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 mainly on the mechanical part of the MOTOMAN-MPX2600 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 the Chapter 1: Safety of the DX200 instructions. To ensure correct and safe operation, carefully read the DX200 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.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338
www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved YASKAWA training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the MOTOMAN-MPX2600.

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

DANGER
Indicates an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.

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

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

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

PROHIBITED
Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations.

At any rate, be sure to follow these important items.

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

DANGER

• Maintenance and inspection must be performed by specified personnel.
Failure to observe this caution may result in electric shock or injury.
• For disassembly or repair, contact your YASKAWA representative.
• Do not remove the motor, and do not release the brake.
Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator’s arm.
WARNING

• Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX200 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:
  – Be sure to use a lockout device to the safeguarding when going inside. Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
  – 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 DX200.
  – 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 DX200 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 supply 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>DX200 controller</td>
<td>DX200</td>
</tr>
<tr>
<td>DX200 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and</td>
<td>Manipulator cable</td>
</tr>
<tr>
<td>the controller</td>
<td></td>
</tr>
</tbody>
</table>

Description of the Operation Procedure

In the explanation of the operation procedure, the expression “Select • • •” means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and TM are omitted.
Explanation of Warning Labels

The following warning labels are attached to the manipulator. Always follow the warnings on the labels. Also, an identification label with important information is placed on the body of the manipulator. Prior to operating the manipulator, confirm the contents.

Fig. : Warning Label Location

Battery warning label
The label is on the cover which the battery is mounted.
HW1372692-A(For S-,L-axis)
-B(For U-,R-axis)
-C(For B-,T-axis)
Battery pack type: ENERGIZER L91
Manufacturer: YASKAWA Electric Corporation
<table>
<thead>
<tr>
<th>Warning Label</th>
<th>AA**</th>
<th>B**</th>
<th>C**,F**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nameplate</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Battery Warning Label</td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td>Pressure Switch Unit Warning Label</td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
</tr>
<tr>
<td>Warning Label A</td>
<td><img src="image10.png" alt="Image" /></td>
<td><img src="image11.png" alt="Image" /></td>
<td><img src="image12.png" alt="Image" /></td>
</tr>
<tr>
<td>Warning Label B</td>
<td><img src="image13.png" alt="Image" /></td>
<td><img src="image14.png" alt="Image" /></td>
<td><img src="image15.png" alt="Image" /></td>
</tr>
</tbody>
</table>
Safeguarding Tips

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

• Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator’s manuals, the system equipment, and options and accessories should be permitted to operate this equipment.

• Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

• The system must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.

• In accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

Mechanical Safety Devices

The safe operation of this equipment is ultimately the users responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this equipment.

Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety equipment is provided as standard:

• Safety barriers
• Door interlocks
• Emergency stop palm buttons located on operator station

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
Programming, Operation, and Maintenance Safety

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this equipment should be permitted to program, or maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the equipment to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.

- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.

- Check the E-Stop button on the operator station for proper operation before programming. The equipment must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.

- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.

- Any modifications to the controller unit can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the controller unit. Making any changes without the written permission from YASKAWA will void the warranty.

- Some operations require a standard passwords and some require special passwords.

- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications. All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that the changes have not created hazards or dangerous situations.

- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.

- Use proper replacement parts.

- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
Maintenance Safety

Turn the power OFF and disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

Perform only the maintenance described in this manual. Maintenance other than specified in this manual should be performed only by YASKAWA-trained, qualified personnel.

Summary of Warning Information

This manual is provided to help users establish safe conditions for operating the equipment. Specific considerations and precautions are also described in the manual, but appear in the form of Dangers, Warnings, Cautions, and Notes.

It is important that users operate the equipment in accordance with this instruction manual and any additional information which may be provided by YASKAWA. Address any questions regarding the safe and proper operation of the equipment to YASKAWA Customer Support.
Customer Support Information

If you need assistance with any aspect of your MPX2600 system, please contact YASKAWA Customer Support at the following 24-hour telephone number:

(937) 847-3200

For routine technical inquiries, you can also contact YASKAWA Customer Support at the following e-mail address:

techsupport@motoman.com

When using e-mail to contact YASKAWA Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact YASKAWA Customer Support at the telephone number shown above.

