Dobot CRA Series Robot Maintenance Guide

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SHENZHEN DOBOT CORP LTD

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Before using our product, please thoroughly read and understand the contents of this document and related technical documents that are published online, to ensure that the robot arm is used on the premise of fully understanding the robot arm and related knowledge. Please use this document with technical guidance from professionals. Even if follow this document or any other related instructions, damages or losses may happen in the using process. Dobot shall not be considered as a guarantee regarding all security information contained in this document.

The user has the responsibility to make sure following the relevant practical laws and regulations of the country, in order that there is no significant danger in the use of the robot arm.

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Preface

Purpose

This document aims to help users safely perform robot maintenance and troubleshooting.

Intended audience

This document is intended for:

- Customer Engineer
- Sales Engineer
- Installation and Commissioning Engineer
- Technical Support Engineer

Revision history

Date	Revision history
2025/12/11	The first release

Symbol conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, could result in death or serious injury.
WARNING	Indicates a hazard with a medium level or low level of risk which, if not avoided, could result in minor or moderate injury, robot arm damage.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in robot arm damage, data loss, or unanticipated result.
NOTE	Provides additional information to emphasize or supplement important points in the main text.

Contents

1. Safety Precautions

This chapter describes the safety precautions that should be noticed when you use this product. Please read this document carefully before using the robot arm for the first time. This product needs to be used in an environment meeting design specification. You cannot remold the product without authorization, otherwise, it could lead to product failure, and even personal injury, electric shock, fire, etc. People who use this product for system design and manufacture must be trained by our company, relevant institutions, or must have the same professional skills. The installation personnel, operators, teaching personnel, programmers and system developers of the robot arm must read this document carefully and use the robot arm strictly according to the regulations of this document.

1.1 Safety warning sign

The safety warning signs that may be found in this document are defined as follows.

Symbol	Description
⚠ **DANGER**	Indicates a hazard with a high level of risk which, if not avoided, could result in death or serious injury.
⚠ **ELECTRICITY**	Indicates a potentially dangerous electrical situation that, if not avoided, could result in injury, death, or serious damage to the equipment.
⚠ **HOT**	May cause dangerous hot surface, if touched, may cause personal injury.
⚠ **WARNING**	Indicates a hazard with a medium level or low level of risk which, if not avoided, could result in minor or moderate injury, robot arm damage.
⚠ **NOTICE**	Indicates a potentially hazardous situation which, if not avoided, could result in robot arm damage, data loss, or unanticipated result.
⚠ **NOTICE**	Indicates a situation that, if not avoided, could result in personnel injury or damage to the equipment. For items marked with such signs, depending on the specific situation, there is sometimes a possibility of significant consequences

1.2 General safety

Please follow the safety instructions below.

DANGER

- Please be sure to install the robot arm and all electrical equipment according to the requirements and specifications in this guide.
- Preliminary test and inspection of the robot arm and its protection system are required before it is used for the first time and put into production.
- Before starting the system and device for the first time, check whether the device and system are intact, safe to operate, and damaged. This inspection must comply with effective safety production regulations and rules of the country or region, and all safety functions must be tested.
- You must check and ensure that all safety parameters and user programs are correct and that all safety functions works properly. A person qualified to operate the robot arm is required to check each safety function. Start the machine only after it has passed a thorough and careful safety test and has reached the safety level.
- Professional personnel are required to install and debug the robot arm according to the installation standards.
- Once the robot arm is installed and constructed, you need to carry out a full risk assessment again and maintain the documentation.
- Set and change safety parameters by authorized personnel. Use passwords or isolation measures to prevent unauthorized personnel from changing or setting safety parameters. After changing safety parameters, you need to analyze related safety functions.
- In case of accidents or abnormal operation of robot arm, you can press the emergency stop switch to stop the action of the robot arm.
- CRA series joint modules are partly equipped with brakes. Maintain the posture of the robot arm when the power is off. Do not manually switch on or off the power supply system frequently. It is recommended that the interval between switching on and off the power supply system be longer than 10 seconds.
- The CRA robot arm has a built-in collision detection feature. If it encounters unexpected resistance stronger than your preset limit while powered on, it will automatically shut down to prevent damage or injury. This feature is specifically designed for the CRA series to enable safe human-robot collaboration. However, it requires that the robot arm system operates within its normal parameters and is used with a CRA series controller. If the user employs a self-developed power system, the robot arm will no longer possess the aforementioned functions. The user shall bear full responsibility for any resulting hazards or consequences.
- The robot and controller generate heat during operation. Do not operate or touch the robot while it is running or immediately after it stops.
- Turn off the power and wait one hour for the robot to cool down.
- Do not place your fingers on the heat generating area of the controller.

NOTICE

- When the robot arm is connected to or interacts with machinery that could potentially damage it, it is highly recommended to conduct separate and comprehensive checks of all the arm's functions and its program.
- Do not expose the robot arm to a permanent magnetic field, as it can cause damage to the robot arm.
- Dobot assumes no responsibility for any damage to the robot arm or personal injury caused by programming errors or improper operation of the robot arm.

WARNING

- Make sure that both the robot arm and the tools are correctly and securely installed.
- Make sure that the robot arm has sufficient space to move freely.
- Do not using the robot if it is damaged.
- Do not connect safety devices to standard I/O interfaces; only use dedicated safety interfaces.
- Ensure that correct installation and configuration are performed (e.g., the robot arm's mounting angle, weight in TCP, TCP offset, and safety settings).
- Tools and obstacles must not have sharp edges or pinch points. Additionally, ensure that all personnel keep their heads and faces outside the robot arm's reachable range.
- When operating the robot arm, always be mindful of its range of motion.
- Any impact will release a large amount of kinetic energy, which can be much higher than during high-speed or high-load operations.
- Connecting different devices may increase existing hazards or create new ones. Always conduct a comprehensive risk assessment of the entire installation. When setting the performance levels for safety and emergency stop functions, it is recommended to choose the highest performance level. Be sure to read and understand the user guides for all devices used in the installation.
- Do not modify the robot arm. Any unauthorized modifications could introduce hazards that the integrator cannot predict. The authorization and reorganization of the robot arm must comply with the latest version of the relevant service guide. Dobot disclaims all responsibility if the robot arm is altered or modified in any way.
- Before transporting the robot arm, the user needs to check the insulation condition and protective measures.
- When transporting the robot arm, ensure that transport requirements are followed, handle with care, and avoid any bumps or impacts.

1.3 Personal safety

When operating the robot arm system, the safety of personnel must be the primary priority. The following general precautions are listed. Please take appropriate measures to ensure the safety of all personnel.

WARNING

- Comply with local laws or regulations with regard to the maximum weight one person is permitted to carry.
- Do not touch the wiring terminals or disassemble the equipment while it is powered on, as this may result in electric shock.
- Make sure that the equipment is properly grounded, otherwise, it may endanger personal safety.
- Do not touch the power terminals or disassemble internal components within 10 minutes of disconnecting the robot from the power supply, as residual voltage in the internal capacitors may cause electric shock.
- Even if the controller's power switch is already in the "OFF" status, do not touch or disassemble internal components, as residual voltage in the internal capacitors may cause electric shock.
- Do not wear loose clothing or jewelry when working with the robot. Tie your long hair back behind your head.
- If the robot appears to be stationary while the equipment is running, it may be in a standby state, waiting for a start signal. In such cases, the robot should still be considered active. Do not approach the robot.

2. Recommended Inspection Activities

2.1 General cleaning

If dust, dirt, or oil is observed on the controller or robot arm, the exterior surfaces may be cleaned using a lint-free cloth and 10% alcohol solution. The surfaces should then be inspected for defects or other irregularities.

2.2 Inspection list

Below are the suggested inspection intervals and items to be checked: If any parts are found to be non-compliant during inspections, please repair or replace them immediately.

Item	Type	Period		
		Monthly	6 months	1 year
Inspect the effectiveness of the emergency stop button.	F	√		
Inspect the effectiveness of safety devices (Safety I/O).	F	√		
Inspect the heavy-duty cable	V			√
Inspect the power cable	V		√	
Inspect the status of the terminals inside the controller	V		√	
Check that the resistance between the exposed metal parts of the controller casing and the AC plug's PE pin is less than 0.5Ω.	F	√		
Inspect the status of the controller interfaces	V			√

V = Visual Inspection F = Functional Inspection

2.3 Safety function

To ensure the safety functions of the robot arm, it is recommended to conduct testing monthly. The following tests must be performed:

A. Test the hardware emergency stop button function:

- While the robot arm is in motion, press the emergency stop button.

- Observe whether the robot arm stops immediately.
- Release the emergency stop button. Clear the alarm message in DobotStudio Pro, and then re-enable the robot arm (if the emergency stop exceeds 500ms, the robot arm will power down, requiring you to power it up according to the popup instructions in DobotStudio Pro first).

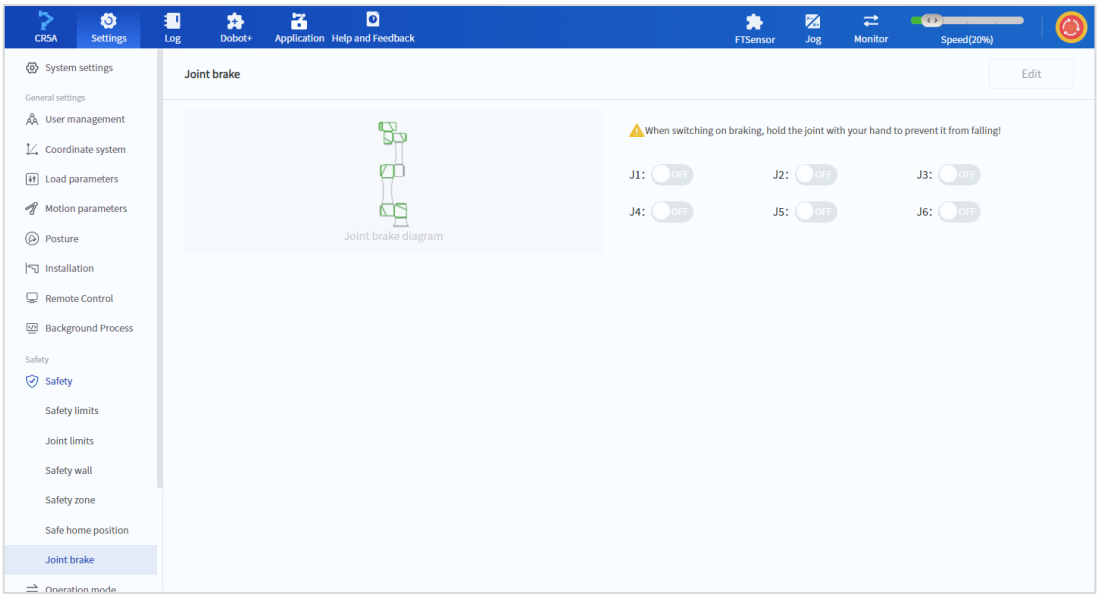
B. Test the functionality of the software emergency stop button:

- While the robot arm is in motion, press the emergency stop button located at the top right corner of DobotStudio Pro, and then click it once more to release the button.

- Observe whether the robot arm stops immediately.
- Clear the alarm message in DobotStudio Pro, and then re-enable the robot arm (if the emergency stop exceeds 500ms, the robot arm will power down, requiring you to power it up according to the popup instructions in DobotStudio Pro first).

C. Test the brake function in Safety settings:

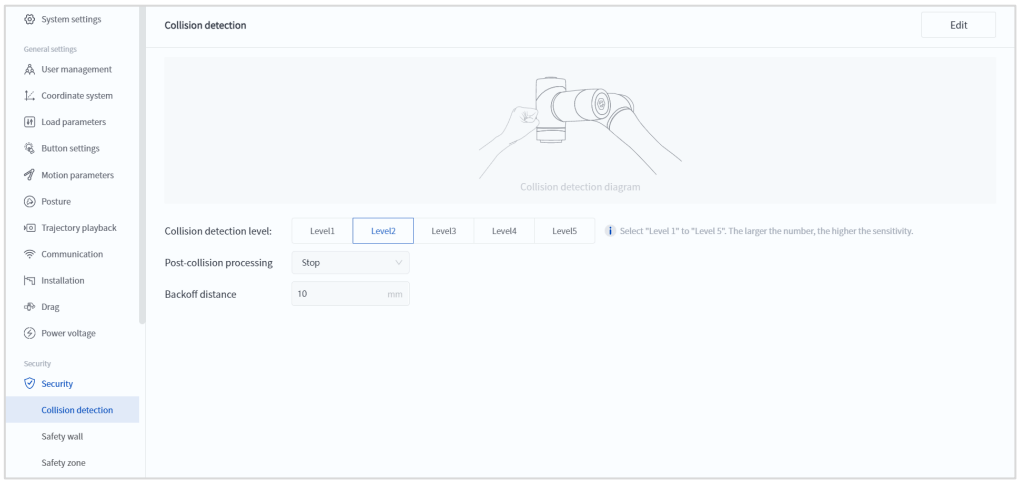
- After enabling the robot arm, navigate to the **"Settings > Safety > Joint brake"** page to activate the joint brake function. While activating, make sure to hold the joint with your hand to prevent any movement.



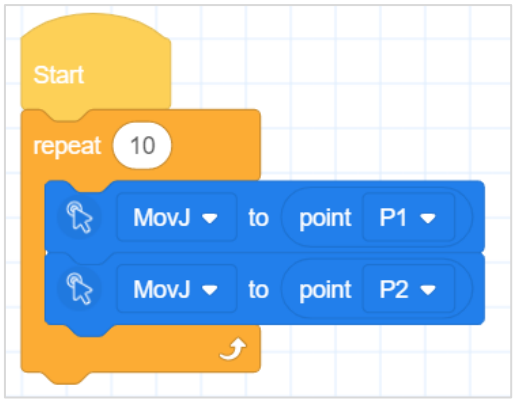
- Sequentially activate the joint brake from Joint 1 to Joint 6 to check if each brake is functioning properly. After completing each test, be sure to deactivate the brake.

D. Test the collision detection function in the safety settings:

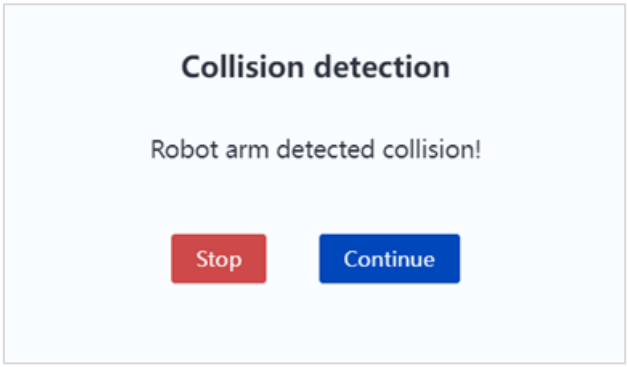
- Navigate to the **"Settings > Safety > Collision detection"** page and set the collision level to 5.



- Execute a project that includes motion commands (Note: Before the robot arm moves, ensure there are no obstacles within its range of motion), for example:



- During the movement of the robot arm, apply a 50N reverse force to trigger collision detection. The robot arm will stop operating, and DobotStudio Pro software will pop up a warning.



- Click the Stop button.

E. Test the functions of hand-guiding button:

- Hold the robot joint and long-press (more than 1.5 seconds) the drag button to drag the robot arm in drag state (LED flashes green quickly). There is no reverse force in drag mode. As shown in the figure:

- Briefly press the drag button to exit drag mode; the robot arm cannot be dragged, and the LED will remain solid green.

2.4 Visual inspection

- Disconnect the power cable of the controller to ensure it is not powered.
- Inspect the controller's internal terminals for any looseness, and check if the cables are damaged or have come loose from the terminals.
- Check all the fixing screws of the circuit boards inside the controller.
- Inspect the interior of the power supply for dirt or dust, and use an anti-static discharge vacuum cleaner to clean it.
- Inspect the heavy-duty cables for any damage and check for any looseness between the cables and the heavy-duty connectors.
- Inspect the power cables for any damage or severe softening issues.
- Check all the interfaces on the controller for any looseness or damage.

NOTICE

Avoid using compressed air guns to clean the interior of the controller, as this might damage internal components or pose a risk of electrical short circuits.

3. Protect Parts Vulnerable to Static Electricity

To protect parts vulnerable to static electricity, please follow the instructions below. In addition, there are standard precautions, such as turning off the power before removing the circuit board.

Keep the parts vulnerable to static electricity (in an ESD bag) in the original packing case until the parts are ready for installation. Wear an ESD wrist strap on your wrist. Connect the wrist strap to the system to release all the static electricity in your body to the ground.

Step 1. Place the old board in the spare ESD bag.

Step 2. Take the new board out of the ESD bag.

NOTICE

- Hold the edges of parts that are vulnerable to static electricity. Do not touch the pins.
- Do not place parts vulnerable to static electricity on non-conductive materials or metal tables.
- If you need to put down the parts vulnerable to static electricity for any reason, place them in special ESD bags.
- Machine cover and metal table are electrically grounded. It creates discharge paths from the user's body through parts vulnerable to electrostatic damage, thus increasing the risk of damage. (Large metal objects can be used as ungrounded discharge paths.)
- As low humidity can increase static electricity when you use heating in cold weather, take care when using parts that are vulnerable to static electricity.

4. Installation and Maintenance Tools

When installing and maintaining a robot arm, you need to prepare the following tools (anti-static tools):

- Flat-head screwdriver: -2# (used for three-phase power line of motor); Cross-head screwdriver: -PH0, PH1

- Hex screwdriver & bits: M2.5, M3, M4, M5

- Wrench

Size	Function	Torque
5.5# (opposite side)	For tightening M3 outer hexagonal bolt	Tightening torsion: 2N.m
7# (opposite side)	For tightening M4 outer hexagonal screw	Tightening torsion: 4N.m
8# (opposite side)	For tightening M5 outer hexagonal screw	Tightening torsion: 9N.m
10# (opposite side)	For tightening M6 outer hexagonal screw	Tightening torsion: 15N.m

- Socket screwdriver

  5.5 mm (diagonal size), 6 mm (diagonal size)

- ESD wrist strap

- Others: Internal clamp spring pliers, external clamp spring pliers, tweezers

When installing and maintaining a controller, you need to prepare the following tools (anti-static tools):

- Cross head screwdriver -PH0, PH1

- Hexagonal screwdriver

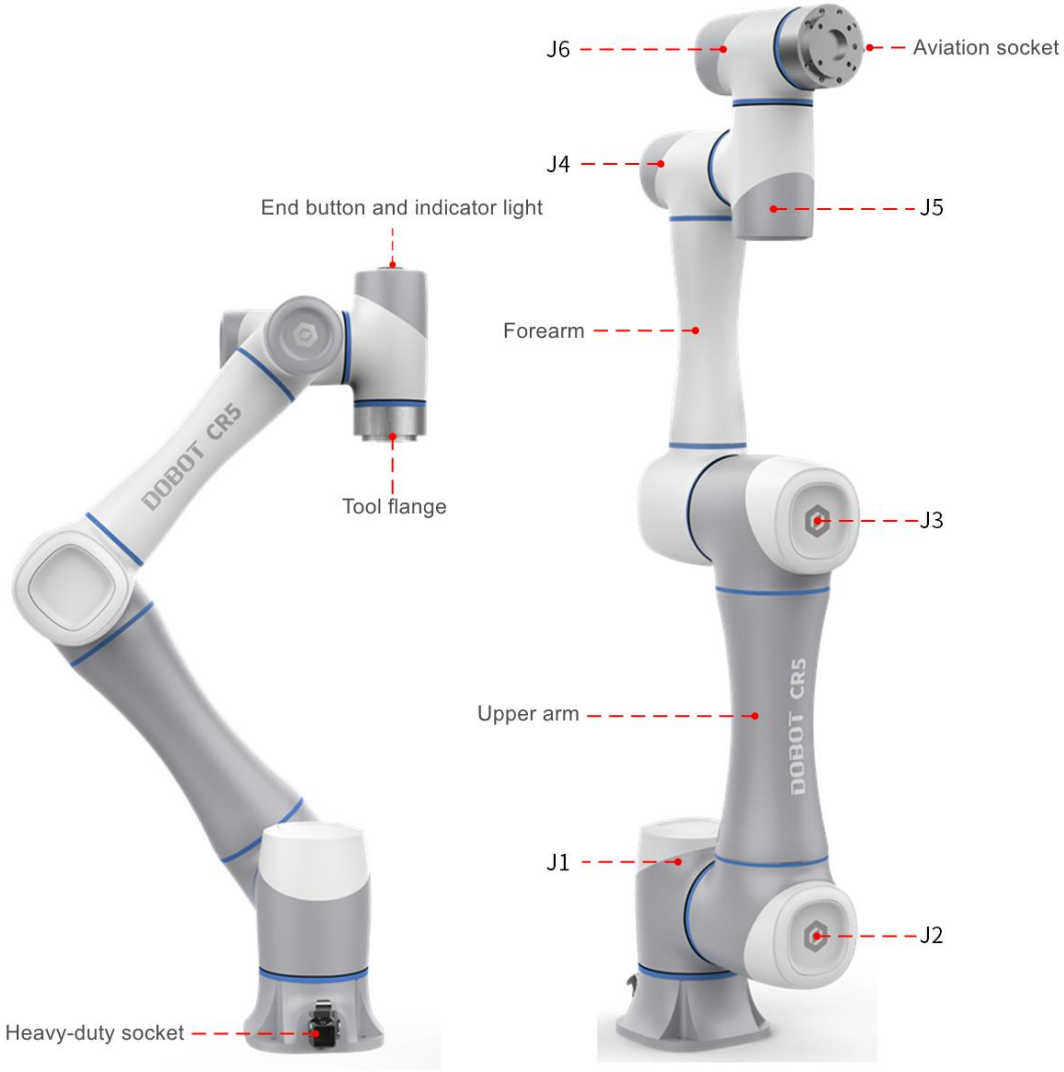
- ESD wrist strap

5. Maintenance of the Robot Arm

5.1 Preparation for Parts Return

- Remove all non-Dobot equipment such as clamps, hoses, cables etc. from the robot arm. Dobot will not be responsible for any damage to non-Dobot equipment installed on the robot arm.
- Before shipping the robot arm/parts to Dobot, please ensure all relevant files are backed up in advance. Dobot will not be responsible for the loss of programs, data or files stored in robot.
- Before returning the robot arm, it should be moved to the packing posture. This posture minimizes the space occupied by the robot arm, facilitating packaging and transportation.
- On the "**Settings > Posture**" page, long-press the "Run to" button corresponding to the packing posture to move the robot arm into the packing position.

5.2 Configuration of robot arm



CR3A, CR5A, CR7A, CR10A, CR12A, and CR16A all consist of five types of joints, some of which are interchangeable between different positions and robot arms. The joint distribution of the CR series robot is shown in Table 5.1.

Table 5.1 The distribution of joints in a robot arm

Model	CR3A	CR5A	CR7A	CR10A	CR12A	CR16A
J1	Size 20	Size 25	Size 25	Size 32	Size 32	Size 32
J2	Size 20	Size 25	Size 25	Size 32	Size 32	Size 32
J3	Size 17	Size 25	Size 25	Size 25	Size 25	Size 25
J4	Size 14	Size 14	Size 14	Size 17	Size 17	Size 17
J5	Size 14	Size 14	Size 14	Size 17	Size 17	Size 17
J6	Size 14	Size 14	Size 14	Size 17	Size 17	Size 17

Screw specifications for each connection position of joints are as follows.

Table 5.2 Screw specifications

Joint type	Size 32	Size 25	Size 20	Size 17	Size 14
Screw size	M6 outer hexagonal screws M6*25	M5 outer hexagonal screws M5*20	M4 outer hexagonal screws M4*16	M4 outer hexagonal screws M4*16	M3 outer hexagonal screws M3*12

5.3 Brake release

If necessary, the brakes on the joints can be released without being connected to power.

NOTICE

- Before releasing the brake, you must remove any dangerous parts to avoid dangerous conditions.
- If you release the brake from the base joint, shoulder joint or elbow joint, proper mechanical support must be provided before the brake is released.
- When releasing the brakes, make sure that there is no danger to personnel.
- Move the joint only within the range necessary. You should move the joint no more than 160° to ensure that the arm can find its original physical position.

Steps to release the brake:

Step 1. Power off.

Step 2. Remove the rear cover of the joint.

Step 3. With a specialized electromagnetic brake fixture, the joint can be rotated once powered.

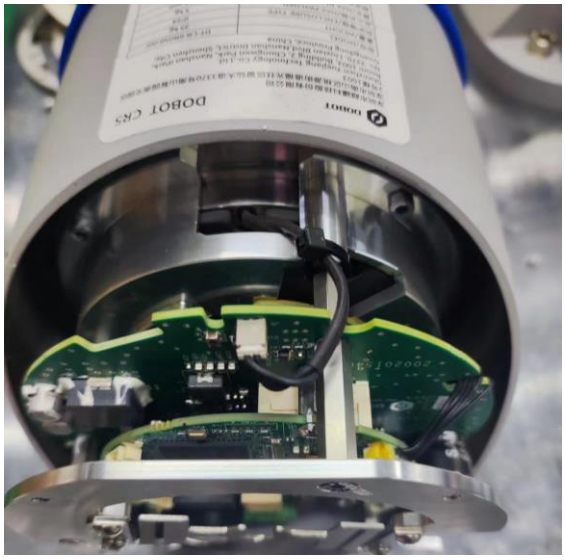


Figure 5.1 Brake on Size 25

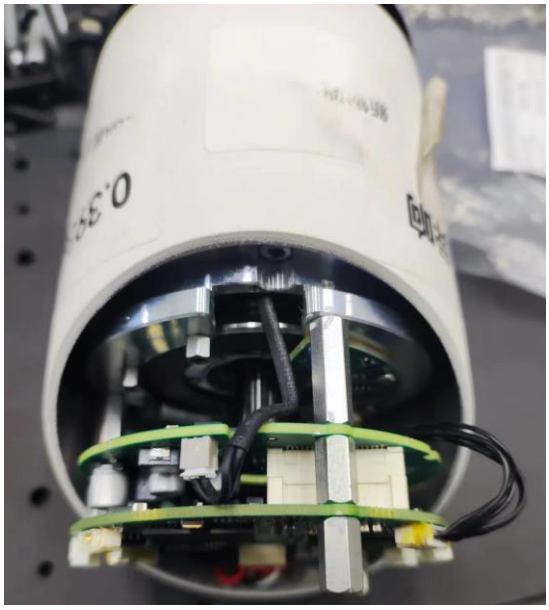


Figure 5.2 Brake on Size 14

Step 4. Make sure that the rear cover is properly placed back on the joint, tighten the screws, and then turn on the power.

5.4 General operation of joint disassembly and assembly

5.4.1 Joint disassembly

Step 1. Before maintenance, prepare related tools and documents.

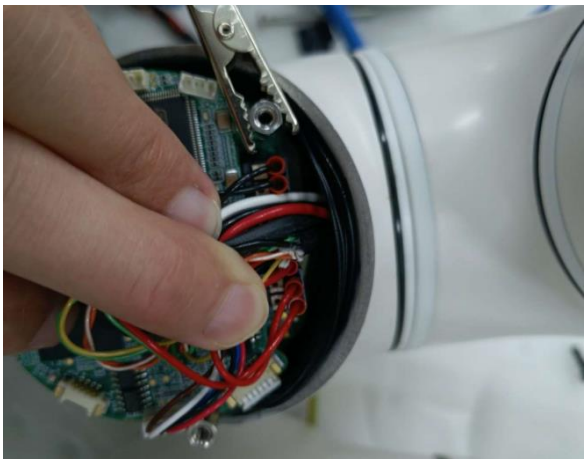
- Torque tools, ESD wrist strap and other maintenance kits.
- If it is necessary to disassemble the robot body, please prepare the following tools: an M3 cross wrench, M3 and M4 hex wrenches, diagonal pliers, nylon zip ties, etc.
- Read and understand this guide thoroughly.

Step 2. Move the robot arm to a comfortable disassembly position. If necessary, disassemble the entire arm from the work unit and place it on a firm surface (mechanical support must be provided).

Step 3. Power off.

Step 4. Remove the rear cover.

Step 5. Re-secure the screws on the rear cover and attach the alligator clip from the ESD wrist strap to the stud.



Step 6. Gently unplug the cable connector, but avoid bending the printed circuit board.

- Disassembly of Size 25 joint cables: Remove the cables of Size 25 joint marked below.
- Disassembly of Size 14 joint cables: Use tweezers to clamp the white cable card on the front end of the marked-position of Size 14 joint, and remove the cable.

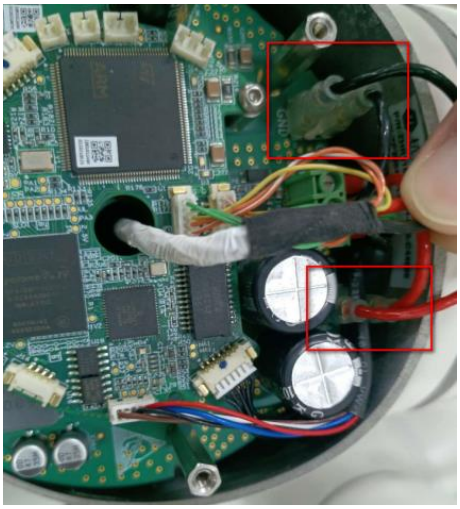


Figure 5.3 Size 25 joint

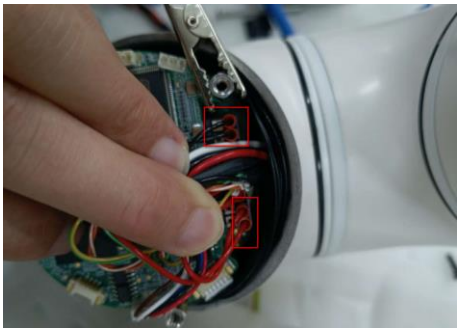
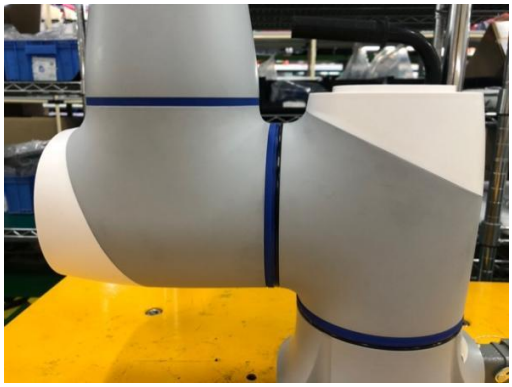
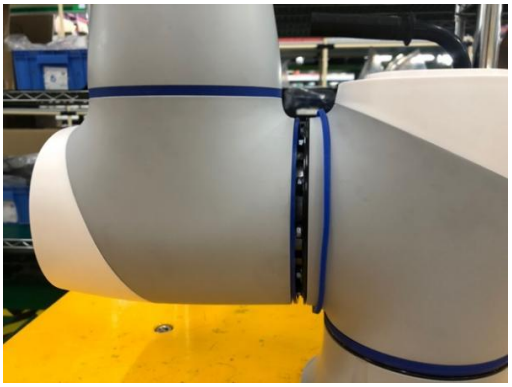


Figure 5.4 Size 14 joint

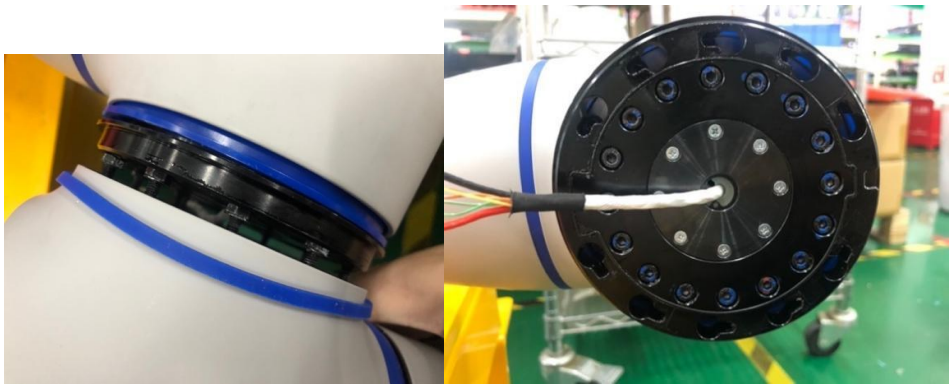
Step 7. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing and sliding it over the joint casing.



Step 8. Slide the decorative ring support bracket backward. You can see the external hex screws on both sides of the joint. Using a hex wrench, loosen the screws so that they are at least 3mm apart.



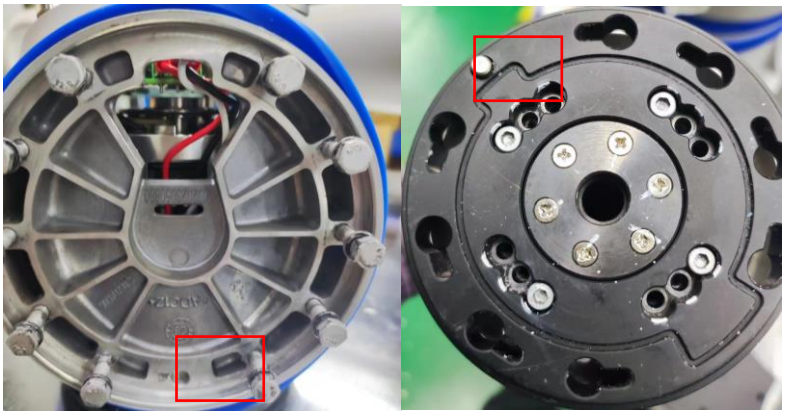
Step 9. Pull the two parts apart and gently twist them counterclockwise by approximately 9° until reaching the mechanical stop (the hole is keyhole-shaped). Next, return the two parts along the axial direction.



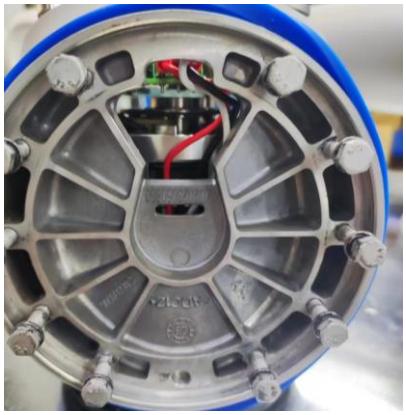
5.4.2 Joint assembly

Step 1. Take the required number and specification of external hex screws for the joint. Use instant adhesive to attach flat washers to the screw heads. Apply threadlocker (Loctite 243) below 1/3 of the thread depth, then insert the screws into the corresponding holes on the base to a depth of 2mm.

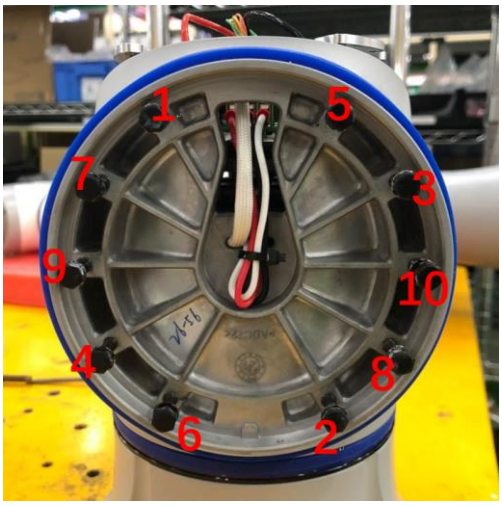
When assembling the area indicated by the red box in the diagram below, the positioning holes need to be aligned. If they are misaligned, the joint cannot be fully assembled.



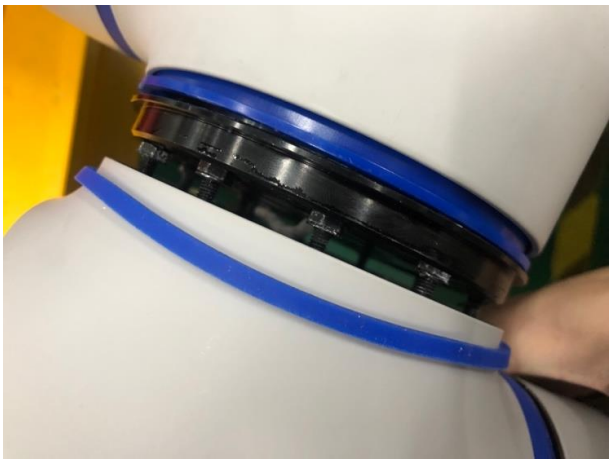
Step 2. Align the large hole of the output flange of the corresponding joint with the external hex screw on the base. The external hex screw should pass through the large hole of the output flange. Rotate the joint until the external hex screw aligns with the small hole in the output flange. Once the locating pin is aligned with the locating hole, push the joint axially into place.

