MOTOPOS-S500F POSITIONER INSTRUCTIONS

TYPE:
YR-MPS500F-A00

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

MOTOMAN INSTRUCTIONS
MOTOPOS-S500F INSTRUCTIONS
YRC1000 INSTRUCTIONS
YRC1000 OPERATOR’S MANUAL (GENERAL) (SUBJECT SPECIFIC)
YRC1000 MAINTENANCE MANUAL
YRC1000 ALARM CODES (MAJOR ALARMS) (MINOR ALARMS)

Please have the following information available when contacting Yaskawa Customer Support:
• System
• Primary Application
• Software Version (Located on Programming Pendant by selecting: (Main Menu) - (System Info) - (Version))
• Robot Serial Number (Located on robot data plate)
• Robot Sales Order Number (Located on controller data plate)

Part Number: 181229-1CD
Revision: 2
DANGER

• This instruction manual is intended to explain mainly on the mechanical part of the MOTPOS for the application to the actual operation and for proper maintenance and inspection. It describes on safety and handling, details on specifications, necessary items on maintenance and inspection, to explain operating instructions and maintenance procedures. Be sure to read and understand this instruction manual thoroughly before installing and operating the MOTPOS. Any matter not described in this manual must be regarded as “prohibited” or “improper”.

• General items related to safety are listed in the Section 1: Safety of the YRC1000 instructions. To ensure correct and safe operation, carefully read the YRC1000 instructions before reading this manual.

CAUTION

• In some drawings in this manual, protective covers or shields are removed to show details. Make sure that all the covers or shields are installed in place before operating this product. The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids the product warranty.

NOTICE

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

• YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

• If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of your MOTOPOS.

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

**DANGER**
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Safety Signs identified by the signal word DANGER should be used sparingly and only for those situations presenting the most serious hazards.

**WARNING**
Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. Hazards identified by the signal word WARNING present a lesser degree of risk of injury or death than those identified by the signal word DANGER.

**CAUTION**
Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to “NOTICE”.

**NOTICE**
NOTICE is the preferred signal word to address practices not related to personal injury. The safety alert symbol should not be used with this signal word. As an alternative to “NOTICE”, the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.

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

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

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

- Do not remove the motor, and do not release the brake.
Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the table of the MOTOPOS.

WARNING

- Maintenance and inspection must be performed by specified personnel.
Failure to observe this caution may result in electric shock or injury.
- For disassembly or repair, contact your YASKAWA representative.
• Before operating the MOTOPOS, make sure the servo power is turned OFF by performing the following operations. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.
  – Press the emergency stop buttons on the front door of the YRC1000, on the programming pendant, on the external control device, etc.
  – Disconnect the safety plug of the safety fence. (when in the play mode or in the remote mode)
If operation of the MOTOPOS cannot be stopped in an emergency, personal injury and/or equipment damage may result.

Fig. : Emergency Stop Button

• Before releasing the emergency stop, make sure to remove the obstacle or error caused the emergency stop, if any, and then turn the servo power ON.
Failure to observe this instruction may cause unintended movement of the MOTOPOS, which may result in personal injury.

Fig. : Release of Emergency Stop

• Observe the following precautions when performing a teaching operation within the operating range of the MOTOPOS:
  – Be sure to perform lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence. In addition, the operator of the teaching operation must display the sign that the operation is being performed so that no other person closes the safety fence.
  – View the MOTOPOS from the front whenever possible.
  – Always follow the predetermined operating procedure.
  – Always keep in mind emergency response measures against the unexpected movement of the MOTOPOS toward a person.
  – Ensure a safe place to retreat in case of emergency.
Failure to observe this instruction may cause improper or unintended movement of the MOTOPOS, which may result in personal injury.

• Confirm that no person is present in the operating range of the MOTOPOS and that the operator is in a safe location before:
  – Turning ON the YRC1000 power
  – Moving the MOTOPOS by using the programming pendant
  – Running the system in the check mode
  – Performing automatic operations
Personal injury may result if a person enters the operating range of the MOTOPOS during operation. Immediately press an emergency stop button whenever there is a problem. The emergency stop buttons are located on the front panel of the YRC1000 and on the right of the programming pendant.

