

ROBO CYLINDER®

Rotary Chuck

RCP6- RTCKSRE, RTCKSRI
RTCKSPE, RTCKSPI
RCP6- RTCKMRE, RTCKMRI
RTCKMPE, RTCKMPI

Instruction Manual First Edition ME3790-1E



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Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

Please download the user's manual from our website.

You can download it free of charge. User registration is required for the first time downloading.

URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
- Use or reproduction of this instruction manual in full or in part without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.

RCP6 Rotary Chuck Instruction Manual Configuration

Product Name	Instruction Manual Name	Control Number
RCP6 Rotary Chuck	Instruction Manual (this document)	ME3790

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Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	• This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) • Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. • Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact • For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	• When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. • When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. • When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. • Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. • Do not step or sit on the package. • Do not put any heavy thing that can deform the package, on it. • When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. • When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment’s capability limit. • Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. • Do not get on the load that is hung on a crane. • Do not leave a load hung up with a crane. • Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	• The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. • Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. • Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. • Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. • When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring • Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. • Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. • Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. • When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. • Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. • Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire. (3) Grounding • The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. • For the ground terminal (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. • Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures • When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. • When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot’s movable range. When the robot under operation is touched, it may result in death or serious injury. • Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. • Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. • Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. • When the installation or adjustment operation is to be performed, give clear warnings such as “Under Operation; Do not turn ON the power!” etc. Sudden power input may cause an electric shock or injury. • Take the measure so that the work part is not dropped in power failure or emergency stop. • Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. • Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. • When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	• When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. • Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. • When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. • When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. • Place a sign “Under Operation” at the position easy to see. • When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	• When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. • After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. • When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. • Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. • Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	• Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. • Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. • Make sure to operate automatic operation start from outside of the safety protection fence. • In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. • When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	• When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. • Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. • When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. • When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. • When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. • Place a sign “Under Operation” at the position easy to see. • For the grease for the guide or ball screw, use appropriate grease according to the instruction manual for each model. • Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. • When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. • The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. • Pay attention not to lose the removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	• Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	• When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. • When removing the actuator for disposal, pay attention to drop of components when detaching screws. • Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	• Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. • See Overseas Specifications Compliance Manual to check whether complies if necessary. • For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety. • Using the devise in a way not indicated by IAI may lose the protection performance equipped to the device.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the instruction manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

Precautions for Handling

1. The Safety Guide attached with the product is intended to permit safe use of the product and thus to prevent risks and property damage. Be sure to read it before handling the product.

2. Do not attempt any handling or operation that is not indicated in this instruction manual.

3. Make sure to secure the actuator properly in accordance with this instruction manual.

If the actuator is not securely fixed, this may lead to abnormal noise, vibration, breakdown or shortened product life.

4. Make sure to observe the usage conditions and environment of the product.

Operation outside the warranty could cause decreased performance or product breakdown.

Use within the allowable range for each item.

Item	Cautions for use	Problems or breakdowns which may occur if the allowable range is exceeded
operation	Use within the allowable range	May lead to abnormal noise, vibration, breakdown, or shortened product life.
Allowable moment	Use within the allowable range	May lead to abnormal noise, vibration, breakdown, or shortened product life.
Overhang		

5. Avoid contamination from getting into the moving part of the fingers.

Contamination may get pinched and may cause malfunction.

6. In some conditions of environment of use, postures of installation and conditions of operation, the base oil separated from the grease may come out.

It is recommended to have a protection in case the peripheral devices could get influence of the base oil.

7. When it is necessary to open the fingers manually with hand, make sure to open both fingers at the same time.

Opening fingers on only one side would give excess force to the internal cam feature and could damage it.

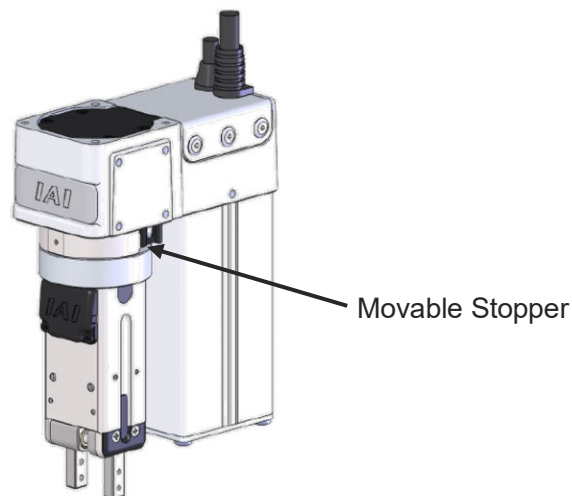
8. Do not put anything that is magnetic close to the position sensor.

It may cause wrong detection.

9. Do not apply excess impact or force on the movable stopper.

Applying excess impact or force may damage the movable stopper.

As the limit in rotation will be lost if the movable stopper gets damaged, there is a concern that the cables inside may get broken if rotating in such a condition.



10. When the rotation speed is slow (S Type: 120deg/s or less, M Type: 90deg/s or less), vibration or driving noise should increase due to the rotation characteristics of the motor.

International Standard Compliance

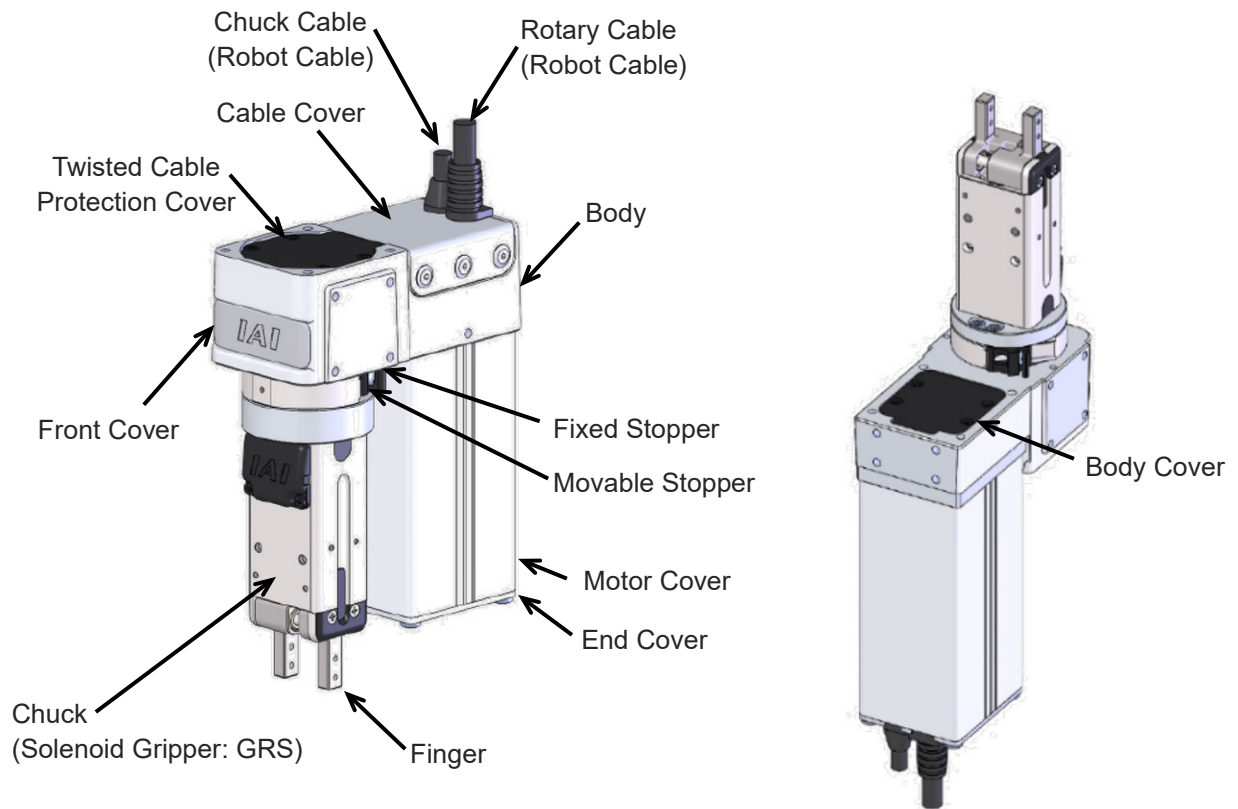
The rotary chuck complies with the following overseas standards.

Refer to the Overseas Standard Compliance Manual (ME0287) for more detailed information.

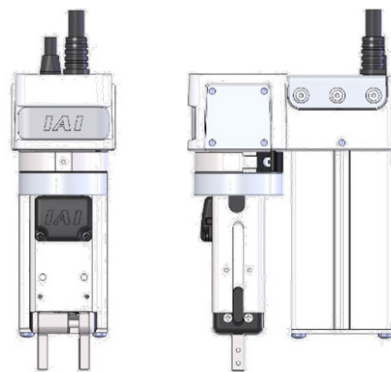
CE Marking	RoHS3 Directive
○	○

Names of the Parts

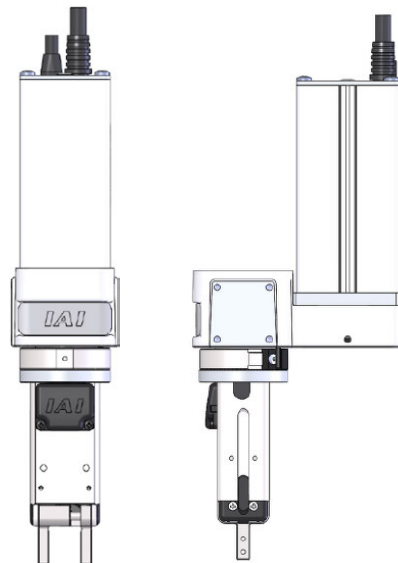
Rotary Chuck



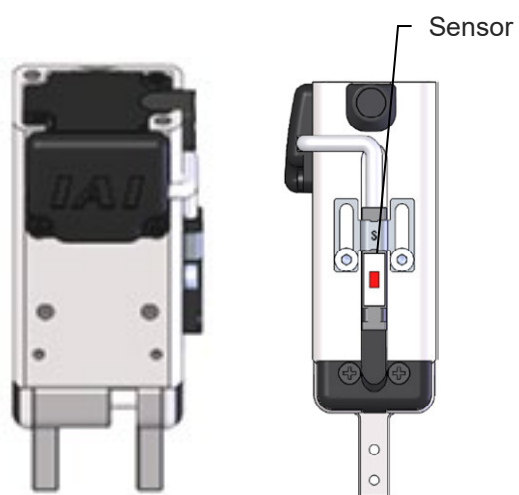
[Direction of Motor Reversed]



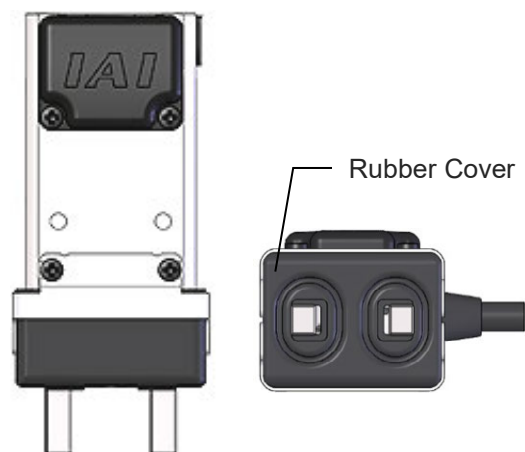
Reversed Type



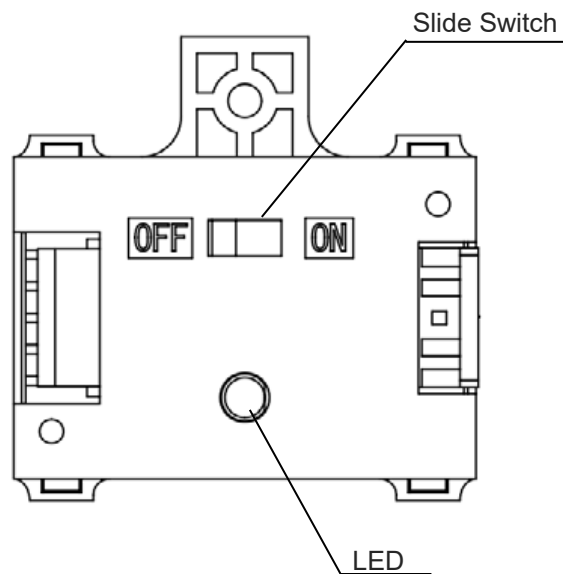
Parallel Type



Attaching Sensor (Option)



Rubber Cover (Option)

**[Slide Switch]**

Set this switch to "ON" side and the fingers on the chuck should get released.
For the outer gripping type, fingers can be compulsorily open.
For the inner gripping type, it should be compulsorily close.
While the switch is on, the LED lamp should be on.
(However, it cannot be turned OFF compulsorily when Release Signal is ON.)
Turn the slide switch OFF when in normal use.

[LED]

It is an LED lamp that turns on and off in accordance with the operation open and close (signal ON/OFF) of the chuck fingers.

Chapter 1

Specifications

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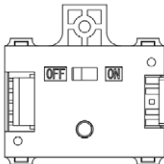
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1.1 Checking the Product

Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

Item	Shape	Quantity	Remarks
Body		1	
Driver Box		1	
Motor Encoder Integrated Cables		1	
Solenoid Driver Cable		1	

1.1 Checking the Product

Item	Shape	Quantity	Remarks
Safety Guide	 The image shows the cover of the 'Safety Guide Sixth Edition' (安全ガイド 第6版). It features the IAI logo at the top, a QR code on the left, and a list of instructions in Japanese and English. The Japanese text includes: 1. Before use, read this guide thoroughly. 2. Follow the guide and take necessary measures to ensure safety. 3. This guide is for the customer's use only. The English text includes: 1. Make sure to read this Guide thoroughly before use of the robot. 2. Please follow this Guide and take necessary measures to ensure safety in the design and production of the system by use of the robot. 3. Please ensure that this Guide is ultimately delivered to the customer who uses the product. A note at the bottom states: * Using or copying all or a part of this SAFETY GUIDE without permission is prohibited.	1	

How to Read the Model Nameplate

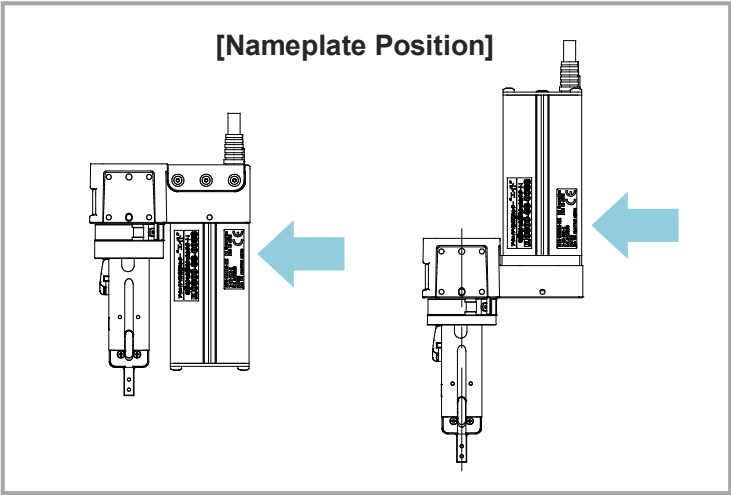
[Main Body]

Model Number

Serial Number

RCP6-RTCKXXX-XXX
X-XX-XXX-X
S/N A80000000
CAUTION
Use IAI specified cables

IAI Corporation
MADE IN JAPAN
CE



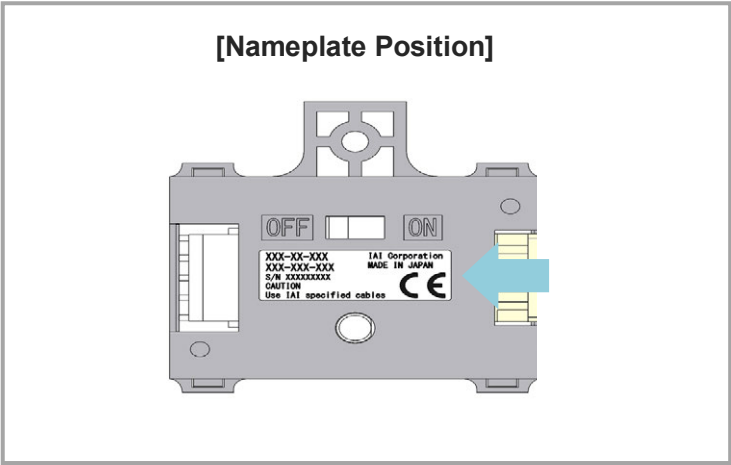
[Driver Box]

Model Number

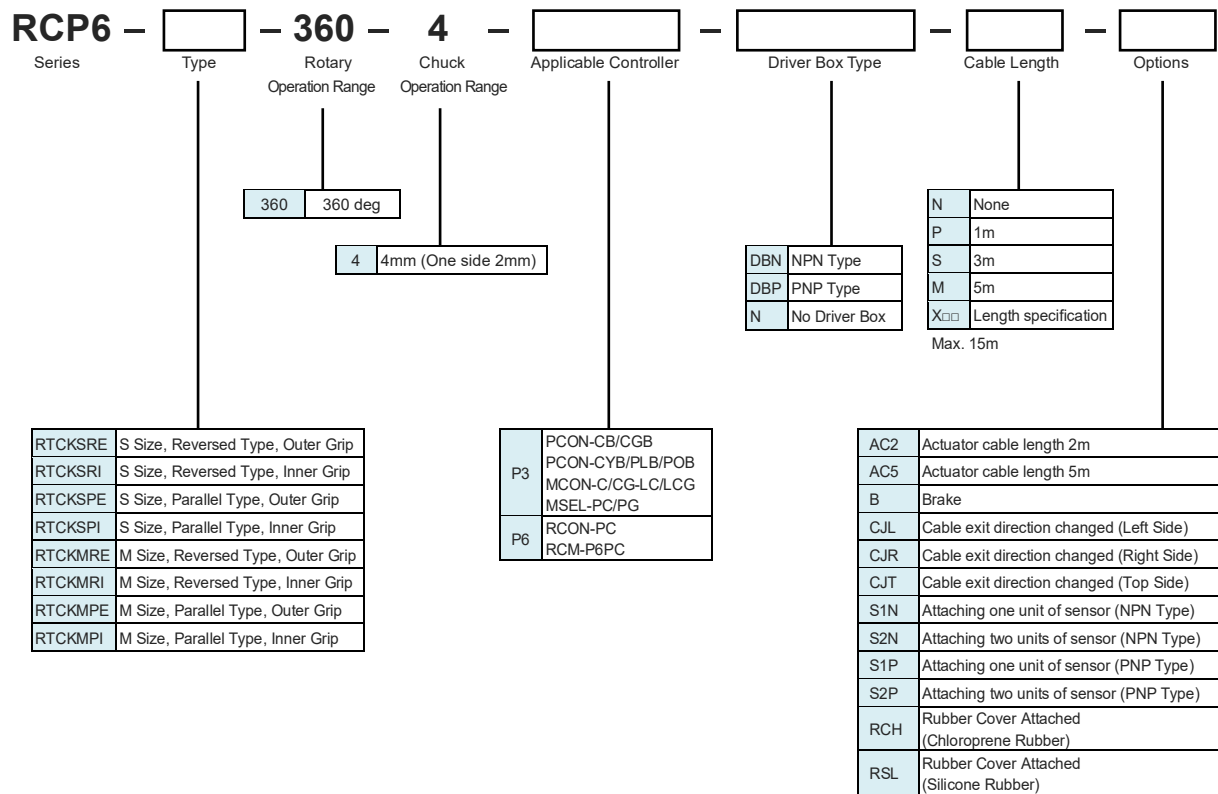
Serial Number

GRS-DB-NPN
S/N A80531979
CAUTION
Use IAI specified cables

IAI Corporation
MADE IN JAPAN
CE



How to Read the Model Number



* The length of the actuator cable should be 1m unless any indication.

1.2 Specifications

Specifications

[1] RCP6-RTCKSRE, RTCKSRI, RTCKSPE, RTCKSPI

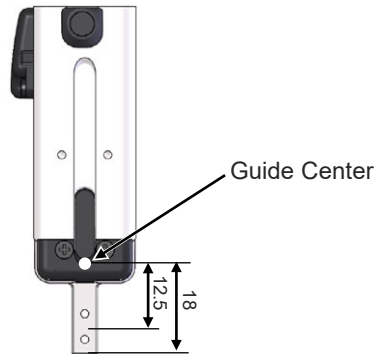
[Main Specifications]

Item	Contents
Open/Close Stroke (mm)	4 (One side 2)
Max. Grip Force ^{*1} (N)	10 (One side 5)
Repeated Gripping Accuracy ^{*2} (mm)	±0.1
Gripping Backlash (mm)	One side 0.5 or less
Gripper Open/Close Operation Time (sec)	0.03 or less
Gripping Max. Operation Frequency (CPM)	120
Rotary Operation Range (deg)	0 to 360 (Within 1 turn)
Max. Torque (N•m)	0.29
Allowable moment (kg•m ²)	2.30×10^{-4}
Rotary Min. Velocity (deg/s)	113
Rotary Max. Velocity ^{*3} (deg/s)	1800
Rotary Max. Acceleration/Deceleration (deg/s ²)	29400
Rotary Max. Acceleration/Deceleration (Controller Setting) (G)	3
Rotary Gear Ratio	1/4
Rotary Angle Repeated Positioning Accuracy (deg)	±0.02
Rotary Angle Lost Motion (deg)	0.05
Brake Holding Torque (Option) (N•m)	0.1
Gripping Function	Compression Spring + Cam Feature
Releasing Function	Solenoid Electromagnetic Force + Cam Feature
Rotary Function	Stepping Motor + Timing Belt Deceleration
Allowable Load in Vertical ^{*4} (N)	150
Static Allowable Moment ^{*4} (N•m)	Ma: 0.62
	Mb: 0.62
	Mc: 0.99
Rotary Part Motor Type	28P Pulse Motor
Rotary Part Encoder Type	Battery-less Absolute
Number of Encoder Pulse on Rotary Part	8192 pulse/rev
Ambient Operating Temperature/Humidity	0 to 40°C, 85% RH or less (Non-condensing)

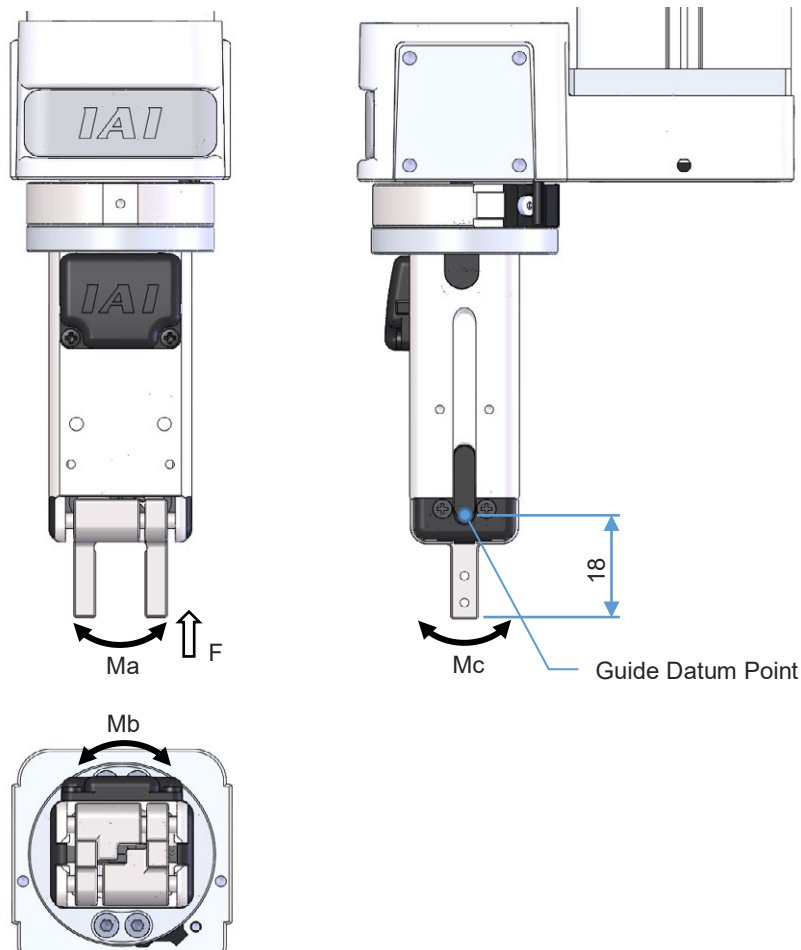
CPM: cycle per minute

- *1 It is the grip force of the fingers at 2mm on one side when the grip point at 12.5mm and overhang distance 0mm. The grip force should vary depending on the position on the stroke when a workpiece is gripped.

