

# MOTOMAN-EPX1750 and EPX2050 INSTRUCTIONS

**TYPE:****YR-EPX1750-B5\*\*****YR-EPX2050-B5\*\***

---

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

---

**MOTOMAN INSTRUCTIONS****MOTOMAN-EPX1750 & EPX2800 INSTRUCTIONS****NX100 INSTRUCTIONS****NX100 INSTRUCTIONS (EPX INSTRUCTION SUPPLEMENTS)****NX100 OPERATOR'S MANUAL FOR PAINTING****NX100 MAINTENANCE MANUAL**

The NX100 operator's manual above corresponds to specific usage.  
Be sure to use the appropriate manual.

**Part Number: 154771-1CD****Revision: 2**

Copyright © 2015, Yaskawa America, Inc.

#### Terms of Use and Copyright Notice

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

Printed in the United States of America

First Printing, 2015

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

[www.motoman.com](http://www.motoman.com)

 **MANDATORY**

- This manual describes the specifications, precautions for operation and required items for maintenance or inspections, for proper application of the MOTOMAN EPX1750 & EPX2050. Read this manual carefully and be sure to understand its contents before handling the MOTOMAN.
- General items related to safety are listed in the Section 1: Safety of the NX100 Instructions. To ensure correct and safe operation, carefully read the NX100 Instructions before reading this manual.
- Refer to NX100 Operator's Manual for the operation methods.

 **CAUTION**

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- 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.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

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

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

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

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

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

## Notes for Safe Operations

Read this manual carefully before installation, operation, maintenance, or inspection of the MOTOMAN. In this manual, the Notes for Safe Operation are classified as “DANGER”, “WARNING”, “CAUTION”, “MANDATORY”, or “PROHIBITED”.



**DANGER**

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



**WARNING**

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



**CAUTION**

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



**MANDATORY**

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



**PROHIBITED**

Must never be performed.

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



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

## Notes for Safe Operations



## WARNING

- Before operating the manipulator, check that servo power is turned OFF when the emergency stop buttons on the front door of the NX100 and programming pendant are pressed. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

Emergency Stop Button



- Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

Release of Emergency Stop



- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

- Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning ON the NX100 power.
  - Moving the manipulator with the programming pendant.
  - Running the system in the check mode.
  - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problems. The emergency stop buttons are located on the right of the front door of the NX100 and the programming pendant.



## CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.

- Check for problems in manipulator movement.
- Check for damage to insulation and sheathing of external wires.




- Always return the programming pendant to the hook on the NX100 cabinet after use.

The programming pendant can be damaged if it is left in the P-point maximum envelope of the manipulator, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the NX100 Instructions before operating the EPX1750 & EPX2050.

## Explanation of Warning Labels

The following warning labels are attached to the manipulator and NX100.  
Always follow the warnings on the labels.

 <b>WARNING</b>	
<ul style="list-style-type: none"> <li>The following warning labels are attached to NX100. Always follow the warnings on the labels.</li> </ul> <p>Neglect of this warning may cause a serious accident.</p> <p>To find these labels, please refer the Manipulator Instruction book.</p>	
	
<p>Do not enter robot work area</p>	<p>Moving parts may cause injury</p>
<ul style="list-style-type: none"> <li>The following warning labels are attached to the NX100. Always follow the warnings on the labels.</li> </ul> <p>Neglect of this warning may cause a serious accident.</p> <p>To find these labels, please refer the Manipulator Instruction book</p>	



## 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.

Equipment	Manual Designation
NX100 controller	NX100
NX100 programming pendant	Programming pendant
Cable between the manipulator and the controller	Manipulator cable

## Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select . . ." means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

## Customer Support Information

## Customer Support Information

If you need assistance with any aspect of your EPX1750 & EPX2050 system, please contact Motoman Customer Support at the following 24-hour telephone number:

**(937) 847-3200**

For **routine** technical inquiries, you can also contact Motoman Customer Support at the following e-mail address:

[techsupport@motoman.com](mailto:techsupport@motoman.com)

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



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

Please have the following information ready before you call Customer Support:

- |                            |  |
|----------------------------|--|
| • System                   | EPX1750 & EPX2050  |
| • Robots                   | _____  |
| • Primary Application      | Painting   |
| • Controller               | NX100  |
| • Software Version         | Access this information on the Programming Pendant's LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION} |
| • Robot Serial Number      | Located on the robot data plate  |
| • Robot Sales Order Number | Located on the NX100 controller data plate   |

---

# Table of Contents

## 1 Safety Precautions

## 2 Features

<b>2.1</b> Methods of Protection .....	2-1
<b>2.2</b> Teaching .....	2-2

## 3 Installation

<b>3.1</b> Requirements .....	3-1
<b>3.2</b> Installation Site .....	3-2

## 4 Transport and Installation

<b>4.1</b> Preparation.....	4-1
<b>4.2</b> Receiving and Handling .....	4-2
<b>4.3</b> Transport.....	4-3
<b>4.3.1</b> Transporting Method .....	4-3
<b>4.3.2</b> Shipping Bolts and Brackets .....	4-5
<b>4.4</b> Installation.....	4-6
<b>4.4.1</b> Installation of Safeguarding .....	4-7
<b>4.4.2</b> Mounting Procedures for Manipulator Base .....	4-7
<b>4.4.3</b> Mounting the Manipulator on the Baseplate .....	4-8
<b>4.4.4</b> Mounting Manipulator Directly on the Floor.....	4-9
<b>4.4.5</b> Location.....	4-10
<b>4.4.6</b> Controller and Programming Pendant.....	4-10
<b>4.4.7</b> Safety Devices.....	4-10

## 5 Connection

<b>5.1</b> Wiring .....	5-1
<b>5.1.1</b> Grounding .....	5-2
<b>5.2</b> Cable Connection .....	5-2
<b>5.2.1</b> Connection to the Manipulator .....	5-2
<b>5.2.2</b> Power Cable Construction Method Example .....	5-4
<b>5.2.3</b> Cable and Air Tube Connection .....	5-5
<b>5.3</b> Internal Connections .....	5-5

## 6 System Configuration

<b>6.1</b> Manipulator .....	6-1
<b>6.2</b> Robot Controller .....	6-3
<b>6.3</b> Pneumatic Unit .....	6-3
<b>6.4</b> O-Ring and X-Ring in the Wrist .....	6-5

## 7 Basic Specifications

<b>7.1</b> Basic Specifications .....	7-1
<b>7.2</b> Wrist Flange .....	7-2
<b>7.3</b> System Application .....	7-3

## 8 Frequent Inspections

<b>8.1</b> Frequent Inspections .....	8-1
<b>8.2</b> Daily Inspections .....	8-3
<b>8.2.1</b> Manipulator .....	8-3
<b>8.2.2</b> Pneumatic Unit .....	8-4
<b>8.2.3</b> Safety Devices .....	8-4
<b>8.2.4</b> Options .....	8-5

---

## 9 Maintenance and Inspection

<b>9.1</b>	Inspection Schedule .....	9-2
<b>9.2</b>	Maintenance for Manipulator .....	9-4
<b>9.2.1</b>	Grease Replenishment/Replacement .....	9-4
<b>9.2.2</b>	Lubricating Oil Replacement R-, B-, and T-Axis Speed Reducers .....	9-7
<b>9.2.3</b>	Tightening Bolts .....	9-8
<b>9.2.4</b>	Wrist Speed Reducer and Bearing .....	9-9
<b>9.2.5</b>	Air Sealings for Internal Air Pressure .....	9-10
<b>9.3</b>	Maintenance and Inspection of the Pneumatic Unit .....	9-12
<b>9.3.1</b>	Solenoid Valve .....	9-12
<b>9.3.2</b>	Pressure Reducing Valve .....	9-12
<b>9.4</b>	Inspection of Explosion-Proof Devices .....	9-13
<b>9.4.1</b>	Pressure Switch .....	9-13
<b>9.4.2</b>	Master Valve .....	9-13
<b>9.4.3</b>	Pressurized Anti-Explosion Barrier .....	9-13

## 10 Recommended Spare Parts

# 1 Safety Precautions

- Respect the law, local regulations, and safety codes for connecting the painting robot.
- Specify the working regulations and the person in charge for the following operations:
  - Turning the power to the robot ON/OFF, and RUN/STOP operations  
To avoid any faulty operation, take measures such as putting up a notice to remind operators of procedures and precautions explained in the instruction manual.
  - Warning sign or signal to inform operator of the robot operation status  
Starting an operation while someone is in the manipulator's working envelope or while someone is doing maintenance checks or repairs may cause a serious accident.  
When on standby, the manipulator can be moved by an external signal.  
To avoid these accidents caused by a lack of information, put up a board or indicator lamp to show the robot operation status.
  - Action to be taken in case of a failure or an accident  
Appoint a person to be contacted and the action to be taken in case of a failure or an accident.
  - Safety standards and the supervisor for safe operation  
Appoint a supervisor for the safe operation of the manipulator and establish the working regulations.
  - Appoint a person to be in charge of teaching, maintenance and inspections and provide training or lectures on safety and the actions to be taken in case of an emergency.



## WARNING

Install the MOTOMAN-EPX1750 & EPX2050 in a location that meets the requirements of Area Classification "Division I" prescribed in FM Approval Standard.

## 1 Safety Precautions

**DANGER**

- Take the following measures when teaching, correcting, inspecting, or adjusting the manipulator when the motor power supply is ON:
  - (a) Appoint a personnel to stay beside the emergency stop button of the NX100 and perform the operations holding the programming pendant with the emergency stop button.
  - (b) Before the operation, verify the correct robot motion and that the emergency stop works.
- Observe the following precautions during an automatic operation:
  - (a) Do not enter inside the safeguards during operation.
  - (b) Confirm the following before starting the operation:
    - No person is inside the manipulator working envelope.
    - No obstacles such as unnecessary workpieces and tools are inside the manipulator working envelope.
    - The manipulator is in its standby position.
  - (c) When any abnormality occurs, immediately press the emergency stop button to stop the manipulator.
  - (d) Before entering inside the manipulator working envelope, be sure to stop the manipulator and turn OFF the main power supply to the NX100.
- Brake release (Option)

A braking system is provided on each axis of the manipulator to hold the arm in its position when a failure or fault occurs. When the brake is activated, the manipulator cannot be moved manually even if the power is OFF. To change the posture of the manipulator after a failure or fault, the brake can be released by the operation from the controller.

When the brake is released with the manipulator's power OFF, each axis falls down because of the arm weight. While two or more people are holding the arm in position before releasing the brake, change the posture of the manipulator within the minimum motion range.

Use the brake release function only when absolutely necessary.

**PROHIBITED**

Any modification of the MOTOMAN-EPX1750 & EPX2050, and the following is strictly prohibited:

1. Explosion-proof devices and system installation
2. Safeguards and the safety devices mounted on these safeguards
3. Emergency stop button, and other safety devices
4. Robot control system such as the NX100 robot controller, the manipulator drive section and the power transmission section

## 2 Features

The MOTOMAN-EPX1750 & EPX2050 is designed for easy-handling and to consider safety first in operation.

### 2.1 Methods of Protection

The MOTOMAN-EPX1750 & EPX2050 is evaluated as Type X Purged for use in Class I, Division 1, Groups A, B, C and D indoor hazardous (classified) locations T4, and appear in the Factory Mutual (FM) Research Approval Guide. They have the construction of protection as follows:

Method of Protection;

- **The *pressurized explosion-proof method*** prevents explosive gas from entering the manipulator by supplying a protective gas, such as clean air or an inert gas, to keep the internal air pressure constant.
- **The *Intrinsic-safety explosion-proof method*** prevents explosive gas from igniting by electric spark and heat.



**DANGER**

Install the MOTOMAN-EPX1750 & EPX2050 in a location that meets the requirements of Area Classification "Division1" prescribed in FM Approval Standard.



## 2.2 Teaching

The target positions, the motion speed, and the ON/OFF timing of the spray can be taught with the programming pendant while moving the manipulator, which shortens the time required for teaching and, the data can be corrected at any time.

Because the teaching function and the correction function are integrated, the operations such as forward/reverse run, position modification, addition/deletion of points can be performed during teaching and the management function, which manages the parameter settings, enables you to monitor the actual status during teaching. The on-screen guidance and the interactive system on the pull-down menus lead the operator through the operation procedures.

- Large-capacity backup as a standard

A large-capacity drive for PC cards is provided as a standard feature of backup unit and enables data to be transmitted easily.



### CAUTION

Be sure to save the backup data for the controller, such as the data for jobs and constants, on a PC card. If not, the necessary data for the manipulator may be lost if an internal memory fault occurs in the controller.

- High reliability
  - The built-in microcomputer continuously checks the I/O data and the manipulator motion to ensure high-reliability.
  - Can detect power supply faults and software faults with its self-diagnosis functions.
- When an error such as an operation error or a controller fault occurs, the alarm code and message are displayed, and the date and time of the error occurrence with its explanation are stored in the alarm history to help you take a quick, corrective action.

## 3 Installation

### 3.1 Requirements

Prepare the power supply, the air supply, and the grounding according to the following specifications.

Table 3-1 Specifications

No.	Item	Specifications	Remarks
1	Power supply	3-phase 200/220 VAC (±10 % to -15 %) 50/60 Hz (±2 Hz) 5 kVA (at peak)	(Option) 3-phase 240/480/575VAC (+10% to -15%) 50/60 Hz (±2 Hz) 5 kVA
2	Air supply Spray ON/OFF Gun-tilt switching Pressurized explosion proof enclosure	Required pressure: 0.35 MPa to 0.65 MPa Capacity: For turning the spray ON/OFF: 30 N/min For switching the tilt of the gun: 30 N/min For the pressurized explosion proof 30 N/min usually 1000 N/min when purging Dryness: Freezing at -18°C	Use <i>dry air</i> for the pressurized explosion-proof construction.
3	Grounding	Grounding resistance: 100 ohm or less (Non I.S. GND) 10 ohm or less (I.S. GND)	For the robot controller



### CAUTION

Use dry air for the pressurized explosion-proof enclosure. Moisture in the air supply may damage the electronic parts.

### 3 Installation

#### 3.2 Installation Site

## 3.2 Installation Site

This section describes the conditions of the installation site for the robot system. Only devices that are approved as explosion-proof can be installed in hazardous locations. Refer to the local regulations and safety codes for the definition of a hazardous location. Install the controller and control panels in a location free from water drops, dust, and dirt.