• Read and understand the Explanation of the Warning Labels before operating the MOTOPOS.
Definition of Terms Used Often in This Manual

The MOTOPOS is the positioner for the YASKAWA industrial robot. The MOTOPOS usually consists of MOTOPOS positioner unit, a controller unit, a programming pendant, and power cables.

In this manual, the equipment is defined as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRC1000 controller</td>
<td>YRC1000</td>
</tr>
<tr>
<td>YRC1000 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between MOTOPOS and the YRC1000</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>

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 ™ are omitted.
Explanation of Warning Labels

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

1 Receiving ........................................................................................................................................1-1
  1.1 Contents Confirmation ........................................................................................................1-1
  1.2 Checking the Order Number ..............................................................................................1-2

2 Transportation .............................................................................................................................2-1
  2.1 Transporting Method ..........................................................................................................2-1
     2.1.1 Using a Crane ............................................................................................................2-1
     2.1.2 Using a Forklift .........................................................................................................2-3

3 Installation ..................................................................................................................................3-1
  3.1 Installation of the Safeguarding ..........................................................................................3-1
  3.2 Mounting Procedures for MOTOPOS Baseplate ..............................................................3-2
     3.2.1 In case of Installing the MOTOPOS and Manipulator on a Common Baseplate ..3-2
     3.2.2 In Case of Mounting the MOTOPOS on the Floor ................................................3-3
  3.3 Location ..................................................................................................................................3-4

4 Wiring ...........................................................................................................................................4-1
  4.1 Grounding ............................................................................................................................4-1
  4.2 Cable Connection ................................................................................................................4-2
     4.2.1 Connection to the MOTOPOS ..............................................................................4-2
     4.2.2 Connection to the YRC1000 .................................................................................4-2

5 Basic Specifications ....................................................................................................................5-1
  5.1 Basic Specifications List .....................................................................................................5-1
  5.2 Part Names and Working Axes .........................................................................................5-2
  5.3 Baseplate Dimensions .....................................................................................................5-3
  5.4 Dimensions and Working Envelope .................................................................................5-4

6 Load Specifications and Jig Mounting Section .........................................................................6-1
  6.1 Allowable Load ..................................................................................................................6-1
  6.2 Details of Jig Mounting Face ............................................................................................6-3

7 Electrical Equipment Specification ...........................................................................................7-1
  7.1 Internal Connections .........................................................................................................7-1

8 Maintenance and Inspection .....................................................................................................8-1
  8.1 Inspection Interval .............................................................................................................8-1
  8.2 Notes on Maintenance Procedures ....................................................................................8-4
Contents

8.2.1 Battery Pack Replacement................................................................. 8-4
8.2.2 Grease Replenishment/Exchange for Speed Reducer.......................... 8-6
  8.2.2.1 Notes on Grease Exchange Procedures........................................ 8-7
  8.2.2.2 Grease Exchange Procedure....................................................... 8-8
8.2.3 Grounding Unit Replacement Procedure............................................ 8-10
9 Recommended Spare Parts........................................................................... 9-1
1 Receiving

1.1 Contents Confirmation

Confirm the contents of the delivery when the product arrives. Standard delivery includes the following six items:

- Manipulator
- YRC1000
- Programming pendant
- Cable between the YRC1000 and the manipulator (1 or 2 cable(s))
- MOTOPOS
- Cable between the MOTOPOS and the YRC1000 (2 cables)

**CAUTION**

- Confirm that the MOTOPOS and the YRC1000 have the same order number. Pay special attention when installing two or more units of MOTOPOS. Failure to observe this instruction may cause improper movement of the MOTOPOS, which may result in personal injury and/or equipment damage.
1.2 Checking the Order Number

Check that the order number of the MOTOPOS corresponds to the YRC1000. The order number is located on a label as shown below.

*Fig. 1-1: Location of Order Number Labels*
2 Transportation

2.1 Transporting Method

2.1.1 Using a Crane

As a rule, when unpacking the MOTOPOS and moving it, a crane should be used. The MOTOPOS should be lifted using wire rope threaded through attached eyebolts.

