CKD

DMSDG/DLSH/DCKW Series Electric Actuator

Compact Guided Type/Gripper 2-Finger Type/Gripper 3-Finger Type

INSTRUCTION MANUAL

Read this Instruction Manual before using the product.
In particular, read the safety notes carefully.
Keep this Instruction Manual safe for use at any time.

2025-10-03 SM-A69064-A/6

PREFACE

Thank you for purchasing CKD's "D-Series spring drive type" electric actuator.

This Instruction Manual describes basic matters related to the operation of this product in order to fully demonstrate its performance. 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.

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.
Ensure to observe organization’s standards, laws and regulations etc. for safety related to design and management of the equipment.
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.
Various safety measures have been taken for the product, but handling that is not described in this Instruction Manual may cause an accident. 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.

<Warning symbol type>

	A general purpose mark indicating prohibited (not allowed) actions.		A mark that prohibits touching equipment.
	A mark that prohibits the act of putting a finger.		A general purpose mark indicating the danger such as electric shock and burn.
	A mark indicating the danger that occurs when an automatic equipment is started.		A general purpose mark indicating what you must do.
	A mark instructing you to carefully read the Instruction Manual.		A mark instructing the connection of the ground wire.

In addition, the following icons indicate general precautions, usage tips, technical information and glossary.

- Contains useful information such as general precautions, supplementary information, and reference information.

- Contains detailed information and tips on how to use it in a practical way.

- Contains technical information and glossary that you should know when using the function.

Precautions on Product Use

DANGER

Do not use this 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

Never modify or implement additional processing to the product.

- Modification or additional processing may not only pose a risk of fire or electric shock, but may not satisfy the specifications described in this Instruction Manual.

Never handle the product, install or remove the equipment until safety is confirmed.

- Check and maintain the machinery and equipment only after confirming that all systems related to the product are safe. In addition, be careful not to get an electric shock by turning off the power of the device or the power of the corresponding equipment.
- Even after the operation is stopped, as there may be high-temperature parts or charging parts, carefully handle the product, and install or remove the equipment.

The product must be handled by the person who has sufficient knowledge and experience.

- This product is designed and manufactured as general industrial machinery equipment and parts, so please handle with care.

Use the product within the specifications.

- It cannot be used outside of product-specific specifications.
- Since this product is intended to use in general industrial machinery equipment and parts, it is not applicable when used in the following conditions. It will be applicable if you consult with our company at the time of its adoption and understand the specifications of our company's product. However, even in such a case, take safety measures to avoid danger in case of failure.
  - ◎ Use under conditions and environments other than those specified, and outdoor use.
  - ◎ Use in equipment and applications that come into direct contact with nuclear power, railways, aviation, ships, vehicles, medical equipment, beverages and food.
  - ◎ Use in applications requiring safety, such as recreational equipment, emergency shut off circuits, press machines, and safety measures.
  - ◎ Use in applications that are expected to have a significant impact on people and property and require special safety.

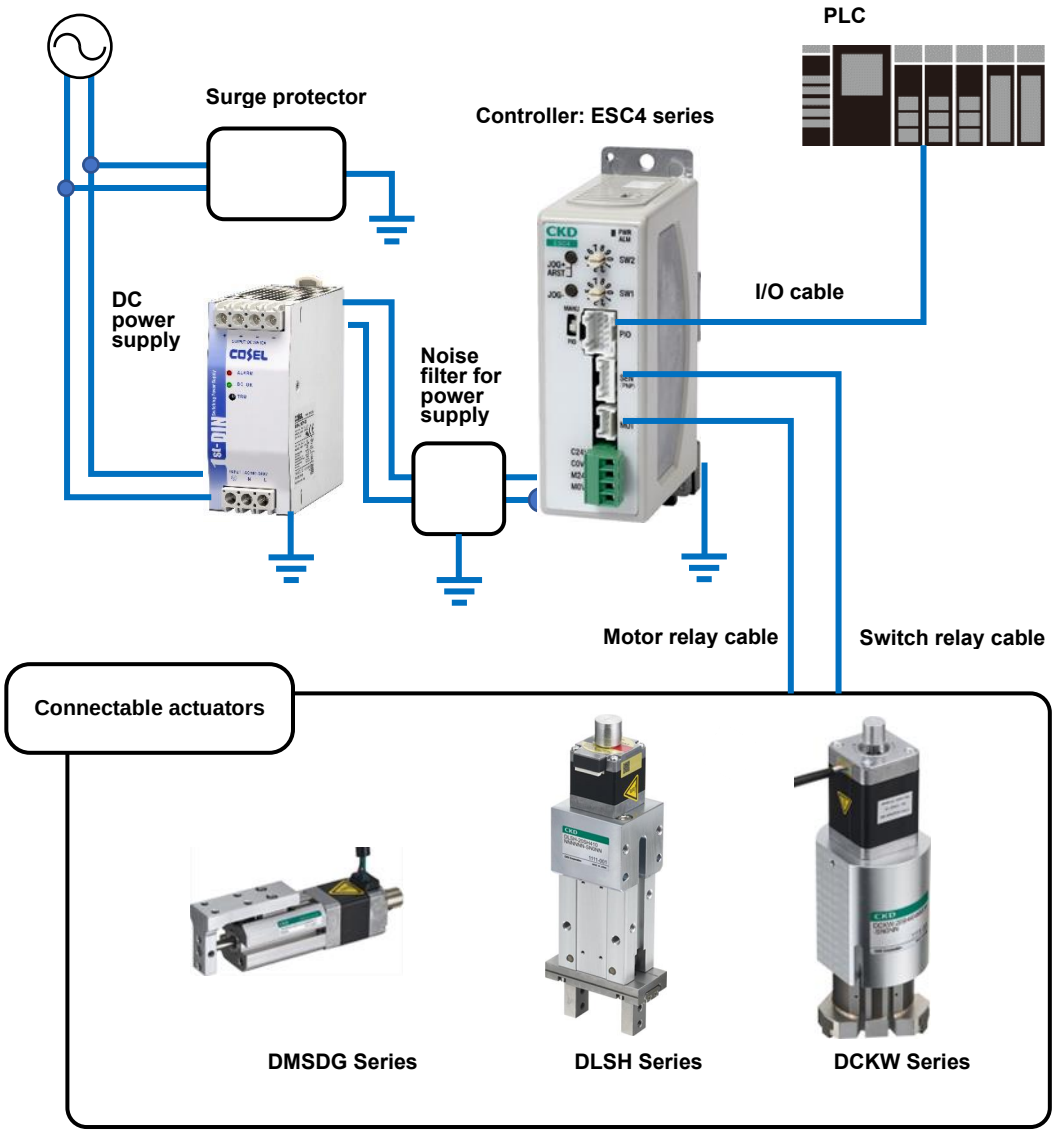
CONTENTS

1. PRODUCT OVERVIEW

1.1. System Structure

Use the DMSDG/DLSH/DCKW series by connecting it to the ESC4 series controller.

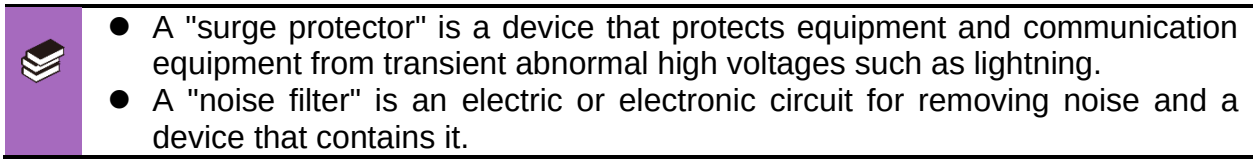
1.1.1. System Structure



※ Refer to "1.4 Model Number Indication" for the connectable actuator model number.

The following items can be purchased from us in the system configuration.

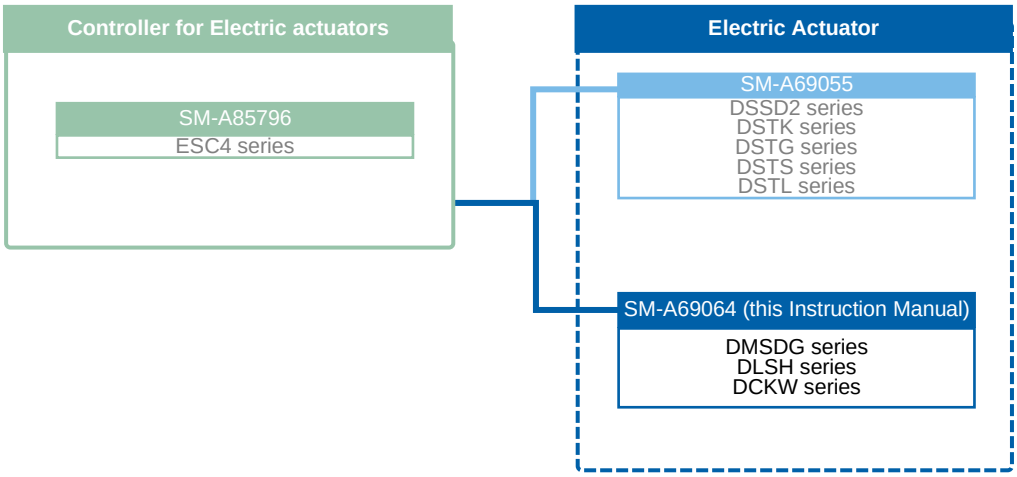
	Component	Product name/Model No.
This product	Actuator	DMSDG/DLSH/DCKW series
Accessories	Controller	ESC4 series
	Motor relay cable	ESC3-M2-R□
	Switch relay cable	ESC3-S2-R□
	Cylinder switch cable	ESC3-SW-□
	I/O cable	ESC3-NP2-□
Sold separately	Power supply connector	MC 1,5/ 4-ST-3,81 (PHOENIX CONTACT)
	24 VDC power supply	EA-PWR-KHNA240F-24
	Noise filter	AX-NSF-NF2015A-OD



- A "surge protector" is a device that protects equipment and communication equipment from transient abnormal high voltages such as lightning.
- A "noise filter" is an electric or electronic circuit for removing noise and a device that contains it.

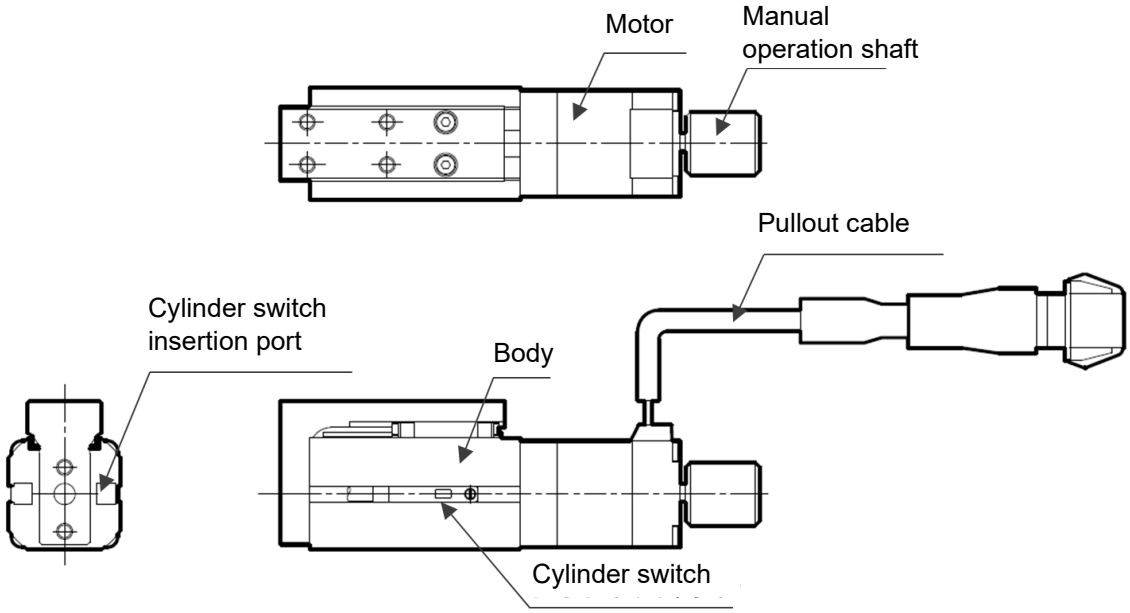
1.2. Instruction Manuals Related to This Product

This Instruction Manual is "SM-A69064-A".
The instruction manuals related to this product are as follows.

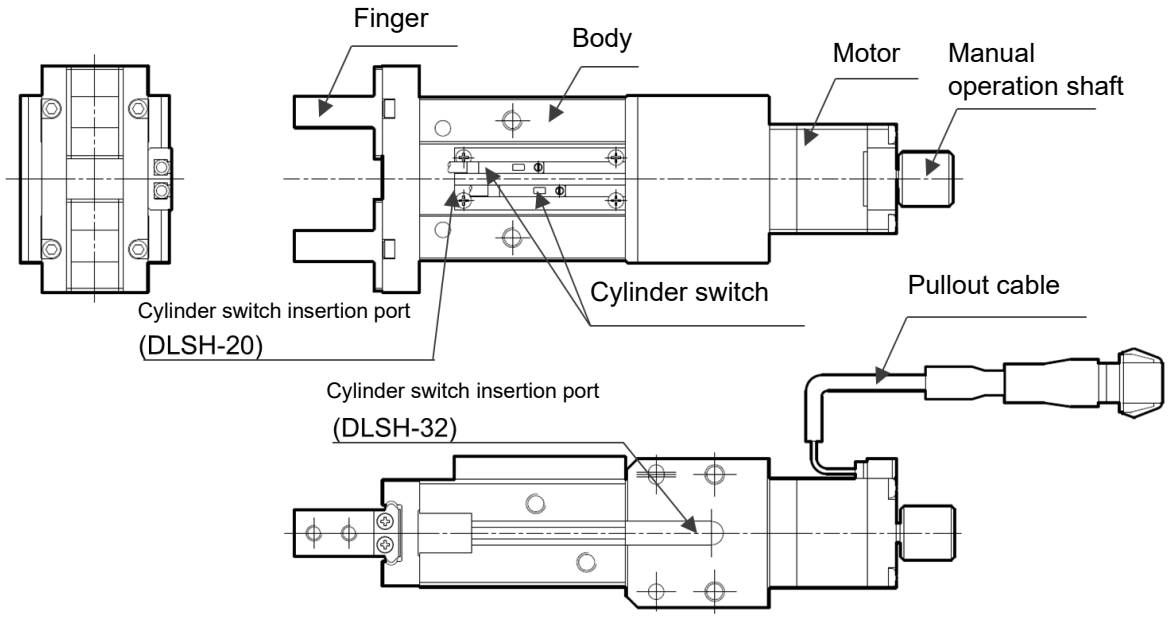


1.3. Part Name

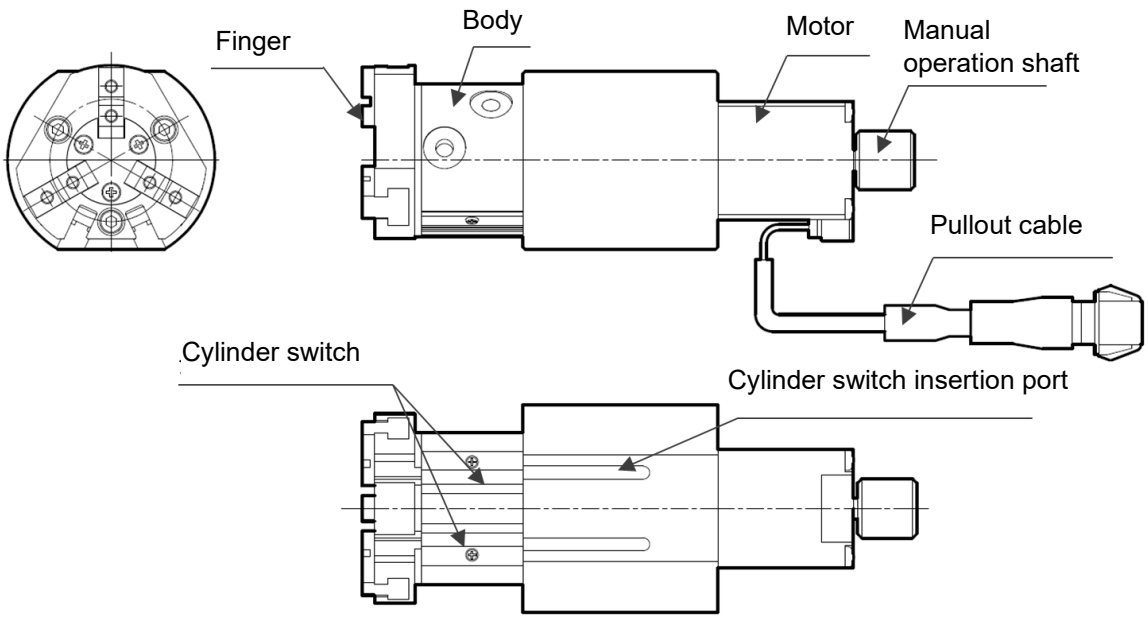
1.3.1. DMSDG series



1.3.2. DLSH series



1.3.3. DCKW series



1.4. Model Number Indication

- Use this product by connecting it to the ESC4 series controller. It does not work when connected to other controllers such as ECG-A/B and ECR series controllers.