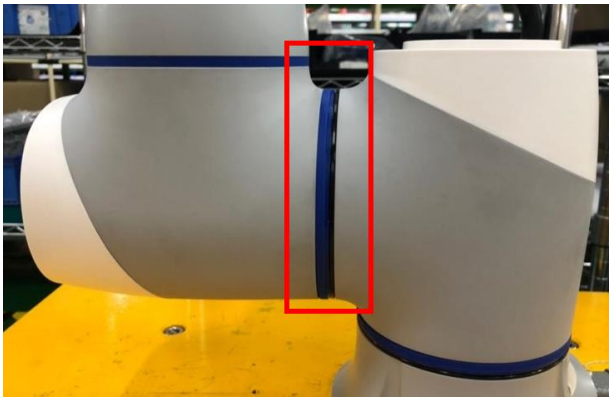


Step 3. Tighten the screws in a crisscross pattern according to the sequence shown in the image below. Tighten the screws using the correct torque to ensure that both surfaces are parallel. Please refer to Table 5.3 for the torque value.



Step 4. Move the decorative ring support bracket into position, then gently slide the decorative ring onto the top of the support bracket.





Step 5. Install the wiring harness.

Step 6. Mount the rear cover onto the joint.

Step 7. Perform zeroing calibration on the robot arm.

5.4.3 Torque value

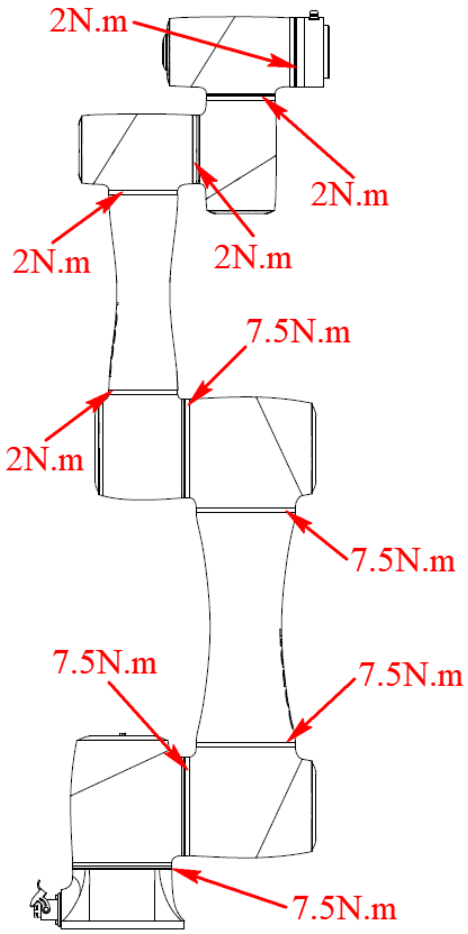
The bolt tightening torques are shown in Table 5.3.

Table 5.3 Torque values

Nominal thread diameter	Outer hexagonal screw (joint)	Inner hexagonal screw (12.9)	Inner hexagonal screw (rear cover)
3 mm	2 Nm	2 Nm	0.7 Nm
4 mm	4 Nm	4 Nm	-
5 mm	7.5 Nm	9 Nm	-
6 mm	15 Nm	18 Nm	-
8 mm	-	37 Nm	-

5.5 Details on joint assembly and disassembly

The following are the torque values for the joint screws of the CR7A. For the torque values of joint screws for other robot arm models, please refer to Table 5.3 in conjunction with the tools being used.



NOTICE

- Check materials before going online to ensure accuracy.
- Pay attention to the orientation of assembled parts, arrange cables properly, and avoid pinching.
- After completing the work, conduct self-inspection and mutual inspection. Confirm that the process is correct before proceeding to the next step.
- After replacing joint materials, let them stand for 24 hours.
- After standing, perform aging of the entire robot. The back cover should not be installed before aging for easier debugging.

5.5.1 Base and J1 joint

- **Disassembly**

Step 1. Power off.

Step 2. Remove the back cover and disconnect the cable terminal.

Step 3. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing and sliding it over the joint casing.

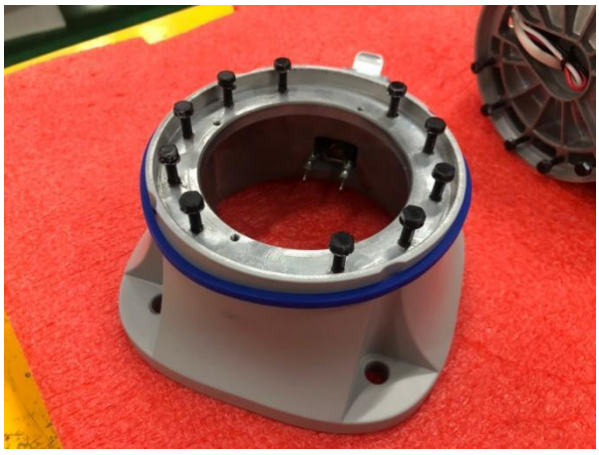
Step 4. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.

Step 5. Retract the base and the J1 joint along the axis of rotation of the J1 joint until the screw heads contact the flange surface of the J1 joint. Rotate the base approximately 9° to align the external hex screws with the larger opening of the keyhole slot on the output flange.

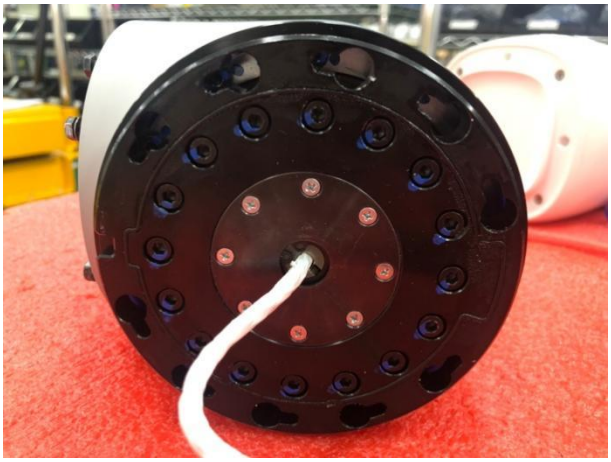
Step 6. Retract the base along the axis of rotation of the J1 joint.

- **Assembly**

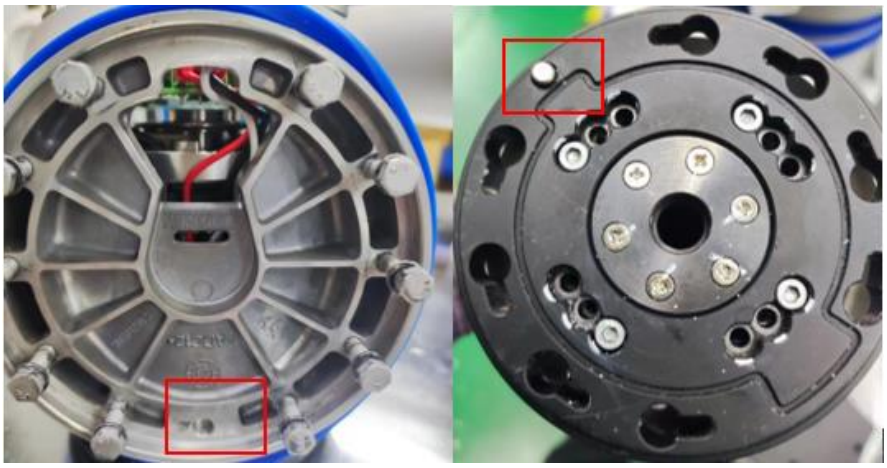
Step 1. Prepare the required number and specifications of external hex screws for the base. Attach flat washers to the screw heads using instant adhesive. Apply thread adhesive (Loctite 243) below 1/3 of the threaded depth, then screw them into the corresponding holes in the base to a depth of 4mm.



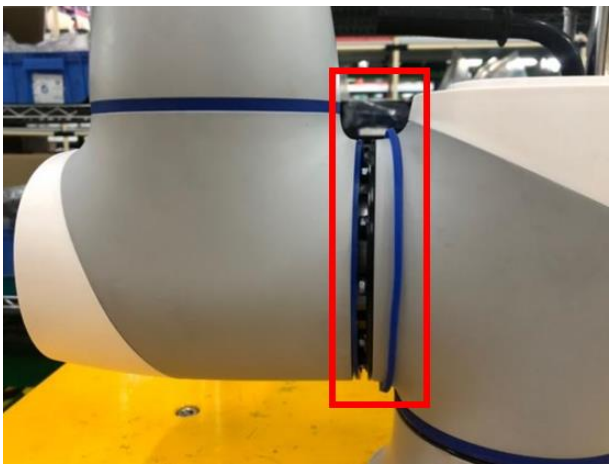
Step 2. Take a joint sealing ring of size 25 and install it (You may apply a small amount of grease to prevent it from slipping off).



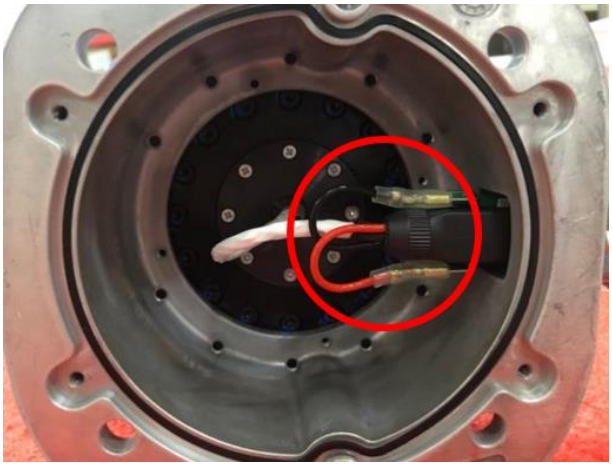
Step 3. Align the large hole of the output flange corresponding to the J1 joint with the hex screw heads on the base, allowing the hex screws to pass through the large hole of the output flange. Rotate the joint approximately 9° until the hex screws align with the smaller hole of the output flange's slotted hole. Align the dowel pin holes in the base with the dowel pins on the output flange of the J1 joint, and gently press the joint into the base along the axial direction.



Step 4. Securely tighten the 10 full-thread hex head bolts (M5*20) in a symmetrical sequence. Torque specification: 7.5 Nm.

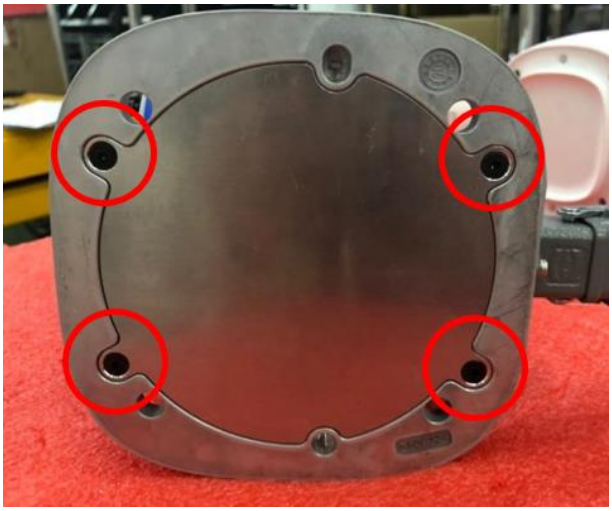


Step 5. Connect the base wiring harness to the corresponding port, with the black connector on the left side. Insert the Ethernet cable connector into the middle port.



Step 6. Apply an appropriate amount of grease to the base sealing ring and place it within the sealing groove of the base.

Step 7. Install the base cover plate, securing it with 4 countersunk hex socket screws (M4*10). Torque specification: 2.0 N.m.



Step 8. Push the decorative ring support bracket up to the base flange surface, and then install the decorative ring into the designated position.

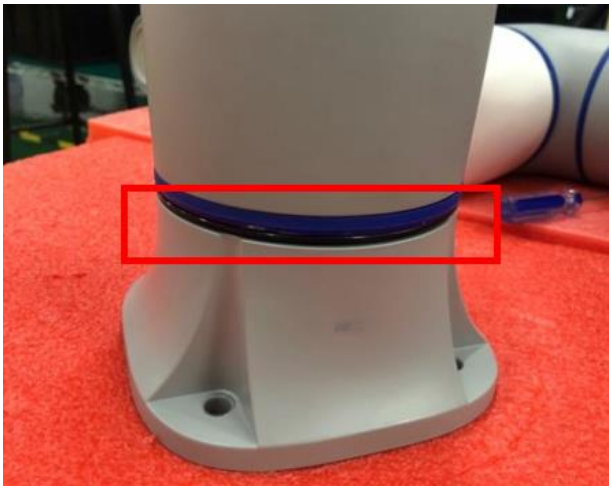


Table 5.4 Material list

No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	Property class: 12.9 M5*20	10	3205040031
2	Small washer	Black zinc plated, salt spray test 48H, φ5	10	3205050002
3	Joint sealing ring -25 / Base sealing ring	Joint sealing ring -25 / Base sealing ring	1/1	3202020074/ 3202020090
4	Base cover/Decorative ring-25	Aluminum alloy 6061-T6/Tensile silicone	1	3201001039/ 3202020089
5	Hexagon socket countersunk head screw	property class: 12.9, M4*10	4	3205010299

- **J1 joint rear cover assembly**

Step 1. Install the rear cover sealing ring into the sealing groove of the first 25-joint rear cover.

Step 2. Mount the rear cover onto the first 25 joint and tighten the 4 pieces of hexagon socket head cap screws (M3×6), torque: 0.7 N·m.

Step 3. Install 25 joint screw covers.

No.	Material name	Material specifications	Qty.	Material code
1	Rear cover seal ring-25	Rear cover seal ring-25, NBR, V1.0, NBR, V1.0	1	3202020027
2	25 joint rear cover - White	ABS, V1.0	1	3202010016
3	Hexagon socket head cap screw	Salt spray test 48H, property class: 6.8, M3×6	4	3205010224
4	25 joint screw cover plate	25 joint screw cover plate, silicone, V1.0	1	3202020062

5.5.2 J2 joint

- **Disassembly**

Step 1. Power off.

Step 2. Remove the back cover and disconnect the cable terminals.

Step 3. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing and sliding it over the joint casing.

Step 4. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.

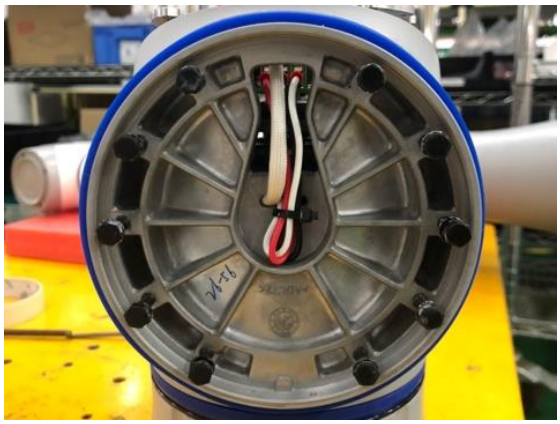
Withdraw the J2 joint along its axial direction until the screw heads contact the flange surface. Rotate the J2 joint to align the external hex screws with the larger opening of the keyhole slot on the output flange.

Step 5. Separate the base mounting plate from the base joint.

- **Assembly**

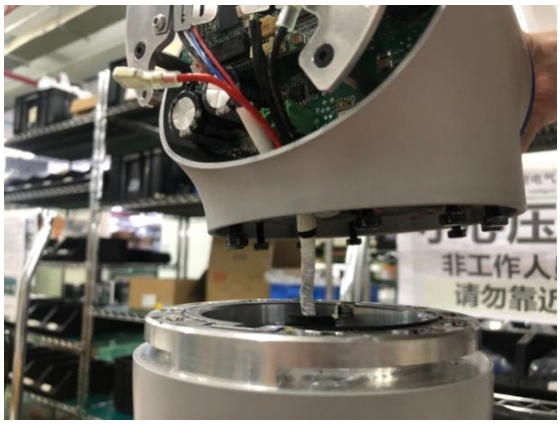
Step 1. Take the required number and specification of external hex screws for the joint. Use instant adhesive to attach flat washers to the screw heads. Apply threadlocker (Loctite 243) below 1/3 of the thread depth, then insert the screws into the corresponding holes on the base.

Step 2. Place the wire into the groove.

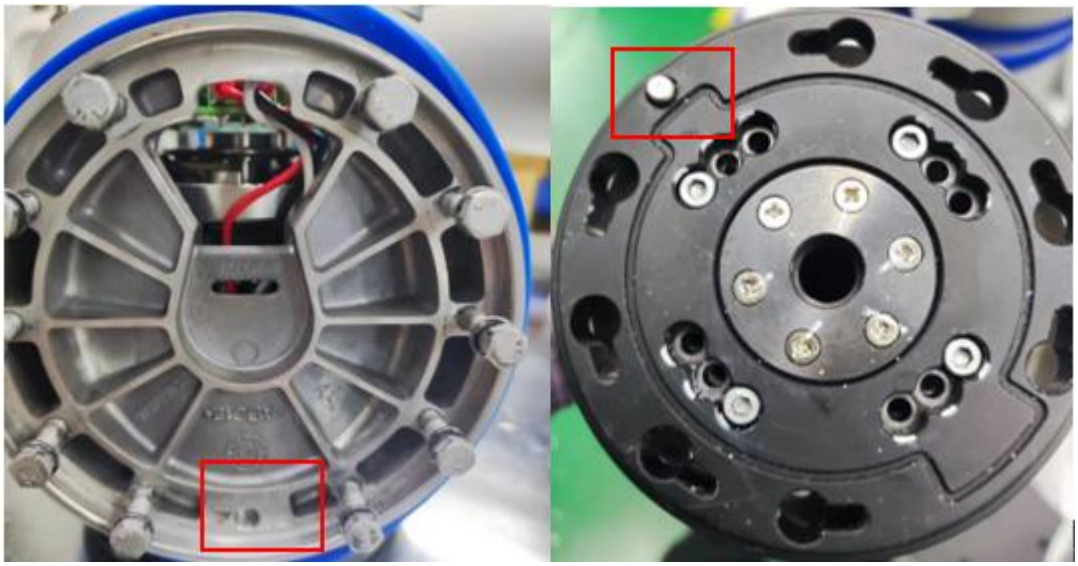


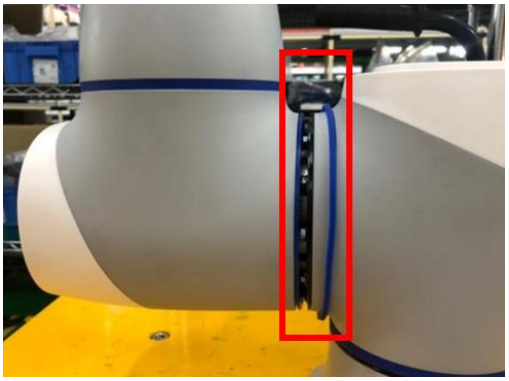
Step 3. Take a 25-joint, install the sealing ring (a small amount of grease can be applied to prevent detachment), and mount it in place.

Step 4. Thread the wiring of the second 25-joint through the groove of the first joint, ensuring the wires are properly routed to avoid crushing or breakage.

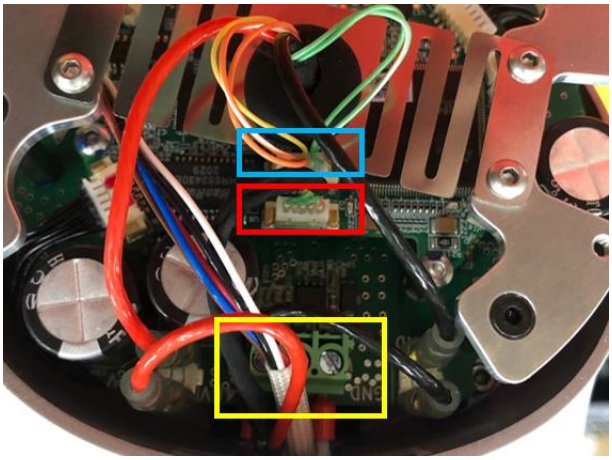


Step 5. Align the large hole of the output flange of the corresponding joint with the external hex screw on the base. The external hex screw should pass through the large hole of the output flange. Rotate the joint until the external hexagon screws align with the smaller openings of the output flange. Then, push the joint axially into the corresponding assembly part. Finally, tighten the screws in a crisscross pattern to the specified torque value.

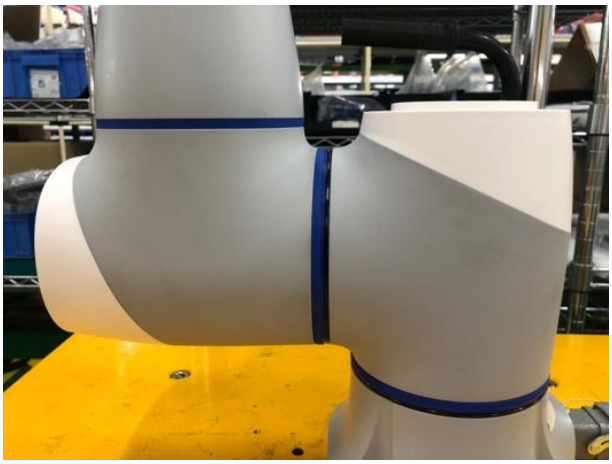




Step 6. ① Connect the wiring harness of the first 25-joint to the port indicated by the blue frame. ② Connect the wiring harness of the second 25-joint to the port indicated by the red frame. ③ Wiring: Connect the black wire to the GND terminal, and the red wire to the remaining terminal.



Step 7. Push the decorative ring support bracket up to the base flange surface, and then install the decorative ring into the designated position.

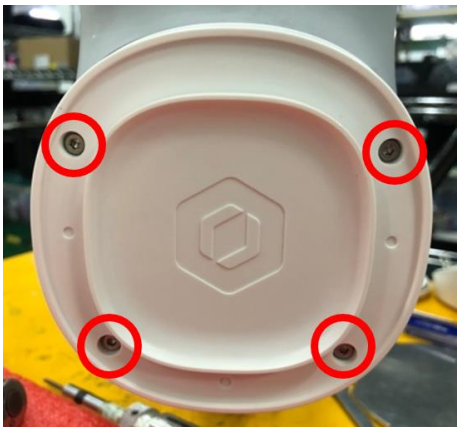


No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	Property class: 12.9 M5*20	10	3205040031
2	Small washer	Black zinc plated, salt spray test 48H, φ5	10	3205050002
3	Joint sealing ring -25	Joint sealing ring -25	1/1	3202020074
4	Decorative ring-25	Tensile silicone	1	3202020089

- **J2 joint rear cover assembly**

Step 1. As shown in the figure below, install the rear cover sealing ring into the sealing groove of the second 25-joint rear cover.

Step 2. Assemble the rear cover onto the second 25-joint, and tighten the 4 pieces of hexagon socket head cap screws (M3×6), torque: 0.7 N·m.

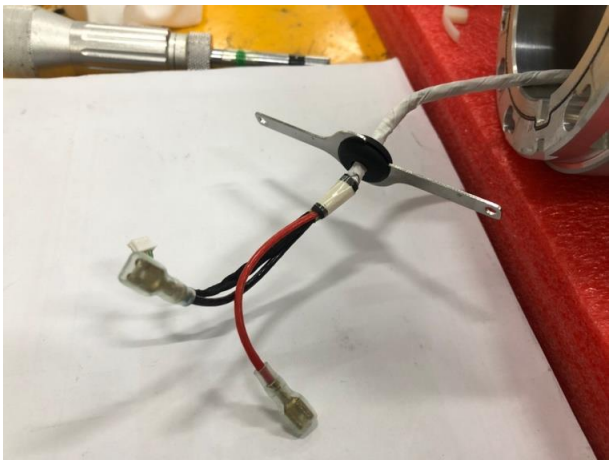


Step 3. Install the 25-joint screw cover plate.

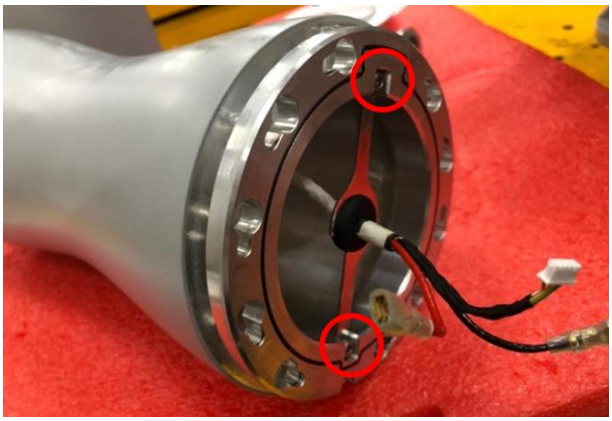
No.	Material name	Material specifications	Qty.	Material code
1	Rear cover seal ring-25	Rear cover seal ring-25, NBR, V1.0, NBR, V1.0	1	3202020027
2	25 joint rear cover - White	ABS, V1.0	1	3202010016
3	Hexagon socket head cap screw	Salt spray test 48H, property class: 6.8, M3×6	4	3205010224
4	25 joint screw cover plate	25 joint screw cover plate, silicone, V1.0	1	3202020062

5.5.3 Upper arm assembly

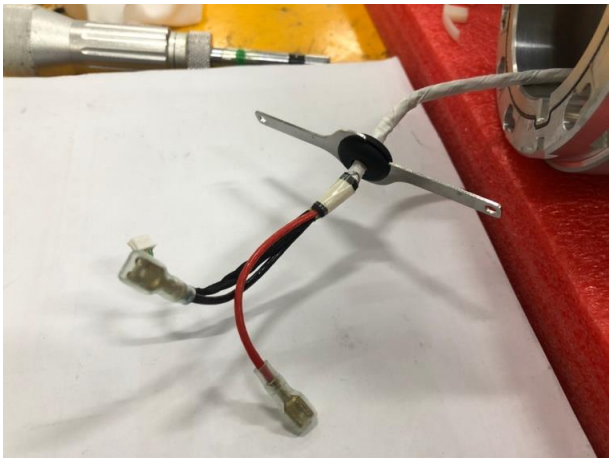
Step 1. Pass the 1 piece of upper arm wiring harness through the cable protector first, then install it on the upper arm wire routing bracket.



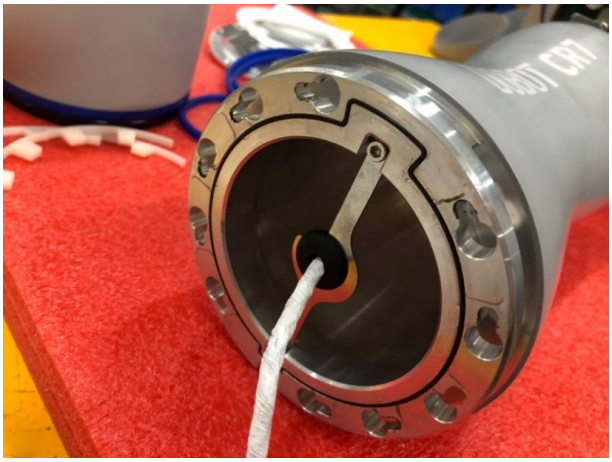
Step 2. Route the harness through the upper arm. Install the wire routing bracket on either end of the upper arm and secure it with 2 pieces of M3×6 screws, torque: 1.5 N·m.



Step 3. Then, pass the upper arm wiring harness through another 1 piece of cable protector and install it on another 1 piece of upper arm wire routing bracket.



Step 4. Install the wire routing bracket on the other end of the upper arm and secure it with 2 pieces of M3×6 screws, torque: 1.5 N·m.



Step 5. Organize the wiring harness, straighten the wires, and ensure that the lengths of the harness protruding from both ends are approximately equal.

No.	Material name	Material specifications	Qty.	Material code
1	Upper arm wire routing bracket	SUS304, V1.0	2	3204000158
2	Cable protector	Silicone, V1.0	2	3202020084
3	Upper arm	Surface powder coating, color code: RAL9003PANTON705	1	3201004261
4	Hexagon socket head cap screw	Property class: 6.8, M3*6	4	3205010118
5	Upper arm wiring harness	Length: 520mm, terminals secured with UV-curable adhesive	1	3800000062

5.5.4 Upper arm and J2 joint

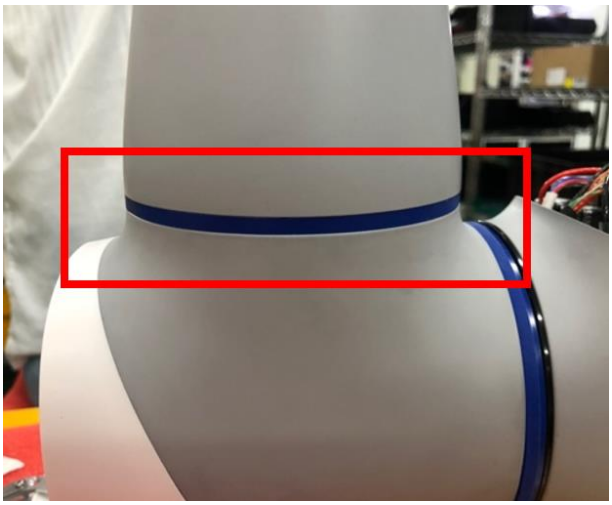
- **Disassembly**

Step 1. Power off.

Step 2. Remove the rear cover of the J2 axis.

Step 3. Disconnect the upper arm wiring harness inside the J2 axis.

Step 4. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing, and then slide it onto the upper arm.



Step 5. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.

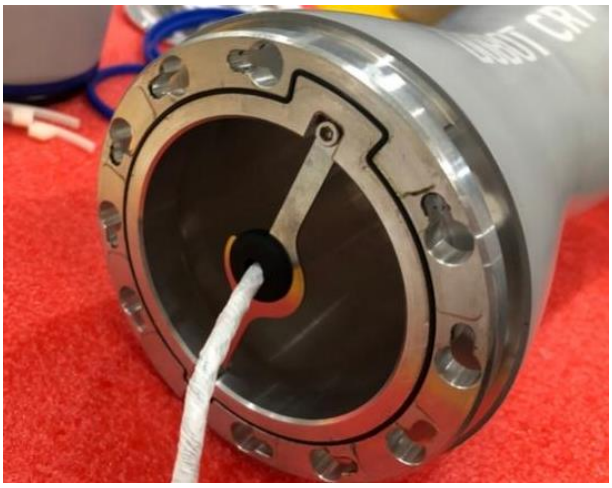
Step 6. Withdraw the J2 joint along its axial direction until the screw heads contact the flange surface. Rotate the J2 joint to align the external hex screws with the larger opening of the keyhole slot on the output flange.

Step 7. Separate the upper arm from the J2 joint.

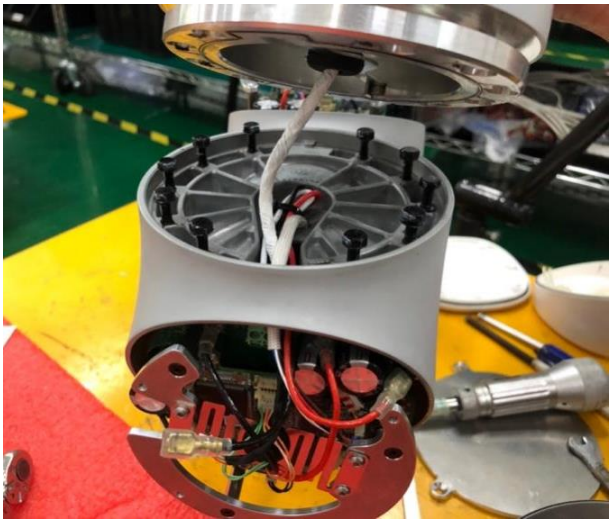
- **Assembly**

Step 1. Take the required number and specification of external hex screws for the joint. Use instant adhesive to attach flat washers to the screw heads. Apply threadlocker (Loctite 243) below 1/3 of the thread depth, then insert the screws into the corresponding holes on the base.

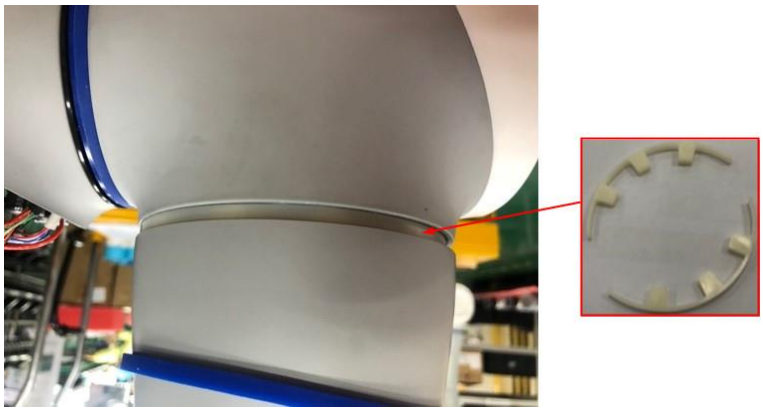
Step 2. Install joint sealing rings sequentially at both ends of the upper arm.



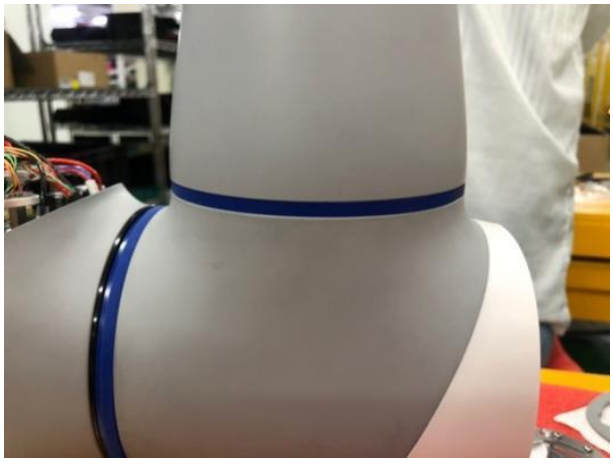
Step 3. Align the large opening of the output flange on the corresponding upper arm with the hex socket screw head on the joint, allowing the hex socket screw head to pass through the large opening of the output flange. Rotate the joint until the external hexagon screws align with the smaller openings of the output flange. Then, push the joint axially into the corresponding assembly part. Finally, tighten the screws in a crisscross pattern to the specified torque value.



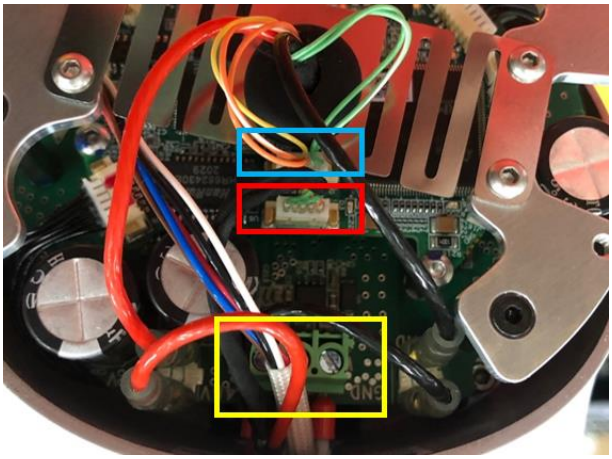
Step 4. Insert the semicircular decorative ring support bracket into the gap between the joint and the upper arm.



Step 5. Then, slide the decorative ring from the upper arm onto the support bracket.



Step 6. ① Connect the wiring harness of the 25-joint to the port indicated by the blue frame; ② Connect the upper arm wiring harness to the port indicated by the red frame; ③ Wiring: Connect the black wire to the GND terminal, and the red wire to the remaining terminal.



No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	property class: 12.9, M5*16	10	3205040033
2	Small washer	Black zinc plated, salt spray test 48H, φ5	10	3205050002
3	Joint sealing ring -25	NBR, V1.0	2	3202020074
4	Upper arm decorative ring support bracket	POM, V1.0	2	3202010189
5	Upper arm decorative ring-25	Silicone, V1.0	1	3202020367

5.5.5 J3 joint

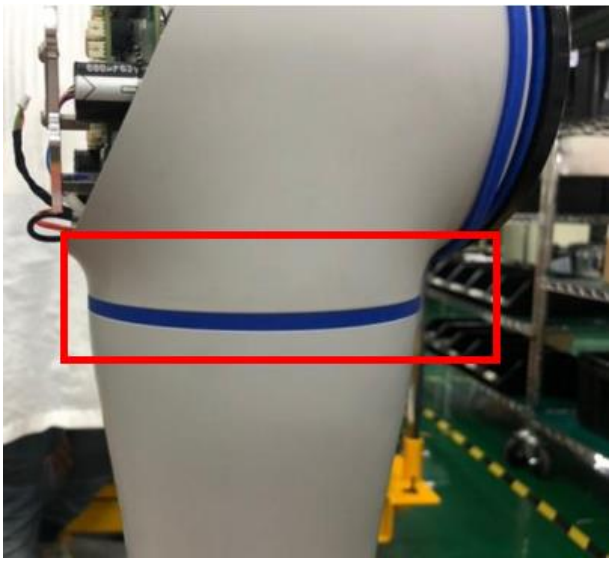
- **Disassembly**

Step 1. Power off.

Step 2. Remove the rear cover of the J3 axis.

Step 3. Disconnect the upper arm wiring harness inside the J3 axis.

Step 4. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing, and then slide it onto the upper arm.



Step 5. Slide the decorative ring support bracket backward to expose the external hexagon screws on both sides of the joint. Then, use an external hexagon wrench to loosen the screws.