Table. 3-2 Installation Site

System Components	Hazardous Location (Inside Painting Booth)	Non-hazardous location (Outside Painting Booth)	Ambient Temperature	Maximum Ambient Humidity
Manipulator (explosion-proof)	○	-	0 to 40°C	80 %RH
Controller (not explosion-proof)	×	○	0 to 45°C	90 %RH
Pneumatic unit (not explosion-proof)	×	○	0 to 45°C	85 %RH
Programming pendant (not explosion-proof)	×	○	0 to 40°C	85 %RH
Programming pendant (explosion-proof) (Option)	○	○	0 to 40°C	85 %RH
Conveyor speed detector (not explosion-proof)	×	○	0 to 50°C	90 %RH
Conveyor speed detector (explosion-proof)	○	-	0 to 50°C	90 %RH
Conveyor switch (explosion-proof)	○	-	0 to 50°C	90 %RH
Workpiece supplier (explosion-proof)	○	○	0 to 50°C	85 %RH
Control panel for workpiece supplier (not explosion-proof)	×	○	0 to 45°C	90 %RH
Safety devices Box for emergency stop switches Safety plugs Limit switches Flashing light Indicator lamps Photoelectric switches	Selected according to the requirements of the customer. Refer to the appropriate instruction manual provided separately.  × : Not acceptable ○ : Acceptable			



## DANGER

Devices that are not explosion-proof must not be installed in hazardous locations. Failure to observe this warning may result in a fire.

---

# 4 Transport and Installation

Read the “Motoman Setup Manual” thoroughly before handling and installing the Motoman system, and then carry out the operation safely observing the following precautions.

- 1) Signs indicating prohibitions such as, “The lighting of fires is prohibited”
- 2) Clean working place that is clearly defined and free of obstacles
- 3) Appointment of personnel in charge
- 4) Company working regulations for safe operation

## 4.1 Preparation

Before installing the MOTOMAN, do the following:

- 1) Confirm the installation layout and the dimensions of each device to ensure the transportation route and the installation space.
- 2) Check if the transportation route can support the weight of each device. If necessary, reinforce the route.
- 3) To lift the manipulator, use the appropriate machinery such as a forklift.

## 4.2 Receiving and Handling

When the package arrives, check the contents. Are the items and quantities in accordance with your order sheet? Was any damage incurred during shipment?



### CAUTION

- Confirm that the manipulator and the NX100 have the same order number. Special care must be taken when more than one manipulator is to be installed.

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

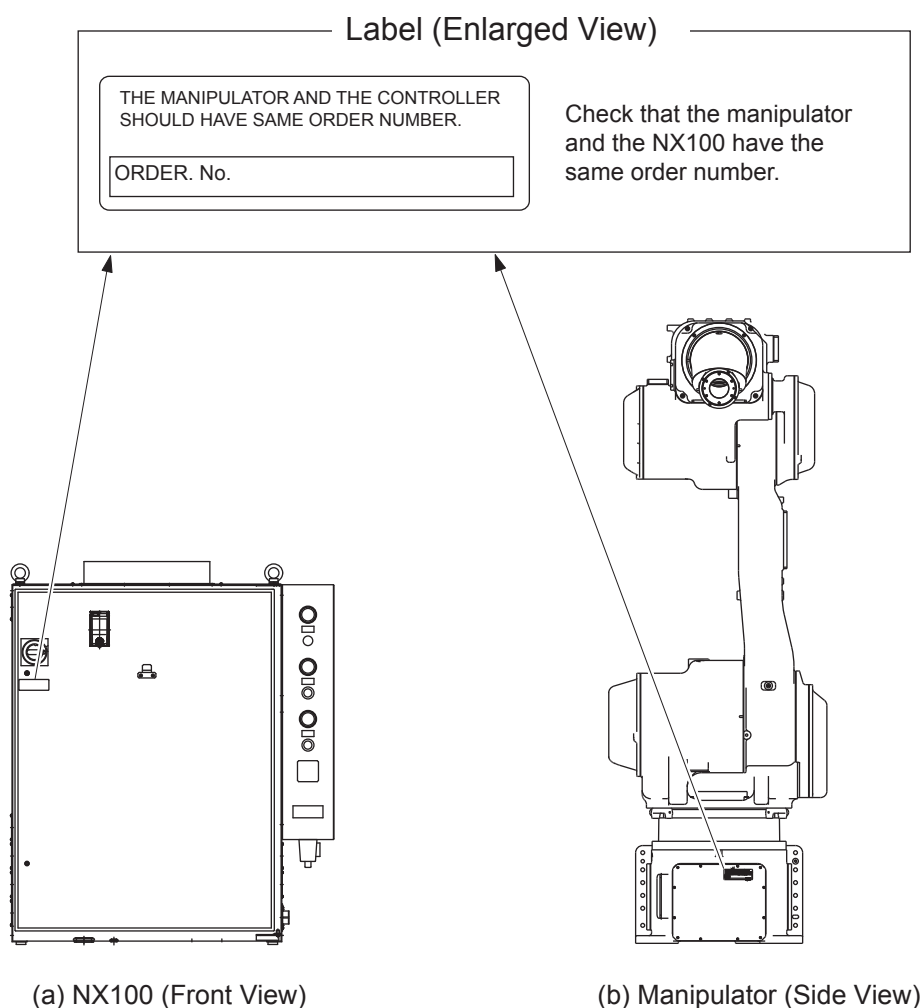


Fig. 4-1 Location of Order Number Labels

## 4.3 Transport



### CAUTION

- Sling and crane or forklift operations must be performed by authorized personnel only.

Failure to observe this caution may result in injury or damage.

- Avoid excessive vibration or shock during transport.

The system consists of precision components. Failure to observe this caution may adversely affect performance.

### 4.3.1 Transporting Method



- The mass of the manipulator is approximately 900 kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the mass.
- The attached eyebolts are designed to support the manipulator mass. Never use them for anything other than transporting the manipulator.
- Mount the shipping bolts and brackets before transporting the manipulator.
- With any transportation equipment, make sure to avoid external force on the arm or motor unit when transporting the manipulator.

## 4 Transport and Installation

### 4.3 Transport

#### ■ Using a Crane

As a rule, when uncrating the manipulator and moving it, a crane should be used. Lift the manipulator with a wire rope using the attached eyebolts. Make sure to fix the manipulator with shipping bolts and brackets before transport, and lift it in the posture as shown in Fig. 4-2 "Transport Using a Crane".

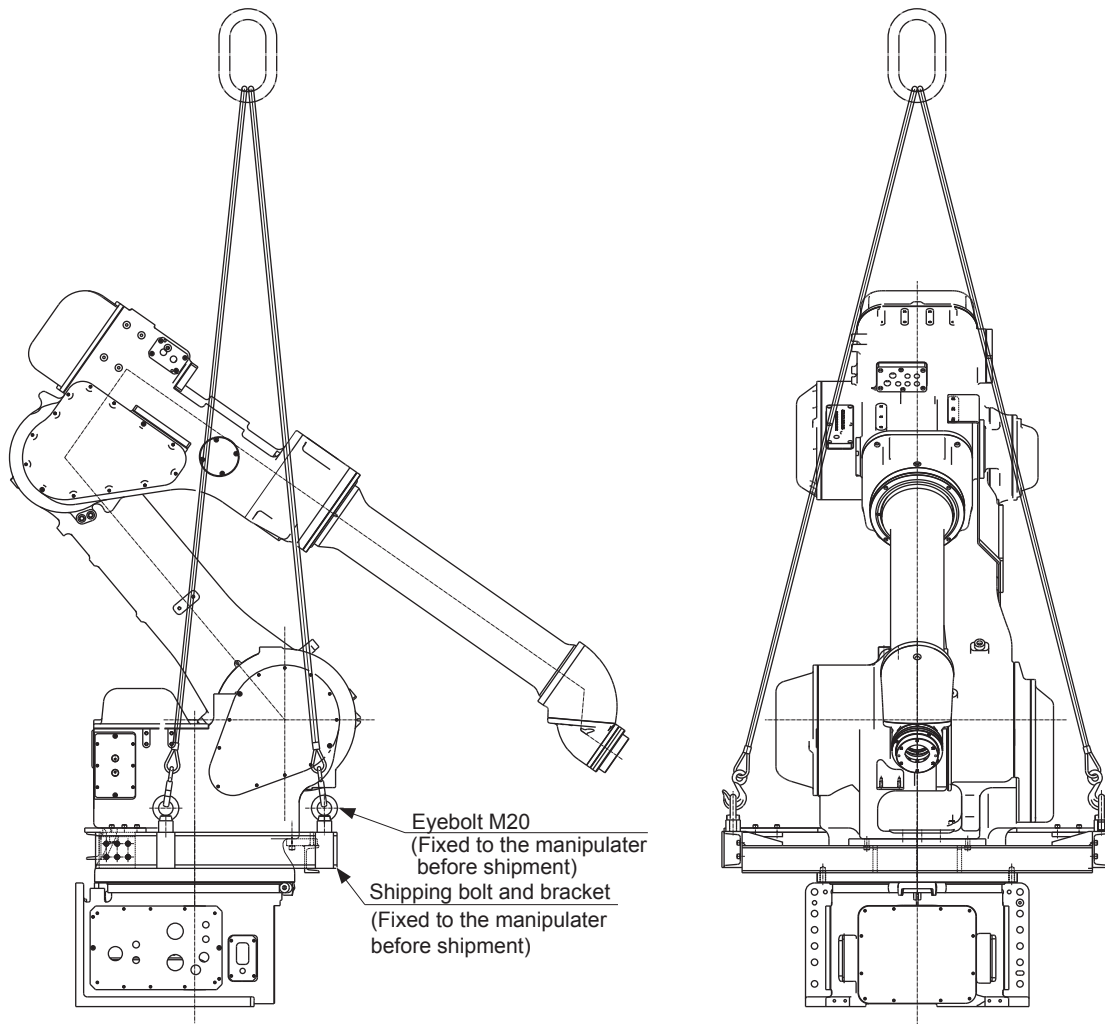


Fig. 4-2 Transport Using a Crane

### ■ Using a Forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts and bracket as shown in Fig. 4-3 "Transport 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 overturn or slippage.

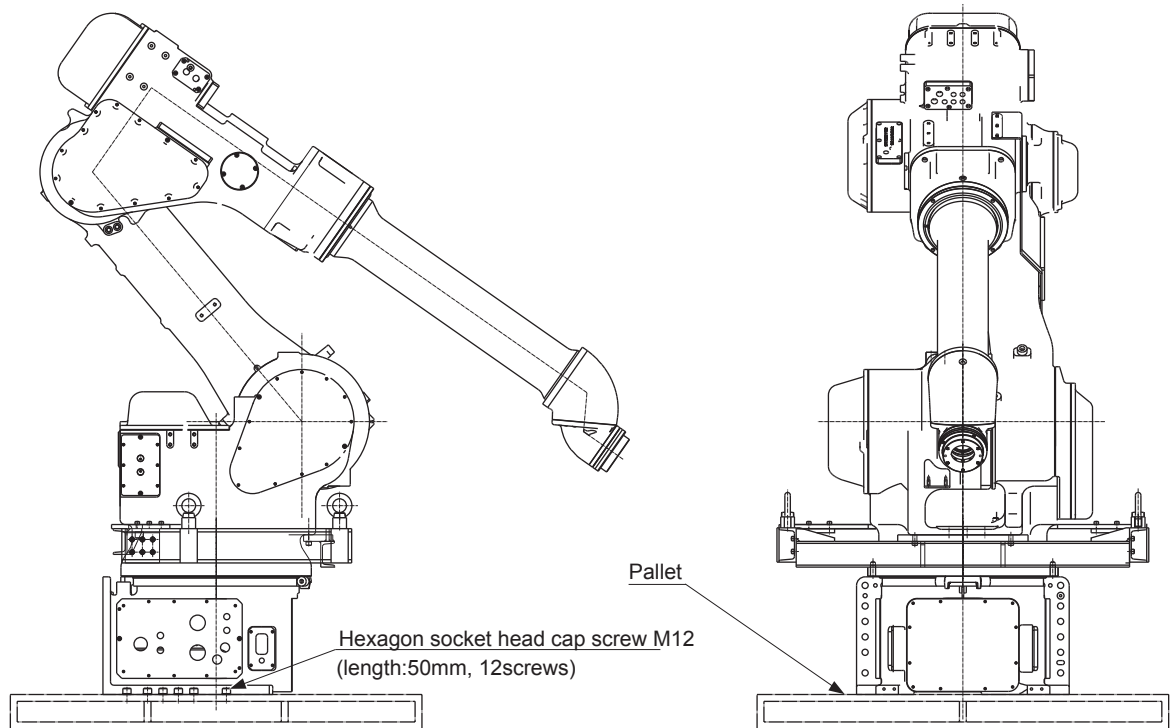


Fig. 4-3 Transport Using a Forklift

### 4.3.2 Shipping Bolts and Brackets

The manipulator is provided with shipping bolts and brackets at positions as shown in the figures in Fig. 4-2 "Transport Using a Crane", to protect its driving units from various external force during transport.

The shipping brackets are painted yellow.



Before turning ON the power, check to be sure that the shipping bolts and brackets have been removed. The shipping bolts and brackets then must be stored for future use, in the event that the manipulator must be moved again for relocation.



## 4.4 Installation



### WARNING

- Install the safeguarding.

Failure to observe this warning may result in injury or damage.

- Install the manipulator in a location where the manipulator's tool or the workpiece held by the manipulator will not reach the wall, safeguarding, or NX100 when the arm is fully extended.

Failure to observe this warning may result in injury or damage.

- Do not start the manipulator or even turn ON the power before it is firmly anchored.

The manipulator may overturn and cause injury or damage.



### CAUTION

- Do not install or operate a manipulator that is damaged or lacks parts.

Failure to observe this caution may cause injury or damage.

- Do not install the paint gun and the gun brackets until the manipulator is firmly anchored.

Any contact to the unstable manipulator may cause injury or damage.

- Before turning ON the power, check to be sure that the shipping bolts and brackets explained in Fig. 4-2 "Transport Using a Crane" are removed.

Failure to observe this caution may result in damage to the driving parts.

## 4.4.1 Installation of Safeguarding

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

### **Responsibility for Safeguarding (ISO 10218)**

The user of a manipulator or robot system shall ensure that safeguarding is 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.

## 4.4.2 Mounting Procedures for Manipulator Base

The manipulator should be firmly mounted on a baseplate or foundation strong enough to support the manipulator and withstand repulsion forces during acceleration and deceleration. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion force of the manipulator. (Refer to Table 4-1 "Maximum Repulsion Force of the Manipulator at Emergency Stop".)

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.

For installation, refer to section "4.4.3 Mounting the Manipulator on the Baseplate".

Table 4-1 Maximum Repulsion Force of the Manipulator at Emergency Stop

Maximum torque in horizontal rotation (S-axis moving direction)	11000 N·m (1100 kgf·m)
Maximum torque in vertical rotation (L-, U-axes moving direction)	21400 N·m (2140kgf·m)

## 4 Transport and Installation

### 4.4 Installation

#### 4.4.3 Mounting the Manipulator on the Baseplate

The baseplate should be rugged and durable to withstand maximum repulsion force of the manipulator and to ensure that the manipulator and fixture are in the correct relative position. The thickness of the baseplate is 40 mm or more and an M16 size or larger anchor bolt is recommended.

