Maintenance

DUCO Robots CO., LTD.

Apr 30, 2024

CONTENTS

SAFETY

1.1 Abstract

This section describes important safety and risk assessments that you need to be aware when installing, applying, and maintaining on robot and its components. The user must read and fully understand this information before the robot is powered on for the first time.

Before performing any operations, be sure to read all operating instructions provided with the equipment, in particular, instructions that may endanger personal safety and equipment safety, such as hazards, warnings, and cautions, to minimize the chance of an accident. When this document differs from the documentation shipped with the device, the documentation shipped with the device shall prevail.

The technicians responsible for installing and maintaining the equipment must be a trained person who has proper methods of operation and all safety precautions. Only trained and qualified technicians are able to perform equipment installation and maintenance.

1.2 Limitation of Liability

This information neither includes how to design, install and operate a complete robot system, nor any peripherals that affect the overall system. In order to protect personal safety, an outstanding system must be designed and installed in accordance with the safety requirements stipulated in the standards and regulations of the country where the robot is installed.

The robot integrator is responsible for ensuring that the robot system complies with the applicable safety laws and regulations of the country or region where the robot is located and that the necessary safety equipment for the protection of the robot system operator is properly designed and correctly installed.

Specifically including but not limited to the following:

- Ensure that the robot system meets all basic requirements;

- Perform a risk assessment of the complete system;

- Ensure the design and installation of the entire system is accurate;

- Make appropriate security settings in the software and ensure that it will not be modified by the user;

- Develop detailed operating instructions;

- Issue a declaration of conformity;

- Collect all information in technical documents;

- Label the integrator's logo and contact information on the installed robotic system.

SIASUN Co., Ltd. is committed to providing reliable safety information and will not be liable unless there is intentional or gross negligence by SIASUN Co., Ltd. in providing reliable safety information. It is important to declare that even if all operations are carried out in a safe manner, there is no guarantee that the robot system will not cause personal and property damage to the user.

SIASUN Co., Ltd. will not be liable for the loss of users caused by the following reasons:

- Force Majeure events (e.g., natural disasters, fires, wars, etc.);

- Natural damage or wear of the robot system;

- The site operating environment (e.g., voltage, temperature, humidity, etc.) or external factors (e.g., external interference, etc.) cannot meet the environmental requirements for normal operation as indicated;

- The robot system is not installed correctly (including not reinstalled correctly after relocation);

- due to the willful or negligence of the user or a third party, improper use (including the user's failure to use in accordance with this User's Manual and/or other requirements of SIASUN Co., Ltd.) or willful sabotage.

Unless otherwise agreed, SIASUN Co., Ltd. will not be liable for the indirect, special and incidental losses caused by the use of the robot system, including but not limited to the loss of revenue, actual or expected revenue, business loss, opportunity loss, goodwill loss, reputation loss, data loss, damage or leakage, etc.

1.3 Risk Assessment

Risk assessment is one of the most important tasks that integrators must accomplish. The robot itself is a partially completed machine, and the safety of the robot installation depends on how the robot is integrated (e.g. tools, obstacles and other machineries).

It is recommended that integrators perform risk assessment in accordance with ISO12100 (GB 15706) and ISO10218-2 (GB 11291.2). Alternatively, technical specification ISO/T 15066 (GB/T 36008) may be selected as additional guidance. Integrators performing a risk assessment should consider all procedures during the entire lifespan of the robot, including but not limited to:

- Teach robots when developing robots;

- Fault diagnosis and maintenance;

- General operation of robot installation.

Risk assessment must be performed before the robot arm is powered on for the first time. Part of the risk assessment performed by the integrator is the necessity to identify the correct security configuration settings, emergency stop buttons and additional protections for specific robot applications.

The following list identifies the significant risks that integrators must consider. Please note that there may be other significant hazards from certain robotic devices.

- Finger is clamped between joint 4 and joint 5;

- Sharp edges and sharp spots on the tool or the tool connector may cause damage to human skin;

- The obstacles sharp edges and sharp spots, which is closed by the robot track, may be dangerous to human skin;

- Sprains or fractures due to impact between the robot payload and a solid surface;

- Consequences due to loosening of bolts used to secure robot or tools;

- Items fall off the tool. For example, due to insufficient clamping or accidentally power down;

- Operating error due to different emergency stop button allocation and types.

If the robot is installed in a non-cooperative application (e.g. using dangerous tools) where the risk cannot be adequately eliminated by using its internal safety functions, the system integrator must install other protective devices based on the risk assessment (e.g. Installing a safety enclosure that can provide protection to the integrator during installation and programming).

1.4 Safety Operations

1.4.1 Emergency Stop

Emergency stop takes precedence over all the other robot control operations. Pressing emergency stop will cause all controlled hazards to stop, removing the motor power from the robot drive. It will remain in effect until reset manually.

Activate emergency stop to immediately stop the robot from any motion. The user must perform a restoration procedure, resetting the emergency stop button and pressing the "Power On" button on demonstrator, to resume normal operation. Emergency stop shall not be used as a risk reduction measure, but as a secondary protective device.

Emergency stop must not be used for normal program stop; constantly pressing may result in additional unnecessary wear on the robot.

1.5 Safety-related Functions and Interfaces

1.5.1 Introduction

Siasun GCR series are equipped with a range of built-in safety functions as well as safety I/O, digital and analog control signals to connect to other machines and additional protective devices.

⚠️Caution

- The use and configuration of safety functions and interfaces must follow the risk assessment procedures for each robot application

- If the robot discovers a fault or violation in the safety system (e.g. if one of the wires in the Emergency Stop circuit is cut or a safety limit is violated) then a Stop Category 0 is initiated

- The stopping time should be taken into account as part of the application risk assessment.

⚠️Warning

- The use of safety configuration parameters different from those determines by the risk assessment can result in hazards that are not reasonably eliminated or risks that are not sufficiently reduced**.**

- Ensure tools and grippers are connected appropriately so if there is an interruption of power, no hazards occur.

- The end effector is not protected by the GCR safety system. The end effector and / or connection cable is not monitored.

1.5.2 Stop Categories

Depending on the circumstances, the robot can initiate three types of stop categories defined according to IEC 60204-1. These categories are defined in the following table.

Stop Category	Description
0(SS0)	Stop the robot by immediate removal the power
1(SS1)	Reduce joints acceleration to 0 as soon as possible. Once each joint stopped, brake applied and power removed
2(SS2)	Stop the robot with power available to the drives, while maintaining the trajectory. Drive power is maintained after robot is stopped; no brake applied.

Swap between each stop categories:

The timer runs as soon as any stop category 1 occurs. At 500ms, if the robot is still running over speed, the stop category will be automatically swapped to category 0.

1.5.3 Safety functions

The GCR robot safety functions, are meant to control the robot system, such as the robot with its attached tool/ end effector. The robot safety functions are used to reduce robot system risks determined by the risk assessment. Positions and speeds are relative to the base of the robot.

The control unit safety functions are listed as follow:

Safety Function	Description
Emergency stop (ES)	Perform SS1
Protective stop	Perform SS2
Safe Operating Stop (SOS)	After SS2 is executed, SOS monitoring will be triggered to monitor the current position deviation of the robot. If it is violated, SS0 will be triggered
Joint Safe limited position (SLP)	According to the threshold setting, SS2 is triggered when the joint position reaches the threshold. If the trigger joint is limited, SS0 is fired directly
Joint Safe limited speed (SLS)	According to the threshold setting, SS2 is triggered when the joint velocity reaches the threshold. If the joint speed limit is triggered, SS0 is fired directly
TCP position limit	The safe plane can be set to limit the operating area of the robot, which is set according to the threshold value. When the threshold value is reached, SS2 is triggered. If the safety plane is triggered, the safety controller directly triggers SS0. Up to 6 security planes and 3 TCP coordinate systems are allowed
Tcp speed limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the TCP speed limit is triggered, the safety controller directly triggers SS0
elbow pos limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow position limit is triggered, the safety controller fires SS0 directly
elbow speed limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow speed limit is triggered, the safety controller fires SS0 directly
joint force limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If joint torque limits are triggered, the safety controller directly triggers SS0
tcp force limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the end force limit is triggered, the safety controller directly triggers SS0
elbow force limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow force limit is triggered, the safety controller fires SS0 directly
power limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If power limits are triggered, the safety controller directly triggers SS0
mode switch input	You can optionally enable this input , you can toggle through the UI; But not both. SS2 is triggered when the mode is switched. If the script is currently running, the script is paused and can continue to run later.
enable device input	You can optionally enable this input. This input is valid only in manual mode, not in automatic mode. Violation triggers SS2.
protective stop input	Valid in all modes, triggering SS2. If the reset input is not activated, after the signal disappears, it will reset automatically. Otherwise, it can reset only when the reset input is triggered.
protective stop reset input	You can optionally reset the signal input. If the safety protection reset is activated, when the trigger safety protection stops and the trigger signal disappears, the channel signal input is required before the movement. The rising edge is effective and the high level needs to be maintained at 500ms
automatic protective stop input	Only valid in automatic mode, triggering SS2. After the signal disappears, the safe mode resumes Normal

automatic protective	Similar to the Protective Stop Reset Input, only valid for protective stops triggered by Automatic Protective Stop Input.

1.6 The Risk of Collision

There is still a collision detection blind zone during the actual operation of the robot. Users must pay attention to the risk of collision detection failure under special working conditions. Typical three types of operating conditions are as follows.

Scenario 1: When the robot tool flange is outside the range A from the center of the robot base, if the robot moves along the direction of the red arrow in Figure 1 and Figure 2, the robot is less sensitive to external forces in the moving direction. The risk of pinching is more likely to occur; when the robot moves along the direction of the green arrow in Figure 1 and Figure2, if the robot collides with the external environment, the external force generated by the collision is more sensitive.
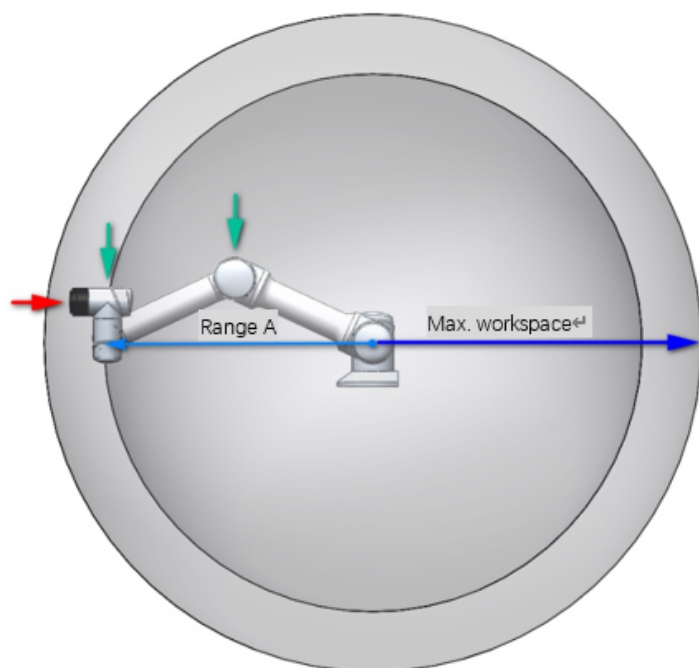
Model	Range A mm
GCR3-618	500
GCR5-910	750
GCR7-910	750
GCR10-1300	1000
GCR10-2000	1500
GCR12-1300	1000
GCR14-1400	1000
GCR16-960	750
GCR20-1100	900
GCR25-1800	1300

