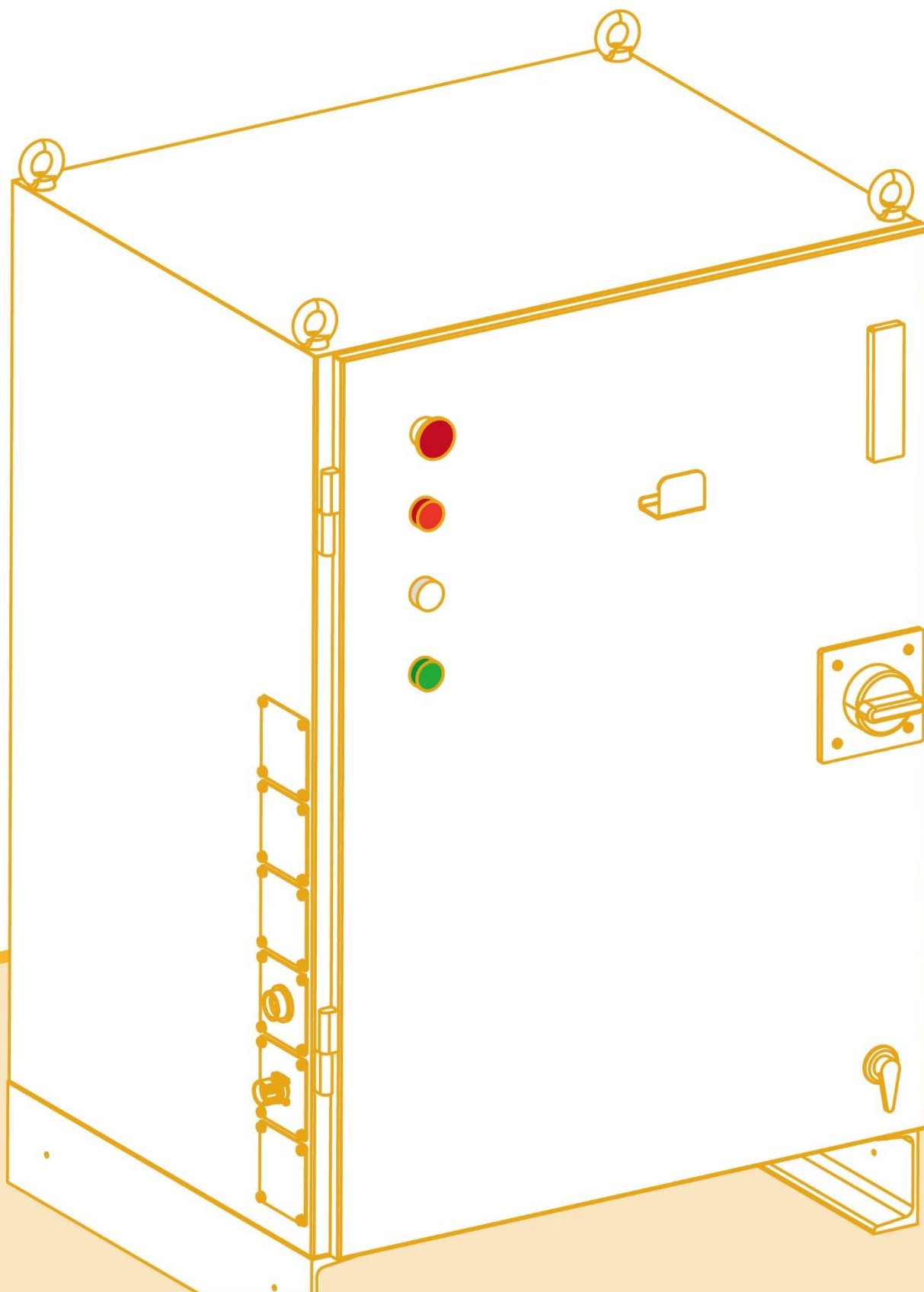


# ARC4-50 Control Cabinet Manual

V1.2.1





# Introduction

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## About this manual

This manual is for technicians to quickly, correctly and safely install and use the ARC4-50 control cabinet, familiarize themselves with relevant precautions and do regular routine maintenance of the control cabinet.

## Operating prerequisites

Before operating the robot, please read the general safety instructions and safety precautions of the product carefully. The user must understand the safety knowledge and basic operating knowledge before operating the robot.

Please refer to:

- "AIR50-2230A Industrial Robot Manipulator Manual"
- "AIR-TP Teach Pendant Operation Manual"
- "ARL Programming Manual"
- "AIR50-2230A Industrial Robot Quick Operation Manual"




## Target groups


- Operator
- Product technicians
- Technical service personnel
- Teachers

## Common logo meaning

The signs and their meanings in the manual are shown in Table 1 below.

Table 1 Identifiers used in this article

Sign	Meaning
 Danger	If you do not follow the instructions, accidents may occur, resulting in serious or fatal personal injury
 Warning	If you do not follow the instructions, accidents may occur, resulting in moderate injuries or minor injuries, or only material damage may occur
 Notice	Prompt you to pay attention to environmental conditions and important matters, or quick operation methods

Sign	Meaning
	You are prompted to refer to other documents and instructions for additional information or more detailed operating instructions

### Manual description

The content of this manual will be supplemented and modified. Please pay attention to the "Download" of our company website regularly to obtain the latest version of the manual in time.

My company website URL: <http://robot.peitian.com/>

### Revision record

The revision record accumulates the description of each document update. The latest version of the document contains the updated content of all previous versions of the document.

Table 2 Document revision history

Version	Release time	Modify the description
V1.1.0	2020.12.31	1. Optimize the layout of the manual 2. Add specifications and joint size description of encoder line and power line
V1.2.0	2021.04.22	Update 6.1 PLC_ MF chapter is illustrated, and the PIN number of DI and DO connectors is modified
V1.2.1	2021.08.23	Fix known bugs.

### Document number and version

See Table 3 for document number and version information.

Table 3 Document number and version information

Name	"ARC4-50 Control Cabinet Manual"
Document number	UM-P0511000033-001
Document version	V1.2.1

### Declaration of applicable safety standards

The requirements that the industrial robot system design meets are shown in Table 4.

Table 4 Declaration of applicable safety standards

Standard	Description	Version
<i>2006/42/EC</i>	Machinery directive: Machinery Directive 2006/42/EC (new edition) released by the European Parliament and Council on May 17, 2006, including changes to 95/16/EC	2006
<i>2014/30/EU</i>	EMC directive: Directive 2014/30/EU released by the European Parliament and Council on February 26, 2014 to balance EMC regulations among member states	2014
<i>2014/68/EU</i>	Pressure equipment directive: Directive 2014/68/EU released by the European Parliament and Council on May 15, 2014 to balance the pressure equipment regulations among member states (Only applicable for robots with hydro-pneumatic balance weights.)	2014
<i>ISO 13850</i>	Safety of machinery: Emergency stop function - Principles for design	2015
<i>ISO 13849-1</i>	Safety of machinery: Safety-related parts of control systems; Part 1: General principles for design	2015
<i>ISO 12100</i>	Safety of machinery: General principles for design - Risk assessment and risk reduction	2010
<i>ISO 10218-1</i>	Safety requirements for industrial robots: Part 1: Robots (tip: The content complies with ANSI/RIAR.15.06-2012, Part 1)	2011
<i>61000-6-2</i>	Electromagnetic compatibility (EMC): Part 6-2: Professional basic standards; Immunity for industrial environments	2005
<i>61000-6-4 + A1</i>	Electromagnetic compatibility (EMC): Part 6-4: Generic standards; Radiated interference for industrial environments	2011
<i>60204-1 + A1</i>	Safety of machinery: Electrical equipment of machines; Part 1: General requirements	2009
<i>IEC 60529</i>	Degrees of protection provided by enclosures (IP code): This standard applies to the classification of degrees of protection provided by enclosures for electrical equipment with a rated voltage above 72.5kv.	2001



# General safety instructions

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Thanks very much for your purchase of the manipulator made by the company. The information described is necessary for safely using the manipulator. Please read associated manual carefully before using the manipulator, and properly use it under the premise of understanding its contents.

Please adequately understand the manipulator specifications through available instructions for detailed function.

## Safety precautions

In general, the manipulator cannot be operated singly, but it is efficient when fitting with end effector, and constructed with peripheral equipment and system.



In consideration of security, the manipulator cannot put into separate consideration, while it shall be placed in the system environment.

Please take corresponding measures for safety barriers during the manipulator operation.


## Warning, caution and notices


This manual contains various attentions including operating personnel safety and preventing manipulator damage. The significance of safety is described in form of "Warning" and "Caution", and other supplementary instructions are stated in form of "Notices".

Please thoroughly read these matters described in "Warning", "Caution" and "Notices".


 Warning	Faulty operation may lead to death or serious injury of operator or other operating personnel.
 Tip	Faulty operation may lead to minor injury of operator or other operating personnel or equipment damage.

## General cautions



 Warning	<ul style="list-style-type: none"> <li>■ When connecting or disconnecting related peripheral devices (such as safety fences, etc.) and various signals of the manipulator, be sure to confirm that the manipulator is in a stopped state to avoid incorrect connections.</li> <li>■ Do not use the manipulator in the following situations. Otherwise, it will not only cause adverse effects on the manipulator and peripheral equipment, but also may cause injury or death to operators:                     <ul style="list-style-type: none"> <li>● Use in flammable environment</li> <li>● Use in explosive environment</li> <li>● Use in environments with a lot of radiation</li> </ul> </li> </ul>
--	---

	<ul style="list-style-type: none"> <li>● Use in water or high humidity environment</li> <li>● Use for the purpose of transporting people or animals.</li> <li>● Use as a tripod (such as climbing on top of the manipulator, or hanging below)</li> <li>■ Operators who use the manipulator should wear the following safety equipment before performing work:             <ul style="list-style-type: none"> <li>● Work clothes suitable for the content of the job</li> <li>● Safety shoes</li> <li>● Safety helmet</li> </ul> </li> </ul>
 Tip	Personnel performing programming and maintenance operations must receive appropriate training through relevant training provided by the company.


Installation attentions

 Warning	<ul style="list-style-type: none"> <li>■ Please follow the methods shown in the manual for proper operation during carrying and installing the manipulator. Any operation in wrong methods may lead turnover of the manipulator and then result in injury and death of operating personnel.</li> <li>■ Please operate the manipulator in low speed, and then increase the speed gradually to ensure whether it is abnormal when the manipulator is used for the first time upon installation.</li> </ul>
--	--



Attentions during the operation

 Warning	<ul style="list-style-type: none"> <li>■ During the manipulator operation, please ensure there is no one in the safety barriers for subsequent operation. Accordingly, check whether there are potential risks; when the potential risks are verified, operate it after eliminating the risks.</li> <li>■ During the demonstrator operation, wearing gloves may cause errors in operation, thus, taking the gloves off is necessary for subsequent operation.</li> </ul>
 Tip	Program, system variables and other information can be saved in the storage card and other storage medium. To prevent data loss from unexpected accidents, the users are recommended to backup data regularly.


Attentions during the programming

 Warning	<ul style="list-style-type: none"> <li>■ Operate outside safety barrier as far as possible during the programming. If it is required to operate in the safety barrier for unavoidable conditions, following precautions shall be noticed:             <ul style="list-style-type: none"> <li>● Carefully view the conditions in the safety barrier, and then enter the barrier after ensuring there is no danger;</li> <li>● Make sure the emergency stop button can be pressed at any time;</li> <li>● Operate the manipulator in low speed;</li> </ul> </li> </ul>
--	--



	<ul style="list-style-type: none"> <li>● Operate it after ensuring the whole system state to prevent the operating personnel from caught in danger due to the remote-control command or motion for peripheral equipment.</li> <li>■ Operators who use the manipulator should wear the following safety equipment before performing work:             <ul style="list-style-type: none"> <li>● Work clothes suitable for the content of the job</li> <li>● Safety shoes</li> <li>● Safety helmet</li> </ul> </li> <li>■ When programming, it should be carried out outside the safety fence as much as possible. When it is necessary to carry out inside the safety fence due to unavoidable circumstances, the following matters should be paid attention to:             <ul style="list-style-type: none"> <li>● Check the situation inside the safety fence carefully and confirm that there is no danger before entering the inside of the fence.</li> <li>● You can press the emergency stop button at any time.</li> <li>● The manipulator should be operated at a low speed.</li> <li>● The operation should be performed after confirming the status of the entire system to prevent operators from falling into dangerous situations due to remote control commands or actions for peripheral equipment.</li> </ul> </li> </ul>
 Notice	After programming, be sure to perform the test operation in accordance with the prescribed steps. At this time, the operator must operate outside the safety fence.
 Tip	Those who perform programming and maintenance operations must pass the relevant training of our company.

Attentions during the maintenance

 Warning	<ul style="list-style-type: none"> <li>■ Some maintenances have electric shock hazard when powered on, thus it shall be carried out under the disconnection of the manipulator and system power supply. Professional maintenance personnel shall be designated to take maintenance as required; other personnel shall be avoided to switch on power in the maintenance, if it is required, the personnel shall press the emergency stop button for subsequent operation.</li> <li>■ Please consult the company if it is necessary to replace the parts.</li> <li>■ If customers replace the parts by themselves, unexpected accidents may occur, and then it will cause damage and injury to the manipulator and operating personnel respectively.</li> <li>■ When entering into the safety barrier, the whole system shall be checked to ensure there is no danger. If there is dangerous situation and there is no choice but to enter the barrier, the system state shall be grasped, and extremely careful.</li> <li>■ If it is necessary to replace any part, please use the one</li> </ul>
--	--

specified by the company. But beyond this, it may cause damage to the manipulator.

