

**SCARA Robots  
XG Series**

**R6Y - XGC/XGP series**

**MAINTENANCE MANUAL**

**OMRON**



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## Safety Instructions

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# Safety Instructions

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# 1. Safety Information

Industrial robots are highly programmable, mechanical devices that provide a large degree of freedom when performing various manipulative tasks. To ensure safe and correct use of OMRON industrial robots and controllers, carefully read and comply with the safety instructions and precautions in this "Safety Instructions" guide. Failure to take necessary safety measures or incorrect handling may result in trouble or damage to the robot and controller, and also may cause personal injury (to installation personnel, robot operator or service personnel) including fatal accidents.

Before using this product, read this manual and related manuals and take safety precautions to ensure correct handling. The precautions listed in this manual relate to this product. To ensure safety of the user's final system that includes OMRON robots, please take appropriate safety measures as required by the user's individual system.

To use OMRON robots and controllers safely and correctly, always comply with the safety rules and instructions:

- For specific safety information and standards, refer to the applicable local regulations and comply with the instructions.
- Warning labels attached to the robots are written in English, Japanese, Chinese and Korean. This manual is available in English or Japanese (or some parts in Chinese). Unless the robot operators or service personnel understand these languages, do not permit them to handle the robot.
- Cautions regarding the official language of EU countries:  
For equipment that will be installed in EU countries, the language used for the manuals, warning labels, operation screen characters, and CE declarations is English only.  
Warning labels only have pictograms or else include warning messages in English. In the latter case, messages in Japanese or other languages might be added.

It is not possible to list all safety items in detail within the limited space of this manual. So please note that it is essential that the user have a full knowledge of safety and also make correct judgments on safety procedures.

## 2. Signal words used in this manual

This manual uses the following safety alert symbols and signal words to provide safety instructions that must be observed and to describe handling precautions, prohibited actions, and compulsory actions. Make sure you understand the meaning of each symbol and signal word and then read this manual.



### **DANGER**

THIS INDICATES AN IMMEDIATELY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.



### **WARNING**

THIS INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.



### **CAUTION**

This indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or damage to the equipment.



### **NOTE**

Explains the key point in the operation in a simple and clear manner.

## 3. Warning labels

Warning labels shown below are attached to the robot body and controller to alert the operator to potential hazards. To ensure correct use, read the warning labels and comply with the instructions.

### 3.1 Warning labels



#### WARNING

IF WARNING LABELS ARE REMOVED OR DIFFICULT TO SEE, THEN THE NECESSARY PRECAUTIONS MAY NOT BE TAKEN, RESULTING IN AN ACCIDENT.

- DO NOT REMOVE, ALTER OR STAIN THE WARNING LABELS ON THE ROBOT BODY.
- DO NOT ALLOW WARNING LABELS TO BE HIDDEN BY DEVICES INSTALLED ON THE ROBOT BY THE USER.
- PROVIDE PROPER LIGHTING SO THAT THE SYMBOLS AND INSTRUCTIONS ON THE WARNING LABELS CAN BE CLEARLY SEEN FROM OUTSIDE THE SAFETY ENCLOSURE.

#### 3.1.1 Warning label messages on robot and controller

Word messages on the danger, warning and caution labels are concise and brief instructions. For more specific instructions, read and follow the "Instructions on this label" described on the right of each label shown below. See "7.1 Movement range" in "Safety instructions" for details on the robot's movement range.

##### 1. Warning label 1 (SCARA robots)



#### DANGER

SERIOUS INJURY MAY RESULT FROM CONTACT WITH A MOVING ROBOT.

- KEEP OUTSIDE OF THE ROBOT SAFETY ENCLOSURE DURING OPERATION.
- PRESS THE EMERGENCY STOP BUTTON BEFORE ENTERING THE SAFETY ENCLOSURE.

| Instructions on this label            |  |
|---------------------------------------|--|
|                                       | <ul style="list-style-type: none"> <li>• Always install a safety enclosure to keep all persons away from the robot movement range and prevent injury from contacting the moving part of the robot.</li> <li>• Install an interlock that triggers emergency stop when the door or gate of the safety enclosure is opened.</li> <li>• The safety enclosure should be designed so that no one can enter inside except from the door or gate equipped with an interlock device.</li> <li>• Warning label 1 that comes supplied with a robot should be affixed to an easy-to-see location on the door or gate of the safety enclosure.</li> </ul> |
| <b>Potential hazard to human body</b> | Serious injury may result from contact with a moving robot.  |
| <b>To avoid hazard</b>                | <ul style="list-style-type: none"> <li>• Keep outside of the robot safety enclosure during operation.</li> <li>• Press the emergency stop button before entering the safety enclosure.</li> </ul>  |

##### 2. Warning label 2 (SCARA robots)



#### WARNING

MOVING PARTS CAN PINCH OR CRUSH HANDS.  
KEEP HANDS AWAY FROM THE MOVABLE PARTS OF THE ROBOT.

| Instructions on this label            |   |
|---------------------------------------|---|
|                                       | <p>Use caution to prevent hands and fingers from being pinched or crushed by the movable parts of the robot when transporting or moving the robot or during teaching.</p> |
| <b>Potential hazard to human body</b> | Moving parts can pinch or crush hands.  |
| <b>To avoid hazard</b>                | Keep hands away from the movable parts of the robot.  |

### 3. Warning label 3 (SCARA robots)



#### WARNING

IMPROPER INSTALLATION OR OPERATION MAY CAUSE SERIOUS INJURY.  
BEFORE INSTALLING OR OPERATING THE ROBOT, READ THE MANUAL AND INSTRUCTIONS ON THE WARNING LABELS AND UNDERSTAND THE CONTENTS.

| Instructions on this label     |   |
|--------------------------------|---|
|                                | <ul style="list-style-type: none"> <li>• Be sure to read the warning label and this manual carefully to make you completely understand the contents before attempting installation and operation of the robot.</li> <li>• Before starting the robot operation, even after you have read through this manual, read again the corresponding procedures and "Safety instructions" in this manual.</li> <li>• Never install, adjust, inspect or service the robot in any manner that does not comply with the instructions in this manual.</li> </ul> |
| Potential hazard to human body | Improper installation or operation may cause serious injury.  |
| To avoid hazard                | Before installing or operating the robot, read the manual and instructions on the warning labels and understand the contents.   |

### 4. Warning label 4 (SCARA robots)



#### CAUTION

Do not remove the parts on which Warning label 4 is attached.  
Doing so may damage the ball screw.

| Instructions on this label |  |
|----------------------------|--|
|                            | <p>The Z-axis ball screw will be damaged if the upper end mechanical stopper on the Z-axis spline is removed or moved. Never attempt to remove or move it.</p> |

### 5. Warning label 5 (Controller)



#### WARNING

GROUND THE CONTROLLER TO PREVENT ELECTRICAL SHOCK.  
GROUND TERMINAL IS LOCATED INSIDE THIS COVER.  
READ THE MANUAL FOR DETAILS.

| Instructions on this label     |   |
|--------------------------------|---|
|                                | <ul style="list-style-type: none"> <li>• High voltage section inside</li> <li>• To prevent electrical shock, always ground the robot using the ground terminal located inside the cover.</li> </ul> |
| Potential hazard to human body | Electrical shock  |
| To avoid hazard                | Ground the controller.  |


## 6. "Read instruction manual" label (Controller)\*

\* This label is attached to the front panel.



### CAUTION

Refer to the manual.

|   | Instructions on this label  |
|---|---|
|  | <p>This indicates important information that you must know and is described in the manual.</p> <p>Before using the controller, be sure to read the manual thoroughly.</p> <p>When adding external safety circuits or connecting a power supply to the controller, read the manual carefully and make checks before beginning the work.</p> <p>Connectors have an orientation. Insert each connector in the correct direction.</p> |

### 3.1.2 Supplied warning labels

Some warning labels are not affixed to robots but included in the packing box. These warning labels should be affixed to an easy-to-see location.

- Warning label is attached to the robot body.
- Warning label comes supplied with the robot and should be affixed to an easy-to-see location on the door or gate of the safety enclosure.
- ◎ Warning label comes supplied with the robot and should be affixed to an easy-to-see location.

|                 |   | SCARA robots  |
|-----------------|---|---|
| Warning label 1 |    | <ul style="list-style-type: none"> <li>● *1</li> <li>○</li> </ul> |
| Warning label 2 |   | <ul style="list-style-type: none"> <li>● *1</li> </ul>            |
| Warning label 3 |  | <ul style="list-style-type: none"> <li>● *1</li> </ul>            |

\*1: See "Part names" in each SCARA robot manual for label positions.

## 3.2 Warning symbols


Warning symbols shown below are indicated on the robots and controllers to alert the operator to potential hazards. To use the OMRON robot safely and correctly always follow the instructions and cautions indicated by the symbols.

### 1. Electrical shock hazard symbol



#### WARNING

TOUCHING THE TERMINAL BLOCK OR CONNECTOR MAY CAUSE ELECTRICAL SHOCK, SO USE CAUTION.


|   | Instructions by this symbol   |
|---|---|
|  | <p>This indicates a high voltage is present. Touching the terminal block or connector may cause electrical shock.</p> |

### 2. High temperature hazard symbol



#### WARNING

MOTORS, HEATSINKS, AND REGENERATIVE UNITS BECOME HOT, SO DO NOT TOUCH THEM.


|  | Instructions by this symbol  |
|--|--|
|  | <p>This indicates the area around this symbol may become very hot. Motors, heatsinks, and regenerative units become hot during and shortly after operation. To avoid burns be careful not to touch those sections.</p> |

### 3. Caution symbol



#### CAUTION

Always read the manual carefully before using the controller.

|   | Instructions by this symbol   |
|---|---|
|  | <p>This indicates important information that you must know and is described in the manual. Before using the controller, be sure to read the manual thoroughly. When adding external safety circuits or connecting a power supply to the controller, read the manual carefully and make checks before beginning the work. Connectors must be attached while facing a certain direction, so insert each connector in the correct direction.</p> |

## 4. Major precautions for each stage of use

This section describes major precautions that must be observed when using robots and controllers. Be sure to carefully read and comply with all of these precautions even if there is no alert symbol shown.

### 4.1 Precautions for using robots and controllers

General precautions for using robots and controllers are described below.

#### 1. Applications where robots cannot be used

OMRON robots and robot controllers are designed as general-purpose industrial equipment and cannot be used for the following applications.



##### **DANGER**

OMRON ROBOT CONTROLLERS AND ROBOTS ARE DESIGNED AS GENERAL-PURPOSE INDUSTRIAL EQUIPMENT AND CANNOT BE USED FOR THE FOLLOWING APPLICATIONS.

- IN MEDICAL EQUIPMENT SYSTEMS WHICH ARE CRITICAL TO HUMAN LIFE
- IN SYSTEMS THAT SIGNIFICANTLY AFFECT SOCIETY AND THE GENERAL PUBLIC
- IN EQUIPMENT INTENDED TO CARRY OR TRANSPORT PEOPLE
- IN ENVIRONMENTS WHICH ARE SUBJECT TO VIBRATION SUCH AS ONBOARD SHIPS AND VEHICLES.

#### 2. Qualification of operators/workers

Operators or persons who handle the robot such as for teaching, programming, movement check, inspection, adjustment, and repair must receive appropriate training and also have the skills needed to perform the job correctly and safely. They must read the manual carefully to understand its contents before attempting the robot operation or maintenance.

Tasks related to industrial robots (teaching, programming, movement check, inspection, adjustment, repair, etc.) must be performed by qualified persons who meet requirements established by local regulations and standards for industrial robots.



##### **WARNING**

- THE ROBOT MUST BE OPERATED ONLY BY PERSONS WHO HAVE RECEIVED SAFETY AND OPERATION TRAINING. OPERATION BY AN UNTRAINED PERSON IS EXTREMELY HAZARDOUS.
- ADJUSTMENT AND MAINTENANCE BY REMOVING A COVER REQUIRE SPECIALIZED TECHNICAL KNOWLEDGE AND SKILLS, AND MAY ALSO INVOLVE HAZARDS IF ATTEMPTED BY AN UNSKILLED PERSON. THESE TASKS MUST BE PERFORMED ONLY BY PERSONS WHO HAVE ENOUGH ABILITY AND QUALIFICATIONS IN ACCORDANCE WITH LOCAL LAWS AND REGULATIONS. FOR DETAILED INFORMATION, PLEASE CONTACT YOUR DISTRIBUTOR WHERE YOU PURCHASED THE PRODUCT.



## 4.2 Design

### 4.2.1 Precautions for robots

#### 1. Restricting the robot moving speed

**WARNING**

RESTRICTION ON THE ROBOT MOVING SPEED IS NOT A SAFETY-RELATED FUNCTION. TO REDUCE THE RISK OF COLLISION BETWEEN THE ROBOT AND WORKERS, THE USER MUST TAKE THE NECESSARY PROTECTIVE MEASURES SUCH AS ENABLE DEVICES ACCORDING TO RISK ASSESSMENT BY THE USER.

#### 2. Restricting the movement range

See “7.1 Movement range” in “Safety instructions” for details on the robot’s movement range.

**WARNING**

SOFT LIMIT FUNCTION IS NOT A SAFETY-RELATED FUNCTION INTENDED TO PROTECT THE HUMAN BODY. TO RESTRICT THE ROBOT MOVEMENT RANGE TO PROTECT THE HUMAN BODY, USE THE MECHANICAL STOPPERS INSTALLED IN THE ROBOT (OR AVAILABLE AS OPTIONS).

**CAUTION**

If the robot moving at high speed collides with a mechanical stopper installed in the robot (or available as option), the robot may be damaged.

#### 3. Provide safety measures for end effector (gripper, etc.)

**WARNING**

- END EFFECTORS MUST BE DESIGNED AND MANUFACTURED SO THAT THEY CAUSE NO HAZARDS (SUCH AS A LOOSE WORKPIECE OR LOAD) EVEN IF POWER (ELECTRICITY, AIR PRESSURE, ETC.) IS SHUT OFF OR POWER FLUCTUATIONS OCCUR.
- IF THE OBJECT GRIPPED BY THE END EFFECTOR MIGHT POSSIBLY FLY OFF OR DROP, THEN PROVIDE APPROPRIATE SAFETY PROTECTION TAKING INTO ACCOUNT THE OBJECT SIZE, WEIGHT, TEMPERATURE, AND CHEMICAL PROPERTIES.

#### 4. Provide adequate lighting

Provide enough lighting to ensure safety during work.

#### 5. Install an operation status light

**WARNING**

INSTALL A SIGNAL LIGHT (SIGNAL TOWER) AT AN EASY-TO-SEE POSITION SO THAT THE OPERATOR WILL BE AWARE OF THE ROBOT STOP STATUS (TEMPORARILY STOPPED, EMERGENCY STOP, ERROR STOP, ETC.).

### 4.2.2 Precautions for robot controllers

#### 1. Emergency stop input terminal

**DANGER**

EACH ROBOT CONTROLLER HAS AN EMERGENCY STOP INPUT TERMINAL TO TRIGGER EMERGENCY STOP. USING THIS TERMINAL, INSTALL A SAFETY CIRCUIT SO THAT THE SYSTEM INCLUDING THE ROBOT CONTROLLER WILL WORK SAFELY.

#### 2. Maintain clearance

**CAUTION**

Do not bundle control lines or communication cables together or in close to the main power supply or power lines. Usually separate these by at least 100mm. Failure to follow this instruction may cause malfunction due to noise.

## 4.3 Moving and installation

### 4.3.1 Precautions for robots

#### ■ Installation environment

##### 1. Do not use in strong magnetic fields



**WARNING**

DO NOT USE THE ROBOT NEAR EQUIPMENT OR IN LOCATIONS THAT GENERATE STRONG MAGNETIC FIELDS. THE ROBOT MAY BREAK DOWN OR MALFUNCTION IF USED IN SUCH LOCATIONS.

##### 2. Do not use in locations subject to possible electromagnetic interference, etc.



**WARNING**

DO NOT USE THE ROBOT IN LOCATIONS SUBJECT TO ELECTROMAGNETIC INTERFERENCE, ELECTROSTATIC DISCHARGE OR RADIO FREQUENCY INTERFERENCE. THE ROBOT MAY MALFUNCTION IF USED IN SUCH LOCATIONS CREATING HAZARDOUS SITUATIONS.

##### 3. Do not use in locations exposed to flammable gases



**WARNING**

- OMRON ROBOTS ARE NOT DESIGNED TO BE EXPLOSION-PROOF.
- DO NOT USE THE ROBOTS IN LOCATIONS EXPOSED TO EXPLOSIVE OR INFLAMMABLE GASES, DUST PARTICLES OR LIQUID. FAILURE TO FOLLOW THIS INSTRUCTION MAY CAUSE SERIOUS ACCIDENTS INVOLVING INJURY OR DEATH, OR LEAD TO FIRE.

#### ■ Moving

##### 1. Use caution to prevent pinching or crushing of hands or fingers



**WARNING**

MOVING PARTS CAN PINCH OR CRUSH HANDS OR FINGERS.  
KEEP HANDS AWAY FROM THE MOVABLE PARTS OF THE ROBOT.

As instructed in Warning label 2, use caution to prevent hands or fingers from being pinched or crushed by movable parts when transporting or moving the robot. For details on warning labels, see "3. Warning labels" in "Safety instructions."

##### 2. Take safety measures when moving the robot

To ensure safety when moving a SCARA robot with an arm length of 500mm or more, use the eyebolts that come supplied with the robot.

Refer to the Robot Manual for details.

#### ■ Installation

##### 1. Protect electrical wiring and hydraulic/pneumatic hoses

Install a cover or similar item to protect the electrical wiring and hydraulic/pneumatic hoses from possible damage.

#### ■ Wiring

##### 1. Protective measures against electrical shock



**WARNING**

ALWAYS GROUND THE ROBOT TO PREVENT ELECTRICAL SHOCK.

## ■ Adjustment

### 1. Adjustment that requires removing a cover



#### WARNING

ADJUSTMENT BY REMOVING A COVER REQUIRE SPECIALIZED TECHNICAL KNOWLEDGE AND SKILLS, AND MAY ALSO INVOLVE HAZARDS IF ATEMPTED BY AN UNSKILLED PERSON. THESE TASKS MUST BE PERFORMED ONLY BY PERSONS WHO HAVE ENOUGH ABILITY AND QUALIFICATIONS IN ACORDANCE WITH LOCAL LAWS AND REGULATIONS. FOR DETAILED INFORMATION, PLEASE CONTACT YOUR DISTRIBUTOR WHERE YOU PURCHASED THE PRODUCT.

## 4.3.2 Precautions for robot controllers

### ■ Installation environment

#### 1. Installation environment



#### WARNING

OMRON ROBOTS ARE NOT DESIGNED TO BE EXPLOSION-PROOF. DO NOT USE THE ROBOTS AND CONTROLLERS IN LOCATIONS EXPOSED TO EXPLOSIVE OR INFLAMMABLE GASES, DUST PARTICLES OR LIQUID SUCH AS GASOLINE AND SOLVENTS. FAILURE TO FOLLOW THIS INSTRUCTION MAY CAUSE SERIOUS ACCIDENTS INVOLVING INJURY OR DEATH, AND LEAD TO FIRE.



#### WARNING

- USE THE ROBOT CONTROLLER IN LOCATIONS THAT SUPPORT THE ENVIRONMENTAL CONDITIONS SPECIFIED IN THIS MANUAL. OPERATION OUTSIDE THE SPECIFIED ENVIRONMENTAL RANGE MAY CAUSE ELECTRICAL SHOCK, FIRE, MALFUNCTION OR PRODUCT DAMAGE OR DETERIORATION.
- THE ROBOT CONTROLLER AND PROGRAMMING BOX MUST BE INSTALLED AT A LOCATION THAT IS OUTSIDE THE ROBOT SAFETY ENCLOSURE YET WHERE IT IS EASY TO OPERATE AND VIEW ROBOT MOVEMENT.
- INSTALL THE ROBOT CONTROLLER IN LOCATIONS WITH ENOUGH SPACE TO PERFORM WORK (TEACHING, INSPECTION, ETC.) SAFELY. LIMITED SPACE NOT ONLY MAKES IT DIFFICULT TO PERFORM WORK BUT CAN ALSO CAUSE INJURY.
- INSTALL THE ROBOT CONTROLLER IN A STABLE, LEVEL LOCATION AND SECURE IT FIRMLY. AVOID INSTALLING THE CONTROLLER UPSIDE DOWN OR IN A TILTED POSITION.
- PROVIDE SUFFICIENT CLEARANCE AROUND THE ROBOT CONTROLLER FOR GOOD VENTILATION. INSUFFICIENT CLEARANCE MAY CAUSE MALFUNCTION, BREAKDOWN OR FIRE.

### ■ Installation

To install the robot controller, observe the installation conditions and method described in the manual.

#### 1. Installation



#### WARNING

SECURELY TIGHTEN THE SCREWS FOR THE L-SHAPED BRACKETS USED TO INSTALL THE ROBOT CONTROLLER. IF NOT SECURELY TIGHTENED, THE SCREWS MAY COME LOOSE CAUSING THE CONTROLLER TO DROP.

#### 2. Connections



#### WARNING

- ALWAYS SHUT OFF ALL PHASES OF THE POWER SUPPLY EXTERNALLY BEFORE STARTING INSTALLATION OR WIRING WORK. FAILURE TO DO THIS MAY CAUSE ELECTRICAL SHOCK OR PRODUCT DAMAGE.
- NEVER DIRECTLY TOUCH CONDUCTIVE SECTIONS AND ELECTRONIC PARTS OTHER THAN THE CONNECTORS, ROTARY SWITCHES, AND DIP SWITCHES ON THE OUTSIDE PANEL OF THE ROBOT CONTROLLER. TOUCHING THEM MAY CAUSE ELECTRICAL SHOCK OR BREAKDOWN.
- SECURELY INSTALL EACH CABLE CONNECTOR INTO THE RECEPTACLES OR SOCKETS. POOR CONNECTIONS MAY CAUSE THE CONTROLLER OR ROBOT TO MALFUNCTION.

## ■ Wiring

### 1. Connection to robot controller

The controller parameters are preset at the factory before shipping to match the robot model. Check the specified robot and controller combination, and connect them in the correct combination.

Since the software detects abnormal operation such as motor overloads, the controller parameters must be set correctly to match the motor type used in the robot connected to the controller.

### 2. Wiring safety points

**WARNING**

ALWAYS SHUT OFF ALL PHASES OF THE POWER SUPPLY EXTERNALLY BEFORE STARTING INSTALLATION OR WIRING WORK. FAILURE TO DO THIS MAY CAUSE ELECTRICAL SHOCK OR PRODUCT DAMAGE.

**CAUTION**

- Make sure that no foreign matter such as cutting chips or wire scraps get into the robot controller. Malfunction, breakdown or fire may result if these penetrate inside.
- Do not apply excessive impacts or loads to the connectors when making cable connections. This might bend the connector pins or damage the internal PC board.
- When using ferrite cores for noise elimination, be sure to fit them onto the power cable as close to the robot controller and/or the robot as possible, to prevent malfunction caused by noise.

### 3. Wiring method

**WARNING**

SECURELY INSTALL THE CONNECTORS INTO THE ROBOT CONTROLLER AND, WHEN WIRING THE CONNECTORS, MAKE THE CRIMP, PRESS-CONTACT OR SOLDER CONNECTIONS CORRECTLY USING THE TOOL SPECIFIED BY THE CONNECTOR MANUFACTURER.

**CAUTION**

When disconnecting the cable from the robot controller, detach by gripping the connector itself and not by tugging on the cable. Loosen the screws on the connector (if fastened with the screws), and then disconnect the cable. Trying to detach by pulling on the cable itself may damage the connector or cables, and poor cable contact will cause the controller or robot to malfunction.

### 4. Precautions for cable routing and installation

**CAUTION**

- Always store the cables connected to the robot controller in a conduit or clamp them securely in place. If the cables are not stored in a conduit or properly clamped, excessive play or movement or mistakenly pulling on the cable may damage the connector or cables, and poor cable contact will cause the controller or robot to malfunction.
- Do not modify the cables and do not place any heavy objects on them. Handle them carefully to avoid damage. Damaged cables may cause malfunction or electrical shock.
- If the cables connected to the robot controller may possibly become damaged, then protect them with a cover, etc.
- Check that the control lines and communication cables are routed at a gap sufficiently away from main power supply circuits and power lines, etc. Bundling them together with power lines or close to power lines may cause faulty operation due to noise.

### 5. Protective measures against electrical shock

**WARNING**

BE SURE TO GROUND THE CONTROLLER USING THE GROUND TERMINAL ON THE POWER TERMINAL BLOCK. POOR GROUNDING MAY CAUSE ELECTRICAL SHOCK.

## 4.4 Safety measures

### 4.4.1 Safety measures

#### 1. Referring to warning labels and manual



##### WARNING

- BEFORE STARTING INSTALLATION OR OPERATION OF THE ROBOT, BE SURE TO READ THE WARNING LABELS AND THIS MANUAL, AND COMPLY WITH THE INSTRUCTIONS.
- NEVER ATTEMPT ANY REPAIR, PARTS REPLACEMENT AND MODIFICATION UNLESS DESCRIBED IN THIS MANUAL. THESE TASKS REQUIRE SPECIALIZED TECHNICAL KNOWLEDGE AND SKILLS AND MAY ALSO INVOLVE HAZARDS. PLEASE CONTACT YOUR DISTRIBUTOR FOR ADVICE.



##### NOTE

For details on warning labels, see "3. Warning labels" in "Safety instructions."

#### 2. Draw up "work instructions" and make the operators/workers understand them



##### WARNING

DECIDE ON "WORK INSTRUCTIONS" IN CASES WHERE PERSONNEL MUST WORK WITHIN THE ROBOT SAFETY ENCLOSURE TO PERFORM STARTUP OR MAINTENANCE WORK. MAKE SURE THE WORKERS COMPLETELY UNDERSTAND THESE "WORK INSTRUCTIONS".

Decide on "work instructions" for the following items in cases where personnel must work within the robot safety enclosure to perform teaching, maintenance or inspection tasks. Make sure the workers completely understand these "work instructions".

1. Robot operating procedures needed for tasks such as startup procedures and handling switches
2. Robot speeds used during tasks such as teaching
3. Methods for workers to signal each other when two or more workers perform tasks
4. Steps that the worker should take when a problem or emergency occurs
5. Steps to take after the robot has come to a stop when the emergency stop device was triggered, including checks for cancelling the problem or error state and safety checks in order to restart the robot.
6. In cases other than above, the following actions should be taken as needed to prevent hazardous situations due to sudden or unexpected robot operation or faulty robot operation as listed below.
  - Place a display sign on the operator panel
  - Ensure the safety of workers performing tasks within the robot safety enclosure
  - Clearly specify position and posture during work
    - Specify a position and posture where worker can constantly check robot movements and immediately move to avoid trouble if an error/problem occurs
  - Take noise prevention measures
  - Use methods for signaling operators of related equipment
  - Use methods to decide that an error has occurred and identify the type of error

Implement the "work instructions" according to the type of robot, installation location, and type of work task.

When drawing up the "work instructions", make an effort to include opinions from the workers involved, equipment manufacturer technicians, and workplace safety consultants, etc.

#### 3. Take safety measures



##### DANGER

- NEVER ENTER THE ROBOT MOVEMENT RANGE WHILE THE ROBOT IS OPERATING OR THE MAIN POWER IS TURNED ON. FAILURE TO FOLLOW THIS WARNING MAY CAUSE SERIOUS ACCIDENTS INVOLVING INJURY OR DEATH. INSTALL A SAFETY ENCLOSURE OR A GATE INTERLOCK WITH AN AREA SENSOR TO KEEP ALL PERSONS AWAY FROM THE ROBOT MOVEMENT RANGE.
- WHEN IT IS NECESSARY TO OPERATE THE ROBOT WHILE YOU ARE WITHIN THE ROBOT MOVEMENT RANGE SUCH AS FOR TEACHING OR MAINTENANCE/INSPECTION TASKS, ALWAYS CARRY THE PROGRAMMING BOX WITH YOU SO THAT YOU CAN IMMEDIATELY STOP THE ROBOT OPERATION IN CASE OF AN ABNORMAL OR HAZARDOUS CONDITION. INSTALL AN ENABLE DEVICE IN THE EXTERNAL SAFETY CIRCUIT AS NEEDED. ALSO SET THE ROBOT MOVING SPEED TO 3% OR LESS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY CAUSE SERIOUS ACCIDENTS INVOLVING INJURY OR DEATH.

**WARNING**

- DURING STARTUP OR MAINTENANCE TASKS, DISPLAY A SIGN "WORK IN PROGRESS" ON THE PROGRAMMING BOX AND OPERATION PANEL IN ORDER TO PREVENT ANYONE OTHER THAN THE PERSON FOR THAT TASK FROM MISTAKENLY OPERATING THE START OR SELECTOR SWITCH. IF NEEDED, TAKE OTHER MEASURES SUCH AS LOCKING THE COVER ON THE OPERATION PANEL.
- ALWAYS CONNECT THE ROBOT AND ROBOT CONTROLLER IN THE CORRECT COMBINATION. USING THEM IN AN INCORRECT COMBINATION MAY CAUSE FIRE OR BREAKDOWN.

**4. Install system**

When configuring an automated system using a robot, hazardous situations are more likely to occur from the automated system than the robot itself. So the system manufacturer should install the necessary safety measures required for the individual system. The system manufacturer should provide a proper manual for safe, correct operation and servicing of the system.

**WARNING**

TO CHECK THE ROBOT CONTROLLER OPERATING STATUS, REFER TO THIS MANUAL AND TO RELATED MANUALS. DESIGN AND INSTALL THE SYSTEM INCLUDING THE ROBOT CONTROLLER SO THAT IT WILL ALWAYS WORK SAFELY.

**5. Precautions for operation****WARNING**

- DO NOT TOUCH ANY ELECTRICAL TERMINAL. DIRECTLY TOUCHING THESE TERMINALS MAY CAUSE ELECTRICAL SHOCK, EQUIPMENT DAMAGE, AND MALFUNCTION.
- DO NOT TOUCH OR OPERATE THE ROBOT CONTROLLER OR PROGRAMMING BOX WITH WET HANDS. TOUCHING OR OPERATING THEM WITH WET HANDS MAY RESULT IN ELECTRICAL SHOCK OR BREAKDOWN.

**6. Do not disassemble and modify****WARNING**

NEVER DISASSEMBLE AND MODIFY ANY PART IN THE ROBOT, CONTROLLER, AND PROGRAMMING BOX. DO NOT OPEN ANY COVER. DOING SO MAY CAUSE ELECTRICAL SHOCK, BREAKDOWN, MALFUNCTION, INJURY, OR FIRE.

**4.4.2 Installing a safety enclosure**

Be sure to install a safety enclosure to keep anyone from entering within the movement range of the robot. The safety enclosure will prevent the operator and other persons from coming in contact with moving parts of the robot and suffering injury.

See "7.1 Movement range" in "Safety instructions" for details on the robot's movement range.

**DANGER**

SERIOUS INJURY MAY RESULT FROM CONTACT WITH A MOVING ROBOT.

- KEEP OUTSIDE OF THE ROBOT SAFETY ENCLOSURE DURING OPERATION.
- PRESS THE EMERGENCY STOP BUTTON BEFORE ENTERING THE SAFETY ENCLOSURE.

**WARNING**

- INSTALL AN INTERLOCK THAT TRIGGERS EMERGENCY STOP WHEN THE DOOR OR GATE OF THE SAFETY ENCLOSURE IS OPENED.
- THE SAFETY ENCLOSURE SHOULD BE DESIGNED SO THAT NO ONE CAN ENTER INSIDE EXCEPT FROM THE DOOR OR GATE EQUIPPED WITH AN INTERLOCK DEVICE.
- WARNING LABEL 1 (SEE "3. WARNING LABELS" IN "SAFETY INSTRUCTIONS") THAT COMES SUPPLIED WITH A ROBOT SHOULD BE AFFIXED TO AN EASY-TO-SEE LOCATION ON THE DOOR OR GATE OF THE SAFETY ENCLOSURE.

## 4.5 Operation

When operating a robot, ignoring safety measures and checks may lead to serious accidents. Always take the following safety measures and checks to ensure safe operation.



### DANGER

CHECK THE FOLLOWING POINTS BEFORE STARTING ROBOT OPERATION.

- NO ONE IS WITHIN THE ROBOT SAFETY ENCLOSURE.
- THE PROGRAMMING UNIT IS IN THE SPECIFIED LOCATION.
- THE ROBOT AND PERIPHERAL EQUIPMENT ARE IN GOOD CONDITION.

### 4.5.1 Trial operation

After installing, adjusting, inspecting, maintaining or repairing the robot, perform trial operation using the following procedures.

#### 1. If a safety enclosure has not yet been provided right after installing the robot:

Then rope off or chain off the movement range around the robot in place of the safety enclosure and observe the following points. See “7.1 Movement range” in “Safety instructions” for details on the robot’s movement range.



### DANGER

PLACE A "ROBOT IS MOVING - KEEP AWAY!" SIGN TO KEEP THE OPERATOR OR OTHER PERSONNEL FROM ENTERING WITHIN THE MOVEMENT RANGE OF THE ROBOT.



### WARNING

- USE STURDY, STABLE POSTS WHICH WILL NOT FALL OVER EASILY.
- THE ROPE OR CHAIN SHOULD BE EASILY VISIBLE TO EVERYONE AROUND THE ROBOT.

#### 2. Check the following points before turning on the controller.

- Is the robot securely and correctly installed?
- Are the electrical connections to the robot wired correctly?
- Are items such as air pressure correctly supplied?
- Is the robot correctly connected to peripheral equipment?
- Have safety measures (safety enclosure, etc.) been taken?
- Does the installation environment meet the specified standards?

#### 3. After the controller is turned on, check the following points from outside the safety enclosure.

- Does the robot start, stop and enter the selected operation mode as intended?
- Does each axis move as intended within the soft limits?
- Does the end effector move as intended?
- Are the correct signals being sent to the end effector and peripheral equipment?
- Does emergency stop function?
- Are teaching and playback functions normal?
- Are the safety enclosure and interlocks functioning as intended?

#### 4. Working inside safety enclosures

Before starting work within the safety enclosure, **always confirm from outside the enclosure that each protective function is operating correctly (see the previous section 2.3).**



##### DANGER

NEVER ENTER WITHIN THE MOVEMENT RANGE WHILE WITHIN THE SAFETY ENCLOSURE.

See “7.1 Movement range” in “Safety instructions” for details on the robot’s movement range.



##### WARNING

WHEN WORK IS REQUIRED WITHIN THE SAFETY ENCLOSURE, PLACE A SIGN "WORK IN PROGRESS" IN ORDER TO KEEP OTHER PERSONS FROM OPERATING THE CONTROLLER SWITCH OR OPERATION PANEL.



##### WARNING

WHEN WORK WITHIN THE SAFETY ENCLOSURE IS REQUIRED, ALWAYS TURN OFF THE CONTROLLER POWER EXCEPT FOR THE FOLLOWING CASES:

##### Exception

##### Work with power turned on, but robot in emergency stop

|                             |              |   |
|-----------------------------|--------------|---|
| Origin position setting     | SCARA robots | Follow the precautions and procedure described in "2. Adjusting the origin" in Chapter 3.             |
| Standard coordinate setting | SCARA robots | Follow the precautions and procedure described in "4. Setting the standard coordinates" in Chapter 3. |
| Soft limit settings         | SCARA robots | Follow the precautions and procedure described in "3. Setting the soft limits" in Chapter 3.          |

##### Work with power turned on

|          |              |   |
|----------|--------------|---|
| Teaching | SCARA robots | Refer to "5. Teaching within safety enclosure" described below. |
|----------|--------------|---|

#### 5. Teaching within the safety enclosure

When performing teaching within the safety enclosure, check or perform the following points **from outside the safety enclosure.**



##### DANGER

NEVER ENTER WITHIN THE MOVEMENT RANGE WHILE WITHIN THE SAFETY ENCLOSURE.

See “7.1 Movement range” in “Safety instructions” for details on the robot’s movement range.



##### WARNING

- MAKE A VISUAL CHECK TO ENSURE THAT NO HAZARDS ARE PRESENT WITHIN THE SAFETY ENCLOSURE.
- CHECK THAT THE PROGRAMMING BOX OR HANDY TERMINAL OPERATES CORRECTLY.
- CHECK THAT NO FAILURES ARE FOUND IN THE ROBOT.
- CHECK THAT EMERGENCY STOP WORKS CORRECTLY.
- SELECT TEACHING MODE AND DISABLE AUTOMATIC OPERATION.



## 4.5.2 Automatic operation

Check the following points when operating the robot in AUTO mode. Observe the instructions below in cases where an error occurs during automatic operation. Automatic operation described here includes all operations in AUTO mode.

### 1. Checkpoints before starting automatic operation

Check the following points before starting automatic operation



#### DANGER

- CHECK THAT NO ONE IS WITHIN THE SAFETY ENCLOSURE.
- CHECK THE SAFETY ENCLOSURE IS SECURELY INSTALLED WITH INTERLOCKS FUNCTIONAL.



#### WARNING

- CHECK THAT THE PROGRAMMING BOX / HANDY TERMINAL AND TOOLS ARE IN THEIR SPECIFIED LOCATIONS.
- CHECK THAT THE SIGNAL TOWER LAMPS OR OTHER ALARM DISPLAYS INSTALLED FOR THE SYSTEM ARE NOT LIT OR FLASHING, INDICATING NO ERROR IS OCCURRING ON THE ROBOT AND PERIPHERAL DEVICES.

### 2. During automatic operation and when errors occur

After automatic operation starts, check the operation status and the signal tower to ensure that the robot is in automatic operation.



#### DANGER

NEVER ENTER THE SAFETY ENCLOSURE DURING AUTOMATIC OPERATION.



#### WARNING

IF AN ERROR OCCURS IN THE ROBOT OR PERIPHERAL EQUIPMENT, OBSERVE THE FOLLOWING PROCEDURE BEFORE ENTERING THE SAFETY ENCLOSURE.

- 1) PRESS THE EMERGENCY STOP BUTTON TO SET THE ROBOT TO EMERGENCY STOP.
- 2) PLACE A SIGN ON THE START SWITCH, INDICATING THAT THE ROBOT IS BEING INSPECTED IN ORDER TO KEEP OTHER PERSONS FROM RESTARTING THE ROBOT.

## 4.5.3 Precautions during operation

### 1. When the robot is damaged or an abnormal condition occurs



#### WARNING

- IF UNUSUAL ODORS, NOISE OR SMOKE OCCUR DURING OPERATION, IMMEDIATELY TURN OFF POWER TO PREVENT POSSIBLE ELECTRICAL SHOCK, FIRE OR BREAKDOWN. STOP USING THE ROBOT AND CONTACT YOUR DISTRIBUTOR.
- IF ANY OF THE FOLLOWING DAMAGE OR ABNORMAL CONDITIONS OCCURS THE ROBOT, THEN CONTINUING TO OPERATE THE ROBOT IS DANGEROUS. IMMEDIATELY STOP USING THE ROBOT AND CONTACT YOUR DISTRIBUTOR.

| Damage or abnormal condition                                   | Type of danger                               |
|--|--|
| Damage to machine harness or robot cable                       | Electrical shock, robot malfunction          |
| Damage to robot exterior                                       | Damaged parts fly off during robot operation |
| Abnormal robot operation (position deviation, vibration, etc.) | Robot malfunction                            |
| Z-axis (vertical axis) or brake malfunction                    | Loads fall off                               |

### 2. High temperature hazard



#### WARNING

- DO NOT TOUCH THE ROBOT CONTROLLER AND ROBOT DURING OPERATION. THE ROBOT CONTROLLER AND ROBOT BODY ARE VERY HOT DURING OPERATION, SO BURNS MAY OCCUR IF THESE SECTIONS ARE TOUCHED.
- THE MOTOR AND SPEED REDUCTION GEAR CASING ARE VERY HOT SHORTLY AFTER OPERATION, SO BURNS MAY OCCUR IF THESE ARE TOUCHED. BEFORE TOUCHING THOSE PARTS FOR INSPECTIONS OR SERVICING, TURN OFF THE CONTROLLER, WAIT FOR A WHILE AND CHECK THAT THEIR TEMPERATURE HAS COOLED.

### 3. Use caution when releasing the Z-axis (vertical axis) brake



#### WARNING

THE VERTICAL AXIS WILL SLIDE DOWNWARD WHEN THE BRAKE IS RELEASED, CAUSING A HAZARDOUS SITUATION. TAKE ADEQUATE SAFETY MEASURES IN CONSIDERATION BY TAKING THE WEIGHT AND SHAPE INTO ACCOUNT.

- BEFORE RELEASING THE BRAKE AFTER PRESSING THE EMERGENCY STOP BUTTON, PLACE A SUPPORT UNDER THE VERTICAL AXIS SO THAT IT WILL NOT SLIDE DOWN.
- BE CAREFUL NOT TO LET YOUR BODY GET CAUGHT BETWEEN THE VERTICAL AXIS AND THE INSTALLATION BASE WHEN PERFORMING TASKS (DIRECT TEACHING, ETC.) WITH THE BRAKE RELEASED.

### 4. Be careful of Z-axis movement when the controller is turned off or emergency stop is triggered (air-driven Z-axis)



#### WARNING

THE Z-AXIS STARTS MOVING UPWARD WHEN POWER TO THE CONTROLLER OR PLC IS TURNED OFF, THE PROGRAM IS RESET, EMERGENCY STOP IS TRIGGERED, OR AIR IS SUPPLIED TO THE SOLENOID VALVE FOR THE Z-AXIS AIR CYLINDER.

- DO NOT LET HANDS OR FINGERS GET CAUGHT AND SQUEEZED BY ROBOT PARTS MOVING ALONG THE Z-AXIS.
- KEEP THE USUAL ROBOT POSITION IN MIND SO AS TO PREVENT THE Z-AXIS FROM HANGING UP OR BINDING ON OBSTACLES DURING RAISING OF THE Z-AXIS EXCEPT IN CASE OF EMERGENCY STOP.

### 5. Take protective measures when the Z-axis interferes with peripheral equipment (air-driven Z-axis)



#### WARNING

WHEN THE Z-AXIS COMES TO A STOP DUE TO OBSTRUCTION FROM PERIPHERAL EQUIPMENT, THE Z-AXIS MAY MOVE SUDDENLY AFTER THE OBSTRUCTION IS REMOVED, CAUSING INJURY SUCH AS PINCHED OR CRUSHED HANDS.

- TURN OFF THE CONTROLLER AND REDUCE THE AIR PRESSURE BEFORE ATTEMPTING TO REMOVE THE OBSTRUCTION.
- BEFORE REDUCING THE AIR PRESSURE, PLACE A SUPPORT UNDER THE Z-AXIS BECAUSE THE Z-AXIS WILL DROP UNDER ITS OWN WEIGHT.

### 6. Be careful of Z-axis movement when air supply is stopped (air-driven Z-axis)



#### WARNING

THE Z-AXIS WILL SLIDE DOWNWARD WHEN THE AIR PRESSURE TO THE Z-AXIS AIR CYLINDER SOLENOID VALVE IS REDUCED, CREATING A HAZARDOUS SITUATION.  
TURN OFF THE CONTROLLER AND PLACE A SUPPORT UNDER THE Z-AXIS BEFORE CUTTING OFF THE AIR SUPPLY.

### 7. Make correct parameter settings



#### CAUTION

The robot must be operated with the correct tolerable moment of inertia and acceleration coefficients that match the manipulator tip mass and moment of inertia. Failure to follow this instruction will lead to a premature end to the drive unit service life, damage to robot parts, or cause residual vibration during positioning.

### 8. If the X-axis, Y-axis or R-axis rotation angle is small



#### CAUTION

If the X-axis, Y-axis or R-axis rotation angle is set smaller than 5 degrees, then it will always move within the same position. This restricted position makes it difficult for an oil film to form on the joint support bearing, and so may possibly damage the bearing. In this type of operation, add a range of motion so that the joint moves through 90 degrees or more, about 5 times a day.

## 4.6 Inspection and maintenance

Always perform daily and periodic inspections and make a pre-operation check to ensure there are no problems with the robot and related equipment. If a problem or abnormality is found, then promptly repair it or take other measures as necessary.

Keep a record of periodic inspections or repairs and store this record for at least 3 years.

### 4.6.1 Before inspection and maintenance work

#### 1. Do not attempt any work or operation unless described in this manual.

Never attempt any work or operation unless described in this manual.

If an abnormal condition occurs, please be sure to contact your distributor. Our service personnel will take appropriate action.



#### WARNING

NEVER ATTEMPT INSPECTION, MAINTENANCE, REPAIR, AND PART REPLACEMENT UNLESS DESCRIBED IN THIS MANUAL. THESE TASKS REQUIRE SPECIALIZED TECHNICAL KNOWLEDGE AND SKILLS AND MAY ALSO INVOLVE HAZARDS. PLEASE BE SURE TO CONTACT YOUR DISTRIBUTOR FOR ADVICE.

#### 2. Precautions during repair and parts replacement



#### WARNING

WHEN IT IS NECESSARY TO REPAIR OR REPLACE PARTS OF THE ROBOT OR CONTROLLER, PLEASE BE SURE TO CONTACT YOUR DISTRIBUTOR AND FOLLOW THE INSTRUCTIONS THEY PROVIDE. INSPECTION AND MAINTENANCE OF THE ROBOT OR CONTROLLER BY AN UNSKILLED, UNTRAINED PERSON IS EXTREMELY HAZARDOUS.

Adjustment, maintenance and parts replacement require specialized technical knowledge and skills, and also may involve hazards. These tasks must be performed only by persons who have enough ability and qualifications required by local laws and regulations.



#### WARNING

ADJUSTMENT AND MAINTENANCE BY REMOVING A COVER REQUIRE SPECIALIZED TECHNICAL KNOWLEDGE AND SKILLS, AND MAY ALSO INVOLVE HAZARDS IF ATTEMPTED BY AN UNSKILLED PERSON. FOR DETAILED INFORMATION, PLEASE CONTACT YOUR DISTRIBUTOR WHERE YOU PURCHASED THE PRODUCT.

#### 3. Shut off all phases of power supply



#### WARNING

ALWAYS SHUT OFF ALL PHASES OF THE POWER SUPPLY EXTERNALLY BEFORE CLEANING THE ROBOT AND CONTROLLER OR SECURELY TIGHTENING THE TERMINAL SCREWS ETC. FAILURE TO DO THIS MAY CAUSE ELECTRICAL SHOCK OR PRODUCT DAMAGE OR MALFUNCTION.

#### 4. Allow a waiting time after power is shut off (Allow time for temperature and voltage to drop)



#### WARNING

- WHEN PERFORMING MAINTENANCE OR INSPECTION OF THE ROBOT CONTROLLER UNDER YOUR DISTRIBUTOR'S INSTRUCTIONS, WAIT AT LEAST 30 MINUTES FOR THE YRC SERIES AFTER TURNING THE POWER OFF. SOME COMPONENTS IN THE ROBOT CONTROLLER ARE VERY HOT OR STILL RETAIN A HIGH VOLTAGE SHORTLY AFTER OPERATION, SO BURNS OR ELECTRICAL SHOCK MAY OCCUR IF THOSE PARTS ARE TOUCHED.
- THE MOTOR AND SPEED REDUCTION GEAR CASING ARE VERY HOT SHORTLY AFTER OPERATION, SO BURNS MAY OCCUR IF THEY ARE TOUCHED. BEFORE TOUCHING THOSE PARTS FOR INSPECTIONS OR SERVICING, TURN OFF THE CONTROLLER, WAIT FOR A WHILE AND CHECK THAT THE TEMPERATURE HAS COOLED.

#### 5. Precautions during inspection of controller



#### WARNING

- WHEN YOU NEED TO TOUCH THE TERMINALS OR CONNECTORS ON THE OUTSIDE OF THE CONTROLLER DURING INSPECTION, ALWAYS FIRST TURN OFF THE CONTROLLER POWER SWITCH AND ALSO THE POWER SOURCE IN ORDER TO PREVENT POSSIBLE ELECTRICAL SHOCK.
- DO NOT DISASSEMBLE THE CONTROLLER. NEVER TOUCH ANY INTERNAL PARTS OF THE CONTROLLER. DOING SO MAY CAUSE BREAKDOWN, MALFUNCTION, INJURY, OR FIRE.

## 4.6.2 Precautions during service work

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### 1. Be careful when removing the Z-axis motor (SCARA robots)



#### WARNING

- THE Z-AXIS WILL SLIDE DOWNWARD WHEN THE Z-AXIS MOTOR IS REMOVED, CAUSING A HAZARDOUS SITUATION.
- TURN OFF THE CONTROLLER AND PLACE A SUPPORT UNDER THE Z-AXIS BEFORE REMOVING THE Z-AXIS MOTOR.
  - BE CAREFUL NOT TO LET YOUR BODY GET CAUGHT BY THE DRIVING UNIT OF THE Z-AXIS OR BETWEEN THE Z-AXIS DRIVE UNIT AND THE INSTALLATION BASE.
- 

### 2. Do not remove the Z-axis upper limit mechanical stopper



#### CAUTION

- Warning label 4 is attached to each SCARA robot. (For details on warning labels, see "3. Warning labels" in "Safety instructions.") Removing the upper limit mechanical stopper installed to the Z-axis spline or shifting its position will damage the Z-axis ball screw. Never attempt to remove it.
- 

### 3. Use caution when handling a robot that contains powerful magnets



#### WARNING

- POWERFUL MAGNETS ARE INSTALLED INSIDE THE ROBOT. DO NOT DISASSEMBLE THE ROBOT SINCE THIS MAY CAUSE INJURY. DEVICES THAT MAY MALFUNCTION DUE TO MAGNETIC FIELDS MUST BE KEPT AWAY FROM THIS ROBOT.
- 

See "6. Cautions regarding strong magnetic fields" in "Safety instructions" for detailed information on strong magnetic fields.

### 4. Use the following caution items when disassembling or replacing the pneumatic equipment.



#### WARNING

- AIR OR PARTS MAY FLY OUTWARD IF PNEUMATIC EQUIPMENT IS DISASSEMBLED OR PARTS REPLACED WHILE AIR IS STILL SUPPLIED.
- DO SERVICE WORK AFTER TURNING OFF THE CONTROLLER, REDUCING THE AIR PRESSURE, AND EXHAUSTING THE RESIDUAL AIR FROM THE PNEUMATIC EQUIPMENT.
  - BEFORE REDUCING THE AIR PRESSURE, PLACE A SUPPORT STAND UNDER THE Z-AXIS SINCE IT WILL DROP UNDER ITS OWN WEIGHT.
- 

### 5. Use caution to avoid contact with the controller cooling fan



#### WARNING

- TOUCHING THE ROTATING FAN MAY CAUSE INJURY.
  - IF REMOVING THE FAN COVER, FIRST TURN OFF THE CONTROLLER AND MAKE SURE THE FAN HAS STOPPED.
- 

### 6. Precautions for robot controllers



#### CAUTION

- Back up the robot controller internal data on an external storage device. The robot controller internal data (programs, point data, etc.) may be lost or deleted for unexpected reasons. Always make a backup of this data.
  - Do not use thinner, benzene, or alcohol to wipe off the surface of the programming box. The surface sheet may be damaged or printed letters or marks erased. Use a soft, dry cloth and gently wipe the surface.
  - Do not use a hard or pointed object to press the keys on the programming box. Malfunction or breakdown may result if the keys are damaged. Use your fingers to operate the keys.
  - Do not insert any SD memory card other than specified into the SD memory card slot in the programming box. Malfunction or breakdown may result if the wrong memory card is inserted.
-

## 4.7 Disposal

When disposing of robots and related items, handle them carefully as industrial wastes. Use the correct disposal method in compliance with your local regulations, or entrust disposal to a licensed industrial waste disposal company.

### 1. Disposal of lithium batteries

When disposing of lithium batteries, use the correct disposal method in compliance with your local regulations, or entrust disposal to a licensed industrial waste disposal company. We do not collect and dispose of the used batteries.

### 2. Disposal of packing boxes and materials

When disposing of packing boxes and materials, use the correct disposal method in compliance with your local regulations. We do not collect and dispose of the used packing boxes and materials.

### 3. Strong magnet

**WARNING**

STRONG MAGNETS ARE INSTALLED IN THE ROBOT. BE CAREFUL WHEN DISPOSING OF THE ROBOT.

See "6. Cautions regarding strong magnetic fields" in "Safety instructions" for detailed information on strong magnetic fields.

## 5. Emergency action when a person is caught by robot

If a person should get caught between the robot and a mechanical part such as the installation base, then release the axis.

### ■ Emergency action

Release the axis while referring to the following section in the manual for the robot controller.

| Controller | Refer to:  |
|------------|--|
| YRC        | Section 1, "Freeing a person caught by the robot" in Chapter 1 |



#### NOTE

Make a printout of the relevant page in the manual and post it a conspicuous location near the controller.

## 6. Cautions regarding strong magnetic fields

Some OMRON robots contain parts generating strong magnetic fields which may cause bodily injury, death, or device malfunction. Always comply with the following instructions.

- Persons wearing ID cards, purses, or wristwatches must keep away from the robot.
- Do not bring tools close to the magnet inside the robot.

## 7. Using the robot safely

### 7.1 Movement range

When a tool or workpiece is attached to the robot manipulator tip, the actual movement range enlarges from the movement range of the robot itself (Figure A) to include the areas taken up by movement of the tool and workpiece attached to the manipulator tip (Figure B).

The actual movement range expands even further if the tool or workpiece is offset from the manipulator tip. The movement range here is defined as the range of robot motion including all areas through which the robot arms, the tool and workpiece attached to the manipulator tip, and the solenoid valves attached to the robot arms move.

To make the robot motion easier to understand, the figures below only show the movement ranges of the tool attachment section, tool, and workpiece.

Please note that during actual operation, the movement range includes all areas where the robot arms and any other parts move along with the robot.

#### Movement range

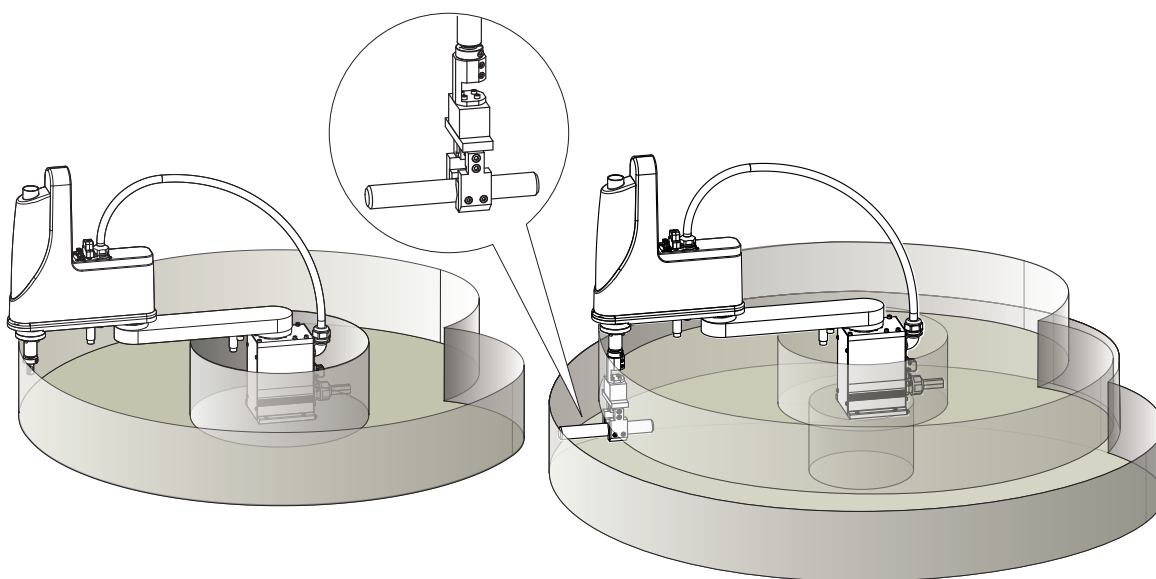


Figure A: Movement range of robot itself

Figure B: Movement range when tool and workpiece are attached to manipulator tip



#### CAUTION

To make the robot motion easier to understand, the above figures only show the movement ranges of the tool attachment section, tool, and workpiece. In actual operation, the movement range includes all areas where the robot arms and any other parts move along with the robot.

## 7.2 Robot protective functions

Protective functions for OMRON robots are described below.

### 1. Overload detection

This function detects an overload applied to the motor and turns off the servo.

If an overload error occurs, take the following measures to avoid such errors:

1. Insert a timer in the program.
2. Reduce the acceleration.

### 2. Overheat detection

This function detects an abnormal temperature rise in the driver inside the controller and turns off the servo.

If an overheat error occurs, take the following measures to avoid the error:

1. Insert a timer in the program.
2. Reduce the acceleration.

### 3. Soft limits

Soft limits can be set on each axis to limit the working envelope in manual operation after return-to-origin and during automatic operation. The working envelope is the area limited by soft limits.



#### WARNING

SOFT LIMIT FUNCTION IS NOT A SAFETY-RELATED FUNCTION INTENDED TO PROTECT THE HUMAN BODY. TO RESTRICT THE ROBOT MOVEMENT RANGE TO PROTECT THE HUMAN BODY, USE THE MECHANICAL STOPPERS INSTALLED IN THE ROBOT (OR AVAILABLE AS OPTIONS).

### 4. Mechanical stoppers

If the servo is turned off by emergency stop operation or protective function while the robot is moving, then these mechanical stoppers prevent the axis from exceeding the movement range. The movement range is the area limited by the mechanical stoppers.

|                     |  |
|---------------------|--|
| <b>SCARA robots</b> | <ul style="list-style-type: none"><li>• The X and Y axes have mechanical stoppers that are installed at both ends of the maximum movement range. Some robot models have a standard feature that allows changing the mechanical stopper positions. On some other models, the mechanical stopper positions can also be changed by using option parts.</li><li>• The Z-axis has a mechanical stopper at the upper end and lower end. The stopper positions can be changed by using option parts.</li><li>• No mechanical stopper is provided on the R-axis.</li></ul> |
|---------------------|--|



#### WARNING

AXIS MOVEMENT DOES NOT STOP IMMEDIATELY AFTER THE SERVO IS TURNED OFF BY EMERGENCY STOP OR OTHER PROTECTIVE FUNCTIONS, SO USE CAUTION.



#### CAUTION

If the robot moving at high speed collides with a mechanical stopper installed in the robot (or available as option), the robot may be damaged.

### 5. Z-axis (vertical axis) brake

An electromagnetic brake is installed on the Z-axis to prevent the Z-axis from sliding downward when the servo is OFF. This brake is working when the controller is OFF or the Z-axis servo power is OFF even when the controller is ON. The Z-axis brake can be released by the programming unit / handy terminal or by a command in the program when the controller is ON.



#### WARNING

THE VERTICAL AXIS WILL SLIDE DOWNWARD WHEN THE BRAKE IS RELEASED, CAUSING A HAZARDOUS SITUATION. TAKE ADEQUATE SAFETY MEASURES IN CONSIDERATION BY TAKING THE WEIGHT AND SHAPE INTO ACCOUNT.

- BEFORE RELEASING THE BRAKE AFTER PRESSING THE EMERGENCY STOP BUTTON, PLACE A SUPPORT UNDER THE VERTICAL AXIS SO THAT IT WILL NOT SLIDE DOWN.
- BE CAREFUL NOT TO LET YOUR BODY GET CAUGHT BETWEEN THE VERTICAL AXIS AND THE INSTALLATION BASE WHEN PERFORMING TASKS (DIRECT TEACHING, ETC.) WITH THE BRAKE RELEASED.



### 7.3 Residual risk

To ensure safe and correct use of OMRON robots and controllers, System integrators and/or end users implement machinery safety design that conforms to ISO12100.

Residual risks for OMRON robots and controllers are described in the DANGER or WARNING instructions provided in each chapter and section. Read them carefully.

### 7.4 Special training for industrial robot operation

Operators or persons who handle the robot for tasks such as for teaching, programming, movement checks, inspections, adjustments, and repairs must receive appropriate training and also have the skills needed to perform the job correctly and safely. They must also read the manual carefully to understand its contents before attempting the robot operation or maintenance.

Tasks related to industrial robots (teaching, programming, movement check, inspection, adjustment, repair, etc.) must be performed by qualified persons who meet requirements established by local regulations and safety standards for industrial robots.

**Comparison of terms used in this manual with ISO**

| This manual                    | ISO 10218-1       | Note   |
|--------------------------------|-------------------|--|
| <b>Maximum movement range</b>  | maximum space     | Area limited by mechanical stoppers.         |
| <b>Movement range</b>          | restricted space  | Area limited by movable mechanical stoppers. |
| <b>Working envelope</b>        | operational space | Area limited by software limits.             |
| <b>Within safety enclosure</b> | safeguarded space |  |

See “7.1 Movement range” in “Safety instructions” for details on the robot’s movement range.



# Warranty

The OMRON robot and/or related product you have purchased are warranted against the defects or malfunctions as described below.

## ■ Warranty description

If a failure or breakdown occurs due to defects in materials or workmanship in the genuine parts constituting this OMRON robot and/or related product within the warranty period, then OMRON shall supply free of charge the necessary replacement/repair parts.

## ■ Warranty period

The warranty period ends 24 months after the date of manufacturing as shown on the products.

## ■ Exceptions to the warranty

This warranty will not apply in the following cases:

1. Fatigue arising due to the passage of time, natural wear and tear occurring during operation (natural fading of painted or plated surfaces, deterioration of parts subject to wear, etc.)
2. Minor natural phenomena that do not affect the capabilities of the robot and/or related product (noise from computers, motors, etc.)
3. Programs, point data and other internal data were changed or created by the user.

Failures resulting from the following causes are not covered by warranty.

1. Damage due to earthquakes, storms, floods, thunderbolt, fire or any other natural or man-made disaster.
2. Troubles caused by procedures prohibited in this manual.
3. Modifications to the robot and/or related product not approved by OMRON or OMRON sales representative.
4. Use of any other than genuine parts and specified grease and lubricant.
5. Incorrect or inadequate maintenance and inspection.
6. Repairs by other than authorized dealers.

