MOTOMAN-UP50SD INSTRUCTIONS

TYPE: YR-UP050SD-A00 (STANDARD SPECIFICATION)
YR-UP050SD-A01 (WITH LIMIT SWITCHES FOR S-, L-, U-AXES)

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

- This instruction manual is intended to explain operating instructions and maintenance procedures primarily for the MOTOMAN-UP50SD.
- General items related to safety are listed in Section 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 DX100.

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 when the emergency stop buttons on the front door of the DX100 and programming pendant are pressed. 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 ON the servo power. 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.
  - 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 persons are present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning ON the DX100 power.
  - Moving the manipulator with the programming pendant.
  - Running check operations.
  - 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 button is 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 consists of “Manipulator” (robot itself), “DX100” (robot controller), “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</td>
<td>Manipulator cable</td>
</tr>
<tr>
<td>controller</td>
<td></td>
</tr>
</tbody>
</table>
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 Labels Location
UP50SD

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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 (3 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 indicated on a label as shown below.

Fig. 1-1: Location of Order Number Label

(a)DX100 (Front View)  (b)Manipulator (Side View)

THE MANIPULATOR AND THE CONTROLLER SHOULD HAVE THE SAME ORDER NUMBER.

ORDER No.
2 Transport

2.1 Transporting Method

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 transport. The system consists of precision components. Failure to observe this caution may adversely affect performance.

NOTE

- Check that the eyebolts are securely fastened.
- The weight of the manipulator is approximately 545 kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the mass.
- The attached eyebolts are designed to support the manipulator mass.
- Do not use them for anything other than transporting the manipulator.
- Mount the shipping bolts and brackets before transporting the manipulator.
- With any transportation equipment, make sure to avoid external force on the arm or motor unit when transporting the manipulator.
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 in Using Crane”.

*Fig. 2-1: Transporting Position in Using Crane*
2.1.2 Using a Forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts and brackets as shown in fig. 2-2 “Transporting Position in Using Forklift”. Insert claws into the forklift claw entries of 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 overturn or slippage.

Fig. 2-2: Transporting Position in Using Forklift
The manipulator is provided with shipping bolts and brackets at positions as shown in the figures in chapter 2.1 “Transporting Method”, to protect its driving units from various external force during transport.

The shipping bolts and brackets are painted yellow, and are fixed by two hexagon socket head cap screws M8.

**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 for relocation.
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 manipulator’s tool or the workpiece held by the manipulator will not reach the wall, safeguarding, or DX100 when the arm is fully extended. 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.
- When mounting the manipulator on the wall or the ceiling, the base section must have sufficient strength and rigidity to support the weight of the manipulator. Also, it is necessary to consider countermeasures to prevent the manipulator from falling. Failure to observe this warning may result in injury or damage.

**CAUTION**

- Do not install or operate a manipulator that is damaged or lacks 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 explained in fig. 2-1 “Transferring Position in Using Crane” and fig. 2-2 “Transferring Position in Using Forklift” are removed. Failure to observe this caution may result in damage to the driving parts.
3 Installation

3.1 Installation of Safeguarding

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

Responsibility for Safeguarding (ISO 10218)

The user of a manipulator or robot system shall ensure that 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 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 force of the manipulator. (Refer to table 3-1 “Maximum Repulsion Force 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.

For installation, refer to fig. 3-1 “Mounting the Manipulator on the Baseplate” or fig. 3-2 “Mounting the Manipulator on the Floor”.

<table>
<thead>
<tr>
<th>Table 3-1: Maximum Repulsion Force of the Manipulator at Emergency Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum torque in horizontal rotation (S-axis moving direction)</td>
</tr>
<tr>
<td>Maximum torque in vertical rotation (LU-axis moving direction)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3-2: Endurance Torque in Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endurance torque in horizontal operation</td>
</tr>
<tr>
<td>Endurance torque in vertical operation</td>
</tr>
</tbody>
</table>
3.2 Mounting Procedures for Manipulator Base

3.2.1 Mounting the Manipulator on the Baseplate

The baseplate should be rugged and durable to withstand maximum repulsion force of the manipulator and to ensure that the manipulator and fixture are in the correct relative position. The thickness of the baseplate is 50 mm or more and an M20 size or larger anchor bolt is recommended. After anchoring the baseplate firmly on the floor, fix the manipulator base to the baseplate with the hexagon head screw M20 (8 screws, length of 70 mm or more is recommended) using mounting holes on the manipulator base. The manipulator base is tapped for eight mounting holes. Tighten the hexagon head bolts and anchor bolts securely so that they will not work loose during operation. For details, refer to fig. 3-1 “Mounting the Manipulator on the Baseplate”.

