MOTOMAN-HP6
INSTRUCTIONS

TYPE: YR-HP6-A00 (STANDARD SPECIFICATION)
YR-HP6-A01 (WITH LIMIT SWITCHES FOR S-, L-, U-AXES)

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

MOTOMAN INSTRUCTIONS

MOTOMAN-HP6 INSTRUCTIONS
NX100 INSTRUCTIONS
NX100 OPERATOR'S MANUAL
NX100 MAINTENANCE MANUAL

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

YASKAWA

MANUAL NO. HW0481893 ◇2◇

MANDATORY

- **This instruction manual is intended to explain operating instructions and maintenance procedures primarily for the MOTOMAN-HP6.**
- **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.**

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.**

Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the NX100.

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

 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.
 MANDATORY	Always be sure to follow explicitly the items listed under this heading.
 PROHIBITED	Must never be performed.

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

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

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

WARNING

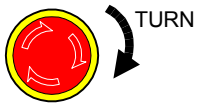
- **Before operating the manipulator, check that servo power is turned off when the emergency stop buttons on the front door of the NX100 and programing pendant are pressed.**
  When the servo power is turned off, the SERVO ON LED on the programing pendant is turned off.

  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 working 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 manipulator's work envelope and that you are in a safe location before:**
  - Turning on the NX100 power
  - Moving the manipulator with the programing pendant
  - Running check operations
  - Performing automatic operations

  Injury may result if anyone enters the working envelope of the manipulator during operation. Always press an emergency stop button immediately if there are problems.
  The emergency stop button is located on the right of the front door of the NX100 and programing 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 programing pendant to the hook on the NX100 cabinet after use.**

  The programing pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- **Read and understand the Explanation of the Warning Labels in the NX100 instructions before operating the manipulator.**

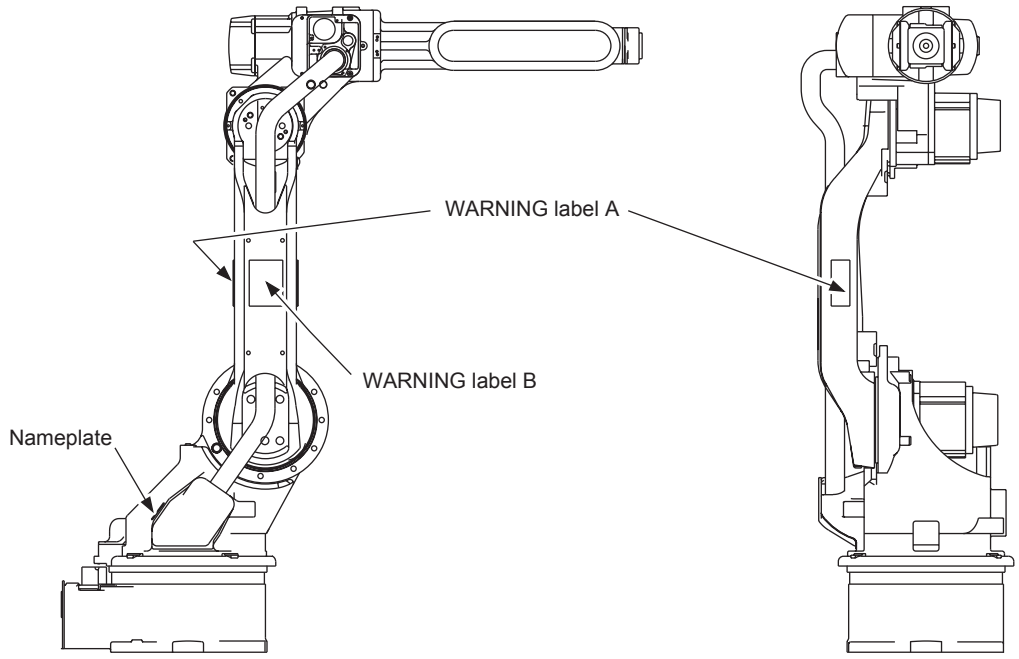
Definition of Terms Used Often in This Manual

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

Equipment	Manual Designation
NX100 Controller	NX100
NX100 Programing Pendant	Programing Pendant
Cable between the manipulator and controller	Manipulator Cable

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.



Nameplate:

MOTOMAN

TYPE
□□□□□□

PAYLOAD
□□ kg

MASS
□□□ kg

ORDER NO.
□□□□□□

DATE
□□

SERIAL NO.
□□□□□□

YASKAWA ELECTRIC CORPORATION
JAPAN

WARNING label A:

WARNING label B:

1 Product Confirmation

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.

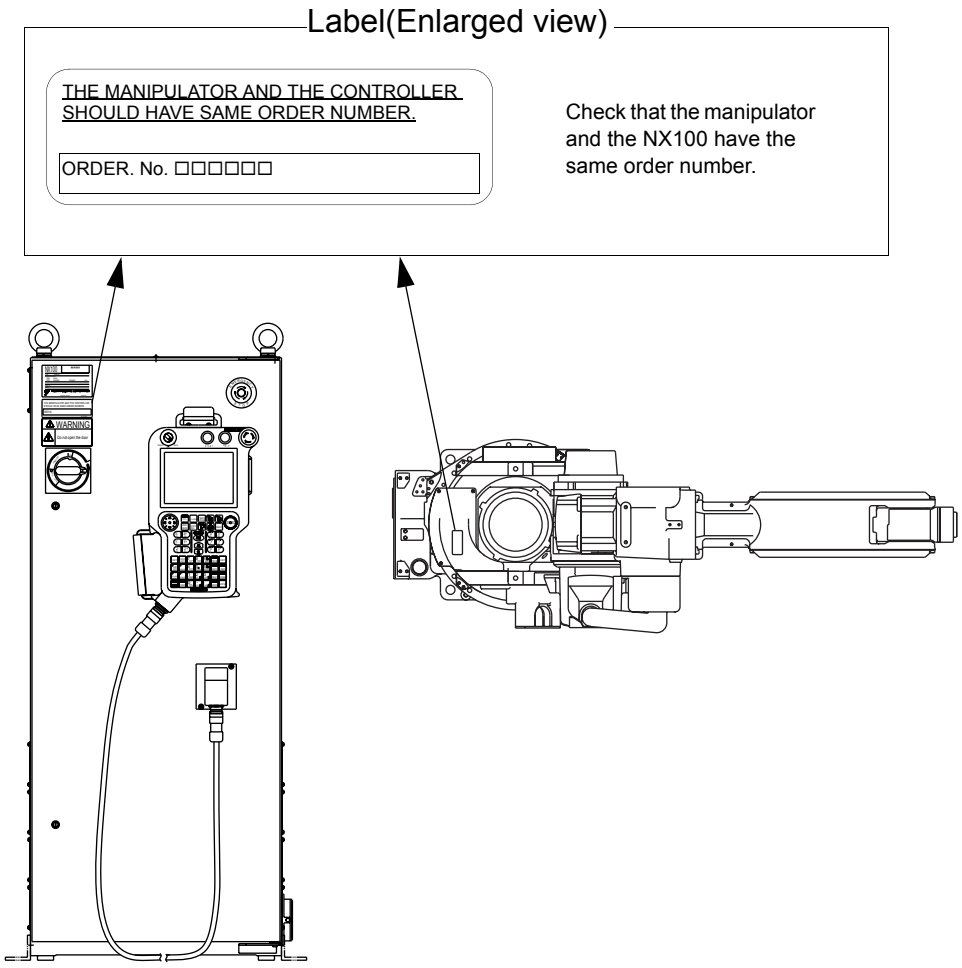
1.1 Contents Confirmation

Confirm the contents of the delivery when the product arrives.
Standard delivery includes the following four items (Information for the content of optional goods is given separately):

- Manipulator
- NX100
- Programing Pendant
- Manipulator Cable (Between Manipulator and NX100)

1.2 Order Number Confirmation

Check that the order number of the manipulator corresponds to the NX100. The order number is located on a label as shown below.



(a) NX100 (Front View) (b) Manipulator (Top View)

Fig. 1 Location of Order Number Labels

2 Transporting

CAUTION

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

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

- **Avoid excessive vibration or shock during transporting.**

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

2.1 Transporting Method

NOTE

- The weight of the manipulator is approximately 135kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the weight.
- Mount the shipping bolts and brackets for transporting the manipulator.
- Avoid putting 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.

2.1.1 Using a Crane

As a rule, when removing the manipulator from the package and moving it, a crane should be used. The manipulator should be lifted using wire rope.
Be sure the manipulator is fixed with the shipping bolts and brackets before transporting, and lift it in the posture as shown in " Fig. 2 Transporting Position ".

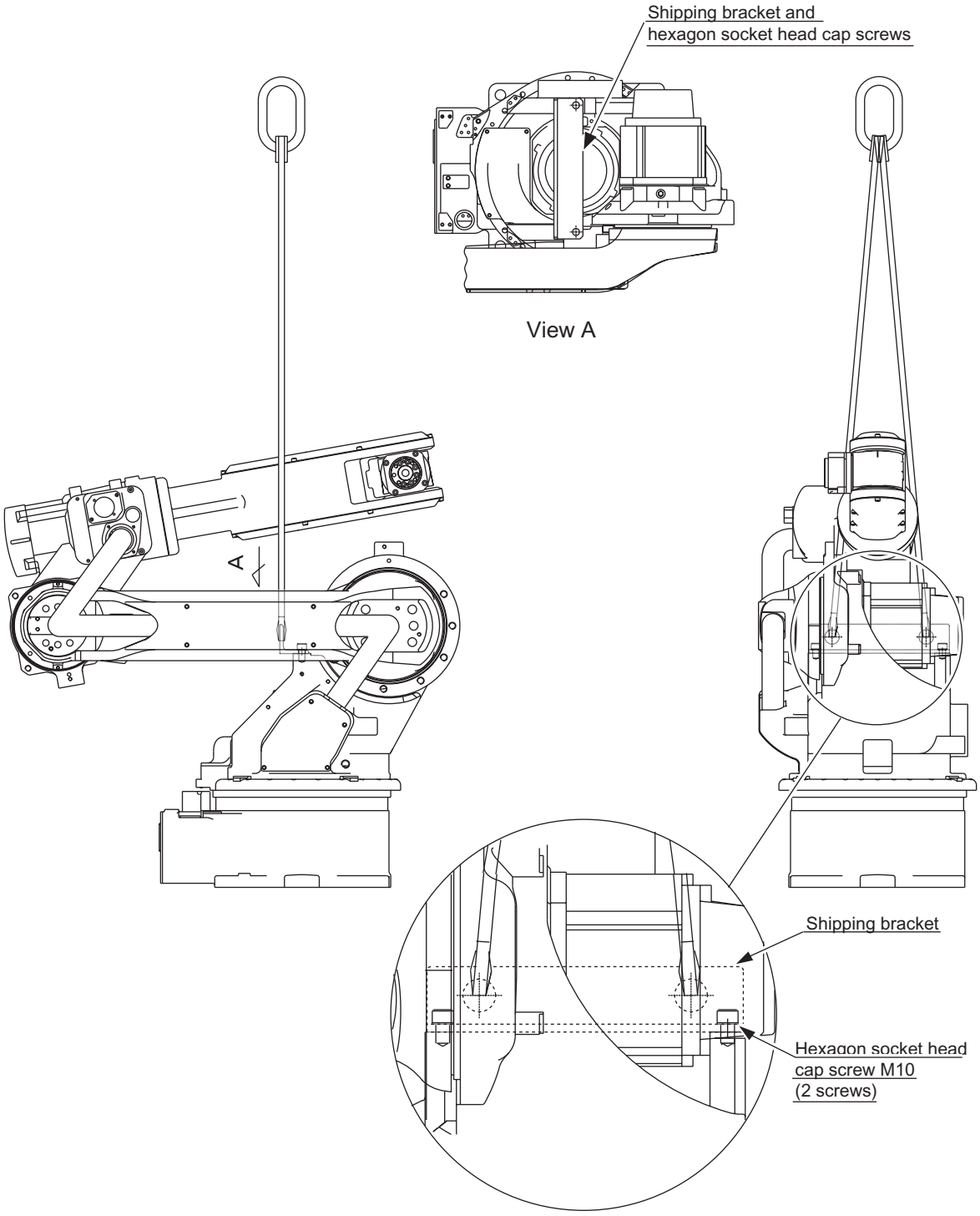


Fig. 2 Transporting Position

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. 3 Using a Forklift ". Insert claws under the pallet and lift it. The pallet must be strong enough to support the manipulator. Transporting of the manipulator must be performed slowly in order to avoid overturning or slippage.

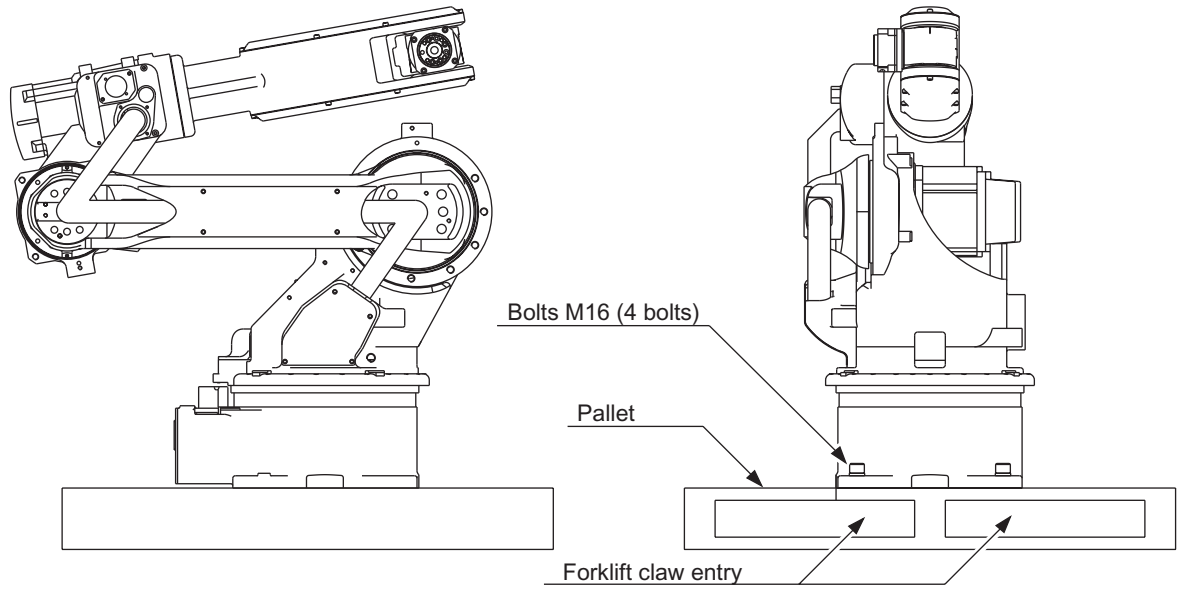


Fig. 3 Using a Forklift

2.2 Shipping Bolts and Brackets

The manipulator is provided with a shipping bracket and 2 screws. (See Fig. 2 Transporting Position").

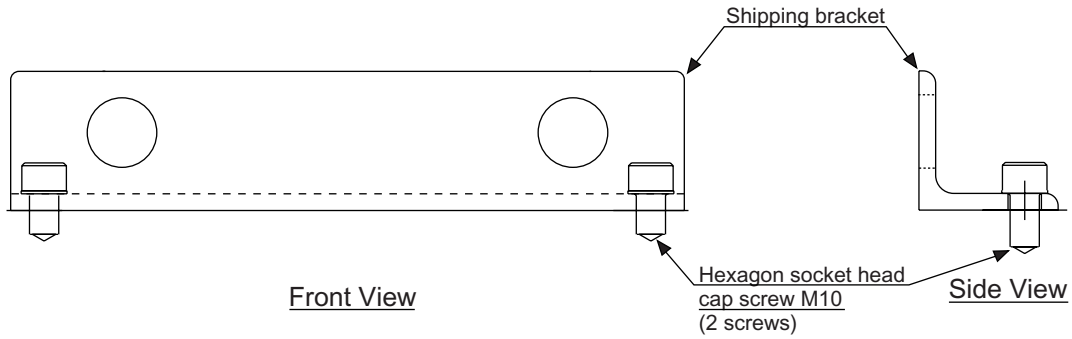


Fig. 4 Shipping Bolts and Brackets

- The shipping bracket and screws are painted yellow.
- The shipping bracket is fixed with the hexagon socket head cap screw M10 (2 screws).

NOTE Before turning on the power, make sure that the shipping bolts and brackets are removed. The shipping bolts and brackets then must be stored for future use, in the event that the manipulator must be moved again.

3 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.

- **When mounting the manipulator on the ceiling or wall, the base section must have sufficient strength and rigidity to support the weight of the manipulator. Also, it is necessary to consider countermeasures to prevent the manipulator from falling.**

  Failure to observe these warnings may result in injury or damage.

CAUTION

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

  Failure to observe this caution may cause injury or damage.

- **Before turning on the power, check to be sure that the shipping bolts and brackets explained in "Fig. 4 Shipping Bolts and Brackets" are removed.**

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

3.1 Installation of the Safeguarding

To insure safety, be sure to install safeguarding. 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 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.

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 repulsion forces during acceleration and deceleration. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the manipulator as shown in "Table. 1 Maximum Repulsion Forces of the Manipulator at Emergency Stop" and "Table. 2 Maximum Torque of Acceleration and Deceleration". If the mounting face is out of plane, the manipulator shape may change and its functional ability may be compromised. Out of the plane for installation must be kept at 0.5mm or less. Mount the manipulator base as in the following way: " 3.2.1 Mounting Example ".

Table. 1 Maximum Repulsion Forces of the Manipulator at Emergency Stop

Horizontal rotating maximum torque (S-axis moving direction)	2000N • m (204kgf• m)
Vertical rotating maximum torque (LU-axis moving direction)	3500N • m (357kgf• m)

Table. 2 Maximum Torque of Acceleration and Deceleration

Horizontal maximum torque of acceleration and deceleration (S-axis moving direction)	450N • m (46kgf • m)
Vertical maximum torque of acceler-ation and deceleration (LU-axis moving direction)	1300N • m (132kgf • m)

3.2.1 Mounting Example

Fix the baseplate onto the floor. The baseplate should be rugged and durable to prevent shifting of the manipulator or the mounting fixture. The thickness of the baseplate is 40mm or more, and an M16 size or larger anchor bolt is recommended.
Fix the manipulator base onto the baseplate with the hexagon socket head cap screws M16 (mm). The plate is tapped for M16 (length: 50mm) screws. Tighten the screws and anchor bolts securely so that they will not work loose during operation. See “Fig. 4 Mounting the Manipulator Baseplate” for the method.

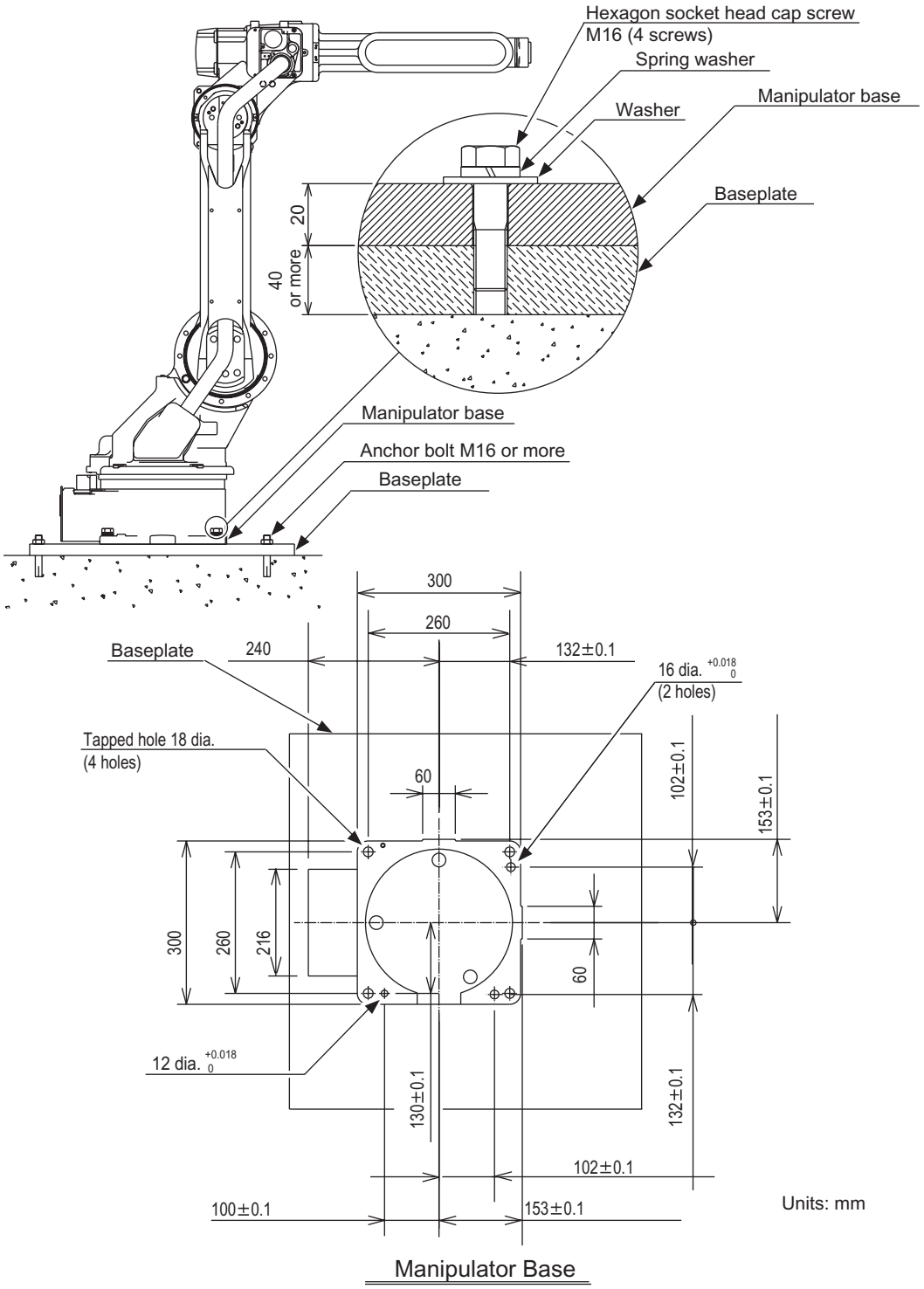


Fig. 5 Mounting the Manipulator Baseplate

3.3 Types of Mounting

The manipulator can be mounted in three different ways: floor-mounted (standard), wall-mounted, and ceiling-mounted types are available. For wall- and ceiling-mounted types, the following points are different from the floor-mounted types.

