MOTOMAN XRC
INSTRUCTION MANUAL
MOTOMAN-SV3X, -SV3XL

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

MOTOMAN ROBOTICS AB
A subsidiary of YASKAWA Electric Corporation

MANUAL NO. MRS52050

Reference list

Operator's manual basic programming
MOTOMAN XRC Maintenance manual

Revision

990614
First release of this manual

Revision

990810
Master page updated with new company name.
(MOTOMAN ROBOTICS EUROPE AB)

Revision

991125
Data for robot type SV3XL is added.

Revision

000403
Spare part list is added.

Safety

NOTES FOR SAFE OPERATION

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

In this manual, the Notes for Safe Operation are classified as "WARNING" or "INFORMATION".

WARNING

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

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

INFORMATION

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

This manual explains the various components of the MOTOMAN XRC system and general operations. Read this manual carefully and be sure to understand its contents before handling the MOTOMAN XRC.

General items related to safety are listed in the MOTOMAN XRC Setup Manual. To ensure correct and safe operation, carefully read the Setup Manual before reading this manual.

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.

The equipment is manufactured in conformity with the EC Machinery directive, the EMC-directive as well as the LVD-directive.

The equipment is intended to be incorporated into machinery or assembled with other machinery to constitute machinery covered by this directive, and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of EC´s Machinery, EMC and LVD Directive.

Information how to connect to the MOTOMAN XRC is described in the XRC Service Manual.

MOTOMAN is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

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

If your copy of the manual is damaged or lost, contact a MOTOMAN 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.

MOTOMAN is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

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 playback panel, the programming pendant and supply cables.

In this manual, the equipment is designated as follows.

Equipment	Manual designation
MOTOMAN XRC Controller	XRC
MOTOMAN XRC Playback panel	P-Panel
MOTOMAN XRC Programming pendant	P-Pendant
Start panel for machinery operation in PLAY-mode	Start panel

Key operation

Descriptions of the programming pendant and playback panel keys, buttons and displays are shown as follows:

Equipment		Manual designation
Programming pendant	Character keys	The keys which have characters printed on them are denoted with [ ] ex. [ENTER]
	Symbol keys	The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture. ex. page key  The cursor key is an exception and a picture is not shown.
	Axis keys Number keys	"Axis keys" and "Number keys" are generic names for the keys for axis operation and number input.
	Keys pressed simultaneously	When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them, ex. [SHIFT]+[COORD]
	Displays	The menu displayed in the programming pendant is denoted with *"italic"* characters. ex. *JOB*
Playback panel	Buttons	Playback panel buttons are enclosed in brackets. ex. [TEACH] on the playback panel

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.

Teaching

Before operating the robot, check that the servo power is turned off when the emergency stop buttons on the playback panel or programming pendant are pressed.
Injury or damage to machinery may result if the emergency stop circuit cannot stop the robot during emergency. The MOTOMAN XRC should not be used if the emergency stop buttons do not function.

Always set the Teach Lock before entering the robot work envelope to teach a job.
Operator injury can occure if other person reset safety and restart robot in PLAY-mode.

Confirm that no persons are present in the robot work envelope and that you are in a safe location before:
✔Turning on the MOTOMAN XRC power.

✔Moving the robot with the programming pendant.

✔Running check operations.

✔Performing automatic operations.

Injury may result if anyone enters the working envelope of the robot during operation. Always press an emergency stop button immediately if there are problems.

Service

Perform the following inspection procedures prior to conducting robot teaching. If problems are found, repair them immediately and be sure that all other necessary processing has been performed.
✔Check for problems in robot movement.

✔Check for damages to insulation and sheathing of external wires.

Always return the programming pendant to the hook after use.
The programming pendant can be damaged if it is left in the robots work area, on the floor or near fixtures.

Spare parts
MOTOMAN warranty is only valid if original spare parts are used.

Motoman SV3X

1. Receiving

Note!
Confirm that the manipulator and the XRC have the same serial 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 Checking package contents

When the package arrives, check the contents for the following standard items (Any additional options ordered should be checked as well.):

✔ Manipulator (robot arm)
✔ XRC robot controller
✔ Programming pendant
✔ Motor cable
✔ Signal cable

1.2 Checking the serial number

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

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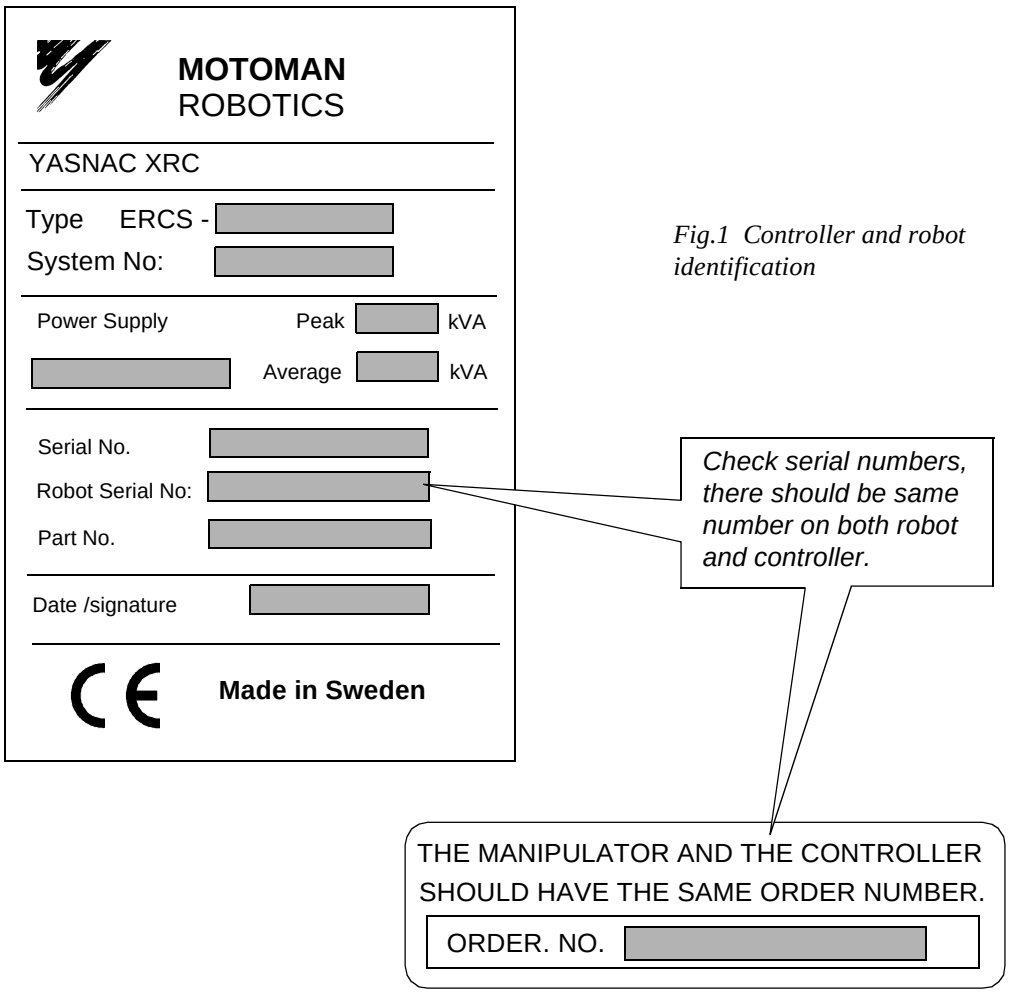
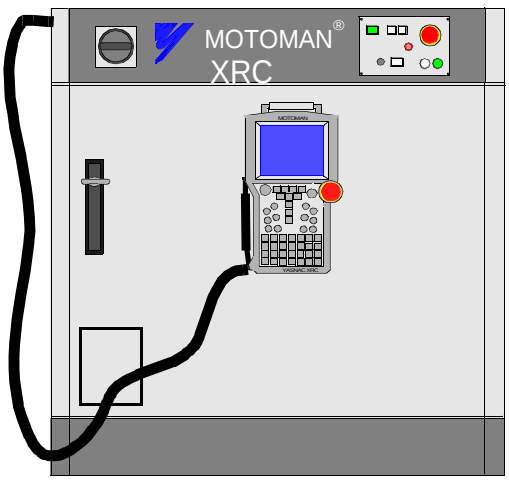
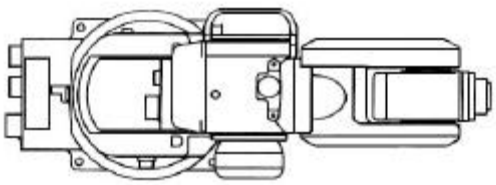


Fig.1 Controller and robot identification



(a) XRC (front view)



(b) Manipulator (top view)

Fig.2 Location of order number labels

2. Transporting

Note!
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.
The system consists of precision components, so failure to observe this caution may adversely affect performance.

2.1 Transporting method

2.1.A Using the 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 threaded through attached eyebolts. Be sure the manipulator is fixed with jigs before transporting and lift it in the posture as shown in the figure “Transporting position”.

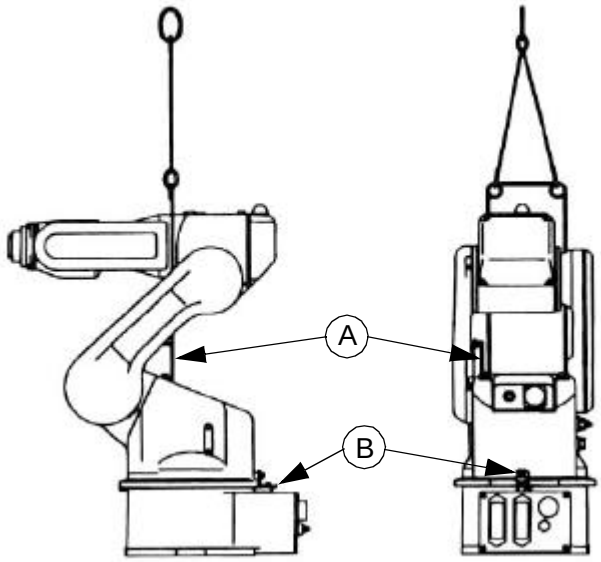


Fig.3 Transporting position

2.1.B Using the forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts and jigs as shown in the figure “Using the 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 over-turning or slippage.

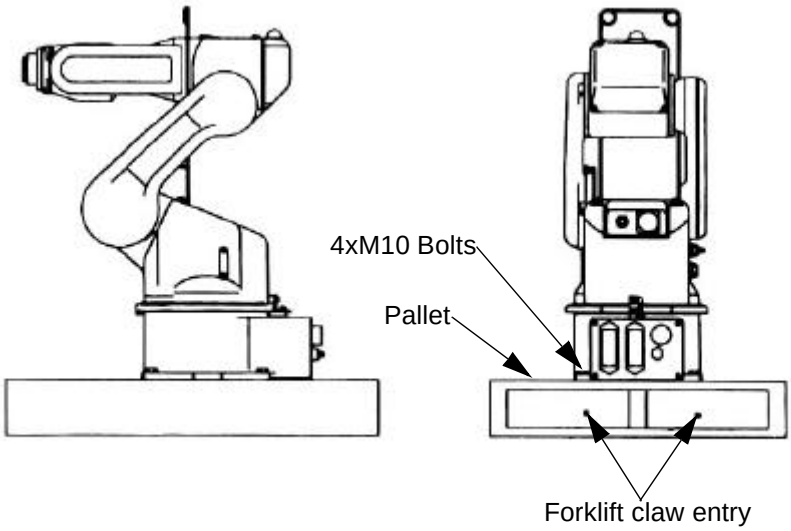


Fig.4 Using the forklift

Note!
Check that the eyebolts are securely fastened.

The weight of the maniputator is approximately 35kg including the shipping bolts and jigs. Use a wire rope strong enough to withstand the weight.

Attached eyebolts are designed to support the manipulator weight. Do not use them for anything other than transporting the manipulator.

Mount the shipping bolts and jigs for transporting the manipulator.

Avoid exerting force on the arm or motor unit when transporting, use caution when using transporting equipment other than a crane or forklift, as injury may occur.

2.2 Shipping bolts and jigs

The manipulator is provided with shipping bolts and jigs at points A and B (see the figure “Transporting position”).

✔ The jigs are painted yellow.

✔ The number of hexagon socket head cap screws are: A: M6 X 3, B: M5 X 2

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

3. Installation

Note!
Install the safety guards according to CE-marking before taking into service.
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 in the ceiling or on the wall, the base section must have sufficient strength and rigidity to support the weight of the manipulator. Also, it is necessary to consider counter-measures to prevent the manipulator from falling.
Failure to observe these warnings may result in injury or damage.

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 jigs have been removed.
Failure to observe this caution may result in damage to the driving parts.

3.1 Safety guard installation

To insure safety, be sure to install safety guards according to the EC-directive related to machinery. They prevent unforeseen accidents with personnel and damage to equipment.

Responsibility for safeguarding

The user of a manipulator or robot system shall ensure that safeguards are provided. 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. Example of safetyguardings are barriers, interlock barriers, perimeter guarding, awareness barriers and awareness signals.

3.2 Mounting procedures for manipulator baseplate

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 the table “Maximum repulsion force of the manipulator”.

During installation, if out of the plane is not right, 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 baseplate in either of the following ways: see following chapter.

Maximum repulsion forces of the manipulator

Horizontal rotating maximum torque (S-axis moving direction)	500 Nm
Vertical rotating maximum torque (LU-axis moving direction)	700 Nm

3.2.A When the manipulator and mounting fixture are installed on a common flat steel plate

The common base should be rugged and durable to prevent shifting of the manipulator or the mounting fixture. The thickness of the common base is 30 mm or more and an M10 size or larger anchor bolt is recommended. Affix the manipulator by fastening the plate with the M10 (mm) anchor bolts. The plate is tapped for M10 (35 mm length) bolts. Tighten the bolts and anchor bolts securely so that they will not work loose during operation. See the figure " Mounting the manipulator baseplate" for the method.

