Operating and Maintenance Instructions

MYS850L

- Please read these instructions before operation and keep them for later reference.
- The operating instructions are only for internal use.

Part Number: 160355-1CD
Revision: 0
MANDATORY

• This instruction manual is intended to explain mainly on the mechanical part of the MOTOMAN-MYS850L 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 robot.

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

CAUTION

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

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

• MOTOMAN robotec GmbH 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 MOTOMAN robotec GmbH 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.

• MOTOMAN robotec GmbH is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product’s warranty.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the MOTOMAN-MYS850L.

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.

jsonwebtoken

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

Injury or damage to machinery may result if the emergency stop circuit cannot stop the robot during an emergency. The robot 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 robot. Then turn the servo power ON.

Injury may result from unintentional or unexpected robot motion.

*Fig. : Release of Emergency Stop*

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

Improper or unintended robot operation may result in injury.

- Confirm that no person is present in the P-point maximum envelope of the robot and that you are in a safe location before:
  - Turning ON the power for the DX100.
  - Moving the robot 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 robot during operation. Always press an emergency stop button immediately if there is a problem.

The emergency stop buttons are located on 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 robot, 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>DX100 controller</td>
<td>DX100</td>
</tr>
<tr>
<td>DX100 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the robot and the controller</td>
<td>Robot cable</td>
</tr>
</tbody>
</table>

CAUTION

- Perform the following inspection procedures prior to conducting robot teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in robot movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the cabinet of the DX100 after use.

The programming pendant can be damaged if it is left in the robot's work area, on the floor, or near fixtures.
- Read and understand the Explanation of Warning Labels in the DX100 Instructions before operating the robot:
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## 9.5 Layout of Maintenance Parts

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### 9.5.2 Wall Mounting type

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1 Product Confirmation

CAUTION

• Confirm that the robot and the DX100 have the same order number. Special care must be taken when more than one robot is to be installed.

If the numbers do not match, robots may not perform as expected and cause injury or damage.

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 are given separately):

• Robot
• DX100
• Programming pendant
• Robot cables (between the DX100 and the Robot)
1.2 Location of the Serial Number

Check whether the serial numbers of the programming pendant, the control and the robot match the details on your delivery note. As shown below, the serial number can be found on a type plate.

