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

MOTOMAN INSTRUCTIONS

SIGMA 5 INSTRUCTIONS
DX100 INSTRUCTIONS
DX100 OPERATOR'S MANUAL
DX100 MAINTENANCE MANUAL

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

General items related to safety are listed in Section 2 of the DX100 Controller Manual. To ensure correct and safe operation, carefully read the DX100 Controller Manual before reading this manual.

CAUTION

- 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 a modification is made, the manual number will also be revised.
- If 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 the products warranty.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the MSR-Series Sigma 5 Positioner.

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

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

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

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

![PROHIBITED]
Must never be performed.

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

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 MSR-Series Sigma 5 Positioner, check that servo power is turned OFF by pressing the EMERGENCY STOP button on the operator station or Programming Pendant (refer to Figure 1). When 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 button cannot stop the positioner during an emergency. The positioner should not be used if the EMERGENCY STOP buttons do not function.

Figure 1: EMERGENCY STOP Button

• Release the EMERGENCY STOP button (refer to Figure 2). Once this button is released, clear the cell of all items which could interfere with the operation of the positioner then, turn servo power ON.

Injury may result from unintentional or unexpected positioner motion.

Figure 2: Release of EMERGENCY STOP Button

• Observe the following precautions when performing teaching operations within the working envelope of the positioner:
  – View the positioner from the front whenever possible.
  – Always follow the predetermined operating procedure.
  – Ensure that there is a safe place to retreat to in case of emergency.

Improper or unintended manipulator operation may result in injury.

• Confirm that no person is present in the working envelope of the positioner and that you are in a safe location before:
  – Turning on the power for the DX100 controller.
  – Moving the positioner with the Programming Pendant.
  – Running the system in the check mode.
  – Performing automatic operations.

Injury may result if anyone enters the working envelope of the positioner during operation. Always press an EMERGENCY STOP button immediately if there is a problem. The EMERGENCY STOP buttons are located on the operator station and 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 manipulator, the DX100 controller, manipulator cables, the DX100 programming pendant (optional), and the DX100 programming pendant dummy connector (optional).

In this manual, the equipment is designated as follows:

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

**CAUTION**

- Perform the following inspection procedures prior to conducting positioner teaching. If problems are found, repair them immediately and be sure that all other necessary processing has been performed.
  - Check for problems in positioner 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 controller after use.
- The Programming Pendant can be damaged if it is left in the work area, on the floor, or near fixtures.
- Read and understand the Explanation of Warning Labels in the **DX100 Controller Manual** before operating the MSR-Series Sigma 5 Positioner.
Descriptions of the programming pendant keys, buttons, displays and keyboard of the PC are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td>Character Keys The keys which have characters printed on them are denoted with [ ]. e.g. [ENTER]</td>
</tr>
<tr>
<td>Symbol Keys</td>
<td>The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture. e.g. PAGE key The cursor key is an exception, and a picture is not shown.</td>
</tr>
<tr>
<td>Axis Keys Numeric Keys</td>
<td>“Axis keys” and “Numeric keys” are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td>Keys Pressed Simultaneously</td>
<td>When two keys are to be pressed simultaneously, the keys are shown with a “+” sign between them. e.g. SHIFT key + COORD key</td>
</tr>
<tr>
<td>Mode Key</td>
<td>Three kinds of modes that can be selected by the mode key are denoted as follows: REMOTE, PLAY, or TEACH</td>
</tr>
<tr>
<td>Button</td>
<td>Three buttons on the upper side of the programming pendant are denoted as follows: HOLD button START button EMERGENCY STOP button</td>
</tr>
<tr>
<td>Displays</td>
<td>The menu displayed in the programming pendant is denoted with { }. e.g. {JOB}</td>
</tr>
<tr>
<td>PC Keyboard</td>
<td>The name of the key is denoted. e.g. Ctrl key on the keyboard</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.
1 Introduction........................................................................................................................................ 1-1
  1.1 About this Document .................................................................................................................. 1-1
  1.2 Customer Service Information .............................................................................................. 1-1
  1.3 System Overview ...................................................................................................................... 1-1
    1.3.1 System Layout .................................................................................................................. 1-2
    1.3.2 System Identification ...................................................................................................... 1-3
  1.4 Reference to Other Documentation .......................................................................................... 1-3

