WSX1400 Robot User Manual

--- Version 1.1

Shenzhen Worthing Technology Co., LTD

www.wsxlaser.com

Contents

Chapter 1 Robot Installation and Connection

1. Preface

1. Before using the WSX robot, it is important to carefully read the relevant instructions of our company system, and use the robot on the basis of understanding this content.
2. This manual does not guarantee the use of systems other than our application systems. At the same time, our company will not be liable for accidents, damages and/or problems related to industrial property rights that may result from the use of such a system.
3. We seriously recommend that all personnel involved in the operation, teaching, maintenance, repair and inspection of the robot should learn the operating instructions of our system in advance.
4. We reserves the right to change, revise or update this manual without prior notice.
5. This manual may not be reprinted or reproduced in whole or in part without the prior written permission of us.
6. Please keep this manual carefully to ensure that it reaches the end user. Be sure to include this manual if the robot needs to be reinstalled, or moved to a different location, or sold to another user. In case of loss or serious damage, please contact your dealer or technician.
7. All parameter indicators and design may be modified at any time, without affecting the effectiveness of the use of the premise, without separate notice.
8. We have tried to describe in this instruction manual as many situations as possible. However, we have not described situations that are not necessary or impossible due to various possibilities. Therefore, those cases that are not specifically described in the specification can be considered as "impossible" cases.
9. In the process of writing this manual will inevitably omissions and errors, such as in the process of reading found that there are errors or can not understand the place, welcome to call for advice and correction.

2. Precautions

This manual describes how to install and connect WSX robot series. Before performing any operation, please read and fully understand the contents of this manual and the safety manual, and be sure to strictly observe all safety regulations. This manual only describes the mounting and connection of the robot arm. For robot operation programming, please refer to other related manuals.
It is emphasized that you should not perform any operation until you have fully understood the entire contents of this manual. We will not be held responsible for accidents or damages caused by operating the robot in accordance with only one part of this manual.

Throughout this manual, special attention should be paid to the contents of the following symbols.

To ensure proper and safe operation of the robot and to prevent injury to persons and damage to property, observe the safety information expressed in the boxed symbols below.

! Warning

Failure to comply with the contents of this sign may result in personal injury or death.

!Caution

Failure to comply with this sign may cause personal injury and/or mechanical damage.

[Note]

Indicates cautionary information about robot specifications, operation, and maintenance.

2.1 Precautions in Handling, Installation and Storage

When transporting our robots to their mounting locations, the following precautions must be strictly observed for transport and mounting.

! Warning

- It is prohibited to manually support the robot body when handling the robot with a crane or forklift. It is prohibited to stand on the robot or under the lifted robot during handling.
- Before starting the installation, be sure to disconnect the controller power supply and the main power supply. Set up a conspicuous "INSTALLATION" sign, lock the external power switch or hang a sign to prevent workers or others from accidentally turning on the power to avoid unpredictable accidents such as electric shock.
- When running the robot, be sure to turn on the power to the motor and adjust the robot's arm to the specified attitude after confirming that its mounting status is safe, being careful not to approach the arm and be clamped and squeezed.

!Caution

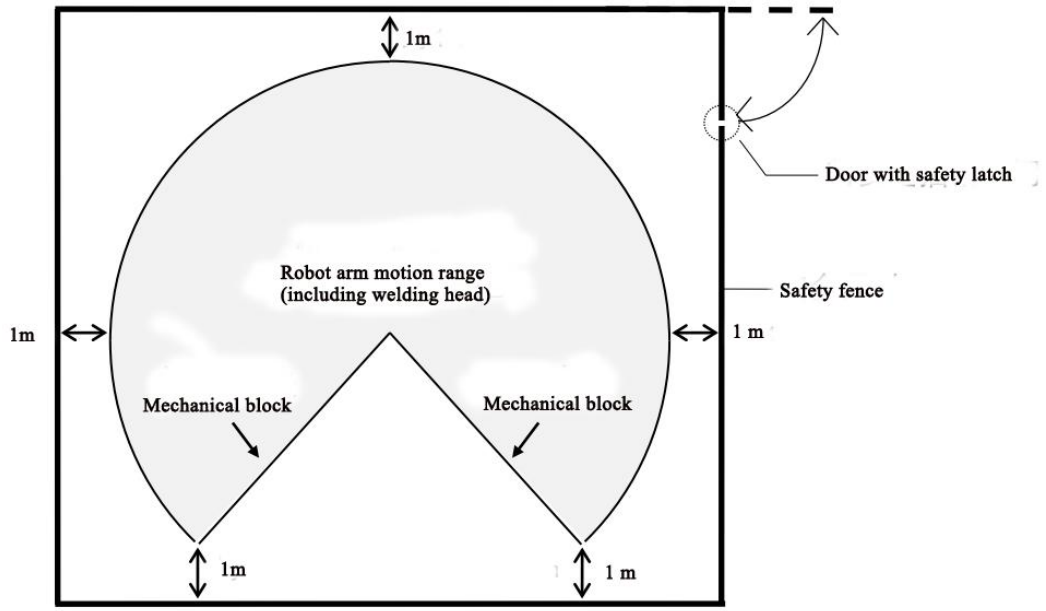
- Since the robot body consists of precision parts, it is important to avoid subjecting the robot to excessive shock and vibration during handling.
- When moving the robot by crane or forklift, remove obstacles beforehand to ensure safe transportation to the installation location.
- When handling and storing robots:
Keep the surrounding environment temperature within -10℃-60℃.
Keep the relative humidity within 35%-85%RH (no condensation).
Avoid excessive vibration and shock.

2.2 Robot arm installation environment

Install the robot arm in a place where the following conditions are met.
- When mounting on the floor or ceiling, make sure that the level with the floor is within 5° .
- When mounting on a wall, make sure that the angle between the mounting surface and the floor is within 85-95° .
- Make sure that the mounting surface and the mounting base have sufficient rigidity.
- Ensure flatness to avoid extra force on the base part of the robot. (If the flatness cannot be

achieved, use pads to adjust the flatness.)

- The operating ambient temperature must be between 0℃ and 45℃. (The viscosity of grease and gear oil is high when starting at low temperatures, which may cause abnormal deviation or overload. In this case, warm up the machine at a low speed (about half of the normal starting speed) for 5-10 minutes.
- Relative humidity must be between 35% and 85% RH without condensation.
- Ensure that the installation location is minimally exposed to dust, fumes and water.
- Ensure that the installation location is free from flammable and corrosive liquids and gases.
- Ensure that the installation location is not subject to excessive vibration. (0. 5G or less)
- Ensure that the mounting location has minimal electromagnetic interference.
- Ensure that the mounting location has enough space for the robot to move.
- Install a safety fence around the robot to ensure that the robot has maximum space to move and that it does not interfere with the surrounding machines, even when fixtures and laser heads are mounted on the arm.
- Install safety gates with safety pins at the entrances and exits of the safety fence for access.



3. Workflow of robot installation and connection

Preliminary	Checking the mounting position and the robot's range of motion	Refer to: 5. Robot Motion Range and Specifications
	Inspection and preparation of the installation site	Refer to: 2.Precautions 6. Mounting Dimensions of the Base 7.Mounting Method
Installation	Handling of the robot	Refer to: 4. Robot Handling Methods

	Installation of the robot	Refer to: 2.Precautions 6. Mounting Dimensions of the Base 7.Mounting Method
	Installation tools	Installation according to the object
Operating with a controller	Connection to the controller	Factory connected
	Confirmation of robot arm	Refer to: System manual
	Confirmation of other functions	Refer to: Instruction manuals for the respective functions
Operation completed		

This workflow describes only the robot arm section. For the robot system part, refer to the system manual.

4. Handling of robots

4.1 Handling of robots using a traveling crane

!Caution

Be careful when lifting the robot, as the robot will tilt forward/backward depending on the robot's attitude and the mounting status of the option class. If the robot is lifted in a tilted position, any impact will cause the robot to shake and possibly break surrounding objects. Remove the lifting ring mounted on the robot after handling.

!Warning

When handling a robot, the weight of the robot must be taken into account. For example, the body of the WSX1400 robot is approximately 177 kg. If the machine is equipped with a load, the weight of the load must be calculated. Also the load capacity of the handling must be within the safe range of the sling or pallet.

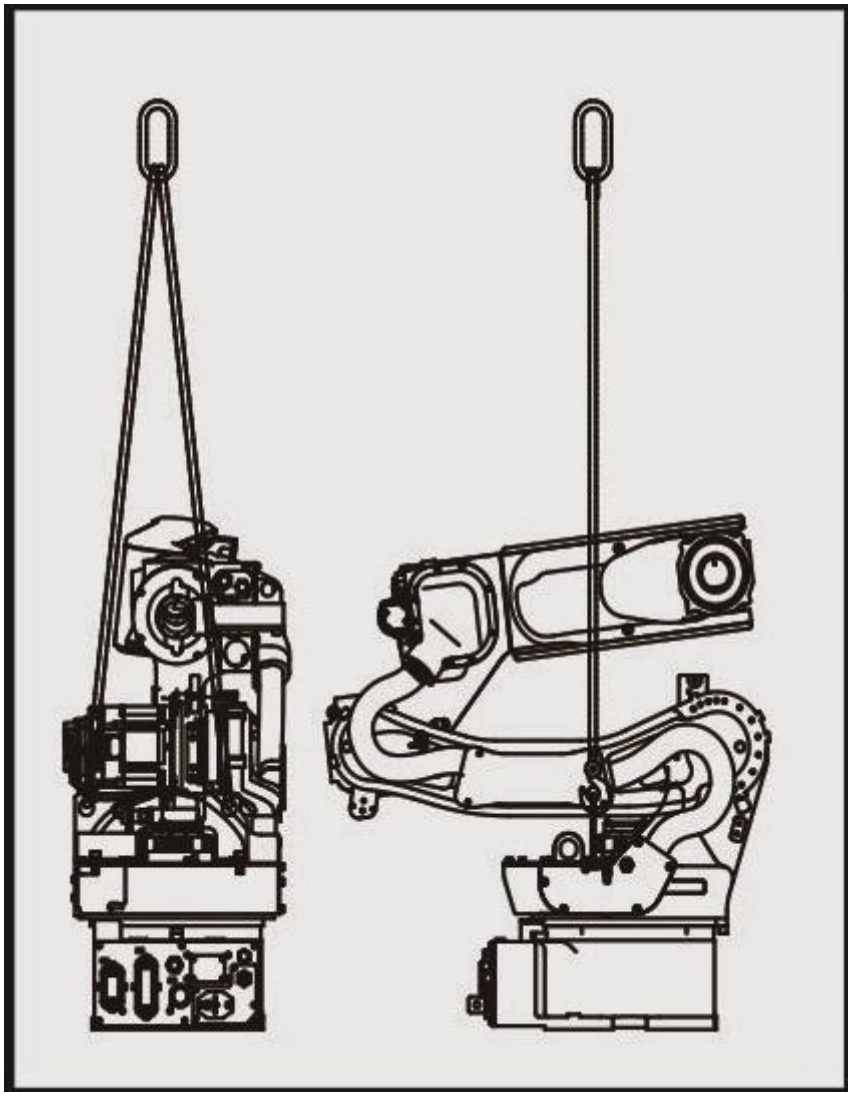


Figure 4.1 Robot handling attitude

Before robot handling, the following preparations must be made.
(1) The robot must be adjusted to the handling attitude (refer to Figure 4.1)
(2) Lock the lifting ring at the waist of the robot.
(3) Use a sling, or wire rope, that meets the robot's handling requirements, to pass through the lifting ring.
(4) Place a cushioning material where the sling has contact with the robot body.
(5) When handling, it must be slow and smooth to prevent the robot from shaking during handling.