### WARNING

- Operation of the crane, sling, or forklift must be performed only by authorized personnel. Failure to observe this instruction may result in personal injury and/or equipment damage.

### NOTICE

- Avoid excessive vibration or shock while transporting or moving the MOTOPOS. Failure to observe this instruction may adversely affect the performance of the MOTOPOS because it consists of precision components.
2 Transportation

2.1 Transporting Method

Fig. 2-1: Transporting Position

- Check that the eyebolts are securely fastened.
- The weight of the MOTOPOS is approximately 150 kg including the eyebolts. Use a wire rope strong enough to withstand the weight.
- Attached eyebolts are designed to support the MOTOPOS weight. Do not use them for anything other than transporting the MOTOPOS.
- Avoid applying external force on the table or connectors when transporting by a crane, forklift, or other equipment. Failure to observe this instruction may result in injury.
2.1.2 Using a Forklift

When using a forklift, fix the MOTOPOS on a pallet with shipping bolts as shown in fig. 2-2 “Using a Forklift”. Insert claws under the pallet and lift it. The pallet must be strong enough to support the MOTOPOS. Transport the MOTOPOS slowly with due caution in order to avoid overturning or slippage.

Fig. 2-2: Using a Forklift
3 Installation

3.1 Installation of the Safeguarding

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

**Responsibility for Safeguarding (ISO10218)**

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

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**DANGER**

- Install the safety fence.
  Failure to observe this warning may result in injury or damage.

**WARNING**

- Install the MOTOPos in a location where the MOTOPos with a jig does not hit against anything such as the wall or the safety fence.
  Failure to observe this warning may result in injury or damage.
- Make sure to firmly anchor the MOTOPos before turning ON the power and operating the MOTOPos.
  Failure to observe this instruction may cause overturning of the MOTOPos, which may result in personal injury and/or equipment damage.
- Do not install or operate a damaged MOTOPos or a MOTOPos any of whose components is missing.
  Failure to observe this instruction may cause improper movement, etc. of the MOTOPos, which may result in personal injury and/or equipment damage.
3 Installation

3.2 Mounting Procedures for MOTOPOS Baseplate

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

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

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 MOTOPOS may deform and its functional ability may be compromised. Mount the baseplate either as shown in "3.2.1 In case of Installing the MOTOPOS and Manipulator on a Common Baseplate" or "3.2.2 In Case of Mounting the MOTOPOS on the Floor".

### Table 3-1: Maximum repulsion forces of the MOTOPOS

<table>
<thead>
<tr>
<th>Force Type</th>
<th>Maximum Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotating maximum torque</td>
<td>2058 N•m</td>
</tr>
<tr>
<td></td>
<td>(210 kgf•m)</td>
</tr>
<tr>
<td>Moment by overhang payload</td>
<td>2450 N•m</td>
</tr>
<tr>
<td></td>
<td>(250 kgf•m)</td>
</tr>
</tbody>
</table>

#### 3.2.1 In case of Installing the MOTOPOS and Manipulator on a Common Baseplate

The baseplate should be rugged and durable to ensure that the MOTOPOS 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.

For mounting the MOTOPOS base, use four hexagon head screws M16 (tensile strength: 1200 N/mm² or more) (recommended length: 55 mm) and then use the tightening torque of 206 N•m to tighten screws. Tighten the screws and anchor bolts securely so that they will not work loose during the operation.

Fig. 3-1: Mounting the MOTOPOS Base on a Common Baseplate
3.2 Mounting Procedures for MOTOPOS Baseplate

3.2.2 In Case of Mounting the MOTOPOS on the Floor

The floor should be strong enough to support the MOTOPOS. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the MOTOPOS as shown in Table 3-1 “Maximum repulsion forces of the MOTOPOS”. When there is a concrete floor thickness of 200 mm or more, a baseplate (MOTOPOS baseplate thickness of 28 mm or more) can be fixed directly to the floor with anchor bolts M20. Before mounting the MOTOPOS on the floor, check the flatness, cracks, etc. of the floor. If there are any cracks and the like 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. 3-2: Fixing the MOTOPOS on the Floor
3.3 Location

When the MOTOPOS is installed, it is necessary to satisfy the undermentioned environmental conditions:

- Ambient Temperature: 0°C to +45°C
- Humidity: 20 to 80%RH (at constant temperature)
- 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
- Altitude: 1000 m or less

**NOTE**

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

4.1 Grounding

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

- Never use this wire 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 electrical installation standards.

