

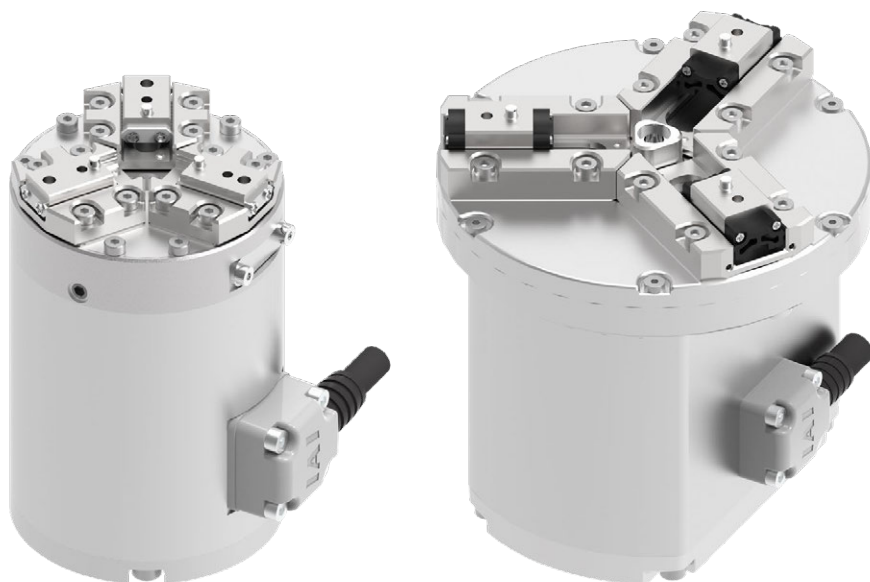
ROBO Cylinder®

Small 3-finger Gripper Type

RCP6-GRTR6
RCP6-GRTR9

Instruction Manual

Second edition ME3849-2A



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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 Small 3-finger Gripper Type Instruction Manual Configuration

Product name	Instruction manual name	Control number
RCP6 Small 3-finger Gripper	First Step Guide	ME3855
RCP6 Small 3-finger Gripper	Instruction Manual (this document)	ME3849
PCON-CB/CGB Controller	PCON-CB/CGB Controller Instruction Manual	ME0342
PCON-CYB/PLB/POB Controller	PCON-CYB/PLB/POB Controller Instruction Manual	ME0353
MCON-C/CG Controller	MCON-C/CG Controller Instruction Manual	ME0341
RCON Controller	RCON Controller Instruction Manual	ME0384
MSEL-PC/PG Controller	MSEL-PC/PG Controller Instruction Manual	ME0336
PC Compatible Software for XSEL	IA-101-X-MW/IA-101-X-USBMW Instruction Manual	ME0154
PC Teaching Software	IA-OS First Step Guide	ME0391
Touch Panel Teaching Pendant	TB-02/02D Instruction Manual Applicable for Position Controller	ME0355
Touch Panel Teaching Pendant	TB-03 Instruction Manual Applicable for Position Controller	ME0376
Touch Panel Teaching Pendant	TB-02/02D Instruction Manual Applicable for Program Controller	ME0356
Touch Panel Teaching Pendant	TB-03 Instruction Manual Applicable for Program Controller	ME0377

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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
Speed and acceleration/deceleration	Use within the allowable range	May lead to abnormal noise, vibration, breakdown, or shortened product life.
Allowable load moment		May lead to abnormal noise, vibration, breakdown, or shortened product life. In extreme cases, flaking may occur on the guide or ball screw.

5. Use the unit with the pressing operation when holding a workpiece.
6. If the power gets cut while a workpiece is being gripped, in the case of the GRTR9, the brake (option) feature should activate. Although it is not a feature to guarantee that the workpiece would not drop.
7. GRTR6 does not have a self-locking function. Since the workpiece cannot be held when the servo is off or the power is off, take appropriate measures to prevent the workpiece from falling.
8. Do not attempt to give a shock to the unit, especially to the fingers.

9. Pay attention to the finger moving part to avoid contamination getting in.
Contamination may get pinched and cause damage on components.
10. When using the GRTR9, if the with a brake (option) requires workpiece removal when the power is off, do not attempt to pull the workpiece forcefully.
Remove the workpiece by turning the finger opening scroll or removing the one-sided finger attachment. Pulling the workpiece forcefully to remove it may cause damage to the machinery. However, the amount of finger opening scroll rotation should be kept to a minimum. It could shorten the brake life.
Refer to [1.4 Operating conditions 1.4.2 [5]].
11. Remove a workpiece in case of stop for a long period of time.
Leaving a workpiece remained for a long time may cause performance drop and bad impact to the guides.
12. When using the GRTR9 with a brake (option), do not in principle turn the finger opening/closing scroll while the brake is engaged.
It could shorten the brake life.
When removing the gripped workpiece, keep the amount of rotation to the minimum necessary.
13. Do not attempt to have the pressing operation conducted for a long time exceeding 30 minutes.
Pressing operation for a long time in an environment in high temperature may cause an error stop. Decrease the current limit or shorten the duration of the pressing operation in such a case.
14. When using the GRTR9, white powder may sometimes be found adhering to the cap that covers the hole for the finger opening/closing scroll (for details, refer to [Part Names]), however, this is caused by a blooming phenomenon and does not affect the composition or performance of the product.
Wipe it off with alcohol when it comes to your mind.
15. Base oil separated from grease may overflow from inside of ELECYLINDER to outside of it in some environment of use, installation posture and operational conditions.
Make a protection in case there is a risk of bad influence to peripheral devices due to base oil applied.
16. This product cannot be used with the high output setting enabled. Use the product with the high output parameter setting disabled (default setting).

International Standard Compliance

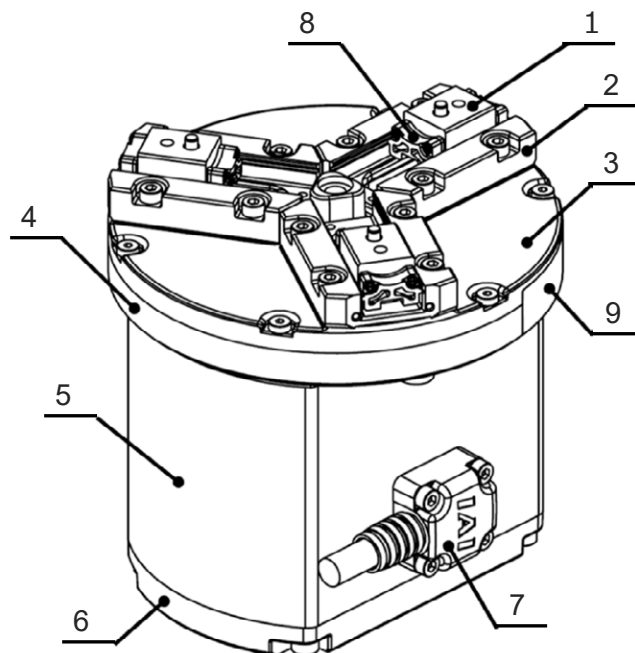
This actuator complies with the following overseas standard.

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

RoHS3 Directive	CE Marking
☐	☐

Part Names

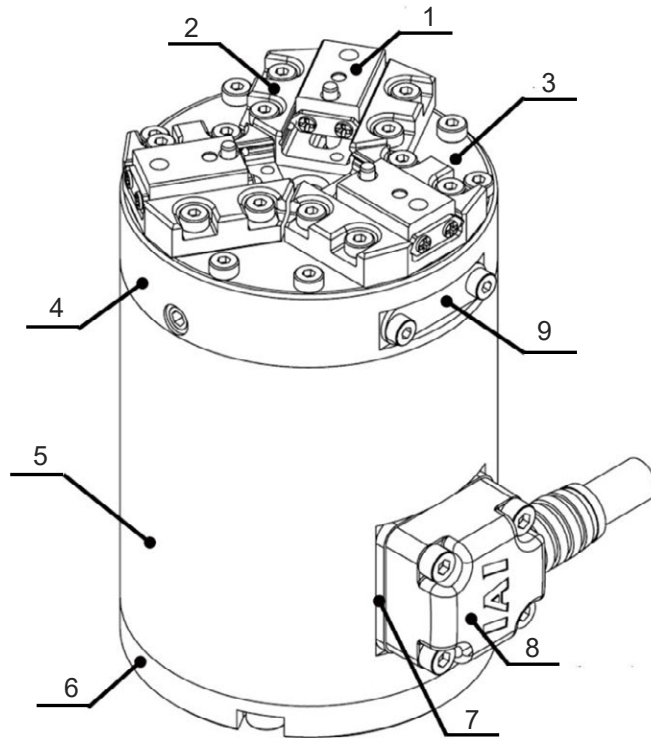
Gripper Type (GRTR9)



[Main Component Materials]

No.	Name	Materials	Surface Treatment
1	Finger	Alloy Steel	Electroless Nickel Plated
2	Guide base	Alloy Steel	Electroless Nickel Plated
3	Base flange	Aluminum Alloy	Coating
4	Motor bracket	Aluminum Alloy	Coating
5	Frame	Aluminum Alloy	White Anodizing Treatment
6	End cover	Aluminum Alloy	Coating
7	Wiring Cover	Synthetic Resin	—
8	Return	Synthetic Resin	—
9	Scroll Cap for Manual Opening/Closing	Rubber	—

Gripper Type (GRTR6)



[Main Component Materials]

No.	Name	Materials	Surface Treatment
1	Finger	Alloy Steel	Electroless Nickel Plated
2	Guide base	Alloy Steel	Electroless Nickel Plated
3	Base flange	Aluminum Alloy	Trivalent Bright Chromate
4	Motor bracket	Aluminum Alloy	White Anodizing Treatment
5	Frame	Aluminum Alloy	White Anodizing Treatment
6	End cover	Aluminum Alloy	—
7	Spacer	Aluminum Alloy	—
8	Cable box	Resin	—
9	Lid for Manual Opening/Closing	Stainless Steel	—

ROBO Cylinder

Chapter 1

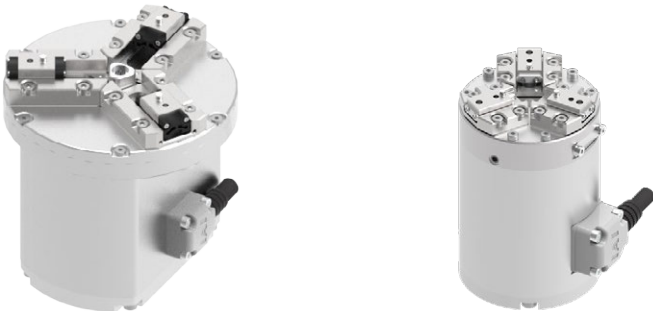
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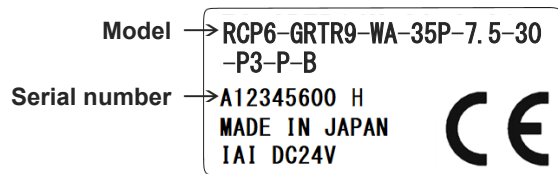
1.1 Checking the Product

1.1.1 Components (GRTR9/GRTR6)

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.

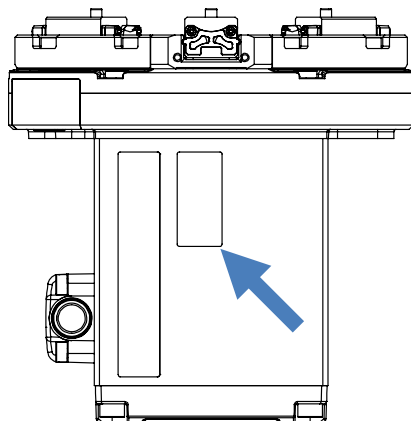
Body	
ROBO Cylinder Quantity 1	
	
Accessories	
Motor • Encoder Cable Quantity 1 Motor Encoder Integrated Cable or Motor Encoder Integrated Robot Cable	Safety Guide Quantity 1 M0194
	

1.1.2 How to read the model nameplate

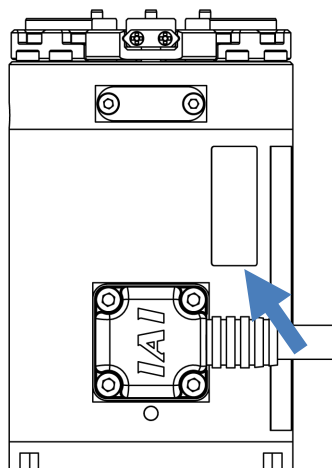


[Nameplate Position]

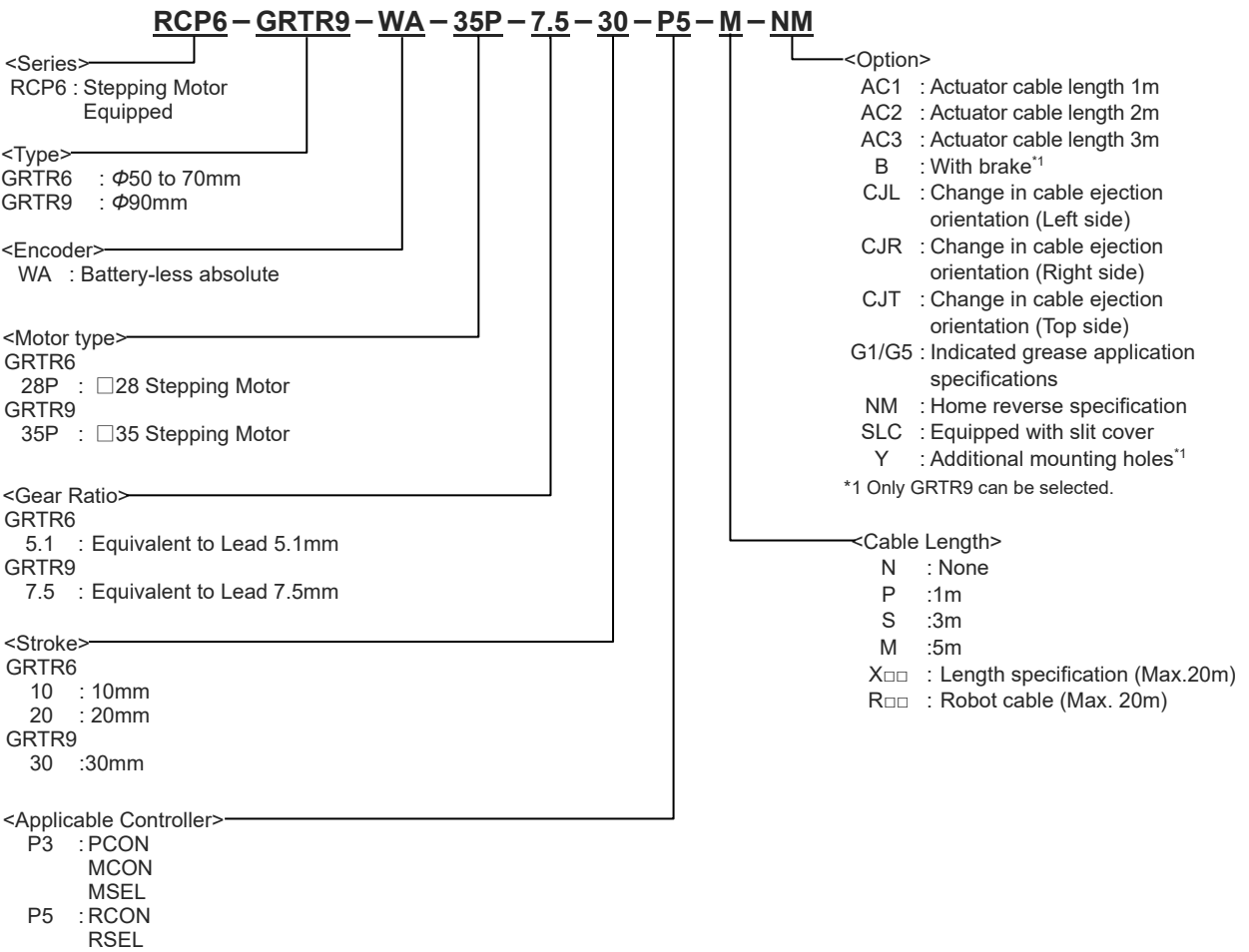
[GRTR9]



[GRTR6]



1.1.3 How to read the model number



1.2 Mechanical Specifications

1.2.1 RCP6-GRTR9

[1] Actuator Specifications

Item	Content
Drive system	Special CAM
Positioning repeatability	±0.03mm
Lost motion	0.2mm or less
Backlash	0.2mm or less
Linear guide	Linear infinite circulation system
Static allowable moment	Ma: 1.97N·m, Mb: 2.81N·m, Mc: 5.32N·m
Gear Ratio ^(Note 1)	Equivalent to Lead 7.5mm
Stroke [mm] ^(Note 2)	15
Maximum speed [mm/s] ^(Note 2)	85
Minimum speed [mm/s] ^(Note 2)	9.4
Rated Acceleration/Deceleration [G] ^(Note 2)	0.05
Max. Acceleration/Deceleration [G] ^(Note 2)	0.05
Brake specification	Non-excitation activating electromagnetic
Max. Grip Force [N] ^(Note 3)	70
Velocity at Grip Operation [mm/s] ^(Note 2)	20
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)
Allowable load on vertical direction*	88.7N
Degree of protection	IP20
Vibration and impact resistance	4.9m/s ²
Motor type	Pulse Motor (□35)
Encoder type	Battery-less absolute (standard)
Encoder pulse count	8192pulse/rev

* The value shows the allowable load to one finger.

