Oriental motor

Small Robots OVR
3-axis SCARA
Operating Manual

WM-0001-2E

Thank you for purchasing an Oriental Motor product. This manual describes product handling procedures and safety precautions. Please read the manual thoroughly to ensure safe operation.

- Only qualified personnel of electrical and mechanical engineering should work with the product.
- The product described in this manual is designed and manufactured to be incorporated into general industrial equipment. Do not use it for any other purpose. Oriental Motor Co., Ltd. is not responsible for any compensation for damage caused through failure to observe this warning.
- Use the product correctly after thoroughly reading the section "Safety precautions" on page 4. In addition, be sure to observe the contents described in warning, caution, and note in this manual.

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Safety precautions

The precautions described below are intended to ensure the safe and proper use of the product and to prevent the user and other personnel from exposure to the risk of injury. Use the product only after carefully reading and fully understanding these instructions.
In regard to a robot, it is prohibited to start operating the robot (i.e., to operate the device in accordance with the specified purpose) when the machine in which the robot is incorporated does not meet the relevant safety standards. The factory safety manager or safety personnel in charge of the applicable machine must ensure that the machine is operated only by qualified personnel who has expert knowledge on safety, and thereby prevent injury or damage to the machine.
The term “qualified personnel” refers to persons who have received the necessary training or education and have pertinent experience; who are familiar with the relevant standards and regulations; who are authorized by the factory safety manager to engage in the necessary activities; and who have the ability to discern and prevent potential dangers.

⚠ WARNING

Handling the product without observing the instructions that accompany a “WARNING” symbol may result in serious injury or death.

⚠ CAUTION

Handling the product without observing the instructions that accompany a “CAUTION” symbol may result in injury or property damage.

Note

The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

Tip

The items under this heading contain related information and contents to gain a further understanding of the text in this manual.

WARNING

General

- Never use the product for equipment in connection with the maintenance or management of human life or health.
- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, in areas subjected to splashing water, or near combustible materials. Doing so may result in fire or injury.

- Assign qualified personnel having expert knowledge on electrical and mechanical engineering as well as safety to the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Handling by unqualified personnel may result in fire, injury, or damage to equipment.
- Conduct a risk assessment in a state where all parts and components including the product have been installed in the equipment. Failure to do so may result in injury or damage to equipment.
- Provide an interlocking guard at a position that meets the safety distance specified in EN ISO 13857 so that an operator or other personnel does not enter the movable range of the product while the equipment is operating Failure to do so may result in injury.
- When teaching, adjusting, or inspecting the product inside the cage with interlock, take appropriate safety measures according to the results of the risk assessment of the entire equipment. Failure to do so may result in injury.
- Provide appropriate safety measures so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- Provide an emergency stop function for the equipment. Failure to do so may result in injury.
- The function and performance of the safety-related control system are appropriately determined according to the results of the risk assessment of the entire equipment. This may result in injury.
- Do not allow your hands to be caught in moving parts of the product. Doing so may result in injury or damage to equipment.
- Use the product in a condition where the entire equipment complies with relevant international standards such as EN ISO 12100, EN ISO 10218-1, EN ISO 10218-2, national standards, and legal regulations such as occupational health and safety required in each country. Failure to do so may result in injury or damage to equipment.
- Do not disassemble any components other than those specified for the motor replacement work. Also, do not modify the product. Doing so may result in injury or damage to equipment.
- Do not install, connect, or inspect/troubleshoot the product while the power is on. When working with the power on state, provide work rules in accordance with the Ordinance on Industrial Safety and Health and take appropriate safety measures. Failure to do so may result in fire, injury, or damage to equipment.

Installation and wiring

- When transporting or installing the product, wear a helmet, safety shoes, gloves, or other protective equipment to hold the specified places. Failure to do so may result in injury.
- Be sure to secure the product itself according to the instructions. Failure to do so may result in injury or damage to equipment.
- Be sure to wire and connect according to the instructions. Failure to do so may result in fire or damage to equipment.
- Do not pull the cable and connector, apply excessive force to them, or step on them. Also, do not excessively bend the cable. Doing so may result in injury or damage to equipment.
- Depending on the operating environment, the cable between the product and the controller may be damaged or deteriorated. Therefore, protect the cable with a protective tube or cover as necessary. Failure to do so may result in injury or damage to equipment.

- Make sure that two or more people work together to perform the necessary tasks when installing the product. Also, when working with two or more people, clarify the relationship and roles of the primary worker and assistant worker, while communicating with each other to ensure safety. Failure to do so may result in injury.
- Install an external fuse, if necessary, to prevent ignition due to a large amount of current flowing from the power supply side.

Operation

- Take appropriate safety measures when placing the motor in a non-excitation state. Failure to do so may result in injury or damage to equipment.
- Check the condition of the surrounding area to ensure safety. This may cause injury or damage to equipment.
- When turning on the driver power, make sure there is no signal input from the host controller. The product may start operating unintentionally, causing injury or damage to equipment.
- Turn off the power supply of the driver in the event of a power failure. Otherwise, the product may start suddenly when the power is restored, causing injury or damage to equipment.
- If any abnormality is observed, immediately stop operation and turn off the power to the motor that drives the product. Failure to do so may result in injury or damage to equipment.
- Do not turn off the power or input a signal to place the motor in a non-excitation state during operation. The robot may move unexpectedly, causing injury or damage to equipment.
- When operating the product after the driver power supply is turned on or the power to the motor is turned off, adjust the position at low speed to ensure safety. Failure to do so may result in injury or damage to equipment.

Maintenance and inspection

- Perform the pre-work (daily) inspection and periodic inspection according to the instructions in this manual, and check that there are no abnormalities in the product and related equipment before working. Failure to do so may result in injury or damage to equipment.

CAUTION

- Do not use the product beyond its specifications. Doing so may result in injury or damage to equipment.
- Keep the area around the product free of combustible materials. Failure to do so may result in fire or a skin burn(s).
- Do not leave anything around the product that would obstruct ventilation. Doing so may result in damage to equipment.
- When conducting the insulation resistance measurement or the dielectric strength test, be sure to separate the connection between the product and the driver. Failure to do so may result in damage to equipment.

- Take measures against static electricity when handling. Static electricity may cause the encoder (ABZO sensor) of the motor that drives the product or the driver to malfunction or be damaged. This may result in injury or damage to equipment.
- Stop operation if abnormal noise or vibration occurs during operation. Failure to do so may result in injury or damage to equipment.
- When installing and wiring, take measures against EMC. Without effective measures to suppress Electromagnetic Interference (EMI) caused by the product or driver to the surrounding control system equipment and Electromagnetic Susceptibility (EMS) generated by the product or driver, the function of your equipment may be seriously affected. Verify EMC compliance with the completed equipment. This may result in injury or damage to equipment.
- Since the motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions, if the operator is allowed to approach the motor, affix a warning label shown in the figure on a conspicuous place. The surface is hot, and this may cause a skin burn(s).

- Use a driver and cable that are connected to the motor only in the specified combination. Failure to do so may result in fire, injury, or damage to equipment.
- Keep the encoder (ABZO sensor) of the motor away from a strong magnetic field. This may damage to the encoder (ABZO sensor) or cause the product to malfunction. Injury or damage to equipment may result.
- To protect the encoder (ABZO sensor), use the motor in a condition where the motor surface temperature does not exceed 80 °C (176 °F). Failure to do so may result in damage to equipment.
- Make sure not to apply a strong shock to the encoder (ABZO sensor) of the motor. This may damage to the encoder (ABZO sensor) and cause the product to malfunction, resulting in damage to the equipment. The label shown in the figure is affixed on the motor.

- Be careful not to make any mistakes in the combinations when connecting a motor and a driver. Wiring in the wrong combination may cause unexpected movement. This may result in injury or damage to equipment.
- The status of the actuating controls shall be clearly indicated, e.g. power on, fault detected, automatic operation. If an indicator light is used, it shall be suitable for its installed location and its color shall meet the requirement of IEC 60204-1.
- Be careful not to get your fingers caught by the stopper (1 place) that limits the movement of the product's 1st axis (M1). Failure to do so may result in injury. The label shown in the figure is affixed on the stopper part.

- Hold the cover firmly to prevent it from falling, when removing the tape from the cover. Failure to do so may result in injury or damage to equipment.
- Be sure to attach the cover after wiring. Failure to do so may result in injury or damage to equipment.

Preparation

Checking the product

Verify that the items listed below are included. Report any missing or damaged items to the Oriental Motor sales office from which you purchased the product.

OVR3041K3-H

- Robot ... 1 unit
- Positioning pin for origin setting ... 1 piece
- Unpacking procedure ... 1 copy

OVR3046K10-H and OVR3070K3-H

- Robot ... 1 unit
- Mechanical stopper ... 1 piece
- Cover screws ... 12 Pieces
- Positioning pin for origin setting ... 1 piece
- Unpacking procedure ... 1 copy

How to identify the product model

Verify the model name of the purchased product against the model shown on the nameplate of the product.

OVR	3	041	K	3	-	H
	1	2	3	4		5

1	Number of axes	3: 3 axes
2	Reach length	041: 410 mm (16.14 in.) 046: 460 mm (18.11 in.) 070: 700 mm (27.56 in.)
3	Power supply specification	K: 24 VDC
4	Transportable mass	3: 3 kg (6.6 lb.) 10: 10 kg (22 lb.)
5	Robot type	H: SCARA

Driver and controller that can be combined

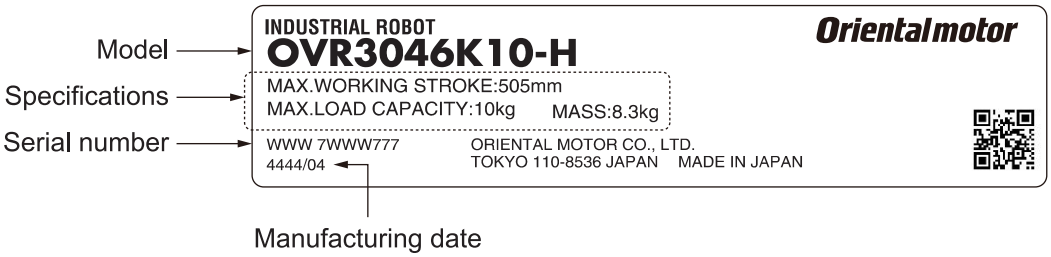
Product	Series	Type	Model
Driver	AZ Series	Built-in controller type	AZD-KD
		mini Driver RS-485 communication type	AZD-KR2D
Controller	MRCU Series	–	MRCU3AK MRCU4AK MRCU5AK MRCU6AK MRCU7AK MRCU8AK

Information about nameplate

The figure shows an example.

Tip

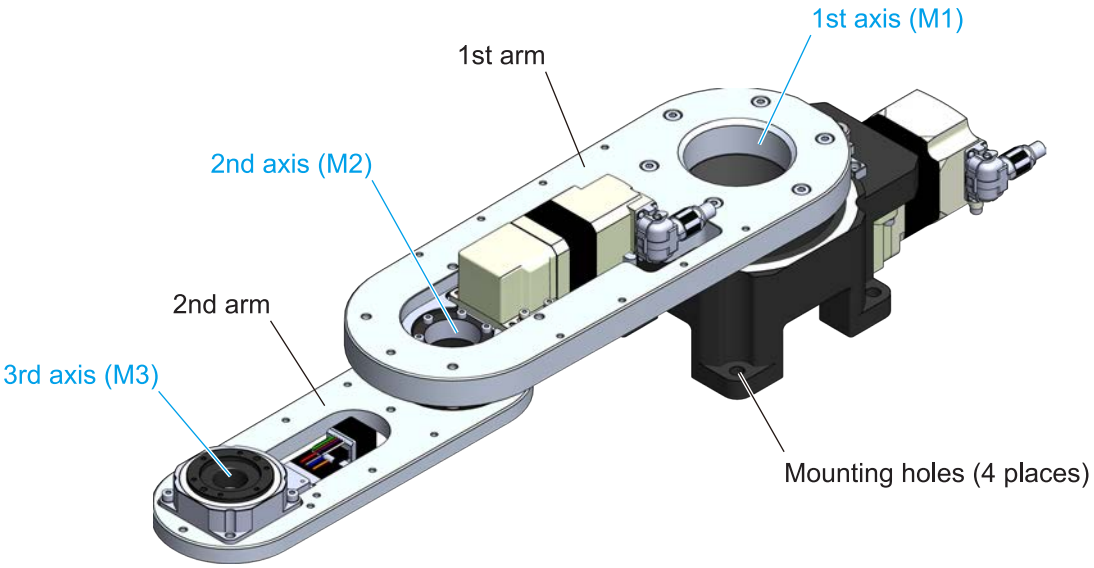
The position describing the information may vary depending on the product.



