FLSH

2-Finger Gripper Type

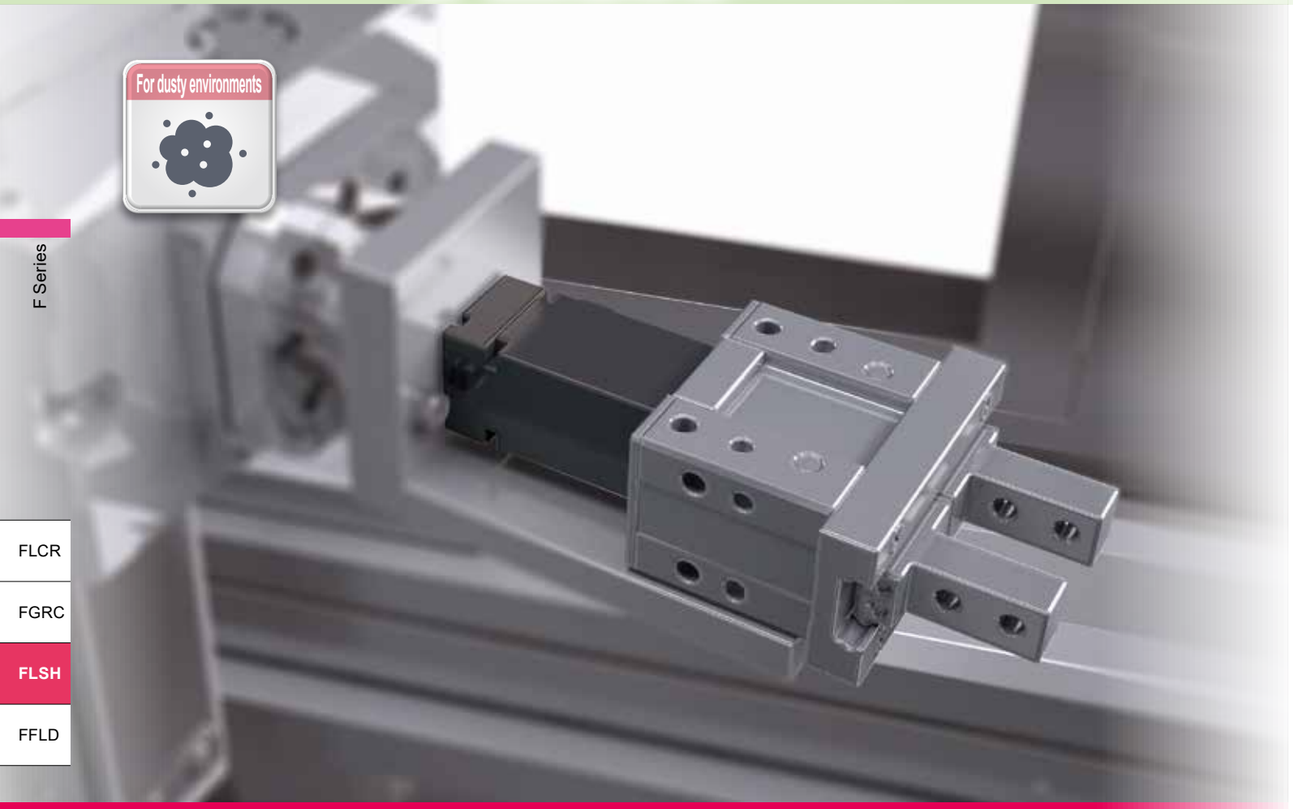
Electric Actuator with Motor Specification

CONTENTS

FLSH System Table

Model No.	Motor Size	Stroke and max. speed (mm/s)						Max. Gripping force (N)
		6 mm	10 mm	12 mm	14 mm	18 mm	22 mm	
FLSH-16	□20	50 mm/s		50				20
FLSH-20	□25		50			50		42
FLSH-25	□25L				50		50	65

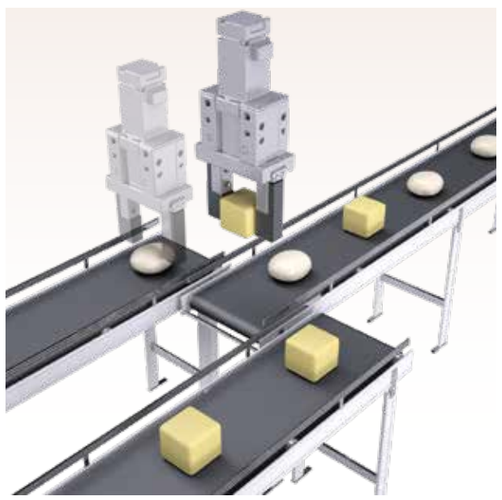
2-Finger Gripper FLSH Series



For soft handling of various workpieces

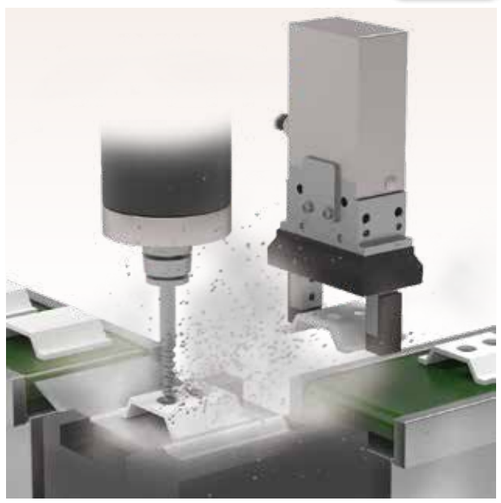
Application examples

Grip deformable various workpieces softly with one actuator



Improved environmental resistance with optional case cover

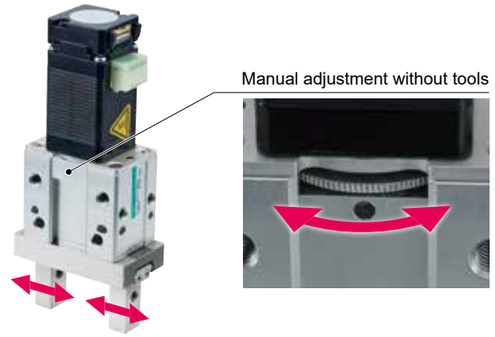
IP50 Compatible



Easy maintenance

Manual operation and self-lock mechanisms

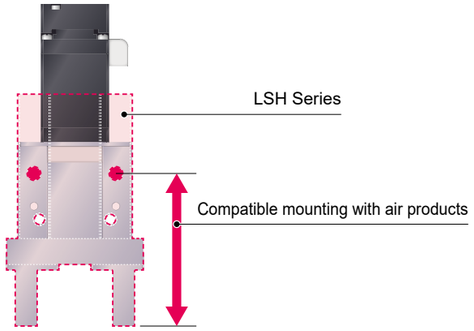
Equipped with a manual operation mechanism that can be operated without tools. The gripping position held by the self-lock can be adjusted.



Reduced design

Dimensions equivalent to air products

Since it is mounting-compatible with the air gripper LSH series, the range of choices at the time of design is expanded. The FLSH series is recommended when handling of various workpieces is required.



High versatility Special environment

Abundant options

Various options such as with case, with rubber cover, and finger shape are supported.

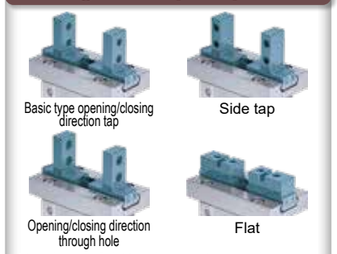
With case

Reduced risk of disconnection with flexible cable

Rubber cover option

Improved environmental resistance (+ with case for IP50)

Finger shape option



Design of Attachments as desired

Electric actuator 2-Finger Gripper

FLSH-16

□20 Stepping motor

For compatible detailed model Nos., please visit the CKD website.

Model No. Notation Method

FLSH - 16 ❶ | G ❷ | H1 ❸ | 06 ❹ | N ❺ | C ❻ | N ❼ - F ❽ | S03 ❾

❶Size

16

❷Connected Controllers *1

G	ECMG/ECG-B
Blank	ECR

❸Screw lead

H1	1.5 mm

❹Stroke

06	6 mm (3 mm one side)
12	12 mm (6 mm one side)

❺Rubber cover *2

N	None
G	Chloroprene rubber
F	Fluororubber

❻Encoder

C	Incremental Encoder

❼Finger

N	Basic type
2	Side tap
3	Through hole
4	Flat

❽Cable lead-out type/directional *3 *4

L	Case outlet	Left side
R	Case outlet	Right surface
T	Case ejector	Top
F	Direct outlet	Front
S	Direct leadout	Side

❾Relay cable *5

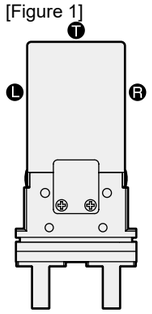
N00	None
S01	Fixing cable 1 m
S03	Fixing cable 3 m
S05	Fixing cable 5 m
S10	Fixing cable 10 m
R01	Movable cable 1 m
R03	Movable cable 3 m
R05	Movable cable 5 m
R10	Movable cable 10 m

*1 Select the controller from page 529.
*2 When the rubber cover "G, F" has been selected, only the finger "N" can be selected.
*3 Refer to Figure 1 and Figure 2.
*4 When the rubber cover "N" or finger "N" has been selected for the stroke "06", only the cable lead-out type/direction "F, S" can be selected.
*5 For ECR, refer to page 607 for Dimensions diagram , or for ECMG/ECG, refer to page 592.