2 Safety.................................................................................................................................................. 2-1
  2.1 Introduction .................................................................................................................................. 2-1
  2.2 General Safeguarding Tips ....................................................................................................... 2-2
  2.3 Safety Devices ............................................................................................................................ 2-2
  2.4 Installation Safety ....................................................................................................................... 2-3
  2.5 Programming Safety .................................................................................................................. 2-3
  2.6 Operation Safety ......................................................................................................................... 2-4
  2.7 Maintenance Safety .................................................................................................................... 2-5

3 Equipment Description ................................................................................................................... 3-1
  3.1 MSR-Series Sigma 5 Positioner Rotary Positioner – Type I .................................................... 3-1
    3.1.1 Additional Components ..................................................................................................... 3-1
    3.1.2 System Specifications – Type I ....................................................................................... 3-2
    3.1.3 Arc Shield ......................................................................................................................... 3-2
  3.2 MSR-Series Sigma 5 Positioner Rotary Positioner – Type II .................................................... 3-2
    3.2.1 Additional Components ..................................................................................................... 3-3
    3.2.2 System Specifications – Type II ....................................................................................... 3-4
    3.2.3 Arc Shield .......................................................................................................................... 3-4
4 Installation ............................................................................................................4-1
    4.1 Materials Required ................................................................................4-1
        4.1.1 Customer-Supplied Items .................................................................4-1
        4.1.2 List of Tools .................................................................................... 4-1
    4.2 Site Preparation .........................................................................................4-1
        4.2.1 Mounting Hole Pattern .................................................................4-3
    4.3 Installing the MSR-series Table .........................................................4-4
        4.3.1 Unpack and Install ................................................................4-4
        4.3.2 Connecting the Cables ...................................................................4-5
    4.4 Conducting a Safety/Operation Check ...............................................4-5

5 Tooling Recommendations.................................................................................5-1
    5.1 Tooling Recommendations ....................................................................5-1

6 Maintenance .........................................................................................................6-1
    6.1 Spare Parts .....................................................................................6-1
    6.2 Ordering Parts .... ...................................................................................6-1
    6.3 Maintenance Schedule ........................................................................6-1
    6.4 Home Position ...................................................................................... 6-1
        6.4.1 Set Factory Home Position ...........................................6-2
    6.5 Troubleshooting .........................................................................................6-3

A Illustrated Parts List........................................................................................... A-1
    A.1 Introduction ..................................................................................... A-1
        A.1.1 General ...................................................................................... A-1
        A.1.2 Purpose ...................................................................................... A-1
        A.1.3 Arrangement ................................................................................ A-1
        A.1.4 Explanation of Parts List .................................................. A-1
    A.2 Parts List .............................................................................................. A-2
        A.2.1 Explanation of Parts List Arrangement ........................................ A-2
        A.2.2 Symbols and Abbreviations ................................................ A-2
1 Introduction

1.1 About this Document

This manual provides general information about the MSR-Series Sigma 5 Positioner, and contains the following sections:

- SECTION 1 - Introduction
  
  This section provides general information about the MSR-Series Sigma 5 Positioner positioner, a list of reference documents, and customer service information.

- SECTION 2 - Safety
  
  This section provides information regarding the safe use and operation of the MSR-Series Sigma 5 Positioner positioner.

- SECTION 3 - Equipment Description
  
  This section provides detailed descriptions of the major components of the MSR-Series Sigma 5 Positioner positioner. It also includes a table, listing component specifications.

- SECTION 4 - Installation
  
  This section provides instructions for installing the positioner.

- SECTION 5 - Tooling Recommendations
  
  This section provides guidelines for customer-supplied tooling design.

- SECTION 6 - Operation
  
  This section provides operation instructions for the MSR-Series Sigma 5 Positioner.

- SECTION 6 - Maintenance
  
  This section provides detailed instructions for maintaining each MSR-Series Sigma 5 Positioner.

- APPENDIX
  
  Appendix A provides exploded views and illustrated parts lists for the MSR-Series Sigma 5 Positioner.