Note 1 It shows the amount of movement one finger per rotation of the motor.

Note 2 It is the value per finger.

Note 3 It is the value when the current limit is at 70% on the top of the finger (gripping at 0mm, overhang 0mm). It is the total grip force (reference) of the three fingers.

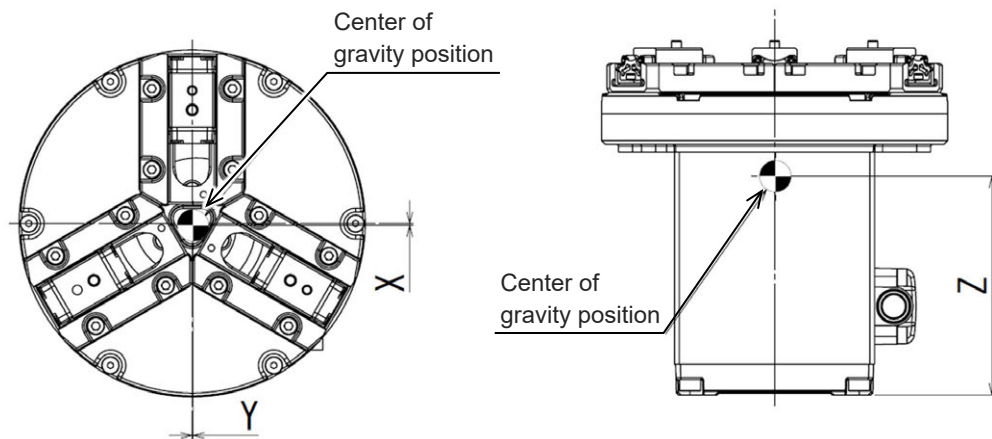
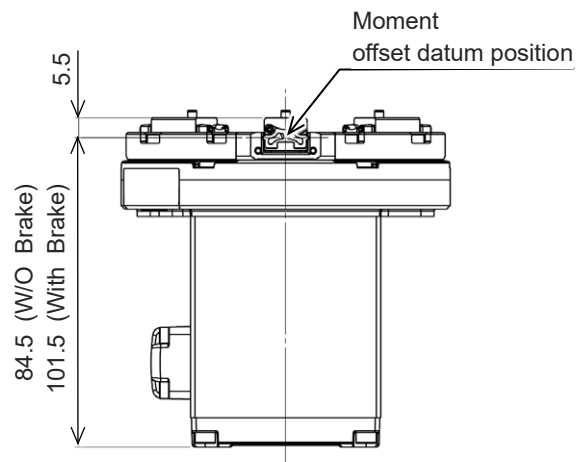


Caution

- The maximum speed may not be achieved when the movement distance is short or when acceleration/deceleration is set low.
- Setting the lower speed than the minimum speed may cause such concerns of generating abnormal noise or making the speed unstable.
- 0.05G should be set as 100% for the [%] input.

[2] Center of gravity position

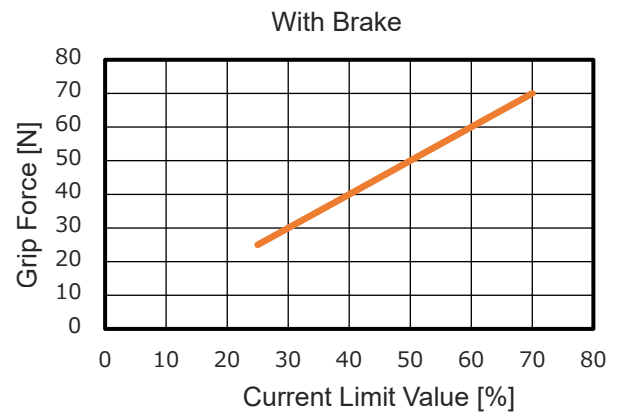
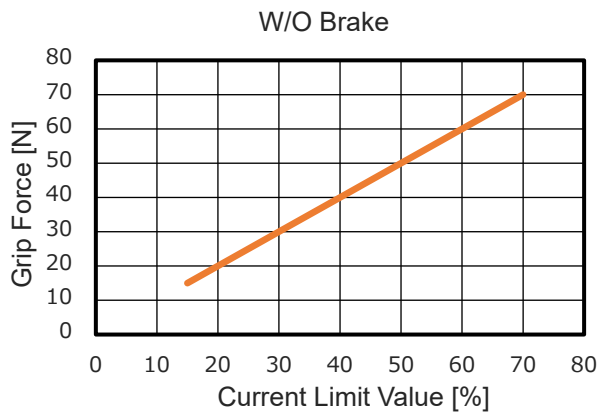
Item	Dimension [mm]	
	W/O Brake	With Brake
X	0	0
Y	0	0
Z	57	67

**[3] Moment****Moment Direction****Moment offset datum position**

[4] Relation between Grip Force and Current Limit Value

The graph shows the total grip force of 3 fingers.

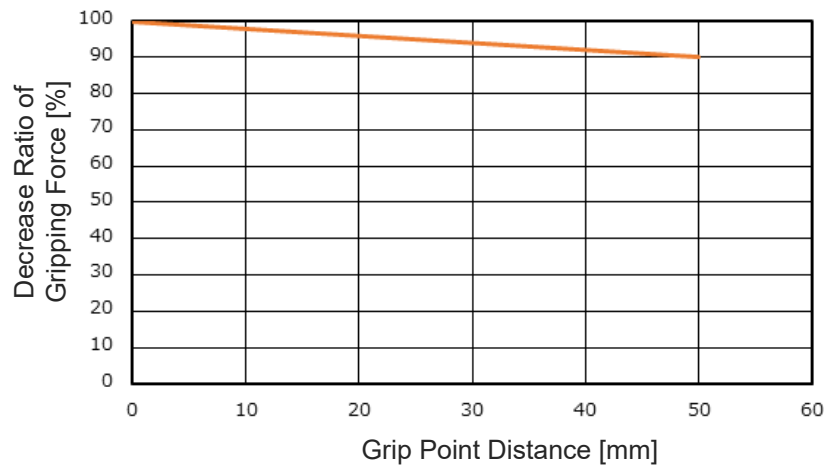
It is the grip force on the top of the fingers (when distances of grip point L are 0).

**Caution**

- The relation between the grip force and current limit is a reference when gripping with velocity at 20mm/s.
- The relation between the grip force and current is a reference. Be aware that there is a dispersion of 0 to 40% at the maximum.

[5] Relation Between Distance to Grip Point and Grip Force (Reference)

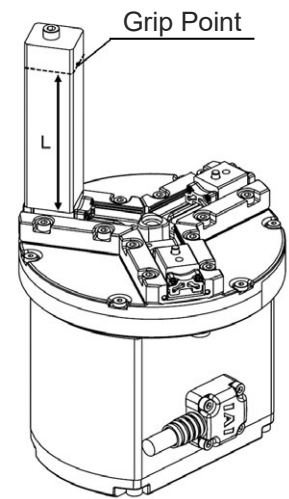
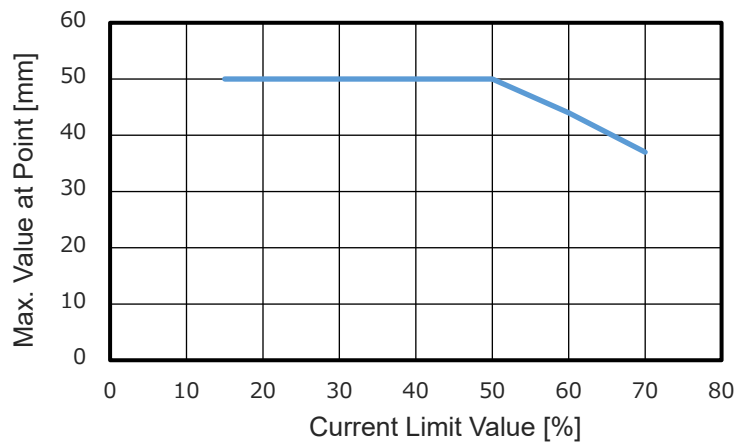
Grip force at a position with overhang from the fingers should drop the grip force.
The figure below shows a reference derived from actual measurements.
The result also may be affected by the stiffness of the finger attachment used.



[6] Distance to Grip Point

Ensure that the gripping point L is less than or equal to the value shown below.

	Current Value [%]						
	15	20	30	40	50	60	70
Max. Value at Point [mm]	50	50	50	50	50	44	37



Even if the distance to the grip point is in the limited range, have the finger attachments as small and light as possible.
If the fingers are long and large or weight is high, the inertial force and the bending moment during open and close may drop the performance or give bad impact on the guide part

1.2.2 RCP6-GRTR6

[1] Actuator Specifications

Item	Content	
	RCP6-GRTR6	
	10 Stroke	20 Stroke
Drive system	Special CAM	
Positioning repeatability	±0.03mm	
Lost motion	0.2mm or less	
Backlash	0.2mm or less	
Linear guide	Limited Guide	
Static allowable moment	Ma: 0.99N·m, Mb: 1.41N·m, Mc: 2.76N·m	Ma: 1.44N·m, Mb: 2.05N·m, Mc: 3.38N·m
Gear Ratio ^(Note 1)	Equivalent to Lead 5.1mm	
Stroke [mm] ^(Note 2)	5	10
Maximum speed [mm/s] ^(Note 2)	45	65
Minimum speed [mm/s] ^(Note 2)	6.4	
Rated Acceleration/Deceleration [G] ^(Note 2)	0.05	
Max. Acceleration/Deceleration [G] ^(Note 2)	0.05	
Max. Grip Force [N] ^(Note 3)	50	
Velocity at Grip Operation [mm/s] ^(Note 2)	20	
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)	
Allowable load on vertical direction*	61.4N	75.1N
Degree of protection	IP20	
Vibration and impact resistance	4.9m/s ²	
Motor type	Pulse Motor (□28)	
Encoder type	Battery-less absolute (standard)	
Encoder pulse count	8192pulse/rev	

* The value shows the allowable load to one finger.

Note 1 It shows the amount of movement one finger per rotation of the motor.

Note 2 It is the value per finger.

Note 3 It is the value when the current limit is at 70% on the top of the finger (gripping at 0mm, overhang 0mm). It is the total grip force (reference) of the three fingers.



Caution

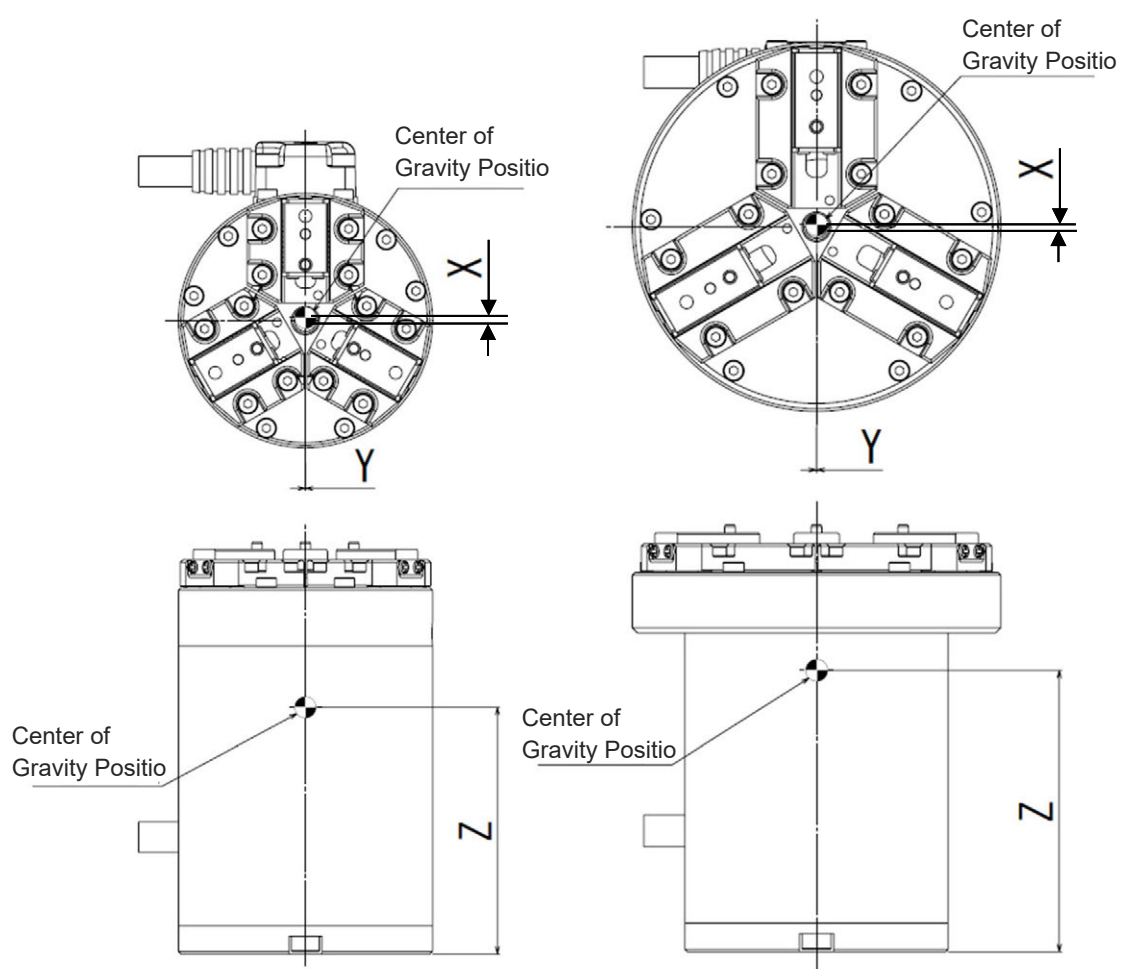
- The maximum speed may not be achieved when the movement distance is short or when acceleration/deceleration is set low.
- Setting the lower speed than the minimum speed may cause such concerns of generating abnormal noise or making the speed unstable.
- 0.05G should be set as 100% for the [%] input.

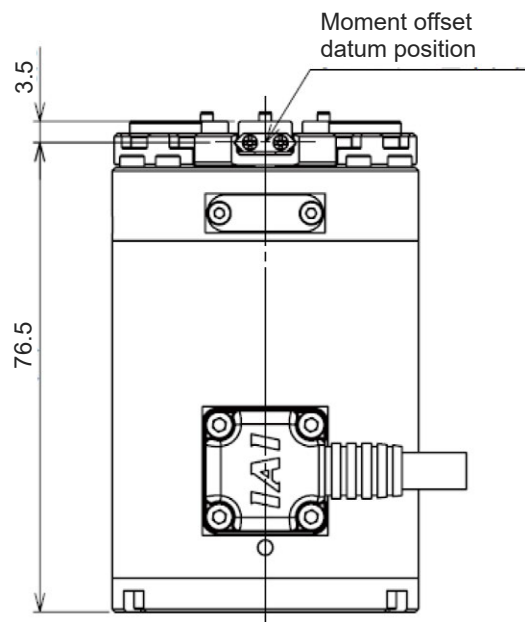
[2] Center of gravity position

Item	Dimension [mm]	
	10 Stroke	20 Stroke
X	0.6	0.4
Y	0	0
Z	48.5	53.4

[10 Stroke]

[20 Stroke]



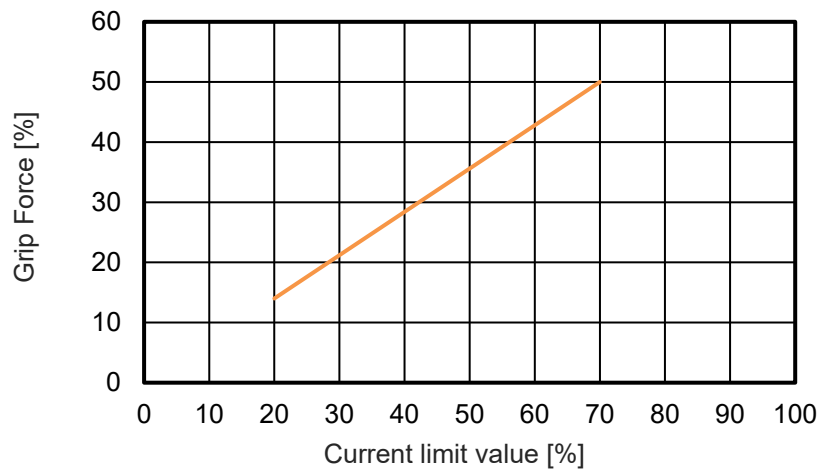
[3] Moment**Moment direction****Moment offset datum position**

*The moment offset datum position is common for both 10 stroke and 20 stroke models.

[4] Relation between Grip Force and Current Limit

The graph shows the total grip force of three fingers.

It is the grip force on the top of the fingers (when distances of Grip Points L is 0).

**Caution**

- When performing gripping (pressing), the speed will be 20mm/s. If the approach speed is 20mm/s or less, gripping will be performed at the same approach speed.
- The relation between the grip force and current is a reference. Be aware that there is a dispersion of 0 to 40% at the maximum.