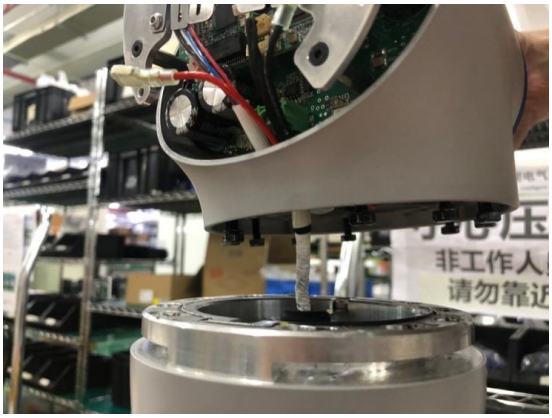
Step 6. Withdraw the J3 joint along the axial direction of the upper arm until the screw heads contact the flange surface. Rotate the upper arm to to align the external hex screws with the larger opening of the keyhole slot on the output flange.

Step 7. Withdraw the joint along the axial direction of the upper arm.

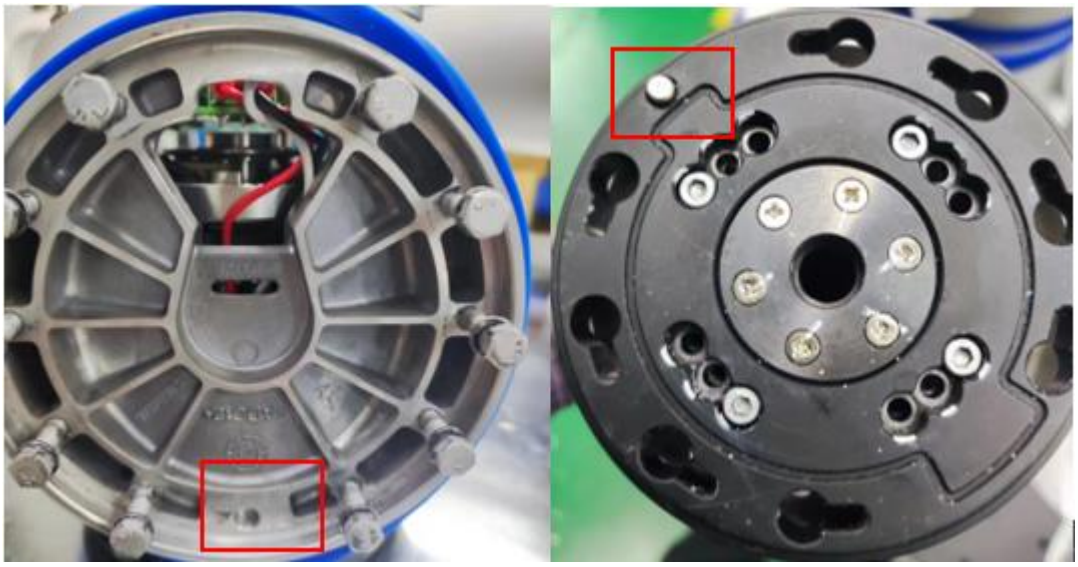
- **J3 joint assembly**

Step 1. Take the required quantity and specification of external hexagon screws for the joint. Adhere the flat washer to the screw head using instant adhesive. Apply threadlocker (Loctite 243) to the lower one-third of the screw threads, and also add one drop of threadlocker into the threaded hole. Then, screw the bolts into the corresponding holes on the base.

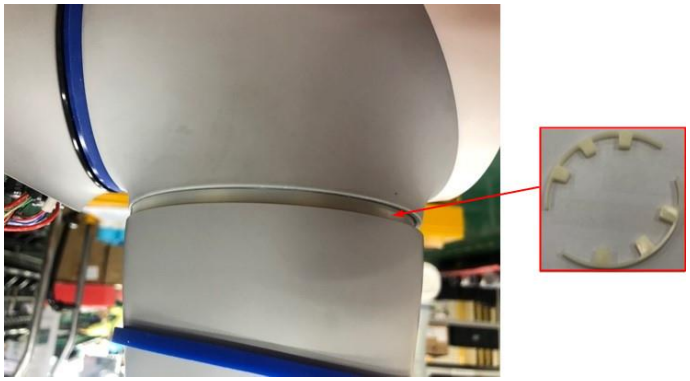
Step 2. Thread the upper arm wiring harness through the hole of the third 25-joint.



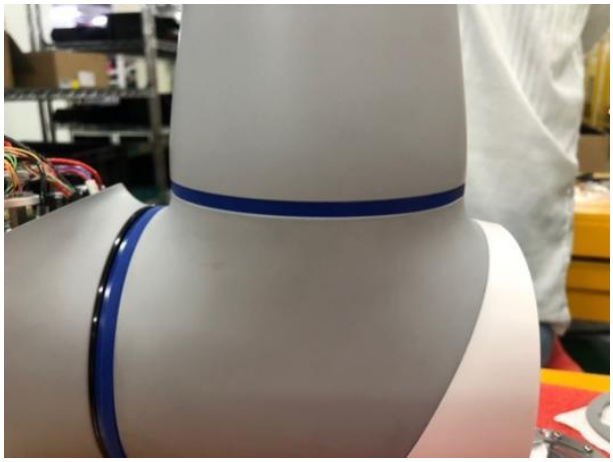
Step 3. Align the large hole of the output flange of the corresponding joint with the external hex screw on the base. The external hex screw should pass through the large hole of the output flange. Rotate the joint until the external hexagon screws align with the smaller openings of the output flange. Then, push the joint axially into the base. Finally, tighten the corresponding fully threaded hex head screws in a crisscross pattern to the specified torque value.



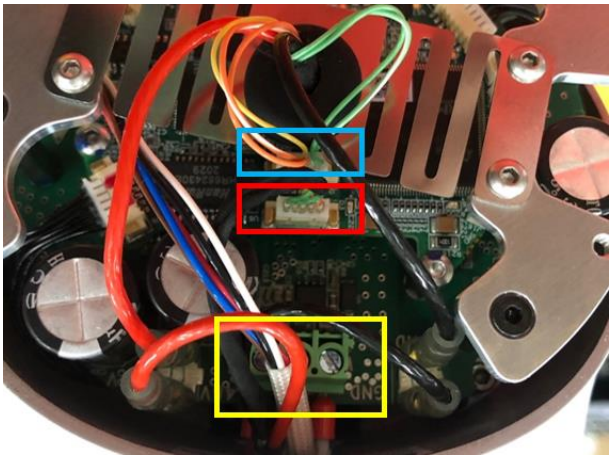
Step 4. Insert the decorative ring support bracket of the upper arm into the gap between the upper arm and the joint.



Step 5. Slide the decorative ring on the upper arm onto the upper arm decorative ring support bracket.



Step 6. ① Connect the wiring harness of the upper arm to the port indicated by the blue frame; ② Connect the 25-joint wiring harness to the port indicated by the red frame; ③ Wiring: Connect the black wire to the GND terminal, and the red wire to the remaining terminal.



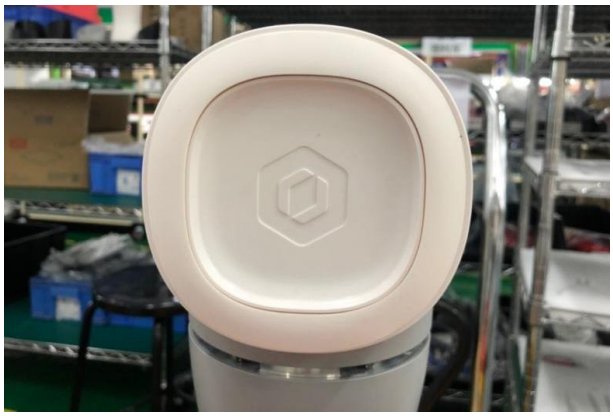
No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	Property class: 12.9, M5*16	10	3205040033
2	Small washer	Black zinc plated, salt spray test 48H, φ5	10	3205050002
3	Joint sealing ring -25	NBR, V1.0	2	3202020074
4	Upper arm decorative ring support bracket	POM, V1.0	2	3202010189
5	Upper arm decorative ring-25	Silicone, V1.0	1	3202020367

- **Assemble the rear cover of the J3 joint**

Step 1. Install the rear cover sealing ring into the sealing groove of the third 25-joint rear cover.

Step 2. Install the rear cover onto the third 25 joint. Secure it using 4 pieces of M3*6 internal hex cylindrical head screws with a torque of 1.0 Nm.

Step 3. Install the 25-joint screw cover plate.



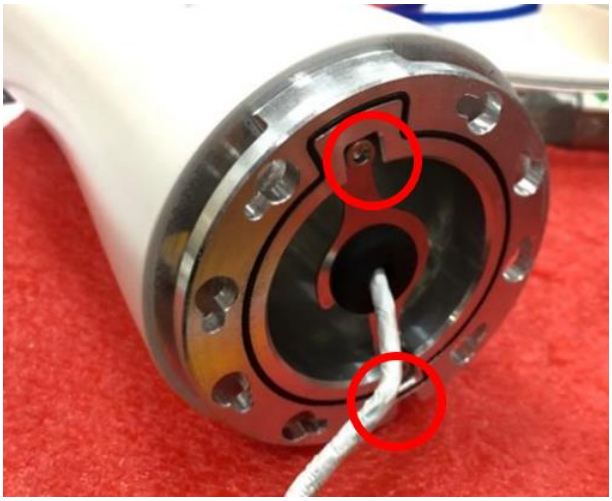
No.	Material name	Material specifications	Qty.	Material code
1	Wire clip	Wire clip, sus301，V1.0	1	3201003122
2	Size 25 rear cover - White	ABS, V1.0	1	3202010016
3	Hexagon socket head cap screw	Salt spray test 48H, property class: 6.8, M3×6	4	3205010224
4	Size 25 screw cover plate	Size 25 screw cover plate, silicone, V1.0	1	3202020062

5.5.6 Forearm

- **Assembly**

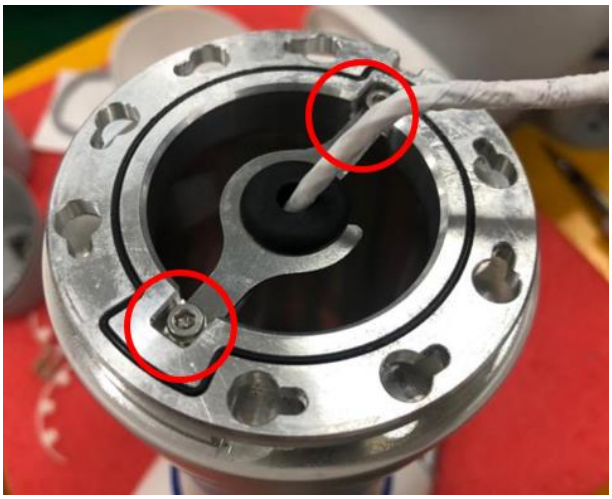
Step 1. Pass the 1 piece of forearm wiring harness through the 1 piece of cable protector first, then install it on the 1 piece of forearm wire routing bracket.

Step 2. Route the harness through the forearm wire routing bracket, install the bracket on either end of the forearm, and secure it with 2 pieces of M3×6 screws at a torque of 1.5 N·m.



Step 3. Pass the other end of the forearm wiring harness through 1 piece of cable protector, then install it on 1 piece of forearm wire routing bracket.

Step 4. Secure the wire routing bracket on the other end of the forearm using 2 pieces of M3×6 screws, torque: 1.5 N·m.



Step 5. Organize the wiring harness by straightening the wires. At the end away from the "DOBOT" marking, leave a wire reserve of approximately 100 mm.

Step 6. Install 2 pieces of joint sealing rings at both ends of the forearm. To prevent detachment, a small amount of grease may be applied.

No.	Material name	Material specifications	Qty.	Material code
1	Forearm wire routing bracket	SUS304, V1.0	2	3204000157
2	Cable protector	Silicone, V1.0	2	3202020084
3	Forearm	Surface powder coated, color: white	1	3201004260
4	Hexagon socket head cap screw	Property class: 6.8, M3*6	4	3205010224
5	J3-J4 wiring harness	Length: 520mm, terminals secured with UV-curable adhesive	1	2005064901
6	Joint sealing ring - 14	Mechanical category, plastic component, joint sealing ring-14	2	3202020075

5.5.7 Transition joint and forearm

- **Disassembly**

Step 1. Power off.

Step 2. Remove the rear cover of the J3 axis.

Step 3. Disconnect the upper arm wiring harness inside the J3 axis.

Step 4. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing and sliding it over the joint casing.

Step 5. Use a flat-head screwdriver to pry open the transition joint screw cover plate, then remove the four M3×6 hex socket head cap screws and the transition joint rear cover.

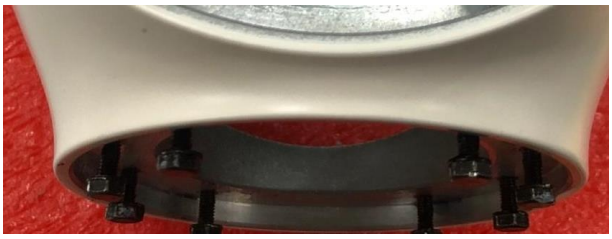
Step 6. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.

Step 7. Withdraw the joint along the axial direction of the joint output flange until the external hexagon screws contact the flange surface. Rotate the joint to align the screws with the larger openings of the keyhole slots, then pull the joint out along its rotational axis direction.

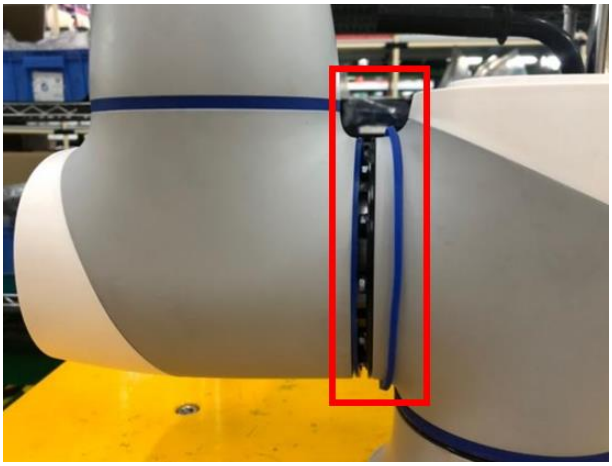
Step 8. Separate the forearm from the transition joint.

- **Assembly**

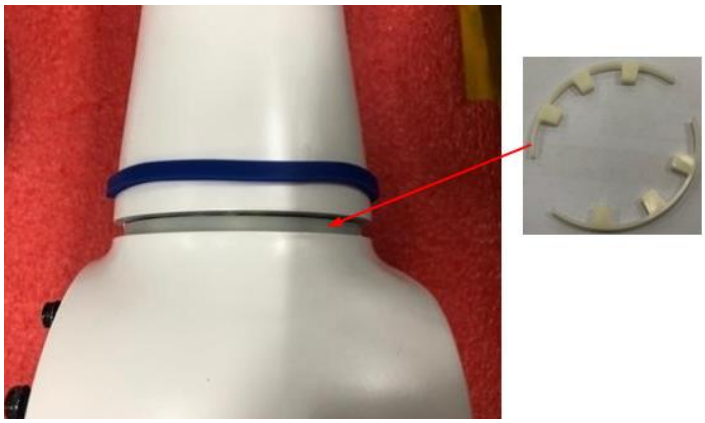
Step 1. Take the required number and specification of external hex screws for the joint. Use instant adhesive to attach flat washers to the screw heads. Apply threadlocker (Loctite 243) below 1/3 of the thread depth, then insert the screws into the corresponding holes on the base to a depth of 2mm.



Step 2. Align the larger hole of the corresponding forearm output flange with the external hexagon screws of the joint, allowing the screws to pass through the larger holes of the output flange. Rotate the joint until the external hexagon screws align with the smaller openings of the output flange. Then, push the joint axially into the forearm. Finally, tighten the corresponding fully threaded hex head screws in a crisscross pattern to the specified torque value.



Step 3. Insert the forearm decorative ring support bracket into the gap between the forearm and the J4 joint.



Step 4. Slide the decorative ring that is fitted on the forearm onto the decorative ring support bracket.

No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	Property class: 12.9, M3*10	8	3205040035
2	Small washer	Black zinc plated, salt spray test 48H, φ3	8	3205050004
3	Forearm decorative ring Forearm decorative ring-blue	Silicone	1	3202020059
4	Forearm decorative ring support bracket	POM	2	3202010190

- **Transition joint rear cover assembly**

Step 1. Install the transition joint sealing ring into the groove of the transition joint rear cover.

Step 2. Install the rear cover onto the transition joint, and tighten the 4 pieces of hex socket head cap screws (M3×6) to a torque of 0.7 N·m.

Step 3. Install the transition joint screw cover plate.

No.	Material name	Material specifications	Qty.	Material code
1	Transition joint sealing ring	NBR, V1.0	1	3202020026
2	Transition joint rear cover	ABS, V1.0	1	3202010191
3	Hexagon socket head cap screw	property class: 6.8, M3*6	4	3205010118
4	Transition joint screw cover plate	ABS, V1.0	1	3202010191

5.5.8 Transition Joint and J3 Joint

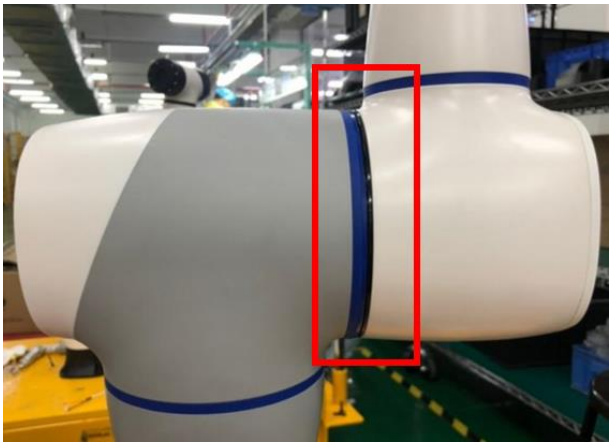
- **Disassembly**

Step 1. Power off.

Step 2. Remove the rear cover of the J3 axis.

Step 3. Disconnect the forearm wiring harness inside the J3 axis.

Step 4. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing and sliding it over the joint casing.



Step 5. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.

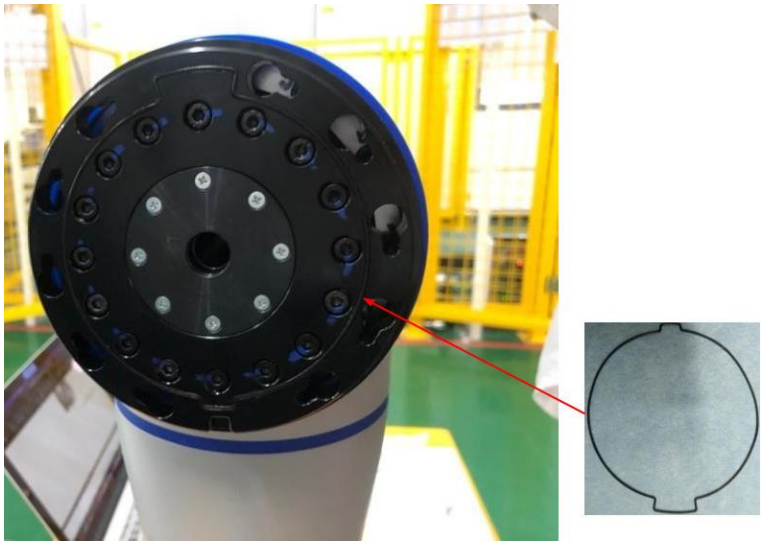
Step 6. Withdraw the base and joint along the axial direction until the screw heads contact the flange surface. Rotate the base to align the external hexagon screws with the larger openings of the keyhole slots on the output flange.

Step 7. Withdraw the transition joint along the axial direction of the J3 joint rotation.

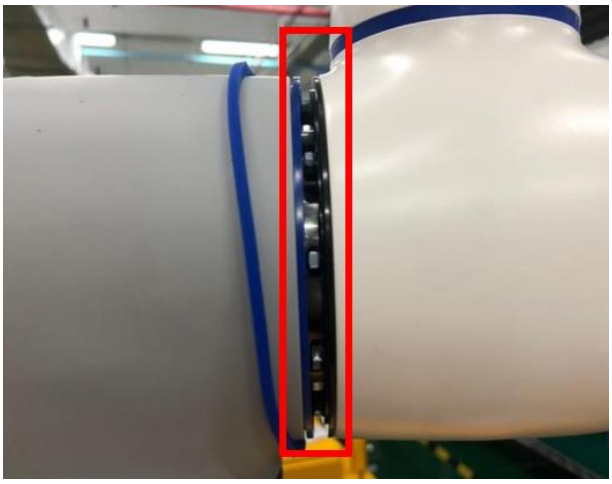
- **Assembly**

Step 1. Take out the required number and specifications of external hex screws for the joint. Use instant adhesive to attach the flat washers to the screw heads. Apply thread locker (Loctite 243) below one-third of the thread depth. Then, screw the bolts into the corresponding holes in the joint.

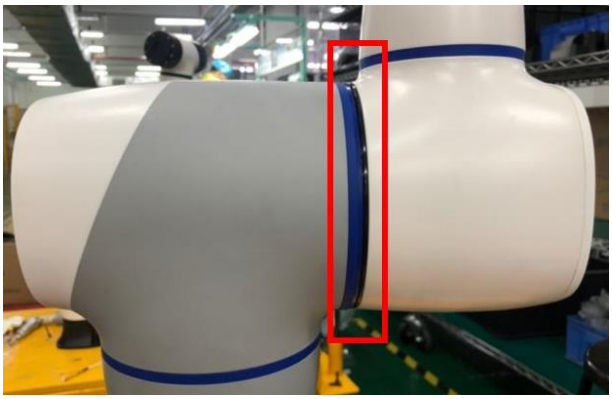
Step 2. Install one joint seal at the J3 joint. To prevent detachment, apply an appropriate amount of grease.



Step 3. Align the larger hole of the corresponding joint output flange with the external hexagon screws of the mounting joint, allowing the screws to pass through the larger holes of the output flange. Rotate the joint until the external hexagon screws align with the smaller openings of the output flange. Then, push the joint axially into the forearm. Finally, tighten the corresponding fully threaded hex head screws in a crisscross pattern to the specified torque value.



Step 4. Push the decorative ring support bracket up to the joint flange surface, and then install the decorative ring into the designated position.



No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	property class: 12.9, M5*20	10	3205040031
2	Small washer	Black zinc plated, salt spray test 48H, φ5	10	3205050002
3	Joint sealing ring - 25	NBR, V1.0	1	3202020074
4	Decorative ring-25-Blue-M	Tensile silicone, V1.0	1	3202020325

5.5.9 J4 joint

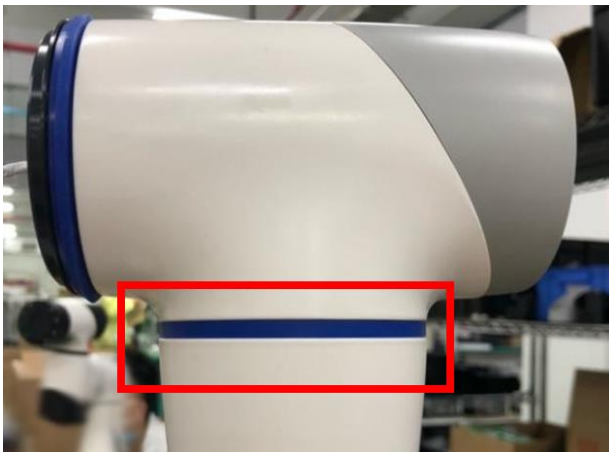
- **Disassembly**

Step 1. Power off.

Step 2. Remove the rear cover of the J4 axis.

Step 3. Disconnect the upper arm wiring harness inside the J4 axis.

Step 4. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing and sliding it over the joint casing.



Step 5. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.

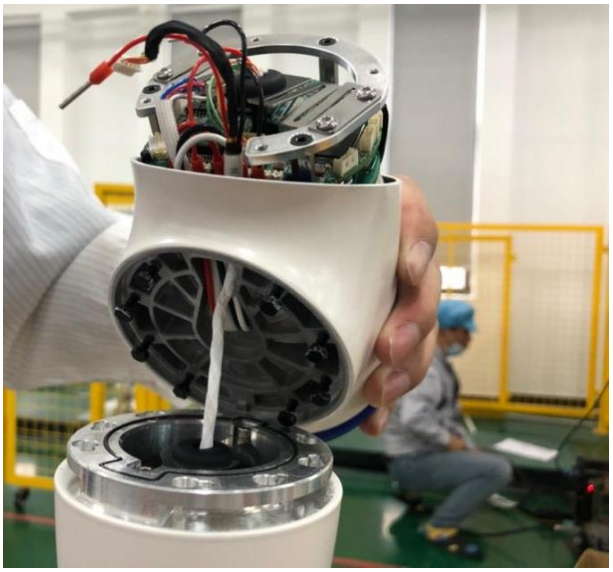
Step 6. Withdraw the forearm and transition joint along the axial direction until the screw heads contact the flange surface. Rotate the forearm to align the external hexagon screws with the larger openings of the keyhole slots on the output flange.

Step 7. Withdraw the forearm along the axial direction.

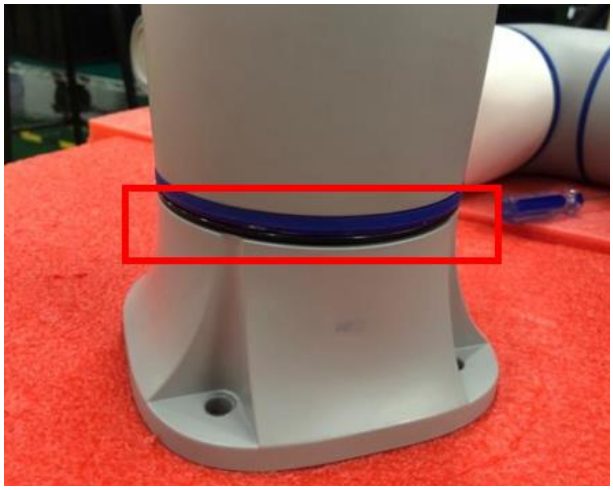
- **Assembly**

Step 1. Take the required number and specification of external hex screws for the joint. Use instant adhesive to attach flat washers to the screw heads. Apply threadlocker (Loctite 243) below 1/3 of the thread depth, then insert the screws into the corresponding holes on the base.

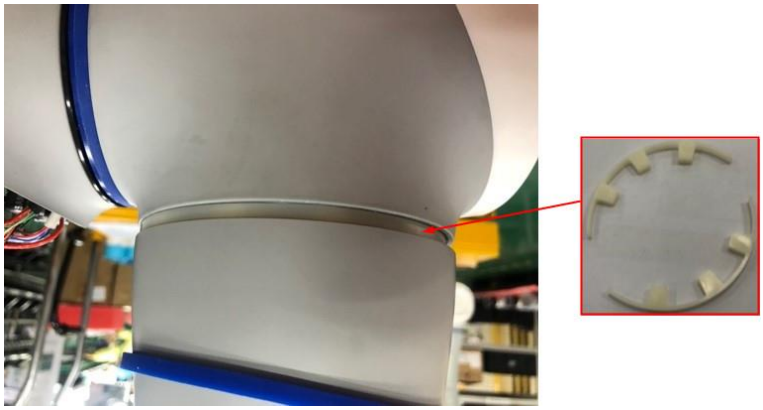
Step 2. Thread the forearm wiring harness through the J4 joint.



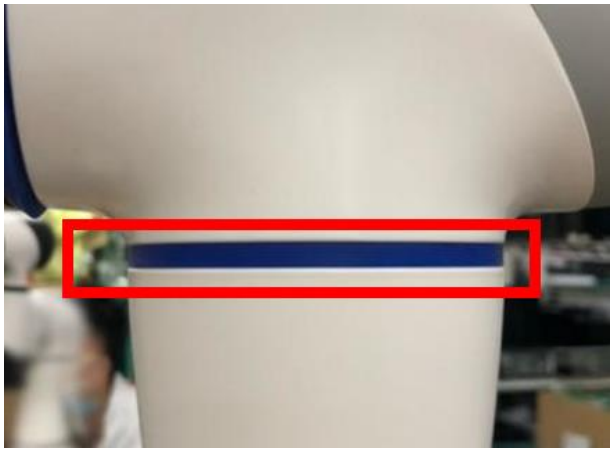
Step 3. Align the pin holes. Then, align the larger hole of the corresponding joint output flange with the external hexagon bolt heads on the forearm, allowing the bolt heads to pass through the larger holes of the output flange. Rotate the joint until the external hexagon screws align with the smaller openings of the output flange. Then, push the joint axially into the forearm. Finally, tighten the corresponding fully threaded hex head screws in a crisscross pattern to the specified torque value.



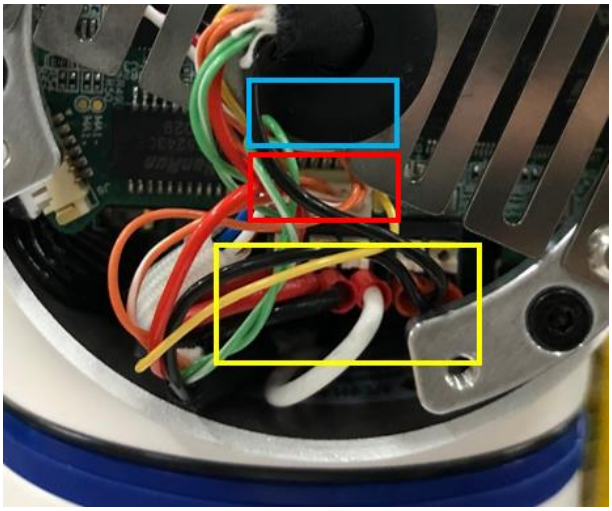
Step 4. Install 2 pieces of the forearm decorative ring bracket.



Step 5. Install the forearm decorative ring.



Step 6. ① Connect the forearm wiring harness to the port indicated by the blue frame;
② Connect the 14-joint wiring harness to the port indicated by the red frame;
③ Wiring: Connect the black wire to the GND terminal, and the red wire to the remaining terminal.

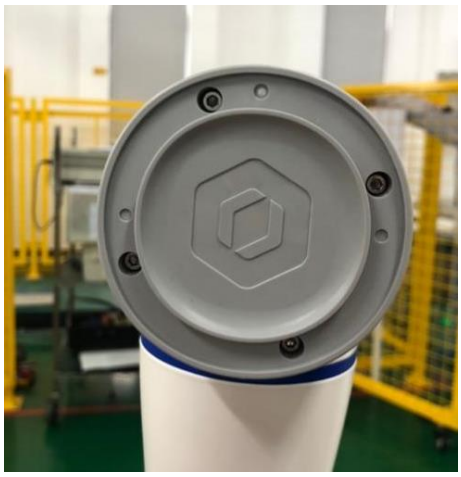


No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	property class: 12.9, M3*10	8	3205040035
2	Small washer	Black zinc plated, salt spray test 48H, φ3	8	3205050004
3	Joint sealing ring - 14	NBR, V1.0	1	3202020075
4	Forearm decorative ring-blue	Silicone, V1.0	2	3202020059
5	Forearm decorative ring support bracket	POM, V1.0	1	3202010190

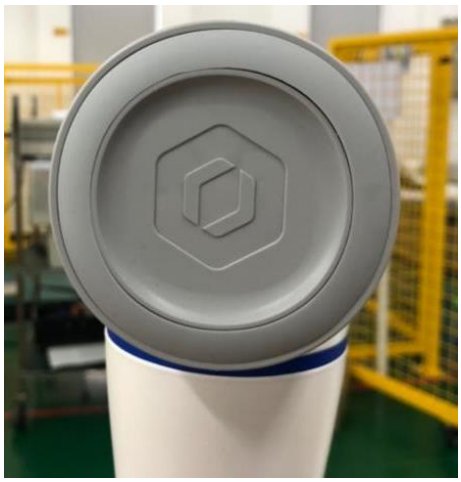
- **J4 joint rear cover assembly**

Step 1. Install the rear cover sealing ring into the sealing groove of the first 14-joint rear cover.

Step 2. Assemble the rear cover onto the first 14-joint, and tighten the 4 pieces of hexagon socket head cap screws (M3×6), torque: 0.7 N·m.



Step 3. Install the 14-joint screw cover plate.



No.	Material name	Material specifications	Qty.	Material code
1	Rear cover seal ring-14	NBR, V1.0	1	3202020028
2	14 joint rear cover - Gray	ABS, V1.0	1	3202010015
3	Hexagon socket head cap screw	Property class: 6.8, M3*6	4	3205010224
4	14 joint screw cover plate-Gray	Silicone, V1.0	1	3202020063

5.5.10 J5 joint

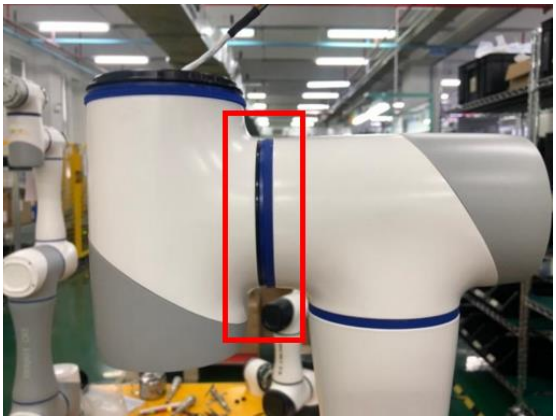
- **Disassembly**

Step 1. Power off.

Step 2. Remove the rear cover of the J5 axis.

Step 3. Disconnect the 14 wiring harness inside the J5 axis.

Step 4. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing and sliding it over the joint casing.



Step 5. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.

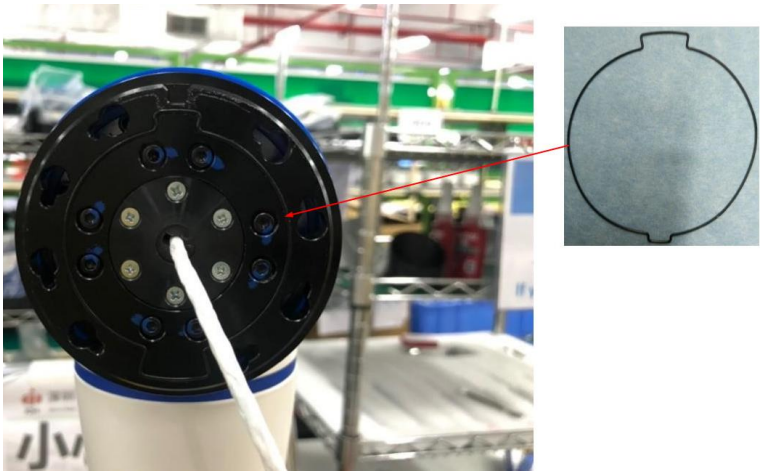
Step 6. Separate the J4 joint from the J5 joint, then rotate it approximately 9° along the direction of the larger hole until it reaches the mechanical stop (the hole is a keyhole slot).

Step 7. Separate the J4 joint from the J5 joint.

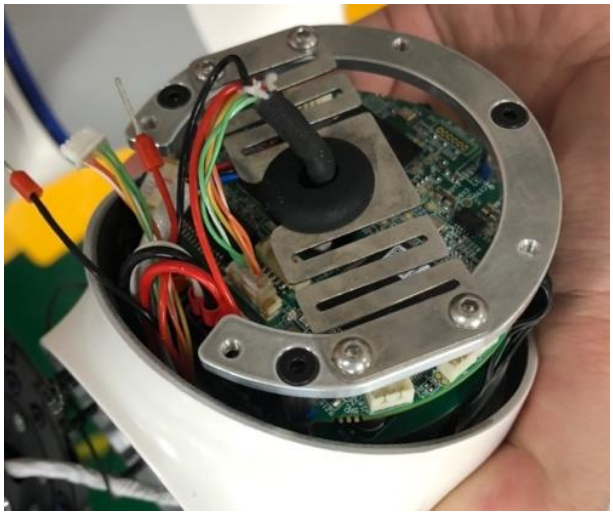
- **Assembly**

Step 1. Take the required number and specification of external hex screws for the joint. Use instant adhesive to attach flat washers to the screw heads. Apply threadlocker (Loctite 243) below 1/3 of the thread depth, then insert the screws into the corresponding holes on the base.

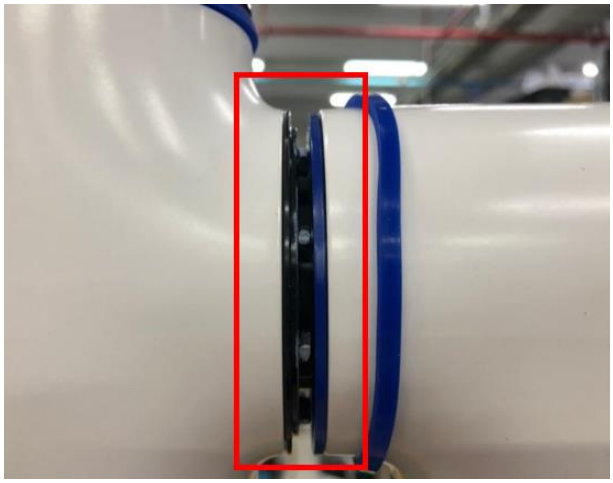
Step 2. Install one joint seal at the J4 joint. To prevent detachment, apply an appropriate amount of grease.



