

# Introduction

## ◆ Manual description:

In order for customers to use Moka universal six-axis welding series robot products safely and accurately, this manual has been specially written to cover safe handling, installation, operation and maintenance. It can be downloaded and consulted from the company's official website ([mocarobot.com](http://mocarobot.com))

## ◆ Device Description:

### 1. Overview:

This series of welding robot products mainly consists of the robot body, robot electric control cabinet, welding power supply, welding gun and wire feeding device. This model of welding robot can perform conventional welding work on carbon steel, stainless steel, galvanized sheets, and aluminum materials. It has functions such as ultra-low spatter, standard single pulse, ultra-short arc pulse, constant penetration, and fast spot welding.

### 2. Performance features:

- ① High speed: Continuous and stable high-speed
- ② work to improve production efficiency. High
- ③ precision: Precisely control movements
- ④ and reduce human errors.
- ⑤ High flexibility: The spatter generated during the welding process is minimal, and the weld seam is beautifully formed.  
Digitalization: Fully digital control system enables precise control of the welding process and stable arc length. Expert database: The system has built-in welding expert database and automatic and intelligent parameter combination.
- ⑥ Easy to use: The control system has a simple interface, simple operation and easy to use.

### 3. Application areas:

Agricultural machinery industry welding, coal machinery industry welding, engineering equipment welding, furniture industry welding, machine tool accessories welding, window guardrail welding, high and low bed frame welding, automobile and spare parts industry welding, (bicycle, electric vehicle and tricycle) industry welding.

## Preface

This user manual is applicable to the robot body models as shown in the following table:

Model type	Model name	Payload	Robot weight
Welding robot	MR10W-1440	10KG	210KG
	MR12-2010	12KG	313KG

## Warranty

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**This series of models is shipped and delivered after rigorous testing by our company. For detailed warranty information, please contact the agent where you purchased it.**

❖ **Warranty period :** 1 from the date of delivery of this product to the customer The warranty period is within one year. If the customer needs services such as extending the warranty period , please contact the agent where you purchased it.

❖ **Warranty object :** Products delivered with original packaging by our company

❖ **Situations that cause malfunctions not covered by the warranty:**

1. Failure to strictly follow the manual requirements or industrial standards for product transportation, installation, wiring, connection of other auxiliary control equipment, and inspection Repair, maintenance, etc.;
2. A serious collision or other accident occurs during use;
3. When used, the product usage parameters or performance standards shown in this manual are exceeded;
4. The placement environment, working conditions, and usage do not comply with the specified range or restriction range of the product in the instruction manual;
5. Unauthorized modification of original product parts or structures resulting in abnormal operation or functional failure of the product;
6. Product damage caused by natural disasters such as fires, earthquakes, floods, and lightning strikes;
7. Except for the above circumstances, other malfunctions are not caused by the product itself and are not caused by Tongka's responsibility;

**According to the above instructions or relevant terms, our company will only monitor products and parts that are shipped directly or sold to agent dealers. We guarantee the defects, defects and malfunctions. Furthermore, we are not responsible for any consequential damages or other consequences of any kind arising from the products. The card does not assume any relevant liability ( as detailed in Chapter 2.4 - Limitation of Liability in this User Manual ).**

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## General safety instructions before use

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### 1. Preface

Thank you for purchasing and using our company's robot products. Please read the manual content carefully before using the product. Based on your understanding of the content, Use with caution. Please read this manual to fully understand the detailed functions and precautions of the robot.

### 2. Safety instructions in the instruction manual

When introducing product information and operation content in this manual, the following signs are attached for supplementary explanation to assist users in clearly understanding the use of the product. Pay attention to the precautions and quickly get started using our products. Please read the content carefully before installing and using the product. If you omit or overlook important Required safety precautions and solutions may cause safety accidents such as casualties or equipment damage.

 Danger	<b>Incorrect operation may result in serious injury or death.</b>
 warn	<b>If the operation is incorrect, the operator and other workers may be slightly injured or the equipment may be damaged.</b>
 remind	<b>Remind you of some precautions or quick operation methods, etc.</b>
 Notice	<b>Annotate or emphasize some special content</b>

### 3. Precautions

1. When transporting and installing the robot, be sure to follow the methods shown in this manual, otherwise the robot may tip over and cause an accident.
2. There should be no heavy hanging objects above the robot to prevent it from falling and damaging equipment such as the robot or injuring workers.

3. Be sure to define a safe area before installing the robot to prevent stray people from entering and causing injury.

## General instructions before use

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4. Do not expose this product to places with water vapor, corrosive gases, flammable gases and other substances, otherwise it may cause electric shock. Or accidents such as fire.
5. Before starting the machine, please confirm whether the emergency stop device can be activated at any time.
6. When using the robot for the first time, be sure to operate it at a low speed first, then gradually accelerate it, and confirm whether there are any abnormalities.
7. When the robot is running, it is prohibited to operate within the working range of the robot to avoid personal injury.
8. All peripheral devices should be connected to appropriate ground wires.
9. It is strictly prohibited to move the axes of the robot at will, otherwise it may cause personal injury and equipment damage.
10. It is strictly prohibited to lean on the electric control cabinet or touch the buttons at will to prevent the robot from making unexpected movements and causing personal injury or equipment damage. damage.
11. During operation, please do not touch the controller and manipulator at will, otherwise it may cause burns or bruises.
12. When the power is on, it is prohibited to open the electrical cabinet door.
13. Power off<sup>10</sup> Do not touch the terminals within minutes to avoid electric shock accidents.
14. Do not change the wiring while the power is on, otherwise it may cause electric shock.
15. Do not switch the power on and off frequently. If you need to switch the power on and off continuously, please control it once a minute.
16. Please have operators who meet the job requirements and qualifications perform relevant operations.
17. Emergency stop can only be used to stop the robot in emergency situations, and cannot be used to stop the normal program, shut down the robot, etc.
18. When disassembling the robot, pay attention to the parts that may fall from the robot to avoid injuring people.
19. When using the teaching pendant, wearing gloves may lead to operational errors. Be sure to take off the gloves before operation.
20. Protective measures must be taken when wiring and piping between the electrical control cabinet, the robot, and peripheral equipment, such as removing pipes, wires, or cables from the pit. Pass it through inside or cover it with a protective cover to prevent it from being stepped on or damaged by being rolled over by a forklift.
21. Any working robot may have unpredictable movements, causing serious injury to people within the working range or damage to the equipment. Cause damage. Before preparing the robot to work, the reliability of each safety measure ( fence gate, brake, safety indicator light ) needs to be tested . Before turning on the robot, make sure there are no other people within the robot's working range.
22. The operating range and load conditions set through the software must not exceed the specified values in the product specification table. Improper settings may cause personal injury. Injury or machine damage.
23. If work must be performed within the robot's working range , the following rules must be followed:
  - When the robot is in manual mode, the speed must be limited to 250mm/s below; when the robot needs to be adjusted to manual full speed, Only professionals who fully understand the risks should operate it;
  - Pay attention to the rotating joints of the robot to prevent hair and clothes from being involved in the joints; also pay attention to the robot or other ancillary equipment. Other dangers that may arise from exercise;
  - Test whether the motor holding brake is working properly to prevent personal injury caused by

abnormality of the robot;

- Consider contingency plans when the robot suddenly moves to its own location.



warn

请任何人勿站在机器人机械臂下，防止机器异常工作导致人员受伤。



remind

请在机器人操作区域附近设置灭火器设备，以免机器人意外失火造成人员伤亡或财物损坏。

## 4. Robot stop function

### 1. Power off and stop

This is a robot stopping method that turns off the servo power and stops the robot's motion instantly. Because it is disconnected when the robot moves Servo power supply, the trajectory of the deceleration action cannot be controlled. Stop the operation by cutting off the power and perform the following processing:

- After the alarm is issued, disconnect the servo power supply. The robot's movements stopped for a moment.
- Pause program execution.

For a robot in motion, frequent power-off operations such as emergency stop buttons will cause the robot to malfunction. Everyday situations should be avoided System configuration for power failure shutdown.

### 2. Alarm stop

This is a robot stop that uses control instructions to decelerate and stop the robot after the robot system issues an alarm ( except for the power-off alarm ). stop method. Stop by controlling and perform the following processing:

- The robot system issues an alarm due to overload, malfunction, etc. (except for power outage alarm ) .
- The servo system issues a " control stop " command to decelerate and stop the robot's movement, pausing the execution of the program.
- Disconnect servo power.

### 3. Keep

This is a robot stopping method that maintains servo power and decelerates the robot's movements to a stop. By holding, the following processing is performed:

- Slow down and stop the robot's movements and pause the execution of the program.





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# 1. product specifications and performance

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## 1.1 Robot ontology model



● MR10W-1440 robot model

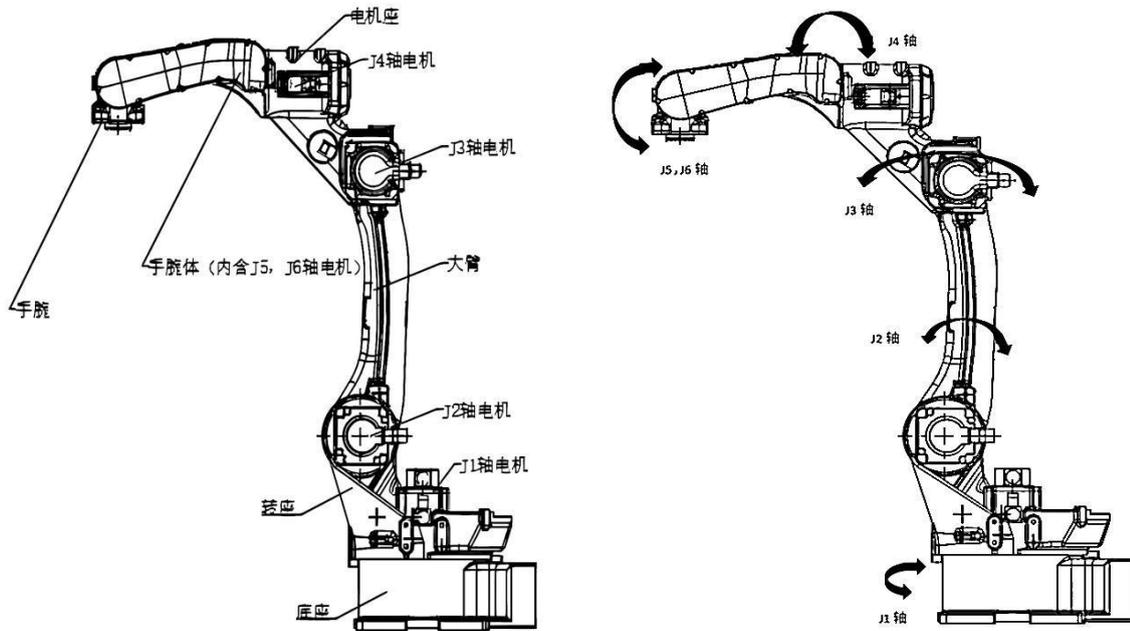


● MR12-2010 robot model

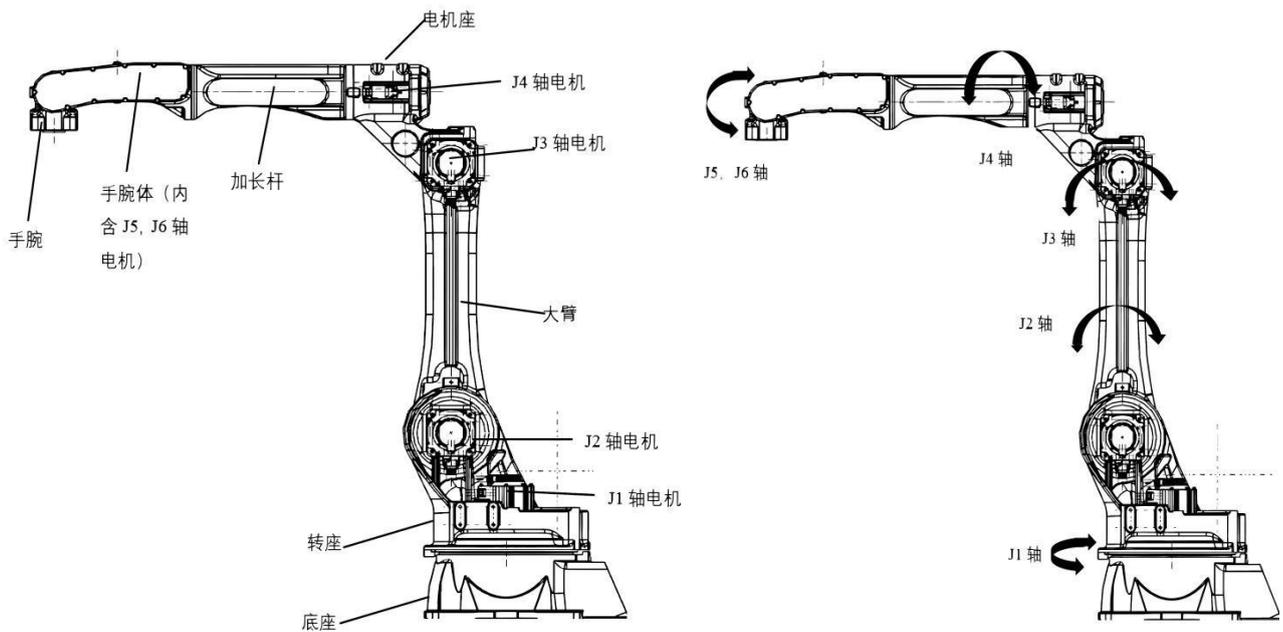
## 1.2 Robot body composition and movement direction

The robot body refers to the mechanism used to grab or move tools and workpieces in the robot system. This series of welding robot products are six-free. The names and action directions of each structure (main part) of the tandem robot are as follows:

- MR10W-1440 Schematic diagram of robot composition and action orientation

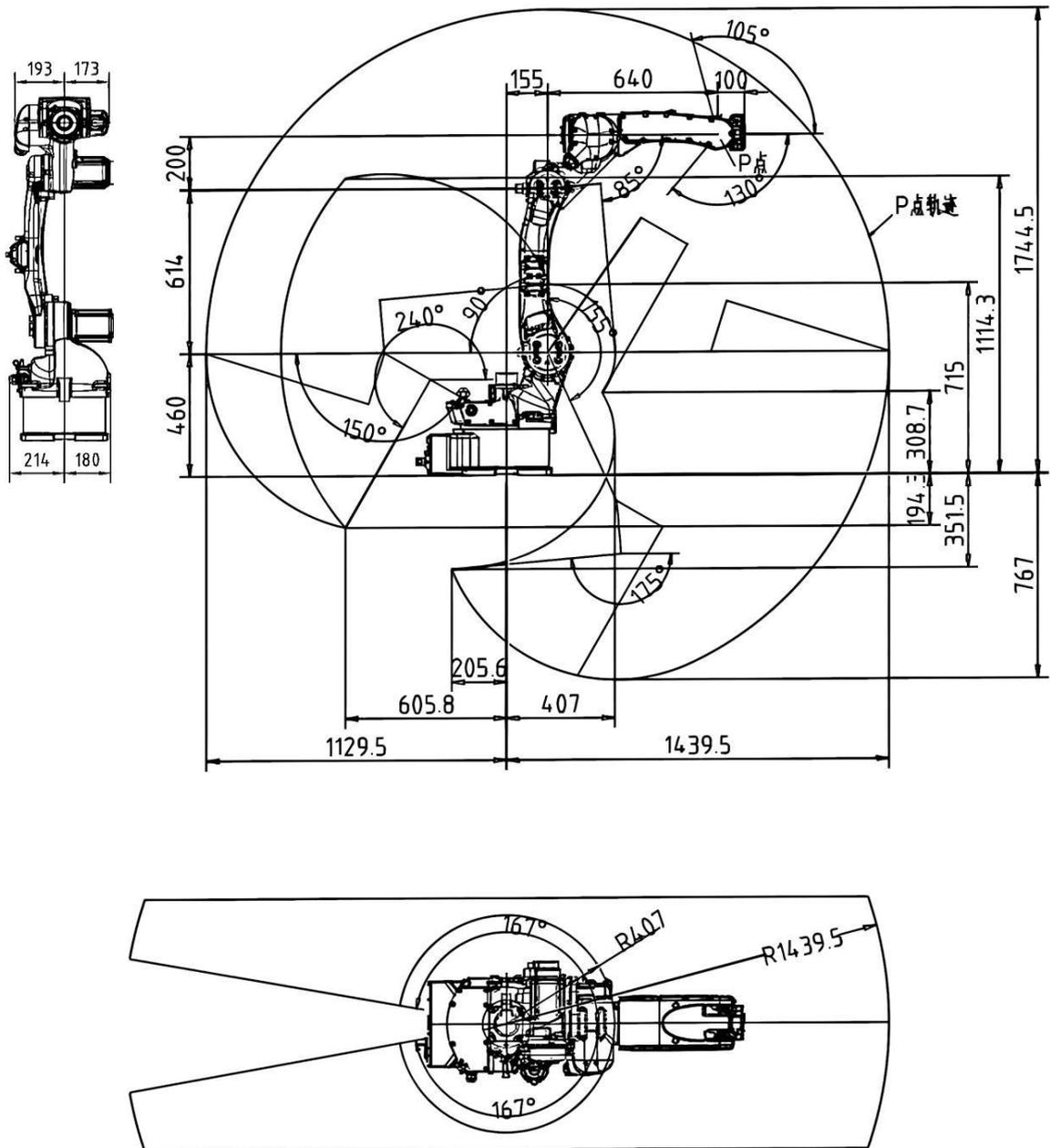


- MR12-2010 Schematic diagram of robot composition and action orientation

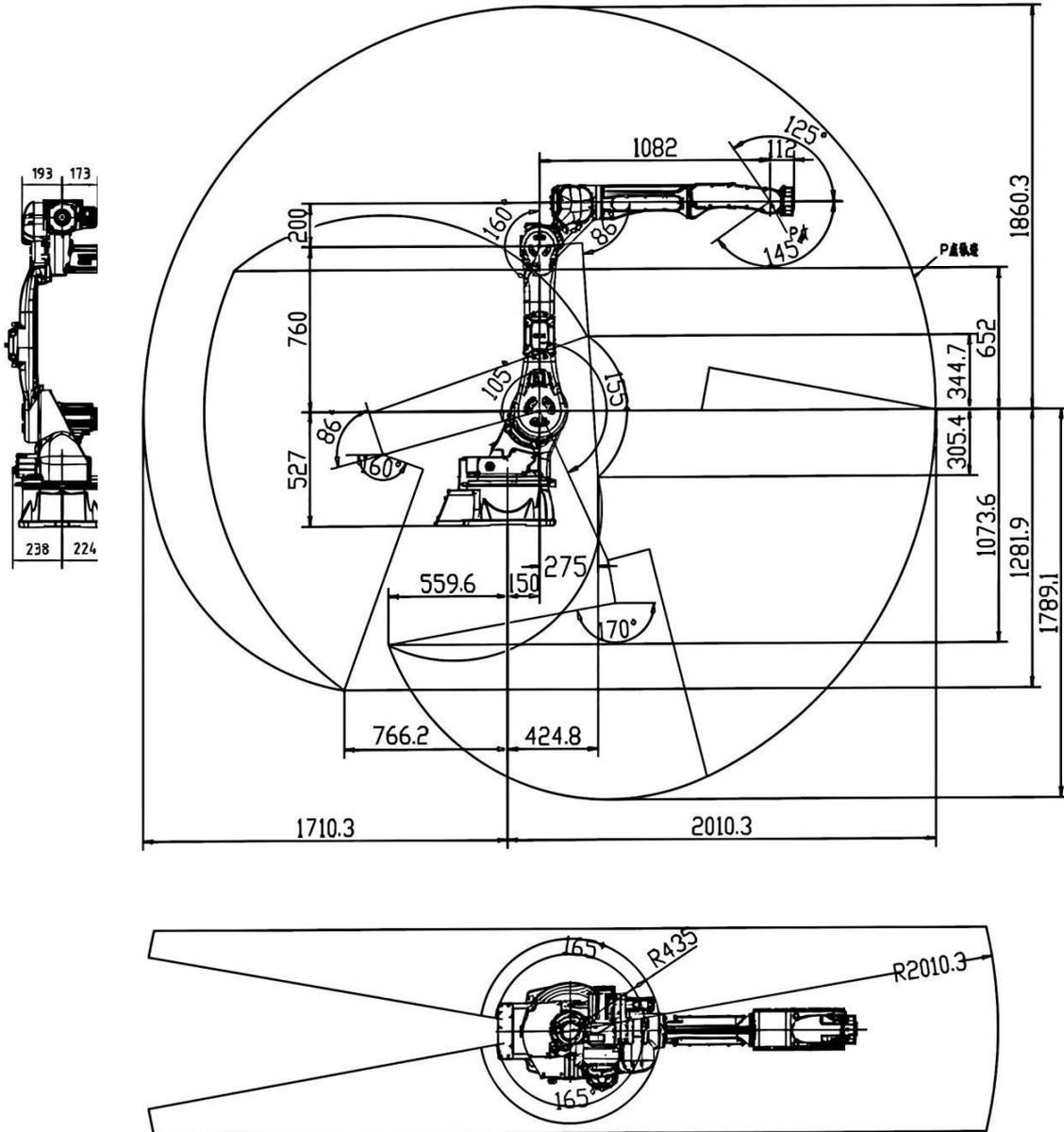


### 1.3 Robot dimensions and movement range

- MR10W-1440 Robot dimensions and movement range  
(Unit : mm Shaded area :p point action range )

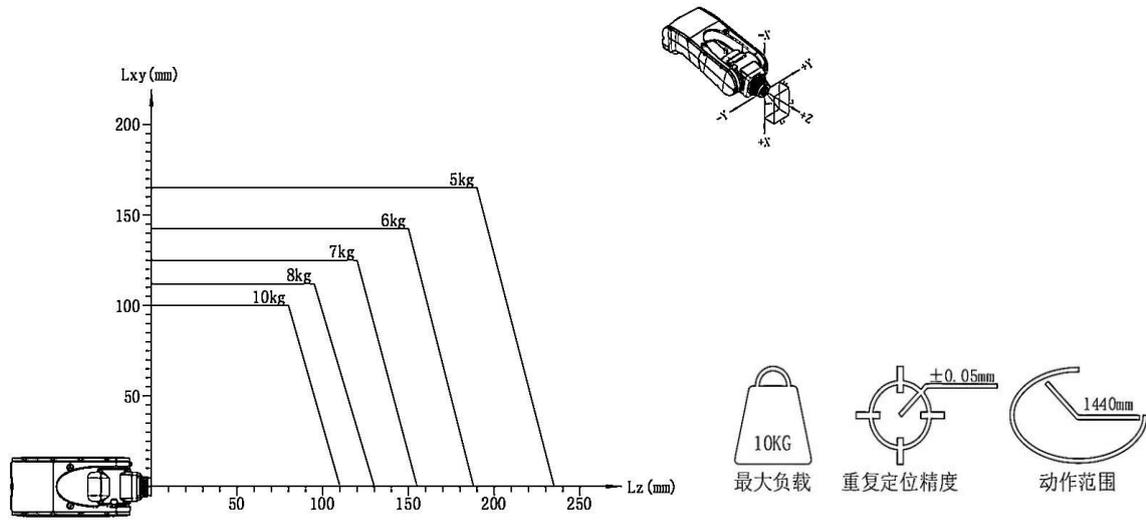


- MR12-2010 Robot dimensions and movement range  
(Unit : mm Shaded area :p point action range )



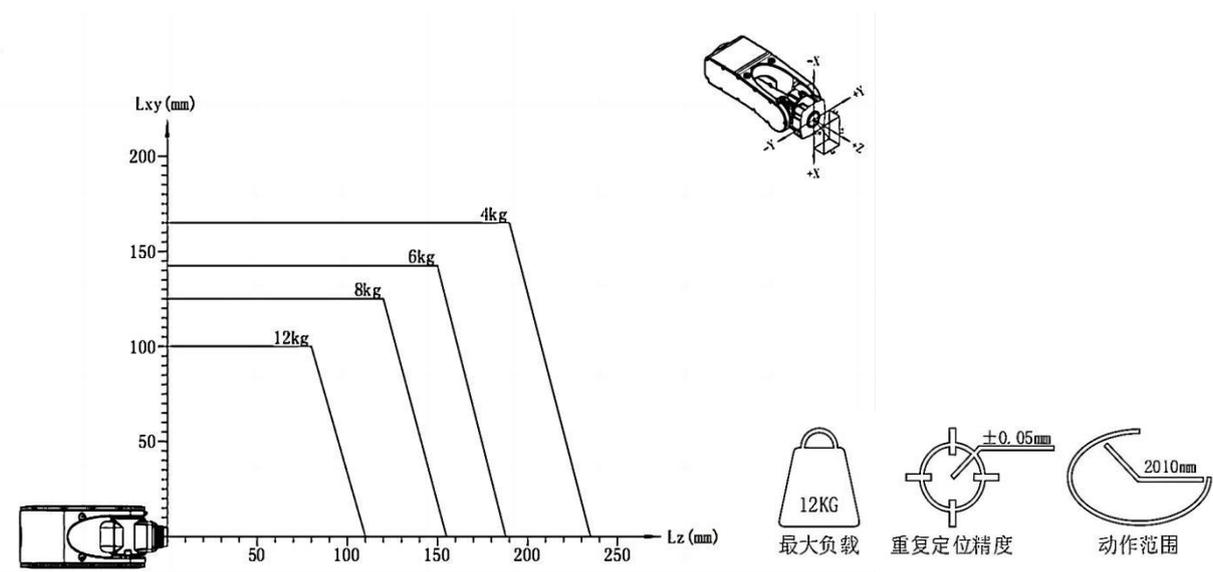
### 1.4 Wrist load conditions

The load capacity of the robot (including the mass of the hand gripper, welding gun, etc.) depends on the model of the robot. Please strictly abide by the responsibility for robots Loading



moment and load inertia limits, the load conditions should be within the range shown in the chart.

● MR10W-1440 robot wrist load diagram



● MR12-2010 Robot wrist load diagram

## 1.4 Equipment specifications

### 1.4.1 Robot body specifications

model	MR10W-1440	MR12-2010
Number of axes	6 axis	6 axis
Movement radius	1440mm	2010mm
finite load	10KG	12KG
Protection level	J1 , J2 Shaft TP56 (J3 , J4 , J5 , J6 Shaft TP67)	J1 , J2 Shaft TP56 (J3 , J4 , J5 , J6 Shaft TP67)
Installation method	Floor type / stand type / upside down type	Floor type / stand type / upside down type
battery capacity	4.5kW	6KW
input / output signals	Standard configuration 16 Enter /16 Out 24VDC	Standard configuration 16 Enter /16 Out 24VDC
Robot weight	210KG	313KG
Repeatability	±0.05	±0.05
range of motion		
1 Axis S	± 167°	± 165°
2 Axis L	+ 80° to - 145°	+ 80° to - 145°
3 Axis U	+ 145° to - 75°	+ 145° to - 75°
4 Axis R	± 190°	± 190°
5 Axis B	+ 50° to - 210°	+ 50° to - 210°
6 Axis T	± 220°	± 220°
Movement speed		
1 Axis S	285° /	203° /
2 Axis L	247° /	203° /
3 Axis U	285° /	214° /
4 Axis R	392° /	392° /
5 Axis B	272° /	276° /
6 Axis T	1353° /	1356° /
Application areas	Special for welding ( gas shield, argon arc, laser, aluminum, no stainless steel, carbon steel )	Special for welding ( gas protection, argon arc, laser, aluminum, stainless steel steel, carbon steel )
Torque		
4 Axis R(N·m )	103.5	88.5
5 Axis S(N·m )	51.84	45.52
6 Axis T (N·m )	32.64	32.64
Built-in	Ø10	Ø10

<b>trachea</b>		
<b>Installation method</b>	Floor, wall-mounted, tilted, upside-down	Floor, wall-mounted, tilted, upside-down
<b>Installation Environment</b>	Temperature 0-45 °C Humidity 20~80%RH ( no condensation ) Vibration acceleration 4.9m/s <sup>2</sup> (0.5G) or less Altitude 1000m the following	
	No flammable, corrosive gases or liquids, no splashing water, little oil and dust , Stay away from electromagnetic sources and magnetic fields	

### 1.4.2 Control cabinet specifications

project	MR10-1440	MR12-2010
<b>Dimensions</b>	650( width )*495( depth )*580( height )mm ( including protrusions )	
<b>rough mass</b>	60kg	
<b>cooling method</b>	direct cooling	
<b>Power Specifications</b>	AC220V50/60HZ	
<b>ground</b>	Industrial grounding ( dedicated grounding with ground resistance below 100Ω )	
<b>Input and output signals</b>	Universal signal: input 16 Output 16(16 Enter 16 out )	
<b>Position control method</b>	Serial communication method EtherCAT.TCP/IP	
<b>Memory Capacity</b>	JOB:200000 steps, 10000 Robot commands ( 200M in total )	
<b>LAN ( host connection )</b>	Ethercat(1 ) TCP/IP(1 individual )	
<b>Serial I/F</b>	RS485(1 RS422(1 ) pcs )R232(1 ) CAN interface ( 1 ) USB interface (1 individual )	
<b>control method</b>	Software servo < position control >	
<b>Drive unit</b>	AC Servo package for servo ( 6 in total axis ) ; external axes can be added	
<b>ambient temperature</b>	When powered on: 0~+45°C , when stored: -20~+60°C	
<b>Relative humidity</b>	10%~90% ( no condensation )	
<b>altitude conditions</b>	Altitude 1000m the following Over 1000m , every additional 100m The maximum ambient temperature is reduced by 1% , up to 2000m use	
<b>vibration conditions</b>	0.5G the following	
<b>other requirements</b>	No flammable, corrosive gas or liquid	
	No dust, cutting fluid (including coolant) , organic solvent, oil fume, water, salt, medicine, anti-rust oil	
	No strong microwave, ultraviolet, X rays, radiation exposure	

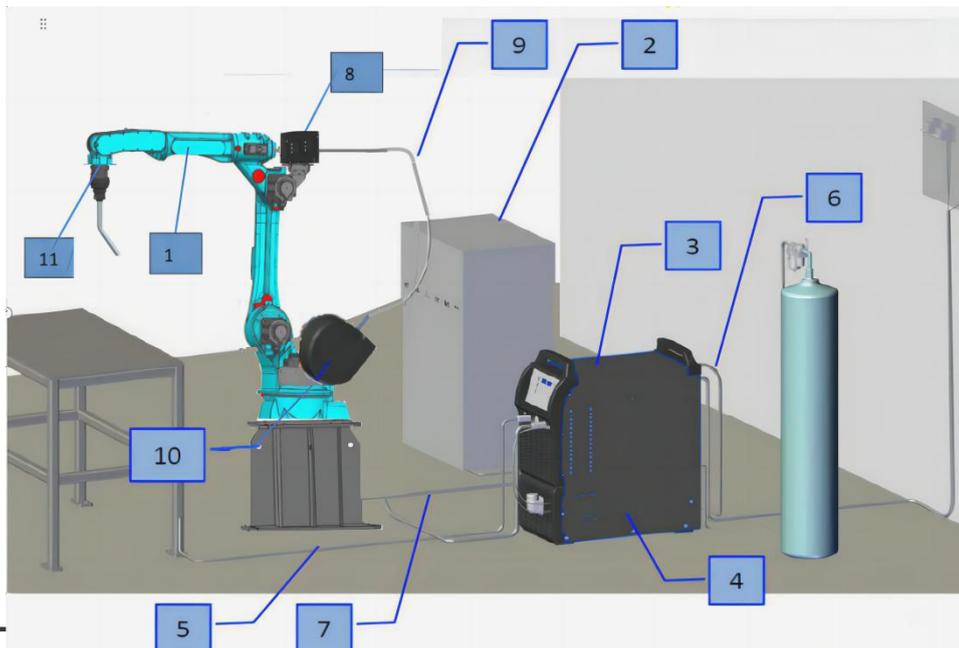
### 1.4.3 Teaching programmer specifications

<b>Dimensions</b>	280 ( width ) × 220 ( depth ) × 120 ( height ) mm ( including protrusions )
<b>gross</b>	0.6KG

<b>weight</b>	
<b>Material</b>	Reinforced plastic
<b>operating machine</b>	Select keys, axis operation keys, value / application keys, switch mode key / (teaching mode, reproduction mode) with key mode, remote mode), emergency stop button, start button, USB Port 1 individual
<b>Display</b>	8 inch color LCD, touch screen 640×480 Pixel
<b>Protection level</b>	IP54
<b>cable length</b>	Standard: 5m ; Optional: 15m