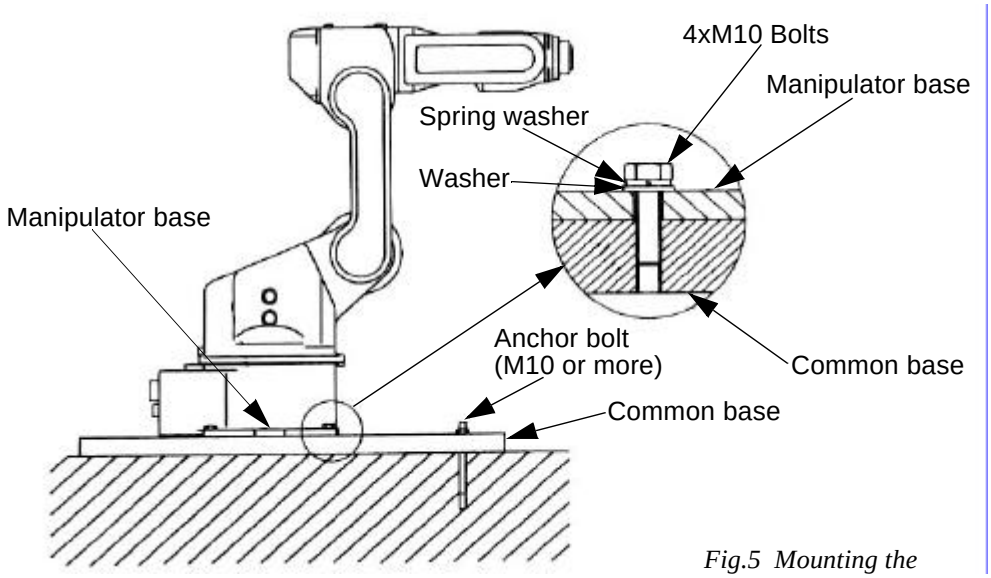


Fig.5 Mounting the manipulator baseplate

3.2.B When the manipulator is mounted 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 shown in table 1. As a rough standard, when there is a concrete thickness (floor) is 150 mm or more, the base of the manipulator can be fixed directly to the floor with M10 anchor bolts. Before mounting the manipulator, however, check that the floor is level and that all cracks, etc. are repaired. Any thickness less than 150 mm is insufficient for mounting, even if the floor is concrete.

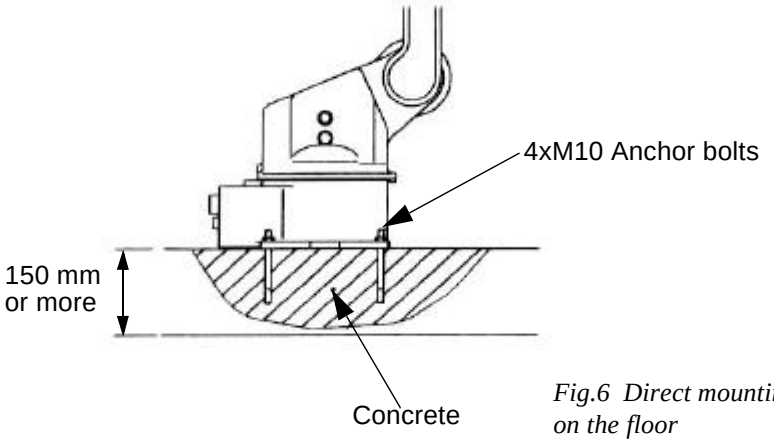


Fig.6 Direct mounting on the floor

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 three points listed below are different from the floor-mounted types.

✔ S-axis working range.
✔ Affixing the manipulator base.
✔ Precautions to prevent the manipulator from falling.

3.3.A S-axis working range

When performing a wall installation, the S-axis movable range must be ±30°.
S-axis motor becomes with the brake.

3.3.B Affixing the manipulator base

When performing a wall or ceiling installation, be sure to use four M10 hexagon socket head cap bolts. Use a torque of 48 Nm when screwing in the bolts.

3.3.C Precautions to prevent the manipulator from falling

When performing wall or ceiling installations, for safety purposes, take measures to keep the manipulator from falling. Refer to the figure " When using ceiling- and wall-mounted types" for details.

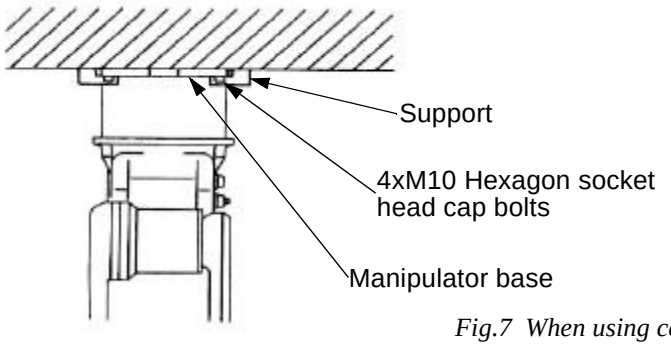


Fig.7 When using ceiling and wall-mounted types

Note!
When using wall-mounted or ceiling mounted types, contact MOTOMAN-service.

3.4 Location

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

- ✔ 0° to +45°C (Ambient temperature)
- ✔ 20 to 80%RH (no moisture)
- ✔ Free from dust, soot or water.
- ✔ Free from corrosive gases, liquid or explosive gases.
- ✔ Free from excessive vibration (less than 0.5G).
- ✔ Free from large electrical noise (plasma).
- ✔ Out of the plane for installation is 0.5 mm or less.

4. Wiring

Note!
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.

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 local regulations for grounding line size.

Note!
Do not use this line in common with other ground lines or grounding electrodes for other electric power, motor power, welding devices, etc.

Where metal ducts, metallic conduits or distributing racks are used for cable laying, ground in accordance with Electric Equipment Technical Standards.

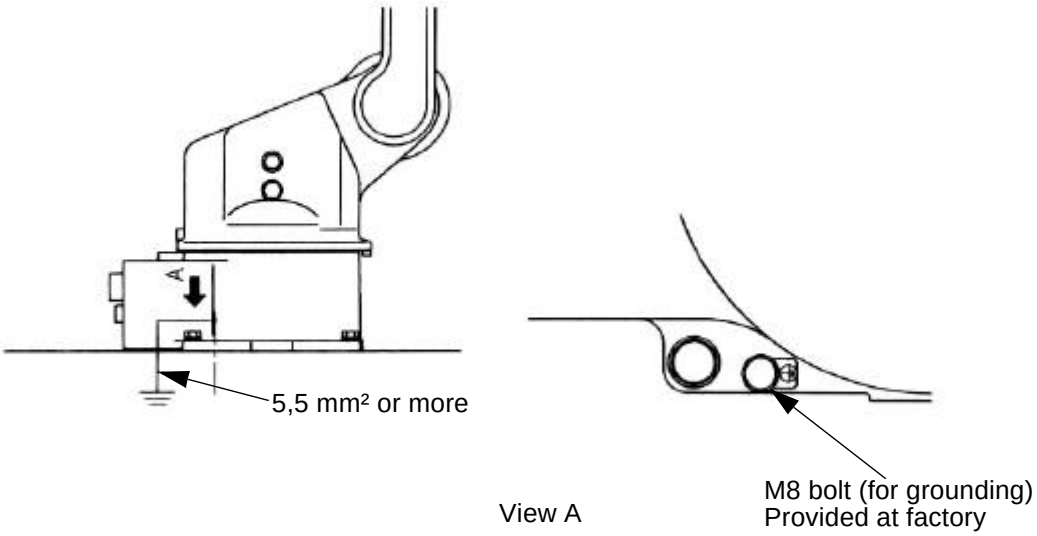


Fig.8 Grounding method

4.2 Cable connection

There are two cables for the power supply; a signal cable for detection (1BC) and a power cable (2BC). Connect these cables to the manipulator base connectors and the XRC. Refer to the figures “Power cable connection to the manipulator” and “Power cable connection to the XRC”.

4.2.A Connection to the manipulator

Before connecting two cables to the manipulator, verify the numbers: 1BC and 2BC on both power supply cables and the manipulator base connectors. When connecting, adjust the cable connector positions to the main key positions of the manipulator and insert cables in the order of 2BC, 1BC and then set the lever until hearing a “click”.

Tighten the connectors with the M3 hexagon socket head cap bolt (Accessory) at the end.

4.2.B Connection to the XRC

Connect each cable to the connector. Be sure to verify the numbers on both the cable and connectors before connecting.

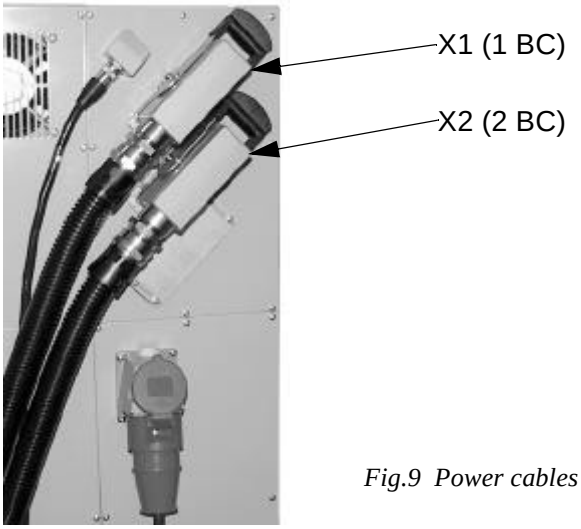


Fig.9 Power cables

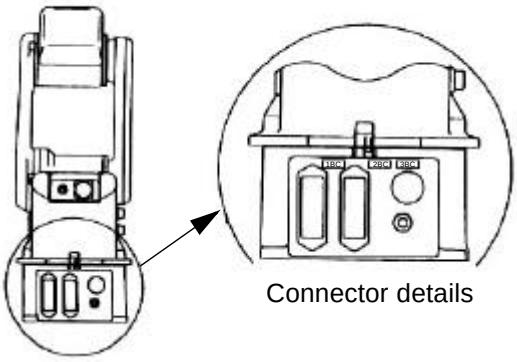


Fig.10 Power cable connection to the manipulator

5. Basic specifications

5.1 Basic specifications

Basic specifications[1]

		SV3X	SV3XL
Operation mode		Vertically articulated	
Degree of freedom		6	
Payload		3 kg	
Repetitive positioning accuracy[2]		±0.03 mm	
Motion range	S-axis (turning)	±170°	
	L-axis (lower arm)	+150°, -45°	
	U-axis (upper arm)	+190°, -70°	
	R-axis (wrist roll)	±180°	
	B-axis (wrist pitch/yaw)	±135°	
	T-axis (wrist twist)	±350°	
Maximum speed	S-axis	3.67 rad/s, 210°/s	2.62 rad/s, 150°/s
	L-axis	2.79 rad/s, 170°/s	2.09 rad/s, 120°/s
	U-axis	3.93 rad/s, 225°/s	3.40 rad/s, 195°/s
	R-axis	5.23 rad/s, 300°/s	5.23 rad/s, 300°/s
	B-axis	5.23 rad/s, 300°/s	5.23 rad/s, 300°/s
	T-axis	7.33 rad/s, 420°/s	7.33 rad/s, 420°/s
Allowable moment[3]	R-axis	5.39 Nm (0.55 kgfm)	
	B-axis	5.39 Nm (0.55 kgfm)	
	T-axis	2.94 Nm (0.3 kgfm)	
Allowable inertia ($GD^2/4$)	R-axis	0.1 kgm^2	
	B-axis	0.1 kgm^2	
	T-axis	0.03 kgm^2	
Mass		30 kg	35 kg
Ambient conditions	Temperature	0° to 45C°	
	Humidity	20 to 80% RH (non-condensing)	
	Vibration	Less than 0.5G	
	Others	- Free from corrosive gasses, liquids or explosive gasses. - Clean and dry. - Free from excessive electrical noise (plasma).	
Power capacity		1kVA	

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

2. Conformed to ISO9283

3. Refer to chapter "Allowable wrist load" for details on the permissible moment of inertia.

5.2 Part names and working axes

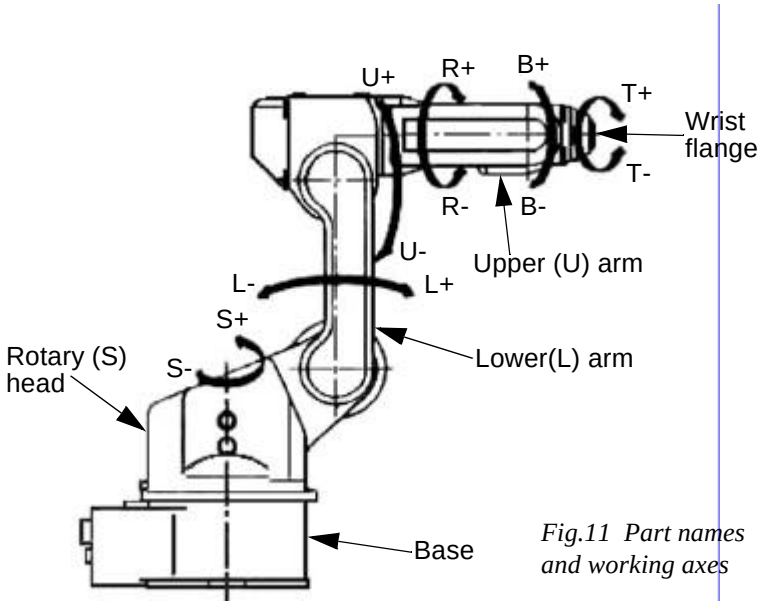


Fig.11 Part names and working axes

5.3 Baseplate dimensions

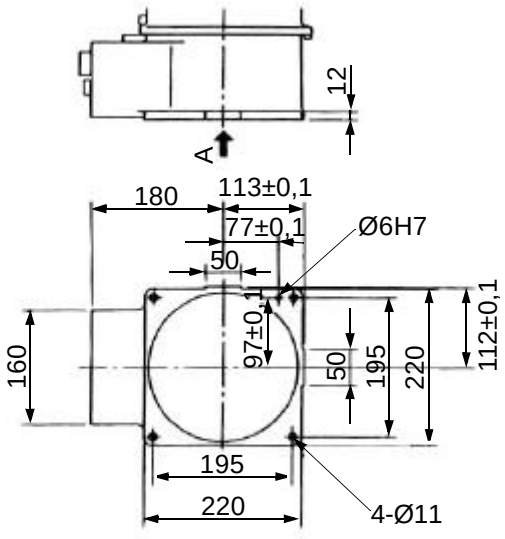


Fig.12 Baseplate dimensions (mm)