[5] Relation Between Distance to Grip Point and Grip Force (Reference)

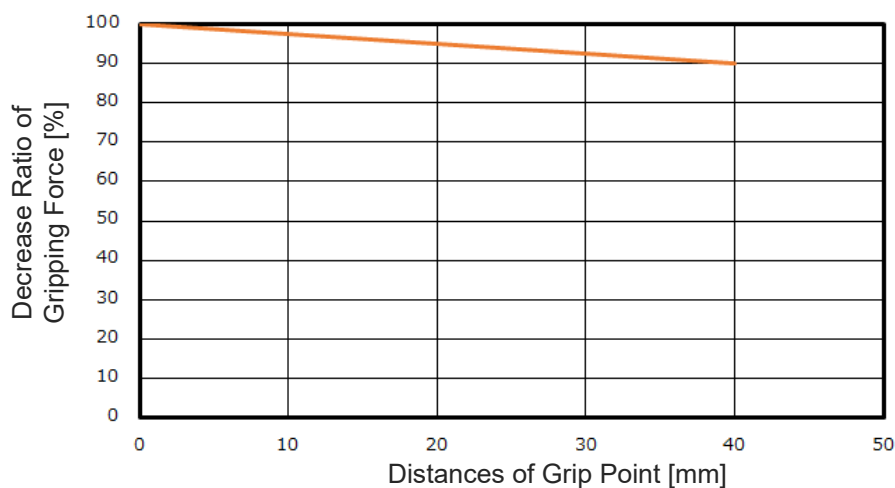
Grip force at a position with overhang from the fingers should drop the grip force.

The figure below shows a reference derived from actual measurements.

The result also may be affected by the stiffness of the finger attachment used.

* Gripping force by grip point is common for both 10 stroke and 20 stroke models.

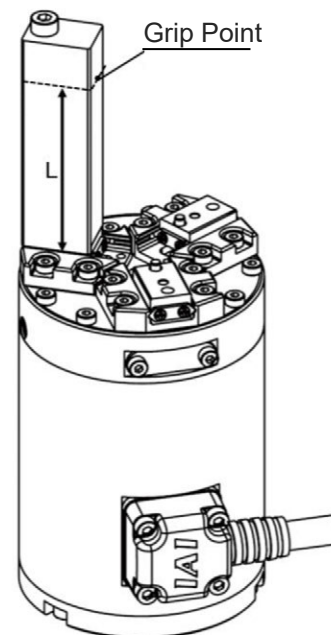
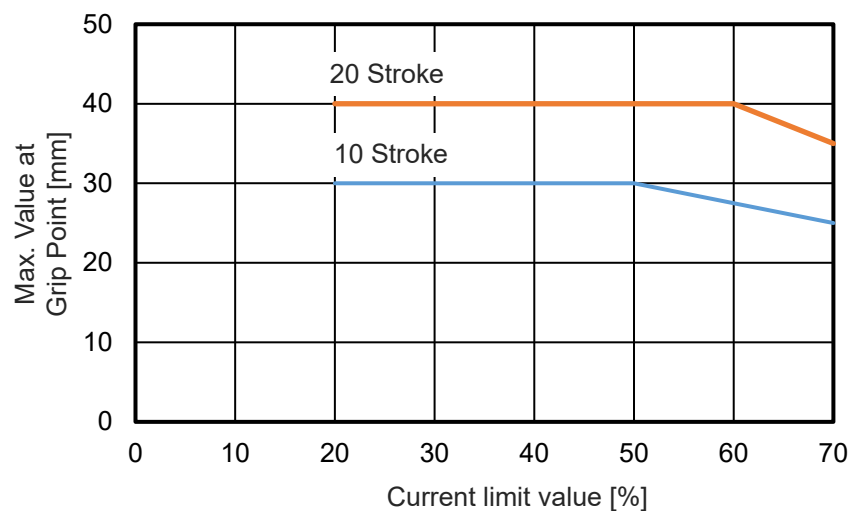
* For 10 stroke, the maximum grip point is 30mm.



[6] Distance to Grip Point

Ensure that the gripping point L is less than or equal to the value shown below.

Model	Current Value [%]					
	20	30	40	50	60	70
10 Stroke	30	30	30	30	27.5	25
20 Stroke	40	40	40	40	40	35



Even if the distance to the grip point is in the limited range, have the finger attachments as small and light as possible.

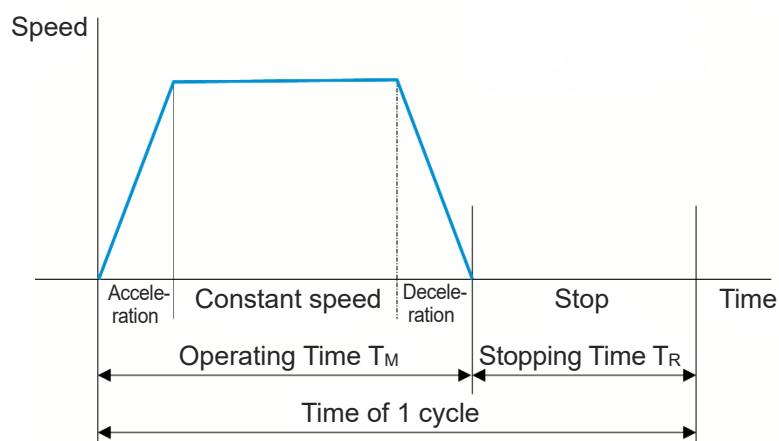
If the fingers are long and large or weight is high, the inertial force and the bending moment during open and close may drop the performance or give bad impact on the guide part.

1.3 Duty Ratio

The duty ratio is the operating rate, shown in percentage [%], of the actuator operating time within one cycle.

$$D = \frac{T_M}{T_M + T_R} \times 100 \text{ [%]}$$

D : Duty ratio
 T_M : Operating time
 (including push-motion operation)
 T_R : Stopping time



RCP6-GRTR9/GRTR6 continuous operation with duty ratio 100% is available.

1.4 Operating Conditions

1.4.1 Checking operating conditions

The following conditions must be satisfied before operating the unit. Calculate the conditions using the following formula.

- Procedure 1** Check of Necessary Grip Force and Workpiece Payload available for Transportation
- Procedure 2** Check of Finger Vertical Allowable Load and Allowable Moment

[1] Procedure 1 Check of Necessary Grip Force and Workpiece Payload available for Transportation

The necessary grip force when gripping a workpiece with friction force of the grip force should be calculated as shown below.

◆ In Normal Transportation

F : Grip force [N].....Total of grip force of each finger

μ : Coefficient of static friction between finger attachment and work piece

m : Workpiece payload [kg]

g : Gravitational acceleration [= 9.8m/s²]

W : Gravitational [N] = mg

The condition that the workpiece would not drop when gripping it statically should be:

$$F\mu > W$$

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

The necessary grip force in the normal transportation when the recommended safety factor 2 is considered should be:

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

When coefficient of friction μ is from 0.1 to 0.2;

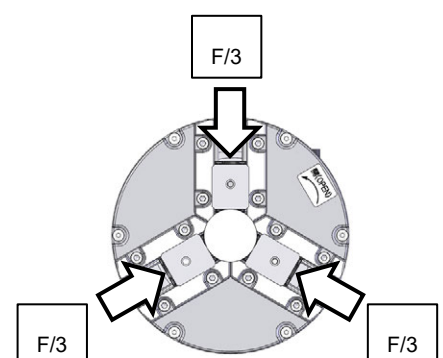
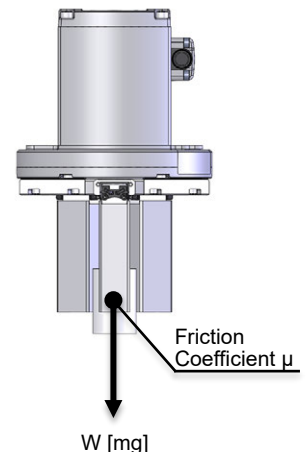
$$F > \frac{mg}{\mu} \times 2 = (10 \sim 20) \times mg$$

- * The workpiece payload capable of transportation is higher as the coefficient of static friction gets higher, however, it is necessary to select a model that is capable of getting a grip force 10 to 20 times higher considering the safety.

For ordinary work piece transportation;

Necessary Grip Force $F \Rightarrow$ 10 to 20 times higher than the workpiece payload W

Workpiece Payload Capable of Transportation $\Rightarrow$ 1/10 to 1/20 or less of grip



◆ **When high acceleration/deceleration or impact force applied applied during workpiece transportation**

In addition to the gravitational force, there should be a high inertial force work on a workpiece.
In such a case, it is necessary to consider even higher safety factor to select a model.

When high acceleration/deceleration or impact is to be applied

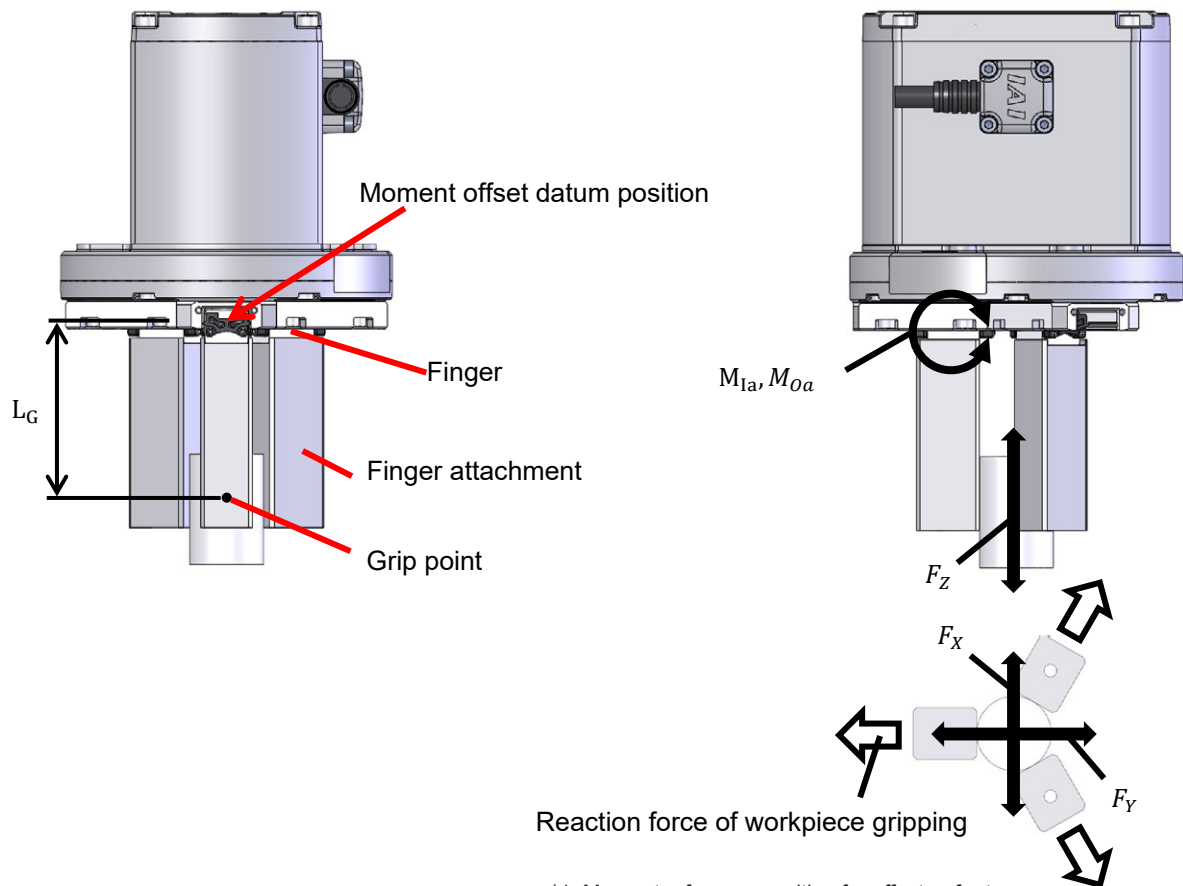
Necessary Grip Force $\Rightarrow$ 30 to 50 times higher than the workpiece payload

Workpiece Payload Capable of Transportation $\Rightarrow$ 1/30 to 1/50 or less of

[2] Procedure 2 Check of Finger Vertical Allowable Load and Allowable Moment

Check the vertical load and moment applied on the finger. For the three-fingered gripper, refer to (1) to (3) described below to calculate F_z and M_a and select a model that would not exceed the allowable value. Or, set the distance to the grip point smaller or grip force smaller so the force would not exceed the allowable value.

Load and Moment Applied to Finger



*1 Moment reference position for offset, refer to [1.2 Mechanical specifications, Moment offset datum position].

F_x : External force in X direction applied to workpiece and finger attachment [N]	M_{Ia} : Moment in Ma direction generated on finger due to grip force [N·m]
F_y : External force in Y direction applied to workpiece and finger attachment [N]	M_{Oa} : Moment in Ma direction generated on finger due to external force [N·m]
F_z : External force in Z direction applied to workpiece and finger attachment [N]	M_a : All moments in Ma direction generated on finger [N·m]
L_G : Distance from moment offset datum position to grip point (grip point) [mm] ^(Note 1)	

Note 1 L_G should keep the values stated in the graph. Use above the allowable range may apply excessive moment to the finger sliding part and internal mechanical features, which could cause a bad influence to the product life.

(1) Moment Generated on Finger due to Grip Force

Moment in Ma direction [M_{la}]

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

 F_G : Grip force of gripper [N]

Refer to [Relation between Grip Force and Current Limit in 1.2 Mechanical specifications] for the grip force F_G .

As the grip force is a reference, the safety factor of 1.5 is added on in the calculation of the moment.

(2) Moment Generated on Finger due to External Force

External force other than the grip force would be applied on a workpiece and the finger attachment when operation such as linear move or turning move is performed with the gripper main unit attached on an orthogonal robot, articulated robot or other actuators. Perform the following calculation.

◆ External Force Applied to Workpiece and Finger Attachment (F_X , F_Y and F_Z)

Calculate and sum up the following external force applied to a workpiece and the finger attachment in the three directions X, Y and Z from the conditions of the gripper use and figure out F_X , F_Y and F_Z .

a) Weight of the Workpiece and Finger Attachment

$$F = mg$$

m: Weight of workpiece and attachment [kg],

g: Gravity acceleration [= 9.8m/s²]

b) Inertial force in gripper linear move

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

c) Centrifugal force in gripper turning move

$$F = mr\omega^2 \quad r: \text{Rotation radius [m], } \omega: \text{Angular velocity [rad/s]}$$

Make sure that F_Z is at the vertical allowable load F_{zmax} or less in the table.

◆ Moment Generated on Finger due to External Force

Figure out the moment in the Ma direction by the calculated external forces F_X , F_Y and F_Z .

$$\text{Moment in Ma direction [} M_{oa} \text{]} \quad M_{oa} = L_G F_Y \times 10^{-3}$$

- (3) All Moment in Ma Direction Generated on Finger

$$M_a = M_{Ia} + M_{Oa}$$

Make sure that the value figured out above is at the maximum allowable moment or less in the table.

- (Note) Even if the finger attachment is within the allowable value, it is preferable to be as small and light as possible.

If the finger attachment is long and large or with heavy weight, it may drop the performance or give a bad influence to the guide part due to the impact by the moment at gripping.

Allowable Load and Allowable Moment on Finger (Note 1)

Type	Allowable Load in Vertical Direction [N] F_{Zmax}		Max. Allowable Moment [N•m] (Note 2)		
			M_{amax}	M_{bmax}	M_{cmax}
GRTR9	88.7		1.97	2.81	5.32
GRTR6	10 Stroke	61.4	0.99	1.41	2.76
	20 Stroke	75.1	1.44	2.05	3.38

Note 1 The allowable load and the allowable moment show values in static condition on one unit of finger.

Note 2 The allowable moment show values when load is applied in one direction. It should be 1/2 of described when applying load in two directions at the same time and should be 1/3 of described when applying load in three directions at the same time.

1.4.2 Precautions

[1] Backlash

Note that the product has some backlash (play) and pay attention to those as stated below:

- The fingers may not move when the movement amount is set less than the backlash.
- The position may get misaligned while the product is stopped as a result of slight move for the amount of backlash if there is an external force to the moving direction.
- The movement amount after the movement direction getting reversed should be shorter for the backlash amount. This variance can be adjusted by inputting a value considering the backlash.

Type	Backlash
GRTR9/GRTR6	0.2mm or less

[2] Moving stroke

The stroke stated in [1.2 Mechanical specifications] should be the maximum movement amount on one finger.

[3] Command Values of Velocity and Acceleration

The velocity and acceleration on one finger should be the command values.

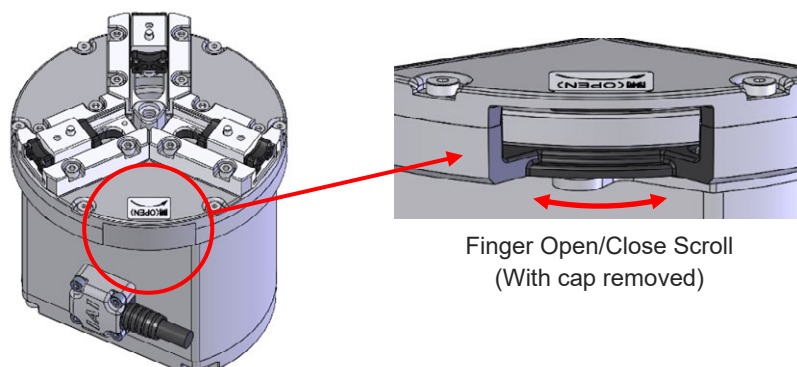
[4] Gripping operation

Make sure to set the operation command to the pressing operation when having a touch to a workpiece.

