MOTOMAN-MH6S
INSTRUCTIONS

TYPE: YR-MH0006S-C00 (IP65, SHORT ARM SPECIFICATION)
YR-MH0006S-C01 (IP65, SHORT ARM, SLU-AXES WITH LIMIT
SWITCHES SPECIFICATION)

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

MOTOMAN INSTRUCTIONS
MOTOMAN-MH6S INSTRUCTIONS
DX100 INSTRUCTIONS
DX100 OPERATOR’S MANUAL
DX100 MAINTENANCE MANUAL

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

Part Number: 156829-1CD
Revision: 0
MANDATORY

• This instruction manual is intended to explain mainly on the mechanical part of the MOTOMAN-MH6S 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-MH6S.

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.

NOTE
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.

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1 Product Confirmation

1.1 Contents Confirmation

Confirm the contents of the delivery when the product arrives. Standard delivery includes the following four items (information for the content of optional goods is given separately):

- Manipulator
- DX100
- Programming pendant
- Manipulator cables (between the DX100 and the Manipulator)

**CAUTION**

- Confirm that the manipulator and the DX100 have the same order number. Special care must be taken when more than one manipulator is to be installed.
- If the numbers do not match, manipulators may not perform as expected and cause injury or damage.
1.2 Order Number Confirmation

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*

(a) DX 100 (Front View)  (b) Manipulator (Top View)
2 Transport

2.1 Transport Method

2.1.1 Using a Crane

As a rule, the manipulator should be lifted by a crane with two wire ropes when removing it from the package and moving it. Be sure that the manipulator is fixed with the shipping bolts and brackets before transport, and lift it in the posture as shown in fig. 2-1 “Transporting Position” at page 2-2.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sling applications and crane or forklift operations must be performed by authorized personnel only. Failure to observe this caution may result in injury or damage.</td>
</tr>
<tr>
<td>• Avoid excessive vibration or shock during transport. The system consists of precision components. Failure to observe this caution may adversely affect performance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The weight of the manipulator is approximately 135 kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the weight.</td>
</tr>
<tr>
<td>• Mount the shipping bolts and brackets for transporting the manipulator.</td>
</tr>
<tr>
<td>• Avoid putting external force on the arm or motor unit when transporting by a crane, forklift, or other equipment. Failure to observe this instruction may result in injury.</td>
</tr>
</tbody>
</table>
2.1.2 Using a Forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts as shown in fig. 2-2. "Using a Forklift". Insert claws under the pallet and lift it. The pallet must be strong enough to support the manipulator. Transport the manipulator slowly with due caution in order to avoid overturning or slippage.

Fig. 2-2: Using a Forklift
2.2 Shipping Bolts and Brackets

The manipulator is provided with a shipping bracket and screws.

(See fig. 2-1 "Transporting Position" at page 2-2.)

- The shipping bracket is painted yellow.
- The shipping bracket is to be fixed with the hexagon socket head cap screw M12 (2 screws).

**NOTE**

Before turning ON the power, check to be sure that the shipping bolts and brackets are removed. The shipping bolts and brackets then must be stored for future use, in the event that the manipulator must be moved again.
To ensure safety, be sure to install safeguarding. It prevents unforeseen accidents with personnel and damage to equipment. Refer to the quoted clause for your information and guidance:

**Responsibility for Safeguarding (ISO10218)**

The user of a manipulator or robot system shall ensure that safeguards are 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 baseplate 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 referring to table 3-1 “Maximum Repulsion Forces of the Manipulator at Emergency Stop” and table 3-2 “Endurance Torque in Operation”.

A baseplate flatness must be kept at 0.5 mm or less: insufficient flatness of installation surface may deform the manipulator shape and affect its functional abilities. Mount the manipulator base as instructed in chapter 3.2.1 “Mounting Example” at page 3-2.

Table 3-1: Maximum Repulsion Forces of the Manipulator at Emergency Stop

| Maximum torque in horizontal rotation (S-axis moving direction) | 3800 N•m (390 kgf•m) |
| Maximum torque in vertical rotation (L-, U-axes moving direction) | 3500 N•m (357 kgf•m) |

Table 3-2: Endurance Torque in Operation

| Endurance torque in horizontal operation (S-axis moving direction) | 900 N•m (93 kgf•m) |
| Endurance torque in vertical operation (L-, U-axes moving direction) | 1500 N•m (158 kgf•m) |

3.2.1 Mounting Example

For the first process, anchor the baseplate firmly to the ground. The baseplate should be rugged and durable to prevent shifting of the manipulator or the mounting fixture. It is recommended to prepare a baseplate of 40 mm or more thickness, and anchor bolts of M16 or larger size.

Next, fix the manipulator base to the baseplate. The manipulator base is tapped for four mounting holes; securely fix the manipulator base to the baseplate with four hexagon head bolts M16 (50 mm long is recommended). Tighten the hexagon head bolts and anchor bolts firmly so that they will not work loose during the operation.

Refer to fig. 3-1 “Mounting the Manipulator on Baseplate” at page 3-3.
Fig. 3-1: Mounting the Manipulator on Baseplate

- Bolt M16 (4 bolts)
- Spring washer
- Washer
- Manipulator base
- Anchor bolt (M16 or larger)
- Baseplate

View A

Unit: mm

102 ±0.1
153 ±0.1
240
260
300
132 ±0.1
20 ±0.1
12 dia. ±0.1
60
102 ±0.1
100 ±0.1
Tapped hole 18 dia. (4 holes)

16 dia. ±0.1
20 ±0.1
12 dia. ±0.1
60
102 ±0.1
100 ±0.1
Baseplate

Manipulator base

Anchor bolt (M16 or larger)

Baseplate
3.3 Types of Mounting

The MOTOMAN-MH6S is available in three types: floor-mounted type (standard), wall-mounted type and ceiling-mounted type. For wall-mounted and ceiling-mounted types, the three points listed below are different from the floor-mounted type.