1.4.1. DMSDG series

DMSDG - 08 S H3 10 F3PH - T R1 D 1

Size	
08	8

Applicable controller Note 1	
S	ESC4

Spring lead	
H3	3.3 mm

Stroke length	
10	10 mm
20	20 mm
30	30 mm

Switch	
NNNN	Not included
F3PH	F-type straight type
F3PV	F-type L-shaped type

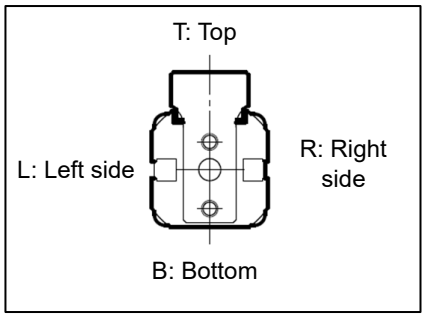
Connector take-out direction Note 2	
T	Top
B	Bottom
R	Right side
L	Left side

Relay cable Note 3	
N0	Not included
R1	Movable 1 m
R3	Movable 3 m
R5	Movable 5 m
RX	Movable 10 m

IO cable length	
N	Not included
1	1 m
3	3 m
5	5 m
X	10 m

Controller attachment Note 4	
N	Not included
A	DIN rail mounting specifications
B	Panel mounting specifications

[Fig. 1]



Note 1: Refer to the SM-A85796 instruction manual for the applicable controller.
Note 2: Refer to Fig. 1.
Note 3: Refer to “1.4.4Relay cable, cylinder switch cable”, for the external dimensions of the switch cables and relay cables.
Note 4: If you select a controller attachment method other than "N: None", the controller is provided.

DMSDG - 16 S H5 10 F3PH - T R1 D 1

Size	
16	16

Applicable controller Note 1	
S	ESC4

Spring lead	
H5	5.1 mm

Stroke length	
10	10 mm
20	20 mm
30	30 mm

Switch	
NNNN	Not included
F3PH	F-type straight type
F3PV	F-type L-shaped type

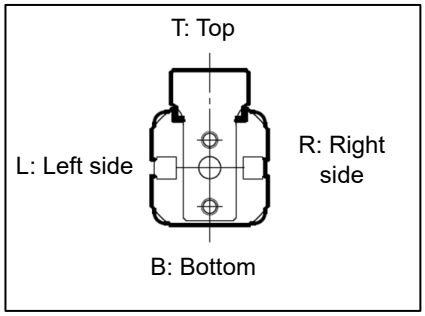
Connector take-out direction Note 2	
T	Top
B	Bottom
R	Right side
L	Left side

Relay cable Note 3	
N0	Not included
R1	Movable 1 m
R3	Movable 3 m
R5	Movable 5 m
RX	Movable 10 m

IO cable length	
N	Not included
1	1 m
3	3 m
5	5 m
X	10 m

Controller attachment Note 4	
N	Not included
A	DIN rail mounting specifications
B	Panel mounting specifications

[Fig. 1]



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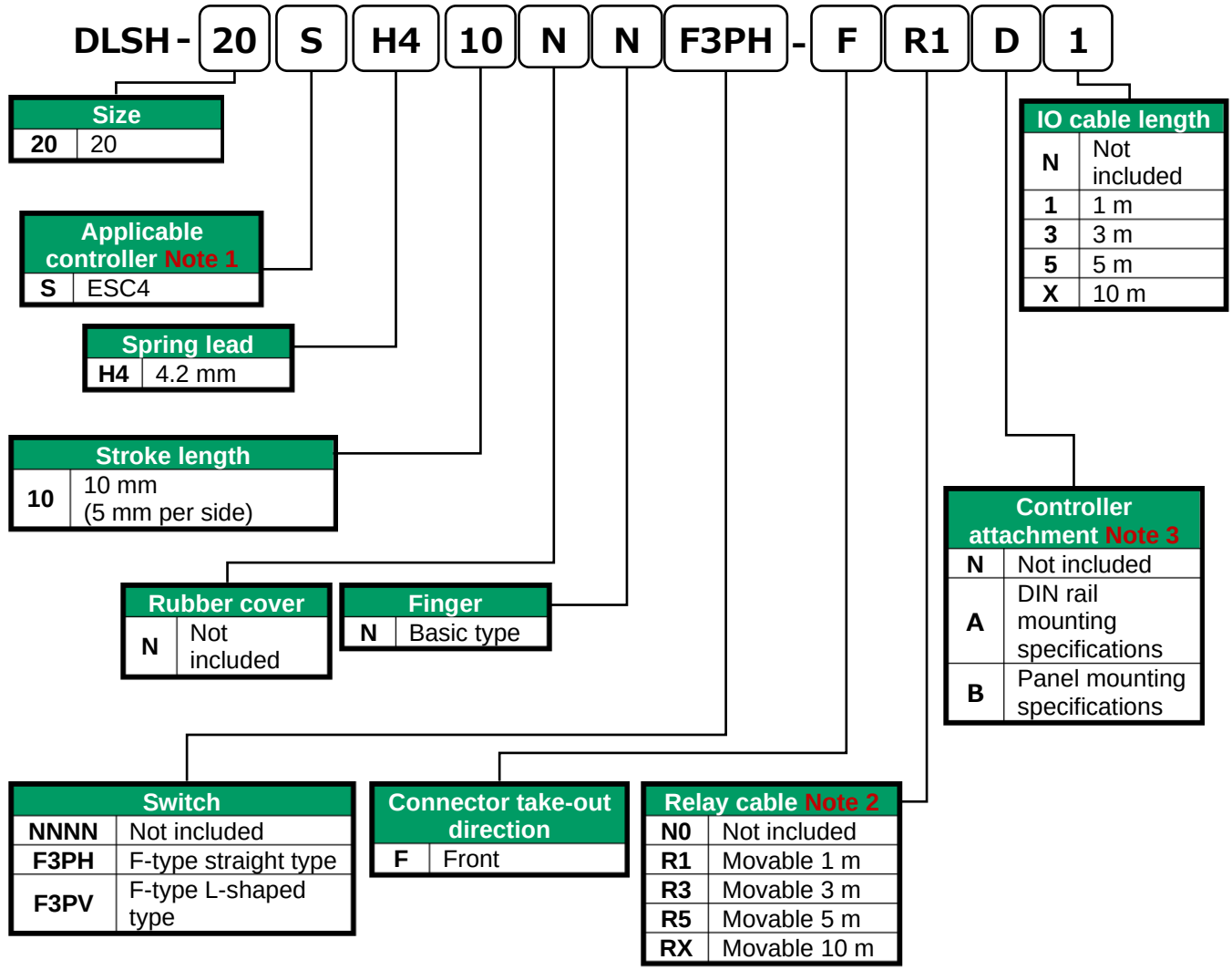
Note 2: Refer to Fig. 1.
Note 3: Refer to “1.4.4Relay cable, cylinder switch cable”, for the external dimensions of the switch cables and relay cables.
Note 4: If you select a controller attachment method other than "N: None", the controller is provided.

1.4.2. DLSH series



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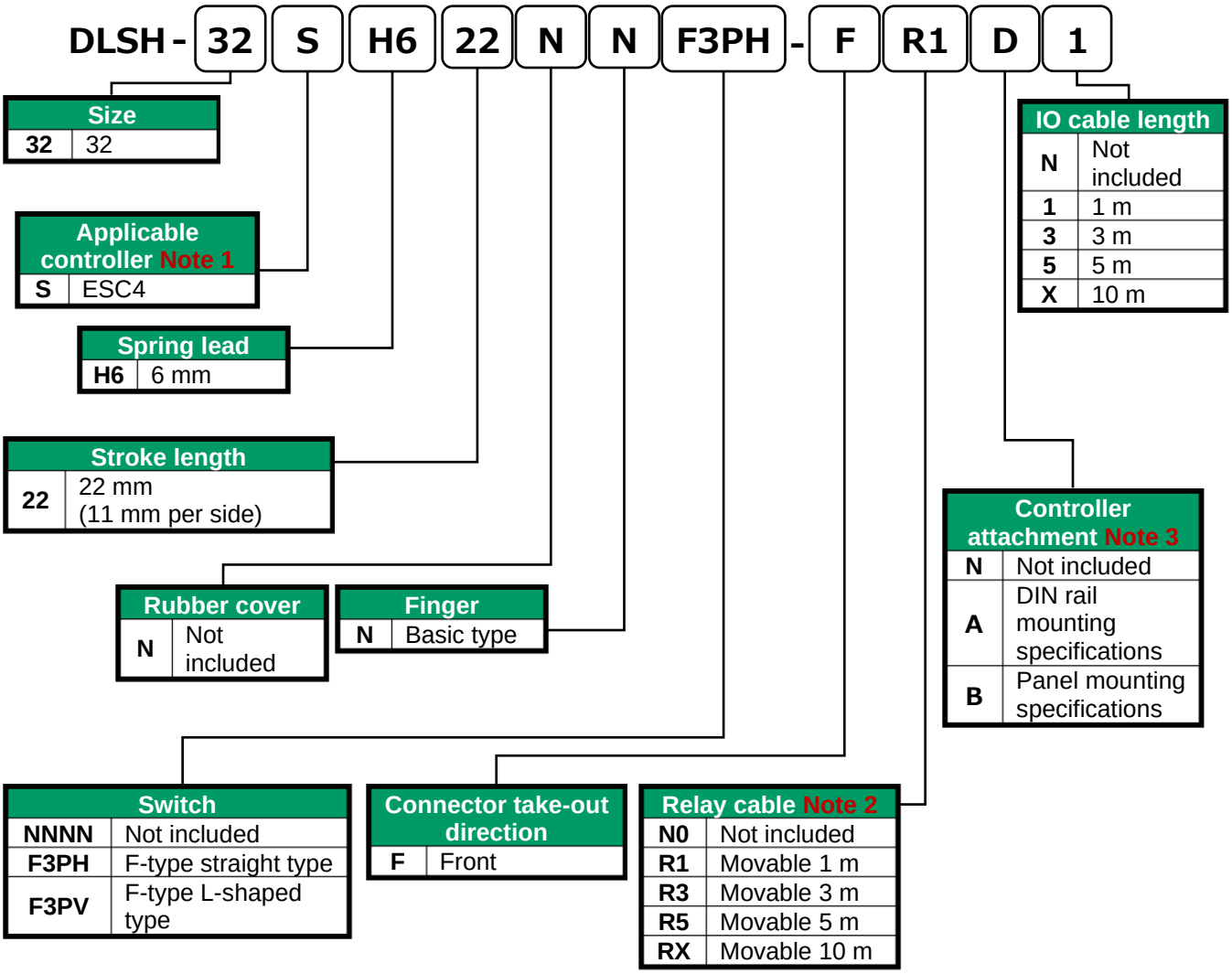
Note 2: Refer to “1.4.4Relay cable, cylinder switch cable”, for the external dimensions of the switch cables and relay cables.
Note 3: If you select a controller attachment method other than "N: None", the controller is provided.



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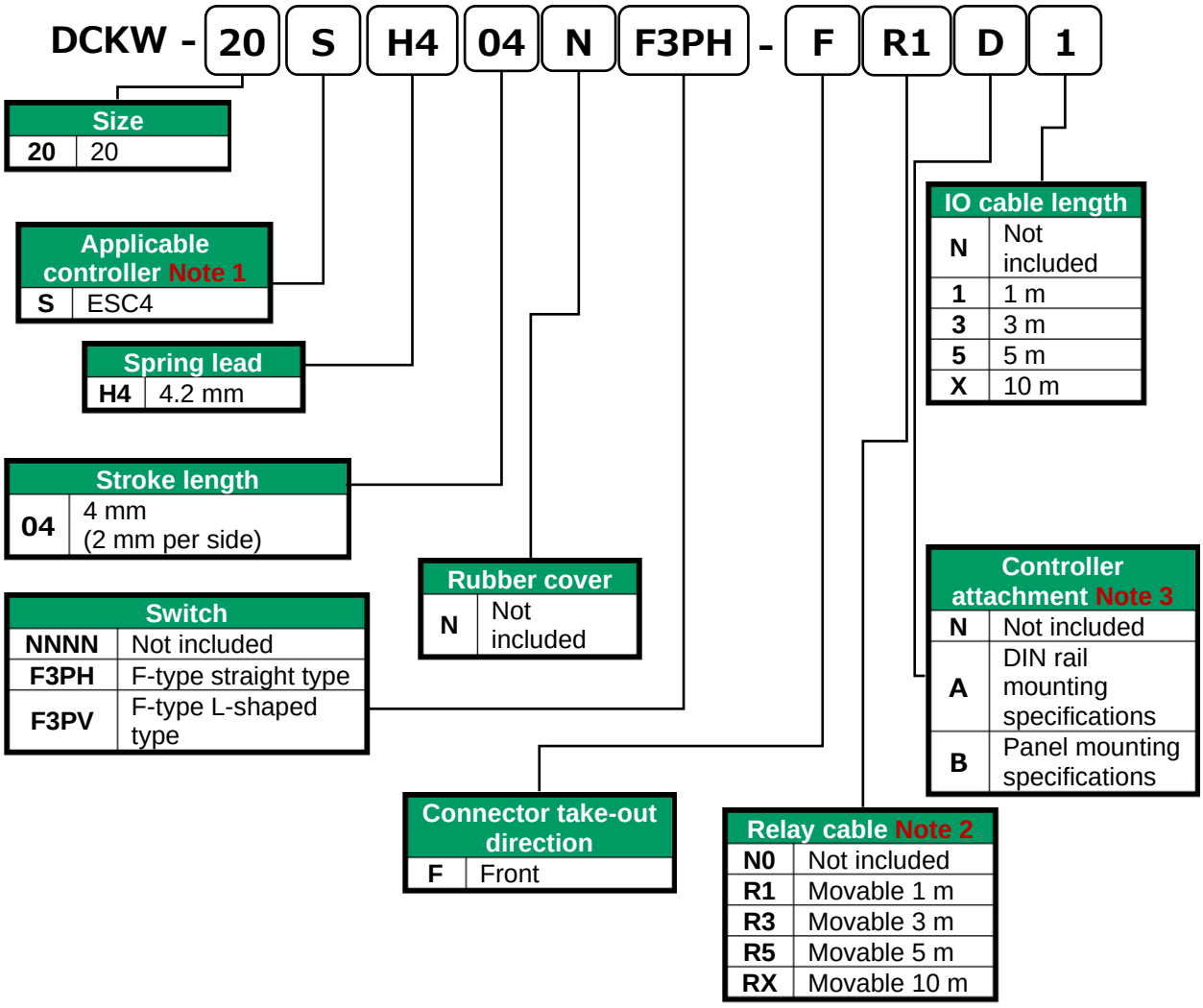
Note 2: Refer to “1.4.4Relay cable, cylinder switch cable”, for the external dimensions of the switch cables and relay cables.
Note 3: If you select a controller attachment method other than "N: None", the controller is provided.