[Refer to relation between the finger stroke and the grip force in the next page]

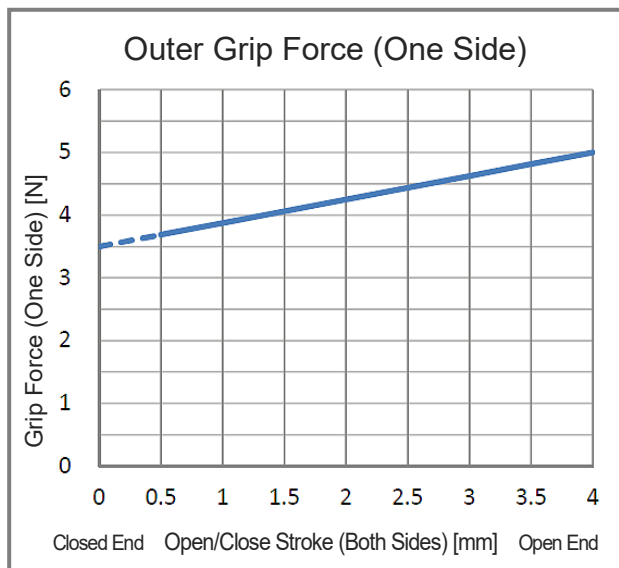
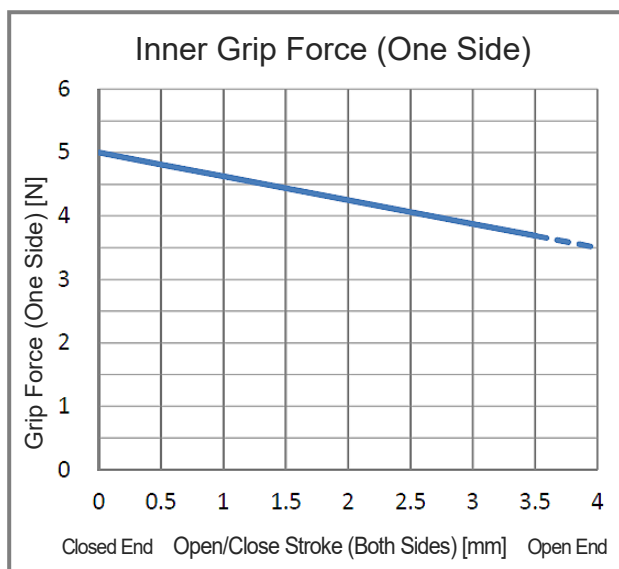


- *2 It is the repeatability Accuracy for gripping. Be aware it is not the repeatability accuracy for releasing operation.
- *3 When the rotation speed is slow (120deg/s or less), vibration or driving noise should increase due to the rotation characteristics of the motor.
- *4 The vertical load direction F and directions for allowable static moments Ma, Mb and Mc are as shown in the figures below.



[Relation between the Finger Stroke and the Grip Force]

The graph shows the grip force on one finger.

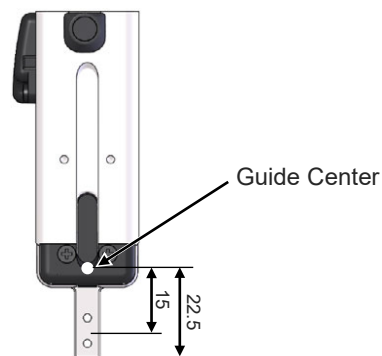
RCP6-RTCKSRE, RTCKSPE**RCP6-RTCKSRI, RTCKSPI**

[2] RCP6-RTCKMRE, RTCKMRI, RTCKMPE, RTCKMPI**[Main Specifications]**

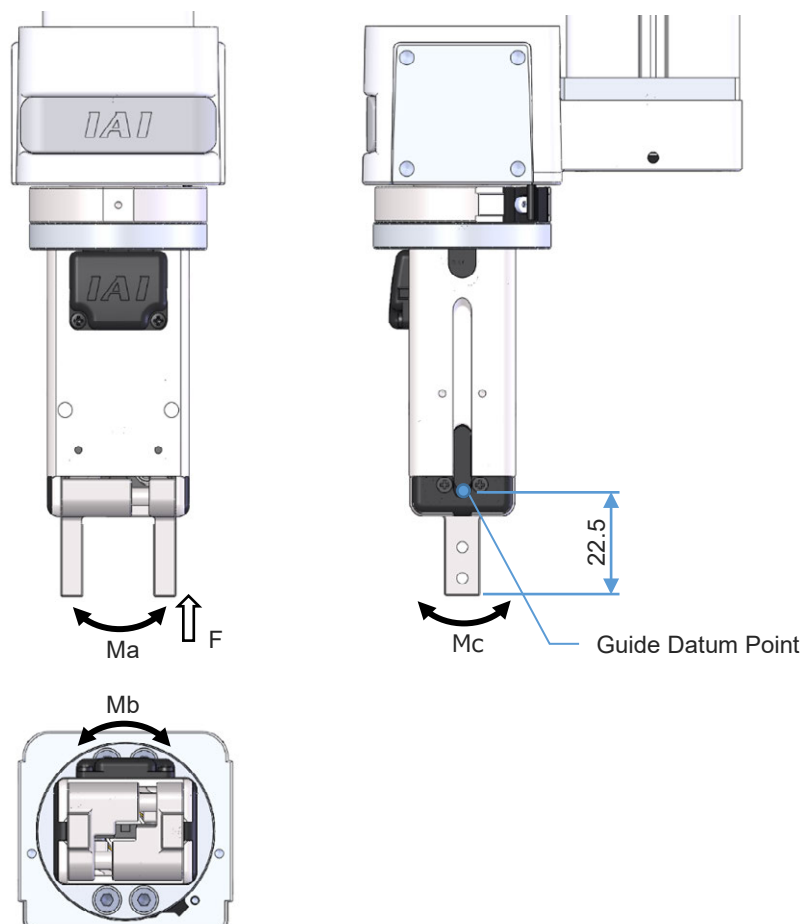
Item	Contents
Open/Close Stroke (mm)	4 (One side 2)
Max. Grip Force ^{*1} (N)	20 (One side 10)
Repeated Gripping Accuracy ^{*2} (mm)	±0.1
Gripping Backlash (mm)	One side 0.5 or less
Gripper Open/Close Operation Time (sec)	0.03 or less
Max. Operation Frequency (CPM)	120
Rotary Operation Range (deg)	0 to 360 (Within 1 turn)
Max. Torque (N•m)	0.36
Allowable moment (kg•m ²)	3.60 × 10 ⁻⁴
Rotary Min. Velocity (deg/s)	90
Rotary Max. Velocity ^{*3} (deg/s)	1800
Rotary Max. Acceleration/Deceleration (deg/s ²)	29400
Rotary Max. Acceleration/Deceleration (Controller Setting) (G)	3
Rotary Gear Ratio	1/5
Rotary Angle Repeated Positioning Accuracy (deg)	±0.02
Rotary Angle Lost Motion (deg)	0.05
Brake Holding Torque (Option) (N•m)	0.125
Gripping Function	Compression Spring + Cam Feature
Releasing Function	Solenoid Electromagnetic Force + Cam Feature
Rotary Function	Stepping Motor + Timing Belt Deceleration
Allowable Load in Vertical ^{*4} (N)	240
Static Allowable Moment ^{*4} (N•m)	Ma: 1.08
	Mb: 1.08
	Mc: 2.64
Rotary Part Motor Type	28P Pulse Motor
Rotary Part Encoder Type	Battery-less Absolute
Number of Encoder Pulse on Rotary Part	8192 pulse/rev
Ambient Operating Temperature/Humidity	0 to 40°C, 85% RH or less (Non-condensing)

CPM: cycle per minute

- *1 It is the grip force of the fingers at 2mm on one side when the grip point at 15mm and overhang distance 0mm. The grip force should vary depending on the position on the stroke when a workpiece is gripped. [Refer to relation between the finger stroke and the grip force in the next page]

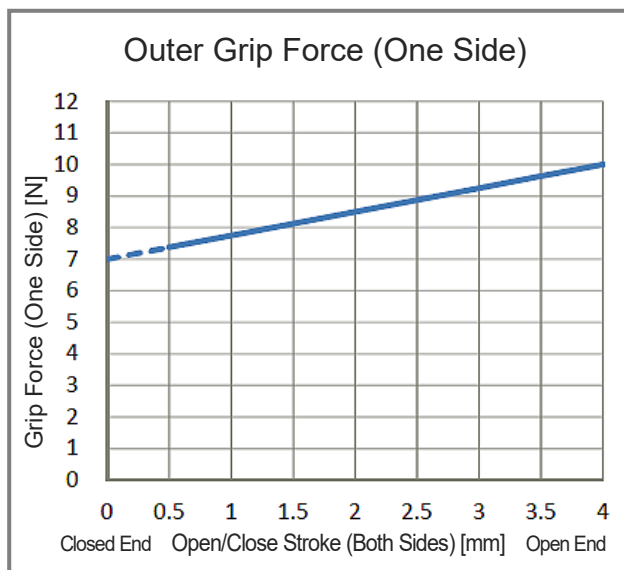
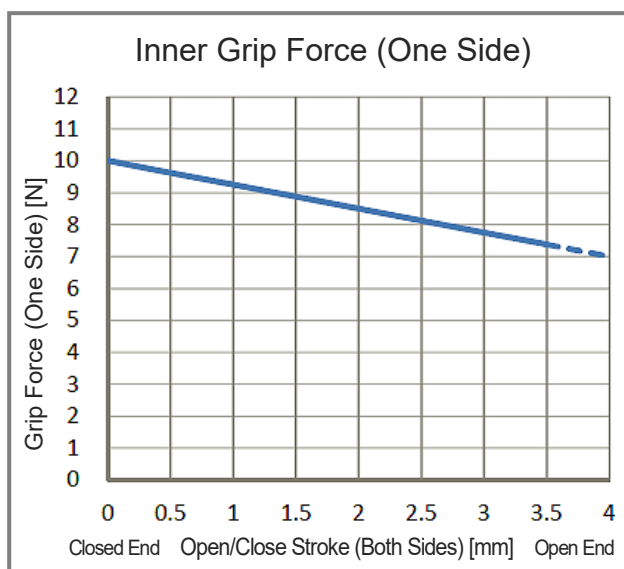


- *2 It is the repeatability Accuracy for gripping. Be aware it is not the repeatability accuracy for releasing operation.
- *3 When the rotation speed is slow (90deg/s or less), vibration or driving noise should increase due to the rotation characteristics of the motor.
- *4 The vertical load direction F and directions for allowable static moments Ma, Mb and Mc are as shown in the figures below.



[Relation between the Finger Stroke and the Grip Force]

The graph shows the grip force on one finger.

RCP6-RTCKMRE, RTCKMPE**RCP6-RTCKMRI, RTCKMPI**

1.3 Operating Conditions

It is necessary to satisfy the conditions stated below to use the product. Conduct the following calculation to make sure it is satisfied.

Procedure 1 Check for the necessary grip force of chuck and transportable weight of workpiece



Procedure 2 Check for the vertical allowable load of the fingers and allowable moment



Procedure 3 Check for the allowable moment of inertia

Procedure 1 Check for the necessary grip force of chuck and transportable weight of workpiece

The necessary grip force should be calculated as shown below when a workpiece is to be gripped with the friction force of the chuck grip force.

(1) In case of ordinary transportation

F : Grip Force [N].....Sum of pressing force on each finger

μ : Coefficient of static friction between finger attachment and workpiece

m : Mass of workpiece [kg]

g : Gravitational acceleration [= 9.8m/s²]

The condition to grip the workpiece statically and that the workpiece would not drop is;

$$F\mu > W$$

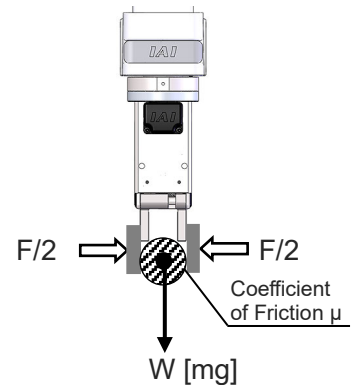
$$F > \frac{mg}{\mu}$$

The necessary grip force assuming the safety factor recommended for ordinary transportation is 2 should be;

$$F > \frac{mg}{\mu} \times 2 \text{ (safety factor)}$$

When coefficient of friction is $\mu 0.1$ to 0.2 ;

$$F > \frac{mg}{0.1 \text{ to } 0.2} \times 2 = (10 \text{ to } 20) \times mg$$



- * The mass of a transportable workpiece will get higher as the coefficient of static friction is higher. However it is necessary to that enables it to obtain a grip force of 10 to 20 times or more to ensure the safety.

For ordinary workpiece transportation;

Necessary grip force $\Rightarrow$ 10 to 20 times or more of the workpiece mass

Transportable workpiece mass $\Rightarrow$ 1/10 to 1/20 or less of the grip force

- (2) In case of high acceleration/deceleration speed or a big impact is applied to the workpiece during transportation

High inertial force, in addition to the gravity, will be applied to the workpiece. In such cases, consider an even higher safety factor if it is necessary.

When high acceleration/deceleration speed or a big impact is applied;

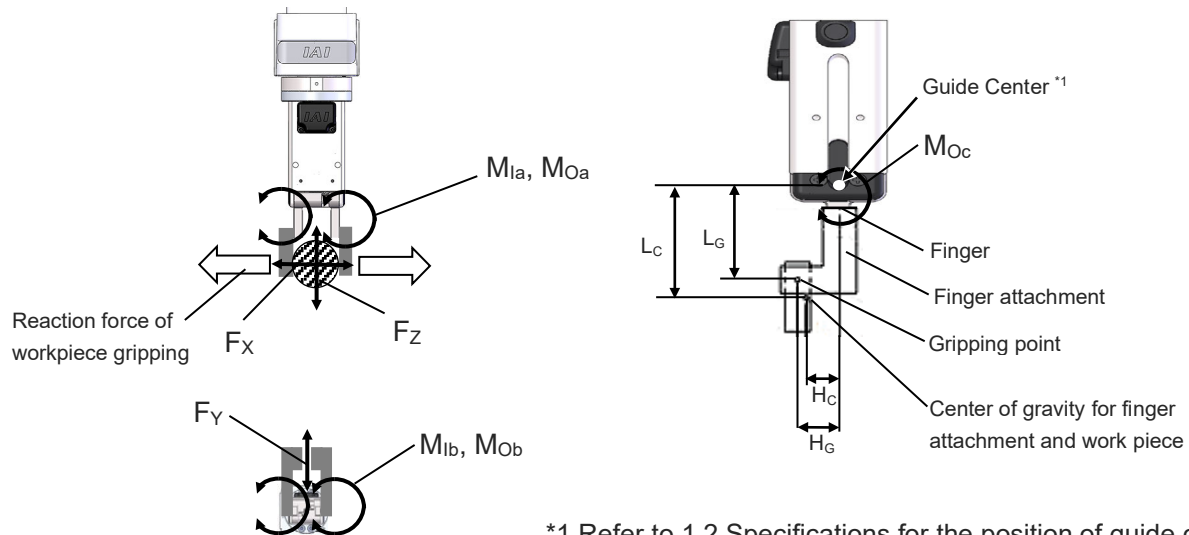
Necessary grip force $\Rightarrow$ 30 to 50 times or more of the workpiece mass

Transportable workpiece mass $\Rightarrow$ 1/30 to 1/50 or less of the grip force

Procedure 2 Check for the vertical allowable load of the fingers and allowable moment

Check the vertical load and the moment applicable to the finger. Calculate F_z , M_a , M_b and M_c by referring to (1) to (3) described below, and select a model considering not to exceed the allowable value. Or, consider to make the overhang smaller at the gripping point so it would not exceed the allowable value.

Load and the moment applicable to the finger



*1 Refer to 1.2 Specifications for the position of guide center

F_x : External force in X direction applied to workpiece and finger [N]

F_y : External force in Y direction applied to workpiece and finger [N]

F_z : External force in Z direction applied to workpiece and finger [N]

L_g : Distance from finger attachment surface to gripping point [mm] (Note1)

H_g : Distance from center of fingers to gripping point (Overhang) [mm] (Note1)

L_c : Distance from finger attachment surface to center of gravity for workpiece and finger attachment [mm]

H_c : Distance from center of fingers to center of gravity for workpiece and finger attachment [mm]

M_{la} : Moment in M_a direction generated on fingers due to grip force [N·m]

M_{lb} : Moment in M_b direction generated on fingers due to grip force [N·m]

M_{oa} : Moment in M_a direction generated on fingers due to external force [N·m]

M_{ob} : Moment in M_b direction generated on fingers due to external force [N·m]

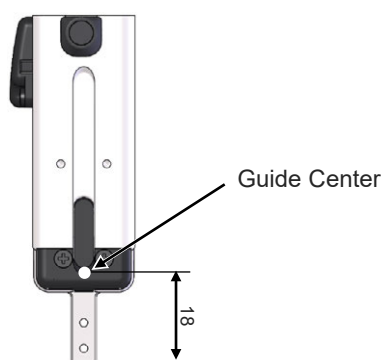
M_{oc} : Moment in M_c direction generated on fingers due to external force [N·m]

M_a : All moments in M_a direction generated on fingers [N·m]

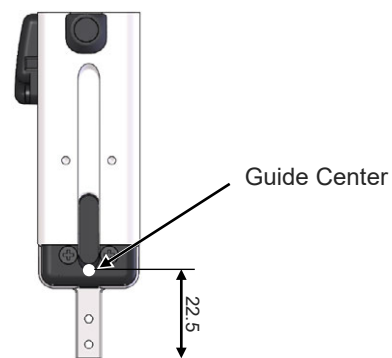
M_b : All moments in M_b direction generated on fingers [N·m]

M_c : All moments in M_c direction generated on fingers [N·m]

Note 1 For L_g and H_g , have the values below as the upper limit. Exceeding the allowable range may generate an excessive moment on the finger sliding mechanism, which may be a cause of a bad impact to the product life.



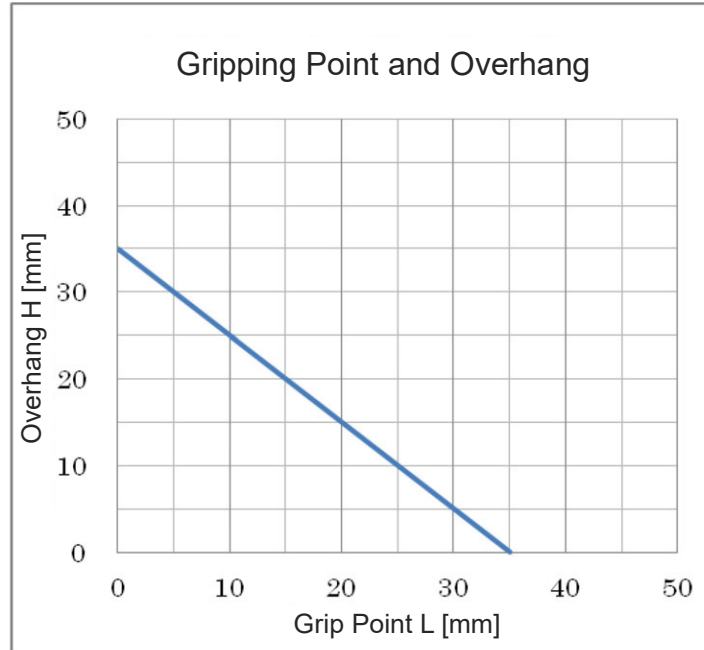
[RTCKSRE/RTCKSRI/RTCKSPE/RTCKSPI]



[RTCKMRE/RTCKMRI/RTCKMPE/RTCKMPI]

Upper Limit for Gripping Point L_G and Overhang H_G

[RTCKSRE/RTCKSRI/RTCKSPE/RTCKSPI]



[RTCKMRE/RTCKMRI/RTCKMPE/RTCKMPI]

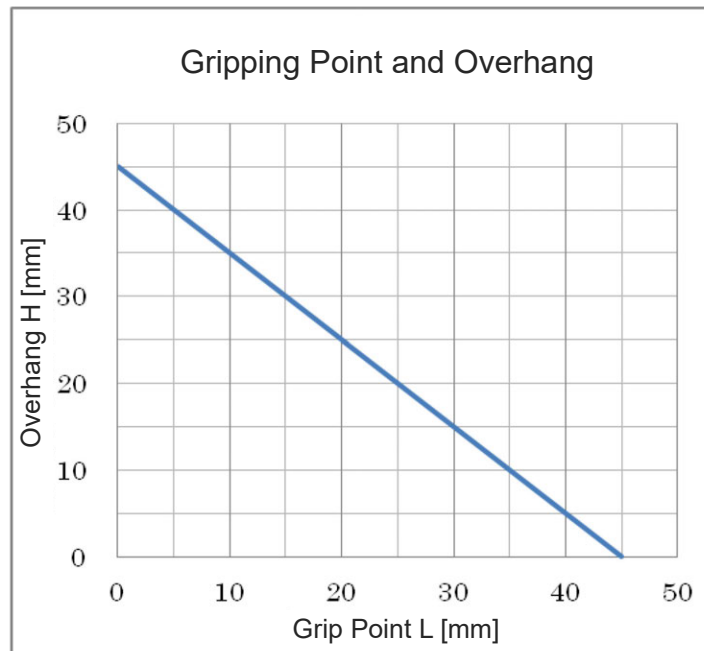


Table 1: Allowable Load and Allowable Moment on the Fingers ^(Note 1)

Model	Allowable Load in Vertical [N] F_{Zmax}	Max. Allowable Moment ^(Note2) [N•m]		
		M_{amax}	M_{bmax}	M_{cmax}
RTCKSRE/RTCKSRI/RTCKSPE/RTCKSPI	150	0.62	0.62	0.99
RTCKMRE/RTCKMRI/RTCKMPE/RTCKMPI	240	1.08	1.08	2.64

Note 1 The graphs show the values for allowable load and allowable moment in static on one finger.

