MOTOMAN-GP8/AR700,-GP7/AR900
INSTRUCTIONS

TYPE:
YR-1-06VX8-A00 (STANDARD SPECIFICATIONS)
YR-1-06VX7-A00 (STANDARD SPECIFICATIONS)
YR-1-06VX8-B00 (CORROSION PROOF SPECIFICATIONS)
YR-1-06VX7-B00 (CORROSION PROOF SPECIFICATIONS)

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

MOTOMAN INSTRUCTIONS
MOTOMAN-GP8/AR700,-GP7/AR900 INSTRUCTIONS
YRC1000 INSTRUCTIONS
YRC1000 OPERATOR’S MANUAL (GENERAL) (SUBJECT SPECIFIC)
YRC1000 MAINTENANCE MANUAL
YRC1000 ALARM CODES (MAJOR ALARMS) (MINOR ALARMS)

The YRC1000 operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.
The YRC1000 operator’s manual above consists of “GENERAL” and “SUBJECT SPECIFIC”.
The YRC1000 alarm codes above consists of “MAJOR ALARMS” and “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: 178959-1CD
Revision: 2
This instruction manual is intended to explain mainly on the mechanical part of the MOTOMAN-GP8/AR700, -GP7/AR900 for the application to the actual operation and for proper maintenance and inspection. It describes on safety and handling, details on specifications, necessary items on maintenance and inspection, to explain operating instructions and maintenance procedures. Be sure to read and understand this instruction manual thoroughly before installing and operating the manipulator. Any matter not described in this manual must be regarded as “prohibited” or “improper”.

General information related to safety are described in “Chapter 1. Safety” of the YRC1000 INSTRUCTIONS. To ensure correct and safe operation, carefully read “Chapter 1. Safety” of the YRC1000 INSTRUCTIONS.

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.

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 the MOTOMAN-GP8/AR700, -GP7/AR900.

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

**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.

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 manipulator's arm.

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 manipulator, 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 manipulator cannot be stopped in an emergency, personal injury and/or equipment damage may result.

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 manipulator, which may result in personal injury.

Observe the following precautions when performing a teaching operation within the manipulator’s operating range:
- 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 manipulator from the front whenever possible.
- Always follow the predetermined operating procedure.
- Always keep in mind emergency response measures against the manipulator’s unexpected movement 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 manipulator, which may result in personal injury.

Confirm that no person is present in the manipulator’s operating range and that the operator is in a safe location before:
- Turning ON the YRC1000 power
- Moving the manipulator by using the programming pendant
- Running the system in the check mode
- Performing automatic operations

Personal injury may result if a person enters the manipulator’s operating range 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 manipulator.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product. The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and supply cables. In this manual, the equipment is designated as follows:

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

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 manipulator.

Always follow the warnings on the labels.

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

Fig. : Warning Label Locations (GP8/AR700,GP7/AR900)

Description

Make sure to secure the manipulator base by using the bolts of the specified sizes and by tightening the bolts with the specified tightening torques. If the power is turned ON and the manipulator is operated without securing the manipulator properly, the manipulator may fall down, which may result in personal injury and/or equipment damage.
Collision hazard label

Description
Personal injury may result if a person enters the manipulator's operating range during operation. Immediately press an emergency stop button whenever there is a problem. Confirm that no person is present in the manipulator's operating range and that the operator is in a safe location before:

- Turning ON the YRC1000 power
- Moving the manipulator by using the programming pendant
- Running the system in the check mode
- Performing automatic operations

Crush hazard label

Description
Keep clear of moving parts when performing a teaching operation within the manipulator's operating range. Failure to observe this instruction may result in personal injury.
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1 Product Confirmation

1.1 Contents Confirmation

Confirm the contents of the delivery when the product arrives.

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

YRC1000 Packing contents
- Manipulator (accessories included)
- YRC1000 (spare parts included)
- Programming Pendant
- Manipulator cable (between the YRC1000 and the manipulator)
- Manual

Fig. 1-1: Five Items for Standard Delivery

<table>
<thead>
<tr>
<th>Accessories of Manipulator</th>
<th>Pcs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexagon socket head cap screw M10 (length:35 mm)</td>
<td>4</td>
</tr>
<tr>
<td>Conceal spring washer M10</td>
<td>4</td>
</tr>
</tbody>
</table>

CAUTION

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

CAUTION

- Confirm that the manipulator and the YRC1000 have the same order number. Pay special attention when installing two or more manipulators.

Failure to observe this instruction may cause improper movement of the manipulator, which may result in personal injury and/or equipment damage.

Accessories of Manipulator Pcs
- Hexagon socket head cap screw M10 (length:35 mm) 4
- Conceal spring washer M10 4

Complete Set of Manuals
(in the CD-ROM which is connected to the USB connector)
1.2 Order Number Confirmation

Confirm the order number of the manipulator corresponds to the YRC1000. The order number is located on a label as shown below.

Fig. 1-2: Location of Order Number Labels

(a) YRC1000 (Front View)  (c) Manipulator (Back View)
2 Transporting

2.1 Transporting Method

**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 YRC1000.

Failure to observe this instruction may adversely affect the performance of the YRC1000 because it consists of precision components.

**NOTE**

- Check that the eyebolts are securely fastened.
- The weight of the manipulator is approximately 32kg for GP8/AR700, 34kg for GP7/AR900 (including the shipping bolts and brackets). Use a wire rope strong enough to withstand the weight.
- Attached eyebolts are designed to support the manipulator’s mass. Do not use them for anything other than transporting the manipulator.
- Avoid applying external force on the arm or motor unit when transporting by a crane, forklift, or other equipment. Failure to observe this instruction may result in injury.
2 Transporting
2.1 Transporting Method

2.1.1 Using a Crane

As a rule, the manipulator should be lifted by a crane with two wire ropes when removing it from the package and moving it.

Be sure to lift the manipulator in the posture as shown in fig. 2-1 “Transporting Position (factory setting)”. The length of the wire rope must be 150 mm or longer. ( indicates the position of the center of gravity).

Fig. 2-1: Transporting Position (factory setting)
2 Transporting
2.1 Transporting Method

2.1.2 Using a Forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts and brackets 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 manipulator.

Transport the manipulator slowly with due caution in order to avoid overturning or slippage.

Fig. 2-2: Using a Forklift
3 Installation

DANGER

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

WARNING

• Install the manipulator in a location where the tool or the workpiece held by its fully extended arm will not reach the wall, the safety fence, or the YRC1000, etc.
  Failure to observe this warning may result in injury or damage.
• Make sure to firmly anchor the manipulator before turning ON the power and operating the manipulator.
  Failure to observe this instruction may cause overturning of the manipulator, which may result in personal injury and/or equipment damage.
• When mounting the manipulator on the wall, the wall must have sufficient strength and rigidity to support the weight of the manipulator. In addition, take precautionary measures on the manipulator base to prevent the manipulator from falling.
  Failure to observe this instruction may result in personal injury and/or equipment damage.
• Do not install or operate a damaged manipulator or a manipulator any of whose components is missing.
  Failure to observe this instruction may cause improper movement, etc. of the manipulator, which may result in personal injury and/or equipment damage.

NOTICE

• After completing the installation of the manipulator, make sure to remove the shipping bolts and brackets before turning ON the power.
  Failure to observe this instruction may result in damage to the main drive unit.
3 Installation

3.1 Installation of the Safety fence

To insure safety, be sure to install safety fence. They prevent 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 safety fences are provided and used in accordance with Sections 6, 7, and 8 of this standard. The means and degree of safeguarding, including any redundancies, shall correspond directly to the type and level of hazard presented by the robot system consistent with the robot application. Safeguarding may include but not be limited to safeguarding devices, barriers, interlock barriers, perimeter guarding, awareness barriers, and awareness signals.

3.2 Mounting Procedures for Manipulator Base

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

Construct a solid foundation with the appropriate thickness to withstand maximum reaction forces of the manipulator referring to table 3-1(a) “Reaction Force and Torque of GP8/AR700”, table 3-1(b) “Reaction Force and Torque of GP7/AR900”.

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

**Table 3-1(a): Reaction Force and Torque of GP8/AR700**

<table>
<thead>
<tr>
<th></th>
<th>Horizontal rotation</th>
<th>Vertical rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reaction force FH</td>
<td>Torque MH</td>
</tr>
<tr>
<td>Emergency stop</td>
<td>1079 N (110 kgf)</td>
<td>765 N•m (78 kgf•m)</td>
</tr>
<tr>
<td>Acceleration/deceleration</td>
<td>343 N (35 kgf)</td>
<td>216 N•m (22 kgf•m)</td>
</tr>
</tbody>
</table>

**Table 3-1(b): Reaction Force and Torque of GP7/AR900**

<table>
<thead>
<tr>
<th></th>
<th>Horizontal rotation</th>
<th>Vertical rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reaction force FH</td>
<td>Torque MH</td>
</tr>
<tr>
<td>Emergency stop</td>
<td>1570 N (160 kgf)</td>
<td>1140 N•m (116 kgf•m)</td>
</tr>
<tr>
<td>Acceleration/deceleration</td>
<td>450 N (46 kgf)</td>
<td>310 N•m (32 kgf•m)</td>
</tr>
</tbody>
</table>
3 Installation
3.2 Mounting Procedures for Manipulator Base

Fig. 3-1: Manipulator Reaction Force and Torque

GP8/AR700

GP7/AR900
3.2 Mounting Procedures for Manipulator Base

3.2.1 Mounting Example

For the first process, anchor the baseplate firmly to the ground. The baseplate should be rugged and durable to prevent shifting of the manipulator or the mounting fixture. It is recommended to prepare a baseplate of 30 mm or more thickness, and anchor bolts of M10 or larger size.