Fix the manipulator base to the baseplate with the hexagon socket head cap screws M16 (8 screws, length of 70 mm or more is recommended) using mounting holes on the manipulator base.

Tighten the hexagon socket head cap screws and anchor bolts securely so that they will not work loose during operation.

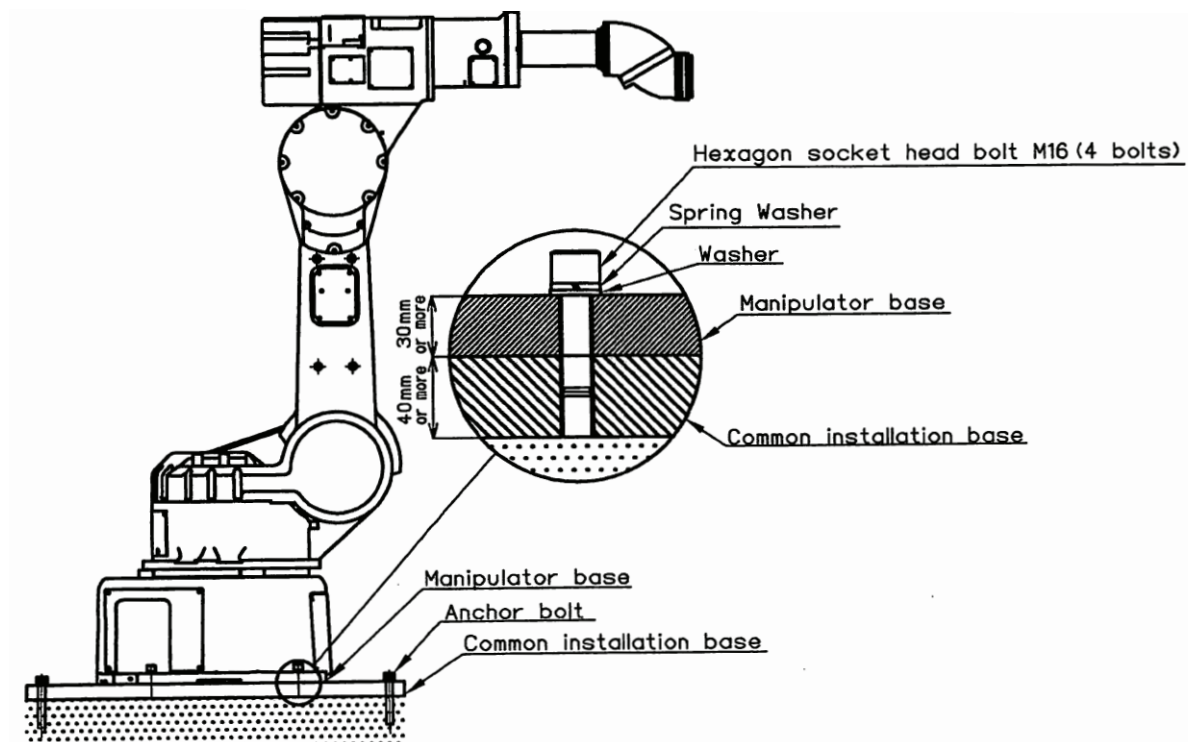


Fig. 4-4 Mounting on the Common Installation Base

### 4.4.4 Mounting Manipulator Directly on the Floor

The floor should be strong enough to support the manipulator. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the manipulator. As a rough standard, when there is a concrete thickness (floor) of 150 mm or more, the manipulator base can be fixed directly on the floor with M16 anchor bolts. Make the floor surface even and repair all the cracks. A non-concrete floor or a concrete floor less than 150 mm thick is insufficient to install the manipulator directly.

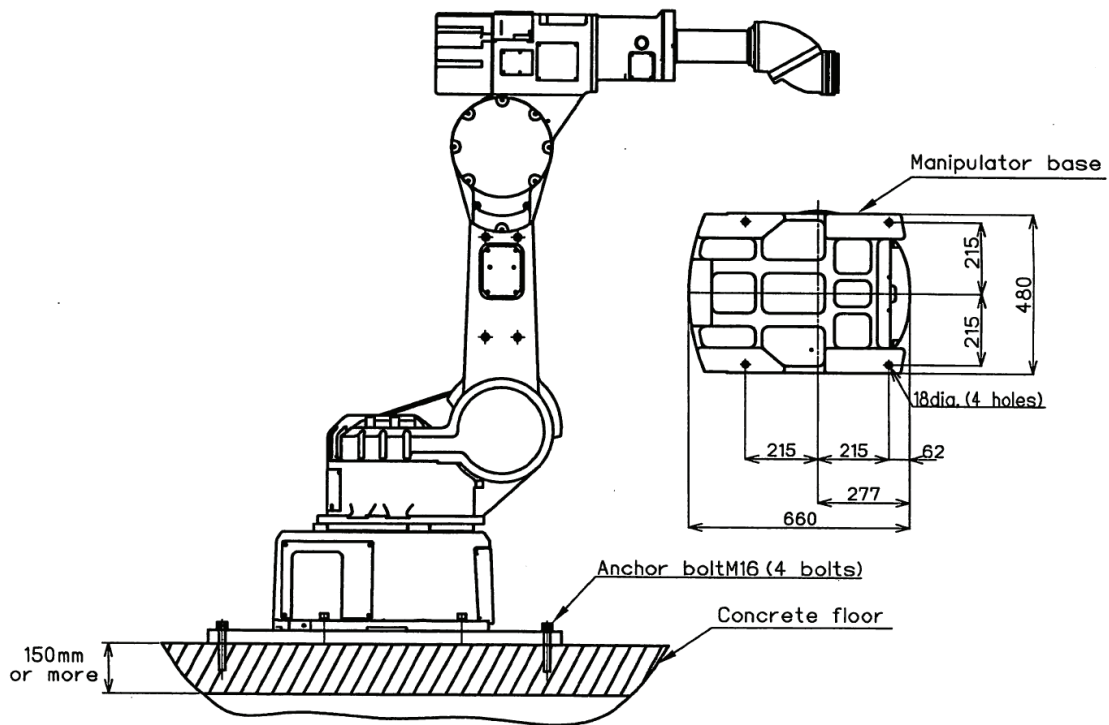


Fig. 4-5 Mounting Directly on the Floor

### 4.4.5 Location

When installing the manipulator, satisfy the following environmental conditions.

- Ambient temperature: 0° to 40°C
- Humidity: 20 to 80% RH at constant temperature
- Free from exposure to water, oil, or dust
- Free from corrosive gas or liquid, or explosive gas or liquid
- Free from excessive vibration (Vibration acceleration: 4.9 m/s<sup>2</sup> [0.5 G] or less)
- Free from large electrical noise (plasma)
- Flatness for installation is 0.5 mm or less

### 4.4.6 Controller and Programming Pendant

- The controller and the programming pendant are not explosion-proof (the explosion-proof programming pendant is available as an option). Never install the controller and the programming pendant that are not explosion-proof in a hazardous location.
- Keep a minimum space of 60 cm around the controller for maintenance. When the sufficient space is not available, provide equipment for maintenance such as a drawing-out system.
- An exhaust fan is provided on the back of the controller. Keep enough space behind the controller so that air can be exhausted properly.
- Do not install the controller and programming pendant close to any noise source such as the power supply for other devices.
- Install the controller in a location where the optimum atmosphere, temperature, and humidity are assured and provide protection against water drops or thinner. If necessary, install a control room to supply clean and temperature-controlled air.

### 4.4.7 Safety Devices

The standard safety devices are listed below. Refer to the instructions for connecting safety devices required for your system application.

Install each device considering each function.

- Emergency stop switches
- Safety plugs
- Limit switches
- Flashing lights
- Indicator lamps
- Photoelectric intrusion detecting switches

## 5 Connection

### 5.1 Wiring



#### WARNING

- Ground resistance must be:
  - Non I.S. GND - 100  $\Omega$  or less
  - I.S. GND - 10  $\Omega$  or lessFailure to observe this warning may result in fire 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 fire or electric shock.



#### CAUTION

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

### 5.1.1 Grounding

The grounding methods differ depending on the system application. Refer to the connection instructions that are provided separately.

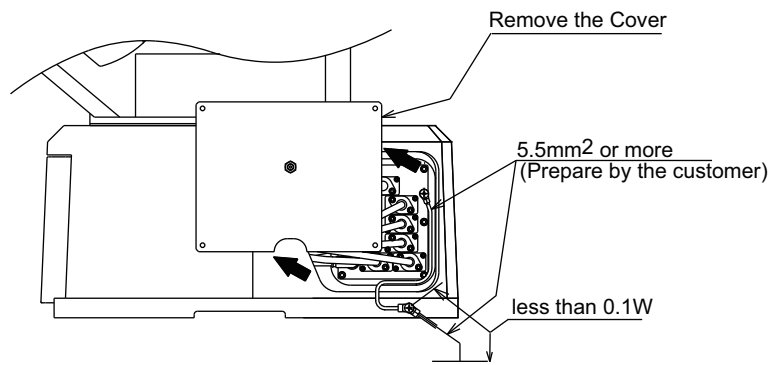


Fig. 5-1 Grounding Method

## 5.2 Cable Connection

### 5.2.1 Connection to the Manipulator

Before connecting the cables to the manipulator, verify the connectors named 1BC-1, -2, -3, -4, -5, -6, -7 and 2BC-1, -3, -4, -6, 3BC-1, -2, and -3 on both cables and manipulator. Then connect each connector of cables to same-named connector of Manipulator. Fix the plate of cables 6 bolts M6 (4 bolts 12 mm long and 2 bolts 20 mm long recommended) with spring washers and washers. The air hose for the pressure switch, the intrinsically safe cable, and the crimped terminals should be prepared by the customer.

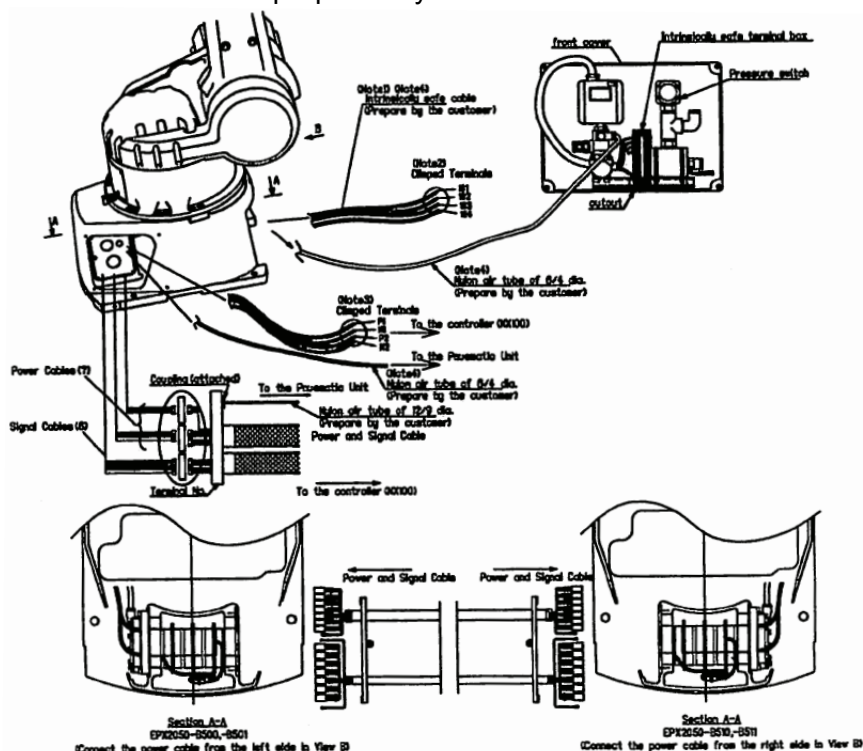


Fig. 5-2 Manipulator Internal Cable Connections

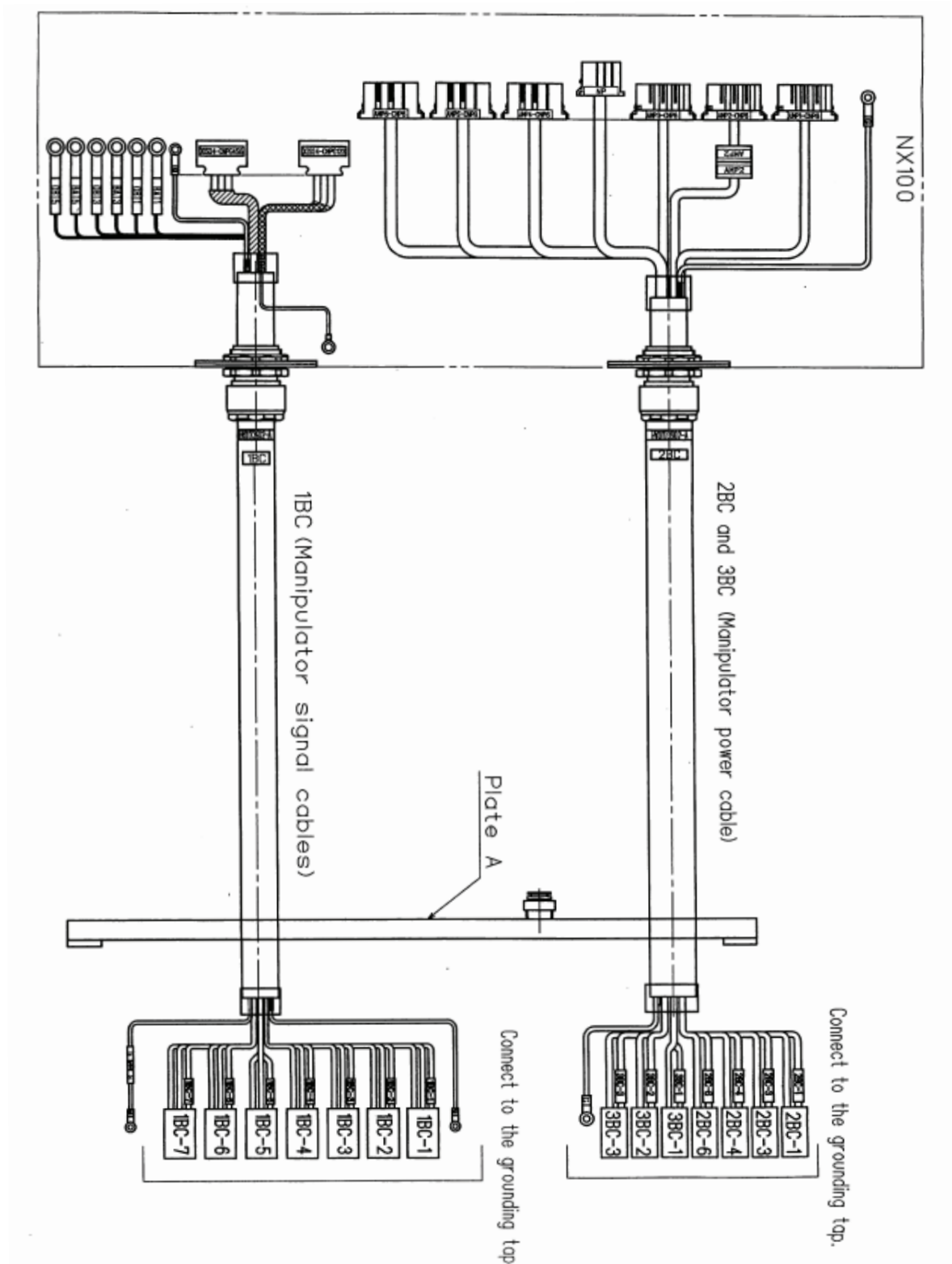


Fig. 5-3 Manipulator Cable Connection



## 5.2.2 Power Cable Construction Method Example

The construction example is shown as follows:

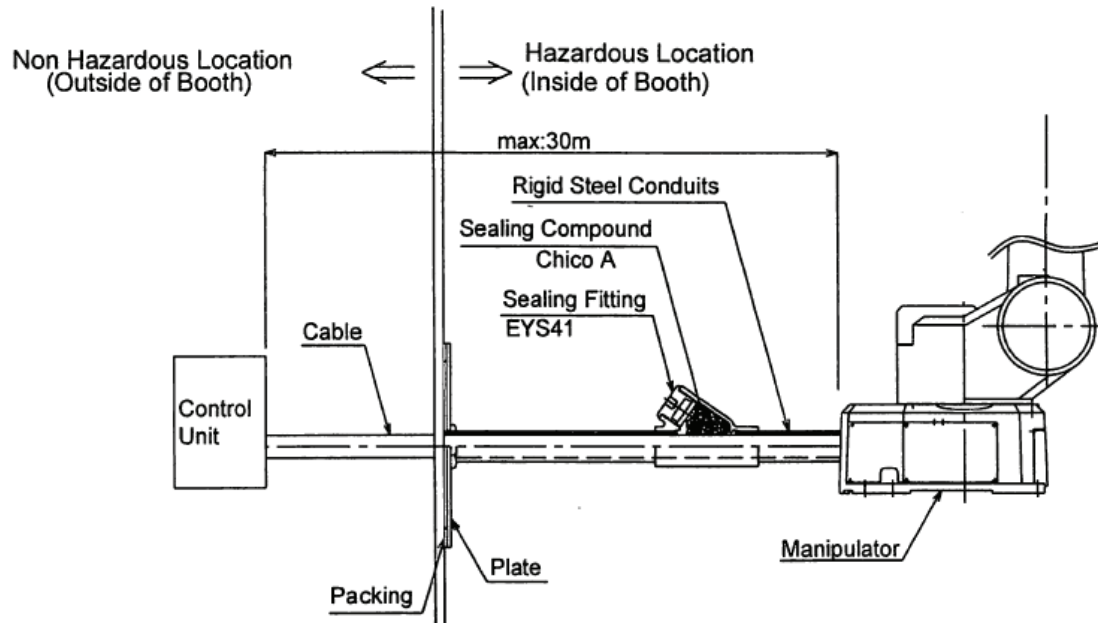


Fig. 5-4 Metal Pipe Construction Example



- Construct the signal cable and the peripheral device coupling cable as mention above.
- The metal pipe must have enough strength
- For the explosion-proof approved parts use neither sealing fitting nor sealing compound other than the above-mentioned model. (Manufacturer: Cooper Industrial Inc, or equivalent)

### 5.2.3 Cable and Air Tube Connection

The cables and tubes necessary for installation are shown in the table below. The customer must prepare the power supply cable, the grounding cable, the cables for optional equipment, and the air tubes.

Use	Connection	Type
Power supply cable	Power source to/from controller	CVV-3.5SQ-4C
Intrinsically-safe signal line cable	Manipulator to/from controller	CVV-1.25SQ-2Cx2
Cable for conveyor-speed detection device	To/from controller	CVV-SB-1.25SQ-3C
Cable for optional equipment	To/from controller	CVV-SB-1.25SQ
Air tube for pressurized explosion-proof	Manipulator to/from pneumatic unit	φ12/9, φ6/4 nylon tube (each line)
Air tube for air supply	Air supply source to/from pneumatic unit	φ12/9 nylon tube

## 5.3 Internal Connections

Fig. 5-5 (a) "Internal Connection Diagram", Fig. 5-5 (b) "Internal Connection Diagram" show the internal connections and Fig. 5-5 (c) "Intrinsically Safe Circuit Diagram" shows the Intrinsically Safe Circuit Diagram.

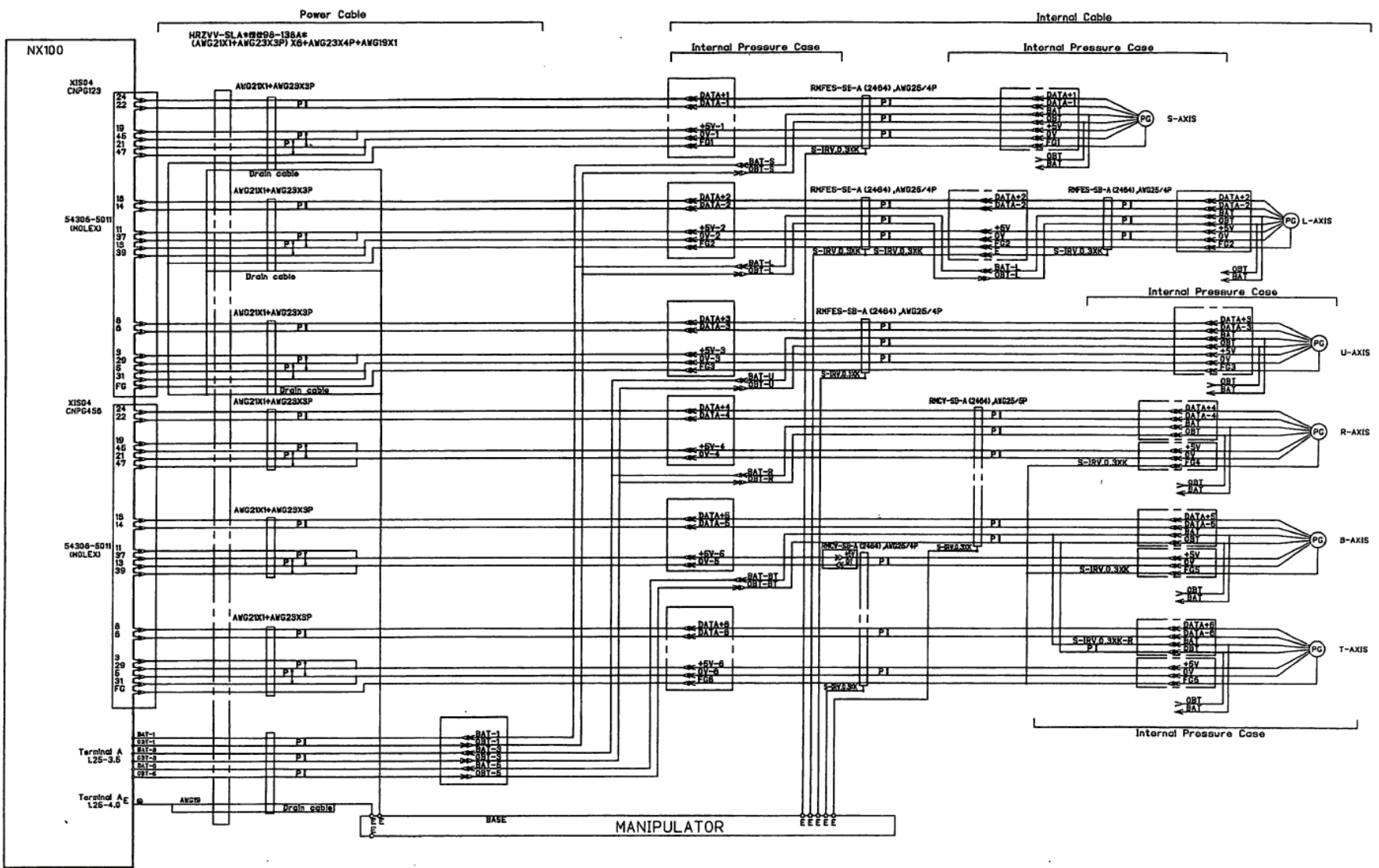
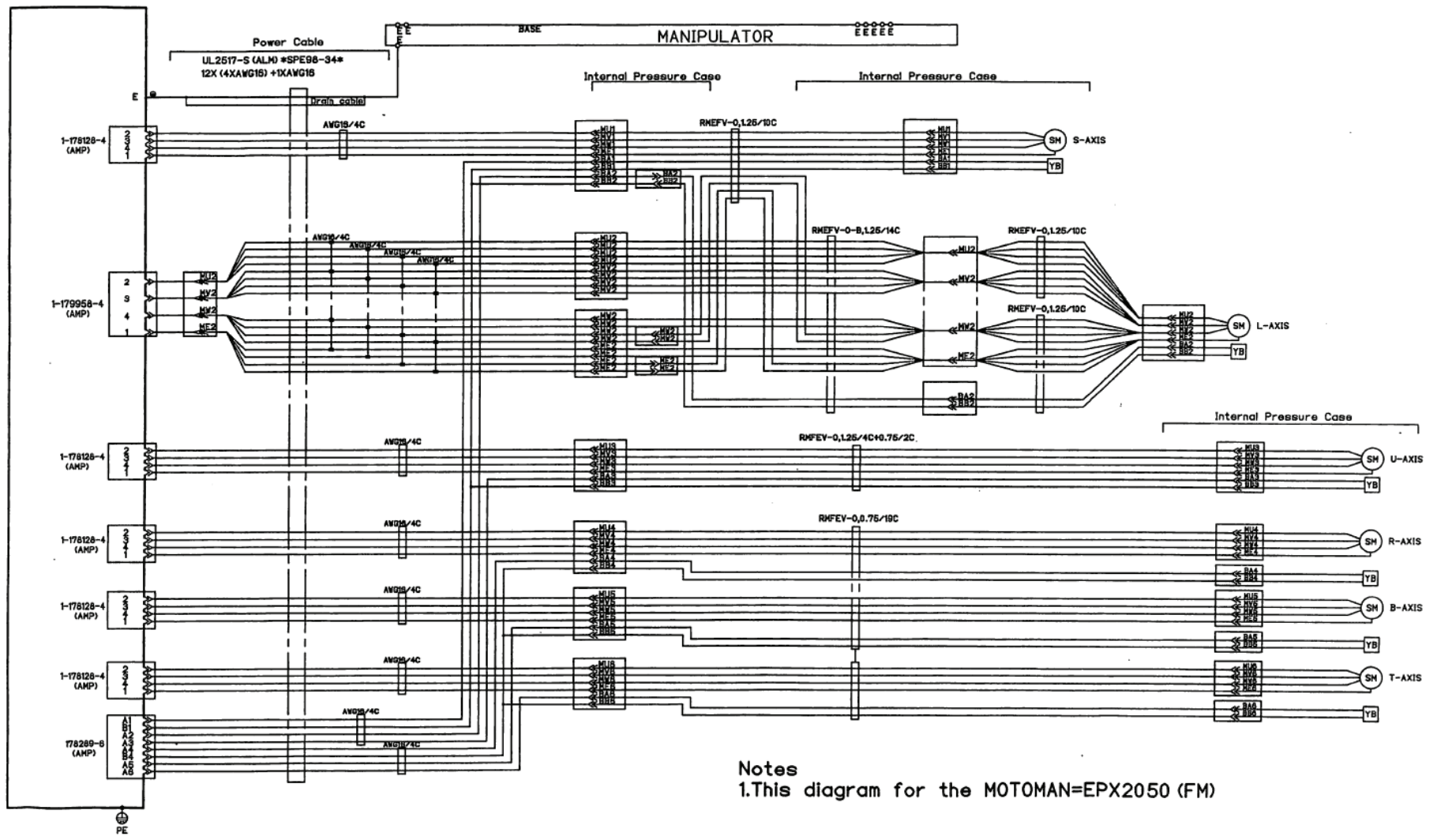


Fig.5-5 (a) Internal Connection Diagram



Notes  
1.This diagram for the MOTOMAN=EPX2050 (FM)

Fig.5-5 (b) Internal Connection Diagram

5-7

HW1480052

5 Connection  
5.3 Internal Connections

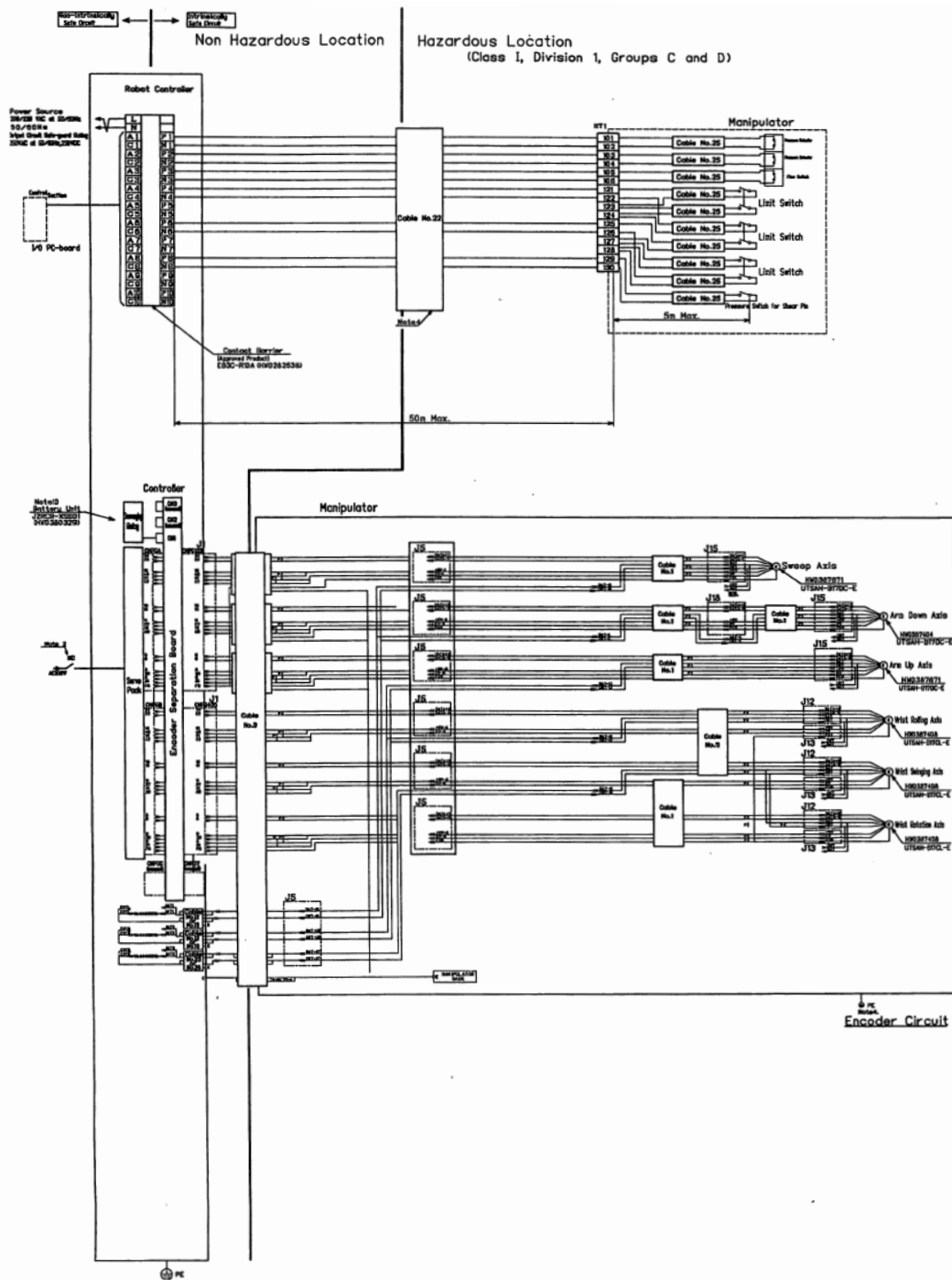


Fig.5-5 (c) Intrinsically Safe Circuit Diagram

## 6 System Configuration

Fig. 6-1 "System Configuration" shows the system configuration of the MOTOMAN-EPX1750 & EPX2050.