1.2 Customer Service Information

If you need technical assistance, contact the Motoman service staff at 937.847.3200. Please have the following information ready before you call:

- Product (Type I or Type II MSR-Series Sigma 5 Positioner positioner)
- Serial Number

1.3 System Overview

The MSR-Series Sigma 5 Positioner rotary positioner provides controlled rotary motion and can be mounted in any orientation needed. The standard configuration utilizes an AC servo-motor, a high-ratio gear reducer, table top, and housing. It also includes integral position switches.
1.3.1 System Layout

An arc screen divides the table top in half, providing two semicircular work areas labeled SIDE A and SIDE B. When SIDE A is in the robot's welding zone, SIDE B is facing the operator and is ready to be loaded or unloaded with parts, and vice versa. Loading fixtures are supplied by the customer.

Fig. 1-1: System Layout Type I
1.3.2 System Identification

Each MSR-Series Sigma 5 Positioner positioner has identification label, located at the base, that contains specifications for the positioner Fig. 1-3 Identification Label.

Fig. 1-3: Identification Label

1.4 Reference to Other Documentation

For additional information refer to the following:

- MH-Series Sigma 5 Positioner Manual - P/N 162068-1CD.
1 Introduction
1.4 Reference to Other Documentation
2  Safety

2.1  Introduction

It is the purchaser's responsibility to ensure that all local, county, state, and national codes, regulations, rules, or laws relating to safety and safe operating conditions for each installation are met and followed.

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems. This information can be obtained from the Robotic Industries Association by requesting ANSI/RIA R15.06. The address is as follows:

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

Ultimately, the best safeguard is trained personnel. The user is responsible for providing personnel who are adequately trained to operate, program, and maintain the robot cell. The robot must not be operated by personnel who have not been trained!

We recommend that all personnel who intend to operate, program, repair, or use the robot system be trained in an approved Motoman training course and become familiar with the proper operation of the system.

This safety section addresses the following:

• Section 2.2 - "General Safeguarding Tips"
• Section 2.3 - "Safety Devices"
• Section 2.4 - "Installation Safety"
• Section 2.5 - "Programming Safety"
• Section 2.6 - "Operation Safety"
• Section 2.7 - "Maintenance Safety"
2.2 General Safeguarding Tips

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot 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 robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.

- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.

- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).

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

- In accordance with ANSI/RIA R15.06, section 6.13.4 and 6.13.5, 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).

2.3 Safety Devices

The safe operation of the robot, positioner, auxiliary equipment, and system is ultimately the user's 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 safety standards, and other local codes that may pertain to the installation and use of industrial equipment. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety measures are available:

- Safety fences and barriers
- Light curtains
- Door interlocks
- Safety mats
- Floor markings
- Warning lights

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
2.4 Installation Safety

Safe installation is essential for protection of people and equipment. The following suggestions are intended to supplement, but not replace, existing federal, local, and state laws and regulations. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. Installation tips are as follows:

• Be sure that only qualified personnel familiar with national codes, local codes, and ANSI/RIA R15.06 safety standards are permitted to install the equipment.

• Identify the work envelope of each robot with floor markings, signs, and barriers.

• Position all controllers outside the robot work envelope.

• Whenever possible, install safety fences to protect against unauthorized entry into the work envelope.

• Eliminate areas where personnel might get trapped between a moving robot and other equipment (pinch points).

• Provide sufficient room inside the workcell to permit safe teaching and maintenance procedures.

2.5 Programming Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Programming tips are as follows:

• Any modifications to PART 1 of the controller PLC can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1. Making any changes without the written permission of Motoman will VOID YOUR WARRANTY!

• Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. YOUR WARRANTY WILL BE VOID if you use these special passwords.

• Back up all programs and jobs onto a floppy disk whenever 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.

• The concurrent I/O (Input and Output) function allows the customer to modify the internal ladder inputs and outputs for maximum robot performance. Great care must be taken when making these modifications. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations that may damage the robot or other parts of the system.