- S-axis Operating Range
- Fixing the Manipulator Base
- Precautions to Prevent the Manipulator from Falling

3.3.1 S-axis Operating Range

For wall-mounted type, the S-axis operating range is ±30°. (The range is adjusted prior to the shipment.)

3.3.2 Fixing the Manipulator Base

For wall- and ceiling-mounted types, be sure to use four hexagon socket head cap screws M16 (tensile strength: 1200 N/mm² or more) when fixing the manipulator base. Use a torque of 206 N•m when tightening the screws.

3.3.3 Precautions to Prevent the Manipulator from Falling

For the wall- or ceiling-mounted types, take appropriate measures to avoid the falling of the manipulator in case of emergency. Refer to fig. 3-2 “Precaution Against Falling” for details.

Fig. 3-2: Precaution Against Falling

In case of using the wall-ceiling-mounted type, inform Yaskawa of the matter when placing an order. Be sure to contact your Yaskawa representative (listed on the back cover of this instruction manual) to perform a wall/ceiling installation on site.

NOTE
3.4 Location

When installing a manipulator, it is necessary to satisfy the following environmental conditions:

- Ambient temperature: 0°C to +45°C
- Humidity: 20 to 80%RH (non-condensing)
- Free from dust or soot, free from substances that may reduce the efficacy of sealant materials such as nitrile rubber oil seal, O-ring, gasket, and liquid gasket used in the manipulator.
- Free from corrosive gas or liquid, or explosive gas or liquid
- Free from excessive vibration (Vibration acceleration: 4.9 m/s² [0.5 G] or less)
- Free from large electrical noise (plasma)
- Flatness for installation: 0.5 mm or less
4 Wiring

4.1 Grounding

Follow electrical installation standards and wiring regulations for grounding. A ground wire of 5.5 mm² or more is recommended. Refer to fig. 4-1 “Grounding Method” at page 4-2 to connect the ground line directly to the manipulator.

- Never use this wire sharing 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 electrical installation standards.

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.
4.2 Cable Connection

Two manipulator cables are delivered with the manipulator: an encoder cable (1BC) and a power cable (2BC). (Refer to fig. 4-2 "Manipulator Cables" at page 4-3.)

Connect these cables to the manipulator base connectors and to the DX100. Refer to fig. 4-3(a) "Manipulator Cable Connectors (Manipulator Side)" at page 4-4 and fig. 4-3(b) "Manipulator Cable Connection (DX100 Side)" at page 4-4.

4.2.1 Connection to the Manipulator

Before connecting two cables to the manipulator, verify the numbers on both manipulator cables and the connectors on the connector base of the manipulator. When connecting, adjust the cable connector positions to the main key positions of the manipulator, and insert cables in the order of 2BC, then 1BC. After inserting the cables, depress the lever until it clicks.

4.2.2 Connection to the DX100

Before connecting cables to the DX100, verify the numbers on both manipulator cables and the connectors on the DX100. When connecting, insert the cables in the order of X21, then X11, and depress each lever until it clicks.
4 Wiring
MH6S
4.2 Cable Connection

Fig. 4-2: Manipulator Cables

DX100 side

Manipulator side

Encoder cable

DX100 side

Manipulator side

Power cable

X21

1BC

2BC
Fig. 4-3(a): Manipulator Cable Connectors (Manipulator Side)

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

### 5.1 Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Model MOTOMAN-MH6S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Vertically Articulated</td>
</tr>
<tr>
<td>Degree of Freedom</td>
<td>6</td>
</tr>
<tr>
<td>Payload</td>
<td>6 kg</td>
</tr>
<tr>
<td>Repeatability¹</td>
<td>±0.08 mm</td>
</tr>
<tr>
<td>Range of Motion</td>
<td></td>
</tr>
<tr>
<td>S-Axis (turning)</td>
<td>±170°</td>
</tr>
<tr>
<td>L-Axis (lower arm)</td>
<td>+133°, -80°</td>
</tr>
<tr>
<td>U-Axis (upper arm)</td>
<td>+125°, -130°</td>
</tr>
<tr>
<td>R-axis (wrist roll)</td>
<td>±180°</td>
</tr>
<tr>
<td>B-Axis (wrist pitch/yaw)</td>
<td>+225°, -45°</td>
</tr>
<tr>
<td>T-Axis (wrist twist)</td>
<td>±360°</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td></td>
</tr>
<tr>
<td>S-Axis</td>
<td>3.84 rad/s, 220°/s</td>
</tr>
<tr>
<td>L-Axis</td>
<td>3.84 rad/s, 220°/s</td>
</tr>
<tr>
<td>U-Axis</td>
<td>3.84 rad/s, 220°/s</td>
</tr>
<tr>
<td>R-Axis</td>
<td>7.16 rad/s, 410°/s</td>
</tr>
<tr>
<td>B-Axis</td>
<td>7.16 rad/s, 410°/s</td>
</tr>
<tr>
<td>T-Axis</td>
<td>10.65 rad/s, 610°/s</td>
</tr>
<tr>
<td>Allowable Moment³</td>
<td></td>
</tr>
<tr>
<td>R-Axis</td>
<td>11.8 N•m (1.2 kgf•m)</td>
</tr>
<tr>
<td>B-Axis</td>
<td>9.8 N•m (1.0 kgf•m)</td>
</tr>
<tr>
<td>T-Axis</td>
<td>5.9 N•m (0.6 kgf•m)</td>
</tr>
<tr>
<td>Allowable Inertia (GD²/4)</td>
<td></td>
</tr>
<tr>
<td>R-Axis</td>
<td>0.27 kg•m²</td>
</tr>
<tr>
<td>B-Axis</td>
<td>0.27 kg•m²</td>
</tr>
<tr>
<td>T-Axis</td>
<td>0.06 kg•m²</td>
</tr>
<tr>
<td>Approx. Mass</td>
<td>130 kg</td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>0 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/s² (0.5G) or less</td>
</tr>
<tr>
<td>Others</td>
<td>Free from corrosive gas or liquid, or explosive gas Free from dust, soot, and substances that spoil sealing performance of the lips of nitrile rubber oil seals used in the manipulator Free from excessive electrical noise (plasma)</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>1.5 kVA</td>
</tr>
</tbody>
</table>