Fig. 3-1: Mounting the Manipulator on the Baseplate
3.2.2 Mounting the Manipulator 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 force of the manipulator shown in "Table 3-1 Maximum Repulsion Force of the Manipulator at Emergency Stop". As a rough standard, if there is a concrete thickness (floor) of 200 mm 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. Any thickness less than 200 mm is insufficient for mounting, even if the floor is concrete.

Fig. 3-2: Mounting the Manipulator on the Floor

Bolt A: Bolt M20 (length: 70) (8 screws); spring washer, flat washer
Bolt B: Bolt M24 (length: 70) (4 screws); spring washer
The fixing screws and bases are to be prepared by customer.
3.3 Types of Mounting

The manipulator can be mounted in three different ways: floor-mounted (standard), and wall-mounted, and ceiling-mounted types are available. For wall-mounted and ceiling-mounted types, the three points listed below are different from the floor-mounted type.

- S-Axis Operating Range
- Processes in Fixing the Manipulator Base
- Precautions to Prevent the Manipulator from Falling

3.3.1 S-Axis Operating Range

In case of installing wall-mounted type, the S-axis operating range must be ±30°. (Set before shipment.)

3.3.2 Processes in Fixing the Manipulator Base

In case of installing wall/ceiling-mounted types, be sure to use eight hexagon socket head cap screws M20. Use a torque of 402 N-m (41 kgf•m) when tightening the screws.

3.3.3 Precautions to Prevent the Manipulator from Falling

In case of installing wall/ceiling-mounted types, for safety purposes, take measures to keep the manipulator from falling. Refer to fig. 3-3 “Precautions to Prevent the Manipulator from Falling” for details.

Fig. 3-3: Precautions to Prevent the Manipulator from Falling

Preventive support against falling

Hexagon socket head cap screw M20 (8 screws)

Tensile strength: 1200 N/mm² or more

In case of using the wall/ceiling-mounted types, inform Yaskawa of the matter in an order placement. Be sure to contact your Yaskawa representative to execute wall/ceiling installations on site.
3.4 Notes in Mounting the Manipulators on the Ceiling

In the case if the manipulator shipped is the floor-mounted type, yet is to be mounted on the ceiling, mounting positions of each part on the view A in the figure below should be changed after installing the manipulator on the ceiling, to prevent a grease leakage from an air breather. Change the mounting positions of the parts as shown in the figure below.

After installing the manipulator on the ceiling, replace the positions of the parts installed in the LU-axes motor base, by switching the positions of the union and the hexagon socket head plug PT 1/8, and the positions of the grease cap and the air breather.

Replace the positions of the grease cap and the air breather promptly, to prevent the grease leakage from a hole where a grease cap is to be installed.

Fig. 3-4: Parts Positions for Ceiling Mounted Manipulator
3 Installation

3.5 IP (International Protection)

For standard type, the environmental protection based on IEC standard for the main part of the manipulator conforms to IP54, and the wrist part conforms to IP67. However, note that the main parts of the wall/ceiling-mounted types do not conform to IP54.

IP65 is conformable to all the types of the manipulators (floor-mounted, wall-mounted, and ceiling-mounted types) as options.

In case of using the wall/ceiling-mounted types, inform Yaskawa of the matter in an order placement. Be sure to contact your Yaskawa representative to execute wall/ceiling installations on site.

3.6 Location

When installing the manipulator, satisfy the following environmental conditions.

- Ambient temperature: 0°C to 45°C
- Humidity: 20 to 80%RH at constant temperature
- Free from exposure to water, oil, or dust
- 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 is 0.5 mm or less
4 Wiring

4.1 Grounding

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

![Grounding Method Diagram](image)

- Do not use this line 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 local electric equipment technical 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 OFF the primary power supply, 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.

**NOTE**

- Bolt M8 for grounding (Delivered with the manipulator)

View A

5.5 mm² or more
4.2 Manipulator Cable Connection

There are three manipulator cables: 1BC, 2BC, and 3BC (Refer to "Fig. 4-2 Manipulator Cables "). Connect these cables to the manipulator base connectors and the DX100 respectively. For the details on connection, refer to "Fig. 4-3(a) Manipulator Cable Connection (To the Manipulator) " and "Fig. 4-3(b) Manipulator Cable Connection (To the DX100) ".