**WARNING**

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

**CAUTION**

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

**NOTE**

- Never use this wire 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 electrical installation standards.

Fig. 4-1: Grounding Method
4.2 Cable Connection

There are two cables for the power supply; a power cable (1BC) and an encoder cable for detection (2BC). Connect the MOTOPOS base connectors and the YRC1000 using both cables. Refer to fig. 4-2(a) "Connection of the MOTOPOS and the YRC1000" to fig. 4-2(b) "Connection of the MOTOPOS and the YRC1000".

4.2.1 Connection to the MOTOPOS

Before connecting the cables to the MOTOPOS, check the numbers on both cables and the MOTOPOS base connectors. Adjust the cable connector positions to the main key positions of the MOTOPOS. Insert each cable and then tighten the nut sufficiently.

4.2.2 Connection to the YRC1000

Before connecting the cables to the YRC1000, check the numbers on both cables and the YRC1000 base connectors in the order of -X4 then -X3. Connect each cable adjusting the cable connector positions to the main key positions of the YRC1000 and then tighten the nut until it clicks.

Fig. 4-2(a): Connection of the MOTOPOS and the YRC1000
**Fig. 4-2(b): Connection of the MOTOPOS and the YRC1000**

- Connector for motor power (1BC)
- Connector for motor encoder (2BC)
## 5 Basic Specifications

### 5.1 Basic Specifications List

**Table 5-1: Basic Specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of Freedom</td>
<td>1</td>
</tr>
<tr>
<td>Payload</td>
<td>500 kg</td>
</tr>
<tr>
<td>Repetitive Positioning Accuracy</td>
<td>±0.05 mm (R250 mm)</td>
</tr>
<tr>
<td>Motion Range</td>
<td>±200°</td>
</tr>
<tr>
<td>Maximum speed of the rotation axis</td>
<td>3.32 rad/s (190°/s)</td>
</tr>
<tr>
<td>Allowable moment of the rotation axis</td>
<td>509.6 N•m (52 kgf•m)</td>
</tr>
<tr>
<td>Allowable Overhang Amount</td>
<td>340 mm from table surface (when the load is 500 kg)</td>
</tr>
<tr>
<td>Allowable Inertia (GD²/4)²</td>
<td>35 kg•m²</td>
</tr>
<tr>
<td>Equipment Specifications</td>
<td>Signal None³</td>
</tr>
<tr>
<td></td>
<td>Air None³</td>
</tr>
<tr>
<td>Approximate Mass</td>
<td>150 kg</td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>0°C to 45°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>20% to 80% RH (non-condensing)</td>
</tr>
<tr>
<td>Vibration</td>
<td>4.9 m/s² (0.5G) or less</td>
</tr>
<tr>
<td>Altitude</td>
<td>1000 mm or less</td>
</tr>
<tr>
<td>Others</td>
<td>• Free from explosive and corrosive gas or liquid.</td>
</tr>
<tr>
<td></td>
<td>• Clean and dry.</td>
</tr>
<tr>
<td></td>
<td>• Free from excessive electrical noise (plasma).</td>
</tr>
<tr>
<td>Power Capacity</td>
<td>0.3 kVA</td>
</tr>
</tbody>
</table>

1. SI units are used in this table. However, gravitational unit is used in ().  
2. Refer to Chapter 6.1 “Allowable Load” for details on the permissible moment of inertia.  
3. Use hollow shaft hole (60 mm dia).
5.2 Part Names and Working Axes

Fig. 5-1: Part Names and Working Axes
5.3 Baseplate Dimensions

Fig. 5-2: Baseplate Dimensions
5.4 Dimensions and Working Envelope

Fig. 5-3: Dimensions and Working Envelope
6 Load Specifications and Jig Mounting Section

6.1 Allowable Load

This section describes the allowable values and various limitations.

The maximum payload of the MOTOPOS is 500 kg. The moment and moment of inertia are limited as shown in table 6-1 "Moment and Total Inertia".