[5] Release of the Grippped Work Piece

[GRTR9]

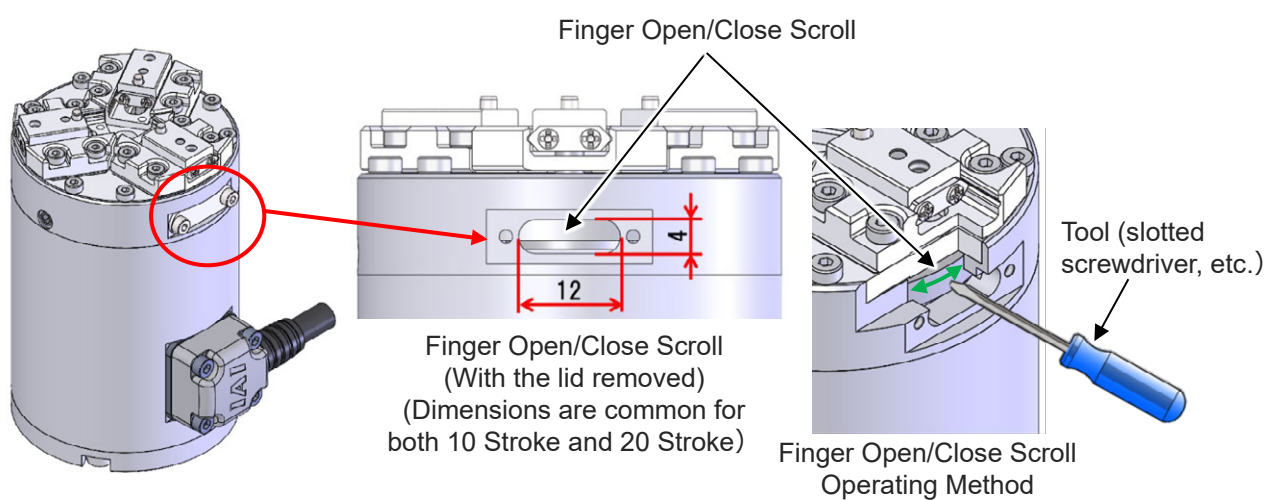
The GRTR9 retains the workpiece by applying the brake (option) even when the servo is OFF or the power is OFF. However, it does not guarantee that the workpiece will not fall. When removing a gripped workpiece while the power is OFF, operate the finger open/close scroll or remove the finger attachment to take out the workpiece. However, keep the amount of rotation of the finger open/close scroll to the minimum necessary. Excessive rotation may reduce the brake life.



[GRTR6]

GRTR6 does not have a self-locking function. Since the workpiece cannot be held when the servo is off or the power is off, take appropriate measures to prevent the workpiece from falling.

When removing a gripped workpiece while the power is off, operate the finger open/close scroll or remove the finger attachment to take out the workpiece. Pulling off the workpiece forcefully to remove it may damage machinery. Operate the finger open/close scroll using a tool such as a slotted screwdriver.



1.5 Option

1.5.1 Actuator cable length □m (Model: AC1, AC2, AC3)

Specify this when changing the length of the actuator cable.

AC1: 1m, AC2: 2m, AC3: 3m

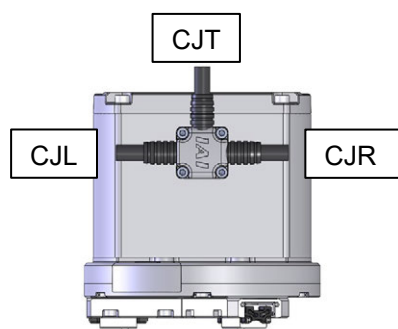
1.5.2 With brake (Model: B)

Applicable Models : GRTR9

This is a feature to retain the finger when the power is OFF or the servo is OFF.

1.5.3 Change in cable ejection orientation (Model: CJL, CJR, CJT)

The ejection direction of the actuator cable can be selected from three directions, bottom (model code: CJR), left (model code: CJL) and top (model code: CJT). Make sure to select one of these symbols.



1.5.4 Indicated grease application specifications (Model: G1)

The grease to be applied on the the linear guides on an actuator is to be changed to low particle emission grease (Kuroda C Grease).

1.5.5 Indicated grease application specifications (Model: G5)

The grease to be applied on the linear guides on an actuator is to be changed to food machinery grade grease (White Alcom Grease No. 2).

1.5.6 Home reverse specification (Model: NM)

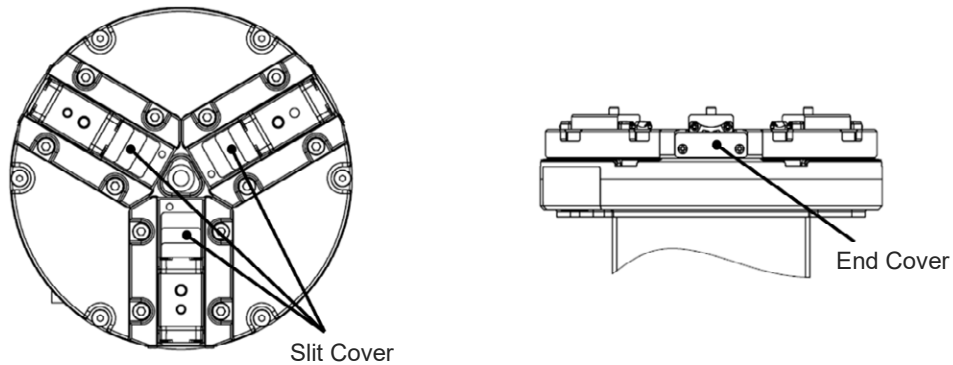
The home position in the standard type is set at the open end.

It is to be set up when it is required to have the home orientation on the closed end.

1.5.7 Equipped with slit cover (Model: SLC)

This is an optional feature that adds a slit cover to the lower part of the guide to prevent the ingress of foreign matter through the guide opening. An end cover is added to the guide end face to ensure that the slit cover does not protrude outward.

* The overall height of the gripper does not change even with the slit cover installed.



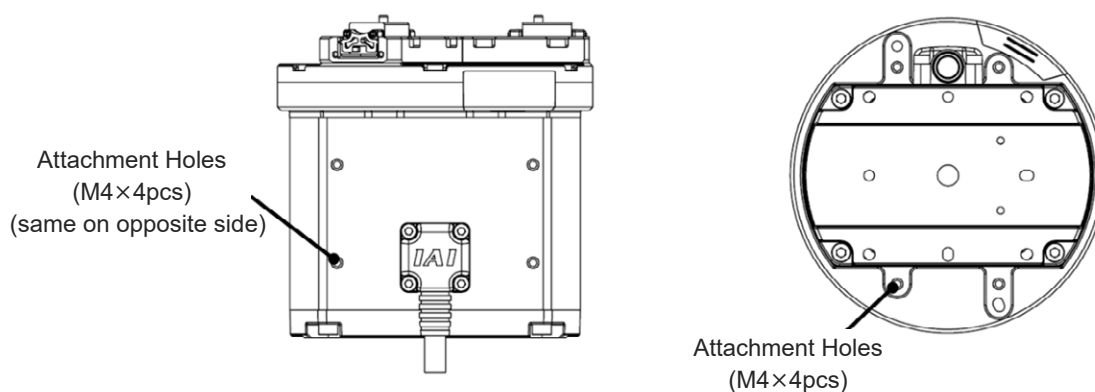
1.5.8 Additional mounting holes (Model: Y)

Applicable Models : GRTR9

This is an optional feature that adds mounting holes to the frame and motor bracket.

To prevent the ingress of foreign matter, the holes are plugged with set screws at the time of shipment.

For details regarding the position and dimensions, Refer to [Chapter 5 External Dimensions].



ROBO Cylinder

Chapter 2

Installation

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2.2.2	Storage/preservation environment	2-4
2.3	Installation Method	2-5
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2.1 Precautions for Transportation

2.1.1 Handling of the robot

[Handling the package]

- Do not damage or drop.
The package is not specially designed to withstand dropping or shock due to collision.
- Do not have a single operator to carry a heavy package.
Use an appropriate method for transportation.
- Keep the unit in a horizontal orientation when placing it on the ground or transporting.
- Do not step or sit on the package.
- Do not put any load that may cause a deformation or breakage of the package.

[Handling after unpacking]

- When handling the actuator out of the packaging, hold the frame part.
- Do not attempt to bring up the unit only at fingers or cables.
It may cause failure such as damage on the moving parts or breakage of the cables.
- Do not damage or drop the actuator during transportation.
- Do not attempt to force any part of the actuator.

An actuator will be wrapped in film.

Open up the film with care to the actuator and cables so they would not be damaged.



2.1.2 Handling in condition of being assembled in machinery equipment (System)

These are some caution notes for when transporting the actuator being assembled in the machinery equipment (system).

- Fix the slider so they would not accidentally move during transportation.
- If the actuator 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 actuator or cable.

2.2 Installation and Storage/Preservation Environment

Usage is possible in environments of pollution degree 2 or equivalent.

Pollution degree 2: Environment in which generally only nonconductive pollution occurs, but temporary conductive pollution may occur due to condensation (IEC 60664-1)

2.2.1 Installation environment

In general, it is an environment where an operator can work with no protection gear worn.

Avoid the following locations for installation.

- 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

Provide sufficient work space for the following maintenance and inspection.

- Space to replenish grease

Make sure to make a shield very well in a use in the following circumstances.

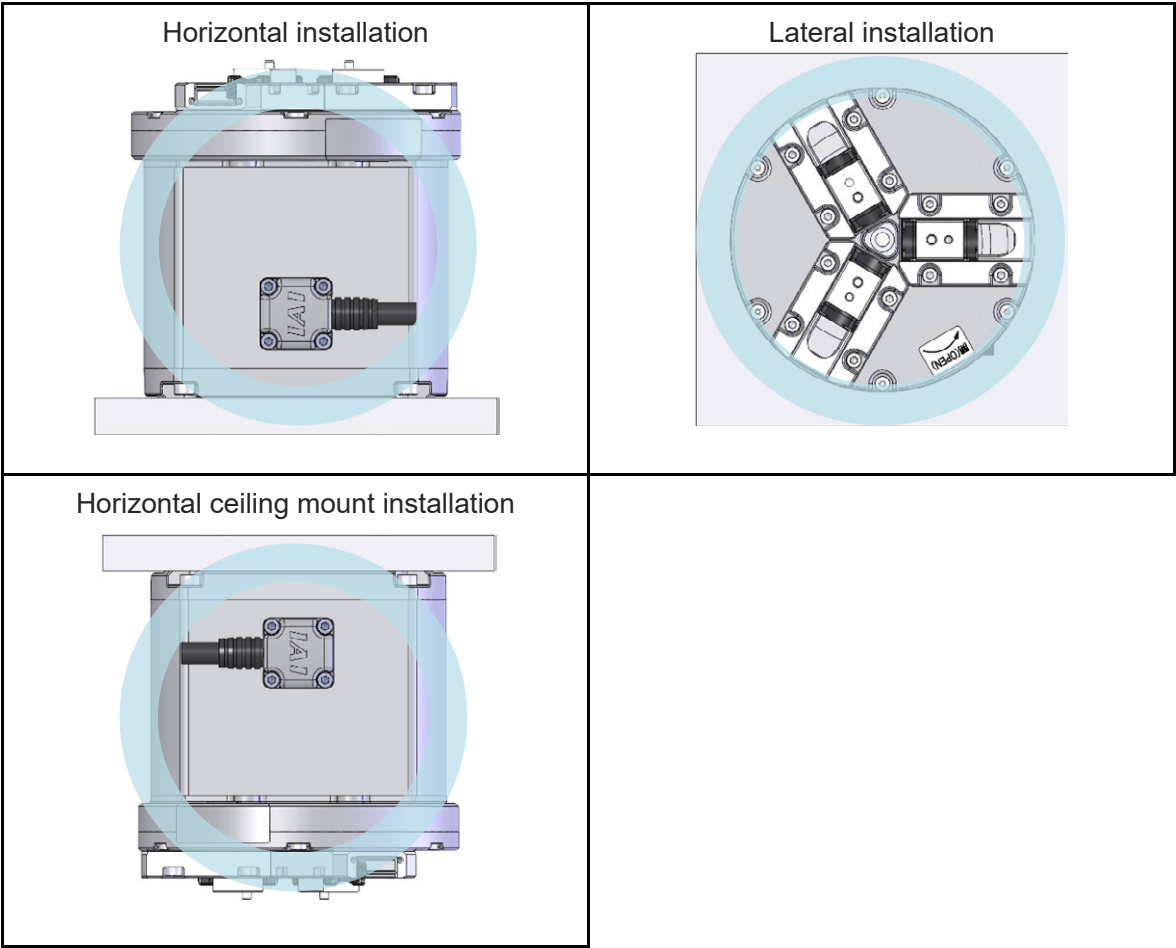
- Where noise is generated due to static electricity, etc.
- Where the unit is subject to a strong electric or magnetic field
- Where the unit is subject to ultraviolet or radiation

2.2.2 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 Method

2.3.1 Installation orientation



○: Available for Installation

2.3.2 Installation surface

- For installation of the main body, make sure to set in on a flat surface with its flatness of machine finished or with its flatness accuracy equivalent to it.
- The vibration transmitted to the main body should be 0.5G (4903mm/s²) or less.
- The material with high heat conductivity, not on a material with low heat conductivity such as resin.
- Consider sufficient space for maintenance work such as actuator replacement and inspection.

2.3.3 Fixing bolt

- The bolts for fixing actuator on the installation surface are to be prepared by the customer.
- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- Be careful with regard to the length of the mounting bolt and positioning pin.
- The use of screw-in depth greater than that of the screw or reamed mounting holes may damage the screw hole or reduce the mounting strength of the actuator, leading to decreased accuracy or unexpected accidents.

Type	Fixing bolt	Tightening Torque	
		Non-fastening surface: Steel	Non-fastening surface: Aluminum
GRTR9 GRTR6	M4	3.6N·m	1.8N·m

2.3.4 Precautions for mounting

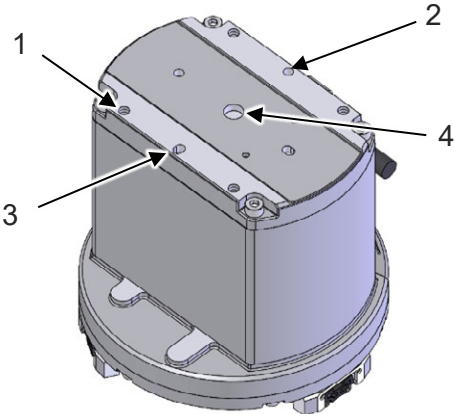
- Make sure to use all the threaded holes for attachment in order to affix an actuator.
- There is a reamed hole and an oblong hole equipped for positioning pins on the bottom surface of the actuator. Use the reamed hole and oblong hole if mounting reproducibility after detachment is required.

2.3.5 Body mounting

For details regarding the position and dimensions, Refer to [Chapter 5 External Dimensions].

[GRTR9]

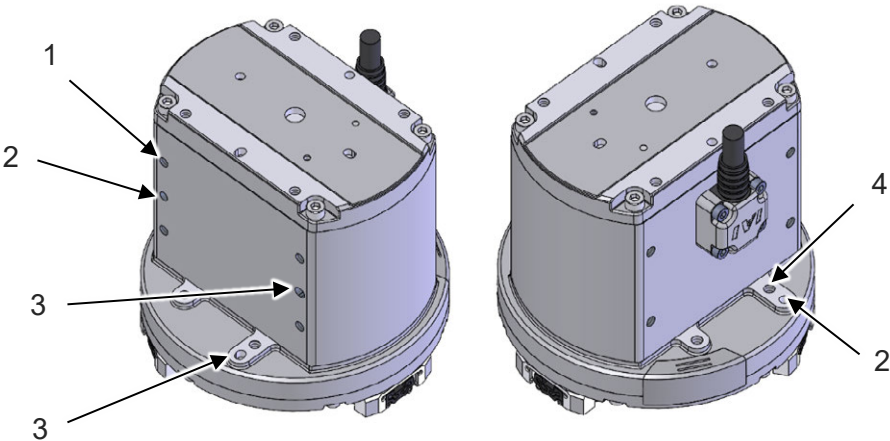
◆ Standard type



No.	Part Name	Size	Quantity	Tightening Torque [N•m]
1	Screw hole	M4 through (screw-in depth 8)	4	—
2	Reamed hole	Φ3H7 depth 3	2	—
3	Oblong hole	3H7×4 depth 3	2	—
4	Reamed hole	Φ6H7 depth 3	1	—

* For fixing bolts, refer to [2.3.3 Fixing bolts].

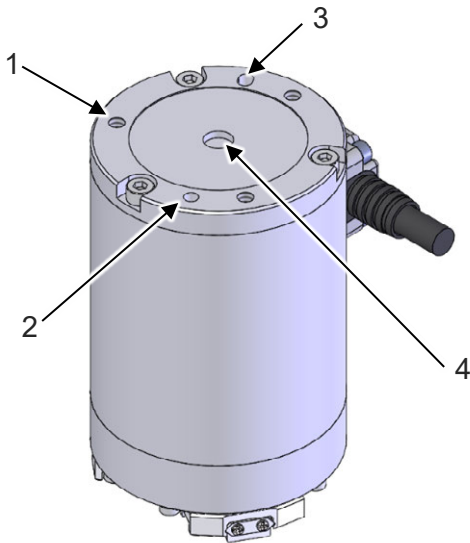
◆ Added to attachment hole (optional)



No.	Part Name	Size	Quantity	Tightening Torque [N•m]
1	Screw hole	M4 through (screw-in depth 6)	4	—
2	Reamed hole	Φ3H7 depth 3	2	—
3	Oblong hole	3H7×4 depth 3	2	—
4	Screw hole	M4 through (screw-in depth 5)	4	—

* For fixing bolts, refer to [2.3.3 Fixing bolts].