- S-Axis Operating Range
- Fixing the Manipulator Base
- Precautions to Prevent the Manipulator from Falling

3.3.1 S-Axis Operating Range

For the wall-mounted type, the S-Axis movable range must be ±30°.

3.3.2 Fixing the Manipulator Base

For the wall- or ceiling-mounted types, be sure to use four hexagon socket head cap screws M16 when fixing the manipulator base. Use a torque of 206N• m when tightening the bolts.

3.3.3 Precautions to Prevent the Manipulator from Falling

For the wall- or ceiling-mounted types, take appropriate measures to avoid the falling of the manipulator in case of emergency. Refer to "Fig. 5 When Using Ceiling- and Wall-Mounted Types" for details.

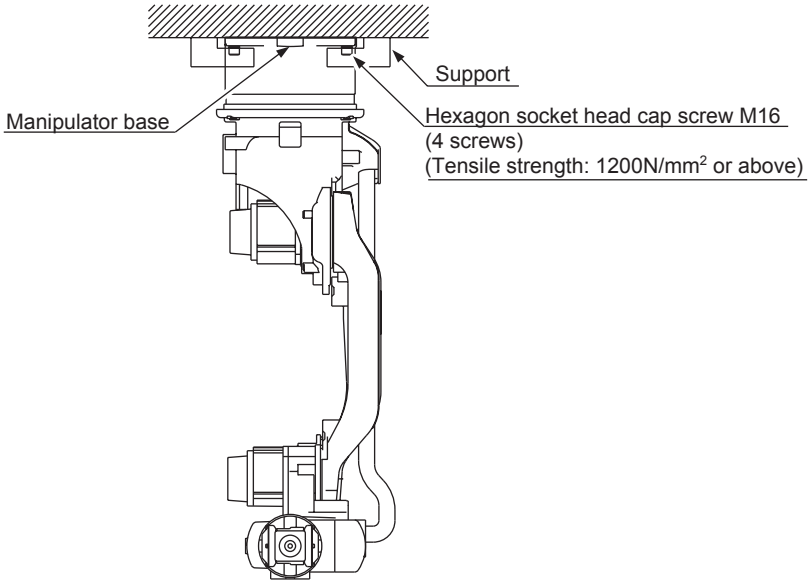


Fig. 6 When Using Ceiling- and Wall-Mounted Types

NOTE When using wall-mounted or ceiling-mounted types, contact your Yaskawa representative.

3.4 Location

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

- Ambient Temperature: 0° to +45°C
- Humidity: 20 to 80%RH (non-condensing)
- Free from dust, soot, or water
- Free from corrosive gas or liquid, or explosive gas
- Free from excessive vibration (less than 4.9m/s^2 [0.5G])
- Free from large electrical noise (plasma)
- The flatness for installation is 0.5mm or less

4 Wiring

WARNING

- **Ground resistance must be 100 Ω or less.**

  Failure 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.

4.1 Grounding

Follow the local regulations and electrical installation standards for grounding. The recommended grounding wire size is 5.5mm^2 at minimum.
For grounding, connect the ground wire directly to the manipulator as in "Fig. 6 Grounding Method".

NOTE
- Do not use this line in common with other ground wires 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 the local electrical installation standards.

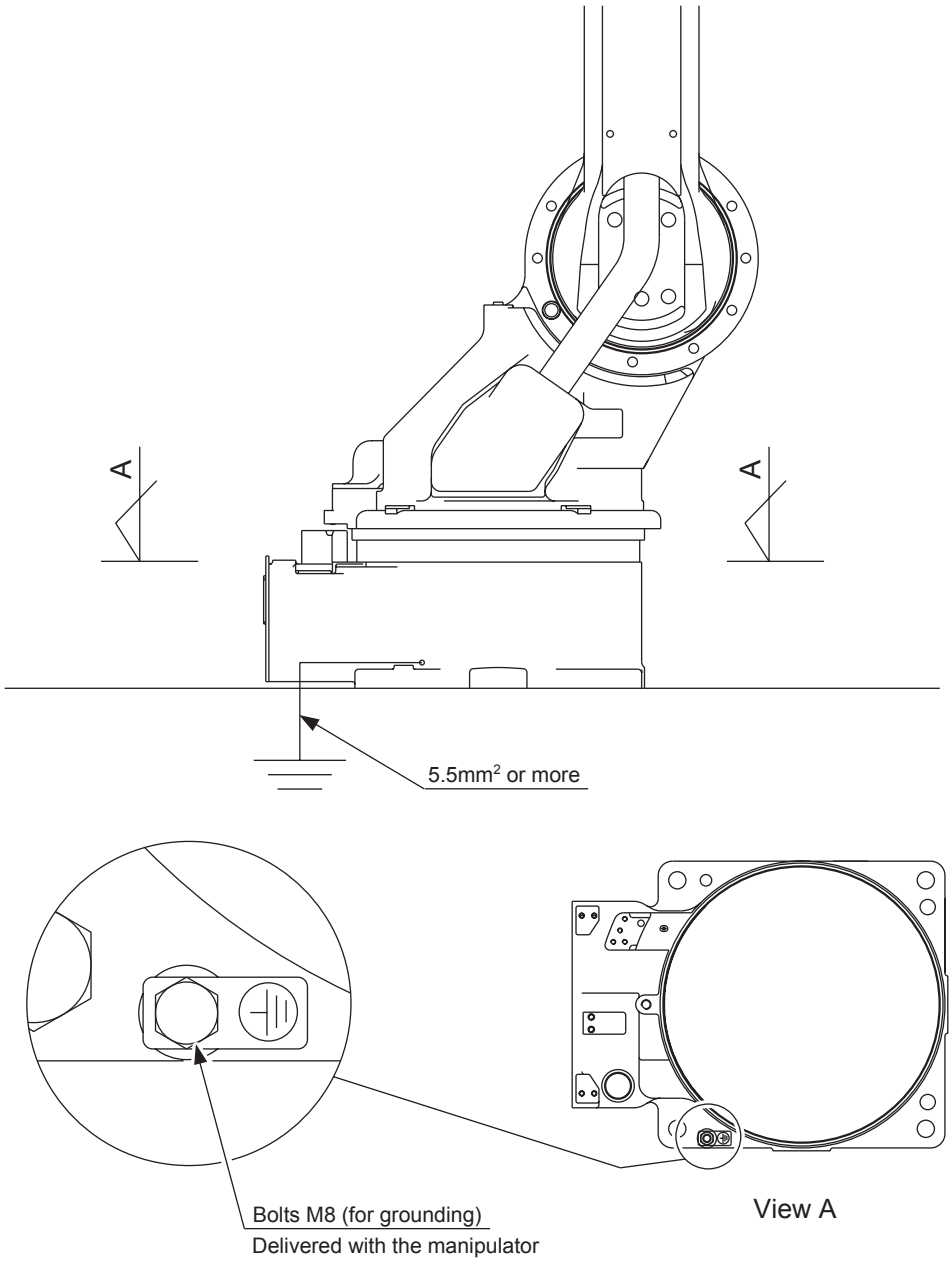


Fig. 7 Gounding Method

4.2 Cable Connection

Two manipulator cables are provided; a signal cable (1BC) and a power cable (2BC). Connect these cables to the manipulator base connectors and to the NX100. Refer to “Fig.8 (a) Cable Connection to the Manipulator” and “Fig.8 (b) Cable Connection to the NX100”.

4.2.1 Connection to the Manipulator

Before connecting the manipulator cables to the manipulator, verify the numbers: 1BC and 2BC on both the cables and the manipulator base connectors. Connect 2BC first, and then 1BC. After inserting the cables, set the lever until it clicks.

4.2.2 Connection to the NX100

Before connecting the manipulator cables to the NX100, verify the numbers: 1BC and 2BC on both the cables and the NX100 connectors. Connect 2BC first, and then 1BC. After inserting the cables, set the lever until it clicks.

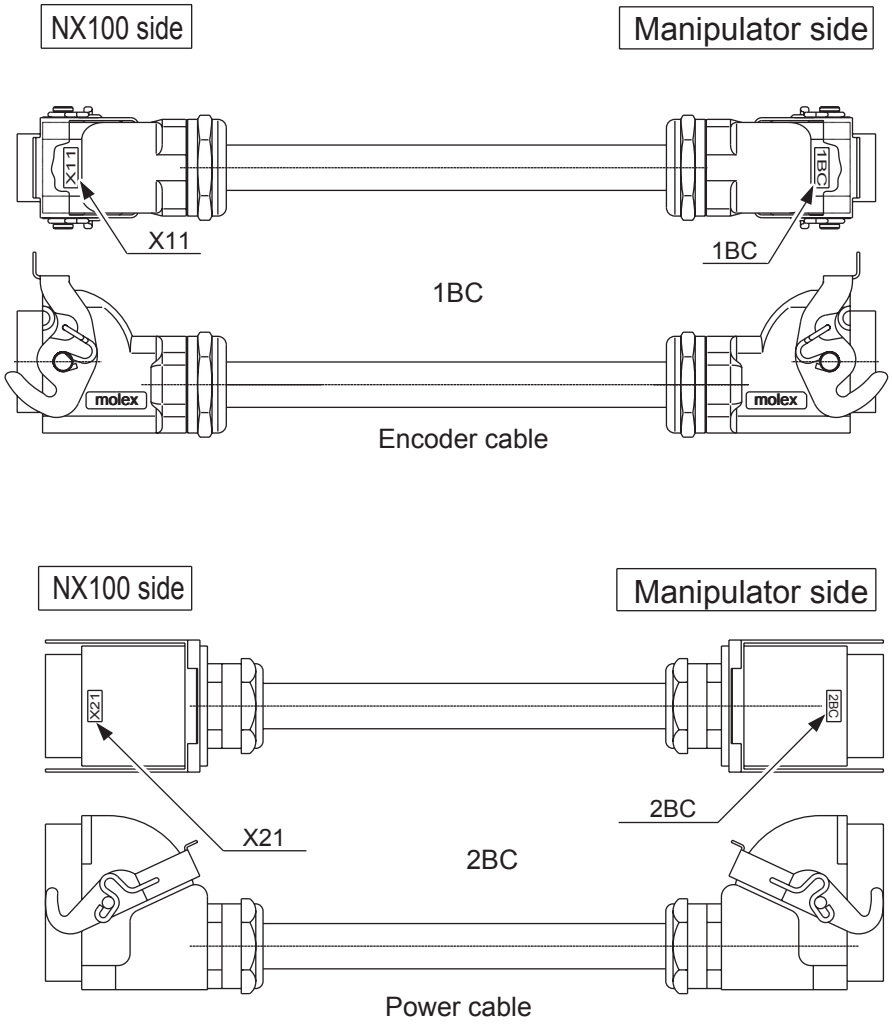


Fig. 8 Manipulator Cable Connections

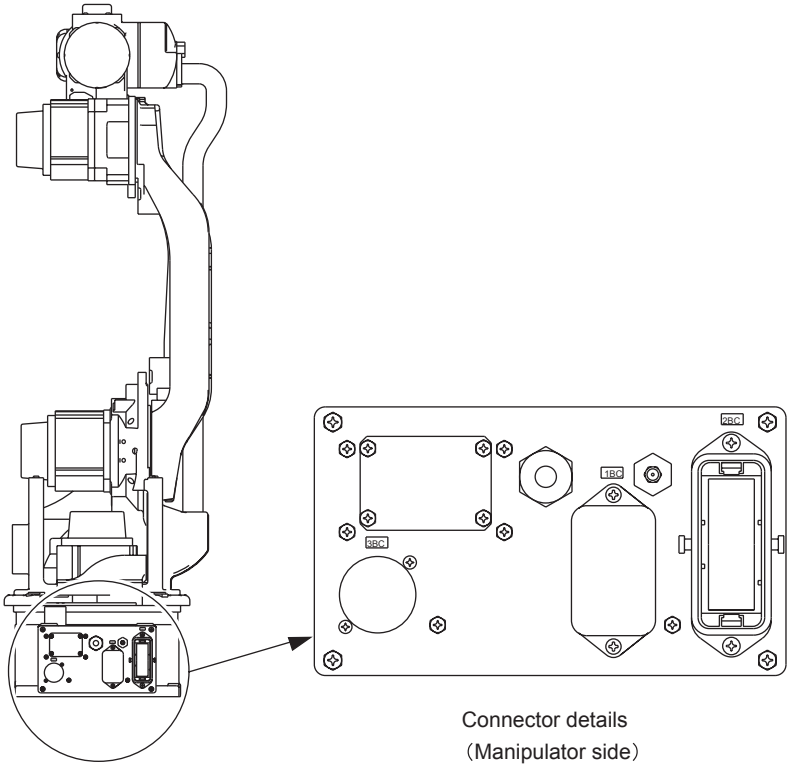


Fig. 9 (a) Details of the Manipulator Cable Connectors (Manipulator Side)

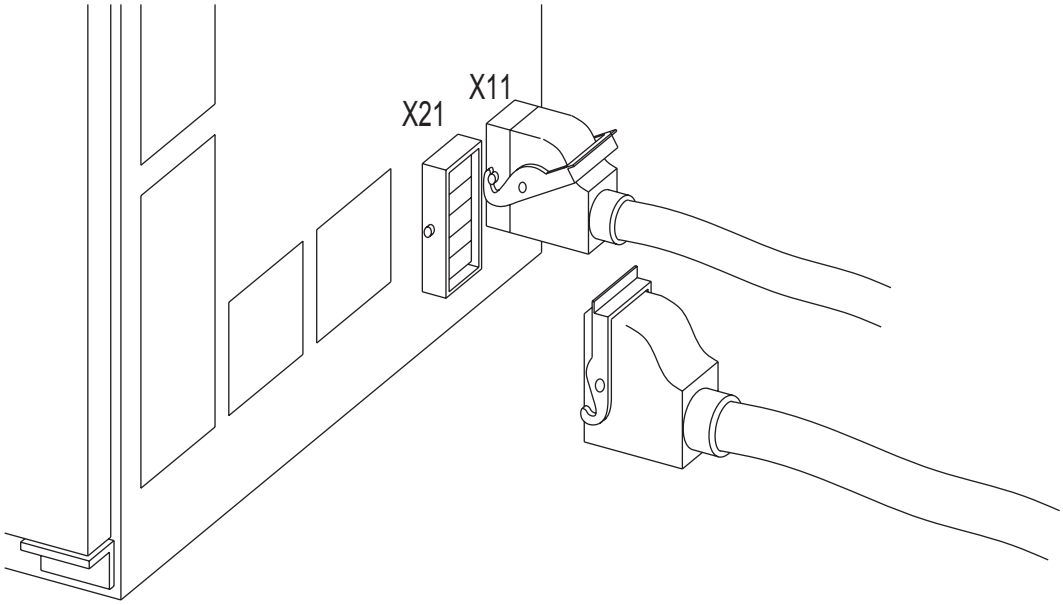


Fig. 9 (b) Manipulator Cable Connections to the NX100

5 Basic Specifications

5.1 Basic Specifications

Table. 3 Basic Specifications*1

Operation Mode		Vertically Articulated
Degree of Freedom		6
Payload		6kg
Repetitive Positioning Accuracy*2		±0.08mm
Motion Range	S-Axis (turning)	±170°
	L-Axis (lower arm)	+155°, -90°
	U-Axis (upper arm)	+250°, -175°
	R-Axis (wrist roll)	±180°
	B-Axis (wrist pitch/yaw)	+225°, -45°
	T-Axis (wrist twist)	±360°
Maximum Speed	S-Axis	2.62 rad/s, 150°/s
	L-Axis	2.79 rad/s, 160°/s
	U-Axis	2.97 rad/s, 170°/s
	R-Axis	5.93 rad/s, 340°/s
	B-Axis	5.93 rad/s, 340°/s
	T-Axis	9.08 rad/s, 520°/s
Allowable Moment*3	R-Axis	11.8N•m (1.2kgf•m)
	B-Axis	9.8N•m (1.0kgf•m)
	T-Axis	5.9N•m (0.6kgf•m)
Allowable Inertia ($GD^2/4$)	R-Axis	0.24kg•m^2
	B-Axis	0.17kg•m^2
	T-Axis	0.06kg•m^2
Mass		130kg
Ambient Conditions	Temperature	0° to 45°C
	Humidity	20 to 80% RH (no-condensing)
	Vibration	Less than 4.9m/s^2 (0.5G)
	Others	• Free from corrosive gas or liquid, or explosive gas • Free from dust, soot, or water • Free from excessive electrical noise (plasma)
Power Capacity		1.5kVA