- When dismantling motor or brake, it shall be dismantled after crane lifting and other measures are taken to prevent manipulator arm, etc. from falling.
- If the manipulator is moved for unavoidable reasons during the maintenance, the following matters shall be noticed:
  - Make sure the escape routes are unobstructed, and operate it after grasping the whole system operation conditions to avoid manipulator and peripheral equipment blocking the route of retreat.
  - Constantly notice whether there is danger around, and make preparations for pressing emergency stop button at any time when needed.
- When mobile motor, reducer, etc. equipped with parts unit with a certain weight, crane and other auxiliary equipment shall be used to prevent overlarge operation burden for operating personnel. Meanwhile, any mistake shall be avoided; otherwise, it will cause injury and death of operating personnel.
- Don't tumble due to the lubricating oil scattered on the floor, and wipe it off for ruling out the possibility of danger.
- During the operation, any part of the body cannot be put on the manipulator, and climb on the top of the manipulator to avoid unnecessary damage or adverse effects on the manipulator.
- Note that the following section will become hot. Well prepare heat-resistant gloves and other protective tools when the equipment is required to touch under heating circumstance for unavoidable reasons.
  - Servo motor;
  - Reducer;
  - Components near motor / reducer;
  - Interior control cabinet.
- The parts dismantled from components (such as bolts, etc.) shall be installed in the original position. If the parts are not sufficient or surplus, ensure it again and install it normally.
- When maintaining pneumatic system and hydraulic system, internal pressure shall be released to 0 at first for subsequent operation.
- Testing and operation shall be carried out in accordance with prescribed methods after components replacement. At this moment, the operating personnel shall operate outside the safety barrier.
- After maintenance ends, lubricating oil, debris, water, etc. scattered on the floor around the manipulator and in the safe barriers shall be swept thoroughly.
- Dust and other foreign matters are not allowed in the manipulator during the process of components replacement.
- Operating personnel who are in charge of maintenance and repair shall accept the company's training and pass the examination.

- During the maintenance, appropriate luminaire shall be equipped, but note that this cannot be the sources to cause new danger.
- Take periodic maintenance with reference to this instruction; if not, it will cause the service life of the manipulator and may result in accidents.

## Safety precautions

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Before operating the manipulator, peripheral equipment and its manipulator system, sufficiently study the safety precaution for operating personnel and system. Figure 1 is a diagram of the safe work of industrial robots.

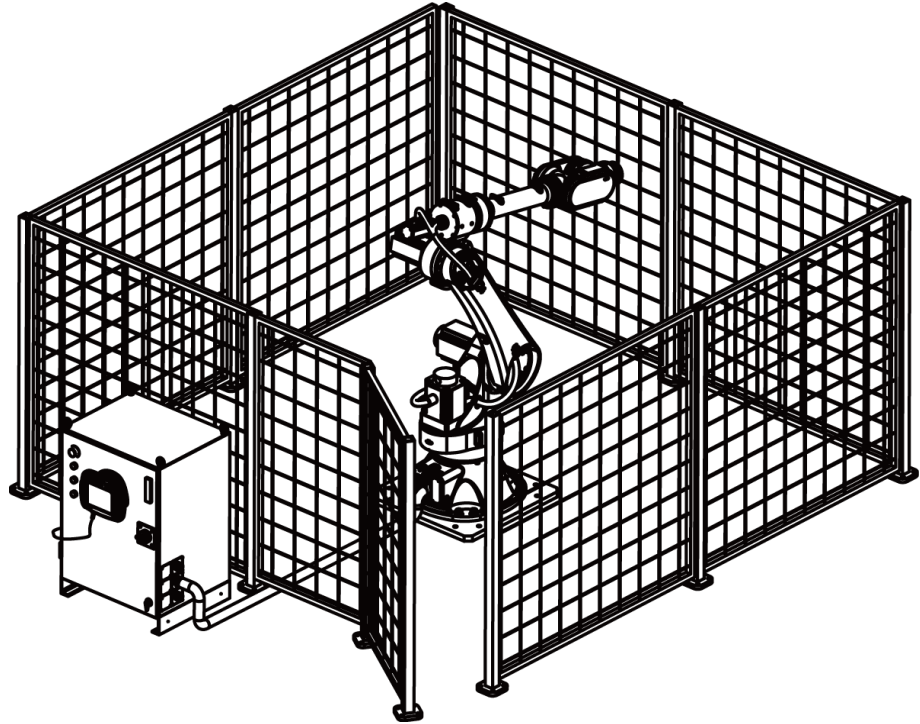


Figure 1 Diagram of the safe work of industrial robots

### Definition of operating personnel

Operators of the manipulator are mainly divided into three types: operators, teachers, and maintenance engineers. The conditions that these three types of operators need to meet are described as follows:

#### Operator

- Carry out the operation of manipulator power ON/OFF;
- Start the manipulator program through the operation panel;
- No right to work in the safety fence.

#### Teacher

- Have the functions of an operator;
- The operation machine can be taught in the safety fence.

#### Maintenance engineer

- Have the function of a demonstrator;

- The operation machine can be maintained (repair, adjustment, replacement, etc.) operations.

#### Safety of operating personnel

When operating, programming, and maintaining the manipulator, operators, instructors, and maintenance engineers must pay attention to safety and at least wear the following items for work:

- Appropriate working clothes;
- Safety shoes;
- Safety helmet.

When applying the automatic system, the safety of operating personnel shall be guaranteed. Since the motion range is very dangerous, measures for preventing the operating personnel from entering into the manipulator motion range shall be applied.

General cautions are shown as below. Proper available measures shall be applied to ensure the safety of operating personnel:

- Operating personnel who are in charge of operating the manipulator system shall accept the company's training and pass the examination.
- During the equipment operation, even the manipulator seems to be shut down, it may be because the manipulator may be in motion state waiting for start signal. This state shall be treated as operation state. To ensure the safety of operating personnel, warning lamps and other equipment display or sound shall be applied to ensure the manipulator is in the operation state;
- Safety barriers and safety door around the system shall be set, so as to make operating personnel cannot enter into the safety barriers if the safety door is not opened. Interlock switch, safety latch, etc. shall be set on the safety door, so as to stop the manipulator when operating personnel open the safety door;
- Electrical grounding shall be applied for peripheral equipment;
- Peripheral equipment shall be set outside the manipulator motion range as far as possible;
- The motion range of the manipulator shall be marked with a line on the ground or in other ways, the operator knows clearly about the motion range, including mechanical arm and other tools fitted on the manipulator;
- The ground shall be set with cushion switch or fitted with photoelectric switch, etc. so as to sound alarm through buzzer or to glows, etc. when operating personnel enter into the motion range of the manipulator;
- One lock shall be set as required; no one can connect the manipulator power except the operating personnel;

- When taking single commissioning of peripheral equipment, the manipulator power shall be disconnected.

### The safety of operator

Operator is not entitled to operate in the safety barriers:

- If the manipulator motion is not required, its control cabinet power shall be disconnected or the emergency stop button shall be pressed;
- Manipulator system shall be operated outside the safety barrier;
- To prevent irrelevant personnel from spraying into manipulator motion range or to prevent operator from entering into hazardous area, protective fence and safety door shall be set;
- Emergency stop button shall be set in arm's reach for operator.



Manipulator control device can connect external emergency stop button. Thus, once the emergency stop button is pressed, the manipulator will be shut down through this connection.

### Safety of teachers

When taking manipulator demonstration operation, if entering into manipulator motion range is required in some cases, please pay particular attention to safety:

- Please operate outside the manipulator motion range in case that there is no need to operate in its range;
- Please ensure the manipulator or peripheral equipment is in safety state before demonstration operation;
- Please confirm location, state, etc. of safety device (such as emergency stop button, emergency stop the switch of demonstrator, etc.) in advance if the demonstration is operated in the manipulator range for unavoidable reasons;
- Programmer shall pay special attention to keep other personnel from entering into manipulator motion range;
- Please fully confirm that there is no one in the manipulator range and no abnormal sign before starting;
- Please follow the following procedures to carry out testing and operation after demonstration ends:

Step1. Execute for at least one cycle with single cycle at low speed to ensure there is no abnormal sign;

Step2. Continuously operate for at least one cycle at low speed to ensure there is no abnormal sign;

Step3. Continuously operate for at least one cycle at intermediate speed to ensure there is no abnormal sign;

Step4. Continuously operate for at least one cycle at intermediate speed to ensure there is no abnormal sign;

Step5. Execute programming under automatic operation mode;

- Programmer shall evacuate to the outer place of the safety barrier during automatic operation of the manipulator.

#### The safety of maintenance engineer

To ensure the safety of maintenance engineer, the following items shall be fully noticed:

- During the manipulator operation, don't enter into its motion range;
- Take maintenance when the power supply of control device is disconnected. Apply lock, etc. to lock on main circuit breaker to prevent other personnel from connecting the power;
- Press control cabinet or demonstrator emergency stop button if entering into the manipulator motion range is required for unavoidable reasons in an energized state. In addition, operating personnel shall put up the sign of "under maintenance", and remind the other personnel of not operating the manipulator arbitrarily;
- Please ensure the manipulator or peripheral equipment is in safety state before maintenance;
- Don't execute automatic operation when there is someone in the manipulator motion range;
- Don't block the escape routes of the operating personnel when operating near wall, tool, etc. or the distance between personnel is close;
- When the manipulator is equipped with the tool and there are movable appliances such as band carrier, etc. except manipulator, attentions shall be fully paid for these devices;
- One person who is familiar with manipulator system and can easily observe dangers shall be assigned around the manipulator during the operation to ensure that the emergency button can be pressed at any time;
- When replacing the parts or reassembling, attentions shall be paid in case of foreign material adhesion or foreign material invasion;
- When maintaining internal control device, in case of contacting unit, printed circuit board, etc., to prevent electric shock, power supply of main circuit breaker of control device shall be disconnected firstly before the operation;
- Use parts specified by the company when replacing the parts;
- Fully ensure that there is no one within operation scope of the manipulator and the manipulator and peripheral equipment are in good conditions when restarting the manipulator system after the maintenance.

## Safety of peripheral equipment

### Attentions on relevant program

- Checkout equipment such as limit switch, etc. shall be used in order that dangerous condition is detected, and the manipulator shall be shut down as appropriate according to the signal of checkout equipment;
- Applicable measures such as stopping the manipulator, etc. shall be taken against abnormality in other manipulators or peripheral equipment even if there are no problems in this manipulator;
- Mutual interference shall be avoided on system in which the manipulator and peripheral equipment operate synchronously;
- In order to control status of all equipment from manipulator, the manipulator and peripheral equipment can be mutually locked and the operation of manipulator can be stopped according to the needs.

### Attentions on machinery

- Keep the system of the manipulator clear and use it under environment without influence from grease, water, dust, etc.;
- Cutting fluid and cleaning agent are not allowed to use;
- Control the operation of the manipulator with limit switch and mechanical brake in case of mutual collision between manipulator and peripheral equipment;
- Subscriber cable, hose, etc. are not allowed to be put inside the manipulator;
- Mechanical movement shall be avoided when installing the cable outside the manipulator;
- As for the model of exposed cables in the manipulator, operation for exposed cable shall not be modified;
- Interference in other parts of the manipulator shall be fully avoided when installing peripheral equipment on the manipulator;
- Any frequent outage and shutdown through emergency stop button, etc. on operating manipulator can lead to manipulator fault.

## Machinery safety of the manipulator

### Attentions during the operation

Operators shall be on high alert and quickly respond to occurrence of all problems when operating the manipulator through slow feeding mode under any condition.

### Attentions on relevant program

Mutual interference between manipulators shall be fully avoided during operational scope from multiple manipulators.



Set a specified work origin for manipulator program and create a program starting from work origin and ending at this one to see clearly whether operation of the manipulator is finished or not from the outer edge.

Attentions on mechanism

Keep operating environment of the manipulator clear and use it under environment without influence from grease, water and dust, etc.

Safety for end effector

Time difference before the command reaches the actual operation shall be fully considered and exercise the control with some extension and contraction after sending control command out when controlling all actuators (pneumatic, hydraulic and electric).

Set the detection unit on end effector to monitor status of end effector and control operation of the manipulator.



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# 1 Overview of ARC4-50 Control Cabinet

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## 1.1 Overview of industrial robot

The industrial robot is composed of the following components:

- Manipulator
- Control cabinet
- Teach pendant
- Connection (power supply) cables, etc.