[GRTR6]



No.	Part Name	Size	Quantity	Tightening Torque [N•m]
1	Screw hole	M4 through (screw-in depth 7)	3	—
2	Reamed hole	Φ3H7 depth 3	1	—
3	Oblong hole	3H7×4 depth 3	1	—
4	Reamed hole	Φ6H7 depth 2 (From seat surface)	1	—

* For fixing bolts, refer to [2.3.3 Fixing bolts].

2.3.6 Installation of finger attachment (To be prepared by user)

For a purpose of accuracy improvement for the installation of finger attachment and improvement of repeatability of reattachment, it is recommended to use positioning collars.

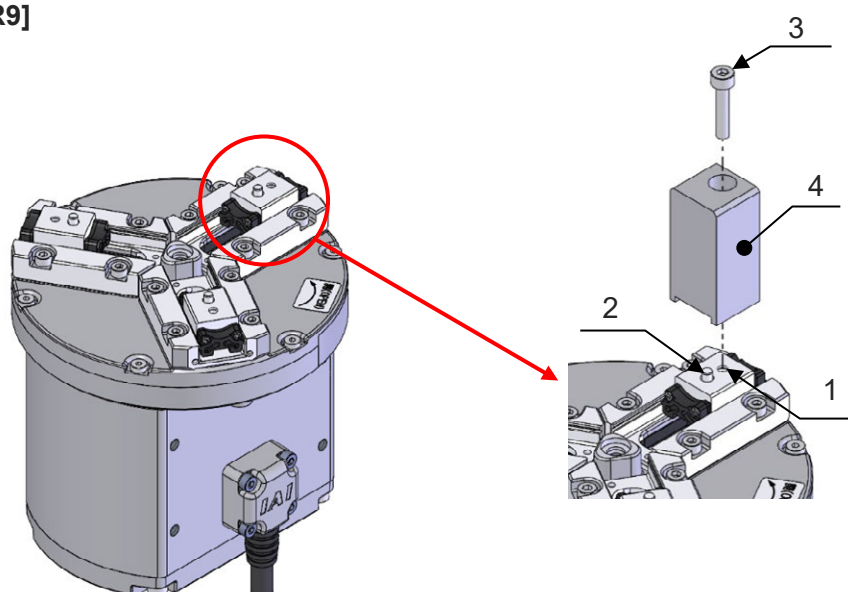
For details regarding the position and dimensions, Refer to [Chapter 5 External Dimensions].



Caution

- When attaching or detaching an attachment on a finger, tighten or loosen the fixing bolts while holding the attachment with a wrench so load or impact would not be applied on the guide.
- Make sure that you will not use any screw with its length longer than the thread depth. Doing so may damage the threaded hole or internal mechanism.
- A finger attachment and fixing bolts are to be prepared by the user.

[GRTR9]



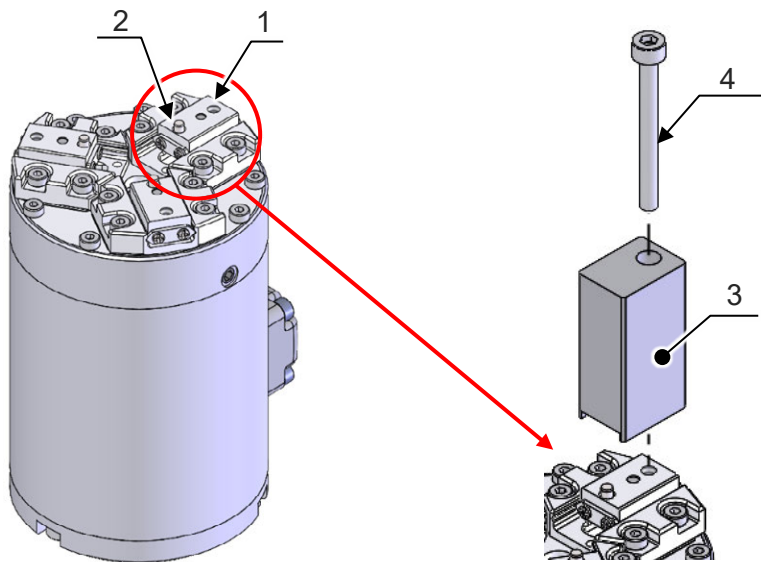
No.	Type	Part Name	Size	Quantity	Tightening Torque [N·m] (for Each Screw Seating Surface)	
1	GRTR9	Screw hole	M3 depth 4	1	—	—
2		Positioning pin	Φ2.5h7 Projection Length 2mm	1	—	—
3		Fixing bolt (Hex socket head bolt)	M3	1	Steel: 1.54	Aluminum: 0.83
4		Finger attachment	—	1	—	—

[GRTR6]

To improve the mounting accuracy and repeatability of the finger attachment, it is recommended to position it using two points: the locating pin and the finger reference surface.

A finger attachment and fixing bolts are to be prepared by the user.

For details, refer to [Chapter 5 External Dimensions].



No.	Type	Part Name	Size	Quantity	Tightening Torque [N•m] (for Each Screw Seating Surface)	
1	GRTR6	Screw hole	M3 depth 4	3	—	—
2		Positioning pin	Φ2h7 Projection Length 1.5mm	3	—	—
3		Finger attachment	—	3	—	—
4		Fixing bolt (Hex socket head bolt)	M3	3	Steel: 1.54	Aluminum: 0.83

ROBO Cylinder

Chapter 3

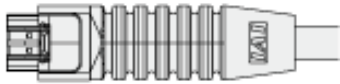
Connecting with the Controller

3.1	Connecting with the Controller	3-1
3.2	Motor • Encoder Cables	3-7
3.2.1	Dedicated connection cable for other than RCON, RSEL, and RCM-P6PC	3-7
3.2.2	Dedicated connection cable for RCON, RSEL, and RCM-P6PC	3-9

3.1 Connecting with the Controller

As the connection cable for the controller and the actuator, use the IAI-dedicated connection cable.

Dedicated Connection Cable

Standard Connector Type (Actuator side)	4-way Connector Type (Actuator side)
	
CB-CAN-MPA□□□(-RB)	CB-CAN2-MPA□□□(-RB)
CB-ADPC-MPA□□□(-RB)	CB-ADPC2-MPA□□□(-RB)

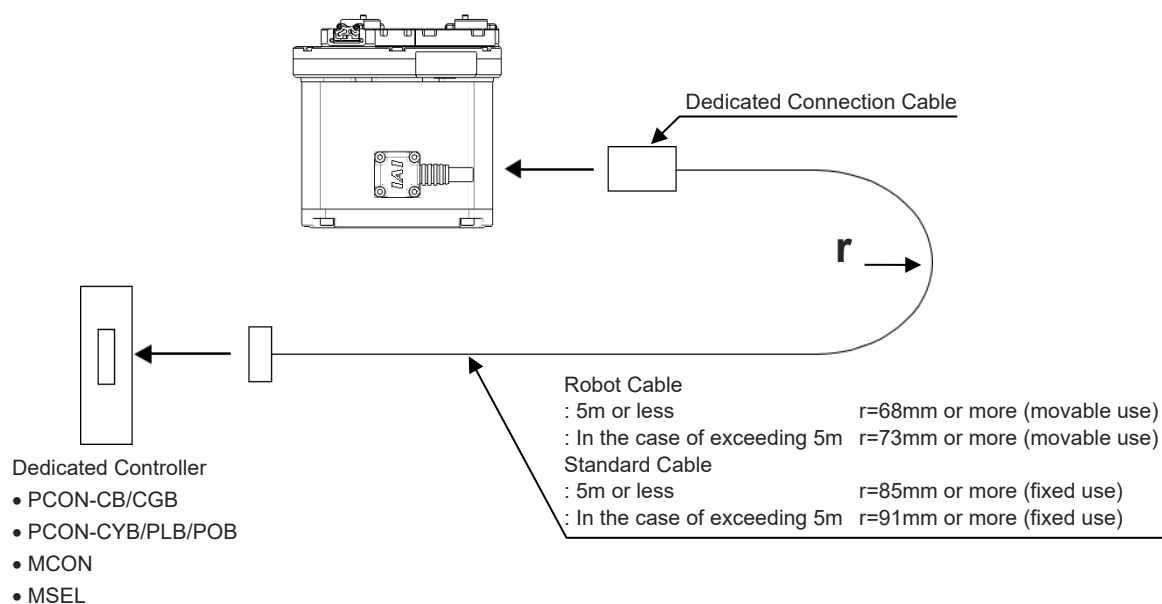


Caution

- If the dedicated connection cable cannot be secured, reduce the load on the cable by allowing it to deflect only by the weight of the cable or wire it in a self-standing cable hose, etc., having a large radius.
- Do not cut and reconnect the dedicated connection cable for extension or shorten the cable.
- Do not pull on the dedicated connection cable or bend it forcibly.
- The 4-way connector type should not rotate in 360degC. It can be turned "1 time to left" and "2 times to right" from the datum point. (Have the count of rotation at 10 times or less)



[1] For Controllers PCON, MCON and MSEL

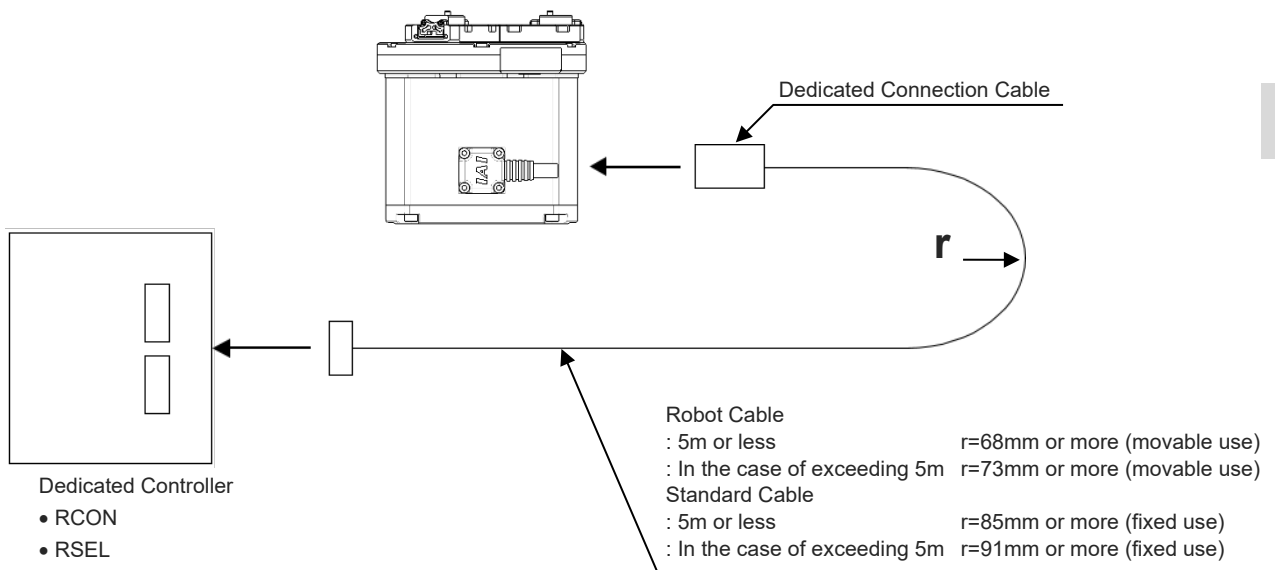


Dedicated Connection Cable Model Code

Cable	Model code
Motor Encoder Integrated Cable	CB-ADPC-MPA□□□
Motor Encoder Integrated Robot Cable	CB-ADPC-MPA□□□-RB
Motor Encoder Integrated Cable 4-way Connector Type	CB-ADPC2-MPA□□□
Motor Encoder Integrated Robot Cable 4-way Connector Type	CB-ADPC2-MPA□□□-RB

* □□□ represents the cable length. The longest corresponds to 20m. e.g.) 080 = 8m

[2] For Controllers RCON, RSEL



Dedicated Connection Cable Model Code

Cable	Model code
Motor Encoder Integrated Cable	CB-ADPC-MPA□□□
Motor Encoder Integrated Robot Cable	CB-ADPC-MPA□□□-RB
Motor Encoder Integrated Cable 4-way Connector Type	CB-ADPC2-MPA□□□
Motor Encoder Integrated Robot Cable 4-way Connector Type	CB-ADPC2-MPA□□□-RB

* □□□ represents the cable length. The longest corresponds to 20m. e.g.) 080 = 8m



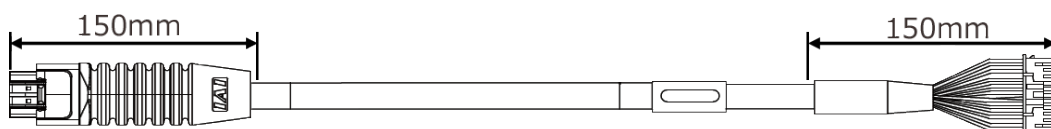
Caution

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.

- Applying force to the actuator cable extending from the motor unit may cause malfunction. Secure the actuator cable so that it does not move.
- Make sure to turn the power off in the process of power line or cable connection or disconnection.
- Do not attempt to cut a dedicated cable with connectors on both ends to extend, shorten or rejoin it.
- 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 carrier.
- 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.

Standard Cables CB-CAN-MPA□□□, CB-ADPC-MPA□□□

Robot Cables CB-CAN-MPA□□□-RB, CB-ADPC-MPA□□□-RB

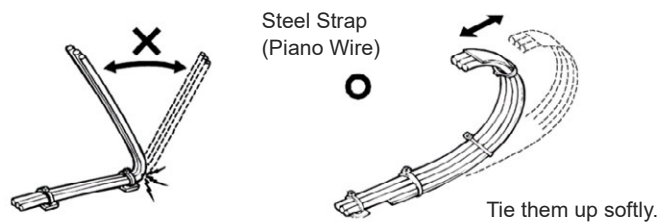


- Do not attempt to use the motor / encoder cable in a condition that the cable is bundled up in several layers such as coil winding.

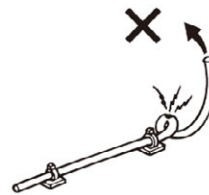
There are motor driving power line and encoder signal line in the motor / encoder cable. Therefore, if the motor / encoder cable is bundled up, the noise generated from the motor driving power line could give an influence to the encoder and may cause an error.



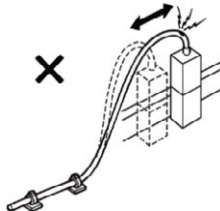
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.



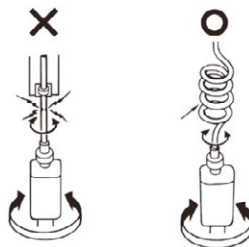
- Do not let the cable bend, kink or twist.



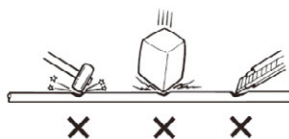
- Do not pull the cable with a strong force.



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



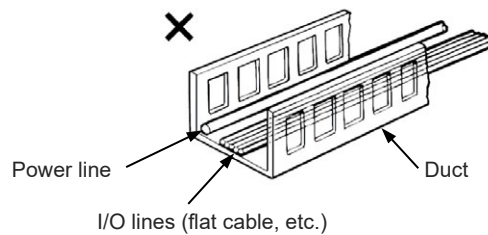
- Do not pinch, drop a heavy object onto or cut the cable.



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

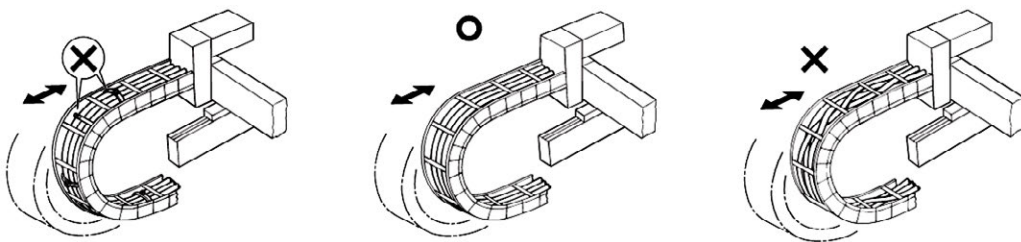


- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



[Follow the instructions below when using a cable carrier.]

- If there is an indication to the cable for the space factor in a cable carrier, refer to the wiring instruction given by the supplier when storing the cable in the cable carrier.
- Avoid the cables to get twined or twisted in the cable carrier, 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.