4.2 Forklift handling robot

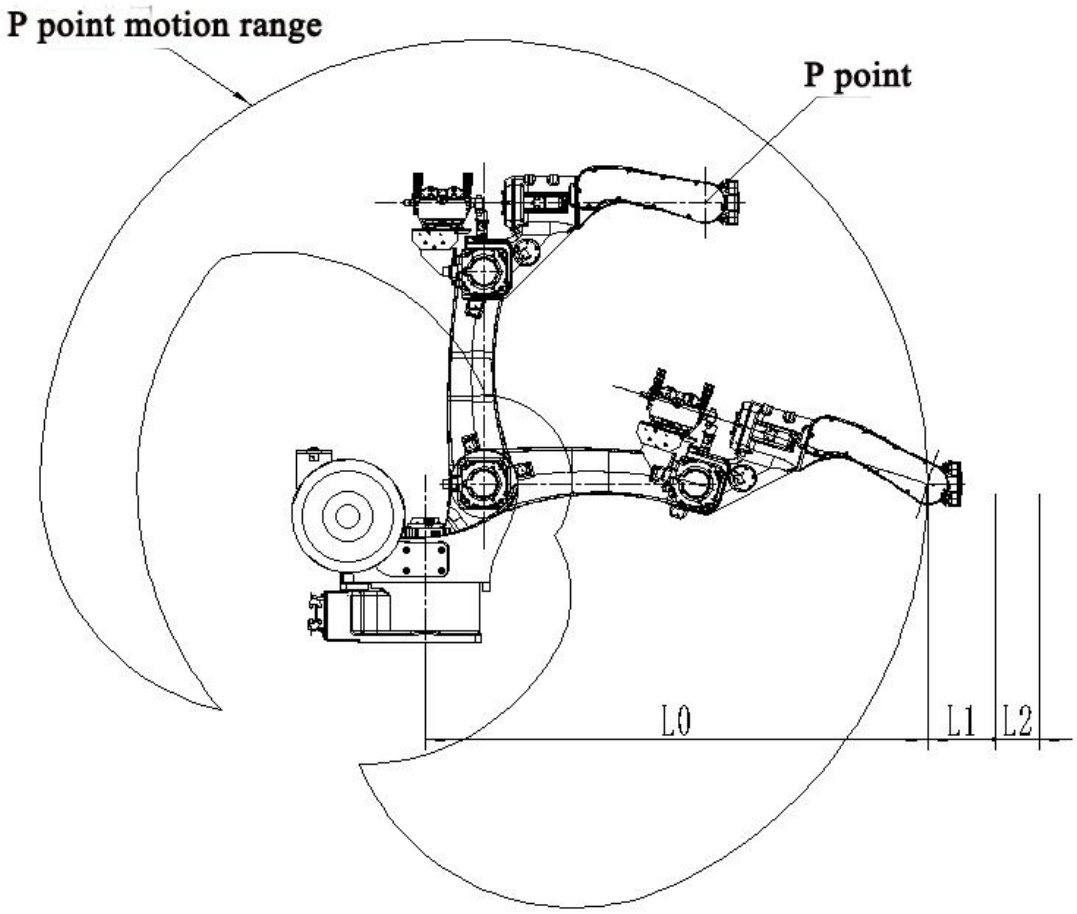
When using a forklift to move the robot, a pallet must be used that can withstand the weight of the robot, and the robot must be secured to the moving pallet with M16 screws to prevent the robot from tipping over and injuring someone during the moving process.

Before robot handling, the following preparations must be made.

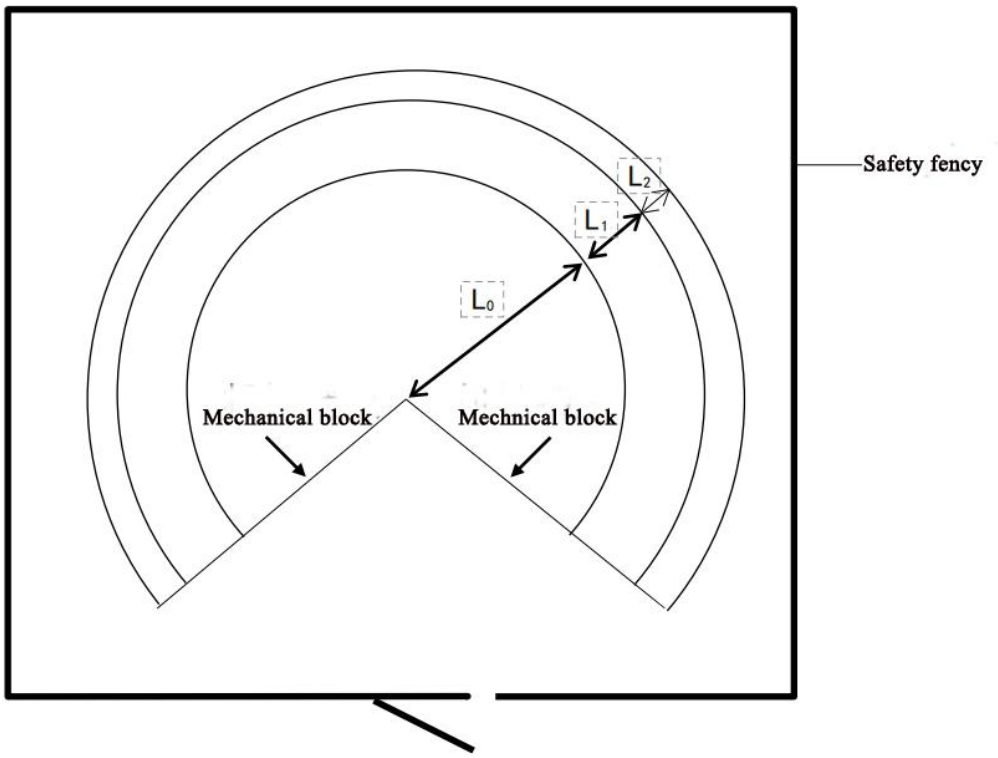
(1) The robot must be adjusted to the handling attitude (refer to Figure 4.1)
(2) Use a pallet that can support the weight of the robot.
(3) Fix the robot in the middle of the pallet with M16 bolts. It is prohibited to place the robot on the edge of the pallet.
(4) Handling must be slow and smooth to prevent the robot from shaking during handling.

!Warning

If other means of handling the robot are used, safety must be ensured.

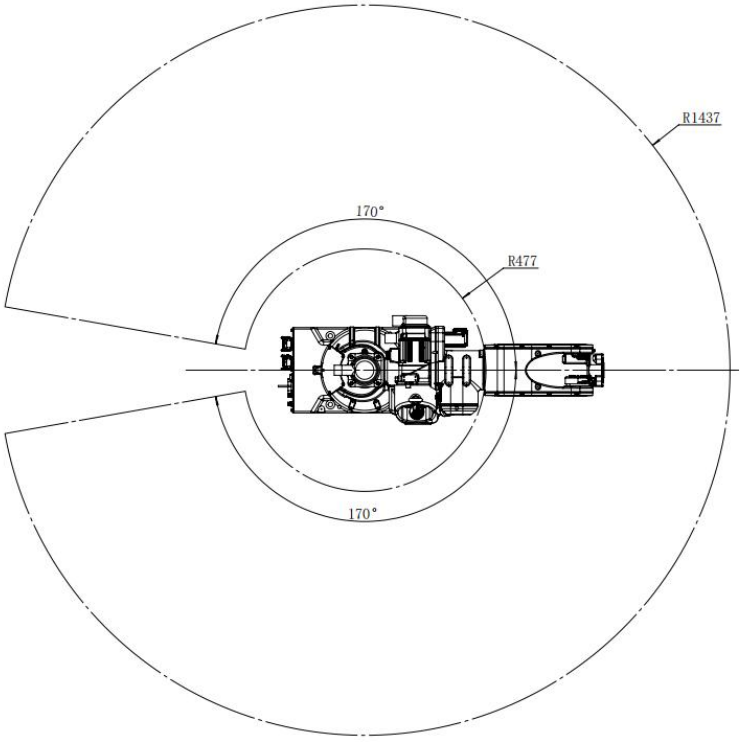


If the range of motion of point P in the above figure is taken as the range of motion of the robot, then
L0 :The range of motion of the robot (refer to "5.2 Range of Motion and Specification of the Robot").
L1 :The sum of the lengths of the wrist flange, tool, and workpiece.
L2 :Safety space
It should be ensured that the dimension of the safety fence is greater than L0+L1+L2 from the center of the arm (point A in the figure below).

