Electric Actuator with Motor Specification

DLSH

2-Finger Gripper Type

CONTENTS

DLSH System Table

Actuator Model No.	Motor Size	Spring lead (mm)	Stroke (mm) and Max. Speed (mm/s)		Max. Gripping Force (N)
			10	22	
DLSH-20	□28	4.2	63		10
DLSH-32	□42	6		60	40

Electric Actuator 2-Finger Gripper Type

DLSH-20

□28 Stepping Motor

For compatible detailed model Nos., please see our website.

Model No. Notation Method

DLSH - 20 S H4 10 N N F3PH - F R1 A 1

❶Size

20	20

❷Connected Controller *1

S	ESC4

❸Spring Lead

H4	4.2 mm

❹Stroke

10	10 mm (5 mm one side)

❺Rubber Cover

N	None

❻Finger

N	Basic type

❼Switch

NNNN	None
F3PH	F-type straight type
F3PV	F-type L-shape type

❽Connector Outlet Direction

F	Front

❾Relay Cable *2

N0	None
R1	Flexible 1 m
R3	Flexible 3 m
R5	Flexible 5 m
RX	Flexible 10 m

❿Controller Attached

N	None
A	DIN rail mounting specification
B	Panel mounting specification

⓫IO Cable Length

N	None
1	1 m
3	3 m
5	5 m
X	10 m

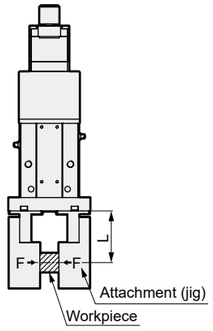
*1 For controllers, please refer to P. 611.
*2 For the external dimension drawing of the relay cable, please refer to P. 618.

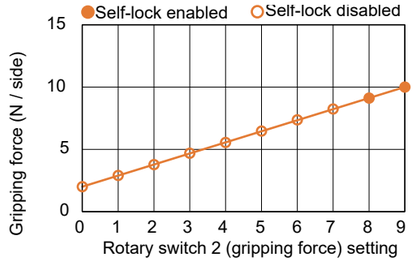
Specifications

Connected Controller	ESC4
Motor	□28 Stepping Motor
Drive Method	Cylindrical spring
Stroke mm	10 (one side 5)
Effective Pushing Range mm	5 (one side 2.5)
Max. Gripping Force *1 N	10 (per side)
Static Allowable Moment N·m	MP=2.1, MY=2.1, MR=2.1
Operating Speed Range mm/s	11 to 60
Max. Acceleration/Deceleration mm/s²	1371 (setting 9)
Gripping Speed Range mm/s	11 to 60
Repeatability *2 mm	±0.02
Insulation Resistance	10 MΩ, 500 VDC
Withstanding Voltage	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
Weight g	600

*1 Gripping is only possible in the closing direction. Performing a gripping operation in the opening direction may lead to damage to the internal parts of the actuator.
*2 Repeatability indicates the variation when the same workpiece is repeatedly gripped under the same operating conditions.

Gripping force and rotary switch setting

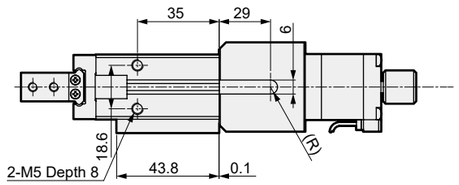


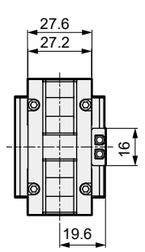


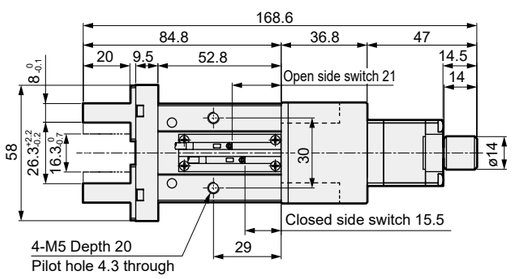
*1 The gripping force is a guideline. Errors will occur due to pushing position and cylinder switch adjustment.
*2 This is for speed setting 9 (60 mm/s). (L=20)
*3 Pushing position = stroke×0.5
*4 The self-locking range is a reference value. Self-locking may not work depending on the conditions.