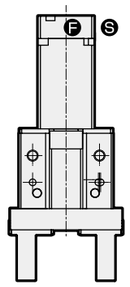
Option Compatibility Table

Option	Model No.	Connected Controller ECMG ECG-B	Connected Controller ECR
❹Stroke	06	●	●
	12	●	
❺Rubber Cover	N	●	●
	G/F	●	
❼Finger	N	●	●
	2/3/4	●	
❽Cable outlet type/direction	L/R/T	●	
	F/S	●	●

[Figure 1]



[Figure 2]



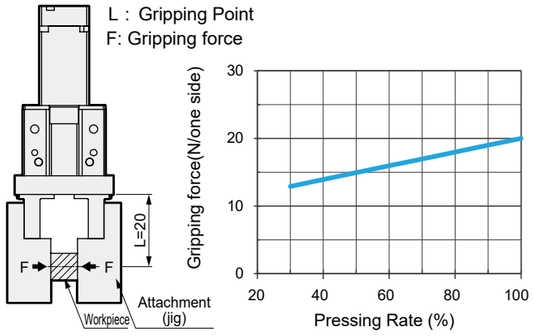
Specifications

Connected Controller		ECMG, ECG-B, ECR	
Motor		□20. Stepping motor	
Encoder Type		Incremental Encoder	
Drive Method		Sliding screw	
Stroke	mm	6 (one side 3)	12 (one side 6)
Screw lead	mm	1.5	
Max. gripping force *1	N	20 (one side)	
Open/close speed range	mm/s	5 to 50 (one side)	
Acceleration/deceleration speed range	G	0.1 to 0.3	
Gripping speed range *1	mm/s	5 to 15 (one side)	
Repeatability *2	mm	±0.02	
Positioning repeatability *3	mm	±0.05 (one side)	
Lost Motion	mm	0.3 or less (one side)	
Static Allowable Moment	N·m	MP=0.68, MY=0.68, MR=1.36	
Motor power supply voltage *4		24VDC ±10% or 48 VDC ±10%	
Insulation resistance		10 MΩ, 500 VDC	
Dielectric Strength		500 VAC for 1 minute	
Operating Ambient Temperature, Humidity		0 to 40°C (no freezing) 35 to 80% RH (no condensation)	
Storage Ambient Temperature, Humidity		-10 to 50°C (No freezing) 35 to 80% RH (no condensation)	
Atmosphere		No corrosive gas, explosive gas, or dust	
Protection structure		IP40 (IP50 *5)	
Weight g	ECMG, ECG-B *6	200	220
	ECR	250	-

*1 Gripping is done with pressing operation.
*2 Repeat accuracy indicates the variation when the same workpiece is repeated gripped at the same power, under the same operation conditions.
*3 This results in variations in the stop position when repeated positioning to the same point is performed.
*4 48 VDC is compatible only with Controllers ECR.
*5 Rubber cover (G/F), cable outlet type/direction: When case outlet (L/R/T) is selected.

Gripping Force and Pushing Rate

[At 24/48 VDC]



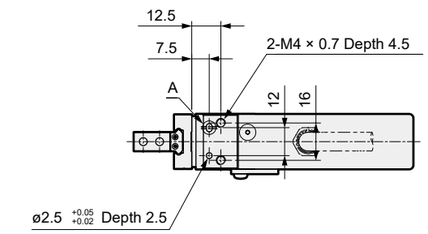
* Gripping force and pressing rate are guidelines. Power supply voltages, individual motor differences and variations in mechanical efficiency may result in differing actual values, even at the same pressing rate.
* Speed during gripping operation is 15mm/s. (L=20)

Option weight (*6) (g)

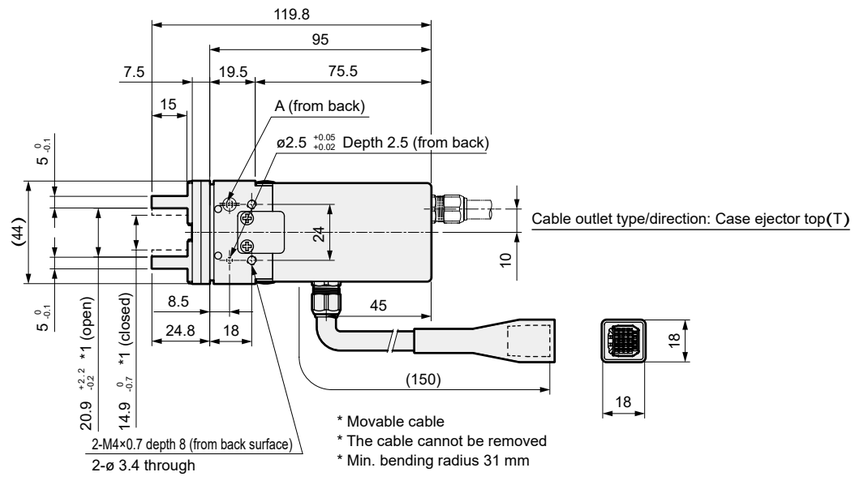
Option	Stroke 06	Stroke 12
Rubber Cover	+0	+10
Case outlet	+100	+100

Outline Dimension Drawing

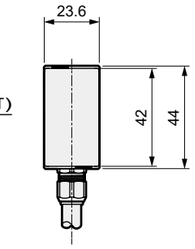
● FLSH-16GH106NC3-L/R/T *(stroke: 6 mmm, rubber cover: None, Finger: through hole, Cable outlet type/direction: Case outlet)



Cable outlet type/direction: Case outlet left side (L)



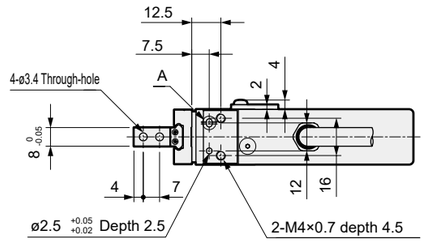
Cable outlet type/direction: Case ejector top(T)

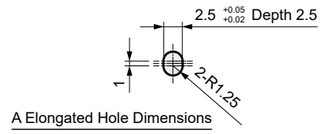


* Movable cable
* The cable cannot be removed
* Min. bending radius 31 mm

*1 Including the zero point return distance

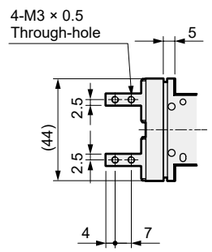
Cable outlet type/direction: Case outlet right surface(R)



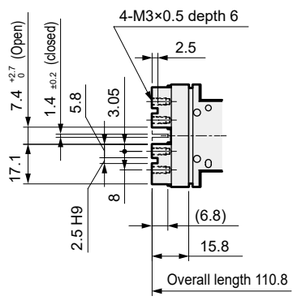


A Elongated Hole Dimensions

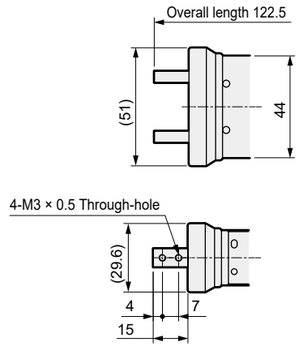
●Finger: Side tap (2)



●Finger: Flat (4)

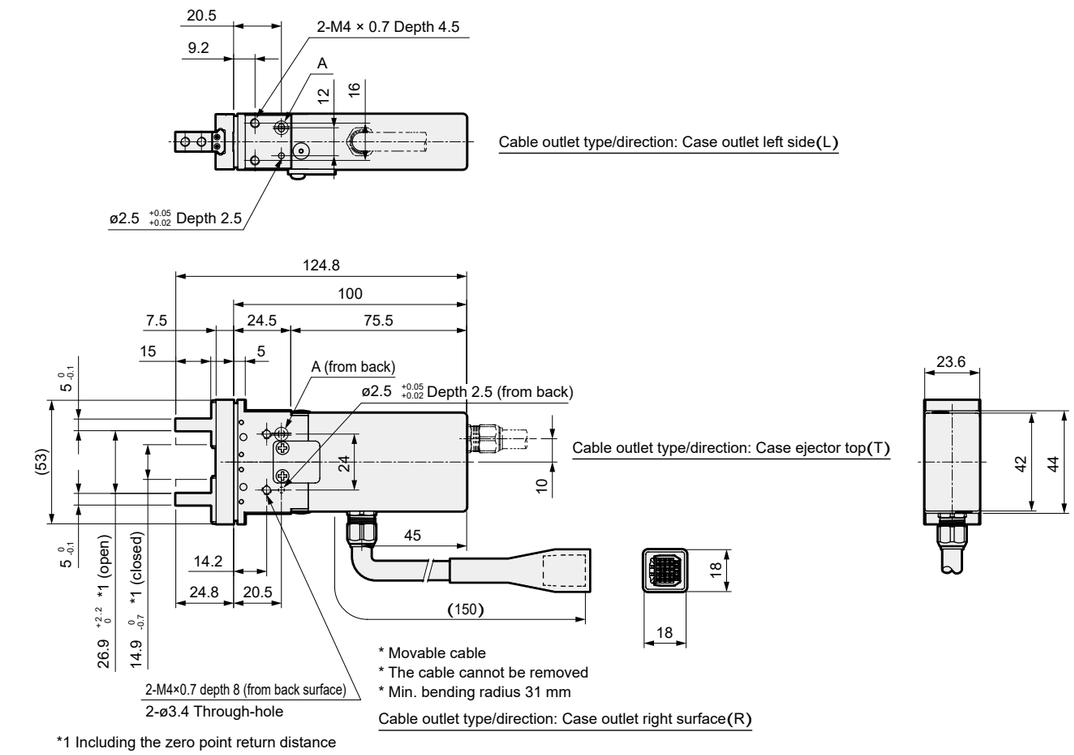


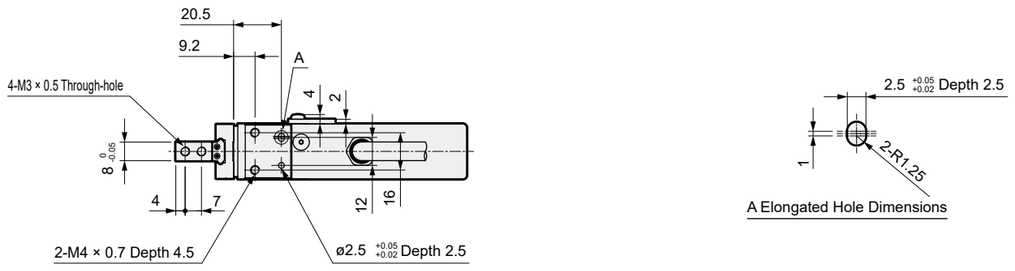
●Rubber cover(G/F)
Finger: Basic(N)



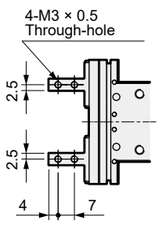
Outline Dimension Drawing

● FLSH-16GH112NCN-L/R/T *(stroke: 12 mmm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Case outlet)

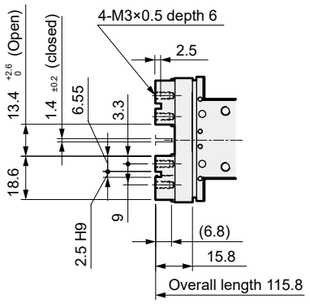




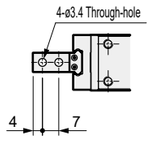
●Finger: Side tap (2)