Figure 1 Scenario 1: robot front view
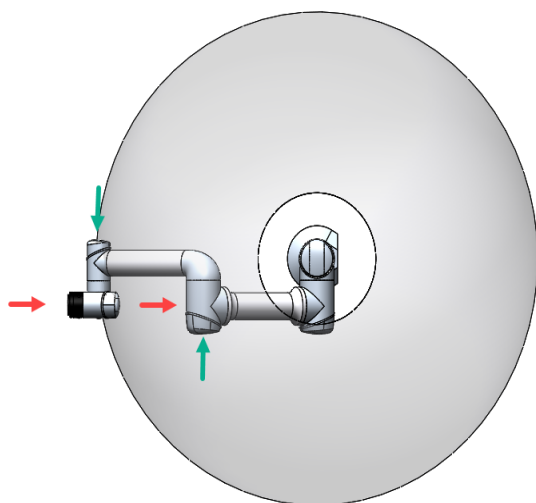
Figure 2 Scenario 1: robot top view

Scenario 2: Centering on the Z-direction of the robot base coordinate system, the radius is shown in Figure 3. If the contact point is within this range B, and the contact force direction is perpendicular to the plane of the joints of the joints 2 and joint 3, the collision detection function is difficult to detect collisions between the robot and the outside world. As the red arrow shown in Figure 3 in Figure 4; if the force direction between the robot and the outside is consistent with the Z direction of the robot base, the robot is more sensitive to the external force generated by the collision, as the green arrow shown in Figure 3.
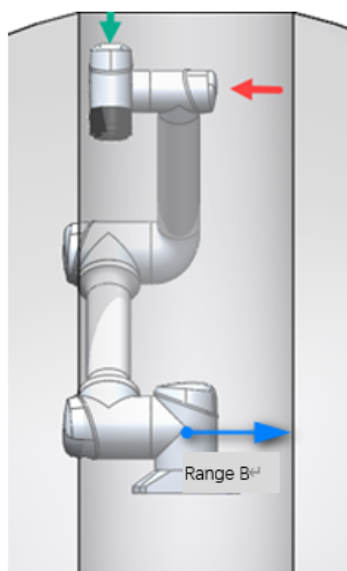
Model	Range B mm
GCR3-618	150
GCR5-910	200
GCR7-910	200
GCR10-1300	350
GCR10-2000	500
GCR12-1300	350
GCR14-1400	500
GCR16-960	350
GCR20-1100	500
GCR25-1800	600

Figure 3 Scenario 2: robot front view
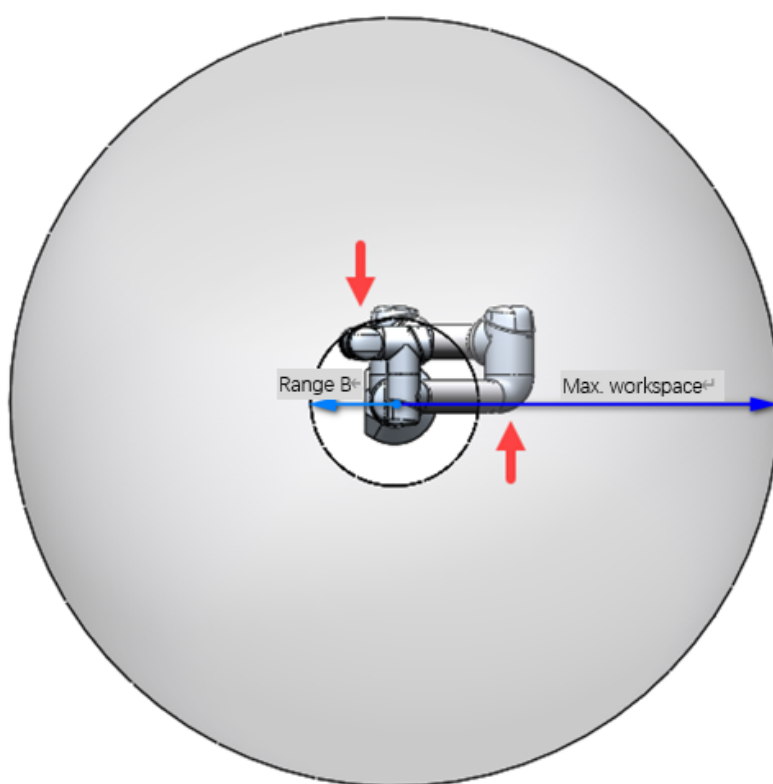
Figure 4 Scenario 2: robot front view

Scenario 3: When the robot collides with the outside world, and if the collision point is located in the spherical range with a radius C on the robot base, the robot is more difficult to detect the collision regardless of the pose and state of the robot. It is more prone to the risk of pinching, as the arrow shown in Figure 5 and in Figure 6; when the collision point is outside the range, and does not meet the conditions of the collision detection zone described in scenario 1 and scenario 2. At the time, the robot is more likely to detect collisions with the outside world, as the green arrow shown in Figure 5 and in Figure 6.

Model	Range C mm
GCR3-618	150
GCR5-910	200
GCR7-910	200
GCR10-1300	350
GCR10-2000	500
GCR12-1300	350
GCR14-1400	500
GCR16-960	350
GCR20-1100	500
GCR25-1800	600
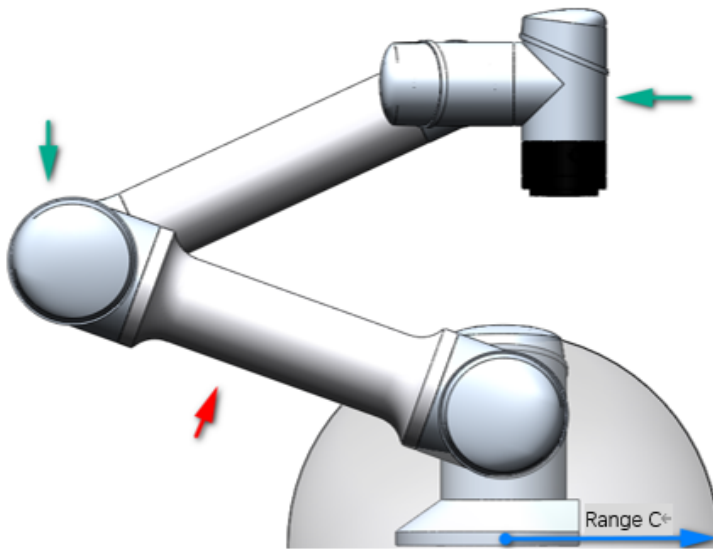
Figure 5 Scenario 3: robot side view

Range C
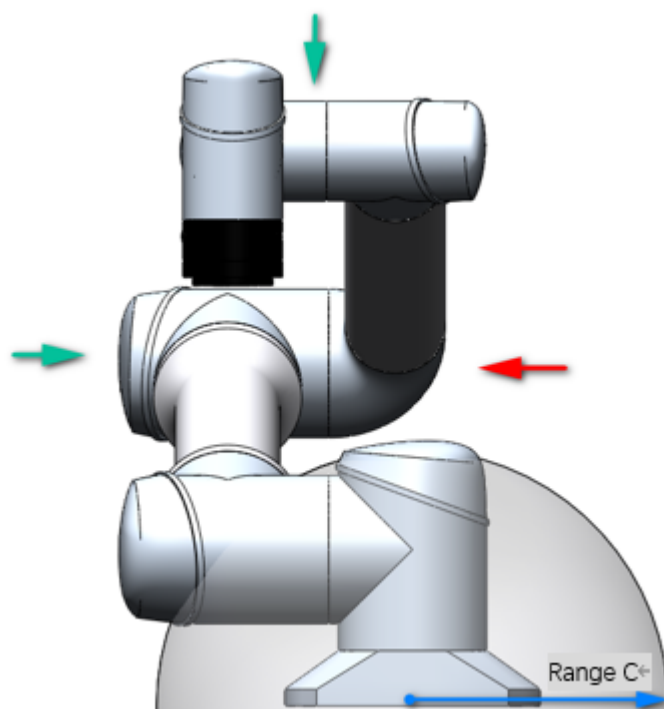
Figure 6 Scenario 3: robot front view

For all above-described scenarios, if the robot moves in a direction that is insensitive to external collision detection, considering the limitation of the cooperation between the robot and the outside world, the running speed at this time should be reduced as much as possible.

1.7 Risk of Stall at Robot Singularity

When the robot performs motion planning (straight line, arc, etc., excluding joint motion) near the singularity point, it will automatically reduce speed. When teaching, avoid the singularity point or pass the singularity point with joint motion. For the GCR series configuration, there are shoulder singularities, elbow singularities and wrist singularities.

1.7.1 Shoulder Singularity

When the wrist joint center O6 is on a joint axis J1, the shoulder singularity is caused at this time, resulting in no solution for joint 1. When O6 is located very close to J1, it will also be affected strangely. At this time, moving the end may cause joint 1 to overspeed. Refer to the picture below for the singular pose near the shoulder.
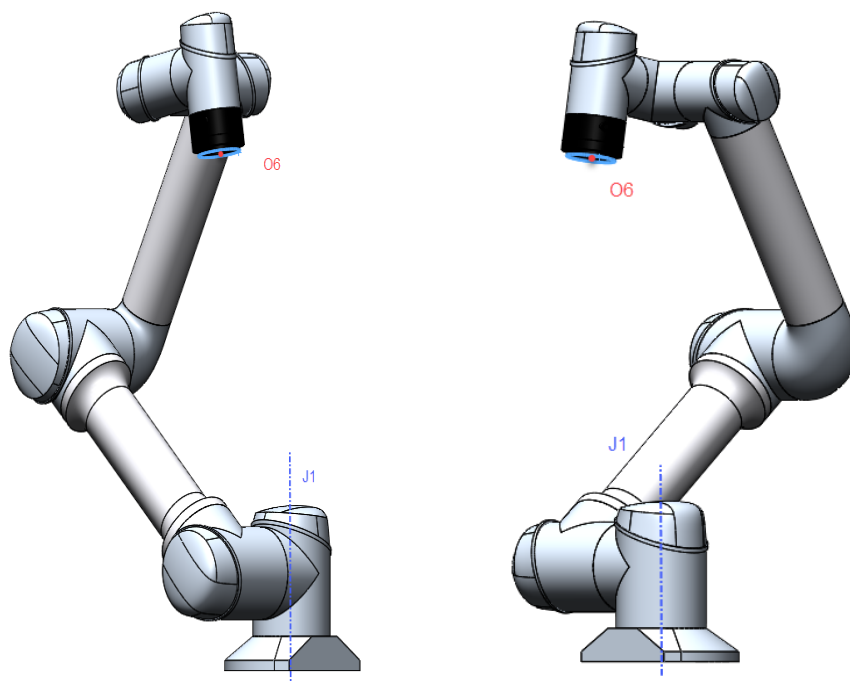
Figure 7 Shoulder singularity pose reference pose

1.7.2 Elbow singularity

When the axes of the two, three, and four joints J2, J3, and J4 are coplanar, at this time, the two joints have no solution. Simply, when joint 3 is near 0 degrees in a near singularity, moving the end may cause 2 joints, 3 joints, and 4 joints to overspeed. Refer to the figure below near the elbow singularity:
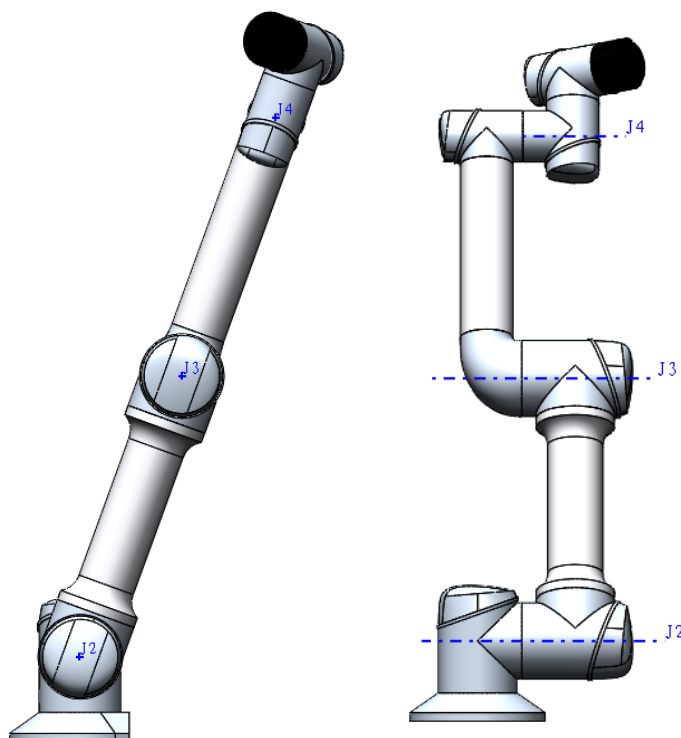
Figure 8 Elbow Singularity Pose Reference