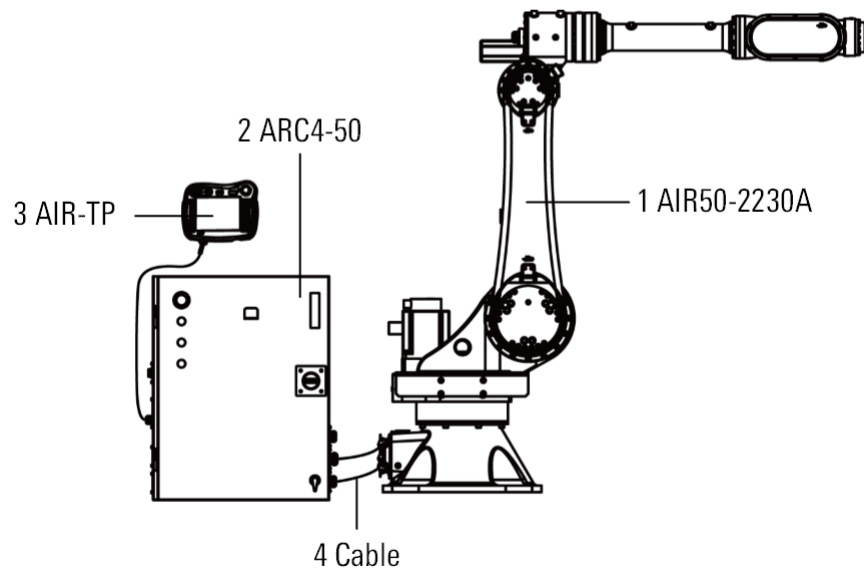


Figure 1-1 Composition of robot system

Figure 1-1 shows an example for industrial robot system, where:

- |                  |                                    |
|------------------|------------------------------------|
| 1. Manipulator   | 2. Control cabinet                 |
| 3. Teach pendant | 4. Connection (power supply) cable |

### Robot body

The robot body refers to the mechanism that is used to grab or move an object (tool or workpiece) in the robot system, and also is known as the manipulator.

### Control cabinet

The control cabinet is equipped with the electrical equipment that is required to control the robot, including the motor drive, PLC, safety module, power module, movement control module and other components, and provides the connection interfaces with the robot body and other external equipment. The appearance of the control cabinet is shown in Figure 1-2.

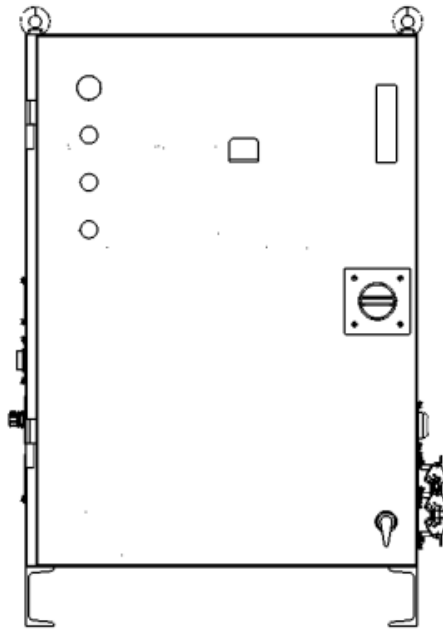


Figure 1-2 Control cabinet appearance

### Teach pendant

The teach pendant is connected to the master control system of the robot's control cabinet. It is used to remotely control the robot to run manually and automatically, record the running trajectory, display playback or record teach points and program according to the teach points.

## 1.2 Basic composition of control cabinet

The position of internal devices in the control cabinet is shown in Figure 1-3.

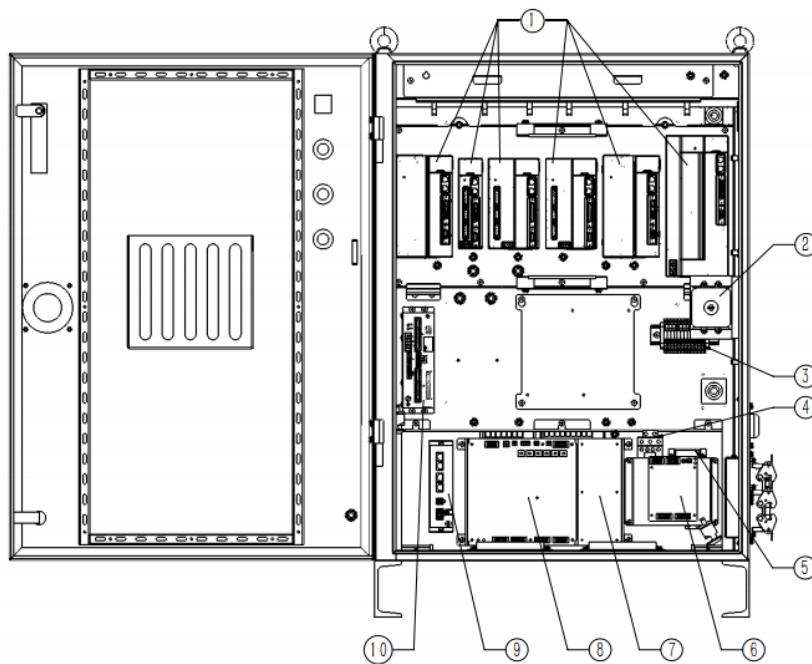


Figure 1-3 Diagram of internal components of control cabinet


See Table 1-1 for the serial number and name of each device.

Table 1-1 Serial number and name of components inside the control cabinet

Serial number	Name
1	Driver
2	Circuit breaker
3	Terminal blocks
4	Contactor group
5	Arc arrester group
6	Security module
7	Power adapter board
8	PLC_INT
9	PLC_MF
10	MCB

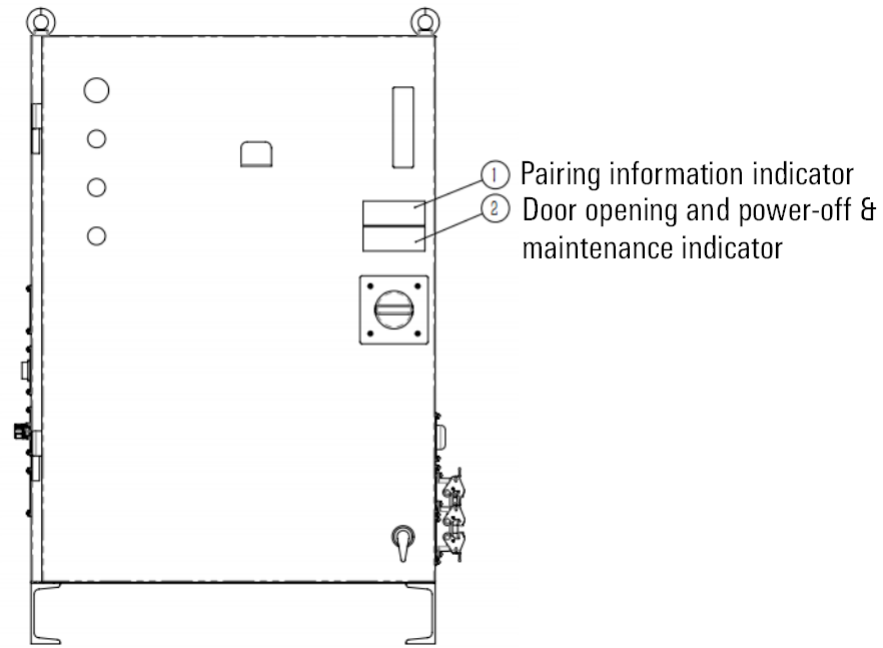
### 1.3 Control cabinet characteristics

- The total weight of ARC4-50 control cabinet is 180kg.
- The size of the control cabinet is 666mm (\*) long x 553mm (\*) thick x 1002mm (\* \*) high.
- The top of the control cabinet can withstand an average load of 1000N.

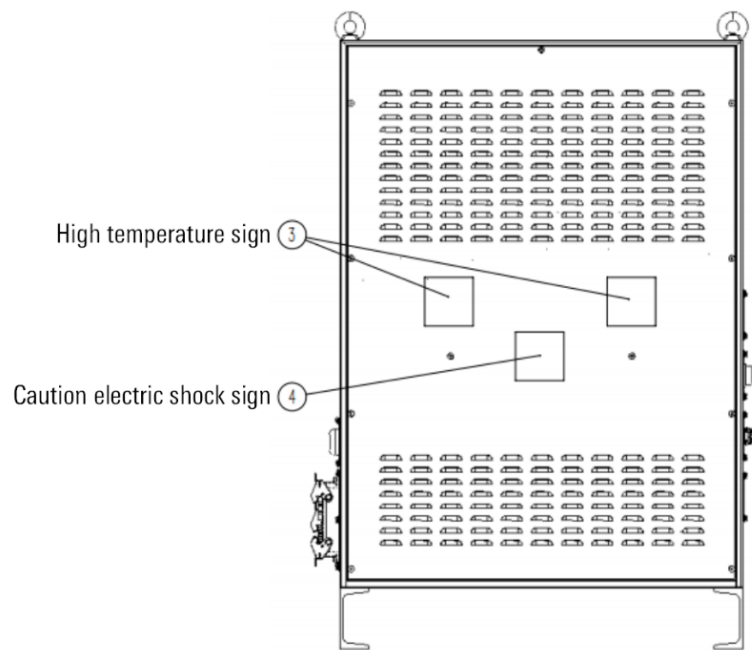
 Caution	<ul style="list-style-type: none"> <li>■ *: Excluding the size of connector outside the cabinet</li> <li>■ **: Including the height of support feet</li> </ul>
--	--

### 1.4 Label and meaning of control cabinet

ARC4-50 type control cabinet contains five kinds of labels. Refer to Figure 1-4 for the specific location of each label.

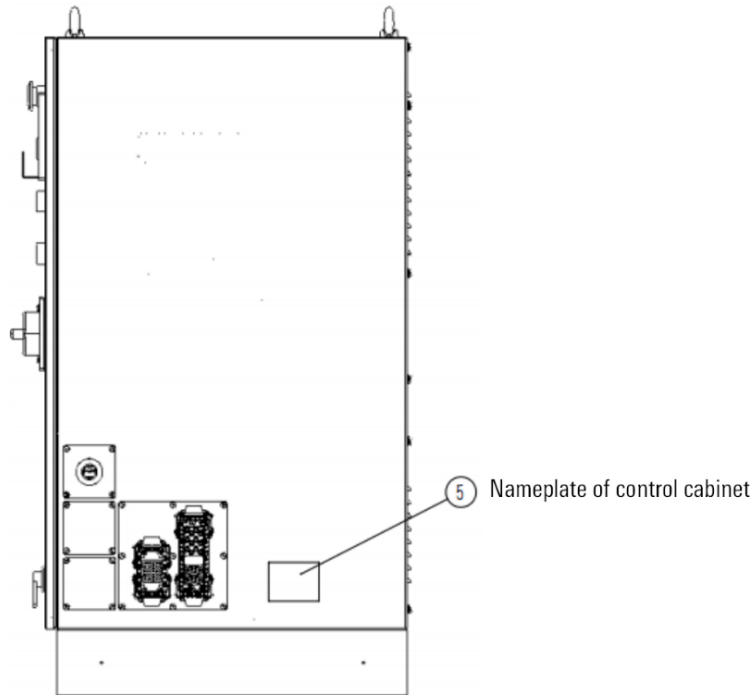


(a)



(b)





(c)

Figure 1-4 Location diagram of labels contained in control cabinet

### Pairing information indicator

The pairing information indicator is shown in Figure 1-5.



Figure 1-5 Pairing information indicator

### Door opening and power-off & maintenance indicator

The door opening and power-off & maintenance indicator is shown in Figure 1-6.



Figure 1-6 Door opening and power-off & maintenance indicator

## High temperature sign

The place with high temperature sign (Figure 1-7) may get hot again. When you see this sign, you should pay attention to it to avoid scalding. If you have to touch the equipment under the condition of heat, please use protective equipment such as inner heat gloves before touching.



Figure 1-7 Identification of high temperature

## Caution electric shock sign

Watch out for electric shock sign as shown in Figure 1-8.



Figure 1-8 Electric shock sign

## Nameplate of control cabinet

The nameplate of the control cabinet is shown in Figure 1-9. The nameplate indicates the model, serial number, weight, production date and other relevant information of the control cabinet (the parameters are subject to the actual object).

 配天机器人技术有限公司 Peitian Robotics Technology Co., Ltd.		
型号	Type	ARC4-50
产品号	Product No.	
序列号	Serial No.	
生产日期	Date	
重量	Weight	170kg
电源电压	Supply Voltage	380V/3AC
电源频率	Frequency	49~61Hz
满载电流	Full-load Current	8.5A

Figure 1-9 Nameplate of control cabinet

## 1.5 Installation environment of control cabinet

- The ambient temperature should be 0°C -45°C.
- The relative humidity should be 20%-80% RH.
- The dust, oil mist and water vapor in the installation environment must be minimized.
- The environment must be free of flammable and corrosive liquids or gases.
- The equipment should be installed away from the impact and vibration sources.
- The control cabinet should have a heat dissipation distance of at least 20cm from the surrounding installation environment.

## 1.6 Working environment of control cabinet

- The control cabinet can work normally within the range of 0°C~40°C, and can be stored and transported for a long time within the range of -25°C~40°C. It can also withstand short-term transportation and storage (with backup battery) at 70°C for no more than 24h.
- The control cabinet can work normally under the relative humidity of 20%-80% RH.
- The control cabinet can work normally when the altitude is  $\leq 1000\text{m}$ . Please consult our company when using at an altitude higher than 1000 meters.
- The control cabinet can work normally under the atmospheric pressure of 86kPa ~106kPa.



## 2 ARC4-50 control cabinet transportation and handling

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Four M12 lifting screws are provided above the control cabinet, as shown in Figure 2-1. Four lifting rings can be used for lifting and handling.