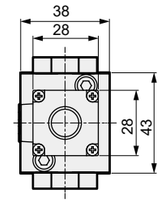
External Dimension Drawing

● DLSH-20

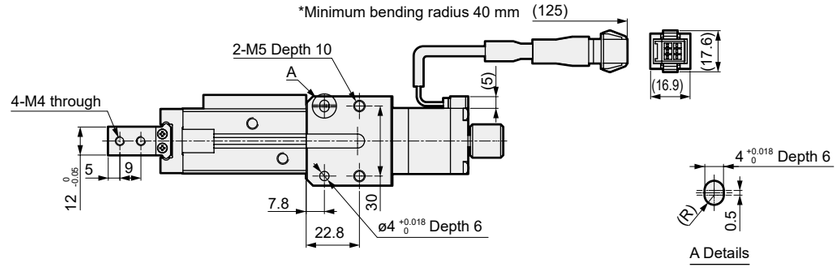








*This is a fixed cable.
*The cable cannot be removed.
*Minimum bending radius 40 mm



* When switch, F3PH (F-type straight type) is selected, the lead wire outlet direction is on the finger side. If lead wire handling is an issue, please use F3PV (F-type L-shape type).

Electric Actuator 2-Finger Gripper Type

DLSH-32

□42 Stepping Motor

For compatible detailed model Nos., please see our website.

Model No. Notation Method

DLSH - 32 S H6 22 N N F3PH - F R1 A 1

❶Size

32	32

❷Connected Controller *1

S	ESC4

❸Spring Lead

H6	6 mm

❹Stroke

22	22 mm (11 mm one side)

❺Rubber Cover

N	None

❻Finger

N	Basic type

❼Switch

NNNN	None
F3PH	F-type straight type
F3PV	F-type L-shape type

❽Connector Outlet Direction

F	Front

❾Relay Cable*2

N0	None
R1	Flexible 1 m
R3	Flexible 3 m
R5	Flexible 5 m
RX	Flexible 10 m

❿Controller Attached

N	None
A	DIN rail mounting specification
B	Panel mounting specification

⓫IO Cable Length

N	None
1	1 m
3	3 m
5	5 m
X	10 m

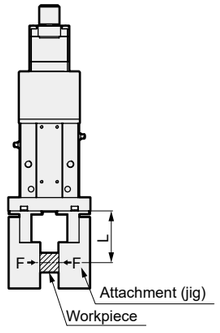
*1 For controllers, please refer to P. 611.
*2 For the external dimension drawing of the relay cable, please refer to P. 618.

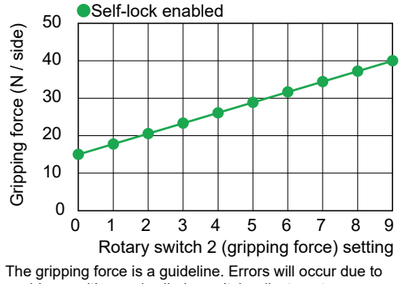
Specifications

Connected Controller	ESC4
Motor	□42 Stepping Motor
Drive Method	Cylindrical spring
Stroke mm	22 (one side 11)
Effective Pushing Range mm	11 (one side 5.5)
Max. Gripping Force *1 N	40 (per side)
Static Allowable Moment N·m	MP=4.5, MY=4.5, MR=4.5
Operating Speed Range mm/s	15 to 63
Max. Acceleration/Deceleration mm/s²	840 (setting 9)
Gripping Speed Range mm/s	15 to 63
Repeatability *2 mm	±0.02
Insulation Resistance	10 MΩ, 500 VDC
Withstanding Voltage	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
Weight g	1950

*1 Gripping is only possible in the closing direction. Performing a gripping operation in the opening direction may lead to damage to the internal parts of the actuator.
*2 Repeatability indicates the variation when the same workpiece is repeatedly gripped under the same operating conditions.