1.5 Whole machine connection and instructions

1.5.1 Handling robot system composition description

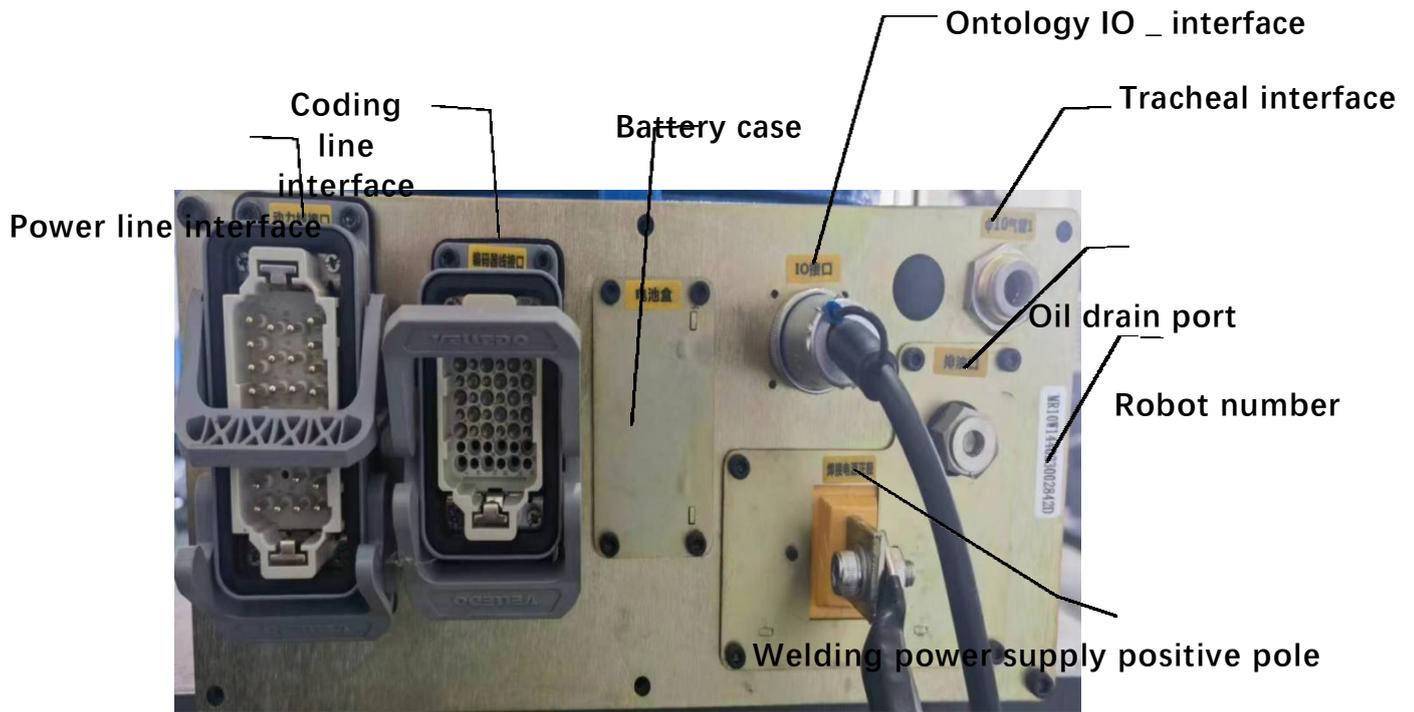


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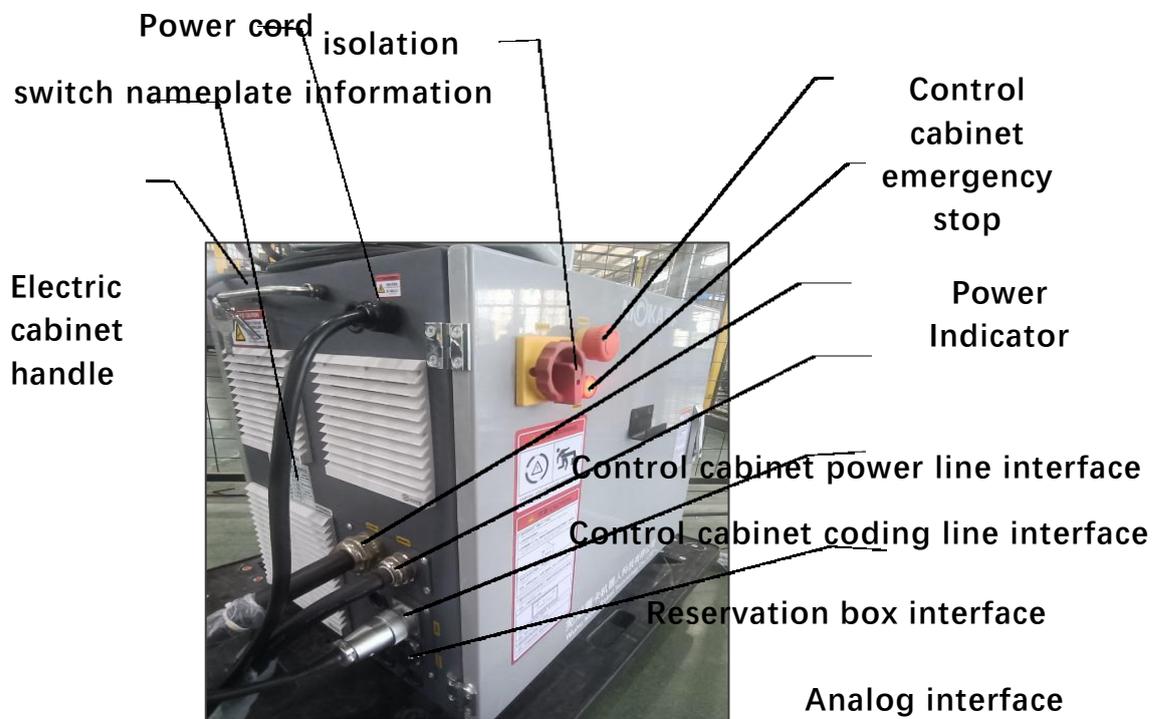
Please refer to the appendix for the robot control cabinet schematic diagram, IO interface schematic diagram, robot body wiring harness connection diagram, etc.

1	Robot body
2	Robot control cabinet
3	welding power source
4	Water cooler ( optional )
5	welding cable
6	Robot control cable ( control cabinet-welding machine )
7	Robot control cable ( welding machine-body )
8	Wire Feeder
9	Guide wire tube
10	Wire feed reel parts
11	Robot-specific welding gun (external or built-in )

1.5.2 Robot body base connection and instructions



1.5.3 Schematic diagram of robot control cabinet





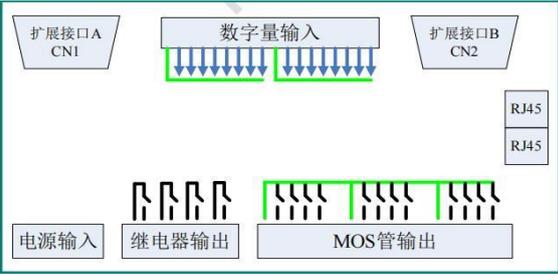
- The serial number of the robot body must match the serial number of the control cabinet. Mismatching of the serial numbers will lead to deviations in robot accuracy.
- Before turning on the power to the control unit, connect the robot and the control unit via a ground wire. If the ground wire is not connected, there is a risk of electric shock.
- There is a small amount of anti-rust oil in the grounding position of the robot. Please clean it before grounding.

### 1.5.4 R4C-IO and R4A-IO Interface board description

Please refer to Appendix 11 and Appendix 12 for detailed description of this section



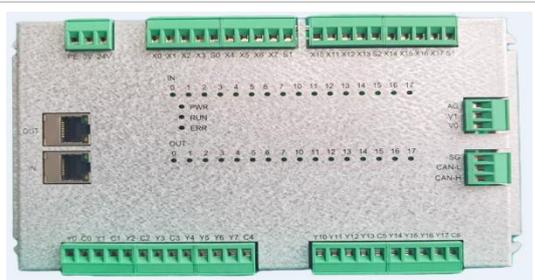
Physical map



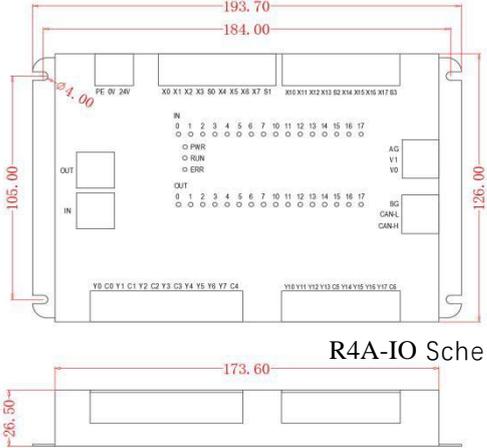
Layout

R4C-IO Schematic diagram of interface board

- Physical map

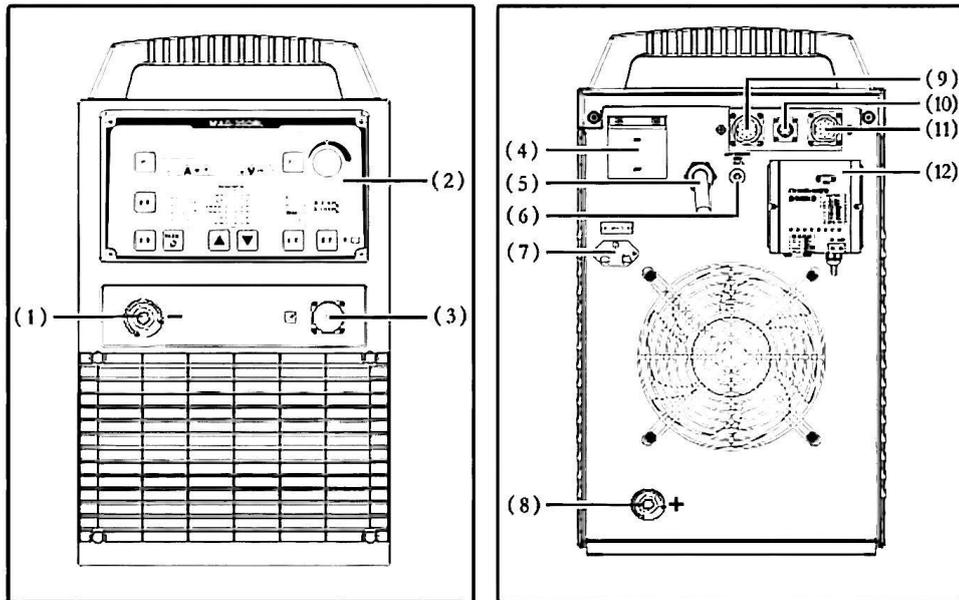


Layout



R4A-IO Schematic diagram of interface board

1.5.5 Welding machine interface connection and instructions



serial number	name	Function
1	Output socket (-)	Before welding, connect it to the workpiece to be welded through a ground cable.
2	control Panel	Used for function selection and partial parameter setting. Control panel includes digital display Window, adjustment knob, button, LED indicator light.
3	Arc voltage feedback line connection socket	It is connected to the workpiece to be welded through the arc voltage feedback line.
4	automatic air switch	The main function is to automatically cut off power when overload or failure occurs to protect the equipment.
5	Power input cable	Power the welding power source.
6	Wire feeder overload protector	Protect the wire feed motor.
7	Heated power output socket ( A C 3 6V )	Supply power to the gas meter heating device.
8	Output socket (+)	Connect the wire feeder welding cable to the input socket of the wire feeder.
9	Analog interface connection socket X5	Used to connect analog control lines. This interface method has low cost and high reliability. The robot can complete basic welding tasks, but it does not have the ability to call experts The function of the family library
10	Digital interface connection socket X6	Used to connect communication controller. Digital interface requires the robot to have digital communication communication module.

		Corresponding communication controllers will be provided according to customer needs when leaving the factory.
11	Wire feed mechanism control line socket X7	Connected to the robot wire feed mechanism through the wire feed mechanism control line
12	communication controller	For digital communication with robots.

## 2. Safe use matters

### 2.1 Security overview

This product is an industrial robot with great freedom of movement during operation, so safe use is very important.

This chapter focuses on the safety precautions that must be understood during use. For the personal safety of operators and other related personnel, please be sure to You must carefully understand it before use and abide by the safety tips and precautions stated in this manual ( this manual does not cover all safety precautions). Please note that the operator must have certain safety knowledge and judgment ) . Ignoring important or necessary safety warnings may result in Major safety accidents such as user injury or death may occur, and the robot may malfunction or be damaged.

### 2.2 warning label



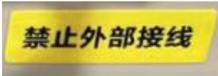
- Do not remove the warning labels on the robot body or ancillary equipment at will. Otherwise, the robot may be damaged or personnel may be injured due to careless operation or mistakes.
- Please ensure that the logo and text on the warning label can be clearly seen from outside the safety fence.

 <p><b>Disassembly and replacement logo</b></p>	<p>Where this label is attached, attention should be paid to regularly replacing the filter cotton to prevent the wind duct from being blocked.</p>
 <p><b>No approach sign</b></p>	<p>Operators are prohibited from entering the working range of the robot when the robot is powered on, and Keep an appropriate distance and plan an escape route for unexpected situations, otherwise casualties may occur.</p>
 <p><b>Action range warning sign</b></p>	<p>Where this label is affixed, you should carefully understand the range of motion of the robot's joints, and it is prohibited to operate the robot while the robot's power supply is turned on. Do not enter this action range without the source, otherwise it may cause injury to the operator.</p>



Transportation and placement warning signs

This label indicates the pairs of robot bodies, control cabinets and other peripheral equipment for operation and maintenance of different models. According to the transportation and placement requirements, please strictly follow the label content, otherwise it may cause damage to the equipment or personnel. casualties.

 <p><b>Electric shock warning sign</b></p>	<p>There is a risk of electric shock where this label is attached. Operation by non-professionals is prohibited, and unauthorized modification of the product is prohibited. Please turn off the power first when performing relevant operations. Do not touch live parts within one minute after turning off the power to avoid fatal electric shock or burns.</p>
 <p><b>No wiring sign</b></p>	<p>External axis wiring is prohibited where this label is attached, otherwise it may cause equipment damage or other accidents.</p>

### 2.3 Safety fence settings

In order to prevent the operator or other related personnel from being injured due to contact with the movable parts of the robot, be sure to install safety guardrails to prevent Enter the robot's movable range.

- (1) It is prohibited to enter the safety guardrail while the robot is operating automatically.
- (2) When entering the safety fence, press the emergency stop button.
- (3) For the range of installation of safety guardrails, please refer to the robot's movement range in Chapter 1.
- (4) Please put a 'no entry during operation' sign on the safety guardrail and stick it in a conspicuous place.
- (5) Before preparing to operate the robot, the operator should ensure that there is no one inside the safety guardrail.
- (6) Do not place too many bulky items near the safety fence to avoid overturning and damaging the robot or obstructing people in the event of an accident. Dodge.

### 2.4 General safety in operation

- (1) Before operating the robot system, please carefully read the main text of this manual - the general safety instructions before use and the details in this chapter. Note that operating without understanding the contents may lead to operational errors and accidents.
- (2) Do not enter the robot's movement range after turning on the power. Even if you see the robot seems to have stopped, it may continue to move. Take the next step and may cause serious safety accidents.
- (3) Before operating the robot to perform other actions, please confirm that the emergency stop switch can be used normally.
- (4) Before operating the robot system, please confirm that there is no one inside the safety guardrail and run it at low speed and low power in teaching mode. Robots to ensure operator safety.

- 
- (5) If the robot moves abnormally during operation, please press the emergency stop switch immediately and do not continue to operate, otherwise an safety hazard may occur. accident or equipment damage.
  - (6) Please be sure to turn off the power of the controller and related devices and unplug the power plug before performing the replacement operation, and wait 3-5 Do it again after a few minutes . Working with power on may result in risk of electric shock or high temperature burns.

- (7) When the robot moves at low speed, continuous vibration may occur depending on the combination of the direction of the robot arm and the load on the end of the clamp. The vibration is mechanical. It is caused by the natural vibration frequency of the arm, which can be adjusted and controlled through the following measures.
  - ❖ Change robot speed
  - ❖ Change teaching point
  - ❖ Change fixture end load
- (8) In principle, one person can operate the system. If multiple people are required to operate the system, please maintain communication with each other.
- (9) Note that during operations such as lubrication and dragging and teaching, do not directly touch the screw shaft and its grease with your hands. Frequent contact with the screw shaft will causing it to rust.
- (10) When the robot operates under high load and high speed, high temperature may occur on the surface of the robot body. Please wait until the robot body cools down before proceeding. Perform related operations.

## 2.5 Electrical Safety

- (1) In order to comply with national regulations, input power must be installed. Fully integrate the power supply wiring of the robot. If necessary, it must be connected from the main power supply. Manually disconnect the power cord.
- (2) When working in the control cabinet, the main switch and main power supply must be disconnected, and the robot power must be turned off. Locks and signs should be considered.
- (3) The wiring harness between the controller and the robot arm should be secured to avoid tripping and fraying.
- (4) Whenever possible, switching power on or off or restarting the robot controller should be done while all personnel are in a safe zone. Executed outside the domain.
- (5) When connecting grounding and other cable units, please strictly abide by the electrical safety regulations of the place of use.
- (6) The single-phase AC220V power supply waveform should be a standard sine wave , the effective value is +7% , -10% , the frequency is 50Hz , and the three-phase AC380V  
The power waveform should be a standard sine wave, the effective value is 380V±7% , the frequency is 50Hz , and the unbalance of the three-phase voltage is ≤ 5 % .
  - ❖ The power input is shown in the table below:

project	MR10W/MR12 robot control cabinet	MAG-350RL welding machine
Input power	Single phase AC220V	Three-phase AC380V
frequency	50HZ	50HZ
Input cable	≥4m m 2	≥4 m m 2
Output cable	/	≥50m m 2

Ground wire	$\geq 4 \text{ m m } 2$	$\geq 4 \text{ m m } 2$
-------------	-------------------------	-------------------------

When a fire breaks out in the robot,  
use carbon dioxide fire extinguishing  
agent!

## 2.6 Maintenance and repair safety

### 2.6.1 Operational requirements

- ❖ Only personnel who have received robot training can perform fault repairs.
- ❖ All electrical, pneumatic and hydraulic power supplies must be turned off during maintenance or repair to ensure that there are no other hazards.
- ❖ Before performing maintenance or repairs, the possible hazards caused by the mechanical energy stored in the robot arm to balance the axes must be considered.
- ❖ Never use the robot as a ladder, and do not climb on the controller, robotic arm, including motors and other components. Otherwise, you can Slips and falls may occur, possibly damaging the robot.
- ❖ After completing the robot maintenance work, check the screws, joints and other parts to ensure that they are not loose or missing.
- ❖ After the robot repair work is completed, it is necessary to verify that the safety features are functioning properly.

### 2.6.2 Battery Hazard Protection

Under rated conditions, the electrode materials and liquid electrolyte in the battery are sealed and not exposed.

- ❖ In the event of abuse ( mechanical, thermal, electrical installation ), it will cause the safety valve to activate or the battery box to rupture. Therefore, in a certain In some cases, electrolyte leakage, electrode material reacting with moisture, or battery ventilation explosion causing fire may occur.
- ❖ Do not short-circuit, charge, puncture, incinerate, crush, soak, forcibly discharge the battery, or subject it to work exceeding the specifications of the product. Temperature ranges where these may pose a fire or explosion hazard.

### 2.6.3 Gear box lubrication treatment protection

Tips	Overview	Security
<b>Lubricating oil overheated</b>	Gearbox replacement may be required at temperatures up to 90 °C lubricating oil	Make sure you always wear protective gear at work, such as eye protection Mirror and gloves
<b>allergic reaction</b>	Risk of allergies when handling lubricants	Make sure you always wear protective gear such as goggles and gloves while working
<b>Gear lubricant spilled</b>	Spilled gear lubricant can cause excessive pressure inside the gearbox , which in turn can damage the seals parts and washers to restrict the free movement of the robot	Please make sure there is no spillage when filling the gears with lubricant , and check whether the oil level is correct after filling.
<b>There may be pressure in the gearbox</b>	When the lubricant plug is opened, there may be some pressure in the gearbox that causes lubricant to spurt out of the opening.	Open the plug carefully and stay away from the opening to prevent spillage when filling the gearbox lubricant

<b>mix different types of lubricants</b>	Mixing different lubricants can cause serious damage to the gearbox	When injecting gearbox oil, do not mix different types . Be sure to use the type specified in the product.
<b>residual oil residue</b>	Oil residue may be present in a drained gearbox and may escape when the motor and gearbox are separated during maintenance	Please make sure to always wear protective tools during work, such as goggles, protective masks, etc., and place the oil suction device in an appropriate position to catch the oil residue.
<b>heating oil</b>	Hot oil drains faster than cold oil	The robot should be operated before changing the gearbox oil
<b>Treatment of contaminated oil in gearbox</b>	If the contaminated oil in the gearbox is not treated in time, the service life of the gearbox will be reduced.	To ensure service life, the oil in the gearbox should be drained as much as possible every time. The magnetic oil plug will suck away any remaining metal shavings

### 2.6.4 Robotic arm shakes unexpectedly

**Unexpected movement of the robot arm may cause serious injury to the operator or damage to the equipment. The dangers caused by the use of the brake release device or the weight of the robot arm should be considered.**

In an emergency, you can press the brake release button to manually release the brake on the robot axis. When the brake is released, the robot axis can move quickly and sometimes in unpredictable ways. Make sure there are no people next to or underneath the robot.

### 2.6.5 Brake test

The brakes on each axis motor are subject to normal wear during operation. A test can be performed to determine if the brakes are still able to perform its function. The test method is as follows:

- ① Run each axis to the position where the total weight of the robot arm and
- ② any load is greatest (maximum static load) . The robot motor switches to the enable-off state.
- ③ Check to see if the axis position is maintained.

The braking function is available if the robot arm does not change position when the motor is turned off.

## 2.7 Troubleshooting safety

When power needs to be turned on for troubleshooting, special considerations must be made:

- ❖ Safety circuits may be silenced or disconnected.
- ❖ Electrical components must be considered live.
- ❖ The robotic arm can move

unexpectedly at any time. There is a risk of hot surfaces that may cause burns.

## 2.8 Limitation of Liability

Any information regarding safety mentioned in this manual shall not be construed as acknowledgment by our company that if all safety instructions are followed, the industrial machine person will not cause injury or damage" warranty.

In particular, we are not responsible for harm or damage caused by any of the following reasons:

- Failure to use the robot as required;
- Improper operation or maintenance;
- Operating the robot with defective safety devices, not in the designated position, or in any case not functioning properly;
- Failure to follow operating instructions;
- Changing the structure of the robot without authorization;
- Repairs to the robot and its parts are performed by inexperienced or unqualified personnel;
- external objects;
- force majeure;
- / or use of non-original spare parts and equipment negatively affects the safety, functionality,

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performance and structural properties of the Robot.

### 3. Transportation, installation and debugging



Danger

- Please be careful during transportation. No one is allowed to stand or stay around the transportation route. If the robot falls and injures someone, it may cause serious injury.
- Please do not stand within the working range of the robot before installation and commissioning.

#### 3.1 Equipment handling

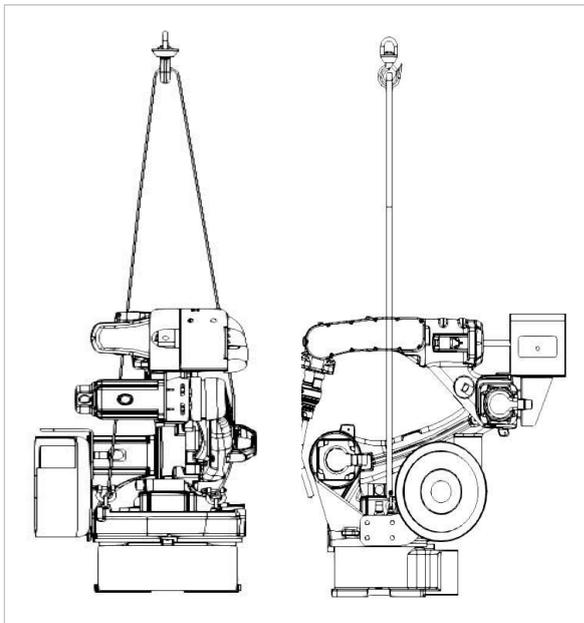
##### 3.1.1 Robot handling steps

- ① Before moving the robot, move each joint of the robot to the transportation posture to ensure that the robot maintains the transportation posture during transportation. Immobile and fixed;
- ② Disconnect power from all devices;
- ③ Unplug the power cable and signal cable connected to the control cabinet;
- ④ Unscrew the base installation fixing screws and remove the robot from the installation platform;
- ⑤ Securing the robot to the handling equipment;
- ⑥ Use hoisting method to lift the robot body onto the installation bench

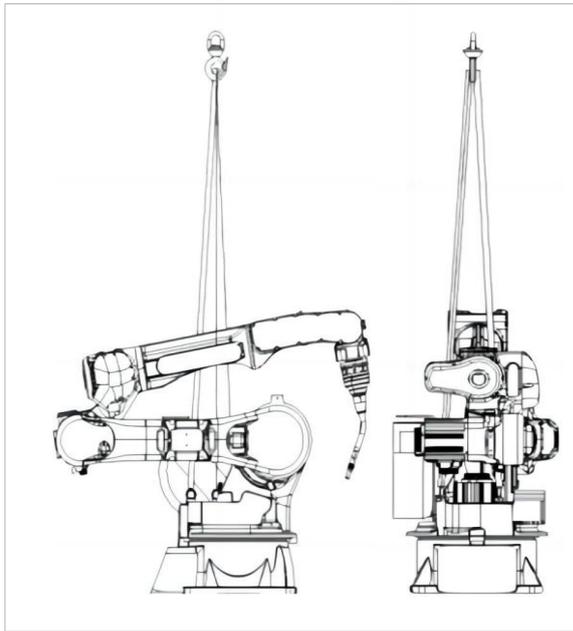


remind

- 1.1. Do not pull the lifting eye screw sideways;
- 2.2. Do not use the claws of forklifts, cranes, etc. to exert impact force on the transport components;
- 3.3. Do not hang chains, etc. on the transport components.



MR10W-1440 Robot hoisting diagram

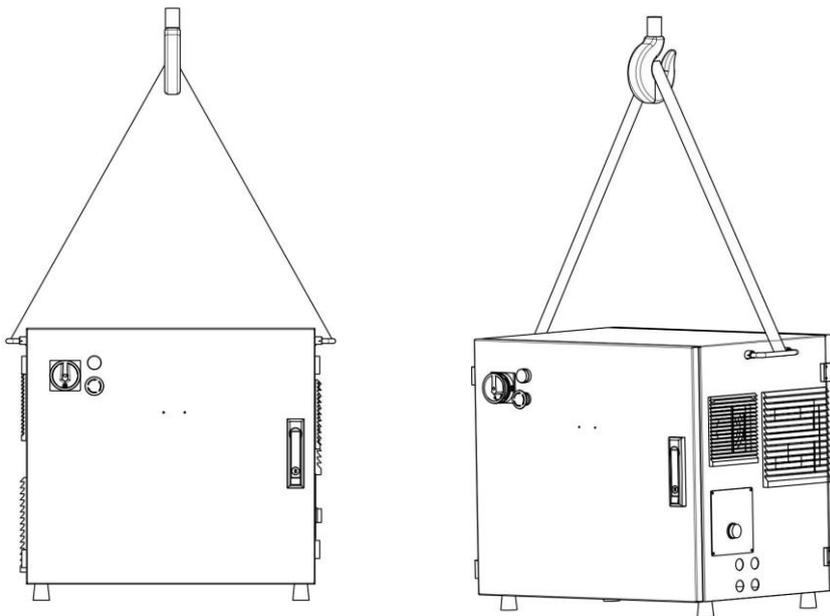


MR12-2010 Robot hoisting diagram

● Robot transportation joint angles

joint	robot	J1	J2	J3	J4	J5	J6
angle	MR10W-1440	0°	74°	-74°	0°	-15°	0°
	MR12-2010	0°	74°	-74°	0°	12°	0°

3.1.2 Control cabinet transportation and placement



● Electric control cabinet hoisting diagram



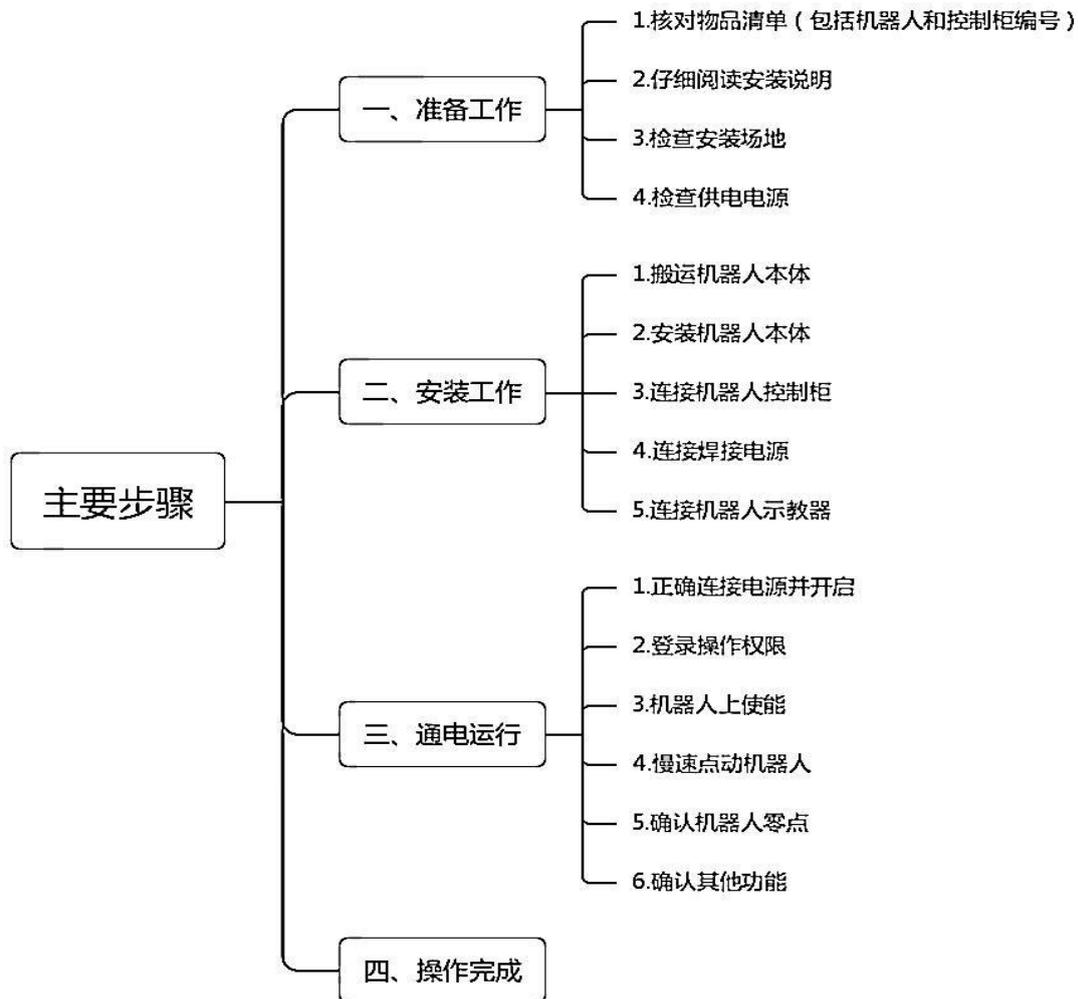
Note

Please refer to Appendix 3 for the electrical layout of the mainboard in the electrical cabinet.

When transporting the robot control cabinet , in order to ensure personal safety and equipment stability, the following matters should be paid attention to:

- (1) An overhead crane should be used.
- (2) Search instructions 1.4.2 Chapter, confirm the weight of the corresponding model control cabinet and ensure that the lifting rope has the appropriate load capacity. And with shackle.
- (3) Please use eye bolts when transporting and make sure they are tightened.
- (4) Make sure there is enough space for robots, control cabinets and other peripheral equipment for operation and maintenance.
- (5) Please place the control cabinet in a place where it can be seen clearly and is safe to operate.
- (6) Please place the control cabinet outside the robot's safety fence.

### 3.2 Installation process



### 3.3 Unpacking and inspecting the machine

#### 3.3.1 Unpacking and inspection matters

- ❖ Visually inspect the packaging for damage and remove the packaging if there is no obvious damage.
- ❖ Check for any visible shipping collision damage. If there is obvious damage, please stop unpacking and contact the company.
- ❖ Try to use a lint-free cloth when cleaning.
- ❖ Make sure the installation environment meets the requirements of this product.
- ❖ Before moving the robot, please test the stability of the robot to see if there is any risk of it tilting over. After meeting the above requirements, it can be transported to the installation site and the required equipment can be installed ( in compliance with the adaptation requirements of this product) .

### 3.3.2 Check product list

After unpacking, please confirm the product status, quantity and type according to the packing list.