• 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 robot should be permitted to operate the system.
2.6 Operation Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Operation tips are as follows:

- Be sure that only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories are permitted to operate this robot system.
- Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Inspect the robot and work envelope to ensure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Ensure that all safeguards are in place.
- 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 robot should be permitted to operate the system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.
2.7 Maintenance Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Maintenance tips are as follows:

- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- 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 robot should be permitted to operate the system.
- Back up all your programs and jobs onto a floppy disk whenever program changes are made. A backup must always be made before any servicing or changes are made to options, accessories, or equipment to avoid loss of information, programs, or jobs.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- Be sure all safeguards are in place.
- Use proper replacement parts.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
MSR-Series Sigma 5 Positioner

2 Safety
2.7 Maintenance Safety
3 Equipment Description

The MSR-Series Sigma 5 Positioner rotary positioner consists of an AC motor plus gear reducer. Position switches are included as a standard feature.

3.1 MSR-Series Sigma 5 Positioner Rotary Positioner – Type I

The Type I positioner is designed around the MH500 drive assembly. The MH500 is mounted vertically between two steel columns and is primary drive component for the rotary table.

Fig. 3-1: MSR-Series Sigma 5 Positioner Type I

3.1.1 Additional Components

- Ground Brushes
  - The MSR205 comes with factory-installed ground brushes. Additional ground brushes can be added as needed.

Table 3-1 Weld Ground Brushes

<table>
<thead>
<tr>
<th>Component</th>
<th>Standard</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSR205kg – Weld ground brushes with rated * capacity</td>
<td>2 (800 Amp)</td>
<td>3 (1200 Amp)</td>
</tr>
</tbody>
</table>

* Weld capacity is at 100% duty cycle.
3.1.2 System Specifications – Type I

See Table 3-2 Type I Table Specifications for MSR-Series Sigma 5 Positioner Type I table specifications.

Table 3-2 Type I Table Specifications

<table>
<thead>
<tr>
<th>Series Component</th>
<th>MSR205 (158595-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Load (per side) – kgf</td>
<td>205</td>
</tr>
<tr>
<td>Standard Table Diameter – mm/inch</td>
<td>1525/60</td>
</tr>
<tr>
<td>Table Center Through Hole – mm/inch</td>
<td>None</td>
</tr>
<tr>
<td>Base to Table Height – mm/inch</td>
<td>755 (29.72)</td>
</tr>
<tr>
<td>180-Degree Sweep Time – sec</td>
<td>3.7</td>
</tr>
</tbody>
</table>

For detailed performance specifications on the MSR205 drive assemblies, see the MH-Series Sigma 5 Positioner Manual (P/N 162068-1CD).

3.1.3 Arc Shield

Do not operate this equipment unless the arc screen is in place or eye damage can occur!

The Yaskawa Motoman MSR-Series Sigma 5 Positioner has an arc screen that runs the width of the positioner table and visually separates the loading zone from the welding zone. This screen acts as a shield to protect the operator from the arc radiation and sparks produced by the welding operation. Do not operate this equipment in a welding application unless the arc screen is in place.

3.2 MSR-Series Sigma 5 Positioner Rotary Positioner – Type II

The appearance of the two Type II table positioners are the same; capacity is the primary difference. The Type II, MSR-series drive assembly is designed around a cast-iron base and a steel arc screen.

The MSR-series, Type II table positioners is available in two different configurations (Section 3.2.1 “Additional Components”):

- MSR505
- MSR1005
3.2.1 Additional Components

- Ground Brushes
  - The Type II positioners come with factory-installed ground brushes
  
  Table 3-3 Weld Ground Brushes. Additional ground brushes can be added as needed.

Table 3-3  Weld Ground Brushes

<table>
<thead>
<tr>
<th>Component</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSR 505 kg - Weld ground brushes with rated capacity*</td>
<td>3 (1200 Amp)</td>
</tr>
<tr>
<td>MSR 1005 kg - Weld ground brushes with rated capacity*</td>
<td>3 (1200 Amp)</td>
</tr>
</tbody>
</table>

* Weld capacity is at 100% duty cycle.
3.2 MSR-Series Sigma 5 Positioner Rotary Positioner – Type II

3.2.2 System Specifications – Type II

See Fig. 3-4 MSR-Series Sigma 5 Positioner Type II Specifications for table specifications.