5.4 Dimensions and working range

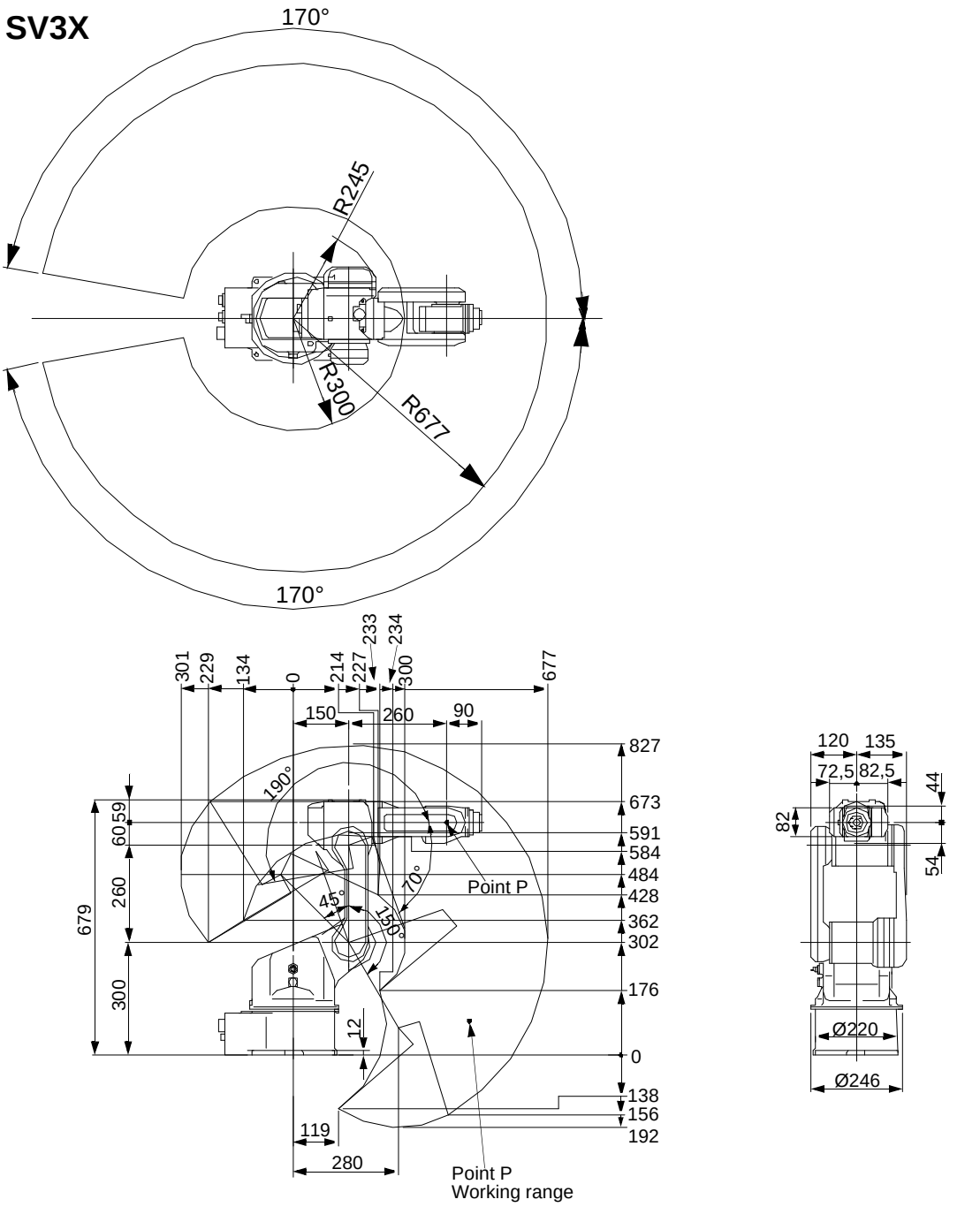


Fig.13 Dimesions and working range

SV3XL

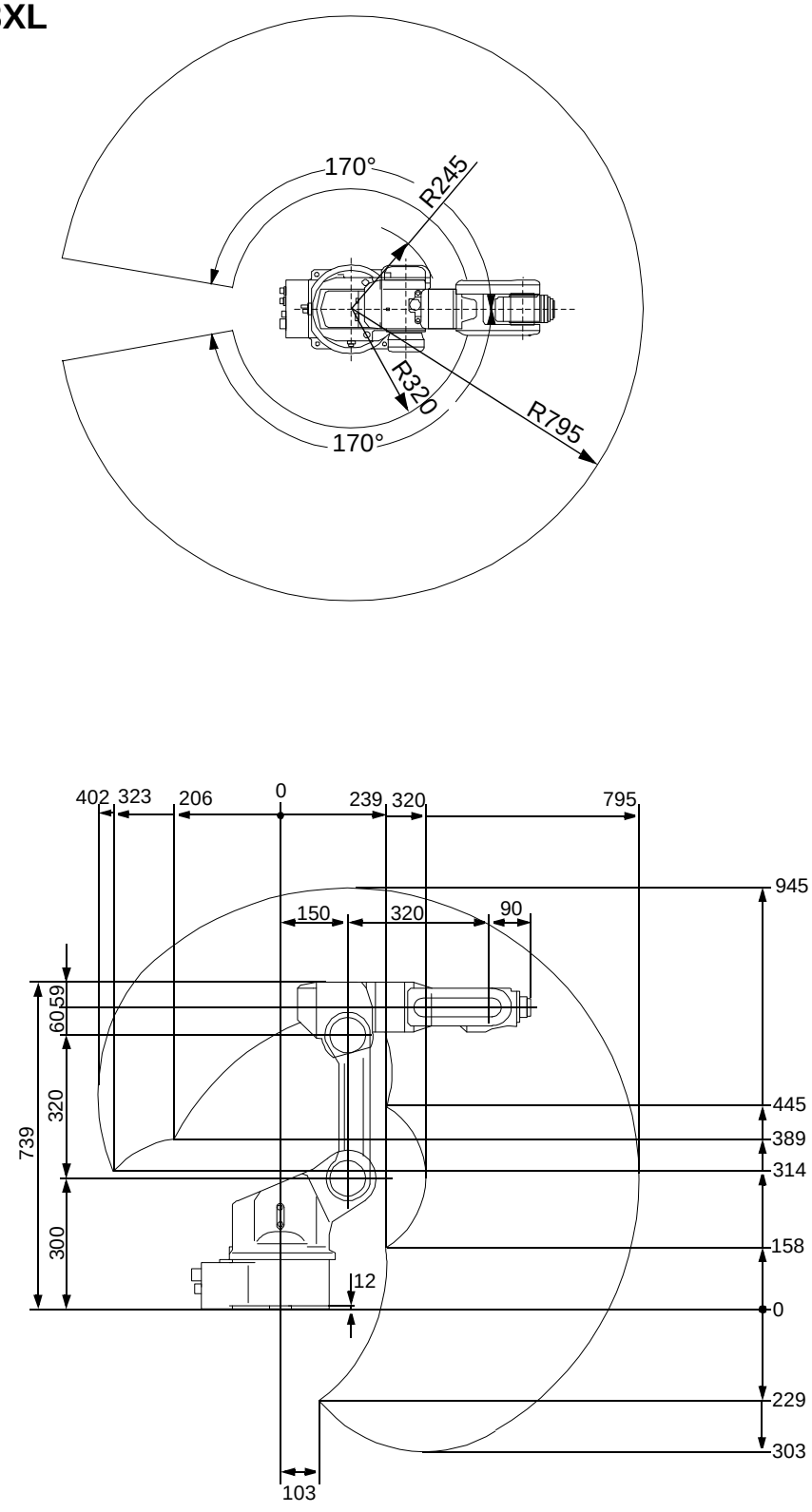


Fig.14 Dimesions and working range

5.5 B-axis working range

The working range of the B-axis maintaining a constant angle to the center of the U-arm is shown in the figure “B-axis working range”.

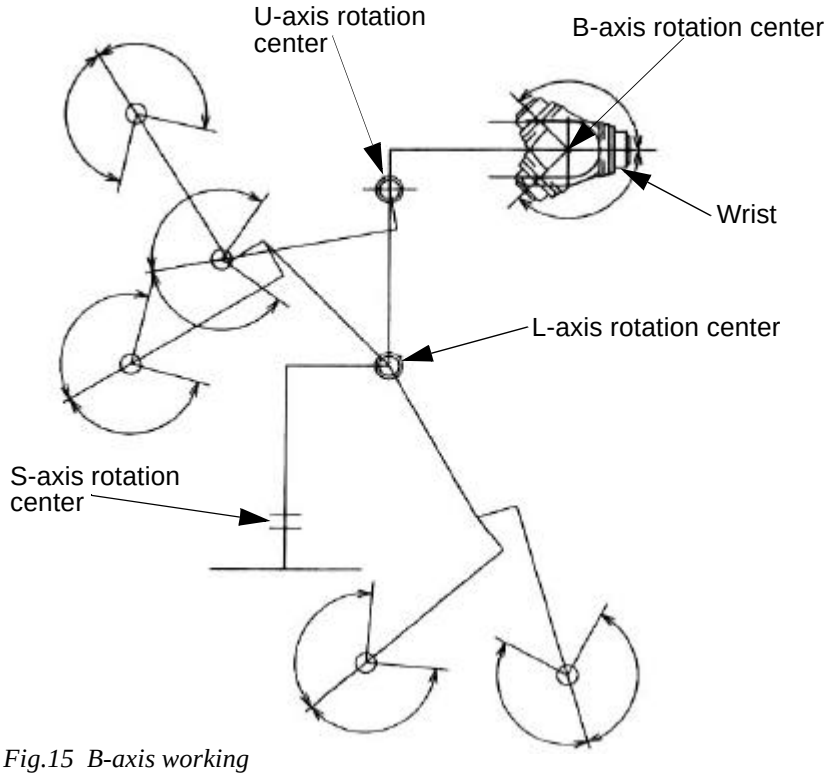


Fig.15 B-axis working range

Note!
The list might come in contact with the robot body by the pose of the basic axis (S,L,U).

5.6 Alterable working range

The working range of the S-axis can be altered according to the operating conditions as shown in the table “S-axis working range”. If alteration is necessary, contact MOTOMAN-service in advance.

S-axis working range

Item	Specifications
S-axis working range	±170°(standard) ±150° ±120° ±90° ±60° ±30°

6. Allowable load for wrist axis and wrist flange

6.1 Allowable wrist load

The allowable wrist load is 3 kg. 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 the table “Moment nad total inertia”. Contact MOTOMAN-service for further information or assistance.

Moment and total inertia

Axis	Moment Nm (kgfm)[1]	$GD^2/4$ Total inertia kgm^2
R-axis	5.39 (0.55)	0.1
B-axis	5.39 (0.55)	0.1
T-axis	2.94 (0.3)	0.03

1. ( ): Gravitational unit.

When the volume load is small, refer to the moment arm rating shown in the figure “Moment arm rating”.

The allowable total inertia is calculated when the moment is at the maximum. Contact MOTOMAN-service 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 MOTOMAN-service.

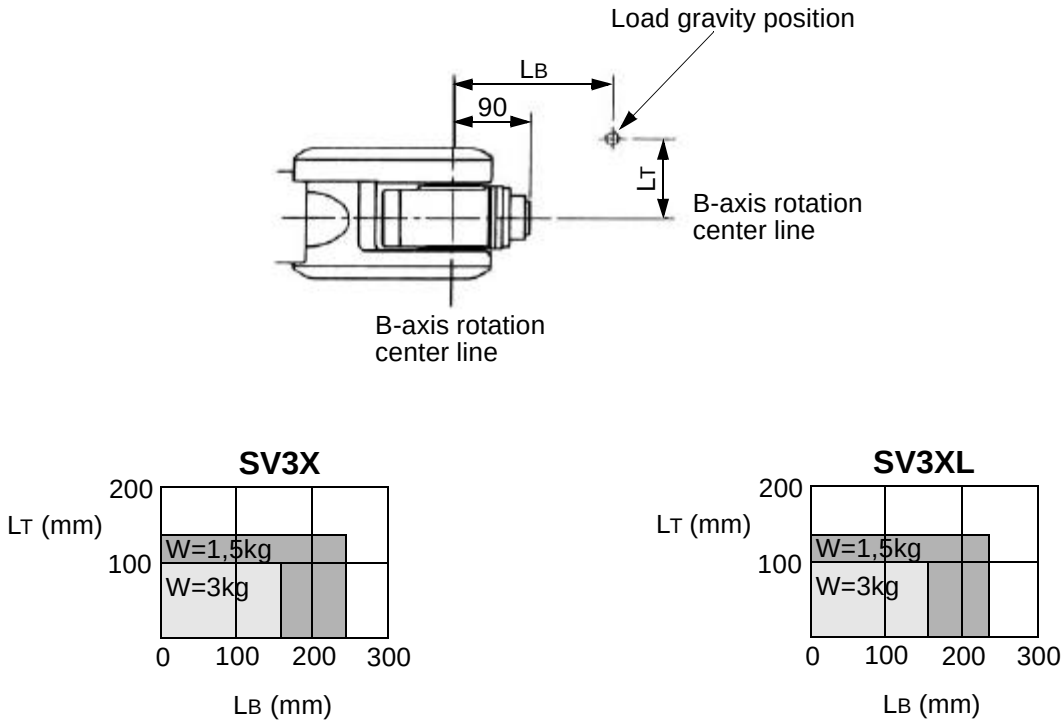


Fig.16 Moment arm rating

6.2 Wrist flange

The wrist flange dimensions are shown in the figure “Wrist flange”. In order to see the tram marks, it is recommended that the attachment be mounted inside the fitting. Fitting depth of inside and outside fittings must be 6 mm or less.

