YASKAWA

Rotating Workpiece Supplying System for Painting MOTOFEEDER TILT-MTP5026 Maintenance Manual

TYPE:
YR-MTP5026-*0* (With Robot)
YR-MTP5026-*1* (Without Robot)

Procedures described in this maintenance manual should be carried out by the person who took the maintenance-relevant trainings offered by YASKAWA.
Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOFEEDER Instructions

MOTOFEEDER TILT-MTP5026 Instructions
MOTOFEEDER TILT-MTP5026 Maintenance Manual
MOTOFEEDER TILT-MTP5026 Operating Instructions
MOTOFEEDER TILT-MTP5026 Operating Instructions Supplement
Instructions for Explosion-Proof Specifications
DX200 Instructions
DX200 Operator's Manual (for each purpose)
DX200 Maintenance Manual (Volume1)(Volume2)

MANUAL NO.
HW2481691 ①

Contents

Contents

1 Introduction

MANDATORY

- This maintenance manual is intended to explain maintenance procedures primarily for the MOTOFEEDER TILT-MTP5026. Any matter not described in this manual must be regarded as “prohibited” or “improper”.
- General items related to safety are listed in Chapter 1: Safety of the DX200 Instructions. To ensure correct and safe operation, carefully read the DX200 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 and maintenance 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. 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 your product.

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

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

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

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

DANGER

- The inspection and maintenance of explosion-proof electric equipments must be performed by experienced maintenance personnel who have been trained on different types of explosion-proof enclosures, installation of electric equipment, related laws and regulations, and general principles for hazardous area classifications.
- Maintenance and inspection must be performed by specified personnel.

Failure to observe this caution may result in electric shock or injury.

- For disassembly or repair, contact your YASKAWA representative.
- Do not remove the motor, and do not release the brake.

Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.

WARNING

- Before maintenance, inspection, or wiring, 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.

- After maintenance, check the home position before operating the manipulator.

Injury may result from unexpected manipulator motion.

- Before operating the manipulator, check that servo power is turned OFF by pressing the emergency stop buttons on the front door of the DX200 and the programming pendant.
  When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

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

Fig. : 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.

Fig. : Release of Emergency Stop

- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  - Be sure to use a lockout device to the safeguarding when going inside. Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Keep in mind the emergency response measures against the manipulator's unexpected motion toward you.
  - 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 person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning ON the power for the DX200.
  - Moving the manipulator with the programming pendant.
  - Running the system in the check mode.
  - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem.
The emergency stop buttons are located on the right of front door of the DX200 and the programming pendant.

CAUTION

- Perform maintenance inspection with the specific person who took the maintenance training course in YASKAWA.

Failure to observe this may result in electric shock or injury.

- When the maintenance inspection is performed, be sure to mount the battery pack before removing the motor encoder connector.

Failure to observe this caution may result in disappearance of the home position data.

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.

- Always return the programming pendant to the hook on the cabinet of the DX200 after use.

The programming 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 Warning Labels in the DX200 Instructions before operating the manipulator:

Definition of Terms Used Often in This Manual

MOTOFEEDER is the YASKAWA rotating workpiece supplying system for industrial use.

MOTOFEEDER consists of the MOTOFEEDER TILT-MTP5026 which is the main body of rotating workpiece supplying system, the DX200 controller for the rotating workpiece supplying system, the DX200 programming pendant, and manipulator cables.

In this manual, the equipment is designated as follows:

Equipment	Manual Designation
Rotating workpiece supplying system “MOTOFEEDER TILT-MTP5026”	Manipulator
DX200 controller	DX200
DX200 programming pendant	Programming pendant
Cable between the manipulator and the controller	Manipulator cable

For the terms used for the painting robot and ancillary equipment used in combination with this product, refer to the respective manipulator instruction manual.

Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and TM are omitted.

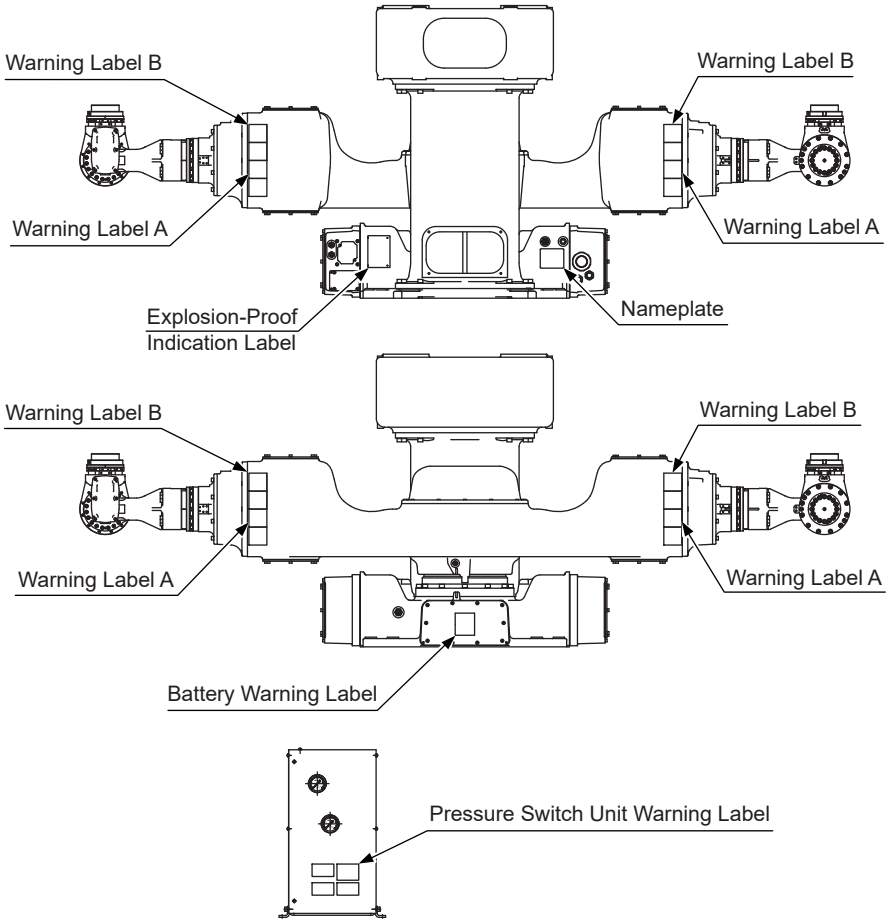
Explanation of Warning Labels

The following warning labels are attached to the manipulator.

Always follow the warnings on the labels.

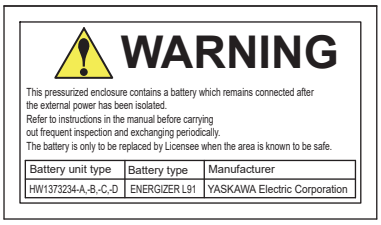
Also, an identification label with important information is placed on the body of the manipulator. Prior to operating the manipulator, confirm the contents.

Fig. : Locations for the Nameplate and the Warning Label

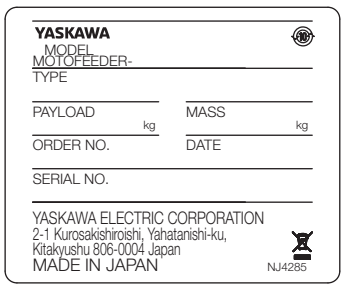


Pressure Switch Unit

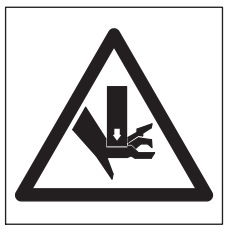
Battery Warning Label



Nameplate



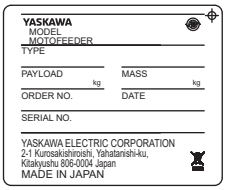
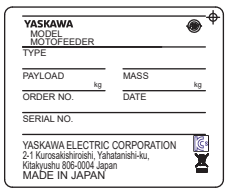
Warning Label A



Pressure Switch Unit Warning Label

Warning Label B

Fig. : List of Warning Labels and Nameplate

Type	YR-MTP5026-A**	YR-MTP5026-E**
Nameplate		
Battery Warning Label		
Pressure Switch Unit Warning Label		
Warning Label A		
Warning Label B		

2 Notes for Maintenance

NOTE

- When an encoder connector for a motor needs to be disconnected, be sure to connect a battery pack before disconnecting the encoder connector. If the encoder connector is disconnected without connecting the battery pack, the home position data will disappear.
- Never remove the battery pack in the connector base.

NOTE

- Never insert a flat tip screwdriver, an edged tool, etc. into the gasket to remove the motor cover so as not to damage the gasket. If the gasket is damaged, air leak will result.

2.1 Inspection of Gasket

CAUTION

- Be sure to turn OFF the DX200 power and shut off supply of compressed air before removing the covers and ducts. Always remove the covers and ducts in a safe condition.

■ Cover Gasket

The motor cover may not be uninstalled due to gasket absorption power even cover mounting screws are removed. In such a case, use a tapped through hole to remove the cover.

Fig. 2-1: Gaskets of Base

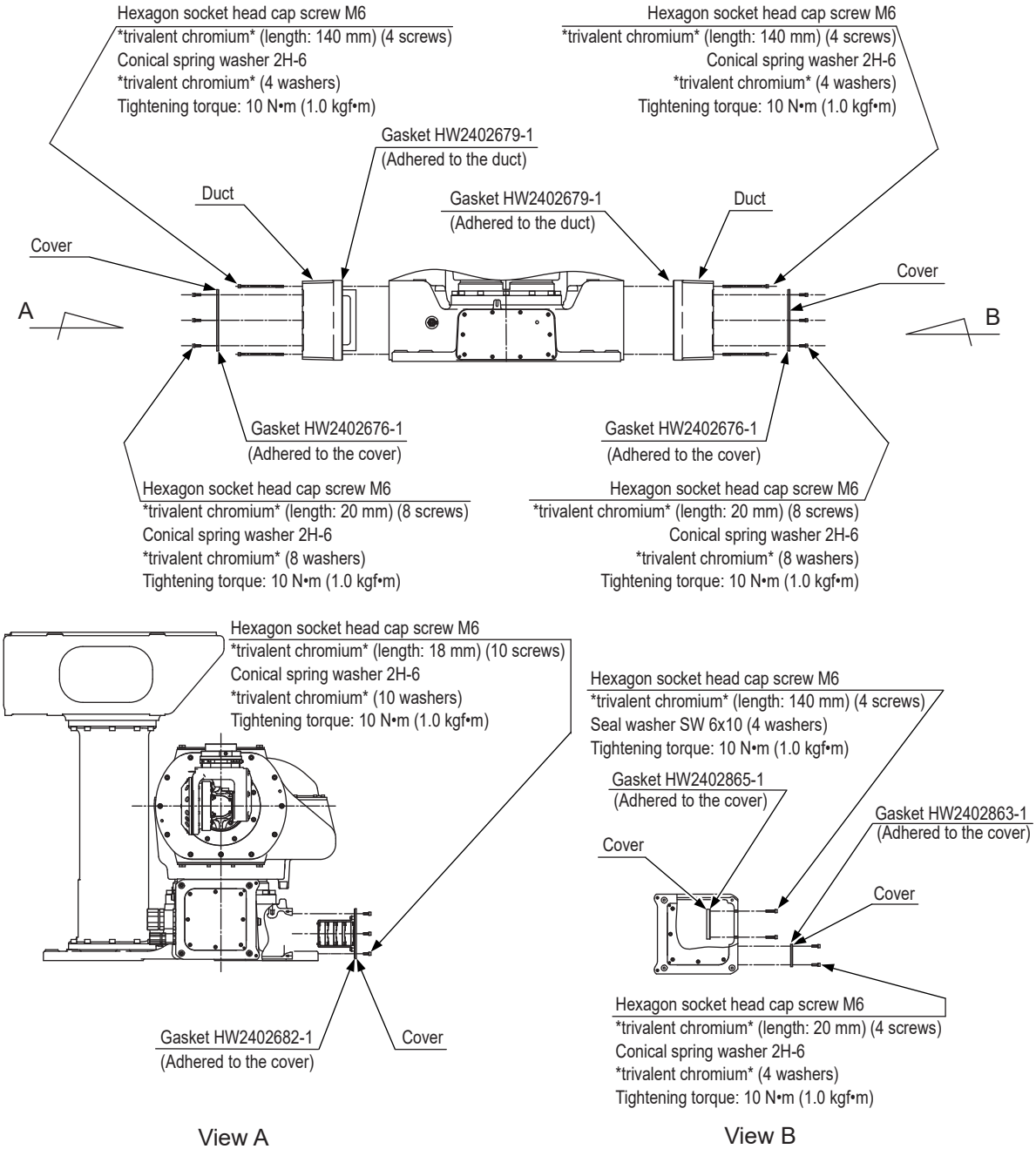
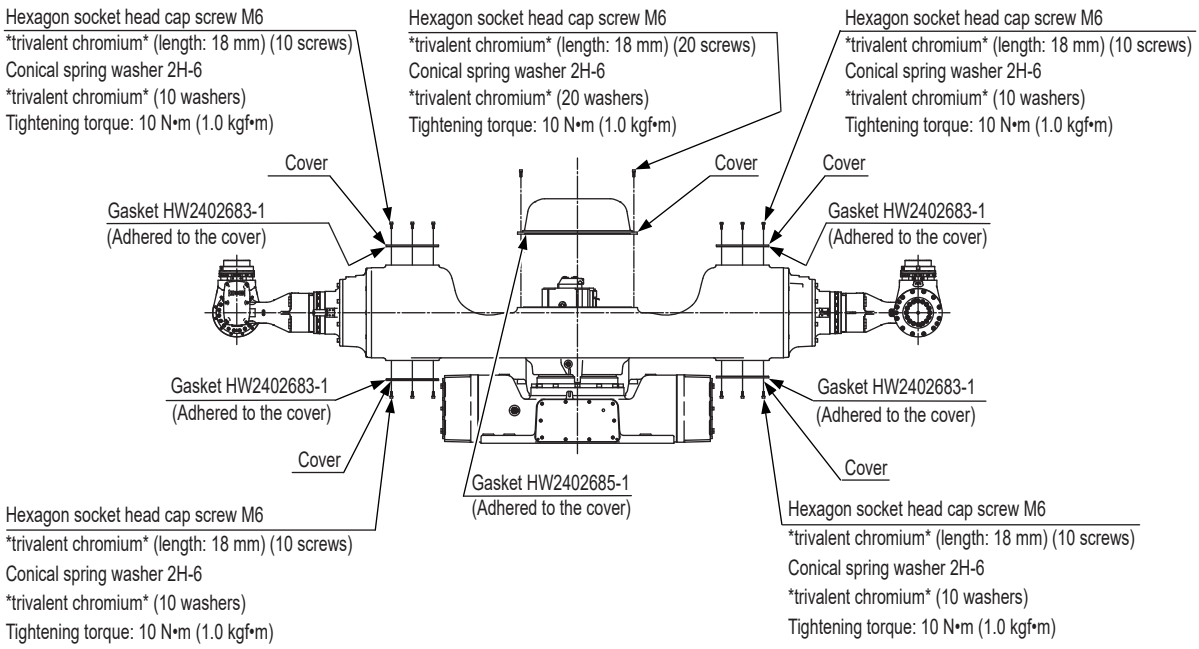


Fig. 2-2: Gaskets of S-head



2.2 Details of Internal Connections

For the encoder and the power supply of the motor of each axis, lead wires are connected to each part of the manipulator.

When replacing a motor or lead wire, prepare the necessary parts and perform maintenance operations by referring to *fig. 2-3 "Details of Internal Connections"* and *table 2-1 "Details of Internal Connections"* .

Fig. 2-3: Details of Internal Connections

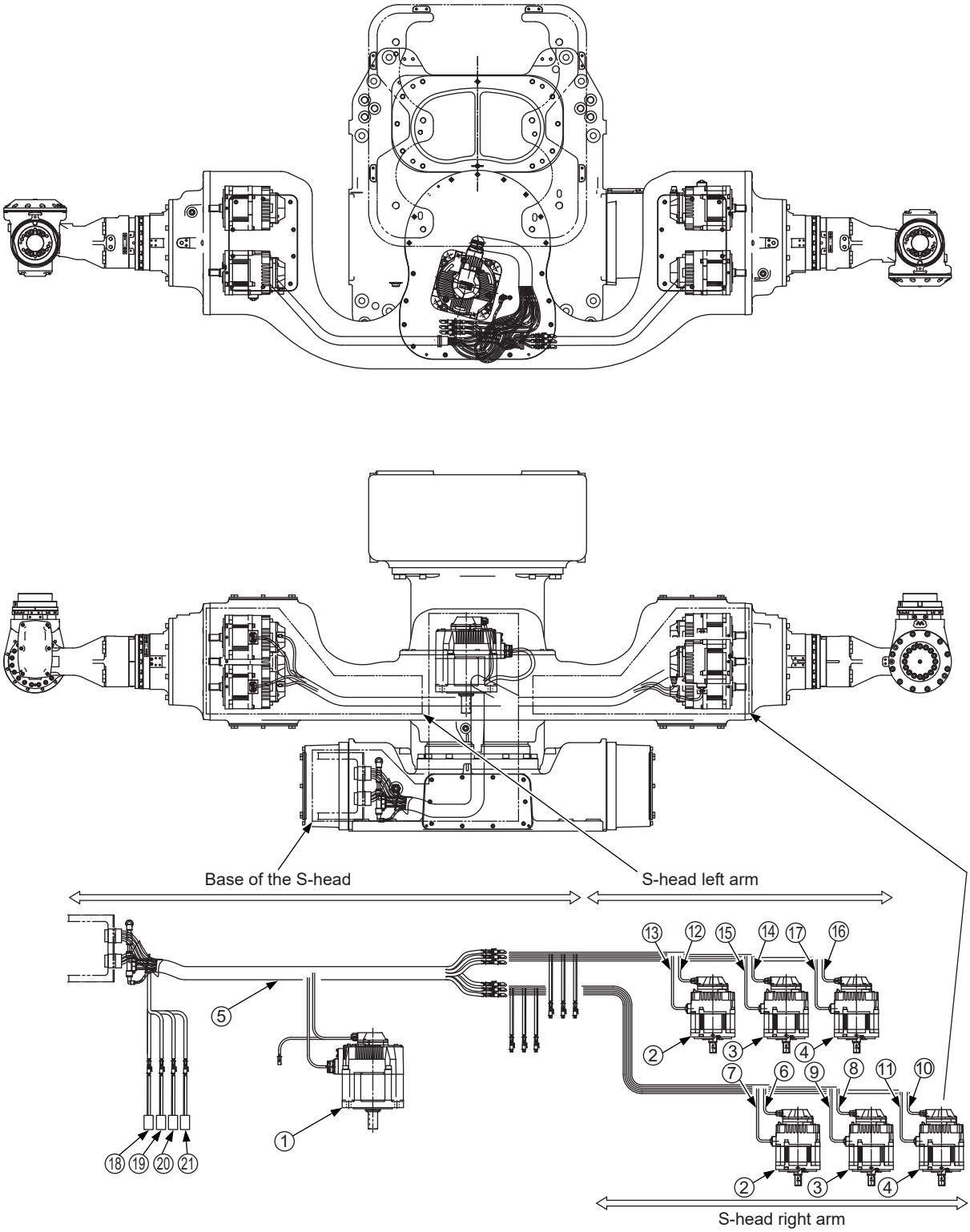


Table 2-1: Details of Internal Connections

No	Item	Qty	Remark
①	S1-axis motor	1	
②	S2-1- and S3-1-axis motor	2	
③	S2-2- and S3-2-axis motor	2	
④	S2-3- and S3-3-axis motor	2	
⑤	Internal wiring harness	1	Between the base and the S-head
⑥	Internal wiring harness	1	S-head arm For the S2-1-axis motor (encoder)
⑦	Internal wiring harness	1	S-head arm For the S2-1-axis motor (power)
⑧	Internal wiring harness	1	S-head arm For the S2-2-axis motor (encoder)
⑨	Internal wiring harness	1	S-head arm For the S2-2-axis motor (power)
⑩	Internal wiring harness	1	S-head arm For the S2-3-axis motor (encoder)
⑪	Internal wiring harness	1	S-head arm For the S2-3-axis motor (power)
⑫	Internal wiring harness	1	S-head arm For the S3-1-axis motor (encoder)
⑬	Internal wiring harness	1	S-head arm For the S3-1-axis motor (power)
⑭	Internal wiring harness	1	S-head arm For the S3-2-axis motor (encoder)
⑮	Internal wiring harness	1	S-head arm For the S3-2-axis motor (power)
⑯	Internal wiring harness	1	S-head arm For the S3-3-axis motor (encoder)
⑰	Internal wiring harness	1	S-head arm For the S3-3-axis motor (power)
⑱	S1-axis battery pack	1	Refer to *table 2-2 “Battery Pack for Maintenance (Spare Parts)”* .
⑲	S2-1- and S2-2-axis battery pack	1	Refer to *table 2-2 “Battery Pack for Maintenance (Spare Parts)”* .

2 Notes for Maintenance
2.2 Details of Internal Connections

Table 2-1: Details of Internal Connections

No	Item	Qty	Remark
⑳	S2-3- and S3-3-axis battery pack	1	Refer to *table 2-2 “Battery Pack for Maintenance (Spare Parts)”* .
㉑	S3-1- and S3-2-axis battery pack	1	Refer to *table 2-2 “Battery Pack for Maintenance (Spare Parts)”* .

2.3 Battery Pack Replacement

MANDATORY

- Be sure to disconnect the battery pack of the motor after maintenance, then start the manipulator.

DANGER

- Be sure to replace the battery pack for the motor in a non-hazardous location.

Table 2-2: Battery Pack for Maintenance (Spare Parts)

Manipulator Type	Battery Pack (Spare Parts)	Axis
YR-MTP5026-*0* YR-MTP5026-*1*	HW1373234-A	S1-axis
	HW1373234-B	S2-1- and S2-2-axis
	HW1373234-C	S2-3- and S3-3-axis
	HW1373234-D	S3-1- and S3-2-axis

NOTE

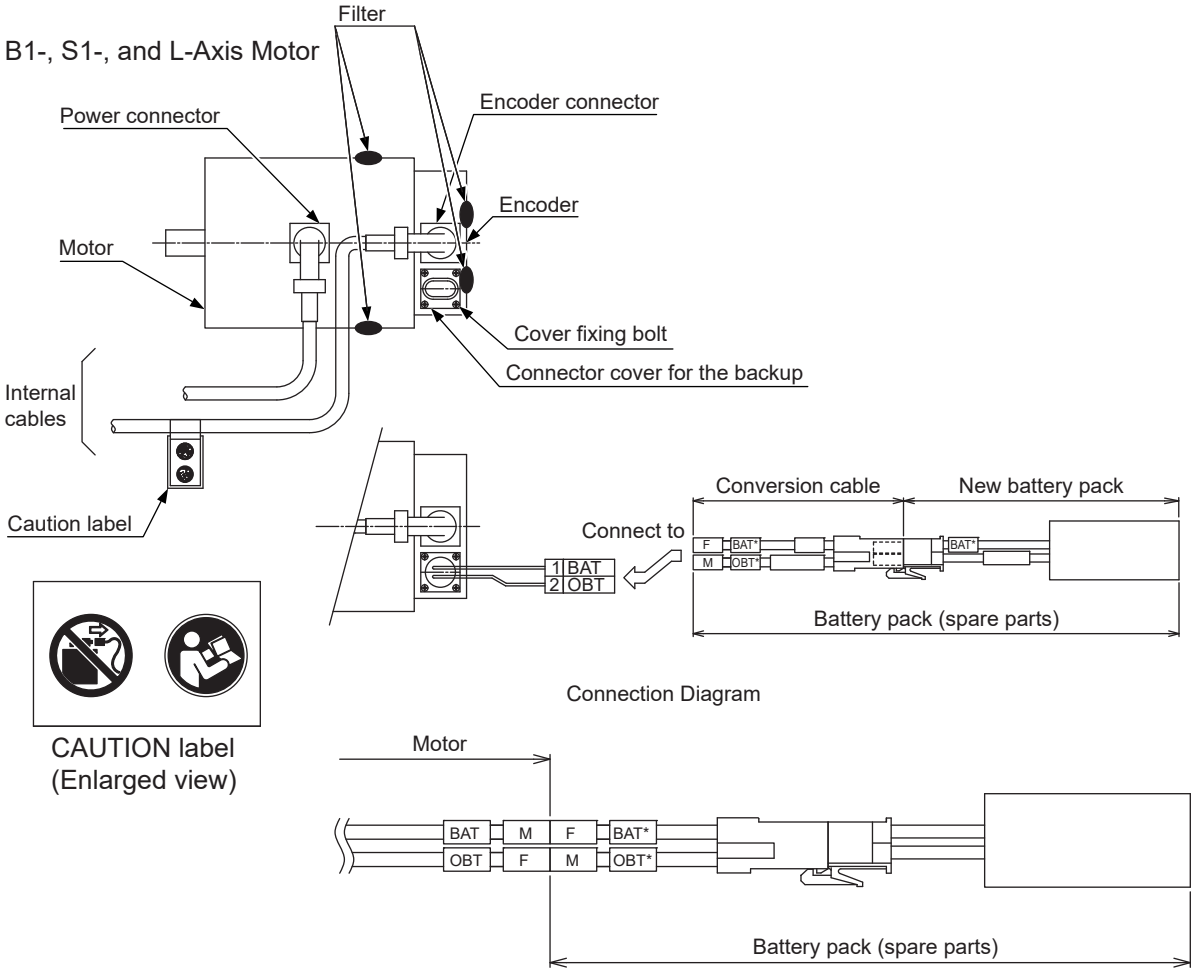
- When an encoder connector for a motor needs to be disconnected, be sure to connect a battery pack before disconnecting the encoder connector. If the encoder connector is disconnected without connecting the battery pack, the home position data will disappear.
- Never remove the battery pack in the connector base.

■ **S1-axis Motor**

The backup connector (crimped contact-pin terminal) is mounted on the encoder connector of the motor. Refer to *fig. 2-4(a) "Backup Battery Pack Connection for S1-axis Motor"* , and connect the battery pack according to the following procedure.

1. Connect the battery to the connectors for the battery backup of the motor encoder connector.
2. Confirm all connectors connection after the maintenance check ends, and then remove the battery pack.

Fig. 2-4(a): Backup Battery Pack Connection for S1-axis Motor

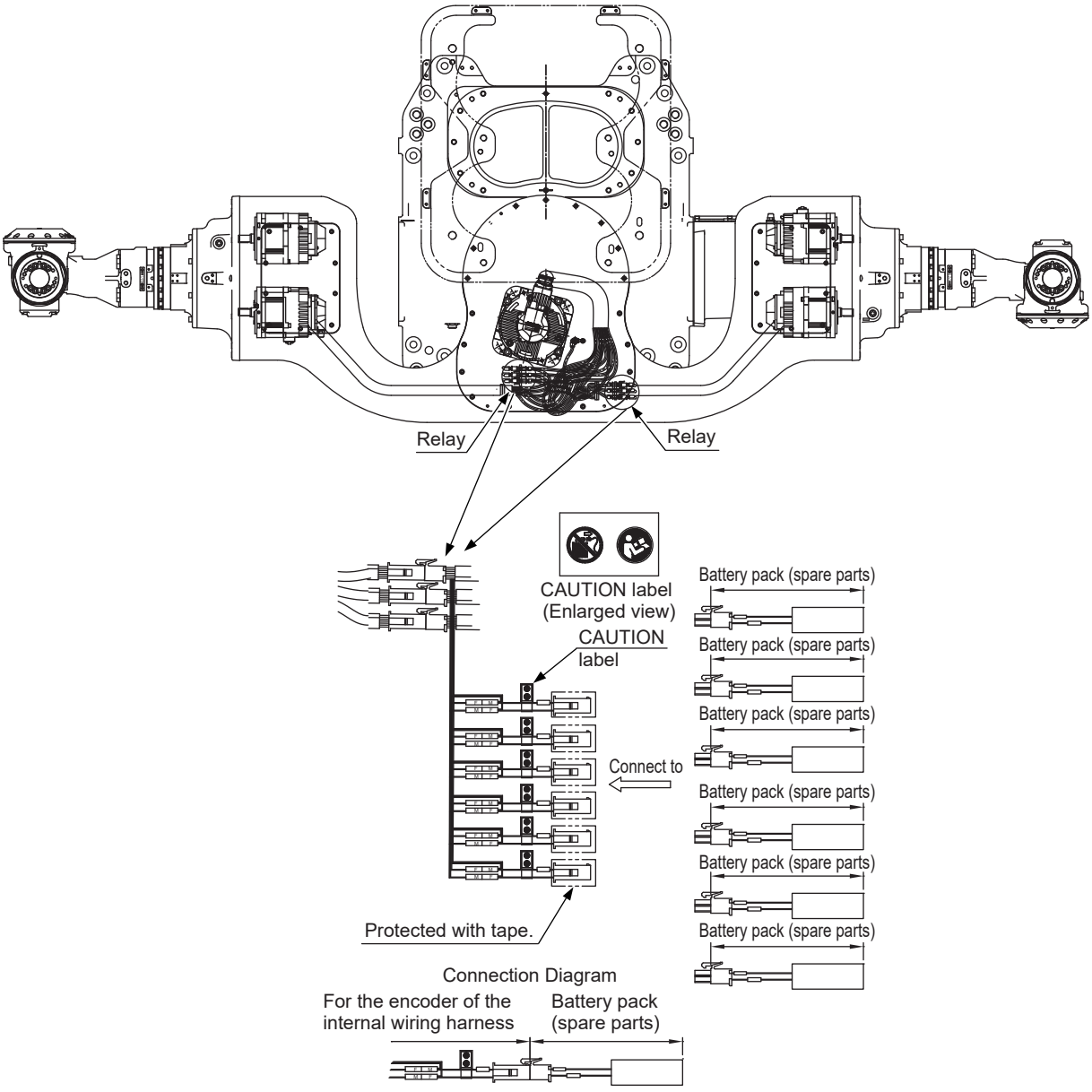


■ **S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Motors**

The connectors for the battery pack protected with tape is mounted on the relays. Refer to *fig. 2-4(b) "Backup Battery Pack Connection for S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Motors"* , and connect the battery pack according to the following procedure.