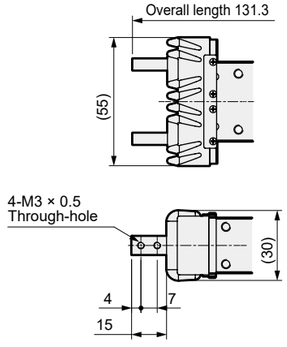
●Finger: Flat (4)



●Finger: Through hole (3)

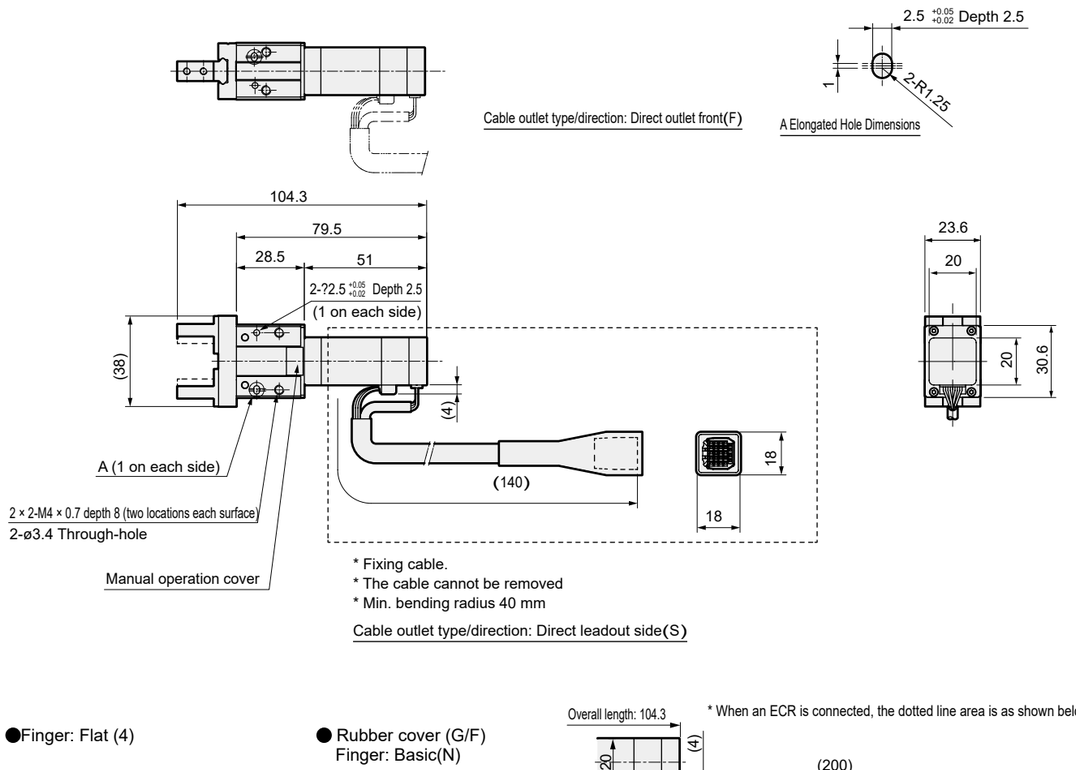


●Rubber cover(G/F)
Finger: Basic(N)

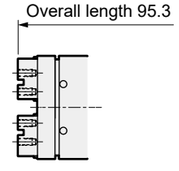


Outline Dimension Drawing

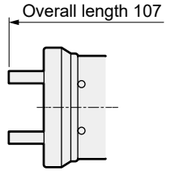
● FLSH-16GH106NCN-F/S * (stroke: 6 mmm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Direct outlet)



●Finger: Flat (4)

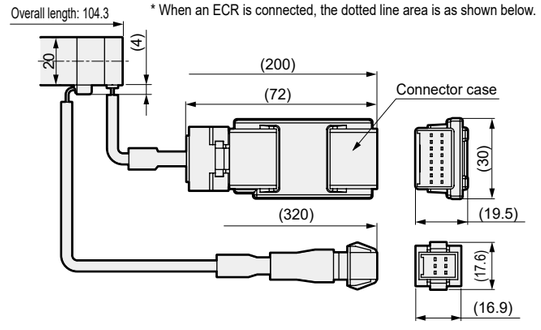


● Rubber cover (G/F)
Finger: Basic(N)

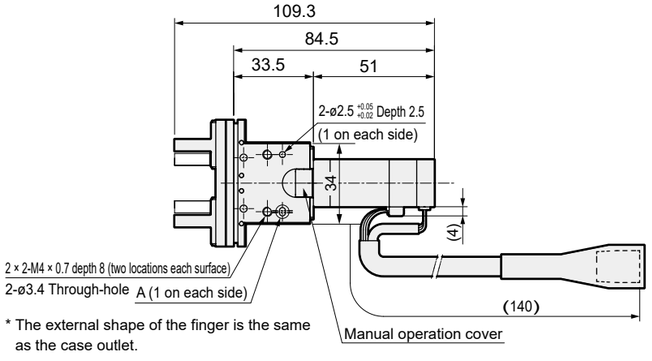


* The external shape of the finger is the same as the case outlet.

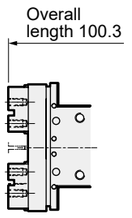
* When an ECR is connected, the dotted line area is as shown below.



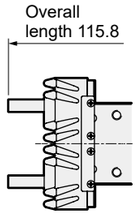
● FLSH-16GH112NCN-F/S *(stroke: 12 mm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Direct outlet)



●Finger: Flat (4)



●Rubber cover (G/F)
Finger: Basic (N)



Electric actuator 2-Finger Gripper

FLSH-20

□25 Stepping motor

For compatible detailed model Nos., please visit the CKD website.

Model No. Notation Method

FLSH - 20 ❶ | G ❷ | H1 ❸ | 10 ❹ | N ❺ | C ❻ | N ❼ - F ❽ | S03 ❾

❶Size

20

❷Connected Controllers *1

G	ECMG/ECG-B
Blank	ECR

❸Screw lead

H1	1.5 mm

❹Stroke

10	10 mm (5 mm one side)
18	18 mm (9 mm one side)

❺Rubber cover *2

N	None
G	Chloroprene rubber
F	Fluororubber

❻Encoder

C	Incremental Encoder

❼Finger

N	Basic type
2	Side tap
3	Through hole
4	Flat

❽Cable lead-out type/directional *3 *4

L	Case outlet left side
R	Case outlet right surface
T	Case ejector top
F	Direct outlet front
S	Direct leadout side

❾Relay cable *5

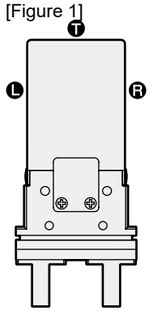
N00	None
S01	Fixing cable 1 m
S03	Fixing cable 3 m
S05	Fixing cable 5 m
S10	Fixing cable 10 m
R01	Movable cable 1 m
R03	Movable cable 3 m
R05	Movable cable 5 m
R10	Movable cable 10 m

*1 Select the controller from page 529.
*2 When the rubber cover "G, F" has been selected, only the finger "N" can be selected.
*3 Refer to Figure 1 and Figure 2.
*4 When the rubber cover "N" or finger "N" has been selected for the stroke "10", only the cable lead-out type/direction "F, S" can be selected.
*5 For ECR, refer to page 607 for Dimensions diagram , or for ECMG/ECG, refer to page 592.

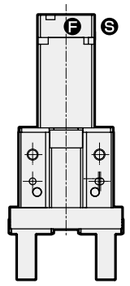
Option Compatibility Table

Option	Model No.	Connected Controller: ECMG ECG-B	Connected Controller: ECR
❹Stroke	10	●	●
	18	●	
❺Rubber Cover	N	●	●
	G/F	●	
❼Finger	N	●	●
	2/3/4	●	
❽Cable outlet type/direction	L/R/T	●	
	F/S	●	●

[Figure 1]



[Figure 2]



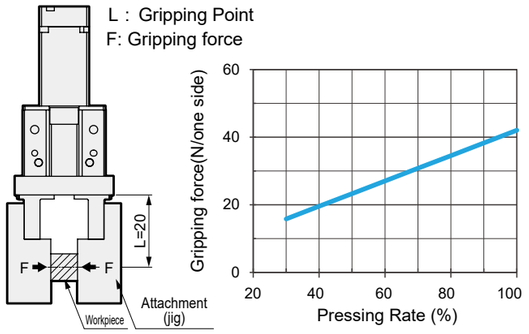
Specifications

Connected Controller		ECMG, ECG-B, ECR	
Motor		□25 Stepping motor	
Encoder Type		Incremental Encoder	
Drive Method		Sliding screw	
Stroke	mm	10 (one side 5)	18 (one side 9)
Screw lead	mm	1.5	
Max. gripping force *1	N	42 (one side)	
Open/close speed range	mm/s	5 to 50 (one side)	
Acceleration/deceleration speed range	G	0.1 to 0.3	
Gripping speed range *1	mm/s	5 to 15 (one side)	
Repeatability *2	mm	±0.02	
Positioning repeatability *3	mm	±0.05 (one side)	
Lost Motion	mm	0.3 or less (one side)	
Static Allowable Moment	N·m	MP=1.32, MY=1.32, MR=2.65	
Motor power supply voltage *4		24VDC ±10% or 48 VDC ±10%	
Insulation resistance		10 MΩ, 500 VDC	
Dielectric Strength		500 VAC for 1 minute	
Operating Ambient Temperature, Humidity		0 to 40°C (no freezing) 35 to 80% RH (no condensation)	
Storage Ambient Temperature, Humidity		-10 to 50°C (No freezing) 35 to 80% RH (no condensation)	
Atmosphere		No corrosive gas, explosive gas, or dust	
Protection structure		IP40 (IP50 *5)	
Weight g	ECMG, ECG-B *6	380	440
	ECR	380	-

*1 Gripping is done with pressing operation.
*2 Repeat accuracy indicates the variation when the same workpiece is repeated gripped at the same power, under the same operation conditions.
*3 This results in variations in the stop position when repeated positioning to the same point is performed.
*4 48 VDC is compatible only with Controllers ECR.
*5 Rubber cover (G/F), cable outlet type/direction: When case outlet (L/R/T) is selected.

