

M3XSL POSITIONER INSTRUCTIONS

MRM2 250/750SL

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

YASKAWA INSTRUCTIONS

MOTOMAN MRM2-250/750SL INSTRUCTIONS
DX100 INSTRUCTIONS
DX100 OPERATOR'S MANUAL
DX100 MAINTENANCE MANUAL

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

Part Number: 157541-1CD
Revision: 7

Copyright © 2016, 2014, 2013, 2012, YASKAWA America, Inc.

Terms of Use and Copyright Notice

All rights reserved. This manual is freely available as a service to customers to assist in the operation of YASKAWA Motoman robots, related equipment and software. This manual is copyrighted property of YASKAWA and may not be sold or redistributed in any way. You are welcome to copy this document to your computer or mobile device for easy access but you may not copy the PDF files to another website, blog, cloud storage site or any other means of storing or distributing online content.

Printed in the United States of America

First Printing, 2016

YASKAWA America, Inc.
Motoman Robotics Division
100 Automation Way
Miamisburg, OH 45342
Phone: 937-847-6200

www.motoman.com



MANDATORY

- This user guide provides an overview of the MRM2-250/750SL system. It gives general information about the system, a description of its major components, and the procedures for installation, system operation, and preventive and repair maintenance. Be sure to read and understand this manual thoroughly before installing and operating the MRM2-250/750SL system.
- 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.
- 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



CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure that all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative, 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 your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

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

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

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

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

Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the MRM2-250/750SL system.

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



DANGER

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



WARNING

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



CAUTION

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



MANDATORY

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



PROHIBITED

Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.



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



WARNING

- Before operating the manipulator, check that servo power is turned OFF by pressing the EMERGENCY STOP buttons on the operator station or Programming Pendant (refer to *Fig. 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 circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the EMERGENCY STOP buttons do not function.

Figure 1: EMERGENCY STOP Button



- Release the EMERGENCY STOP button (refer to *Fig. 2*). Once this button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

Fig. 2 : Release of EMERGENCY STOP Button



- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator.
 - View the manipulator from the front whenever possible.
 - Always follow the predetermined operating procedure.
 - Ensure that 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 P-point maximum envelope of the manipulator and that you are in a safe location before:
 - Turning on the power for the DX100 controller.
 - Moving the manipulator with the Programming Pendant.
 - Running the system in the check mode.
 - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an EMERGENCY STOP button immediately if there is a problem. The EMERGENCY STOP buttons are located on the operator station and on the Programming Pendant.



CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately and be sure that all other necessary processing has been performed.
 - Check for problems in manipulator movement.
 - Check for damage to insulation and sheathing of external wires.
- Always return the Programming Pendant to the hook on the cabinet of the DX100 controller after use.
- The Programming Pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.
- Read and understand the Explanation of Warning Labels in the *DX100 Controller Manual* before operating the MRM2-250/750SL system.

Definition of Terms Used Often in This Manual

The MOTOMAN manipulator is a YASKAWA industrial robot product.

The manipulator usually consists of the controller, the Programming Pendant, and supply cables.

In this manual, the equipment is designated as follows:

Equipment	Manual Designation
DX100 controller	DX100
DX100 Programming Pendant	Programming Pendant
Cable between the manipulator and the controller	Manipulator cable

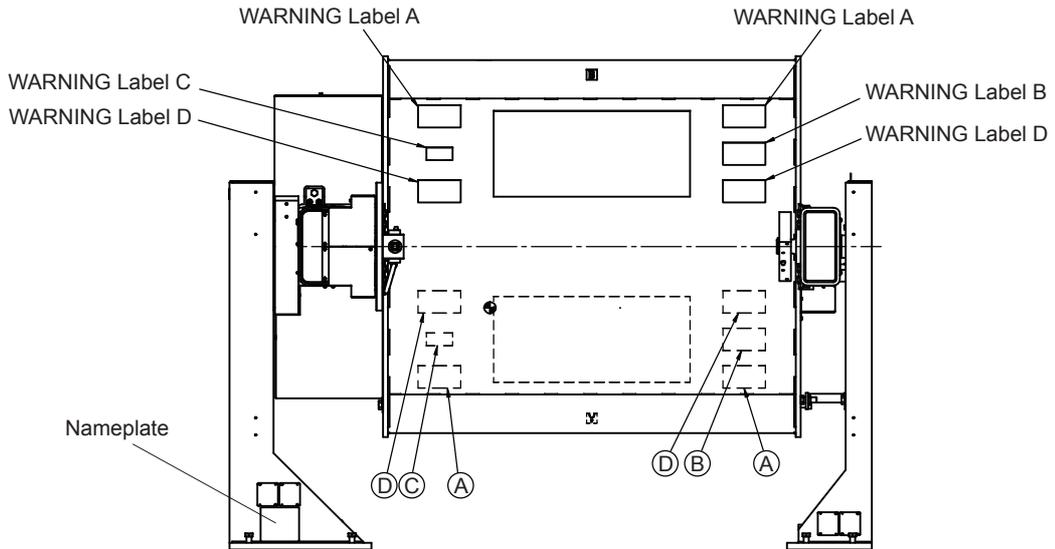
Explanation of Warning Labels

The following warning labels are attached to the positioner (refer to Fig. 3).

Always follow the warnings on the labels.

Also, an identification label with important information is placed on the body of the positioner. Prior to operating the manipulator, confirm the contents.

Figure 3: Warning Labels Location



Nameplate:



WARNING Label C:



WARNING Label A:



WARNING Label B:



WARNING Label D:



Safeguarding Tips

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

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this equipment.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
- The system must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

Mechanical Safety Devices

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

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

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

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

Programming, Operation, and Maintenance Safety

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

- Inspect the equipment to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Check the E-Stop button on the operator station for proper operation before programming. The equipment must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.
- Any modifications to the controller unit can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the controller unit. Making any changes without the written permission from will void the warranty.
- Some operations require standard passwords and some require special passwords.
- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications. All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that the changes have not created hazards or dangerous situations.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Use proper replacement parts.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

Maintenance Safety

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

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

Summary of Warning Information

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

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

Table of Contents

1	Introduction	1-1
1.1	MRM2-250/750SL Configuration	1-4
1.2	Welding Ground System	1-4
1.3	Major Components.....	1-4
1.3.1	Optional Equipment	1-4
1.4	Reference Documentation	1-5
1.5	Customer Support Information.....	1-5
2	Installation.....	2-1
2.1	Contents Confirmation	2-1
2.1.1	Major Components	2-1
2.1.2	Optional Equipment	2-1
2.2	Shipping Bolts and Bracket.....	2-2
2.3	Transporting Method.....	2-3
2.3.1	Using a Crane.....	2-3
2.3.2	Using Forklifts.....	2-4
2.4	Installation of Safeguarding	2-5
2.4.1	Responsibility for Safeguarding (ISO10218)	2-5
2.5	Mounting Procedures for the MRM2-250/750SL	2-6
2.5.1	Installing the Positioner on a Common Baseplate	2-6
2.5.2	Installing the Positioner as a Standalone Product	2-7
2.5.3	Installing the Positioner within a Cell and Attached to a Robot Base	2-7
2.5.4	Mounting the Positioner on the Floor.....	2-8
2.6	Location	2-9
2.7	Customer-Supplied Tooling Fixtures.....	2-9
3	Wiring.....	3-1
3.1	Grounding	3-1
3.2	Cable Connection	3-2
3.2.1	Connection to the MRM2-250/750SL	3-2
3.2.2	Connection to the DX100.....	3-2

4	Basic Specifications	4-1
4.1	Basic Specifications List	4-1
4.2	Part Names and Working Axes	4-2
4.3	Mounting Dimensions	4-2
4.4	Dimensions and Working Envelope	4-3
5	Load Specifications and Jig Mounting	5-1
5.1	Details of Fixture Mounting	5-1
6	Maintenance and Inspection	6-1
6.1	Inspection Interval	6-2
6.2	Battery Pack Replacement	6-3
6.3	Grease Replenishment/Exchange for Speed Reducers	6-3
6.3.1	Main Axis	6-3
6.3.2	Tooling Axes	6-3
6.4	General Cleaning	6-3
6.5	SIGMA V AC Servomotors	6-3
6.6	Servo Pack	6-4
6.7	Main (Sweep) Axis Reduction Gear Unit (RV-320E-X)	6-4
6.8	Tooling Axis Reduction Gear Units (RV-80E-X)	6-4
6.9	Main (Swing) Axis Hardstops	6-4
6.10	Welding Ground System	6-5
6.10.1	Inspection and Cleaning of Carbon Brushes	6-5
6.10.2	Ground Brush Replacement	6-5
6.10.3	Ground Brush Installation	6-6
6.10.4	Inspection of Welding Ground Connections	6-6
6.11	AC Servomotor Encoder Back-Up Battery	6-7
6.12	Positioner Home Position	6-8
6.12.1	Setting the Main Axis (S1) to Home (Zero) Position	6-8
6.12.2	Setting the Tooling Axis (S2 & S3) to Home (Zero) Position	6-8
7	Recommended Spare Parts	7-1

8 Illustrated Parts List.....	8-1
8.1 Introduction	8-1
8.1.1 Arrangement.....	8-1
8.1.2 General.....	8-1
8.1.3 Purpose	8-1
8.2 Illustrated Parts List (IPL).....	8-1
8.2.1 IPL Layout	8-1
8.2.2 Item Categories Not Included in the IPL.....	8-1
8.2.3 Parts List Table Structure	8-2

1 Introduction

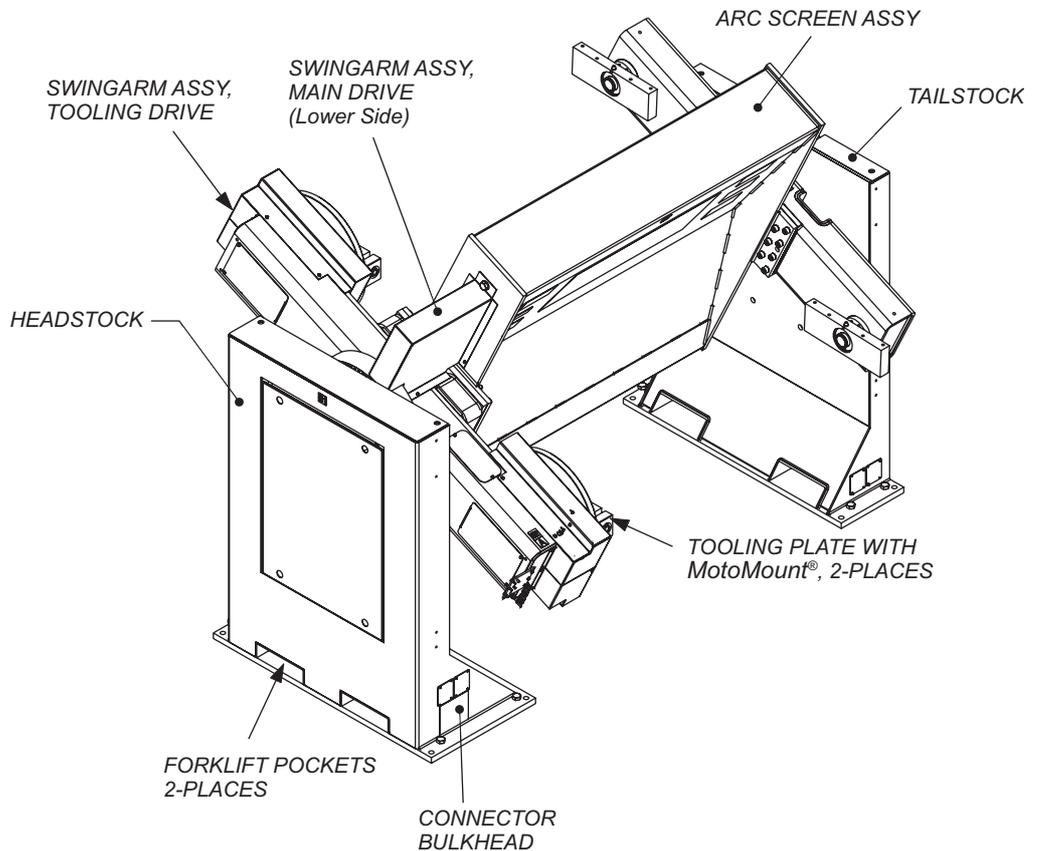
The MRM2-250/750SL can be used with a variety of applications that require precise parts movement. Typically, the MRM2-250/750SL is integrated with a YASKAWA robot and controller in a work cell arrangement.

The MRM2-250/750SL is a two station headstock/tailstock (HS/TS) positioner. Because of certain operational dynamics, this type of positioner is often referred to as a “Ferris wheel” positioner.

The main (sweep) axis and both tooling plate (orbital) axes are rotated by individual SIGMA V AC servomotors (working through gear reduction units) that are controlled by circuitry in the controller.

All three axes can be driven simultaneously during a sweep motion. In addition, movement of the MRM2-250/750SL can be coordinated with robot motion to allow complex jobs such as the welding of circumferential joints.