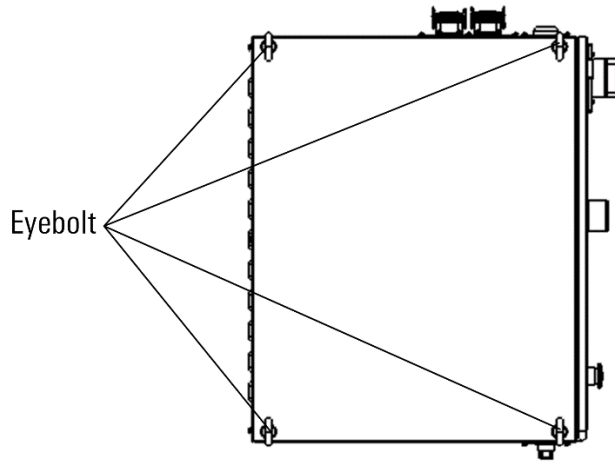


Figure 2-1 Control cabinet lifting ring handling

	<p>When the control cabinet is transported by lifting ring, please place the lifting point on the central axis of the top surface of the control cabinet, otherwise it is easy to tilt and cause other accidents such as collision of the control cabinet.</p>
--	--

The cabinet body of the control cabinet is designed with a forklift handling bracket, which can be handled by the forklift in the following ways (see Figure 2-2).

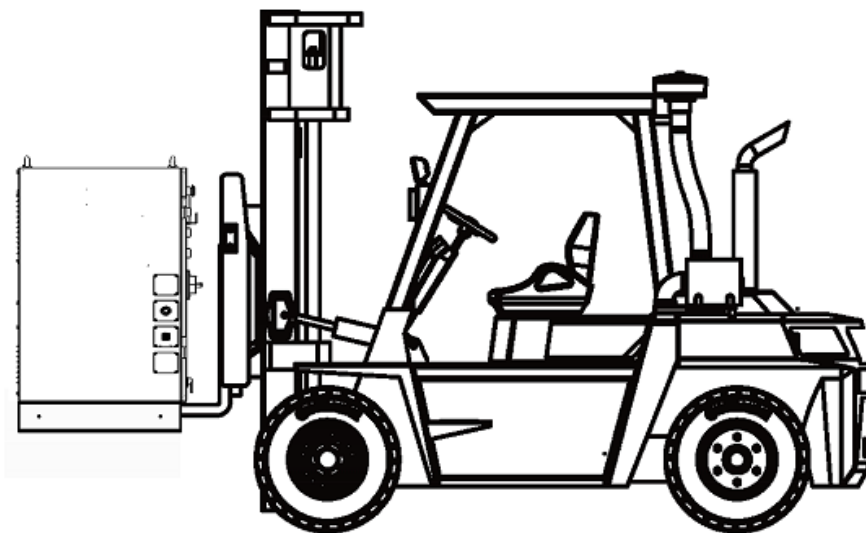


Figure 2-2 Control cabinet forklift handling



### 3 Installation and connection of ARC4-50 Control Cabinet

#### 3.1 Check item

Before installing the control cabinet, the following items must be strictly observed:

- Make sure that the installation personnel must pass the relevant training of the company and perform the installation work in compliance with international and local laws and regulations.
- Make sure that the control cabinet is free from bump or damage after unpacking.
- Make sure that the control cabinet installation environment meets the requirements in Section 1.5 of this manual.

#### 3.2 Definition of control cabinet electrical connection

Interface definition of aviation plug power line and holding brake line at cabinet side

ARC4-50 control cabinet side aviation plug power line and band brake line connector (WEEN H24B-TEH-4B-M32, part number P04083000076) is shown in Figure 3-1.

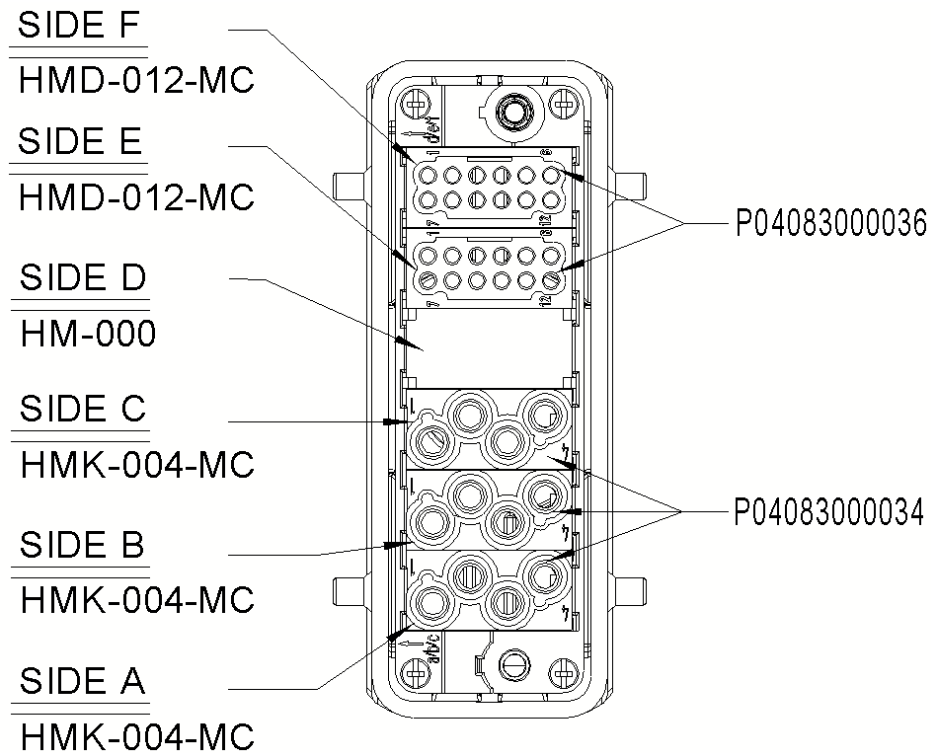


Figure 3-1 ARC4-50 control cabinet side aviation plug power line and brake wire connector

See Figure 3-2 for the definition of the power line and brake line interface of the aviation plug on the side of the ARC4-50 control cabinet.

**SIDE A**  
**HMK-004-MC**

Definition of pins on the control cabinet side

Pin number	Definition
1	U1
2	V1
3	W1
4	PE

(a)

**SIDE B**  
**HMK-004-MC**

Definition of pins on the control cabinet side

Pin number	Definition
1	U2
2	V2
3	W2
4	PE

(b)

**SIDE C**  
**HMK-004-MC**

Definition of pins on the control cabinet side

Pin number	Definition
1	U3
2	V3
3	W3
4	PE

(c)



**SIDE E**  
**HMD-012-MC**  
 Definition of pins on the control cabinet side

Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition
1	U4	2	V4	3	W4	4	PE	5	J4_24V	6	J4_0V
7	J1_24V	8	J1_0V	9	J2_24V	10	J2_0V	11	J3_24V	12	J3_0V
Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition
1	U6	2	V6	3	W6	4	PE	5	J6_24V	6	J6_0V
7	U5	8	V5	9	W5	10	PE	11	J5_24V	12	J5_0V

**SIDE F**  
**HMD-012-MC**  
 Definition of pins on the control cabinet side

(d)

Figure 3-2 ARC4-50 control cabinet side aviation plug power line and band brake line interface definition

Definition of power line and holding brake line interface of aviation plug on manipulator side

The power line and brake wire connector of aviation plug on the manipulator side of ARC4-50 control cabinet (WEEN H24B-TEH-4B-M32, part number P04083000076) is shown in Figure 3-3.

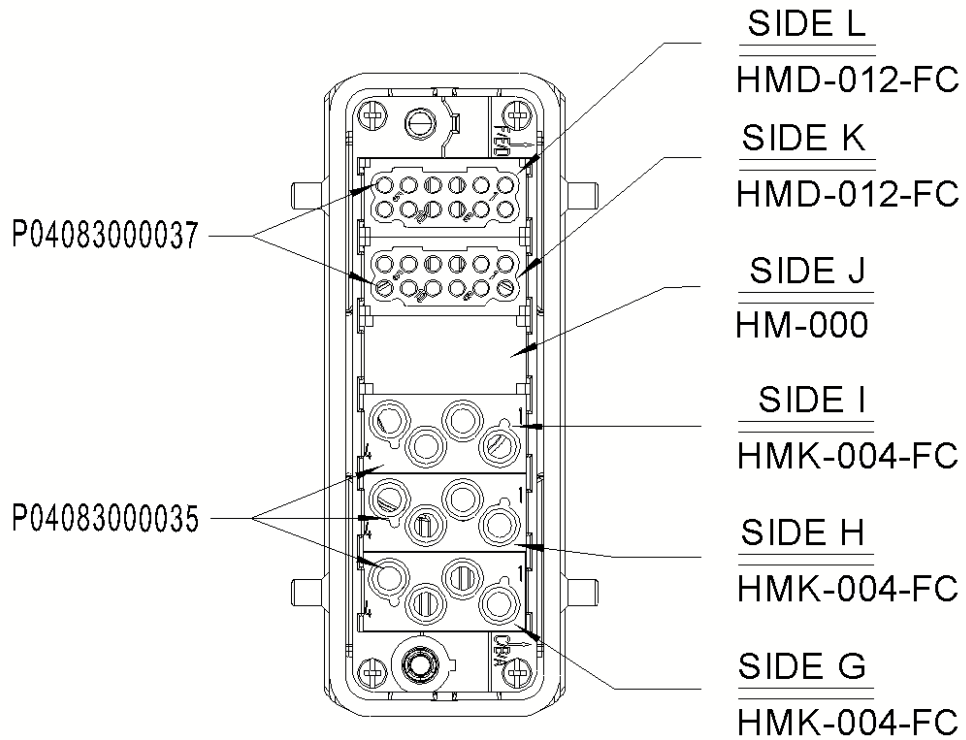


Figure 3-3 ARC4-50 control cabinet manipulator side aviation plug power line and brake wire connector

See Figure 3-4 for the definition of the power line and holding brake line interface of the aviation plug on the manipulator side of the ARC4-50 control cabinet.

**SIDE G**  
**HMK-004-FC**

Definition of pins on the control  
 cabinet side

Pin number	Definition
1	U1
2	V1
3	W1
4	PE

(a)

**SIDE H**  
**HMK-004-FC**

Definition of pins on the control  
 cabinet side

Pin number	Definition
1	U2
2	V2
3	W2
4	PE

(b)

**SIDE I**  
**HMK-004-FC**

Definition of pins on the control  
 cabinet side

Pin number	Definition
1	U3
2	V3
3	W3
4	PE

(c)

**SIDE K**  
**HMD-012-FC**

Definition of pins on the control cabinet side

Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition
1	U4	2	V4	3	W4	4	PE	5	J4_24V	6	J4_0V
7	J1_24V	8	J1_0V	9	J2_24V	10	J2_0V	11	J3_24V	12	J3_0V
Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition
1	U6	2	V6	3	W6	4	PE	5	J6_24V	6	J6_0V
7	U5	8	V5	9	W5	10	PE	11	J5_24V	12	J5_0V

**SIDE L**  
**HMD-012-FC**

Definition of pins on the control cabinet side

(d)

Figure 3-4 ARC4-50 control cabinet manipulator side aviation plug power line and band brake line interface definition

Cabinet side encoder line interface definition

Encoder wire connector on the side of ARC4-50 control cabinet (WEEN H10B-TEH-4B-M25, part number P0408300012) is shown in Figure 3-5.

**SIDE A**  
**HDD-042-MC**  
**P04083000008**

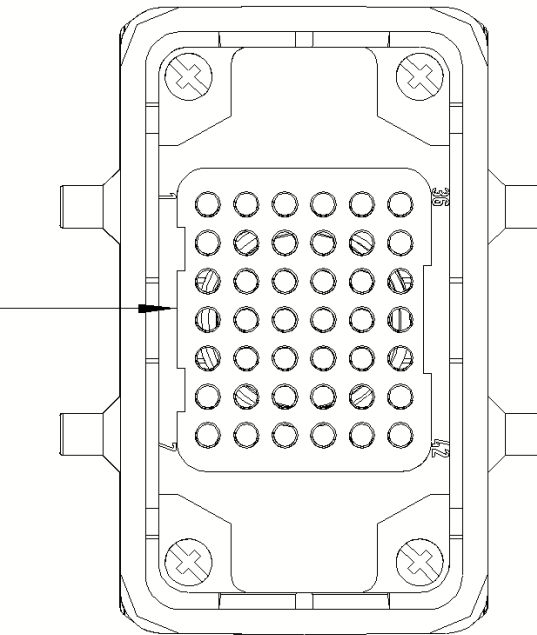


Figure 3-5 Encoder wire connector on the side of ARC4-50 control cabinet

See Figure 3-6 for the definition of encoder line interface on the side of ARC4-50 control cabinet.

**SIDE A**  
**HDD-042-MC**

Definition of pins on the control cabinet side

Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition
1	J1_PS-	8	J2_PS-	15	J3_PS-	22	J4_PS-	29	J5_PS-	36	J6_PS-
2	J1_PS+	9	J2_PS+	16	J3_PS+	23	J4_PS+	30	J5_PS+	37	J6_PS+
3	J1_0V	10	J2_0V	17	J3_0V	24	J4_0V	31	J5_0V	38	J6_0V
4	J1_5V	11	J2_5V	18	J3_5V	25	J4_5V	32	J5_5V	39	J6_5V

Figure 3-6 ARC4-50 control cabinet side encoder line interface definition

Definition of encoder line interface on manipulator side

Encoder wire connector on manipulator side of ARC4-50 control cabinet (WEEN H10B-TEH-4B-M25, part number P0408300012) is shown in Figure 3-7.