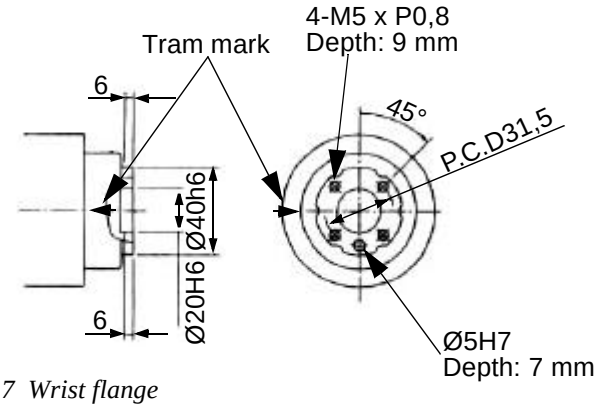


Fig.17 Wrist flange

Note!
Wash off anti-corrosive paint (solid color) on the wrist flange surface with thinner or light oil before mounting the tools.

7. System application

7.1 Mounting equipment

When peripheral equipment is attached to the U-axis, the following conditions should be observed.

7.1.A Allowable load

The allowable load on the U-axis is a maximum of 4 kg, including the wrist load.
For instance, when the mass installed in the wrist point is 3 kg, the mass which can be installed on the upper arm becomes 1 kg.

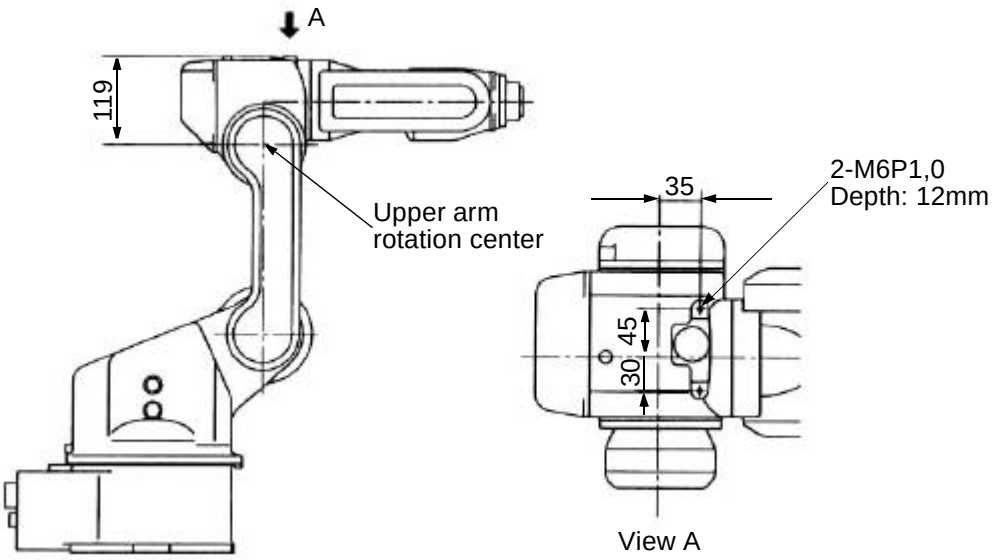


Fig.18 Installing peripheral equipment

7.2 Incorporated wire and airduct

Wires and an air line are incorporated into the manipulator for user application. There are 12 wires and an air duct rating. The allowable current for wires must be 2.5 or below for each wire. (The total current value for pins 1 to 12 must be 40A or below). The maximum pressure for the air duct is 490 kPa (5 kgf/cm^2) and its inside diameter is Ø5mm.

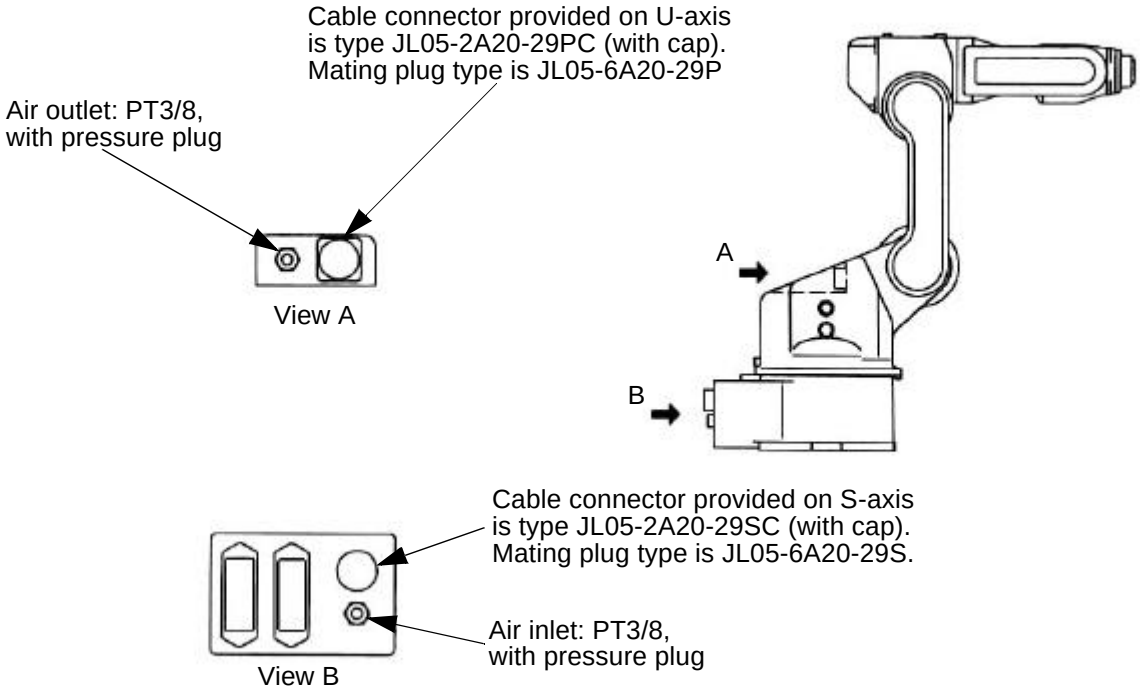


Fig.19 Incorporated wire and airduct

Internal wires: 0,2mm², 12 wires

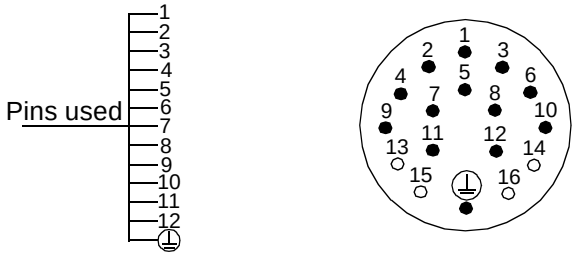


Fig.20 Detailed drawing of connector pin numbers

The same pin number (1-12) of two connectors is connected in the lead line of single 0.2 mm^2.

8. Motoman construction

8.1 Internal connections

High reliability connectors which can be easily removed are used with each connector part. For the number and location of connectors, see the figure “Location and numbers of connectors”.

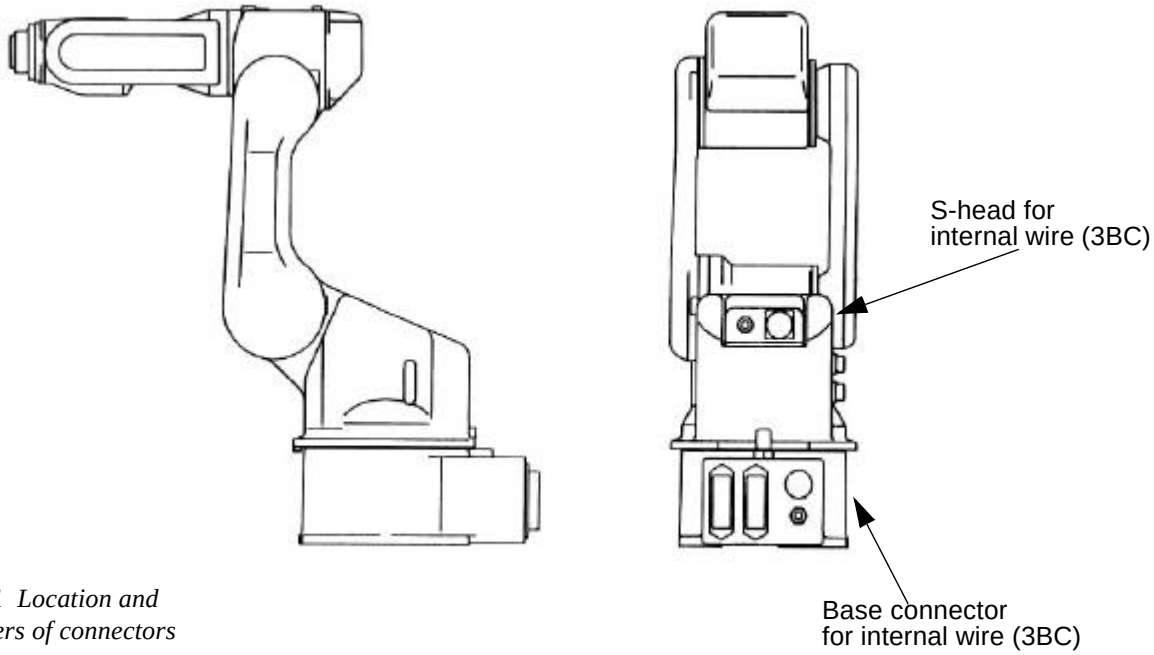


Fig.21 Location and numbers of connectors

List of connector types

Name	Type of connector
Base connector for internal wire	JL05-2A20-29PC (JL05-6A20-29S: Optional)
S-head for internal wire	JL05-2A20-29SC (JL05-6A20-29P: Optional)

9. Maintenance and inspection

Note!
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.

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 Motoman-service.

The battery unit 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 the table “Inspection items”.

In the table “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 MOTOMAN-service.

Inspection items

Items[1]		Schedule						Method	Operation	Inspection charge		
		Daily	1000H Cycle	6000H Cycle	12000H Cycle	24000H	36000H			Specified person	Licensee	Service company
1	Tram mark	✔						Visual	Check tram mark accordance and damage at the home position.	✔	✔	✔
2	Working area and manipulator	✔						Visual	Clean the work area if dust or spatter is present. Check for damage and outside cracks.	✔	✔	✔
3	Baseplate mounting bolts		✔					Spanner Wrench	Tighten loose bolts. Replace if necessary.	✔	✔	✔
4	Cover mounting screws		✔					Screwdriver, Wrench	Tighten loose bolts. Replace if necessary.	✔	✔	✔
5	Base connectors		✔					Manual	Check for loose connectors.	✔	✔	✔
6	RBT-axes timing belt				✔			Manual	Check for belt tension and wear.		✔	✔
7	Wire harness in manipulator (S-axis 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[2]		✔	✔
						✔			Replace[3]			
8	Wire harness in manipulator (L-arm leads))				✔				Check for conduction between terminals and wear of protective spring.[2]			✔
						✔			Replace[3]			
9	Wire harness In manipulator (U-arm leads)				✔			Visual Multimeter	Check for conduction between terminals and wear of protective spring.[2]		✔	✔
						✔			Replace[3]			✔
10	Battery unit in manipulator						✔		Replace the battery unit when the battery alarm occurs or the manipulator drove for 36000H.		✔	✔

Inspection items

Items[1]		Schedule						Method	Operation	Inspection charge		
		Daily	1000H Cycle	6000H Cycle	12000H Cycle	24000H	36000H			Specified person	Licensee	Service company
11	S-axis speed reducer			✔				Grease gun	Check for malfunction. (Replace if necessary.) Supply grease[4] (6000H cycle).		✔	✔
12	L-axis speed reducers			✔				Grease gun	Check for malfunction. (Replace if necessary.) Supply grease[4] (6000H cycle).		✔	✔
13	U-axis speed reducers			✔				Grease gun	Check for malfunction. (Replace if necessary.) Supply grease[4] (6000H cycle).		✔	✔
14	RB-axes speed reducers			✔				Grease gun	Check for malfunction. (Replace if necessary.) Supply grease[4] (6000H cycle).		✔	✔
15	T-axis speed reducers			✔				Grease gun	Check for malfunction. (Replace if necessary.) Supply grease[4] (6000H cycle).		✔	✔
16	Overhaul					✔						✔

1. Inspection no. correspond to the numbers in the figure “Inspection parts and inspections numbers”.

2. 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 detecter side for each axis from the motor. Otherwise, the home position may be lost.

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

4. For the grease, refer to the table “Inspection parts and grease used”.

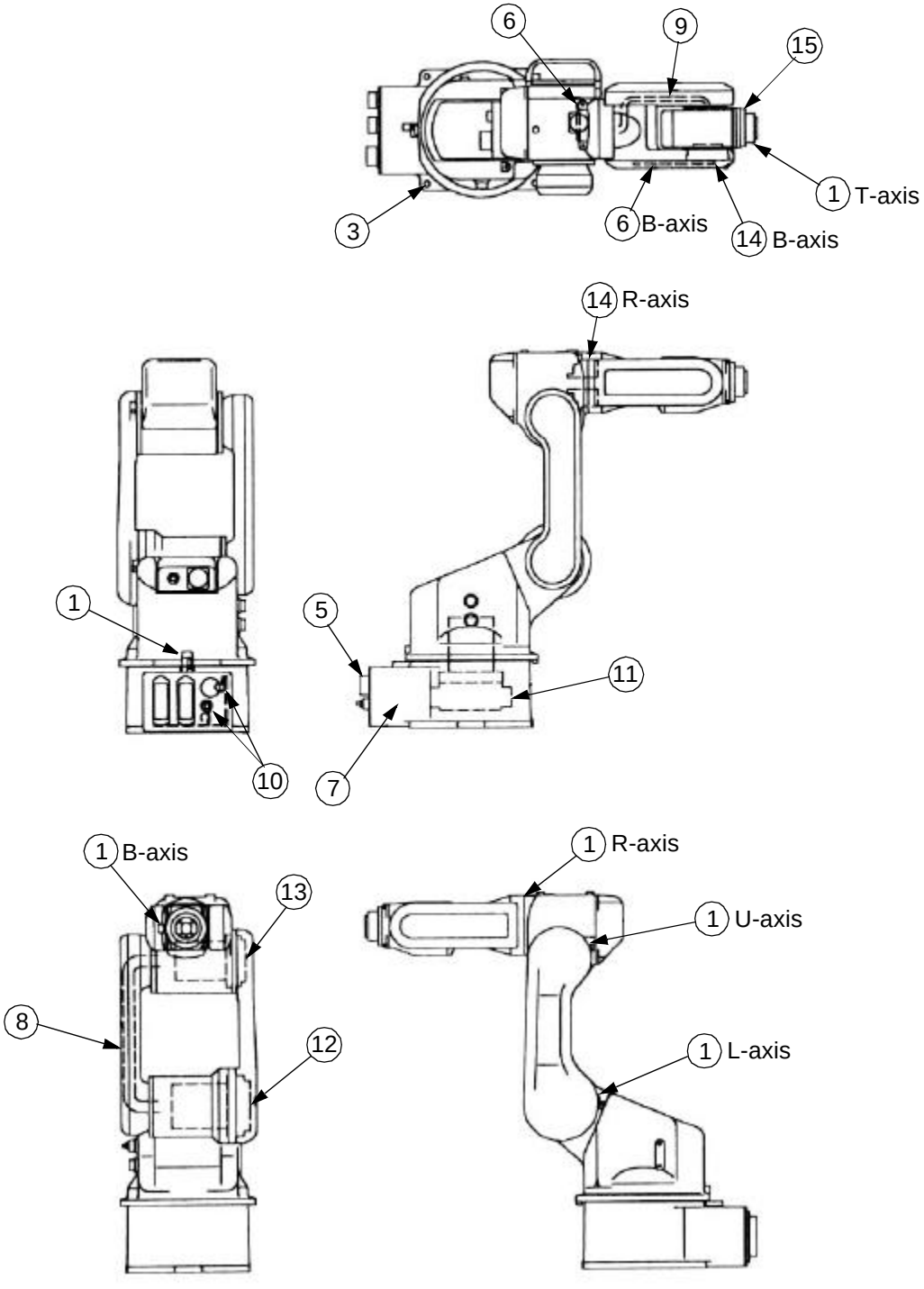


Fig.22 Inspection parts and inspection numbers

Inspection parts and grease used

No.	Grease used	Inspected parts
11, 12, 13, 14, 15	Harmonic Grease 4B No. 2	S-, L-, U-,R-, B- and T-axes speed reducers

The numbers in the above table correspond to the numbers in the table “Inspection items”.

