Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

The DX100 operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.
MANDATORY

• This instruction manual is intended to explain mainly on the mechanical part of the MOTOMAN-MCL130 for the application to the actual operation and for proper maintenance and inspection. It describes on safety and handling, details on specifications, necessary items on maintenance and inspection, to explain operating instructions and maintenance procedures. Be sure to read and understand this instruction manual thoroughly before installing and operating the manipulator.

• General items related to safety are listed in Chapter 1: Safety of the DX100 Instructions. To ensure correct and safe operation, carefully read the DX100 Instructions before reading this manual.

CAUTION

• Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.

• The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

• YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

• If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the MOTOMAN-MCL130.

In this manual, the Notes for Safe Operation are classified as "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".

- **WARNING**: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

- **CAUTION**: Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.

- **MANDATORY**: Always be sure to follow explicitly the items listed under this heading.

- **PROHIBITED**: Must never be performed.

Even items described as "CAUTION" may result in a serious accident in some situations. At any rate, be sure to follow these important items.

To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as "CAUTION" and "WARNING".
WARNING

- Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX100 and the programming pendant. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

  Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

  Fig. : Emergency Stop Button

- Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

  Injury may result from unintentional or unexpected manipulator motion.

  Fig. : Release of Emergency Stop

- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Keep in mind the emergency response measures against the manipulator’s unexpected motion toward you.
  - Ensure that you have a safe place to retreat in case of emergency.

  Improper or unintended manipulator operation may result in injury.

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning ON the power for the DX100.
  - Moving the manipulator with the programming pendant.
  - Running the system in the check mode.
  - Performing automatic operations.

  Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem.

  The emergency stop buttons are located on the right of front door of the DX100 and the programming pendant.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product. The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and manipulator cables.

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX100 controller</td>
<td>DX100</td>
</tr>
<tr>
<td>DX100 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>

CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the cabinet of the DX100 after use.
- The programming pendant can be damaged if it is left in the manipulator’s work area, on the floor, or near fixtures.
- Read and understand the Explanation of Warning Labels in the DX100 Instructions before operating the manipulator:
**Explanation of Warning Labels**

The following warning labels are attached to the manipulator.
Always follow the warnings on the labels.

Also, an identification label with important information is placed on the body of the manipulator. Prior to operating the manipulator, confirm the contents.

*Fig.: Warning Label Locations*
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  1.1 Checking Package Contents .................................................................................................. 1-1
  1.2 Checking the Order Number .............................................................................................. 1-2
2 Transporting .................................................................................................................................. 2-1
  2.1 Transporting Method ........................................................................................................ 2-1
    2.1.1 Using the Crane ........................................................................................................ 2-1
  2.2 Shipping Bolts and Brackets .............................................................................................. 2-3
  2.3 After Removing the Shipping Bolts and Brackets .............................................................. 2-4
3 Installation ..................................................................................................................................... 3-1
  3.1 Installation of Safeguarding ............................................................................................... 3-2
  3.2 Mounting Procedures for Manipulator Base ................................................................ 3-2
    3.2.1 When the Manipulator and Mounting Fixture are Installed on a Common Base .......... 3-3
    3.2.2 When the Manipulator is Mounted Directly on the Floor ........................................ 3-3
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  5.3 Part Names and Working Axes ........................................................................................... 5-3
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  5.6 B-axis Working Range ......................................................................................................... 5-5
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7 System Application

7.1 Peripheral Equipment Mounts

7.2 Internal User I/O Wiring Harnesses and Air Line

8 HMOTOMAN Construction

8.1 Position of S-axis Limit Switch

8.2 Internal Connections

9 Maintenance and Inspection

9.1 Inspection Schedule

9.2 Notes on Maintenance Procedures

9.2.1 Battery Pack Replacement

9.2.2 Grease Replenishment/Replacement for S-axis Speed Reducer and Gear

9.2.2.1 Grease Replenishment (Refer to fig. 9-5 “S-axis Speed Reducer and Gear Diagram”)

9.2.2.2 Grease Replacement (Refer to fig. 9-5 “S-axis Speed Reducer and Gear Diagram” at page 9-8)

9.2.3 Grease Replenishment/Replacement for L-axis Speed Reducer

9.2.3.1 Grease Replenishment (Refer to fig. 9-6 “L-axis Speed Reducer Diagram”)

9.2.3.2 Grease Replacement (Refer to fig. 9-6 “L-axis Speed Reducer Diagram” at page 9-10)

9.2.4 Grease Replenishment/Replacement for U-axis Speed Reducer

9.2.4.1 Grease Replenishment (Refer to fig. 9-7 “U-axis Speed Reducer Diagram”)

9.2.4.2 Grease Replacement (Refer to fig. 9-7 “U-axis Speed Reducer Diagram” at page 9-12)

9.2.5 Grease Replenishment/Replacement for R-axis Speed Reducer

9.2.5.1 Grease Replenishment (Refer to chapter Fig. 9-8: “R-axis Speed Reducer Diagram”)

9.2.5.2 Grease Replacement (Refer to fig. 9-8 “R-axis Speed Reducer Diagram” at page 9-14)

9.2.6 Grease Replenishment/Replacement for B-axis Speed Reducer and Gear

9.2.6.1 Grease Replenishment (Refer to fig. 9-9 “B-axis Speed Reducer and Gear Diagram”)

9.2.6.2 Grease Replacement (Refer to fig. 9-9 “B-axis Speed Reducer and Gear Diagram” at page 9-16)

9.2.7 Grease Replenishment/Replacement for T-axis Speed Reducer and Gear

9.2.7.1 Grease Replenishment (Refer to fig. 9-10 “T-axis Speed Reducer and Gear Diagram”)

9.2.7.2 Grease Replacement (Refer to fig. 9-10 “T-axis Speed Reducer and Gear Diagram” at page 9-18)

9.2.8 Grease Replenishment for Balancer Connection Part

9.2.9 Notes for Maintenance

9.2.9.1 Battery Pack Connection for S-, L-, and U-axes Motors
9.2.9.2 Battery Pack Connection for R-, B-, and T-axes Motors ....................... 9-21

10 Recommended Spare Parts................................................................................................. 10-1
1.1 Checking Package Contents

When the package arrives, check the contents for the following standard items (Any additional options ordered should be checked as well):