1. Remove the tape, and then connect the battery packs to the connectors for the battery backup of each connector.
2. Confirm all connectors connection after the maintenance check ends, and then remove the battery pack.
3. Protect the connectors for the battery pack on the relays with tape.

Fig. 2-4(b): Backup Battery Pack Connection for S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Motors



Prepare the number of battery packs (spare parts) required.

3 Home Position Return

NOTE

Reset the home position of the manipulator if the home position is cleared or deviated. The DX200 stores the position data of the job program (hereinafter called JOB) as the pulse number from the home position of each axis. Thus, by precisely resetting the home position, the JOB used before resetting can be used without correction.

Perform home position return in one of the following cases:

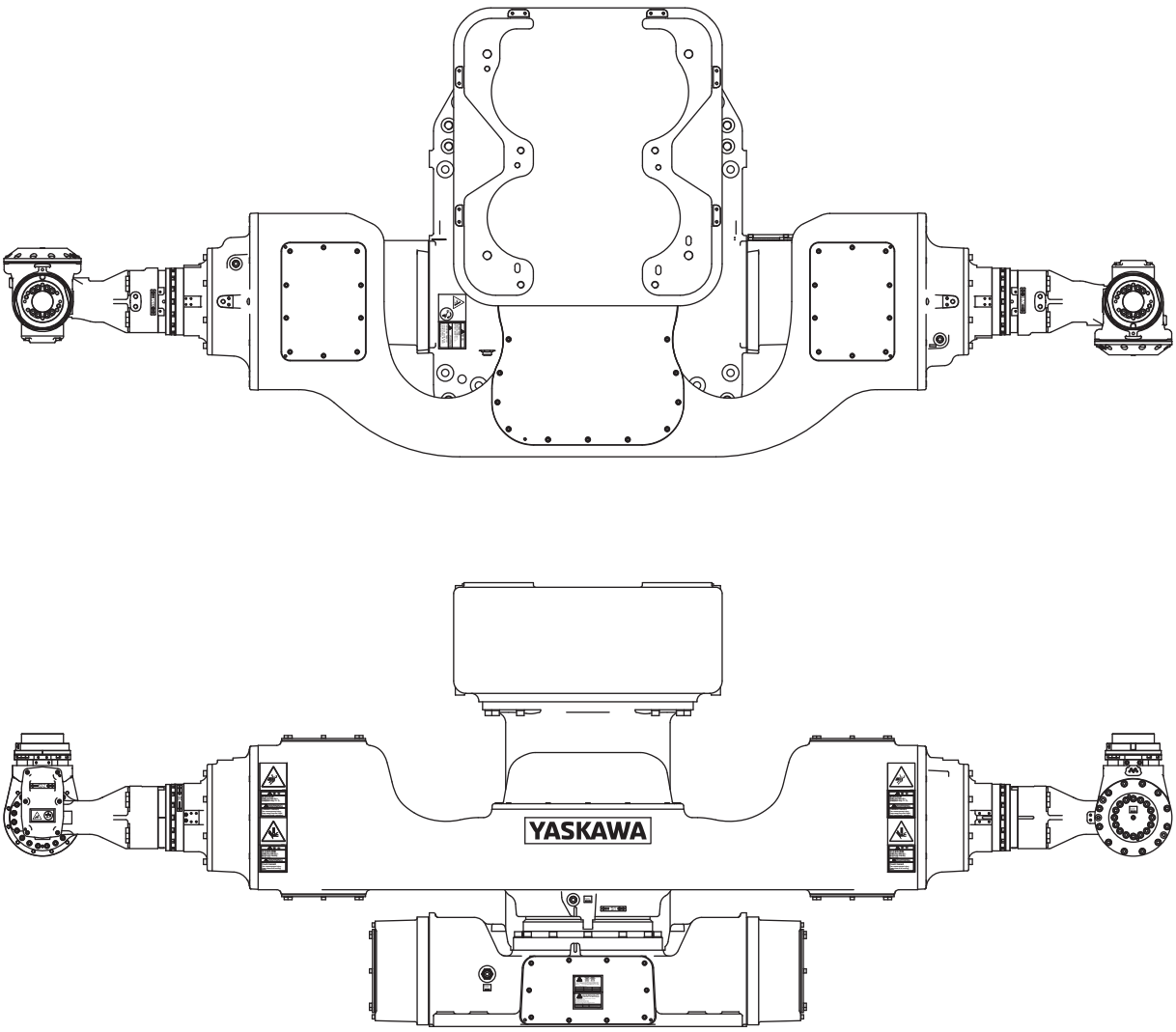
- The motor or absolute encoder is replaced.
- Stored memory is cleared due to the run-out of the internal battery.
- The home position is deviated by hitting the manipulator against a workpiece, etc.
- A main part such as a speed reducer is replaced or disassembled and reassembled.

When performing home position return, be sure that no external force is applied to the manipulator.

3.1 Home Position Posture of Manipulator

The home position of MOTOFEEDER TILT-MTP5026 is shown in *fig. 3-1 “Home Position Posture”* .

Fig. 3-1: Home Position Posture



Manipulator (Front)

3.2 Types of Methods for Home Position Return

This section explains the types of methods for home position return in detail.

3.2.1 Using a Teaching Point for Setting the Home Position

As a preparation, create the standard position for home position adjustment under normal operating conditions. After the replacement of the motor, etc., move the manipulator to the created position to adjust the deviation.

3.2.2 Using Keys

As a preparation, on the home position label inside of the DX200, write down the difference of the pulse numbers between the key position and the factory-set home position of the manipulator. If the home position data disappear, move the manipulator to the key position, and set the position where the above difference of the pulse numbers is reflected as the home position.

3.2.3 Using Encoder Backup Error Recovery Function

If the stored memory is cleared due to the run-out of the internal battery and the “Encoder Backup Error” alarm occurs, run the “Backup Alarm Restoration” software on the programming pendant.

This function cannot be used when the motor or absolute encoder is replaced.

3.2.4 Table of Suitable Methods for Home Position Return

Suitable methods to return the home position for each case are shown in *table 3-1 “Table of Suitable Methods for Home Position Return”* .

Table 3-1: Table of Suitable Methods for Home Position Return

Case / Method	Replacement of motor or encoder	Run-out of internal battery	Hitting against a workpiece	Replacing a main part
Teaching point	High	N/A	N/A	High
Key	Mid	Mid	N/A	Mid
Encoder backup error recovery function	N/A	High	N/A	N/A

Accuracy of home position return is categorized as follows:
High, Mid, Low (The home position of all axes are changed.),
N/A (not applicable)

3.3 Methods for Home Position Return

3.3.1 Using a Teaching Point for Setting the Home Position

3.3.1.1 Preparation

Before the replacement of a motor or a speed reducer, the standard position (hereinafter called the check-point) must be created for home position adjustment. The standard position is used after the replacement. Create the check-point by satisfying the following conditions. Also, create the JOB so that the manipulator safely moves from the standby position, etc. to the check-point. (The JOB created in this manner is hereinafter called the check-JOB.)

- The position of the check-point must not be deviated by turning the power ON or OFF, or lowering air pressure.
  Do not create the check-point in the movable part of the tool (end-effector) or the jigs (related unit including the rotary table). It is recommended to use a specific jig if necessary.
- Use a pointed object (stylus, etc.) to create the check-point so that deviation is easily found.
  Keep the distance between the check-point and the rotational center of the axis under home position adjustment as far as possible.
- Consider the moving direction of the axis under home position adjustment, and create the check-point where deviation can be easily found and the axis does not interfere with jigs, etc. even if it deviates.

It is recommended to create the check-point for each axis under normal operating conditions beforehand. To create the check-point, each axis must operate normally. The check-point cannot be created if the axis does not move because of failure.

3.3.1.2 Replacement of Motor or Speed Reducer

Perform the replacement by referring to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"* , *chapter 6 "Disassembly and Reassembly of Motor"* and *chapter 7 "Disassembly and Reassembly of Wrist Assembly"* , *chapter 8 "Disassembly and Reassembly of Speed Reducer"* .

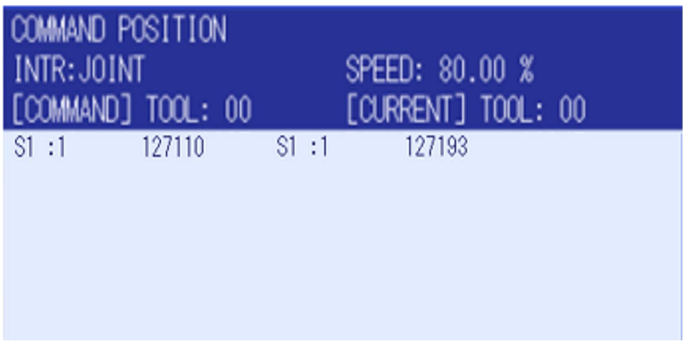
3.3.1.3 Home Position Adjustment

Once the replacement is complete, move the replaced axis to a position where the home position mark, key gap, or keyhole align, and then temporarily register the home position. For details, refer to chapter 8.1 "Home Position Calibration" in "DX200 INSTRUCTIONS (RE-CTO-A220)".

Move the axis to the check-point by the check-JOB. Ensure that the manipulator does not interfere with jigs, etc. when moving the axis. Correct the deviation from the check-point created before the replacement by moving only the axis whose motor or speed reducer was replaced.

Display the position screen (COMMAND POSITION).

The following figure shows the values of the S1-axis as an example.

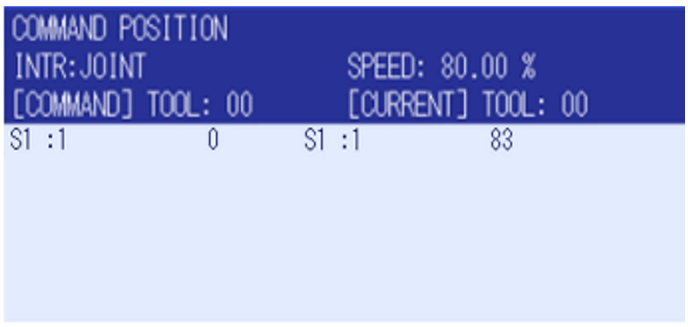


By using the above values, calculate the amount of deviation. (Subtract the CMD (command value) from the CURR (current value).)

S1 (127193) - (127110) = 83

Perform stepping back, etc. of the check JOB to move the axis to the position where the axis does not interfere with jigs, etc. when it moves to the home position. Ensure that the manipulator does not interfere with jigs, etc. when moving the axis. Refer to the position screen, and move the axis to the position where the pulse number is equal to the amount of deviation.

The following figure shows an example.



At this position, perform home position calibration only for the axis whose motor or speed reducer was replaced. For details, refer to chapter 8.1 “Home Position Calibration” in “DX200 INSTRUCTIONS (RE-CTO-A220)”.

Move the axis again to the check-point by the check-JOB. Confirm that the axis is at the check-point created before the replacement. (If it is deviated, repeat the adjustment procedure.)

Check the manipulator operation by using the JOB used before the replacement. If there is no problem, write down the modified home position data (ABSO data) and the date on the label inside of the DX200.

Move the axis to the modified home position and check the position of the home position mark. If the home position mark is deviated, modify the home position mark.

3.3.2 Using Keys

As a preparation, write down the difference of the pulse numbers between the key position and the factory-set home position of the manipulator on the home position label inside of the DX200. If the home position data disappears, move the manipulator to the key position, and set the position where the above difference of the pulse numbers is reflected as the home position.

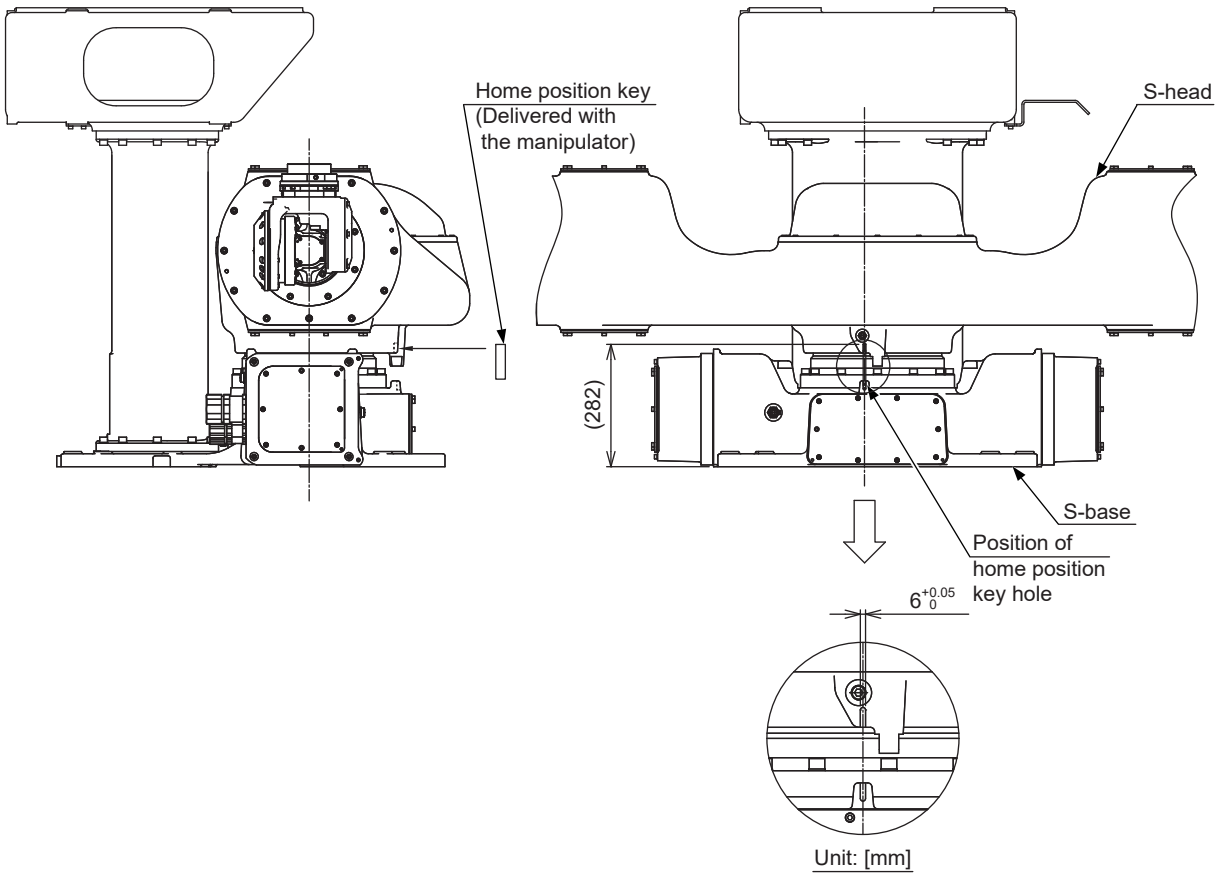
The parts in *table 3-2 "Parts List"* are required. Prepare them beforehand.
(Only one key and one home position fixture are supplied with the manipulator.)

Table 3-2: Parts List

Drawing No.	Name	Qty.	Note
HW1408750-1	Key	1	For S1-, S2-1-, and S3-1-axis
HW2470807-A	Home position fixture	1	For S2-2-, S2-3-, S3-2-, and S3-3-axis

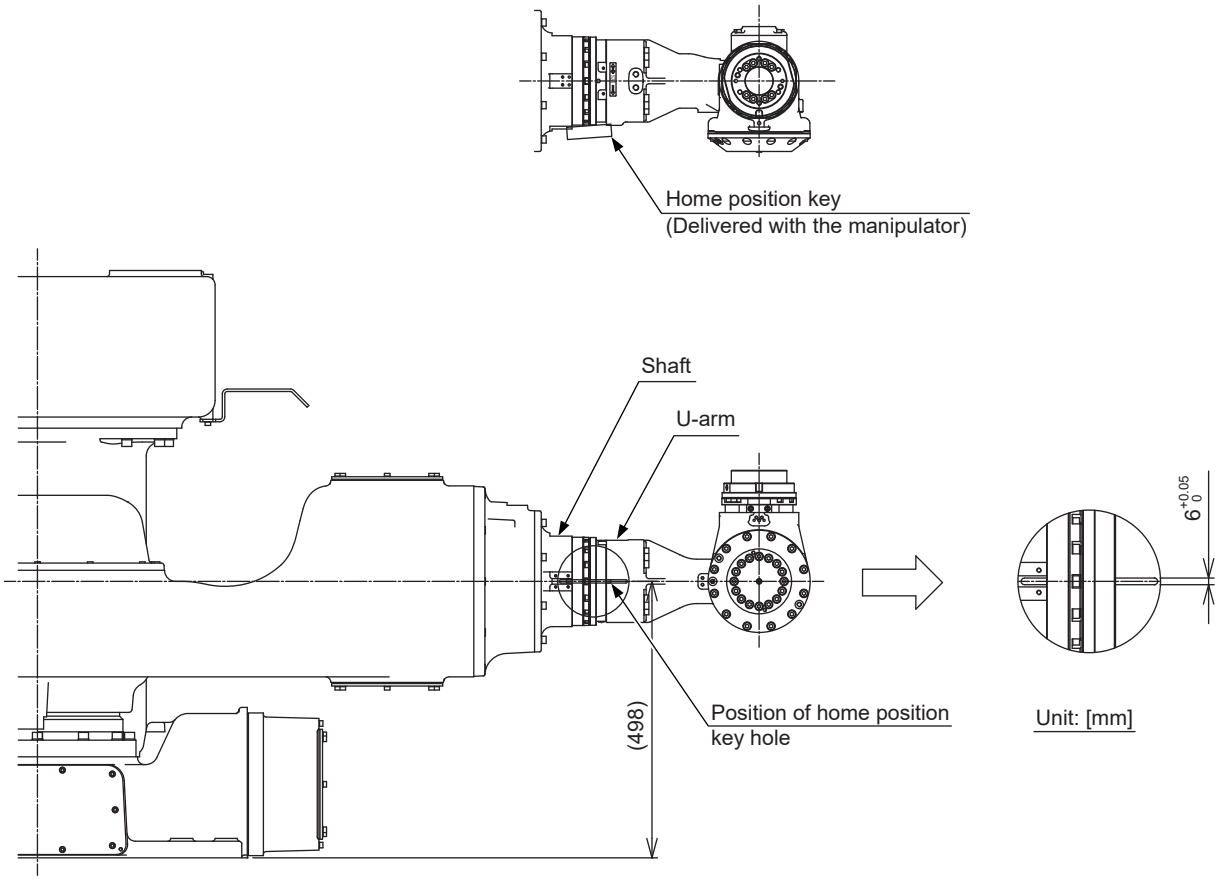
1. S1-Axis Positioning
   As shown in *fig. 3-2 "S1-Axis Positioning"*, perform positioning by using the programming pendant so that the key fits into the gap provided at the location shown in the figure.

Fig. 3-2: S1-Axis Positioning



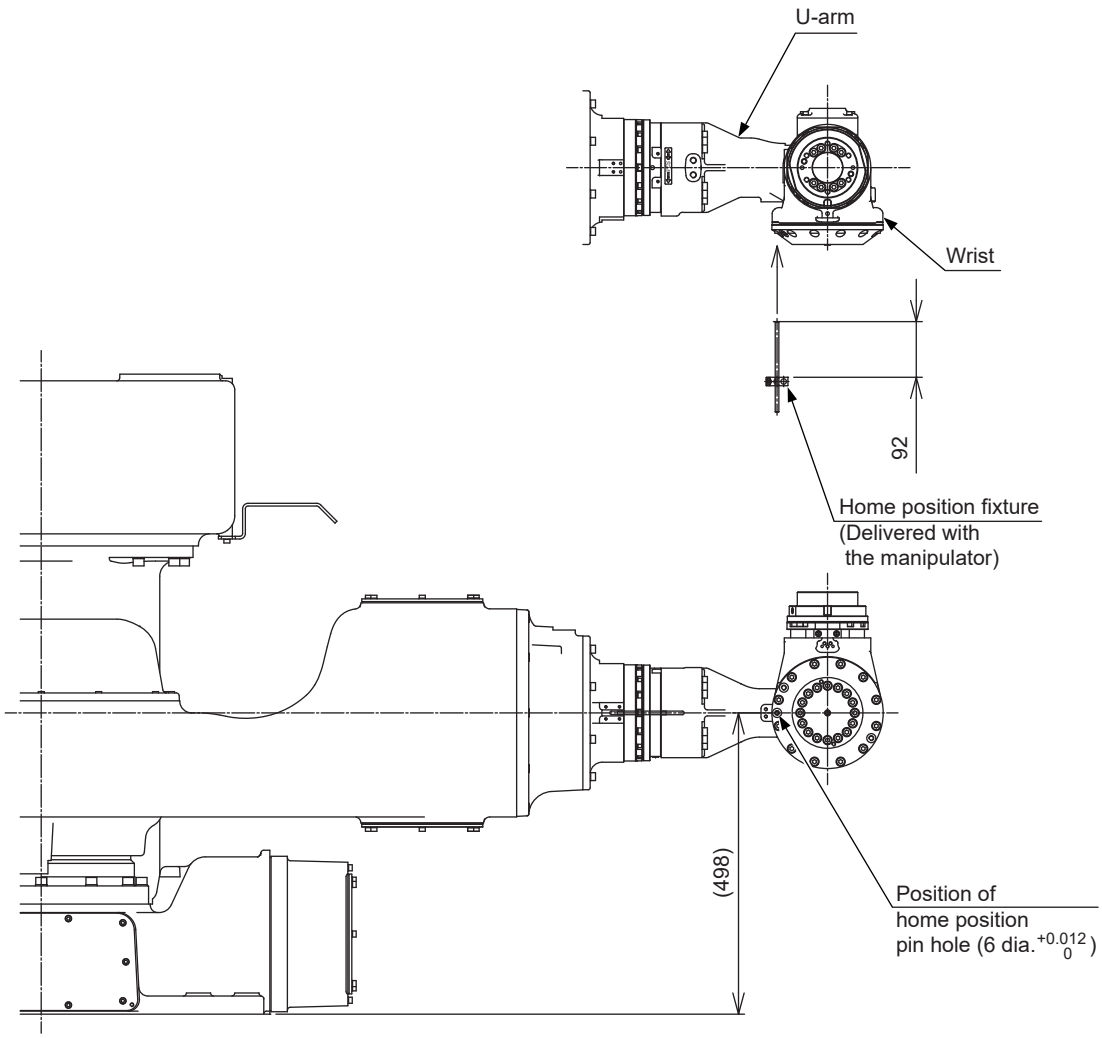
2. S2-1- and S3-1-axis Positioning
   As shown in *fig. 3-3 "S2-1- and S3-1-axis Positioning"* , perform positioning by using the programming pendant so that the key fits into the gap provided at the location shown in the figure.

Fig. 3-3: S2-1- and S3-1-axis Positioning



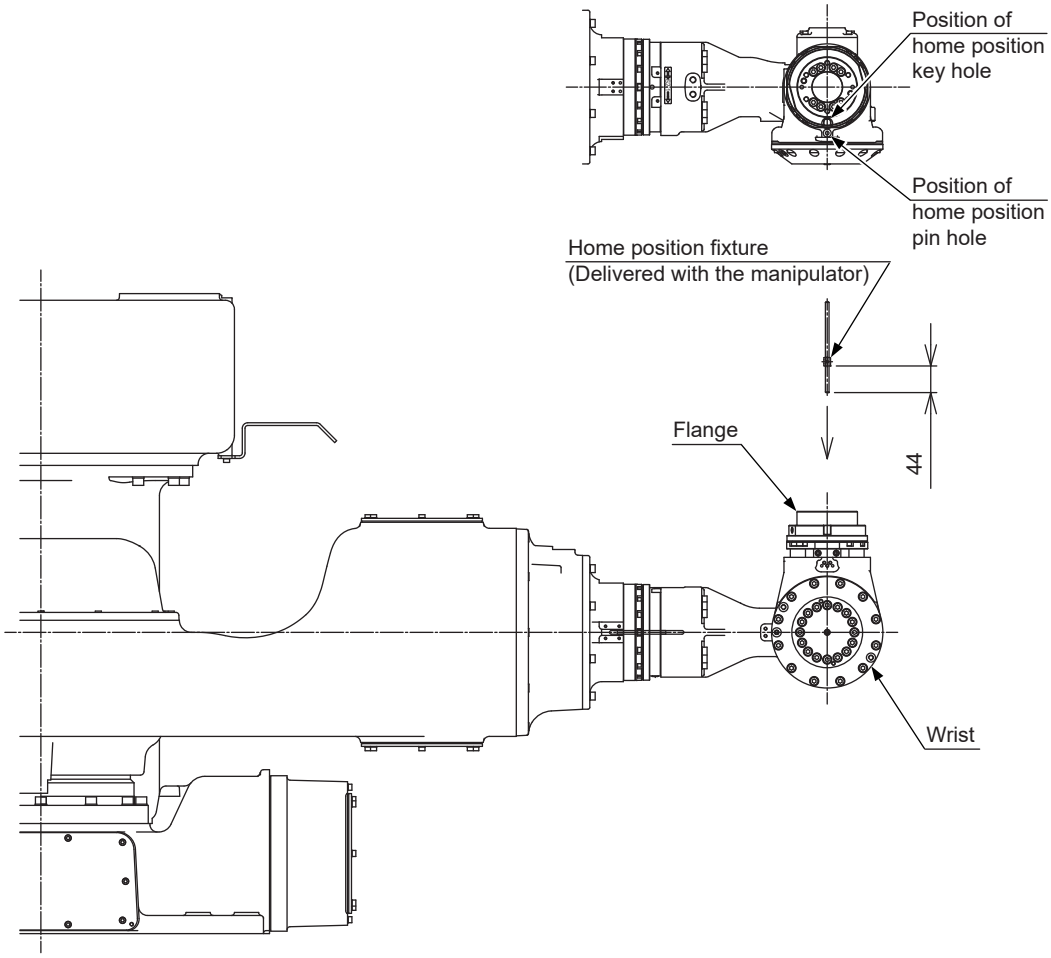
3. S2-2- and S3-2-axis Positioning
   As shown in *fig. 3-4 "S2-2- and S3-2-axis Positioning"* , perform positioning by using the programming pendant so that the pin fits into the hole provided at the location shown in the figure.

Fig. 3-4: S2-2- and S3-2-axis Positioning



4. S2-3- and S3-3-axis Positioning
   As shown in *fig. 3-5 “S2-3- and S3-3-axis Positioning”* , perform positioning by using the programming pendant so that the pin and the key fit into the hole and the groove provided at the locations shown in the figure.

Fig. 3-5: S2-3- and S3-3-axis Positioning



3.3.3 Using Encoder Backup Error Recovery Function

For details on the encoder backup error recovery function, refer to “DX200 INSTRUCTIONS” (RE-CTO-A220).

4 Grease Replenishment/Exchange

4.1 Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers

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

NOTE

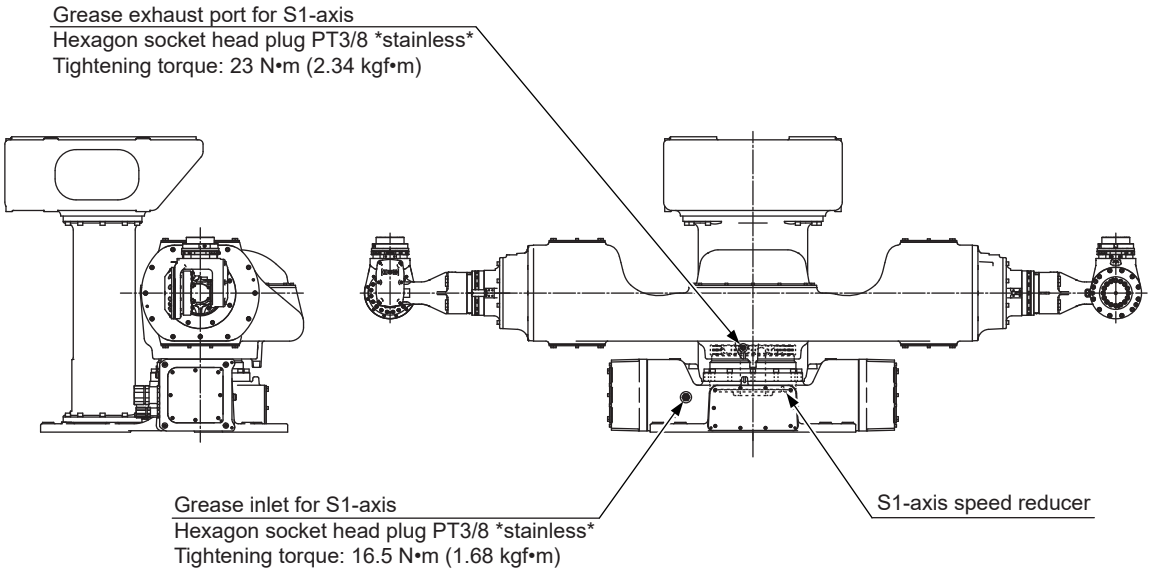
- If grease is injected without removing the plug from the grease exhaust port, the grease will leak inside a motor, or an oil seal of a speed reducer will come off. Make sure to remove the plug and inject grease.
  Also, when using a tube, the length must be 150 mm or shorter and the inside diameter must be 6 mm or longer. If the tube is too long, the exhaust resistance at the tube part is increased, and the inner pressure of the grease bath is raised. It may result in coming off of an oil seal.
- Make sure to use a grease pump to inject grease. Set air supply pressure to the grease pump at 0.3 MPa or less, and the grease injection rate at 7 g/s or less.
- When using extrusion air for discharging the grease, set air supply pressure at 0.025 MPa or less.
  If the air supply pressure is higher than above mentioned value, an oil seal of a speed reducer will come off, and it may result in a failure.
- When using extrusion air for discharging grease, grease may be vigorously discharged from the exhaust port. Perform an operation such as using a tube at the grease exhaust port to pour into an appropriate container.
- Make sure to fill the hose on the grease inlet with grease beforehand to prevent air from leaking into the speed reducer.
- After injecting grease, discharge the specified amount of grease. If insufficient, the inner pressure is raised during the operation, and grease may leak. When discharged too much, the speed reducer is not lubricated sufficiently during the operation, and it may cause the early failure of the speed reducer.
- When filling/replacing grease, the grease may flow out from the grease inlet or the grease exhaust port. Prepare a container to receive the grease and a waste cloth to wipe the grease in advance.
- After mounting a speed reducer or a motor, wait for 30 minutes or more, and then inject grease. If grease is filled before the sealing bond is solidified, it may cause grease to leak.