Fig. 1-1: Location of Order Number Labels

< Example >

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

S/N.
```
2 Transport

2.1 Transport 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 robot is approximately 48 kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the weight.
- Attached eyebolts are designed to support the robot mass. Do not use them for anything other than transporting the robot.
- Make sure to mount the shipping bolts and brackets when transporting the robot. (Refer to fig. 2-1 “Transporting Position” at page 2-2.)
- With any transportation equipment, make sure to avoid external force on the arm or motor unit when transporting the robot.
2.1.1 Using a Crane

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

*Fig. 2-1: Transporting Position*
3 Installation

WARNING

• Install the safeguarding. Failure to observe this warning may result in injury or damage.
• Install the robot in a location where the fully extended arm and tool will not reach the wall, safeguarding, or controller. Failure to observe this warning may result in injury or damage.
• Do not start the robot or even turn ON the power before it is firmly anchored. The robot may overturn and cause injury or damage.
• When mounting the robot on the wall, the base section must have sufficient strength and rigidity to support the weight of the robot. Also, it is necessary to consider countermeasures to prevent the robot from falling. Failure to observe these warnings may result in injury or damage.

CAUTION

• Do not install or operate the robot 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 are removed. Failure to observe this caution may result in damage to the driving parts.
3.1 Safeguarding Installation

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

Responsibility for Safeguarding (ISO10218)

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

3.2 Mounting Procedures for Robot Base

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

Refer to table 3-1 “Maximum Repulsion Forces” to construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the robot.

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

Table 3-1: Maximum Repulsion Forces

<table>
<thead>
<tr>
<th>Item</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Reaction torque on the horizontal plate</td>
<td>900 Nm</td>
</tr>
<tr>
<td>Max. Horizontal reaction force</td>
<td>1500 Nm</td>
</tr>
<tr>
<td>Max. Vertical reaction force</td>
<td>2000 Nm</td>
</tr>
</tbody>
</table>

- The threaded holes for the robot base are M12. Use mounting bolts with specifications conforming to ISO898-1 property class: 10.9 or 12.9
- The plate for the robot mounting face should be 20 mm thick or more and made of steel to reduce vibration. The surface roughness of the steel plate should be 25 µm or less.
- The table must be secured on the floor or wall to prevent it from moving.
- The robot must be installed horizontally.
- Level the robot horizontal and vertical direction.
### 3.2.1 Mounting Example

For the first process, anchor the baseplate firmly to the ground. The baseplate should be rugged and durable to prevent shifting of the robot or the mounting fixture. It is recommend to prepare a baseplate of 32 mm or more thick, and anchor bolts of M16 or larger size.

The robot base is tapped for four mounting holes; securely fix the robot base to the baseplate with four hexagon head bolts M16 (60 mm long is recommended). Next, fix the robot base to the baseplate.

Tighten the hexagon head bolts and anchor bolts firmly so that they will not work loose during the operation.

Refer to fig. 3-1 “Mounting the Robot on Baseplate”.

Fig. 3-1: Mounting the Robot on Baseplate
3.3 Types of Mounting

The MOTOMAN-MYS850L is available in three types: floor-mounted type (standard), wall-mounted type, and ceiling-mounted type. For wall-mounted and ceiling-mounted types, the three points listed below are different from the floor-mounted type.

3.3.1 Table Top Mounting

**CAUTION**

- Install the Table Top Mounting Robot with four or more people. The Robot weights are as follows. Be careful not to get hands, fingers, or feet caught and / or have equipment damaged by a fall of the Robot.
  MYS850L: Approximately 48 kg

1. Secure the base to the base table with four bolts

**NOTE**

Use bolts with specifications conforming to ISO898-1 Property Class: 10.9 or 12.9
Thightening Torque: 7350 Ncm

- 4 screws M12 x 40
- Spring washer
- Plane washer
- Screw Hole (depth 20 mm or more)

2. Using nippers, cut off the wire tie binding the shaft and arm retaining bracket on the bas.

3. Remove the bolts securing the wire ties removed in Step 2.
3.3.2 Wall Mounting

WARNING

- Install the Wall Mounting Robot with four or more people. The Robot weights are as follows. Be careful not to get hands, fingers, or feet caught and/or have equipment damaged by a fall of the Robot.

  MYS850L: Approximately 53 kg

- When installing the robot to the wall, support the Robot, and then secure the anchor bolts. Removing the support without securing the anchor bolts properly is extremely hazardous and may result in fall of the Robot.

1. Unpack the robot with retaining the arm posture.

2. Secure the base to the wall with six bolts.
3.3.3 Ceiling Mounting

**NOTE**

Use bolts with specifications conforming to ISO898-1 Property Class: 10.9 or 12.9

---

**WARNING**

- Install the Ceiling Mounting Robot with four or more people. The Robot weights are as follows. Be careful not to get hands, fingers, or feet caught and / or have equipment damaged by a fall of the Robot.

  MYS850L: Approximately 48 kg

- When installing the robot to the ceiling, support the Robot, and then secure the anchor bolts. Removing the support without securing the anchor bolts properly is extremely hazardous and may result in fall of the Robot.

1. Unpack the robot with retaining the arm posture.
2. Secure the base to the wall with four bolts.

NOTE Use bolts with specifications conforming to ISO898-1 Property Class: 10.9 or 12.9

3.3.4 Precautions to Prevent the Robot from Falling

For the wall- or ceiling-mounted types, take appropriate measures to avoid the falling of the robot in case of emergency.

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

3.4 Location

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

- Ambient temperature: 0° to +45°C
- Humidity: 20 to 80% RH (non-condensing)
- Free from dust, soot, or water
- Free from corrosive gas or liquid, or explosive gas
- Free from excessive vibration
  (Vibration acceleration: 4.9 m/s² [0.5 G] or less)
- Free from large electrical noise (plasma)
- Flatness for installation: 0.5 mm or less
Follow local regulations for grounding line size. A line of 6.0 mm² or more is recommended.

Refer to fig. 4-1 “Grounding Method” at page 4-2 to connect the ground wire directly to the robot.

- Never 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 Electric Equipment Technical Standards.
4.2 Cable Connection

There are two robot cables; one encoder cable (XXX), and one power cables (XXX) (Refer to fig. 4-2 “Robot Cables” at page 4-3.)

Connect these cables to the robot base connectors and to the DX100. Refer to fig. 4-3(a) “Robot Cable Connectors (Robot Side)” at page 4-4 and fig. 4-3(b) “Robot Cable Connection (DX100 Side)” at page 4-4.”
4.2.1 Connection to the Robot

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

4.2.2 Connection to the DX100

Before connecting cables to the DX100, verify the numbers on both robot cables and the connectors on the DX100. When connecting, insert the cables in the order of XXX, then XXX, and depress each lever until it clicks.

Fig. 4-2: Robot Cables
4 Wiring
4.2 Cable Connection

Fig. 4-3(a): Robot Cable Connectors (Robot Side)

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

### 5.1 Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>MYS850L</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mount method</strong></td>
<td>Table Top</td>
</tr>
<tr>
<td><strong>Arm length</strong></td>
<td>850 mm</td>
</tr>
<tr>
<td><strong>Weight (not include the weight of cables)</strong></td>