### 6.1 Manipulator

The explosion-proof manipulator can be installed in hazardous locations such as in the painting booth. For painting, a spray gun is mounted on the end of the wrist with special fixtures.

Fig. 6-2 "Dimensions and P-point Maximum Envelope" shows the dimensions and the range of motion of the EPX1750 & EPX2050. The manipulator is driven by the servo motors in vertically articulated operation mode with 6 degrees of freedom on the manipulator base. The motion of the manipulator is made by six axis:

The three main axes are used for positioning the spray gun: the S-axis which turns the arm, the L-axis which moves the arm left and right, and the U-axis which moves the arm up and down.

The three wrist axis are used for changing the direction of the spray gun: the R-, B-, and T-axis.

The range of motion shown in Fig. 6-2 "Dimensions and P-point Maximum Envelope" is that of the wrist axis center P-point that is made by the combination of the motions of the three main axis.



#### WARNING

When taking safety precautions, consider the range of motion of the manipulator shown in Fig. 6-2 "Dimensions and P-point Maximum Envelope".

6 System Configuration  
 6.1 Manipulator

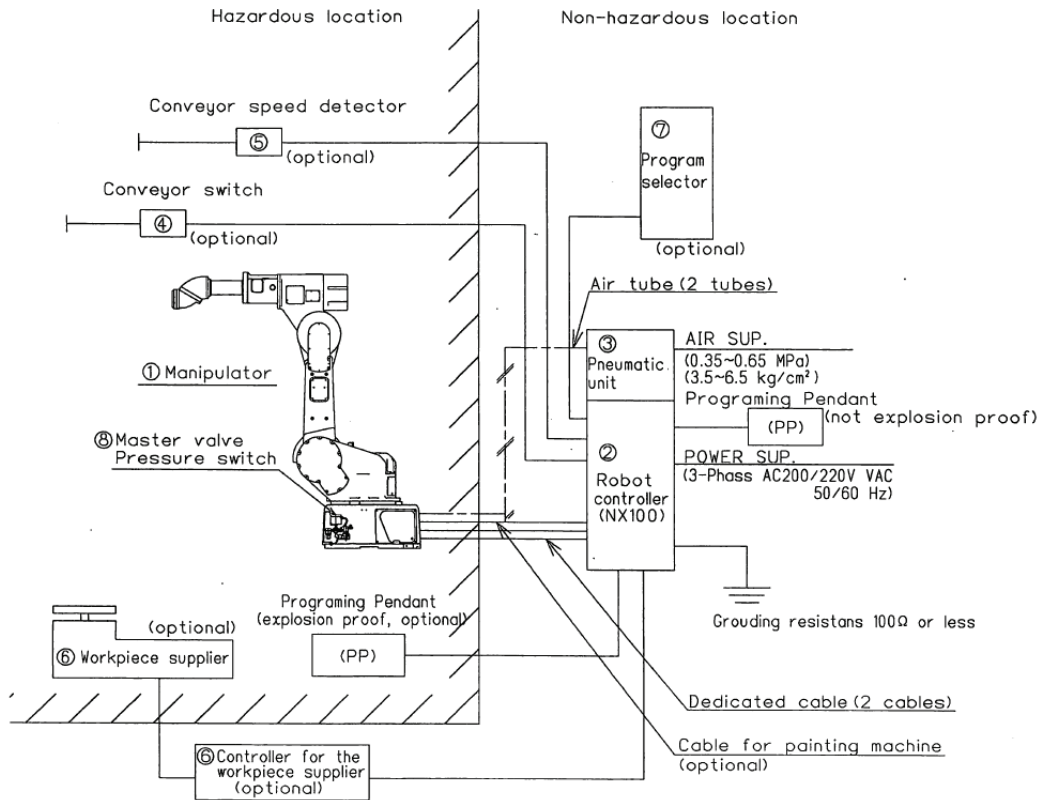


Fig. 6-1 System Configuration

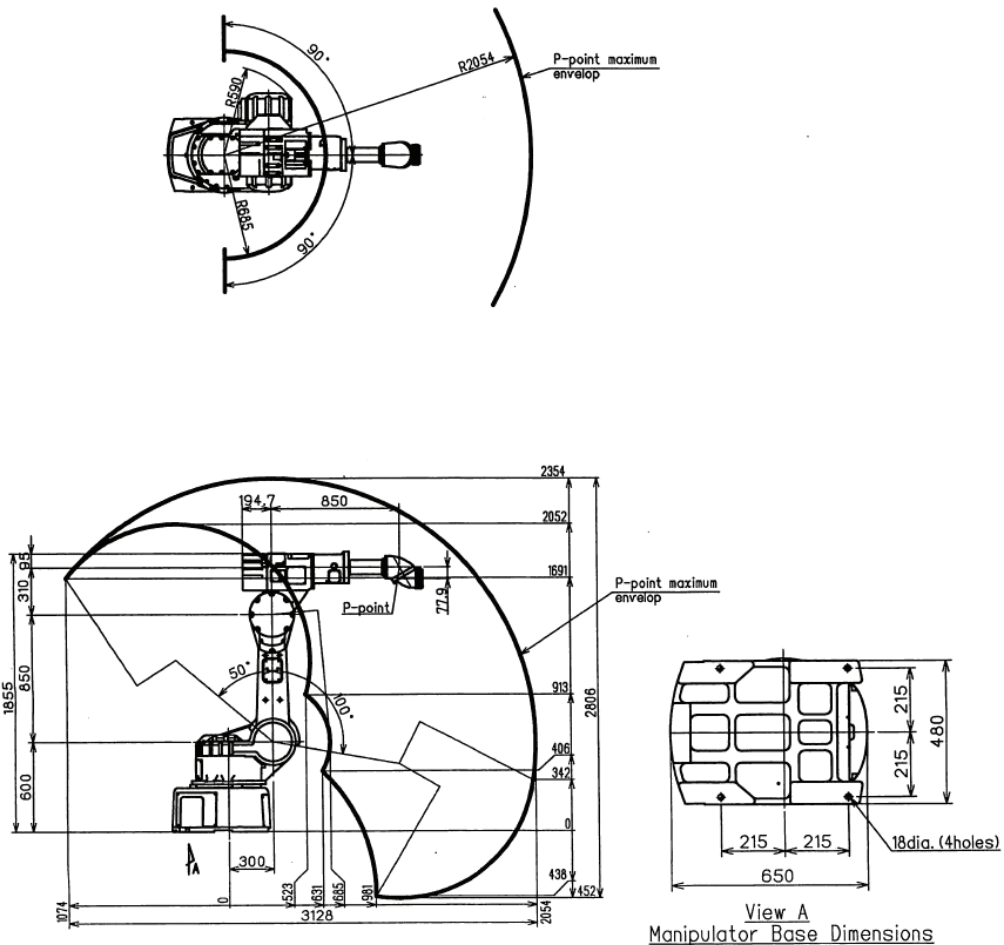


Fig. 6-2 Dimensions and P-point Maximum Envelope

## 6.2 Robot Controller

The robot controller has a built-in microcomputer that controls all motion of the robot by saving motion signals when teaching and sending these signals to the manipulator. The power unit that supplies power to the manipulator is also built into the robot controller.



### DANGER

- The power supply of the robot controller is 200/220 VAC. Be sure to turn OFF the primary power supply of the controller before starting maintenance.

Failure to observe this warning may result in electric shock.

## 6.3 Pneumatic Unit

The pneumatic unit supplies protective air or gas to the manipulator to prevent explosive gas from entering the manipulator. Usually, the unit is attached to the side of the robot controller. The circuit diagram and dimensions are shown in Fig. 6-3 "Pneumatic Unit Air Circuit" and Fig. 6-4 "Pneumatic Unit External View". Set the air pressure so that the pressure shown on the pressure gauge of each pressure reducing valve will be within the pressure ranges shown in Fig. 6-3 "Pneumatic Unit Air Circuit".



### CAUTION

The pneumatic unit is used to provide a pressurized explosion-proof barrier for the manipulator. Because the barrier is only ensured when the air supply is within the recommended pressure range, a lower air pressure will reduce the barrier's efficiency, and a higher air pressure will damage the pneumatic unit. Be sure to keep the air pressure within the specified range.



## 6 System Configuration

### 6.3 Pneumatic Unit

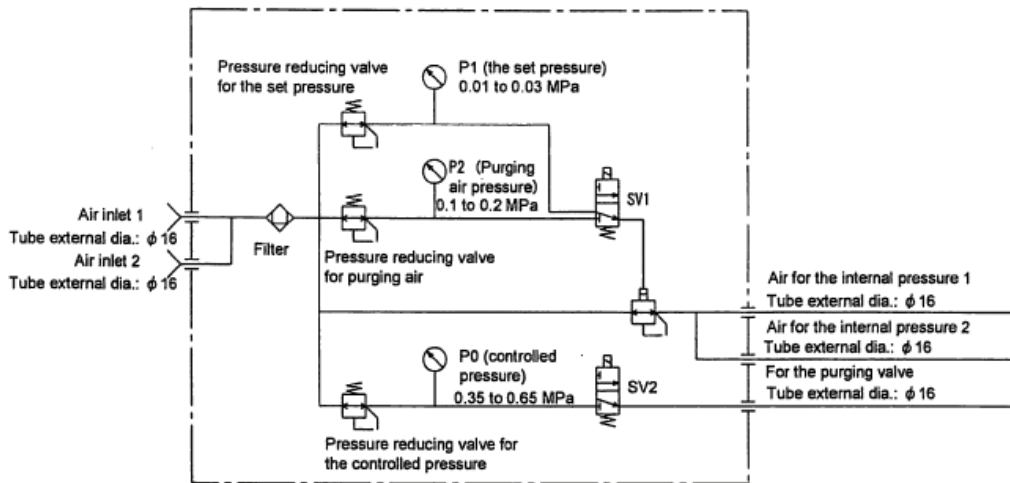


Fig. 6-3 Pneumatic Unit Air Circuit



## CAUTION

Manufacturer is requested to strictly, observe that the supply air is between 0.35 MPa to 0.65 MPa. The pressurized explosion-proof will not operate properly without the required amount of air pressure, if air pressure is low. If increase the air pressure, the pneumatics equipment for the pressurized explosion-proof system will be caused for equipment damage.

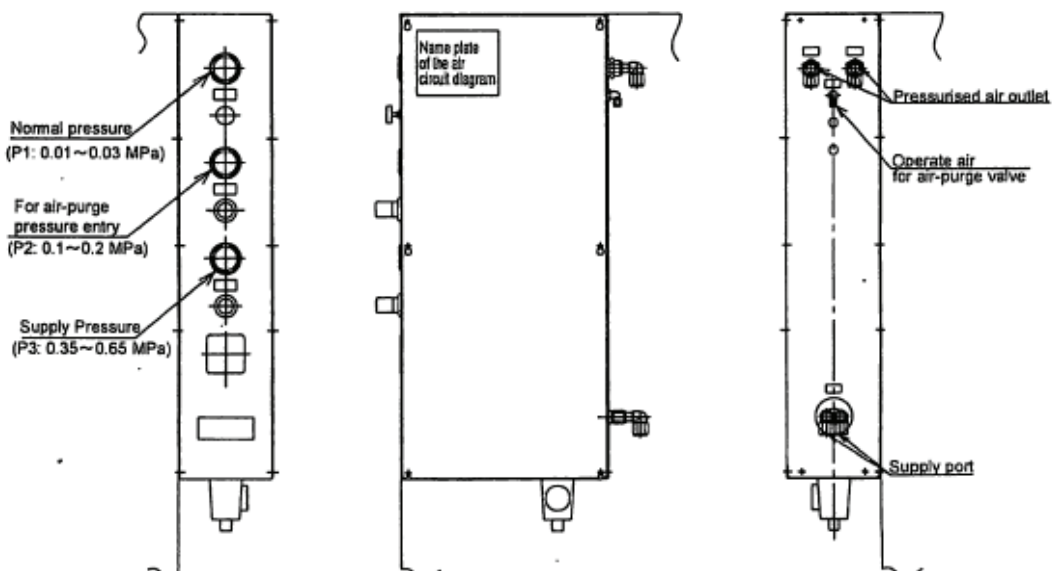


Fig. 6-4 Pneumatic Unit External View

## **6.4** O-Ring and X-Ring in the Wrist

Periodically replace the O-ring and X-ring in the wrist. Contact your Yaskawa representative to replace the ring. When the wrist is cleaned two or three times a week with the recovered thinner, the O-rings may become deformed, which causes malfunctions. Contact your Yaskawa representative for more information about the O-ring made of special material (option.)

# 7 Basic Specifications

## 7.1 Basic Specifications

Table 7-1 Basic Specifications\*1

Item	Type	EPX1750-B5**	EPX2050-B5**
Configuration		Vertically articulated	
Degree of Freedom		6	
Payload		15 kg	
Repeatability*2		± 0.5 mm	
Range of Motion	S-axis (turning)	± 90°	
	L-axis (lower arm)	+100° - -50°	
	U-axis (upper arm)	+6° - 163°	+5° - 163°
	R-axis (wrist roll)	± 360°	
	B-axis (wrist pitch/yaw)	± 360°	
	T-axis (wrist twist)	± 360°	
Maximum Speed		2 m/s	
Allowable Moment	R-axis	45.8 N•m (4.67 kgf•m)	
	B-axis	33.8 N•m (3.45 kgf•m)	
	T-axis	10.8 N•m (1.1 kgf•m)	
Allowable Moment of Inertia (GD <sup>2</sup> /4)	R-axis	1.45 kg•m <sup>2</sup>	
	B-axis	0.79 kg•m <sup>2</sup>	
	T-axis	0.1 kg•m <sup>2</sup>	
Approx. Mass		530 kg	540 kg
Ambient Conditions	Temperature	0 to + 45 °C	
	Humidity	20 to 80 %RH (non-condensing)	
	Vibration Acceleration	Less than 4.9 m/s <sup>2</sup> (0.5G)	
	Others	Free from excessive electrical noise.	
Power Capacity		5 kVA	

\*1 SI units are used in this table. However, gravitational unit is used in ( ).