Gripping force and rotary switch setting

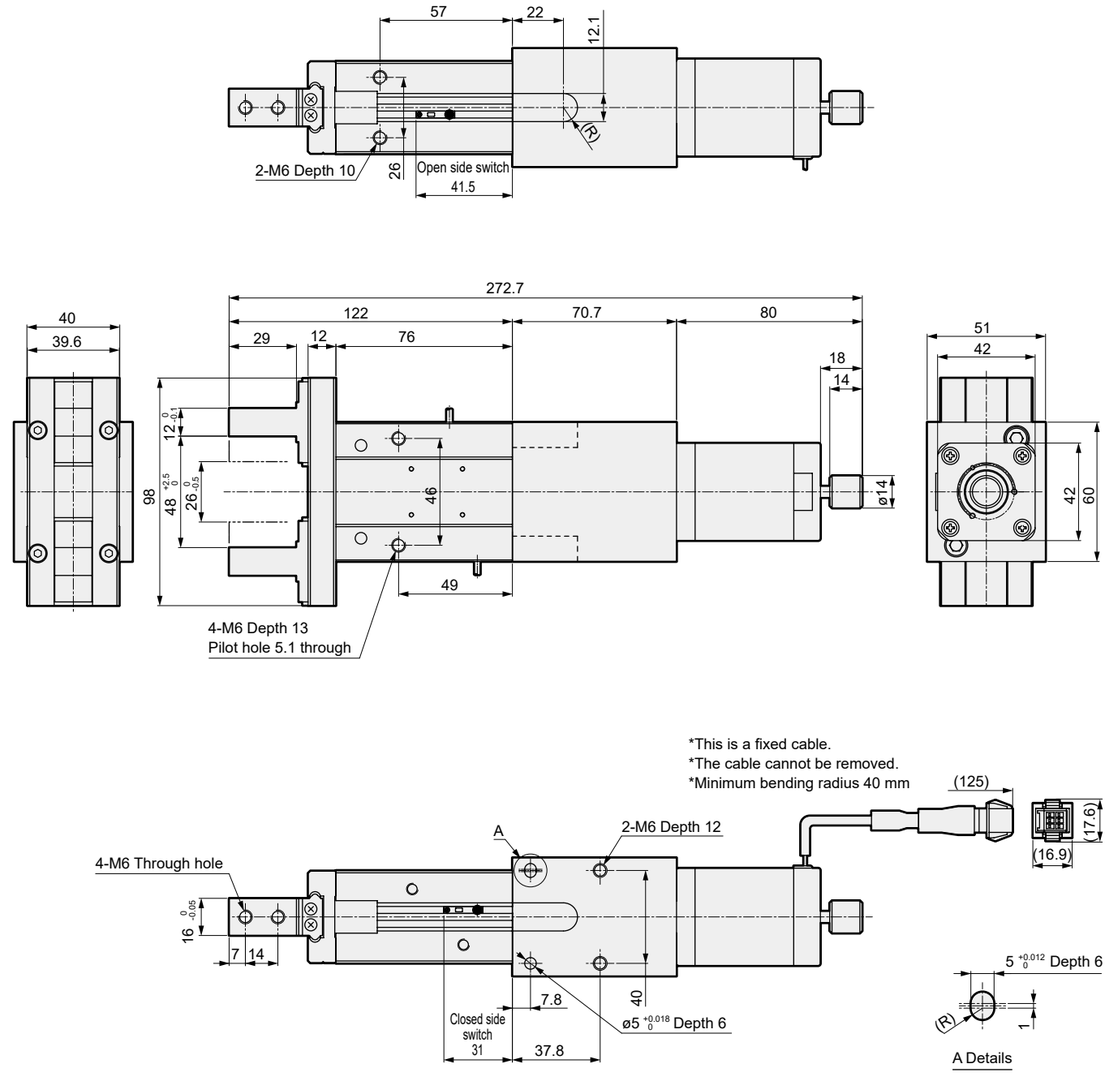




*1 The gripping force is a guideline. Errors will occur due to pushing position and cylinder switch adjustment.
*2 This is for speed setting 9 (63 mm/s). (L=20)
*3 Pushing position = stroke×0.5
*4 The self-locking range is a reference value. Self-locking may not work depending on the conditions.

External Dimension Drawing

● DLSH-32



STEP1 Calculation of Required Gripping Force

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

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

FW: Required gripping force (N)
n: Number of attachments = 2
WL: Workpiece weight (kg)
g: Gravitational acceleration = 9.8 (m/s²)
K: Transport coefficient
5 [Holding only]
10 [Normal transport]
20 [Rapid acceleration transport]

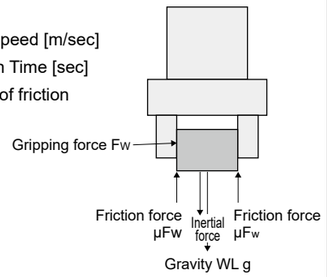
About Transport Coefficient K

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



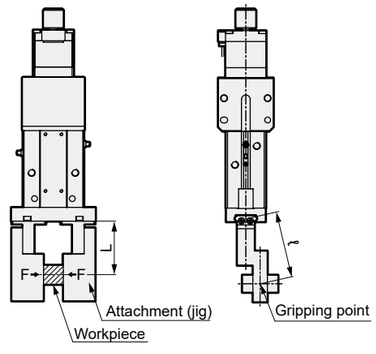