<td>48 kg</td>
</tr>
<tr>
<td><strong>Driving method</strong></td>
<td>All joints</td>
</tr>
<tr>
<td><strong>Max. operating speed</strong> <em>1</em>*</td>
<td>11000 mm/s</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>± 0.025 mm</td>
</tr>
<tr>
<td><strong>Max. motion range</strong></td>
<td>± 152 deg</td>
</tr>
<tr>
<td><strong>Max. pulse range (pulse)</strong></td>
<td>-1805881 to +7048761</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>0.0000343 deg/pulse</td>
</tr>
<tr>
<td><strong>Motor power consumption</strong></td>
<td>750 W</td>
</tr>
<tr>
<td><strong>Payload</strong></td>
<td>rated 5 kg</td>
</tr>
<tr>
<td><strong>U allowable moment of inertia</strong></td>
<td>rated 0.02 kgm²</td>
</tr>
<tr>
<td><strong>Hand</strong></td>
<td>Shaft diameter ø25 mm</td>
</tr>
<tr>
<td><strong>Z down force</strong></td>
<td>250 Nm</td>
</tr>
<tr>
<td><strong>Installed wire for customer use</strong></td>
<td>24 wires (15-pin + 9-pin: D-sub connector)</td>
</tr>
<tr>
<td><strong>Installed pneumatic tube for customer use</strong></td>
<td>2 pneumatic tubes (ø6 mm): 0.59 Mpa</td>
</tr>
</tbody>
</table>
5.2 Enviromental Conditions

A suitable environment is necessary for the robot system to function properly and safely. Be sure to install the robot system in environments that meet the following conditions:

<table>
<thead>
<tr>
<th>Item</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental requirements</td>
<td></td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>5 to 4° C (with minimum temperature variation)</td>
</tr>
<tr>
<td>Ambient relative humidity</td>
<td>10 to 80% (non condensation)</td>
</tr>
<tr>
<td>Equivalent continuous A-weighted sound pressure level</td>
<td>$L_{Aeq} = 70$ dB (A)</td>
</tr>
</tbody>
</table>

**NOTE**

Robots are not suitable for operation in harsh environments such as working in painting areas, etc. When using Robots in inadequate environments that do not meet the above conditions, please consult us.
5.3 Part Names and Working Axes

Fig. 5-1: Part Names and Working Axes
5.4  Robot Base Dimensions

Fig. 5-2: Robot Base Dimensions

(*) indicates the stroke margin by mechanical stop.

1 mm flat cut
Conical hole \(\varphi 4.90°\)

Max. \(\varphi 18\) through hole
\(\varphi 25\) h7 shaft diameter
\(\varphi 39.5\) mechanical stop diameter

Detail of "A"
(Calibration point position of Z and U)

Reference through hole
(View from the bottom of the base)

<table>
<thead>
<tr>
<th>MYS850L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
</tr>
<tr>
<td>b</td>
</tr>
<tr>
<td>c</td>
</tr>
<tr>
<td>d</td>
</tr>
</tbody>
</table>
5.5 Dimensions and P-point Maximum Envelope

Fig. 5-3(a): Dimensions and P-Point Maximum Envelope YS850 Table Top

Table Top Mounting

<table>
<thead>
<tr>
<th></th>
<th>MYS850L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Length of ∡1 (mm)</td>
</tr>
<tr>
<td>b)</td>
<td>Length of ∡2 (mm)</td>
</tr>
<tr>
<td>c)</td>
<td>(Motion range)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>Motion range of ∡1 (degree)</td>
</tr>
<tr>
<td>e)</td>
<td>Motion range of ∡2 (degree)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>(Mechanical stop area)</td>
</tr>
<tr>
<td>g)</td>
<td>∡1 angle to hit mechanical stop (degree)</td>
</tr>
<tr>
<td>h)</td>
<td>∡2 angle to hit mechanical stop (degree)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
In the range Z: –360 to –390 mm, the area is limited by interference of the Robot body and the arm.
Wall Mounting

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>MYS850L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Length of $\mathcal{d}_1$ (mm)</td>
<td>450</td>
</tr>
<tr>
<td>b)</td>
<td>Length of $\mathcal{d}_2$ (mm)</td>
<td>400</td>
</tr>
<tr>
<td>c)</td>
<td>(Motion range)</td>
<td>207.8</td>
</tr>
<tr>
<td>d)</td>
<td>Motion range of $\mathcal{d}_1$ (degree)</td>
<td>107</td>
</tr>
<tr>
<td>e)</td>
<td>Motion range of $\mathcal{d}_2$ (degree)</td>
<td>152.5</td>
</tr>
<tr>
<td>f)</td>
<td>(Mechanical stop area)</td>
<td>183.3</td>
</tr>
<tr>
<td>g)</td>
<td>$\mathcal{d}_1$ angle to hit mechanical stop (degree)</td>
<td>3</td>
</tr>
<tr>
<td>h)</td>
<td>$\mathcal{d}_2$ angle to hit mechanical stop (degree)</td>
<td>3.5</td>
</tr>
</tbody>
</table>
5.6 Motion Range Setting by Mechanical Stops

Mechanical stops physically limit the absolute area that the robot can move.

Both Joints 1 and 2 have threaded holes in the positions corresponding to the angle for the mechanical stop settings. Install the bolts in the holes corresponding to the angle that you want to set. Joints Z can be set to any length less than the maximum stroke.

<table>
<thead>
<tr>
<th></th>
<th>MYS850L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Length of 1 (mm)</td>
</tr>
<tr>
<td>b)</td>
<td>Length of 2 (mm)</td>
</tr>
<tr>
<td>c)</td>
<td>Motion range</td>
</tr>
<tr>
<td>d)</td>
<td>Motion range of 1 (degree)</td>
</tr>
<tr>
<td>e)</td>
<td>Motion range of 2 (degree)</td>
</tr>
<tr>
<td>f)</td>
<td>Mechanical stop area</td>
</tr>
<tr>
<td>g)</td>
<td>1 angle to hit mechanical stop (degree)</td>
</tr>
<tr>
<td>h)</td>
<td>2 angle to hit mechanical stop (degree)</td>
</tr>
</tbody>
</table>
Table Top Mounting

Wall Mounting

Ceiling Mounting

* The different mechanical stop positions from Table Top Mounting are indicated for Wall Mounting and Ceiling Mounting.
5.6.1 Setting the Mechanical Stops of □1 and □2

Both □1 and □2 have threaded holes in the positions corresponding to the angle for the mechanical stop settings. Install the bolts in the holes corresponding to the angle that you want to set.

### □1 Mechanical Stops

<table>
<thead>
<tr>
<th>Mounting</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table Top</td>
<td>+152°</td>
<td>+107°</td>
<td>+60°</td>
<td>+15°</td>
<td>-15°</td>
<td>-60°</td>
<td>-107°</td>
<td>-152°</td>
</tr>
<tr>
<td>Ceiling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Setting Angle</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
</tr>
</thead>
<tbody>
<tr>
<td>+152°</td>
<td>+107°</td>
<td>+60°</td>
<td>+15°</td>
<td>-15°</td>
<td>-60°</td>
<td>-107°</td>
<td>-152°</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pulse Value</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
</tr>
</thead>
<tbody>
<tr>
<td>+7048761</td>
<td>+5738041</td>
<td>+4369067</td>
<td>+3058347</td>
<td>+2184534</td>
<td>+873814</td>
<td>-495161</td>
<td>-1805881</td>
<td></td>
</tr>
</tbody>
</table>

(*: degree)
2 Mechanical Stops

### Table Top

<table>
<thead>
<tr>
<th>Setting Angle</th>
<th>m</th>
<th>n</th>
<th>o</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>+100°</td>
<td>+122.5°</td>
<td>+152.5°</td>
<td>-152.5°</td>
<td>-122.5°</td>
</tr>
<tr>
<td>Ceiling / Wall</td>
<td>+122.5°</td>
<td>+152.5°</td>
<td>-152.5°</td>
<td>-122.5°</td>
</tr>
</tbody>
</table>

### Ceiling / Wall

<table>
<thead>
<tr>
<th>Setting Angle</th>
<th>m</th>
<th>n</th>
<th>o</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>+100°</td>
<td>+122.5°</td>
<td>+152.5°</td>
<td>-152.5°</td>
<td>-122.5°</td>
</tr>
<tr>
<td>Ceiling / Wall</td>
<td>+122.5°</td>
<td>+152.5°</td>
<td>-152.5°</td>
<td>-122.5°</td>
</tr>
</tbody>
</table>

### Pulse Value

<table>
<thead>
<tr>
<th>Setting Angle</th>
<th>m</th>
<th>n</th>
<th>o</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>+100°</td>
<td>+122.5°</td>
<td>+152.5°</td>
<td>-152.5°</td>
<td>-122.5°</td>
</tr>
<tr>
<td>Ceiling / Wall</td>
<td>+122.5°</td>
<td>+152.5°</td>
<td>-152.5°</td>
<td>-122.5°</td>
</tr>
</tbody>
</table>

### Pulse Value

<table>
<thead>
<tr>
<th>Setting Angle</th>
<th>m</th>
<th>n</th>
<th>o</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>+100°</td>
<td>+122.5°</td>
<td>+152.5°</td>
<td>-152.5°</td>
<td>-122.5°</td>
</tr>
<tr>
<td>Ceiling / Wall</td>
<td>+122.5°</td>
<td>+152.5°</td>
<td>-152.5°</td>
<td>-122.5°</td>
</tr>
</tbody>
</table>

**NOTE**

In the range Z: –360 to –390 mm, the area is limited by interference of the Robot body and the arm.

1. Turn OFF the Controller.
2. Install a hexagon socket head cap bolt into the hole corresponding to the setting angle, and tighten it.