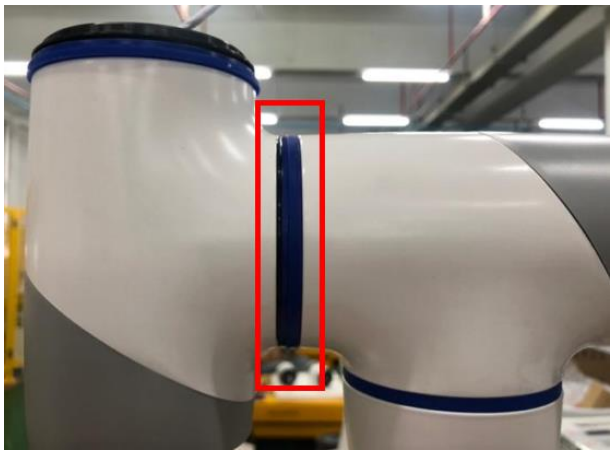
Step 3. Thread the J4-axis wiring harness through the J5 axis.



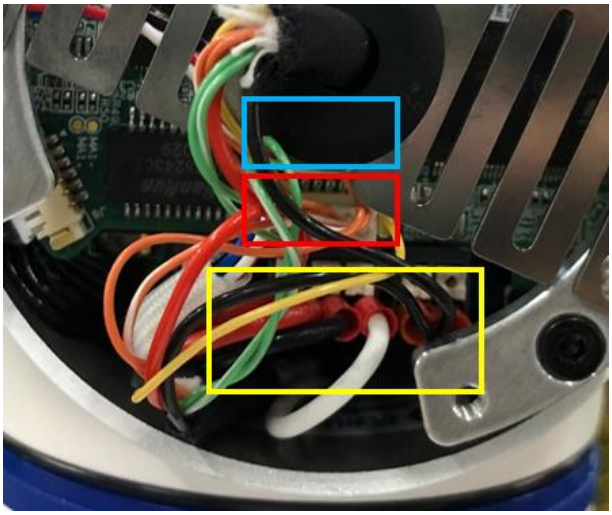
Step 4. Align the groove. Then, align the larger hole of the corresponding joint output flange with the external hexagon bolts of the joint, allowing the bolts to pass through the larger holes of the output flange. Rotate the joint until the external hexagon bolts align with the smaller openings of the output flange. Then, push the joint axially into the next joint. Finally, tighten the corresponding fully threaded hex head bolts in a crisscross pattern to the specified torque value.



Step 5. Tighten the corresponding fully threaded hex head bolts in a crisscross pattern to the specified torque value.



Step 6. ① Connect the wiring harness of the first 14-joint to the port indicated by the blue frame. ② Connect the wiring harness of the second 14-joint to the port indicated by the red frame. ③ Wiring: Connect the black wire to the GND terminal, and the red wire to the remaining terminal.

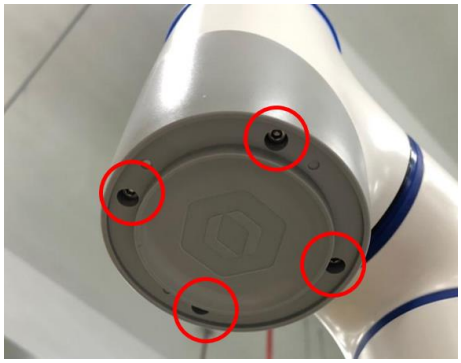


No.	Material name	Material specifications	Qty.	Material code
1	Rear cover seal ring-14	NBR, V1.0	1	3202020028
2	14 joint rear cover - Gray	ABS, V1.0	1	3202010015
3	Hexagon socket head cap screw	Property class: 6.8, M3*6	4	3205010224
4	14 joint screw cover plate-Gray	Silicone, V1.0	1	3202020063

- **J5 joint rear cover assembly**

Step 1. Install the rear cover sealing ring into the sealing groove of the second J4-joint rear cover.

Step 2. Assemble the rear cover onto the second 14-joint, and tighten the 4 pieces of hexagon socket head cap screws (M3×6), torque: 0.7 N·m.



Step 3. Install the 14-joint screw cover plate.

No.	Material name	Material specifications	Qty.	Material code
1	Rear cover seal ring-14	NBR, V1.0	1	3202020028
2	14 joint rear cover - Gray	ABS, V1.0	1	3202010015
3	Hexagon socket head cap screw	Property class: 6.8, M3*6	4	3205010224
4	14 joint screw cover plate-Gray	Silicone, V1.0	1	3202020063

5.5.11 J6 joint

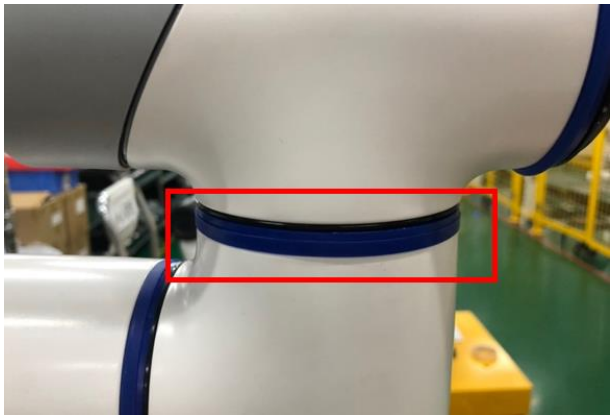
- **Disassembly**

Step 1. Power off.

Step 2. Remove the rear cover of the J6 axis.

Step 3. Disconnect the wiring harness inside the J6 axis.

Step 4. Using a flat-head screwdriver or tweezers, gently remove the decorative ring by pulling it backward from its original position on the joint casing and sliding it over the joint casing.



Step 5. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.

Step 6. Separate the J5 joint from the J6 joint, then rotate it approximately 9° along the direction of the larger hole until it reaches the mechanical stop (the hole is a keyhole slot).

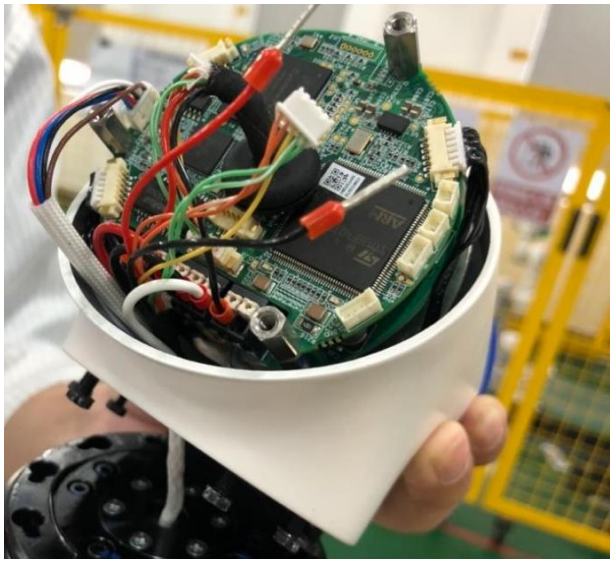
Step 7. Separate the J5 joint from the J6 joint.

- **Assembly**

Step 1. Take the corresponding quantity and specification of external hexagon bolts required for the joint. Adhere the flat washer to the bolt head using instant adhesive. Apply threadlocker (Loctite 243) to the lower one-third of the bolt threads, then screw the bolt into the corresponding hole of the joint.

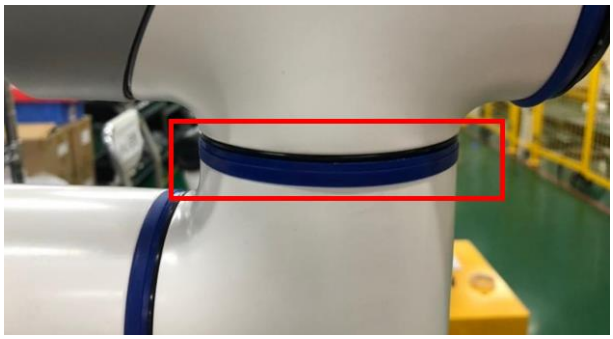
Step 2. Install one joint seal at the J5 joint. To prevent detachment, apply an appropriate amount of grease.

Step 3. Thread the J5-axis wiring harness through the J6 axis.

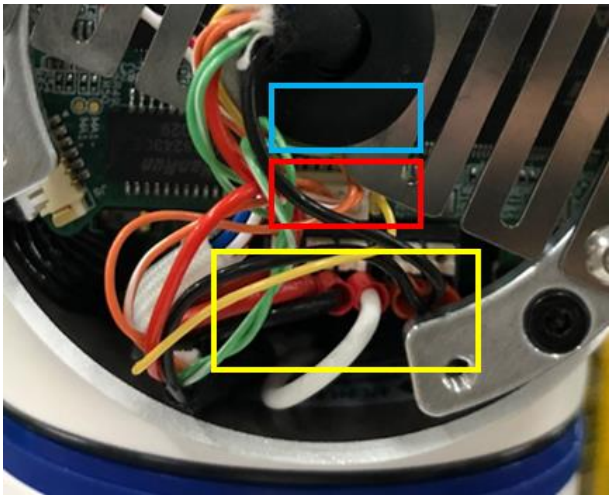


Step 4. Align the pin holes. Then, align the larger hole of the corresponding joint output flange with the external hexagon bolts on the base, allowing the bolts to pass through the larger holes of the output flange. Rotate the joint until the external hexagon screws align with the smaller openings of the output flange. Then, push the joint axially into the forearm. Finally, tighten the corresponding fully threaded hex head screws in a crisscross pattern to the specified torque value.

Step 5. Install the decorative ring.



Step 6. ① Connect the wiring harness of the first 14-joint to the port indicated by the blue frame. ② Connect the wiring harness of the second 14-joint to the port indicated by the red frame. ③ Wiring: Connect the black wire to the GND terminal, and the red wire to the remaining terminal.

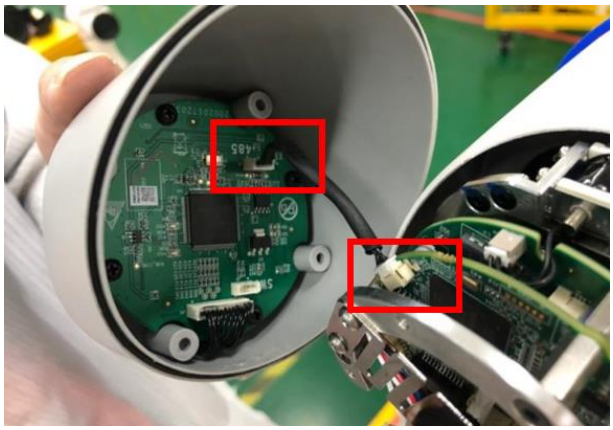


No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	property class: 12.9, M3*10	8	3205040035
2	Small washer	Black zinc plated, salt spray test 48H, φ3	8	3205050004
3	Joint sealing ring -14	NBR, V1.0	1	3202020075
5	Forearm decorative ring support bracket	POM, V1.0	1	3202010190

- **J6 joint rear cover assembly**

Step 1. Install the rear cover sealing ring-14 into the sealing groove of the J6 joint rear cover.

Step 2. Plug the other end of the button control panel wiring harness into the interface on the J6 joint.



Step 3. Install the rear cover of the J6 joint onto the J6 joint and secure it with 4 pieces of hex socket head cap screws (M3×6), tightening them to a torque value of 1.2 N·m.

Step 4. Install the J6-joint screw cover plate. Must be pressed into place until fully seated.

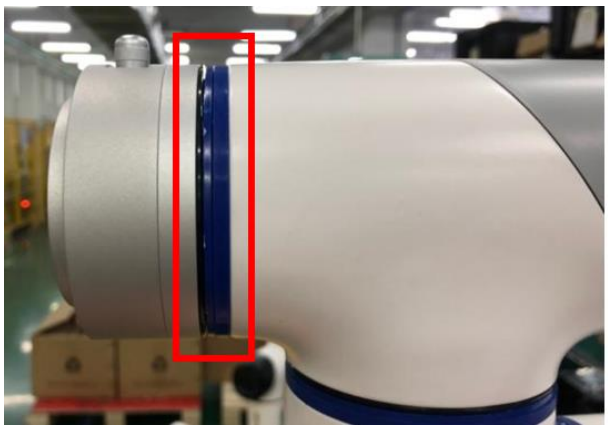
No.	Material name	Material specifications	Qty.	Material code
1	Rear cover seal ring-14	NBR, V1.0	1	3202020028
2	Hexagon socket head cap screw	Property class: 6.8, M3*6	4	3205010224
3	J6 joint screw cover plate-Gray	Silicone, V1.0	1	3202020061

5.5.12 End IO flange

- **Disassembly**

Step 1. Power off.

Step 2. Move the decorative ring support frame back to the joint's end surface to expose the external hex screws. Use the appropriate open-end wrench to loosen the screws counterclockwise, loosening them approximately 3mm.



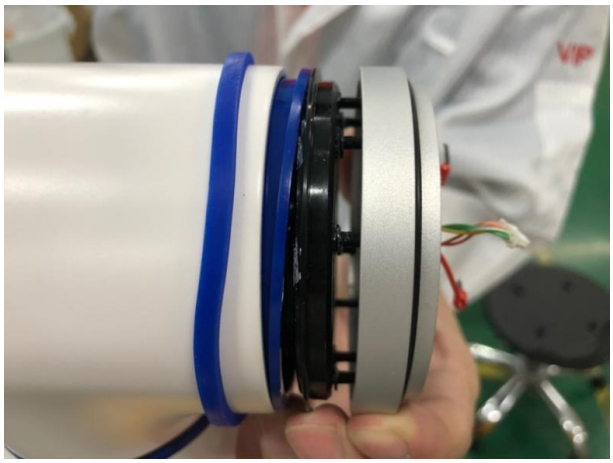
Step 3. Withdraw the flange and joint along the axial direction until the bolt heads contact the flange surface. Rotate the base to align the external hexagon bolts with the larger openings of the keyhole slots on the output flange.

Step 4. Withdraw the forearm along the axial direction.

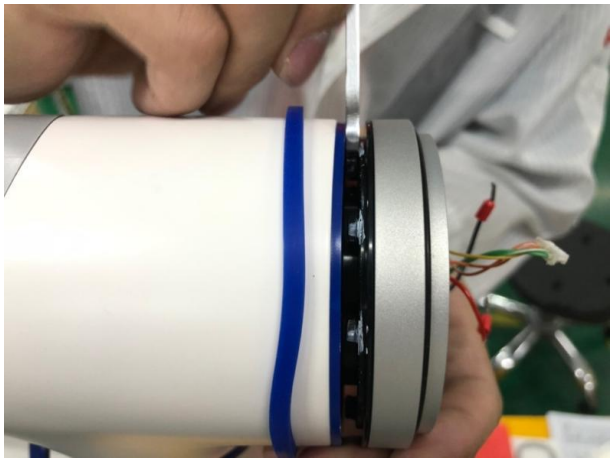
- **Assembly**

Step 1. Take 1 piece of joint sealing ring-14 and install it onto the J6 axis.

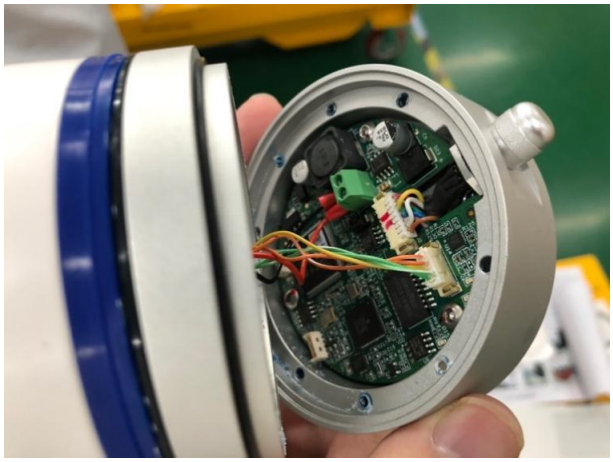
Step 2. Take the required number and specification of external hex screws for the joint. Use instant adhesive to attach flat washers to the screw heads. Apply threadlocker (Loctite 243) below 1/3 of the thread depth, then insert the screws into the corresponding holes on the base to a depth of 3mm.



Step 3. Align the large hole of the output flange of the corresponding joint with the external hex screw on the base. The external hex screw should pass through the large hole of the output flange. Rotate the joint until the external hexagon screws align with the smaller openings of the output flange. Then, push the joint axially into the forearm. Finally, tighten the corresponding fully threaded hex head screws in a crisscross pattern to the specified torque value.



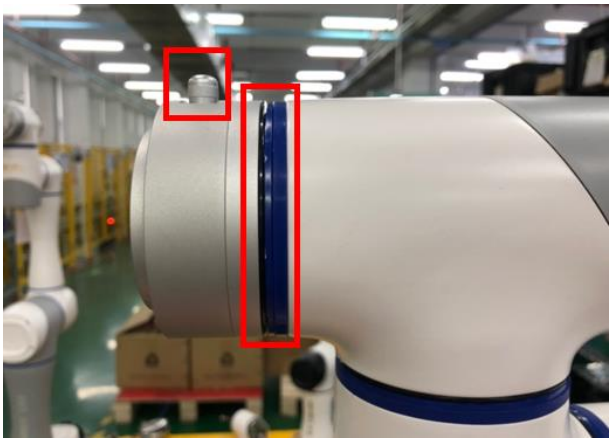
Step 4. Connect the wiring between the IO flange and the corresponding port on the J6 joint. Connect the black wire to GND.



Step 5. ① Install the O-ring on the IO flange adapter, and then align and assemble the IO flange according to the hole positions shown in the diagram.

② Tighten the 8 pieces of M3×20 hex socket head cap screws (with applied Loctite 243) symmetrically and in sequence to a torque of 2.0 N·m.

Step 6. Install the decorative ring and tighten the aviation plug cap.



No.	Material name	Material specifications	Qty.	Material code
1	Fully threaded hex head bolt	Property class: 12.9, M3*10	8	3205040036
2	Small washer	Black zinc plated, salt spray test 48H, φ3	8	3205050004
3	Joint sealing ring -14/Decorative ring-14-14	Joint sealing ring -14/High-tensile silicone, V1.0	1/1	3202020075/3202020058
4	O-ring/IO flange transition	Inner diameter Φ75, cross-section diameter Φ1.5/Aluminum alloy 7075-T6	1	3202020012/3201004556
5	Hexagon socket head cap screw	Property class: 12.9, M3*20	8	3205010153
6	Terminal aviation connector cap	Aluminum alloy 6061-T6, V1.0	1	3201000933

5.6 Wiring harness and mounting plate installation

In addition to the wiring harness kit suitable for the correct joint size, it is recommended to use tools that have passed electrostatic discharge (ESD) certification during replacement:

- Circlip pliers
- M3 hex driver bit
- Manual torque driver bit

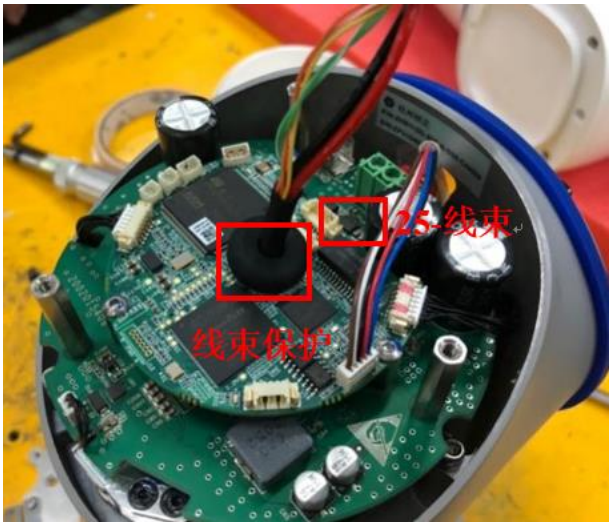
NOTICE

- Check materials before going online to ensure accuracy.
- Pay attention to the orientation of assembled parts, arrange cables properly, and avoid pinching.
- After completing the work, conduct self-inspection and mutual inspection. Confirm that the process is correct before proceeding to the next step.

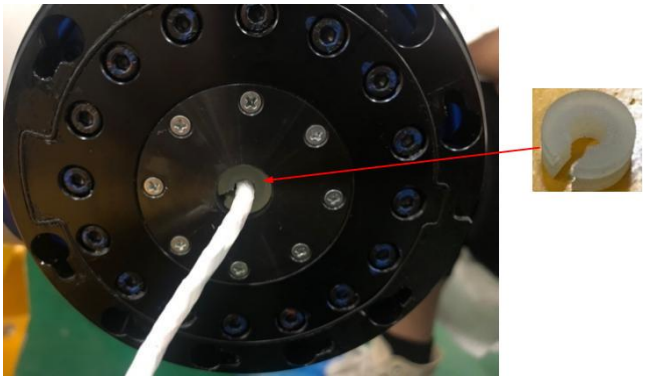
5.6.1 25-Joint assembly wiring harness and mounting plate

- **Wiring harness installation**

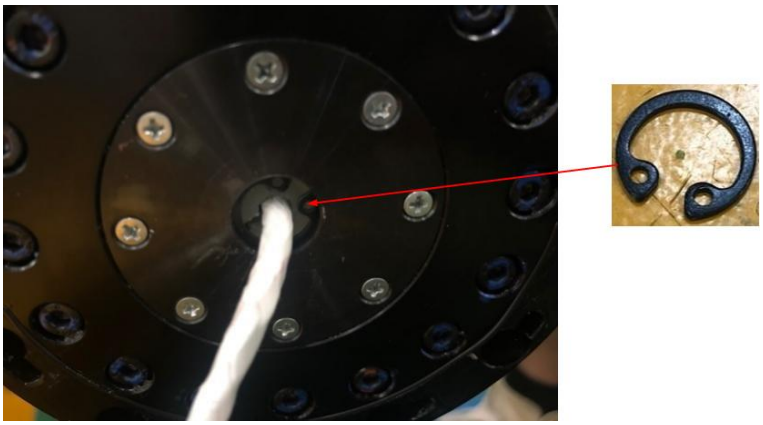
Step 1. Take a 25-joint that has passed the aging test. First, thread the forearm wiring harness through the slow-speed axis, then slide it into the cable protector. Leave approximately 13 mm of wire length exposed at the upper PCB end. The longer end of the wiring harness heat shrink tube should be on the black flange side.



Step 2. Assemble the wiring harness block into the center shaft of the black flange, ensuring it is secured within the heat shrink tube of the harness.



Step 3. Using internal circlip pliers, install the C-shaped retaining ring into the hole as shown in the figure. The circlip must be fully seated, with a relatively long cable reserved. Cable protection sleeves must be installed at the heat shrink tube locations (in two places).

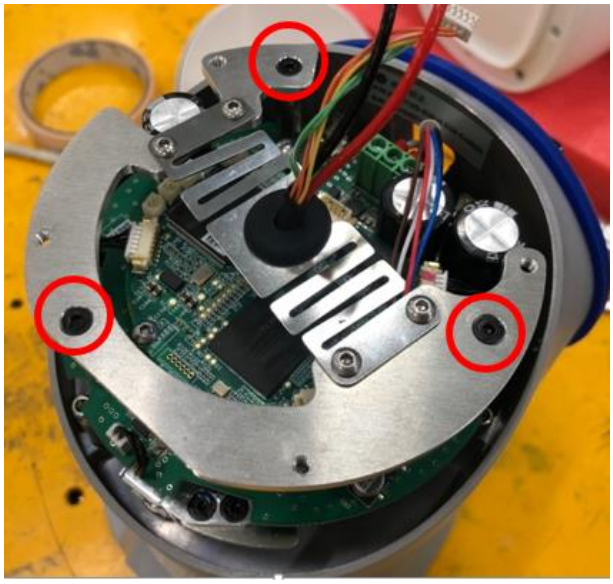


No.	Material name	Material specifications	Qty.	Material code
1	Forearm wiring harness	Length: 675mm, terminals secured with UV-curable adhesive, V3.0	1	3800000062
2	Wire clamp-25	Polyurethane, V2.0	1	3201000841
3	Cable protector	Silicone, V1.0	3	3202020084
4	Internal circlip	Internal circlip, black zinc plated, salt spray test 48H, size Φ13	1	3205060006

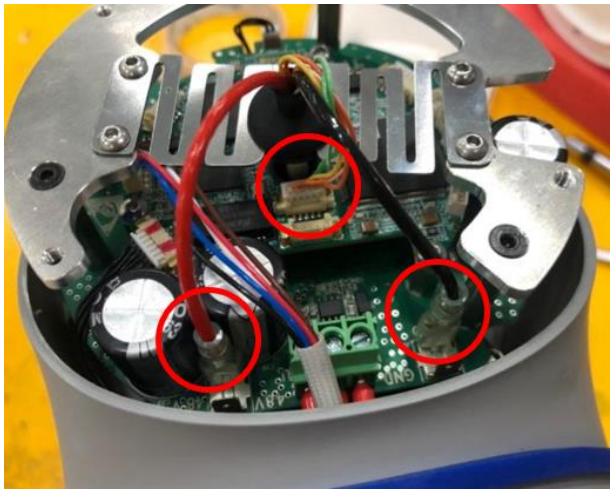
- **Mounting plate installation**

Step 1. Assemble the spring plate onto the mounting plate and secure it with 4 pieces of M3*4 internal hex flat head screws, with a torque of 0.7 Nm.

Step 2. First, assemble the mounting plate onto the joint and secure it with 3 pieces of M3*6 countersunk internal hex screws, applying a torque of 0.7 Nm. Then clip the wiring harness protector onto the spring plate (as shown in the diagram).



Step 3. Connect the power cable: connect the black wire to the hole position on the right side of the figure (GND), connect the red wire to the hole position on the left side of the figure, and connect the signal wire to the interface on the outer side as shown in the figure.



Step 4. Organize the motor cables and secure them with zip ties to ensure they do not rise above the tabletop surface.

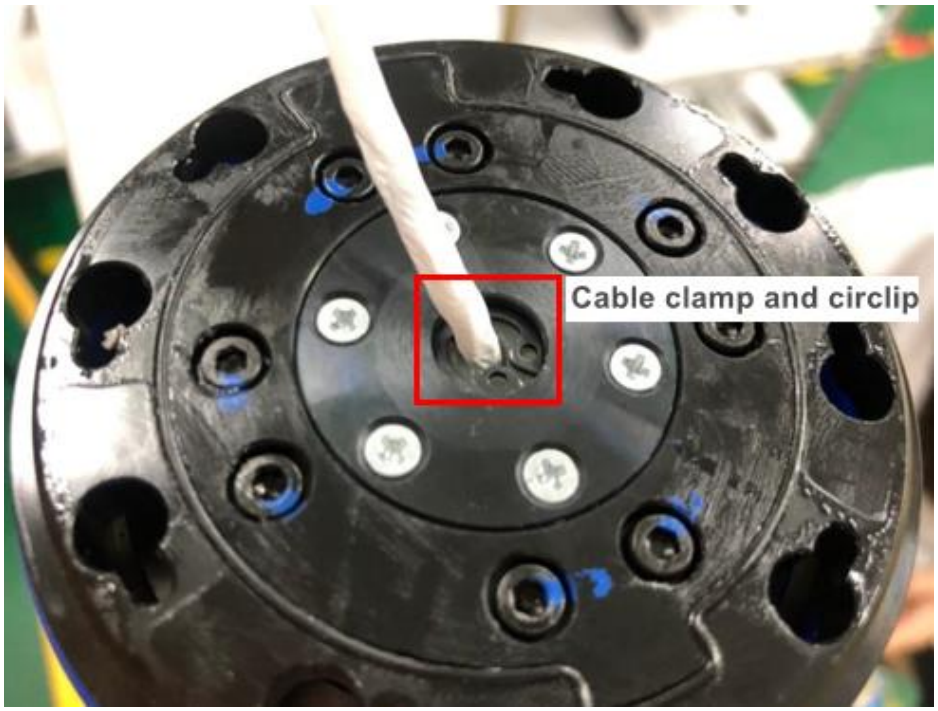
No.	Material name	Material specifications	Qty.	Material code
1	Wire clip	sus301, V1.0	1	3205060006
2	Mounting plate-25	Aluminum alloy 6061-T6, V2.0	1	3201000846
3	Hexagon socket button head screws	Salt spray test 48H, property class: 6.8, M3×4	4	3205010246
4	Hexagon socket countersunk head screw	Salt spray test 48H, property class: 10.9, M3×6	3	2201000700
5	Black zip tie	Specification: 2.5mm × 150mm, black	1	3502000003

5.6.2 14-Joint assembly wiring harness and mounting plate

- **Wiring harness installation**

Step 1. Take the 14 joints that passed the aging test, first thread the 14 wires through the slow-speed shaft, then insert them into the cable protector, leaving approximately 12 mm of wire length at the upper end.

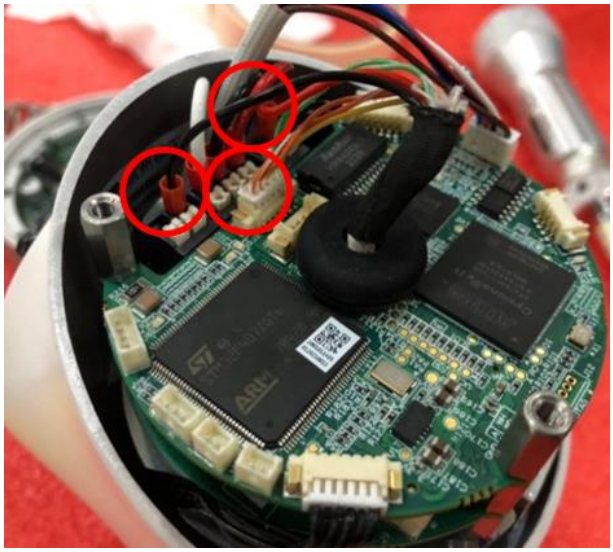
Step 2. Clip the wire harness block into the wire harness heat shrink tube, assemble it into the center shaft of the black flange (as shown in the diagram), and then use internal circlip pliers to insert the C-shaped retaining ring into the hole as illustrated. The circlip must be fully seated.



No.	Material name	Material specifications	Qty.	Material code
1	14 wiring harness	Length: 280mm, terminals secured with UV-curable adhesive, V3.0	1	2005039400
2	Wire clamp-14-sunline	Wire clamp-14-sunline, polyurethane, V2.0	1	3201000097
3	Cable protector	Cable protector, silicone, V1.0	1	3202020084
4	Reverse installation internal circlip (Type C)	Black zinc plated, salt spray test 48H, size Φ10	1	3205100051

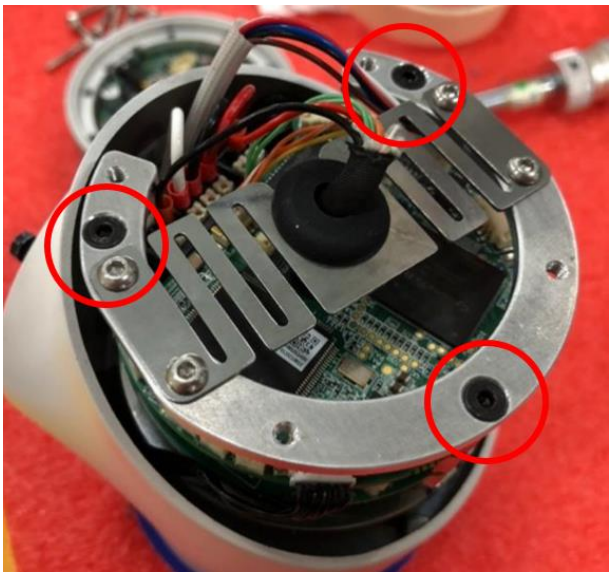
- **Mounting plate installation**

Step 1. Connect the power cable: connect the black wire to the hole position on the left side of the figure (GND), connect the red wire to the hole position on the right side of the figure below, and connect the signal wire to the outer position indicated in the figure below.



Step 2. Assemble the spring plate onto the mounting plate and secure it with 4 pieces of M3*4 internal hex flat head screws, with a torque of 0.7 Nm.

Step 3. First, assemble the mounting plate onto the joint and secure it with 3 pieces of M3*6 countersunk internal hex screws, applying a torque of 0.7 Nm. Then clip the wiring harness protector onto the spring plate (as shown in the diagram).



No.	Material name	Material specifications	Qty.	Material code
1	Wire clip	sus301, V1.0	1	3201003122
2	14-Rear cover fixing plate-M	Aluminum alloy 6061-T6, V2.0	1	3201004374
3	Hexagon socket button head screws	Property class: 6.8, M3*4	4	3205010246
4	Hexagon socket countersunk head screw	Property class: 10.9, M3*8	3	3205010313

5.7 Size 25 board removal

NOTICE

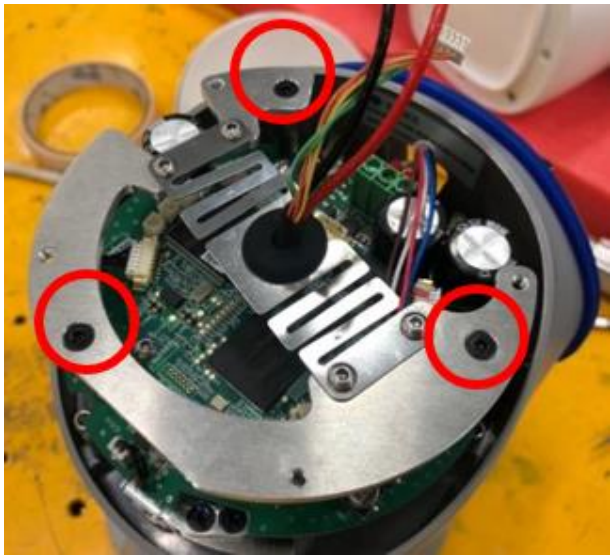
When replacing the PCBA board inside the controller, an anti-static wrist strap must be worn at all times;

The PCBA board should be sealed and stored in an anti-static bag, and touching the components on the PCBA is prohibited.

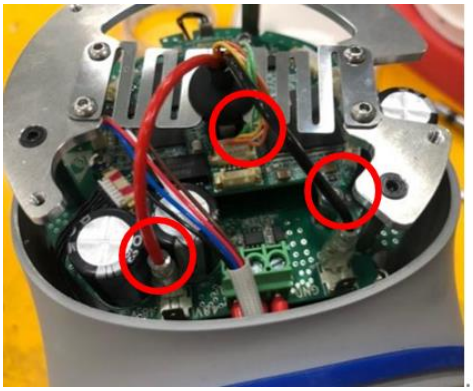
Step 1. Before removing the board, make sure to wear an anti-static wrist strap.

Step 2. Remove the 25-joint screw cover, and then proceed to remove the four M3*6 hex socket screws.

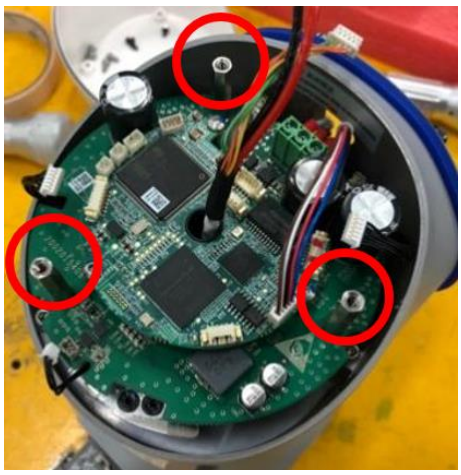
Step 3. Use a 3# hex screwdriver to remove the 3 countersunk hex screws M3*6, and take out the fixing plate.



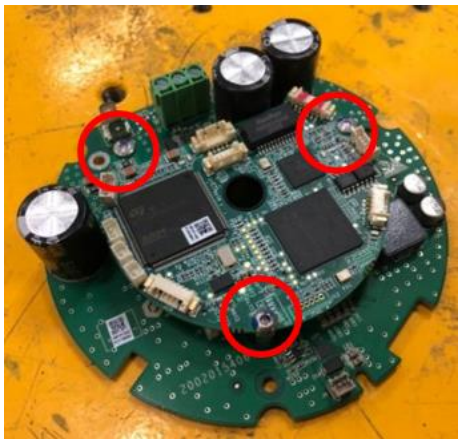
Step 4. Loosen the black wire, the red power wire, and the signal wire as shown in the diagram below. Additionally, loosen the encoder wire and the solenoid wire harness.



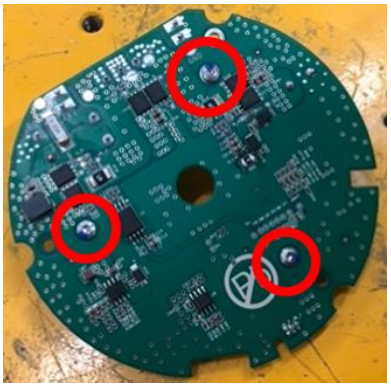
Step 5. Remove the 3 pieces of M3×20+6 single-end hex standoffs, and take out the board assembly (driver board + control board).



Step 6. Remove the 3 pieces of M3×4 hex socket button head screws, and take out the joint controller board.