WARNING

When operating the manipulator, do not enter into the working area of the manipulator. Injury may result if anyone enter into the working area during operation.

4 Grease Replenishment/Exchange
4.1 Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers

Fig. 4-1(a): Grease-Up Procedure for S1-axis Speed Reducer



4 Grease Replenishment/Exchange
4.1 Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers

Fig. 4-1(b): Grease-Up Procedure for S2-1-, S3-1-axis Speed Reducer

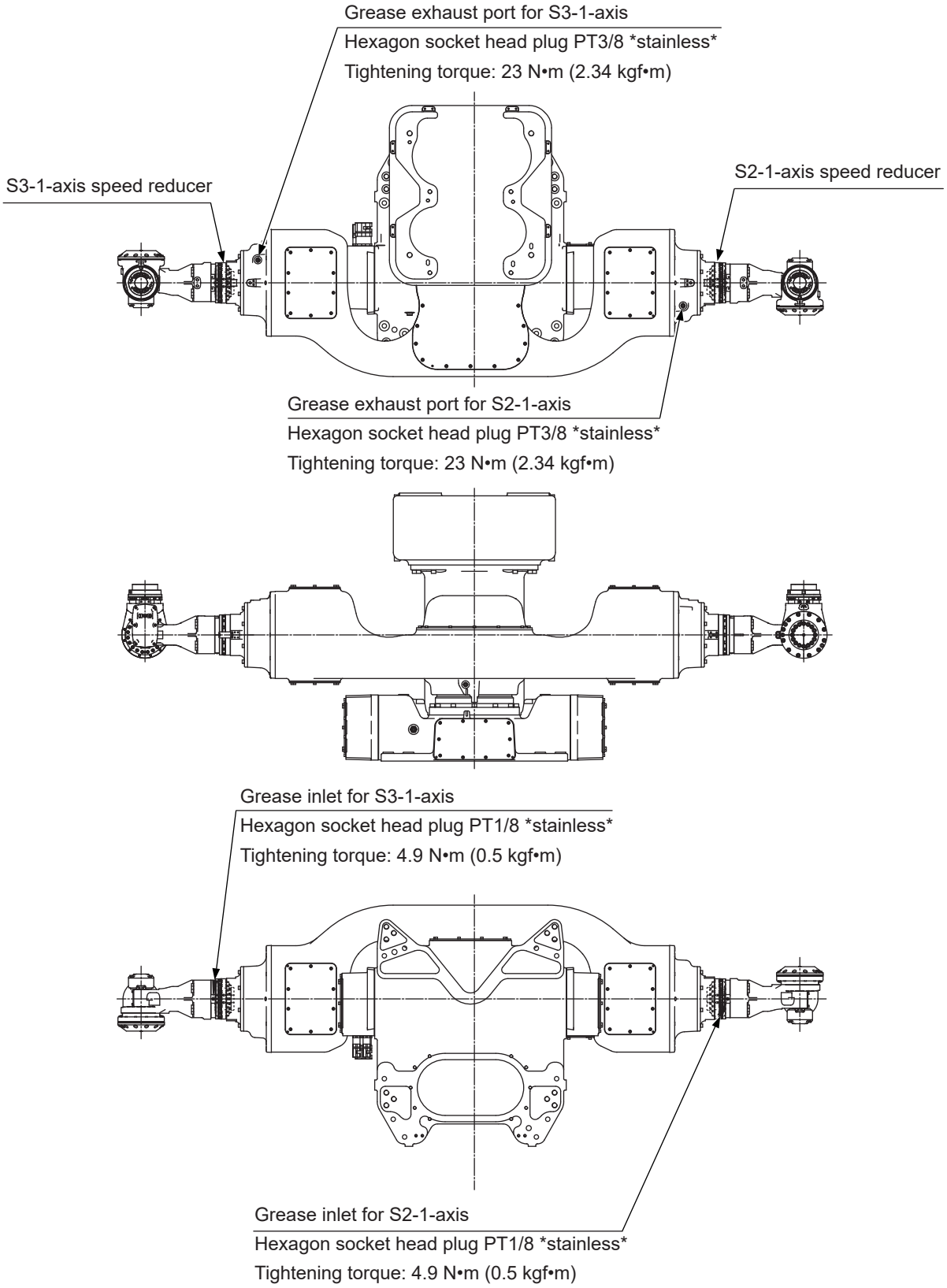
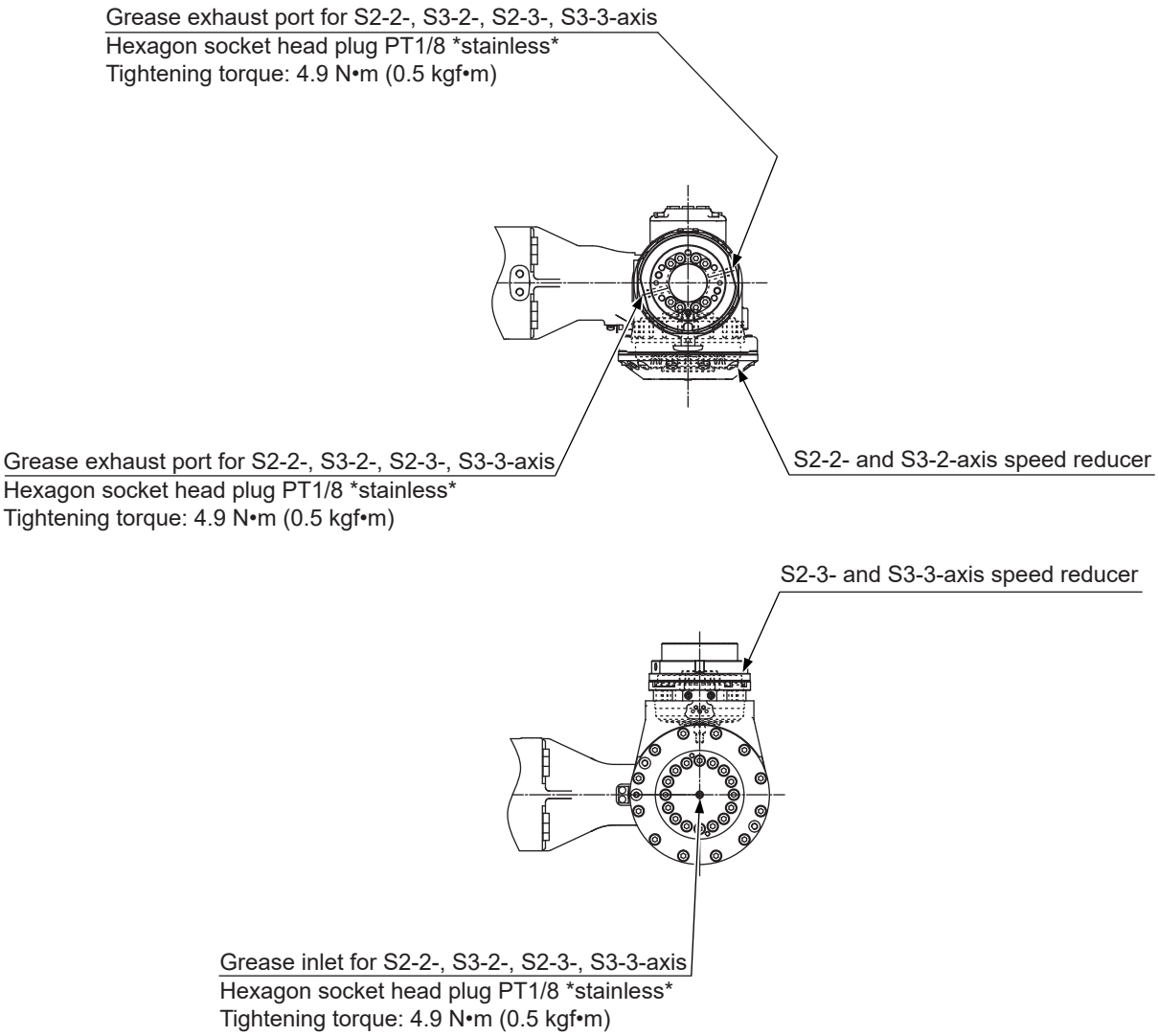


Fig. 4-1(c): Grease-Up Procedure for S2-2-, S3-2-, S2-3-, and S3-3-axis Speed Reducer



1. Before injecting grease, move the robot to the posture shown in *table 4-1 "Recommended posture for grease injection"* .
   If the recommended posture cannot be obtained due to outfitting or other reasons, position the robot so that the inlet port is at the bottom and the exhaust port is at the top as much as possible. If the exhaust port is positioned too low, the grease may not be fully replaced.

Table 4-1: Recommended posture for grease injection

Setting condition	**Inlet axis**	**Posture**						
		S1-axis	S2-1-axis	S2-2-axis	S2-3-axis	S3-1-axis	S3-2-axis	S3-3-axis
Floor-mounted	S1-axis	Any	Any	Any	Any	Any	Any	Any
	S2-1-, S3-1-axis	Any	0°	Any	Any	0°	Any	Any
	S2-2-, S3-2-, S2-3-, S3-3-axis	Any	0°	0°	0°	0°	0°	0°

2. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.
3. Install a grease zerk A-PT1/8 or A-PT3/8 to the grease inlet.
   (The grease zerk is delivered with the manipulator.)

4. Inject the grease through the grease inlet using a grease gun.
   - Grease type: RV grease LB00
   - Recommended grease lubricator: Air-operated grease gun (e.g., Powerlube P3C made by Macnaught)
   - Amount of grease: 7 g/s or less
     (For example, if grease is supplied from the lubricator at 2 times/s, set the amount to 3.5 g/time or less.)
   - Air supply pressure of grease pump: Approximately 0.3 MPa or less

Table 4-2: Amount of Grease

Axis to exchange grease	**Amount of grease**
S1-axis	Approx. 2100 g
S2-1-, S3-1-axis	Approx. 2800 g
S2-2-, S3-2-, S2-3-, S3-3-axis S2-2-, S3-2-, S2-3-, S3-3-axis gears	Approx. 580 g

5. Injection stop:
   - <When replacing the speed reducer>
     Stop injecting grease when grease can be seen from the exhaust port.
   - <When exchanging grease>
     The old grease is discharged from the grease exhaust port. At this time, stop injection when the mixture of the old grease and the new grease in an equal ratio is seen.
     * Proceed to step 8.
6. Operate each axis about 5 times in the teach mode as shown in *table 4-3 “Teaching Operation for Each Axis”* .

Table 4-3: Teaching Operation for Each Axis

Axis to replenish grease	**Angle for teaching operation**	**Speed for teaching operation**
S1-axis	S1-axis ±45°	Any
S2-1-, S3-1-, S2-2-, S3-2-, S2-3-, S3-3-axis S2-1-, S3-1-, S2-2-, S3-2-, S2-3-, S3-3-axis gears	S2-1-, S3-1-axis ±45°	
	S2-2-, S3-2-axis ±30°	
	S2-3-, S3-3-axis ±45°	

7. Inject grease again, and when grease comes out of the exhaust port, grease injection is completed.

8. Discharge the specified amount of grease from the grease inlet or grease exhaust port. (Refer to *table 4-4 "Amount of Grease Discharged from Each Axis"* .) In order to discharge the specified amount of grease, receive the discharged grease by using a container, and then measure the weight of the discharged grease by weighing the container till the amount reaches to the specified amount.
   Use one of the following methods to discharge grease.

   Method 1: Extruding grease by air

   (1) Connect the joint and the hose to the grease inlet.

   (2) Connect the regulator to the grease exhaust port.

   (3) Inject air from the grease exhaust port to extrude grease by air. (Extrusion air pressure: 0.025 MPa or less)

   (4) If the grease is not discharged enough by injecting air, operate the manipulator about 5 times in the teach mode as shown in *table 4-3 "Teaching Operation for Each Axis"* .

   Method 2: Suctioning grease out

   (1) Keep the inlet open and insert the tube into the exhaust port.

   (2) Discharge grease by suctioning grease out of the exhaust port. (Suction pressure: 0.025 MPa or less)

   (3) If grease is not discharged by suctioning, operate the manipulator again about 5 times in the teach mode as shown in *table 4-3 "Teaching Operation for Each Axis"* .

Table 4-4: Amount of Grease Discharged from Each Axis

Manipulator mounting method	**Axis**	**Amount of exhausted grease**	
		[g]	**[cc]**
Floor-mounted	S1-axis	105±15	115±15
	S2-1-, S3-1-axis	140±20	155±20
	S2-2-, S3-2-, S2-3-, S3-3-axis S2-2-, S3-2-, S2-3-, S3-3-axis gears	30±5	35±5

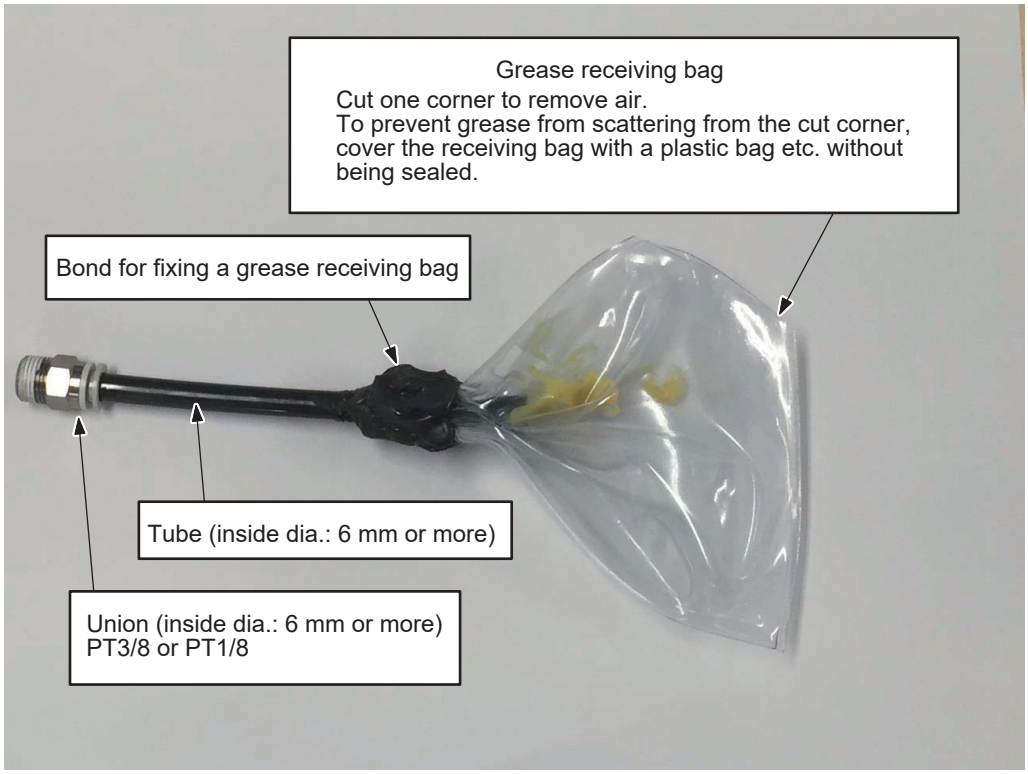
9. For the axis where grease is exchanged, perform a playback operation indicated in *table 4-5 "Running-In Operation for Each Axis"* for running-in the speed reducer with grease.
   At this time, grease may be discharged during the operation.
   Remove the grease zerk from the grease inlet, and clean and degrease the tap part and the thread part of the plug. Wrap the seal tape TB4501 around the plug, then, mount the grease zerk at inlet ports. Also, discharge the excess grease in order not to increase the inner pressure of the speed reducer. Attach a bag to receive grease such as indicated in *fig. 4-2 "Grease Receiving Bag (Rough Standard)"* , and then perform the running-in operation.

Table 4-5: Running-In Operation for Each Axis

Axis to exchange grease	**Running-in operation**			
	Operation angle	Operation speed	Timer after each operation	Operating time
S1-axis	S1-axis ±45°	MOVJ VJ=50.00	1.0 s	15 minutes
S2-1-, S3-1-, S2-2-, S3-2-, S2-3-, S3-3-axis S2-1-, S3-1-, S2-2-, S3-2-, S2-3-, S3-3-axis gears	S2-1-, S3-1-axis ±90°	MOVJ VJ=50.00	1.0 s	15 minutes
	S2-2-, S3-2-axis ±30°			
	S2-3-, S3-3-axis ±90°			

10. Wipe the discharged grease with a cloth, and reinstall the plug. Clean and degrease the tap part and the thread part of the plug. Wrap the seal tape TB4501 around the plug, then, mount the grease zerk at exhaust ports.

Fig. 4-2: Grease Receiving Bag (Rough Standard)



5 Disassembly and Reassembly of Arm Unit Assembly

DANGER

The MOTOFEEDER TILT-MTP5026 is a pressurized explosion-proof apparatus in which high-pressure air is contained.
Do not loosen the fixing bolts of the arm unit and the cover on the manipulator when high-pressure air remains inside the manipulator.
Failure to observe this instruction may result in serious personal injury.

Before loosening the fixing bolts of the arm unit and the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

NOTE

Refer to *chapter 2 "Notes for Maintenance"* , *chapter 3 "Home Position Return"* , and *chapter 4 "Grease Replenishment/Exchange"* .

If you replace the motor, you don't need to insert the backup battery.

Remove old sealing bond from each part before reassembling.

5.1 Disassembly and Reassembly of Arm Unit Assembly

• Refer to *fig. 5-1 "Disassembly and Reassembly of Arm Unit Assembly"* .

NOTE Refer to *chapter 2 "Notes for Maintenance"* and *chapter 3 "Home Position Return"* .

CAUTION

- Before removing the arm unit and the cover, make sure to shut off the internal pressure air supply and that there is no residual pressure in the manipulator.

■ Disassembly

1. Turn OFF the DX200 power supply.
2. Unscrew the hexagon socket head cap screws ①, and then remove the cover ③ from the S-head ②.
3. Connect the battery pack to the connectors of the motor encoder cables on the relays. (Refer to *chapter 2.3 "Battery Pack Replacement"* .)
   (Connection of the battery pack is not necessary when the motor is to be replaced.)
4. Disconnect the connectors connected to the base of the S-head and the arm on the relays.
5. Confirm the load center position in *fig. 5-1 "Disassembly and Reassembly of Arm Unit Assembly"* , and then support the arm unit ④ with a chain block, etc.
6. Unscrew the hexagon socket head cap screws ⑤, and then remove the arm unit ④ from the S-head ② using the tapped hole on the arm unit ④.
7. Remove the old sealing bond.

■ Reassembly

1. Apply ThreeBond 1206C to the contact surface of the arm unit ④ and the S-head ②.
2. Mount the arm unit ④ to the S-head ②, and then tighten the hexagon socket head cap screws ⑤ with the tightening torque shown in *table 5-1 "Arm Unit Assembly Parts Checklist"* .
3. Connect the cables of the base of the S-head and the arm to the connectors on the relays.
4. Disconnect the battery pack from the relays, and then protect the connectors of the wire harnesses in the manipulator with tape.
   (Refer to *chapter 2.3 "Battery Pack Replacement"* .)

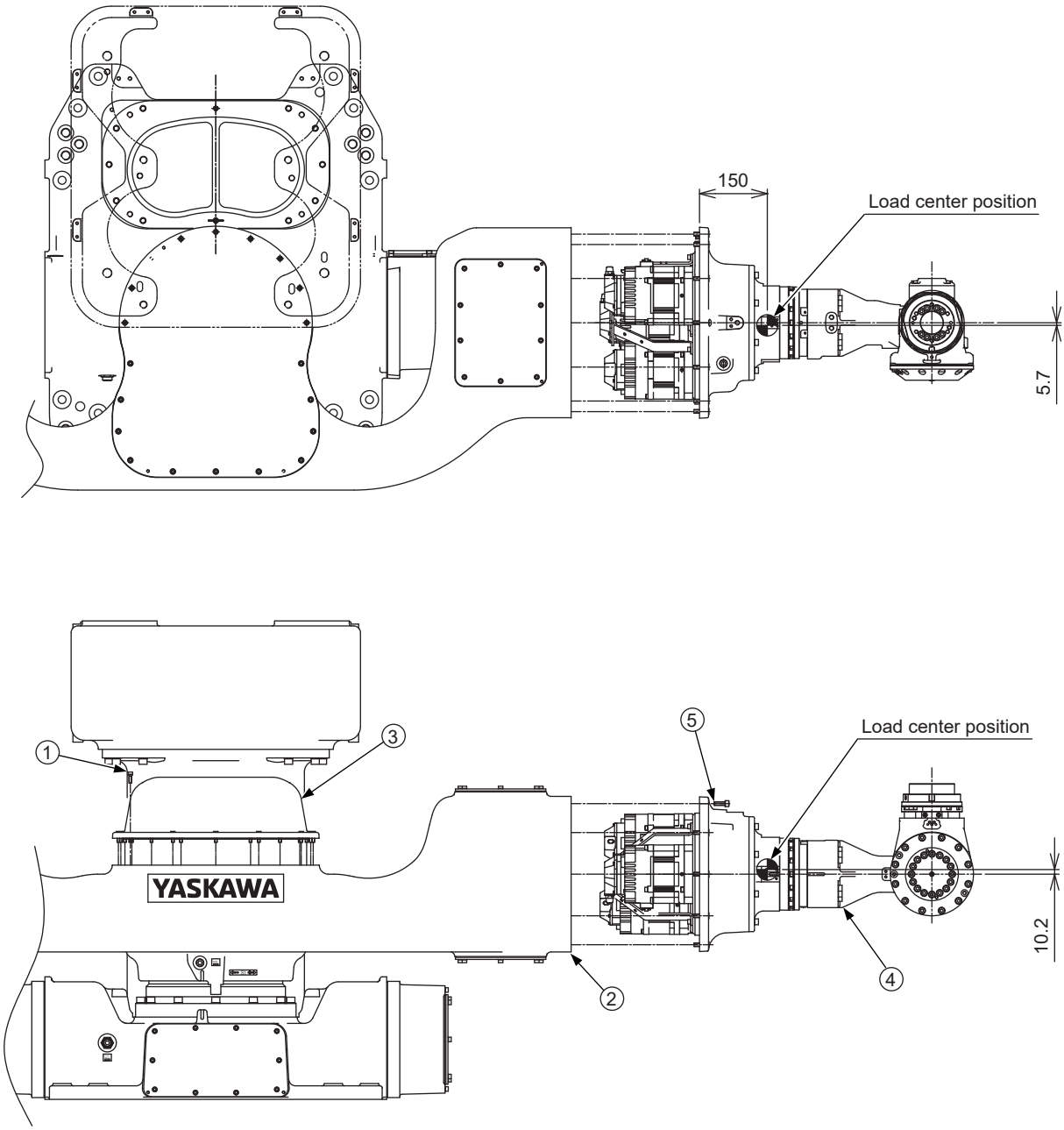
5. Mount the cover ③ to the S-head ② by using the hexagon socket head cap screws ①, and then tighten them with the tightening torque shown in *table 5-1 "Arm Unit Assembly Parts Checklist"* .
6. Turn ON the DX200 power supply.

Table 5-1: Arm Unit Assembly Parts Checklist

No	Item	Qty	Remark
①	Hexagon socket head cap screw M6 (length: 18 mm) *trivalent chromium* Conical spring washer 2H-6 *trivalent chromium*	20 each	Tightening torque: 10 N•m (1.0 kgf•m)
②	S-head HW2100314-1	1	
③	Cover (S1) HW2200211-1 Gasket (S1) HW2402685-1	1 each	Adhere the gasket to the cover.
④	Arm unit assembly	1	
⑤	Hexagon socket head cap screw M8 (length: 25 mm) Conical spring washer 2L-8	12 each	Tightening torque: 40 N•m (4.1 kgf•m)

*The quantity shown below is for one arm.

Fig. 5-1: Disassembly and Reassembly of Arm Unit Assembly



6 Disassembly and Reassembly of Motor

6.1 Disassembly and Reassembly of S1-axis Motor

• Refer to *table 6-1 "S1-axis Motor Parts Checklist"* and *fig. 6-1 "Disassembly and Reassembly of S1-axis Motor"* .

CAUTION

- Before removing the arm unit and the cover, make sure to shut off the internal pressure air supply.

■ Disassembly

1. Turn OFF the DX200 power supply.
2. Unscrew the hexagon socket head cap screws ①, and then remove the cover ③ from the S-head ②.
3. Disconnect the cables (encoder, power, and brake cables) of the S1-axis motor ④ from the S1-axis motor ④.
4. Unscrew the hexagon socket head cap screws ⑤, and then remove the S1-axis motor unit assembly ⑬ from the S-head ②.
   (In the S1-axis motor unit assembly ⑬, the S1-axis motor ④, M-base ⑥, gear ⑨, hexagon socket head cap screws ⑦, ⑩, and key ⑪ are assembled.)
   If it is difficult to remove the S1-axis motor unit assembly, remove the plug from the grease exhaust port or the grease inlet port of the S1-axis speed reducer to release the negative pressure inside the speed reducer.
   (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
5. Remove the O-ring ⑫ from the M-base ⑥, and then wipe off the old grease.
   Replace the O-ring ⑫ if it is worn out.
6. Unscrew the hexagon socket head cap screw ⑩, and then remove the gear ⑨ and key ⑪ from the S1-axis motor unit assembly ⑬.
7. Unscrew the hexagon socket head cap screws ⑦, and then remove the S1-axis motor ④ from the M-base ⑥.
   Wipe off the old grease on the oil seals ⑧.
8. Remove the old sealing bond.

■ Reassembly

1. Replenish grease MP-1 to the lip part of the oil seals ⑧.
   (Refer to *fig. 6-1 "Disassembly and Reassembly of S1-axis Motor"* "Details of A".)
2. Mount the S1-axis motor ④ to the M-base ⑥ by using the hexagon socket head cap screws ⑦, and then tighten them with the tightening torque shown in *table 6-1 "S1-axis Motor Parts Checklist"* .
3. Mount the key ⑪ to the S1-axis motor ④.
4. Apply ThreeBond 1206C to the contact surface of the S1-axis motor ④ and the gear ⑨ (refer to "Details of A" in *fig. 6-1 "Disassembly and Reassembly of S1-axis Motor"*), and then mount the gear ⑨.