4.2.1 Connection to the Manipulator

Before connecting the 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 depress the lever until it clicks.

4.2.2 Connection to the DX100

Before connecting the cables to the DX100, verify the numbers: X11, X21, and X22 on both manipulator cables and the DX100 bboard connectors. When connecting, adjust the cable connector positions to the main key positions of the DX100, and insert cables in the order of X21, X22, X11 and then depress the lever until it clicks.

Fig. 4-2: Manipulator Cables
4 Wiring

4.2 Manipulator Cable Connection

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

Connector Details (Manipulator Side)

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

#### 5.1 Basic Specifications

Table 5-1: Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
</tr>
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<tbody>
<tr>
<td><strong>Configuration</strong></td>
<td>Vertically Articulated</td>
</tr>
<tr>
<td><strong>Degree of Freedom</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>Payload</strong></td>
<td>50 kg</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>±0.07 mm</td>
</tr>
</tbody>
</table>

**Range of Motion**

<table>
<thead>
<tr>
<th>Axis</th>
<th>Range of Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-axis (turning)</td>
<td>-180° to +180°</td>
</tr>
<tr>
<td>L-axis (lower arm)</td>
<td>-90° to +135°</td>
</tr>
<tr>
<td>U-axis (upper arm)</td>
<td>-140° to +236°</td>
</tr>
<tr>
<td>R-axis (wrist roll)</td>
<td>-360° to +360°</td>
</tr>
<tr>
<td>B-axis (wrist pitch/yaw)</td>
<td>-125° to +125°</td>
</tr>
<tr>
<td>T-axis (wrist twist)</td>
<td>-360° to +360°</td>
</tr>
</tbody>
</table>

**Maximum Speed**

<table>
<thead>
<tr>
<th>Axis</th>
<th>Maximum Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-axis</td>
<td>2.97 rad/s, 170°/s</td>
</tr>
<tr>
<td>L-axis</td>
<td>2.97 rad/s, 170°/s</td>
</tr>
<tr>
<td>U-axis</td>
<td>2.97 rad/s, 170°/s</td>
</tr>
<tr>
<td>R-axis</td>
<td>4.36 rad/s, 250°/s</td>
</tr>
<tr>
<td>B-axis</td>
<td>4.36 rad/s, 250°/s</td>
</tr>
<tr>
<td>T-axis</td>
<td>6.11 rad/s, 350°/s</td>
</tr>
</tbody>
</table>

**Allowable Moment**

<table>
<thead>
<tr>
<th>Axis</th>
<th>Allowable Moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-axis</td>
<td>196 Nm (20 kgf•m)</td>
</tr>
<tr>
<td>B-axis</td>
<td>196 Nm (20 kgf•m)</td>
</tr>
<tr>
<td>T-axis</td>
<td>127 Nm (13 kgf•m)</td>
</tr>
</tbody>
</table>

**Allowable Inertia (GD^2/4)**

<table>
<thead>
<tr>
<th>Axis</th>
<th>Allowable Inertia</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Axis</td>
<td>13 kg•m^2</td>
</tr>
<tr>
<td>B-Axis</td>
<td>13 kg•m^2</td>
</tr>
<tr>
<td>T-Axis</td>
<td>5.5 kg•m^2</td>
</tr>
</tbody>
</table>

**Approx. Mass**

| Approx. Mass | 545 kg |

**Ambient Conditions**

| Temperature | 0°C to 45°C |
| Humidity | 20 to 80% RH at constant temperature |
| Vibration Acceleration | Less than 4.9 m/s² (0.5 G) |
| Others | Free from corrosive gas or liquid, or explosive gas. Free from water, oil, or dust. Free from excessive electrical noise (plasma). |

**Power Capacity**

| Power Capacity | 4.5 kVA |

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1 SI units are used in this table. However, gravitational unit is used in ( ).
2 Conformed to ISO9283
3 For the limit switch specification (type: MOTOMAN-UP050SD-A01), the range of motion is limited with limit switch before shipment. Refer to "MOTOMAN-UP050SD INSTRUCTIONS FOR S-, L-, and U- AXIS OVERRUN RIMIT SWITCH FUNCTION".
4 Refer to table 6-1 “Moment and Total Moment of Inertia” at page 6-1” for details on the allowable moment of inertia.
5.2 Part Names and Working Axes