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

2 Conformed to ISO9283

3 Refer to " 6.1 Allowable Wrist Load " for details on the permissible moment of inertia.

5.2 Part Names and Working Axes

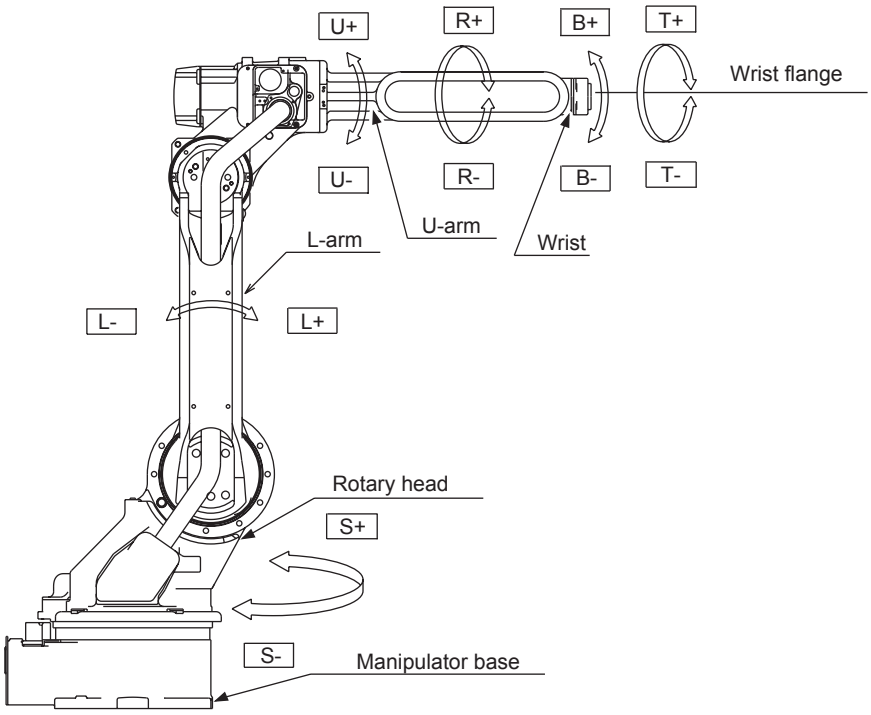


Fig. 10 Part Names and Working Axes

5.3 Baseplate Dimensions

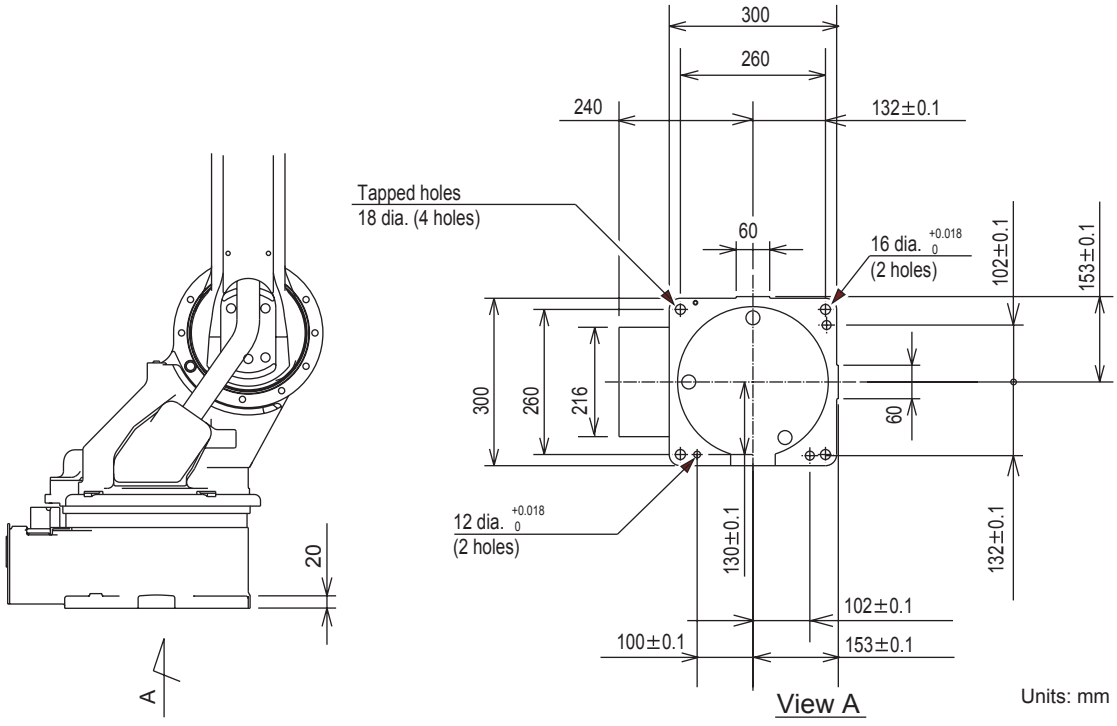


Fig. 11 Baseplate Dimensions

5.4 Dimensions and P-Point Maximum Envelope

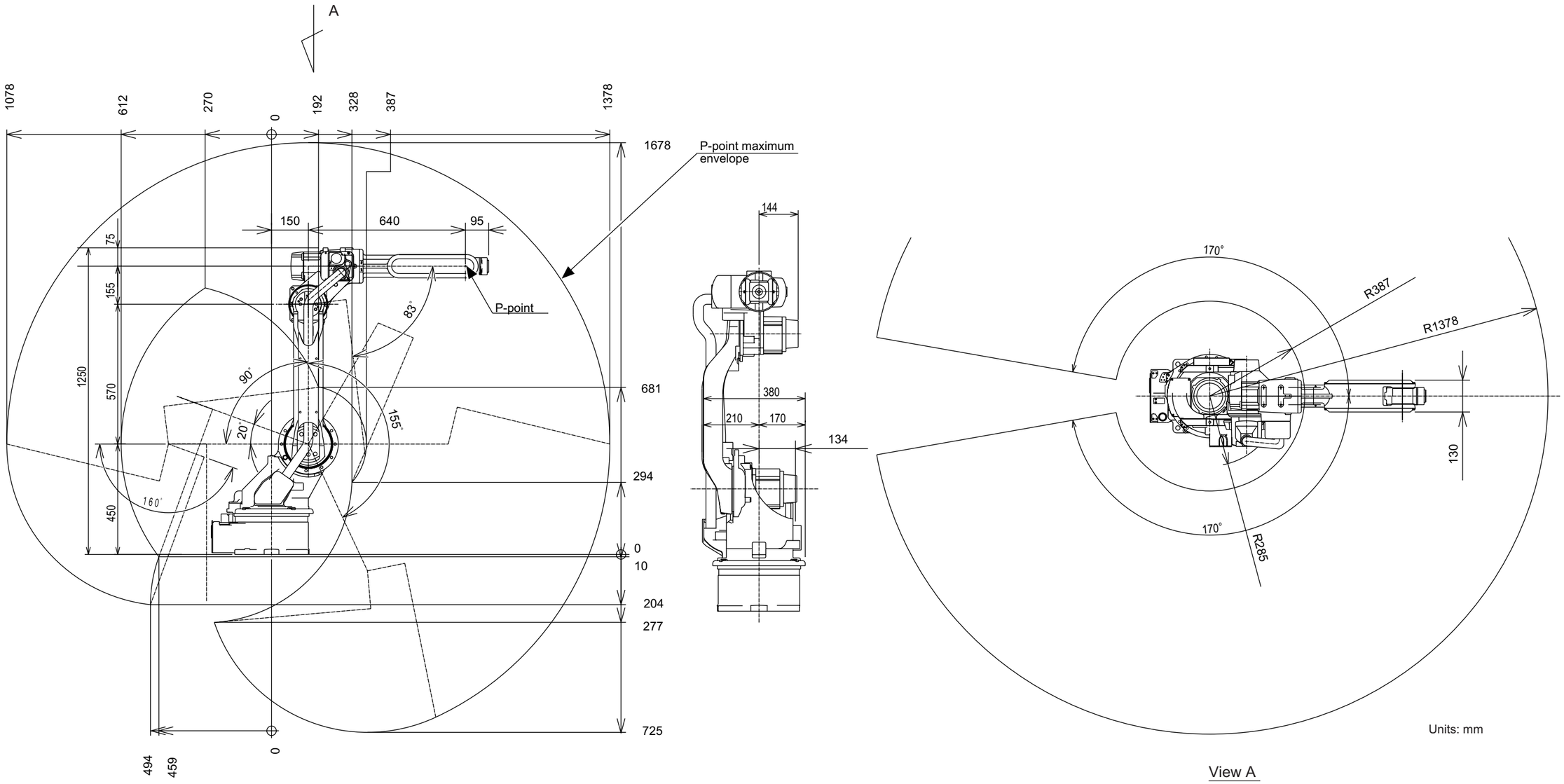


Fig. 12 Dimensions and Operating Range

5.5 Alterable Operating Range

The operating range of the S-Axis can be altered as in "Table. 4 S-Axis Operating Range" in accordance with the operating conditions. If alteration is necessary, contact your Yaskawa representative in advance.

Table. 4 S-Axis Operating Range

Item	Specifications
S-Axis Working Range	±170°(standard) ±150° ±135° ±120° ±105° ±90° ±75° ±60° ±45° ±30° ±15°

6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

The allowable wrist load is 6kg. If force is applied to the wrist instead of the load, force on R-, B-, and T-Axes should be within the value shown in " Table. 5 Moment and Total Inertia ". Contact your Yaskawa representative for further information or assistance.

Table. 5 Moment and Total Inertia

Axis	Moment N•m (kgf•m)*1	$GD^2/4$ Total Inertia kg•m^2
R-Axis	11.8 (1.2)	0.24
B-Axis	9.8 (1.0)	0.17
T-Axis	5.9 (0.6)	0.06

*1 ( ): Gravitational unit

When the volume load is small, refer to the moment arm rating shown in "Fig. 12 Moment Arm Rating".
The allowable total inertia is calculated when the moment is at the maximum. Contact your Yaskawa representative when only inertia moment, or load moment is small and inertia moment is large. Also, when the load mass is combined with an outside force, contact your Yaskawa representative in advance.

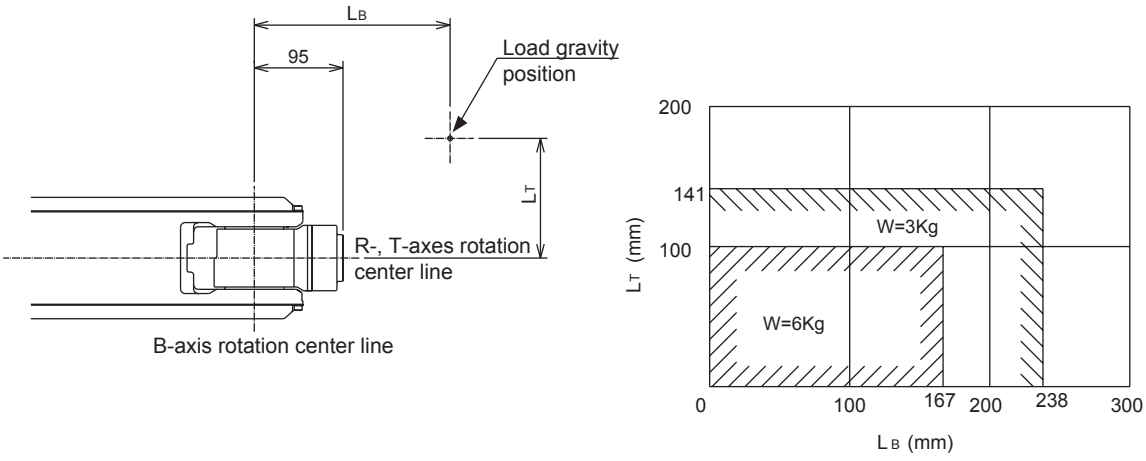


Fig. 13 Moment Arm Rating

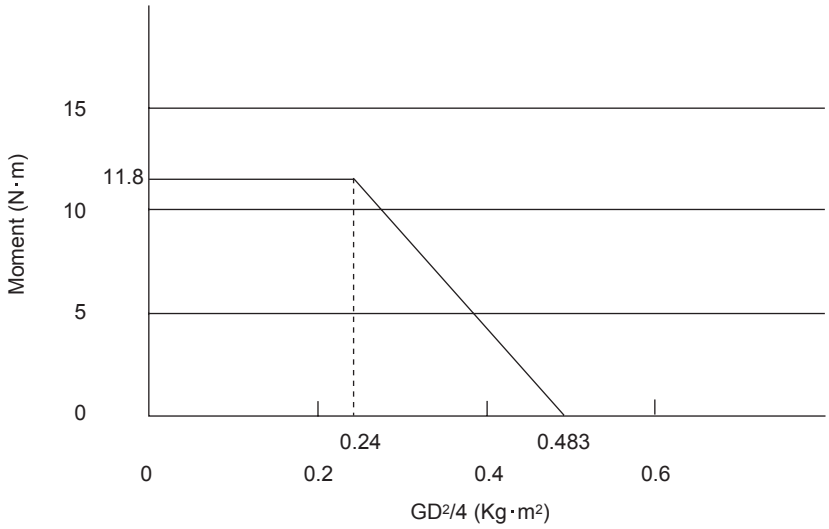


Fig. 14 The Diagram Moment/Inertia for R-Axis

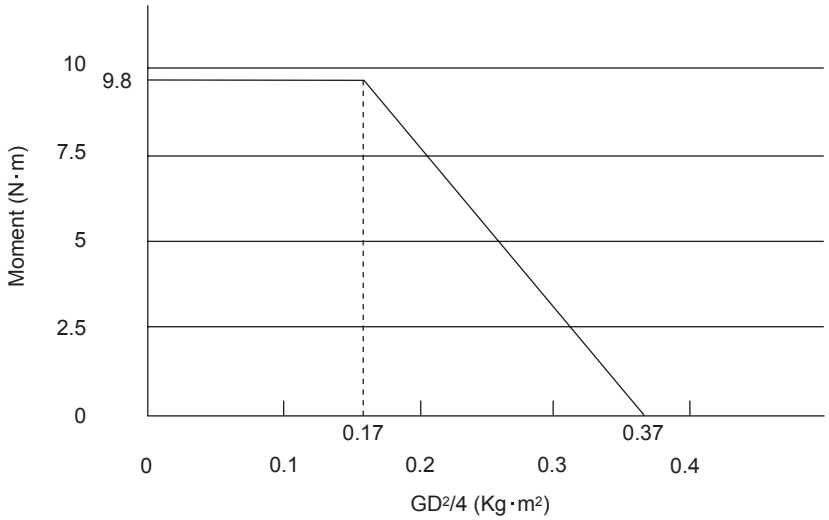


Fig. 15 The Diagram Moment/Inertia for B-Axis

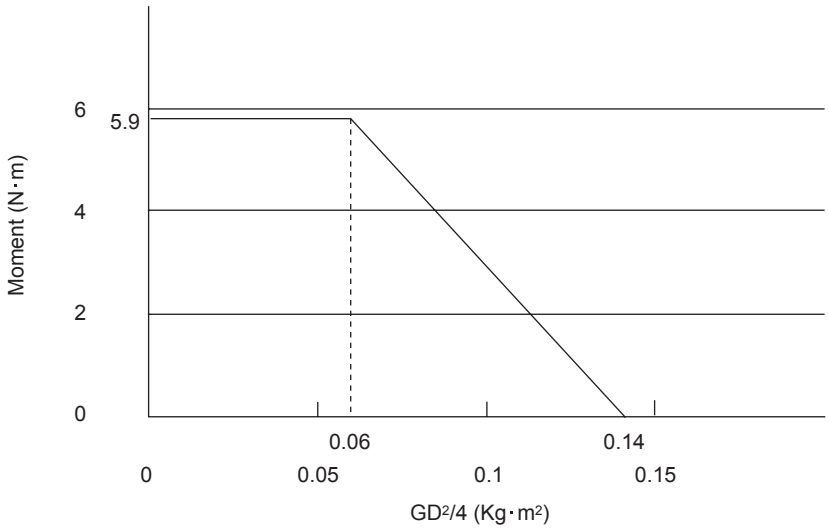


Fig. 16 The Diagram Moment/Inertia for T-Axis

6.2 Wrist Flange

The wrist flange dimensions are shown in " Fig. 17 Wrist Flange ". In order to see the alignment marks, it is recommended that the attachment be mounted inside the fitting. Fitting depth of inside and outside fittings must be 5mm or less.

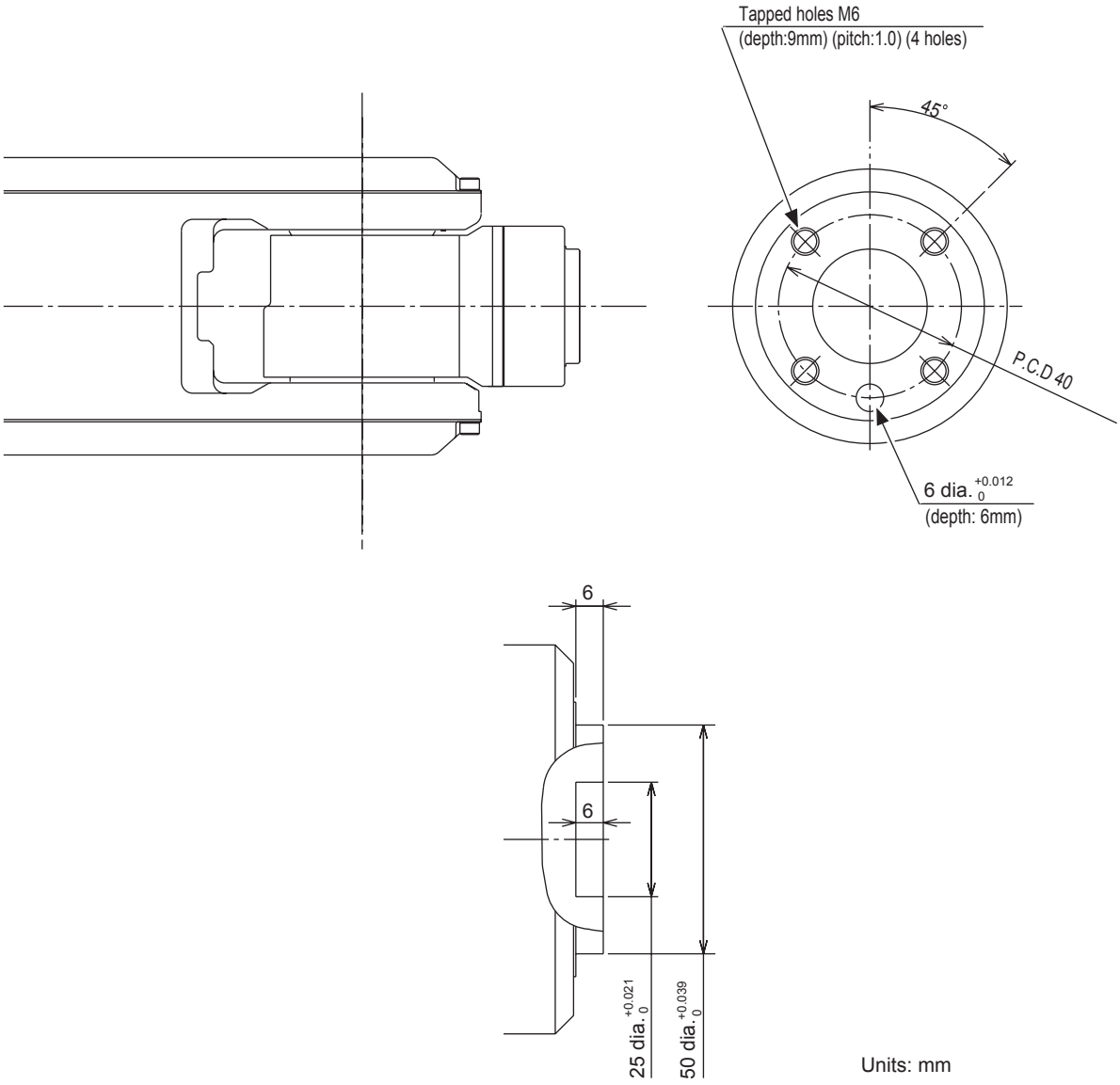


Fig. 17 Wrist Flange

NOTE

- Wash off anti-corrosive paint (solid color) on the wrist flange surface with thinner or light oil before mounting the tools.
- Mount the attachment with the mounting bolts (length: 9mm or less).
  Failure to observe this instruction may affect the manipulator performance.

7 System Application

7.1 Mounting Equipment

The peripheral equipment mounts are provided on the U-Axis (upper arm) and S-Axis (rotary head) as shown in " Fig. 18 Installing Peripheral Equipment " for easier installation of the users' system applications. The following conditions should be observed to attach or install peripheral equipments.

7.1.1 Allowable Load

- The allowable load on the U-Axis is a maximum of 15 kg, including the wrist load. For instance, when the mass installed in the wrist point is 6 kg, the mass which can be installed on the upper arm becomes 9 kg.
- The allowable load on the S-Axis is a maximum of 20 kg. Install the peripheral equipment on the S-Axis so that the moment of inertia ($GD^2/4$) from the S-Axis rotation center becomes 1.25 kg·m^2 or less.

7.1.2 Installation Position

There is a limitation also on the installation position.
" Fig. 19 Allowable Load on U-Axis " shows the distance between the U-Axis rotation center and the load gravity.

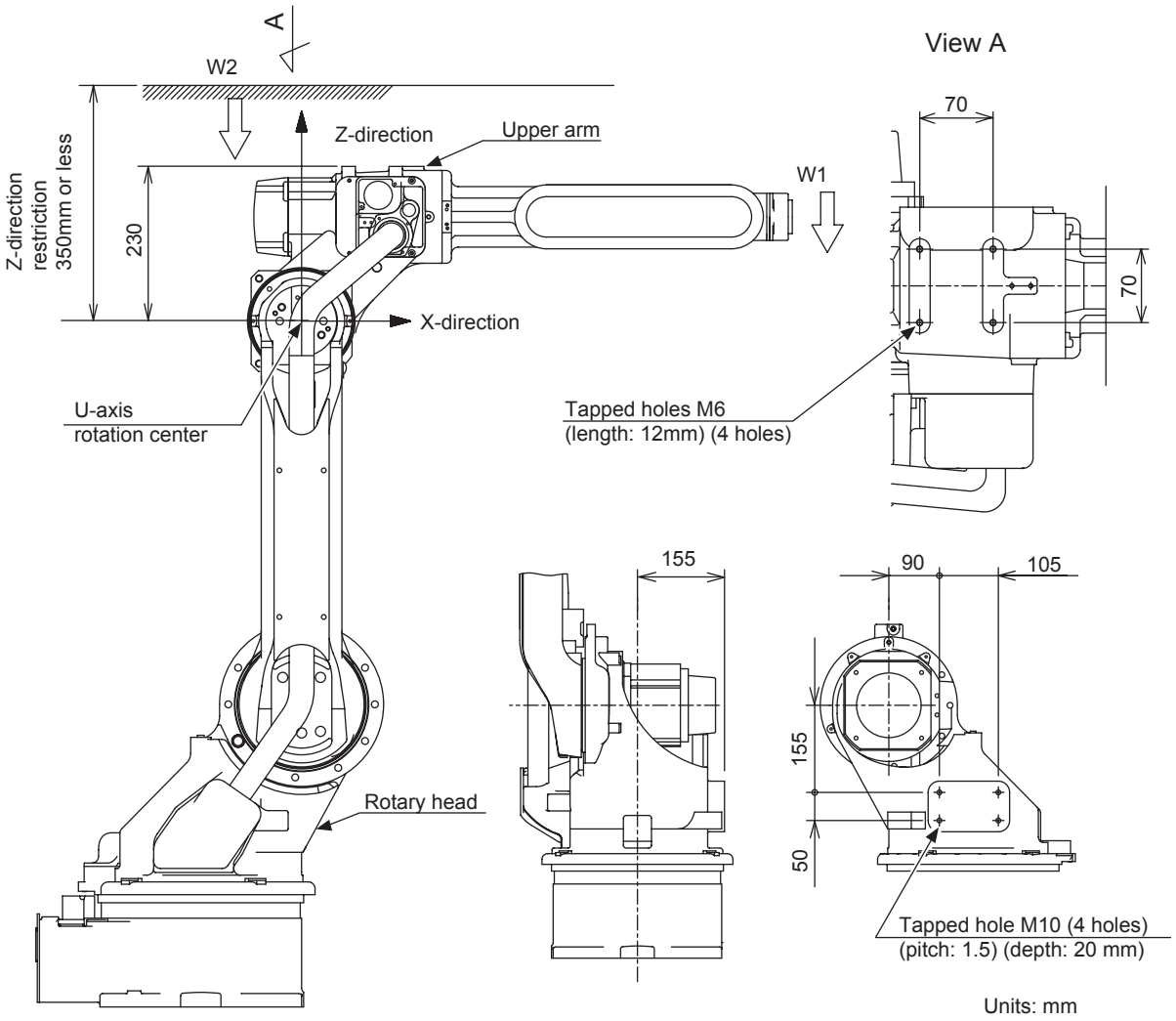


Fig. 18 Installing Peripheral Equipment

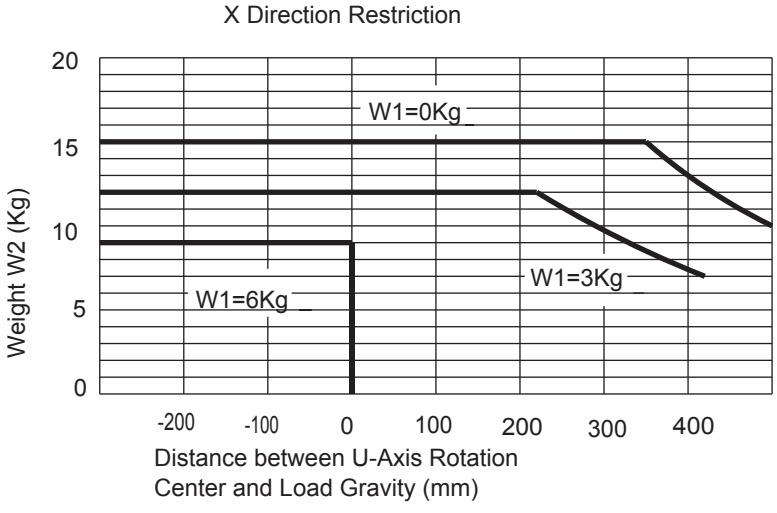


Fig. 19 Allowable Load on U-Axis

7.2 Internal User I/O Wiring Harness and Air Lines

Wires and an air line are incorporated into the manipulator for user application. An internal user I/O wiring harness (0.2mm^2 x 8, 1.25mm^2 x 6) and an air line are used in the manipulator for the drives of the peripheral devices.