Table 3-4 MSR-Series Sigma 5 Positioner Type II Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Standard 163291-2</th>
<th>Option 163291-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Load (per side) – kgf</td>
<td>505</td>
<td>1005</td>
</tr>
<tr>
<td>Standard Table Diameter – mm/inch</td>
<td>1525/60</td>
<td>1525/60</td>
</tr>
<tr>
<td>Table Center Through Hole – mm/inch</td>
<td>110/43</td>
<td>110/43</td>
</tr>
<tr>
<td>Base to Table Height – mm/inch</td>
<td>780 (30.7)</td>
<td></td>
</tr>
<tr>
<td>180-degree Sweep Time – sec</td>
<td>2.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

For detailed performance specifications on the MH drive assemblies, see the MH-Series Sigma 5 Positioner Manual (P/N 162068-1CD).

3.2.3 Arc Shield

Do not operate this equipment unless the arc screen is in place or eye damage can occur!

The Motoman MSR-Series Sigma 5 Positioner positioner has an arc screen that runs the width of the positioner table and visually separates the loading zone from the welding zone. This screen acts as a shield to protect the operator from the arc radiation and sparks produced by the welding operation. Do not operate this equipment in a welding application unless the arc screen is in place.
4 Installation

Installation of the MSR-Series Sigma 5 Positioner should be performed by personnel who are familiar with this Motoman product. Follow established safety procedures at all times throughout the installation process. Failure to use safe work practices can result in damage to the equipment and injury to the workers.

4.1 Materials Required

This section identifies customer-supplied items and tools required to complete installation.

4.1.1 Customer-Supplied Items

- Servo motion control unit
- Incoming power supply
- Two earth ground cables with two earth ground stakes

4.1.2 List of Tools

- Safety Glasses
- Hammer drill with appropriate concrete bits
- Level
- Forklift and/or overhead crane
- Adjustable Wrench Set
- Open-end wrench sets (standard and metric)

4.2 Site Preparation

Each MSR-Series Sigma 5 Positioner positioner should be firmly mounted on a machine base or foundation rigid enough to support the static and dynamic forces.

■ Type I

To prepare your site, proceed as follows:

1. Clear the floor space needed for the positioner see Fig.4-1 Area Needed For Installation - Type I or Fig.4-2 Area Needed for Installation - Type II.
2. Gather all required tools listed in Section 4.1.2 “List of Tools”.
Fig. 4-1: Area Needed For Installation - Type I

Fig. 4-2: Area Needed for Installation - Type II
4.2 Site Preparation

4.2.1 Mounting Hole Pattern

Use the mounting hole pattern in Fig. 4-3 to accurately position the Type I MSR-Series Sigma 5 Positioner on the floor or mounting base. Use the mounting hole pattern in Fig. 4-4 to accurately position the Type II MSR-Series Sigma 5 Positioner on the floor or mounting base.

Fig. 4-3: Floor Mounting Hole Pattern - Type I

![Fig. 4-3: Floor Mounting Hole Pattern - Type I](image)

Fig. 4-4: Floor Mounting Hole Pattern - Type II

![Fig. 4-4: Floor Mounting Hole Pattern - Type II](image)
4.3 Installing the MSR-series Table

The MSR-Series Sigma 5 Positioner table must be firmly mounted on a machine base or on a foundation rigid enough to support the static and dynamic forces.

4.3.1 Unpack and Install

The positioner table is shipped on a wood shipping pallet. To install the table, proceed as follows:

1. Carefully remove protective plastic wrapping from system.
2. Inspect system for shipping damage.
3. Unbolt table from wood shipping pallet using a 3/4-inch socket wrench.

**WARNING**

The Type I MSR205 positioner weighs 450 kg (1000 lbs). The Type II MSR505/1005 positioner weighs 1200 kg (2700 lbs). Be sure that your lifting device is capable of handling this much weight or damage to the equipment or injury to personnel can result.

4. Insert two eye bolts (four total) on each side of the arc screen. Use the four bolts that are closest to the arc screen see Fig.4-5 Unbolting the Table - Typical.

5. Attach chains from lifting device to the eye bolts and raise the table from wood shipping pallet.
4.3.2 Connecting the Cables

Do not connect any cables until after the drive assembly is securely in place.