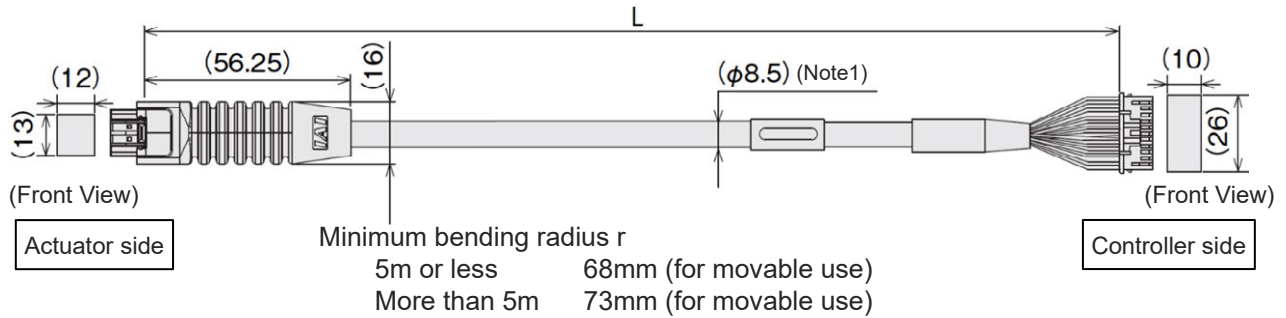
3.2 Motor • Encoder Cables

3.2.1 Dedicated connection cable for other than RCON, RSEL, and RCM-P6PC

[1] Motor • Encoder Integrated Cables

Model code **CB-CAN-MPA□□□ / CB-CAN-MPA□□□-RB** (Robot Cable)

(□□□ indicates the cable length L, Example: 030=3m), Max.20m



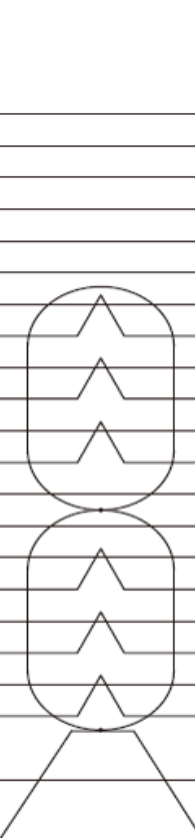
* A robot cable is a cable with high bending resistance performance.
A robot cable is to be used when cables laid through in a cable carrier.

(Note1) It should be $\Phi 9.1$ when the cable length is 5m or longer.

Connection diagram

DF62DL-24S-2.2C (Hirose)

PADP-24V-1-S (JST)

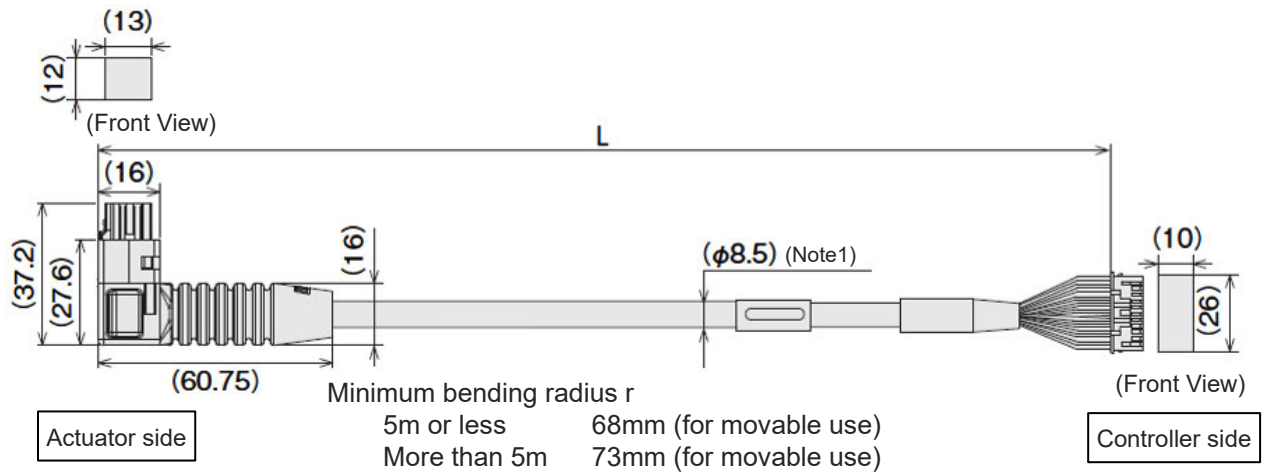
Color (Thickness)			Symbol	Pin No.		Pin No.	Symbol
Standard cable	Robot cable						
	July 2022 and later	July 2022 and earlier					
Blue(AWG22/19)	Black(AWG22/19)	Blue(AWG22/19)	ΦA	3		1	ΦA
Orange(AWG22/19)	White(AWG22/19)	Orange(AWG22/19)	VMM	5		2	VMM
Brown(AWG22/19)	Green(AWG22/19)	Brown(AWG22/19)	ΦB	10		3	ΦB
Gray(AWG22/19)	Yellow(AWG22/19)	Gray(AWG22/19)	VMM	9		4	VMM
Green(AWG22/19)	Brown(AWG22/19)	Green(AWG22/19)	Φ_A	4		5	Φ_A
Red(AWG22/19)	Red(AWG22/19)	Red(AWG22/19)	Φ_B	15		6	Φ_B
Light Blue(AWG26)	White(AWG26)	Light Blue(AWG26)	SA [mABS]	12		11	SA [mABS]
Orange(AWG26)	Yellow(AWG26)	Orange(AWG26)	SB [mABS]	17		12	SB [mABS]
Green(AWG26)	Red(AWG26)	Green(AWG26)	A+	1		13	A+
Brown(AWG26)	Green(AWG26)	Brown(AWG26)	A-	6		14	A-
Gray(AWG26)	Black(AWG26)	Gray(AWG26)	B+	11		15	B+
Red(AWG26)	Brown(AWG26)	Red(AWG26)	B-	16		16	B-
Black(AWG26)	Blue(AWG26)	Black(AWG26)	VPS	18		18	VPS
Yellow(AWG26)	Pink(AWG26)	Yellow(AWG26)	LS+	8		7	LS+
Light Blue(AWG26)	Black(AWG26)	Light Blue(AWG26)	BK+	20		9	BK+
Orange(AWG26)	Brown(AWG26)	Orange(AWG26)	BK-	2		10	BK-
Gray(AWG26)	White(AWG26)	Gray(AWG26)	VCC	21		17	VCC
Red(AWG26)	Yellow(AWG26)	Red(AWG26)	GND	7		19	GND
Brown(AWG26)	Red(AWG26)	Brown(AWG26)	LS-	14		8	LS-
Green(AWG26)	Green(AWG26)	Green(AWG26)	LS_GND	13		20	LS_GND
—	—	—	—	19		22	—
Pink(AWG26)	Orange(AWG26)	Pink(AWG26)	CF_VCC	22		21	CF_VCC
—	—	—	—	23		23	—
Black(AWG26)	Green(AWG26)	Black(AWG26)	FG	24		24	FG

Standard: Purple (AWG26)
Robot: Gray (AWG26)

[2] Motor • Encoder Integrated Cables 4-way Connector

Model code CB-CAN2-MPA□□□ / CB-CAN2-MPA□□□-RB (Robot cable)

(□□□ indicates the cable length L, Example: 030=3m), Max.20m



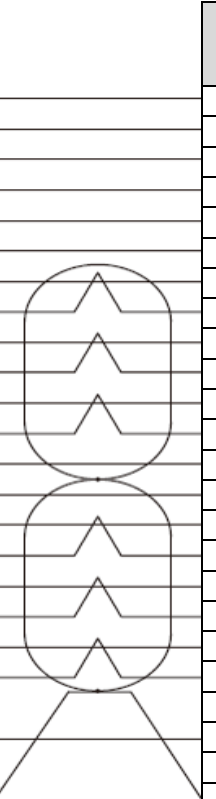
* A robot cable is a cable with high bending resistance performance.
A robot cable is to be used when cables laid through in a cable carrier.

(Note1) It should be $\Phi 9.1$ when the cable length is 5m or longer.

Connection diagram

DF62DL-24S-2.2C (Hirose)

PADP-24V-1-S (JST)

Color (Thickness)			Symbol	Pin No.		Pin No.	Symbol
Standard cable	Robot cable						
	July 2022 and later	July 2022 and earlier					
Blue(AWG22/19)	Black(AWG22/19)	Blue(AWG22/19)	ΦA	3		1	ΦA
Orange(AWG22/19)	White(AWG22/19)	Orange(AWG22/19)	VMM	5		2	VMM
Brown(AWG22/19)	Green(AWG22/19)	Brown(AWG22/19)	ΦB	10		3	ΦB
Gray(AWG22/19)	Yellow(AWG22/19)	Gray(AWG22/19)	VMM	9		4	VMM
Green(AWG22/19)	Brown(AWG22/19)	Green(AWG22/19)	Φ_A	4		5	Φ_A
Red(AWG22/19)	Red(AWG22/19)	Red(AWG22/19)	Φ_B	15		6	Φ_B
Light Blue(AWG26)	White(AWG26)	Light Blue(AWG26)	SA [mABS]	12		11	SA [mABS]
Orange(AWG26)	Yellow(AWG26)	Orange(AWG26)	SB [mABS]	17		12	SB [mABS]
Green(AWG26)	Red(AWG26)	Green(AWG26)	A+	1		13	A+
Brown(AWG26)	Green(AWG26)	Brown(AWG26)	A-	6		14	A-
Gray(AWG26)	Black(AWG26)	Gray(AWG26)	B+	11		15	B+
Red(AWG26)	Brown(AWG26)	Red(AWG26)	B-	16		16	B-
Black(AWG26)	Blue(AWG26)	Black(AWG26)	VPS	18		18	VPS
Yellow(AWG26)	Pink(AWG26)	Yellow(AWG26)	LS+	8		7	LS+
Light Blue(AWG26)	Black(AWG26)	Light Blue(AWG26)	BK+	20		9	BK+
Orange(AWG26)	Brown(AWG26)	Orange(AWG26)	BK-	2		10	BK-
Gray(AWG26)	White(AWG26)	Gray(AWG26)	VCC	21		17	VCC
Red(AWG26)	Yellow(AWG26)	Red(AWG26)	GND	7		19	GND
Brown(AWG26)	Red(AWG26)	Brown(AWG26)	LS-	14		8	LS-
Green(AWG26)	Green(AWG26)	Green(AWG26)	LS_GND	13		20	LS_GND
—	—	—	—	19		22	—
Pink(AWG26)	Orange(AWG26)	Pink(AWG26)	CF_VCC	22		21	CF_VCC
—	—	—	—	23		23	—
Black(AWG26)	Green(AWG26)	Black(AWG26)	FG	24		24	FG

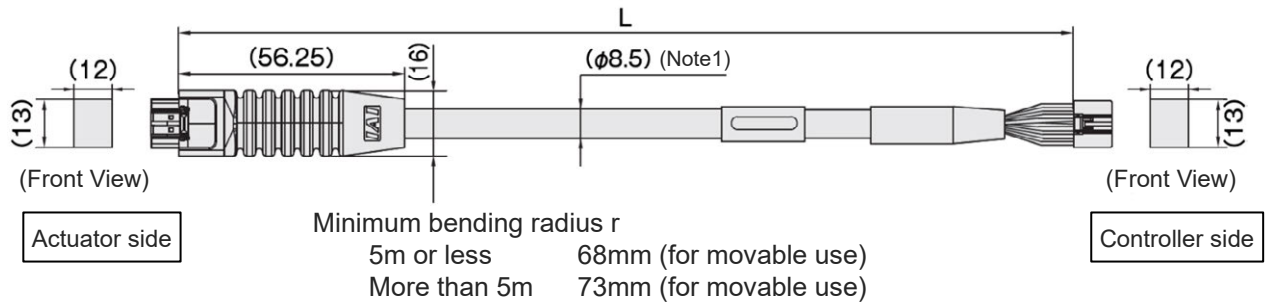
Standard: Purple (AWG26)
Robot: Gray (AWG26)

3.2.2 Dedicated connection cable for RCON, RSEL, and RCM-P6PC

[1] Motor • Encoder Integrated Cables Standard Connector

Model code CB-ADPC-MPA□□□ / CB-ADPC-MPA□□□-RB (Robot cable)

(□□□ indicates the cable length L, Example: 030=3m), Max.20m



* A robot cable is a cable with high bending resistance performance.
A robot cable is to be used when cables laid through in a cable carrier.

(Note1) It should be $\phi 9.1$ when the cable length is 5m or longer.

Connection diagram

DF62DL-24S-2.2C (Hirose)				DF62DL-24S-2.2C (Hirose)				
Color (Thickness)		Symbol	Pin No.		Pin No.	Symbol	Color (Thickness)	
Standard cable	Robot cable						Standard cable	Robot cable
Blue(AWG22/19)	Black(AWG22/19)	ΦA	3		3	ΦA	Blue(AWG22/19)	Black(AWG22/19)
Orange(AWG22/19)	White(AWG22/19)	VMM	5		5	VMM	Orange(AWG22/19)	White(AWG22/19)
Brown(AWG22/19)	Green(AWG22/19)	ΦB	10		10	ΦB	Brown(AWG22/19)	Green(AWG22/19)
Gray(AWG22/19)	Yellow(AWG22/19)	VMM	9		9	VMM	Gray(AWG22/19)	Yellow(AWG22/19)
Green(AWG22/19)	Brown(AWG22/19)	Φ_A	4		4	Φ_A	Green(AWG22/19)	Brown(AWG22/19)
Red(AWG22/19)	Red(AWG22/19)	Φ_B	15		15	Φ_B	Red(AWG22/19)	Red(AWG22/19)
Light Blue(AWG26)	White(AWG26)	SA [mABS]	12		12	SA [mABS]	Light	White(AWG26)
Orange(AWG26)	Yellow(AWG26)	SB [mABS]	17		17	SB [mABS]	Orange(AWG26)	Yellow(AWG26)
Green(AWG26)	Red(AWG26)	A+	1		1	A+	Green(AWG26)	Red(AWG26)
Brown(AWG26)	Green(AWG26)	A-	6		6	A-	Brown(AWG26)	Green(AWG26)
Gray(AWG26)	Black(AWG26)	B+	11		11	B+	Gray(AWG26)	Black(AWG26)
Red(AWG26)	Brown(AWG26)	B-	16		16	B-	Red(AWG26)	Brown(AWG26)
Black(AWG26)	Blue(AWG26)	VPS	18		18	VPS	Black(AWG26)	Blue(AWG26)
Yellow(AWG26)	Pink(AWG26)	LS+	8		8	LS+	Yellow(AWG26)	Pink(AWG26)
Light Blue(AWG26)	Black(AWG26)	BK+	20		20	BK+	Light	Black(AWG26)
Orange(AWG26)	Brown(AWG26)	BK-	2		2	BK-	Orange(AWG26)	Brown(AWG26)
Gray(AWG26)	White(AWG26)	VCC	21		21	VCC	Gray(AWG26)	White(AWG26)
Red(AWG26)	Yellow(AWG26)	GND	7		7	GND	Red(AWG26)	Yellow(AWG26)
Brown(AWG26)	Red(AWG26)	LS-	14		14	LS-	Brown(AWG26)	Red(AWG26)
Green(AWG26)	Green(AWG26)	LS_GND	13		13	LS_GND	Green(AWG26)	Green(AWG26)
—	—	—	19		19	—	—	—
Pink(AWG26)	Orange(AWG26)	CF_VCC	22		22	CF_VCC	Pink(AWG26)	Orange(AWG26)
—	—	—	23		23	—	—	—
Black(AWG26)	Green(AWG26)	FG	24		24	FG	Black(AWG26)	Green(AWG26)

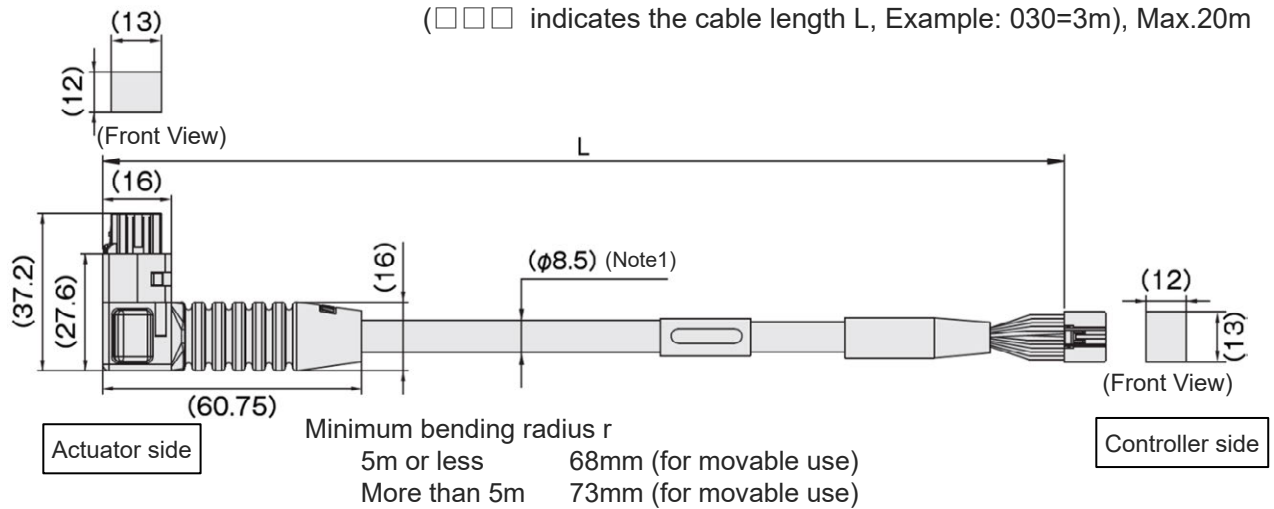
Purple (AWG26)

Purple (AWG26)

[2] Motor • Encoder Integrated Cables 4-way Connector

Model code **CB-ADPC2-MPA□□□ / CB-ADPC2-MPA□□□-RB** (Robot cable)

(□□□ indicates the cable length L, Example: 030=3m), Max.20m



* A robot cable is a cable with high bending resistance performance.
A robot cable is to be used when cables laid through in a cable carrier.