\*2 Conformed to ISO9283.

## 7.2 Wrist Flange

The wrist flange dimensions are shown in Fig. 7-1 "Wrist Flange". Fitting depth of inside and outside fittings must be 7 mm or less.

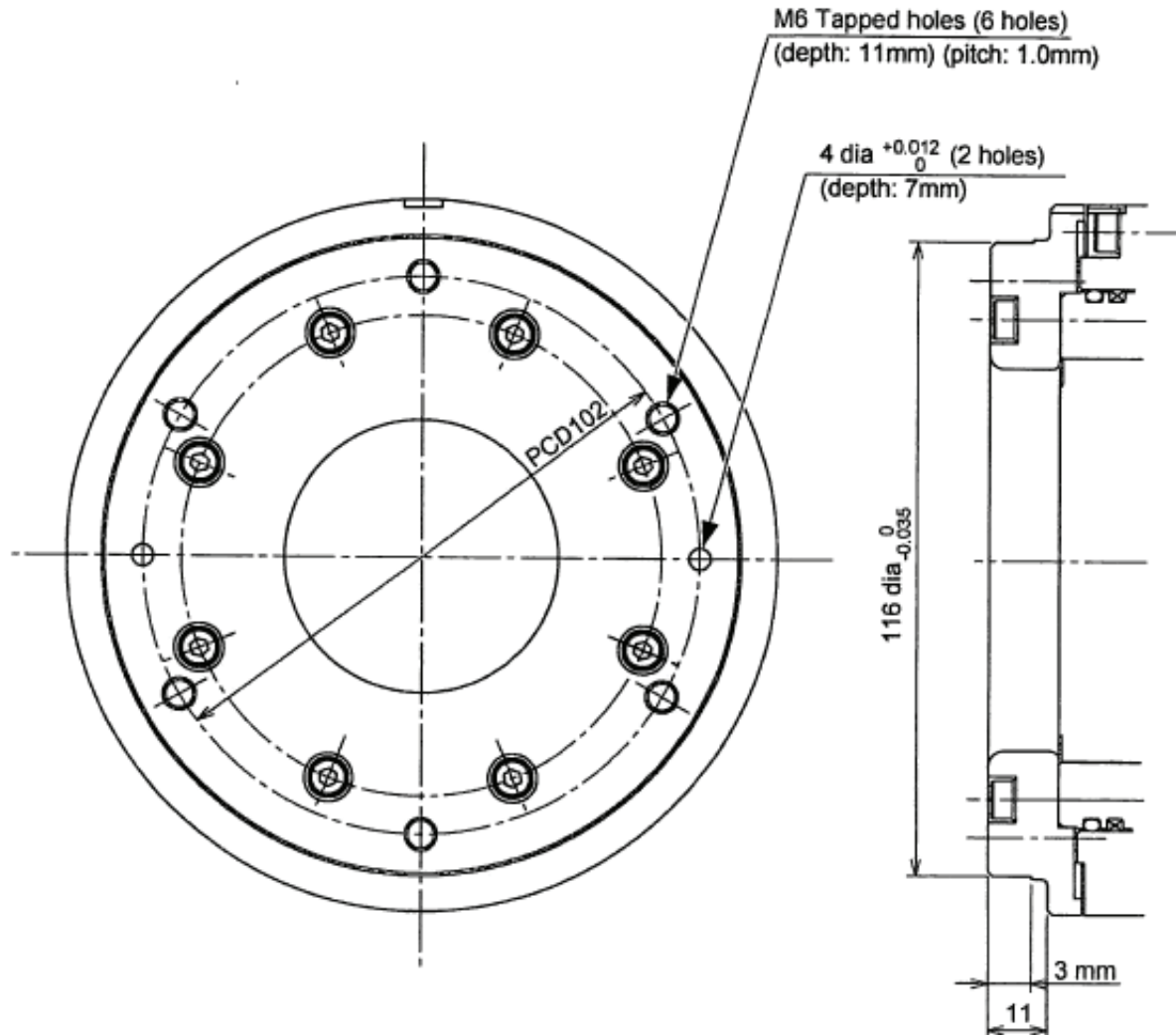


Fig. 7-1 Wrist Flange

## 7.3 System Application

The device required for the system application can be mounted on the horizontal arm. Observe the following restriction.

- Maximum allowable load: 15 kg
- Mounting Position: Refer to Fig. 7-2 "Device Mounting Position"

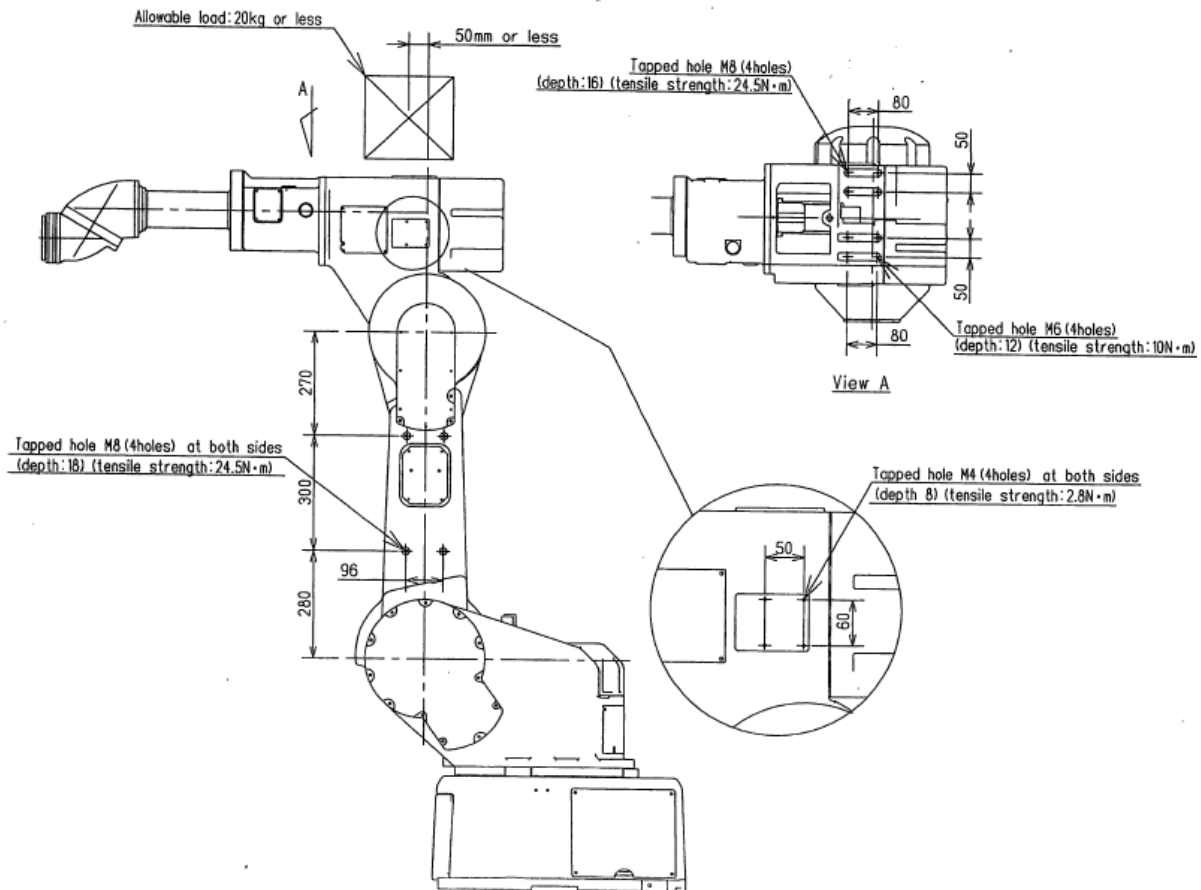


Fig. 7-2 Device Mounting Position






# 8 Frequent Inspections

## 8.1 Frequent Inspections

The painting robot is a precision device using advanced technology. It is important to frequently inspect the robot and remove any dried paint. Conduct the daily and weekly inspections listed in Table 8-1 "Frequent Inspections" to ensure the long life of the robot and its performance.

For more information about the inspection items, refer to section 8.2 "Daily Inspections"


Table 8-1 Frequent Inspections

	No.	Items to be Inspected	Inspection	Daily	Weekly	Remarks
Manipulator	1	Motion	Smooth tuning, horizontal, and vertical motions of each arm. The robot's home position does not change.	○		 <b>DANGER</b> Do not enter the robot working envelope.
	2	Noise and vibration during operation	No abnormal noise and vibration during robot operation.	○		 <b>DANGER</b> Do not enter the robot working envelope.
	3	Tubes	No severe wear and tear on paint and air supply tubes.	○	○	 <b>CAUTION</b> Use a pair of protective glasses to protect your eyes against paint or thinner that is being removed.
	4	Air leakage	No excessive air leakage from the fitting of the motor case.	○	○	 <b>CAUTION</b> Make sure that the air tube is firmly inserted in the joint. Accidental disconnection of the air tube may cause injury.
	5	Dried paint	Remove the dried paint on the robot.	○	○	Replace the sheet.  <b>WARNING</b> When removing the paint with a tool, be careful not to damage the robot.
Pneumatic Unit	1	Water drained from the air filter			○	
	2	Pressure set value	The pressure of the pressure reducing valve is within the specified range	○		

## 8 Frequent Inspections

### 8.1 Frequent Inspections

Table 8-1 Frequent Inspections

	No.	Items to be Inspected	Inspection	Daily	Weekly	Remarks
Safety Devices	1	Operation of emergency stop button and safety plug. Dried paint	1. The manipulator stops immediately when the emergency stop button is pressed.	○		 CAUTION Inspect the robot while it is in its standby position and not in motion.
			2. The manipulator stops immediately when the safety plug is pulled out.	○		
			3. Remove the dried paint on the emergency stop button and the safety plug.	○		
	2	Operation of the photoelectric intrusion detecting switch Dried paint	1. The manipulator stops when the photoelectric switch is turned OFF.	○		
			2. Remove the dried paint on the light beam detector.	○		
	3	Operation of limit switch. Dried paint	1. Normal operation of the limit switch	○	○	
2. Remove the dried paint on the limit switch.			○	○		
Options	1	Operation of the gun tilt switching	The gun tilt changes correctly when air is supplied.	○	○	
	2	Operation of the shear pin system	1. The manipulator stops immediately when the shear pin is sheared.	○	○	
			2. The test valve is closed and the tube is not broken.	○	○	

## 8.2 Daily Inspections

Inspect the robot daily to ensure its high performance and early detection of any abnormalities.

### 8.2.1 Manipulator

#### ■ Visual Inspection

Before turning ON the power to the manipulator, check if any abnormality can be found on the manipulator. Remove the jacket if it is attached.

#### ■ Manipulator Motions and Noise/Vibration during Operation

Check if the manipulator home posture does not change when turning ON the power supply using the eye mark.

Also, check for abnormal noise and vibration during operation.



**DANGER**

Never enter inside the safeguarding and the manipulator working envelope after turning ON the power supply.



**CAUTION**

Paint stuck on the manipulator rotating parts prevents them from turning normally and smoothly. Periodically remove the paint on the manipulator.  
A cloth that is soaked in paint thinner can be used for cleaning the inside of the wrist, because an anti-thinner enclosure is provided. But, be careful not to remove the original coat of paint on the manipulator.

#### ■ Tubes and Air Leakage

Check for excessive air leakage from the tubes, the couplings, and the joint fittings of the motor on each axis when the air is supplied in the manipulator to form the anti-explosion barrier.

The actual amount of air leakage is not important if a fault in the internal air pressure does not occur. However, if internal air pressure faults occur frequently, check if the pressure of the air source and the pressure setting of the pressure reducing valve are correct and if excessive air is leaking.



## 8 Frequent Inspections

### 8.2 Daily Inspections

#### ■ Dried Paint, Dust, and Dirt

Remove any dried paint on the manipulator and other devices.  
 Replace the vinyl sheet if any.  
 Replace the jacket if it is dirty.



#### WARNING

When using a tool to remove the dried paint, be careful not to damage the manipulator.

#### ■ Noise and Vibration during Operation

Check if the manipulator standby posture does not change when turning ON the power supply.  
 Also check for abnormal noise or vibration during operation.



#### WARNING

Never enter inside the safeguards and the manipulator working envelope after turning ON the power supply.

### 8.2.2 Pneumatic Unit

#### ■ Drained Water from Air Filter

Empty the water drained from the air filter on the pneumatic unit.

#### ■ Pressure

Before moving the manipulator, check if the gauges of the pressure reducing valves on the pneumatic unit show the pressure to be within the specified range.

### 8.2.3 Safety Devices

#### ■ Emergency Stop Button and Safety Plug

Before operating the manipulator, check the following to make sure that the emergency stop button and the safety plug operate correctly:

The manipulator stops immediately when the emergency stop button is pressed.

The manipulator stops immediately when the safety plug is pulled out.

Inspect the manipulator while it is in the standby posture and not in motion with the power supply turned ON. Repeated sudden stops while the manipulator is in motion will damage the braking system.

Remove any dried paint on the emergency stop button and the safety plug.

### ■ Photoelectric Intrusion Detecting Switch

Make sure that the photoelectric intrusion detecting switch operates correctly.  
Remove any dried paint on the light beam receiving section on the switch.  
When the air is purging, check the air for purging.

### ■ Limit Switch

Make sure that the limit switches for positioning workpieces, starting the robot, and return the robot to home operate correctly.  
Remove any dried paint that may obstruct the robot motion.

## 8.2.4 Options

### ■ Gun Tilt Switching

Check if the gun changes its tilt smoothly when compressed air is supplied.  
If excessive shock is applied on both ends, reduce the pressure supplied to the actuator.

### ■ Shear Pin

Disconnect the air supply tube, and check if the shear pin breaks immediately to shut off the power supply to the manipulator.  
Also, make sure that the air tube is not bent or crushed.

## 9 Maintenance and Inspection



### DANGER

- 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.
- 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

- 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.

## 9.1 Inspection Schedule

Conduct daily and periodic inspections to ensure the long life of the robot and its performance. 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 given in the levels shown in Table 9-1 "Inspection Schedule".