3. Turn ON the Controller.

4. Set the pulse range corresponding to the new positions of the mechanical stops.

5. Move the arm by hand until it touches the mechanical stops, and make sure that the arm does not hit any peripheral equipment during operation.

6. Operate the joint changed at low speeds until it reaches the positions of the minimum and maximum pulse range. Make sure that the arm does not hit the mechanical stops. (Check the position of the mechanical stop and the motion range you set.)

If the arm is hitting the mechanical stops or if an error occurs after the arm hits the mechanical stops, either reset the pulse range to a narrower setting or extend the positions of the mechanical stops within the limit.

### 5.6.2 Setting the Mechanical Stops of Z

This method applies only to the Standard-model Robot MYS850L.

1. Turn ON the Controller and turn OFF the motors using the Motor OFF command.

2. Push up the shaft while pressing the brake release button.

Do not push the shaft up to its upper limit or it will be difficult for the arm top cover to be removed. Push the shaft up to a position where the Z mechanical stop can be changed.

When you press the brake release button, the shaft may lower and rotate due to the weight of the end effector. Be sure to hold the shaft by hand while pressing the button.

<table>
<thead>
<tr>
<th></th>
<th>Hexagon socket head cap bolt (fully threaded)</th>
<th>The number of bolts</th>
<th>Recommended tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M12 × 20</td>
<td>1</td>
<td>12740 Ncm</td>
</tr>
<tr>
<td>2</td>
<td>M10 × 10</td>
<td>2</td>
<td>7350 Ncm</td>
</tr>
</tbody>
</table>

**NOTE** Be sure to set the pulse range inside the positions of the mechanical stop range.
3. Turn OFF the Controller.

4. Loosen the lower limit mechanical stop set screw (M5 x 6).

5. The upper end of the shaft defines the maximum stroke. Move the lower limit mechanical stop down by the length you want to limit the stroke.

For example, when the lower limit mechanical stop is set at “420 mm” stroke, the lower limit Z coordinate value is “-420”. To change the value to “-100”, move the lower limit mechanical stop down “320 mm”. Use calipers to measure the distance when adjusting the mechanical stop.

6. Firmly tighten two setscrews which are open at a 120 degrees interval so that they do not enter the shaft groove.

Recommended tightening torque: 980 Ncm
7. Turn ON the Controller.

8. Move Z to its lower limit while pressing the brake release button, and then check the lower limit position. Do not lower the mechanical stop too far. Otherwise, the joint may not reach a target position.

9. Calculate the lower limit pulse value of the pulse range using the formula shown below and set the value. The result of the calculation is always negative because the lower limit Z coordinate value is negative.

\[
\text{Example:}
\]

When lowering the mechanical stop by 80 mm and changing the lower limit Z coordinate value to “-100” in 180 mm stroke

\[
\frac{-100}{25} \times 131072 \times \frac{66}{32} = -1081344
\]

10. Using the Pulse command (Go Pulse command), move Z to the lower limit position of the pulse range at low speed. If the mechanical stop range is less than the pulse range, Z will hit the mechanical stop and an error will occur. When the error occurs, either change the pulse range to a lower setting or extend the position of the mechanical stop within the limit.

**NOTE**

If it is difficult to check whether Joint #3 hits a mechanical stop, turn OFF the Controller and lift the arm top cover to check the condition causing the problem from the side.
6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Attaching an End Effector

Users are responsible for making their own end effector(s). Before attaching an end effector, observe these guidelines:

**CAUTION**

- If you use an end effector equipped with a gripper or chuck, connect wires and/or pneumatic tubes properly so that the gripper does not release the work piece when the power to the robot system is turned OFF. Improper connection of the wires and/or pneumatic tubes may damage the robot system and/or work piece as the work piece is released when the Emergency Stop switch is pressed. I/O outputs are configured at the factory so that they are automatically shut off (0) by power disconnection, the Emergency Stop switch, or the safety features of the robot system.

Shaft

- Attach an end effector to the lower end of the shaft. For the shaft dimensions, and the overall dimensions of the robot, refer to Chapter 5.1 “Basic Specifications” on page 1.
- Do not move the upper limit mechanical stop on the lower side of the shaft. Otherwise, when “Jump motion” is performed, the upper limit mechanical stop may hit the robot, and the robot system may not function properly.
- Use a split muff coupling with an M4 bolt or larger to attach the end effector to the shaft.

Brake release button

- Z and U cannot be moved up/down by hand because the electromagnetic brake is applied to the joints while power to the robot system is turned OFF. This prevents the shaft from hitting peripheral equipment and rotating in the case that the shaft is lowered by the weight of the end effector when the power is disconnected during operation, or when the motor is turned OFF even though the power is turned ON.

To move Z up/down or rotate U while attaching an end effector, turn ON the Controller and move the joint up/down or rotate the joint while pressing the brake release button switch. This button switch is a momentary-type; the brake is released only while the button switch is being pressed. The respective brakes for Z and U are released simultaneously.
Be careful of the shaft falling and rotating while the brake release button switch is being pressed because the shaft may be lowered by the weight of the end effector.
7 System Application

7.1 Peripheral Equipment Mounts

The peripheral equipment mounts are provided on the U-axis (upper arm) as shown in fig. 7-1 "Installing Peripheral Equipment" at page 7-2 for easier installation of the users’ system applications. The following conditions shall be observed to attach or install peripheral equipment.

### CAUTION

- Only authorized or certified personnel should be allowed to perform wiring. Wiring by unauthorized or uncertified personnel may result in bodily injury and/or malfunction of the robot system.

### CAUTION

- Only authorized or certified personnel should be allowed to perform wiring. Wiring by unauthorized or uncertified personnel may result in bodily injury and/or malfunction of the robot system. User electrical wires and pneumatic tubes are contained in the cable unit.

7.1.1 Additional Load

- **Attaching Cameras and Valves**

  2 has threaded holes as shown in the figure below. Use these holes for attaching cameras, valves, and other equipment.
Common Dimensions

Table Top Mounting

Wall Mounting

Ceiling Mounting

Units: mm

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

Internal user I/O wiring harness (0.211 mm² x 24 wires) and an air line are incorporated in the robot 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 Line Table Top Mounting”.

<table>
<thead>
<tr>
<th>The allowable current for internal user I/O wiring harness</th>
<th>1.0 A or less for each wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>The maximum pressure for the air line</td>
<td>0.59MPa or less (The air line inside diameter: 2.5mm)</td>
</tr>
</tbody>
</table>

### Fig. 7-2: Connectors for Internal User I/O Wiring Harness and Air Line Table Top Mounting

![Diagram of Connectors for Internal User I/O Wiring Harness and Air Line Table Top Mounting]

### Fig. 7-3: Connectors for Internal User I/O Wiring Harness and Air Line Wall Mounting

![Diagram of Connectors for Internal User I/O Wiring Harness and Air Line Wall Mounting]
7.2 Internal User I/O Wiring Harness and Air Line

Fig. 7-4: Connectors for Internal User I/O Wiring Harness and Air Line
Ceiling Mounting

### 7.2.1 Electrical Wires

#### Table 7-1: Inside wires

<table>