The manipulator base is tapped for four mounting holes. Fix the manipulator base to the baseplate with the four hexagon socket head cap screws M10 (Tensile strength: 1200N/mm², recommended length: 35 mm) by using the tightening torque 48N·m.

The hexagon socket head cap screws and the anchor bolts must be tightened firmly so that they will not work loose during the operation. When conducting maintenance on the S-axis or replacing the wire harness in the manipulator, the manipulator and the baseplate must be separated. If the positions of the manipulator before and after its reinstallation are different, teaching points of all JOBs must be modified. Thus, positioning of the manipulator by using the reference hole or the reference plane is recommended.

Refer to fig. 3-2 “Mounting the Manipulator on Baseplate (GP8/AR700)”. 

3-4
3 Installation
3.2 Mounting Procedures for Manipulator Base

Fig. 3-2: Mounting the Manipulator on Baseplate (GP8/AR700)

- Hexagon socket head cap screw M10 (4 holes)
- Conical spring washer (M10)
- Anchor bolt (M10 or larger)
- Baseplate
- Manipulator base

View A
3 Installation
3.2 Mounting Procedures for Manipulator Base

<Optional: Manipulator Cable on the Bottom>
Prepare the base plate with an opening, as shown in the following figure, when the manipulator cable is on the bottom.

Fig. 3-2: Example of Manipulator Installation Base When the Manipulator Cable Is on the Bottom

Example of Manipulator Installation Base

When Installing Manipulator (Bottom View)
3 Installation

3.3 Mounting Method

The MOTOMAN-GP8/AR700, -GP7/AR900 are available in four ways: floor-mounted, wall-mounted, tilt-mounted and ceiling-mounted way. For wall-mounted, tilt-mounted and ceiling-mounted ways, the three points listed below are different from the floor-mounted way.

- S-axis Operating Range
- Precautions to Prevent the Manipulator from Falling

3.3.1 S-Axis Operating Range

For the wall-mounted way, the S-axis operating range is ±30°.

(Optional)

For the tilt-mounted way, the operating range of the S-axis varies as shown in the following table.

<table>
<thead>
<tr>
<th>Installation angle (θ)</th>
<th>Operating range of S-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0° ≤ θ ≤ 30°</td>
<td>within ±170° (no limit)</td>
</tr>
<tr>
<td>30° &lt; θ ≤ 35°</td>
<td>within ±60°</td>
</tr>
<tr>
<td>35° &lt; θ ≤ 45°</td>
<td>within ±45°</td>
</tr>
<tr>
<td>45° &lt; θ</td>
<td>within ±30°</td>
</tr>
</tbody>
</table>

Fig. 3-4: Installation Angle for Tilt-Mounted Way
3.3.2 Precautions to Prevent the Manipulator from Falling

For the wall- or ceiling-mounted ways, take appropriate measures to avoid the falling of the manipulator in case of emergency. Refer to fig. 3-5 “Precaution against Falling (GP8/AR700)” for details.

Fig. 3-5: Precaution against Falling (GP8/AR700)

- Hexagon socket head cap screw M10 (4 screws)
- Conical spring washer
- Tensile strength: 1200N/mm²

In case of using the wall-/ceiling-mounted way, inform YASKAWA of the matter when placing an order. Be sure to contact YASKAWA representative (listed on the back cover of this instruction manual) to execute a wall/ceiling installation on site.
3.4 Location

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

• Ambient Temperature: 0° to +45°C
• Humidity: 20 to 80% RH (non-condensing)
• Free from corrosive gas or liquid, or explosive gas or liquid.
• Free from excessive vibration (Vibration acceleration: 4.9 m/s² [0.5G] or less)
• Free from large electrical noise (plasma)
• Flatness for installation: 0.5 mm or less
• Free from the strong magnetic field
• 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 due to the resistance of the drive.
If the alarm occurs, perform the break-in for few minutes.
3 Installation

3.5 Notes on Dust-Proof/Water-Proof Specifications

The MOTOMAN-GP8/AR700, -GP7/AR900 manipulators conform to IP67.

**NOTE**

< Definition of IP (protection class) >

- Definition of IP6
  - IP6x: Protection from the entry of dust
- IP x7: Protection from immersion in water with being submerged for a specified duration and pressure.

However, the following precautions must be observed:

- Do not use the following liquids, because the rubber parts of the manipulator (gasket, oil seal, O-ring, etc.) may be deteriorated or corroded:
  - Organic solvent
  - Chlorine-based cutting fluid
  - Amine-based cleaning fluid
  - Corrosive substances such as acids or alkalis, or liquids/solutions causing rust
  - Other liquids/solutions to which nitrile-butadiene rubber (NBR) is not resistant
- After removing a gasket for parts replacement or maintenance/inspection, make sure to replace the gasket with a new one.
- Do not use cutting fluid or cleaning fluid which contains unknown chemical substances.
4 Wiring

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.
- Wiring must be performed by authorized or certified personnel. Failure to observe this caution may result in fire and/or electric shock.
- When laying the cables from the manipulator to the YRC1000, DO NOT cover the cable with heat insulating material and avoid multiple cabling. Failure to observe this caution may result in burn caused by cable heat emission failure.
4 Wiring
4.1 Grounding

Follow the electrical installation standards and wiring regulations for grounding. A ground wire of 5.5 mm² or more is recommended.

Refer to fig. 4-1 "Grounding Method (GP8/AR700, GP7/AR900)" to connect the ground line directly to the manipulator.

- 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 (GP8/AR700, GP7/AR900)
4.2 Cable Connection

Connect the both edge of the manipulator cable to the manipulator base connectors and to the YRC1000. Before connecting the cable to the manipulator, verify the numbers on the connector as shown in fig. 4-3 “Manipulator Cable for YRC1000”. For the connecting position, refer to fig. 4-4 “Manipulator Cable Connection (Manipulator Side)” and fig. 4-5 “Manipulator Cable Connection (YRC1000 Side)”. Refer to table 4-1 “Specifications of Manipulator Cable” and fig. 4-6 “Manipulator Cable Connection (Manipulator Side)” for the outside diameter and the minimum bending radius (for fixed part and moving part) of the manipulator cable and the details of the manipulator cable connection on the manipulator side.

- **Procedures for inserting the connector**
  1. Confirm the connector lever of the manipulator cable is at the initial position. Insert the cable straight into the connector on the back side of the YRC1000. Insert the manipulator cable to a fixed depth then the lever rotates about 30 degree forward automatically.
  2. Push the lever with hand and turn it (about 30 degree) until the lock is clicked.

- **Procedures for removing the connector**
  1. Release the lock by pushing the unlock part of the lever to unlock. Turn the lever about 60 degree to return to the initial position.
  2. Pull out the connector straight.

![Fig. 4-2: Connection of Manipulator Cable](image)

Inserting

- Initial position of lever
- Insert
- Rotate automatically

Removing

- Initial position of lever
- Rotate manually
- Push the unlock part

Pull out
4 Wiring
4.2 Cable Connection

Fig. 4-3: Manipulator Cable for YRC1000

Fig. 4-4: Manipulator Cable Connection (Manipulator Side)

Fig. 4-5: Manipulator Cable Connection (YRC1000 Side)
4 Wiring
4.2 Cable Connection

Table 4-1: Specifications of Manipulator Cable

<table>
<thead>
<tr>
<th>Outside diameter (mm)</th>
<th>Minimum bending radius (mm)</th>
<th>Distance between A and B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.1</td>
<td>90 Fixed part</td>
<td>260 Moving part</td>
</tr>
<tr>
<td></td>
<td>R 90 mm or more</td>
<td>350</td>
</tr>
</tbody>
</table>

Fig. 4-6: Manipulator Cable Connection (Manipulator Side)
## 5 Basic Specifications