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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 permissible moment of inertia.
5.2 Part Names and Working Axes

Fig. 5-1: Part Names and Working Axes

5.3 Manipulator Base Dimensions

Fig. 5-2: Manipulator Base Dimensions
5.4 Dimensions and P-Point Maximum Envelope

Fig. 5-3: Dimensions and P-Point Maximum Envelope
5.5 Alterable Operating Range

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

Table 5-2: S-Axis Operating Range

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Axis Operating Range</td>
<td>±170° (standard)</td>
</tr>
<tr>
<td></td>
<td>±150°</td>
</tr>
<tr>
<td></td>
<td>±135°</td>
</tr>
<tr>
<td></td>
<td>±120°</td>
</tr>
<tr>
<td></td>
<td>±105°</td>
</tr>
<tr>
<td></td>
<td>±90°</td>
</tr>
<tr>
<td></td>
<td>±75°</td>
</tr>
<tr>
<td></td>
<td>±60°</td>
</tr>
<tr>
<td></td>
<td>±45°</td>
</tr>
<tr>
<td></td>
<td>±30°</td>
</tr>
<tr>
<td></td>
<td>±15°</td>
</tr>
</tbody>
</table>
6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

The allowable wrist load is 6 kg maximum. If force is applied to the wrist instead of the load, force on B- and T-axes should be within the value shown in table 6-1 "Allowable Wrist Load". Contact your Yaskawa representative for further information or assistance.

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

The allowable total moment of inertia is calculated when the moment is at the maximum. Contact your Yaskawa representative beforehand when only moment of inertia, or load moment is small and moment of inertia is large. Also, when the load mass is combined with an outside force, contact your Yaskawa representative beforehand.

**Table 6-1: Allowable Wrist Load**

<table>
<thead>
<tr>
<th>Axis</th>
<th>Moment N·m (kgf·m)(^1)</th>
<th>(GD^2/4) Total Moment of Inertia kgf·m(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Axis</td>
<td>11.8 (1.2)</td>
<td>0.27</td>
</tr>
<tr>
<td>B-Axis</td>
<td>9.8 (1.0)</td>
<td>0.27</td>
</tr>
<tr>
<td>T-Axis</td>
<td>5.9 (0.6)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

\(^1\): Gravitational unit

**Fig. 6-1: Moment Arm Rating**
Fig. 6-2: The Diagram Moment/Inertia for R-axis

Fig. 6-3: The Diagram Moment/Inertia for B-axis

Fig. 6-4: The Diagram Moment/Inertia for T-axis
6.2 Wrist Flange

The wrist flange dimensions are shown in fig. 6-5 “Wrist Flange”. It is recommended that the attachment be mounted inside the fitting in order to identify the alignment marks. Fitting depth of inside and outside fittings must be 5 mm or less.

Fig. 6-5: Wrist Flange

Tapped holes M6 (depth:9 mm) (pitch:1.0) (4 holes)

<table>
<thead>
<tr>
<th>Units: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

NOTE Wrist Flange surface with thinner or light oil before mounting the tools.
7 System Application

7.1 Peripheral Equipment Mounts

The peripheral equipment mounts are provided on the U-axis (upper arm) and S-axis (rotary head) as shown in fig. 7-1 “Installing Peripheral Equipment” for easier installation of the users’ system applications. The following conditions shall be observed to attach or install peripheral equipment.

7.1.1 Allowable Load

The maximum allowable load on the U-axis is 15 kg, including the wrist load. For instance, when the mass installed on the wrist point is 6 kg, the mass which can be installed on the upper arm is 9 kg.

The maximum allowable load on the S-axis is 20 kg. Install the peripheral equipment on the S-axis so that the moment of inertia \(GD^2/4\) from the S-axis rotation center is 1.25 kg•m² or less.

7.1.2 Installation Position

There is a limitation also on the installation position. Fig. 7-2 “Allowable Load on U-axis” at page 7-2 shows the distance between the U-axis rotation center and the load gravity.

Fig. 7-1: Installing Peripheral Equipment
7.2 Internal User I/O Wiring Harness and Air Lines

Internal user I/O wiring harness (14 wires: 0.2 mm² x 8 wires, 0.75 mm² x 2 wires and 1.25 mm² x 4 wires) and one air line are incorporated in the manipulator for the drive of peripheral device mounted on the upper arm as shown in fig. 7-3 “Connectors for Internal User I/O Wiring Harness and Air Line” at page 7-3.

The connector pins 1 to 16 are assigned as shown in fig. 7-4 “Details of the Connector Pin Numbers” at page 7-4. Wiring must be performed by users.