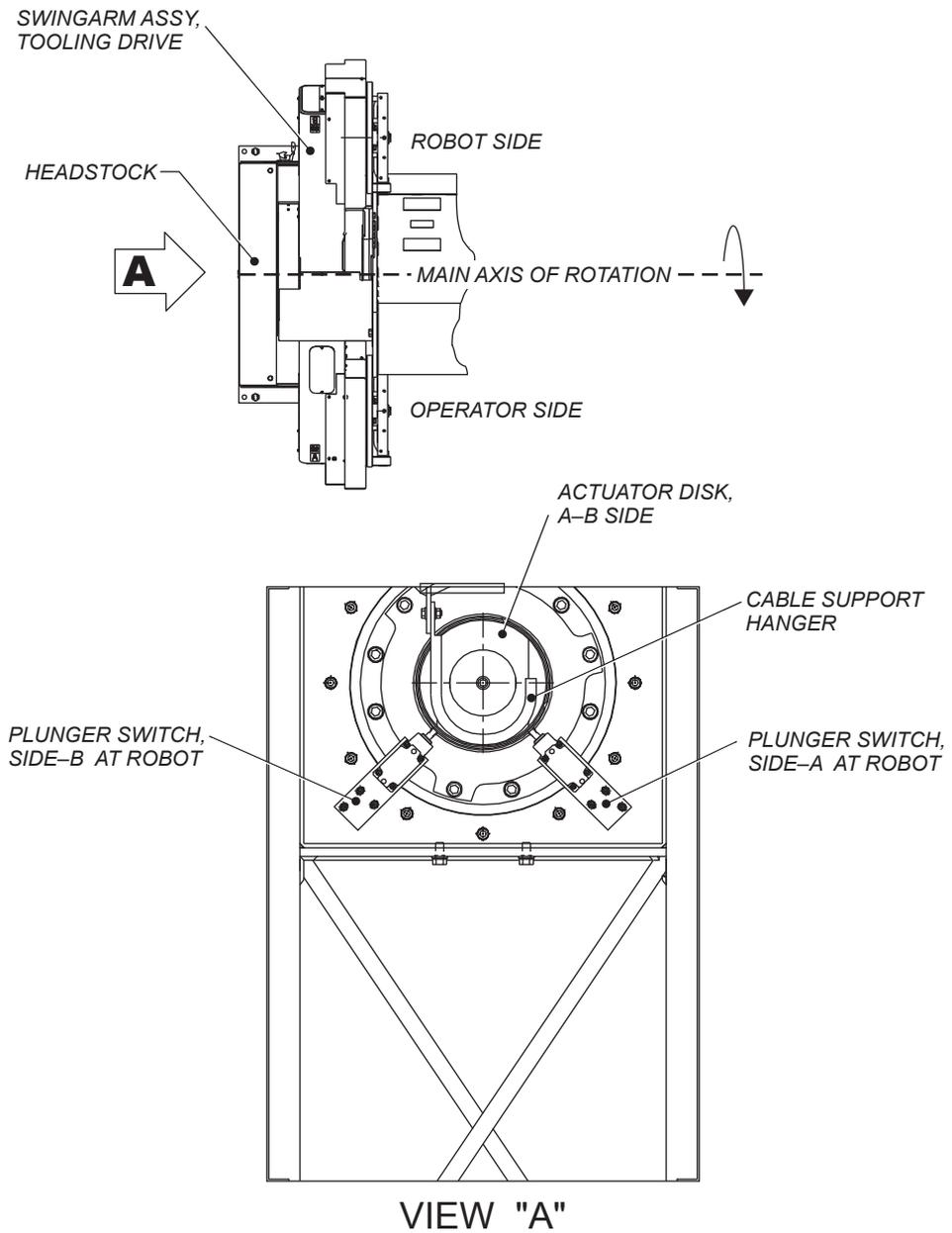
Fig. 1-1: MRM2-250/750SL Assembly



The main drive swingarm, the tooling drive swingarm, and the arc shield rotate around a main (sweep) axis and are limited in rotation by hardstops located on the tooling drive swing arm.

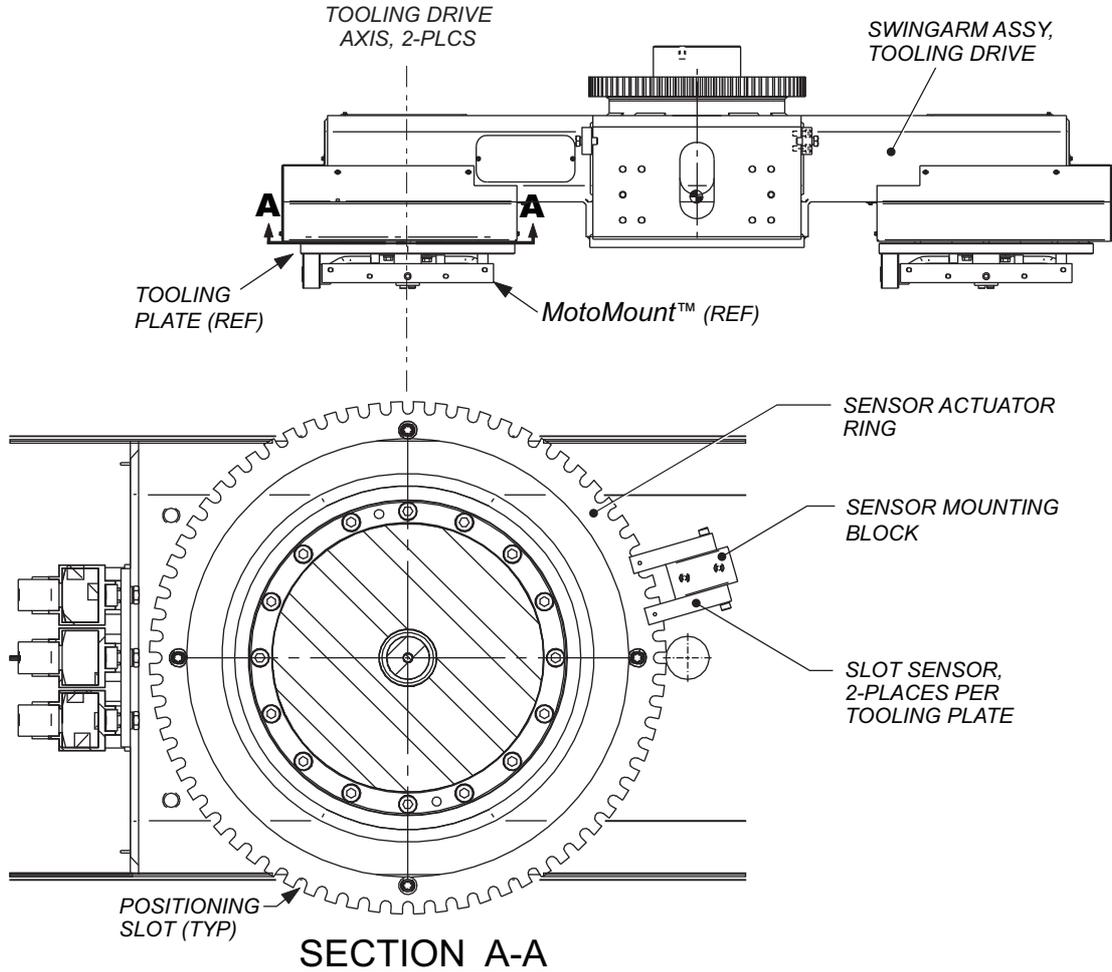
Dual "in position" switches are mounted in the headstock housing (see Fig. 1-2). These provide switch closures, as a backup to encoder data, to indicate to safety circuitry whether or not the swingarm assemblies are in the correct and safe position after a positioner sweep.

Fig. 1-2: Main (Sweep) Axis — Side-A, Side-B "In Position" Safety Switches



A tooling plate multiple angle control feature allows the programmer to define the angle of the tooling presented to the operator (with a resolution of approximately 2.5°). This improves load station ergonomics and part tacking (see Fig. 1-3).

Fig. 1-3: Tooling (Orbital) Axis “S” — Tooling Plate Multiple Angle Control Components



All MRM2-250/750SL tooling plates are fitted with the MotoMount™ flexible tool mounting system as the tooling interface (see Fig. 1-1 and Fig. 1-3).

Each AC servomotor incorporates a small Lithium-Ion “keep alive” battery pack that maintains servo positioning data in memory, should the main cables between the positioner and controller be disconnected. This battery pack is a part of each cable assembly (internal to the MRM2-250/750SL) that connects each AC servomotor to its associated multi-pin plug on the positioner base (see Fig. 6-1). These battery packs have a very long life. However, if they drop below a certain charge level, a “low battery” indication appears on the Programming Pendant LCD display screen.

Refer to Table 4-1 “MRM2-250/750SL Technical and Operational Specifications”.

1.1 MRM2-250/750SL Configuration

The MRM2-250/750SL assembly is available in two configurations (250 or 750). The main (sweep) axis AC servomotor and tooling (orbital) axis AC servomotors are located on the headstock swingarm of the positioner. This configuration, along with other proprietary features, endow the MRM2-250/750SL with an exceptional Total Index Time (refer to *Table 4-1 "MRM2-250/750SL Technical and Operational Specifications"* for a complete listing of specifications).

1.2 Welding Ground System

The MRM2-250/750SL incorporates spring-loaded carbon brushes to connect each tooling plate to the welding ground system. A group of 3 carbon brushes contact the posterior side of each tooling plate. The negative (–) ground cable to the welding power source is connected to a ground block located inside the MRM2-250/750SL headstock swingarm assembly.

1.3 Major Components

The MRM2-250/750SL includes the following major components –

- One tooling drive housing assembly (headstock)
- One main drive housing assembly (tailstock)
- One main (sweep) axis SIGMA V_{AC} servomotor (and associated gear reduction unit)
- Two tooling (orbital) axes SIGMA V_{AC} servomotors (and associated gear reduction units)
- One arc screen
- Three positioner-to-controller interconnect cables (2 data, 1 power)
- One assembly kit for the controller (servo packs, etc.)

1.3.1 Optional Equipment

This manual documents a standard YASKAWA positioner assembly. If the positioner assembly is modified or incorporates optional equipment, refer to the Engineering Drawing Package and associated Bill of Materials (BOM) in addition to this manual. The Engineering Drawing Package and BOM are included with the positioner shipment. Please refer to those documents, along with this manual, when troubleshooting or provisioning spare parts for the positioner assembly.

1.4 Reference Documentation

For additional information on individual components of the MRM2-250/750SL system, refer to the following documentation that is included with the system:

- YASKAWA *Manipulator Manual*
- YASKAWA *DX100 Controller Manual* (P/N 155494-1CD)
- YASKAWA *Maintenance Manual for DX100* (P/N 155492-1CD)
- YASKAWA *Operator's Manual* for the application
- YASKAWA *DX100 Concurrent I/O Manual* (P/N 155491-1CD)
- YASKAWA *INFORM User's Manual* (P/N 155493-1CD)
- Vendor manuals for system components not manufactured by YASKAWA

1.5 Customer Support Information

If assistance is needed with any aspect of the MRM2-250/750SL, contact YASKAWA Customer Support at the following 24-hour telephone number:

(937) 847-3200

For **routine** technical inquiries, feel free to contact YASKAWA Customer Support at the following e-mail address:

techsupport@motoman.com

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



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

Please have the following information ready before calling:

- | | |
|----------------------|--|
| • Positioner | MRM2-250/750SL |
| • Controller | DX100 |
| • Software Version | Access this information on the Programming Pendant's LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION} |
| • Serial Number | Located on the positioner data plate |
| • Sales Order Number | Located on the positioner data plate |

2 Installation



WARNING

- The MRM2-250/750SL must be installed by qualified personnel who is familiar with the installation and set-up of this type of positioner.
- Always comply with established safety procedures during installation of the MRM2-250/750SL.



All anchoring hardware for the MRM2-250/750SL must be supplied by the customer.

2.1 Contents Confirmation

Confirm the contents of the delivery when the product arrives.