Table 6-1: Moment and Total Inertia

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Moment N(\cdot)m (kgf(\cdot)m) (^1)</th>
<th>Total Inertia kg(\cdot)m(^2) (GD(^2))/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotary Axis S1</td>
<td>509.6 (52)</td>
<td>35</td>
</tr>
</tbody>
</table>

\(^1\) (\(\cdot\)): Gravitational unit

Fig. 6-1 “Moment Rating” shows the allowable range for the center of gravity. Regardless of the posture, the jigs must be designed to be sure that the L1 and L2 are within the range for each mass as shown in fig. 6-1.

When the load is not applied as mass but applied as force, etc., contact your YASKAWA representative.

If the L2 exceeds the range or the jig length is long, use the methods of holding both ends using tailstock.

The closer the L1 approaches the center of the rotation, the larger the inertia load of the jig is available.

For the allowable inertia of each load moment, refer to fig. 6-2 “Load Moment and Moment of Inertia”.

Fig. 6-1: Moment Rating
6 Load Specifications and Jig Mounting Section
6.1 Allowable Load

Formula
Allowable inertia: \( I \geq \frac{47}{52}T + 82 \) (T: Load moment)

Example
Load moment: \( T = 40\text{kgf} \cdot \text{m} \)
Allowable inertia \( I \geq \frac{47}{52} \times 40 + 82 = 45.8 \text{kgf-m}^2 \) or less
6 Load Specifications and Jig Mounting Section
6.2 Details of Jig Mounting Face

The jig mounting dimensions are shown in fig. 6-3 “Details of Jig Mounting Face”. It is recommended that the table and the jig be mounted using two dowel pins. The dowel pins are to be prepared by customers.

Fig. 6-3: Details of Jig Mounting Face

- Tapped hole M12 (6 holes) (depth: 24 mm) (For the mounting bolt of the jig)
- 12 dia. (1/8-in) (2 holes) (depth: 20 mm) (For the positioning dowel pin of the jig)
- PCD280 250±0.02

PCD280 250±0.02
7 Electrical Equipment Specification

7.1 Internal Connections

High reliability connectors which can be easily put on and removed are used in each connector part.

Fig. 7-1: Internal Connection Diagram (YR-MPS500F-A00)
8 Maintenance and Inspection

8.1 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. Inspection intervals are classified into six levels as shown in Table 8-1 “Inspection Items”. Conduct periodical inspections according to the inspection schedule in Table 8-1.

In Table 8-1, the inspection items are categorized by 3 types of operations: operations which can be performed by personnel authorized by the user, operations which can be performed by personnel being trained, and operations which can be performed by service company personnel. Only specified personnel are to do inspection work.

- 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.

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DANGER

- Do not remove the motor, and do not release the brake. Failure to observe this caution may result in injury from unexpected turning of the MOTOPOS’s table.

WARNING

- Maintenance and inspection must be performed by specified personnel. Failure to observe this caution may result in electric shock or injury.
- For disassembly or repair, contact your YASKAWA representative.
- Before maintenance or inspection, be sure to turn the main power supply OFF, 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

- The battery pack must be connected before removing detection connector when maintenance and inspection. Failure to observe this caution may result in the loss of home position data.

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NOTE

- 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.
### 8.1 Inspection Interval