Note 2 The values for the allowable moment are those when the load is applied in one direction only.

The values become one half when the load is applied from in two directions.

(1) Moment generated on fingers due to grip force

1) Moment in M_a direction [M_{Ia}]

$$M_{Ia} = L_G \frac{1.5F_G}{2} \times 10^{-3}$$

F_G : Grip force of chuck (N)

2) Moment in M_b direction [M_{Ib}]

$$M_{Ib} = H_G \frac{1.5F_G}{2} \times 10^{-3}$$

F_G : Grip force of chuck (N)

Refer to “1.2 Specifications Relation between the Finger Stroke and the Grip Force” for grip force F_G . As the grip force is a reference value, it is multiplied by 1.5 for the safety margin in the moment calculation.

(2) Moment generated on the fingers due to an external force

External force other than grip force should be applied to a workpiece and finger attachment when an operation such as to move straight or turn is performed with the rotary chuck attached on a cartesian robot or other actuators.

Have the following calculation.

◆ External force applied on the workpiece and finger attachment [F_X , F_Y , F_Z]

Figure out the following types of external forces in three directions, X, Y and Z, applied on the workpiece and finger attachment considering the condition of the rotary chuck use, and sum up all the values to determine F_X , F_Y and F_Z .

a) Weight of the workpiece and finger attachment

$$F = mg$$

m : mass of the workpiece and finger attachment [kg], g : gravitational acceleration [= 9.8m/s²]

b) Inertial force in the chuck moving straight

$$F = ma \quad a : \text{Acceleration/deceleration during transportation [m/s}^2\text{]}$$

c) Centrifugal force in chuck turning

$$F = mr\omega^2 \quad r : \text{Radius of turning [m]}, \omega : \text{Angular velocity [deg/s]}$$

Confirm that F_Z is below the allowable load vertical direction, F_{Zmax} in Table 1.

◆ Moment generated on the fingers due to an external force

Figure out the moment in each direction due to external forces F_X , F_Y and F_Z calculated above.

1) Moment in M_a direction [M_{oa}] $M_{oa} = LcF_X \times 10^{-3}$

2) Moment in M_b direction [M_{ob}] $M_{ob} = HcF_X \times 10^{-3}$

3) Moment in M_c direction [M_{oc}] $M_{oc} = LcF_Y \times 10^{-3} + HcF_Z \times 10^{-3}$

(3) All moments in each direction generated to the fingers

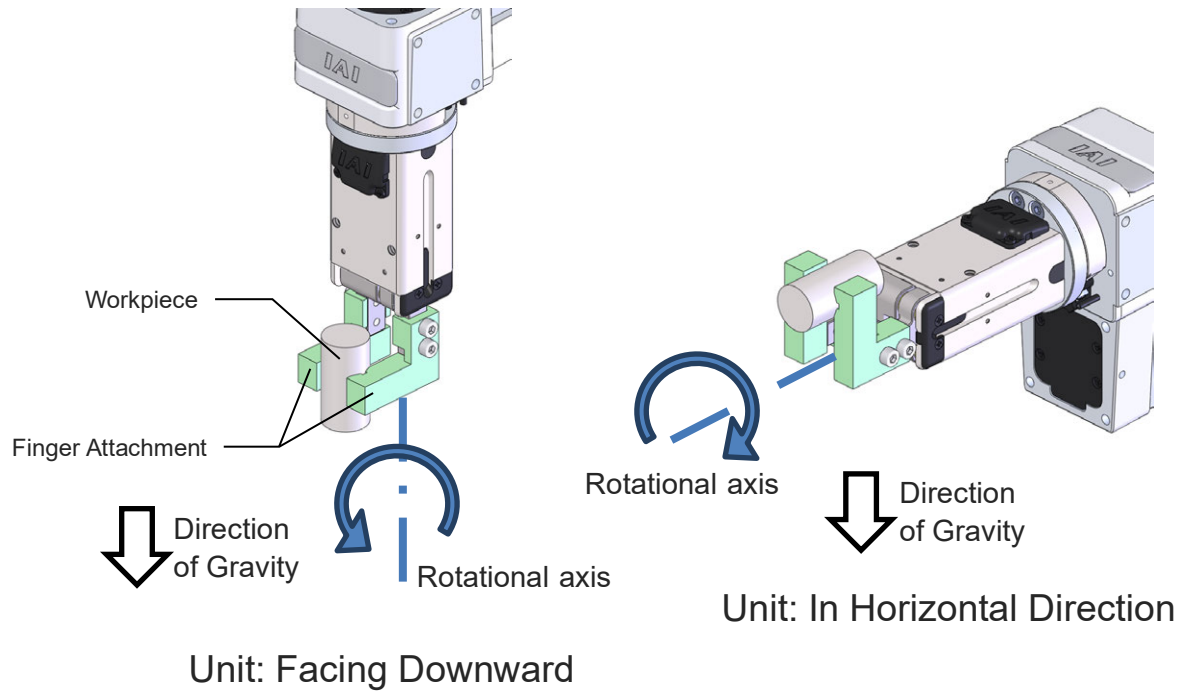
$$M_a = M_{la} + M_{oa}, \quad b = M_{lb} + M_{ob}, \quad M_c = M_{oc}$$

Confirm that the value figured out in the calculation above is below the allowable moment stated in Table 1.

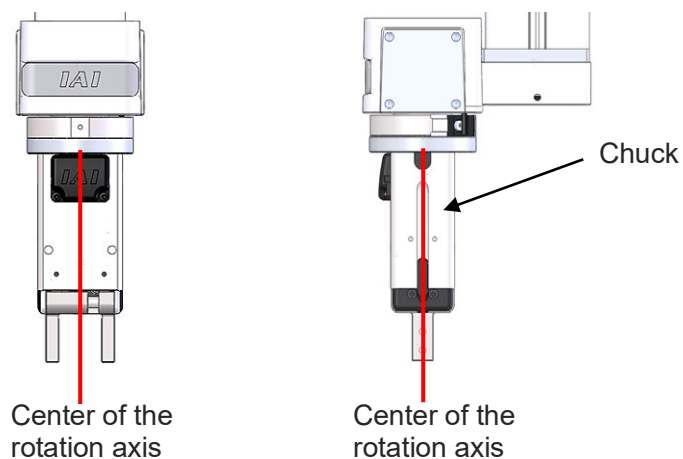
(Note) Attempt to have the finger attachment minimized in size and weight even if it is in the allowable range. If the fingers are long and big in size and heavy in mass, the moment caused by an impact at gripping may cause a performance drop or give a bad impact to the guide area.

Procedure 3 Check for the allowable moment of inertia

Calculate the moment of inertia on a transported object such as a workpiece to make sure the moment is in the allowable moment of inertia.



Refer to how to calculate the moment of inertia for a representative profile in the following page and figure out the moment of inertia on a transported object such as a workpiece and finger attachment. The center of the rotation axis should be the position shown below.



In the table below, shows the allowable moment of inertia for a rotary part. Figure out the moment of inertia on a transported object such as a workpiece and finger attachment and make sure the moment is in the allowable moment of inertia.

Table 2: Allowable Moment of Inertia

Model	Allowable Moment [kg•m ²]
RTCKSRE/RTCKSRI/RTCKSPE/RTCKSPI	2.30×10^{-4}
RTCKMRE/RTCKMRI/RTCKMPE/RTCKMPI	3.60×10^{-4}

If the result of calculation shows a value above the allowable moment of inertia, make a counteraction such as to shorten the distance of the workpiece from the center of the rotation axis so the moment falls into the allowable moment of inertia.

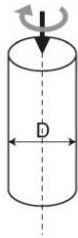
● Calculation of Moment of Inertia for Representative Profile

1. When the rotation axis goes through the center of an object

(1) Inertia Moment 1 for Column

* Same formula applicable to any column (or disk) no matter of height

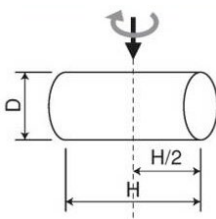
$$\text{<Equation> } I = M \times (D \times 10^{-3})^2 / 8 \text{ [kg} \cdot \text{m}^2 \text{]}$$



Inertia Moment for Column: I ($\text{kg} \cdot \text{m}^2$)
 Column Weight : M (Unit: kg)
 Column Diameter : D (mm)

(2) Inertia Moment 2 for Column

$$\text{<Equation> } I = M \times ((D \times 10^{-3})^2 / 4 + (H \times 10^{-3})^2 / 3) / 4 \text{ [kg} \cdot \text{m}^2 \text{]}$$

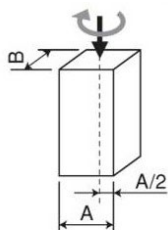


Inertia Moment for Column: I ($\text{kg} \cdot \text{m}^2$)
 Column Weight : M (kg)
 Column Diameter : D (mm)
 Column Length : H (mm)

(3) Inertia Moment 1 for Square Pillar

* Same formula applicable to any square pillar (or square plate) no matter of height

$$\text{<Equation> } I = M \times ((A \times 10^{-3})^2 + (B \times 10^{-3})^2) / 12 \text{ [kg} \cdot \text{m}^2 \text{]}$$



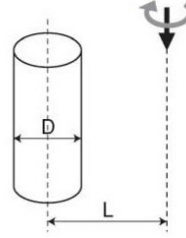
Inertia Moment for Square Pillar: I ($\text{kg} \cdot \text{m}^2$)
 Pillar Side A (mm)
 Pillar Side B (mm)

2. When Object Center Offset from Rotation Axis

(4) Inertia Moment 3 for Column

* Same formula applicable to any column (or disk) no matter of height

$$\text{<Equation> } I = M \times (D \times 10^{-3})^2 / 8 + M \times (L \times 10^{-3})^2 \text{ [kg} \cdot \text{m}^2 \text{]}$$

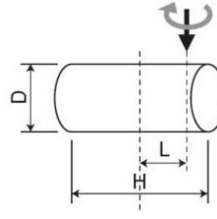


Inertia Moment for Column: I ($\text{kg} \cdot \text{m}^2$)
 Column Weight : M (kg)
 Column Diameter : D (mm)
 Distance from Rotary Axis to Center: L (mm)

(5) Inertia Moment 4 for Column

<Equation>

$$I = M \times ((D \times 10^{-3})^2 / 4 + (H \times 10^{-3})^2 / 3) / 4 + M \times (L \times 10^{-3})^2 \text{ [kg} \cdot \text{m}^2 \text{]}$$



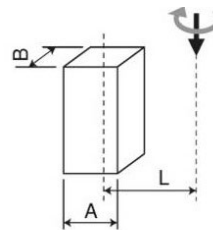
Inertia Moment for Column: I ($\text{kg} \cdot \text{m}^2$)
 Column Weight : M (kg)
 Column Diameter : D (mm)
 Column Length : H (mm)
 Distance from Rotary Axis to Center: L (mm)

(6) Inertia Moment 2 for Square Pillar

* Same formula applicable to any square pillar (or square plate) no matter of height

<Equation>

$$I = M \times ((A \times 10^{-3})^2 + (B \times 10^{-3})^2) / 12 + M \times (L \times 10^{-3})^2 \text{ [kg} \cdot \text{m}^2 \text{]}$$



Inertia Moment for Square Pillar: I ($\text{kg} \cdot \text{m}^2$)
 Pillar Weight: M (kg)
 Pillar Side A (mm)
 Pillar Side B (mm)
 Distance from Rotary Axis to Center: L (mm)

1.4 Options

Changing Actuator Cable Length (Model Code: AC2, AC5)

It is 1m in standard. If it is necessary to have a longer actuator cable, you can indicate the length from the following variations.

- AC2 : 2m
- AC5 : 5m

Brake (Model Code: B)

It is a retaining feature to prevent the chuck from rotating while the power or the servo is turned off.

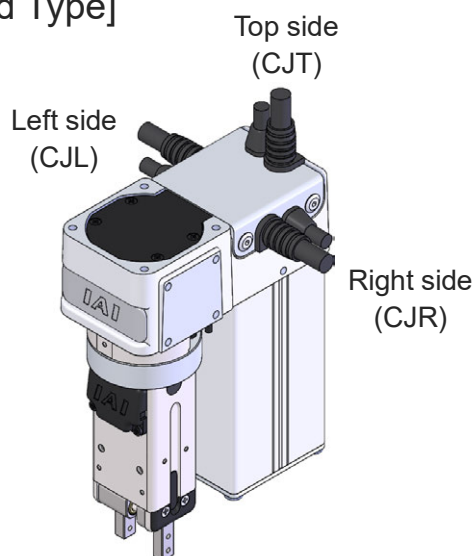
Cable Exit Direction Changed

Cable Ejected to Top (Model Code: CJT), Ejected to Right (Model Code: CJR),
Ejected to Left (Model Code: CJL)

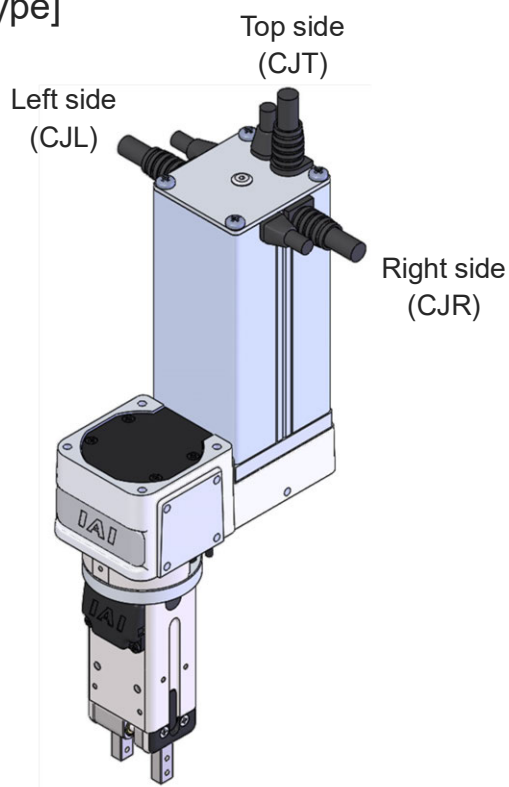
The orientation of the motor encoder integrated cables to be installed on the actuator unit can be changed to top side, right side and left side.

The orientation of cable ejection should be right (CJR) or left (CJL) in the view from motor side.

[Reversed Type]

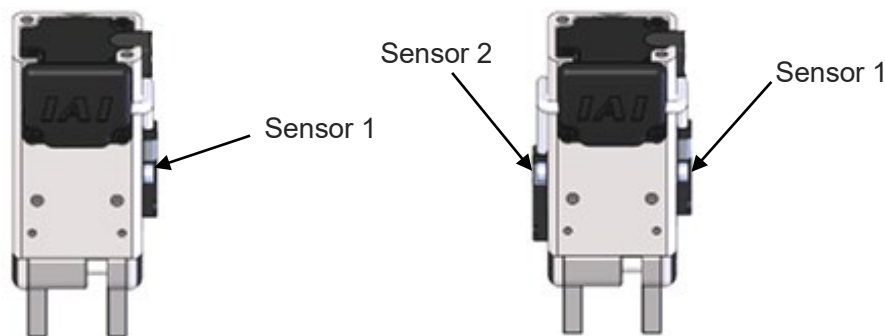


[Parallel Type]



Attaching Sensor (Model Code: S1N, S2N, S1P and S2P)

One or two units of a sensor to detect the operation open and close of the fingers can be attached. NPN type and PNP type are available to select for a sensor.

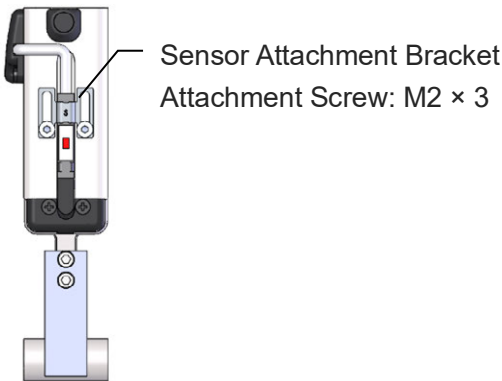


Attaching one unit of sensor (NPN Type): S1N Attaching two units of sensor (NPN Type): S2N
Attaching one unit of sensor (PNP Type): S1P Attaching two units of sensor (PNP Type): S2P

Sensor 1 and Sensor 2 should be adjusted as shown below at delivery.
* For attaching one unit of sensor (S1N, S1P), only a sensor 1 that turns ON when releasing should be available.

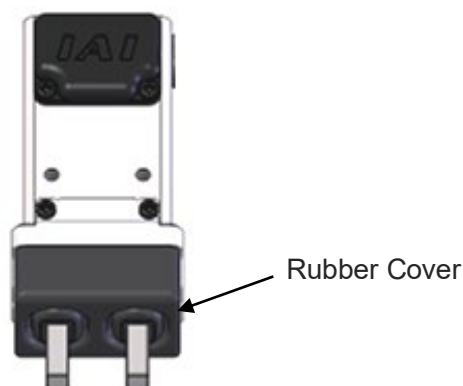
operation	Release	Gripped workpiece existed	No gripped workpiece
Sensor 1	ON	OFF	
Sensor 2	OFF		ON

When you use the sensor, check the operation of gripping a workpiece, and adjust the position of the sensor by loosening the screw on the sensor attachment bracket if necessary.



Rubber Cover Attached (Chloroprene Rubber) (Model Code: RCH)

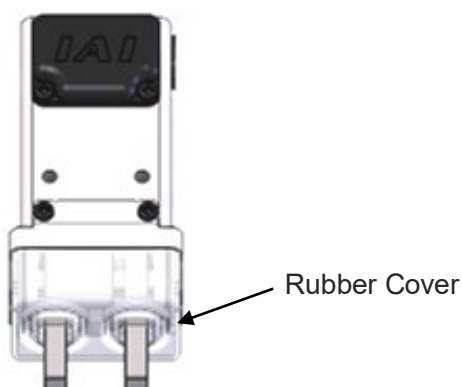
A rubber cover made of chloroprene rubber can be attached on the fingers.



Rubber Cover Attached (Chloroprene Rubber): RCH

Rubber Cover Attached (Silicone Rubber) (Model Code: RSL)

A rubber cover made of silicone rubber can be attached on the fingers.

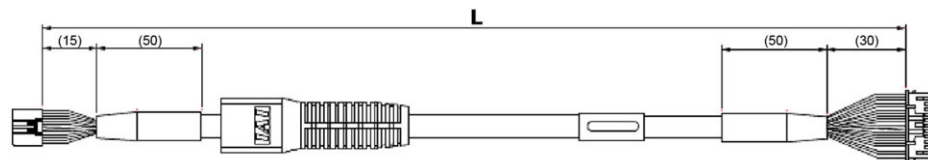


Rubber Cover Attached (Silicone Rubber): RSL

1.5 Accessories

Motor Encoder Integrated Cables: Except for RCON and RCM-P6PC Controllers

Model Code **CB-CAN-MPA**□□□



Actuator side

Connector: DF62B-24S-2.2C
Contact:
DF62-2428SCFA (For AWG26)
DF62-22SCFA (For AWG22)

Minimum bending radius R

5m or less $r = 85\text{mm}$ or more (Fixed Use)
5m then longer cases $r = 91\text{mm}$ or more (Fixed Use)

Controller side

Connector: PADP-24V-1-S
Contact:
SPND-002T-C0.5 (For AWG26)
SPND-001T-C0.5 (For AWG22)

Connection diagram

Actuator side

Thickness	Electric Wire Color	Symbol	Pin No.
AWG22/19	Blue	ϕA	3
AWG22/19	Orange	VMM	5
AWG22/19	Brown	ϕB	10
AWG22/19	Gray	VMM	9
AWG22/19	Green	ϕ_A	4
AWG22/19	Red	ϕ_B	15
AWG26	Light Blue	SA	12
AWG26	Orange	SB	17
AWG26	Green	A+	1
AWG26	Brown	A-	6
AWG26	Gray	B+	11
AWG26	Red	B-	16
AWG26	Black	VPS	18
AWG26	Yellow	LS+	8
AWG26	Light Blue	BK+	20
AWG26	Orange	BK-	2
AWG26	Gray	VCC	21
AWG26	Red	GND	7
AWG26	Brown	LS-	14
AWG26	Green	LS_GND	13
-	-	-	19
AWG26	Pink	-	22
-	-	-	23
AWG26	Black	FG	24

Controller side

Pin No.	Symbol	Electric Wire Color	Thickness
1	ϕA	Blue	AWG22/19
2	VMM	Orange	AWG22/19
3	ϕB	Brown	AWG22/19
4	VMM	Gray	AWG22/19
5	ϕ_A	Green	AWG22/19
6	ϕ_B	Red	AWG22/19
11	SA	Light Blue	AWG26
12	SB	Orange	AWG26
13	A+	Green	AWG26
14	A-	Brown	AWG26
15	B+	Gray	AWG26
16	B-	Red	AWG26
18	VPS	Black	AWG26
7	LS+	Yellow	AWG26
9	BK+	Light Blue	AWG26
10	BK-	Orange	AWG26
17	VCC	Gray	AWG26
19	GND	Red	AWG26
8	LS-	Brown	AWG26
20	LS_GND	Green	AWG26
22	-	-	-
21	-	Pink	AWG26
23	-	-	-
24	FG	Black	AWG26

(Note) About thickness AWG22/19

The thickness is AWG22 when the cable length is 5m or less, and AWG19 when longer than 5m.

- The cable length is available from 1m to 15m.
Specify the length in increments of 1m.
- The following shows a sample model number.

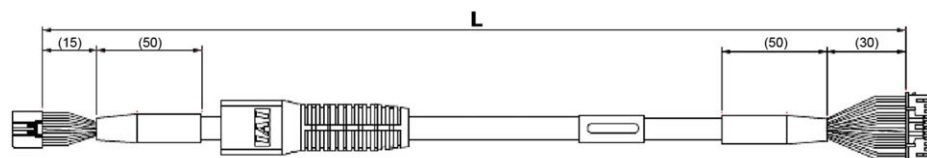
Cable length **1m** → CB-CAN-MPA**010** (-RB)

Cable length **3m** → CB-CAN-MPA**030** (-RB)

Cable length **10m** → CB-CAN-MPA**100** (-RB)

Motor Encoder Integrated Cables Robot Type: Except for RCON and RCM-P6PC Controllers

Model Code **CB-CAN-MPA** **-RB**



Actuator side

Connector: DF62B-24S-2.2C
Contact:
DF62-2428SCFA (For AWG26)
DF62-22SCFA (For AWG22)

Minimum bending radius R

5m or less $r = 68\text{mm}$ or more (Movable Use)
5m then longer cases $r = 73\text{mm}$ or more (Movable Use)

Controller side

Connector: PADP-24V-1-S
Contact:
SPND-002T-C0.5 (For AWG26)
SPND-001T-C0.5 (For AWG22)

Connection diagram

Actuator side

Thickness	Electric Wire Color	Symbol	Pin No.
AWG22/19	Blue	ϕA	3
AWG22/19	Orange	VMM	5
AWG22/19	Brown	ϕB	10
AWG22/19	Gray	VMM	9
AWG22/19	Green	ϕ_A	4
AWG22/19	Red	ϕ_B	15
AWG26	Black	LS+	8
AWG26	Yellow	LS-	14
AWG26	Blue	SA	12
AWG26	Orange	SB	17
AWG26	Green	A+	1
AWG26	Brown	A-	6
AWG26	Gray	B+	11
AWG26	Red	B-	16
AWG26	Blue	BK+	20
AWG26	Orange	BK-	2
AWG26	Gray	VCC	21
AWG26	Red	GND	7
AWG26	Brown	VPS	18
AWG26	Green	LS_GND	13
-	-	-	19
AWG26	Pink	-	22
-	-	-	23
AWG26	Green	FG	24

Controller side

Pin No.	Symbol	Electric Wire Color	Thickness
1	ϕA	Blue	AWG22/19
2	VMM	Orange	AWG22/19
3	ϕB	Brown	AWG22/19
4	VMM	Gray	AWG22/19
5	ϕ_A	Green	AWG22/19
6	ϕ_B	Red	AWG22/19
7	LS+	Black	AWG26
8	LS-	Yellow	AWG26
11	SA	Blue	AWG26
12	SB	Orange	AWG26
13	A+	Green	AWG26
14	A-	Brown	AWG26
15	B+	Gray	AWG26
16	B-	Red	AWG26
9	BK+	Blue	AWG26
10	BK-	Orange	AWG26
17	VCC	Gray	AWG26
19	GND	Red	AWG26
18	VPS	Brown	AWG26
20	LS_GND	Green	AWG26
22	-	-	-
21	-	Pink	AWG26
23	-	-	-
24	FG	Green	AWG26

(Note) About thickness AWG22/19

The thickness is AWG22 when the cable length is 5m or less, and AWG19 when longer than 5m.