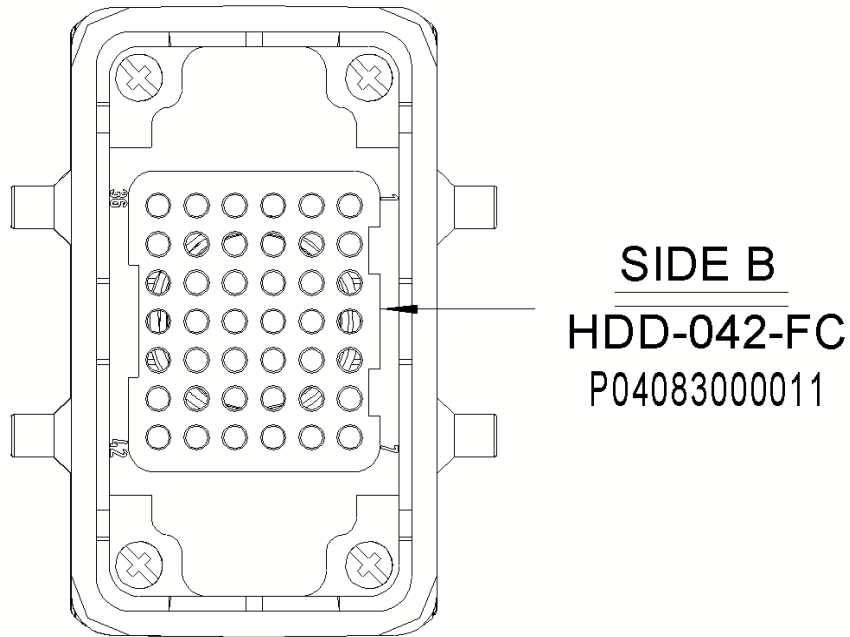


Figure 3-7 Encoder wire connector on manipulator side of ARC4-50 control cabinet

See Figure 3-8 for the definition of encoder line interface on the manipulator side of ARC4-50 control cabinet.

**SIDE A**  
**HDD-042-MC**  
Definition of pins on the control cabinet side

Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition	Pin number	Definition
1	J1_PS-	8	J2_PS-	15	J3_PS-	22	J4_PS-	29	J5_PS-	36	J6_PS-
2	J1_PS+	9	J2_PS+	16	J3_PS+	23	J4_PS+	30	J5_PS+	37	J6_PS+
3	J1_0V	10	J2_0V	17	J3_0V	24	J4_0V	31	J5_0V	38	J6_0V
4	J1_5V	11	J2_5V	18	J3_5V	25	J4_5V	32	J5_5V	39	J6_5V

Figure 3-8 Encoder line interface definition on manipulator side of ARC4-50 control cabinet

Encoder wire specification and joint size description

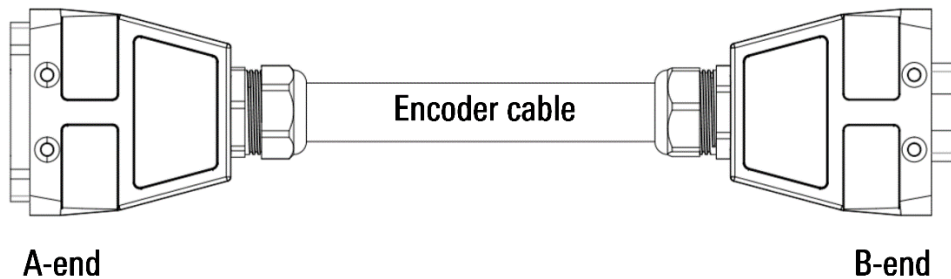


Figure 3-9 Diagram of ARC4-50 encoder line

Table 3-1 ARC4-50 encoder cable specification table

Name	Connection form of end A	Connection form of end B	Wire diameter /mm	Minimum bending radius
ARC4-50 encoder cable	Snap connection	Snap connection	11	8D

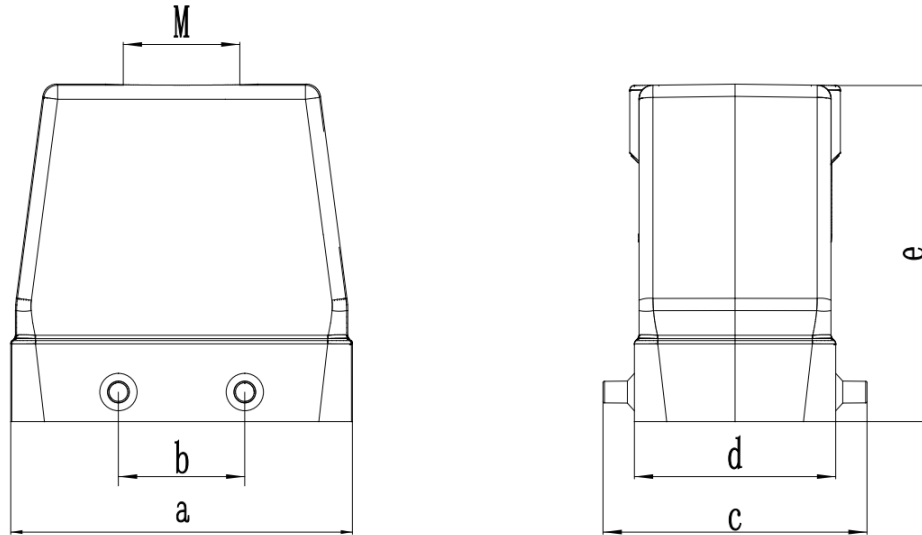


Figure 3-10 Encoder line heavy-duty connector size

Table 3-2 Dimension table of encoder line heavy load connector

Control cabinet	a	b	c	d	e	M
ARC4-50	73	27	56.4	43	72	M25

Power line specification and joint size description

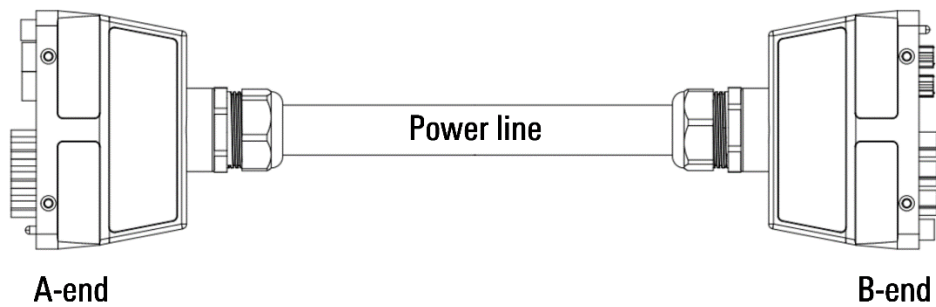


Figure 3-11 ARC4-50 power line diagram

Table 3-3 ARC4-50 power line specification table

Name	Connection form of end A	Connection form of end B	Wire diameter /mm	Minimum bending radius
ARC4-50 power line	Snap connection	Snap connection	23	6D

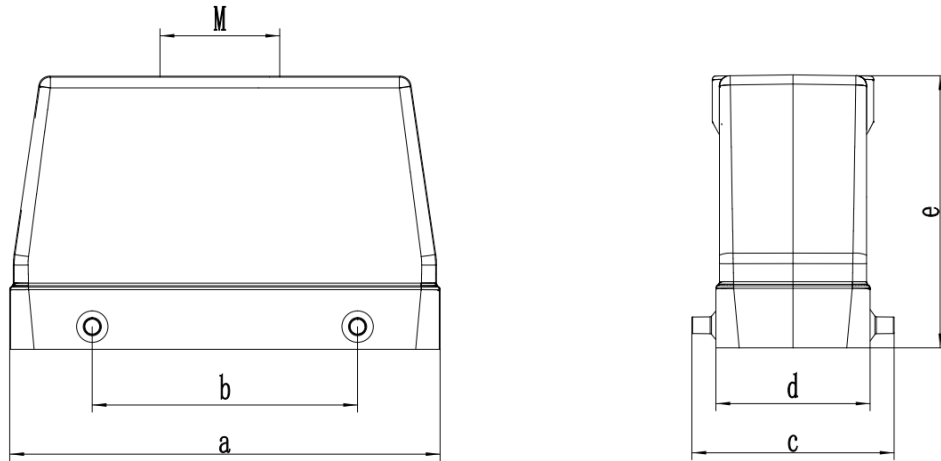


Figure 3-12 Power line heavy load joint size

Table 3-4 Dimension table of encoder line heavy load connector

Control cabinet	a	b	c	d	e	M
ARC4-50	120	74	56.4	43	76	M32

### Definition of input power supply of control cabinet

- Nominal voltage: three-phase 380V.
- Nominal frequency: 50Hz.
- Full load power: 5.6kW.
- Full load current: 8.5A.

### Input power requirements of control cabinet

- Voltage: the steady-state voltage is 0.9-1.1 times the nominal voltage.
- Frequency: 0.99-1.01 times the nominal frequency (continuous).  
0.98-1.02 times nominal frequency (short time operation).

## 3.3 Connection method of control cabinet and manipulator

The ARC4-50 control cabinet has one external cable, that is, one 4-core main power cable connected to the power supply. The power cable specifications are shown in Table 3-5.

Table 3-5 Power cord specification

Name	Item No	Specifications	Length	Cable connector specification
ARC4-50 power cord	P04081000045	4×6mm <sup>2</sup> PE cable with yellow and green	7m	M25B

Encoder line with heavy load connector and power brake line are divided into cables inside the cabinet and cables outside the cabinet. The heavy load connector female plug of the cables inside the cabinet is fixed on the control cabinet shell. The encoder cable in the cabinet needs to be shielded. Peel off the outer cover of the encoder cable to expose the shielding layer and clamp it on the shield clamp (see Figure 3-13).

When connecting the heavy load connector, insert the male plug of the heavy load connector of the cable outside the cabinet into the female plug of the control cabinet shell. It is necessary to prevent wrong insertion and fasten the lock.

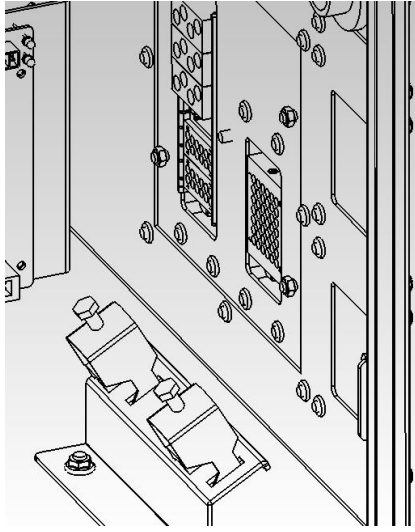


Figure 3-13 Encoder cable shield





## 4 Safe use of ARC4-50 control cabinet

### 4.1 Grounding of control cabinet

ARC4-50 control cabinet shall be reliably grounded for the following main purposes:

- Grounding makes all unit circuits in ARC4-50 control cabinet have a common reference zero potential, so that there is no potential difference between the ground of each circuit, and ensures the stable operation of the system.
- The reliable ground connection of ARC4-50 control cabinet can prevent the interference of external electromagnetic field. The casing grounding provides a discharge channel for transient interference, which can discharge a large amount of electricity accumulated on the casing due to electrostatic induction through the ground.
- Can ensure safe work. When the electromagnetic induction of direct lightning occurs, the damage of electronic equipment can be avoided; When the input voltage of the power frequency AC power supply is directly connected to the casing due to poor insulation or other reasons, the operator can avoid electric shock.

ARC4-50 control cabinet is grounded through the PE pin in the power line inlet. It is necessary to ensure that the cable input end connected to the control cabinet has a reliable ground connection. Under normal circumstances, the resistance between the cable input end PE and the ground is not more than 100Ω.

### 4.2 Robot stop method

According to 9.2.2 "Definition of stop function" of GB5226.1-2008 "Electrical safety of machinery-Part 1: General Conditions", in combination with the specific design of the robot, the three stop methods are defined below. The corresponding description is given in Table 4-1:

Table 4-1 Stop method and corresponding description

Type	Description	
STOP0	Case1	PLC_INT alarm stop0 indicates that the drive execution stops immediately without keeping track, and then PLC_INT delay control cuts off the power supply through the contactor, which belongs to uncontrollable stop
	Case2	The uncontrollable fault of the driver triggers the free stop or holding brake stop, which belongs to uncontrollable stop
	Case3	When the external power is suddenly cut off, the driver cannot stop immediately, triggering the holding brake stop, which is uncontrollable
STOP1	Robot stops quickly and keeps the current planned path. After the robot stops, the control drive serve_off, and cuts off the power supply via the thyristor, which is a controllable stop.	
STOP2	Robot stops quickly and keeps the current planned path. After the robot stops, it does not serve_off and does not cut off the power supply, which is a controllable stop.	



## 5 Description of ARC4-50 Control Cabinet Interface

### 5.1 Description of control cabinet indicator

ARC4-50 control cabinet provides three indicator lights, as shown in Figure 5-1, among which:

- The white indicator light is a power indicator, which is on when the control cabinet is startup.
- The green indicator is a running indicator, which is on when the drive power is on.
- The red indicator light is an alarm indicator, which is on when the control system is abnormal.