### 5.1 Basic Specifications

**Table 5-1: Basic Specifications (GP8/AR700)**

<table>
<thead>
<tr>
<th>Item</th>
<th>MOTOMAN-GP8/AR700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Vertically Articulated</td>
</tr>
<tr>
<td>Payload</td>
<td>Wrist part: 8 kg, U-arm: 1 kg</td>
</tr>
<tr>
<td>Degree of freedom</td>
<td>6</td>
</tr>
<tr>
<td>Repeatability</td>
<td>±0.02 mm</td>
</tr>
<tr>
<td>Range of Motion</td>
<td>S-Axis (turning): -170° - +170° (On the wall: -30° - +30°)</td>
</tr>
<tr>
<td></td>
<td>L-Axis (lower arm): -65° - +145°</td>
</tr>
<tr>
<td></td>
<td>U-Axis (upper arm): -70° - +190°</td>
</tr>
<tr>
<td></td>
<td>R-Axis (wrist roll): -190° - +190°</td>
</tr>
<tr>
<td></td>
<td>B-Axis (wrist pitch/yaw): -135° - +135°</td>
</tr>
<tr>
<td></td>
<td>T-Axis (wrist twist): -360° - +360°</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td>S-Axis: 7.94 rad/s, 455°/s</td>
</tr>
<tr>
<td></td>
<td>L-Axis: 6.72 rad/s, 385°/s</td>
</tr>
<tr>
<td></td>
<td>U-Axis: 9.07 rad/s, 520°/s</td>
</tr>
<tr>
<td></td>
<td>R-Axis: 9.59 rad/s, 550°/s</td>
</tr>
<tr>
<td></td>
<td>B-Axis: 9.59 rad/s, 550°/s</td>
</tr>
<tr>
<td></td>
<td>T-Axis: 17.46 rad/s, 1000°/s</td>
</tr>
<tr>
<td>Allowable Moment</td>
<td>S-Axis: 17 Nm (1.73 kgf•m)</td>
</tr>
<tr>
<td></td>
<td>B-Axis: 17 Nm (1.73 kgf•m)</td>
</tr>
<tr>
<td></td>
<td>T-Axis: 10 Nm (1.02 kgf•m)</td>
</tr>
<tr>
<td>Allowable Inertia (GD²)</td>
<td>R-Axis: 0.5 kg•m²</td>
</tr>
<tr>
<td></td>
<td>B-Axis: 0.5 kg•m²</td>
</tr>
<tr>
<td></td>
<td>T-Axis: 0.2 kg•m²</td>
</tr>
<tr>
<td>Approx. Mass</td>
<td>32 kg</td>
</tr>
<tr>
<td>Protective enclosure</td>
<td>IP67</td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td>Temperature: 0 to 45°C</td>
</tr>
<tr>
<td></td>
<td>Humidity: 20 to 80% RH (non-condensing)</td>
</tr>
<tr>
<td></td>
<td>Vibration: 4.9 m/s² (0.5G) or less</td>
</tr>
<tr>
<td></td>
<td>Altitude: 1000 m or less</td>
</tr>
<tr>
<td></td>
<td>Others: Free from corrosive gas or liquid, or explosive gas. Free from excessive electrical noise (plasma). Free from strong magnetic field</td>
</tr>
<tr>
<td>Power Capacity</td>
<td>1 kVA</td>
</tr>
<tr>
<td>Applicable controller</td>
<td>YRC1000</td>
</tr>
<tr>
<td>Noise</td>
<td>75 dB or less</td>
</tr>
</tbody>
</table>

1 SI units are used in this table. However, gravitational unit is used in ( )
2 The load applied on the U-arm will vary depending on the load mass of the wrist part. For details, refer to chapter 7.1.1 “Allowable Load”.
3 Conformed to ISO6283.
4 Refer to fig. 6-1 “Moment Arm Rating” for details on the allowable inertia.
5 For the tilt,- and the wall-mounted ways, S-axis has the limited operating range. For details, refer to chapter 3.3.1 “S-Axis Operating Range”.
6 Conformed to equivalent continuous A-weighted sound pressure level measured in accordance with ISO11201(EN31201).
## 5.1 Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>MOTOMAN-GP7/AR900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td></td>
<td>Vertically Articulated</td>
</tr>
<tr>
<td>Degree of freedom</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Payload</td>
<td>Wrist part</td>
<td>7 kg</td>
</tr>
<tr>
<td></td>
<td>U-arm(2)</td>
<td>1 kg</td>
</tr>
<tr>
<td>Repeatability(3)</td>
<td></td>
<td>±0.03 mm</td>
</tr>
<tr>
<td>Range of Motion</td>
<td>S-Axis (turning)</td>
<td>-170° - +170° (On the wall: -30° - +30°)</td>
</tr>
<tr>
<td></td>
<td>L-Axis (lower arm)</td>
<td>-65° - +145°</td>
</tr>
<tr>
<td></td>
<td>U-Axis (upper arm)</td>
<td>-70° - +190°</td>
</tr>
<tr>
<td></td>
<td>R-Axis (wrist roll)</td>
<td>-190° - +190°</td>
</tr>
<tr>
<td></td>
<td>B-Axis (wrist pitch/yaw)</td>
<td>-135° - +135°</td>
</tr>
<tr>
<td></td>
<td>T-Axis (wrist twist)</td>
<td>-360° - +360°</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td>S-Axis</td>
<td>6.54 rad/s, 375°/s</td>
</tr>
<tr>
<td></td>
<td>L-Axis</td>
<td>5.50 rad/s, 315°/s</td>
</tr>
<tr>
<td></td>
<td>U-Axis</td>
<td>7.15 rad/s, 410°/s</td>
</tr>
<tr>
<td></td>
<td>R-Axis</td>
<td>9.59 rad/s, 550°/s</td>
</tr>
<tr>
<td></td>
<td>B-Axis</td>
<td>9.59 rad/s, 550°/s</td>
</tr>
<tr>
<td></td>
<td>T-Axis</td>
<td>17.45 rad/s, 1000°/s</td>
</tr>
<tr>
<td>Allowable Moment(4)</td>
<td>R-Axis</td>
<td>17 Nm (1.73 kgf•m)</td>
</tr>
<tr>
<td></td>
<td>B-Axis</td>
<td>17 Nm (1.73 kgf•m)</td>
</tr>
<tr>
<td></td>
<td>T-Axis</td>
<td>10 Nm (1.02 kgf•m)</td>
</tr>
<tr>
<td>Allowable Inertia (GD^2)</td>
<td>R-Axis</td>
<td>0.5 kgf•m^2</td>
</tr>
<tr>
<td></td>
<td>B-Axis</td>
<td>0.5 kgf•m^2</td>
</tr>
<tr>
<td></td>
<td>T-Axis</td>
<td>0.2 kgf•m^2</td>
</tr>
<tr>
<td>Approx. Mass</td>
<td></td>
<td>38 kg</td>
</tr>
<tr>
<td>Protective enclosure</td>
<td></td>
<td>IP67</td>
</tr>
<tr>
<td>Mounting method(5)</td>
<td></td>
<td>Floor-, wall-, tilt-, ceiling-mounted.</td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td>Temperature</td>
<td>0 to 45°C</td>
</tr>
<tr>
<td></td>
<td>Humidity</td>
<td>20 to 80% RH (non-condensing)</td>
</tr>
<tr>
<td></td>
<td>Vibration</td>
<td>4.9 m/s^2 (0.5G) or less</td>
</tr>
<tr>
<td></td>
<td>Altitude</td>
<td>1000 m or less</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>Free from corrosive gas or liquid, or explosive gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Free from excessive electrical noise (plasma)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Free from strong magnetic field</td>
</tr>
<tr>
<td>Power Capacity</td>
<td></td>
<td>1 kVA</td>
</tr>
<tr>
<td>Applicable controller</td>
<td></td>
<td>YRC1000</td>
</tr>
<tr>
<td>Noise(6)</td>
<td></td>
<td>75 dB or less</td>
</tr>
</tbody>
</table>

1. SI units are used in this table. However, gravitational unit is used in ( )
2. The load applied on the U-arm will vary depending on the load mass of the wrist part. For details, refer to chapter 7.1.1 “Allowable Load”.
3. Conformed to ISO9283.
4. Refer to fig. 6-1 “Moment Arm Rating” for details on the permissible moment of inertia.
5. For the tilt-, and the wall-mounted ways, S-axis has the limited operating range. For details, refer to chapter 3.3.1 “S-Axis Operating Range”.
6. Conformed to equivalent continuous A-weighted sound pressure level measured in accordance with ISO11201(EN31201)

1. Measurement is carried out when the maximum load is mounted to the manipulator and operated in the maximum speed.
2. Measurement is carried out:
   - between 1.2m and 1.5m above the ground.
   - 400mm away from the P-point maximum envelope.
5 Basic Specifications
5.2 Part Names and Working Axes

5.2 Part Names and Working Axes

Fig. 5-1: Part Names and Working Axes

GP8/AR700

GP7/AR900
5.3 Baseplate Dimensions

Fig. 5-2: Manipulator Base Dimensions
5.4 Dimensions and P-Point Maximum Envelope

Note 1: The hatched area in the P-point maximum envelope indicates the area where the P-point cannot reach when the mating connector in the casing cover is used or when air is used or when the optional solenoid valve is used.
5 Basic Specifications
5.4 Dimensions and P-Point Maximum Envelope

Fig. 5-3(b): GP7/AR900: Dimensions and P-Point Maximum Envelope (mm)
5.5 Stopping Distance and Time for S-, L-, and U-Axes

5.5.1 General Information

- The stopping distance is an angle traveled by the manipulator from the moment when the stop signal is activated until the manipulator comes to a complete standstill.
- The stopping time is a time elapsed from the moment that the stop signal is activated until the manipulator comes to a complete standstill.
- The data that are given for the main axes S, L and U are the maximum displacement.
- Superposed axes motions may result in longer stopping distance.
- Stopping distance and stopping time are measured in accordance with ISO 10218-1, Annex B.
- Stop categories: According to IEC60204-1
  - Stop category 0
  - Stop category 1

- The values specified for Stop category 0 are the reference values that are determined by tests and simulations. The actual stopping distance and stopping time may differ.