## **WARRANTY**

**OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.**

**OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NONINFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.**

## **LIMITATIONS OF LIABILITY**

**OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.**

**In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.**

**IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE OR INAPPROPRIATE MODIFICATION OR REPAIR.**



# Chapter 1 Overview

## Contents

1. Overview

1-1



# 1. Overview



## WARNING

- THE ADJUSTMENT AND MAINTENANCE WORK WITH THE COVER REMOVED NEEDS THE SPECIAL KNOWLEDGE AND SKILL. IF UNSKILLED WORK PERSON PERFORMS SUCH WORK, THIS MAY INVOLVE RISK. ONLY QUALIFIED ENGINEERS WHO HAVE RECEIVED THE ROBOT TRAINING COURSE CONDUCTED BY YOUR DISTRIBUTOR AND HAVE THE SKILL AND LICENSE IN ACCORDANCE WITH THE LAWS AND REGULATIONS IN EACH COUNTRY ARE ALLOWED TO CARRY OUT THE ADJUSTMENT AND MAINTENANCE WORK WHILE REFERRING TO THIS MANUAL.
- PLACE A CONSPICUOUS SIGN INDICATING THE ROBOT IS BEING ADJUSTED, TO PREVENT OTHERS FROM TOUCHING THE CONTROLLER SWITCH, PROGRAMMING BOX OR OPERATION PANEL.
- IF A SAFETY ENCLOSURE HAS NOT YET BEEN PROVIDED RIGHT AFTER INSTALLATION OF THE ROBOT, ROPE OFF OR CHAIN OFF THE MOVEMENT AREA AROUND THE MANIPULATOR IN PLACE OF A SAFETY ENCLOSURE, AND OBSERVE THE FOLLOWING POINTS.
  1. USE STABLE POSTS WHICH WILL NOT FALL OVER EASILY.
  2. THE ROPE OR CHAIN SHOULD BE EASILY VISIBLE BY EVERYONE AROUND THE ROBOT.
  3. PLACE A CONSPICUOUS SIGN PROHIBITING THE OPERATOR OR OTHER PERSONNEL FROM ENTERING THE MOVEMENT AREA OF THE MANIPULATOR.
- TO CHECK THE OPERATION AFTER THE ADJUSTMENT HAS BEEN MADE, SEE "4.5.1 TRIAL OPERATION" IN THE SAFETY GUIDE.



## CAUTION

Use only the lubricants specified by your distributors.





## Chapter 2

# Attaching, detaching, and replacing the cover

## Contents

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# 1. Attaching, detaching, and replacing the cover

## 1.1 R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600

To detach the covers, remove the bolts and screws.

It is recommended to replace the O-rings and seals shown below with new ones.

### 1. Replacement parts

| No. | Part name        | Part number   | Q'ty |  |
|-----|------------------|---------------|------|--|
| 1   | O-ring           | 90200-01J350  | 2    |  |
| 2   | O-ring           | 90990-17J025  | 1    |  |
| 3   | Seal washer      | 90990-36J008  | 4    |  |
| 4   | Seal             | KDM-M1328-000 | 1    |  |
| 5   | Seal             | KDM-M1329-000 | 1    |  |
| 6   | Seal             | KDM-M1567-000 | 1    | R6YXGLC(P)250, R6YXGLC(P)350,<br>R6YXGLC(P)400                                 |
|     |                  | KDM-M1567-100 |      | R6YXGLC(P)500, R6YXGLC(P)600   |
| 7   | Seal             | KDM-M1568-000 | 1    | R6YXGLC(P)250, R6YXGLC(P)350,<br>R6YXGLC(P)400                                 |
|     |                  | KDM-M1568-100 |      | R6YXGLC(P)500, R6YXGLC(P)600   |
| 8   | Seal washer      | 90990-36J008  | 4    |  |
| 9   | Seal             | KDM-M1315-000 | 2    |  |
| 10  | Y-axis arm cover | KCY-M1314-001 | 1    | Spare (replace when damaged)<br>R6YXGLC(P)250, R6YXGLC(P)350,<br>R6YXGLC(P)400 |
|     |                  | KCY-M1314-100 | 1    | Spare (replace when damaged)<br>R6YXGLC(P)500, R6YXGLC(P)600                   |
| 11  | Base rear cover  | KCY-M1310-000 | 1    | Spare (replace when damaged)   |
| 12  | Base front cover | KCY-M1311-000 | 1    | Spare (replace when damaged)   |

### 2. Other tools

| Name                       | Part No.    | Manufacturer | Remarks                     |
|----------------------------|-------------|--------------|-----------------------------|
| Hex wrench set             |             |              |                             |
| Phillips screwdriver       |             |              |                             |
| Screw thread locking agent | Loctite 241 | Henkel       | Medium-strength type (blue) |



#### WARNING

WHEN THE COVERS HAVE BEEN REMOVED FOR THE MAINTENANCE WORK, BE SURE TO RETURN THE COVERS TO THEIR ORIGINAL POSITIONS USING THE SCREWS AND BOLTS THAT HAVE SECURED THEM. IF ANY SCREW IS LOST, BE SURE TO SECURE THE COVERS USING THE SPECIFIED SCREWS AND QUANTITIES WHILE REFERRING TO THE FIG. BELOW.

IF THE COVERS ARE NOT SECURED FIRMLY, NOISE MAY OCCUR, THE COVER MAY DROP AND FLY OUT, YOUR HAND MAY BE ENTANGLED IN THE DRIVE UNIT DURING TEACHING, OR YOUR HAND MAY BE IN CONTACT THE HOT DRIVE UNIT, CAUSING BURN. TO PREVENT SUCH TROUBLES, STRICTLY OBSERVE THIS INSTRUCTION.



#### CAUTION

- The Y-axis arm cover cannot be detached or attached unless the Z-axis is moved down to its lower end.
- If any seal loses its strength when detaching the cover, it is recommended to replace it with a new one. If not replaced with a new one, the dust/drip proof performance or the degree of cleanliness may lower.
- Some seals are affixed. When removing such seal, peel off the adhesive agent and replace the seal with a new one.

## ■ Y-axis arm cover

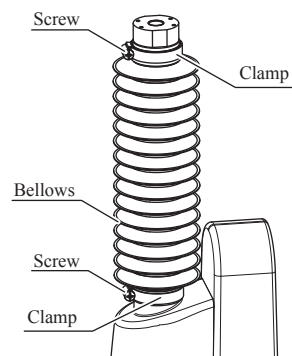
- 1 **Turn on the controller.**  
Check that no one is inside the safety enclosure, and then turn on the controller.
- 2 **Press the emergency stop button.**  
Press the emergency stop button on the PB to put the robot in the emergency stop status.
- 3 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 4 **Enter the safety enclosure while holding the PB.**
- 5 **Disconnect the user wiring and tubing from the spline.**  
Disconnect all of the user wiring and tubing that have passed through the spline from the spline.
- 6 **Loosen the screw of the clamp.**
- 7 **Remove the bellows and remove the O-ring.**
- 8 **Remove the rolling mechanism part and O-ring.**
- 9 **To prevent the Z-axis from dropping, be sure to prop the spline or end effector with a support stand.**
- 10 **Release the Z-axis brake.**  
Make sure that dropping of the Z-axis is prevented. Then, carefully move down the Z-axis to a position close to the lower end of the Z-axis.



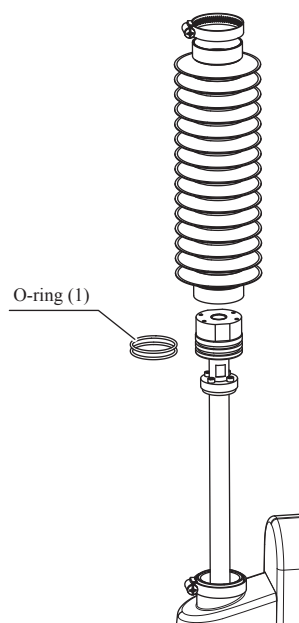
### NOTE

For details about how to release the Z-axis brake, see the OMRON robot controller user's manual.

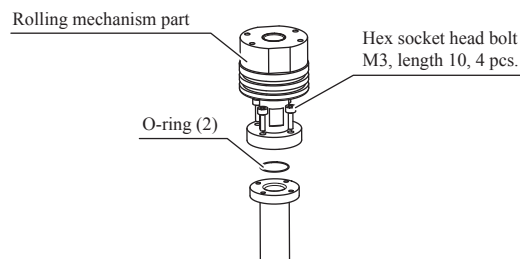
### ▶ Step 5-6 Disconnecting the user wiring and tubing



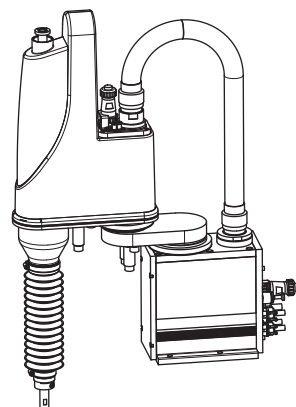
### ▶ Step 7 Removing the bellows



### ▶ Step 8 Removing the rolling mechanism part




### ▶ Step 10 Releasing the Z-axis brake

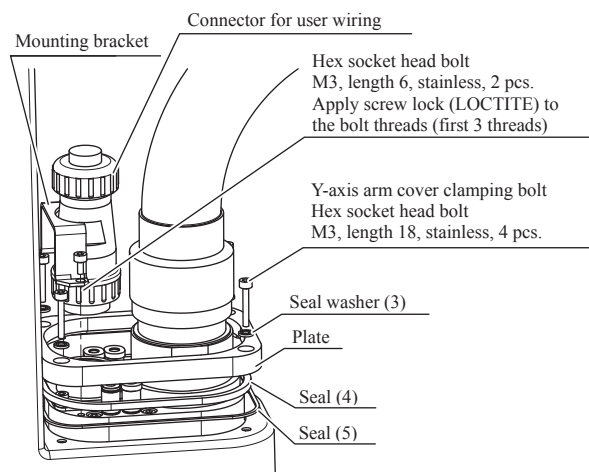


- 11 **Turn off the controller.**
- 12 **Remove the mounting bracket, disconnect the connector for the user wiring, and remove the plate, seal, and seal washer.**

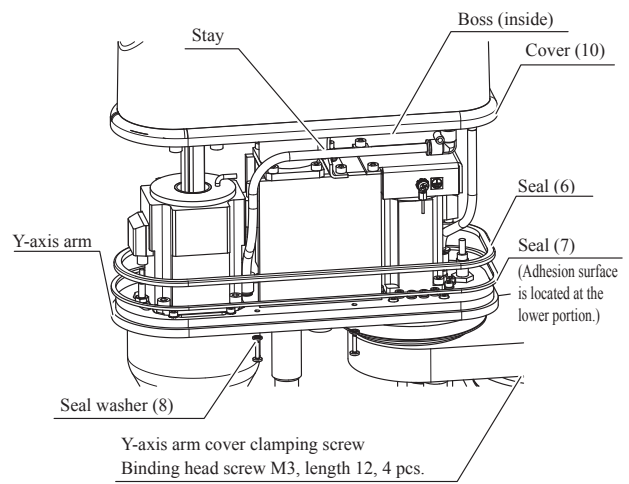
- 13 **Remove the cover, seal (6), and seal (7).**  
Since the seal (7) is affixed to the Y-axis arm, peel off the adhesive agent completely.

**CAUTION**  When detaching or attaching the cover, it may be in contact with the boss inside the cover or the stay. So, install the cover while widening it slightly or shifting it.

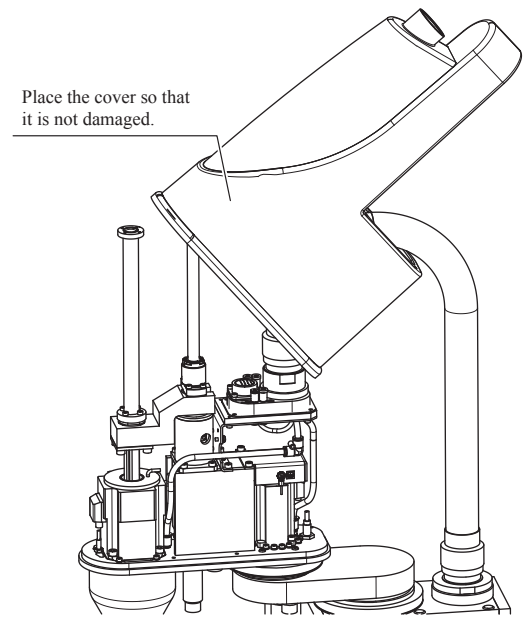
**Step 12** **Disconnecting the connector for the user wiring and removing the plate, seal, and seal washer.**



**Step 13** **Removing the cover and seal**



**Step 13** **Cautions on detaching or attaching the covers**



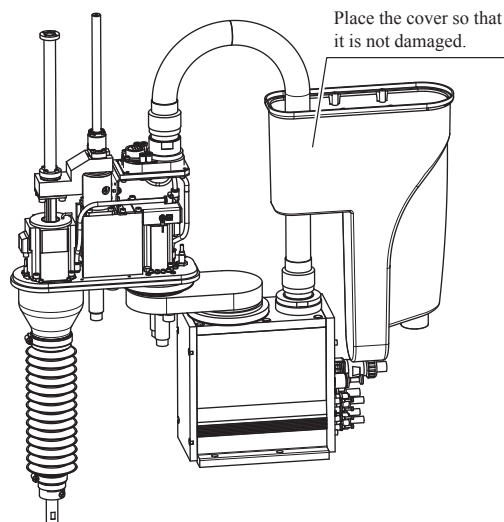
14 *Place the cover on the base side.*

15 *Reattach the cover in the reverse order of detachment.*

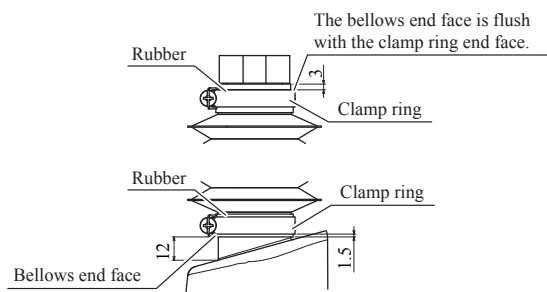
It is recommended to replace the O-rings and seals with new ones. If these parts are not replaced or reattached, the dust/drip proof performance or the degree of cleanliness may lower.

For details about the bellows clamp position, see the Fig. on the right.

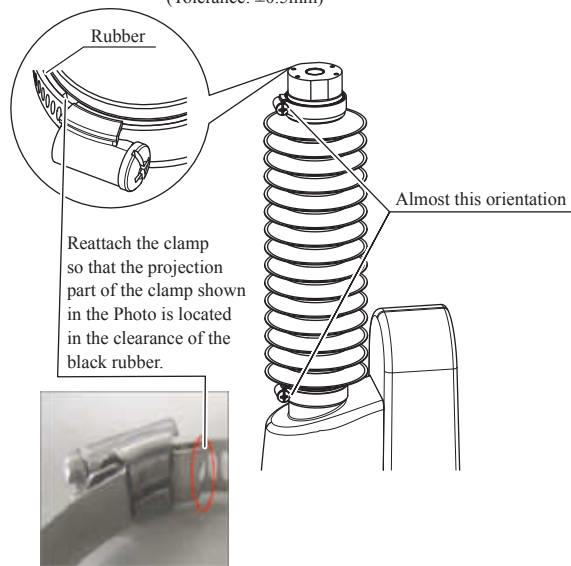
▶ **Step 14** **Placing the cover**



▶ **Step 15** **Clamp**



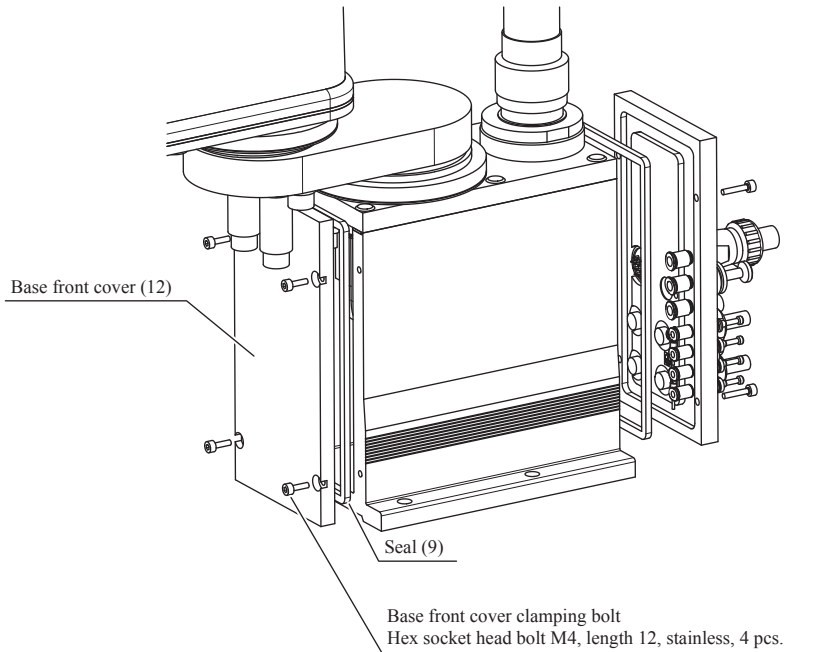
\* Install the bellows and clamp at the positions shown in the Fig. above.  
(Tolerance:  $\pm 0.5\text{mm}$ )



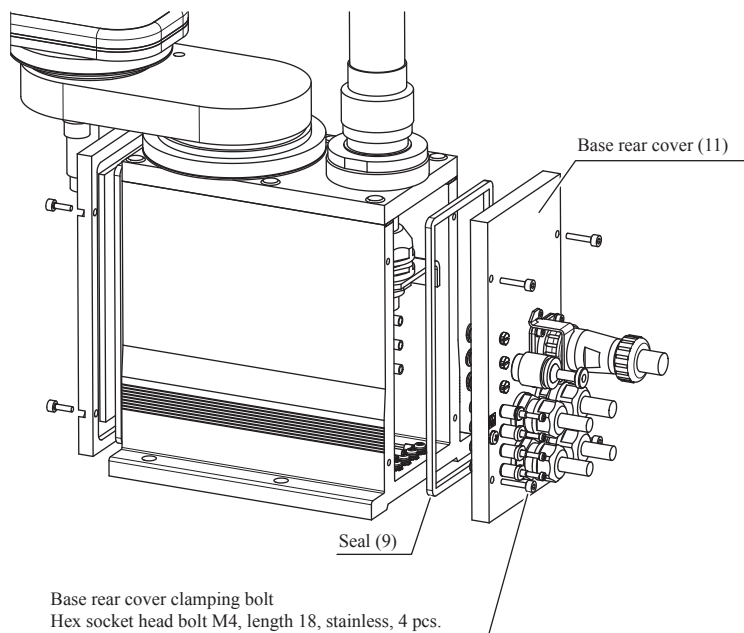
## ■ Base cover

It is recommended to replace the seals with new ones. If these parts are not replaced or reattached, the dust/drip proof performance or the degree of cleanliness may lower.

### Removing the base front cover



### Removing the base rear cover



## 1.2 R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

### • List of Y-axis arm cover seals

| No. | Part name   | Part number   | Q'ty |  |
|-----|-------------|---------------|------|--|
| 1   | Seal washer | 90990-28J159  | 14   | R6YXGP500 Z200, R6YXGP600 Z200                         |
| 2   | Seal washer | 90990-28J159  | 16   | R6YXGP500 Z300, R6YXGP600 Z300                         |
| 3   | Seal washer | 90990-28J159  | 18   | R6YXGHP600 Z200 to R6YXGP1000 Z200                     |
| 4   | Seal washer | 90990-28J159  | 22   | R6YXGHP600 Z400 to R6YXGP1000 Z400                     |
| 5   | Seal        | KAD-M22KB-100 |      | (690mm + 480mm)<br>R6YXGP500 Z200, R6YXGP600 Z200      |
| 6   | Seal        | KAD-M22KB-100 |      | (890mm + 480mm)<br>R6YXGP500 Z300, R6YXGP600 Z300      |
| 7   | Seal        | KAD-M22KB-100 |      | (750mm + 550mm)<br>R6YXGHP600 Z200 to R6YXGP1000 Z200  |
| 8   | Seal        | KAD-M22KB-100 |      | (1150mm + 550mm)<br>R6YXGHP600 Z400 to R6YXGP1000 Z400 |

### • List of base cover seals

| No. | Part name | Part number   | Q'ty |  |
|-----|-----------|---------------|------|--|
| 1   | Seal      | KDN-M1315-00x | 2    | R6YXGP500, R6YXGP600                                       |
| 2   | Seal      | KDP-M1315-00x | 2    | R6YXGHP600, R6YXGP700, R6YXGP800,<br>R6YXGP900, R6YXGP1000 |

To detach the covers, remove the bolts and screws shown in the Fig. below.



#### WARNING

WHEN THE COVERS HAVE BEEN REMOVED FOR THE MAINTENANCE WORK, BE SURE TO RETURN THE COVERS TO THEIR ORIGINAL POSITIONS USING THE SCREWS AND BOLTS THAT HAVE SECURED THEM.

IF ANY SCREW IS LOST, USE THE SPECIFIED SCREWS AND QUANTITIES TO SECURE THE COVERS WHILE REFERRING TO THE FIG. BELOW.

IF THE COVERS ARE NOT SECURED FIRMLY, NOISE MAY OCUR, THE COVER MAY DROP AND FLY OUT, YOUR HAND MAY BE ENTANGLED IN THE DRIVE UNIT DURING TEACHING, OR YOUR HAND MAY BE IN CONTACT THE HOT DRIVE UNIT, CAUSING BURN. TO PREVENT SUCH TROUBLES, STRICTLY OBSERVE THIS CAUTION.

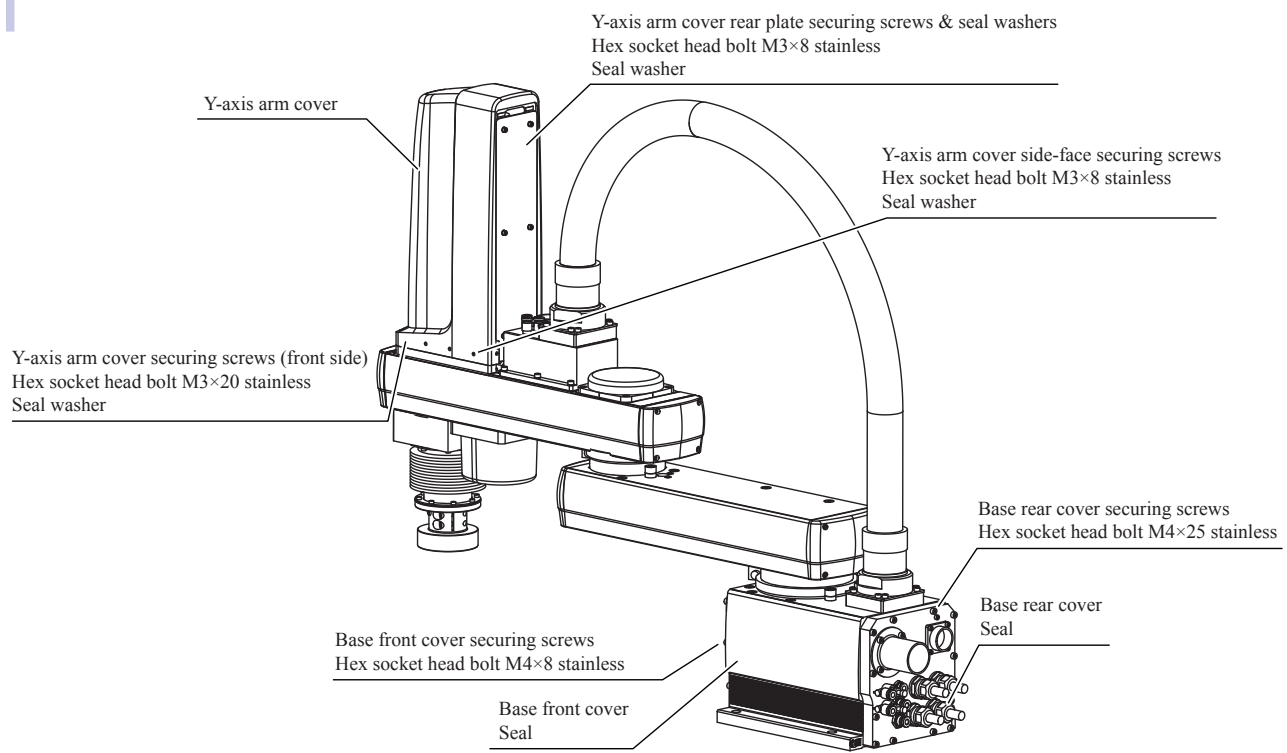


#### CAUTION

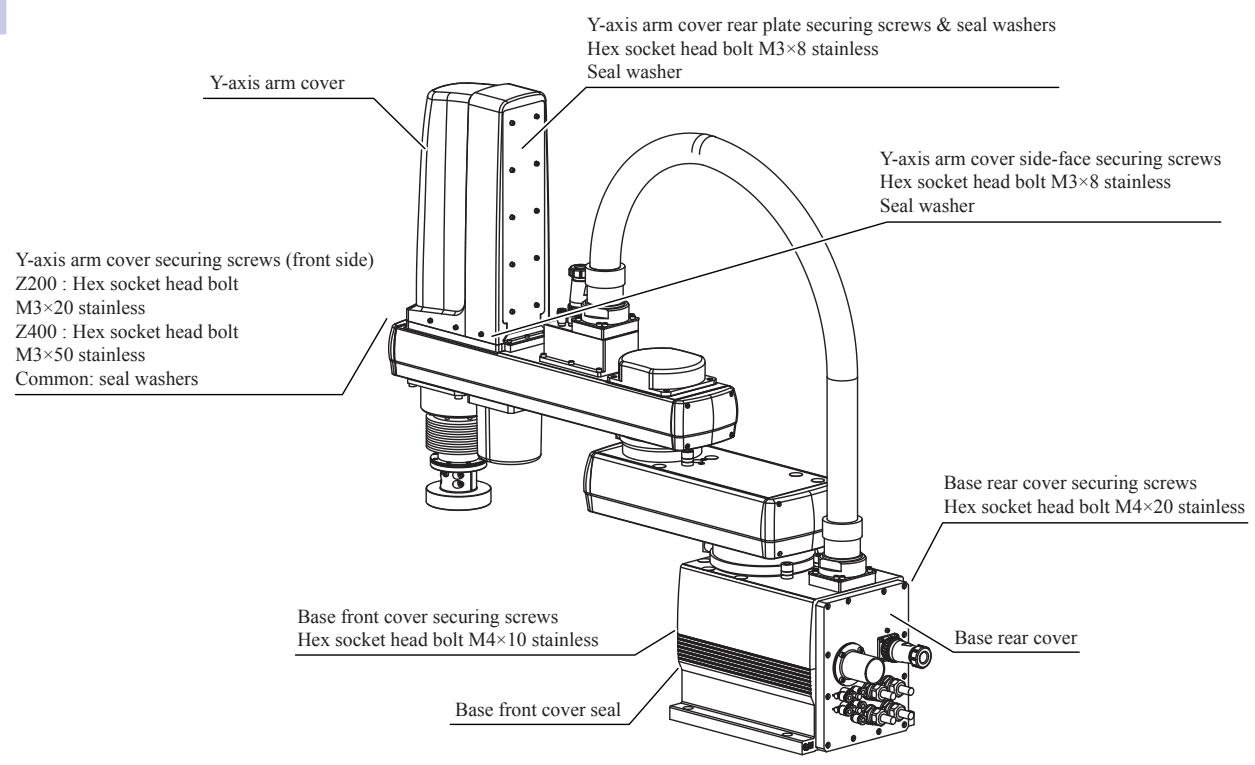
- The Y-axis arm cover cannot be detached or attached unless the Z-axis is moved down to its lower end.
- If any seal loses its strength when detaching the cover, it is recommended to replace it with a new one. If not replaced with a new one, the dust/drip proof performance or the degree of cleanliness may lower.
- Some seals are affixed. When removing such seal, peel off the adhesive agent and replace the seal with a new one.



**R6YXGP500, R6YXGP600**



**R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000**





# Chapter 3 Periodic inspection

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| 2.2 Applying the grease to the ball screw   | 3-4        |



# 1. Periodic inspection

This chapter describes only the points that are different from the standard models.  
For details about other explanations and cautions, see the maintenance manual for XG series standard models.

## 1.1 Six-month inspection

For details about cautions on inspection work, see the maintenance manual for XG standard models.

### ■ Inspection to be performed with the controller turned off

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign showing that the robot is being inspected, to keep others from operating the controller switch.
- 3 **Perform the daily inspection.**  
Enter the safety enclosure and check the following points.

| Checkpoint  | Procedure  |
|---|--|
| Manipulator bolts and screws (Only for major bolts and screws exposed externally) | Check for looseness and tighten if necessary. (See the Table below.)   |
| Controller  | Check for looseness at each terminal and connector on the panel.<br>(See “4. Robot cable connection” in Chapter 2 of the Installation Manual.) |
| Application of grease to Z-axis ball screw and spline                             | See “2. Applying the grease” in this chapter.  |
| Z-axis ball spline, ball screw  | Check for backlash. (If any abnormality is found, contact your distributor.)   |
| Bellows   | Check for breakage.  |

### Bolt tightening torque

| Bolt size           | Tightening torque (kgfcm) | Tightening torque (Nm) |
|---------------------|---------------------------|------------------------|
| M3 button head bolt | 14                        | 1.4                    |
| M4 set screw        | 20                        | 2.0                    |
| M3                  | 20                        | 2.0                    |
| M4                  | 46                        | 4.5                    |
| M5                  | 92                        | 9.0                    |
| M6                  | 156                       | 15.3                   |
| M8                  | 380                       | 37                     |
| M10                 | 459                       | 45.0                   |
| M12                 | 1310                      | 128                    |
| M14                 | 2090                      | 205                    |

■ Inspection to be performed with the controller turned on



**WARNING**

- THE ROBOT CONTROLLER MUST BE INSTALLED OUTSIDE THE SAFETY ENCLOSURE, TO PREVENT A HAZARDOUS SITUATION IN WHICH YOU OR ANYONE ENTER THE SAFETY ENCLOSURE TO INSPECT THE CONTROLLER WHILE IT IS TURNED ON.
- BODILY INJURY MAY OCCUR FROM COMING INTO CONTACT WITH THE FAN WHILE IT IS ROTATING.
- WHEN REMOVING THE FAN COVER FOR INSPECTION, FIRST TURN OFF THE CONTROLLER AND MAKE SURE THE FAN HAS STOPPED.

1 **Turn on the controller.**

Check that no one is inside the safety enclosure, and then turn on the controller.

2 **Place a sign indicating the robot is being adjusted.**

Place a sign indicating the robot is being inspected, to keep others from operating the controller, programming box or operation panel.

3 **Perform the daily inspection.**

Check the following points from outside the safety enclosure.

| Checkpoint                        | Procedure  |
|-----------------------------------|--|
| Cooling fan at rear of controller | <ul style="list-style-type: none"> <li>• Check if the fan rotates normally.</li> <li>• Check if objects blocking the fan are located and remove if any are found.</li> <li>• Check for abnormal noise from the rotating fan. If abnormal noise is heard, visually check and remove the cause. If no cause is found, contact your distributor .</li> <li>• Check for dust on the fan cover. Remove and clean if necessary.</li> </ul> |

■ Adjustment and parts replacement



**CAUTION**

- After inspection, if you notice any adjustment or parts replacement is needed, first turn off the controller and then enter the safety enclosure to perform the necessary work. o perform the inspection after the adjustment and parts replacement work, follow the steps stated in “n Inspection to be performed with the controller turned off” and “n Inspection to be performed with the controller turned on” described above.
- If repair or parts replacement is required for the robot or controller, please contact your distributor. This work requires specialized technical knowledge and skill, so do not attempt it by yourself.

## 2. Applying the grease

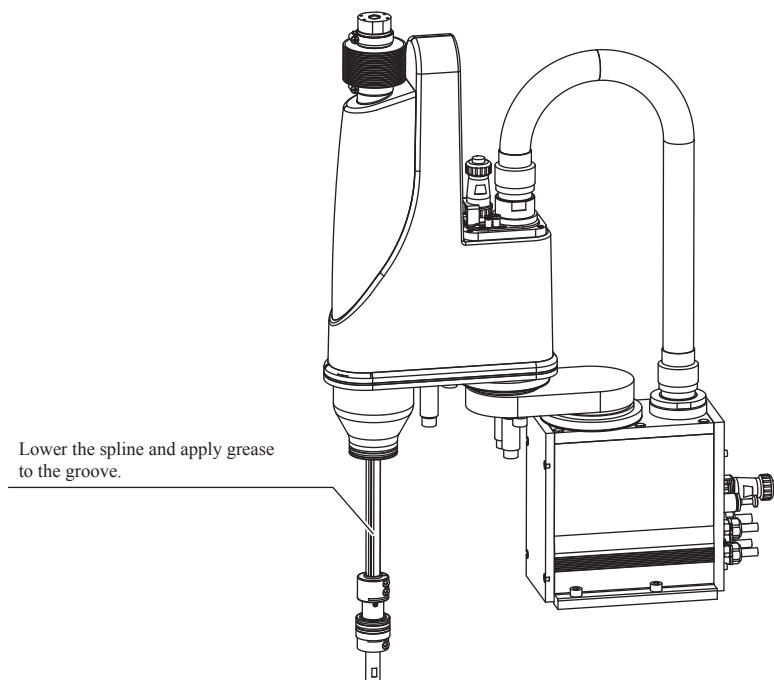
### 2.1 Applying the grease to the spline shaft

Follow the steps below to apply the grease to the spline shaft.

- 1 **Turn off the controller power.**  
Move down the Z-axis to its lower end and turn off the controller power.
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the lower bellows.**  
Remove the lower bellows as described in Chapter 7 "2. Replacing the lower bellows".  
There is no need to remove the bellows on the following models: R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000.  
Remove the screws (M3 × 8 screws) which secure the upper part of the bellows, then, with the bellows lowered, apply the grease.
- 5 **Remove the old grease with a cloth rag.**
- 6 **Apply the grease.**  
Apply the grease to the spline shaft of the Z-axis.

|  |                                 |
|--|---------------------------------|
| Clean room specifications R6YXG(L)C grease:      | LG2 (NSK)                       |
| Dust/drip proof specifications R6YXG(L)P grease: | Alvania S2 grease (Showa Shell) |

#### Applying the grease



## 2.2 Applying the grease to the ball screw

Follow the steps below to apply the grease to the ball screw.



### WARNING

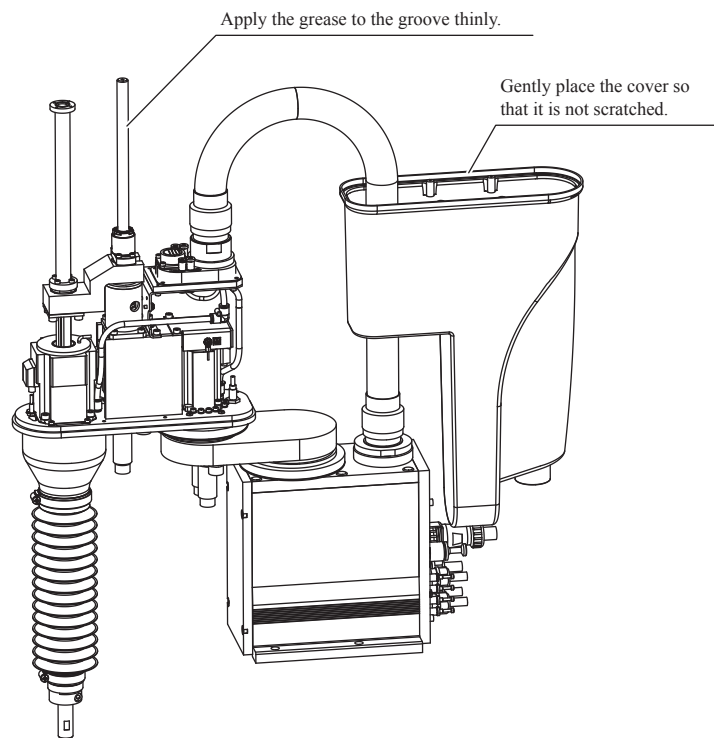
BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

- 1 **Turn off the controller power.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the Y-axis arm cover.**
- 5 **Remove the old grease with a cloth rag.**
- 6 **Apply the grease.**

Apply the grease to the screw threads of the ball screw. (See the Fig. below.)

|                                   |                                 |
|-----------------------------------|---------------------------------|
| Grease for clean room model:      | LG2 (NSK)                       |
| Grease for dust/drip proof model: | Alvania S2 grease (Showa Shell) |

### Applying the grease





# Chapter 4 Robot settings

## Contents

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# 1. Overview

Various settings have been completely made at the factory or by your distributor before shipment, including the origin position setting. If the operating conditions are changed and the robot needs to be set again, then follow the procedures described in this chapter.

The following describes the safety precautions to be observed when making various settings.



## CAUTION

---

- Read and understand the contents of this chapter completely before attempting to set the robot.
  - Place a conspicuous sign indicating the robot is being adjusted, to prevent others from touching the controller switch, programming box or operation panel.
  - If a safety enclosure has not yet been provided right after installation of the robot, rope off or chain off the movement area around the manipulator in place of a safety enclosure, and observe the following points.
    1. Use stable posts which will not fall over easily.
    2. The rope or chain should be easily visible by everyone around the robot.
    3. Place a conspicuous sign prohibiting the operator or other personnel from entering the movement area of the manipulator.
  - To check the operation after the settings have been made, refer to the section "4.5.1 Trial Operation" in Chapter "Safety Instructions" of this manual.
- 

This chapter describes only the points that are different from the standard models.  
For details about other explanations, see the installation manual for XG series standard models.

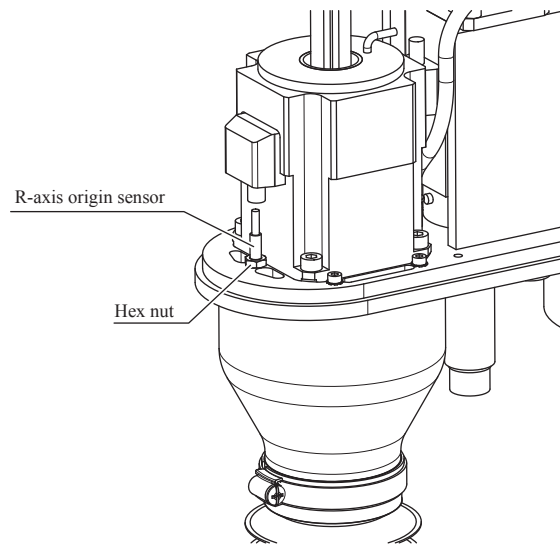
## 2. Adjusting the origin

This section describes only the origin adjustment points that are different from the standard models. For details about other explanations, see the installation manual for XG series standard models.

### ■ Adjusting the origin of the R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500 or R6YXGLC(P)600

- Since the joints of the X-, Y-, and R-axis are covered, it is difficult to understand the clearance between the sensor and dog. After the origin has been adjusted in the same manner as the standard model, touch the arm, etc. to carefully adjust the machine reference so that the origin does not deviate. After the machine reference has been adjusted, turn the joint to check that the sensor does not collide with the dog.
- Since the joints are covered, the origin positions of the X-axis and Y-axis cannot be changed.
- The R-axis sensor uses a compact sensor. So, carefully check that the tightening torque of the hex nut is as small as 1Nm (10kgfcm). If tightened to a torque larger than this level, the sensor may break.

#### R-axis origin sensor and hex nut



## 3. Standard coordinate setting using a standard coordinate setup jig

### 3.1 R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600

Use a standard coordinate setup jig (option) to set the standard coordinates more accurately. The following describes how to set the standard coordinates using the standard coordinate setup jig.

**Standard coordinate setup jig (option)**

|   | Part No.      | Name | Q'ty |
|---|---------------|------|------|
| 1 | KCY-M1577-000 | Pin  | 1    |
| 2 | 91312-04065   | Bolt | 1    |

- 1 **Turn on the controller.**  
Check that no one is inside the safety enclosure, and then turn on the controller.
- 2 **Put the robot in the emergency stop status.**  
Press the emergency stop button on the PB to put the robot in the emergency stop status.

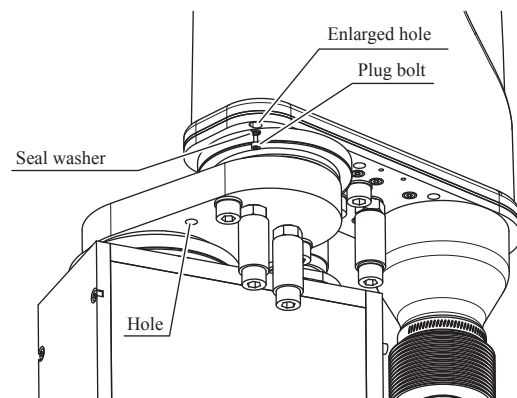


**NOTE**

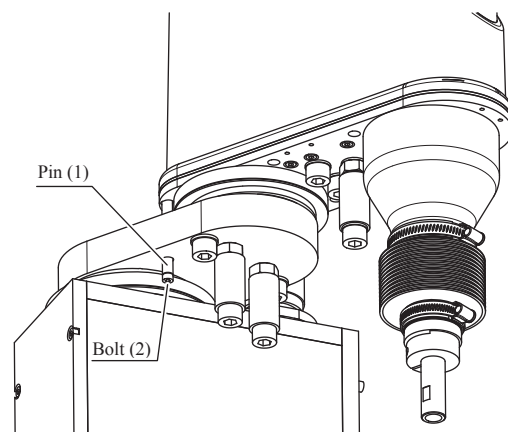
For details about emergency stop and how to cancel the emergency stop, see the "OMRON Robot Controller User's Manual".

- 3 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 4 **Enter the safety enclosure while holding the PB.**
- 5 **Remove the plug bolt and seal washer.**  
Put the robot in the posture with the positional relationship between the Y-axis arm and the X-axis arm as shown in the Fig. on the right, and then remove the plug bolt and seal washer.
- 6 **Insert the pin (1).**
  1. Put the robot in the arm posture allowing insertion of the pin, and make the X-axis arm almost aligned with the Y-axis.
  2. Adjust the arm positions so that the pin can be inserted into the enlarged hole in the Y-axis arm and the hole in the X-axis arm without jamming, and then insert the pin into the holes.
- 7 **Secure the pin (1) with the bolt (2).**  
Tighten the bolt so that the pin does not move.

▶ **Step 5 Removing the plug bolt**



▶ **Step 6-8 Y-axis position pulse value**



### 8 **Make a note of the Y-axis position pulse value.**

1. Enter "MANUAL>POINT" mode.
2. Lightly apply a clockwise torque to the Y-axis while holding the X-axis arm.
3. Make a note of the Y-axis position pulse value displayed on [POS] when the torque is unloaded.
4. Lightly apply a counterclockwise torque to the Y-axis while holding the X-axis arm.
5. Make a note of the Y-axis position pulse value displayed on [POS] when the torque is unloaded.

### 9 **Determine the + direction of the X-axis.**

Move the X-axis arm in the direction that you want to set as the + direction of the X-axis. At this time, make a note of the X-axis position pulse value displayed on [POS].

### 10 **Enter the "11. Arm length [mm]" values.**

Enter the following values in M1 and M2 for "11. Arm length [mm]" of axis parameters.

|               | M1 (X-axis arm length) | M2 (Y-axis arm length) |
|---------------|------------------------|------------------------|
| R6YXGLC(P)250 | 100.00                 | 150.00                 |
| R6YXGLC(P)350 | 200.00                 | 150.00                 |
| R6YXGLC(P)400 | 250.00                 | 150.00                 |
| R6YXGLC(P)500 | 250.00                 | 250.00                 |
| R6YXGLC(P)600 | 350.00                 | 250.00                 |

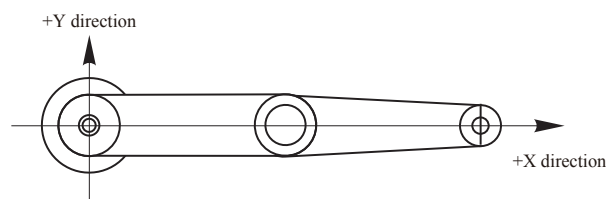
### 11 **Enter the "12. Offset pulse" values.**

Enter the values shown on the right in "12. Offset pulse" of axis parameters.

### 12 **Reattach the plug bolt and seal washer.**

1. Remove the pin and bolt.
2. Reattach the plug bolt and seal washer.

#### ▶ Step 9 **X-axis + direction**



#### ▶ Step 11 **Entering the "12. Offset pulse" values**

M1= X-axis position pulse value you have made a note of in step 9

$$M2 = \frac{\text{Y-axis position pulse value you have made a note of in step 8 (clockwise)} + \text{Y-axis position pulse value you have made a note of in step 8 (counterclockwise)}}{2}$$

**Note:** Round off the decimal part of the M2 value.

## 3.2 **R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000**

Refer to the maintenance manual for XG series standard models with regard to the following models: R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000.

# Chapter 5

# Replacing the harmonic drive

## Contents

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# 1. Cautions on replacement of the harmonic drive

The following describes the cautions on replacement of the harmonic drive. Before beginning the replacement work, always be sure to read these replacement procedures and caution.

## ■ Cautions on replacement of the harmonic drive



### WARNING

- THE MOTOR AND SPEED REDUCTION GEAR CASING ARE EXTREMELY HOT AFTER AUTOMATIC OPERATION, SO BURNS MAY OCCUR IF THESE ARE TOUCHED. BEFORE TOUCHING THESE PARTS, TURN OFF THE CONTROLLER, WAIT FOR A WHILE AND CHECK THAT THE TEMPERATURE HAS COOLED.
- WHEN REMOVING THE WAVE GENERATOR FROM THE MOTOR SHAFT OR REINSTALLING IT BACK ONTO THE MOTOR SHAFT, USE CAUTION TO AVOID AS MUCH AS POSSIBLE, APPLYING A THRUST LOAD TO THE MOTOR SHAFT. IF A LOAD IS APPLIED, THE RESOLVER MAY BE DAMAGED RESULTING IN A HAZARDOUS SITUATION OF THE ROBOT TROUBLE.

### PRECAUTIONS WHEN HANDLING HARMONIC GREASE, CLEANING OIL:

- INFLAMMATION MAY OCCUR IF THEY GET IN THE EYES. BEFORE HANDLING THEM, WEAR YOUR SAFETY GOGGLES TO ENSURE THEY WILL NOT COME IN CONTACT WITH THE EYES.
- INFLAMMATION MAY OCCUR IF THEY COME INTO CONTACT WITH SKIN. BE SURE TO WEAR PROTECTIVE GLOVES TO PREVENT CONTACT WITH SKIN.
- DO NOT TAKE ORALLY OR EAT. (EATING WILL CAUSE DIARRHEA AND VOMITING.)
- HANDS AND FINGERS MIGHT BE CUT WHEN OPENING THE CONTAINER, SO USE PROTECTIVE GLOVES.
- KEEP OUT OF THE REACH OF CHILDREN.
- DO NOT HEAT THEM OR PLACE NEAR AN OPEN FLAME SINCE THIS COULD LEAD TO SPARKS AND FIRES.

### EMERGENCY TREATMENT:

- IF THEY GET IN THE EYES, WASH LIBERALLY WITH PURE WATER FOR ABOUT 15 MINUTES AND CONSULT A PHYSICIAN FOR TREATMENT.
- IF THEY COME IN CONTACT WITH THE SKIN, WASH AWAY COMPLETELY WITH SOAP AND WATER.
- IF TAKEN INTERNALLY, DO NOT INDUCE VOMITING BUT PROMPTLY CONSULT A PHYSICIAN FOR TREATMENT.

### DISPOSING OF HARMONIC GREASE, CLEANING OIL AND THE CONTAINER:

- PROPER DISPOSAL IS COMPULSORY UNDER FEDERAL, STATE AND LOCAL REGULATIONS. TAKE APPROPRIATE MEASURES IN COMPLIANCE WITH LEGAL REGULATIONS.
- DO NOT PRESSURIZE THE EMPTY CONTAINER. PRESSURIZING MAY CAUSE THE CONTAINER TO RUPTURE.
- DO NOT ATTEMPT TO WELD, HEAT UP, DRILL HOLES OR CUT THIS CONTAINER. THIS MIGHT CAUSE THE CONTAINER TO EXPLODE AND THE REMAINING MATERIALS INSIDE IT TO IGNITE.



### CAUTION

The harmonic drive service life may shorten if the grease recommended by OMRON is not used.

## ■ Recommended grease

Use the following harmonic drive grease.

4B No.2 (made by Harmonic Drive Systems Inc.)



### CAUTION

Harmonic drive

- Do not apply strong shocks or impacts to these parts such as with a hammer. Also, do not scratch, scar or dent these parts by dropping, etc. Such actions will damage the harmonic drive.
- The specified performance cannot be maintained if any part of the harmonic drive is used in a damaged state. This damage or wear may also lead to trouble with the harmonic drive.
- Since a positional shift occurs after replacing the harmonic drive, it is necessary to make absolute reset, standard coordinate setting and point data setting again.

## 2. Replacement procedure for harmonic drive

The following describes the procedures and precautions for replacing the harmonic drive.

For the bolt tightening torque in the harmonic drive replacement work, see the Table below. However, when tightening the mounting bolts for the harmonic drive, observe the tightening torque specified in each replacement procedure. Use only OMRON genuine bolts.

### ■ Bolt tightening torque

| Bolt size           | Tightening torque (kgfcm) | Tightening torque (Nm) |
|---------------------|---------------------------|------------------------|
| M3 button head bolt | 14                        | 1.4                    |
| M4 set screw        | 20                        | 2.0                    |
| M3                  | 20                        | 2.0                    |
| M4                  | 46                        | 4.5                    |
| M5                  | 92                        | 9.0                    |
| M6                  | 156                       | 15.3                   |
| M8                  | 380                       | 37                     |
| M10                 | 720                       | 71                     |

Recommended "Screw Lock": LOCTITE 262 (made by Henkel Corporation)



#### CAUTION

Some seals are affixed. When removing such seal, peel off the adhesive agent and replace the seal with a new one.

## 2.1 R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600

### 2.1.1 Replacing the X-axis harmonic drive



#### WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

The following shows the parts and tools necessary for the X-axis harmonic drive replacement work.

#### 1. Replacement parts

|    | Part Name                      | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks                           |
|----|--------------------------------|----------------|---|------|-----------------------------------|
| 1  | Harmonic drive                 | KCY-M2110-001  |   | 1    |                                   |
| 2  | O-ring                         | KN4-M257K-000  | Cross section diameter: 1.78mm<br>Inner diameter: 72.75mm | 1    | Becomes worn and must be replaced |
| 3  | O-ring                         | KN3-M2143-000  | Cross section diameter: 1.5mm<br>Inner diameter: 49.0mm   | 1    | Becomes worn and must be replaced |
| 4  | O-ring                         | KN3-M2144-000  | Cross section diameter: 0.99mm<br>Inner diameter: 53.28mm | 1    | Supplied with harmonic drive      |
| 5  | Motor mounting bolt            | 91312-05014    | M5, length: 14  | 4    | Spare parts                       |
| 6  | Harmonic drive mounting bolt   | 91312-03020    | M3, length: 20  | 16   | Must be replaced                  |
| 7  | Harmonic drive mounting bolt   | 91312-03030    | M3, length: 30  | 11   | Must be replaced                  |
| 8  | Panhead bolt for dog           | 98502-03030    | M3, length: 30  | 1    | Spare parts                       |
| 9  | Spacer for dog                 | KDM-M2134-000  |   | 1    | Spare parts                       |
| 10 | Seal washer                    | 90990-36J008   | SWS 3×6.4   | 16   | Must be replaced                  |
| 11 | Plate mounting bolt            | 91312-05020    | M5, length: 20  | 6    | Spare parts                       |
| 12 | Seal washer                    | 90990-36J006   | SWS 5×9   | 6    | Must be replaced                  |
| 13 | O-ring                         | 90200-01J900   | S90   | 2    | Must be replaced (*1)             |
|    |                                |                |   | 1    | Must be replaced (*1)             |
| 14 | End face seal                  | KDM-M2111-000  | V-95A NBR510  | 1    | Must be replaced (*1)             |
| 15 | Cap                            | KDM-M1152-000  | MTC5B5  | 6    | Must be replaced                  |
| 16 | Seal                           | KDM-M1315-000  |   | 2    | Must be replaced                  |
| 17 | Stay mounting bolt             | 91380-04012    | M4, length: 12(Stainless)                                 | 2    | Spare parts                       |
| 18 | Seal washer                    | 90990-36J009   | SWS 4×9   | 2    | Must be replaced                  |
| 19 | Seal                           | KDM-M1151-000  |   | 2    | Must be replaced                  |
| 20 | Plate securing bolt            | 91312-05020    | M4, length: 12  | 6    | Spare parts                       |
| 21 | Screw for round terminal       | 97602-04308    | M4, length: 8   | 3    | Spare parts                       |
| 22 | Lock washer for round terminal | 90172-00J040   | For M3  | 3    | Spare parts                       |

\*1: "XG(L)P" indicates dust/drip proof specs., and "XG(L)C" indicates clean room specs.

## 2. Torque wrench, etc.



### CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

|   | Name               | Part No.                  | Manufacturer                         | Remarks  |
|---|--------------------|---------------------------|--------------------------------------|--|
| A | Torque wrench      | N120SPCK                  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M5 hex socket head bolt<br>Tightening torque: 7.4Nm (76kgfcm)  |
|   | Changeable head    | 230HCK4                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | Wrench (without ball end) for M5 hex socket head bolt; insert 110mm  |
| B | Torque screwdriver | N30LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 hex socket head bolt<br>Tightening torque: 1.8Nm (18kgfcm)  |
|   | Drive bit          | B35, opposite side 2.5×75 | Vessel Co., Inc.                     | Attachment hexagonal width across flat : 6.35mm<br>Overall length : 75mm<br>Hexagonal width across flat at tip : 2.5mm |
| C | Torque screwdriver | N12LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 set screw<br>Tightening torque: 0.7Nm (7kgfcm)  |
|   | Drive bit          | 3C1507                    | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat : 6.35mm<br>Overall length : 70mm<br>Hexagonal width across flat at tip : 1.5mm |
| D | Torque screwdriver | N12LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 Phillips-head screw<br>Tightening torque: 0.9Nm (9kgfcm)  |
|   | Drive bit          | B35+2×50                  | Vessel Co., Inc.                     | Attachment hexagonal width across flat : 6.35mm<br>Overall length : 50mm<br>Bit number : #2                            |

\* Use a commercially available torque wrench to tighten bolts other than those shown above.

## 3. Other tools

| Name                 | Part No.     | Manufacturer           | Remarks  |
|----------------------|--------------|------------------------|--|
| Harmonic grease      | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |
| Cleaning wipe        |              |                        |  |
| Phillips screwdriver |              |                        |  |
| Hex wrench set       |              |                        |  |
| "Screw Lock" LOCTITE | Loctite 262  | Henkel                 | High strength type (red)   |

\*1 : 25g

### ■ Removal

Follow the steps below to remove the X-axis parts.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**



### CAUTION

In the following steps, when the work is performed without removing the Y-axis arm from the X-axis arm, perform the work with great care since the X-arm without removing the Y-axis arm is very heavy.

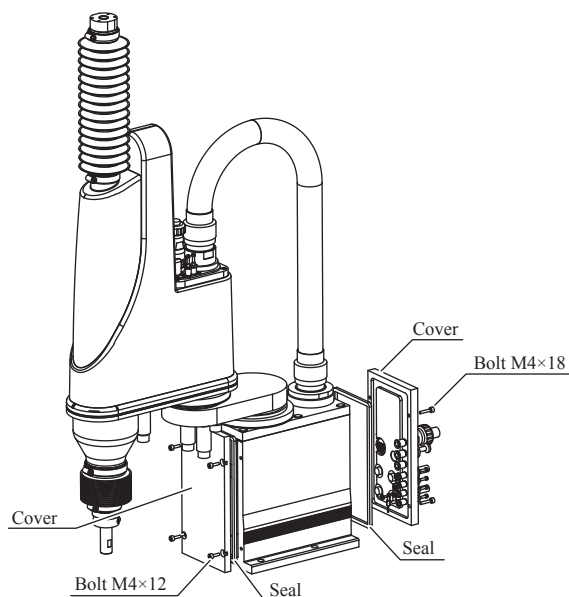
- 4 **Remove the base front and rear covers, and seals.**



### NOTE

Some seals are affixed. When removing such seal, peel off the adhesive agent and replace the seal with a new one.

#### ▶ Step 4 Removing the base covers and seals



- 5 **Disconnect the X-axis motor power wire XM connector and resolver wire XP connector in the base, and the round terminals of the X-axis motor and machine harness.**

- 6 **Remove the machine harness stay mounting bolts and seal washers.**



**NOTE**  
Be sure to replace the seal and seal washer with new ones.

- 7 **Remove the plate from the base.**

1. Remove the caps, bolts, and seal washers from the top surface of the plate.
2. Remove the seals.



**NOTE**  
Some seals or seal washers are affixed. When removing such seal or seal washer, peel off the adhesive agent and replace the seal or seal washer with a new one.

3. Lay down the plate together with the X-axis and Y-axis arms to place it onto a cloth rag.

- 8 **Remove the X-axis motor.**

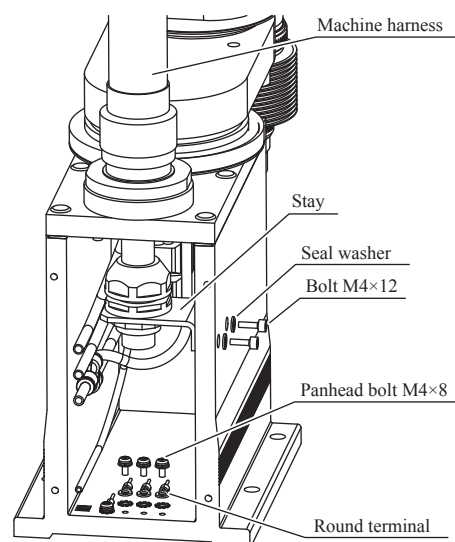
1. Disconnect the air tube from the joint.
2. Using the tool A, remove the bolts that secure the motor.
3. Pull out the motor from the plate while turning the X-axis arm.



**NOTE**  
An O-ring is placed between the motor mating and the plate. Replace this O-ring with a new one.

▶ **Step 5-6**

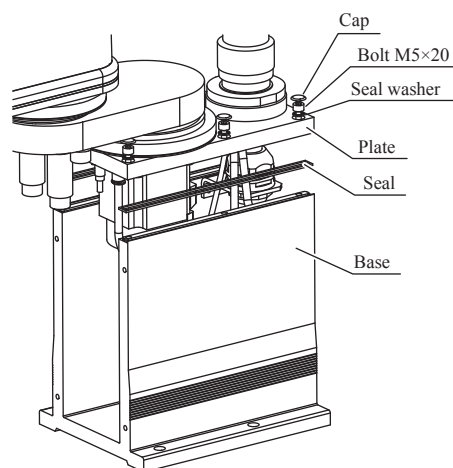
**Disconnecting the connectors and round terminals, and removing the mounting bolts, and washers**



\* The position of the round terminal may differ according to the model in question.

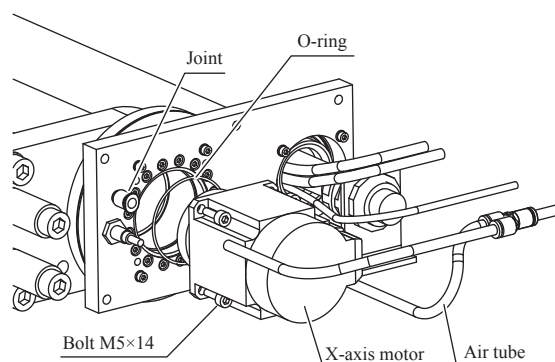
▶ **Step 7**

**Removing the plate**



▶ **Step 8**

**Removing the motor**



9

**Remove the wave generator.**

Remove the set screw (1 pc.) that secure the wave generator.

10

**Remove the X-axis arm.**

Remove the X-axis arm mounting bolts and seal washers. Remove the end face seal. Place the X-axis arm that has been removed in a place where it does not hinder the work.



**NOTE**

Replace the seal washer and the end face seal with new ones.

11

**Remove the X-axis harmonic drive from the X-axis arm.**

Remove the X-axis harmonic drive mounting bolts, panhead bolts, spacers, and cover.

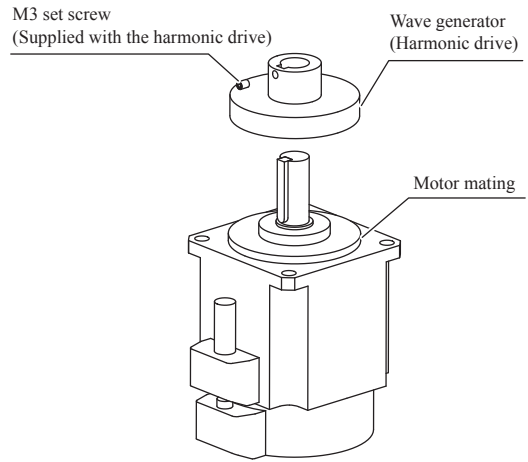


**NOTE**

Be sure to replace all the O-rings and seal washers with new ones.

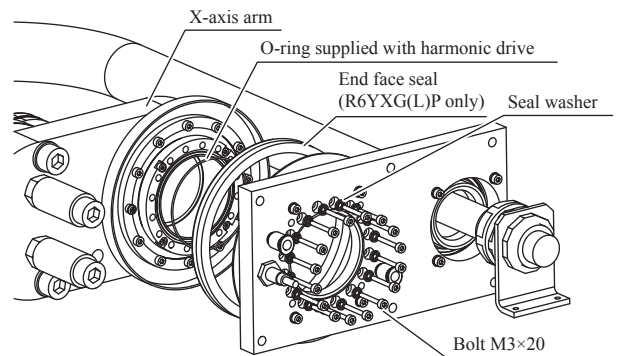
**Step 9**

**Removing the wave generator**



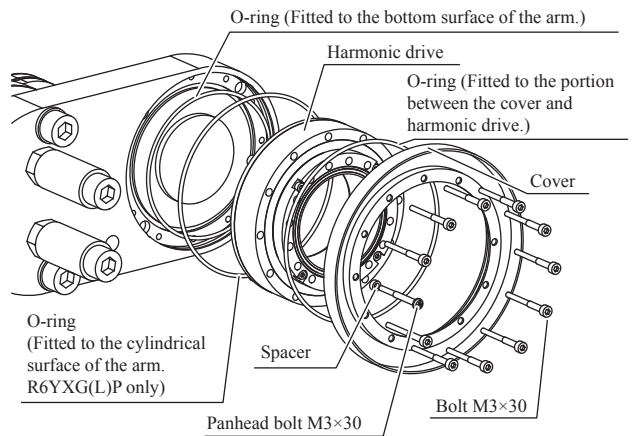
**Step 10**

**Removing the X-axis arm**



**Step 11**

**Removing the harmonic drive**



## ■ Replacement and reassembly

Follow the steps below to replace the harmonic drive with a new one and reassemble it.