<table>
<thead>
<tr>
<th>Distance between U-Axis Rotation Center and Load Gravity (mm)</th>
<th>Weight W2 (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>W1=0 Kg</td>
</tr>
<tr>
<td>15</td>
<td>W1=6 Kg</td>
</tr>
<tr>
<td>10</td>
<td>W1=3 Kg</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>-5</td>
<td></td>
</tr>
<tr>
<td>-10</td>
<td></td>
</tr>
<tr>
<td>-20</td>
<td></td>
</tr>
<tr>
<td>-30</td>
<td></td>
</tr>
<tr>
<td>-40</td>
<td></td>
</tr>
</tbody>
</table>

The allowable current for internal user I/O wiring harness 3.0 A or less for each wire (The total current value for pins 1 to 16 must be 40 A or less.)

The maximum pressure for the air line 490 kPa (5 kgf/cm²) or less. (The air line inside diameter: 8.0 mm)
Fig. 7-3: Connectors for Internal User I/O Wiring Harness and Air Line

Connector for the internal user I/O wiring harness:
JL05-2A20-29SC (socket connector with a cap)
Prepare pin connector: JL05-6A20-29P

Air inlet
PT3/8 with a pipe plug

Connector for the internal user I/O wiring harness:
JL05-6A20-29PC (pin connector with a cap)
Prepare socket connector: JL05-6A20-29S
The same numbered pins (1 to 16) of the two connectors are connected with a single lead wire of 0.2 mm², 0.75 mm² or 1.25 mm².
8 Electrical Equipment Specification

8.1 Position of Limit Switch

The limit switches are optional. See fig. 8-1 “Location of Limit Switches”. The manipulator with S- and L-axis overrun limit switches, and L-, U-axes interference limit switches is the type YR-MH0006S-C01.

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

Highly reliable connectors are equipped on each connection part of the manipulator to enable easy removal and installation for maintenance and inspection. For the number and location of connectors, see fig. 8-2 "Location and Numbers of Connectors".

Diagrams for internal connections of the manipulator are shown in fig. 8-3(a) "Internal Connection Diagram" at page 8-3 and fig. 8-3(b) "Internal Connection Diagram" at page 8-4.

Fig. 8-2: Location and Numbers of Connectors

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector for the internal user I/O wiring harness on the connector base</td>
<td>JL05-2A20-29PC (JL05-6A20-29S: Optional)</td>
</tr>
<tr>
<td>Connector for the internal user I/O wiring harness on the U-arm</td>
<td>JL05-2A20-29SC (JL05-6A20-29P: Optional)</td>
</tr>
</tbody>
</table>
8-3
8.2 Internal Connections

Fig. 8-3(b): Internal Connection Diagram
9 Maintenance and Inspection

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 classified into six levels as shown in Table 9-1 “Inspection Items” at page 9-2.

In Table 9-1 “Inspection Items” at page 9-2, the inspection items are categorized by three types of operations: operations which can be performed by personnel authorized by the user, operations to be performed by trained personnel, and operations to be performed by service company personnel. Only specified personnel shall perform the inspection work.

- The inspection interval depends on the total servo operation time.
- The following inspection schedule is based on the case where the manipulator is used for arc welding application. If the manipulator is used for other application or if it is used under special conditions, a case-by-case examination is required. The inspection may be conducted at shorter intervals if the manipulator is used very frequently for the application such as handling; in this case, contact your Yaskawa representative.
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>1. Alignment mark</td>
<td>Daily</td>
<td>Visual</td>
<td>Check alignment mark accordance and damage at the home position.</td>
<td>Specified Person: Licensee, Service Company</td>
</tr>
<tr>
<td>2. External lead</td>
<td>Daily</td>
<td>Visual</td>
<td>Check for damage and deterioration of leads.</td>
<td></td>
</tr>
<tr>
<td>3. Working area and manipulator</td>
<td>Daily</td>
<td>Visual</td>
<td>Clean the work area if dust or spatter is present. Check for damage and outside cracks.</td>
<td></td>
</tr>
<tr>
<td>9. Wire harness in manipulator (SLU-axis wires)</td>
<td>Visual, Multimeter</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></td>
</tr>
<tr>
<td>11. Battery pack in manipulator</td>
<td>Replace</td>
<td>Replace</td>
<td>Replace the battery pack when the battery alarm occurs or the manipulator drive for 36,000H.</td>
<td></td>
</tr>
</tbody>
</table>
9 Maintenance and Inspection

MH6S 9.1 Inspection Schedule

13 Speed reducers for L- and U-axes
   • Grease Gun Check for malfunction. (Replace if necessary.) Supply grease5) (6000H cycle.) See chapter 9.3.2 at page 9-9 and chapter 9.3.3 at page 9-11.

14 Speed reducers for R-, B- and T-axes
   • Grease Gun Check for malfunction. (Replace if necessary.) Supply grease5) (6000H cycle.) See chapter 9.3.4 at page 9-13 and chapter 9.3.5 at page 9-14.

15 T-axis gear
   • Grease Gun Check for malfunction. (Replace if necessary.) Supply grease5) (6000H cycle.) See chapter 9.3.6 at page 9-15.

16 R-axis cross roller bearing
   • Grease Gun Check for malfunction. (Replace if necessary.) Supply grease5) (6000H cycle.) chapter 9.3.7 at page 9-16.