- The allowable current for wires must be 3A or below for each wire. (The total current value for pins 1 to 16 must be 40A or below).
- The maximum pressure for the air line is 490 kPa (5 kgf/cm^2) and its inside diameter is 6.5mm.

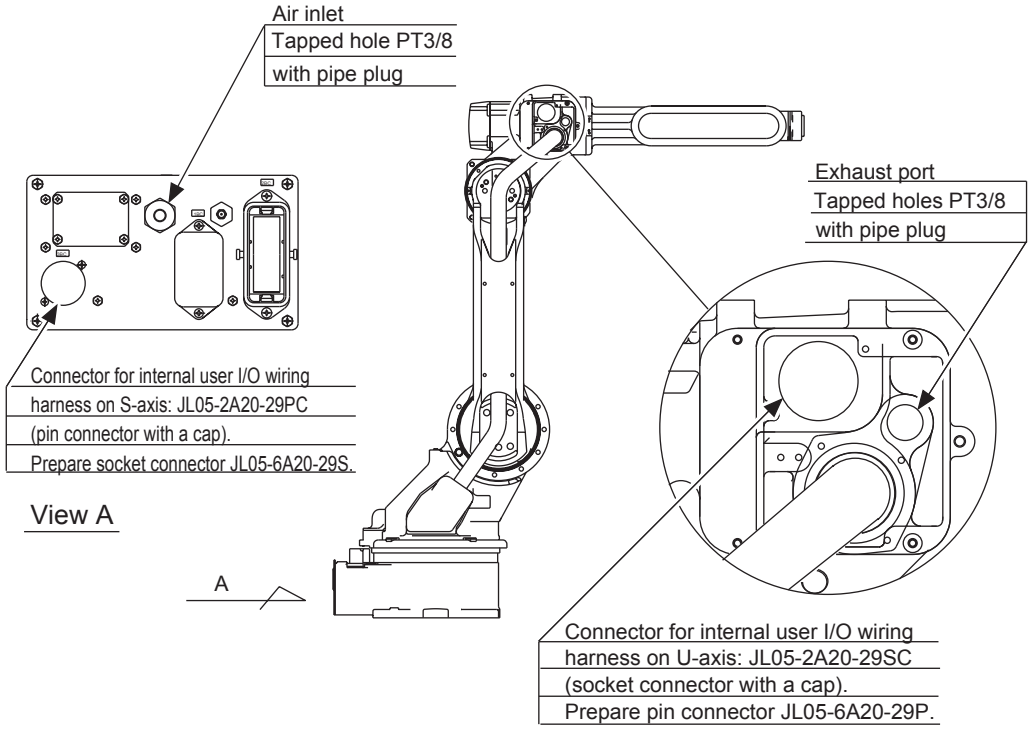


Fig. 20 Internal User I/O Wiring Harness and Air Lines

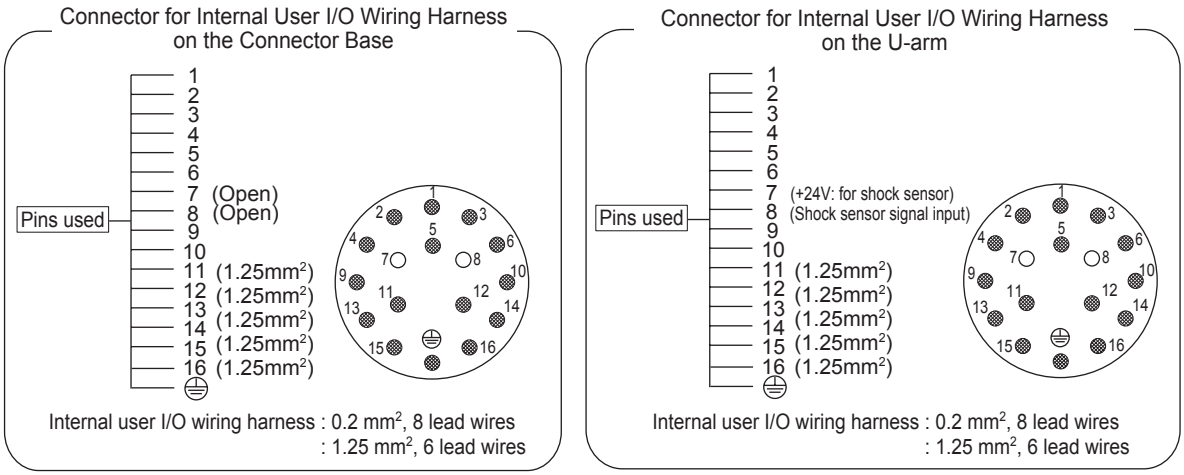


Fig. 21 Detailed Drawing of Connector Pin Numbers

NOTE

- For the standard specification, the pins No.7 and No.8 of 3BC connector on the U-Arm are respectively connected with the shock sensor power supply and shock sensor signal input port of the NX100 controller.
- The pins No.7 and No.8 of respective 3BC connectors on the connector base side and the U-Arm side are not connected with each other.
- For the wiring, refer to " Fig.24 (b) Internal Connection Diagram ".

The same pin number (1-16) of two connectors is connected in the lead line of single 0.2mm^2 or 1.25mm^2.

8 Motoman Construction

8.1 Position of S-Axis Limit Switch

The limit switches are optional and are located as shown in " Fig. 22 Location of Limit Switches ". The overrun limit switches for the the S-Axis and L-Axis, and LU-Axes interference limit switch are applied to the robot type: YR-HP6-A01.

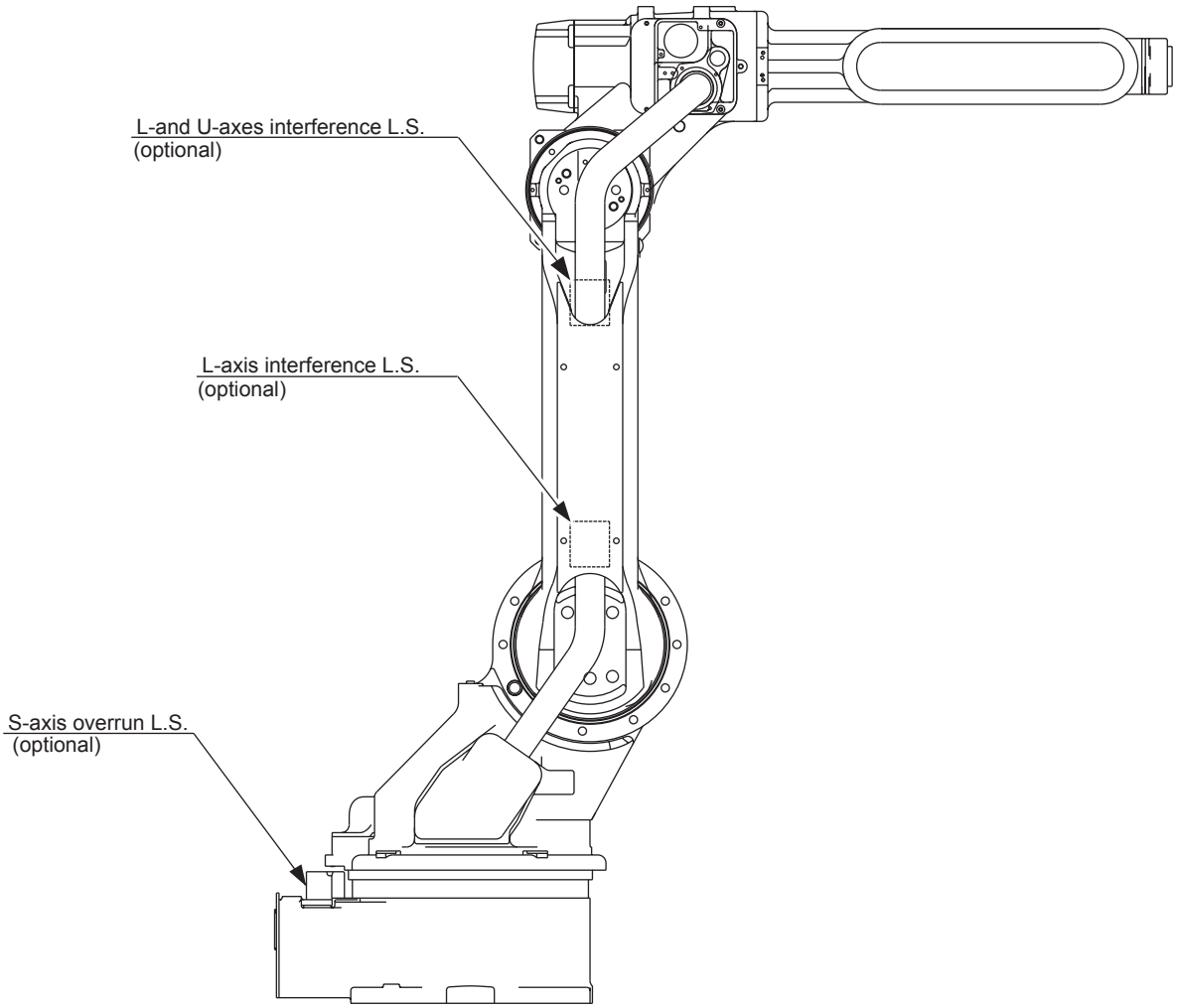


Fig. 22 Location of Limit Switches

8.2 Internal Connections

High reliability connectors which can be easily put on and removed are used with each connector part. For the numbers, types, and locations of connectors, see "Fig. 22 Location and Numbers of Connectors".

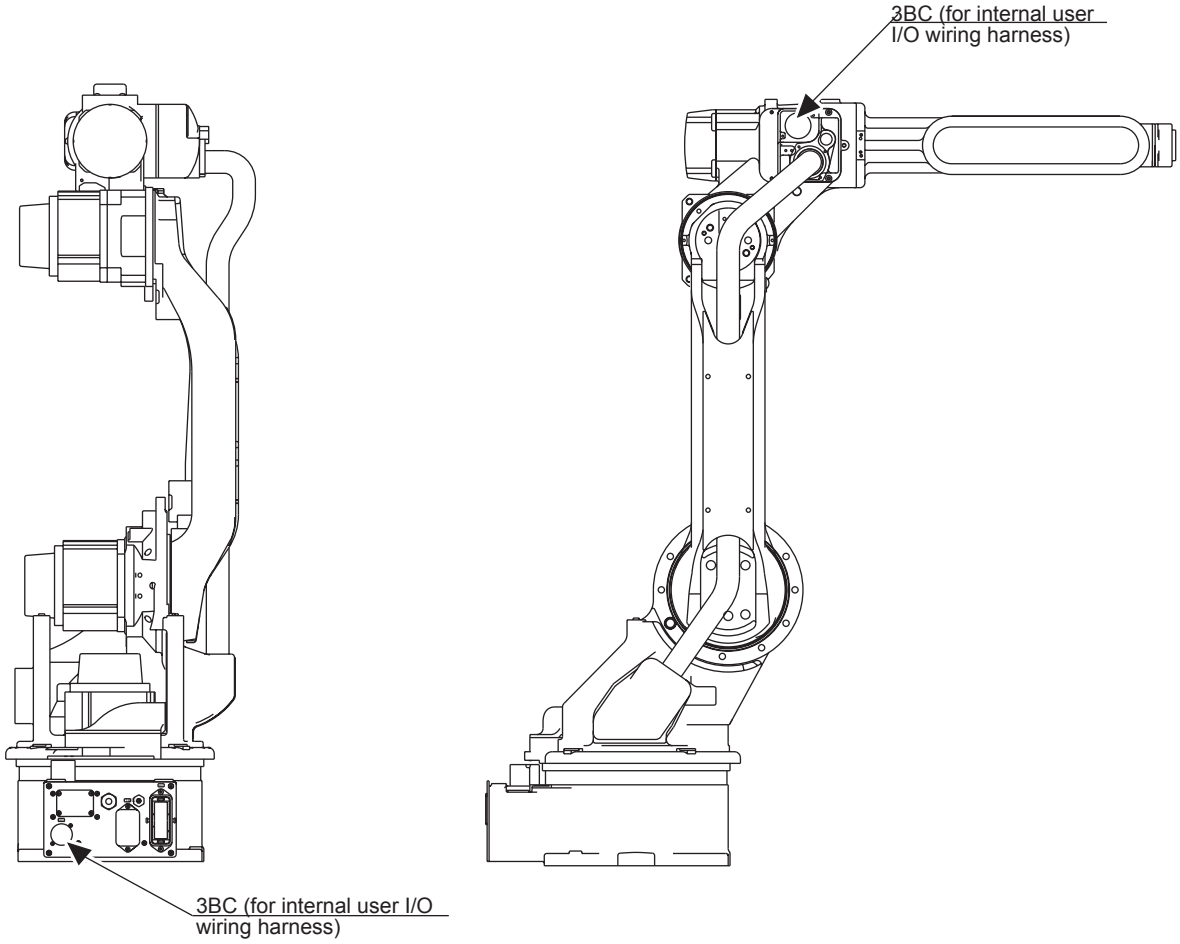


Fig. 23 Location and Numbers of Connectors

Table. 6 List of Connector Types

Name	Type of Connector
Base Connector for Internal User I/O Wiring Harness	JL05-2A20-29PC (JL05-6A20-29S: Optional)
U-arm Connector for Internal User I/O Wiring Harness	JL05-2A20-29SC (JL05-6A20-29P: Optional)

POWER CABLE | INTERNAL CABLE IN S-AXIS | INTERNAL CABLE IN L-AXIS | INTERNAL CABLE IN BT-AXIS

Applicable Serial Number: Before RH9520-4097
The products which were manufactured by August, 2004

NX100

1BC(10X4)

ENCODER POWER SUPPLY BOARD

DC/DC

S-AXIS

L-AXIS

U-AXIS

R-AXIS

B-AXIS

T-AXIS

FOR LAMP(OPTIONAL)

S-AXIS OVERRUN L.S

L-AXIS OVERRUN L.S

L AND U-AXIS INTERFERENCE L.S

SLU-AXES WITH OVERRUN L.S. SPECIFICATION

Base

Casing

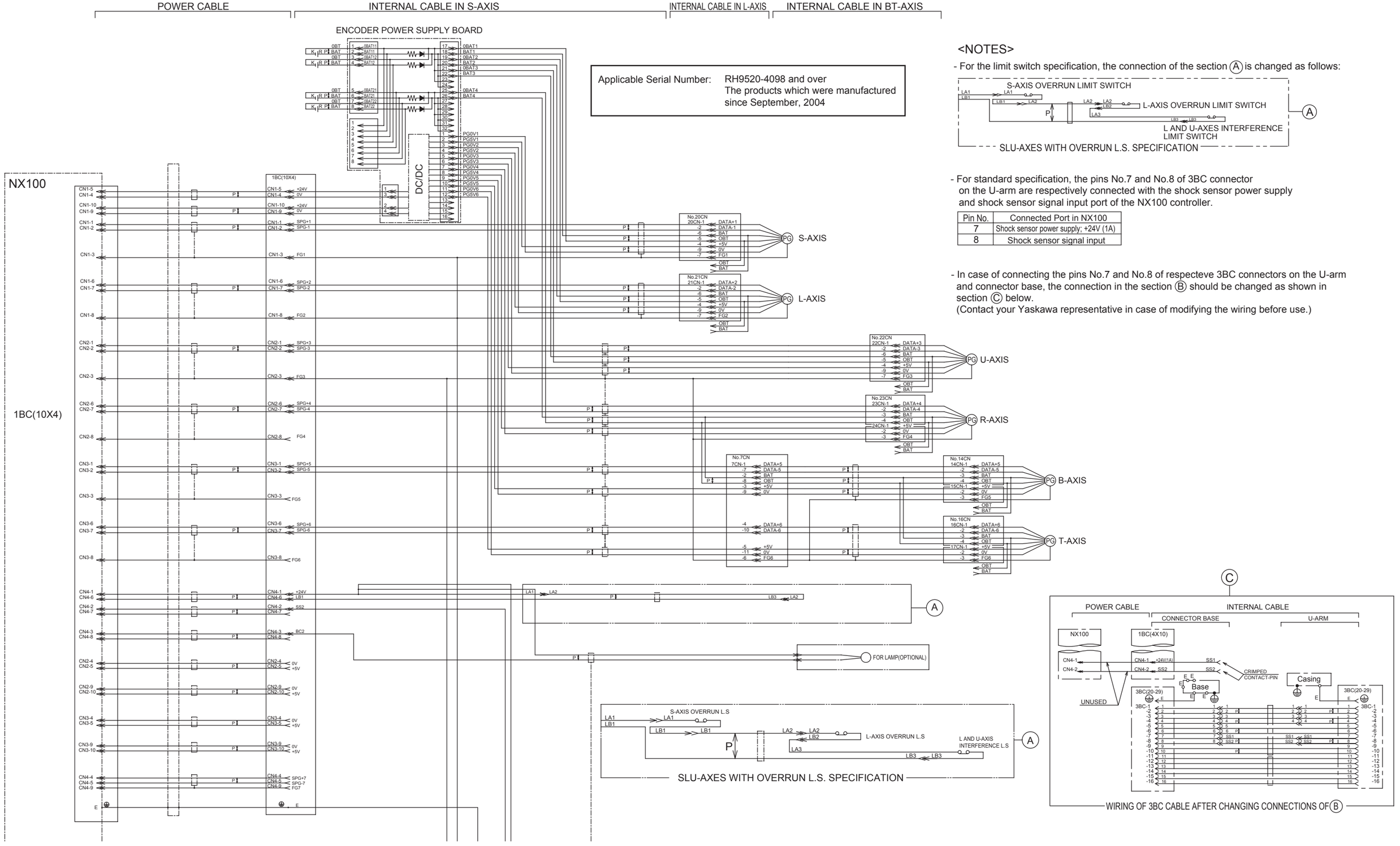
3BC(20-29)

2BC-1

SHOCK SENSOR (OPTIONAL)

FOR SPARE CABLE

Fig. 24 (a) Internal Connection Diagram



Pin No.	Connected Port in NX100
7	Shock sensor power supply; +24V (1A)
8	Shock sensor signal input

Fig. 24 (b) Internal Connection Diagram

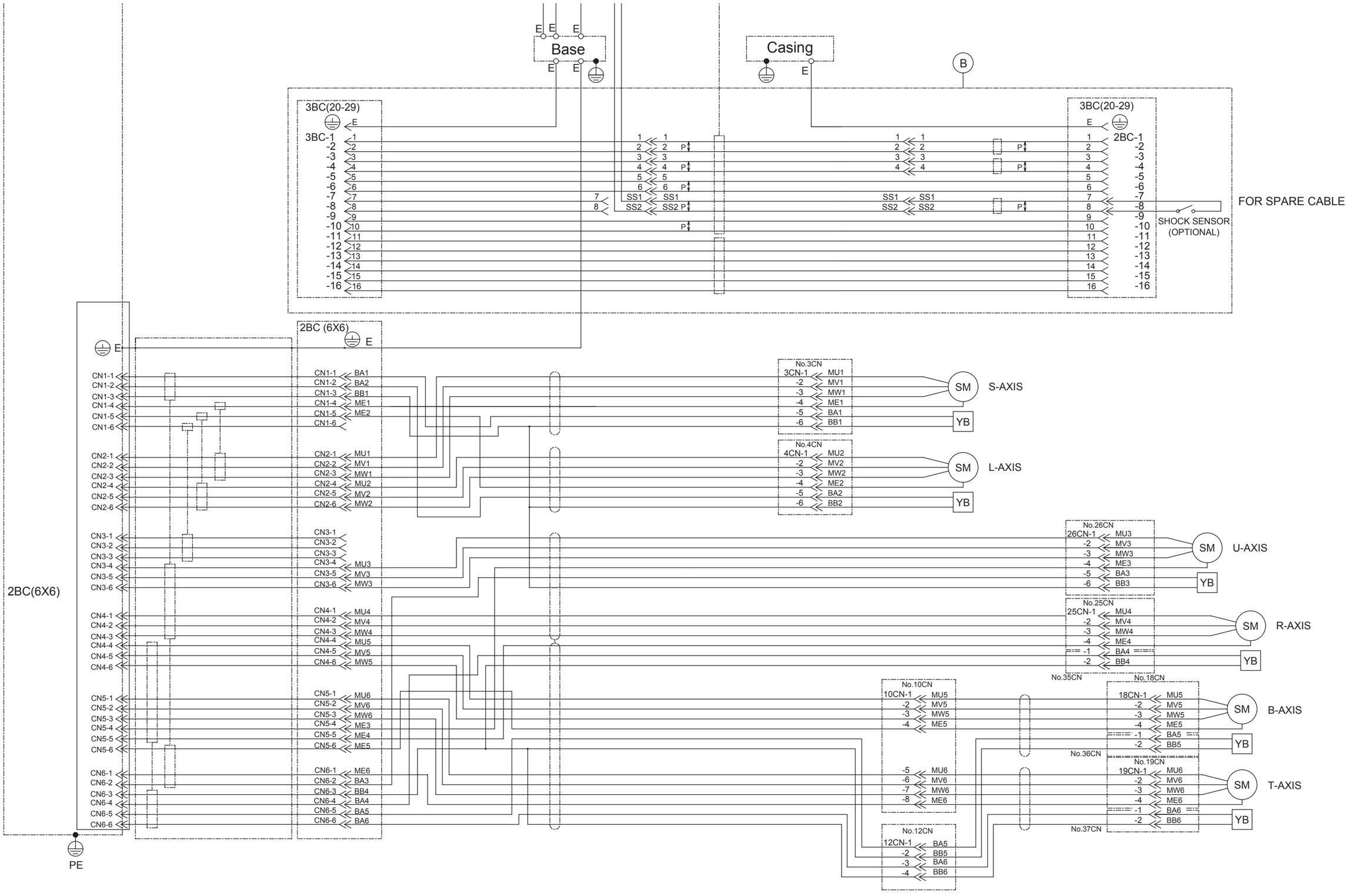


Fig. 24 (c) Internal Connection Diagram

9 Maintenance and Inspection

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

- **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.**

- **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

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 displayed in six levels. Conduct periodical inspections according to the inspection schedule in " Table. 7 Inspection Items ".
In " Table. 7 Inspection Items ", the inspection items are classified into three types of operation: operations which can be performed by personnel authorized by the user, operations which can be performed by personnel being trained, and operations which can be performed by service company personnel. Only specified personnel are to do inspection work.