Step 7. Remove the 3 pieces of M3×10 through-hole standoffs and the PCB support pillars.



No.	Material name	Material specifications	Qty.	Material code
1	25-joint screw cover plate-White	Silicone, V1.0	1	3202020062
2	25 joint rear cover - White	ABS, V1.0	1	3202010016
3	Hexagon socket button head screws	SSUS304, property class: 6.8, M3×4	4	3205010246
4	Hexagon socket countersunk head screw	property class: 10.9, M3*8	3	3205010313
5	Mounting plate-25	Aluminum alloy 6061-T6, V1.0	1	3201000846
6	Single-head hex standoff	SUS304, M3*22+6	3	3205100046
7	Grommet	Silicone, V1.0	1	3202020403
8	Wire clip	SUS301, V1.0	1	3201003122
9	Hexagon socket button head screws	SUS304, property class: 6.8, M3×6	4	3205010246
11	Double-threaded hex standoff	SUS304, property class: 6.8, M3×10	3	3205030023
12	PCB standoff	POM, V1.0	1	3201001190

5.8 Size 25 board assembly

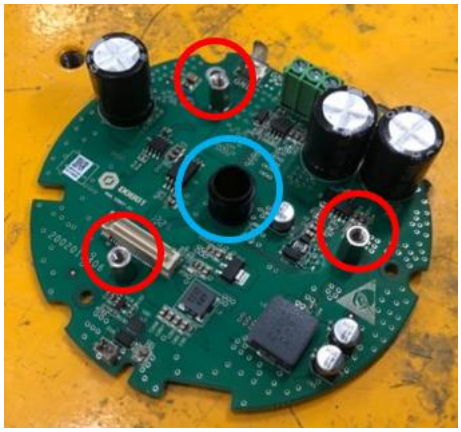
NOTICE

When replacing the PCBA board inside the controller, it is necessary to wear an anti-static wrist strap throughout the entire process;

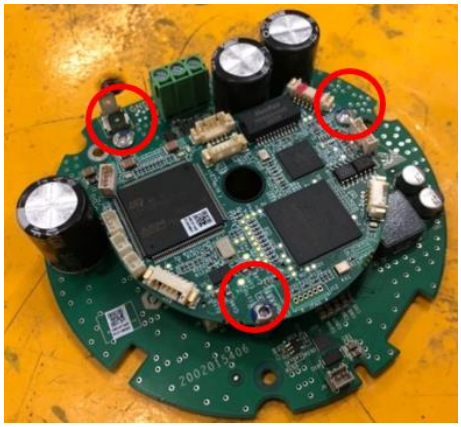
The PCBA board should be sealed and stored in an anti-static bag, and touching the components on the PCBA is prohibited.

Step 1. Before assembling the board, ensure that you are wearing an anti-static wrist strap.

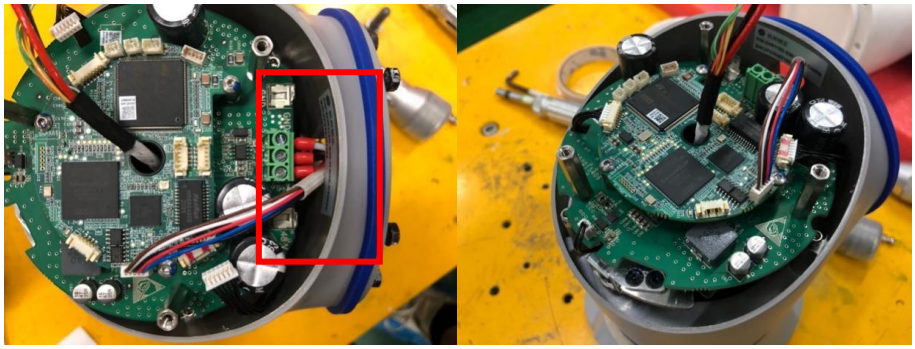
Step 2. Tighten three M3*10 double-ended studs and insert the PCB support pillar into the central hole.



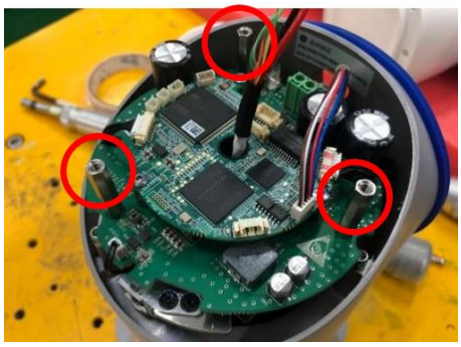
Step 3. Install the joint control board and tighten three M3*4 hexagon socket button head screws.



Step 4. Insert the motor power wires into the designated sockets as required and secure them. Then, pass the black and red power wires as well as the signal wire through the PCB support pillars, and connect the encoder wiring harness and the electromagnet wiring harness.

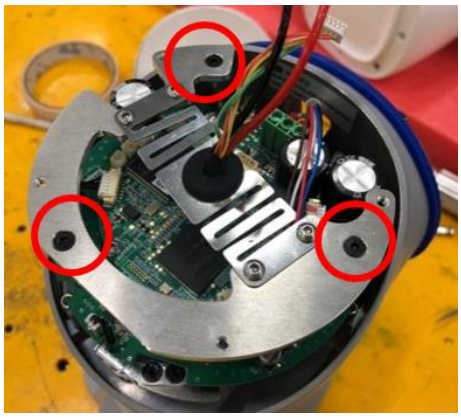


Step 5. Place the joint board assembly inside the joint and secure it using three M3*20+6 single-ended hex studs.

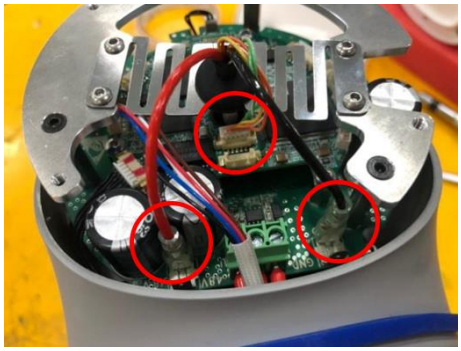


Step 6. Thread the harness into the cable protector.

Step 7. Tighten the 3PCS countersunk hex socket screws M3*6 using a 3# hex screwdriver.



Step 8. Connect the power cable and the encoder cable.



Step 9. After the joint test is confirmed to be OK, tighten the four M3*6 hex socket screws on the rear cover and install the 25-joint screw cover plate.

No.	Material name	Material specifications	Qty.	Material code
1	25-joint screw cover plate-White	Silicone, V1.0	1	3202020062
2	25 joint rear cover - White	ABS, V1.0	1	3202010016
3	Hexagon socket button head screws	SUS304, property class: 6.8, M3×4,	4	3205010246
4	Hexagon socket countersunk head screw	Property class: 10.9, M3*8	3	3205010313
5	Mounting plate-25	Aluminum alloy 6061-T6, V1.0	1	3201000846
6	Single-head hex standoff	SUS304, M3*22+6	3	3205100046
7	Grommet	Silicone, V1.0	1	3202020403
8	Wire clip	SUS301, V1.0	1	3201003122
9	Hexagon socket button head screws	SUS304, property class: 6.8, M3×6,	4	3205010246

11	Double-threaded hex standoff	SUS304, property class: 6.8, M3×10,	3	3205030023
12	PCB standoff	POM, V1.0	1	3201001190

6. Controller Maintenance (Using CC262 AC as an Example)

NOTICE

When replacing the PCBA board inside the controller, an anti-static wrist strap must be worn at all times;

The PCBA board should be sealed and stored in an anti-static bag, and touching the components on the PCBA is prohibited.

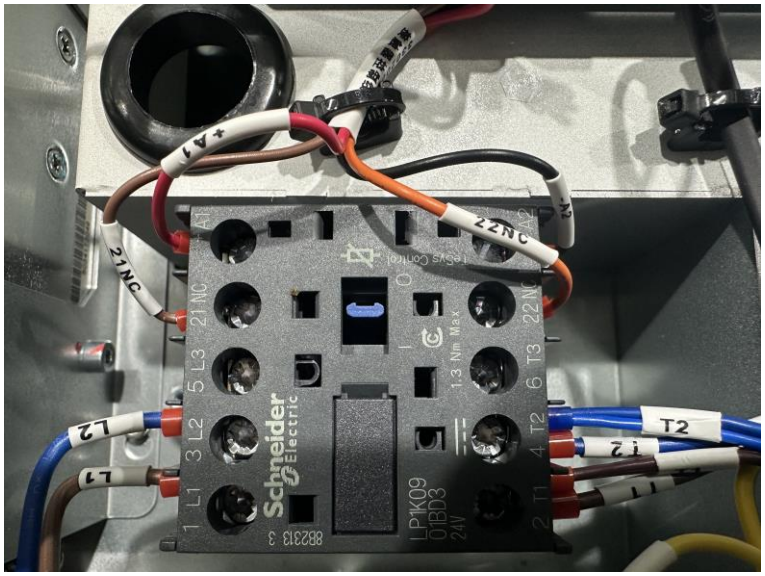
6.1 Replacing the contactor

Step 1. Turn off the power rocker switch on the controller panel, and unplug the power cable.

Step 2. Use a Phillips screwdriver to remove the 13 screws from the left side cover of the controller and take off the left side panel. Be careful not to damage the sealing strip on the cover.

Step 3. Use a Phillips screwdriver to loosen the terminal screws on the contactor, and pull out the wiring terminals.

Step 4. Use a hex key to remove the 4 mounting screws securing the contactor, then detach the contactor.



Step 5. Replace the old contactor with a new one following the steps above, tightening the screws to a torque of 0.6 Nm. Insert the labeled tubes L1, L2, T1, T2, 21NC, 22NC, +A1, and -A2 into their corresponding terminal sockets in sequence. Tighten the terminal screws to a torque of 1.0 Nm.

Step 6. Apply electronic red glue to secure the heads of the four screws used to install the contactor.

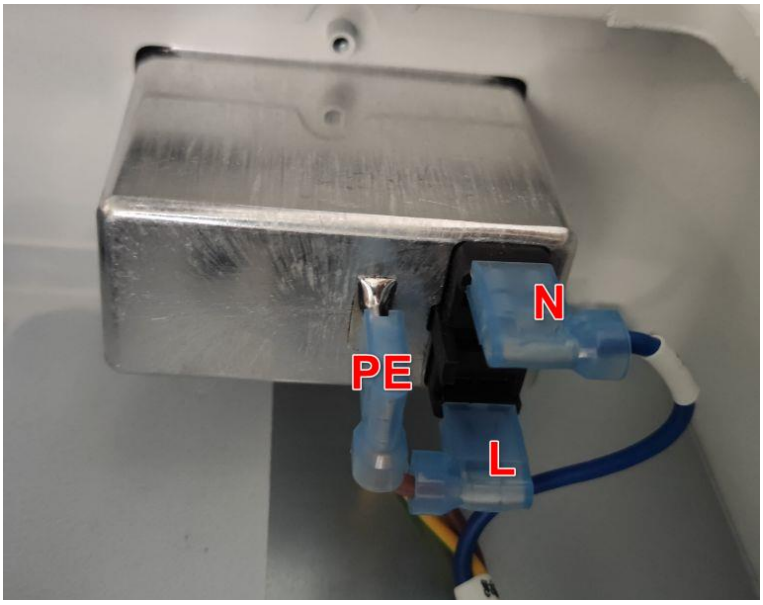
Step 7. Reinstall the controller cover plate and tighten it using M3 countersunk head screws, applying a torque of 1.2 Nm. When installing the cover plate, ensure it is aligned symmetrically and tighten the screws gradually in steps.

6.2 Replace the filter

Step 1. Turn off the power rocker switch on the controller panel, and unplug the power cable.

Step 2. Use a Phillips screwdriver to remove the 13 screws from the left side cover of the controller and take off the left side panel. Be careful not to scratch or damage the sealing strip on the cover plate.

Step 3. Sequentially disconnect the L, N, PE terminals from the terminal block on the filter.



Step 4. Use an Allen wrench to loosen the two screws securing the filter on the panel, and then remove the filter.

Step 5. Follow the above steps to install the new filter. Tighten the screws with a torque of 0.6 Nm, and ensure that the L, N, and PE terminals are connected properly to the filter.

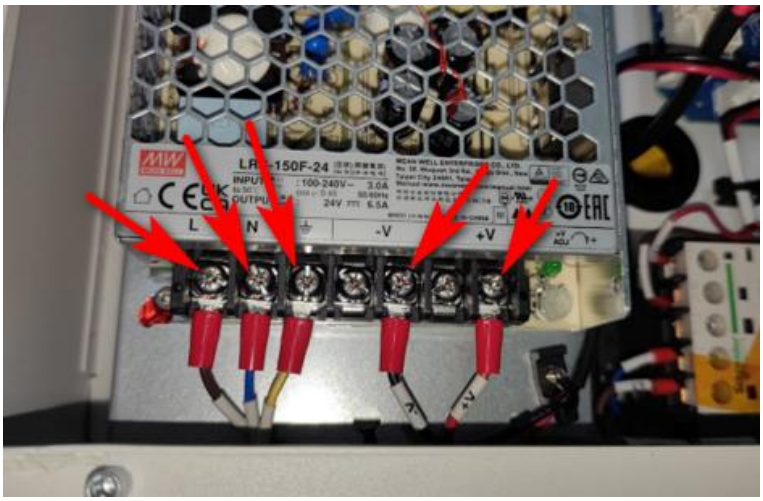
Step 6. Reinstall the controller cover plate and tighten it using M3 countersunk head screws, applying a torque of 1.2 Nm. When installing the cover plate, ensure it is aligned symmetrically and tighten the screws gradually in steps.

6.3 Replace the DC24V switching power supply

Step 1. Turn off the power rocker switch on the controller panel, and unplug the power cable.

Step 2. Use a Phillips screwdriver to remove the 13 screws from the left side cover of the controller and take off the left side panel. Be careful not to scratch or damage the sealing strip on the cover plate.

Step 3. Use a Phillips screwdriver to remove the screws securing the terminals L, N, PE, -V, and +V, then pull out the cables.



Step 4. Use a hex key to loosen the two screws securing the 24V power supply, then remove the power supply.

Step 5. Take the power supply to be replaced and secure it to the power supply mounting bracket using two M3 hex socket head screws. The screw torque should be 2.0 Nm.

Step 6. Insert the terminal identification tubes labeled L, N, PE, -V, and +V into their respective interfaces in sequence. The screw torque should be 1.0 Nm.

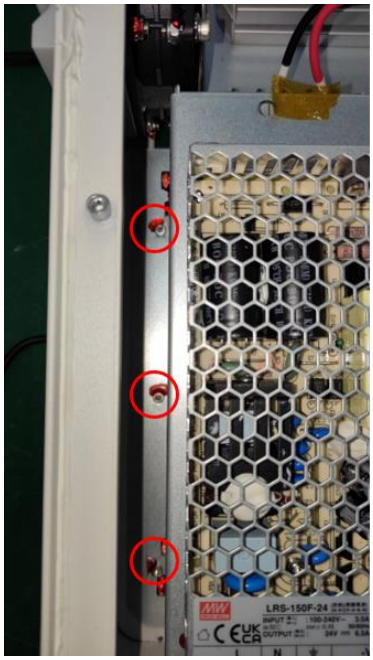
Step 7. Apply electronic red adhesive to secure the heads of the two screws used for installing the 24V power supply.

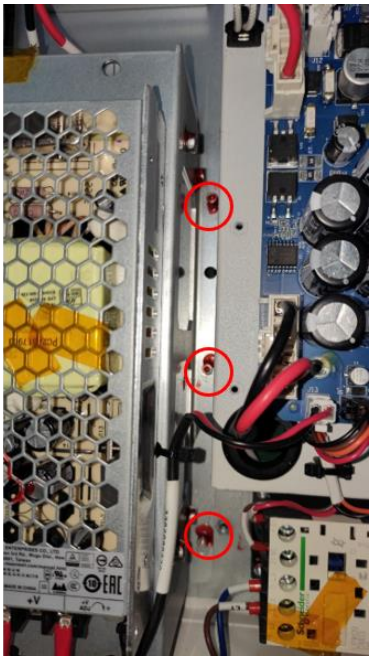
Step 8. Reinstall the controller cover plate and tighten it using M3 countersunk head screws, applying a torque of 1.2 Nm. When installing the cover plate, ensure it is aligned symmetrically and tighten the screws gradually in steps.

6.4 Replace the DC48V switching power supply

Step 1. Remove the terminals from the DC24V power supply. There is no need to remove the 24V power supply.

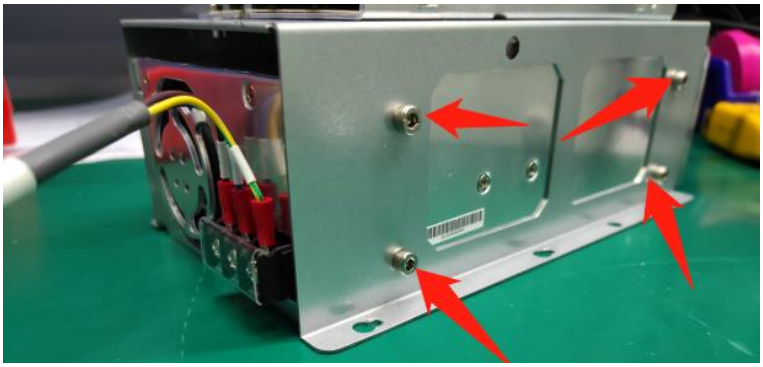
Step 2. Use an Allen wrench to loosen the six screws securing the 48V power supply (loosen only, do not remove the screws). Push the DC48V power supply unit upward to align the large holes of the sheet metal keyhole with the screw heads, then remove the entire 48V power supply unit.





Step 3. Use a Phillips screwdriver to loosen the screws on the terminal blocks at the bottom and top of the power supply, and then pull out all the wiring terminals.

Step 4. Use an Allen wrench to remove the four screws on each side of the power supply mounting bracket.



Step 5. Take the power supply to be replaced and secure the mounting plate to both sides of the power supply with eight M4 hex socket head screws, tightening them with a torque of 2.0 Nm.

Step 6. Secure the cable terminals labeled L, N, PE, -V, and +V according to the instructions on the marker sleeves to the corresponding terminals on the power supply, using a torque of 1.0 Nm for the screws.

Step 7. Align the larger openings of the keyhole slots on the pre-assembled component with the 6 screws on the partition plate. Push the component downward into position until the screws contact the smaller openings of the keyhole slots. Then, tighten the screws to a torque of 2.0 Nm.

Step 8. Reconnect the cable terminals to the DC24V power supply as described in step 3.2.3.

Step 9. Apply electronic red adhesive to secure the heads of the 6+8 screws that fix the 48V power supply in place.

Step 10. Reinstall the controller cover plate and tighten it using M3 countersunk head screws, applying a torque of 1.2 Nm. When installing the cover plate, ensure it is aligned symmetrically and tighten the screws gradually in steps.

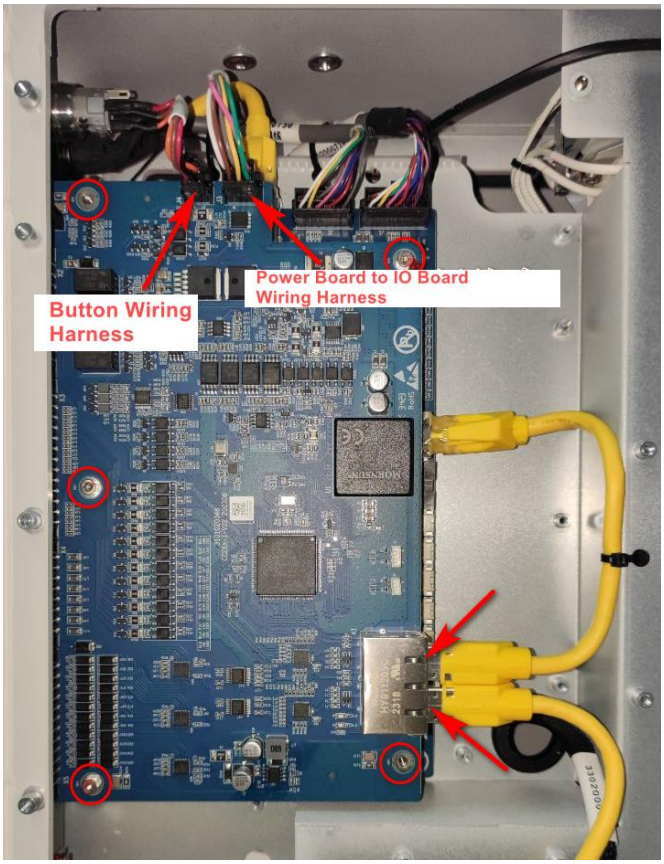
6.5 Replace the general IO board/safety IO board/power board

Step 1. Turn off the power rocker switch on the controller panel, and unplug the power cable.

Step 2. Use a Phillips screwdriver to remove the 13 screws from the left side panel and the 14 screws from the right side panel of the controller, then detach both the left and right side panels. Be careful not to scratch or damage the sealing strip on the cover plate.

Step 3. General IO board replacement procedure:

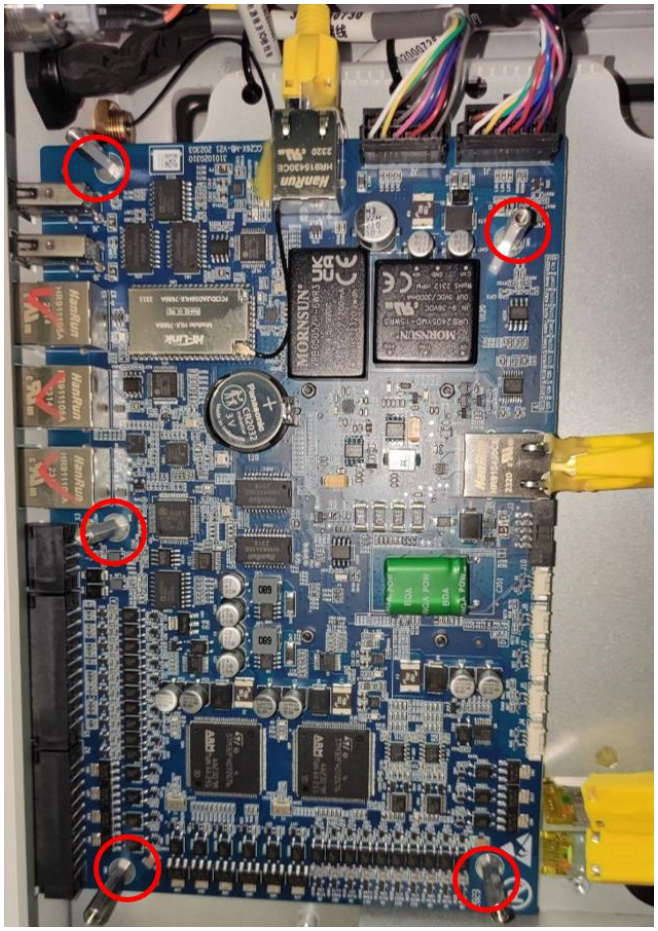
1. Disconnect the terminal of the button wiring harness from the general IO board, the wiring harness terminals from the power board to the IO board, and the two RJ45 connectors.



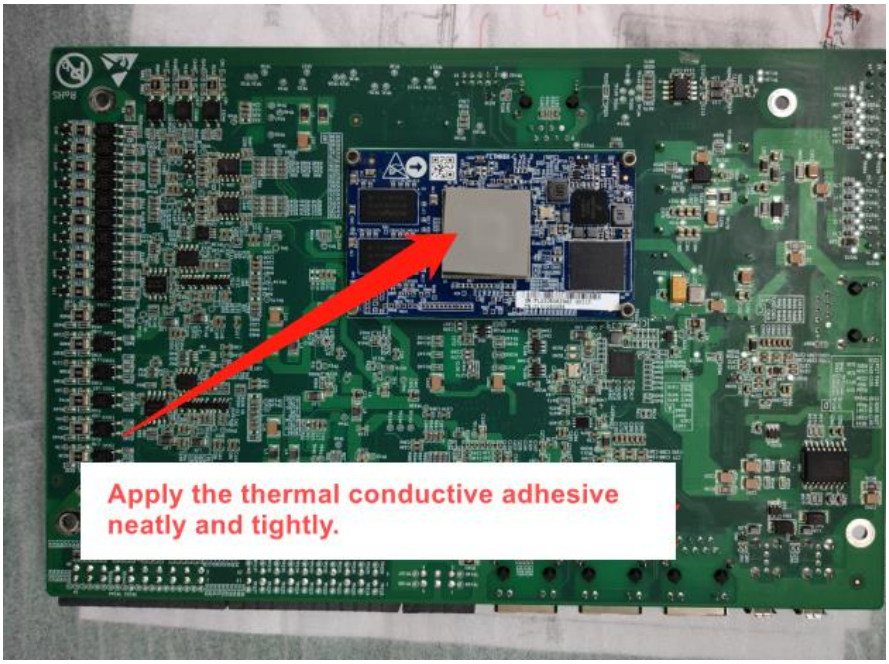
2. Use an Allen wrench to remove the five screws securing the General IO board. Carefully remove the circuit board and place it into an anti-static bag for sealed storage.
3. Take the General IO board PCBA to be replaced out of the anti-static bag, and secure it with the five screws, applying a torque of 1.5 Nm.
4. Insert the button wiring harness terminal, the power board to IO board wiring harness terminals, and the two RJ45 connectors into their original terminal blocks in sequence. Then, secure them by applying electronic yellow adhesive.
5. Apply electronic red adhesive to the heads of the screws securing the PCB for fixation.

Step 4. Safety IO board replacement procedure:

1. Remove the General IO board as described in Step 3.
2. Disconnect the power terminals of the safety IO board, the 2 RJ45 connectors, and the teach pendant terminal. Then, remove the antenna secured with yellow adhesive as well as the wiring terminals.



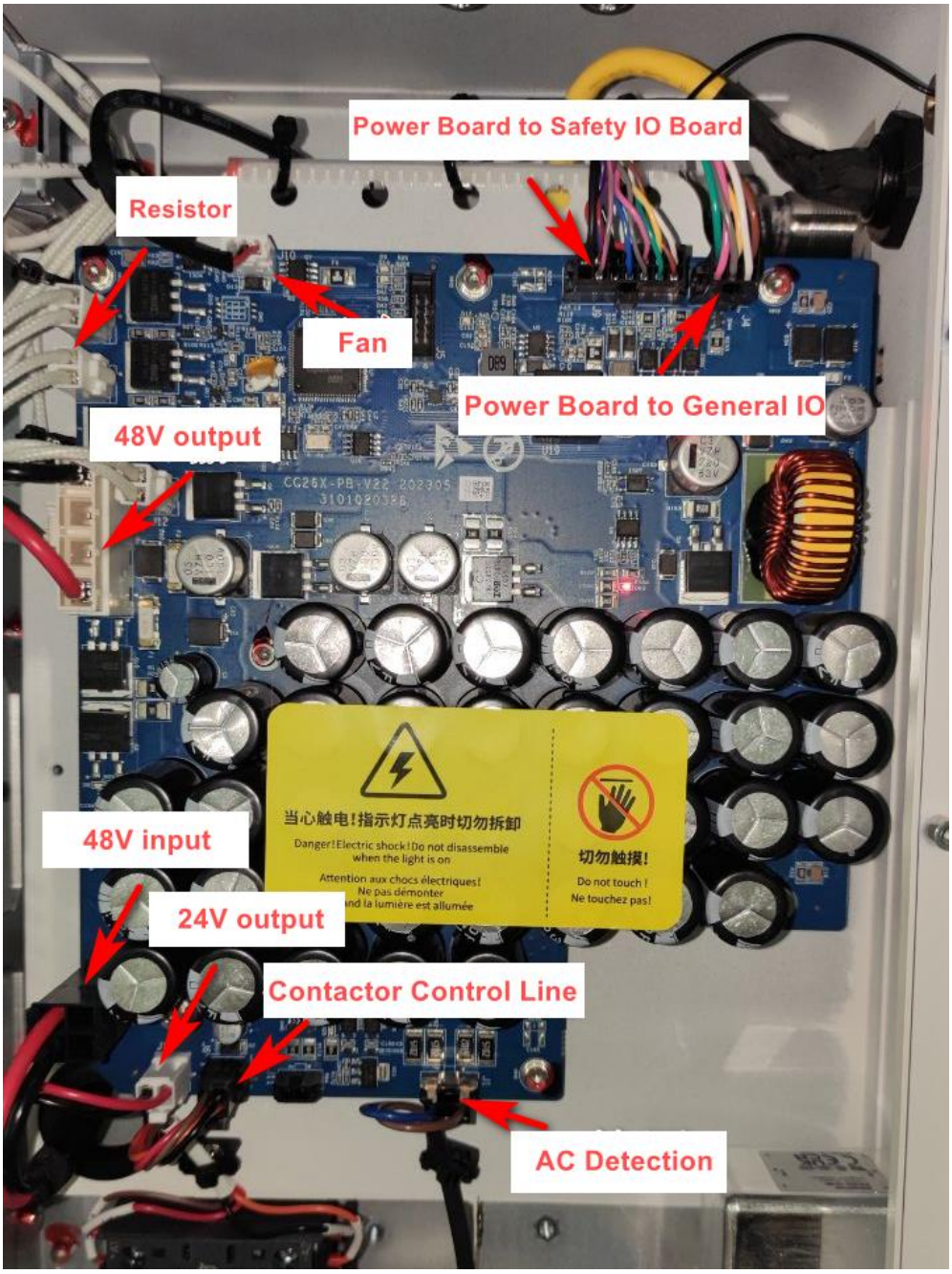
3. Use a hex socket wrench to remove the 5 fixed hex standoffs securing the safety IO board. Take out the circuit board and place it in an anti-static bag for sealed storage.
4. Take the safety IO board PCBA to be replaced out of the anti-static bag. Apply thermal conductive silicone paste to the core board chip, then secure the safety IO board using 5 hex standoffs, tightening them to a torque of 1.5 N·m.



5. Insert the power terminals, the 2 RJ45 connectors, and the teach pendant terminal into their original terminal blocks in sequence, then secure them by applying electronic yellow adhesive.
6. Refer to the general IO board removal procedure to reinstall the general IO board. Secure the screw heads of the PCB board by applying electronic red adhesive.

Step 5. Power board replacement procedure:

1. Disconnect the terminal from the power board.



2. Use an Allen wrench to loosen the 7 screws on the power board, then carefully remove the circuit board and place it in an anti-static bag for sealed storage.
3. Take the power board PCBA to be replaced out of the anti-static bag. Then, apply two thermal silicone pads onto the surface of the MOSFETs. Use an Allen wrench to tighten the 7 hex socket screws with a torque of 1.5 Nm. Apply electronic red adhesive to the screw heads.
4. Insert the cable terminals into their respective terminal blocks as shown in the diagram, and secure them with electronic yellow adhesive.

Step 6. Power on and test to verify whether the controller is functioning normally.

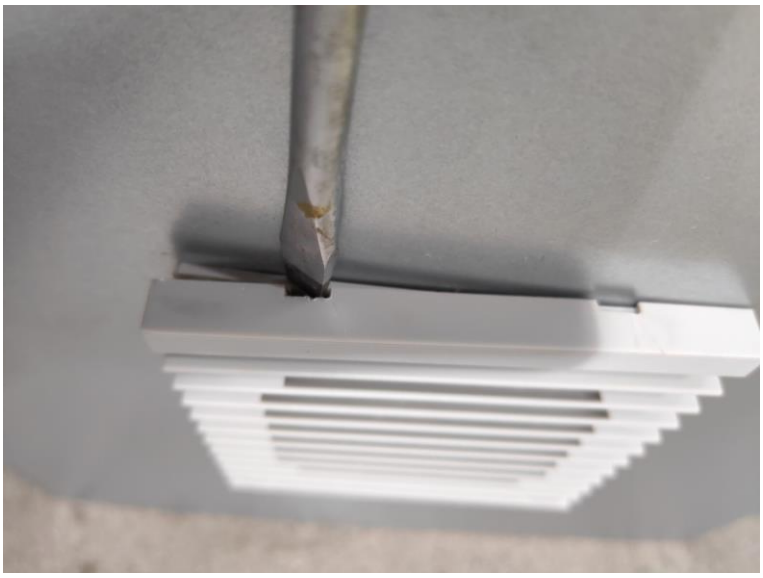
Step 7. Reinstall the controller cover plate and tighten it using M3 countersunk head screws, applying a torque of 1.2 Nm. When installing the cover plates, ensure

they are aligned symmetrically and tighten the screws gradually in steps. Pay attention to distinguish between the left and right cover plates.

6.6 Replace the fan mesh filter cotton

Step 1. Turn off the power rocker switch on the controller panel, and unplug the power cable.

Step 2. Insert a flat-head screwdriver into the two small holes at the bottom of the fan mesh, rotate the screwdriver to release the latches, and pry open the fan mesh cover.



Step 3. Remove the old filter cotton from the fan mesh cover and replace it with a new one. Ensure the filter cotton completely covers the air outlet. If it does not, replace it with a filter cotton of the appropriate size.

Step 4. Reattach the fan mesh cover plate in its original direction to complete the filter replacement.

7. Programming

Please use the robot maintenance tool for upgrade operations. This document only describes the programming procedure.

7.1 Programming of various IO boards

If the firmware update fails using the general slave upgrade tool or the connection cannot be established, the following methods can be used for update and upgrade. This chapter describes the firmware programming process for the second-generation cabinet safety controller board and the general IO board. The firmware programming for other boards can be referred to accordingly.

JLink is used for programming ARM series chips.

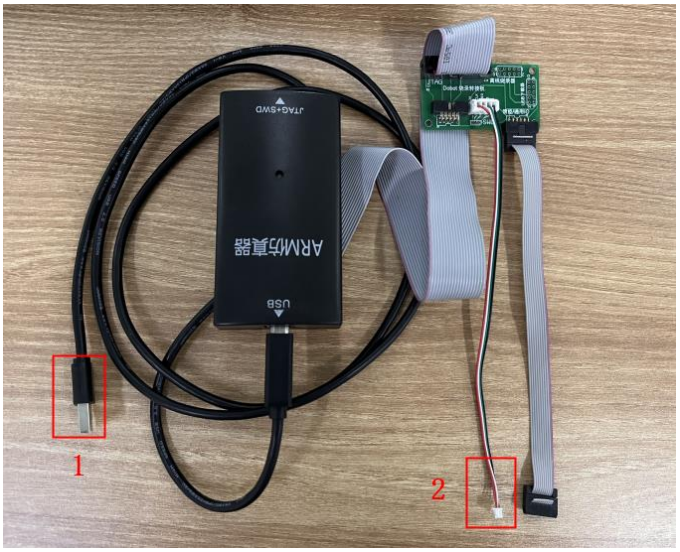
The Renesas programmer is used for programming Renesas chips, such as the second-generation cabinet general IO board, CRA body servo joint board, and end IO board.

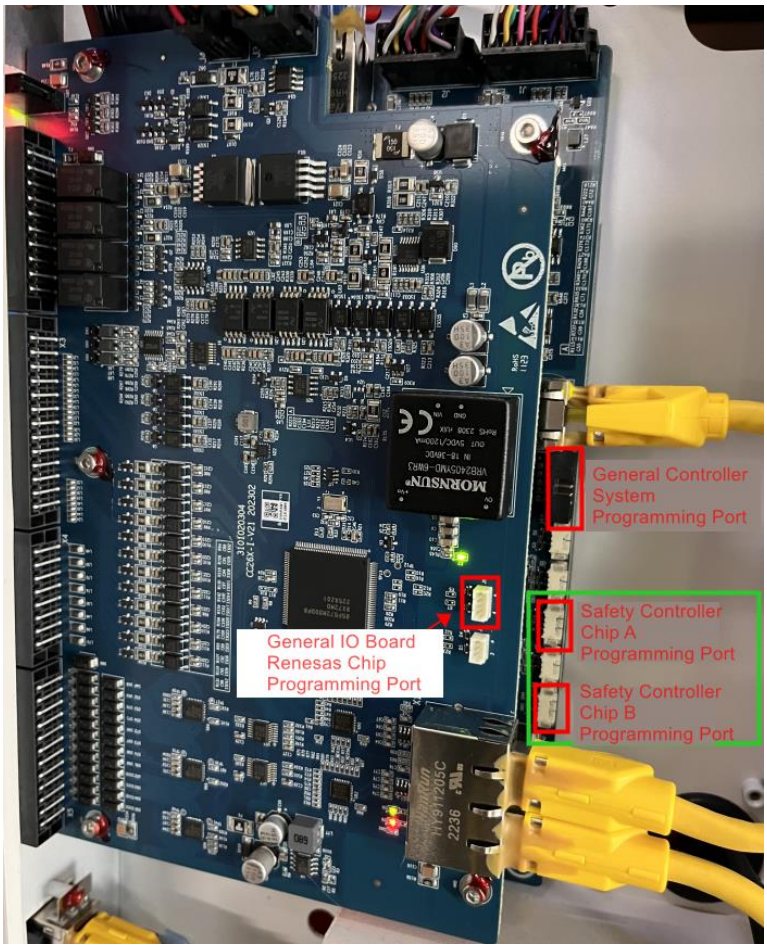
A. Programming tool

JLink programming tool	
JLink software	
Safety controller firmware	CRV2_SCB_ST_APP_V1.1.0.0.bin

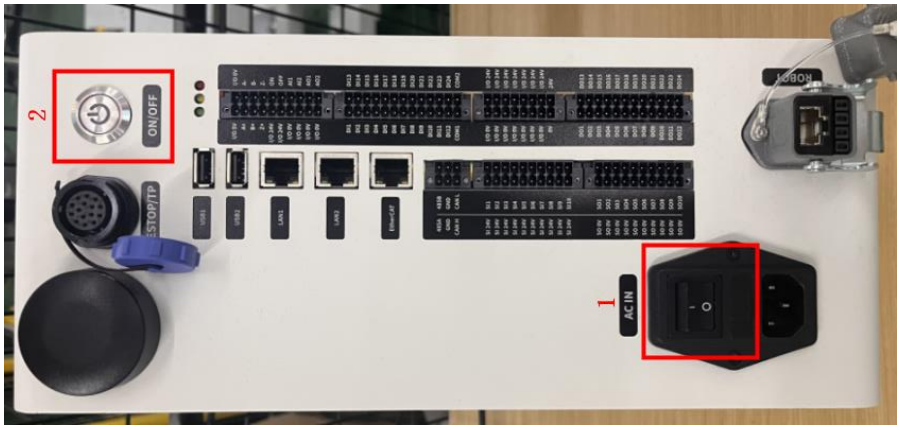
B. Programming step

Step 1. As shown in the figure below, connect ① to the computer's USB port, and ② to the programming port of the safety controller.