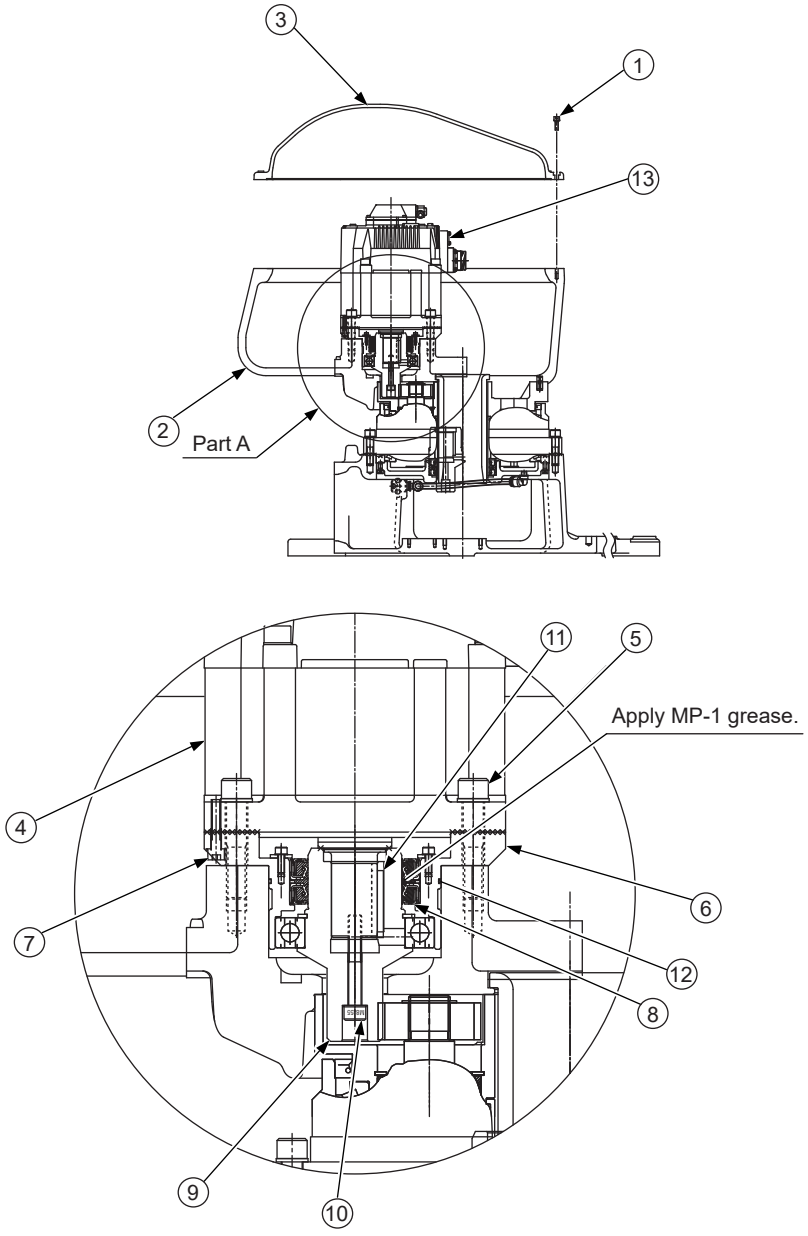
5. Pass the conical spring washer through the hexagon socket head cap screw ⑩, apply LOCTITE 243 to the thread part, and then tighten the screw with the tightening torque shown in *table 6-1 "S1-axis Motor Parts Checklist"*.
6. Apply grease MP-1 to the O-ring ⑫, and then assemble the O-ring ⑫ to the M-base ⑥.
7. Mount the S1-axis motor unit assembly ⑬ with the M-base ⑥, oil seals ⑧, gear ⑨, hexagon socket head cap screws ⑦, ⑩, and key ⑪ assembled to the S1-axis motor ⑬ by using the hexagon socket head cap screws ⑤, and then tighten them with the tightening torque shown in *table 6-1 "S1-axis Motor Parts Checklist"*.
8. Connect the cables (encoder, power, and brake cables) to the S1-axis motor ④.
9. Mount the cover ③ to the S-head ② by using the hexagon socket head cap screws ①, and then tighten them with the tightening torque shown in *table 6-1 "S1-axis Motor Parts Checklist"*.
10. Supply the grease. (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"*.)
11. Turn ON the DX200 power supply.

Table 6-1: S1-axis Motor Parts Checklist

No	Item	Qty	Remark
①	Hexagon socket head cap screw M6 (length: 18 mm) *trivalent chromium* Conical spring washer 2H-6 *trivalent chromium*	20 each	Tightening torque: 10 N•m (1.0 kgf•m)
②	S-head HW2100314-1	1	
③	Cover (S1) HW2200211-1 Gasket (S1) HW2402685-1	1 each	Adhere the gasket to the cover.
④	S1-axis motor	1	SGM7G-37APK-YRA1
⑤	Hexagon socket head cap screw M12 (length: 60 mm) Conical spring washer 2H-12	4 each	Tightening torque: 84.4 N•m (8.6 kgf•m)
⑥	M-base HW1305562-1	1	
⑦	Hexagon socket head cap screw M6 (length: 30 mm) Conical spring washer 2L-6	2 each	Tightening torque: 10 N•m (1.0 kgf•m)
⑧	Oil seal HW9481329-A	2	
⑨	Gear HW2301978-1	1	
⑩	Hexagon socket head cap screw M8 (length: 55 mm) Conical spring washer 2L-8	1 each	Tightening torque: 40 N•m (4.1 kgf•m) Apply LOCTITE 243.
⑪	Key	1	Provided with the motor
⑫	O-ring S100	1	
⑬	S1-axis motor unit assembly	1	Assemble the parts from ④ to ⑫.

6 Disassembly and Reassembly of Motor
6.1 Disassembly and Reassembly of S1-axis Motor

Fig. 6-1: Disassembly and Reassembly of S1-axis Motor



6.2 Disassembly and Reassembly of S2-1- and S3-1-axis Motor

- Refer to *table 6-2 "S2-1- and S3-1-axis Motor Parts Checklist"* and *fig. 6-2 "Disassembly and Reassembly of S2-1- and S3-1-axis Motor"* .

DANGER

- If you remove a motor, the axis corresponding to the removed motor will move freely, which leads to falling of the axis due to gravity. Steady the axis with a chain block, etc. so that the axis does not move.

CAUTION

- Before removing the arm unit assembly and the cover, make sure to shut off the internal pressure air supply.

■ Disassembly

1. Turn OFF the DX200 power supply.
2. Remove the arm unit assembly from the S-head.
   (Refer to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"* .)
3. Disconnect the cables (encoder, power, and brake cables) of the S2-1- and S3-1-axis motor ② from the S2-1- and S3-1-axis motor ②.
4. Unscrew the hexagon socket head cap screws ③, and then remove the S2-1- and S3-1-axis motor unit assembly ⑬ from the gear case ①.
   (In the S2-1- and S3-1-axis motor unit assembly ⑬, the M-base ④, gear ⑦, hexagon socket head cap screws ⑤, ⑧, key ⑨, collar ⑪, and bearing ⑫ are assembled to the S2-1- and S3-1-axis motor ②.)
   If it is difficult to remove the S2-1- and S3-1-axis motor unit assembly ⑬, remove the plug from the grease exhaust port or the grease inlet port of the S2-1- and S3-1-axis speed reducer to release the negative pressure inside the speed reducer.
   (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
5. Remove the O-ring ⑩ from the M-base④, and then wipe off the old grease.
6. Unscrew the hexagon socket head cap screw ⑧, and then remove the gear ⑦, key ⑨, and collar ⑪ from the S2-1- and S3-1-axis motor ②.
7. Unscrew the hexagon socket head cap screws ⑤, and then remove the S2-1- and S3-1-axis motor ② from the M-base ④.
   Wipe off the old grease on the oil seals ⑥.
8. Remove the old sealing bond.

■ Reassembly

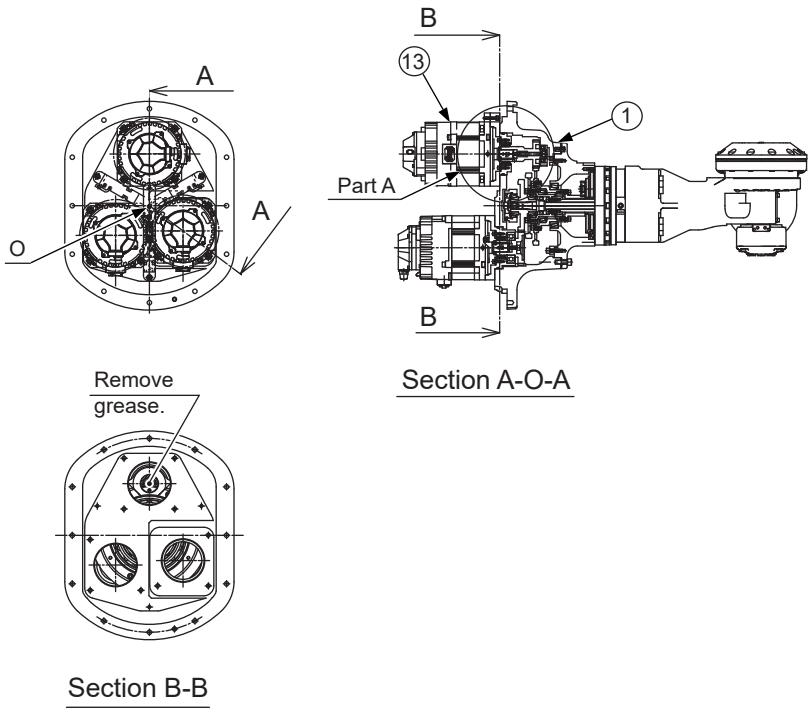
1. Replenish grease MP-1 to the lip part of the oil seals ⑥.
   (Refer to *fig. 6-2 "Disassembly and Reassembly of S2-1- and S3-1-axis Motor"* "Details of A".)
2. Mount the S2-1- and S3-1-axis motor ② to the M-base ④ by using the hexagon socket head cap screws ⑤, and then tighten them with the tightening torque shown in *table 6-2 "S2-1- and S3-1-axis Motor Parts Checklist"* .
3. Apply ThreeBond 1206C to the contact surface of the S2-1- and S3-1-axis motor ② and the collar ⑪ (refer to "Details of A" in *fig. 6-2 "Disassembly and Reassembly of S2-1- and S3-1-axis Motor"*), and then mount the collar ⑪. Then, mount the key ⑨.
4. Apply ThreeBond 1206C to the contact surface of the collar ⑪ and the gear ⑦ (refer to "Details of A" in *fig. 6-2 "Disassembly and Reassembly of S2-1- and S3-1-axis Motor"*), and then mount the gear ⑦.
5. Pass the conical spring washer through the hexagon socket head cap screw ⑧, apply LOCTITE 243 to the thread part, and then tighten the screw with the tightening torque shown in *table 6-2 "S2-1- and S3-1-axis Motor Parts Checklist"* .
6. Apply grease MP-1 to the O-ring ⑩, and then assemble the O-ring ⑩ to the M-base ④.
7. Remove grease from the gear case ①, the tip of the gears ② and ⑦, and the installation part of the bearing ⑫.
   (Refer to "Section B-B" in *fig. 6-2 "Disassembly and Reassembly of S2-1- and S3-1-axis Motor"* .)
8. Mount the S1-axis motor unit assembly ⑬ with the M-base ④, oil seals ⑥, gear ⑦, hexagon socket head cap screws ⑤, ⑧, and key ⑨ assembled to the S2-1- and S3-1-axis motor ② to the gear case ① by using the hexagon socket head cap screws ③, and then tighten them with the tightening torque shown in *table 6-2 "S2-1- and S3-1-axis Motor Parts Checklist"* .
9. Connect the cables (encoder, power, and brake cables) to the S2-1- and S3-1-axis motor ②.
10. Assemble the arm unit assembly to the S-head.
    (Refer to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"* .)
11. Supply the grease. (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
12. Turn ON the DX200 power supply.

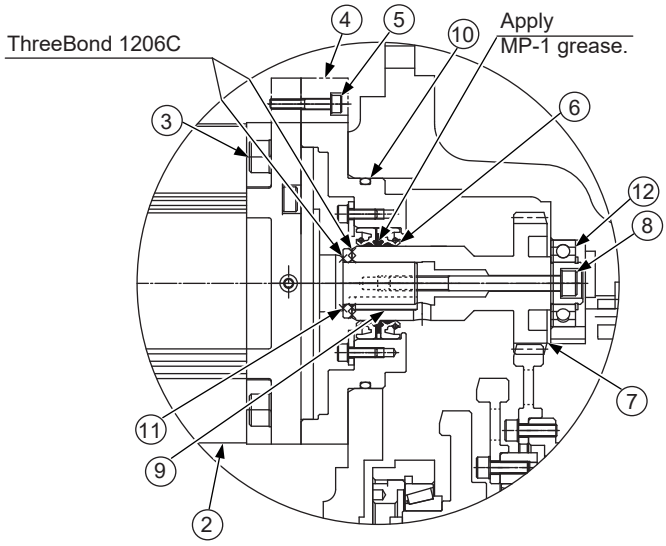
Table 6-2: S2-1- and S3-1-axis Motor Parts Checklist

No	Item	Qty	Remark
①	Gear case HW2200210-1	1	
②	S2-1- and S3-1-axis Motor	1	SGM7G-09APK-YRA1
③	Hexagon socket head cap screw M8 (length: 45 mm) Conical spring washer 2L-8	4 each	Tightening torque: 24.5 N•m (2.5 kgf•m)
④	M-base HW2302402-1	1	
⑤	Hexagon socket head cap screw M4 (length: 25 mm) Conical spring washer 2L-4	2 each	Tightening torque: 2.8 N•m (0.29 kgf•m)
⑥	Oil seal TC30458	2	
⑦	Gear HW2302286-1	1	
⑧	Hexagon socket head cap screw M6 (length: 70 mm) Conical spring washer 2L-6	1 each	Tightening torque: 16.5 N•m (1.7 kgf•m) Apply LOCTITE 243.
⑨	Key	1	Provided with the motor.
⑩	O-ring G80	1	
⑪	Collar HW0400470-1	1	
⑫	Bearing 6003	1	
⑬	S2-1- and S3-1-axis motor unit assembly	1	Assemble the parts from ② to ⑩.

*The quantity shown below is for one arm.

Fig. 6-2: Disassembly and Reassembly of S2-1- and S3-1-axis Motor





6.3 Disassembly and Reassembly of S2-2- and S3-2-axis Motor

- Refer to *table 6-3 "S2-2- and S3-2-axis Motor Parts Checklist"* and *fig. 6-3 "Disassembly and Reassembly of S2-2- and S3-2-axis Motor"* .

DANGER

- If you remove a motor, the axis corresponding to the removed motor will move freely, which leads to falling of the axis due to gravity. Steady the axis with a chain block, etc. so that the axis does not move.

CAUTION

- Before removing the arm unit and the cover, make sure to shut off the internal pressure air supply.

■ Disassembly

1. Turn OFF the DX200 power supply.
2. Remove the arm unit assembly from the S-head.
   (Refer to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"* .)
3. Disconnect the cables (encoder, power, and brake cables) of the S2-2- and S3-2-axis motor ② from the S2-2- and S3-2-axis motor ②.
4. Unscrew the hexagon socket head cap screws ③, and then remove the S2-2- and S3-2-axis motor unit assembly ⑬ from the gear case ①.
   (In the S2-2- and S3-2-axis motor unit assembly ⑫, the M-base ④, gear ⑦, hexagon socket head cap screws ⑤, ⑧, key ⑨, and collar ⑪ are assembled to the S2-2- and S3-2-axis motor ②.)
   If it is difficult to remove the S2-2- and S3-2-axis motor unit assembly ⑫, remove the plug from the grease exhaust port or the grease inlet port of the S2-2- and S3-2-axis speed reducer to release the negative pressure inside the speed reducer.
   (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
5. Remove the O-ring ⑩ from the M-base④, and then wipe off the old grease.
6. Unscrew the hexagon socket head cap screw ⑧, and then remove the gear ⑦, key ⑨, and collar ⑪ from the S2-2- and S3-2-axis motor ②.
7. Unscrew the hexagon socket head cap screws ⑤, and then remove the S2-2- and S3-2-axis motor ② from the M-base ④.
   Wipe off the old grease on the oil seals ⑥.
8. Remove the old sealing bond.

■ Reassembly

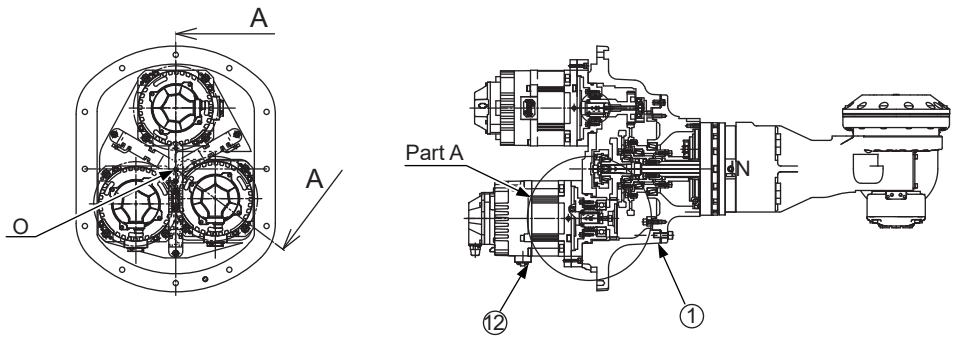
1. Replenish grease MP-1 to the lip part of the oil seals ⑥.
   (Refer to *fig. 6-3 "Disassembly and Reassembly of S2-2- and S3-2-axis Motor"* "Details of A".)
2. Mount the S2-2- and S3-2-axis motor ② to the M-base ④ by using the hexagon socket head cap screws ⑤, and then tighten them with the tightening torque shown in *table 6-3 "S2-2- and S3-2-axis Motor Parts Checklist"* .
3. Apply ThreeBond 1206C to the contact surface of the S2-2- and S3-2-axis motor ② and the collar ⑪ (refer to "Details of A" in *fig. 6-3 "Disassembly and Reassembly of S2-2- and S3-2-axis Motor"*), and then mount the collar ⑪. Then, mount the key ⑨.
4. Apply ThreeBond 1206C to the contact surface of the collar ⑪ and the gear ⑦ (refer to "Details of A" in *fig. 6-3 "Disassembly and Reassembly of S2-2- and S3-2-axis Motor"*), and then mount the gear ⑦.
5. Pass the conical spring washer through the hexagon socket head cap screw ⑧, apply LOCTITE 243 to the thread part, and then tighten the screw with the tightening torque shown in *table 6-3 "S2-2- and S3-2-axis Motor Parts Checklist"* .
6. Apply grease MP-1 to the O-ring ⑩, and then assemble the O-ring ⑩ to the M-base ④.
7. Mount the S2-2- and S3-2-axis motor unit assembly ⑫ with the M-base ④, oil seals ⑥, gear ⑦, hexagon socket head cap screws ⑤, ⑧, and key ⑨ assembled to the S2-2- and S3-2-axis motor ② to the gear case ① by using the hexagon socket head cap screws ③, and then tighten them with the tightening torque shown in *table 6-2 "S2-1- and S3-1-axis Motor Parts Checklist"* .
8. Connect the cables (encoder, power, and brake cables) to the S2-2- and S3-2-axis motor ②.
9. Assemble the arm unit assembly to the S-head.
   (Refer to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"* .)
10. Supply the grease. (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
11. Turn ON the DX200 power supply.

Table 6-3: S2-2- and S3-2-axis Motor Parts Checklist

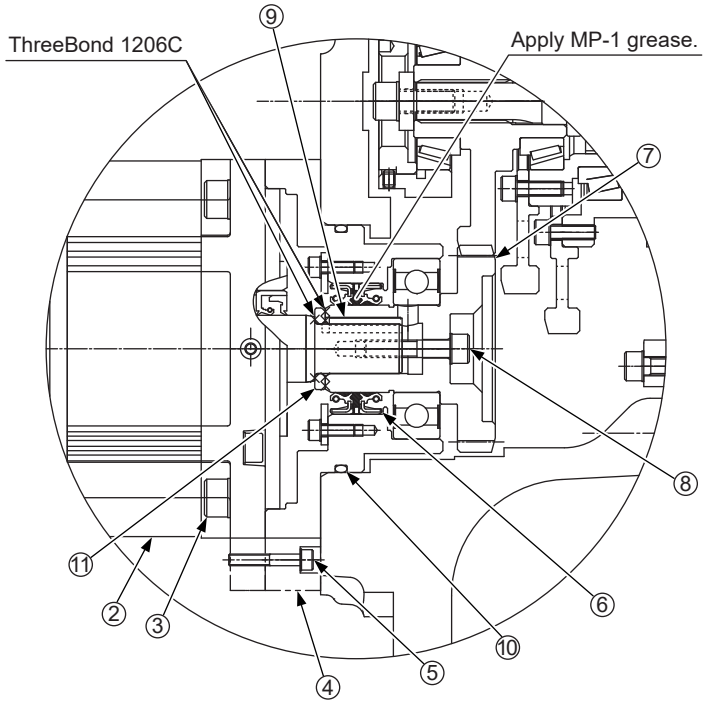
No	Item	Qty	Remark
①	Gear case HW2200210-1	1	
②	S2-2- and S3-2-axis motor	1	SGM7G-09APK-YRA1
③	Hexagon socket head cap screw M8 (length: 45 mm) Conical spring washer 2L-8	4 each	Tightening torque: 24.5 N•m (2.5 kgf•m)
④	M-base HW2302288-1	1	
⑤	Hexagon socket head cap screw M4 (length: 25 mm) Conical spring washer 2L-4	2 each	Tightening torque: 2.8 N•m (0.29 kgf•m)
⑥	Oil seal TC30458	2	
⑦	Gear HW2302287-1	1	
⑧	Hexagon socket head cap screw M6 (length: 35 mm) Conical spring washer 2L-6	1 each	Tightening torque: 16.5 N•m (1.7 kgf•m) Apply LOCTITE 243.
⑨	Key	1	Provided with the motor.
⑩	O-ring G80	1	
⑪	Collar HW0400470-1	1	
⑫	S2-2- and S3-2-axis motor unit assembly	1	Assemble the parts from ② to ⑪.

*The quantity shown below is for one arm.

Fig. 6-3: Disassembly and Reassembly of S2-2- and S3-2-axis Motor



Section A-O-A



Details of A

6.4 Disassembly and Reassembly of S2-3- and S3-3-axis Motor

• Refer to *table 6-4 "S2-3- and S3-3-axis Motor Parts Checklist"* and *fig. 6-4 "Disassembly and Reassembly of S2-3- and S3-3-axis Motor"* .

DANGER

- If you remove a motor, the axis corresponding to the removed motor will move freely, which leads to falling of the axis due to gravity. Steady the axis with a chain block, etc. so that the axis does not move.

CAUTION

- Before removing the arm unit assembly and the cover, make sure to shut off the internal pressure air supply.

■ Disassembly

1. Turn OFF the DX200 power supply.
2. Remove the arm unit assembly from the S-head.
   (Refer to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"* .)
3. Disconnect the cables (encoder, power, and brake cables) of the S2-3- and S3-3-axis motor ② from the S2-3- and S3-3-axis motor ②.
4. Unscrew the hexagon socket head cap screws ③, and then remove the S2-3- and S3-3-axis motor unit assembly ⑫ from the gear case ①.
   (In the S2-3- and S3-3-axis motor unit assembly ⑫, the M-base ④, gear ⑦, hexagon socket head cap screws ⑤, ⑧, key ⑨, and collar ⑪ are assembled to the S2-3- and S3-3-axis motor ②.)
   If it is difficult to remove the S2-3- and S3-3-axis motor unit assembly ⑫, remove the plug from the grease exhaust port or the grease inlet port of the S2-3- and S3-3-axis speed reducer to release the negative pressure inside the speed reducer.
   (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
5. Remove the O-ring ⑩ from the M-base④, and then wipe off the old grease.
6. Unscrew the hexagon socket head cap screw ⑧, and then remove the gear ⑦, key ⑨, and collar ⑪ from the S2-3- and S3-3-axis motor ②.
7. Unscrew the hexagon socket head cap screws ⑤, and then remove the S2-3- and S3-3-axis motor ② from the M-base ④.
   Wipe off the old grease on the oil seals ⑥.
8. Remove the old sealing bond.

■ Reassembly

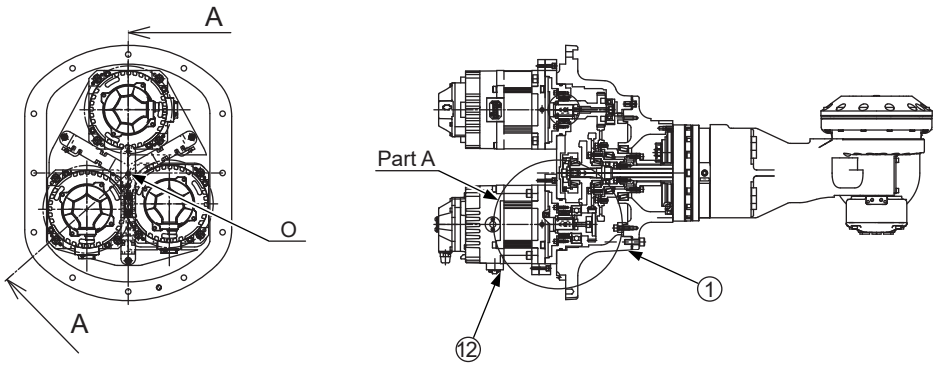
1. Replenish grease MP-1 to the lip part of the oil seals ⑥.
   (Refer to *fig. 6-4 "Disassembly and Reassembly of S2-3- and S3-3-axis Motor"* "Details of A".)
2. Mount the S2-3- and S3-3-axis motor ② to the M-base ④ by using the hexagon socket head cap screws ⑤, and then tighten them with the tightening torque shown in *table 6-4 "S2-3- and S3-3-axis Motor Parts Checklist"* .
3. Apply ThreeBond 1206C to the contact surface of the S2-3- and S3-3-axis motor ② and the collar ⑪ (refer to "Details of A" in *fig. 6-4 "Disassembly and Reassembly of S2-3- and S3-3-axis Motor"*), and then mount the collar ⑪. Then, mount the key ⑨.
4. Apply ThreeBond 1206C to the contact surface of the collar ⑪ and the gear ⑦ (refer to "Details of A" in *fig. 6-4 "Disassembly and Reassembly of S2-3- and S3-3-axis Motor"*), and then mount the gear ⑦.
5. Pass the conical spring washer through the hexagon socket head cap screw ⑧, apply LOCTITE 243 to the thread part, and then tighten the screw with the tightening torque shown in *table 6-4 "S2-3- and S3-3-axis Motor Parts Checklist"* .
6. Apply grease MP-1 to the O-ring ⑩, and then assemble the O-ring ⑩ to the M-base ④.
7. Mount the S2-3- and S3-3-axis motor unit assembly ⑫ with the M-base ④, oil seals ⑥, gear ⑦, hexagon socket head cap screws ⑤, ⑧, and key ⑨ assembled to the S2-3- and S3-3-axis motor ② to the gear case ① by using the hexagon socket head cap screws ③, and then tighten them with the tightening torque shown in *table 6-4 "S2-3- and S3-3-axis Motor Parts Checklist"* .
8. Connect the cables (encoder, power, and brake cables) to the S2-3- and S3-3-axis motor ②.
9. Assemble the arm unit assembly to the S-head.
   (Refer to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"* .)
10. Supply the grease. (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
11. Turn ON the DX200 power supply.

Table 6-4: S2-3- and S3-3-axis Motor Parts Checklist

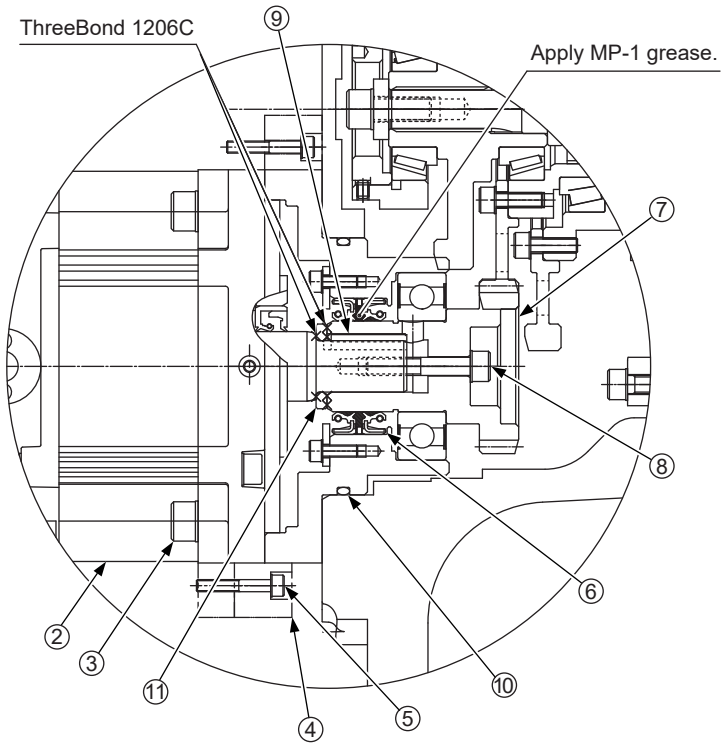
No	Item	Qty	Remark
①	Gear case HW2200210-1	1	
②	S2-3- and S3-3-axis motor	1	SGM7G-09APK-YRA1
③	Hexagon socket head cap screw M8 (length: 45 mm) Conical spring washer 2L-8	4 each	Tightening torque: 24.5 N•m (2.5 kgf•m)
④	M-base HW2302288-1	1	
⑤	Hexagon socket head cap screw M4 (length: 25 mm) Conical spring washer 2L-4	2 each	Tightening torque: 2.8 N•m (0.29 kgf•m)
⑥	Oil seal TC30458	2	
⑦	Gear HW2302276-1	1	
⑧	Hexagon socket head cap screw M6 (length: 30 mm) Conical spring washer 2L-6	1 each	Tightening torque: 16.5 N•m (1.7 kgf•m) Apply LOCTITE 243.
⑨	Key	1	Provided with the motor.
⑩	O-ring G80	1	
⑪	Collar HW0400470-1	1	
⑫	S2-3- and S3-3-axis motor unit assembly	1	Assemble the parts from ② to ⑪.

*The quantity shown below is for one arm.

Fig. 6-4: Disassembly and Reassembly of S2-3- and S3-3-axis Motor



Section A-O-A



Details of A

7 Disassembly and Reassembly of Wrist Assembly

7.1 Disassembly and Reassembly of Wrist Assembly

- Refer to *table 7-1 "Wrist Assembly Parts Checklist"* and *fig. 7-1 "Disassembly and Reassembly of Wrist Assembly"* .

■ Disassembly

1. Turn OFF the DX200 power supply.
2. Unscrew the hexagon socket head cap screws ③, and then remove the wrist assembly ① from the flange ② using the tapped hole on the wrist assembly ①.

* Prepare a fully threaded tap bolt M6 (length: 90 mm to 100 mm).