Fig. 5-1: Part Names and Working Axes

- Upper arm (U-arm)
- Lower arm (L-arm)
- Wrist (W)
- Wrist flange
- Rotary head (S-head)
- Upper arm (U-arm)
- Lower arm (L-arm)
- Wrist (W)
- Wrist flange
- Rotary head (S-head)

5.3 Manipulator Base Dimensions

Fig. 5-2: Manipulator Base Dimensions

- Units: mm
- View A
- Manipulator Base Dimensions
5.4 Dimensions and P-Point Maximum Envelope

Fig. 5-3: Dimensions and P-Point Maximum Envelope

NOTE: For the limit switch specification (type: MOTOMAN-UP50SD-A01), the range of motion is limited with limit switch before shipment. Refer to "MOTOMAN-UP50SD INSTRUCTIONS FOR S-, L-, and U-AXIS OVERRUN LIMIT SWITCH FUNCTION".
5.5 Alterable Operating Range

The operating range of the S-axis can be altered according to the operating conditions as shown in Fig. 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>-180° to +180° (standard)</td>
</tr>
<tr>
<td></td>
<td>-150° to +150°</td>
</tr>
<tr>
<td></td>
<td>-120° to +120°</td>
</tr>
<tr>
<td></td>
<td>-90° to +90°</td>
</tr>
<tr>
<td></td>
<td>-60° to +60°</td>
</tr>
<tr>
<td></td>
<td>-30° to +30°</td>
</tr>
</tbody>
</table>
6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

The allowable wrist load is 50 kg. 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 Moment of Inertia". Contact your Yaskawa representative for further information or assistance.

Table 6-1: Moment and Total Moment of Inertia

<table>
<thead>
<tr>
<th>Axis</th>
<th>Moment N·m (kgf·m)</th>
<th>GD^2/4 Total Inertia kg·m^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-axis</td>
<td>196 (20)</td>
<td>13</td>
</tr>
<tr>
<td>B-axis</td>
<td>196 (20)</td>
<td>13</td>
</tr>
<tr>
<td>T-axis</td>
<td>127 (13)</td>
<td>5.5</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 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.

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

The wrist flange dimensions are shown in fig. 6-2 "Wrist Flange". To make the alignment mark visible and to enable an easy grease exchange for the B- and T-axis gears, mount the attachment inside the fitting. Fitting depth of inside and outside fittings must be 5 mm or less.

Fig. 6-2: Wrist Flange

![Diagram of wrist flange with dimensions and notes]

**NOTE**
Wash off anti-corrosive paint (Yellow) on the 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 fixed on the upper arm for easier installation of the user's system application as shown in fig. 7.1 “Installing Peripheral Equipment”. Observe the conditions in the figure and table below in mounting the peripheral equipment on the U-axis.

Table 7-1: Constraint for Attaching

<table>
<thead>
<tr>
<th>Section</th>
<th>Application</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Cable processing and valve load</td>
<td>Up to 10 kg. 49 N•m (5 kgf•m) max. for increased moment amount of upper arm</td>
</tr>
<tr>
<td>B</td>
<td>Others</td>
<td>Up to 30 kg. (only for floor- and ceiling-mounted types)</td>
</tr>
</tbody>
</table>
7.2 Internal User I/O Wiring Harness and Air Lines

Internal user I/O wiring harness (0.5 mm² x 23 wires) and an air line are incorporated in the manipulator for the drive of peripheral devices mounted on the upper arm as shown in fig. 7-2 “Connectors for Internal User I/O Wiring Harness and Air Lines”.

The fig. 7-2 “Connectors for Internal User I/O Wiring Harness and Air Lines” also shows the connector pin (1 to 23) assignment. Perform wiring referring to the figure and the conditions below.

<table>
<thead>
<tr>
<th>Items</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The allowable current for internal user I/O wiring harness</td>
<td>6.6A or less per a wire. The total current value for pins 1 to 23 must be 60 A 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 mm.)</td>
</tr>
</tbody>
</table>

Fig. 7-2: Connectors for Internal User I/O Wiring Harness and Air Lines

The same pin number (1-23) of two connectors is connected with the lead wire of single 0.75 mm².
8 Electrical Equipment Specification

8.1 Location of Limit Switches

Limit switches are optional. The limit switches (the S- and L-axis overrun limit switches and the LU-axes interference limit switch) can be mounted only if the manipulator type is YR-UP050SD-A01. For each location, refer to fig. 8-1 “location of Limit Switches”.

