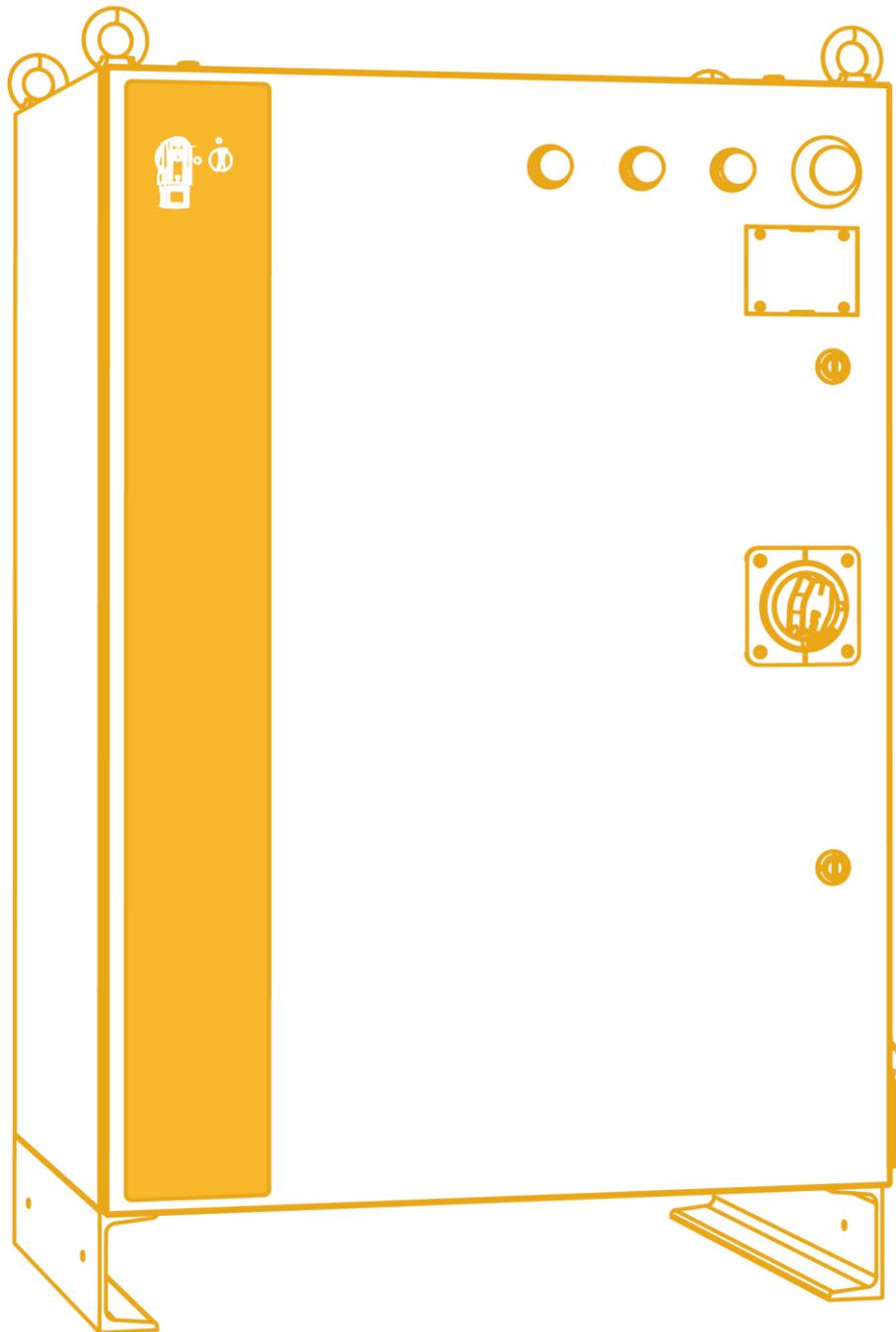


# ARC5-280 Control Cabinet Manual

V1.0.0





# Introduction

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## About this manual

This manual is for technicians to quickly, correctly and safely install and use the ARC5-280 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:

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

## Target groups

- Operator
- Product technicians
- Technical service personnel
- Teachers

## Common identification meanings

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
 Tip	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
V1.0.0	2023.10.07	1st official release

### Document number and version

See Table 3 for document number and version information.

Table 3 Document number and version information

Name	ARC5-280 Control Cabinet Manual
Document number	UM-P05110000049-001
Document version	V1.0.0

### 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:	2014

Standard	Description	Version
	Directive 2014/30/EU released by the European Parliament and Council on February 26, 2014 to balance EMC regulations among member states	
<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>
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	<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 specified by the company. But beyond this, it may cause damage to the manipulator.</li> </ul>
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- 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.

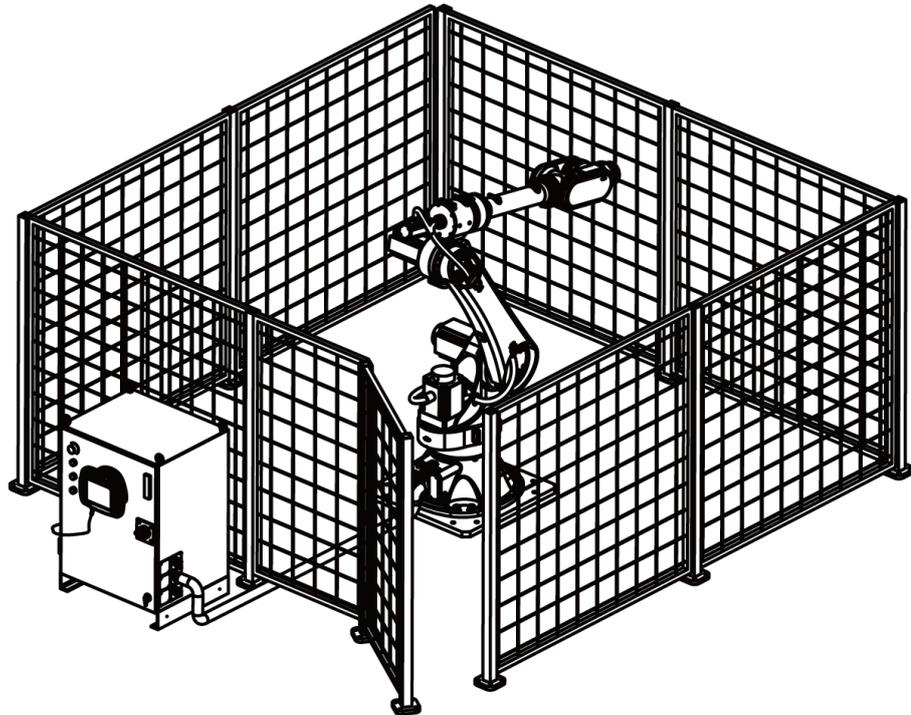


Figure 1 Diagram of the safe work of industrial robots

### 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 ARC5-280 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.

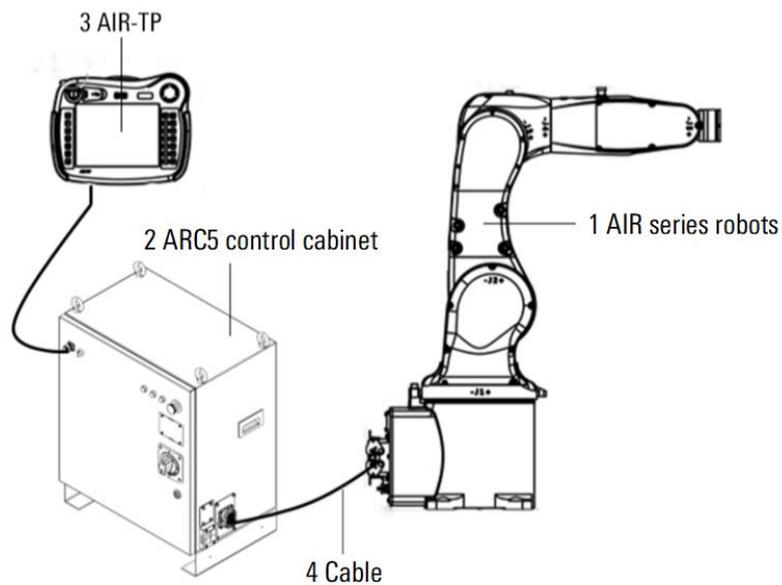


Figure 1-1 Composition of robot system

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.

## 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 1-2 and Figure 1-3.

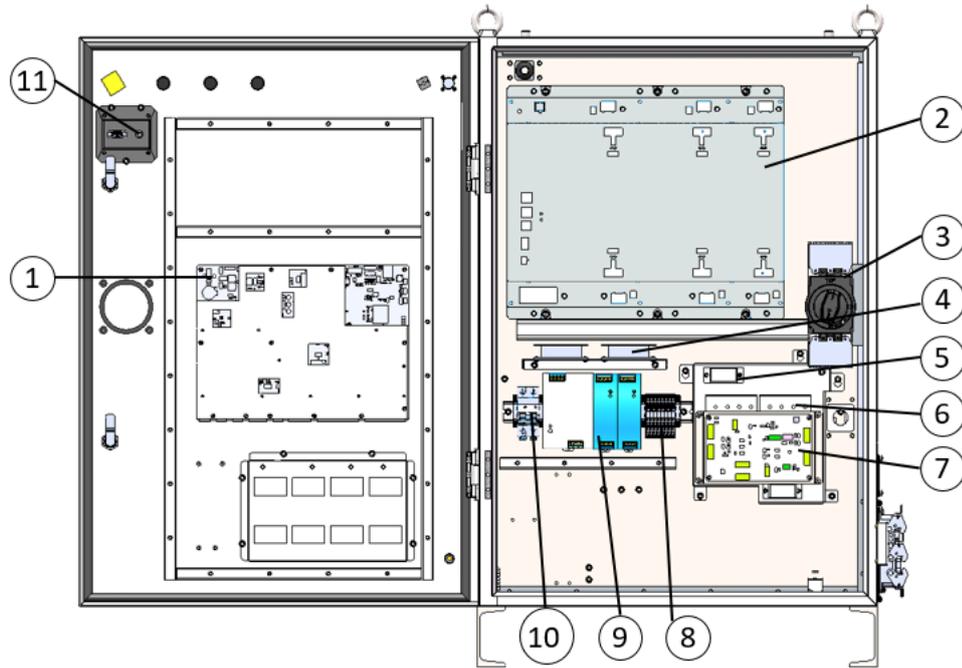


Figure 1-2 Diagram of internal components in the front cavity of the control cabinet

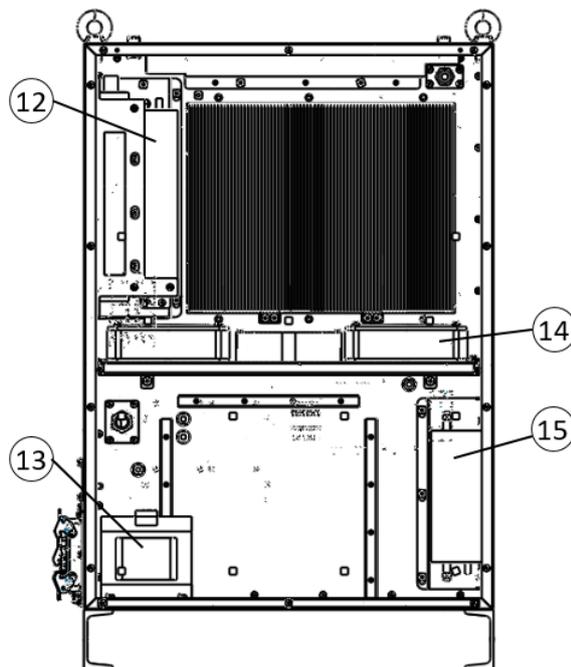


Figure 1-3 Diagram of internal components in the back cavity of the control cabinet

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	Serial number	Name
1	MCBS main control circuit	9	Switching power supply
2	Driver	10	DC disconnecter
3	Disconnecter	11	Manual brake release button
4	Axial flow fan	12	Braking resistor
5	Arc extinguisher	13	Transformer
6	Contactactor	14	Axial flow fan
7	IAB interface circuit board	15	Filter
8	220V power terminal		

### 1.3 Control cabinet characteristics

The characteristic parameters of ARC5-280 control cabinet are shown in Table 1-2.

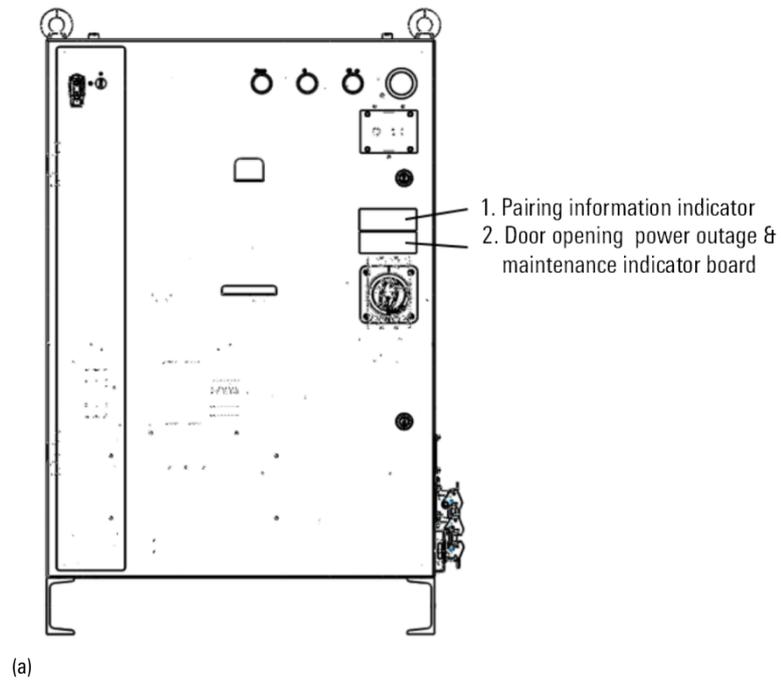
Table 1-2 ARC5-280 control cabinet characteristic parameter list

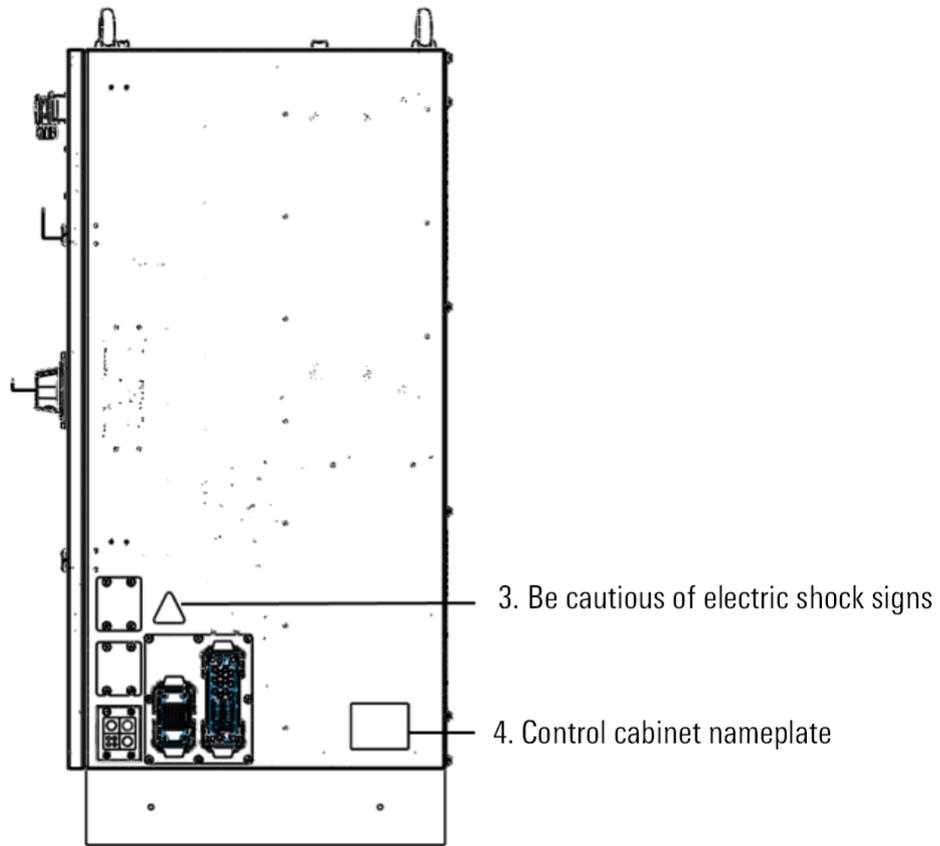
Name	Characteristic	
Cabinet type	Vertical high protection cabinet	
Color	Grey	
Weight	60kg	
Noise	50dB (A)	
Rated supply voltage	AC380V $\pm$ 10%	
Power frequency	49Hz~61Hz	
Full load power	9.5KVA	
Fusing current	25A	
Vibration conditions	Work	Transportation
Vibration acceleration	0.5g	6g
Vibration frequency	4Hz~120Hz	5Hz~500Hz
Impact acceleration	2.5g	300g
Shock waveform/period	Half sine/11ms	Sawtooth wave/9ms
Operating temperature	0°C~45°C	
Temperature change rate	<1.1K/min	
Storage temperature	-25°C~60°C	
Working humidity	$\leq$ 80%RH	
Storage humidity	$\leq$ 90%RH	

Name	Characteristic
Front cavity protection level	IP54
Back cavity protection level	IP20
Altitude	Works normally at an altitude of 1000m
	When the altitude is 1000m~4000m, derate by 5%/1000m.