#### ◆ MR10W-1440 Robot packing list

serial number	product name	unit	quantity
1	Robot body	tower	1
2	Electric control cabinet	Only	1
3	Teaching pendant	set	1
4	IO Plug /12 core	pieces	1
5	Electric cabinet to welding machine plug /20 core	pieces	1
6	Wire feeder, wire feed box, welding gun	set	1
7	Wire feed hose	Only	1
8	Electric cabinet key	Only	2
9	Certificate	share	1
10	System User Manual	share	1
11	Driver manual	share	1

#### ◆ MR12-2010 Robot packing list

serial number	product name	unit	quantity
1	Robot body	tower	1
2	Electric control cabinet	Only	1
3	Teaching pendant	set	1
4	IO Plug /12 core	pieces	1
5	Electric cabinet to welding machine plug /20 core	pieces	1
6	Wire feeder, wire feed box, welding gun, two-station reservation box kit	set	1
7	Wire feed hose	Only	1
8	Electric cabinet key	Only	2
9	Certificate	share	1
10	System User Manual	share	1

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11	Driver manual	share	1
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### 3.4 Robot body installation



If the robot is connected to a power source, make sure the robot's ground wire is grounded before starting any installation work. If the ground wire is not connected, there is a risk of electric shock.

Before installing the robot, you need to read and follow the following rules:

- ❖ Make sure you have read and understood the information in the Instructions for Safe Use;
- ❖ Ensure that the robot is installed by qualified installers, and the installation procedures must comply with local laws and regulations;
- ❖ Make sure that when installing the robot, the handling equipment can bear the weight of the robot parts being moved.

#### 3.4.1 Installation conditions

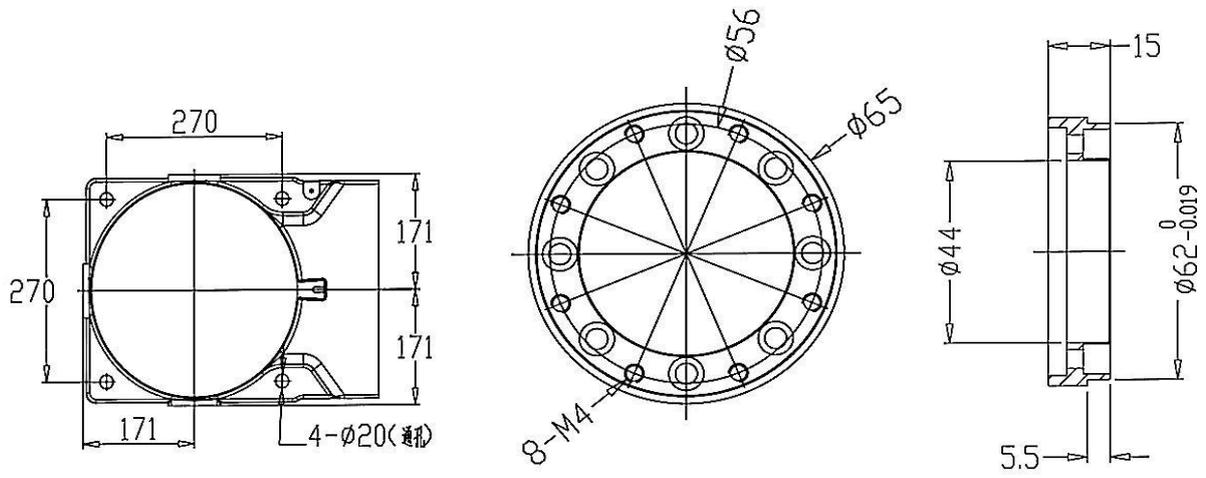
- Installation base requirements

Installation base requirements	
Maximum surface roughness	0.5mm
Installation maximum tilt angle	5°

- The drug resistance and solvent resistance of the robot body
  - (1) The following liquids may cause rubber parts ( seals, oil seals, O P l e a s e d o n o t u s e if the sealing ring, etc. ) is aging or corroded . (Except products approved by our company )
    - a. Organic solvents
    - b. Chlorine-based and gasoline-based cutting fluids
    - c. Amine cleaning agent
    - d. Corrosive liquids such as acids and alkalis, liquids or aqueous solutions that cause the robot to rust
    - e. Other non-resistant liquids or aqueous solutions such as nitrile rubber ( NBR )
  - (2) When using the robot in an environment where liquids such as water splash onto the robot, pay full attention to the drainage of the base. If drainage is insufficient and If the base is frequently immersed in water, it will cause the robot to malfunction.
  - (3) Do not use cutting fluid or cleaning fluid of unknown properties.
  - (4) The robot cannot be immersed in water for a long time or used in an environment that is prone to getting wet. For example, if the motor is exposed, if the If the machine is wet, liquid may infiltrate into the motor and cause malfunction.

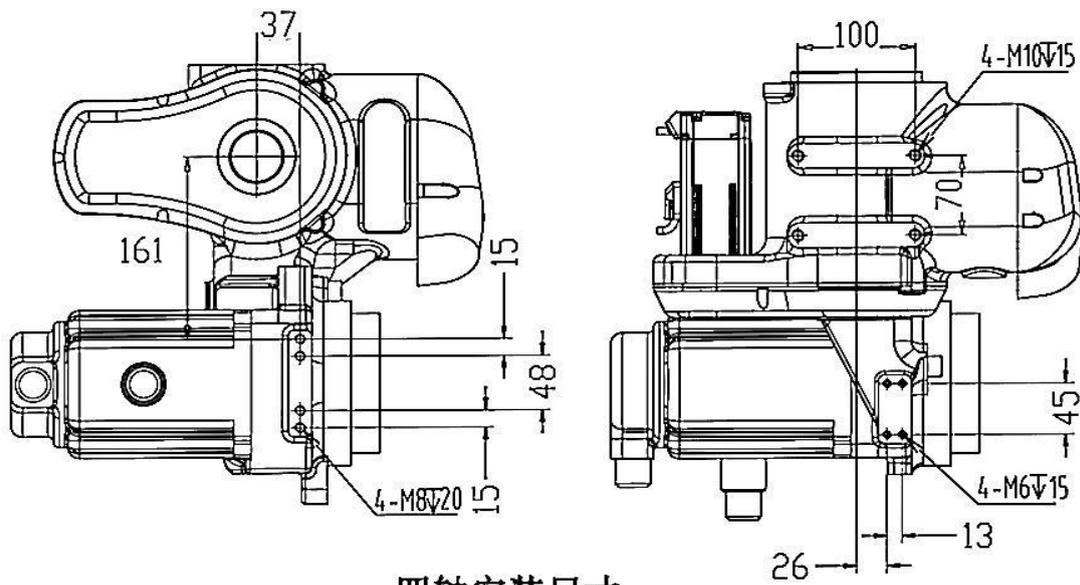
### 3.5 Robot installation dimensions

When installing and fixing the robot, some installation dimensions are shown in the following chart.



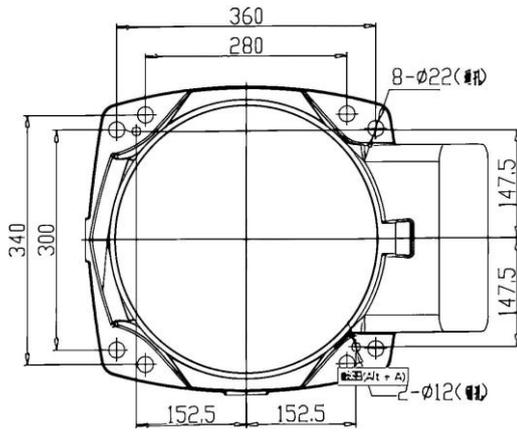
底座安装尺寸

End mounting flange dimensions

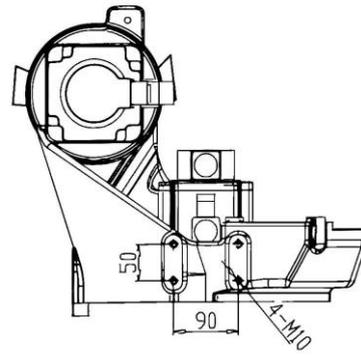


四轴安装尺寸

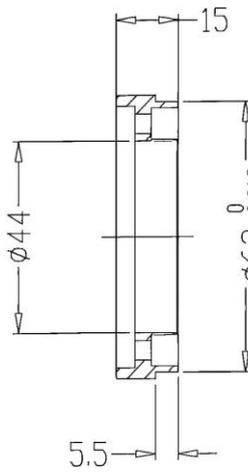
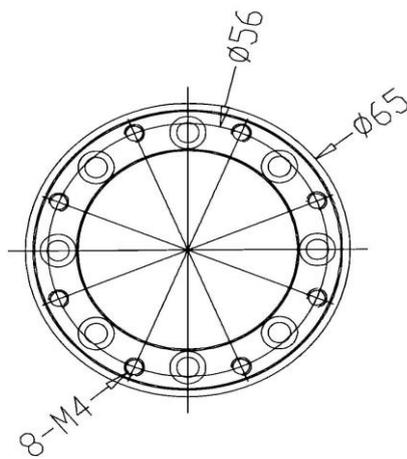
● MR10W-1440 Robot installation dimensions diagram



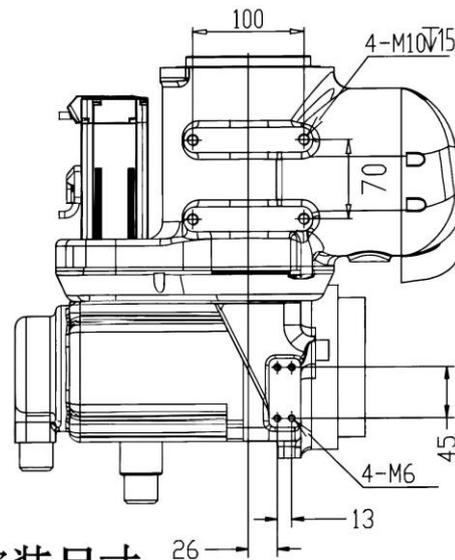
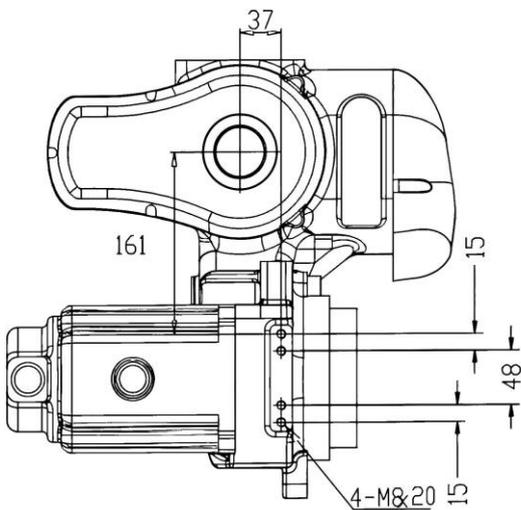
底座安装尺寸



转座安装尺寸



End mounting flange dimensions



四轴安装尺寸

● MR12-2010 Robot installation dimensions diagram

### 3.6 robot fixed

The robot supports three installation postures: floor-standing / stand-mounted / upside-down. There are differences in the fixing methods on the mounting contact surfaces of different materials. The specific fixing method should be appropriately selected according to the conditions of the scene used; the strength of chemical bolts is affected by the strength of concrete. When working, you should refer to the design guidelines of each manufacturer and fully consider safety before use.

◆ Parts required for robot fixation

Part model	Part quantity	Remark
Robot fixed base	1 individual	Highly customizable
Movement expansion bolt M20*200mm ( not less than 4.8 class )	12 individual	Secure the base to the ground
Fixing screw M16 × 55 (12.9 class )	4 individual	Secure the robot to the base

◆ Base fixed

① Use 12 \_ M20 × 200mm \_ Movement expansion bolt ( strength grade 12.9 ) , place 1 robot base (highly customizable ) Fixed to the ground.

② Adopt 4 \_ M6 × 55 \_ Bolts ( strength grade 12.9 ) , install the robot on the robot fixed base ( highly customizable ) .



remind

- There must be no insulating material between the robot fixed plate and installation bracket, the operating machine and the concrete.
- The bracket needs to be firmly installed on the ground
- The length of the fixing screw M20 must not be shorter than 40mm. Too short a length may cause accidents such as poor fixation.



## 4. Zero point calibration

### 4.1 Calibration overview

Zero point calibration refers to an operation that relates the angle of each robot joint to the pulse count value. The purpose of zero point calibration operation is to obtain the pulse count value corresponding to the zero position. "Zero point calibration" is completed before leaving the factory. There is no need to perform zero calibration in daily operation. However, zero point calibration operation is required under the following circumstances:

1. Motor replacement
2. Pulse encoder replacement
3. Reducer replacement
4. Cable replacement
5. The battery used for pulse counting backup in the mechanical body has run out of power.



remind

**Data including zero point calibration data and pulse encoder data are saved via respective backup batteries. Data loss will occur when the battery is exhausted. Batteries in controls and robots should be replaced regularly. When the battery voltage drops, the system will issue an alarm to notify the user.**

### 4.2 Mechanical zero point calibration

Due to mechanical disassembly or maintenance, the zero point data of the robot is lost. It is necessary to jog the six axes to the zero point position at the same time. Calibrate the zero position of each axis through hole position or zero marking line.

The zero point calibration of this equipment is mainly based on visual inspection of the engraved lines on each joint and the middle engraved line on the zero mark patch for calibration. Now take J1 as an example to calibrate the zero point of this joint : adjust the robot to align with the scale line indicated by visual inspection in the illustration.

As shown in the figure, there is a marking line on the base and the swivel base. Please follow the steps below to calibrate.

- ① Use the teaching box to turn J1 axis so that the middle scale lines of the two scale plates are aligned.
- ② Jog J1 through the teaching box to the zero position of the axis.

At this point, J1 calibration of the axis has been completed. Users can refer to the above steps to complete the calibration of other axes, or after finding the zero point positions of all joints, set the zero point positions of all joints at once through the teaching box. Other schematics in this section will assist the user in calibration operations.

- ◆ The following pictures and texts are actual schematic diagrams of mechanical zero point calibration of each axis ( the picture below is only for MR10W-1440 Model, other models of the same series will not be shown separately )



J1 Axis calibration diagram

J2 Axis



J3

J4



J5、J6

## 5. Robot control system

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This chapter covers the basic use of the robot teaching pendant. Before operating the robot, please be sure to read the robot instructions carefully. book, strictly abide by the robot safety operating procedures, and ensure that operators can only operate the robot after receiving professional training.

### 5.1 Robot Quick Start Guide

This chapter briefly introduces the manual operation of each axis of the robot through the teach pendant, so that users can easily and quickly become familiar with the most basic functions of the robot. Operation, establish an intuitive understanding of the use of the teaching pendant and the entire robot system, and try to shorten the on-site debugging and application time as much as possible.

#### 5.1.1 safe operating procedures

##### 1. It is not recommended to use robots

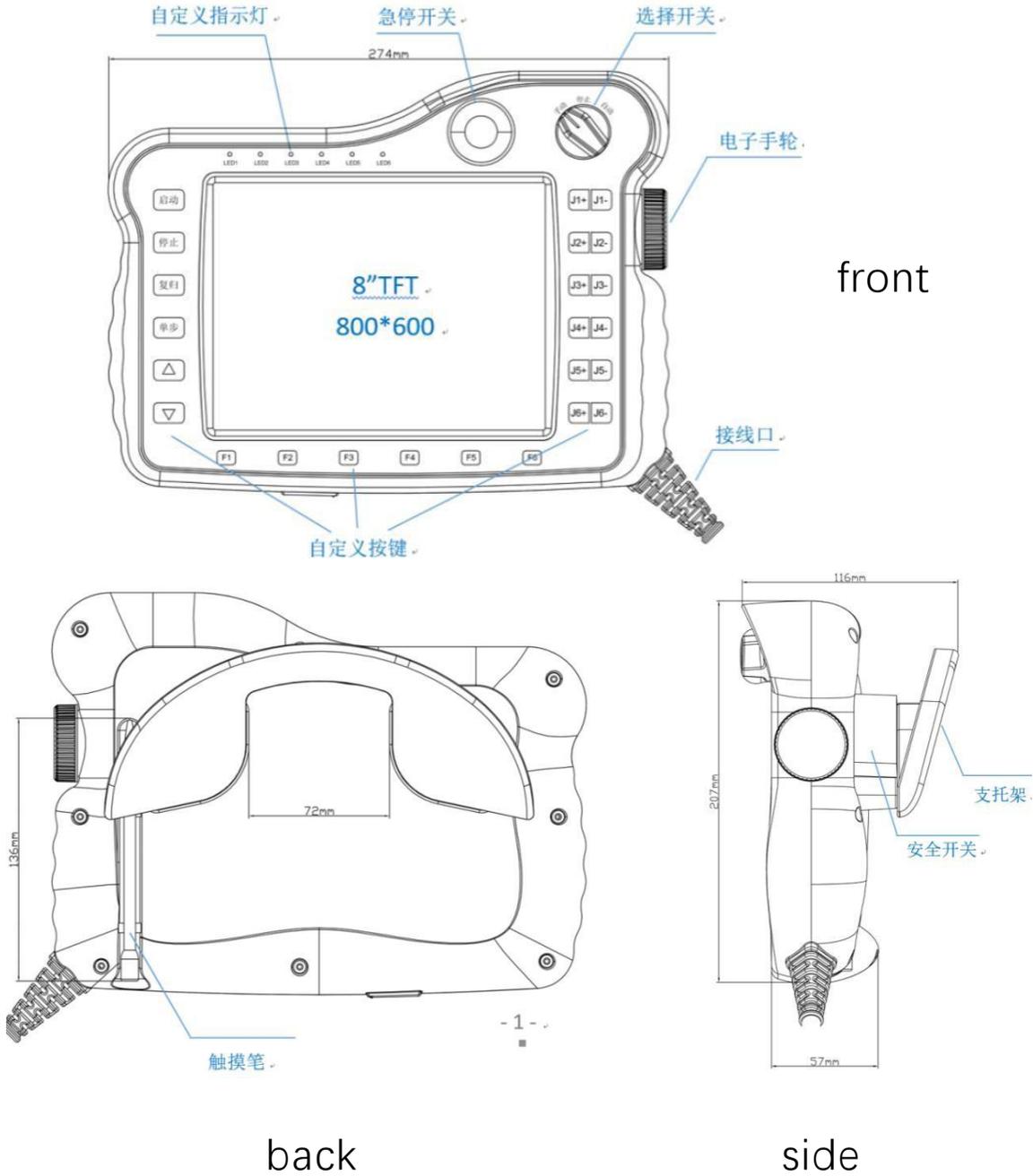
- ❖ burning environment
- ❖ Explosive environment
- ❖ Environment with severe electromagnetic interference
- ❖ in water or other liquids
- ❖ Environment with serious oil pollution, water vapor and dust
- ❖ Other hazardous environments

##### 2. safe operating procedures

- ❖ Operators are not allowed to operate the teach pendant and operation panel with gloves on;
- ❖ The operator stands outside the workspace where the robot operates;
- ❖ The operator keeps observing the robot from the front to ensure a safe escape route in case of emergency;
- ❖ Before taking action, make sure there are no people within the robot's operating range, consider the movement trajectory of the robot in advance, and confirm The route is free from interference;
- ❖ Before taking action, check whether there is any alarm on the robot. If there is an alarm, please clear it before running;
- ❖ Before taking action, please check whether the mechanical zero position of the robot matches the position of each axis of the teaching pendant;
- ❖ Before powering on the servo, confirm the robot speed and the currently selected coordinate system;
- ❖ When jogging the robot, use a lower speed magnification to increase the chance of controlling the robot;
- ❖ Before starting to run the program, you must know all the tasks that the robot will perform according to the programmed program;

- 
- ❖ The position and status of all switches, sensors and control signals that affect the movement of the robot must be known;
  - ❖ The location of the emergency stop buttons on the robot control cabinet and peripheral control equipment must be known so that they can be used in an emergency. use;
  - ❖ Don't think that the program has been completed without the robot moving. The robot may be waiting for instructions to continue moving;
  - ❖ The robot's "Emergency Stop" or "Pause" button must be pressed before entering the robot's operating range.

5.1.2 Schematic diagram of the teaching pendant



● Robot teaching pendant description diagram

### 5.1.3 Teaching pendant physical button description

left button		right button	
	Switch current servo status		Pause program in run mode
	Switch the current robot ( only available in multi-machine mode )		Start program in run mode
	Switch between current robot and external axes (only available with external axis )		During teaching, the corresponding axis runs in the negative direction.
	Return to zero point button		During teaching, the corresponding axis runs in the positive direction.
	Reply button		Rotary switch: left, switch to teaching mode
	Clear the error after the servo reports an error ( only available in teaching mode )		Rotary switch: middle, switches to run mode
	reserved		Rotary switch: right, switch to remote mode
lower button		Three-stage button	
	execution and reverse sequence execution when single-stepping the program in teaching mode.		Press to the middle to control the robot to power on
	Step through the program in teach mode		Press all the way to control the robot to power off.
	Reduce teaching or operating speed		Release the button to control the robot to power off
	Increase teaching or operating speed	other	

	Switch tool hand		emergency button
	Switch coordinate system		scroll wheel knob

### 5.1.4 Teaching pendant operating robot

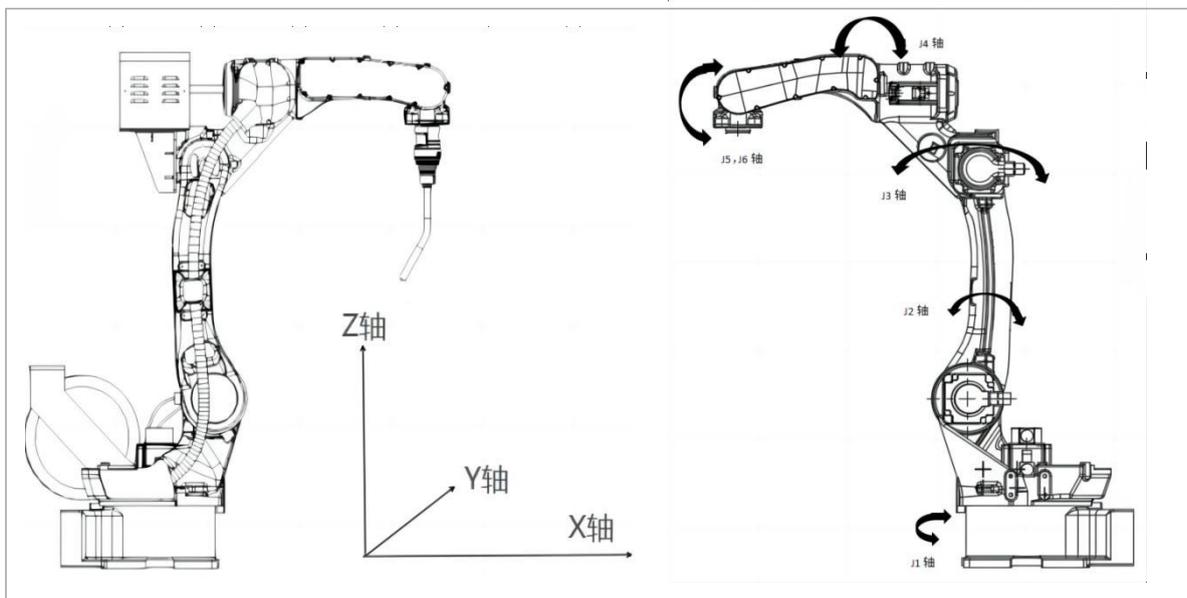
The preparation steps are as follows:

- ① Connect the cables between the robot teaching pendant, the main body and the control cabinet accordingly.
- ② Confirm that the robot power supply is AC220V The voltage is correct and
- ③ the power switch of the rotary control cabinet is ON. state. The power indicator light of the control cabinet lights up, waiting for the connection between the teaching pendant and the controller to be successful.

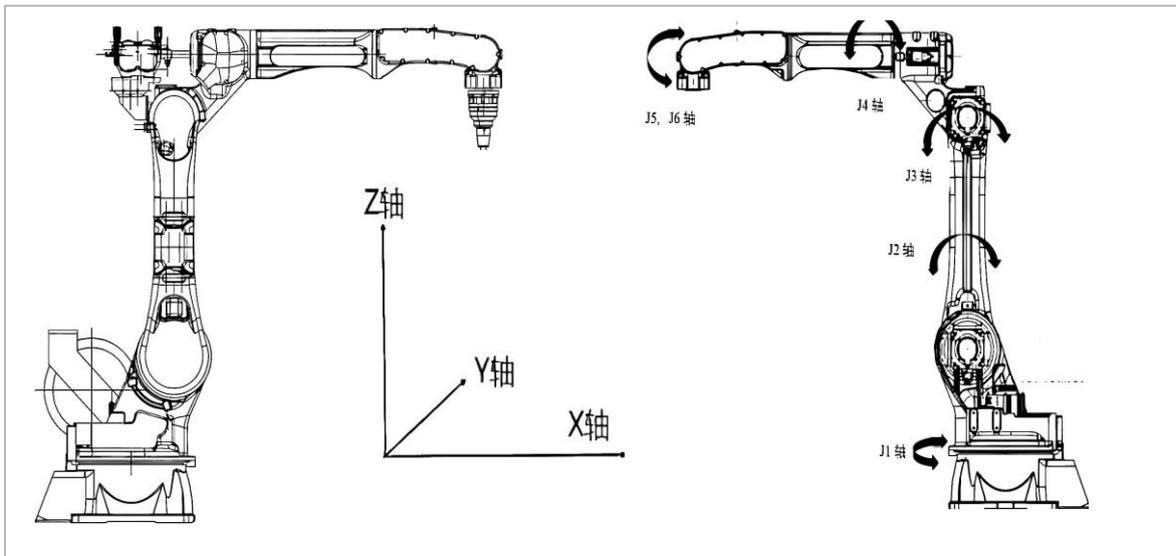
● Actual pictures of robot teaching pendant



● Schematic diagram of robot coordinate system operation orientation







● MR12-2010 robot

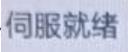
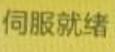
### 1. Inching operation (teaching mode )

- " and " + " on the right side of the teach pendant panel to move the robot. This operation is only allowed in the teaching mode. wait After the service is enabled, you need to set the coordinate system type and movement rate of the robot before performing electric operation.

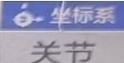
The steps are as follows:

- (1) Turn the rotary switch on the teach pendant to the left 

- (2) Initial password for login technician privileges: 123456

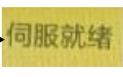
- (3) Light up servo  → 

- (4) Select the required coordinate system: joint coordinate system, rectangular coordinate system, tool coordinate system,

User coordinate system, select joint here 

- (5) Adjust the speed to  → 

(In teaching mode, it is not recommended to set the robot speed too fast )

- (6) Press 3 gear enable  →  → 

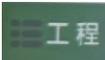
At the same time, you hear the sound of the robot's motor brake opening, and J1~J6 will be displayed next to the right button. icon

- (7) Press on the right side of   the corresponding joint to run in the positive direction of the

corresponding axis during teaching ;

Press the corresponding joint  right side , corresponding to the axis running in the negative direction during teaching.

## 2. Automatic mode

(1) Log in with technician privileges and click on the project option on the main interface. 

(2) Select the desired program and click 

(3) Turn the rotary switch on the teach pendant to the middle position  →  

(4) Press the start button , the robot starts to run the program automatically

(5) You can set the number of runs below and select single or cycle runs.   

(6) press button , the robot pauses the running program

## 3. Turn off the power of the robot

(1) Pressing the button  in automatic mode will cause the robot to pause the program.

(2) Turn the rotary switch on the teach pendant to the left . At the same time, you can hear the sound of the robot body motor brake closing.  → 

(3) Manually move the robot to a safe posture

(4) Press any emergency stop button on the control cabinet or teach pendant

(5) Hang the teaching pendant on the fixed frame

(6) The power switch of the rotary control cabinet is OFF status, the power indicator light of the control cabinet is off.

(7) Turn off the power switch or circuit breaker

## 5.2 Introduction to coordinate systems

The coordinate system is a position indicator system whose function is to determine the position and posture of the industrial robot in space. Robot based on Different reference objects use the following four coordinate systems.

- **joint coordinate system**

---

The joint coordinate system is the coordinate system set in the industrial robot joint. In the joint coordinate system, the position and attitude of the industrial robot are The origin angle on the base side of each joint is the reference, and the value in the joint coordinate system is the angle value of the joint's positive and negative direction rotation.

● **Cartesian coordinate system**

X of the front end of the robot along the base in the Cartesian coordinate system Axis, Y Axis, Z axis parallel movement. A , B , C respectively around X , Y , Z The shaft rotates. The Euler angle order used in this system is X 'Y'Z' and the fixed angle order is ZYX .

● **tool coordinate system**

In the tool coordinate system, the effective direction of the robot wrist tool is regarded as Z Axis defines the origin of the coordinate system at the tip point of the tool, and the tip point of the body moves parallel according to the coordinates. TA , TB , TC They are around TX , TY and TZ respectively. The shaft rotates. The origin and direction of the tool coordinate system constantly change with the end position and angle. The coordinate system is actually derived from the rectangular coordinate system through rotation and displacement transformation.

● **User coordinate system**

The user coordinate system is a user-defined coordinate system. It is a rectangular coordinate system customized by the user for each work space. This coordinate system is actually The basic coordinate system is obtained through axial deflection angle transformation, and the tip point of the body moves parallel according to the coordinates.

**5.3 Controller Settings - System Settings**

This chapter mainly introduces the system settings of the controller, including but not limited to version upgrade and file upload, time setting, IP Settings, import / export program, one-click backup system, modify teach pendant configuration, import / export controller



● Teach pendant system setting interface

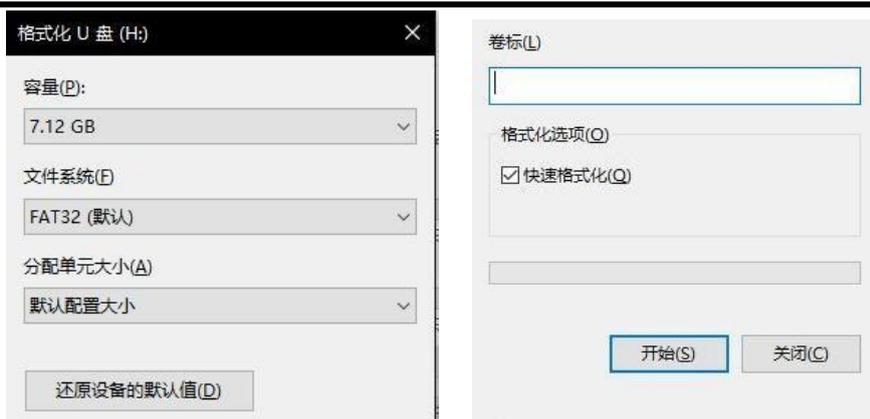
**5.3.1 Make FAT32 Format U plate**

/exporting parameters and programs in this system requires FAT32 Format U plate. Make FAT32 Format U The steps are as follows:

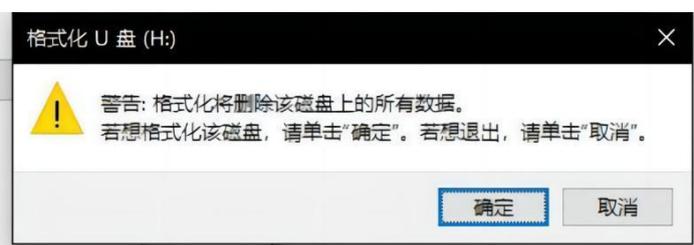
- ① Prepare a computer and a USB disk, please note that the production process will Erasing all the contents of the disk is irreversible. Please change the U Disk content backup;
- ② Will U Insert the disk into the USB of the computer After the interface, open "My Computer" or Win10 on the computer The system's "This Computer" interface; There should be U at this time The drive letter of the disk. If it does not appear, please unplug and

insert the USB again. If the USB disk does not appear yet, please replace it with another USB disk .disk attempt;

- ④ Right-click U drive letter, click "Format" in the menu that appears;
- ⑤ In the pop-up interface, set as shown in the figure below



- ⑥ Click the Start button and click the [OK] button in the pop-up confirmation box;



- ⑦ When the "Format Completed" window pops up, FAT32 Format U The disk is formatted.



### 5.3.2 Version upgrade and file upload

In the Settings - System Settings - Version Upgrade View interface, you can view the software versions of the teach pendant and controller, and display them. Upgrade operation of teaching software.

#### ❖ Teach pendant software upgrade

- ① The upgrade file ( Zip format, no need to decompress, and special characters such as parentheses cannot appear in the file name ) into U In the root directory of the disk , ( U The disk must be FAT32 format ) will U Insert the disk into the USB of the teach pendant interface;
- ② - [System Settings] - [Version and Upgrade] on the robot teaching pendant ;

设置/系统设置/版本升级

**版本和升级**

控制器: rc1-21.05.31-chengtong-2021060211

示教器: rc1-20.02.25-zhanghongyu-2021061015

14:36  
星期六  
2021/06/19

返回 检测升级 上传文件

- ③ Select the automatically detected
- ④ upgrade file in the list; Click the [OK] option;
- ⑤ After the upgrade is successful, the teach pendant will automatically restart, and the upgrade will be successful after the restart.