- The cable length is available from 1m to 15m.
Specify the length in increments of 1m.
- The following shows a sample model number.

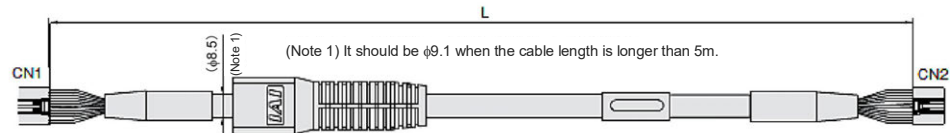
Cable length 1m → CB-CAN-MPA010-RB

Cable length 3m → CB-CAN-MPA030-RB

Cable length 10m → CB-CAN-MPA100-RB

Motor Encoder Integrated Cables: RCON and RCM-P6PC Controllers

Model Code **CB-ADPC-MPA**□□□



Actuator side

Connector: DF62B-24S-2.2C
Contact: DF62-2428SCFA (For AWG26)
DF62-22SCFA (For AWG22)

Minimum bending radius R

5m or less $r = 85\text{mm}$ or more (Fixed Use)
5m then longer cases $r = 91\text{mm}$ or more (Fixed Use)

Controller side

Connector: DF62B-24S-2.2C
Contact: DF62-2428SCFA (For AWG26)
DF62-22SCFA (For AWG22)

Connection diagram

Actuator side

Thickness	Electric Wire Color	Symbol	Pin No.
AWG22/19	Blue	ϕ_A	3
AWG22/19	Orange	VMM	5
AWG22/19	Brown	ϕ_B	10
AWG22/19	Gray	VMM	9
AWG22/19	Green	ϕ_A	4
AWG22/19	Red	ϕ_B	15
AWG26	Black	LS+	8
AWG26	Yellow	LS-	14
AWG26	Blue	SA	12
AWG26	Orange	SB	17
AWG26	Green	A+	1
AWG26	Brown	A-	6
AWG26	Gray	B+	11
AWG26	Red	B-	16
AWG26	Blue	BK+	20
AWG26	Orange	BK-	2
AWG26	Gray	VCC	21
AWG26	Red	GND	7
AWG26	Brown	VPS	18
AWG26	Green	LS_GND	13
-	-	-	19
AWG26	Pink	-	22
-	-	-	23
AWG26	Black	FG	24

Controller side

Pin No.	Symbol	Electric Wire Color	Thickness
3	ϕ_A	Blue	AWG22/19
5	VMM	Orange	AWG22/19
10	ϕ_B	Brown	AWG22/19
9	VMM	Gray	AWG22/19
4	ϕ_A	Green	AWG22/19
15	ϕ_B	Red	AWG22/19
8	LS+	Black	AWG26
14	LS-	Yellow	AWG26
12	SA	Blue	AWG26
17	SB	Orange	AWG26
1	A+	Green	AWG26
6	A-	Brown	AWG26
11	B+	Gray	AWG26
16	B-	Red	AWG26
20	BK+	Blue	AWG26
2	BK-	Orange	AWG26
21	VCC	Gray	AWG26
7	GND	Red	AWG26
18	VPS	Brown	AWG26
13	LS_GND	Green	AWG26
19	-	-	-
22	-	Pink	AWG26
23	-	-	-
24	FG	Black	AWG26

(Note) About thickness AWG22/19

The thickness is AWG22 when the cable length is 5m or less, and AWG19 when longer than 5m.

- The cable length is available from 1m to 15m.

Specify the length in increments of 1m.

- The following shows a sample model number.

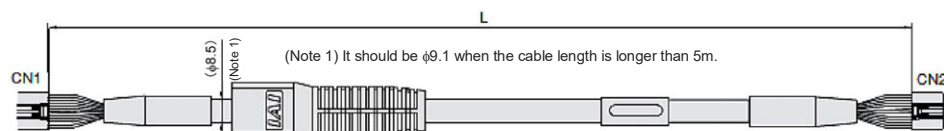
Cable length 1m → CB-ADPC-MPA010

Cable length 3m → CB-ADPC-MPA030

Cable length 10m → CB-ADPC-MPA100

Motor Encoder Integrated Cables Robot Type: RCON and RCM-P6PC Controllers

Model Code **CB-ADPC-MPA□□□-RB**



Actuator side

Connector: DF62B-24S-2.2C
Contact:
DF62-2428SCFA (For AWG26)
DF62-22SCFA (For AWG22)

Minimum bending radius R

5m or less $r = 68\text{mm}$ or more (Movable Use)
5m then longer cases $r = 73\text{mm}$ or more (Movable Use)

Controller side

Connector: DF62B-24S-2.2C
Contact:
DF62-2428SCFA (For AWG26)
DF62-22SCFA (For AWG22)

Connection diagram

Actuator side

Thickness	Electric Wire Color	Symbol	Pin No.
AWG22/19	Blue	ϕA	3
AWG22/19	Orange	VMM	5
AWG22/19	Brown	ϕB	10
AWG22/19	Gray	VMM	9
AWG22/19	Green	ϕA	4
AWG22/19	Red	ϕB	15
AWG26	Black	LS+	8
AWG26	Yellow	LS-	14
AWG26	Blue	SA	12
AWG26	Orange	SB	17
AWG26	Green	A+	1
AWG26	Brown	A-	6
AWG26	Gray	B+	11
AWG26	Red	B-	16
AWG26	Blue	BK+	20
AWG26	Orange	BK-	2
AWG26	Gray	VCC	21
AWG26	Red	GND	7
AWG26	Brown	VPS	18
AWG26	Green	LS_GND	13
-	-	-	19
AWG26	Pink	-	22
-	-	-	23
AWG26	Green	FG	24

Controller side

Pin No.	Symbol	Electric Wire Color	Thickness
3	ϕA	Blue	AWG22/19
5	VMM	Orange	AWG22/19
10	ϕB	Brown	AWG22/19
9	VMM	Gray	AWG22/19
4	ϕA	Green	AWG22/19
15	ϕB	Red	AWG22/19
8	LS+	Black	AWG26
14	LS-	Yellow	AWG26
12	SA	Blue	AWG26
17	SB	Orange	AWG26
1	A+	Green	AWG26
6	A-	Brown	AWG26
11	B+	Gray	AWG26
16	B-	Red	AWG26
20	BK+	Blue	AWG26
2	BK-	Orange	AWG26
21	VCC	Gray	AWG26
7	GND	Red	AWG26
18	VPS	Brown	AWG26
13	LS_GND	Green	AWG26
19	-	-	-
22	-	Pink	AWG26
23	-	-	-
24	FG	Green	AWG26

(Note) About thickness AWG22/19

The thickness is AWG22 when the cable length is 5m or less, and AWG19 when longer than 5m.

- The cable length is available from 1m to 15m.
Specify the length in increments of 1m.
- The following shows a sample model number.

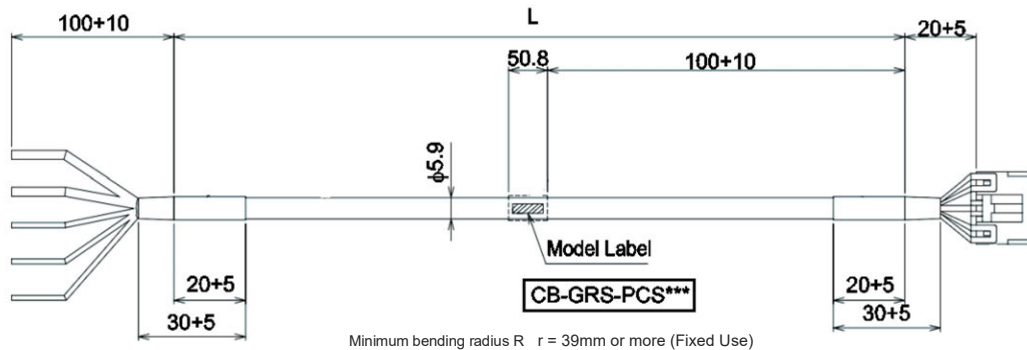
Cable length 1m → CB-ADPC-MPA010-RB

Cable length 3m → CB-ADPC-MPA030-RB

Cable length 10m → CB-ADPC-MPA100-RB

Solenoid Driver Cable (Cable Not for Robot Use)

Model Code **CB-GRS-PCS**



Color	Signal name	Thickness
White	24V	AWG18
Black	0V	
Brown	ON/OFF	AWG22
Red	Sensor 1	
Green	Sensor 2	

- The cable length is available from 1m to 15m.
Specify the length in increments of 1m.

- The following shows a sample model number.

Cable length 1m → CB-GRS-PCS010

Cable length 3m → CB-GRS-PCS030

Cable length 10m → CB-GRS-PCS100

Chapter 2

Installation

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2.1 Precautions for Transportation

[Handling the package]

- Do not damage or drop the package.

The package is not specially designed to withstand dropping or shock due to collision.

- Keep the unit in horizontal orientation for stationary positioning or transportation.
- Do not climb onto the package.
- Do not put anything that could deform the package on it.

[Handling after unpacking]

- Hold the body part when you carry the unit.
- Do not attempt to transfer the unit by holding cables. Do not attempt to transfer the unit by pulling cables.
- Do not damage or drop the package during transportation.
- Do not apply excessive force to any part. Do not apply excess force especially on the fingers.

→ For the names of each part, refer to “Names of the Parts” on page Intro-12 to 14.

[Handling when assembled into machinery (system)]

- Secure finger to prevent sudden movement during transport.
- If the body or any moving part is overhanging, fix it appropriately to avoid large wobbles due to external vibration. When transporting without fixing the tip, do not apply impact of 0.3G or more.
- When suspending machinery (system) with ropes, be careful not to catch the rope on the body or cable.

2.2 Installation and Storage/Preservation Environment

Usage is possible in environments of pollution degree 3 or equivalent.

Pollution degree 3: Conductive pollution or dry nonconductive pollution, which could become conductive due to expected condensation. (IEC 60664-1)

Installation Environment

Avoid the following locations for installation.

In general, the installation environment should be one in which an operator can work without protective gear.

- Where the unit receives radiant heat from strong heat sources such as heat treatment furnaces
- Where the ambient temperature exceeds the range of 0 to 40°C
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 85% RH
- Where the unit receives direct sunlight
- Where the unit is exposed to corrosive or combustible gases
- Where the ambient air contains a large amount of dust, salt or iron (at levels exceeding those typical of an assembly plant)
- Where the unit is subject to splashed water or oil (including oil mist or cutting fluid) or chemical solutions
- Where the body receives impact or vibration
- Where the altitude is more than 2000m

Also, provide sufficient work space for the following maintenance and inspection:

- Space to replenish grease

If the unit is used in any of the following locations, provide sufficient shielding measures:

- Where noise is generated due to static electricity, etc.
- Where the unit is subject to a strong electric or magnetic field
- Where the unit is subject to ultraviolet or radiation

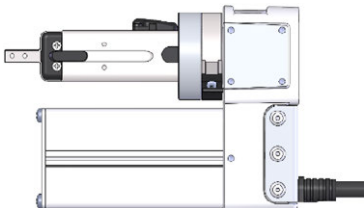
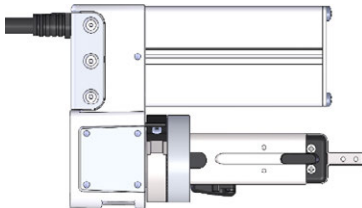
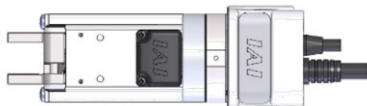
Storage/Preservation Environment

- For the storage and preservation environment, see the installation environment.
However, give especial consideration to the prevention of condensation during long-term storage/preservation.
- Unless especially specified, desiccant is not included in the package at shipping.
If the product is to be stored/preserved in an environment where condensation is anticipated, take condensation preventive measures.
- For short-term storage, it can be stored at 60°C or below.
For storage of one month or more, make sure that the temperature does not exceed 50°C.
- The product should be placed horizontally for storage and preservation.
If storing in the packaged condition, observe the conditions, if any, regarding storage orientation.

2.3 Installation

Mounting Orientation

In the figures, shows an example for the reversed type, however, the horizontal type is also available for installation style below.

☐	Chuck Downward Orientation	☐	Chuck Upward Orientation
			
☐	Chuck Oriented Horizontally with Motor at Bottom	☐	Chuck Oriented Horizontally with Motor at Top
			
☐	Chuck Oriented Horizontally with Motor Beside		
			

Notice for Attachment

As the current flows when the chuck is released, the temperature could rise.

The temperature increase could vary depending on the frequency of open and close operation, condition of unit installation, attachment material and so on.

→Refer to **Temperature Increase Measurement Data (Reference)** in Appendix 8.1.

Notice

- In case there is a concern of temperature influence on a workpiece, use a material which possesses low heat conduction performance such as plastic for finger attachment.
-

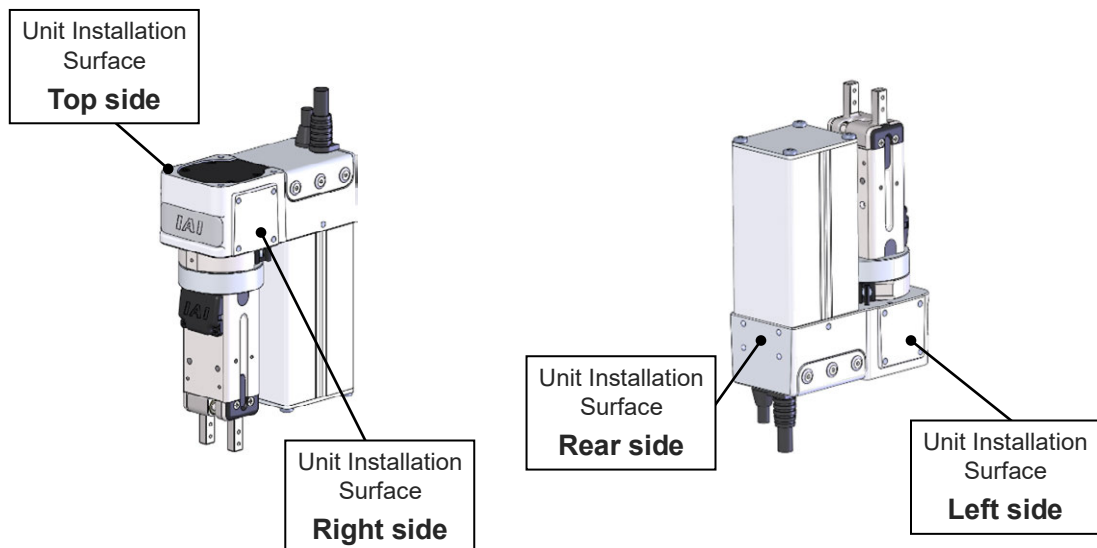
Main Body Mounting

(1) RCP6-RTCKSRE, RCP6-RTCKSRI: Reversed Type

- The main body can be installed in four ways.
- The surface to install the unit should possess the flatness of machine finished or equivalent.
- To hold the unit, make sure all the screw holes (4plcs) on the installation surface are used to affix the unit.

Without using all the screw holes, screws or screw holes may get damaged depending on the load applied on the unit.

- When the parallel type is to be installed with the bottom side affixed, make sure that the movable stopper in revolution should not interfere with anything in the movable range.





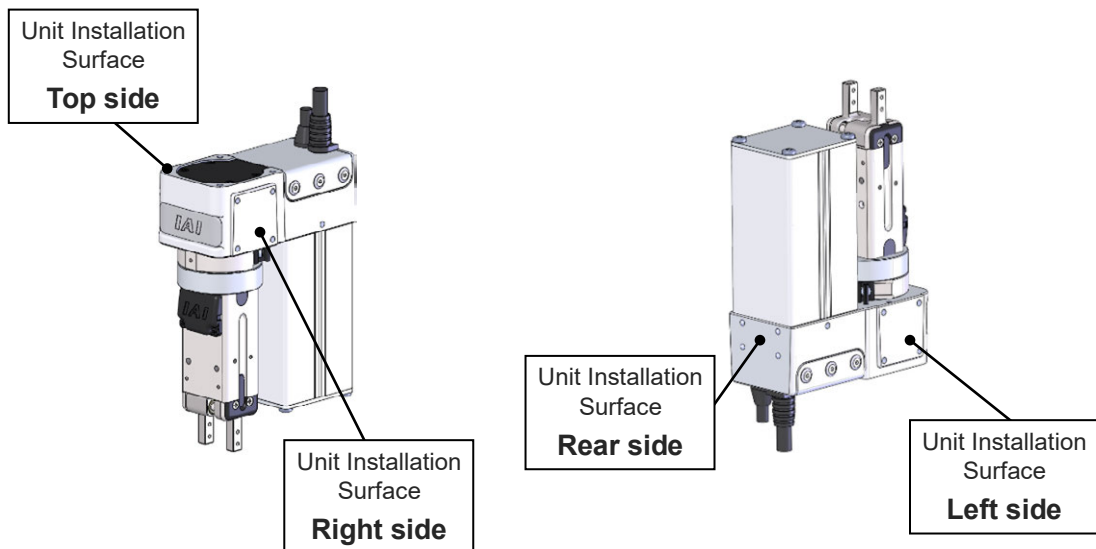
- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- Make sure the internal thread and bolt effective engagement length is approximately 1 time the nominal diameter or more.

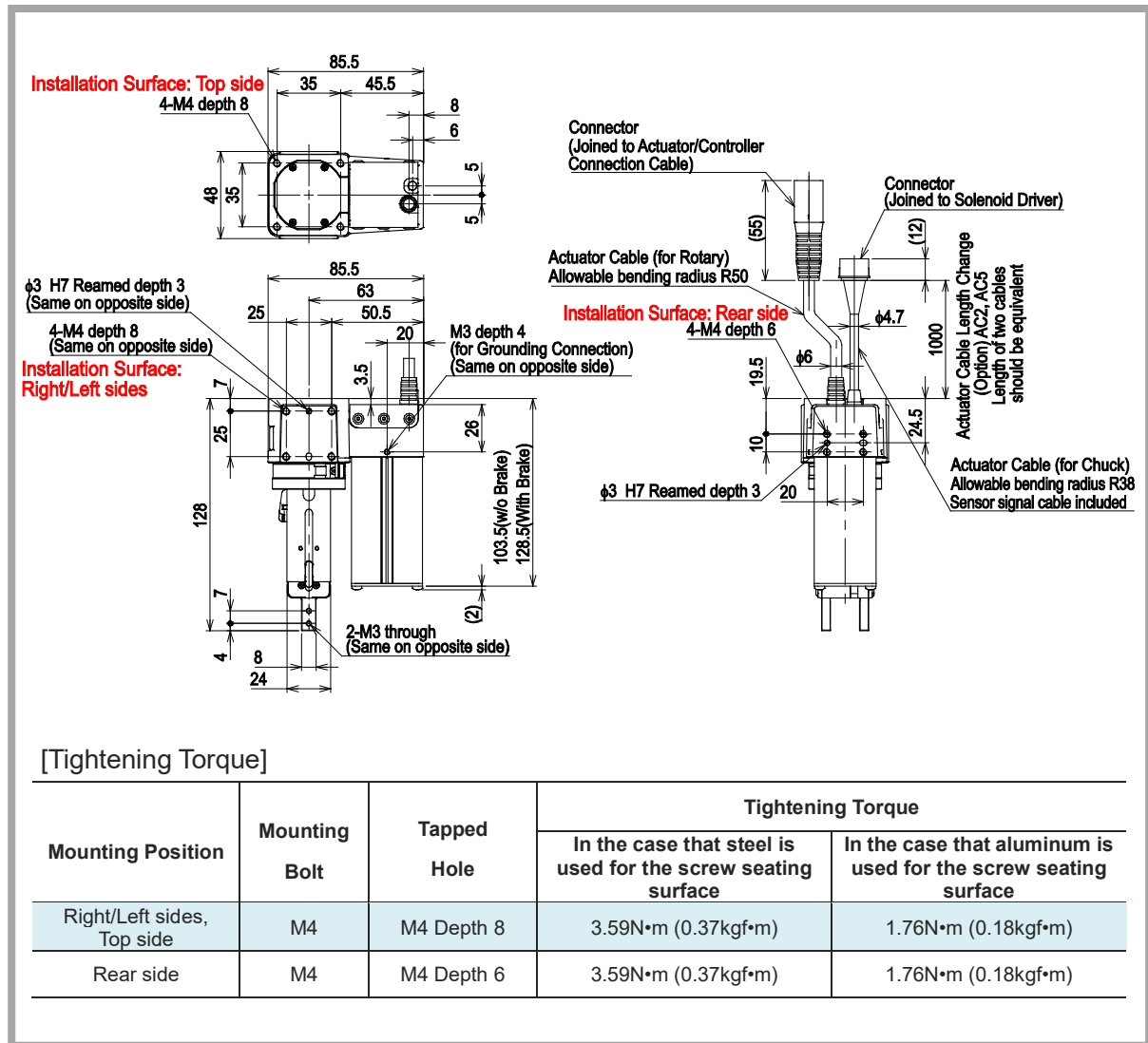
(2) RCP6-RTCKMRE, RCP6-RTCKMRI: Reversed Type

- The main body can be installed in four ways.
- The surface to install the unit should possess the flatness of machine finished or equivalent.
- To hold the unit, make sure all the screw holes (4plcs) on the installation surface are used to affix the unit.

Without using all the screw holes, screws or screw holes may get damaged depending on the load applied on the unit.

- When the parallel type is to be installed with the bottom side affixed, make sure that the movable stopper in revolution should not interfere with anything in the movable range.





Caution

- Pay attention to screw depth. Having the length too long could deform components and damage them.