9.2 Notes on maintenance procedures

9.2.A Battery unit replacement

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

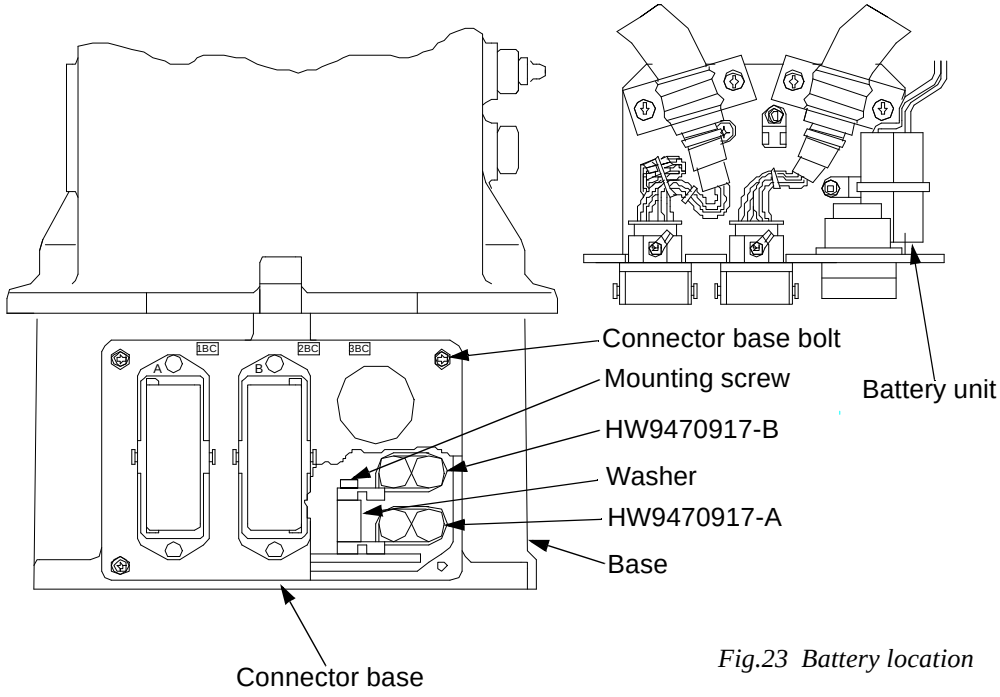


Fig.23 Battery location

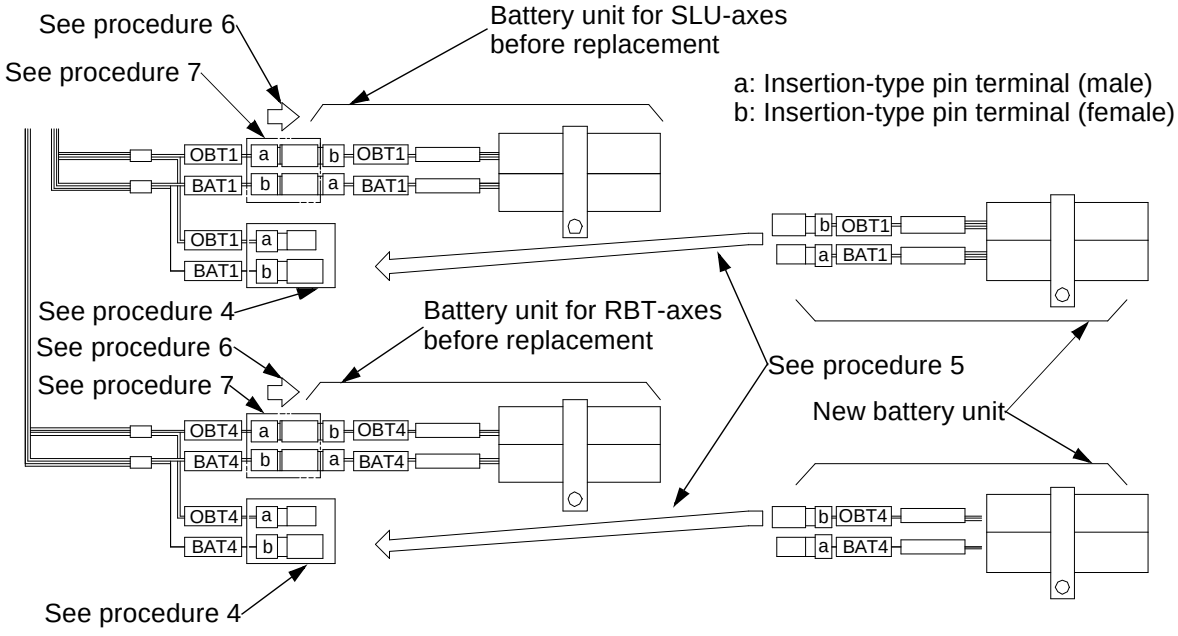


Fig.24 Battery connection

a) Turn the XRC main power supply off.

b) Remove the connector base and grease tube from the union.

c) Remove the battery unit mounting screw on the connector base.

d) Remove the plastic tape (insulation tape) protecting the connection part of the battery unit in the manipulator.

e) Connect the new battery.

f) Remove the old battery and washer.

g) Protect the connection part of the battery unit in the manipulator with plastic tape (insulation tape).

h) Mount the battery unit and washer with the screws, connect the grease tube to the union and then mount the connector base.

Note!
Remove the old battery unit after connecting the new one so that the encoder absolute data does not disappear.

9.2.B Grease replenishment for S-axis speed reducer

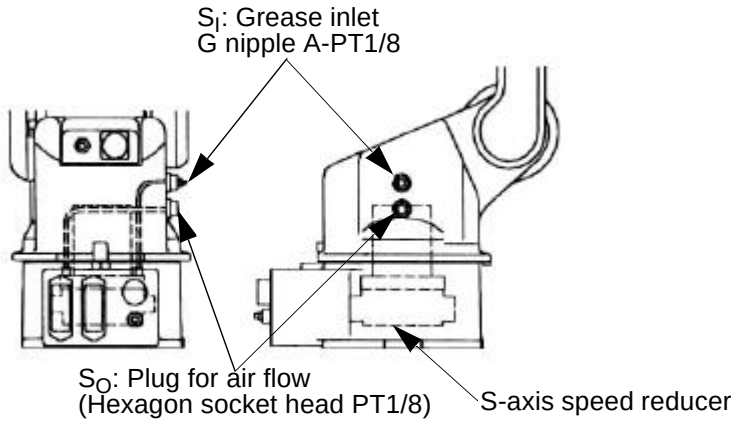


Fig.25 S-axis speed reducer diagram

■ ***Grease replenishment (for S-axis)***

Replenish the grease according to the following procedure:

a) Be sure to remove the S_O plug for air flow.

b) Inject the grease into the S_I grease inlet using a grease gun.

Grease type: Harmonic grease 4B No.2 Amount of grease: 25cc

c) Reinstall the S_O plug for air flow and cover.

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

If grease is added with the S_O plug in place, the internal pressure is increased and the grease will infiltrate from the oil seal.

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

9.2.C Grease replenishment for L-axis speed reducer

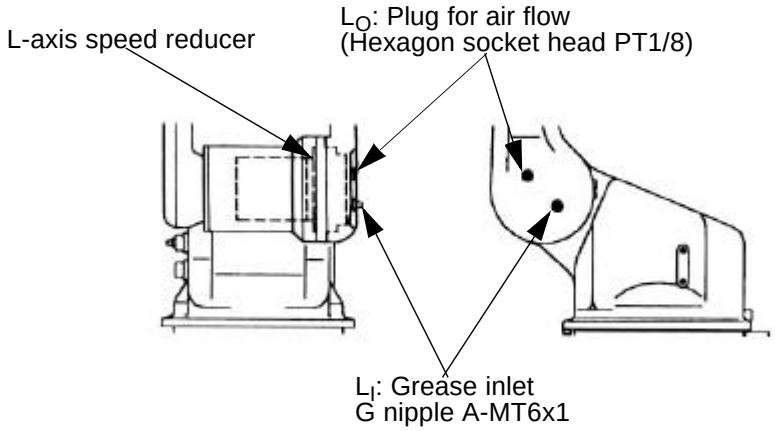


Fig.26 L-axis speed reducer diagram

■ ***Grease replenishment (for L-axis)***

a) Be sure to remove L_O plug for air flow.

b) Inject grease into the L_I grease inlet using a grease gun.

Grease type: Harmonic grease 4B No.2 Amount of grease: 20cc

c) Wipe the L_O exhaust plugs with a cloth and reinstall the plugs.

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

If grease is added with the L_O plug in place, the internal pressure is increased and the grease will infiltrate from the oil seal.

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

9.2.D Grease replenishment for U-axis speed reducer

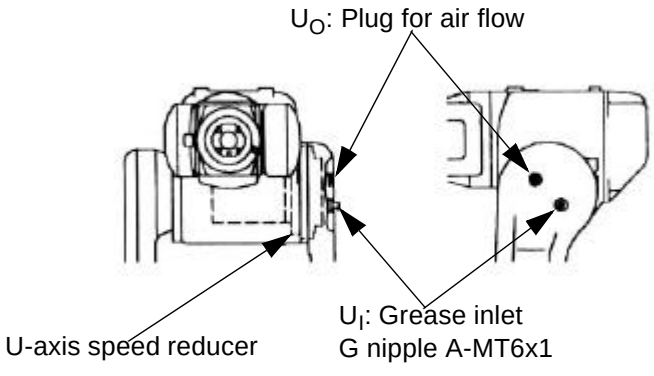


Fig.27 U-axis speed reducer diagram

■ ***Grease replenishment (for U-axis)***

a) Be sure to remove U_O plug for air flow.

b) Inject grease into the U_I grease inlet using a grease gun.

Grease type: Harmonic grease 4B No.2 Amount of grease: 8cc

c) Reinstall the U_O plug for air flow.

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

If grease is added with the U_O plug in place, the internal pressure is increased and the grease will infiltrate from the oil seal.

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

9.2.E Grease replenishment for R-and B-axes speed reducer

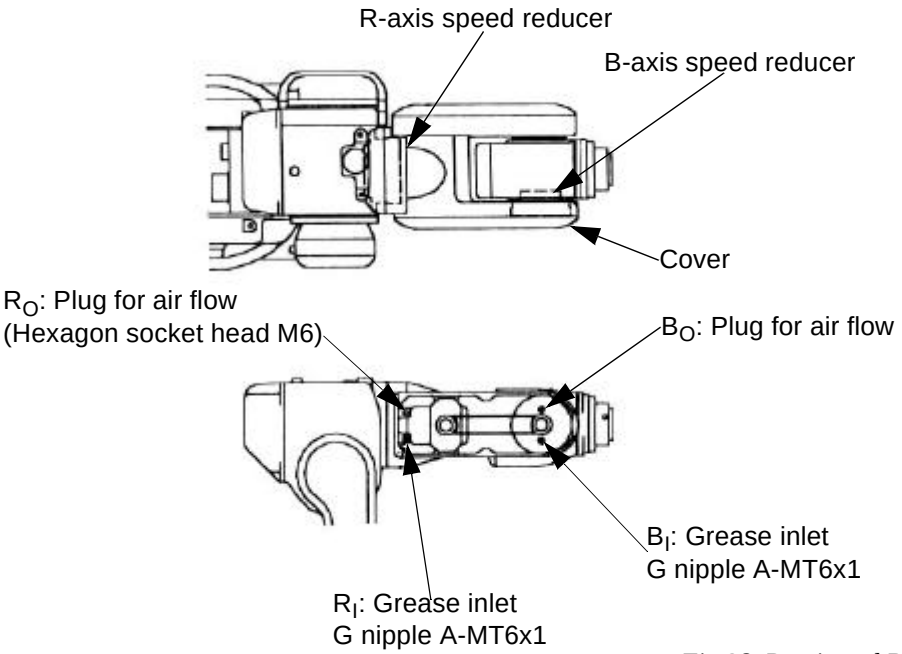


Fig.28 R-axis and B-axis speed reducer diagram

a) Be sure to remove R_O and B_O plugs for air flow, after removing the cover.

b) Inject grease into the R_I and B_I grease inlet using a grease gun.

Grease type: Harmonic grease 4B No.2 Amount of grease: For R-axis (R_I): 4cc For B-axis (B_I): 4cc

c) Reinstall the R_O and B_O plugs for air flow and cover.