5.5.2 Definition of Use

| Load | Rated load weight and load on an arm |
| Speed | Operating speed of the manipulator |
| Extension | Distance between the rotation center and the P-point of each axis |

5.5.3 Stopping Distance and Time for Stop Category 0: S-, L- and U-Axes

Measurement Conditions

- Load: Maximum load
- Speed: Maximum speed
- Posture: Maximum inertia generation posture

<table>
<thead>
<tr>
<th>Axis</th>
<th>Stopping distance (deg)</th>
<th>Stopping Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-axis</td>
<td>35.5</td>
<td>0.533</td>
</tr>
<tr>
<td>L-axis</td>
<td>30.0</td>
<td>0.533</td>
</tr>
<tr>
<td>U-axis</td>
<td>54.1</td>
<td>0.721</td>
</tr>
</tbody>
</table>
5.5 Stopping Distance and Time for S-, L-, and U-Axes

5.5.4 Stopping Distance and Time for Stop Category 1: S-, L- and U-Axes

5.5.4.1 Extension

Refer to fig. 5-4 "S-Axis Extension", fig. 5-5 "L-Axis Extension" and fig. 5-6 "U-Axis Extension" for each axis arm extension.

Fig. 5-4: S-Axis Extension

Fig. 5-5: L-Axis Extension

Fig. 5-6: U-Axis Extension
5.5 Stopping Distance and Time for S-, L-, and U-Axes

Fig. 5-6: U-Axis Extension
5.5.4.2 Stopping Distance and Time for Stop Category 0: S-Axis (GP8/AR700)
5.5 Stopping Distance and Time for S-, L-, and U-Axes

5.5.4.3 Stopping Distance and Time for Stop Category 0: L-Axis (GP8/AR700)
5.5.4.4 Stopping Distance and Time for Stop Category 0: U-Axis (GP8/AR700)

* U-axis has only one posture for its structure. (* The extension 100% data only)
5.5.4.5 Stopping Distance and Time for Stop Category 0: S-Axis (GP7/AR900)
5 Basic Specifications
5.5 Stopping Distance and Time for S-, L-, and U-Axes

5.5.6 Stopping Distance and Time for Stop Category 0: L-Axis (GP7/AR900)
5.5.4.7 Stopping Distance and Time for Stop Category 0: U-Axis (GP7/AR900)

* U-axis has only one posture for its structure. (* The extension 100% data only)
5.5.4.8 Stopping Distance and Time for Stop Category 1 (GP8/AR700)

(a) S-axis

(b) L-axis

(c) U-axis
5.5 Stopping Distance and Time for S-, L-, and U-Axes

5.5.4.9 Stopping Distance and Time for Stop Category 1 (GP7/AR900)

(a) S-axis

(b) L-axis

(c) U-axis
5.6 Alterable Operating Range

The operating range of the S-axis can be altered in accordance with the operating conditions as shown in Table 5-3 “S-Axis Operating Range (GP8/AR700, GP7/AR900)”. If alteration is necessary, contact your YASKAWA representative in advance.

Table 5-3: S-Axis Operating Range (GP8/AR700, GP7/AR900)

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Axis Operating Range</td>
<td></td>
</tr>
<tr>
<td>-170° - +170° (standard)</td>
<td></td>
</tr>
<tr>
<td>-135° - +135°</td>
<td></td>
</tr>
<tr>
<td>-120° - +120°</td>
<td></td>
</tr>
<tr>
<td>-105° - +105°</td>
<td></td>
</tr>
<tr>
<td>-90° - +90°</td>
<td></td>
</tr>
<tr>
<td>-75° - +75°</td>
<td></td>
</tr>
<tr>
<td>-60° - +60°</td>
<td></td>
</tr>
<tr>
<td>-45° - +45°</td>
<td></td>
</tr>
<tr>
<td>-30° - +30°</td>
<td></td>
</tr>
<tr>
<td>-15° - +15°</td>
<td></td>
</tr>
</tbody>
</table>

5.6.1 Components for Altering Operating Range

Prepare the components listed in Fig. 5-7 “The Components of the S-Axis Stopper and Stopper Mounting Position.”, when modifying the angle of S-axis.

1. Plate (HW1306659-1) (2 plates)
2. Block (HW1408127-1) (1 block)
3. Block (HW1408127-2) (1 block)
4. Hexagon socket head cap screw M6 (length: 40 mm) (4 screws) (FA coat) (Tensile strength: 1200N/mm² or more)
5. Hexagon socket head cap screw M6 (length: 25 mm) (4 screws) (FA coat) (Tensile strength: 1200N/mm² or more)
6. Conical spring washer M6 (8 washers) (FA coat)
7. Hexagon socket head cap screw M8 (length: 16 mm) (2 screws) (FA coat) (Tensile strength: 1200N/mm² or more)
8. Conical spring washer M8 (2 washers) (FA coat)
5 Basic Specifications

5.6 Alterable Operating Range

Fig. 5-7: The Components of the S-Axis Stopper and Stopper Mounting Position.

<table>
<thead>
<tr>
<th>S-axis operating range</th>
<th>Stopper position</th>
</tr>
</thead>
<tbody>
<tr>
<td>-170° - +170°</td>
<td></td>
</tr>
<tr>
<td>-150° +150°</td>
<td>⑤</td>
</tr>
<tr>
<td>-135° +135°</td>
<td>⑥</td>
</tr>
<tr>
<td>-120° +120°</td>
<td>⑦</td>
</tr>
<tr>
<td>-105° +105°</td>
<td>⑧</td>
</tr>
<tr>
<td>-90° +90°</td>
<td>⑨</td>
</tr>
<tr>
<td>-75° +75°</td>
<td>⑩</td>
</tr>
<tr>
<td>-60° +60°</td>
<td>⑪</td>
</tr>
<tr>
<td>-45° +45°</td>
<td>⑫</td>
</tr>
<tr>
<td>-30° +30°</td>
<td>⑬</td>
</tr>
</tbody>
</table>

Section A-A Plate Mouting Position

Stopper position

Hexagon socket head cap screw M6
(length: 46 mm) (4 screws) (FA coat)
(Tensile strength: 1200 N/mm² or more)
Conical spring washer M6 (4 washers) (FA coat)
Tightening torque: 10 Nm (1.0 kgf·m)

Hexagon socket head cap screw M6
(length: 28 mm) (4 screws) (FA coat)
(Tensile strength: 1200 N/mm² or more)
Conical spring washer M6 (4 washers) (FA coat)
Tightening torque: 10 Nm (1.0 kgf·m)

HW1408127-1 (plate) (2 plates)

HW1408127-2 (block)

Mounting Example: GP8/AR700

Same for GP7/AR900

Tapped hole M8 (18 places)

Section A-A Plate Mouting Position

171.9° (Mechanical Limit)
5.6 Alterable Operating Range

5.6.2 Notes on the Mechanical Stopper Installation

When mounting the S-axis mechanical stopper, as shown in fig. 5-7 "The Components of the S-Axis Stopper and Stopper Mounting Position.", mount the HW1306659-1 (2 plates) and the HW1408127-1, HW1408127-2 (blocks) on the S-head (2 places) by using the screws specified in the fig. 5-7.

The mechanical stopper can be set at 30° pitch intervals from 30° to 150° range. For the settable angles, refer to table 5-4 "The Settable Angle for S-Axis Stopper".

1. Use the specified bolts when mounting the S-Axis mechanical stopper.
2. Turn OFF the electric power supply before mounting.

5.6.3 Adjustment to the Pulse Limitation of S-Axis

For altering the range of motion of S-Axis, refer to chapter 6.13 “Softlimit Setting Function” in “YRC1000 GENERAL OPERATOR’S MANUAL (RE-CSO-A051)”. With programming pendant, input the numeric value as shown in the following table to modify the parameter.