<thead>
<tr>
<th>Rated Voltage</th>
<th>Allowable Current</th>
<th>Wires</th>
<th>Nominal Sectional Area</th>
<th>Outer Diameter</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC/DC30 V</td>
<td>1 A</td>
<td>24</td>
<td>0.211 mm²</td>
<td>ø8.3±0.3 mm</td>
<td>Shielded</td>
</tr>
</tbody>
</table>

#### Table 7-2: Connector types

<table>
<thead>
<tr>
<th></th>
<th>Maker</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 pin</td>
<td>Suitable Connector</td>
<td>JAE</td>
</tr>
<tr>
<td></td>
<td>Clamp Hood</td>
<td>JAE</td>
</tr>
<tr>
<td>9 pin</td>
<td>Suitable Connector</td>
<td>JAE</td>
</tr>
<tr>
<td></td>
<td>Clamp Hood</td>
<td>JAE</td>
</tr>
</tbody>
</table>

Pins with the same number, indicated on the connectors on both ends of the cables, are connected.

### 7.2.2 Pneumatic Tubes

#### Table 7-3: Inside pneumatic tubes

<table>
<thead>
<tr>
<th>Max. Usable Pneumatic Pressure</th>
<th>Pneumatic Tubes</th>
<th>Outer Diameter × Inner Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.59 MPa</td>
<td>2</td>
<td>ø6 mm x ø4 mm</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>ø4 mm x ø2.5 mm</td>
</tr>
</tbody>
</table>

Fittings for ø6 mm and ø4 mm (outer diameter) pneumatic tubes are supplied on the both ends of the pneumatic tubes.
8 Electrical Equipment Specification

8.1 Signal cable
8.2 Power cable
### 8.3 User cable

#### Cable color Code Cable color

<table>
<thead>
<tr>
<th></th>
<th>Cable color</th>
<th>Code</th>
<th>Cable color</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Black</td>
<td>P</td>
<td>Pink</td>
</tr>
<tr>
<td>BR</td>
<td>Brown</td>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>G</td>
<td>Green</td>
<td>V</td>
<td>Violet</td>
</tr>
<tr>
<td>L</td>
<td>Blue</td>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>LG</td>
<td>Light green</td>
<td>Y</td>
<td>Yellow</td>
</tr>
<tr>
<td>O</td>
<td>Orange</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### D-sub 9pin

<table>
<thead>
<tr>
<th>No.</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R/BR</td>
</tr>
<tr>
<td>2</td>
<td>(R)/BR</td>
</tr>
<tr>
<td>3</td>
<td>V/BR</td>
</tr>
<tr>
<td>4</td>
<td>(V)/BR</td>
</tr>
<tr>
<td>5</td>
<td>L/B</td>
</tr>
<tr>
<td>6</td>
<td>L/B</td>
</tr>
<tr>
<td>7</td>
<td>Y/B</td>
</tr>
<tr>
<td>8</td>
<td>(Y)/B</td>
</tr>
<tr>
<td>9</td>
<td>(G)/BR</td>
</tr>
</tbody>
</table>

#### D-sub 15pin

<table>
<thead>
<tr>
<th>No.</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L(W)</td>
</tr>
<tr>
<td>2</td>
<td>(L)/W</td>
</tr>
<tr>
<td>3</td>
<td>Y(W)</td>
</tr>
<tr>
<td>4</td>
<td>(Y)/W</td>
</tr>
<tr>
<td>5</td>
<td>G(W)</td>
</tr>
<tr>
<td>6</td>
<td>(G)/W</td>
</tr>
<tr>
<td>7</td>
<td>R(W)</td>
</tr>
<tr>
<td>8</td>
<td>(R)/W</td>
</tr>
<tr>
<td>9</td>
<td>V(W)</td>
</tr>
<tr>
<td>10</td>
<td>(V)/W</td>
</tr>
<tr>
<td>11</td>
<td>L(BR)</td>
</tr>
<tr>
<td>12</td>
<td>(L)/BR</td>
</tr>
<tr>
<td>13</td>
<td>Y(BR)</td>
</tr>
<tr>
<td>14</td>
<td>(Y)/BR</td>
</tr>
<tr>
<td>15</td>
<td>G(BR)</td>
</tr>
</tbody>
</table>
### Electrical Equipment Specification

#### 8.3 User cable

<table>
<thead>
<tr>
<th>Code</th>
<th>Cable color</th>
<th>Code</th>
<th>Cable color</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Black</td>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>BR</td>
<td>Brown</td>
<td>V</td>
<td>Violet</td>
</tr>
<tr>
<td>G</td>
<td>Green</td>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>L</td>
<td>Blue</td>
<td>Y</td>
<td>Yellow</td>
</tr>
</tbody>
</table>
9 Maintenance and Inspection

**WARNING**

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

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

**CAUTION**

- Maintenance and inspection must be performed by specified personnel.
- For disassembly or repair, contact your MOTOMAN robotec GmbH representative.
- When performing maintenance and inspection, make sure to connect the battery pack before removing the encoder connector.

Failure to observe this caution may result in the loss of home position data.

![Image of robot monitoring system]

**SYS MONITORING TIME**

- CONTROL POWER TIME (1998/07/06 10:00 ~)
- SERVO POWER TIME (1998/07/06 10:30 ~)
- PLAYBACK TIME (1998/10/22 11:12 ~)
- MOVING TIME (1998/10/22 15:30 ~)
- OPERATING TIME (1998/10/22 16:12 ~)

**DATA** | **EDIT** | **DISPLAY** | **UTILITY**
---|---|---|---

Main Menu | ShortCut |
## 9.1 Inspection Schedule

Inspection points are divided into five stages: daily, monthly, quarterly, semiannual, and annual. The inspection points are added every stage. If the robot is operated for 250 hours or longer per month, the inspection points must be added every 250 hours, 750 hours, 1500 hours, and 3000 hours operation.

### Table 9-1: Inspection Positions

<table>
<thead>
<tr>
<th>Inspection Point</th>
<th>Daily inspection</th>
<th>Monthly inspection</th>
<th>Quarterly inspection</th>
<th>Semiannual inspection</th>
<th>Annual inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 month (500 h)</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 months (500 h)</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 months (750 h)</td>
<td></td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 months (1000 h)</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 months (1250 h)</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months (1500 h)</td>
<td></td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>7 months (17500 h)</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 months (2000 h)</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 months (2250 h)</td>
<td></td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 months (2500 h)</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 months (2750 h)</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 months (3000 h)</td>
<td></td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>13 months (3250 h)</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>. . . . . . . . . .</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

h = hour
### 9.1.1 Inspection While the Power is OFF (Robot is not operating)

**Table 9-2: Inspection Points**

<table>
<thead>
<tr>
<th>Inspection Point</th>
<th>Inspection Place</th>
<th>Daily</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Semiannual</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check looseness or backlash of screws. Tighten them if necessary. (For the tightening torque, refer to Maintenance: Chapter 9.4 &quot;Tightening Hexagon Socket Head Cap Bolts&quot;).</td>
<td>End effector mounting bolts</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>robot mounting bolts</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Each arm locking bolts</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Bolts/screws around shaft</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolts/screws securing motors, reduction gear units, etc.</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Check looseness of connectors. If the connectors are loosen, push it securely or tighten.</td>
<td>External connectors on robot (on the base connector plates etc.)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>robot cable unit</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Visually check for external defects. Clean up if necessary.</td>
<td>External appearance of robot</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>External cables</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Check for bends or improper location. Repair or place it properly if necessary.</td>
<td>Safeguard etc.</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Check tension of timing belts. Tighten it if necessary.</td>
<td>Inside of 2</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Grease conditions</td>
<td>Refer to Maintenance: 9.3 &quot;Greasing&quot;</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### 9.1.2 Inspection While the Power is ON (Robot is operating)

**Table 9-3: Inspection Points**

<table>
<thead>
<tr>
<th>Inspection Point</th>
<th>Inspection Place</th>