Standard delivery includes the following items (information for the content of optional goods is given separately):

2.1.1 Major Components

The MRM2-250/750SL includes the following major components –

- One headstock swingarm assembly
- One tailstock swingarm assembly
- One main (sweep) axis SIGMA V_{AC} servomotor drive (and associated gear reduction unit)
- Two tooling (orbital) axes SIGMA V_{AC} servomotors (and associated gear reduction units)
- One spreader beam/arc screen
- Three positioner-to-controller interconnect cables (2 data, 1 power)
- One assembly kit for the controller (servo packs, etc.)
- Shipping bracket/ lifting bracket

2.1.2 Optional Equipment

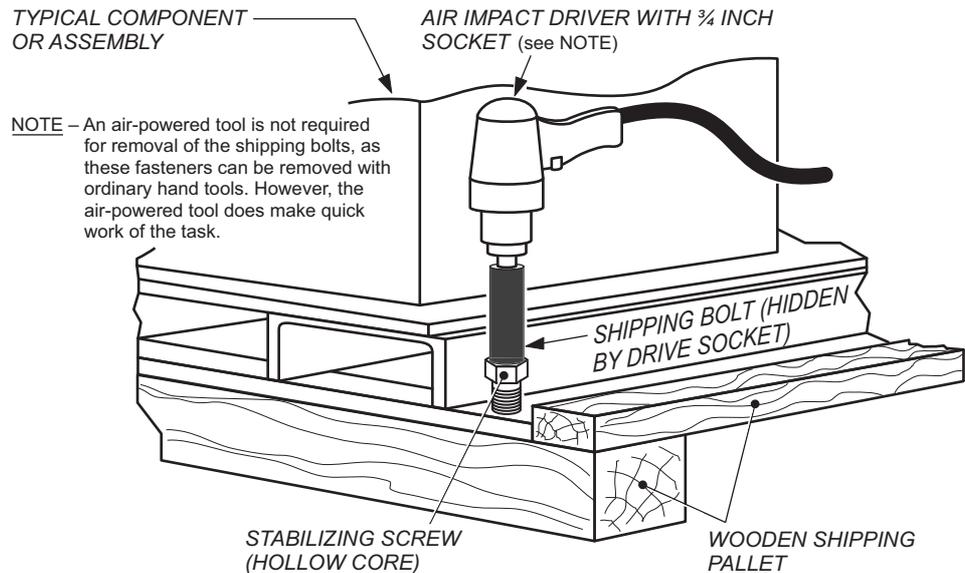
This manual documents a standard YASKAWA positioner assembly. If positioner assembly is modified or incorporates optional equipment, refer to the Engineering Drawing Package and associated Bill of Materials (BOM) in addition to this manual. The Engineering Drawing Package and BOM are included with the positioner shipment. Please refer to those documents, along with this manual, when troubleshooting or provisioning spare parts for the positioner assembly.

2.2 Shipping Bolts and Bracket

The MRM2-250/750SL is attached to a wooden shipping skid at the factory, prior to shipment to the customer. The customer is responsible for removing the positioner from the shipping skid and inspecting for shipping damage.

NOTE Notify shipping agent immediately if there is any shipping damage.

Fig. 2-4: Shipping Bolt Removal



The MRM2-250/750SL is provided with shipping bolts and bracket Fig.2-5 "Transporting the Positioner (Crane or Hoist)".

- The bracket is painted yellow.
- The shipping bracket is mounted with four hexagon socket head cap screws M20 (length: 50 mm; class 8.8).

NOTE Before turning ON the power, check to be sure that the shipping bolts and bracket are all removed. The shipping bolts and bracket then must be stored for future use, in the event that the positioner must be moved again.

2.3 Transporting Method



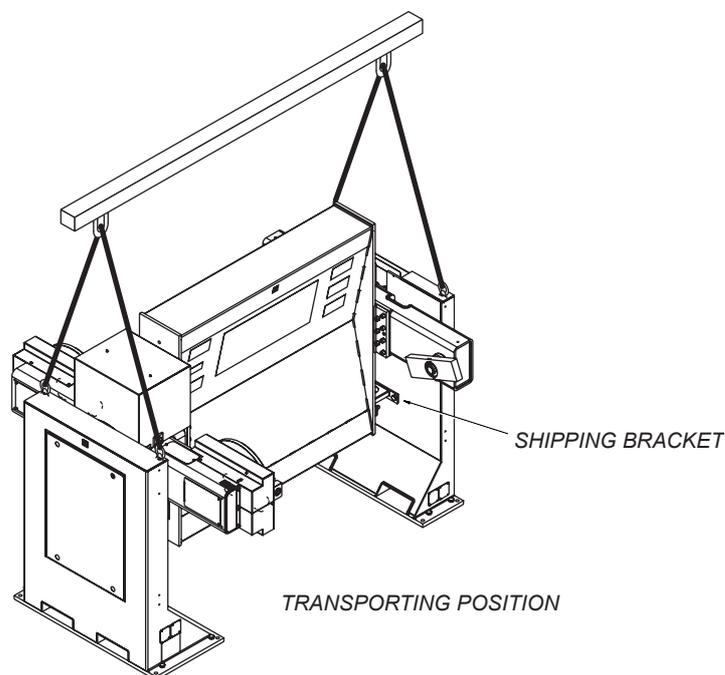
WARNING

- Sling applications and crane or forklift operations must be performed by authorized personnel only. Failure to observe this caution may result in injury or damage.
- Never place any part of your body under a suspended load or move a suspended load over any part of another person's body. A shifted or dropped load could result in serious injury or death.
- Avoid excessive vibration or shock during transportation. The system consists of precision components. Failure to observe this caution may adversely affect the performance.

2.3.1 Using a Crane

As a rule, when unpacking the MRM2-250/750SL and moving it, a crane or forklift should be used. The positioner should be lifted using wire rope threaded through attached M20 eyebolts on the head and tailstock. A forklift can be used with a spreader beam only when the positioner is in the shipping position and the shipping lifting bracket is installed (see *Fig. 2-5*). Be sure that the positioner is fixed with shipping bolts and bracket before transposition, and lift it in the posture as shown in *Fig. 2-5*.

Fig. 2-5: Transporting the Positioner (Crane or Hoist)



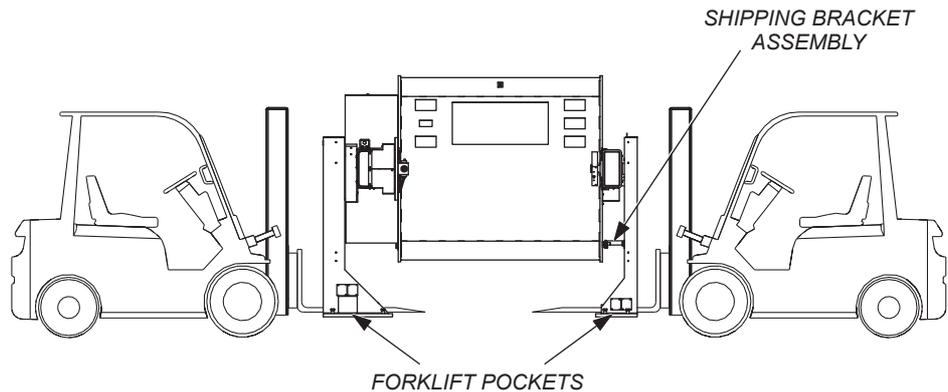


- Check that the eyebolts are securely fastened.
- The weight of the MRM2-250/750SL is approximately 2200 kg including the shipping bolts and bracket. Use a wire rope strong enough to withstand this weight.
- Be sure to mount the shipping bolts and bracket before transporting the positioner.
- Avoid exerting force on the motors when transporting the positioner. To avoid injury, be careful when using transporting equipment other than a crane or forklift.

2.3.2 Using Forklifts

Two forklifts can be used with the forklift pockets when the positioner is in the shipping position and the shipping lifting bracket is installed see *Fig. 2-6*. Be sure that the positioner is fixed with shipping bolts and bracket before transposition, and lift it in the posture as shown in "*Fig. 2-6*".

Fig. 2-6: Transporting the Positioner (Forklift)



2.4 Installation of Safeguarding



WARNING

- Install all safeguarding.
Failure to observe this warning may result in injury or damage.
- Install the MRM2-250/750SL in a location where the positioner with a jig does not hit against anything such as the wall or the safeguarding.
Failure to observe this warning may result in injury or damage.
- Do not start operating the MRM2-250/750SL or turn ON the power before it is firmly anchored.
The MRM2-250/750SL may overturn and cause injury or damage.



CAUTION

- The MRM2-250/750SL system should be installed by qualified personnel who are familiar with the installation and setup of a robotic system.
- Do not install or operate a positioner 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 all shipping bolts and brackets are removed.
Failure to observe this caution may cause in damage to the major driving parts.

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

2.4.1 Responsibility for Safeguarding (ISO10218)

The user of a manipulator or robot system ensures 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.

2.5 Mounting Procedures for the MRM2-250/750SL

The MRM2-250/750SL should be firmly mounted on a baseplate or foundation strong enough to support the positioner and withstand repulsion forces in acceleration and deceleration.

Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the positioner.

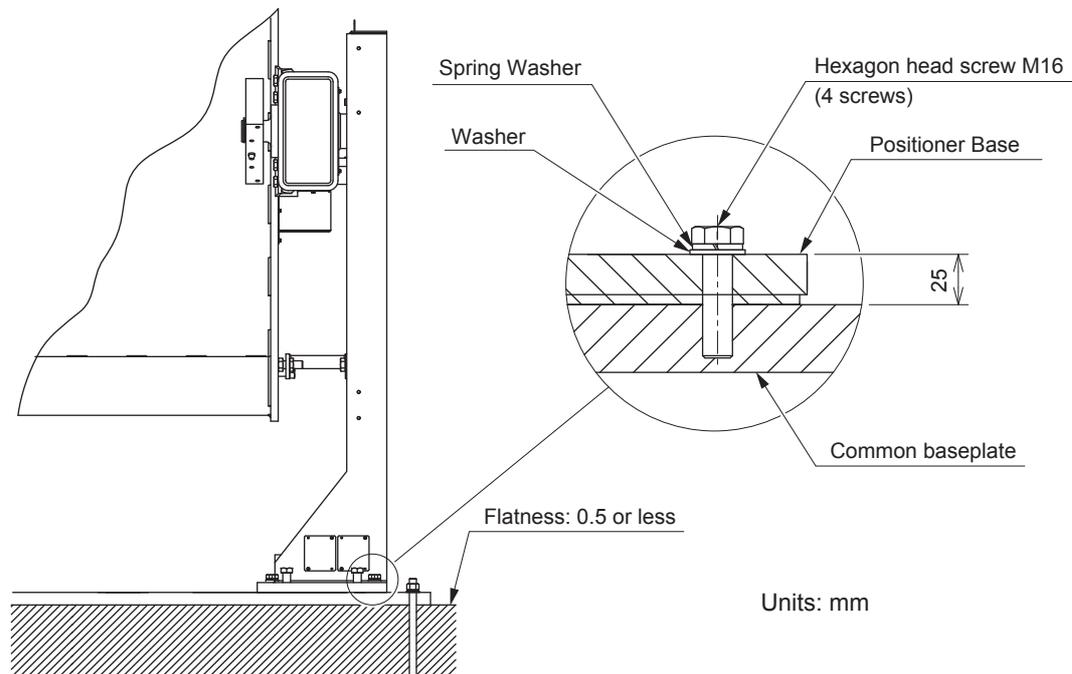
The flatness for installation must be kept at 0.5 mm or less: if the flatness of the mounting face is insufficient, the shape of the MRM2-250/750SL may deform and its functional ability may be compromised. Mount the positioner either as shown in *section 2.5.1 "Installing the Positioner on a Common Baseplate"* or *section 2.5.4 "Mounting the Positioner on the Floor"*.

2.5.1 Installing the Positioner on a Common Baseplate

The baseplate should be rugged and durable to ensure that the positioner and the manipulator are in the correct relative position. Thickness of the baseplate and the size of the mounting anchor bolts should meet the recommendations in the manual for the manipulator to be combined.

Mount the positioner base securely with four hexagon head screws M16 (recommended length: 60 mm). Tighten the screws and anchor bolts securely so that they will not work loose during the operation.

Fig. 2-7: Mounting the Positioner on a Common Base



2.5.2 Installing the Positioner as a Standalone Product

If installing the positioner as a standalone product create a straight line on the floor that will be visible through the 20 mm lag holes in the base of the head and tail stocks. Place the positioner over the line and center the line in the 4 lag holes. Drill and install all 8 lags and remove shipping bracket. After the positioner is powered rotate the main axis, while watching the headstock housing.

If the headstock housing is moving parallel to the floor, adjust the tailstock by raising or lowering the jack bolts in pairs on the operator side or robot side, until the headstock no longer moves.

If the headstock housing is moving perpendicular to the floor, adjust the headstock by raising or lowering the jack bolts in pairs on the outside (opposite X beam) or inside (with X beam), until the headstock no longer moves.

When all adjustments are complete, check all lags for tightness.