Note!
If grease is added with the R_O and B_O plugs in place, the internal pressure is increased and the grease will infiltrate from the oil seal.

The R_O and B_O exhaust port is used for air flow. Do not inject excessive grease into the R_I grease inlet.

9.2.F Grease replenishment for T-axis speed reducers

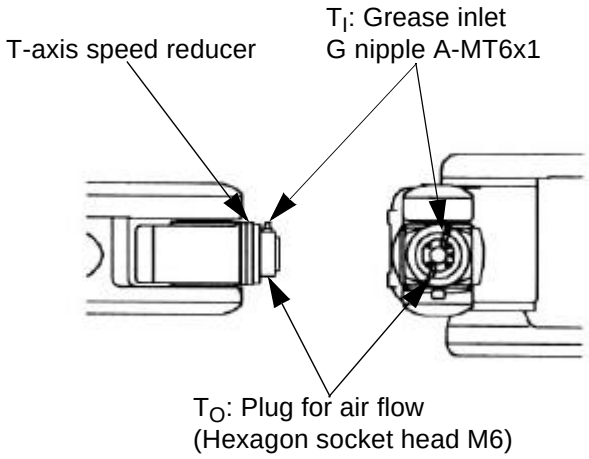


Fig.29 T-axis speed reducers diagram

a) Be sure to remove T_O plug for air flow.

b) Inject grease into the T_I grease inlets using a grease gun.

Grease type: Harmonic grease 4B No.2 Amount of grease: For T-axis (T_I): 4cc

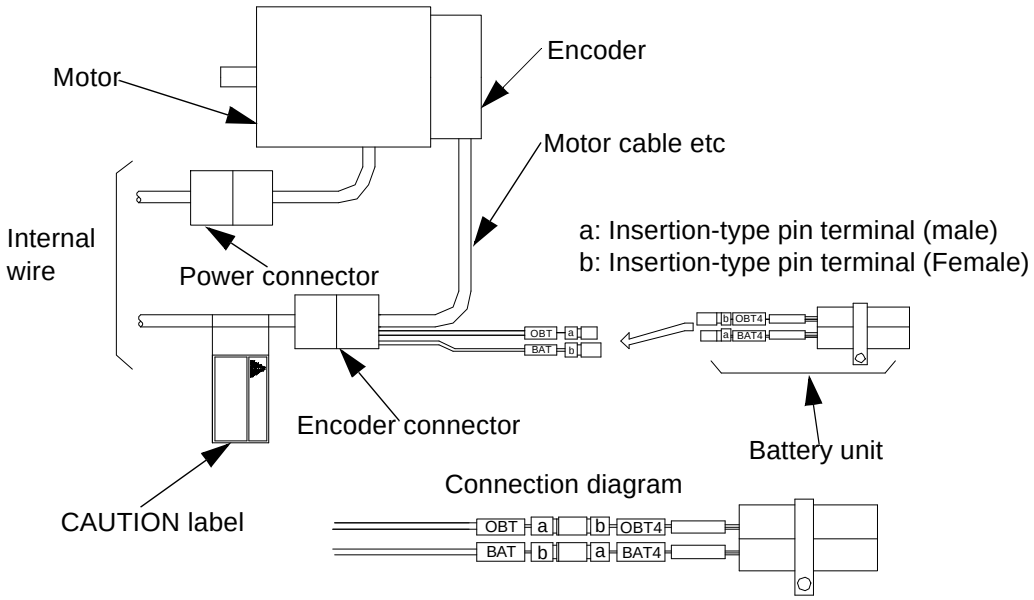
c) Reinstall the T_O plug for air flow.

Note!
If grease is added with the T_O plug in place, the internal pressure is increased and the grease will infiltrate from the oil seal.

The T_O exhaust ports are used for air flow. Do not inject excessive grease into the T_I grease inlets.

9.2.G Notes for maintenance

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



WARNING

Connect battery to encoder to save the data before removing connector.

Fig.30 Encoder connector diagram

10. Recommended spare parts

It is recommended that the following parts and components be kept in stock as spare parts for the Motoman-SV3. The spare parts list for the Motoman-SV3 is shown below. Product performance can not be guaranteed when using spare parts from any company other than Motoman. 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 MOTOMAN-service.

Spare parts for the MOTOMAN-SV3 (YR-SV3X-J00) and (YR-SV3XL-J20)

Rank	Parts No.	Name	Type	Manufacturer	Qty	Qty per Unit	Remarks
A	1	Grease	Harmonic Grease 4BNo.2	Yaskawa Electric Corporation	2.5kg	-	
	2	Battery unit	HW9470917-B	Yaskawa Electric Corporation	1	1	for SLU-axes
	3	Battery unit	HW9470917-A	Yaskawa Electric Corporation	1	1	for RBT-axes
B	4	R-axis timing belt	050S4.5M198	Mitsuboshi Belting Limited	1	1	
	5	B-axis timing belt	050S4.5M315	Mitsuboshi Belting Limited	1	1	
	6	S-axis speed reducer	HW9381283-A	Yaskawa Electric Corporation	1	1	
	7	L-axis speed reducer	HW9381284-A	Yaskawa Electric Corporation	1	1	
	8	U-axis speed reducer	HW9381285-A	Yaskawa Electric Corporation	1	1	
	9	R-axis speed reducer	HW9381225-A	Yaskawa Electric Corporation	1	1	
	10	B-axis speed reducer	HW9381226-A	Yaskawa Electric Corporation	1	1	
	11	T-axis speed reducer	HW9381227-A	Yaskawa Electric Corporation	1	1	
	12	S-axis internal wiring	HW9171589-A	Yaskawa Electric Corporation	1	1	

Spare parts for the MOTOMAN-SV3 (YR-SV3X-J00) and (YR-SV3XL-J20)

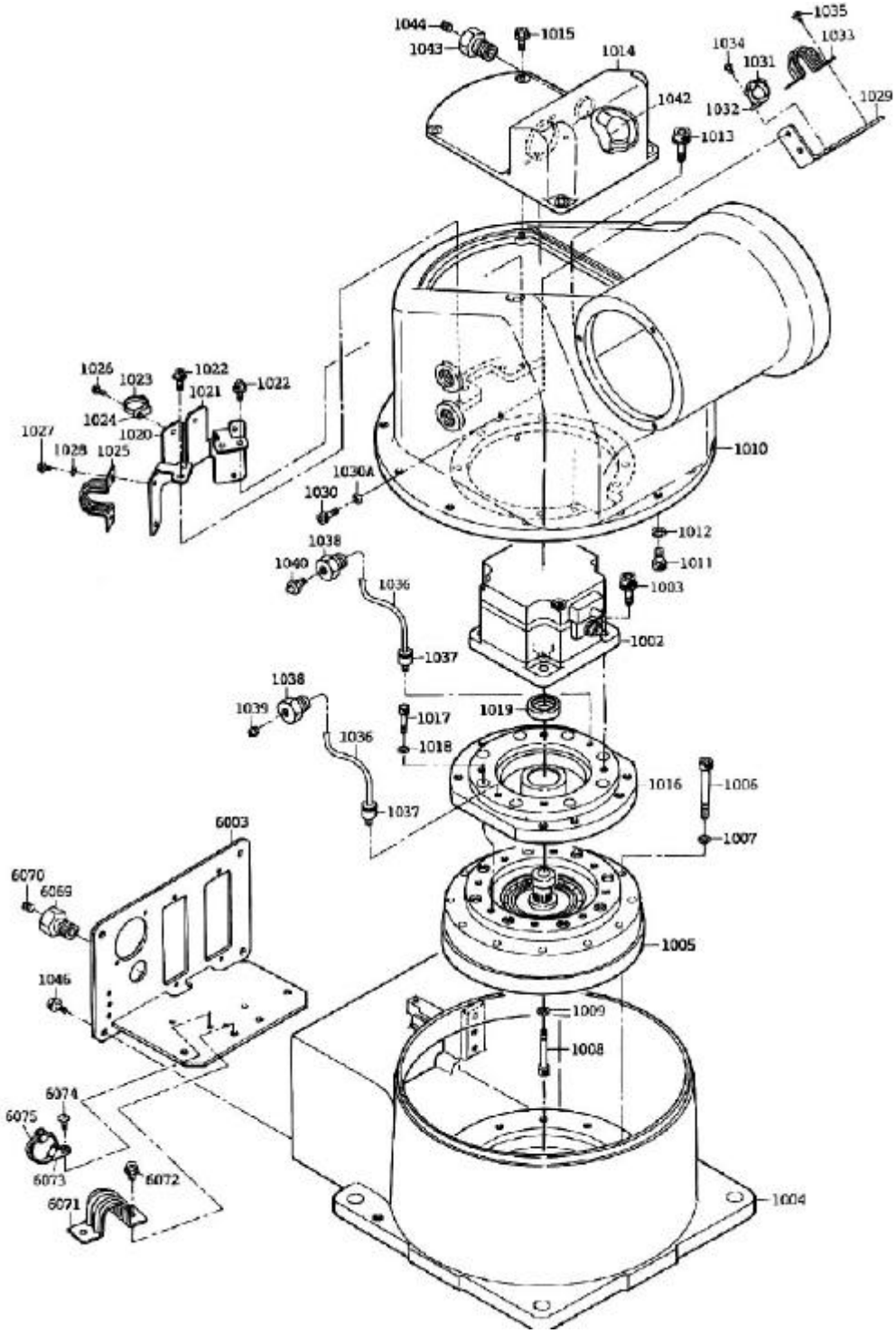
Rank	Parts No.	Name	Type	Manufacturer	Qty	Qty per Unit	Remarks
B	13	In L-arm internal wiring	HW9271096-A	Yaskawa Electric Corporation	1	1	U-,R-,B-,T-axes (for SV3X)
	14	In L-arm internal wiring	HW9271096-B	Yaskawa Electric Corporation	1	1	U-,R-,B-,T-axes (for SV3XL)
	15	In U-arm internal wiring	HW9270889-A	Yaskawa Electric Corporation	1	1	B-,T-axes (for SV3X)
	16	In U-arm internal wiring	HW9270889-B	Yaskawa Electric Corporation	1	1	B-,T-axes (for SV3XL)
C	17	S-axis AC servomotor	HW9381585-A SGMPH-02A1A-YR21	Yaskawa Electric Corporation	1	1	No key, lead terminal treatment completion
	18	L-axis AC servomotor	HW9381586-A SGMPH-02A1A-YR11	Yaskawa Electric Corporation	1	1	With breake, no key, lead terminal treatment completion
	19	U-axis AC servomotor	HW9381587-A SGMPH-01A1A-YR11	Yaskawa Electric Corporation	1	1	With breake, no key, lead terminal treatment completion
	20	R-,B-,T-axes AC servomotor	HW9381588-A SGMAH-A5A1A-YR21	Yaskawa Electric Corporation	1	3	No key, lead terminal treatment completion

Spare parts for the MOTOMAN-SV3 (YR-SV3X-J10) and (YR-SV3XL-J30)

Rank	Parts no.	Name	Type	Manufacturer	Qty	Qty per unit	Remarks
A	1	Grease	Harmonic Grease 4BNo.2	Yaskawa Electric Corporation	2.5kg	-	
	2	Battery unit	HW9470917-B	Yaskawa Electric Corporation	1	1	for SLU-axes
	3	Battery unit	HW9470917-A	Yaskawa Electric Corporation	1	1	for RBT-axes
B	4	R-axis timing belt	050S4.5M198	Mitsuboshi Belting Limited	1	1	
	5	B-axis timing belt	050S4.5M315	Mitsuboshi Belting Limited	1	1	
	6	S-axis speed reducer	HW9381283-A	Yaskawa Electric Corporation	1	1	
	7	L-axis speed reducer	HW9381284-A	Yaskawa Electric Corporation	1	1	
	8	U-axis speed reducer	HW9381285-A	Yaskawa Electric Corporation	1	1	
	9	R-axis speed reducer	HW9381225-A	Yaskawa Electric Corporation	1	1	
	10	B-axis speed reducer	HW9381226-A	Yaskawa Electric Corporation	1	1	
	11	T-axis speed reducer	HW9381227-A	Yaskawa Electric Corporation	1	1	
	12	S-axis internal wiring	HW9171589-A	Yaskawa Electric Corporation	1	1	
	13	In L-arm internal wiring	HW9271096-A	Yaskawa Electric Corporation	1	1	U-,R-,B-,T-axes (for SV3X)
	14	In L-arm internal wiring	HW9271096-B	Yaskawa Electric Corporation	1	1	U-,R-,B-,T-axes (for SV3XL)
	15	In U-arm internal wiring	HW9270889-A	Yaskawa Electric Corporation	1	1	B-,T-axes (for SV3X)
	16	In U-arm internal wiring	HW9270889-B	Yaskawa Electric Corporation	1	1	B-,T-axes (for SV3XL)
C	17	S- and L-axes AC Servomotor	HW9381586-A SGMPH-02A1A-YR11	Yaskawa Electric Corporation	1	2	With breake, no key, lead terminal treatment comple-tion
	18	U-axis AC servomotor	HW9381587-A SGMPH-01A1A-YR11	Yaskawa Electric Corporation	1	1	With breake, no key, lead terminal treatment comple-tion
	19	R-, B-and T-axes AC servomotor	HW9381589-A SGMAH-A5A1A-YR21	Yaskawa Electric Corporation	1	3	With breake, no key, lead terminal treatment comple-tion