<th>Daily</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Semiannual</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check motion range</td>
<td>Each joint</td>
<td></td>
<td></td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Move the cables back and forth lightly to check whether the cables are dis-connected.</td>
<td>External cables (including cable unit of the robot)</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Push each arm in MOTOR ON status to check whether backlash exists.</td>
<td>Each arm</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Check whether unusual sound or vibration occurs.</td>
<td>Whole</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Measure the accuracy repeatedly by a gauge.</td>
<td>Whole</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
9.2 Maintenance procedures

9.2.1 Battery pack replacement

**WARNING**

- Do not insert or pull out the motor connectors while the power to the robot system is turned ON. Inserting or pulling out the motor connectors with the power ON is extremely hazardous and may result in serious bodily injury as the robot may move abnormally, and also may result in electric shock and/or malfunction of the robot system.

- To shut off power to the robot system, pull out the power plug from the power source. Be sure to connect the AC power cable to a power receptacle. DO NOT connect it directly to a factory power source.

- Before performing any replacement procedure, turn OFF the Controller and related equipment, and then pull out the power plug from the power source. Performing any replacement procedure with the power ON is extremely hazardous and may result in electric shock and/or malfunction of the robot system.

**CAUTION**

Use meticulous care when handling the lithium battery. Improper handling of the lithium battery as mentioned below is extremely hazardous, may result in heat generation, leakage, explosion, or inflammation, and may cause serious safety problems.

*Improper Handling*
- Battery Charge
- Disassembly
- Incorrect Installation
- Exposing to Fire
- Forced Discharge Deformation by Pressure
- Short-circuit (Polarity: Positive/Negative)
- Heating (100°C or more)
- Soldering the terminal of the lithium battery directly

When the lithium battery power is low, an error will occur to warn the user about the low battery status when the Controller is turned ON (when software is started up). When the error occurs, the position data in motors will be lost and all joints need to be completely calibrated again.

The life span of the lithium battery is 3 years. Even if the robot is constantly connected to power, the lithium battery needs to be replaced every 3 years.
9.2.2 Replacing the Battery Unit (Lithium Battery)

- **Battery unit (lithium battery) Removal**
  1. Turn OFF the Controller
  2. Push down the shaft to its lower limit while pressing the brake release button switch. Be sure to keep enough space and prevent the end effector hitting any peripheral equipment.

    The brake release button switch is applied to both Joints Z and U. When the brake release button switch is pressed, the respective brakes of the Joints Z and U are released simultaneously.

    Be careful of the shaft falling and rotating while the brake release button switch is being pressed because the shaft may be lowered by the weight of an end effector.

  3. Remove the arm top cover
  4. Connect the connector of the new lithium battery to the battery board.

    User the unused connector of the two connectors X60A, X60B on the upper part of the battery board.

    Be sure to connect the connector of the new battery before disconnecting the old battery. If the current battery is disconnected before connecting the new battery, the robot will lose the home position data and the calibration must be executed again.

    Except when the Power-Low warning is appearing.

5. Cut off the wire tie banding the cables of used lithium battery.
6. Cut off the wire tie banding the lithium battery and remove the lithium battery
Battery unit (lithium battery) Installation
1. Mount the new lithium battery to the battery board.
2. Refer to the Removal step (4) to mount cables of the lithium battery and the connector from the battery board.
3. Mount the arm top cover.
4. Turn ON the Controller.
5. Check if the robot moves to points (poses) correctly. To do so, select 2 points (poses) or more from the registered points (poses) and move the robot to the points (poses).
6. If the robot does not move to the points (poses) correctly, perform the calibration of all joints and axes.

9.2.3 Replacing the Battery Board

After battery board and parts have been replaced (motors, reduction gear units, brakes, timing belts, ball screw spline unit, etc.), the robot cannot operate properly because a mismatch exists between the origin stored in each motor and its corresponding origin stored in the Controller. After replacing the parts, it is necessary to match these origins.

The process of aligning the two origins is called “Calibration”.

Battery board Removal
1. Turn OFF the Controller.
2. Push down the shaft to its lower limit while pressing the brake release button switch. Be sure to keep enough space and prevent the end effector hitting any peripheral equipment.

The brake release button switch is applied to both Z and U. When the brake release button switch is pressed, the respective brakes of the Z and U are released simultaneously.

Be careful of the shaft falling and rotating while the brake release button switch is being pressed because the shaft may be lowered by the weight of an end effector.
3. Remove the arm top cover.
4. Cut off the wire tie banding the connector cables.
5. Disconnect the connectors X61, X62, X63, and X64 connected to the battery board.

6. Loosen the screws securing the battery board and remove the battery board.
### Battery board Installation

1. Mount the new battery board and secure it with screws.
2. Connect the connectors X61, X62, X63, and X64.
3. Refer to the Removal step (4) to mount the cables of connector with wire tie.
4. Mount the arm top cover.
5. Turn ON the Controller.
6. Perform the calibration of all joints.
### 9.2.4 Inspection While the Power is OFF (Robot is not operating)

**Table 9-4: Inspection Points**

<table>
<thead>
<tr>
<th>Inspection Point</th>
<th>Inspection Place</th>
<th>Daily</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Biannual</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check looseness or backlash of screws. Tighten them if necessary.</td>
<td>End effector mounting bolts</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(For the tightening torque, refer to Maintenance: Chapter 9.4 “Tightening Hexagon Socket Head Cap Bolts”.)</td>
<td>robot mounting bolts</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Each arm locking bolts</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Bolts/screws around shaft</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolts/screws securing motors, reduction gear units, etc.</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Check looseness of connectors. If the connectors are loose, push it securely or tighten.</td>
<td>External connectors on robot (on the base connector plates etc.)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>robot cable unit</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Visually check for external defects. Clean up if necessary.</td>
<td>External appearance of robot</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>External cables</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Check for bends or improper location. Repair or place it properly if necessary.</td>
<td>Safeguard etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check tension of timing belts. Tighten it if necessary.</td>
<td>Inside of □ 2</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Grease conditions</td>
<td>Refer to Maintenance: 9.3 “Greasing”.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 9.2.5 Inspection While the Power is ON (Robot is operating)

**Table 9-5: Inspection Points**

<table>
<thead>