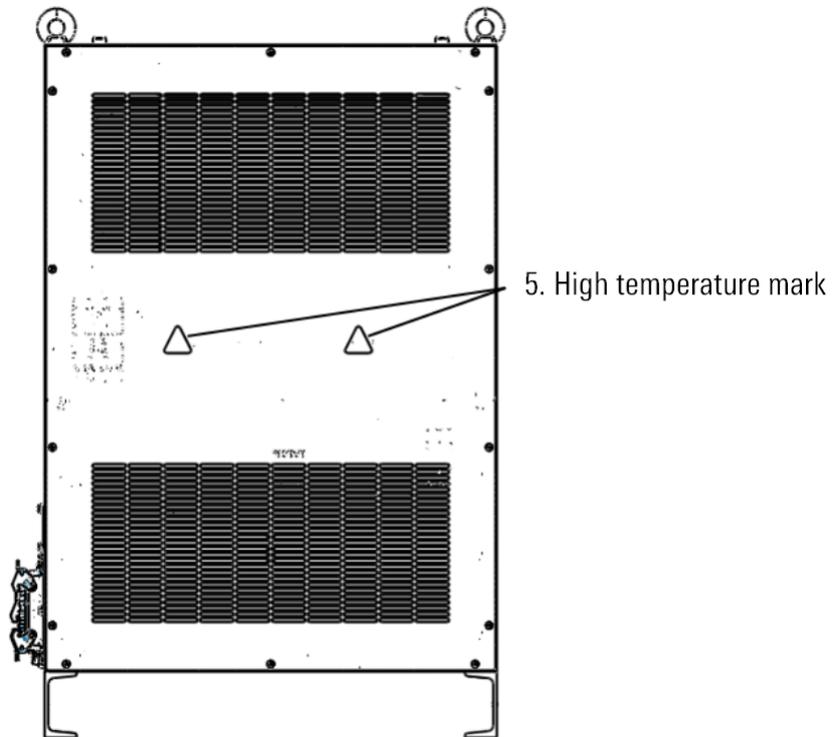
### 1.4 Label and meaning of control cabinet

ARC5-280 type control cabinet contains five kinds of labels. Refer to Figure 1-4 for the specific location of each label.





(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 &amp; 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
产品号	Product No.
序列号	Serial No.
生产日期	Date
重量	Weight
电源电压	Supply Voltage
电源频率	Frequency
满载电流	Full-load Current

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 operate normally within the range of 0°C~45°C, and can be stored and transported for a long time within the range of -25°C~45°C. And can withstand short-term transportation and storage (with backup batteries) at a temperature of 70°C for no more than 24 hours.
- The control cabinet can work normally under the relative humidity of 20%~80% RH.
- The control cabinet can work normally when the altitude is ≤ 1000m. 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 ARC5-280 control cabinet transportation and handling

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Four M10 lifting screws are provided above the control cabinet, as shown in Figure 2-1. Four lifting rings can be used for lifting and handling.

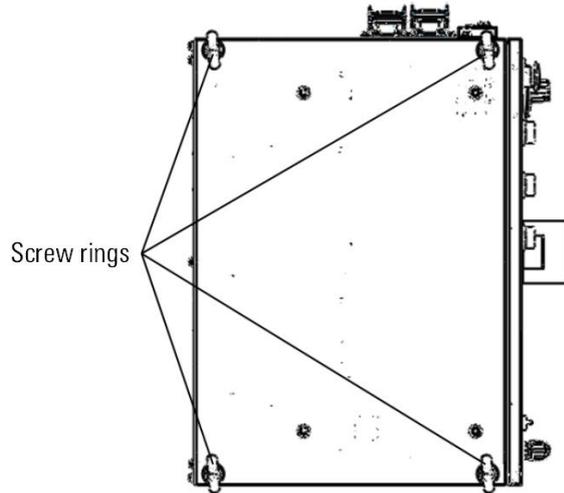


Figure 2-1 Control cabinet lifting ring handling



Caution

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.

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 ARC5-280 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 Installation dimensions

The exterior dimensions of the ARC5-280 control cabinet are shown in Figure 3-1.

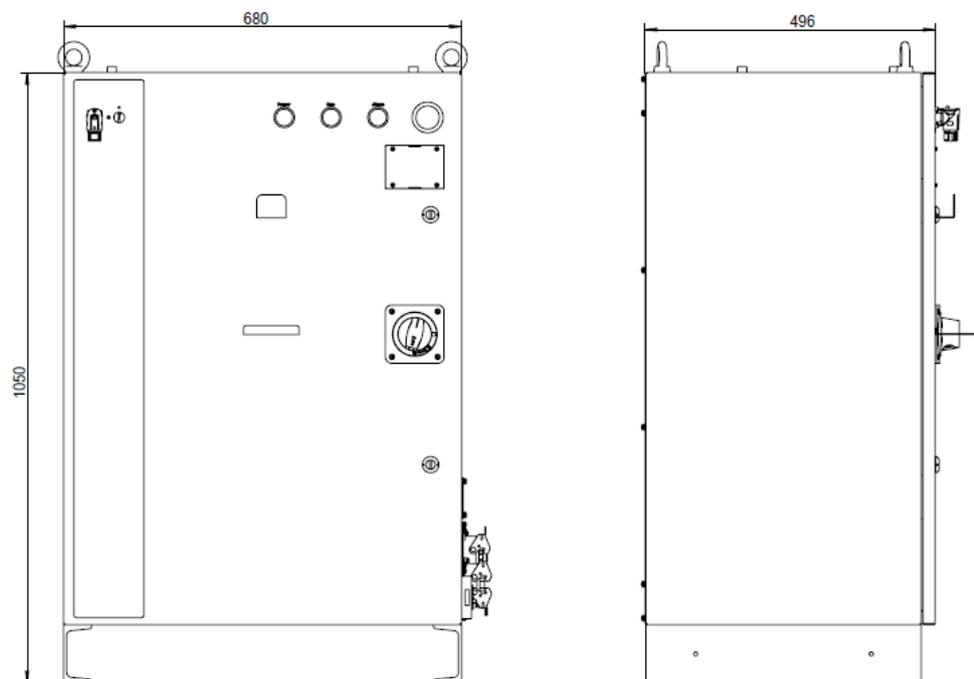


Figure 3-1 Appearance of control cabinet

### 3.3 Definition of control cabinet electrical connection

Definition of power line interface for heavy-duty plugs in control cabinets

The definition of the power line interface for the heavy-duty plug of the ARC5-280 control cabinet is shown in Figure 3-2.

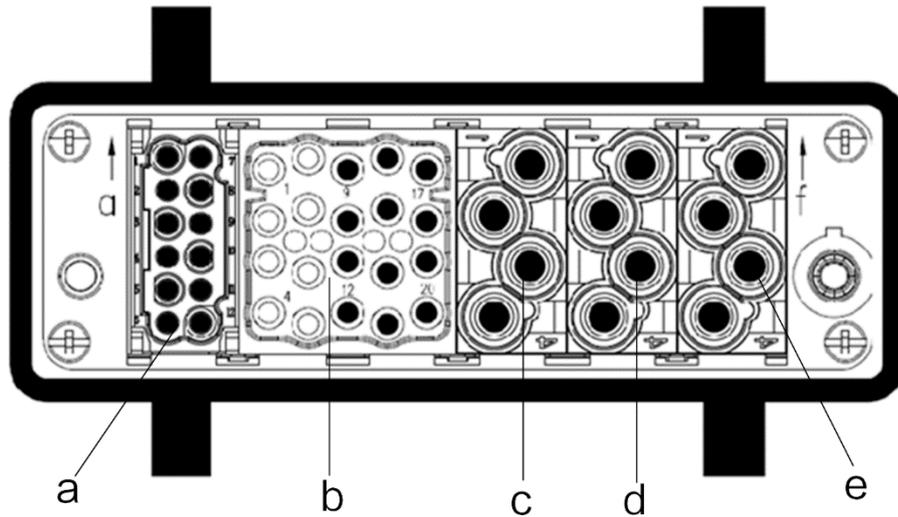


Figure 3-2 ARC5-280 control cabinet heavy-duty control cabinet power line interface

The definition of the power line interface for the heavy-duty plug of ARC5-280 control cabinet is detailed in Table 3-1.

Table 3-1 Definition of heavy-duty plug power line interface

Plug pin number	Definition	Plug pin number	Definition
f-1	1 axis-U1	b-15	5 axis -W5
f-2	1 axis -V1	b-16	5 axis -PE5
f-3	1 axis -W1	b-9	6 axis -U6
f-4	1 axis -PE1	b-10	6 axis -V6
e-1	2 axis -U2	b-11	6 axis -W6
e-2	2 axis -V2	b-12	6 axis -PE6
e-3	2 axis -W2	a-1	Holding brake line-1 axis YB1+
e-4	2 axis -PE2	a-2	Holding brake line -1 axis YB1-
d-1	3 axis -U3	a-3	Holding brake line -2 axis YB2+
d-2	3 axis -V3	a-4	Holding brake line -2 axis YB2-
d-3	3 axis -W3	a-5	Holding brake line -3 axis YB3+
d-4	3 axis -PE3	a-6	Holding brake line -3 axis YB3-
b-17	4 axis -U4	a-7	Holding brake line -4 axis YB4+
b-18	4 axis -V4	a-8	Holding brake line -4 axis YB4-
b-19	4 axis -W4	a-9	Holding brake line -5 axis YB5+
b-20	4 axis -PE4	a-10	Holding brake line -5 axis YB5-
b-13	5 axis -U5	a-11	Holding brake line -6 axis YB6+
b-14	5 axis -V5	a-12	Holding brake line -6 axis YB6-

## Control cabinet heavy-duty (Encoder) interface definition

The interface definition of ARC5-280 control cabinet heavy-duty (encoder) is shown in Figure 3-3.

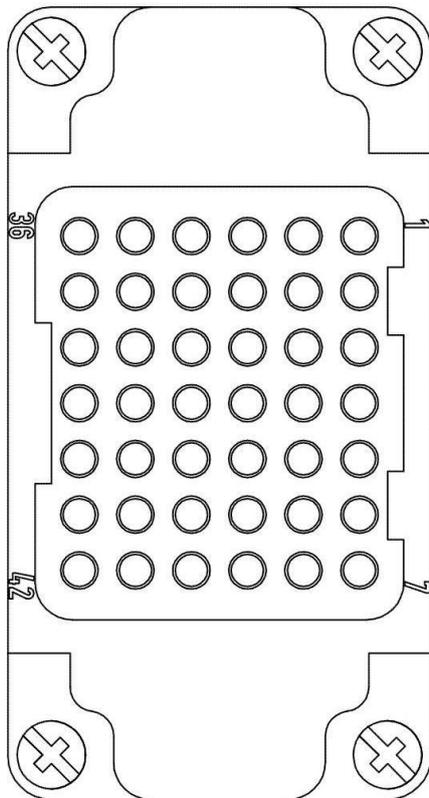


Figure 3-3 ARC5-280 control cabinet heavy-duty (encoder) interface definition

The definition of the encoder line interface for ARC5-280 control cabinet is detailed in Table 3-2.