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 numbers, types, and locations of connectors, see fig. 8-2 "Location of Connectors" and fig. 8-1 "List of Connector Types".

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 connector base</td>
<td>JL05-2A24-2BPC</td>
</tr>
<tr>
<td></td>
<td>Prepare JL05-6A24-28S (optional)</td>
</tr>
<tr>
<td>Connector for internal user I/O wiring harness on U-arm</td>
<td>JL05-2A24-2BSC</td>
</tr>
<tr>
<td></td>
<td>Prepare JL05-6A24-28P (optional)</td>
</tr>
</tbody>
</table>
1. This diagram shows the internal wiring for increasing the torque of the MOTOMAN-UP50SD.

For the limit switch specification, the connection of the section A is different.
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 1 Inspection Items". Conduct periodical inspections according to the inspection schedule in the table.

In Table 1, the inspection items are categorized by three types of operations: operations which can be performed by personnel authorized by 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 the inspection work.

- The inspection interval depends on the total servo operation time.
- If axes are used very frequently (in handling applications, etc.), inspections may be required at shorter intervals. Contact your Yaskawa representative.
<table>
<thead>
<tr>
<th>Item</th>
<th>Inspection Method</th>
<th>Operation</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual</td>
<td>Check alignment mark and damage at the home position.</td>
<td>Daily</td>
</tr>
<tr>
<td>2</td>
<td>Visual</td>
<td>Check for damage and deterioration. Clean the work area if dust or spatter is present. Check for missing, loose, or damaged parts.</td>
<td>Daily</td>
</tr>
<tr>
<td>3</td>
<td>Visual</td>
<td>Check for grease leakage.</td>
<td>24,000HCycle</td>
</tr>
<tr>
<td>4</td>
<td>Spanner</td>
<td>Tighten loose bolts.</td>
<td>36,000HCycle</td>
</tr>
<tr>
<td>5</td>
<td>Screwdriver, Wrench</td>
<td>Tighten loose connectors and spot welds if necessary.</td>
<td>72,000HCycle</td>
</tr>
<tr>
<td>6</td>
<td>Manual</td>
<td>Manual</td>
<td>180,000HCycle</td>
</tr>
<tr>
<td>7</td>
<td>Manual</td>
<td>Manual</td>
<td>360,000HCycle</td>
</tr>
<tr>
<td>8</td>
<td>Manual</td>
<td>Manual</td>
<td>540,000HCycle</td>
</tr>
<tr>
<td>9</td>
<td>Manual</td>
<td>Manual</td>
<td>720,000HCycle</td>
</tr>
</tbody>
</table>
### 9.1 Inspection Schedule

#### 10 Wire harness in manipulator
- **Method**: Visual, Multimeter
- **Operation**: Check for conduction between the main connector of base and intermediate connector by manually shaking the wire.
- **Inspection Charge**: Replace in every 24000H.

#### 11 Limit switches and dogs (For S-, L-, and U-axes)
- **Method**: Screwdriver, Wrench, Multimeter
- **Operation**: Check for stain, damage, and looseness. Tighten and check the dog movement.

#### 12 Battery pack in manipulator
- **Operation**: Replace the battery pack when the battery alarm occurs or when the manipulator has been operated for 36000H.

#### 13 S-axis speed reducer
- **Method**: Grease Gun
- **Operation**: Check for malfunction. (Replace if necessary.)
  - Supply grease. (6000H cycle)
  - Exchange grease. (12000H cycle)
- **Inspection Charge**: See section 9.3.1.

#### 14 L-, U-axes speed reducers
- **Method**: Grease Gun
- **Operation**: Check for malfunction. (Replace if necessary.)
  - Supply grease. (6000H cycle)
  - Exchange grease. (12000H cycle)
- **Inspection Charge**: See sections 9.3.2 and 9.3.3.