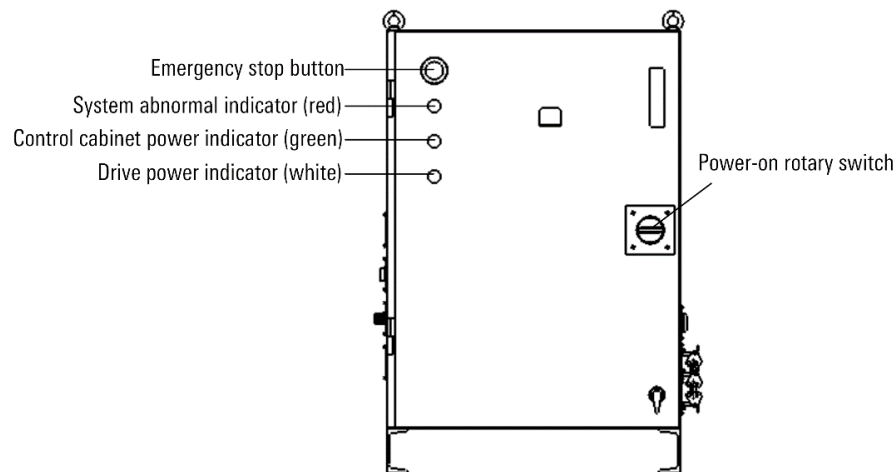


Figure 5-1 Control cabinet indicator

### 5.2 Functions of switches outside the control cabinet

#### Power-on rotary switch

The power-on rotary switch of the control cabinet (see Figure 5-1 for the specific position) is used to turn on and off the power supply of the control cabinet. The text on the rotary switch (see Figure 5-2) is described as follows:

- ON - Power on.
- OFF - power off.
- OPENRESET - Open the door.

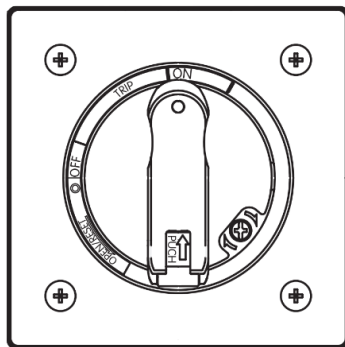



Figure 5-2 Power-on rotary switch




Caution

Turn the switch to the "OPENRESET" position before opening the control cabinet door, otherwise the knob switch and circuit breaker will be damaged!

### Emergency stop button

Press the emergency stop button and the robot will stop immediately (see Figure 5-1). When it is necessary to release the safety status, the emergency stop button shall be turned in the direction indicated on the button.



Caution

Do not use the emergency stop button as a pause function, otherwise the manipulator may be damaged.

## 5.3 Functions of switches inside the control cabinet

### Manual brake release button

PLC\_INT module on the lower front of robot control cabinet provides 1~6 axis motor holding brake release button (refer to Figure 5-3).

Operation steps:

- Step1. Pull out the PLC\_INT power terminal.
- Step2. Insert the manual brake release interface.
- Step3. Press the brake release button, and the corresponding motor brake will be released.

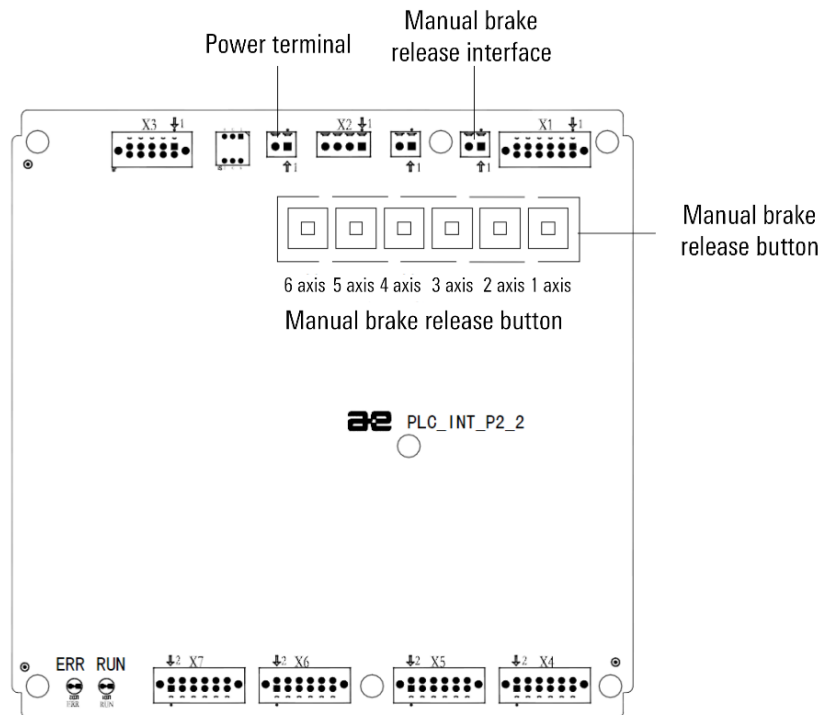

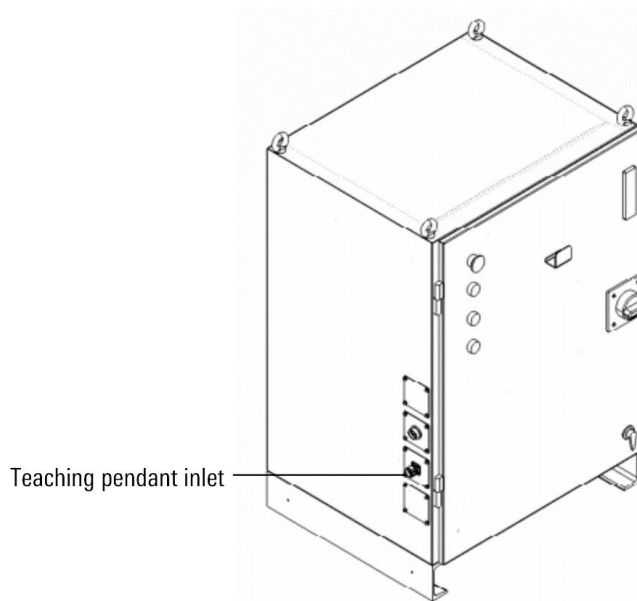


Figure 5-3 Manual brake release interface description

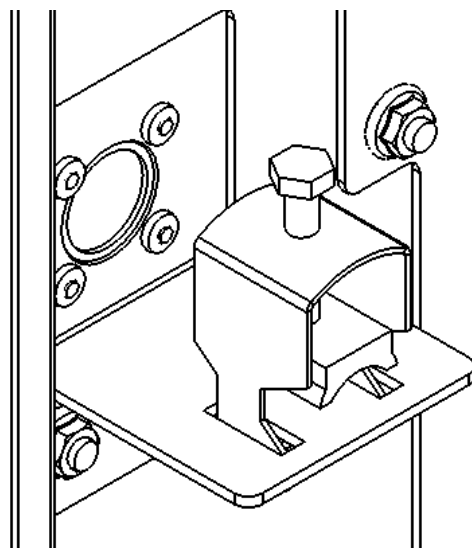
 Warning	When using the manual brake release function, please pay attention to the possibility that the corresponding axis may fall suddenly under the action of gravity. The auxiliary support and personnel safety must be considered in advance.
--	--

## 5.4 External interface of control cabinet

The control cabinet provides a teaching pendant installation interface, which is located under the left side of the control cabinet (see Figure 5-4 (a)). The cable is connected into the control cabinet from the position shown in the figure and is divided into two ways, one of which is connected to the network port of MCB; The other circuit is connected with the outgoing connector of the safety module. The shielding layer of the teaching pendant cable is pressed on the bracket with a cable clamp (see Figure 5-4 (b)).



(a)



(b)

Figure 5-4 Teaching pendant connector

In addition to the teaching pendant interface, the control cabinet also provides two heavy-duty connector interfaces, namely, the motor power and bandbrake line interface and encoder interface, and one external power input interface, which is led from the lower right side of the control cabinet as shown in Figure 5-5.

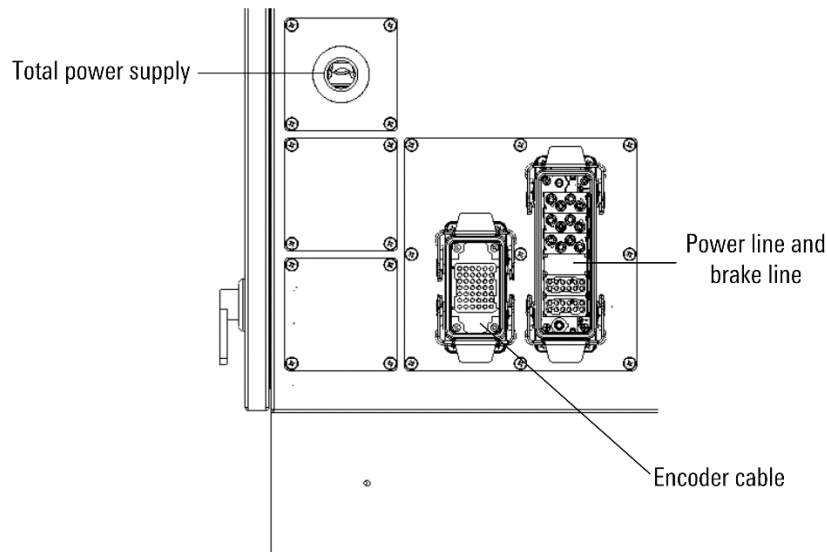


Figure 5-5 ARC4-50 control cabinet external cable

The power and holding brake heavy-load line and encoder heavy-load line are both divided into in-cabinet harness and out-of-cabinet harness. The material number and specification of each harness are shown in Table 5-1.

The control cabinet supports the optional external axis expansion interface, which can be connected to 6 external axes at most.

Table 5-1 Specification of heavy-duty cable

Cable bundle	Part number	Connector type
Power and holding brake line in the cabinet	P04082000604-P1.0	WEEN H24B-TEN-4B-M32 heavy-duty connector at one end Scattered line at one end
Power and brake line outside the cabinet	P04082000606-P1.0	Both ends are WEEN H24B-TEN-4B-M32 heavy-duty connectors
Encoder cable in cabinet	P04082000605-P1.0	WEEN H10B-TEN-4B-M25 heavy-duty connector at one end Jingyuanrong SCSI 20P connector at one end
Encoder cable outside the cabinet	P04082000607-P1.0	Both ends are WEEN H10B-TEN-4B-M25 heavy-duty connectors

## 6 ARC4-50 control cabinet hardware module introduction

### 6.1 PLC\_MF

Definition of each port

PLC\_MF is used to communicate with external devices. As shown in Figure 6-1.

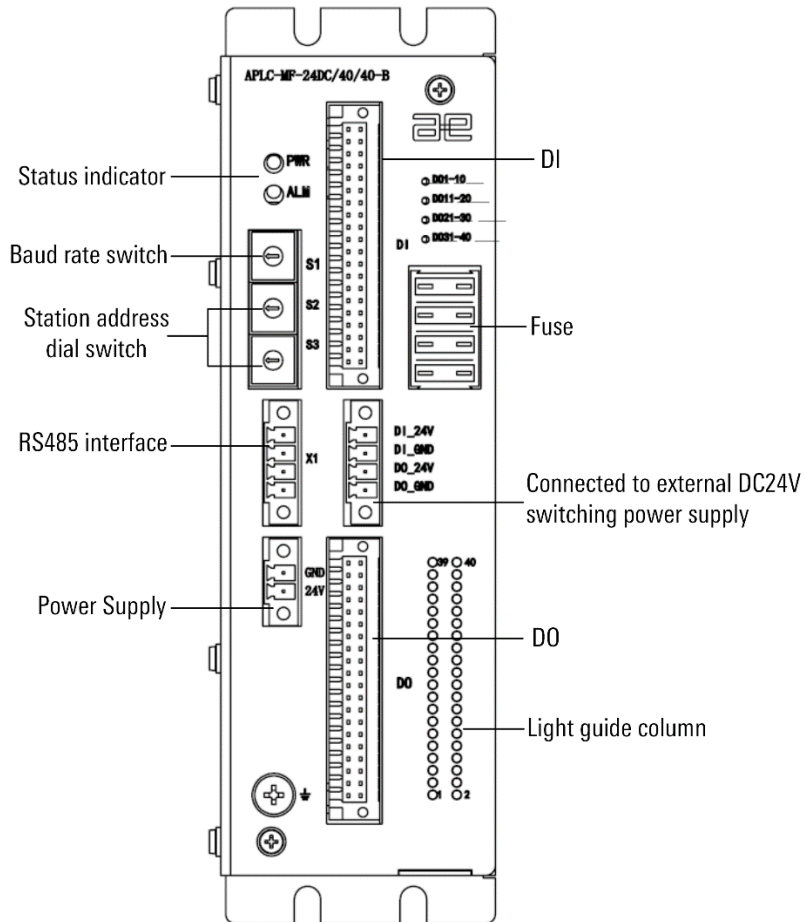


Figure 6-1 PLC\_MF

Station address dial switch

- S2 high-order
- S3 low-order

Power port connector

- Upper 0V
- Lower 24V。

DI port connector

The serial number of DI port connector is shown in Figure 6-2.

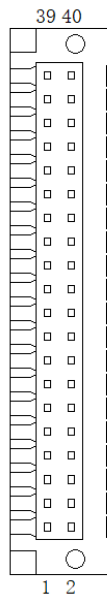


Figure 6-2 DI port serial number

### DO port connector

The serial number of DO port connector is shown in Figure 6-3.