1.4.3. DCKW series



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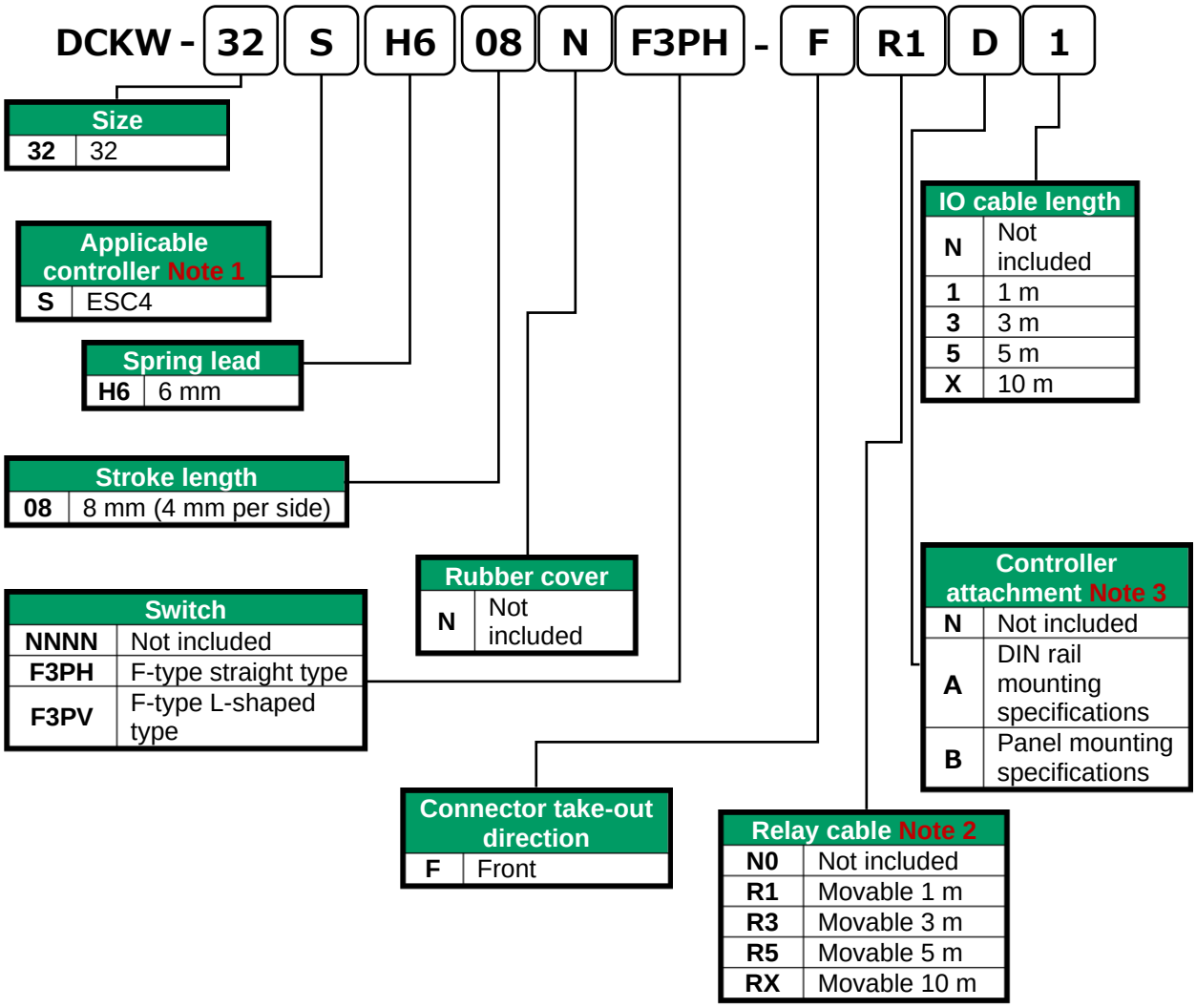
Note 3: If you select a controller attachment method other than "N: None", the controller is provided.



Note 1: Refer to the SM-A85796 instruction manual for the applicable controller.
Note 2: Refer to “1.4.4Relay cable, cylinder switch cable”, for the external dimensions of the switch cables and relay cables.
Note 3: If you select a controller attachment method other than "N: None", the controller is provided.

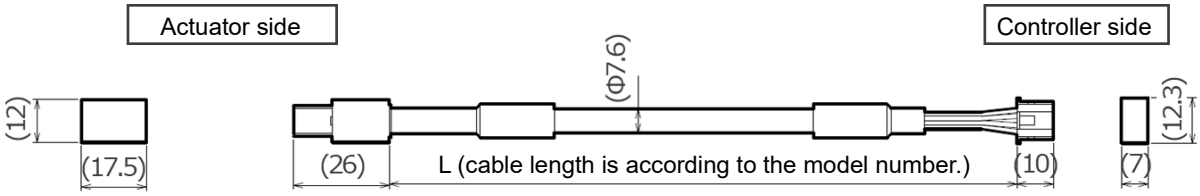
1.4.4. Relay cable, cylinder switch cable

■ Motor relay cable model number system (ESC4 series)

ESC3-M2-R **1**

Cable length	
1	1 m
3	3 m
5	5 m
X	10 m

■ Motor relay cable external dimensions (ESC4 series)

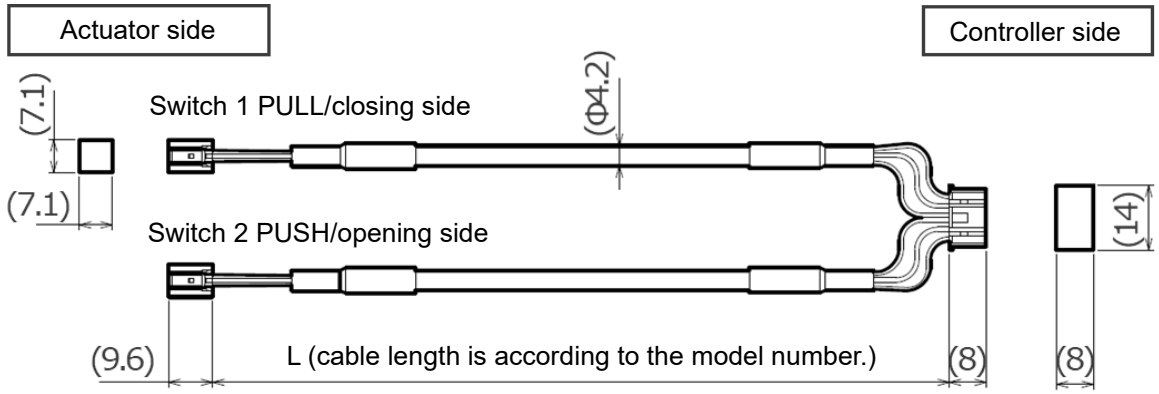


■ Switch relay cable model number system (ESC4 series)

ESC3-S2-R **1**

Cable length	
1	1 m
3	3 m
5	5 m
X	10 m

■ Switch relay cable external dimensions (ESC4 series)



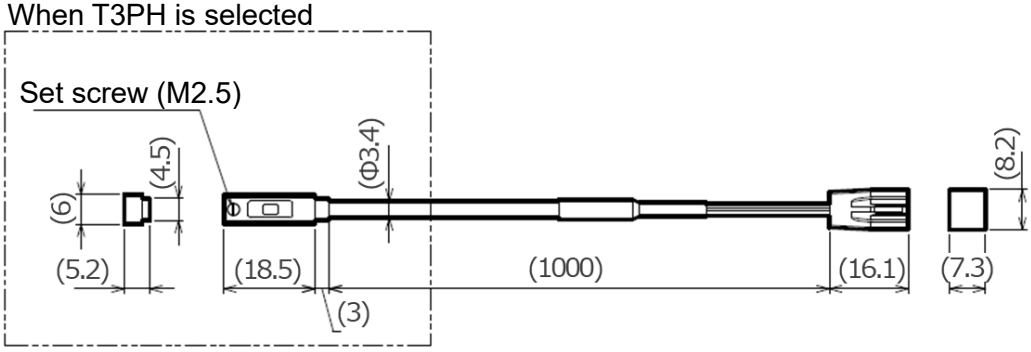
■ Cylinder switch cable model number system (ESC4 series)

ESC3-SW-T3PH

Switch type	
T3PH	T-type straight type
T3PV	T-type L-shaped type
F3PH	F-type straight type
F3PV	F-type L-shaped type

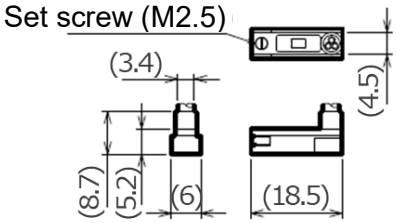
■ Cylinder switch cable external dimensions (ESC4 series)

* When T3PH is selected

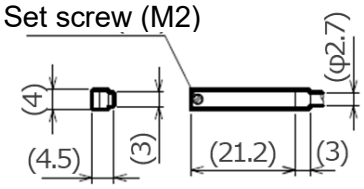


Depending on the switch model number selection, the dotted line part will be as shown below.

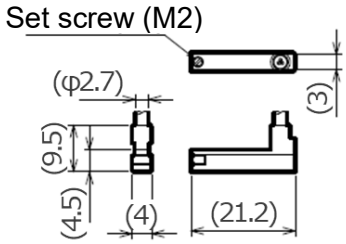
* When T3PV is selected



* When F3PH is selected



* When F3PV is selected



2. INSTALLATION

Common

DANGER

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

Do not work with wet hands.
- Doing so may cause electric shock.

Since the control power supply and motive power supply are not insulated, never connect the + and − terminals of the power supply in reverse.
- Parts may be damaged.

Do not enter the operating range of the product while the product is ready to operate.
- There is a risk of injury due to the product moving unexpectedly.

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 a workpiece to install the product.
- An injury may occur if the product falls down, falls off, or operates abnormally.

For the controller power supply (control power supply and motor power supply) and the input/output circuit power supply, use a DC stabilized power supply (24 VDC ± 10%) with sufficient capacity.
- 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 power supply on the primary side when wiring in accordance with "JIS B 9960-1:2019 (IEC 60204-1:2016) Safety of machinery - Electrical equipment of machines - Part 1: General requirements".

Description from "7.2.1 General" of JIS B 9960-1:2019:

Overcurrent protection shall be provided where the current in a circuit can exceed either the rating of any component or the allowable current of the conductors, whichever is the lesser value. The ratings or settings to be selected are detailed in 7.2.10.

DANGER

There is a risk of your fingers getting caught between the body and the table during operation.

Common

WARNING

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

Do not place heavy objects on cables or pinch them.
- Otherwise, the cover of the cable may tear or excessive stress is applied, causing poor continuity and insulation degradation.

Do not connect the communication connector used for this product to other devices.
- A malfunction or damage may occur.

Do not use or store the product in an environment where there is strong electromagnetic waves or radiation.
- A malfunction or failure may occur.

Because precision instruments are integrated, do not lay the product sideways or subject the product to vibration or impact during transportation.
- Component damage may occur.

Do not perform disassembly or modification of products that are not specified in this manual.
- An injury, accident, malfunction, or failure may occur; in addition, the specifications described in this manual may not be satisfied.

Install a safety fence to prevent entry into the actuator operation range.

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

When restarting after emergency stop or abnormal stop, check that it is safe for the actuator to operate.

WARNING

Design a safety circuit or safety device so that if the machine stops due to a system abnormality such as an emergency stop or a power failure, the equipment will not be damaged or personal injury will not occur.

When wiring the product, refer to this Instruction Manual or any other relevant instruction manuals to make sure that the wiring is correct and connectors are firmly connected.

- Otherwise, abnormal operation or the flow of an overcurrent may result. Overcurrent may cause abnormal operation, damage, or fire.

Make sure that the wiring is insulated.

- Otherwise, abnormal operation or the flow of an overcurrent may result. Overcurrent may cause abnormal operation, damage, or fire.

Make sure that the wires do not contact other circuits and there is no ground fault and insulation failure between terminals.

- Otherwise, abnormal operation or the flow of an overcurrent may result. Overcurrent may cause abnormal operation, damage, or fire.

Make sure to install the emergency stop button in a location where operation is easy.

- Make sure that the emergency stop button has a structure that cannot be automatically reset, and that no one can reset it inadvertently.
- It may take several seconds from the emergency stop to the actuator stop, depending on the speed and loading load when the actuator moves.

Consider the possibility of motor or motive power source failure.

- Even if motor or motive power source failure occurs, take measures to prevent personal injury or equipment failure.

When there is a need for resetting the actuator to the starting position, design a safe control unit.

Install the product indoors and in a dry place.

- It may cause an electric leakage or a fire accident in a place exposed to water or a place with high humidity (place with humidity of 80% or more, or with condensation).

Adopt a safety design in consideration of a gripping force reduction caused by a power failure.

- The gripping force may be reduced by a power failure, resulting in a detaching of workpiece. Design and implement a safety device to prevent injuries to people and damages to mechanical devices.

Perform class D grounding (ground resistance: 100 Ω or less) for the product.

- Electric leakage may cause a fire, electric shock or malfunction.

CAUTION

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

Do not perform a withstand voltage test or an insulation resistance test on a device with the product installed.
- Due to the circuit design, the product may be damaged if a withstand voltage test or an insulation resistance test is performed on the device with the product installed. If a withstand voltage test or an insulation resistance test is required as a device, remove the product before performing it.

Do not store or use the product in a place exposed to ultraviolet rays or in an atmosphere where corrosive gas or salt are present.
- It may cause performance deterioration and strength deterioration due to rust.

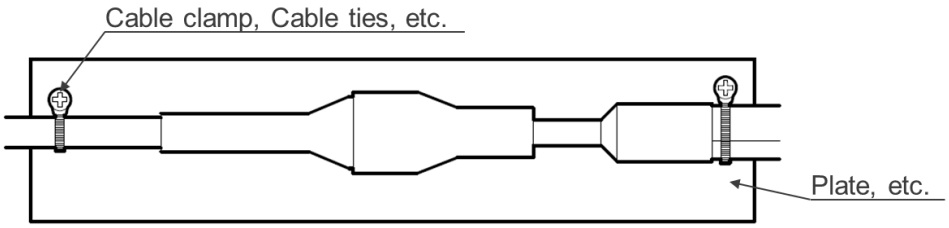
Do not install the product in a place subjected to strong vibrations or shocks.
- If the product is subjected to strong vibrations or shocks, a malfunction may occur.

Do not use the product in a place where condensation occurs due to a sudden change in the ambient temperature.
- It may cause a malfunction of the product or deteriorate of strength.

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

When transporting or mounting, do not have the moving part or cable part of the product.
- An injury or cable disconnection may occur.

Do not move the lead cable from the actuator.
- Secure the connector to the same part using a cable clamp, etc. so as to prevent it from moving. Use the lead cable with a bending radius of 40 mm or more.



Do not bend the relay cable up to 200 mm from the end of the connector.
- Poor continuity may occur.

Do not hold the controller case tightly.

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

When operating the product while the power is not supplied, remove the workpiece by opening/closing the fingers with the manual operation shaft, or by removing the attachment. Also, do not apply any excess force to the manual operation shaft.
- A damage or operation fault may occur.

CAUTION

Do not put dents and scratches interfering with the flatness or perpendicularity of the body mounting surface and of the finger.

Except for the body securing screws and attachment securing screws, do not disassemble or retighten.

- An operation fault may occur.

When performing electric welding to the equipment to which the product is installed, remove all the frame ground connections of the product.

- If electric welding is performed with the frame ground connected, the product may be damaged due to welding current, excessive high voltage during welding, or surge voltage.

Prevent any excess load from being applied to the finger and attachment during the workpiece installation/removal as well as during transportation.