Please have the following information ready before you call Customer Support:

• System MPX2600
• Primary Application ___________________________
• Controller DX200
• Software Version Access this information on the Programming Pendant’s LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION}
• Robot Serial Number Located on the robot data plate
• Robot Sales Order Number Located on the DX200 controller data plate
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1 Manipulator Installation

1.1 Mounting Procedures for Manipulator Base

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

Construct a solid wall, ceiling, and servo track with the appropriate thickness or strength to withstand maximum reaction force of the manipulator in each mounting way.

A baseplate flatness must be kept at 0.5 mm or less: insufficient flatness or straightness of installation surface may deform the manipulator shape and affect its functional abilities.

1.2 Mounting Way

Followings are the mounting ways in optional specifications.

- Mounted on the servo track (Refer to section 1.2.1 “Mounted on the Servo Track”.)
- Wall-mounted way (Refer to section 1.2.2 “Wall-Mounted Way”.)
- Ceiling-mounted way (Refer to section 1.2.3 “Ceiling-Mounted Way”.)
### 1.2.1 Mounted on the Servo Track

*Fig. 1-1: Manipulator Mounted on the Servo Track*

![Manipulator Mounted on the Servo Track](image)

**Table 1-1: Maximum Reaction Force for the Manipulator Mounted on the Servo Track**

<table>
<thead>
<tr>
<th></th>
<th>Horizontal rotation</th>
<th>Vertical rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reaction force $F_H$</td>
<td>Torque $M_H$</td>
</tr>
<tr>
<td>Emergency stop</td>
<td>20580 N (2100 kgf)</td>
<td>25480 N•m (2600 kgf•m)</td>
</tr>
<tr>
<td>Acceleration/ deceleration</td>
<td>6370 N (650 kgf)</td>
<td>7670 N•m (780 kgf•m)</td>
</tr>
</tbody>
</table>
1.2.2 Wall-Mounted Way

Fig. 1-2: Wall-Mounted Manipulator

Table 1-2: Maximum Reaction Force for the Wall-Mounted Manipulator

<table>
<thead>
<tr>
<th></th>
<th>Horizontal rotation</th>
<th>Vertical rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reaction force $F_H$</td>
<td>Torque $M_H$</td>
</tr>
<tr>
<td>Emergency stop</td>
<td>17640 N (1800 kgf)</td>
<td>25480 N•m (2600 kgf•m)</td>
</tr>
<tr>
<td>Acceleration/</td>
<td>5880 N (600 kgf)</td>
<td>7670 N•m (780 kgf•m)</td>
</tr>
<tr>
<td>deceleration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.2.3 Ceiling-Mounted Way

*Fig. 1-3: Ceiling-Mounted Manipulator*

<table>
<thead>
<tr>
<th></th>
<th>Horizontal rotation</th>
<th>Vertical rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reaction force $F_H$</td>
<td>Torque $M_H$</td>
</tr>
<tr>
<td>Emergency stop</td>
<td>20580 N (2100 kgf)</td>
<td>25480 N•m (2600 kgf•m)</td>
</tr>
<tr>
<td>Acceleration/</td>
<td>6370 N (650 kgf)</td>
<td>7670 N•m (780 kgf•m)</td>
</tr>
<tr>
<td>deceleration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.3 Transport

**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.

1.3.1 Transporting Method

- Check that the eyebolts are securely fastened.
- The mass of the manipulator including the shipping bolts and brackets is:
  - approximately 550 kg for the floor-mounted way,
  - approximately 600 kg for the wall-mounted way, and
  - approximately 580 kg for the ceiling-mounted way.
- Use a wire rope strong enough to withstand the mass.
- 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 for transporting the manipulator.
- 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.
- Before turning ON the power, make 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.