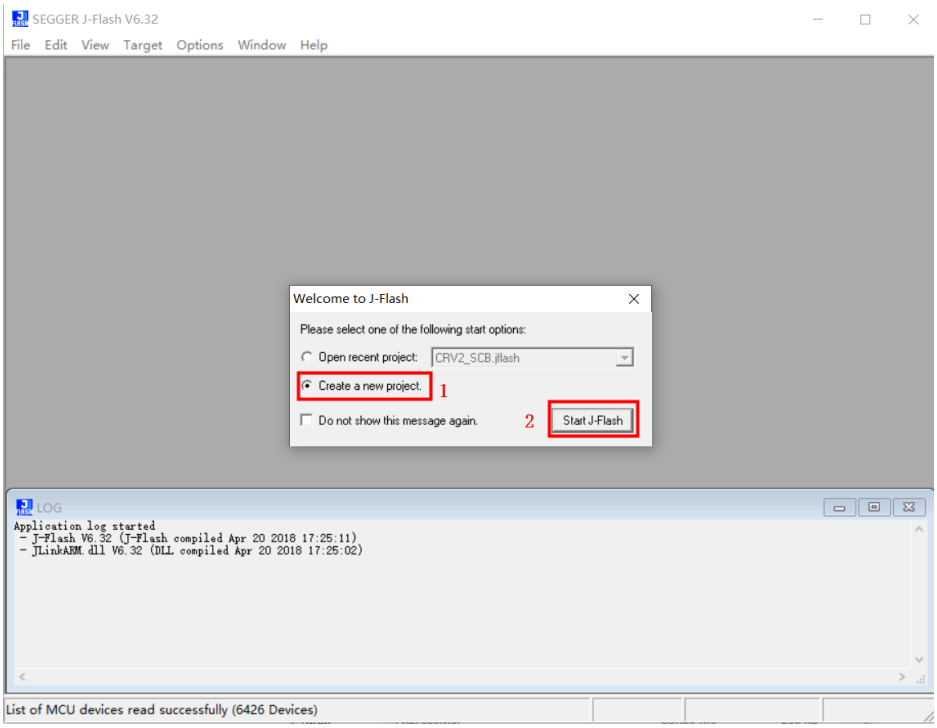




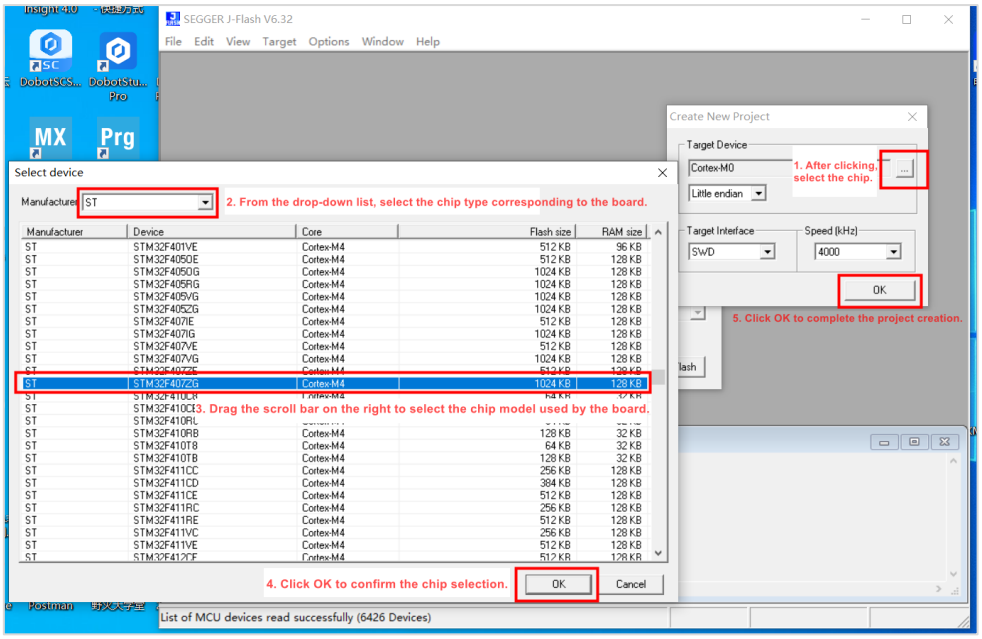
Step 2. Power on the controller and the robot arm.



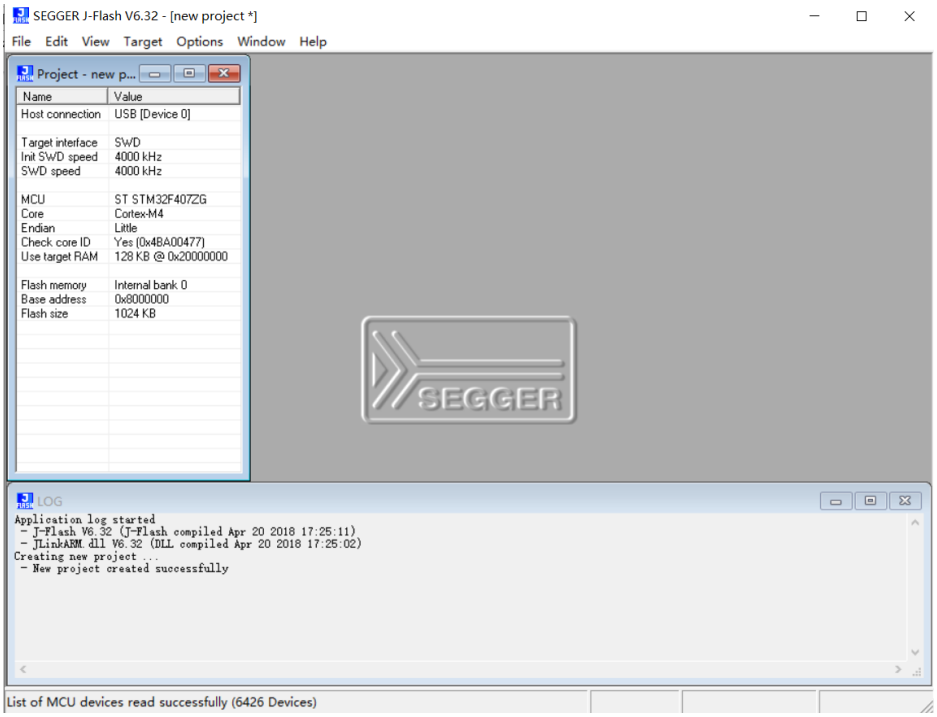
Step 3. Open the JLink software, select "Create New Project" and then click "Start":



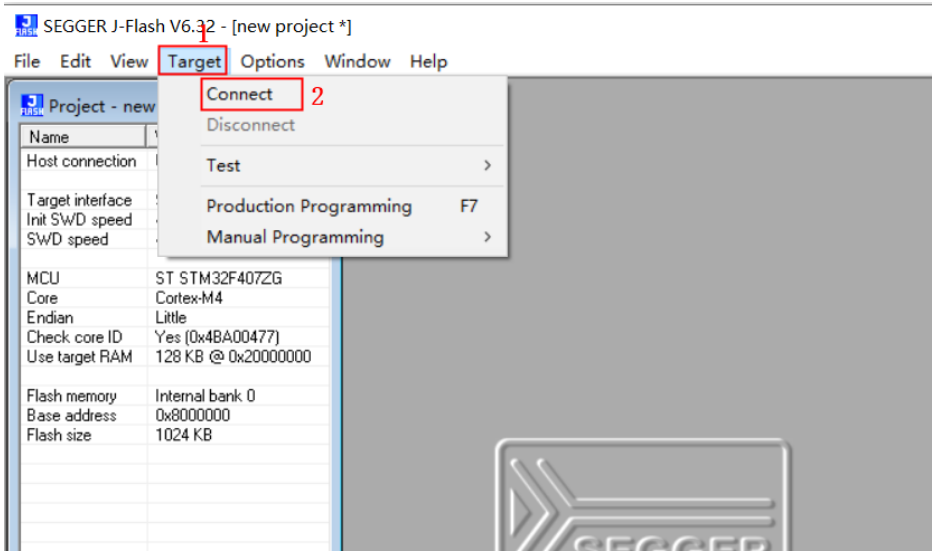
Step 4. Select the specific chip model used by the board. The safety controller board uses the STM32F407ZG chip, so on the ST page, choose the device named STM32F103VE.



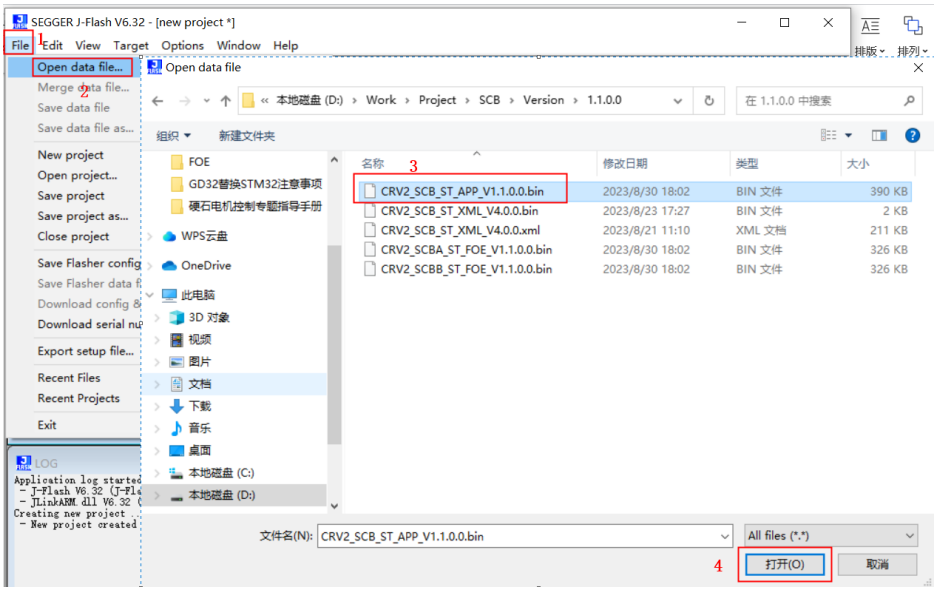
Step 5. After creating the project, the project interface will appear as shown in the figure below. On the left side, you can see information related to the chip.



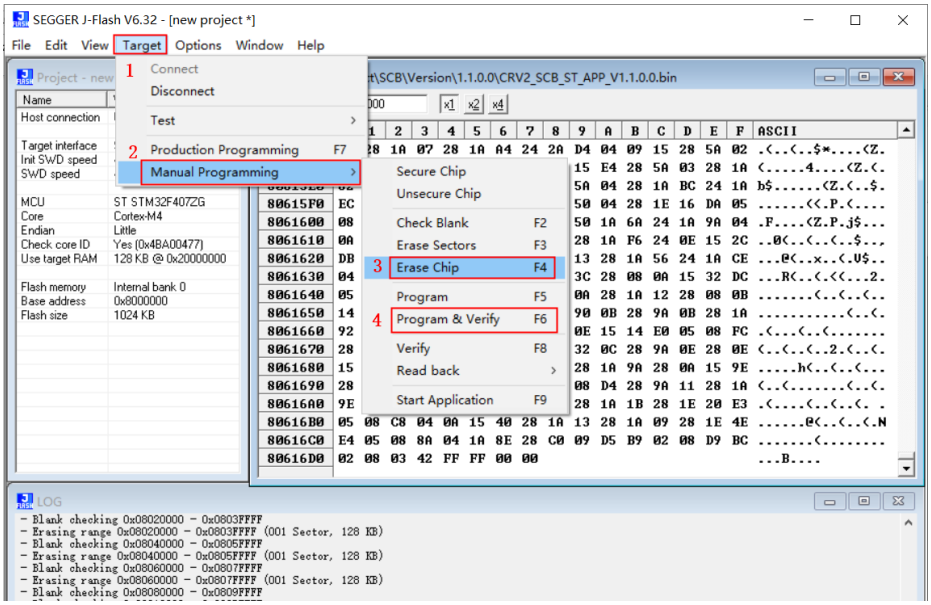
Step 6. Click on the "Target" option and then select "Connect".



Step 7. Under the File menu, select Open data file and choose the firmware to be programmed.



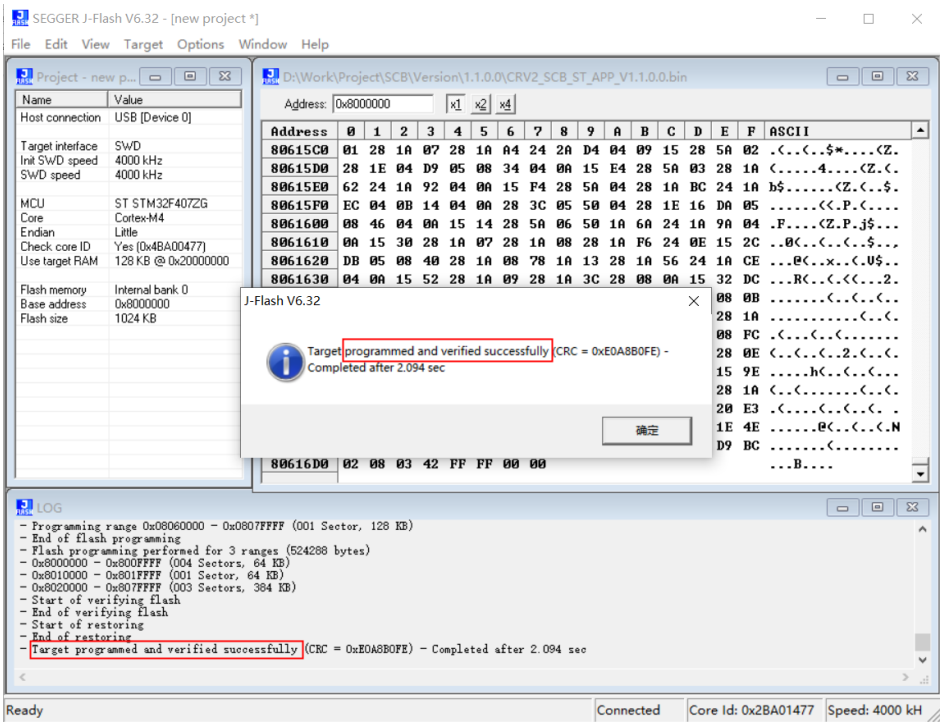
Step 8. Select the Manual programming option under Target, click Erase Chip to erase the chip, and wait for the erasure to complete. Finally, click Program & Verify to start programming the firmware.



Step 9. Wait for the chip programming to complete. Check the pop-up message and the log in the LOG window to confirm whether the operation was successful. Otherwise, consider the programming as failed. The solutions are as follows:

① Change the computer's USB port, keep all other settings unchanged, and repeat the programming steps above.

② Power off the controller, wait for 1 minute, then power it on again and repeat the programming steps above.

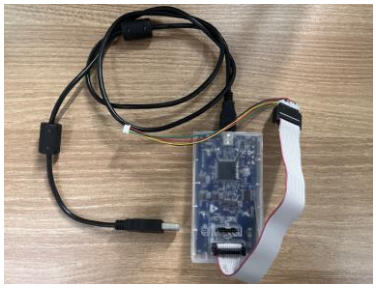


7.2 Programming the general IO board (Renesas chip)

For firmware programming of Renesas chips, you can use either a Renesas emulator or a Renesas offline programmer. The following example illustrates the process using a Renesas emulator.

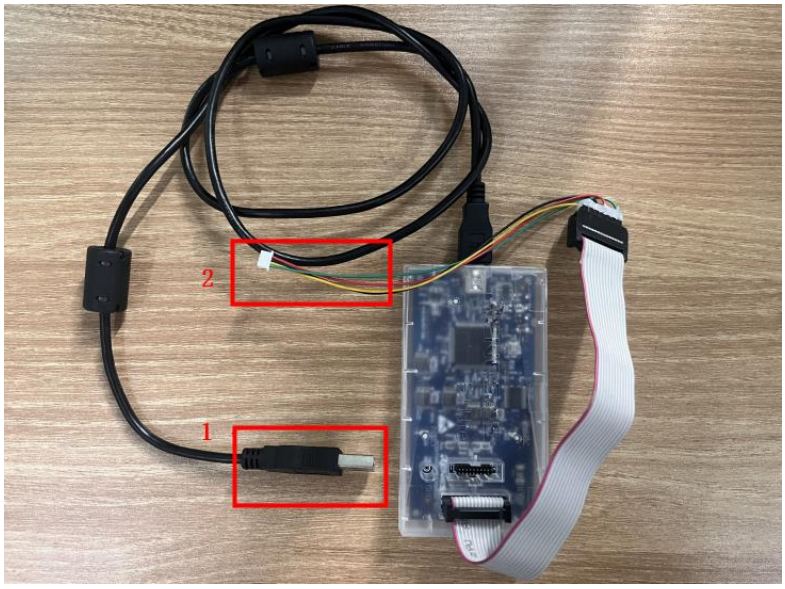
> **NOTICE**
>
> When using the Renesas emulator for programming, the board must be powered separately. For programming the CC262 general IO board, you need to press and hold the controller's power button until the programming is complete.

A. Programming tool

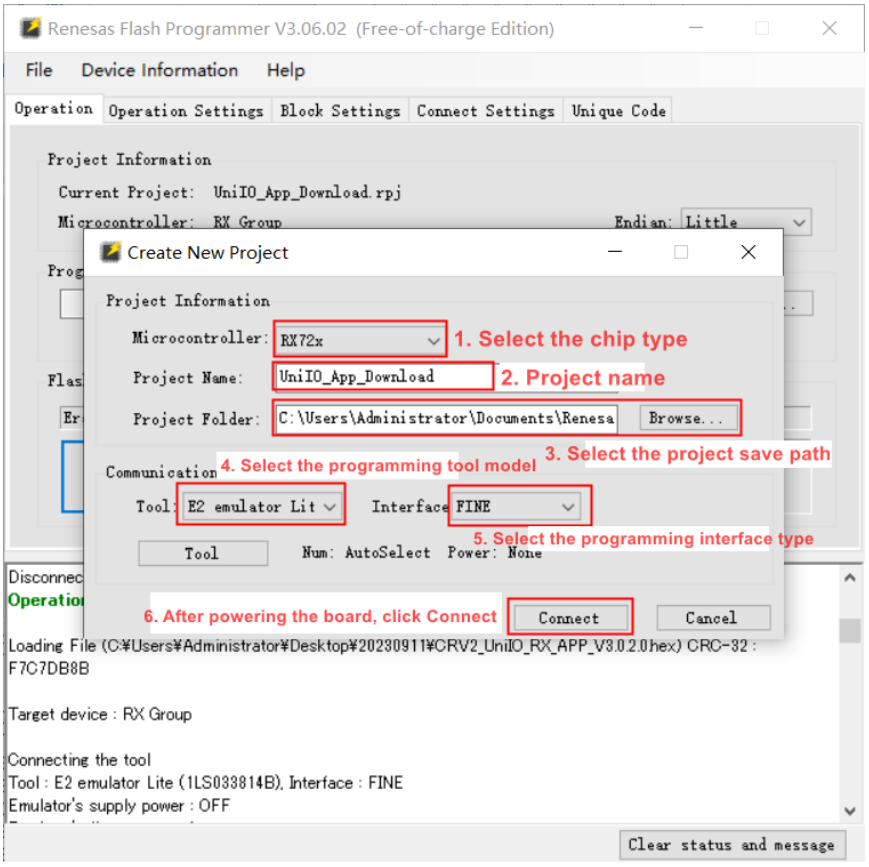
Renesas programming tool (emulator)	
Renesas programming software	
General IO board programming firmware (Renesas chip)	CRV2_UniIO_RX_FOE_V3.0.2.0.efw

B. Programming step

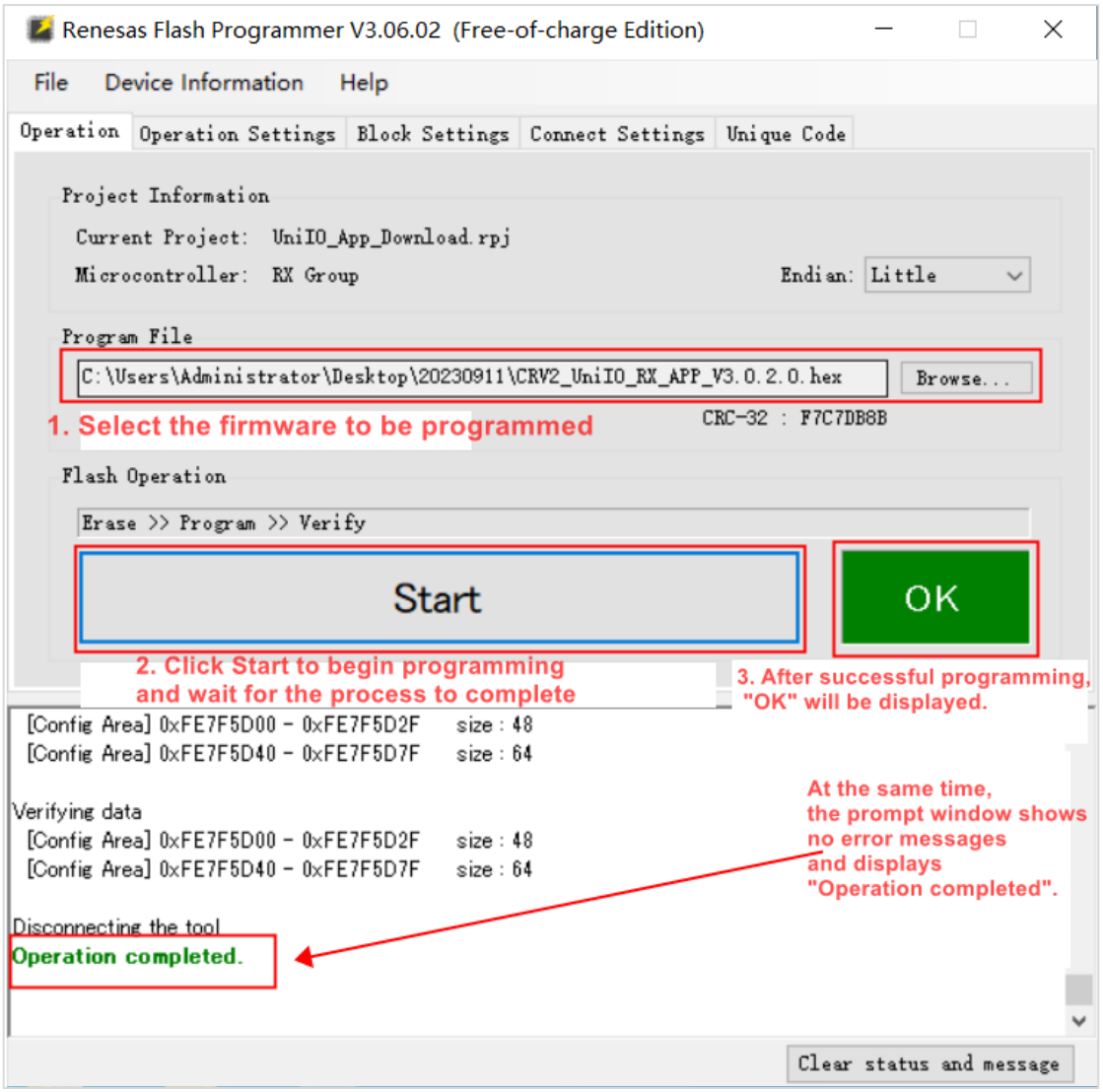
Step 1. As shown in the figure below, connect ① to the computer's USB port and ② to the programming port of the general IO board.



Step 2. Open the Renesas programming software, create a chip project, select the RX72x series for the chip, and choose the Communication settings as shown in the figure below.



Step 3. Open the firmware file, click the Start button to begin programming, and wait for the process to complete.

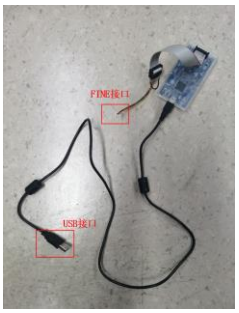
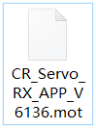


After disconnecting the programming cable, power off and restart the controller. Connect to the robot via the host computer, check the version information to confirm whether the programming was successful.

7.3 CRA servo programming

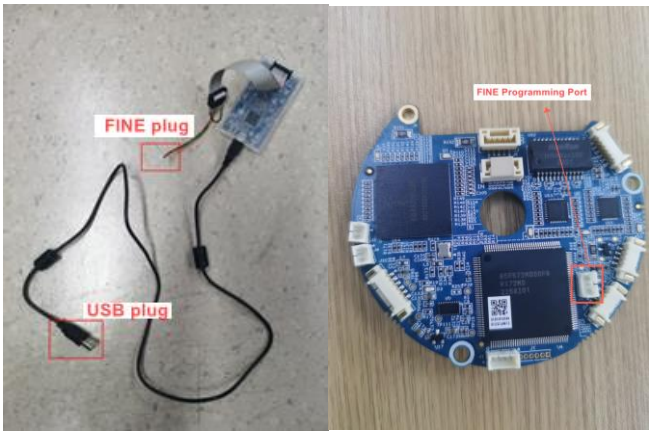
If the firmware update fails using the general slave upgrade tool or the connection cannot be established, the following methods can be used for update and upgrade. This document describes the CRA servo firmware programming process. For programming firmware on other Renesas boards, refer to the following method.

A. Programming tool

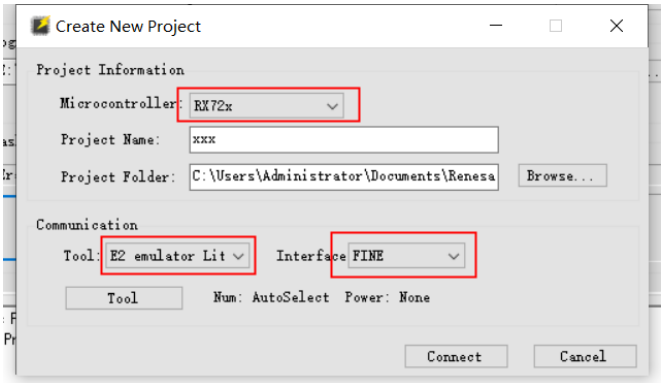
e2lite programming tool	
RenesasFlashProgrammer software	 Renesas Flash Programmer V3.09
Servo firmware	 CR_Servo_RX_APP_V6136.mot

B. Programming steps

Step 1. As shown in the figure below, connect the e2lite programmer's USB port to the computer, and connect the FINE interface to the board's programming port.



Step 2. Open the programming software and create a new project configuration:

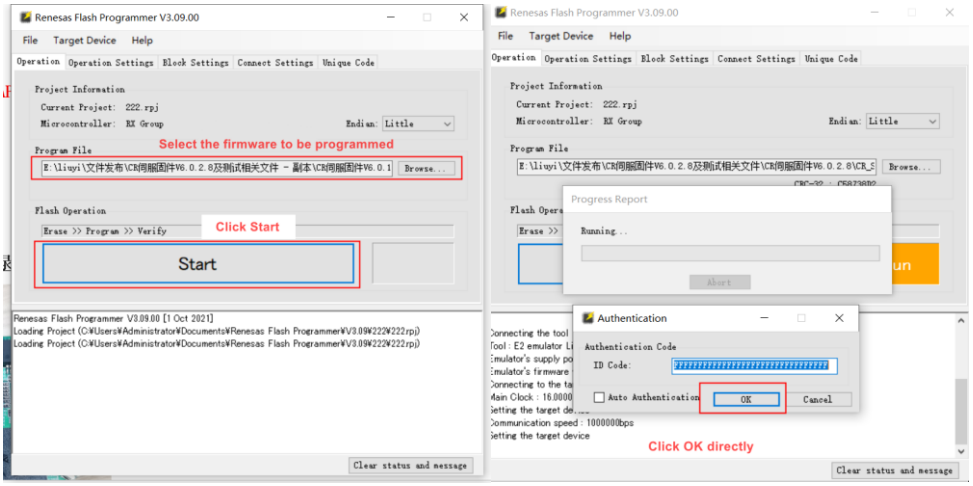


Chip model: RX72x

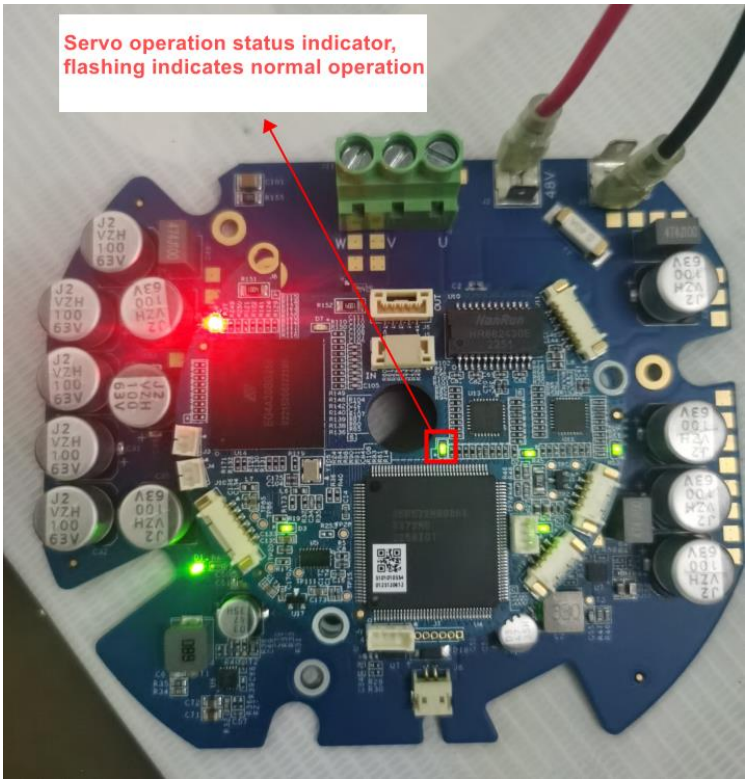
Programming tool: E2lite

Programming interface: FINE

Step 3. Choose the file with "APP" in its name for programming.



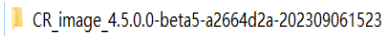
Step 4. **After the programming process is complete, disconnect the programming interface and power the device back on.** If the servo status LED blinks normally, it indicates proper operation.



7.4 Controller system programming

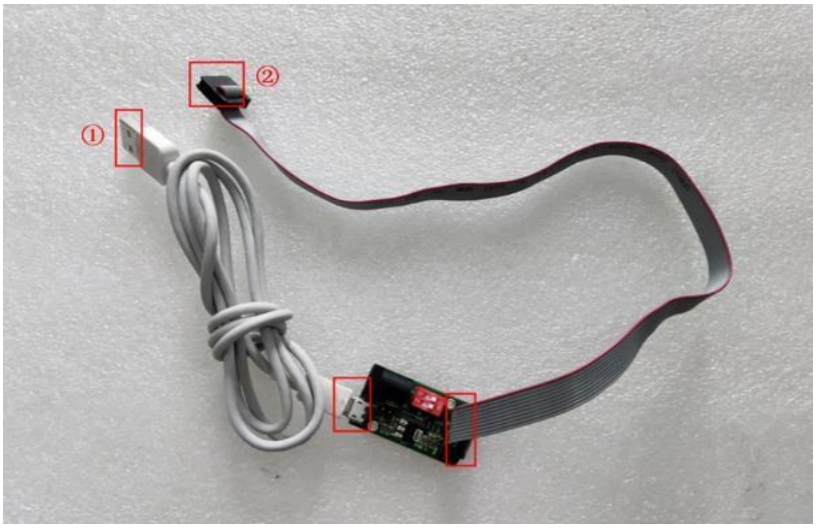
If the update cannot be performed via the one-click update tool or if the power connection cannot be established, the following method can be used for updating. However, please note that after programming the general controller system, all saved project files and taught point data will be lost. Proceed with caution.

A. Programming preparation tool

Android data cable x1 System programmer x1 System programming cable x1	
System image programming file	
Xshell software	

B. Programming step

Step 1. ① Connect to the computer's USB port. ② Connect to the general system programming port on the safety controller board.



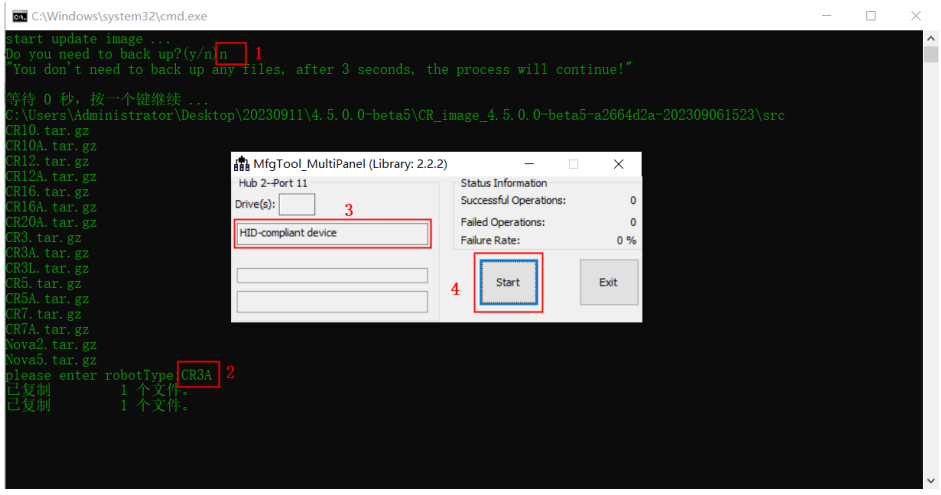
Step 2. Power on the controller and the robot arm.

Step 3. Open the system image folder for programming, and double-click dobot_image.bat.

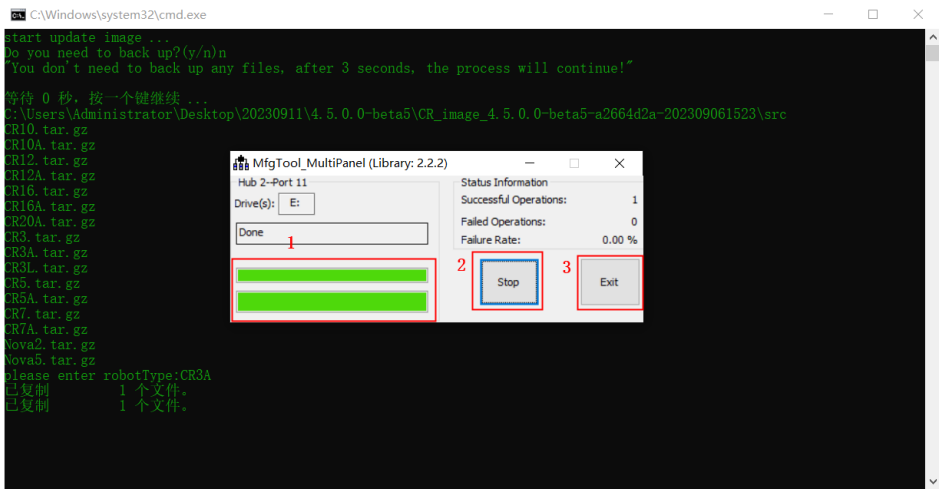
Step 4. In the command window, choose whether to back up the data, then enter the robot model for programming and press Enter. Observe the pop-up window to see if an HID device is detected. If detected, click Start to begin programming. If no HID device is detected, try the following solutions:

①. Change the computer's USB port, keep all other settings unchanged, and repeat the steps above.

②. Power off the controller, wait for 1 minute, then power it on again and repeat the steps above.