2.5.3 Installing the Positioner within a Cell and Attached to a Robot Base

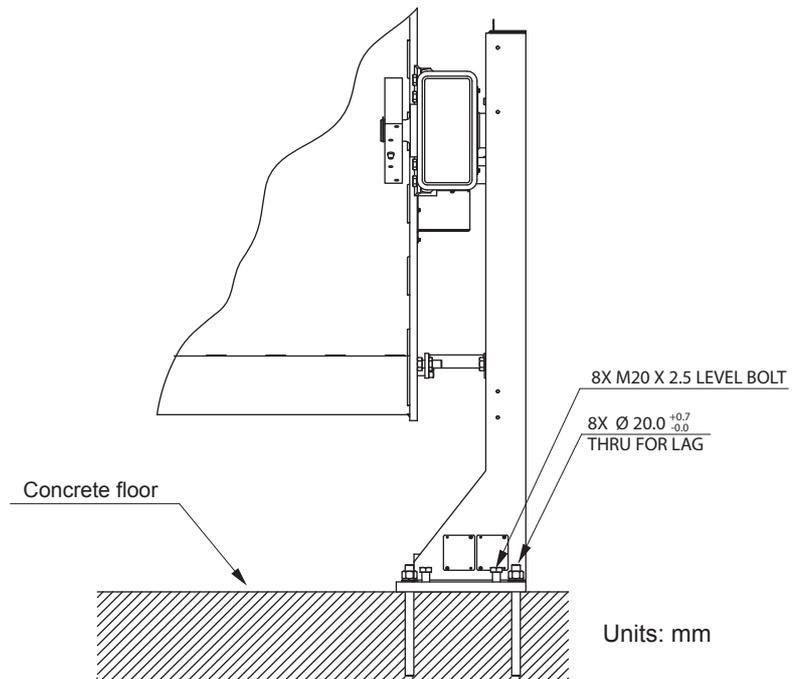
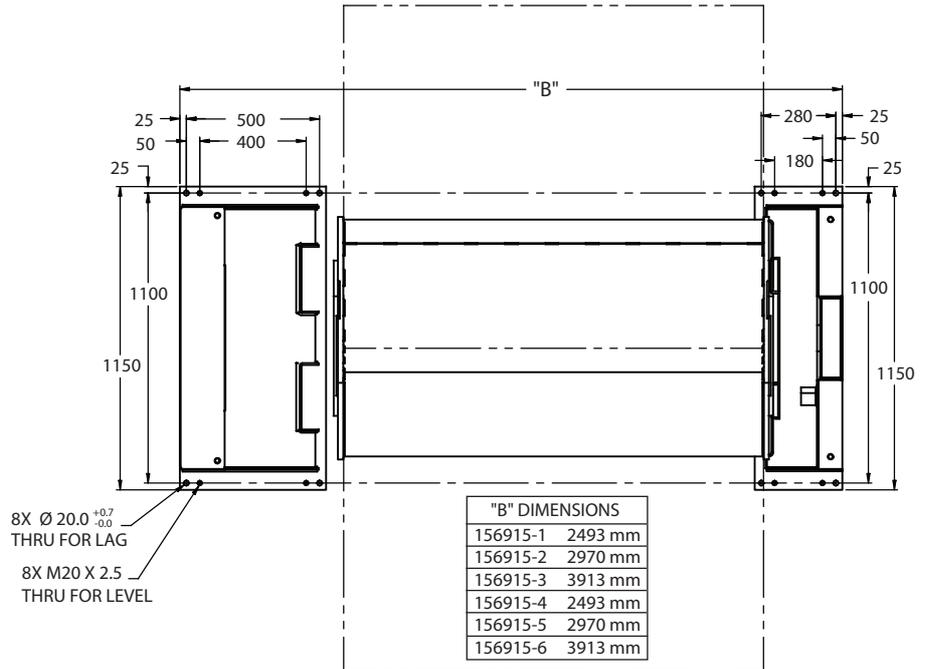
If the positioner is used within a cell and it is attached to a robot base, before lags are installed in the positioner, install and tighten the bolts on the attachment spanners. Then only check for the movement in the perpendicular to the floor direction.

When all adjustments are complete, check all lags for tightness.

2.5.4 Mounting the Positioner on the Floor

The floor should be strong enough to support the positioner. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the positioner. When the thickness of the concrete floor is 200 mm or more, the positioner can be fixed directly to the floor with anchor bolts M20. Before mounting the positioner on the floor, check the flatness, cracks, etc. of the floor. If there are any cracks on the floor, they should be repaired before installation. Any thickness less than 200 mm is insufficient for mounting, even if the floor is concrete.

Fig. 2-8: Mounting the Positioner to the Floor



2.6 Location

When the positioner is installed, it is necessary to satisfy the under mentioned 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

2.7 Customer-Supplied Tooling Fixtures

The MRM2-250/750SL is equipped with the MotoMount™ tool mounting system (see *Fig. 1-1* and *Fig. 1-3*). MotoMount is a flexible tool mounting system for headstock / tailstock style positioners, such as the MRM2-250/750SL. MotoMount provides improved part presentation repeatability compared to traditional hard-mounted systems.

The MotoMount system also minimizes headstock / tailstock bearing loads induced by tooling and headstock / tailstock misalignment (up to a maximum of ± 2 degrees), transmitting only the predictable moment loads resulting from simple beam loading.

For additional information on the correct use and care of the MotoMount tool mounting system, please contact YASKAWA Customer Support (refer to *section 1.5 "Customer Support Information"*).



The customer shall supply all tooling fixtures for the MRM2-250/750SL.

YASKAWA recommends application of a corrosion/rust preventive compound to tooling fixtures located in a high-humidity environment.

3 Wiring



WARNING

- Ground resistance must be 100W or less.
Failure to observe this warning may result in fire or electric shock.
- Before wiring, make sure to turn OFF the primary power supply, and put up a warning sign. (ex. DO NOT TURN ON THE POWER.)
Failure to observe this warning may result in fire or electric shock.



CAUTION

- Wiring must be performed by authorized or certified personnel.
Failure to observe this caution may result in fire or electric shock.

3.1 Grounding

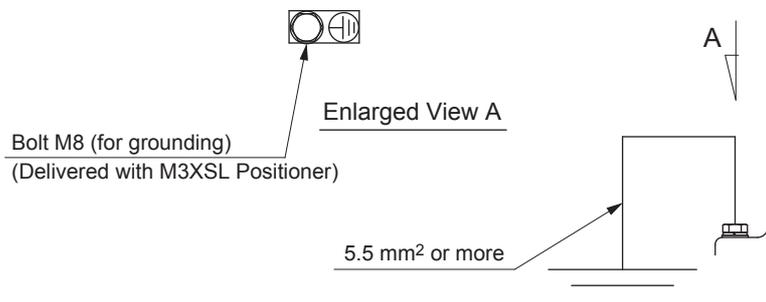
Follow the local regulations and electrical installation standards for grounding. The recommended grounding wire size is 10 Gauge (5.5 mm²) or more.



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.

Fig. 3-1: Grounding Method



3.2 Cable Connection

There are three cables used to connect the positioner to the DX100 controller; a power cable (1BC), an I/O cable (2BC), and an encoder cable (3BC). Connect these cables to the positioner base connectors and the controller respectively. Refer to *Fig. 3-2* and *Fig. 3-3* for connection between the positioner and the controller.

3.2.1 Connection to the MRM2-250/750SL

Before connecting the cables to the positioner, check the numbers on both the cables and positioner base connectors. Connect each cable adjusting the cable connector positions to the main key positions of the positioner, and then tighten the nut until it clicks.

3.2.2 Connection to the DX100

Before connecting the cables to the DX100 controller, check the numbers on both the cables and controller connectors. Connect each cable adjusting the cable connector positions to the main key positions of the positioner, and then tighten the nut until it clicks.

Connect the power cable (1BC) to the bone. Check the numbers on both the cable and the relay connectors before connecting.

Connect the encoder cable (2BC) to the bone. Check the numbers on both the cable and the relay connector before connection.

Fig. 3-2: Connection between the MRM2-250/750SL and the DX100

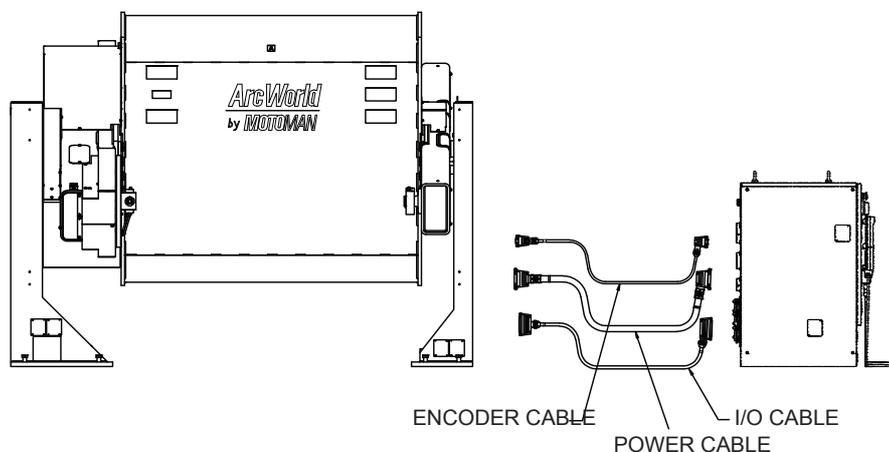
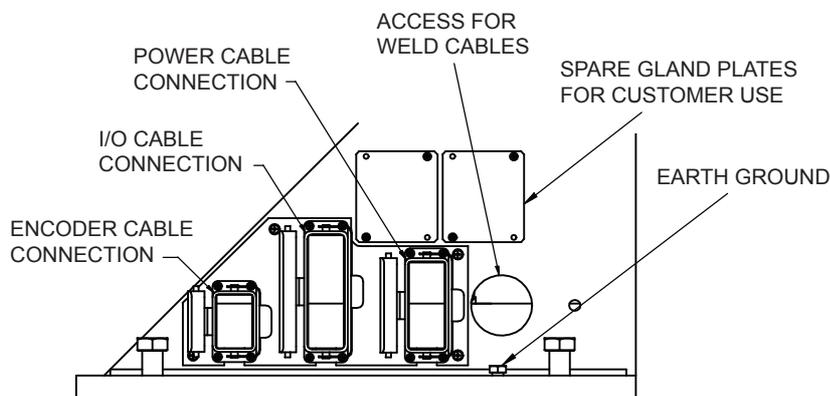


Fig. 3-3: Connection between Positioner and DX100 (Positioner Side)



4 Basic Specifications

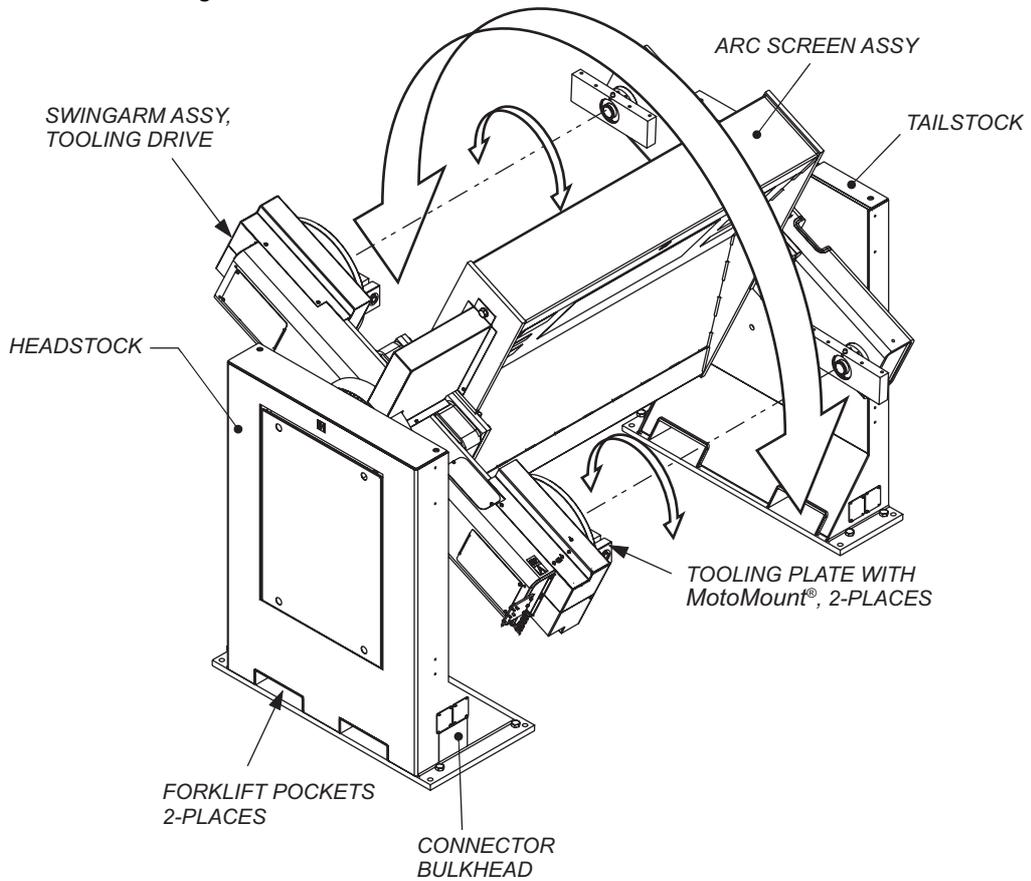
4.1 Basic Specifications List

Table 4-1: MRM2-250/750SL Technical and Operational Specifications

SPECIFICATION	UNITS	MRM2-250	MRM2-750
Model P/N	—	-1, -2, -3	-4, -5, -6
Rated Payload	kg	250	750
Load Height (floor to centerline)	mm	900	900
Maximum Cg Offset	mm	76	76
Maximum Load Imbalance (Side A – Side B)	kg	150	150
Index Motor Power	kW	3.7	3.7
Tooling Motor Power	kW	0.85	0.85
Side A–Side B Sweep Time	sec	1.65	2.22
Index Axis Speed	rpm	0 - 26.9	0 - 21.1
Index Torque	N·m	1746	2230
Tooling Index Time	sec	1.1	1.68
Tooling Axis Speed	rpm	0 – 38.6	0 – 25.5
Tooling Torque	N·m	272	404
Total Index Time	sec	1.65	2.22
Max Fixture Diameter*	mm	1300*	
Standard Fixture Length	m	1.5/2.0/3.0	
Repeatability	mm	± 0.1	
Thru-Hole Headstock	—	No	
Thru-Hole Tailstock	—	Yes	
E-Stop Time	sec	0.435	0.518
Tooling Axis Weld Ground Capacity (100%)	Amps	1200	
Positioner Weight	kg (lb)	~2250 kg	
* Tooling fixture that passes under is limited to a MAXIMUM depth of 450 mm (35.8 in). See Fig. 4-3 for a graphical representation of this requirement.			