Gripping Force and Pushing Rate

[At 24/48 VDC]



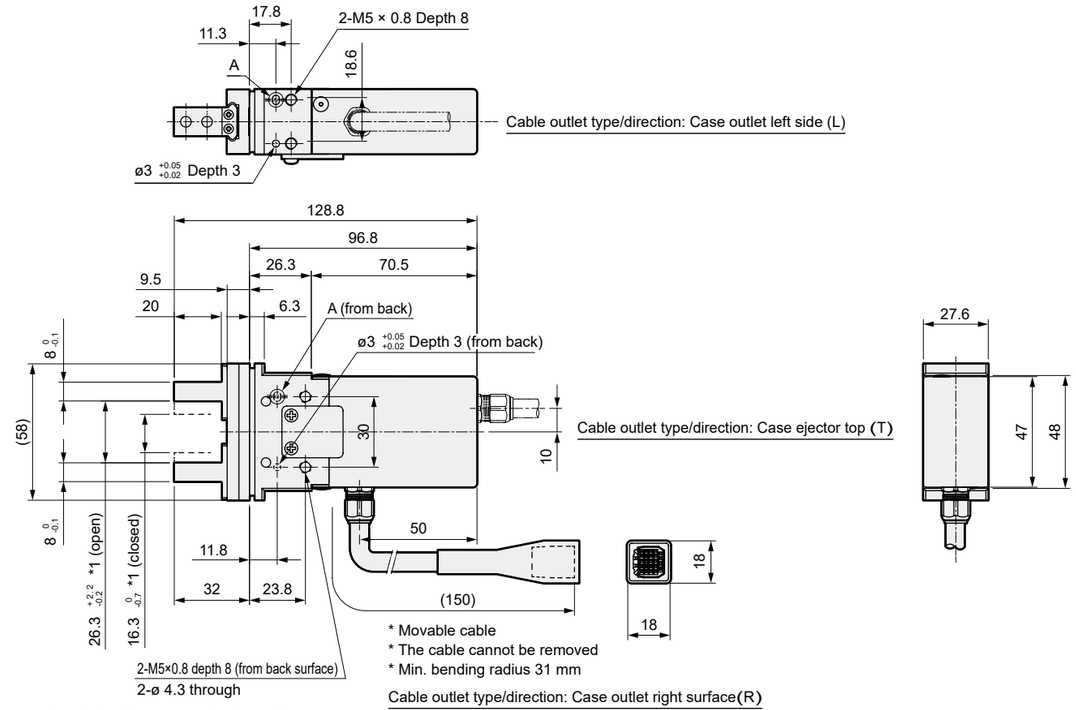
* Gripping force and pressing rate are guidelines. Even with the same pushing rate, errors will occur with the actual numbers due to differences in power supply voltage, individual differences in motors, and variations in mechanical efficiency.
* Speed during gripping operation is 15mm/s. (L=20)

Option weight (*6) (g)

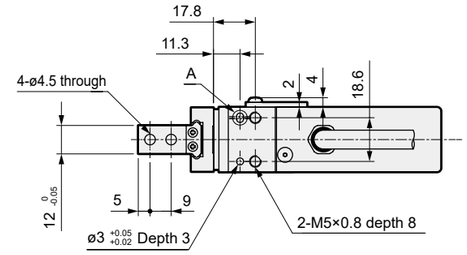
Option	Stroke 10	Stroke 18
Rubber Cover	+10	+20
Case outlet	+110	+110

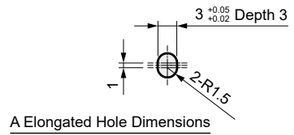
Outline Dimension Drawing

● FLSH-20GH110NC3-L/R/T *(stroke: 10 mmm, rubber cover: None, Finger: through hole, Cable outlet type/direction: Case outlet)



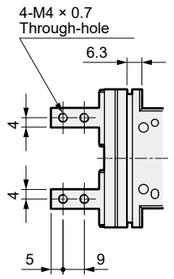
*1 Including the zero point return distance



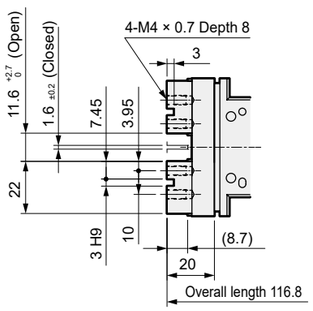


A Elongated Hole Dimensions

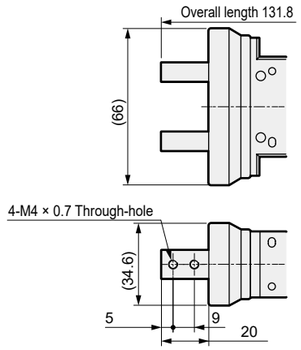
●Finger: Side tap (2)



●Finger: Flat (4)

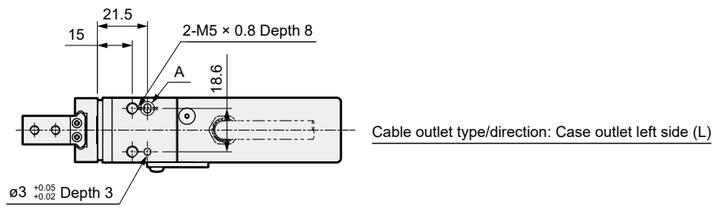


●Rubber cover(G/F)
Finger: Basic(N)

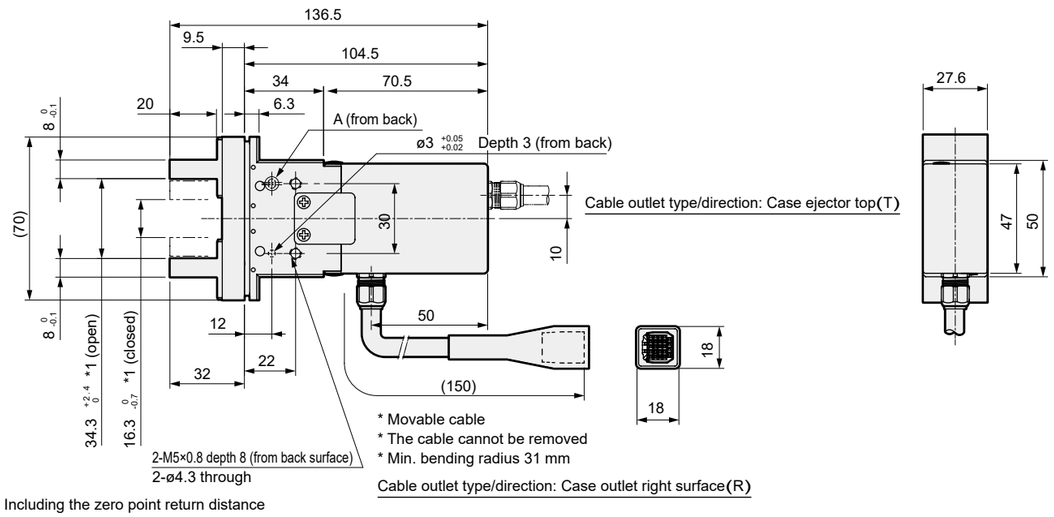


Outline Dimension Drawing

● FLSH-20GH118NCN-L/R/T *(stroke: 18 mm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Case outlet)



Cable outlet type/direction: Case outlet left side (L)

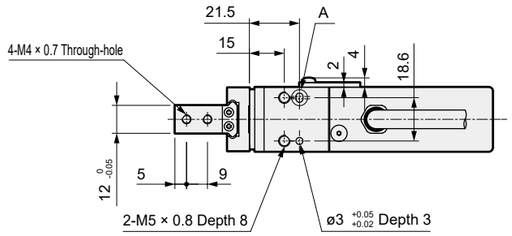


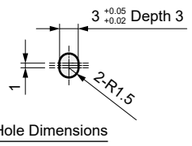
* Movable cable
* The cable cannot be removed
* Min. bending radius 31 mm

Cable outlet type/direction: Case ejector top(T)

Cable outlet type/direction: Case outlet right surface(R)

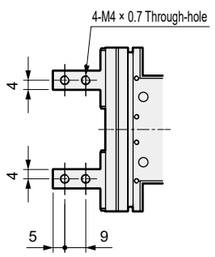
*1 Including the zero point return distance



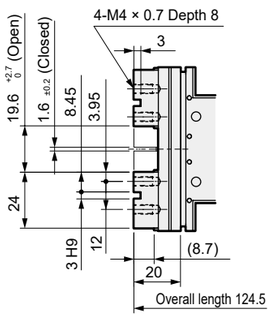


A Elongated Hole Dimensions

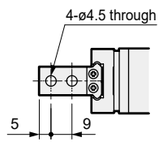
●Finger: Side tap (2)



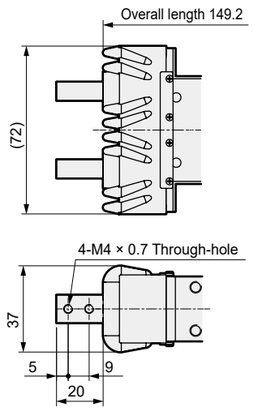
●Finger: Flat (4)



●Finger: Through hole (3)

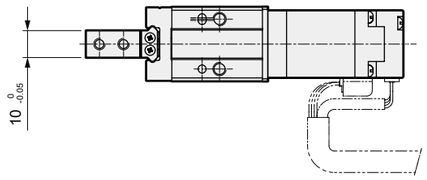


●Rubber cover(G/F)
Finger: Basic(N)

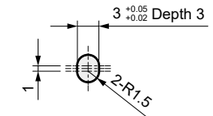


Outline Dimension Drawing

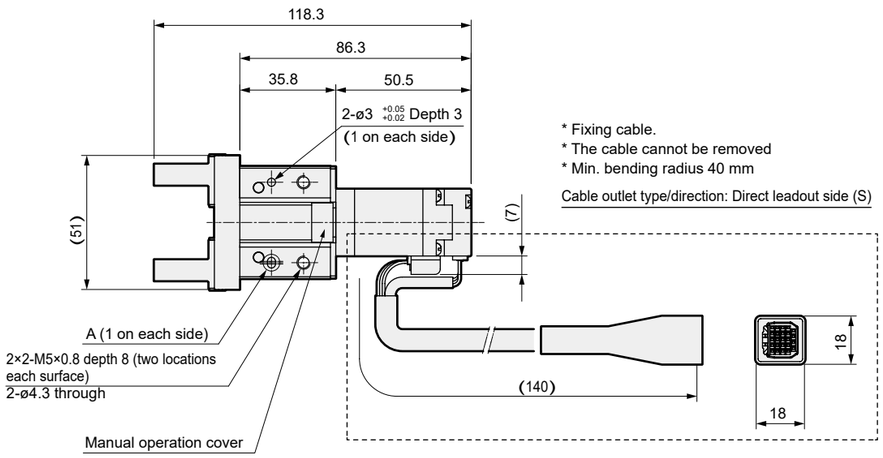
● FLSH-20GH110NCN-F/S *(stroke: 10 mmm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Direct outlet)