Step 5. Wait until both progress bars in the pop-up window turn green, then click the Stop button in the pop-up, followed by the Exit button to complete the system programming.

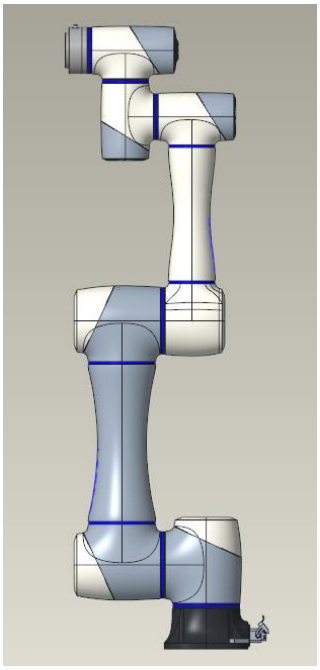


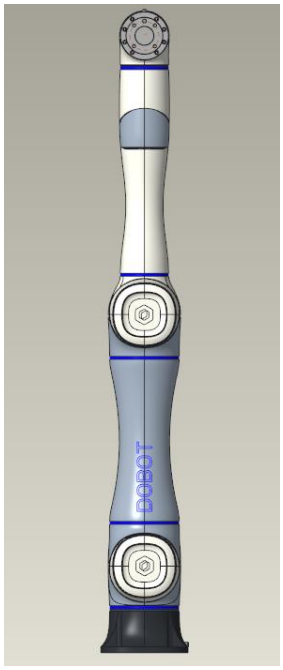
Step 6. After disconnecting the programming cable, power off and restart the controller. Wait for the system to boot up completely, then connect to the robot using DobotStudio Pro. Check the version information to confirm whether the system programming was successful.

8. Zeroing Calibration Instructions

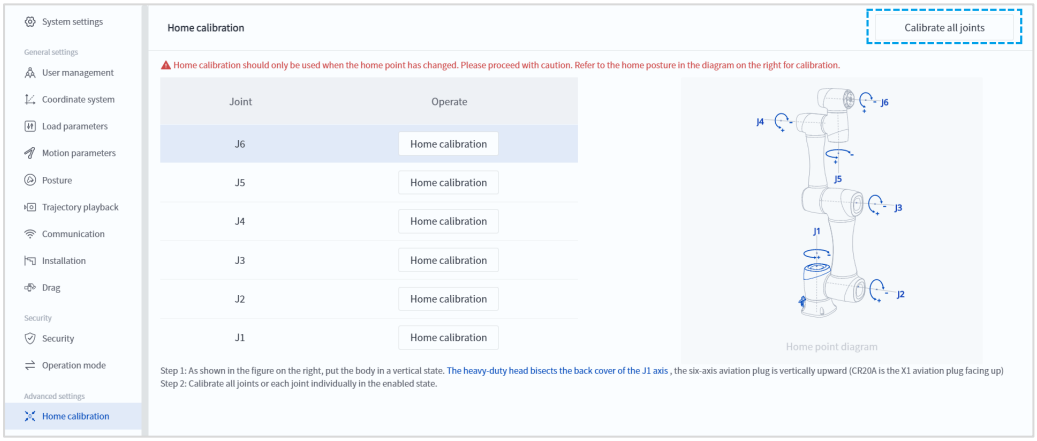
When components such as the robot's motor, reducer, or other parts are replaced, or when the robot collides with a workpiece, the zero position of the robot may change. In such cases, zeroing calibration is required. Manual zeroing steps:

Step 1. Jog the robot arm to the zero position (as shown in the figure below: the arm is vertical, with the aviation socket facing upward).





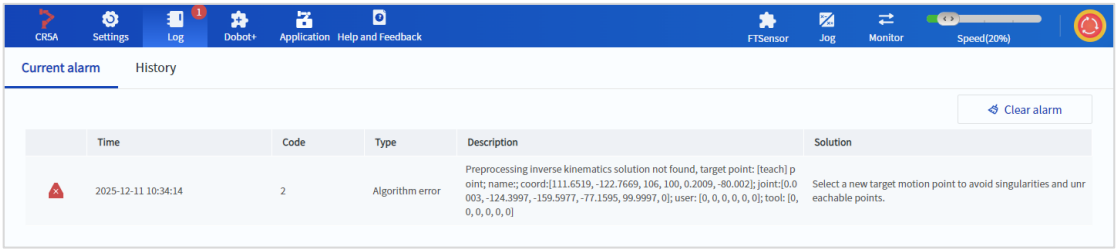
Step 2. With the arm vertical, navigate to the Settings > Home calibration page in DobotStudio Pro, then click the Home Calibration button.



If you do not have the necessary permissions to perform this operation, please refer to the DobotStudio Pro user guide to switch to a role with the required permissions.

9. Alarm Description

If a point is saved incorrectly or the robot is used improperly, for example, a robot moves to where a point is at a limited position or a singularity position, an alarm will be triggered. If an alarm is triggered when the robot is running, a red dot with a number will appear at the upper right of the log icon, indicating the number of current alarms.



When the robot triggers an alarm, the current alarm page will display the alarm level icon, alarm time, error code, alarm type, description, and suggested solution. Please refer to the description and solution to resolve the alarm.

The meanings of the robot alarm level icons are as follows:

Alarm icon	Level	Type	Solution
	0	Fault	Error, pause, disable and power off
	1	Abnormal	Error, pause, and disable
	5	Error	Error and pause
	10	Fault	Error, stop, disable and power off
	11	Abnormal	Error, stop, and disable
	15	Error	Error and stop

Click **Clear alarm** to clear the current alarm. For alarms that cannot be cleared directly, refer to the alarm solution for details.

9.1 Algorithm alarm (0x0000–0x00ff)

Alarm ID (10|16)	Description	Solution	Error level
16|0x0010	The planned point is close to the shoulder singularity	Select a new motion point, or use joint interpolation commands near the singularity.	5
17|0x0011	Inverse kinematics error with no solution	Select a new target motion point to avoid singularities and unreachable points.	5
18|0x0012	Inverse kinematics error with result out of working area	Select a new target motion point to prevent movement beyond the joint's soft limit.	5
19|0x0013	The start point and the end point are the same when the ARC command or Circle command is running	Reselect the movement points to make it meet the requirements of corresponding commands	5
26|0x001a	The planned point is close to the wrist singularity	Select a new motion point, or use joint interpolation commands near the singularity.	5
27|0x001b	The planned point is close to the elbow singularity	Select a new target point, or use joint interpolation commands near the singularity.	5
29|0x001d	Speed parameter error.	Check speed parameters	5
30|0x001e	Full parameter inverse kinematics error with no solution	Restart the controller. If the issue persists, contact the technical support engineer.	5
48|0x0030	Joint 1 overspeed	Reduce joint or Cartesian speed settings, or select a new motion point away from the singularity.	5
49|0x0031	Joint 2 overspeed	Reduce joint or Cartesian speed settings, or select a new motion point away from the singularity.	5
50|0x0032	Joint 3 overspeed	Reduce joint or Cartesian speed settings, or select a new motion point away	5

		from the singularity.	
51|0x0033	Joint 4 overspeed	Reduce joint or Cartesian speed settings, or select a new motion point away from the singularity.	5
52|0x0034	Joint 5 overspeed	Reduce joint or Cartesian speed settings, or select a new motion point away from the singularity.	5
53|0x0035	Joint 6 overspeed	Reduce joint or Cartesian speed settings, or select a new motion point away from the singularity.	5
54|0x0036	Joint 1 position out of range	Move away from the singularity to avoid abnormal joint speed, or restart the controller.	5
55|0x0037	Joint 2 position out of range	Move away from the singularity to avoid abnormal joint speed, or restart the controller.	5
56|0x0038	Joint 3 position out of range	Move away from the singularity to avoid abnormal joint speed, or restart the controller.	5
57|0x0039	Joint 4 position out of range	Move away from the singularity to avoid abnormal joint speed, or restart the controller.	5
58|0x003a	Joint 5 position out of range	Move away from the singularity to avoid abnormal joint speed, or restart the controller.	5
59|0x003b	Joint 6 position out of range	Move away from the singularity to avoid abnormal joint speed, or restart the controller.	5
64|0x0040	Positive limit alarm of Joint 1	Jog the joint towards the opposite direction	5
65|0x0041	Negative limit alarm of Joint 1	Jog the joint towards the opposite direction	5

66|0x0042	Positive limit alarm of Joint 2	Jog the joint towards the opposite direction	5
67|0x0043	Negative limit alarm of Joint 2	Jog the joint towards the opposite direction	5
68|0x0044	Positive limit alarm of Joint 3	Jog the joint towards the opposite direction	5
69|0x0045	Negative limit alarm of Joint 3	Jog the joint towards the opposite direction	5
70|0x0046	Positive limit alarm of Joint 4	Jog the joint towards the opposite direction	5
71|0x0047	Negative limit alarm of Joint 4	Jog the joint towards the opposite direction	5
72|0x0048	Positive limit alarm of Joint 5	Jog the joint towards the opposite direction	5
73|0x0049	Negative limit alarm of Joint 5	Jog the joint towards the opposite direction	5
74|0x004a	Positive limit alarm of Joint 6	Jog the joint towards the opposite direction	5
75|0x004b	Negative limit alarm of Joint 6	Jog the joint towards the opposite direction	5
76|0x004c	End button interferes with robot body	Check the robot end status and select a new motion point.	5
77|0x004d	End flange interferes with robot body	Check the robot end status and select a new motion point.	5
114|0x0072	Robot zero-point calibration failed	Restart the robot and recalibrate. If the issue persists, contact the technical support engineer.	5
115|0x0073	Robot enable failed	Restart the robot and enable it again. If the issue persists, contact the technical support engineer.	5
116|0x0074	The E-Stop button is pressed	Release the E-Stop button	1

132|0x0084	Software E-Stop signal triggered	Software emergency stop signal triggered	1
133|0x0085	User emergency stop signal - Triggered	Reset the user emergency stop signal.	1
146|0x0092	Jog/Step motion planning failed	Restart the controller. If the issue persists, contact the technical support engineer.	5
147|0x0093	Trajectory playback or segment point count less than 4	Check the trajectory file to ensure that the number of non-repeated points exceeds 4. During trajectory playback, identical points at the start and end that are not actually moved through will be filtered out. Therefore, verify the number of actual motion points in the trajectory file.	5
148|0x0094	Failed to play back the trajectory according to the given constraints	Check if the trajectory file is correct or set appropriate speed and acceleration parameters.	5
160|0x00a0	Current command does not support pausing; robot has stopped	Restart the program.	5
224|0x00e0	Tool TCP/elbow crossing the safety wall	Clear the alarm and jog the robot back within the safety wall.	5

9.2 Controller alarm (0x0500–0x900)

Alarm ID range (10|16)	Type
1280 – 1535|0x0500 – 0x5ff	Controller internal alarm
1536 – 1791|0x0600 – 0x6ff	Safety IO alarm
1792 – 2047|0x0700 – 0x7ff	Energy feedback board alarm
2048 – 2303|0x0800 – 0x8ff	Safety controller alarm

9.2.1 Controller internal alarm (0x0500–0x5ff)

File loading alarm

Alarm ID (10|16)	Description	Solution	Level
1301|0x0515	Failed to load the controller type parameter	**Cause**: The file is missing or the file content is incorrect. **Solution:** 1. Check whether the file properties/controlCabType.json exists or has abnormal content. This file is automatically generated by scanning the slave structure while the robot is starting. This error generally occurs after a firmware flash or cover upgrade. If you encounter this error, first check the board version. It is usually caused by mismatched firmware or XML on the board. Please use the robot maintenance tool to upgrade the board to the compatible version and then restart it.	5
1359|0x054f	Failed to load the startup file	This is a general error. When encountering this issue, please focus on other error messages that provide clearer indications. Once other file-related errors, such as missing or abnormal files, are resolved, this error will also disappear.	5

Other internal alarm

Alarm ID (10|16)	Description	Solution	Level
1360|0x0550	Failed to disable the robot	**Cause:** Enabling was not successful within 10 seconds. **Solution:** 1. Clear the alarm and try again. 2. If the error persists, restart the controller.	5
1361|0x0551	Failed to clear cumulative runtime	**Cause:** The file is missing or the file content is incorrect. **Solution:** 1. Check if the settings/workTimeRec.json file is corrupted or missing. 2. If the file is abnormal, you can find it in the upgrade package under the model's public folder: common_sys_files/project/settings.	5
1363|0x0553	Power-on failure	**Solution:** 1. Clear the alarm and power on again. 2. If the error persists, restart the controller.	1
1374|0x055e	WiFi setup failed	**Cause:** The provided ssid or passwd parameter value is empty. (Empty value, length exceeds limit, or contains invalid characters) **Solution:** Please check whether the ssid or passwd is empty, reset the parameters, and reconfigure the WiFi.	5
1418|0x058a	Project file not found	**Cause:** 1. Script project file not found 2. The file content is corrupted, preventing the script startup parameters from being properly compiled.	5

		Solution: Check if there's any exception in this script project file.	
1419|0x058b	Robot power off	**Cause:** 1. Detected an error that requires power down, initiating an automatic shutdown. 2. Detected that the robot body has lost power. **Solution:** 1. Clear the alarm and power on again 2. Clear the error, power on again, and check for any short circuit in the robot	1
1422|0x058e	Abnormal script status	**Cause:** The Lua script has exited, but the controller has not transitioned to the script stopped state for more than 2 seconds. **Solution:** 1. Clear the alarm and try again. 2. If the error persists, check the script.	5
1429|0x0595	Timeout waiting for operation to stop	**Cause:** Frequent script start/pause operations have caused abnormal script status, preventing a normal stop. **Solution:** Please clear the error and then start the script.	5
1430|0x0596	Power off after emergency stop	**Cause:** After the emergency stop was triggered, the robot continued to move for more than 600ms, prompting a power down. **Solution:** 1. Clear the emergency stop and reset any errors; the robot should return to normal operation after powering up. 2. Check for any joint malfunctions that may prevent normal stopping.	0
1439|0x059f	Trajectory playback does not support pausing when moving to the first	**Cause:** If a collision occurs during trajectory playback to the first point, the robot will not pause.	5

	point. The robot has stopped.	**Solution:** Clear the error and re-execute the trajectory playback.	
1445|0x05a5	Joint 1 fieldbus synchronization loss	**Cause:** Joint 1 state error, and the servo error code is 0 (synchronization loss). **Solution:** Check if there's a communication issue with the axis 1.	1
1446|0x05a6	Joint 2 fieldbus synchronization loss	**Cause:** Joint 2 state error, and the servo error code is 0 (synchronization loss). **Solution:** Check if there's a communication issue with the axis 2.	1
1447|0x05a7	Joint 3 fieldbus synchronization loss	**Cause:** Joint 3 state error, and the servo error code is 0 (synchronization loss). **Solution:** Check if there's a communication issue with the axis 3.	1
1448|0x05a8	Joint 4 fieldbus synchronization loss	**Cause:** Joint 4 state error, and the servo error code is 0 (synchronization loss). **Solution:** Check if there's a communication issue with the axis 4.	1
1449|0x05a9	Joint 5 fieldbus synchronization loss	**Cause:** Joint 5 state error, and the servo error code is 0 (synchronization loss). **Solution:** Check if there's a communication issue with the axis 5.	1
1450|0x05aa	Joint 6 fieldbus synchronization loss	**Cause:** Joint 6 state error, and the servo error code is 0 (synchronization loss). **Solution:** Check if there's a communication issue with the axis 6.	1

1451|0x05ab	Joint 1 over-temperature	**Cause:** The temperature of joint 1 has exceeded the preset warning threshold (90°C). **Solution:** Lower the robot's operating temperature.	5
1452|0x05ac	Joint 2 over-temperature	**Cause**: The temperature of joint 2 has exceeded the preset warning threshold (90°C). **Solution:** Reduce the ambient temperature around the robot joints.	5
1453|0x05ad	Joint 3 over-temperature	**Cause**: The temperature of joint 3 has exceeded the preset warning threshold (90°C). **Solution:** Reduce the ambient temperature around the robot joints.	5
1454|0x05ae	Joint 4 over-temperature	**Cause**: The temperature of joint 4 has exceeded the preset warning threshold (90°C). **Solution:** Reduce the ambient temperature around the robot joints.	5
1455|0x05af	Joint 5 over-temperature	**Cause**: The temperature of joint 5 has exceeded the preset warning threshold (90°C). **Solution:** Reduce the ambient temperature around the robot joints.	5
1456|0x05b0	Joint 6 over-temperature	**Cause**: The temperature of joint 6 has exceeded the preset warning threshold (90°C). **Solution:** Reduce the ambient temperature around the robot joints.	5
1457|0x05b1	Main control chip over-temperature	**Cause**: The temperature of the main control chip has exceeded the preset warning	5

		threshold (92°C). **Solution:** Lower the controller's environment temperature.	
1458|0x05b2	User coordinate system not enabled	**Cause**: The user coordinate system used in commands such as trajectory playback, forward kinematics, or motion is not enabled. **Solution:** Check whether the coordinate system referenced in the error-reporting interface has been enabled in the coordinate system list.	5
1459|0x05b3	Tool coordinate system not enabled	**Cause**: The tool coordinate system used in commands such as trajectory playback, forward kinematics, or motion is not enabled. **Solution:** Use the correct tool coordinate system in the command.	5

9.2.2 Safety IO alarm (0x0600–0x6ff)

Alarm ID (10|16)	Description	Bit position (16)	Solution	Level
116 | 0x0074 (Refer to the algorithm's error code for details.)	E-stop button pressed	bit1	**Cause**: This warning will appear when the hardware E-stop button is pressed. **Solution:** 1. Release the E-Stop button and clear the error. 2. If the error persists, check if the button is faulty and replace it if needed. If there is no issue with the E-stop button, please contact a Dobot R&D engineer for assistance.	1
1538|0x0602	Contactor did not close as required for 2 seconds	bit2	**Cause**: After the robot body is powered on, the AC contactor is closed. The software continuously monitors the status of the contactor, where a closed status is indicated by a low level signal. If a high level signal is detected continuously for 2 seconds, it is determined that there is a contactor anomaly. **Solution:** 1. Power off the controller and restart it. At the same time, observe the controller to see if there is clicking noise of the AC contactor. 2. If there is clicking noise of the contactor but the software still reports an error, check if there is poor wiring inside the controller. 3. If there is no clicking noise of the contactor and the error persists after multiple restarts, the AC contactor may be damaged. Please contact Dobot for repair.	1

1540|0x0604	5 minutes after power-on, online data hasn't updated for 1 minute	bit4	**Cause**: The safety I/O board checks the bus communication status 5 minutes after the controller is powered on to ensure it is functioning correctly. **Solution:** In Codesys, check whether the communication status of each slave station is normal; verify if the PDO variable ControlSource of the safety IO is set to 1.	1
1541|0x0605	AC status is abnormal	bit5	**Cause**: AC detection is used to monitor the power status. For AC controller, the AC power goes through waveform shaping before sending a detection signal to the software. The software checks the waveform frequency, if the detected frequency is less than 20Hz or continuously zero, an alarm is triggered. For DC controller, the detection signal will be a high-level signal. The software monitors the signal level, if a low level is detected for more than 100ms, an alarm is triggered. **Solution:** 1. Check if the rocker switch is off or if the power cable has been unplugged; 2. Check if the power supply and 220v voltage are normal; 3. If the alarm persists after multiple restarts, it may be caused by bad wiring of the detection cables inside the controller or hardware failure, please contact the hardware engineer for further assistance.	1
1543|0x0607	Panel switch pressed	bit7	**Cause**: This alarm occurs when the switch on the controller is	0

			pressed to shut down. **Solution:** 1. Turn the switch on. 2. Check if the front panel button is stuck or fails to spring back.	
1544|0x0608	Energy-feedback board is disconnected	bit8	**Cause**: Communication between the safety I/O board and the energy-feedback board uses the 485-bus Modbus protocol. The safety I/O board periodically reads data from the energy-feedback board. If communication fails or the energy-feedback board's heartbeat remains unchanged for more than 2 seconds, an alarm is triggered. **Solution:** 1. Update the firmware to match the version of the controller. 2. After updating, if the alarm persists after multiple restarts, it may be caused by bad wiring of the 485 bus in the controller or hardware failure, please contact the hardware engineer for further assistance.	1
1548|0x060c	24V supercapacitor status error detected	bit12	**Cause**: There is a 24V super capacitor on the AC detection board of the CR controller. After the controller is powered on, it charges the capacitor. The software monitors the charging status. When the voltage is higher than 16.4V, the software detects a high level signal. When the voltage is lower than 16.4V, the software detects a low level signal. An alarm is triggered if a low level signal is detected continuously for 200ms. **Solution:**	0

			1. Restart the controller. 2. If the alarm persists after restart, it is possible that the fuse in the charging circuit of the energy-feedback board is damaged (the energy-feedback board may need to be replaced), contact the hardware engineer for further assistance.	
1549|0x060d	48V supercapacitor status error detected	bit13	**Cause**: There is a 48V super capacitor on the AC detection board of the CR controller. After the controller is powered on, it charges the capacitor. The software monitors the charging status. When the voltage is higher than 36.6V, the software detects a high level signal. When the voltage is lower than 16.4V, the software detects a low level signal. An alarm is triggered if a low level signal is detected continuously for 200ms. **Solution:** 1. Restart the controller. 2. If the alarm persists after restart, it is possible that the fuse in the charging circuit of the energy-feedback board is damaged (the energy-feedback board may need to be replaced), contact the hardware engineer for further assistance.	0

9.2.3 Energy feedback board alarm (0x0700–0x7ff)

CC162 Energy feedback board alarm

Alarm ID (10|16)	Description	Bit position (16)	Solution	Level
1792|0x0700	Input voltage monitoring overvoltage alarm	bit0	**Cause**: The CR controller routes 220V AC through an AC contactor to a 48V switch-mode power supply, then to a 48V regulated power supply, and finally to the 48V input of the energy-feedback board. When powering on the robot body, the energy-feedback board checks the 48V input and triggers an alarm when it detects a voltage value above 49.5V. **Solution:** 1. Check if the power supply and voltage are normal. 2. If the alarm persists after multiple restarts, it might be the controller power failure, please contact the hardware engineer for further assistance.	1
1793|0x0701	Input voltage monitoring undervoltage alarm	bit1	**Cause**: When powering on the robot body, the energy-feedback board checks the 48V input and triggers an alarm when it detects a voltage value below 42V. **Solution:** 1. Check if the power supply is normal and if the voltage is too low. 2. If the power supply is normal, check for any alarms related to safety I/O AC detection errors, contactor abnormalities, or similar issues. 3. After the above two steps, if the alarm persists after	1

			multiple restarts, contact Dobot R&D engineer for further assistance.	
1794|0x0702	Power supply current-limiting chip detection abnormal alarm	bit2	**Cause**: The current-limiting chip monitors the current on the bus. If the current is excessively high, it emits an abnormal signal. Upon detecting this signal, the software triggers an alarm and powers off the robot body to prevent damage due to excessive current. **Solution:** 1. Check if the robot body has experienced any serious collisions. 2. Check if there is a short circuit in the robot body. You can turn off the power, unplug the heavy-duty cable, and restart the controller to see if the alarm persists. 3. If there is no alarm after restarting, it may be a problem with the robot body, and the body needs to be replaced. If the alarm persists after multiple restarts, the hardware may be damaged and the board needs to be replaced.	1
1795|0x0703	Output voltage detection overvoltage alarm	bit3	**Cause**: After the robot body is powered on, the bus voltage is continuously monitored. An alarm is triggered if the bus voltage exceeds 56V. **Solution:** 1. Check if the robot body has experienced any serious collisions. 2. If this alarm occurs during operation, it may indicate a damaged energy-feed resistor, causing a	1

			continuous voltage increase that triggers the alarm.	
1796|0x0704	Output voltage detection overvoltage alarm	bit4	**Cause**: After the robot body is powered on, the bus voltage is continuously monitored. An alarm is triggered if the bus voltage drops below 24V. **Solution:** 1. Check if the power supply is normal. 2. Whether the alarm occurs during full-load, high-speed operation or under harsh working conditions. This may be caused by insufficient power supply capacity. The operating conditions can be adjusted, or a power supply with higher output capacity can be replaced. 3. For DC power, check if the DC supply voltage is too low.	1
1797|0x0705	Internal first voltage regulation value abnormal alarm	bit5	**Cause**: It may be that the power supply is abnormal and exceeds the operating voltage range of the regulator chip. **Solution:** 1. Check if the power supply and voltage are normal. 2. Check if the power supply is sufficient. 3. If the power supply is normal and the alarm persists after multiple restarts, it might be the hardware failure, please contact the hardware engineer for further assistance.	1

1798|0x0706	Internal second voltage regulation value abnormal alarm	bit6	**Cause**: It may be that the power supply is abnormal and exceeds the operating voltage range of the regulator chip. **Solution:** 1. Check if the power supply and voltage are normal. 2. Check if the power supply is sufficient. 3. If the power supply is normal and the alarm persists after multiple restarts, it might be the hardware failure, please contact the hardware engineer for further assistance.	1
1799|0x707	Abnormal output voltage before the robot is slow-starting	bit7	**Cause**: After the controller is powered on, it will not immediately output 48V to the robot body. There will be a slow-start process first (pre-charging of the body). Once the body voltage rises to 44V, the slow-start is discontinued, and the 48V power supply is activated. This process is designed to prevent damage to the body caused by powering on too quickly. Before the slow-start, the output voltage is checked, and an alarm is triggered if the voltage exceeds 49.5V for more than 3 seconds to prevent the circuit from directly burning out the MOSFET. **Solution:** 1. Ensure the robot body is powered on in a stationary status. 2. Check if the power supply and voltage are normal. 3. If the alarm persists after multiple restarts, it might be	1

			the hardware failure, please contact the hardware engineer for further assistance.	
1800|0x0708	Energy feedback current detection exceeds limit alarm	bit8	**Cause**: Operating under harsh conditions with excessive busbar current may cause the regenerative circuit to burn out. **Solution:** Reduce the speed or decrease the load. If it is necessary to operate under current conditions, please contact a Dobot R&D engineer to discuss whether adjustments to the current limit value are required.	1
1801|0x0709	Cement resistor over-power protection alarm	bit9	**Cause**: Typically, when the bus voltage exceeds the energy feedback threshold of 52.5V, the energy feedback system is activated, causing the voltage to drop. Once the voltage falls below the threshold, the energy feedback system shuts off. This process of activating and deactivating the energy feedback occurs periodically. The duration of regenerative activation is typically on the order of milliseconds and does not persist for an extended period. **Solution:** There may be an issue with the energy feedback circuit on the energy feedback board. If this alarm appears, please contact Dobot technical engineer.	1
1802|0x070a	Bus current detection over-limit alarm	bit10	**Cause**: The software continuously monitors the bus current and triggers an alarm when	1

			it detects that the bus current exceeds the limit values (CR3: 10A, CR5/7: 26A, CR10/12: 47.5A, CR16: 47.5A). **Solution:** Generally, this alarm does not appear. If it appears during full-load, high-speed operation, or under harsh working conditions, you can adjust the operating parameters by reducing the load or lowering the speed. If it is necessary to maintain the current working conditions, please contact a Dobot R&D engineer to discuss whether adjustments to the current limit value are required.	
1803|0x070b	An energy feedback alarm occurs when the robot is powered on and the buffer starts	bit11	**Cause**: After the controller is powered on, it will not immediately output 48V to the robot body. There will be a slow-start process first (pre-charging of the body). Once the body voltage rises to 44V, the slow-start is discontinued, and the 48V power supply is activated. This process is designed to prevent damage to the body caused by powering on too quickly. Throughout the slow-start process, the system checks for energy feedback, triggering an alarm if detected to prevent the circuit from directly burning out the MOSFET. **Solution:** 1. Ensure the robot body is powered on in a stationary status. 2. Check if the power supply and voltage are normal. 3. If the alarm persists after multiple restarts, it might be the hardware failure, please	1

			contact the hardware engineer for further assistance.	
1804|0x070c	48V output control MOSFET status detection abnormal alarm	bit12	**Cause**: When the controller powers on, the software detects the output voltage. If the detected voltage exceeds 15.8V, an alarm will be triggered, and the robot body will not be powered on. **Solution:** 1. Ensure the robot body is powered on in a stationary status. 2. If the alarm persists after multiple restarts, it might be the hardware failure, please contact the hardware engineer for further assistance.	1
1805|0x070d	The robot slow-start failed	bit13	**Cause**: If the voltage is detected to be lower than 44V after 500ms of the slow-start, an alarm will be triggered if it is determined that the slow-start has failed. **Solution:** 1. Check if the power supply and voltage are normal. 2. If the alarm persists after multiple restarts, it might be the hardware failure, please contact the hardware engineer for further assistance.	1

CC262 energy feedback board alarm

Alarm ID (10|16)	Description	Bit position (16)	Solution	Level
1808|0x0710	Input voltage monitoring overvoltage alarm	bit0	**Cause**: The controller routes 220V AC through an AC contactor to a 48V switch-mode power supply, then to a 48V regulated power supply, and finally to the 48V input of the energy-feedback board. When powering on the robot body, the energy-feedback board checks the 48V input and triggers an alarm when it detects a voltage value above 63V. **Solution:** For AC controller: If the alarm persists after multiple restarts, it might be the controller power failure, please contact the hardware engineer for further assistance. For DC controller: Check if the power supply operates normally within the broad voltage range (30V – 60V).	0
1809|0x0711	Input voltage monitoring undervoltage alarm	bit1	**Cause**: When the robot is powered on, the energy feedback board will monitor its power input. If the detected voltage is below 28V, it will trigger an alarm. **Solution:** For AC controller: If the alarm persists after multiple restarts, it might be the controller power failure, please contact the hardware engineer for further assistance. For DC controller:	0

			1. Check if the power supply is normal and if the voltage is too low. 2. If the power supply is normal, it is necessary to check for related alarms such as safety IO AC detection errors or contactor anomalies. 3. After the above two steps, if the alarm persists after multiple restarts, contact a Dobot R&D engineer for assistance.	
1810|0x0712	Power current limiting chip detection error alarm	bit2	**Cause**: The current-limiting chip monitors the current on the bus. If the current is excessively high, it emits an abnormal signal. Upon detecting this signal, the software triggers an alarm and powers off the robot body to prevent damage due to excessive current. **Solution:** 1. Check if the robot body has experienced any serious collisions; 2. Check if there is a short circuit in the main body. You can power off, disconnect the heavy-duty cable, and then restart to see if the alarm persists. If there is no alarm after restarting, it may be a problem with the robot body, and the body needs to be replaced. If the alarm persists after multiple restarts, the hardware may be damaged and the board needs to be replaced.	0
1811|0x0713	Output voltage detection overvoltage alarm	bit3	**Cause**: After the robot body is powered on, the bus voltage is continuously monitored. An alarm is triggered if the bus voltage exceeds 63V.	0

			Solution: 1. Check if the robot body has experienced any serious collisions.; 2. If this alarm occurs during operation, it may indicate a damaged energy-feed resistor, causing a continuous voltage increase that triggers the alarm. 3. If this alarm appears, please contact Dobot technical engineer.	
1812|0x0714	Output voltage detection overvoltage alarm	bit4	**Cause**: After the robot body is powered on, the bus voltage is continuously monitored. An alarm is triggered if the bus voltage drops below 28V. **Solution:** 1. Check if the power supply is normal. 2. Check if the alarm occurs under full load and speed or under bad operating conditions. It may be caused by insufficient power supply. you can adjust the operating conditions or replace the power supply with a higher power.	0
1813|0x0715	Robot body pre-charging abnormal alarm	bit5	**Cause**: After the controller is powered on, it will not immediately output 48V to the robot body. There will be a slow-start process first (pre-charging of the body). Once the body voltage rises to 3.5V, turn off the pre-charging and then enable the 48V power supply. This process is designed to prevent damage to the body caused by powering on too quickly. An alarm will be triggered if a charging anomaly is detected during the pre-charging phase. **Solution:**	1

			1. Use a multimeter to check if the 48V output from the power supply is stable. 2. Try restarting the controller. If the alarm persists after multiple restarts, the power board may be faulty. Please contact Dobot R&D support engineer.	
1814|0x0716	48V supercapacitor charging chip overcurrent fault alarm	bit6	**Cause**: After the controller powers on, it charges the 48V supercapacitor. The current-limiting chip in the charging circuit monitors the charging current. If the current exceeds the limit, a fault signal is triggered. The software detects this fault signal and subsequently triggers the alarm. **Solution:** If this alarm appears, try restarting the controller. If it persists, there may be a hardware issue. Please contact Dobot R&D engineer.	1
1815|0x717	48V output control MOSFET over-temperature alarm	bit7	Cause: After the main body is powered on, the software will perform temperature monitoring on the MOSFETs for the 48V output. An alarm is triggered if the temperature exceeds 90 degrees Celsius. **Solution:** 1. Check if the controller's temperature is within normal range and confirm that the cooling fans are working properly. 2. If the operating environment temperature is normal and the alarm persists after multiple restarts, the temperature sensing device may be damaged. Please contact a Dobot R&D engineer for further	0

			assistance.	
1816|0x0718	Energy feedback current detection exceeds limit alarm	bit8	**Cause**: Operating under harsh conditions can lead to excessive bus current, which may result in damage to the energy feedback circuit. **Solution:** Reduce the speed or decrease the load. If it is necessary to operate under current conditions, please contact a Dobot R&D engineer to discuss whether adjustments to the current limit value are required. Default limit values: CR3: 5A CR5, CR7: 24A CR10, CR12: 30A CR16: 30A Other: 24A	1
1817|0x0719	Cement resistor over-power protection alarm	bit9	**Cause**: During deceleration, energy is dissipated through heat generated by the energy-feedback resistor, reducing the bus voltage. The software monitors the current through the resistor, triggering an alarm if the current exceeds 2.55A for more than 5 seconds to prevent the resistor from burning out. **Solution:** There may be an issue with the energy feedback circuit on the energy feedback board, please contact Dobot R&D engineer.	1
1818|0x071a	Bus current detection over-limit	bit10	**Cause**: This alarm generally does not occur under typical	1

	alarm		circumstances, but it may appear when operating under full load at maximum speed in harsh conditions. **Solution:** Adjust the operating conditions, decrease the load, or reduce the speed. If it is necessary to operate under current conditions, contact Dobot R&D engineer to discuss adjusting the current limit.	
1819|0x071b	Regenerative circuit drive voltage abnormal alarm	bit11	**Cause**: After the robot body is powered on, the software monitors the drive voltage of the regenerative circuit. If the detected voltage falls below 0.4V, an alarm will be triggered. **Solution:** There is a high probability that this alarm indicates hardware damage. Please contact a Dobot R&D engineer for further handling.	1
1820|0x071c	48V output control MOSFET status detection abnormal alarm	bit12	**Cause**: When the controller powers on, the software detects the output voltage. If the detected voltage exceeds 15.8V, an alarm will be triggered, and the robot body will not be powered on. **Solution:** 1. Ensure the robot body is powered on in a stationary status. 2. If the alarm persists after multiple restarts, it might be the hardware failure, please contact the Dobot R&D engineer for further assistance.	1
1821|0x071d	Fan status detection abnormal	bit13	**Cause**: After the controller is powered on, the fan begins to operate.	1

	alarm		An alarm is triggered when the software detects an abnormal fan status. **Solution:** Check if the fan is functioning properly. If the fan has not operated since powering on the controller, it may be damaged and needs replacement.	
1824|0x0720	48V supercapacitor comparator circuit reference voltage detection abnormal alarm	bit0	**Cause**: Related to the supercapacitor charging circuit: the software monitors the reference voltage within the charging circuit. An alarm is triggered when an abnormal voltage is detected. **Solution:** 1. Try restarting the controller. If the alarm persists after multiple restarts, there may be a fault in the charging circuit components. Please contact hardware engineer.	1
1825|0x0721	24V supercapacitor circuit abnormal alarm	bit1	**Cause**: After the controller is powered on, it charges the 24V supercapacitor. The software monitors the signals in the charging circuit and triggers an alarm if any abnormal signal is detected. **Solution:** 1. Try restarting the controller. If the alarm persists after multiple restarts, there may be a fault in the charging circuit components. Please contact hardware engineer.	1

1826|0x0722	Input voltage maximum setting abnormal alarm	bit2	**Cause**: The DC version of the controller supports a wide voltage input range (30V–60V). The host computer can set the maximum and minimum power supply voltages, thereby configuring the regenerative threshold as well as the overvoltage and undervoltage limits. For example, if the input power voltage is 48V but the maximum is set to 40V, this error will be reported. **Solution:** Check if the setting matches the actual power supply. If not, reconfigure the maximum voltage.	1
1827|0x0723	Input voltage minimum setting abnormal alarm	bit3	**Cause**: The DC version of the controller supports a wide voltage input range (30V–60V). The host computer can set the maximum and minimum power supply voltages, thereby configuring the regenerative threshold as well as the overvoltage and undervoltage limits. For example, if the input power voltage is 48V but the minimum is set to 50V, this error will be reported. **Solution:** Check if the setting matches the actual power supply. If not, reconfigure the minimum voltage.	1