### Table 9-1: Inspection Items

<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>Daily</td>
<td>1000H Cycle</td>
<td>6000H Cycle</td>
<td>12000H Cycle</td>
</tr>
<tr>
<td>10</td>
<td>Wire harness in manipulator</td>
<td>●</td>
<td>Visual, Multimeter</td>
<td>Check for conduction between the main connector of base and intermediate connector by manually shaking the wire. Check for wear of protective spring.</td>
</tr>
<tr>
<td>11</td>
<td>Limit switches and dogs (For S-, L-, and U-axes)</td>
<td>●</td>
<td>Screwdriver, Wrench, Multimeter</td>
<td>Check for stain, damage, and looseness. Tighten and check the dog movement.</td>
</tr>
<tr>
<td>12</td>
<td>Battery pack in manipulator</td>
<td>●</td>
<td>Grease Gun</td>
<td>Replace the battery pack when the battery alarm occurs or when the manipulator has been operated for 36000H.</td>
</tr>
</tbody>
</table>
| 13    | S-axis speed reducer | ● | Grease Gun | Check for malfunction. (Replace if necessary.)
  - Supply grease. (6000H cycle)
  - Exchange grease. (12000H cycle)
|       | | | | See section 9.3.1. |
| 14    | L-, U-axes speed reducers | ● | Grease Gun | Check for malfunction. (Replace if necessary.)
  - Supply grease. (6000H cycle)
  - Exchange grease. (12000H cycle)
|       | | | | See sections 9.3.2 and 9.3.3. |
## 9 Maintenance and Inspection

### 9.1 Inspection Schedule

<table>
<thead>
<tr>
<th>Inspection Numbers</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>13, 14, 15, 16</td>
<td>Daily</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>License Service Company</td>
</tr>
<tr>
<td></td>
<td>6000H Cycle</td>
<td></td>
<td>Supply grease. (6000H cycle)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12000H Cycle</td>
<td></td>
<td>Exchange grease. (12000H cycle)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24000H Cycle</td>
<td></td>
<td>See section 9.3.4.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>36000H Cycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 R-axis speed reducer</td>
<td>● ●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>License Service Company</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supply grease. (6000H cycle)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exchange grease. (12000H cycle)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>See section 9.3.4.</td>
<td></td>
</tr>
<tr>
<td>16 B-, T-axes speed reducers and gears</td>
<td>● ●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>License Service Company</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supply grease. (6000H cycle)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exchange grease. (12000H cycle)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>See section 9.3.5.</td>
<td></td>
</tr>
<tr>
<td>17 Overhaul</td>
<td>●</td>
<td></td>
<td></td>
<td>License Service Company</td>
</tr>
</tbody>
</table>

**Table 9-1: Inspection Items**

1. Inspection numbers correspond to the numbers in fig. 9-1 “Inspection Parts and Inspection Numbers”.
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 9.3.6.)
4. The application that requires highly frequent operation such as handling may cause grease leakage of air breather or the internal pressure rise of speed reducer. Contact your Yaskawa representative.
5. For the grease, refer to table 9-2 “Inspection Parts and Grease Used”.

**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</td>
<td>Molywhite RE No. 00</td>
<td>Speed reducers for all axes B-, T-axis gears</td>
</tr>
</tbody>
</table>

Inspection numbers correspond to the numbers in fig. 9-1 “Inspection Items”. 
9 Maintenance and Inspection

9.1 Inspection Schedule

Fig. 9-1: Inspection Parts and Inspection Numbers

Note: The manipulator is in the home position.
9.2 Notes on Maintenance Procedures

9.2.1 Battery Pack Replacement

The battery packs (type: HW0470360-A) are attached in the two locations as shown in "(a) Back/Side View" and "(b) Top View" of the *Fig. 9-2 Battery Location*.

*Fig. 9-2: Battery Location*
1. Turn OFF the DX100 main power supply.
2. Remove the cover plate fastening screws M4 and from the connector base and pull out the battery pack to replace with a new battery pack.
3. Remove the old 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.
6. Mount the new battery pack to the battery holder.
7. Reinstall the plate and fix it with the plate fastening screws M4.

**NOTE**
Connect the new battery pack before removing the old one so that the encoder absolute data does not disappear.

**NOTE**
Be sure not to pinch the cable when putting the plate back into place.
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 go 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.
- 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 the hose on the grease inlet with grease to keep air from entering into the speed reducer.
9.3.1 Grease Replenishment/Exchange for S-Axis Speed Reducer

Fig. 9-4: S-Axis Speed Reducer

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

1. Remove the hexagon socket head plug PT1/8 from the grease exhaust port.
2. Remove the hexagon socket head plug PT1/4 from the grease inlet and install the grease zerk PT1/4. (The grease zerk is delivered with the manipulator.)
3. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 700 cc
     (1400 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 and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C (Refer to table 10-1 “Spare Parts for the MOTOMAN-UP50SD” at page 10-1.) to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).
6. Remove the grease zerk from the grease inlet and reinstall the plug PT1/4. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

NOTE
- If grease is injected with the plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
9.3.1.2 Grease Exchange (Refer to "Fig. 9-4  S-Axis Speed Reducer ")

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

2. Remove the hexagon socket head plug PT1/4 from the grease inlet and install the grease zerk PT1/4. (The grease zerk is delivered with the manipulator.)

3. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 3400 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 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 and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/4. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

**NOTE**
- If grease is injected with the plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
9.3.2 Grease Replenishment/Exchange for L-Axis Speed Reducer

Fig. 9-5: L-Axis Speed Reducer

9.3.2.1 Grease Replenishment (Refer to "Fig. 9-5 L-Axis Speed Reducer").

1. Tilt 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 plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

4. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 250 cc (500 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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

6. Wipe the discharged grease with a cloth and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and 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 ")

1. Tilt 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 plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

4. Inject grease into the grease inlets using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 1650 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

5. The grease exchange is completed when new grease appears in the 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 excess grease.

7. Wipe the discharged grease with a cloth and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

8. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

**NOTE**
- If grease is injected with the plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
9.3.3 Grease Replenishment/Exchange for U-Axis Speed Reducer

Fig. 9-6: U-Arm Posture in Grease Replenishment/Exchange for U-Axis Speed Reducer

1. Tilt the U-arm horizontal to the ground. (Refer to "Fig. 9-6 U-Arm Posture in Grease Replenishment/Exchange for U-Axis Speed Reducer ".)
2. Remove the hexagon socket head plug PT1/8 from the grease exhaust port.
3. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)
4. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 170 cc (340 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less
5. Move the U-axis for a few minutes to discharge excess grease.

NOTE
• If grease is injected with the plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
6. Wipe the discharged grease with a cloth and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

9.3.3.2 Grease Exchange (Refer to "Fig. 9-7  U-Axis Speed Reducer ")

1. Tilt the U-arm horizontal to the ground. (Refer to fig. 9-6  "U-Arm Posture in Grease Replenishment/Exchange for U-Axis Speed Reducer".)

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

3. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

4. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 850 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

5. 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.

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

7. Wipe the discharged grease with a cloth and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

8. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).
9.3.4 Grease Replenishment/Exchange for R-Axis Speed Reducer

Fig. 9-8: R-Axis Speed Reducer

9.3.4.1 Grease Replenishment (Refer to "Fig. 9-8 R-Axis Speed Reducer").

1. Remove the hexagon socket head plug 1/8 from the grease exhaust port.

2. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

3. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 90 cc (180 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 R-axis for a few minutes to discharge excess grease.

5. Wipe the discharged grease with a cloth and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

6. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).
9.3.4.2 Grease Exchange (Refer to "Fig. 9-8 R-Axis Speed Reducer")

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

2. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

3. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 410 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 from the grease exhaust port. The new grease is distinguished from the old grease by color.

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

6. Wipe the discharged grease with a cloth and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

**NOTE**

- If grease is injected with the plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.

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- If grease is injected with the plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
9.3.5 Grease Replenishment/Exchange for B- and T-Axis Speed Reducers and Gears

Fig. 9-9: B- and T-Axis Speed Reducers and Gears

9.3.5.1 Grease Replenishment (Refer to "Fig. 9-9 B- and T-Axis Speed Reducers and Gears ").

1. Remove the hexagon socket head set screw M6 from the grease exhaust port.

2. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

3. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 300 cc (600 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 B-axis for a few minutes to discharge excess grease.

5. Wipe the discharged grease with a cloth and reinstall the set screw M6 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the set screw, and tighten the set screw with a tightening torque of 3.9 N·m (0.4 kgf·m).

6. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).
9.3.5.2 Grease Exchange (Refer to "Fig. 9-9  B- and T-Axis Speed Reducers and Gears ")

1. Remove the hexagon socket head set screw M6 from the grease exhaust port.

2. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

3. Inject grease into the grease inlet using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 1500 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 from the grease exhaust port. The new grease is distinguished from the old grease by color.

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

6. Wipe the discharged grease with a cloth and reinstall the set screw M6 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the set screw, and tighten the set screw with a tightening torque of 3.9 N·m (0.4 kgf·m).