Table 3-2 Encoder line interface definition

Signal name	Axis number	Pin number	Signal name	Axis number	Pin number
PS	1 axis	1	PS	4 axis	22
PS	1 axis	2	PS	4 axis	23
E0V	1 axis	3	E0V	4 axis	24
E5V	1 axis	4	E5V	4 axis	25
PS	2 axis	8	PS	5 axis	29
PS	2 axis	9	PS	5 axis	30
E0V	2 axis	10	E0V	5 axis	31
E5V	2 axis	11	E5V	5 axis	32
PS	3 axis	15	PS	6 axis	36
PS	3 axis	16	PS	6 axis	37
E0V	3 axis	17	E0V	6 axis	38
E5V	3 axis	18	E5V	6 axis	39

Encoder wire specifications and joint size instructions

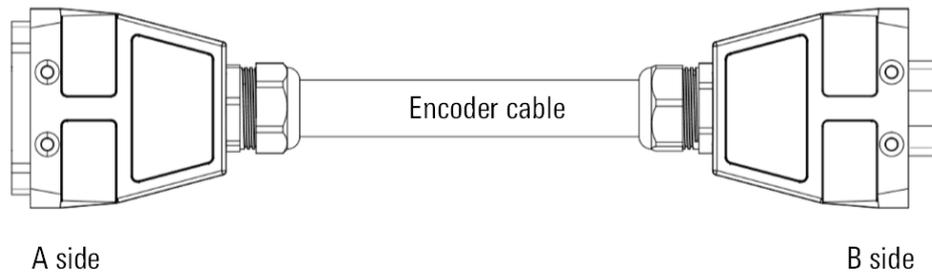


Figure 3-4 Diagram of ARC5-280 encoder line

Table 3-3 ARC5-280 encoder cable specification table

Name	A-end connection form	B-end connection form	Wire diameter/mm	Minimum bending radius
ARC5-280 encoder cable	Snap connection	Snap connection	16.7	8D

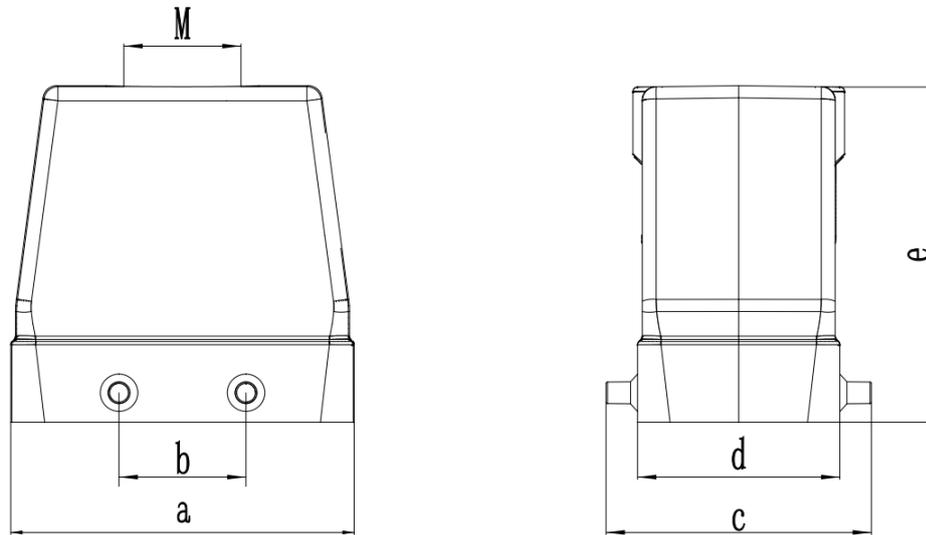


Figure 3-5 Encoder line heavy-duty connector size

Table 3-4 Encoder line heavy-duty connector size table

Control cabinet	a	b	c	d	e	M
ARC5-280	73	27	56.4	43	72	M25

Power line specifications and joint size instructions

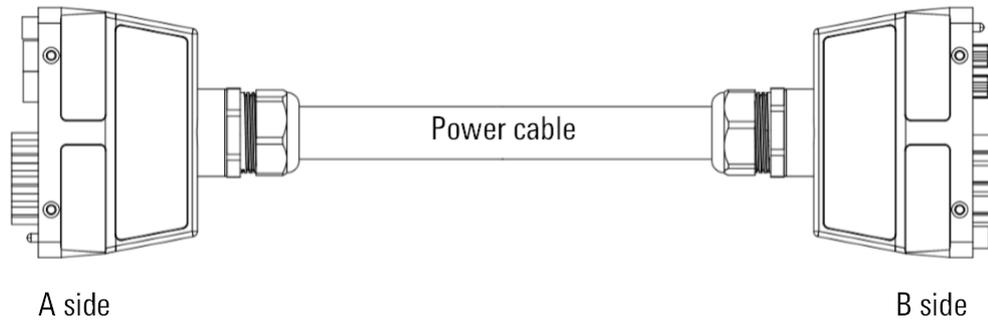


Figure 3-6 ARC4-165 power line diagram

Table 3-5 ARC4-165 power line specification table

Name	A-end connection form	B-end connection form	Wire diameter/mm	Minimum bending radius
ARC5-280 Power line	Snap connection	Snap connection	26.4	6D

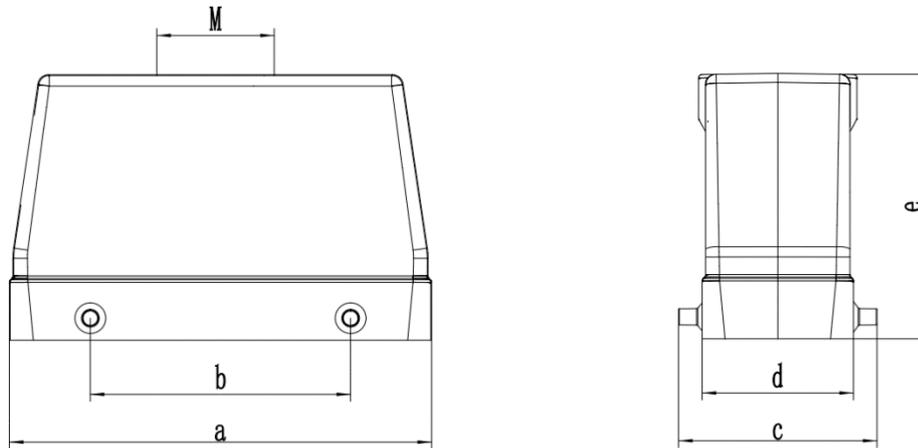


Figure 3-7 Dimensions of heavy-duty connectors for power lines

Table 3-6 Power line heavy-duty joint size table

Control cabinet	a	b	c	d	e	M
ARC5-280	120	74	56.4	43	76	M40

Specification of input power line for control cabinet

The 4-core power cord passes through the control cabinet and connects to the power supply through the side cable of the cabinet. The threading position is shown in Figure 3-8, and the specifications of the two power cords are shown in Table 3-7.

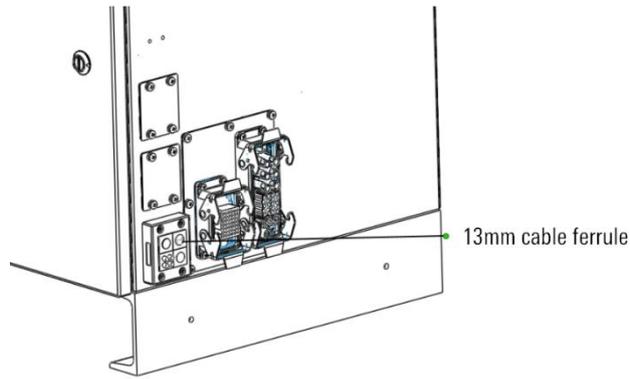


Figure 3-8 Diagram of power line inlet

Table 3-7 Power cord specifications

Name	Material number	Specification	Length
Power cable	P04081000024	4x4.0mm <sup>2</sup>	6m

### Control cabinet input power supply definition

- Nominal voltage: three-phase 380V.
- Nominal frequency: 50Hz.
- Full load power: 14kW.
- Full load current: 25A.

### Control cabinet input power requirements

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

## 4 Safe use of ARC5-280 control cabinet

### 4.1 Grounding of control cabinet

ARC5-280 control cabinet shall be reliably grounded for the following main purposes:

- Grounding makes all unit circuits in ARC5-280 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 ARC5-280 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.

The ARC5-280 control cabinet is grounded through the PE pin in the power cord inlet, and it is necessary to ensure that the input end of the cable connected to the control cabinet has a reliable ground connection. In addition, the control cabinet body provides grounding terminals. If necessary, you can choose to connect the ground wire to the appropriate grounding terminals on the legs of the cabinets on both sides of the control cabinet as shown in Figure 4-1.

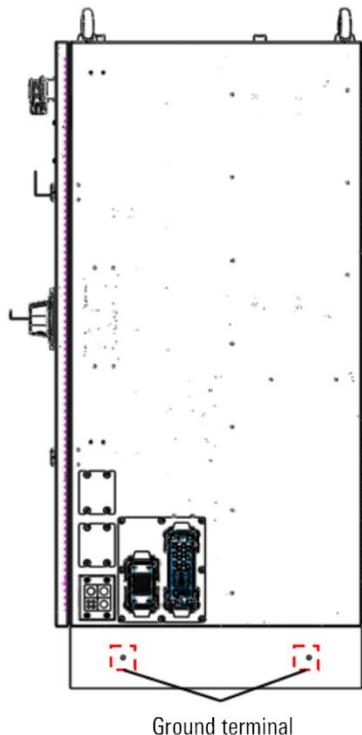


Figure 4-1 Control cabinet indicator light

### 4.2 Robot system safety

The robot system referred to in this article (including the manipulator, control cabinet, teaching pendant, and all the software and hardware included) can only operate normally by constructing peripheral devices and systems. These

peripheral devices and systems must include safety barriers, external emergency stop devices, and external safety input devices necessary for the safe use of robots.

The signal definition of the above safety devices is fixed in the safety IO interface of ARC5-280 control cabinet. The control cabinet can only be used normally when the safety signal of safety IO has a reasonable level, otherwise the control cabinet will alarm. The connection of safety IO interface safety signals is shown in Figure 5-2, and the names and meanings of pin numbers in the figure are detailed in Table 5-1.

The safety input signals include safety barrier signals, external emergency stop input signals, and external safety input signals, as shown in Table 4-1.

Table 4-1 Safety input signal description

Signal name	Illustrate
Safety fence signal	Safety light curtain signal equipped for safety fence Supports PNP type sensors and requires an external DC24V power supply
External emergency stop input signal	Emergency stop signals provided for external systems that collaborate with robots to complete tasks When the external system emergency stop button is pressed, the external emergency stop signal of the control cabinet is effective, and the robot stops according to STOP0 The external emergency stop output signal needs to have two channels, one of which serves as a backup for the safety link, and the external emergency stop input signal is effective at a high level
External safety input signal	The main safety (fault) signal for external systems that collaborate with robots to complete tasks, and the control cabinet will determine whether the robot needs to be stopped based on the status of the external system. External safety input signal is valid at high level

### 4.3 Robot stop mode

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 4-2:

Table 4-2 Stop method and corresponding description

Type	Description
STOP0	Case1 MCBS sends an alarm to DCBS through an internal hard wire connection. DCBS execution immediately stops without maintaining its trajectory, and then MCBS delay control is enabled to cut off power through thyristor, which is an uncontrollable stop
	Case2 DCBS has an uncontrollable fault that triggers a free stop or band brake stop, which is considered an uncontrollable stop
	Case3 Sudden external power outage, DCBS unable to execute immediate stop, triggering brake stop, which is an uncontrollable stop
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 ARC5-280 control cabinet external interface instructions

### 5.1 Description of control cabinet indicator

ARC5-280 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.

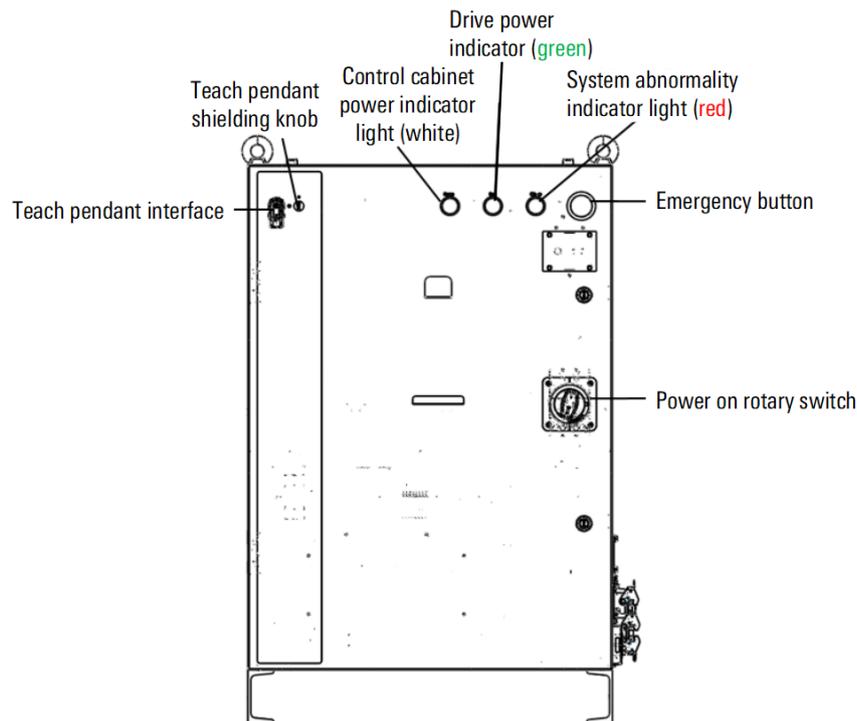


Figure 5-1 Control cabinet indicator light

### 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.

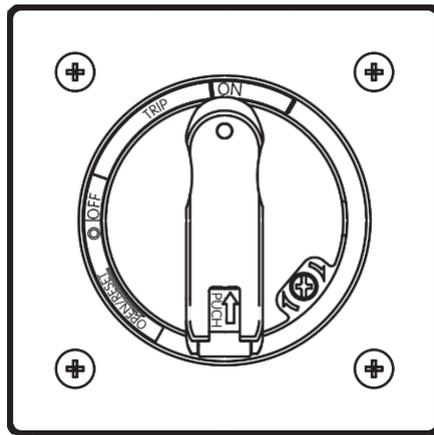


Figure 5-2 Power-on rotary switch



Caution

Turn the switch to the "OPEN/RESET" 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

### Teaching pendant shielding knob

ARC5-280 control cabinet teaching pendant shielding knob, with two positions of 0/1 (refer to Figure 5-1):

- When the knob is set to position 1, it indicates that the teaching pendant must be connected in order to function properly, otherwise the control cabinet will alarm.
- When the knob is set to position 0, it indicates that the teaching pendant can be removed, and the robot system can still continue to operate.

When using a teaching pendant to shield the knob, it is necessary to first place the knob in position 1 and connect the teaching pendant. Load the control program through the teaching pendant. For working systems with fixed control instructions, there is no need for the teaching pendant to control. You can place the knob in position 0, remove the teaching pendant, and control the operation of the robot system through external control knobs, etc.



Caution

For systems that still need to operate after unplugging the teaching pendant, it should be confirmed that the control cabinet is connected to an external control device before unplugging.

### Manual release brake button

ARC5-280 control cabinet provides manual brake release function

The ARC5-280 control cabinet provides a manual brake release button, the usage method is as follows;

The manual brake release button is located in the manual brake release box on the right side of the control cabinet panel. After unscrewing the 4 screws on the cover of the brake release box, you will see the brake release button as shown in Figure 5-3.

Follow the brake release operating instructions on the back of the manual brake release box cover:

Step1.Remove the brake connector of the axis on which the brake needs to be released from the driver (refer to Figure 5-4), and use a flat-blade screwdriver to pull out the brake wire from the connector; (the brake can only be released on one axis at a time)

Step2.Insert the removed loose brake wire into pins 9 and 10 of the J3 interface of the IAB interface circuit board, as shown in Figure 5-5.

Step3.Press and hold the brake release button and manually drag the corresponding axis of the manipulator to your desired position.