Cable outlet type/direction: Direct outlet front (F)

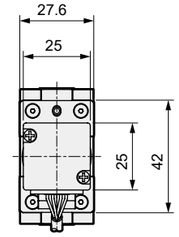


A Elongated Hole Dimensions



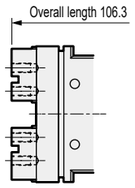
* Fixing cable.
* The cable cannot be removed
* Min. bending radius 40 mm

Cable outlet type/direction: Direct leadout side (S)

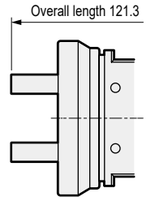


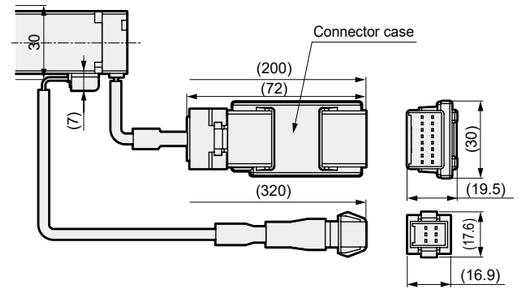
* When an ECR is connected, the dotted line area is as shown below.

●Finger: Flat (4)



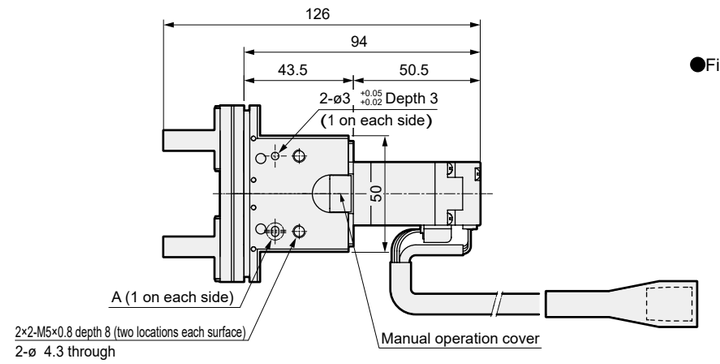
●Rubber cover (G/F)
Finger: Basic(N)



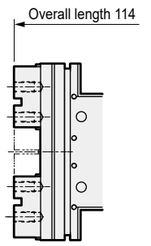


* The external shape of the finger is the same as the case outlet.

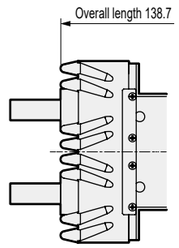
● FLSH-20GH118NCN-F/S *(stroke: 18 mm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Direct outlet)



●Finger: Flat (4)



●Rubber cover(G/F)
Finger: Basic(N)



* The external shape of the finger is the same as the case outlet.

Electric actuator 2-Finger Gripper

FLSH-25

□25L stepping motor

For compatible detailed model Nos., please visit the CKD website.

Model No. Notation Method

FLSH - 25 (1) | G (2) | H1 (3) | 14 (4) | N (5) | C (6) | N (7) - F (8) | S03 (9)

❶Size

25	

❷Connected Controllers *1

G	ECMG/ECG-B
Blank	ECR

❸Screw lead

H1	1.5 mm

❹Stroke

14	14 mm (7 mm one side)
22	22 mm (11 mm one side)

❺Rubber cover *2

N	None
G	Chloroprene rubber
F	Fluororubber

❻Encoder

C	Incremental Encoder

❼Finger

N	Basic type
2	Side tap
3	Through hole
4	Flat

❽Cable lead-out type/directional *3 *4

L	Case outlet	Left side
R	Case outlet	Right surface
T	Case ejector	Top
F	Direct outlet	Front
S	Direct leadout	Side

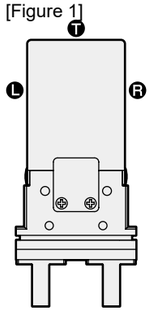
❾Relay cable *5

N00	None
S01	Fixing cable 1 m
S03	Fixing cable 3 m
S05	Fixing cable 5 m
S10	Fixing cable 10 m
R01	Movable cable 1 m
R03	Movable cable 3 m
R05	Movable cable 5 m
R10	Movable cable 10 m

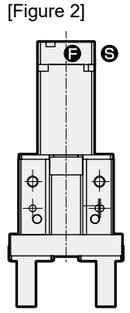
Option Compatibility Table

Option	Model No.	Connected Controller: ECMG ECG-B	Connected Controller: ECR
❹Stroke	14	●	●
	22	●	
❺Rubber cover	N	●	●
	G/F	●	
❼Finger	N	●	●
	2/3/4	●	
❽Cable output type/direction	L/R/T	●	
	F/S	●	●

[Figure 1]



[Figure 2]



*1 Select the controller from page 529.
*2 When the rubber cover "G, F" has been selected, only the finger "N" can be selected. When the rubber cover "G, F" is selected, only the stroke "14" can be selected.
*3 Refer to Figure 1 and Figure 2.
*4 When the rubber cover "N" or finger "N" has been selected for stroke "14", only the cable lead-out type/direction "F, S" can be selected.
*5 The relay cable Dimensions diagram is For ECR,P. 607or For ECMG/ECG, P. 592.

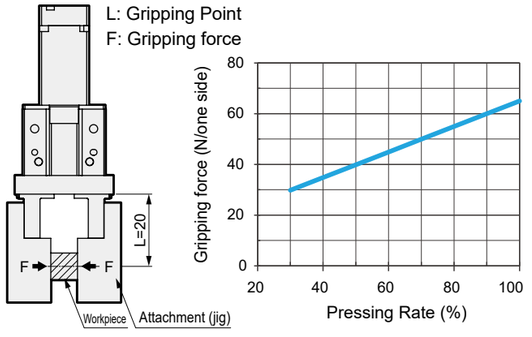
Specifications

Connected Controller		ECMG, ECG-B, ECR	
Motor		□25L stepping motor	
Encoder Type		Incremental Encoder	
Drive Method		Sliding screw	
Stroke	mm	14 (one side 7)	22 (one side 11)
Screw lead	mm	1.5	
Max. gripping force *1	N	65 (one side)	
Open/close speed range	mm/s	5 to 50 (one side)	
Acceleration/deceleration speed range	G	0.1 to 0.3	
Gripping speed range *1	mm/s	5 to 15 (one side)	
Repeatability *2	mm	±0.02	
Positioning repeatability *3	mm	±0.05 (one side)	
Lost Motion	mm	0.3 or less (one side)	
Static Allowable Moment	N·m	MP=1.94, MY=1.94, MR=3.88	
Motor power supply voltage *4		24VDC ±10% or 48 VDC ±10%	
Insulation resistance		10 MΩ, 500 VDC	
Dielectric Strength		500 VAC for 1 minute	
Operating Ambient Temperature, Humidity		0 to 40°C (no freezing) 35 to 80% RH (no condensation)	
Storage Ambient Temperature, Humidity		-10 to 50°C (No freezing) 35 to 80% RH (no condensation)	
Atmosphere		No corrosive gas, explosive gas, or dust	
Protection structure		IP40 (IP50 *5)	
Weight g	ECMG, ECG-B *6	590	630
	ECR	580	-

*1 Gripping is done with pressing operation.
*2 Repeat accuracy indicates the variation when the same workpiece is repeated gripped at the same power, under the same operation conditions.
*3 This results in variations in the stop position when repeated positioning to the same point is performed.
*4 48 VDC is compatible only with Controllers ECR.
*5 Rubber cover (G/F), cable outlet type: Direction: When case outlet (L/R/T) is selected.

Gripping Force and Pushing Rate

[At 24/48 VDC]



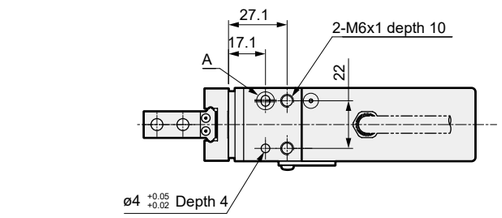
* Gripping force and pressing rate are guidelines. Even with the same pushing rate, errors will occur with the actual numbers due to differences in power supply voltage, individual differences in motors, and variations in mechanical efficiency.
* Speed during gripping operation is 15mm/s. (L=20)

Option weight (*6) (g)

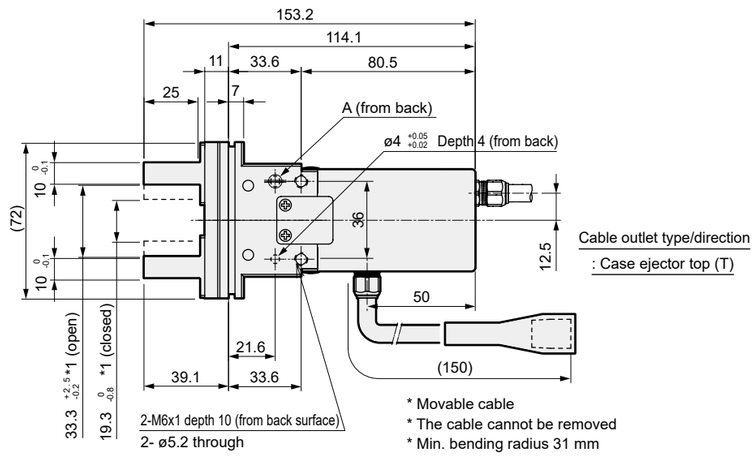
Option	Stroke 14	Stroke 22
Rubber Cover	+20	-
Case outlet	+100	+100

Outline Dimension Drawing

● FLSH-25GH114NC3-L/R/T * (stroke: 14 mm, rubber cover: None, Finger: through hole, Cable outlet type/direction: Case outlet)