17 Overhaul
   •

18 Drain plug6)
   • Screwscrew, Wrench

---

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

<table>
<thead>
<tr>
<th>Items7)</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td>1000 H Cycle</td>
<td>6000 H Cycle</td>
</tr>
<tr>
<td>13 Speed reducers for L- and U-axes</td>
<td>● ●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Supply grease5) (6000H cycle.) See chapter 9.3.2 at page 9-9 and chapter 9.3.3 at page 9-11.</td>
</tr>
<tr>
<td>14 Speed reducers for R-, B- and T-axes</td>
<td>● ●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Supply grease5) (6000H cycle.) See chapter 9.3.4 at page 9-13 and chapter 9.3.5 at page 9-14.</td>
</tr>
<tr>
<td>15 T-axis gear</td>
<td>●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Supply grease5) (6000H cycle.) See chapter 9.3.6 at page 9-15.</td>
</tr>
<tr>
<td>16 R-axis cross roller bearing</td>
<td>●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Supply grease5) (6000H cycle.) chapter 9.3.7 at page 9-16.</td>
</tr>
<tr>
<td>17 Overhaul</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Drain plug6)</td>
<td>●</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

1 Inspection No. correspond to the numbers in fig. 9-1 “Inspection Items” at page 9-4.
2 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.
3 When checking for conduction with multimeter, connect the battery 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 9.3.8 “Notes for Maintenance” at page 9-17.)
4 Wire harness in manipulator to be replaced at 24000H inspection.
5 For the grease, refer to table 9-2 “Inspection Parts and Grease Used” at page 9-5.
6 The inspection interval depends on the total servo operation time.
9 Maintenance and Inspection

9.1 Inspection Schedule

Fig. 9-1: Inspection Items

Note:
This figure shows the standard specification manipulator in the home position.

- B-axis
- R-axis
- T-axis

When ceiling-mounted
When wall-mounted
When floor-mounted
9 Maintenance and Inspection

9.2 Notes on Maintenance Procedures

9.2.1 Battery Pack Replacement

The battery packs (type: HW0470360-A) are installed in the position shown in fig. 9-2 “Battery Location”. If the battery alarm occurs in the DX100, replace the battery in accordance with the following procedure:

<table>
<thead>
<tr>
<th>No.</th>
<th>Grease Used</th>
<th>Inspected Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,13</td>
<td>VIGO Grease RE No.0</td>
<td>Speed reducers for S-, L-, U-axes</td>
</tr>
<tr>
<td>14,15</td>
<td>Harmonic Grease SK-1A</td>
<td>Speed reducers for R-, B-, T-axes, T-axis gear</td>
</tr>
<tr>
<td>16</td>
<td>Alvania EP Grease 2</td>
<td>R-axis cross roller bearings</td>
</tr>
</tbody>
</table>

The numbers in the above table correspond to the numbers in table 9-1 “Inspection Items” at page 9-2.

Fig. 9-2: Battery Location
1. Turn off the DX100 main power supply.

2. Remove the cover of the connector base.

3. Remove the plate fixing screws and the plate, then pull the battery pack out to replace it with the new one.

4. Remove the battery pack from the battery holder.

5. Connect the new battery pack to the unoccupied connector on the board.

6. 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.

7. Mount the new battery pack to the holder.

8. Reinstall the plate. Seal the matching surface of the cover with the sealant. Three Bond 1206C (refer to table 10-1 “Spare Parts for the YR-MH0006S-C00, -C01” at page 10-1.) Also, apply the sealant to the thread part of fixing screws.

**NOTE**
Do not allow the plate to pinch the cables when reinstalling the plate.
9.3 Notes on Grease Replenishment/Exchange Procedures

Make sure to follow the instructions listed below at grease replenishment/exchange. Failure to observe the following notes may result in damage to motor and speed reducer.

- If grease is added without removing the plug/screw from the grease exhaust port, the grease will leak inside a motor or an oil seal of a speed reducer will come off, which may result in damage to the motor. Make sure to remove the plug/screw.
- Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.
- Make sure to use a grease pump to inject grease. Set air supply pressure to the grease pump at 0.3 MPa or less, and the grease injection rate at 8 g/s or less.
- Make sure to fill hoses, which are joined to the grease inlet, with grease beforehand to prevent air from intruding into the speed reducer.

9.3.1 Grease Replenishment/Exchange for S-axis Speed Reducer

Fig. 9-4: S-Axis Speed Reducer Diagram

For the ceiling-mounted manipulator, the grease exhaust port and the grease inlet are inverted.
9.3 Notes on Grease Replenishment/Exchange Procedures

9.3.1.1 Grease Replenishment (Refer to fig. 9-4 “S-Axis Speed Reducer Diagram” at page 9-7.)

1. Remove the hexagon socket head plugs PT1/8 from the grease inlet and grease exhaust port.

   • If grease is injected with the plug on, the grease will leak inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
   • Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Install a grease zerk PT1/8 to the grease inlet. (The grease zerk is delivered with the manipulator.)

3. Inject the grease through the grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 70 cc (140 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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

5. Wipe the discharged grease with a cloth. Remove the grease zerk from the grease inlet, and reinstall the hexagon socket head plugs PT 1/8 to the grease inlet and grease exhaust port. Before installing the plugs, apply Three Bond 1206C on the thread part of each plug, then tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).

9.3.1.2 Grease Exchange (Refer to fig. 9-4 “S-Axis Speed Reducer Diagram” at page 9-7.)

1. Remove the hexagon socket head plugs PT1/8 from the grease inlet and the grease exhaust port.

   • If grease is injected with the plug on, the grease will leak inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
   • Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Install a grease zerk PT1/8 to the grease inlet. (The grease zerk is delivered with the manipulator.)

3. Inject the grease through the grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx. 450 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

4. The grease exchange is completed when new grease appears in the grease 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 excess grease.
6. Wipe the discharged grease with a cloth. Remove the grease zerk from the grease inlet, and reinstall the plugs to the grease inlet and grease exhaust port. Before installing the plugs, apply Three Bond 1206C on the thread part of each plug, then tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).