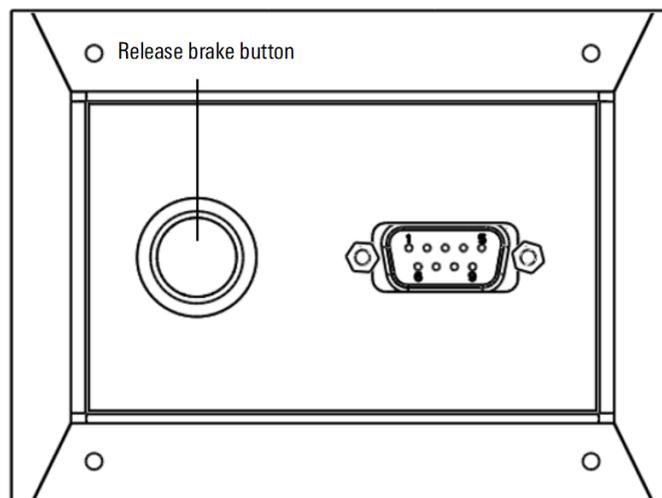


Figure 5-3 Manual brake release button

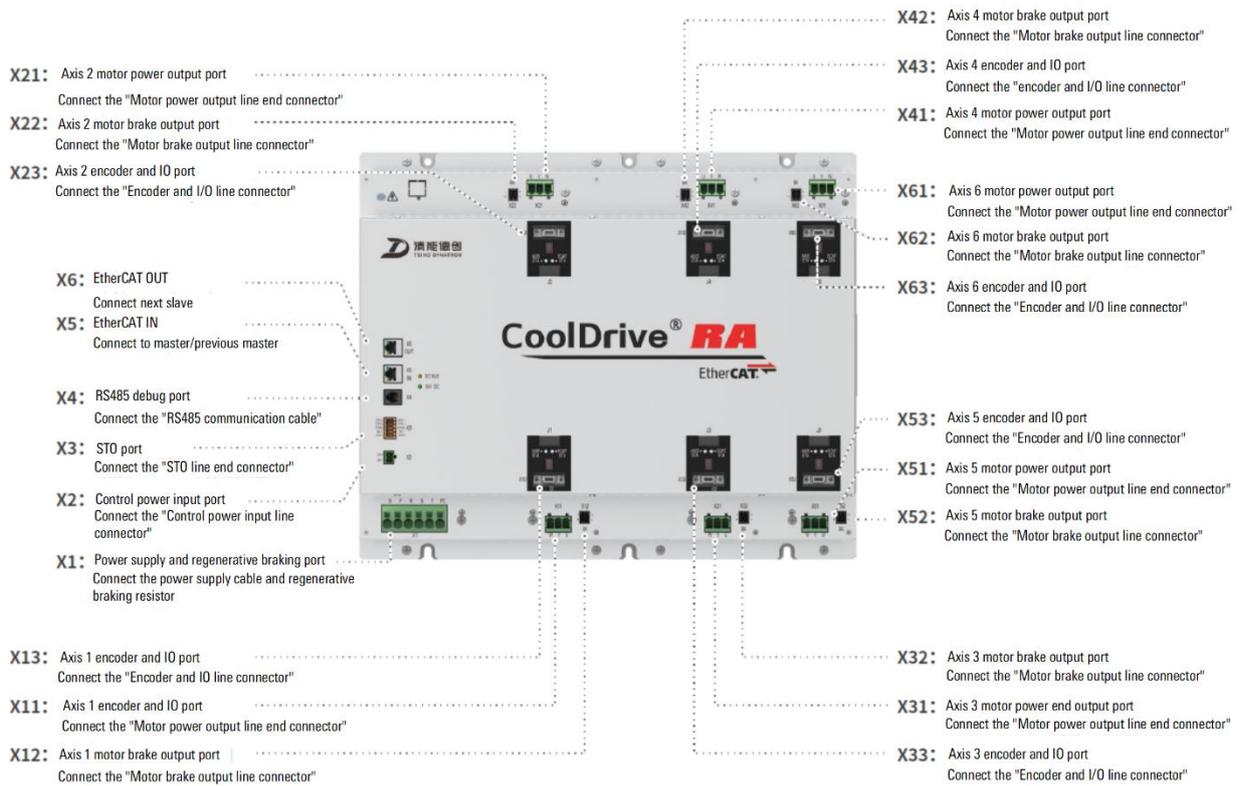


Figure 5-4 Drive interface

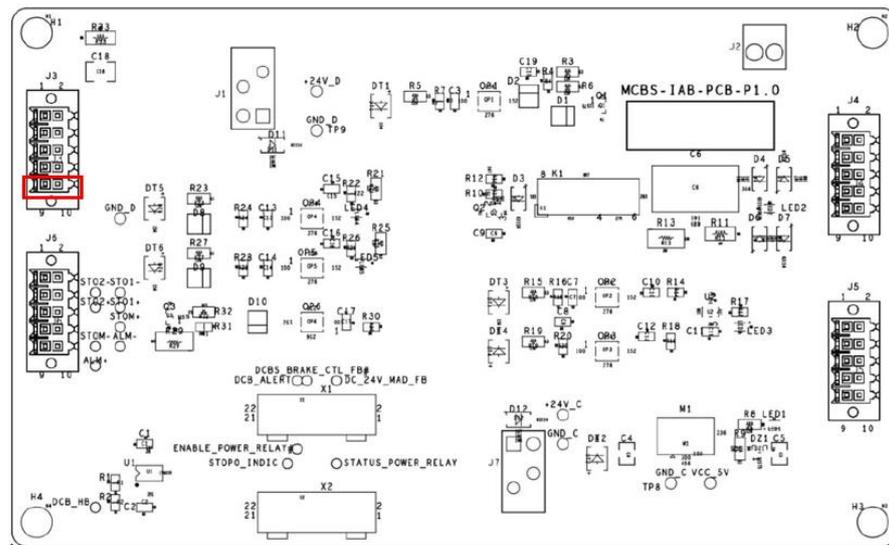


Figure 5-5 IAB interface circuit board



When using the manual brake release function, please be aware that the corresponding axis may suddenly fall under the action of gravity, and auxiliary support and personnel safety issues must be considered in advance.

Warning

## 5.4 External interface of control cabinet

The control cabinet provides a teaching pendant installation interface, located above the left side of the front door of the control cabinet (see Figure 5-1). The teaching pendant interface is shown in Figure 5-6, and the pin number definition of the connector interface is detailed in Table 5-1.

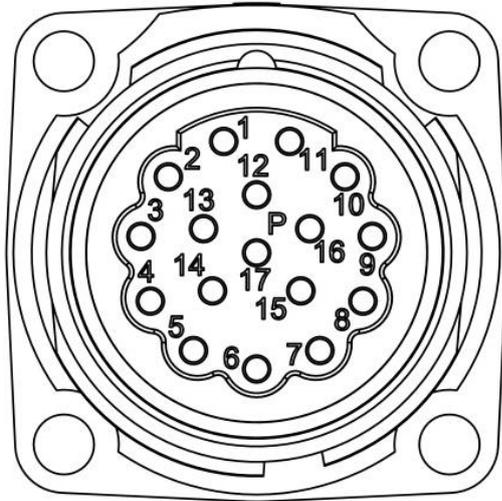


Figure 5-6 Teaching pendant interface

Table 5-1 Pin number definition of teaching pendant connector interface

Pin number	Signal name	Linear color	Pin number	Signal name	Linear color
1	ESTOP_INT+	White	9	+24VD	Black
2	ESTOP_INT-	Brown	10	+24VD_RTN	Purple
3	ESTOP_SAF+	Green	12	TX+	White/Orange
4	ESTOP_SAF-	Yellow	13	TX-	Orange
5	ENA_INT+	Grey	14	RX+	White/Green
6	ENA_INT-	Orange	15	RX-	Green
7	ENA_SAF+	Blue	17	Shielding layer	Shell
8	ENA_SAF_	Red			

## 5.5 24V power supply module inside the control cabinet

There are three 24V switch power supplies installed below the fan inside the control cabinet, which are used for the bandgap power supply, control cabinet power supply, and 24V backup power supply for optional accessories (or other customer requirements) (see Figure 5-7). Among them, the 150W switch power supply can be provided for the use of optional accessories in the cabinet. The interface definition is shown in Figure 5-8. When this switch power supply is needed, it can be connected to the switch power supply through a U-shaped terminal to provide 24V power supply for the optional accessories.

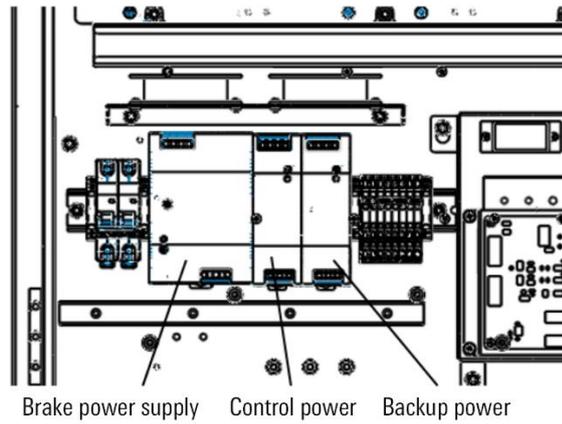


Figure 5-7 Diagram of switch power supply position

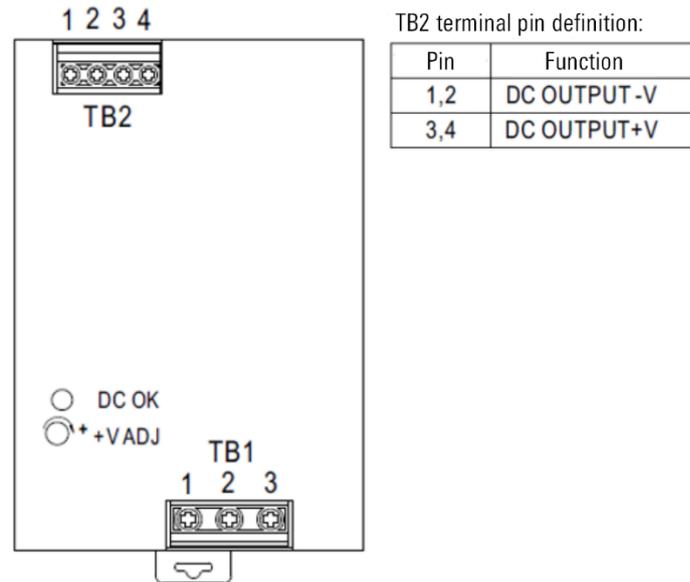


Figure 5-8 Definition of switching power supply interface

## 5.6 Installation of internal optional accessories in the control cabinet

The ARC5-280 control cabinet has reserved installation space for different optional modules, and customers can install the required optional components in the cabinet according to their needs.

### PEB module

The lower left part of the control cabinet has reserved space for the installation of the PEB module, which is used to expand PROFINET communication functions. When using the PEB module, the PEB module needs to be powered by a 24V power supply from the backup 150W switching power supply inside the control cabinet (see Section 5.5 for the location and use of the switching power supply).

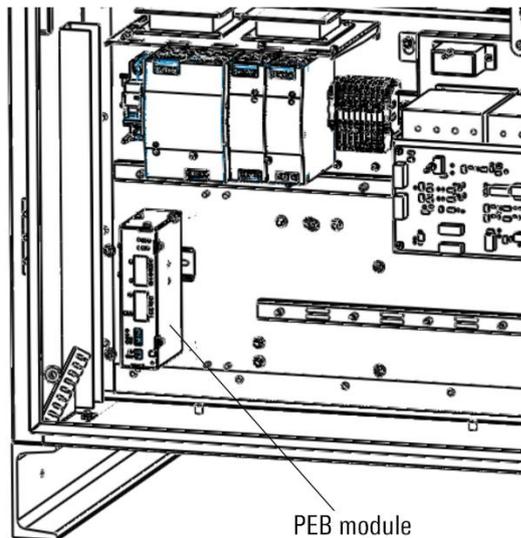


Figure 5-9 PEB module



Tip

The installation and use of the PEB module refer to the content of the "PROFINET Communication Module" section in the "Installation and Use Manual for Optional Accessories" provided by Peitian.

### ARC5-280 External Expansion 48 Channel IO Module (NPN Type)

The installation space for ARC5-280 external expansion 48 channel IO modules (NPN type) is reserved directly above the MCBF board of the control cabinet door, which is used for additional expansion of the number of IOs. When using the ARC5-280 external expansion 48 channel IO module (NPN type), the 24V power supply needs to be provided by the backup 150W switching power supply inside the control cabinet (see Section 5.5 for the location and use of the switching power supply).

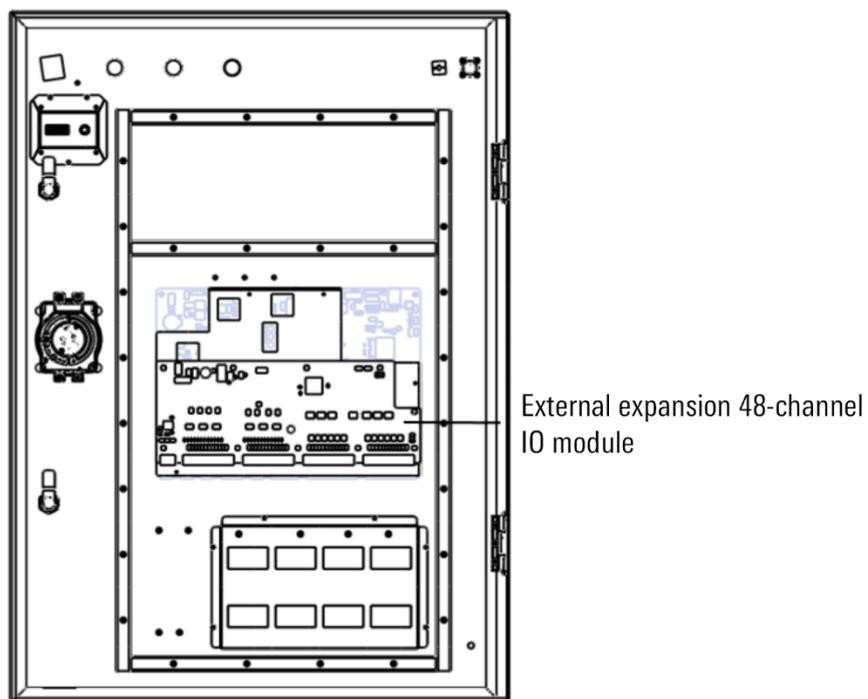


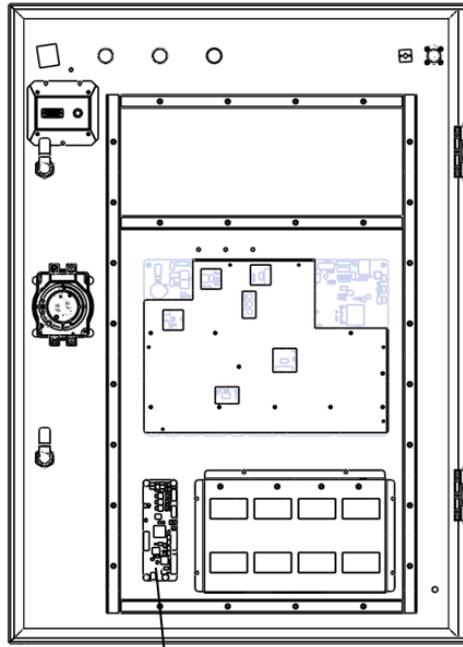
Figure 5-10 ARC5-280 external expansion 48 channel IO module (NPN Type)



The installation and use of ARC5-280 external expansion 48 channel IO module (NPN type) refer to the content of the "External Expansion I/O Module" section in the "Installation and Use Manual for Optional Parts" provided by Peitian.

### IEB (Multi-functional communication module)

The installation space for MCBS-IEB is reserved in the lower left part of the control cabinet door. IEB is an optional accessory for attaching to the MCBS module, providing expansion interfaces such as CAN, magnetic scale, incremental encoder, absolute encoder, analog output, analog input, PWM output, etc. for users to use.



MCBS-IEB

Figure 5-11 MCBS-IEB



The installation and use of MCBS-IEB refer to the content of the "IEB (Multi-functional Communication Module)" section in the "Installation and Use Manual for Optional Accessories" provided by Peitian.

### Guide rail

A guide rail installation position is reserved at the bottom of the control cabinet. If customers need to arrange accessories inside the cabinet that can be installed with guide rails, they can install them at an appropriate position at the bottom of the control cabinet.