Names of parts

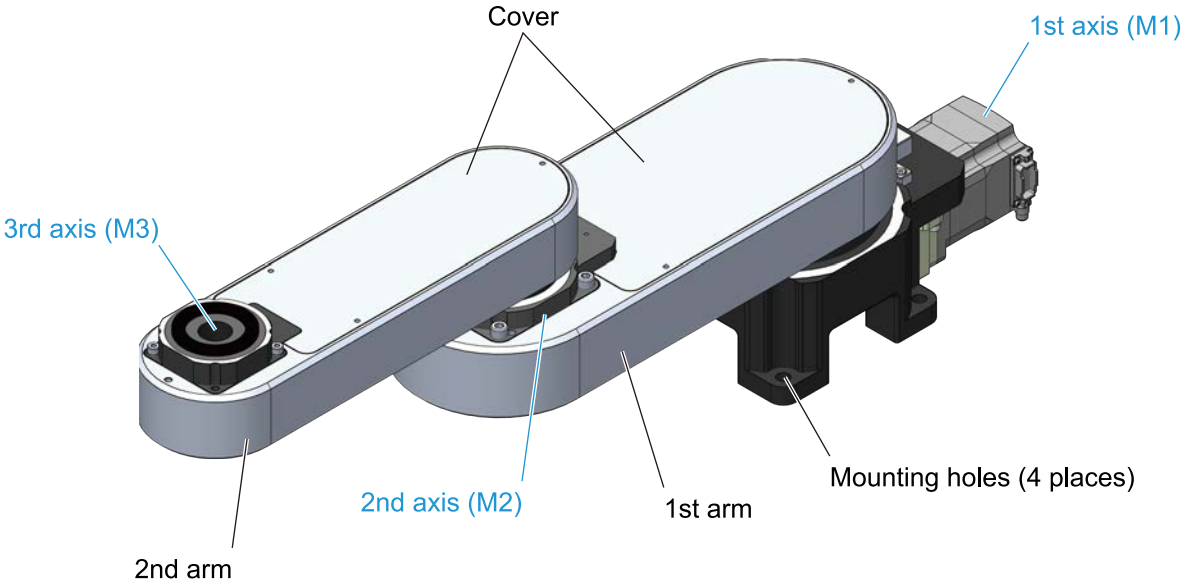
The robot consists of three axes: 1st axis (M1), 2nd axis (M2), and 3rd axis (M3). All motors are of the AZ Series equipped with a battery-free absolute encoder (ABZO sensor). All motors are of the AZ Series equipped with a battery-free absolute encoder (ABZO sensor).
The robot has no mechanism to hold the arm. The arm can be moved manually when the power supply to the robot is turned off due to an emergency stop.

OVR3041K3-H



Axis	Axis name	Component products model
1st axis	M1	DGB130R36-AZAKHL
2nd axis	M2	DGR85R36-AZAKHR
3rd axis	M3	DGR60R30-AZAKU

OVR3046K10-H/OVR3070K3-H



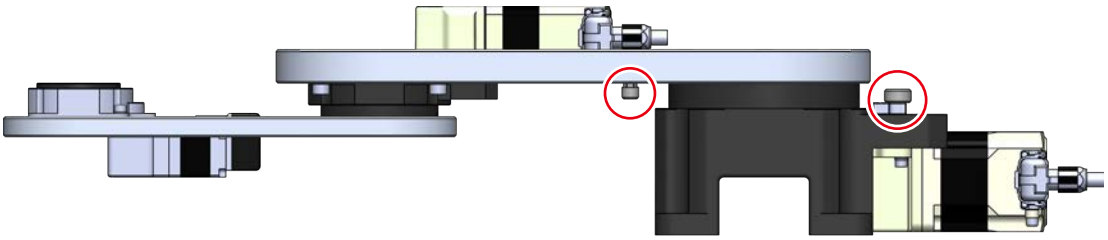
Axis	Axis name	Component products model
1st axis	M1	DGB130R36-AZAKHL
2nd axis	M2	DGR85R36-AZAKHR
3rd axis	M3	DGR60R30-AZAKR

Rotation limit mechanical stopper

OVR3041K3-H

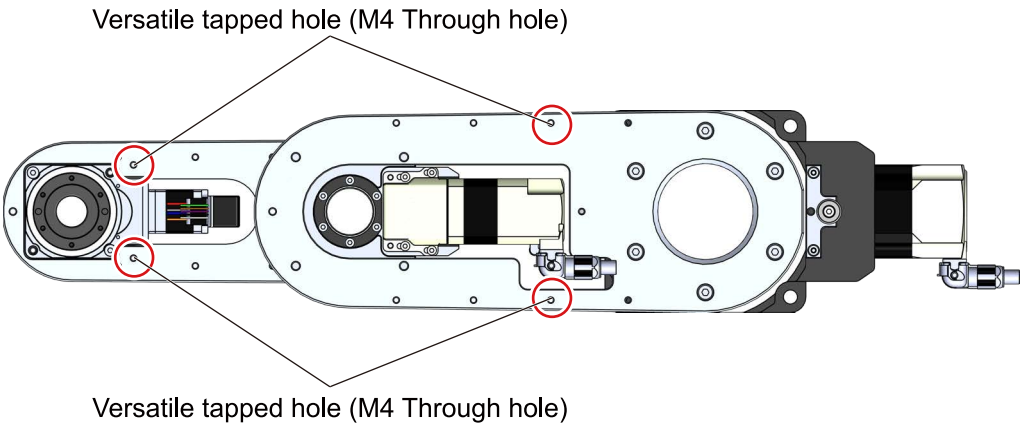
1st axis (M1)

The first axis (M1) has a mechanical stopper that limits the range of movement of the product.



2nd axis (M2)

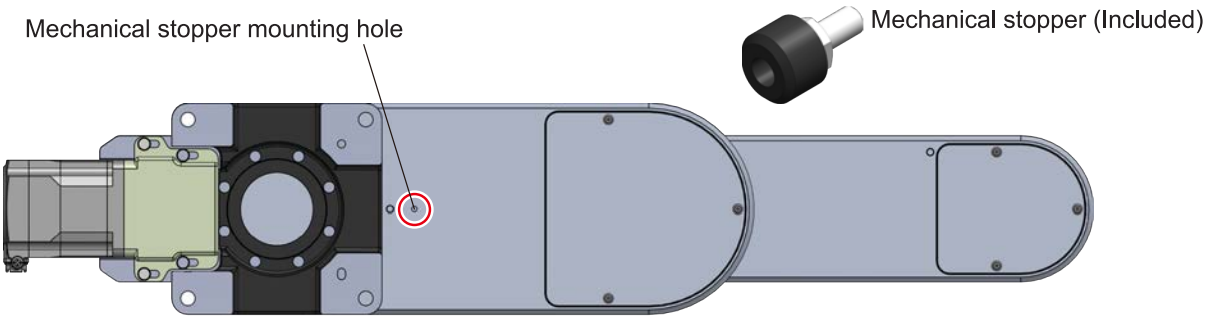
A mechanical stopper is not included with the 2nd axis (M2). If necessary, use the versatile tapped hole on the arm to install a mechanical stopper.



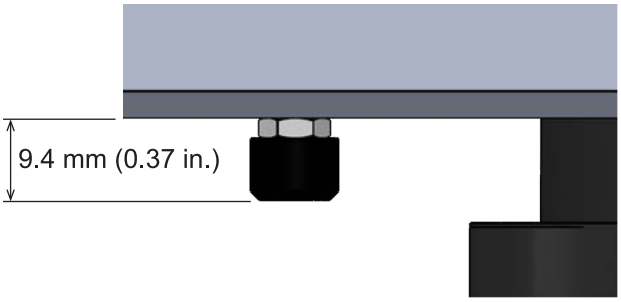
OVR3046K10-H and OVR3070K3-H

1st axis (M1)

The included mechanical stopper is for the 1st axis (M1). If necessary, install a mechanical stopper using a hex key.
Tightening torque: 2.2 N·m (310 oz-in)



Install the mechanical stopper so that it is below the specified value shown in the figure.



Note

- The height of the mechanical stopper must be less than the specified value shown in the figure. If the specified value is exceeded, the mechanical stopper may hit the case of the 1st axis (M1), causing damage to the mechanical stopper.
- If the 1st arm is stopped by hitting it against the mechanical stopper, the mechanical stopper may loosen. When the 1st arm is stopped by hitting it against the mechanical stopper, check the tightening torque of the mechanical stopper.

2nd axis (M2)

A mechanical stopper is not included with the 2nd axis (M2). Set the limit on the software side as necessary.

Robot installation

Installation location

The product described in this manual is designed and manufactured to be incorporated into general industrial equipment. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure installed indoors (provide ventilation holes)
- Operating ambient temperature: 0 to +40 °C [+32 to 104 °F] (non-freezing)
- Operating ambient humidity: 85 % or less (non-condensing)
- Area free of explosive atmosphere, toxic gas (such as sulfuric gas), or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles, or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets), or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power equipment, etc.)
- Area free of radioactive materials, magnetic fields, or vacuum
- Up to 1,000 m (3,300 ft.) above sea level

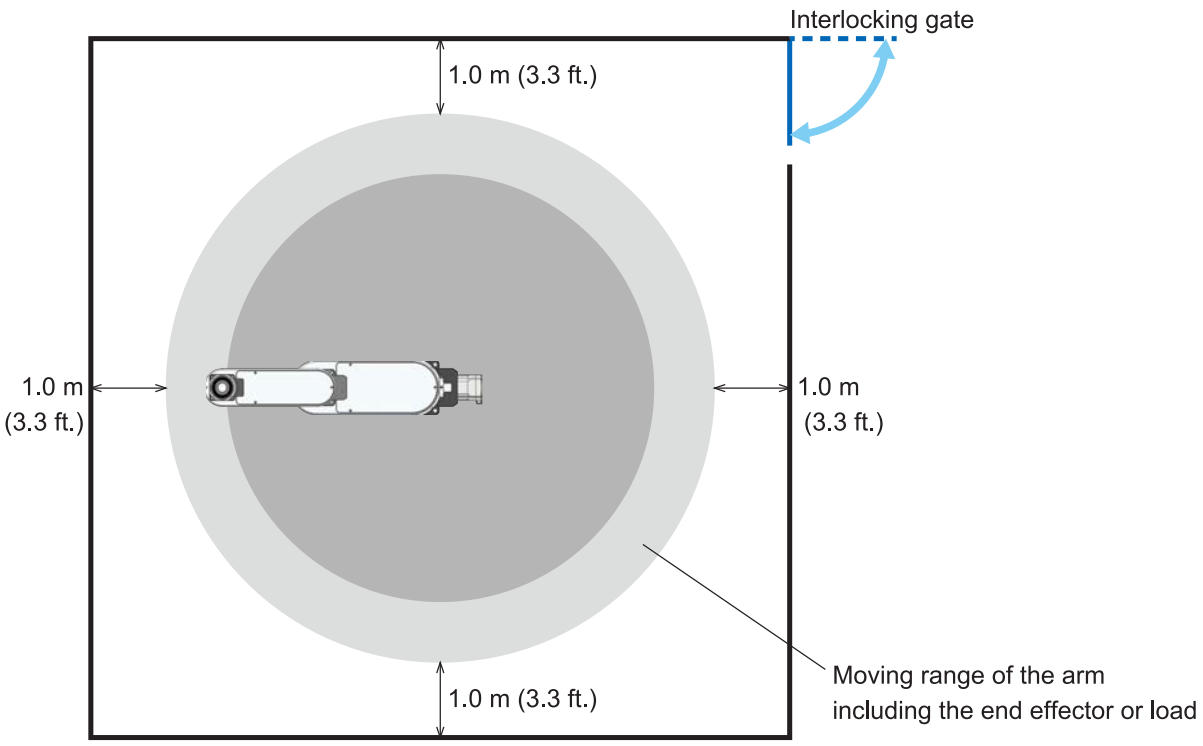
Safety cage

- Install a safety cage around the robot to prevent interference with surrounding equipment, even when the arm reaches the maximum operating range with the end effector or load attached.
- The number of entrances and exits to the safety cage should be minimized (one as much as possible), and an interlocking gate should be provided.
- Be sure to observe the requirements of EN ISO 14120, EN ISO 13857, EN ISO 13854, and EN ISO 14119 when installing a safety cage.