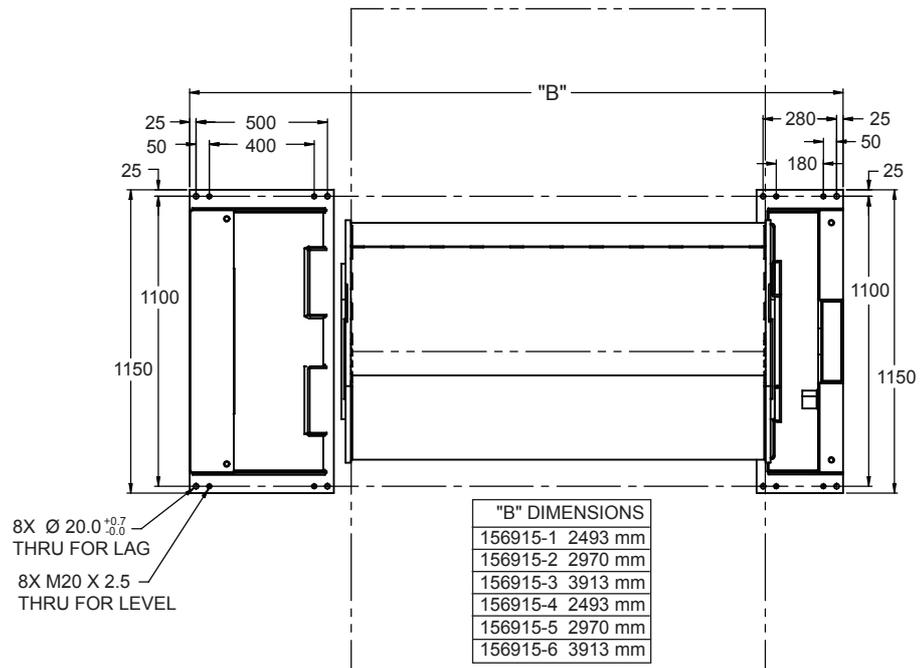
4.2 Part Names and Working Axes

Fig. 4-1: Part Names and Working Axes



4.3 Mounting Dimensions

Fig. 4-2: Mounting Dimensions (swingarms removed for clarity)

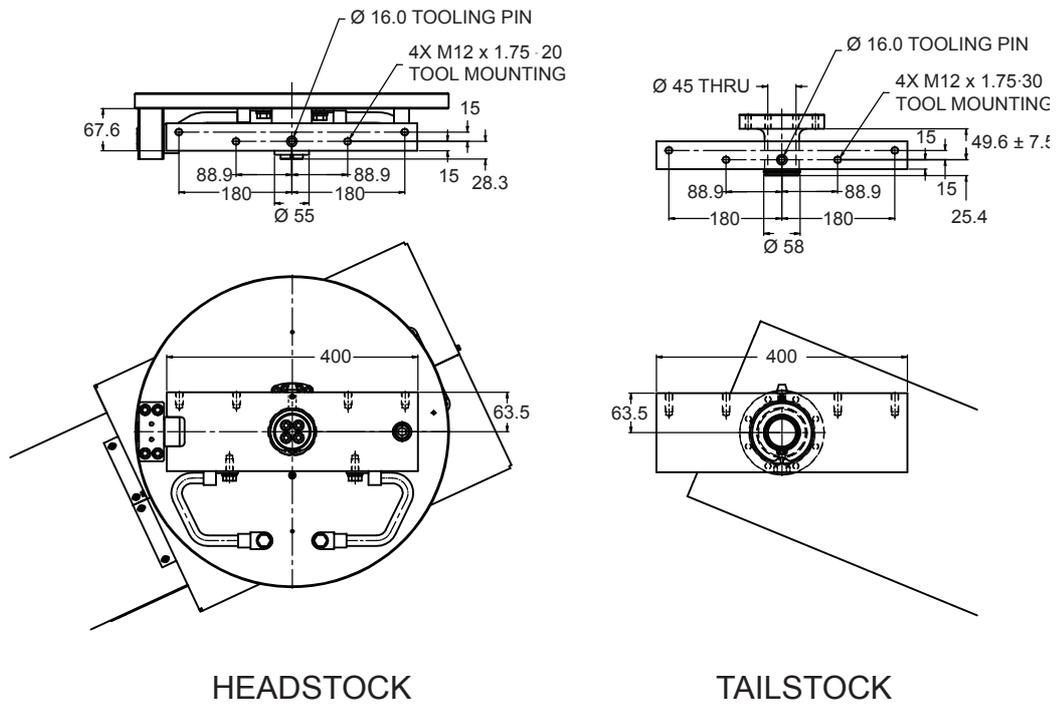


5 Load Specifications and Jig Mounting

5.1 Details of Fixture Mounting

The fixture mounting dimensions are shown in the figures below. It is a requirement that the fixture be located with the 16 mm dowel and attached with 4 x M12 bolts (10.9 or 8.8 grade)

Fig. 5-1: Details of Jig Mounting Face



6 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.
- Failure to observe this caution may result in electric shock or injury.
- For disassembly or repair, contact a YASKAWA representative.
- Do not remove the motor or release the brake.
Failure to observe this caution may result in injury from unexpected turning of the table.

6.1 Inspection Interval

Proper inspections are essential not only to assure that the mechanism will be able to function for a long period, but also to prevent malfunctions and assure safe operation.

Table 6-1: Periodic Maintenance for Positioner

Inspection Item	Frequency	Inspection Operation
Physical damage	Daily	Check for physical damage; this indicates a load collision and is evidence of misuse.
Excessive or unusual noise	Daily	Listen for grinding, excessive or irregular noise. Contact YASKAWA Customer Support. Refer to <i>section 1.5 "Customer Support Information"</i>
Weld Brushes	Weekly	Check for dirt and ensure full contact with faceplate.
S1 Gear and Pinion Axis	Monthly	Grease with P/N 180144-1, Mobil CM-P, Lithium complex. Apply lubricant to with a suitable brush
Cleaning	As required	Clean with dry cloth or compressed air.
Positioner Axis Motor Connectors	<ul style="list-style-type: none"> • 1,000 H • 6,000 H • 12,000 H 	Check for loose connections. tighten if necessary.
Position Axis Speed Reducer and Gear	6,000 H	Grease with P/N 132412-1, Molywhite RE00
Positioner Axis Speed Reducer and Gear	12,000 H	Grease with P/N 132412-1, Molywhite RE00
Limit Switch Actuator for Positioner Axis	<ul style="list-style-type: none"> • 6,000 H • 12,000 H 	Check for damage and looseness. Tighten and check the actuator movement.
Motomount Bearing	Monthly	Grease with P/N 132177-1, Gadus S2 V220 2



The inspection interval depends on the total servo operation time.

For axes which are used very frequently other than arc welding, it is recommended that inspections be conducted at shorter intervals. Contact your YASKAWA representative.

Table 6-2: Inspection Parts and Grease Used

No.	Grease Used	Inspected Parts
1	Molywhite RE00	Speed reducers of all axes
2	Mobil CM-P, Lithium Complex	S1 Gear and Pinion Axis
3	Gadus S2 V220 2	Motomount Bearing

6.2 Battery Pack Replacement

If a battery alarm occurs in the DX100, replace the battery according to the following procedure.

1. Turn OFF the DX100 main power supply.
2. Remove the cover of the tilting frame and pull out the battery pack to replace.
3. Remove the old battery.
4. Connect the new battery.



Be sure not to pinch cables when reinstalling the cover of the frame section.

6.3 Grease Replenishment/Exchange for Speed Reducers

6.3.1 Main Axis

Rotate the main axis until the swing arms are horizontal and the arc screen is vertical. Remove 1 of the 3 set screws from the face of the drive pinion (in the upper most position) Remove the button head screw above the motor flange and install the M6 grease zerk. Pump grease through the reducer from the motor side and vented on the gear side. Reseal.

6.3.2 Tooling Axes

Remove the button head screws above the motors and below the Motomount. Install M6 grease zerk in the faceplate and pump grease through the reducer. Reseal.

6.4 General Cleaning

The MRM2-250/750SL requires only occasional cleaning to remove dust and welding by-products. Use compressed air or vacuum, and a bristle brush (if required).



YASKAWA recommends application of a corrosion/rust preventive compound to tooling fixtures located in a high-humidity environment.

6.5 SIGMA V AC Servomotors

The SIGMA V AC servomotors (1 sweep axis, 2 tooling plate axis) are sealed units and have no parts that need inspection or replacement on a regular basis. Do NOT disassemble a SIGMA V_{AC} servomotor. If suspecting that the servomotor requires maintenance or overhaul, contact YASKAWA Customer Support (refer to *section 1.5 "Customer Support Information"*).

6.6 Servo Pack

The servo pack (located in the controller) does not require customer maintenance. If suspecting a problem with the servo pack, contact YASKAWA Customer Support (refer to refer to *section 1.5 “Customer Support Information”*).

6.7 Main (Sweep) Axis Reduction Gear Unit (RV–320E–X)

The main (sweep) axis Reduction Gear Unit (RV–320E–X) is located on the Main Drive Housing Assembly (see *Fig. 1-1 “MRM2-250/750SL Assembly”*). This unit is sealed and contains no parts that need inspection or replacement on a regular basis. Do NOT disassemble the reduction gear unit or remove it from its associated AC servomotor. If suspecting the Reduction Gear Unit requires maintenance or an overhaul, contact YASKAWA Customer Support (refer to *section 1.5 “Customer Support Information”*).

6.8 Tooling Axis Reduction Gear Units (RV–80E–X)

Two Reduction Gear Units (RV–80E–X) are located in the Tooling Drive Swingarm Assembly, one for each tooling plate see *Fig. 1-1 “MRM2-250/750SL Assembly”*. These units are sealed and contain no parts that need inspection or replacement on a regular basis. Do NOT disassemble the reduction gear unit or remove it from its associated AC servomotor. If suspecting the Reduction Gear Unit requires maintenance or an overhaul, contact YASKAWA Customer Support (refer to *section 1.5 “Customer Support Information”*).

6.9 Main (Swing) Axis Hardstops

The MRM2-250/750SL incorporates two buffered hardstops that are welded to the Tooling Drive Swingarm Assembly. The hardstops provide a positive stop for the Tooling Drive Swingarm Assembly (and thus the Arc Shield and Main Axis Swingarm Assembly) during a sweep cycle. The hardstops are preset at the factory for correct performance, and do not need further adjustment. If suspecting that the hardstops need a replacement or adjustment, contact YASKAWA Customer Support (refer to *section 1.5 “Customer Support Information”*).

6.10 Welding Ground System

6.10.1 Inspection and Cleaning of Carbon Brushes

Inspect the ground brushes where they contact the rear of tooling drive plates. Make sure that the contact area is clean and free of dust and welding by-products. Use compressed air and a small bristle brush to clean the ground brushes where they contact the tooling plates.



Always ensure that welding ground connections and brushes in the MRM2-250/750SL are clean and tight. If the ground points are not properly made and kept clean and secure, high welding currents can bypass the normal return path and, instead, pass through the drive components of the positioner. This is especially hard on positioner drive bearings when they are under load. High welding current, if allowed to pass through the drive components, can result in increased bearing wear and premature replacement.

6.10.2 Ground Brush Replacement

Ground Brush Removal Procedure –

1. Remove all hazardous energies from the MRM2-250/750SL and other system components.



Each ground brush is enclosed in a box-shaped brush holder that is attached to a mounting plate. The brush holder incorporates a spring tensioner device that holds the ground brush, under spring tension, against the rear of the tooling plate when locked into position (see *Fig. 8-2 "Tooling Swingarm Housing Assembly"*).