NOTE

- The inspection interval must be based on the servo power supply on time.
- These inspections were developed for applications where the manipulator is used for arc welding work. For any different or special applications, the inspection process should be developed on an case-by-case basis.
  For axes which are used very frequently (in handling applications, etc.), it is recommended that inspections be conducted at shorter Intervals. Contact your Yaskawa representative.

Table. 7 Inspection Items

Items*4		Schedule						Method	Operation	Inspection Charge		
		Daily	1000 H Cycle	6000 H Cycle	12000 H Cycle	24000 H	36000 H			Specified Person	Licensee	Service Company
①	Alignment mark	○						Visual	Check tram mark accordance and damage at the home position.	○	○	○
②	External lead	○						Visual	Check for damage and deterioration of leads.	○	○	○
③	Working area and manipulator	○						Visual	Clean the work area if dust or spatter is present. Check for damage and outside cracks.	○	○	○
④	S,L,U-axes motor	○						Visual	Check for grease leakage. *5	○	○	○
⑤	Baseplate mounting bolts		○					Spanner Wrench	Tighten loose bolts. Replace if necessary.	○	○	○
⑥	Cover mounting screws		○					Screw-driver, Wrench	Tighten loose bolts. Replace if necessary.	○	○	○
⑦	Base connectors		○					Manual	Check for loose connectors.	○	○	○
⑧	BT-axes timing belt				○			Manual	Check for belt tension and wear.		○	○
⑨	Wire harness in manipulator (SLURBT-axes leads))				○			Visual Multimeter	Check for conduction between the main connecter of base and intermediate connector with manually shaking the wire. Check for wear of protective spring *1		○	○
						○			Replace *2			○
⑩	Wire harness In manipulator (BT-axes leads)				○			Visual Multimeter	Check for conduction between terminals and wear of protective spring. *1		○	○
						○			Replace *2			○
⑪	Battery pack in manipulator						○		Replace the battery pack when the battery alarm occurs or the manipulator drove for 36000H.		○	○

Table. 7 Inspection Items

Items*4		Schedule						Method	Operation	Inspection Charge		
		Daily	1000 H Cycle	6000 H Cycle	12000 H Cycle	24000 H	36000 H			Specified Person	Licensee	Service Company
⑫	S-axis speed reducer			○	○			Grease Gun	Check for malfunction. (Replace if necessary.) Supply grease*3 (6000H cycle). See Par. " 9.2.2 Grease Replenishment/ Exchange for S-Axis Speed Reducer " Replace grease*3. (12000H cycle) See Par. " 9.2.2 Grease Replenishment/Exchange for S-Axis Speed Reducer "		○	○
⑬	LU-axes speed reducers			○	○			Grease Gun	Check for malfunction. (Replace if necessary.) Supply grease*3 (6000H cycle). See Par. " 9.2.3 Grease Replenishment/ Exchange for L-Axis Speed Reducer " Replace grease*3 (12000H cycle). See Par. " 9.2.3 Grease Replenishment/ Exchange for L-Axis Speed Reducer "		○	○
⑭	RBT-axes speed reducers			○				Grease Gun	Check for malfunction. (Replace if necessary.) Supply grease*3 (6000H cycle). See Par. " 9.2.5 Grease Replenishment for R-Axis Speed Reducer ", " 9.2.6 Grease Replenishment for B- and T-Axes Speed Reducers "		○	○
⑮	T-axis gear			○				Grease Gun	Check for malfunction. (Replace if necessary.) Supply grease*3 (6000H cycle).See Par. " 9.2.7 Grease Replenishment for T-Axis Gear "		○	○
⑯	R-axis cross roller bearing			○				Grease Gun	Check for malfunction. (Replace if necessary.) Supply grease*3 (6000H cycle). See Par. " 9.2.8 Grease Replenishment for R-Axis Cross Roller Bearing "		○	○
⑰	Overhaul						○					○

1 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 may be lost. (Refer to " 9.2.9 Notes for Maintenance ")

2 Wire harness in manipulator to be replaced at 24000H inspection.

3 For the grease, refer to " Table. 8 Inspection Parts and Grease Used ".

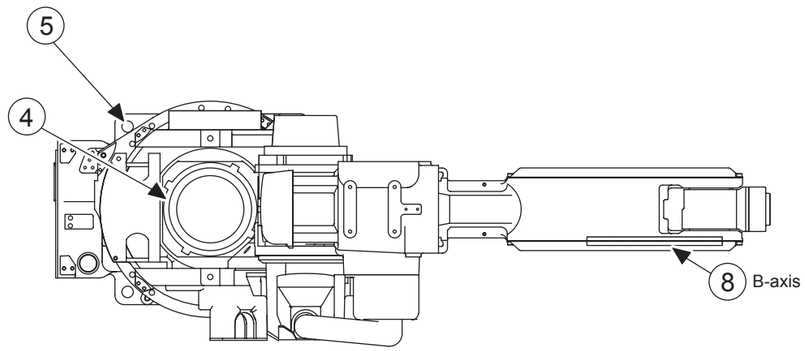
4 Inspection No. correspond to the numbers in " Fig. 25 Inspection Parts and Inspection Numbers ".

5 The occurrence of a grease leakage indicates the possibility that grease has seeped into the motor. This can cause a motor breakdown. Contact your Yaskawa representative.

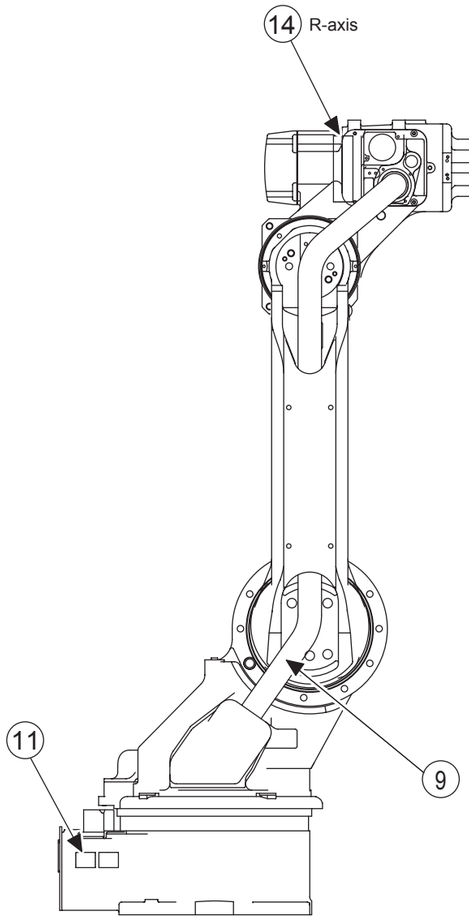
Table. 8 Inspection Parts and Grease Used

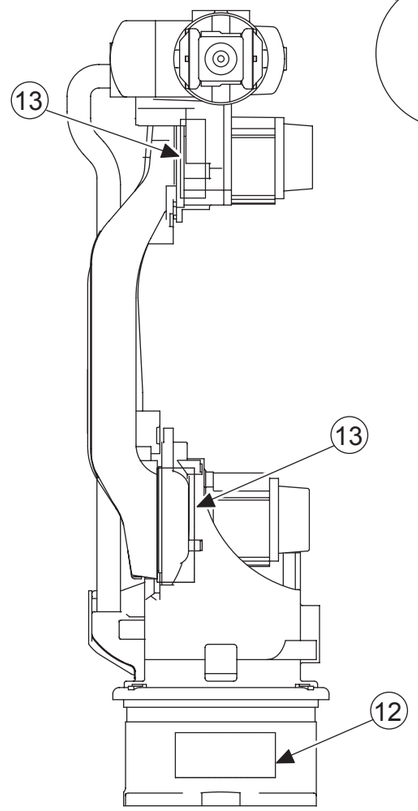
No.	Grease Used	Inspected Parts
⑫, ⑬	Molywhite RE No.00	S-, L-, and U-axis speed reducers
⑭, ⑮	Harmonic Grease SK-1A	R-, B-, and T-axis speed reducers, T-axis gear
⑯	Alvania EP Grease 2	R-axis cross roller bearings

The numbers in the above table correspond to the numbers in " Table. 7 Inspection Items ".



Note: The home position of the manipulator takes the B-axis folded to a 90 degree downward position to the manipulators illustrated in "Fig. 25 Inspection Parts and Inspection Numbers".
The manipulator illustrated in "Fig. 25" is not in a complete home position since the B-axis is extended horizontal to the ground.





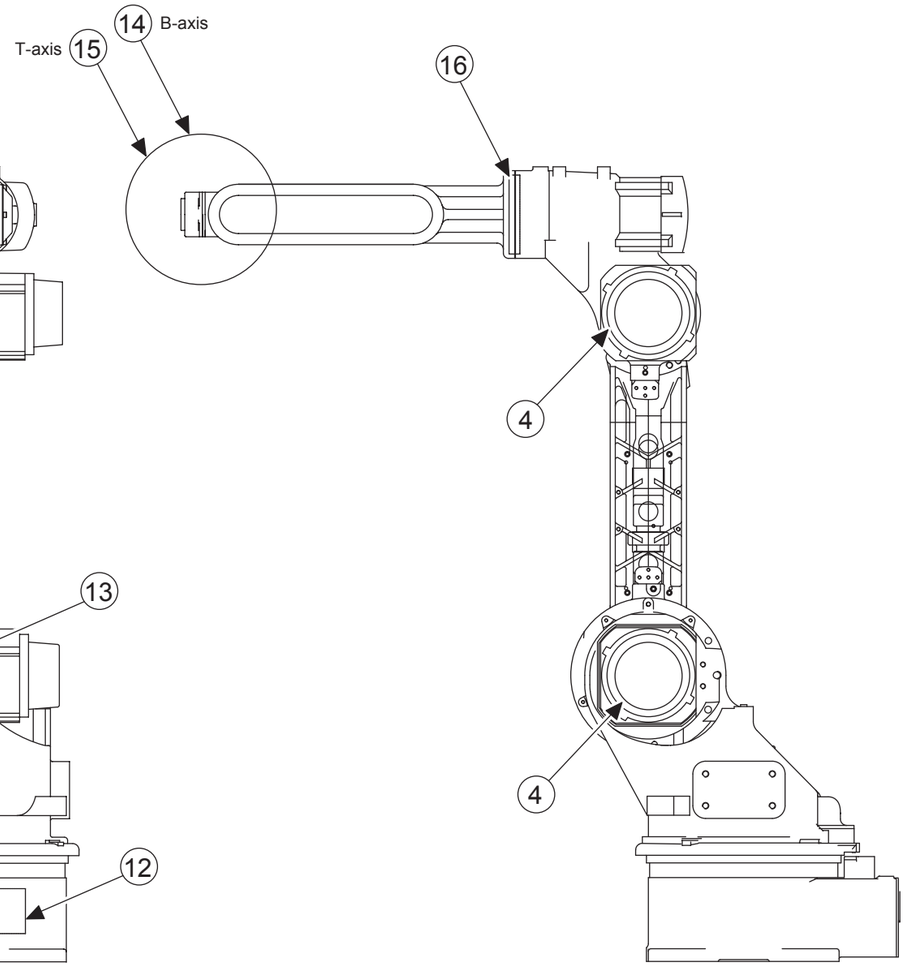


Fig. 25 Inspection Parts and Inspection Numbers (Manipulator in Home Position: Except for B-axis)

9.2 Notes on Maintenance Procedures

9.2.1 battery pack Replacement

If the battery alarm occurs in the NX100, replace the battery in accordance with the following procedure:

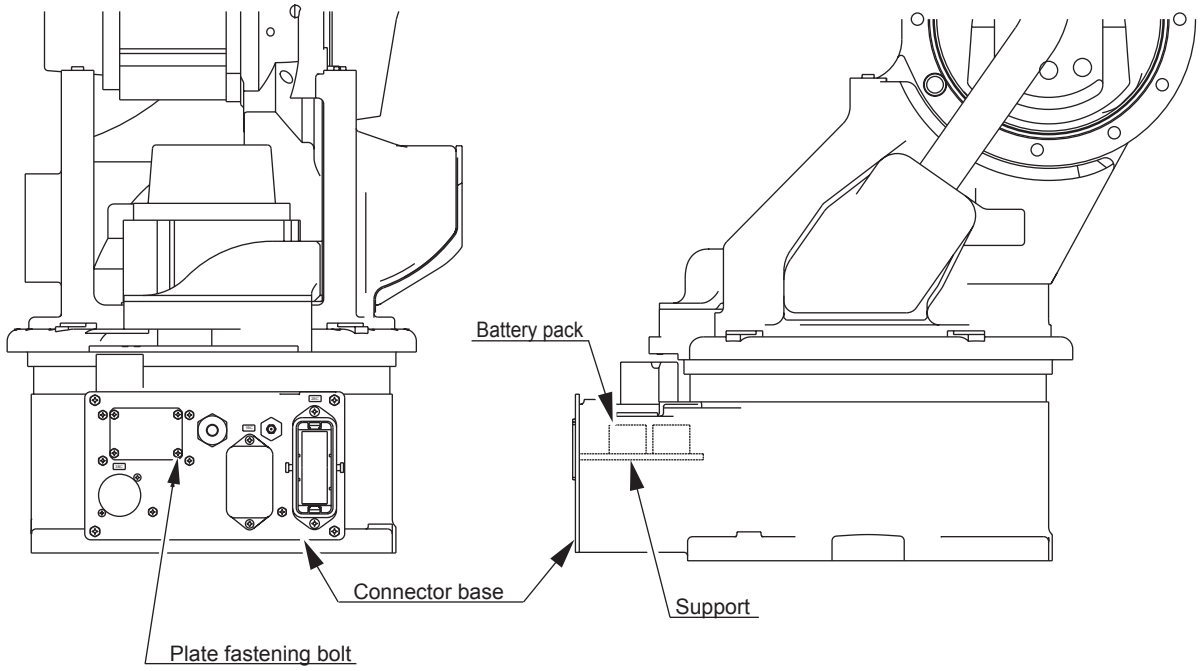


Fig. 26 Battery Location

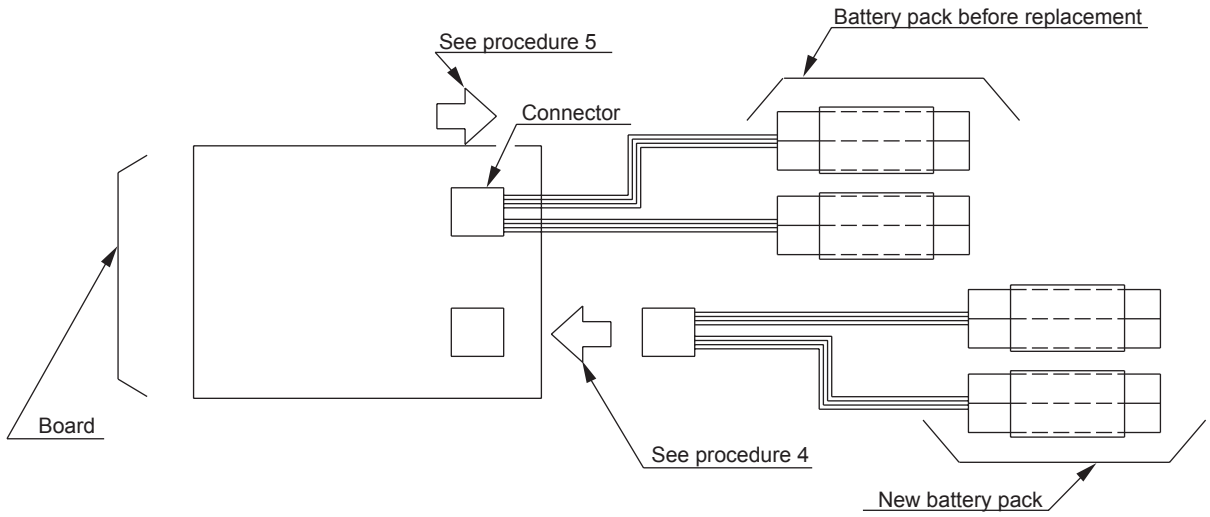


Fig. 27 Battery Connection

1. Turn off the NX100 main power supply.
2. Uninstall the plate from the base connector and pull the battery pack out to replace with a new battery pack.
3. Remove the battery pack from the battery holder.
4. Connect the new battery pack to the unoccupied connectors on the board.
5. Remove the old battery pack from the board.

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

6. Mount the new battery pack on the battery holder.
7. Reinstall the plate.

NOTE Do not pinch the cable when the plate is installed.

9.2.2 Grease Replenishment/Exchange for S-Axis Speed Reducer

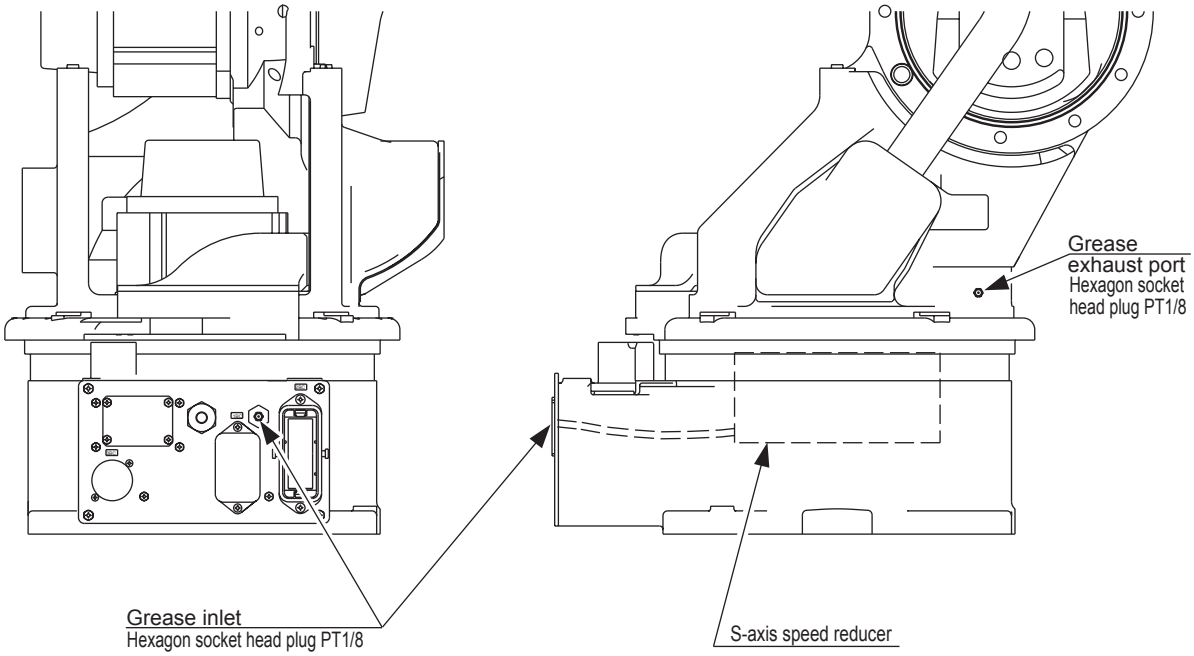


Fig. 28 S-Axis Speed Reducer Diagram

NOTE For ceiling mounted manipulators, the grease exhaust port and the grease inlet are inverted.

■ Grease Replenishment (Refer to " Fig. 28 S-Axis Speed Reducer Diagram ".)

Replenish the grease in accordance with the following procedure:

1. Remove plugs from the grease exhaust port and grease inlet.

NOTE If grease is injected with the plugs on, the grease will go inside the motor and may damage it. Be sure to remove the plugs.