- Manipulator
- DX100
- Programming pendant
- Manipulator cables (three cables)
- Accessories

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexagon socket head cap bolt M20 × 90mm: Anti-corrosive</td>
<td>8</td>
</tr>
<tr>
<td>Flat washer M20: Anti-corrosive</td>
<td>8</td>
</tr>
<tr>
<td>Spring washer M20: Anti-corrosive</td>
<td>8</td>
</tr>
<tr>
<td>Flat washer M12: Anti-corrosive</td>
<td>4</td>
</tr>
<tr>
<td>Hexagon socket head cap bolt M12 × 35mm: Anti-corrosive</td>
<td>8</td>
</tr>
<tr>
<td>Hexagon socket head cap bolt M8 × 20mm: Anti-corrosive</td>
<td>2</td>
</tr>
<tr>
<td>Plate A: Anti-corrosive</td>
<td>2</td>
</tr>
<tr>
<td>Plate B: Anti-corrosive</td>
<td>1</td>
</tr>
<tr>
<td>Plate C: Anti-corrosive</td>
<td>1</td>
</tr>
<tr>
<td>Hexagon wrench × 17mm</td>
<td>1</td>
</tr>
</tbody>
</table>
1.2 Checking the Order Number

Check that the order number of the manipulator corresponds to the DX100. The order number is located on a label as shown below.

Fig. 1-1: Location of Order Number Labels
2 Transporting

2.1 Transporting Method

2.1.1 Using the Crane

As a rule, when removing the manipulator from the package and moving it, a crane should be used. The manipulator should be lifted using wire rope threaded through attached eyebolts. Be sure the manipulator is fixed with shipping bolts and brackets before transporting, and lift it in the posture as shown in fig. 2-1 “Transporting Position” at page 2-2.

**CAUTION**

- **Sling and crane or forklift operations must be performed by authorized personnel only.**
  
  Failure to observe this caution may result in injury or damage.

- **Avoid excessive vibration or shock during transporting.**
  
  The system consists of precision components, so failure to observe this caution may adversely affect performance.
2 Transporting MCL130

2.1 Transporting Method

Fig. 2-1: Transporting Position

- Check that the eyebolts are securely fastened.
- The mass of the manipulator is approximately 1400kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the weight.
- Attached eyebolts are designed to support the manipulator weight. Do not use them for anything other than transporting the manipulator.
- Mount the shipping bolts and brackets for transporting the manipulator.
- Avoid external force on the arm or motor unit when transporting. Use caution when using transporting equipment other than a crane or forklift, as injury may occur.
2.2 Shipping Bolts and Brackets

The manipulator is provided with shipping bolts and brackets at points A, B, and C (fig. 2-1 “Transporting Position” at page 2-2).

• The shipping bolts and brackets are painted yellow.

<table>
<thead>
<tr>
<th>Installing Location</th>
<th>Anti-corrosive Bolt</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Hexagon socket head cap bolt M8 × 20mm (Tensile strength: 1200N/mm² or more)</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>Hexagon socket head cap bolt M12 × 50mm (Tensile strength: 1200N/mm² or more)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Hexagon socket head cap bolt M12 × 35mm (Tensile strength: 1200N/mm² or more)</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>Hexagon socket head cap bolt M12 × 50mm (Tensile strength: 1200N/mm² or more)</td>
<td>4</td>
</tr>
</tbody>
</table>

NOTE

Before turning ON the power, check to be sure that the shipping bolts and brackets have been removed. The shipping bolts and brackets then must be stored for future use, in the event that the manipulator must be moved again.
### 2.3 After Removing the Shipping Bolts and Brackets

After removing the shipping bolts and brackets, install the parts described in the following table on each installing location in fig. 2-2 “After Removing the Shipping Bolts and Brackets” for preventing corrosion.

*Fig. 2-2: After Removing the Shipping Bolts and Brackets*

<table>
<thead>
<tr>
<th>Installing Location</th>
<th>Anti-corrosive Bolt</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Four locations)</td>
<td>Flat washer M12</td>
<td>1 (Four locations)</td>
</tr>
<tr>
<td></td>
<td>Hexagon socket head cap bolt M12 × 35mm</td>
<td>1 (Four locations)</td>
</tr>
<tr>
<td>B (Two locations)</td>
<td>Plate A</td>
<td>1 (Two locations)</td>
</tr>
<tr>
<td></td>
<td>Hexagon socket head cap bolt M12 × 35mm</td>
<td>2 (Two locations)</td>
</tr>
<tr>
<td>C</td>
<td>Plate B</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Hexagon socket head cap bolt M12 × 35mm</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>Plate C</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Hexagon socket head cap bolt M8 × 20mm</td>
<td>2</td>
</tr>
</tbody>
</table>
3 Installation

**WARNING**

- Install the safeguarding.
  Failure to observe this warning may result in injury or damage.

- Install the manipulator in a location where the fully extended arm and tool will not reach the wall, safeguarding, or DX100.
  Failure to observe this warning may result in injury or damage.

- Do not start the manipulator or even turn ON the power before it is firmly anchored.
  The manipulator may overturn and cause injury or damage.

**CAUTION**

- Do not install or operate a manipulator that is damaged or lacking parts.
  Failure to observe this caution may cause injury or damage.

- Before turning ON the power, check to be sure that the shipping bolts and brackets have been removed.
  Failure to observe this caution may result in damage to the driving parts.
3.1 Installation of Safeguarding

To insure safety, be sure to install the safeguarding. It prevents unforeseen accidents with personnel and damage to equipment. The following is quoted for your information and guidance.

(ISO10218)

Responsibility for Safeguarding

The user of a manipulator or robot system shall ensure that the safeguarding is provided and used in accordance with Sections 6, 7, and 8 of this standard. The means and degree of safeguarding, including any redundancies, shall correspond directly to the type and level of hazard presented by the robot system consistent with the robot application. Safeguarding may include but not be limited to safeguarding devices, barriers, interlock barriers, perimeter guarding, awareness barriers, and awareness signals.

3.2 Mounting Procedures for Manipulator Base

The manipulator should be firmly mounted on a base or foundation strong enough to support the manipulator and withstand repulsion forces during acceleration and deceleration.

Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the manipulator as shown in table 3-1 “Maximum Repulsion Forces of the Manipulator”

During installation, if the flatness is not right, the manipulator shape may change and its functional ability may be compromised. The flatness for installation must be kept at 0.5mm or less. Mount the manipulator base in either of the following ways: chapter 3.2.1 “When the Manipulator and Mounting Fixture are Installed on a Common Base” at page 3-3 or chapter 3.2.2 “When the Manipulator is Mounted Directly on the Floor” at page 3-3

<table>
<thead>
<tr>
<th>Table 3-1: Maximum Repulsion Forces of the Manipulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal rotating maximum torque (S-axis moving direction)</td>
</tr>
<tr>
<td>Vertical rotating maximum torque (LU-axis moving direction)</td>
</tr>
</tbody>
</table>
3.2 Mounting Procedures for Manipulator Base

3.2.1 When the Manipulator and Mounting Fixture are Installed on a Common Base

The common base should be rugged and durable to prevent shifting of the manipulator or the mounting fixture. The thickness of the common base is 50mm or more and an M20 size or larger anchor bolt is recommended. For the installation dimensions of the manipulator installation base, refer to the dimensions in fig. 3-2 "Direct Mounting on the Floor" at page 3-4. Affix the manipulator securely with the hexagon head bolts M20 (90mm long recommended). Tighten the bolts and anchor bolts securely so that they will not work loose during operation. See "Fig. 3-1 Mounting on the Common Base" for the method.

Fig. 3-1: Mounting on the Common Base

3.2.2 When the Manipulator is Mounted Directly on the Floor

The floor should be strong enough to support the manipulator. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the manipulator. As a rough standard, when there is a concrete thickness (floor) is 200mm or more, the manipulator base can be fixed directly to the floor with anchor bolts M20. Before mounting the manipulator, however, check that the floor is level and that all cracks, etc. are repaired. A non-concrete floor or a floor less than 200mm thick is insufficient for installation, even if the floor is concrete.
3 Installation

3.2 Mounting Procedures for Manipulator Base

Fig. 3-2: Direct Mounting on the Floor

Weld these portions after installation and adjustment.

The surface must be level and even.

Dimensions in mm

Bolt A: Bolts M20 (length: 90mm) (8 bolts), spring washers, flat washers
Bolt B: Bolts M24 (length: 70mm) (8 bolts), spring washers
Bolts, base A and B should be equipped by user.
3.3 Mounted Type

The MOTOMAN-MCL130 is floor-mounted type.

3.4 Location

The MOTOMAN-MCL130 is used in the clean room.

When the manipulator is installed, it is necessary to satisfy the undermentioned environmental conditions:

- 15° to +45°C (ambient temperature)
- 20 to 80%RH (no moisture, non-condensing)
- Free from water
- Free from corrosive gases or liquid, or explosive gases
- Free from excessive impact or vibration (less than 4.9m/s² (0.5G))
- Free from large electrical noise
- The flatness for installation is 0.5mm or less
WARNING

• Ground resistance must be 100 Ω or less.
  Failure to observe this warning may result in fire or electric shock.

• Before wiring, make sure to turn the primary power supply OFF, and put up a warning sign. (ex. DO NOT TURN THE POWER ON.)
  Failure to observe this warning may result in fire or electric shock.

CAUTION

• Wiring must be performed by authorized or certified personnel.
  Failure to observe this caution may result in fire or electric shock.

• Do not cover the cable or allow it to tangle. Keep the cable as straight as possible.
  Failure to observe this caution may result in preventing heat of the cable from being discharged.
4.1 Grounding

Follow local regulations for grounding line size. A line of 5.5mm² or more is recommended. Refer to fig. 4-1 “Grounding Method” to connect the ground line directly to the manipulator.

- Do not use this line in common with other ground lines or grounding electrodes for other electric power, motor power, welding devices, etc.
- Where metal ducts, metallic conduits, or distributing racks are used for cable laying, ground in accordance with Electric Equipment Technical Standards.

![Fig. 4-1: Grounding Method](image)

4.2 Cable Connection

There are three manipulator cables; an encoder cable for detection (1BC) and power cables (2BC and 3BC). Connect these cables to the manipulator base connectors and the DX100. Refer to fig. 4-3(a) “Manipulator Cable Connection to the Manipulator” at page 4-4 and fig. 4-3(b) “Manipulator Cable Connection to the DX100” at page 4-4.

4.2.1 Connection to the Manipulator

Before connecting three cables to the manipulator, verify the numbers: 1BC, 2BC, and 3BC on both manipulator cables and the manipulator base connectors. When connecting, adjust the cable connector positions to the main key positions of the manipulator, and insert cables in the order of 2BC, 3BC, 1BC, and then push down the lever until hearing a “click.”
4.2.2 Connection to the DX100

Remove the cover on the DX100 side. Pass the encoder cable for detection (1BC), the power cables (2BC and 3BC), through the opening for the cables, and then fasten bolts on the opening.

Connect the 2BC and 3BC cables to the terminals inside of the DX100. Be sure to verify the numbers on both the cable and board connectors before connecting.

Connect the 1BC cable to the boards. Be sure to verify the numbers on both the cable and board connectors before connecting, and to fasten the bolts on connectors to prevent cables from loosening.

Fig. 4-2: Manipulator Cables

The DX100 Side The Manipulator Side

Encoder Cable

The DX100 Side The Manipulator Side

Power Cable

The DX100 Side The Manipulator Side

Power Cable
4 Wiring

4.2 Cable Connection

**Fig. 4-3(a): Manipulator Cable Connection to the Manipulator**

**Fig. 4-3(b): Manipulator Cable Connection to the DX100**
# 5 Basic Specifications

## 5.1 Basic Specifications

Table 5-1: Basic Specifications\(^1\)