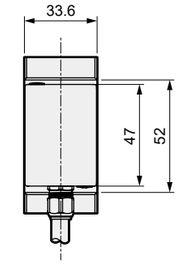


Cable outlet type/direction: Case outlet left side (L)



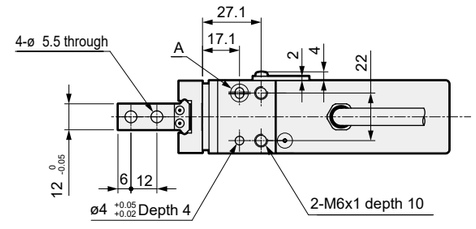
*1 Including the zero point return distance

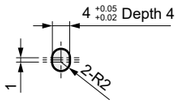
Cable outlet type/direction : Case ejector top (T)



* Movable cable
* The cable cannot be removed
* Min. bending radius 31 mm

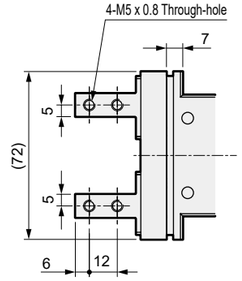
Cable outlet type/direction: Case outlet right side (R)



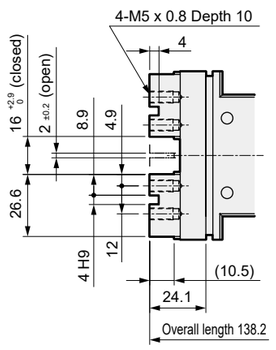


A Elongated Hole Dimensions

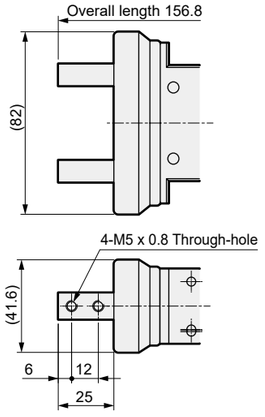
●Finger: Side tap (2)



●Finger: Flat (4)

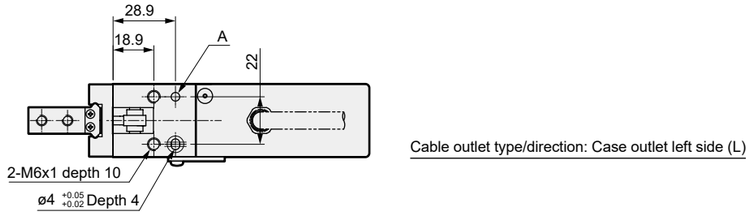


●Rubber cover(G/F)
Finger: Basic(N)

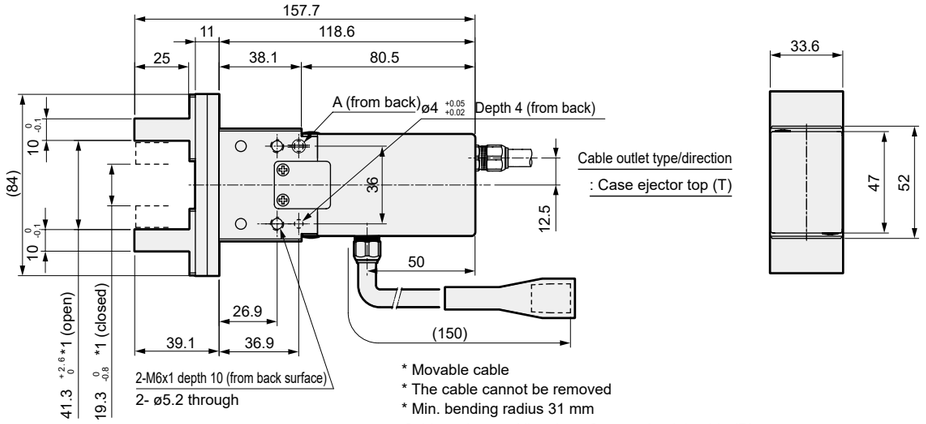


Outline Dimension Drawing

● FLSH-25GH122NCN-L/R/T * (stroke: 22 mm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Case outlet)



Cable outlet type/direction: Case outlet left side (L)

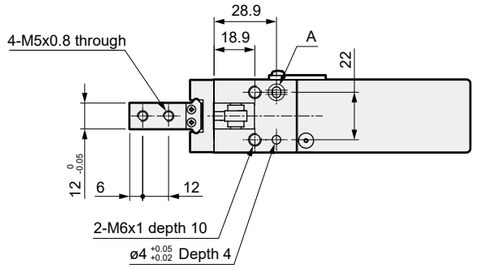


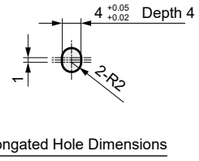
Cable outlet type/direction
: Case ejector top (T)

* Movable cable
* The cable cannot be removed
* Min. bending radius 31 mm

Cable outlet type/direction: Case outlet right side (R)

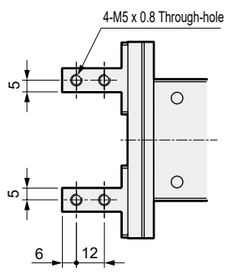
*1 Including the zero point return distance



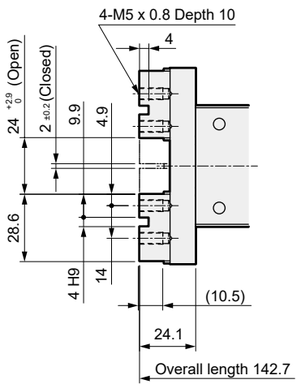


A Elongated Hole Dimensions

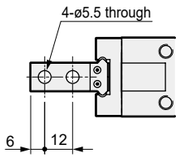
●Finger: Side tap (2)



●Finger: Flat (4)

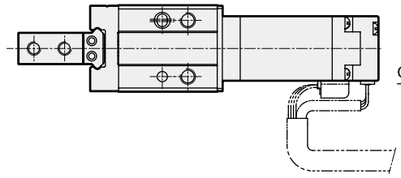


●Finger: Through hole (3)

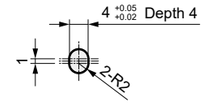


Outline Dimension Drawing

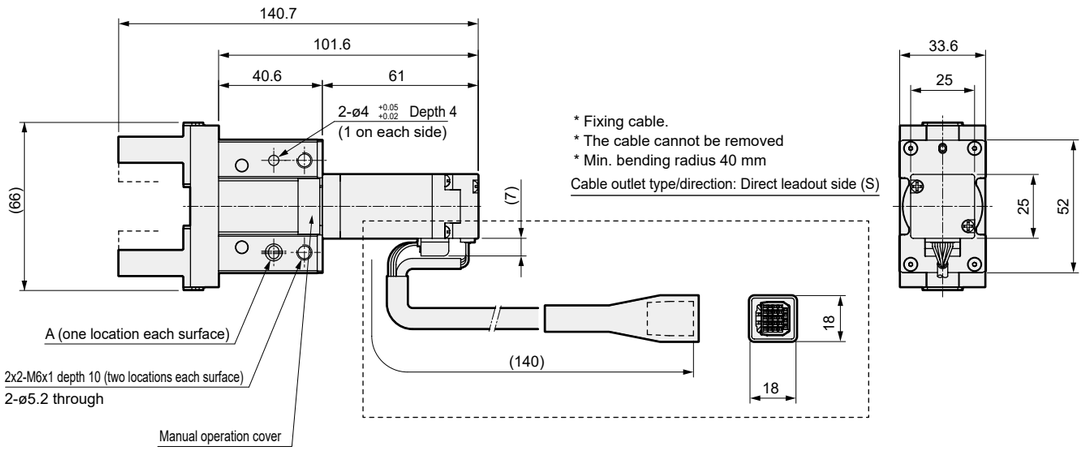
● FLSH-25GH114NCN-F/S * (stroke: 14 mm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Direct outlet)



Cable outlet type/direction: Direct outlet front (F)



A Elongated Hole Dimensions



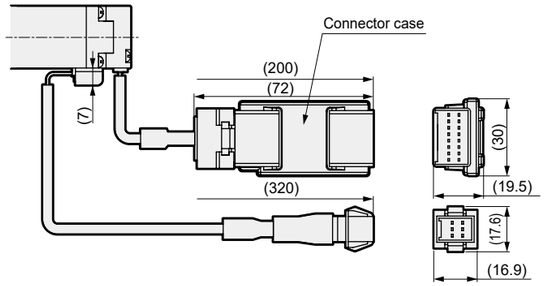
* Fixing cable.
* The cable cannot be removed
* Min. bending radius 40 mm

Cable outlet type/direction: Direct leadout side (S)

●Finger: Flat (4)

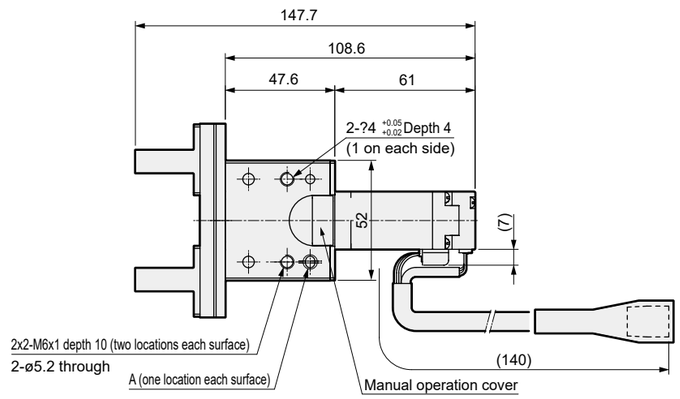
●Rubber cover (G/F)
Finger: Basic (N)

When an ECR * is connected, the dotted line area is as shown below.

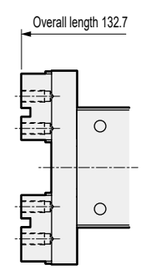


* The external shape of the finger is the same as the case outlet.

● FLSH-25GH122NCN-F/S * (stroke: 22 mm, rubber cover: None, Finger: Basic type, Cable outlet type/direction: Direct outlet)



● Finger: Flat (4)



* The external shape of the finger is the same as the case outlet.