❖ **upload files**

To upload ENI file to the controller, follow these steps:

- ① Prepare a computer and a USB plate;
- ② in U Create a new folder on the disk named **upgrade**;



Put the files to be uploaded into **upgrade** within the folder; Will U Insert

- ③ the disk into the USB of the teach
- ④ pendant interface;
- ⑤ - [System Settings] - [Version Upgrade] on the robot teaching
- ⑥ pendant ; Click the Upload File button;



- ⑦ Select the file to upload among the detected files that pops up, and click the [OK] option.

**5.3.3 System time settings**

The system date and time can be set in the system setting interface. The specific steps are as follows:

- ① Open the system
- ② settings interface; Click the [Modify] option;
- ③ Just select the year, month, day, hour, and minute in the date settings and time settings.



- ④ Click the [Save] option.

### 5.3.4 IP set up

In [Settings] - [System Settings] - [IP] In the Settings interface, you can modify the controller IP, the teaching pendant, and



- Please do not modify the IP unless necessary to avoid malfunctions.
- If you modify the controller IP to a non-default value (192.168.1.13), please record the controller IP yourself.
- The teach pendant connection IP is used for switching when a teach pendant is connected to multiple controllers at the same time.

the IP connected to the teaching pendant .

remind

#### ❖ **Modify current connection IP**

- ① Click [System Settings] - [IP set up] ;
- ② Click the [Modify] option
- ③ corresponding to "Connect IP ";  
Change to the required IP Address,  
effective immediately.

#### ❖ **Modify current controller IP**

- ① Click [System Settings] - [IP set up] ;
- ② Click the [Modify] option corresponding to
- ③ "Modify Controller IP ";Change to the  
required IP Address, effective  
immediately.

#### ❖ **the IP of the teach pendant itself**

- ① Click [System Settings] - [IP set up] ;
- ② the [Modify] option corresponding to
- ③ "Teaching Pendant IP ";Change to the  
required IP Address, effective  
immediately.

### 5.3.5 Import / export program settings

#### ❖ **Import controller configuration**

Click the [Import Configuration Parameters] button at the bottom of the system

- ① settings interface to import the local configuration parameters into the teaching  
pendant. Will U Insert the disk into the USB of the teach pendant interface.
- ② Click the [Settings]-[Import Configuration Parameters] button
- ③ The system pops up all relevant files in the USB flash drive (files in other formats are not  
displayed), select the program to be imported, and click the [OK] button

---

④ Waiting for import.

❖ **Export controller configuration**

Click the [Export Configuration Parameters] button at the bottom of the system settings interface to export the controller configuration parameters to a USB flash drive. The controller configuration parameters are saved for robot, IO, external axis, process parameters and other configuration parameters.

① Will U Insert the disk into the USB of the teach pendant interface.

② Click the [Settings]-[Export

③ Configuration Parameters] button. Click the [OK] button.

- ④ Waiting for export.

**5.3.6 Log export**

Click the [Export Log] button in the system settings interface / [Export] button in the log interface to import the logs to a USB flash drive. When we find the cause of robot errors, controller logs are the most commonly used

- ① Convert a " FAT32 " formatted U Insert the disk
- ② into the USB of the teach pendant interface; Enter the "System Settings" interface / "Log" interface of the teach pendant ;
- ③ Click the [Export Controller Log] button in the system settings interface / [Export] button in the log interface to choose to export 5/30/100/500 log;
- ④ After the export is completed, the controller's log will be saved in U On the plate.

**5.3.7 language switch**

The instructions and interface of this system can be switched between Chinese and English languages respectively. To switch languages, follow these steps:

- ① Enter Settings-System Settings-Modify the teach pendant configuration;
- ② Click the modify button;
- ③ Select the required command language or interface language;
- ④ Click Save. After saving, the command language will take effect immediately. The interface language needs to be restarted to take effect.

**5.3.8 Cleanup program**

The clear program function can clear all programs in the system at one time, and is used when there are too many programs and they are useless. The cleaning steps are as follows:

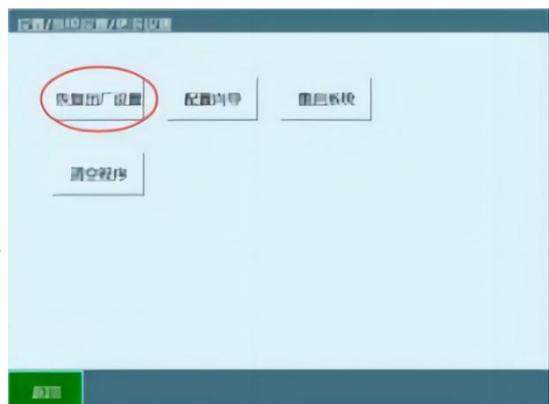
- ① Enter the Settings-System Settings-
- ② Other Settings interface;Click the Clear Programs button;
- ③ Click the OK button in the pop-up dialog box.

**5.3.9 reset**

Restoring factory settings will clear all robot parameters, programs, etc., please operate with caution! Please be sure to do this before performing this operation Back up all parameters and program files!

Proceed as follows:

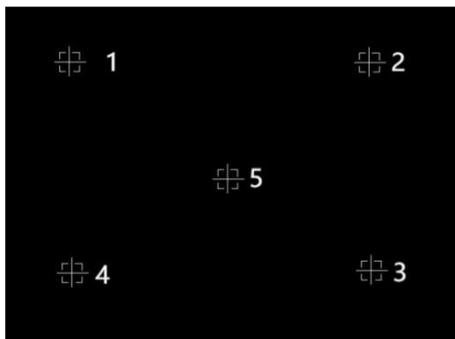
- ① Enter the Settings-System Settings-
- ② Other Settings interface;Click the [Restore Factory Settings] button;
- ③ Click the [OK] button in the pop-up dialog box.



### 5.3.10 Screen calibration

Proceed as follows:

- ① In the power-on state, press the left [ O ] + middle [Coordinate] + right [ STOP ] physical buttons at the same time, and the teach pendant will pop up a prompt. It displays "The calibration file has been deleted and will take effect after restarting the teaching device". Enter the calibration interface after manually restarting the teaching device.
- ② According to the example, click 1-5 respectively with the stylus. The calibration can be completed at the



center of the cross.

### 5.3.11 Controller automatic backup and recovery function

#### ❖ Automatic backup

- ① Backup content: programs, parameters, software (nrc.out);
- ② Number of backups: maximum 10, the
- ③ latest replaces the oldest; Backup naming: named according to premise, version and time;

Example: 2020 Year 9 Month 10 Day 13 Point 10 Modify the parameters separately, the backup name is "Parameter -20.04-3.3.7-202009101310", the prerequisites for triggering the backup: boot, modify parameters, modify programs, upgrade;

④ Backup frequency: Backup once after confirming that the version and parameters are normal when turning on the computer; 5 times after modifying parameters No modifications have been made within minutes Parameter backup once; 5 times after modifying the program (inserting instructions, modifying instructions) The backup has not been modified again within minutes; the backup has been made before upgrading .

#### ❖ Restore backup

- ① Select the backup you want to restore, and the cursor will be displayed after selection;

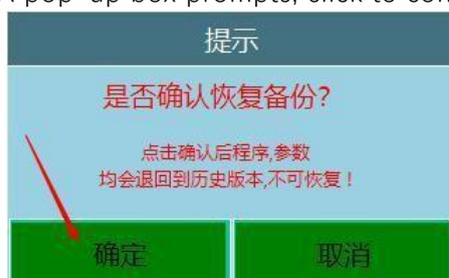
设置/系统设置	
自动备份恢复	
备份名	备份时间
开机-20.06.0-3.3.9-202525252525	2025年25月25日25时25分
参数-20.06.0-3.4.5-20201015082714	2020年10月15日08时27分
参数-20.06.0-3.4.5-20201015072021	2020年10月15日07时20分
程序-20.06.0-3.4.5-20201015065502	2020年10月15日06时55分
参数-20.06.0-3.4.5-20201015061054	2020年10月15日06时10分
程序-20.06.0-3.4.5-20201014101346	2020年10月14日10时13分
开机-20.06.0-3.4.5-20201014100208	2020年10月14日10时02分
开机-20.06.0-3.4.5-20201014063243	2020年10月14日06时32分
重启-20.06.0-3.4.5-20201014063204	2020年10月14日06时32分
开机-20.06.0-3.4.5-20201014062338	2020年10月14日06时23分

- ②

Click the "Restore Backup" button;



- ③ A pop-up box prompts, click to confirm;



- ④ During the recovery process, please do not cut off the power.

## 5.4 Connection between robot and welding machine ( taking Aotai welding machine as an example )

### 5.4.1 Ethercat communication connection

#### ❖ Environment setup

- ① Nabet robot control system
- ② Robot body, control cabinet and
- ③ its external equipment Aotai digital welding machine
- ④ Aotai Ethercat communication controller

#### ❖ connection method

Connect the Nabet control system, servo driver and Aotai digital welding machine through the network cable according to the Ethercat protocol connection.

- ② Teach pendant - Settings - Robot parameters - Slave station configuration, check whether the order of slave station reading is correct. If the corresponding slave station cannot be recognized , please check whether the network cable and the corresponding servo are normal. If the slave station is correctly identified, it will prompt that the corresponding ENI Communication file, upload the corresponding ENI After communicating the file, restart the controller. Upload steps ( prepare a FAT32 Format U \_ disk, in U Create a new file named upgrade in the root directory of the disk folder, place ENI Put in the communication file, and then plug it into the USB under the teaching pendant. i n t e r f a c e , click to upload files in the teach pendant — Settings — System Settings — Version Upgrade. Restart the controller after the upload is successful ).
- ③ In settings - welding process - welding machine settings - welding machine control mode - digital control - communication method selection

Ethercat , the welding machine power supply manufacturer chooses Aotai. After saving the settings, the green light of the welding machine communication status lights up, indicating that the communication is successful.

#### 5.4.2 Can communication connection

##### ❖ Environment setup

- ① Nabot robot control system
- ② Robot body, control cabinet and
- ③ its external equipment Aotai digital welding machine
- ④ Otacan \_ communication controller

##### ❖ connection method

- ① Will Nabot IO Communication module expansion interface A ( CN1 ) , use twisted pair cable to connect to Aotai welding machine **Can** The interface corresponding to the communication controller .
- ② Nabot IO The module already has 24V and does not require power supply from a welding machine; **Can** Interface positive end and **Can** The negative end of the interface needs to be connected to 120 Ohm resistance.
- ③ **Can** in Settings - Welding Process - Welding Machine Settings - Welding Machine Control Mode - Digital Control - Communication Method , the welding machine power supply manufacturer chooses Aotai. After saving the settings, the green light of the welding machine communication status lights up, indicating that the communication is successful.

#### 5.4.3 Analog connection

- ① Nabot robot control system
- ② The robot body, control cabinet
- ③ and its external equipment Aotai analog welding machine

##### ❖ connection method

- ① In Settings - Welding Process - Welding IO Settings, set arc starting, wire feeding, wire withdrawing, and gas supply corresponding **DOUT in the welding outputPort** ( corresponding to IO Four sets of relay outputs on the module ) , and the **arc starting success signal DIN** is set in the welding input port ( any input port ) , **AOUT** corresponding to the given current and voltage in the analog output port. (IO Communication module expansion interface A (CN1) ).
- ② In settings - welding process - welding machine settings - welding machine control mode - analog control.
- ③ In Settings - Welding Process - Current and Voltage Matching, match the current and voltage. After the configuration is completed, test whether the current and voltage sent by the controller are consistent with those displayed by the welder.

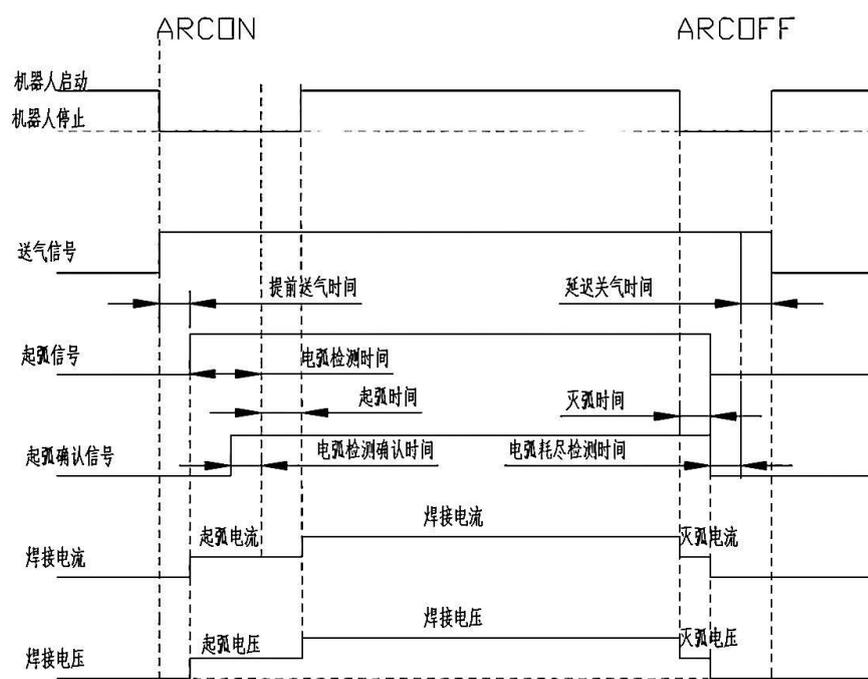
#### 5.5 Introduction to welding process

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This chapter mainly introduces the welding process setting instructions and welding cases on the control system, including but not limited to welding equipment settings, welding Parameter setting, current and voltage matching, manual operation, weaving parameters, welding IO Description of settings and welding machine selection settings.

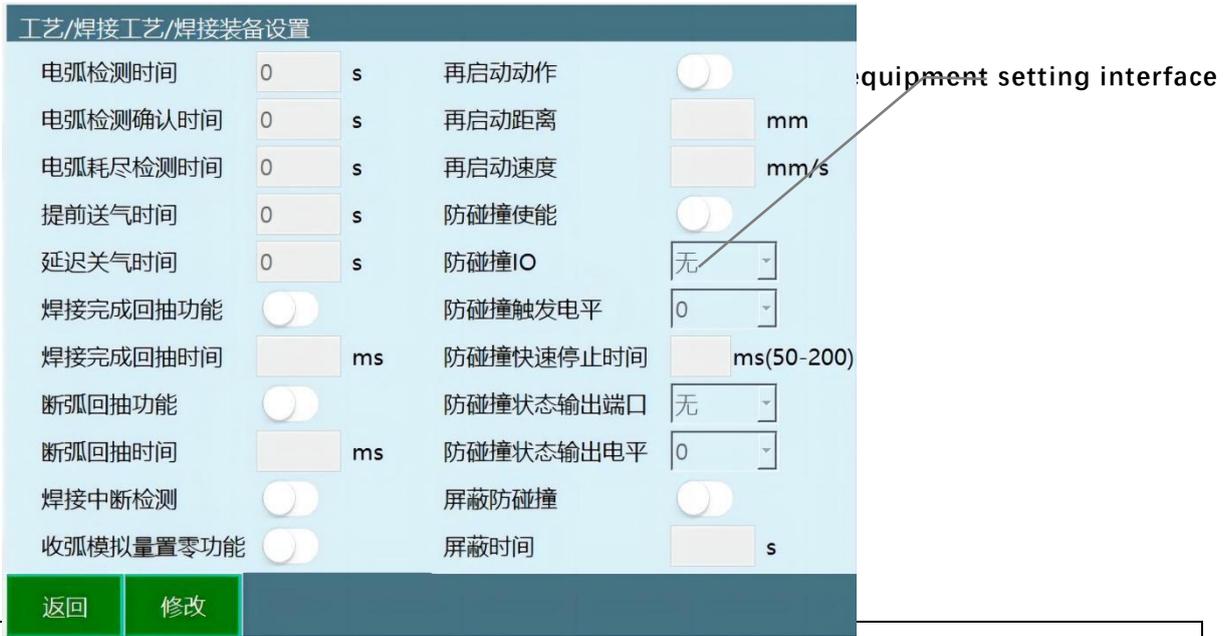


### 5.5.1 Welding sequence diagram



### 5.5.2 Welding equipment setup

- ① To set up the welding device, you need to enter "Process / Welding Process / Welding Equipment Settings" to modify it.
- ② Enter the "Process / Welding Settings / Welding Equipment Settings" page.
- ③ Click "Modify", and in the selection box below the function selection, select the function you need to modify.
- ④ Note: The input box under the function settings turns white, and you can enter values behind the respective functions.



Welding equipment setup instructions	
Arc detection time:	When welding starts, an arc starting signal is sent, and it is necessary to detect whether there is a signal in the arc;
Arc detection confirmation time:	To prevent the signal from being disturbed by obstacles such as dust, a delay is required to ensure that the arc There is signal transmission, and if the successful arc starting signal is continuously detected during this period, welding will begin;
Arc exhaustion detection time:	At the end of welding, the period from when an arc extinguishing signal is given to when the arc is actually extinguished;
Advance air delivery time:	During welding, in order to prevent the welding wire from being oxidized by air, protective gas needs to be supplied. This cannot wait until the welding time. Therefore, the gas needs to be sent in advance;
Delayed gas off time:	After the welding is completed and the arc extinguishing signal is sent, the welding wire has not yet cooled down. If this happens, stop sending protection. Gas, oxidation will still occur, so the gas needs to be turned off delayed, and the welding gun needs to be cooled at the same time. Function.
Welding completion retraction function:	At the end of the welding, the welding gun will receive the signal and the welding wire will be retracted to prevent it from being touched when going to the next welding spot. Hit the workpiece;

Arc breaking withdrawal function:	<p>The welding current exceeds the rated load rate of the welding machine. The welding machine has a short-term protection and arc interruption occurs.</p> <p>The welding wire is retracted to prevent adhesion with the workpiece;</p>
Set arc closing analog value to zero:	At the end of welding, the analog voltage and current signals return to zero;
Restart action:	After opening, the welding process interruption point can be retreated a certain distance when running again.
Restart distance:	The distance to retreat when starting the action again.
Restart speed:	The speed at which the action is retracted when restarted.
Anti-collision enabled:	Turn on enable detection of anti-collision signal.
Anti-collision IO:	Anti-collision input signal.
Anti-collision trigger level:	1/0 Corresponds to high level / low level.

Anti-collision quick stop time:	The time required until the robot stops when anti-collision is triggered.
Anti-collision status output port:	The specified value output port outputs a signal when anti-collision is triggered.
Anti-collision status output level:	1/0 Corresponds to high level / low level.
Shielding and anti-collision:	Enable shielding and anti-collision. After it is turned on, the anti-collision signal will no longer be detected during the shielding time. Disable it. Anti-collision signal, shield anti-collision enable and turn off immediately.
Blocking time:	Shield anti-collision time parameters.

**5.5.3 Welding parameter settings**

- ① To set up the welding device, you need to enter "Process /
- ② Welding Process / Welding Parameter Settings" to modify it.  
Enter the "Process / Welding Settings / Welding Parameter Settings" page.
- ③ Choose the appropriate welding parameter number
- ④ Click "Modify", and in the selection box below the function selection, select the function you need to modify. Note: The input box under the function settings turns white, and you can enter values behind the respective functions.



Welding parameter setting interface

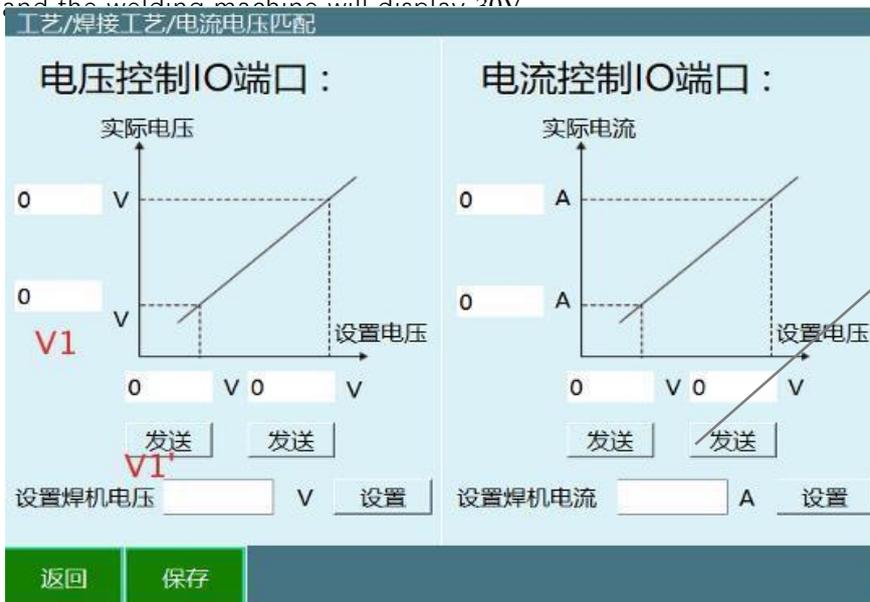
Welding parameter setting instructions	
Welding parameter number:	You can set 1-10 different parameters and call them as needed;
Arcing voltage, current time:	The voltage, current and time applied when heating the welding wire;

Welding voltage and current:	The voltage and current applied during welding;
Anti-sticking wire voltage, current, time:	At the end of the welding, the controller gives the arc extinguishing signal to the welding machine to prevent the welding wire from sticking when it cools down. A strong pulse causes the welding wire to melt;
Terminating arc voltage:	It refers to the conditions that ensure that the arrester can extinguish the arc when the power frequency freewheeling current crosses the zero value for the first time. The highest power frequency voltage applied to the arrester. The arc extinguishing voltage should be greater than the arrester working bus The highest possible power frequency voltage, otherwise the arrester may explode due to inability to extinguish the arc.

terminating arc current:	The current given by the arc extinguisher when arc extinguishing is required during welding;
Arc closing time:	The arc extinguishing time varies according to different arc extinguishing media, generally on the millisecond level.
Flight arcing:	When moving from other points to the welding starting point, air is supplied in advance so that the robot reaches the welding starting point. You can start arcing when you connect to the starting point.

**5.5.4 Welding voltage and current matching ( analog quantity )**

- ① Enter the " Process /Welding Process /Welding Voltage and Current Matching " page. At this time, the current and voltage input box is gray and no values can be entered. After clicking Modify, the Modify button changes to Save, the current and voltage input boxes turn white, and you can fill in the values behind the respective parameters.
- ② There is a proportional relationship between the voltage and current sent by the controller to the welding machine and the actual voltage and current of the welding machine. The controller and the welding machine Connect it, open the teaching pendant interface as shown in the figure, in V1 Set a voltage parameter at V1', click Send, you can see that a corresponding voltage will appear on the welding machine, fill in the voltage at V1', so that the voltage on the controller can be set, and the current can be set in the same way .
- ③ Set current: Enter the current value in the input box, click Set, and the welding machine will display the corresponding value. For example: in the input box Enter 200 , click Set, and the welding machine will display 200A ;
- ④ Set voltage: Enter the voltage value in the input box, click Set, and the welding machine will display the corresponding value. For example: in the input box Enter 30 , click Settings, and the welding machine will display 30V



ltage-matching interface

---

### 5.5.5 manual operation

- ① To set manual operation, you need to enter "Process / Welding Process / Manual Operation" to modify it.
- ② For the convenience of welding, we have added "Process / Welding" in the status bar. Click "Welding" and manual operation will appear. The welding window has the same functions and effects as the manual operation in the welding process.



Manual operation

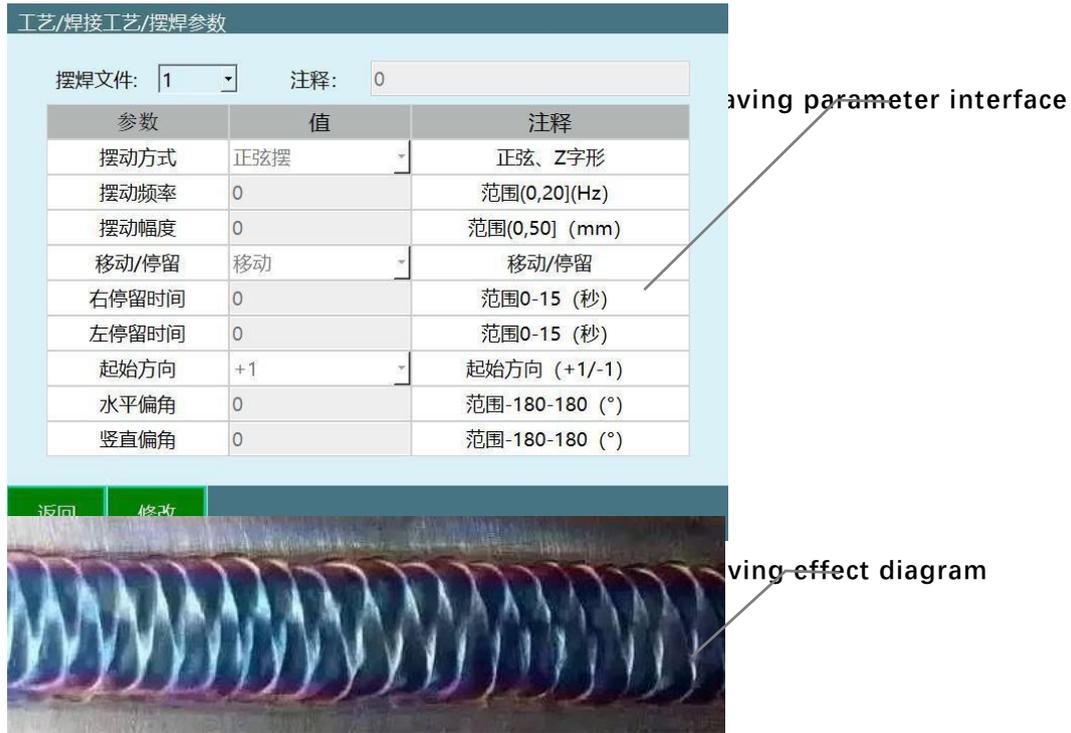
status bar - welding window

Manual operating instructions	
Welding enable	When turned on, the robot will perform welding functions, otherwise it will just follow the trajectory.
Manual arc starting mode	When turned on, manual arc starting is allowed.
Manual spot welding:	Click Modify to set the spot welding current, spot welding voltage, maximum time, and save it to take effect. Long press the manual spot welding button (press and hold to take effect, release to have no effect), the robot will weld, release the button button, the robot stops welding;
Maximum time:	The maximum time the manual spot welding button is allowed to be pressed.
Spot welding current:	Spot welding output current
Spot welding voltage:	spot welding output voltage
Wire feeding, wire withdrawing,	Press to take effect, release to have no effect
Fault reset:	It is valid when using a digital welding machine and can be used to reset the welding machine fault.

### 5.5.6 Weaving parameters

- ① To set the weaving parameters, you need to enter " Process / Welding Process / Weaving Parameters " to modify.

- 
- ② Weaving welding: It is a welding operation in which the heat source of the weld seam swings regularly laterally on the weldment during welding. Weaving welding has two swing methods Formula, including sine, Z Font type; parameters such as swing frequency, swing amplitude, starting direction, horizontal declination angle, and vertical declination angle can be adjusted and can be set according to the actual needs of the industrial site.
  - ③ 9 weaving files can be saved. individual;
  - ④ Click the modify button below, select the weaving file that needs to be modified, click the modify button at the bottom, and all input boxes will become inputable. Enter the state; click the save button after completing the input.



### 5.5.7 Welding IO set up

- ① Welding IO Settings need to enter "Process / Welding Process / Welding IO Modify in Settings.
- ② 焊接机器人出厂已设置好。



### 5.5.8 Welding selection settings

- ① The welding machine selection settings need to be modified in "Process / Welding Process / Welding Machine Selection Settings".
- ② There are two ways to control the welding machine: analog control and digital control, which can be changed according to actual needs.



Welding device selection and setting interface

5.6

### 5.6.1 Welding process settings before programming

① Enter the "Process / Welding Settings / Welding Device Settings" page and make settings.



Welding device setting interface

② Enter the "Process / Welding Settings / Welding Parameter Settings" page and make settings



Welding parameter setting interface

③ Enter "Process / Welding Settings / Welding IO Settings" page to make settings

功能	DI端口	功能	DO端口
起弧成功信号	1-1	起弧信号	1-1
寻位成功信号	无	点动送丝信号	1-2
预留参数	无	反向送丝信号	1-3
预留参数	无	气体检测信号	1-4
预留参数	无	寻位模式	无
预留参数	无	预留参数	无

➤ Note: All parameter value settings in this chapter are only used as examples.

### 5.6.2 Program case

```

0 NOP
1 MOVL P001 V = 10 mm/s PL = 0 ACC = 1 DEC = 1
2 ARCON #1
3 MOVL P002 V = 10 mm/s PL = 0 ACC = 1 DEC = 1
4 ARCOFF
5 END
    
```

Combined with 5.6.1 Welding process settings before programming, explain the above procedure

**The first line:** the robot moves to the starting point of welding P001 ;

**Second line:** ARCON#1 ( contains 4s The advance air supply time and 1s arc detection time ) to start arcing, and execute the welding parameter label 10~4s, 4s advance air supply time (0s When, the gas supply starts and gas is detected, the gas detection signal outputs high level, that is, DO Port 1-4 Light on; 4s After that, provide the arc starting signal, that is, 4s Time DO Port 1-1 Light on ) 4~5s, 1s arc detection time ( if 1s The successful arc starting signal is detected to be high level, that is, DI Port 1-1 The light is on and the program continues to run. If it cannot be detected, the error " Timeout waiting for successful welding arc starting signal " will be reported ) ;

**Third line:** The robot moves to the end point of welding P002 . During this process, the robot starts the welding function, and the arc starting voltage is 100V . Arc starting current 10A , arc starting time 10s , welding voltage 200V , welding current 20A , arc extinguishing voltage 300V , arc extinguishing current 30A ,Arc extinguishing time 30s ( all values correspond to the actual voltage and actual current of " current and voltage matching " , not the set voltage and set current ) ;

**The fourth line:** ARCOFF ( contains 3s arc exhaustion detection time and 5s Delayed air off time ) 0~3s , 3s arc exhaustion detection time (0s When, the arc starting signal outputs low level, that is, DO Port 1-1 The light goes out; if 3s The successful arc starting signal is detected to be low level. That is DI Port 1-1 The light goes out and the program continues to run. If it cannot be detected, the error " Timeout waiting for successful welding arc extinguishing signal " will be reported ) 3~8s , 5s Delayed gas off time (8s When, the gas supply stops and the gas detection signal outputs low level, that is, DO Port 1-4 Lights off ) ;

**Line 5:** The program ends.

### 5.6.3 Steps

#### 1. Program writing:

- ① Click " Project " , click " New " , enter the program name, and click " OK " ;
- ② Move the robot to the starting point of welding, click " Insert " , select " Motion Control Class " , select " Straight Line " , click " OK " , Modify the speed value and click " OK " ;
- ③ Click " Insert " , select " Welding Control Class " , select " Welding Start " , click " OK " , enter the file number ( the file number is correct (the value in the welding parameter

---

setting interface ), click "OK " ;

- ④ Move the robot to the end point of the welding, click " Insert " , select " Motion Control Class " , select " Straight Line " , click " OK " , and modify Change the speed value and click " OK " ;
- ⑤ Click " Insert " , select " Welding Control Class " , select " Welding End " , and click " OK " .

**2. Track confirmation:**

- ① After the program is written, turn the key to switch the teaching box from teaching mode to running mode, click "Start " and do a slow test run. OK, confirm whether the robot's running trajectory is correct and meets the needs;
- ② Welding: After confirming that the running trajectory is correct, the welding enable must be turned on before the robot can perform the welding function;
- ③ Switch the teaching box to teaching mode, click Process /Welding in the upper right corner, and the following picture will appear;



- ④ Select " Enable " and click to open.
- Note: When the program is in running mode, after pressing "Start" and then "Stop", the program will no longer be executed after it is restarted. Welding function.

## 6. Failure and maintenance

### 6.1 Common operations

#### 6.1.1 leak testing

- ❖ Test Time: After reinstalling any motor and gearbox, all enclosed gearboxes must be tested for seal integrity. This is done through leak testing. Before performing a leak test, the oil must be drained from the gearbox out.
- ❖ Leak test operations:
  - ① Complete the relevant motor or gear modification procedures, but do not refill the gears with oil before leak testing procedures wheel box.
  - ② Remove the oil plug from the gear and replace it with a leak tester, you may need a regulator, regulator kit Included in leakage testing.
  - ③ Use compressed air and use a ball handle to increase the pressure until the correct value is displayed on the pressure gauge. Please operate with caution. Note that the pressure must not be higher than ( 20~25kpa ) under any circumstances .
  - ④ Disconnect the compressed air supply.
  - ⑤ Wait about 8~10 minutes to ensure that no pressure drop occurs.
  - ⑥ If a pressure drop occurs, follow the steps to find the leak. If a pressure drop does not occur, If it drops, remove the leak tester and reinstall the ink, and the test is completed.
  - ⑦ Spray any suspected leak areas with leak detection spray, bubbles will
  - ⑧ indicate a leak. After finding the leak point, take relevant measures to deal with the leak.