2. Release the spring tensioner by squeezing together both of the black levers that are visible on each brush holder. While squeezing the levers together, pull out and away from the brush holder. This should produce the ground brush.
3. Each ground brush has two braided copper leads that connect to silver-plated, high current quick disconnect posts on the ground brush mounting plate (see *Fig. 8-2 "Tooling Swingarm Housing Assembly"*). After the ground brush is free and clear of the brush holder, use a flat blade screwdriver or needle nose pliers to disconnect each of the braided copper brush leads from the quick disconnect posts.

6.10.3 Ground Brush Installation

1. Connect braided copper brush cables (from the new brush) to the quick disconnect posts on the ground brush mounting plate (see Fig. 8-2 "Tooling Swingarm Housing Assembly").

NOTE

This is a good time to check the cleanliness and condition of the quick disconnect posts. If dirt or grease buildup is noticed on the posts, clean them. Use a small bristle brush (toothbrush size) and compressed air.

2. Make sure that the spring tensioner in the brush holder is released and pulled as far back as possible.
3. Insert the new brush into the brush holder and push forward as far as possible.
4. Lock the new brush into position by squeezing together the black tensioner levers and pushing the tensioner forward into the brush holder until it "clicks" into the locked position.

6.10.4 Inspection of Welding Ground Connections

Inspect all welding ground cable connections for cleanliness and security.

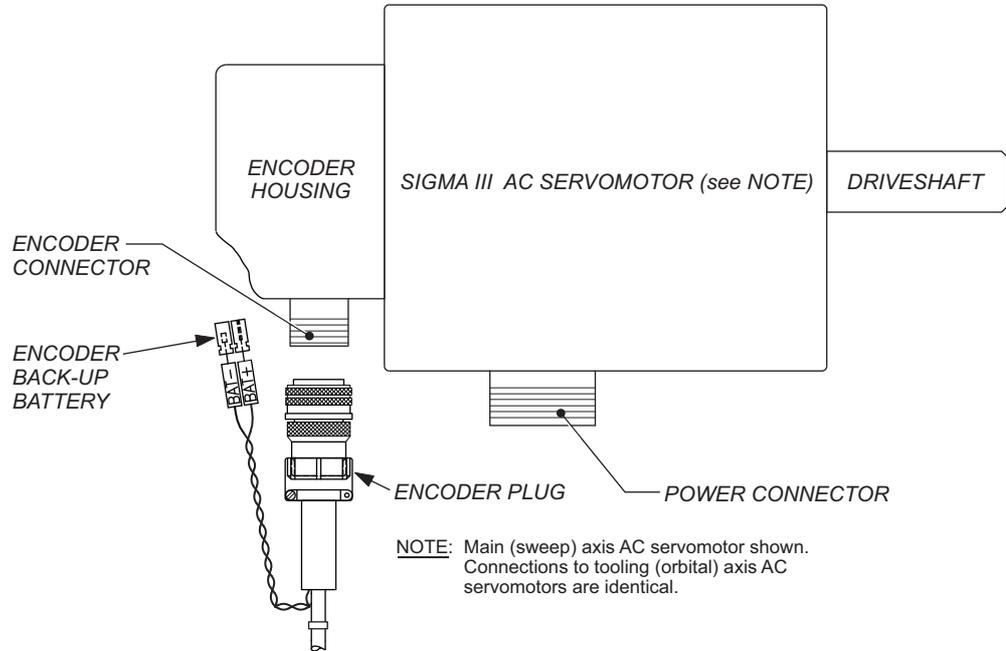
NOTE

Ground cable connections must be clean and tight. A loose or dirty connection can cause excess heat (high resistance connection) or arcing. Either of these conditions can damage the cable and cable connection point.

6.11 AC Servomotor Encoder Back-Up Battery

The main (sweep) axis and tooling (orbital) axes SIGMA V_{AC} servomotors all incorporate an external Lithium-Ion “keep alive” battery pack that maintains encoder positioning data in system memory, should the main cables between the positioner and controller be disconnected (see Fig. 6-1 “Typical Encoder “Keep-Alive” Battery Location”).

Fig. 6-1: Typical Encoder “Keep-Alive” Battery Location



The “keep alive” batteries have a long life in this particular application. However, should one or more of these batteries drop below a certain charge level, an indicator will appear on the Programming Pendant display screen, indicating the need for battery renewal.

To replace a depleted encoder “keep alive” battery pack, gain access to the encoder plug on the applicable SIGMA V_{AC} servomotor, locate the depleted battery pack, and replace it with a new battery pack of the same type (see Fig. 6-1 “Typical Encoder “Keep-Alive” Battery Location”).

6.12 Positioner Home Position

■ Home Position Definition:

S1 with Side B at Robot & Side A at Operator

S2 Tooling Down (At Operator Side)

S3 Tooling Up (At Robot Side)

6.12.1 Setting the Main Axis (S1) to Home (Zero) Position

1. Using the Programming Pendant, place the robotic system into MANAGEMENT mode.
2. Jog the S1 axis into the positioner hard stop with Side B at robot. Increment positioner against hard stop until the axis holding torque equals 25% (+/- 5%).
3. Press the [TOP MENU] key on the programming pendant.
4. Cursor to {ROBOT} and press [SELECT].
5. Cursor to {HOME POSITION} and press [SELECT].
6. Press the [PAGE OVER] key to {S1} (indicated in top right corner of Programming Pendant display panel).
7. Press [SELECT].
8. Cursor to {YES}, then press [SELECT].

6.12.2 Setting the Tooling Axis (S2 & S3) to Home (Zero) Position

1. Using the Programming Pendant, place the robotic system into MANAGEMENT mode.
2. Remove the cover to gain access to the ground brushes.
3. Jog the S1 axis into the positioner hard stop with S3 tooling at robot, and S3 tooling side up and level in the horizontal plane.
4. Slowly rotate the tooling plate until the homing pin hole in the tooling plate is accessible.
5. Install the plastic homing pin (see *Fig. 6-2 "Homing Pin Details"*) into the homing pin hole in the tooling plate (see *Fig. 6-3 "Tooling Plate Home (Zero) Position"*).

Fig. 6-2: Homing Pin Details

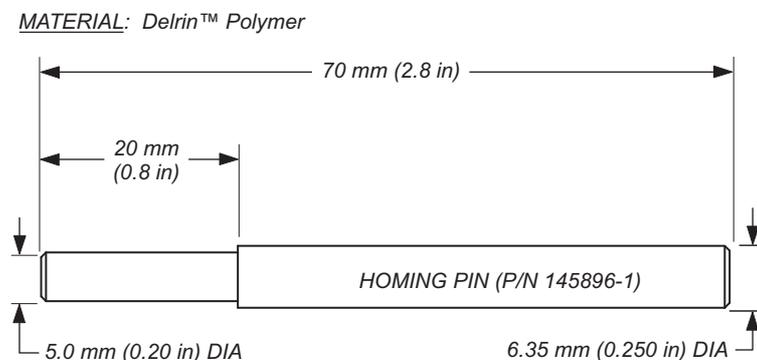
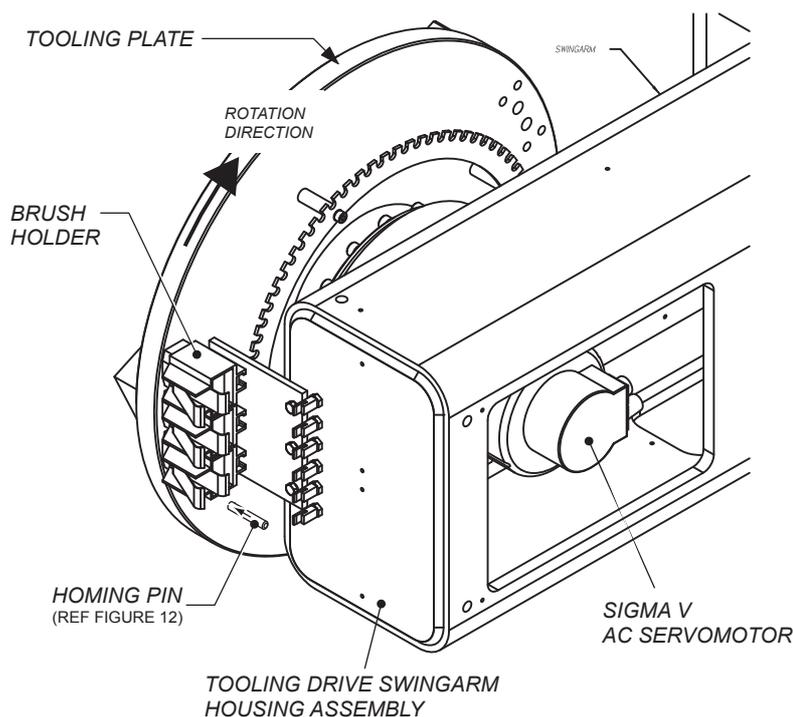


Fig. 6-3: Tooling Plate Home (Zero) Position



6. Slowly jog the tooling plate in the direction indicated in Fig. 6-3 until the homing pin just contacts the brush holder.



If you go too far with the tooling plate rotation, the plastic alignment pin will bend and result in an inaccurate adjustment. If this happens, slowly reverse the tooling plate rotation until the pin returns to a straight position.

7. Press {TOP MENU} on the programming pendant.
8. Cursor to {ROBOT} and press [SELECT].
9. Cursor to {HOME POSITION} and press [SELECT].
10. Press [PAGE OVER] to {S3} (indicated in top right corner of Programming Pendant display panel).
11. Press [SELECT].
12. Cursor to {YES}, press [SELECT].

The tooling plate is now reset to zero.

13. Remove the homing pin from the tooling plate.
14. Reinstall the cover.

7 Recommended Spare Parts

It is recommended that the parts and components in the following table be kept in stock as spare parts for the MRM2-250/750SL. Product performance can not be guaranteed when using spare parts from any company other than . The spare parts are ranked as follows:

- Rank A: Expendable and frequently replaced parts
- Rank B: Parts for which replacement may be necessary as a result of frequent operation
- Rank C: Drive Unit



To replace parts in Rank B or Rank C, contact YASKAWA Customer Support. (Refer to *section 1.5 “Customer Support Information”*).

To order spare parts or replacement parts for the MRM2-250/750SL, please contact YASKAWA Customer Support (Refer to *section 1.5 “Customer Support Information”*).

Table 7-1: Spare Parts for the MRM2-250/750SL

Rank	Parts No.	Name	Type	Qty	Qty per Unit	Remarks
A	1	Grease			-	For speed reducer of each axis
A	3	Battery Pack		1	1	

8 Illustrated Parts List

8.1 Introduction

8.1.1 Arrangement

The Illustrated Parts List Chapter is arranged as follows –

- *section 8.1 “Introduction”*
- *section 8.2 “Illustrated Parts List (IPL)”*

8.1.2 General

The Illustrated Parts List (IPL) identifies, describes, and illustrates detail parts of the MRM2-250/750SL.

8.1.3 Purpose

The IPL provides parts identification and descriptive information for use in provisioning, purchasing, storing, and issuing spare parts.

8.2 Illustrated Parts List (IPL)

The Illustrated Parts List contains illustrations (exploded views) and associated parts list tables that show detail parts of a particular component, assembly, or subassembly.

8.2.1 IPL Layout

The IPL is arranged so that the illustration (exploded view) for an assembly appears directly above the parts list table for that illustration. When this is not possible, due to a large illustration or an extensive parts list table, the parts list table is listed on the facing page. This format always attempts to present the illustration and its associated parts list table to the reader in one view, regardless of viewing format (PDF or printed).

8.2.2 Item Categories Not Included in the IPL

The following item categories are not included in the IPL –

- Standard hardware items (attaching parts) such as nuts, screws, washers, etc. These are commercially available to the customer.
- Bulk items and consumables such as wire, cable, sleeving, tubing, certain fluids, etc. These are commercially available to the customer.
- Permanently attached parts that lose their identity because they are welded, soldered, riveted, etc., to other parts, assemblies, or subassemblies.

8.2.3 Parts List Table Structure

Each figure's parts list table contains the following data columns –

■ **FIGURE AND ITEM NUMBER**

An entry in this column gives the item number for a part shown in the associated illustration (exploded view). The item number listed in this column is the same as the item number shown on the illustration. Item numbers on the illustration are identified by a circled number and leader line that points to the particular part (item) on the illustration.



Items not shown in the illustrations are indicated by a dash (–) prefix to the item number. An example could include a right-hand (RH) part that is otherwise identical to the illustrated left-hand (LH) part.

■ **PART NUMBER**

An entry in this column gives the part number for an item. Refer to this number when ordering or referencing the part.

■ **DESCRIPTION**

An entry in this column gives the description (nomenclature) for an item number or part number.

■ **QTY**

An entry in this column gives the total quantity of an item or part number required for an assembly or subassembly in which the part appears. The quantity given in this column may or may not be the total quantity required for the complete end item. The letters "REF" in this column indicate a reference to the top assembly in the figure.