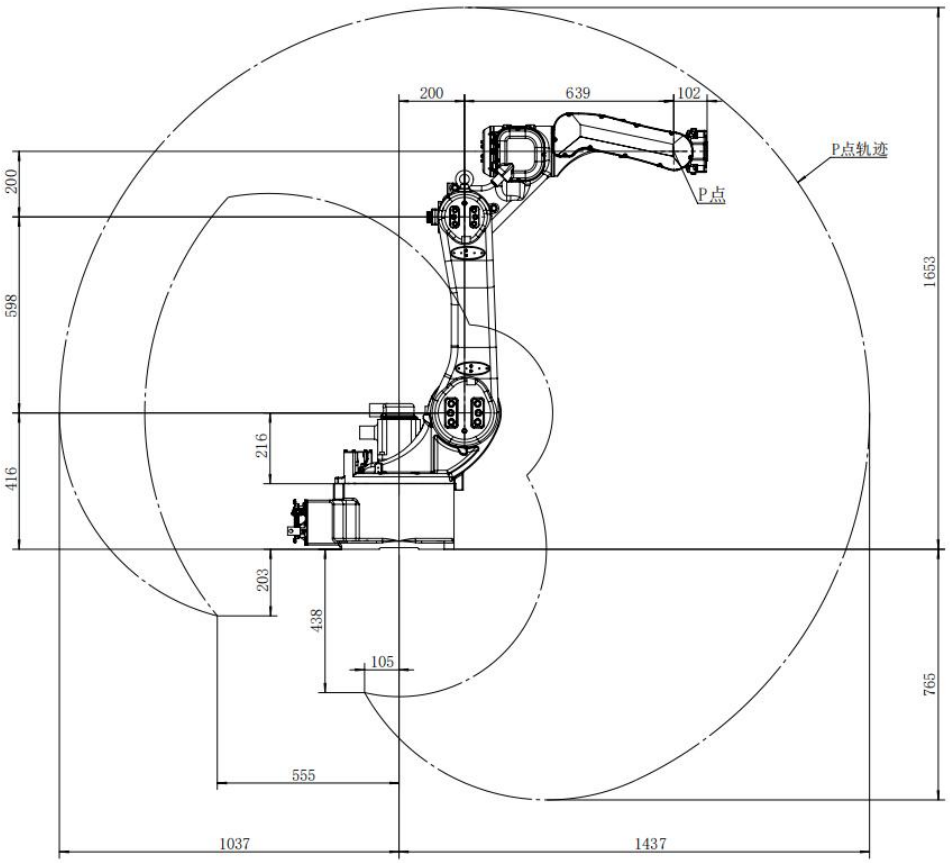

Safety fency
L2
L1
L0
Mechanical block
Mechnical block

5. Range of Motion and Specification of the Robot

5.1 WSX1400



Top view



Side view

Table 5.2.1 Specifications for WSX1400 Industrial Robots

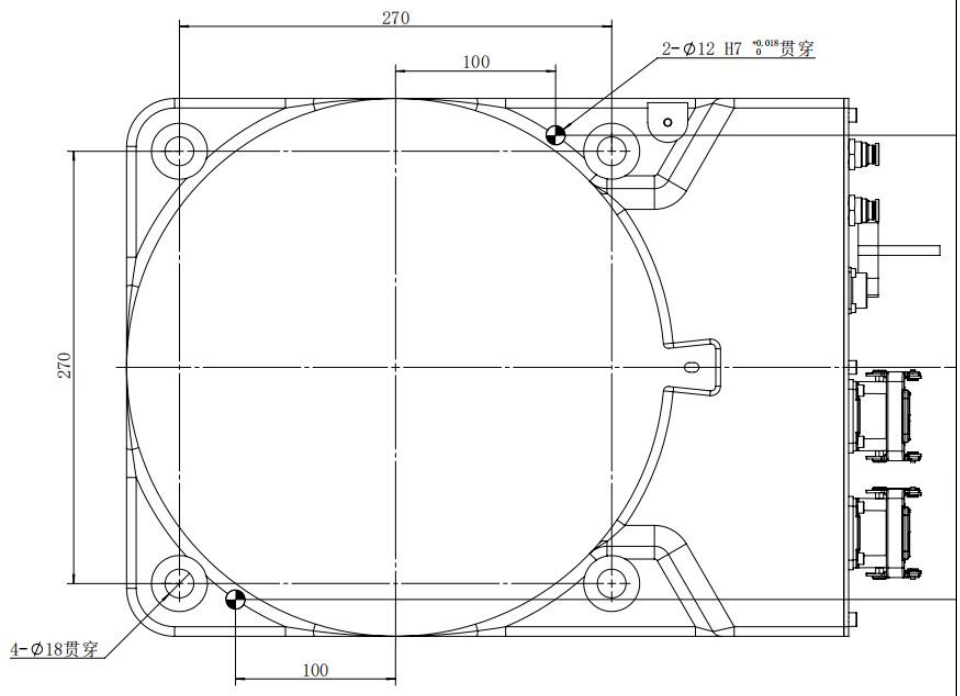
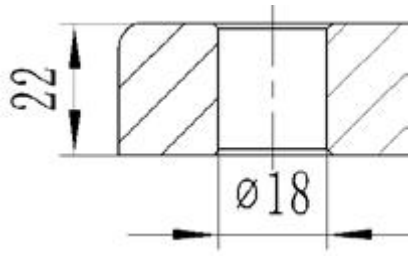
Model no.		WSX1400-10
Number of Axis		6
Movement radius		1437mm
Maximum load		10KG
Repeat positioning accuracy		±0.05mm
Maximum stroke	Axis 1	±170°
	Axis 2	90°-155°
	Axis 3	150°-85°
	Axis 4	±190°
	Axis 5	130°-105°
	Axis 6	±360°
Maximum speed	Axis 1	171°/S
	Axis 2	171°/S
	Axis 3	171°/S
	Axis 4	294°/S
	Axis 5	206°/S
	Axis 6	520°/S
Weight		175KG
Applications		Welding

Installation method		Ground, wall-mounted, upside-down
Air pipes		Φ8X2
Circuit		0.3mm²X12pin（aviation plug）
Protection level		Axis J5\J6: IP67; other: IP54
Installation Environment	Temperature	0~45℃
	Humidity	20-80%（No condensation）
	Vibration	Below 0.5G
	Other	Away from flammable and explosive corrosive liquid or gas, away from electrical interference sources

6. Mounting Dimensions of the Base

6.1 Base of model WSX1400

When mounting the robot base, use high-strength bolts to secure it through the bolt holes.

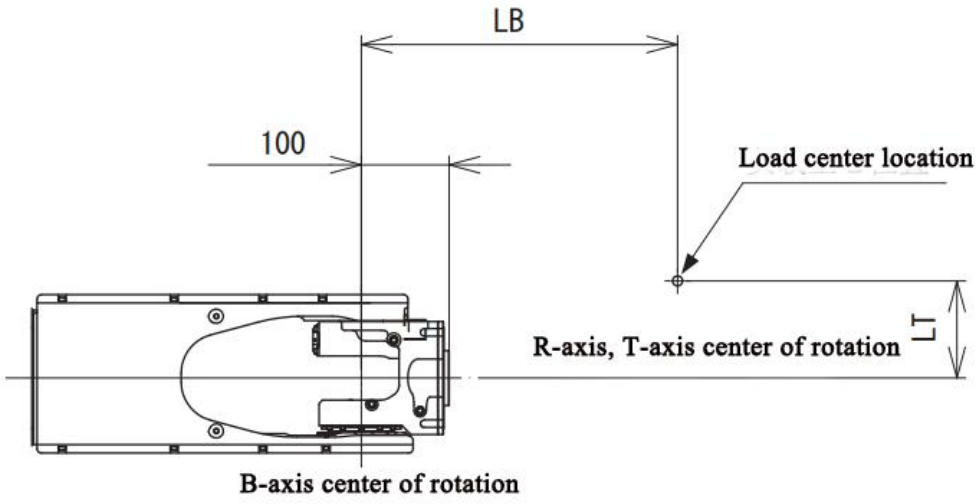
Model	WSX1400-10
Mounting dimensions of the base	
Base cross-section	
Bolt hole	4- Φ 18
High strength bolts	4-M16; Strength grade: 10.9 and above

Mounting surface levelness	Within ±5°

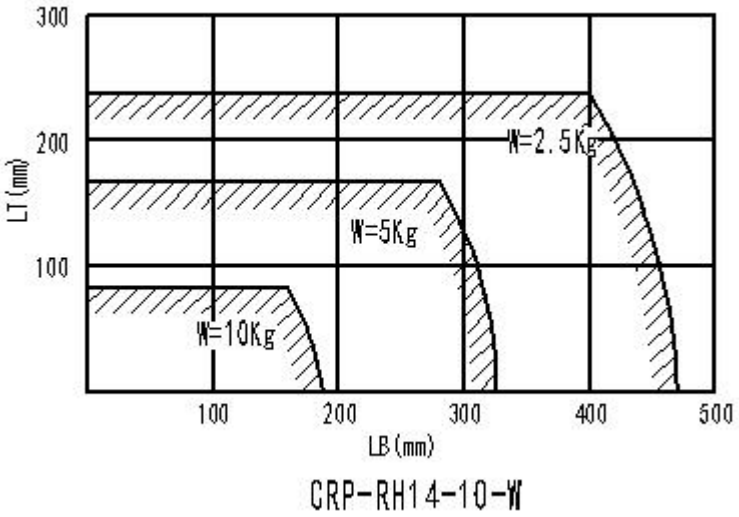
7. Wrist Axis Loads and Wrist Flanges

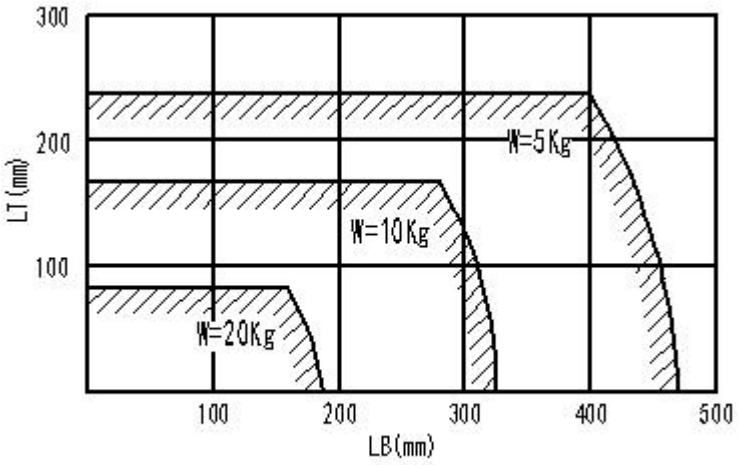
7.1 Allowable Loads on the Wrist Axis

Although the loadable weight (including workpiece) of the wrist axis is fixed for each model (see the parameter table for each model), due to the limitation of torque and moment of inertia, it is necessary to meet the following requirements when using the wrist axis. When the load is not a weight but a force, please be careful not to exceed the permissible load value of the wrist axis (see the parameter table of each model). When the size of the load is small, the limit mounting dimensions (LB, LT) are shown in7.1.1 "Limit Mounting Dimensions".

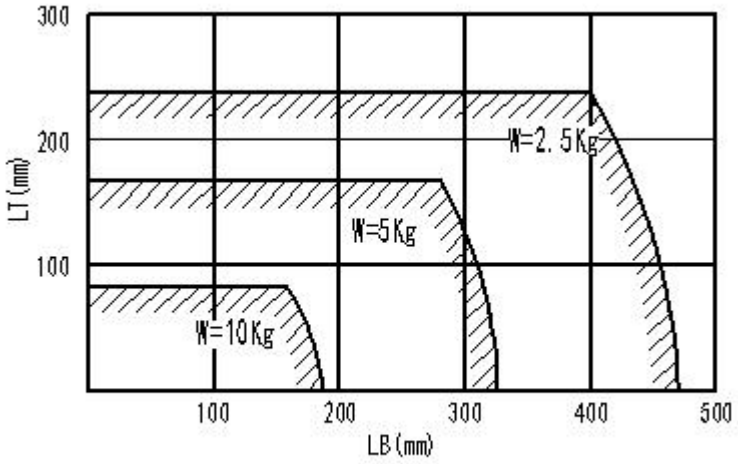


7.1.1 Limit Mounting Dimensions





CRP-RH18-20-W



CRP-RH20-10-W

7.2 Wrist Flanges

!Warning

When installing the arm or other tools, be sure to disconnect the power supply of the controller and the external power switch, set up a conspicuous sign of "under installation", and lock or hang a sign on the external power switch to prevent the operator or other people from accidentally turning on the power supply, so as to avoid the occurrence of unpredictable accidents such as electric shock.

At the end of the robot arm, there are flanges for mounting the hand claw and welding head. The dimensions of the flange at the front end of the wrist axis are detailed in Figure 7.2.1, and the depth of the contact surface between the fitting and the flange should be 5mm or less. Also, do not mount the fittings outside the range shown in Figure 7.2.1.

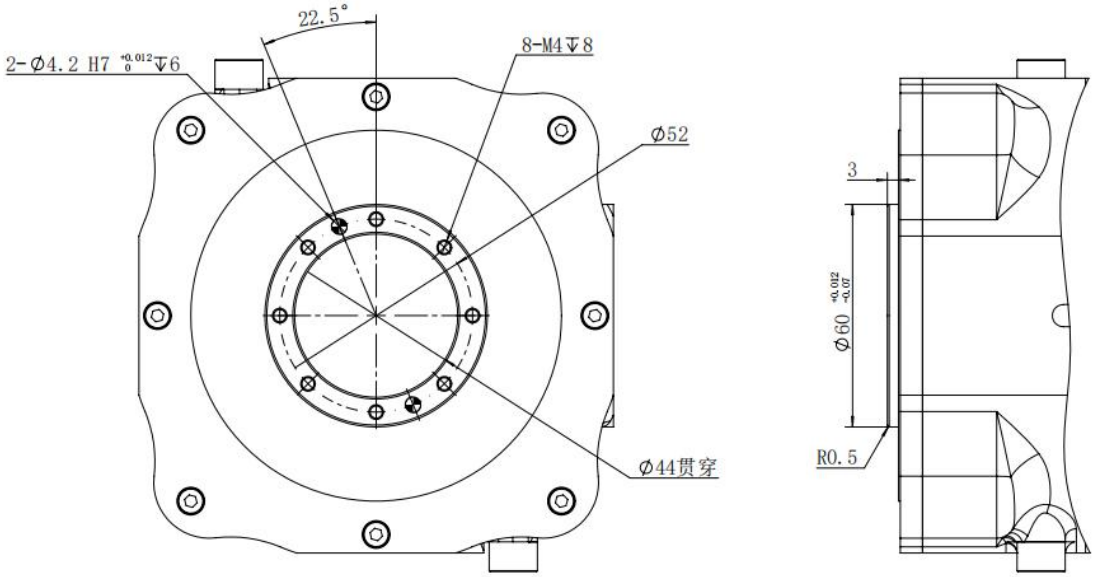
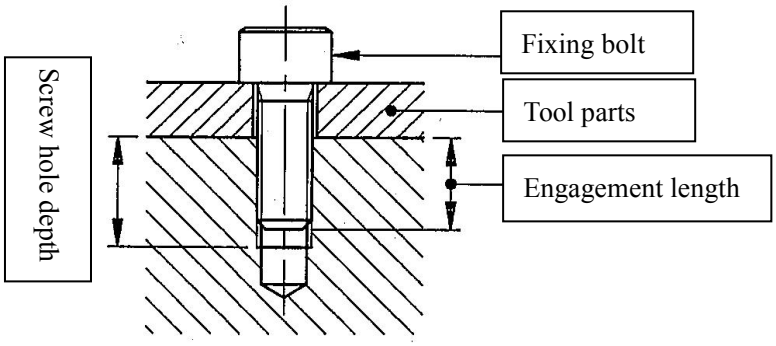


Figure 7.2.1. Flange detail

7.3 Fixing bolt specification



Select the length of the fixing bolts in accordance with the depth of the screw holes in the mounting flange and in compliance with the specified screw-in thread depth (engagement length) to ensure a reliable threaded connection. Use high-strength bolts in the screw holes and tighten them with a standard torque.