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Vertically Articulated</td>
</tr>
<tr>
<td>Degree of Freedom</td>
<td>6</td>
</tr>
<tr>
<td>Payload</td>
<td>130 kg</td>
</tr>
<tr>
<td>Repeatability(^2)</td>
<td>±0.2 mm</td>
</tr>
<tr>
<td>Range of Motion</td>
<td></td>
</tr>
<tr>
<td>S-axis (turning)</td>
<td>-150° -  +150°</td>
</tr>
<tr>
<td>L-axis (lower arm)</td>
<td>-60° -  +76°</td>
</tr>
<tr>
<td>U-axis (upper arm)</td>
<td>-130° -  +240°</td>
</tr>
<tr>
<td>R-axis (wrist roll)</td>
<td>-360° -  +360°</td>
</tr>
<tr>
<td>B-axis (wrist pitch/yaw)</td>
<td>-130° -  +130°</td>
</tr>
<tr>
<td>T-axis (wrist twist)</td>
<td>-360° -  +360°</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td></td>
</tr>
<tr>
<td>S-axis</td>
<td>2.27 rad/s, 130°/s</td>
</tr>
<tr>
<td>L-axis</td>
<td>2.27 rad/s, 130°/s</td>
</tr>
<tr>
<td>U-axis</td>
<td>2.27 rad/s, 130°/s</td>
</tr>
<tr>
<td>R-axis</td>
<td>3.75 rad/s, 215°/s</td>
</tr>
<tr>
<td>B-axis</td>
<td>3.14 rad/s, 180°/s</td>
</tr>
<tr>
<td>T-axis</td>
<td>5.24 rad/s, 300°/s</td>
</tr>
<tr>
<td>Allowable Moment(^3)</td>
<td></td>
</tr>
<tr>
<td>R-axis</td>
<td>735N•m (75 kgf•m)</td>
</tr>
<tr>
<td>B-axis</td>
<td>735N•m (75 kgf•m)</td>
</tr>
<tr>
<td>T-axis</td>
<td>421 N•m (43 kgf•m)</td>
</tr>
<tr>
<td>Allowable Inertia (GD(^2)/4)</td>
<td></td>
</tr>
<tr>
<td>R-axis</td>
<td>45 kg•m(^2)</td>
</tr>
<tr>
<td>B-axis</td>
<td>45 kg•m(^2)</td>
</tr>
<tr>
<td>T-axis</td>
<td>15 kg•m(^2)</td>
</tr>
<tr>
<td>Mass</td>
<td>1300 kg</td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>15° C to 45° C</td>
</tr>
<tr>
<td>Humidity</td>
<td>20 to 80% RH (non-condensing)</td>
</tr>
<tr>
<td>Vibration</td>
<td>4.9 m/s(^2) or less (0.5 G)</td>
</tr>
<tr>
<td>Others</td>
<td>Free from corrosive gasses or liquids, or explosive gases or liquids</td>
</tr>
<tr>
<td></td>
<td>Free from exposure to water, oil, or dust</td>
</tr>
<tr>
<td></td>
<td>Free from excessive electrical noise (plasma)</td>
</tr>
<tr>
<td></td>
<td>A baseplate flatness must be kept at 0.5 mm or less.</td>
</tr>
<tr>
<td>Power Capacity</td>
<td>7.5 kVA</td>
</tr>
</tbody>
</table>

1 SI units are used in this table. However, gravitational unit is used in ( ).
2 Conformed to ISO9283
3 Refer to *chapter 6.1 "Allowable Wrist Load" at page 6-1* for details on the allowable inertia.
5.2 Maniplator Clean Specifications

The MOTOMAN-MCL130 is ISO-14644 rated, cleanliness class 6\textsuperscript{T} (equivalent to the FEDERAL STANDARD 209E, cleanliness class 1000).

1. Under the condition that the manipulator is in the downflow of 0.4m/s or more (vertically rectified state) and exhausted (exhausted amount of 400 liter/min) inside from the exhaust port A for the manipulator internal air, and the balancer is exhausted (exhausted amount of 150 liter/min) inside from the exhaust port B for the manipulator internal air. Refer to fig. 5-1 "Exhaust Ports for Manipulator Internal Air"

Fig. 5-1: Exhaust Ports for Manipulator Internal Air
5.3 Part Names and Working Axes

Fig. 5-2: Part Names and Working Axes

- Upper arm (U-arm)
- Lower arm (L-arm)
- Wrist flange
- (Rotary head)
- (S-head)
- Manipulator installation base

5.4 Manipulator Installation Base Dimensions

Fig. 5-3: Manipulator Base Dimensions

Dimensions in mm

- 22 dia. holes (12 holes)
- 365 +0.1
- 230 -0.1
- 320 +0.1
- 685 +0.1

View A

Dimensions in mm
5.5 Dimensions and P-point Maximum Envelope

Fig. 5-4: Dimensions and P-point Maximum Envelope
5.6 **B-axis Working Range**

The working range of the B-axis maintaining a constant angle to the center of the U-arm is shown in fig. 5-5 “B-axis Working Range”

![Fig. 5-5: B-axis Working Range](image)

5.7 **Alterable Working Range**

The working range of the S-axis can be altered according to the operating conditions as shown in table 5-2 “S-axis Working Range.” If alteration is necessary, contact your Yaskawa representative in advance.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-axis Working Range</td>
<td>-150° - + 150° (standard)</td>
</tr>
<tr>
<td></td>
<td>-120° - + 120°</td>
</tr>
<tr>
<td></td>
<td>-90° - + 90°</td>
</tr>
<tr>
<td></td>
<td>-60° - + 60°</td>
</tr>
<tr>
<td></td>
<td>-30° - + 30°</td>
</tr>
</tbody>
</table>
6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

The allowable wrist load including the mass of the mount/gripper is:

- YR-MCL0130-A00: 130kg maximum

If force is applied to the wrist instead of the load, force on R-, B-, and T-axes should be within the value shown in table 6-1 “Moment and Total Inertia.” Contact your Yaskawa representative for further information or assistance.

Table 6-1: Moment and Total Inertia

<table>
<thead>
<tr>
<th>Axis</th>
<th>Moment N•m (kgf•m)(^1)</th>
<th>Total Inertia kg•m(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-axis</td>
<td>735 (75)</td>
<td>45</td>
</tr>
<tr>
<td>B-axis</td>
<td>735 (75)</td>
<td>45</td>
</tr>
<tr>
<td>T-axis</td>
<td>421 (43)</td>
<td>15</td>
</tr>
</tbody>
</table>

\(^1\) ( ): Gravitational unit

When the volume load is small, refer to the moment arm rating shown in “Fig. 6-1 Moment Arm Rating.”