(Note1) It should be $\phi 9.1$ when the cable length is 5m or longer.

Connection diagram

DF62DL-24S-2.2C (Hirose)

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

Purple (AWG26)

DF62DL-24S-2.2C (Hirose)

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

ROBO Cylinder

Chapter 4

Maintenance and Inspection

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4.1 Precautions for Maintenance and Inspection Work

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



Warning

- Do not climb on or put anything on the actuator.
Otherwise, this may lead to accidental falling, injury or damage to the product due to falling objects, product loss of function or performance degradation, or shortening of product life.



Caution

- 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 modify, disassemble/assemble, or use maintenance parts not specified on your own discretion under any circumstances.
- When performing continuous reciprocating operation within a distance of 5mm or less for GRTR9, 3mm or less for GRTR6, the grease oil film may break down.
To restore the oil film, as a guideline, perform about five full-stroke reciprocating operations every 5,000 to 10,000 cycles. If the oil film breaks down, there is a risk of guide damage.



Notice

- 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.
 - Depending on the operating environment, mounting orientation, and operating conditions, the base oil may separate from the grease. Base oil may also leak from the inside of the actuator to the exterior through gaps. Check visually for oil drips when supplying grease. Wipe it off in case of any dripping.
 - An actuator stored for 6 months or more may suffer from grease degradation.
Supply grease before the start of use.
Refer to [4.5 Grease supply].
-

4.2 Inspection

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.

4.2.1 Inspection items and schedule

Inspection period	External inspection	Grease supply
Start of work inspection	○	—
1-month inspection	○	—
6-months inspection	○	○
Every 6 months thereafter	○	○



Caution

- Make sure to follow the inspection period in the table to supply grease.

4.3 Visual Inspection

Refer to [4.5 Grease supply] for detailed information about the greasing method.

Refer to [4.6 Component replacement] for detailed information about specific component replacement.

4.3.1 External visual inspection

Inspection items	Maintenance work
Is abnormal noise or vibration generated?	Take an action by referring to [Troubleshooting in Controller Instruction Manual].
Mounting bolts loose?	Tighten them further. Refer to the tightening torque described in [2.3 Installation method].
Is the cable scratched?	Replace if the damage is severe.
Is the connector loose?	Re-insert correctly.
Is grease dripping out?	Clean up any drips. Replenish the grease.
Is grease on the guide not lubricating well? (Even if the grease is brown, lubrication is adequate if the running surface is shiny)	Replenish the new grease.

4.4 Cleaning

4.4.1 External cleaning

- Clean exterior surfaces as necessary.
- If a drop of grease base oil is found, wipe it off with soft cloth.
- 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.

4.4.2 Internal cleaning

- When cleaning up inside, use a soft cloth to wipe up dirt.
- Do not blow too hard with compressed air, as it may cause dust to get in through gaps.
- Do not use petroleum-based solvents, neutral detergent or alcohol.

4.5 Grease Supply

4.5.1 Grease to be used

◆Standard Type: Use recommended or equivalent product

Application location	During maintenance (recommended product)
Guide	Idemitsu Kosan Co., Ltd./ Daphne Grease MP No.2 (Lithium Based Grease)

[Reference] The recommended greases are used as the grease used on delivery.



Caution

- In the case of standard type, do not attempt to apply any grease other than lithium grease.
Mixing with grease types other than lithium grease not only reduces the performance of the grease, but it may even cause damage to the actuator.

◆Indicated Grease Applied Specification Low Particle-Emission Grease

(Option Model Code: G1)

Application location	During maintenance (recommended product)
Guide	Kuroda Precision Industries/ Kuroda C Grease (Urea Based Grease)

[Reference] The recommended greases are used as the grease used on delivery.



Caution

- For the specified grease application low-dust grease (option model G1), do not use any grease other than urea-based grease under any circumstances.
Mixing with grease types other than urea based grease not only reduces the performance of the grease, but it may even cause damage to the actuator.

◆Indicated Grease Applied Specification Food Machinery Grade Grease

(Option Model Code: G5)

Application location	During maintenance (recommended product)
Guide	Sumitomo Lubricant Co., Ltd./White Alcom Grease No.2

[Reference] The recommended greases are used as the grease used on delivery.



Caution

- In the case of Indicated Grease Applied Specification Food Machinery Grade Grease (Option Model Code: G5), do not attempt to use any grease other than food grade machinery grease.

4.5.2 Greasing method



Caution

- Do not apply grease during operation.
- When using a PC teaching for work, prepare the emergency stop button (emergency stop circuit) near you before starting the work.
- Do not apply too much grease. It may cause a failure.
- If the grease enters your eye, immediately see a specialist physician for appropriate care.
- After supplying grease, wash your hands well with soap.

[1] Preparation

- Protection Tool (Rubber Gloves, etc.)
- Grease Supply Tool (Recommended)
 - Syringe Model: SS-20LZ, 20ml, Lock Type (Terumo)
 - Taper nozzle Model: TPND-22G-U, inner diameter 0.40mm (Musashi Engineering, Inc.)
- Grease

[2] How to supply grease

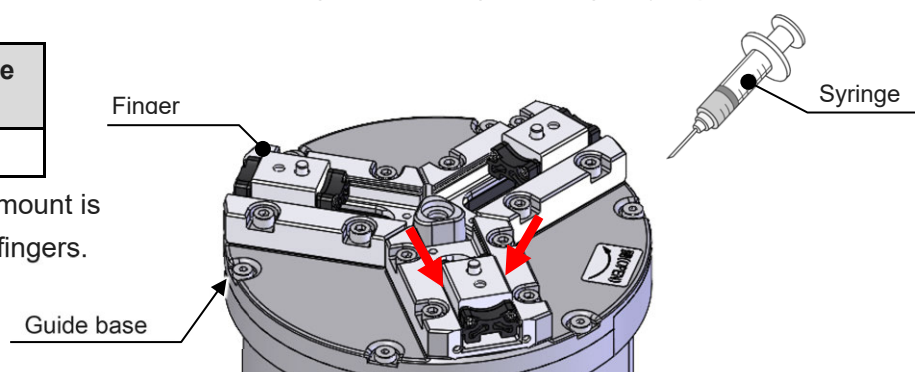
◆ Guide Area

[GRTR9]

1. Apply grease to the steel balls between the guide and fingers using a syringe.

Reference for Grease Supply Volume
0.06 g

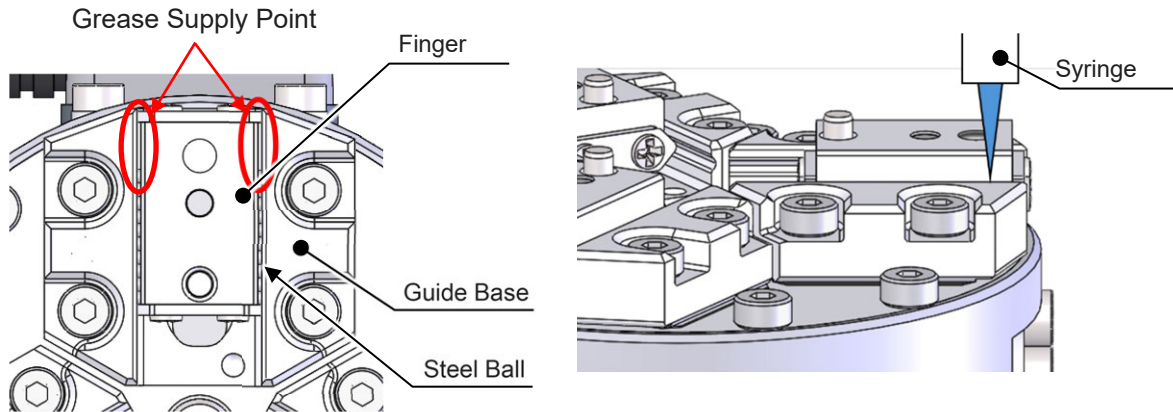
* The grease supply amount is the total for all three fingers.



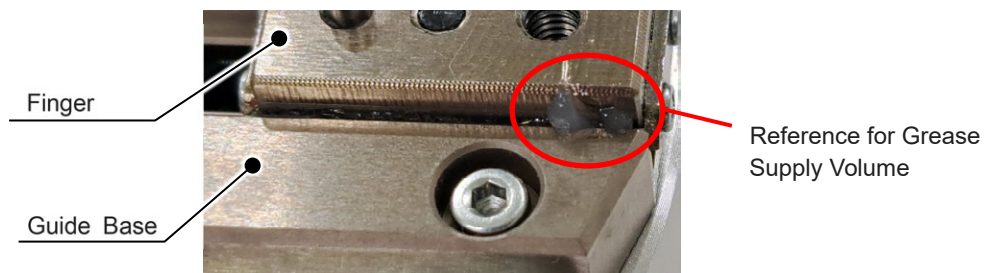
2. Use the finger open-close screw or a teaching tool to turn the fingers several times to spread the grease evenly.

[GRTR6]

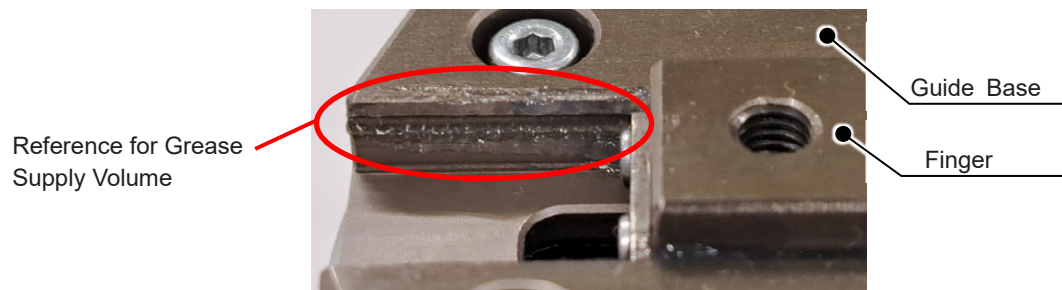
1. When the fingers are moved to the home position, a space without steel balls is created near the home position. Place the syringe nozzle vertically against this space and supply grease.



2. Supply grease until it slightly overflows, and then wipe off the excess grease.



3. Use the scroll for finger open-close or a teaching tool to turn the fingers several times to spread the grease evenly. Make sure that sufficient grease is applied to the rolling surfaces of the guide base. (If the amount of grease is insufficient, repeat Steps 1 to 3.)



4.6 Component Replacement

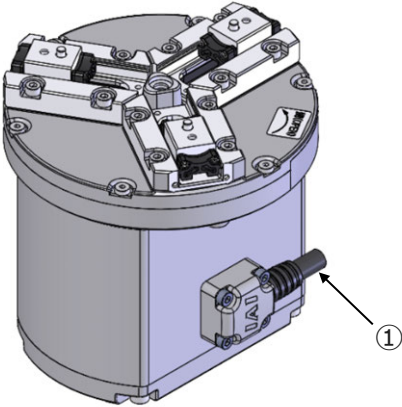
4.6.1 List of parts for replacement

List of Parts Available for Maintenance

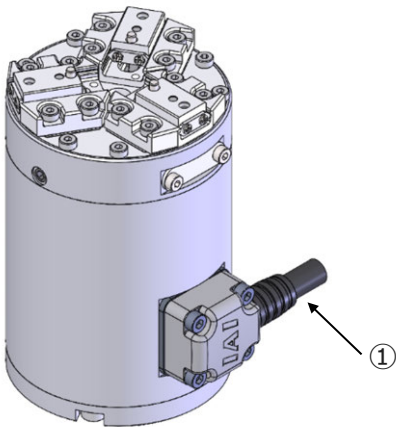
① Actuator Cable Assembly

Type	Model
GRTR9	CB-RCP6-GRTR9-MPA□□□-AS
GRTR6	CB-RCP6-GRTR6-MPA□□□-AS

* □□□ represents the cable length



GRTR9



GRTR6

4.6.2 Actuator cable assembly replacement

[1] Preparation

- Hex Wrench or Torque Wrench Parallel Faces: 2mm, 2.5mm
- Protection Equipment (e.g. Cotton Work Gloves)
- Actuator cable assembly for Replacement

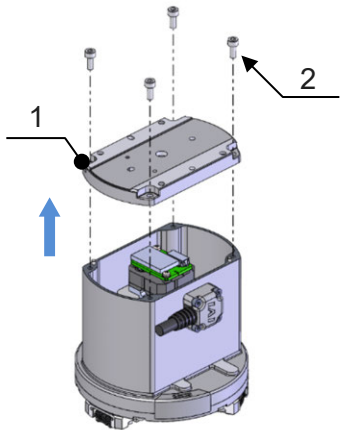
Type	Model
GRTR9	CB-RCP6-GRTR9-MPA□□□-AS
GRTR6	CB-RCP6-GRTR6-MPA□□□-AS

* □□□ represents the cable length

[2] Replacement procedure

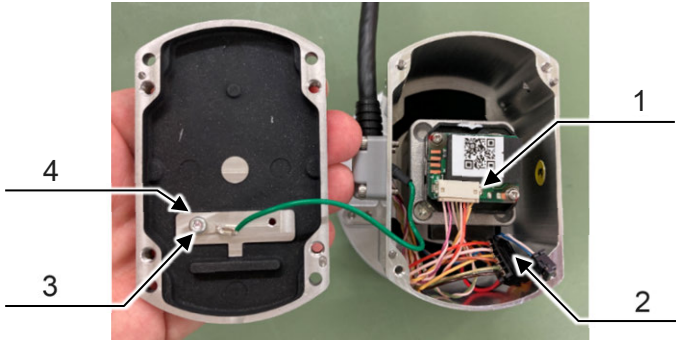
[GRTR9]

1. Remove the hex socket head bolts (4pcs) and take off the end cover.



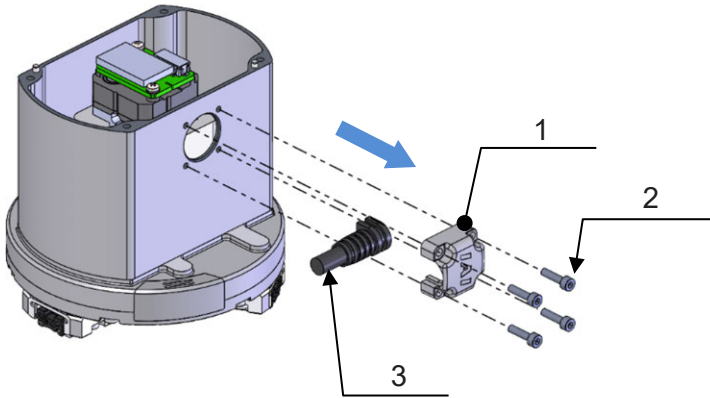
No.	Type	Part Name	Size	Q'ty	Tightening torque
1	Common	End cover	—	1	—
2		Hex socket head bolt	M3×8	4	0.83N·m

2. Remove the hex socket head bolt (1pc), and take off the ground terminal and the connector on the actuator cable assembly.



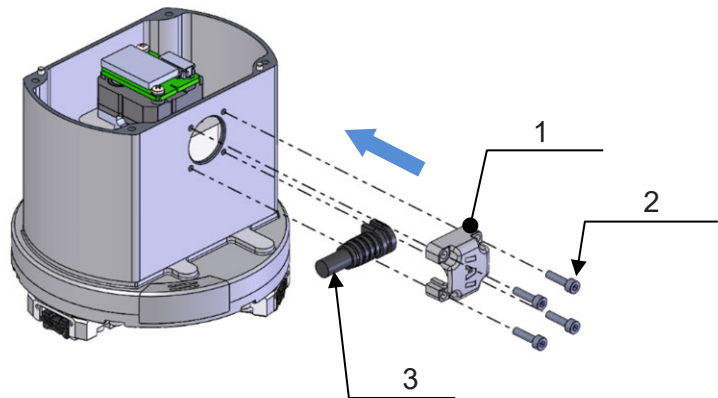
No.	Type	Part Name	Size	Q'ty	Tightening torque
1	Common	Connector A	—	1	—
2		Connector B	—	1	—
3		Hex socket head bolt	M2.5×4	1	0.3N·m
4		Ground terminal	—	1	—

3. Remove the hex socket head bolts (4pcs) and take the wiring cover and actuator cable assembly off.



No.	Type	Part Name	Size	Q'ty	Tightening torque
1	Common	Cable box	—	1	—
2		Hex socket head bolt	M2.5×10	4	0.3N·m
3		Actuator cable assembly	—	1	—

4. Attach the replacement actuator cable assembly with the hex socket head bolts (4pcs).

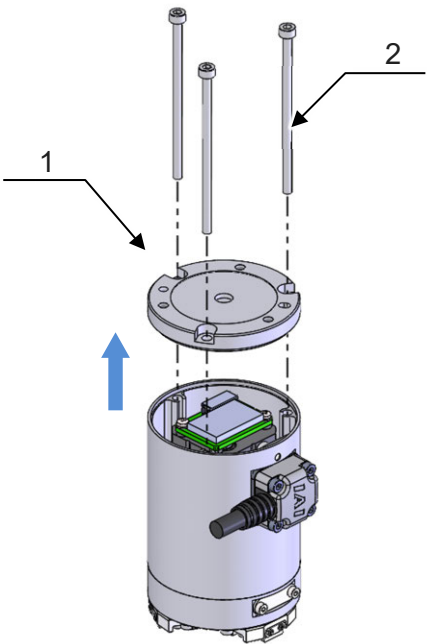


No.	Type	Part Name	Size	Q'ty	Tightening torque
1	Common	Cable box	—	1	—
2		Hex socket head bolt	M2.5×10	4	0.3N·m
3		Actuator cable assembly	—	1	—

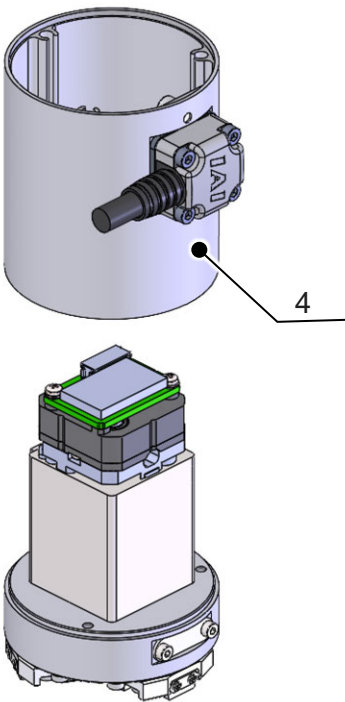
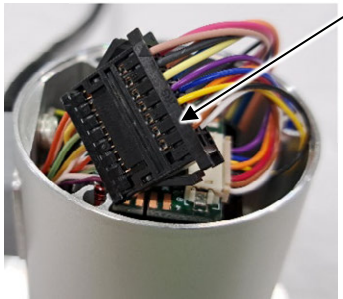
5. Put the components back on in the order from Step 2. to 1.
* Pay attention to the cable so it would not be pinched.