#### 6.1.2 Damaged parts replacement

- ❖ Description : Follow these steps whenever you damage the robot 's paint while replacing parts .
- ❖ tool : Cleaner , knife , lint -free cloth , touch-up paint
- ❖ Disassembly operation : 1. Use a knife to cut the paint layer at the joint between the disassembled parts and the structure . The paint layer on one side will crack in a large area . 2. Carefully grind and polish the remaining paint layer burrs on the structure .

#### 6.1.3 Brake release button stuck

- ❖ The brake release device has buttons for releasing the brake of the motor for each axis. In SMB When performing repair work in a recess involving disassembly



**If the brake release button is stuck in the depressed position, the affected motor brake may release once power is applied, which may cause serious personal injury and machine damage.**

and reassembly of the brake release device, the brake release button may become stuck after reassembly;

**warn**

- ❖ Please follow the steps below to eliminate the risk of brake release and jamming that may occur after maintenance;

seria	operate
I	

number	
1	Make sure to turn off the power
2	If necessary, remove button protection
3	Verify the brake release buttons by pressing them one at a time to ensure that none of the button stuck in tube
4	If the buttons become stuck in the depressed position, the alignment of the brake release unit must be adjusted so that each button The button can move smoothly within its tube

## 6.2 Common faults and solutions ( machinery )

Robot failures are sometimes caused by a combination of multiple different reasons. It is often difficult to thoroughly identify the cause. For example, using error handling Failure to do so may



**Please turn off the power before performing any maintenance operations to avoid personal injury or equipment damage!**

lead to further deterioration of the fault, so it is important to analyze the fault situation in detail and find out the real cause.

warn

situation	description	Possible Causes	Solution
Clicking or vibrating noise	The bottom surface is not firmly connected to the ground solid	Because the robot vibrates when working Frequent movement leads to looseness	Re-tighten the robot to the ground surface connection
	Robot joint joints are loose	The joint connecting bolts did not reach the specified pretightening force, and no corresponding protective measures were added to the bolts. Loosening measures ( gasket )	Reinstall and re-retain the bolts
	If the robot exceeds a certain speed and vibrates significantly,	The program the robot follows is correct to the machine It is more laborious for the robot to run	Improve robot program running route
	robot in a specific location vibration is particularly obvious	The load imposed on the robot is too large	Reduce robot load
	Reducer damaged	The joint reducer has not been used for a long time. replace	Replace reducer
	The robot collides or grows Vibration occurs due to time overload	Joints caused by collision or overload The structure or reducer is damaged	Replace the vibration reducer or repair structure
	Robot vibration and other operations	Resonance between robots	Change the distance between robots

	related to making robots		Leave
	When shutting down the robot, pulling the robot by hand causes the machine to people shaking	Due to overload, impact caused the bolts on the robot joints to loosen move	Check whether the joint bolts are loose and tighten them
Motor overheated	Robot working environment temperature Rising or the servo motor is covered by an object	The ambient temperature rises or the electricity The heat of the machine cannot be dissipated, causing the temperature to rise.	Reduce ambient temperature, increase heat dissipation , and remove motor coverings
	robot control program or load change	The program or load exceeds the machine Robot tolerance range	Adjust the program to reduce the load
	Parameters imported into the controller The number changes causes the motor to overheat	The imported parameters do not conform to the robot model	Import the correct parameters
Gearbox oil leakage	Oil leakage from joints	The robot has been used for too long , resulting in sealing rubber parts Ageing	Replace the sealing oil seal or O Ring
		Because dismantling and reassembling Careless operation leads to sealing ring	Replace the sealing oil seal or O type lock up

Gearbox oil leakage	Oil leakage from joints	be damaged	
		Damage to the oil seal may be caused by scratches on the lip of the oil seal caused by the intrusion of dust and other foreign matter.	if the oil seal at the reducer is damaged, the reducer must be replaced; if the oil seal on the motor end is damaged, new oil must be replaced. seal up.
		There is a gap in the sealing surface	Retighten the mounting screws so that The joint surface is tightly bonded
		Motor or reducer mounting surface Sealant failure	Reapply sealant
		The oil nozzle or screw plug is present question	Replace with new oil nozzle or screw plug
	Cracks in castings and broken oil chambers due to collisions and other situations damage	Replace with new parts	
Joints cannot lock	The robot cannot stop at a certain position accurately , or the robot cannot stop due to gravity after a period of time. joint rotation under action	There is a problem with the servo motor brake	Replace servo motor

### 6.3 Common faults and solutions ( system )

#### 6.3.1 The upper left corner of the teach pendant shows disconnection ( red )

- ❖ **Phenomenon 1** : After turning on the teaching pendant, the upper left corner of the teaching pendant always displays a red " Connection Disconnected " without any change.

**solution:**

- ① Close the control cabinet and wait 1 Restart after a few minutes to see if the connection is successful;
- ② Check whether the wiring between the controller and the teaching pendant is correct. The network cable of the teaching pendant adapter box needs to be connected to the controller marked " teaching pendant ". The other network port of the controller needs to be connected to the "IN" network port of the servo;

- ③ Switch the permission of the teach pendant to administrator and enter " Settings - System Settings -IP" Settings " interface, check whether the " Connection IP" item matches the IP of the controller. same;
  - ④ Check IP Set the teach pendant IP in the interface Whether and controller IP In the same network segment, that is, the IP of the controller and the teaching pendant Both are 192.168.1.xxx Or both are 192.168.0.xxx ;
  - ⑤ Plug a monitor into the controller's VGA On the port, check whether the controller boots normally. If it does not boot normally, please restart the controller. If it still cannot boot normally, please go to [www.inexbot.com/service/download/](http://www.inexbot.com/service/download/) to download the debugging software and replace the controller program through the debugging software. .
- ❖ **Phenomenon 2** : After turning on the teaching pendant, the upper left corner of the teaching pendant always displays a red " Connection Disconnected " , but it will automatically connect after a while.
- solution:**
- ① Re-insert and unplug the teaching pendant to ensure that there is no poor contact in the aviation plug;
  - ② Replace the network cable connecting the teaching pendant and the controller. Please use a Category 6e shielded network cable.

### 6.3.2 Unable to upgrade program

- ❖ **Phenomenon 1** : U After inserting the disk into the teaching pendant, click the [Detect Upgrade] button on the "Version Upgrade" interface, and the " Upgrade file not found" prompt will pop up .

**solution:**

- ① Re-plug U disk, confirm U Insert the disk;
- ② OKU \_ There is an upgrade file in “.zip” format on the disk ;
- ③ Confirm to copy to U The upgrade file on the disk is in “.zip” format, and there are no special characters in the file name;
- ④ U Insert the disk into the computer, right-click U in the file manager disk, click "Properties" and check " Whether the file system format is FAT32" in the properties box , if it is NTFS or other formats, please format U The disk is FAT32 Format;
- ⑤ OKU \_ The interface of the disk is intact. If it is loose, please replace it. plate.

- ❖ **Phenomenon 2** : Select the upgrade file and click the [OK] button. The upgrading interface pops up, but it flashes and then disappears. Neither the teach pendant nor the controller automatically restarted.

**solution:**

- ① Make sure the file name of the selected upgrade file does not have special characters , such as "" , () , & , % wait ;
- ② Make sure the controller and teach pendant are connected properly. Is there a word "Connection Disconnected" displayed in the upper left corner of the teaching pendant? If the current connection is disconnected, it cannot be upgraded;
- ③ Put U Insert the disk into the computer and use winrar Wait for the decompression software to open the ".zip" upgrade file and check its content to see if it is Qt-tp. and nrc.out Two files. If not, please check whether the wrong file was copied.

- ❖ **Phenomenon 3** : After the upgrading interface pops up, a "waiting timeout" message appears in the interface, and the interface disappears without automatically restarting.

**solution:**

- ① Make sure the controller and teach pendant are connected properly.
- ② Check whether the word "Connection Disconnected" is displayed in the upper left corner of the teaching pendant. If the current connection is disconnected, it cannot be upgraded.

- ❖ **Phenomenon 4** : After the upgrading interface pops up, the message "Failed to copy the upgrade file" appears in the interface, and the interface disappears without automatically restarting.

**solution:**

- ① Enter the "Status - System Status" interface to view the remaining space of each directory.
- ② If the storage space of any directory has reached 0.0M , the program cannot be upgraded, please contact technical personnel .

### 6.3.3 Shows servo not connected

- ❖ **Phenomenon 1** : After the teach pendant is turned on, the "Servo Not Connected" message bar pops up in the lower right corner, and after pressing the clear button, the "Servo Not Connected" message bar also pops up , but the "Corresponding ENI not found " message bar does not pop up .

**solution:**

- ① Check whether the network cable connecting the controller to the servo is correct. One end of the network cable connected to the servo needs to be connected to the port marked "Servo" on the controller. network port, and the other end is connected to the " IN " network port of the servo;

- ② Check whether the network cable between servo and servo is connected well. Both ends of the network cable connecting from the first servo to the second servo need to be connected to the first The " OUT " network port of the first servo and the " IN" network port of the second servo , and so on;
  - ③ Check servo with EtherCAT IO Check whether the network cable of the board is connected properly. Both ends of the network cable need to be connected to the " OUT" network port of the servo and EtherCAT IO " IN" network port;
  - ④ Check "Settings - Robot Parameters - Robot Configuration", "Settings - IO-IO" in turn Configure the number of robots, robot type, servo and IO of each axis in the two interfaces Number of boards, IO Whether the board model and other information are filled in strictly according to the actual wiring, determine the servo model, IO After selecting the board model number, contact the manufacturer to obtain an EIN. document.
- ❖ **Phenomenon 2 :** After the teach pendant is turned on, the message bar "Corresponding ENI not found" and "Servo not connected" pop up in the lower right corner.

**solution:**

- ① Check "Settings - Robot Parameters - Robot Configuration", "Settings - IO-IO" in turn Configure the number of robots, robot type, servo and IO of each axis in the two interfaces Number of boards, IO Whether the board model and other information are filled in strictly according to the actual wiring to determine the servo model, IO After confirming the board model number, contact the manufacturer to obtain the ENI. document;
- ② Get ENI After file, please prepare a FAT32 Format U disk, confirm U The method to format the disk is to change the U Insert the disk into the computer, right-click U in "My Computer" Drive letter, click "Properties", in the pop-up dialog box there is a line " File system: xxxx ", if it is FAT32 You can use it if it is NTFS Please format U disk, select "FAT32 " as the file system when formatting;
- ③ in U Create a new folder named "upgrade" in the disk and copy the obtained ENI P u t
- ④ the file ( suffix .xml) into this folder;Will U Insert the disk into the teach pendant, and make sure that the teach pendant is connected to the controller ( there is no red "Connection Disconnected" in the teach pendant status bar. characters ), switch the teaching pendant permissions to "Administrator" permissions, click to enter the "Settings - System Settings - Version Upgrade" interface, click below "Upload file" button, select .xml File upload will take effect after the upload is successful and restarted.

### 6.3.4 Version mismatch shown when booting

- ❖ **Phenomenon 1 :** " Controller (xxx)-teaching pendant (xxx) , versions do not match " is displayed after powering on .

**solution:**

- ① Record the numbers in the controller (xxx) -teaching pendant (xxx) and provide them to the manufacturer to obtain the upgrade package;
- ② prepare one F A T 3 2 Formatted U disk ;
- ③ Upgrade package (. zip file ) in U In the root directory of the disk;
- ④ Make sure that the controller and the teach pendant are connected ( there is no " Connection

Disconnected " in the status bar above the teach pendant ) , switch the right of the teach pendant. Only for " Administrator " , click to enter the " Settings - System Settings - Version Upgrade " interface of the teach pendant , click the " Check Upgrade " button, and select in.zip \_ File, confirm, it will take effect after automatic restart.

### 6.3.5 The teach pendant cannot be turned on

- ❖ **Phenomenon 1** : When the teach pendant is turned on, it is stuck in the interface of the progress bar. The progress bar has been completed but the program has not been entered.

**Solution:** If there is a U disk, please change U After unplugging the disk, power off and restart.

- ❖ **Phenomenon 2** : The teaching pendant is not plugged into the U disk, when booting, it is stuck in the interface of the progress bar and does not enter the program.

**solution:**

- ① Please find a U disk, in U Create a new folder named "app" in the disk ;
- ② Upgrade the program.zip Unzip the file and put Qt-tp in it Copy the file into the folder, insert it into the teach pendant, and restart the teach pendant ;
- ③ When the teach pendant is restarted and the progress bar is completed, it will automatically restart again. At this time, unplug the U disk and wait for the teach pendant to power on automatically.

❖ **Phenomenon 3** : I have tried all the above methods, but still cannot boot.

**Solution:** Please contact the manufacturer to solve the problem.

### 6.3.6 A red servo error appears above the teach pendant.

❖ **Phenomenon 1** : A red "Servo Error" is displayed in the servo status of the status bar above the teach pendant .

**solution:**

- ① Switch to the teaching mode, check whether the emergency stop button on the teaching
- ② pendant, control cabinet, and reservation box is pressed. If pressed, pull it out. Press the
- ③ "Clear Error" button on the teach pendant. If the "Servo Error" above the teach pendant disappears, the servo error is cleared and you can continue to use it; If an error still occurs after pressing "Clear Error", record the servo error information, that is, the error code of each axis;
- ④ Insert a FAT32 Format U disk to the teach pendant (FAT32 Format U Please refer to the "Servo Not Connected " section for disk inspection and production methods ) ;
- ⑤ Enter the "Settings - System Settings" interface and click "Export Controller Logs."
- ⑥ Will U The "controllerLog( date - time )" just exported from
- ⑦ the disk is packaged and compressed;Submit the



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compressed file and servo error code to the manufacturer, who will analyze the reasons;

**Note**

### 6.3.7 It cannot be enabled after pressing the three-position push switch of the teaching pendant.

❖ **Phenomenon 1** : After pressing the three-position push switch of the teaching pendant, it prompts "Servo not ready"

**solution:**

Press the "Servo" button on the teach pendant, or click the servo status column in the status bar above the teach pendant, and click the "Servo Ready" button button, the servo status above the teaching pendant displays flashing "Servo Ready". At this time, press the three-position push switch in the "teaching mode". Can be enabled.

❖ **Phenomenon 2** :

**solution:**

- ① Determine whether it is currently in "teaching mode". If not, please rotate the key
- ②

switch or click the mode column in the upper status bar. Check whether the servo alarm indicator light in the control cabinet is on. If so, please clear the servo error and restart the cabinet.

- ③ If the servo drive and teach pendant modes are correct and it still cannot be enabled after pressing the three-position push switch, please check the teach pendant adapter board. Is the common terminal on the wiring board connected to +24V? Series connection, as shown in the figure.

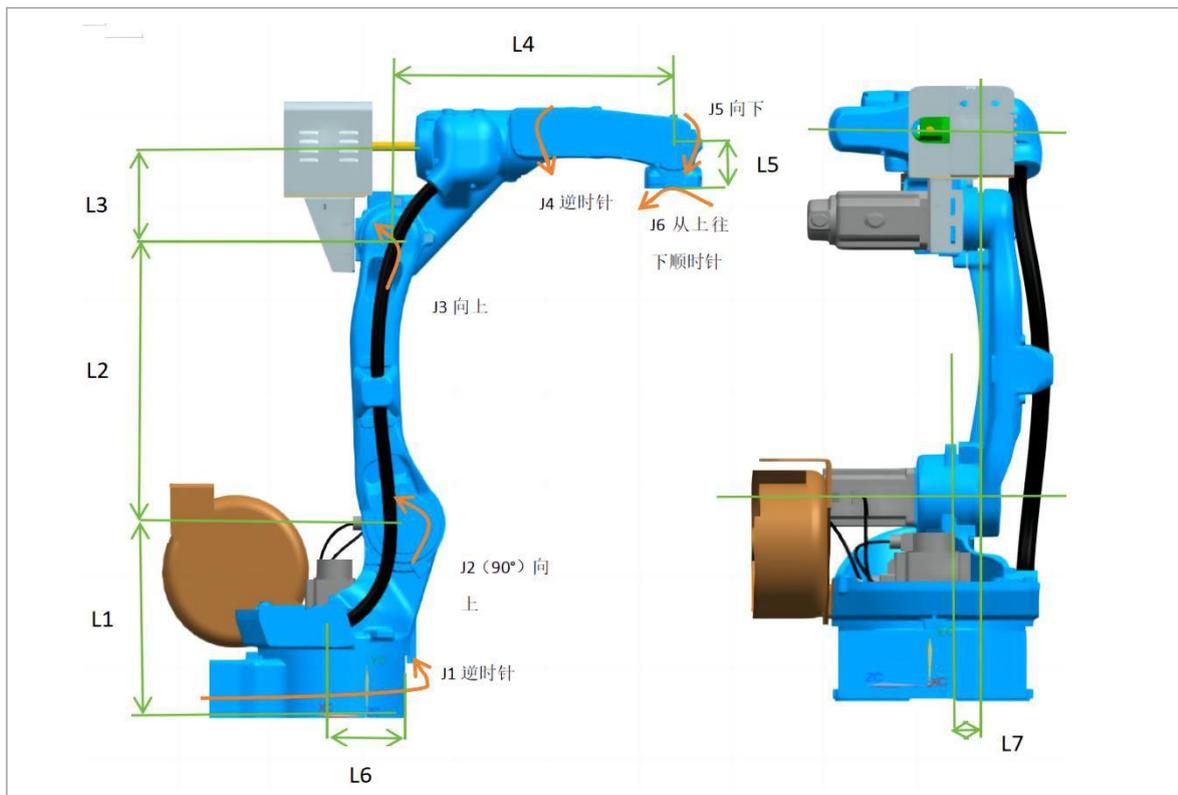


### 6.3.8 Robot DH Fill in parameters

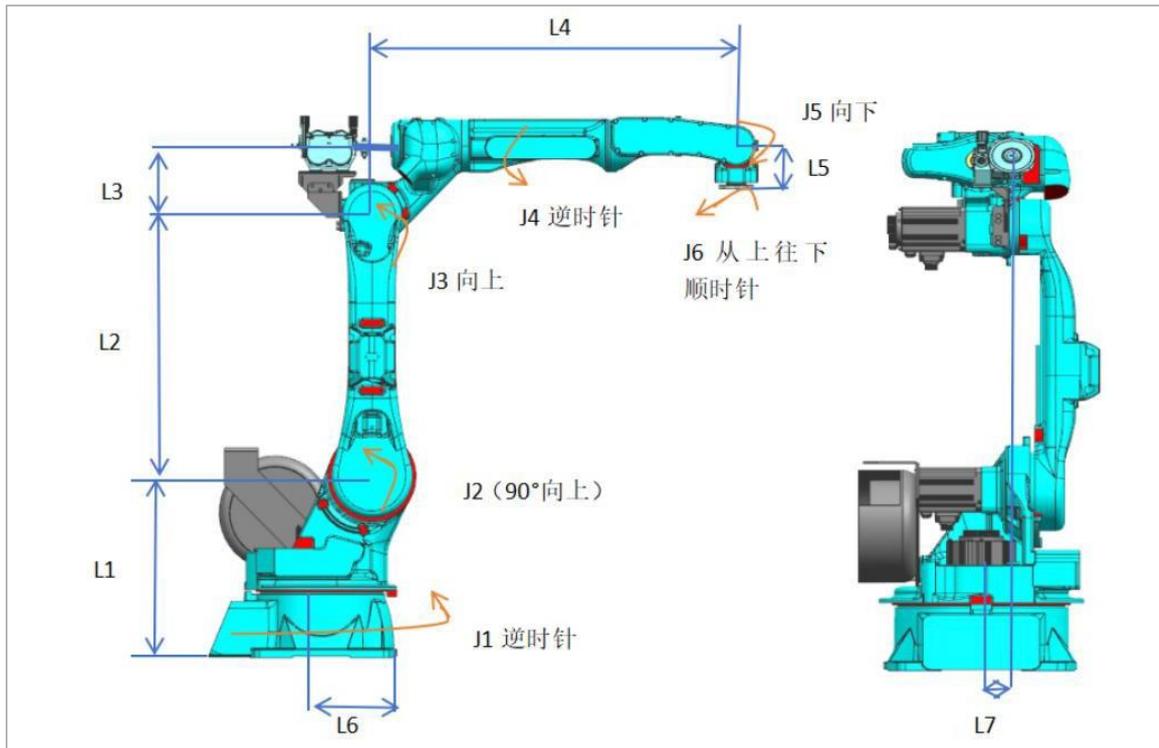
❖ **Phenomenon 1** : I don't know DH Parameters meaning of each parameter

**solution:**

- ① Please fill in the corresponding length ( mm ) of each rod length as shown in the picture below .
- ② Please note that if 5 The zero point of the axis is vertically downward, please select "Vertical downward 90° " in the last item "Five-axis direction" ; if 5 The axis zero point is horizontal forward, please select "Horizontal 0 °".



● MR10W-1440 Robot DH ginseng digital diagram



● MR12-2010 Robot DH Parameter diagram

**6.3.9 The rectangular coordinates of the jog are incorrect (cannot walk in a straight line )**

❖ **Phenomenon 1 :** Manually operated robot moves Axis, Y The axis does not go straight, and after teaching two points, the linear motion command between the two points does not go straight either.

**solution:**

- ① Check whether the robot zero point is correct
- ② Check whether the reduction ratio of each axis of the robot is correct
- ③ 90 degrees manually degree, check whether the coordinate value in the teach pendant is also rotated 90 degrees degree, if not, the shaft reduction ratio is incorrect, please contact the manufacturer to obtain the correct reduction ratio.
- ④ Check robot DH Are the parameters (including coupling ratio)
- ⑤ correct ( contact the manufacturer to obtain )Check whether the direction of each axis of the robot is correct ( there are direction labels on the body )
- ⑥ If the problem still cannot be solved, please contact the manufacturer.

❖ **Phenomenon 2 :** Robot 5 Move X when the axis is vertically downward , Y , Z The axis moves in a straight line normally, but moves X after changing the posture. , Y , Z The shaft is not running straight.

**solution:**

- ① Check the robot zero point, reduction ratio, DH Parameters, joint directions.

- ② Check 5 Axis zero point setting. If 5 The zero point of the axis is vertically downward, please select "Vertical downward 90°" in the last item "Five-axis direction" ;If 5 The zero point of the axis is horizontally forward, please select "Horizontal 0°".
- ③ If the problem still cannot be solved, please contact the manufacturer.

### 6.3.10 Tool hand calibration results are inaccurate

- ❖ **Phenomenon 1** : After calibrating the tool hand, select the tool hand and align the tip of the tool hand with a sharp point, and operate the tool coordinate system TA , TB , TC , it was found that the position of the end of the tool hand and the sharp point deviated greatly.

**solution:**

- ① Check the robot zero point, reduction ratio, DH Parameters (including coupling ratio) and joint directions.
- ② Check 5 Axis zero point setting. If 5 The zero point of the axis is vertically downward, please select "Vertical downward 90°" in the last item "Five-axis direction" ;  
If 5 The axis zero point is horizontal forward, please select "horizontal 0" °.
- ③ The calibration method is wrong and the calibration point is inaccurate.
- ④ Use the system's built-in 20 Point calibration method recalibration. If every point during the calibration process is accurately calibrated and the above parameters are correct, please contact the manufacturer for resolution.

### 6.3.11 System 20 The meaning of point calibration

- ❖ The inaccurate zero point of the robot will lead to inaccurate robot accuracy. At this time, the zero point needs to be accurately calibrated. 20 Point calibration can correct the zero point compensation and use the tool hand for 20 During point calibration, the deviation value of the end of the tool hand relative to the center of the flange will be calibrated at the same time ( the attitude is not calibrated ) .
- ❖ 20 Point calibration can only compensate for 3mm The error is within
- ❖ 20 After point calibration, click Calculate. If the error in the calibration result is too large, please recalibrate.

### 6.3.12 Can't draw a full circle

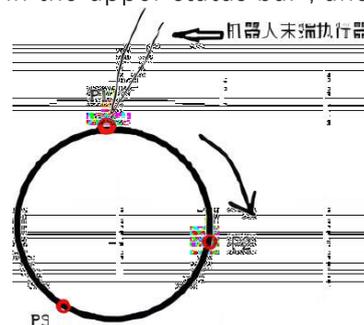
- ❖ **Phenomenon 1** : The robot has a welding gun and its posture does not change when it walks in a full circle.

**Solution:** Modify the inserted MOVCA instruction, place SPIN Check it.

- ❖ **Phenomenon 2** : The drawing of a circle is completely inaccurate.

**solution:**

To teach the robot to walk a complete circle, the move command is MOVCA . Instruction insertion premise, click the "Tool" button in the upper status bar , and select the previously calibrated tool hand;



Insert steps, four instructions in total:

- ① Click Insert, click coordinates to switch categories, select **SWITCHTOOL** , and select the previously calibrated tool number;
- ② Move to any point of the circle you want to draw, as shown in Figure P1 , click Insert, click the
- ③ Motion Control class, and select **movj** or **movl** ;Then move to any point of the circle you want to draw, as shown in Figure P2 ( different from the 2nd point in the step ) , click the " Coordinate System" button in the upper status bar, select the "Tools" coordinate system, click Insert, click the motion control class, and select **movca** ;

- ④ Then move to any point of the circle you want to draw, as shown in Figure P3 ( it must be different from 2,3 point in the step ), click the "Coordinate System" button in the upper status bar, select the "Tools" coordinate system, click Insert, click the motion control class, and select `movca` .
- ❖ **Phenomenon 3** : Already followed Phenomenon 2 I have compiled the program according to the steps in, but the circle drawing is still inaccurate.

**solution:**

Please check if the tool hand is accurate.

Inspection method: Find a cone fixed on a plane, align the robot tip with the cone tip, switch the coordinate system to the tool coordinate system and switch to the tool hand, and go TA , TB , TC Three postures to see if the walking is accurate. If there is a large deviation, Please recalibrate the tool hand, it is recommended to use 20 Point calibration.

### 6.3.13 Running program is too slow

- ❖ **Phenomenon 1** : When running the program in running mode, the robot moves very slowly.

**solution:**

- ① The running speed of the program = command speed × status bar speed;
- ② Please check whether the command speed in the program is very low and increase the required command speed;
- ③ Please check whether the speed percentage in the upper status bar is very low. If so, press the button on the teach pendant before starting the program in the running mode. The " V+" button turns the speed up;
- ④ If it is still very slow after checking the above, please check the joint parameter interface and Cartesian parameter interface in "Settings - Robot Parameters". The multiple of acceleration and deceleration relative to the maximum speed. If it is very low, increase it. It can be set to 4-8. times.

### 6.3.14 Remote mode runs too fast

- ❖ **Phenomenon 1** : The program runs too fast in remote mode.

**solution:**

Reference 6.3.13 Make settings settings

- ① Remote mode running speed = command speed × status bar speed
- ② The status bar speed in remote mode is in the "Settings - Remote Program Settings" interface



### 6.3.15 How to import and export files

Including but not limited to version upgrade and file upload, time setting, IP Settings, export / import program, one-click system backup, modify teach pendant configuration, export / import controller configuration, export log, automatic backup and recovery setting methods. ( See 5.3 for details Controller - System Settings )

### 6.3.16 Teach pendant IP Set the local IP in the interface is empty

- ❖ **Phenomenon 1** : "Settings - System Settings -IP Teach pendant IP in Settings is empty.

**solution:**

- ① Connect the controller through the computer or use the keyboard to debug the teaching pendant;
- ② Enter the command "cd /etc/network" , press Enter, "cp interfaces\_bak interfaces" , Enter, "vi interfaces" , press Enter;
- ③ In the newly popped-up interface, press the "INS" button on the keyboard to modify the IP is 192.168.1.235 , then press "ESC"  
Press the key, enter ":wq" , press Enter, and restart the educator.

### 6.3.17 Change LOGO , boot image, program startup image

- ❖ **Change LOGO ( icon in the upper left corner ):**

**Steps:**

- ① Prepare a logo Image file, requirement: 145\*60 pixel, png Format, named Logo.png ( note case ) ;Compress image files into a .zip Format compressed package such as logo.zip ;
- ② will.zip \_ The compressed package is placed in U In the root directory of the package, plug it into the teaching pendant and upgrade the file.

- ❖ **Change the boot picture ( two pictures of power on and progress bar ):**

**Steps:**

- ① Prepare two pictures, htq\_logo.bmp , htq\_logo\_sys.bmp , the resolution is 800\*600 , it is recommended to use 24 bit color;Compress two images into one .zip Compressed package, such as open.zip ;
- ② will.zip \_ The compressed package is placed in U In the root directory of the package, insert it into the teaching pendant and upgrade the file;
- ④ While restarting, press and hold the second button from the top on the left row of the teach pendant and **START** and **STOP**. These three buttons, with four lines of words appearing on the teaching pendant, of which the fourth line has the red words " please " manual restart your system ", power off and restart the teaching device.

- ❖ **Change the program startup image:**

( StartImage.png This is a picture after completing the progress bar, SoftUpdatingBackground.png

- ① This is the background image when upgrading the program )Prepare two pictures, both with resolution 800\*600 , png format, respectively named StartImage.png , SoftUpdatingBackground.png ( note the case ) , the latter is the background image when upgrading the program;
- ② Compress two files into one .zip Compressed package, such as background.zip ;
- ③ will.zip \_ The compressed package is placed in U In the root directory of the package, plug it into the teaching pendant and upgrade the file.



## 7. Maintenance and maintenance



**Robot maintenance can only be performed after the robot is powered off!**

### 7.1 maintenance items

#### 7.1.1 Routine maintenance items

Industrial robots operate under harsh working conditions. Even if they are designed with perfect design specifications, they must undergo regular inspections. and preventive maintenance. During daily operation of the system, the following items should be maintained and inspected.

serial number	project	Maintenance method
1	Oil leakage inspection	Check if there is any oil seeping out of the robot product, if so please wipe it clean
2	Vibration, abnormal noise, motor heating	Check whether there is vibration and abnormal noise in each transmission mechanism, and whether the motor temperature is abnormally high.
3	Positioning accuracy check	Check whether there is any deviation from the last teaching position and whether there is any deviation in the stop position.
4	Control cabinet air cooling inspection	Check whether the fan behind the control cabinet is ventilated smoothly and whether there is any abnormal noise.
5	Peripheral cable fastener inspection	Whether it is complete and complete, whether there is any wear and tear , whether there is any rust.
6	Peripheral electrical accessories inspection	Check whether the external circuit connection of the robot is normal, whether there is any damage, and whether the buttons are normal.
7	warning check	Confirm whether there is a warning on the warning screen of the teaching pendant. If so, please refer to the alarm code. Code list processing.
8	Operating machine cleaning	Clean the surface of the operating machine daily

#### 7.1.2 Regular maintenance items

Carry out inspection and repair based on the specified operating cycle or accumulated operating time as the approximate interval standard. Perform regular maintenance steps to maintain For the

best performance of the robot, regular inspection and repair can be performed by the user according to the table below.

Maintenance cycle	project	Maintenance method
1 For the first time in a month and every 3 months	Cleaning of control unit vents	If a large amount of dust adheres to the vents of the control unit, it should be removed
every 3 months	Confirmation of trauma and peeling paint	or paint peeling caused by interference with peripheral equipment . If interference occurs, eliminate the cause. in addition,

		If the damage caused by interference is so large that it affects use, it is necessary to Corresponding parts must be replaced.
every 3 months	Confirmation of damaged cable protective cover	Please confirm whether the cable protective cover of the cable inside the mechanism has holes or tears. bad. When damaged, the cable protective cover needs to be replaced. if it is with If the cable protective cover is damaged due to contact with peripheral equipment, the original because.
every 3 months	Confirmation of getting wet	Please check whether there is water or cutting oil splashed on the robot. splashed with water or When cutting oil, eliminate the cause and wipe off the liquid.
3 For the first time and every 1 month Year	the teaching pendant, control cabinet connecting cable, and robot connecting cable are damaged	Please check whether the teaching pendant, control cabinet connection cable, and robot connection cable are excessive. Twisted, with or without damage. If damaged, replace the cable
3 For the first time and every 1 month Year	Confirmation of damage to cables ( movable parts ) within the robot	Please observe the movable part of the robot cable and check whether the cable coating is damaged. Whether local bending or twisting occurs.
3 For the first time and every 1 month Year	End effector (robot ) Confirmation of cable damage	Please check whether the end effector cable is excessively twisted or damaged. damaged time, replace the cable.
3 For the first time and every 1 month Year	Check whether the connectors of each axis motor and other exposed connectors are loose.	Please check whether the connectors of each axis motor and other exposed connectors are loose.
3 For the first time and every 1 month	Tightening of end effector mounting bolts	Please tighten the end effector mounting bolts.