Fig. 8-1: Major Assemblies — M3XSL Positioner

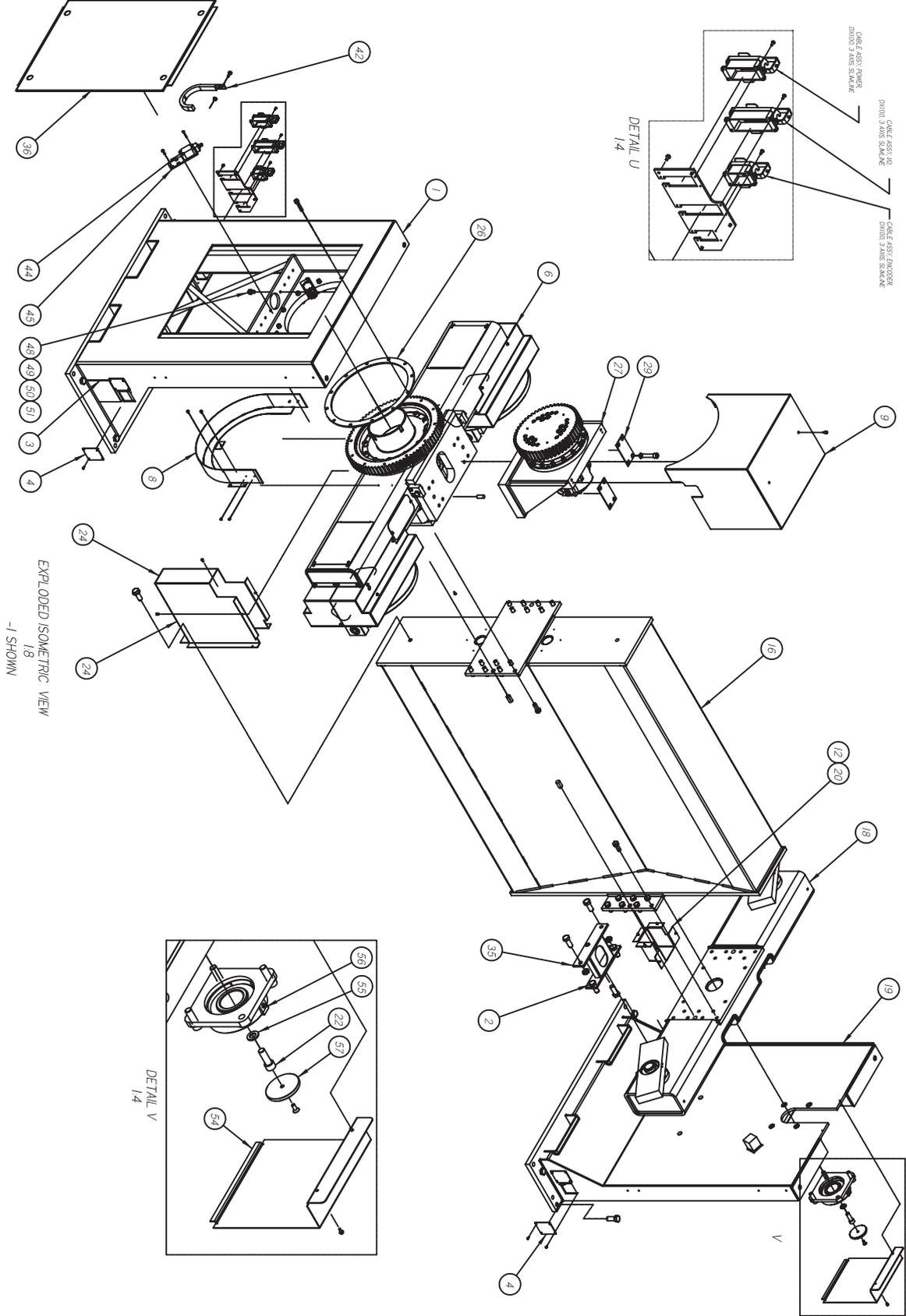


Table 8-1: Major Assemblies — M3XSL Positioner

ITEM NO.	PART NO.	DESCRIPTION	Qty
1	156928-1	HOUSING, MAIN DRIVE	1
4	143047-7	PLATE, GLAND, XRC/MRC	8
6	156905-1	HOUSING ASSY, SWINGARM, TOOL	1
8	157149-1	COVER, BEARING, MAIN DRIVE	1
9	157150-1	COVER, MOTOR & GEAR, MAIN DRIVE	1
16	156921-1	BEAM, X, SPREADER, 1.5 METER	1
18	157076-1	HOUSING ASSY, SWINGARM, TSTOCK	1
19	157036-1	HOUSING, TAILSTOCK	1
20	154027-2	COVER, SHORT, SWINGARM/ARC SHIELD	1
24	157288-1	PANEL, HEADSTOCK SWINGARM	1
26	156942-1	SPACER, GEAR BRG, MAIN DRIVE	1
27	156906-1	(250) DRIVE ASSY, MAIN AXIS	1
	156906-2	(750) DRIVE ASSY, MAIN AXIS	1
29	156944-1	SPACER, WASHER PLATE, MAIN DRIVE	2
35	157057-1	BRACKET, POSITIONER, SHIPPING	1
36	157189-1	COVER, MAIN DRIVE HOUSING	1
42	151843-1	HANGER, SUPPORT, CABLE	1
44	148748-1	SWITCH ASSY, TOP ROLLER PLUNGER	2
45	156938-1	BRACKET, LIMIT SWITCH, A-B POS.	2
51	130887-9	CABLE, WELD, 4/0, 1.4M	2
53	157171-1	PLATE, GLAND, POSITIONER	1
54	157048-1	COVER, TAILSTOCK BEARING	1
56	148153-1	BEARING, FLANGE, EXPANSION	1
57	157188-1	RETAINER, TAILSTOCK SWINGARM	1
60	145896-2	PIN, HOMING, DROP CENTER	1

Fig. 8-2: Tooling Swingarm Housing Assembly

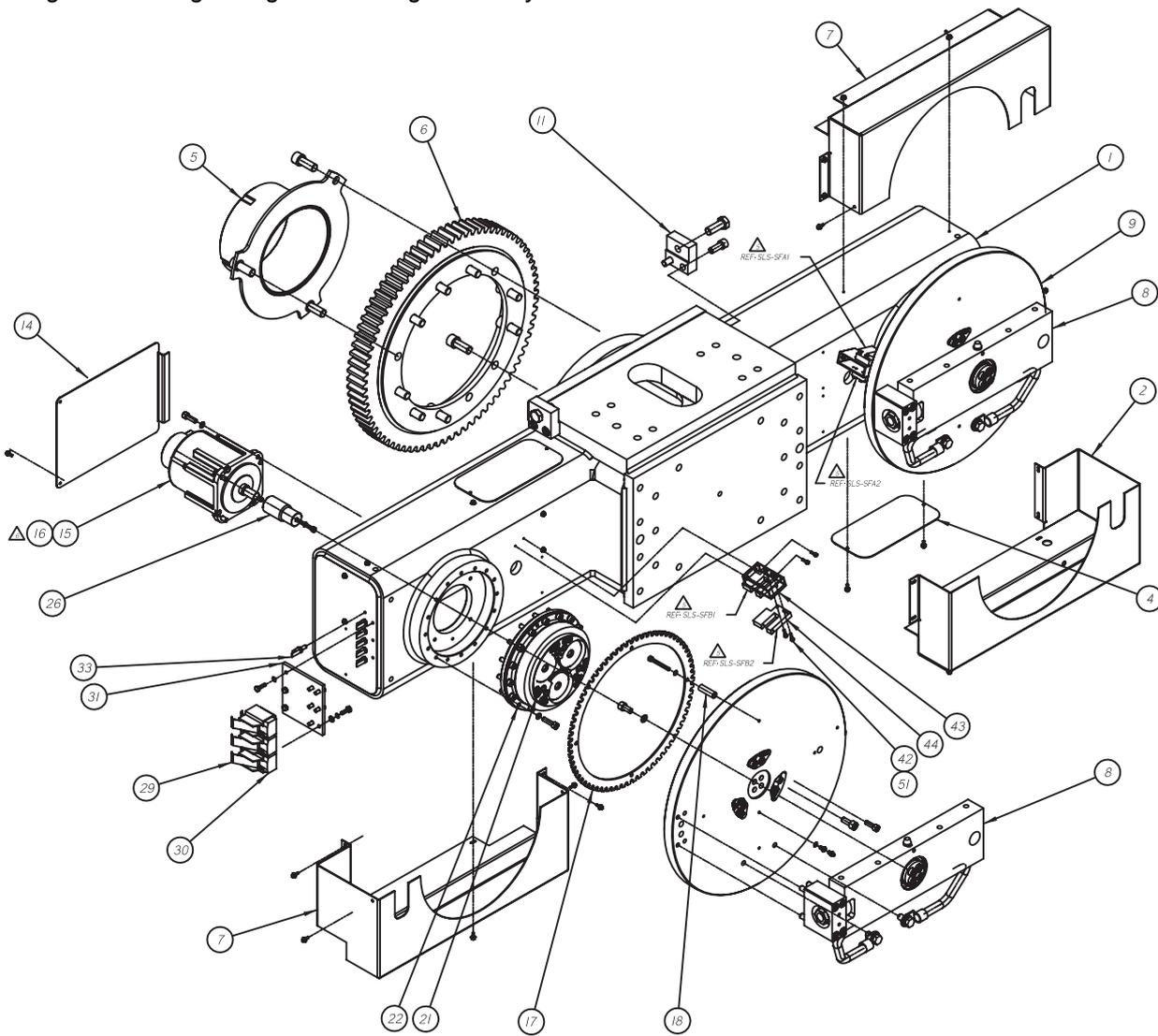


Table 8-2: Tooling Swingarm Housing Assembly

ITEM NO.	PART NO.	DESCRIPTION	Qty
1	156910-1	HOUSING, SWINGARM, MAIN DRIVE	1
2	156994-2	COVER, TOOL DRIVE AXIS, LH	2
4	156996-1	COVER, SWINGARM, ACCESS TOP	2
5	156934-1	ACTUATOR, A-B POSITION	1
6	140786-2	BEARING, SLEWING, EXT	1
7	156994-1	COVER, TOOL DRIVE AXIS, RH	2
8	149202-2	BLOCK ASSY, HEADSTOCK MOTOMOUNT	2
9	151451-1	PLATE, FACE, TOOLING	2
11	156909-1	BLOCK, ALIGNMENT, MAIN DRIVE	2
14	157170-1	COVER, TAILSTOCK SWINGARM	2
15	156009-2	MOTOR, AC SERVO, 850W, SIGMA V	2
16	479014-3	ADHESIVE, GASKET, LIQUID	0
17	148090-4	ACTUATOR, SENSOR	2
18	151558-1	SPACER, PNEUMATIC RING	8
21	146123-1	SEAL KIT, RV80E	2
22	151594-3	(250) REDUCER, RV, RV-80E-101	2
	151594-5	(750) REDUCER, RV, RV-80E-153	
26	151595-3	(250) GEAR, INPUT, PINION, RV-80E-101	2
	151595-5	(750) GEAR, INPUT, PINION, RV-80E-153	
29	144372-1	BRUSH HOLDER, 1"X1.5"X2	6
30	144371-1	BRUSH, GROUND, METAL, GRAPHITE	6
31	156997-1	BRACKET, HOLDER, GROUND BRUSH	2
33	144370-1	TERMINAL, QUICK DISC, WELD GRND	12
43	151584-2	BLOCK, MTG, SENSOR	2
44	148093-1	SENSOR, SLOT, 10-30V, 15MM	4