The allowable total inertia is calculated when the moment is at the maximum. Contact your Yaskawa representative when only inertia moment, or load moment is small and inertia moment is large. Also, when the load is combined as a force but a mass, contact your Yaskawa representative.

Fig. 6-1: Moment Arm Rating
6.2 Wrist Flange

If the fitting is used to mount the attachment, the fitting depth inside the fitting must be 8mm or less; outside 5mm or less.

Fig. 6-2: Wrist Flange
7 System Application

7.1 Peripheral Equipment Mounts

When peripheral equipment is attached to the U-axis, the following conditions described in table 7-1 “Constraint for Attaching” at page 7-2 should be observed.

Fig. 7-1: Clamp and Trapped Holes

Dimensions in mm
7.2 Internal User I/O Wiring Harnesses and Air Line

Internal user I/O wiring harnesses (0.75mm², 23 cables) and two air lines are used in the manipulator for the drives of the peripheral devices mounted on the upper arm and the connector pins (1 to 23) are assigned as shown in Fig. 7-2 "Internal User I/O Wiring Harnesses and Air Line" at page 7-3. Wiring must be performed by user.

<table>
<thead>
<tr>
<th>Application</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Attaching load mass is 130kg max. for YR-MCL0130-A00 including wrist load.</td>
</tr>
<tr>
<td>A2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>30kg max. 49N·m (5kgf·m) max. for moment increase amount of upper arm</td>
</tr>
<tr>
<td>C</td>
<td>200kg max.</td>
</tr>
</tbody>
</table>

Table 7-1: Constraint for Attaching

- **A1** Cable Processing
- **A2** Cable Processing and Valve Load
- **B** Others

### Table 7-1: Constraint for Attaching

<table>
<thead>
<tr>
<th>Application</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Attaching load mass is 130kg max. for YR-MCL0130-A00 including wrist load.</td>
</tr>
<tr>
<td>A2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>30kg max. 49N·m (5kgf·m) max. for moment increase amount of upper arm</td>
</tr>
<tr>
<td>C</td>
<td>200kg max.</td>
</tr>
</tbody>
</table>

7.2 Internal User I/O Wiring Harnesses and Air Line

Internal user I/O wiring harnesses (0.75mm², 23 cables) and two air lines are used in the manipulator for the drives of the peripheral devices mounted on the upper arm and the connector pins (1 to 23) are assigned as shown in Fig. 7-2 “Internal User I/O Wiring Harnesses and Air Line” at page 7-3. Wiring must be performed by user.

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The allowable current for internal user I/O wiring harness</td>
<td>8.6 A or less / wire. (The total current value for pins 1 to 23 must be 60A or less.)</td>
</tr>
<tr>
<td>The maximum pressure for the air line</td>
<td>490 kPa (5 kgf/cm²) or less (The air line inside diameter: 8.0mm)</td>
</tr>
</tbody>
</table>
The same pin number (1-23) of two connectors is connected in the lead wire of single 0.75mm².
8.1 Position of S-axis Limit Switch

The limit switch is mounted on the S-axis as shown in fig. 8-1 “Location of Limit Switch”

Fig. 8-1: Location of Limit Switch
8.2 Internal Connections

High reliability connectors which can be easily removed are used with each connector part. For the number and location of connectors, refer to fig. 8-2 “Location and Numbers of Connectors”

![Connector for internal user I/O wiring harness](image)

Table 8-1: List of Connector Types

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector for internal user I/O wiring harness on base</td>
<td>JL05-2A24-28PC (JL05-6A24-28S: Optional)</td>
</tr>
<tr>
<td>Connector for internal user I/O wiring harness on U-arm</td>
<td>JL05-2A24-28SC (JL05-6A24-28P: Optional)</td>
</tr>
</tbody>
</table>
Fig. 8-3(a): Internal Connection Diagram
Fig. 8-3(b): Internal Connection Diagram
9 Maintenance and Inspection

**WARNING**

- Before maintenance or inspection, be sure to turn the main power supply OFF, and put up a warning sign. (ex. DO NOT TURN THE POWER ON.)

Failure to observe this warning may result in electric shock or injury.

**CAUTION**

- Maintenance and inspection must be performed by specified personnel.
  
  Failure to observe this caution may result in electric shock or injury.

- For disassembly or repair, contact your Yaskawa representative.

- Do not remove the motor, and do not release the brake.
  
  Failure to observe this caution may result in injury from unexpected turning of the manipulator’s arm.

- The battery pack must be connected before removing detection connector when maintenance and inspection.
  
  Failure to observe this caution may result in the loss of home position data.
9.1 Inspection Schedule

Proper inspections are essential not only to assure that the mechanism will be able to function for a long period, but also to prevent malfunctions and assure safe operation. Inspection intervals are displayed in six levels. Conduct periodical inspections according to the inspection schedule in Table 9-1 “Inspection Items” at page 9-3.

In Table 9-1 “Inspection Items” at page 9-3 the inspection items are classified into three types of operation: operations which can be performed by personnel authorized of the user, operations which can be performed by personnel being trained, and operations which can be performed by service company personnel. Only specified personnel are to do inspection work.

- The inspection interval must be based on the servo power supply on time.
- For axes which are used very frequently (in handling applications, etc.), it is recommended that inspections be conducted at shorter intervals. Contact your Yaskawa representative.