- Scratches or dents may occur to the linear guide rolling surface of the finger, leading to an operation fault.

When using the actuator for other than horizontal installation, provide an external stopper.

- When the power is turned off or the motor steps out, the moving parts may fall, causing injury or damage to the workpiece.

Install the wiring so that no induction noise is applied.

- Avoid a place where a large current or strong magnetic field occurs.
- Do not use the same piping or wiring (with multi-core cables) as the power line of a large motor other than the product.
- Do not use the same piping or wiring as the power supplies and wires for inverters used for robots. Apply frame ground to the power supply and insert a filter into the output section.

Use a stabilized power supply (24 VDC ± 10%) as the power supply, and select one with sufficient capacity for the number of installed products.

- If the capacity is not sufficient, a malfunction may occur.

Use the movable cable with a bending radius of 46 mm or more. In addition, fix the fixed cable so as not to move easily.

- Since the bending radius cannot be applied to the bending of the connector part, it is recommended to fix near the connector.

Secure sufficient space for maintenance and inspection.

- Otherwise, maintenance and inspection cannot be performed, which may cause equipment stop or damage, or injuries.

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

When holding the product, hold its bottom surface.

When transporting and installing the product, ensure the safety of the workers by securely supporting the product using a lift or supporting gear and by assigning more than one worker.

CAUTION

Install the product in a way that it is not subjected to twisting or bending force.

When using positioning holes, make sure to use pins having the size that does not require press-fitting.

- Press fitting pins may cause damage or distortion in the guide section, resulting in reduced accuracy. The recommended tolerance of the pin is JIS tolerance of 6 µm or less.

Separate the power for the output section of the product from the power for inductive loads such as solenoid valves and relays that generate surges.

- If the power supply is shared, surge current may be applied to the output part, causing damage.
  If the power cannot be separated, connect the surge absorption elements in parallel directly to all the inductive loads.

DMSDG series

CAUTION

Do not use the actuator as a stopper.

Design with safety in mind.

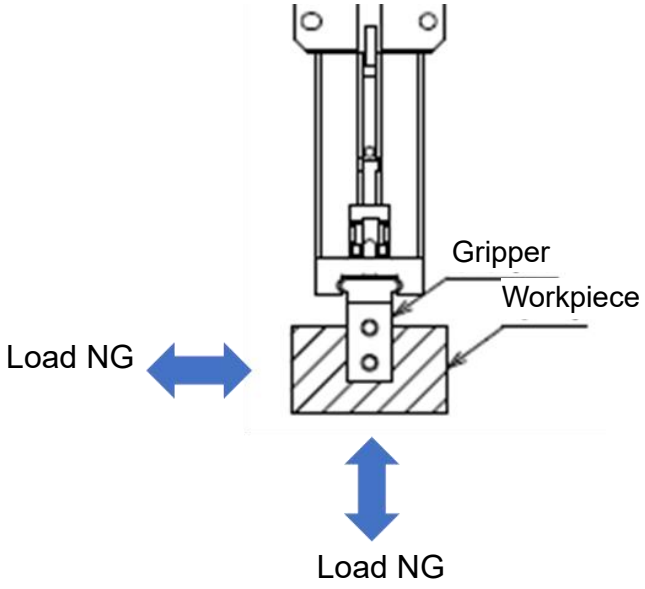
- Self-lock when de-energized may not work depending on the pressing amount.

DLSH series

CAUTION

Prevent any excess load from being applied to the finger and attachment while loading/unloading the workpiece or transporting the workpiece.

- Scratches or dents may occur on the linear guide rolling surface of the finger, leading to malfunction.



DLSH/DCKW Series

CAUTION

Design with safety in mind.

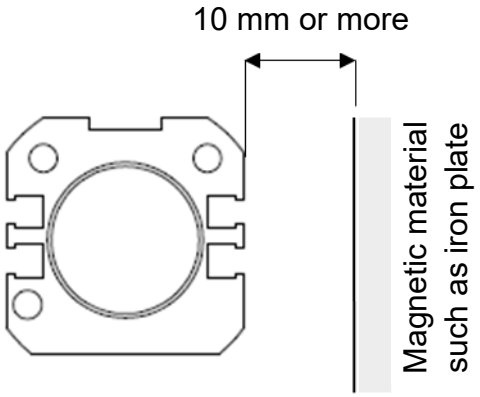
- Self-lock when de-energized may not work depending on the gripping amount.
- The gripping force may decrease due to a power failure, etc., which may cause the workpiece to fall.

Select a model with ample opening/closing width for the workpiece size.

- Variations in the opening/closing width and the workpiece may cause instability of the gripping position.
  In addition, increase the stroke when opening from the gripping operation.

2.1. Environment

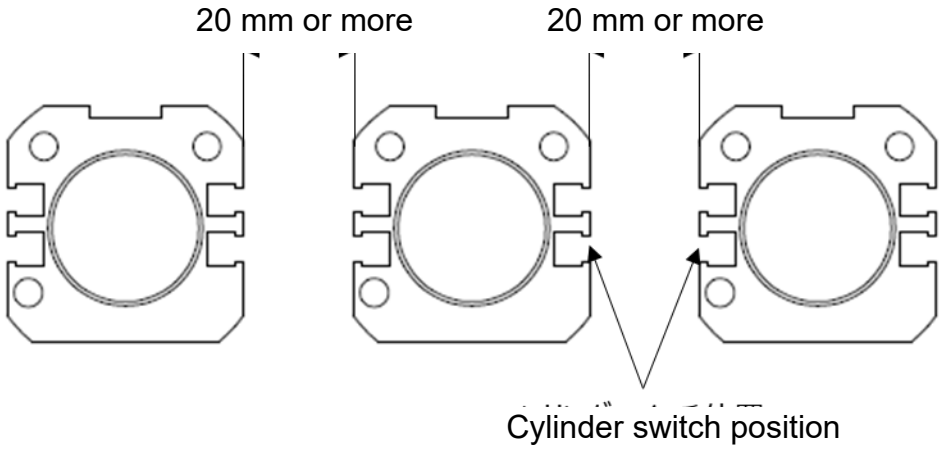
- Before storing or using the product, check the ambient temperature and atmosphere specified in the product specifications.
- Use the product at an ambient temperature between 0°C and 40°C. Ventilate if heat can become trapped.
- Use the product at an ambient humidity between 35% and 80% RH. Do not use the product in a place where condensation occurs.
- Store in a place with an ambient temperature of -10 to 50°C and an ambient humidity of 35 to 80% RH, and avoid condensation and freezing.
- Avoiding places exposed to direct sunlight or near heating elements, install in a place free from dust, corrosive gas, explosive gas, flammable gas, and flammable materials. Chemical resistance has not been considered for the product.
- Install the actuator on a smooth and flat surface.
- Installing the actuator on a smooth surface with dents may cause the actuator to malfunction or be damaged.
- If there is a magnetic material such as an iron plate near the cylinder switch, it may cause malfunction.
  Keep a distance of at least 10 mm from the actuator surface.



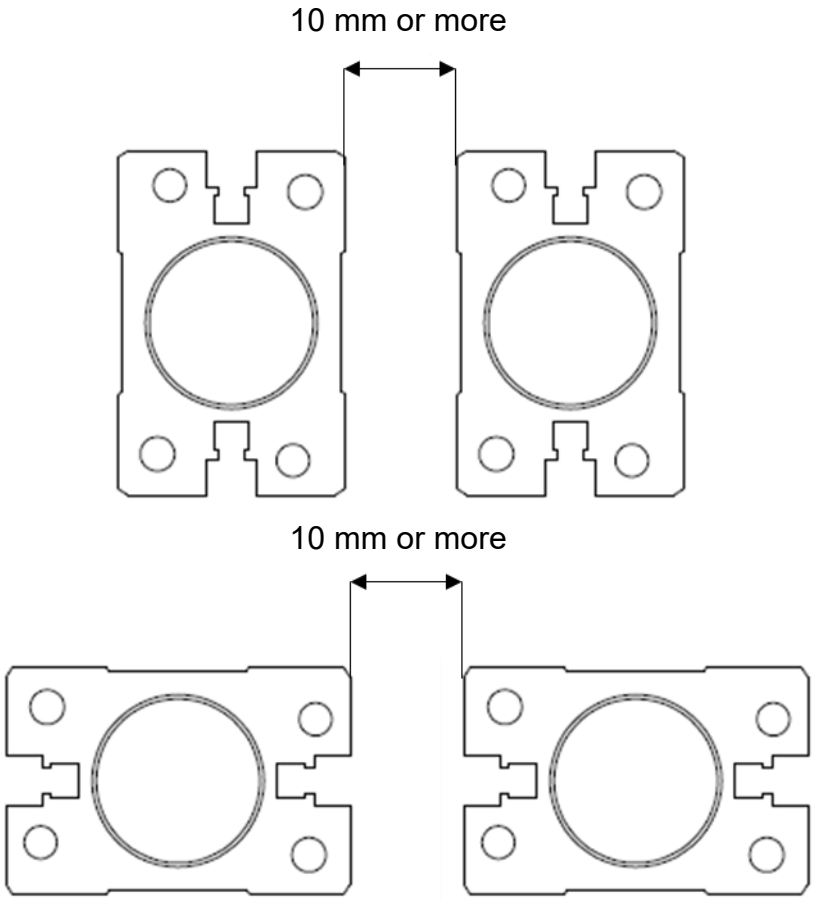
2.1.1. Actuator

- If the actuators are adjacent to each other, the cylinder switch may malfunction. Keep the distance below from the actuator surface.

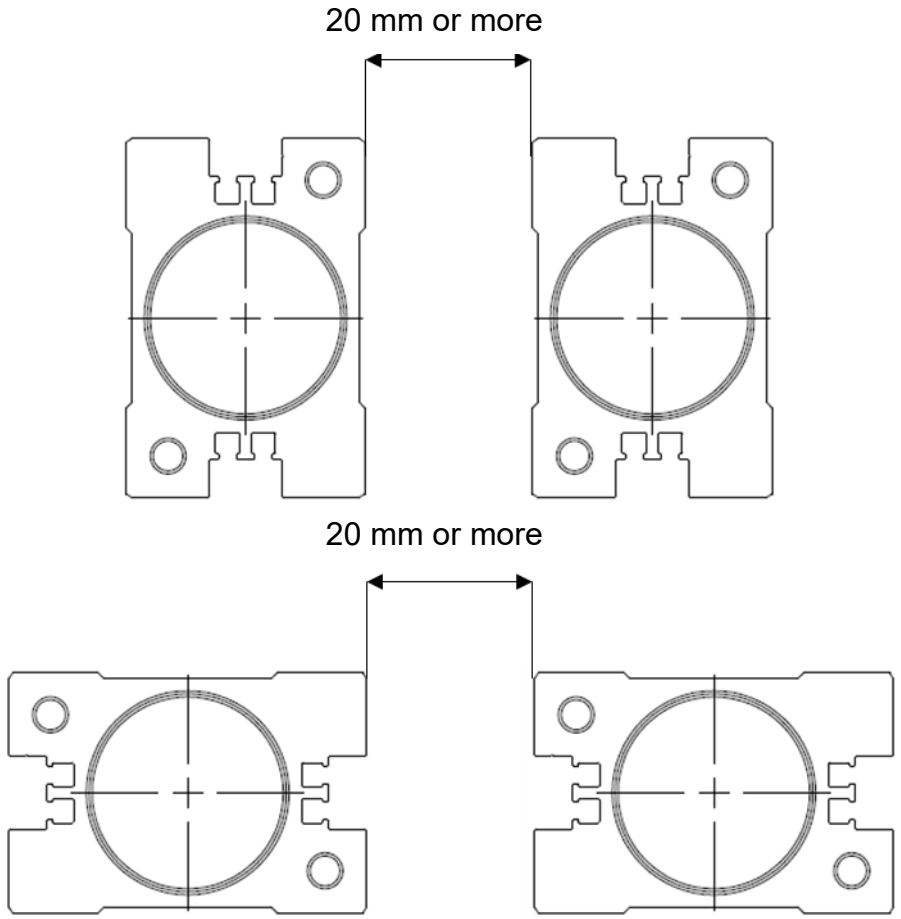
■ DMSDG series



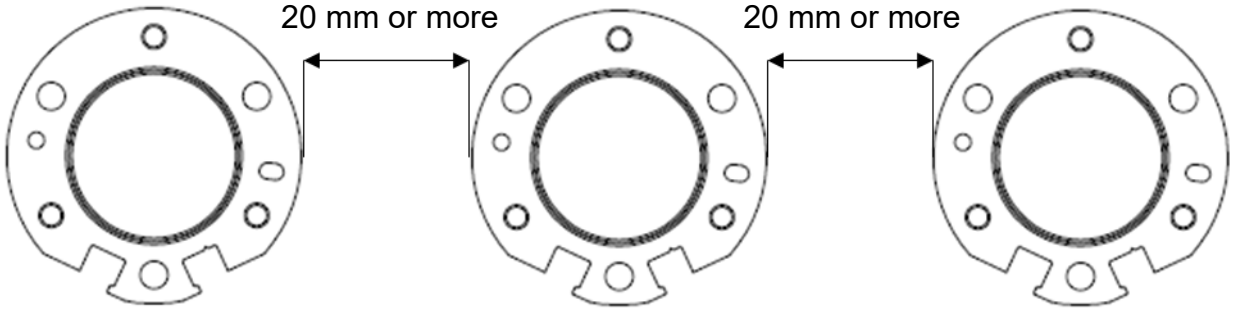
■ DLSH-20



■ DLSH-32



■ DCKW series



2.2. Unpacking

CAUTION

Do not carry heavy products alone.

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.

Do not apply unnecessary force to any part of the product.

When carrying or handling the product, use extreme care not to apply impact to the product (for example, do not drop the product).

When taking the product out of the package, hold the product body.

Place the product horizontally when not in use.

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 Note 1	1
Motor relay cable Note 2	1
Switch relay cable Note 2	1
Cylinder switch cable Note 3	1
IO cable Note 4	1

Note 1: If you select a controller attachment method "N" for the actuator model number when purchasing, the controller is not provided. Purchase it as needed.
Note 2: If you select "N0" for the actuator model number when purchasing, a relay cable is not provided. Purchase it as needed.
Note 3: If you select "NNNN" for the actuator model number when purchasing, a cylinder switch cable is not provided.
Purchase it as needed.
Note 4: If you select IO cable length "N" for the actuator model number when purchasing, the IO cable is not provided. Purchase it as needed.

※ Refer to Fig. "1.4.4Relay cable, cylinder switch cable", for the model number indication of the relay cables and cylinder switch cables.

2.3. Installing

2.3.1. Actuator

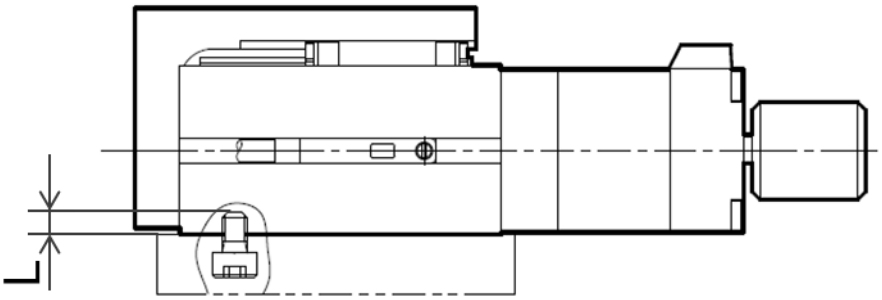
⚠ CAUTION

Do not allow excessive shock or moment to act on the actuator.
• A malfunction or damage may occur.

The flatness of the mounting surface of the body shall be 0.05 mm or less. Do not apply twisting or bending force to the product.
• An operation fault or damage may occur.