Notice

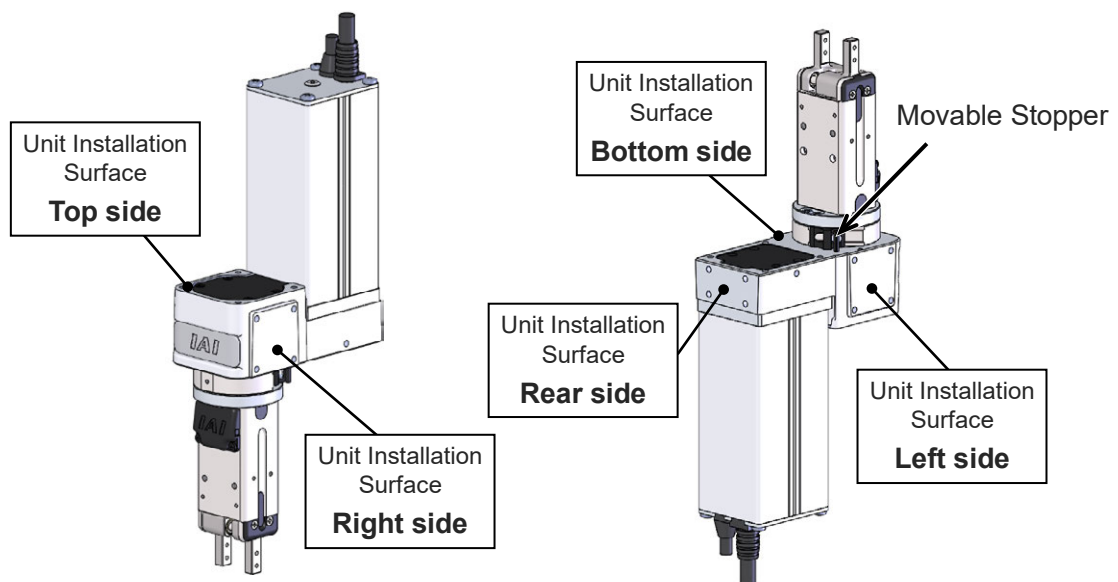
- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- Make sure the internal thread and bolt effective engagement length is approximately 1 time the nominal diameter or more.

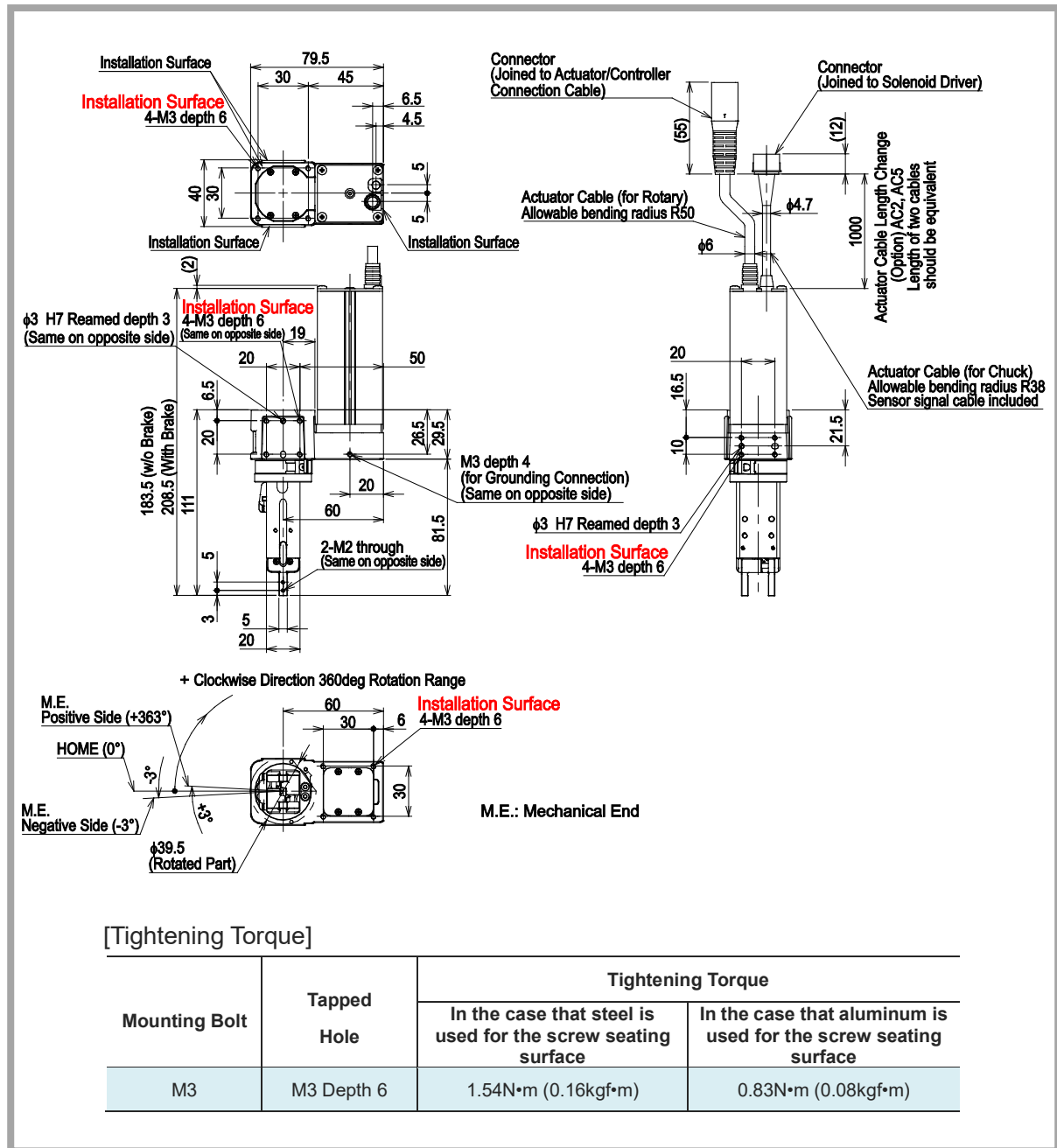
(3) RCP6-RTCKSPE, RCP6-RTCKSPI: Parallel Type

- The main body can be installed in five ways.
- The surface to install the unit should possess the flatness of machine finished or equivalent.
- To hold the unit, make sure all the screw holes (4plcs) on the installation surface are used to affix the unit.

Without using all the screw holes, screws or screw holes may get damaged depending on the load applied on the unit.

- When the parallel type is to be installed with the bottom side affixed, make sure that the movable stopper in revolution should not interfere with anything in the movable range.





Caution

Pay attention to screw depth. Having the length too long could deform components and damage them.



Notice

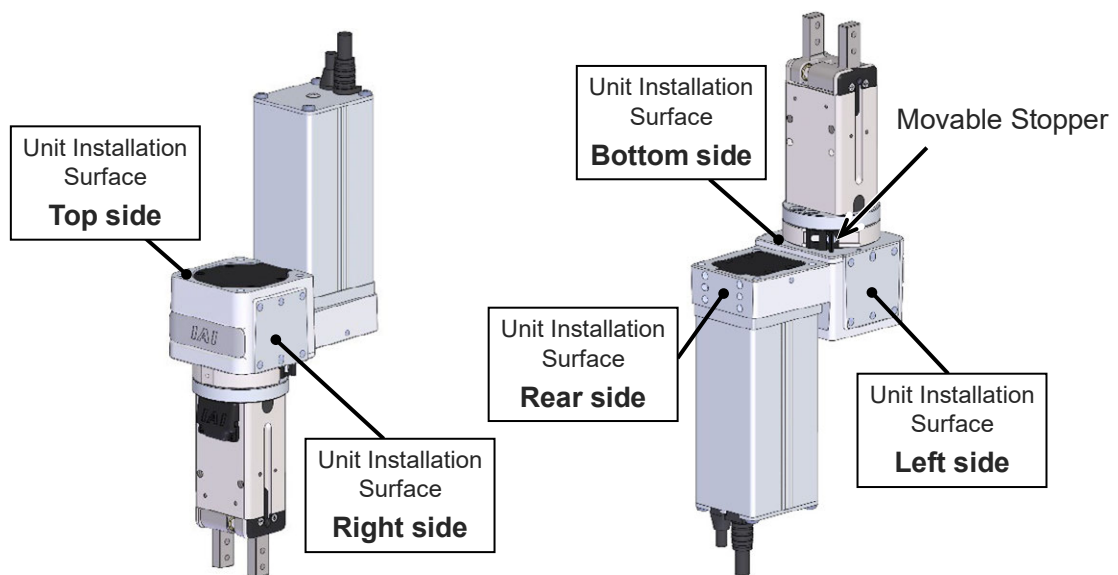
- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- Make sure the internal thread and bolt effective engagement length is approximately 1 time the nominal diameter or more.

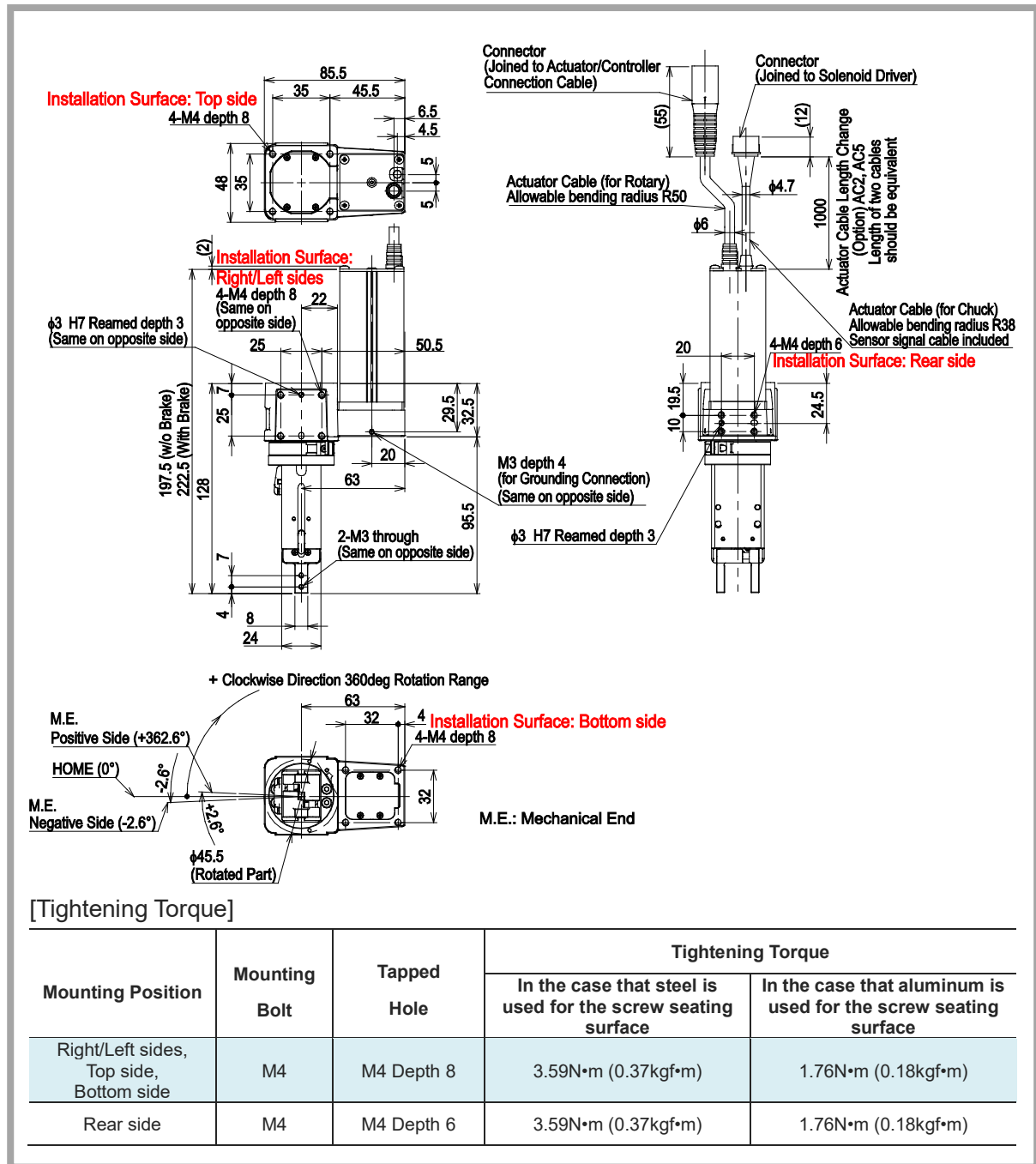
(4) RCP6-RTCKMPE, RCP6-RTCKMPI: Parallel Type

- The main body can be installed in five ways.
- The surface to install the unit should possess the flatness of machine finished or equivalent.
- To hold the unit, make sure all the screw holes (4plcs) on the installation surface are used to affix the unit.

Without using all the screw holes, screws or screw holes may get damaged depending on the load applied on the unit.

- When the parallel type is to be installed with the bottom side affixed, make sure that the movable stopper in revolution should not interfere with anything in the movable range.





Caution

Pay attention to screw depth. Having the length too long could deform components and damage them.

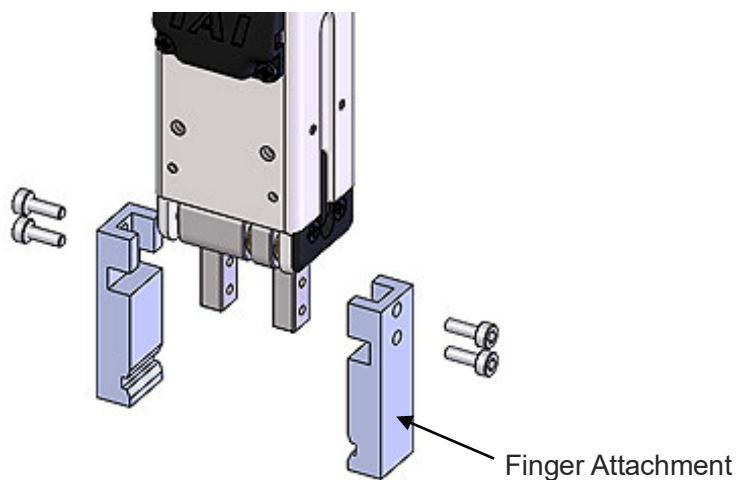


Notice

- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- Make sure the internal thread and bolt effective engagement length is approximately 1 time the nominal diameter or more.

[Finger Attachment Mounting]

- The finger attachment are to be prepared by the customer.
- Avoid applying excess force on fingers when attaching the attachments.



Model Name	Mounting Bolt	Tapped Hole	Tightening Torque		
			In the case that steel is used for the screw seating surface	In the case that aluminum is used for the screw seating surface	In the case that plastic is used for the screw seating surface
RTCKSRE RTCKSRI RTCKSPE RTCKSPI	M2	4-M2 Through	0.42N•m (0.04kgf•m)	0.25N•m (0.03kgf•m)	0.17N•m (0.02kgf•m)
RTCKMRE RTCKMRI RTCKMPE RTCKMPI	M3	4-M3 Through	1.54N•m (0.16kgf•m)	0.83N•m (0.08kgf•m)	0.54N•m (0.06kgf•m)

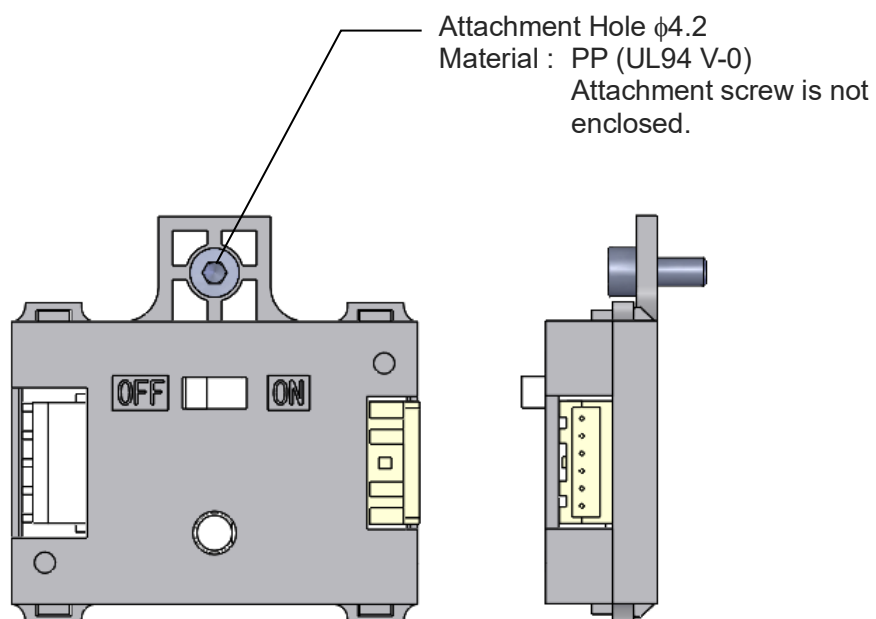


Notice

- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- Make sure the internal thread and bolt effective engagement length is approximately 1 time the nominal diameter or more.

[Driver Box Mounting]

Utilize the attachment hole when attaching the driver box.



Mounting Bolt	Tightening Torque
M4	0.75N•m (0.08kgf•m)

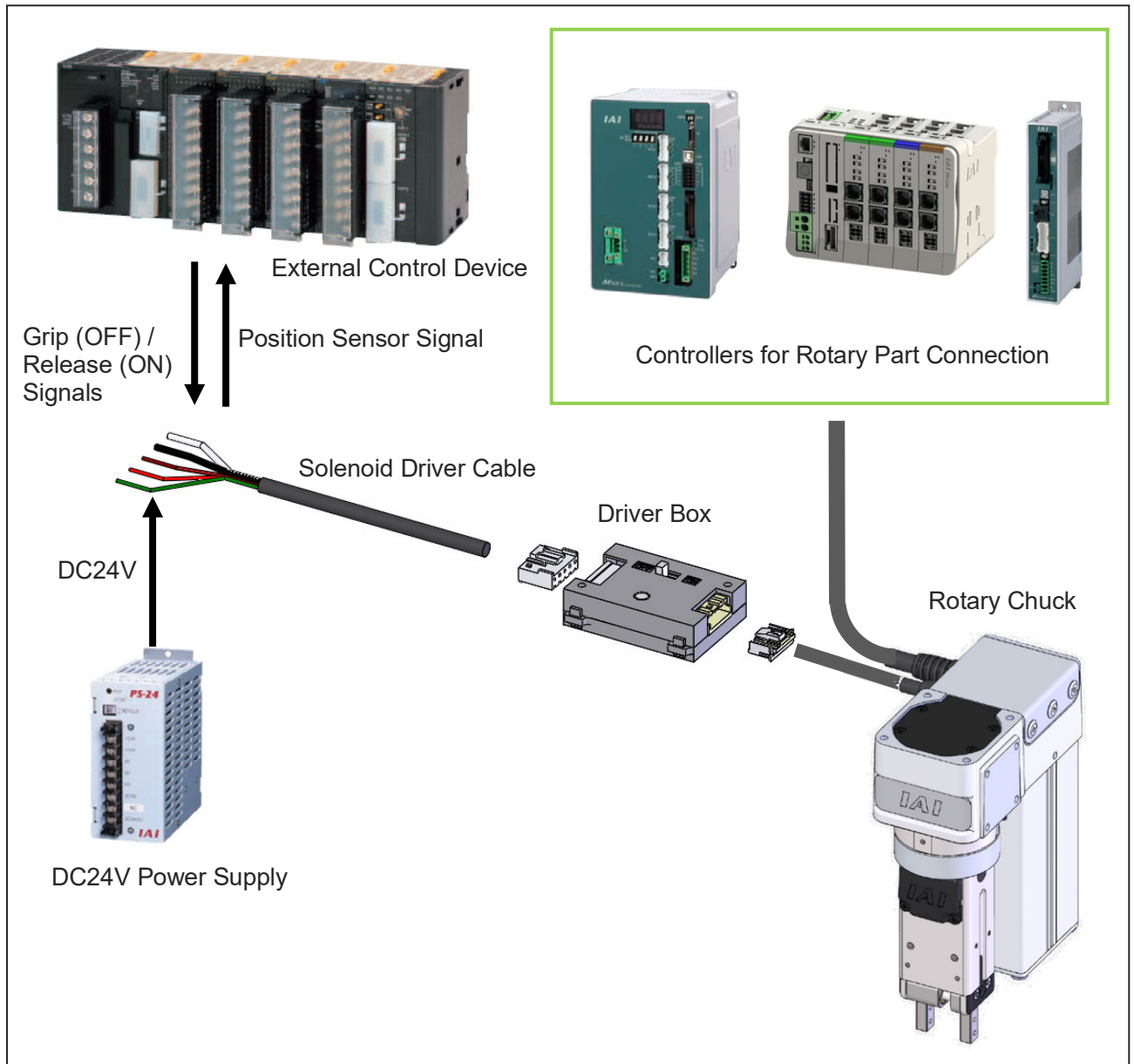
Chapter 3

Wiring

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	Driver Box Specifications	3-2
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	Specifications of Chuck Grip (OFF) / Release (ON) Signals ...	3-4
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3.3	Wiring Connection	3-8
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	Solenoid Driver Cable : Wiring to Master Device such as PLC	3-9
	Wiring between Rotary Part and Controller	3-10
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3.1 System Configuration

The following shows the system configuration.



Fingers on the chuck should be supplied with 24V DC and grip (OFF) a release (ON) signals should be input from a host device to the driver box in order to perform open/close operation. The rotary part is to be rotated with a controller such as RCON, PCON-CB and MSEL.

3.2 Electric Specifications of Chuck

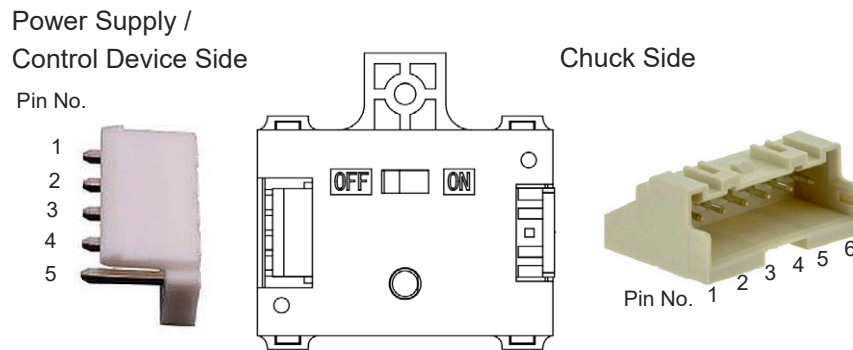
Driver Box Specifications

Item	Contents	
Controlled Subject	RTCKSRE, RTCKSRI RTCKSPE, RTCKSPI	RTCKMRE, RTCKMRI RTCKMPE, RTCKMPI
Power-supply Voltage	DC24V±10%	
Max. Output Current (Release Initial Peak 40ms)	2.8A	3.7A
Max. Power Consumption (Release Initial Peak 40ms)	74W	97W
Release Retained Power Consumption (Resealed Condition Retained)	2.0W	2.1W
Power Consumption in Gripping Condition	0W	0W
Open / Close Signals Input	24V DC dedicated signal input (select NPN or PNP)	
Position Sensor Signal Input	24V DC dedicated signal output (select NPN or PNP)	
Overcurrent Input Protection	Overcurrent 6.3A 1sec or more, by semiconductor fuse	
LED Display	In Releasing Operation: On (Green) In Gripping Operation: Off	
Manual Switch	OFF when in normal operation Manual switch available to turn ON only when Open / Close Signal input is OFF	
Temperature	0 to 40°C	
Humidity	85% RH or less (non-condensing)	
Surrounding Environment	Should be no corrosive gas	
Surrounding Storage Temperature	-10 to 65°C	
Surrounding Storage Humidity	90% RH or less (non-condensing)	
Cooling Method	Natural air-cooling	
Degree of Protection	IP20	

* Conditions for Output Current and Power Consumption: 25°C Power-supply Voltage DC24V±10%

The Specifications of The Interface in The Driver Box

The specifications of the interface in the driver box is as shown below.