!Caution

If the thread depth (engagement length) is screwed in beyond the specified depth, the retaining bolt may push up against the bottom of the threaded hole so that the tool cannot be reliably tightened.

Model	WSX1400-01
Bolt hole	8-M4
Position circle	Φ 52
Position pin hole	Φ 4H7 depth 6
Center reference hole	Φ 60H7 depth 6
Bolt hole depth	12mm
Engagement length	8mm

High Strength Bolt	Above 10.9

8. Wiring connections

8.1 Robot Connection to the Control Cabinet

Robot Control Cabinet Power Requirements

Model	Rated voltage	Power capacity
WSX1400-01	Single phase/220V(10%-15%) 50/60Hz	3KVA

Connection method.
(1) Connect the X1 (encoder line cable) and X2 (power line cable) cable heavy-duty connectors of the control cabinet to the corresponding positions on the bottom plate of the robot body.
(2) Connect the power inlet cable according to the power requirement of the control cabinet.

8.2 Robot Body Ground Connection

After the robot body is fixed, the robot body ground wire connection should be connected. The ground wire should be reliably connected to the user's grounding network, and a yellow-green wire with a cross-sectional area of not less than $4mm^2$ should be used.

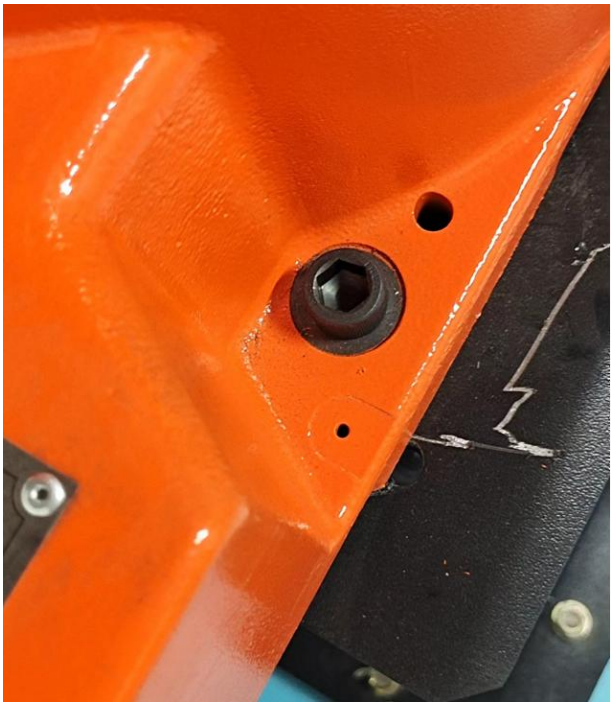


Figure 8.1 Robot base ground connection

9. Comprehensive Robot Instructions

9.1 Robot Load Mounting Instructions

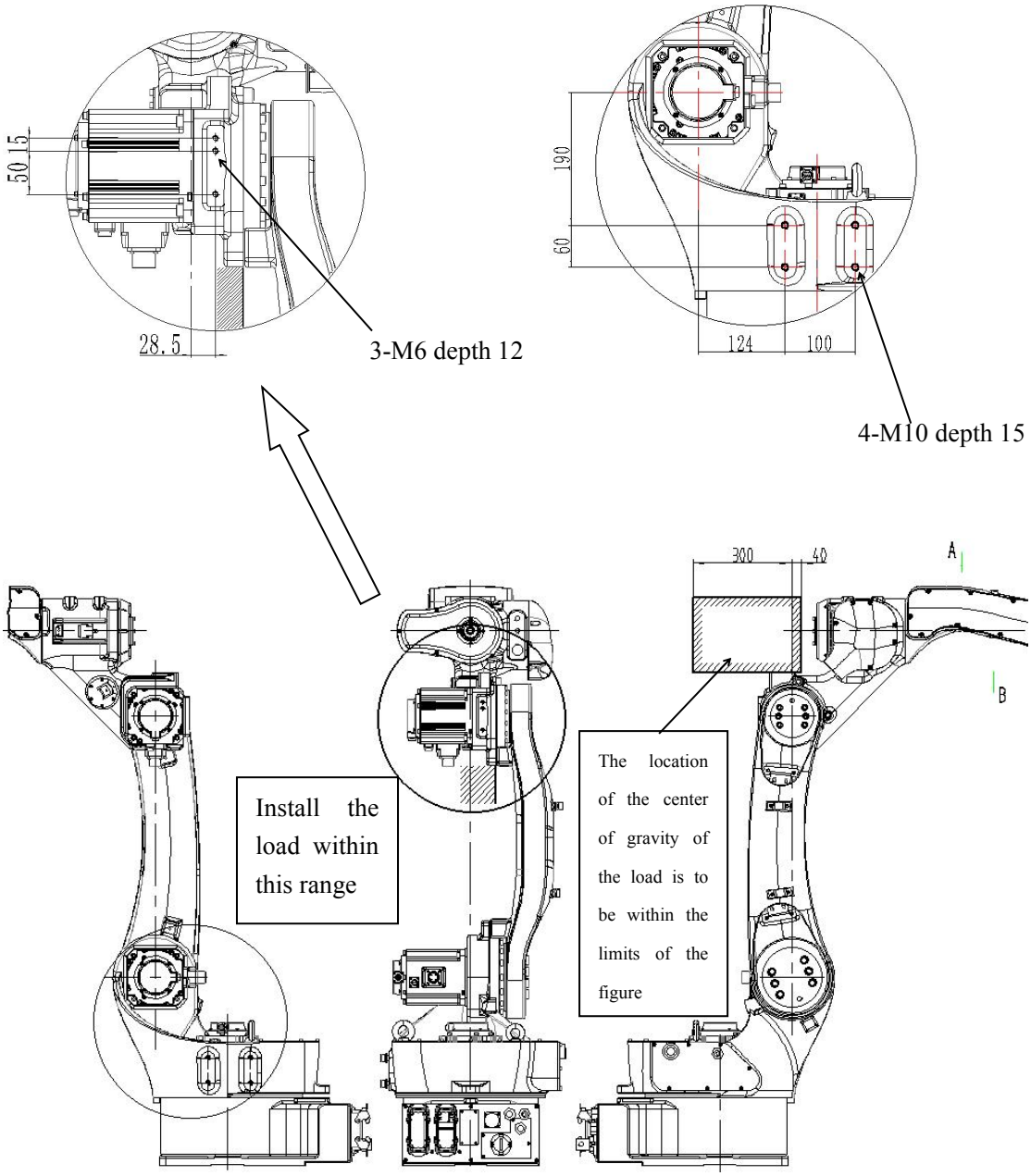
Our industrial robots can be installed with loads on the axis-1 and axis-3 and axis-6 ends of the robot. Taking the WSX1400-10 welding robot as an example, the robot is installed with a wire disk in the axis-1, a wire feeder in the axis-3 and a welding head at the end of the axis-6. If the load calculation is performed by dividing the load section into multiple parts, (e.g., a hand gripper section and a workpiece section, etc.), then the total value should be used to calculate the load moment and the load moment of inertia. Please strictly observe the following limitations for flanged ends. The load capacity, including the mass of the hand gripper, is to be less than or equal to the following values. WSX1400-10 = 10 kg.

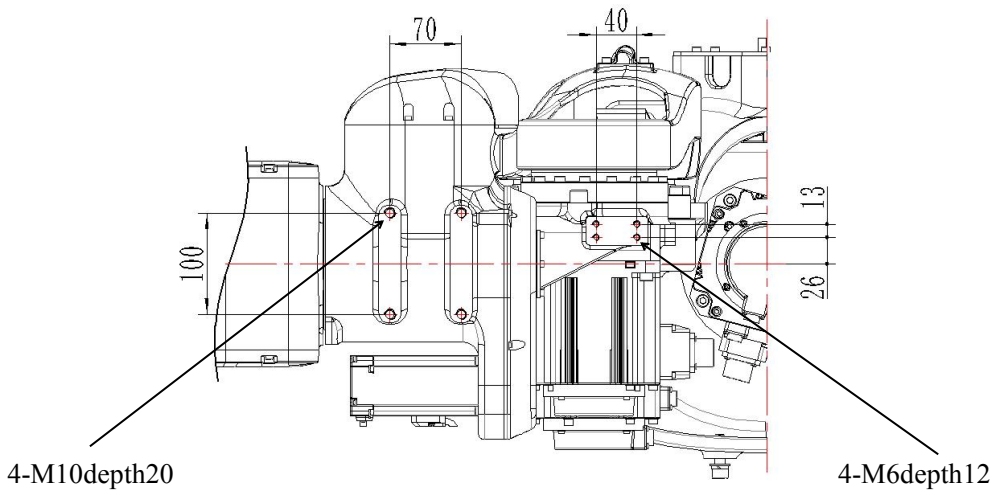
The load moment and load moment of inertia around each wrist joint (J1,J3,J6) are limited, see the robot parameter table for the relevant parameters.

Load mounting standards, see table below.

Model	WSX1400-10
J6(End load)(kg)	⩽10
J3(kg)	⩽8
J1(kg)	⩽25

Load Mounting Location





9.2 Welding Cables and Gas Pipes

9.2.1 Welding Cables (supplied with welding version configuration)

The welding cable on our RH type robot is 70mm² , with an allowable welding current of 350A and an allowable utilization rate of 60% or less.

9.2.2 Gas Pipes

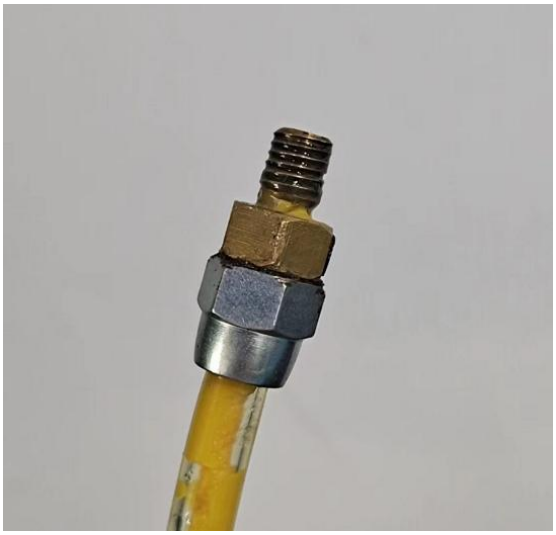
Our robot is equipped with two sets of air pipes A and B. One set is black and the other set is white. The outer diameter of air pipe is φ8, The two ends of the air tube are 1/4 quick-connect air pipe plugs, which need to be plugged when not in use to prevent dust or foreign matter from entering the air pipe and affecting its future use.
Take the welding robot WSX1400-10 as an example, the welding protection gas line is group B gas pipe. The two ends of the group A gas pipe are sealed with plugs to prevent foreign objects from entering the gas pipe.