1.3.1.1 Shipping Bolts and Brackets

To protect the mechanical part of the manipulator from the external force during the transportation, shipping bolts and brackets are mounted.
- Shipping bolts and brackets are painted yellow.

1.3.1.2 Using a Crane

The manipulator should be lifted by a crane when removing it from the package and moving it.

Be sure to lift the manipulator with wire ropes, using attached eyebolts in the posture as shown in Fig. 1-4 “Transport Using a Crane (Wall-Mounted)” and “The manipulator is in the nailed wooden box when it is delivered.”

When using a crane for the servo track incorporated specification, perform the same procedure as the standard specification. Refer to section 2.1.1 “Using a Crane” of MOTOMAN-MPX2600 INSTRUCTIONS.
1 Manipulator Installation

1.3 Transport

Fig. 1-4: Transport Using a Crane (Wall-Mounted)

- Hexagon socket head cap screw M10 (2 screws, length: 35 mm)
  Conical spring washer 2L-10 (2 washers)
  Tightening torque: 48 N\(\cdot\)m (4.9 kgf\(\cdot\)m)

- Hexagon socket head cap screw M8 (4 screws, length: 30 mm)
  Conical spring washer 2L-8 (4 washers)
  Tightening torque: 24.5 N\(\cdot\)m (2.5 kgf\(\cdot\)m)

- Hexagon socket head cap screw M16 (4 screws, length: 50 mm)
  Conical spring washer 2H-16 (4 washers)
  Washer M16 (4 washers)
  Tightening torque: 206 N\(\cdot\)m (21 kgf\(\cdot\)m)

- Hexagon socket head cap screw M10 (4 screws, length: 35 mm)
  Conical spring washer 2L-10 (4 washers)
  Tightening torque: 48 N\(\cdot\)m (4.9 kgf\(\cdot\)m)

Wire Rope length: 1.0 m or more

Gravity center “G” : Manipulator and shipping bolts and brackets

<table>
<thead>
<tr>
<th>Axis</th>
<th>S-axis</th>
<th>L-axis</th>
<th>U-axis</th>
<th>R-axis</th>
<th>B-axis</th>
<th>T-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle</td>
<td>0°</td>
<td>0°</td>
<td>-60°</td>
<td>0°</td>
<td>0°</td>
<td>0°</td>
</tr>
<tr>
<td>Pulse</td>
<td>0</td>
<td>0</td>
<td>-144625</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Factory setting for angle and pulse of each axis

Hexagon socket head cap screw M8 (4 screws, length: 30 mm)
Conical spring washer 2L-8 (4 washers)
Tightening torque: 24.5 N\(\cdot\)m (2.5 kgf\(\cdot\)m)

Wire Rope length: 1.0 m or more

Hexagon socket head cap screw M10 (4 screws, length: 35 mm)
Conical spring washer 2L-10 (4 washers)
Tightening torque: 48 N\(\cdot\)m (4.9 kgf\(\cdot\)m)
1.3 Transport

The manipulator is in the nailed wooden box when it is delivered.

**Fig. 1-5: Transport Using a Crane (Ceiling-Mounted)**

The manipulator is in the nailed wooden box when it is delivered.

- **Gravity center “G”:** Manipulator and Shipping bolts and brackets

### Factory setting for angle and pulse of each axis

<table>
<thead>
<tr>
<th></th>
<th>Angle</th>
<th>L-axis</th>
<th>U-axis</th>
<th>R-axis</th>
<th>B-axis</th>
<th>T-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-axis</td>
<td>0°</td>
<td>0°</td>
<td>-60°</td>
<td>0°</td>
<td>0°</td>
<td>0°</td>
</tr>
<tr>
<td>Pulse</td>
<td>0</td>
<td>0</td>
<td>-144625</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1.3.1.3 Using a Forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts and bracket as shown in **Fig. 1-6 “Transport Using a Forklift (Wall-Mounted)”, Fig. 1-7 “Transport Using a Forklift (Ceiling-Mounted)”**.