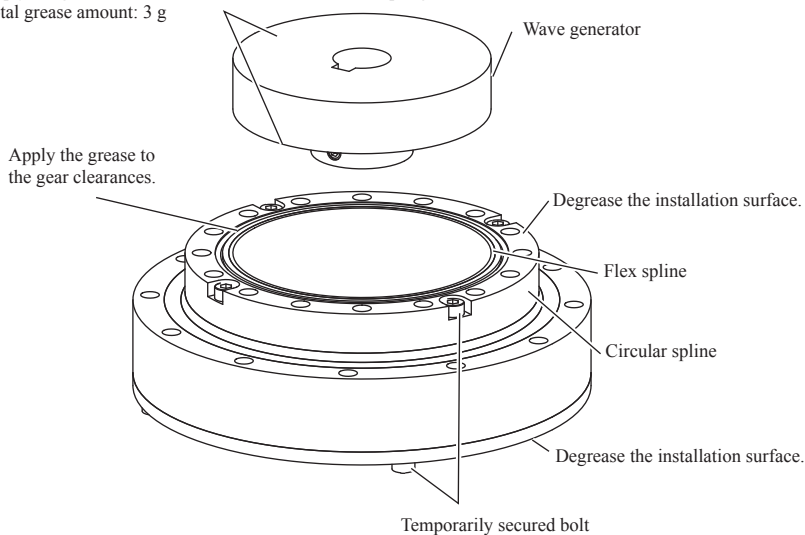
1

### **Perform the work shown below before reassembling the harmonic drive.**

1. Apply the harmonic grease to a new wave generator. For details about how to apply the grease, see the Fig. below.  
Before applying the grease, degrease the top and bottom surfaces of the harmonic drive.

#### Step 1 Applying the harmonic grease

Fill ball spaces with the grease sufficiently.  
Apply the grease to the entire surface of Oldham's coupling.  
Total grease amount: 3 g



2. Remove the old grease and worn-out particles from the motor, plate, and X-axis arm completely.



#### CAUTION

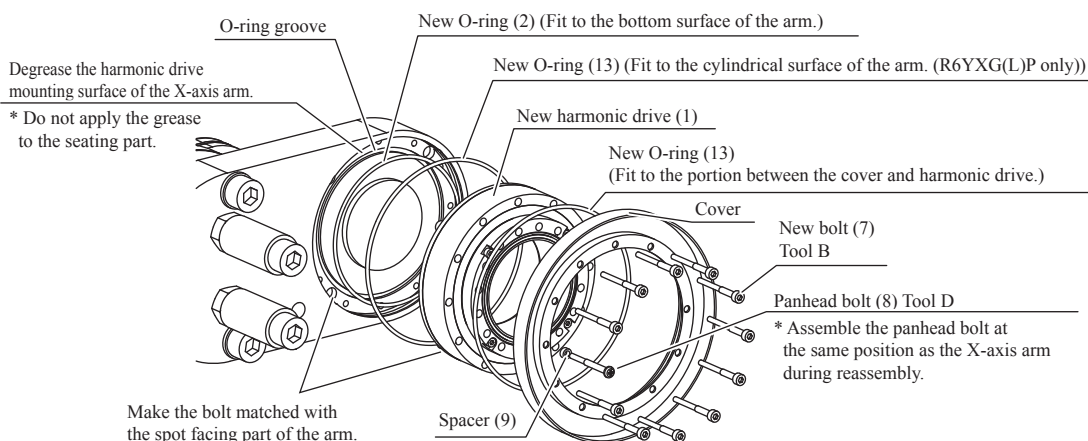
- If foreign matter is caught in during reassembly work, this may cause the noise from the harmonic drive or the harmonic drive to break.
- Never remove the temporarily secured bolts. Doing so may cause a misalignment.

2

### **Secure a new harmonic drive (1) to the X-axis arm.**

1. Degrease the harmonic drive installation surface of the X-axis arm.  
Do not apply the grease to the seating part.

#### Step 2 Mounting the harmonic drive



2. Fit the O-ring (2) and O-ring (13) (R6YXG(L)P only) coated with the grease into the O-ring groove of the X-axis arm. Fit another O-ring (13) to the portion between the harmonic drive and cover.  
Since the grease application to the O-ring is intended to prevent the O-ring from coming off, it is accepted to apply a small amount of the grease.



#### CAUTION

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

- Secure the new harmonic drive to the X-axis arm with new bolts.  
Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.  
Grease applied to the bolt tip is intended to stabilize the bolt axial force.
- Secure the panhead bolts and spacers to their original positions.
- Fit the end face seal.



**CAUTION**

Do not apply the grease to the panhead bolt. Doing so may cause the bolt to loosen.

**3**

**Tighten the bolts and panhead bolts in the order shown below.**

- Using the wrench, tighten the bolts and panhead bolts manually in the order indicated by circled numbers.
- Using the torque wrench, tighten the bolts and panhead bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
- Tighten the bolts and panhead bolts to the specified torque in the order indicated by circled numbers.
- Finally, check that the bolts and panhead bolts are tightened to the specified torque.

**4**

**Install the new O-ring (4).**

- Degrease the top surface of the plate where the harmonic drive is to be installed.

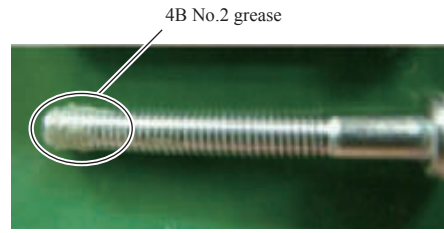


**CAUTION**

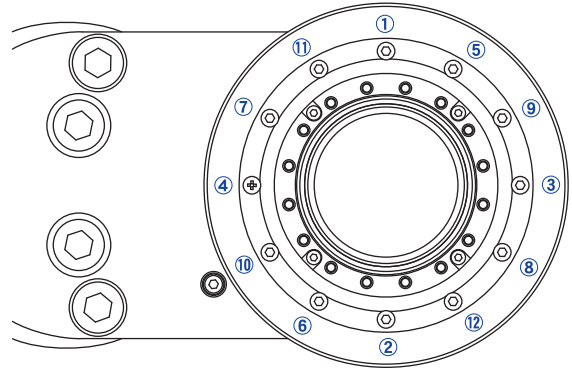
Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

- Fit the new O-ring (4) coated with the harmonic grease into the O-ring groove of the harmonic drive.  
Since the grease application to the O-ring is intended to prevent the O-ring from coming off, it is accepted to apply a small amount of the grease.
- Fit the end face seal into the holder. At this time, fit the end face seal so that its seat is closely in contact with the holder.

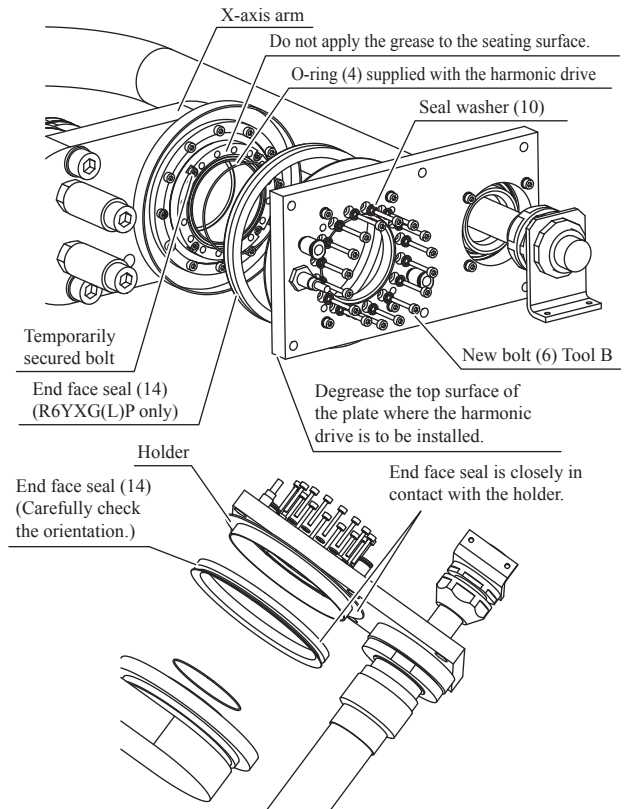
**Step 2, 5 Applying the grease to the mounting bolt**



**Step 3 Bolt and panhead bolt tightening order**



**Step 4 Installing the harmonic drive**





## 5 **Secure the harmonic drive to the plate.**

Secure the harmonic drive to the plate with the new bolts.

The harmonic drive's phase with respect to the plate should be as shown in the Fig. on the right.

Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.

## 6 **Tighten the bolts in the order shown below.**

1. Using the wrench, tighten the bolts manually in the order indicated by circled numbers.
2. Using the torque wrench, tighten the bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts to the specified torque in the order indicated by circled numbers.
4. Finally, check that the bolts are tightened to the specified torque.

## 7 **Fit the new O-ring (3) into the motor mating.**



### CAUTION

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

## 8 **Secure the spacer and wave generator.**

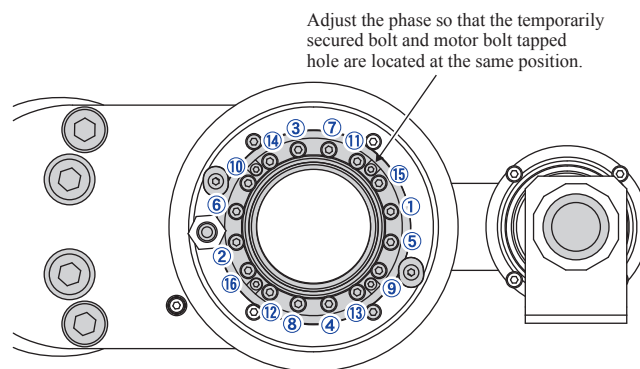
1. Pass the spacer and wave generator through the motor shaft.  
Push in the spacer and wave generator until they are in contact with the motor.
2. Secure the wave generator with the set screw (1 pc.).  
At this time, apply a small amount of the screw lock to the set screw.
3. Apply the harmonic grease to the portion between the wave generator and motor and the top surface of the wave generator.



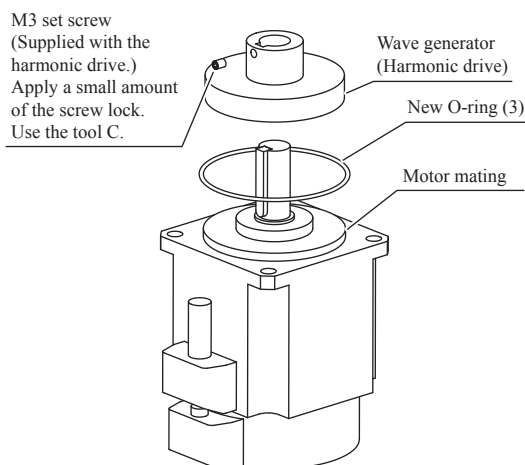
### CAUTION

- If it is difficult to fit the wave generator onto the motor shaft by pushing by hand, do not forcefully push in. Grind the key or motor shaft with sandpaper or similar tool to make it easier to fit the wave generator onto the motor shaft.
- Apply the specified amount of harmonic grease (total specified amount, 25g) to each part of the harmonic drive. An insufficient amount of grease may shorten the service life of the drive parts, and an excessive amount may cause the grease to leak.

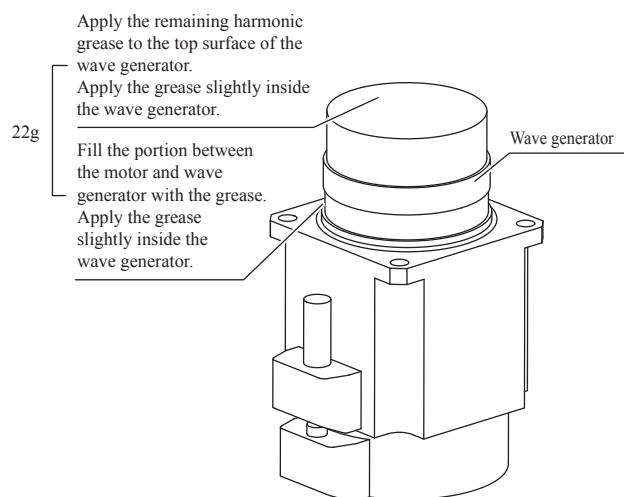
### ▶ Step 5-6 **Phase with respect to the plate**



### ▶ Step 7-8 **Securing the spacer and wave generator**



### ▶ Step 8 **Applying the harmonic grease**

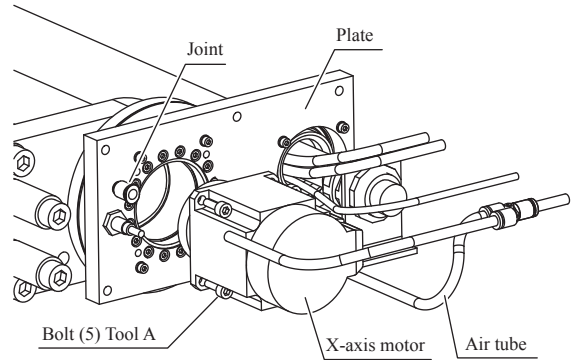


9

**Install the X-axis motor.**

1. Push the X-axis motor into the plate while moving the X-axis arm manually. At this time, pay special attention so that any grease does not stick to the plate.
2. Using the tool A, uniformly tighten the four bolts while moving the X-axis arm by hand slowly left and right at intervals of 45°. At this time, if any jamming or catching is felt, reassemble from the beginning.
3. Connect the air tube.

▶ **Step 9 Installing the X-axis motor**



10

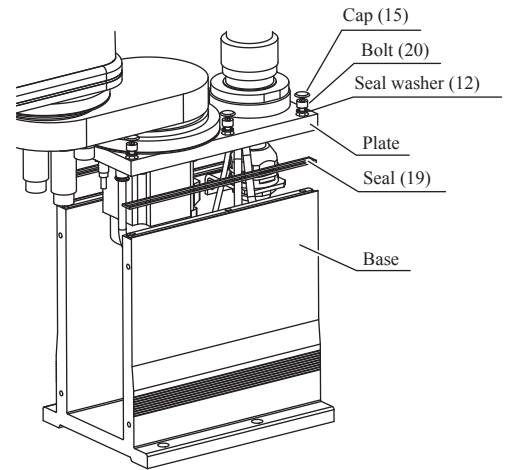
**Secure the plate.**

Put the seal between the plate and base, place the plate on the base, and secure the plate with the bolts and seal washers.

Attach the cap to the top of the bolt.

Reassemble the plate so that there is no height difference between the plate and base end face.

▶ **Step 10 Securing the plate**



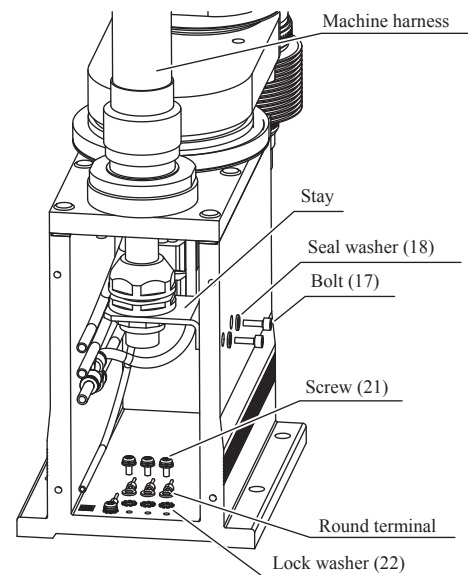
11

**Connect the X-axis motor power wire connector XM and resolver wire connector XP, and the round terminals of the machine harness and X-axis motor.**

12

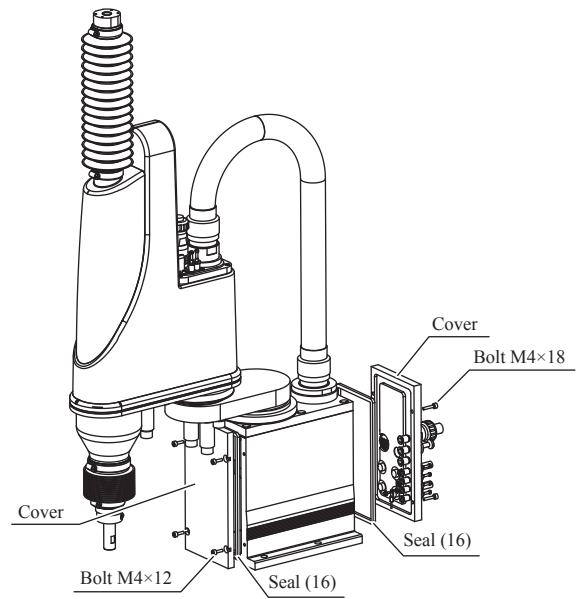
**Secure the stay with the bolts and seal washers.**

▶ **Step 11-12 Connecting the connectors and round terminals, and reattaching the mounting bolts and seal washers**



13 *Reattach the base front and rear covers, and seals.*

▶ Step 13 Reattaching the base front and rear covers



■ Aging

1 *Go out of the safety enclosure.*

2 *Turn on the controller.*

Check that no one is inside the safety enclosure, and then turn on the controller.



**CAUTION**

After the harmonic drive has been replaced, it is necessary to perform the absolute reset and set the standard coordinates and point data again. Make the adjustments while referring to Chapter 3 “Adjusting the robot” in the Installation Manual.

3 *Perform the aging.*

Perform the aging for 30 minutes at 5% speed and for another 30 minutes at 20% speed by rotating the X-axis arm as much as possible (at least 10°).

## 2.1.2 Replacing the Y-axis harmonic drive



### WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

The following shows the parts and tools necessary for the Y-axis harmonic drive replacement work.

### 1. Replacement parts

|    | Part Name                    | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks                               |
|----|------------------------------|----------------|---|------|---------------------------------------|
| 1  | Harmonic drive               | KCY-M2510-001  |   | 1    |                                       |
| 2  | O-ring                       | KN4-M1896-000  | Cross section diameter: 1.78mm<br>Inner diameter: 63.22mm | 1    | Becomes worn and must be replaced     |
| 3  | O-ring                       | 90220-01J800   | S80   | 2    | Must be replaced. R6YXG(L)P           |
|    |                              |                |   | 1    | Must be replaced. R6YXG(L)C           |
| 4  | O-ring                       | 90990-17J016   | Cross section diameter: 0.8mm<br>Inner diameter: 45.40mm  | 1    | Supplied with harmonic drive          |
| 5  | End face seal                | KDM-M2511-000  | V-80A NBR510  | 1    | Must be replaced. R6YXG(L)P only (*1) |
| 6  | Harmonic drive mounting bolt | 91312-03022    | M3, length: 22  | 16   | Must be replaced                      |
| 7  | Harmonic drive mounting bolt | 91312-03025    | M3, length: 30  | 11   | Must be replaced                      |
| 8  | Panhead bolt for dog         | 98502-03030    | M3, length: 30  | 1    | Spare parts                           |
| 9  | Spacer for dog               | KDM-M2534-000  |   | 1    | Spare parts                           |
| 10 | Seal washer                  | 90990-36J008   | SWS 3×6.4   | 16   | Must be replaced                      |
| 11 | Plate, cover securing bolts  | 91312-04010    | M4, length: 10  | 4    | Spare parts                           |

\*1: "XG(L)P" indicates dust/drip proof specs., and "XG(L)C" indicates clean room specs.

### 2. Torque wrench, etc.



### CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

|   | Name               | Part No.                  | Manufacturer                       | Remarks  |
|---|--------------------|---------------------------|------------------------------------|--|
| A | Torque wrench      | N60CPCCK                  | KANON<br>(Nakamura Mfg. Co., Ltd.) | For M4 hex socket head bolt<br>Tightening torque: 3.8Nm (39kgfcm)  |
|   | Changeable head    | 230HCK3                   | KANON<br>(Nakamura Mfg. Co., Ltd.) | Wrench (without ball end) for M4 hex socket head bolt; insert 93mm   |
| B | Torque screwdriver | N30LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.) | For M3 hex socket head bolt<br>Tightening torque: 1.8Nm (18kgfcm)  |
|   | Drive bit          | B35, opposite side 2.5×75 | Vessel Co., Inc.                   | Attachment hexagonal width across flat : 6.35mm<br>Overall length : 75mm<br>Hexagonal width across flat at tip : 2.5mm |
| C | Torque screwdriver | N12LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.) | For M3 set screw<br>Tightening torque: 0.7Nm (7kgfcm)  |
|   | Drive bit          | 3C1507                    | NAC<br>(Nakamura Mfg. Co., Ltd.)   | Attachment hexagonal width across flat : 6.35mm<br>Overall length : 70mm<br>Hexagonal width across flat at tip : 1.5mm |
| D | Torque screwdriver | N12LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.) | For M3 Phillips-head screw<br>Tightening torque: 0.9Nm (9kgfcm)  |
|   | Drive bit          | B35+2×50                  | Vessel Co., Inc.                   | Attachment hexagonal width across flat : 6.35mm<br>Overall length : 50mm<br>Bit number : #2                            |

\* Use a commercially available torque wrench to tighten bolts other than those shown above.

### 3. Other tools

| Name                 | Part No.     | Manufacturer           | Remarks   |
|----------------------|--------------|------------------------|---|
| Harmonic grease      | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago.<br>The grease has probably deteriorated. |
| Cleaning wipe        |              |                        |   |
| Phillips screwdriver |              |                        |   |
| Hex wrench set       |              |                        |   |

|                      |             |        |                          |
|----------------------|-------------|--------|--------------------------|
| "Screw Lock" LOCTITE | Loctite 262 | Henkel | High strength type (red) |
|----------------------|-------------|--------|--------------------------|

\*1 : 12g

## ■ Removal

Follow the steps below to remove the Y-axis parts.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2. As the Y-axis motor wiring is clamped at several locations, the connectors are difficult to disconnect. So, perform the replacement work without disconnection of the connectors.



### WARNING

IF THE Y-AXIS ARM MOUNTING BOLTS ARE REMOVED IN STEP 5, THE Y-AXIS ARM COMES OFF, CAUSING HAZARDOUS SITUATION.

IF A HEAVY TOOL IS ATTACHED TO THE ARM TIP, THE ARM MAY DROP. TAKE GREAT CARE WHEN REMOVING THE Y-AXIS ARM MOUNTING BOLTS.

- 5 **Remove the Y-axis arm.**
  1. Remove the harness support plate and motor cover, and disconnect the air tube.
  2. Remove the Y-axis arm mounting bolts and seal washers.
  3. Remove the Y-axis arm.  
Place the Y-axis arm that has been removed in a place where it is not in contact with the harness and it does not hinder the work.
  4. Remove the O-ring.

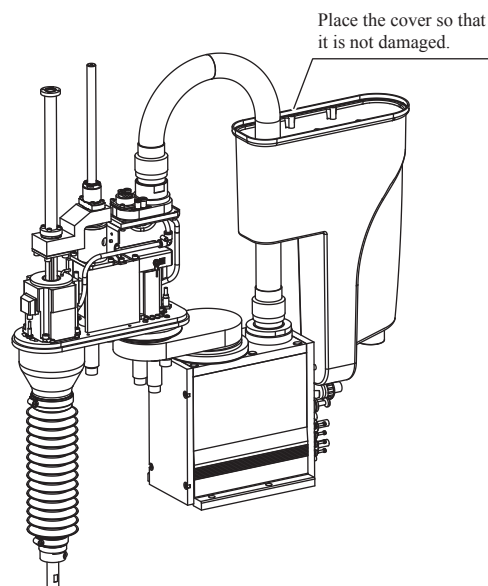


### NOTE

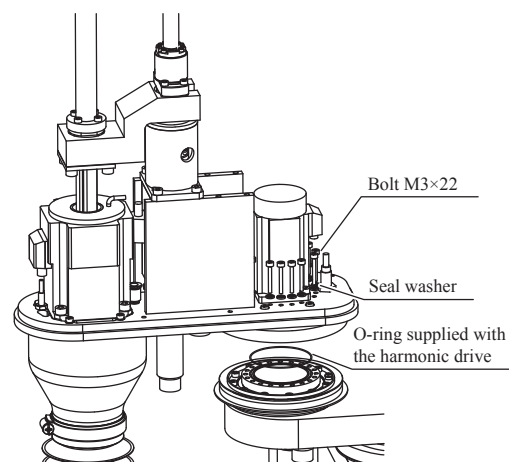
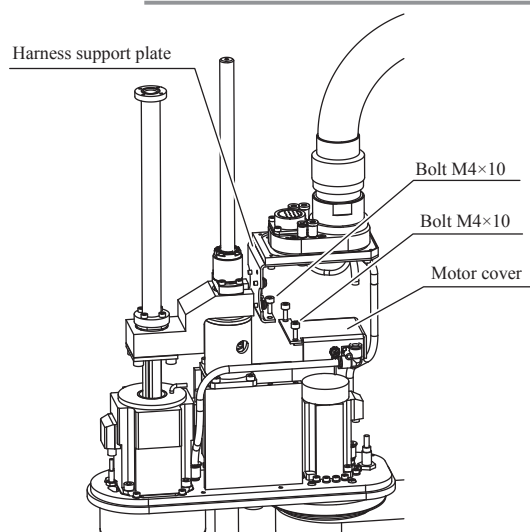
The O-rings and seal washers of the harmonic drive are replaced later.

The O-ring may stick to the bottom surface of the Y-axis arm. Be sure to remove the O-ring securely.

### ▶ Step 4 Removing the cover



### ▶ Step 5 Removing the Y-axis arm



**6 Remove the wave generator from the motor shaft.**

Remove the set screws (2 pcs.) that secure the wave generator.

**7 Remove the Y-axis harmonic drive from the top surface of the X-axis arm.**

1. Remove the Y-axis harmonic drive mounting bolts, panhead bolts, spacers, and cover.
2. Remove the O-rings and end face seals.

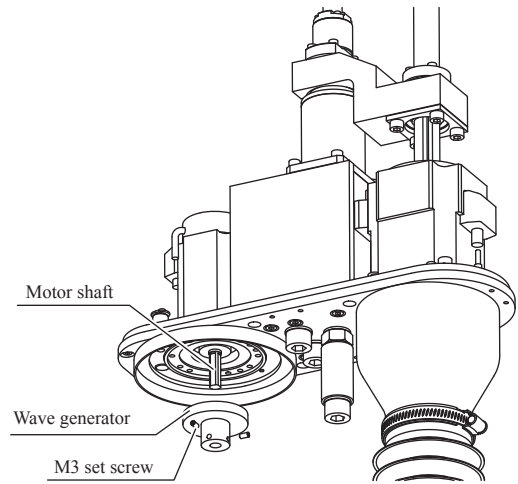


**NOTE**

The O-rings of the Y-axis harmonic drive, and other rings and end face seals are replaced later.

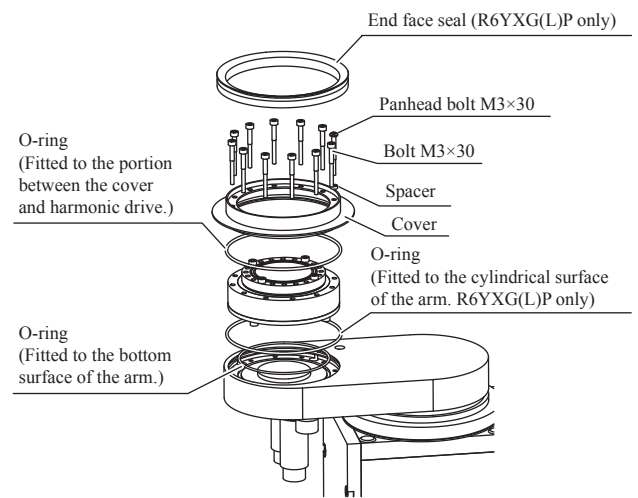
**Step 6**

**Removing the wave generator**



**Step 7**

**Removing the Y-axis harmonic drive**



**■ Replacement and reassembly**

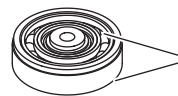
Follow the steps below to replace the harmonic drive with a new one and reassemble it.

**1 Perform the work shown below before reassembling the harmonic drive.**

1. Apply the harmonic grease 4B No.2 to a new wave generator.
2. Remove the old grease and worn-out particles from the motor, X-axis arm, and Y-axis arm completely.

**Step 1**

**Applying the harmonic grease (wave generator)**



Fill ball spaces with the grease sufficiently.  
Apply the grease.  
Total grease amount: 2 g



**CAUTION**

If foreign matter is caught in during reassembly work, this may cause the noise from the harmonic drive or the harmonic drive to break.

3. Apply the specified amount of harmonic grease to each part of the harmonic drive.



**CAUTION**

An insufficient amount of grease may shorten the service life of the drive parts, and an excessive amount may cause the grease to leak.

## 2

**Secure a new harmonic drive (1) to the X-axis arm.**

1. Degrease the harmonic drive installation surface of the X-axis arm.  
Do not apply the grease to the seating surface.
2. Fit new O-ring (2) and O-ring (11) (R6YXG(L)P only) into the O-ring groove of the X-axis arm. Additionally, fit the O-ring (11) to the portion between the harmonic drive and cover.

**CAUTION**

- Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.
- Never remove the temporarily secured bolt. Doing so may cause a misalignment.

3. Place a new harmonic drive on the X-axis arm, reattach the O-ring (11) and cover to it, and secure it with the bolts.  
Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.  
Grease applied to the bolt tip is intended to stabilize the bolt axial force.
4. Secure the panhead bolts and nuts at their original positions.
5. Fit the end face seal.

**CAUTION**

Do not apply the grease to the panhead bolt. Doing so may cause the bolt to loosen.

## 3

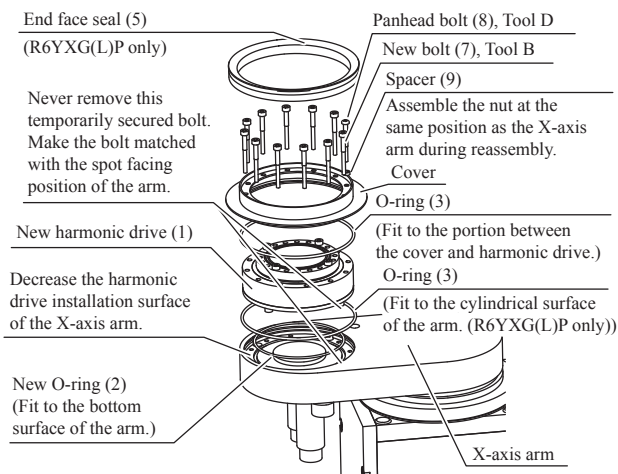
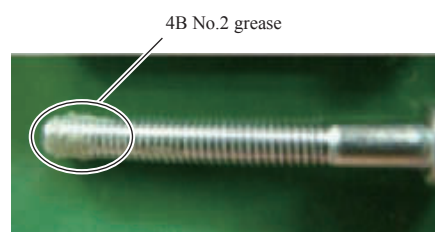
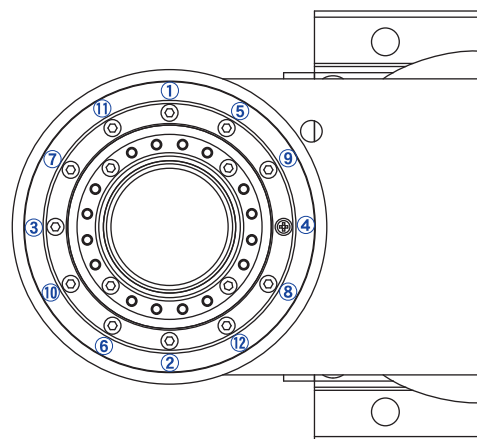
**Tighten the bolts and panhead bolts in the order shown below.**

1. Using the wrench, tighten the bolts and panhead bolts manually in the order indicated by circled numbers.
2. Using the torque driver, tighten the bolts and panhead bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts and panhead bolts to the specified torque in the order indicated by circled numbers.
4. Finally, check that the bolts and panhead bolts are tightened to the specified torque.

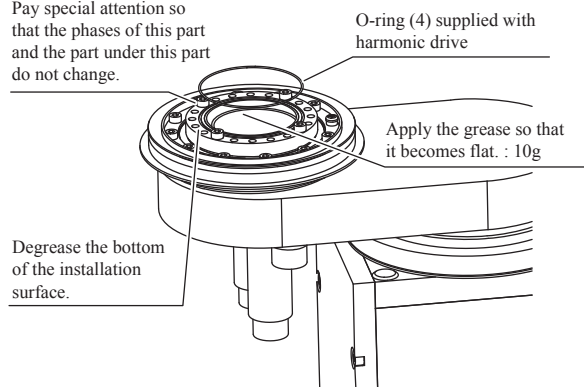
## 4

**Apply the grease to the inside of the harmonic drive main body.**

For the Y-axis, apply the grease so that it becomes flat.

▶ **Step 2****Securing the harmonic drive**▶ **Step 2, 7****Applying the grease to the mounting bolt**▶ **Step 3****Bolt and panhead bolt tightening order**▶ **Step 4-6****Applying the grease to the inside of the harmonic main body.**

Remove these temporarily secured bolts (4 pcs. only). Pay special attention so that the phases of this part and the part under this part do not change.



5 **Remove the temporarily secured bolts (4 pcs.).**

6 **Install the O-ring (4) provided with the new harmonic drive.**

1. Degrease the installation surface on the top surface of the harmonic drive.
2. Fit the O-ring supplied with the new harmonic drive into the O-ring groove of the harmonic drive.  
If it is difficult to fit the O-ring into the groove, slightly stretch the O-ring.  
It is accepted to apply a small amount of the harmonic drive grease to the O-ring in order to prevent the O-ring from coming off the groove.



**CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

7 **Secure the wave generator.**

1. Pass the wave generator through the motor shaft while carefully checking its orientation. Push in the wave generator until it is in contact with the stepped part of the motor shaft.
2. Secure the wave generator with the set screws (2 pcs.).  
At this time, apply a small amount of the screw lock to the set screws.



**CAUTION**

- If it is difficult to fit the wave generator onto the motor shaft by pushing by hand, do not forcefully push in. Grind the key or motor shaft with sandpaper or similar tool to make it easier to fit the wave generator onto the motor shaft.
- Apply the specified amount of the harmonic grease to each part of the harmonic drive. An insufficient amount of grease may shorten the service life of the drive parts, and an excessive amount may cause the grease to leak.

8 **Secure the Y-axis arm to the harmonic drive.**

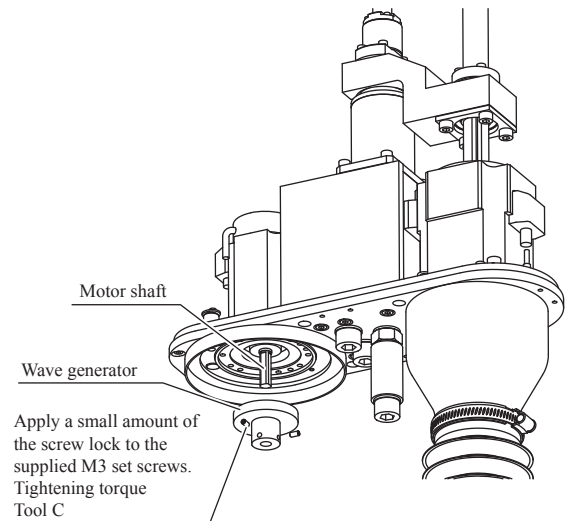
1. Degrease the Y-axis arm side where the harmonic drive is to be installed.
2. Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.



**CAUTION**

When tightening the bolts with the moment load applied to the harmonic drive, this may cause breakage. Perform the work not to apply the moment load to the harmonic drive.

▶ **Step 7** **Securing the wave generator**





- Secure the Y-axis arm to the harmonic drive with new mounting bolts (6).

Perform the following procedure to prevent noise from the harmonic:

First, seat only bolts (3)(4)(11)(12) shown in the Step 9 illustration on next page, and tighten them until they are snug (no torque applied). Then screw in the other bolts.

At this time, two work personnel perform the work with the Y-axis arm kept horizontally so that no moment load is applied to the Y-axis harmonic drive. One person supports the end of the Y-axis arm and the other person secures the Y-axis arm in place.

## 9

### ***Tighten the bolts in the order shown below.***

- While rotating the Y-axis arm, gradually tighten bolts (3) (4) (11) (12) in an alternating manner until they can no longer be turned by hand. Tighten these bolts in the order indicated below while the arm is being rotated at ultra-low-speed mode (1/10 of turn per second). The bolts should be gradually tightened in the following alternating sequence 3 times: (3) - (4) - (11) - (12) - (3) - (4), etc.
- Use Tool B to tighten bolts (3) - (4) - (11) - (12) (4 bolts) while rotating the Y-axis arm.
- Gradually tighten the remaining 12 bolts in an alternating, diagonal pattern.
- Finally, check that the bolts are tightened to the specified torque.

## 10

### ***Reattach the harness support plate and motor cover.***

## 11

### ***Reattach the cover.***

Reattach the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.

### ■ Aging

## 1

### ***Go out of the safety enclosure.***

## 2

### ***Turn on the controller.***

Check that no one is inside the safety enclosure, and then turn on the controller.



### CAUTION

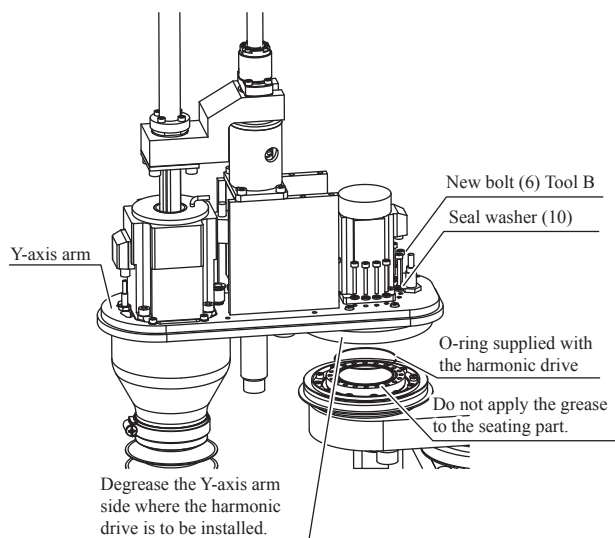
After the harmonic drive has been replaced, it is necessary to perform the absolute reset and set the standard coordinates and point data again.

## 3

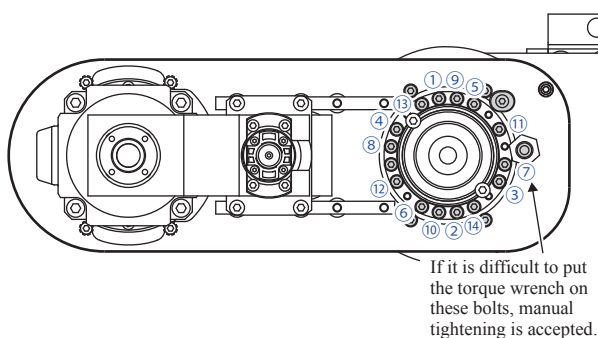
### ***Perform the aging.***

Perform the aging for 30 minutes at 5% speed and for another 30 minutes at 20% speed by rotating the Y-axis arm as much as possible (at least 10°).

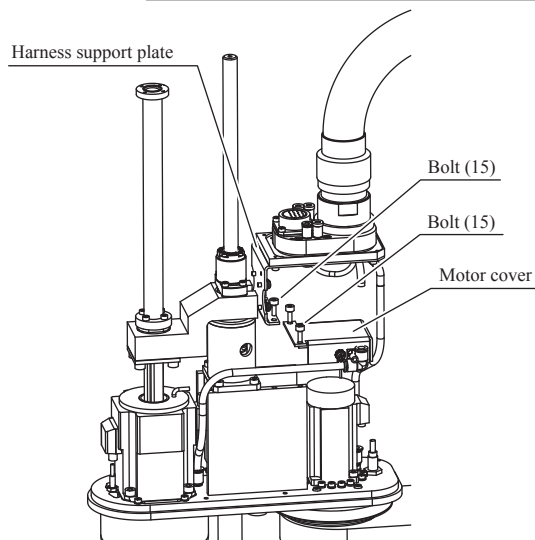
### ▶ Step 8 Securing the Y-axis arm



### ▶ Step 9 Bolt tightening order



### ▶ Step 10 Retightening the bolts



## 2.1.3 Replacing the R-axis harmonic drive



### WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

The following shows the parts and tools necessary for the R-axis harmonic drive replacement work.



### CAUTION

At Step 2 of the "n Replacement and reassembly" procedure, a motor-securing vise and a dial gauge are required in order to check the deflection of the harmonic drive's wave generator.

If a vise and dial gauge are not available, the wave generator can be installed at OMRON, with the assembly then being shipped to the customer.

In that case, the customer should order an "additional new KCY-M4883-000 motor" replacement part and request that the wave generator be installed in the motor.

### 1. Replacement parts

|    | Part Name                      | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks                                     |
|----|--------------------------------|----------------|---|------|---|
| 1  | Harmonic drive                 | KCY-M1821-000  |   | 1    |   |
| 2  | O-ring                         | KN3-M1895-000  | S53 (JIS)   | 1    | Becomes worn and must be replaced           |
| 3  | O-ring                         | 90990-17J001   | Cross section diameter: 0.90mm<br>Inner diameter: 35.40mm | 1    | Supplied with harmonic drive                |
| 4  | O-ring                         | KN5-M181H-000  | Cross section diameter: 0.80mm<br>Inner diameter: 33.7mm  | 1    | Becomes worn and must be replaced           |
| 5  | O-ring                         | KN3-M2144-000  | Cross section diameter: 0.99mm<br>Inner diameter: 53.28mm | 1    | Becomes worn and must be replaced           |
| 6  | O-ring                         | 90990-17J034   | Cross section diameter: 0.60mm<br>Inner diameter: 22.20mm | 1    | Becomes worn and must be replaced           |
| 7  | Motor mounting bolt            | 91312-05016    | M5, length: 16  | 4    | Spare parts                                 |
| 8  | Harmonic drive mounting bolt   | 91312-03014    | M3, length: 14  | 12   | Must be replaced                            |
| 9  | Harmonic drive mounting bolt   | 91312-03022    | M3, length: 22  | 8    | Must be replaced                            |
| 10 | O-ring                         | 90990-17J032   | Cross section diameter: 1.00mm<br>Inner diameter: 46.00mm | 1    | Becomes worn and must be replaced           |
| 11 | Washer for dog                 | 90990-28J064   |   | 1    | Spare parts                                 |
| 12 | Seal washer                    | 90990-36J002   | SW4×7.2<br>(Musashi Oil Seal Mfg. Co. Ltd.)               | 4    | Becomes worn and must be replaced           |
| 13 | Seal washer                    | 90990-36J008   | SWS 3×6.4   | 12   | Must be replaced                            |
| 14 | Dog                            | KDM-M1888-000  |   | 1    | Spare parts                                 |
| 15 | O-ring                         | 90200-01J500   | S50 (JIS)   | 2    | Must be replaced                            |
| 16 | O-ring                         | KN4-M2159-000  | Cross section diameter: 1.78<br>Inner diameter: 85.00     | 1    | Spare parts                                 |
| 17 | Lock washer                    | 90172-00J030   | For M3  | 4    | Spare parts                                 |
| 18 | O-ring                         | 90200-01J350   | S35 (JIS)   | 2    | Must be replaced                            |
| 19 | O-ring                         | 90990-17J025   | Cross section diameter: 0.5<br>Inner diameter: 15.0       | 1    | Must be replaced                            |
| 20 | Spline nut securing bolts      | 91312-04012    | M4, length: 12  | 4    | Spare parts                                 |
| 21 | Bearing                        | 90933-01J002   | 6002ZZ  | 2    | Spare parts                                 |
| 22 | Bearing nut                    | KCY-M1874-000  |   | 1    | Spare parts                                 |
| 23 | Bearing plate securing bolts   | 91312-05014    | M5, length: 14  | 4    | Spare parts                                 |
| 24 | End face seal (*1)             | KCY-M1886-000  |   | 1    | Replace with spare when damaged or missing. |
| 25 | Extension shaft securing bolts | 91312-03010    | M3, length: 10  | 4    | Spare parts                                 |

\*1 : A new end face seal will be subjected to a high level of friction if sufficient R-axis aging has not occurred. Therefore, be sure to perform R-axis aging, and do not replace this seal unless it is damaged.

## 2. Torque wrench, etc.



### CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

|   | Name               | Part No.                  | Manufacturer                         | Remarks   |
|---|--------------------|---------------------------|--------------------------------------|---|
| A | Torque wrench      | N120SPCK                  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M5 hex socket head bolt<br>Tightening torque: 7.4Nm (76kgfcm)   |
|   | Changeable head    | 230HCK4                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | Wrench (without ball end) for M5 hex socket head bolt; insert 110mm   |
| B | Torque screwdriver | N30LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 hex socket head bolt<br>Tightening torque: 1.8Nm (18kgfcm)   |
|   | Drive bit          | B35, opposite side 2.5×75 | Vessel Co., Inc.                     | Attachment hexagonal width across flat : 6.35mm<br>Overall length : 75mm<br>Hexagonal width across flat at tip : 2.5mm  |
| C | Torque screwdriver | N12LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 set screw<br>Tightening torque: 0.55Nm (5.6kgfcm)  |
|   | Drive bit          | 3C1507                    | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat : 6.35mm<br>Overall length : 100mm<br>Hexagonal width across flat at tip : 1.5mm |
| D | Torque wrench      | N380SPK24                 | KANON<br>(Nakamura Mfg. Co., Ltd.)   | Torque wrench for 24mm-wide wrench, Set the tightening torque to 20Nm (200kgfcm).                                       |

\* Use a commercially available torque wrench to tighten bolts other than those shown above.

## 3. Other tools

| Name                                      | Part No.     | Manufacturer           | Remarks  |
|---|--------------|------------------------|--|
| Harmonic grease                           | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |
| Cleaning wipe                             |              |                        |  |
| Phillips screwdriver                      |              |                        |  |
| Hex wrench set                            |              |                        |  |
| Spanner (wrench), Width across flat: 15mm | 6M-13-15     | BAHCO                  |  |
| "Screw Lock" LOCTITE                      | Loctite 262  | Henkel                 | High strength type (red)   |

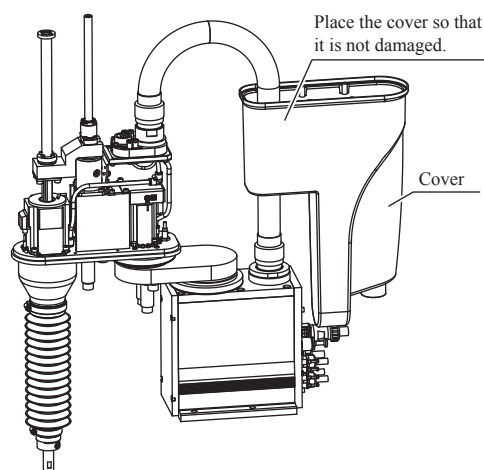
\*1 : 4.2g

### ■ Removal

Follow the steps below to remove the R-axis parts.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.  
As the R-axis motor wiring is clamped at several locations, the connectors are difficult to disconnect. So, perform the replacement work without disconnection of the connectors.

#### ▶ Step 4-5 Removing the cover



### WARNING

IF THE BEARING MOUNTING BOLTS ARE REMOVED IN STEP 9, THE Z-AXIS MAY DROP, CAUSING HAZARDOUS SITUATION. BEFORE REMOVING THE BEARING MOUNTING BOLTS, SUPPORT THE Z-AXIS USING A BASE, ETC.

## 5 Remove the extension shaft.



### NOTE

If it is difficult to perform the work shown below, press the emergency stop button on the PB, turn on the controller power, and put the Z-axis servo in the free status. Move the Z-axis to a position where the work can be performed easily, put on the Z-axis brake, and turn off the controller power.

Remove the bolts, and then remove the extension shaft and O-ring.



### NOTE

The O-ring is fitted to the extension shaft. Be sure to replace this O-ring with a new one.

## 6 Loosen the screws of the clamp.

## 7 Remove the holder and bellows.

Remove the bolts and seal washers, and remove the holder.

Remove also the bellows, clamp, and O-ring.

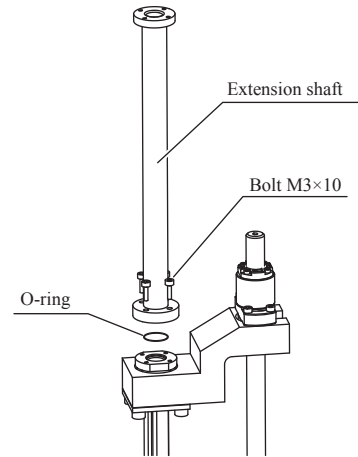


### NOTE

Be sure to replace the O-ring and seal washer with new ones.

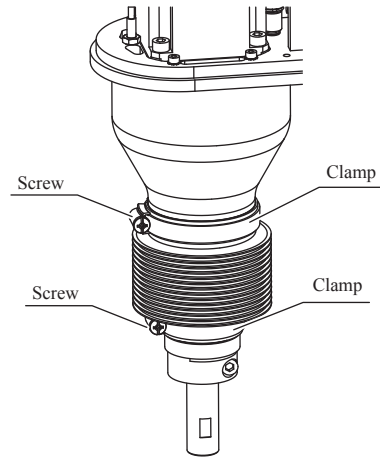
## Step 5

### Removing the extension shaft



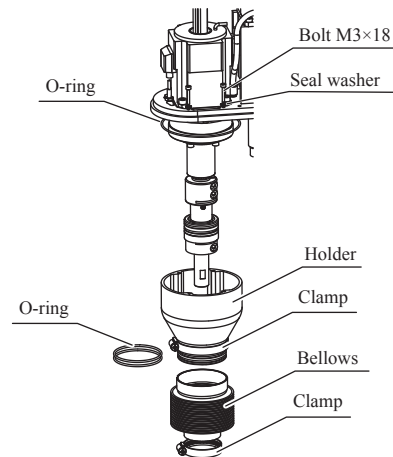
## Step 6

### Loosening the screws of the clamp



## Step 7

### Removing the holder and bellows



## 8 ***Pull out the spline and bearing from the holder.***

Remove the bolt at the top end of the spline that secures the bearing. Pull out the spline and bearing from the holder.

## 9 ***Remove the bearing and bearing mount plate.***

Fit the wrenches to the width across flat surfaces of the bearings at the bottom and top of the spline and remove the bearing nut from the top of the spline. Then, remove the bearing and bearing mount plate. At this time, be careful to keep the spline shaft so that it does not come off the spline nut.

## 10 ***Remove the bolt of the spline nut, and then remove the spline nut.***

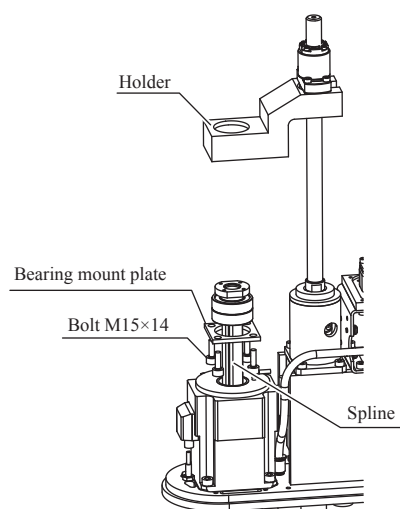


### NOTE

An O-ring is fitted to the shaft. Replace this O-ring with a new one. Additionally, replace also the seal washer with a new one.

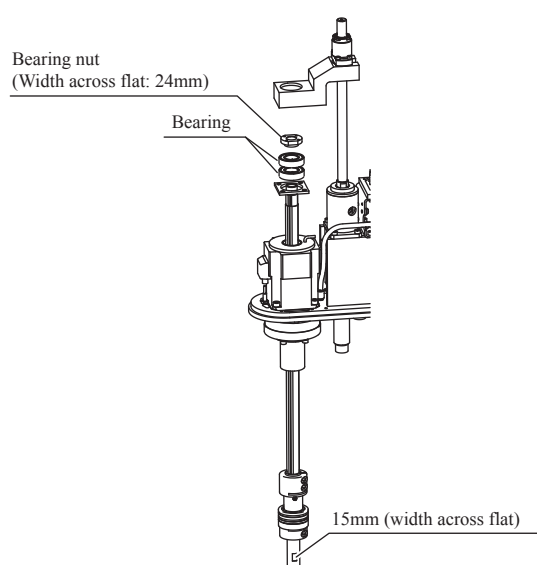
### ▶ Step 8

#### Removing the spline



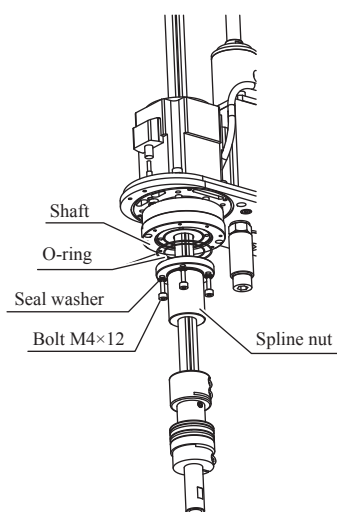
### ▶ Step 9

#### Removing the bearing and bearing mount plate




### ▶ Step 10


#### Removing the spline nut




- 11 ***Pull out the R-axis motor.***  
Remove the bolts that secure the R-axis motor, and then pull out the R-axis motor while turning the outer periphery of the R-axis harmonic drive.

 **NOTE**  
An O-ring is placed between the R-axis motor flange and the Y-axis arm. Replace this O-ring with a new one.

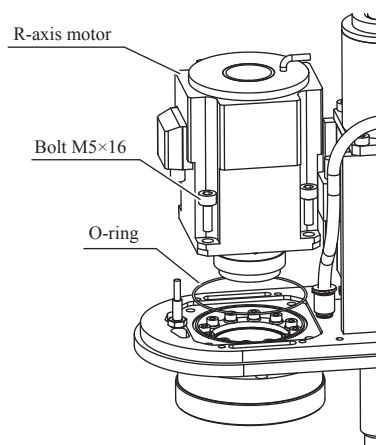
- 12 ***Pull out the wave generator from the R-axis motor shaft.***  
Loosen two set screws of the wave generator, and then pull out the wave generator from the R-axis motor shaft.

 **NOTE**  
An O-ring is placed between the R-axis motor shaft and the wave generator. Replace this O-ring with a new one.

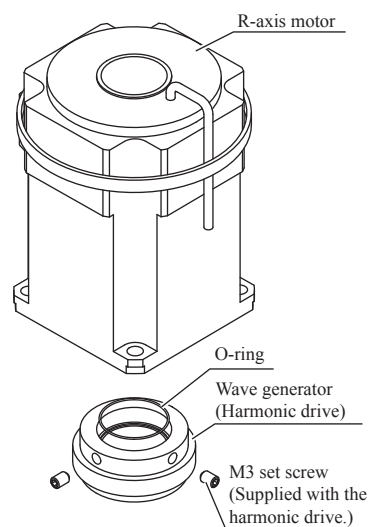
- 13 ***Remove the harmonic drive.***  
Remove the harmonic drive mounting bolts and seal washers, and remove the harmonic drive.

 **NOTE**  
An O-ring is fitted to the harmonic drive. Replace this O-ring with a new one. Replace also the seal washer with a new one.

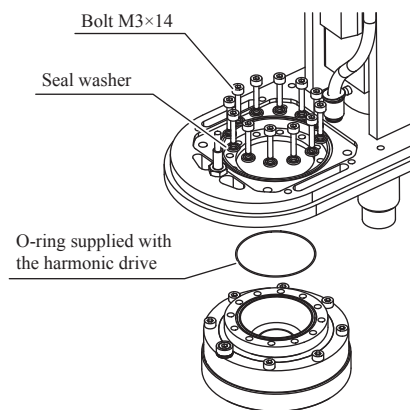
▶ **Step 11 Removing the R-axis motor**



▶ **Step 12 Removing the wave generator**



▶ **Step 13 Removing the harmonic drive**



## Remove the shaft from the harmonic drive.

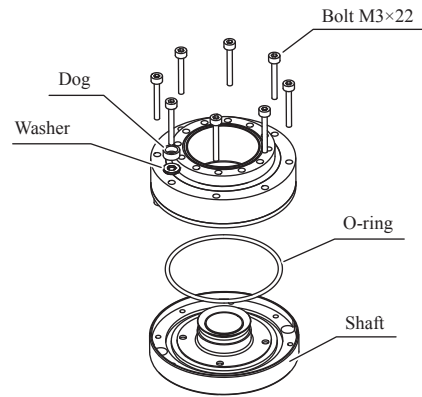
Remove the shaft mounting bolts and dog from the harmonic drive, and then remove the shaft.



### NOTE

An O-ring is placed between the harmonic drive and the shaft. Replace this O-ring with a new one.

## Step 14 Removing the shaft



## Replacement and reassembly

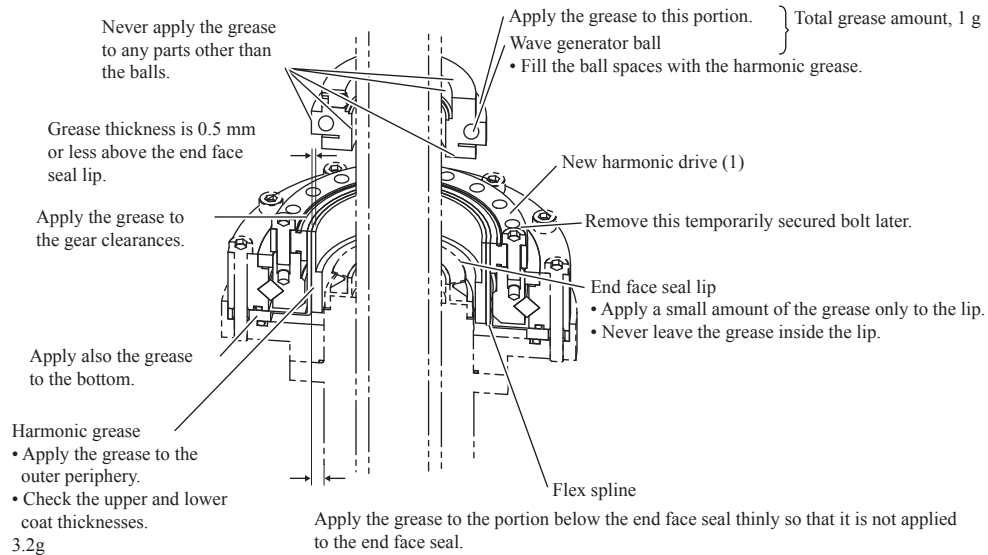
Follow the steps below to replace the harmonic drive with a new one and reassemble it.

1

## Apply the harmonic grease to a new wave generator.

For details about how to apply the grease, see the Fig. below.

### Step 1 Applying the harmonic grease

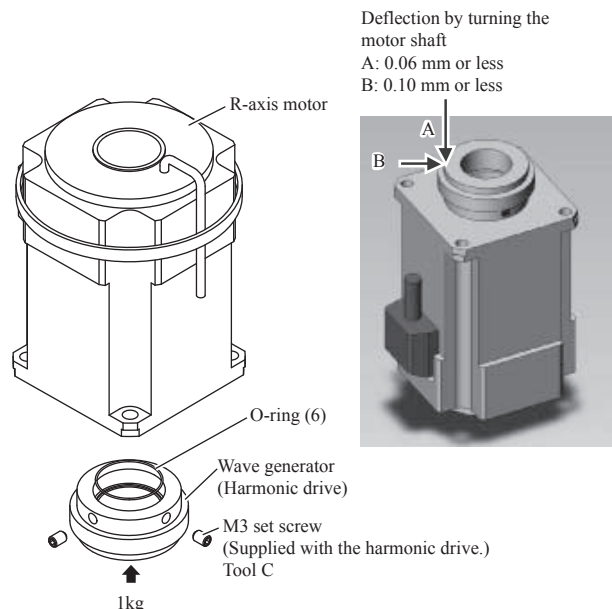


2

## Secure the new wave generator to the R-axis motor.

- Fit the O-ring (6) to the inside of the new wave generator.
- Insert the wave generator into the inner end of the R-axis motor shaft and secure it with two set screws while pressing the wave generator with a load of about 1kg.
- The wave generator deflection must satisfy the values shown in the Fig. on the right. Also make sure that the O-ring does not drop.

## Step 2 Securing the wave generator



### 3 Apply the harmonic grease to the flex spline.

For details about how to apply the harmonic grease, see the Fig. stated in step 1.



#### CAUTION

Perform the assembly work so that the flat face is in parallel to the side surface of the Y-axis arm at the R-axis origin position while observing the phases at the locations indicated by "Check phase" as shown in the Fig. on the right.

### 4

#### Secure the harmonic drive to the shaft.

1. Degrease the upper and lower installation surfaces of the harmonic drive.
2. Degrease the harmonic drive installation surface of the shaft.
3. Fit the new O-ring (2) coated with the harmonic grease into the groove in the shaft.



#### CAUTION

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

4. Install the washer, dog, and new mounting bolts, and then secure the harmonic drive to the shaft.



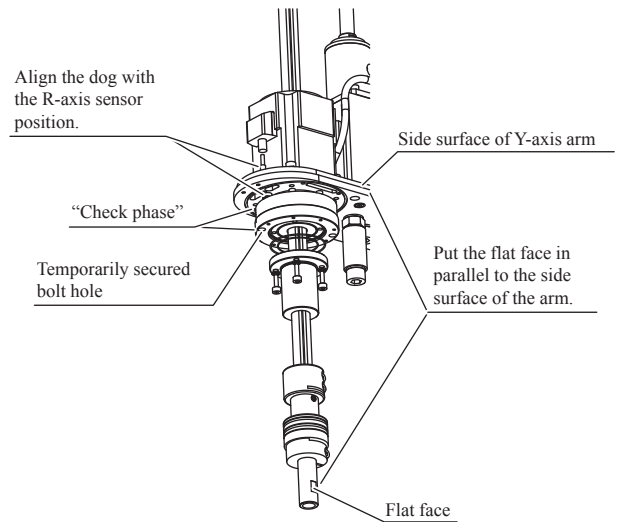
#### CAUTION

Never remove the temporarily secured bolt. Doing so may cause a misalignment.

For details about the temporarily secured bolt and dog position, see the Fig. on the right. Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease. Grease applied to the bolt tip is intended to stabilize the bolt axial force.

### Step 3

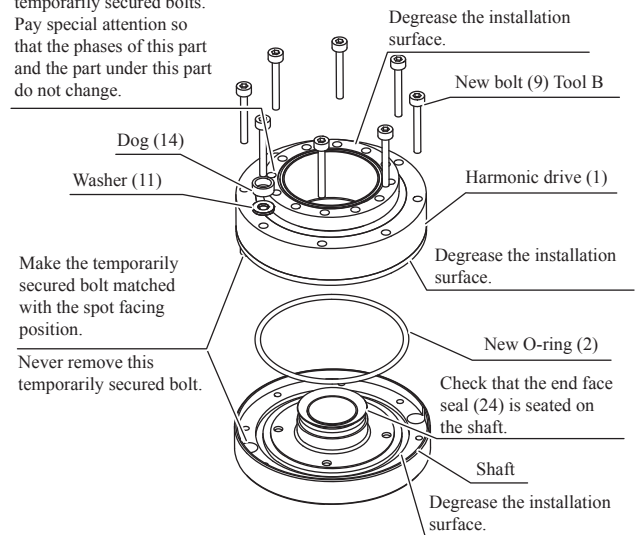
#### Checking the phases



### Step 4

#### Securing the harmonic drive

Remove only four upper temporarily secured bolts. Pay special attention so that the phases of this part and the part under this part do not change.