∴ The transport coefficient K at this time is, from the above formula $\dfrac{W_L \times g \times K}{n} = 86.5\ WL$

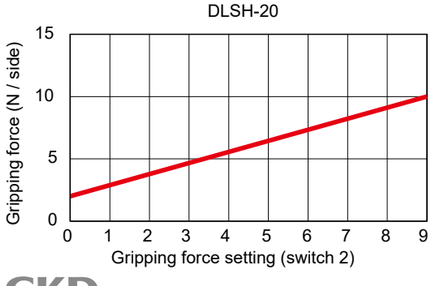
$$K = \frac{n \times 86.5}{g} = \frac{2 \times 86.5}{9.8} \approx 20$$

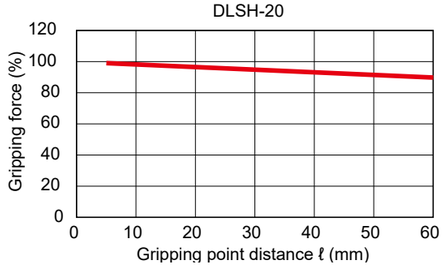
Note) The transport coefficient K needs to allow a margin for impacts during transport, etc. Even if the friction coefficient μ is higher than μ=0.1, for safety, please set the transport coefficient K to 10 to 20 or more.

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 gripping force setting. Please confirm that sufficient gripping force can be obtained under your conditions of use from the graph.



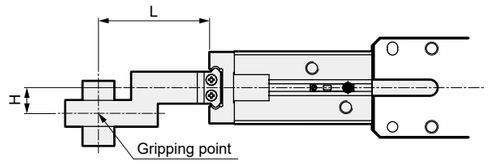


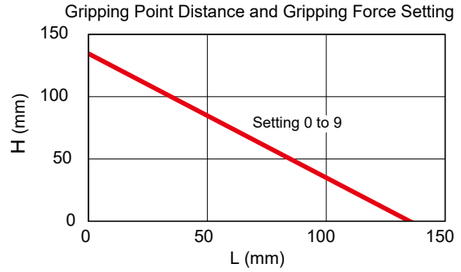


STEP3 Confirmation of Attachment Shape

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

Ex) L: 30 mm H: 20 mm





When DLSH-20 is selected, L: 30 mm, H: 20 mm intersection point of is inside the line of gripping force setting 0 to 9, so it can be used.