1.7.3 Wrist singularity

When the joint 5 is 0 degrees, the joint 6 has no solution at this time, causing the wrist to be singular. When joint 5 is close to 0 degrees, it is a strange posture near the wrist. At this time, moving the end may cause 4 joints, 5 joints, and 6 joints to overspeed. Refer to the following figure:
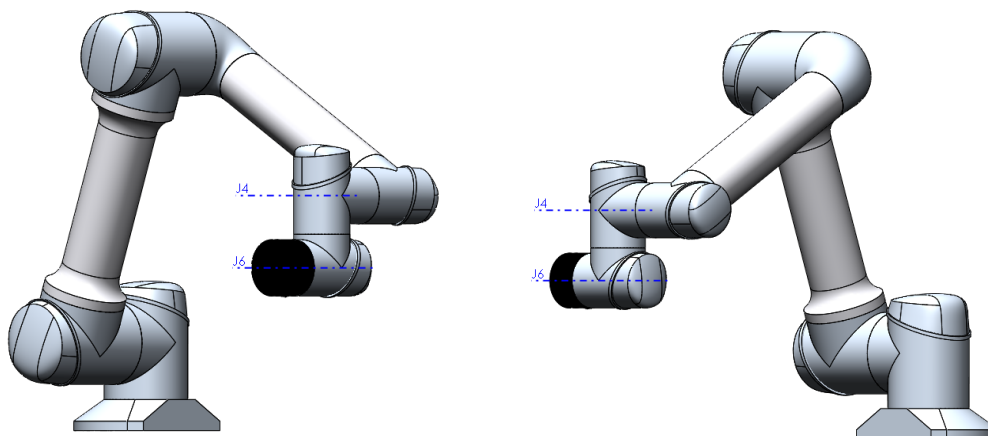
Figure 9 Wrist Singularity Reference

When the robot reaches or approaches the singularity, the planned movement based on Cartesian coordinates cannot be correctly reversed to the joint motion of each axis, and the movement planning cannot be performed correctly. The off motion or move j motion instruction can be used.

⚠️**Caution**

- Avoid using commands such as straight lines, arcs, and moving the ends in the directions of X, Y, Z, RX, RY, and RZ near the singularity points. The robot is at risk of stalling.

- For trajectories with singular risks, they must be fully evaluated before running.

MAINTENANCE AND REPAIR

All safety instructions in this manual must be strictly followed for maintenance and repair work.

Maintenance, calibration, repair work should be performed according to the latest service manual.

2.1 Safety Instructions

After maintenance, the safety level of the system must be checked again. Verification must comply with valid standards and safety laws and regulations. All safety functions should also be tested to ensure that they can work properly.

The purpose of maintenance is to ensure the normal operation of the system, or to help the system return to normal operation in the event of a failure. Maintenance includes fault diagnosis and actual maintenance.

Safety measures should be taken during maintenance operations include:

Prerequisites Before maintenance:

- The robot must be turned off and have protection measures that can prevent accidental restart.

- Remove the main input cable to ensure complete power failure, disconnecting other energy sources. Take precautions to avoid system power reconnection during maintenance.

- Check whether the ground connection is good before restarting the system.

- Wait 5 minutes until the intermediate loop is fully discharged. Avoid splitting the power supply system in the control cabinet. The high voltage can be retained in the power supply system for several hours after the control cabinet is closed.

- Follow ESD standards when disassembling the robot arm or control cabinet.

- The pneumatic system is a part of the system independent of the robot and the fixture. After the main power supply of the robot is turned off, the air pressure remains. The robot's power supply must be cut off and the pressure released before installing or servicing the fixture.

  Note:

- Do not change any information (such as force limits) in the software security configuration. The security configuration is described in the manual. If safety parameters change, the entire robotic system should be considered new, which means that all safety audit processes, such as risk assessment, which must be updated.

- Replace the faulty part with a new part with the same part number or an approved equivalent part.

- Reactivate all disabled safety measures as soon as maintenance and repair are complete.

- Record all maintenance operations in writing and keep them in the technical documentation associated with the entire robotic system.

2.2 Maintenance and Cleaning

2.2.1 Robot maintenance

After the commissioning of the equipment, the maintenance work shall be carried out according to the specified maintenance period.

the Robot Maintenance Period Specification Table

No.	Maintenance Activity	Inspection Mode	Every 1Month	Every 6Months	Every 12Months
1	Check the rear cap and bolt of the robot joint	Visual i nspection		√	
2	Check the robot dustproof rubber ring	Visual i nspection		√	
3	Check the cables of the robot	Visual i nspection		√	
4	Check the mounting bolts of robot base	F unctional ex amination	√		
5	Check the mounting bolts of robot end tool	F unctional ex amination	√		
6	Check the mounting bolts of robot joint	F unctional ex amination		√	
7	Check the seal ring of light belts	Visual i nspection	√		
8	Check joint gaps for grease spills	Visual i nspection	√		

The figure is an example. In total, there are 6 joints to be examined. It is necessary to regularly check whether the bolt marking is complete, whether the structure is reliable, and whether the grease is spilled.
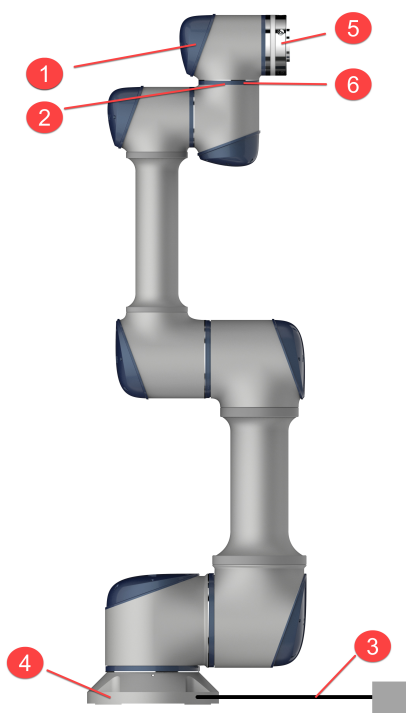
Figure 1 Robot Structure Diagram

2.2.2 Robot Cleaning

Dust/dirt/oil observed on the robot arm can be wiped off using a clean cloth and water or 10% ethanol. In some extreme cases, a small amount of grease may spill from the joint, which does not affect the performance or life of the joint.

2.2.3 Robot zero position and positive direction

After the commissioning of the equipment, the maintenance work shall be carried out according to the specified maintenance period.

the Control System Maintenance Period Specification Table

No.	Maintenance Activity	Inspection Mode	Every 1Month	Every 6Months	Every 12Months
1	Check emergency stop	F unctional ex amination	√		
2	Check the three-position enable switch of the teach-pendant	F unctional ex amination	√		
3	Check control cabinet safety input and output	F unctional ex amination	√		
4	Check the teach-pendant cables and connectors	Visual i nspection		√	
5	Check the fan filter of the control cabinet	Visual i nspection	√		
6	Check the I/O terminal block of the control cabinet	F unctional ex amination		√	
7	Check the power port of the control cabinet	F unctional ex amination			√

Note: When used in an environment with humidity greater than 90%, the control cabinet must be connected with the teach-pendant. If you need to pull out the teach-pendant for use, please take necessary protective treatment on the interface of the teach-pendant of the control cabinet.
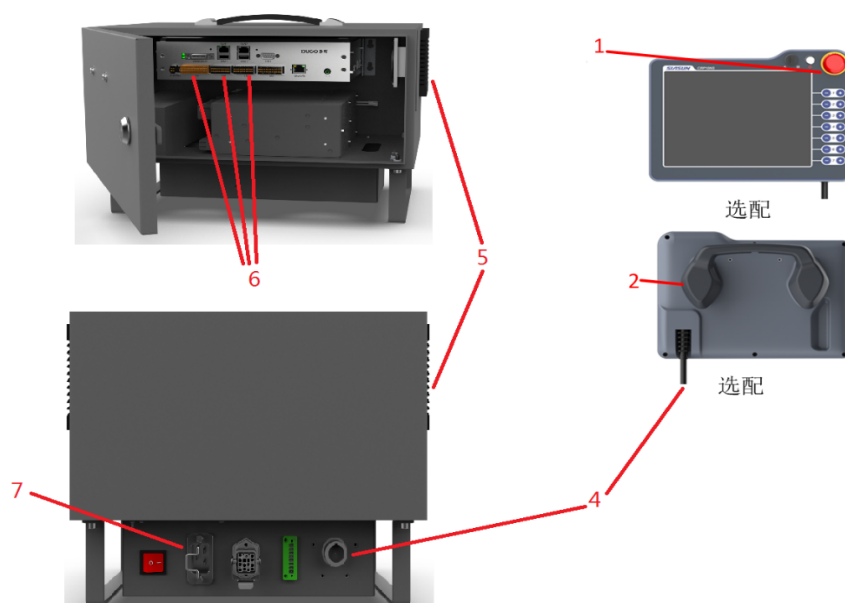
Figure 2 Control System Structure Diagram

2.2.4 Control Cabinet Cleaning

The control cabinet package contains two fan shields on both sides, and is equipped with IP44 filter screen, which is mainly used for internal heat dissipation of the control cabinet.

Note: Adjust the direction of the fan dust cover for different control cabinets. Otherwise, the IP protection level will be affected.
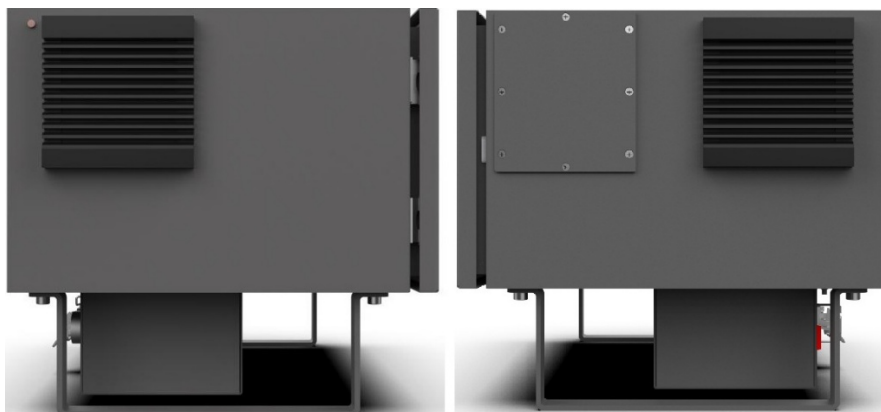
Figure 3 Fan Dust Cover Installed on the Side of the Control Cabinet

Fan filter cleaning procedure:

1) As shown in Figure 4, there are two gaps in the red box. Insert a small flat-head screwdriver into the gap and pry outward. Remove the dust cover when it becomes loose.