2. Install the grease zerk PT1/8 to the grease inlet. The grease zerk is provided at factory. Inject the grease into the inlet using a grease gun.

Grease type: Molywhite RE No.00 Amount of grease: 65cc (130cc for 1st supply)

3. Move the S-axis for a few minutes to discharge the excess grease.
4. Remove the grease zerk, then reinstall the plugs to the exhaust and inlet.
   Apply Three Bond 1206C to screwed parts when installing the plugs.

■ Grease Exchange (Refer to " Fig. 28 S-Axis Speed Reducer Diagram ".)

1. Remove a plug from the grease exhaust port.

NOTE If grease is injected with the plug on, the grease will go inside the motor and may damage it. Be sure to remove the plug.

2. Install the grease zerk PT1/8 to the grease inlet. The grease zerk is provided at factory.
3. Inject the grease into the grease inlet using a grease gun.

Grease type: Molywhite RE No.00 Amount of grease: 410cc

4. The grease replacement is complete when new grease appears in the exhaust port.
   The new grease can be distinguished from the old grease by its color.
5. Move the S-axis for a few minutes to discharge the excess grease.
6. Wipe the waste grease with a cloth. Remove the grease zerk from the grease inlet, then reinstall the plugs to the inlet and exhaust ports.
   Apply Three Bond 1206C to screwed parts when installing the plugs.

9.2.3 Grease Replenishment/Exchange for L-Axis Speed Reducer

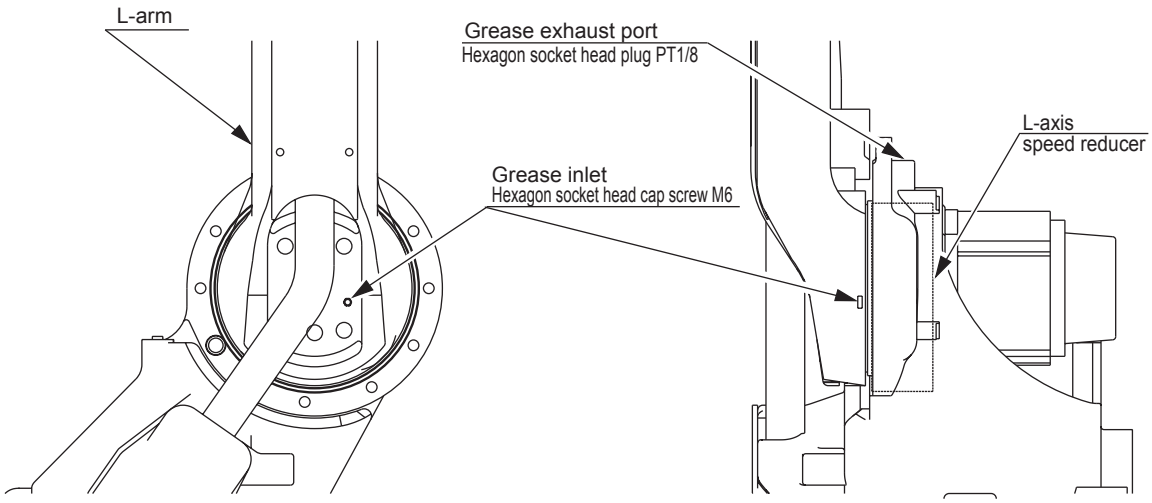


Fig. 29 L-Axis Speed Reducer Diagram

NOTE For ceiling mounted manipulators, the grease exhaust port and the grease inlet are inverted.

■ Grease Replenishment (Refer to " Fig. 29 L-Axis Speed Reducer Diagram ".)

1. Make the L-arm vertical to ground.
2. Remove a plug from the grease exhaust port.
3. Remove bolts from the grease inlet.

NOTE If grease is injected with the exhaust plug on, the grease will go inside the motor and may damage it. Be sure to remove the plug.

4. Install the grease zerk A-MT6 x 1 to the grease inlet. The grease zerk is provided at factory.
5. Inject grease into the grease inlet using a grease gun.

Grease type: Molywhite RE No.00 Amount of grease: 55cc (110cc for 1st supply)

6. Move the L-Axis for a few minutes to discharge the excess grease.
7. Remove the grease zerk from the grease inlet and reinstall bolts.
   Apply Three Bond 1206C to screwed parts when installing the bolts.
8. Wipe the waste grease with a cloth and reinstall the plug to the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the plugs.

■ Grease Exchange (Refer to " Fig. 29 L-Axis Speed Reducer Diagram ".)

1. Make the L-arm vertical to ground.
2. Remove a plug from the grease exhaust port.
3. Remove bolts from the grease inlet.

NOTE If grease is injected with the plug on, the grease will go inside the motor and may damage it. Be sure to remove the plug.

4. Install the grease zerk A-MT6 x 1 to the grease inlet. The grease zerk is provided at factory.
5. Inject grease into the grease inlet using a grease gun.

Grease type: Molywhite RE No.00 Amount of grease: approx. 365cc

6. The grease replacement is complete when new grease appears in the exhaust ports. The new grease can be distinguished from the old grease by its color.
7. Move the L-Axis for a few minutes to discharge the excess grease.
8. Remove the grease zerk from the grease inlet and reinstall bolts to the grease inlet. Apply Three Bond 1206C to screwed parts when installing the bolts.
9. Wipe the waste grease with a cloth and reinstall the plug to the exhaust port. Apply Three Bond 1206C to screwed parts when installing the plug.

9.2.4 Grease Replenishment/Exchange for U-Axis Speed Reducer

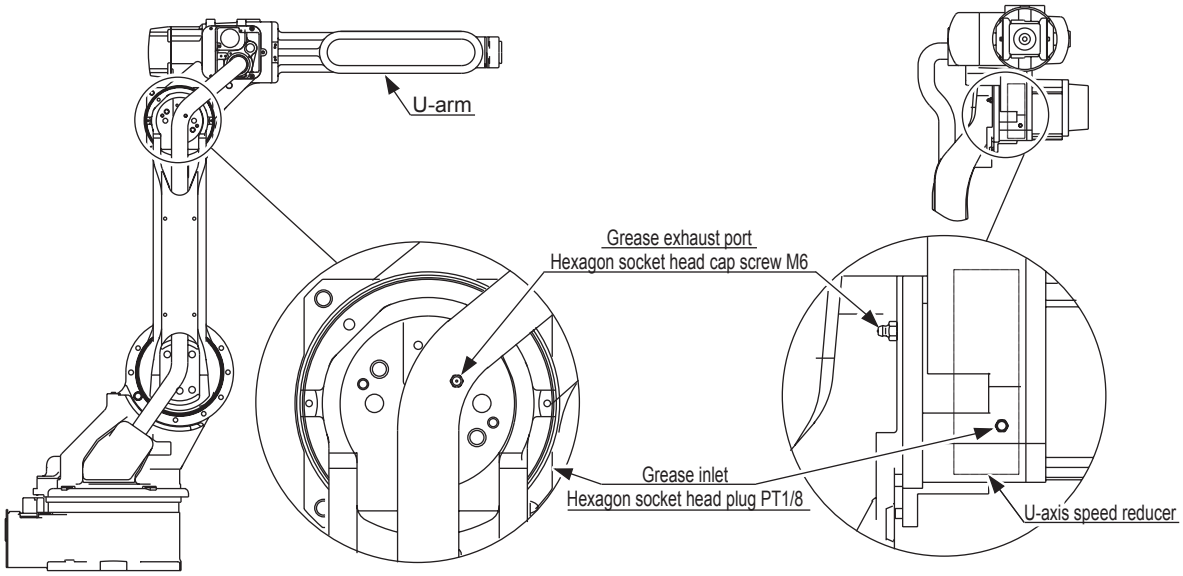


Fig. 30 U-Axis Speed Reducer Diagram

NOTE For ceiling mounted manipulators, the exhaust port and the grease inlet are inverted.

■ Grease Replenishment (Refer to " Fig. 30 U-Axis Speed Reducer Diagram ".)

1. Make the U-arm horizontal to ground.
2. Remove bolts from the grease exhaust port
3. Remove a plug from the grease inlet.

NOTE If grease is injected with the bolts on, the grease will go inside the motor and may damage it. Be sure to remove the bolts.

4. Install the grease zerk PT1/8 to the grease inlet. The grease zerk is provided at factory.
5. Inject grease into the grease inlet using a grease gun.

Grease type: Molywhite RE No.00 Amount of grease: 30cc (60cc for 1st supply)

6. Move the U-Axes for a few minutes to discharge the excess grease.
7. Remove the grease zerk from the grease inlet and reinstall the plug.
   Apply Three Bond 1206C to screwed parts when installing the plug.
8. Wipe the waste grease with a cloth and reinstall the bolts to the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the bolts.

■ Grease Exchange (Refer to " Fig. 30 U-Axis Speed Reducer Diagram ".)

1. Make the U-arm horizontal to ground.
2. Remove bolts from the grease exhaust port.
3. Remove a plug from the grease inlet.

NOTE If grease is injected with the bolts on, the grease will go inside the motor and may damage it. Be sure to remove the bolts.

4. Install the grease zerk PT1/8 to the grease inlet. The grease zerk is provided at factory.
5. Inject grease into the grease inlet using a grease gun.

Grease type: Molywhite RE No.00 Amount of grease: approx. 200cc

6. The grease replacement is complete when new grease appears in the exhaust ports. The new grease can be distinguished from the old grease by its color.
7. Move the U-Axes for a few minutes to discharge the excess grease.
8. Remove the grease zerk from the grease inlet and reinstall the plug.
   Apply Three Bond 1206C to screwed parts when installing the plug.
9. Wipe the waste grease with a cloth and reinstall the bolts to the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the bolts.

9.2.5 Grease Replenishment for R-Axis Speed Reducer

Note that the grease replenishment procedure is different by serial number of the subject manipulator.
The serial number is indicated on a nameplate. (Refer to " Explanation of Warning Labels " on page 6(vi).)

■ For Application of Serial Numbers S3W120-5 to S3W120-6

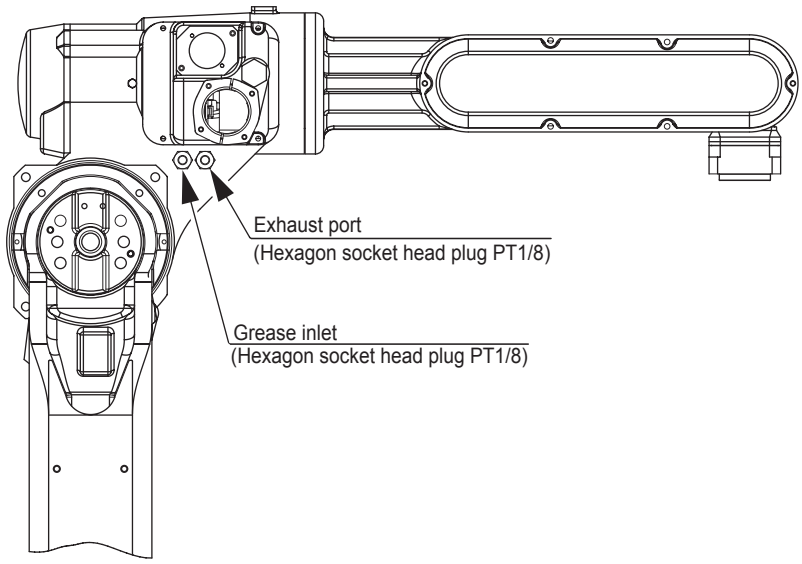


Fig. 31 (a) R-Axis Speed Reducer Diagram (For Serial Numbers S3W120-5 to S3W120-6)

1. Remove a plug from the exhaust port.
2. Remove a plug from the grease inlet, then install the grease zerk PT1/8. The grease zerk is provided at factory.
3. Inject grease into the grease inlet using a grease gun. (Refer to " Fig. 31 (a) R-Axis Speed Reducer Diagram (For Serial Numbers S3W120-5 to S3W120-6) ".)

Grease type: Harmonic grease SK-1A Amount of grease: 8cc (16cc for first supply)

NOTE The exhaust port is used for air flow. Do not inject excessive grease into the grease inlet.

4. Remove the grease zerk from the grease inlet, then reinstall the plug.
   Apply Three Bond 1206C to screwed parts when installing the plug.
5. Reinstall the plug on the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the plug.

■ For Application of Serial Numbers S3W120-7 to RH9520-3112

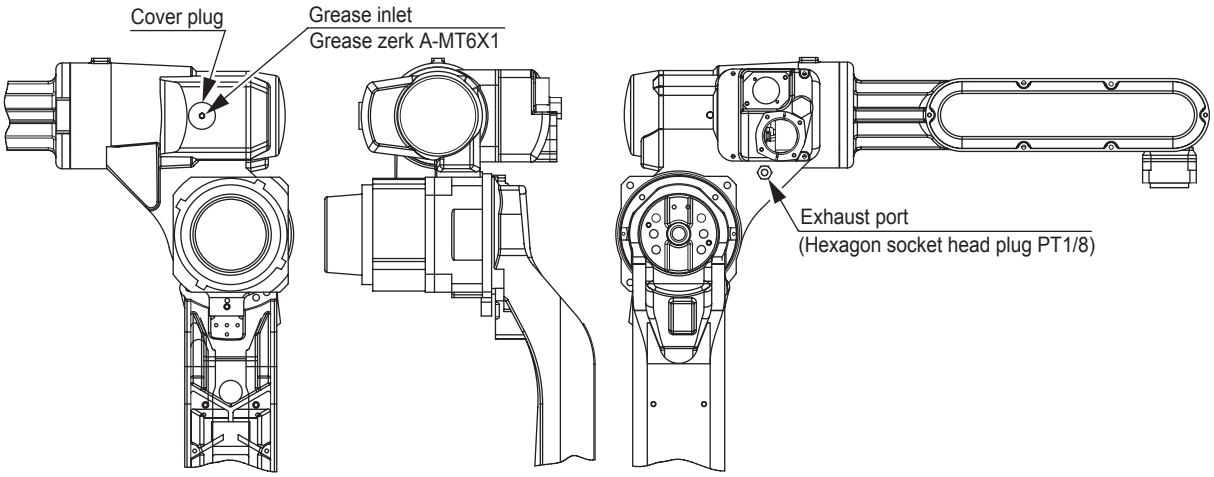


Fig. 31 (b) R-Axis Speed Reducer Diagram (For Serial Numbers S3W120-7 to RH9520-3112)

1. Remove a plug from the exhaust port.
2. Remove the cover plug.
3. Inject grease into the grease inlet using a grease gun. (Refer to " Fig. 31 (b) R-Axis Speed Reducer Diagram (For Serial Numbers S3W120-7 to RH9520-3112) ".)

Grease type: Harmonic grease SK-1A Amount of grease: 8cc (16cc for first supply)

NOTE The exhaust port is used for air flow. Do not inject excessive grease into the grease inlet.

4. Reinstall the cover plug.
5. Reinstall the plug on the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the plug.

■ For Application of Serial Numbers RH9520-3121 and Over

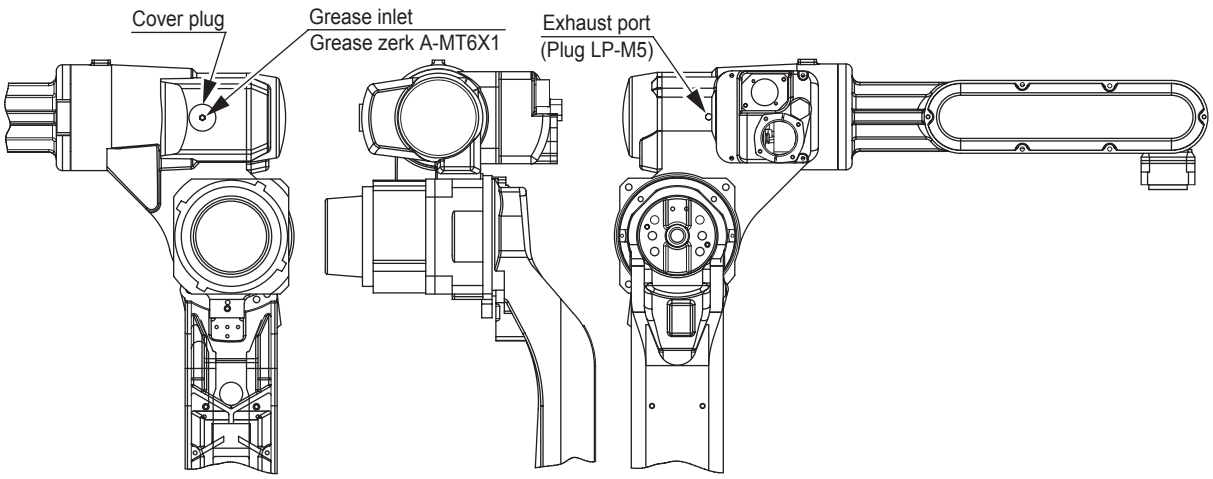


Fig. 31 (c) R-Axis Speed Reducer Diagram (For Serial Numbers RH9520-3121 and Over)

1. Remove a plug from the exhaust port.
2. Remove the cover plug.
3. Inject grease into the grease inlet using a grease gun. (Refer to " Fig. 31 (c) R-Axis Speed Reducer Diagram (For Serial Numbers RH9520-3121 and Over) ".)

Grease type: Harmonic grease SK-1A
Amount of grease: 8cc
(16cc for first supply)

NOTE The exhaust port is used for air flow. Do not inject excessive grease into the grease inlet.

4. Reinstall the cover plug.
5. Reinstall the plug on the exhaust port.

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

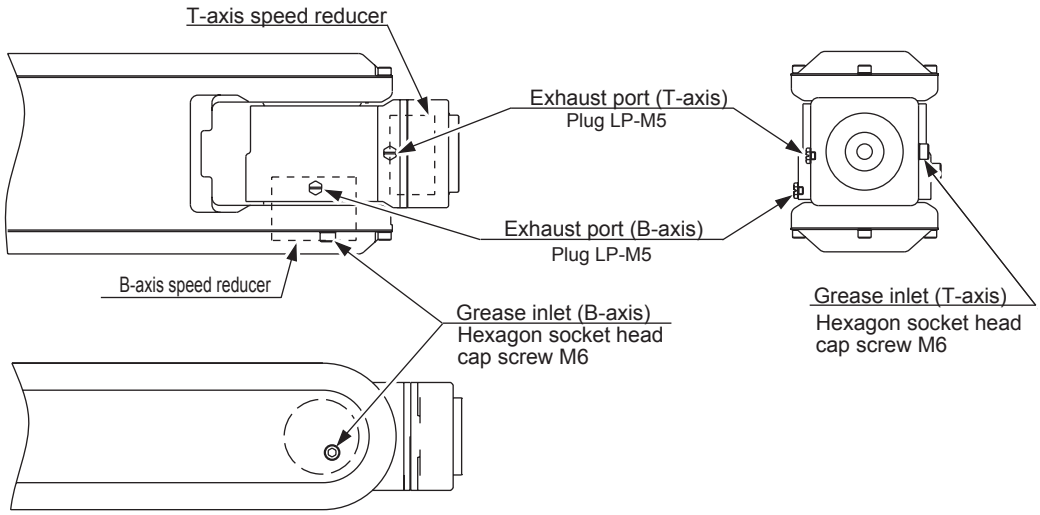


Fig. 32 B- and T-Axes Speed Reducers Diagram

1. Remove plugs from the exhaust port.

NOTE Remove the U-arm cover side of the B-axis speed reducer.

2. Remove bolts from the grease inlets and install the grease zerk A-MT6 x 1. The grease zerk is provided at factory.
3. Inject grease into the grease inlets using a grease gun. (Refer to " Fig. 32 B- and T-Axes Speed Reducers Diagram ".)

Grease type: Harmonic grease SK-1A
Amount of grease:
For B-axis: 10cc (20cc for 1st supply)
For T-axis: 5cc (10cc for 1st supply)

NOTE The exhaust port is used for air flow. Do not inject excessive grease into the grease inlets.

4. Remove the grease zerk form the grease inlets and reinstall the bolts.
   Apply Three Bond 1206C to screwed parts when installing the bolts.
5. Reinstall the plugs to the exhaust ports.
   Apply Three Bond 1206C to screwed parts when installing the plugs.

NOTE Mount the U-arm cover side of the B-axis speed reducer. (Refer to " 9.2.9 Notes for Maintenance ")

9.2.7 Grease Replenishment for T-Axis Gear

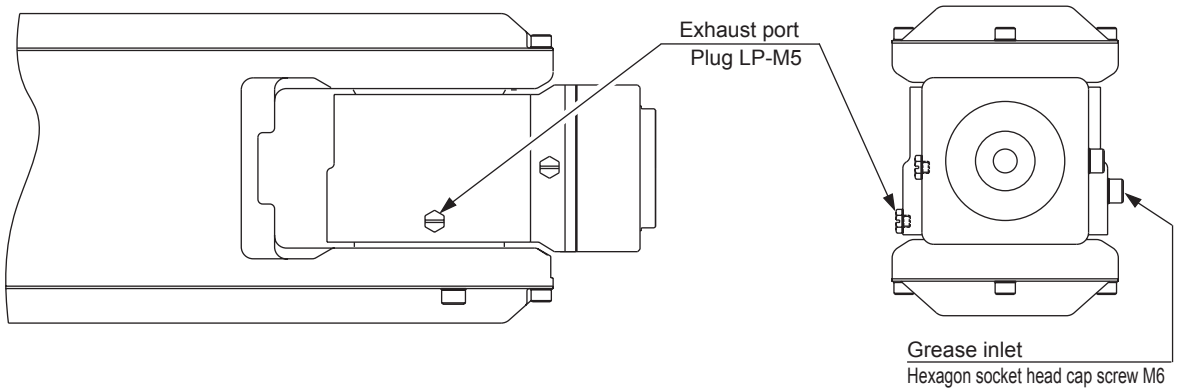


Fig. 33 T-Axis Gear Diagram

1. Remove a plug from the grease exhaust port.
2. Remove bolts from the grease inlet, then install the grease zerk A-MT6 x 1. The grease zerk is provided at factory.
3. Inject grease into the gear grease inlet using a grease gun. (Refer to " Fig. 33 T-Axis Gear Diagram ".)