10. Robot Mounted Upside Down

10.1 J1 Axis Replenished with Grease

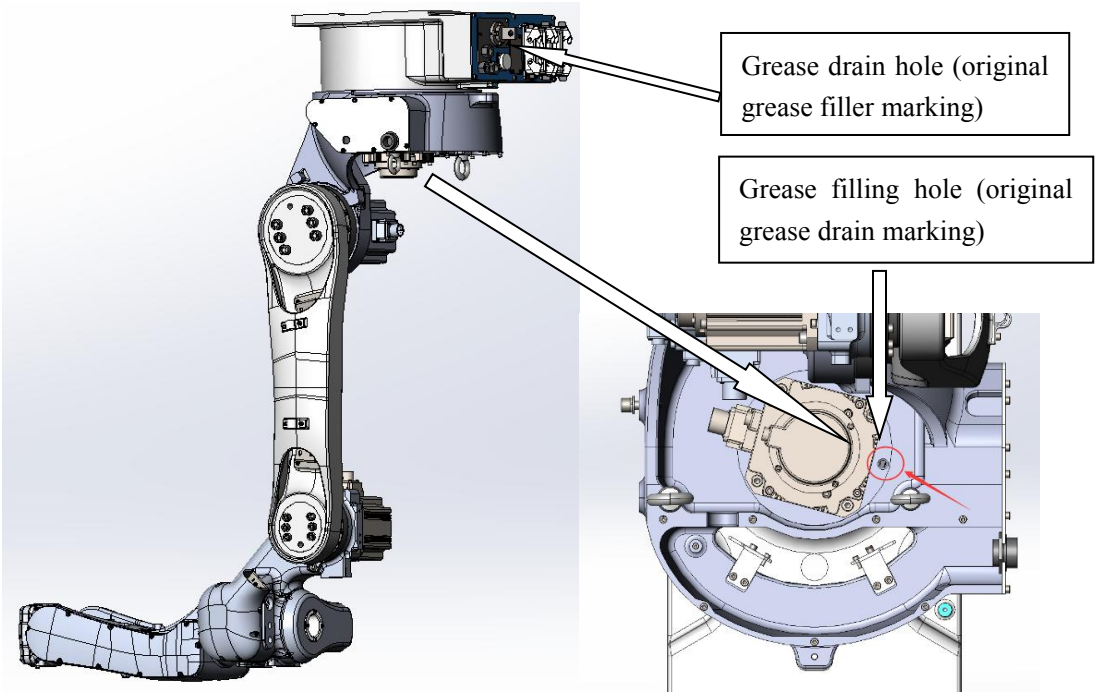
Due to the limitations of the robot body structure, when the robot is upside down and positively mounted, the J1-axis reducer has different grease requirements. The upside down state requires more grease to be added to ensure the normal lubrication of the reducer, and due to the limitations of the J1-axis structure, the robot is in the positively mounted state, so it is not possible to inject the amount of grease required for the upside down state. Therefore, when the customer uses the robot inverted, it is necessary to refill the 1-axis reducer when the robot is in the inverted state, as follows.

Grease filling tool: manual filling gun, air pipe diameter: φ8mm, connector thread: M8



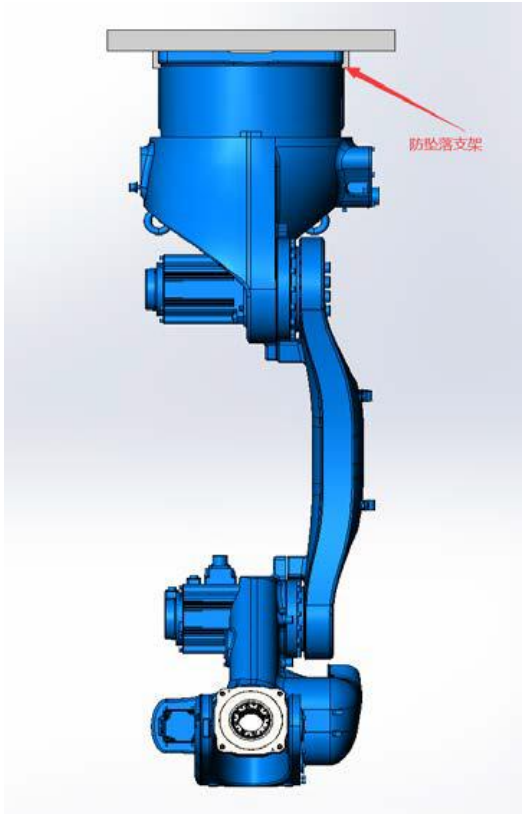
Grease filling instruction

1. Change the original grease drain hole to grease filling hole for refilling according to the illustration of the body, and change the original grease filling hole to grease drain hole.
2. Move the robot so that the arm is in the zero position and turn off the power supply.
3. Unscrew the plug on the grease drain port.
4. Unscrew the plug on the filling port and screw in the grease nozzle.
5. Refill new grease from the filling port.
6. Unscrew the grease nozzle from the filling port, sassafras the grease around the filling port with a rag, wrap the plug with a sealing tape for 3 ½ turns, and screw it into the filling port. (R1/4-tightening torque: 6.9 N. m)
7. Before installing the plug in the grease drain port, rotate the J1 shaft for a few minutes to allow excess grease to drain from the drain port.
8. Wipe off any grease around the drain port with a rag, wrap the plug around the sealing tape 3 1/2 times, and screw it into the drain port. (R1/4-tightening torque: 6.9 N. m)



10.2 Robot Fall Protection Measures

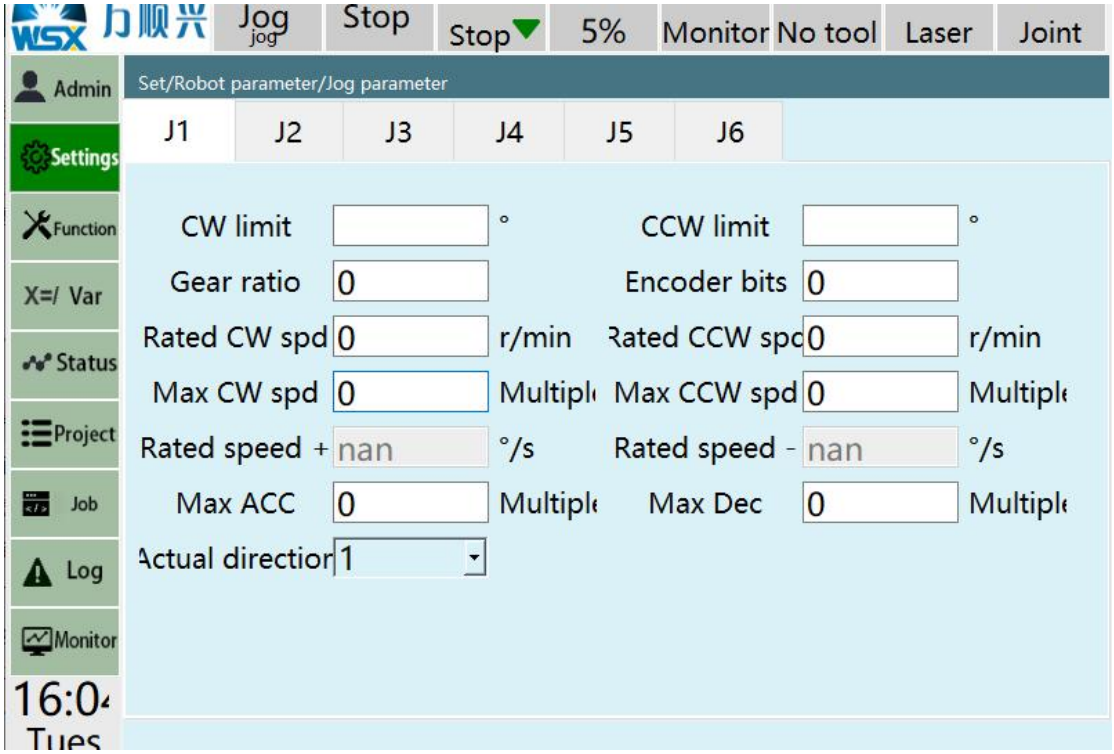
For wall mounting and upside down mounting, the robot base must be protected against falling as a precaution. The following figure shows how to prevent the robot base from falling.



10.3 Robot Inversion Parameterization

10.3.1 Modifying Limit Parameters

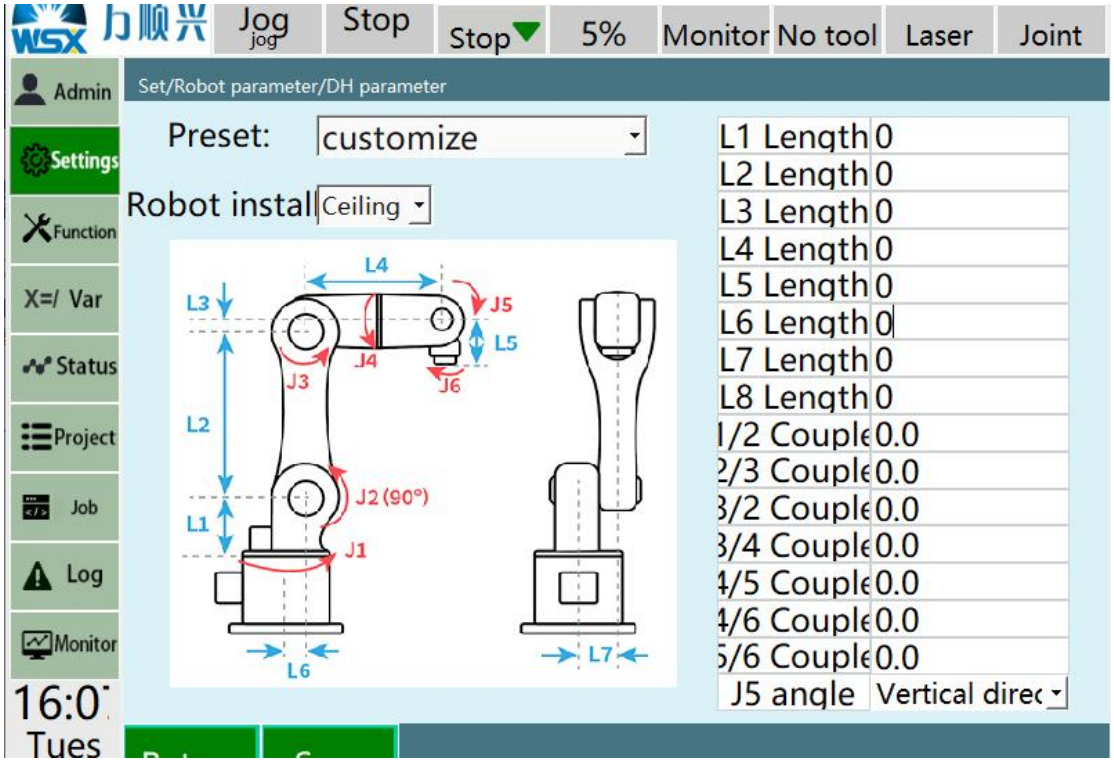
Path: [Set] - [Robot Parameters] - [Jog Parameters], modify the limit angle of each axis according to the actual need.

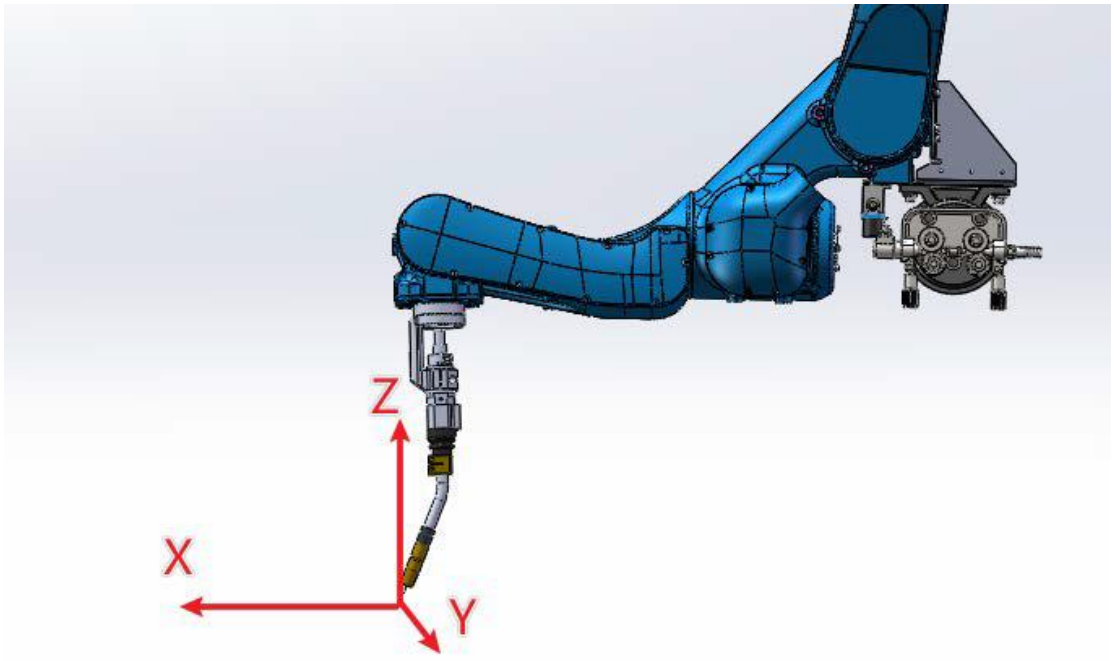


10.3.2 Modifying Polar Coordinate Settings

Path: [Settings] - [Robot parameters] - [DH parameters] .