1828|0x0724	Regenerative time detection abnormal alarm	bit4	**Cause**: During regeneration, the software monitors the regenerative time. If continuous regeneration lasts for 1 second, or if cumulative regeneration reaches 2.5 seconds within a 5-second interval, an alarm is triggered to prevent overheating and damage to the regenerative resistor. **Solution:** This alarm typically does not occur under normal conditions. If it appears, please contact a Dobot R&D engineer.	0
1829|0x0725	Regenerative circuit control signal detection abnormal alarm	bit5	**Cause**: During regeneration, the software monitors the regenerative control feedback signal. The feedback signal should be in the opposite state of the control signal. An alarm is triggered when the feedback signal is detected to be consistent with the control signal. **Solution:** If the alarm persists after multiple restarts, it might be the hardware failure, please contact the Dobot R&D engineer for further assistance.	0

9.2.4 Safety controller alarm (0x0800–0x8ff)

CC262 safety controller alarm

Alarm ID (10|16)	Description	Bit position (16)	Solution	Level
2050|0x0802	Protective stop timeout alarm	bit2	**Cause**: When a protective stop is triggered, the safety controller calculates the speed of each joint based on encoder values and checks whether the robot has come to a halt (with each joint speed below 1°/s). If the robot has not stopped within 1.5 seconds, this alarm will be triggered, and the robot body will be powered off. **Solution:** Confirm whether the robot body decelerates too slowly or experiences dropping during the stop. Check whether the robot body exhibits shaking after stopping. If this alarm is triggered repeatedly after multiple protective stops, please contact a Dobot R&D engineer for further handling.	0
2051|0x0803	Joint 1 position exceeded limit	bit3	**Cause**: Each joint of the robot has a soft limit value, such as ±360 degrees for Joint 1 and ±164 degrees for Joint 3. The safety controller sets a safety limit at the soft limit value +5°. When it detects the joint position exceeding this safety limit, an alarm is triggered. **Solution:** Check if the joint position values are normal and if any over-rotation has	1

			occurred. 2. Verify whether the joint limits in the safety controller are correct. The safety limits for the safety controller are stored in the general controller, located at: setting/function/safecontrollerParams.json. 3. Clear the error, re-enable the robot, and jog the joint in the reverse direction.	
2052|0x0804	Joint 2 position exceeded limit	bit4	Refer to the corresponding measures for handling cases where Joint 1 exceeds its position limit.	1
2053|0x0805	Joint 3 position exceeded limit	bit5	Refer to the corresponding measures for handling cases where Joint 1 exceeds its position limit.	1
2054|0x0806	Joint 4 position exceeded limit	bit6	Refer to the corresponding measures for handling cases where Joint 1 exceeds its position limit.	1
2055|0x0807	Joint 5 position exceeded limit	bit7	Refer to the corresponding measures for handling cases where Joint 1 exceeds its position limit.	1
2056|0x0808	Joint 6 position exceeded limit	bit8	Refer to the corresponding measures for handling cases where Joint 1 exceeds its position limit.	1
2057|0x0809	Joint 1 speed exceeds limit	bit9	**Cause**: The safety controller monitors the speed of each robot joint. If a joint's speed exceeds the safety limit (the maximum joint speed configurable on the general controller plus +20°/s), an alarm will be	1

			triggered. **Solution:** Verify whether the safety rate limits are correct. The safety limits for the safety controller are stored in the general controller, located at: setting/function/safeControllerParams.json.	
2058|0x080a	Joint 2 speed exceeds limit	bit10	Refer to the corresponding measures for handling cases where Joint 1 exceeds its speed limit.	1
2059|0x080b	Joint 3 speed exceeds limit	bit11	Refer to the corresponding measures for handling cases where Joint 1 exceeds its speed limit.	1
2060|0x080c	Joint 4 speed exceeds limit	bit12	Refer to the corresponding measures for handling cases where Joint 1 exceeds its speed limit.	1
2061|0x080d	Joint 5 speed exceeds limit	bit13	Refer to the corresponding measures for handling cases where Joint 1 exceeds its speed limit.	1
2062|0x080e	Joint 6 speed exceeds limit	bit14	Refer to the corresponding measures for handling cases where Joint 1 exceeds its speed limit.	1
2063|0x080f	Joint 1 torque exceeds limit	bit15	**Cause**: The safety controller monitors the speed of each robot joint. If a joint's speed exceeds the safety limit (the maximum joint speed configurable on the general controller plus +20°/s), an alarm will be triggered. **Solution:** Verify whether the safety	1

			torque limits are correct. The safety limits for the safety controller are stored in the general controller, located at: setting/function/safeControllerParams.json.	
2064|0x0810	Joint 2 torque exceeds limit	bit0	Refer to the measures corresponding to Joint 1 torque exceeding the limit.	1
2065|0x0811	Joint 3 torque exceeds limit	bit1	Refer to the measures corresponding to Joint 1 torque exceeding the limit.	1
2066|0x0812	Joint 4 torque exceeds limit	bit2	Refer to the measures corresponding to Joint 1 torque exceeding the limit.	1
2067|0x0813	Joint 5 torque exceeds limit	bit3	Refer to the measures corresponding to Joint 1 torque exceeding the limit.	1
2068|0x0814	Joint 6 torque exceeds limit	bit4	Refer to the measures corresponding to Joint 1 torque exceeding the limit.	1
2069|0x0815	TCP position exceeded limit	bit5	**Cause**: The TCP position limitation function allows setting the maximum allowable safe position for the tool center point, preventing the robot from exceeding this position limit. The safety controller monitors the TCP position and triggers an alarm when the position exceeds the safety limit. **Solution:** Verify whether the safety position limits are correct. The safety limits for the safety controller are stored in the general controller, located at: setting/function/safecontrollerParams.json;	1
2070|0x0816	TCP speed exceeded limit	bit6	**Cause**: The TCP speed limitation function allows setting the	1

			maximum allowable safe position for the tool center point, preventing the robot from exceeding this speed limit. The safety controller monitors the TCP speed and triggers an alarm when the speed exceeds the safety limit (for script execution: external parameter × 2 mm/s; for teach mode: 300 mm/s). **Solution:** Verify whether the safety torque limits are correct. The safety limits for the safety controller are stored in the general controller at the following path: setting/function/safecontrollerParams.json.	
2071|0x0817	Safety Controller version mismatch between Board A and Board B	bit7	**Cause**: An alarm is triggered when a version mismatch is detected between the safety controller board A and board B. **Solution:** Update the firmware to ensure compatibility.	1
2072|0x0818	TCP force exceeded limit	bit8	**Cause**: The TCP force limitation function allows setting the maximum permissible force at the tool end, preventing the robot from exceeding this force limit. The safety controller monitors the TCP force and triggers an alarm when the TCP force exceeds the safety limit. **Solution:** 1. Verify whether the safety torque limits are correct. The safety limits for the safety controller are stored in the general controller at the following	1

			path: setting/function/safecontrollerParams.json. 2. Check if the robot is operating at full load and speed, or in harsh conditions, which may cause the TCP force to exceed the limit. If operation under these conditions is necessary, please contact Dobot R&D engineer.	
2073|0x0819	Once the safety wall or physical wall is triggered, the position exceeds the allowable limits	bit9	**Cause**: Based on the safety wall parameters set by the host computer, the safety controller sets the safety threshold as the safety wall position plus a 100mm offset. The safety controller triggers an alarm when it detects that the robot has exceeded this safety threshold of the safety wall. **Solution:** 1. Under normal circumstances, if the robot crosses the safety wall, it will first trigger a general controller alarm, causing the robot to stop without activating the safety controller's alarm. You can begin by checking the general controller alarm. 2. If this alarm continues to occur frequently, please contact a Dobot R&D engineer for further assistance.	1
2074|0x81a	Once the safety wall or virtual wall is triggered, the speed exceeds the allowable limits	bit10	**Cause**: When the robot elbow and/or TCP exceeds the virtual wall area, it enters reduced mode. The safety controller monitors the robot's speed—including joint speed and Cartesian speed—after crossing the	1

			virtual wall (for 0.3 seconds). An alarm is triggered if the detected speed exceeds the limit. Safety joint speed limit = Maximum joint speed in reduced mode + 10°/s Safety Cartesian speed limit = Maximum Cartesian speed in reduced mode + 50 mm/s **Solution:** Confirm whether the robot decelerates and enters reduced mode after crossing the safety virtual wall.	
2075|0x81b	Contactor status error detected	bit11	**Cause**: After the robot body is powered on, the AC contactor is closed. The software continuously monitors the status of the contactor, where a closed status is indicated by a low level signal. If a high level signal is detected continuously for 2 seconds, it is determined that there is a contactor anomaly. **Solution:** 1. Power off the controller and restart it. At the same time, observe the controller to see if there is clicking noise of the AC contactor. 2. If there is clicking noise of the contactor but the software still reports an error, check if there is poor wiring inside the controller. 3. If there is no clicking noise of the contactor and the error persists after multiple restarts, the AC contactor may be damaged.	1

2076|0x81c	Regeneration board online detection abnormal	bit12	**Cause**: Communication between the safety controller and the regeneration board uses the 485-bus Modbus protocol. The safety controller periodically reads data from the regeneration board. If communication fails or the energy-feedback board's heartbeat remains unchanged for more than 2 seconds, an alarm is triggered. **Solution:** If the alarm persists after multiple restarts, it may be due to poor wiring of the internal 485 bus or hardware damage. Please contact a Dobot R&D engineer for troubleshooting.	1
2077|0x81d	Front panel switch pressed	bit13	**Cause**: This alarm occurs when the switch on the controller is pressed to shut down. **Solution:** Restart.	0
2078|0x81e	AC error detected	bit14	**Cause**: AC detection is used to monitor the power status. For AC controller, the AC power goes through waveform shaping before sending a detection signal to the software. The software checks the waveform frequency, if the detected frequency is below 30 Hz or above 84 Hz, or the voltage is below 80 V or above 260 V, an alarm is triggered. For DC controller, the detection signal will be a high-level signal. The software monitors the signal level, if	1

			a low level is detected for more than 100ms, an alarm is triggered. **Solution:** For AC controller: 1. Check if the rocker switch is off or if the power cable has been unplugged. 2. Check if the power supply is normal. 3. If the alarm persists after multiple restarts, it may be caused by bad wiring of the detection cables inside the controller or hardware failure, please contact the hardware engineer for further assistance. For DC controller: 1. Check if the power supply is normal. 2. Confirm whether the power supply is sufficient (if battery-powered, efficiency may degrade over time; replacing the battery with a new one is recommended). 3. If the alarm persists after multiple restarts, it may be caused by bad wiring of the detection cables inside the controller or hardware failure, please contact the hardware engineer for further assistance.	
2080|0x0820	Robot Joint 1 drive system position or speed deviation	bit0	**Cause**: The safety controller calculates the joint angle based on the values from the inner and outer ring encoders, respectively. An alarm is triggered when the difference between the two exceeds 2.5°. **Solution:**	1

			1. Ensure all robot joints have been calibrated to zero. Refer to section "3. Jointinner/outer ring deviation alarm" in the document "Factory issue / Fixture failure / Robot handling methods" for troubleshooting. 2. Confirm that the reduction ratios on the controller match the actual joints.	
2081|0x0821	Robot Joint 2 transmission system position or speed deviation	bit1	Refer to the troubleshooting steps for the "Joint 1 Transmission system position or speed deviation".	1
2082|0x0822	Robot Joint 3 transmission system position or speed deviation	bit2	Refer to the troubleshooting steps for the "Joint 1 Transmission system position or speed deviation".	1
2083|0x0823	Robot Joint 4 transmission system position or speed deviation	bit3	Refer to the troubleshooting steps for the "Joint 1 Transmission system position or speed deviation".	1
2084|0x0824	Robot Joint 5 transmission system position or speed deviation	bit4	Refer to the troubleshooting steps for the "Joint 1 Transmission system position or speed deviation".	1
2085|0x0825	Robot Joint 6 transmission system position or speed deviation	bit5	Refer to the troubleshooting steps for the "Joint 1 Transmission system position or speed deviation".	1
2087|0x0827	Safety limit parameter verification error alarm	bit7	**Cause**: The safety controller writes the safety limit parameters related to safety functions into the chip's flash memory. Each	1

			time the system powers on, these safety parameters are verified. If the verification fails, an alarm is triggered. **Solution:** 1. Try restarting the robot. 2. If the alarm persists, update the safety controller firmware and then restart the robot. 3. If the alarm continues after the firmware update, there may be damage to the flash memory. Please contact a Dobot R&D engineer for further troubleshooting.	
2088|0x0828	Safety limit parameter mismatch error alarm	bit8	**Cause**: The safety controller maintains a dual backup of safety parameters. During each startup, the two sets of parameters are compared, and if any inconsistency is detected, an alarm is triggered. **Solution:** 1. Restart the controller; 2. If the alarm persists, update the safety controller firmware and then restart the robot. 3. If the alarm continues after the firmware update, there may be damage to the flash memory. Please contact a Dobot R&D engineer for further troubleshooting.	1
2089|0x0829	IO input error detected	bit9	**Cause**: The safety controller periodically tests the IO input ports to determine if the IO hardware is functioning properly. If an anomaly is detected during the test, an alarm	1

			will be triggered. **Solution:** 1. I/O chip is malfunctioning. Contact a Dobot R&D engineer for troubleshooting.	
2090|0x082a	IO output error detected	bit10	**Cause**: The safety controller periodically tests the IO output ports to determine if the IO hardware is functioning properly. If an anomaly is detected during the test, an alarm will be triggered. **Solution:** 1. I/O chip is malfunctioning. Contact a Dobot R&D engineer for troubleshooting.	1
2091|0x082b	3.3V voltage error detected	bit11	**Cause**: An alarm is triggered when the voltage value exceeds the specified limit 3.3V: <2.7V or >3.9V **Solution:** 1. Check if the power supply is normal. 2. If the alarm persists after multiple restarts, it might be the hardware failure, please contact the Dobot R&D engineer for further assistance.	1
2092|0x082c	5V voltage error detected	bit12	**Cause**: An alarm is triggered when the voltage value exceeds the specified limit 5V: <4.0V or >6.0V **Solution:** 1. Check if the power supply is normal. 2. If the alarm persists after multiple restarts, it might be the hardware	1

			failure, please contact the Dobot R&D engineer for further assistance.	
2093|0x082d	24V voltage error detected	bit13	**Cause**: An alarm is triggered when the voltage value exceeds the specified limit 24V: <19.6V or >28.8V **Solution:** 1. Check if the power supply is normal. 2. If the alarm persists after multiple restarts, it might be the hardware failure, please contact the Dobot R&D engineer for further assistance.	1
2096|0x0830	SCBB online status detection abnormal alarm	bit0	**Cause**: The safety controller board consists of two MCUs: the main chip is SCBA, and the secondary chip is SCBB. SCBA monitors the communication status with SCBB, and triggers an alarm when a communication abnormality is detected. **Solution:** 1. Attempt to clear the error. 2. Restart the controller; 3. If the alarm persists, update the safety controller firmware and then restart the robot. **Solution:** 1. If the alarm persists after updating the firmware, there may be hardware damage. Please contact a Dobot R&D engineer for troubleshooting.	1
2099|0x0833	Joint 1 outer ring position	bit3	**Cause**:	1

	exceeded limit		Each joint of the robot has a soft limit value, such as ±360 degrees for Joint 1 and ±164 degrees for Joint 3. The safety controller sets safety limits based on the software limit values + 5° + 2.5° (the outer ring limit is slightly larger than the inner ring limit). If the monitored joint position exceeds these safety limits, an alarm will be triggered. **Solution**: Check if the joint position values are normal and if any over-rotation has occurred. 2. Verify whether the joint limits in the safety controller are correct. The safety limits for the safety controller are stored in the general controller, located at: setting/function/safecontrollerParams.json. 3. Clear the error, re-enable the robot, and jog the joint in the reverse direction.	
2100|0x0834	Joint 2 outer ring position exceeded limit	bit4	Refer to the corresponding measures for Joint 1 outer ring exceeded its position limit.	1
2101|0x0835	Joint 3 outer ring position exceeded limit	bit5	Refer to the corresponding measures for Joint 1 outer ring exceeded its position limit.	1
2102|0x0836	Joint 4 outer ring position exceeded limit	bit6	Refer to the corresponding measures for Joint 1 outer ring exceeded its position limit.	1
2103|0x0837	Joint 5 outer ring position exceeded limit	bit7	Refer to the corresponding measures for Joint 1 outer ring exceeded its position limit.	1

2104|0x0838	Joint 6 outer ring position exceeded limit	bit8	Refer to the corresponding measures for Joint 1 outer ring exceeded its position limit.	1
2105|0x0839	Joint 1 outer ring speed exceeded limit	bit9	**Cause**: The safety controller monitors the speed of each robot joint. If the monitored speed exceeds the safety limit (i.e., the maximum joint speed configurable in the general controller +20 +2.5°/s, with the outer ring limit being slightly higher than the inner ring limit), an alarm will be triggered. **Solution:** Verify whether the safety rate limits are correct. The safety limits for the safety controller are stored in the general controller, located at: setting/function/safeControllerParams.json.	1
2106|0x083a	Joint 2 outer ring speed exceeded limit	bit10	Refer to the corresponding measures for handling cases where Joint 1 outer ring exceeded its speed limit.	1
2107|0x083b	Joint 3 outer ring speed exceeded limit	bit11	Refer to the corresponding measures for handling cases where Joint 1 outer ring exceeded its speed limit.	1
2108|0x083c	Joint 4 outer ring speed exceeded limit	bit12	Refer to the corresponding measures for handling cases where Joint 1 outer ring exceeded its speed limit.	1
2109|0x083d	Joint 5 outer ring speed exceeded limit	bit13	Refer to the corresponding measures for handling cases where Joint 1 outer ring exceeded its speed limit.	1
2110|0x083e	Joint 6 outer ring speed	bit14	Refer to the corresponding measures	1

	exceeded limit		for handling cases where Joint 1 outer ring exceeded its speed limit.	

CC262 general I/O alarm

Alarm ID (10|16)	Description	Bit position (16)	Solution	Level
2112|0x0840	DO chip error	bit0	**Cause**: This alarm occurs when the DO chip is unable to read or write data normally. **Solution:** 1. If a DO chip error appears on startup, check if I/O 0V and I/O 24V are correctly shorted to 0V and 24V (or connected to an external power supply). After fixing the wiring, restart the controller and check if the error clears. 2. If a DO chip error is reported during normal robot operation, please check whether the DO interface is short-circuited. 3. If no short circuit is found and the error cannot be cleared, try restarting the system. 4. If the DO chip fails to recover after multiple system restarts, it is likely burnt out and the board will need to be replaced.	1
2113|0x0841	DO overcurrent	bit1	**Cause**: An alarm for DO overcurrent will be triggered when the DO output current exceeds 1.6A. **Solution:** 1. Check if the DO is short-circuited. 2. Make sure the DO load power is within the allowed limit.	1

2114|0x0842	24V output alarm	bit2	**Cause**: An alarm will be triggered when the output current of the I/O board's external 24V power supply exceeds 3A. **Solution:** 1. Check whether the DO board/24V output is short-circuited. 2. Check whether the load current of the 24V output exceeds the limit.	1

CCBOX bard alarm messages

Alarm ID (10|16)	Description	Bit position (16)	Solution	Level
2128|0x0850	Power voltage detection undervoltage alarm	bit0	**Cause**: The small controller triggers an undervoltage alarm when it detects that the bus voltage falls below the preset minimum voltage value, which is defaulted to 30V. **Solution:** 1. Check if the power supply is stable and confirm the voltage is not too low. If powered by an AGV, starting the device with a low battery could trigger this alarm. 2. If the power supply is stable upon multiple checks, please contact Dobot R&D engineer.	1
2129|0x0851	Power supply voltage detection overvoltage alarm	bit1	**Cause**: The small controller triggers an overvoltage alarm when it detects that the bus voltage exceeds the preset maximum voltage value, which is defaulted to 60V. **Solution:**	1

			1. Check if the power supply is stable. A standard power supply will automatically shut down the controller to protect it. 2. If a non-standard power supply is used, check if the robot has experienced a severe impact. 3. (For non-standard power supplies) During operation, bus voltage may rise when decelerating, but the hardware should automatically dissipate energy (default threshold is 52V) to prevent further increase. If this alarm occurs during operation, it may indicate a damaged energy-feed resistor, causing a continuous voltage increase that triggers the alarm.	
2130|0x0852	Regenerative circuit detection abnormal alarm	bit2	**Cause**: The small controller will detect the regenerative signal when switching the regenerative function to check whether energy feedback is operating normally. **Solution:** When a regenerative circuit detection abnormal alarm is reported and the regenerative circuit is confirmed to be faulty, please contact a Dobot R&D engineer for further handling.	1
116 | 0x0074 (Refer to the algorithm's error code for details.)	E-Stop button pressed	bit3	**Cause**: This warning will appear when the hardware E-stop button is pressed **Solution:** Unlock the E-stop button and clear the errors.	

2132|0x0854	Emergency stop circuit detection abnormal alarm	bit4	**Cause**: The emergency stop detection involves two emergency stop signals, which should normally be consistent. When there is an issue with the hardware emergency stop circuit, an alarm is triggered indicating that the two emergency stop signals are different. **Solution:** Replace the E-Stop cable and clear the error. 2. If the error persists after multiple cable replacements and system restarts, there may be a hardware issue with the controller. Please contact a Dobot R&D engineer for further troubleshooting.	1
2133|0x0855	Robot circuit short-circuit alarm	bit5	**Cause**: The controller continuously monitors the bus voltage after the robot is powered on. When a short circuit occurs in the robot, the bus voltage drops, triggering the robot circuit short-circuit alarm. **Solution:** 1. Check if there's a short circuit on the external interface of the tool IO. Remove the tool IO load and clear the error. 2. If no external devices are connected to the robot and the alarm persists after multiple restarts, please contact a Dobot R&D engineer for further handling.	0
2134|0x0856	Error in setting the minimum power input voltage	bit6	**Cause**: The small controller can be configured for the input voltage range via the host	1

			computer. An alarm will be triggered if the minimum input voltage set by the host computer is less than 30 or if the minimum input voltage exceeds the maximum input voltage value, indicating an error in the minimum power input voltage setting. **Solution:** Reconfigure the correct input voltage on DobotStudio Pro.	
2135|0x0857	Error in setting the maximum power input voltage	bit7	**Cause**: The small controller can be configured for the input voltage range via the host computer. An alarm will be triggered if the maximum input voltage set by the host computer exceeds 60 or if the maximum input voltage is less than the minimum input voltage, indicating an error in the maximum power input voltage setting. **Solution:** Reconfigure the correct input voltage on DobotStudio Pro.	1
2136|0x0858	MCU chip temperature detection indicates overheating	bit8	**Cause**: The small controller continuously monitors the internal board temperature in real-time after power-on and triggers an alarm when the temperature exceeds 85°. **Solution:** 1. Operating in an environment exceeding its normal operating temperature range. 2. If the ambient temperature is normal, there might be an issue with the controller's heat	1

			dissipation. Please contact a Dobot R&D engineer for assistance.	
2137|0x0859	DI type PNP configuration detection error alarm	bit9	**Cause**: The DI of the small controller can be configured as NPN or PNP type. When configured as PNP, the circuit feedback is expected to detect a high level. If a low level is detected, it will trigger an error alarm. **Solution:** If this alarm occurs, it indicates an internal circuit issue within the controller. Please contact a Dobot R&D engineer for assistance.	1
2138|0x085a	DI type NPN configuration detection error alarm	bit10	**Cause**: The DI of the small controller can be configured as NPN or PNP type. When configured as NPN, the circuit feedback is expected to detect a low level. If a high level is detected, it will trigger an error alarm. **Solution:** If this alarm occurs, it indicates an internal circuit issue within the controller. Please contact a Dobot R&D engineer for assistance.	1
2139|0x085b	Shutdown execution detection abnormal alarm	bit11	**Cause**: When operating in remote power on/off mode, the device remains powered on until the remote switch IO is disconnected. If the panel power button is pressed and held for more than 3 seconds while the device is in remote power-on mode, it will trigger a shutdown execution	1

			detection abnormal alarm. **Solution:** Pressing the panel button while in remote control mode is incorrect. To shut down properly, disconnect the remote IO.	
2140|0x085c	Power supply time error detected	bit12	**Cause**: Under normal conditions, the energy feedback function should lower the voltage to within the specified range within 0.1 seconds. If the energy feedback fails to operate normally and sustains beyond this duration, it will trigger an abnormal energy feedback time alarm. **Solution:** 1. Check for any serious collisions. 2. If this alarm continues to occur frequently, please contact a Dobot R&D engineer for further assistance.	0
2141|0x085d	Abnormal energy feedback alarm	bit13	Please check whether a non-standard component has been connected. If the alarm occurs during normal operation, contact a Dobot R&D engineer for assistance.	0

CC263 board alarm messages

Alarm ID (10|16)	Description	Bit position (16)	Solution	Level
2144|0x0860	Tool disconnection alarm	bit0	**Cause**: End DO communication loss alarm. When the end communication is abnormal or the EtherCAT bus connection is broken, a red light will illuminate and an alarm will be	1

			triggered. **Solution:** 1. Check if the tool cable is loose; try reconnecting the EtherCAT cable to see if it resolves the issue. 2. If the disconnection reoccurs after reconnecting, consider replacing the EtherCAT cable. 3. If disconnection persists even after replacing the cable, further investigation in conjunction with the controller is required. Please contact a Dobot R&D engineer for assistance.	
2145|0x0861	DO1 output overcurrent alarm	bit1	**Cause**: End DO output chip alarm. When a chip error is detected, an end DO output overcurrent alarm will be triggered. **Solution:** 1. Check if tool DO1 is short-circuited. 2. Check if the load connected to tool DO1 meets specifications. 3. If no issues are detected with tool DO1, please contact Dobot R&D engineer.	1
2146|0x0862	DO2 output overcurrent alarm	bit2	**Cause**: End DO output chip alarm. When a chip error is detected, an end DO output overcurrent alarm will be triggered. **Solution:** 1. Check if tool DO2 is short-circuited. 2. Check if the load connected to tool DO2 meets specifications. 3. If no issues are detected with tool DO1, please contact Dobot R&D engineer.	1

2147|0x0863	DO3 output overcurrent alarm	bit3	**Cause**: End DO output chip alarm. When a chip error is detected, an end DO output overcurrent alarm will be triggered. **Solution:** 1. Check if tool DO3 is short-circuited. 2. Check if the load connected to tool DO3 meets specifications. 3. If no issues are detected with tool DO1, please contact Dobot R&D engineer.	1
2148|0x0864	DO4 output overcurrent alarm	bit4	**Cause**: End DO output chip alarm. When a chip error is detected, an end DO output overcurrent alarm will be triggered. **Solution:** 1. Check if tool DO4 is short-circuited. 2. Check if the load connected to tool DO4 meets specifications. 3. If no issues are detected with tool DO1, please contact Dobot R&D engineer.	1
2149|0x0865	24V output overcurrent alarm	bit5	**Cause**: When the end total 24V current load reaches 3A, an end 24V output overcurrent alarm will be triggered. **Solution:** 1. Check if the tool is short-circuited. 2. Check if the load connected to the tool meets specifications. 3. If no issues are detected with the end, please contact Dobot R&D engineer.	1

End IO alarm message

Alarm ID (10|16)	Description	Bit position (16)	Solution	Level
2160|0x0870	Tool DO 1 output overcurrent	bit0	**Cause**: End DO output chip alarm. When a chip error is detected, an end DO output overcurrent alarm will be triggered. **Solution:** 1. Check if tool DO1 is short-circuited. 2. Check if the load connected to tool DO1 meets specifications. 3. If no issues are detected with tool DO1, please contact Dobot R&D engineer.	1
2161|0x0871	Tool DO 2 output overcurrent	bit1	**Cause**: End DO output chip alarm. When a chip error is detected, an end DO output overcurrent alarm will be triggered. **Solution:** 1. Check if tool DO2 is short-circuited. 2. Check if the load connected to tool DO2 meets specifications. 3. If no issues are detected with tool DO1, please contact Dobot R&D engineer.	1
2162|0x0872	Tool 24V output overcurrent	bit2	**Cause**: End DO output chip alarm. When a chip error is detected, an end DO output overcurrent alarm will be triggered. **Solution:** 1. Check if the tool is short-circuited. 2. Check if the load connected to the tool meets specifications. 3. If no issues are detected with the end, please contact	1

			Dobot R&D engineer.	

9.2.5 Added controller alarm

Error ID	Description	Solution	Level
4096	Trajectory playback file not found	**Cause**: Trajectory file not found. **Solution:** Please use the host computer to check if the trajectory playback file exists.	5
4098	Trajectory playback file name error	**Cause**: The file name in the lua or TCP command is incorrect. **Solution:** Please ensure the trajectory playback file name corresponds to an existing file in the host computer interface and that the file has a .csv extension.	5
4100	Pausing not supported for current trajectory playback	A collision was encountered during trajectory playback. Recovery is not possible in this situation. The process can only be halted by reporting an error or by restarting the trajectory playback from the beginning.	5
4112	Robot SN and controller SN do not match	**Cause**: Incorrect pairing of the robot body and controller. **Solution:** 1. Check the matching relationship between the robot and the controller. 2. If it is confirmed that the pairing is correct, the robot maintenance tool can be used to write the correct serial number (SN) into the robot body.	5
4128	Controller CODESYS project version and board version mismatch	**Cause**: Controller CODESYS project does not match the hardware board. **Solution:** This error generally occurs after a firmware flash or cover upgrade. If you encounter this error, first check	5

		the board version. It is usually caused by mismatched firmware or XML on the board. Please use the robot maintenance tool to upgrade the board to the compatible version and then restart it. Check the files /dobot/userdata/SlaveLog and /dobot/userdata/codesys/codesys.json to verify compatibility between the CODESYS project and board versions. Contact technical support if needed.	
4192	Dobot+ error	**Cause**: An internal error occurred within the Dobot+ plugin. **Solution:** 1. Check the user log for detailed error information. 2. The detailed content of the Dobot+ error cannot currently be reflected in the error logs within the controller. Please check the dedicated logs to pinpoint the issue.	5
4193	Eco-plugin interface error on user script startup	**Cause**: There is a script error within the Dobot+ plugin that is preventing it from starting. **Solution:** 1. Uninstall the plugin that may be causing issues to ensure the script can run again. 2. If the plugin is required, please contact a Dobot R&D engineer for assistance.	5

9.3 Servo alarm (0x2230–0x8612)

Error ID (10|16)	Description	Solution	Level
8752|0x2230	Hardware overcurrent or IPM anomaly	**Cause**: The actual current measured by the servo exceeds 90% of the hardware's maximum sampling current. This alarm is determined by the FPGA, and hardware overcurrent is assessed before software overcurrent, so the hardware overcurrent alarm is usually reported. **Solution:** 1. Check for any short circuits in the drive circuit. 2. Check if the sampling resistor has an abnormal resistance value. 3. Check if the brake can be switched on normally. 4. Switch on the brake and check if the joint rotates smoothly. 5. Check the load to ensure it does not exceed the load curve limits specified in the product manual.	1
8992|0x2320	Software overcurrent	**Cause**: The actual current measured by the servo exceeds 90% of the hardware's maximum sampling current. **Solution:** 1. Check for any short circuits in the drive circuit. 2. Check if the sampling resistor has an abnormal resistance value. 3. Check if the brake can be switched on normally. 4. Switch on the brake and check if the joint rotates smoothly. 5. Check the load to ensure it does not exceed the load curve limits specified in the product manual.	1

9088|0x2380	The current offset of the zero point is too high	**Cause**: One phase of the collected UVW three-phase current significantly deviates from its zero-point current, exceeding the protection threshold. **Solution:** 1. Check if the sampling resistor has a normal resistance value. 2. Check if the bus voltage is within normal limits.	1
12816|0x3210	Voltage between PN is too high	**Cause**: The bus voltage detected exceeds the threshold for each model. **Solution:** Check if the voltage output from the power switch, adapter, or AGV battery is normal.	1
12832|0x3220	Voltage between PN is too low	**Cause**: The bus voltage detected is below the threshold for each model. **Solution:** 1. Check if the voltage output from the power switch, adapter, or AGV battery is normal. 2. Check for any short circuits in the main bus circuit across each board. Check if the load is too high or if there is overspeed.	1
12928|0x3280	Servo and motor power matching fault	**Cause**: The power rating marked on the hardware does not match the motor power parameter set in the servo. **Solution:** 1. Check if the power board version matches the corresponding joint. 2. Check if the servo firmware is compatible with the corresponding power board.	1
17168|0x4310	Driver temperature is too high	**Cause**: The MCU detects that the temperature register is higher than 90°C. **Troubleshooting**:	1

		1. Check if the robot has been operating in excessively high temperatures for extended periods or under prolonged overload. 2. Check if there is a short circuit or damage in the servo driver. **Solution**: 1. Disable the robot, power off the robot body and cool it down for a period of time. 2. Replace the servo power board.	
21008|0x5210	Driver board recognition error protection	**Troubleshooting**: 1. Check whether the connection between the servo control board and the servo power board is loose. 2. Check whether the servo power board is damaged. **Solution**: Ensure that the connection between the servo control board and the servo power board is secure and intact.	1
28961|0x7121	Stalled motor overheat protection	**Cause**: 1. Check if the motor is jammed due to a mechanical failure. 2. Check if the motor brake is functioning properly or is damaged. **Solution**: If the motor shaft can rotate normally with the brake on and the motor is disabled, you can enable the motor and carry out the operation of the whole unit.	1
29056|0x7180	Motor is in overload status	**Solution:** 1. Check if the brake can be switched on normally. 2. Switch on the brake and check if the joint rotates smoothly. 3. Check the load to ensure it does not exceed the load curve limits specified in the product manual.	1
29568|0x7380	Encoder communication is abnormal	Check the cable, try to unplug and replug it. If the error persists, replace the cable with a new one.	1

29569|0x7381	Encoder is abnormal	Check if the encoder is loose or damaged. Replace or recalibrate the encoder if needed.	1
29570|0x7382	Encoder battery is abnormal	Test the encoder battery voltage to see if it is below the alarm threshold. Replace the encoder battery if needed.	1
29571|0x7383	Main encoder internal error	Check if the encoder is loose or damaged. Replace or recalibrate the encoder if needed.	1
29572|0x7384	Main encoder CRC check error	Check if the encoder is loose or damaged. Replace or recalibrate the encoder if needed.	1
29573|0x7385	Auxiliary encoder is disconnected	Check the encoder terminal connections for the motor axis triggering this alarm. Try reconnecting the cables. If the error persists, replace the cable.	1
29574|0x7386	Auxiliary encoder internal error	Check if the encoder is loose or damaged. Replace or recalibrate the encoder if needed.	1
29575|0x7387	Auxiliary encoder CRC check error	Check if the encoder is loose or damaged. Replace or recalibrate the encoder if needed.	1
29576|0x7388	PWM output buffer error	Joint servo control board error. Replace the servo control board.	1
29577|0x7389 (Only applicable to CRA)	Brake power supply anomaly	Check whether the brake is connected or damaged.	1
29584	Large deviation of joint position	1. Check production parameters. 2. Check encoder installation. 3. Check the transmission structure.	1
30080|0x7580	EtherCAT communication is abnormal	Ensure the stability of the EtherCAT communication link between the controller and the servo. If the problem persists, contact the development team for troubleshooting.	1
30081|0x7581	Unburned XML configuration file	Troubleshooting: If the servo slave station is not programmed with an XML file, the controller cannot read	1

		its information. In this case, you need to connect to the servo host computer to view the alarm and resolve the issue by correctly programming the XML file via the controller.	
30082|0x7582	Synchronization cycle configuration error	System error, please contact technical support engineer.	1
33920|0x8480	Motor overspeed	**Cause**: The planned command exceeds the motor's maximum speed. **Solution:** Check whether the controller and servo versions are compatible.	1
33921|0x8481	Difference between the set speed and current speed exceeds the range	**Troubleshooting**: 1. Check if the robot has collided and caused the alarm to appear on the corresponding joint motor. 2. Check if the servo parameters are configured properly.	1
33922|0x8482	Motor stalled	**Troubleshooting**: 1. Check if the motor angle in the servo parameters is abnormal. 2. Check if the motor's three-loop gain parameters in the servo settings are configured correctly. 3. Check if the motor is damaged.	1
34321|0x8611	Difference between the set position and current position exceeds the range	**Troubleshooting**: 1. Check if the robot has collided and caused the alarm to appear on the corresponding joint motor. 2. Check if the servo parameters are configured properly.	1
34322|0x8612	Position is out of range	**Cause**: The planned command of the controller is abnormal. **Solution:** Check whether the controller and servo versions are compatible.	1

65282|0xFF02	Failed to identify angles	**Cause**: 1. This alarm may occur when the motor U, V, and W phase wiring sequence is incorrect. 2. The motor angle identification process was interfered with manually or affected by the gravity of the robot arm. **Solution**: 1. Correctly connect the motor's U, V, and W phases to the servo board. 2. During the motor angle self-learning process, ensure the motor is free from external interfering forces to prevent impact on the identification results.	1