11. Parts list

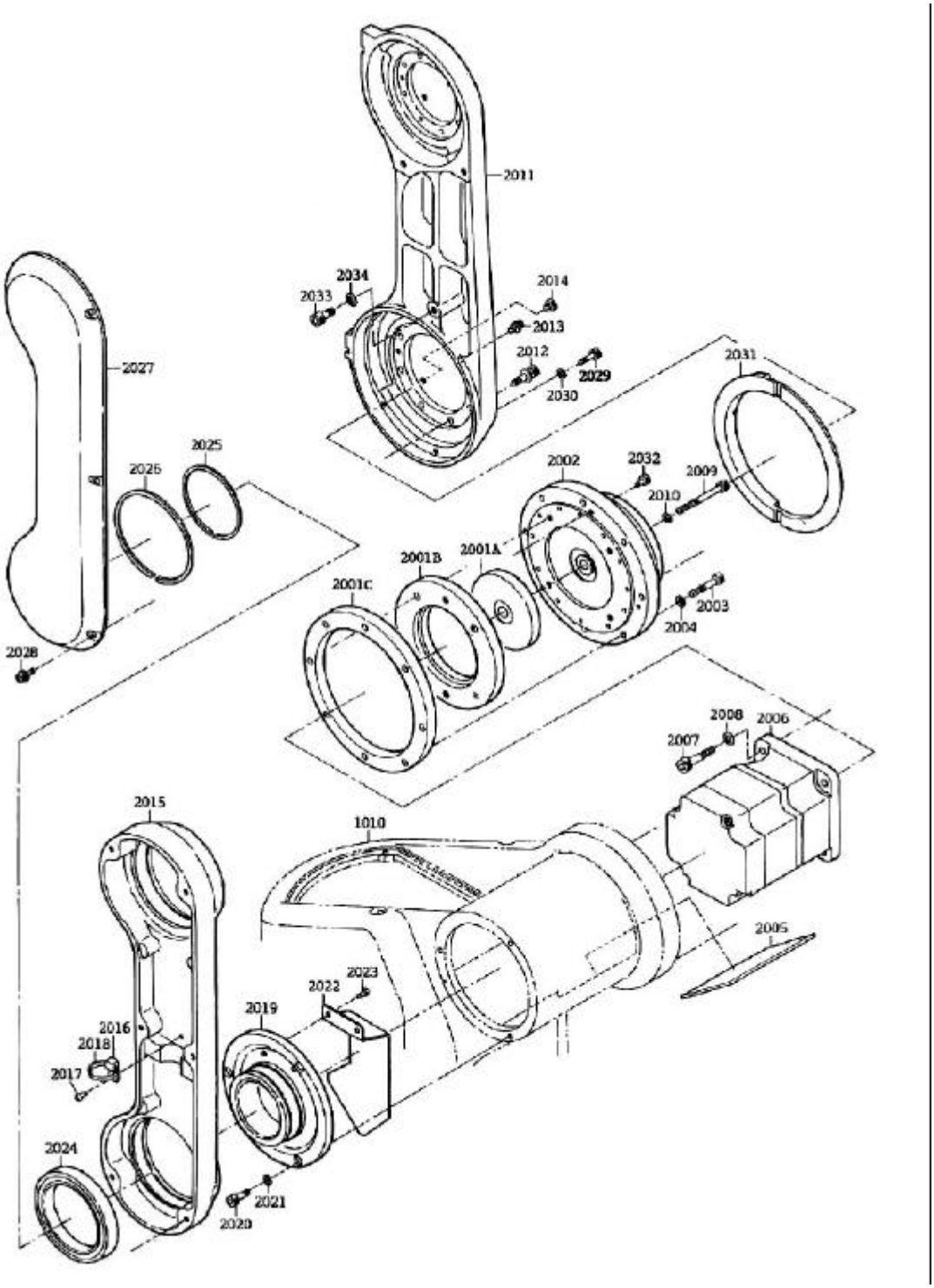
11.1 S-axis driving unit



No.	Name	DWG no.	Pcs
1002	AC servo motor	SGMPH-02A1A-YR21	1
1003	Socket screw	GT-SA M6 × 20	4
1004	Base	HW9100950-1	1
1005	RV reduction gear	HW9381283-A	1
1006	Socket screw	M5 × 45	12
1007	Spring washer	2H-5	12
1008	Socket screw	M4 × 35	1
1009	Spring washer	2H-4	1
1010	S head	HW9100847-1	1
1011	Socket screw	M6 × 10	1
1012	Spring washer	2H-6	1
1013	Socket screw	GT-SA M6 × 20	7
1014	Cover	HW9301806-1	1
1015	APS bolt	M4 × 10	4
1016	M base	HW9301922-1	1
1017	Socket screw	M5 × 16	8
1018	Spring washer	2H-5	8
1019	Oil seal	UE15257	1
1020	Support	HW9404556-1	1
1021	Support	HW9404556-2	1
1022	Socket screw	GT-LA M4 × 16	4
1023	Insulok’tie	T50R	2
1024	Clamp	TA1-8	2
1025	Saddle	CD-15	2
1026	Round head screw	M4 × 8	2
1027	APS bolt	M5 × 8	4
1028	Washer	M5	4
1029	Support	HW9404555-1	1
1030	Socket screw	M4 × 12	2
1030A	Spring washer	2H-4	2
1031	Insulok’tie	T50R	1
1032	Clamp	TA1-S8	1
1033	Saddle	CD-15	1
1034	Round head screw	M4 × 8	1
1035	APS bolt	M5 × 8	2
1036	Tube	TP-6-0.25	2
1037	Union	POC6-M5M	2
1038	Union	PMF6-01	2

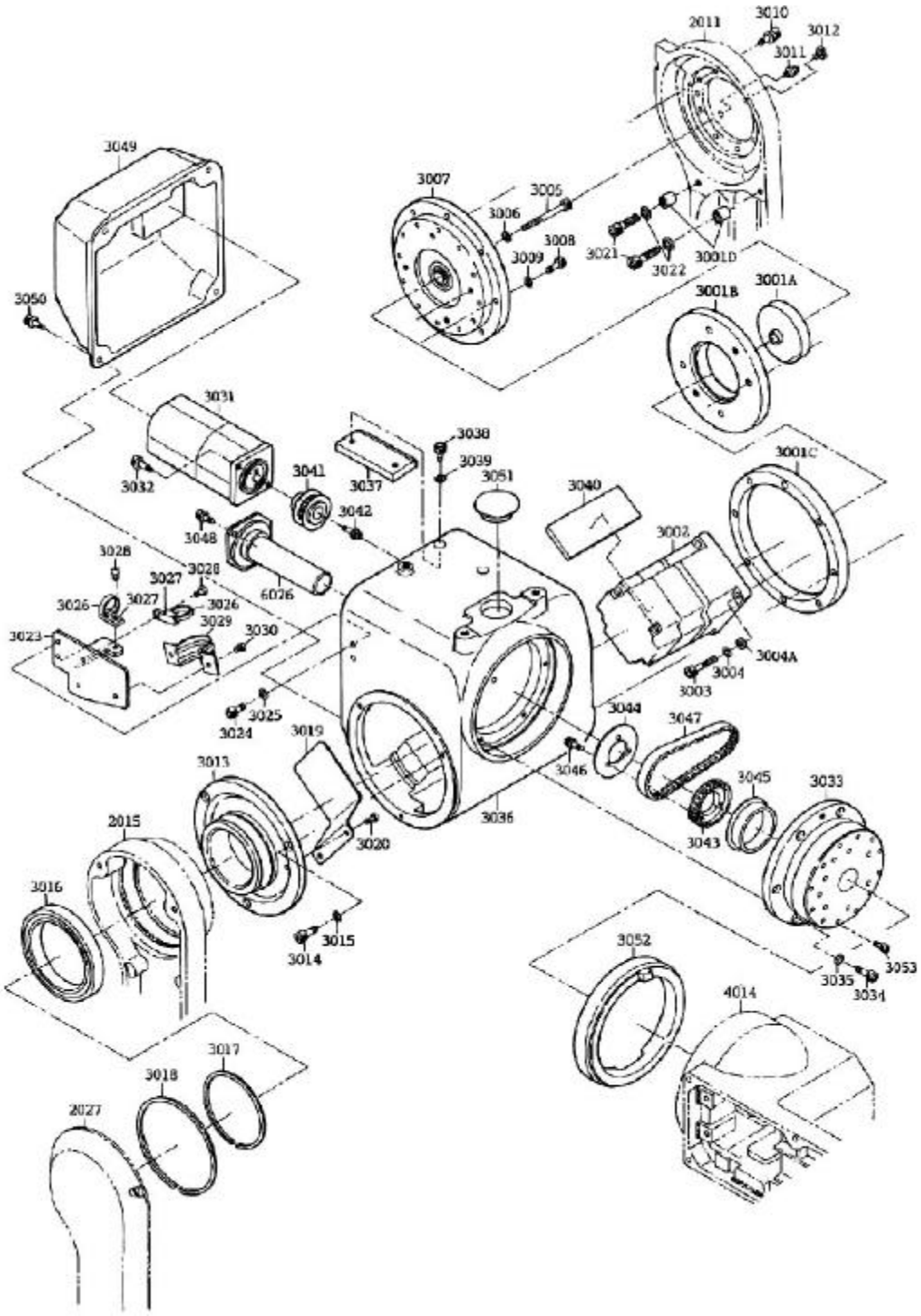
No.	Name	DWG no.	Pcs
1039	Plug	PT1/8	1
1040	G nipple	A-PT1/8	1
1042	Socket elbow	PLJ8	1
1043	Union	KQE08-03	1
1044	Plug	PT3/8	1
1046	APS bolt	M4 × 10	4
6003	C base	HW9302397-A	1
6069	Union	KQE08-03	1
6070	Plug	PT3/8-19	1
6071	Saddle	CD-15	2
6072	APS bolt	M5 × 8	4
6071	Saddle	CD-15	2
6072	APS bolt	M5 × 8	4
6073	Clamp	TA1-S8	2
6074	Round head screw	M4 × 8	2
6075	Insulok'tie	T50R	2

11.2 L-axis driving unit



No.	Name	DWG no.	Pcs
1010	S head	HW9100847-1	1
2001A	Fly wheel	HW9404928-1	1
2001B	Distance piece	HW9404929-1	1
2001C	Distance piece	HW9404930-1	1
2002	Reduction gear	HW9381284-A	1
2003	Socket screw	M5 × 25	8
2004	Spring washer	2H-5	8
2005	Sheet	HW9481967-A	1
2006	Motor	SGMPH-02A1A-YR11	1
2007	Socket screw	M6 × 25	4
2008	Spring washer	2H-6	4
2009	Socket screw	M4 × 45	1
2010	Spring washer	2H-4	1
2011	L arm A	HW9100868-1	1
2012	Socket screw	GT-LA M5 × 20	8
2013	Grease nipple	A-MT6 × 1	1
2014	Plug	LP-M5	1
2015	L arm B	HW9100837-1	1
2016	Clamp	TA1-S8	1
2017	Round head screw	M4 × 6	1
2018	Insulok'tie	T50R	1
2019	Shaft	HW9301793-1	1
2020	Socket screw	M4 × 12	3
2021	Spring washer	2H-4	3
2022	Guide	HW9404533-1	1
2023	Round head screw	M4 × 8	2
2024	Bearing	6812LLU	1
2025	Clip	WR6	1
2026	Clip	AR78	1
2027	Cover	HW9200835-1	1
2028	Socket screw	GT-SA M4 × 10	6
2029	Socket screw	M5 × 14	1
2030	Spring washer	2H-5	1
2031	stopper	HW9404532-1	1
2032	Socket screw	M4 × 6	2
2033	Socket screw	M6 × 10	1
2034	Spring washer	2H-6	1

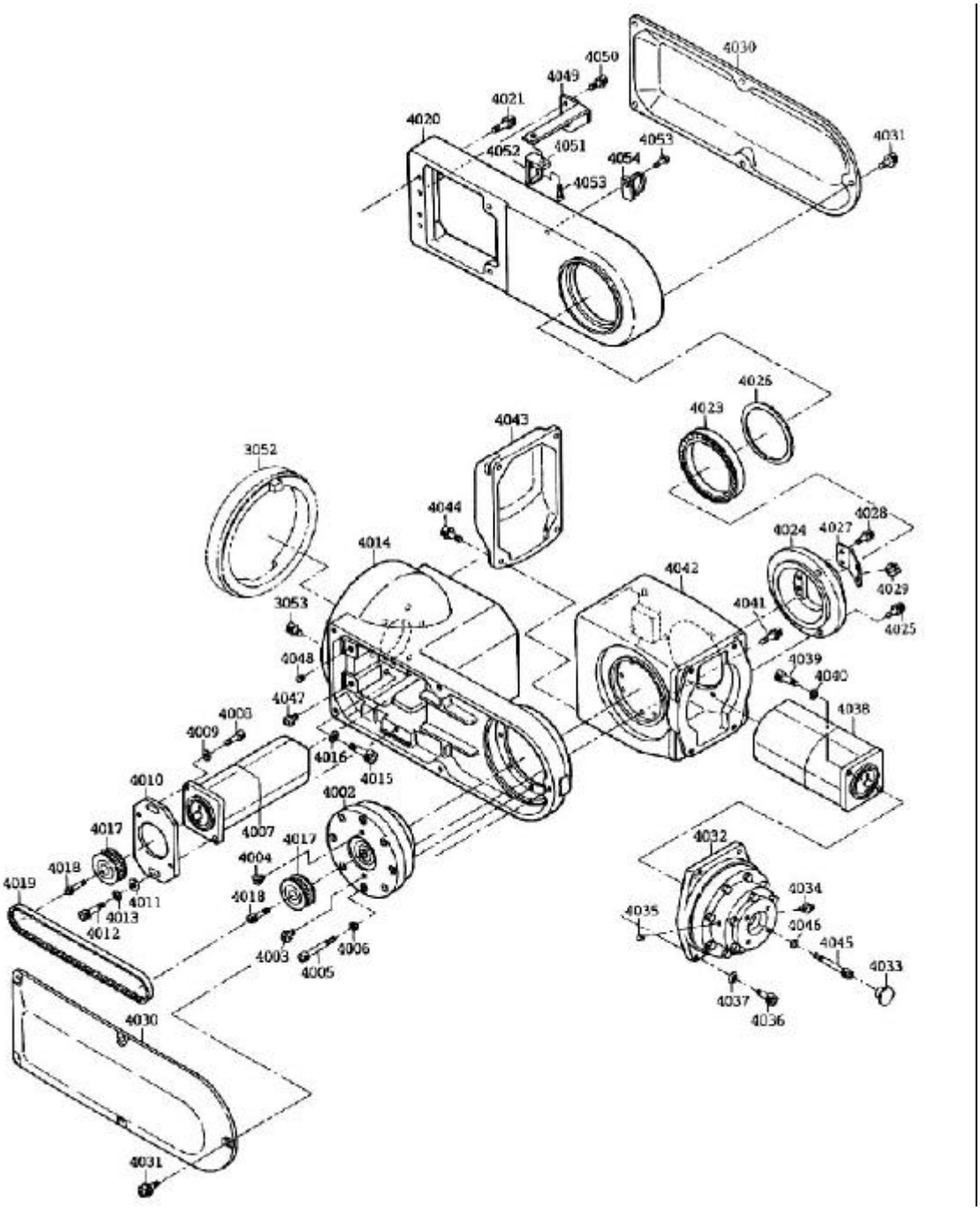
11.3 U- and R-axes driving unit



No.	Name	DWG no.	Pcs
2011	L arm A	HW9100868-1	1
2015	L arm B	HW9100837-1	1
2027	Cover	HW9200835-1	1
3001A	Fly wheel	HW9404925-1	1
3001B	Distance piece	HW9404926-1	1
3001C	Distance piece	HW9404927-1	1
3001D	Distance piece	HW9404930-1	1
3002	Motor	SGMPH-01A1A-YR11	1
3003	Socket screw	M5 × 25	4
3004	Spring washer	2H-5	4
3004A	Washer	MSRB5.5-2.0	4
3005	Socket screw	M4 × 35	1
3006	Spring washer	2H-4	1
3007	RV reduction gear	HW9381285-A	1
3008	Socket screw	M4 × 20	8
3009	Spring washer	2H-4	8
3010	Socket screw	GT-LAM4 × 16	8
3011	G nipple	A-MT6 × 1	1
3012	Plug	LP-M5	1
3013	Shaft	HW9301793-1	1
3014	Socket screw	M4 × 12	3
3015	Spring washer	2H-4	3
3016	Bearing	6812LLU	1
3017	Clip	WR60	1
3018	Clip	AR78	1
3019	Guide	HW9404541-1	1
3020	Round head screw	M4 × 8	2
3021	Socket screw	M6 × 20	2
3022	Spring washer	2H-6	2
3023	Support	HW9404660-1	1
3024	Socket screw	M4 × 12	2
3025	Spring washer	2H-4	2
3026	Insulok’tie	T50R	2
3027	Clamp	TA1-S8	2
3028	Round head screw	M4 × 6	2
3029	Saddle	CD-15	1
3030	Round head screw	M5 × 6	2
3031	Motor	SGMAH-A5A2A-YR21	1