<table>
<thead>
<tr>
<th>Degree</th>
<th>±30°</th>
<th>±45°</th>
<th>±60°</th>
<th>±75°</th>
<th>±90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP8</td>
<td>±30720</td>
<td>±46080</td>
<td>±61440</td>
<td>±76800</td>
<td>±92160</td>
</tr>
<tr>
<td>GP7</td>
<td>±37236</td>
<td>±55855</td>
<td>±74473</td>
<td>±93091</td>
<td>±111709</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>±105°</th>
<th>±120°</th>
<th>±135°</th>
<th>±150°</th>
<th>±170°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP8</td>
<td>±107520</td>
<td>±122880</td>
<td>±138240</td>
<td>±153600</td>
<td>±174080</td>
</tr>
<tr>
<td>GP7</td>
<td>±130327</td>
<td>±148945</td>
<td>±167564</td>
<td>±186182</td>
<td>±211007</td>
</tr>
</tbody>
</table>

When modifying the range of motion for machinery, adjust both of the pulse limitation and the angle of S-axis mechanical stopper.
The settable angles for S-axis stopper are shown in table 5-4 "The Settable Angle for S-Axis Stopper".

Table 5-4: The Settable Angle for S-Axis Stopper
6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

The allowable payload of the wrist axis is 12 kg. However, the requirements listed in table 6-1 “Allowable Wrist Load (GP8/AR700, GP7/AR900)” must be satisfied regarding the moment and the inertia.

Even if the load is not applied as mass but applied as force, the values in table 6-1 must not be exceeded.

When the volume of the load is relatively small, refer to the moment arm rating (LB, LT) shown in fig. 6-1 “Moment Arm Rating”.

Each value of the allowable inertia above is calculated assuming that the moment load is at the maximum. Thus, in the case when only the inertia load is applied, when the moment load is small while the inertia load is large, or when the load is not applied as mass but applied as force, etc., contact your YASKAWA representative in advance.

When a tool is installed, the tool information and the load information must be set. For the setting, refer to chapter 8.3 “Tool Data Setting” and chapter 8.4 “ARM Control” in “YRC1000 INSTRUCTIONS (RE-CTO-A221)”.

Table 6-1: Allowable Wrist Load (GP8/AR700, GP7/AR900)

<table>
<thead>
<tr>
<th>Axis</th>
<th>Allowable moment Nm (kgf•m)</th>
<th>Allowable inertia (GD²/4) kgm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Axis</td>
<td>17 (1.73)</td>
<td>0.5</td>
</tr>
<tr>
<td>B-Axis</td>
<td>17 (1.73)</td>
<td>0.5</td>
</tr>
<tr>
<td>T-Axis</td>
<td>10 (1.02)</td>
<td>0.2</td>
</tr>
</tbody>
</table>

1 ( ): Gravitational unit

When the load is not applied as mass but applied as force, the values in table 6-1 must not be exceeded.

Fig. 6-1: Moment Arm Rating
6.2 Wrist Flange

The wrist flange dimensions are shown in fig. 6-2 "Wrist Flange (GP8/AR700, GP7/AR900)".

It is recommended that the attachment be mounted inside the fitting in order to identify the alignment marks. Fitting depth shall be 5 mm or less.

Fig. 6-2: Wrist Flange (GP8/AR700, GP7/AR900)

- Wash off anti-corrosive paint (yellow) on the wrist flange surface with thinner before mounting the tools.
- During initial operations, the lubricant may seep from the lip part of the oil seal. Wipe off the seeped lubricant with a cloth before use.
7 System Application

7.1 Peripheral Equipment Mounts

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

7.1.1 Allowable Load

The allowable load on the U-Axis are maximum of 9 kg for the GP8/AR700 and 8 kg for the GP7/AR900, including the wrist load. For instance, when the mass installed in the wrist point is 8 kg for the GP8/AR700, the mass which can be installed on the upper arm is 1 kg.

When a load is applied on the upper arm or the rotary head, the load setting must be performed. For setting procedures, refer to “YRC1000 INSTRUCTIONS (RE-CT0-A221) 8.4 ARM Control”.

CAUTION

- Do not make any additional holes or tapped holes on the manipulator’s body. Failure to observe this instruction may adversely affect the safety and/or performance of the manipulator.
- YASKAWA provides no guarantee against damages, malfunctions, failures, etc. caused by using any means other than the tapped holes shown in the following figure. The tightening bolts used for the mechanical parts of the manipulator must be used only to secure the mechanical parts. Do not additionally secure or attach any other things by using these tightening bolts.
7.1.2 Installation Position

The limitation on where to install the peripheral equipment is shown in fig. 7-1 “Installing Peripheral Equipment”.

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

Internal user I/O wiring harness (18 wires: 0.2 mm²) and two air lines are incorporated in the manipulator for the drive of the peripheral devices mounted on the upper arm as shown in fig. 7-2 "Connectors for Internal User I/O Wiring Harness and Air Line (Standard, Corrosion-Proof, or Food-Grade Grease Specifications)".

The connector pins 1 to 18 are assigned as shown in fig. 7-3 "Details of the Connector Pin Numbers (Standard, Corrosion-Proof, or Food-Grade Grease Specifications)".

Note that the number of pins used for internal user I/O wiring harness and the inside diameter and number of air hoses are different for optional specifications. For details, refer to fig. 7-4 "Connectors for Internal User I/O Wiring Harness and Air Line (When the Connector for Internal User I/O Wiring Harness Is on the U-Arm)", fig. 7-5 "Details of the Connector Pin Numbers (When the Connector for Internal User I/O Wiring Harness Is on the U-Arm)", fig. 7-6 "Connectors for Internal User I/O Wiring Harness and Air Line (with the Manipulator Cable on the Bottom)", fig. 7-7 "Details of the Connector Pin Numbers (with the Manipulator Cable on the Bottom)", fig. 7-8 "Connectors for Internal User I/O Wiring Harness and Air Line (with the Built-In Solenoid Valve)", and fig. 7-9 "Details of the Connector Pin Numbers (with the Built-In Solenoid Valve)".

For the internal piping diagram of the built-in solenoid valve, refer to fig. 7-10 "Internal Piping Diagram (With the Built-In Solenoid Valve)".

Wiring must be performed by users.

The operating conditions are shown in the following table.

<table>
<thead>
<tr>
<th>Description</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>The allowable current for internal user I/O wiring harness</td>
<td>2.5 A or less for each wire (The total current value for pins 1 to 18 must be 40 A or less.)</td>
</tr>
<tr>
<td>The maximum pressure for the air line</td>
<td>490 kPa (5 kgf/cm²) or less</td>
</tr>
<tr>
<td>The range of temperature for the use of the air line</td>
<td>0°C to +45°C</td>
</tr>
</tbody>
</table>
Fig. 7-2: Connectors for Internal User I/O Wiring Harness and Air Line (Standard, Corrosion-Proof, or Food-Grade Grease Specifications)

- **GP8/AR700**
  - Air supply port (2 ports): Tapped hole M5 with pipe plug
  - Air outlet (2 ports): Tapped hole M5 with pipe plug
  - Air inlet (2 inlets): Tapped hole PT1/4 with pipe plug
  - Connector for internal user I/O wiring harness: LF13WBRB-20S
  - Prepare pin connector LF13WBLP-20P*HIROSE*.

- **GP7/AR900**
  - Air supply port (2 ports): Tapped hole M5 with pipe plug
  - Air outlet (2 outlets): Tapped hole M5 with pipe plug
  - Air inlet (2 inlets): Tapped hole PT1/4 with pipe plug
  - Connector for internal user I/O wiring harness: LF13WBRB-20S
  - Prepare pin connector LF13WBLP-20P*HIROSE*.

Note: When the mating connector is used, the P-point cannot reach the hatched area in fig. 5-3(a).
7 System Application
7.2 Internal User I/O Wiring Harness and Air Lines

*Fig. 7-3: Details of the Connector Pin Numbers
(Standard, Corrosion-Proof, or Food-Grade Grease Specifications)*

![Diagram showing Connector Base (View B) and Casing (View A)]
7 System Application
7.2 Internal User I/O Wiring Harness and Air Lines

Fig. 7-4: Connectors for Internal User I/O Wiring Harness and Air Line
(When the Connector for Internal User I/O Wiring Harness Is on the U-Arm)

GP8/AR700

Air supply port (2 ports):
Tapped hole M5 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

Connector for internal user
I/O wiring harness: LF13WBB-20S
Prepare pin connector
LF13WBP-20PA*HIROSE*

Connector for internal user
I/O wiring harness: LF13WBB-20S
Prepare socket connector
LF13WBP-20SS*HIROSE*

Air inlet (2 inlets):
Tapped hole PT1/4 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

View A

GP7/AR900

Air supply port (2 ports):
Tapped hole M5 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

Connector for internal user
I/O wiring harness: LF13WBB-20S
Prepare pin connector
LF13WBP-20PA*HIROSE*

Connector for internal user
I/O wiring harness: LF13WBB-20S
Prepare socket connector
LF13WBP-20SS*HIROSE*

Air inlet (2 inlets):
Tapped hole PT1/4 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

View B

View A

GP8/AR700

Air supply port (2 ports):
Tapped hole M5 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

Connector for internal user
I/O wiring harness: LF13WBB-20S
Prepare pin connector
LF13WBP-20PA*HIROSE*

Connector for internal user
I/O wiring harness: LF13WBB-20S
Prepare socket connector
LF13WBP-20SS*HIROSE*

Air inlet (2 inlets):
Tapped hole PT1/4 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

View B

View A

GP7/AR900

Air supply port (2 ports):
Tapped hole M5 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

Connector for internal user
I/O wiring harness: LF13WBB-20S
Prepare pin connector
LF13WBP-20PA*HIROSE*

Connector for internal user
I/O wiring harness: LF13WBB-20S
Prepare socket connector
LF13WBP-20SS*HIROSE*

Air inlet (2 inlets):
Tapped hole PT1/4 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

View B

View A
7.2 Internal User I/O Wiring Harness and Air Lines

Fig. 7-5: Details of the Connector Pin Numbers
(When the Connector for Internal User I/O Wiring Harness Is on the U-Arm)

- Connector Base (View B)
- Casing (View A)

Internal User I/O Wiring Harness: 0.2 mm² (16 wires)
7 System Application
7.2 Internal User I/O Wiring Harness and Air Lines

Fig. 7-6: Connectors for Internal User I/O Wiring Harness and Air Line (with the Manipulator Cable on the Bottom)

Connector for internal user I/O wiring harness: LF13WBRB-20P
Prepare pin connector LF13WBLP-20PA*HIROSE*

Air supply port (2 ports):
Tapped hole M5 with pipe plug

Air outlet (2 outlets):
Tapped hole M5 with pipe plug

Note: When the mating connector is used, the P-point cannot reach the hatched area in fig. 5-3(a).