<tr>
<th>Inspection Point</th>
<th>Inspection Place</th>
<th>Daily</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Biannual</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check motion range</td>
<td>Each joint</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Move the cables back and forth lightly to check whether the cables are disconnected.</td>
<td>External cables (including cable unit of the robot)</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Push each arm in MOTOR ON status to check whether backlash exists.</td>
<td>Each arm</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Check whether unusual sound or vibration occurs.</td>
<td>Whole</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Measure the accuracy repeatedly by a gauge.</td>
<td>Whole</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
The ball screw spline and reduction gear units need greasing regularly. Only use the grease specified in the following table.

### CAUTION

- Keep enough grease in the robot. Operating the robot with insufficient grease will damage sliding parts and/or result in insufficient function of the robot. Once the parts are damaged, a lot of time and money will be required for the repairs.
- If grease gets into your eyes, mouth, or on your skin, follow the instructions below.
  - If grease gets into your eyes
    - Flush them thoroughly with clean water, and then see a doctor immediately.
  - If grease gets into your mouth
    - If swallowed, do not induce vomiting. See a doctor immediately.
    - If grease just gets into your mouth, wash out your mouth with water thoroughly.
  - If grease gets on your skin
    - Wash the area thoroughly with soap and water.

### Table 9-6: Greasing Points

<table>
<thead>
<tr>
<th>Greasing part</th>
<th>Greasing Interval</th>
<th>Grease</th>
<th>Refer to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  2</td>
<td>Reduction gear units</td>
<td>In the replacement of motor*</td>
<td>SK-1A Maintenance: 10.1 Replacing the 1 Reduction Gear Unit 10.2 Replacing the 2 Reduction Gear Unit</td>
</tr>
<tr>
<td>Z</td>
<td>Ball screw spline shaft</td>
<td>First time: after 50 km operation 2nd or more: after 100 km operation</td>
<td>AFB Maintenance: 10.10 Greasing the Ball Screw Spline Unit</td>
</tr>
<tr>
<td>U</td>
<td>Backlash-less gear</td>
<td>In Z greasing</td>
<td>AFB Following indication</td>
</tr>
</tbody>
</table>

* Under normal conditions, the reduction gear units shall be greased only when the motor is replaced. However, in case of severe working conditions (such as high duty, high speeds, large payloads, etc.), the reduction gear units must be greased every 10,000 hours.
9.4 Tightening Hexagon Socket Head Cap Bolts

Hexagon socket head cap bolts are used in places where mechanical strength is required.
(A hexagon socket head cap bolt will be called a “bolt” in this manual.)
These bolts are fastened with the tightening torques shown in the following table.

When it is necessary to refasten these bolts in some procedures in this manual (except special cases as noted), use a torque wrench so that the bolts are fastened with the appropriate tightening torques as shown below.

Table 9-7: Tightening torques

<table>
<thead>
<tr>
<th>Bolt</th>
<th>Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>245 Ncm</td>
</tr>
<tr>
<td>M4</td>
<td>490 Ncm</td>
</tr>
<tr>
<td>M5</td>
<td>980 Ncm</td>
</tr>
<tr>
<td>M6</td>
<td>1,760 Ncm</td>
</tr>
<tr>
<td>M8</td>
<td>3,720 Ncm</td>
</tr>
<tr>
<td>M10</td>
<td>7,350 Ncm</td>
</tr>
<tr>
<td>M12</td>
<td>12,740 Ncm</td>
</tr>
</tbody>
</table>

Table 9-8: Tightening torques

<table>
<thead>
<tr>
<th>Set screws</th>
<th>Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4</td>
<td>245 Ncm</td>
</tr>
<tr>
<td>M5</td>
<td>3920 Ncm</td>
</tr>
</tbody>
</table>

We recommend that the bolts aligned on a circumference should be fastened in a crisscross pattern as shown in the figure below.

Do not fasten all bolts securely at one time. Divide the number of times that the bolts are fastened into two or three and fasten the bolts securely with a hexagonal wrench. Then, use a torque wrench so that the bolts are fastened with tightening torques shown in the table above.
9.5 Layout of Maintenance Parts

9.5.1 Table Top Mounting type

9.5.2 Wall Mounting type
9.5.3 Ceiling Mounting type

Ball screw spline unit
U motor
U brake
Z belt
U belt
Lithium battery and Battery board
Z brake

LED lamp
Brake release button switch
Arm cover

9.5.4 Battery unit in DX100
10.1 Replacing the Joint 1 Reduction Gear Unit

A reduction gear unit consists of the following three parts and two attached parts. At replacing the reduction gear unit, be sure to always replace them all together as one set.

Reduction gear unit: Waveform generator / Flexspline / Circular spline

Attachment: Spacer / Grip ring

For details of the reduction gear unit, refer to: 11. Spare parts.

Joint 1 reduction gear unit removal
1. Execute the removal steps from (1) to (5) in Maintenance: 10.1 Replacing Joint 1 Reduction Gear Unit.

2. Remove the arm cap on the base side.
   For details, refer to Maintenance: 10.4 Arm 1 Cover.

3. Turn the robot laterally.

   CAUTION

   • When turning the robot laterally, there must be two or more people to work on it so that at least one of them can support the arm while others are removing the bolts. Removing the bolts without supporting the arm may result in the arm falling, bodily injury, and/or malfunction of the robot system.

4. Use the extracting M5 screws and remove the spacer, flexspline and the grip ring.

5. Remove the circular spline from the base.
Joint 1 reduction gear unit installation

1. A new reduction gear unit contains the parts shown in the picture on the right when it is unpacked.

2. Apply LOCTITE 241 on the screws.
   Set the hole on the circular spline and the tap hole on the base.
   Apply grease (SK-1A) on the gear side of the circular spline.
   Loosely secure all bolts in a crisscross pattern so that the bolts will be secured evenly. Then, using a torque wrench, tighten each bolt securely in a crisscross pattern at the torque specified in the table below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Bolt type</th>
<th>Number of bolts</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint 1 reduction gear unit</td>
<td>M5 x 25</td>
<td>16</td>
<td>1000Ncm</td>
</tr>
<tr>
<td></td>
<td>M8 x 20</td>
<td>8</td>
<td>3000Ncm</td>
</tr>
</tbody>
</table>

3. Apply LOCTITE 241 on the screws.
   Set the grip ring by aligning it with the tap hole.
   Apply grease (SK-1A) on the gear side of the flexspline.
   Set the flexspline by aligning it with the tap hole. Align the position of the air vent of the spacer and secure the flexspline.
4. Apply grease (SK-1A) inside the flexspline. Grease volume: 43 g.

5. Apply grease to the bearing part of the waveform generator.

6. Execute steps from (2) to (4) in Maintenance: 5.1 Replacing the Joint Ⅰ Reduction Gear Unit.

7. Turn and secure the robot to the mounting position.

10.2 Replacing the Joint Ⅱ Reduction Gear Unit

A reduction gear unit consists of the following three parts and two attached parts. At replacing the reduction gear unit, be sure to always replace them all together as one set.

Reduction gear unit: Waveform generator / Flexspline / Circular spline

Attachment: Spacer

For details of the reduction gear unit, refer to Spare parts: 11.1 Recommended spare parts.
Joint 2 reduction gear unit removal
1. Turn ON the Controller.
2. Push down the shaft to its lower limit while pressing the brake release button switch. Be sure to keep enough space and prevent the end effector hitting any peripheral equipment. The brake release button switch is applied to both Joints Z and U. When the brake release button switch is pressed, the respective brakes of the Joints Z and U are released simultaneously. Be careful of the shaft falling and rotating while the brake release button switch is being pressed because the shaft may be lowered by the weight of an end effector.
3. Turn OFF the Controller.