Connection to Motoman Controller

Two sets of cables lead from the controller to the positioner: I/O cable and power cable. These cables are sent through the back of the interface box and steadied with a gland plate. Connect these cables onto the interface panel.

• I/O Cables – One ribbon cable and two spares
  a) The I/O ribbon cable fastens to the PC Interference Board.
  b) Securely tie the spare wires out of the way.

• Power Cables – Three black cables and one green
  a) The three black cables connect to the fuse holder block labeled 2, 4, and 6. See system drawings.
  b) The green cable connects to the ground lug on the interface panel.

When the MSR-Series Sigma 5 Positioner table is delivered with a Motoman robot, connections between the two have been made at the factory. See separate schematics and/or documentation specific to your system.

Ground Cables

For ground cable installation instructions, see the MH-series Positioner Manual with MotoMount and Drive Assemblies (P/N 162068-1CD)

4.4 Conducting a Safety/Operation Check

Before operating the MSR-Series Sigma 5 Positioner system, take a few minutes to perform a safety/operation check. To perform a safety/operation check, proceed as follows:

1. Check that all cable connections are tight.
2. Check that the tooling is properly attached to table.
3. Make sure all loose components are removed from table.
4 Installation
4.4 Conducting a Safety/Operation Check
5 Tooling Recommendations

The MSR-Series Sigma 5 Positioner table is now ready for the installation of tooling for your application. Installation of tooling should be performed by personnel who are familiar with the operation of this system. Tooling is supplied by the customer.

5.1 Tooling Recommendations

The customer-supplied tooling must be designed to fit the table top mounting holes Fig. 5-1 Fixture Mounting Holes.

Fig. 5-1: Fixture Mounting Holes
6  Maintenance

6.1  Spare Parts

Maintenance of the MSR-Series Sigma 5 Positioner components should be performed only by authorized personnel who are familiar with the design and construction of this positioner. The following procedures should be performed only as needed. Read through the instructions completely before performing any maintenance procedure. Be sure that you understand the procedure, have the proper tools, and observe all applicable safety precautions.

MSR-Series Sigma 5 Positioner tables are powered by MH-series drive assemblies. To identify the spare parts to keep on hand for the MH-series drive assemblies, see the MH-Series Sigma 5 Positioner Manual (P/N 162068-1CD).

6.2  Ordering Parts

When ordering spare parts, always state:

- Machine type (Positioner)
- Machine Name (MSR205/505/1005)
- Motoman Part No.
- Part name
- Number of parts

Send orders to:

Customer Service
Yaskawa America Inc.
Motoman Robotics Division
100 Automation Way
Miamisburg, Ohio, 45342
Telephone:937.847.3200
Telefax:937.847.3211

6.3  Maintenance Schedule

MSR-Series Sigma 5 Positioner tables are powered by MH-series drive assemblies. To schedule maintenance for the MH-series drive assemblies, see the MH-Series Sigma 5 Positioner Manual (P/N 162068-1CD).

6.4  Home Position

Any position of the table can be programmed as home. Resetting to factory home position is typically done before new tooling and fixturing is installed, or when the motor has been serviced.
6.4.1 Set Factory Home Position

To set the table to home position, proceed as follows:

1. Make sure the robot(s) is in home position.

2. Locate the homing hole on the positioner (see Fig. 6-1 Factory Home Position - Type I or Fig. 6-2 Factory Hope Position - Type II for Type II).

3. Jog the table until the homing hole and homing surface are close to each other.

4. Install the homing pin into the homing hole. The pin may need to be tapped in with a hammer.
6.5 Troubleshooting

MSR-Series Sigma 5 Positioner tables are powered by MH-series drive assemblies. For troubleshooting procedures for the MH-series drive assemblies, see the MH-Series Sigma 5 Positioner Manual (P/N 162068-1CD)
MSR-Series Sigma 5 Positioner

6 Maintenance
6.5 Troubleshooting
A Illustrated Parts List

A.1 Introduction

A.1.1 General
The Illustrated Parts List identifies, describes, and illustrates detail parts of the main assemblies for the MSR-Series Sigma 5 Positioner manufactured by Yaskawa Motoman.