#### Table 8-1: Inspection Items

<table>
<thead>
<tr>
<th>Items</th>
<th>Inspection Interval</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Home position key</td>
<td>Daily</td>
<td>Visual</td>
<td>Check the key accordance at the home position</td>
<td>Specified Personnel Licensee Service Company</td>
</tr>
<tr>
<td>2 Working area and whole exterior of MOTOPPOS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Motor</td>
<td></td>
<td>Visual</td>
<td>Check for grease leakage.</td>
<td></td>
</tr>
<tr>
<td>4 Earth brush</td>
<td>Air/blow</td>
<td>Spanner Wrench</td>
<td>Check for damage, deterioration and wear of brushes.</td>
<td></td>
</tr>
<tr>
<td>5 Baseplate mounting bolts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Cover mounting screws</td>
<td></td>
<td>Spanner Wrench</td>
<td>Tighten loose bolts.</td>
<td></td>
</tr>
<tr>
<td>7 Manipulator cable connector</td>
<td></td>
<td>Manual</td>
<td>Check for loose connectors.</td>
<td></td>
</tr>
<tr>
<td>8 Wire harness in MOTOPPOS</td>
<td></td>
<td>Visual Manual</td>
<td>Check for communication error. (By shaking the wire manually)</td>
<td></td>
</tr>
<tr>
<td>9 Battery pack in MOTOPPOS</td>
<td></td>
<td></td>
<td>Replace the battery pack when the battery alarm occurs or the MOTOPPOS drove for 36000H.</td>
<td></td>
</tr>
<tr>
<td>10 Reducer / gear</td>
<td>Grease Gun</td>
<td></td>
<td>Replace grease. (12000H cycle). See chapter 8.2.2 “Grease Replenishment/Exchange for Speed Reducer.”</td>
<td></td>
</tr>
<tr>
<td>11 Overhaul</td>
<td></td>
<td></td>
<td>Check for malfunction. (Replace if necessary)</td>
<td></td>
</tr>
</tbody>
</table>

---

1. Inspection No. correspond to the numbers in fig. 8-1 (a) “Inspection Parts and Inspection Numbers”.
2. A grease leakage indicates the possibility that grease has seeped into the motor, which can cause a motor breakdown. Contact your YASKAWA representative.
3. When a surface contact is not secured because of flaws or adhesion of foreign substances or when wearing over a predetermined amount, the earth brush may be damaged. For the replacement period when a surface contact is secured, refer to fig. 8-1(b) “Check for the Wear of Earth Brush”.
4. When checking for conduction with multimeter, remove connectors on detector side for each axis from the motor.
5. For the grease, refer to table 8-2 “Inspection Parts and Grease Used”.

---
8 Maintenance and Inspection

8.1 Inspection Interval

Fig. 8-1(a): Inspection Parts and Inspection Numbers

Fig. 8-1(b): Check for the Wear of Earth Brush

Wear limit line (Replace the brush immediately when the line disappears)

Table 8-2: Inspection Parts and Grease Used

<table>
<thead>
<tr>
<th>No.</th>
<th>Grease Used</th>
<th>Inspected Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Molywhite RE No.00</td>
<td>Speed reducers</td>
</tr>
</tbody>
</table>

The numbers in the above table correspond to the numbers in table 8-1 “Inspection Items”.
8.2 Notes on Maintenance Procedures

8.2.1 Battery Pack Replacement

The battery pack is mounted in the location indicated in fig. 8-2 “Battery Location.”

If a battery alarm occurs in the YRC1000, replace the battery according to the following procedure:

Fig. 8-2: Battery Location

Fig. 8-3: Battery Connection

See procedure 6
See procedure 7
See procedure 4
See procedure 5

a: Crimped contact-pin (Pin)
b: Crimped contact-pin (Socket)
8 Maintenance and Inspection
8.2 Notes on Maintenance Procedures

1. Turn OFF the YRC1000 main power supply.
2. Remove the cover of the tilting frame section and pull out the battery pack to replace.
3. Remove the battery pack mounting screw.
4. Remove the plastic tape (insulation tape) protecting the connection part of the battery pack in the MOTOPOS.
5. Connect the new battery.
6. Remove the old battery.

**NOTE**
Remove the old battery pack after connecting the new one so that the encoder absolute data do not disappear.

7. Protect the connection part of the battery pack in the MOTOPOS with plastic tape (insulation tape).
8. Mount the battery pack with the screws, and then reinstall the cover to complete the replacement.

**NOTE**
Be sure not to pinch cables in reinstalling the cover of the frame section.
8.2.2 Grease Replenishment/Exchange for Speed Reducer

Fig. 8-4: Speed Reducer Diagram

Fig. Grease inlet

To: Grease exhaust port
8.2.2.1 Notes on Grease Exchange Procedures

Make sure to follow the instructions listed below at grease replenishment/exchange. Failure to observe the following notes may result in damage to motor and speed reducer.