2) Remove the filter screen, confirm to use low-pressure gas cleaning or directly replace of the filter screen according to the actual situation of the filter screen. The filter screen needs to be cleaned repeatedly on both sides when cleaning to ensure that the filter screen is thoroughly cleaned.
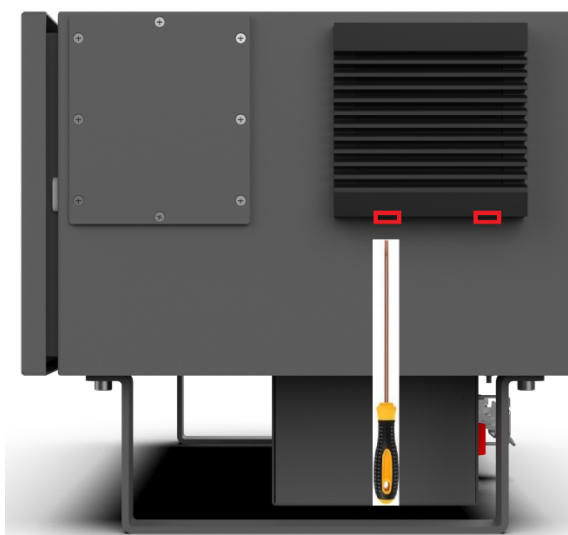
Figure 4 Control Cabinet Screen Cleaning

2.2.5 Operation after Long-term Storage of the Robot

The robot uses harmonic gear technology, the joints are partially sealed and self-lubricating (no need to change or add grease during its service life). During normal operation, lubricating grease is naturally distributed around gears and bearings to maintain normal lubrication of the mechanical system.

When the robot is stored or stopped for more than 1 month, or the joint is in a very small range of motion for a long time, it is recommended to take the following measures periodically, which will benefit the service life of the robot.

1. Before switching on the power supply, please put the robot at room temperature (such as stored in a cold environment);

2. Switch on the power supply of the robot and keep it in a static state for 30 minutes, which will enable the robot to reach its internal working temperature and soften the grease;

3. In manual mode, slowly move all joints respectively. Take care not to load any payload and tools;

4. Create a program to move all joints slowly and continuously for at least 20 minutes (default acceleration is recommended, the velocity is set around 10°/s, and the joints are rotated as far as possible).

ERROR CODES

3.1 Error Message Window

When an error log occurs, a pop-up window will be displayed on the interface at the same time to remind the users. Users can approximately understand the cause and handling methods of the error message through the pop-up window. The form of the pop-up error message window is shown in the following figure:

1. The first line of the pop-up window is marked with yellow bold characters to identify the error content and the corresponding error code.

2. The second line describes the cause of the error and the general direction of troubleshooting.

3. The third line records the time when the error occurred.

4. If you still have questions about the error, click "View Help" to learn more.

3.2 Error Code Composition

The error code is composed of a set of hexadecimal 32-bit error codes, expressed in the form of 8-bit reservation bit + 8-bit error module id+ detailed error id. Take the invalid error 0x00A10007 robot dynamics model as an example:

Reservation Bit	Error Module id	Detailed Error id
0x00	A1	0007

3.3 Error Code Table

3.3.1 System issues[0x00]

0x00000001: Robot power on error

Detailed description of the error	Handle advice
Fatal communication error detected	Restart the control cabinet and contact developer if the error cannot
Safety board state in INIT	be eliminated
Safety board version need to be updated	Use the DucoCore upgrade function to upgrade the safety board to the minimum version required for version compatibility
Get safety board version info fail	The communication layer is abnormal, check the line between the controller and the safety board in the control cabinet, Restart the control cabinet
Get communicaiton board version info fail	The communication layer is abnormal, check the line between the controller and the safety board in the control cabinet,Check the line between the safety board and the communication board in the control cabinet(DC30 control cabinet), Restart the control cabinet
IO board version need to be updated	Use the DucoCore upgrade function to upgrade the communication board to the minimum version required for version compatibility

Table 1 – continued from previous page

Detailed description of the error	Handle advice
Safety controller not in operational status	Observe the switching process of the safety state machine in the dashboard page,record the state machine to which the safety controller was switched to the last before power-on, restart the control cabinet, and replace the safety board if the error cannot be eliminated, and check the internal problems of the replaced safety board
Model parameters config fail 0x********	The communication layer is abnormal, record the communication error
Model parameters check error 0x********	code, check the line between the controller and the
Model parameters check timeout	safety board in
Safety power on fail 0x********	the control cabinet, Restart the control cabinet
Safety error: ****	Record and query the safety board code and restart the control cabinet
Safety stop1 triggered please restore	Check whether the emergency stop of the teach pendant, the emergency stop of the control cabinet, and the emergency stop of the user are pressed and not reset, and power on again after resetting
Safety power feedback abnormal	Restart the control cabinet, if the error cannot be eliminated, check the status of the safety board and the power-on circuit in the control cabinet
Switch communication frame to ready-to-switch-on status fail	The communication layer is abnormal, check the line between the controller and the safety board in the control cabinet,Check the line between the safety board and the communication board in the control cabinet(DC30 control cabinet), Restart the control cabinet, If the error cannot be eliminated, contact developer

Table 1 – continued from previous page

Detailed description of the error	Handle advice
Communication frame swtich to swtiched-on status fail	The communication layer is abnormal, usually caused by some slave abnormalities during the power-up process. Step 1: check the line between the controller and the safety board in the control cabinet,and check the line between the safety board and the communication board in the control cabinet(DC30 control cabinet), check the line between the control cabinet and the robot, check the internal power supply and communication wiring in the robot, and restart the control cabinet. Step 2: Check whether there is a process that has updated the robot system or updated part of the driver board,and there has been an update process exception.If so, contact developer to obtain the corresponding repair update package and re-update the interrupted system update. If the problem cannot be repaired after the above troubleshooting steps, contact developer.
Switch communication frame to pre-operational status fail	The communication layer is abnormal, the error is a fatal initialization error, If so, please contact developer directly for assistance
Initialize communication frame fail	
Communication frame not in ready-to-switch-on status	The communication layer is abnormal, usually caused by the abnormal connection between the safety board and the communication board in the control cabinet, check the line between the controller and the safety board in the control cabinet,and check the line between the safety board and the communication board in the control cabinet(DC30 control cabinet) ,Restart the control cabinet, If the error cannot be eliminated, contact developer
Servo version upload error	Check the status and wiring of the servo drive board in the robot, and restart the control cabinet

Table 1 – continued from previous page

Detailed description of the error	Handle advice
Servo version need to be updated	It is recommended(not mandatory)to upgrade the servo drive to the minimum uniform version required for version compatibility by the DucoCore upgrade feature
Get tcp board version info fail	The communication layer is abnormal, check the wiring of the end
Robot info check error	board of the robot and restart the control cabinet
Robot info and safety function parameters need to be updated	Switch to an account with admin permissions, power on again, and synchronize the parameters stored in the end board of the robot to the control cabinet according to the pop-up window guidance, Restart the control cabinet
Robot info need to be updated	Switch to an account with admin permissions, power on again, and synchronize the parameters stored in the end board of the robot to the control cabinet according to the pop-up window guidance, Restart the control cabinet
Toolboard config fail 0x********	The communication layer is abnormal, check the wiring of the end board of the robot and restart the control cabinet
IO board config fail 0x********	The communication layer is abnormal, check the line between the controller and the safety board in the control cabinet,Check the line
Safety parameters check error,Safety function parameters need to be updated 0x********	between the safety board and the communication board in the control cabinet(DC30 control cabinet), Restart the control cabinet
Safety function parameters need to be updated	Reconfigure the safety parameters after the robot is powered off
Axis config fail 0x********	The communication layer is abnormal, check the status and wiring of the servo drive in the robot. Restart the control cabinet

0x00000002: Robot power off error

Detailed description of the error	Handle advice

0x00000003: Robot enable failed

Detailed description of the error	Handle advice
Brake deactive detected,please activate all brakes before enable operation	By manually releasing the brake function to confirm that all joint brakes are closed and then re-enabled
Safety state in *	Record the abnormal safety controller status and restart the control cabinet. If the error cannot be eliminated, contact developer
Axis * error detected 0x********	Record the servo error code and refer to the servo error checklist for troubleshooting

0x00000004: Robot disable failed

Detailed description of the error	Handle advice

0x00000005: System reset failed

Detailed description of the error	Handle advice
	Check whether the emergency stop signal is reset

0x00000006: System shutdown failed

Detailed description of the error	Handle advice
	Save the project

0x00000007: System restart failed

Detailed description of the error	Handle advice
	Check the shutdown failure cause

0x00000009: Unregistered task or queue is full

Detailed description of the error	Handle advice
	1.Restart the control cabinet;2.Check the programming logic

0x0000000A: Task resume fail

Detailed description of the error	Handle advice
Please remove the current collision state	Eliminate collision states

3.3.2 File system issues[0x01]

0x00010001: Add account failed

Detailed description of the error	Handle advice
The same account exist	Change the name of your new account

0x00010002: Delete account failed

Detailed description of the error	Handle advice
Account does not exist	Confirm your account information

0x00010003: Change password failed

Detailed description of the error	Handle advice
Wrong account number or password	Confirm your account and password

0x00010004: Login failed

Detailed description of the error	Handle advice
Wrong account number or password	Confirm your account and password

0x00010005: Check password failed

Detailed description of the error	Handle advice
Wrong account number or password	Confirm your account and password

0x00010006: Logout failed

Detailed description of the error	Handle advice
none	—

0x00010007: Verify Login failed

Detailed description of the error	Handle advice
Wrong account number or password	Confirm your account and password

0x00010008: Get account list failed

Detailed description of the error	Handle advice
File serialization failed	Restart the control cabinet

0x00010101: Load system file failed

Detailed description of the error	Handle advice
none	Restart the control cabinet

0x00010102: Switch project failed

Detailed description of the error	Handle advice
none	Restart the control cabinet

0x00010103: Set language failed

Detailed description of the error	Handle advice
none	—

0x00010104: Change wlan failed

Detailed description of the error	Handle advice
wifi.config open failed	Check the Wifi module

0x00010105: Change ip failed

Detailed description of the error	Handle advice
ifconfig failed(system)	1. Check the network card, network port connection, network cable; 2. Please contact after-sales

0x00010106: Get network infomation by name failed

Detailed description of the error	Handle advice
The given Ethernet interface does not exist:name	1.Check the network name;2.Check the network card

0x00010201: Add project failed

Detailed description of the error	Handle advice
The same project exists Add folder failed:name	Change the project name

0x00010202: Delete project failed

Detailed description of the error	Handle advice
Project not exist	Confirm the project name

0x00010203: Delete project failed

Detailed description of the error	Handle advice
Delete folder failed:name	Confirm the project name

0x00010204: Get projetct list failed

Detailed description of the error	Handle advice
Load folder failed:project	The file system is damaged, please contact after-sales

0x00010205: Rename project failed

Detailed description of the error	Handle advice
project not exist/Rename folder failed:A to B	Confirm the project name

0x00010206: Export project failed

Detailed description of the error	Handle advice
Compress file failed:name	1. Perform the export operation again; 2. Export again after the project is saved

0x00010207: Import project failed

Detailed description of the error	Handle advice
Compress file failed:name	1. Perform the export operation again; 2. Export again after the project is saved

0x00010301: Init filesystem failed

Detailed description of the error	Handle advice
none	Restart the control cabinet

0x00010302: Save project failed

Detailed description of the error	Handle advice
none	Restart the control cabinet

0x00010303: Get root file path failed

Detailed description of the error	Handle advice
Root is empty	Restart the control cabinet

0x00010401: Load project setting failed

Detailed description of the error	Handle advice
none	Restart the control cabinet

0x00010402: Config function digital input failed

Detailed description of the error	Handle advice
none	1. Check whether the mode is correct; 2. Check whether the index is out of bounds

0x00010403: Config function digital output failed

Detailed description of the error	Handle advice
none	1. Check whether the mode is correct; 2. Check whether the index is out of bounds