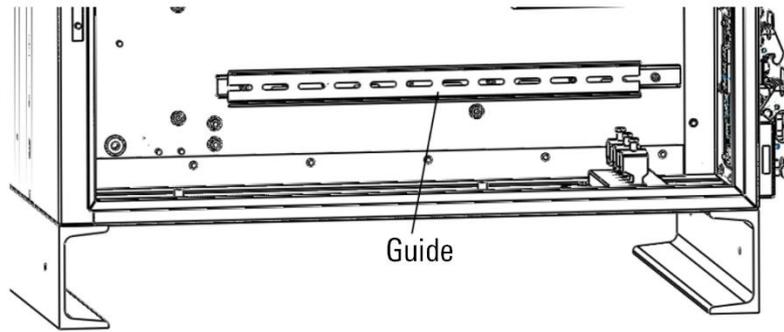


Figure 5-12 Guide rail mounting



## 6 ARC5-280 control cabinet hardware module external interface description

The ARC5-280 control cabinet hardware module is located inside the control cabinet (refer to Figure 1-1 for location), providing some external interfaces for the control cabinet. External cables are introduced into the control cabinet through the cable entry module, as shown in Figure 6-1.

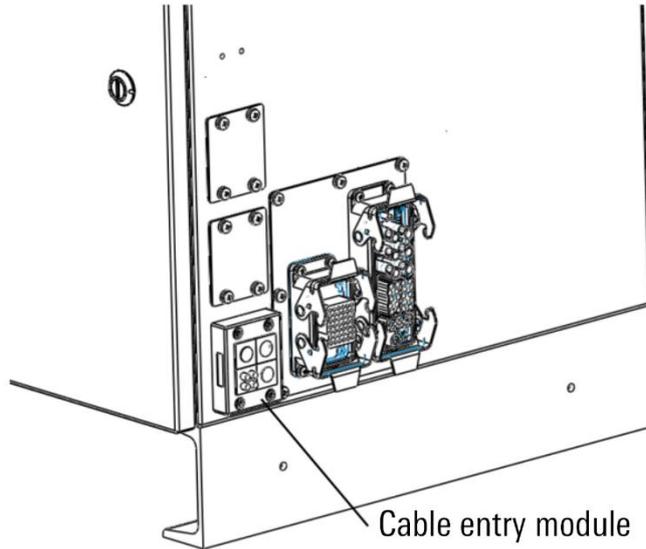


Figure 6-1 Diagram of cable entry module

In the open state of the control cabinet (as shown in Figure 1-1), when viewed from bottom to top, the interface on the MCBS main control circuit is shown in Figure 6-2. The external EtherCAT network port is directly provided by the drive's X6 interface, as shown in Figure 6-3.

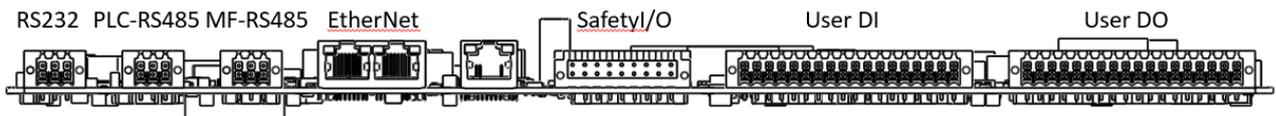


Figure 6-2 MCBS interface diagram

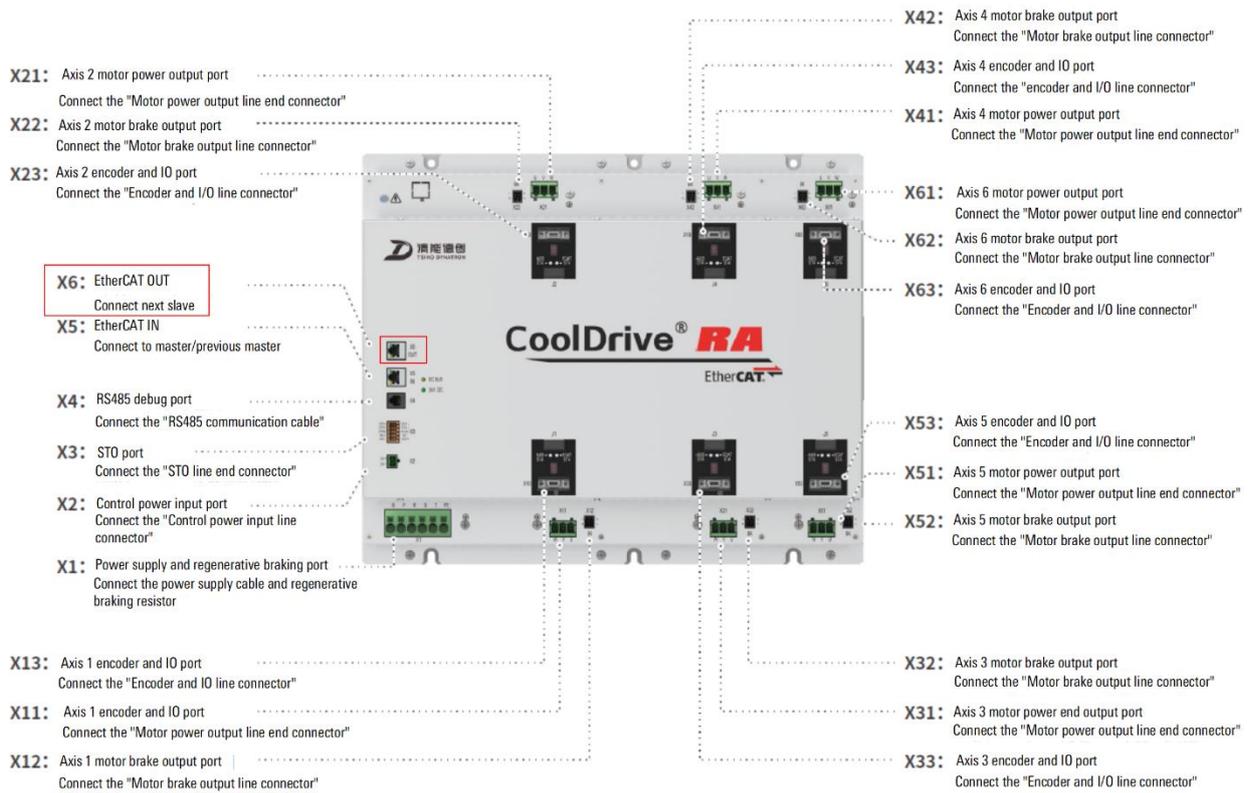


Figure 6-3 Diagram of external expansion EtherCAT interface

The names and functions of the external interfaces on the above hardware modules are detailed in Table 6-1.

Table 6-1 External interface schematic description

Serial Number	Interface	Interface name	Illustrate
1	RS232	User serial port RS232	Connect any device that supports the RS232 serial protocol
2	PLC-RS485	PLC slave interface RS485	Connect any device that supports the Modbus RTU master
3	MF-RS485	PLC-MF master station interface	Connect to the PLC-MF module for extending user DI/DO
4	EtherNet	User EtherNET network port	Connect any device that supports the Ethernet TCP/IP
5	SafetyIO	Safety IO interface	Implement safety functions such as safety barriers, emergency stop outputs, and emergency stop inputs
6	UserDI	User DI interface	Connect any device that supports DI functionality
7	UserDO	User DO interface	Connect any device that supports DO functionality
8	EtherCAT	Expanding the EtherCAT network port of the external axis	Connect any device that supports the EtherCAT bus protocol

## 6.1 Safety IO interface

ARC5-280 control cabinet Safety IO interface, with fixed signal definitions for each interface that cannot be configured by the user. Please refer to Figure 6-4 for the safety IO interface wiring diagram and pin identification diagram, and Table 6-2 for pin definitions.

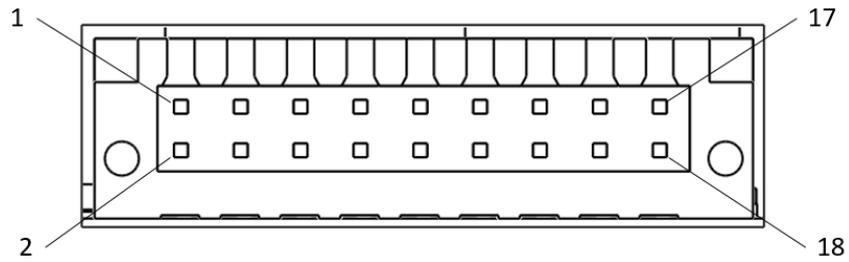


Figure 6-4 Safety IO interface pin identification diagram

Table 6-2 Safety IO interface definition list

Pin number	Signal name	Signal significance	In/Out
1	D+24V_EX	24V power supply	Power
2	EX_ESTOP_DI_SAF	External emergency stop input	In
3	D+24V_EX	24V power supply	Power
4	EX_ESTOP_DI_INT	External emergency stop input	In
5	D+24V_EX	24V power supply	Power
6	BARRIER_DI_SAF	Safety barrier input	In
7	D+24V_EX	24V power supply	Power
8	BARRIER_DI_INT	Safety barrier input	In
9	D+24V_EX	24V power supply	Power
10	EX_SAFE_DI_SAF	External security input	In
11	D+24V_EX	24V power supply	Power
12	EX_SAFE_DI_INT	External security input	In
13	GND_EX	Signal ground	GND
14	EX_ALARM_DI	External alarm input Note: Special alarm input pins for the external axis driver of the Peitian	In
15	ESTOP_OUT_1+	Emergency stop output contact 1 positive	Out
16	ESTOP_OUT_1-	Emergency stop output contact 1 negative	Out
17	ESTOP_OUT_2+	Emergency stop output contact 2 positive	Out
18	ESTOP_OUT_2-	Emergency stop output contact 2 negative	Out

Safety IO provides signals such as emergency stop output, external emergency stop input, external alarm input, external safety barrier input, and external safety confirmation input. The signal usage method is shown in pin numbers 1~18 in Figure 6-5 . The 24V of the Safety IO interface does not provide external power supply.

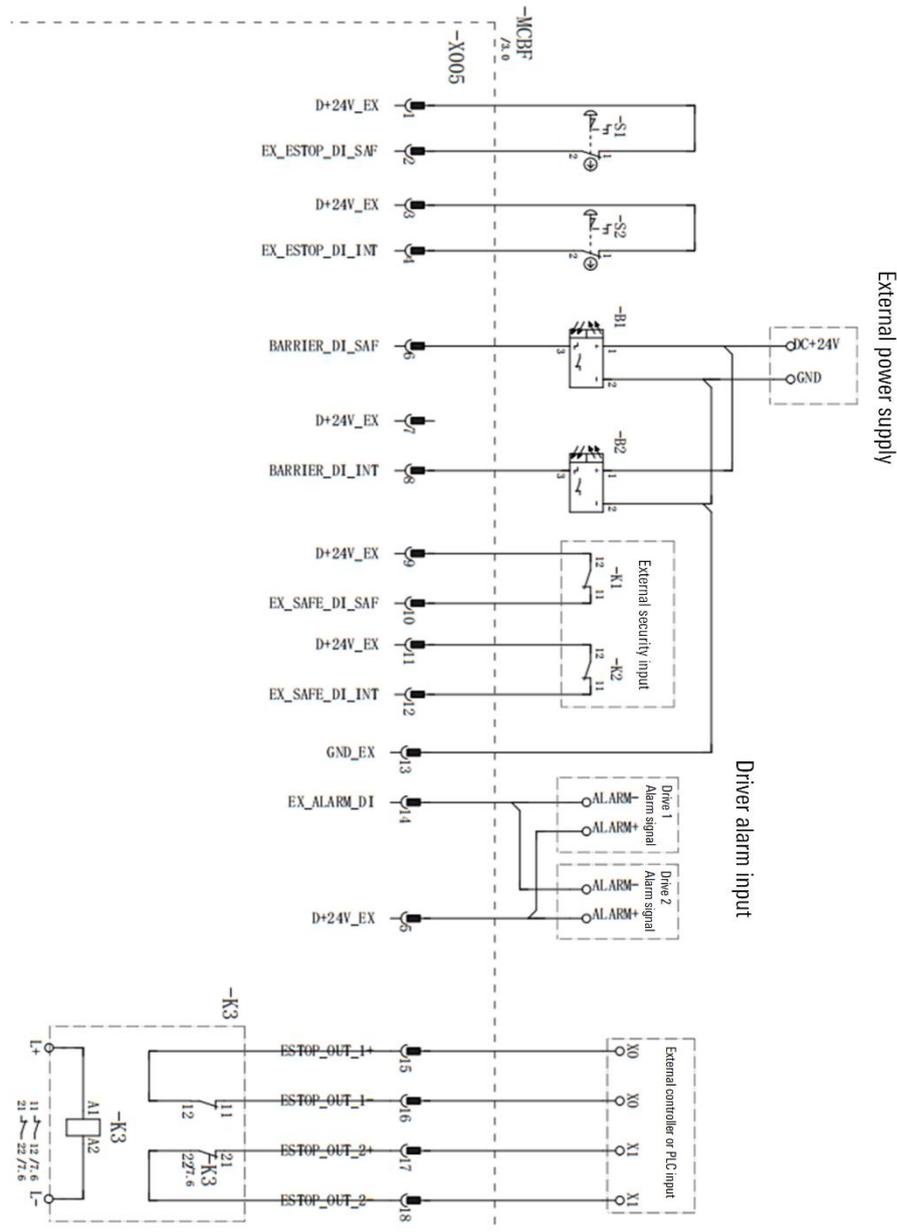


Figure 6-5 Safety IO output signal

## 6.2 User DI interface

ARC5-280 control cabinet provides users with 26 channels of DI, 2 channels of input common interface, and 4 channels of power interface. The D+24V-EX and GND\_EX of this power interface can only be used for DI function testing, and cannot be used for power output above 0.5W, otherwise it will cause abnormal or ineffective IO function.

When using the DI interface, an external power supply must be used.

The User DI and User DO of the control cabinet use the same connector, which may result in incorrect insertion. When the User DO is connected to an inductive load, an external 24V power supply needs to be connected. If the User DI and User DO are plugged in incorrectly, it will cause damage to the circuit of the control cabinet. Please ensure that the connectors are connected to the correct sockets when using User DI and User DO.

The wiring diagram and interface pin labels of the User DI interface are shown in Figure 6-6. The definition of the User DI interface is shown in Table 6-3, and the interface usage information is shown in Figure 6-7 and Figure 6-8.