[Power Supply / Control Device Side]

Connector: B5PS-VH (JST)

Pin No.	Name	Contents	Remarks
1	24V	Power input of 24V DC $\pm 10\%$ for chuck, driver box and sensors	Use ground of master device (PLC, controller) in common
2	0V	0V (GND)	
3	ON/OFF	Grip (OFF) / Release (ON) signals input to chuck	
4	Sensor1	Through output for Sensor 1 for Open/Close status monitor for chuck fingers	
5	Sensor2	Through output for Sensor 2 for Open/Close status monitor for chuck fingers	

[Chuck Side]

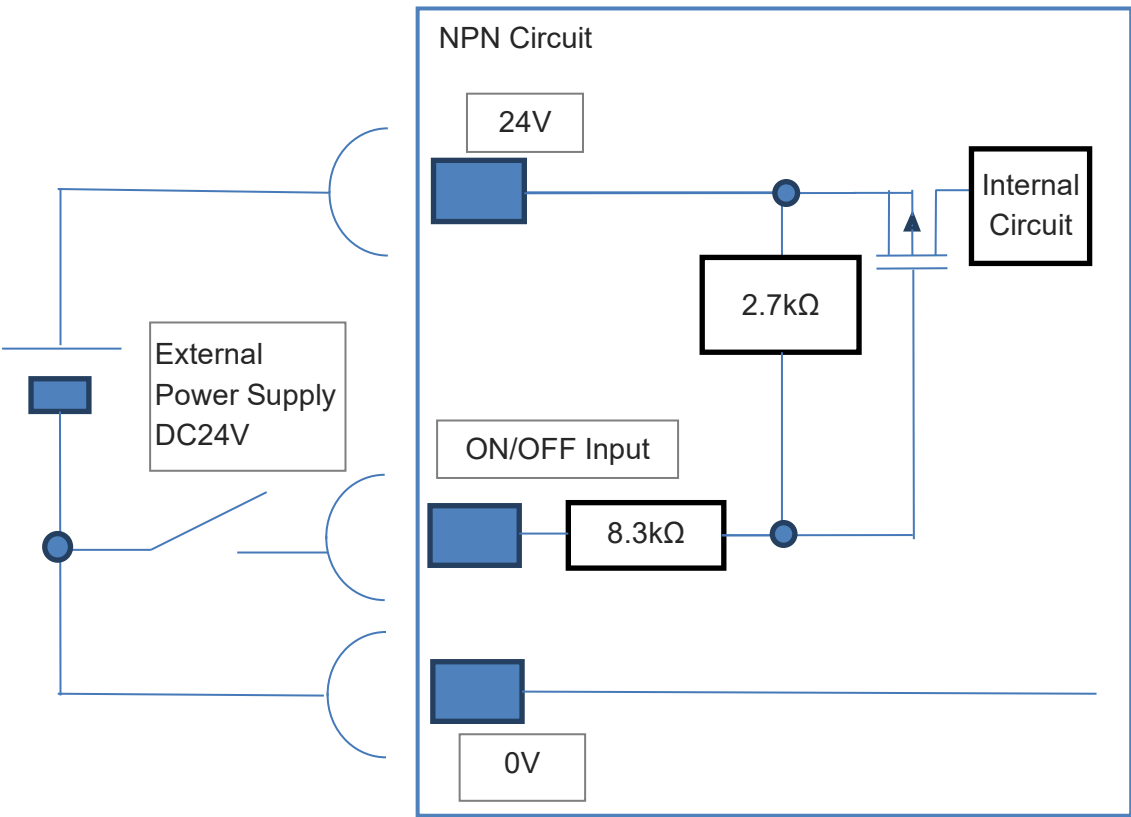
Connector: S06B-XASK-1 (JST)

Pin No.	Name	Contents	Remarks
6	SOL+	Drive output for Chuck	
5	SOL-		
4	24V	Power supply 24V DC $\pm 10\%$ output for sensor	Output directly the input 24V DC
3	0V	0V output for sensor	
2	Sensor1	Through input for Sensor 1 for Open/Close status monitor for chuck fingers	
1	Sensor2	Through input for Sensor 2 for Open/Close status monitor for chuck fingers	

Specifications of Chuck Grip (OFF) / Release (ON) Signals

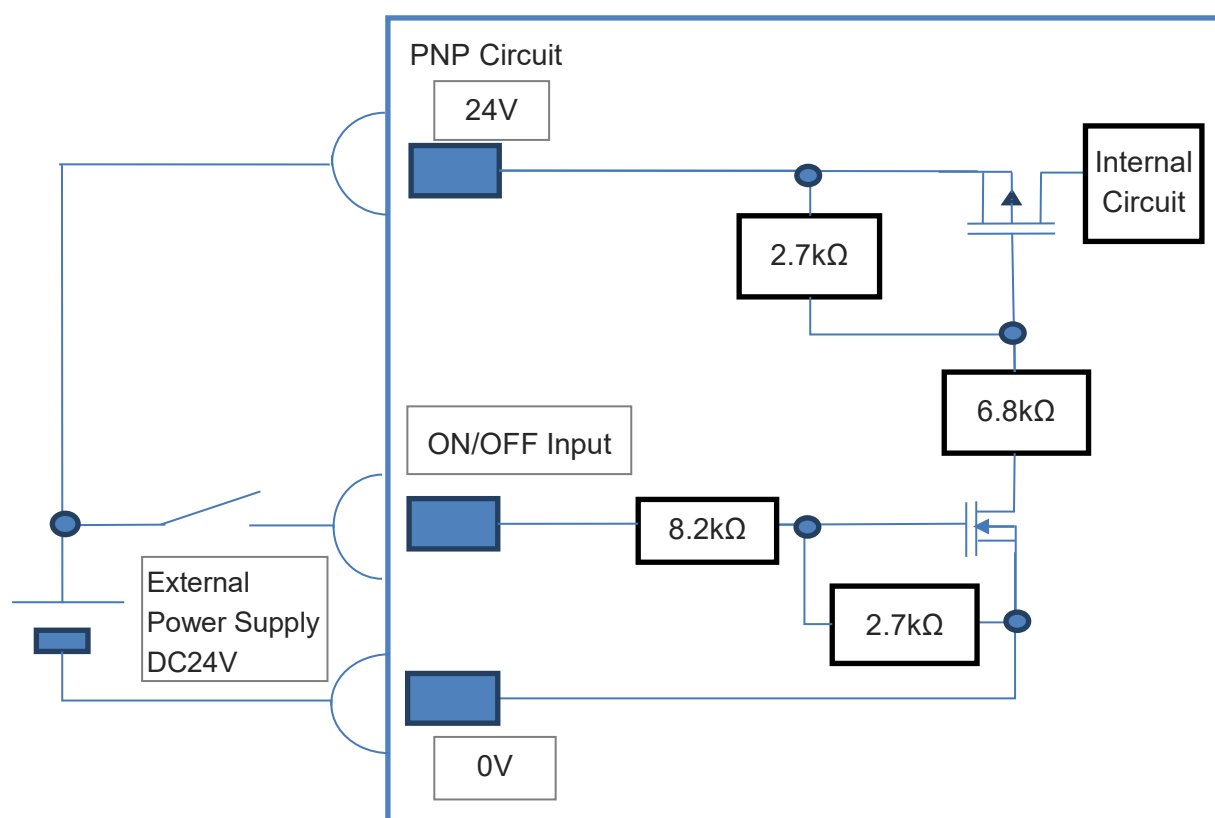
[NPN Type]

Item	Specifications
Input voltage	DC24V $\pm$ 10%
Input current	2mA
Leakage current	Max. 0.25mA
Operation Voltage	ON voltage: 6.0V or less
	OFF voltage: Input voltage -3.0V or more
Isolation type	Non-isolated



[PNP Type]

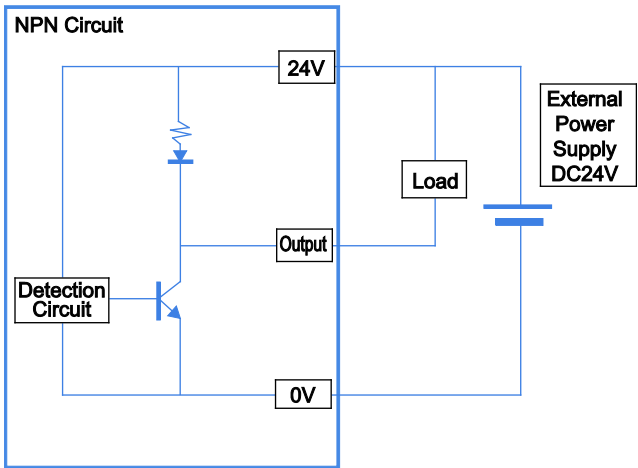
Item	Specifications
Input voltage	DC24V $\pm 10\%$
Input current	2mA
Leakage current	Max. 0.25mA
Operation Voltage	ON voltage: 18.0V or more
	OFF voltage: Input voltage 3.0V or less
Isolation type	Non-isolated



Output Specifications of Chuck Sensor Signals

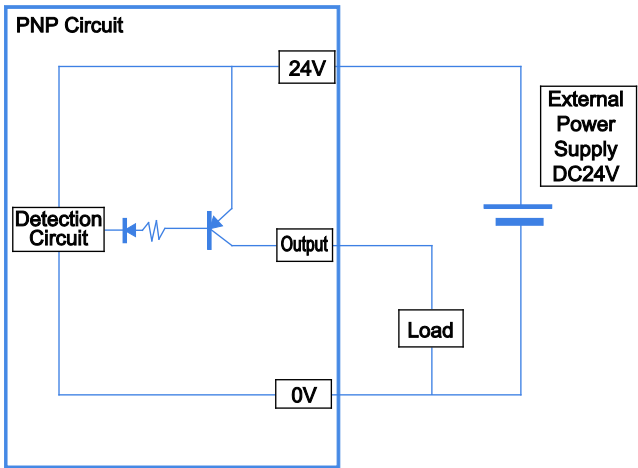
[NPN Type]

Item	Specifications
Power-supply Voltage	DC24V $\pm 10\%$ For chuck drive and power supply in common
Wiring System	Three-wire system
Output Current	15mA MAX
Power Consumption	4mA MAX



[PNP Type]

Item	Specifications
Power-supply Voltage	DC24V $\pm 10\%$ For chuck drive and power supply in common
Wiring System	Three-wire system
Output Current	80mA MAX
Power Consumption	12mA MAX



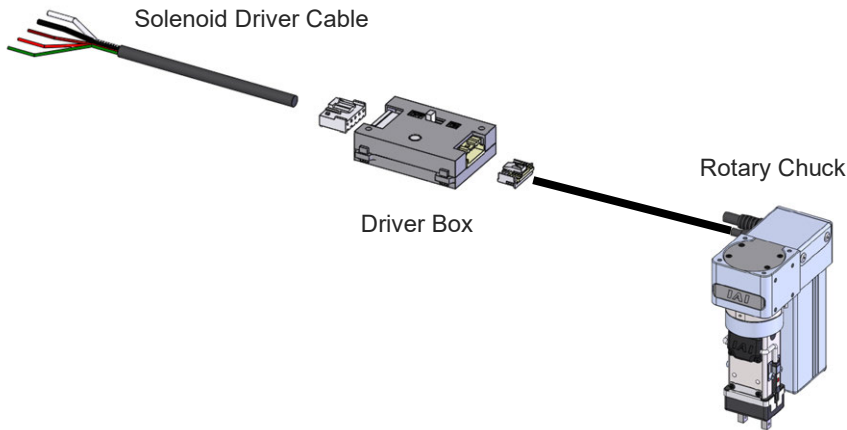
Solenoid Driver Cable Specifications

Chuck supplies the power to the solenoid driver cable and makes the fingers grip and release with Grip (OFF) / Release (ON) Signals.

The outer grip type opens fingers once ON signal gets input. And it closes fingers once OFF signal gets input.

The inner grip type works in the other way.

Below shows the wiring table for the solenoid driver cable.



Color	Signal name	Contents	Thickness
White	24V	Power input of 24V DC $\pm 10\%$ for chuck, driver box and sensors	AWG18
Black	0V	0V (GND)	
Brown	ON/OFF	Grip (OFF) / Release (ON) signals input to chuck	AWG22
Red	Sensor 1	Through output for Sensor 1 for Open/Close status monitor for chuck fingers	
Green	Sensor 2	Through output for Sensor 2 for Open/Close status monitor for chuck fingers	

3.3 Wiring Connection

Below introduces how to connect the wires.

Solenoid Driver Cable : 24VDC Power Supply Wiring

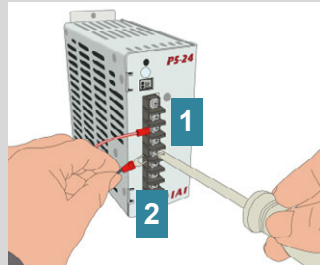
Connect the power wiring to the solenoid driver cable.

After applying terminals on 24V and 0V in the solenoid driver cable, connect them to a terminal block for 24V DC power supply.

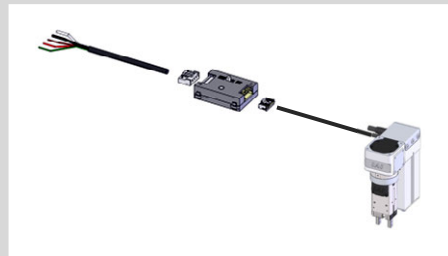
- 1** Connect the wire for 24V (wire color: white) to +24V terminal on 24V DC power supply.
- 2** Connect the wire for 0V (wire color: black) to 0V terminal on 24V DC power supply.

24VDC power supply connection diagram

24VDC Power Supply



Solenoid Driver Cable



Color	Signal abbreviation	Function overview	Required specifications
White	24V	Power supply Input	Power supply voltage: DC24V±10% Max. Output Current RTCKSRE, RTCKSRI, RTCKSPE, RTCKSPI: 2.8A RTCKMRE, RTCKMRI, RTCKMPE, RTCKMPI: 3.7A
Black	0V	Ground	

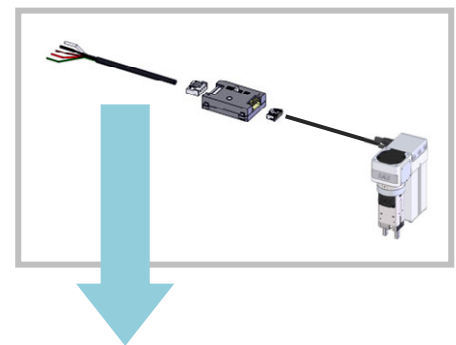
Solenoid Driver Cable : Wiring to Master Device such as PLC

In order to input and output each type of signals from and to a master device such as PLC, it is necessary to connect each wire in the solenoid drive cable to PLC.

Connect the **3** to **5** wiring to the connector terminal block while referring to the connection diagram.

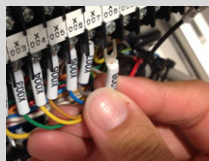
- 3** Connect a brown wire in the cable to the output terminal for “Grip (OFF) / Release (ON)”.
- 4** Connect a red wire in the cable to the input terminal for “Sensor 1 (Option)”.
- 5** Connect a green wire in the cable to the input terminal for “Sensor 2 (Option)”.

Solenoid Driver Cable



PLC connection diagram

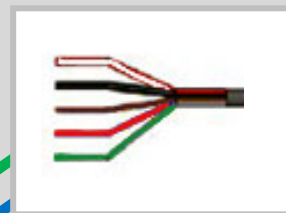
Process the terminals in accordance with PLC specifications in order to conduct wiring.



PLC



Detail View of Solenoid Driver Cable End

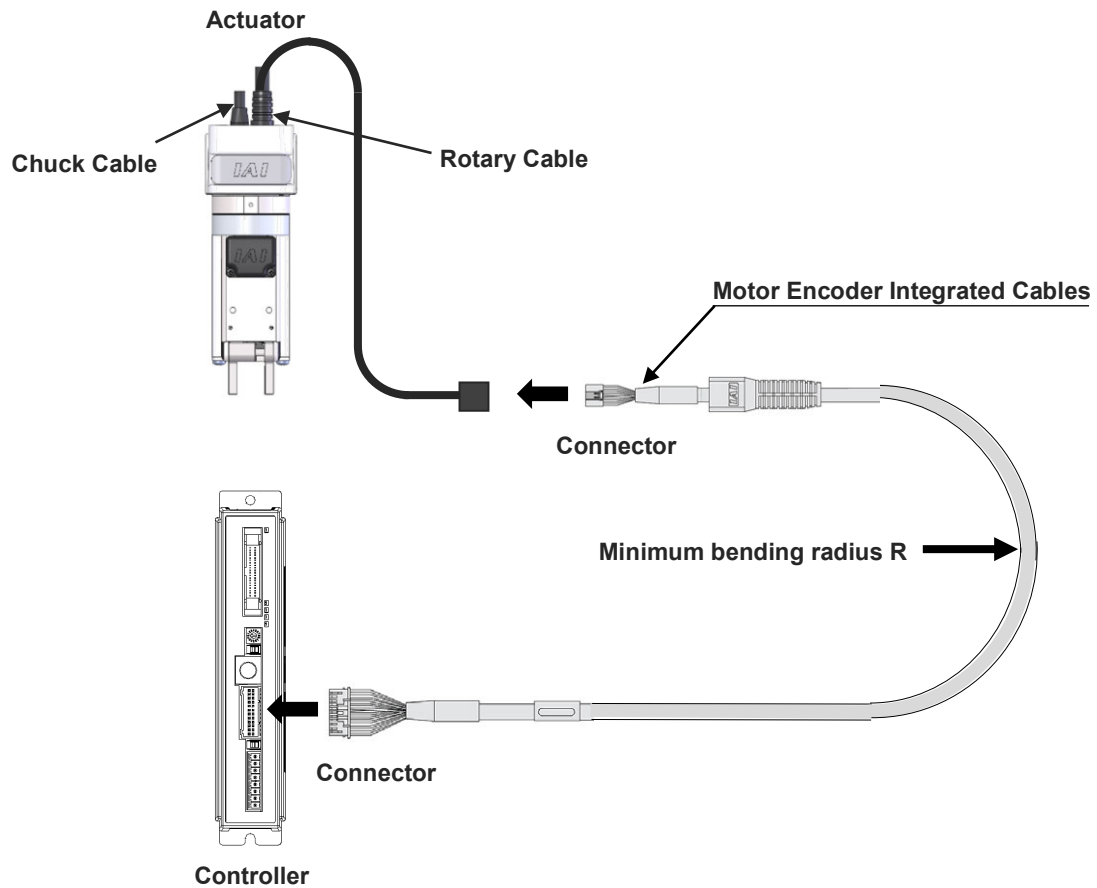


Wiring between Rotary Part and Controller

Use the motor encoder integrated cables of IAI for connection between a controller and an actuator.

Also, in case it is required for a specification change of the motor encoder integrated cables, contact IAI.

Have the rotary cable connected for a connection to a controller.



[List of Connection Cable between Actuator and Controller]

Controller Model	Motor Encoder Integrated Cables					
	Standard Cable (Fixed Use)			Robot Cable (Movable Use)		
	Model (Note 1)	Min. bending radius R [mm]		Model (Note 1)	Min. bending radius R [mm]	
		5m or less	5m and above		5m or less	5m and above
PCON-CB/CGB PCON-CYB/PLB/POB PCON-CFB/CGFB MCON MSEL	CB-CAN-MPA□□□	85 or more	91 or more	CB-CAN-MPA□□□-RB	68 or more	73 or more
	Refer to "1.5 Accessories"			Refer to "1.5 Accessories"		
RCON RCM-P6PC	CB-ADPC-MPA□□□	85 or more	91 or more	CB-ADPC-MPA□□□-RB	68 or more	73 or more
	Refer to "1.5 Accessories"			Refer to "1.5 Accessories"		

Note1 □□□ indicates the cable length. Example) 080 = 8m

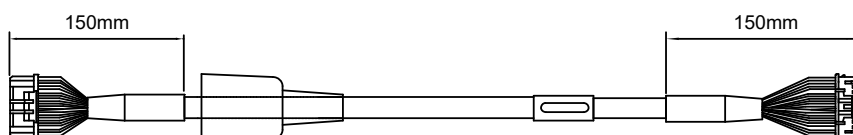
Up to 20m can be specified.

3.4 Precautions for Wiring



Caution

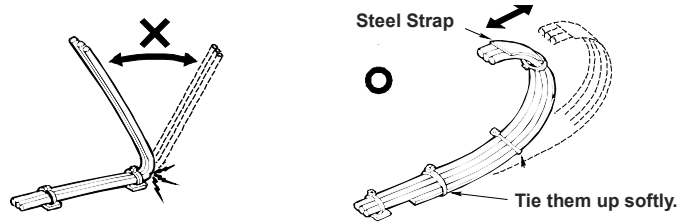
- For the connection cable, make sure you use one dedicated for IAI products.
 - For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, or an operation error, but also electric shock or electric leakage, or may even cause a fire.
 - Make sure to turn the power off in the process of power line or cable connection or disconnection.
 - Except for the bare cut without connectors on the solenoid driver cable, do not attempt to cut and extend, make short-circuit or reconnect the actuator cable or solenoid driver cable (hereafter stated as the dedicated cables).
 - Hold the dedicated cable to avoid mechanical force being applied to the terminals and connectors.
 - Use a cable pipe or duct to have an appropriate protection when there is a possibility of mechanical damage on a dedicated cable.
 - In case a dedicated cable is to be used at a moving part, make sure to lay out the cable without applying any force to pull the connector or extreme bend on the cable. Do not attempt to use the cable with a bending radius below the allowable value.
 - Make certain that the connectors are plugged properly. Insufficient connection may cause an operation error, thus it is extremely risky.
 - Do not lay out the cables to where the machine runs over them.
 - Pay attention to the cable layout so it would not hit peripherals during an operation. In case it does, have an appropriate protection such as a cable track.
 - When a cable is used hanging on the ceiling, prevent an environment that the cable swings with acceleration or wind velocity.
 - Make sure there is not too much friction inside the cable storage equipment.
 - Do not apply radiated heat to power line or cables.
 - Do not bend the cable in the area from the connector tip inward to 150mm on both ends.
- Motor • Encoder Integrated Cables: CB-CAN-MPA□□□, CB-ADPC-MPA□□□
 Motor • Encoder Integrated Cables Robot Type: CB-CAN-MPA□□□-RB,
 CB-ADPC-MPA□□□-RB



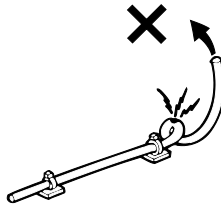


Caution

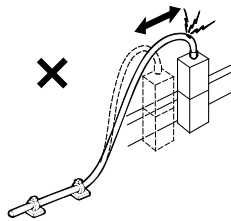
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.