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 overturn or slippage.
When using a forklift for the servo track incorporated specification, perform the same procedure as the standard specification. Refer to section 2.1.2 “Using a Forklift” of MOTOMAN-MPX2600 INSTRUCTIONS.

Fig. 1-6: Transport Using a Forklift (Wall-Mounted)

Mount the manipulator on the transportation base by using the holes (dia. 17.5 mm) (2 holes) (3 places).

### Factory setting for angle and pulse of each axis

<table>
<thead>
<tr>
<th>Axis</th>
<th>S-axis</th>
<th>L-axis</th>
<th>U-axis</th>
<th>R-axis</th>
<th>B-axis</th>
<th>T-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle</td>
<td>0°</td>
<td>0°</td>
<td>-60°</td>
<td>0°</td>
<td>0°</td>
<td>0°</td>
</tr>
<tr>
<td>Pulse</td>
<td>0</td>
<td>0</td>
<td>-144625</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Fig. 1-7: Transport Using a Forklift (Ceiling-Mounted)

Gravity center "G": Manipulator and Shipping bolts and brackets

Unit: [mm]

- Hexagon head screw M16 (4 screws)
- Washer M16 (8 washers)
- Nut M16 (4 nuts)
- 17.5 dia. hole (4 places)

For securing the bracket to the crate
1.4 Location

When installing the manipulator, satisfy the following environmental conditions.

- Ambient temperature: 0° to 40°C
- Humidity: 20 to 80%RH at constant temperature
- Free from dust, soot, oil, or water
- Free from corrosive gas or liquid, or explosive gas or liquid.
- Free from excessive vibration (Vibration acceleration: 4.9 m/s² [0.5G] or less)
- Free from large electrical noise (plasma)
- Free from the strong magnetic field
- Altitude: 1000 m or less
- Flatness for installation: 0.5 mm or less

NOTE

When the operation is started after the manipulator has been out of operation and left in the low temperature (almost 0°C) for a long period, the alarm may occur since the friction torque of the drive unit is large.

If the alarm occurs, perform the break-in for few minutes.
2 Pressure Switch Unit

2.1 Air Tube for the Pressure Switch Unit

The pressure switch unit can be installed in a place up to 20 meters away from the manipulator. Air tubes used in such a case are optional.

Table 2-1: Air Tube for the Pressure Switch Unit (Optional)

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Qty.</th>
<th>Specifications</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nylon tube</td>
<td>TS1612B-20</td>
<td>2</td>
<td>Size: outside dia. 16 mm, inside dia. 12 mm, Color: black, Material: nylon, Length: 20 m</td>
<td></td>
</tr>
<tr>
<td>Union elbow</td>
<td>KQ2L16-00A</td>
<td>4</td>
<td>Applicable tube size: outside dia. 16 mm</td>
<td></td>
</tr>
</tbody>
</table>

- **Installation Requirements**
  - Location: Can be installed in either a hazardous location or a non-hazardous location
  - Direction: vertical installation or horizontal installation

**NOTE**

The length of the air tube between the pressure switch unit and the manipulator must be 20 m or less.
2 Pressure Switch Unit

2.1 Air Tube for the Pressure Switch Unit

Fig. 2-1: Connection Example of the Pressure Switch Unit and Air Tubes

Vertical installation

Horizontal installation
3 External Cabling

A flexible hose can be used to protect external cabling tubes. (Available in floor-, wall-, and ceiling-mounted ways)

Before inserting tubes in the flexible hose, take measures to prevent them from twisting or entangling, e.g., applying Vaseline to the tubes. Also, prevent the flexible hose from interfering with the manipulator, or being pressed or bent. This may cause dust and deteriorate the painting quality.

3.1 Basic Specifications

Details of the flexible hose are as follows.