0x00010404: Config function register input failed

Detailed description of the error	Handle advice
none	1. Check whether the mode is correct; 2. Check whether the index is out of bounds

0x00010405: Config function register output failed

Detailed description of the error	Handle advice
none	1. Check whether the mode is correct; 2. Check whether the index is out of bounds

0x00010406: Config interface name failed

Detailed description of the error	Handle advice
none	1. Change the interface name; 2.Pay attention to naming rules

0x00010407: Set current loaded program failed

Detailed description of the error	Handle advice
none	Check the setting information

0x00010408: Set home position failed

Detailed description of the error	Handle advice
none	Check the home position of the setting

0x00010409: Set project auto login failed

Detailed description of the error	Handle advice
none	—

0x0001040A: Set project default program failed

Detailed description of the error	Handle advice
none	—

0x0001040B: Change interface recipe failed

Detailed description of the error	Handle advice
File parse failed	Rework the recipe

0x0001040C: Open recipe failed

Detailed description of the error	Handle advice
Recipe type not match	Check the recipe type

0x0001040D: Create recipe failed

Detailed description of the error	Handle advice
none	Modify the recipe name

0x0001040F: Delete recipe failed

Detailed description of the error	Handle advice
none	1.Check the recipe name; 2.Stop the program from running

0x00010410: Config profinet diconected response failed

Detailed description of the error	Handle advice
none	Check the function output

0x00010501: Load workcell error

0x00010502: Add TCP coordinate error

Detailed description of the error	Handle advice
The same TCP coordinate exists	Change the tool coordinate name

0x00010503: Modify TCP coordinate error

Detailed description of the error	Handle advice
Tcp not exist	Check the tool coordinate name

0x00010504: Delete TCP coordinate error

Detailed description of the error	Handle advice
Tcp not exist	Check the tool coordinate name

0x00010505: Add user coordinate error

Detailed description of the error	Handle advice
The same user coordinate exist	Change the user coordinate name

0x00010506: Modify user coodinate error

Detailed description of the error	Handle advice
User coodinate not exist	Check the user coordinate name

0x00010507: Delete user coodinate error

Detailed description of the error	Handle advice
User coodinate not exist	Check the user coordinate name

0x00010508: Set default tcp coodinater failed

Detailed description of the error	Handle advice
none	

0x00010509: Set default user coodinater failed

Detailed description of the error	Handle advice
none	

0x0001050A: Set robot installation failed

Detailed description of the error	Handle advice
none	

0x0001050B: Can not find world

Detailed description of the error	Handle advice
none	

0x0001050C: Can not find base

Detailed description of the error	Handle advice
none	

0x0001050D: Add model error

Detailed description of the error	Handle advice
Model with the same name already exists	

0x000163: Delete frame error

Detailed description of the error	Handle advice
Frame does not exist	

0x00010601: Load device file failed

Detailed description of the error	Handle advice
none	1.Resync device information; 2.Restore the system to factory settings; 3.Contact after-sales

0x00010701: Load safety filed failed

Detailed description of the error	Handle advice
none	1.Resynchronize safety parameters; 2.Restore the default settings of safety parameters; 3.Contact after-sales

0x00010801: Load logfile list failed

Detailed description of the error	Handle advice
Open log folder failed	1.Reopen the log after shutting down and restarting; 2.Contact after-sales

0x00010802: Load logfile failed

Detailed description of the error	Handle advice
Open file failed	1.Reopen the log after shutting down and restarting; 2.Contact after-sales

0x00010803: Export logfile failed

Detailed description of the error	Handle advice
Compress file failed	1.Re-export the log after shutting down and restarting; 2.Contact after-sales

0x00010901: Add global variable failed

Detailed description of the error	Handle advice
The same global variable exist	Change the variable name

0x00010902: Set global varialbe init value failed

Detailed description of the error	Handle advice
Value not exist or type not match	1.Check the name of the global variable; 2.Check the input value type and the global variable type

0x00010903: Delete global variable failed

Detailed description of the error	Handle advice
Value not exist	Check the name of the global variable

0x00010904: Get global variable list failed

Detailed description of the error	Handle advice
File serialization failed	Restart the control cabinet

0x00010A01: Set register value failed

Detailed description of the error	Handle advice
none	1.Check the register address; 2.Check the input value type and register type; 3.Check the input values

0x00010B01: Load directory list failed

Detailed description of the error	Handle advice
open name folder failed	The FAT32 format flash drive needs to be replaced

0x00010B02: Create directory failed

Detailed description of the error	Handle advice
:name	Check whether the USB flash drive is in poor contact

0x00010B03: Copy file failed

Detailed description of the error	Handle advice
A to B	1.Modify the file name; 3.Check whether the USB flash drive is in poor contact

0x00010B04: Delete file failed

Detailed description of the error	Handle advice
name	1.Modify the file name; 3.Check whether the USB flash drive is in poor contact

0x00010B05: Save file failed

Detailed description of the error	Handle advice
name	1.Modify the file name; 3.Check whether the USB flash drive is in poor contact

0x00010B06: Load file failed

Detailed description of the error	Handle advice
name	1.Modify the file name; 3.Check whether the USB flash drive is in poor contact

0x00010B07: File parse failed

Detailed description of the error	Handle advice
A to B	1.Check the integrity of the documents; 2.Check the file format

0x00010B08: Export directory error

Detailed description of the error	Handle advice
Compress file fail	Try exporting again

0x00010B09: append file error

Detailed description of the error	Handle advice
name	1.Check the folder name; 2.Check whether the USB flash drive is in poor contact

0x00010C01: Load motion para file failed

Detailed description of the error	Handle advice
	Resynchronize robot parameters

0x00010D01: Install plugin failed

Detailed description of the error	Handle advice
	Confirm the completeness and correctness of the plug-in package

0x00010D02: Uninstall plugin failed

Detailed description of the error	Handle advice
	Confirm the completeness and correctness of the plug-in package

0x00010E01:

Detailed description of the error	Handle advice
	Confirm the completeness and correctness of the plug-in package

3.3.3 Program issues[0x02]

0x00020001: Run program failed

Detailed description of the error	Handle advice
	Stop the running program

0x00020002: Delete program folder failed；Types do not match

Detailed description of the error	Handle advice
	Confirm the folder name

0x00020003: Rename progarm folder failed；Types do not match

Detailed description of the error	Handle advice
	Change the folder name

0x00020004: Record trajectory failed

0x00020005:

Detailed description of the error	Handle advice
	Confirm the name of the trajectory to be stopped

0x00020006: Load progarm list failed

Detailed description of the error	Handle advice
	Confirm the loading path

0x00020007: Load progarm failed

Detailed description of the error	Handle advice
	1.Confirm the loading path;2.Confirm the program name

0x00020008: Save progarm failed

Detailed description of the error	Handle advice
	Confirm the program name

0x00020009: Delete progarm failed

Detailed description of the error	Handle advice
	Confirm the program name

0x0002000A: Rename Program failed

Detailed description of the error	Handle advice
	Change the program name

3.3.4 Movement issues[0x03]

0x00030000: Move state queue fatal error

Detailed description of the error	Handle advice
Queue fault times over limit	Contact develop

0x00030000: Move kinematics calculation error

Detailed description of the error	Handle advice
0x********	Confirm the actual movement status of the robot and adjust the motion script

0x00030000: Move task error

Detailed description of the error	Handle advice
Dual move task received	Check whether there is a non-blocking motion called in the program and a new motion command is sent before the previous motion is completed (except for SpeedMove and ServoMove)

0x00030000: Blend cancel

Detailed descrip- tion of the error	Handle advice
code:0x********	Record fusion cancellation error code 0x********, Refer to the fusion motion programming technique process to modify the fusion motion parameters

0x00030000: Move task aborted

Detailed description of the error	Handle advice
Receive in- valid move task	Confirm whether the current robot is in the program pause state, Check whether the motion task is sent through an external interface such as RPC.Stop the current running program and resend the motion task to confirm if the problem is gone

0x00030001: Online move error

Detailed description of the error	Handle advice
Invalid velocity setting param- eter	Check whether the speed parameter is valid and modify the speed parameter

0x00030002: Single move error

Detailed description of the error	Handle advice
Invalid velocity setting pa- rameter	Check whether the speed parameter is valid and modify the speed parameter
Invalid acceleration setting parameter	Check whether the acceleration parameter is valid and modify the acceleration parameter
Invalid target pose parameter	Check whether the target pose parameter is valid and modify the target pose parameter

0x00030003: Blend move error

Detailed description of the error	Handle advice
Invalid blend radius setting parameter	Check whether the fusion radius parameter is valid and modify the fusion radius parameter

0x00030004: Spline move error

Detailed description of the error	Handle advice
The path input error	Check whether there are two points in Spline programming where the spatial points coincide but there is a change in posture. Modify waypoint information
Invalid velocity setting parameter	Check whether the speed parameter is valid and modify the speed parameter

0x00030005:

Detailed description of the error	Handle advice

0x00030006: Conveyor move error

Detailed description of the error	Handle advice
Conveyor move over limit 0x********	Check whether the current tracking limit distance is reasonable, Check whether the current conveyor speed and encoder value are abnormal.
Robot conveyor sync fail 0x********	Check whether the current conveyor speed and encoder are abnormal, Check whether the current conveyor configuration parameters are reasonable

0x00030007: Handling move error

Detailed description of the error	Handle advice
Unkonwn external force detected, check tcp load parameters	Check that the current robot load mass and centroid parameters are filled in correctly, Check that the current robot installation orientation is set correctly, Check that there is no external force applied to the robot before the robot enters traction mode

0x00030008: Teach replay error

Detailed description of the error	Handle advice
Current point is not same to replay starting point	Confirm the starting point of the reproduction trajectory, and modify the robot script so that the robot is in this position before starting to pull the reproduction task
The path input error	Check whether there are two points in the traction reproduction teaching process where the spatial points coincide but there is a change in posture. Modify waypoint information
Invalid velocity setting parameter	Check whether the speed parameter is valid and modify the speed parameter

0x00030009: Realtime control error

Detailed description of the error	Handle advice
Realtime communication lost	Check the TCP communication wiring and its status
Command joint position exceeds limit	Check the real-time control joint position commands sent to the robot
Command joint speed exceeds limit	Check the real-time control joint position / joint velocity commands sent
Command joint acceleration exceeds limit	to the robot
Command joint jerk exceeds limit	
Command joint torque exceeds limit	Check the real-time control joint moment commands sent to the robot
Command cartesian velocity exceeds limit	Check the real-time control Cartesian position/Cartesian speed commands
Command cartesian acceleration exceeds limit	sent to the robot
Command cartesian jerk exceeds limit	
Inverse kinematic position solve fail	
Inverse kinematic velocity solve fail	
Inverse kinematic acceleration solve fail	
Robot approaches singularity	
Command tool force exceeds limit	Check the real-time control end force commands sent to the robot

0x0003000A: Servo move error

Detailed description of the error	Handle advice
Inverse kinematic position solve fail	Check the ServoMove command sent to the robot
Forward kinematic position solve fail	
Robot approaches singularity	

0x0003000B: Brake test error

Detailed description of the error	Handle advice
Invalid test counter	Confirm whether the joint is effectively displaced during the brake detection
Brake operation error, 0x********	Communication layer problem, confirm the status and wiring of each joint of the robot, and restart the control cabinet

0x0003000C: Dual robot calibration error

Detailed description of the error	Handle advice
Calibration calculation fail code: 0x********	Check whether the multi-machine collaboration function is started normally. Check whether the communication between the master and slave robot is normally connected,Check whether the calibration point position is coplanar, and record the calibration error code 0x********