NOTE
### Table 9-1: Inspection Items (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Items</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000H Cycle</td>
<td>6000H Cycle</td>
<td>12000H Cycle</td>
<td>18000H Cycle</td>
</tr>
<tr>
<td>1. Alignment mark</td>
<td>Visual</td>
<td>Check alignment mark accordance and damage at the home position.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>2. External lead</td>
<td>Visual</td>
<td>Check for damage and deterioration of leads.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>3. Manipulator</td>
<td>Visual</td>
<td>Clean the exterior. Check for damage, exterior cracks, and grease leakage.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>4. L-U-axes motor</td>
<td>Visual</td>
<td>Check for grease leakage.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>5. Base mounting bolts</td>
<td>Spanner Wrench</td>
<td>Tighten loose bolts. Replace if necessary.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>6. Cover mounting screws</td>
<td>Screwdriver, Wrench</td>
<td>Tighten loose bolts. Replace if necessary.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>7. SL-U-axes motor connectors</td>
<td>Manual</td>
<td>Tighten loosen bolts.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>8. Base connectors</td>
<td>Manual</td>
<td>Check for loose connectors.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>9. Balancer</td>
<td>Grease Gun</td>
<td>Supply grease (6000H cycle). See chapter 9.2.8 at page 9-20</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>10. N-R-U-B-T-axes timing belt</td>
<td>Manual</td>
<td>Check for belt tension and wear.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>11. SL-U-RT-B-T-axes internal wires</td>
<td>Visual Multimeter</td>
<td>Check for conduction between the main connector of base and intermediate connector with manually shaking the wire. Check for wear of protective spring.</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>13. S-axis speed reducer and gear</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Supply grease (6000H cycle). See chapter 9.2.2 at page 9-8. Replace greases (12000H cycle). See chapter 9.2.2 at page 9-8</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
<tr>
<td>14. L-axis speed reducer</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Supply grease (6000H cycle). See chapter 9.2.3 at page 9-10. Replace greases (12000H cycle). See chapter 9.2.3 at page 9-10</td>
<td>Specified Person</td>
<td>Licensee</td>
</tr>
</tbody>
</table>
Table 9-1: Inspection Items (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Items</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 U-axis speed reducer</td>
<td>Daily</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>1000H Cycle</td>
<td>6000H Cycle</td>
<td>Supply grease (6000H cycle). See chapter 9.2.4 at page 9-12</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>12000H Cycle</td>
<td>18000H</td>
<td>Replace grease (12000H cycle). See chapter 9.2.4 at page 9-12</td>
<td>✔</td>
</tr>
<tr>
<td>16 R-axis gear</td>
<td>Daily</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>6000H Cycle</td>
<td>12000H Cycle</td>
<td>Supply grease (6000H cycle). See chapter 9.2.5 at page 9-14</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>18000H Cycle</td>
<td>24000H</td>
<td>Replace grease (12000H cycle). See chapter 9.2.5 at page 9-14</td>
<td>✔</td>
</tr>
<tr>
<td>17 BT-axes speed reducers and gears</td>
<td>Daily</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>6000H Cycle</td>
<td>12000H Cycle</td>
<td>Supply grease (6000H cycle). See chapter 9.2.6 at page 9-16 and chapter 9.2.7 at page 9-18</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>18000H Cycle</td>
<td>24000H</td>
<td>Replace grease (12000H cycle). See chapter 9.2.6 at page 9-16 and chapter 9.2.7 at page 9-18</td>
<td>✔</td>
</tr>
<tr>
<td>18 Overhaul</td>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Inspection No. correspond to the numbers in fig. 9-1 "Inspection Parts and Inspection Numbers" at page 9-5
2. If a grease leakage occurs, contact your Yaskawa representative as soon as possible.
3. The occurrence of a grease leakage indicates the possibility that grease has seeped into the motor. This can cause a motor breakdown. Contact your Yaskawa representative.
4. When checking for conduction with multimeter, connect the battery pack to "BAT" and "OBT" of connectors on the motor side for each axis, and then remove connectors on detector side for each axis from the motor. Otherwise, the home position may be lost. (Refer to chapter 9.2.9 "Notes for Maintenance" at page 9-21)
5. Internal cables to be replaced at 18000H inspection.
6. For the grease, refer to fig. 9-2(a) "Battery Pack Location (Rear View)" at page 9-6
9 Maintenance and Inspection
9.1 Inspection Schedule

*Fig. 9-1: Inspection Parts and Inspection Numbers*

![Diagram of inspection parts](image)

**Table 9-2: Inspection Parts and Grease Used**

<table>
<thead>
<tr>
<th>No.</th>
<th>Grease Used</th>
<th>Inspected Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>13, 14, 15, 16, 17</td>
<td>VIGO Grease RE No.0</td>
<td>All axes speed reducers and R-, B-, and T-axes gears</td>
</tr>
<tr>
<td>9</td>
<td>Alvania EP Grease 2</td>
<td>L-axis balancer</td>
</tr>
</tbody>
</table>

The numbers in the above table correspond to the numbers in table 9-1 "Inspection Items" at page 9-3
9.2 Notes on Maintenance Procedures

9.2.1 Battery Pack Replacement

If the battery alarm occurs in the DX100, replace the battery pack according to the following procedure:

Fig. 9-2(a): Battery Pack Location (Rear View)

Fig. 9-2(b): Battery Pack Location (Top View)
1. Turn OFF the DX100 main power supply.
2. Remove the plate fixing screws and the plate on the connector base, then pull the battery pack out to replace it with the new one.
3. Remove the battery pack from the battery holder.
4. Connect the new battery pack to the unoccupied connector on the board.
5. Remove the old battery pack from the board.

NOTE: Remove the old battery pack after connecting the new one so that the encoder absolute data does not disappear.

6. Mount the new battery pack to the holder.
7. Reinstall the plate.

NOTE: Do not allow plate to pinch the cables when reinstalling the plate.
9.2.2 Grease Replenishment/Replacement for S-axis Speed Reducer and Gear

Fig. 9-4: S-axis Speed Reducer and Gear Diagram

9.2.2.1 Grease Replenishment (Refer to fig. 9-4 “S-axis Speed Reducer and Gear Diagram”)

Replenish the grease according to the following procedure:

1. Remove the So exhaust plug PT1/8.

2. Remove the plug on the Si grease inlet and install the grease zerk A-PT1/4.

3. Inject the grease into the Si grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 530 cc (1060 cc for 1st supply)

4. Move the S-axis for a few minutes to discharge the excess grease.

5. Wipe the So exhaust port with a cloth and reinstall the plug. (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

6. Remove the grease zerk and reinstall the plug in the Si grease inlet. (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

NOTE

If grease is added without removing the exhaust plug, the grease will go inside the motor and may damage it. It is absolutely necessary to remove the plug.
9.2.2.2 Grease Replacement (Refer to fig. 9-4 “S-axis Speed Reducer and Gear Diagram” at page 9-8)

1. Remove the So exhaust plug PT1/8.

2. Remove the plug on the Si grease inlet and install the grease zerk A-PT1/4.

3. Inject the grease into the Si grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx. 3650 cc

4. The grease replacement is complete when new grease appears in the So exhaust port. The new grease can be distinguished from the old grease by color.