Grease type: Harmonic grease SK-1A Amount of grease: 5cc (10cc for 1st supply)

NOTE The exhaust port is used for air flow. Do not inject excessive grease into the gear grease inlet.

4. Remove the grease zerk from the grease inlet and reinstall the bolts.
   Apply Three Bond 1206C to screwed parts when installing the bolts.
5. Reinstall the plug to the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the plug.

9.2.8 Grease Replenishment for R-Axis Cross Roller Bearing

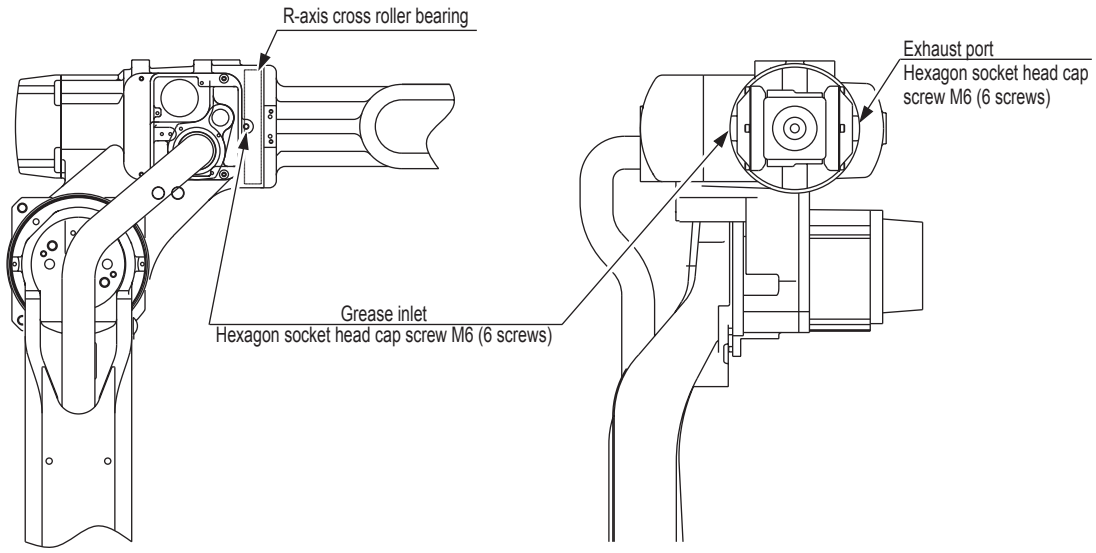


Fig. 34 R-Axis Cross Roller Bearing Diagram

1. Remove bolts of the exhaust port.
2. Remove bolts of the grease inlet, then install the grease zerk A-MT6 x 1. The grease zerk is provided at factory.
3. Inject grease into the grease inlet using a grease gun. (Refer to " Fig. 34 R-Axis Cross Roller Bearing Diagram ").

Grease type: Alvania EP grease 2 Amount of grease: 3cc (6cc for 1st supply)

NOTE The exhaust port is used for air flow. Do not inject excessive grease into the gear grease inlet.

4. Remove the grease zerk from the grease inlet and reinstall the bolts.
   Apply Three Bond 1206C to screwed parts when installing the bolts.
5. Reinstall the bolts to the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the bolts.

9.2.9 Notes for Maintenance

■ Wrist Axes

The motor and encoder units are provided with the wrist unit. To prevent fumes from penetrating into the wrist unit, the matched parts are sealed with sealing bond. Therefore, if the wrist cover is disassembled, reseal with sealing bond (Three Bond 1206C, refer to " Table. 9 Spare Parts for YR-HP6-A00 and YR-HP6-A01 ").

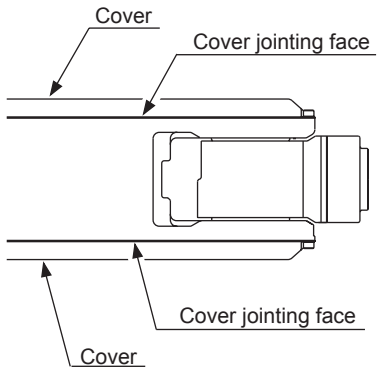


Fig. 35 Sealing Part of Wrist Unit

■ Battery Pack Connector (with CAUTION label)

Connect the battery pack with reference to the following figure before removing the encoder connector (with CAUTION label).

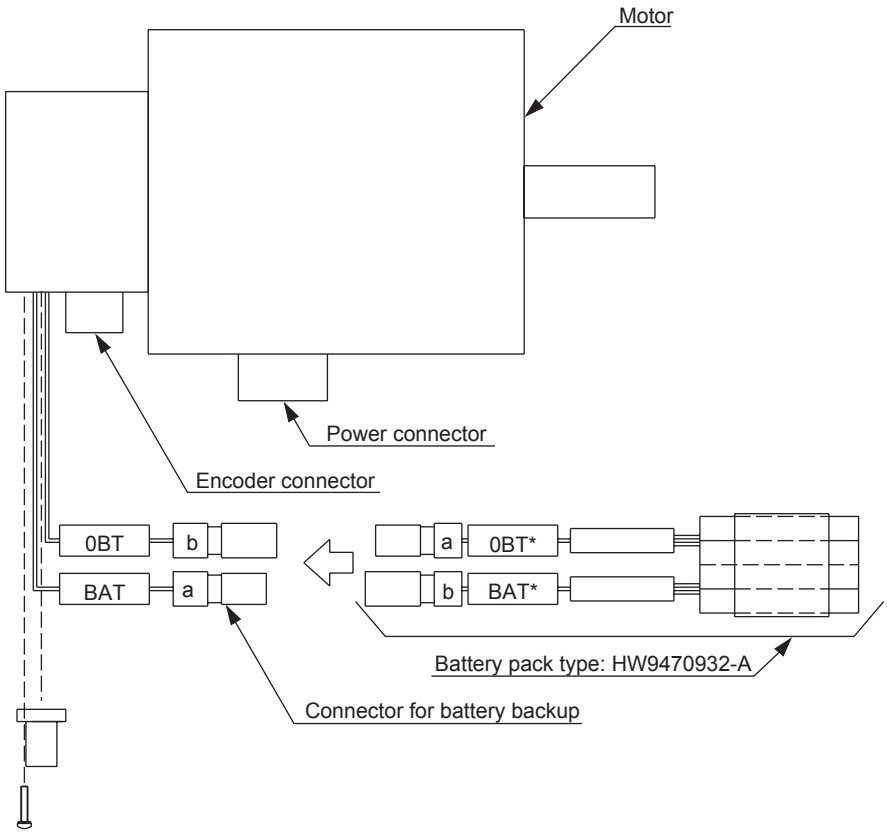


Fig. 36 Battery Pack Connector Diagram for SLU-Axes

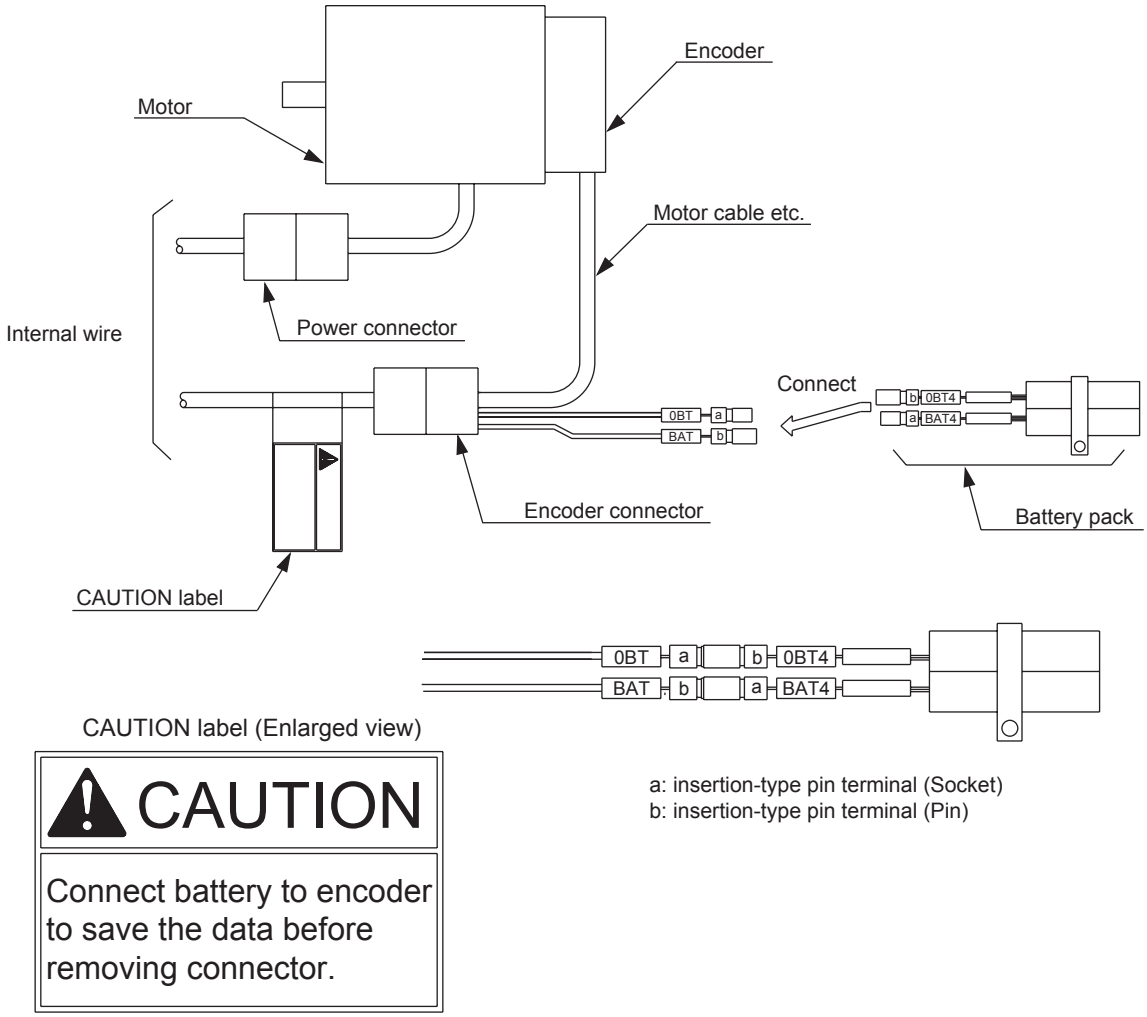


Fig. 37 Battery Pack Connector Diagram for RBT-Axes

10 Recommended Spare Parts

It is recommended that the following parts and components be kept in stock as spare parts for the MOTOMAN-HP6. The spare parts list for the MOTOMAN-HP6 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 unit

NOTE For replacing parts in Rank B or Rank C, contact your Yaskawa representative.

Table. 9 Spare Parts for YR-HP6-A00 and YR-HP6-A01

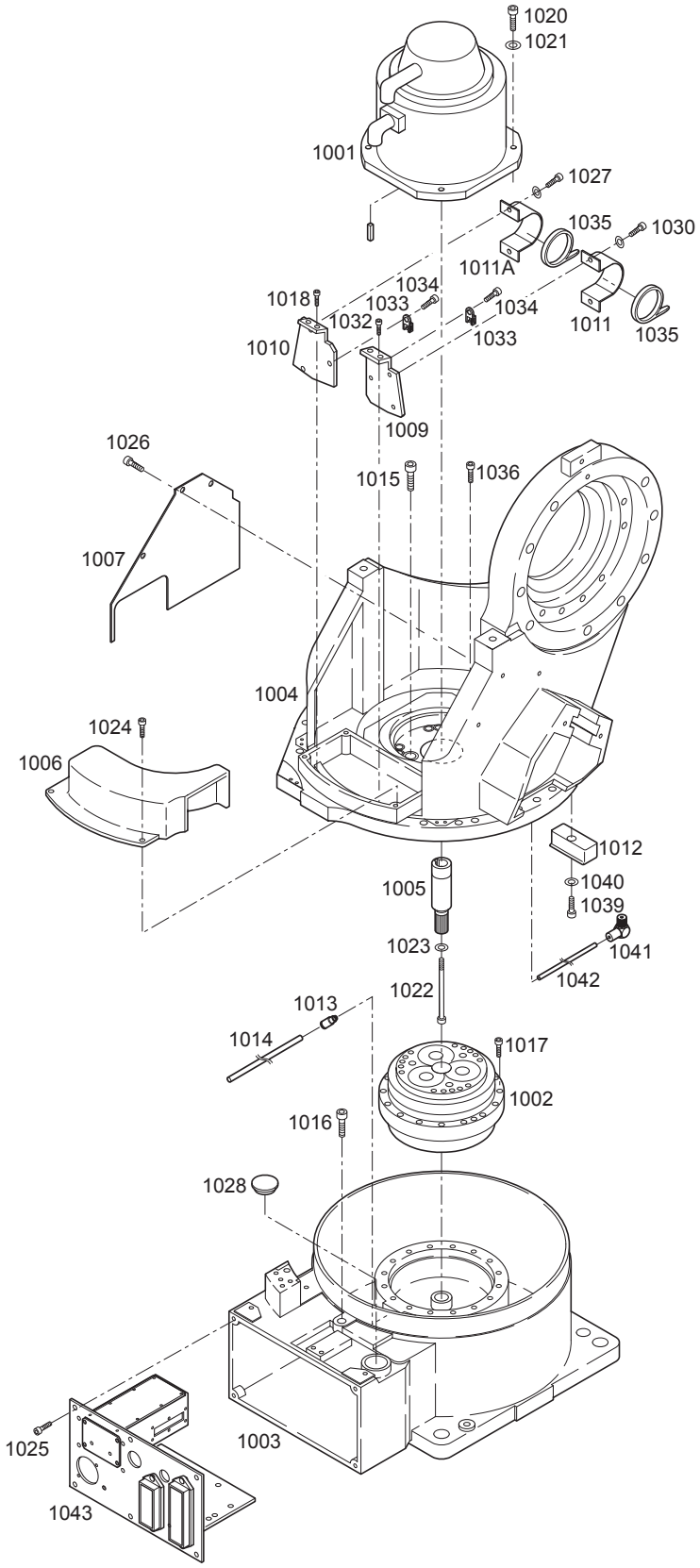
Rank	Parts No.	Name	Type	Manufacturer	Qty	Qty per Unit	Remarks
A	1	Grease	Molywhite RE No.00	Yaskawa Electric Corporation	16kg	-	
A	2	Grease	Harmonic Grease SK-1A	Harmonic Drive System Co., Ltd.	2.5kg	-	
A	3	Grease	Alvania EP Grease 2	Showa Shell Sekiyu K.K.	16kg	-	
A	4	Liquid Gasket	Three Bond 1206C	Three Bond Co., Ltd.	-	-	
A	5	Battery Pack	HW0470360-A	Yaskawa Electric Corporation	1	1	for SLU-axes
A	6	Battery Pack	HW9470932-A	Yaskawa Electric Corporation	-	1	
B	7	B-Axis Timing Belt	60S4.5M558	Mitsuboshi Belting Limited	1	1	
B	8	T-Axis Timing Belt	60S4.5M387	Mitsuboshi Belting Limited	1	1	
B	9	S-Axis Speed Reducer	HW9280729-B	Yaskawa Electric Corporation	1	1	
B	10	S-Axis Input Gear	HW0303548-1	Yaskawa Electric Corporation	1	1	
B	11	L-Axis Speed Reducer	HW9280732-B	Yaskawa Electric Corporation	1	1	
B	12	L-Axis Input Gear	HW0303276-1	Yaskawa Electric Corporation	1	1	

Table. 9 Spare Parts for YR-HP6-A00 and YR-HP6-A01

Rank	Parts No.	Name	Type	Manufacturer	Qty	Qty per Unit	Remarks
B	13	U-Axis Speed Reducer	HW9280738-B	Yaskawa Electric Corporation	1	1	
B	14	U-Axis Input Gear	HW0303277-1	Yaskawa Electric Corporation	1	1	
B	15	R-Axis Speed Reducer	HW0382277-A	Yaskawa Electric Corporation	1	1	
B	16	B-Axis Speed Reducer	HW0381646-A	Yaskawa Electric Corporation	1	1	
B	17	R-Axis Cross Roller Bearing	HW0381872-A	Yaskawa Electric Corporation	1	1	
B	18	T-Axis Speed Reducer	HW0381831-A	Yaskawa Electric Corporation	1	1	Serial No: Before RH9520-4118 (The products which were manufactured by October, 2004)
			HW0382917-A	Yaskawa Electric Corporation	1	1	Serial No: RH9520-4119 and over (The products which were manufactured since November, 2004)
B	19	Wire Harness in Manipulator	HW0171196-A	Yaskawa Electric Corporation	1	1	
B	20	B- and T-Axes Wire Harness in Manipulator	HW0270875-A	Yaskawa Electric Corporation	1	1	For B- and T- axes
C	21	S-and U-Axes AC Servomotor	HW0382153-A SGMRS-06A2B-YR1*	Yaskawa Electric Corporation	1	2	With brake, with key, lead terminal treatment completion
C	22	L-Axis AC Servomotor	HW0382155-A SGMRS-12A2B-YR1*	Yaskawa Electric Corporation	1	1	With brake, with key, lead terminal treatment completion
C	23	R- B-, and T-Axes AC Servomotor	HW0382151-A SGMPH-01A2A-YR1*	Yaskawa Electric Corporation	1	3	With brake, no key, lead terminal treatment completion

11 Parts List

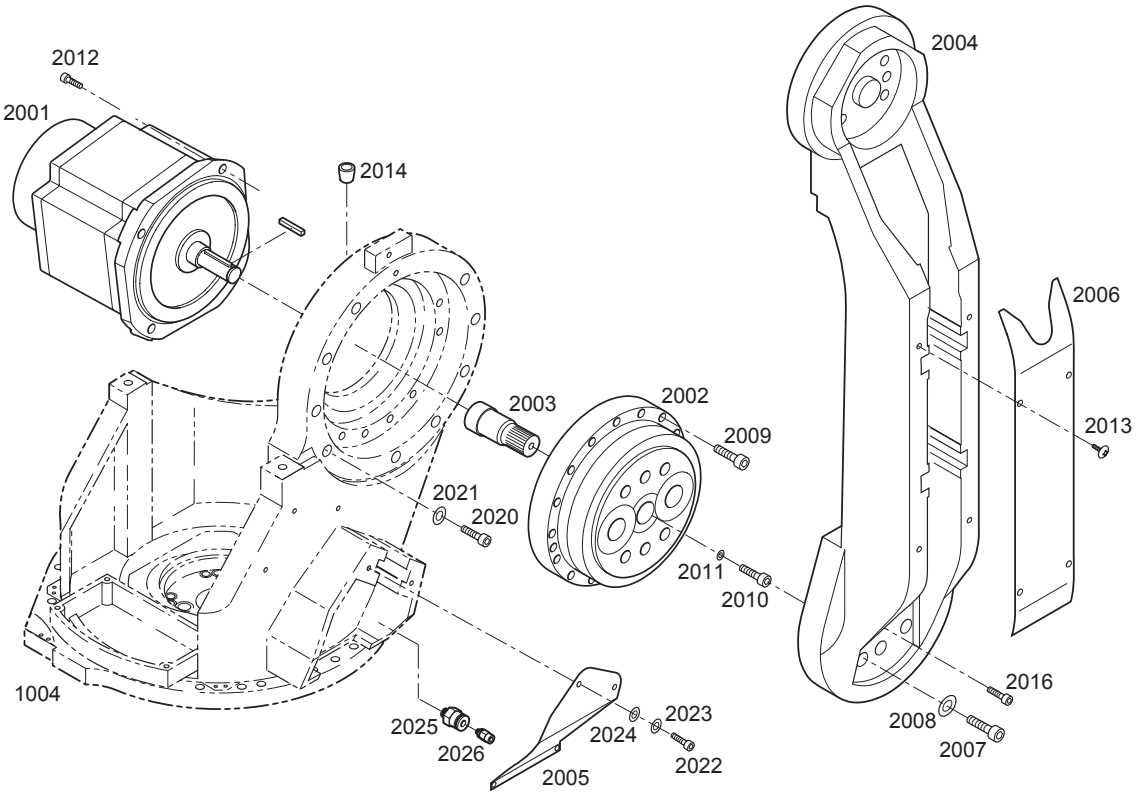
11.1 S-axis Unit



11.1 S-axis Unit

No.	DWG No.	Name	Pcs
1001	SGMRS-06A2B-YR1*	Motor	1
1002	HW9280729-B	Speed reducer	1
1003	HW0100455-1	Base	1
1004	HW0100456-1	S-head	1
1005	HW0303548-1	Gear	1
1006	HW0200132-1	Cover	1
1007	HW0404551-1	Cover	1
1009	HW0404549-1	Support	1
1010	HW0403842-1	Support	1
1011	CD-19	Saddle	2
1011A	CD-31	Saddle	2
1012	HW9405278-1	Spacer	1
1013	TSH6-01M	Air joint	1
1014	NB-0640-0.23	Tube	1
1015	M10X25	Socket screw	3
	2H-10	Spring washer	3
1016	M10X20	Socket screw	1
	2H-10	Spring washer	1
1017	M6X30	Socket screw	16
	2H-6	Spring washer	16
1018	M6X15	Socket screw	2
	2H-6	Spring washer	2
1020	M8X30	Socket screw	3
1021	2H-8	Spring washer	3
1022	M4X80	Socket screw	1
1023	2H-4	Spring washer	1
1024	M5X16	Bolt	4
	2H-5	Spring washer	4
1025	M5X10	Bolt	4
1026	M6X8	Bolt	3
1027	M6X8	Socket screw	2
	2H-6	Spring washer	2
1028	EZ5036A0	Cap	1
1030	M5X10	Socket screw	2
	2H-5	Spring washer	2
1032	M6X15	Socket screw	2
	2H-6	Spring washer	2
1033	TA1-S10	Clamp	2
1034	M5X10	Bolt	2
1035	T50R	Cable tie	2
1036	M6X20	Socket screw	12
	2H-6	Spring washer	12
1039	M10X35	Socket screw	1
1040	2H-10	Spring washer	1
1041	POL6-01	Union	1
1042	NB-0640-0.35	Tube	1
1043	HW0171196-A	Wire Harness	1