■ DMSDG series

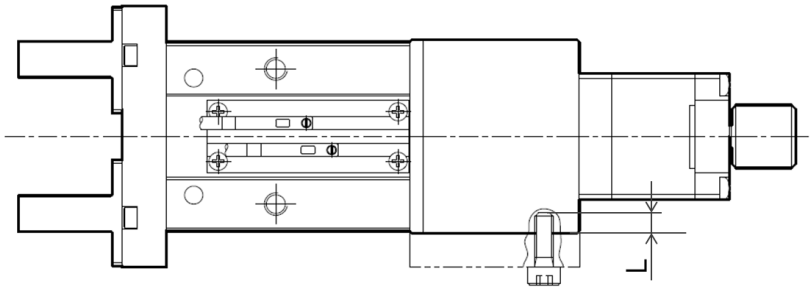
• For the screw-in depth and the tightening torque of bolts for installing the body, refer to the following table.



Item	Bolt	Tightening torque (N·m)	Max. screw-in depth L (mm)
DMSDG-08	M3 × 0.5	0.59	3
DMSDG-16	M3 × 0.5	0.59	5

■ DLSH series

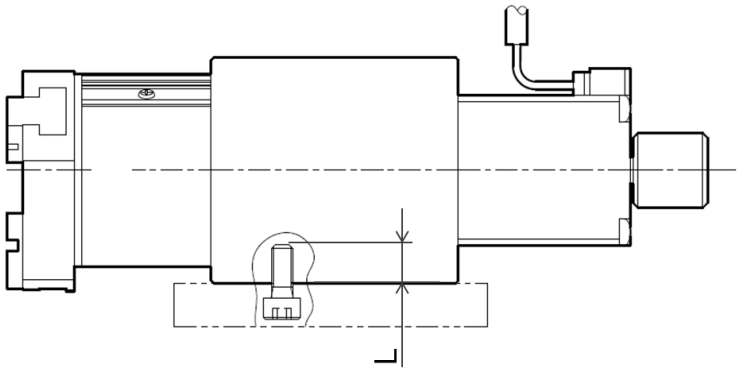
• For the screw-in depth and the tightening torque of bolts for installing the body, refer to the following table.



Item	Bolt	Tightening torque (N·m)	Max. screw-in depth L (mm)
DLSH-20	M5 × 0.8	2.8	10
DLSH-32	M6 × 1.0	4.9	12

■ DCKW series

• For the screw-in depth and the tightening torque of bolts for installing the body, refer to the following table.



Item	Bolt	Tightening torque (N·m)	Max. screw-in depth L (mm)
DCKW-20	M5 × 0.8	3.3	10
DCKW-32	M5 × 0.8	3.3	8

■ Allowable load

For details, refer to the "Selection guide" page in the catalog.

2.3.2. Table/finger

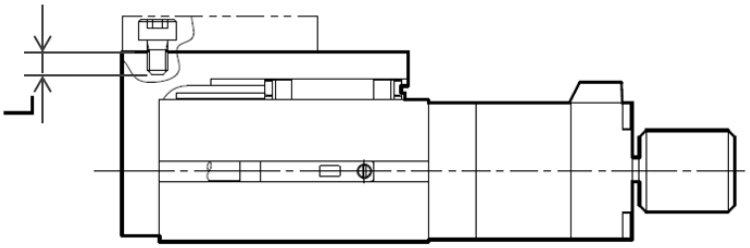
CAUTION

The flatness of the mounting surface of the table shall be 0.02 mm or less. Do not apply twisting or bending force to the product. An operation fault or damage may occur.

Do not apply strong impact or excessive moment to the slide table. A malfunction or damage may occur with the product.

■ DMSDG series

• When fixing the table to the jig, use the appropriate tightening torque.



Item	Bolt	Tightening torque (N·m)	Max. screw-in depth L (mm)
DMSDG-08	M3 × 0.5	0.59	4
DMSDG-16	M4 × 0.7	1.4	5.5

⚠ CAUTION

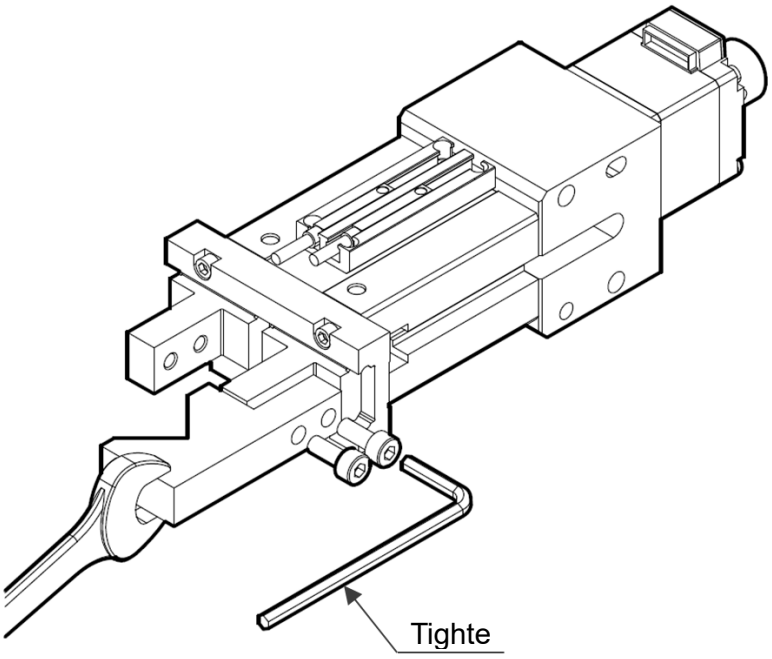
When mounting the attachment to the finger, take into consideration the effects exerted on the hand body and perform tightening while providing support using a tool such as a spanner so to prevent the finger from being distorted.

- Damage may occur.

When mounting the attachment to the finger, be careful not to apply lateral load to the finger.
When mounting the attachment to the finger, use the tightening torque listed below.
Applying an excessive lateral load or any impactful load to the finger can cause backlash or damage.

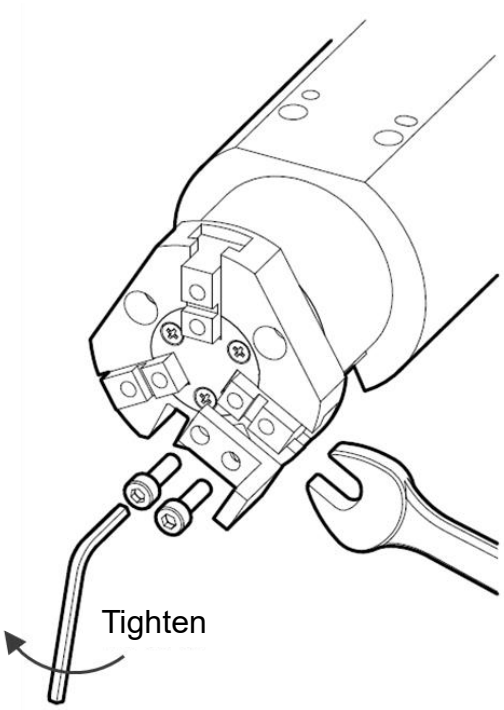
Make sure to use the product while keeping the external force exerted on the finger within the allowable load listed in the catalog.

■ DLSH series



Item	Bolt	Tightening torque (N·m)
DLSH-20	M4 × 0.7	1.4
DLSH-32	M6 × 1.0	4.9

■ DCKW series



Item	Bolt	Tightening torque (N·m)
DCKW-20	M3 × 0.5	0.59
DCKW-32	M4 × 0.7	1.4

2.3.3. Cylinder switch

WARNING

Never use in an explosive gas atmosphere.

- The cylinder switch is not explosion-proof. Never use the product in an explosive gas atmosphere as it may cause an explosion hazard.

Use it correctly within the specification range.

- Applications, load currents, voltages, temperatures, impacts, environments, etc. outside the specification range may cause damage or malfunction. Therefore, use the product correctly within the specification range.

CAUTION

Observe the tightening torque when installing the cylinder switch.

- If the maximum tightening torque is exceeded, setscrews, brackets, switches, etc. may be damaged. In addition, if the switch is tightened with less than the minimum tightening torque, the switch mounting position may be shifted.

Pay attention to the bending stress and tensile force of the lead wire.

- The minimum bend radius of the lead wire must be 9 mm or more (fixed), and care must be taken not to apply repeated bending stress or tensile force to the lead wire.

Make sure that no external force is applied to the cylinder switch.

- When handling, do not apply external force such as dropping, bending, impact (more than 980 m/s^2 for non-contact switch), pressure, or pulling. This may result in internal damage to the switch or malfunction of the body.

Fix the cylinder switch at a position that provides sufficient margin for the stroke.

- There is a risk of colliding with the mechanical end, causing the motor to step out.

Since the operating position of the cylinder switch changes due to temperature, the stop position of the actuator may change slightly.

- If the amount of the change is a problem, readjust the position of the cylinder switch.
- Select a model with ample margin for the stroke range.

Slide the switch from outside the operating range and set it at the rising position of the operating range.

- The actuator detects the rising edge of the switch and decelerates to a stop. If it is set to the center of the operating range, it may stop further than the desired position and collide with the mechanical stopper, etc.

Avoid using the product in an environment where it is constantly exposed to water.

- Insulation failure may occur, resulting in malfunction.

Avoid using the product in oily or chemical environments.

- Cylinder switches may be adversely affected (poor insulation, malfunction, hardening of lead wire coating, etc.) when used in environments with various oils, coolant fluids, cleaning fluids, or chemicals, so please consult with our company.

Be careful not to deposit iron powder or come close to magnetic materials.

- The magnetic force in the actuator may be taken away and the cylinder switch may not work.

Be careful not to bring actuators close together.

The switch may malfunction due to magnetic interference on both sides.

CAUTION

If the switch is set to the center of the operating range, gripping force may be reduced during PUSH/closing operation.

Do not use the switch lead wire to carry the cylinder.

- It may cause the lead wire to break or the internal elements of the switch to be damaged.

Do not use the product in an environment with a large impact.

Do not use in locations with surge sources.

- If there is equipment (electromagnetic lifters, high frequency guideways, motors, etc.) that generates a large surge around the actuator with a non-contact switch, it may cause deterioration or damage of the internal circuit elements of the switch. Therefore, take into consideration measures against the surge for the source.

■ Cylinder switch

• Refer to the table below for the tightening torque when fixing to the actuator body.

Item	Tightening torque (N·m)
T3	0.1 to 0.2
F3	0.03 to 0.08

※ To tighten the fixing screw, use a flathead screwdriver with a grip diameter of 5 to 6 mm, tip shape width of 2.4 mm or less, and thickness of 0.3 mm or less.

3. USAGE

DANGER

Do not enter the operating range while the actuator can operate.
- An injury may occur.

Do not work with wet hands.
- Doing so may cause electric shock.

WARNING

Do not climb on the product or put things on it.
- A fall accident, injury due to the product falling down or off, etc., or malfunction and runaway due to the product damage may occur.

Do not issue a command with a set value smaller than the positioning repeatability.
- The positioning control may not be performed properly.

Do not apply a load greater than the allowable value to the product.
- Details of the allowable value are provided on the model selection page of the catalog.

Do not touch the main unit with hands or body during operation or immediately after stopping.
- There is a risk of contact with hot areas and burns.

Confirm the wiring with peripheral devices and that equipment is safe to operate before supplying electricity to the product.
- If electricity is supplied inadvertently, an electric shock or injury may occur.

If the controller LED does not light or blink when the power is turned on, turn off the power immediately.

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

When a power failure occurs, turn off the power to the controller.
- The product can suddenly start moving when the power is restored and it can lead to an accident.

When moving the moving part of the actuator by hand, make sure that the power is turned off.
- When turning off the power, operate with sufficient care for safety so that there is no danger of the moving part falling or the like.

Take measures to prevent damage to the human body and the device in case of power failures.
- An unexpected accident may occur.

CAUTION

When the controller and actuator are connected with a cable, do not move the actuator moving part by external force except for manual operation.
- A malfunction or damage may occur due to regenerative currents.

Do not dent or scratch the moving part of the actuator.
- An operation fault may occur.

Do not turn off the power when gravity or inertia force is applied.
- When the power is turned off, the moving part may keep moving or fall. For safety reasons, be sure to turn off the power in a balanced state, or if installed vertically, be careful not to allow the workpiece to fall by its own weight.

Do not issue the stop command during acceleration or deceleration.
- There is a risk of danger due to speed change.

Do not turn the power on and off frequently.
- Elements in the controller may become damaged.

Do not allow to hit the end of the stroke in any direction other than the pressing direction.
- Internal parts may be damaged due to impacts, causing malfunction.

Do not insert fingers or objects into the opening of the product.
- An injury or product damage may occur.

If it operates with vibration, adjust the speed or gain to prevent vibration.
- Depending on the conditions of use, it may operate with vibration even within the operation speed range.

CAUTION

When changing the combination of the actuator and controller, be sure to check the combination before operating them.
- An accident may occur.

Use the actuator so that no impact is applied to the moving part.

Since the product life varies depending on the transfer load, etc., set it with sufficient margin.

The required gripping force/pressing force must be set with sufficient margin.
- The gripping force and operating current consumption values listed in "7.1Specifications" are a guideline. Variation in the motor torque may cause errors even when the setting values are the same.

Do not use a load that does not fall within the specified range.
- If the specified range is exceeded, the unbalanced load applied to the guide section becomes excessive. This may cause play in the guide section, make the accuracy worse, and adversely affect the service life.

When operating the product without power supplied, use the manual operation shaft.

The small guide type DMSDG is not suitable for positioning operation.
- Use it by pressing it against the external stopper at the stop position.

When gripping with a pressing operation, make sure that the cylinder switch detects (lit) before the gripping or contacting position of the workpiece.

If the cylinder switch does not detect (lit) even when the workpiece is gripped or contacted, the motor will not stop and an error will occur.
- Refer to the ESC3 Controller Instruction Manual SM-A85796 for details.

Grip the workpiece with PUSH/closing operation.

Do not allow to hit the fingers or attachments against the work. An operation fault may occur.

If force of inertia is applied due to movement or rotation, the steel ball becomes offset, increasing sliding resistance and reducing accuracy. In this case, perform full stroke operation by operating the manual operation shaft or opening/closing the attachment by hand.

DMSDG series

CAUTION

When pressing a workpiece, use only in the PUSH direction.
- Applying a load in the PULL direction to the rod may cause failure.

For DMSDG-08 only, make sure that the stop time at the unclamping end is 50% or more of one cycle.
- This may result in failure of the cylinder switch.

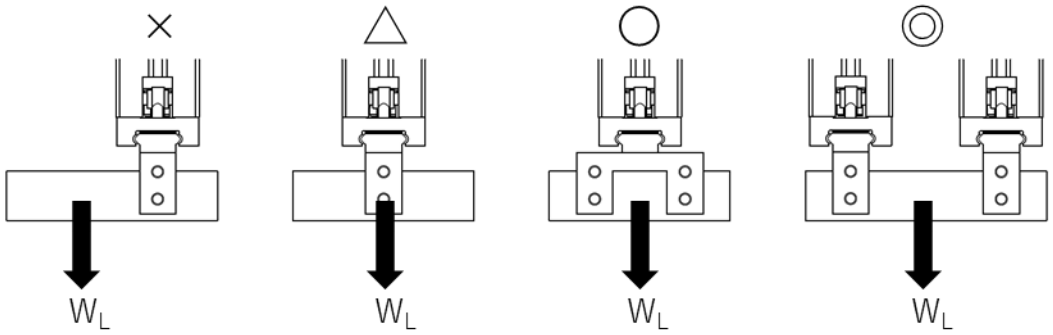
⚠ CAUTION

When gripping a workpiece, use only in the closing direction.

- If used in the opening direction, excessive force will be applied to the spring, causing failure.

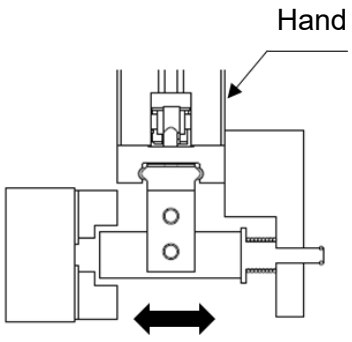
The detection range of the cylinder switch varies depending on the temperature and installation. Select a model with sufficient gripping force for the workpiece mass.