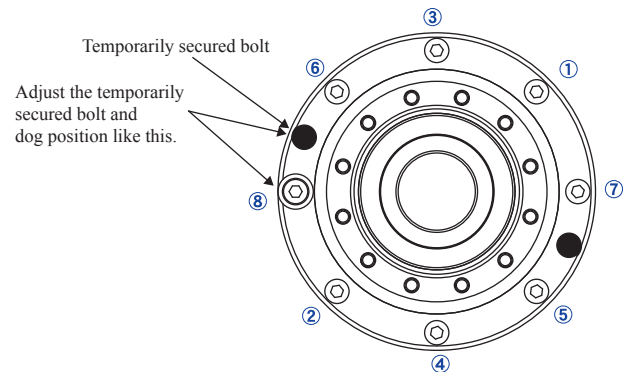


Make the temporarily secured bolt matched with the spot facing position.

Never remove this temporarily secured bolt.

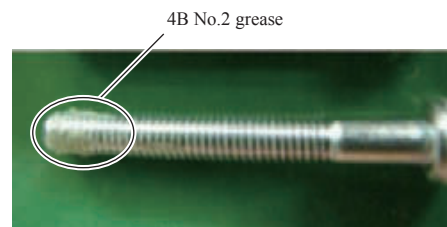
### Step 4, 5

#### Temporarily secured bolt and dog positions



### Step 4, 7

#### Applying the grease to the mounting bolt





## 5 **Tighten the bolts in the order shown below.**

1. Using the wrench, tighten the bolts manually in the order indicated by circled numbers.
2. Using the torque driver, tighten the bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts to the specified torque in the order indicated by circled numbers.
4. Finally, check that the bolts are tightened to the specified torque.

## 6 **Install the O-ring (3).**

1. Degrease the installation surface of the Y-axis arm where the harmonic drive is to be installed.
2. Fit the O-ring (3) coated with a small amount of the harmonic grease into the O-ring groove of the new harmonic drive. If it is difficult to fit the O-ring into the groove, slightly stretch the O-ring.



### CAUTION

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

## 7 **Secure the harmonic drive to the Y-axis arm.**

From the upper portion of the Y-axis arm, secure the harmonic drive to the Y-axis arm.

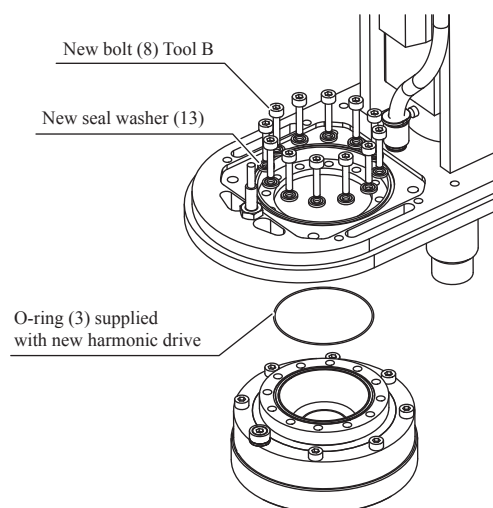
Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.

Grease applied to the bolt tip is intended to stabilize the bolt axial force.

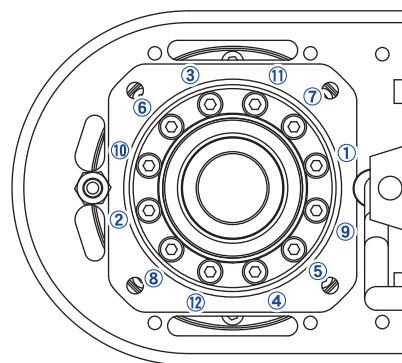
## 8 **Tighten the bolts in the order shown below.**

1. Using the wrench, tighten the bolts manually in the order indicated by circled numbers.
2. Using the torque driver, tighten the bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts to the specified torque in the order indicated by circled numbers.
4. Finally, check that the bolts are tightened to the specified torque.

### ▶ Step 6 **Installing the harmonic drive**



### ▶ Step 8 **Mounting bolt tightening order**



- 9 **Fit the new O-ring (5) coated with the harmonic grease into the O-ring groove of the Y-axis arm.**



**CAUTION**  
Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

- 10 **Insert the R-axis motor into the Y-axis arm.**

Insert the R-axis motor into the Y-axis arm while turning the R-axis. Tighten the bolts while turning the R-axis.

- 11 **Fit the new O-rings (4) and (10) coated with the harmonic grease into the groove at the lower portion of the shaft.**



**CAUTION**  
Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

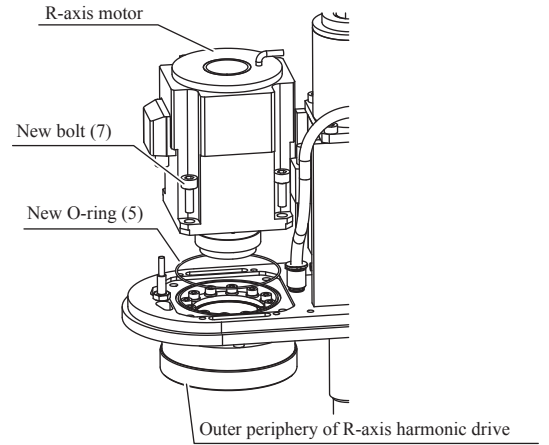
- 12 **Secure the spline nut to the shaft with the bolt.**

Put the seal washer (12).

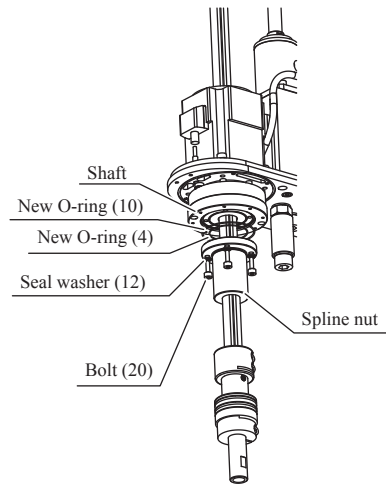
- 13 **Secure the bearing.**

Pass the bearing mounting plate and bearing through the upper portion of the spline and secure the bearing with the bearing nut. (Utilize the width across flat part of the spline in the same manner as described for removing of the bearing nut.)

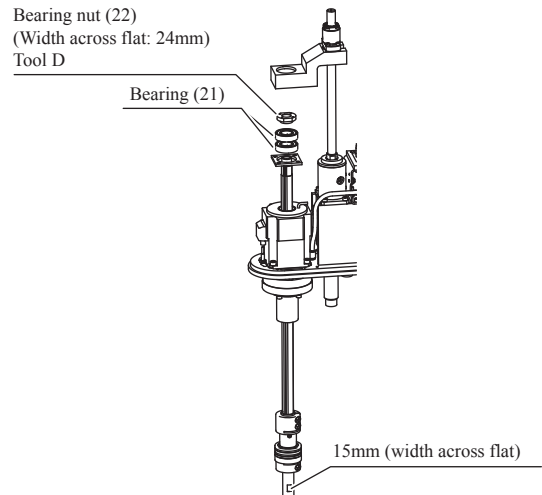
▶ **Step 9-10 Inserting the R-axis motor**



▶ **Step 11-12 Securing the spline nut**



▶ **Step 13 Securing the bearing**



**14** *Insert the spline and bearing into the holder.*

Insert the spline and bearing into the holder and secure them with the bolt.

**15** *Install the holder and bellows.*

Fit the O-ring (18).

Fit the O-ring (15) into the holder and tighten the screw at the upper portion of the bellows to clamp it. For details about bellows clamp position, see the Fig. stated in Step 16.

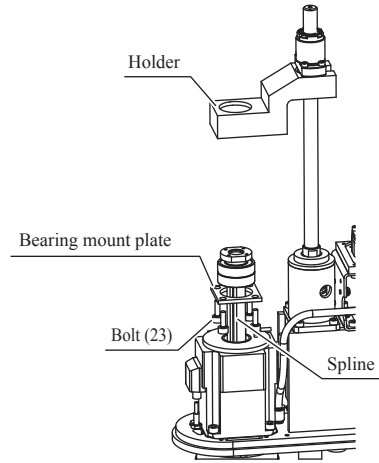
Fit the O-ring (16) into the groove under the Y-axis arm and secure the holder with the lock washers and bolts.



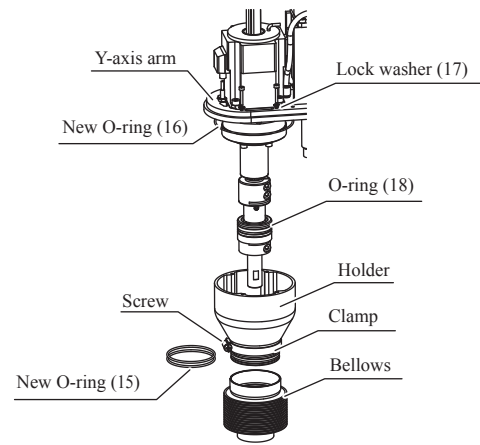
**CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

**Step 14** **Inserting the spline and bearing**



**Step 15** **Installing the holder and bellows**



## 16 **Clamp the lower portion of the bellows.**

Tighten the screw to clamp the lower portion of the bellows. For details about bellows clamp position, see the Fig. on the right.

## 17 **Install the extension shaft.**

Fit the O-ring into the groove of the extension shaft.



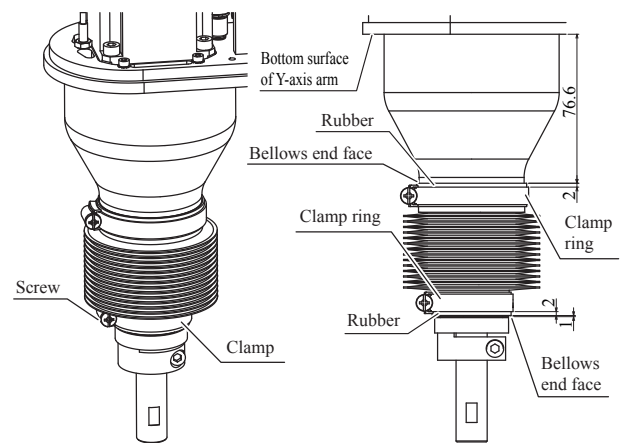
### CAUTION

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

## 18 **Reattach the cover.**

Reattach the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.

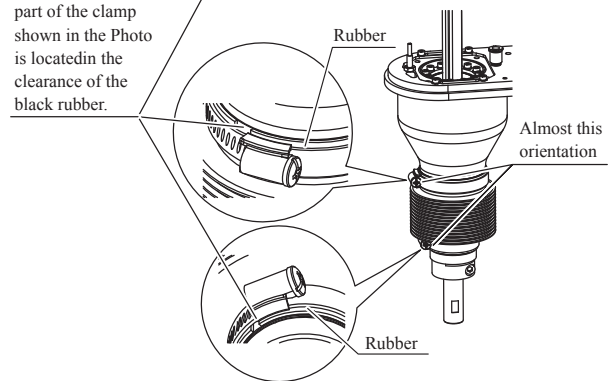
### Step 16 **Clamping the lower portion of the bellows**



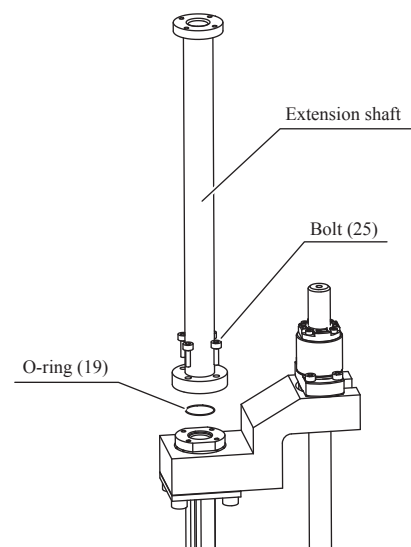
Install the bellows and clamp at the positions shown in the Fig. above. (Tolerance:  $\pm 0.5\text{mm}$ )



Reattach the clamp so that the projection part of the clamp shown in the Photo is located in the clearance of the black rubber.



### Step 17 **Installing the extension shaft**



### ■ Aging

#### 1 **Go out of the safety enclosure.**

#### 2 **Turn on the controller.**

Check that no one is inside the safety enclosure, and then turn on the controller.



### CAUTION

After the harmonic drive has been replaced, it is necessary to perform the absolute reset and set the standard coordinates and point data again. Make the adjustments while referring to Chapter 3 "Adjusting the robot" in the Installation Manual.

#### 3 **Perform the aging.**

Perform the aging for 30 minutes at 5% speed and for another 30 minutes at 20% speed by rotating the R-axis arm as much as possible (at least  $10^\circ$ ).

## 2.2 R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

### 2.2.1 Replacing the X-axis harmonic drive



#### WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ “1. ATTACHING, DETACHING, AND REPLACING THE COVER” IN CHAPTER 2.

The following shows the parts and tools necessary for the X-axis harmonic drive replacement work.

#### 1. Replacement parts

##### • R6YXGP500, R6YXGP600

|    | Part Name                    | OMRON Part No. | Part No. / Specs   | Q'ty | Remarks  |
|----|------------------------------|----------------|--|------|--|
| 1  | Harmonic drive               | KBF-M2110-000  |  | 1    |  |
| 2  | O-ring                       |                | Cross section diameter: 1.30mm<br>Inner diameter: 66.5mm | 1    | Supplied with harmonic drive                                     |
| 3  | O-ring                       | KN4-M2143-000  | S90 (JIS)  | 1    | Becomes worn and must be replaced                                |
| 4  | O-ring                       | 90990-17J030   | Cross section diameter: 1.78mm<br>Inner diameter: 66.4mm | 1    | Becomes worn and must be replaced                                |
| 5  | Motor mounting bolt          | KBP-M259A-000  | M6, length: 16   | 4    | Must be replaced when robot reference number is prior to KC346   |
|    |                              | 91312-06016    | M6, length: 16   | 4    | Spare parts for robots with a reference number of KC346 or later |
| 6  | Harmonic drive mounting bolt | 91312-04020    | M4, length: 20   | 16   | Must be replaced   |
| 7  | Harmonic drive mounting bolt | 91312-04030    | M4, length: 30   | 11   | Must be replaced   |
| 8  | Panhead bolt for dog         | 98502-04030    | M4, length: 30   | 1    | Spare parts  |
| 9  | Nut for dog                  | 95302-05600    | M4   | 1    | Spare parts  |
| 10 | Washer                       | 92903-04600    | M4   | 16   | Must be replaced   |

##### • R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|    | Part Name                    | OMRON Part No. | Part No. / Specs   | Q'ty | Remarks                           |
|----|------------------------------|----------------|--|------|-----------------------------------|
| 1  | Harmonic drive               | KBP-M2110-000  |  | 1    |                                   |
| 2  | O-ring                       |                | Cross section diameter: 1.50mm<br>Inner diameter: 87.5mm | 1    | Supplied with harmonic drive      |
| 3  | O-ring                       | KN5-M2159-000  | S115 (JIS)   | 1    | Becomes worn and must be replaced |
| 4  | O-ring                       | 90990-17J035   | Cross section diameter: 1.50mm<br>Inner diameter: 82.0mm | 1    | Becomes worn and must be replaced |
| 5  | Motor mounting bolt          | 91312-5016     | M5, length: 16   | 4    | Spare parts                       |
| 6  | Harmonic drive mounting bolt | 91312-05040    | M5, length: 40   | 16   | Must be replaced                  |
| 7  | Harmonic drive mounting bolt | 91312-05040    | M5, length: 40   | 11   | Must be replaced                  |
| 8  | Panhead bolt for dog         | 98502-05040    | M5, length: 40   | 1    | Spare parts                       |
| 9  | Nut for dog                  | 95302-06600    | M6   | 1    | Spare parts                       |
| 10 | Washer                       | KBF-M2146-001  |  | 1    | Spare parts                       |

## 2. Torque wrench, etc.



### CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

#### • R6YXGP500, R6YXGP600

|   | Name               | Part No. | Manufacturer                         | Remarks  |
|---|--------------------|----------|--------------------------------------|--|
| A | Torque wrench      | N230QLK  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M6 hex socket head bolt<br>Tightening torque: 15.2Nm (156kgfcm)  |
|   | Drive bit          | 3KH5L    | TONE<br>(Maeda Kinzoku Kogyo)        | Attachment hexagonal width across flat: 9.53mm<br>Overall length: 100mm<br>Hexagonal width across flat at tip: 5mm |
| B | Torque wrench      | N120QLK  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 hex socket head bolt<br>Tightening torque: 4.0Nm (41kgfcm)  |
|   | Drive bit          | 2H3      | TONE<br>(Maeda Kinzoku Kogyo)        | Attachment hexagonal width across flat: 6.35mm<br>Hexagonal width across flat at tip: 3mm                          |
| C | Torque screwdriver | N20LTDK  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 set screw<br>Tightening torque: 1.7Nm (17kgfcm)   |
|   | Drive bit          | 3C2010   | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 100mm<br>Hexagonal width across flat at tip: 2mm |
| D | Torque screwdriver | N20LTDK  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 Phillips-head screw<br>Tightening torque: 1.6Nm (16kgfcm)   |
|   | Drive bit          | +2×50    | Vessel Co., Inc.                     | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 50mm<br>Bit number: #2                           |

#### • R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|   | Name               | Part No.  | Manufacturer                         | Remarks  |
|---|--------------------|-----------|--------------------------------------|--|
| A | Torque wrench      | N230QLK   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M5 hex socket head bolt<br>Tightening torque: 9Nm (92kgfcm)  |
|   | Drive bit          | BT3-04L   | KTC<br>(Kyoto Tool)                  | Attachment hexagonal width across flat: 9.53mm<br>Overall length: 128mm<br>Hexagonal width across flat at tip: 4mm |
| B | Torque wrench      | N230QSPK  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M5 hex socket head bolt<br>Tightening torque: 8.4Nm (86kgfcm)  |
|   | Drive bit          | 3010M-100 | Koken<br>(Yamashita Kogyo Kenkyusho) | Attachment hexagonal width across flat: 9.53mm<br>Overall length: 100mm<br>Hexagonal width across flat at tip: 4mm |
| C | Torque screwdriver | N20LTDK   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 set screw<br>Tightening torque: 1.7Nm (17kgfcm)   |
|   | Drive bit          | 3C2010    | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 100mm<br>Hexagonal width across flat at tip: 2mm |
| D | Torque screwdriver | N50LTDK   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M5 Phillips-head screw<br>Tightening torque: 3.2Nm (32kgfcm)   |
|   | Drive bit          | B35+2×50  | Vessel Co., Inc.                     | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 50mm<br>Bit number: #2                           |

## 3. Other tools

| Name                       | Part No.     | Manufacturer           | Remarks   |
|----------------------------|--------------|------------------------|---|
| Harmonic grease            | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago.<br>The grease has probably deteriorated. |
| Cleaning wipe              |              |                        |   |
| Phillips screwdriver       |              |                        |   |
| Hex wrench set             |              |                        |   |
| Screw thread locking agent | Loctite 262  | Henkel                 | High strength type (red)  |

\*1: R6YXGP500, R6YXGP600: 20g  
R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000: 60g

## ■ Removal

Follow the steps below to remove the X-axis parts.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**



### CAUTION

In the following steps, if the Y-axis arm is not removed from the X-axis arm, the integrated unit is very heavy. So, it is recommended to perform the work after the Y-axis arm has been removed from the X-axis arm beforehand while referring to "2.2.2. Replacing the Y-axis harmonic drive".

- 4 **Remove the cover from the base.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.
- 5 **Disconnect the connectors of the X-axis motor power wire XM and resolver wire XP in the base, and the round terminal of the X-axis motor.**



### CAUTION

When removing the motor, pay special attention so that your hand is not caught in the portion between the motor and base.

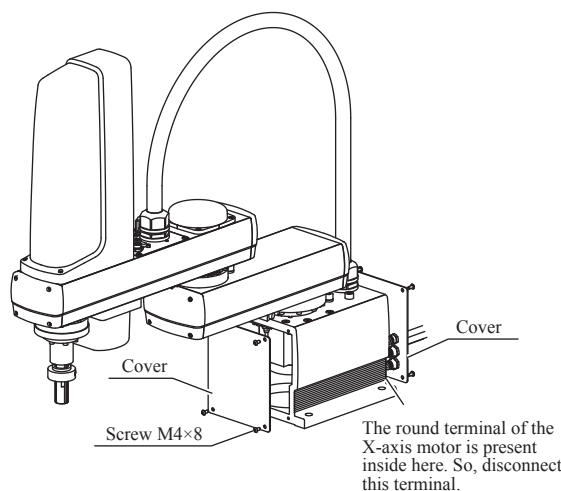


### NOTE

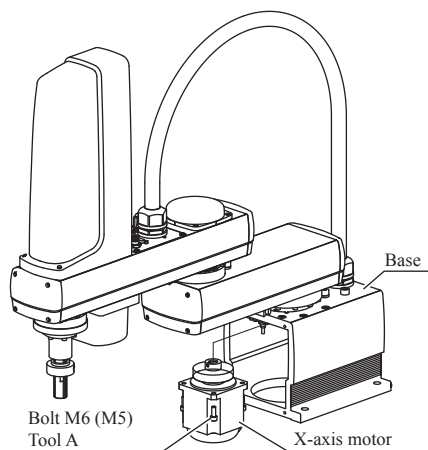
- In the R6YXGP500 and R6YXGP600, an O-ring is fitted into the portion between the motor mating end face and the base. Be sure to replace this O-ring with a new one.
- In the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, an O-ring is fitted into the portion between the end face of the motor flange and the base. Be sure to replace this O-ring with a new one.

- 6 **Remove the X-axis motor.**
  1. Using the tool A, remove the bolts that secure the motor. The bolts are replaced with new ones later on.
  2. Support the motor so that it does not drop.
  3. Pull out the motor from the plate while turning the X-axis arm.

### ▶ Step 4-5 Removing the cover



### ▶ Step 6 Removing the X-axis motor



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

7

### Remove the wave generator from the motor shaft.

Remove the set screw (1 pc.) that secure the wave generator.

For the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, further remove the spacer and bolt.



#### CAUTION

A spacer is fitted into the portion between the wave generator and motor. Carefully handle it so that it is not lost. In the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, this spacer is not fitted.



#### WARNING

- IF THE X-AXIS ARM MOUNTING BOLTS ARE REMOVED IN STEP 8, THE X-AXIS ARM COMES OFF, CAUSING HAZARDOUS SITUATION. IF A HEAVY TOOL IS ATTACHED TO THE ARM TIP, THE ARM MAY DROP. SO, TAKE GREAT CARE WHEN REMOVING THE X-AXIS ARM MOUNTING BOLTS. (SEE THE FIG. IN STEP 8.)
- IF THE X-AXIS ARM REMOVAL WORK IS PERFORMED ALONE, THIS IS DANGEROUS. REMOVE THE X-AXIS ARM BY TWO OR MORE PERSONNEL OR REMOVE THE Y-AXIS ARM BEFOREHAND. FOR DETAILS ABOUT HOW TO REMOVE THE Y-AXIS ARM, SEE "2.2.2. REPLACING THE Y-AXIS HARMONIC DRIVE".

8

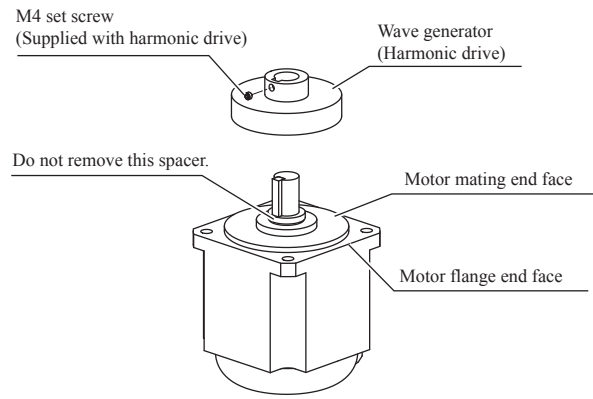
### Remove the X-axis arm.

Using the tool B, remove the bolts that secure the X-axis arm.

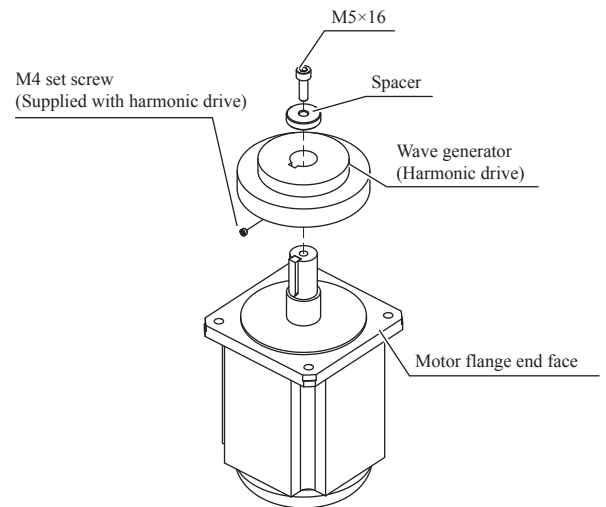
Place the X-axis arm that has been removed in a place where it does not hinder the work.

#### Step 7

#### Removing the wave generator



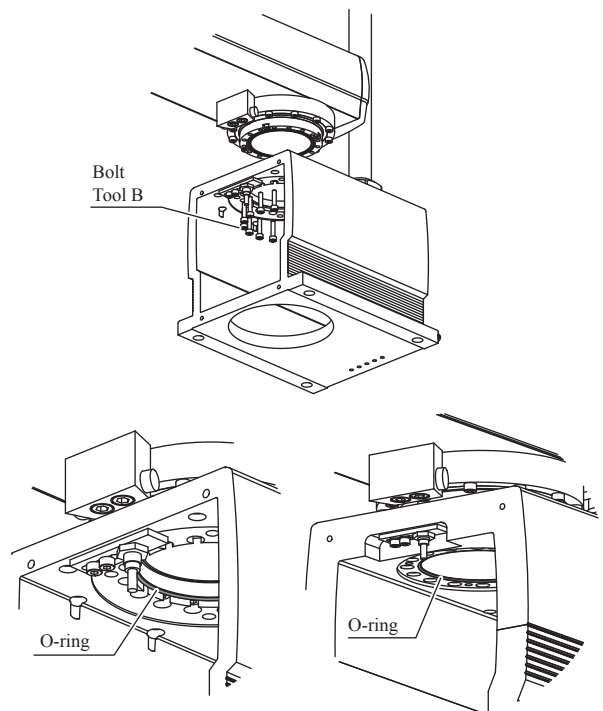
R6YXGP500, R6YXGP600



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

#### Step 8

#### Removing the X-axis arm



R6YXGP500, R6YXGP600

R6YXGHP600, R6YXGP700,  
R6YXGP800, R6YXGP900,  
R6YXGP1000



**Remove the X-axis harmonic drive from the X-axis arm.**

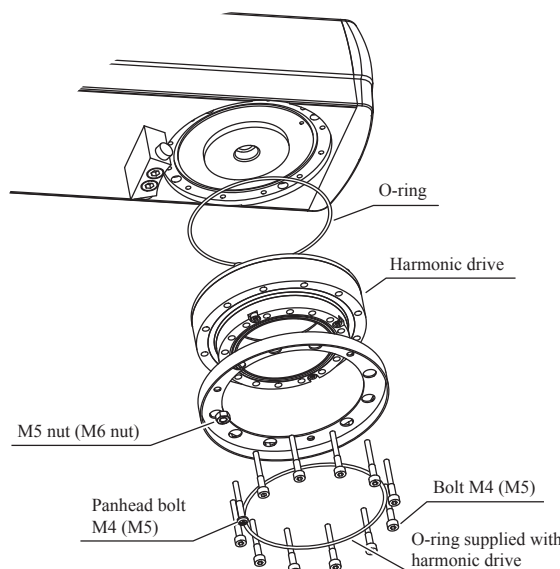
Remove the bolts, panhead bolts, and nuts that secure the X-axis harmonic drive.



**NOTE**

An O-ring is fitted to the X-axis arm. Replace this O-ring with a new one.

**Step 9 Removing the harmonic drive**



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

**Replacement and reassembly**

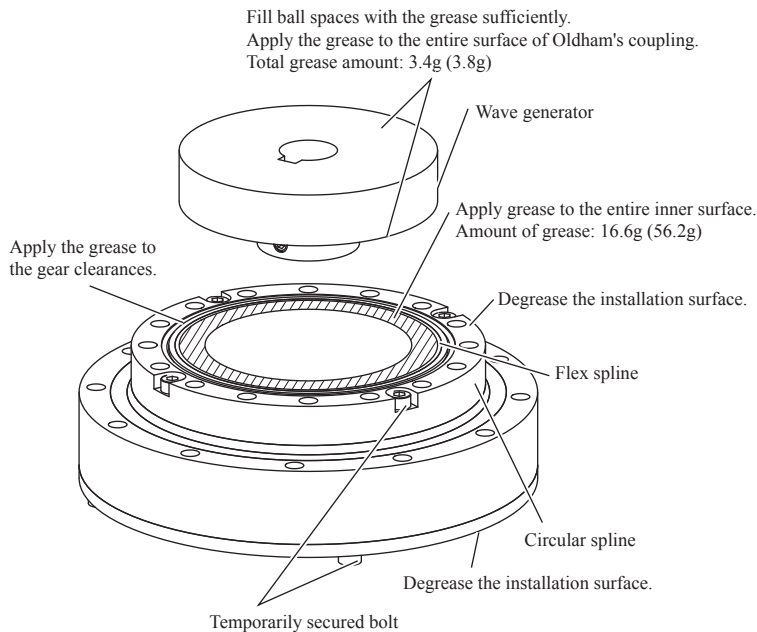
Follow the steps below to replace the harmonic drive with a new one and reassemble it.

1

**Perform the work shown below before reassembling the harmonic drive.**

1. Apply the harmonic grease to new wave generator and flex spline. For details about how to apply the harmonic grease, see the Fig. below.  
Before applying the grease, degrease the top and bottom surfaces of the harmonic drive.

**Step 1 Applying the harmonic grease**



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

2. Remove the old grease and worn-out particles from the motor, base, and X-axis arm completely.



**CAUTION**

- If foreign matter is caught in during reassembly work, this may cause the noise from the harmonic drive or the harmonic drive to break.
- Never remove the temporarily secured bolts. Doing so may cause a misalignment.

## 2

### **Secure a new harmonic drive (1) to the X-axis arm.**

1. Degrease the harmonic drive installation surface of the X-axis arm.  
Do not apply the grease to the seating part.
2. Fit the O-ring (3) coated with the new harmonic grease into the O-ring groove of the X-axis arm. Since the grease application to the O-ring is intended to prevent the O-ring from coming off, it is accepted to apply a small amount of the grease.



#### **CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

3. Secure the new harmonic drive to the X-axis arm with new bolts.  
Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.  
Grease applied to the bolt tip is intended to stabilize the bolt axial force.
4. Secure the panhead bolts and nuts at their original positions.



#### **CAUTION**

Do not apply the grease to the panhead bolt. Doing so may cause the bolt to loosen.

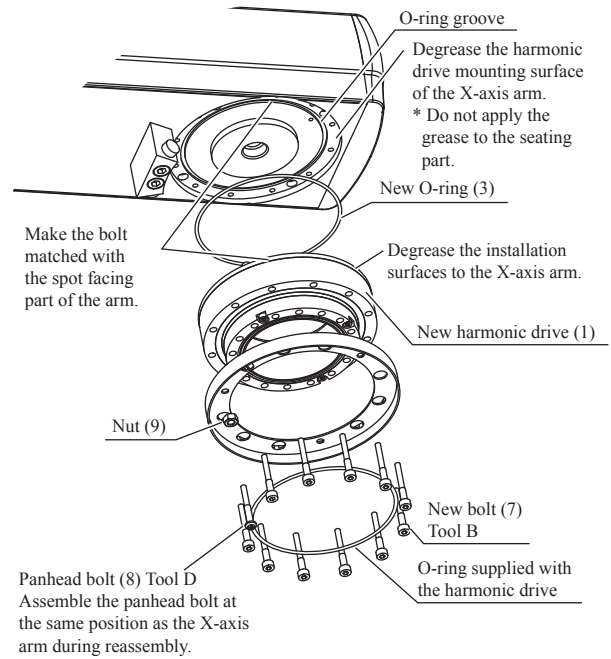
## 3

### **Tighten the bolts and panhead bolts in the order shown below.**

1. Using the wrench, tighten the bolts and panhead bolts manually in the order indicated by circled numbers.
2. Using the torque wrench, tighten the bolts and panhead bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts and panhead bolts to the specified torque in the order indicated by circled numbers. Then, loosen the bolts and panhead bolts 1 to 2 rotations once (do not remove any bolt at this time). After that, tighten the first bolt to the specified torque again, and then tighten the next and subsequent bolts to the specified torque in order.  
This work is intended to stabilize the bolt axial force.
4. Finally, check that the bolts and panhead bolts are tightened to the specified torque.

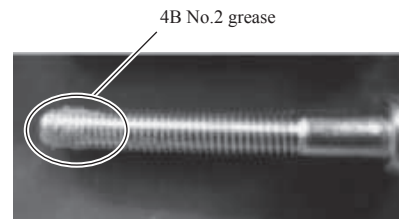
## ▶ Step 2, 4

### **Mounting the harmonic drive**



## ▶ Step 2, 5

### **Applying the grease to the mounting bolt**



#### 4 **Install the new O-ring (2).**

1. Degrease the top surface of the plate where the harmonic drive is to be installed.



#### CAUTION

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

2. Fit the new O-ring (2) coated with the harmonic grease into the O-ring groove of the harmonic drive.

Since the grease application to the O-ring is intended to prevent the O-ring from coming off, it is accepted to apply a small amount of the grease.

#### 5 **Secure the harmonic drive to the base.**

Secure the harmonic drive to the base with new bolts. The harmonic drive's phase with respect to the base should be aligned as shown in the Fig. on the right.



#### CAUTION

At this time, two personnel should make the X-axis arm and Y-axis arm horizontal so that any moment load is not applied to the harmonic drive during work. One person should support the X-axis arm and Y-axis arm while another person installs the X-axis arm.

Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.



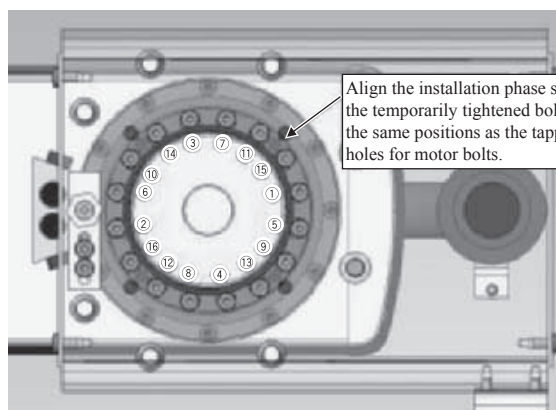
#### CAUTION

When tightening the bolts with the moment load applied to the harmonic drive, this may cause breakage. So, carefully perform the work so that any moment load is not applied to the harmonic drive.

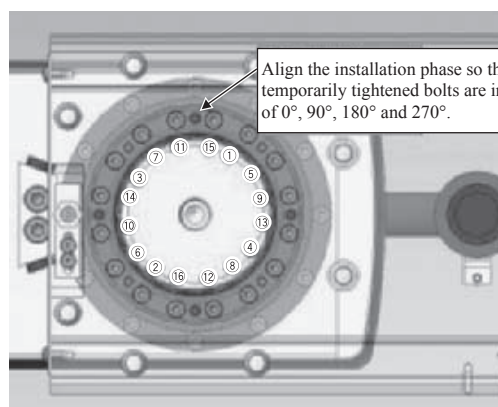
#### 6 **Tighten the bolts in the order shown below.**

1. Using the wrench, tighten the bolts manually in the order indicated by circled numbers.
2. Using the torque wrench, tighten the bolts to approximately 50% of the specified torque in the order indicated by circled numbers.

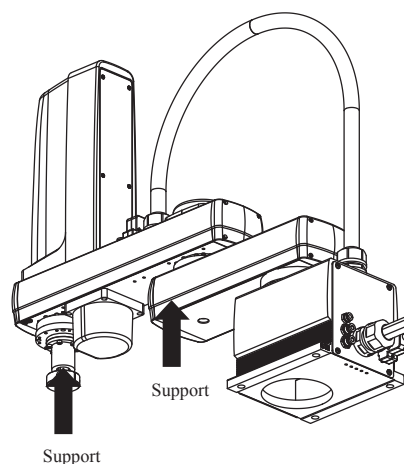
#### Step 5 **Phase with respect to the base**



R6YXGP500, R6YXGP600



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000



3. Tighten the bolts to the specified torque in the order indicated by circled numbers. Then, loosen the bolts 1 to 2 rotations once (do not remove any bolt at this time). After that, tighten the first bolt to the specified torque again, and then tighten the next and subsequent bolts to the specified torque in order.
4. Finally, check that the bolts are tightened to the specified torque.

## 7

### Secure the spacer and wave generator

1. For the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, secure the wave generator with the spacer and M5 bolt.
2. Pass the spacer and wave generator through the motor shaft.  
Push in the spacer and wave generator until they are in contact with the motor.
3. Secure the wave generator with the set screw (1 pc.).  
At this time, apply a small amount of the screw lock to the set screw.



#### CAUTION

- If it is difficult to fit the wave generator onto the motor shaft by pushing by hand, do not forcefully push in. Grind the key or motor shaft with sandpaper or similar tool to make it easier to fit the wave generator onto the motor shaft.
- Apply the specified amount of harmonic grease to each part of the harmonic drive. An insufficient amount of grease may shorten the service life of the drive parts, and an excessive amount may cause the grease to leak.

## 8

### Fit a new O-ring (4) into the base cylindrical surface and push it into the upper end face.

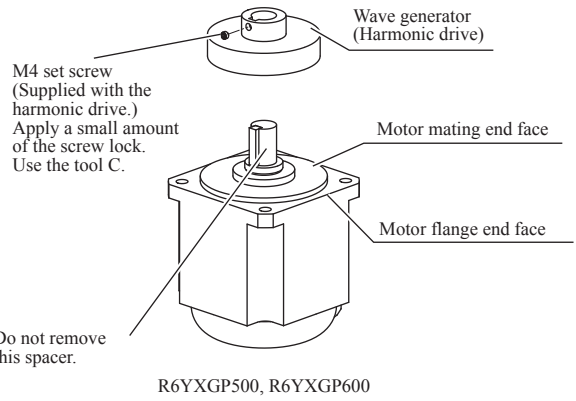
For the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, it is accepted to fit a new O-ring into one groove.



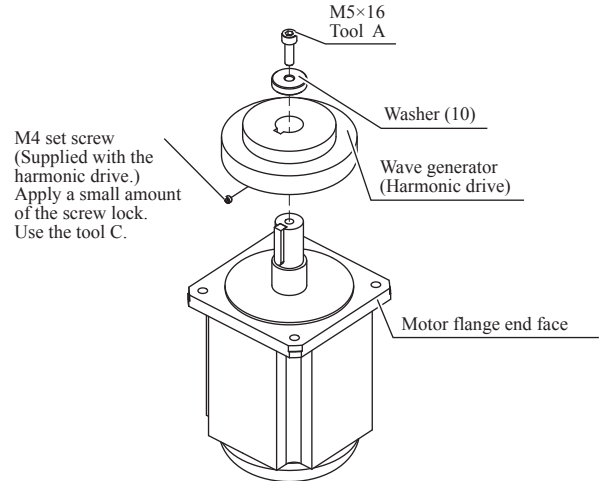
#### CAUTION

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

### Step 7 Securing the spacer and wave generator

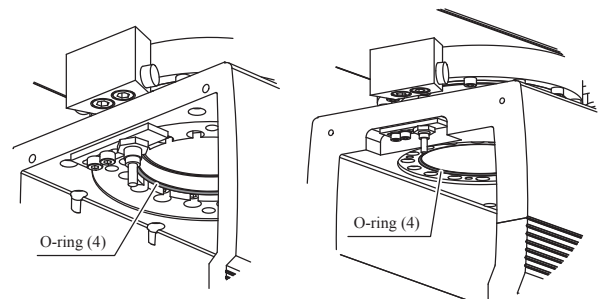
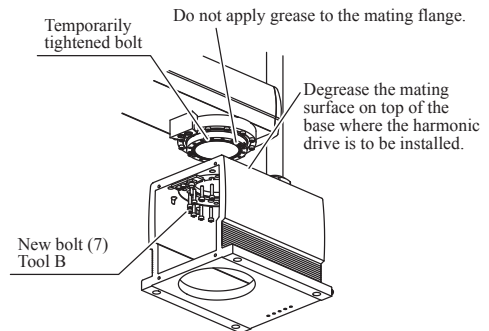


R6YXGP500, R6YXGP600



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

### Step 6, 8 Installing the base



R6YXGP500, R6YXGP600

R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

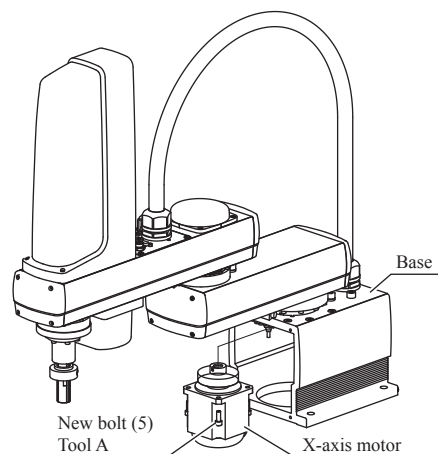
## 9 **Secure the X-axis motor to the base.**

1. Push the X-axis motor into the plate while moving the X-axis arm manually.
2. Using the tool A, uniformly tighten the four bolts while moving the X-axis arm by hand slowly left and right at intervals of 45°. At this time, if any jamming or catching is felt, reassemble from the beginning.

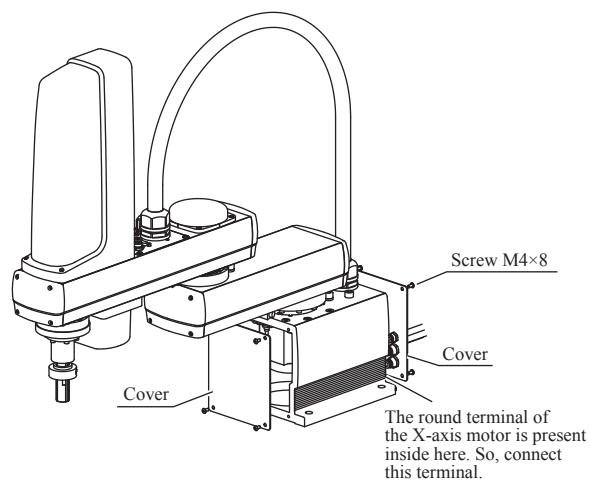
## 10 **Connect the connectors of the X-axis motor power wire XM and resolver wire XP, and the round terminal of the X-axis motor.**

## 11 **Reattach the base front and rear covers.**

### ▶ Step 9 **Installing the X-axis motor**



### ▶ Step 10-11 **Reattaching the cover**



### ■ Aging

#### 1 **Go out of the safety enclosure.**

#### 2 **Turn on the controller.**

Check that no one is inside the safety enclosure, and then turn on the controller.



#### CAUTION

After the harmonic drive has been replaced, it is necessary to perform the absolute reset and set the standard coordinates and point data again. Make the adjustments while referring to Chapter 3 “Adjusting the robot” in the Installation Manual.

#### 3 **Perform the aging.**

Perform the aging for 30 minutes at 5% speed and for another 30 minutes at 20% speed by rotating the X-axis arm as much as possible (at least 10°).

## 2.2.2 Replacing the Y-axis harmonic drive



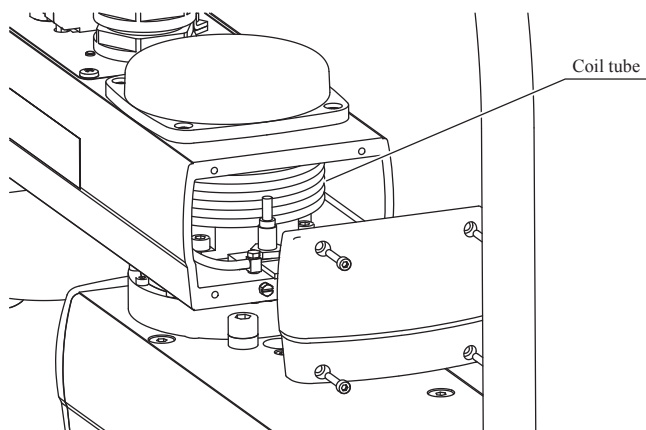
### WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ “1. ATTACHING, DETACHING, AND REPLACING THE COVER” IN CHAPTER 2.

The coil tube shown below is absolutely required for the Y-axis reduction unit replacement work. If the coil tube has not been connected, prepare a new coil tube. Even when the coil tube has been connected, prepare a new coil tube since it needs to be replaced.

If the coil tube is not connected, this may cause the grease to leak.

Coil tube



The following shows the parts and tools necessary for the Y-axis harmonic drive replacement work.

### 1. Replacement parts

#### • R6YXGP500, R6YXGP600

|    | Part Name                    | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks  |
|----|------------------------------|----------------|---|------|--|
| 1  | Harmonic drive               | KBF-M2510-000  |   | 1    |  |
| 2  | O-ring                       |                | Cross section diameter: 0.99mm<br>Inner diameter: 53.28mm | 1    | Supplied with harmonic drive                                     |
| 3  | O-ring                       | KN4-M257K-000  | Cross section diameter: 1.78mm<br>Inner diameter: 72.75mm | 1    | Becomes worn and must be replaced                                |
| 4  | O-ring                       | KN3-M2143-000  | Cross section diameter: 1.50mm<br>Inner diameter: 49.00mm | 1    | Becomes worn and must be replaced                                |
| 5  | Motor mounting bolt          | KBF-M259A-000  | M5, length: 12  | 4    | Must be replaced when robot reference number is prior to KC394   |
|    |                              | 91312-05012    | M5, length: 12  | 4    | Spare parts for robots with a reference number of KC394 or later |
| 6  | Harmonic drive mounting bolt | 91312-03016    | M3, length: 16  | 16   | Must be replaced   |
| 7  | Harmonic drive mounting bolt | 91312-03030    | M3, length: 30  | 11   | Must be replaced   |
| 8  | Panhead bolt for dog         | 98502-03030    | M3, length: 30  | 1    | Spare parts  |
| 9  | Nut for dog                  | 95302-04600    | M4  | 1    | Spare parts  |
| 10 | Coil tube                    | KBF-M2511-000  |   | 1    |  |
| 11 | Joint                        | SUEF4-M3       | UEF4-M3 (KOGANEI)   | 1    | No need to be replaced if coil tube is originally equipped       |

• R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|    | Part Name                    | OMRON Part No. | Part No. / Specs   | Q'ty | Remarks  |
|----|------------------------------|----------------|--|------|--|
| 1  | Harmonic drive               | KBP-M2510-000  |  | 1    |  |
| 2  | O-ring                       |                | Cross section diameter: 1.30mm<br>Inner diameter: 66.5mm | 1    | Supplied with harmonic drive                                     |
| 3  | O-ring                       | KN4-M2143-000  | S90 (JIS)  | 1    | Becomes worn and must be replaced                                |
| 4  | O-ring                       | 90990-17J030   | Cross section diameter: 1.78mm<br>Inner diameter: 66.4mm | 1    | Becomes worn and must be replaced                                |
| 5  | Motor mounting bolt          | KBP-M259A-000  | M6, length: 16   | 4    | Must be replaced when robot reference number is prior to KC346   |
|    |                              | 91312-06016    | M6, length: 16   | 4    | Spare parts for robots with a reference number of KC346 or later |
| 6  | Harmonic drive mounting bolt | 91312-04020    | M4, length: 20   | 16   | Must be replaced   |
| 7  | Harmonic drive mounting bolt | 91312-04030    | M4, length: 30   | 11   | Must be replaced   |
| 8  | Panhead bolt for dog         | 98502-04030    | M4, length: 30   | 1    | Spare parts  |
| 9  | Nut for dog                  | 95302-05600    | M4   | 1    | Spare parts  |
| 10 | Washer                       | 92903-04600    | M4   | 16   | Must be replaced   |
| 11 | Coil tube                    | KBP-M2511-000  |  | 1    |  |
| 12 | Joint                        | SUEF4-M3       | UEF4-M3 (KOGANEI)  | 1    | No need to be replaced if coil tube is originally equipped       |
| 13 | Washer                       | KBF-M2146-001  |  | 1    | Spare parts  |

2. Torque wrench, etc.



**CAUTION**

Use accurately calibrated torque screwdrivers and torque wrenches.

• R6YXGP500, R6YXGP600

|   | Name               | Part No.                  | Manufacturer                         | Remarks   |
|---|--------------------|---------------------------|--------------------------------------|---|
| A | Torque wrench      | N120SPCK                  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M5 hex socket head bolt<br>Tightening torque: 7.4Nm (76kgfcm)   |
|   | Changeable head    | 230HCK4                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | Wrench (without ball end) for M5 hex socket head bolt; insert 110mm   |
| B | Torque screwdriver | N30LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 hex socket head bolt<br>Tightening torque: 1.8Nm (18kgfcm)   |
|   | Drive bit          | B35, opposite side 2.5×75 | Vessel Co., Inc.                     | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 75mm<br>Hexagonal width across flat at tip: 2.5mm |
| C | Torque screwdriver | N12LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 set screw<br>Tightening torque: 0.7Nm (7kgfcm)   |
|   | Drive bit          | 3C1507                    | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 70mm<br>Hexagonal width across flat at tip: 1.5mm |
| D | Torque screwdriver | N12LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 Phillips-head screw<br>Tightening torque: 0.9Nm (9kgfcm)   |
|   | Drive bit          | B35+2×50                  | Vessel Co., Inc.                     | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 50mm<br>Bit number: #2                            |

• R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|   | Name               | Part No. | Manufacturer                         | Remarks  |
|---|--------------------|----------|--------------------------------------|--|
| A | Torque wrench      | N230SPCK | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M6 hex socket head bolt<br>Tightening torque: 15.2Nm (156kgfcm)  |
|   | Changeable head    | 230HCK5  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | Wrench (without ball end) for M6 hex socket head bolt; insert 100mm  |
| B | Torque screwdriver | N50LTDK  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 hex socket head bolt<br>Tightening torque: 4.0Nm (41kgfcm)  |
|   | Drive bit          | 3C3007   | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 70mm<br>Hexagonal width across flat at tip: 3mm  |
| C | Torque screwdriver | N20LTDK  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 set screw<br>Tightening torque: 1.7Nm (17kgfcm)   |
|   | Drive bit          | 3C2010   | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 100mm<br>Hexagonal width across flat at tip: 2mm |
| D | Torque screwdriver | N20LTDK  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 Phillips-head screw<br>Tightening torque: 1.6Nm (16kgfcm)   |
|   | Drive bit          | +2×50    | Vessel Co., Inc.                     | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 50mm<br>Bit number: #2                           |

### 3. Other tools

| Name                       | Part No.               | Manufacturer           | Remarks   |
|----------------------------|------------------------|------------------------|---|
| Harmonic grease            | 4B No.2 (*1)           | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago.<br>The grease has probably deteriorated. |
| Cleaning wipe              |                        |                        |   |
| Phillips screwdriver       |                        |                        |   |
| Hex wrench set             |                        |                        |   |
| Screw thread locking agent | Loctite 262            | Henkel                 | High strength type (red)  |
| Spanner (wrench)           | width across flat: 5mm |                        |   |
| Tie band                   |                        |                        |   |

\*1: R6YXGP500, R6YXGP600: 27g

R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000: 48g

Make sure to install a coil tube for applying the specified amount of grease. If a coil tube is not used, grease may leak.



## ■ Removal

Follow the steps below to remove the Y-axis parts.

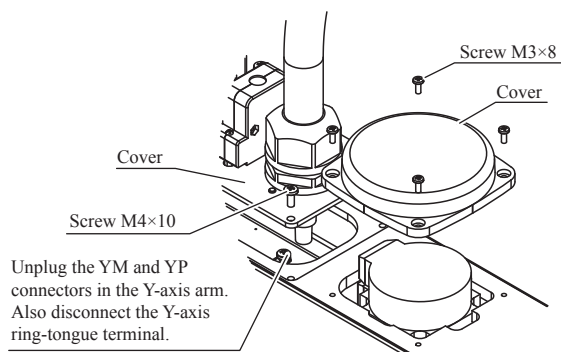
- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.
- 5 **Disconnect the connectors of the Y-axis motor power wire YM and resolver wire YP in the Y-axis arm, and the round terminal of the Y-axis motor.**
- 6 **Remove the cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.
- 7 **Disconnect the coil tube or air tube.**  
When the coil tube is connected, disconnect it from the joint. Cut the tie bands and take out the coil tube from the Y-axis arm window.  
If the coil tube is not connected, disconnect the air tube together with the joint.  
At this time, pay special attention so that no grease leaks from the tube and joint.  
For the wall-mount inverse model not needing the coil tube, move to Step 8.  
The work stated in Step 7 is not needed.
- 8 **Remove the Y-axis motor.**
  1. Remove the bolts that secure the Y-axis motor.  
The bolts are replaced with new ones later on.
  2. Gradually pull out the Y-axis motor while turning the Y-axis joint area.
  3. Remove the O-ring.



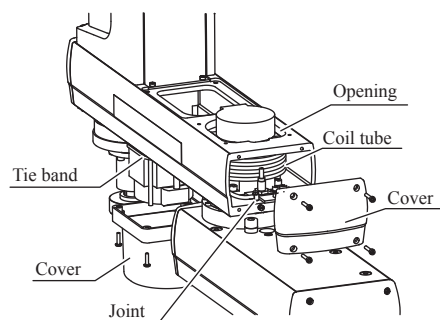
### NOTE

The O-ring of the Y-axis arm is replaced with a new one later on.

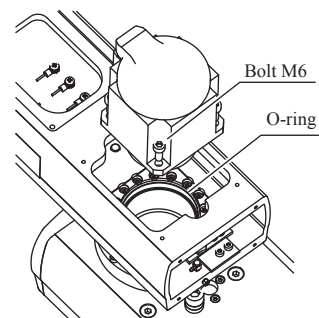
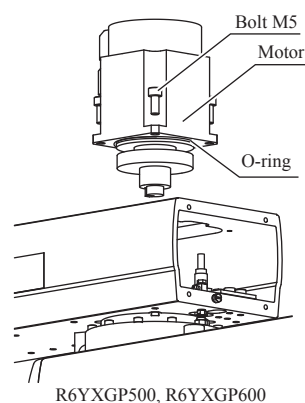
#### ▶ Step 4-5 Removing the cover



#### ▶ Step 6-7 Disconnecting the joint



#### ▶ Step 8 Removing the Y-axis motor



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

9

**Remove the wave generator from the motor shaft.**

Remove the set screws (1 pcs.) that secure the wave generator.



**WARNING**

IF THE Y-AXIS MOUNTING BOLTS ARE REMOVED IN STEP 10, THE Y-AXIS ARM COMES OFF, CAUSING HAZARDOUS SITUATION.

IF A HEAVY TOOL IS ATTACHED TO THE ARM TIP, THE ARM MAY DROP. SO, TAKE GREAT CARE WHEN REMOVING THE X-AXIS ARM MOUNTING BOLTS. (SEE THE FIG. IN STEP 10.)

10

**Remove the Y-axis arm.**

1. Before removing the Y-axis arm, reattach the cover so that the wiring is not stretched.
2. Remove the Y-axis arm mounting bolts.
3. Remove the Y-axis arm.

Place the Y-axis arm that has been removed in a place where it is not in contact with the harness and it does not hinder the work.

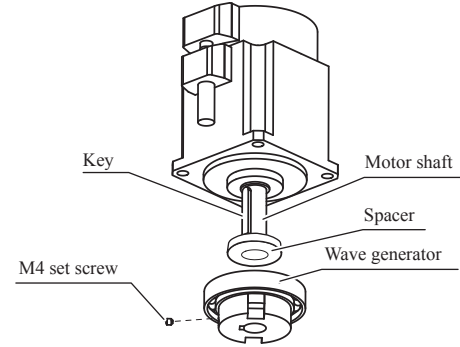
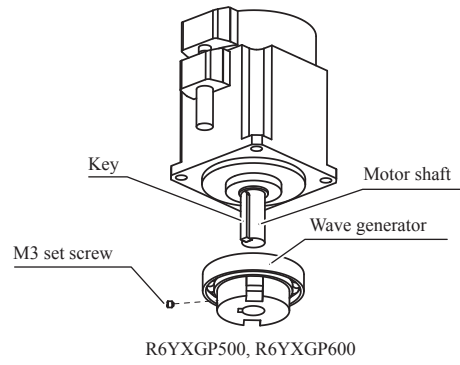
4. Remove the O-ring.

The O-ring of the harmonic drive is replaced with a new one later on.

The O-ring may adhere to the bottom surface of the Y-axis arm. So, be sure to remove it completely.

▶ Step 9

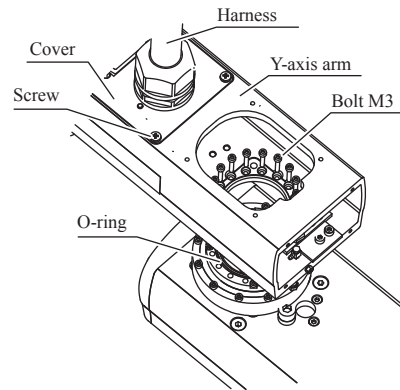
**Removing the wave generator**



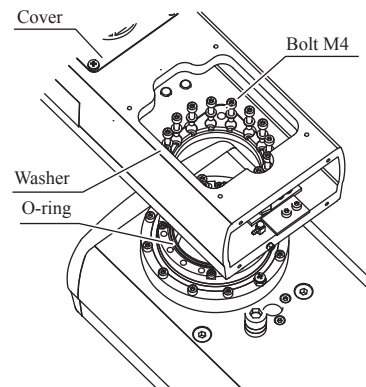
R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

▶ Step 10

**Removing the Y-axis arm**



R6YXGP500, R6YXGP600



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

## 11 Remove the Y-axis harmonic drive from the top surface of the X-axis arm.

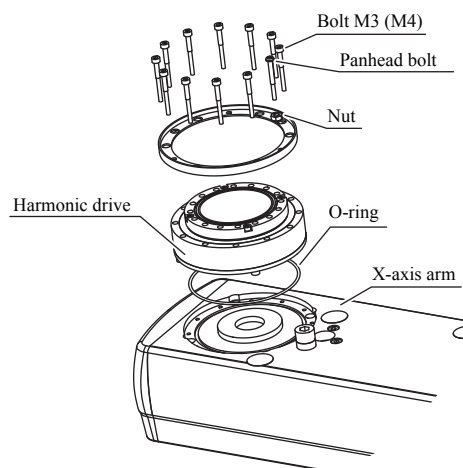
1. Remove the bolts, panhead bolts, and nuts that secure the Y-axis harmonic drive.
2. Remove the O-ring.



### NOTE

The O-ring in the harmonic drive must be replaced with a new one later on.

## Step 11 Removing the Y-axis harmonic drive



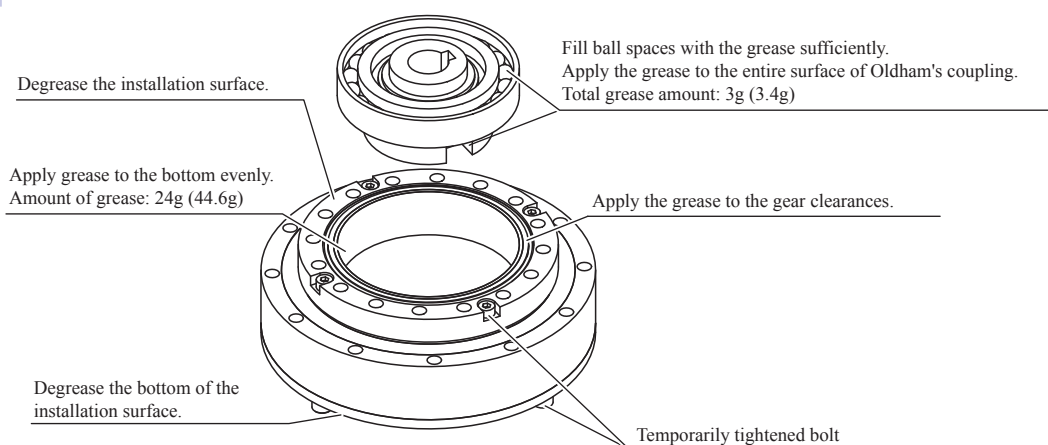
## Replacement and reassembly

Follow the steps below to replace the harmonic drive with a new one and reassemble it.

## 1 Perform the work shown below before reassembling the harmonic drive.

1. Apply harmonic grease 4B No.2 to the wave generator and main body bottom of a new harmonic drive. For details about how to apply the grease, see the Fig. below.

### Step 1 Applying the harmonic grease



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

2. Remove the old grease and worn-out particles from the motor, X-axis arm, and Y-axis arm completely.



### CAUTION

- If foreign matter is caught in during reassembly work, this may cause the noise from the harmonic drive or the harmonic drive to break.
- Never remove the temporarily secured bolts. Doing so may cause a misalignment.

3. Apply the specified amount of harmonic grease to each part of the harmonic drive.



### CAUTION

An insufficient amount of grease may shorten the service life of the drive parts, and an excessive amount may cause the grease to leak.

## 2

### **Secure a new harmonic drive (1) to the X-axis arm.**

1. Degrease the harmonic drive installation surface of the X-axis arm.  
Do not apply the grease to the seating surface.
2. Fit a new O-ring (3) into the O-ring groove in the X-axis arm.



#### **CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

3. Place the new harmonic drive on the X-axis arm and secure it with the bolts.  
Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.  
Grease applied to the bolt tip is intended to stabilize the bolt axial force.
4. Secure the panhead bolts and nuts at their original positions.



#### **CAUTION**

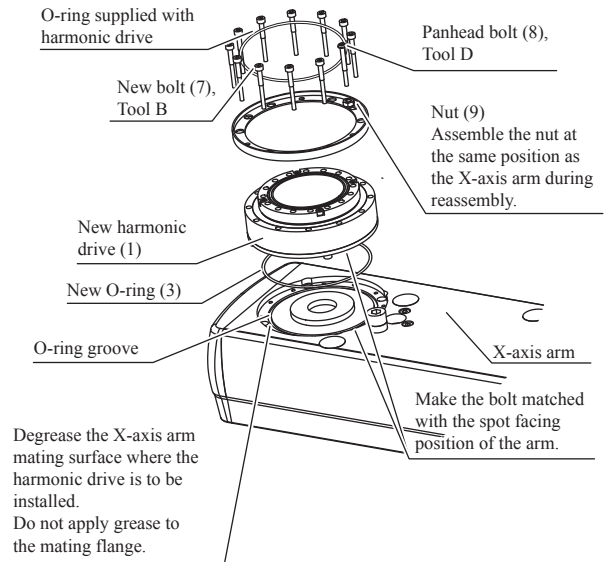
Do not apply the grease to the panhead bolt. Doing so may cause the bolt to loosen.