Please refer to P. 506.

● Please use attachments that are as light and short as possible. If they are long and heavy, the inertial force during opening and closing will be large, which may cause play in the fingers or accelerate wear on the finger sliding parts, adversely affecting the service life.
- Even if the attachment shape is within the performance data, making it as small as possible will allow the product to be used for a long time.
- The weight of the attachments affects the service life, so please keep it below the following.
  W < 1/4H (1 piece) 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].

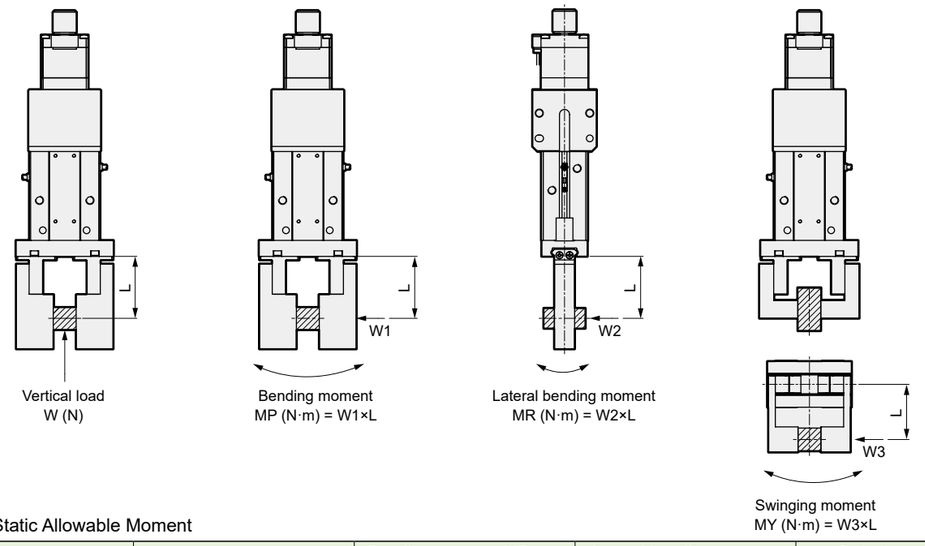


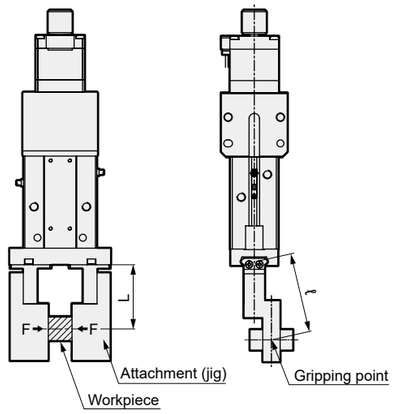
Table 1 Static Allowable Moment

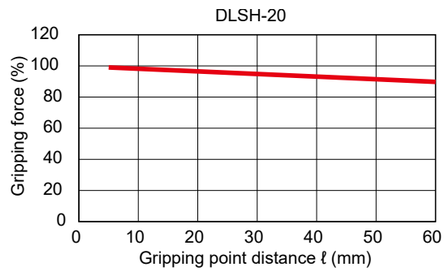
Size	Vertical Load Wmax (N)	Bending moment MPmax (N·m)	Lateral bending moment MRmax (N·m)	Swinging moment MYmax (N·m)
DLSH20	265	2.1	2.1 (40)	2.1
DLSH32	490	4.5	4.5 (90)	4.5