For customer convenience, the robot coordinates can be switched to the ceiling method. In this way, the robot right-angle coordinate Z direction switching to: upward is positive, downward is negative.

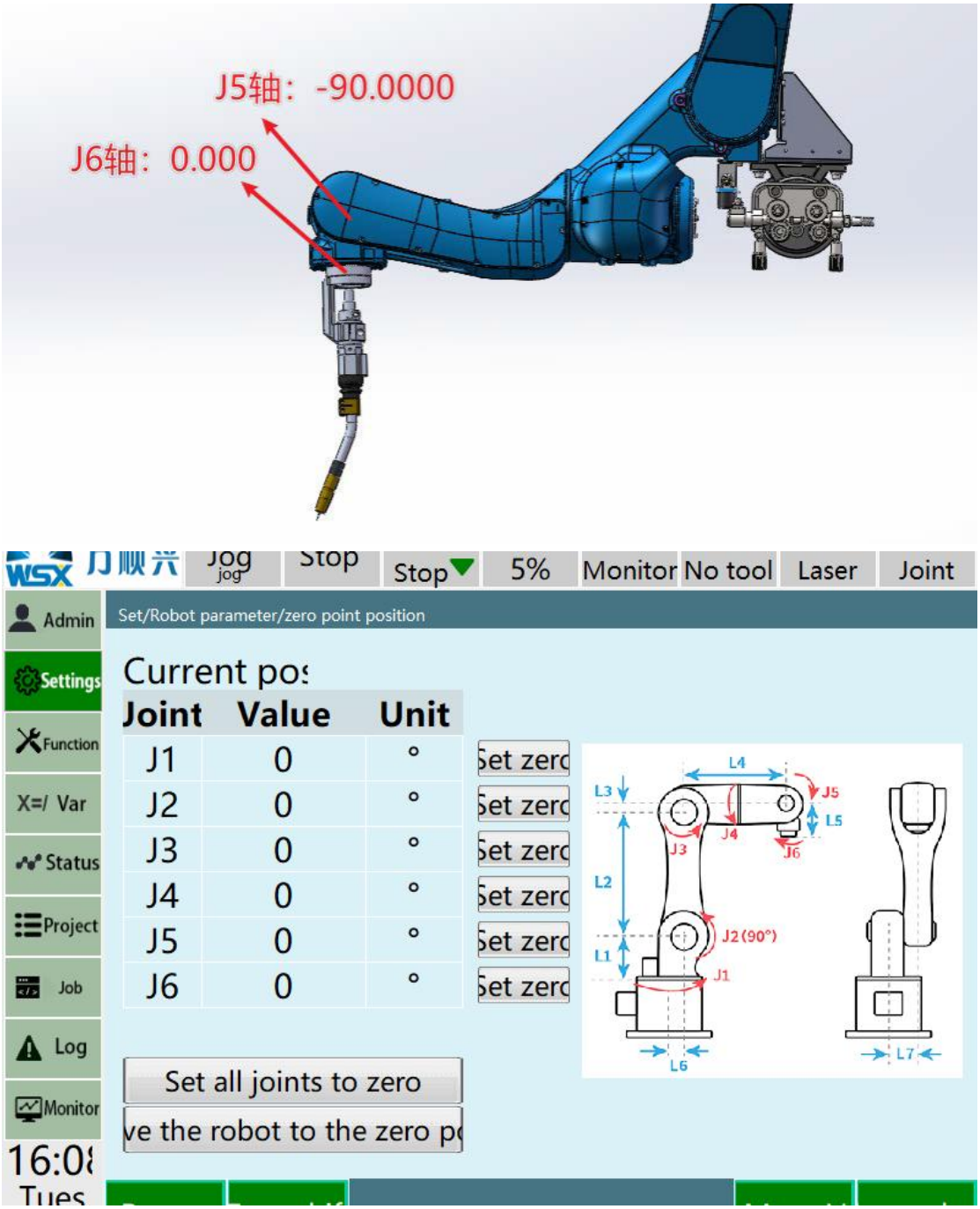




10.3.3 Modifying the J5J6 Axis Zero Position

Path: [Settings] - [Robot parameters] - [Zero position].

Manually move the J5 axis joints to -90 degrees. The -90 coordinate is required to be very accurate.



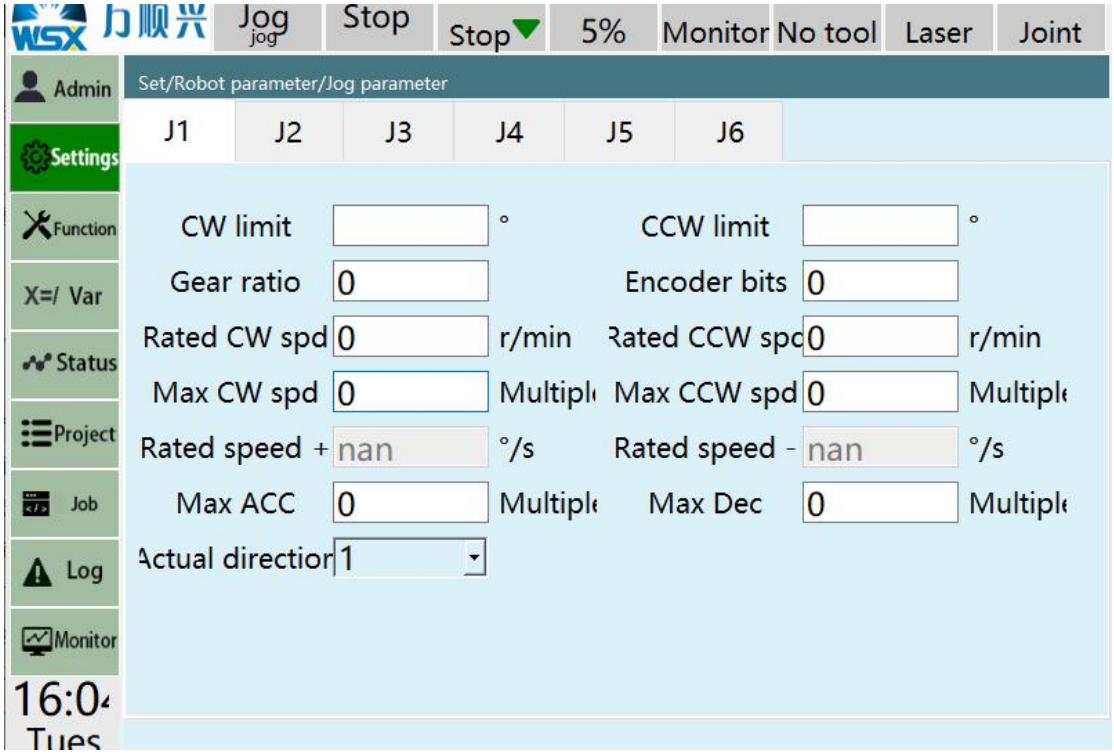
Set the corresponding axis coordinates to zero after the joint is adjusted in place.

11. Wall Mounting

11.1 Wall Mounting Limit Setting

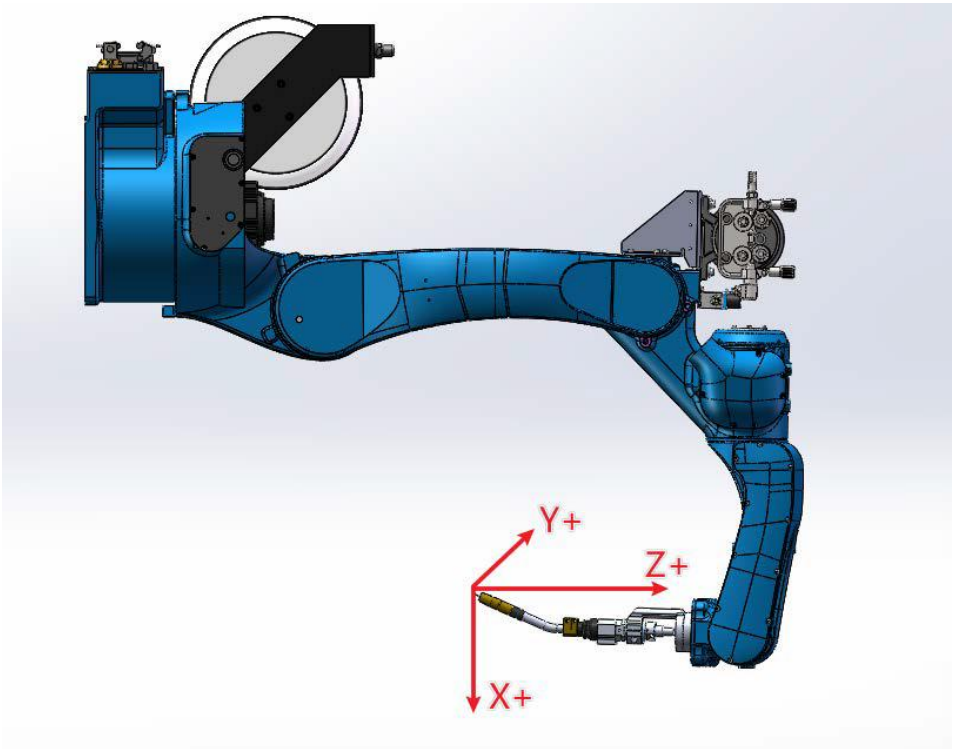
Path: [Setup] - [Robot Parameters] - [Jog Parameters],

For robot wall motion range, modify the J1 axis limit angle ± 30 degrees, the other axis according to the actual need to set.



11.2 Other

This system does not have a base coordinate setup specifically designed for wall mounting, so wall mounting can only use the orthographic coordinate system at present.



Chapter 2 Robot Body Inspection and Maintenance

1.Preface

This section describes how to inspect and maintain WSX1400 series.
Before performing any operation, be sure to thoroughly read and understand the contents of this section and the safety section, and strictly observe all safety rules. Also, if necessary, refer to the relevant manuals.
In particular, do not perform any operation until you fully understand the contents of this section. We will not be liable for accidents or damages caused by operating only in accordance with the limited parts of this manual.

!Dangerous
Failure to comply with the contents of this sign may result in personal death.

! Warning
Failure to comply with the contents of this sign may result in personal injury or death.

!Caution
Failure to comply with this sign may cause personal injury and/or mechanical damage.

[Note]
- The diagrams, sequences and detailed explanations given in this manual may not be absolutely correct. Therefore, it is necessary to pay maximum attention when using this manual to do any work. In the event of unspecified problems or troubles, please contact us.
- The safety descriptions in this manual for individual cases are not fully applicable to all machine work. In order to ensure the safety of each job, please read and fully understand the explanations and descriptions of safety in the safety manual and related laws, regulations, ordinances and their related materials, and take appropriate safety measures for each job.

2. Precautions

Before performing maintenance operations on our robots, please note the following to ensure safety.

! Warning
1.Before starting the inspection, be sure to disconnect the controller power supply and external power supply. Set up a conspicuous "Inspection and Maintenance in Progress" sign, and lock or hang a sign on the external power switch to prevent the operator or others from accidentally turning on the power to avoid unpredictable accidents such as electric shock.
2.If operations such as grease replenishment require changing the joint angle, then first turn on the motor power. Next, adjust the robot's arm to the specified attitude, being careful not to approach the arm and be clamped and squeezed. After adjusting the robot to the specified

attitude, disconnect the controller power supply and external power supply again, lock the external power switch, and place the "Inspection and Maintenance in Progress" sign on the robot before starting operation.