0x0003000C: Sync Move Error

Detailed description of the error	Handle advice
Sync Move function is deactivated	Check whether the multi-machine collaboration function is properly enabled in the settings page
Illegle client sync move state	Check whether the client robot is in a normal state. Check whether the communication between the master and slave robot is normally connected
Illegle server sync move state	Check whether the server robot is in a normal state.Check whether the communication between the master and slave robot is normally connected
Fail to enter sync move	Contact developer
Sync move start position illegal	Check whether the starting point of multi-machine cooperative motion is and the client robot respectively, and whether the robot is in the server robot in a singular configuration or exceeds the maximum spatial range, and modify the point
Real-time control error	Confirm the status of the master-slave robot, confirm whether the communication between the master and slave robot is normally connected, and confirm whether there is an error in the process of multi-machine cooperative movement

3.3.5 Coordinate system issues[0x04]

0x00040001: Set tcp coodinate failed

Detailed description of the error	Handle advice
	Modify the tool coordinate system name

0x00040002: Set user coodinate failed

Detailed description of the error	Handle advice
	Modify the user coordinate system name

0x00040003: Tcp calibration error

Detailed description of the error	Handle advice
Calibrate points are too close, The distance between any two points should be greater than 1 mm	Re-teach the calibration point position to ensure that the distance between the points is greater than 1mm
Unknown calibration type	

0x00040004: User Coordinate calibration error

Detailed description of the error	Handle advice
Calibrate points are too close, The distance between any two points should be greater than 1 mm	Re-teach the calibration point position to ensure that the distance between the points is greater than 1mm
Calibration points are collinear	

3.3.6 Manipulation mode issues[0x05]

0x00050001: Switch operation mode error

Detailed description of the error	Handle advice
Operation timeout	The safety board is abnormal, confirm the status of the safety board and restart the control cabinet

0x00050002: Switch operation mode error

Detailed description of the error	Handle advice
Robot must in Enable state	After the robot is enabled,switch the simulation mode
Robot must in Stopped state	Stop the current robot motion and the running script and switch the simulation mode

3.3.7 IO port issues[0x06]

0x00060001: Set digital output fail

Detailed description of the error	Handle advice
	Confirm that whether the output port number is correct

0x00060002: Get digtial input fail

Detailed description of the error	Handle advice
	Confirm that whether the output port number is correct

0x00060003: Set digital output failed

Detailed description of the error	Handle advice
io is configured with output function	1.Confirm that whether the output port number is correct; 2.Confirm the current mode of the port

0x00060004: Set digital output fail

Detailed description of the error	Handle advice
io is configured with output function	Check whether the port is configured as a function output

0x00060005: Set analog output mode fail

Detailed description of the error	Handle advice
Communication error 0x********	1.Confirm that whether the output port number is correct; 2.Confirm the current mode of the port

0x00060006: Set analog input mode fail

Detailed description of the error	Handle advice
Communication error 0x********	1.Confirm that whether the output port number is correct; 2.Confirm the current mode of the port

3.3.8 Safety setting issues[0x07]

0x00070001: Safety controller switch to config mode fail

Detailed description of the error	Handle advice
Safety communication state not in OP	Please disable and power off the robot first
Operation timeout	The safety board is abnormal, confirm the status of the safety board and restart the control cabinet

0x00070002: Safety controller exit config mode error

Detailed description of the error	Handle advice
Safety in failure state	The safety board is abnormal, confirm the status of the safety board and restart the control cabinet

0x00070003: Set safety parameters tag error

Detailed description of the error	Handle advice
Operation timeout	The safety board is abnormal, confirm the status of the safety board and restart the control cabinet

0x00070004: Apply safety parameter error

Detailed description of the error	Handle advice
Operation timeout	The safety board is abnormal, confirm the status of the safety board and restart the control cabinet

0x00070005: Set safety parameters error

Detailed description of the error	Handle advice
Safety parameters download fail, 0x********	The communication layer is abnormal, check the line between the controller and the safety board in the control cabinet, Check the line between the safety board and the communication board in the control cabinet(DC30 control cabinet), Restart the control cabinet
Safety parameters upload fail, 0x********	
Safety parameters crc check invalid, 0x********	The communication layer is abnormal, check the status of the safety board, check the line between the controller and the safety board in the control cabinet,Check the line between the safety board and the communication board in the control cabinet(DC30 control cabinet), Restart the control cabinet

0x00070006: Abort set safety parameters error

Detailed description of the error	Handle advice
Operation timeout	Restart the control cabinet

3.3.9 Toolboard issues[0x08]

0x00080001: Set toolboard digital output fail

Detailed description of the error	Handle advice
	Confirm that whether the output port number is correct

0x00080002: Set toolboard io mode error

Detailed description of the error	Handle advice
Mode parameter download fail	1.Confirm that whether the output port number is correct; 2.Confirm the current mode of the port

0x00080003: Config toolboard reuse interface error

Detailed description of the error	Handle advice
Port parameter download fail	Confirm the current interface mode
Baud rate parameter download fail	

0x00080004: Update toolboard firmware error

Detailed description of the error	Handle advice
Firmware upload fail	1.Check whether the upgrade package is damaged. 2.Perform the upgrade operation again

0x00080005: Change toolboard recipe failed

Detailed description of the error	Handle advice
	Rework the recipe

0x00080006: Config toolboard interface name failed

Detailed description of the error	Handle advice
	1.Change the name; 2.Confirm the configured interface number

0x00080007: Tool 485 write fail

Detailed description of the error	Handle advice
Occupied by real cycle or insert the queue fail	Wait for the current task to complete

0x00080008: Tool 485 read fail

Detailed description of the error	Handle advice
Occupied by real cycle or insert the queue fail	Wait for the current task to complete

0x00080009: Set tool led light brightness fail

Detailed description of the error	Handle advice
Configuration parameter write fail	Confirm whether the end board of the current robot is damaged, Confirm whether the robot parameters are stored in the end board of the current robot, Confirm the status of the end board of the robot, Confirm the wiring of the end board of the robot, Restart the control cabinet

3.3.10 Modbus communication issues[0x09]

0x00090001: Add modbus device failed

Detailed description of the error	Handle advice

0x00090002: Delete modbus device failed

Detailed description of the error	Handle advice

0x00090003: Add modbus signal failed

Detailed description of the error	Handle advice

0x00090004: Delete Modbus signal failed

Detailed description of the error	Handle advice

0x00090005: Update modbus signal failed

Detailed description of the error	Handle advice

0x00090006: Write modbus value failed

Detailed description of the error	Handle advice

3.3.11 DataComm[0x0A]

0x000A0001: Tcp socket open fail

Detailed description of the error	Handle advice
socket name already exist or socket num limit exceeded; socket open fail;socket open timeout	1.Check whether there is a socket port with the same name open; 2.Check the socket

0x000A0002: Tcp socket close fail

Detailed description of the error	Handle advice
close socket fail;socket name doesn't exist	Check whether the socket port is closed

0x000A0003: Tcp socket write fail

Detailed description of the error	Handle advice
socket name doesn't exist;socket write fail	Confirm the name of the socket being operated

0x000A0004: Tcp socket read fail

Detailed description of the error	Handle advice
socket name doesn't exist	Confirm the name of the socket being operated

0x000A0005: 485 write fail

Detailed description of the error	Handle advice
in real cycle or insert the queue fail	Wait for the current task to complete

0x000A0006: 485 read fail

Detailed description of the error	Handle advice
in real cycle or already in use	Wait for the current task to complete

0x000A0007: CAN write fail

Detailed description of the error	Handle advice
in real cycle or data length incorrect	Check whether the CAN configuration information is correct

0x000A0008: CAN read fail

Detailed description of the error	Handle advice
in real cycle	Check whether the CAN configuration information is correct

3.3.12 Other issues[0x0F]

0x00F00001: Synchronize robot parameter files fail

Detailed description of the error	Handle advice
Robot parameter files upload fail, 0x********	Confirm whether the end board of the current robot is damaged, Confirm whether the robot parameters are stored in the end
Robot parameter files download fail, 0x********	board of the current robot,Confirm the status and wiring of the end board of the robot, and restart the control cabinet

0x00F00002: Config encode interface fail

Detailed description of the error	Handle advice
IO board paramerter config fail, 0x********	The communication layer is abnormal, check the line between the controller and the safety board in the control cabinet, Check the line between the safety board and the communication board in the control cabinet(DC30 control cabinet), Restart the control cabinet

0x00F00003: Change baud rate fail

Detailed description of the error	Handle advice
Baud rate config fail, 0x********	The communication layer is abnormal, check the line between the controller and the safety board in the control cabinet, Check the line between the safety board and the communication board in the control cabinet(DC30 control cabinet), Restart the control cabinet

0x00F00004: Update firmware fail

0x00F00005: Change can recipe fail

Detailed description of the error	Handle advice
file	Rework the recipe

0x00F00006: Change 485 recipe fail

Detailed description of the error	Handle advice
file	Rework the recipe

0x00F00007: Change socket recipe fail

Detailed description of the error	Handle advice
file	Rework the recipe

0x00F00008: Update robot software fail

0x00F00009: Brake control error

Detailed description of the error	Handle advice
Invalid target control mode	Contact developer
Brake operation interface error, 0x********	The communication layer is abnormal,Check the status and wiring of the servo drive board in the robot. Restart the control cabinet

0x00F0000A: Kinematics calculation error

Detailed description of the error	Handle advice
0x********	Check the target point sent to the robot

0x00F00010: Path length exceed limit

Detailed description of the error	Handle advice
0x********	Re-record the track point

0x00F00020:

Detailed description of the error	Handle advice
	Check whether the current robot model posture is consistent with the actual situation

0x00F00021: Set servo parameter fail

Detailed descrip-tion of the error	Handle advice
0x********	Record detailed error codes and feedback to the developer, Refer to the detailed error code information to troubleshoot communication exceptions

0x00F00022: Apply servo parameter fail

Detailed descrip-tion of the error	Handle advice
0x********	Record detailed error codes and feedback to the developer, Refer to the detailed error code information to troubleshoot communication exceptions

0x00F00023: Path offser calculation error

Detailed description of the error	Handle advice
Invalid path type	Check whether the path type parameter is correct in the corresponding script

3.3.13 EtherCAT communication monitoring issues[0xA0]

0x00A00001: Communication error

Detailed description of the er-ror	Handle advice
code:0x13xxxxxx(busdevice er-ror id) -0xxxxxxxxx(acontis error id)	Record the BusDevice error ID and the ACONTIS error ID, Restart the control cabinet,and contact developer if the problem cannot be eliminated

3.3.14 Safety function monitoring issues[0xA1]

0x00A10000: Unknown joint movement detected during robot power off status

Detailed description of the error	Handle advice
Please verify current joint position accu-racy	Confirm whether the displayed position on the robot teach pendant model matches the real robot position, and continue to operate the robot after confirming that it is correct according to the prompts. If it does not match,it will be Power off, stop using and contact developer

0x00A10001: Safety function violation detected

Detailed description of the error	Handle advice
Safety Error Description - 0x******** (Safety Error Code)	For more information, please refer to the safety function error code, In view of the frequent speed safety problems, priority is given to safety monitoring errors due to speed fluctuations caused by robot vibrations, Try using the vibration control function as long as the site conditions allow

0x00A10002:

Detailed description of the error	Handle advice

0x00A10003: Safety soft protection triggered

Detailed description of the error	Handle advice
Stop x triggered - protection message	Check the trigger cause of the safety input, see safety function error code for details. If it is not a safety input trigger reason,In view of the frequent speed safety problems, priority is given to safety monitoring errors due to speed fluctuations caused by robot vibrations,Try using the vibration control function as long as the site conditions allow

0x00A10004: Collision detection triggered

Detailed description of the error	Handle advice
Safety collision reaction triggered - Joint * / Robot tool / Robot base encountered a collision	1.Check whether the robot collides with the outside world, Check whether the tools, dresspack and other factors have an impact on the normal operation of the robot, etc.; 2.Check whether the load mass and centroid parameters of setting are quite different from the actual working conditions; 3.Check whether there is a large deviation between the installation direction setting and the actual installation direction of the robot; 4.Check whether the brake is out of order.