Installation example of a safety cage

The horizontal safety distance between the robot and the safety cage varies depending on the height of the safety cage.
The figure shows the horizontal safety distance under the following conditions.

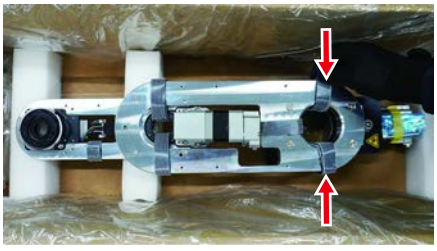
- The results of the risk assessment are corresponded to the low risk specified in EN ISO 13857 (unrecoverable, or not foreseeable as resulting in injuries requiring a long period of recovery).
- The hight of the safety cage is 1.2 m (3.9 ft.).
- The hight that includes the end effector and load is 1.4 m (4.6 ft.).



How to unpack

OVR3041K3-H

1. Place the package on a horizontal, flat surface to unpack.
   The product is not in a fixed state in the package. Be careful when handling the product as it may tilt.
2. Take out the cushioning materials and remove the bands (2 places) that secure the product to the reinforcing plate.



3. Take out the product holding the motor of the 1st axis (M1) and the motor of the 2nd axis (M2) with both hands.
   When removing, be sure to use both hands to hold the specified positions. Improper holding, such as holding the product with one hand or in a position other than that specified, may cause the axis to move in an unexpected direction, resulting in a fall or injury.

4. Place the product in the installation area and remove the band that secures the arm.

> **Note**
>
> - If the band is removed before placing the product in the installation area, the arm may shift unexpectedly and fingers may be caught in it, which may cause injury.
> - When the arm is extended, the center of gravity shifts, and the product may tilt. Work carefully during operation.

OVR3046K10-H, OVR3070K3-H

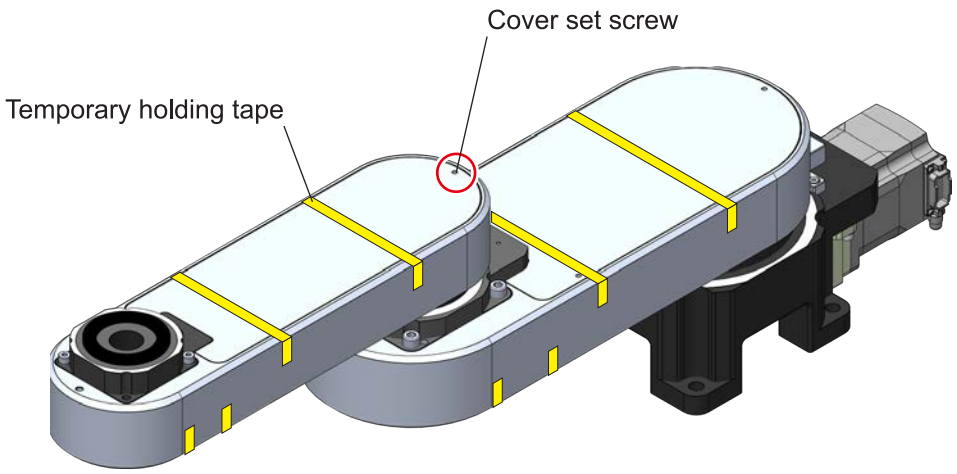
1. Place the package on a horizontal, flat surface to unpack.
   The product is not in a fixed state in the package. Be careful when handling the product as it may tilt.
2. Take out the cushioning materials and accessories.
3. Take out the product holding the motor of the 1st arm with both hands.
   When removing, be sure to use both hands to hold the specified positions. Improper holding, such as holding the product with one hand or in a position other than that specified, may cause the axis to move in an unexpected direction, resulting in a fall or injury.

4. Place the product in the installation area and remove the band that secures the arm.

> **Note**
>
> - If the band is removed before placing the product in the installation area, the arm may shift unexpectedly and fingers may be caught in it, which may cause injury.
> - When the arm is extended, the center of gravity shifts, and the product may tilt. Work carefully during operation.

About cover

1. The cover is temporarily fixed with tape at the time of shipment. Hold the cover firmly to prevent it from falling, when removing the tape.



2. Be sure to secure the cover using the included screws for the cover.
   Tightening torque: 0.6 N·m (85 oz-in)
   Specifications of cover screws (included): ultra-low head hexagon socket head cap screw (M3), length under neck 10 mm (0.39 in.), property class 4.8 or more

   Note

   - Observe the specified screw tightening torque. Also, do not insert tools at an angle. Doing so may result in damage to the screws.
   - Check to see if the screw for the cover is loose or failed to fasten.

Installation method

The product can be installed either frame mounted or ceiling mounted.

Note

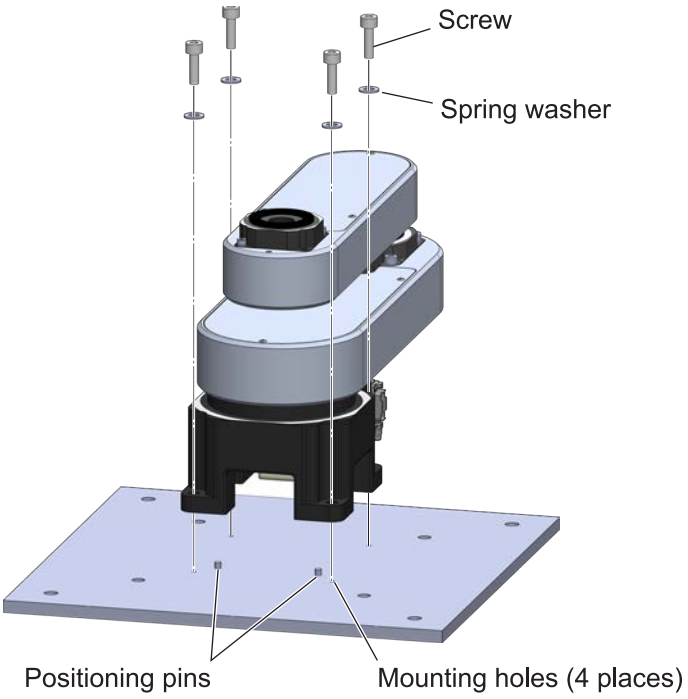
- Ensure that there is sufficient work space at the installation site so that teaching and maintenance/inspection can be performed safely.
- Do not loosen or remove any screws on the product. This may result in reduced positioning accuracy or damage to the product.
- Work in a stable condition so that the product does not tilt.
- Install the product on a metal surface of sufficient strength to prevent vibration or twisting of an enclosure in which the product is installed.

Secure the product to the mounting plate using the mounting holes (four places) of the 1st axis (M1)
Provide screw holes in the mounting plate.
Use the positioning pin holes (two places) when positioning the product.
Screws, spring washers, positioning pin, are to be provided by the customer.
The values of the tightening torque are recommended. Tighten the screws to an appropriate torque according to the design conditions of the mounting plate.

Mounting plate	Thickness	10 mm (0.39 in.) or more
	Material	Steel
Mounting hole	Hole diameter	φ9 mm (φ0.35 in.)
	Nominal size	M8
	Tightening torque	13 N·m (115 lb-in)
Positioning pin holes	Pin hole diameter	$\varphi 5_{0}^{+0.012}$ mm ($\varphi 0.1969_{0}^{+0.0005}$ in.)
	Pin hole depth	5 mm (0.20 in.) (Blind hole)

Frame mounting

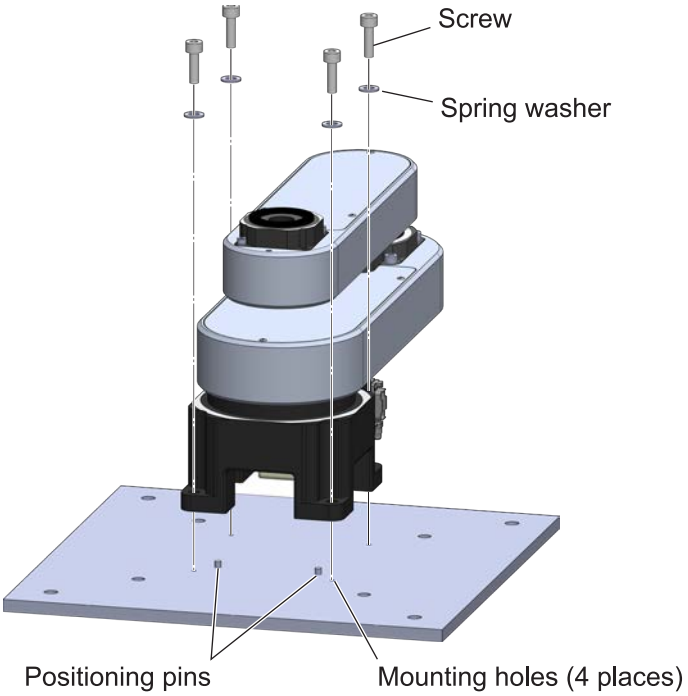
The figure shows a OVR3046K10-H.



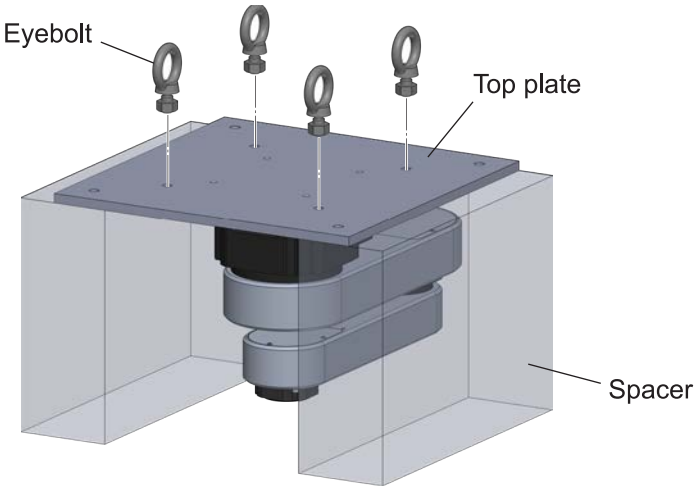
Ceiling mounting

The figure shows a OVR3046K10-H.

1. Secure the product to the top plate.

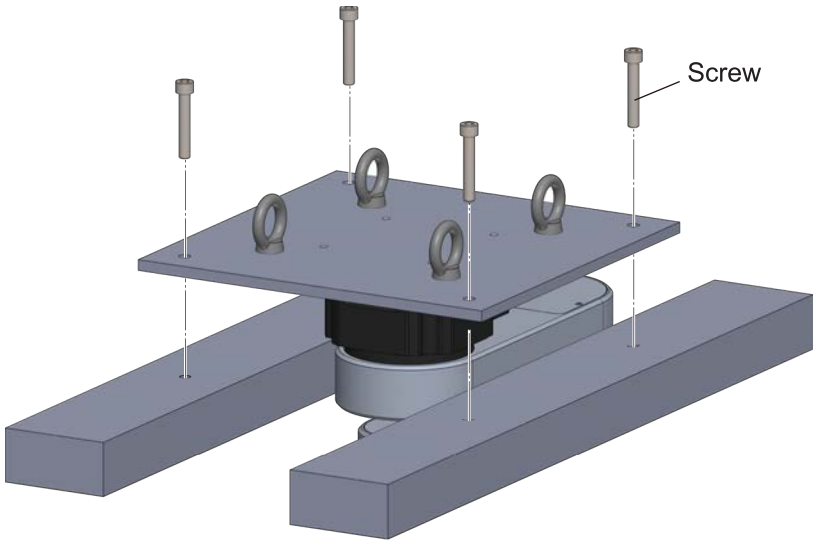


2. Install the eyebolt to the top plate.
   Eyebolts are not included with the product. Provide eyebolts that are suitable for lifting the product mass.