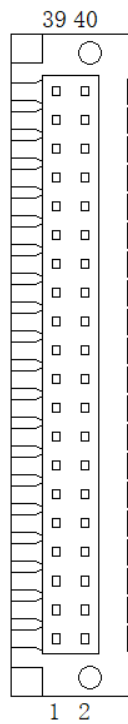


Figure 6-3 DO port serial number

### Baud rate setting

See Table 6-1 for PLC\_MF baud rate setting method.



Table 6-1 PLC\_MF baud rate setting

Dial switch points	Baud rate	Dial switch points	Baud rate
0	1200	7	56000
1	2400	8	57600
2	4800	9	115200
3	9600	A	230400
4	14400	B	460800
5	19200	C	921600
6	38400	Other	1200

## 6.2 PLC\_INT

PLC\_INT is used for internal control of control cabinet, as shown in Figure 6-4.

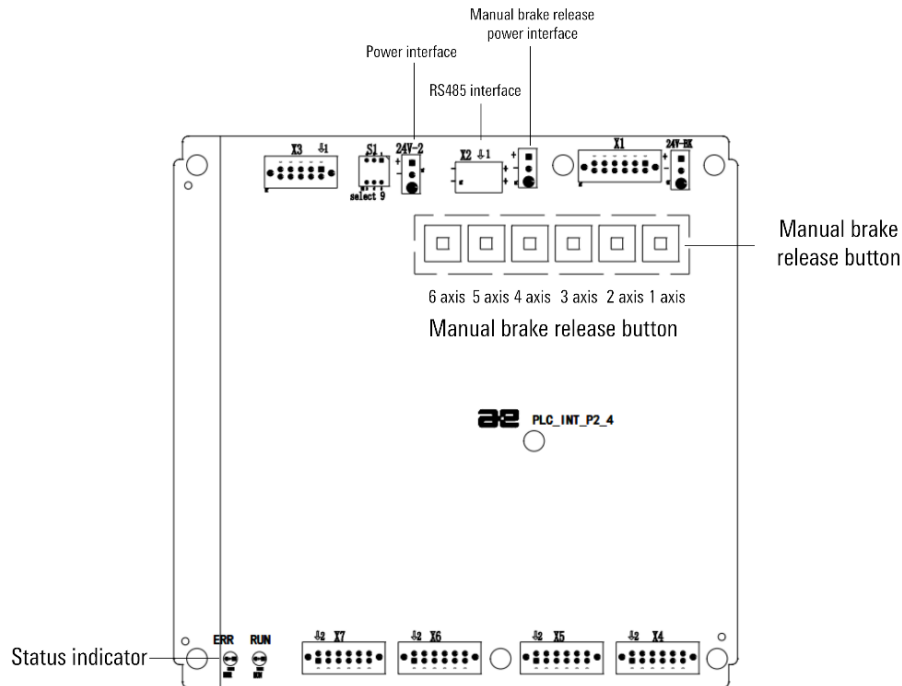


Figure 6-4 PLC\_INT

### Definition of PLC\_INT holding brake input connector (X1)

The port number marked with "PBT" on the terminal plug is 1, the opposite side is 2, and so on.

See Table 6-2 for the definition of PLC\_INT holding brake input connector (X1).

Table 6-2 Definition of PLC\_INT holding brake input connector (X1)

Pin number	Signal name	Pin number	Signal name
1	COMMON_MOTOR/GND (Common terminal of brake alarm signal of drive 1)	2	DI_MOTOR1 (Driver 1 brake alarm signal/input)

Pin number	Signal name	Pin number	Signal name
3	COMMON_MOTOR/GND (Common terminal of brake alarm signal of drive 2)	4	DI_MOTOR2 (Driver 2 brake alarm signal/input)
5	COMMON_MOTOR/GND (Common terminal of brake alarm signal of drive 3)	6	DI_MOTOR3 (Driver 3 brake alarm signal/input)
7	COMMON_MOTOR/GND (Common terminal of brake alarm signal of drive 4)	8	DI_MOTOR4 (Driver 4 brake alarm signal/input)
9	COMMON_MOTOR/GND (Common terminal of brake alarm signal of drive 5)	10	DI_MOTOR5 (Driver 5 brake alarm signal/input)
11	COMMON_MOTOR/GND (Common terminal of brake alarm signal of drive 6)	12	DI_MOTOR6 (Driver 6 brake alarm signal/input)

Definition of PLC\_INT RS485 connector (X2)

See Table 6-3 for the definition of PLC\_INT RS485 connector (X2).

Table 6-3 PLC\_INT RS485 connector (X2) definition

Pin number	Signal name
1	RS485+ ( 485 bus positive )
2	RS485- ( 485 bus negative )
3	RS485+ ( 485 bus positive )
4	RS485- ( 485 bus negative )

Definition of PLC\_INT safety module connector (X3)

See Table 6-4 for the definition of PLC\_INT safety module connector (X3).

Table 6-4 Definition of PLC\_INT safety module connector (X3)

Pin number	Signal name	Pin number	Signal name
1	COMMON_SAFE (SAF module status common terminal)	2	DI_SAFE_STATE (SAF module status/input)
3	DGND_IO (Signal ground)	4	DO_SAFE_RESET_N (SAF module reset signal negative/output)
5	DO_SAFE_RESET_P	6	DO_CTR_STATE_N

Pin number	Signal name	Pin number	Signal name
	(SAF module reset signal positive/output)		(SAF module control signal negative/output)
7	DO_CTR_STATE_P (SAF module control signal positive/output)	8	DO_CONTACTOR2 (Contactor control signal 2/output)
9	DO_CONTACTOR1 (Contactor control signal 1/output)	10	DO_MODE_SW (Brake alarm control mode/output)

### Definition of PLC\_INT holding brake output connector (X4)

See Table 6-5 for the definition of PLC\_INT holding brake output connector (X4).

Table 6-5 Definition of PLC\_INT holding brake output connector (X4)

Pin number	Signal name	Pin number	Signal name
1	A6_BRAKE (6 # motor brake power supply / output)	2	A6_BRAKE_COM/GND (6 # motor power supply ground)
3	A5_BRAKE (5 # motor brake power supply / output)	4	A5_BRAKE_COM/GND (5 # motor power supply ground)
5	A4_BRAKE (4 # motor brake power supply / output)	6	A4_BRAKE_COM/GND (4 # motor power supply ground)
7	A3_BRAKE (3 # motor brake power supply / output)	8	A3_BRAKE_COM/GND (3 # motor power supply ground)
9	A2_BRAKE (2 # motor brake power supply / output)	10	A2_BRAKE_COM/GND (2 # motor power supply ground)
11	A1_BRAKE (1 # motor brake power supply / output)	12	A1_BRAKE_COM/GND (1 # motor power supply ground)

### Definition of PLC\_INT output reserved connector (X5)

See Table 6-6 for the definition of PLC\_INT output reserved connector (X5).

Table 6-6 Definition of PLC\_INT output reserved connector (X5)

Pin number	Signal name	Pin number	Signal name
1	DO_PANEL2/GND (Panel signal 2 corresponds to ground)	2	DO_PANEL2 (Panel signal 2/output)
3	DO_PANEL1/GND (Panel signal 1 corresponds to ground)	4	DO_PANEL1 (Panel signal 1/output)
5	DO_RESERVE4/GND (Panel signal 4 corresponds to ground)	6	DO_RESERVE4 (Panel signal 4/output)
7	DO_RESERVE3/GND (Panel signal 3 corresponds to ground)	8	DO_RESERVE3 (Panel signal 3/output)
9	DO_RESERVE2/GND	10	DO_RESERVE2

Pin number	Signal name	Pin number	Signal name
	(Panel signal 2 corresponds to ground)		(Panel signal 2/output)
11	DO_RESERVE1GND (Panel signal 1 corresponds to ground)	12	DO_RESERVE1 (Panel signal 1/output)

### Definition of PLC\_INT input reserved connector (X6)

See Table 6-7 for the definition of PLC\_INT input reserved connector (X6).

Table 6-7 Definition of PLC\_INT input reserved connector (X6)

Pin number	Signal name	Pin number	Signal name
1	COMMON_RESERVE6/+24V (Digital signal 6 common terminal)	2	DI_RESERVE6 (Digital signal 6/input)
3	COMMON_RESERVE5/+24V (Digital signal 5 common terminal)	4	DI_RESERVE5 (Digital signal 5/input)
5	COMMON_RESERVE4/+24V (Digital signal 4 common terminal)	6	DI_RESERVE4 (Digital signal 4/input)
7	COMMON_RESERVE3/+24V (Digital signal 3 common terminal)	8	DI_RESERVE3 (Digital signal 3/input)
9	COMMON_RESERVE2/+24V (Digital signal 2 common terminal)	10	DI_RESERVE2 (Digital signal 2/input)
11	COMMON_RESERVE1/+24V (Digital signal 1 common terminal)	12	DI_RESERVE1 (Digital signal 1/input)

### Definition of PLC\_INT internal input connector (X7)

See Table 6-8 for the definition of PLC\_INT internal input connector (X7).

Table 6-8 PLC\_INT internal input connector (X7) definition

Pin number	Signal name	Pin number	Signal name
1	DI_STOP1 (Cabinet door emergency stop signal/input)	2	DI_PANEL1 (Panel signal 1/input)
3	COMMON_PANEL/+24V (Signal common ground)	4	DI_PANEL2 (Panel signal 2/input)
5	COMMON_DOOR/+24V (Common terminal of cabinet door switch status signal)	6	DI_DOOR (Cabinet door switch status signal/input)
7	COMMON_PWR_STATE/+24V (Common terminal of power status signal)	8	DI_PWR_STATE (Power status signal/input)
9	COMMON_STOP2/+24V (Common end of emergency stop signal of teaching pendant)	10	DI_STOP2 (Teaching pendant emergency stop signal/input)

Pin number	Signal name	Pin number	Signal name
11	COMMON_KEY_EN/+24V (Common end of teaching pendant enable signal)	12	DI_KEY_EN (Teaching pendant enable signal/input)

Baud rate setting

See Table 6-9 for the setting method of PLC\_INT baud rate.

Table 6-9 PLC\_INT baud rate setting

Dial switch points	Baud rate	Dial switch points	Baud rate
0	1200	7	56000
1	2400	8	57600
2	4800	9	115200
3	9600	A	230400
4	14400	B	460800
5	19200	C	921600
6	38400	Other	1200

6.3 Security module

The security module is used for security function backup, as shown in Figure 6-5.

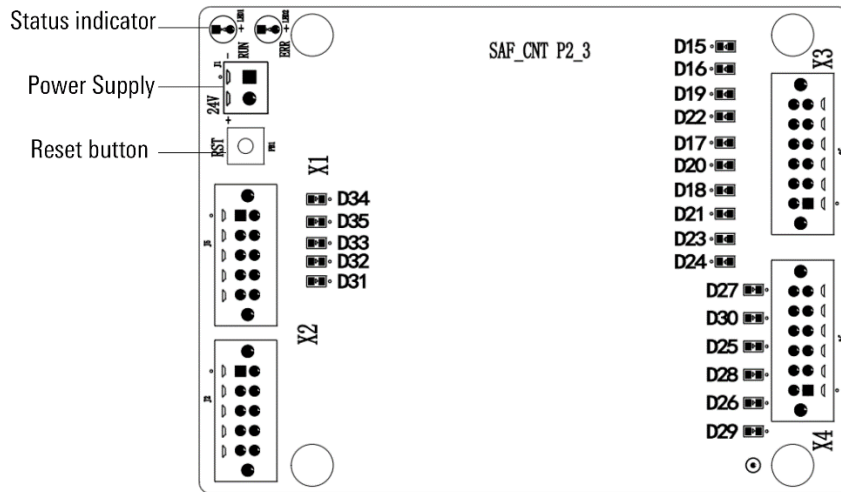


Figure 6-5 Security module

Definition of PLC connector (X1) inside the safety module

See Table 6-10 for the definition of internal PLC connector (X1) of safety module.

Table 6-10 Definition of PLC connector (X1) inside the safety module

Pin number	Signal name	Pin number	Signal name
1	DGND_IO (Common ground)	2	DO_SAFE_STATE (Security module status)
3	DGND_IO (Common ground)	4	DI_RSTN (Safety module reset signal N)
5	DI_RSTP (Safety module reset signal P)	6	DI_CTRLN (Safety module enable signal N)
7	DI_CTRLP (Safety module enable signal P)	8	DI_KM2_CON (Contactor 2 control input)
9	DI_KM1_CON (Contactor 1 control input)	10	DI_MODE_SW (Holding brake control mode signal)

### Definition of safety module output connector (X2)

See Table 6-11 for the definition of safety module output connector (X2).

Table 6-11 Definition of safety module output connector (X2)

Pin number	Signal name	Pin number	Signal name
1	CONTACT1- (Contactor 1 control output -)	2	CONTACT1+ (Contactor 1 control output +)
3	CONTACT2- (Contactor 2 control output -)	4	CONTACT2+ (Contactor 2 control output +)
5	EXT_SAFE2- (External safety signal 2 -)	6	EXT_SAFE2+ (External safety signal 2 +)
7	EXT_SAFE1- (External safety signal 1 -)	8	EXT_SAFE1+ (External safety signal 1 +)
9	AC220_L (220V positive)	10	AC220_N (220V ground)

### Definition of safety module input signal connector 1 (X3)

See Table 6-12 for the definition of safety module input signal connector 1 (X3).