9.3.2 Grease Replenishment/Exchange for L-axis Speed Reducer

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

1. Make the L-arm vertical to the ground.
2. Remove the hexagon socket head plug PT1/8 from the grease exhaust port.
3. Remove the hexagon socket head cap screw M6 from the grease inlet.
4. Install a grease zerk A-MT6 x 1 to the grease inlet. (The grease zerk is delivered with the manipulator.)

NOTE
For the ceiling-mounted manipulator, the grease exhaust port and the grease inlet are inverted.

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

1. Make the L-arm vertical to the ground.
2. Remove the hexagon socket head plug PT1/8 from the grease exhaust port.
3. Remove the hexagon socket head cap screw M6 from the grease inlet.

- If grease is injected with the plug on, the grease will leak inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
- Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

4. Install a grease zerk A-MT6 x 1 to the grease inlet. (The grease zerk is delivered with the manipulator.)
5. Inject grease through the grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 65 cc (130 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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

7. Remove the grease zerk from the grease inlet, and reinstall the screw.
   Before installing the screw, apply Three Bond 1206C on the thread part of the screw. Then tighten the screw with a tightening torque of 10 N•m (1.0 kgf•m).

8. Wipe the discharged grease with a cloth, and reinstall the plug. Before installing the plug, apply Three Bond 1206C on the thread part of the plug. Then tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).

9.3.2.2 Grease Exchange (Refer to fig. 9-5 “L-Axis Speed Reducer Diagram” at page 9-9.)

1. Make the L-arm vertical to the ground.

2. Remove the hexagon socket head plug PT1/8 from the grease exhaust port.

3. Remove the hexagon socket head cap screw M6 from the grease inlet.

   • If grease is injected with the plug on, the grease will leak inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
   • Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

4. Install a grease zerk A-MT6 x 1 to the grease inlet. (The grease zerk is delivered with the manipulator.)

5. Inject grease through the grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx. 420 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

6. The grease exchange is completed when new grease appears in the grease exhaust port. (The new grease can be distinguished from the old grease by color.)

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

8. Remove the grease zerk from the grease inlet, and reinstall the screw.
   Before installing the screw, apply Three Bond 1206C on the thread part of the screw. Then tighten the screw with a tightening torque of 10 N•m (1.0 kgf•m).

9. Wipe the discharged grease with a cloth, and reinstall the plug to the grease exhaust port. Before installing the plug, apply Three Bond 1206C on the thread part of the plug, then tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.3.3 Grease Replenishment/Exchange for U-axis Speed Reducer

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

9.3.3.1 Grease Replenishment (Refer to fig. 9-6 "U-Axis Speed Reducer Diagram").

1. Make the U-arm horizontal to the ground.
2. Remove the hexagon socket head cap screw M6 from the grease exhaust port.
3. Remove the hexagon socket head plug PT1/8 from the grease inlet.
4. Install a grease zerk PT1/8 to the grease inlet. (The grease zerk is delivered with the manipulator.)
5. Inject grease through the grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: 30 cc (60 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less
6. Move the U-axis for a few minutes to discharge excess grease.

NOTE

- If grease is injected with the screw on, the grease will leak inside the motor and may cause a damage. Make sure to remove the screw before the grease injection.
- Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

For the ceiling-mounted manipulator, the grease exhaust port and the grease inlet are inverted.
9 Maintenance and Inspection

MH6S 9.3 Notes on Grease Replenishment/Exchange Procedures

7. Remove the grease zerk from the grease inlet, and reinstall the plug. Before installing the plug, apply Three Bond 1206C on the thread part of the plug, then tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).

8. Wipe the discharged grease with a cloth, and reinstall the screw to the grease exhaust port. Before installing the screw, apply Three Bond 1206C on the thread part of the screw, then tighten the screw with a tightening torque of 10 N•m (1.0 kgf•m).

9.3.3.2 Grease Exchange (Refer to fig. 9-6 “U-Axis Speed Reducer Diagram” at page 9-11.)

1. Make the U-arm horizontal to the ground.

2. Remove the hexagon socket head cap screw M6 from the grease exhaust port.

3. Remove the hexagon socket head plug PT1/8 from the grease inlet.

4. Install a grease zerk PT1/8 to the grease inlet. (The grease zerk is delivered with the manipulator.)

5. Inject grease through the grease inlet using a grease gun.
   - Grease type: VIGO Grease RE No.0
   - Amount of grease: approx. 200 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

6. The grease exchange is completed when new grease appears in the grease exhaust port. (The new grease can be distinguished from the old grease by color.)

7. Move the U-axis for a few minutes to discharge excess grease.

8. Remove the grease zerk from the grease inlet and reinstall the plug. Before installing the plug, apply Three Bond 1206C on the thread part of the plug, then tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).

9. Wipe the discharged grease with a cloth, and reinstall the screw to the grease exhaust port. Before installing the screw, apply Three Bond 1206C on the thread part of the screw, then tighten the screw with a tightening torque of 10 N•m (1.0 kgf•m).

**NOTE**

- If grease is injected with the screw on, the grease will leak inside the motor and may cause a damage. Make sure to remove the screw before the grease injection.
- Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

- If grease is injected with the screw on, the grease will leak inside the motor and may cause a damage. Make sure to remove the screw before the grease injection.
- Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.
9.3.4 Grease Replenishment for R-axis Speed Reducer

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

1. Remove the plug LP-M5 from the exhaust port.
2. Remove the pipe plug.
3. Inject grease through the grease inlet using a grease gun. (Refer to fig. 9-7 "R-Axis Speed Reducer Diagram".)
   - Grease type: Harmonic grease SK-1A
   - Amount of grease: 8 cc (16 cc for 1st supply)

   The exhaust port is used for air exhaust, and the grease is not exhausted from the exhaust port. Do not inject excessive grease through the grease inlet.