3.When inspecting the product immediately after stopping continuous operation, the part of the arm may become hot due to the surrounding temperature. Touching this part with bare hands may cause burns, so make sure that the temperature drops before proceeding.

4.The electric shock, pinch and high temperature warning symbols are attached to the arm at the corresponding locations, so be sure to check them in advance. See the following pages for the warning labels and their locations.

Positioning of Warning Signs

(1) **High temperature warning**. The high temperature warning is posted on the motor. When the robot is operating, the temperature of the motor can reach 50°C. If the motor is touched immediately after stopping the robot, it may cause burns.

(2) **Robot motion range warning**. If you enter the robot's range of motion while the robot is moving, it can cause an unforeseen accident. It is prohibited to enter the range of motion of the robot while it is operating.

3. Maintenance & Inspection Items

Maintenance and inspection of the robot include daily inspection, periodic inspection (5,000 hours, 10,000 hours, and 15,000 hours), and overhaul.

This manual describes maintenance and inspection items, as well as inspection and adjustment methods. These items are important for the normal use of the robot in a stable environment for a long period of time. Therefore, be sure to perform the following maintenance and inspections.

Inspection item \ Inspection period	daily inspection	5000 hours	10000 hours	15000 hours	20000 hours
Appearance of the robot	○	○	○	○	
Robot motion and abnormal noise	○	○	○	○	
Robot positioning accuracy	○	○	○	○	
Grease replenishment of gears		○	○	○	
Grease replenishment of reduction unit		○	○	○	
Grease replacement of reduction unit			○		
Battery pack replacement			○		
Re-tightening			○		
Synchronous belt inspection			○		
Overhauling					○

4. Details of Daily Inspections

Please follow the below routine inspection items for our robots.

No.	Inspection item	Inspection content	Solution
1	Is there any damage to the robot?	1. Inspect all parts of the robot for damage caused by interference, etc., especially the wrist joint.	1. Remove causes such as interference.
2	Are the cables and hoses abnormal?	1. Check hoses, cables, etc. connected to the tool for localized bending, twisting, and damage.	1. Re-adjust the fixture to eliminate the error cause.
3	Is the robot's motion abnormal?	1. Check that the axis move smoothly. 2. Observe for abnormal noise and vibration. 3. Check for excessive overshoot.	1. Check the grease status. 2. Check the inside of the drive system for any abnormalities. 3. If the problem is caused by an increase in gear side clearance, please contact us.
4	Does the positioning accuracy change?	1. Check that multiple reproduction motions are all positioned at the same exact location. 2. Check that the stopping	1. Check the inside of the drive system for any abnormalities. 2. If the problem is caused by an increase in gear side

		position is not uneven.	clearance, please contact us.

If the above anomalies cannot be resolved by inspection and mechanical error elimination methods, please contact us for control system inspection and adjustment.

5.Gear Grease Replenishment and Replacement

!Caution

1. Be sure to disconnect the controller power supply and external power supply before performing grease replenishment or replacement. Installation Set up a conspicuous "Inspection and Maintenance in Progress" sign, lock the external power switch or hang a sign to prevent others from accidentally turning on the power.

2. Before replenishing or replacing the grease, be sure to remove the plug of the drain port. Otherwise, the internal pressure of replenishing grease may break the seal or cause grease to seep into the motor.

!Caution

1. When replenishing or replacing the grease, please replenish it according to the specified amount and do not add too much.

2. Please use a manual type grease gun to replenish or replace grease.

3. If you need to use air pump type grease gun, please use ZM-45 type (made by Zhengmao Company, pressure ratio is 50 : 1). Please use the regulator to adjust the air pressure to less than 0.26 MPa (2.5kgf/cm).

(If you are using a grease gun other than the air pump type mentioned above, please contact us).

4.During grease replenishment, do not connect the drain tube directly to the drain outlet. Due to the filling pressure, if the grease cannot be discharged smoothly, the internal pressure will rise, which will cause seal damage or grease backflow, thus leading to grease leakage.

5. Before grease replenishment, follow the precautions of the latest grease Material Safety Data Sheet (MSDS) to perform.

6. When replenishing or replacing grease, prepare a container and a rag to dispose of the grease from the filler and drain ports.

7. Used grease is considered industrial waste under the Waste Disposal and Cleaning Law (commonly known as the Waste Disposal and Cleaning Law), so please follow local rules and regulations for proper disposal.

[Note]

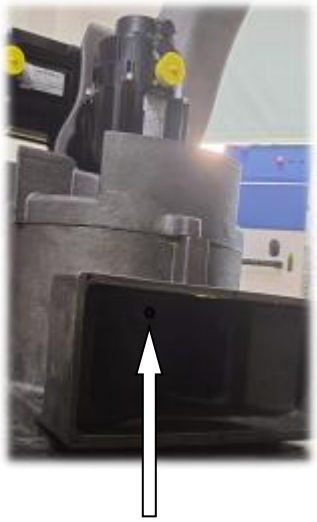
When loading or unloading the plug, use a hex wrench of the following sizes or a torque wrench attached to the hex bar.

Plug	Width of opposite side [mm]
M5	4
M6	3
R1/4	6

5.1 J1 Reducer Grease Replenishment and Replacement

5.1.1 J1 reducer grease replenishment

Model	WSX1400-10
Grease grades	Synergy RE NO.00
Working position	Refer to Fig. 5.1.1



J1 grease filling hole

J1 grease drain hole

Figure 5.1.1

Procedure

1. Move the robot so that the arm is in zero position and turn off the power.
2. Unscrew the plug on the grease drain hole.
3. Unscrew the plug on the filling hole, and then screw in the grease nozzle.
4. Replenish new grease from the filling hole.
5. Unscrew the grease nozzle on the filling hole, wipe off the grease around the filling hole with a rag, wrap the plug with sealing tape for 3 ½ turns and screw the filling hole. (M8-tightening torque: 38 N • m)
6. Before installing the plug in the grease drain hole, let the J1 axis to rotate for a few minutes so that excess grease can be discharged from the grease drain hole.
7. Wipe off any grease around the grease drain hole with a rag, wrap the plug around the sealing tape 3 ½ turns, and screw it into the grease drain hole. (M8 tightening torque: 38 N • m).

5.1.2 J1 reducer grease replacement

Model	WSX1400-10
Grease grades	Synergy RE NO.00
Working position	Refer to Fig. 5.1.1

Procedure

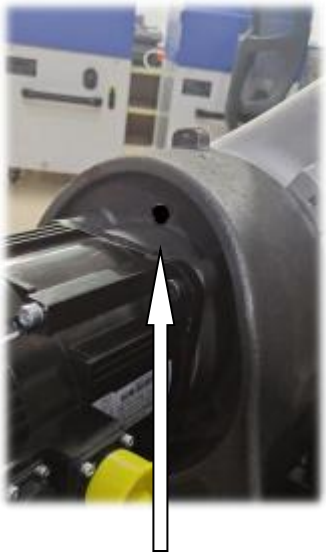
1. Move the robot so that the arm is in zero position and turn off the power.
2. Unscrew the plug on the grease drain hole.
3. Unscrew the plug on the filling hole, and then screw in the grease nozzle.
4. Replenish the new grease from the filling hole until the old grease is completely discharged from the grease drain hole and the new grease is discharged. (Look at the color to judge the old grease and new grease).
5. Unscrew the grease nozzle on the filling hole, wipe off the grease around the filling hole with a rag, wrap the plug with sealing tape for 3 ½ turns and screw the filling hole. (M8-tightening torque: 38 N • m)
6. Before installing the plug in the grease drain hole, let the J1 axis to rotate for a few minutes so that excess grease can be discharged from the grease drain hole.
7. Wipe off any grease around the grease drain hole with a rag, wrap the plug around the sealing tape 3 ½ turns, and screw it into the grease drain hole. (M8 tightening torque: 38 N • m).

5.2 J2 Reducer Grease Replenishment and Replacement

5.2.1 J2 reducer grease replenishment

Model	WSX1400-10
Grease grades	Synergy RE NO.00
Working position	Refer to Fig. 5.2.1

J2 grease filling hole



J2 grease drain hole

Procedure

1. Move the robot so that the arm is in zero position and turn off the power.
2. Unscrew the plug on the grease drain hole.
3. Unscrew the plug on the filling hole, and then screw in the grease nozzle.
4. Replenish new grease from the filling hole.
5. Unscrew the grease nozzle on the filling hole, wipe off the grease around the filling hole with a rag, wrap the plug with sealing tape for 3 ½ turns and screw the filling hole. (M8-tightening torque:

38 N • m)
6. Before installing the plug in the grease drain hole, let the J1 axis to rotate for a few minutes so that excess grease can be discharged from the grease drain hole.
7. Wipe off any grease around the grease drain hole with a rag, wrap the plug around the sealing tape 3 ½ turns, and screw it into the grease drain hole. (M8 tightening torque: 38 N • m).

5.2.2 J2 reducer grease replacement

Model	WSX1400-10
Grease grades	Synergy RE NO.00
Working position	Refer to Fig. 5.2.1

Procedure
1. Move the robot so that the arm is in zero position and turn off the power.
2. Unscrew the plug on the grease drain hole.
3. Unscrew the plug on the filling hole, and then screw in the grease nozzle.
4. Replenish the new grease from the filling hole until the old grease is completely discharged from the grease drain hole and the new grease is discharged. (Look at the color to judge the old grease and new grease).
5. Unscrew the grease nozzle on the filling hole, wipe off the grease around the filling hole with a rag, wrap the plug with sealing tape for 3 ½ turns and screw the filling hole. (M8-tightening torque: 38 N • m)
6. Before installing the plug in the grease drain hole, let the J2 axis to rotate for a few minutes so that excess grease can be discharged from the grease drain hole.
7. Wipe off any grease around the grease drain hole with a rag, wrap the plug around the sealing tape 3 ½ turns, and screw it into the grease drain hole. (M8 tightening torque: 38 N • m).

5.3 J3 Reducer Grease Replenishment and Replacement

5.3.1 J3 reducer grease replenishment

Model	WSX1400-10
Grease grades	Synergy RE NO.00
Working position	Refer to Fig. 5.3.1

J3 grease filling hole

J3 grease drain hole

Procedure

1. Move the robot so that the arm is in zero position and turn off the power.
2. Unscrew the plug on the grease drain hole.
3. Unscrew the plug on the filling hole, and then screw in the grease nozzle.
4. Replenish new grease from the filling hole.
5. Unscrew the grease nozzle on the filling hole, wipe off the grease around the filling hole with a rag, wrap the plug with sealing tape for 3 ½ turns and screw the filling hole. (M8-tightening torque: 38 N • m)
6. Before installing the plug in the grease drain hole, let the J3 axis to rotate for a few minutes so that excess grease can be discharged from the grease drain hole.
7. Wipe off any grease around the grease drain hole with a rag, wrap the plug around the sealing tape 3 ½ turns, and screw it into the grease drain hole. (M8 tightening torque: 38 N • m).

5.3.2 J3 reducer grease replenishment

Model	WSX1400-10
Grease grades	Synergy RE NO.00
Working position	Refer to Fig. 5.3.1

Procedure

1. Move the robot so that the arm is in zero position and turn off the power.
2. Unscrew the plug on the grease drain hole.
3. Unscrew the plug on the filling hole, and then screw in the grease nozzle.
4. Replenish new grease from the filling hole.
5. Unscrew the grease nozzle on the filling hole, wipe off the grease around the filling hole with a rag, wrap the plug with sealing tape for 3 ½ turns and screw the filling hole. (M8-tightening torque: 38 N • m)
6. Before installing the plug in the grease drain hole, let the J1 axis to rotate for a few minutes so that excess grease can be discharged from the grease drain hole.

7. Wipe off any grease around the grease drain hole with a rag, wrap the plug around the sealing tape 3 ½ turns, and screw it into the grease drain hole. (M8 tightening torque: 38 N • m).

5.4 J6 Reducer Grease Replenishment

Model	WSX1400-10
Grease grades	Synergy RE NO.00
Working position	Refer to Fig. 5.4.1

J6 grease filling hole

J6 grease drain hole

!Caution

1. Before replenishing or replacing the grease, be sure to remove the plug at the drain hole. Otherwise, the internal pressure of replenished grease may break the seal or cause grease to seep out.