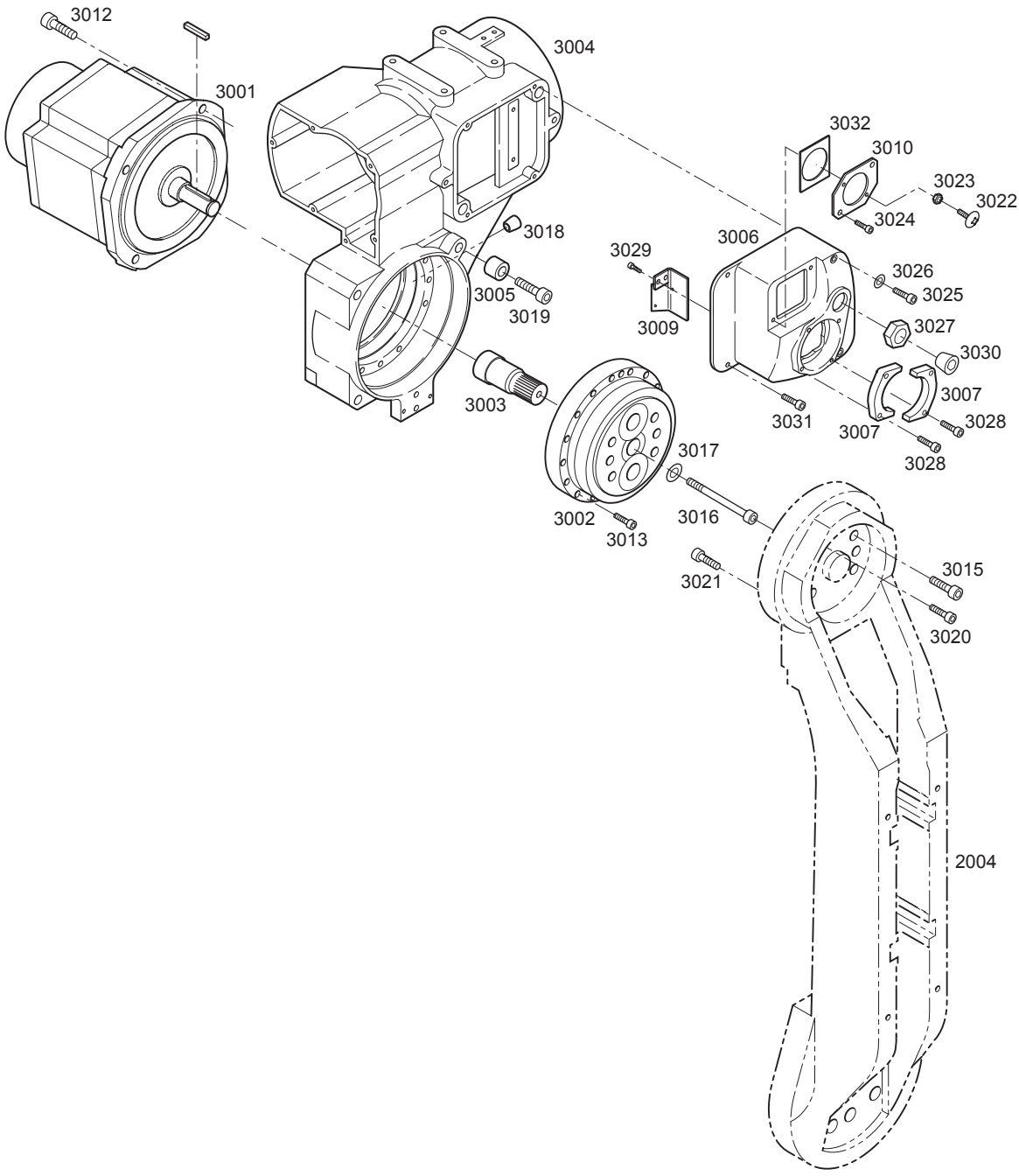
11.2 L-Axis Unit



11.2 L-Axis Unit

No.	DWG No.	Name	Pcs
2001	SGMRS-12A2B-YR1*	Motor	1
2002	HW9280732-B	Speed reducer	1
2003	HW0303276-1	Gear	1
2004	HW0100503-1	L-arm	1
2005	HW0303910-1: Serial No ~ RH9520-4023 HW0303127-1: Serial No RH9520-4024 ~ RH9520-402J HW0304456-1: Serial No RH9520-402K ~	Cover	1
2006	HW0304457-1	Cover	1
2007	M14X35	Socket screw	6
2008	M14	Washer	6
2009	M8X40	Socket screw	12
	2H-8	Spring washer	12
2010	M6X60	Socket screw	1
2011	2H-6	Spring washer	1
2012	M8X30	Socket screw	4
	2H-8	Spring washer	4
2013	M6X8	Bolt	4
2014	PT1/8	Grease zerk	1
2016	M6X6	Socket screw	1
2020	M12X20	Socket screw	2
2021	2H-12	Spring washer	2
2022	M6X12	Socket screw	4
2023	2H-6	Spring washer	4
2024	M6	Washer	4
2025	PMF6-01	Union	1
2026	PT1/8	Plug	1
1004	HW0100456-1	S-head	1

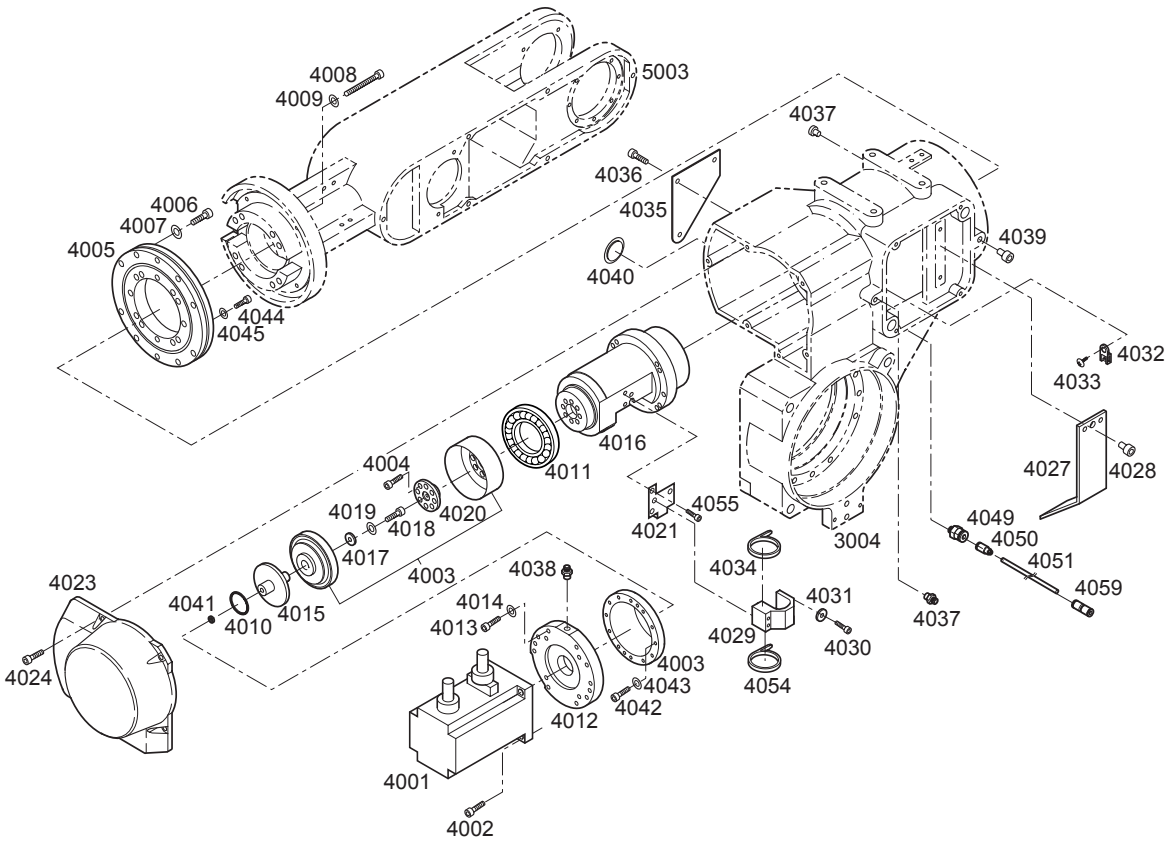
11.3 U-Axis Unit



11.3 U-Axis Unit

No.	DWG No.	Name	Pcs
3001	SGMRS-06A2B-YR1*	Motor	1
3002	HW9280738-B	Speed reducer	1
3003	HW0303277-1	Gear	1
3004	HW0100619-1	Casing	1
3005	HW0404196-2	Washer	1
3006	HW0200493-1	Cover	1
3007	HW0404179-1	Stopper	2
3009	HW0404152-1	Support	1
3010	HW0404718-1	N-base	1
3012	M8X30	Socket screw	4
	2H-8	Spring washer	4
3013	M6X35	Socket screw	12
	2H-6	Spring washer	12
3015	M10X30	Socket screw	6
	2H-10	Spring washer	6
3016	M4X50	Socket screw	1
3017	2H-4	Spring washer	1
3018	PT1/8	Plug	1
3019	M10X35	Socket screw	1
3020	M6X6	Socket screw	1
3021	M10X20	Socket screw	2
	2H-10	Spring washer	2
3022	M3X16	Round head screw	2
3023	M3	Nut	2
3024	M4X10	Socket screw	2
	2H-4	Spring washer	2
3025	M4X55	Socket screw	2
3026	2H-4	Spring washer	2
3027	KOE10-01	Air joint	1
3028	M4X16	Socket screw	4
	2H-4	Spring washer	4
3029	M4X10	Socket screw	2
	2H-4	Spring washer	2
3030	PT1/8	Plug	1
3031	M4X12	Bolt	2
	2H-4	Spring washer	2
3032	HW9481087-A	Gas socket	1
2004	HW0100503-1	L-arm	1

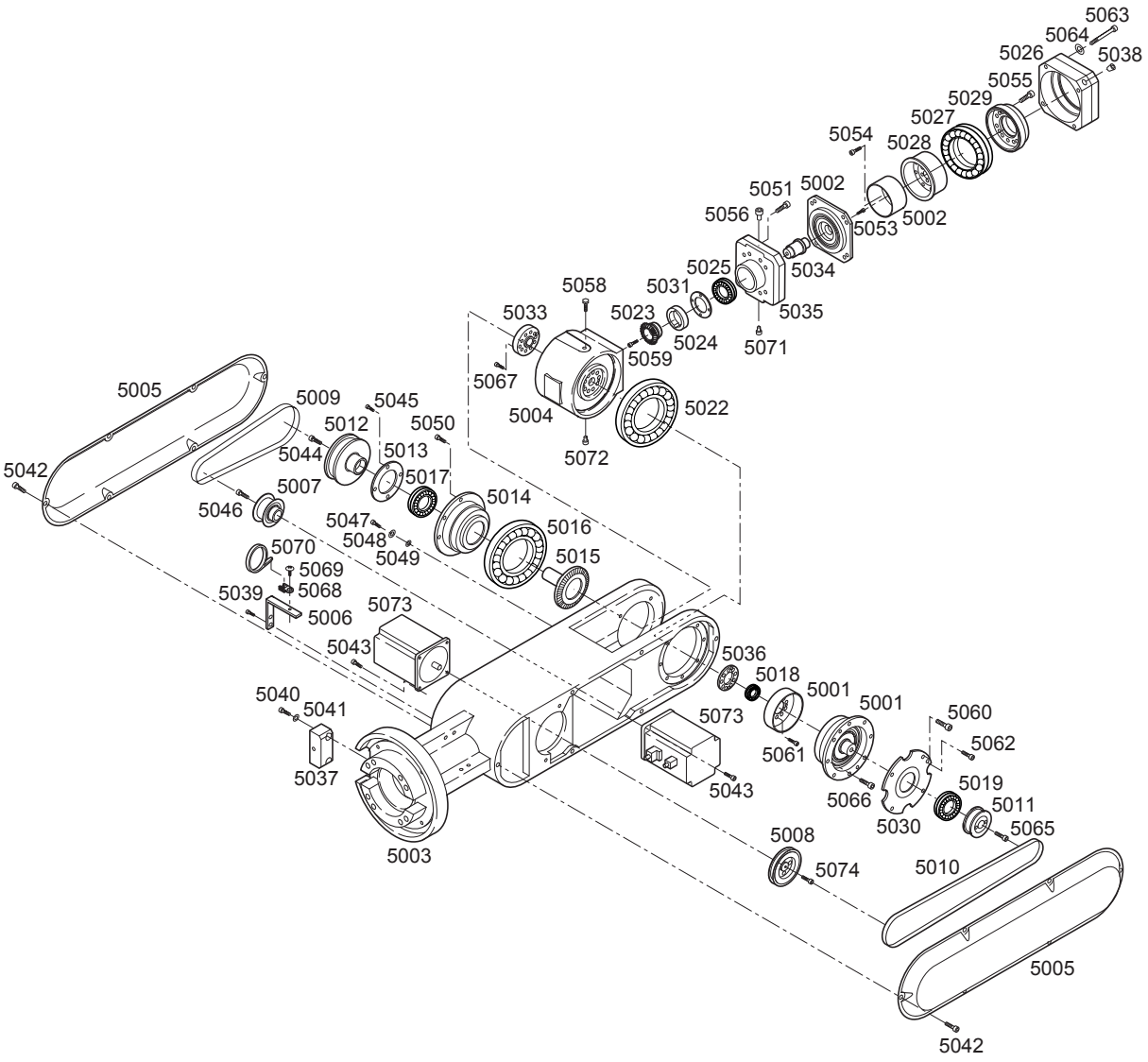
11.4 R-Axis Unit



11.4 R-Axis Unit

No.	DWG No.	Name	Pcs
4001	SGMPH-01A2A-YR1*	Motor	1
4002	M5X12	Socket screw	4
	2H-5	Spring washer	4
4003	HW0382277-A	Speed reducer	1
4004	M5X16	Socket screw	8
	2H-5	Spring washer	8
4005	HW0381872-A	Cross roller bearing	1
4006	M6X30	Socket screw	8
4007	2H-6	Spring washer	8
4008	M6X60	Socket screw	8
4009	2H-6	Spring washer	8
4010	TC12227FKM	Oil seal	1
4011	6809ZZ	Bearing	1
4012	HW0404161-1	M-base	1
4013	M4X25	Socket screw	9
4014	2H-4	Spring washer	9
4015	HW0404163-1	Fly wheel	1
4016	HW0303556-1: Serial No ~ RH9520-3112 HW0304348-1: Serial No RH9520-3121 ~	Shaft	1
4017	HW0404196-1	Washer	1
4018	M4X40	Socket screw	1
4019	2H-4	Spring washer	1
4020	HW0404164-1	Shaft	1
4021	HW0403849-1: Serial No ~ RH9520-3112 HW0404717-1: Serial No RH9520-3121 ~	Support	1
4023	HW0304455-1	Cover	1
4024	M4X16	Socket screw	6
	2H-4	Spring washer	6
4027	HW0404333-1: Serial No ~ RH9520-3112 HW0404478-1: Serial No RH9520-3121 ~	Plate Cover	1 1
4028	M4X12	Socket screw	2
	2H-4	Spring washer	2
4029	HW0404503-1	Saddle	2
4030	M4X20	Socket screw	4
4031	2H-4	Spring washer	4
4032	TA1-S8	Clamp	1
4033	M4X10	Round head screw	2
4034	T50R	Cable tie	1
4035	HW0404720-1	Cover	1
4036	M4X10	Socket screw	3
	2H-4	Spring washer	3
4037	LP-M5	Plug	2
4038	MT6X1	Grease zerk	1
4039	M6X6	Socket screw	1
4040	EZ5036AO	Cap	1
4041	HW0404304-1	Gasket	1
4042	M3X16	Socket screw	12
4043	2H-3	Spring washer	12
4044	M6X30	Socket screw	2
4045	2H-6	Spring washer	2
4046	CD-12: Serial No ~ RH9520-3112	Saddle	1
4049	PMF6-01: Serial No ~ RH9520-3112	Air joint	1
4050	PT1/8: Serial No ~ RH9520-3112	Plug	1
4051	TU0640C-0.1: Serial No ~ RH9520-3112	Tube	1
4054	T50R	Cable tie	2
4055	M4X12	Socket screw	2
	2H-4	Spring washer	2
4059	POC-M6M: Serial No ~ RH9520-3112	Coupling	2
4062	HW0304123-1: Serial No ~ RH9520-3112	Support	1
3004	HW0100619-1	Casing	1
5003	HW0100620-1	U-arm	1

11.5 Wrist Unit



11.5 Wrist Unit

No.	DWG No.	Name	Pcs
5001	HW0381646-A	Speed reducer	1
5002	HW0381831-A	Speed reducer	1
		For serial No: before RH9520-4118	
	HW0382917-A	Speed reducer	1
		For serial No: RH9520-4119 and over	
5003	HW0100620-1	U-arm	1
5004	HW0200491-1	Wrist base	1
5005	HW9200780-1	Cover	2
5006	HW9406556-1	Support	1
5007	HW9482352-A	Pulley	1
5008	HW0481429-A	Pulley	1
5009	60S4.5M387	Belt	1
5010	60S4.5M558	Belt	1
5011	HW0481692-A	Pulley	1
5012	HW9482220-A	Pulley	1
5013	HW9404988-1	B-cover	1
5014	HW0404266-1	Housing	1
5015	HW9381452-A	Gear	1
5016	6811LLU	Bearing	1
5017	HW9482218-A	Bearing	1
5018	688A	Bearing	1
5022	6812LLU	Bearing	1
5023	HW9381384-A	Gear	1
5024	HW9405199-1	B-nut	1
5025	HW9481180-A	Bearing	1
5026	HW0404550-1	Housing	1
5027	HW9481024-A	Bearing	1
5028	HW0303559-1	Shaft	1
5029	HW0303560-1	Flange	1
5030	HW0403705-1	Housing	1
5031	SP-0120**	Shim	1
5033	HW0404302-1	Shaft	1
5034	HW0404166-1	Shaft	1
		For serial No: before RH9520-4118	
	None	Shaft	0
		For serial No: RH9520-4119 and over	
5035	HW0303912-1	Housing	1
5036	HW0404303-1	Coller	1
5037	HW0404279-1	Block	1
5038	HW0404371-1	Bolt	1
5039	M4X12	Socket screw	2
	2H-4	Spring washer	2
5040	M4X20	Socket screw	2
5041	2H-4	Spring washer	2
5042	M5X12	Socket screw	12
	2H-5	Spring washer	12
5043	M4X16	Socket screw	4
	2H-4	Spring washer	4
5044	M4X12	Socket screw	1
	2H-4	Spring washer	1
5045	M4X12	Socket screw	4
5046	M4X12	Socket screw	1
5047	M6X14	Socket screw	1
5048	2H-6	Spring washer	1
5049	M6	Washer	1
5050	M4X12	Socket screw	4
	2H-4	Spring washer	4

No.	DWG No.	Name	Pcs
5051	M4X12	Socket screw	8
	2H-4	Spring washer	8
5053	M4X12	Socket screw	1
	2H-4	Spring washer	1
		For serial No: before RH9520-4118	
	None	Socket screw	0
	None	Spring washer	0
		For serial No: RH9520-4119 and over	
5054	M5X12	Socket screw	6
	2H-5	Spring washer	6
5055	M4X10	Socket screw	6
	2H-4	Spring washer	6
5056	M6X6	Socket screw	1
5058	LP-M5	Plug	1
5059	M4X12	Socket screw	1
	2H-4	Spring washer	1
5060	M4X16	Socket screw	4
	2H-4	Spring washer	4
5061	M4X16	Socket screw	9
	2H-4	Spring washer	9
5062	M6X6	Socket screw	1
5063	M4X30	Socket screw	4
5064	2H-4	Spring washer	4
5065	M5X16	Socket screw	1
	2H-5	Spring washer	1
5066	M4X12	Socket screw	4
	2H-4	Spring washer	4
5067	M3X12	Socket screw	2
	2H-3	Spring washer	2
5068	TA1-S8	Clamp	1
5069	M4X8	Round head screw	1
5070	T50R	Cable tie	1
5071	M6X6	Socket screw	1
5072	M6X6	Socket screw	1
5073	SGMPH-01A2A-YR1*	Motor	2
5074	M4X12	Socket screw	1
	2H-4	Spring washer	1

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