STEP1 Calculation of Required Gripping Force

Calculate the gripping force required to transport the workpiece (weight WL) based on the following.

$$F_w > \frac{W_L x g x K}{n}$$

F_w : Required gripping force (N)
n : Number of Small Fingers = 2
W_L: Workpiece weight [kg]
g : Gravitational acceleration = 9.8 (m/s²)
K : Conveyance Factor
5 [holding only]
10 [normal transport]
20 [suddenly accelerated transport]

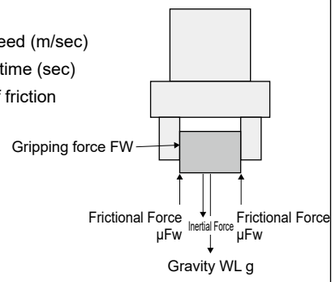
About Conveyance Factor K

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

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

V: Transport speed (m/sec)
t: Deceleration time (sec)
μ: Coefficient of friction

- Inertial force = $W_L x (V/t)$
- Gravity = $W_L g$
- Required gripping force $F_W > \frac{WLx(V/t)+W_Lg}{n\mu} = \frac{W_Lx(V/t+g)}{n\mu} = \frac{17.3\ W_L}{2 \times 0.1} = 86.5\ W_L$



∴ The transport coefficient K at this time is, from the above formula

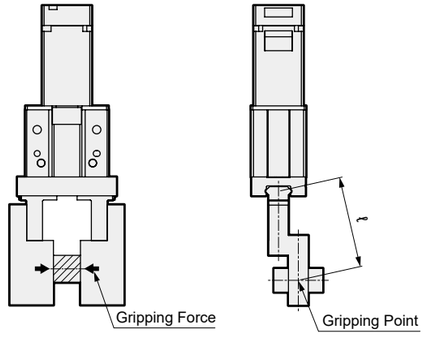
$$\frac{W_L x g x K}{n} = 86.5\ W_L$$

$$K = \frac{n \times 86.5}{g} = \frac{2 \times 86.5}{9.8} \approx 20$$

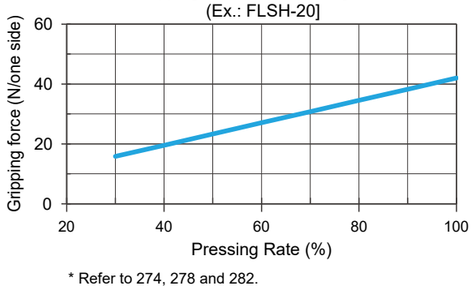
Note) The transport coefficient K needs to allow a margin for impacts during transport, etc. Even if the friction coefficient μ is higher than μ=0.1, set the conveyance factor K to 10 to 20 or more for safety.

STEP2 Provisional selection of model from gripping force graph

Confirm the conditions on the right and provisionally select a model from the gripping force graph. The gripping force changes depending on the gripping point distance ℓ and the pushing rate. Please confirm that sufficient gripping force can be obtained under your conditions of use from the graph.

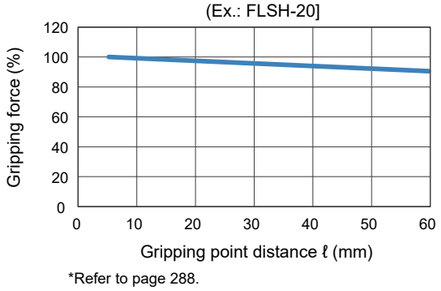


Gripping Force and Pushing Rate
(Ex.: FLSH-20)



* Refer to 274, 278 and 282.

Gripping force and gripping point distance
(Ex.: FLSH-20)

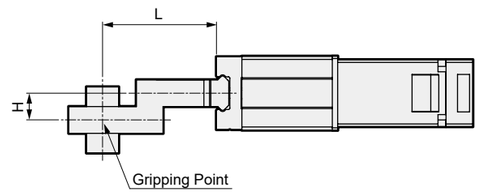


*Refer to page 288.

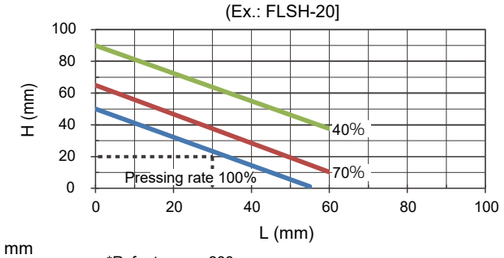
STEP3 Confirmation of Attachment Shape

Please use the gripping point distance within the range of the graph on the right.

Ex) L: 30mm H: 20 mm



Gripping Point Distance and Pushing Rate
(Ex.: FLSH-20]



When FLSH-20 is selected, L: 30 mm, H: The intersection of 20 mm is inside the line with a pressing rate of 100%, so it can be used.

*Refer to page 288.

●Use attachments as short and lightweight as possible.
If they are long and heavy, the inertial force during opening and closing becomes large, which may cause backlash in the fingers or accelerate wear of the finger sliding parts, adversely affecting the service life.
●Minimizing the attachment shape as much as possible within the performance data enables the product to be used for a longer time.
●The weight of the attachment affects the service life, so check that the weight is less than the following value.
W < 1/4h (1 pc.) W: Weight of attachment
h: Product Weight-Finger Gripper

STEP4 Confirmation of External Force on Fingers

If external force is applied to the fingers, please use within the limits of [Table 1].

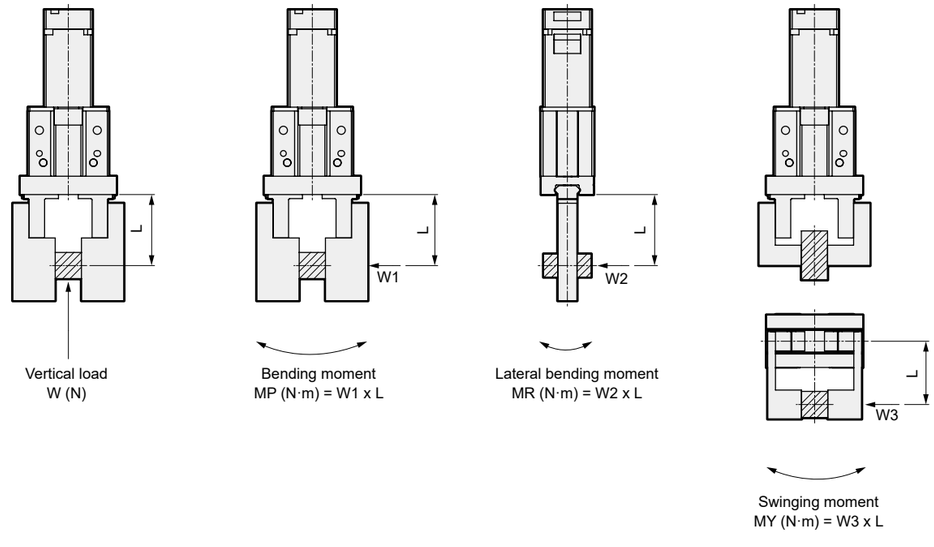


Table 1 Static allowable moment

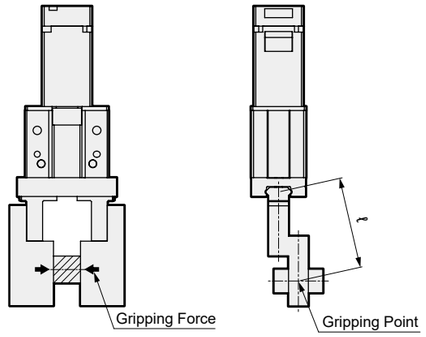
Size	Vertical load Wmax (N)	Bending moment MPmax (N·m)	Lateral bending moment MRmax (N·m)	Swinging moment MYmax (N·m)
FLSH-16	98	0.68	1.36	0.68
FLSH-20	147	1.32	2.65	1.32
FLSH-25	255	1.94	3.88	1.94

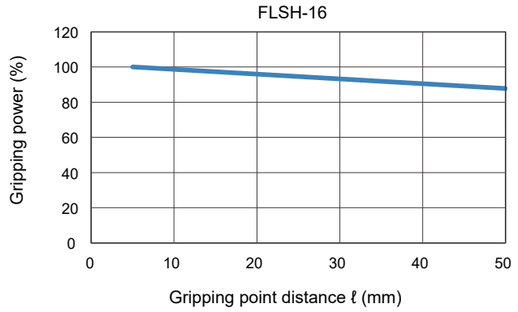
Calculation example)
Model No.: FLSH-20, L: 40 mm when a load W1: 30N is applied
$MP = 30 \times 40 \times 10^{-3} = 1.2\ N{\cdot}m < MPmax = 1.32\ N{\cdot}m$

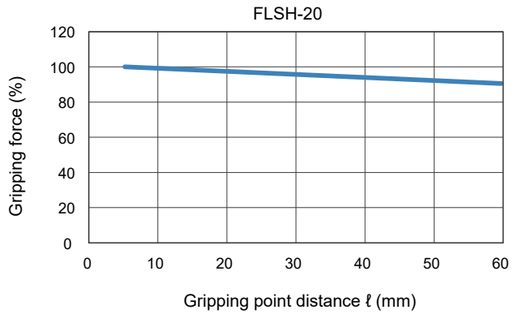
Gripping force and gripping point distance

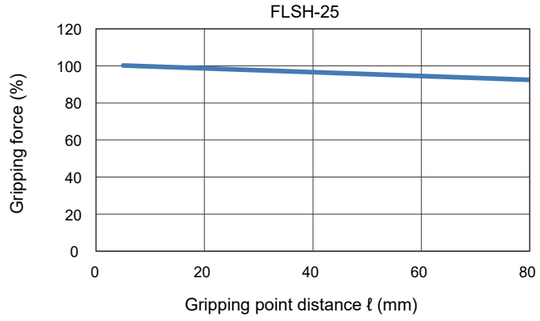
Indicates the gripping force at the gripping point distance ℓ.

Calculated as $\ell = \sqrt{L^2 + H^2}$.