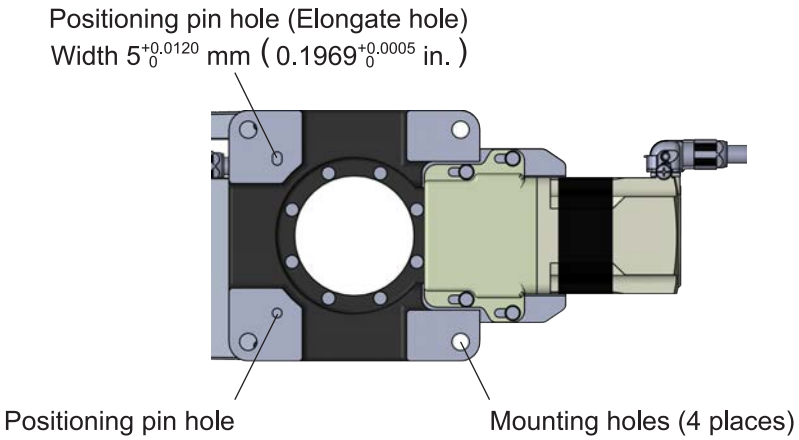
> **Note**
>
> Securely tighten the eyebolts with the appropriate torque so that they do not loosen according to the product load and the eyebolt specifications.

3. Use a crane to lift the product.
4. Secure the top plate to the installation place.

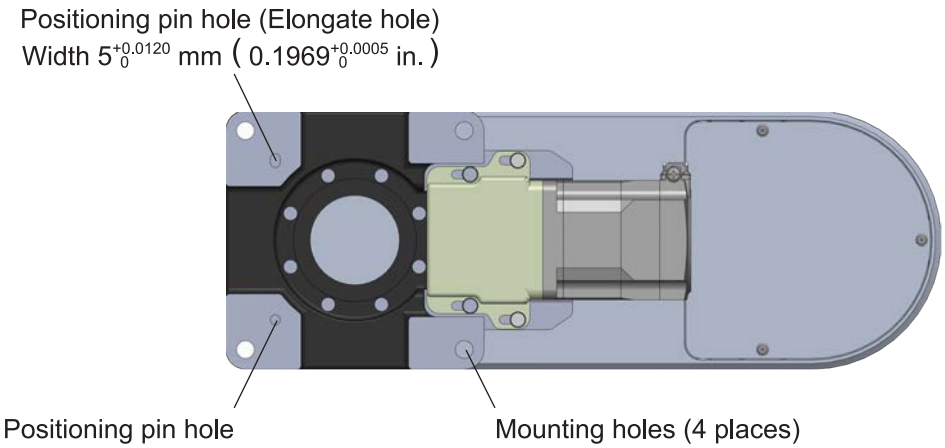


The figure shows the view from the installation surface side.

OVR3041K3-H



OVR3046K10-H, OVR3070K3-H

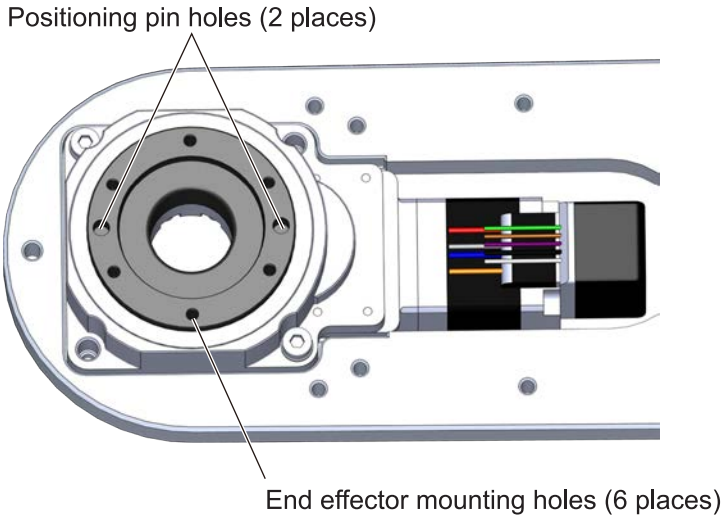


Mounting the end effector

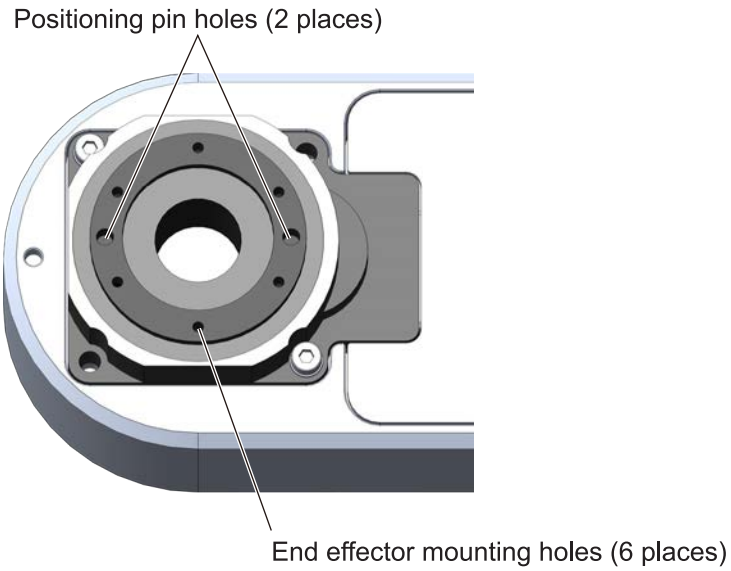
Install the end effector using the mounting holes (six places) on the 3rd axis (M3), secure the end effector with screws.
Use the positioning pin holes (two places) of the 3rd axis (M3) when positioning the end effector.
The values of the tightening torque are recommended. Tighten the screws to an appropriate torque according to the design conditions of the end effector.

End effector	Material	Steel or aluminum
Mounting hole	Nominal size	M3
	Tightening torque	1.4 N·m (198 oz-in)
Positioning pin holes	Effective depth of screw	6 mm (0.24 in.)
	Pin hole diameter	$\varphi 4_{0}^{+0.012}$ mm ($\varphi 0.1575_{0}^{+0.0005}$ in.)
	Pin hole depth	6 mm (0.24 in.) (Blind hole)

OVR3041K3-H



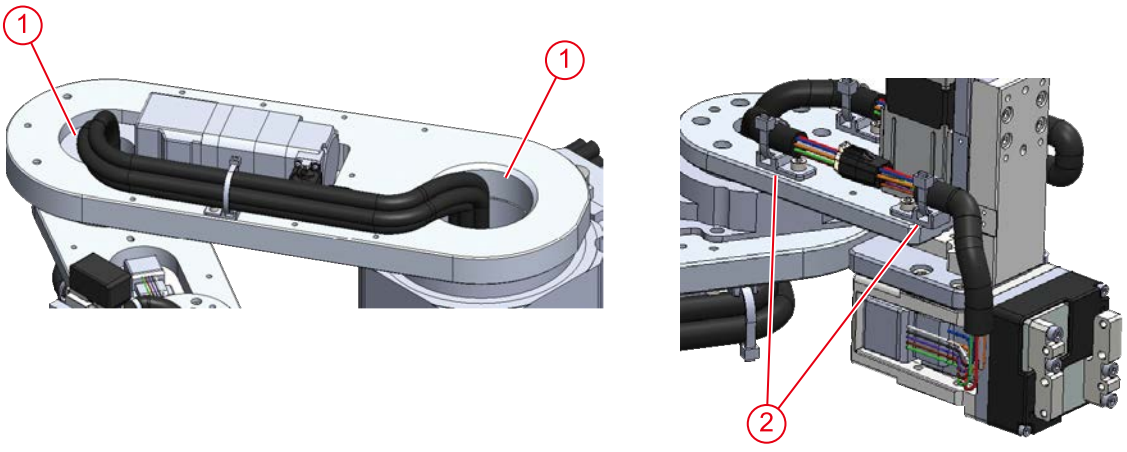
OVR3046K10-H, OVR3070K3-H



Wiring example

The figure shows an image.

1. Wire the cables using the hollow hole.
2. Secure the cables near the connectors to prevent stress at each connection point of the connectors and cables.
3. Wire the cables with sufficient slack to prevent stress.

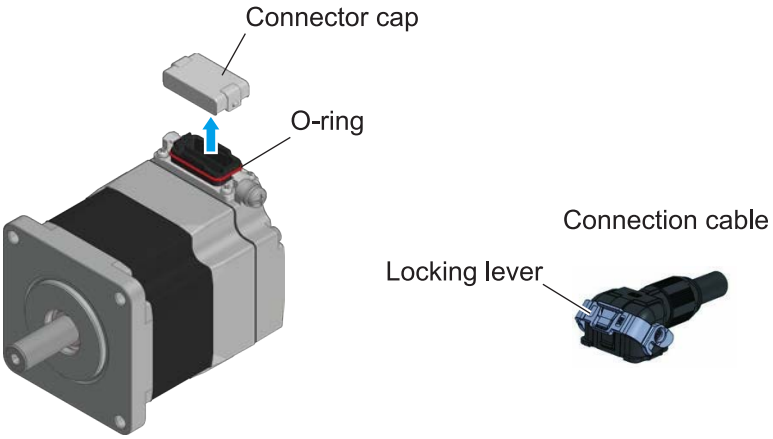


Note

The cover of the OVR3046K10-H and OVR3070K3-H is temporarily fixed with tape at the time of shipment. Hold the cover firmly to prevent it from falling, when removing the tape. Refer to this chapter.

Connecting the connector type motor

The motors for the 1st axis (M1) and 2nd axis (M2) use a connector type for their cable connections. Connect according to the following steps.

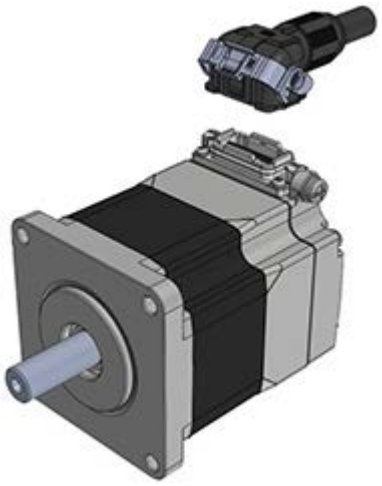


1. Remove the connector cap.

   Note

   Do not damage the O-ring of the connector when removing the connector cap.

2. Check the position of the connector terminals and connect the connector of the connection cable.
   The figure shows an example where the cable outlet direction is opposite to the output shaft direction.



Note

If the locking lever is in a state of being turned up to the 90-degree position or down to the 0-degree position, parts around the locking lever and the connector are in contact with each other, and the connectors cannot be connected.

Locking lever is in 90-degree position

Locking lever is in 0-degree position

3. Turn the locking lever down to the 0-degree position to fix the connector.

Handling of locking lever

- Do not apply excessive force to the locking lever. If the locking lever is damaged, the connector may not be fixed securely.
- After connecting the connector, turn the locking lever down securely to the 0-degree position to fix the connector.

⚠ WARNING

Be sure to turn down the locking lever. If the connector is not fixed, the cable may come off, resulting in fire, electric shock, or damage to equipment.