In Table 9-1 "Inspection Schedule", the inspection items are classified into three types of operation: operations which can be performed by personnel authorized of 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 must be based on the servo power supply ON time.

Table 9-1 Inspection Schedule

Maintenance and Inspection	Item	Schedule					Operation	Inspection Charge		
		1000H Cycle	6000H Cycle	12000H Cycle	24000H Cycle	36000H Cycle		Specified Personnel	Licensee	Service Company
Inspection, replacement and grease replenishment/ replacement of bearing, speed reducers, and gears <sup>a</sup> Refer to Section 9.2	Gear inside the wires	○ Replenish grease					Replace the belt and gear if any abnormality is found. Use Alvania EP grease 2		○	○
			○ Adjustment gear (Every-7500H)				Contact your Yaskawa representative for gear adjustment			○
	RV speed reducer		○ Replenish grease	○ Replenish grease			Replace the speed reducer if any abnormality is found Use Molywhite RE No. 00 grease		○	○
	R-, B-, T-axis speed reducer made by Alpha Getriebebau GmbH					○	Contact your Yaskawa representative.			○
Tightening of bolts	Tighten the bolts that loosen from vibration and an excessively swing load.	○						○	○	○
Inspection of Wrist	O- and X-ring		○				Replace if any abnormality is found. Contact your Yaskawa representative		○	○
	Presence check abnormality		○					○	○	○

## 9 Maintenance and Inspection

### 9.1 Inspection Schedule

Maintenance and Inspection	Item	Schedule					Operation	Inspection Charge	
		1000H Cycle	6000H Cycle	12000H Cycle	24000H Cycle	36000H Cycle		Specified Personnel	Service Company
Inspection of air sealing parts for internal pressure	Inspection of the packing of the motor case		○				Replace the picking if excessive wear is found	○	○
	Inspection of packing of the box		○					○	○
Replacement of pneumatic unit filter	Replace pneumatic unit filter.		○					○	○
	Check operation of the solenoid valve		○					○	○
	Check operation of the pressure reducing valve.		○					○	○
Inspection of explosion-proof devices	Check the operation of the pressure switch		○					○	○
	Check the operation of the master valve.		○					○	○
	Check the operation of the explosion-proof enclosure		○					○	○
	Check operation of the relief valve		○					○	○
Inspection of internal cables <sup>b</sup>	Check the conduction. Check for the wears on the protective spring			○ Inspect	○ Replace <sup>c</sup>		Swinging the lead wire, check the conduction of the main connector and intermediate connector of the box. Check for the wears on the protective spring	○	○
Motor Connector	Check if the connectors are securely inserted.	○					Insert the connector securely if it is loose	○	○
Battery in manipulator	Replacement of the battery					○ Replace	Replace the battery when the battery alarm is displayed on the XRC	○	○
Overhaul						○	Contact your Yaskawa representative		○

a. When replenishing or replacing the grease, be careful not to let any grease into the motor. Grease in the motor may cause motor failure. When any grease enters in the motor, contact your Yaskawa representative.

b. When checking for conduction with multimeter, connect the battery to “BAT” and “OBT” of connectors on the motor side for each axis, and then remove connectors on detector side for each axis from the motor. Otherwise, the home position data may be lost.

c. Replace the internal cables of S-, L-, U-, R-, B-, and T-axis at 24,000H inspection.

## 9.2 Maintenance for Manipulator

### 9.2.1 Grease Replenishment/Replacement

Inspection parts and Inspection numbers show the location of the components of the manipulator. Replenish or replace the grease for the following:

- 1) Gears on the wrist and the end of the U-arm
- 2) RV speed reducers for the S-, L- and U-axis

#### ■ Gears

Remove the cover and the plug. Inject Alvania EP grease 2 by using a grease gun to the gear teeth. See Fig. 9-1 "Injecting Grease at Wrist and End of U-arm (PX2850-A10)" and Fig. 9-2 "Injecting Grease at R-, B-, T-axis Gear"

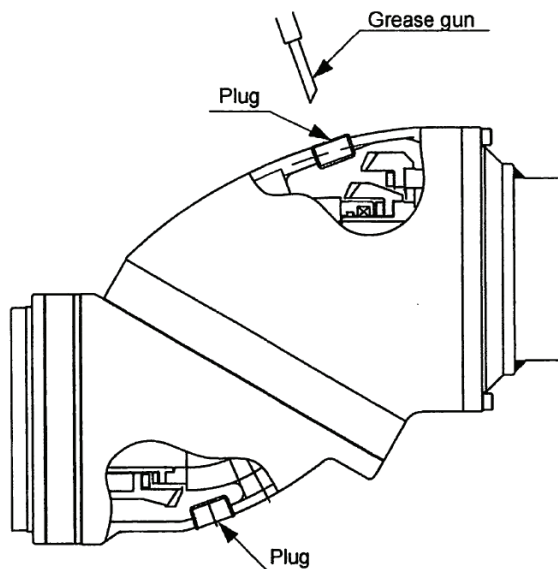


Fig. 9-1 Injecting Grease at Wrist and End of U-arm (PX2850-A10)

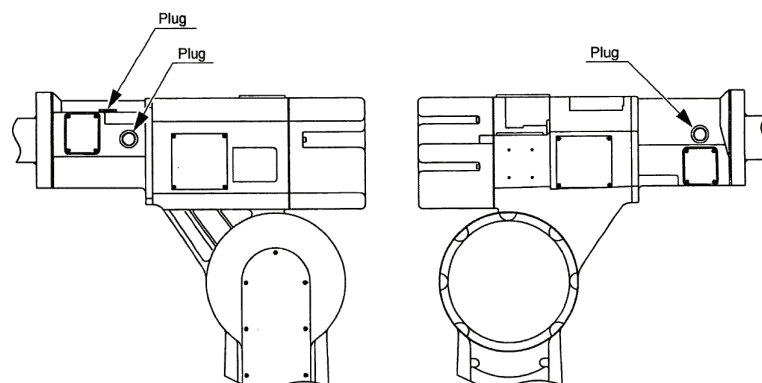


Fig. 9-2 Injecting Grease at R-, B-, T-axis Gear

## ■ RV Speed Reducers

### Grease Replenishment

Refer to Fig , Fig, and Fig

1. Remove the plug on the So (Lo, Uo) grease exhaust port. Remove the cover on the L-axis motor side..

#### NOTE

- If grease is added without removing the plug, the internal pressure will be higher and may damage it. It is absolutely necessary to remove the plug.
- When injecting grease into the L-axis speed reducer, grease may come out from the air flow on the motor base. Remove the cover on the motor side to check if excessive grease is coming out. If there is any grease, wipe it off.

2. Inject grease into the Si (Li, Ui) grease inlet with the injecting pressure of 0.3 Mpa or less and injecting speed of 8.0 g/s or less. (Ass for L- and U-axis, before injecting grease, remove the plugs on Li and Ui and install G nipples A-PT 1/8.)

<p>Grease type: Molywhite RE No.00 Amount of grease: S-axis: 700 cc (1400 cc for the 1st supply) L-axis: 600 cc (1200 cc for the 1st supply) U-axis: 300 cc (600 cc for the 1st supply)</p>
---

3. Move S-axis (L-axis, U-axis) for more than 20 minutes to discharge excessive grease.
4. Wipe the So (Lo, Uo) exhaust ports with a cloth and reinstall plugs in So (Li, Lo and Ui, Uo) exhaust ports. Apply Three Bond 4501 on screwed parts. Reinstall the cover on the L-axis motor side.

### Grease Replacement

Refer to Fig , Fig, and Fig

1. Remove the plug on the So (Lo, Uo) grease exhaust port. Remove the cover on the L-axis motor side..

#### NOTE

- If grease is added without removing the plug, the internal pressure will be higher and may damage it. It is absolutely necessary to remove the plug.
- When injecting grease into the L-axis speed reducer, grease may come out from the air flow on the motor base. Remove the cover on the motor side to check if excessive grease is coming out. If there is any grease, wipe it off.

2. Inject grease into the Si (Li, Ui) grease inlet with the injecting pressure of 0.3 Mpa or less and injecting speed of 8.0 g/s or less. (Ass for L- and U-axis, before injecting

grease, remove the plugs on Li and Ui and install G nipples A-PT 1/8.)

Grease type: Molywhite RE No.00  
Amount of grease:  
S-axis: 1700 cc  
L-axis: 2000 cc  
U-axis: 900 cc

3. The grease replacement is complete when new grease appears in the So (Lo, Uo) exhaust port. The new grease can be distinguished from the old grease by color.
4. Move S-axis (L-axis, U-axis) for more than 20 minutes to discharge excessive grease.
5. Wipe the exhaust ports with a cloth and reinstall plugs in the So (Lo, Uo) exhaust port. Apply three Bond 4501 on screwed parts. Reinstall the cover on the L-axis motor side.



If the plug (So, Lo, Uo) is installed while the grease is being exhausted, the grease will go inside the motor and may cause a damage. Ensure that the grease has been completely exhausted before installing the plug (So, Lo, Uo).

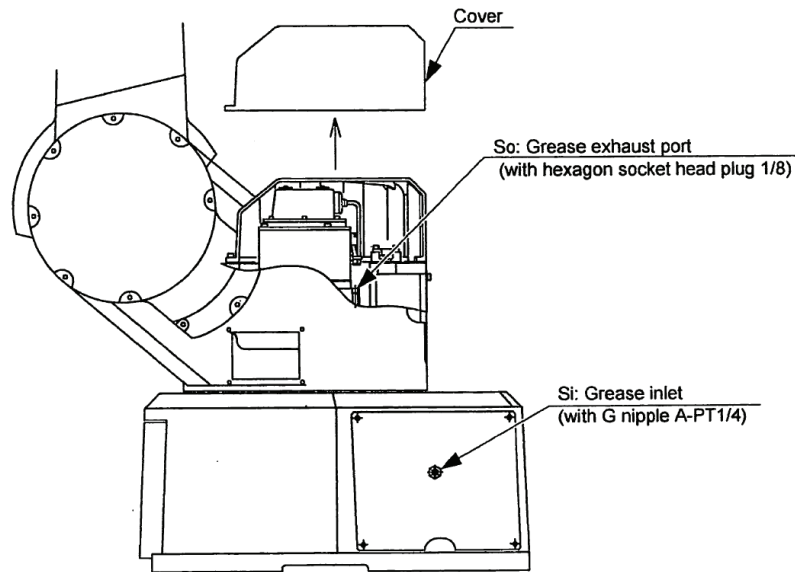


Fig. 9-3 S-axis RV Speed Reducer

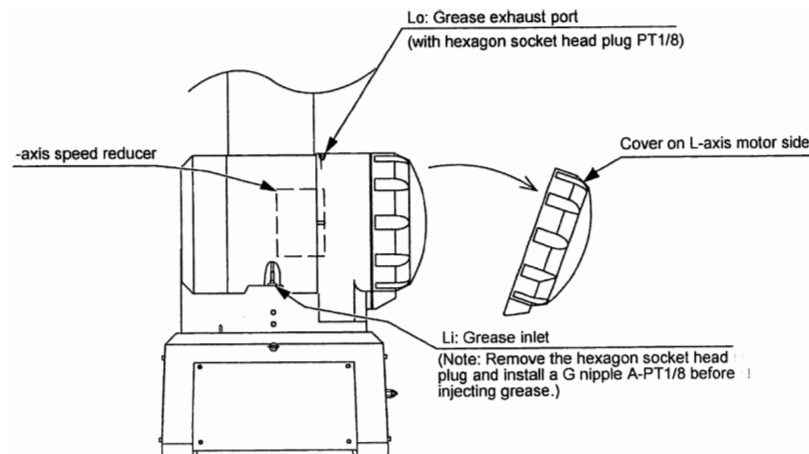


Fig. 9-4 L-Axis RV Speed Reducer



## 9 Maintenance and Inspection

### 9.2 Maintenance for Manipulator

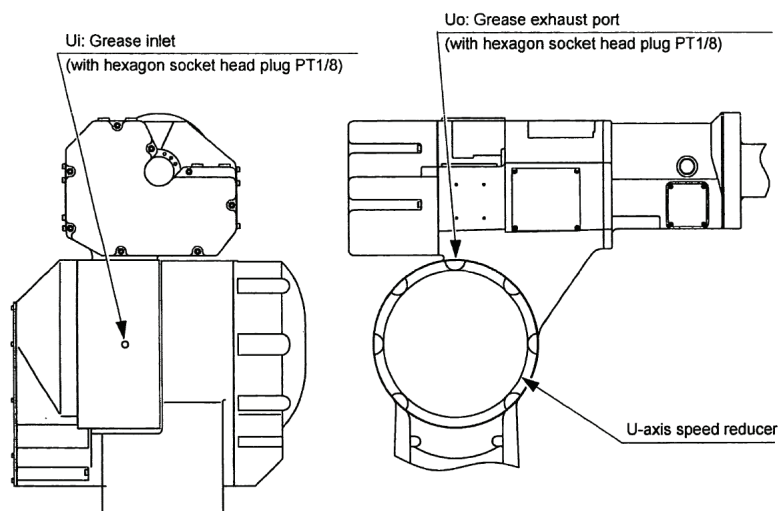


Fig. 9-5 U-Axis RV Speed Reducer

### 9.2.2 Lubricating Oil Replacement R-, B-, and T-Axis Speed Reducers

Contact your Yaskawa representative because motors and drive shafts for the R- B-, and T-axis need to be removed to replace the lubricating oil..