Air inlet (2 inlets):
Tapped hole PT1/4 with pipe plug

Note: When air is used, the P-point cannot reach the hatched area in fig. 5-3(a).

GP8/AR700
View A
View B

GP7/AR900
View A
View B
7 System Application
7.2 Internal User I/O Wiring Harness and Air Lines

Fig. 7-7: Details of the Connector Pin Numbers
(with the Manipulator Cable on the Bottom)

Connector Base (View B)

Casing (View A)

Internal User I/O Wiring Harness: 0.2 mm² (18 wires)
Fig. 7-8: Connectors for Internal User I/O Wiring Harness and Air Line (with the Built-In Solenoid Valve)

Air outlet: with silencer (air from the solenoid valve)

Air outlet:
Tapped hole M5 with pipe plug

Connector for internal user
I/O wiring harness: LF15WBRB-20S
Prepare pin connector LF13WBLP-20PA*HIROSE*

Air inlet (to the U-arm)
PT1/4 with pipe plug

Air inlet (to the Solenoid Valve)
PT1/4 with pipe plug

Air supply ports (up to 6 ports)
1 pair of valves: 2 ports (1A, 1B)
2 pairs of valves: 4 ports (1A, 1B, 2A, 2B)
3 pairs of valves: 6 ports (1A, 1B, 3A, 3B, 2A, 2B)

Note: When the optional solenoid valve is used, the P-point cannot reach the hatched area in fig. 5-3(a).

Air supply ports (up to 6 ports)
1 pair of valves: 2 ports (1A, 1B)
2 pairs of valves: 4 ports (1A, 1B, 2A, 2B)
3 pairs of valves: 6 ports (1A, 1B, 3A, 3B, 2A, 2B)

GP8/AR700

Air outlet: Tapped hole M5 with pipe plug

Connector for internal user
I/O wiring harness: LF15WBRB-20S
Prepare socket connector LF13WBLP-20S*HIROSE*

Air supply port (6 ports), air outlet for the solenoid valve:
Tapped hole M5 with pipe plug

Air supply port (2 ports):
Tapped hole M5 with pipe plug

View A

View B

View C

GP7/AR900

Air supply port (6 ports), air outlet for the solenoid valve:
Tapped hole M5 with pipe plug

Air supply port (2 ports):
Tapped hole M5 with pipe plug

Connector for internal user
I/O wiring harness: LF15WBRB-20S
Prepare pin connector LF13WBLP-20PA*HIROSE*

Air outlet:
Air outlet (to the U-arm)
PT1/4 with pipe plug

Air outlet:
Tapped hole M5 with pipe plug

View A

View B

View C
7 System Application
7.2 Internal User I/O Wiring Harness and Air Lines

Fig. 7-9: Details of the Connector Pin Numbers (with the Built-In Solenoid Valve)

Connector Base (View B)

For the solenoid valve

1 pair

U-Arm (View C)

For the user

S1

Internal User I/O Wiring Harness: 0.2 mm² (10 wires)

2 pairs

Internal User I/O Wiring Harness: 0.2 mm² (7 wires)

3 pairs

Internal User I/O Wiring Harness: 0.2 mm² (14 wires)
7 System Application
7.2 Internal User I/O Wiring Harness and Air Lines

Fig. 7-10: Internal Piping Diagram (With the Built-In Solenoid Valve)

- Built-In Solenoid Valve: 3-Ream Specification
- Built-In Solenoid Valve: 2-Ream Specification
- Built-In Solenoid Valve: 1-Ream Specification

Connector base

Inside diameter: 4.0 mm

Double-solenoid
Rated voltage: 24 V
(Max. 3 solenoids)

Inside diameter: 2.5 mm
Inside diameter: 2.0 mm

Pin No. 1 to 7
Pin No. 10 to 16

Built-In Solenoid Valve: 3-Ream Specification
Built-In Solenoid Valve: 2-Ream Specification
Built-In Solenoid Valve: 1-Ream Specification

Air outlet
Casing

Inside diameter: 4.0 mm
Inside diameter: 2.5 mm
Inside diameter: 2.0 mm

U-arm

Pin No. 10 to 16
8 Electrical Equipment Specification

8.1 Position of Servo ON Lamp

Servo ON lamp is an optional. For its location, refer to fig. 8-1 “Servo ON Lamp”.

Fig. 8-1: Servo ON Lamp
8.2 Internal Connections

Diagrams for internal connections of the manipulator and the YRC1000 are shown in fig. 8-2(a) “Internal Connection Diagram for YRC1000 (GP8/AR700, GPT/AR900)”, fig. 8-2(b) “Internal Connection Diagram for YRC1000 (GP8/AR700, GPT/AR900)”
Fig. 8-2(a): Internal Connection Diagram for YRC1000 (GP8/AR700, GP7/AR900)
8.1 Internal Connections

Fig. 8-2(b): Internal Connection Diagram for YRC1000 (GP8/AR700, GP7/AR900)

Note:
- The part labeled A is different when the connector for internal user I/O wiring harness is on the U-arm.
- Specifications for part A when the connector for internal user I/O wiring harness is on the U-arm.
9 Maintenance and Inspection

9.1 Inspection Schedule

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 9-1 “GP8/AR700, GP7/AR900 Inspection Items”.

In table 9-1, the inspection items are categorized by types of operations: operations which can be performed by personnel authorized by the user, operations to be performed by trained personnel, and operations to be performed by service company personnel. Only specified personnel shall perform the inspection work.

- The inspection interval must be based on the servo power supply on time.
- The following inspection schedule is based on the case where the manipulator is used for arc welding application. If the manipulator is used for other application or if it is used under special conditions, a case-by-case examination is required. The inspection may be conducted at shorter intervals if the manipulator is used very frequently for the application such as handling, in this case, contact your YASKAWA representative.

DANGER
- Do not remove the motor, and do not release the brake.
Failure to observe this caution may result in death or serious injury from unexpected turning of the manipulator’s arm.

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.

NOTICE
- 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.
<table>
<thead>
<tr>
<th>Items</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Alignment mark</td>
<td>Daily</td>
<td>Visual</td>
<td>Check alignment mark accordance at the home position. Check for damage.</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
<tr>
<td>2 Working area and manipulator</td>
<td>1000hrs/Cycle</td>
<td>Visual</td>
<td>Clean the work area if dust or spatter is present. Clean the seeped oil or etc. Check for damage and outside cracks.</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
<tr>
<td>3 Baseplate mounting bolts</td>
<td>Spanner Wrench</td>
<td>Tense loose bolts. Replace if necessary.</td>
<td>Specified Personnel, Licensee, Service Company</td>
<td></td>
</tr>
<tr>
<td>4 Cover mounting screws</td>
<td>Screwdriver</td>
<td>Visual</td>
<td>Check for damage and outside cracks.</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
<tr>
<td>5 Connector base</td>
<td>Manual</td>
<td>Visual</td>
<td>Check for loose connectors.</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
<tr>
<td>6 Connector of manipulator cable</td>
<td>Manual</td>
<td>Visual</td>
<td>Check for loose connectors.</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
<tr>
<td>7 L, U, R, B, T-axis timing belt</td>
<td>Manual</td>
<td>Visual</td>
<td>Check the tension and the condition. Replace if necessary.</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
<tr>
<td>8 Wire harness in manipulator</td>
<td>Visual Multimeter</td>
<td>Visual</td>
<td>Check for conduction between the main connector of base and intermediate connector with manually shaking the wire. Check for wear of protective spring</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
<tr>
<td>9 Battery pack in manipulator</td>
<td>Replace</td>
<td></td>
<td>Replace the battery pack when the battery alarm occurs or the manipulator drove for 24000H.</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
<tr>
<td>10 S-axis speed reducer S-axis gear</td>
<td>Injection Syringe</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>Specified Personnel, Licensee, Service Company</td>
<td></td>
</tr>
<tr>
<td>11 LU-axes speed reducers</td>
<td>Injection Syringe</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>Specified Personnel, Licensee, Service Company</td>
<td></td>
</tr>
</tbody>
</table>
9.1 Inspection Schedule

1. The numbers in the above table correspond to the numbers in table 9-1 "GP8/AR700, GP7/AR900 Inspection Items".

2. R-axis speed reducer
   - Injection Syringe Check for malfunction. (Replace if necessary.)
   - Supply grease (12000H cycle).
   - See chapter 9.4.5

3. BT-axes speed reducers
   - Injection Syringe Check for malfunction. (Replace if necessary.)
   - Supply grease (12000H cycle).
   - See chapter 9.4.6

4. Overhaul
   - Inspection No. correspond to the numbers in fig. 9-1(a) "GP8/AR700: Inspection Items" and fig. 9-1(b) "GP7/AR900: Inspection Items".