Removing the cable

Turn up the locking lever and pull out the connector.

Tip

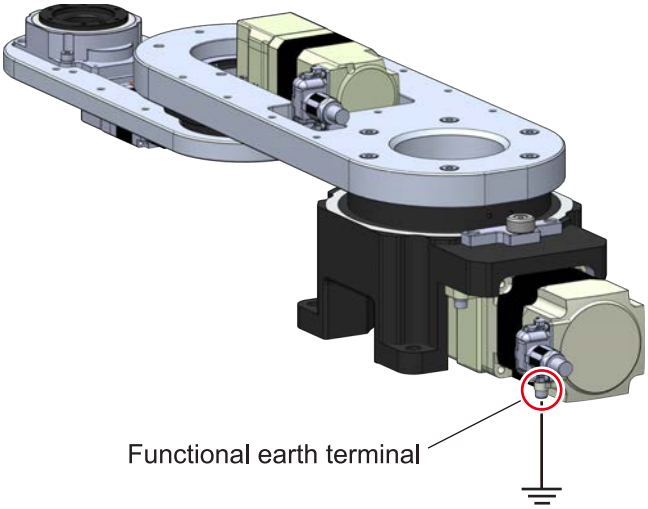
Turning up the locking lever to the 90-degree position simultaneously disconnects the connector.

Grounding

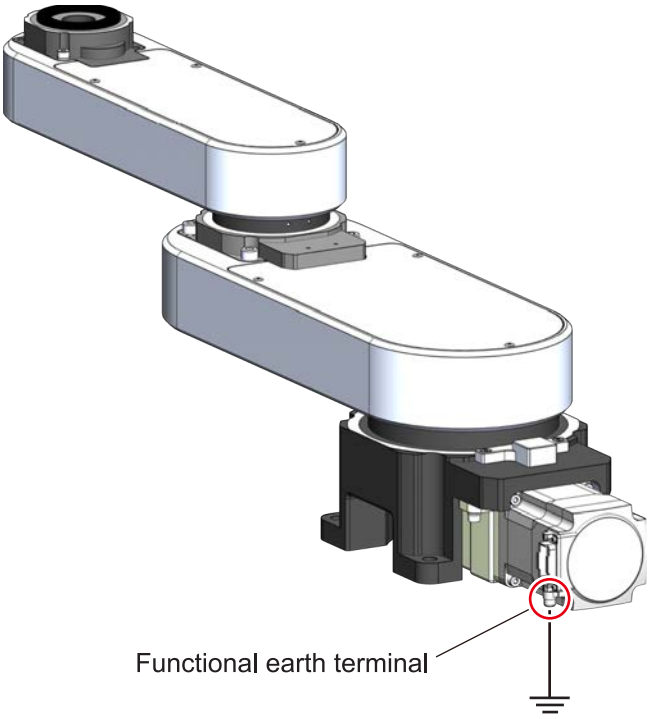
Ground the functional earth terminal if necessary.
Use a round terminal when grounding, and be sure to secure it with a screw and washer. A grounding wire and a crimp terminal are not included.

- Conductor size: AWG18 (0.75 mm^2) or thicker wire
- Screw size of functional earth terminal: M4
- Tightening torque: 1.2 N·m (170 oz-in)

OVR3041K3-H



OVR3046K10-H/OVR3070K3-H



Setup

⚠ WARNING

- Always check that the axis movement shown on the screen of the MRC Studio software matches the actual axis movement during setup. If the actual axis movement does not match what is shown on the MRC Studio screen, the product may operate unintentionally, causing injury or damage to equipment.
- When inserting a positioning pin for origin setting, shut off the main power supply of the product. Performing work on the product while the main power supply is turned on may result in injury if the product malfunctions.

How to setup

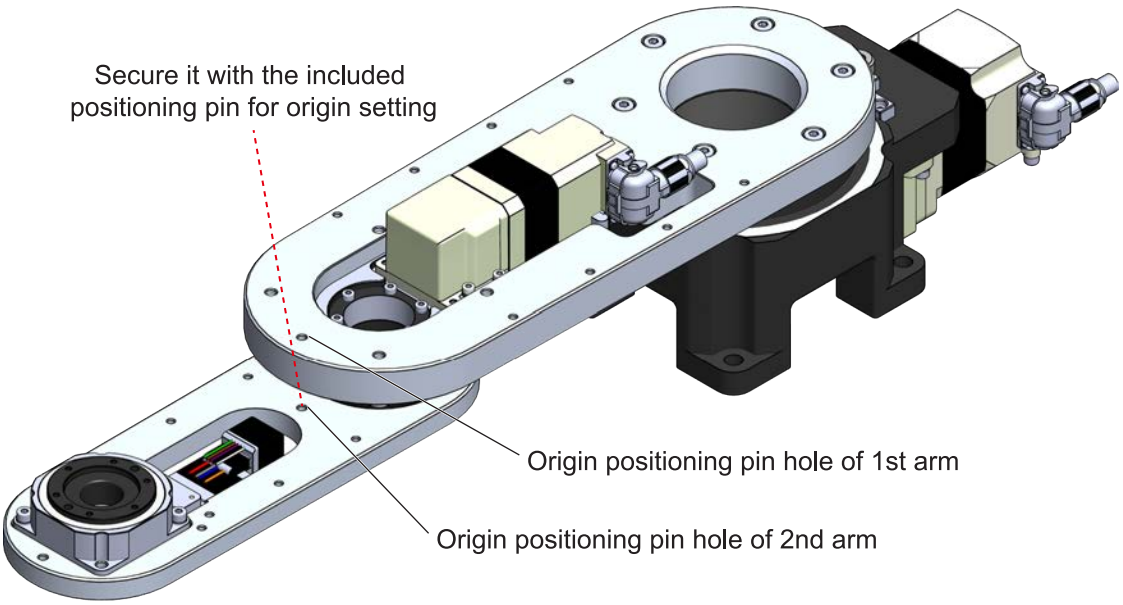
Set the information of the robot with the MRC Studio programing software.

1. Start the MRC Studio software.
2. Click [Communication port], select a connected controller.
3. Click [Setup] on the start screen.
4. Set the robot type and the mechanism information according to the instructions on the screen.

Origin position during setup

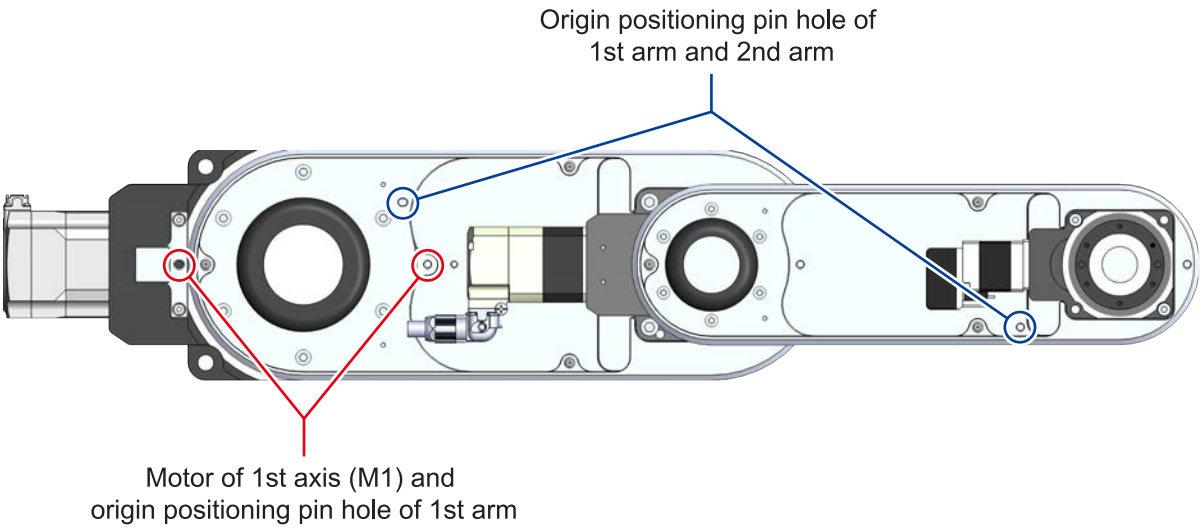
OVR3041K3-H

This product has positioning pin holes (2 places) for origin setting. Use the positioning pin holes when aligning the 1st arm and 2nd arm.
Pin hole diameter: $\varphi 4^{+0.018}_{0}$ mm ($\varphi 0.1575^{+0.0007}_{0}$ in.)

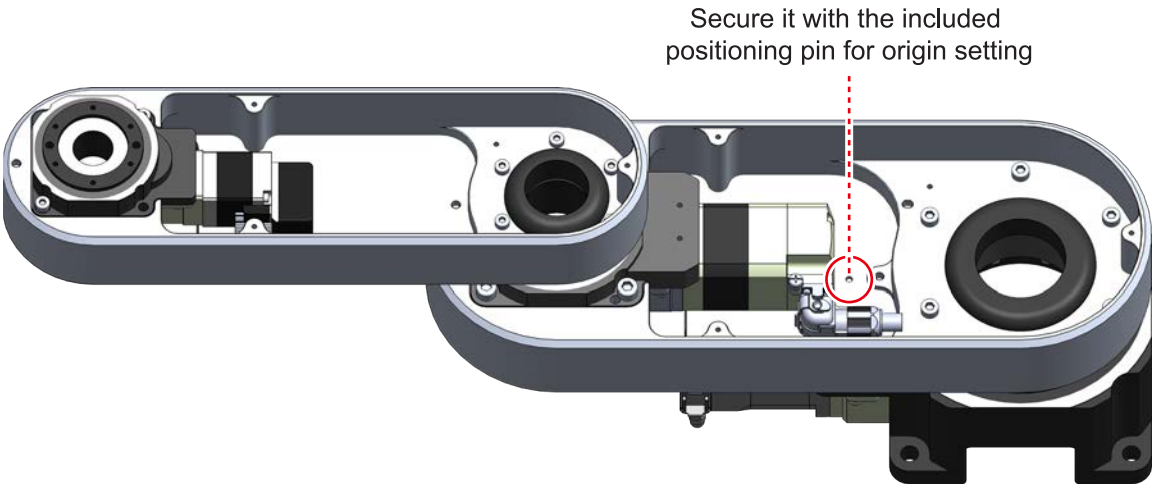


OVR3046K10-H, OVR3070K3-H

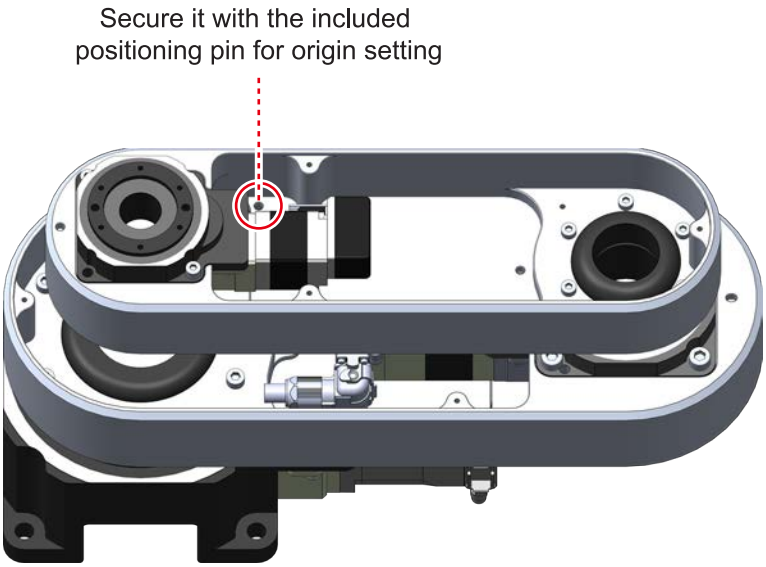
This product has positioning pin holes (4 places) for origin setting. Use the positioning pin holes when aligning the motor of the 1st axis (M1) and the 1st arm, and the 1st arm and the 2nd arm.
Pin hole diameter: $\varphi 4_{0}^{+0.018}$ mm ($\varphi 0.1575_{0}^{+0.0007}$ in.)