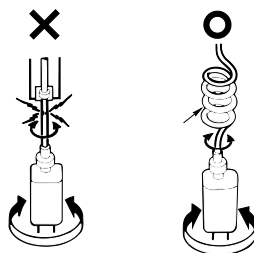
- Do not let the cable bend, kink or twist.



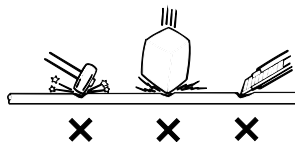
- Do not pull the cable with a strong force.



- Pay attention not to concentrate the twisting force to one point on a cable.



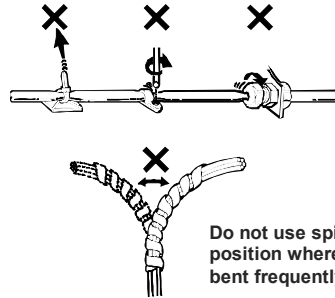
- Do not pinch, drop a heavy object onto or cut the cable.





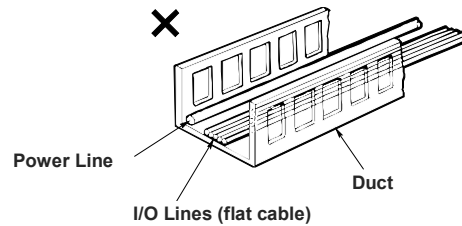
Caution

- When a cable is fastened to affix, make sure to have an appropriate force and do not tighten too much.



Do not use spiral tube in any position where cables are bent frequently.

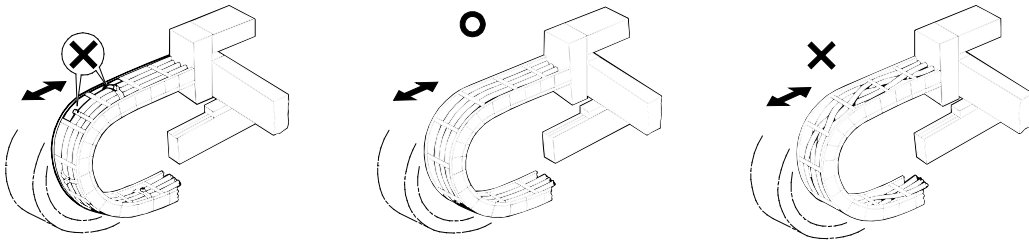
- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.





Caution

- Follow the instructions below when using a cable track.
- If there is an indication to the cable for the space factor in a cable track, refer to the wiring instruction given by the supplier when storing the cable in the cable track.
- Avoid the cables to get twined or twisted in the cable track, and also to have the cables move freely and do not tie them up. (Avoid tension being applied when the cables are bent.)
- Do not pile up cables. It may cause faster abrasion of the sheaths or cable breakage.



Chapter 4

Operation

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4.2	About Chuck Input and Output Signals	4-2
	I/O Signal List	4-2
4.3	Operating Chuck from Host Device such as PLC	4-3
	Open / Close Operation : Grip (OFF) / Release (ON) Signals	4-3
	Operation of Sensors (Option)	4-4
4.4	Operation of Rotary Part	4-5
	Rotation Range	4-5
	Rotation Direction	4-5
	Maximum Rotation Speed and Maximum Rotation Acceleration/Deceleration	4-6
4.5	Removing Gripped Workpiece	4-7

4.1 Operation of Chuck

By inputting signals from a host device to the driver box on the chuck, it should get available to perform open/close operation on the fingers.

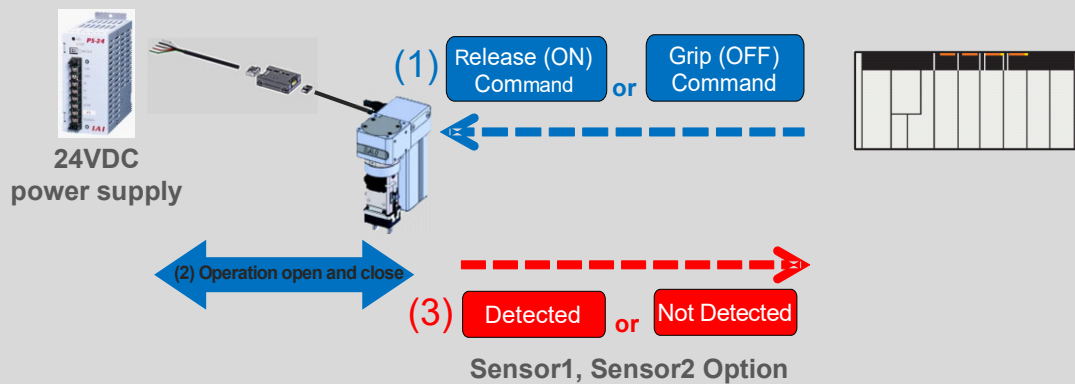
Also, by the master device receiving signals output from optional Sensor 1 and Sensor 2, the condition whether the fingers are open or close should be able to be recognized.

Control is just as simple as when using a solenoid valve (SOL valve) and air cylinder drive. This manual introduces an example using a PLC connected as the master device.

Connection image

PLC/Chuck connection

- (1) Input Release (ON) Signal or Grip (OFF) Signal from the PLC.
- (2) The chuck fingers should perform open/close operation.
- (3) Signals of detected and not detected get output from Sensor 1 and Sensor 2 (option).



Reference

The outer gripping type (RTCKSRE, RTCKSPE, RTCKMRE and RTCKMPE) continues open while Release (ON).

Fingers close with springs once Grip (OFF) Signal gets input.

The inner gripping type (RTCKSRI, RTCKSPI, RTCKMRI and RTCKMPI) works in the opposite way, closes with signal ON and opens with OFF.

4.2 About Chuck Input and Output Signals

I/O Signal List

Chuck I/O signals are as follows.

Category	Signal name	Function overview
Input	Grip (OFF) / Release (ON)	Outer gripping type (RTCKSRE, RTCKSPE, RTCKMRE and RTCKMPE) open fingers with Release (ON). The fingers should be kept open while Release (ON) is being input.
		The fingers close with force of springs once Grip (OFF) gets input.
Output	Sensor1	Detected / not detected signals for Sensor 1 for open/close monitoring
	Sensor2	Detected / not detected signals for Sensor 2 for open/close monitoring

(Note) Inner gripping type (RTCKSRI, RTCKSPI, RTCKMRI and RTCKMPI) should be other way around for open and close.

4.3 Operating Chuck from Host Device such as PLC

Open / Close Operation : Grip (OFF) / Release (ON) Signals

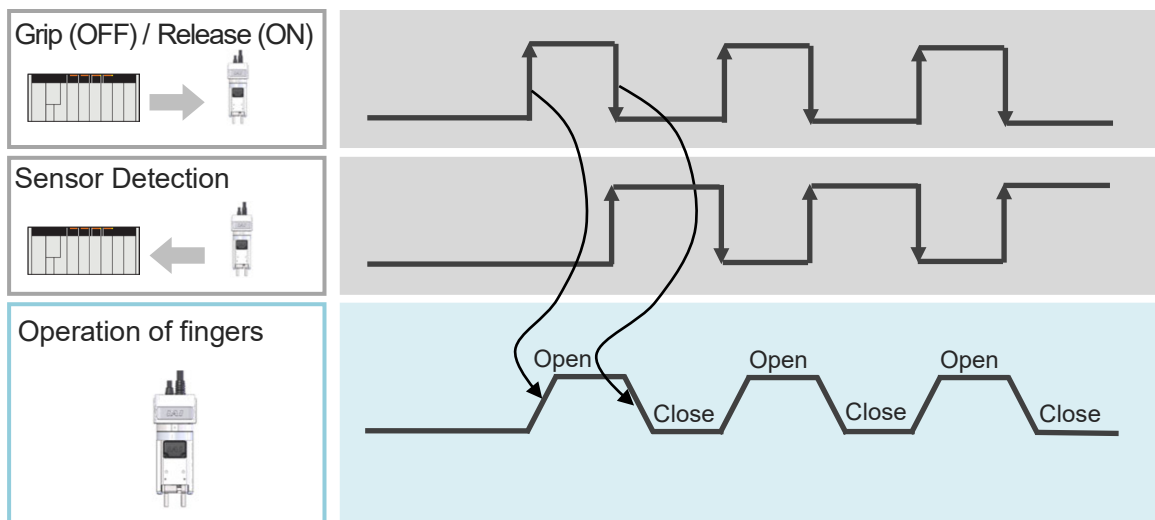
Outer gripping type (RTCKSRE, RTCKSPE, RTCKMRE and RTCKMPE) open fingers with Release (ON).

The fingers should be kept open while Release (ON) is being input.

The fingers close with Grip (OFF).

In the figure below shows an example for when Sensor 1 and Sensor 2 (Option) are adjusted to detect when the fingers are closed.

(Note) Inner gripping type (RTCKSRI, RTCKSPI, RTCKMRI and RTCKMPI) should be other way around for open and close.



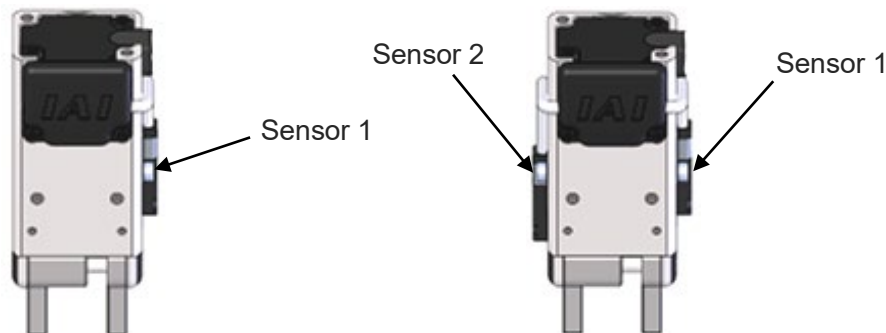
Caution

Make sure that the frequency of operation open and close in one minute is 120 times or less.

Operation of Sensors (Option)

One or two units of a sensor to detect the operation open and close of the fingers can be attached (Option).

There are two types of sensors, NPN type and PNP type.

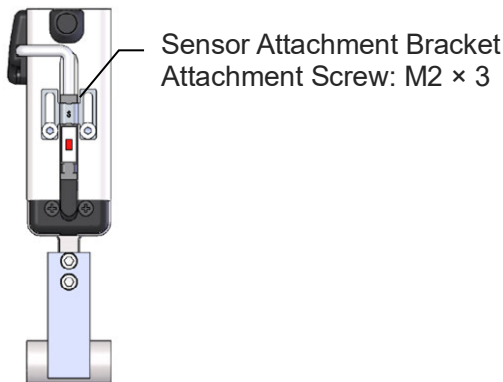


Sensor 1 and Sensor 2 should be adjusted as shown below at delivery.

* For attaching one unit of sensor (S1N, S1P), only a sensor that turns on when releasing should be available.

operation	Release	Gripped workpiece existed	No gripped workpiece
Sensor 1	ON	OFF	
Sensor 2	OFF		ON

When you use the sensor, check the operation of gripping a workpiece, and adjust the position of the sensor by loosening the screw on the sensor attachment bracket if necessary.



4.4 Operation of Rotary Part

The rotary part should be operated by setting the position data (rotated angle) on the controller.
In below, shows the rotation range and direction.

[Refer to the instruction manual for a PC software for how to set up the position data]

Rotation Range

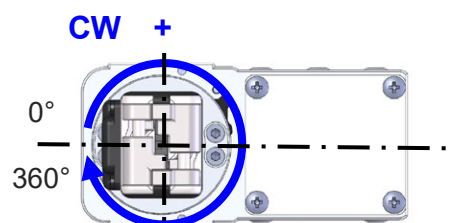
0° to 360° (Within 1 turn)

Rotation Direction

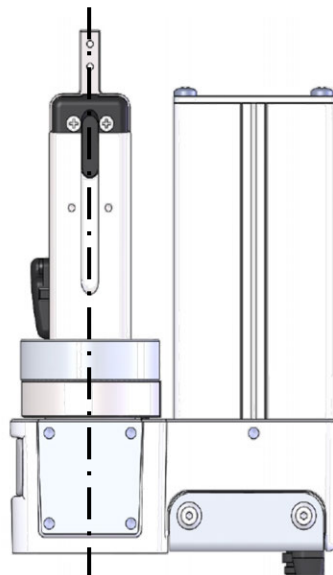
At view from chuck side:

Clockwise (CW) : Positive Direction of Coordinate

Counterclockwise (CCW) : Negative Direction of Coordinate



Shown in tiger is condition of 0deg



Maximum Rotation Speed and Maximum Rotation Acceleration/Deceleration

Make sure that the operation is held below the maximum rotation speed and maximum rotation acceleration/deceleration.

In below, shows the maximum rotation speed and maximum rotation acceleration/deceleration.

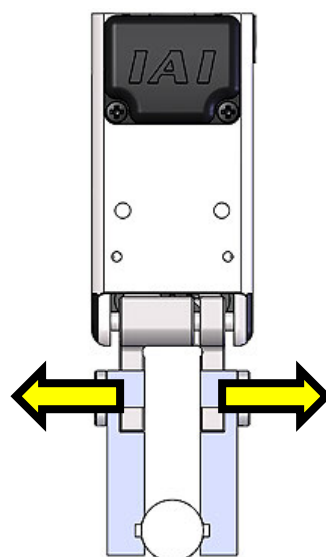
Item	Contents
Rotary Max. Rotation Speed ^{*1} (deg/s)	1800
Rotary Max. Rotation Acceleration/Deceleration (deg/s ²)	29400
Rotary Max. Acceleration/Deceleration (Controller Setting) (G)	3

^{*1} When the rotation speed is slow (S Type: 120deg/s or less, M Type: 90deg/s or less), vibration or driving noise should increase due to the rotation characteristics of the motor.

4.5 Removing Gripped Workpiece

In order to remove a workpiece that is gripped, open the both fingers at the same time at the root part of them.

Do not attempt to open only on one finger or open the fingers at the tip of them.



Push the root part of both fingers at the same time to open the fingers.

Chapter 5

Maintenance and Inspection

5.1	Precautions for Maintenance and Inspection Work	5-1
5.2	Inspection Items and Schedule	5-3
	Rotary Chuck	5-3
5.3	Visual Inspection Items	5-4
	External Visual Inspection	5-4
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	External Cleaning	5-5
5.5	Inspection for Timing Belt	5-6
5.6	Greasing Method	5-8
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	[2] Greasing Method	5-8
5.7	How to Replace Components	5-9
	Attaching and Replacing Sensors (Option)	5-9
	Motor Replacement	5-10

5.1 Precautions for Maintenance and Inspection Work

Make sure to read the following precautions before conducting any maintenance or inspection work.



Caution

- Do not climb on or put anything on the actuator.
It may cause damage on the product, loss of product function, performance drop or drop of production life.
Before releasing the brake, make sure to check there is nothing that will interfere with moving parts within the operation range.
- Check that the power to the actuator is OFF before conducting any maintenance or inspections.
- Be careful not to lose the cover or any removed screws.
Be sure to return the product to the original condition after maintenance and inspection work.
Mounting in an incomplete state may cause injuries or damage to the product.
- Do not attempt to replace the actuator cable, change the direction of cable ejection or cut the cable.
- Do not modify, disassemble/assemble, or use maintenance parts not specified on your own discretion under any circumstances.

Notice

- First, be sure to wipe off the old grease, and then supply new grease.
- The degradation speed of grease may differ depending on the operating environment (temperature, humidity and ambient atmosphere).

It is recommended to shorten the grease supply period if the actuator is used under poor environmental conditions such as high temperatures, high humidity or dusty atmospheres.

Also, it is recommended to improve the environmental conditions in case the grease changes color notably due to poor operating conditions.

- Base oil may separate from the grease due to the mounting orientation or operating conditions.

Base oil may also leak from the inside of the actuator to the exterior through gaps.

Check visually for oil drips when supplying grease.

- An actuator stored for 6 months or more may suffer from grease degradation.

Supply grease before the start of use.

→ For details, refer to “5.6 Greasing method”.

5.2 Inspection Items and Schedule

Follow the maintenance inspection schedule below.

It is assumed that the equipment is operating 8 hours per day.

If the equipment is running continuously night and day or otherwise running at a high operating rate, inspect more often as needed.

 Rotary Chuck

Inspection period	External inspection	Inspection for timing belt	Greasing
Start of work inspection	○		
1-month inspection	○		
6-month inspection	○	○	
1-year inspection	○	○	○
Every 6 months thereafter	○		
Every 1 year thereafter	○	○	○

5.3 Visual Inspection Items

External Visual Inspection

Inspection items	Maintenance work
Is abnormal noise or vibration generated?	When an abnormal noise or vibration has occurred, many cases can be considered as a cause such as the condition of load, condition of installation and stiffness of equipment to install.
Are actuator mounting bolts loose?	If the bolts are found loose, tighten them further.
Is the cable scratched?	Replace the cable when it is remarkably damaged.
Is the connector loose?	When the connector is found loose, make sure to insert it certainly.
Is grease dripping out? (especially if vertically mounted)	Clean up any drips. For chuck, supply grease. ^{*1}

^{*1} Refer to "5.6 Greasing Method" for detailed information about specific greasing method.

5.4 Cleaning

External Cleaning

- Clean exterior surfaces as necessary.
- Use a soft cloth to wipe away dirt and buildup.
- Do not blow too hard with compressed air, as it may cause dust to get in through gaps.
- Do not use petroleum-based solvents as they can harm resin and painted surfaces.
- To remove severe buildup, wipe gently with a soft cloth soaked in a neutral detergent or alcohol.

5.5 Inspection for Timing Belt

Remove the front cover and check the following points to see the timing belt is fine.

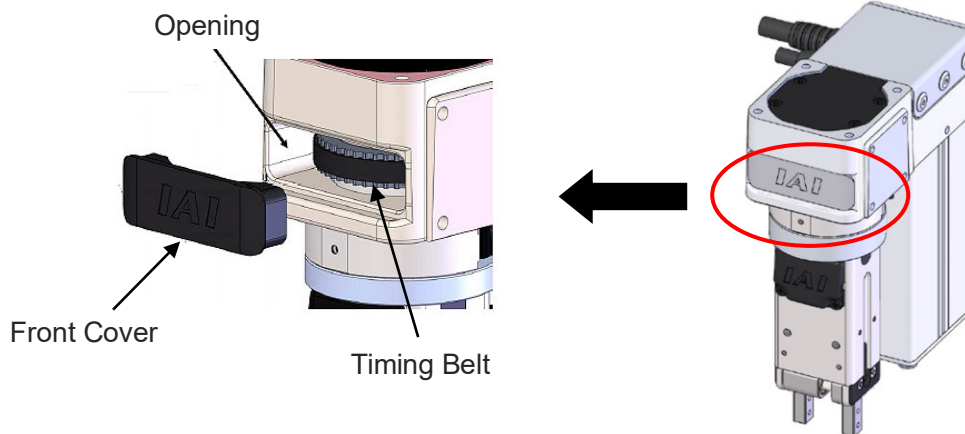
Turn the rotary part manually to check the timing belt all around.

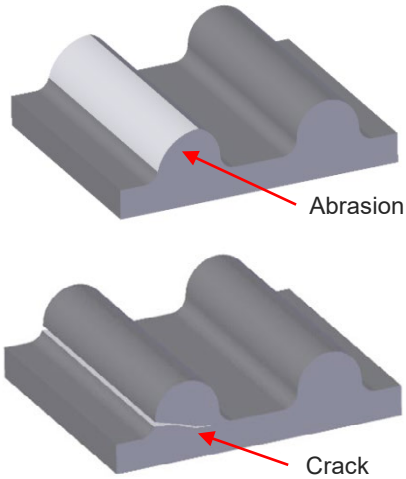
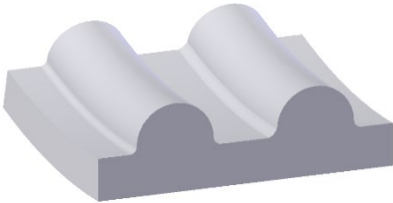
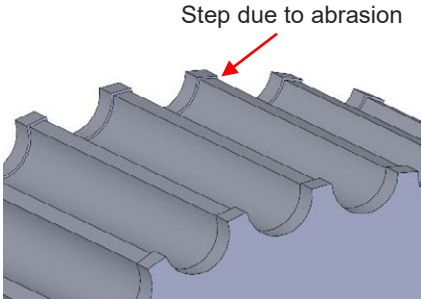
If it is equipped with a brake, release the brake at the brake release (BK RLS) switch on the controller.

Put the front cover back on after the inspection.

The timing belt is not available for a customer to replace.

Request IAI to replace the timing belt when an abnormality is found and it is necessary to replace.



Inspection Points for Timing Belt	
Inspection Points	Contents of Inspection
Cut on Belt	• Check if there is a cut on belt
Abrasion, Crack, Missing Tooth on Belt 	• Check if there is a tooth on the belt remarkably worn out • Check if there is a crack on root of a tooth • Check if there is a missing tooth
Hardened, Softened, Deformed Belt 	• Check if the belt is hardened, softened or deformed (shrunk or expanded)
Abrasion on Pulley Tooth 	• Check if there is a tooth on the pulley remarkably worn out

5.6 Greasing Method

[1] Grease Used

Use lithium based grease equivalent to the one described in the list.

Application Location	During Maintenance (recommended product)	Default (reference)
Finger Guide	Kyodo Yushi/Multemp AC-D	Kyodo Yushi/Multemp AC-D

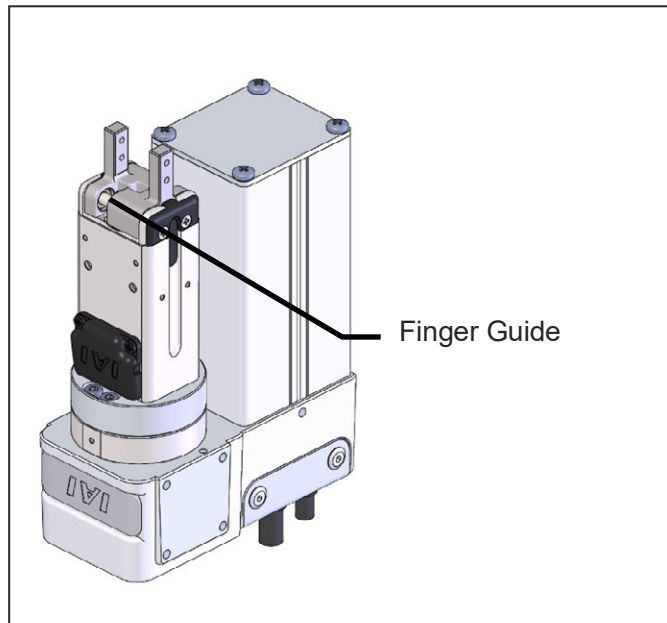


Caution

- Never use fluorine-based or urea-based grease.
- Mixing with lithium-based grease not only reduces the performance of the grease, it may even cause damage to the actuator.