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m).

**NOTE**

• If grease is injected with the set screw on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
9.3.6 Notes for Maintenance

When performing maintenance such as replacement of a wire harness in the manipulator, the encoder connector may be necessary to be removed. In this case, be sure to connect the battery pack to the battery backup connector before removing the encoder connector.

Removing the encoder connector without connecting the battery pack leads to disappearance of the encoder absolute data.

For the battery pack connection, refer to "Fig. 9 Battery Pack Connection for Motors".

**NOTE**

Do not remove battery pack in the connector base.

9.3.6.1 Battery Pack Connection for Motors

The connectors (crimped contact-pin) for battery backup are installed at the end point of each motor (marked as BAT and OBT). Connect the battery pack according to the following procedure.

1. Remove a cap attached to battery backup connectors of the motor.
2. Connect a battery pack (HW9470932-A) to the battery backup connectors (BAT and OBT are marked) located at the end point of an encoder cable. With the battery pack connected to the battery backup connectors, perform maintenance check.
3. After the maintenance check, confirm all connectors are connected and remove the battery pack. Reinstall the cap onto the battery backup connectors of the motor.

**NOTE**

Do not remove battery pack in the connector base.
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-UP50SD. 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

Table 10-1: Spare Parts for the MOTOMAN-UP50SD (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 per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Grease</td>
<td>Molywhite RE No. 00</td>
<td>Yaskawa Electric Corporation</td>
<td>16 kg</td>
<td>For all axis speed reducers and wrist units</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>Liquid Gasket</td>
<td>Three Bond 1206C</td>
<td>ThreeBond Co., Ltd.</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Battery Pack</td>
<td>HW9470932-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>For replacement of wire harness in manipulator</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Battery Pack</td>
<td>HW0470360-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>R-Axis Timing Belt</td>
<td>250SM525</td>
<td>Bando Chemical Industries, Ltd.</td>
<td>1</td>
<td></td>
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<tr>
<td>B</td>
<td>6</td>
<td>B-Axis Timing Belt</td>
<td>250SM575</td>
<td>Bando Chemical Industries, Ltd.</td>
<td>1</td>
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<tr>
<td>B</td>
<td>7</td>
<td>S-axis Speed Reducer</td>
<td>HW9381671-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
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<tr>
<td>B</td>
<td>8</td>
<td>S-axis Input Gear</td>
<td>HW9381676-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
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<tr>
<td>B</td>
<td>9</td>
<td>L-axis Speed Reducer</td>
<td>HW9381465-B</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
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<tr>
<td>B</td>
<td>10</td>
<td>L-axis Input Gear</td>
<td>HW9482771-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
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</tbody>
</table>

To replace parts in Rank B or Rank C, contact your Yaskawa representative.
# 10 Recommended Spare Parts

## MOTOMAN-UP50SD

### Table 10-1: Spare Parts for the MOTOMAN-UP50SD (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name Type</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>Qty per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>11</td>
<td>U-axis Speed Reducer</td>
<td>HW9381670-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>B</td>
<td>12</td>
<td>U-axis Input Gear</td>
<td>HW94827770-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
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<tr>
<td>B</td>
<td>13</td>
<td>R-axis Speed Reducer</td>
<td>HW9381640-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>B</td>
<td>14</td>
<td>B-axis Speed Reducer</td>
<td>HW9381636-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>B</td>
<td>15</td>
<td>F-axis Speed Reducer</td>
<td>HW9381635-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>C</td>
<td>16</td>
<td>AC Servomotor for S-axis</td>
<td>SGMRS-30A2A-YR1* HW0382198-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>17</td>
<td>AC Servomotor for L-axis</td>
<td>SGMRS-37A2A-YR1* HW0382157-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>18</td>
<td>AC Servomotor for U-axis</td>
<td>SGMRS-13A2A-YR1* HW0382158-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
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<tr>
<td>C</td>
<td>19</td>
<td>AC Servomotors for R-, B-, and T-axes</td>
<td>SGMRS-12A2B-YR1* HW0382155-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>3</td>
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<tr>
<td>C</td>
<td>20</td>
<td>Wire Harness in Manipulator</td>
<td>HW0171128-B</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
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</tr>
<tr>
<td>C</td>
<td>21</td>
<td>Connector base Unit</td>
<td>HW0371036-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
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