When gripping a long or large workpiece, gripping the center of gravity is a prerequisite for stable gripping, but it is also necessary to stabilize it by increasing the size or using multiple units.

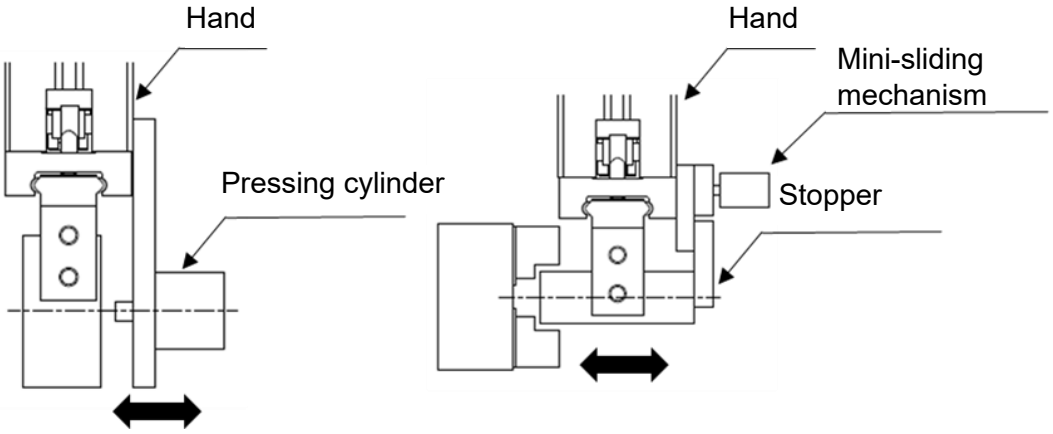


When inserting a workpiece directly into a jig with the hand, consider escape when designing.

- The hand may be damaged. If the workpiece is slid on the attachment, the life of the chuck may be significantly reduced. Careful consideration must be given to the shape of the attachment.
- Pressing to a jig with a knockout



- When using a pressing cylinder



- Repeatability refers to the displacement of the finger stop position when clamping and unclamping are repeated under the same conditions. The same conditions include hand fixing and use of the same attachment, as described below.

<Conditions>

◎ Attachment size, shape, and weight

◎ Workpiece gripping position of attachment

◎ Clamping method and length

◎ Resistance between the attachment and workpiece contact area

◎ Variations in grip force, etc.

Opening/closing shocks may cause a displacement of workpiece position and may worsen repeat accuracy. Wear and lack of rigidity of the attachment may also lead deterioration of accuracy.

- "Regenerative current" is the current that is generated by the motor operating like a generator when the moving part of the actuator is moved by an external force. Reverse current flows from the motor to the controller, causing malfunction or damage.

3.1. Usage

For information on how to use the DMSDG/DLSH/DCKW series, refer to the instruction manual of the ESC4 series.
For the instruction manual numbers, refer to "1.2Instruction Manuals Related to This Product".

3.2. Using the Controller

For information on how to use the controller, refer to the instruction manual of the ESC4 series.
For the instruction manual numbers, refer to "1.2Instruction Manuals Related to This Product".

3.3. Manual Operation

CAUTION

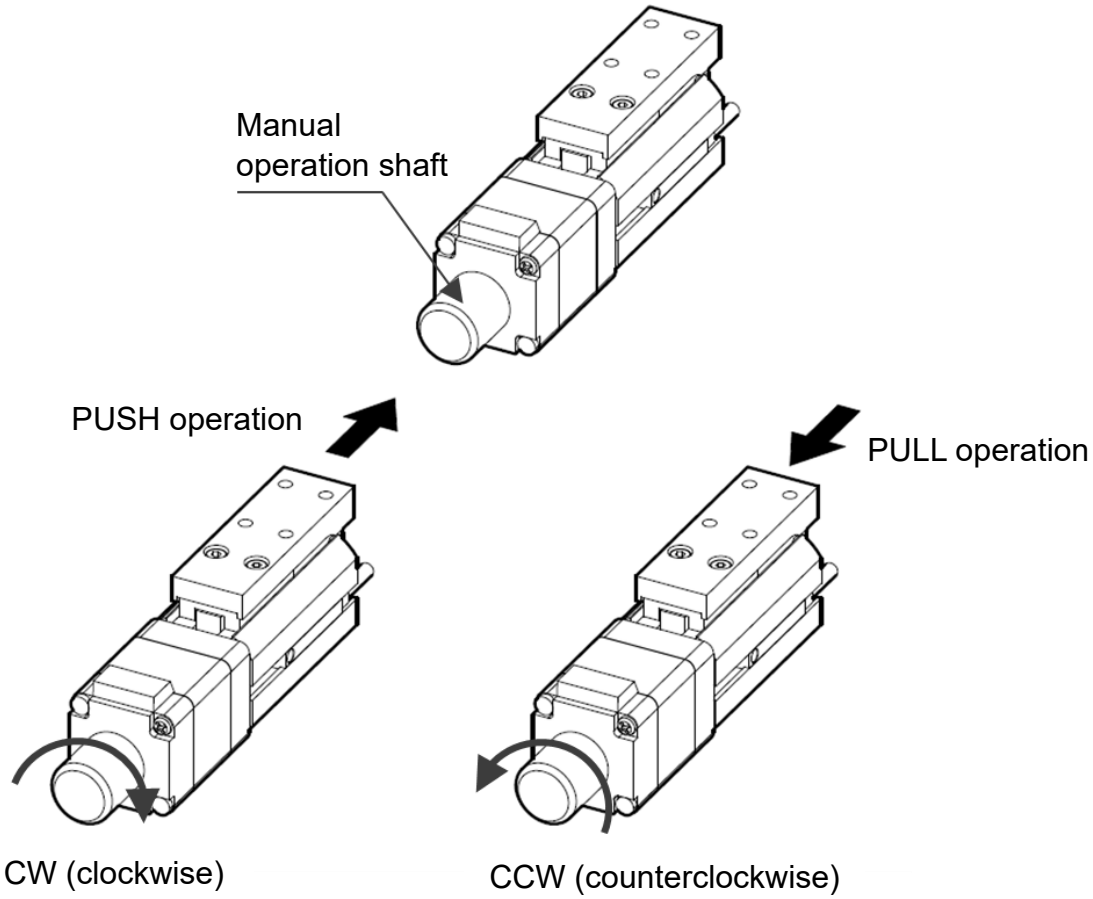
Do not apply excessive torque to the manual operation shaft.
- An operation fault or damage may occur.

Make sure that the motor is in de-energized state before operating it.
- A malfunction or damage may occur with the product.

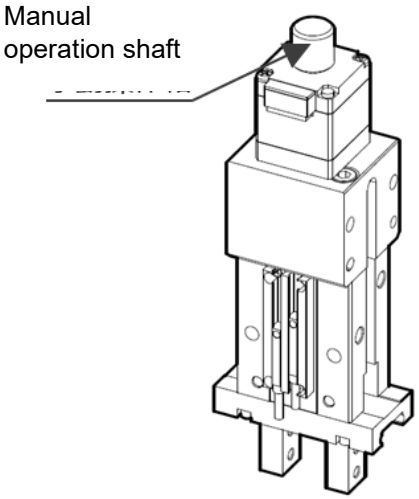
Manual operation is mainly used during startup, maintenance, and inspection.
- Frequent use may cause the actuator to operate in an unexpected way.

Turn the knob of the manual operation shaft.

■ DMSDG

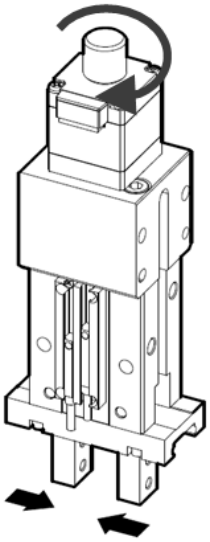


■ DLSH/DCKW

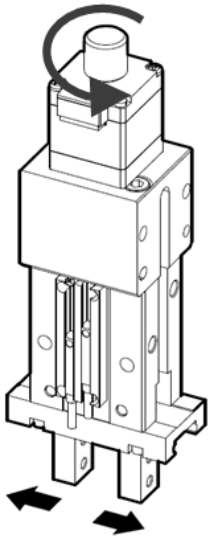


CW (clockwise): Finger closes.

CCW (counterclockwise): Finger opens.



Close



Open

3.4. Self-lock

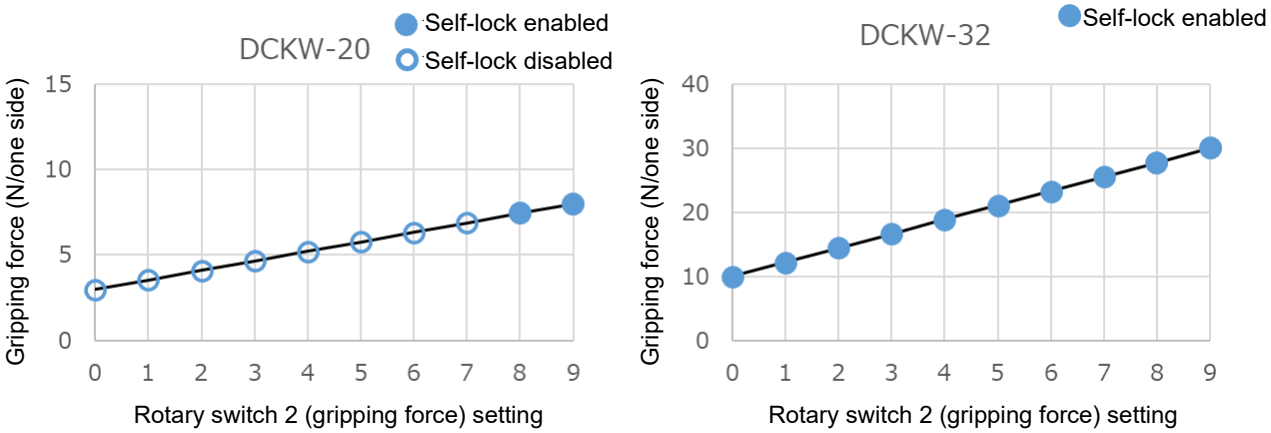
The DLSH and DCKW series maintain gripping force (self-lock) even when the motive power supply is de-energized during pressing and gripping. The self-lock effective range depends on the size and rotary switch setting.

- The DMSDG series does not support the self-lock.
  Contact us if you need the self-lock.

■ DLSH

※ Pressing position L = Stroke center value.
※ The self-lock effective range is a reference value. The self-lock may not work depending on the conditions.

■ DCKW



※ Pressing position L = Stroke center value.
※ The self-lock effective range is a reference value. The self-lock may not work depending on the conditions.

4. MAINTENANCE AND INSPECTION

WARNING

Do not perform disassembly or modification of products that are not specified in this manual.
- An injury, accident, malfunction, or failure may occur; in addition, the specifications described in this manual may not be satisfied.

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

Do not work with wet hands.
- Doing so may cause electric shock.

Do not touch the inside of the controller or the actuator motor.
- Electric shock or burns may result.

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

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

CAUTION

Take measures to prevent a third person from turning on the power unexpectedly when performing maintenance, inspection, or repair.

Turn off the power immediately if abnormal heat, smoke, odor, sound, or vibration occurs in the product.
- Damage to the product or fire may occur.

Wiring and inspections must be performed by specialists.

Use a power cable with a sufficient capacity that allows the maximum instantaneous current.
- 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.

Grease the guide section at intervals of 6 months or 500,000 operations, whichever comes first as a guide.
- Since the greasing interval depends on the conditions of use, consider the appropriate interval when performing initial inspection.

Wear protective glasses when greasing.
- If spattered grease comes in contact with the eyes, it can cause inflammation.

4.1. Periodic Inspection

CAUTION

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

4.1.1. Inspection item

Inspection item	Inspection method	Solution
Check that the mounting bolts on the product and the screws on the terminal block are not loose.	Looseness check	Turn off the power, and then additionally tighten them with the specified torque.
Check that connectors are not loose.	Looseness check	Turn off the power, and then insert the connectors correctly.
Check that there are no scratches and cracks on the cables.	Visual inspection	Turn off the power and then replace cables.
Check that foreign matters are not accumulating or are not stuck in between the movable section.	Visual inspection	Turn off the power, and then perform cleaning. Note 1 After cleaning, apply grease. As a guide, the frequency should be once every 6 months or 500,000 operations. DLSH lithium-based grease: AFF grease (THK Co., Ltd.)
Check that there are no vibrations or abnormal sounds while the product is stopped or operated.	Noise inspection	If there is any abnormality, contact your nearest CKD sales office or distributor.
Check that the power supply voltage is normal.	Inspection by a tester	Check the power system and use the product within the power supply voltage range described in the Specifications. Supply voltage: 24 VDC ±10%

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

- Greasing is to apply grease to bearings, etc., to reduce friction and smooth mechanical operation. Because the performance cannot be demonstrated due to deterioration of grease or adhesion of foreign material, periodic maintenance is required.

4.2. Precautions on Product Disposal

CAUTION

When disposing of the product, comply with “Waste Management and Public Cleansing Act” and have an industrial waste disposal company dispose of the product.

5. TROUBLESHOOTING

5.1. Problems, Causes, and Solutions

If the product does not operate as intended, confirm the table below for a possible solution.
Refer to the catalog or the instruction manual of each controller for details on how to take action. Refer to "1.2Instruction Manuals Related to This Product" for the instruction manual numbers of controllers.

Problem	Cause	Solution	References
The LED does not light or blink even when the power supply is turned ON.	Wiring is not correct.	Check the wiring.	"2.3.1 Wiring with the power supply" Note 1
	The cable is broken.	Check for cable sheath damage, disconnection, connectors and terminals.	"2.3.1 Wiring with the power supply" Note 1
	Product is malfunctioning or is damaged.	It will need to be repaired.	"5.1.1 Items to check when a problem occurs" Note 1
	The power supply is malfunctioning.	Repair or replace the power supply.	-
	Power capacity is insufficient.	Use a power supply with a larger capacity.	"2.3.1 Wiring with the power supply" Note 1
The LED remains blinking green.	It is in emergency stop state.	Cancel the emergency stop (turn on the motive power supply).	"3.2.2 Emergency stop and cancellation" Note 1
	Wiring is not correct.	Check the wiring.	"2.3.1 Wiring with the power supply" Note 1
	The cable is broken.	Check for cable sheath damage, disconnection, connectors and terminals.	"2.3.1 Wiring with the power supply" Note 1
	The power supply is malfunctioning.	Repair or replace the power supply.	
The LED remains blinking red.	Operation alarm has been issued.	Review the mounting condition of the cylinder switch. Check that there is no damage to the cylinder switch, switch relay cable, or motor relay cable.	"2.3.2 Wiring with actuator" Note 1 "3.1.2 Setting the stop position" Note 1
The LED remains lit red.	System alarm has been issued.	It will need to be repaired.	"5.1.1 Items to check when a problem occurs" Note 1

Note 1: The reference item is "SM-A85796" in the instruction manual of the controller.