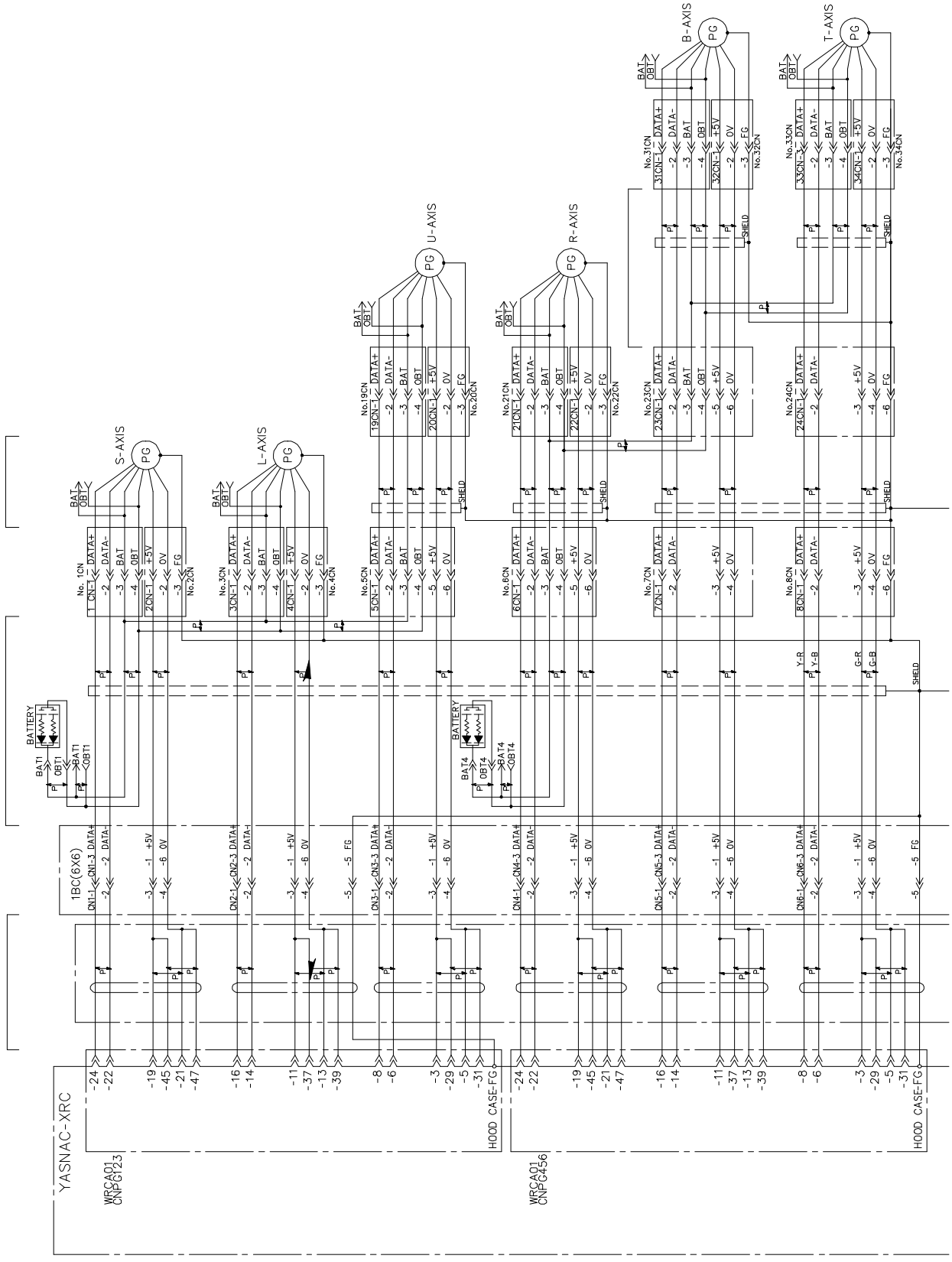
No.	Name	DWG no.	Pcs
3032	Socket screw	GT-SAM3 × 12	2
3033	RV reduction gear	HW9381225-A	1
3034	Socket screw	M4 × 12	6
3035	Spring washer	2H-4	6
3036	Casing	HW9100804-1	1
3037	Block	HW9404757-1	1
3038	Socket screw	M4 × 12	2
3039	Spring washer	2H-4	2
3040	Sheet	HW9481967-A	1
3041	Pulley	HW9481901-A	1
3042	Socket screw	GT-SA M3 × 12	1
3043	Pulley	HW9481902-A	1
3044	Washer	HW9404536-1	1
3045	Flange	HW9404537-1	1
3046	Socket screw	GT-SA M3 × 12	3
3047	Timing belt	050S4 5M198	1
3048	Socket screw	GT-SAM4 × 10	2
3049	Cover	HW9200834-1	1
3050	Socket screw	GT-SA M4 × 10	4
3051	Cap	EZ5036AO	1
3052	Stopper	HW9404539-1	1
3053	Socket screw	M4 × 6	2
4014	U arm A	HW9100842-1	1
6076	Pipe	HW9404538-A	1

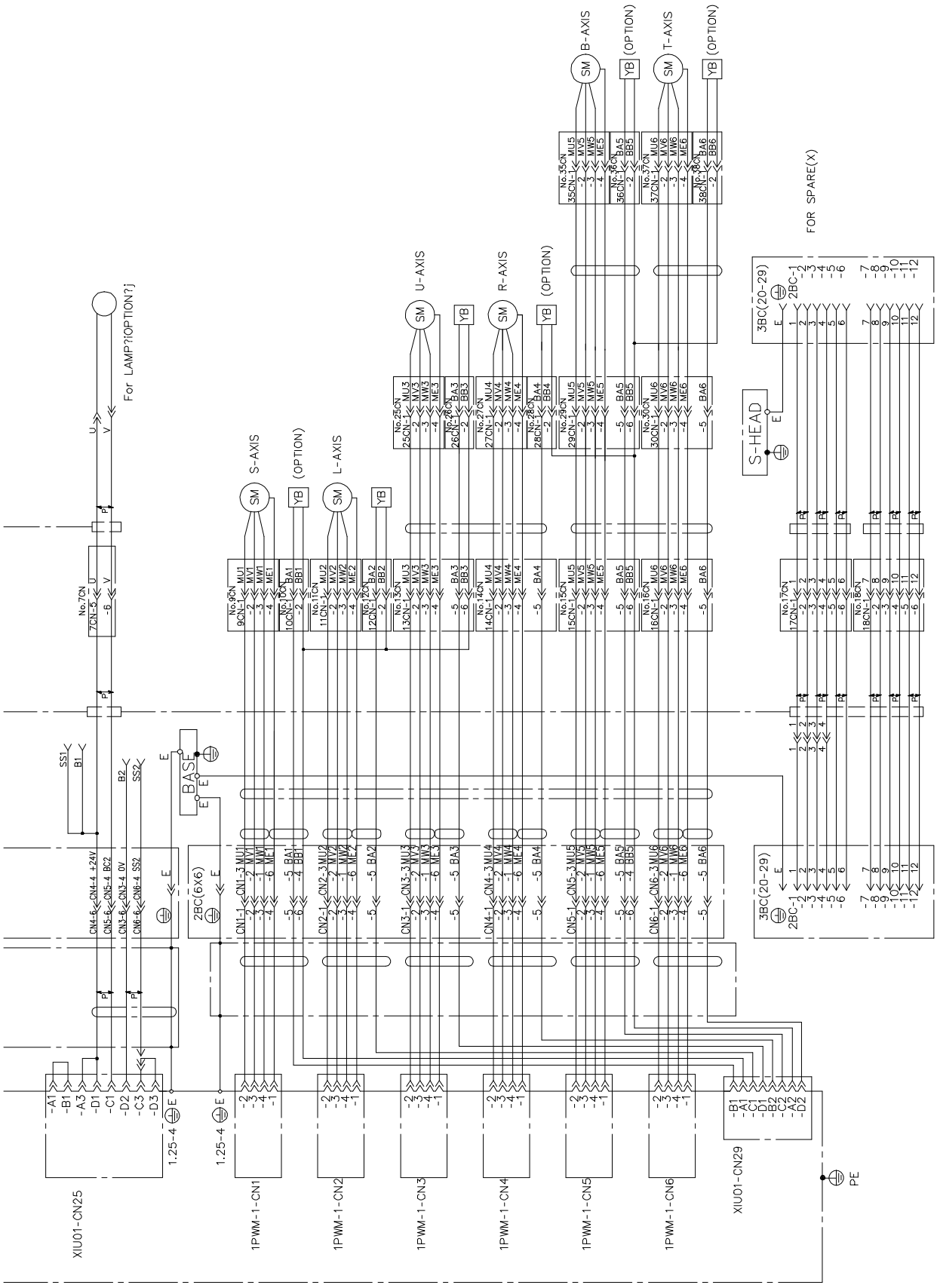
11.4 Wrist unit



No.	Name	DWG no.	Pcs
3052	Stopper	HW9404539-1	1
3053	Socket screw	M4 × 6	2
4002	Reduction screw	HW9381226-A	1
4003	G nipple	A-MT6 × 1	1
4004	Plug	LP M5	1
4005	Socket screw	M3 × 25	8
4006	Spring washer	2H-3	8
4007	Motor	SGMAH-A5A1A-YR21	1
4008	Socket screw	M4 × 12	2
4009	Spring washer	2H-4	2
4010	M base	HW9404521-1	1
4011	Washer	M4	2
4012	Socket screw	M4 × 16	2
4013	Spring washer	2H-4	2
4014	U arm A	HW9100842-1	1
4015	Socket screw	M5 × 16	6
4016	Spring washer	2H-5	6
4017	Pulley	HW9481900-A	2
4018	Socket screw	GT-SA M3×12	1
4019	Timing belt	050S4.5M315	1
4020	U arm B	HW9200833-1	1
4021	Socket screw	GT-LA M4×16	4
4023	Bearing	6809DD	1
4024	Shaft	HW9301794-1	1
4025	Socket screw	GT-SA M4×10	3
4026	Clip	ISTW-45	1
4027	Support	HW9404520-1	1
4028	Socket screw	GT-SA M4×10	2
4029	Insulok'tie	T30R	1
4030	Cover	HW9301798-1	2
4031	Socket screw	GT-SA M4×10	10
4032	Reduction gear	HW9381227-A	1
4033	Cap	EZ5002A0	1
4034	G nipple	A-MT6 × 1	1
4035	H set screw	M6 × 6	1
4036	Socket screw	M4 × 12	4
4037	Spring washer	2H-4	4
4038	Motor	SGMAH-A5A1A-YR21	1

No.	Name	DWG no.	Pcs
4039	Socket screw	M4 × 12	2
4040	Spring washer	2H-4	2
4041	Socket screw	GT-LA M3 × 15	8
4042	Wrist base	HW9200925-1	1
4043	Cover	HW9301797-1	1
4044	Socket screw	GT-SAM4 × 10	4
4045	Socket screw	M3 × 30	1
4046	Spring washer	2H-3	1
4047	G nipple	A-MT6 × 1	1
4048	H set screw	M6 × 6	1
4049	Support	HW9404701-1	1
4050	Socket screw	GT-SA M4 × 10	2
4051	Clamp	TA1-S8	2
4052	Insulok’tie	T30R	2
4053	Round head screw	M4 × 8	2
4054	Clamp	NK-9N	1


S-AXIS
L-AXIS
U-AXIS
R-AXIS
B-AXIS
T-AXIS
PG
BAT
OBT
BATTERY
1BC(6X6)
YASNAC-XRC
WRCA01
CNPG123
WRCA01
CNPG456
HOOD CASE-FG
SHIELD


S-AXIS
(OPTION)
L-AXIS
U-AXIS
R-AXIS
(OPTION)
B-AXIS
(OPTION)
T-AXIS
(OPTION)
FOR SPARE(X)
S-HEAD
BASE
2BC(6X6)
3BC(20-29)
For LAMP?(OPTION?)
XIU01-CN25
1PWM-1-CN1
1PWM-1-CN2
1PWM-1-CN3
1PWM-1-CN4
1PWM-1-CN5
1PWM-1-CN6
XIU01-CN29
PE

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