1. Fold the 1st arm and align the motor of the 1st axis (M1) and the 1st arm using the included positioning pin for origin setting.



2. Remove the positioning pin.
3. Fold the 2nd arm and align the 1st arm and the 2nd arm using the included positioning pin for origin setting.



Note

Turn off the power supply of the robot when the arm is moved manually. However, if the arm is operated beyond the movable angle range based on the arm position at the time of setup, an alarm of joint angle range error will be generated when the power supply of the robot is turned on.

- Movable angle range
  1st arm: ±360°
  2nd arm: ±170°

Maintenance

Assign qualified personnel with sufficient knowledge and experience to perform daily and periodic inspections in accordance with the “Safety precautions” section.
Be sure to perform these inspections in order to prevent malfunctions in advance and to ensure safety, and check that there are no abnormalities in the product and related equipment before operation. If any abnormality is found, discontinue use immediately and take necessary action, such as repair.

Inspection

Inspection period (cycle)

Perform maintenance for each time period shown in the table when operating eight hours per day. Shorten the maintenance cycle depending on the situation when the product is operated continuously day and night or when the operating rate is high.

Maintenance timing	Inspection	Cleaning
When operated for the first time	✓	–
Six months after initial operation	✓	–
Every six months thereafter	✓	–
As needed	–	✓

Inspection items

- Check to see if the position securing the product is loose.
- Check to see if any of the screws securing the end effector are loose.
- Check to see if the cable is damaged, scraped or stressed.
- Check to see if the connection between the motor and driver is loose.
- Before and after the power is turned on, check to see if there is any abnormal noise or vibration coming from the bearing or gears.
- Check to see if the operating point has shifted during return-to-home operation and normal operation (original program operation).

Note

- Enter the inspection results and any special comments on the daily checklist when the inspection is performed.
- Perform the inspection outside of the movable range as much as possible.
- If the product has been repaired as a result of the inspection, keep a record of the contents for at least three years.

Tip

Replace the cable if the cable has been abraded as a result of the inspection.

Cleaning

- Wipe off dirt with a soft cloth. If it is very dirty, wipe with a soft cloth with neutral detergent.
- Do not blow with compressed air. Dust may enter through the gap.
- Do not use petroleum-based solvents as they may damage the painted surface.

Warranty

Check on the Oriental Motor Website for the product warranty.

Disposal

Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.
When removing the motor or actuator for disposal, remove the screws carefully to prevent injury from falling parts.

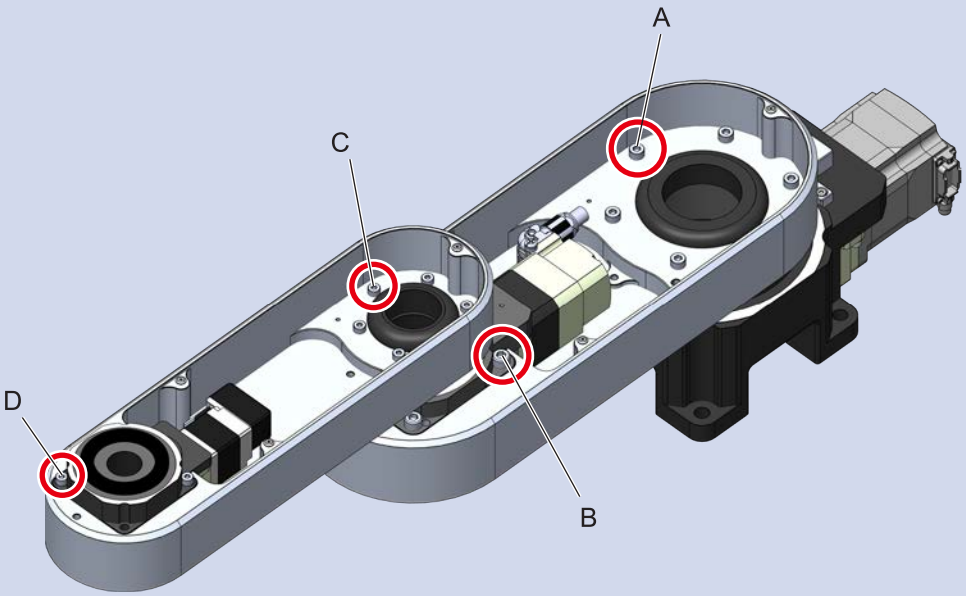
Replacement work

Note

- Remove the end effector and load before replacing.
- Do not remove or loosen any screws other than those specified for the replacement work. This may result in reduced positioning accuracy or damage to the product.

Removable screws

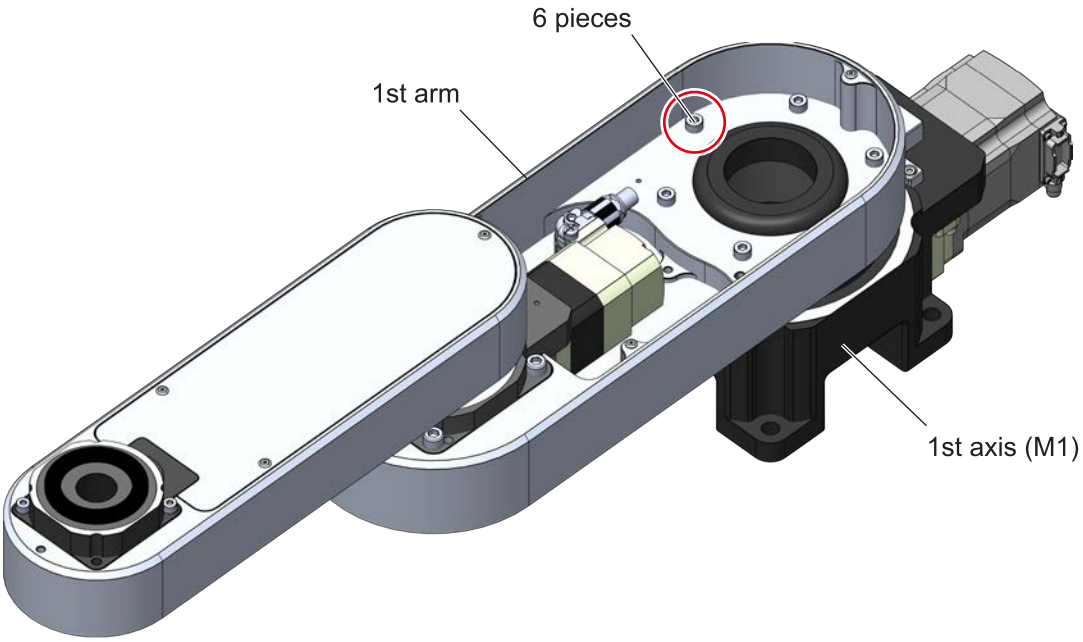
Refer to the table for details.



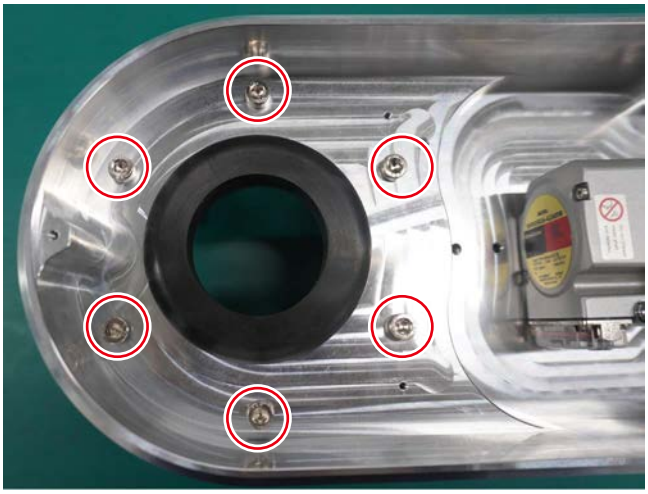
Screw position	Screw type	Size	Number of screws	Length	Material	Property class
A: Screws securing the 1st axis (M1) and 1st arm	Hexagon socket head cap screw	M5	6 pcs.	20 mm	Steel	10.9
B: Screws securing the 2nd axis (M2) and 1st arm	Hexagon socket head cap screw	M6	4 pcs.	18 mm	Stainless steel	A2-70
C: Screws securing the 2nd axis (M2) and 2nd arm	Hexagon socket head cap screw	M4	6 pcs.	15 mm	Steel	10.9
D: Screws securing the 3rd axis (M3) and 2nd arm	Hexagon socket head cap screw	M4	2 pcs.	20 mm	Steel	10.9

1st axis (M1) replacement

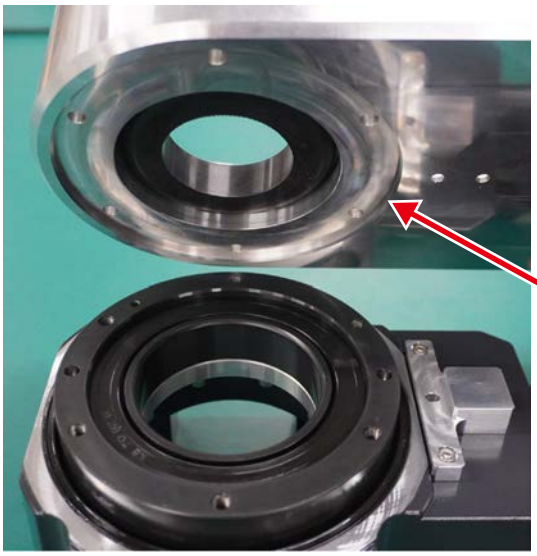
This explains how to use by taking the OVR3046K10-H as an example.



1. Remove the screw that secures the cover on the 1st arm and remove the cover.
2. Remove the Screws (6 pieces) securing the 1st arm and 1st axis (M1) then remove the 1st arm.



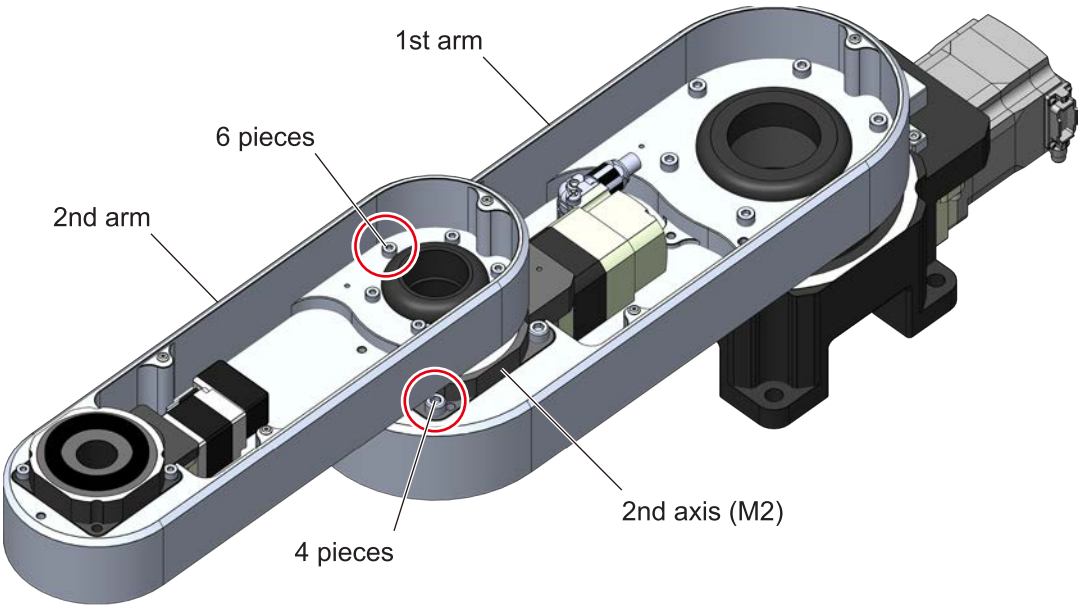
3. Using the pilot of the 1st arm as a guide, secure the 1st arm to the new 1st axis (M1) and tighten the screws (6 pieces).
   Tightening torque: 3.5 N·m (490 oz-in)