2. The main purpose of the J6 grease drain hole is for venting, so please do not fill excessive grease.

Procedure

1. Move the robot so that the arm is in zero position and turn off the power.
2. Unscrew the M8 bolt on the grease drain hole.
3. Unscrew the plug on the filling hole, and then screw in the grease nozzle.
4. Replenish new grease from the filling hole.
5. Unscrew the grease nozzle on the filling hole, wipe off the grease around the filling hole with a rag, apply 1206C sealant to M5 bolts. (M8-tightening torque: 38 N • m)
6. Before installing the plug in the grease drain hole, let the J6 axis to rotate for a few minutes so that excess grease can be discharged from the grease drain hole.
7. Wipe off any grease around the grease drain hole with a rag, apply 1206C sealant to M5 bolts, and screw it into the grease drain hole. (M8 tightening torque: 38 N • m).

5.5 Description of J4 and J5 reduction units

The J4 and J5 reduction units of our WSX1400-10 industrial robots use a one-piece harmonic reducer and do not require to replenish or replace the reducer grease.

6. Battery Pack Replacement

!Caution

1. When changing batteries, the robot needs to be energized, but be sure to disable it. Set up a "Check and Maintenance in Progress" sign. Do not touch any wiring other than the battery during the replacement process to avoid unpredictable accidents such as electric shock.
2. Use only the batteries specified by us.
3. Do not recharge, heat, change or disassemble the battery.
4. Do not dispose of the battery in water or fire.
5. Do not short-circuit the positive and negative terminals of the battery.
6. Dispose of discarded batteries in accordance with local rules and regulations.

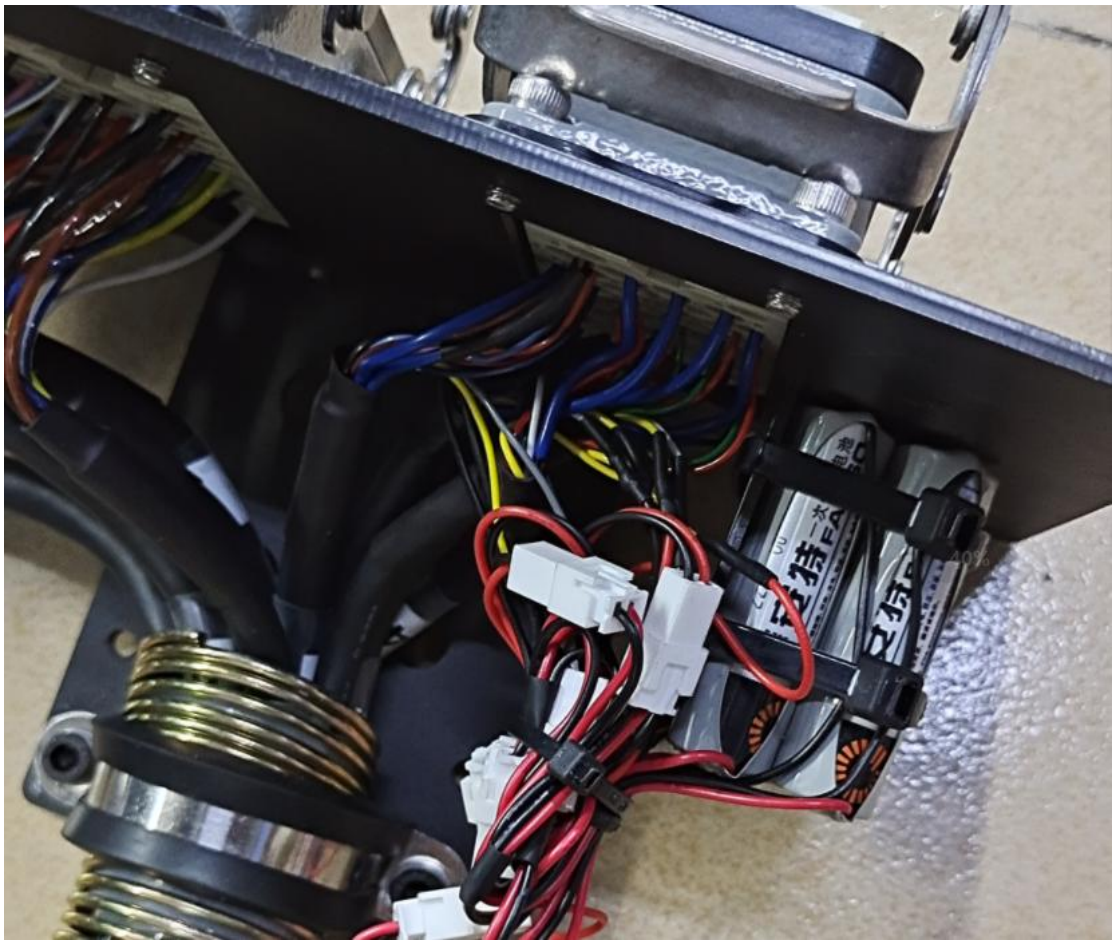


Figure 8.1 Battery Pack Replacement

Procedure

1. Before changing batteries, be sure to return the robot to zero position. [SETUP] - [ROBOT PARAMETERS] - [ZERO POSITION]. (Changing batteries will lose the zero position if it is not running to zero position)
2. Power up the robot and switch to servo down mode. Then, unscrew the fixing bolts of the battery holder and remove the battery holder.
Be careful not to touch the wiring harness when removing it.
Note:The robot is energized, but must be dis-enabled.
3. Unplug the battery connector, remove the screws securing the battery, and remove the battery.
4. **Place** the new battery in the battery holder. Secure it with **rolled tape** and insert it into the battery connector. Install the battery holder in its original position.

Note: Replacement of the battery should be completed within 5 minutes.

!Caution

Do not dispose of used batteries in garbage that needs to be incinerated, landfilled, or dumped on the ground. When disposing of batteries, wrap them in a bag so that they do not come into contact with other metals, and dispose of them properly in accordance with local rules and regulations.

7. Retightening

Check each bolt or nut for looseness. If necessary, re-tighten bolts and nuts securely. Of the items to be retightened, the following six are the most important.
A. Servo motor fixing bolts
B. J5/J6 motor mounting plate fixing bolts
C. Reducer fixing bolts
D. Tool fixing bolts
E. Base fixing bolts
F. Cover plate fixing bolts

Our screw torque standard(N.m)		
Screw size	Iron-based	Aluminum-based
M3	1.4	1.4
M4	4.8	2.8
M5	10	6
M6	16.5	10
M8	40	24.5
M10	82	50
M12	120	82
M14	180	130

8. Synchronous Belt Inspection

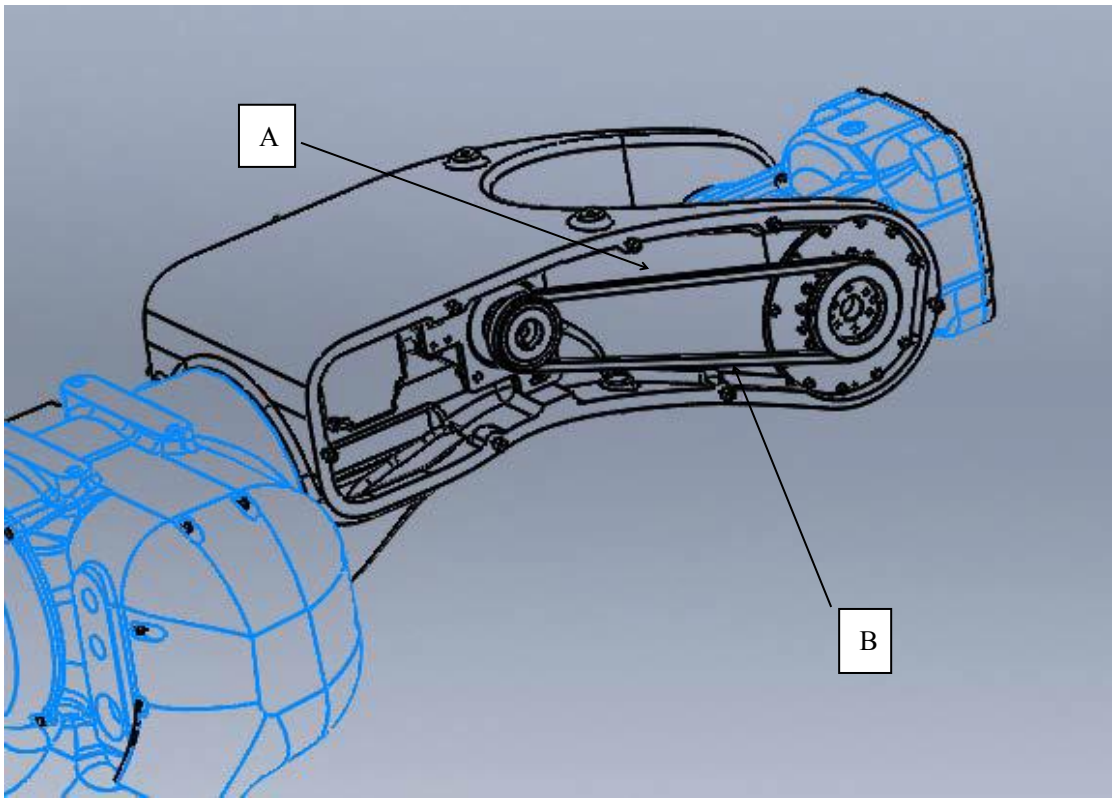
!Caution

Before checking the belt, be sure to disconnect the controller power supply and external

power supply. Set up a conspicuous "Inspection and Maintenance in Progress" sign and lock or hang a sign on the external power switch to prevent accidental turning on of the power by the operator or other persons to avoid unforeseen accidents such as electric shock.

[Note]

When checking or replacing the synchronous belt, move the axis to a no-load attitude. When it is necessary to measure the vibration frequency of the synchronous belt in the loaded position, take measurements at A and B as shown in the figure below and calculate the average value.



Procedure

1. When performing a check every 10,000 hours, go to 8.1
2. When the checked synchronous belt tension is not correct, go to 8.2
3. When replacing an abnormal synchronous belt, go to 8.3

When measuring tension, attach a contact type tensiometer to the back of the belt at the midpoint of the two synchronous pulleys.

8.1 Inspection steps

1. Remove the covers on both sides of the small arm housing.
2. Perform a visual inspection (breakage, damage) of the synchronous belt. When there is an abnormality, go to 8.3.
3. Check the tension of the synchronous belt.

4. As shown in the figure below, if the vibration frequency f of the synchronous belt (at the time of inspection) is within the range of the value shown in the table below when using a contact tensiometer, the tension is appropriate.
5. When the tension is not appropriate, go to 8.2.

Model	J4(HZ)	J5(HZ)	J6(HZ)
WSX1400-10	200~210	68~77	50~56

8.2 Re-adjustment Steps

1. Loosen the screws used to secure the servo motor mounting plate about one turn.
2. Use a tool to move the motor mounting plate to tension the synchronous belt and temporarily secure the screws.
3. Measure the tension of the synchronous belt again (vibration frequency f).
4. After confirming that the tension is within the required range, tighten the fixing screws of the motor mounting plate. (J5J6: 2. 8N.m J4: 6Nm)
5. After tightening the fixing screws of the motor mounting plate, check the tension again.
6. Reinstall the small arm cover.

8.3 Replacement Steps

1. Loosen the screws securing the motor mounting plate and remove them, taking care to prevent the motor from falling.
2. Remove the synchronous belt.
3. Clean the synchronous wheel and the foreign matter around the threaded hole.
4. Install the synchronous belt.
5. Use the tool to move the motor mounting plate to tighten the synchronous belt and temporarily fix the screws.
6. Measure the tension of the synchronous belt again (vibration frequency f).
7. After confirming that the tension is within the required range, tighten the fixing screws of the motor mounting plate. (J5J6: 2.8N. m J4: 6Nm).
8. After tightening the fixing screws of the motor mounting plate, check the tension again.
9. Reinstall the small arm cover.