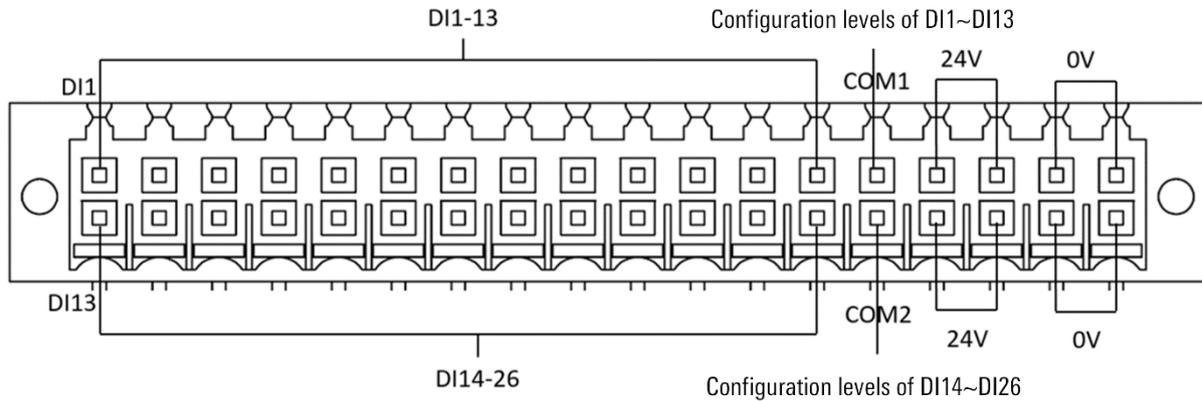


Figure 6-6 DI interface and pin identification diagram

Table 6-3 User DI interface definition list

Pin number	Signal name	Signal significance	In/Out
DI 1	Configurable digital input	In	In
DI 2	Configurable digital input	In	In
DI 3	Configurable digital input	In	In
DI 4	Configurable digital input	In	In
DI 5	Configurable digital input	In	In
DI 6	Configurable digital input	In	In
DI 7	Configurable digital input	In	In
DI 8	Configurable digital input	In	In
DI 9	Configurable digital input	In	In
DI 10	Configurable digital input	In	In
DI 11	Configurable digital input	In	In
DI 12	Configurable digital input	In	In
DI 13	Configurable digital input	In	In
DI 14	Configurable digital input	In	In
DI 15	Configurable digital input	In	In
DI 16	Configurable digital input	In	In
DI 17	Configurable digital input	In	In
DI 18	Configurable digital input	In	In
DI 19	Configurable digital input	In	In
DI 20	Configurable digital input	In	In
DI 21	Configurable digital input	In	In
DI 22	Configurable digital input	In	In
DI 23	Configurable digital input	In	In
DI 24	Configurable digital input	In	In
DI 25	Configurable digital input	In	In
DI 26	Configurable digital input	In	In

Pin number	Signal name	Signal significance	In/Out
COM 1	DI1-13 input common terminal		
COM 2	DI14-26 input common terminal		
24V	24V power supply	Power	
24V	24V power supply	Power	
24V	24V power supply	Power	
24V	24V power supply	Power	
0V	Signal ground	GND	
0V	Signal ground	GND	GND
0V	Signal ground	GND	GND
0V	Signal ground	GND	Power

PNP or NPN type sensor signals, switch signals, and relay contact signals can be used as inputs for user DI. The ARC5-280 control cabinet supports PNP and NPN type sensor inputs. When using NPN type sensors, it is necessary to connect the common end corresponding to this DI to the external 24V power supply. When using PNP type sensors, it is necessary to connect the common end corresponding to this DI to the external power supply ground. The control cabinet provides two sets of configurable common terminals. Among them, COM1 corresponds to DI1~DI13, and COM2 corresponds to DI14~DI26.

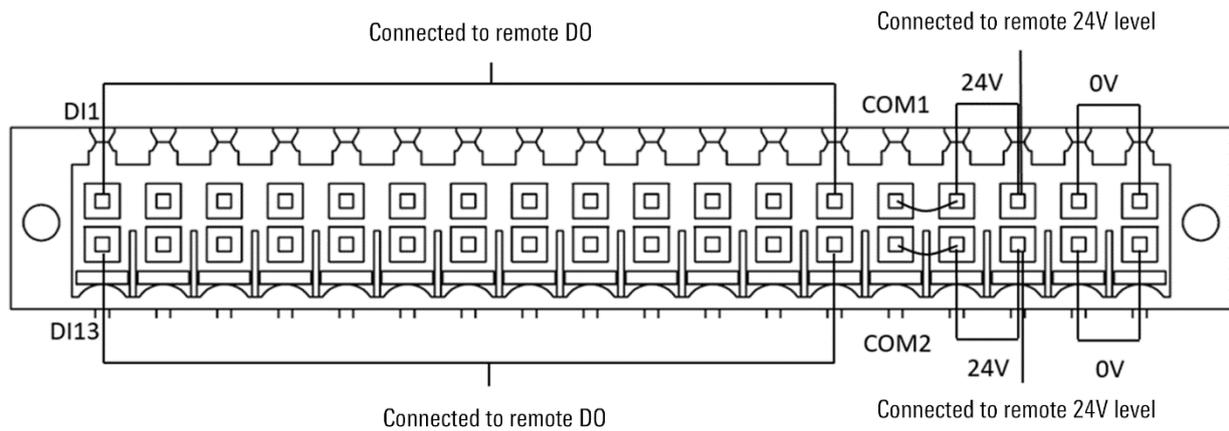


Figure 6-7 User DI interface instructions (NPN Input)

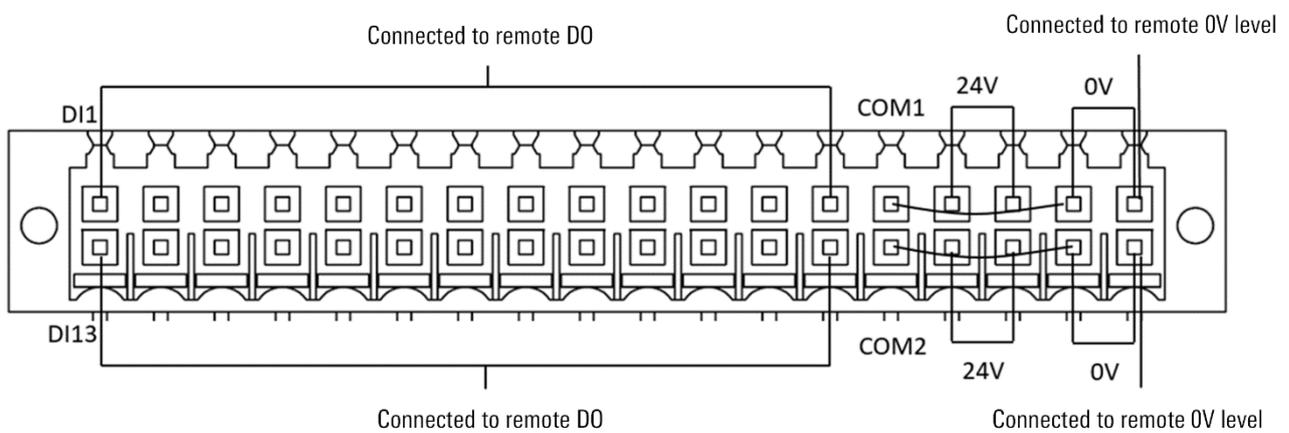


Figure 6-8 User DI interface instructions (PNP Input)

### 6.3 User DO interface

The ARC5-280 control cabinet provides users with 26 DO and 4 continuous current power interfaces. The User DO interface and pin labels are shown in Figure 6-9, and the definition of the User DO interface is detailed in Table 6-4.

The ARC5-280 control cabinet provides users with 26 DO interfaces with NPN polarity, and the maximum single input current of all DOs is 160mA. When DO is connected to an external load, to avoid damage to the interface during shutdown, it is necessary to connect "24V" to an external power source. Refer to Figure 6-9 for interface usage information.

If external PNP polarity sensors and switches are required, corresponding polarity transfer equipment needs to be used.

The User DI and User DO of the control cabinet use the same connector, which may result in incorrect insertion. When the User DO is connected to an inductive load, an external 24V power supply needs to be connected. If the User DI and User DO are plugged in incorrectly, it will cause damage to the circuit of the control cabinet. Please ensure that the connectors are connected to the correct sockets when using User DI and User DO.

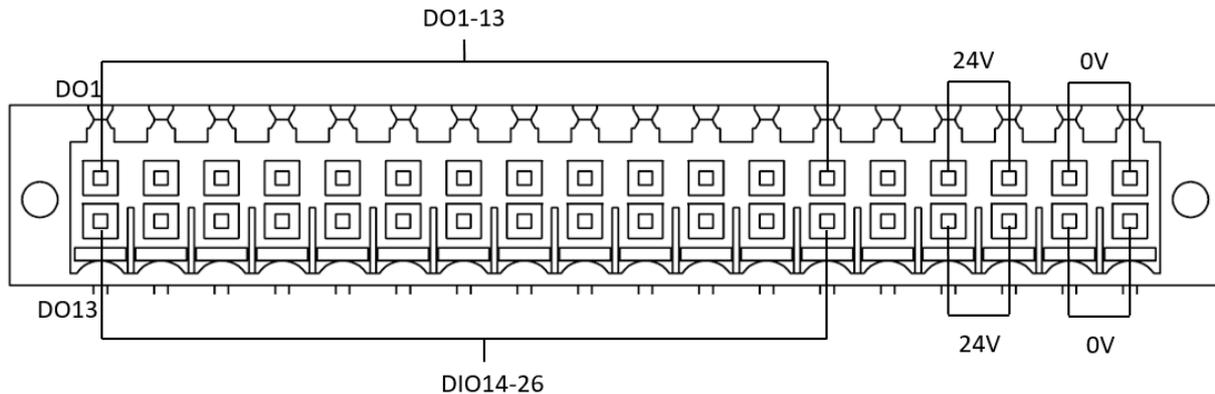


Figure 6-9 User DO interface and pin identification diagram

Table 6-4 User DO interface definition list

Pin number	Signal name	Signal significance	In/Out
DO 1	NPN digital output	Out	Out
DO 2	NPN digital output	Out	Out
DO 3	NPN digital output	Out	Out
DO 4	NPN digital output	Out	Out
DO 5	NPN digital output	Out	Out
DO 6	NPN digital output	Out	Out
DO 7	NPN digital output	Out	Out
DO 8	NPN digital output	Out	Out
DO 9	NPN digital output	Out	Out
DO 10	NPN digital output	Out	Out
DO 11	NPN digital output	Out	Out
DO 12	NPN digital output	Out	Out
DO 13	NPN digital output	Out	Out
DO 14	NPN digital output	Out	Out

Pin number	Signal name	Signal significance	In/Out
DO 15	NPN digital output	Out	Out
DO 16	NPN digital output	Out	Out
DO 17	NPN digital output	Out	Out
DO 18	NPN digital output	Out	Out
DO 19	NPN digital output	Out	Out
DO 20	NPN digital output	Out	Out
DO 21	NPN digital output	Out	Out
DO 22	NPN digital output	Out	Out
DO 23	NPN digital output	Out	Out
DO 24	NPN digital output	Out	Out
DO 25	NPN digital output	Out	Out
DO 26	NPN digital output	Out	Out
NC	Not connected		
NC	Not connected		GND
24V	Power interface for continuous flow	Power	GND
24V	Power interface for continuous flow	Power	GND
24V	Power interface for continuous flow	Power	GND
24V	Power interface for continuous flow	Power	GND
0V	Ground	GND	GND
0V	Ground	GND	Power
0V	Ground	GND	Power
0V	Ground	GND	Power

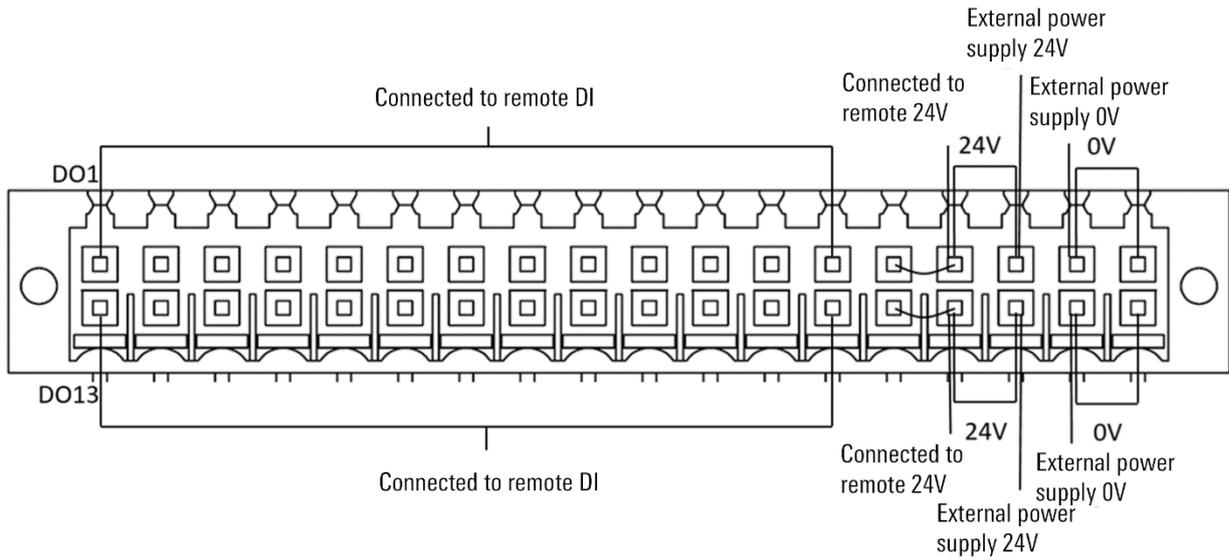


Figure 6-10 User DO interface instructions

## 6.4 User serial port RS232 interface

The ARC5-280 control cabinet RS232 interface is an RS232 communication interface provided for users, and the RS232 interface is a plug-in terminal connector.

Refer to Figure 6-11 for the wiring diagram and pin identification diagram of the RS232 interface, and refer to Table 6-5 for the cable definition.

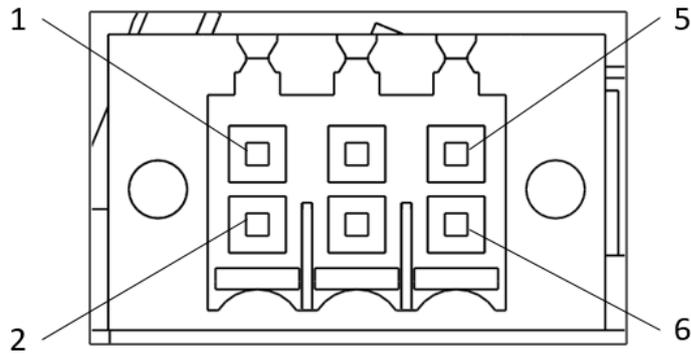


Figure 6-11 RS232 interface pin identification diagram

Table 6-5 RS232 interface definition diagram

Interface	Pin	Cable definition
RS232	1	PC_UART0_RXD
	2	PC_UART0_TXD
	3	GND_ISO_RS232
	4	CHGND_1
	5	-
	6	-

## 6.5 MF-RS485 interface

The MF-RS485 interface of the ARC5-280 control cabinet is an external MF interface, connected to the PLC\_MF master station, RS485 interface is a plug-in terminal connector.

The MF-RS485 interface wiring diagram and pin identification diagram refer to Figure 6-12, and the cable definition refers to Table 6-6.

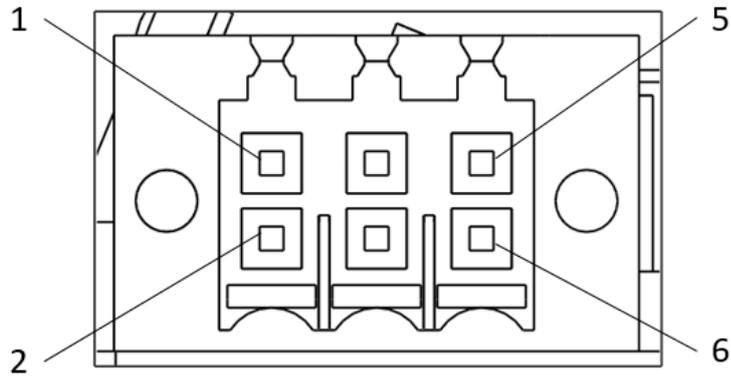


Figure 6-12 MF-RS485 interface pin identification diagram

Table 6-6 MF-RS485 interface definition list

Interface	Pin	Cable definition
MF-RS485 interface	1	RS485_2_0_+
	2	RS485_2_0_-
	3	GND_ISO_RDC
	4	CHGND_1
	5	120 Ω resistor short contact 1
	6	120 Ω resistor short contact 2

## 6.6 PLC-RS485 interface

The PLC-RS485 interface of the ARC5-280 control cabinet is an external PLC interface that connects to the PLC slave station. The RS485 interface is a plug-in terminal connector.