A.1.2 Purpose
This list provides parts identification and descriptive information for use in provisioning, requesting, purchasing, storing, and issuing spare parts.

A.1.3 Arrangement
Appendix A is arranged as follows:
- Appendix A.1 – Introduction
- Appendix A.2 – Illustrated Parts List

A.1.4 Explanation of Parts List

- Contents
The parts list contains a breakdown of the equipment into detail parts. All parts of the equipment are listed except the following:

1. Standard hardware items (attaching parts) such as nuts, screws, washers, etc., which are available commercially.
2. Bulk items such as wire, cable, sleeving, tubing, etc., which are also commercially available.
3. Permanently attached parts which lose their identity by being welded, soldered, riveted, etc., to other parts, or assemblies.

- Parts List Form
This form is divided into four columns as follows:

1. “Figure - Item Number” Column
This Figure column lists the figure number of the illustration applicable to a particular parts list and also identifies each part in the list by an item number. These item numbers also appear on the illustration. Each item number on the illustration is connected to the part to which it pertains by a leader line and arrow. Thus, the figure and item numbering system ties the parts list to the illustrations and vice versa.

2. “Part Number” Column
All part numbers appearing in this column are part numbers.

3. “Description” Column
The item nomenclature appears in this column.

4. “QTY” Column
This column indicates the quantity of parts required for an assembly or subassembly in which the part appears. This column does not necessarily reflect the total used in the complete end item.
A.2 Parts List

A.2.1 Explanation of Parts List Arrangement
The parts list is arranged so that the illustration will appear on left-hand page and the applicable parts list will appear on the opposite right-hand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

A.2.2 Symbols and Abbreviations
The following is a list of symbols and abbreviations used in the parts list.

- amp – ampere
- AC – alternating current
- cyl – cylinder
- DC – direct current
- fig – figure
- hex – hexagon
- ID – inside diameter
- in. – inch
- m – meter
- mm – millimeter
- No. – number
- psi – pounds per square inch
- v – voltage
Fig. A-1: MSR205 Components
Table A-1: Parts List – MSR205 Components

<table>
<thead>
<tr>
<th>Figure B-1 Item Number</th>
<th>Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>158595-1</td>
<td>POSITIONER ASSY, MSR205</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>146710-1</td>
<td>SCREEN ASSY, POSITIONER</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>146174-1</td>
<td>FRAME, TABLE, POSITIONER, ROTARY</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>146176-1</td>
<td>SHIELD, TABLE, POSITIONER, ROTARY</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>147201-1</td>
<td>PLATE, MOUNT</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>147034-1</td>
<td>SUPPORT, 450 kg DRIVE ASSY, AUX</td>
<td>1</td>
</tr>
<tr>
<td>*6</td>
<td>158482-2</td>
<td>POSITIONER ASSY, HEADSTOCK, 450 kg</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>147033-1</td>
<td>SUPPORT, 450 kg DRIVE ASSY, MAIN</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>132652-12</td>
<td>PIN, DOWEL, M12 X 30</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>147103-1</td>
<td>PLATE, BACK UP</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>146818-2</td>
<td>PLATE, MTG, POWER/ENCODER</td>
<td>1</td>
</tr>
<tr>
<td>NS</td>
<td>156975-1</td>
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</tr>
<tr>
<td>NS</td>
<td>158351-2</td>
<td>CABLE ASSY, ENCODER, 1.3 kW</td>
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</tr>
<tr>
<td>NS</td>
<td>158476-1</td>
<td>CABLE ASSY, LIMIT SWITCH</td>
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</tr>
<tr>
<td>NS</td>
<td>479348-2</td>
<td>BATTERY ASSY, BACKUP</td>
<td>1</td>
</tr>
</tbody>
</table>

* For parts list breakdown of headstock, refer to the MH-Series Sigma 5 Positioner Manual (P/N 162068-1CD).

NS = Not Shown
NOTE: The MSR505 (high speed) and MSR1005 (low speed) drive assemblies have the same common parts except for the gear reducer and gear pinion components.
For parts list breakdown of drive assembly, refer to the MH-Series Sigma 5 Positioner Manual (P/N 162068-1CD).

NS = Not Shown