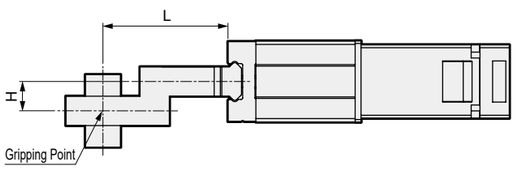


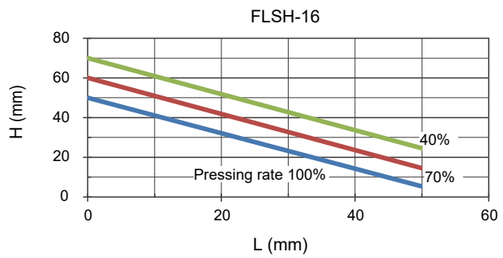


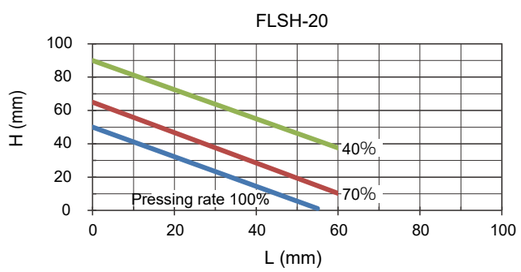


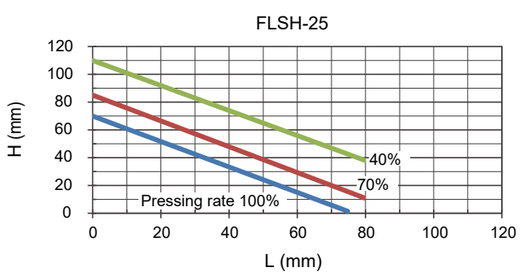


Gripping Point Distance and Pushing Rate









Maintenance Parts

■Maintenance parts (rubber cover)

	Model No. 	Applicable Models
Chloroprene rubber	FLSH-16G-06-COVER-G	FLSH-16GH106
	FLSH-20G-10-COVER-G	FLSH-20GH110
	FLSH-25G-14-COVER-G	FLSH-25GH114
	FLSH-16G-12-COVER-G	FLSH-16GH112
	FLSH-20G-18-COVER-G	FLSH-20GH118
Fluoro Rubber	FLSH-16G-06-COVER-F	FLSH-16GH106
	FLSH-20G-10-COVER-F	FLSH-20GH110
	FLSH-25G-14-COVER-F	FLSH-25GH114
	FLSH-16G-12-COVER-F	FLSH-16GH112
	FLSH-20G-18-COVER-F	FLSH-20GH118

To Use This Product Safely

Be sure to read this before use.
Refer to Intro 17 for general information on electric actuators.

Individual Precautions: Electric actuator FLSH Series

During Design / Selection

1. Common

DANGER

■ Do not use in places where dangerous goods such as ignitable substances, inflammable substances or explosives are present.
There is a risk of ignition, fire, or explosion.

■ Ensure that the product is free of water droplets and oil droplets.
This can cause fire or malfunction.

■ When mounting the product, be sure to securely hold and fix (including the workpiece) it.
There is a risk of injury due to the product tipping over, falling, malfunctioning, etc. As a general rule, please fix the product using all mounting holes.

Warning

■ Use within the product's specified operating range.

■ Provide a safety fence to prevent entry to the movable range of the electric actuator. In addition, install the emergency stop button switch as a device in a location which is easy to operate in an emergency situation. The emergency stop push button must have a structure and wiring that does not automatically reset and cannot be carelessly reset by a person.

■ If the moving workpiece poses a possible risk to personnel or if fingers could be caught, take safety measures.

■ It may take several seconds to complete an emergency stop, depending on the travel speed and load.

■ If the machine stops in the event of a system failure such as emergency stop or power outage, equipment damage or injury do not occur. Design a safety circuit or device.

■ Install indoors with low humidity.
In places where it is exposed to rainwater or in humid places (humidity of 85% or more, places with condensation), there is a risk of electric leakage or fire. Oil drops and oil mist are also strictly prohibited. Use in such an environment will cause damage and malfunction.

■ Make sure that the product is D type grounded (ground resistance of 100 Ω or less).
If an electric leakage occurs, there is a risk of electric shock or malfunction.

■ Use and store in accordance with the working/storage temperatures and where there is no condensation.
(Storage Temperature: -10°C to 50°C, Storage Humidity: 35% to 80%, Operating Temperature: 0°C to 40°C, Operating Humidity: 35% to 80%) It may cause abnormal shutdown of the product or decrease its service life. Ventilate if heat builds up.

■ Do not use this product in a location where the ambient temperature could suddenly change and cause dew to condense.

■ Install in a location free from direct sunlight, dust, and corrosive gas/explosive gas/inflammable gas/combustibles, and away from heat sources. In addition, this product has not been considered for chemical resistance.
This can cause malfunction, explosion, or fire.

■ Use and store in locations free from strong electromagnetic waves, ultraviolet rays, or radiation.
This can cause malfunction or failure.

■ Take possibility of power source breakdown into consideration.
Take measures to ensure that even if a failure occurs in the power source, it does not cause injury or damage to people or equipment.

■ Take the operational status into consideration if the machine is reactivated after emergency or abnormal stops.
Design it so that restarting does not cause harm to people or equipment. Also, if it is necessary to reset the electric actuator to the starting position, design a safe control device. Consider the possibility of failure of the installed motor. Take measures to ensure that even if a failure occurs in the power source, it does not cause harm to people or equipment.

■ Avoid using this product where vibration and impact are present.

■ Do not apply a load to the product that is greater than or equal to the allowable load listed in the materials for selection.

■ The gripping force may decrease during a power outage or similar. Use a safe design that takes this into consideration. The gripping force may decrease during a power outage or similar, dislodging the workpiece, so be sure to incorporate a safety device to prevent injury or mechanical damage.

Caution

■ Never disassemble or modify the product.

■ The customer is responsible for the compatibility of CKD products with the customer's systems, machines and equipmentfor details.

■ ULUse an Class2 power supply unit conforming to UL1310 for the combination DC power supply.

■ Set up the wiring so as not to apply inductive noise.
Avoid places where large currents or strong magnetic fields are generated. Do not use the same wiring as the power lines for large motors other than this product. Do not use the same wiring as the inverter power supply and wiring part used for robots, etc., apply a frame ground to the power supply, and insert a filter in the output part.

■ Be sure to separate the power supply of the output of this product and the power supply of inductive loads that generate surges, such as solenoid valves and relays.
If the power supply is shared, surge current will flow into the output part, causing damage. If a separate power supply cannot be used, connect a surge absorbing element directly in parallel to all inductive loads.

■ Select a power supply which provides ample capacity based on the number of installed products. If there is not enough capacity, it may malfunction.

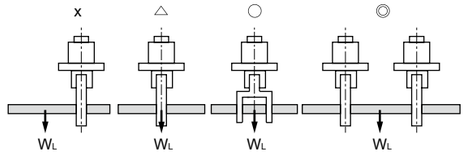
■ Fix the fixing cable so that it does not easily move, as it cannot be used in applications involvingrepeated bending. For use in locations involving repeated bending, please use a flexible cable.

■ Use a movable/fixed cable with a bending radius of 63 mm or more.
The bending radius cannot accommodate bending of the connector part, so it is recommended to fix it near the connector.

■ The origin position is recognized when the power supply is turned ON. If an external stopper or holding mechanism (brake, etc.) is attached, an unintended position may be recognized as the origin position. After turning on the power, please pay attention to the placement of external stoppers, etc., so that the home position can be reliably detected.

■ Use a cable within 10 m to connect the IF connector.

■ When gripping long or large workpieces, stable gripping requires a grip on the center of gravity. Stability is a must when using larger or multiple workpieces as well.



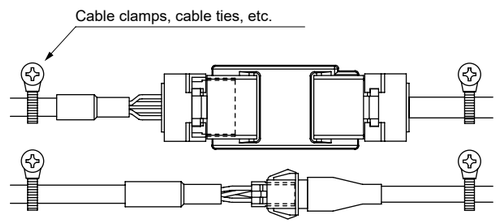
◎:Excelent, ○:Good, △: Conditional, X : Not Applicable

■ Select a model that has sufficient power to grip the workpiece weight.

■ Select a model that has sufficient opening/closing width for the workpiece size. Variations in the opening/closing width and workpieces can cause the gripping position to become unstable. When opening after gripping operation, increase the stroke by an amount corresponding to the backlash amount.

■ Do not hold the product's movable parts or cables during transportation and installation.
This can cause injury or disconnection.

■ Do not move the cable leading out of the actuator. Fix the cable part. Furthermore, use cables with a bending radius of 40mm or more.



For precautions regarding mounting, installation, adjustment, operation, and maintenance, please refer to the CKD Equipment Product Site (https: //www.ckd.co.jp/kiki/en/) → 'model No.' → Instruction Manual

FLSH Series Model Selection Checklist → CKD (Contact)

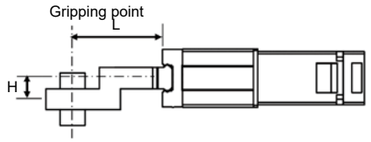
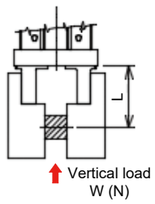
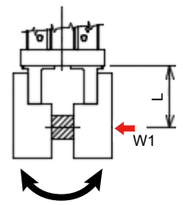
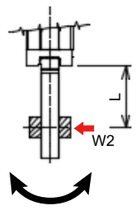
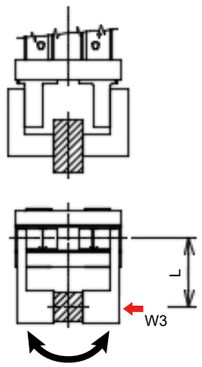
Fill in the form and send to the nearest CKD Sales Office. We will reply with the model selection results.

MEMO

Customer:

Company		Department	
Name		E-mail	
TEL		FAX	

Selection Conditions:

Desired Model	
Basic Specifications	Max. stroke length (one side): mm
Operating Conditions	Travel stroke (one side): mm, travel time: s
	Gripping force (one side): N
	Open/close speed (one side): mm/s, gripping speed: mm/s
	Repeatability: ± mm, positioning repeatability: ± mm
Load Conditions	Mounting orientation: Horizontal / Wall-mounted / Vertical/Other
	Weight of workpiece: kg, workpiece material:
	Finger quantity: Finger material:
	Finger length: H: mm L: mm 
	External force on fingers: No / Yes  (Load: N)  Bending moment (Load: N, distance: mm)  Lateral bending moment (Load: N, distance: mm)  Swinging moment (Load: N, distance: mm)
Usage Environment	Ambient Temperature: °C, ambient humidity: %
	Atmosphere:
Interface Specifications	Parallel I/O / IO-Link / CC-Link / EtherCAT / EtherNet/IP
Special Notes	

F Series
FLCR
FGRC
FLSH
FFLD
Ending