Year		
3 For the first time and every 1 month Year	Tightening of main external bolts	Please tighten the robot installation bolts, maintenance and other loose bolts and exposed bolts on the robot. External bolts. For bolt tightening torque, please refer to Appendix A. Screw tightening torque table. Some bolts are coated with anti-loosening adhesive. When using the recommended tightening torque When tightening with the above torque, the anti-loosening adhesive may peel off, so be sure to use Recommended tightening torque for tightening.
3 For the first time and every 1 month Year	Confirmation of mechanical brake	Please confirm whether the mechanical brake has any traces of trauma, deformation or other collision. Check whether the fixing bolts of the device are loose.
3 For the first time and every month	Cleaning of splashes, chips, dust, etc.	Please check whether there are splashes, cutting chips, dust, etc. attached to the robot body or accumulation. Clean when there is buildup. The movable parts of the robot ( each joint,

1 Year		Balance cylinder rod, balance cylinder front / rear support part, cable protective cover ) pay special attention to cleaning.
3 For the first time and every 1 month Year	Checking cooling fan operation	(When installing the cooling fan to each axis motor) Please confirm the cooling air Is the fan working properly? Replace the cooling fan when it does not operate.
per 1 Year	Replacing the battery of the robot body	Please replace the battery of the robot body
per 1 Year	Lubricating oil replacement of each axis reducer	Please replace the lubricating oil of each axis reducer
every 4 Year	Replacement of cables inside the robot	Please replace the internal cables of the robot. Regarding the replacement method, please consult our company. Inquire

## 7.2 Maintenance process

### 7.2.1 cleaning robot

In order to ensure that the robot can operate for a long time, every 3 The robot should be cleaned regularly every month.

Proceed as follows:

- ① Adjust the robot to the calibration state.
- ② To prevent danger, turn off the power, hydraulic and pneumatic
- ③ sources connected to the robot. Clean the operator with a vacuum cleaner or wipe it with a cloth.
- ④ Clear access to machine base and arms.
- ⑤ If the manipulator is protected by grease or other protection, remove it as required (plastic protection should be avoided) .
- ⑥ To prevent static electricity, non-conductive surfaces such as spray equipment, hoses, etc. must be wiped with a soaked or damp rag. Do not use Use a dry cloth.
- ⑦ After ensuring that all safety conditions are met, proceed with subsequent work on the operating machine.



warn

- It is prohibited to use water jets on operating machines, especially joints, seals or cable entrances and exits;
- It is prohibited to use compressed air to clean the robot;
- It is prohibited to remove any robot protective devices;
- The use of solvents to clean robots is prohibited;

### 7.2.2 Electrical cabinet maintenance

**❖ Power outage check:**

- ① Clean the teaching pendant. After shutting down, use a rag with a small amount of
- ② cleaning fluid to clean the teaching pendant and the connecting wire between the teaching pendant and the electrical cabinet. Clean the fan inlet / outlet. Use a dust brush
- ③ when cleaning and vacuum the dust under the brush. Do not use a vacuum cleaner to clean the components directly , otherwise it will cause electrostatic discharge and damage the components. Air inlet and outlet filter cloth 500H Need to be replaced every hour. After shutting down, open the control cabinet door and use an air gun to remove dust. Be careful not to use too much air volume.

- ④ After shutting down, put on an anti-static bracelet and touch the components in the electrical cabinet with your fingers with slight force to check whether they are loose.

❖ **Power on check:**

- ① Measure the robot incoming line voltage and power module voltage. The reference values are  $380\pm 10\%$  and  $24V \pm 10\%$  respectively .
- ② After starting up, it is necessary to conduct a functional test on the buttons on the teaching pendant and the electrical cabinet to ensure that the enable and emergency stop functions, and that the touch screen Accurate and good.
- ③ Make sure the cooling fans are functioning properly.

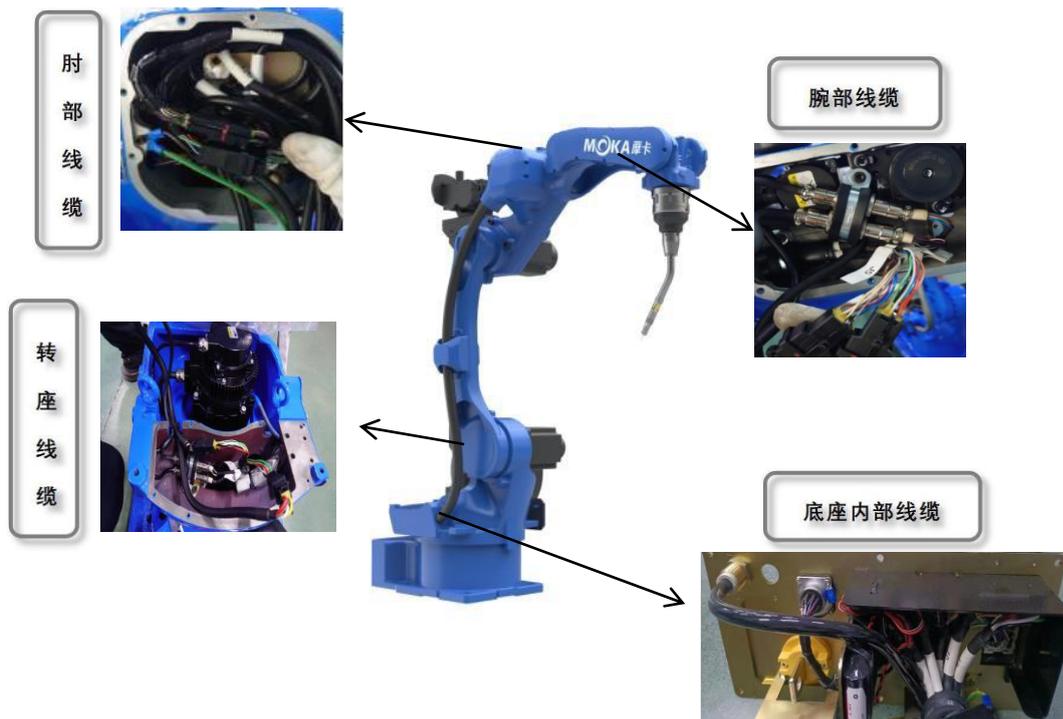
### 7.2.3 Access cable

In order to ensure that the robot can operate for a long time, every 6 The robot cable should be checked once every month.

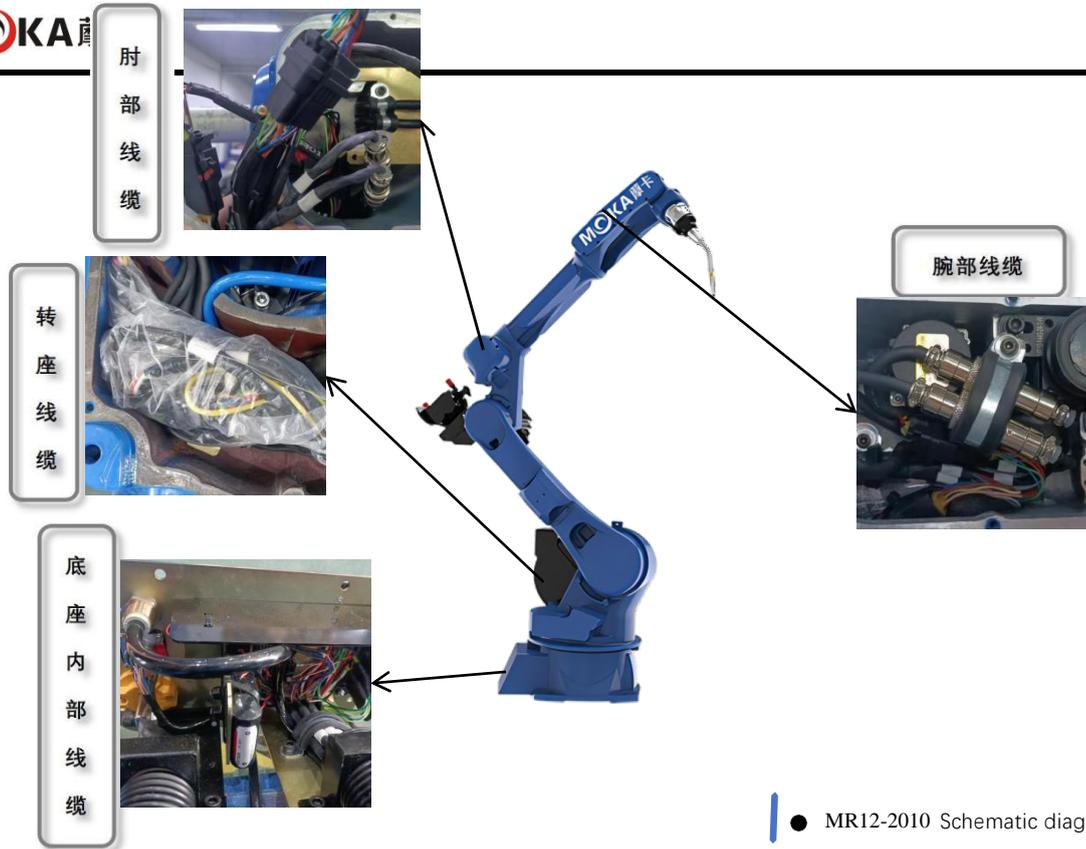
❖ **Access external cables**

Maintenance steps:

- ① Adjust the robot to the appropriate posture.
- ② To prevent danger, turn off the power, hydraulic and pneumatic
- ③ sources connected to the operating machine. Visually inspect all external cables for fraying or damage.
- ④ Check that all cable connectors are intact.
- ⑤ Check that all brackets and straps are intact and
- ⑥ fastened to the operating machine. Check whether there is any wear or damage where the cable is fixed to the bracket.
- ⑦ If there are cracks, wear or damage, please contact our company for replacement in time.



- MR10W-1440 Schematic diagram of robot cable layout



● MR12-2010 Schematic diagram of robot cable layout

### ❖ Inspecting the internal cables of the base

Maintenance steps:

- ① Remove the electrical installation plate and pull out the cables inside the base.
- ② Check whether the bracket secures the cable
- ③ to the operating machine intact. Check
- ④ whether there is any wear or damage where the cable is fixed to the bracket. Check internal cables for fraying or damage.
- ⑤ If there are cracks, wear or damage, please contact our
- ⑥ company for replacement in time. Check whether the grease on the internal cable surface has disappeared.
- ⑦ If the grease on the cable surface
- ⑧ disappears, it should be replenished in time. Install the cable inside the base, keeping it in a " U " shape.
- ⑨ Install the electrical installation plate, and apply sealant to the joint surface between the electrical



installation plate and the base casting.

- Robot J1 , J2 Motor connection

#### ❖ Accessing internal elbow cables

Maintenance steps:

- ① Remove the elbow cable retaining plate.
- ② Pull out the cable and check whether the
- ③ connection between the cable and the fixing plate is reliable. Check whether there is any wear or damage where the cable is fixed to the bracket.
- ④ Check internal cables for fraying or damage.
- ⑤ If there are cracks, wear or damage, please contact our
- ⑥ company for replacement in time. Check whether the grease on the internal cable surface has disappeared.
- ⑦ If the grease on the cable surface
- ⑧ disappears, it should be replenished in time. Route the cable inside the elbow.
- ⑨ Install the cable retention plate.

#### ❖ Accessing Internal Wrist Cables

Maintenance steps:

- ① Remove the cover
- ② Check whether there is any wear or damage where
- ③ the cable is fixed to the silicone sheath. Check internal cables for fraying or damage.
- ④ If there are cracks, wear or damage, please contact our
- ⑤ company for replacement in time. Install the cover plate and apply sealant to the joint surface between the cover plate and the forearm.

### 7.2.4 Replacement battery



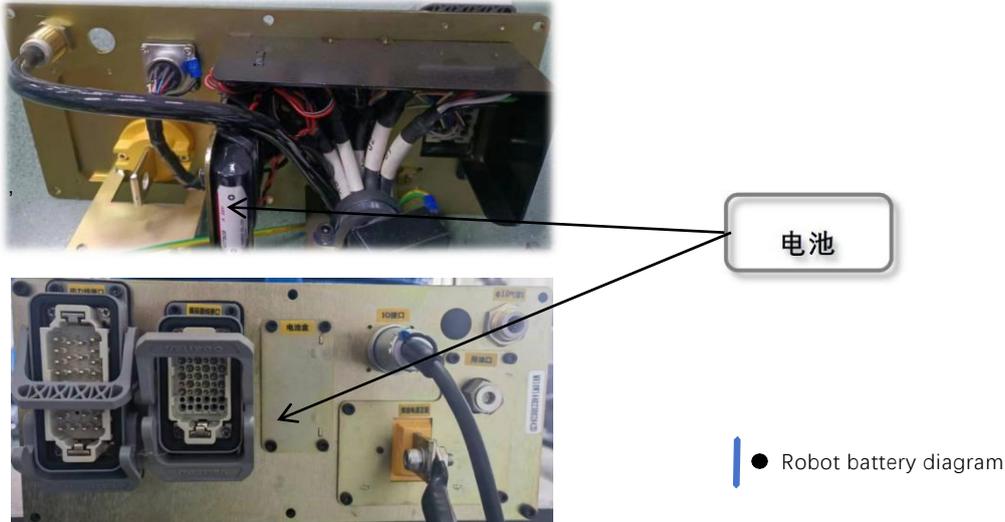
remind

电池更换过程中应保持控制柜不断电，若控制柜断电，机器人位置信息将丢失，更换电池后需进行零点校准。

The position data of each axis of the robot is saved through the backup battery. Every time the battery passes 1 It should be replaced regularly every year. In addition, when the voltage drop alarm of the backup battery is displayed, the battery should also be replaced. Battery replacement steps:

- ① When replacing the battery, to prevent
- ② danger, please press the emergency stop button. Remove the battery box cover.

- ③ Remove the used battery from the battery box.
- ④ Install new batteries into the battery compartment. Be
- ⑤ careful not to mistake the positive and negative polarity of the battery. Install the battery compartment cover.



### 7.2.5 Replace timing belt

- ① Adjust the operating machine to the
- ② appropriate posture and cut off the power supply to the control device; Remove the cover and loosen the motor assembly screws;
- ③ Replace timing belt;
- ④ Install the motor base screws
- ⑤ using the specified torque; Install the cover plate and calibrate the operating machine.

### 7.2.6 Check main fixing bolts

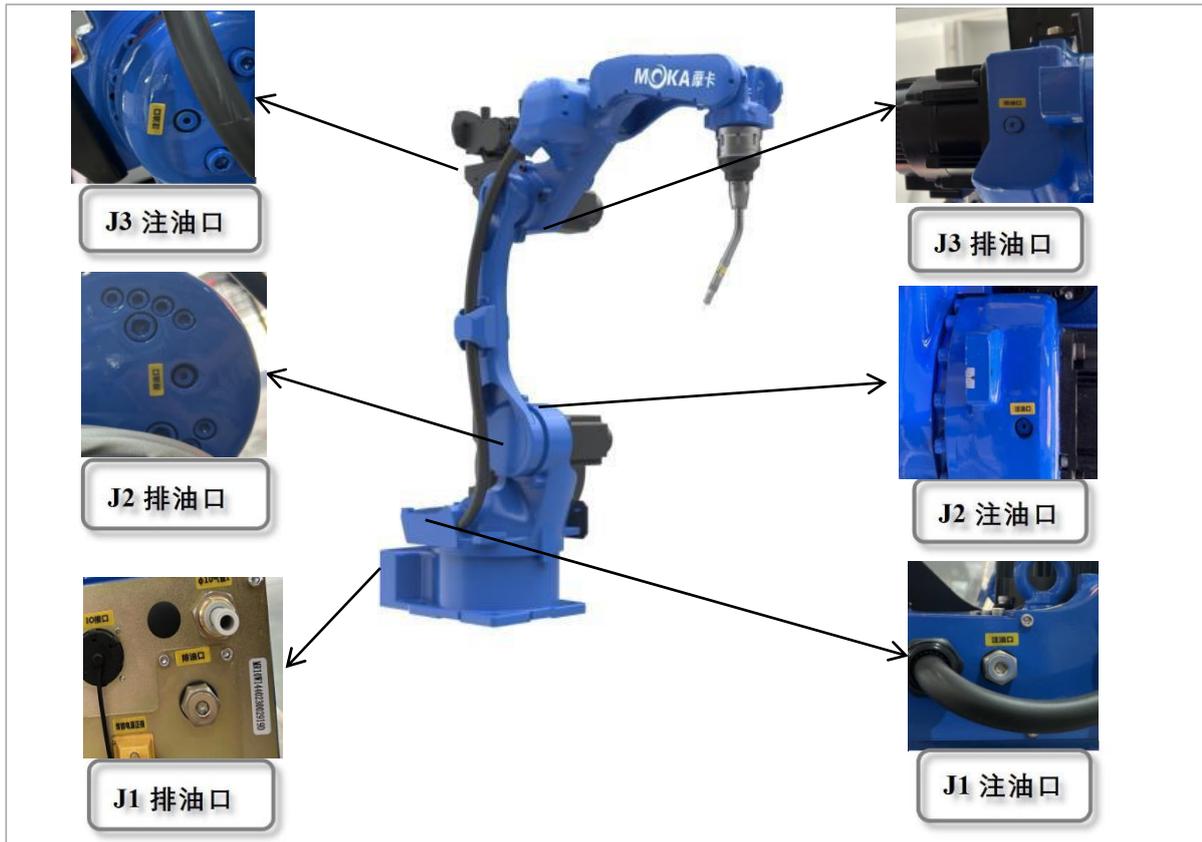
- ① The fastening screws and clamps that fix the manipulator to the foundation must be kept clean and must not be exposed to corrosion such as water, acid and alkali solutions, etc. sexual fluids. This avoids fastener corrosion;
- ② When the screws are loose, use a torque wrench to tighten them to the appropriate torque;

### 7.2.7 Robot lubrication

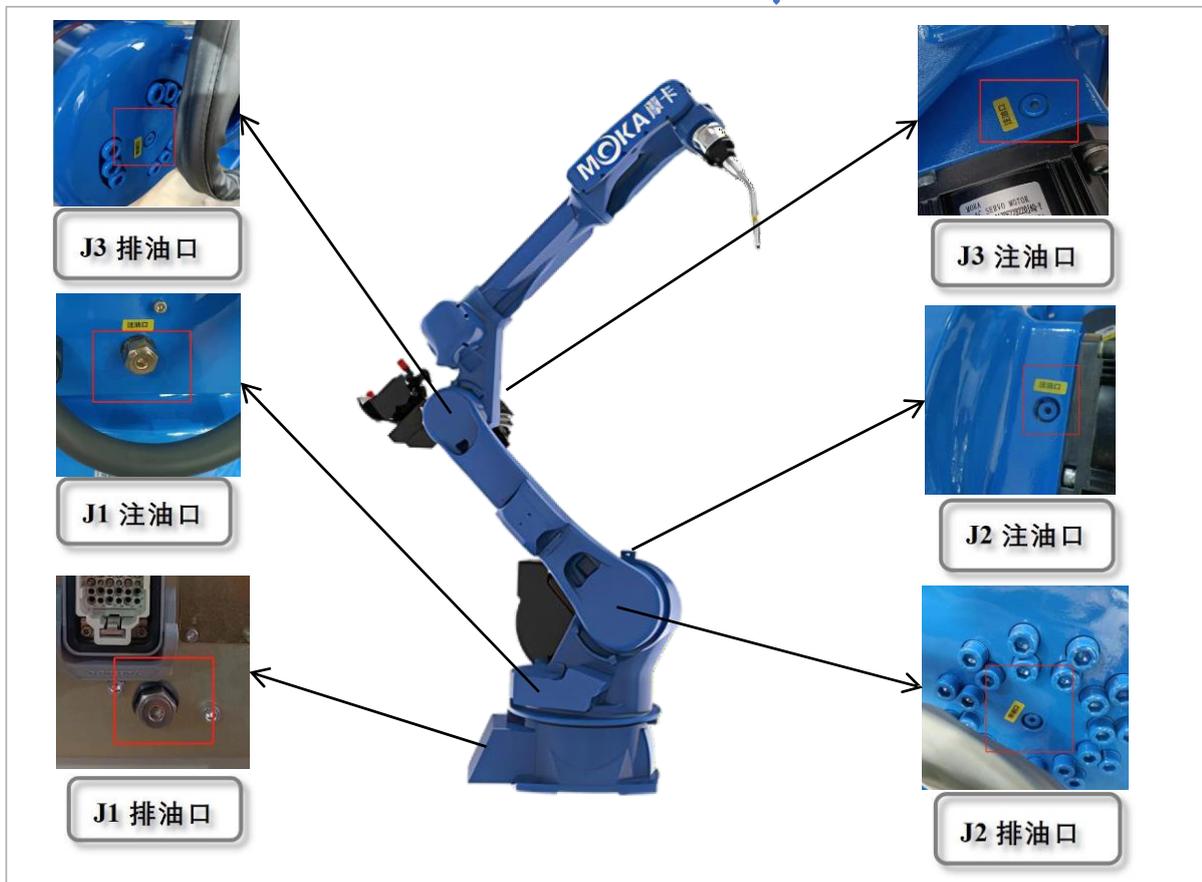
This series of robots J1 Shaft to J6 The axis reducer accumulates 11520 per running time hours or 3 Years (whichever is shorter ), the internal grease needs to be replaced .



- The reducer oil temperature may be higher than 90°, replace it after cooling.
- Open the oil drain port carefully and slowly to prevent oil from splashing.
- Wear gloves to prevent allergic reactions.



● MR10W-2010 机器人减速机注油口与排油口



● MR12-2010 Robot reducer oil filling port and oil drain port

### 7.2.8 Check the brakes of each axis

is subject to normal wear during operation . To determine if the brake is working properly , a test must be performed at this time.

**Test Method: Check the brakes on each axis motor as described below.**

- ① Run the robot axis to the corresponding position , where the total weight of the robot
- ② arm and all loads reach the maximum value ( maximum static load ) the motor is powered off;
- ③ Check that all axes remain in place.

If the manipulator does not change position when the motor is powered off, the braking torque is sufficient. You can also move the manipulator manually to check whether further protective measures are required. When a mobile robot makes an emergency stop, the brakes help stop it, so wear may occur. Place Therefore, repeated testing is required during the service life of the machine to verify whether the machine maintains its original capabilities.

## appendix

## Appendix 1 Screw Strength and Screw Tightening Torque Table

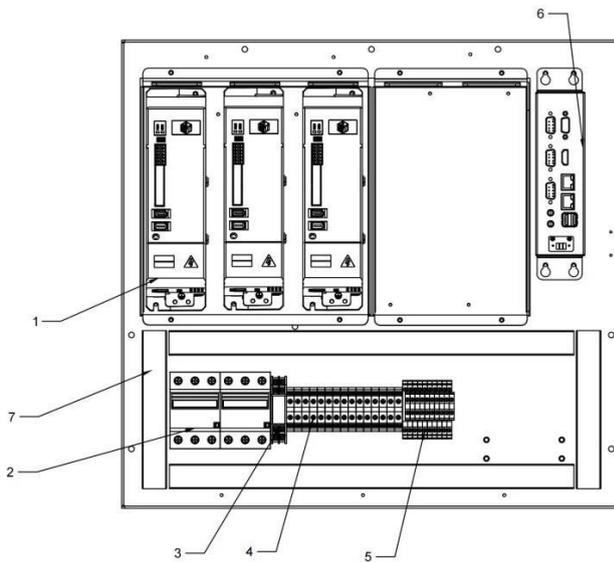
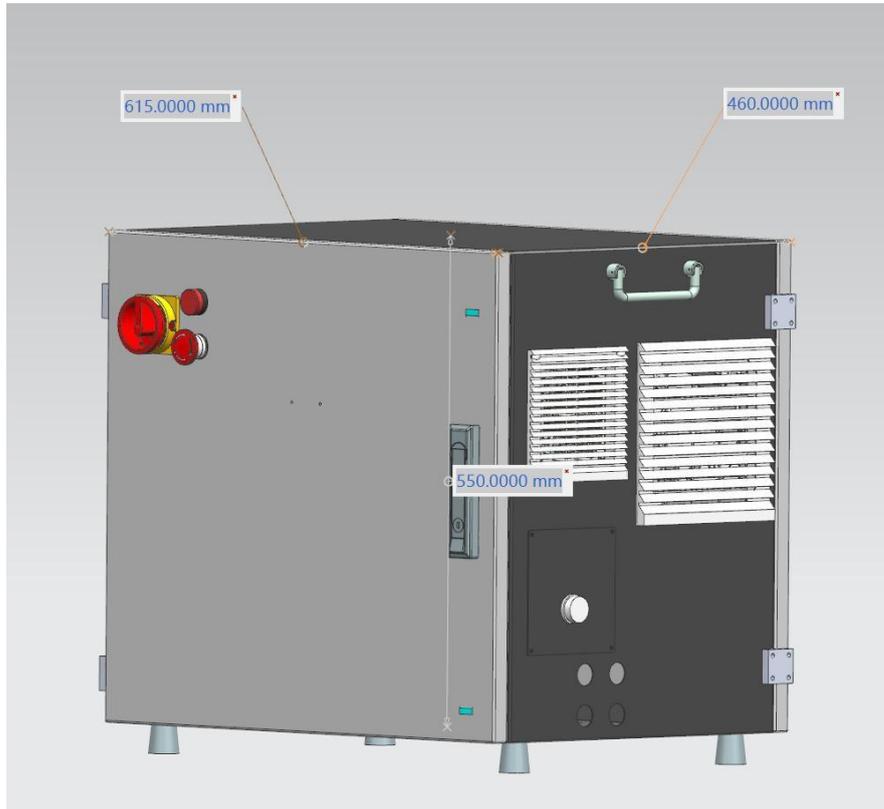
	M3	M3.5	M4	M5	M6	M7	M8	M10	M12
Bolt strength grade	Torque T (N • M)								
3.6 class	0.3	0.5	0.8	1.6	2.7	4.6	6.6	13	twenty three
4.6 class	0.4	0.7	1.0	2.0	3.4	5.7	8.3	16	29
4.8 class	0.6	0.9	1.4	2.8	4.7	7.9	11	twenty three	39
5.6 class	0.5	0.8	1.2	2.5	4.3	7.1	10	20	36
5.8 class	0.7	1.1	1.7	3.4	5.8	9.7	14	28	48
6.8 class	0.8	1.3	1.9	3.9	6.7	11.2	16	32	56
8.8 class	1.1	1.7	2.6	5.2	8.8	15	twenty one	42	74
9.8 class	1.2	1.9	2.9	5.8	9.9	17	twenty four	48	83
10.9 class	1.6	2.5	3.7	7.4	13	twenty one	31	61	106
12.9 class	1.8	2.9	4.3	8.7	15	25	36	71	124
tolerance	± 0.1	± 0.1	± 0.2	± 0.2	± 0.5	± 0.5	±1	±1	±2

## Appendix 2 Recommended Spare Parts List

<b>MR10W-1440</b>				
<b>serial number</b>	<b>Material code</b>	<b>name</b>	<b>quantity</b>	<b>Remark</b>
1	01.02.0020	5 Shaft motor pulley Z=22	1	
2	01.02.0019	4 Shaft reducer pulley ( Z=51 ) MR10/12	1	
3	01.02.0018	4 Shaft motor pulley ( Z=34 ) MR10/12	1	
4	01.05.01.0098	2.6 KW QN Motor	1	
5	01.05.01.0067	2.6 KW QN Motor	1	
6	01.05.01.0034	1.3 KW QN Motor	1	
7	01.05.06.0063	0.4 KW QN Motor	1	
8	01.01.12.065	Robot battery ( palletizing 2 Only / unit; other three units )	3	

<b>MR12-2010</b>				
<b>serial number</b>	<b>Material code</b>	<b>name</b>	<b>quantity</b>	<b>Remark</b>
1	01.02.0020	5 Shaft motor pulley Z=22	1	
2	01.02.0019	4 Shaft reducer pulley ( Z=51 ) MR10/12	1	
3	01.02.0018	4 Shaft motor pulley ( Z=34 ) MR10/12	1	
4	01.05.01.0068	5.0 KW QN Motor	1	
5	01.05.01.0069	2.0 KW QN Motor	1	
6	01.05.04.0024	0.4 KW WG Motor	1	
7	01.05.01.0063	0.15KW QN Motor ( thick shaft )	1	
8	01.01.12.065	Robot battery ( palletizing 2 Only / unit; other three units )	3	

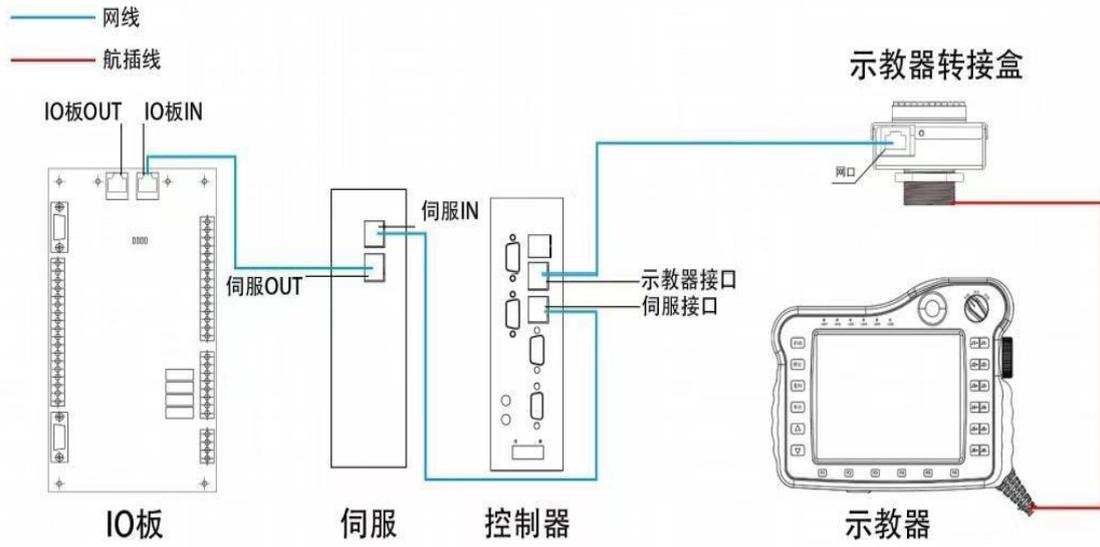
Appendix 3 Control cabinet schematic diagram and electrical layout



电柜内主板电气排版

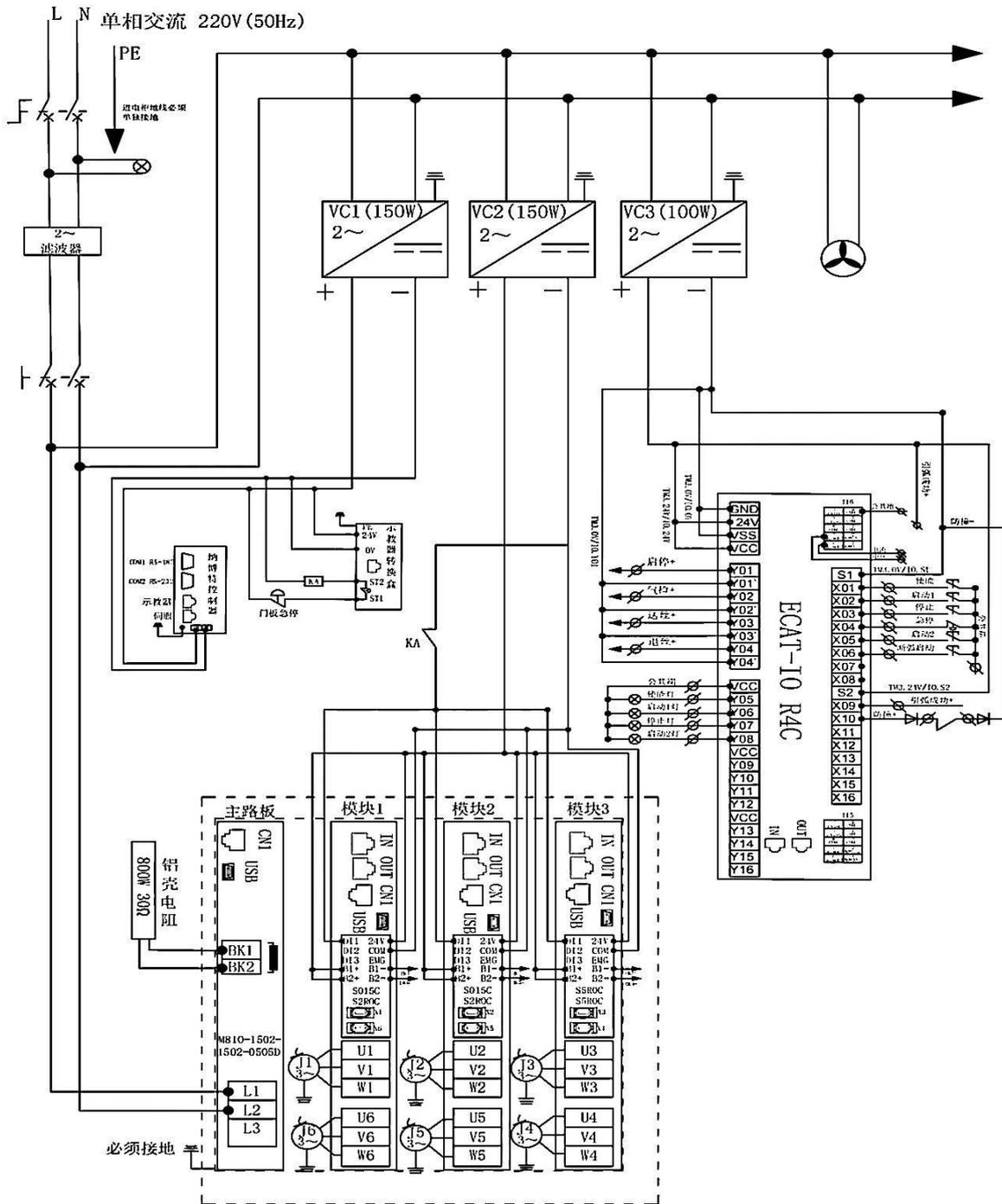
1	伺服驱动器
2	断路器
3	继电器
4	UK6N接线端子
5	双层接线端子
6	控制器
7	线槽