5. Move the S-axis for a few minutes to discharge the excess grease.

6. Wipe the So exhaust port with a cloth and reinstall the plug. (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

7. Remove the grease zerk and reinstall the plug in the Si grease inlet. (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

If grease is added without removing the exhaust plug, the grease will go inside the motor and may damage it. It is absolutely necessary to remove the plug.

If the plug is installed when the grease is still being replaced, the grease will go inside the motor and may damage it. Confirm that the old grease has been completely replaced before reinstalling the plug.
9.2.3 Grease Replenishment/Replacement for L-axis Speed Reducer

Fig. 9-5: L-axis Speed Reducer Diagram

9.2.3.1 Grease Replenishment (Refer to fig. 9-5 “L-axis Speed Reducer Diagram”)

1. Make the L-arm vertical for ground.

2. Remove the Lo exhaust plug.

3. Remove the plug on the Li grease inlet and install the grease zerk A-PT1/8.

4. Inject the grease into the Li grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 400 cc (800 cc for 1st supply)

5. Move the L-axis for a few minutes to discharge the excess grease.

6. Wipe the Lo exhaust port with a cloth and reinstall the plug. (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

7. Remove the grease zerk and reinstall the plug in the Li grease inlet. (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

NOTE: If grease is added without removing the exhaust plug, the grease will go inside the motor and may damage it. It is absolutely necessary to remove the plug.
9.2.3.2 Grease Replacement (Refer to fig. 9-5 “L-axis Speed Reducer Diagram” at page 9-10)

1. Make the L-arm vertical for ground.
2. Remove the Lo exhaust plug.
3. Remove the plug on the Li grease inlet and install the grease zerk A-PT1/8.
4. Inject the grease into the Li grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx 2000cc for Li
5. The grease replacement is complete when new grease appears in the Lo exhaust port. The new grease can be distinguished from the old grease by color.
6. Move the L-axis for a few minutes to discharge the excess grease.
7. Wipe the Lo exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
8. Remove the grease zerk and reinstall the plug in the Li grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

NOTE

If grease is added without removing the exhaust plug, the grease will go inside the motor and may damage it. It is absolutely necessary to remove the plug.
9.2.4 Grease Replenishment/Replacement for U-axis Speed Reducer

Fig. 9-6: U-axis Speed Reducer Diagram

9.2.4.1 Grease Replenishment (Refer to fig. 9-6 “U-axis Speed Reducer Diagram”)

1. Make the U-arm horizontal for ground.
2. Remove the Uo exhaust plug.

If grease is added without removing the exhaust plug, the grease will go inside the motor and may damage it. It is absolutely necessary to remove the plug.

3. Remove the plug on the Ui grease inlet and install the grease zerk A-PT1/8.
4. Inject the grease into the Ui grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 250cc for Ui (500cc for 1st supply)
5. Move the U-axis for a few minutes to discharge the excess grease.
6. Wipe the Uo exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
7. Remove the grease zerk and reinstall the plug in the Ui grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
9.2.4.2 Grease Replacement (Refer to fig. 9-6 “U-axis Speed Reducer Diagram” at page 9-12)

1. Make the U-arm horizontal for ground.
2. Remove the Uo exhaust plug.
3. Remove the plug on the Ui grease inlet and install the grease zerk A-PT1/8.
4. Inject the grease into the Ui grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx. 1650cc for Ui
5. The grease replacement is complete when new grease appears in the Uo exhaust port. The new grease can be distinguished from the old grease by color.
6. Move the U-axis for a few minutes to discharge the excess grease.
7. Wipe the Uo exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
8. Remove the grease zerk and reinstall the plug in the Ui grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

**NOTE**
If grease is added without removing the exhaust plug, the grease will go inside the motor and may damage it. It is absolutely necessary to remove the plug.

If the plug is installed when the grease is still being replaced, the grease will go inside the motor and may damage it. Confirm that the old grease has been completely replaced before reinstalling the plug.
9.2.5 Grease Replenishment/Replacement for R-axis Speed Reducer

Fig. 9-7: R-axis Speed Reducer Diagram

9.2.5.1 Grease Replenishment (Refer to fig. 9-7 "R-axis Speed Reducer Diagram")

1. Remove the Ro exhaust plug.

2. Remove the plug on the Ri grease inlet and install the grease zerk A-PT1/8.

3. Inject the grease into the Ri grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 28cc for Ri (56cc for 1st supply)

4. Move the R-axis for a few minutes to discharge the excess grease.

5. Wipe the Ro exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

6. Remove the grease zerk and reinstall the plug in the Ri grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
9 Maintenance and Inspection

9.2 Notes on Maintenance Procedures

9.2.5.2 Grease Replacement (Refer to fig. 9-7 “R-axis Speed Reducer Diagram” at page 9-14)

1. Remove the Ro exhaust plug.

   NOTE
   
   If grease is added without removing the exhaust plug, the grease will go outside the grease box and may damage it. It is absolutely necessary to remove the plug.

2. Remove the plug on the Ri grease inlet and install the grease zerk A-PT1/8.

3. Inject the grease into the Ri grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx. 140cc for Ri

4. The grease replacement is complete when new grease appears in the Ro exhaust port. The new grease can be distinguished from the old grease by color.

5. Move the R-axis for a few minutes to discharge the excess grease.

6. Wipe the Ro exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

7. Remove the grease zerk and reinstall the plug in the Ri grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
9.2.6 Grease Replenishment/Replacement for B-axis Speed Reducer and Gear

**Fig. 9-8: B-axis Speed Reducer and Gear Diagram**

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### 9.2.6.1 Grease Replenishment (Refer to fig. 9-8 "B-axis Speed Reducer and Gear Diagram")

1. Remove the Bi exhaust plug.

   ![Diagram](image)

   **NOTE**

   If grease is added without removing the exhaust plug, the grease will go outside the grease box and may damage it. It is absolutely necessary to remove the plug.

2. Remove the bolt on the Bi grease inlet and install the grease zerk A-MT6.

3. Inject the grease into the Bi grease inlet using a grease gun.

   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 200cc for Bi (400 cc for 1st supply)

4. The grease replacement is complete when new grease appears in the Bo exhaust port. The new grease can be distinguished from the old grease by color.

