates that there is an abnormality in the encoder data signal for exciting the motor when the servo is turned on for the first time after turning on the power.	Check the connection of the cable and the connector connecting the controller and the actuator. Check that the actuator is not restrained and reset the alarm.	Possible
61	Encoder	Indicates that the Z phase signal of the encoder cannot be detected when a movement is made for the first time after turned on the power.	Check the connection of the cable and the connector connecting the controller and the actuator. Check that there is no problem and reset the alarm.	Possible
62	Return to origin	Indicates that the mechanical end cannot be detected even after a movement of a distance longer than the stroke of the actuator when returning to the origin.	Check the connection of the cable and the connector connecting the controller and the actuator. Check that there is no rupture of the timing belt. Check that there is no problem and reset the alarm.	Possible

Alarm code	Alarm item	Description	Solution	Reset
64	Outside software limit	Indicates that the origin position is outside the range of the software limit when moving from point to point.	If the alarm occurs due to an overshoot when positioning close to the software limit, check the load conditions. The alarm will also occur when a point move command outside the range of the software limit is input. In this case, move the actuator manually so that the origin position is within the range of the software limit. Check that there is no problem and reset the alarm.	Possible
65	Overload (M)	Indicates that the slider or the rod cannot move.	Check the load and operating conditions. Check that there is no problem and reset the alarm.	Possible
66	Overload (P)	Indicates that the slider or the rod has been pressed back to the pressing start position by external force during pressing.	Check the load and operating conditions. Check that there is no problem and reset the alarm.	Possible
67	Overload (S)	Indicates that the slider or the rod cannot stop.	Check the load and operating conditions. Check that there is no problem and reset the alarm.	Possible
68	Overload (H)	Indicates that the slider or the rod has become misaligned when stopping.	Check the load and operating conditions. Check the setting of the "Current during stop" in the parameter data. Check that there is no problem and reset the alarm.	Possible
69	Overload (C)	Indicates that an overcurrent has flowed into the motor.	Check the load and operating conditions. Check that there is no problem and reset the alarm.	Possible

6. WARRANTY PROVISIONS

6.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

6.2 Warranty Period

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

6.3 Remarks

- Warranty period specified in 6.2 is based on the assumption that the product is operated for not more than eight (8) hours a day. If the product reaches the end of its service life within one (1) year, the warranty shall expire at that time.
- If the product is exported outside Japan by the customer, it shall be repaired if returned to CKD's facility or a company or plant specified by CKD. Work and cost associated with the return shall not be covered by the warranty. The repaired product shall be delivered to a place in Japan specified by the customer in a package appropriate for delivery in Japan.