Fig. 8-3: Main Axis Drive Assembly

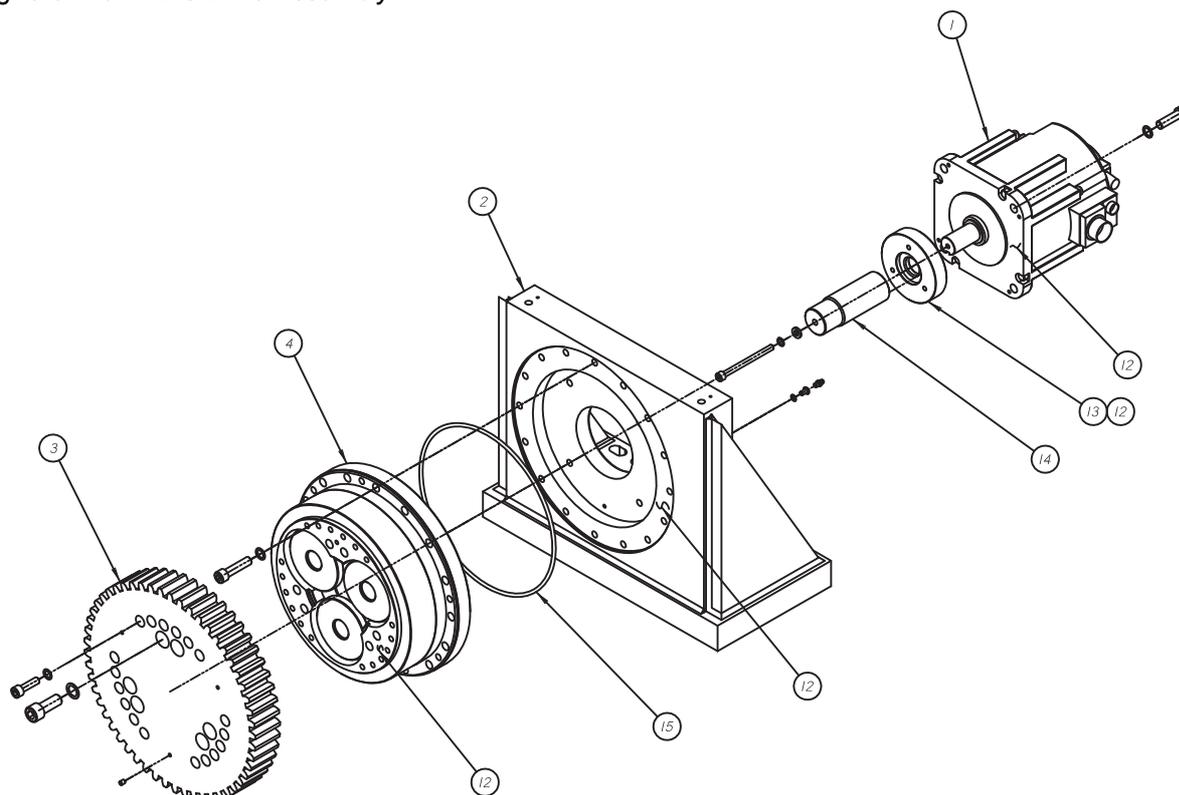


Table 8-3: Main Axis Drive Assembly

ITEM NO.	PART NO.	DESCRIPTION	Qty
1	156009-6	MOTOR, AC SERVO, 3.7KW, SIGMA V	1
2	156908-1	MOUNT, FRAME, MAIN DRIVE	1
3	156907-1	GEAR, DRIVE, 53 T, 13.25" PITCH	1
4	151592-2	(250) REDUCER, RV, RV-320E-101	1
	151592-4	(750) REDUCER, RV, RV-320-E-129	
12	479014-3	ADHESIVE, GASKET, LIQUID	0
13	152538-1	ADAPTER, FLYWHEEL, MRM2-250/750	1
14	151593-2	(250) GEAR, INPUT, PINION, RV-320E-101	1
	151593-4	(750) GEAR, INPUT, PINION, RV-320E-129	
15	146924-1	SEAL, O-RING, 265ID X 5MM THICK	1

Fig. 8-4: Tailstock Swingarm Housing Assembly

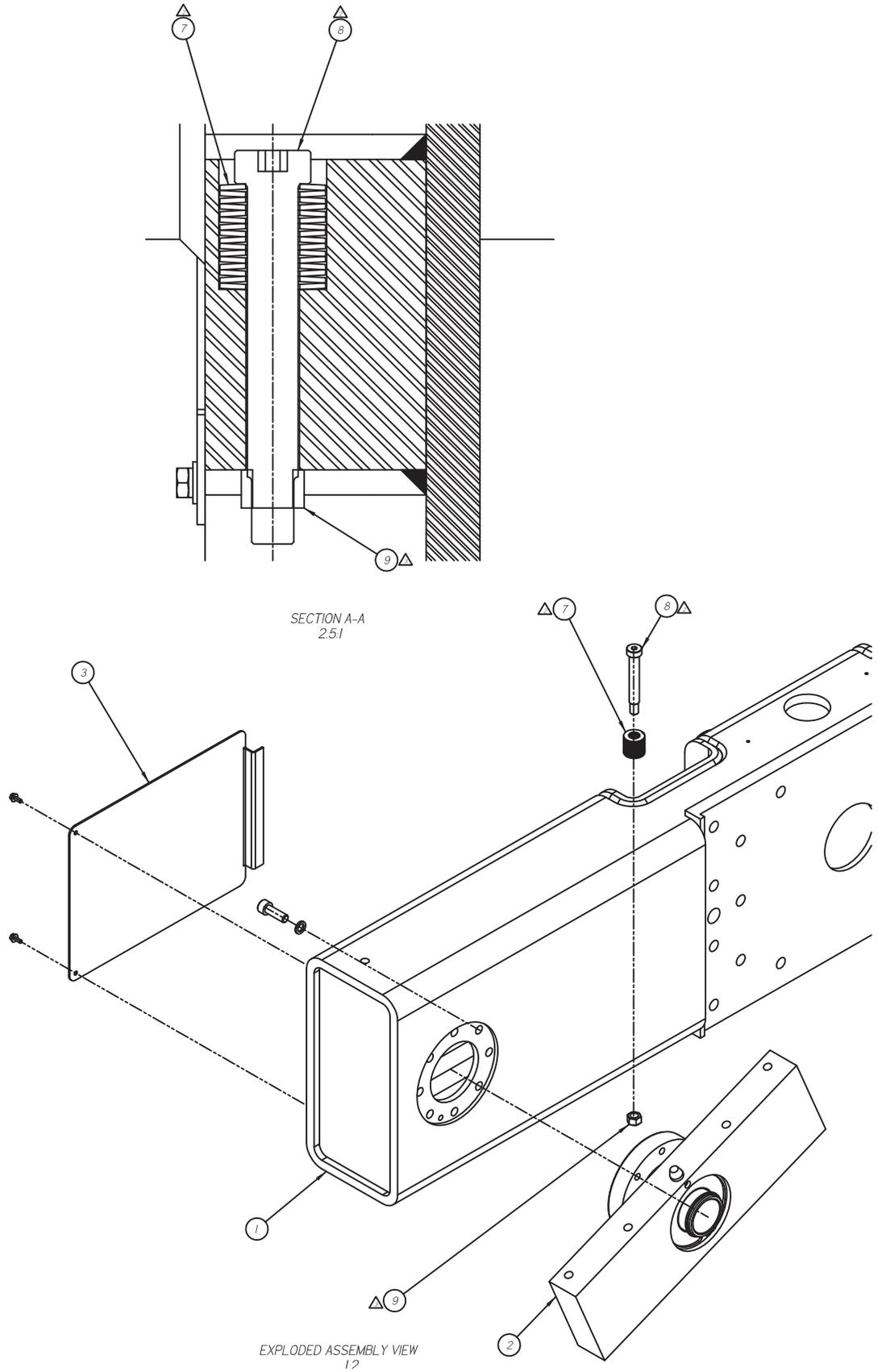


Table 8-4: Tailstock Swingarm Housing Assembly

ITEM NO.	PART NO.	DESCRIPTION	Qty
1	157035-1	HOUSING, SWINGARM, TAILSTOCK	1
2	157037-1	ADAPTER ASSY, TAILSTOCK	2
3	157170-1	COVER, TAILSTOCK SWINGARM	2
7	152712-1	WASHER, BELLEVILLE	32
8	137298-6	SCREW, SHOULDER, 1/2 X 2-3/4	2
9	130441-7	NUT, HEX, 3/8-16, ZP	2

Fig. 8-5: Tailstock Adapter Assembly

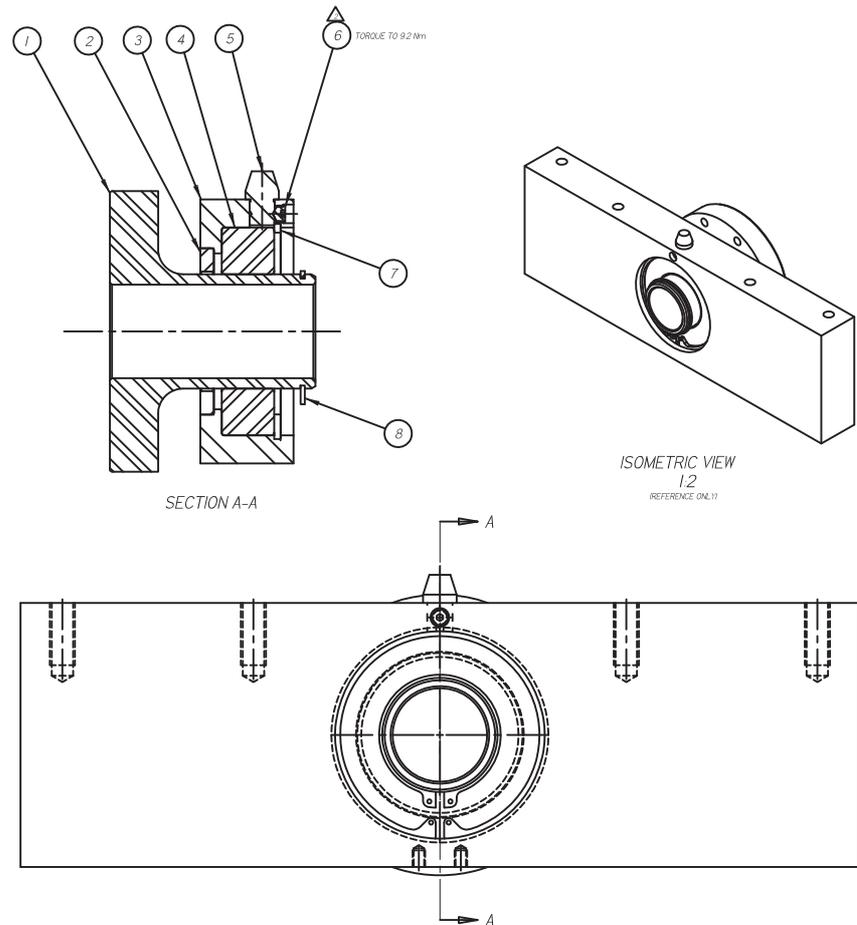


Table 8-5: Tailstock Adapter Assembly

ITEM NO.	PART NO.	DESCRIPTION	Qty
1	157077-1	SHAFT, FLANGED, MTG, MOTOMOUNT, TS	1
2	147632-2	BUMPER, ROTATION LIMITER	1
3	148821-1	ADAPTER, BLOCK, TAILSTOCK	1
4	148136-1	BEARING, SHPERICAL ROLLER	1
5	148124-1	PIN, LOCATOR, 16mm	1
6	148135-1	SCREW, SET, CONE PT, M8 X 6	1
7	146940-4	RING, RETAINING, INTERNAL, 100	1
8	146953-3	RING, RETAINING, EXTERNAL, 55	1

M3XSL POSITIONER INSTRUCTIONS

HEAD OFFICE

2-1 Kurosakishiroishi, Yahatanishi-ku, Kitakyushu 806-0004, Japan
Phone +81-93-645-7703 Fax +81-93-645-7802

YASKAWA America Inc. (Motoman Robotics Division)
100 Automation Way, Miamisburg, OH 45342, U.S.A.
Phone +1-937-847-6200 Fax +1-937-847-6277

YASKAWA Europe GmbH (Robotics Division)
Yaskawastrasse 1, 85391 Allershausen, Germany
Phone +49-8166-90-100 Fax +49-8166-90-103

YASKAWA Nordic AB
Verkstadsgatan 2, Box 504, SE-385 25 Torsås, Sweden
Phone +46-480-417-800 Fax +46-486-414-10

YASKAWA Electric (China) Co., Ltd.
22F, One Corporate Avenue, No.222, Hubin Road, Huangpu District, Shanghai 200021, China
Phone +86-21-5385-2200 Fax +86-21-5385-3299

YASKAWA SHOUGANG ROBOT Co. Ltd.
No7 Yongchang North Road, Beijing E&T Development Area, China 100176
Phone +86-10-6788-2858 Fax +86-10-6788-2878

YASKAWA India Private Ltd. (Robotics Division)
#426, Udyog Vihar, Phase- IV, Gurgaon, Haryana, India
Phone +91-124-475-8500 Fax +91-124-475-8542

YASKAWA Electric Korea Corporation
35F, Three IFC, 10 Gukjegeumyung-ro, Yeongdeungpo-gu, Seoul, Korea 07326
Phone +82-2-784-7844 Fax +82-2-784-8495

YASKAWA Electric Taiwan Corporation
12F, No.207, Sec. 3, Beishin Rd., Shindian District, New Taipei City 23143, Taiwan
Phone +886-2-8913-1333 Fax +886-2-8913-1513

YASKAWA Electric (Singapore) PTE Ltd.
151 Lorong Chuan, #04-02A, New Tech Park, Singapore 556741
Phone +65-6282-3003 Fax +65-6289-3003

YASKAWA Electric (Thailand) Co., Ltd.
59, 1st-5th Floor, Flourish Building, Soi Ratchadapisek 18, Ratchadapisek Road,
Huaykwang, Bangkok 10310, THAILAND
Phone +66-2-017-0099 Fax +66-2-017-0199

PT. YASKAWA Electric Indonesia
Secure Building-Gedung B Lantai Dasar & Lantai 1 Jl. Raya Protokol Halim Perdanakusuma,
Jakarta 13610, Indonesia
Phone +62-21-2982-6470 Fax +62-21-2982-6741

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