Appendix 4 Network cable connection diagram ( blue is the network cable )

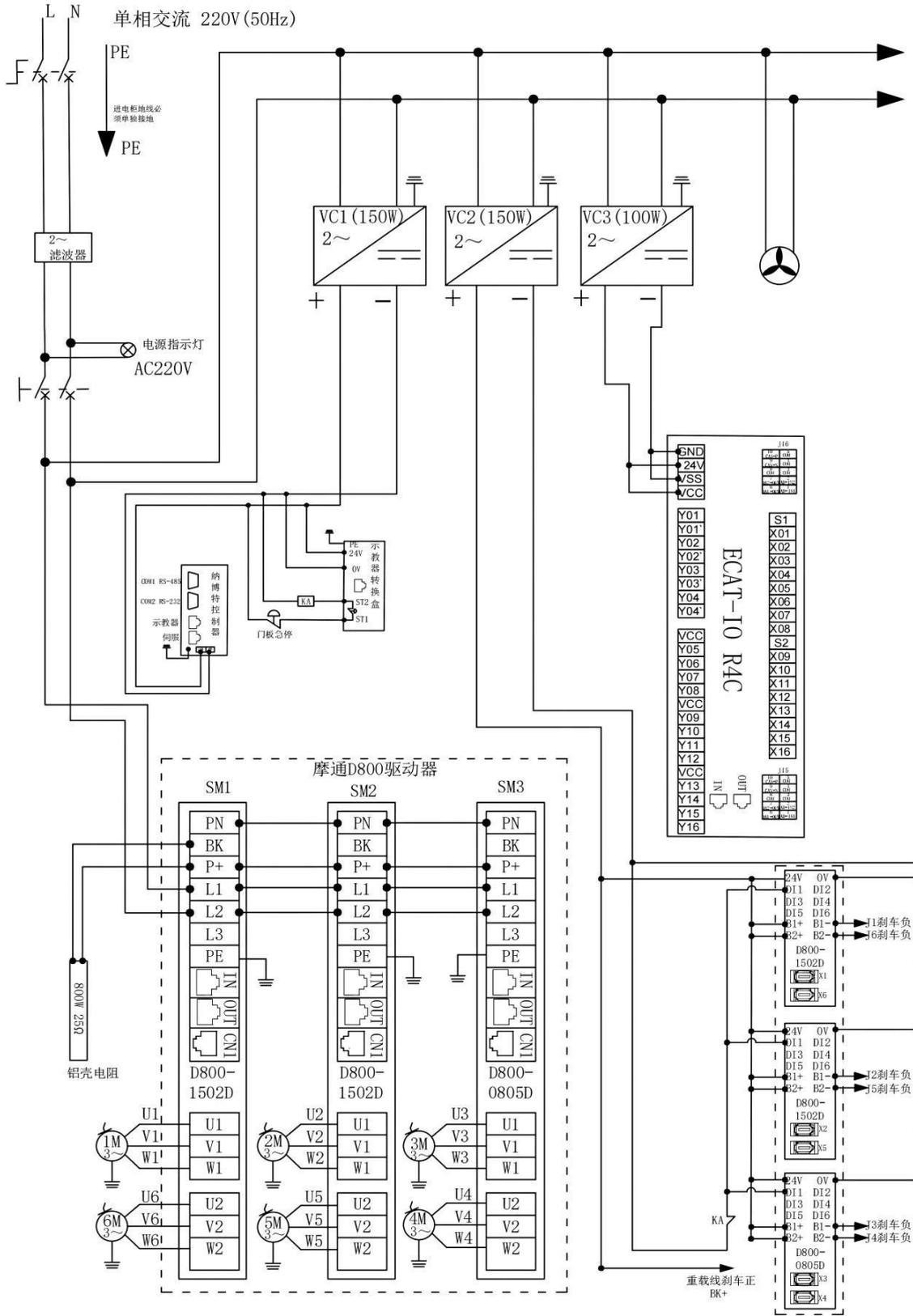


Appendix 5 Control Cabinet Electrical Schematic Diagram

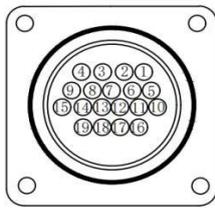
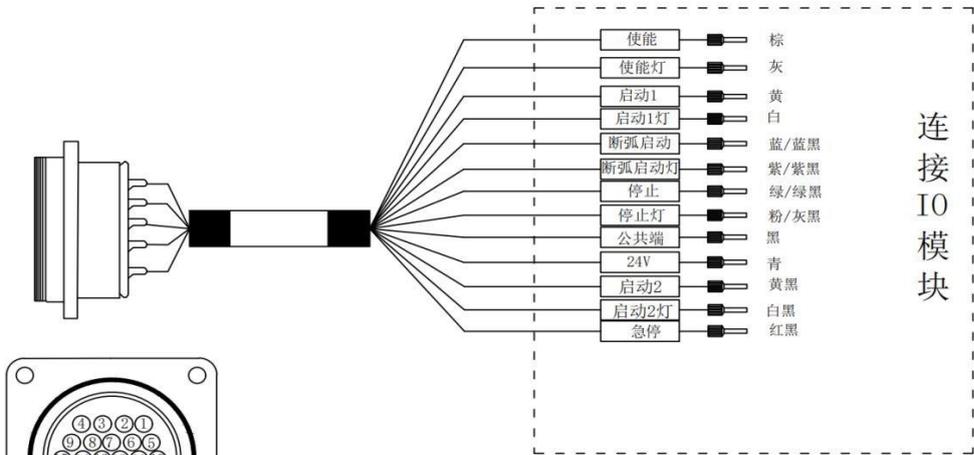
- MR10W-1440 robot



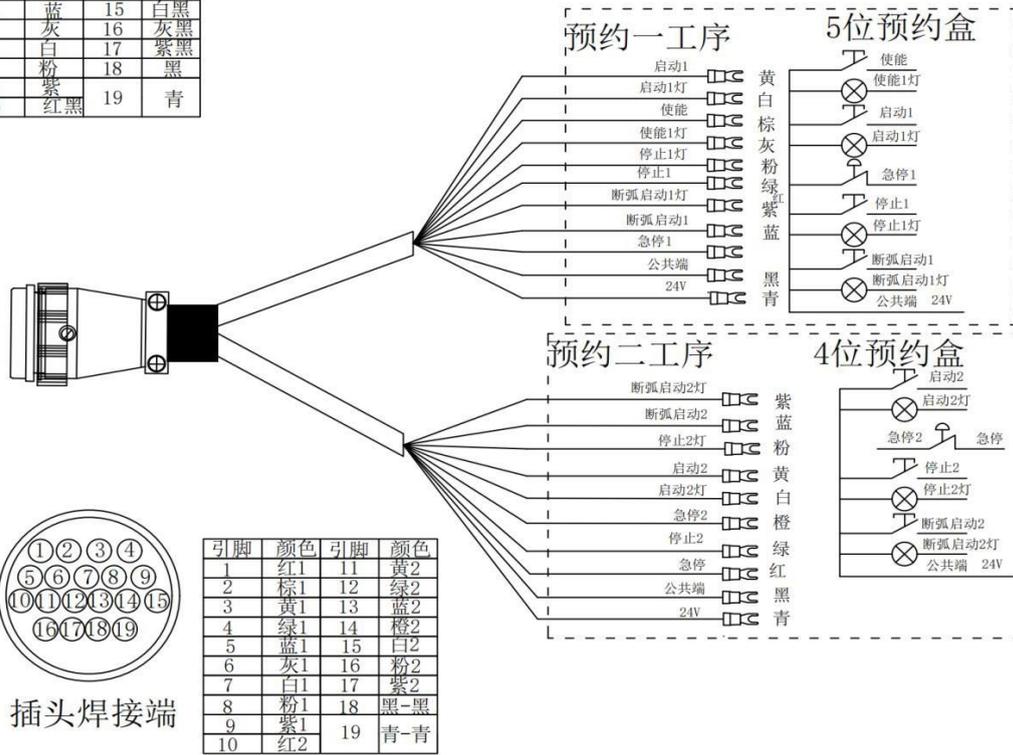
● MR12-2010 robot



Appendix 6 Reservation Box and Control Cabinet IO Interface diagram

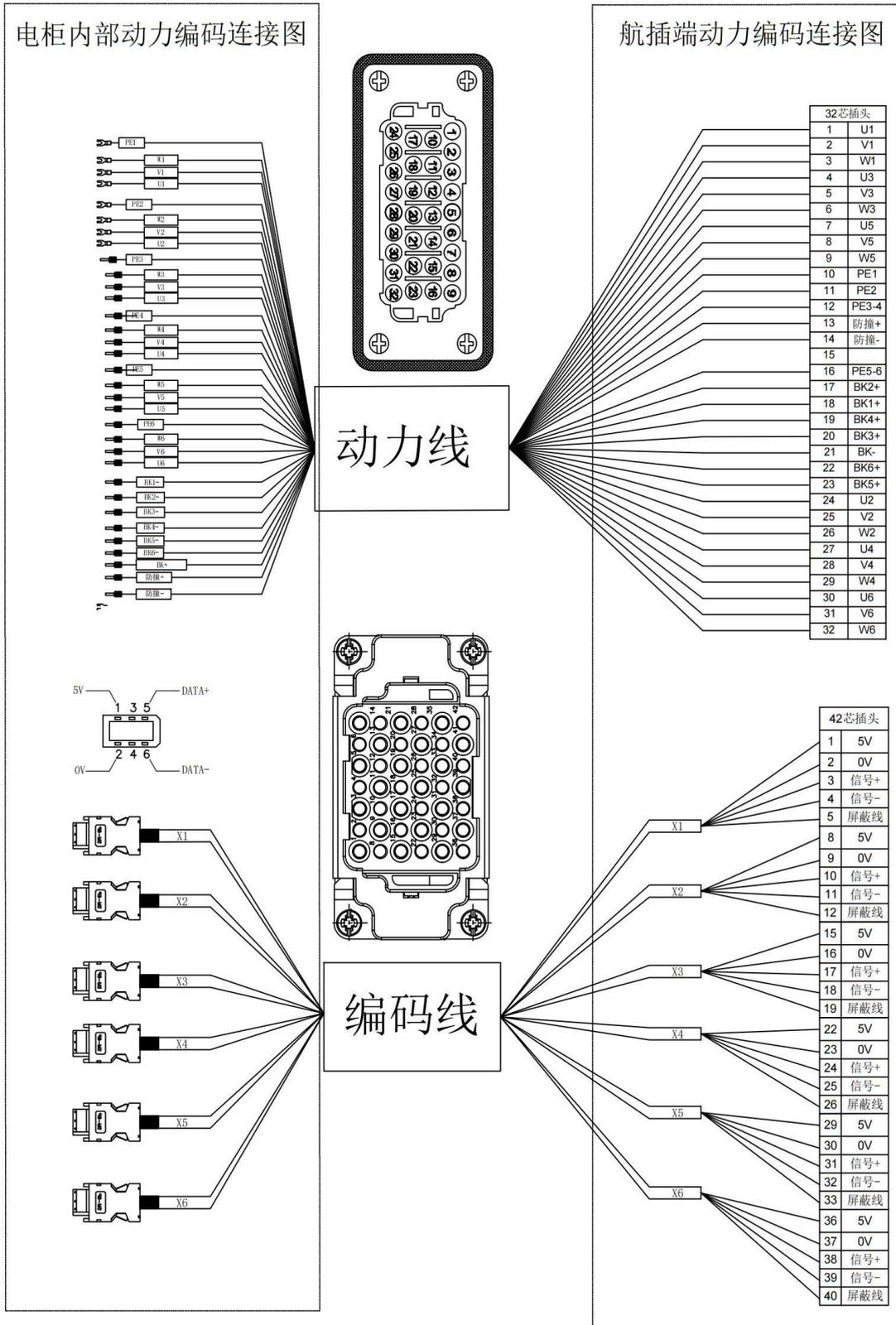


引脚	颜色	引脚	颜色
1	红	11	黄黑
2	棕	12	绿黑
3	黄	13	蓝黑
4	绿	14	橙
5	蓝	15	白黑
6	灰	16	灰黑
7	白	17	紫黑
8	粉	18	黑
9	紫	19	青
10	红黑		

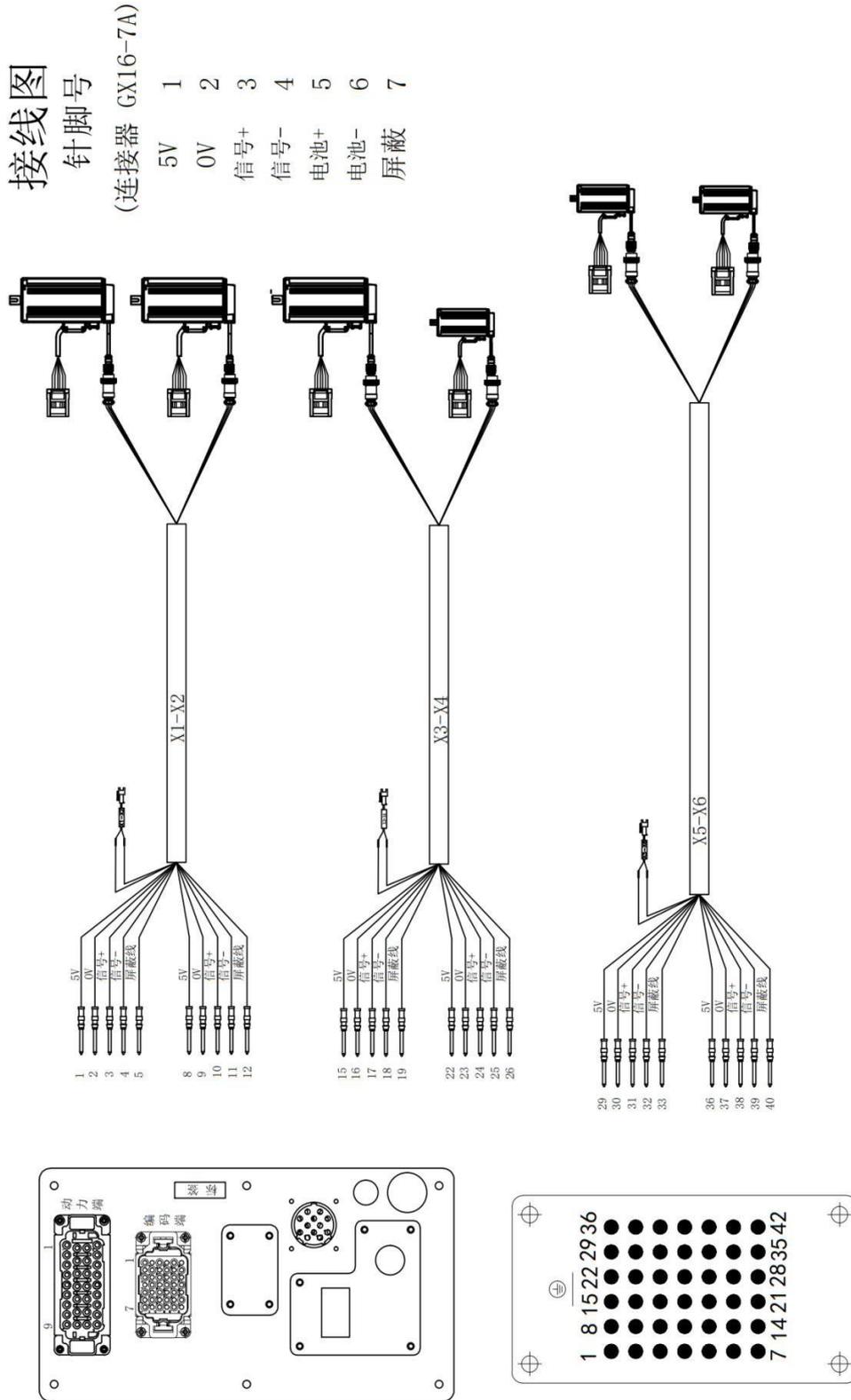


引脚	颜色	引脚	颜色
1	红1	11	黄2
2	棕1	12	绿2
3	黄1	13	蓝2
4	绿1	14	橙2
5	蓝1	15	白2
6	灰1	16	粉2
7	白1	17	紫2
8	粉1	18	黑-黑
9	紫1	19	青-青
10	红2		

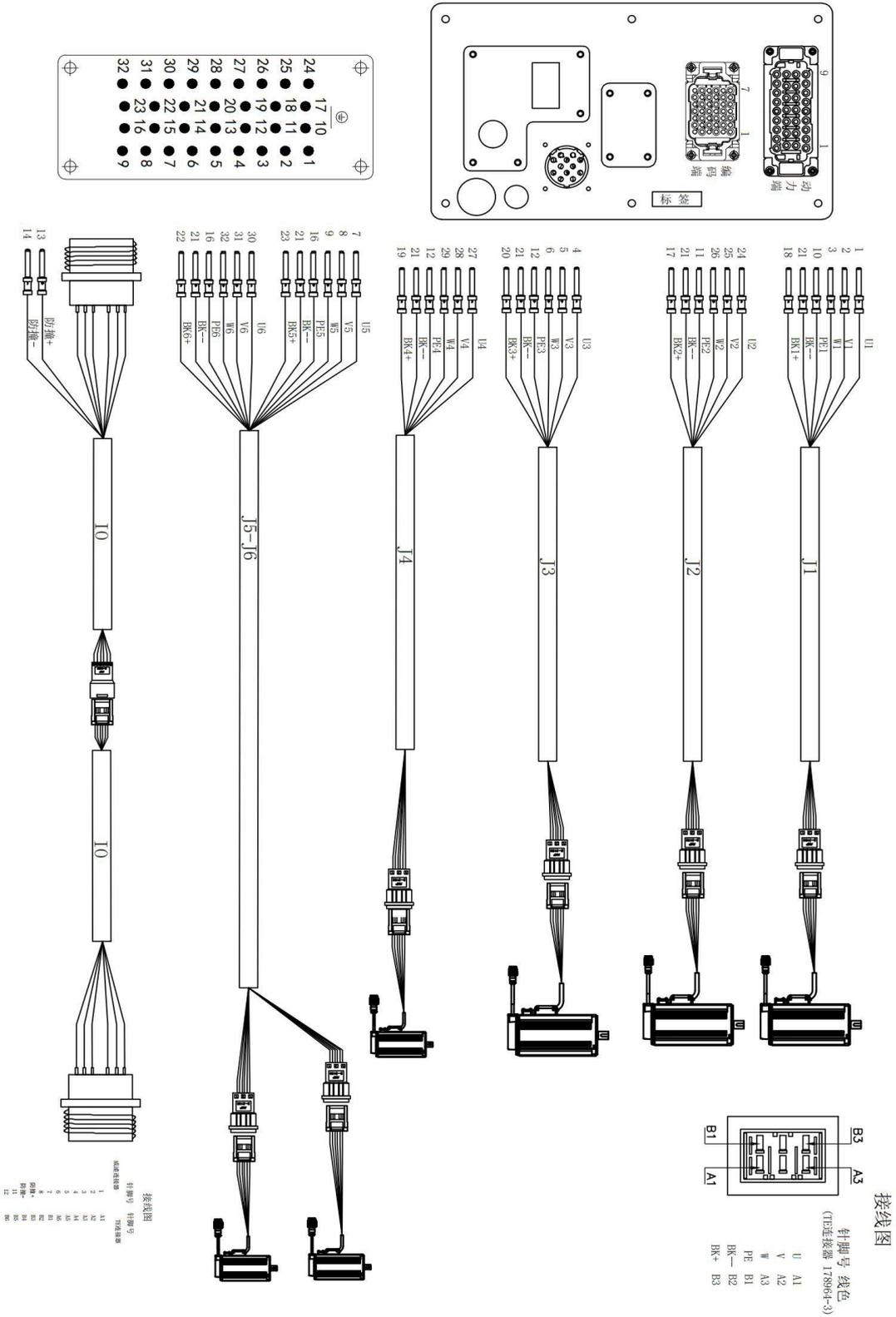
Appendix 7: Power line and coding line connection diagram



Appendix 8 Schematic diagram of coding lines on the main body side



Appendix 9 Schematic diagram of main body side power line



## Appendix 10: Driver Parameter Description and Alarm Handling Opinions

### ❖ Motoron Drive

#### ◆ 1. Parameter description

PE01 0x2E01 Drive model;

PE02 0x2E02 Servo motor code, the motor and code must match;

PE03 0x2E03 Parameter management, enter 100, wait for one minute and then restart, the drive will be restored to factory settings and parameters will be initialized; PE05 0x2E05 Maximum speed threshold 0~6000rpm;

PE08 0x2E08 Motor direction logic;

PE09 0x2E09 Encoder type setting - units digit: Encoder type 0: Incremental type 1: Multi-turn absolute value type 2: Single-turn absolute value type; PE11 0x2E0B Servo receives Servo On Command to brake On The delay time (100~500ms) is now changed to 400 by default;

PE12 0x2E0C Servo receives Servo Off The delay time from command to motor de-energization (1~1000ms) is now changed to 400 by default; PE17 0x2E11 Enable 0: Servo OFF, 1: Servo ON 1 0;

PE18 0x2E12 External emergency stop shielding 0: External emergency stop shielding 1: External emergency stop is valid;

PE18 Write 0, linkage alarm will not be performed, and FF18 will not appear on the teaching pendant. Alarm word (FF18 Indicates that there is no exception in the current module, But other modules have exceptions);

PE20 0x2E14 The speed stiffness coefficient is related to adjust the speed gain 50~500%;

PE21 0x2E15 The larger the speed loop gain, the faster the response. If it is too large, it will cause vibration;

PE22 0x2E16 The larger the speed loop integral time constant, the stronger the integral effect and the stronger the speed tracking ability;

PE23 0x2E17 The position ring increases. The larger the value, the faster the position tracking. If it is too large, it will cause vibration (6 joints must be the same);

PE24 0x2E18 2nd \_ The larger the speed loop gain, the faster the response. If it is too large, it will cause vibration;

PE25 0x2E19 2nd \_ Speed loop integration time constant, the smaller it is, the stronger the integral effect is, and the stronger the speed tracking ability is 0~500; PE26 0x2E1A 2nd \_ Position loop gain (with PE23 Same), the larger the value, the faster the position tracking will be. If it is too large, it will cause vibration;

PE27 0x2E1B Change the torque speed function switch to 100 and turn on the second-stage gain;

PE28 0x2E1C Velocity feedforward gain, increasing can reduce the steady-state position deviation, but if it is too large, it will cause overshoot;

PE29 0x2E1D The speed feedforward smoothing filter constant, the smoothing speed feedforward amount, are coordinated with the speed feedforward gain;

PE30 0x2E1E Damping coefficient position loop damping coefficient 50~500 1 100;

PE31 0x2E1F DI1 Function settings (default 000006: emergency stop), PE32 0x2E20 DI2 Function settings;

PE33 0x2E21 DI3 Function settings, PE34 0x2E22 DI4 Function settings (EMG);

PE37 0x2E25 DI Terminal filter time 0~32ms

1 5; PE38 0x2E26 Electronic gear selection;

PE41 0x2E29 Moving average filter constant 0~1024(x0.25ms) 1 0 (6 joints must be consistent);

PE49 0x2E31 Position deviation limit 0.1~50.0 Circle 0.1 10.0 ■;

PE50 0x2E32 EtherCAT Communication cycle (6 The joints must be consistent. Nabot is set to 4, Baoyuan is set to 8); PE51 0x2E33 Quadrant Raised CCW Direction compensation value, PE52 0x2E34 Quadrant Raised CW direction compensation value;

PE53 0x2E35 Quadrant bulge compensation delay 0~1000ms, PE54 0x2E36 Quadrant bulge compensation filtering 0~100ms; PE55 0x2E37 Gravity compensation value

0~1000%, PE56 0x2E38 Gravity compensated polarity 0: CCW 1: CW;

PE57 0x2E39 Notch frequency \_ 10-5000 Hz;

PE58 0x2E3A Notch depth 0~20, PE59 0x2E3B Notch filter gain 0~500%;

PE71 0x2E47 Adaptive stiffness 0~300 (if there is a nodding phenomenon during the enabling

process under gravity or load conditions, increase it appropriately );PE72 0x2E48 The first set of gain speed inflection points 0~6000rpm 1 6000 ( with PE27=100 use );

PE73 0x2E49 The second set of gain speed inflection points 0~6000 rpm 1 6000 ( with PE27=100 use );

PE92 0x2E5C Function code E5DA: Clear the encoder multi-turn value and take effect after restarting.

◆ 2. Driver alarm codes and handling opinions

( 1 ) Er - 001 emergency stop alarm;

①The controller is connected to the drive's external EMG emergency stop port;

EMG Function effective conditions: PE-18 set to 1 , PE-31 and PE-34 Set to 06 , the control system sends an emergency stop command signal , and the driver executes the command to stop and alarm.

②The controller is not connected to the drive EMG emergency stop port;  
View drive parameters PE - 18 Whether the value is 0 , PE-18 set to 1 , PE-37 set to 0 , PE-31 to 34 Set to 0 .

( 2 ) Er-002 axis 1 Overcurrent alarm; Er-003 for axis 2 Overcurrent alarm

①The motor code (PE-02, PF-02 ) is wrong;

Check the motor code. If you don't know what the motor code is, please contact our technical staff.

②Axis 1 Is the encoder wire connected to axis 2 ? on the encoder port;

Check whether the encoder cable is plugged into the wrong port. The encoder port (ECD1 ) must correspond to axis 1 . Power line (UVW ) port matching wiring.

③ There is a short circuit in the three phases of the motor or power line (UVW ) ;

Use a multimeter to measure U Phase and V Phase, U Phase and W Phase, V Phase and W  
Check whether the resistance between the two phases is equal. If the resistance difference is within 20% , continue to use a multimeter to measure (UVW ) whether the resistance of the three phases and the ground wire is infinite. After confirming that there is no abnormality, an alarm still occurs and the driver needs to be replaced.

④ Overcurrent is reported when powering on;

Check whether the power line and encoder line are damaged or have poor contact. If not, replace the driver.

( 3 ) Er-004 External bus disconnected

① Abnormal communication between driver modules;

Check whether the black (IBUS ) wire on the top of the driver is loose or the terminal is damaged resulting in poor contact. Re-plug or replace the (IBUS ) wire.

②The braking resistor is not connected;

Check d0-16 ( the current voltage of the bus ) , check d0-17 ( the lowest voltage in history after the motor is enabled ) , d0 - 18 ( the highest voltage in history after the motor is enabled ) , when the highest voltage of the bus reaches 390V When , a braking resistor needs to be connected.

③The bus voltage reaches 395V ;

It is necessary to check whether the input voltage is within a reasonable range (187V to 242V) The braking resistor is not connected, the specifications are inappropriate, or it is damaged, causing the highest voltage of the connected braking resistor to reach 395V. The braking function of the drive power module fails and the drive needs to be replaced.

( 4 ) Er-005 axis 1 Overload; Er-006 Axis 2 overload

①The brake is not turned on;

Check external 24V Check whether the switching power supply and wiring are normal. If the wiring is normal, the upper brake is still not turned on. Measure B+ with a multimeter. and B The voltage between - is 24V , please replace the motor; when it is not enabled, use a multimeter to measure the voltage between B+ and B - and it is 24V. , the driver needs to be replaced.

②The motor code is wrong;

Check the motor code. If you don't know what the motor code is, please contact our technical staff.

③The encoder wire is connected reversely;

axis 1 Is the encoder wire connected to axis 2 ? on the encoder port.

④The motor is blocked;

Loosen the motor shaft load and control the motor operation alone. If it cannot be driven, please replace the motor. If the motor can be driven normally, please check Check whether the mechanical structure of the reducer is stuck.

⑤The motor power line wiring is wrong;

Motor power line UVW Whether the three-phase phase sequence is connected incorrectly.

⑥The motor zero point is lost;

Check whether the motor zero point is normal.

( 5 ) Er-007 for axis 1 Motor initialization; Er-008 for axis 2 initialization

---

① Encoder wiring error;

Check whether the motor encoder connector is loose, 1394 Check whether the plug shrapnel is normal, whether the encoder wire is shielded and twisted, and whether the diameter of a single wire is equal to or greater than  $0.3\text{mm}^2$ .

② Motor failure;

Check whether the three phases of the motor are normal and whether they are short-circuited to ground.

③ Driver failure;

The drive needs to be restored to factory settings, enable and set PE-03 to 0100, etc. PE-03 Change back to 0000 After powering off and restarting, the alarm still occurs and the driver needs to be replaced.

( 6 ) Er-009 for axis 1 Abnormal motor current; Er-010 for axis 2 Abnormal motor current

①The motor power line is not connected;

Check whether the motor power line is connected.

②UVW \_ The three-phase wiring sequence is wrong;

Press UVW Three-phase correct wiring sequence

③The power line docking terminal is loose or disconnected;

Re-plug the power line port and measure UVW with a multimeter Whether there is continuity at both ends.

④The motor code setting is wrong;

Check the motor code. If you don't know what the motor code is, please contact our technical personnel.

⑦ Internal failure of the driver;

Swap test the power line and coding line of the motor with the same power. If axis 1 It still gives an alarm and the driver needs to be replaced.

⑧Exceed the maximum speed of the motor;Monitor motor speed.

⑨PE -21 , PF-21 Whether it is too large;

Watch the waveform and modify PE-57 , PF-57 Notch frequency.

⑩ Abnormal bus voltage;

It is necessary to check whether the input voltage is within a reasonable range (187V to 242V) .

⑪The motor zero point is lost;

Check whether the motor zero point is normal.

( 7 ) Er-011 DC bus undervoltage

①The power supply voltage of the on-site power grid is too low;

Measure L1 with a multimeter with L2 Is the AC voltage between the , monitor do-16 , d0-17 , d0-18 Voltage value,If the voltage is unstable, a transformer or voltage regulator needs to be added.

( 8 ) Er-012 DC bus overvoltage

①The resistance of the braking resistor is too large, resulting in a long time to release energy;

Ordinary machine: 3 Axis Recommendation: 200W 20 or 25R ; 5 Axis recommendation: 400W~500w 20 or 25R  
High-speed machine: The resistance of the resistor remains unchanged, and the power can be appropriately increased.

If the resistance is small, it will damage the drive and control unit. If the resistance is large, the braking effect will be poor. 20 is recommended. Euro ~25 Just Europe.

②The on-site power supply voltage is too high;

Measure L1 with a multimeter with L2 Whether the AC voltage between them is higher than 240V , monitor do-16 , d0-17 , d0-18 Voltage value,If the voltage is too high, a transformer or voltage regulator needs to be added.

③The power supply voltage is normal and the bus voltage exceeds 400V ;Encoder line 0V, 5V Caused by reverse connection.

( Nine ) Er-013 for axis 1 The position command is too large; Er-014 for axis 2 Position command too large

① In multi-axis linkage situations, it may be related to the controller failure and enabling, other faults should be checked first ( if the drive module reports Er-020, Er-020 should be checked first) ;

② The master station position command increment is too large, and the master station encoder unit setting is wrong;

Monitor the control system command waveform to see if there is a sudden change. Please contact the control manufacturer to handle the sudden change.

---

③The synchronization cycle setting is wrong;

Whether the synchronization cycle is set correctly (PE-50) .

④The driver is not set to absolute value type, causing the reference point to be lost after power on;

PE-09 Whether the ones digit of the number parameter is set to 1 .

⑤ If the electronic gear parameters are set incorrectly, the instructions issued by the system will mutate;  
the electronic gear parameter settings of the control system correct ? PE/PF (38,39,40 parameter ) . \_

( ten ) Er-015 Drive overheating

① The ambient temperature is too high  
and the installation environment is not  
forcedly ventilated; The electrical  
cabinet needs to be equipped with a  
cooling fan.

②The drive fan is damaged and the drive exceeds 75 degrees Celsius causes the drive to alarm;

Check whether the fan of the drive is damaged. If the fan is damaged, replace the fan. Monitor d0 - 19. Value exceeds 75 The drive will alarm.