- **NOTE**
  - If grease is injected without removing the plug from the grease exhaust port, the grease will leak inside a motor, or an oil seal of a speed reducer will come off. Make sure to remove the plug or it may result in a failure. Also, when using a tube, the length must be 150 mm or shorter and the inside diameter must be 6 mm or longer. If the tube is too long, the exhaust resistance at the tube part is increased, and the inner pressure of the grease bath is raised. It may result in coming off of an oil seal.
  - Make sure to use a grease pump to inject grease. Set the grease injection rate to 7 g/s or less. (Air supply pressure to the grease pump: 0.3 MPa or less (rough standard))
  - When using extrusion air for discharging the grease, set air supply pressure at 0.025 MPa or less. If the air supply pressure is higher than above mentioned value, an oil seal of a speed reducer will come off, and it may result in a failure.
  - When using extrusion air for discharging grease, grease may be vigorously discharged from the exhaust port. Perform an operation such as using a tube at the grease exhaust port to pour into an appropriate container.
  - Make sure to fill the hose on the grease inlet with grease beforehand to prevent air from leaking into the speed reducer.
  - After injecting grease, discharge the specified amount of grease. If insufficient, the inner pressure is raised during the operation, and grease may leak. When discharged too much, the speed reducer is not lubricated sufficiently during the operation, and it may cause the early failure of the speed reducer.
  - When filling/exchanging grease, the grease may flow out from the grease inlet or the grease exhaust port. Prepare a container to receive the grease and a waste cloth to wipe the grease in advance.
8.2.2.2 Grease Exchange Procedure

1. Remove the plug from To grease exhaust port.
2. Install a grease zerk A-PT3/8 to the grease inlet.
   (The grease zerk is delivered with the manipulator.)
3. Inject the grease through the grease inlet by using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Recommended grease lubricator: Powerlube P3C (made by Macnaught)
   - Air supply pressure of grease pump: 0.3 MPa or less (approx.)
   - Speed of grease injection: 7 g/s or less
     (For example, if grease is supplied from the lubricator at 2 times/s, set the amount to 3.5 g/time or less)
   - Amount of grease: 930 g (1069 cc) / approx.
4. The old grease is discharged from the grease exhaust port. At this time, stop injection when the mixture of the old grease and the new grease in an equal ratio is seen.
5. Discharge the specified amount of grease from the grease inlet or grease exhaust port. In order to discharge the specified amount of grease, receive the discharged grease by using a container, and then measure the weight of the discharged grease by weighing the container till the amount reaches to the specified amount.
   Use one of the following methods to discharge grease.
   - Amount of discharged grease: 90 to 140 g
     Method 1: Extruding grease by air from the grease exhaust port
       (1) Connect the joint and the hose to the grease inlet.
       (2) Connect the regulator to the grease exhaust port.
       (3) Inject air from the grease exhaust port to extrude grease by air.
         (Extrusion air pressure: 0.025 MPa or less)
     Method 2: Suctioning grease out
       (1) Keep the inlet open and insert the tube into the exhaust port.
       (2) Discharge grease by suctioning grease out of the exhaust port.
         (Suction pressure: 0.025 MPa or less)
6. For the axis where grease is exchanged, perform a playback operation indicated in table 8-3 “Running-In Operation for Each Axis” for running-in the speed reducer with grease.
   At this time, grease may be discharged during the operation.
   Remove the grease zerk from the grease inlet, and clean and degrease the tap part and the thread part of the plug. Apply liquid gasket to the thread part of the plug. Tighten the plug on the grease inlet with the tightening torque of 5 N•m (0.5 kgf•m). Also, discharge the excess grease in order not to increase the inner pressure of the speed reducer. Attach a bag to receive grease such as indicated in fig. 8-5 “Grease Receiving Bag (Rough Standard)”, and then perform the running-in operation.
8 Maintenance and Inspection
8.2 Notes on Maintenance Procedures

7. Wipe the discharged grease with a cloth. Before installing the plug, clean and degrease the tap part and the thread part of the plug. Apply liquid gasket to the thread part of the plug. Tighten the plug on the grease inlet by using the tightening torque 23 N•m(2.3 kgf•m).