The wiring diagram and pin identification diagram of the PLC-RS485 interface refer to Figure 6-13, and the cable definition refers to Table 6-7.

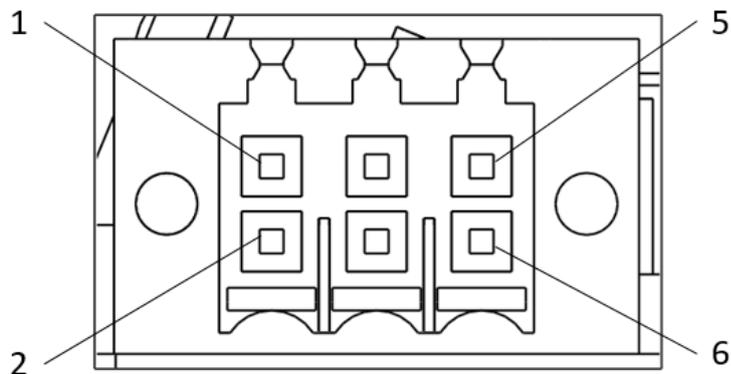


Figure 6-13 PLC-RS485 interface pin identification diagram

Table 6-7 PLC-RS485 interface definition list

Interface	Pin	Cable definition
PLC-RS485 interface	1	RS485_1_0_+
	2	RS485_1_0_-
	3	GND_ISO_MF
	4	CHGND_1
	5	120 $\Omega$ resistor short contact 1
	6	120 $\Omega$ resistor short contact 2

## 6.7 User Ethernet port

The ARC5-280 control cabinet provides the user with two user Ethernet ports, which are used to connect Industrial Ethernet and sensors communicating with Ethernet.

Refer to Figure 6-2 for the interface diagram of the user Ethernet port.

## 6.8 User EtherCAT network port

The ARC5-280 control cabinet reserves one EtherCAT interface as the expansion external axis interface and EtherCAT protocol conversion port. Refer to Figure 6-3 for the interface diagram of the user EtherCAT network port.

The extended use of the external axis is as follows: the external axis driver is external, and the control cabinet does not provide power supply for the external axis motor and external axis driver, nor does it provide power supply for the external axis brake. The external axis communicates with the control cabinet through EtherCAT bus, and the alarm of the external axis driver can be connected to the control cabinet through a safety IO interface. The control cabinet provides two safety IO connections.



## 7 ARC5-280 control cabinet maintenance and fault handling

### 7.1 Routine maintenance items and cycles

The multi axis drive debugging interface for ARC5-280 control cabinet is located inside the front door brake box at the back of the control cabinet. After unscrewing the four screws on the cover plate of the brake box, you can see the debugging interface, as shown in Figure 7-1. When debugging multi axis drive parameters, it is necessary to use an RS422 to USB cable to connect to the interface shown in the diagram.

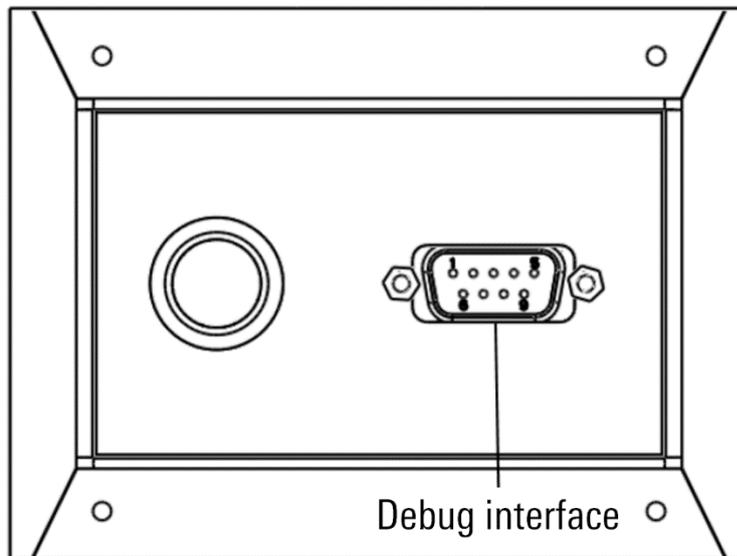


Figure 7-1 Control cabinet multi axis drive debugging interface

The routine maintenance items and cycles of the ARC5-280 control cabinet are detailed in Table 7-1.

Table 7-1 Routine maintenance items and cycles

Maintenance project	Maintenance cycle
Emergency stop switch	6 months
Circuit breaker	6 months
Pilot lamp	6 months
Heavy-duty connectors	6 months
Fan and air duct	6 months

#### Maintenance process

Check whether the circuit breaker operation reset mechanism can be flexibly connected and disconnected, whether the appearance is clean, without damage or carbonization phenomenon, whether indicator lights and other indicating devices can send signals normally, and whether the connection at the heavy-duty connector is loose.

## Dust screen replacement

The ARC5-280 control cabinet is equipped with two dust screens at the back door assembly and the air duct under the main body of the cabinet. Refer to Figure 7-2 Under normal use, the control cabinet dust screen should be cleaned every 3 months and replacement every other year; when the environment is harsh, the replacement and cleaning cycle should be shortened, as shown in Figure 7-3.

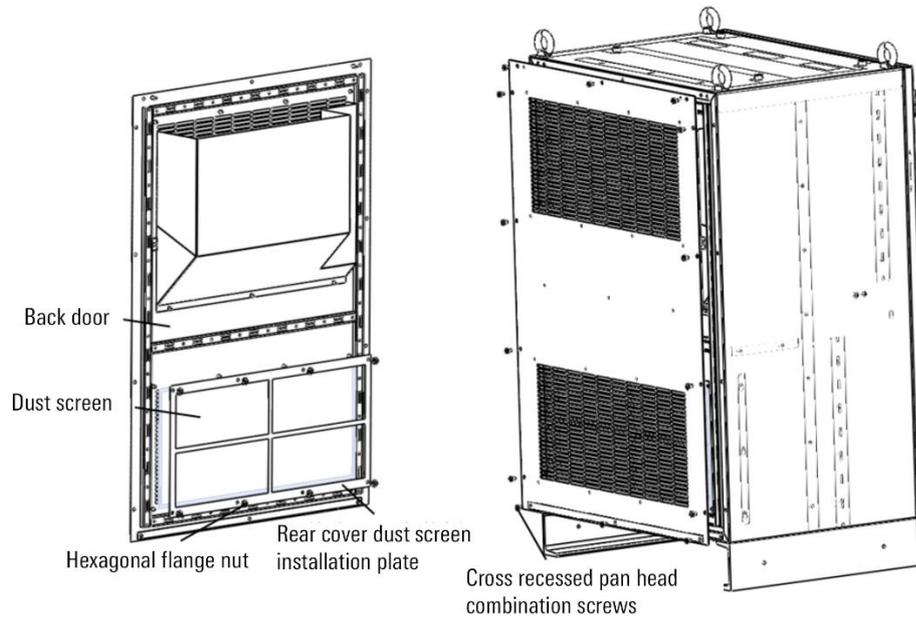


Figure 7-2 Replace or clean the back dust screen

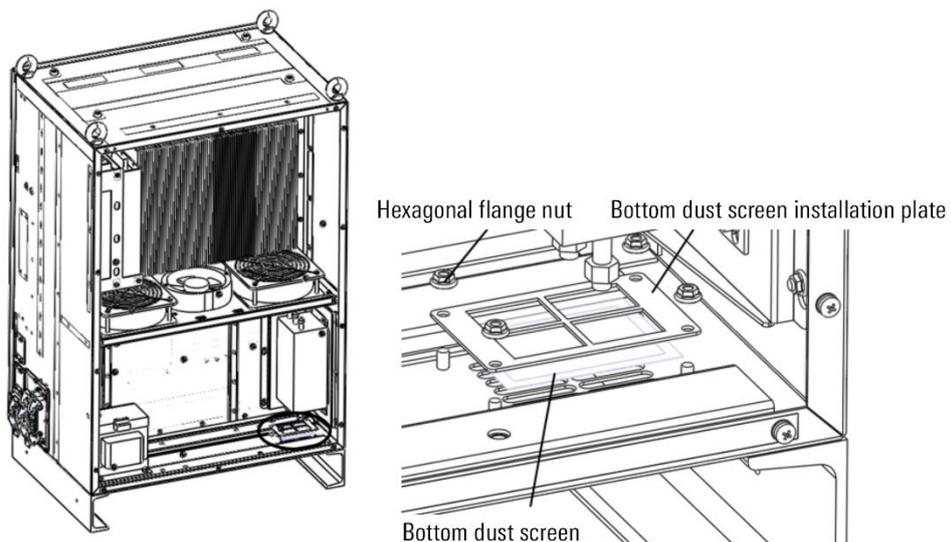


Figure 7-3 Replace or clean the bottom dust screen

Steps for disassembling the dust screen:

Step1. Use a cross screwdriver to remove the M5 × 10 cross slot pan head combination screw of the upper cover plate and remove the rear door assembly.

Step2. Use a sleeve to remove the M5 hexagonal flange nut on the rear door assembly, and remove the rear cover dust screen installation plate to remove the dust screen.

Step3.Then use a hexagonal wrench to remove the M5 hexagonal flange nut at the bottom of the cabinet body, and remove the bottom dust screen installation plate to remove the bottom dust screen.

Step4.Clean or replace the two dust screens.

Installation steps for dust screen:

Step1.Paste the cleaned or new dust screen onto the corresponding sheet metal through its own double-sided adhesive tape: the back dust screen is pasted on the rear door, and the bottom dust screen is pasted on the bottom of the cabinet body.

Step2.Use four M5 hexagonal flange nuts to fix the bottom dust screen to the cabinet body.

Step3.Use eight M5 hex flange nuts to secure the back dust screen mounting plate to the rear door.

Step4.Using 14 M5 × 10 cross recessed pan head combination screws secure the rear door assembly to the main body of the cabinet.

## 7.2 Possible troubleshooting steps

### Circuit breaker

When the circuit breaker cannot be flexibly switched on or off or the appearance is damaged and carbonized, they should be replaced immediately. (the above operations shall be carried out by personnel with professional qualification certificate).

### 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.

### Fan

When the fan rotates abnormally, first determine if there is a fault in the connecting harness; If there is no fault in the circuit, replace the fan and observe whether it rotates normally.

### Heavy-duty connector

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

### Fuse

When the power indicator light of the control cabinet is on, but some electrical components cannot be powered on, please check whether the corresponding fuse on the adapter board is burnt out. If there is a burn out situation, please replace the fuse according to Table 7-2.

Table 7-2 Instructions for the function and replacement of each fuse

MCBS				
Serial Number	Number	Model	Parameter	Significance
1	F1	0454001.	1A/125VAC	Body, 24VDC isolated power supply
2	F2	0454002.	2A/125VAC	Teaching pendant, 24VDC power supply
3	F3	0454001.	1A/125VAC	Panel, 24VDC power supply
4	F4	0454001.	1A/125VAC	Fan, 24VDC power supply
5	F5	0454002.	2A/125VAC	MCBS board, 24VDC power supply
6	F6	0454001.	1A/125VAC	Safety IO, 24VDC isolated power supply

## 8 ARC5-280 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 under constant temperature conditions



## Appendix A ARC5-280 accessories list

Schedule 1 ARC5-280 control cabinet cable accessories list

Accessory Name	Part number	Corresponding interface	Accessory Properties
ARC5-280 outside the cabinet encoder line	P04082001472	Encoder line interface	Standard (8 meters in length)
ARC5-280 heavy-duty power wiring harness outside the cabinet	P04082001473	Power line interface	Standard configuration for models with AIR170-2700 and below load (8 meters in length)
AIR280-2700 heavy-duty power wiring harness outside the cabinet	P04082001493	Power line interface	Standard configuration for aircraft models with AIR170-3100 and above load (8 meters in length)
ARCC-teaching pendant external wiring harness-10 meters	P04082000587	Teach pendant Interface	Standard (10 meters in length)
Power cable	P04081000024		Standard (6 meters in length)
SCRC10- RS232 wiring harness outside the cabinet	P04082000843	RS232	Optional (3 meters in length)
SCRC10- RS485 wiring harness outside the cabinet	P04082000844	PLC-RS485	Optional (5 meters in length)
SCRC10- RS485 wiring harness outside the cabinet	P04082000844	MF-RS485	Optional (5 meters in length)
Industrial network cable	P04082000279	Ethernet	Optional (5 meters in length)
	P04082000279	EtherCAT	Optional (5 meters in length)
inCube20- User DI terminal module cable	P04082001304	User DI	Optional
inCube20- User DO terminal module cable	P04082001305	User DO	Optional
USB to RS422/RS485 cable	P04082000251	Servo Debugger	Optional
MCBS-IEB gusset plate	P05245000108	-	(Optional at the same time)
ARC5-MCBS and gusset board connection cable	P04082001166	-	(Optional at the same time)
PWM and analog output_voltage and current input cables	P04082000594	J3\J5	Optional (5 meters in length)
Magnetic grating ruler and CAN_Encoder shared wiring harness	P04082000596	J6\J7	Optional (5 meters in length)



## Appendix B ARC5-280 accessories description

### External wiring for heavy-duty interfaces

The basic specifications and installation methods of external wiring for heavy-duty interfaces are detailed in Schedule 2--Schedule 4.

Schedule 2 Basic specifications and installation methods for external wiring of ARC5-280 heavy-duty encoder line interface

No.	-	Name	ARC5-280 cabinet external encoder	Device code	P04082001472
A-end connector	Heavy-duty, metal casing, female terminal, metal casing, sticker protection cover				
B-end connector	Heavy-duty, metal casing, female terminal, metal casing, sticker protection cover				
Cable	Customized cables	Length	8 meters (standard)		

Schedule 3 Basic specifications and installation methods for external wiring of AIR170-2700 and below heavy-duty power line interface.

No.	-	Name	ARC5-280 cabinet external heavy-duty power	Device code	P04082001473
A-end connector	Heavy-duty, metal casing, female terminal, metal casing, sticker protection cover				
B-end connector	Heavy-duty, metal casing, female terminal, metal casing, sticker protection cover				
Cable	Customized cables	Length	8 meters (standard)		

Schedule 4 Basic specifications and installation methods for external wiring of AIR170-3100 and above load heavy-duty power line interface.

No.	-	Name	AIR280-2700 cabinet external heavy-duty power	Device code	P04082001493
A-end connector	Heavy-duty, metal casing, female terminal, metal casing, sticker protection cover				
B-end connector	Heavy-duty, metal casing, female terminal, metal casing, sticker protection cover				
Cable	Customized cables	Cable	Customized cables		



Tip

- The two types of external heavy-duty power harnesses corresponding to ARC5-280 control are distinguished based on the different loads of the main body.
- The definition of heavy-duty interfaces can be found in Chapter 3.3.

### External wiring of teaching pendant interface

The basic specifications and installation method of ARC5-280 teaching pendant wiring harness are detailed in Schedule 5.