**Table 3-1: Size of Flexible Hose**

<table>
<thead>
<tr>
<th>Type</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>PISG-48B</td>
<td>dia. 54.2 mm</td>
</tr>
</tbody>
</table>

**Fig. 3-1: Flexible Hose Fixing Part**

- Hexagon Socket Head Cap Screw M6 (length: 20 mm) (trivalent chromium) (4 screws) Conical Spring Washer 2H-6 (trivalent chromium) (4 washers) Washer M6 (trivalent chromium) (4 washers) Tightening torque: 10 N·m (1.0 kgf·m)
- Hexagon Socket Head Cap Screw M6 (length: 20 mm) (trivalent chromium) (2 screws) Conical Spring Washer 2H-6 (trivalent chromium) (2 washers) Washer M6 (trivalent chromium) (2 washers) Tightening torque: 4.1 N·m (0.42 kgf·m)

- Hexagon Socket Head Cap Screw M6 (length: 20 mm) (trivalent chromium) (4 screws) Conical Spring Washer 2H-8 (trivalent chromium) (4 washers) Tightening torque: 24.5 N·m (2.5 kgf·m)
- Hexagon Socket Head Cap Screw M8 (length: 25 mm) (trivalent chromium) (4 screws) Conical Spring Washer 2H-8 (trivalent chromium) (4 washers) Tightening torque: 24.5 N·m (2.5 kgf·m)

Flexible hose: 2298 mm
3.2 Internal Tube

Following is the size and maximum quantity of internal tubes for the flexible hose specified by YASKAWA.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Bell gun</th>
<th>dia. [mm]</th>
<th>× Number of tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbine air</td>
<td>TA</td>
<td>10 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Bearing air</td>
<td>BA</td>
<td>6 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Brake air</td>
<td>BK</td>
<td>6 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Shaping air (inside)</td>
<td>SA1</td>
<td>10 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Shaping air (outside)</td>
<td>SA2</td>
<td>10 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Trigger valve</td>
<td>TV</td>
<td>4 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Dump valve</td>
<td>DV</td>
<td>4 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Paint IN</td>
<td>PI</td>
<td>6 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Paint OUT</td>
<td>PO</td>
<td>10 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Valve for cleaning inside of the bell gun</td>
<td>GV1</td>
<td>4 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Thinner for cleaning inside of the bell gun</td>
<td>FTH</td>
<td>6 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Valve for cleaning back of the bell gun</td>
<td>GV12</td>
<td>4 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Thinner for cleaning back of the bell gun</td>
<td>BTH</td>
<td>6 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>LV cable</td>
<td>Cable</td>
<td>12 dia.</td>
<td>×1</td>
</tr>
<tr>
<td>Fiber cable</td>
<td>Fiber</td>
<td>4 dia.</td>
<td>×1</td>
</tr>
</tbody>
</table>
4 Zeroing

4.1 Zeroing Function

Zeroing function automatically allows for the restoration of the home position data when the manipulator’s home position data disappear.

Outline

The DX200 stores the manipulator home position based on the pulse value of each axis encoder. Since the home position is already set and registered before shipment, zeroing operation does not need to be performed at the normal operation. However, zeroing operation needs to be performed to restore the home position since the home position data disappear when performing the following operations, or the followings occur.

- Replacement of Motors
- Replacement of Encoders
- Backup Battery Exhaustion in the Manipulator

NOTE

- The home position data is stored by the backup battery. If the battery is exhausted, the home position data disappear again when turning OFF the DX200 power even when the zeroing operation is performed. Be sure to replace the battery periodically. For the battery replacement, refer to “Maintenance and Inspection” of “MOTOMAN-MPX2600 INSTRUCTIONS”
- The home positioning cannot be performed accurately by the zeroing operation if the combination of the manipulator and the DX200 are changed.

Fig. 4-1: Zeroing Adjustable Axes

![Diagram of Zeroing Adjustable Axes]
4.2 Mounting Zeroing Parts

4.2.1 Mounting S-Axis Zeroing Parts

Refer to Fig. 4-2 “Mounting S-Axis Zeroing Parts” and Table 4-1 “S-Axis Zeroing Parts Checklist”.