[2] Greasing Method

- 1 Apply grease directly on the finger guides using a tool such as a cotton swab.



Caution

- In case the grease got into your eye, wash it with clean water for 15 minutes and immediately go see the doctor to get appropriate care.
- After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease OFF.

5.7 How to Replace Components

○ Attaching and Replacing Sensors (Option)

[How to Replace and Attached]

Items required for Attaching and replacing

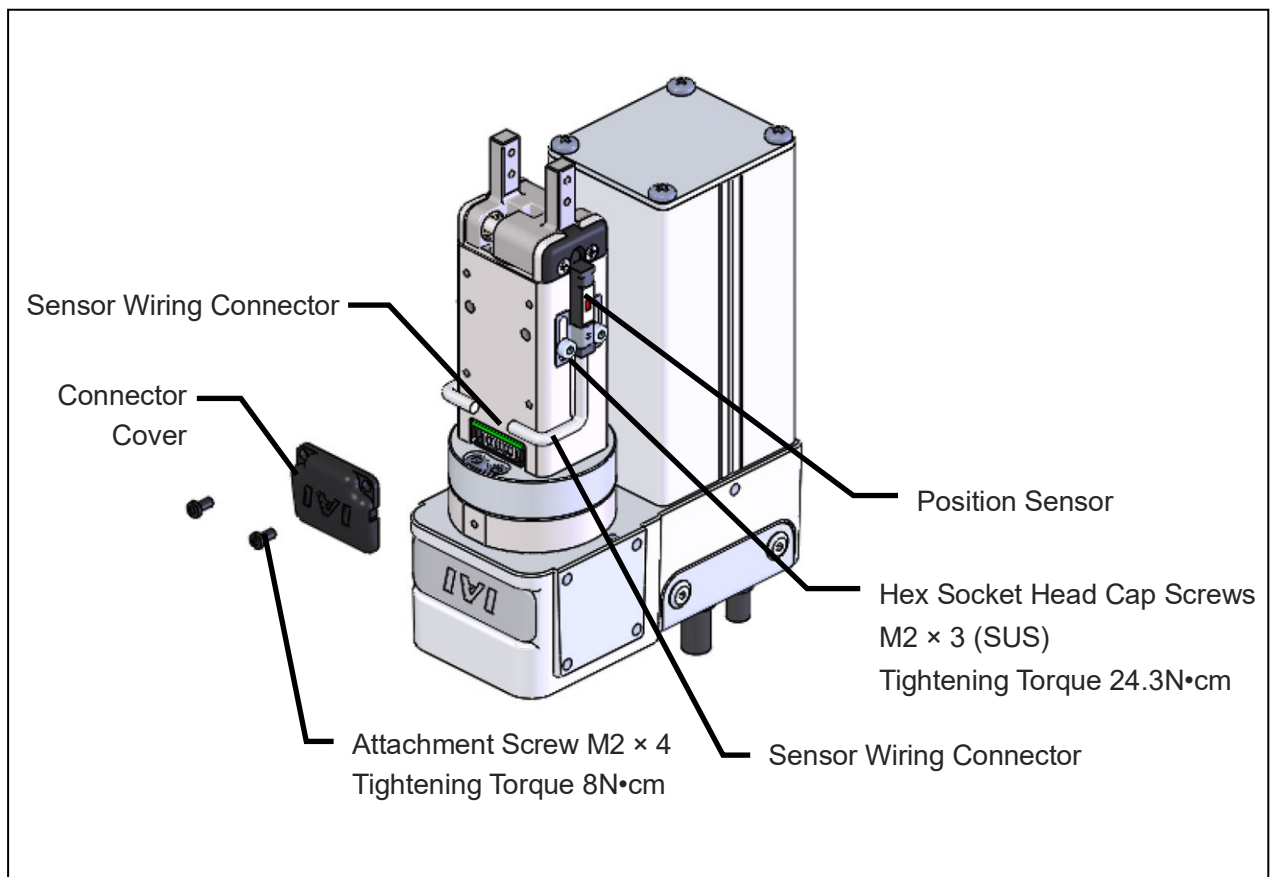
- Hex wrench 1.5mm (for hexagon socket head cap screw)
- + Screwdriver (for screws for precision instruments (panhead))

1

Use hex socket head cap screws (M2 × 3) to attach the sensors.

For wiring, take off the connector cover and insert the sensor connector.

Put the connector cover back on once the work is finished.



Motor Replacement

Motor is not available for replacement by a customer.

Ask IAI when it is necessary to have a motor replacement.

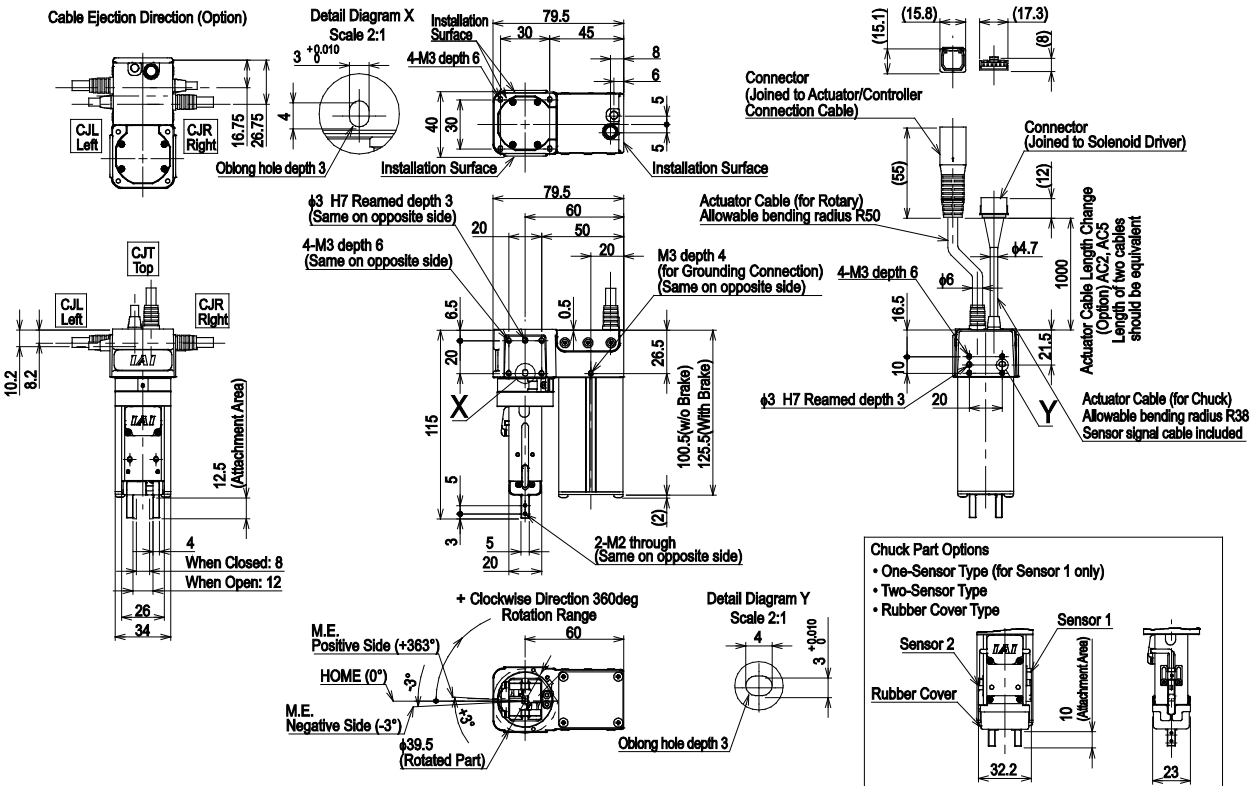
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	RCP6-RTCKMPE/RTCKMPI	6-4

6.1 External Dimensions

RCP6-RTCKSRE/RTCKSRI

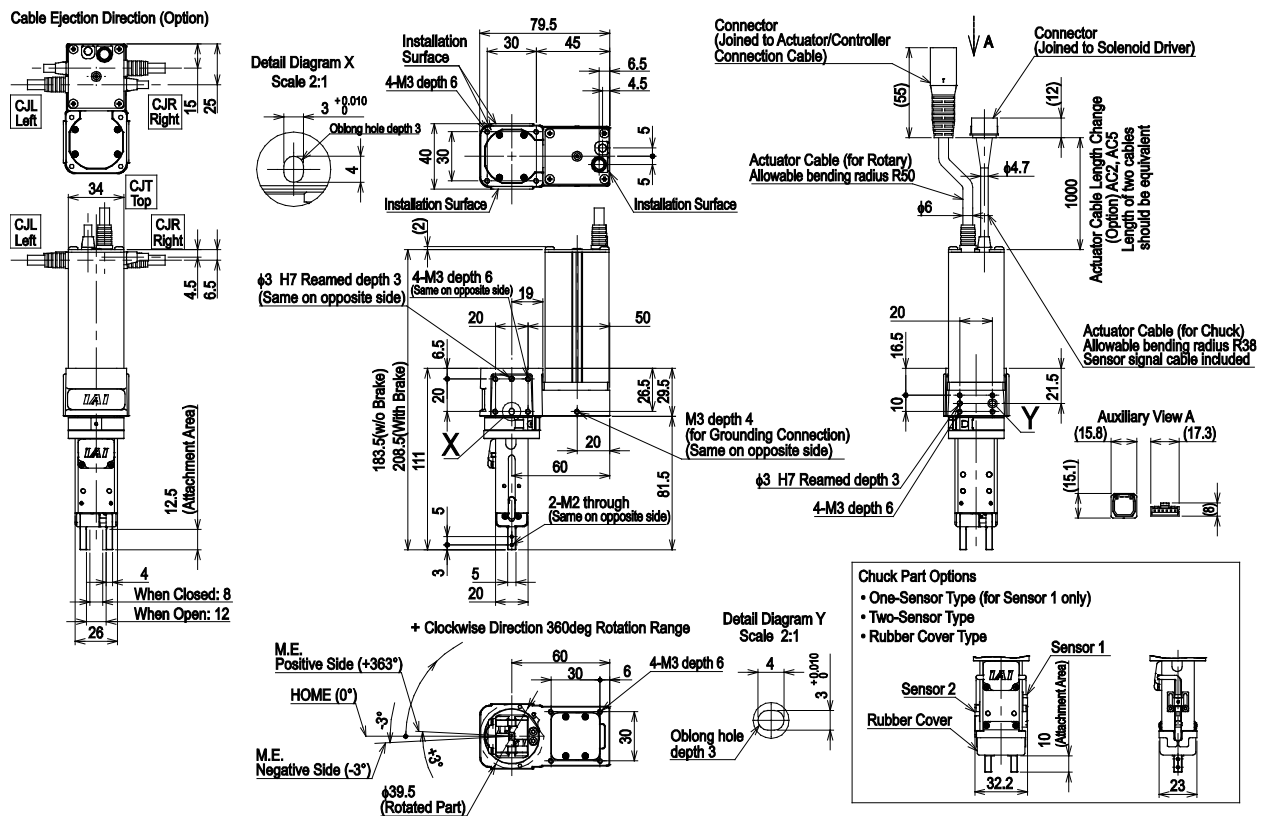


M.E.: Mechanical End

- [Note]
- RTCKSRE Type grips at the outer diameter. Fingers should open when power conducted and close when not (normally closed).
 - RTCKSRI Type grips at the inner diameter. Fingers should close when power conducted and open when not (normally open).

Mass	
w/o Brake	0.68 kg
With Brake	0.74 kg

RCP6-RTCKSPE/RTCKSPI

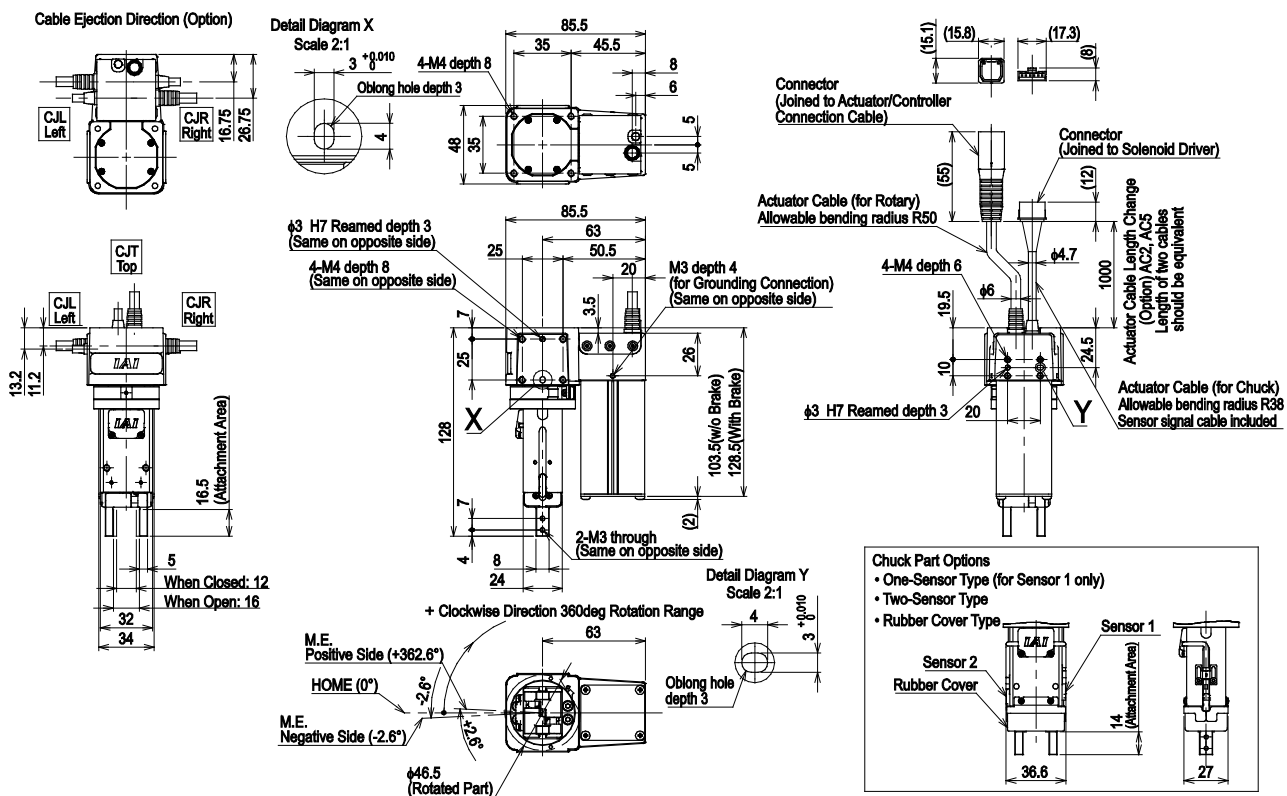


M.E.: Mechanical End

[Note]

- RTCKSPE Type grips at the outer diameter. Fingers should open when power conducted and close when not (normally closed).
- RTCKSPI Type grips at the inner diameter. Fingers should close when power conducted and open when not (normally open).

Mass	
w/o Brake	0.67 kg
With Brake	0.73 kg



M.E.: Mechanical End

[Note]

- RTCKMRE Type grips at the outer diameter. Fingers should open when power conducted and close when not (normally closed).
- RTCKMRI Type grips at the inner diameter. Fingers should close when power conducted and open when not (normally open).

Mass	
w/o Brake	0.88 kg
With Brake	0.94 kg

Chapter 7

Warranty

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7.1 Warranty period

Whichever of the following periods is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to the specified location
- 2,500 hours of operation

7.2 Scope of the warranty

Our products are covered by warranty when all of the following conditions are met.

Faulty products covered by warranty will be replaced or repaired free of charge:

- (1) The breakdown or malfunction in question pertains to our product as delivered by IAI or our authorized dealer.
- (2) The breakdown or malfunction in question occurred during the warranty period.
- (3) The breakdown or malfunction in question occurred while the product was in use for an appropriate purpose under the operating conditions and operating environment specified in the instruction manual and catalog.
- (4) The breakdown or malfunction in question was caused by a specification defect, malfunction, or poor product quality.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

- (a) Anything other than our product
- (b) Modification or repair performed by a party other than IAI (unless approved by IAI)
- (c) Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
- (d) Natural disaster, unnatural disaster, incident or accident for which we are not liable
- (e) Natural fading of paint or other symptoms of aging
- (f) Wear, depletion or other expected result of use
- (g) Operation noise, vibration or other subjective sensations not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

7.3 Honoring the warranty

As a rule, the product must be consigned to IAI for repair under warranty.

7.4 Limited liability

- (1) We assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
- (2) We assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

7.5 Conformance with applicable standards/regulations, etc., and application conditions

- (1) If our product is combined with another product or any system, equipment, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc.
In such a case we assume no liability for the conformance of our product with the applicable standards, etc.
- (2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications.

Contact IAI if you must use our product for any of these applications:

- (a) Medical equipment used to maintain, control or otherwise affect human life or physical health
- (b) Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
- (c) Machinery components essential for safety (safety devices etc.)
- (d) Equipment used to handle cultural assets, art or other irreplaceable items
- (3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

7.6 Other Items excluded from warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

- (1) Guidance for mounting/adjustment and witnessing of test operation
- (2) Maintenance and inspection
- (3) Technical guidance and education on operating/wiring methods, etc.
- (4) Technical guidance and education on programming and other items related to programs



Chapter 8

Appendix

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8.1 Temperature Increase Measurement Data (Reference)

Temperature of the body and the fingers on the rotary chuck should rise when it makes a releasing operation as the current flows when it releases. Temperature rise could vary depending on the frequency of chuck open/close operation.

The rotary chuck possesses a structure that the heat generated on the driving motor of the rotary is to be radiated from the motor cover and the rotary body.

The rotary should generate heat also when it stops the rotation as the power flows. It generates large amount of heat when it stops rotation rather than when it makes rotation movement.

Shown below is a table of data measuring the temperature rise (reference).

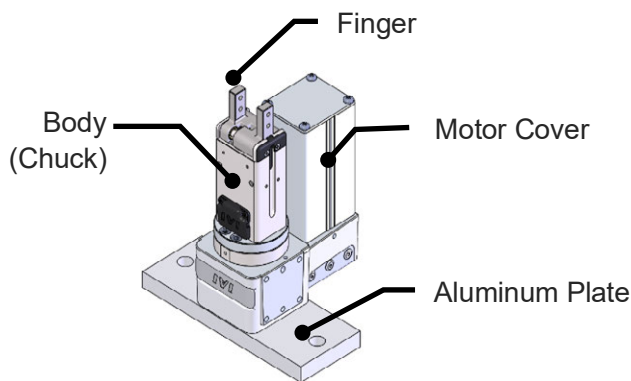
Temperature Increase Measurement Data (Reference) [Δ°C]

Condition of Chuck Operation	Measured Point	Type			
		RTCKSR S Motor Reversing Type	RTCKSP S Motor Parallel Type	RTCKMR M Motor Reversing Type	RTCKMP M Motor Parallel Type
Released Condition Continued (1h)	Finger	13.3	11.8	11.6	11.4
	Body (Chuck)	15	15.2	13.2	12.6
	Motor Cover	11.2	13.2	9.7	10.3
Open/Close Operation Continued (60CPM 1h)	Finger	16.7	17.8	15.6	15.4
	Body (Chuck)	19.1	20.6	17.3	17.9
	Motor Cover	12.9	14.1	10.0	10.8
Open/Close Operation Continued (120CPM 1h)	Finger	24.1	24.5	22.1	23.0
	Body (Chuck)	26.7	28.4	23.7	26.9
	Motor Cover	13.8	13.2	11.2	12.3

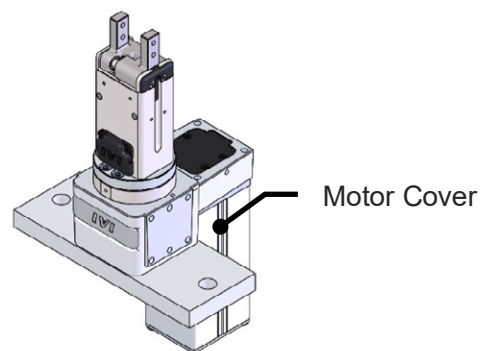
* Condition of Chuck Operation 60CPM : Open 0.5s / Close 0.5s

120CPM : Open 0.25s / Close 0.25s

* Rotary stopped (Servo on)



1) Motor Reversing Type



2) Motor Parallel Type

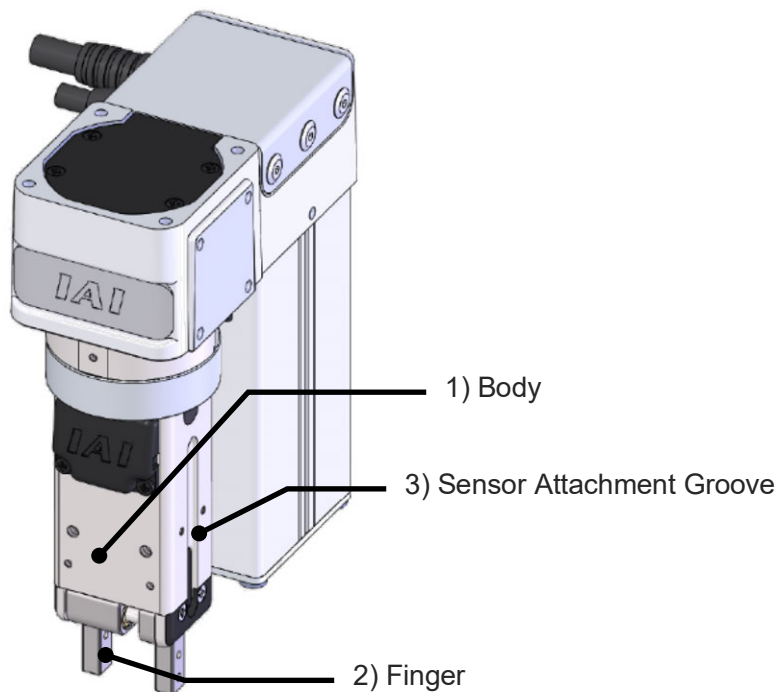
8.2 Leakage Flux Measurement Data (Reference)

By conducting to the built-in solenoid, the chuck generates flux, however, the leakage flux externally stays small as it is covered with a body made of copper.

On the sensor attachment grooves located on the sides of the body, leakage flux should be generated from the built-in magnet.

Shown below is the measurement data (reference) of the leakage flux.

Leakage Flux Measurement Data (Reference) [mT]				
Type	Operational Conditions	Condition of Unit Installation		
		1) Body	2) Finger	3) Side (Sensor Attachment Groove)
S	Gripping (Power not conducted)	0.7	0	24
	Released (Power conducted)	0.2	0.1	22
M	Gripping (Power not conducted)	0.4	0	20
	Released (Power conducted)	0.1	0.1	20



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8.4 Revision history

Revision Date	Revision Description
September 2018	First Edition
October 2018	1B Edition Pg. 1-3 Model nameplate on main body changed
November 2018	1C Edition Pg. 1-5, 1-8 Rotary gear ratio and minimum velocity added
April 2020	1D Edition Pg. 1-24 Electric wire color changed Pg. 5-7 Change made to belt figure
February 2026	1E Edition • Changes due to discontinuation of including the First Step Guide • Changes due to discontinuation of including the Instruction Manual DVD • International Standards Compliances complied with RoHS3 Directive



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