Table 8-3: Running-In Operation for Each Axis

<table>
<thead>
<tr>
<th>Axis to exchange grease</th>
<th>Running-in operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operation angle</td>
</tr>
<tr>
<td>S1-axis</td>
<td>±90°</td>
</tr>
</tbody>
</table>

Fig. 8-5: Grease Receiving Bag (Rough Standard)

- Grease receiving bag
  - Cut one corner to remove air.
  - To prevent grease from scattering from the cut corner, cover the receiving bag with a plastic bag etc. without being sealed.
- Bond for fixing a grease receiving bag
- Tube (inside dia.: 6 mm or more)
- Union (inside dia.: 6 mm or more) PTH3/8
8.2.3 Grounding Unit Replacement Procedure

Refer to fig. 8-6 “Grounding Unit Parts Checklist” when replacing the grounding unit.

- **Removal**
  1. Turn OFF the MOTOPOS power supply.
  2. Unscrew the cross head APS bolts ① and remove the side cover of the frame ②.
  3. Unscrew the hexagon head screw ③ and disconnect the negative cable ④ from the grounding unit ⑤.
  4. Unscrew the hexagon socket head cap screws ⑥, and remove grounding unit ⑦.
     Wipe off the residue on the collector ring ⑧ (it is mounted between the grounding unit ⑦ and the collector ring ⑨) if any.
     (The grounding unit is mounted by pressing against the mounting place using the spring structure. For this reason, be careful to the spring mechanism tension when removing.)

- **Attachment**
  1. Insert the grounding unit ⑦ till its mounting position, and then tighten the hexagon socket head cap screws ⑥ with the tightening torque shown in table 8-4 “Grounding Unit Parts Checklist”.
     (The grounding unit ⑦ is mounted by pressing against the mounting place using the spring structure. For this reason, be careful to the spring mechanism tension when removing.)
  2. Connect the negative cable ④ to the grounding unit ⑦ by using the hexagon head screw ③.
  3. Mount the side cover of the frame ② by using the cross head APS bolts ①.
  4. Turn ON the MOTOPOS power supply.
8.2 Notes on Maintenance Procedures

Table 8-4: Grounding Unit Parts Checklist

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Qty</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cross head APS bolt M5 (length: 12 mm) Washer M5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cover HS1300679-1 (HS1300679-2 for the opposite side)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hexagon head screw M10 (length: 20 mm) Nut M10 Washer M10 Spring washer M10</td>
<td>1</td>
<td>each</td>
</tr>
<tr>
<td>4</td>
<td>Negative cable</td>
<td>1</td>
<td>Prepared by the customer</td>
</tr>
<tr>
<td>5</td>
<td>Hexagon socket head cap screw M6 (length: 50 mm) GT-LH M6</td>
<td>2</td>
<td>each</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tightening torque 10.0 Nm</td>
</tr>
<tr>
<td>6</td>
<td>Grounding unit HS1381439-A</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Collector ring HS1300601-1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 8-6: Grounding Unit Parts Checklist
9 Recommended Spare Parts

It is recommended to keep the parts and components in the following table in stock as spare parts for the MOTOPOS. Product performance cannot be guaranteed when using spare parts from any company other than YASKAWA. The spare parts are ranked as follows:

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

Table 9-1: Spare Parts for the MOTOPOS

<table>
<thead>
<tr>
<th>Rank</th>
<th>Part No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>Qty per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Grease</td>
<td>Molywhite RE No. 00</td>
<td>YASKAWA Electric Corporation</td>
<td>16 kg</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>Liquid Gasket</td>
<td>TB1206C</td>
<td>Three Bond Co., Ltd.</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Battery Pack</td>
<td>HW8471030-A</td>
<td>YASKAWA Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Grounding Unit</td>
<td>HS1381439-A</td>
<td>YASKAWA Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>Replacement Kit for S1-Axis Speed Reducer</td>
<td>Y005C-MPS600FA00S1</td>
<td>YASKAWA Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>Wire Harness in MOTOPOS</td>
<td>HS1370721-A</td>
<td>YASKAWA Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>7</td>
<td>AC Servomotor</td>
<td>SGM7G-09APK-YR1* HW1385163-A</td>
<td>YASKAWA Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: To replace parts in Rank B or Rank C, contact your YASKAWA representative.