5. Move the B-axis for a few minutes to discharge the excess grease.

6. Wipe the Bo exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

7. Remove the grease zerk and reinstall the bolt in the Bi grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
9.2.6.2 Grease Replacement (Refer to fig. 9-8 “B-axis Speed Reducer and Gear Diagram” at page 9-16)

1. Remove the Bo exhaust plug.

   **NOTE**
   If grease is added without removing the exhaust plug, the grease will go outside the grease box and may damage it. It is absolutely necessary to remove the plug.

2. Remove the bolt on the Bi grease inlet and install the grease zerk A-MT6.

3. Inject the grease into the Bi grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx. 900cc for Bi

4. The grease replacement is complete when new grease appears in the Bo exhaust port. The new grease can be distinguished from the old grease by color.

5. Move the B-axis for a few minutes to discharge the excess grease.

6. Wipe the Bo exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

7. Remove the grease zerk and reinstall the bolt in the Bi grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
9.2.7 Grease Replenishment/Replacement for T-axis Speed Reducer and Gear

Fig. 9-9: T-axis Speed Reducer and Gear Diagram

1. Remove the hexagon socket head cap bolt M5 in the To exhaust port.
2. Remove the bolt on the Ti grease inlet and install the grease zerk A-MT6.
3. Inject the grease into the Ti grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 200cc for Ti (400cc cc for 1st supply)
4. Move the T-axis for a few minutes to discharge the excess grease.
5. Wipe the To exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
6. Remove the grease zerk and reinstall the bolt in the Ti grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

NOTE
If grease is added without removing the bolt, the grease will go outside the grease box and may damage it. It is absolutely necessary to remove the bolt.
9.2.7.2 Grease Replacement (Refer to fig. 9-9 “T-axis Speed Reducer and Gear Diagram” at page 9-18)

1. Remove the hexagon socket head cap bolt M5 in the To exhaust port.

2. Remove the bolt on the Ti grease inlet and install the grease zerk A-MT6.

3. Inject the grease into the Ti grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx. 900 cc for Ti

4. The grease replacement is complete when new grease appears in the To exhaust port. The new grease can be distinguished from the old grease by color.

5. Move the T-axis for for a few minutes to discharge the excess grease.

6. Wipe the To exhaust port with a cloth and reinstall the plug.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

7. Remove the grease zerk and reinstall the bolt in the Ti grease inlet.
   (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)

**NOTE**
If grease is added without removing the bolt, the grease will go outside the grease box and may damage it. It is absolutely necessary to remove the bolt.
9.2.8 Grease Replenishment for Balancer Connection Part

Fig. 9-10: Balancer Connection Part Diagram

1. Remove two plugs for exhaust port in ① and ②. (Refer to fig. 9-10 “Balancer Connection Part Diagram”)
2. Remove two plugs on the Vc grease inlets in ① and ② and install the grease zerk A-PT1/8.
3. Inject the grease into the Vc grease inlets in ① and ② using a grease gun.
   - Grease type: Alvania EP grease 2
   - Amount of grease: 5cc (10 cc for 1st supply)

   **NOTE**
   The grease is not exhausted from the exhaust ports ① and ②. Do not inject excessive grease into the Vc grease inlets.

4. Reinstall the plugs on the exhaust ports in ① and ②. (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
5. Remove the grease zerk and reinstall the bolts in the Vc grease inlets. (Confirm that no oil adheres to the screw of the plug and spread Three Bond 1206C.)
6. Wipe off excess grease and abrasion power adhering to the rod with a clean waste cloth, then lightly apply AFE grease.
9.2 Notes on Maintenance Procedures

9.2.9 Notes for Maintenance

Remove the old battery pack after connecting the new one so that the encoder absolute data does not disappear. For the battery pack connection for the S-, L-, and U-axes motors and R-, B-, and T-axes motors, refer to fig. 9-11 “Battery Pack Connection for Motor” at page 9-22.

9.2.9.1 Battery Pack Connection for S-, L-, and U-axes Motors

The connector (crimped contact-pin) for the battery backup is installed in the end point of the cable for the encoder of the S-, L-, and U-axes motors (BAT and OBT are marked). Connect the battery pack according to the following procedure.

1. Connect battery pack (HW9470917-A) with the battery backup connector (BAT and OBT are marked) located in the end point of the cable for the encoder. (Under such a condition, remove the encoder connector and do the maintenance check work.)

2. Confirm all connectors connection after the maintenance check ends, and remove the battery pack.

**NOTE**
Do not remove the battery pack in the base connector.

9.2.9.2 Battery Pack Connection for R-, B-, and T-axes Motors

The connector (crimped contact-pin) for the battery backup is installed in the end point of the cable for the encoder of the R-, B-, and T-axes motors (BAT and OBT are marked). Connect the battery pack according to the following procedure.

1. Connect battery pack (HW9470917-B) with the battery backup connector (BAT and OBT are marked) located in the end point of the cable for the encoder. (Under such a condition, remove the encoder connector and do the maintenance check work.)

2. Confirm all connectors connection after the maintenance check ends, and remove the battery pack.

**NOTE**
Do not remove the battery pack in the base connector.
Fig. 9-11: Battery Pack Connection for Motor

Motor power connector
Connector for the encoder
Connector for the battery backup

Battery Pack: HW9470917-A

a: Insertion-type pin terminal (Pin)
b: Insertion-type pin terminal (Socket)
10 Recommended Spare Parts

It is recommended that the following parts and components be kept in stock as spare parts for the MOTOMAN-MCL130. The spare parts list for the MOTOMAN-MCL130 is shown below. Product performance can not be guaranteed when using spare parts from any company other than Yaskawa. The spare parts are ranked as follows:

- Rank A: Expendable and frequently replaced parts
- Rank B: Parts for which replacement may be necessary as a result of frequent operation
- Rank C: Drive unit

NOTE
To replace parts in Rank B or Rank C, contact your Yaskawa representative.

### Fig. 10-1: Spare Parts for the MOTOMAN-MCL130 (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>Qty per Unit</th>
<th>Remarks</th>
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<td>-</td>
<td>For all axes speed reducers and wrist units</td>
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<td>-</td>
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