4. Reinstall the pipe plug.
5. Reinstall the LPM5 plug to the exhaust port.
9.3.5 Grease Replenishment for B- and T-axes Speed Reducers

**Fig. 9-8: B- and T-Axes Speed Reducers Diagram**

1. Remove the plug LP-M5 of B-axis or the hexagon socket head cap screw M6 of T-axis from the exhaust port.

2. Remove the hexagon socket head cap screw M6 from the grease inlet and install the grease zerk A-MT6 x 1. (The grease zerk is delivered with the manipulator.)

3. Inject grease into the grease inlets using a grease gun. (Refer to fig. 9-8 “B- and T-Axes Speed Reducers Diagram”)
   - **Grease type:** Harmonic grease SK-1A
   - **Amount of grease:**
     - For B-axis: 10 cc (20 cc for 1st supply)
     - For T-axis: 5 cc (10 cc for 1st supply)

4. Remove the grease zerk form the grease inlet, and reinstall the hexagon socket head cap screw M6. Before installing the screw, apply Three Bond 1206C on the thread part of the screw, then tighten the screw with a lightening torque of 6 N•m (0.6 kgf•m).

5. Reinstall the LPM5 plug of B-axis or the hexagon socket head cap screw M6 of T-axis to the exhaust port. Before installing the plug or the screw, apply Three Bond 1206C on the thread part of the plug or the screw. Tighten the screw with a tightening torque of 6 N•m (0.6 kgf•m).

**NOTE**

Remove the cover for the B-axis speed reducer.

The exhaust port is used for air exhaust, and the grease is not exhausted from the exhaust port. Do not inject excessive grease through the grease inlet.
9.3.6 Grease Replenishment for T-axis Gear

Fig. 9-9: T-Axis Gear Diagram

1. Remove the plug LP-M5 from the exhaust port.
2. Remove the hexagon socket head cap screw M6 from the grease inlet, then install the grease zerk A-MT6 x 1. (The grease zerk is delivered with the manipulator.)
3. Inject grease into the grease inlet using a grease gun. (Refer to fig. 9-9 “T-Axis Gear Diagram”)
   - Grease type: Harmonic grease SK-1A
   - Amount of grease: 5 cc (10 cc for 1st supply)

NOTE
The exhaust port is used for air exhaust, and the grease is not exhausted from the exhaust port. Do not inject excessive grease through the grease inlet.

4. Remove the grease zerk from the grease inlet and reinstall the screw. Before installing the screw, apply Three Bond 1206C on the thread part of the screw, then tighten the screw with a tightening torque of 6 N•m (0.6 kgf•m).
5. Reinstall the plug to the exhaust port. Before installing the plug, apply Three Bond 1206C to the thread part of the plug.
9.3.7 Grease Replenishment for R-axis Cross Roller Bearing

Fig. 9-10: R-axis Cross Roller Bearing Diagram

1. Remove the plug LP-M5 from the exhaust port.
2. Remove the hexagon socket head cap screw M6 from the grease inlet, then install the grease zerk A-MT6 x 1. (The grease zerk is delivered with the manipulator.)
3. Inject grease into the grease inlet using a grease gun. (Refer to fig. 9-10 “R-axis Cross Roller Bearing Diagram”)
   - Grease type: Alvania EP grease 2
   - Amount of grease: 3 cc (6 cc for 1st supply)
4. Remove the grease zerk from the grease inlet and reinstall the screw. Before installing the screw, apply Three Bond 1206C on the thread part of the screw, then tighten the screw with a tightening torque of 6 N•m (0.6 kgf•m).
5. Reinstall the plug to the exhaust port. Before installing the plug, apply Three Bond 1206C to the thread part of the plug.

NOTE: The exhaust port is used for air exhaust, and the grease is not exhausted from the exhaust port. Do not inject excessive grease through the grease inlet.
9 Maintenance and Inspection

MH6S  9.3 Notes on Grease Replenishment/Exchange Procedures

9.3.8 Notes for Maintenance

9.3.8.1 Wrist Unit

The motor and encoder units are provided with the wrist unit. To prevent fumes from penetrating into the wrist unit, the matched parts are sealed with sealing bond. If the wrist cover is disassembled, make sure to reseal with sealing bond. (Three Bond 1206C, refer to table 10-1 “Spare Parts for the YR-MH0006S-C00, -C01” at page 10-1.)

Fig. 9-11: Sealing Part of Wrist Unit

9.3.8.2 Battery Pack Connection

Before removing the encoder connector (with CAUTION label), connect the battery pack referring to the following figures.

Fig. 9-12(a): Encoder Connector Diagram (for S-, L-, and U-Axes)
Fig. 9-12(b): Encoder Connector Diagram (for R-, B-, and T-axes)

Connect battery to encoder to save the data before removing connector.