3. Remove the old sealing bond.

■ Reassembly

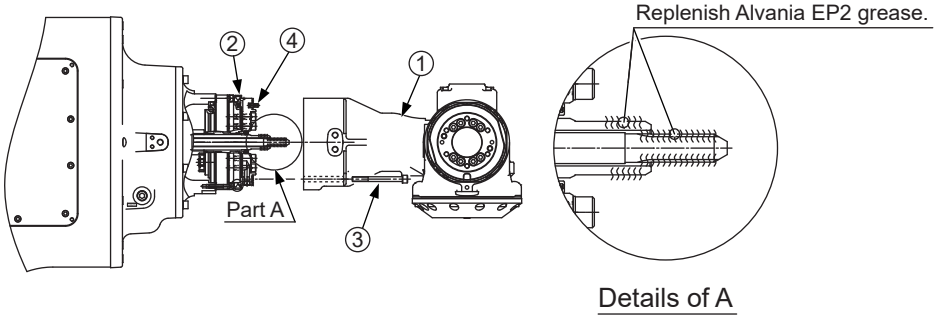
1. Check that the parallel pin ④ is inserted into flange ②, and replenish part A with Alvania EP2 grease. Refer to *fig. 7-1 "Disassembly and Reassembly of Wrist Assembly"* .
2. Apply ThreeBond 1206C to the contact surface of the wrist assembly ① and the flange ②.
3. Mount the wrist assembly ① to the flange ②, and then tighten the hexagon socket head cap screws ③ with the tightening torque shown in *table 7-1 "Wrist Assembly Parts Checklist"* .
4. Turn ON the DX200 power supply.

Table 7-1: Wrist Assembly Parts Checklist

No	Item	Qty	Remark
①	Wrist assembly HW2170956-A	1	
②	Flange HW1308143-1	1	
③	Hexagon socket head cap screw M8 (length: 85 mm) Conical spring washer 2L-8	12 each	Tightening torque: 40 N•m (4.1 kgf•m)
④	Parallel pin HW1408161-6-15	1	

*The quantity shown below is for one arm

Fig. 7-1: Disassembly and Reassembly of Wrist Assembly



8 Disassembly and Reassembly of Speed Reducer

DANGER

The MOTOFEEDER TILT-MTP5026 is a pressurized explosion-proof apparatus in which high-pressure air is contained.
Do not loosen the fixing bolt of the cover on the manipulator when high-pressure air remains inside the manipulator.
Failure to observe this instruction may result in serious personal injury.

Before loosening the fixing bolts of the arm unit and the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

NOTE

Refer to chapter *chapter 2 "Notes for Maintenance"* , *chapter 3 "Home Position Return"* , *chapter 4 "Grease Replenishment/Exchange"* , and *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"* .

Remove old sealing bond from each part before assembling.

8.1 Disassembly and Reassembly of S1-axis Speed Reducer

- Refer to *table 8-1 "S1-axis Speed Reducer Parts Checklist"* , *fig. 8-1(a) "Disassembly and Reassembly of S1-axis Speed Reducer"* , *fig. 8-1(b) "Surface to Apply Sealing Bond on S1-axis Speed Reducer"* and *fig. 8-1(c) "Load Center Position of Arm + Wrist Unit"* .

DANGER

Before loosening the fixing bolt of the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

■ Disassembly

1. Turn OFF the DX200 power supply.
2. Unscrew the hexagon socket head cap screws ①, and then remove the cover ③ from the S-head ②.
3. Connect the battery pack to each of the S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis motors. (Refer to *chapter 2.3 "Battery Pack Replacement"* .) Prepare the number of battery packs (spare parts) required.
4. Unscrew the hexagon socket head cap screws ④, and then remove the cover ⑥ from the base ⑤.
5. Remove the manipulator cable unit. (Refer to chapter 4.2 "Cable and Air Tube Connections" in "MOTOFEEDER TILT-MTP5026 INSTRUCTIONS (HW2481431)".)

6. Disconnect the hose coming out from the wire harness in the manipulator and the elbows ⑨ from the manifolds ⑧.
7. Remove the crimped contact-pin terminal connected to the ground wire. (Refer to “Section C-C” in *fig. 8-1(a) “Disassembly and Reassembly of S1-axis Speed Reducer”* .)
8. Disconnect the connector connected to the battery pack. (Refer to “View D” in *fig. 8-1(a) “Disassembly and Reassembly of S1-axis Speed Reducer”* .)
9. Cut the cable ties ⑩.
10. Pull out the internal wiring harness from the base ⑤ side to S-head ② side.
11. Unscrew the hexagon socket head cap screws ⑪, and then remove the bracket ⑫ and the cable guide ⑬.
12. Remove the S1-axis motor unit assembly ⑦.
(Refer to *chapter 6.1 “Disassembly and Reassembly of S1-axis Motor”* .)
13. Unscrew the hexagon socket head cap screws ⑮ and ⑯, attach a chain block, etc., by referring to *fig. 8-1(c) “Load Center Position of Arm + Wrist Unit”* , and then lift up the upper part of the speed reducer ⑭. Remove the S-head ② from the speed reducer ⑭ using the tapped hole.
14. Remove the tube ⑰ from the joint of the speed reducer ⑭.
15. Unscrew the hexagon socket head cap screws ⑱, and then remove the speed reducer ⑭ from the base ⑤.
16. Remove the old sealing bond.

■ **Reassembly**

1. Apply ThreeBond 1206C to the contact surface of the speed reducer ⑭ and the base ⑤, and then mount the speed reducer ⑭ to the base ⑤. For the place to apply sealing bond, refer to *table 8-1 “S1-axis Speed Reducer Parts Checklist”* .
2. Mount the hexagon socket head cap screws ⑱, and then tighten them with the tightening torque shown in *table 8-1 “S1-axis Speed Reducer Parts Checklist”* .
3. Apply ThreeBond 1206C to the contact surface of the speed reducer ⑭ and the S-head ②. For the place to apply sealing bond, refer to *table 8-1 “S1-axis Speed Reducer Parts Checklist”* .
4. Apply ThreeBond 1206C seamlessly in a string form around the entire circumference of section ① (refer to “Details of a” in *fig. 8-1(a) “Disassembly and Reassembly of S1-axis Speed Reducer”*) on the speed reducer ⑭.
5. Lift the upper part of the S-head ② with a chain block, etc., by referring to *fig. 8-1(c) “Load Center Position of Arm + Wrist Unit”* , align the position of the pin ⑲, and then mount the S-head ② to the speed reducer ⑭.
6. Apply ThreeBond 1206C to the thread part of the hexagon socket head cap screws ⑮ and ⑯, and then tighten them with the tightening torque shown in *table 8-1 “S1-axis Speed Reducer Parts Checklist”* .

7. Place the cable guide ⑬ in the S-head ②, mount the bracket ⑫ by using the hexagon socket head cap screws ⑪, and then tighten them with the tightening torque shown in *table 8-1 "S1-axis Speed Reducer Parts Checklist"* .
8. Mount the S1-axis motor unit ⑦ to the S-head ②.
(Refer to *chapter 6.1 "Disassembly and Reassembly of S1-axis Motor"* .)
9. Put the internal wiring harness through the base side from the S-head ② side.
10. Connect the manipulator cable unit. (Refer to chapter 4.2 "Cable and Air Tube Connections" in "MOTOFEEDER TILT-MTP5026 INSTRUCTIONS (HW2481431)".)
11. Connect the hose coming out from the wire harness in the manipulator and the elbows ⑨ to the manifolds ⑧.
12. Mount the crimped contact-pin terminal connected to the ground wire. (Refer to "Section C-C" in *fig. 8-1(a) "Disassembly and Reassembly of S1-axis Speed Reducer"* .)
13. Connect the connector connected to the battery pack. (Refer to "View D" in *fig. 8-1(a) "Disassembly and Reassembly of S1-axis Speed Reducer"* .)
14. Secure the internal wiring harness to the metal fitting ⑳ with the cable ties ⑩.
15. Mount the tube ⑰ to the speed reducer ⑭.
16. Remove the battery packs from each of the S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis motors.
(Refer to *chapter 2.3 "Battery Pack Replacement"* .)
17. Mount the cover ⑥ to the base ⑤ by using the hexagon socket head cap screws ④, and then tighten them with the tightening torque shown in *table 8-1 "S1-axis Speed Reducer Parts Checklist"* .
18. Mount the cover ③ to the S-head ② by using the hexagon socket head cap screws ①, and then tighten them with the tightening torque shown in *table 8-1 "S1-axis Speed Reducer Parts Checklist"* .

If grease is filled before the sealing bond is solidified, it may cause grease to leak. After tightening the screws, leave it 30 minutes or more, and then fill with grease.

19. Supply the grease.
(Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
20. Turn ON the DX200 power supply.

Table 8-1: S1-axis Speed Reducer Parts Checklist

No	Item	Qty	Remark
①	Hexagon socket head cap screw M6 (length: 18 mm) *trivalent chromium* Conical spring washer 2H-6 *trivalent chromium*	20 each	Tightening torque: 10 N•m (1.0 kgf•m)
②	S-head HW2100314-1	1	
③	Cover (S1) HW2200211-1 Gasket (S1) HW2402685-1	1 each	Adhere the gasket to the cover.
④	Hexagon socket head cap screw M6 (length: 18 mm) *trivalent chromium* Conical spring washer 2H-6 *trivalent chromium*	10 each	Tightening torque: 10 N•m (1.0 kgf•m)
⑤	Base HW2100311-1	1	
⑥	Cover (SB1) HW2302278-A Gasket (SB1) HW2402682-1 Battery pack	1 each	The gasket is adhered to the cover, and the battery pack is installed to the cover.
⑦	S1-axis motor unit assembly	1	SGM7G-37APK-YRA1 Unit assembly
⑧	Manifold KM13-06-10-3	2	
⑨	Elbow KQ2L06-10A	2	
⑩	Cable tie T120R-HSW	2	
⑪	Hexagon socket head cap screw M6 (length: 14 mm) Conical spring washer 2L-6	4 each	Tightening torque: 10 N•m (1.0 kgf•m)
⑫	Bracket HW2302285-1	1	
⑬	Cable guide HW2402817-1	1	
⑭	Speed reducer HW2380782-A	1	F2CF-W55-64
⑮	Hexagon socket head cap screw M12 (length: 40 mm) Conical spring washer 2H-12	18 each	Tightening torque: 142 N•m (14.5 kgf•m)
⑯	Hexagon socket head cap screw M12 (length: 30 mm) Conical spring washer 2H-12	2 each	Tightening torque: 142 N•m (14.5 kgf•m)
⑰	Tube NB-1075-0.36	1	
⑱	Hexagon socket head cap screw M12 (length: 50 mm) Conical spring washer 2H-12	12 each	Tightening torque: 142 N•m (14.5 kgf•m)
⑲	Pin HW1408161-10-25	1	
⑳	Metal fitting HW9403595-1	1	

8 Disassembly and Reassembly of Speed Reducer
8.1 Disassembly and Reassembly of S1-axis Speed Reducer

Fig. 8-1(a): Disassembly and Reassembly of S1-axis Speed Reducer

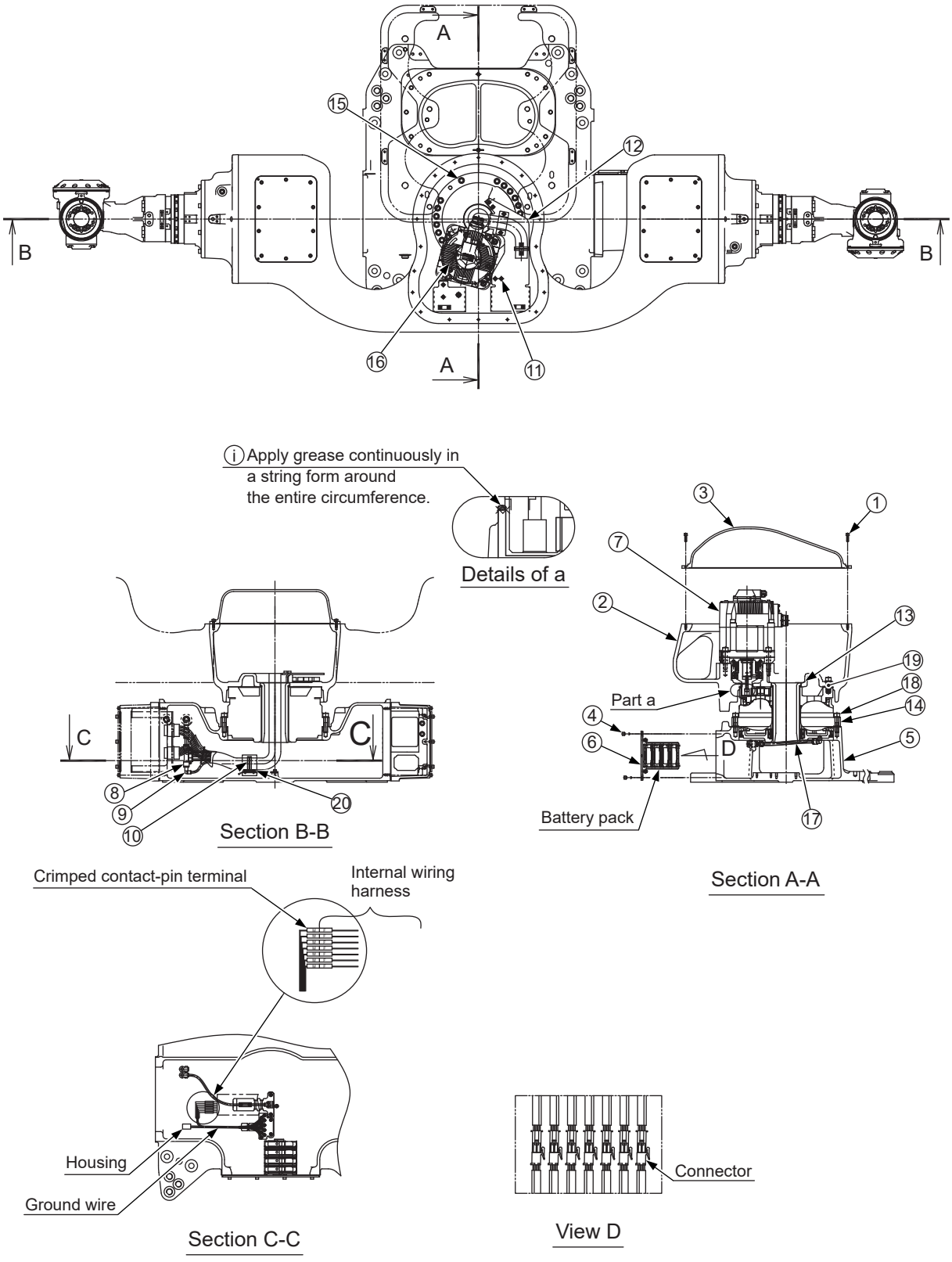


Fig. 8-1(b): Surface to Apply Sealing Bond on S1-axis Speed Reducer

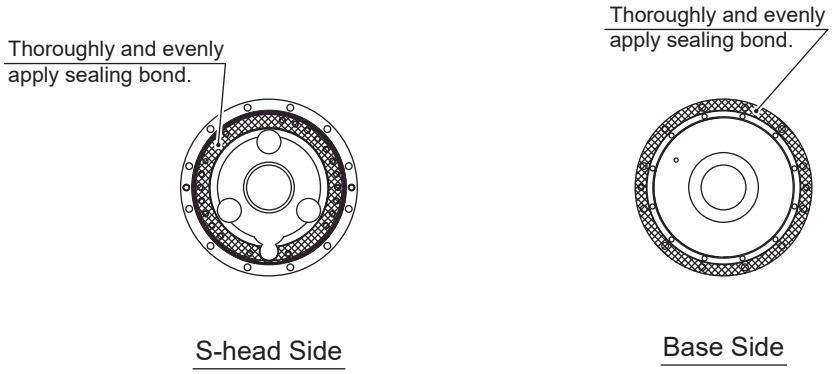
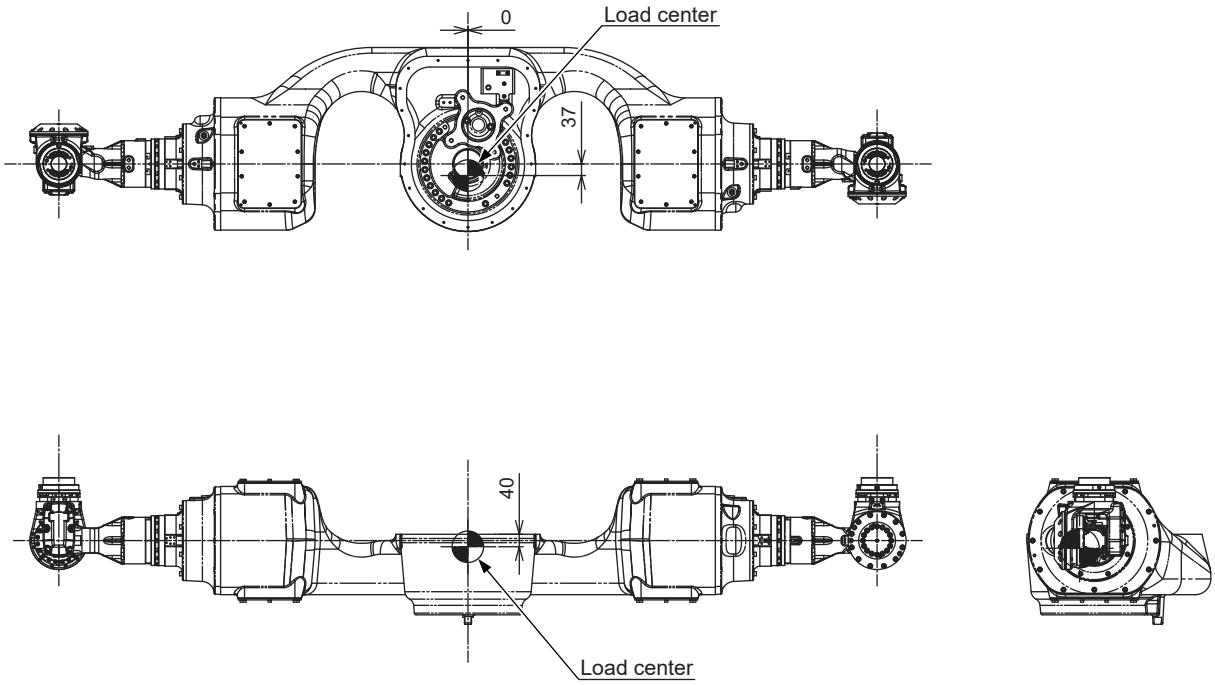


Fig. 8-1(c): Load Center Position of Arm + Wrist Unit



8.2 Disassembly and Reassembly of S2-1- and S3-1-axis Speed Reducer

- Refer to *table 8-2 "S2-1- and S3-1-axis Speed Reducer Parts Checklist"* , *fig. 8-2(a) "Disassembly and Reassembly of S2-1- and S3-1-axis Speed Reducer"* , and *fig. 8-2(b) "Surface to Apply Sealing Bond on S2-1- and S3-1-axis Speed Reducer"* .

DANGER

Before loosening the fixing bolt of the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

■ Disassembly

1. Turn OFF the DX200 power supply.
2. Remove the wrist assembly ⑩. (Refer to *chapter 7.1 "Disassembly and Reassembly of Wrist Assembly"* .)
3. Unscrew the hexagon socket head cap screws ④, and then remove the flange ③. Be careful not to damage the oil seal ⑧ during removal. Wipe off the old grease on the oil seal ⑧.
4. Remove the V-ring ⑦. Wipe off the old grease on the V-ring ⑦.
5. Unscrew the hexagon socket head cap screws ②, and then remove the speed reducer ① from the shaft ⑨.
6. Remove the ring ⑤ from the speed reducer ①.
7. Remove the old sealing bond.

■ Reassembly

1. Mount the ring ⑤ to the speed reducer ①.
2. Apply ThreeBond 1206C to the contact surface of the shaft ⑨ and the speed reducer ①, and then mount the speed reducer ① to the shaft ⑨.
   For the place to apply sealing bond, refer to *fig. 8-2(b) "Surface to Apply Sealing Bond on S2-1- and S3-1-axis Speed Reducer"* .
3. Tighten the hexagon socket head cap screws ② with the tightening torque shown in *table 8-2 "S2-1- and S3-1-axis Speed Reducer Parts Checklist"* .
4. Apply JEX or KDL grease to the lip part (refer to "Details of b" in *fig. 8-2(a) "Disassembly and Reassembly of S2-1- and S3-1-axis Speed Reducer"*) of the V-ring ⑦.
5. Mount the V-ring ⑦ to the speed reducer ①.
6. Apply MP-1 grease to the lip part (refer to "Details of a" in *fig. 8-2(a) "Disassembly and Reassembly of S2-1- and S3-1-axis Speed Reducer"*) of the oil seal ⑧ in the flange ③.

7. Apply ThreeBond 1206C to the contact surface of the speed reducer ① and the flange ③, and then mount the flange ③ to the speed reducer ①.
   For the place to apply sealing bond, refer to *fig. 8-2(b) "Surface to Apply Sealing Bond on S2-1- and S3-1-axis Speed Reducer"*.
   Be careful so that no foreign material gets stuck in the lip part of the oil seal.
8. Tighten the hexagon socket head cap screws ④ with the tightening torque shown in *table 8-2 "S2-1- and S3-1-axis Speed Reducer Parts Checklist"*.
9. Mount the parallel pin ⑥ to the flange ③.
10. Mount the wrist assembly ⑩. (Refer to *chapter 7.1 "Disassembly and Reassembly of Wrist Assembly"*.)

NOTE If grease is filled before the sealing bond is solidified, it may cause grease to leak. After tightening the screws, leave it 30 minutes or more, and then fill with grease.

11. Supply the grease. (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"*.)
12. Turn ON the DX200 power supply.

Table 8-2: S2-1- and S3-1-axis Speed Reducer Parts Checklist

No	Item	Qty	Remark
①	Speed reducer HW0387754-A	1	RV42N-30.23
②	Hexagon socket head cap screw M6 (length: 35 mm) Conical spring washer 2L-6	16 each	Tightening torque: 16.5 N•m (1.7 kgf•m)
③	Flange HW1308143-1	1	
④	Hexagon socket head cap screw M8 (length: 25 mm) Conical spring washer 2L-8	18 each	Tightening torque: 40 N•m (4.1 kgf•m)
⑤	Ring HW1308144-1	1	
⑥	Parallel pin HW1408161-6-15	1	
⑦	V-ring VR140A	1	
⑧	Oil seal AC1306G0 (SC25387)	1	
⑨	Shaft HW0200768-1	1	
⑩	Wrist assembly HW2170956-A	1	

*The quantity shown below is for one arm.

Fig. 8-2(a): Disassembly and Reassembly of S2-1- and S3-1-axis Speed Reducer

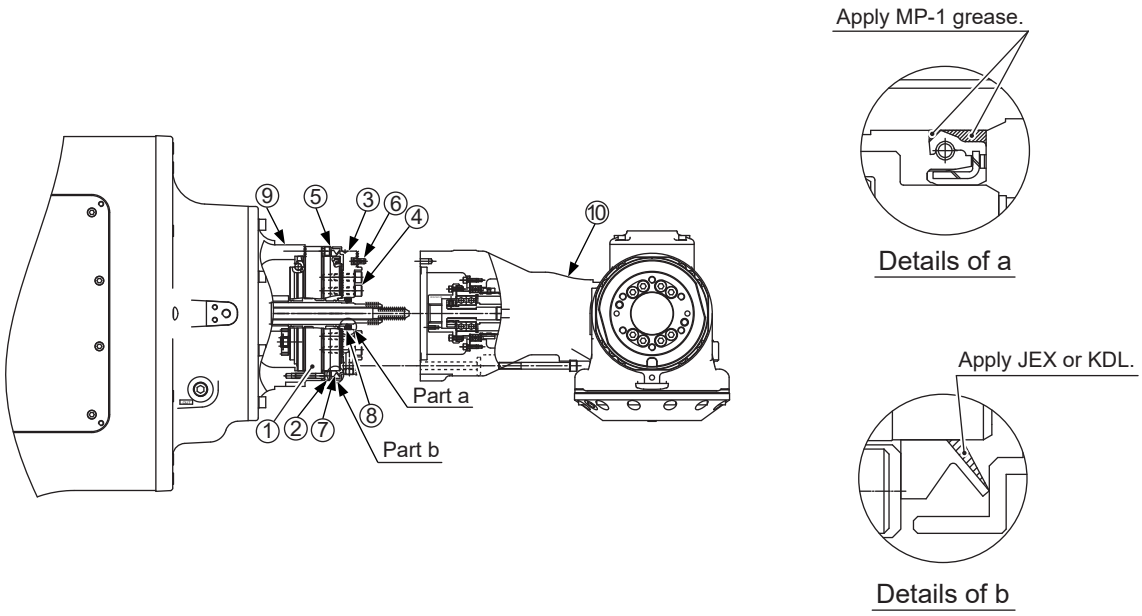
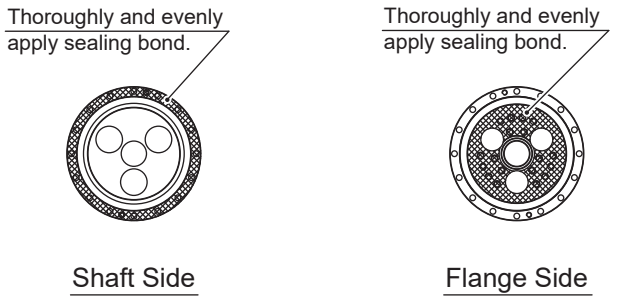


Fig. 8-2(b): Surface to Apply Sealing Bond on S2-1- and S3-1-axis Speed Reducer



8.3 Disassembly and Reassembly of S2-2- and S3-2-axis Speed Reducer

- Refer to *table 8-3 "S2-2- and S3-2-axis Speed Reducer Parts Checklist"* , *fig. 8-3(a) "Disassembly and Reassembly of S2-2- and S3-2-axis Speed Reducer"* , and *fig. 8-3(b) "Surface to Apply Sealing Bond on S2-2- and S3-2-axis Speed Reducer"* .

DANGER

Before loosening the fixing bolt of the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

■ Disassembly

1. Turn OFF the DX200 power supply with the flange face of the manipulator tip facing downward.
2. Unscrew the hexagon socket head cap screws ③ and ④, and then remove the flange ②. If the flange face of the manipulator tip is not facing downward, the B-axis will rotate when the hexagon socket head cap screws ③ and ④ are unscrewed. Thus, before unscrewing the hexagon socket head cap screws ③ and ④, secure the B-axis so that it does not rotate.
3. Unscrew the hexagon socket head cap screws ⑤, and then remove the speed reducer ①. Pay attention to the grease discharge.
4. Unscrew the hexagon socket head cap screws ⑥, and then remove the gear ⑩ and shim ⑪ from the speed reducer ①.
5. Remove the V-ring ⑦. Wipe off the old grease on the V-ring ⑦.
6. Remove the old sealing bond.

■ Reassembly

1. Mount the gear ⑩ and shim ⑪ to the speed reducer ①, and then tighten the hexagon socket head cap screws ⑥ with the tightening torque shown in *table 8-3 "S2-2- and S3-2-axis Speed Reducer Parts Checklist"* .
2. Apply ThreeBond 1206C to the contact surface of the speed reducer ① and the wrist assembly, and then mount the speed reducer ① to the U-arm ⑧. For the place to apply sealing bond, refer to *fig. 8-3(b) "Surface to Apply Sealing Bond on S2-2- and S3-2-axis Speed Reducer"* .
3. Tighten the hexagon socket head cap screws ⑤ with the tightening torque shown in *table 8-3 "S2-2- and S3-2-axis Speed Reducer Parts Checklist"* .
4. Apply JEX or KDL grease to the lip part (refer to "Details of a" in *fig. 8-3(b) "Surface to Apply Sealing Bond on S2-2- and S3-2-axis Speed Reducer"*) of the V-ring ⑦.
5. Mount the V-ring ⑦ to the speed reducer ①.

6. Apply ThreeBond 1206C to the contact surface of the speed reducer ① and the flange ②, and then mount the flange ② to the speed reducer ①. For the place to apply sealing bond, refer to *fig. 8-3(b) "Surface to Apply Sealing Bond on S2-2- and S3-2-axis Speed Reducer"* .
7. Tighten the hexagon socket head cap screws ④ with the tightening torque shown in *table 8-3 "S2-2- and S3-2-axis Speed Reducer Parts Checklist"* .
8. Apply ThreeBond 1206C to the contact surface of the speed reducer ① and the flange ②, and then mount the flange ② to the speed reducer ①. For the place to apply sealing bond, refer to *fig. 8-3(b) "Surface to Apply Sealing Bond on S2-2- and S3-2-axis Speed Reducer"* .
9. Tighten the hexagon socket head cap screws ④ with the tightening torque shown in *table 8-3 "S2-2- and S3-2-axis Speed Reducer Parts Checklist"* .
10. Tighten the hexagon socket head cap screws ③ with the tightening torque shown in *table 8-3 "S2-2- and S3-2-axis Speed Reducer Parts Checklist"* .

NOTE If grease is filled before the sealing bond is solidified, it may cause grease to leak. After tightening the screws, leave it 30 minutes or more, and then fill with grease.

11. Supply the grease. (Refer to *chapter 4.1 "Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers"* .)
12. Turn ON the DX200 power supply.