0x00A10005: Safety function parameters invalid

Detailed description of the error	Handle advice
Safety function parameters need to be updated	Re-execute the process of configuring safety parameters

0x00A10006: 3-position enable button loosen

Detailed description of the error	Handle advice
Stop 2 triggered - 3-position enable button need to be triggered to continue the operation	Check whether the external three-position enable input is configured in the safety parameters,and if so,check whether the three-position enable is pressed normally

0x00A10007: Need to carry out brake test

Detailed description of the error	Handle advice

3.3.15 Joint error monitoring issues[0xA2]

0x00A20100: Axis 1 status abnormal

Detailed description of the error	Handle advice
Axis 1 error detected, code:0x13xxxxxx(BusDevice error ID) -0xxxxxxxxx(Servo error ID)	For more information, see Servo Error Codes

0x00A20200: Axis 2 status abnormal

Detailed description of the error	Handle advice
Axis 2 error detected, code:0x13xxxxxx(BusDevice error ID) -0xxxxxxxxx(Servo error ID)	For more information, see Servo Error Codes

0x00A20300: Axis 3 status abnormal

Detailed description of the error	Handle advice
Axis 3 error detected, code:0x13xxxxxx(BusDevice error ID) -0xxxxxxxxx(Servo error ID)	For more information, see Servo Error Codes

0x00A20200: Axis 4 status abnormal

Detailed description of the error	Handle advice
Axis 4 error detected, code:0x13xxxxxx(BusDevice error ID) -0xxxxxxxxx(Servo error ID)	For more information, see Servo Error Codes

0x00A20200: Axis 5 status abnormal

Detailed description of the error	Handle advice
Axis 5 error detected, code:0x13xxxxxx(BusDevice error ID) -0xxxxxxxxx(Servo error ID)	For more information, see Servo Error Codes

0x00A20200: Axis 6 status abnormal

Detailed description of the error	Handle advice
Axis 6 error detected, code:0x13xxxxxx(BusDevice error ID) -0xxxxxxxxx(Servo error ID)	For more information, see Servo Error Codes

3.3.16 Serial port data monitoring issues[0xA3]

0x00A30001: Port parameters read error

Detailed description of the error	Handle advice
Cannot read serial port existing parameters	Check the serial communication line inside the control cabinet

0x00A30002: Set port parameters error

Detailed description of the error	Handle advice
Cannot set serial port parameters	Check the serial communication line inside the control cabinet

0x00A30101: Serial port open failed

Detailed description of the error	Handle advice
Serial port of power control board open failed	Check the serial communication cable of the power management board inside the control cabinet

0x00A30102: Abnormal communication detected

Detailed description of the error	Handle advice
Failed to send power control message/ power off message ····..	Check the serial communication cable of the power management board inside the control cabinet

0x00A30103: Abnormal communication detected

Detailed description of the error	Handle advice
Cannot receive the message from power control board	Check the serial communication cable of the power management board inside the control cabinet

0x00A30104: Power control board error

Detailed description of the error	Handle advice
Precharge resistor is overheated, please restart	Let it sit for a while after shutting down

0x00A30105: Power control board error

Detailed description of the error	Handle advice
Temperature of Power control board is too high, please restart	Let it sit for a while after shutting down

0x00A30106: Abnormal communication detected

Detailed description of the error	Handle advice
Failed to send restart message	Check the serial communication cable of the power management board inside the control cabinet

0x00A30201: Serial port open failed

Detailed description of the error	Handle advice
Serial port of teach pendant open failed	Check the teach pendant wiring in the inside of the control cabinet

0x00A30202: Manual movement is not allowed

Detailed description of the error	Handle advice
Teach pendent button disabled, robot need to be enabled	Start the teach pendant button

3.3.17 Websocket interface[0xB0]

0x00B00001:

Detailed description of the error	handle advice

3.3.18 TCP/IP interface[0xB1]

3.3.19 RPC interface[0xB2]

3.3.20 Profinet interface[0xB3]

3.3.21 Compilation issues[0xC0-0xC1]

0x00C00000: compiler error

Detailed description of the error	handle advice
See error description	Check the program logic

0x00C10001: Task Parameter mismatch

Detailed description of the error	handle advice
task_name	Confirm the Parameter correctness of task

3.4 Servo Error Code

Fault Detail		Fault Cause	Troubleshooting Method or Solution
Comp atibility error	(#99)C ompati bility Err	The driver firmware version is too low. The firmware versions of CPU1 and CPU2 are incompatible.	Suggestion: Upgrade the firmware versions of drives CPU1 and CPU2 to the latest version.
Bus und ervoltage	w0 **Under_** voltag e_soft (0000 0001)	Failure of the power supply itself	Check whether the power output is proper.
		Insufficient power supply	Check whether only one power supply is connected to the large-load control cabinet.

Table 2 – continued from previous page

Fault Detail		Fault Cause	Troubleshooting Method or Solution
		Excessive speed or load (often accompanied by 20 hardware failures or 8000 current loop saturation failures)	Check for excessive load and track speed.
		Driver device falling off Driver device welding error	Exclude the above problems and try to replace the drive.
Bus ov ervoltage	w **1Over_** voltag e_soft (0000 0002)	Power supply voltage fault	Check whether the power supply voltage is within the operating range
		The brake board is not connected.	Check whether the brake board is connected
		The hardware circuit of the overvoltage protection part is wrong. The driver device falls off or is welded incorrectly.	Exclude the above problems and replace the drive.
Overspeed	w3Over _Speed (0000 0008)	The ABS encoder is abnormal or the INC encoder is faulty	Refer to Section 5.5 to check the corresponding sensor and harness according to ABS and INC error messages.
Driver te mperature sensor fault	w4IGB **TTemp_** sensor _error (0000 0010)	Thermistor missing or welding error.	Replace the drive.
Hardware ove rcurrent/ unde rvoltage/ ov ervoltage	w5Ha rdware _error (0000 0020)	The UVW is loose or in poor contact.	If the current waveform sometimes changes to 0, check whether the UVW cable is secure.
		The INC connection sequence is reversed or the pulse is lost.	**Check whether the INC connection is correct, whether the code disk is scratched, and whether the installation is qualified; Refer to Section 5.5 to search for INC code loss.**

Table 2 – continued from previous page

Fault Detail		Fault Cause	Troubleshooting Method or Solution
		If 1 undervoltage or 8000 current ring saturation fault occurs at the same time during operation, the possible cause is that the bus voltage drops abnormally	The oscilloscope observes whether the bus voltage is normal
		Incorrect parameters lead to current oscillation and overcurrent	Confirm the servo parameters.
		After the upper computer detects the collision, the back-up acceleration instruction is too large. Excessive user trajectory acceleration and speed;	**Check the 1og file for collision detection at the same time. Check the parameter settings of user trajectories.**
		The power supply is insufficient, and there is a problem with the current sharing module (for example, all joints of the whole arm report the fault at the same time)	Replace the power supply or current balancing module.
		The driver board hardware faulty	If the preceding information is normal, replace the drive.
		ABS encoder is abnormal.	**Refer to Section 5.5 to query the ABS status.**
Position error out of limit	w6Pos i_Erro r_Over (0000 0040)	The three-phase line sequence of the motor itself is reversed.	Check whether the three-phase cable sequence of the motor is reversed.
		UVW tightening force is too strong, resulting in the fracture of the three-phase cable.	Check whether the three-phase cable of the motor is broken.
		The INC wiring harness is reversed. The reading head code disk installation gap is problematic. The radial installation distance is problematic. The code disk is contaminated.	Check INC encoders one by one (harness sequence, code disk, mounting distance, reading head).

Table 2 – continued from previous page

Fault Detail		Fault Cause	Troubleshooting Method or Solution
Driver board o ver-heated	w7I GBT_Ov ertemp (0000 0080)	The ambient tempera-ture is too high or the thermistor is damaged.	Stop running for a period of time. After the temperature drops, power on the driver and check whether the ambient temperature exceeds the threshold. If no, the ambient temperature exceeds the threshold
Self-test failure	w8Se lfTest (0000 0100)	The power-on self-test of the driver board failed.	Power off and restart. If the error is still re-ported, contact R & D.
Ethernet comm unica-tion overtime	w9 No_Mot ionCMD (0000 0200)	The ECAT network ca-ble or connector ter-minal is damaged (for example, the buckle is damaged).	Try to change the cable; Attempt to change the drive.
		If the communication is broken, the communi-cation recovers by it-self after cooling for a while: the power chip overtemperature causes the DSP to reset.	Check whether the am-bient temperature is too high.
		The communication is completely discon-nected and can be restored after being powered on again: the communication module is overheated.	Check whether the am-bient temperature is too high.
U-phase current sensor fault	w10Cur **rentu_** sensor _error (0000 0400)	H ardware-related fault	Replace the drive.
Invalid ABS encoder data	w **11ABS_** data_i nvalid (0000 0800)	H ardware-related fault	Refer to Section 5.5 and check the wiring har-ness and encoder ac-cording to the ABS er-ror message; If nothing goes wrong, replace the drive.
Bus voltage sensor fault	w12Vo **ltage_** sensor _error (0000 1000)	The bus voltage sens-ing chip is not welded, welded incorrectly or damaged.	Replace the drive.

Table 2 – continued from previous page

Fault Detail		Fault Cause	Troubleshooting Method or Solution
Abnormal ABS encoder c onnection	w **13ABS_** lost_c onnect (0000 2000)	ABS encoder harness contact is poor.	Replace the ABS harness.
		The driver board connector is damaged or in poor contact	Replace the drive board.
Current sampling module fault	w 14Curr _samp_ module _error (0000 4000)	H ardware-related fault	Replace the drive.
Current loop s aturation fault	w 15Satu ration (0000 8000)	The current sharing module of the power cabinet is not connected, and the voltage drops due to insufficient power under high speed and acceleration conditions.	Check whether only one power module is connected to the large-load cabinet.
		A phase of the motor is broken.	Check whether the three-phase cable of the motor is tight.
		Instruction acc eleration/speed is too high.	Check user trajectory parameter settings.
		The MOSFET is damaged or the current sampling chip is removed.	Replace the drive.
Hardware version error	w16Har dwareV ersion (0001 0000)	The hardware version number is not written or is incorrectly written.	Return to incoming material inspection station for processing
Motor overte mperature	w18M otorOv erHeat (0004 0000)	**The electromagnet did not bounce off.**	**Check whether the electromagnet bounces off.**
		Command spe ed/ acceleration is too large.	Check the user trajectory.
		INC failure; Motor three-phase line sequence reverse; Parameter file error.	**Check INC code loss with reference to Section 5.5, check the motor three-phase line sequence, and confirm the parameter file.**
main control chip overheat	w20 DSP_Ov erTemp (0010 0000)	DSP overtemperature	Ambient temperature is too high.