Schedule 5 ARC5-280- Basic specifications and installation method of teaching pendant wiring harness

No.	-	Name	ARCC-Teaching pendent external harness-10 meters	Device code	P04082000587
A-end connector	M23 female head				
B-end connector	Teach pendant				

Cable	A total of 14 cores, of which 4 are super Category 5 network cables, and the remaining 10 are directly connected	Length	10 meters
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Tip

Refer to Chapter 5.4 for the definition of the teach pendant interface end

### External wiring of power interface

The basic specifications and installation methods of the power wire harness corresponding to ARC5-280 are detailed in Chapter 3.3.

### User DO interface external wiring

The basic specifications and installation method of ARC5-280 user DO terminal module cables are detailed in Schedule 6.

Schedule 6 ARC5-280- Basic specifications and installation method of user DO terminal module cables

No.	-	Name	inCube20- User DO terminal module	Device code	P04082001305
A-end connector	Weidmuller, C2P 3.50_36_180LR SN OR BX quick plug terminal connector				
B-end connector	European style cold pressed terminal				
Cable	36 core 0.3mm <sup>2</sup>				



Tip

- The connector wire sequence at both ends of the inCube20 user DO terminal module cable corresponds one-to-one with the number tube label.
- The cable numbers of the inCube20 user DO terminal module correspond one-to-one with the control cabinet and user DO interface numbers.
- If selecting a wiring harness, it is recommended to choose a cable with a wire diameter of AWG26-AWG16.

### User DI interface external wiring

The basic specifications and installation method of ARC5-280 user DI terminal module cables are detailed in Schedule 7.

Schedule 7 ARC5-280- Basic specifications and installation method of user DI terminal module cables

No.	-	Name	inCube20- User DI terminal module	Device code	P04082001304
A-end connector	Weidmuller, C2P 3.50_36_180LR SN OR BX quick plug terminal connector				
B-end connector	European style cold pressed terminal				
Cable	36 core 0.3mm <sup>2</sup>				

 <p>Tip</p>	<ul style="list-style-type: none"> <li>■ The connector wire sequence at both ends of the inCube20 user DI terminal module cable corresponds one-to-one with the number tube label.</li> <li>■ The cable number of the inCube20 user DI terminal module corresponds one-to-one with the control cabinet and User DI interface number.</li> <li>■ If selecting a wiring harness, it is recommended to choose a cable with a wire diameter of AWG26-AWG16.</li> </ul>
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**RS232 interface external wiring**

The basic specifications and installation method of external wiring for ARC5-280 RS232 interface are detailed in Schedule 8.

Schedule 8 ARC5-280- RS232 interface external wiring basic specifications and installation method

No.	-	Name	SCRC10- RS232 harness outside the cabinet	Device code	P04082000843
A-end connector	Weidmuller, C2P 3.50/06/180F SN BK BX quick plug terminal type connector				
B-end connector	D_ SUB, DB9 male, plug, plastic casing				
Cable	3x0.25mm <sup>2</sup> shielding wire	Length	3 meters		

**PLC-RS485 interface external wiring**

The basic specifications of ARC5-280 PLC-RS485 cables are detailed in Schedule 9.

Schedule 9 ARC5-280- Basic specifications for external expansion Modbus cables

No.	-	Name	SCRC10- RS485 harness outside the cabinet	Device code	P04082000844
A-end connector	Weidmuller, C2P 3.50/06/180F SN BK BX quick plug terminal type connector				
B-end connector	Cold-pressed terminal				
Cable	2x2x0.25mm <sup>2</sup> shielded twisted-pair cable	Length	5 meters		

**MF-RS485 interface external wiring**

The basic specifications of ARC5-280-MF-RS485 cables are the same as Schedule 8.

**Ethernet interface external wiring**

The basic specifications of industrial network cables are detailed in Schedule 10.

Schedule 10 Basic specifications of inCube20 industrial network cable

No.	-	Name	Industrial network cable	Device code	P04082000279
Brand	Hellolink	Cable	4-core AWG26	Length	5 meters

## EtherCAT interface external cable

The basic specifications of industrial network cables are the same as Schedule 9.

## Servo Debugger external wiring

The basic specifications of the USB to RS422/RS485 cable are detailed in Schedule 11.

Schedule 11 Basic specifications of USB to RS422/RS485 cable

No.	-	Name	USB to RS422/RS485 cable	Device code	P04082000251
A-end connector		DB9	Brand/Model	Z-TEK	
B-end connector		USB	Brand/Model	Z-TEK	
Cable		5-core	Length	1.8 meters	

## Related options for gusset plates

The basic specifications and installation method of ARC5-280 installation gusset plate are detailed in Schedule 12 and Schedule 13.

Schedule 12 Basic specifications of MCBS-IEB gusset plates

No.	-	Name	MCBS-IEB gusset plate	Device code	P05245000108
Illustrate		Clamping plate, install screws using 4 cross recessed pan head combination screws M4X8			

Schedule 13 Basic specifications of MCBS and gusset board gusset plates

No.	-	Name	ARC5-MCBS and gusset board connection plate	Device code	P04082001166
A-end connector		Hirose, DF50S-50DS-1C			
B-end connector		Hirose, DF50S-50DS-1C			



The DF50S point numbers at both ends correspond one-to-one.

## J3\J5 interface external wiring

The basic specifications of PWM and analog output voltage and current input cables are detailed in Schedule 14.

Schedule 14 The basic specifications of PWM and analog output voltage and current input cables

No.	-	Name	PWM and analog output voltage and current input cable	Device code	P04082000594
A-end connector		Hirose, DF51-10DS-2C			

B-end connector	European terminals C0.5-8		
Cable	10CX0.2mm <sup>2</sup>	Length	5 meters

### J6\J7 interface external wiring

The basic specifications of the shared wiring harness between the magnetic grating ruler and the CAN\_ encoder are detailed in Schedule 15.

Schedule 15 The basic specifications of the shared wiring harness between the magnetic grating ruler and the CAN\_ encoder

No.	-	Name	Magnetic grating ruler and CAN_ encoder share the same wiring	Device code	P04082000596
A-end connector	Jingyuan Rong SCSI 14P M				
B-end connector	European terminals C0.5-8				
Cable	Jingyuanrong 10.0 twelve core (6 pairs) shielded braided black wire, $\phi$ 10	Length	5 meters		

### ARC5-280 cable entry assembly

The outgoing cables of the ARC5-280 control cabinet need to enter the cabinet from the cable entry component on the right side of the control cabinet, as shown in Figure 6-1. The control cabinet is equipped with a set of cable entry components as standard, each containing 1 cable entry frame, 4 small cable cores, and 6 module plugs:

- The 4 cable cores are 1 KT8, 2 KT12, and 1 KT4/5 respectively;
- The 6 module plugs are 2 ST12 and 4 ST5 respectively (see Schedule 16 for the corresponding relationship between the core piercing and plug model specifications).

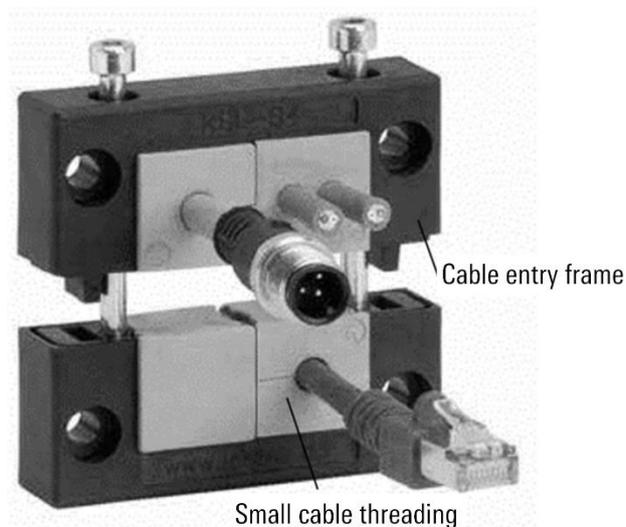
When this cable entry component is installed as standard, 6 module plugs will be installed on 2 KT12 and 1 KT4/5 cable cores, and the power cord will be introduced into the cabinet through the KT13 cable cores. To meet the introduction needs of more wiring harnesses, a space for another cable introduction component is also reserved above the standard introduction component. Customers can choose appropriate cable core specifications based on the cable outer diameter of the selected wiring harness accessories (or customer made). The wire diameter and corresponding single core cable threading model of the accessories in Appendix A are shown in Schedule 16.

Schedule 16 ARC5-280 control cabinet entry cable single core cable penetration model table

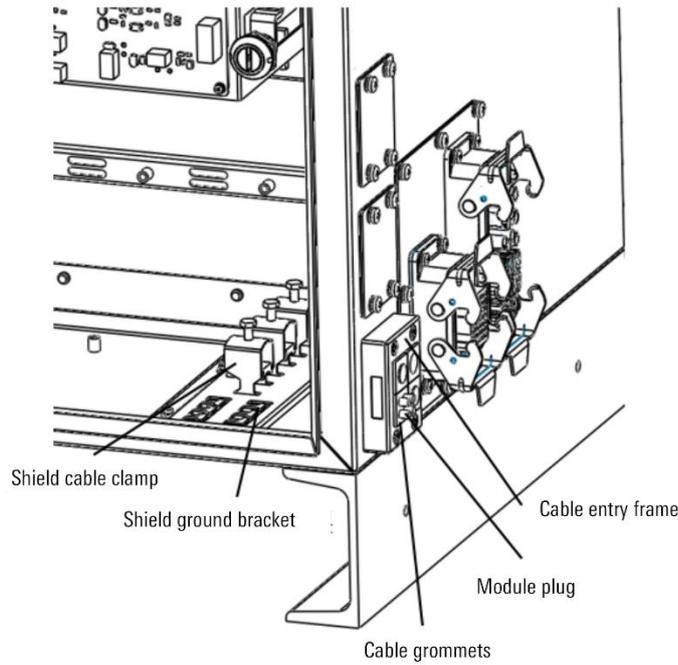
Name of incoming cable	Incoming cable part number	Introducing Cable Properties	Cable core model	Cable threading part number
Power line	P04081000024	Standard (outer diameter 13.4mm)	KT13	P01055001499
SCRC10- RS232 harness outside the cabinet	P04082000843	Optional (outer diameter 4mm)	KT4	P01055001548
SCRC10- RS485 wiring harness outside the cabinet	P04082000844	Optional (outer diameter 4mm)	KT4	P01055001548

Name of incoming cable	Incoming cable part number	Introducing Cable Properties	Cable core model	Cable threading part number
SCRC10- RS485 harness outside the cabinet	P04082000844	Optional (outer diameter 4mm)	KT4	P01055001548
Industrial network cable	P04082000279	Optional (outer diameter 5mm)	KT5	P01055001619
	P04082000279	Optional (outer diameter 5mm)	KT5	
inCube20- User DI terminal module cable	P04082001304	Optional (outer diameter 12mm)	KT12	P01055001617
inCube20- User DO terminal module cable	P04082001305	Optional (outer diameter 12mm)	KT12	P01055001617
PWM and analog output_voltage and current input cables	P04082000594	Optional (outer diameter 10mm)	KT10	P01055001500
Magnetic grating ruler and CAN_Encoder shared wiring harness	P04082000596	Optional (outer diameter 6mm)	KT6	P01055001498

When installing the cable introduction component to introduce the wiring harness, it is necessary to first connect the internal part of the cabinet that has been connected to the wiring harness, adjust the wiring routing inside the cabinet, and then clip the introduced wiring harness into the small cable core (if the introduced wiring harness has a shielding layer, it needs to be peeled off and exposed at a suitable position, and after the installation of the introduction component is completed, use a cable clamp to press its shielding layer onto the grounding bracket); After adjusting the inner part of the wiring harness cabinet, fix the small cable through the core in the lead-in frame (replace the position where the cable does not need to pass through the core with a core plug), and lock the upper and lower parts of the frame with screws, and fix the entire component on the cabinet side with screws.



(a)



(b)

Figure1 Use of cable entry

In addition to the single core cables provided in Schedule 16, customers can also combine different specifications of cable cores according to the actual cable outer diameter and quantity used. If there are many cables introduced, a set of cable entry components can also be added in the reserved position. The specifications and models of cable entry accessories available for selection are shown in Schedule 17.

Schedule 17 ARC5-280 control cabinet cable entry accessories specification and model table

Name	Cable core model	Cable threading part number	Specifications
Cable entry frame	KEL 6/4	P01055001496	Opening size: 46mm x46mm, height 17mm
Small cable threading	KT2	P01055001621	Outer diameter 2mm~3mm
Small cable threading	KT3	P01055001540	Outer diameter 3mm~4mm
Small cable threading	KT4	P01055001548	Outer diameter 4mm~5mm
Small cable threading	KT5	P01055001619	Outer diameter 5mm~6mm
Small cable threading	KT6	P01055001498	Outer diameter 6mm~74mm
Small cable threading	KT7	P01055001622	Outer diameter 7mm~8mm
Small cable threading	KT8	P01055001539	Outer diameter 8mm~9mm
Small cable threading	KT9	P01055001624	Outer diameter 9mm~10mm
Small cable threading	KT10	P01055001500	Outer diameter 10mm~11mm
Small cable threading	KT11	P01055001625	Outer diameter 11mm~12mm
Small cable threading	KT12	P01055001617	Outer diameter 12mm~13mm
Small cable threading	KT13	P01055001499	Outer diameter 13mm~14mm

Name	Cable core model	Cable threading part number	Specifications
Small cable threading	KT14	P01055001626	Outer diameter 14mm~15mm
Small cable threading	KT15	P01055001627	Outer diameter 15mm~16mm
Small cable threading	KTs16	P01055001628	Outer diameter 16mm
Small cable threading	KT2/3	P01055001629	Outer diameter 2xφ3mm
Small cable threading	KT2/4	P01055001630	Outer diameter 2xφ4mm
Small cable threading	KT2/5	P01055001497	Outer diameter 2xφ5mm
Small cable threading	KT2/6	P01055001631	Outer diameter 2xφ6mm
Small cable threading	KT2/7	P01055001632	Outer diameter 2xφ7mm
Small cable threading	KT2/8	P01055001633	Outer diameter 2xφ8mm
Small cable threading	KT4/3	P01055001634	Outer diameter 4xφ3mm
Small cable threading	KT4/4	P01055001635	Outer diameter 4xφ4mm
Small cable threading	KT4/5	P01055001618	Outer diameter 4xφ5mm
Small cable threading	KT4/6	P01055001636	Outer diameter 4xφ6mm
Core piercing plug	BTK	P01055001504	-
Module plug	ST2	P01055001637	Φ2mm
Module plug	ST3	P01055001638	Φ3mm
Module plug	ST4	P01055001639	Φ4mm
Module plug	ST5	P01055001640	Φ5mm
Module plug	ST6	P01055001641	Φ6mm
Module plug	ST7	P01055001642	Φ7mm
Module plug	ST8	P01055001643	Φ8mm
Module plug	ST9	P01055001644	Φ9mm
Module plug	ST10	P01055001645	Φ10mm
Module plug	ST11	P01055001646	Φ11mm
Module plug	ST12	P01055001647	Φ12mm
Module plug	ST13	P01055001648	Φ13mm
Module plug	ST14	P01055001649	Φ14mm
Module plug	ST15	P01055001650	Φ15mm
Module plug	ST16	P01055001651	Φ16mm
Shielding layer cable clamp	UB12-18	P01055000002	-



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