Problem	Cause	Solution	References
Product does not operate as intended with PLC signal. **Or, product cannot be operated with PLC.**	Input signal is unstable.	The input signal from the host equipment may be chattering. Ensure the input signal is at least 20 msec.	"3.2.1 Basic operation" Note 1
	Wiring is not correct.	Check the wiring.	"2.3.3 Wiring with the I/O cable" Note 1
	The cable is broken.	Check for cable sheath damage, disconnection, connectors and terminals.	"2.3.3 Wiring with the I/O cable" Note 1
	The position setting is incorrect.	Check the mounting position of the cylinder switches.	"3.1.3 Setting the stop position" Note 1
	The speed setting is incorrect.	Check the settings of rotary switches 1 and 2.	"3.1.4 Setting the speed" Note 1
	The setting of pressing force or gripping force is incorrect.	Check the settings of rotary switches 1 and 2.	"3.1.5 Setting the pressing and gripping forces" Note 1
	Setting of control mode is incorrect.	Check the setting of control mode selector switch.	"3.1.2 Setting the control mode" Note 1
	Product is malfunctioning or is damaged.	It will need to be repaired.	"5.1.1 Items to check when a problem occurs" Note 1
	Power capacity is insufficient.	Confirm that the power capacity satisfies the required voltage and current.	"2.3.1 Wiring with the power supply" Note 1
	It stops during operation.	The transport load may be too large. Recheck the specifications.	Catalogs and instruction manuals for each actuator
	Friction load is too large.	Check the friction load during transport. Confirm that it is not seizing with the workpiece.	-
	It is colliding with the workpiece.	Check the assembly and setting status.	-
	Internal resistance of product has increased.	Check the environment conditions and the conditions of use. Check the usage period (operating distance).	-
	Actuator body is damaged.	It will need to be repaired.	"5.1.1 Items to check when a problem occurs" Note 1
	The operation mode is manual.	Switch to the PIO mode with the operation mode selector switch.	"3.1.1Setting the operation mode" Note 1

Note 1: The reference item is "SM-A85796" in the instruction manual of the controller.

Problem	Cause	Solution	References
The operation completion output does not turn on.	The mounting positions of the cylinder switches on both sides are too far apart for the moving distance.	Check the mounting position of the cylinder switches.	"3.1.3 Setting the stop position" Note 1
	The mounting positions of the cylinder switches on both sides are reversed.	Check the mounting position of the cylinder switches.	"3.1.3 Setting the stop position" Note 1
Product cannot reach target takt time.	The speed setting is incorrect.	Check the settings of rotary switches 1 and 2.	"3.1.4 Setting the speed" Note 1
Pressing operation cannot be performed.	Pressing operation is not supported.	Models other than the DMSDG, DLSH, and DCKW series do not support pressing operation. Use the DMSDG, DLSH or DCKW series.	Catalogs and instruction manuals for each actuator
Workpiece moves due to its own weight during an emergency stop.	The power is turned off at an emergency stop.	Use an external stopper or holding mechanism (such as a brake).	Catalogs and instruction manuals for each actuator
Product itself vibrates.	Connection to actuator is loose.	Tighten the bolts, etc. again.	Catalogs and instruction manuals for each actuator
The actuator is making abnormal sound.	Resonation occurs.	Review the speed setting.	Catalogs and instruction manuals for each actuator
		Review the carrying load.	Catalogs and instruction manuals for each actuator
	Actuator body is damaged.	It will need to be repaired.	"5.1.1 Items to check when a problem occurs" Note 1

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

Note 1: The reference item is "SM-A85796" in the instruction manual of the controller.

Problem	Cause	Solution	References
The actuator does not work.	It is in emergency stop state.	Cancel the emergency stop (turn on the motive power supply).	"3.2.2 Emergency stop and cancellation" Note 1
	Power capacity is insufficient.	Confirm that the power capacity satisfies the required voltage and current.	"2.3.1 Wiring with the power supply" Note 1
	The load is large.	The transport load may be too large. Recheck the specifications.	Catalogs and instruction manuals for each actuator
	It is colliding with the workpiece.	Check the assembly and setting status.	-
	Actuator body is damaged.	It will need to be repaired.	"5.1.1 Items to check when a problem occurs" Note 1

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

Note 1: The reference item is "SM-A85796" in the instruction manual of the controller.

5.1.1. Items to check when a problem occurs

<table>
<tr><th>Item</th><th>What to check</th></tr>
<tr><td>Controller</td><td>Check the controller LED display.
<table>
<tr><th colspan="3">Controller status</th><th>Servo lamp (green)</th><th>Alarm lamp (red)</th></tr>
<tr><td colspan="3">Control power OFF</td><td>Off</td><td rowspan="3">Off</td></tr>
<tr><td rowspan="3">Normal</td><td rowspan="2">When PIO operation mode is selected</td><td>Motor energized state</td><td>ON</td></tr>
<tr><td>Motor de-energized state</td><td>Blinking
(Lit once per second)</td></tr>
<tr><td colspan="2">When the manual operation mode is selected</td><td>Blinking
(Lit once every 0.5 seconds)</td></tr>
<tr><td rowspan="2">At alarm occurrence</td><td colspan="2">When an operation alarm occurs</td><td rowspan="2">Off</td><td>Blinking
(Lit once per second)</td></tr>
<tr><td colspan="2">When a system alarm occurs</td><td>ON</td></tr>
<tr><td rowspan="3">At the time of the occurrence of warning</td><td rowspan="2">When PIO operation mode is selected</td><td>Motor energized state</td><td>ON</td><td rowspan="3">Blinking
(lit once per 2 seconds)</td></tr>
<tr><td>Motor de-energized state</td><td>Blinking
(Lit once per second)</td></tr>
<tr><td colspan="2">When the manual operation mode is selected</td><td>Blinking
(Lit once every 0.5 seconds)</td></tr>
</table></td></tr>
<tr><td>Alarm</td><td>Check the controller LED display.</td></tr>
<tr><td>PLC</td><td>Check whether there is an error on the PLC.</td></tr>
<tr><td>PLC communication</td><td>Check the I/O status using the monitoring function of the PLC side.</td></tr>
<tr><td>Actuator connection check</td><td>Check whether the controller model number supports the connected actuator.</td></tr>
<tr><td>Cable connection check</td><td>Make sure that the cables are connected properly without "disconnection" or "damaged sheath".
Before checking the continuity, be sure to turn off the power and remove the cables to prevent an electric shock.</td></tr>
<tr><td>Control power</td><td>Check the voltage of the control power supply (24 VDC).</td></tr>
<tr><td>Power supply</td><td>Check the voltage of the motive power supply (24 VDC).</td></tr>
<tr><td>Anti-noise measure</td><td>Check that measures (such as connecting ground wire and attaching a surge protector) have been taken against noise.</td></tr>
</table>

Situation check	Check the history leading up to the trouble occurring and the operation condition when the trouble occurred.
Serial number	Check the product's serial No. It may be requested for confirmation when you make an inquiry.

※Examine the cause of the trouble on the basis of the above items. Also refer to "5.1Problems, Causes, and Solutions" or "5.2Alarm Indications and Countermeasures" for solutions.

5.2. Alarm Indications and Countermeasures

5.2.1. Alarm

An alarm is output from the controller when an abnormality affecting the actuator operation is detected.
Check the alarm items, contents, causes/countermeasures. As a tip for countermeasures, the reference is described.
After taking corrective action, confirm that there is no problem before canceling the alarm.

- There are two alarm cancellation methods depending on the degree of abnormality.
  Cancelable alarm: The alarm can be canceled by resetting the alarm from the host device (PLC, etc.) or by emergency stop (turning off the motive power supply).
  Non-cancelable alarm: The alarm can be canceled by turning on the power again.

Alarm Item	Phenomenon	Cause/Solution	References	Cancellation methods
Operation alarm (Cancelable alarm)	When operated in the PUSH/opening direction, the cylinder switch on the PUSH/opening side cannot be detected.	Review the mounting condition of the cylinder switch. Check that there is no damage to the cylinder switch, switch relay cable, or motor relay cable.	"3.1.3 Setting the stop position" Note 1	Alarm reset
	When operated in the PULL/closing direction, the cylinder switch on the PULL/closing side cannot be detected.	Review the mounting condition of the cylinder switch. Check that there is no damage to the cylinder switch, switch relay cable, or motor relay cable.	"3.1.3 Setting the stop position" Note 1	Alarm reset
System alarm (Non-cancelable alarm)	The controller malfunctioned due to internal failure or noise.	Make sure there are no noise sources nearby.	-	Power cycle
	The temperature in the controller is high.	Turn off the power and eliminate the cause of high temperature rise.	-	Power cycle
	An overcurrent has flown into the motor.	-	-	Power cycle

Note 1: The reference item is "SM-A85796" in the instruction manual of the controller.
※ If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.

Alarm Item	Phenomenon	Cause/Solution	References	Cancellation methods
Warning	The motive power supply voltage has dropped below a certain value.	The motive power supply voltage detected by the controller is less than 21.6 V while the motive power supply is ON. Adjust the motive power supply voltage. The warning is canceled when the motive power supply voltage detected by the controller is 21.6 V or more.	"2.3.1 Wiring with the power supply" Note 1	Eliminating the cause of occurrence

Note 1: The reference item is "SM-A85796" in the instruction manual of the controller.

※ If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.

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 free of charge or repair the faulty product at one of CKD's facilities free of charge.
However, the following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments that deviate from those stated in the catalog, the Specifications, or this Instruction Manual.
- Failures due to excess durability (number of times, distance, time, etc.) and consumables
- 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 caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by causes that are not CKD responsibility, such as natural disasters and disasters.

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.

7. REFERENCE INFORMATION

7.1. Specifications

7.1.1. DMSDG series

Item			DMSDG-08			DMSDG-16		
Motor type			□20 stepping motor			□28 stepping motor		
Drive system			Cylindrical spring					
Stroke length		mm	10	20	30	10	20	30
Effective pressing range		mm	5	5 to 15	5 to 25	5	5 to 15	5 to 25
Max. pressing force (setting 9) Note 1		N	10			30		
Static allowable moment		N·m	MP = 0.16, MY = 0.16, MR = 0.24			MP = 0.57, MY = 0.57, MR = 1.16		
Max. portable mass	**Horizontal**	g	270			800		
	Vertical	g	80			800		
Operating speed range		mm/s	8 to 50			13 to 77		
Maximum acceleration/deceleration (setting 9)		mm/s^2	982			2259		
Pressing speed range		mm/s	8 to 50			13 to 77		
Motor power supply voltage			24 VDC ± 10%					
Insulation resistance			10 MΩ, 500 VDC					
Withstand voltage			500 VAC, 1 minute					
Operating ambient temperature			0 to 40°C (no freezing)					
Operating ambient humidity			35 to 80% RH (no condensation)					
Storage ambient temperature			-10 to 50°C (no freezing)					
Storage ambient humidity			35 to 80% RH (no condensation)					
Atmosphere			No corrosive gas, explosive gas, or dust					
Degree of protection			IP40					
Weight		g	110	130	140	290	310	330

Note 1: Pressing operation is possible only during PUSH.
If the pressing operation is performed during PULL, there is a risk of damage to the internal parts of the actuator.

Note 2: For DMSDG-08 only, make sure that the stop time at the unclamping end is 50% or more of one cycle.
This may result in failure of the cylinder switch.

7.1.2. DLSH series

Item		DLSH-20	DLSH-32
Motor type		□28 stepping motor	□42 stepping motor
Drive system		Cylindrical spring	
Stroke length	mm	10 (5 per side)	22 (11 per side)
Effective pressing range	mm	5 (2.5 per side)	11 (5.5 per side)
Max. gripping force (setting 9) Note 1	N	10 (one side)	40 (one side)
Static allowable moment	N·m	MP = 2.1, MY = 2.1, MR = 2.1	MP = 4.5, MY = 4.5, MR = 4.5
Operating speed range	mm/s	11 to 60	15 to 63
Maximum acceleration/deceleration (setting 9)	mm/s^2	1371	840
Gripping speed range	mm/s	11 to 60	15 to 63
Repeatability Note 2	mm	±0.02	
Motor power supply voltage		24 VDC ± 10%	
Insulation resistance		10 MΩ, 500 VDC	
Withstand voltage		500 VAC, 1 minute	
Operating ambient temperature		0 to 40°C (no freezing)	
Operating ambient humidity		35 to 80% RH (no condensation)	
Storage ambient temperature		-10 to 50°C (no freezing)	
Storage ambient humidity		35 to 80% RH (no condensation)	
Atmosphere		No corrosive gas, explosive gas, or dust	
Degree of protection		IP40	
Weight	g	600	1950

Note 1: Gripping is only possible in the closing direction. If the gripping operation is performed in the opening direction, there is a risk of damage to the internal parts of the actuator.

Note 2: Repeatability indicates the variation when repeatedly gripping the same workpiece under the same operating conditions.

7.1.3. DCKW series

Item		DCKW-20	DCKW-32
Motor type		□28 stepping motor	□42 stepping motor
Drive system		Cylindrical spring	
Stroke length	mm	4 (2 per side)	8 (4 per side)
Effective pressing range	mm	2 (1 per side)	4 (2 per side)
Max. gripping force (setting 9) **Note 1**	N	8 (one side)	30 (one side)
Operating speed range	mm/s	11 to 60	15 to 63
Maximum acceleration/deceleration (setting 9)	mm/s^2	1371	840
Gripping speed range	mm/s	11 to 60	15 to 63
Repeatability **Note 2**	mm	±0.02	
Motor power supply voltage		24 VDC ± 10%	
Insulation resistance		10 MΩ, 500 VDC	
Withstand voltage		500 VAC, 1 minute	
Operating ambient temperature		0 to 40°C (no freezing)	
Operating ambient humidity		35 to 80% RH (no condensation)	
Storage ambient temperature		-10 to 50°C (no freezing)	
Storage ambient humidity		35 to 80% RH (no condensation)	
Atmosphere		No corrosive gas, explosive gas, or dust	
Degree of protection		IP40	
Weight	g	400	1800

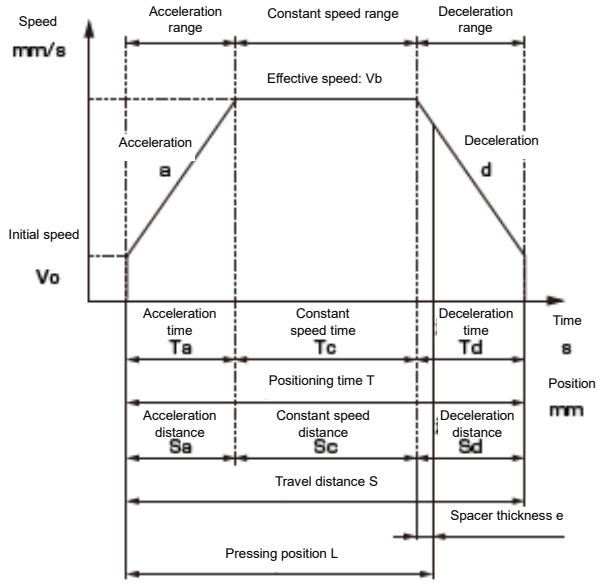
Note 1: Gripping is only possible in the closing direction. If the gripping operation is performed in the opening direction, there is a risk of damage to the internal parts of the actuator.

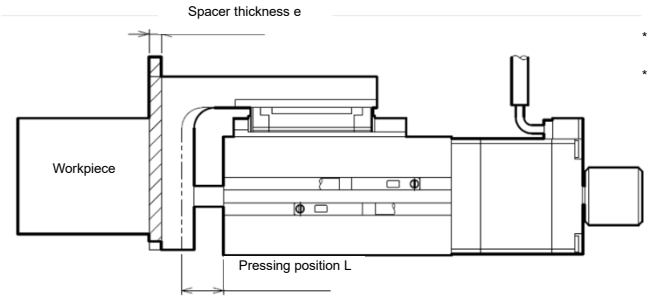
Note 2: Repeatability indicates the variation when repeatedly gripping the same workpiece under the same operating conditions.

7.2. Calculation of Positioning Time

The method for calculating the positioning time of the DMSDG series is as follows.

Positioning time of pressing operation





	Description	Code	Unit	Formula
Setting value	Initial speed	V0	mm/s	According to the table below (= Value of switch setting 0)
	Speed setting	V	mm/s	According to the table below
	Acceleration	a	mm/s²	According to the table below (fixed value)
	Deceleration	d		
	Pressing position	L	mm	
	Spacer thickness	e	mm	
Calculated value	Reached speed	Vmax	mm/s	$=(2\times(L-e)\times a+V0^2)^{1/2}$
	Effective speed	Vb	mm/s	Smaller of V and Vmax
	Acceleration rate	Ta	s	$= (Vb-V0) /a$
	Deceleration rate	Td	s	$=(Vb-V0)/d$
	Constant speed time	Tc	s	$=Sc/Vb$
	Acceleration distance	Sa	mm	$=V0\times Ta+ (a\times Ta^2) /2$
	Deceleration distance	Sd	mm	$=V0\times Td+(d\times Td^2) /2$
	Constant speed distance	Sc	mm	$=(L-e)-Sa$
	Positioning time	T	s	$=Ta+Td+Tc$

* Depending on the speed setting and stroke, the trapezoidal speed waveform may not be formed (the set speed may not be reached).