CAUTION

a: Crimped contact-pin (Socket)
b: Crimped contact-pin (Pin)
9.3.9 How to Drain Condensation Water from the Drain Plug

9.3.9.1 For Floor-Mounted Type

Fig. 9-13: Draining Condensation Water (For Floor-Mounted Type)

1. Make the U-axis horizontal to the ground as shown in fig. 9-13 “Draining Condensation Water (For Floor-Mounted Type)”.
2. Remove the plug from the condensation water drain port 1.
3. Remove the plug from the condensation water drain port 2.
4. Drain condensation water.
5. Apply Three Bond 1206C on the thread part of each plug, and reinstall the plugs on the condensation water drain port 1 and 2. Tighten the plugs with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.3.9.2 For Wall-Mounted Type

**Fig. 9-14: Draining Condensation Water (For Wall-Mounted Type)**

1. Make the U-axis horizontal to the ground as shown in fig. 9-14 “Draining Condensation Water (For Wall-Mounted Type)”.
2. Remove the plug from the condensation water drain port 1.
3. Drain condensation water.
4. Apply Three Bond 1206C on the thread part of the plug, and reinstall the plug on the condensation water drain port 1. Tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.3.9.3 For Ceiling-Mounted Type

Fig. 9-15: Draining Condensation Water (For Ceiling-Mounted Type)

1. Make the U-axis horizontal to the ground as shown in fig. 9-15 “Draining Condensation Water (For Ceiling-Mounted Type)”.
2. Remove the plug from the condensation water drain port 1.
3. Remove the plug from the condensation water drain port 2.
4. Drain condensation water.
5. Apply Three Bond 1206C on the thread part of each plug, and reinstall the plugs on the condensation water drain port 1 and 2. Tighten the plugs with a tightening torque of 4.9 N•m (0.5 kgf•m).
### 10 Recommended Spare Parts

It is recommended to keep the parts and components in the following table in stock as spare parts for the MOTOMAN-MH6S. Product performance cannot 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

For replacing parts in Rank B or Rank C, contact your Yaskawa representative.

#### Table 10-1: Spare Parts for the YR-MH0006S-C00, -C01 (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>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Grease</td>
<td>VIGO Grease RE No.0</td>
<td>Yaskawa Electric Corporation</td>
<td>16 kg</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>Grease</td>
<td>Harmonic Grease SK-1A</td>
<td>Harmonic Drive Systems Inc.</td>
<td>2.5 kg</td>
<td>-</td>
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<tr>
<td>A</td>
<td>3</td>
<td>Grease</td>
<td>Alvania EP Grease 2</td>
<td>Showa Shell Sekiyu K.K.</td>
<td>16 kg</td>
<td>-</td>
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<td>A</td>
<td>4</td>
<td>Liquid Gasket</td>
<td>Three Bond 1206C</td>
<td>Three Bond Co., Ltd.</td>
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<td>-</td>
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<tr>
<td>A</td>
<td>5</td>
<td>Battery Pack</td>
<td>HW0470360-A</td>
<td>Yaskawa Electric Corporation</td>
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<td>1</td>
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<td>A</td>
<td>6</td>
<td>Battery Pack</td>
<td>HW9470952-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For replacement of the wire harness in manipulator</td>
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<td>7</td>
<td>B-axis Timing Belt</td>
<td>60S4.5M518</td>
<td>Mitsubishi Belting Limited</td>
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<td>T-axis Timing Belt</td>
<td>60S4.5M387</td>
<td>Mitsubishi Belting Limited</td>
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<td>B</td>
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<td>S-axis Speed Reducer</td>
<td>HW0388621-B</td>
<td>Yaskawa Electric Corporation</td>
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<td>B</td>
<td>10</td>
<td>S-axis Input Gear</td>
<td>HW0312734-1</td>
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<td>B</td>
<td>11</td>
<td>L-axis Speed Reducer</td>
<td>HW0387809-B</td>
<td>Yaskawa Electric Corporation</td>
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<td>B</td>
<td>12</td>
<td>L-axis Input Gear</td>
<td>HW0314503-1</td>
<td>Yaskawa Electric Corporation</td>
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<td>Rank</td>
<td>Parts No.</td>
<td>Name Type</td>
<td>Manufacturer</td>
<td>Qty per Unit</td>
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<td></td>
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<tr>
<td>B</td>
<td>13</td>
<td>U-axis Speed Reducer</td>
<td>HW9280738-B Yaskawa Electric Corporation</td>
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<td>U-axis Input Gear</td>
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<td>B</td>
<td>16</td>
<td>B-axis Speed Reducer</td>
<td>HW9381828-A Yaskawa Electric Corporation</td>
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<td>B</td>
<td>17</td>
<td>T-axis Speed Reducer</td>
<td>HW0383361-A Yaskawa Electric Corporation</td>
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<td>B</td>
<td>18</td>
<td>R-axis Cross Roller Bearing</td>
<td>HW0381872-A Yaskawa Electric Corporation</td>
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<td>B</td>
<td>19</td>
<td>Wire Harness in Manipulator</td>
<td>HW0174871-A Yaskawa Electric Corporation</td>
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<td>B</td>
<td>20</td>
<td>Wire Harness in Manipulator for B- and T-axes</td>
<td>HW0271431-A Yaskawa Electric Corporation</td>
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<tr>
<td>C</td>
<td>21</td>
<td>AC Servomotor for S- and U-axes</td>
<td>SGMRV-05ANA-YR2* HW0388664-A Yaskawa Electric Corporation</td>
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<td>C</td>
<td>22</td>
<td>L-axis AC Servomotor</td>
<td>SGMRV-09ANA-YR1* HW0389666-A Yaskawa Electric Corporation</td>
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<tr>
<td>C</td>
<td>23</td>
<td>AC Servomotor for R-, B-, and T-axes</td>
<td>SGMPH-01ANA-YR1* HW0389297-A Yaskawa Electric Corporation</td>
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</tr>
</tbody>
</table>

Table 10-1: Spare Parts for the YR-MH6006S-C00, -C01 (Sheet 2 of 2)
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