Table 8-3: S2-2- and S3-2-axis Speed Reducer Parts Checklist

No	Item	Qty	Remark
①	Speed reducer HW0387737-B	1	F4C-D25-41
②	Flange HW1300244-1	1	
③	Hexagon socket head cap screw M8 (length: 18 mm) Conical spring washer 2L-8	16 each	Tightening torque: 40 N•m (4.1 kgf•m)
④	Hexagon socket head cap screw M8 (length: 30 mm) Conical spring washer 2L-8	12 each	Tightening torque: 24.5 N•m (2.5 kgf•m)
⑤	Hexagon socket head cap screw M6 (length: 25 mm) Conical spring washer 2L-6	16 each	Tightening torque: 16.5 N•m (1.7 kgf•m)
⑥	Hexagon socket head cap screw M5 (length: 16 mm) Conical spring washer 2L-5	4 each	Tightening torque: 10 N•m (1.0 kgf•m)
⑦	V-ring VR140A	1	
⑧	U-arm HW2100315-1	1	
⑨	Wrist HW1308275-3	1	
⑩	Gear HW0312828-1	1	
⑪	Shim HW0412695-1 to 7	1	

*The quantity shown below is for one arm.

Fig. 8-3(a): Disassembly and Reassembly of S2-2- and S3-2-axis Speed Reducer

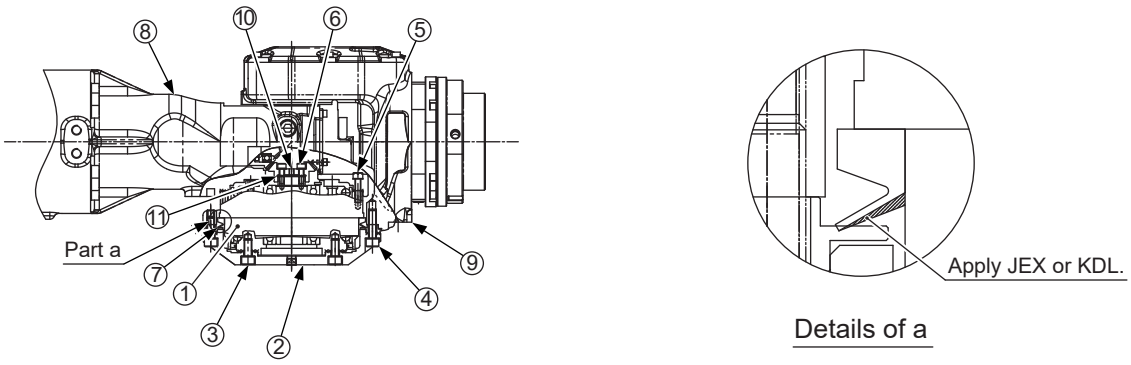
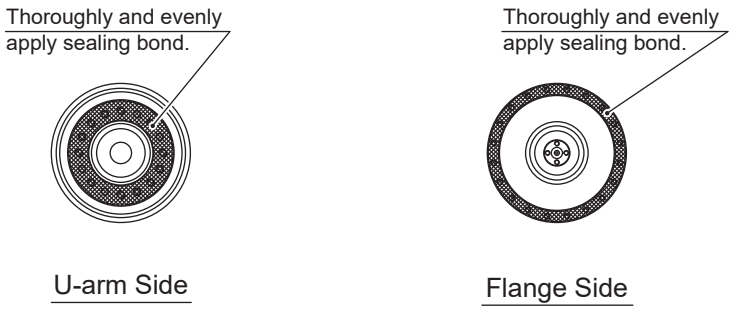


Fig. 8-3(b): Surface to Apply Sealing Bond on S2-2- and S3-2-axis Speed Reducer



8.4 Disassembly and Reassembly of S2-3- and S3-3-axis Speed Reducer

- Refer to *table 8-4 "S2-3- and S3-3-axis Speed Reducer Parts Checklist"* , *fig. 8-4(a) "Disassembly and Reassembly of S2-3- and S3-3-axis Speed Reducer"* , and *fig. 8-4(b) "Surface to Apply Sealing Bond on S2-3- and S3-3-axis Speed Reducer"* .

DANGER

Before loosening the fixing bolt of the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

■ Disassembly

1. To prevent grease from discharging when removing the speed reducer ①, turn OFF the DX200 power supply with the flange face of the manipulator tip facing upward.
2. Unscrew the hexagon socket head cap screws ④, and then remove the flange ③ and oil seal ⑦.
3. Unscrew the hexagon socket head cap screws ②, and then remove the speed reducer ① and ring ⑥.
4. Remove FINE U-NUT ⑤, and then remove the washer ⑧, gear ⑨, and shim ⑩ from the speed reducer ①.
5. Apply gasket remover (recommended product: LOCTITE 7200) to the residual sealing bond adhered to the flange and wrist. Remove the sealing bond when it is softened (approx. 15 mins).

NOTE

Any gasket remover on the coated part of the exterior may cause peeling of the coating. Protect the coated part of the exterior around the sealing bond application surface with masking tape or other protective material so as not to allow gasket remover to get on.

- When removing the sealing bond, use a resin spatula to prevent damage to the flange face.

■ Reassembly

1. Mount the washer ⑧, gear ⑨, and shim ⑩ to the speed reducer ①.
2. Apply LOCTITE 243 to the thread part of FINE U-NUT ⑤, and then tighten the nut with the tightening torque shown in *table 8-4 "S2-3- and S3-3-axis Speed Reducer Parts Checklist"* . (FINE U-NUT ⑤ is provided with the speed reducer ①.)
3. Apply LOCTITE 518 to the contact surface of the wrist ⑪ and the speed reducer ①, and then mount the speed reducer to wrist ⑪. For the place to apply sealing bond, refer to *fig. 8-4(b) "Surface to Apply Sealing Bond on S2-3- and S3-3-axis Speed Reducer"* .
4. Mount the ring ⑥ to the speed reducer ①, and then tighten the hexagon socket head cap screws ② with the tightening torque shown in *table 8-4 "S2-3- and S3-3-axis Speed Reducer Parts Checklist"* .

5. Apply MP-1 grease to the lip part (refer to “Details of a” in *fig. 8-4(a) “Disassembly and Reassembly of S2-3- and S3-3-axis Speed Reducer”*) of the oil seal ⑦.
6. Apply LOCTITE 518 to the contact surface of the flange ③ and the speed reducer ①, and then mount the flange ③ and oil seal ⑦ to the speed reducer ①. For the place to apply sealing bond, refer to *fig. 8-4(b) “Surface to Apply Sealing Bond on S2-3- and S3-3-axis Speed Reducer”* .
7. Tighten the hexagon socket head cap screws ④ with the tightening torque shown in *table 8-4 “S2-3- and S3-3-axis Speed Reducer Parts Checklist”* .

NOTE If grease is filled before the sealing bond is solidified, it may cause grease to leak. After tightening the screws, leave it 30 minutes or more, and then fill with grease.

8. Supply the grease. (Refer to *chapter 4.1 “Grease Replacement Procedures for S1-, S2-1-, S2-2-, S2-3-, S3-1-, S3-2-, and S3-3-axis Speed Reducers”* .)
9. Turn ON the DX200 power supply.

Table 8-4: S2-3- and S3-3-axis Speed Reducer Parts Checklist

No	Item	Qty	Remark
①	Speed reducer HW0389043-A	1	F4CF-D15-41
②	Hexagon socket head cap screw M6 (length: 35 mm) Conical spring washer 2L-6	10 each	Tightening torque: 10 N•m (1.0 kgf•m)
③	Flange HW2302305-1	1	
④	Hexagon socket head cap screw M8 (length: 40 mm) *FA coat* Conical spring washer 2L-8 *FA coat*	8 each	Tightening torque: 40 N•m (4.1 kgf•m)
⑤	FINE U-NUT FC00SC	1	Tightening torque: 17.6 N•m (1.8 kgf•m)
⑥	Ring HW1308145-1	1	
⑦	Oil seal TC1151306	1	
⑧	Washer	1	Provided with the speed reducer
⑨	Gear HW0313631-1	1	
⑩	Shim HW0412696-1 to 7	1	
⑪	Wrist HW1308275-3	1	

*The quantity shown below is for one arm.

Fig. 8-4(a): Disassembly and Reassembly of S2-3- and S3-3-axis Speed Reducer

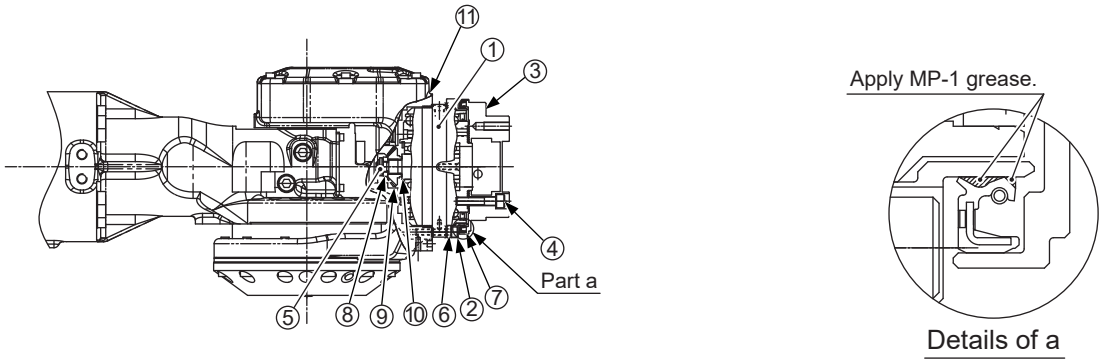
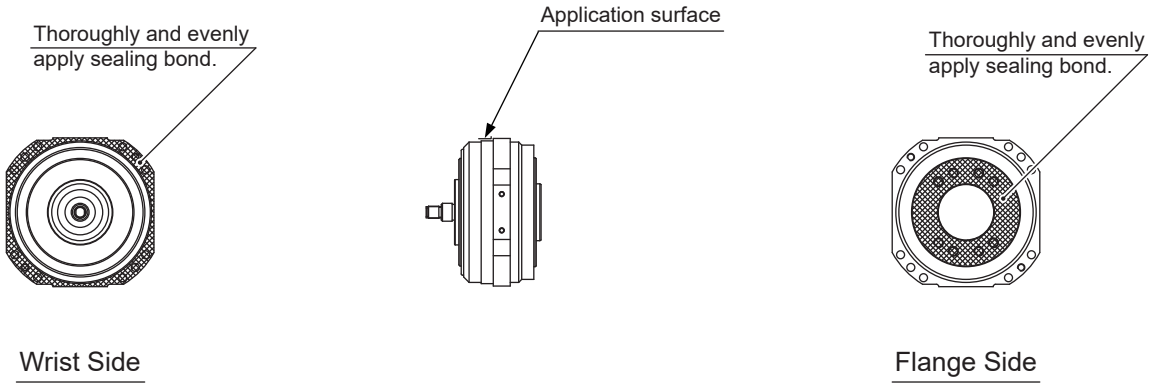


Fig. 8-4(b): Surface to Apply Sealing Bond on S2-3- and S3-3-axis Speed Reducer



9 Battery Pack Replacement

WARNING

Before replacing the battery pack, turn OFF the power supply to the DX200, and check that no explosive atmosphere exists around the battery pack.

MANDATORY

When replacing the battery, be sure to replace the entire battery pack for the explosion-proof certification.

Do not simply replace the battery because there is a risk that it may become the source of ignition as a result of operational errors.
For the same reason, do not replace the battery with one produced by a different manufacturer.

The battery pack should only be replaced by a Licensee (qualified by YASKAWA) or your YASKAWA representative.

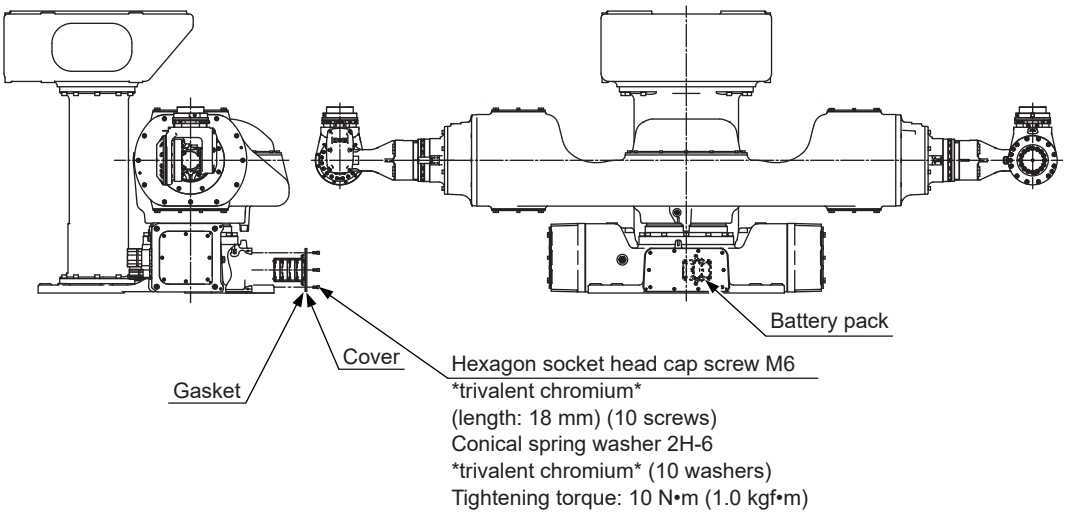
9 Battery Pack Replacement

The battery packs are installed in the locations shown in *fig. 9-1 "Battery Pack Location"* .

Type	Battery pack	Reference
YR-MTP5026-A**	HW1373234-A,-B,-C,-D	*fig. 9-2 "Details of Battery Pack Section"*

If a battery alarm occurs in the DX200, replace the battery pack in the following procedures.

Fig. 9-1: Battery Pack Location



1. Turn OFF the power to the DX200.
2. Ventilate around the manipulator to remove explosive gas.
3. Remove the front cover from the base, and pull out the battery pack.
4. Refer to *fig. 9-2 "Details of Battery Pack Section"* , and remove the battery bracket and cable ties fixing the old battery packs.
5. Remove the plastic tape (insulation tape) which is applied for protecting the battery pack connector inside of the manipulator.
6. Connect the new battery pack by referring to *fig. 9-3 "Battery Pack Connection"* .
7. Remove the old battery pack.

NOTE Be sure to connect the new battery packs before disconnecting the old one so that the data does not disappear.

8. Protect the battery pack connector left in the manipulator with the plastic tape (insulation tape).
9. Refer to *fig. 9-2 "Details of Battery Pack Section"* , and mount the battery packs on the cover by using the battery bracket and screw (hexagon socket head cap screws M4 (length: 8 mm): 2 screws). Then fix the lead wires of the battery packs to the bracket with the cable ties (T18L-HSW: 2 places). (Strictly observe the specified tightening torque.)

10. Re-install the cover. This completes the work. (Strictly observe the specified tightening torque.)

Fig. 9-2: Details of Battery Pack Section

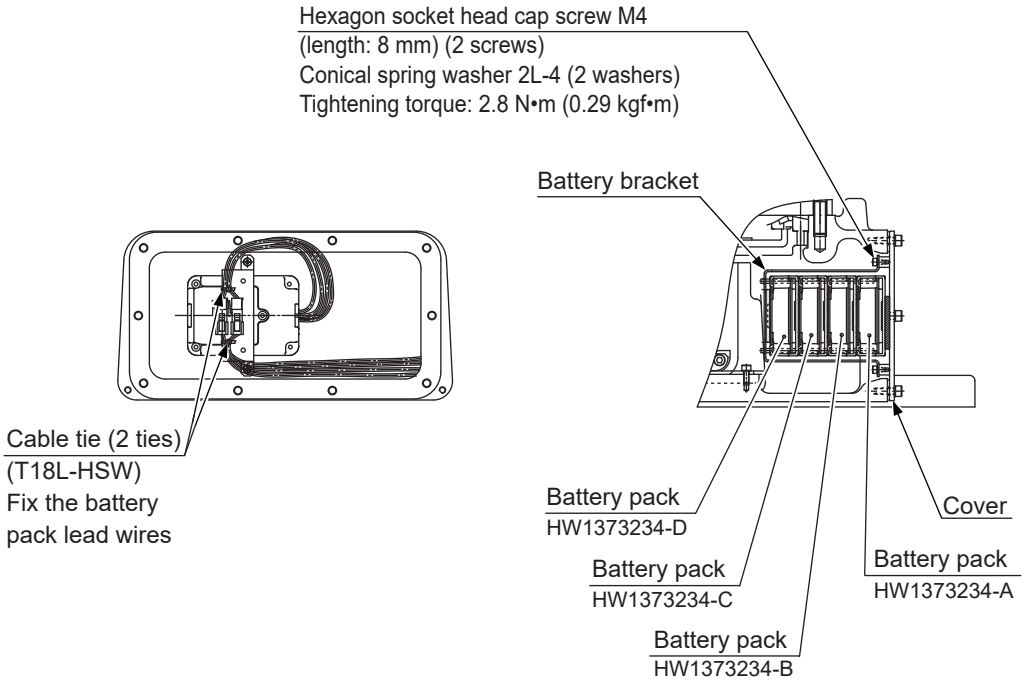
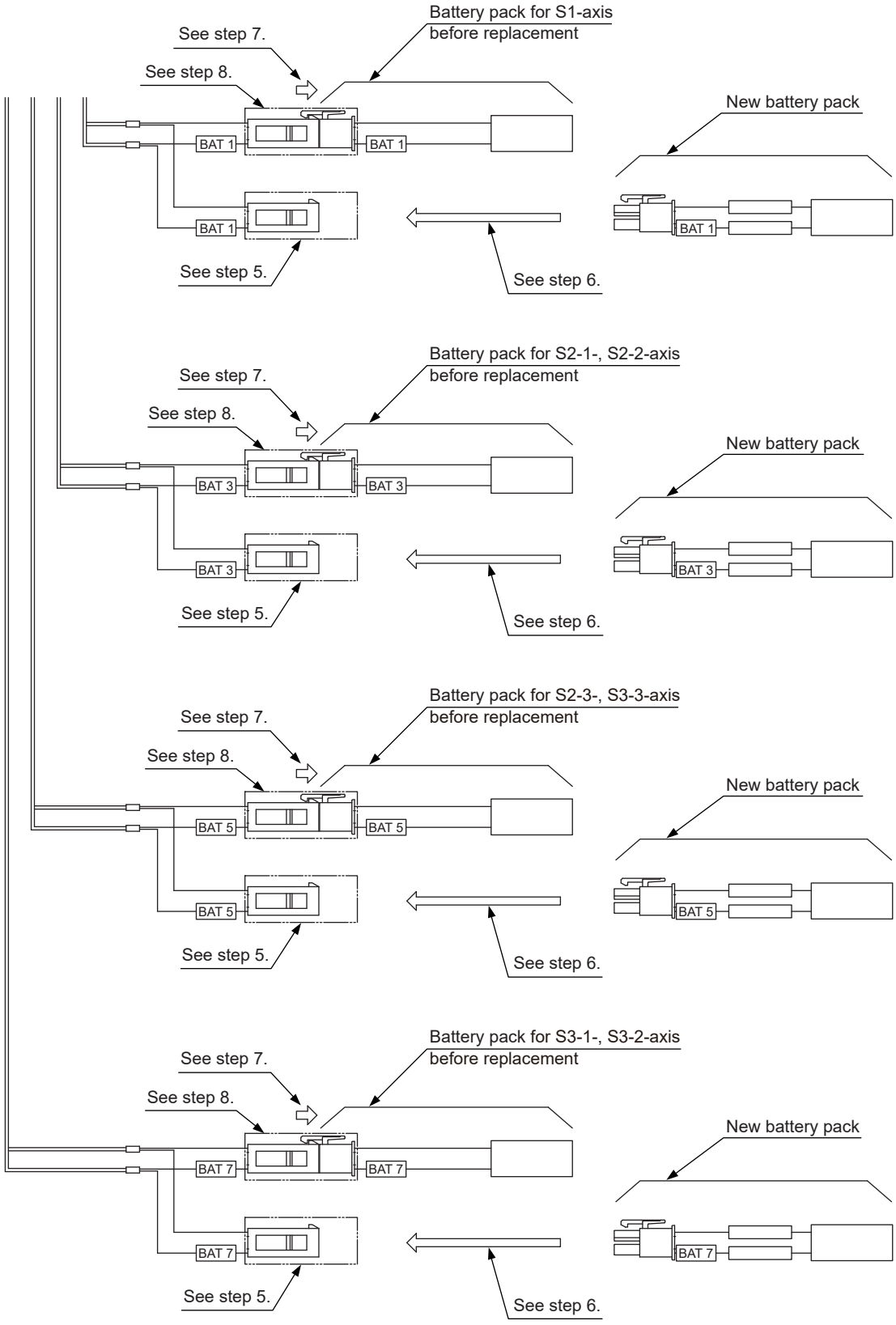


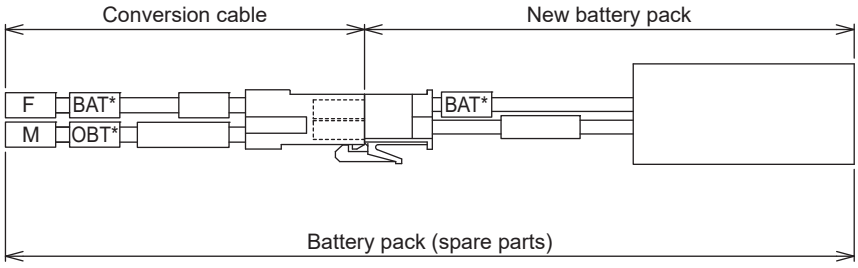
Fig. 9-3: Battery Pack Connection



9 Battery Pack Replacement

For the battery pack (spare parts), the cable to convert to the contact-pin terminals for connecting the backup connector of the motor are attached in the standard specification. (Refer to *chapter 2.3 "Battery Pack Replacement"* .)

When connecting the battery pack above, remove the conversion cable to connect the battery pack.



10 Cable Wiring

DANGER

The MOTOFEEDER TILT-MTP5026 is a pressurized explosion-proof apparatus in which high-pressure air is contained.
Do not loosen the fixing bolts of the arm unit and the cover on the manipulator when high-pressure air remains inside the manipulator.
Failure to observe this instruction may result in serious personal injury.

Before loosening the fixing bolt of the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

DANGER

Before loosening the fixing bolts of the arm unit assembly and the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

NOTE Refer to *chapter 2 "Notes for Maintenance"* and *chapter 3 "Home Position Return"* .

■ Disconnecting Cables

1. Inside the S-head Left and Right Arms

- Refer to *table 10-1 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)"* and *fig. 10-1 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)"* .

1. Turn OFF the DX200 power supply.
2. Unscrew the hexagon socket head cap screws ②, and then remove the cover ③ from the S-head ①.
3. Unscrew the hexagon socket head cap screws ④, and then remove the cover ⑤ from the S-head ①. (four places)
4. Connect the battery packs to the connectors of the motor encoder cables on the relays.
   (Refer to *chapter 2.3 "Battery Pack Replacement"* .)
5. Cut the cable ties ⑧ (six places).
6. Remove the tubes ㉘ from the joints ⑨.
7. Cut the cable ties ⑪ (12 places) of both the power side cables and encoder side cables, remove the vinyl covers ⑩ (12 places), and then disconnect the connectors.

8. Remove the arm unit ⑥ from the S-head ①. In addition, pull out the 123-axis lead wire (power) assemblies ⑯, ⑰, ⑱, ㉒, ㉓, ㉔, 123-axis lead wire (encoder) assemblies ⑲, ⑳, ㉑, ㉕, ㉖, ㉗, and tubes ㉘. (Refer to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"*.)
   (When removing the 123-axis lead wire (encoder) assemblies ⑲, ⑳, ㉑, ㉕, ㉖, ㉗ from the motor, connect the battery pack to the same part as the S1-axis motor on the motor removes.)
9. Cut the cable ties ⑮ (four places), and then remove the zipper tubes ㉙.
10. Cut the cable ties ⑬ (10 places).
11. Remove the tubes ㉘ from the elbows ⑭. (six places)
12. Remove the 123-axis lead wire (power) assemblies ⑯, ⑰, ⑱, ㉒, ㉓, ㉔ and 123-axis lead wire (encoder) assemblies ⑲, ⑳, ㉑, ㉕, ㉖, ㉗ from the motor connectors.

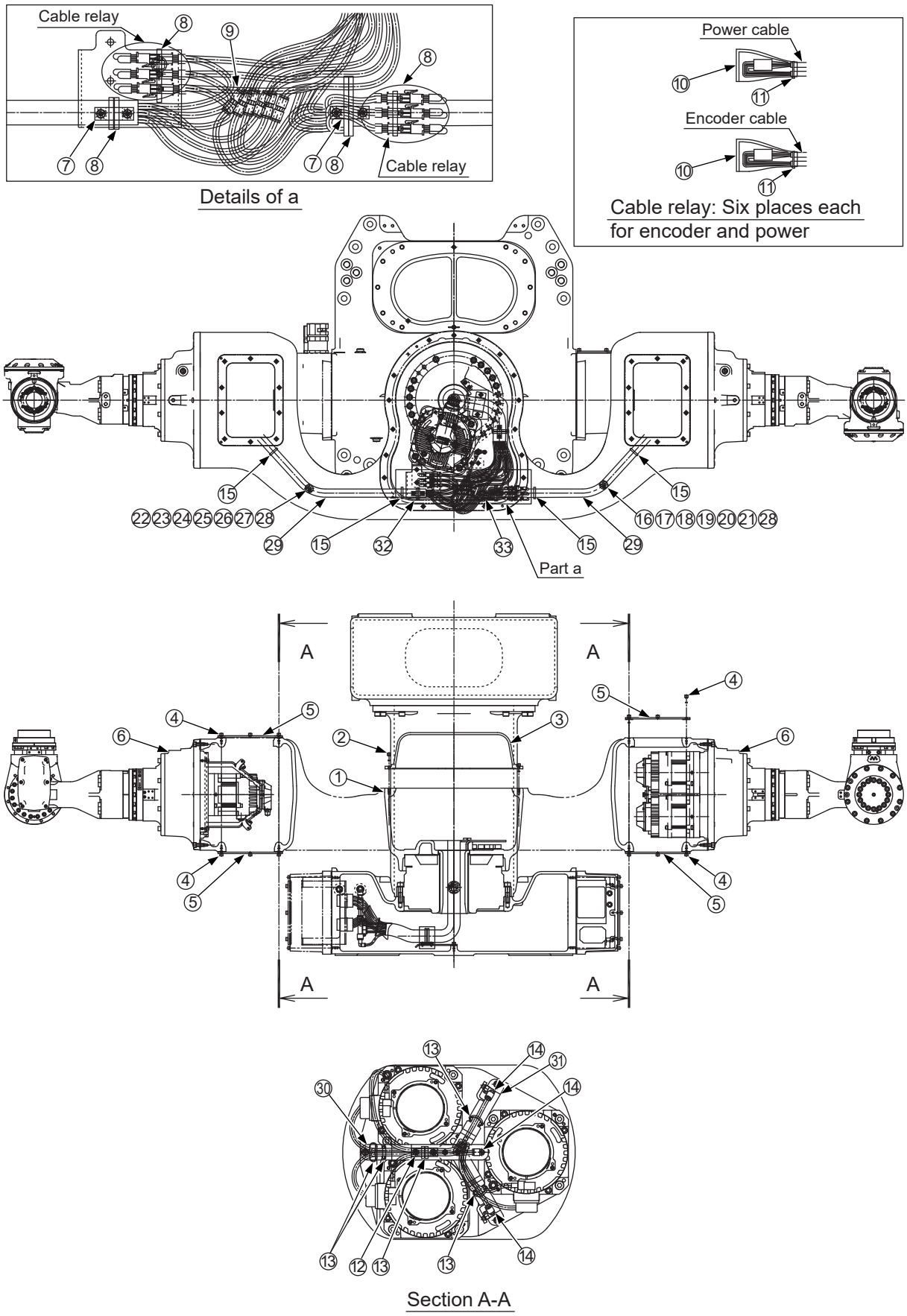
Table 10-1: Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)

No	Item	Qty	Remark
①	S-head HW2100314-1	1	
②	Hexagon socket head cap screw M6 (length: 18 mm) *trivalent chromium* Conical spring washer 2H-6 *trivalent chromium*	20 each	Tightening torque: 10 N•m (1.0 kgf•m)
③	Cover (S1) HW2200211-1 Gasket (S1) HW2402685-1	1 each	Adhere the gasket to the cover.
④	Hexagon socket head cap screw M6 (length: 18 mm) *trivalent chromium* Conical spring washer 2H-6 *trivalent chromium*	40 each	Tightening torque: 10 N•m (1.0 kgf•m)
⑤	Cover (S2) HW2402684-1 Gasket (S2) HW2402683-1	4 each	Adhere the gasket to the cover.
⑥	Arm unit HW2170958-A	2	
⑦	Metal fitting HW9403595-1	2	
⑧	Cable tie T120R-HSW	6	
⑨	Joint KQ2H06-00A	6	
⑩	Vinyl cover HW9404951-A	12	
⑪	Cable tie T30L-HSW	12	
⑫	Metal fitting HW9403595-1	2	
⑬	Cable tie T50R-HSW	12	
⑭	Elbow KQ2L06-M6A	6	
⑮	Cable tie T120R-HSW	4	
⑯	123-axis lead wire (power) assemblies HW2470682-A	1	
⑰	123-axis lead wire (power) assemblies HW2470682-B	1	
⑱	123-axis lead wire (power) assemblies HW2470682-C	1	
⑲	123-axis lead wire (encoder) assemblies HW2470683-A	1	

Table 10-1: Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)

No	Item	Qty	Remark
⑳	123-axis lead wire (encoder) assemblies HW2470683-B	1	
㉑	123-axis lead wire (encoder) assemblies HW2470683-C	1	
㉒	123-axis lead wire (power) assemblies HW2470682-D	1	
㉓	123-axis lead wire (power) assemblies HW2470682-E	1	
㉔	123-axis lead wire (power) assemblies HW2470682-F	1	
㉕	123-axis lead wire (encoder) assemblies HW2470683-D	1	
㉖	123-axis lead wire (encoder) assemblies HW2470683-E	1	
㉗	123-axis lead wire (encoder) assemblies HW2470683-F	1	
㉘	Tube TU0604BU (1150 mm)	6	
㉙	Zipper tube MTK-75-700 mm	2	
㉚	Support HW2302283-1	2	
㉛	Support HW2302284-1	2	
㉜	Bracket HW2402686-1	1	
㉝	Bracket HW2302285-1	1	

Fig. 10-1: Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)



2. Inside the Base and S-head

- Refer to *table 10-2 “Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)”* and *fig. 10-2 “Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)”* .