1. Turn OFF the DX200.
2. Glue the gasket 2 to the cover 1.
3. After attaching washers to the cross recessed pan-head screws 1, mount the cover 1 and the gasket 2 on the S-head 4 with the cross recessed pan-head screws 1.
4. Insert the pin 6 in the base 5 and mount the block 7 on the pin 6.
5. Attach conical spring washers to the hexagon socket head cap screws 8 and fix the block 7 on the base 5.
7. Mount the plug 9 and the gasket 10 on the block 7.
4 Zeroing
4.2 Mounting Zeroing Parts

- Mounting a Sensor
  1. Remove the parts marked * in Fig. 4-2 “Mounting S-Axis Zeroing Parts”.
  2. Mount the sensor on the block.

**Fig. 4-2: Mounting S-Axis Zeroing Parts**

---

**Table 4-1: S-Axis Zeroing Parts Checklist**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cover HW1405958-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gasket HW1405959-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cross recessed pan-head screw M4 (length: 6 mm)</td>
<td>2 each</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washer M4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>S-head HW1100665-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Base HW1100664-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pin HW1405946-4-10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Block HW1402000-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Hexagon socket head cap screw M5 (length: 35 mm)</td>
<td>2 each</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conical spring washer 2H-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Plug HW0405202-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Gasket HW0405203-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sensor</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE** Mounting screws for the pin and the plate are small. Be careful not to lose them in the procedure.
4.2 Mounting Zeroing Parts

4.2.2 Mounting L-Axis Zeroing Parts

Refer to Fig. 4-3 “Mounting L-Axis Zeroing Parts” and Table 4-2 “L-Axis Zeroing Parts Checklist”.

1. Turn OFF the DX200.
2. Glue the gasket  to the cover .
3. After attaching washers to the cross recessed pan-head screws , mount the cover and the gasket on the S-head with the cross recessed pan-head screws .
4. Insert the pin in the L-arm and mount the block on the pin .
5. Attach conical spring washers to the hexagon socket head cap screws and fix the block on the L-arm .
6. Mount the gasket on the plug .
7. Mount the plug and the gasket on the block .
4. Zeroing
4.2 Mounting Zeroing Parts

Mounting a Sensor
1. Remove the parts marked * in Fig. 4-3 “Mounting L-Axis Zeroing Parts”.
2. Mount the sensor on the block.

Fig. 4-3: Mounting L-Axis Zeroing Parts

NOTE
Mounting screws for the pin and the plate are small. Be careful not to lose them in the procedure.

Table 4-2: L-Axis Zeroing Parts Checklist

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cover HW1405958-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gasket HW1405959-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cross recessed pan-head screw M4 (length: 6 mm) Washer M4</td>
<td>2 each</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>L-arm HW1100666-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>S-head HW1100665-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pin HW1405946-4-10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Block HW1402000-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Hexagon socket head cap screw M5 (length: 35 mm) Conical spring washer 2H-5</td>
<td>2 each</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Plug HW0405202-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Gasket HW0405203-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sensor</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
4 Zeroing
4.2 Mounting Zeroing Parts

4.2.3 Mounting U-Axis Zeroing Parts

Refer to Fig. 4-4 “Mounting U-Axis Zeroing Parts” and Table 4-3 “U-Axis Zeroing Parts Checklist”.

1. Turn OFF the DX200.
2. Glue the gasket② to the cover①.
3. After attaching washers to the cross recessed pan-head screws①, mount the cover① and the gasket② on the L-arm④ with the cross recessed pan-head screws①.
4. Insert the pin⑧ in the casing⑤ and mount the block⑦ on the casing⑥.
5. Attach conical spring washers to the hexagon socket head cap screws⑥ and fix the block⑦ on the casing⑥.
6. Mount the gasket⑩ on the plug⑨.
7. Mount the plug⑨ and the gasket⑩ on the block⑦.
4 Zeroing
4.2 Mounting Zeroing Parts

Mounting a Sensor
1. Remove the parts marked * in Fig. 4-4 “Mounting U-Axis Zeroing Parts”.
2. Mount the sensor (11) on the block (7).