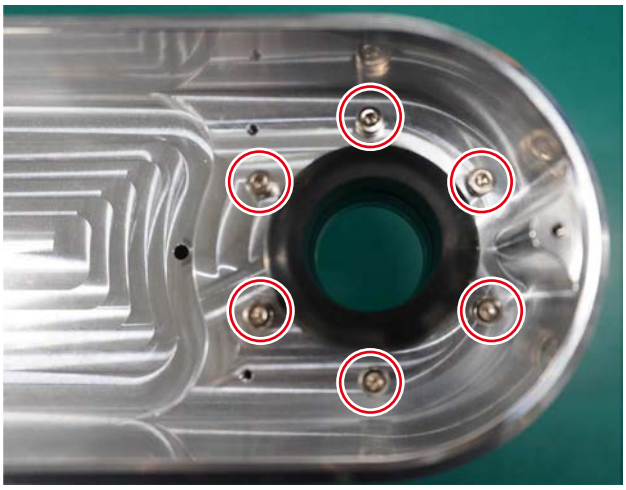
4. After replacement, the setup will be performed again.
5. Attach the movable cover and tighten the screws.
   Tightening torque: 0.6 N·m (85 oz-in)

2nd axis (M2) replacement

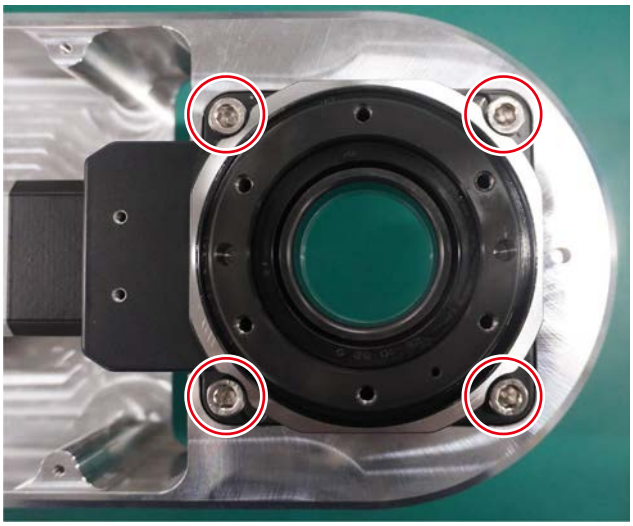
This explains how to use by taking the OVR3046K10-H as an example.



1. Remove the screw securing the cover of the 1st arm and the 2nd arm then remove the each cover.
2. Remove the Screws (6 pieces) securing the 2nd arm and 2nd axis (M2) then remove the 2nd arm.



3. Remove the Screws (4 pieces) securing the 2nd axis and the 1st arm then remove the 2nd axis (M2).

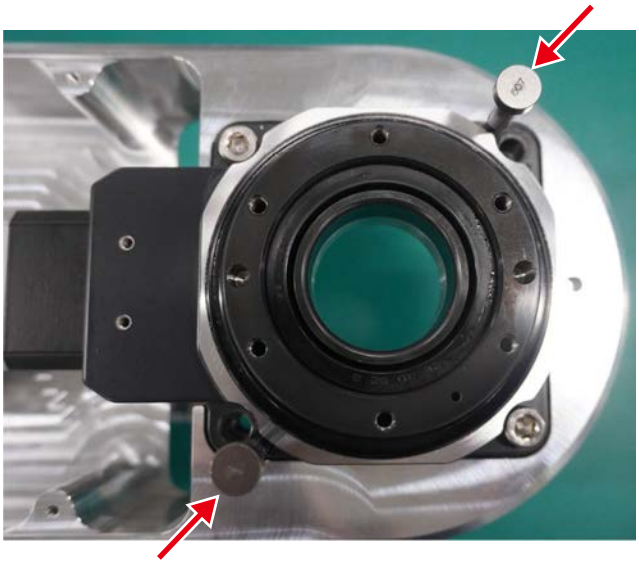


Note

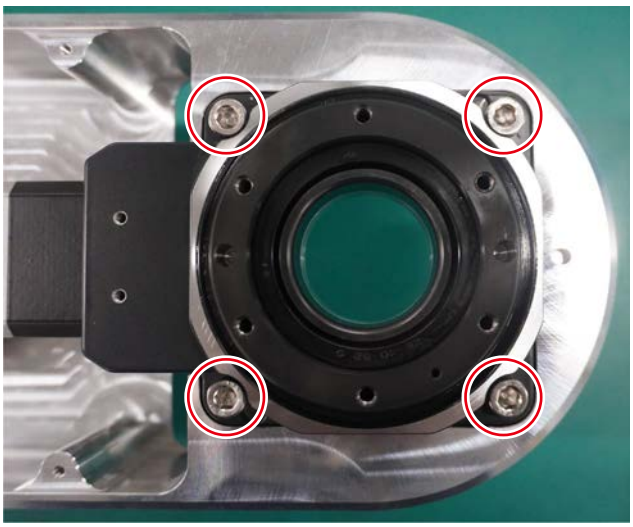
This product requires working from the underside. Hold the 2nd arm and the 2nd axis (M2) firmly to prevent them from dropping.

4. Insert the positioning pins (2 pieces) into the new 2nd axis (M2).
Positioning pins are to be provided by the customer.

Positioning pin hole diameter	$\varphi 5_{0}^{+0.012}$ mm ($\varphi 0.1969_{0}^{+0.0005}$ in.)
Positioning pin hole depth	15 mm (0.59 in.)



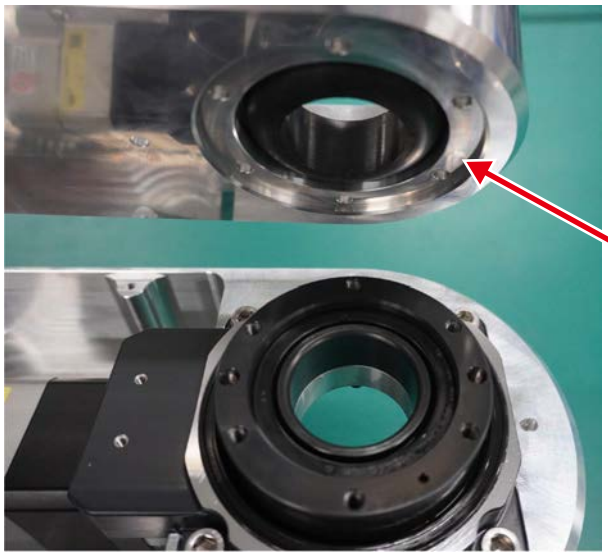
5. Using the positioning pin as a guide, secure the new 2nd axis (M2) to the 1st arm and tighten the screws (4 pieces).
   Tightening torque: 6 N·m (850 oz-in)



Note

This product requires working from the underside. Securely hold the 2nd arm and the 2nd axis (M2) to prevent them from dropping.

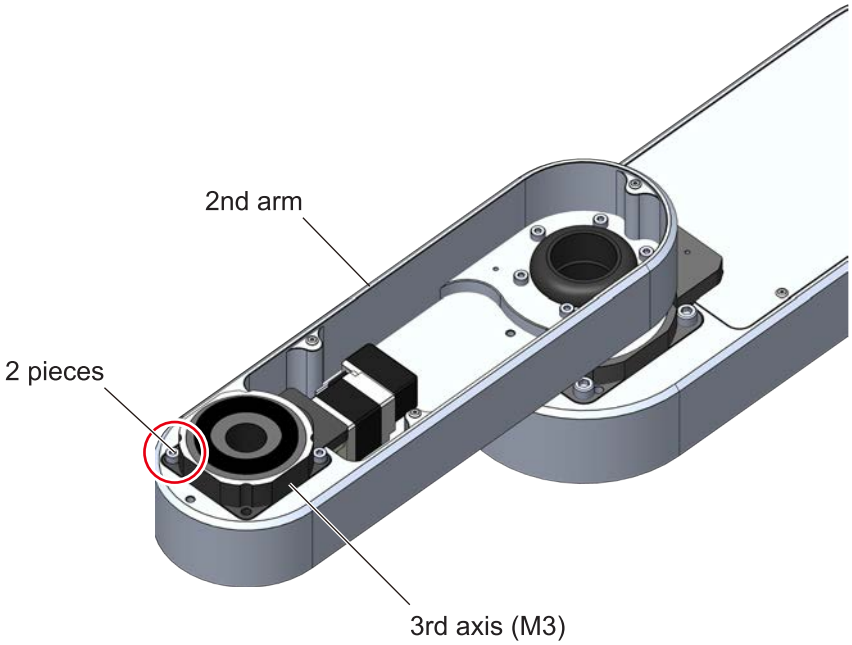
6. Remove the positioning pin.
7. Using the pilot of the 2nd arm as a guide, secure the 2nd arm to the new 2nd axis (M2) and tighten the screws (6 pieces).
   Tightening torque: 2 N·m (280 oz-in)



8. After replacement, the setup will be performed again.
9. Attach the movable cover and tighten the screws.
   Tightening torque: 0.6 N·m (85 oz-in)

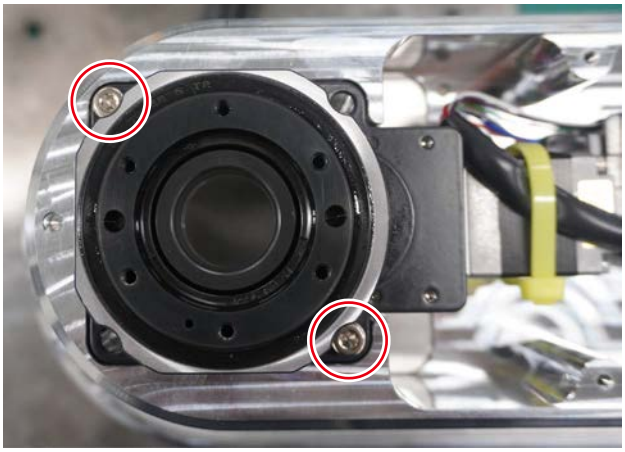
3rd axis (M3) replacement

This explains how to use by taking the OVR3046K10-H as an example.

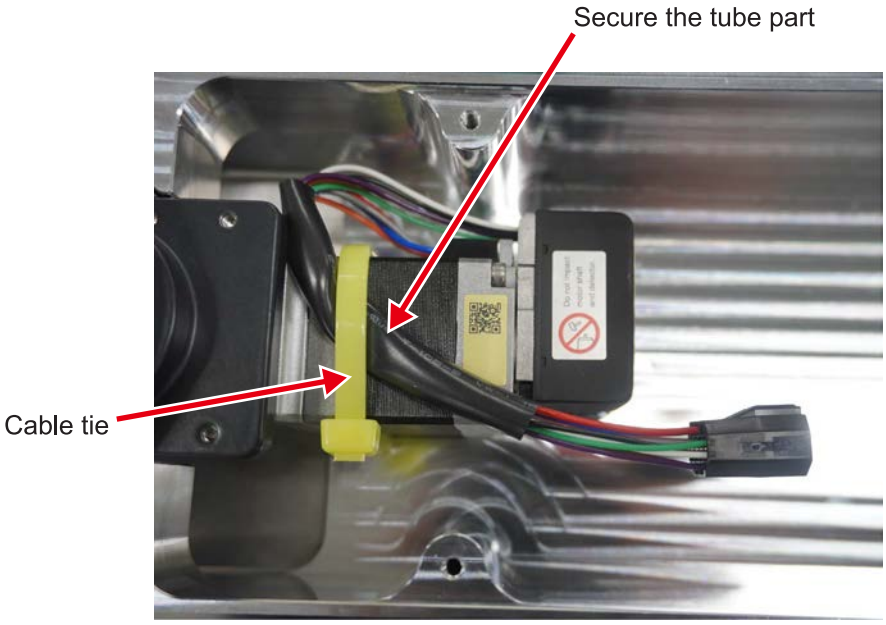


1. Remove the screw that secures the cover on the 2nd arm and remove the cover.
2. Remove the Screws (2 pieces) securing the 3rd axis (M3) and the 2nd arm then remove the 3rd

axis (M3).