## 3

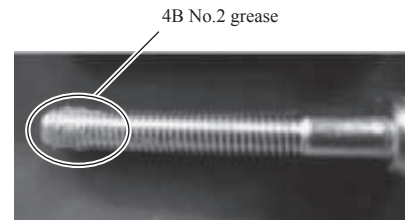
### **Tighten the bolts and panhead bolts in the order shown below.**

1. Using the wrench, tighten the bolts and panhead bolts manually in the order indicated by circled numbers.
2. Using the torque driver, tighten the bolts and panhead bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts and panhead bolts to the specified torque in the order indicated by circled numbers.
4. Finally, check that the bolts and panhead bolts are tightened to the specified torque.

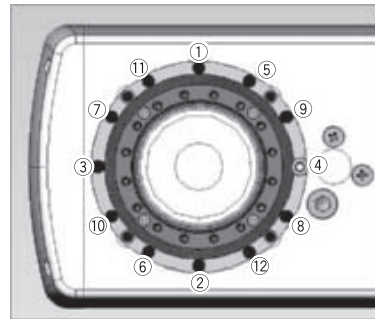
### ▶ Step 2-4 **Securing the harmonic drive**



### ▶ Step 2, 5 **Applying the grease to the mounting bolt**



### ▶ Step 3 **Bolt and panhead bolt tightening order**



#### 4 Install the O-ring (2) provided with the new harmonic drive.

1. Degrease the installation surface on the top surface of the harmonic drive.
2. Fit the O-ring supplied with the new harmonic drive into the O-ring groove of the harmonic drive.  
If it is difficult to fit the O-ring into the groove, slightly stretch the O-ring.  
It is accepted to apply a small amount of the harmonic drive grease to the O-ring in order to prevent the O-ring from coming off the groove.



#### CAUTION

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

#### 5 Secure the Y-axis arm to the harmonic drive.

1. Degrease the Y-axis arm side where the harmonic drive is to be installed.
2. Apply harmonic grease 4B No.2 to the tip of each bolt so that the roots of at least the first four threads are filled with grease.

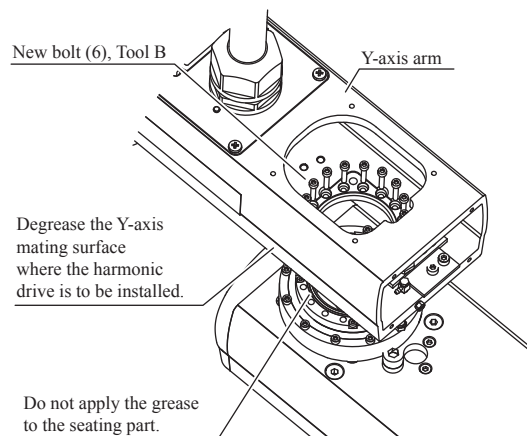


#### CAUTION

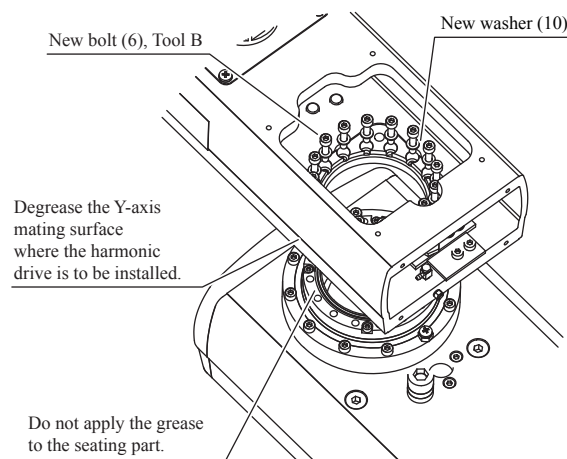
When tightening the bolts with the moment load applied to the harmonic drive, this may cause breakage. Perform the work not to apply the moment load to the harmonic drive.

3. Align the harmonic drive's phase with respect to the Y-axis arm and install the Y-axis arm so that the spot facing of the harmonic drive is matched with the tapped hole in the Y-axis arm.  
At this time, two work personnel perform the work with the Y-axis arm kept horizontally so that no moment load is applied to the Y-axis harmonic drive. One person supports the end of the Y-axis arm and the other person secures the Y-axis arm in place.

#### Step 5-6 Installing the Y-axis arm

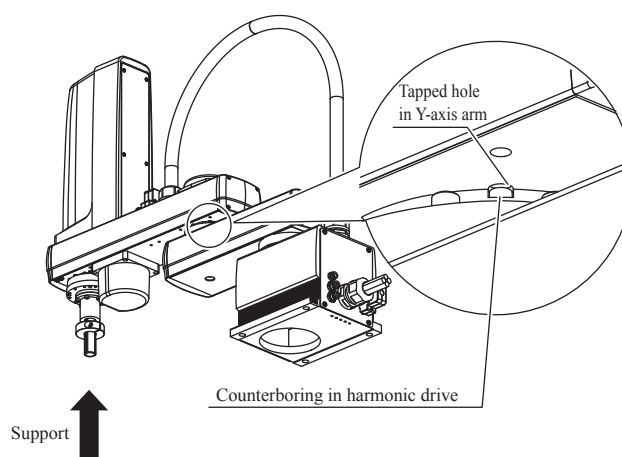


R6YXGP500, R6YXGP600



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

#### Step 5 Securing the Y-axis arm



## 6

### Tighten the bolts in the order shown below.

1. Using the wrench, tighten the bolts manually in the order indicated by circled numbers.
2. Using the torque driver, tighten the bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts to the specified torque in the order indicated by circled numbers.
4. Finally, check that the bolts are tightened to the specified torque.



#### NOTE

For the R6YXGP500 and R6YXGP600, apply grease to fill in around the groove.

## 7

### Secure the wave generator.

1. For the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, put a spacer and pass the wave generator through the motor shaft while carefully checking the orientation of the wave generator. At this time, push the wave generator until it is in contact with the stepped surface.
2. Secure the wave generator with the set screw (1 pc.). At this time, apply a small amount of the screw lock to the set screw.

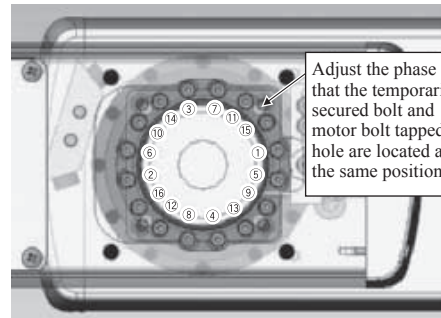


#### CAUTION

- If it is difficult to fit the wave generator onto the motor shaft by pushing by hand, do not forcefully push in. Grind the key or motor shaft with sandpaper or similar tool to make it easier to fit the wave generator onto the motor shaft.
- Apply the specified amount of harmonic grease to each part of the harmonic drive. An insufficient amount of grease may shorten the service life of the drive parts, and an excessive amount may cause the grease to leak.

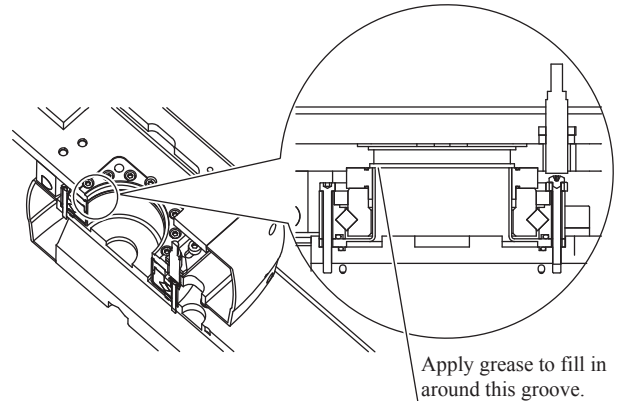
### Step 6

#### Bolt tightening order



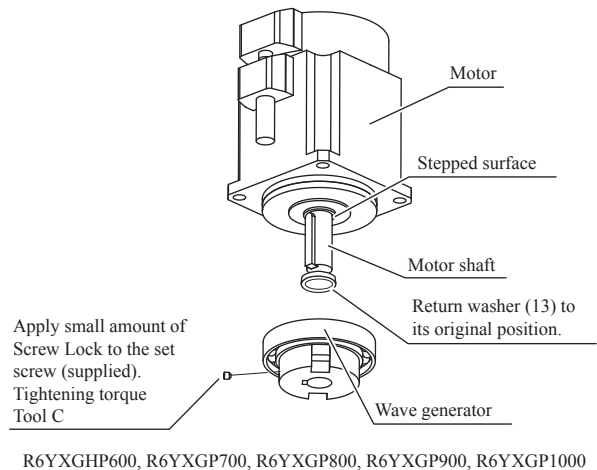
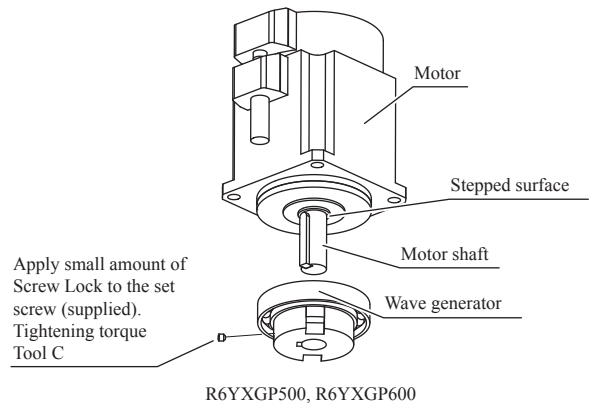
### Step 6

#### R6YXGP500, R6YXGP600



### Step 7

#### Securing the wave generator



## 8 **Subsequently, proceed the steps as follows.**

If the coil tube has already been connected, move to step 9.

If the coil tube has not been connected, move to step 13.

For the wall-mount inverse model not needing the coil tube, move to Step 9.

## 9 **Secure the motor to the Y-axis arm temporarily.**

1. Open the cover. Pass the wiring through the Y-axis arm side.
2. Fit a new O-ring (4) into the motor mating (Y-axis arm mating for the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000).
3. Gradually put the motor into the Y-axis arm while turning the Y-axis joint area and secure the motor to the Y-axis arm temporarily with the mounting bolts.



### CAUTION

Do not allow the O-ring to get caught out of the groove. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

## 10 **Retighten the temporarily secured bolts uniformly.**

Retighten the temporarily secured bolts (4 pcs.) uniformly while turning the Y-axis joint area.

At this time, if unusual feeling such as jamming is felt, reassemble from the beginning.

## 12 **Insert the coil tube.**

Insert the coil tube through the clearance between the Y-axis arm window and Y-axis. Connect the coil tube with the short straight portion to the joint.

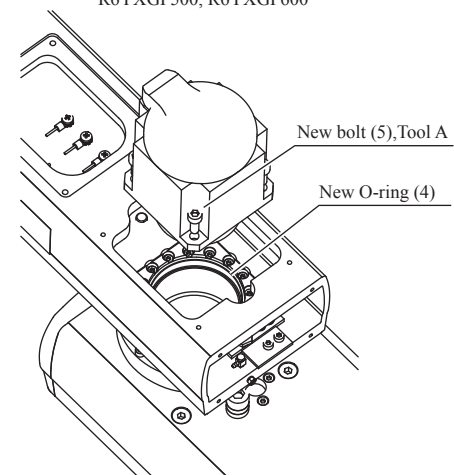
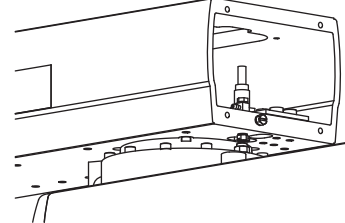
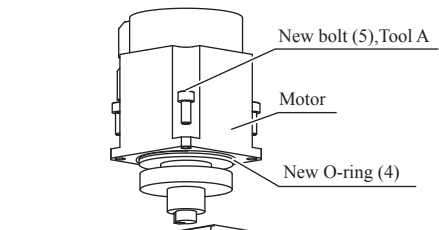
If the straight portion of the coil tube is too long, cut it to an appropriate level, and then connect it to the joint correctly. Connect the coil tube with the long straight portion to the Z-axis motor with tie bands. At this time, pay special attention so that the coil tube is not crushed or bent.

If the straight portion of the coil tube is longer than the Z-axis motor, cut the excess part.

## 13 **Install the cover.**

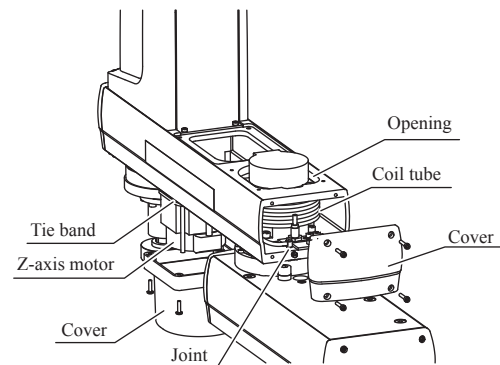
## 14 **Connect the connectors of the Y-axis motor power wire YM and resolver wire YP, and the round terminal of the Y-axis motor.**

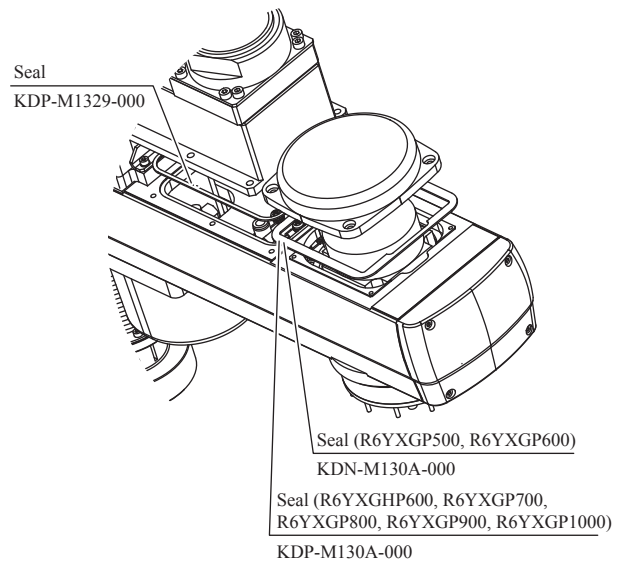
### Step 9-10 **Securing the motor temporarily**



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

### Step 11 **Inserting the coil tube**





### ■ Aging

1 *Go out of the safety enclosure.*

2 *Turn on the controller.*

Check that no one is inside the safety enclosure, and then turn on the controller.



#### CAUTION

After the harmonic drive has been replaced, it is necessary to perform the absolute reset and set the standard coordinates and point data again.

3 *Perform the aging.*

Perform the aging for 30 minutes at 5% speed and for another 30 minutes at 20% speed by rotating the Y-axis arm as much as possible (at least 10°).



## 2.2.3 Replacing the R-axis harmonic drive



### WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

The following shows the parts and tools necessary for the R-axis harmonic drive replacement work.



### CAUTION

At Step 2 of the "■ Replacement and reassembly" procedure, a motor-securing vise and a dial gauge are required in order to check the deflection of the harmonic drive's wave generator.

If a vise and dial gauge are not available, the wave generator can be installed at OMRON, with the assembly then being shipped to the customer.

In that case, the customer should order one of the following "additional new motor" replacement parts and request that the wave generator be installed in the motor.

Additional motors:

KBF-M4883-002 (R6YXGP500, R6YXGP600)

KBP-M4883-001 (R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000)

## 1. Replacement parts

### • R6YXGP500, R6YXGP600

|    | Part Name                    | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks  |
|----|------------------------------|----------------|---|------|--|
| 1  | Harmonic drive               | KBF-M1821-100  |   | 1    |  |
| 2  | O-ring                       |                | Cross section diameter: 0.80mm<br>Inner diameter: 45.40mm | 1    | Supplied with harmonic drive                                     |
| 3  | O-ring                       | KN4-M1896-000  | Cross section diameter: 1.78mm<br>Inner diameter: 63.22mm | 1    | Becomes worn and must be replaced                                |
| 4  | O-ring                       | 90990-17J031   | Cross section diameter: 1.00mm<br>Inner diameter: 35.30mm | 1    | Becomes worn and must be replaced                                |
| 5  | O-ring                       | 90990-17J032   | Cross section diameter: 1.00mm<br>Inner diameter: 46.00mm | 1    | Becomes worn and must be replaced                                |
| 6  | O-ring                       | 90990-17J034   | Cross section diameter: 0.60mm<br>Inner diameter: 22.20mm | 1    | Becomes worn and must be replaced                                |
| 7  | Motor mounting bolt          | KBF-M259A-000  | M5, length: 12  | 4    | Must be replaced when robot reference number is prior to KC368   |
|    |                              | 91312-05014    | M5, length: 14  | 4    | Spare parts for robots with a reference number of KC368 or later |
| 8  | Harmonic drive mounting bolt | 91312-03014    | M3, length: 14  | 16   | Must be replaced   |
| 9  | Harmonic drive mounting bolt | 91312-03025    | M3, length: 25  | 11   | Must be replaced   |
| 10 | Panhead bolt for dog         | 98502-03030    | M3, length: 30  | 1    | Spare parts  |
| 11 | Nut for dog                  | 95302-04600    | M4  | 1    | Spare parts  |
| 13 | Spline nut securing bolts    | 91312-04010    | M4, length: 10  | 6    | Spare parts  |
| 14 | End face seal (*1)           | KBF-M1886-000  |   | 1    | Replace with spare when damaged or missing.                      |
| 15 | Bearing nut                  | 90185-03J00    |   | 1    | Spare parts  |
| 16 | Bearing                      | 90933-01J003   | 6003ZZ  | 2    | Spare parts  |
| 17 | Bearing plate securing bolts | 91312-05014    | M5, length: 14  | 4    | Spare parts  |

\*1: A new end face seal will be subjected to a high level of friction if sufficient R-axis aging has not occurred. Therefore, be sure to perform R-axis aging, and do not replace this seal unless it is damaged.

### • R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|   | Part Name      | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks                           |
|---|----------------|----------------|---|------|-----------------------------------|
| 1 | Harmonic drive | KBP-M1821-011  |   | 1    |                                   |
| 2 | O-ring         |                | Cross section diameter: 0.99mm<br>Inner diameter: 53.28mm | 1    | Supplied with harmonic drive      |
| 3 | O-ring         | KN3-M2159-000  | S71 (JIS)   | 1    | Becomes worn and must be replaced |
| 4 | O-ring         | 90990-17J036   | Cross section diameter: 1.00mm<br>Inner diameter: 43.00mm | 1    | Becomes worn and must be replaced |

|    | Part Name                    | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks  |
|----|------------------------------|----------------|---|------|--|
| 5  | O-ring                       | 90990-17J038   | Cross section diameter: 1.30mm<br>Inner diameter: 53.00mm | 1    | Becomes worn and must be replaced                                |
| 6  | O-ring                       | 90990-17J037   | Cross section diameter: 0.50mm<br>Inner diameter: 28.00mm | 1    | Becomes worn and must be replaced                                |
| 7  | End face seal                | KBP-M1886-000  | V-28A (N+C)   | 1    |  |
| 8  | Motor mounting bolt          | KBP-M259A-000  | M6, length: 16  | 4    | Must be replaced when robot reference number is prior to KC172   |
|    |                              | 91312-06016    | M6, length: 16  | 4    | Spare parts for robots with a reference number of KC172 or later |
| 9  | Harmonic drive mounting bolt | 91312-03016    | M3, length: 16  | 16   | Must be replaced   |
| 10 | Harmonic drive mounting bolt | 91312-03025    | M3, length: 25  | 11   | Must be replaced   |
| 11 | Bolt for dog                 | 91312-03030    | M3, length: 30  | 1    | Spare parts  |
| 12 | Dog                          | KBP-M1888-000  |   | 1    | Spare parts  |
| 13 | Spline nut securing bolts    | 91312-05014    | M5, length: 14  | 6    | Spare parts  |
| 14 | End face seal (*1)           | KBP-M1886-000  |   | 1    | Spare parts  |
| 15 | Bearing nut                  | KBP-M1862-000  |   | 1    | Spare parts  |
| 16 | Bearing                      | 90933-01J022   | 602ZZZ  | 2    | Spare parts  |
| 17 | Bearing plate securing bolts | 91312-05014    | M5, length: 14  | 4    | Spare parts  |

\*1: A new end face seal will be subjected to a high level of friction if sufficient R-axis aging has not occurred. Therefore, be sure to perform R-axis aging, and do not replace this seal unless it is damaged.

## 2. Torque wrench, etc.



### CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

#### • R6YXGP500, R6YXGP600

|   | Name               | Part No.                  | Manufacturer                         | Remarks   |
|---|--------------------|---------------------------|--------------------------------------|---|
| A | Torque wrench      | N120CPCK                  | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M5 hex socket head bolt<br>Tightening torque: 7.4Nm (76kgfcm)   |
|   | Changeable head    | 230HCK4                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | Wrench (without ball end) for M5 hex socket head bolt; insert 110mm   |
| B | Torque screwdriver | N30LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 hex socket head bolt<br>Tightening torque: 1.8Nm (18kgfcm)   |
|   | Drive bit          | B35, opposite side 2.5×75 | Vessel Co., Inc.                     | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 75mm<br>Hexagonal width across flat at tip: 2.5mm |
| C | Torque screwdriver | N20LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 set screw<br>Tightening torque: 0.7Nm (7.1kgfcm)   |
|   | Drive bit          | 3C2010                    | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 100mm<br>Hexagonal width across flat at tip: 2mm  |
| D | Torque screwdriver | N12LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M3 Phillips-head screw<br>Tightening torque: 0.9Nm (9kgfcm)   |
|   | Drive bit          | B35+2×50                  | Vessel Co., Inc.                     | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 50mm<br>Bit number: #2                            |
| E | Ratchet handle     | FUTR-3/8                  | Fuji Seimitsu                        | Insertion angle, 9.52 mm  |
|   | Socket             | FUT#03                    | Fuji Seimitsu                        | Socket for fine U-nut, M17 x P1.0   |

#### • R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|   | Name               | Part No.                  | Manufacturer                       | Remarks   |
|---|--------------------|---------------------------|------------------------------------|---|
| A | Torque wrench      | N230SPCK                  | KANON<br>(Nakamura Mfg. Co., Ltd.) | For M6 hex socket head bolt<br>Tightening torque: 15.2Nm (156kgfcm)   |
|   | Changeable head    | 230HCK5                   | KANON<br>(Nakamura Mfg. Co., Ltd.) | Wrench (without ball end) for M6 hex socket head bolt; insert 100mm   |
| B | Torque screwdriver | N30LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.) | For M3 hex socket head bolt<br>Tightening torque: 1.8Nm (18kgfcm)   |
|   | Drive bit          | B35, opposite side 2.5×75 | Vessel Co., Inc.                   | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 75mm<br>Hexagonal width across flat at tip: 2.5mm |

|   |                    |         |                                      |  |
|---|--------------------|---------|--------------------------------------|--|
| C | Torque screwdriver | N12LTDK | KANON<br>(Nakamura Mfg. Co., Ltd.)   | For M4 set screw<br>Tightening torque: 0.8Nm (8.1kgfcm)  |
|   | Drive bit          | 3C2010  | NAC<br>(Nagahori Industry Co., Ltd.) | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 100mm<br>Hexagonal width across flat at tip: 2mm |

### 3. Other tools

| Name                       | Part No.     | Manufacturer           | Remarks  |
|----------------------------|--------------|------------------------|--|
| Harmonic grease            | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |
| Cleaning wipe              |              |                        |  |
| Phillips screwdriver       |              |                        |  |
| Hex wrench set             |              |                        |  |
| 19mm spanner               |              |                        | R6YXGP500, R6YXGP600   |
| Hook spanner               |              |                        | Fine U-nut outer diameter: $\varnothing 28\text{mm}$<br>R6YXGP500, R6YXGP600                     |
| 24mm spanner               |              |                        | R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900,<br>R6YXGP1000                                       |
| 32mm spanner               |              |                        |  |
| Screw thread locking agent | Loctite 262  | Henkel                 | High strength type (red)   |

\*1: R6YXGP500, R6YXGP600: 8g  
R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000: 10g

### ■ Removal

Follow the steps below to remove the R-axis parts.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.
- 5 **Disconnect the connectors of the R-axis motor power wire RM and resolver wire RP in the Y-axis arm, and the round terminal of the R-axis motor.**

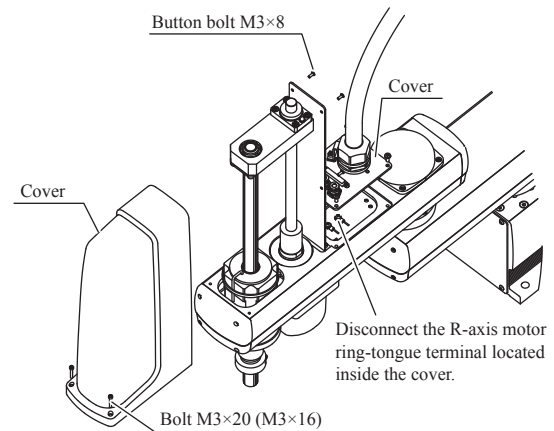


#### WARNING

IF THE BEARING MOUNTING BOLTS ARE REMOVED IN STEP 6, THE Y-AXIS MAY DROP, CAUSING HAZARDOUS SITUATION. BEFORE REMOVING THE BEARING MOUNTING BOLTS, SUPPORT THE Z-AXIS USING A BASE, ETC.

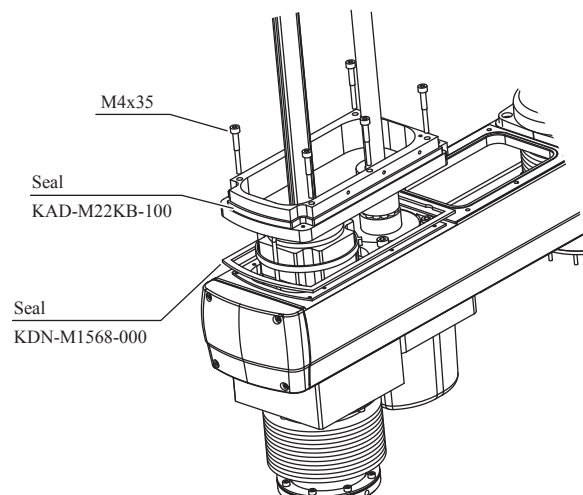
- 6 **Remove the bracket.**

#### ▶ Step 4-5 Removing the cover



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

#### ▶ Step 6 Removing the bracket



7

**Remove the tool flange.**

After removing the positioning bolt, loosen the M6 bolts, then remove the tool flange in the downward direction.

8

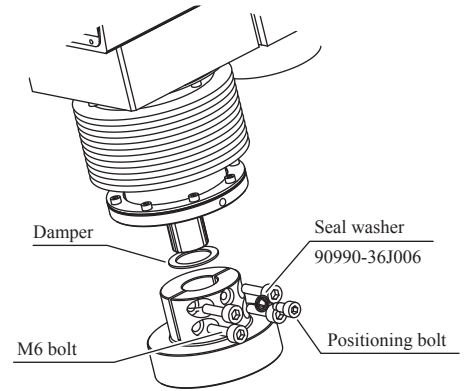
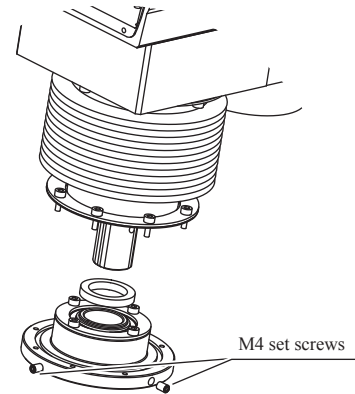
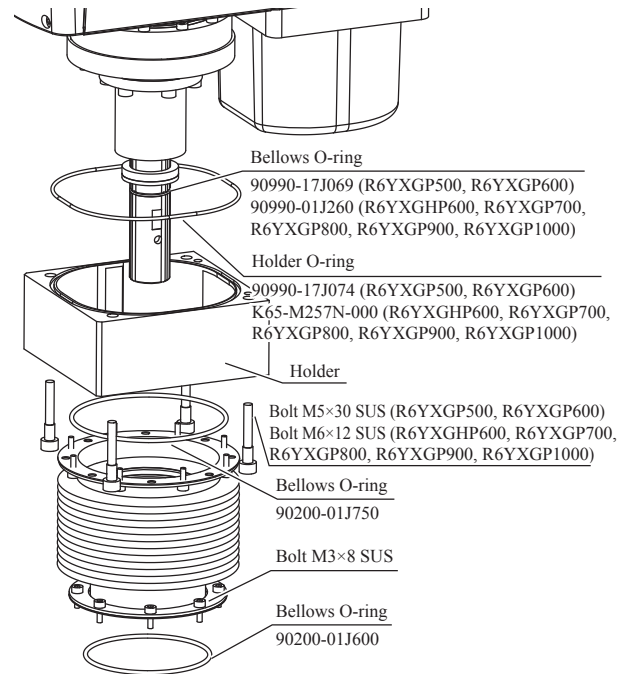
**Remove the holder.**

Loosen the 2 M4 set screws, then remove the holder in the downward direction.

9

**Remove the bellows and the holder.**

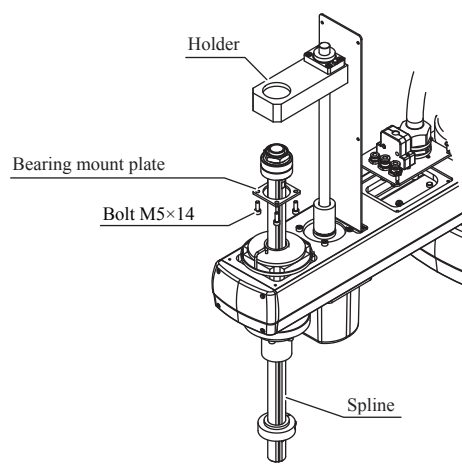
After removing the bellows, replace the bellows O-ring. Also replace the holder O-ring after removing the holder.

▶ **Step 7****Removing the tool flange**▶ **Step 8****Removing the holder**▶ **Step 9****Removing the bellows and holder**

**10** *Extract the spline and bearing from the holder.*

Remove the bolt which secures the bearing at the spline's upper end, then extract the spline and bearing from the holder.

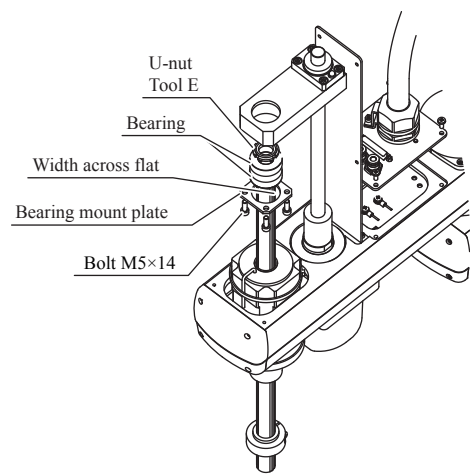
**Step 10** **Removing the spline and bearing**



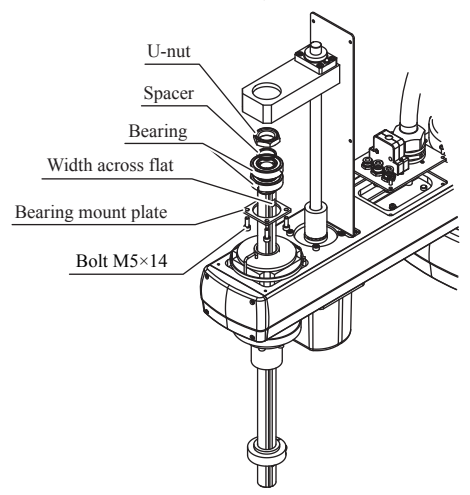
**11** *Remove the bearing and bearing mount plate.*

Fit the wrench to the width across flat surfaces at the lower portion of the bearing, remove the U-nut at the upper portion of the spline with the hook spanner, and then remove the bearing and bearing mount plate. At this time, be careful to keep the spline shaft so that it does not come off the spline nut.

**Step 7** **Removing the bearing and bearing mount plate**



R6YXGP500, R6YXGP600



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

**12** *Remove the bolt of the spline nut, and then remove the spline nut.*



**NOTE**  
An O-ring is fitted to the shaft. Replace this O-ring with a new one. At this time, do not remove the V-ring and sleeve.

**13** *Pull out the R-axis motor.*

Remove the bolts that secure the R-axis motor and pull out the R-axis motor while turning the R-axis.



**NOTE**  
An O-ring is placed between the R-axis motor flange and the Y-axis arm. Replace this O-ring with a new one.

**14** *Pull out the wave generator from the R-axis motor.*

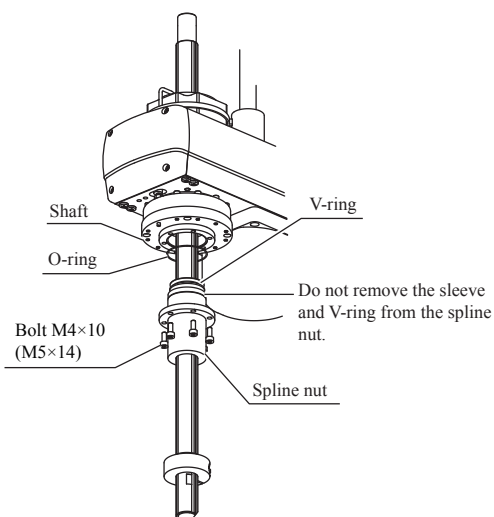
Loosen two set screws of the wave generator, and then pull out the wave generator from the R-axis motor shaft.



**NOTE**  
An O-ring is placed between the R-axis motor shaft and the wave generator. Replace this O-ring with a new one.

**Step 12**

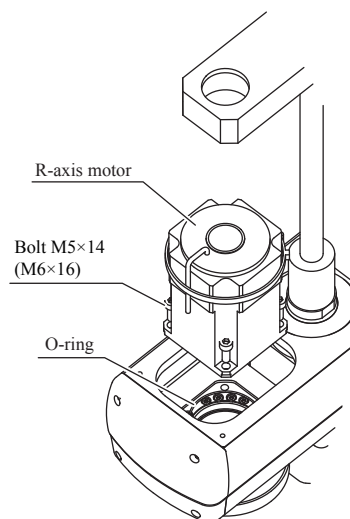
**Removing the spline nut**



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

**Step 13**

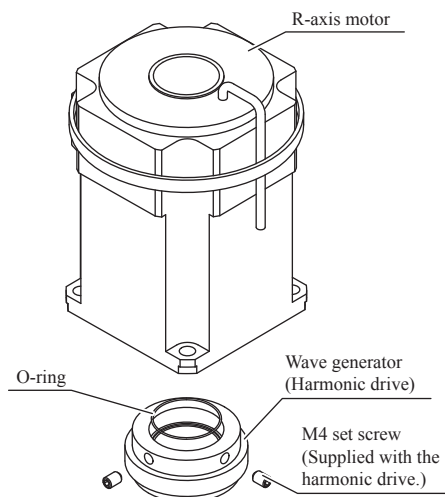
**Removing the R-axis motor**



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

**Step 14**

**Removing the wave generator**



15

**Remove the harmonic drive.**

Remove the bolts that secure the harmonic drive, and then remove the harmonic drive.



**NOTE**

An O-ring is fitted to the harmonic drive. Replace this O-ring with a new one.

16

**Remove the bolts that secure the shaft, and the panhead bolt and nut from the harmonic drive, and then remove the shaft.**

For the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, remove the dog and bolt.

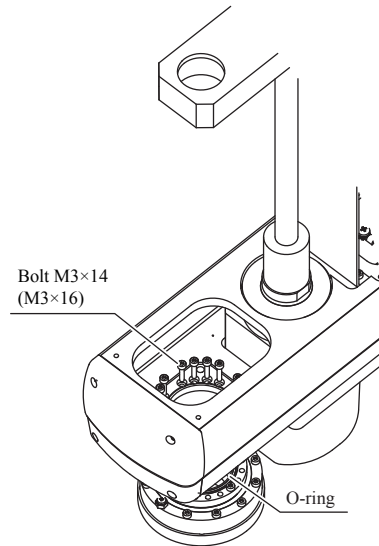


**NOTE**

An O-ring is placed between the harmonic drive

▶ **Step 15**

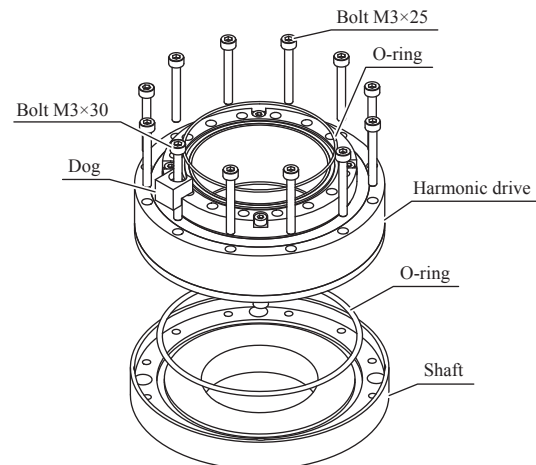
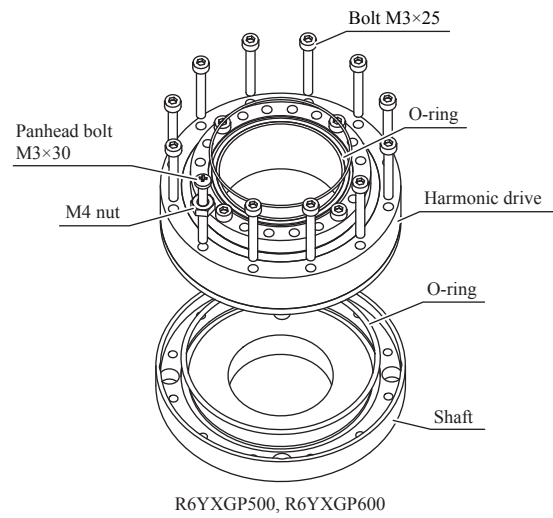
**Removing the harmonic drive**



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

▶ **Step 16**

**Removing the shaft**



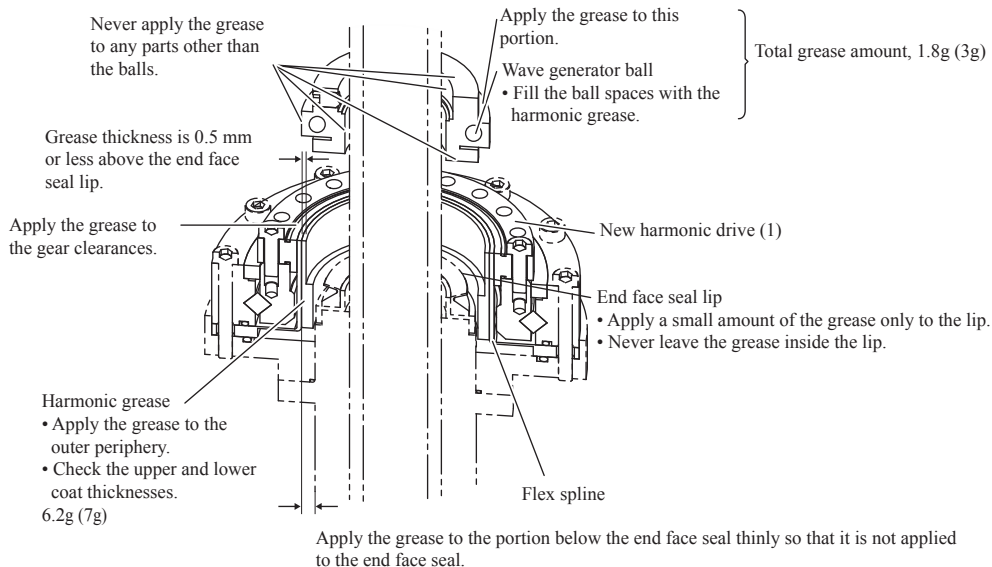
## ■ Replacement and reassembly

Follow the steps below to replace the harmonic drive with a new one and reassemble it.

### 1 **Apply the harmonic grease to a new wave generator.**

For details about how to apply the grease, see the Fig. below.

#### Step 1 Applying the harmonic grease



\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.

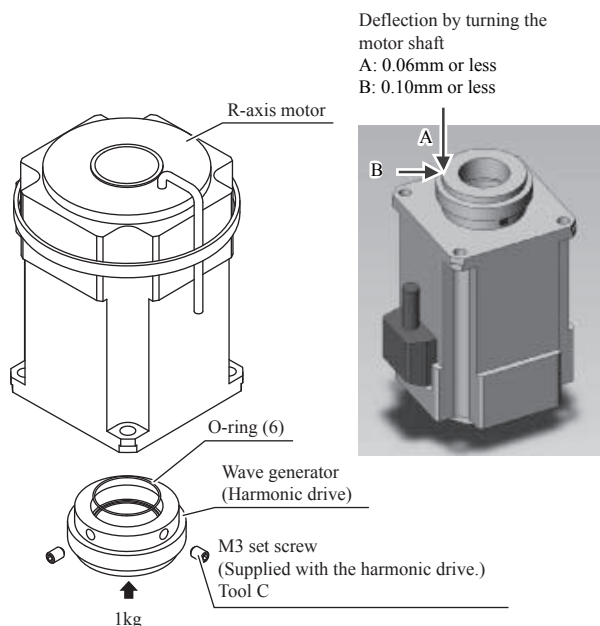
### 2 **Secure the new wave generator to the R-axis motor.**

1. Fit the O-ring (6) to the inside of the new wave generator.
2. Insert the wave generator into the inner end of the R-axis motor shaft and secure it with two set screws while pressing the wave generator with a load of about 1kg.
3. The wave generator deflection must satisfy the values shown in the Fig. on the right. Also make sure that the O-ring does not drop.

### 3 **Apply the harmonic grease to the flex spline.**

For details about how to apply the harmonic grease, see the Fig. stated in step 1.

#### ▶ Step 2 **Securing the wave generator**





**4** *Secure the harmonic drive to the shaft.*

1. Degrease the upper and lower installation surfaces of the harmonic drive.
2. Degrease the harmonic drive installation surface of the shaft.
3. Fit the new O-ring (3) coated with the harmonic grease into the groove in the shaft.
4. Secure the harmonic drive to the shaft with new bolts (9).



**CAUTION**

Never remove the temporarily secured bolt. Doing so may cause a misalignment.

**5** *Secure the panhead bolt and nut (bolt and dog (12) for the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000) to their original positions.*

It is not necessary to apply any grease to the panhead bolt (10) and bolt (11).

**6** *Tighten the bolts and panhead bolts in the order shown below.*

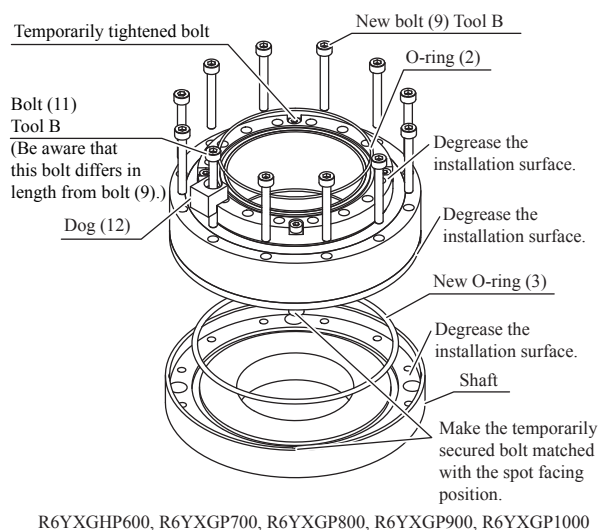
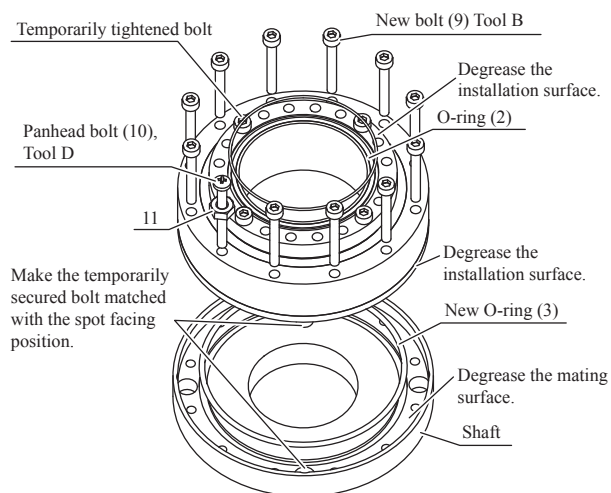
1. Using the wrench, tighten the bolts and panhead bolts manually in the order indicated by circled numbers.
2. Using the torque driver, tighten the bolts and panhead bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts and panhead bolts to the specified torque in the order indicated by circled numbers.
4. Finally, check that the bolts and panhead bolts are tightened to the specified torque.



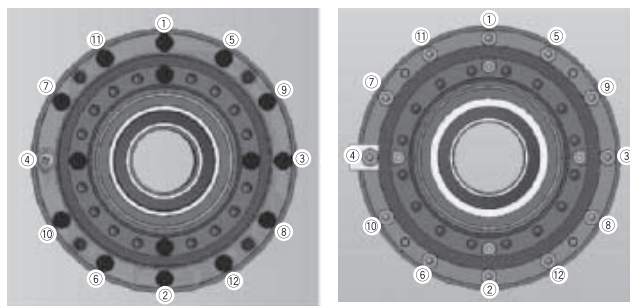
**CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

**Step 4-5** **Securing the harmonic drive**



**Step 6** **Bolt and panhead bolt tightening order**



7

**Install the O-ring (2).**

1. Degrease the installation surface of the Y-axis arm where the harmonic drive is to be installed.
2. Fit the O-ring (2) coated with a small amount of the harmonic grease into the O-ring groove of the new harmonic drive. If it is difficult to fit the O-ring into the groove, slightly stretch the O-ring.

**CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

8

**Secure the harmonic drive to the Y-axis arm.**

From the upper portion of the Y-axis arm, secure the harmonic drive to the Y-axis arm.

9

**Tighten the bolts in the order shown below.**

1. Using the wrench, tighten the bolts manually in the order indicated by circled numbers.
2. Using the torque driver, tighten the bolts to approximately 50% of the specified torque in the order indicated by circled numbers.
3. Tighten the bolts to the specified torque in the order indicated by circled numbers.
4. Finally, check that the bolts are tightened to the specified torque.

**CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

10

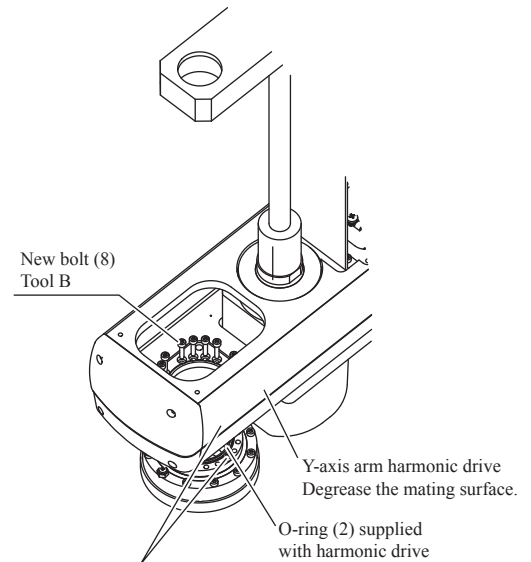
**Fit the new O-ring (5) coated with the harmonic grease into the O-ring groove of the Y-axis arm.****CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

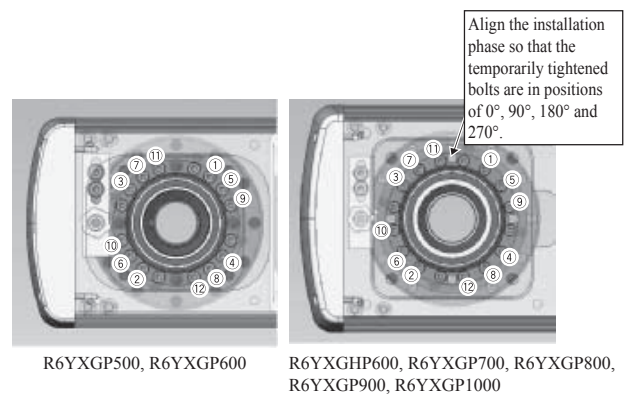
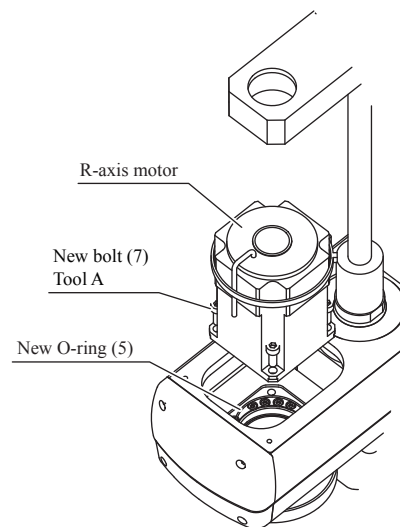
11

**Insert the R-axis motor into the Y-axis arm.**

Insert the R-axis motor into the Y-axis arm while turning the R-axis. Tighten the bolts while turning the R-axis.

**Step 7-8****Installing the harmonic drive**

- Reassemble while aligning the temporarily tightened bolts with the counterbored positions in the Y-axis arm. (R6YXGP500 and R6YXGP600)
- For the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, align the phase as shown in the Fig. stated in step 9.

**Step 9****Mounting bolt tightening order****Step 10-11****Inserting the R-axis motor**

12 **Fit the new O-rings (4) coated with the harmonic grease into the groove at the lower portion of the shaft.**



**CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

13 **Secure the spline nut to the shaft with the bolt (13).**

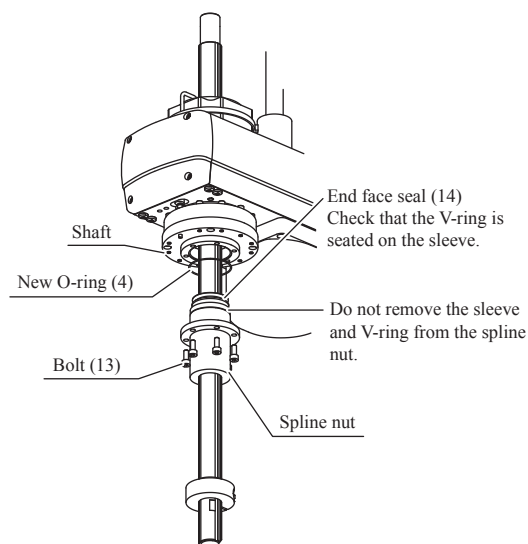
Check that the sleeve and V-ring are installed correctly.

14 **Secure the bearing.**

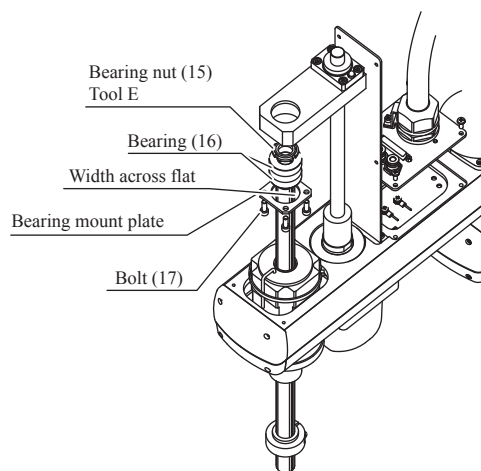
Fit the bearing plate and bearing (16) over the top of the spline, then secure the bearing with bearing nut (15). (At this time, utilize the width across flat surfaces of the spline in the same manner as the U-nut is loosened.)

For the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000, be careful not to forget the spacer.

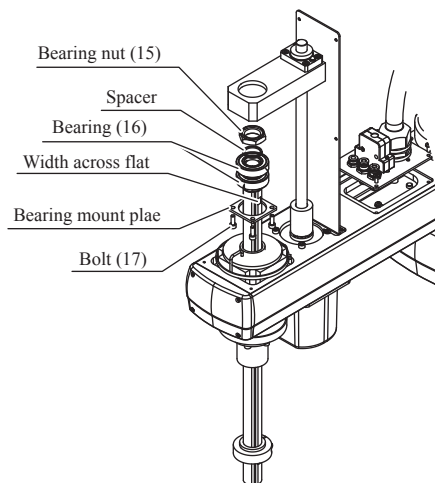
▶ Step 12-13 **Securing the spline nut**



▶ Step 14 **Securing the bearing**



R6YXGP500, R6YXGP600



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

**15** *Insert the spline and bearing into the holder.*

Insert the spline and bearing into the holder and secure them with the bolt (17).

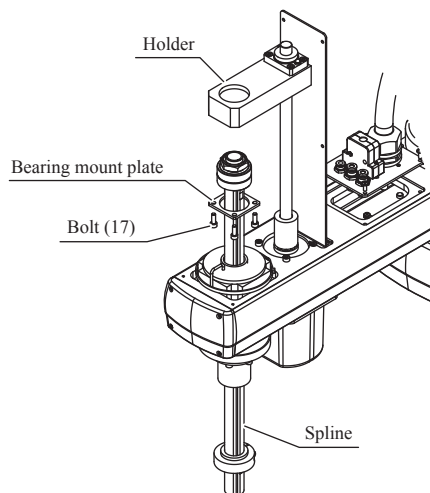
**16** *Install the bellows and holder.*

Don't forget to install the O-rings for the bellows and holder. At this point, only the upper side of the bellows should be secured. The lower side is not secured.

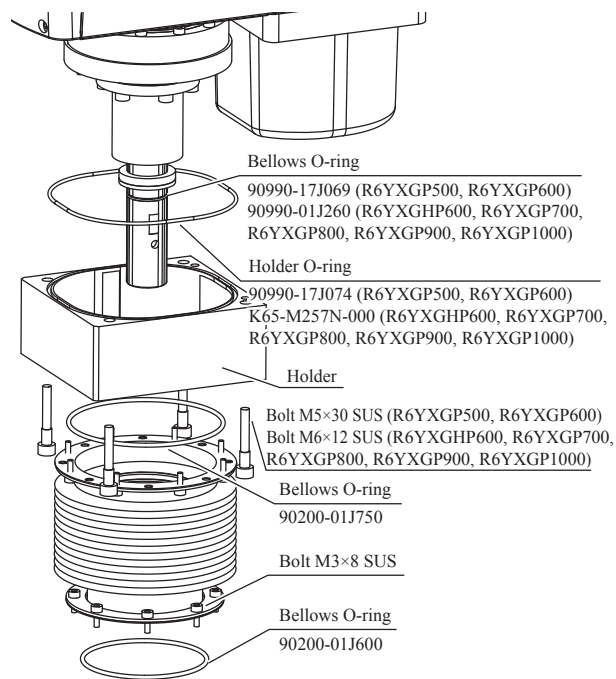
**17** *Install the holder.*

With the two M4 set screws loosened, place the holder on the spline.

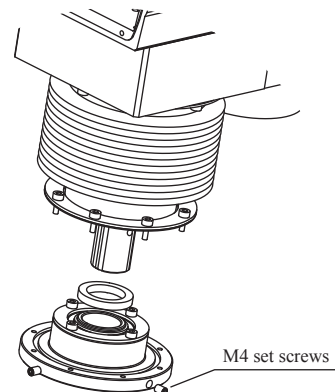
**Step 15** **Inserting the spline and bearing**



**Step 16** **Installing the bellows and holder.**



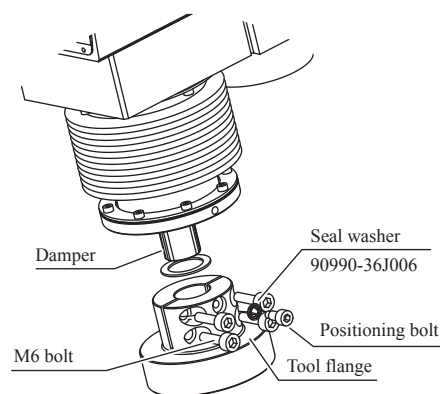
**Step 17** **Installing the holder**



18

**Install the tool flange.**

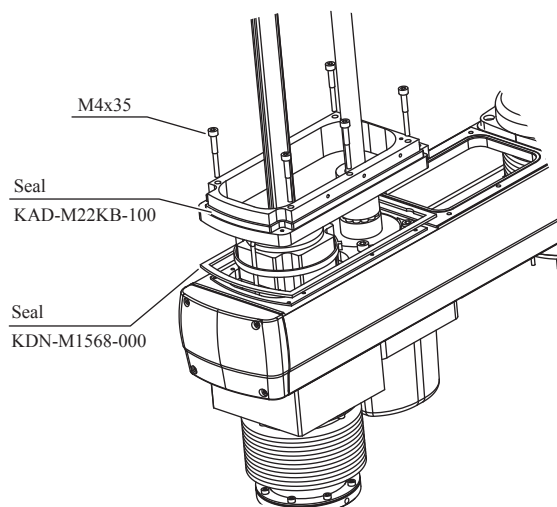
1. Place the tool flange on the spline shaft.
2. Align the spline positioning holes with the tool flange positioning holes, then screw in the positioning bolts.
3. Secure the tool flange by firmly tightening the 4 M6 bolts in a uniform manner.
4. Move the holder (previously placed on the spline shaft) against the tool flange, then tighten the 2 M4 set screws. At this time, be sure that one of the set screws is being screwed in against the chamfered part of the spline shaft.
5. Finally, secure the lower part of the bellows to the holder.

▶ **Step 18****Installing the tool flange**

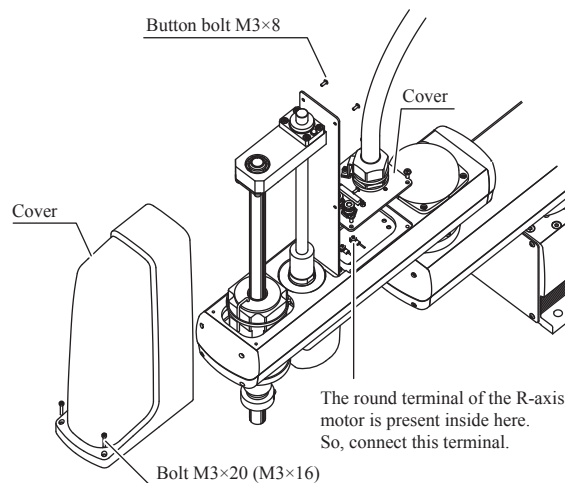
19

**Install the bracket.**

Replace the seal with a new one.

▶ **Step 19****Installing the tool flange**

20

**Connect the connectors of the R-axis motor power wire RM and resolver wire RP, and the round terminal of the R-axis motor.**▶ **Step 19-21****Reattaching the cover**

21

**Reattach the cover.**■ **Aging**

1

**Go out of the safety enclosure.**

2

**Turn on the controller.**

Check that no one is inside the safety enclosure, and then turn on the controller.

**CAUTION**

After the harmonic drive has been replaced, it is necessary to perform the absolute reset and set the standard coordinates and point data again. Make the adjustments while referring to Chapter 3 “Adjusting the robot” in the Installation Manual.

3

**Perform the aging.**

Perform the aging for 30 minutes at 5% speed and for another 30 minutes at 20% speed by rotating the R-axis arm as much as possible (at least 10°).

\* Values in parentheses apply to the R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900 and R6YXGP1000.



# Chapter 6

# Replacing the machine harness

## Contents

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| <b>2. Y-axis arm side I/O connector replacement</b>                               | <b>6-16</b> |
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# 1. Replacing the machine harness



## CAUTION

- Some seals are affixed. When removing such seal, peel off the adhesive agent and replace the seal with a new one.
- If the bolt tightening torque is not instructed, see the tightening torque stated in “2. Replacement procedure for harmonic drive” in Chapter 5.
- An absolute reset is required after a machine harness replacement.

## 1.1 R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600

The following shows the parts necessary for the replacement work.

### 1. Replacement parts

|    | Part Name                      | Part No.      | Part No. / Specs                                     | Q'ty | Remarks         |
|----|--------------------------------|---------------|--|------|-----------------|
| 1  | Bolt                           | 91380-03010   | M3×10, stainless                                     | 4    | Spare parts     |
| 2  | O-ring                         | 90990-17J021  | Cross section diameter: 1.5<br>Inner diameter: 52.00 | 1    |                 |
| 3  | Seal washer                    | 90990-36J008  | SWS 3×6.4  | 8    |                 |
| 4  | Seal                           | KDM-M1315-000 |  | 1    |                 |
| 5  | Bolt                           | 91380-04018   | M4×18, stainless                                     | 4    | Spare parts     |
| 6  | Bolt                           | 91380-03018   | M3×18, stainless                                     | 4    | Spare parts     |
| 7  | Seal                           | KDM-M1327-000 |  | 1    |                 |
| 8  | Joint                          | STSH4-M5M     | TSH4-M5M (KOGANEI)                                   | 8    | Spare parts     |
| 9  | Harness securing bolt          | 91312-03018   | M3, length: 18                                       | 4    | Spare parts     |
| 10 | Screw for round terminal       | 97602-04308   | M4, length: 8  | 2    | Spare parts     |
| 11 | Lock washer for round terminal | 90172-00J040  | For M4   | 4    | Spare parts     |
| 12 | Screw for round terminal       | 97602-04306   | M4, length: 6  | 2    | Spare parts     |
| 13 | Machine harness                | KDM-M4843-001 |  | 1    | R6YXGLP250 (*1) |
|    |                                | KDM-M4843-101 |  | 1    | R6YXGLP350 (*1) |
|    |                                | KDM-M4843-201 |  | 1    | R6YXGLP400 (*1) |
|    |                                | KDM-M4843-301 |  | 1    | R6YXGLP500 (*1) |
|    |                                | KDM-M4843-401 |  | 1    | R6YXGLP600 (*1) |
|    |                                | KDM-M4843-501 |  | 1    | R6YXGLC250 (*1) |
|    |                                | KDM-M4843-601 |  | 1    | R6YXGLC350 (*1) |
|    |                                | KDM-M4843-701 |  | 1    | R6YXGLC400 (*1) |
|    |                                | KDM-M4843-801 |  | 1    | R6YXGLC500 (*1) |
|    |                                | KDM-M4843-901 |  | 1    | R6YXGLC600 (*1) |

\*1: "XG(L)P" indicates dust/drip proof specs., and "XG(L)C" indicates clean room specs.