  In this case, select the lower of the set speed (V) and the reached speed (Vmax) for the execution speed (Vb).*

* The speed and acceleration rate are determined by the settings of the rotary switches 1 and 2.

* The interim time varies depending on the usage conditions, but it may take about 0.2 s.

* The positioning time is a guideline. Even if the pressing position is the same, there will be an error due to cylinder switch adjustment, power supply voltage, individual differences in motors, variations in mechanical efficiency, etc.

DMSDG-08

Rotary switch 1 (speed)		Rotary switch 2 (pressing force)		
Switch settings	Speed (mm/s)	Switch settings	Acceleration (mm/s^2)	Deceleration (mm/s^2)
0	8	0	0	559
1	13	1	32	509
2	17	2	68	467
3	22	3	127	431
4	27	4	202	400
5	31	5	272	374
6	36	6	373	350
7	40	7	465	330
8	45	8	594	312
9	50	9	738	295

DMSDG-16

Rotary switch 1 (speed)		Rotary switch 2 (pressing force)		
Switch settings	Speed (mm/s)	Switch settings	Acceleration (mm/s^2)	Deceleration (mm/s^2)
0	13	0	0	1569
1	20	1	23	1400
2	27	2	55	1264
3	34	3	97	1152
4	41	4	148	1059
5	48	5	209	979
6	55	6	280	911
7	62	7	360	851
8	69	8	450	799
9	77	9	565	753

※ Positioning time is the time from when the motor starts operation until it stops.

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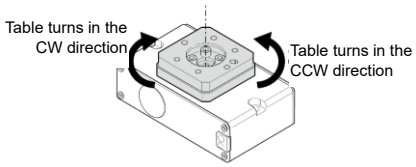
CAT5e

A standard for network cables, also called category 5e or category 5 enhanced. The communication speed has been improved from the conventional CAT5 standard. This cable is less susceptible to crosstalk caused by noise from other cables.

CCW

Abbreviation for Counter Clockwise Rotation. Counterclockwise when viewed from the output shaft side.



CRC

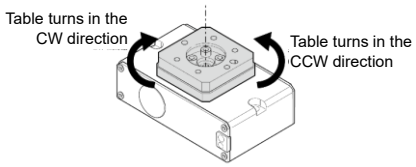
Abbreviation for Cyclic Redundancy Check. Also referred to as cyclic redundancy checking. A method to check whether data was transmitted, recorded, or replicated accurately.

CSP + file

Abbreviation for the Control & Communication System Profile Plus file. It contains information to help start up, operate, and maintain CC-Link compatible devices. Since the profile specification is fixed, parameters can be easily set for CC-Link products even if they are from different manufacturers.

CW

Abbreviation for Clockwise Rotation. Clockwise when viewed from the output shaft side.



Data Storage function

A function to back up the configuration parameter data of an IO-Link device, such as an ECG controller, to the IO-Link master.

DHCP server

A server that automatically assigns IP addresses and other configuration information to devices connected to a network.

EDS file

Abbreviation for Electronic Data Sheet file. It contains information to help start up, operate, and maintain EtherNet/IP-compatible devices. Since the profile specification is fixed, parameters can be easily set for EtherNet/IP products even if they are from different manufacturers.

ESI file

Abbreviation for EtherCAT Slave Information file. It contains information to help start up, operate, and maintain EtherCAT compatible devices. Since the profile specification is fixed, parameters can be easily set for EtherCAT products even if they are from different manufacturers.

HDLC

Abbreviation for High-level Data Link Control, and a type of protocol of the data link layer. Transmission efficiency is high because continuous transmission can be performed without waiting for the other party's response, and data error detection using CRC enables highly reliable data transmission.

IODD file

An abbreviation for the IO Device Description file. It contains information to help start up, operate, and maintain IO-Link compatible devices. Since the profile specification is fixed, parameters can be easily set for IO-Link products even if they are from different manufacturers.

IO-Link device

Devices such as sensors, actuators, and controllers compatible with IO-Link.

IO-Link master

It can connect multiple IO-Link devices and receive signals of the IO-Link devices. The IO-Link master can be set with IO-Link device setting items such as device verification function, backup function, and restore function using PLC development tools.

Input data

It indicates the 32 bit unit data (2 words) to be written from the host device (PLC, etc.) to the controller in EtherCAT communication.

Input signal

It indicates the bit-wise data to be written from the host device (PLC, etc.) to the controller in EtherCAT communication.

Output data

It indicates the 32 bit unit data (2 words) read from the controller by the host device (PLC, etc.) in EtherCAT communication.

Output signal

It indicates the bit-wise data read from the controller by the host device (PLC, etc.) in EtherCAT communication.

NPN

It indicates that NPN transistors are generally used in the output unit of a PLC in the connection of the parallel I/O specification. Even if the NPN transistor is not used, if the − side of the external power supply is connected to the output COM (output common) and the + side of the external power supply is connected to the input COM (input common), the term NPN is used. Also referred to as negative common type or sink type.

PNP

It indicates that PNP transistors are generally used in the output unit of a PLC in the connection of the parallel I/O specification. Even if the PNP transistor is not used, if the + side of the external power supply is connected to the output COM (output common) and the - side of the external power supply is connected to the input COM (input common), the term PNP is used. Also referred to as positive common type or source type.

PLC

Abbreviation for Programmable Logic Controller. A programmable controller for controlling industrial equipment. Possible to control multiple motors, sensors, robots, and other various devices.

WDT

Abbreviation for watchdog timer. A timer that detects an error in the computation time, monitors the time of one scan of the program, and issues an alarm if processing does not finish within the scheduled time.

Alarm code

When an error is detected, it is output from the controller to inform you of the error. You can check the display lamp of the controller, the output signal to the PLC, and all digits or one upper digit of the alarm code from S-Tools. You can check the details of the alarm in the Instruction Manual or the alarm history screen of S-Tools.

Inch operation

It is used when you want to move by relative position specification by the amount of travel set from the current position.

Encoder

There are a linear encoder that measures and outputs movement on a linear axis, and a rotary encoder that measures and outputs angle (rotational movement). The rotary encoder is referred to as an encoder in this Instruction Manual, the instruction manual described in the "Instruction manual for this product", and the catalog.

- Incremental encoder
  An encoder that measures and outputs the angle moved from the measurement start position. When using with an electric actuator, the amount of movement from the home position is unknown, so it is necessary to return to the home position before operating the actuator.
- Absolute encoder
  An encoder that measures and outputs the angle moved from the home position. When using with an electric actuator, it is not necessary to return to the home position before operating the actuator because it outputs the amount of movement from the home position.
- Battery-less absolute encoder
  An absolute encoder that does not require a battery to store the position.

Overhang amount

It indicates the distance from the center of the top surface of the slider to the center of gravity of the object transferred. In the catalog, the amount of overhang that is allowed in the front-back, left-right, and up-down directions is listed for each mass.

Regenerative current

Current that is generated by the motor operating like a generator when the moving part of the actuator is moved by an external force. Reverse current flows from the motor to

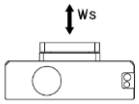
the controller, causing malfunction or damage.

Portable mass

It indicates the maximum mass that the actuator can transfer.

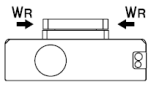
Allowable thrust load

Limit value of the load that can be applied in the direction of the actuator rotation axis. WS is used in this Instruction Manual, the instruction manual described in the "Instruction manual for this product", and the catalog.



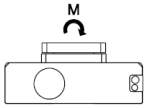
Allowable radial load

Limit value of the load that can be applied perpendicular (laterally) to the actuator rotation axis. WR is used in this Instruction Manual, the instruction manual described in the "Instruction manual for this product", and the catalog.



Allowable moment load

Limit value of the load that can be applied in the direction of tilting the actuator rotation axis. M is used in this Instruction Manual, the instruction manual described in the "Instruction manual for this product", and the catalog.



Home position

Position to be the reference (0 mm) for actuator operation.

Positioning repeatability

A term that is used only for grippers. It indicates the difference between the maximum and minimum stop positions when positioning operation is repeated from the same direction to the same position.

Repeatability

It Indicates the difference between the maximum and minimum stop positions when positioning operation is repeated from the same direction to the same position. However, in the case of grippers, it indicates the variation when the same workpiece is repeatedly gripped under the same operating conditions.

Grease

It is applied to bearings, bearings, etc., to reduce friction and smooth the operation of the machine. Because the performance cannot be demonstrated due to deterioration of grease or adhesion of foreign material, periodic maintenance is required.

Surge protector

A device that protects equipment and communication equipment from transient abnormal high voltage such as lightning.

Power OFF

It indicates that the motor is not energized.

Power ON

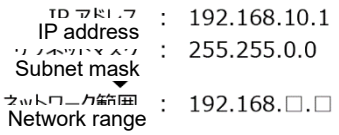
It indicates that the motor is energized.

Cyclic communication (transmission)

It indicates periodic communication between the host device (PLC, etc.) and the controller.

Subnet mask

A value that identifies in the IP address the part indicating which network it belongs to (network range) and the part indicating which device in the network. The subnet mask value tells you how many bits from the beginning of the IP address indicate the network range.



Jog operation

While the travel command is issued, the actuator continues to operate at the set speed.

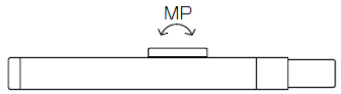
Slave station

A general term for stations other than the master station.

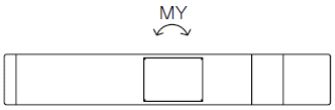
Static allowable moment

Limit value of the load moment that can be applied to the slider when the actuator is stationary. How to apply each moment in the slider type is as follows.

• Pitching moment
A moment acting in the front-rear direction on the slider movement axis. MP is used in this Instruction Manual, the instruction manual described in the "Instruction manual for this product", and the catalog.



• Yawing moment
A moment that acts in the left-right direction on the slider movement axis. MY is used in this Instruction Manual, the instruction manual described in the "Instruction manual for this product", and the catalog.



• Rolling moment
A moment that acts in the axial rotation direction on the slider movement axis. MR is used in this Instruction Manual, the instruction manual described in the "Instruction manual for this product", and the catalog.

Installation category

A concept that expresses how well an electrical device can withstand the application of a transient voltage from an AC power source. The installation category 2 corresponds to "primary side circuit for equipment using a power cord connected to an outlet".

Full-duplex communication

A communication method that allows simultaneous transmission and reception.

The number of stations occupied

In the CC-Link specification, a value that indicates how much traffic the controller occupies in the communication in the system. Since the number of stations that can be used by one master station is fixed, the total number of stations occupied by the controller and other units connected to the master station must be less than that value.

Software limit

It indicates the limit of the operating range set in the controller.

Dynamic brake

A method that quickly stops the rotation of the motor by consuming rotational energy as heat energy by short-circuiting the motor terminals via a resistor in the event of a power failure or emergency stop. Since there is no holding torque during stop, it is necessary to use an electromagnetic brake for vertical installation.

Electromagnetic brake

A mechanism that mechanically fixes the output shaft of the motor to prevent the workpiece from falling off when becoming the servo OFF state due to power failure or an alarm in the vertical installation state. Because it is a brake for holding, it cannot be used for stopping during operation.

Electric Actuator

It is a combination of a motor and mechanical parts, and can control operations such as speed, angle, and force. The rotational force of the motor is transmitted to the drive system and converted into rotational motion or linear motion.

Default gateway

It indicates the IP address of a relay device (such as a router) that connects the inside network to the outside network. When sending or receiving data to or from a device at an address other than the network range set by the subnet mask, the relay device set by the default gateway is always passed through.

Screw lead

It refers to the distance that the workpiece can be moved when the motor rotates once in the electric actuator.

Noise filter

An electrical circuit or electronic circuit that removes noise, or a device that contains it.

Backlash

A mechanical play in gears, etc.. The lower the backlash, the less rattling.

Parameter

Parameters let you set basic items for operating the actuator. In addition to the settings related to the actuator operation, settings related to communication with the PLC and warnings are also set with parameters.

Half-duplex communication

A communication method in which both transmission and reception cannot be performed at the same time (only one of them can be performed).

Fast Ethernet

It is standardized by IEEE802.3u and is a standard that improves the transmission speed of Ethernet to 100 Mbps.

Function block (FB)

It is a component of a circuit block that is used repeatedly so that it can be reused in a sequence program. By making them into the components, the control that combines multiple functions can be simplified as if it were a single command.

Ferrite core

It is magnetic material using ferrite material. It is used to attenuate high frequency noise.

Process data output / PD(out)

It indicates the data to be written from the host device (PLC, etc.) to the controller in IO-Link specification communication.

Process data input / PD(in)

It indicates the data that the host device (PLC, etc.) reads out from the controller in IO-Link specification communication.

Point data

In the point data, the actuator operation pattern such as the target position and speed is set for each point number. In ECG series, the operation pattern for 64 points can be set, and the actuator can be operated by specifying the point number and issuing a travel command.

Polling

If multiple devices communicate separately, processing and signals can conflict and cause problems. Polling is the process in which the main device (master station) checks in order whether there are any requests from other devices (slave station) in order to communicate smoothly.

When polling response is being performed, it means that there is polling from the master station to the slave station, and the slave station is responding to the polling from the master station.

Ball screw

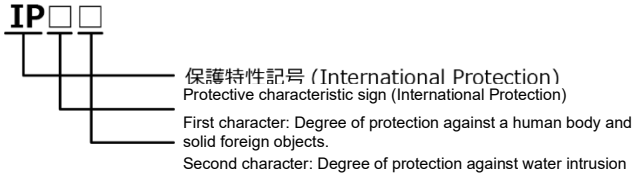
A mechanical element that can convert rotational motion to linear motion. Unlike sliding screws, the ball rolls between the screw shaft and nut, reducing energy loss due to friction. It is used to convert the rotational motion of the motor into the linear motion of the actuator.

Baud rate

It indicates the communication speed. A value that indicates how many times per second digital data can be modulated and demodulated.

Protective class IP20/IP40

The protective class indicates the degree of protection from solid foreign materials such as dust and water. The first digit of the number indicates the degree of protection against the human body and solid foreign materials, and "2" indicates that it is protected against foreign solid materials with a diameter of 12.5 mm or more and "4" indicates that it is protected against foreign solid substances with a diameter of 1.0 mm or more. The second digit of the number indicates the degree of protection against water intrusion, and "0" indicates no protection. It is specified in JIS C 0920 and IEC 60529.



Master station

A station that controls the entire network. One master station is required for one network.

Mechanical end

A position where the moving part of the actuator stops mechanically.

Message communication (transmission)

It indicates communication that occurs irregularly (when necessary) between the host device (PLC, etc.) and the controller.

Remote device station

A station that cyclically transmits bit-wise input/output signal and word-based input/output data to the master station in the communication of CC-Link specification.

Remote output

It indicates bit-wise data that is written from the host device (PLC, etc.) to the controller in the communication of CC-Link specification.

Remote input

It indicates bit-wise data that the host device (PLC, etc.) reads out from the controller in the communication of CC-Link specification.

Remote register (output)

It indicates 16-bit unit (1 word) data that is written from the host device (PLC, etc.) to the controller in the communication of CC-Link specification.

Remote register (input)

It indicates 16-bit unit (1 word) data that the host device (PLC, etc.) reads out from the controller in the communication of CC-Link specification.

Lost motion

It is the maximum value of the difference between the average values at the stop position after rotating in the forward and reverse directions multiple times. It is affected by the backlash and the rigidity of the mechanism.