Fig. 4-4: Mounting U-Axis Zeroing Parts

**NOTE**
Mounting screws for the pin and the plate are small. Be careful not to lose them in the procedure.

Table 4-3: U-Axis Zeroing Parts Checklist

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cover HW1405958-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gasket HW1405959-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cross recessed pan-head screw M4 (length: 6 mm)</td>
<td>2 each</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washer M4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>L-arm HW1100666-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Casing HW1100667-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pin HW1405946-4-10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Block HW1402000-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Hexagon socket head cap screw M5 (length: 35 mm)</td>
<td>2 each</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conical spring washer 2H-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Plug HW0405202-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Gasket HW0405203-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sensor</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
5 External O-Ring for the Wrist

The O-ring attached to the external parts on the arm end is optional.

5.1 Replacement of the O-Ring

If the O-ring cannot be removed/attached because the paint gun is large, remove the paint gun before replacing the O-ring. Forcible attachment may damage the O-ring.

Apply Vaseline to the O-ring before the attachment.

Fig. 5-1: Replacement of the O-Ring
6 Maintenance and Inspection

6.1 Inspection Schedule

Conduct daily and periodic inspections to ensure the long life of the robot and its performance.

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 given in the levels shown in Table 6-1 “Inspection Parts and Inspection Numbers (MPX2600-*1*)”.

In Table 6-1, the inspection items are classified into three types of operation: operations which can be performed by personnel authorized of the user, operations which can be performed by personnel being trained, and operations which can be performed by service company personnel.

Only specified personnel are to do inspection work.

The inspection interval must be based on the servo power supply ON time.
### Table 6-1: Inspection Schedule

<table>
<thead>
<tr>
<th>Item</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection by</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td></td>
<td></td>
<td>Specified personnel (User)</td>
</tr>
<tr>
<td>1</td>
<td>1000 H Cycle</td>
<td></td>
<td>Manual Visual</td>
<td>Check for loose and wear rings. (Replace if necessary.)</td>
</tr>
<tr>
<td>2</td>
<td>6000 H Cycle</td>
<td></td>
<td>Manual Visual</td>
<td>Check for loose bolts. Check for wear of flexible hose. (Replace if necessary.)</td>
</tr>
<tr>
<td>3</td>
<td>12000 H Cycle</td>
<td></td>
<td>Manual Visual</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>24000 H Cycle</td>
<td></td>
<td>Manual Visual</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>36000 H Cycle</td>
<td></td>
<td>Manual Visual</td>
<td></td>
</tr>
</tbody>
</table>

1 Refer to Fig. 6-1 “Inspection Parts and Inspection Numbers (MPX2600-*1*)".
6 Maintenance and Inspection
6.1 Inspection Schedule

Fig. 6-1: Inspection Parts and Inspection Numbers (MPX2600-*1*)
7 Recommended Spare Parts

Confirm the recommended spare parts according to the specifications.
Product performance cannot be guaranteed when using spare parts from any company other than YASKAWA.

Table 7-1: Spare Parts When Using a Flexible Hose

<table>
<thead>
<tr>
<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>1</td>
<td>Flexible hose</td>
<td>PISG-48</td>
<td>PMA</td>
<td>1</td>
<td>1</td>
<td>2.3 m</td>
</tr>
<tr>
<td>2</td>
<td>Sleeve</td>
<td>RKS-48</td>
<td>PMA</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Clamp</td>
<td>BGH-48</td>
<td>PMA</td>
<td>7</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Table 7-2: Spare Parts for the External O-Ring for the Wrist

<table>
<thead>
<tr>
<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>1</td>
<td>O-ring</td>
<td>AS568-251</td>
<td>NOK</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>O-ring</td>
<td>AS568-261</td>
<td>NOK</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>O-ring</td>
<td>AS568-264</td>
<td>NOK</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
MOTOMAN-MPX2600

INSTRUCTIONS

FOR MANIPULATOR OPTIONAL SPECIFICATIONS

Specifications are subject to change without notice for ongoing product modifications and improvements.

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