③ Abnormal temperature sampling;

When the heat dissipation design of the electrical box is reasonable, monitor d0-09 , d0-59 Is the load rate within the range of 100% , and an alarm occurs within the range? Need to return for testing. If the heat dissipation design of the electrical box is unreasonable, it is recommended that the customer optimize the heat dissipation design.

(eleven ) Er-016 Write EEPROM fail

① EEPROM abnormal;

The drive needs to be restored to factory settings, enable and set PE-03 to 0100 , etc. PE-03 Change back to 0000 After powering off and restarting, the alarm still occurs and the driver needs to be replaced.

(12 ) Er-017 Read EEPROM fail

① Contact our technical personnel for processing.

(13 ) Er-018 for axis 1 Position deviation is too large; Er-019 for axis 2 Position deviation is too large

① The motor code is wrong;

Check the motor code. If you don't know what the motor code is, please contact our technical staff.

② The maximum speed of the motor has been reached;

Check whether the bus voltage is normal. If the voltage is too low, the motor cannot reach the maximum speed. Check PE-05. , PF-05 Motor maximum speed, Check whether the waveform motor reaches the maximum speed. It cannot exceed the maximum speed of the motor. The maximum speed needs to be set in the system.

(14 ) Er-020 for axis 1 Encoder error; Er-028 for axis 2 Encoder error

① Encoder wiring error;

Check whether the motor encoder connector is loose, 1394 Check whether the plug shrapnel is normal, whether the encoder wire is shielded and twisted, and whether the diameter of a single wire is equal to or greater than 0.3mm<sup>2</sup> .

② The ground wire is not connected;

The equipment ground terminal and the factory earth are effectively connected together.

③ The motor code is incorrect;

Check whether the motor code is correct. Incorrect motor settings in the Tamagawa and Sankyo agreement will result in an error.

(fifteen ) Er-021 for axis 1 Abnormal speed measurement; Er-029 for axis 2 Abnormal speed measurement

① The motor encoder is abnormal; Replace the motor.

(16 ) Er-022 for axis 1 Encoder initializing; Er-030 for axis 2 Encoder initializing

① Encoder wiring error;

Check whether the motor encoder connector is loose, 1394 Check whether the plug shrapnel is normal, whether the encoder wire is shielded and twisted, and whether the diameter of a single wire is equal to or greater than 0.3mm<sup>2</sup> .

② The motor code is incorrect;

Check the motor code. If you don't know what the motor code is, please contact our technical personnel.

③ The drive is damaged;

(IBUS ) wire on the top of the driver is loose, or the terminal is damaged resulting in poor contact. After powering on, listen to the driver module relay to see if there is a closing sound. If not, replace the power module.

(seventeen ) Er-024 External bus error

① PE - 18\_ , PF-18 set to 1 , the associated alarm function takes effect; Clear other alarm codes before the associated alarm can be eliminated.

(eighteen ) Er-027 EEPROM Parameter verification error

① EEPROM abnormal;

The drive needs to be restored to factory settings, enable and set PE-03 to 0100 , etc. PE-03 Change back to 0000 After powering off and restarting, the alarm still occurs and the driver needs to be replaced.

(nineteen ) Er-032 Parameter initialization error

① EEPROM abnormal;

The drive needs to be restored to factory settings, enable and set PE-03 to 0100 , etc. PE-03 Change back to 0000 After powering off and restarting, the alarm still occurs and the driver needs to be replaced.

(twenty ) Er-033 Communication interruption

①The communication cycle between the control system and the driver is not synchronized; Setting up PE-50 , PF-50 Whether the parameter is d0-52 divide by 4 value.

②The network port of the control system is damaged;

Check whether the controller network port light is flashing. If not, replace the controller.

③The driver network port is damaged;

Check whether the drive network port light is flashing. If it is not flashing, replace the drive.

④The network cable connecting the control system and the driver is abnormal;

Replace a network cable and test it. If no alarm occurs, it means there is a problem with the network cable.

⑤Whether an effective

ground wire is

connected; Check

whether the ground

wire of the electrical

cabinet is reliable.

(21 ) Er-034 for axis 1 Battery failure; Er-035 for axis 2 battery failure

①The battery voltage is lower than 3.3V ;

After the machine returns to zero, replace the battery with a new one, clear the alarm and then the system resets the zero position of this axis.

②The battery voltage is higher than 3.3V ;

Check whether the encoder plug is loose, if the alarm is cleared 1 The alarm will sound repeatedly after 1 minute. Check whether the encoder circuit is short-circuited, open-circuited or weakly soldered. If not, replace the battery board or battery box.

(twenty two ) Er-036 for axis 1 Multi-turn values lost; Er-037 for axis 2 Multiple lap values lost

①The battery voltage is 3.6V ;

Plug and unplug the encoder cable, clear the alarm and reset the zero point.

②The battery voltage is lower than 3.0V ;

Replace the battery with a new one, clear the alarm and then the system resets the zero position of this axis.

(Twenty-three ) Er-040 for axis 1 Abnormal speed measurement; Er-041 for axis 2 Abnormal speed measurement

①The motor code setting is wrong;

Check the motor code. If you don't know what the motor code is, please contact our technical staff.

②The motor

encoder is

abnormal;Replace

the motor.

(twenty four ) Er-042 for axis 1 Motor speed car; Er-043 for axis 2 Motor speed car

①The motor code is wrong;

Check the motor code. If you don't know what the motor code is, please contact our technical staff.

② PE-09 , PF-09 Parameter setting error;

Check soft protection PE-09 , PF-09 Parameters, monitoring d0-97 , d0-98 Parameters, 2020 917

The tens digit before the version is set to 6 , 2020 917 to 2021 701 The version tens digit is set to 5 , 2021 701 Later versions only need to set the single digit value ( the software protection function is turned on by default ).

③ Motor abnormality;

---

Check the motor zero point and whether the motor encoder is abnormal.

(Twenty-five ) Er-044 for axis 1 Current sampling overload; Er-045 for axis 2 Current sampling overload

①The motor code setting is wrong;

Check the motor code. If you don't know what the motor code is, please contact our technical staff.

②Line problem;

Check whether there are any abnormalities in the wiring of the electrical box, whether the motor power line and encoder connectors are loose, whether the wires are frayed, and whether they are short to ground. road.

③Voltage saturation;

1 with keypad d0-06 , d0-08 , axis 2 d0-56 , d0-58 ( d0-06 , d0-56 Maximum 28500 ; d0-08 , d0-58 Maximum 17500 ) , check whether the motor is calibrated within the range, and there is no need to send it back for calibration; if it exceeds the range, the driver must be replaced.

(Twenty-six ) Er-046 for axis 1 Current sampling overcurrent; Er-047 for axis 2 Current sampling overcurrent

①The motor code setting is wrong;

Check the motor code. If you don't know what the motor code is, please contact our technical staff.

②**There** is a problem with the line;

Check whether there are any abnormalities in the wiring of the control cabinet, whether the motor power line and encoder connectors are loose, whether the wires are frayed, and whether they are correct. Short circuit to ground.

③The servo parameter settings are inappropriate;

PE-09 , PF-09 This alarm will appear when software protection is turned on. Failure to turn on software protection will directly damage the driver and motor (202107

In the future, the machine will be forced to turn on, and 9 No. parameters are irrelevant ) .

(Twenty-seven ) Er-227 Drive hardware encryption error

①Upgrading the firmware version is interrupted;Just upgrade again.

Notes on program upgrade:

The version is 2020.9 It is not recommended to upgrade drivers later than 2020.9 If you must upgrade the version before 2 months ago, you need to change PE92 set up

Set to AAAA Upgrade again; version is 2020.9 The previous version was upgraded to 2020.9

After the latest version, you need to restore factory settings. In the same way, you need to restore the factory settings after upgrading; if there is a big difference between the versions before and after the upgrade, it is recommended to restore the factory settings and then set the parameters to run.

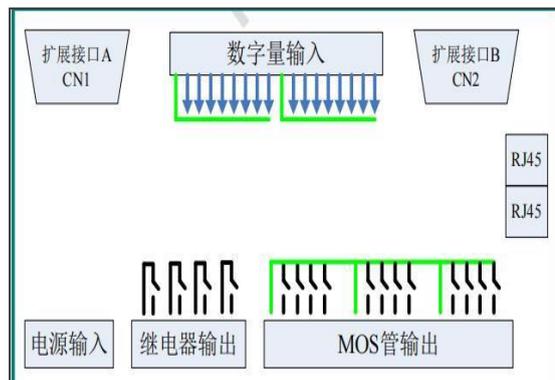
Appendix 11IO \_ Board ( R4C) Detailed Description

R4C Basic specifications	
name	inexbot_IO_R4C
size	122*200mm
bus speed	100Mbps
Distributed clock	support
powered by	24V DC
digital input	16 In, the polarity can be configured
Digital output	16 out (4 circuit relay, 12 road mos
Analog input	2 Road, 0~10V
Analog output	2 Road, 0~10V
Encoder	2 Road, AB Phase Count ( Differential Signaling Interface )
Extension ports	Can interface
Operating temperature	0~60°
Relative humidity	95% , no condensation
communication cycle	Minimum 200us

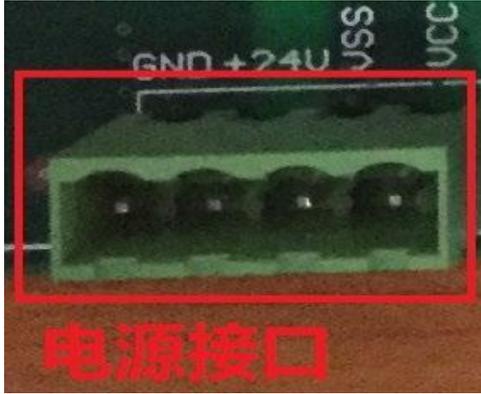
实物图



布局图

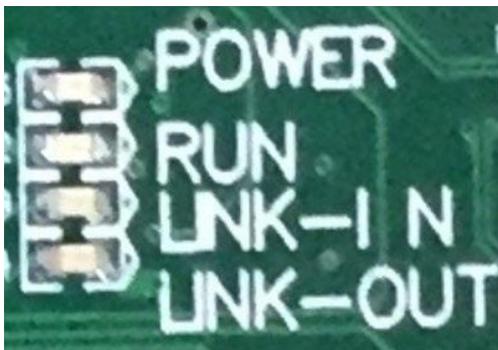


❖ R4C Power interface requirements



R4C 电源接口要求	
要求	24V DC 输入
控制电源:	GND (负极) 和+24V (正极) 接 DC24V, 功率 1A 以上
功率电源:	VSS (负极) 和 VCC (正极) 接 DC24V~26V, 功率 2A 以上, 需要根据实际 负载加大电源功率
备注	控制电源和功率电源可以使用同一电源进行供电。
	当输出电路负载功率较大, 或者使用使用环境比较恶劣时, 建议控制电源与功率电源分

❖ R4C Power and communication indicator lights



R4C 电源及通讯指示灯	
POWER	电源
RUN	通讯成功
LINK-IN	输入网口已连接
LINK-OUT	输出网口已连接

Communication indicator RUN status	
INIT state:	Eternal destruction
Pre-OP state:	flash mob
Safe-OP state:	slow flash
OP state:	Long bright

❖ Digital input interface

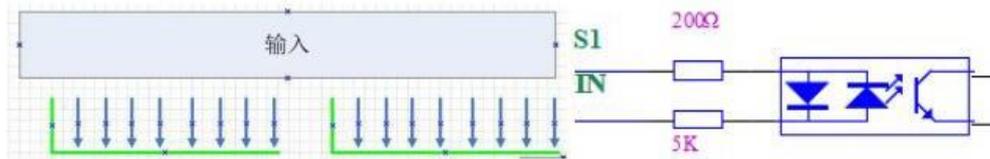


As shown in the figure, the input is divided into two types: X01~X08 with common terminal S1 As a group, X09~X16 with public terminal S2 as a group.

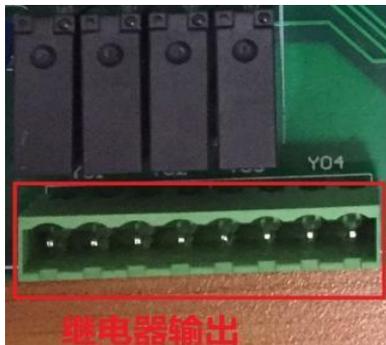
24V for input Level and input polarity are configurable. If the common terminal is connected to high level, the input terminal is active low level; if the common terminal is connected to low level, the input terminal is active high level.

Each input port has a corresponding LED Indicates status.

➤ Equivalent Circuit:



❖ Relay output interface



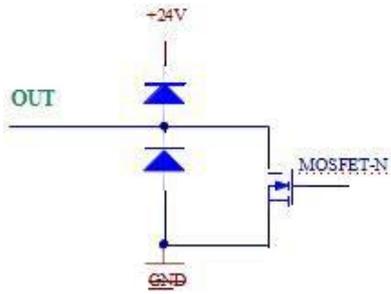
R4C-继电器输出接口	
继电器输出四路	Y01-04 每路输出一个开关量
继电器输出规格	7A-250VAC, 7A-30VDC
LED	每个输出端口有对应的 LED 指示状态
注意	继电器使用寿命约 10 万次, 请注意 开关频率

❖ MOS tube output interface

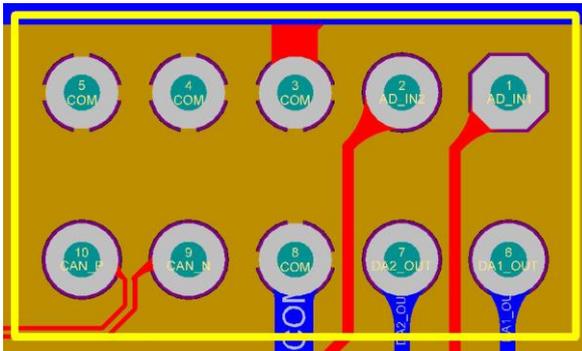


R4C-MOS 管输出接口	
MOS 管	NPN 结构, 输出两个状态: 低电平 0V 和断路状态。
输出能力	0.5 安培/通道(25°C)
注意	路输出功率大于 0.3 安培时, 建议用继电器
	MOS 管输出分为三组, 每四个输出为一组
	每一组都有对应的 VCC 输出 24V(VCC 电压)

➤ Equivalent Circuit:



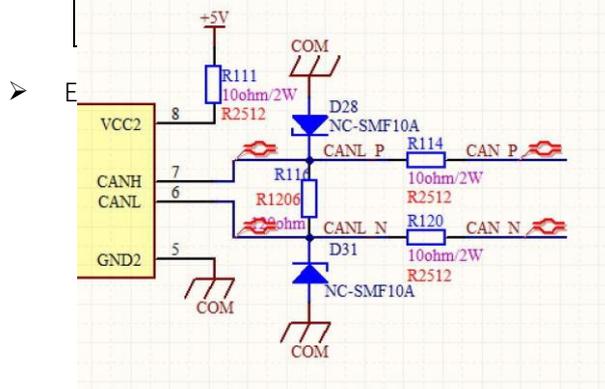
❖ Expansion interface A (CN1)



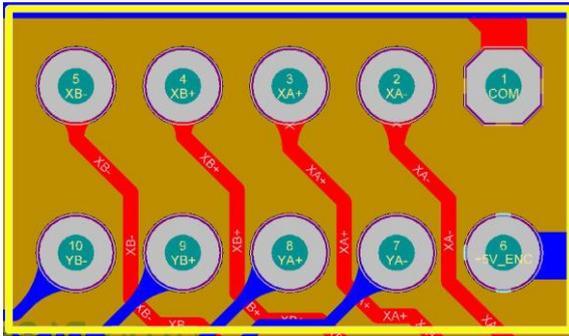
Signal definition of extended interface A (CN1)

pin	definition	illustrate	pin	definition	illustrate
1	AD_IN1	Analog input pass	6	DA1_OUT	Analog output channel
2	AD_IN2	Analog input pass	7	DA2_OUT	Analog output channel
3	COM	signal ground	8	COM	signal ground
4	COM	signal ground	9	CAN_N	can Interface negative end
5	COM	signal ground	10	CAN_P	can Interface positive end

Note: Use differential signals on the interface to use output: 0~10V



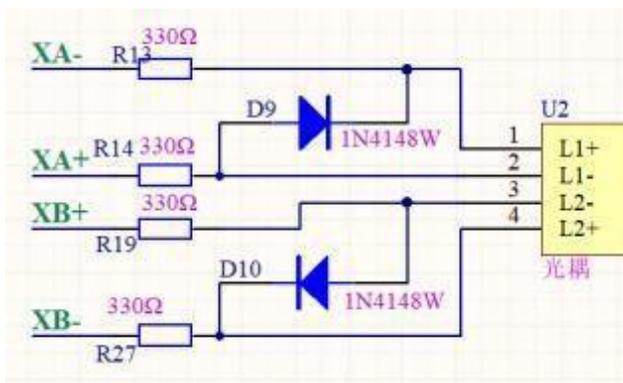
❖ Expansion interface B (CN2)



Signal definition of extended interface B (CN2)					
pin	definition	illustration	pin	definition	illustration
1	COM	signal ground	6	+5V_E	Encoder 5V power supply
2	XA-	axis 1 Encoder A Negative terminal	7	YA-	Axis 2 Encoder A Negative terminal
3	XA+	axis 1 Encoder A Upright	8	YA+	Axis 2 Encoder A Upright
4	XB+	axis 1 Encoder B Upright	9	YB+	Axis 2 Encoder B Upright
5	XB-	axis 1 Encoder B Negative terminal	10	YB-	Axis 2 Encoder B Negative terminal

Note: Use differential signals on the interface to use twisted pair shielded cables.  
Encoder selection suggestions: 5V Power supply, differential output, AB Quadrature output,  
Data type: 32 Bit signed data. The encoder power-on value is 0, and the range is :-2147483648~2147483647

➤ Equivalent Circuit:



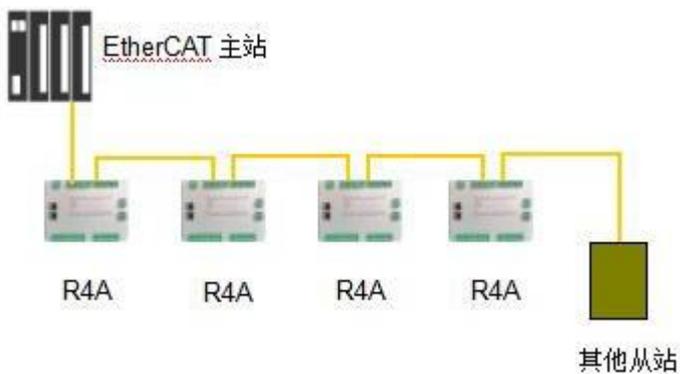
## Appendix 12 IO Board ( R4A) Detailed Description

### ❖ Overview

R4A Remote IO Modules offer standard EtherCAT. The communication interface is standard EtherCAT Slave device, can be connected to any EtherCAT in the communication network. R4A The module provides an IN mouth and an OUT port, use RJ45 Socket, connect to EtherCAT Communication equipment.

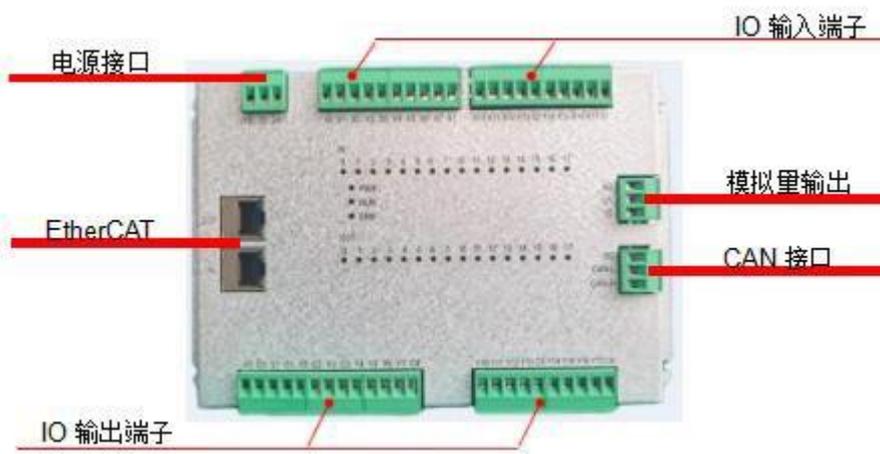
R4A Remote IO The module will distribute the IO Control points connected to EtherCAT Network, over EtherCAT. In the network, R4A The module is a slave station, and its own input and output points have various functional combinations to meet different application needs.

R4A Module connected to EtherCAT The schematic diagram in the network is as follows:



As shown in the figure, R4A Remote IO The module can transmit digital inputs from industrial sites through EtherCAT. The bus is transmitted to the master station, and the control data of the master station can be transmitted to the digital output, analog output, etc. of the industrial site.

### ❖ constitute



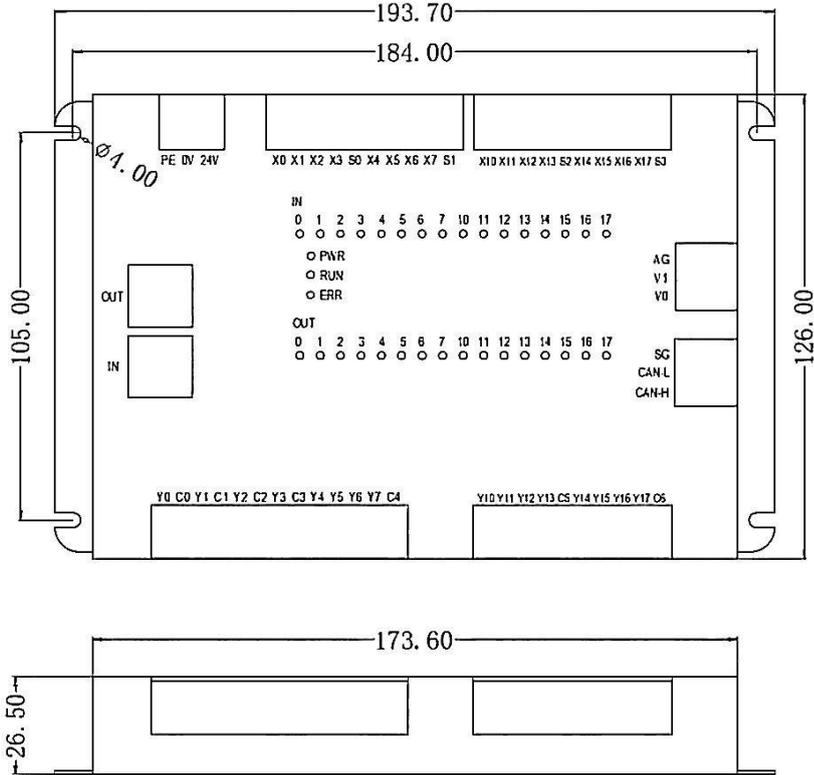
## ❖ Specification

EtherCAT Communication Interface	
Connector	RJ45
transfer method	100BASE-TX
transmission cable	CAT 5 Network cable (shielded)
electrical isolation	500VDC
Transmission rate	100M
Power Specifications	
voltage	24VDC ( 18~36V )
Power consumption	
weight	
Environmental specifications	
interfere with immunity	ESD(IEC 61131-2,IEC 61000-4-2):8KV Air Discharge EFT(IEC 61131-2,IEC 61000-4-4): Power Line:±2kV,Digital Input:±2kV Comunication I/O: ±2kV Conducted Susceptibility Test (EN61000-4-6, IEC 61131-2 9.10) : 150kHz ~ 80MHz,10V/m RS (IEC 61131-2,IEC 61000-4-3): 26MHz ~ 1GHz, 10V/m
Operating / storage environment	operate: 0°C ~ 50°C (temperature), 50 ~ 90% (humidity) pollution degree 2 Storage: -25°C ~ 70°C (temperature), 5 ~ 95% (humidity)
Vibration / shock resistance	country international mark allow regulation Standard IEC 61131-2, IEC 68-2-6 (TEST Fc)/IEC 61131-2& IEC 68-2-27 (TEST Ea)

## ❖ Install

R4A Fix with flat screws, use M3 Use screws to fix the mounting holes on the four corners to the cabinet. R4A The use of semi- enclosed fixing holes makes it easier to disassemble and assemble on site. Need to remove R4A When removing the module, first remove all wiring plugs, and then remove the fixing screws on the four corners to remove the module smoothly.

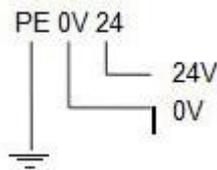
The appearance size chart is as follows:



❖ Hardware connection

- R4A Provide two RJ45 interface, one is IN interface, one is OUT interface. R4A The module can automatically assign addresses without setting the IP address.
- Power interface

R4A The power interface of the module is on the upper left side of the module, and the power supply is 24V DC enter. Please refer to the schematic diagram below and pay attention to connect the ground well. You can directly connect it to the cabinet shell or a grounded guide rail.



- EtherCAT interface

R4A The module provides two RJ45 interface, one is IN interface to connect to the superior EtherCAT device, one is OUT

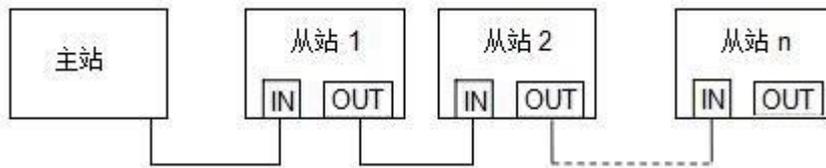
Interface to connect to lower-level EtherCAT equipment.

① R4A EtherCAT provided The interface has the characteristics shown in the following table:

通讯速率	100M
------	------

Communication Cable	Shielded Category 5e CAT -5E communication cable
Number of nodes	65535 nodes per network segment
Interface form	RJ45, with communication status light indicator
Number of interfaces	IN interface, OUT interface

**② EtherCAT Network wiring schematic diagram**



**③ Cable selection**

EtherCAT IEEE based on standards 802.3 protocol, using standard shielding over 5 Category CAT-5E The cable can complete the communication connection . Since most EtherCAT The modules have built-in switches and provide at least two RJ45 Communication port, so in general application sites, special switches are no longer needed for wiring. Only cables are required to complete on-site wiring. EtherCAT In the network , the maximum communication distance between two devices is 100 rice,

If standard communication cables are not used, the maximum communication distance may not be achieved.

**④ EtherCAT \_ Address settings**

R4A The module supports automatic address allocation and does not require any physical switches to set its address. EtherCAT The master station will automatically assign an address, and there is no need to manually configure the IP. address.

**⑤ Input and output specifications**

R4A Remote IO module, providing 16 digital input channels, 16 digital output channels, and 2 analog voltage output channel.

**R4A Terminal arrangement**

Digital input terminal

X0	X1	X2	X3	S0	X4	X5	X6	X7	S1
X10	X11	X12	X13	S2	X14	X15	X16	X17	S3

Digital output terminal

Y0	C0	Y1	C1	Y2	C2	Y3	C3	Y4	Y5	Y6	Y7	C4
----	----	----	----	----	----	----	----	----	----	----	----	----

Y10	Y11	Y12	Y13	C5	Y14	Y15	Y16	Y17	C6
-----	-----	-----	-----	----	-----	-----	-----	-----	----

Analog output terminal

AG
V1
V0

CAN Communication terminal

SG
CANL
CANH

S0~S3 in the input channel The common terminal is independent, C0~C6 of the output channel The public ends are also independent of each other.

⑥Digital input specifications

R4A Series modules provide two input modes: sink type and source type. The detailed input channel parameters are as follows:

Enter points	16 point
Connection method	Open drop-out terminals (pitch 5.08mm )
Input form	sink / source
Input voltage	DC24V
Input signal form	For sinking input: NPN _ open collector transistor For source input: PNP _ open collector transistor
Input loop isolation	Optical couple isolation
Input action display	LED on the panel when input signal is detected Light
Input loop composition	<div style="display: flex; justify-content: space-around; margin-top: 10px;"> <span>Sink input</span> <span>Source input</span> </div>

Note: X0~X3 The common terminal is S0 , X4~X7 The common terminal is S1 , X10~X13 The common terminal

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is S2 , X14~X17

The public end is S3 .

⑦ Digital output specifications

R4A The output channels provide relay output form. The detailed parameters of the relay output channel are as follows:

Output points	16 point
Connection method	Open drop-out terminals ( pitch 5.08mm )
Output type	relay
load capacity	5A@30VDC , 5A@250VAC
Loop isolation	Relay isolation
Output action display	The signal has a corresponding LED output Light
Output loop composition	

⑧ Analog output

R4A Module provides 2 analog output channel, the analog output is voltage type 0-10V Signal. Output value 0-4000 Corresponding output voltage 0-10V , that is, when the output value is 4000 When, the output channel outputs 10V voltage, when the output value is 2000 When, the output channel outputs 5V Voltage.

Note: The analog output channel is fully isolated and provides DC/DC internally. Isolated power supply, no need to connect external power supply at the terminal.

⑨ Fault diagnosis

R4A There are 3 An indicator light is used to indicate the working status, including PWR Lamp, RUN lights, and ERR lamp. PWR Power indicator light display description:

Indicator status	Indicating function	Method of exclusion
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Light s off	No power	Correctly connect the R4A power cord and confirm that the power supply is normal.
green light on	normal work	No processing required.

RUN Indicator light display description:

Indicator status	Indicating function	Method of exclusion
Light s off	No power or initialization state	Connect R4A correctly Module power cord, confirm that the power supply is normal.
Green light flashes	Module is in pre-operational state	1) Check whether the connection to the master station is correct. 2) Confirm whether the master station is running.
Green light flashes twice	Module is in safe operating condition	Confirm whether the master station is running.
green light on	Module is in operation	No processing required.

ERR Indicator light display description:

Indicator status	Indicating function	Method of exclusion
Light s off	working fine	No processing required.
red light flashing	Configuration exception cannot complete the state transition required by the master station.	Confirm that the configuration is correct.
red light double flash	Sync manager timed out	Confirm that the connection between the module and the master station is normal

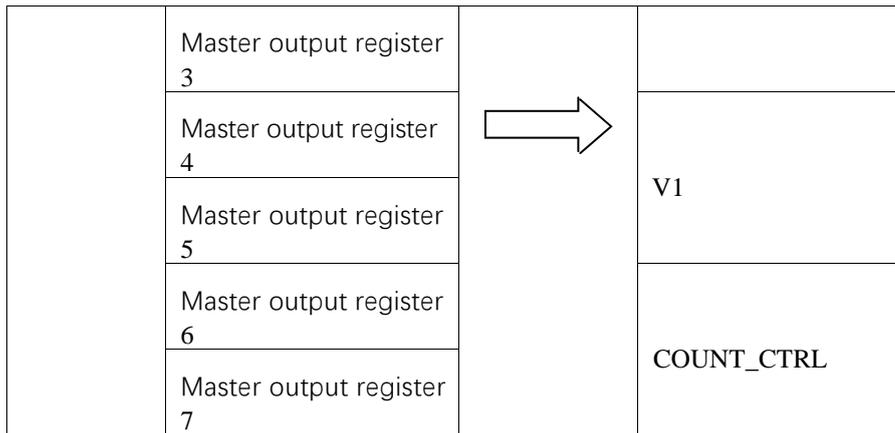
@IO \_ data structure

R4A The module comes with digital input and output points. The input points are X0~X7 and X10~X17. Number, output click Y0~Y7 ,

Y10~Y17 Carry out numbering. R4A The input and output point data of the module are corresponding in order:

	EtherCAT Main site	data flow	R4A
	Master input register 0	←	X0~X7
	Master input register 1		X10~X17
	Master input register 2		COUNT_IN_1
	Master input register 3		
	Master input register 4		
	Master input register 5		
	Master input register 6		

Input data	Master input register 7		COUNT_IN_2
	Master input register 8		
	Master input register 9		
	Master output register 0		Y0~Y7
	Master output register 1		Y10~Y17
	Master output register 2		



As shown in the table above, R4A input data, including 16 digital quantity and two high-speed counting inputs. X0~X17 for 16 digital input signal. The count value of the high-speed counter is 32 bit, the maximum counting frequency is 500K , one-way cumulative counting, COUNT\_IN\_1 The input source of the count value is X0 , COUNT\_IN\_2 The input source of the count value is X2 . Enter data in total 10 bytes, corresponding to 10 of the master station input byte data.

The output data includes analog and digital data, and also provides a counter control word, so the output data has a total of 8 bytes . Y0~Y17 for 16 relay output signal, the common terminals are C0~C6 respectively . V0 and V1 is 2 analog output signal, V0 A word data located, corresponding to analog channel 1 The output range is 0-4000 , corresponding to V0 The output terminal is 0-10V voltage output. V1 A word data located, corresponding to analog channel 2 Output. COUNT\_CTRL Control COUNT\_IN\_1 for the low byte of the high-speed counter control word The count value, the high byte controls COUNT\_IN\_2 count value. When COUNT\_CTRL The low byte is from 0->1 When, R4A COUNT\_IN\_1 will be reset count value. Likewise, when COUNT\_CTRL The high byte is from 0->1 When, R4A COUNT\_IN\_2 will be reset count value.