- Recommend lubricating oil: Renolin PG220 made by Fuchs Lubricants Co. Viscosity = ISO VG200

### 9.2.3 Tightening Bolts

Tighten the bolts shown in Fig. 9-6 "Manipulator Base Box Fixing Bolts" to Fig. 9-8 "Terminal Box in Manipulator Base Box"

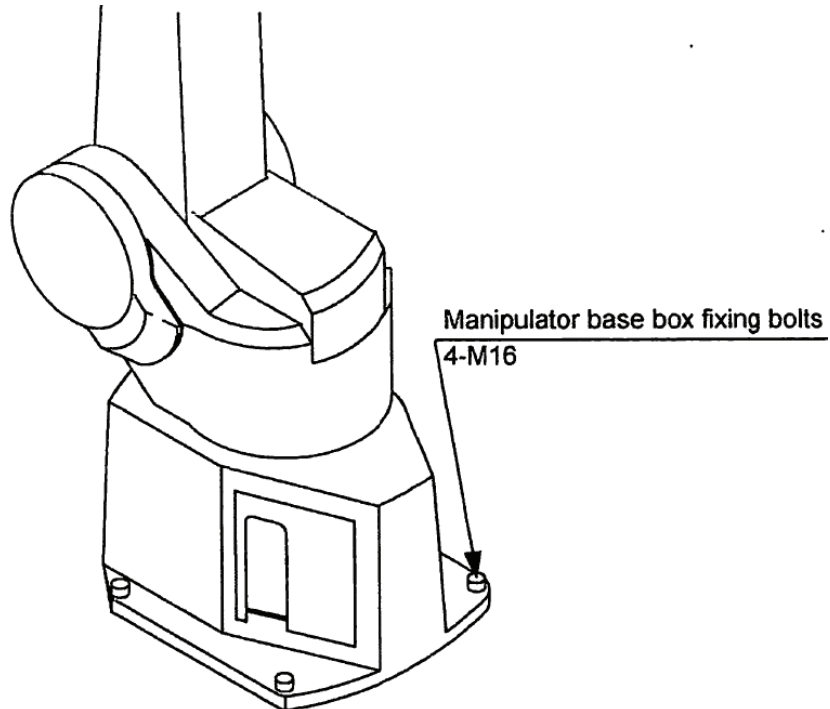


Fig. 9-6 Manipulator Base Box Fixing Bolts

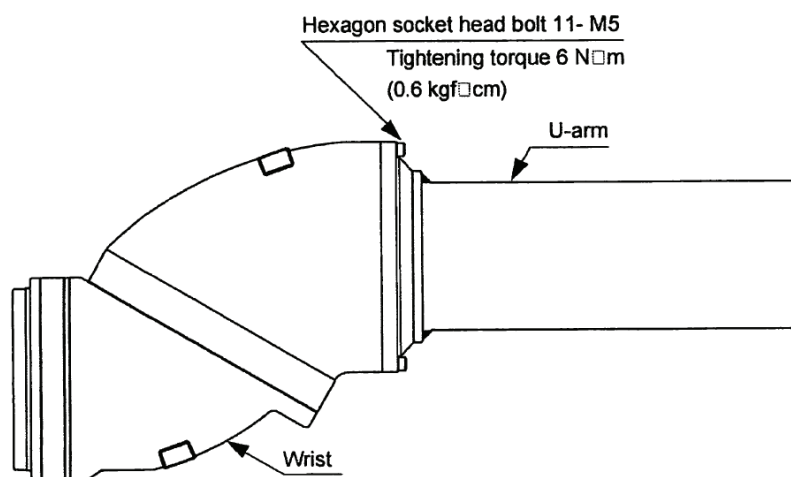


Fig. 9-7 Wrist Fixing Bolts

## 9 Maintenance and Inspection

### 9.2 Maintenance for Manipulator

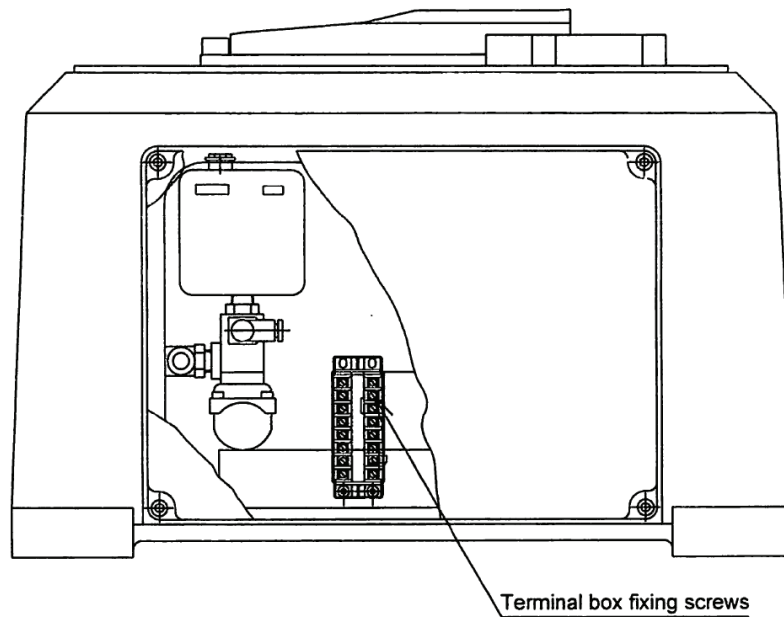


Fig. 9-8 Terminal Box in Manipulator Base Box

#### 9.2.4 Wrist Speed Reducer and Bearing

Check if the three wrist axis move smoothly or not. If the wrist does not move smoothly, contact your Yaskawa representative. Removing and disassembling the wrist to find the faulty axis will be needed for repair or replacement of the bearing, the speed reducer, or the sealing compounds.



#### CAUTION

To remove the wrist from the U-arm, firmly hold the wrist and remove the fixing bolt. If not, the wrist may fall down when the fixing bolt is removed.

## 9.2.5 Air Sealings for Internal Air Pressure

### ■ Packing on the Motor Case

Remove the mounting bolts on the motor case and check the packing where the case is mounted. Remove the cover for the cable inlet in the motor case, and check the packing where the cover is attached. Excessive oil in the air that is used for the internal air pressure can damage the packing, which results in air leakage. Replace the packing if air leakage is found.

Refer to Fig. 9-9 "S- and L-axis Motor Packings" and Fig. 9-10 "R-, B-, and T-axis Motor Packing" for more information on the packing on each axis motor.

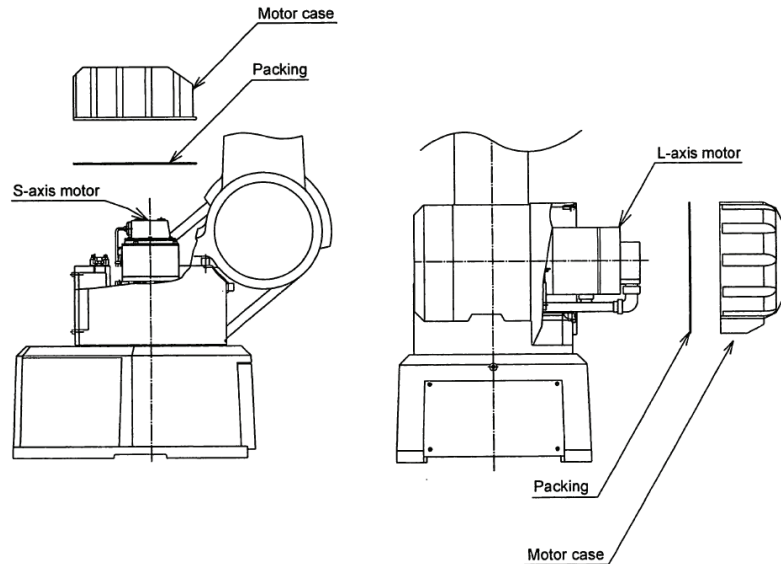


Fig. 9-9 S- and L-axis Motor Packings

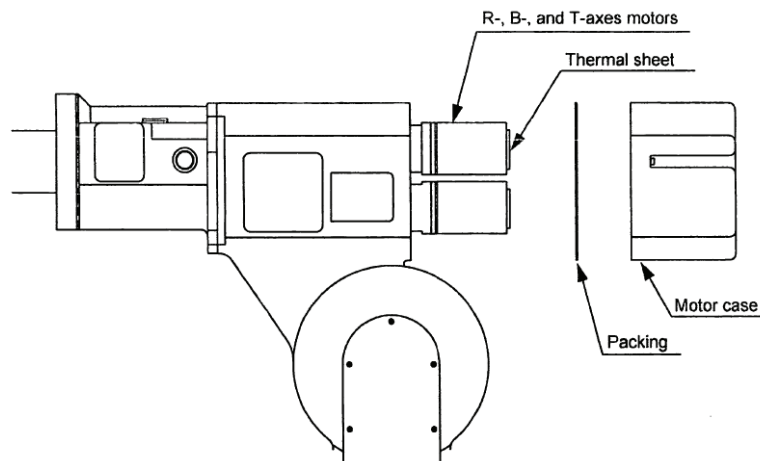


Fig. 9-10 R-, B-, and T-axis Motor Packing

## 9 Maintenance and Inspection

### 9.2 Maintenance for Manipulator

#### ■ Manipulator Base Box Cover Packing

Remove the two covers on the back side of the manipulator base box, and check the rubber packing. Refer to Fig. 9-11 "Manipulator Base Box Rubber Packing"

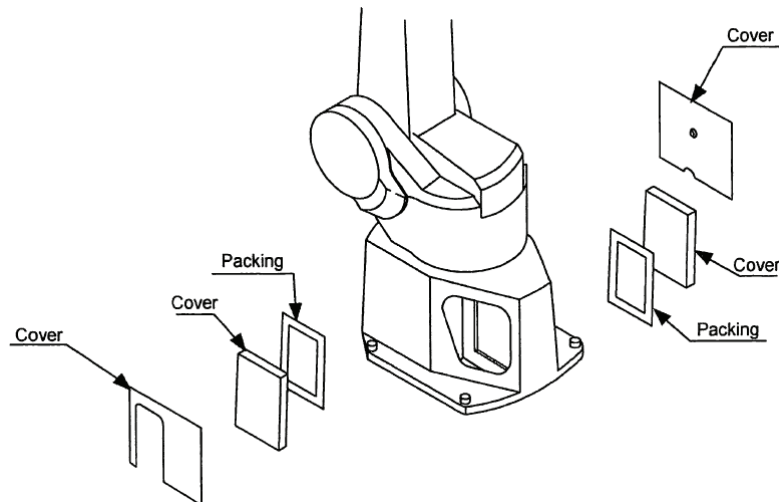


Fig. 9-11 Manipulator Base Box Rubber Packing

## **9.3** Maintenance and Inspection of the Pneumatic Unit

### **9.3.1** Solenoid Valve

Check if the air purge starts a few seconds after turning ON the power to the NX100 and if it ends approximately 8.5 minutes later.

### **9.3.2** Pressure Reducing Valve

Measure the air pressure for the pneumatic unit with a pressure gauge. Remove the test plug or the relief valve on the pneumatic unit and connect the gauge. The air pressure must always be from 0.02 MPa (0.2 kg/cm<sup>2</sup>) to 0.04 MPa (0.4 kg/cm<sup>2</sup>) under normal conditions and from 0.3 MPa (3.0 kg/cm<sup>2</sup>) to 0.45 MPa (4.5 kg/cm<sup>2</sup>) when purging.

## 9.4 Inspection of Explosion-Proof Devices

### 9.4.1 Pressure Switch

Remove the front cover of the pneumatic unit box and check the conduction of the pressure switches. The two pressure switches must be ON when the air is being supplied and OFF when the air is not being supplied.



#### CAUTION

- Be sure to turn OFF the power to the NX100 before inspecting the pressure switch.
- Do not touch the pressure setting dial on the pressure switch during an inspection. Changing the setting prevents the correct pressure from being detected.

### 9.4.2 Master Valve

While the air is being supplied from the pneumatic unit, check if the air purge starts a few seconds after the power to the NX100 is turned ON. Also, check if the air goes out of the two air outlets for the master valve during the air purge.

### 9.4.3 Pressurized Anti-Explosion Barrier

While the air is being supplied from the pneumatic unit, check if the air purge starts a few seconds after the power to the NX100 is turned ON and if it ends approximately 8.5 minutes later.

Also, check the following:

- (a) The alarm "AIR PRESSURE ERROR" occurs immediately after the air supply from the pneumatic unit is stopped and the power supply to the NX100 is turned ON.
- (b) The alarm "AIR PRESSURE ERROR" occurs when the air supply from the pneumatic unit is stopped during air purging.

# 10 Recommended Spare Parts

It is recommended that the following parts and components be kept in stock as spare parts for the MOTOMAN-EPX1750 & EPX2050. The spare parts list is shown below.

Product performance can not 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 units



To replace parts in Rank B or Rank C, contact your Yaskawa representative.

Fig. 10-1 Spare Parts for MOTOMAN-EPX1750 & EPX2050

Rank	Part No.	Name	Type	Manufacturer	Qty	Qty per Unit	Remarks
A	1	Sealing compound	DB-1600	Diabond Industries Co., Ltd.	200ml	-	For packing
A	2	Seal tape	TB-4501	Three Bond Co., Ltd	-	-	For plug seal
A	3	Grease	Alvania EP grease 2	Showa Oil Co., Ltd	16 kg	-	For bevel gear in wrist and R-, B-and T-axes scissors gear
A	4	Grease	VIGO grease RE No.0	Yaskawa	16 kg	-	For RV speed reducer
A	5	Lubricating oi	Renolin PG220	Fuchs Lubricants Co.	10l	-	Alpha Getriebebau speed reducer
B	6	S-axis speed reducer	HW9482854-A	Yaskawa	1	1	
B	7	L-axis speed reducer	HW9482854-C	Yaskawa	1	1	
B	8	U-axis speed reducer	HW0384017-A	Yaskawa	1	1	
B	9	R-, B- and T-axes speed reducers	HW0485932-A	Yaskawa	1	3	
B	10	U-arm unit	HW0171945-B	Yaskawa	1	1	
B	11	Wrist unit	HW0171946-A	Yaskawa	1	1	
C	12	AC servomotors for S- and U-axis	SGMRS-12A2B-YRA*	Yaskawa	1	2	
C	13	AC servomotors for L-axis	SGMRS-30A2A-YRA*	Yaskawa	1	1	
C	14	AC servomotors for R-, B-, and T-axis	SGMPH-04A2A-YR5*	Yaskawa	1	3	



## 10 Recommended Spare Parts

Fig. 10-1 Spare Parts for MOTOMAN-EPX1750 &amp; EPX2050

Rank	Part No.	Name	Type	Manufacturer	Qty	Qty per Unit	Remarks
C	15	Switch unit	HW0370224-A	Yaskawa	1	1	EPX2050-B500, -B510
			HW0370224-B				EPX2050-B501, -B511
C	16	Internal Cable	HW0272857-A	Yaskawa	1	1	For S-axis
C	17	Internal Cable	HW0373190-A	Yaskawa	1	1	For L-axis motor
C	18	Internal Cable	HW0373191-A	Yaskawa	1	1	For L-axis encoder
C	19	Internal Cable	HW0272858-A	Yaskawa	1	1	For R-, B-, and T-axis
C	20	Internal Cable	HW0373189-A	Yaskawa	1	1	For U-axis
	21	Internal Cable	HW0472242-A	Yaskawa	1	1	Battery Cable

# MOTOMAN-EPX1750 & EPX2050 INSTRUCTIONS

---

**HEAD OFFICE**

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

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

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

YASKAWA Nordic AB  
Bredbandet 1 vån. 3 varvsholmen 392 30 Kalmar, Sweden  
Phone +46-480-417-800 Fax +46-480-417-999

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

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

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

YASKAWA Electric Korea Co., Ltd  
9F, Kyobo Securities Bldg., 26-4, Yeouido-dong, Yeongdeungpo-gu, Seoul 150-737, Korea  
Phone +82-2-784-7844 Fax +82-2-784-8495

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

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

YASKAWA Electric (Thailand) Co., Ltd.  
252/125-126 27th Floor, Tower B Muang Thai-Phatra Complex Building,  
Rachadaphisek Road, Huaykwang, Bangkok 10320, Thailand  
Phone +66-2693-2200 Fax +66-2693-4200

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

---

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