   - Due to the operating conditions or the ambient environment, the oil may seep from the lip part of the oil seal and adhere to the outside of the lip part.
   - The seeped oil may accumulate and fall in drops depending on the operation. Before the operation, clean the oil in the lower side of the oil seal of sliding parts to prevent the seeped oil from accumulating. Frequent reverse motions or operations under a high-temperature environment may lead to a high temperature of the motor and the oil may seep due to a rise in the internal pressure of the grease bath. In that case, release the grease inlet immediately after completing the operation to lower the internal pressure. (When releasing the grease inlet, ensure that grease does not scatter.)
   - Wire harness in manipulator to be replaced at 24000H inspection.
   - For the grease, refer to table 9-2 "Inspection Parts and Grease Used (GP8/AR700, GP7/AR900)".

Table 9-1: GP8/AR700, GP7/AR900 Inspection Items (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Items</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td>1000H cycle</td>
<td>12000H cycle</td>
<td>24000H</td>
</tr>
<tr>
<td>12</td>
<td>R-axis speed reducer</td>
<td>Injection Syringe</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>Supply grease (12000H cycle).</td>
</tr>
<tr>
<td>13</td>
<td>BT-axes speed reducers</td>
<td>Injection Syringe</td>
<td>Check for malfunction. (Replace if necessary.)</td>
<td>Supply grease (12000H cycle).</td>
</tr>
<tr>
<td>14</td>
<td>Overhaul</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9-2: Inspection Parts and Grease Used (GP8/AR700, GP7/AR900)

<table>
<thead>
<tr>
<th>No.</th>
<th>Grease Used</th>
<th>Inspected Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>8, 9, 10, 11</td>
<td>Harmonic Grease SK-1A</td>
<td>S, L, U, R, B and T-axes speed reducers, T- and S-axes gears</td>
</tr>
</tbody>
</table>

The numbers in the above table correspond to the numbers in table 9-1 "GP8/AR700, GP7/AR900 Inspection Items".
9 Maintenance and Inspection
9.1 Inspection Schedule

Fig. 9-1(a): GP8/AR700: Inspection Items
9 Maintenance and Inspection
9.1 Inspection Schedule
9.2 Notes for Maintenance

9.2.1 Figure of Arm

The motor, the battery pack and the belt drive part are located in the L-arm and the U-arm. To avoid fumes caused by liquid or welding operations, the jointed faces of the U-arm's cover are sealed with a gasket. If the cover is removed during the maintenance operation, make sure to replace the gasket. (Refer to Table 10-1 "Spare Parts for the YR-1-06VX9-A00/B00")

Fig. 9-2: Sealing Part of L-arm

![Diagram of L-arm sealing part]

Example: GP8/AR700
*Same for GP7/AR900

Fig. 9-3: Sealing Part of U-arm

![Diagram of U-arm sealing part]

Example: GP8/AR700
*Same for GP7/AR900
9.2 Notes for Maintenance

9.2.2 Multi-Port Connector

Three multi-port connectors (refer to fig. 9-4 “Multi-Port Connector”) for the motor signals are mounted on each part of the manipulator. (For the locations, refer to fig. 9-6 “Locations of the Battery and Multi-port Connector”)

The multi-port connector has four ports: two for the motor and the other two for the wire harness. (Refer to fig. 9-5 “Wiring of Multi-port Connector Part”)

When disconnecting the connector of the multi-port connector during the battery replacement, be careful not to disconnect the connector between the motor and the multi-port connector. If the connector between the motor and the multi-port connector is disconnected, the encoder absolute data disappears.

Fig. 9-4: Multi-Port Connector

Fig. 9-5: Wiring of Multi-port Connector Part
9.3 Notes on Maintenance Procedures

9.3.1 Battery Pack Replacement

Each of the three battery packs are located in the positions shown in fig. 9-6 “Locations of the Battery and Multi-port Connector” with the multi-port connector connectors.

When the battery alarm message is shown on the programming pendant, replace the battery pack in accordance with the following two methods. Perform the replacement by referring to chapter 9.2 “Notes for Maintenance”.

Fig. 9-6: Locations of the Battery and Multi-port Connector
9.3 Notes on Maintenance Procedures

- **Normal (The control power supply of the YRC1000 can be turned ON)**

Fig. 9-7: Battery connection (the control power supply of the YRC1000 can be turned ON)

1. Turn ON the control power supply of the YRC1000 and turn OFF the servo power.

![Diagram showing battery connection](HW1483880-A)

**DANGER**

- Make sure to perform the battery replacement with the emergency stop button being pressed.

Failure to observe this instruction may cause improper movement of the manipulator which may result in personal injury and/or equipment damage.

2. Loosen the cover mounting bolt and remove the cover.
3. The old battery pack is fixed with the protective tube and the cable tie. Cut the cable tie to remove the old battery pack from the protective tube.
4. Remove the old battery pack from the multi-port connector and mount the new battery pack.
5. After placing the new battery pack into the protective tube, fix it with the cable tie T18L.
6. Tighten the cover mounting bolt by using the tightening torque shown in fig. 9-6 “Locations of the Battery and Multi-port Connector” to reinstall the cover.

**NOTE**

When reinstalling the cover, be careful not to get caught the cable.
When the control power supply of the YRC1000 cannot be turned ON

1. Prepare the lead for battery replacement (HW1471281-A) and the battery pack for backup. (Apart from the new battery pack for replacement, prepare the battery pack for backup)
2. Loosen the cover mounting bolt and remove the cover.
3. Remove the connector from the “IN” port of the multi-port connector. Connect the lead for battery replacement to the “IN” port of the multi-port connector.
4. Connect the battery pack for backup to the lead for battery replacement.
5. The old battery pack is fixed with the protective tube and the cable tie. Cut the cable tie to remove the old battery pack from the protective tube.
6. Remove the old battery pack from the multi-port connector and mount the new battery pack.
7. After placing the new battery pack into the protective tube, fix it with the cable tie T18L.
8. Remove the lead for battery replacement and the battery pack for backup from the multi-port connector, connect the connector which has been removed in no.3 of this procedure to the “IN” connector again.
9. Tighten the cover mounting bolt by using the tightening torque shown in fig. 9-6 “Locations of the Battery and Multi-port Connector” to reinstall the cover.

Before removing the old battery pack, make sure to connect the battery pack for backup to prevent the encoder absolute data from disappearing.

When reinstalling the cover, be careful not to get caught the cable.
9.4 Notes on Grease Replenishment Procedures

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

- A injection syringe is one of recommended spare parts for grease replenishment. Do not replenish grease by using the grease pump.
- Soften the grease in a injection syringe by stirring or etc., and fill the necessary amount.
- If the replenishment is performed more than the specified numbers, the internal pressure may rise during the operation and the grease leakage may occur.
- When filling, grease may flow from the inlet. Make sure to prepare a cloth or etc. to wipe off grease and the container which receives grease.
9.4 Notes on Grease Replenishment Procedures

9.4.1 Grease Replenishment for S-Axis Speed Reducer

Fig. 9-9: S-Axis Speed Reducer Diagram (GP8/AR700, GP7/AR900)

9.4.1.1 Grease Replenishment

(Refer to fig. 9-9 "S-Axis Speed Reducer Diagram (GP8/AR700, GP7/AR900)".)

Replenish the grease in accordance with the following procedure:

1. Adjust the posture of the manipulator to perform grease replenishment smoothly.
2. Remove the hexagon socket head cap screw M6 from the grease inlet.
3. Install the injection syringe for replenishment to the grease inlet.
   (The injection syringe is a recommended spare part.)
4. Inject the grease into the grease inlet.
   - Grease type: Harmonic Grease SK-1A
   - Amount of grease: 3 g
5. Remove the injection syringe for replenishment from the grease inlet.
   Install the hexagon socket head cap screw M6 to the grease inlet.
   When installing the bolts, apply Three Bond 1206C to the threading part of the screw.
9.4.2 Grease Replenishment for S-Axis Gear

Fig. 9-10: S-Axis Gear Diagram

9.4.2.1 Grease Replenishment

(Refer to fig. 9-10 "S-Axis Gear Diagram").