Table 2 – continued from previous page

Fault Detail		Fault Cause	Troubleshooting Method or Solution
Double encoder ca li-bration error	w21Enc oderHa llCros sCheck (0020 0000)	Incorrect reduction ra-tio setting of joint re-ducer, ABS or INC-related failure	Reconfigure the joint deceleration ratio or check the deceleration model number, refer to Section 5.5 to trou-bleshoot the encoder problem and further target.
ABS encoder CRC check error	w22A BS_CRC _error (0040 0000)	The ABS read head model is not matched, or the signal is inter-fered, or the servo pa-rameters are incorrect	Replace the wiring har-ness, ensure that the reading head is correct, and confirm the servo parameters.
Near invalid ABS en-coder data	w **24ABS_** data_w arn-ing (0100 0000)	Hardware related	Refer to Section 5.5 to identify the root cause.
INC encoder pulse loss	w25INC _error (0200 0000)	The INC code disk is contaminated.	Wipe the code tray if it is contaminated.
		There is a problem with INC installation.	Use INC special detec-tor test, if the same er-ror, adjust the reading head axial/ radial posi-tion, adjust the assem-bly of the code disc, ad-just the gap between the reading head and the code disc.
		Loose connector	The connector is glued and fixed.
		Driver hardware circuit error (push-down resis-tance not removed)	Replace the drive board.
		There's a problem with the harness	Replace the harness.
		Driver board fault	Exclude the preceding faults and replace the driver board.
V phase current sensor fault	w27Cur **rentv_** sensor _error (0800 0000)	H ardware-related fault	Replace the drive.
W phase current sensor fault	w28Cur **rentw_** sensor _error (1000 0000)	H ardware-related fault	Replace the drive.
Phase finding failure	w29Ha llLess _Doubl eCheck (2000 0000)	**INC harness sequence is incorrect.**	**Check that whether the INC harness se-quence is correct.**

Table 2 – continued from previous page

Fault Detail		Fault Cause	Troubleshooting Method or Solution
		The gap between INC read head and code disk is unqualified.	**Test to ensure compliance.**
		The welded heads on the INC harness are bent causing reading problems.	**Replace the unbent harness.**
		The three-phase UVW line of the motor itself is welded back.	**Adjust the UVW to the correct connection to the drive.**
		Wrong parameter file	Confirm the parameter file.
INC encoder loss Z	w30 INCnoZ (4000 0000)	**INC code disk design problems.**	**Replace the correct INC code disk.**
		INC disc radial mounting problem	**Reinstall the INC platter and read head, and control the motor radial runout.**
Elec tromagnet current overflow	w31 BrakeO verCur (8000 0000)	Voltage drop due to overtemperature or insufficient power supply	The driver board recovers after power failure for a period of time, indicating that the temperature is the problem. Check whether the power supply is connected only one way or the user's command track speed/ acceleration is too large.

3.5 Description of the Servo Error Message

When a fault occurs, the controller of the robot arm will automatically query the internal fault word of each axis (provided that the robot arm is not powered off), and the detailed servo error information can be queried by exporting the log information, as shown in Figure 1.

```
[23-02-23-13:31:44][info]Axis   4 servo error debug code: 1:0x      0 2:0x     0 3:0x     0 4:0x     0 5:0x     0 6:0x     0 7:0x     0 8:0x     0
[23-02-23-13:31:44][info]Axis   4 servo error debug code: 9:0x      0 10:0x     0 11:0x     0 12:0x     0 13:0x     0 14:0x   2000 15:0x     0 16:0.0
```
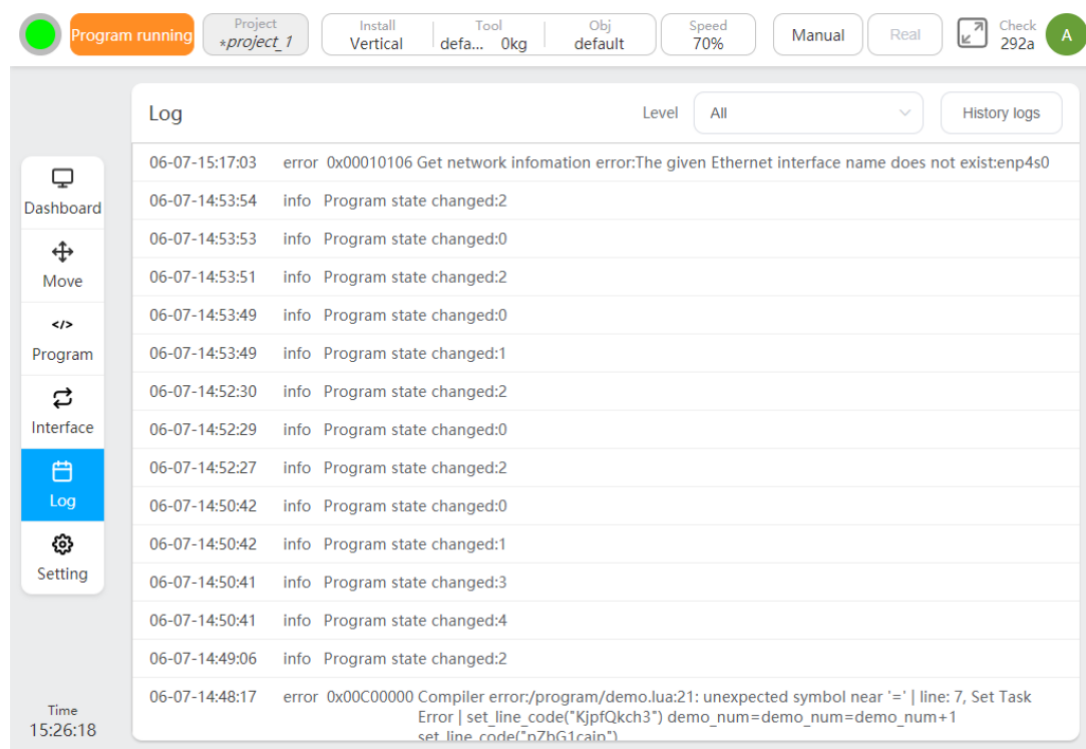
Figure 1 Error information reported on each axis

The message meaning of the error code is as follows:

a) Values 1 to 10 indicate the error axis time. The first 10 hexadecimal numbers related to the INC encoder, whose specific meaning and order are as follows:

1)The pulse number automatically compensated by the firmware;

2)The pulse number increment between the last two Z pulses;

3)The pulse number increment between the first two Z pulses when the maximum code loss occurs;

4)The code corresponding to the last Z-pulse before the fault;

5)~9)The codes corresponding to the last 5 Z pulses (1 circle 0~FFFF);

10)The reference code corresponding to the Z pulse (1 circle 0~FFFF);

b) The values 11 to 15 are hexadecimal numbers. The corresponding meanings are as follows:

11)The maximum code loss value in history (read by the INC encoder) since the last cleaning fault or power-on;

12)ABS fault code;

13)Continuous current loop saturation time (within 100us) before servo fault alarm;

14)The historical fault LOG contains four digits higher information. (Read Section 5.4)

15)The historical fault LOG contains four digits lower information. (Read Section 5.4)

c) The value 16 is a decimal number with the following meanings:

16)The maximum number of consecutive EtherCAT frames lost since power-on (maximum 4);

3.6 Methods for Querying Joint Fault Information

You can query joint fault information as follows:

   a) INC encoder code loss information query

   Taking Axis1 as an example (refer to 11 in Figure 1): The historical maximum code loss since the last cleanup or power-on is explained as follows:

   Definition of reading: The historical maximum code loss value since the last fault clearance or last power-on;

   Conversion method: Assume that the reading is M (converted decimal), INC coil number L; Then:

   The angle corresponding to the code drop (°) = (M/65536) * 360;

   The number of encoder pulses corresponding to code loss = (M/65536) * (L*4);

   Note: (1) The INC code loss that results in complete loss of encoder pulse due to reading head damage and other reasons cannot be detected. (2) The detailed code loss information can be referred to records 1) ~10).

   b) ABS encoder fault query

   Taking Axis1 as an example (refer to Figure 1 12): ABS fault code, meaning all the fault bits that have occurred since power-on, and detailed alarm information and examples are shown in the following figure.

   c) Current loop saturation duration query

   Taking Axis1 as an example (refer to 13 in Figure 1): The current loop saturation time (within 100us) that occurs continuously before the servo fault alarm.

   d) Historical fault LOG information query

   1) High 4 bits of information: taking Axis1 as an example (refer to 14 in Figure 1);

   2) Low 4 bits of information: taking Axis1 as an example (refer to 15 in Figure 1);

   3) Combine the high and low information into an 8-digit hexadecimal number. You can view the fault information in the table. The fault information means all the faults (including the masked faults) that have occurred since the last fault clearance or last power-on;

   4) Specific examples: read high message 0010 and low message 0020; Combine the high-bit and low-bit information into an 8-digit hexadecimal number 00100020. Check the table for the fault information: Hardware fault and DSP overtemperature.

   e) Historical EtherCAT frame drop information query

   Taking Axis1 as an example (refer to 16 in Figure 1): The number of consecutive frames (up to 4) that have been lost since power-on.

实例：ABS故障码	实例：ABS故障码拆解为16个二进制位	16个二进制位报警信息	ABS编码器故障含义
513（十进制）	0	15（高位）	Error记圈错误，断电状态转动超过90°
	0	14	Error间隙过小或存在外部强磁场
	0	13	Warning 间隙过小或存在外部强磁场
	0	12	Error 读头传感器故障
	0	11	Error 读数错误，电场干扰、接地或射频干扰
	0	10	Error 配置错误
	1	9（报警类型）	Error 读数错误，数据不可用
	0	8（报警类型）	Warning 警告，精度或分辨率降低
	0	7	Warning 间隙过小或存在外部强磁场
	0	6	Warning 间隙过大
	0	5	Error 信号丢失，读数头装偏或磁环损坏
	0	4	Warning 温度超限
	0	3	Error 供电电压故障
	0	2	Error 编码器系统故障
	0	1	Error 磁场问题，有外部磁场、异物或安装位置超限
	1	0（低位）	Error 位置突变

备注：实例中ABS故障码为513，对应的故障为：Error 读数错误，数据不可用、Error 位置突变

Figure 2 ABS error message

3.7 Error Message from Safety Controller

Safety controller main status:

SS_INIT	0
SS_WAIT	2
SS_CONFIG	3
SS_POWER_OFF	4
SS_RUN	5
SS_RECOVERY	6
SS_STOP2	7
SS_STOP1	8
SS_STOP0	9
SS_MODEL	10
SS_REDUCE	12
SS_BOOT	13
SS_FAIL	14
SS_ARM_BOOT	15

3.8 Error Code Table Reported by the Safety Controller

31-24	23-20	19-16	15-8	7	6	5	4	3	2	1	0
Chip coding	Master state machine status	Error function module	Error type	Error type	SN	SN	SN	SN	SN	SN	SN
mcu1: 5 mcu2: 6	Refer to Section 5.7	01- ethercat communication disconnected						1			
		02- Stack overflow						1			
		03- estop							channel3	channel2	channel1
		04- Active input IO							Configurable input 2	Configurable input 1	Protective stop
		05- Kinematic limitations	01- Joint position	Double MCU is inconsistent	6	5	4	3	2		Joint 1
			02- Joint velocity	Double MCU is inconsistent	6	5	4	3	2		Joint 1
			3- Joint force	Double MCU is inconsistent	6	5	4	3	2		Joint 1
			4- tcp velocity	Double MCU is inconsistent	6	5	4	3	2		tcp1
			5- tcp safety plane	Double MCU is inconsistent	6	5	4	3	2		Plane 1
			6- elbow velocity	Double MCU is inconsistent	6	5	4	3	2		Joint 1
			7- elbow safety plane	Double MCU is inconsistent	6	5	4	3	2		Plane 1
			8- tcp velocity exceeds manual mode limit	Double MCU is inconsistent	6	5	4	3	2		tcp1
		06- Failed to stop						1			
		07- Load detection								Channel 2	Channel 1
		08- Overvoltage and undervoltage					24v overvoltage and undervoltage	5v undervoltage	5v overvoltage	24v undervoltage	24v overvoltage
		09- Excessive temperature						1			
		10- Power-on failure						1			
		11- Power-off instruction						1			
		12- IO output detection						1- channel 4	1- channel 3	1- channel 2	1- channel 1
		13- The running status of the double MCUS is inconsistent	gl_state (Global state of another chip)								
		14- mode or enable is inconsistent						1			
		15- Power exceeds limit or double MCU cross check fails		Double MCU is inconsistent							