3. For the OVR3046K10-H and OVR3070K3-H, bend the lead wire of the new 3rd axis (M3) to the opposite side of the table and secure the tube to the motor with the cable tie.
   The cable tie is to be provided by the customer.



Note

- Do not secure the lead wires directly.
- Do not excessively bend the lead wires near the connection part of the connector. Applying stress on the lead wires may cause poor contact or disconnection, leading to malfunction or heat generation.

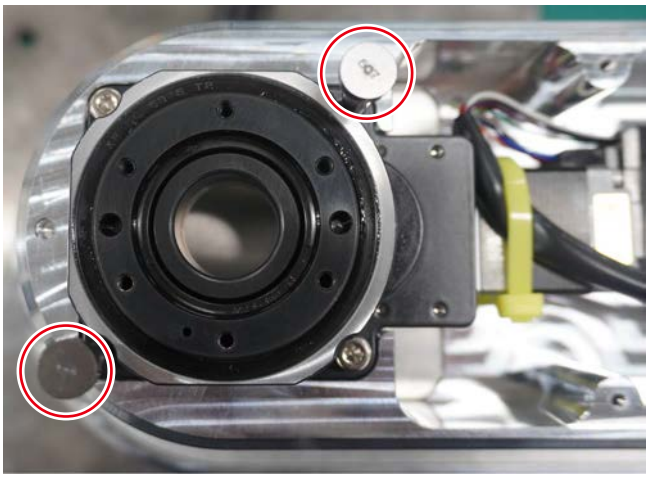
Tip

This step is not required for OVR3041K3-H.

4. Insert the positioning pins (2 pieces) into the new 3rd axis (M3).

Positioning pins are to be provided by the customer.

Positioning pin hole diameter	$\varphi 5_{0}^{+0.012}$ mm ($\varphi 0.1969_{0}^{+0.0005}$ in.)
Positioning pin hole depth	15 mm (0.59 in.)



5. Using the positioning pin as a guide, secure the new 3rd axis (M3) to the 2nd arm and tighten the two screws.
   Tightening torque: 2 N·m (280 oz-in)
6. Remove the positioning pin.
7. After replacement, the setup will be performed again.
8. Attach the movable cover and tighten the screws.
   Tightening torque: 0.6 N·m (85 oz-in)

Specifications

Product specifications

Check on the Oriental Motor Website for the product specifications.

General specifications

Degree of protection

IP40 (excluding the connector part)

Noise level

70 dB or less

Operating environment

Ambient Temperature: 0 to +40 °C (+32 to +104 °F) (non-freezing)
Humidity: 85 % or less (non-condensing)
Altitude: Up to 1,000 m (3,300 ft.) above sea level
Atmosphere: No corrosive gas or dust. No exposure to water or oil.

Storage environment and shipping environment

Ambient temperature: -20 to +60 °C (-4 to +140 °F) (non-freezing)
Humidity: 85 % or less (non-condensing)
Altitude: Up to 3,000 m (10,000 ft.) above sea level
Atmosphere: No corrosive gas or dust. No exposure to water or oil.

Regulations and standards

EU Machinery Directive

The robot and controller have been designed and manufactured to be incorporated into general industrial equipment, and a Declaration of Incorporation of Partly Completed Machinery is issued with them according to the EU Machinery Directive.
Applicable Standards: EN ISO 12100, EN ISO 10218-1

Hazardous substances

This product does not contain substances that exceed the restriction values of the RoHS Directive.

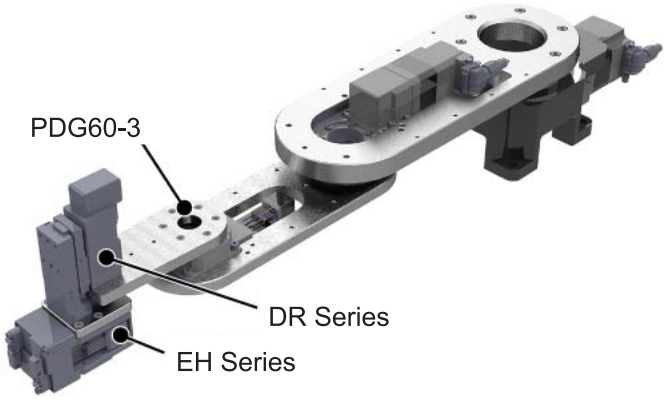
Accessories

Mounting bracket

This can be used for mounting end effectors and lifting axes.

Model	Installation location	Products that can be installed	Included	
			Mounting screw	Positioning pins
PDG60-1	3rd axis (M3)	EH3-AZAKH	M3×8 mm (0.31 in.) (10 pieces)	φ3×5.8 mm (0.23 in.) (2 pieces) φ4×9 mm (0.35 in.) (2 pieces)
PDG60-2		EH4-AZAKH	M3×8 mm (0.31 in.) (6 pieces) M4×8 mm (0.31 in.) (4 pieces)	
PDG60-3*1		DR28T, EH3-AZAKH	M2.5×10 mm (0.39 in.) (4 pieces) M3×8 mm (0.31 in.) (12 pieces)	φ3×5.8 mm (0.23 in.) (4 pieces) φ4×9 mm (0.35 in.) (2 pieces)
PDG60-4*1		DR28T, EH4-AZAKH	M2.5×10 mm (0.39 in.) (4 pieces) M3×8 mm (0.31 in.) (8 pieces) M4×8 mm (0.31 in.) (4 pieces)	
PDG60-5 *2 *3		AZM24AK-CSF8, P3F1, P3F2	M3×5 mm (0.2 in.) (6 pieces) M3×8 mm (0.31 in.) (10 pieces) M3×25 mm (0.98 in.) (4 pieces) M4×8 mm (0.31 in.) (4 pieces)	φ3×5.8 mm (0.23 in.) (2 pieces) φ4×9 mm (0.35 in.) (2 pieces)
PDG130-6	1st axis (M1)	EGC-HD-125-BS (Festo K.K.)	M5×15 mm (0.59 in.) (24 pieces) M8×15 mm (0.59 in.) (3 pieces) M8×25 mm (0.98 in.) (4 pieces)	φ5×8 mm (0.31 in.) (6 pieces)
PDG130-7		SKR46A (THK CO., LTD.)	M5×15 mm (0.59 in.) (8 pieces) M6×16 mm (0.63 in.) (4 pieces) M8×15 mm (0.59 in.) (3 pieces) M8×25 mm (0.98 in.) (4 pieces)	φ5×8 mm (0.31 in.) (4 pieces)

*1 When combined with OVR3046k10-H or OVR3070K3-H, the DR series is moved to the maximum stroke, the EH series may interfere with the 1st arm.



*2 Ensure the lead wire outlet direction downward when installing the motor (AZM24AK-CSF8) on the PDG60-5. If installed in any direction other than downward, the encoder part may interfere with the arm.

*3 This product cannot be used with OVR3046K10-H and OVR3070K3-H.

Specifications of mounting holes and positioning pin holes

Model	Mounting hole				Positioning pin holes	
	Hole diameter	Nominal size	Screw length	Tightening torque	Pin hole diameter	Pin hole depth
PDG60-1	φ3.4 mm (φ0.13 in.)	M3	8 mm (0.31 in.)	1 N·m (142 oz-in)	$\varphi 3_{0}^{+0.014}$ mm ($0.1181_{0}^{+0.0006}$ in.) $\varphi 4_{0}^{+0.018}$ mm ($0.1575_{0}^{+0.0007}$ in.)	3 mm (0.12 in.) (Blind hole) 4 mm (0.16 in.) (Blind hole)
PDG60-2	φ3.4 mm (φ0.13 in.)	M3	8 mm (0.31 in.)	1 N·m (142 oz-in)		
	φ4.5 mm (φ0.18 in.)	M4	8 mm (0.31 in.)	2 N·m (280 oz-in)		
PDG60-3	φ2.9 mm (φ0.11 in.)	M2.5	10 mm (0.39 in.)	0.5 N·m (71 oz-in)		
	φ3.4 mm (φ0.13 in.)	M3	8 mm (0.31 in.)	1 N·m (142 oz-in)		
PDG60-4	φ2.9 mm (φ0.11 in.)	M2.5	10 mm (0.39 in.)	0.5 N·m (71 oz-in)		
	φ3.4 mm (φ0.13 in.)	M3	8 mm (0.31 in.)	1 N·m (142 oz-in)		
	φ4.5 mm (φ0.18 in.)	M4	8 mm (0.31 in.)	2 N·m (280 oz-in)		
PDG60-5	φ3.4 mm (φ0.13 in.)	M3	5 mm (0.20 in.)	1 N·m (142 oz-in)		
	φ3.4 mm (φ0.13 in.)	M3	5 mm (0.20 in.)	1 N·m (142 oz-in)		
	φ3.4 mm (φ0.13 in.)	M3	25 mm (0.98 in.)	1 N·m (142 oz-in)		
	φ4.5 mm (φ0.18 in.)	M4	8 mm (0.31 in.)	2 N·m (280 oz-in)		
PDG130-6	φ5.5 mm (φ0.22 in.)	M5	15 mm (0.59 in.)	3 N·m (420 oz-in)	$\varphi 5_{0}^{+0.018}$ mm ($0.1969_{0}^{+0.0007}$ in.)	4 mm (0.16 in.) (Blind hole)
	φ9 mm (φ0.35 in.)	M8	15 mm (0.59 in.)	12 N·m (106 lb-in)		
	φ9 mm (φ0.35 in.)	M8	25 mm (0.98 in.)	12 N·m (106 lb-in)		
PDG130-7	φ5.5 mm (φ0.22 in.)	M5	15 mm (0.59 in.)	3 N·m (420 oz-in)		
	φ6.6 mm (φ0.26 in.)	M6	16 mm (0.63 in.)	5 N·m (710 oz-in)		
	φ9 mm (φ0.35 in.)	M8	15 mm (0.59 in.)	12 N·m (106 lb-in)		
	φ9 mm (φ0.35 in.)	M8	25 mm (0.98 in.)	12 N·m (106 lb-in)		

Appendix

Stopping distance and stop time

OVR3041K3-H

The following table shows the stopping distance and stop time for each axis when the main power supply is shut off due to an emergency stop while the product operates under the conditions listed below. (Stop category 0)

- Move 400 mm (15.75 in.) in the X-axis direction with linear interpolation operation
- Operating speed: 1,000 mm/s
- Load mass: 1 kg (2.2 lb.)

Axis	Stopping distance [deg]	Stop time [ms]
1st axis (M1)	1.4	400
2nd axis (M2)	18.8	
3rd axis (M3)	–14.1	

Data for the stopping distance and stop time is depend on Oriental Motor's measurement conditions.

OVR3046K10-H

The following table shows the stopping distance and stop time for each axis when the main power supply is shut off due to an emergency stop while the product operates under the conditions listed below. (Stop category 0)

- Move 500 mm (19.69 in.) in the X-axis direction with linear interpolation operation
- Operating speed: 1,000 mm/s
- Load mass: 3 kg (6.6 lb.)

Axis	Stopping distance [deg]	Stop time [ms]
1st axis (M1)	6.6	608
2nd axis (M2)	58.5	
3rd axis (M3)	–14.0	

Data for the stopping distance and stop time is depend on Oriental Motor's measurement conditions.

OVR3070K3-H

The following table shows the stopping distance and stop time for each axis when the main power supply is shut off due to an emergency stop while the product operates under the conditions listed below. (Stop category 0)

- Move 800 mm (31.5 in.) in the X-axis direction with linear interpolation operation
- Operating speed: 1,000 mm/s
- Load mass: 1 kg (2.2 lb.)

Axis	Stopping distance [deg]	Stop time [ms]
1st axis (M1)	7.5	504
2nd axis (M2)	35.3	
3rd axis (M3)	–19.2	

Data for the stopping distance and stop time is depend on Oriental Motor’s measurement conditions.

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