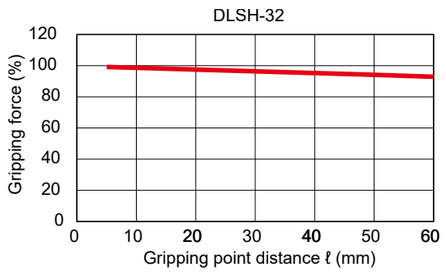
When multiple external forces are applied, the condition is that the resultant of the external forces (formula below) is less than 1.
WT = W/Wmax+MP/MPmax+MR/MRmax+MY/MYmax < 1
The lateral bending moment can also be used below (), but in that case, please use L and H dimensions that are 2/3 or less of the length specified on P. 506.
Calculation example)
Model No.: DLSH-20, L: 40 mm when a load W1: 30N is applied
MP = $30 \times 40 \times 10^{-3}$ = 1.2 N·m < MPmax = 2.1 N·m

Gripping force and gripping point distance

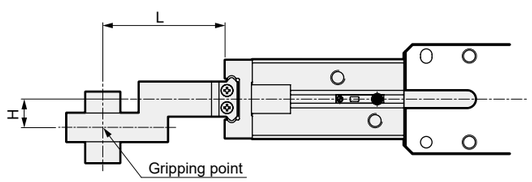
Indicates the gripping force at the gripping point distance ℓ.

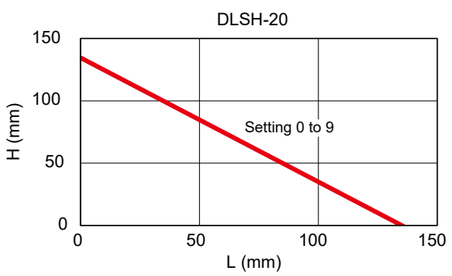


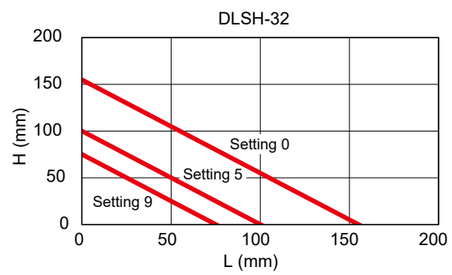




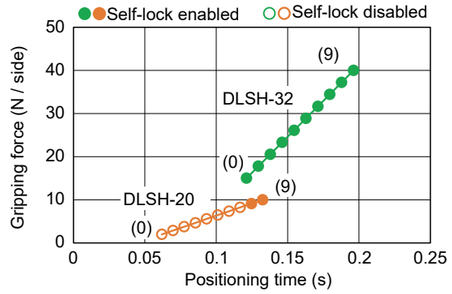
Gripping Point Distance and Gripping Force Setting







Positioning Time during Pushing Operation

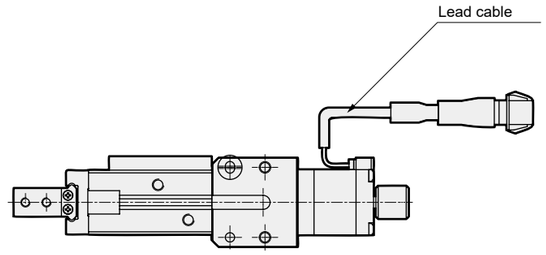


*1 ( ): Rotary switch 2 (gripping force) setting.
*2 The self-locking range is a reference value. Self-locking may not work depending on the conditions.
*3 The gripping force is a guideline. Errors will occur due to pushing position and cylinder switch adjustment.
*4 This is for when pushing position = center of stroke, and rotary switch 1 (speed) setting = 9.
*5 Positioning time is the time from when the motor starts rotating until it stops.

Special Order Product*

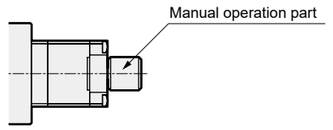
● Change of cable outlet direction

It is possible to change the outlet direction of the lead cable coming out of the motor.



● Add cover to manual operation part

A rubber cover can be included to the manual operation part at the rear of the motor.



*For details on special order products, please contact our sales office.