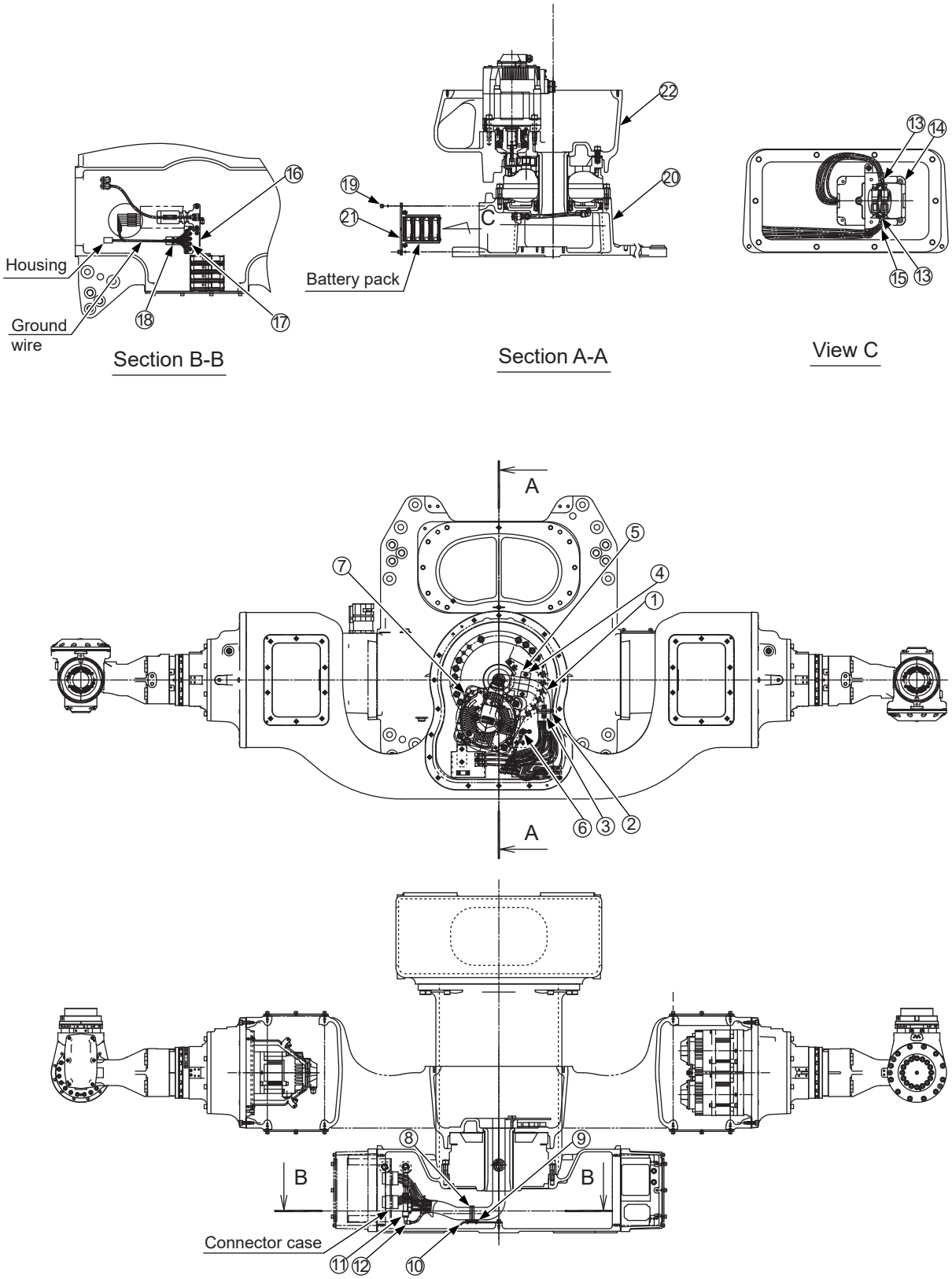
When removing the base and the cables in the S-head only, follow steps 1 to 7 in "Disconnecting Cables, 1. Inside the S-head Left and Right Arms". Then, follow the instructions starting from step 1 in this section "Inside the Base and S-head".

1. Connect the battery pack to the S1-axis motor ⑦. (Refer to *chapter 2.3 “Battery Pack Replacement”* .)
2. Disconnect the S1-axis motor connectors (both encoder and power connectors) of the S-axis internal wiring harness assembly ① mounted to the S1-axis motor ⑦.
3. Cut the cable ties ② (two places).
4. Remove the tube of the S-axis internal wiring harness assembly ① from the joint ⑥.
5. Unscrew the hexagon socket head cap screws ⑤, and then remove the saddle ④.
6. Unscrew the hexagon socket head cap screws ⑲, remove the cover ㉑ from the base ⑳, cut the cable ties ⑬ (two places), and then disconnect the connectors of the battery ⑭.
7. Remove the manipulator cable unit. (Refer to chapter 4.2 “Cable and Air Tube Connections” in “MOTOFEEDER TILT-MTP5026 INSTRUCTIONS (HW2481431)”.)
8. Cut the cable tie ⑱, unscrew the cross head APS bolts ⑰, and then disconnect the ground wire.
9. Remove the tubes of the S-axis internal wiring harness assembly ① from the manifolds ⑪ (six places) and joint ⑫ (one place).
10. Disconnect the connector of the S-axis internal wiring harness assembly ① from the connector case.
11. Cut the cable ties ⑧ (two places), and then pull out the S-axis internal wiring harness assembly ① from the S-head ㉒ side to the base ⑳ side.
12. Pull out the S-axis internal wiring harness assembly ① from the base ⑳.

Table 10-2: Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)

No	Item	Qty	Remark
①	S-axis internal wiring harness assembly HW2170993-A	1	
②	Cable tie T120R-HSW	2	
③	Metal fitting HW9403595-1	1	
④	Saddle FCD36-31	1	
⑤	Hexagon socket head cap screw M6 (length: 20 mm) Conical spring washer 2L-6	2 each	Tightening torque: 10 N•m (1.0 kgf•m)
⑥	Joint KQ2L06-00A	1	
⑦	S1-axis motor	1	SGM7G-37APK-YRA1
⑧	Cable tie T120R-HSW	2	
⑨	Metal fitting HW9403595-1	1	
⑩	Bracket HW2402675-1	1	
⑪	Manifold KM13-06-10-3	2	
⑫	Joint KQ2L06-10A	1	
⑬	Cable tie T18L-HSW	2	
⑭	Battery pack HW1373234-A, B, C, D	1 each	
⑮	Battery bracket HW1308280-D	1	
⑯	Bracket HW2402776-1	1	
⑰	Cross head APS bolt M5 (length: 10 mm) *stainless*	7	Tightening torque: 4 N•m (0.41 kgf•m)
⑱	Cable tie T50R-HSW	1	
⑲	Hexagon socket head cap screw M6 (length: 18 mm) *trivalent chromium* Conical spring washer 2H-6 *trivalent chromium*	10 each	Tightening torque: 10 N•m (1.0 kgf•m)
⑳	Base HW2100311-1	1	
㉑	Cover (SB1) HW2302278-A Gasket (SB1) HW2402682-1	1 each	The gasket is adhered to the cover, and the battery pack is installed to the cover in the battery bracket.
㉒	S-head HW2100314-1	1	

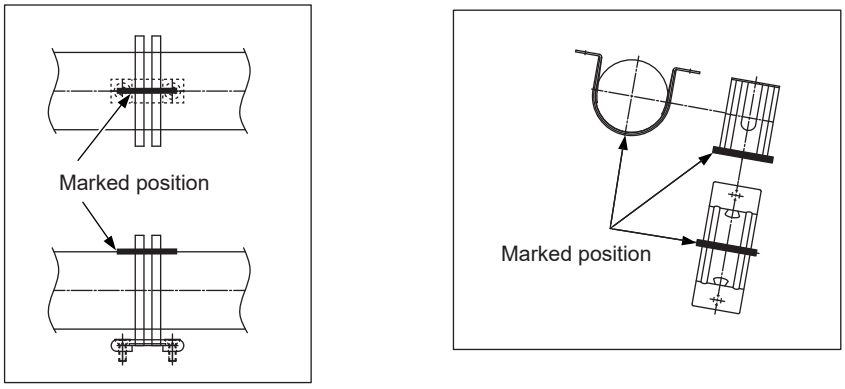
Fig. 10-2: Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)



■ Connecting Cables

As shown in *fig. 10-3 "Phase Alignment Marking"*, align the phase at the white marked position of the S-axis internal wiring harness assembly, and then clamp it.

Fig. 10-3: Phase Alignment Marking



Details of Marked Position

1. Inside the Base and S-head

- Refer to *table 10-2 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)"* and *fig. 10-2 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)"*.

When mounting the base and cables in S-head only, follow steps 1 to 11 in "Inside the Base and S-head". Then, follow the instructions in steps 6 to 12 "Disconnecting Cables, 1. Inside the S-head Left and Right Arms".

1. Protect the connector of the S-axis internal wiring harness assembly ①, and then pass it from the base ⑳ side to the S-head ㉒ side. Then, remove the protection.
2. Secure the S-axis internal wiring harness assembly ① to the metal fitting ⑨ attached to the bracket ⑩ with the cable ties ⑧.
3. Mount the S-axis internal wiring harness assembly ① to the saddle ④ by using the hexagon socket head cap screws ⑤, and then tighten them with the tightening torque shown in *table 10-2 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)"*.
4. Connect the tubes of the S-axis internal wiring harness assembly ① to the manifolds ⑪ (six places) and joint ⑫ (one place).
5. Mount the ground wire to the bracket ⑯ by using the cross head APS bolts ⑰, and then tighten them with the tightening torque shown in *table 10-2 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)"*. Then, secure the ground wire to the bracket ⑯ with the cable tie ⑱.
6. Connect the connector of the battery ⑭, and then secure the connector to the battery bracket ⑮ with the cable ties ⑬.
7. Secure the S-axis internal wiring harness assembly ① to the metal fitting ③ with the cable ties ② (two places).
8. Mount the tube of the S-axis internal wiring harness assembly ① to the joint ⑥.

9. Connect the S1-axis motor connectors (both encoder and power connectors) of the S-axis internal wiring harness assembly ① to the S1-axis motor ⑦.
10. Remove the battery pack of the S1-axis motor ⑦. (Refer to *chapter 2.3 "Battery Pack Replacement"*.)
11. Mount the cover ㉑ by using the hexagon socket head cap screws ⑲, and then tighten them with the tightening torque shown in *table 10-2 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the Base and S-head)"*.

2. Inside the S-head Left and Right Arms

- Refer to *table 10-1 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)"* and *fig. 10-1 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)"*.

1. Connect the 123-axis lead wire (power) assemblies ⑯, ⑰, ⑱, ㉒, ㉓, ㉔ and 123-axis lead wire (encoder) assemblies ⑲, ⑳, ㉑, ㉕, ㉖, ㉗ to the motor connectors.
   (Connect the battery pack to the 123-axis lead wire (encoder) assemblies ⑲, ⑳, ㉑, ㉕, ㉖, ㉗, connect it to the motor, and then disconnect the battery pack that is connected to the same part as the S1-axis motor.)
   (Refer to *chapter 2.3 "Battery Pack Replacement"*.)
2. Mount the tubes ㉘ to the elbows ⑭. (six places)
3. Secure the 123-axis lead wire (power) assemblies ⑯, ⑰, ⑱, ㉒, ㉓, ㉔, 123-axis lead wire (encoder) assemblies ⑲, ⑳, ㉑, ㉕, ㉖, ㉗, and tubes ㉘ to the supports ㉚, ㉛ with the cable ties ⑬.
4. Cover the 123-axis lead wire (power) assemblies ⑯, ⑰, ⑱, ㉒, ㉓, ㉔, 123-axis lead wire (encoder) assemblies ⑲, ⑳, ㉑, ㉕, ㉖, ㉗, and tubes ㉘ using the zipper tubes ㉙, and then secure the both ends with the cable ties ⑮ (four places).
5. Insert the 123-axis lead wire (power) assemblies ⑯, ⑰, ⑱, ㉒, ㉓, ㉔, 123-axis lead wire (encoder) assemblies ⑲, ⑳, ㉑, ㉕, ㉖, ㉗, and tubes ㉘ into the S-head ① first, and then mount the arm units ⑥ to the S-head ①.
   (Refer to *chapter 5 "Disassembly and Reassembly of Arm Unit Assembly"*.)
6. Connect the connectors of both the power side cables and encoder side cables at the cable relay ("Details of a" in *fig. 10-1 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)"*), cover them with the vinyl covers ⑩ (12 places), and then secure the outlet parts with the cable ties ⑪ (12 places).
7. Mount the tubes ㉘ to the joints ⑨. (six places)
8. Secure the cables and tubes to the brackets ㉜, ㉝ with the cable ties ⑧.
9. Disconnect the battery packs from the connectors of the motor encoder cables on the relays.
   (Refer to *chapter 2.3 "Battery Pack Replacement"*.)

10. Mount the covers ⑤ to the S-head ① by using the hexagon socket head cap screws ④, and then tighten them with the tightening torque shown in *table 10-1 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)"*.
11. Mount the covers ③ to the S-head ① by using the hexagon socket head cap screws ②, and then tighten them with the tightening torque shown in *table 10-1 "Disassembly and Reassembly of the Internal Wiring Harness (Inside the S-head Left and Right Arms)"*.
12. Turn ON the DX200 power supply.

11 Gasket Replacement

DANGER

The MOTOFEEDER TILT-MTP5026 is a pressurized explosion-proof apparatus in which high-pressure air is contained.
Do not loosen the fixing bolt of the cover on the manipulator when high-pressure air remains inside the manipulator.
Failure to observe this instruction may result in serious personal injury.

Before loosening the fixing bolts of the arm unit assembly and the cover on the manipulator, make sure to confirm that the air supply to the manipulator is stopped and that there is no residual pressure in the manipulator.

NOTE Refer to *chapter 2 "Notes for Maintenance"* .

NOTE Never insert a flat tip screwdriver, an edged tool, etc. into the gasket to remove the motor cover so as not to damage the gasket. If the gasket is damaged, air leak will result.

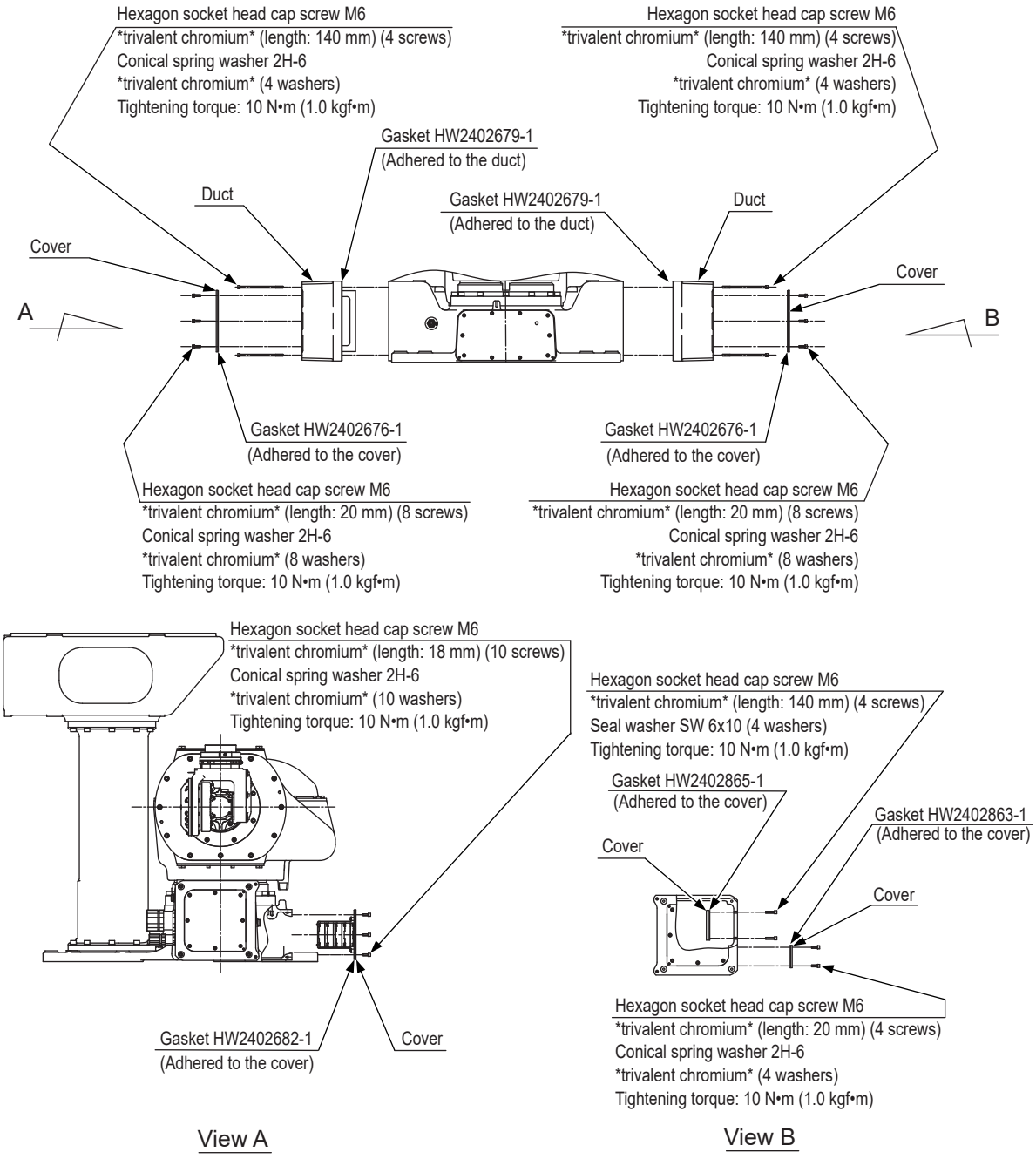
11.1 Attachment by DB Bond

- Refer to *fig. 11-1 "Inspection of Gaskets in the Base"* and *fig. 11-2 "Inspection of Gaskets in the First Arm and Second Arm"* .

1. Remove the cover of the gasket to replace from the manipulator. (Refer to *chapter 2.1 "Inspection of Gasket"* .)
2. Remove the gasket from the cover.
   Since this gasket is adhered by DB bond, remove the gasket carefully.
3. Thoroughly remove DB bond adhered to the cover.
4. Check that attached surface of the cover and the gasket matches.
5. Degrease each attached surface of the cover and the gasket.
6. Apply DB bond to each attached surface of the cover and the gasket by using a brush, or the like, and dry the surface for 5 to 10 minutes.
7. Attach the gasket to the cover and press it lightly.
   Arrange the position so that the bolt holes of the cover and the gasket matches.
8. Thoroughly remove excess DB bond on the surfaces between the cover and the gasket, and the bolt holes.
9. Leave it as is for one hour until DB bond dries.

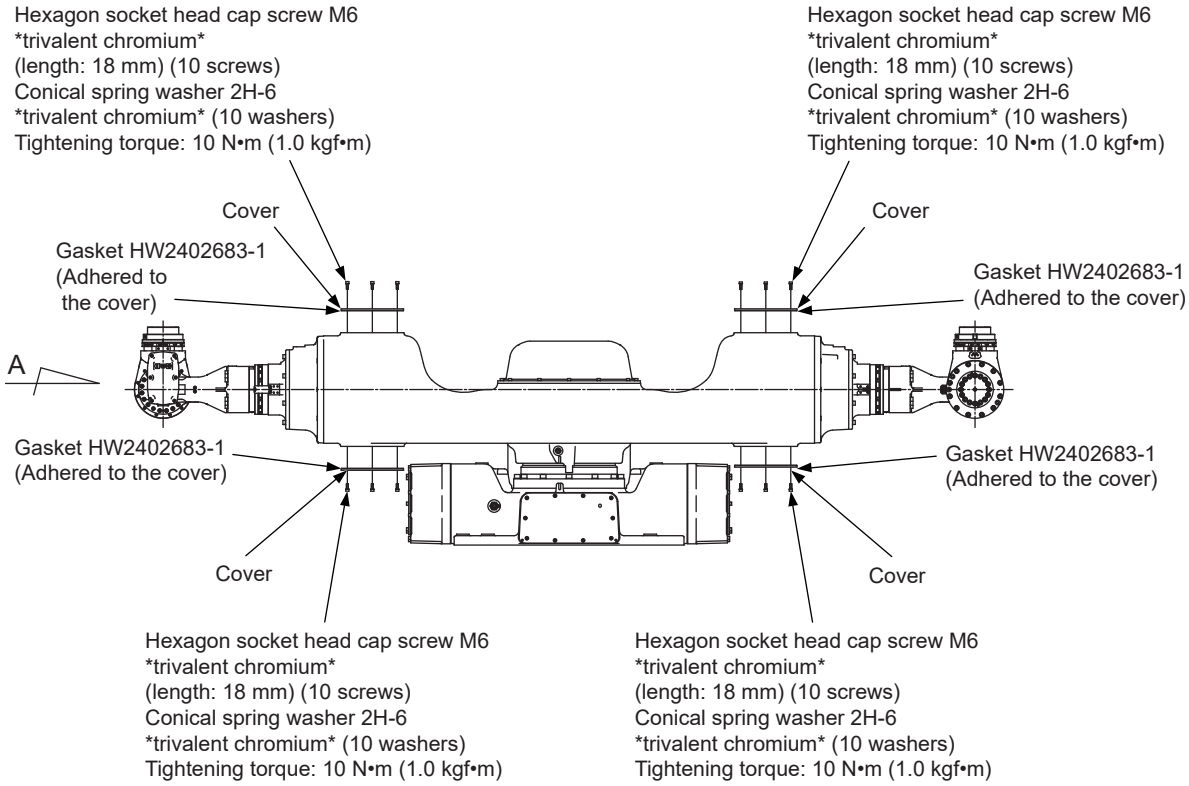
10. Check that the gasket is adhered to the cover, tighten the hexagon socket head cap screws with the specified tightening torque, and then mount the cover on the manipulator.

Fig. 11-1: Inspection of Gaskets in the Base



11 Gasket Replacement
11.1 Attachment by DB Bond

Fig. 11-2: Inspection of Gaskets in the First Arm and Second Arm



11.2 Attachment by Double-sided Tape (93005LE)

- Refer to *fig. 11-3 "Gaskets of S-head"* and *fig. 11-4 "Attachment of Double-sided Tape"* .

1. Remove the cover of the gasket to replace from the manipulator. (Refer to *chapter 2.1 "Inspection of Gasket"* .)
2. Remove the gasket from the cover.
   Since the gasket is adhered with the double-sided tape, remove the gasket carefully.
3. Thoroughly remove the double-sided tape adhered to the cover.
4. Check that attached surface of the cover and the gasket matches.
5. Degrease each attached surface of the cover and the gasket.
6. Referring to *fig. 11-4*, cut the double-sided tape into the specified lengths, and then attach them to the cover.
7. Attach the gasket to the cover.
   Make sure that the gasket is flat.
8. Turn the gasket upside down to confirm that it is firmly adhered to the cover.
9. Tighten the hexagon socket head cap screws with the specified tightening torque to mount the cover to the manipulator while being careful not to get the gasket caught.

Fig. 11-3: Gaskets of S-head

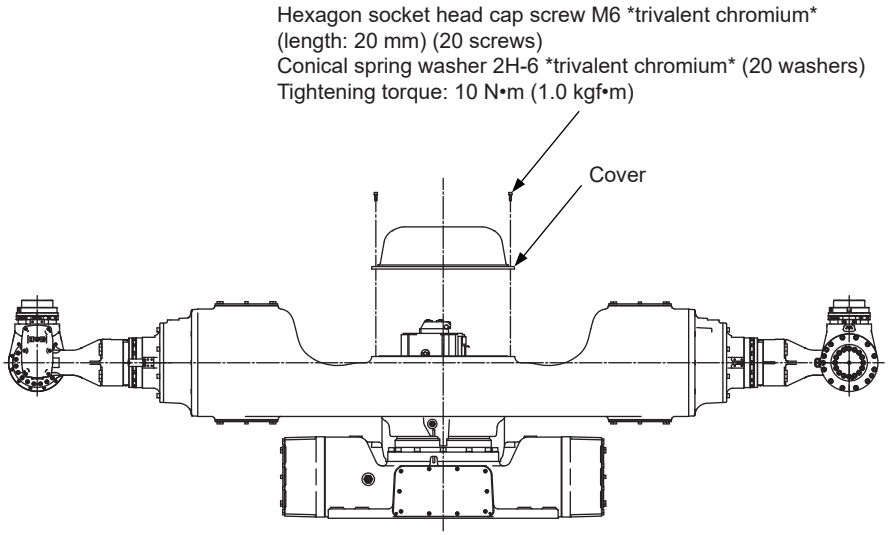
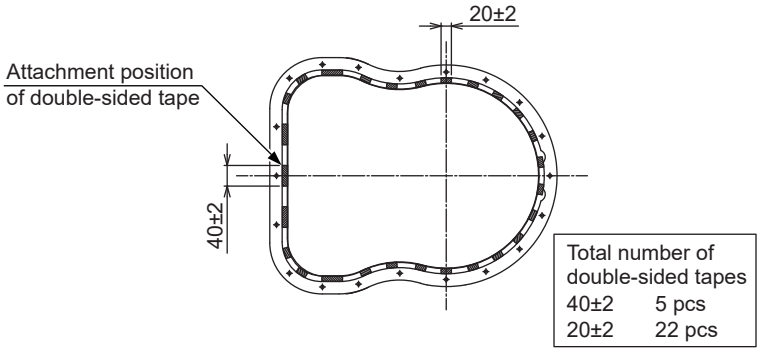


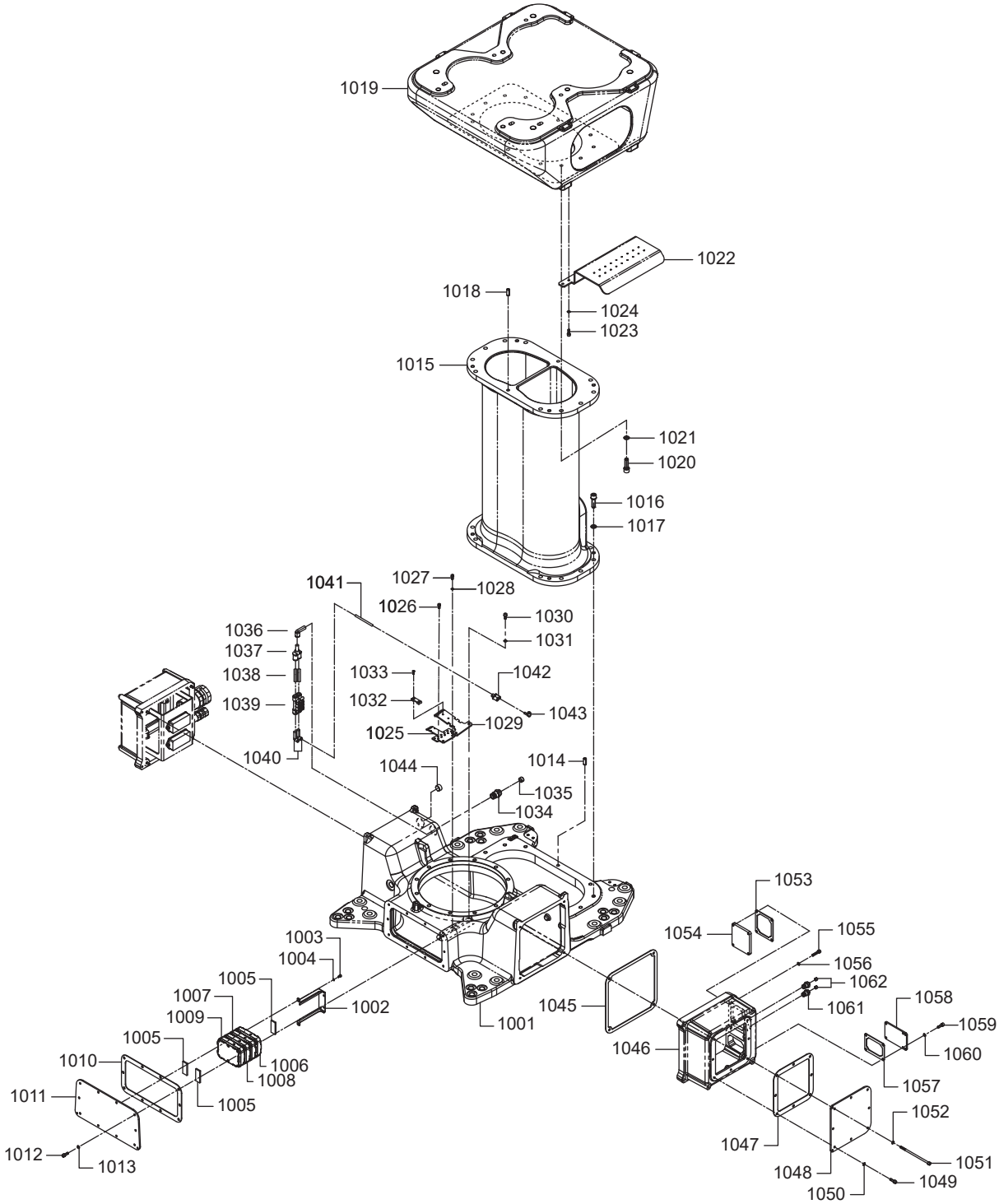
Fig. 11-4: Attachment of Double-sided Tape