4. Execute steps from (1) to (9) in Maintenance: 10.2 Replacing the Joint 2 Reduction Gear Unit.
5. Use the extracting M5 screws and remove the flexspline from Arm 2.

Joint 2 reduction gear unit installation
1. A new reduction gear unit contains the parts shown in the picture on the right when it is unpacked.
2. Apply LOCTITE 241 on the screws. Set the hole on the circular spline and the tap hole on the base. Apply grease (SK-1A) on the gear side of the circular spline.

Loosely secure all bolts in a crisscross pattern so that the bolts will be secured evenly. Then, using a torque wrench, tighten each bolt securely in a crisscross pattern at the torque specified in the table below.
3. Apply LOCTITE 241 on the screws.  
Set the grip ring by aligning it with the tap hole.  
Aligning the tap hole and mount the flexspline.  
Align the position of the air vent of the spacer. If it is difficult to align the position, move Arm 2 from side to side.

<table>
<thead>
<tr>
<th>Item</th>
<th>Bolt type</th>
<th>Number of bolts</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint 2 reduction gear unit</td>
<td>M5 x 25</td>
<td>16</td>
<td>1000Ncm</td>
</tr>
<tr>
<td></td>
<td>M8 x 20</td>
<td>8</td>
<td>3000Ncm</td>
</tr>
</tbody>
</table>

4. Apply grease (SK-1A) inside the flexspline. Grease volume 43 g

5. Apply grease to the bearing part of the waveform generator.

6. Execute steps from (2) to (9) in Maintenance: 6.1 Replacing the Joint 2 Reduction Gear Unit.
10.3 Arm Top Cover removal

1. Turn ON the Controller.
2. Press and hold the brake release button switch to let the shaft down. Be sure to keep enough space and prevent the end effector hitting any peripheral equipment.
   - The brake release button switch affects both Joints Z and U. When the brake release button switch is pressed, the brakes for both Joints Z and U are released simultaneously.
   - Be careful of the shaft falling or rotation while the brake release button switch is being pushed because it may be lowered by the weight of an end effector.
3. Turn OFF the Controller.
4. Unscrew the arm top cover mounting bolts, and then lift the cover.
   - When bellows are installed to the manipulator, remove the upper bellows and then remove the arm top cover.

The cover cannot be removed completely because user wires and tubes are connected. However, you can continue regular maintenance.
LED lamp and the cable of the brake release button switch are located between the main part and the cover. Do not pull the cable strong or the connector may be damaged.

CAUTION

- Do not remove the arm top cover forcibly. Removing the cover forcibly may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the robot system.
- When installing the cover, be careful not to allow the cables to interfere with the cover mounting and do not bend these cables forcibly to push them into the cover. Unnecessary strain on cables may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the robot system.
  When routing the cables, observe the cable locations after removing the cover. Be sure to place the cables back to their original locations.

NOTE

- Do not remove the arm top cover forcibly. Removing the cover forcibly may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the robot system.
Arm Top Cover installation

1. Set the arm top cover to the arm and secure with the arm top cover mounting bolts. After mounting the arm top cover, make sure that the lower limit mechanical stop does not touch the cylindrical part of the arm top cover.
10.4 Arm １ Cover

There are two sets of Arm １ covers.

- Arm caps
- Side covers

Unscrew the bolts mounting the covers and the caps to remove them.

Arm side (Common part)

For the arm cap
4-M4 x 8

For the side cover
4-M4 x 15

Base side (Common part)

Table Top mounting

For the side cover
4-M4 x 8

For the side cover
4-M4 x 15

Wall mounting

For the side cover
4-M4 x 15

For the arm cap
4-M4 x 8

Ceiling mounting

For the side cover
4-M4 x 15

For the arm cap
4-M4 x 8
Unscrew the connector plate mounting bolts and remove the plate.

Table Top mounting

Wall mounting

Ceiling mounting
10.6 Connector Sub Plate

| 4-M4 x 10 | 4-M4 x 10 | 4-M4 x 10 |

**CAUTION**

- Do not remove the connector sub plate forcibly. Removing the connector sub plate forcibly may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the robot system.

- When installing the connector sub plate, be careful not to allow the cables to interfere with the plate mounting and do not bend these cables forcibly to push them into the cover. Unnecessary strain on cables may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the robot system. When routing the cables, observe the cable locations after removing the connector sub plate. Be sure to place the cables back to their original locations.

Unscrew the connector sub plate mounting bolts and remove the plate.
10.7 User Plate

Unscrew the user plate mounting bolts and remove the plate.

**NOTE**

Do not remove the nut by force. The nut for the user plate is combined with the user plate. And if you try to remove the nut, it will damage the user plate.

10.8 Maintenance Plate

Unscrew the user plate mounting bolts and remove the plate.

**Table Top mounting**

**Wall mounting**

**Ceiling mounting**
10.9 Base Bottom Cover

The base bottom cover is removed only when replacing the gasket unit. Unscrew the base bottom cover mounting bolts and remove the cover.

Table Top mounting

Ceiling mounting

10.10 Greasing the Ball Screw Spline Unit

The procedure for greasing the ball screw spline unit varies with the robot used.

- The brake release button switch is applied to both Z and U. When the brake release button switch is pressed, the respective brakes of the Z and U are released simultaneously.

NOTE

- Be careful of the shaft falling and rotating while the brake release button switch is being pressed because the shaft may be lowered by the weight of the end effector.
11 Spare parts

Specify the code when ordering maintenance parts.

11.1 Recommended spare parts

It is recommended to keep the parts and components in the following table in stock as spare parts for the MOTOMAN-MYS850L (see Table 17 "Recommended spare parts for MOTOMAN MYS850L"). Product performance may not be guaranteed when using spare parts recommended by companies other than MOTOMAN.

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Code</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC servo motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 R13B000610 750W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 R13B000611 600W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z R13B000607 400W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U R13B000612 150W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction gear unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 R13B010013 HD32-80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 R13B010014 HD32-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U R13B031601 G10-U</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solenoid Brake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z axis R13B030503 SBR-62z-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U axis R13B030501 AB2M-M1W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timing Belts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z belt R13B030209 Z: width 12mm 744-3GT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U belt R13B030210 U1: width 15 mm 375-3GT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery Board R13B041202</td>
<td></td>
<td>With lithium battery, installed in Arm 2</td>
</tr>
<tr>
<td>O-ring R13B031228</td>
<td></td>
<td>For Motor flange of 1</td>
</tr>
<tr>
<td>LED lamp R13A030000200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ball screw spline R13ZA00330200</td>
<td>AFB grease (400 g)</td>
<td></td>
</tr>
<tr>
<td>Reduction gear unit R13ZA00330100</td>
<td>SK-1A (500 g)</td>
<td></td>
</tr>
<tr>
<td>Cable R13B030304</td>
<td></td>
<td>Tube of GPL-224 (227g)</td>
</tr>
</tbody>
</table>
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