[GRTR6]

1. Remove the hex socket head bolts (3pcs) and take off the end cover.

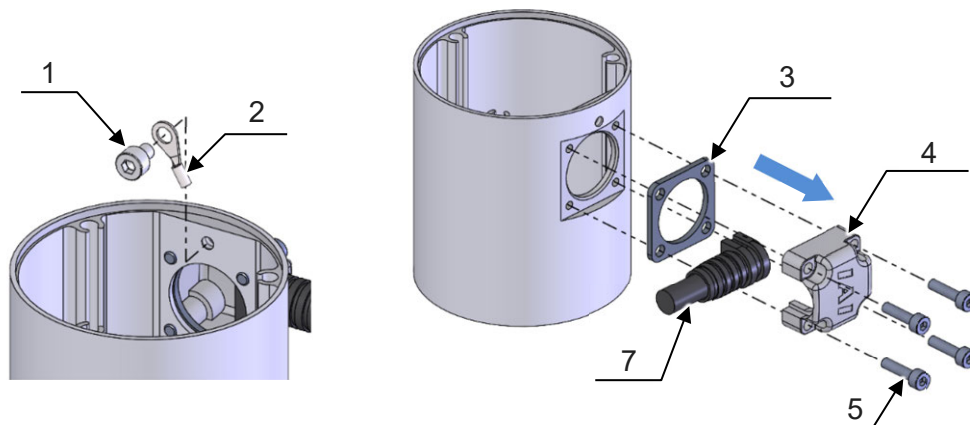


2. Take off the connector of the actuator cable assembly and remove the frame.



No.	Type	Part Name	Size	Q'ty	Tightening torque
1	Common	End cover	—	1	—
2		Hex socket head bolt	M3×60	3	0.83N·m
3		Connector	—	1	—
4		Frame	—	1	—

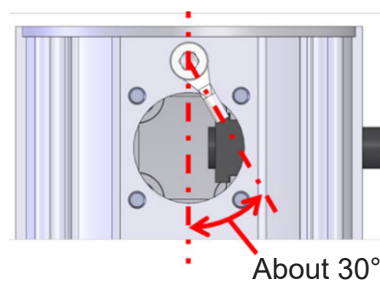
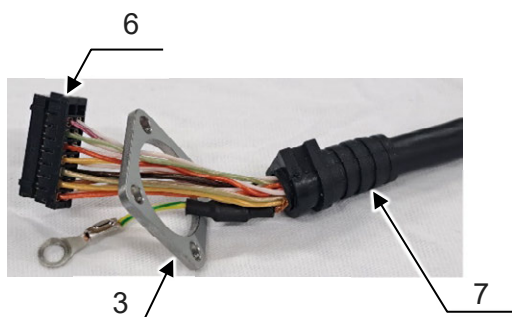
3. Remove the hex socket head bolt (1pc) and take off the ground cable.
After that, remove the hex socket head bolts (4pcs) and take off the cable box, spacer and actuator cable assembly



4. Attach the cable box, spacer and actuator cable assembly for replacement with the hex socket head bolts (4pcs).

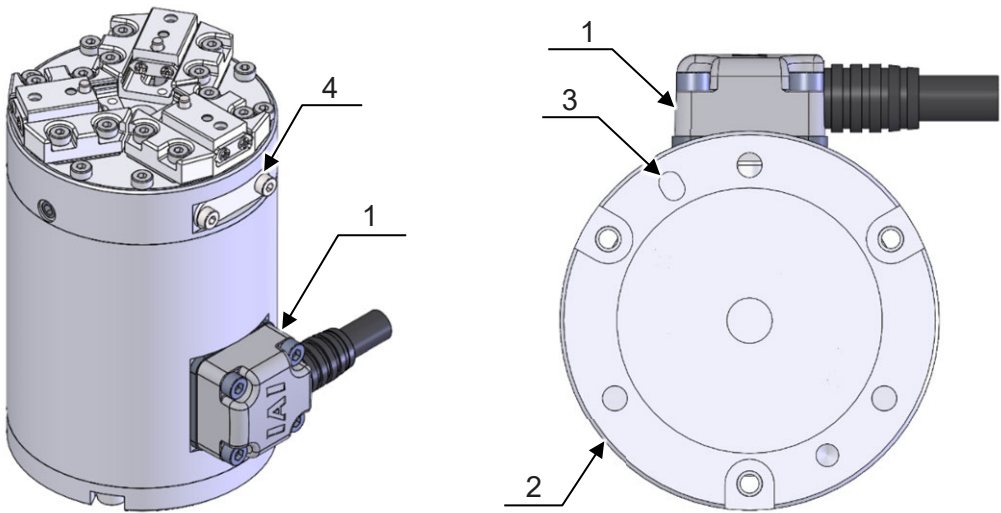
* As shown in the diagram, thread the actuator cable assembly through the spacer.

Attach the ground cable with the the hex socket head bolt (1pc) (The angles shown in the diagram are guideline.)



No.	Type	Part Name	Size	Q'ty	Tightening torque
1	Common	Hex socket head bolt	M3×4	1	0.83N·m
2		Ground cable	—	1	—
3		Spacer	—	1	—
4		Cable box	—	1	—
5		Hex socket head bolt	M2.5×10	4	0.3N·m
6		Connector	—	1	—
7		Hex socket head bolt	—	1	—

5. Put the components back on in the order from Step 2. to 1.
- * Pay attention to the cable so it would not be pinched.
 - * Install the frame so that the lid and cable box are positioned as shown in the figure.
 - * Install the end cover so that the oblong hole is positioned as shown in the figure.



No.	Type	Part Name	Size	Q'ty	Tightening torque
1	Common	Cable box	—	1	—
2		End cover	—	1	—
3		Oblong hole	—	1	—
4		Lid	—	1	—

ROBO Cylinder

Chapter 5

External Dimensions

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5.1.1 RCP6-GRTR9

(Note) The point shown in the drawing should be the home position for standard. In order to have the home position at the closed end, indicate the option (model code: NM).

M.E.: Mechanical end
S.E. : Stroke end



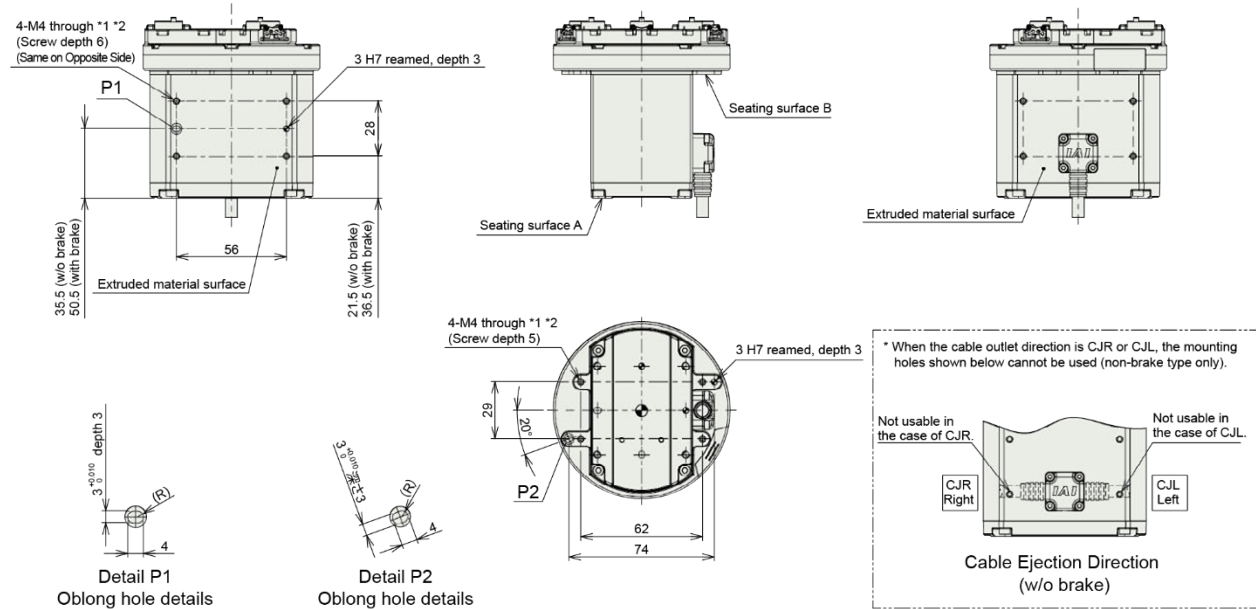
Item		Content
Mass	w/o brake	0.76
	with brake	0.88

(Note) This applies when the actuator cable option is not selected (0.2m).

5.1 3-finger Gripper

■ Additional Mounting Holes (Option)

- * 1 If the bolt is screwed in beyond the insertion depth shown, it may interfere with internal components. Be sure to use an appropriate bolt length.
- * 2 To prevent the ingress of foreign matter, the holes are plugged with set screws. Remove them when using as mounting surfaces.

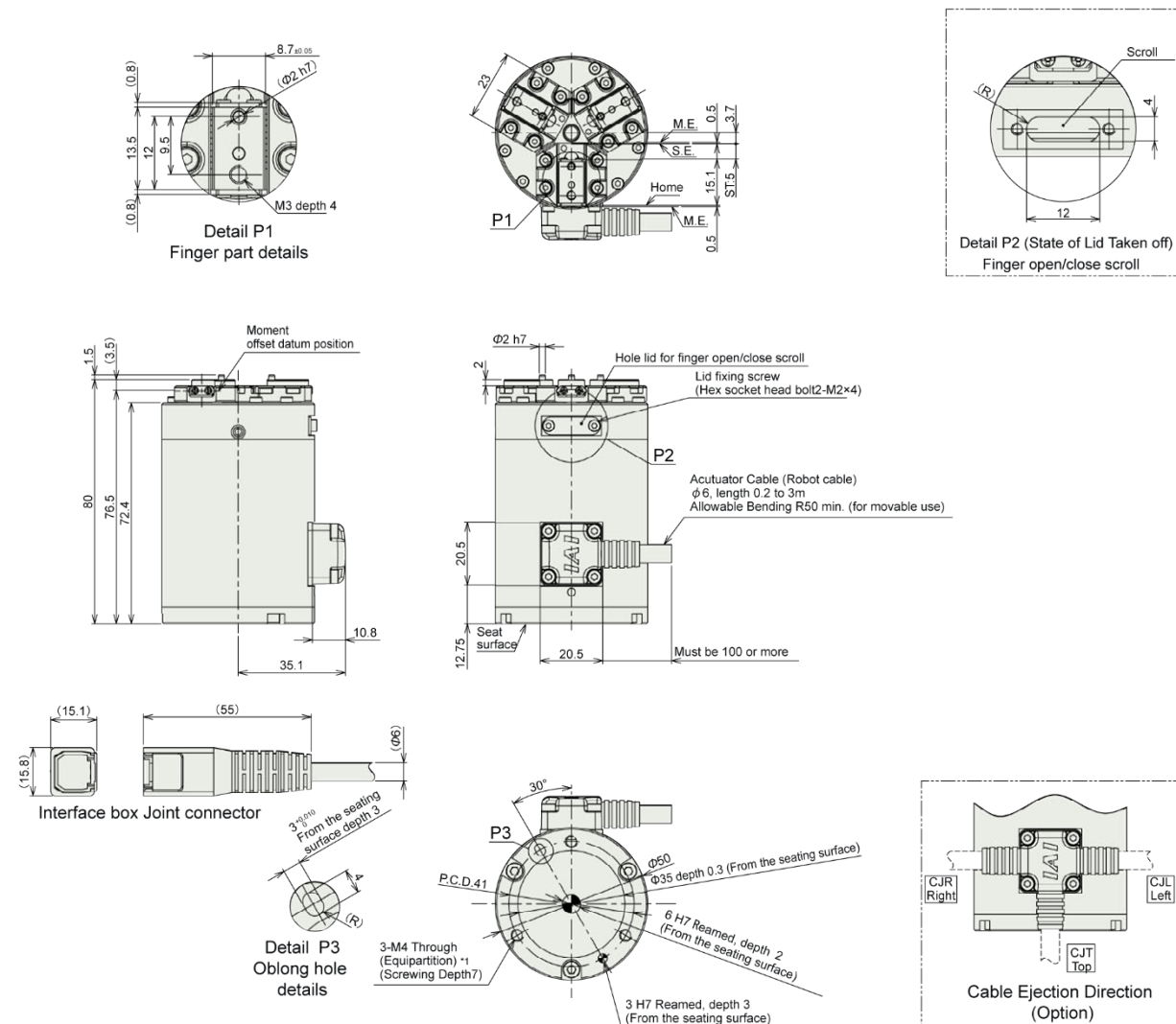


5.1.2 RCP6-GRTR6 (10 Stroke)

*1 If the bolt is screwed in beyond the insertion depth shown, it may interfere with internal components. Be sure to use an appropriate bolt length.

(Note) The point shown in the drawing should be the home position for standard. In order to have the home position at the closed end, indicate the option (model code: NM).

M.E.: Mechanical end
S.E.: Stroke end

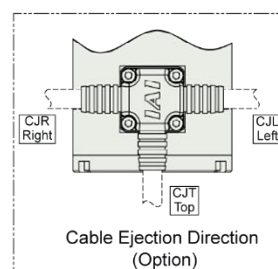
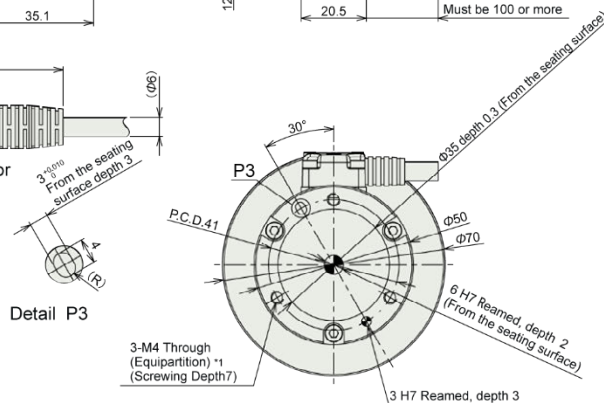
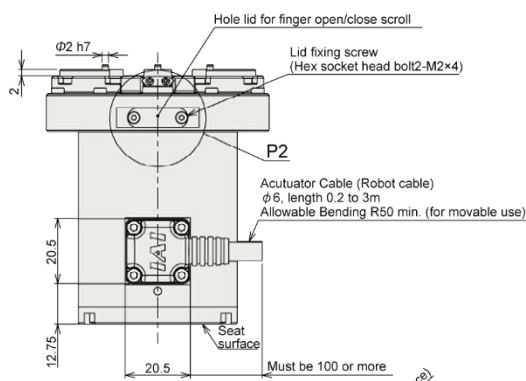
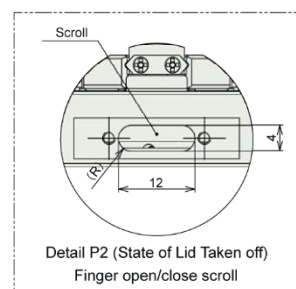


■ Mass for Each Stroke [kg]

Item	Content
Mass	0.39

(Note) This applies when the actuator cable length is selected 200mm.

M.E.: Mechanical end
S.E.: Stroke end



ME3849-2A

ROBO Cylinder

Chapter 6

Life

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-----	----------------------------------	-----

6.1 Concept of Life for Gripper

The gripper life is as shown below.

Life (Reference): 10,000,000 times of gripping operation

The gripper life could vary largely depending on the condition of use, environment and maintenance.

ROBO Cylinder

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 a specified location
- 2,500 operational hours

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:

- Anything other than our product
- Modification or repair performed by a party other than IAI (unless approved by IAI)
- Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
- Natural disaster, unnatural disaster, incident or accident for which we are not liable
- Natural fading of paint or other symptoms of aging
- Wear, depletion or other expected results of use
- 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:

- Medical equipment used to maintain, control or otherwise affect human life or physical health
 - Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
 - Machinery components essential for safety (safety devices etc.)
 - 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:

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

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Revision history

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