## 2. Other tools

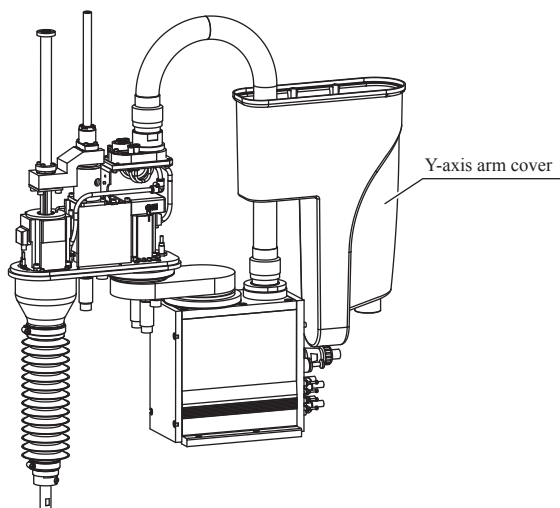
| Name                       | Part No.    | Manufacturer       | Remarks                     |
|----------------------------|-------------|--------------------|-----------------------------|
| Cloth rag                  |             |                    |                             |
| Hex wrench set             |             |                    |                             |
| Tie band                   |             |                    |                             |
| Phillips screwdriver       |             |                    |                             |
| Pliers                     |             |                    |                             |
| Torque wrench              |             |                    |                             |
| Screw thread locking agent | Loctite 241 | Henkel             | Medium-strength type (blue) |
| Silicon grease             | G-501       | Shin-Etsu Chemical | 3.0g                        |

### ■ Removal

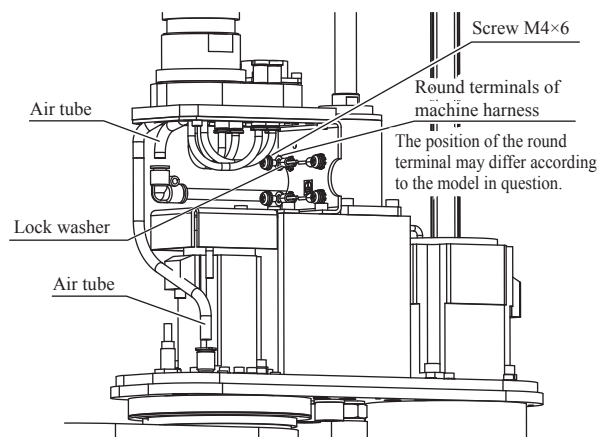
Follow the steps below to disconnect the machine harness.

- 1 **Turn off the controller power.**
- 2 **Place a sign indicating the robot is being adjusted.**
- 3 **Enter the safety enclosure.**
- 4 **Remove the Y-axis arm cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.
- 5 **Remove the air tubes and round terminals.**  
Remove the air tubes and round terminals (round terminals for the white and yellow/green wires). Be careful not to drop any lock washer or screw.
- 6 **Disconnect the wiring connector.**  
Disconnect the connector (black/15 pins) for the user wiring and the wiring connector.

#### ▶ Step 4 Removing the Y-axis arm cover



#### ▶ Step 5-7 Removal



**7** *Disconnect the machine harness from the stay.*

Remove the bolts and disconnect the machine harness from the stay. Remove also the seals.



**NOTE**

Be sure to replace the seal and seal washer with new ones.

**8** *Disconnect the harness from the Y-axis arm cover.*

**9** *Remove the base rear cover.*

**10** *Disconnect the air tube, connector (black/15 pins) for the user wiring, and the round terminals (white and yellow/green wires).*



**NOTE**

Be sure to replace the seal with a new one.

**11** *Disconnect the harness.*

Remove the bolt, lock nut, and seal washer, and disconnect the harness and remove the O-ring.

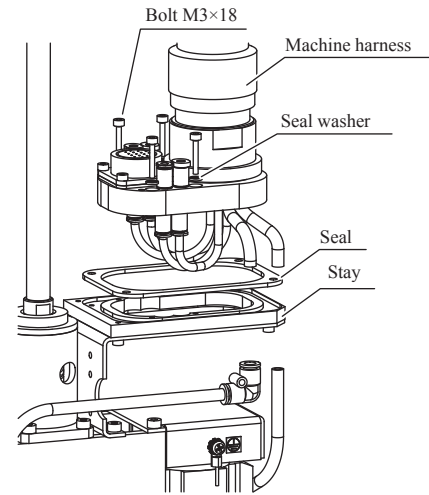


**NOTE**

Be sure to replace the O-ring and seal washer with new ones.

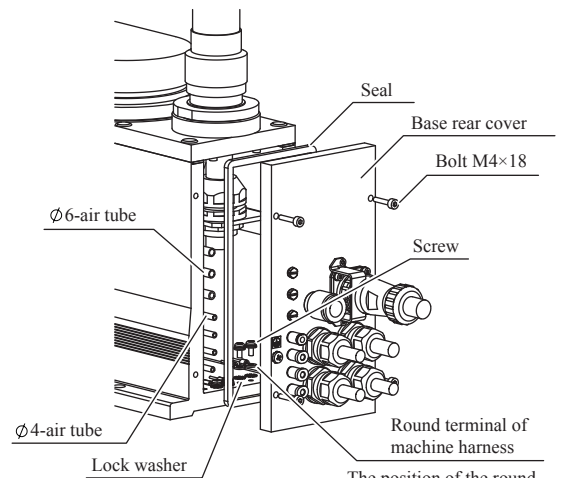
**Step 7**

**Disconnecting the machine harness**



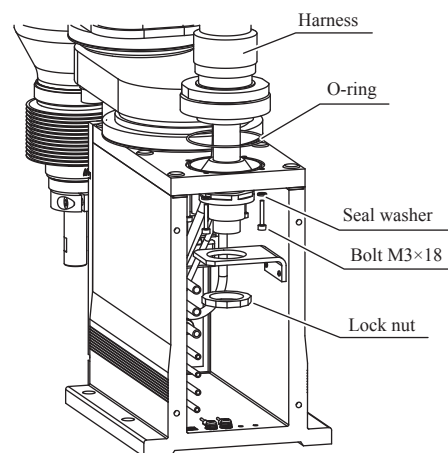
**Step 9-10**

**Removing the base rear cover**



**Step 11**

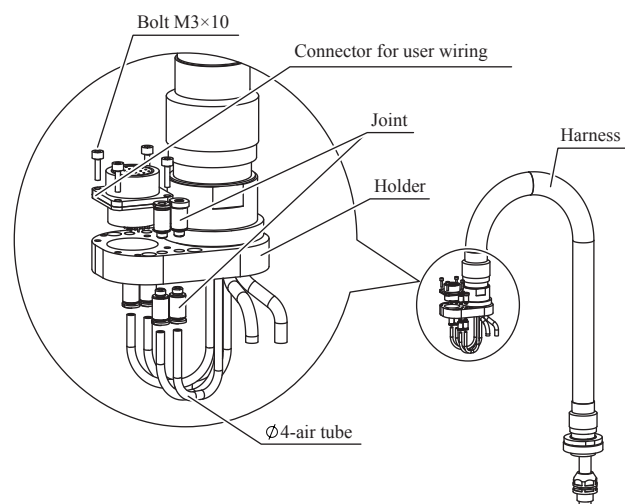
**Disconnecting the harness**



**Disconnect the  $\phi 4$ -air tubes.**

Disconnect the user wiring connector and joints from the harness holder.

▶ **Step 12** **Disconnecting the  $\phi 4$ -air tubes**



■ **Assembly**

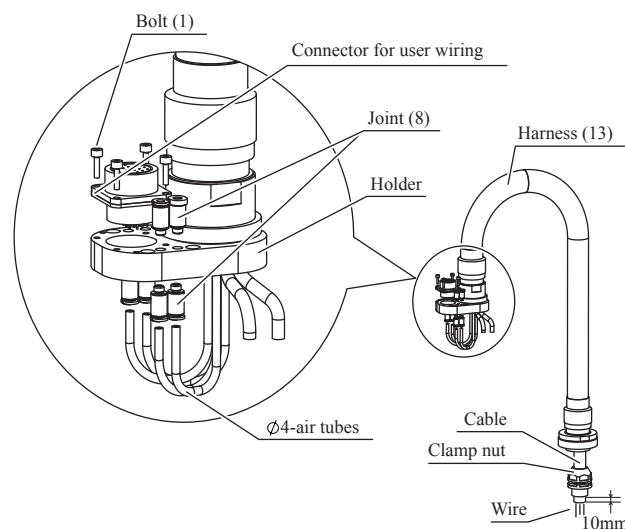
Assemble a new machine harness in the reverse order of removal.

1 **Reconnect the user wiring connectors and joints that have been disconnected to a new harness ASSY.**

At this time, do not connect the air tubes.

Turn the clamp nut at the clamp position shown in the Fig. on the right to tighten it so that the cable does not come off and turn.

▶ **Step 1** **Reconnecting the user wiring connector and joints**



**CAUTION**

Be sure to clamp the cable in this step as the silicon grease is applied to the connector later.

2

**Reconnect the harness.**

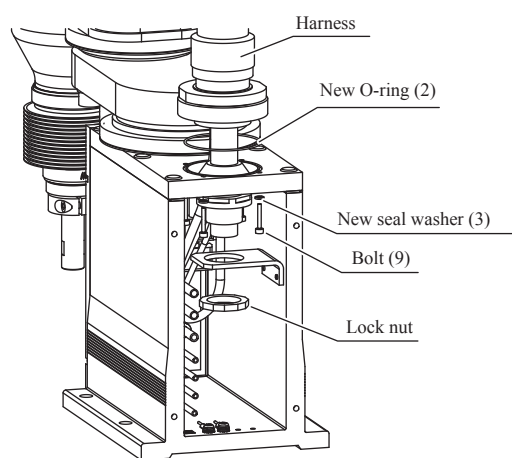
1. Put the O-ring and washer, and then reconnect the harness.
2. Tighten the lock nut firmly.



**CAUTION**

Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.

▶ **Step 2** **Reconnecting the harness**



3

**Apply the silicon grease.**

To prevent rubbing, apply the grease to the inside diameter portion of the hollow shaft, and the cable and air tube. (See the Fig. on the right.)

Silicon grease:

G-501 (Shin-Etsu Chemical), 1.5g

4

**Reconnect the air tubes, connector for the user wiring (black/15 pins), and round terminals (white and yellow/green wires).**

5

**Reattach the base rear cover.**

6

**Place the Y-axis arm cover on the base.**

Pass the cover through the harness while carefully checking the orientation of the Y-axis arm cover, and then place the Y-axis arm cover on the base.

7

**Reconnect the  $\phi 4$ -air tube.**

Cut the air tube to an appropriate length so that it is not broken.



**NOTE**

After the air tube has been connected, supply the air to the air tube to check that the air supply meets the joint color on the base side.

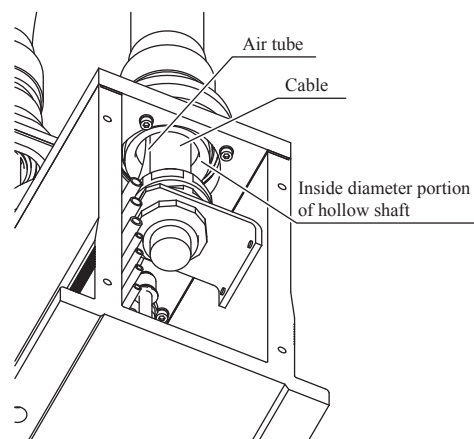
8

**Reconnect the harness.**

Put a new seal (7) and reconnect the harness with the seal washers (3) and bolts (6).

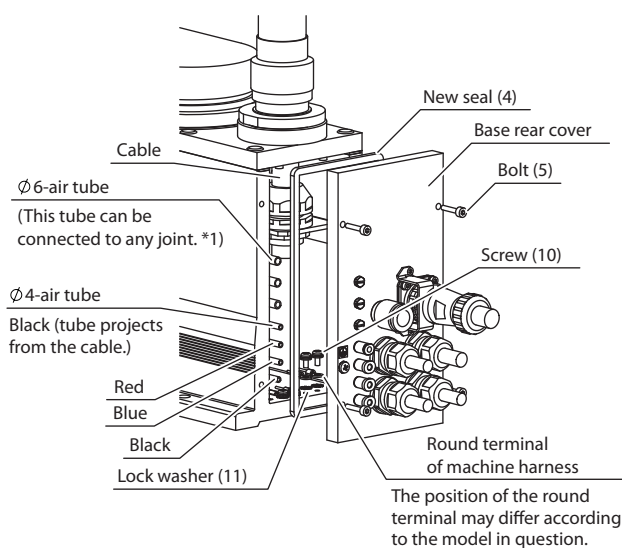
**Step 3**

**Applying the silicon grease**



**Step 4-5**

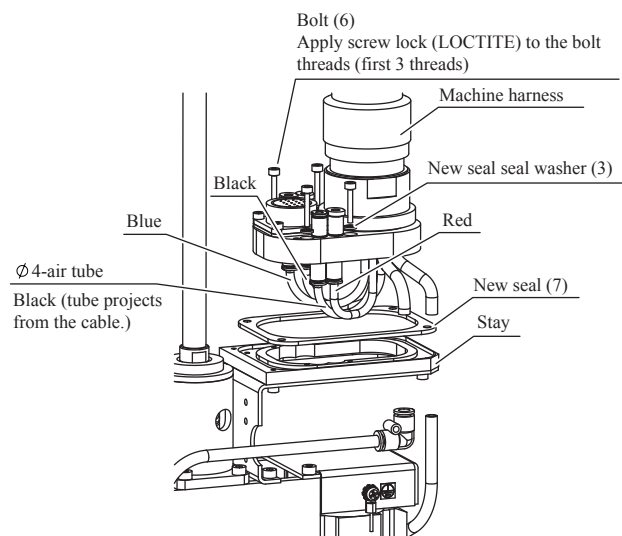
**Reattaching the base rear cover**



\*1 This air tube is the spare tube for the joint suction or air purging.

**Step 8**

**Reconnecting the machine harness**



9 **Reconnect the wiring connector and connector for the user wiring (black/15 pins).**

10 **Reconnect the  $\phi 6$ -air tube.**  
Cut the air tube to an appropriate length so that it is not broken, and then reconnect it to the joint. (This air tube can be connected to any joint.)

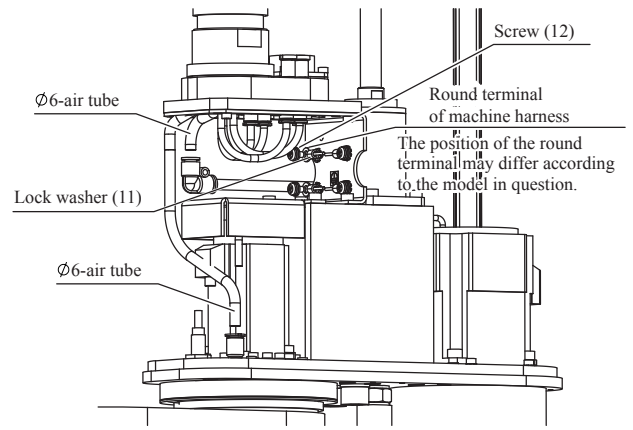
11 **Reconnect the round terminal.**

12 **Apply the silicon grease.**  
To prevent rubbing, apply the silicon grease to the inside diameter portion of the hollow shaft, and the wire and air tube. (See the Fig. on the right.)  
Silicon grease:  
G-501 (Shin-Etsu Chemical), 1.5g

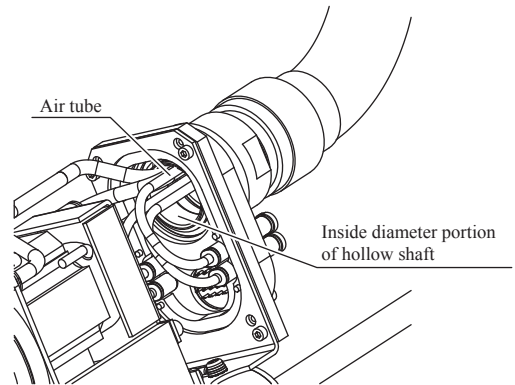
13 **Reconnect the wires.**  
Reconnect the wires as shown in the Photo on the right.  
Reconnect the wires so that any wire does not project from the Y-axis arm before reattaching the Y-axis arm cover.

14 **Reattach the Y-axis arm cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.

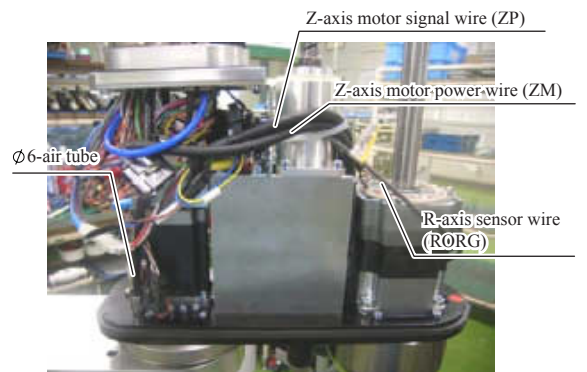
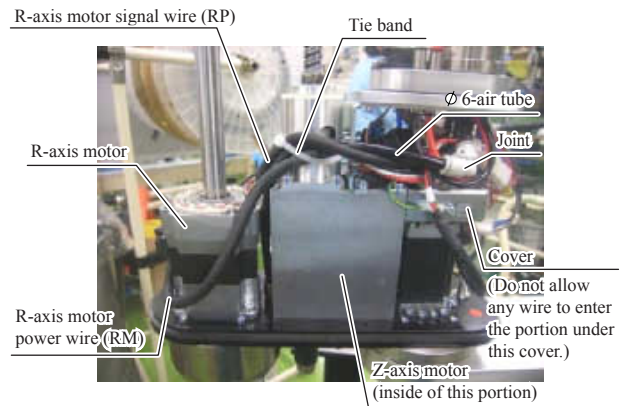
▶ Step 9-11 **Reconnecting the  $\phi 6$ -air tube**



▶ Step 12 **Applying the silicon grease**



▶ Step 13 **Wiring**



## 1.2 R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000



### WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

The following shows the parts necessary for the replacement work.

### 1. Replacement parts

#### • R6YXGP500, R6YXGP600

|    | Part Name   | Part No.      | Part No. / Specs | Q'ty | Remarks     |
|----|-------------|---------------|------------------|------|-------------|
| 1  | Bolt        | 91312-04006   | M4×6             | 2    | Spare parts |
| 2  | Bolt        | 91312-04008   | M4×8             | 2    | Spare parts |
| 3  | Bolt        | 91312-04010   | M4×10            | 4    | Spare parts |
| 4  | Bolt        | 91380-03008   | M3×8 SUS         | 4    | Spare parts |
| 5  | Bolt        | 94380-04010   | M4×10 SUS        | 2    | Spare parts |
| 6  | Bolt        | 91380-04012   | M4×12 SUS        | 6    | Spare parts |
| 7  | Bolt        | 91380-04025   | M4×25 SUS        | 4    | Spare parts |
| 8  | Seal washer | 90990-28J160  |                  | 8    |             |
| 9  | Seal        | KDP-M1329-000 |                  | 1    |             |
| 10 | O-ring      | 90990-17J038  |                  | 1    |             |

#### • R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|    | Part Name   | Part No.      | Part No. / Specs | Q'ty | Remarks     |
|----|-------------|---------------|------------------|------|-------------|
| 1  | Bolt        | 91312-04006   | M4×6             | 2    | Spare parts |
| 2  | Bolt        | 91312-04008   | M4×8             | 2    | Spare parts |
| 3  | Bolt        | 91312-04010   | M4×10            | 4    | Spare parts |
| 3  | Bolt        | 91312-05014   | M5×14            | 2    | Spare parts |
| 4  | Bolt        | 91380-03008   | M3×8 SUS         | 4    | Spare parts |
| 6  | Bolt        | 91380-04014   | M4×14 SUS        | 6    | Spare parts |
| 7  | Bolt        | 91380-04025   | M4×25 SUS        | 4    | Spare parts |
| 8  | Seal washer | 90990-28J160  |                  | 6    |             |
| 9  | Seal        | KDP-M1329-000 |                  | 1    |             |
| 10 | O-ring      | 90990-17J038  |                  | 1    |             |

## 2. Other tools

| Name                       | Part No.    | Manufacturer       | Remarks                     |
|----------------------------|-------------|--------------------|-----------------------------|
| Cloth rag                  |             |                    |                             |
| Hex wrench set             |             |                    |                             |
| Tie band                   |             |                    |                             |
| Phillips screwdriver       |             |                    |                             |
| Pliers                     |             |                    |                             |
| Torque wrench              |             |                    |                             |
| Screw thread locking agent | Loctite 241 | Henkel             | Medium-strength type (blue) |
| Silicon grease             | G-501       | Shin-Etsu Chemical | 3.0g                        |

### ■ Removal

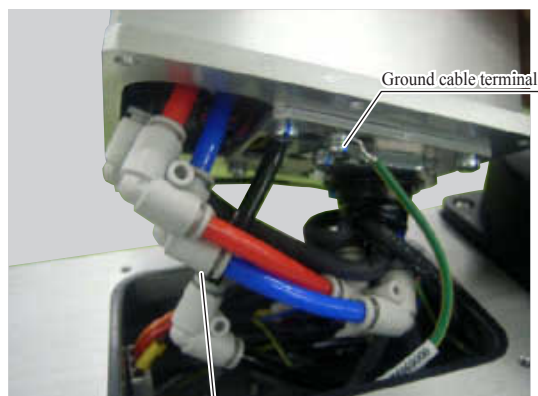
Follow the steps below to disconnect the machine harness.

- 1 **Turn off the controller power.**
- 2 **Place a sign indicating the robot is being adjusted.**
- 3 **Enter the safety enclosure.**
- 4 **Remove the cover.**  
Remove the bolts, then detach the cover.
- 5 **Disconnect the Y-axis speed reduction unit air purge tube, and the ground cable terminal.**

#### ▶ Step 4 Removing the cover



#### ▶ Step 5 Disconnecting the Y-axis speed reduction unit air purge tube, and the ground cable terminal



Disconnect the Y-axis speed reduction unit air purge tube here.

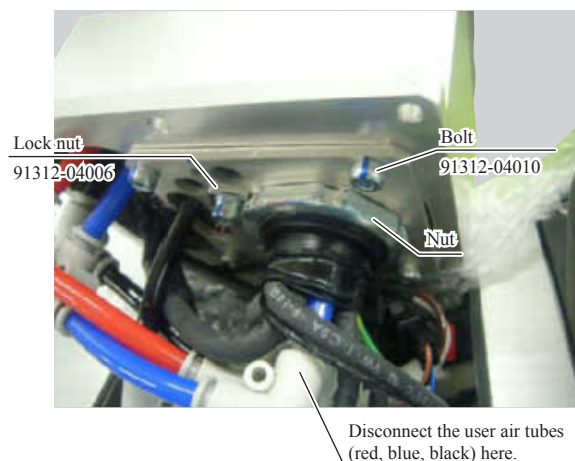


- 6 **Disconnect the ground cable located inside the Y-arm.**
- 7 **Disconnect the user air tubes (red, blue, black).**
- 8 **Remove the plate.**  
Remove the bolts, then remove the plate which secures the machine harness.
- 9 **Remove the lock nut.**  
Remove the lock nut (prevents the nut from loosening) at the nut which secures the machine harness to the plate.
- 10 **Remove the cap-cone lock washer.**
- 11 **Remove the plate.**  
With the cap-cone in a secured condition, turn the nut on the back face to remove the plate.
- 12 **Remove the 6 joints from the machine harness block, and disconnect the user I/O connector.**

▶ Step 6 **Disconnecting the ground cable**



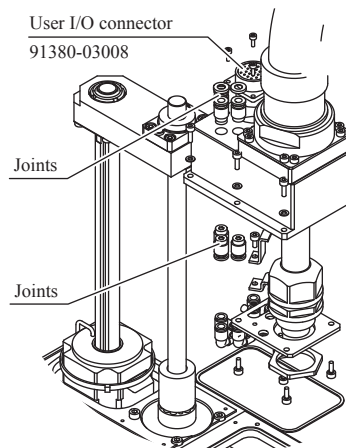
▶ Step 7-9 **Disconnecting the user air tubes**



▶ Step 10-11 **Disconnecting the air tubes and round terminals**



▶ Step 12 **Removing the joints and disconnecting the user I/O connector**



13

**Remove the cover.**

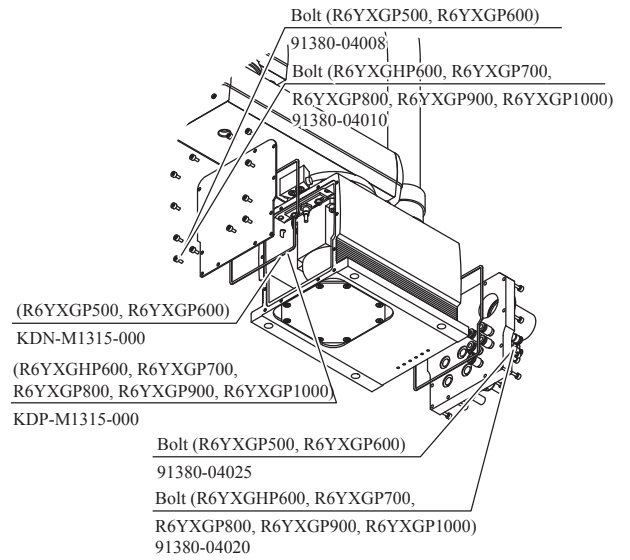
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.

14

**Disconnect the user air tubes, the ground cable terminal, and the connectors.**

▶ **Step 13**

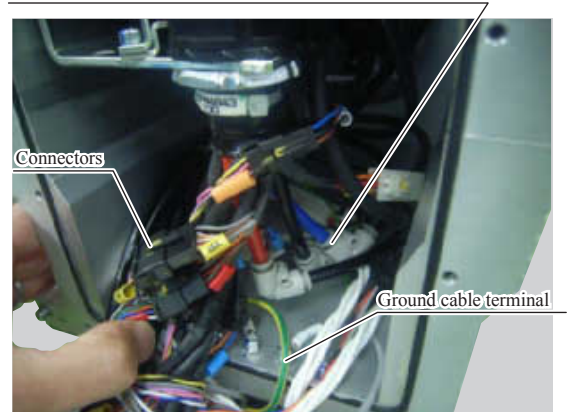
**Removing the cover**



▶ **Step 14**

**Disconnecting the user air tubes, the ground cable terminal, and the connectors**

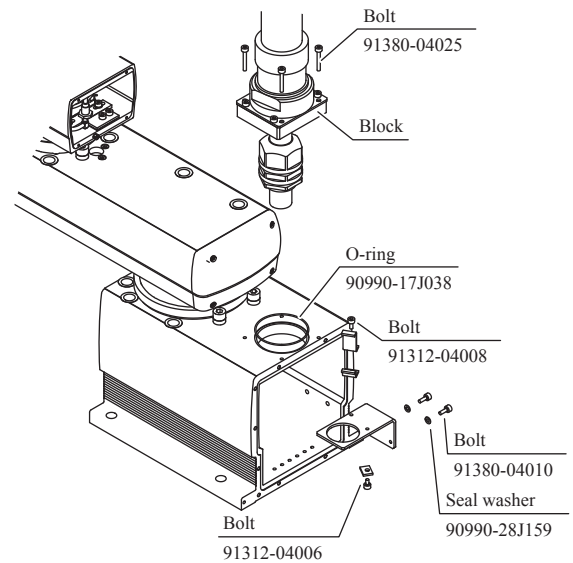
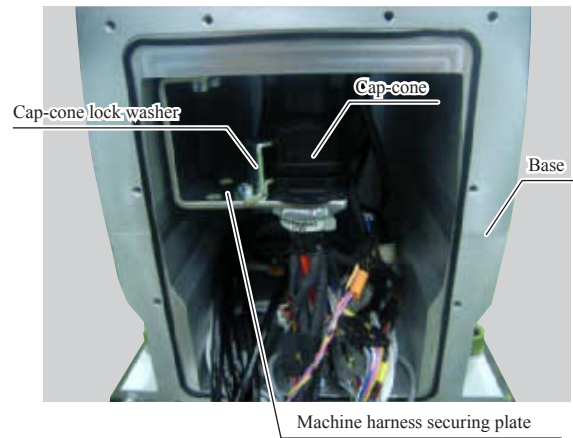
Disconnect the user air tubes (red, blue, black) here.  
Match the tube colors to the joint colors on the base side.



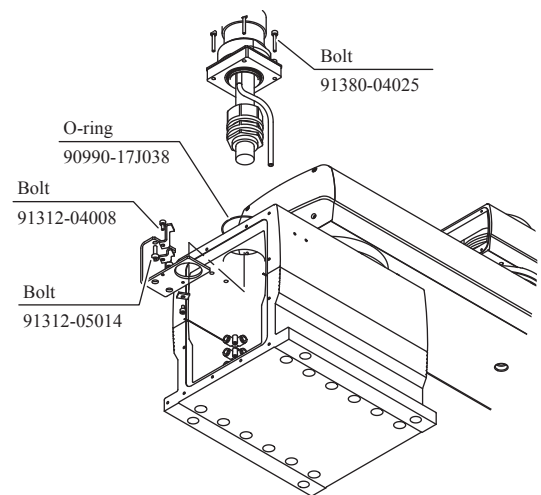
**Remove the machine harness.**

1. Remove the machine harness securing plate from the base.
2. Remove the cap-cone from the securing plate (also remove the cap-cone lock washer).
3. Remove the machine harness block which is secured to the base.
4. Remove the machine harness in the upward direction.

▶ **Step 15 Removing the machine harness**



R6YXGP500, R6YXGP600



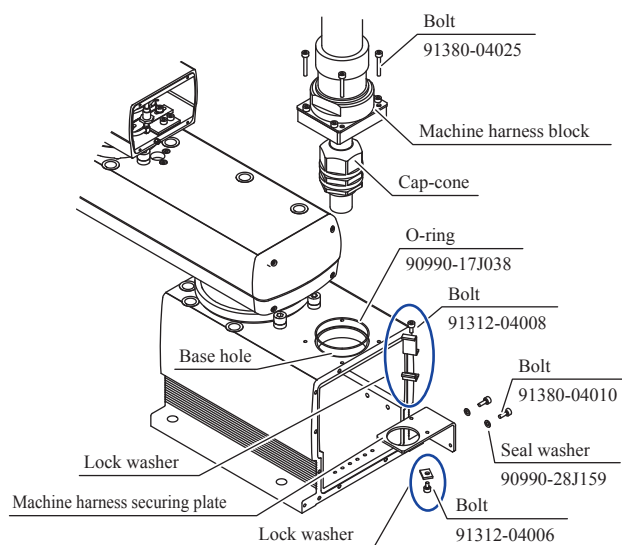
R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

■ Assembly

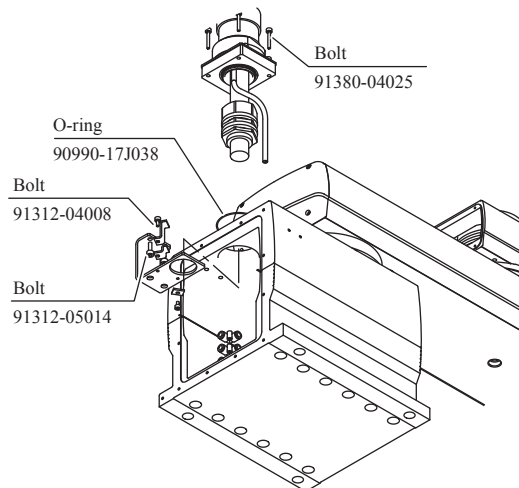
Assemble a new machine harness in the reverse order of removal.

- 1 **Pass the cap-cone through the base hole.**  
Set the O-ring at stepped part of the base, then pass the machine harness cap-cone through the base hole.
- 2 **Secure the machine harness block to the base.**
- 3 **Tighten the machine harness cap-cone to secure it to the securing plate.**  
The harness cap-cone is adequately tightened if it prevents slippage when the machine harness cable is pulled or twisted 90-degrees.
- 4 **Connect the user I/O connectors and install the joints.**  
Connect the user I/O connectors and install the joints which were earlier disconnected/removed from the machine harness block. Replace the joints with new ones (TSH6-01).

▶ Step 1-3 **Connecting the machine harness**

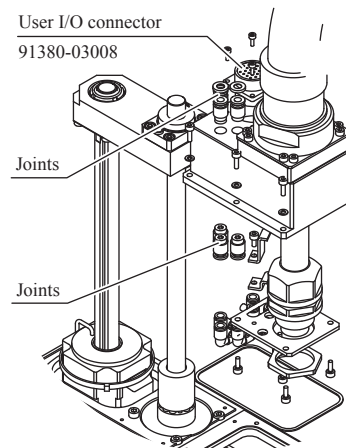


R6YXGP500, R6YXGP600



R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

▶ Step 4 **Connecting the user I/O connectors, and installing the joints**



### 5 **Install the cap-cone and the cap-cone lock washer.**

In the same manner as at the base side, install the machine harness cap-cone on the securing plate, together with its lock washer.

The securing plate and the lock washer which were earlier removed from the machine harness are to be used.

### 6 **Route the air tube.**

After installing the cap-cone, route the air tube (1 tube) through the plate's slot.

### 7 **Apply silicone grease.**

To prevent rubbing damage, apply silicone grease to the inside of the hollow shaft, to the cable, and to the air tube (see the figure at right).

Silicone grease: G-501 (Shin-Etsu Chemical Co., Ltd.) 1.5g

### 8 **Secure the plate to the block.**

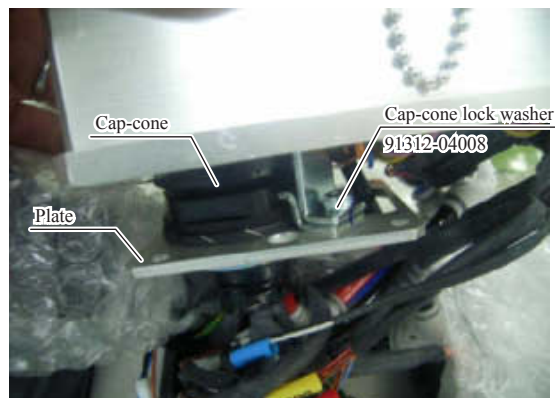
After installing the plate, secure to the block with M4 screws.

### 9 **Connect the user air tubes.**

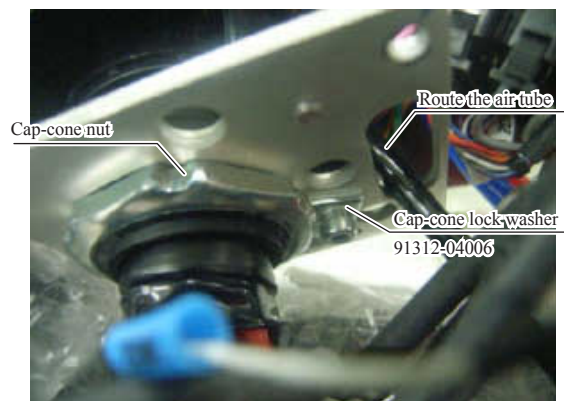
The user air tubes (red, blue, black) pass through the compound cable. Cut these tubes approximately 30mm from the end of the outlet tape. Connect the same air tubes which were earlier disconnected.

Install the air joints at the inner side of the opposite-side block.

#### Step 5 **Installing the cap-cone and the cap-cone lock washer**

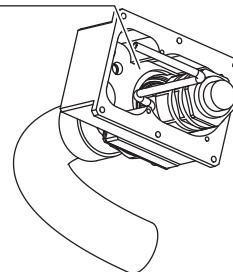


#### Step 6 **Routing the air tube**

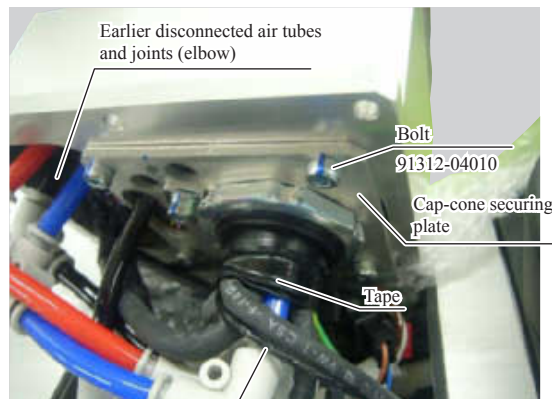


#### Step 7 **Applying silicone grease**

Apply silicone grease to the inside of the flexible duct.



#### Step 8 **Securing the plate**



Connect the user tubes (red, blue, black) after cutting them approximately 30mm from the end of the outlet tape.

10 *Replace the seal with a new one.*

11 *Install the joints (elbow).*

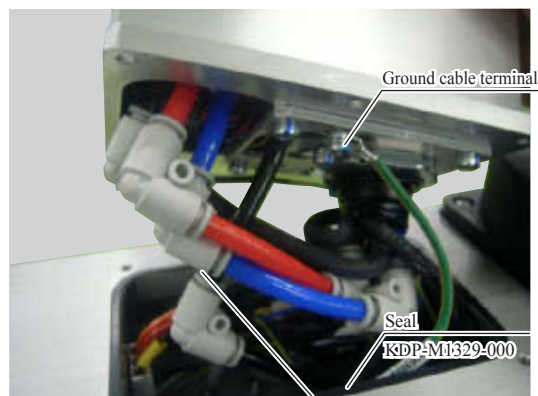
The Y-axis speed reduction unit air purge tube passes through the plate's slot. Cut this tube approximately 70mm from the plate, and connect the Y-arm's inner joint (elbow).

12 *Connect the Y-arm's inner ground cable terminal to the plate.*

13 *Connect the ground cable to the Y-arm's inner tap.*

14 *Use the M4 bolts to connect the block to the Y-arm.*

▶ **Step 10-12** **Installing the joints and connecting the ground cable terminal**



Cut the Y-axis speed reduction unit air purge tube approximately 70mm from the plate, and connect the Y-arm's inner joint (elbow).

▶ **Step 13** **Connecting the ground cable**



▶ **Step 14** **Securing to the Y-arm**



15 **Secure the machine harness securing plate to the base.**

16 **Apply silicone grease.**  
To prevent rubbing damage, apply silicone grease to the inside of the hollow shaft, to the cable, and to the air tube (see the figure at right).

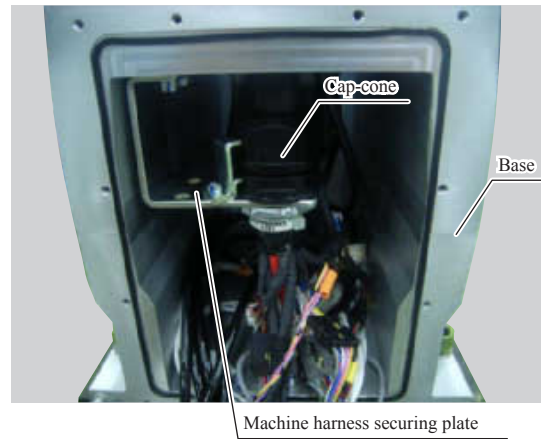
Silicone grease: G-501 (Shin-Etsu Chemical Co., Ltd.) 1.5g

17 **Connect the connectors and tubing.**  
Secure the ground cable terminal to the tap inside the base, then connect the connectors and tubing.

18 **Replace the seal with a new one.**

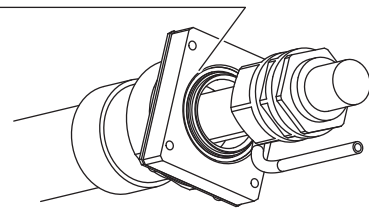
19 **Attach the cover.**

▶ **Step 15 Securing the machine harness securing plate**



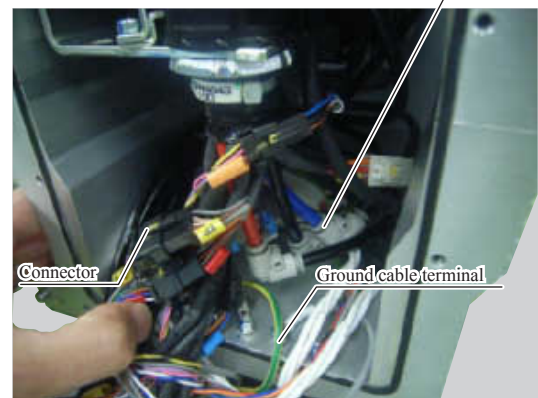
▶ **Step 16 Applying silicone grease**

Apply silicone grease to the inside of the flexible duct from the inner side of the base.

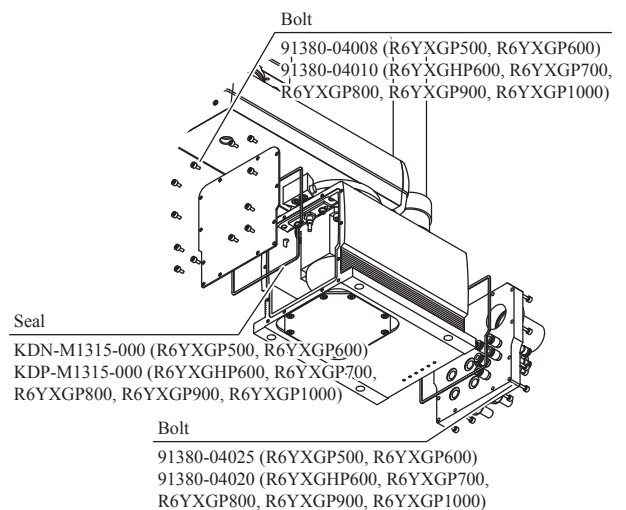


▶ **Step 17 Connecting the connectors and tubing**

Cut the user tubes (red, blue, black) to approximately 50mm, then connect to the base-side joints.



▶ **Step 18-19 Replacing the seal & attaching the cover**



## 2. Y-axis arm side I/O connector replacement

### 1. Replacement parts

|   | Part Name                    | Part No.      | Part No. / Specs         | Q'ty | Remarks     |
|---|------------------------------|---------------|--------------------------|------|-------------|
| 1 | I/O connector                | KDM-M4873-000 |                          | 1    | Spare parts |
| 2 | I/O connector securing bolts | 91380-03010   | M3, length: 10 stainless | 4    | Spare parts |

### 2. Other tools

| Name                       | Part No.    | Manufacturer | Remarks                     |
|----------------------------|-------------|--------------|-----------------------------|
| Hex wrench set             |             |              |                             |
| Screw thread locking agent | Loctite 241 | Henkel       | Medium-strength type (blue) |

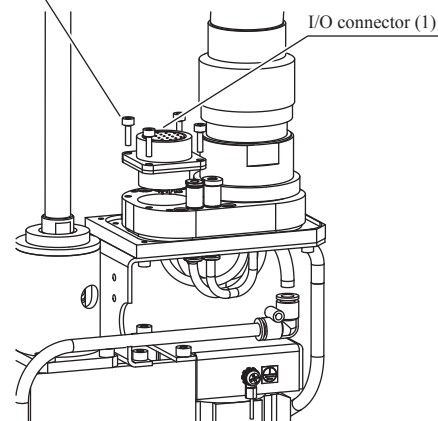
#### ■ Removal

Follow the steps below to disconnect the machine harness.

- 1 **Turn off the controller power.**
- 2 **Place a sign indicating the robot is being adjusted.**
- 3 **Enter the safety enclosure.**
- 4 **Using the machine harness replacement procedure, disassemble to the point where the Y-axis arm cover is removed.**
- 5 **Disconnect the machine harness's Y-axis arm side I/O connector.**
- 6 **Remove the bolt, then disconnect the I/O connector.**

#### ► Step 5 Removing the Y-axis arm side I/O connector

Bolt (2)  
Apply \*screw lock (LOCTITE) to the bolt threads (first 3 threads)



#### ■ Assembly

Install the new I/O connector and reassemble by reversing the disassembly procedure.



## 3. Base side I/O connector replacement

### 1. Replacement parts

|   | Part Name                    | Part No.      | Part No. / Specs         | Q'ty | Remarks     |
|---|------------------------------|---------------|--------------------------|------|-------------|
| 1 | I/O connector                | KDM-M4874-000 |                          | 1    |             |
| 2 | I/O connector securing bolts | 91380-03012   | M3, length: 12 stainless | 4    | Spare parts |
| 3 | Bracket securing bolts       | 91380-03006   | M3, length: 6 stainless  | 2    | Spare parts |
| 4 | Seal washer                  | 90990-36J008  | For M3 stainless         | 4    | Spare parts |

### 2. Other tools

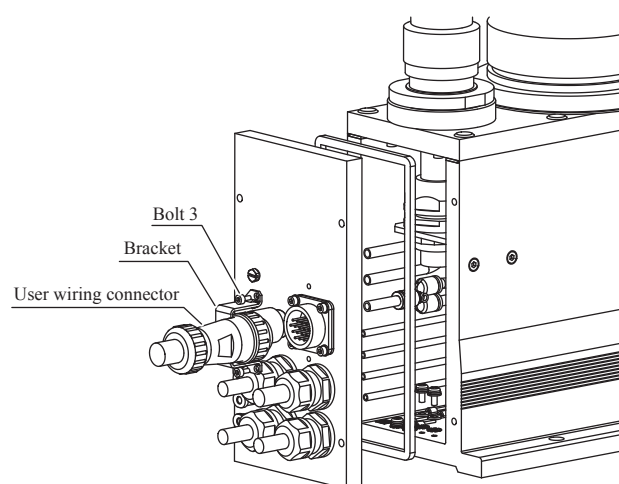
| Name                       | Part No.    | Manufacturer | Remarks                     |
|----------------------------|-------------|--------------|-----------------------------|
| Hex wrench set             |             |              |                             |
| Screw thread locking agent | Loctite 241 | Henkel       | Medium-strength type (blue) |

### ■ Removal

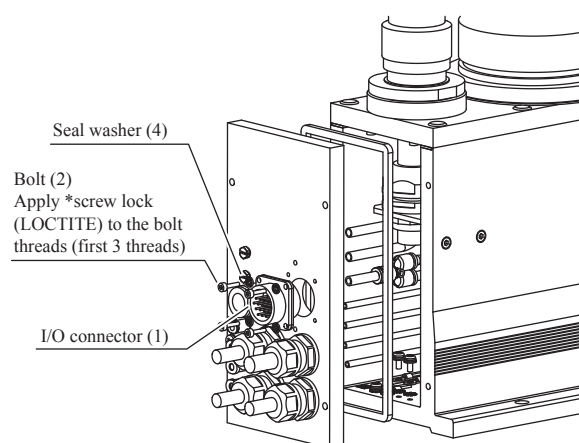
Follow the steps below to disconnect the machine harness.

- 1 **Turn off the controller power.**
- 2 **Place a sign indicating the robot is being adjusted.**
- 3 **Enter the safety enclosure.**
- 4 **Using the machine harness replacement procedure, disassemble to the point where the base rear cover is removed.**
- 5 **Remove the bracket, then disconnect the user wiring connector.**
- 6 **Disconnect the machine harness's base side I/O connector.**

#### ▶ Step 5 Disconnecting the user wiring connector



#### ▶ Step 6 Disconnecting the base side I/O connector



### ■ Assembly

Install the new I/O connector and reassemble by reversing the disassembly procedure.



# Chapter 7 Replacing the bellows

## Contents

- |                                |     |
|--------------------------------|-----|
| 1. Replacing the upper bellows | 7-1 |
| 2. Replacing the lower bellows | 7-3 |



# 1. Replacing the upper bellows

The following shows the replacement parts.

## 1. Replacement parts

|   | Part name | Part No.      | Q'ty | Remarks     |
|---|-----------|---------------|------|-------------|
| 1 | O-ring    | 90200-01J350  | 2    |             |
| 2 | Bellows   | KDM-M1899-000 | 1    |             |
| 3 | Rubber    | KDM-M189J-000 | 2    |             |
| 4 | Clamp     | KDM-M1890-000 | 2    | Spare parts |

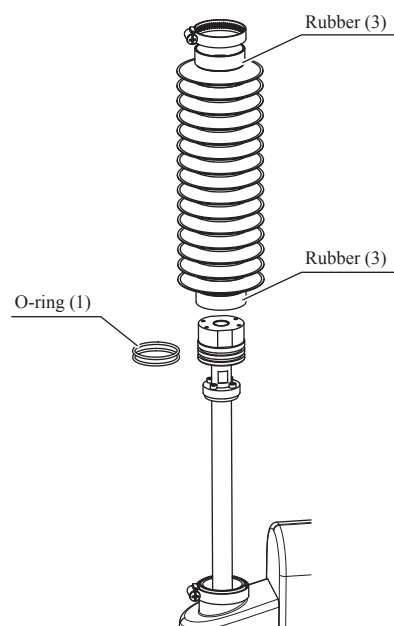
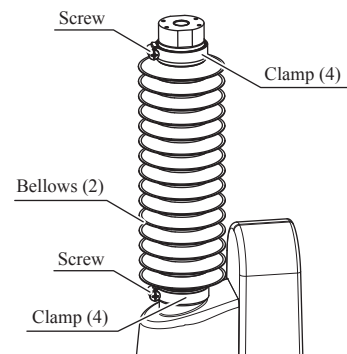
## 2. Other tools

| Name                 | Part No. | Manufacturer | Remarks |
|----------------------|----------|--------------|---------|
| Phillips screwdriver |          |              |         |
| Calipers, etc.       |          |              |         |

- 1 **Turn on the controller.**  
Check that no one is inside the safety enclosure, and then turn on the controller.
- 2 **Press the emergency stop button.**  
Press the emergency stop button on the PB to put the robot in the emergency stop status.
- 3 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 4 **Enter the safety enclosure while holding the PB.**
- 5 **Disconnect the user wiring and tubing from the spline.**  
Disconnect all of the user wiring and tubing that have passed through the spline from the spline.
- 6 **Loosen the screw of the clamp.**
- 7 **Remove the bellows and remove the O-ring.**

▶ Step 7

### Removing the bellows and O-ring



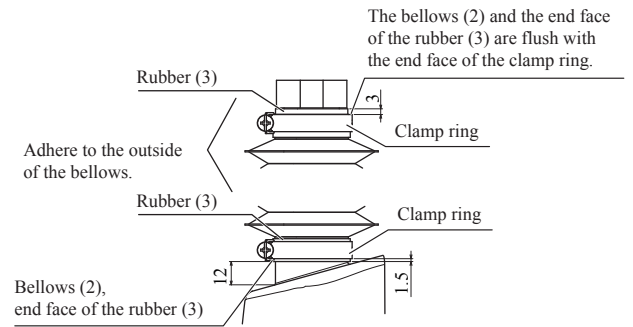
### Install new bellows (2), O-ring (1), and rubber (3).

Reassemble the parts in the reverse order of removal. If the O-ring is not replaced with a new one, the dust/drip proof performance or the degree of cleanliness may lower.

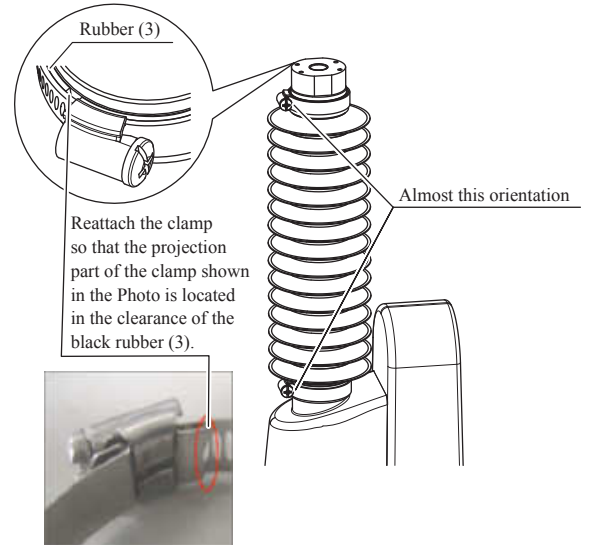
In particular, carefully check the rubber (3) mounting position and bellows clamp position while referring to the Fig. on the right.

#### Step 8

#### Rubber mounting and bellows clamp positions



Install the bellows, clamp, and rubber at the positions shown in the Fig. above. (Tolerance:  $\pm 0.5\text{mm}$ )



## 2. Replacing the lower bellows

The following shows the replacement parts.

### 1. Replacement parts

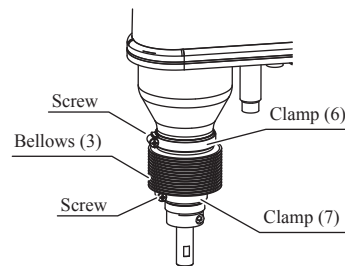
|   | Part name | Part No.      | Q'ty | Remarks     |
|---|-----------|---------------|------|-------------|
| 1 | O-ring    | 90200-01J500  | 2    |             |
| 2 | O-ring    | 90200-01J350  | 2    |             |
| 3 | Bellows   | KDM-M1897-000 | 1    |             |
| 4 | Rubber    | KDM-M1898-000 | 1    | Spare parts |
| 5 | Rubber    | KDM-M189J-000 | 1    |             |
| 6 | Clamp     | KDM-M189A-000 | 1    | Spare parts |
| 7 | Clamp     | KDM-M1890-000 | 1    | Spare parts |

### 2. Other tools

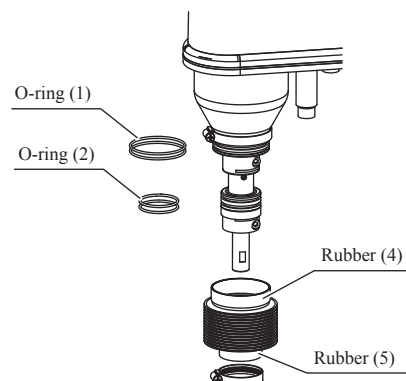
| Name                 | Part No. | Manufacturer | Remarks |
|----------------------|----------|--------------|---------|
| Phillips screwdriver |          |              |         |
| Calipers, etc.       |          |              |         |

- 1 **Turn on the controller.**  
Check that no one is inside the safety enclosure, and then turn on the controller.
- 2 **Press the emergency stop button.**  
Press the emergency stop button on the PB to put the robot in the emergency stop status.
- 3 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 4 **Enter the safety enclosure while holding the PB.**
- 5 **Disconnect the user wiring and tubing from the spline.**  
Disconnect all of the user wiring and tubing that have passed through the spline from the spline.
- 6 **Loosen the screw of the clamp.**
- 7 **Remove the bellows and remove the O-ring.**

#### ▶ Step 6 Loosening the screw of the clamp



#### ▶ Step 7 Removing the bellows and O-rings



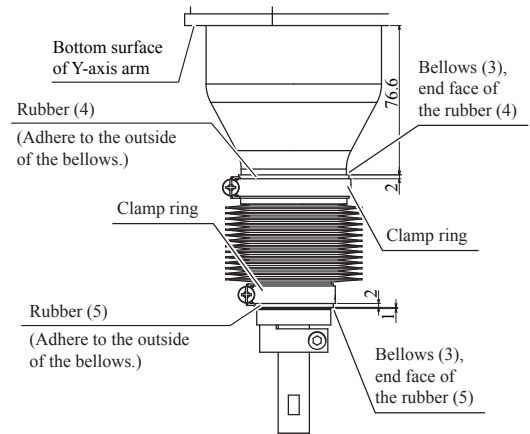
### ***Install new bellows (3), O-rings (1) and (2), and rubbers (4) and (5).***

Reassemble the parts in the reverse order of removal. If the O-ring is not replaced with a new one, the dust/drip proof performance or the degree of cleanliness may lower.

In particular, carefully check the rubbers (4) and (5) mounting positions and bellows clamp position while referring to the Fig. on the right.

#### ▶ Step 8

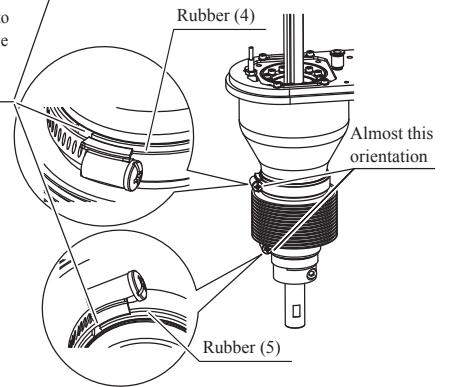
#### Rubber mounting and bellows clamp positions



Install the bellows, clamp, and rubbers at the positions shown in the Fig. above.  
(Tolerance:  $\pm 0.5\text{mm}$ )



Reattach the clamp so that the projection part of the clamp shown in the Photo is located in the clearance between the black rubbers (4) and (5).





# Chapter 8

# Replacing the Z-axis ASSY

## Contents

|   |            |
|---|------------|
| <b>1. Replacing the Z-axis ASSY</b>   | <b>8-1</b> |
| 1.1 R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600     | 8-1        |
| 1.2 R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000 | 8-5        |



# 1. Replacing the Z-axis ASSY

To replace the Z-axis ball screw and Z-axis motor, follow the steps below to replace the Z-axis ASSY.



## CAUTION

- If the bolt tightening torque is not instructed, see the tightening torque stated in "2. Replacing the harmonic drive" in Chapter 5.
- Replacing the Z-axis causes a positional deviation. Therefore, following a Z-axis replacement, an absolute reset must be performed, and the point data must be re-specified.

## 1.1 R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600



## WARNING

BEFORE STARTING THE REPLACEMENT WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

### 1. Replacement parts

|   | Part name                        | OMRON Part No. | Part No. / Specs | Q'ty | Remarks     |
|---|----------------------------------|----------------|------------------|------|-------------|
| 1 | Motor                            | KCY-M4882-000  |                  | 1    | Assembly    |
|   | Motor securing bolt              | 91312-04012    | M4, length: 12   | 2    |             |
|   | Coupling                         | KCY-M1753-000  |                  | 1    |             |
|   | Ball screw                       | KCY-M1750-000  |                  | 1    |             |
|   | Bearing outer ring holder plate  | KCY-M1744-000  |                  | 1    |             |
|   | Ball screw support bearing       | KA1-M2273-000  |                  | 1    |             |
|   | Lower end damper                 | KCY-M1788-000  |                  | 1    |             |
|   | Bolt for outer ring holder plate | 90112-2AJ010   |                  | 8    |             |
|   | Bearing inner ring holder plate  | KCY-M1778-000  |                  | 1    |             |
|   | Bearing housing                  | KCY-M1712-000  |                  | 1    |             |
| 2 | Ball screw securing bolt         | 91312-03014    | M3, length: 14   | 4    | Spare parts |
| 3 | Z-axis assembly securing bolt    | 91312-04014    | M4, length: 14   | 4    | Spare parts |
| 4 | Screw for round terminal         | 97602-04308    | M4, length: 8    | 1    | Spare parts |
| 5 | Lock washer for round terminal   | 90172-00J040   | For M4           | 1    | Spare parts |

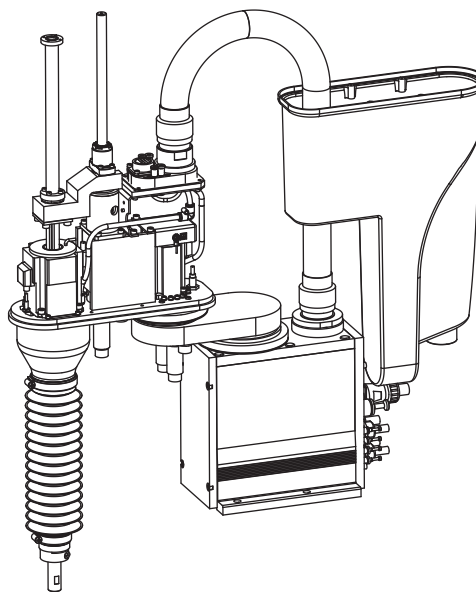
### 2. Other tools

| Name                       | Part No.    | Manufacturer | Remarks                  |
|----------------------------|-------------|--------------|--------------------------|
| Cleaning wipe              |             |              |                          |
| Hex wrench set             |             |              |                          |
| Tie band                   |             |              |                          |
| Phillips screwdriver       |             |              |                          |
| Torque wrench              |             |              |                          |
| Screw thread locking agent | Loctite 262 | Henkel       | High strength type (red) |

Follow the steps below to perform the replacement work.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the Y-axis arm cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.

**Step 4 Removing the Y-axis arm cover**



- 5 **Put on the Z-axis brake and turn off the controller power.**
  1. Press the emergency stop button on the PB and turn on the controller power.
  2. Put the Z-axis in the servo free status and move the Z-axis to its upper end.
  3. Put on the Z-axis brake and turn off the controller power.



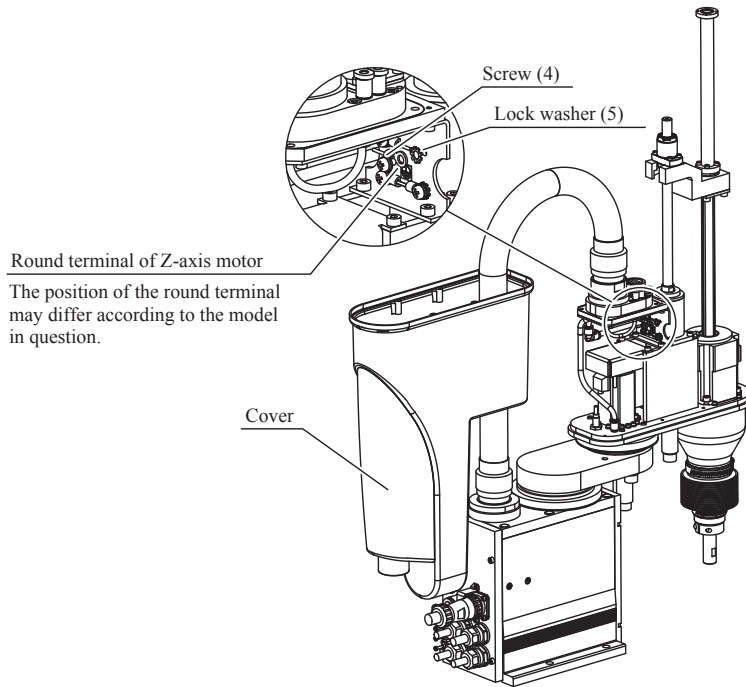
**NOTE**

For details about servo free status and emergency stop, see the OMRON robot controller user's manual.

- 6 **Cut the tie-band.**  
Cut the tie-band as described in Chapter 6 "1. Replacing the machine harness".

- 7 **Disconnect the round terminal of the Z-axis motor and the Z-axis motor connectors ZM, ZP, and ZBK.**

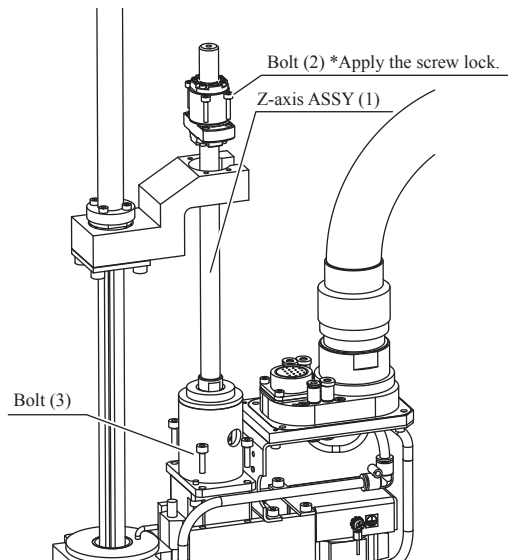
**Step 7 Disconnecting the round terminal and motor connectors**



- 8 **Remove the Z-axis ASSY.**  
Remove the bolts and remove the Z-axis ASSY.