Table 6-12 Definition of safety module input signal connector 1 (X3)

Pin number	Signal name	Pin number	Signal name
1	DI_EXT_SAFE1 (External safety input signal 1)	2	DI_EXT_SAFE2 (External safety input signal 2)
3	DI_DOOR (Control cabinet door travel switch)	4	DI_PWR_STATE (Abnormal signal input of main circuit)
5	DI_RESERVE1	6	DI_RESERVE2

Pin number	Signal name	Pin number	Signal name
	(Reserved safety input 1)		(Reserved safety input 2)
7	COMMON_OTHER (Control cabinet travel switch ground)	8	D+24V_I0 (24VDC)
9	DI_PANEL_SAFE (Panel safety input)	10	COMMON_PANEL_SAFE (Panel safety input ground)
11	DI_STOP1 (Cabinet door emergency stop input)	12	COMMON_STOP1 (Cabinet door emergency stop input ground)

Definition of safety module input signal connector 2 (X4)

See Table 6-13 for the definition of safety module input signal connector 2 (X4).

Table 6-13 Definition of safety module input signal connector 2 (X4)

Pin number	Signal name	Pin number	Signal name
1	DI_ALARM (Driver 1 alarm input)	2	DI_ALARM (Driver 2 alarm input)
3	DI_ALARM (Driver 3 alarm input)	4	DI_ALARM (Driver 4 alarm input)
5	DI_ALARM (Driver 5 alarm input)	6	DI_ALARM (Driver 6 alarm input)
7	COMMON_ALARM (Driver alarm input ground)	8	COMMON_ALARM (Driver alarm input ground)
9	DI_KEY_EN (Teaching pendant key signal input)	10	COMMON_KEY_EN (Teaching pendant key signal input ground)
11	DI_STOP2 (Teaching pendant emergency stop input)	12	COMMON_STOP2 (Teaching pendant emergency stop input ground)

6.4 MCB module

MCB module is shown in Figure 6-6.

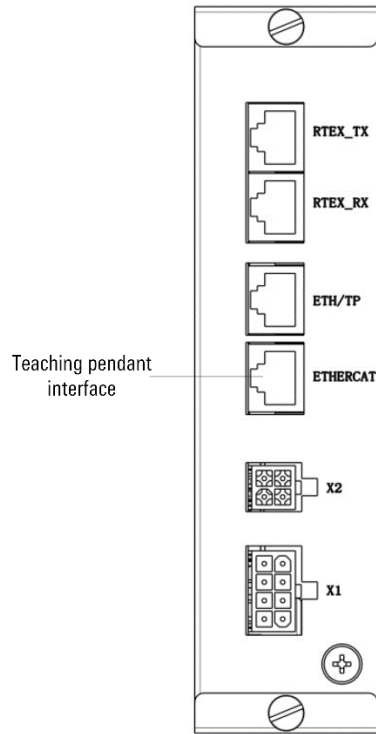


Figure 6-6 MCB module

### MCB module connector (X1) definition

See Table 6-14 for the definition of MCB module connector (X1).

Table 6-14 MCB module connector (X1) definition

Pin number	Signal name	Pin number	Signal name
1	NC	2	NC
3	GND	4	D+24
5	NC	6	NC
7	24V	8	MANUAL_PowerDown

### MCB module connector (X2) definition

See Table 6-15 for the definition of MCB module connector (X2).

Table 6-15 MCB module connector (X2) definition

Pin number	Signal name
1	485+
2	NC
3	485-
4	GND



## 7 Maintenance and troubleshooting of ARC4-50 control cabinet

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### 7.1 Routine maintenance items and cycles

See Table 7-1 for routine maintenance items and cycle of ARC4-50 control cabinet.

Table 7-1 Routine maintenance items and cycle

Maintenance item	Maintenance cycle
Emergency stop switch	6 months
Circuit breaker	6 months
Driver	6 months
Contactor	6 months
Arc-extinguisher	6 months
Indicator light	6 months
Heavy load connector	6 months
Fan and air duct	6 months

#### Maintenance process

Check whether the drive wiring is tight and reliable, whether the circuit breaker, contactor and other operating reset mechanisms can be flexibly connected and disconnected, whether the appearance is clean, free of damage and carbonization, whether all contacts of the contactor are complete, smooth and clean, and in good contact, all kinds of armature movement is flexible and free of jamming, whether the indicator light and other indicating devices can send signals normally, whether the driver has alarm, and whether the connection at the heavy load connector is loose.

### 7.2 Possible fault handling steps

#### Circuit breaker and contactor

When the circuit breaker and other operating reset mechanisms cannot be flexibly switched on or off or the appearance is damaged and carbonized, they should be replaced immediately. The contactor shall be replaced immediately in case of damage or inflexible armature movement or jamming (the above operations shall be carried out by personnel with professional qualification certificate).

#### Encoder battery

When replacing the encoder battery, you need to connect the drive with a USB cable, and use the Servodebugger to clear the encoder multi-turn value.

### Indicator light

When the indicator light and other indicating devices cannot send signals normally, first determine whether the connecting line is faulty; If there is no fault in the circuit, replace the indicating device and observe whether the signal can be sent normally.

### Heavy load connector

When the connection devices such as heavy load connector are loose, the plug of heavy load connector shall be separated from the socket and then re-inserted and fastened to ensure reliable connection.

### Fuse

When the power indicator of the control cabinet is on, but some electrical components cannot be powered on, please check whether the corresponding fuse on the adapter board (refer to Figure 7-1) is burnt out. If it is burnt out, please replace the fuse according to Table 7-2.

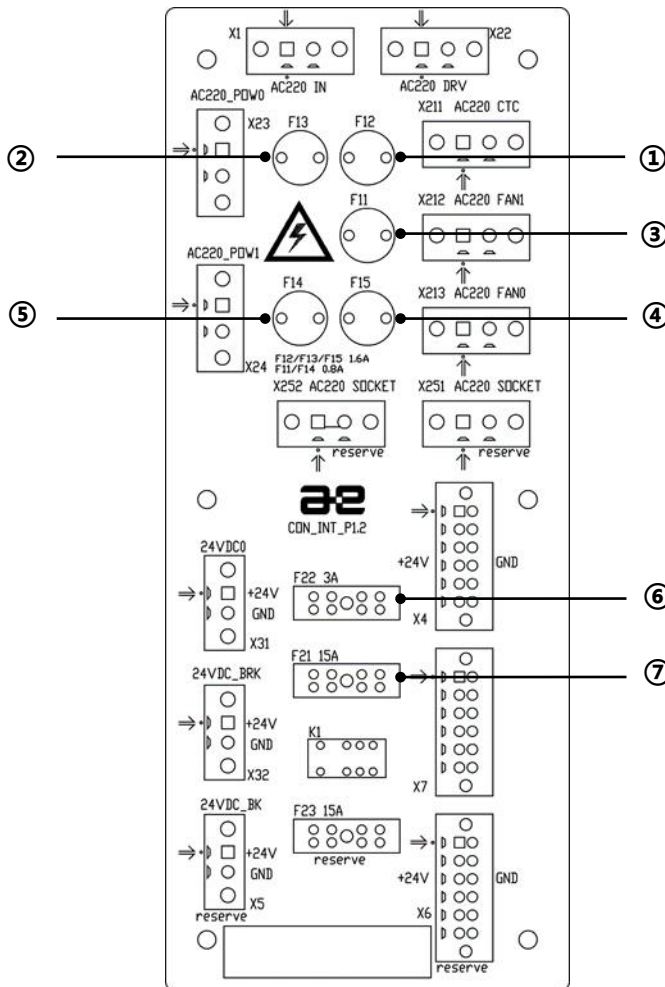


Figure 7-1 Physical drawing of power adapter plate and fuse

Table 7-2 Function and replacement instructions of each fuse

Serial number	Fuse	Corresponding terminal	Function	Specifications
1	F12	X22	Protect drive control power supply	2.5A

Serial number	Fuse	Corresponding terminal	Function	Specifications
2	F13	X23	Protection 220V to 24V power supply module 1	1.6A
3	F11	X211、X212、X213	Protection fan and contactor coil power supply	0.8A
4	F15	X251、X252	Protection 220V standby power supply	1.6A
5	F14	X24	Protection 220V to 24V power supply module 2	0.8A
6	F22	X4	Protect other 24VDC power supply	3A
7	F21	X32	Protection band brake output power supply	15A

### Common alarm and corresponding treatment of driver

See Table 7-3 for common alarm and handling of the driver.

Table 7-3 Driver common alarm and handling

Alarm code	Alarm name	Solution
Er100	Expiration of authorization	Request long-term authorization code
Er101	EEPROM parameter abnormality	Confirm the correctness of the configuration file and try to burn the configuration file again
Er102	Programmable logic configuration failure	Restart
Er103	FPGA initialization error	Restart
Er104	Wrong firmware type	Check the control board model or modify the firmware type configuration
Er105	Calculation engine timeout	Restart
Er106	FPGA loading error	Restart
Er107	Encoder power-on initialization timeout	Restart
Er110	Overcurrent detection fault	Check whether the gain setting path planning is reasonable, whether there is interpolation timeout, etc.
Er112	Fan stop fault	Check whether the fan operates normally
Er113	Power failure of control power supply	Check whether the LN interface voltage is too low
Er400	Bus initialization error	Check whether the bus type and control board match
Er401	Bus check error	Check whether shielded network cable is used
Er402	Bus ID error	Check whether Pn008 is configured correctly
Er403	Bus command error	Confirm whether the system sends instructions to the driver
Er404	Bus communication timeout	Check whether the shielded network cable is used and whether the communication is disconnected

Alarm code	Alarm name	Solution
Er405	Bus UpdateCnt error	Check whether the shielded network cable is used and whether the communication is disconnected
Er410	Bus signal synchronization error	Restart
Er504	Overspeed fault	Check the cause of overspeed
Er512	Motor overload	Check the cause of overload
Er515	Abnormal regeneration	Check the cause of abnormal regeneration
Er516	Regeneration overload	Check the cause of regeneration overload
Er530	Overtemperature	General and overcurrent are detected at the same time to check the heat dissipation
Er550	RST three-phase input phase loss	Check the cause of phase loss
Er551	DC bus overvoltage	Check the cause of overpressure
Er552	DC bus undervoltage	Check the cause of undervoltage
Er560	Encoder frequency division pulse output overspeed	Check the reason
Er650	Excessive position deviation	Check the master station input command
Er660	Abnormal pulse frequency	Check pulse frequency input
Er900	Current sampling failure	Restart drive
Er901	Driver motor type mismatch	Replace the driver or motor
Er997	Serial port failure	Check whether the shield connection of the serial cable is intact
Er995	Virtual 64-bit encoder multi-turn overflow fault	Clear the multi-turn value through Fn010
Er999	Power failure of power supply	Check whether the RST voltage is too low or zero

See Table 7-4 for common alarms and handling of motor encoder.

Table 7-4 Common alarm and treatment of motor encoder

Alarm code	Alarm name	Solution
Er800	Encoder input power short circuit fault	Check encoder wiring
Er830	Encoder off-line fault	Check encoder wiring
Er831	Encoder overspeed	Check the encoder wiring or replace the encoder

Alarm code	Alarm name	Solution
Er832	Encoder overheating	Check the encoder cooling environment
Er833	Encoder battery voltage alarm	Check the encoder battery voltage
Er834	Encoder battery voltage fault	Check the encoder battery voltage
Er835	Encoder multi-turn error	Replace encoder
Er836	Encoder multi-turn overflow	Clear the multi-turn value through Fn010
Er837	Encoder transmission check (PE) failure	Check encoder wiring
Er838	Encoder count exception (CE)	Replace encoder
Er839	Encoder frame boundary level error (DE)	Replace encoder
Er840	Encoder CRC calibration failure	Check encoder wiring
Er841	Encoder synchronization failure	Check encoder wiring
Er842	Encoder frame verification failure	Check encoder wiring
Er843	Encoder multi-turn fault	Replace encoder
Er844	Encoder memory failure (MEMERR)	Replace encoder
Er845	The battery voltage is insufficient at the time of last power-off	Check the encoder battery voltage
Er846	Encoder internal matching exception 1 (STERR)	Replace encoder
Er847	Encoder internal matching exception 2 (PSERR)	Replace encoder
Er849	Encoder internal matching exception 3 (ESO)	Replace encoder

See Table 7-5 for common warnings and handling.

Table 7-5 Warning code list

Alarm code	Alarm name	Solution
Ca999	Main power off warning	Check whether the RST three-phase electric voltage is too low or zero
Ca552	Undervoltage warning	Check whether the RST three-phase electric voltage is too low
Ca550	Phase loss warning	Check whether RST three-phase power is out of phase
Ca516	Regeneration overload warning	Check regeneration overload



## 8 ARC4-50 control cabinet storage conditions

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During long-term storage, the control cabinet shall be placed in a cool and waterproof place away from direct sunlight. The specific environmental requirements are shown in Table 8-1:

Table 8-1 Storage conditions

Parameter	Value
Minimum ambient temperature	-25°C
Maximum ambient temperature	+40°C
Maximum ambient temperature for 24 hours storage	+70°C
Maximum humidity	95% non-condensing at constant temperature



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