12 Parts List

12.1 Base Unit

Fig. 12-1: Base Unit



12 Parts List
12.1 Base Unit

Table 12-1: Base Unit (Sheet 1 of 2)

No.	DWG No.	Name	Pcs
1001	HW2100311-1	Base	1
1002	HW1308280-D	Battery bracket	1
1003	M4×8	Socket screw	2
1004	2L-4	Conical spring washer	2
1005	C-300-CR-5-20	Tape	3
1006	HW1373234-D	Battery pack	1
1007	HW1373234-C	Battery pack	1
1008	HW1373234-B	Battery pack	1
1009	HW1373234-A	Battery pack	1
1010	HW2402682-1	Gasket (SB1)	1
1011	HW2302278-A	Cover (SB1)	1
1012	M6×18	Socket screw	10
1013	2H-6	Conical spring washer	10
1014	HW1408161-10-25	Pin	2
1015	HW2100312-1	Base 1	1
1016	M12×40	Socket screw	10
1017	2H-12	Conical spring washer	10
1018	HW1408161-10-25	Pin	2
1019	HW2100313-1	Base 2	1
1020	M12×40	Socket screw	10
1021	2H-12	Conical spring washer	10
1022	HW2302376-1	Bracket	1
1023	M6×18 (TRIVALENT CHROMIUM coating)	Socket screw	4
1024	2L-6 (TRIVALENT CHROMIUM coating)	Conical spring washer	4
1025	HW2402776-1	Bracket	1
1026	M5×10 (SUS)	Cross head APS bolt	10
1027	M5×12	Socket screw	2
1028	2L-5	Conical spring washer	2
1029	HW2402675-1	Bracket	1
1030	M6×14	Socket screw	2
1031	2L-6	Conical spring washer	2
1032	HW9403595-1	Metal fitting	1
1033	M4×10 (SUS)	Countersunk screw	2
1034	PMF-12-03 XW	Union	1
1035	PT3/8	Hexagon socket head plug	1

12 Parts List
12.1 Base Unit

Table 12-1: Base Unit (Sheet 2 of 2)

No.	DWG No.	Name	Pcs
1036	KQ2L10-12A	Elbow	1
1037	KQ2U10-99A	Branch Union Y	1
1038	KQ2U10-99	Nipple	2
1039	KM13-06-10-3	Manifold	2
1040	KQ2L06-10A	Elbow	2
1041	TU0604BU	Tube	1
1042	KQ2U06-00A	Union Y	1
1043	KQ2L06-99A	Straight elbow	1
1044	PT1/2 (SUS)	Hexagon socket head plug	1
1045	HW2402679-1	Gasket (SB2)	1
1046	HW2200213-1	Duct	1
1047	HW2402676-1	Gasket (SP1)	1
1048	HW2402677-1	Cover (SP1)	1
1049	M6×20 (TRIVALENT CHROMIUM coating)	Socket screw	8
1050	2H-6 (TRIVALENT CHROMIUM coating)	Conical spring washer	8
1051	M6×140 (TRIVALENT CHROMIUM coating)	Socket screw	4
1052	2H-6 (TRIVALENT CHROMIUM coating)	Conical spring washer	4
1053	HW2402865-1	Gasket	1
1054	HW2402864-1	Cover	1
1055	M6×30 (TRIVALENT CHROMIUM coating)	Socket screw	4
1056	SW-6×10	Seal washer	4
1057	HW2402863-1	Gasket	1
1058	HW2402861-1	Cover	1
1059	M6×20 (TRIVALENT CHROMIUM coating)	Socket screw	4
1060	2H-6 (TRIVALENT CHROMIUM coating)	Conical spring washer	4
1061	PMF8-01	Joint	2
1062	PT1/8 (SUS)	Hexagon socket head plug	2

12.2 S1-axis Unit

Fig. 12-2: S1-axis Unit

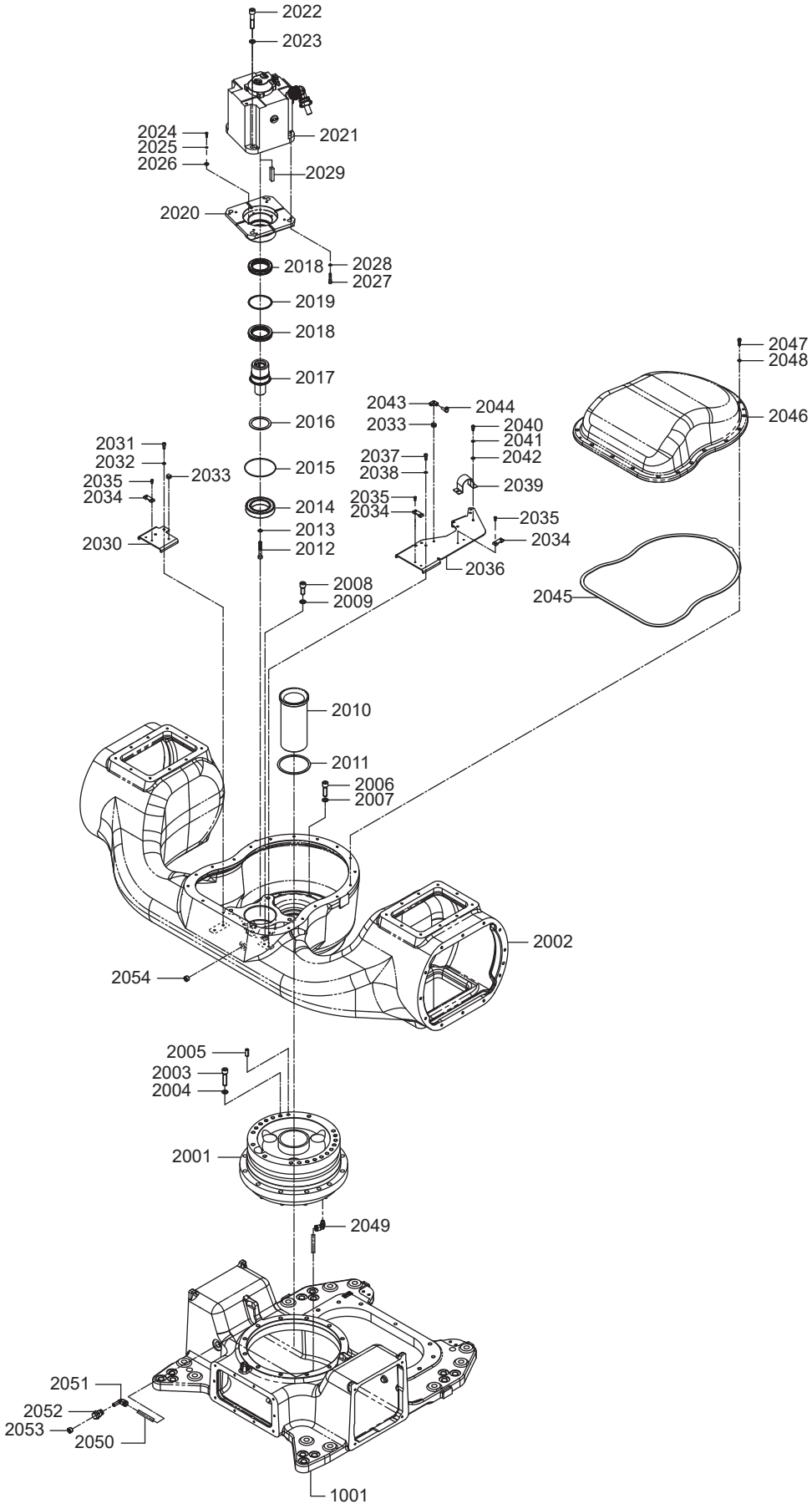


Table 12-2: S1-axis Unit (Sheet 1 of 2)

No.	DWG No.	Name	Pcs
2001	HW2380782-A	Speed reducer	1
2002	HW2100314-1	S-head	1
2003	M12×50	Socket screw	12
2004	2H-12	Conical spring washer	12
2005	HW1408161-10-25	Pin	1
2006	M12×40	Socket screw	18
2007	2H-12	Conical spring washer	18
2008	M12×30	Socket screw	2
2009	2H-12	Conical spring washer	2
2010	HW2402817-1	Cable guide	1
2011	HW2402848-1	Gasket	1
2012	M8×55	Socket screw	1
2013	2L-8	Conical spring washer	1
2014	6012ZZ	Bearing	1
2015	S100	O-ring	1
2016	STW-60	Retaining ring	1
2017	HW2301978-1	Gear	1
2018	HW9481329-A	Oil seal	2
2019	HW0415325-2	Collar	1
2020	HW1305562-1	M-base	1
2021	SGM7G-37APK-YRA1	Motor	1
2022	M12×60	Socket screw	4
2023	2H-12	Conical spring washer	4
2024	M4×12	Socket screw	4
2025	2L-4	Conical spring washer	4
2026	HW0404196-1	Washer	4
2027	M6×30	Socket screw	2
2028	2L-6	Conical spring washer	2
2029	-	Motor key	1
2030	HW2402686-1	Bracket	1
2031	M6×14	Socket screw	2
2032	2L-6	Conical spring washer	2
2033	FT5	Fir tree mount	2
2034	HW9403595-1	Metal fitting	3
2035	M4×10 (SUS)	Countersunk screw	6
2036	HW2302285-1	Bracket	1

Table 12-2: S1-axis Unit (Sheet 2 of 2)

No.	DWG No.	Name	Pcs
2037	M6×14	Socket screw	4
2038	2L-6	Conical spring washer	4
2039	FCD36-31	Saddle	1
2040	M6×20	Socket screw	2
2041	2L-6	Conical spring washer	2
2042	M6 (SUS)	Washer	2
2043	KQ2L06-00A	Elbow	1
2044	KQ2L06-99A	Straight elbow	1
2045	HW2402685-1	Gasket (S1)	1
2046	HW2200211-1	Cover (S1)	1
2047	M6×18 (TRIVALENT CHROMIUM coating)	Socket screw	20
2048	2H-6 (TRIVALENT CHROMIUM coating)	Conical spring washer	20
2049	PL10-01	Union	1
2050	NB-1075-0.36	Tube	1
2051	PLJ10	Union	1
2052	PMF-10-03 XW	Union	1
2053	PT3/8 (SUS)	Hexagon socket head plug	1
2054	PT3/8 (SUS)	Hexagon socket head plug	1

12.3 Gear Unit

Fig. 12-3: Gear Unit (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3)

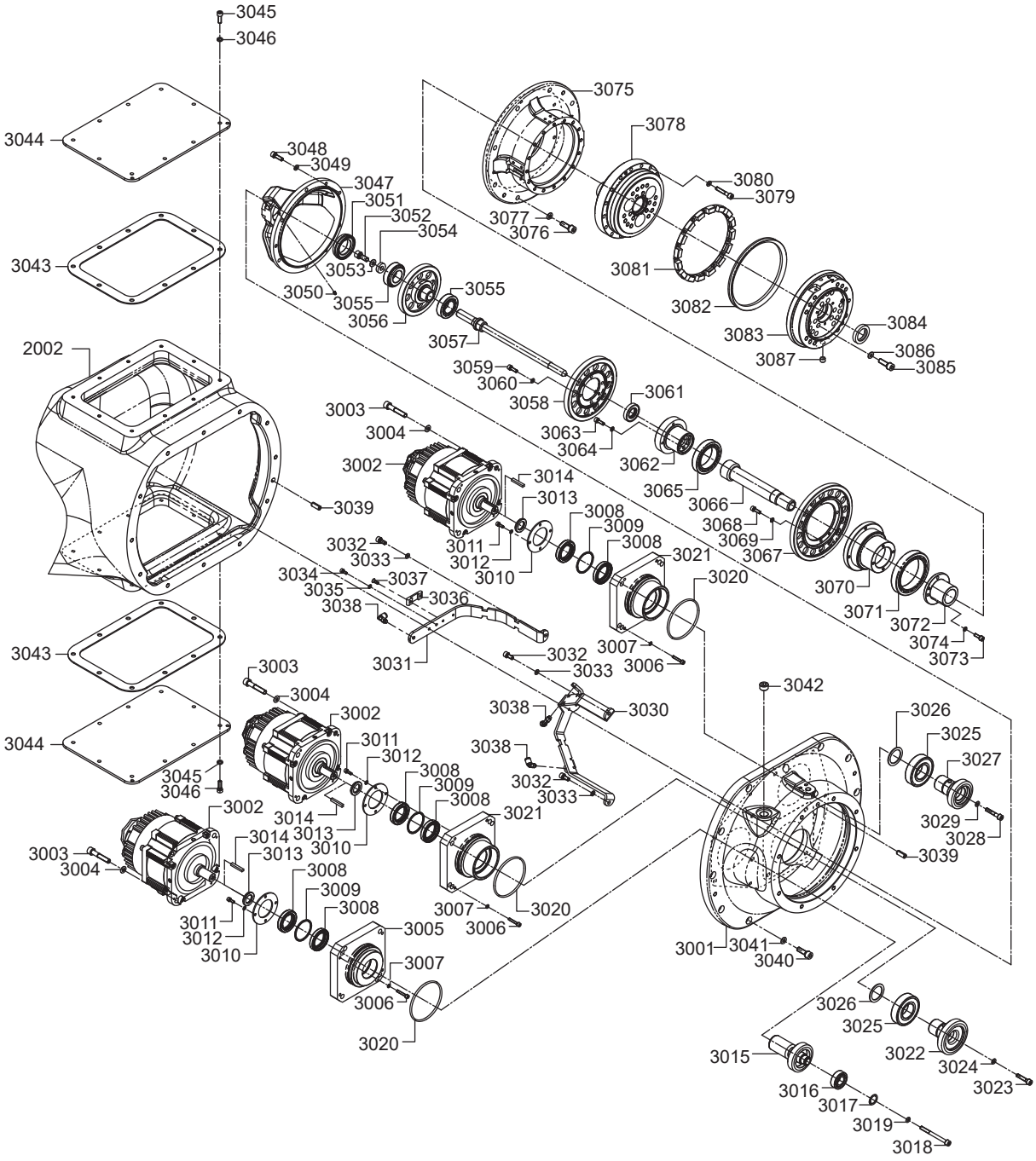


Table 12-3: Gear Unit (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3) (Sheet 1 of 3)

No.	DWG No.	Name	Pcs
3001	HW2200210-1	Gear case	2
3002	SGM7G-09APK-YRA1	Motor	6
3003	M8×45	Socket screw	20
3004	2L-8	Conical spring washer	20
3005	HW2302402-1	M-base	2
3006	M4×25	Socket screw	12
3007	2L-4	Conical spring washer	12
3008	TC30458	Oil seal	12
3009	HW1408732-1	Collar	6
3010	HW1408729-1	Plate	6
3011	M4×12	Socket screw	24
3012	2L-4	Conical spring washer	24
3013	HW0400470-1	Collar	6
3014	-	Motor key	6
3015	HW2302286-1	Gear	2
3016	6003	Bearing	2
3017	ISTW-17	Retaining ring	2
3018	M6×70	Socket screw	2
3019	2L-6	Conical spring washer	2
3020	G80	O-ring	6
3021	HW2302288-1	M-base	4
3022	HW2302276-1	Gear	2
3023	M6×30	Socket screw	2
3024	2L-6	Conical spring washer	2
3025	6206ZZ	Bearing	4
3026	STW-30	Retaining ring	4
3027	HW2302287-1	Gear	2
3028	M6×35	Socket screw	2
3029	2L-6	Conical spring washer	2
3030	HW2302284-1	Support	2
3031	HW2302283-1	Support	2
3032	M6×14	Socket screw	6
3033	2L-6	Conical spring washer	6
3034	M4×10	Socket screw	4
3035	2L-4	Conical spring washer	4
3036	HW9403595-1	Metal fitting	2

Table 12-3: Gear Unit (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3) (Sheet 2 of 3)

No.	DWG No.	Name	Pcs
3037	M4×12 (SUS)	Countersunk screw	4
3038	KQ2L06-M6A	Elbow	6
3039	HW1408161-8-20	Parallel pin	4
3040	M8×25	Socket screw	24
3041	2L-8	Conical spring washer	24
3042	PT3/8 (SUS)	Hexagon socket head plug	2
3043	HW2402683-1	Gasket (S2)	4
3044	HW2402684-1	Cover (S2)	4
3045	M6×18 (TRIVALENT CHROMIUM coating)	Socket screw	40
3046	2H-6 (TRIVALENT CHROMIUM coating)	Conical spring washer	40
3047	HW0312837-1	Housing	2
3048	M6×20	Socket screw	12
3049	2L-6	Conical spring washer	12
3050	M4×6	H set screw	2
3051	HW0412720-1	B nut	2
3052	M8×20	Socket screw	2
3053	2L-8	Conical spring washer	2
3054	HW0404196-8	Washer	2
3055	HR32005XJ	Bearing	4
3056	HW2302277-1	Gear	2
3057	HW0312835-1	Shaft	2
3058	HW0312824-1	Gear	2
3059	M5×16	Socket screw	8
3060	2L-5	Conical spring washer	8
3061	AE1017FO (TC20367) (FKM)	Oil seal	2
3062	HW0312834-1	Shaft	2
3063	M5×16	Socket screw	12
3064	2L-5	Conical spring washer	12
3065	HR32909J	Bearing	2
3066	HW0312833-1	Shaft	2
3067	HW0312822-1	Gear	2
3068	M5×16	Socket screw	8
3069	2L-5	Conical spring washer	8
3070	HW0312832-1	Shaft	2
3071	HR32913J	Bearing	2

Table 12-3: Gear Unit (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3) (Sheet 3 of 3)

No.	DWG No.	Name	Pcs
3072	HW0312831-1	Gear	2
3073	M5×16	Socket screw	8
3074	2L-5	Conical spring washer	8
3075	HW0200768-1	Shaft	2
3076	M8×25	Socket screw	16
3077	2L-8	Conical spring washer	16
3078	HW0387754-A	Speed reducer	2
3079	M6×35	Socket screw	32
3080	2L-6	Conical spring washer	32
3081	HW1308144-1	Ring	2
3082	VR140A (FKM)	V-ring	2
3083	HW1308143-1	Flange	2
3084	AC1306G0 (SC25387) (FKM)	Oil seal	2
3085	M8×25	Socket screw	36
3086	2L-8	Conical spring washer	36
3087	PT1/8 (SUS)	Hexagon socket head plug	2

* The quantity is for one manipulator.

12.4 Wrist Unit

Fig. 12-4: Wrist Unit 1 (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3)

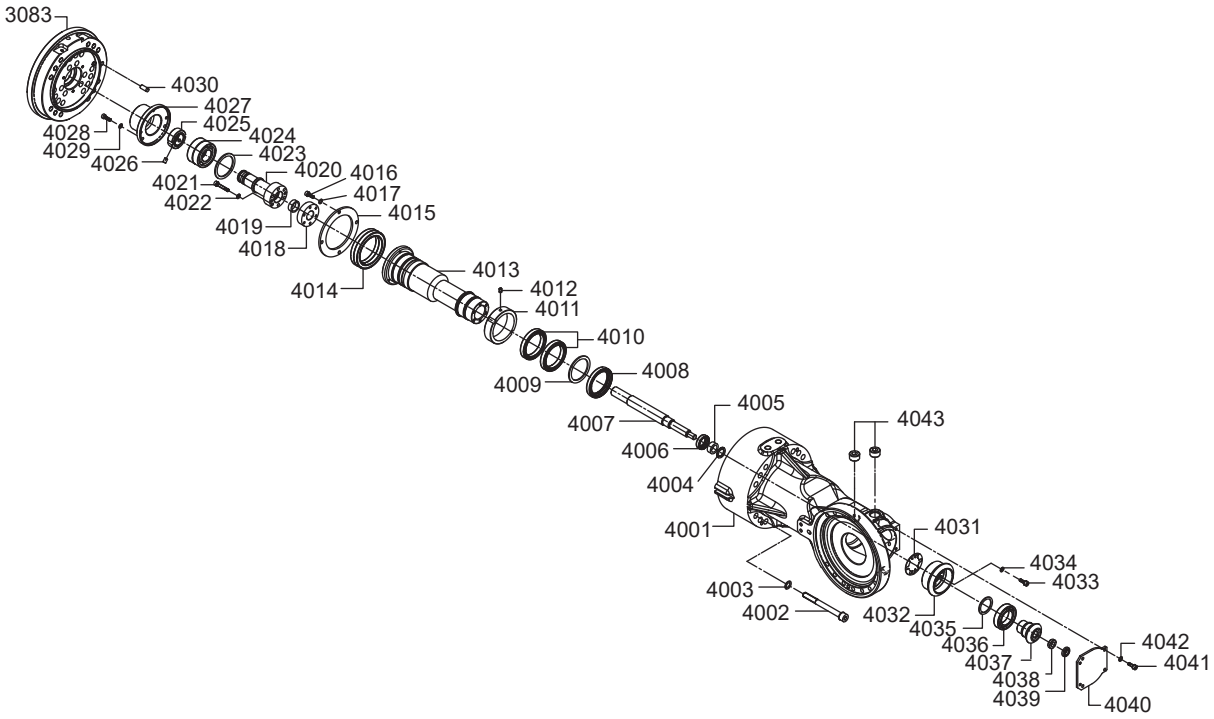


Table 12-4: Wrist Unit 1 (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3) (Sheet 1 of 2)

No.	DWG No.	Name	Pcs
4001	HW2100315-1	U-arm	2
4002	M8×85	Socket screw	24
4003	2L-8	Conical spring washer	24
4004	HW9405888-1 to 7	Shim	2
4005	HW9405883-1	Collar	2
4006	AC0584F0 (SC15247) (FKM)	Oil seal	2
4007	HW1300499-2	Shaft	2
4008	BC6428E0 (SC39528) (FKM)	Oil seal	2
4009	ISTW-40	Retaining ring	2
4010	6808LLU	Bearing	4
4011	HW9405445-1	B nut	2
4012	M4×6	H set screw	2
4013	HW0201297-C	Shaft	2
4014	HW9481234-A	Bearing	2
4015	HW9405880-1	B cover	2
4016	M4×12	Socket screw	8
4017	2L-4	Conical spring washer	8
4018	HW9405892-1	Flange	2

Table 12-4: Wrist Unit 1 (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3) (Sheet 2 of 2)

No.	DWG No.	Name	Pcs
4019	BG3000-15×19	-	2
4020	HW9482765-A	Shaft	2
4021	M4×25	Socket screw	12
4022	2L-4	Conical spring washer	12
4023	RTW-42	Retaining ring	2
4024	6004LBD2PX24V1	Bearing	2
4025	HW9405882-1	B nut	2
4026	M5×7	Magic screw	4
4027	HW9482772-A	Shaft	2
4028	M4×12	Socket screw	6
4029	2L-4	Conical spring washer	6
4030	HW1408161-6-15	Parallel pin	2
4031	HW0412683-1 to 7	Shim	2
4032	HW0312827-1	Gear	2
4033	M4×12	Socket screw	12
4034	2L-4	Conical spring washer	12
4035	STW-25	Retaining ring	2
4036	6905	Bearing	2
4037	HW9381667-A	Gear	2
4038	HW1400695-3	Washer	2
4039	FUMINISS (M8×P0.75)	FINE U-NUT	2
4040	HW0414884-1	Cover	2
4041	M4×12	Socket screw	8
4042	2L-4	Conical spring washer	8
4043	PT3/8 (SUS)	Hexagon socket head plug	4

* The quantity is for one manipulator.

Fig. 12-5: Wrist Unit 2 (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3)

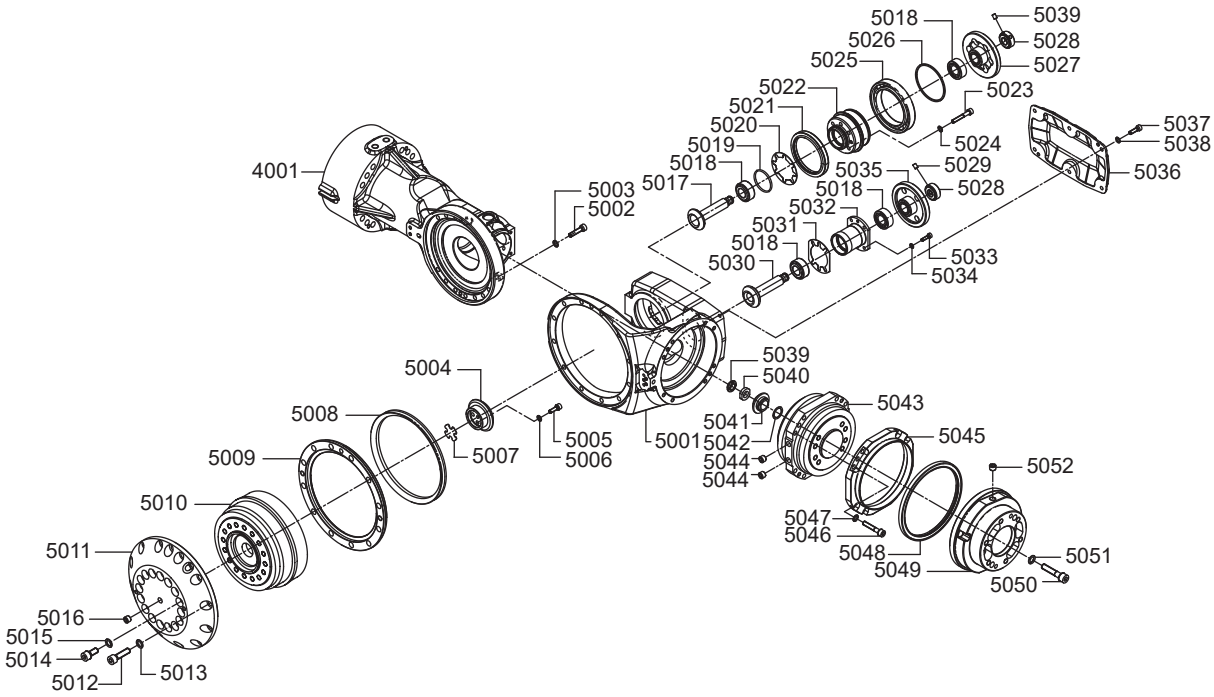


Table 12-5: Wrist Unit 2 (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3) (Sheet 1 of 2)

No.	DWG No.	Name	Pcs
5001	HW1308275-3	Wrist	2
5002	M6×25	Socket screw	32
5003	2L-6	Conical spring washer	32
5004	HW0312828-1	Gear	2
5005	M5×16	Socket screw	8
5006	2L-5	Conical spring washer	8
5007	HW0412695-1 to 7	Shim	2
5008	VR140A (FKM)	V-ring	2
5009	HW1308274-1	Ring	2
5010	HW0387737-B	Speed reducer	2
5011	HW1300244-1	Flange	2
5012	M8×30	Socket screw	24
5013	2L-8	Conical spring washer	24
5014	M8×18	Socket screw	32
5015	2L-8	Conical spring washer	32
5016	PT1/8 (SUS)	Hexagon socket head plug	2
5017	HW9381668-A	Gear	2
5018	HW9480086-A	Bearing	8
5019	S34	O-ring	2
5020	HW0412694-1 to 8	Shim	2
5021	HW1485188-A	Oil seal	2
5022	HW1308276-2	Housing	2
5023	M5×35	Socket screw	12
5024	2L-5	Conical spring washer	12
5025	6912DDUNS7	Bearing	2
5026	WR-60	Circlip	2
5027	HW9381672-A	Gear	2
5028	HW9405881-1	B nut	4
5029	M5×7	Magic screw	8
5030	HW0313630-1	Gear	2
5031	HW9405885-1 to 7	Shim	2
5032	HW9405891-1	Housing	2
5033	M4×14	Socket screw	8
5034	2L-4	Conical spring washer	8
5035	HW9381669-A	Gear	2

Table 12-5: Wrist Unit 2 (S2-1, S2-2, S2-3, S3-1, S3-2, S3-3) (Sheet 2 of 2)

No.	DWG No.	Name	Pcs
5036	HW1307638-1	Cover	2
5037	M5×16	Socket screw	12
5038	2L-5	Conical spring washer	12
5039	FC00SC	FINE U-NUT (Provided with the speed reducer)	2
5040	-	Washer (Provided with the speed reducer)	2
5041	HW0313631-1	Gear	2
5042	HW0412696-1 to 7	Shim	2
5043	HW0389043-A	Speed reducer	2
5044	PT1/8 (SUS)	Hexagon socket head plug	4
5045	HW1308145-1	Ring	2
5046	M6×35	Socket screw	20
5047	2L-6	Conical spring washer	20
5048	TC1151306 (FKM)	Oil seal	2
5049	HW2302305-1	Flange	2
5050	M8×40 (FA coat)	Socket screw	16
5051	2L-8 (FA coat)	Conical spring washer	16
5052	PT1/8 (SUS)	Hexagon socket head plug	4

* The quantity is for one manipulator.

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