- 9 **Replace with a new Z-axis assembly (with Z-axis machine reference adjusted).**

**Step 9 Replacement and reassembly**



- 10 ***Secure the Y-axis arm side wiring with a tie band, then connect the connector and install the round terminal as described in machine harness replacement procedure.***



**NOTE**

---

Refer to Chapter 8 "1.3 Robot inner wiring diagram" of the installation manual for XG series standard models..

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- 11 ***Move to a position outside the safety fence, then turn the controller power ON. Establish an emergency stop status, then enter the safety fence area with the PB in hand.***

After verifying that the Z-axis is prevented from falling, release the Z-axis brake.



**NOTE**

---

For the brake release procedure, refer to the "OMRON Robot Controller User's Manual".

---

While raising and lowering the Z-axis, tighten bolt (2).

Apply grease to the ball screw in accordance with the instructions given in the Periodic Inspections section.

- 12 ***Reattach the cover.***

Move down the Z-axis to its lower end, turn off the controller power, and reattach the cover.

Reattach the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.

- 13 ***Go out of the safety enclosure.***

## 1.2 R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000



### WARNING

BEFORE STARTING THE REPLACEMENT WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

### 1. Replacement parts

#### • R6YXGP500, R6YXGP600

|   | Part Name  | OMRON Part No. | Part No. / Specs    | Q'ty | Remarks          |
|---|--|----------------|---------------------|------|------------------|
| 1 | Motor  | KBF-M4882-002  |                     | 1    |                  |
| 2 | Ball screw   | KBP-M1750-001  | Z-axis stroke 200mm | 1    | Assembly         |
|   |  | KBP-M1750-101  | Z-axis stroke 300mm | 1    |                  |
|   | Nylon nut  | KBP-M1778-001  |                     | 1    |                  |
|   | Motor and ball screw shaft coupling flange               | KBP-M1753-003  |                     | 1    |                  |
|   | Lower end damper   | KBP-M1788-001  |                     | 1    |                  |
| 3 | Ball screw nut securing bolt                             | 91312-05014    | M5, length: 14      | 4    | Must be replaced |
| 4 | Motor and ball screw shaft coupling flange securing bolt | 91312-03020    | M3, length: 20      | 10   | Must be replaced |
| 5 | Motor securing bolt                                      | 91312-05012    | M5, length: 12      | 2    | Must be replaced |
| 6 | Motor securing bolt                                      | 91312-05016    | M5, length: 16      | 2    | Must be replaced |
| 7 | Screw for round terminal                                 | 97602-04308    | M4, length: 8       | 1    | Spare parts      |
| 8 | Lock washer for round terminal                           | 90172-00J040   | For M4              | 1    | Spare parts      |

#### • R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|   | Part Name  | OMRON Part No. | Part No. / Specs    | Q'ty | Remarks          |
|---|--|----------------|---------------------|------|------------------|
| 1 | Motor  | KBP-M4882-001  |                     | 1    |                  |
| 2 | Ball screw   | KBP-M1750-001  | Z-axis stroke 200mm | 1    | Assembly         |
|   |  | KBP-M1750-201  | Z-axis stroke 400mm | 1    |                  |
|   | Nylon nut  | KBP-M1778-001  |                     | 1    |                  |
|   | Motor and ball screw shaft coupling flange               | KBP-M1753-003  |                     | 1    |                  |
|   | Lower end damper   | KBP-M1788-001  |                     | 1    |                  |
| 3 | Ball screw nut securing bolt                             | 91312-05014    | M5, length: 14      | 4    | Must be replaced |
| 4 | Motor and ball screw shaft coupling flange securing bolt | 91312-03020    | M3, length: 20      | 10   | Must be replaced |
| 5 | Motor securing bolt                                      | 91312-05016    | M5, length: 16      | 2    | Must be replaced |
| 6 | Motor securing bolt                                      | 91312-05020    | M5, length: 20      | 2    | Must be replaced |
| 7 | Screw for round terminal                                 | 97602-04308    | M4, length: 8       | 1    | Spare parts      |
| 8 | Lock washer for round terminal                           | 90172-00J040   | For M4              | 1    | Spare parts      |

## 2. Other tools

| Name                       | Part No.    | Manufacturer | Remarks                  |
|----------------------------|-------------|--------------|--------------------------|
| Cleaning wipe              |             |              |                          |
| Hex wrench set             |             |              |                          |
| Tie band                   |             |              |                          |
| Phillips screwdriver       |             |              |                          |
| Torque wrench              |             |              |                          |
| Screw thread locking agent | Loctite 262 | Henkel       | High strength type (red) |

## 3. Seal

### • List of Y-axis arm cover seals

| No. | Part name   | Part number   | Q'ty | Remarks  |
|-----|-------------|---------------|------|--|
| 1   | Seal washer | 90990-28J159  | 14   | R6YXGP500 Z200, R6YXGP600 Z200                         |
| 2   | Seal washer | 90990-28J159  | 16   | R6YXGP500 Z300, R6YXGP600 Z300                         |
| 3   | Seal washer | 90990-28J159  | 18   | R6YXGHP600 Z200 to R6YXGP1000 Z200                     |
| 4   | Seal washer | 90990-28J159  | 22   | R6YXGHP600 Z400 to R6YXGP1000 Z400                     |
| 5   | Seal        | KAD-M22KB-100 |      | (690mm + 480mm)<br>R6YXGP500 Z200, R6YXGP600 Z200      |
| 6   | Seal        | KAD-M22KB-100 |      | (890mm + 480mm)<br>R6YXGP500 Z300, R6YXGP800 Z300      |
| 7   | Seal        | KAD-M22KB-100 |      | (750mm + 550mm)<br>R6YXGHP600 Z200 to R6YXGP1000 Z200  |
| 8   | Seal        | KAD-M22KB-100 |      | (1150mm + 550mm)<br>R6YXGHP600 Z400 to R6YXGP1000 Z400 |

### • Seals for Z-axis motor cover

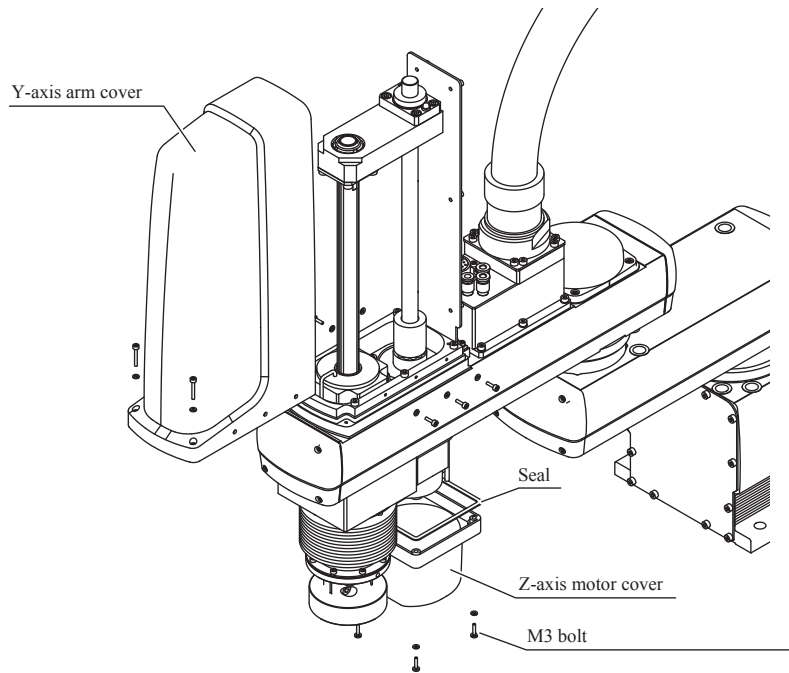
| No. | Part name   | Part number   | Q'ty | Remarks  |
|-----|-------------|---------------|------|--|
| 1   | Seal washer | 90990-28J159  | 4    |  |
| 2   | Seal        | KDN-M130E-000 | 1    | R6YXGP500 Z200, R6YXGP600 Z200                             |
| 3   | Seal        | KDP-M130E-000 | 1    | R6YXGHP600, R6YXGP700, R6YXGP800,<br>R6YXGP900, R6YXGP1000 |



Follow the steps below to perform the replacement work.

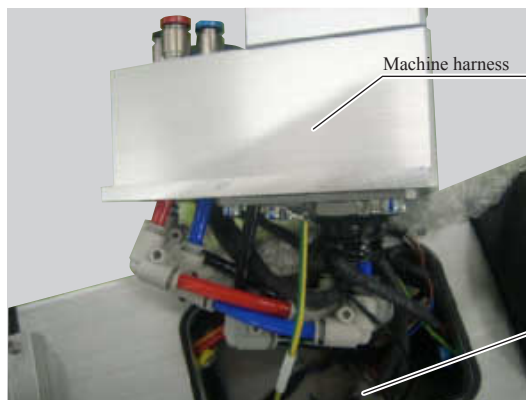
- 1 **Turn off the controller power.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the covers 1 and 2.**  
Remove the bolts, button bolts, and screws.

#### Step 4 Detaching the cover



- 5 **Remove the machine harness block from the Y-arm, then disconnect the round terminals and connectors.**

#### Step 5 Disconnecting the round terminals and connectors



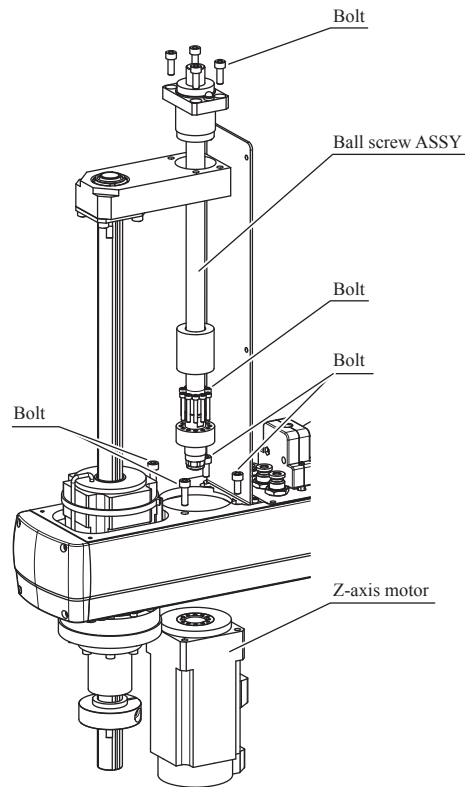
Round terminals (inside Y-arm)  
The position of the round terminal may differ according to the model in question.

6

**Remove the ball screw ASSY and Z-axis motor.**

Remove the bolts, and remove the ball screw ASSY and Z-axis motor.

**Step 6 Removing the ball screw ASSY and Z-axis motor**



7

**Replace with a new Z-axis assembly (with Z-axis machine reference adjusted).**

8

**Be sure to align the flange and motor shaft positioning marks when assembling them.**

9

**Reconnect the wiring at the Y-axis arm side.**

Restore the Y-axis arm's wiring tie band, the connector, and the round terminal as described in Chapter 6 "Replacing the machine harness".



**NOTE**

Refer to the installation manual, Chapter 8 "1.3 Robot inner wiring diagram".

10

**Move to a position outside the safety fence, then turn the controller power ON.**

11

**Establish an emergency stop status, then enter the safety fence area with the PB in hand.**

After verifying that the Z-axis is prevented from falling, release the Z-axis brake.

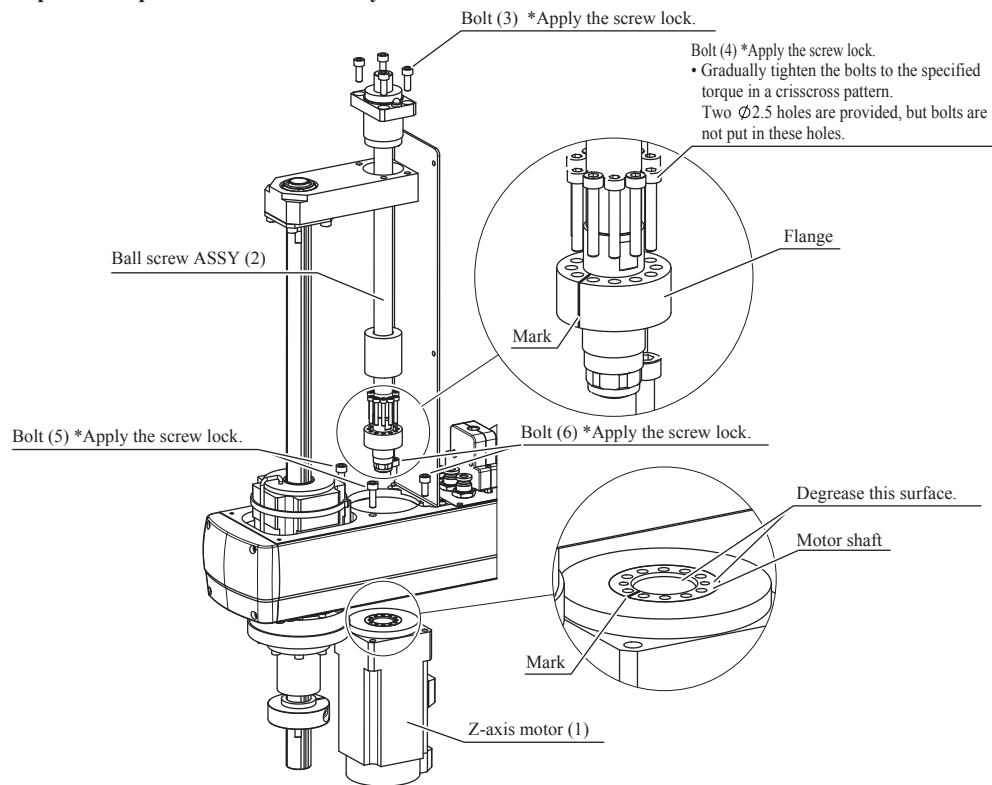


**NOTE**

For the brake release procedure, refer to the "OMRON Robot Controller User's Manual".

**While raising and lowering the Z-axis, tighten bolt (3).**

Apply grease to the ball screw in accordance with the instructions given in the Periodic Inspections section.

**Step 7-12 Replacement and assembly****13 Turn off the controller power.****14 Reattach the covers.**

Reattach the covers while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.



# Chapter 9

## Replacing the spline

### Contents

|   |            |
|---|------------|
| <b>1. Replacing the spline</b>  | <b>9-1</b> |
| 1.1 R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600     | 9-1        |
| 1.2 R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000 | 9-3        |



# 1. Replacing the spline

Replace the spline as shown in the Fig. below while referring to "Replacing the R-axis harmonic drive". Additionally, apply the grease to the ball spline while referring to "Periodic inspection".



## CAUTION

- If the bolt tightening torque is not instructed, see the tightening torque stated in "2. Replacing the harmonic drive" in Chapter 5.
- Replacing the spline causes a positional deviation. Therefore, following a spline replacement, an absolute reset must be performed, and the point data and reference coordinates must be re-specified.



## NOTE

- Refer to the Chapter 5 "2. Replacement procedure for harmonic drive [R-axis]".
- For details about how to apply the grease, see "2.1 Applying the grease to the spline shaft" in Chapter 3.

## 1.1 R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600

### 1. Replacement parts

|   | Part Name                            | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks  |
|---|--------------------------------------|----------------|---|------|--|
| 1 | Ball spline                          | KCY-M1840-001  |   | 1    |  |
| 2 | Stopper securing bolt                | 91312-05014    | M5, length: 14  | 2    | Replace with spare when missing (Standard type)          |
| 3 | Spline nut securing bolt             | 91312-04012    | M4, length: 12  | 4    | Spare parts  |
| 4 | Set screw                            | 92A08-05305    | M5, length: 5   | 1    | Replace with spare when missing (Tool flange mount type) |
| 5 | Spline nut upper O-ring (outer side) | 90990-17J032   | Cross section diameter: 1.00mm<br>Inner diameter: 46.00mm | 1    | Becomes worn and must be replaced                        |
| 6 | Spline nut upper O-ring (inner side) | KN5-M181H-000  | Cross section diameter: 0.80mm<br>Inner diameter: 33.70mm | 1    | Becomes worn and must be replaced                        |
| 7 | Spline nut securing bolt seal washer | 90990-36J002   | For M4  | 4    | Becomes worn and must be replaced                        |
| 8 | Damper                               | KN3-M1788-100  |   | 1    | Spare parts  |

### 2. Other tools

| Name                       | Part No.     | Manufacturer           | Remarks  |
|----------------------------|--------------|------------------------|--|
| Cleaning wipe              |              |                        |  |
| Hex wrench set             |              |                        |  |
| Tie band                   |              |                        |  |
| 15mm spanner               |              |                        |  |
| 24mm spanner               |              |                        |  |
| Calipers, etc.             |              |                        |  |
| Phillips screwdriver       |              |                        |  |
| Screw thread locking agent | Loctite 262  | Henkel                 | High strength type (red)   |
| Harmonic grease            | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |

\*1 : 4.2g

## ■ Removal

Follow the steps below to remove the R-axis parts.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Using the R-axis harmonic replacement procedure, disassemble to the point where the spline is removed.**
- 5 **Remove the bolts and set screws, then remove the damper and all the other parts beneath it from the spline.**

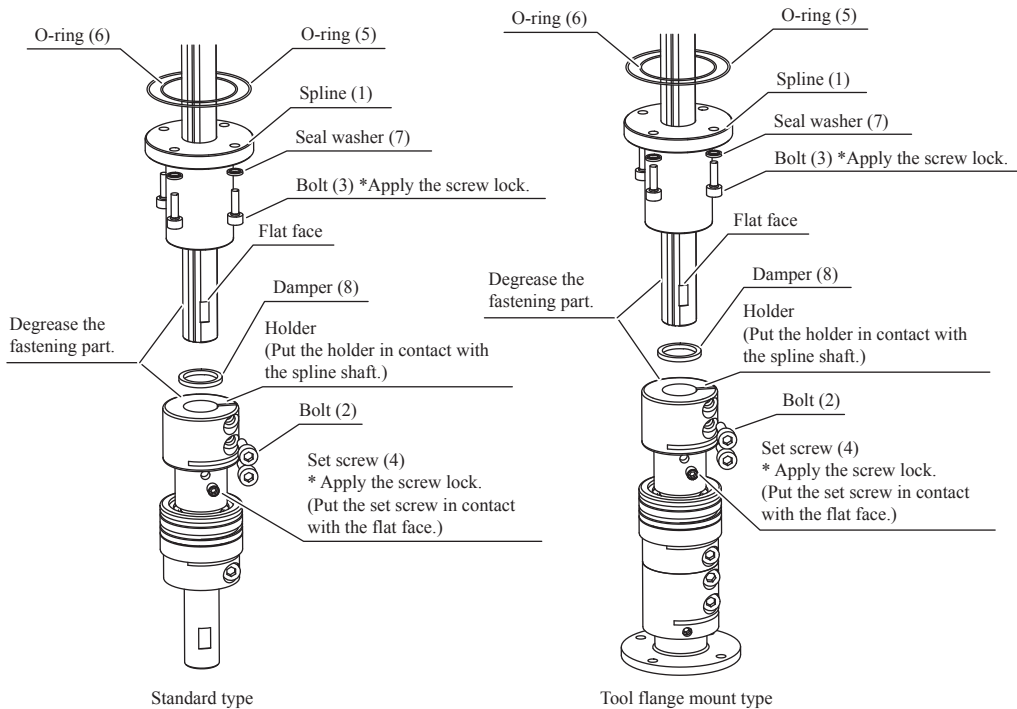
## ■ Replacement and reassembly

Follow the steps below to replace the spline with a new one and reassemble it.

- 1 **Install the damper and stopper (flange) on the spline.**  
Tighten the shaft securing bolts to the prescribed torque. Positional deviations may occur if not fully tightened.
- 2 **Disassemble to the point where the harmonic is removed from the Y-axis arm.**
  1. Disassemble to the point where the harmonic is removed from the Y-axis arm, even if the harmonic is not being replaced. (Do not remove the wave generator.)
  2. Wipe off the old grease from the harmonic, then apply new grease as described in Chapter 3 "2. Applying the grease".
- 3 **Reassemble by reversing the disassembly procedure.**  
Reassemble by reversing the disassembly procedure as described in Chapter 5 "2.1.3 Replacing the R-axis harmonic drive".

### Replacing the spline

\* Replace the maintenance parts R13 to R17 as a set.



\* Screw lock: Loctite 262 (Red) (Henkel Japan) Apply a small amount of the screw lock.



## 1.2 R6YXGP500, R6YXGP600, R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

### 1. Replacement parts

#### • R6YXGP500, R6YXGP600

|   | Part Name                                 | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks                           |
|---|---|----------------|---|------|-----------------------------------|
| 1 | Ball spline                               | KBF-M1840-002  | Z-axis stroke 200m  | 1    | Assembly                          |
|   |   | KBF-M1840-102  | Z-axis stroke 300m  | 1    |                                   |
|   | Ball spline nut upper collar              | KBF-M1871-000  |   | 1    |                                   |
|   | End face seal inside speed reduction unit | KBF-M1886-000  |   | 1    |                                   |
| 2 | Ball spline nut securing bolt             | 91312-04010    | M4, length: 10  | 6    | Must be replaced                  |
| 3 | Ball spline nut upper O-ring              | 90990-17J031   | Cross section diameter: 1.00mm<br>Inner diameter: 35.30mm | 1    | Becomes worn and must be replaced |
| 4 | Stopper securing bolt                     | 91312-06018    | M6, length: 18  | 1    | Spare parts                       |
| 5 | Warning label                             | 90K41-001520   |   | 1    |                                   |
| 6 | Damper                                    | KBF-M1789-001  |   | 1    | Spare parts                       |

#### • R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000

|   | Part Name                                 | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks                           |
|---|---|----------------|---|------|-----------------------------------|
| 1 | Ball spline                               | KBP-M1840-001  | Z-axis stroke 200m  | 1    | Assembly                          |
|   |   | KBP-M1840-101  | Z-axis stroke 400m  | 1    |                                   |
|   | Ball spline nut upper collar              | KBP-M1871-000  |   | 1    |                                   |
|   | End face seal inside speed reduction unit | KBP-M1886-000  | For M5  | 1    |                                   |
| 2 | Ball spline nut securing bolt             | 91312-05014    | M5, length: 14  | 6    | Must be replaced                  |
| 3 | Ball spline nut upper O-ring              | 90990-17J036   | Cross section diameter: 1.00mm<br>Inner diameter: 43.00mm | 1    | Becomes worn and must be replaced |
| 4 | Stopper securing bolt                     | 91312-06020    | M6, length: 20  | 1    | Spare parts                       |
| 5 | Warning label                             | 90K41-001520   |   | 1    |                                   |
| 6 | Damper                                    | KBP-M1789-000  |   | 1    | Spare parts                       |

## 2. Other tools

| Name                       | Part No.     | Manufacturer           | Remarks   |
|----------------------------|--------------|------------------------|---|
| Cleaning wipe              |              |                        |   |
| Hex wrench set             |              |                        |   |
| Tie band                   |              |                        |   |
| 19mm spanner               |              |                        | R6YXGP500, R6YXGP600  |
| Hook spanner               |              |                        | Fine U-nut outer diameter: $\varnothing$ 28mm<br>R6YXGP500, R6YXGP600                               |
| 24mm spanner               |              |                        | R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900,<br>R6YXGP1000  |
| 32mm spanner               |              |                        |   |
| Calipers, etc.             |              |                        |   |
| Phillips screwdriver       |              |                        |   |
| Torque wrench              |              |                        |   |
| Screw thread locking agent | Loctite 262  | Henkel                 | High strength type (red)  |
| Harmonic grease            | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago.<br>The grease has probably deteriorated. |

\*1: R6YXGP500, R6YXGP600:8g  
R6YXGHP600, R6YXGP700, R6YXGP800, R6YXGP900, R6YXGP1000:10g

## ■ Removal

Follow the steps below to remove the R-axis parts.

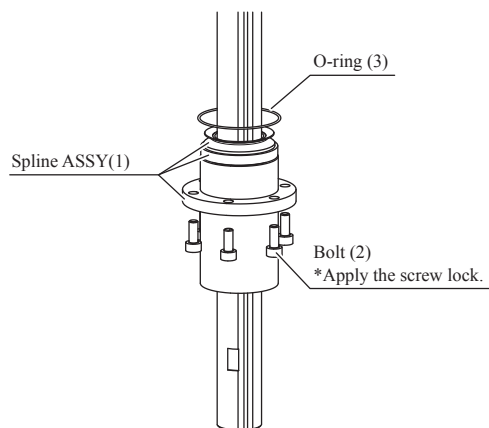
- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the spline.**  
Remove the spline as described in Chapter 5 "2.2.3 Replacing the R-axis harmonic drive"
- 5 **Remove the damper and stopper (flange) from the spline.**  
If the stopper bolt is covered by warning label, use a cutter to cut away the label so that the bolt head is exposed. Then remove the bolt, and remove the damper and stopper from the spline.

## ■ Replacement and reassembly

Follow the steps below to replace the spline with a new one and reassemble it.

- 1 **Install the damper and stopper (flange) on the spline.**  
Secure the stopper (flange) at its prescribed position.
- 2 **Disassemble to the point where the harmonic is removed from the Y-axis arm.**
  1. Disassemble to the point where the harmonic is removed from the Y-axis arm, even if the harmonic is not being replaced.  
(Do not remove the wave generator.)
  2. Wipe off the old grease from the harmonic, then apply new grease as described in Chapter 3 "2. Applying the grease".
- 3 **Reassemble by reversing the disassembly procedure.**  
Reassemble by reversing the disassembly procedure as described in Chapter 5 "2.2.3 Replacing the R-axis harmonic drive".

### Replacing the spline





# Chapter 10 Motor replacement

## Contents

|                                    |             |
|------------------------------------|-------------|
| <b>1. Motor replacement</b>        | <b>10-1</b> |
| 1.1 X and R axis motor replacement | 10-1        |
| 1.2 Y-axis motor replacement       | 10-1        |
| 1.3 Z-axis motor replacement       | 10-3        |



# 1. Motor replacement



## CAUTION

- Replacing the motor causes a positional deviation. Therefore, following a motor replacement, an absolute reset must be performed, and the point data must be re-specified. After an X, Y, R axis motor replacement, the reference coordinates must also be re-specified.
- If the bolt tightening torque is not instructed, see the tightening torque stated in "2. Replacement procedure for harmonic drive" in Chapter 5.

## 1.1 X and R axis motor replacement



## WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

For details regarding motor replacements, refer to the harmonic replacement procedure for each axis.

To replace the X-axis motor, disassemble to the point where the X-axis motor is removed, then wipe the old grease from the harmonic and apply new grease as described in the harmonic replacement procedure.

To replace the R-axis motor, disassemble to the step where the harmonic is removed from the Y-axis arm, then wipe the old grease from the harmonic and apply new grease as described in the harmonic replacement procedure.



## CAUTION

When replacing the R-axis motor as described in the harmonic drive replacement procedure, a deflection check is required for the wave generator of the harmonic drive which was installed in the new motor at Step 2 of the "n Replacement and reassembly" procedure. A motor-securing vise and a dial gauge are required in order to perform this check.

If a vise and dial gauge are not available, the wave generator can be installed at OMRON, with the assembly then being shipped to the customer. In that case, the customer should order an "additional new KCY-M1821-000 harmonic drive" replacement part and request that the wave generator be installed in the motor.

### 1. Replacement parts

|   | Part Name    | OMRON Part No. | Part No. / Specs | Q'ty | Remarks |
|---|--------------|----------------|------------------|------|---------|
| 1 | X-axis motor | KCY-M4880-001  |                  | 1    |         |
| 2 | R-axis motor | KCY-M4883-000  |                  | 1    |         |

### 2. Other tools

| Name                 | Part No.     | Manufacturer           | Remarks  |
|----------------------|--------------|------------------------|--|
| Cleaning wipe        |              |                        |  |
| Hex wrench set       |              |                        |  |
| Phillips screwdriver |              |                        |  |
| Harmonic grease      | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |

\*1: X-axis 25g, R-axis 4.2g

## 1.2 Y-axis motor replacement



## WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

### 1. Replacement parts

|   | Part Name           | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks                           |
|---|---------------------|----------------|---|------|-----------------------------------|
| 1 | Motor O-ring        | KN3-M257K-000  | Cross section diameter: 1.0mm<br>Inner diameter: 29.5mm | 1    | Becomes worn and must be replaced |
| 2 | Motor               | KCY-M4881-000  |   | 1    |                                   |
| 3 | Motor securing bolt | 91312-04008    | M4, length: 8   | 2    | Spare parts                       |

## 2. Torque wrench, etc.



### CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

|   | Name               | Part No.                  | Manufacturer                       | Remarks   |
|---|--------------------|---------------------------|------------------------------------|---|
| A | Torque screwdriver | N30LTDK                   | KANON<br>(Nakamura Mfg. Co., Ltd.) | For M3 hex socket head bolt<br>Tightening torque: 1.8Nm (18kgfcm)   |
|   | Drive bit          | B35, opposite side 2.5×75 | Vessel Co., Inc.                   | Attachment hexagonal width across flat: 6.35mm<br>Overall length: 75mm<br>Hexagonal width across flat at tip: 2.5mm |

## 3. Other tools

| Name            | Part No.     | Manufacturer           | Remarks   |
|-----------------|--------------|------------------------|---|
| Cleaning wipe   |              |                        |   |
| Hex wrench set  |              |                        |   |
| Harmonic grease | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago.<br>The grease has probably deteriorated. |

\*1 : 12g

Follow the steps below to perform the replacement work.

### ■ Removal

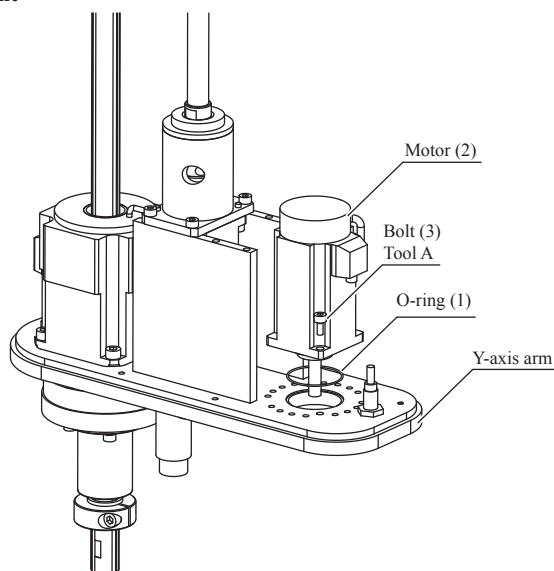
- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the wave generator.**  
Remove the wave generator as described in Chapter 5 "2. Replacing the Y-axis harmonic drive [Y-axis]".
- 5 **Remove the motor and O-ring.**  
Remove the motor's round terminal and the connector. Remove the bolt, then remove the motor and O-ring.



### NOTE

Replace the O-ring with a new one.

### Y-axis motor replacement





## ■ Replacement and reassembly

Use the following procedure to replace the motor and reassemble the removed parts.

- 1 ***Apply new grease to the harmonic.***  
Wipe off the old grease from the harmonic, then apply new grease as described in Chapter 5 "2. Replacing the Y-axis harmonic drive [Y-axis]".

- 2 ***Install the motor and O-ring.***



### CAUTION

- Do not allow the O-ring to get caught out of the groove during reassembly. If the robot is operated with the O-ring left caught out of the groove, this may cause a malfunction.
- If foreign matter is caught in during reassembly work, this may cause the noise from the harmonic drive or the harmonic drive to break.

- 3 ***Secure the round terminal.***

- 4 ***Connect the motor's connector.***

Connect the connector as described in Chapter 6 "Replacing the machine harness".

- 5 ***Install the wave generator and the remaining parts.***

Install the wave generator and the remaining parts as described in Chapter 5 "2. Replacing the Y-axis harmonic drive [Y-axis]".

## 1.3 Z-axis motor replacement

For models R6YXGLC(P)250, R6YXGLC(P)350, R6YXGLC(P)400, R6YXGLC(P)500, R6YXGLC(P)600, replace the Z-axis motor and ball screw assembly as a set, using the procedure described in Chapter 8 "Replacing the Z-axis ASSY".



# Chapter 11

# Sensor replacement

## Contents

|   |             |
|---|-------------|
| <b>1. Sensor replacement</b>            | <b>11-1</b> |
| <b>1.1 X, Y-axis sensor replacement</b> | <b>11-1</b> |
| <b>1.2 R-axis sensor replacement</b>    | <b>11-4</b> |



# 1. Sensor replacement



## CAUTION

- Replacing the sensor could cause a positional deviation. Therefore, following a sensor replacement, it may be necessary to perform an absolute reset, and the point data and reference coordinates may have to be re-specified.
- If the bolt tightening torque is not instructed, see the tightening torque stated in "2. Replacement procedure for harmonic drive" in Chapter 5.

## 1.1 X, Y-axis sensor replacement



## WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

### 1. Replacement parts

|   | Part Name     | OMRON Part No. | Part No. / Specs | Q'ty | Remarks |
|---|---------------|----------------|------------------|------|---------|
| 1 | X-axis sensor | KCY-M4850-400  |                  | 1    |         |
| 2 | Y-axis sensor | KCY-M4850-100  |                  | 1    |         |

### 2. Torque wrench, etc.



## CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

|   | Name          | Part No.   | Manufacturer                       | Remarks   |
|---|---------------|------------|------------------------------------|---|
| A | Torque wrench | N190SPK 13 | KANON<br>(Nakamura Mfg. Co., Ltd.) | Width across flat: 13mm<br>Tightening torque: 5Nm (50kgfcm) |

### 3. Other tools

|  | Name                 | Part No. | Manufacturer | Remarks |
|--|----------------------|----------|--------------|---------|
|  | Cleaning wipe        |          |              |         |
|  | Spanner (wrench)     |          |              |         |
|  | Phillips screwdriver |          |              |         |

Follow the steps below to perform the replacement work.

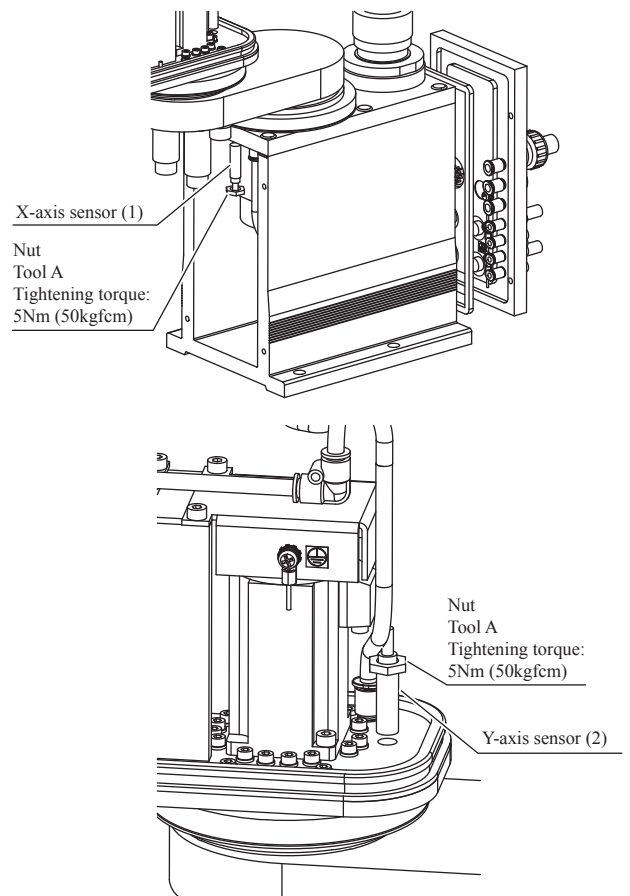
#### ■ Removal

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**

Although the procedure for replacing the X-axis sensor is given here, the same procedure also applies for the Y-axis sensor.

- 4 **Remove the base cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.
- 5 **Disconnect the XORG connector.**
- 6 **Remove the sensor.**  
Remove the nut, then turn the sensor to extract it. If the sensor is difficult to turn, use the width-across-flats at the sensor's end to turn it.

▶ **Step 4-6 Removing the sensor**

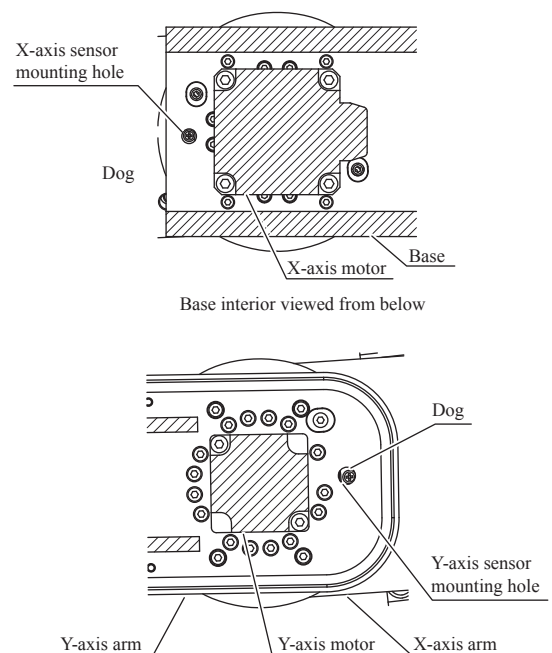


■ **Replacement and reassembly**

Replace the sensor with a new one as described below, then reassemble by reversing the disassembly procedure.

- 1 **While peering through the sensor mounting hole from below, rotate the X-axis arm until the dog is centered in the hole. In this condition, the X-axis arm should be slightly tilted away from the base front face.**  
Do not rotate the X-axis arm from this position until the sensor has been temporarily secured.
- 2 **Fit the nut over the sensor, then screw the sensor in.**  
If the sensor is difficult to screw in, use the width-across-flats at the sensor's end.  
Use care to avoid damaging the sensor's screw threads. The sensor cannot be turned if the threads are damaged.  
Use care to avoid twisting the sensor cable. Doing so could sever the cable.  
Screw the sensor in until it makes contact with the dog, then back it off 1/2 a turn from that position, and temporarily secure it there with the nut. In this condition, the distance (L) between the sensor and dog should be 0.5mm.

▶ **Step 2 Replacing the sensor**



- 3 ***Connect the XORG connector.***
- 4 ***Perform a machine reference adjustment.***

Adjust the machine reference as described in X,Y axis machine reference adjustment procedures given in Chapter 3 "2. Adjusting the origin" of the installation manual, and Chapter 4 "Adjusting the origin" of the maintenance manual for XG series standard models.



**CAUTION**

---

Because the joints are hidden by covers, it is difficult to verify the distance between the sensor and the dog. Use care to prevent the sensor from colliding with the dog.

---

## 1.2 R-axis sensor replacement



### WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

### 1. Replacement parts

|   | Part Name                  | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks  |
|---|----------------------------|----------------|---|------|--|
| 1 | R-axis sensor              | KDM-M4850-400  |   | 1    |  |
| 2 | R-axis motor securing bolt | 91312-05016    | M5, length: 16  | 4    | Spare parts  |
| 3 | R-axis motor O-ring        | KN3-M2144-000  | Cross section diameter: 0.99mm<br>Inner diameter: 53.28mm | 1    | Replacement required when the wire is damaged or deteriorated. |

### 2. Torque wrench, etc.



### CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

|   | Name          | Part No. | Manufacturer                       | Remarks  |
|---|---------------|----------|------------------------------------|--|
| A | Torque wrench | N30SPK 8 | KANON<br>(Nakamura Mfg. Co., Ltd.) | Width across flat: 8mm<br>Tightening torque: 1Nm (10kgfcm) |

\* Use a commercially available torque wrench to tighten bolts other than those shown above.

### 3. Other tools

| Name                 | Part No. | Manufacturer | Remarks |
|----------------------|----------|--------------|---------|
| Cleaning wipe        |          |              |         |
| Tie band             |          |              |         |
| Spanner (wrench)     |          |              |         |
| Phillips screwdriver |          |              |         |

Follow the steps below to perform the replacement work.

#### ■ Removal

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the Y-axis arm cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.
- 5 **Cut the tie band, then disconnect the RORG connector.**



6

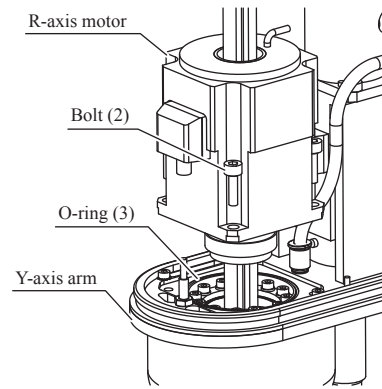
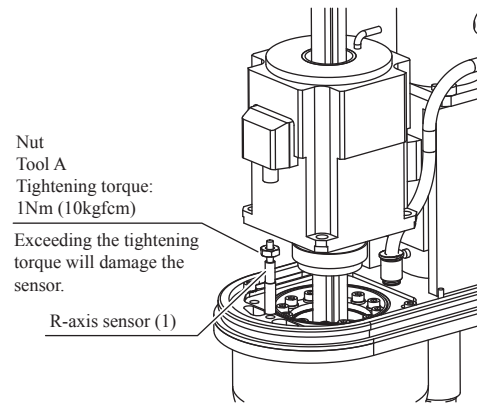
**Remove the R-axis motor.**

Remove the bolts, then remove the R-axis motor. Use care to prevent the O-ring from detaching. If it detaches, press it back into the O-ring groove. If the O-ring is damaged or in a deteriorated condition, replace it as described in the R-axis harmonic replacement procedure. Place a support beneath the motor to prevent it from falling.

7

**Remove the sensor.**

Remove the nut, then turn the sensor to extract it. If the sensor is difficult to turn, use the width-across-flats at the sensor's end to turn it.

**Step 6 Removing the R-axis motor****Step 7 Removing the R-axis sensor****Replacement and reassembly**

Replace the sensor with a new one as described below, then reassemble by reversing the disassembly procedure.

1

**While peering through the sensor mounting hole, rotate the R-axis until the dog is centered in the hole.**

The dog's position is offset from the hole. Use care to avoid mistaking the bolt for the dog (the dog is larger than the bolt).

Do not rotate the R-axis from this position until the sensor has been temporarily secured.

2

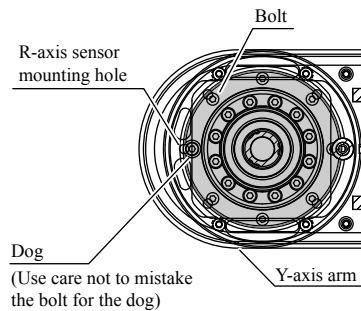
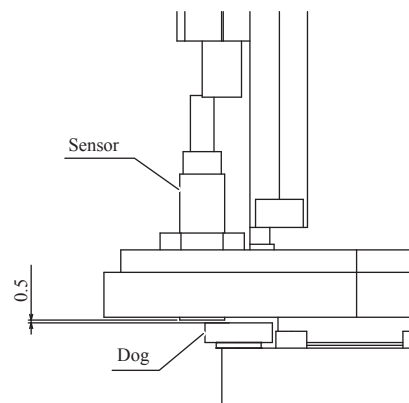
**Fit the nut over the sensor, then screw the sensor in.**

If the sensor is difficult to screw in, use the width-across-flats at the sensor's end.

Use care to avoid damaging the sensor's screw threads. The sensor cannot be turned if the threads are damaged.

Use care to avoid twisting the sensor cable. Doing so could sever the cable.

Screw the sensor in until it makes contact with the dog, then back it off 1/2 a turn from that position, and temporarily secure it there with the nut. In this condition, the distance (L) between the sensor and dog should be 0.5mm.

**Step 1 Replacing the sensor****Step 2 Replacing the R-axis sensor**

- 3 ***Secure the motor with the bolts.***  
Secure the motor with the bolts, using care to avoid pinching the O-ring.
- 4 ***Connect the RORG connector.***  
Secure the connector with a tie band as described in Chapter 6 "Replacing the machine harness".
- 5 ***Perform a machine reference adjustment.***  
Adjust the machine reference as described in X,Y axis machine reference adjustment procedures given in Chapter 3 "2. Adjusting the origin" of the installation manual, and Chapter 4 "Adjusting the origin" of the maintenance manual for XG series standard models.

**CAUTION**

---

Because the joints are hidden by covers, it is difficult to verify the distance between the sensor and the dog. Use care to prevent the sensor from colliding with the dog.

---

# Chapter 12 Robot cable replacement

## Contents

|                            |      |
|----------------------------|------|
| 1. Robot cable replacement | 12-1 |
|----------------------------|------|



# 1. Robot cable replacement



## CAUTION

- An absolute reset is required after a robot cable replacement.
- If the bolt tightening torque is not instructed, see the tightening torque stated in "2. Replacement procedure for harmonic drive" in Chapter 5.



## WARNING

BEFORE STARTING THE WORK, THOROUGHLY READ "1. ATTACHING, DETACHING, AND REPLACING THE COVER" IN CHAPTER 2.

## 1. Replacement parts

|   | Part Name                      | OMRON Part No. | Part No. / Specs | Q'ty | Remarks     |
|---|--------------------------------|----------------|------------------|------|-------------|
| 1 | Screw for round terminal       | 97602-04308    | M4, Length: 8    | 2    | Spare parts |
| 2 | Lock washer for round terminal | 90172-00J040   | For M4           | 2    | Spare parts |
| 3 | Robot cable                    | KDP-M6211-000  |                  | 1    | 3.5m        |
|   |                                | KDP-M6211-100  |                  | 1    | 5m          |
|   |                                | KDP-M6211-200  |                  | 1    | 10m         |

## 2. Other tools

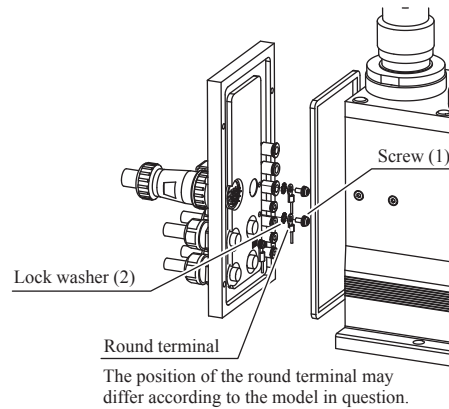
| Name                 | Part No. | Manufacturer | Remarks |
|----------------------|----------|--------------|---------|
| Phillips screwdriver |          |              |         |
| 24mm spanner         |          |              |         |

## ■ Removal

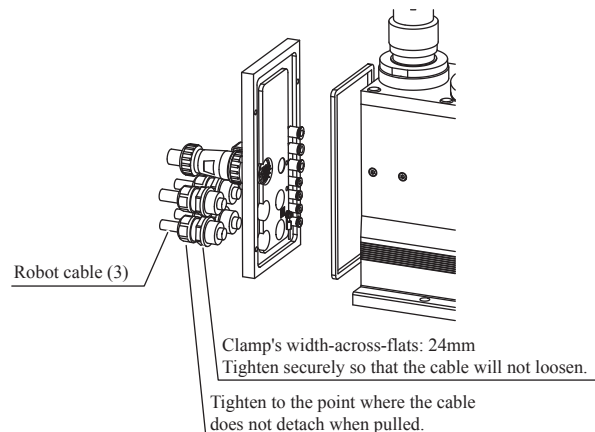
Disassemble using the following procedure.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the base cover.**  
Remove the cover while referring to "1. Attaching, detaching, and replacing the cover" in Chapter 2.
- 5 **Disconnect the connector.**  
Remove the robot cable's round terminal and the connector.
- 6 **Disconnect the robot cable.**  
Loosen by using a spanner at the cable clamp's width-across-flats, then disconnect the robot cable.

### ▶ Step 5 Removing the connector



### ▶ Step 6 Removing the robot cable



## ■ Reassembly

Reassemble by reversing the disassembly procedure.

- 1 *Tighten the lock nut and clamp.*
- 2 *Secure the round terminal and connect the connector.*



### NOTE

---

Refer to Chapter 8 "1.3 Robot inner wiring diagram" of the installation manual for XG series standard models.

---

- 3 *Attach the cover.*

## Chapter 13

# Mechanical stopper replacement

## Contents

|  |             |
|--|-------------|
| <b>1. Mechanical stopper replacement</b> | <b>13-1</b> |
| <b>1.1 X, Y-axis mechanical stoppers</b> | <b>13-1</b> |
| <b>1.2 Z-axis mechanical stopper</b>     | <b>13-3</b> |
| 1.2.1 Upper end mechanical stopper       | 13-3        |
| 1.2.2 Lower end mechanical stopper       | 13-3        |





# 1. Mechanical stopper replacement

To ensure safety, use the following procedure to replace the mechanical stopper when it becomes damaged, deformed, or when it can no longer be properly secured.

In the interest of safety, additional mechanical stoppers should also be replaced with new ones in accordance with the "additional mechanical stopper installation" procedure when they become damaged, deformed, or when they can no longer be properly secured.

If damage is found at the arm or base, etc., please contact your distributor.



## CAUTION

If the bolt tightening torque is not instructed, see the tightening torque stated in "2. Replacement procedure for harmonic drive" in Chapter 5.

## 1.1 X, Y-axis mechanical stoppers

### 1. Replacement parts

#### • X-axis

|   | Part Name      | OMRON Part No. | Part No. / Specs                              | Q'ty | Remarks |
|---|----------------|----------------|---|------|---------|
| 1 | Stopper damper | KCY-M2197-000  |   | 1    |         |
| 2 | Bolt           | 90990-01J066   | M10, Length: 55<br>Electroless nickel plating | 1    |         |
| 3 | Nut            | 90189-06J106   | M10 stainless                                 | 1    |         |

#### • Y-axis

|    | Part Name      | OMRON Part No. | Part No. / Specs                              | Q'ty | Remarks |
|----|----------------|----------------|---|------|---------|
| 1  | Stopper damper | KCY-M2197-000  |   | 1    |         |
| Y2 | Bolt           | 90990-01J067   | M10, Length: 60<br>Electroless nickel plating | 1    |         |
| 3  | Nut            | 90189-06J106   | M10 stainless                                 | 1    |         |
| 4  | Seal washer    | 90990-36J010   | For M10 stainless                             | 3    |         |

### 2. Torque wrench, etc.



## CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

|   | Name          | Part No.   | Manufacturer                       | Remarks   |
|---|---------------|------------|------------------------------------|---|
| A | Torque wrench | N380SPK 14 | KANON<br>(Nakamura Mfg. Co., Ltd.) | Width across flat: 14mm<br>Tightening torque: 20Nm (204kgfcm) |

### 3. Other tools

|  | Name             | Part No. | Manufacturer | Remarks |
|--|------------------|----------|--------------|---------|
|  | Hex wrench set   |          |              |         |
|  | Spanner (wrench) |          |              |         |

Follow the steps below to perform the replacement work.

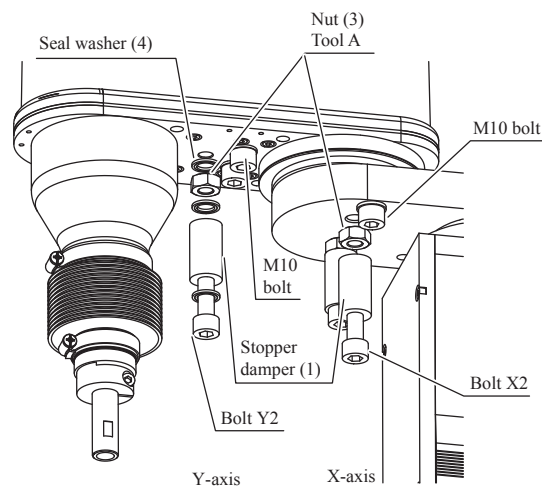
### ■ Removal

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**

Although the procedure for the X-axis is given here, the same procedure also applies for the Y-axis.

- 4 **Loosen the X-axis nut, then remove the stopper damper and the bolts.**

### Mechanical stopper replacement



### ■ Reassembly

Install the new stopper and reassemble by reversing the disassembly procedure.

- 1 **Secure the damper between the bolt and nut.**
  1. Secure the damper (1) between bolt (X2) and nut (3). Use the bolt and nut shown above.
  2. Tighten the nut at the arm side to a torque of 42Nm (428kgf/cm). If the nut is difficult to tighten, remove the surrounding M10 bolts, then tighten the nut. Be sure to return the M10 bolts to their original positions (these are plug bolts). (For details, refer to Chapter 2 "4.1 Installing the X-axis/Y-axis additional mechanical stoppers" in the Installation Manual.)  
At the Y-axis, be sure to install the seal washer.
- 2 **Verify that the movement range is restricted.**
- 3 **Go out of the safety enclosure.**
- 4 **Turn on the controller.**  
Check that no one is inside the safety enclosure, and then turn on the controller.



### CAUTION

From a position outside the safety enclosure, verify that the soft limit stops the X-axis at a position before the stopper.

- 5 **Verify that the X-axis is completely stopped.**  
From a position outside the safety enclosure, verify that the maximum soft limit stops the X-axis at a position before the stopper.

## 1.2 Z-axis mechanical stopper



### CAUTION

Replacing the mechanical stopper causes a positional deviation.

Therefore, following the replacement, it may be necessary to perform an absolute reset, and re-specify the point data and reference coordinates.

### 1.2.1 Upper end mechanical stopper

Replace the damper and shaft, etc., as described in the lower bellows rotation mechanism replacement procedure.

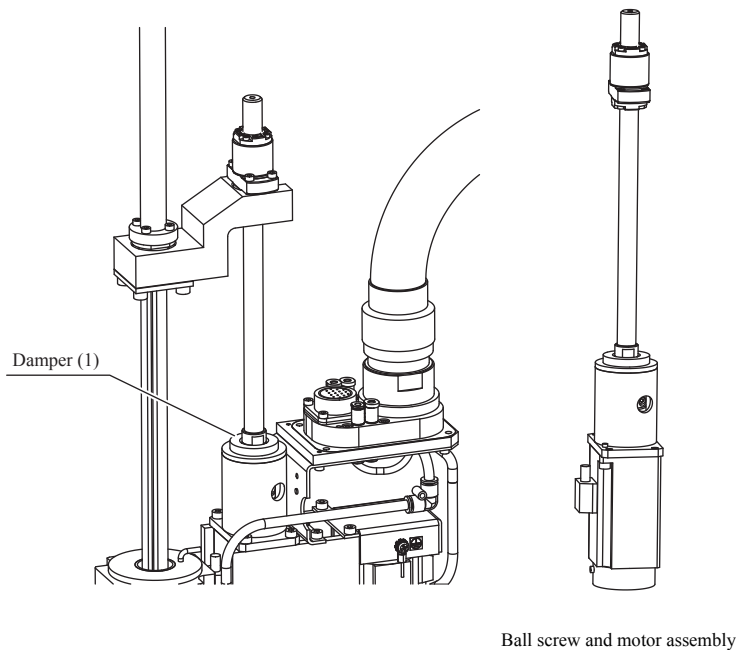
### 1.2.2 Lower end mechanical stopper

#### 1. Replacement parts

|   | Part Name | OMRON Part No. | Part No. / Specs | Q'ty | Remarks |
|---|-----------|----------------|------------------|------|---------|
| 1 | Damper    | KCY-M1788-000  |                  | 1    |         |

In order to replace the damper, the ball screw must be detached from the motor, and this causes a ball screw centerline deviation. When a damper replacement is required, please contact your distributor.

#### Mechanical stopper replacement





# Chapter 14 Dog replacement

## Contents

1. Dog replacement

14-1



# 1. Dog replacement

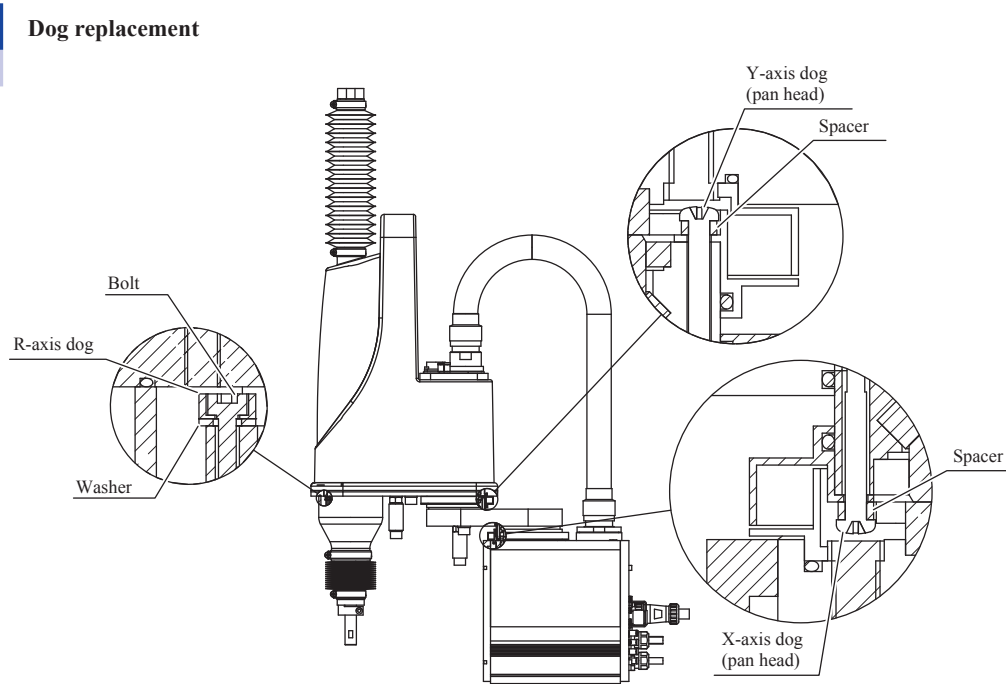


## CAUTION

Replacing the dog causes a positional deviation. Therefore, following the replacement, an absolute reset must be performed, and the point data and reference coordinates must be re-specified.

Dogs are present at the X, Y, and R axes, and are detected by the origin point sensor in return-to-origin operations. The dog positions at each axis are shown below.

Damaged dogs must be replaced in accordance with the harmonic replacement procedure for the robot model and axis in question.







## Chapter 15

# Bellows rotation mechanism replacement

### Contents

- |   |      |
|---|------|
| 1. Lower bellows rotation mechanism replacement | 15-1 |
| 2. Upper bellows rotation mechanism replacement | 15-4 |



# 1. Lower bellows rotation mechanism replacement



## CAUTION

- If the bolt tightening torque is not instructed, see the tightening torque stated in "2. Replacement procedure for harmonic drive" in Chapter 5.
- Replacing the lower bellows rotating mechanism can cause positional deviations. Therefore, following a sensor replacement, it may be necessary to perform an absolute reset, and the point data and reference coordinates may have to be re-specified.

## 1. Replacement parts

|    | Part Name             | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks  |
|----|-----------------------|----------------|---|------|--|
| 1  | Shaft                 | KDM-M1790-000  |   | 1    |  |
| 2  | Damper                | KN3-M1788-100  |   | 1    |  |
| 3  | Shaft securing bolts  | 91312-05014    | M5, length: 14  | 2    | Spare parts  |
| 4  | Set screws            | 92A08-05305    | M5, length: 5   | 1    | Spare parts  |
| 5  | Spline lower O-ring   | 90200-01J112   | S11.2 (JIS)   | 1    | Becomes worn and must be replaced  |
| 6  | Holder securing bolts | 91380-05016    | M5, length: 16 stainless                                | 1    | Spare parts  |
| 7  | Holder O-ring         | 90200-01J160   | S16 (JIS)   | 1    | Becomes worn and must be replaced  |
| 8  | Shaft O-ring          | 90990-17J025   | Cross section diameter: 0.5mm<br>Inner diameter: 15.0mm | 1    | Becomes worn and must be replaced  |
| 9  | Circlip               | 99009-30700    | For hole; nominal diameter: 30                          | 1    |  |
| 10 | Bearing               | 90990-25J017   | 6903LLB   | 1    |  |
| 11 | End face seal         | KBF-M1886-000  |   | 1    | Replacement required when in a deteriorated condition (dust/drip proof specs. XG(L)P only) |
| 12 | O-ring for housing    | KN3-M257K-000  | Cross section diameter: 1.0mm<br>Inner diameter: 29.5mm | 1    | Becomes worn and must be replaced  |
| 13 | Housing               | KDM-M189B-000  |   | 1    |  |
| 14 | Holder                | KDM-M1791-000  |   | 1    |  |
| 15 | Warning label         | 90K41-001490   |   | 1    | Required only at holder replacement.   |

## 2. Other tools

| Name            | Part No. | Manufacturer           | Remarks   |
|-----------------|----------|------------------------|---|
| Cleaning wipe   |          |                        |   |
| Hex wrench set  |          |                        |   |
| Circlip pliers  |          |                        |   |
| Harmonic grease | 4BNo.2   | Harmonic Drive Systems | Small amount. Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. Other grease may also be used (dust/drip proof specs. XG(L)P only) |

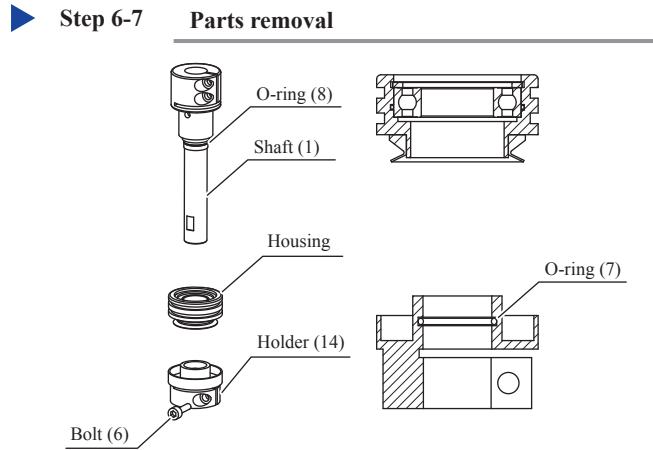
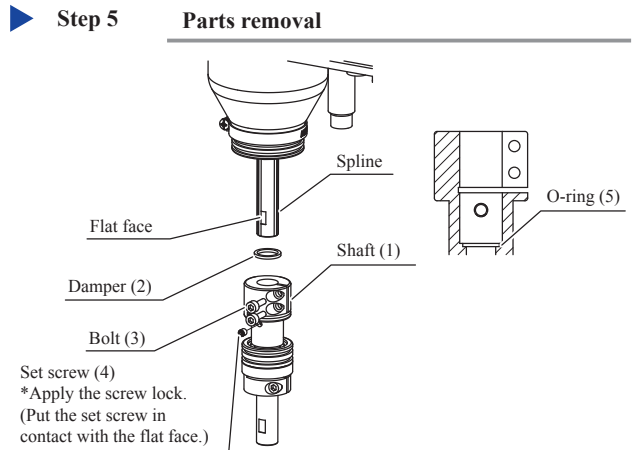
■ Removal

Follow the steps below to remove the R-axis parts.