Replenish the grease in accordance with the following procedure:

1. Adjust the posture of the manipulator to perform grease replenishment smoothly.
2. Remove the hexagon socket head cap screw M6 from the grease inlet.
3. Install the injection syringe for replenishment to the grease inlet.
   (The injection syringe is a recommended spare part.)
4. Inject the grease into the grease inlet.
   - Grease type: Harmonic Grease SK-1A
   - Amount of grease: 3 g
5. Remove the injection syringe for replenishment from the grease inlet.
   Install the hexagon socket head cap screw M6 to the grease inlet.
   When installing the bolts, apply Three Bond 1206C to the threading part of the screw.
9.4 Notes on Grease Replenishment Procedures

9.4.3 Grease Replenishment for L-Axis Speed Reducer

**Fig. 9-11(a):** L-Axis Speed Reducer Diagram (GP8/AR700)

- Grease inlet
- Hexagon socket head cap screw M6
- Tightening torque: 5.0 Nm (0.51 kgf·m)
- L-axis motor
- L-axis speed reducer

**Fig. 9-11(b):** L-Axis Speed Reducer Diagram (GP7/AR900)

- Grease inlet
- Hexagon socket head cap screw M6
- Tightening torque: 5.0 Nm (0.51 kgf·m)
- L-axis motor
- L-axis speed reducer
9.4 Notes on Grease Replenishment Procedures

9.4.3.1 Grease Replenishment (GP8/AR700, GP7/AR900)

(Refer to fig. 9-11(a) "L-Axis Speed Reducer Diagram (GP8/AR700)", fig. 9-11(b) "L-Axis Speed Reducer Diagram (GP7/AR900)")

1. Adjust the posture of the manipulator to perform grease replenishment smoothly.
2. Take off the cover to remove the hexagon socket head cap screw M6 from the grease inlet.
3. Install the injection syringe for replenishment to the grease inlet.
   (The injection syringe is a recommended spare part.)
4. Inject grease into the grease inlet.
   – Grease type: Harmonic Grease SK-1A
   – Amount of grease: 3 g
5. Remove the injection syringe for replenishment from the grease inlet.
   Install the hexagon socket head cap screw M6 to the grease inlet. When installing the bolts, apply Three Bond 1206C to the threading part of the screw.
9.4.4 Grease Replenishment for U-Axis Speed Reducer

Fig. 9-12: U-Axis Speed Reducer Diagram (GP8/AR700, GP7/AR900)

9.4.4.1 Grease Replenishment

(Refer to “fig. 9-12 “U-Axis Speed Reducer Diagram (GP8/AR700, GP7/AR900)”. )

1. Adjust the posture of the manipulator to perform grease replenishment smoothly.
2. Take off the cover to remove the hexagon socket head cap screw M6 from the grease inlet.
3. Install the injection syringe for replenishment to the grease inlet.
   (The injection syringe is a recommended spare part.)
4. Inject grease into the grease inlet.
   - Grease type: Harmonic Grease SK-1A
   - Amount of grease: 1.5 g
5. Remove the injection syringe for replenishment from the grease inlet.
   Install the hexagon socket head cap screw M6 to the grease inlet.
   When installing the bolts, apply Three Bond 1206C to the threading part of the screw.
9.4.5 Grease Replenishment for R-Axis Speed Reducer

Fig. 9-13: R-Axis Speed Reducer Diagram

1. Adjust the posture of the manipulator to perform grease replenishment smoothly.
2. Remove the hexagon socket head cap screw M5 from the grease inlet.
3. Inject grease into the grease inlet.
   - Grease type: Harmonic Grease SK-1A
   - Amount of grease: 1 g
4. Install the hexagon socket head cap screw M6 to the grease inlet.
   - When installing the bolts, apply Three Bond 1206C to the threading part of the screw.
9.4 Notes on Grease Replenishment Procedures

9.4.6 Grease Replenishment for B- and T-Axes Speed Reducers

Fig. 9-14: B- and T-Axes Speed Reducers Diagram (GP8/AR700, GP7/AR900)

9.4.6.1 Grease Replenishment for B-Axis

1. Adjust the posture of the manipulator to perform grease replenishment smoothly.
2. Remove the plug LP-M5 from the grease inlet.
3. Install the injection syringe for replenishment to the grease inlet. (The injection syringe is a recommended spare part.)
4. Inject grease into the grease inlet.
   - Grease type: Harmonic Grease SK-1A
   - Amount of grease: 1 g
5. Install the plug LP-M5 to the grease inlet.
9.4.6.2 Grease Replenishment for T-Axis

(Refer to fig. 9-14 “B- and T-Axes Speed Reducers Diagram (GP8/AR700, GP7/AR900)”.)

1. Adjust the posture of the manipulator to perform grease replenishment smoothly.

2. Remove the hexagon socket head cap screw M4 and the plug LP-M5 from the grease inlet.

3. Install the injection syringe for replenishment to the grease inlet.
   (The injection syringe is a recommended spare part.)

4. Inject grease into the grease inlet.
   - Grease type: Harmonic Grease SK-1A
   - Amount of grease: 1 g

5. Remove the injection syringe for replenishment from the grease inlet.
   Install the screw and the plug to the grease inlet.
   When installing the bolts, apply Three Bond 1206C to the threading part of the screw.
10 Recommended Spare Parts

It is recommended to keep the parts and components in the following table in stock as spare parts for the MOTOMAN-GP8/AR700, -GP7/AR900.

To purchase lead wires of the wire harness or etc., check the order/ manufacture no. and contact YASKAWA representative.

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

NOTE

For replacing parts in rank B or rank C, contact your YASKAWA representative.

Table 10-1: Spare Parts for the YR-1-06VX8-A00(B00) (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Inquiry Code</th>
<th>Manufacturer</th>
<th>Qty. per Unit</th>
<th>Remarks</th>
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<tr>
<td>A</td>
<td>1</td>
<td>Grease</td>
<td>Harmonic Grease SK-1A</td>
<td>Harmonic Drive Systems Co., Ltd.</td>
<td>2.5 kg</td>
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<tr>
<td>A</td>
<td>2</td>
<td>Adhesive</td>
<td>LOCTITE 518</td>
<td>Henkel Japan Ltd.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Liquid gasket</td>
<td>TB1206C</td>
<td>ThreeBond Co., Ltd.</td>
<td>1</td>
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</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Battery pack</td>
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<td>YASKAWA Electric Corporation</td>
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<tr>
<td>A</td>
<td>5</td>
<td>Lead wire for battery replacement</td>
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<tr>
<td>A</td>
<td>6</td>
<td>Gasket</td>
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<td>YASKAWA Electric Corporation</td>
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<tr>
<td>A</td>
<td>7</td>
<td>Gasket</td>
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<td>YASKAWA Electric Corporation</td>
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<td>For the L-arm cover</td>
</tr>
<tr>
<td>A</td>
<td>8</td>
<td>Gasket</td>
<td>HW1406931-1</td>
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<tr>
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<td>B</td>
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<tr>
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### Table 10-1: Spare Parts for the YR-1-06VX8-A00(B00) (Sheet 2 of 2)

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<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Inquiry Code</th>
<th>Manufacturer</th>
<th>Qty. per Unit</th>
<th>Remarks</th>
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<td>Teubakimoto Chain Co.</td>
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<tr>
<td>B</td>
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<td>Replacement kit for S-axis speed reducer</td>
<td>Y005C-06VX8A00S</td>
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<td>B</td>
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<tr>
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<td>18</td>
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<tr>
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<tr>
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<tr>
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<tr>
<td>C</td>
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<td>Bypass cable</td>
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<tr>
<td>C</td>
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<td>SGM7J-04APK-YR1*</td>
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<td>Lead wire between S-axis motor and the multi-port connector</td>
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# 10 Recommended Spare Parts

## Table 10-2: Spare Parts for the YR1-06VX7-A00(B00) (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Inquiry Code</th>
<th>Manufacturer</th>
<th>Qty. per Unit</th>
<th>Qty.</th>
<th>Remarks</th>
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<tr>
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<td>Adhesive</td>
<td>LOCTITE 518</td>
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<tr>
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Table 10-2: Spare Parts for the YR-1-06VX7-A00(B00) (Sheet 2 of 2)

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<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Inquiry Code</th>
<th>Manufacturer</th>
<th>Qty. per Unit</th>
<th>Remarks</th>
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<td>Signal cable for temporary restoration in case of failure</td>
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<tr>
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<td>25</td>
<td>S- and L-axis AC servomotor</td>
<td>SGM7J-04APK-YR1*</td>
<td>YASKAWA Electric Corporation</td>
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<td>2</td>
</tr>
<tr>
<td>C</td>
<td>26</td>
<td>U-axis AC servomotor</td>
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<td>1</td>
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<td>1</td>
<td>1 For the axes detachment function</td>
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MOTOMAN-GP8/AR700, -GP7/AR900

INSTRUCTIONS

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