- 1 **Turn off the controller.**  
Lower the Z-axis approximately 30mm below its origin position, then turn the controller power OFF.
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the bellows.**  
Remove the bellows as described in the Chapter 7 "2. Replacing the lower bellows".

Disassemble down to the part which is to be replaced.

- 5 **Remove the damper and all parts beneath it.**  
Remove the bolts and set screws, then remove the damper and all the other parts beneath it from the spline.
- 6 **Remove the housing and holder from the shaft.**
- 7 **Remove the bearing, etc., from the housing.**

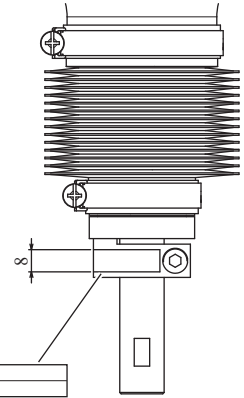


■ Replacement and reassembly

Replace with a new part, then reassemble by reversing the disassembly procedure.

- 1 **Affix a warning label only when the holder has been replaced.**
- 2 **Apply grease to the O-ring.**  
Use care to prevent the O-ring from being pinched.
- 3 **Set in position.**  
Push the shaft, housing, and holder in until they can be pushed no farther, then tighten the shaft securing bolt to its prescribed torque. Positional deviation may occur if not fully tightened.
- 4 **Reassemble by reversing the disassembly procedure.**  
With reference to Chapter 7 "2. Replacing the lower bellows", reassemble by reversing the disassembly procedure.

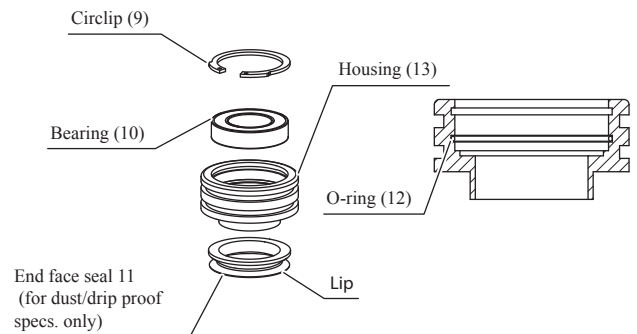
▶ Step 1 Warning label



|  |  |                                 |
|--|--|---------------------------------|
|  | Do not remove the parts.<br>部品を分解しないでください！ | ※ 半導電層を損傷しないよう、<br>この表面を汚さないこと。 |
|--|--|---------------------------------|

The warning label need not completely cover the counterbore hole (because the bolt is protruding).  
Be sure that the warning label does not extend to the stopper's C-face.  
Be sure to wipe all grease from the curved face before affixing the label.

▶ Step 2-3 Reassembling



- Apply a small amount of 4B No.2 grease to the lip.
- Be sure that all the above parts are securely seated all the way around. Keep grease off the seat faces.

## 2. Upper bellows rotation mechanism replacement

### 1. Replacement parts

|   | Part Name     | OMRON Part No. | Part No. / Specs  | Q'ty | Remarks  |
|---|---------------|----------------|---|------|--|
| 1 | Shaft         | KDM-M1873-000  |   | 1    |  |
| 2 | Shaft O-ring  | 90990-17J078   | Cross section diameter: 0.8mm<br>Inner diameter: 13.3mm | 1    | Becomes worn and must be replaced  |
| 3 | Nut           | KDM-M1852-000  |   | 1    |  |
| 4 | End face seal | KBF-M189K-000  |   | 1    | Replacement required when in a deteriorated condition (dust/drip proof specs. XG(L)P only) |
| 5 | Housing       | KDM-M1892-000  |   | 1    |  |
| 6 | Bearing       | 90990-25J018   | 6902LLB   | 1    |  |
| 7 | Circlip       | 99009-30700    | For hole; nominal diameter: 30                          | 1    |  |
| 8 | Shaft O-ring  | 90990-17J037   | Cross section diameter: 0.5mm<br>Inner diameter: 28.0mm | 1    | Becomes worn and must be replaced  |

### 2. Torque wrench, etc.



#### CAUTION

Use accurately calibrated torque screwdrivers and torque wrenches.

|   | Name          | Part No.   | Manufacturer                       | Remarks  |
|---|---------------|------------|------------------------------------|--|
| A | Torque wrench | N380SPK 14 | KANON<br>(Nakamura Mfg. Co., Ltd.) | Width across flat: 14mm<br>Tightening torque 20Nm (204kgfcm) |

### 3. Other tools

|  | Name            | Part No. | Manufacturer           | Remarks  |
|--|-----------------|----------|------------------------|--|
|  | Cleaning wipe   |          |                        |  |
|  | Circlip pliers  |          |                        |  |
|  | Harmonic grease | 4BNo.2   | Harmonic Drive Systems | Small amount. Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |

### ■ Removal

Follow the steps below to remove the R-axis parts.

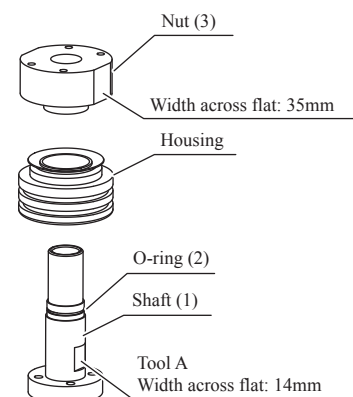
- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Remove the bellows.**  
Remove the bellows as described in the Chapter 7 "1. Replacing the upper bellows".

Disassemble down to the part which is to be replaced.

- 5 **Remove the nut, then remove the housing from the shaft.**

#### Step 5

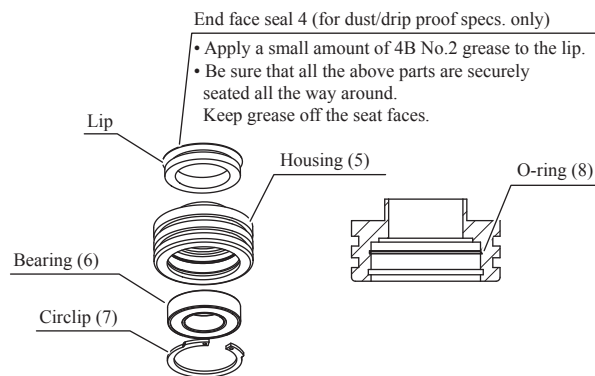
#### Parts removal



6 **Remove the bearing, etc., from the housing.**

▶ Step 6

**Reassembling**



■ **Replacement and reassembly**

Replace with a new part, then reassemble by reversing the disassembly procedure.

- 1 **Apply grease to the O-ring.**  
Use care to prevent the O-ring from being pinched.
- 2 **Set in position.**  
Push the shaft, housing, and nut in until they can be pushed no farther, then tighten the nut to its prescribed torque.
- 3 **Reassemble by reversing the disassembly procedure.**  
With reference to Chapter 7 "1. Replacing the upper bellows", reassemble by reversing the disassembly procedure.





## Chapter 16

# End face seal replacement

## Contents

|   |             |
|---|-------------|
| <b>1. End face seal replacement</b>   | <b>16-1</b> |
| 1.1 Replacing the X-axis end face seal<br>(only on dust/drip proof specification models XG(L)P) | 16-1        |
| 1.2 Replacing the Y-axis end face seal<br>(only on dust/drip proof specification models XG(L)P) | 16-2        |
| 1.3 Replacing the R-axis end face seal  | 16-3        |



# 1. End face seal replacement



## CAUTION

Replacing the end face seal causes a positional deviation. Therefore, following the replacement, an absolute reset must be performed, and the point data and reference coordinates must be re-specified.

The X,Y axis end face seal is present only on dust/drip proof specification models (XG(L)P) in order to keep water and dust out of the joint area. The R-axis end face seal prevents harmonic grease from leaking to the spline side. These seals must be replaced when in a deteriorated condition.

## 1.1 Replacing the X-axis end face seal (only on dust/drip proof specification models XG(L)P)

### 1. Replacement parts

|   | Part Name     | OMRON Part No. | Part No. / Specs | Q'ty | Remarks                              |
|---|---------------|----------------|------------------|------|--------------------------------------|
| 1 | End face seal | KDM-M2111-000  |                  | 1    | (Dust/drip proof specs. XG(L)P only) |

### 2. Other tools

| Name            | Part No.     | Manufacturer           | Remarks  |
|-----------------|--------------|------------------------|--|
| Harmonic grease | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |

\*1: 25g

### ■ Removal

Disassemble using the following procedure.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Refer to the Chapter 5 "2. Replacement procedure for harmonic drive [X-axis]", then disassemble to the step where the end face seal is removed.**

### ■ Reassembly

Reassemble by reversing the disassembly procedure.

- 1 **Reassemble from the point where the new end face seal is installed in the holder.**
- 2 **Apply new grease to the harmonic.**  
Refer to the Chapter 5 "2. Replacement procedure for harmonic drive [X-axis]", then wipe the old grease from the harmonic and apply new grease.

## 1.2 Replacing the Y-axis end face seal (only on dust/drip proof specification models XG(L)P)

### 1. Replacement parts

|   | Part Name     | OMRON Part No. | Part No. / Specs | Q'ty | Remarks                              |
|---|---------------|----------------|------------------|------|--------------------------------------|
| 1 | End face seal | KDM-M2511-000  |                  | 1    | (Dust/drip proof specs. XG(L)P only) |

### 2. Other tools

| Name            | Part No.     | Manufacturer           | Remarks  |
|-----------------|--------------|------------------------|--|
| Harmonic grease | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |

\*1: 12g

#### ■ Removal

Disassemble using the following procedure.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Refer to the Chapter 5 "2. Replacement procedure for harmonic drive [Y-axis]", then disassemble to the step where the end face seal is removed.**

#### ■ Reassembly

Reassemble by reversing the disassembly procedure.

- 1 **Reassemble from the point where the new end face seal is installed in the holder.**
- 2 **Apply new grease to the harmonic.**  
Refer to the Chapter 5 "2. Replacement procedure for harmonic drive [Y-axis]", then wipe the old grease from the harmonic and apply new grease.

## 1.3 Replacing the R-axis end face seal

### 1. Replacement parts

|   | Part Name          | OMRON Part No. | Part No. / Specs | Q'ty | Remarks |
|---|--------------------|----------------|------------------|------|---------|
| 1 | End face seal (*1) | KCY-M1886-000  |                  | 1    |         |

\*1: A new end face seal will be subjected to a high level of friction if sufficient R-axis aging has not occurred. Therefore, be sure to perform R-axis aging, and do not replace this seal unless it is damaged.

### 2. Other tools

| Name            | Part No.     | Manufacturer           | Remarks  |
|-----------------|--------------|------------------------|--|
| Harmonic grease | 4B No.2 (*1) | Harmonic Drive Systems | Do not use grease if it was purchased 4 or more years ago. The grease has probably deteriorated. |

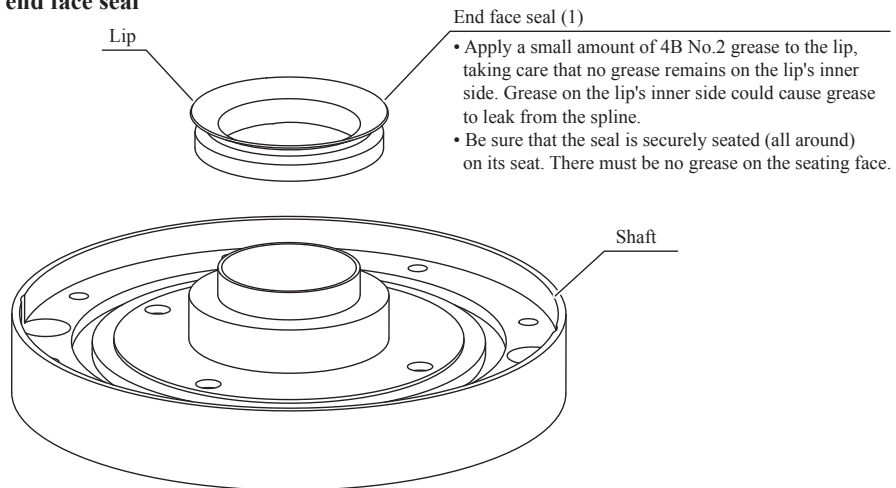
\*1: 4.2g

### ■ Removal

Disassemble using the following procedure.

- 1 **Turn off the controller.**
- 2 **Place a sign indicating the robot is being adjusted.**  
Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.
- 3 **Enter the safety enclosure.**
- 4 **Refer to the Chapter 5 "2. Replacement procedure for harmonic drive [R-axis]", then disassemble to the step where the end face seal is removed.**
- 5 **Remove the end face seal from the shaft.**

#### Replacing the end face seal



## ■ Reassembly

Reassemble by reversing the disassembly procedure.

1 *Install a new end face seal on the shaft.*

2 *Install the harmonic on the shaft.*

3 *Apply new grease to the harmonic.*

Refer to the Chapter 5 "2. Replacement procedure for harmonic drive [R-axis]", then wipe the old grease from the harmonic and apply new grease.



### CAUTION

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A new end face seal will be subjected to a high level of friction due to contact with the harmonic input area, and an overload error could therefore occur if sufficient R-axis aging has not occurred. Be sure to perform sufficient aging.

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# Chapter 17 Maintenance parts

## Contents

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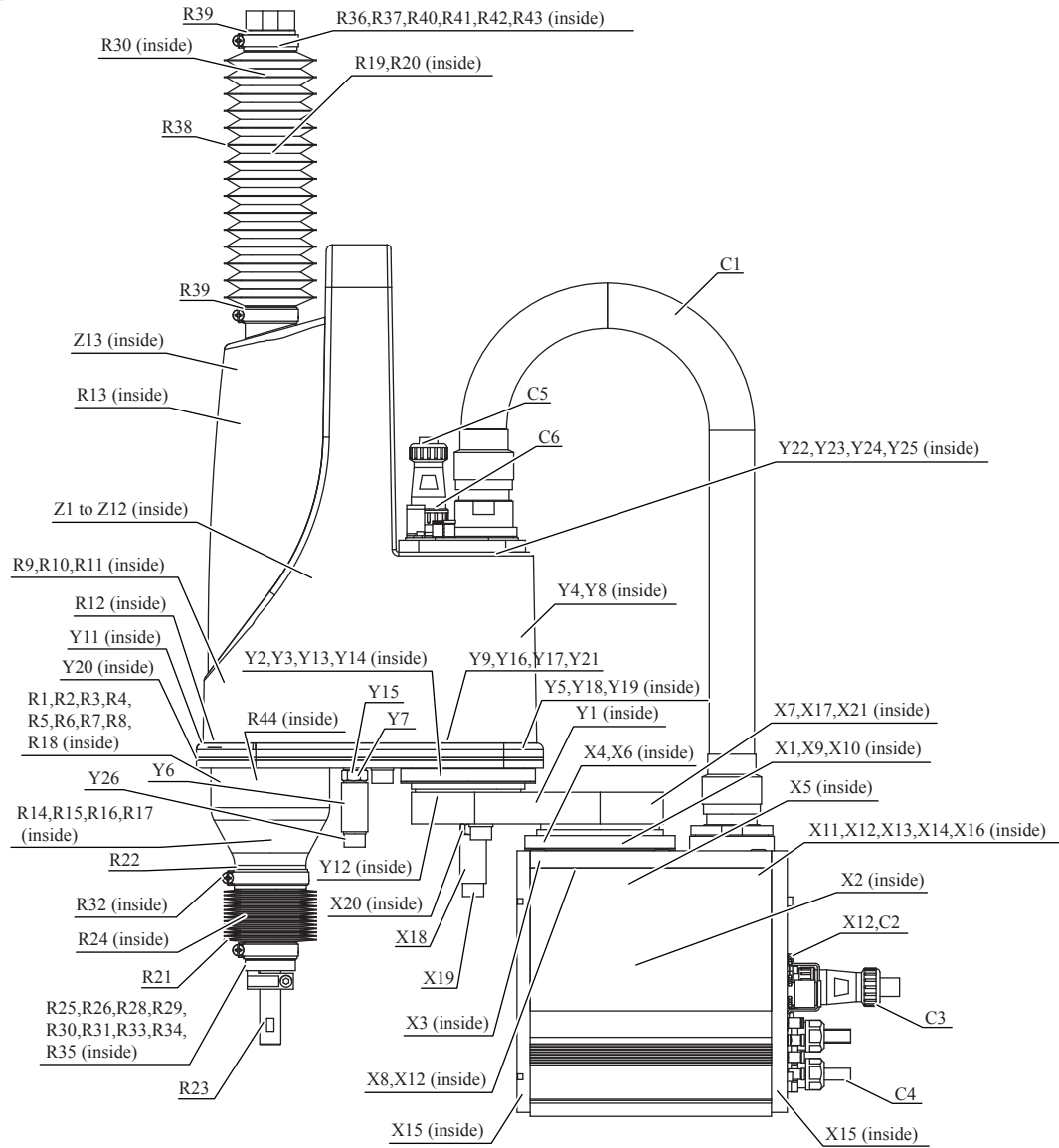
# 1. Maintenance parts

## 1.1 Standard type

|               | No.           | Part No.               | Part name              | Q'ty   | Remarks  | Recommended replacement timing                       |
|---------------|---------------|------------------------|------------------------|--|--|--|
| X-axis        | X1            | KCY-M2110-001          | HARMONIC DRIVE ASSY.   | 1  | Speed reduction unit   | See "2." in Chapter 5 of installation manual for XG. |
|               | X2            | KCY-M4880-001          | MOTOR ASSY.,1          | 1  | Motor  |  |
|               | X3            | KCY-M4850-400          | PROXIMITY SW. ASSY     | 1  | Sensor   |  |
|               | X4            | 98502-03030            | SCREW, PAN HEAD        | 1  | Nut for dog  |  |
|               | X5            | KN3-M2143-000          | O RING,2               | 1  | O-ring for motor mating  |  |
|               | X6            | KDM-M2134-000          | SPACER                 | 1  | Spacer for dog   |  |
|               | X7            | 91312-03030            | BOLT,HEX.SOCKET HEAD   | 11   | Arm side mounting bolt of speed reduction unit   |  |
|               | X8            | 91312-03020            | BOLT,HEX.SOCKET HEAD   | 16   | Base side mounting bolt of speed reduction unit  |  |
|               | X9            | 90200-01J900           | O-RING                 | 1  | Outer O-ring of speed reduction unit   |  |
|               | X10           | KDM-M2111-000          | SEAL                   | 1  | Joint end face seal (XGP and XGLP only)  |  |
|               | X11           | 90990-17J021           | O-RING                 | 1  | O-ring for lower bolt of harness block   |  |
|               | X12           | 90990-36J008           | WASHER SEAL            | 28   | Speed reduction unit mounting bolt, lower bolt of harness block, seal washer for user wiring connector bolt  |  |
|               | X13           | 91312-03018            | BOLT,HEX.SOCKET HEAD   | 4  | Lower bolt of harness block  |  |
|               | X14           | KDM-M1151-000          | SEAL                   | 2  | Lower seal of base plate   |  |
|               | X15           | KDM-M1315-000          | SEAL                   | 2  | Seal for base front and rear covers  |  |
|               | X16           | 91312-05014            | BOLT,HEX.SOCKET HEAD   | 4  | Bolt for base plate  |  |
|               | X17           | KN4-M257K-000          | O RING,1               | 1  | Upper O-ring of speed reduction unit   |  |
|               | X18           | KCY-M2197-000          | DAMPER,2               | 2  | Mechanical stopper damper  |  |
|               | X19           | 90990-01J066           | BOLT, HEX. SOCKET HEAD | 2  | Mechanical stopper bolt  |  |
|               | X20           | 90189-00J106           | NUT, HEXAGON           | 2  | Nut for mechanical stopper bolt  |  |
|               | X21           | 90200-01J900           | O-RING                 | 1  | Outer O-ring for arm side of speed reduction unit  |  |
| Y-axis        | Y1            | KN4-M1896-000          | O RING,2               | 1  | Lower O-ring of speed reduction unit   | See "2." in Chapter 5 of installation manual for XG. |
|               | Y2            | 90200-01J800           | O-RING                 | 1  | Outer O-ring for arm side of speed reduction unit  |  |
|               | Y3            | KCY-M2510-001          | HARMONIC DRIVE ASSY.   | 1  | Speed reduction unit   |  |
|               | Y4            | KCY-M4881-000          | AC SERVO MOTOR         | 1  | Motor  |  |
|               | Y5            | KCY-M4850-100          | PROXIMITY SW. ASSY.    | 1  | Sensor   |  |
|               | Y6            | KCY-M2197-000          | DAMPER,2               | 1  | Mechanical stopper damper  |  |
|               | Y7            | 90189-00J106           | NUT, HEXAGON           | 1  | Nut for mechanical stopper bolt  |  |
|               | Y8            | 91312-04008            | BOLT,HEX.SOCKET HEAD   | 2  | Motor mounting bolt  |  |
|               | Y9            | KN3-M257K-000          | O RING,1               | 1  | O-ring for motor mating  |  |
|               | Y10           | KCY-M1314-001          | COVER,4                | 1  | Y-axis cover   |  |
|               | Y11           | KDM-M1567-000          | SEAL                   | 1  | Upper seal of lower Y-axis arm cover (R6YXGLC(P)250 to R6YXGLC(P)400)  |  |
|               |               | KDM-M1567-100          |                        | 1  | Upper seal of lower Y-axis arm cover (R6YXGLC(P)500, R6YXGLC(P)600)  |  |
|               | Y12           | 91312-03030            | BOLT,HEX.SOCKET HEAD   | 11   | Mounting bolt on X-axis arm side of speed reduction unit   |  |
|               | Y13           | KDM-M2511-000          | SEAL                   | 1  | Joint end face seal (XGP and XGLP only)  |  |
|               | Y14           | 90200-01J800           | O-RING                 | 1  | Outer O-ring of speed reduction unit   |  |
|               | Y15           | 90990-36J010           | WASHER SEAL            | 3  | Seal washer for mechanical stopper bolt  |  |
|               | Y16           | 90990-36J008           | WASHER SEAL            | 23   | Seal washer for Y-axis arm side mounting bolt of speed reduction unit, lower mounting screw of Y-axis cover, mounting bolt of parts around harness block |  |
|               | Y17           | 98980-03012            | SCREW, BINDING HEAD    | 4  | Lower mounting screw of Y-axis cover   |  |
|               | Y18           | KDM-M2534-000          | SPACER                 | 1  | Spacer for dog   |  |
|               | Y19           | 98502-03030            | SCREW, PAN HEAD        | 1  | Nut for dog  |  |
|               | Y20           | KDM-M1568-000          | SEAL                   | 1  | Lower seal for lower Y-axis arm cover (R6YXGLC(P)250 to R6YXGLC(P)400)   |  |
| KDM-M1568-100 |               | 1                      |                        | Lower seal for lower Y-axis arm cover (R6YXGLC(P)500, R6YXGLC(P)600) |  |  |
| Y21           | 91312-03022   | BOLT,HEX.SOCKET HEAD   | 15                     | Y-axis arm side mounting bolt of speed reduction unit                |  |  |
| Y22           | KDM-M1327-000 | SEAL                   | 1                      | Lower seal for harness block   |  |  |
| Y23           | 91380-03018   | BOLT,HEX.SOCKET HEAD   | 8                      | Mounting bolt of harness block and parts around harness block        |  |  |
| Y24           | KDM-M1328-000 | SEAL                   | 1                      | Inner seal for parts around harness block                            |  |  |
| Y25           | KDM-M1329-000 | SEAL                   | 1                      | Outer seal for parts around harness block                            |  |  |
| Y26           | 90990-01J067  | BOLT, HEX. SOCKET HEAD | 1                      | Mechanical stopper bolt  |  |  |
| Z-axis        | Z1            | KCY-M4882-001          | MOTOR ASSY.,3          | 1  | Motor  | These parts need to be replaced as a set.            |
|               | Z2            | 91312-04012            | BOLT,HEX.SOCKET HEAD   | 2  | Motor mounting bolt  |  |
|               | Z3            | KCY-M1753-000          | COUPLING               | 1  | Coupling   |  |
|               | Z4            | KCY-M1750-000          | SCREW,BALL             | 1  | Ball screw   |  |
|               | Z5            | KCY-M1744-000          | PLATE                  | 1  | Bearing outer ring holding plate   |  |
|               | Z6            | KAI-M2273-000          | BEARING                | 1  | Ball screw support bearing   |  |
|               | Z7            | KCY-M1788-000          | DAMPER,1               | 1  | Lower end damper   |  |
|               | Z8            | 90112-2AJ010           | BOLT,HEX.SOCKET HEAD   | 8  | Bolt for outer ring holding plate  |  |
|               | Z9            | KCY-M1778-000          | SLEEVE,LOCK 1          | 1  | Bearing inner ring holding plate   |  |
|               | Z10           | KCY-M1712-000          | HOLDER                 | 1  | Bearing housing  |  |
|               | Z11           | 91312-03014            | BOLT HEX.SOCKET HEAD   | 4  | Ball screw mounting bolt   |  |
|               | Z12           | 91312-04014            | BOLT,HEX.SOCKET HEAD   | 4  | Z-axis ASSY mounting bolt  |  |
|               | Z13           | 90933-01J002           | BEARING                | 2  | Upper bearing of ball spline shaft   |  |
|               | Z14           | KN3-M1788-100          | DAMPER,1               | 1  | Upper end damper   |  |
|               | Z15           | KCY-M1780-001          | STOPPER,1              | 1  | Upper end stopper  |  |

|               | No.           | Part No.        | Part name                    | Q'ty   | Remarks   | Recommended replacement timing                       |
|---------------|---------------|-----------------|------------------------------|--|---|--|
| R-axis        | R1            | KCY-M1821-000   | HARMONIC DRIVE ASSY.         | 1  | Speed reduction unit  | See "2." in Chapter 5 of installation manual for XG. |
|               | R2            | KN3-M1895-000   | O RING                       | 1  | Lower O-ring of speed reduction unit  |  |
|               | R3            | 91312-03022     | BOLT,HEX.SOCKET HEAD         | 8  | Speed reduction unit mounting bolt  |  |
|               | R4            | 90990-17J034    | O-RING                       | 1  | O-ring for input part of speed reduction unit   |  |
|               | R5            | 90990-36J008    | WASHER SEAL                  | 12   | Seal washer for speed reduction unit mounting bolt  |  |
|               | R6            | 91312-03014     | BOLT,HEX.SOCKET HEAD         | 12   | Speed reduction unit mounting bolt  |  |
|               | R7            | KDM-M1888-000   | DOG,R                        | 1  | Nut for dog   |  |
|               | R8            | 90990-28J064    | WASHER,PLAIN                 | 1  | Washer for upper dog of speed reduction unit  |  |
|               | R9            | KCY-M4883-000   | MOTOR ASSY.,3                | 1  | Motor   |  |
|               | R10           | 91312-05016     | BOLT HEX.SOCKET HEAD         | 4  | Motor mounting bolt   |  |
|               | R11           | KN3-M2144-000   | O RING,3                     | 1  | Lower O-ring of motor   |  |
|               | R12           | KDM-M4850-400   | PROXIMITY SW. ASSY.          | 1  | Sensor  |  |
|               | R13           | KCY-M1840-001   | SPLINE,BALL                  | 1  | Ball spline   | These parts need to be replaced as a set.            |
|               | R14           | 90990-17J032    | O-RING                       | 1  | Upper O-ring of ball spline nut (outside)   |  |
|               | R15           | KN5-M181H-000   | O RING,4                     | 1  | Upper O-ring of ball spline nut (inside)  |  |
|               | R16           | 90990-36J002    | WASHER,SEAL                  | 4  | Seal washer for ball spline nut mounting bolt   |  |
|               | R17           | 91312-04012     | BOLT,HEX.SOCKET HEAD         | 4  | Ball spline nut mounting bolt   |  |
|               | R18           | KCY-M1886-000   | SEAL                         | 1  | End face seal inside speed reduction unit   |  |
|               | R19           | KCY-M1872-000   | SHAFT                        | 1  | Spine extension shaft   |  |
|               | R20           | 91312-03010     | BOLT,HEX.SOCKET HEAD         | 4  | Spline extension shaft mounting bolt  |  |
|               | R21           | KDM-M1897-000   | BELLOWS                      | 1  | Lower bellows   |  |
|               | R22           | KDM-M1898-000   | DAMPER                       | 1  | Upper rubber for lower bellows  |  |
|               | R23           | KDM-M1790-000   | SHAFT                        | 1  | Spline lower portion extension shaft  |  |
|               | R24           | 91312-05014     | BOLT,HEX.SOCKET HEAD         | 2  | Spline lower portion extension shaft mounting bolt  |  |
|               | R25           | 90990-25J017    | BEARING                      | 1  | Bearing for lower bellows   |  |
|               | R26           | 99009-30700     | CIRCLIP                      | 1  | Circlip for bearing for lower bellows   |  |
|               | R27           | KDM-M189J-000   | DAMPER                       | 1  | Lower rubber for lower bellows  |  |
|               | R28           | KBF-M1886-000   | SEAL                         | 1  | End face seal for lower bellows (XGP and XGLP only)   |  |
|               | R29           | 90200-01J350    | O-RING                       | 2  | O-ring for lower portion of lower bellows   |  |
|               | R30           | 90990-17J025    | O-RING                       | 2  | O-ring for bearing inner ring for upper and lower bellows of extension shaft at upper portion of spline |  |
|               | R31           | 90200-01J160    | O-RING                       | 1  | O-ring for holding of bearing inner ring for lower bellows  |  |
|               | R32           | 90200-01J500    | O-RING                       | 2  | O-ring for upper portion of lower bellows   |  |
|               | R33           | 90200-01J112    | O-RING                       | 1  | Lower O-ring of spline  |  |
|               | R34           | KN3-M257K-000   | O RING,1                     | 1  | O-ring for bearing outer ring for lower bellows   |  |
|               | R35           | 92A08-05305     | SCREW, SET                   | 1  | Spline lower portion extension shaft mounting set screw   |  |
|               | R36           | 90990-25J018    | BEARING                      | 1  | Bearing for upper bellows   |  |
|               | R37           | 99009-28700     | CIRCLIP                      | 1  | Circlip for bearing for upper bellows   |  |
|               | R38           | KDM-M1899-000   | BELLOWS                      | 1  | Upper bellows   |  |
|               | R39           | KDM-M189J-000   | DAMPER                       | 2  | Rubber for upper bellows  |  |
|               | R40           | 90990-17J078    | O-RING                       | 1  | Shaft O-ring  |  |
|               | R41           | 90990-17J037    | O-RING                       | 1  | O-ring for bearing outer ring for upper bellows   |  |
|               | R42           | 90200-01J350    | O-RING                       | 2  | O-ring for upper portion of upper bellows   |  |
|               | R43           | KDM-M189K-000   | SEAL                         | 1  | End face seal for upper bellows (XGP and XGLP only)   |  |
|               | R44           | KN4-M2159-000   | O,RING 3                     | 1  | Upper O-ring for lower holder of Y-axis arm   |  |
| Cables        | C1            | KDM-M4843-001   | HARNESS,MACHINE 2            | 1  | Machine harness (R6YXGLP250)  |  |
|               |               | KDM-M4843-101   |                              | 1  | Machine harness (R6YXGLP350)  |  |
|               |               | KDM-M4843-201   |                              | 1  | Machine harness (R6YXGLP400)  |  |
|               |               | KDM-M4843-301   |                              | 1  | Machine harness (R6YXGLP500)  |  |
|               |               | KDM-M4843-401   |                              | 1  | Machine harness (R6YXGLP600)  |  |
|               |               | KDM-M4843-501   |                              | 1  | Machine harness (R6YXGLC250)  |  |
|               |               | KDM-M4843-601   |                              | 1  | Machine harness (R6YXGLC350)  |  |
|               |               | KDM-M4843-701   |                              | 1  | Machine harness (R6YXGLC400)  |  |
|               |               | KDM-M4843-801   |                              | 1  | Machine harness (R6YXGLC500)  |  |
|               | KDM-M4843-901 | 1               | Machine harness (R6YXGLC600) |  |   |  |
|               | C2            | KDM-M4874-000   | CONNECTOR E/L 4              | 1  | Connector for user wiring on base side  |  |
|               | C3            | KDM-M4872-000   | CONNECTOR E/L 2              | 1  | Connector for user wiring on base side supplied with robot  |  |
|               | C4            | KDP-M6211-000   | CABLE,ROBOT                  | 1  | Robot cable (3.5m)  |  |
|               |               | KDP-M6211-100   |                              | 1  | Robot cable (5m)  |  |
| KDP-M6211-200 |               | 1               |                              | Robot cable (10m)  |   |  |
| C5            | KDM-M4871-000 | CONNECTOR E/L 1 | 1                            | Connector for user wiring on Y-axis arm side supplied with robot |   |  |
| C6            | KDM-M4873-000 | CONNECTOR E/L 3 | 1                            | Connector for user wiring on Y-axis arm side                     |   |  |

Standard type



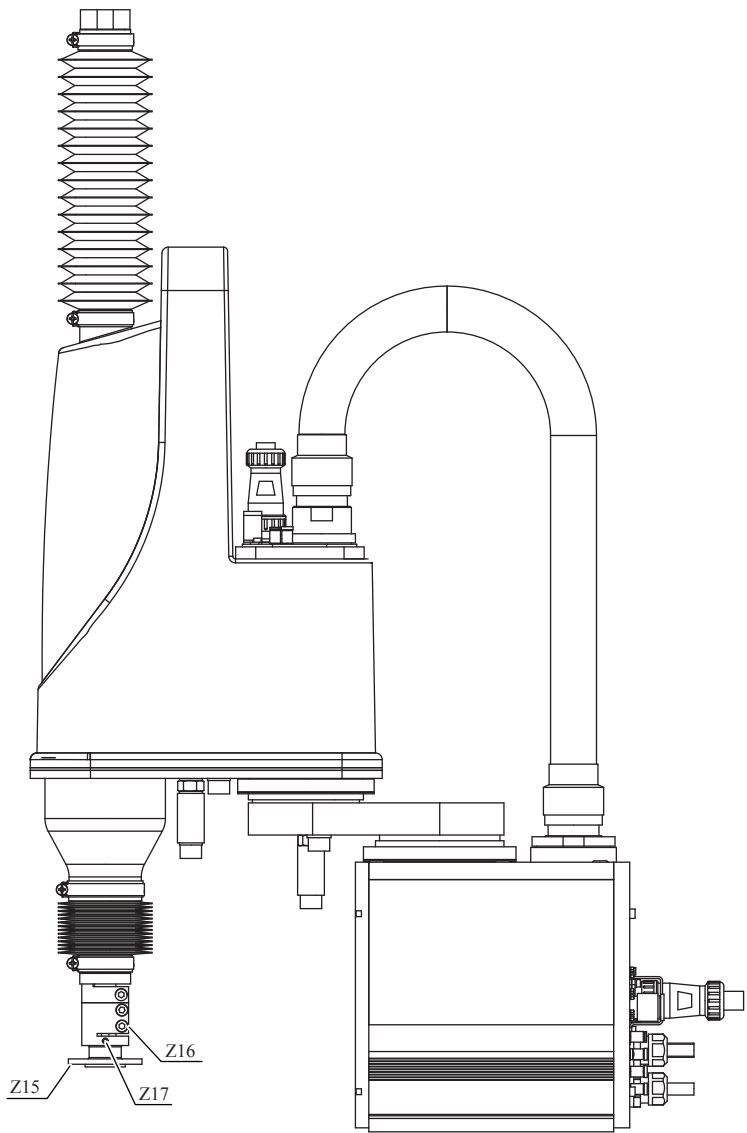
## 1.2 Tool flange mount type

|        | No.           | Part No.               | Part name              | Q'ty  | Remarks  | Recommended replacement timing                       |
|--------|---------------|------------------------|------------------------|---|--|--|
| X-axis | X1            | KCY-M2110-001          | HARMONIC DRIVE ASSY.   | 1   | Speed reduction unit   | See "2." in Chapter 5 of installation manual for XG. |
|        | X2            | KCY-M4880-001          | MOTOR ASSY.,1          | 1   | Motor  |  |
|        | X3            | KCY-M4850-400          | PROXIMITY SW. ASSY     | 1   | Sensor   |  |
|        | X4            | 98502-03030            | SCREW, PAN HEAD        | 1   | Nut for dog  |  |
|        | X5            | KN3-M2143-000          | O RING,2               | 1   | O-ring for motor mating  |  |
|        | X6            | KDM-M2134-000          | SPACER                 | 1   | Spacer for dog   |  |
|        | X7            | 91312-03030            | BOLT,HEX.SOCKET HEAD   | 11  | Arm side mounting bolt of speed reduction unit   |  |
|        | X8            | 91312-03020            | BOLT,HEX.SOCKET HEAD   | 16  | Base side mounting bolt of speed reduction unit  |  |
|        | X9            | 90200-01J900           | O-RING                 | 1   | Outer O-ring of speed reduction unit   |  |
|        | X10           | KDM-M2111-000          | SEAL                   | 1   | Joint end face seal (XGP and XGLP only)  |  |
|        | X11           | 90990-17J021           | O-RING                 | 1   | O-ring for lower bolt of harness block   |  |
|        | X12           | 90990-36J008           | WASHER SEAL            | 28  | Speed reduction unit mounting bolt, lower bolt of harness block, seal washer for user wiring connector bolt  |  |
|        | X13           | 91312-03018            | BOLT,HEX.SOCKET HEAD   | 4   | Lower bolt of harness block  |  |
|        | X14           | KDM-M1151-000          | SEAL                   | 2   | Lower seal of base plate   |  |
|        | X15           | KDM-M1315-000          | SEAL                   | 2   | Seal for base front and rear covers  |  |
|        | X16           | 91312-05014            | BOLT,HEX.SOCKET HEAD   | 4   | Bolt for base plate  |  |
|        | X17           | KN4-M257K-000          | O RING,1               | 1   | Upper O-ring of speed reduction unit   |  |
|        | X18           | KCY-M2197-000          | DAMPER,2               | 2   | Mechanical stopper damper  |  |
|        | X19           | 90990-01J066           | BOLT, HEX. SOCKET HEAD | 2   | Mechanical stopper bolt  |  |
|        | X20           | 90189-00J106           | NUT, HEXAGON           | 2   | Nut for mechanical stopper bolt  |  |
|        | X21           | 90200-01J900           | O-RING                 | 1   | Outer O-ring for arm side of speed reduction unit  |  |
|        | Y-axis        | Y1                     | KN4-M1896-000          | O RING,2  | 1  | Lower O-ring of speed reduction unit                 |
| Y2     |               | 90200-01J800           | O-RING                 | 1   | Outer O-ring for arm side of speed reduction unit  |  |
| Y3     |               | KCY-M2510-001          | HARMONIC DRIVE ASSY.   | 1   | Speed reduction unit   | See "2." in Chapter 5 of installation manual for XG. |
| Y4     |               | KCY-M4881-000          | AC SERVO MOTOR         | 1   | Motor  |  |
| Y5     |               | KCY-M4850-100          | PROXIMITY SW. ASSY.    | 1   | Sensor   |  |
| Y6     |               | KCY-M2197-000          | DAMPER,2               | 1   | Mechanical stopper damper  |  |
| Y7     |               | 90189-00J106           | NUT, HEXAGON           | 1   | Nut for mechanical stopper bolt  |  |
| Y8     |               | 91312-04008            | BOLT,HEX.SOCKET HEAD   | 2   | Motor mounting bolt  |  |
| Y9     |               | KN3-M257K-000          | O RING,1               | 1   | O-ring for motor mating  |  |
| Y10    |               | KCY-M1314-001          | COVER,4                | 1   | Y-axis cover   |  |
| Y11    |               | KDM-M1567-000          | SEAL                   | 1   | Upper seal of lower Y-axis arm cover (R6YXGLC(P)250 to R6YXGLC(P)400)  |  |
|        |               | KDM-M1567-100          |                        | 1   | Upper seal of lower Y-axis arm cover (R6YXGLC(P)500, R6YXGLC(P)600)  |  |
| Y12    |               | 91312-03030            | BOLT,HEX.SOCKET HEAD   | 11  | Mounting bolt on X-axis arm side of speed reduction unit   |  |
| Y13    |               | KDM-M2511-000          | SEAL                   | 1   | Joint end face seal (XGP and XGLP only)  |  |
| Y14    |               | 90200-01J800           | O-RING                 | 1   | Outer O-ring of speed reduction unit   |  |
| Y15    |               | 90990-36J010           | WASHER SEAL            | 3   | Seal washer for mechanical stopper bolt  |  |
| Y16    |               | 90990-36J008           | WASHER SEAL            | 23  | Seal washer for Y-axis arm side mounting bolt of speed reduction unit, lower mounting screw of Y-axis cover, mounting bolt of parts around harness block |  |
| Y17    |               | 98980-03012            | SCREW, BINDING HEAD    | 4   | Lower mounting screw of Y-axis cover   |  |
| Y18    |               | KDM-M2534-000          | SPACER                 | 1   | Spacer for dog   |  |
| Y19    |               | 98502-03030            | SCREW, PAN HEAD        | 1   | Nut for dog  |  |
| Y20    |               | KDM-M1568-000          | SEAL                   | 1   | Lower seal for lower Y-axis arm cover (R6YXGLC(P)250 to R6YXGLC(P)400)   |  |
|        |               | KDM-M1568-100          |                        | 1   | Lower seal for lower Y-axis arm cover (R6YXGLC(P)500, R6YXGLC(P)600)   |  |
| Y21    | 91312-03022   | BOLT,HEX.SOCKET HEAD   | 15                     | Y-axis arm side mounting bolt of speed reduction unit         |  |  |
| Y22    | KDM-M1327-000 | SEAL                   | 1                      | Lower seal for harness block                                  |  |  |
| Y23    | 91380-03018   | BOLT,HEX.SOCKET HEAD   | 8                      | Mounting bolt of harness block and parts around harness block |  |  |
| Y24    | KDM-M1328-000 | SEAL                   | 1                      | Inner seal for parts around harness block                     |  |  |
| Y25    | KDM-M1329-000 | SEAL                   | 1                      | Outer seal for parts around harness block                     |  |  |
| Y26    | 90990-01J067  | BOLT, HEX. SOCKET HEAD | 1                      | Mechanical stopper bolt                                       |  |  |
| Z-axis | Z1            | KCY-M4882-001          | MOTOR ASSY.,3          | 1   | Motor  | These parts need to be replaced as a set.            |
|        | Z2            | 91312-04012            | BOLT,HEX.SOCKET HEAD   | 2   | Motor mounting bolt  |  |
|        | Z3            | KCY-M1753-000          | COUPLING               | 1   | Coupling   |  |
|        | Z4            | KCY-M1750-000          | SCREW,BALL             | 1   | Ball screw   |  |
|        | Z5            | KCY-M1744-000          | PLATE                  | 1   | Bearing outer ring holding plate   |  |
|        | Z6            | KAI-M2273-000          | BEARING                | 1   | Ball screw support bearing   |  |
|        | Z7            | KCY-M1788-000          | DAMPER,1               | 1   | Lower end damper   |  |
|        | Z8            | 90112-2AJ010           | BOLT,HEX.SOCKET HEAD   | 8   | Bolt for outer ring holding plate  |  |
|        | Z9            | KCY-M1778-000          | SLEEVE,LOCK 1          | 1   | Bearing inner ring holding plate   |  |
|        | Z10           | KCY-M1712-000          | HOLDER                 | 1   | Bearing housing  |  |
|        | Z11           | 91312-03014            | BOLT,HEX.SOCKET HEAD   | 4   | Ball screw mounting bolt   |  |
|        | Z12           | 91312-04014            | BOLT,HEX.SOCKET HEAD   | 4   | Z-axis ASSY mounting bolt  |  |
| Z13    | 90933-01J002  | BEARING                | 2                      | Upper bearing of ball spline shaft                            |  |  |
| Z15    | KCY-M1790-000 | SHAFT                  | 1                      | Tool flange   |  |  |
| Z16    | 91312-05014   | BOLT,HEX.SOCKET HEAD   | 2                      | Tool flange mounting bolt                                     |  |  |
| Z17    | 92A08-05308   | SCREW,SET              | 1                      | Tool flange mounting set screw                                |  |  |

|        | No.           | Part No.        | Part name            | Q'ty   | Remarks   | Recommended replacement timing                       |
|--------|---------------|-----------------|----------------------|--|---|--|
| R-axis | R1            | KCY-M1821-000   | HARMONIC DRIVE ASSY. | 1  | Speed reduction unit  | See "2." in Chapter 5 of installation manual for XG. |
|        | R2            | KN3-M1895-000   | O RING               | 1  | Lower O-ring of speed reduction unit  |  |
|        | R3            | 91312-03022     | BOLT,HEX.SOCKET HEAD | 8  | Speed reduction unit mounting bolt  |  |
|        | R4            | 90990-17J034    | O-RING               | 1  | O-ring for input part of speed reduction unit   |  |
|        | R5            | 90990-36J008    | WASHER SEAL          | 12   | Seal washer for speed reduction unit mounting bolt  |  |
|        | R6            | 91312-03014     | BOLT,HEX.SOCKET HEAD | 12   | Speed reduction unit mounting bolt  |  |
|        | R7            | KDM-M1888-000   | DOG,R                | 1  | Nut for dog   |  |
|        | R8            | 90990-28J064    | WASHER,PLAIN         | 1  | Washer for upper dog of speed reduction unit  |  |
|        | R9            | KCY-M4883-000   | MOTOR ASSY.,3        | 1  | Motor   |  |
|        | R10           | 91312-05016     | BOLT HEX.SOCKET HEAD | 4  | Motor mounting bolt   |  |
|        | R11           | KN3-M2144-000   | O RING,3             | 1  | Lower O-ring of motor   |  |
|        | R12           | KDM-M4850-400   | PROXIMITY SW. ASSY.  | 1  | Sensor  |  |
|        | R13           | KCY-M1840-001   | SPLINE,BALL          | 1  | Ball spline   | These parts need to be replaced as a set.            |
|        | R14           | 90990-17J032    | O-RING               | 1  | Upper O-ring of ball spline nut (outside)   |  |
|        | R15           | KN5-M181H-000   | O RING,4             | 1  | Upper O-ring of ball spline nut (inside)  |  |
|        | R16           | 90990-36J002    | WASHER,SEAL          | 4  | Seal washer for ball spline nut mounting bolt   |  |
|        | R17           | 91312-04012     | BOLT,HEX.SOCKET HEAD | 4  | Ball spline nut mounting bolt   |  |
|        | R18           | KCY-M1886-000   | SEAL                 | 1  | End face seal inside speed reduction unit   |  |
|        | R19           | KCY-M1872-000   | SHAFT                | 1  | Spine extension shaft   |  |
|        | R20           | 91312-03010     | BOLT,HEX.SOCKET HEAD | 4  | Spline extension shaft mounting bolt  |  |
|        | R21           | KDM-M1897-000   | BELLOWS              | 1  | Lower bellows   |  |
|        | R22           | KDM-M1898-000   | DAMPER               | 1  | Upper rubber for lower bellows  |  |
|        | R23           | KDM-M1790-000   | SHAFT                | 1  | Spline lower portion extension shaft  |  |
|        | R24           | 91312-05014     | BOLT,HEX.SOCKET HEAD | 2  | Spline lower portion extension shaft mounting bolt  |  |
|        | R25           | 90990-25J017    | BEARING              | 1  | Bearing for lower bellows   |  |
|        | R26           | 99009-30700     | CIRCLIP              | 1  | Circlip for bearing for lower bellows   |  |
|        | R27           | KDM-M189J-000   | DAMPER               | 1  | Lower rubber for lower bellows  |  |
|        | R28           | KBF-M1886-000   | SEAL                 | 1  | End face seal for lower bellows (XGP and XGLP only)   |  |
|        | R29           | 90200-01J350    | O-RING               | 2  | O-ring for lower portion of lower bellows   |  |
|        | R30           | 90990-17J025    | O-RING               | 2  | O-ring for bearing inner ring for upper and lower bellows of extension shaft at upper portion of spline |  |
|        | R31           | 90200-01J160    | O-RING               | 1  | O-ring for holding of bearing inner ring for lower bellows  |  |
|        | R32           | 90200-01J500    | O-RING               | 2  | O-ring for upper portion of lower bellows   |  |
|        | R33           | 90200-01J112    | O-RING               | 1  | Lower O-ring of spline  |  |
|        | R34           | KN3-M257K-000   | O RING,1             | 1  | O-ring for bearing outer ring for lower bellows   |  |
|        | R35           | 92A08-05305     | SCREW, SET           | 1  | Spline lower portion extension shaft mounting set screw   |  |
|        | R36           | 90990-25J018    | BEARING              | 1  | Bearing for upper bellows   |  |
|        | R37           | 99009-28700     | CIRCLIP              | 1  | Circlip for bearing for upper bellows   |  |
|        | R38           | KDM-M1899-000   | BELLOWS              | 1  | Upper bellows   |  |
|        | R39           | KDM-M189J-000   | DAMPER               | 2  | Rubber for upper bellows  |  |
|        | R40           | 90990-17J078    | O-RING               | 1  | Shaft O-ring  |  |
|        | R41           | 90990-17J037    | O-RING               | 1  | O-ring for bearing outer ring for upper bellows   |  |
|        | R42           | 90200-01J350    | O-RING               | 2  | O-ring for upper portion of upper bellows   |  |
|        | R43           | KDM-M189K-000   | SEAL                 | 1  | End face seal for upper bellows (XGP and XGLP only)   |  |
|        | R44           | KN4-M2159-000   | O,RING 3             | 1  | Upper O-ring for lower holder of Y-axis arm   |  |
| Cables | C1            | KDM-M4843-001   | HARNESS,MACHINE 2    | 1  | Machine harness (R6YXGLP250)  |  |
|        |               | KDM-M4843-101   |                      | 1  | Machine harness (R6YXGLP350)  |  |
|        |               | KDM-M4843-201   |                      | 1  | Machine harness (R6YXGLP400)  |  |
|        |               | KDM-M4843-301   |                      | 1  | Machine harness (R6YXGLP500)  |  |
|        |               | KDM-M4843-401   |                      | 1  | Machine harness (R6YXGLP600)  |  |
|        |               | KDM-M4843-501   |                      | 1  | Machine harness (R6YXGLC250)  |  |
|        |               | KDM-M4843-601   |                      | 1  | Machine harness (R6YXGLC350)  |  |
|        |               | KDM-M4843-701   |                      | 1  | Machine harness (R6YXGLC400)  |  |
|        |               | KDM-M4843-801   |                      | 1  | Machine harness (R6YXGLC500)  |  |
|        |               | KDM-M4843-901   |                      | 1  | Machine harness (R6YXGLC600)  |  |
|        | C2            | KDM-M4874-000   | CONNECTOR E/L 4      | 1  | Connector for user wiring on base side  |  |
|        | C3            | KDM-M4872-000   | CONNECTOR E/L 2      | 1  | Connector for user wiring on base side supplied with robot  |  |
|        | C4            | KDP-M6211-000   | CABLE,ROBOT          | 1  | Robot cable (3.5m)  |  |
|        |               | KDP-M6211-100   |                      | 1  | Robot cable (5m)  |  |
|        |               | KDP-M6211-200   |                      | 1  | Robot cable (10m)   |  |
|        | C5            | KDM-M4871-000   | CONNECTOR E/L 1      | 1  | Connector for user wiring on Y-axis arm side supplied with robot  |  |
| C6     | KDM-M4873-000 | CONNECTOR E/L 3 | 1                    | Connector for user wiring on Y-axis arm side |   |  |

**Tool flange mount type**

(Only the parts different from those of the standard type are shown.)



## 2. Consumable parts



### NOTE

For details about consumable part locations, see "1. Maintenance parts" in this chapter.

### Machine harness

| Robot model | Consumable part | Q'ty | Remarks         |
|-------------|-----------------|------|-----------------|
| R6YXGLP250  | KDM-M4843-000   | 1    | Machine harness |
| R6YXGLP350  | KDM-M4843-100   | 1    | Machine harness |
| R6YXGLP400  | KDM-M4843-200   | 1    | Machine harness |
| R6YXGLP500  | KDM-M4843-300   | 1    | Machine harness |
| R6YXGLP600  | KDM-M4843-400   | 1    | Machine harness |
| R6YXGLC250  | KDM-M4843-500   | 1    | Machine harness |
| R6YXGLC350  | KDM-M4843-600   | 1    | Machine harness |
| R6YXGLC400  | KDM-M4843-700   | 1    | Machine harness |
| R6YXGLC500  | KDM-M4843-800   | 1    | Machine harness |
| R6YXGLC600  | KDM-M4843-900   | 1    | Machine harness |
| R6YXGP500   | KDN-M4843-000   | 1    | Machine harness |
| R6YXGP600   | KDN-M4843-100   | 2    | Machine harness |
| R6YXGHP600  | KDP-M4843-000   | 3    | Machine harness |
| R6YXGP700   | KDP-M4843-100   | 4    | Machine harness |
| R6YXGP800   | KDP-M4843-200   | 5    | Machine harness |
| R6YXGP900   | KDP-M4843-300   | 6    | Machine harness |
| R6YXGP1000  | KDP-M4843-400   | 7    | Machine harness |

### Bellows

| Robot model  | Stroke | Consumable part | Q'ty | Remarks       |
|--|--------|-----------------|------|---------------|
| R6YXGLC250, R6YXGLC350,<br>R6YXGLC400, R6YXGLC500,<br>R6YXGLC600 |        | KDM-M1899-000   | 1    | Upper bellows |
| R6YXGLP250, R6YXGLP350,<br>R6YXGLP400, R6YXGLP500,<br>R6YXGLP600 |        | KDM-M1897-100   | 1    | Lower bellows |
| R6YXGP500, R6YXGP600, R6YXGHP600,<br>R6YXGP700, R6YXGP800        | 200    | KDP-M1899-00x   | 1    |               |
| R6YXGP500, R6YXGP600   | 300    | KDP-M1899-10x   | 1    |               |
| R6YXGHP600, R6YXGP700, R6YXGP800,<br>R6YXGP900, R6YXGP1000       | 400    | KDP-M1899-20x   | 1    |               |

### 3. Basic specification

| Robot model                                   |                | R6YXGLC(P)250   | R6YXGLC(P)350 | R6YXGLC(P)400 | R6YXGLC(P)500 | R6YXGLC(P)600 |       |
|---|----------------|---|---------------|---------------|---------------|---------------|-------|
| Axis specifications                           | X-axis         | Arm length  | 100mm         | 200mm         | 250mm         | 250mm         | 350mm |
|   |                | Rotation angle  | ±129°         |               |               |               |       |
|   | Y-axis         | Arm length  | 150mm         |               |               | 250mm         |       |
|   |                | Rotation angle  | ±134°         |               | ±144°         |               |       |
|   | Z-axis         | Stroke  | 150mm         |               |               |               |       |
| R-axis  | Rotation angle | ±360°   |               |               |               |               |       |
| Motor   | X-axis         | 200W  |               |               |               |               |       |
|   | Y-axis         | 150W  |               |               |               |               |       |
|   | Z-axis         | 50W   |               |               |               |               |       |
|   | R-axis         | 100W  |               |               |               |               |       |
| Maximum speed                                 | XY resultant   | 4.5m/s  | 5.6m/s        | 6.1m/s        | 5.1m/s        | 4.9m/s        |       |
|   | Z-axis         | 1.1m/s  |               |               |               |               |       |
|   | R-axis         | 1020°/s   |               |               |               |               |       |
| Repeatability (*1)                            | XY-axes        | ±0.01mm   |               |               |               |               |       |
|   | Z-axis         | ±0.01mm   |               |               |               |               |       |
|   | R-axis         | ±0.004°   |               |               |               |               |       |
| Payload                                       |                | 4kg   |               |               |               |               |       |
| R-axis tolerable moment of inertia (*2)       |                | 0.05kgm <sup>2</sup> (0.5kgfcm <sup>2</sup> )             |               |               |               |               |       |
| User wiring                                   |                | 10 cables   |               |               |               |               |       |
| User tubing                                   |                | ∅4×4  |               |               |               |               |       |
| Travel limit                                  |                | 1.Soft limit 2.Mechanical stopper (XYZ-axes)              |               |               |               |               |       |
| Robot cable                                   |                | 3.5m (option: 5m, 10m)                                    |               |               |               |               |       |
| Weight  |                | 21.5kg  | 22kg          | 22.5kg        | 25kg          | 26kg          |       |
| Degree of cleanliness (R6YXG(L)C)             |                | Class ISO 3 (ISO14644-1), Suction air flow 30N0/min. (*3) |               |               |               |               |       |
| Dust/drip proof protection rating (R6YXG(L)P) |                | IP65 (IEC60529) or its equivalent (*4)                    |               |               |               |               |       |

\*1: At constant ambient temperature (XY)

\*2: There are limits to acceleration coefficient settings.

\*3: Class 10 (0.1µm) FED-STD-209D or its equivalent

The required suction air flow may vary depending on the operating conditions or environment.

\*4: Do not splash the jet flow onto the bellows directly.

For details about drip proof performance for fluid other than water, contact your distributor.

\* The Z-axis spline may vibrate in a Z-axis operation speed range of 20% to 40% depending on the arm position or Z-axis position. If the Z-axis spline vibrates, operate it beyond this operation speed range.

#### Noise level

| Equivalent sound level of robot, Laeq (A)<br>(when there is 10dB or larger difference from the back ground sound pressure level) | Position where the noise level is measured                                     |
|--|--|
| 75.1dB   | 1.25m apart from the back of the robot,<br>1.6m height from the floor surface. |

Note: The noise level can be higher when the robot is set nearby the objects that cause sound reflection.



| Robot model                                   |                | R6YXGP500                                    | R6YXGP600   |
|---|----------------|--|-------------|
| Axis specifications                           | X-axis         | Arm length                                   | 200mm       |
|   |                | Rotation angle                               | ±130°       |
|   | Y-axis         | Arm length                                   | 300mm       |
|   |                | Rotation angle                               | ±145°       |
|   | Z-axis         | Stroke                                       | 200mm/300mm |
| R-axis  | Rotation angle | ±360°  |             |
| Motor   | X-axis         | 400W   |             |
|   | Y-axis         | 200W   |             |
|   | Z-axis         | 200W   |             |
|   | R-axis         | 200W   |             |
| Maximum speed                                 | XY resultant   | 7.6m/sec                                     | 8.4m/sec    |
|   | Z-axis         | 2.3m/sec(200st), 1.7m/sec(300st)             |             |
|   | R-axis         | 1700°/sec                                    |             |
| Repeatability (*1)                            | XY-axes        | ±0.01mm                                      |             |
|   | Z-axis         | ±0.01mm                                      |             |
|   | R-axis         | ±0.004°                                      |             |
| Payload                                       |                | 8kg  |             |
| R-axis tolerable moment of inertia (*2)       |                | 0.30kgm <sup>2</sup>                         |             |
| User wiring                                   |                | 20 cables                                    |             |
| User tubing                                   |                | ∅6×3   |             |
| Travel limit                                  |                | 1.Soft limit 2.Mechanical stopper (XYZ-axes) |             |
| Robot cable                                   |                | 3.5m (option: 5m, 10m)                       |             |
| Weight  |                | 33kg   | 34kg        |
| Dust/drip proof protection rating (R6YXG(L)P) |                | IP65 (IEC60529) or its equivalent (*3)       |             |

\*1: At constant ambient temperature (XY-axes)

\*2: There are limits to acceleration coefficient settings.

\*3: Do not splash the jet flow onto the bellows directly.

For details about drip proof performance for fluid other than water, contact your distributor.

### Noise level

| Equivalent sound level of robot, Laeq (A)<br>(when there is 10dB or larger difference from the back ground sound pressure level) | Position where the noise level is measured                                     |
|--|--|
| 76.2dB   | 1.25m apart from the back of the robot,<br>1.6m height from the floor surface. |

| Robot model                                   |                | R6YXGHP600                                   | R6YXGP700   | R6YXGP800  | R6YXGP900  | R6YXGP1000 |       |
|---|----------------|--|-------------|------------|------------|------------|-------|
| Axis specifications                           | X-axis         | Arm length                                   | 200mm       | 300mm      | 400mm      | 500mm      | 600mm |
|   |                | Rotation angle                               | ±130°       |            |            |            |       |
|   | Y-axis         | Arm length                                   | 400mm       |            |            |            |       |
|   |                | Rotation angle                               | ±150°       |            |            |            |       |
|   | Z-axis         | Stroke                                       | 200mm/400mm |            |            |            |       |
| R-axis  | Rotation angle | ±360°  |             |            |            |            |       |
| Motor   | X-axis         | 750W   |             |            |            |            |       |
|   | Y-axis         | 400W   |             |            |            |            |       |
|   | Z-axis         | 400W   |             |            |            |            |       |
|   | R-axis         | 200W   |             |            |            |            |       |
| Maximum speed                                 | XY resultant   | 7.7m/sec                                     | 8.4m/sec    | 9.2m/sec   | 9.9m/sec   | 10.6m/sec  |       |
|   | Z-axis         | 2.3m/sec(200st), 1.7m/sec(400st)             |             |            |            |            |       |
|   | R-axis         | 920°/sec                                     |             |            |            |            |       |
| Repeatability (*1)                            | XY-axes        | ±0.02mm                                      |             |            |            |            |       |
|   | Z-axis         | ±0.01mm                                      |             |            |            |            |       |
|   | R-axis         | ±0.004°                                      |             |            |            |            |       |
| Payload                                       |                | 18kg   |             |            |            |            |       |
| R-axis tolerable moment of inertia (*2)       |                | 1.0kgm <sup>2</sup>                          |             |            |            |            |       |
| User wiring                                   |                | 20 cables                                    |             |            |            |            |       |
| User tubing                                   |                | ∅6×3   |             |            |            |            |       |
| Travel limit                                  |                | 1.Soft limit 2.Mechanical stopper (XYZ-axes) |             |            |            |            |       |
| Robot cable                                   |                | 3.5m (option: 5m, 10m)                       |             |            |            |            |       |
| Weight  |                | 52kg, 54kg                                   | 54kg, 56kg  | 56kg, 58kg | 58kg, 60kg | 60kg, 62kg |       |
| Dust/drip proof protection rating (R6YXG(L)P) |                | IP65 (IEC60529) or its equivalent (*3)       |             |            |            |            |       |

\*1: At constant ambient temperature (XY-axes)

\*2: There are limits to acceleration coefficient settings.

\*3: Do not splash the jet flow onto the bellows directly.

For details about drip proof performance for fluid other than water, contact your distributor.

### Noise level

| Equivalent sound level of robot, Laeq (A)<br>(when there is 10dB or larger difference from the back ground sound pressure level) | Position where the noise level is measured                                    |
|--|---|
| 78.4dB   | 1.0m apart from the back of the robot,<br>1.6m height from the floor surface. |



## Revision history

A manual revision code appears as a suffix to the catalog number on the front cover manual.

Cat. No. I159E-EN-01



The following table outlines the changes made to the manual during each revision.

| Revision code | Date         | Description         |
|---------------|--------------|---------------------|
| 01            | October 2013 | Original production |



# OMRON

**Authorized Distributor:**