

JAKA

Hardware User Manual



JAKA MiniCab

Original Instructions (en)

File Version: V03

Robot: Zu, Pro, S Series

The definition of collaborative robots follows the ISO standards and relevant national standards to protect the safety of operators. We do not recommend applying the robots directly to cases when the operating object is a human. However, if there is a need for the robot to operate on a human, the robot needs to be equipped with a safe, reliable, fully tested and certified safety protection system to protect the human, provided that the personnel safety is fully assessed by the user or application developer.

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We will regularly revise the manual, and the content may be updated without notice. Please check the factual product information carefully before reading this manual.

This manual is applicable to all products and/or services manufactured or provided by JAKA (hereinafter referred to as the "products"). The information contained in the manual is provided "as is" and is subject to the relevant laws and legislation. To the maximum extent permitted by law, this manual does not constitute any form of express or implied representation or warranty of JAKA, neither constitute a guarantee of merchantability, suitability for specific purposes, achievement of expected results, or non infringement of the products. JAKA assumes no responsibility for any error or omission that may appear in this manual, or any accident or indirect injury arising from the use of this manual and the products described therein. Before installing and operating the product, read this manual carefully.

The pictures in this manual are for reference only.

If the robot body is transformed or disassembled, JAKA will not be responsible for after-sales services.

JAKA reminds users that they must use safety equipment when using and maintaining JAKA robots and must comply with the safety terms.

Programmers of JAKA robots and designers and debugging personnel of robot systems must be familiar with the way to program JAKA robots and install system applications.

More Information

For more product information, scan the QR code on the right to visit our official website: www.jakarobotics.com.



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Foreword

JAKA MiniCab is a compact control cabinet with wide-voltage DC power supply, which can be used with JAKA Zu series, JAKA Pro series, JAKA C series, JAKA S series, JAKA A series and JAKA Mini series. This manual only covers the use with Zu series, Pro series, C series, S series and A series. For instructions on using with the Mini series, please refer to the JAKA Mini Series Hardware User Manual. It can seamlessly integrate into existing equipment and provide powerful performance for numerous applications. Equipped with a Wi-Fi, it can be widely used in AGV, hybrid robots, and other mobile platforms, and deployed in a tight workspace.

The robot pioneers in the control mode with a mobile terminal plus an App to connect the robot, so that one mobile terminal can connect multiple robots. Operators do not need to master professional programming technology, but only need to manually guide the robot to program. In this way, man-machine collaboration is easier, which greatly improves the productivity.

Product List

When you buy a MiniCab, the delivery you will receive is as shown in the following table:

No.	Name	Quantity
1	JAKA MiniCab	1
2	Control stick assembly	1
3	Pluggable terminals of power, emergency stop and I/O	3
4	Wi-Fi antenna	1
5	Brackets and compatible screws	2
6	Guide rail installation kit (optional)	1

1 Manual Instruction

1.1 About the Manual

The manual contains:

- Precautions for the use of the JAKA MiniCab
- Installation of the JAKA MiniCab
- Cleaning and maintenance of the JAKA MiniCab

1.2 Manual Reader

The manual is intended for:

- Operators
- Commissioning staff
- Maintenance staff
- Integrators

1.3 References

Documentations referred to in the manual:

- 1.7.1 JAKA App Software User Manual
- JAKA Mini Series Hardware User Manual
- JAKA Service Manual

**NOTE:**

All documents can be found in JAKA's official website www.jakarobotics.com.

1.4 Prerequisites

The reader should:

- Be trained by JAKA and have the required knowledge of mechanical and electrical installation/repair/maintenance work.
- Be trained to respond to emergencies or abnormal situations.






2 Safety Standard

2.1 Introduction

This chapter introduces the safety principles and standards that should be observed when using the robot or robot system. Users should carefully read and strictly abide by the content related to safety in this manual. Operators should fully recognize the complexity and danger of the robot system, and pay special attention to the content related to warning signs.


2.2 Safety Signals and Symbols



The danger level in this manual is described with the following safety symbols. Contents related to safety should be strictly observed.

Symbol	Description
	<p>WARNING: ELECTRICITY</p> <p>This sign indicates a potentially dangerous power consumption situation which, if not avoided, may result in injuries to personnel or serious damage to equipment.</p>
	<p>WARNING</p> <p>This sign indicates a potentially dangerous power consumption situation which, if not avoided, may result in injuries to personnel or serious damage to equipment.</p>
	<p>WARNING: HOT SURFACE</p> <p>This sign indicates a potentially dangerous hot surface that may result in injuries to personnel if touched.</p>
	<p>NOTICE</p> <p>This signal used to indicate important facts and conditions.</p>
	<p>NOTE</p> <p>This signal used to indicate additional information.</p>

2.3 Warnings and Cautions

This section focuses on the protection for operators and the relevant precautions of the first installation. Users need to read the safety warnings in this manual carefully. However, there are many possibilities, and it is impossible to cover all of them, we have described as many situations as possible herein.

Symbol	Description
	<p>WARNING: ELECTRICITY</p> <ol style="list-style-type: none"> 1. MiniCab must be installed/configured in strict accordance with the instructions and cautions provided in this manual. 2. The setting and modification of robot parameters must be carried out by authorized personnel to prevent unauthorized modification. 3. If operators use their own control cabinets, they are responsible for the risks incurred.

Symbol	Description
	<ol style="list-style-type: none"> Please ensure that all non-waterproof equipment remains dry. In case of water ingress, please lock and tag all power sources and contact JAKA technical service personnel. Please do not use non-original cables. When using the robot, please do not bend the cables.
	<p>WARNING</p> <ol style="list-style-type: none"> To prevent damage, refrain from connecting safety equipment to the standard I/O interface (use safety I/O interface). All safety-related signals should be designed redundantly (with two independent channels). Keep the two independent channels separate from each other to ensure that safety functions are not lost when one channel is in error. Confirm the accuracy of mounting settings, including mounting angles, Tool Center Point (TCP) position, tool mass, TCP offset and the robot's safety configuration. Ensure that tools and obstacles do not possess sharp corners or points and maintain a safe distance between all personnel and the robot. Ensure that tools and obstacles do not possess sharp corners or points and maintain a safe distance between all personnel and the robot. Connecting the robot to different machinery may increase existing hazards or introduce new ones. Conduct a comprehensive risk assessment for the entire system installation. The control cabinet operates with DC voltage input. Please use DC power supply properly. When using battery power, please consider the related risks associated with the battery.
	<p>WARNING: HOT SURFACE</p> <ol style="list-style-type: none"> The robot and MiniCab generate heat during operation. Do not touch the robot immediately after it stops, wait for about 1 hour after powering off before touching. MiniCab also generates heat. Do not put your hand on the MiniCab housing.

2.4 Liability and Risk

Liability

This manual does not involve any applications of how to design, install and operate the robot, nor does it involve any peripheral equipment that may affect the security of the robot system.

It is the responsibility of users of JAKA's robot to ensure that relevant practical national laws and regulations are followed, and that no significant hazards lie in the whole robot application.

All safety information in this manual cannot be considered as a guarantee of JAKA. Even if all safety instructions are followed, injuries or damage may still be caused by operators.

JAKA will keep improving the performance and reliability of our robots. We are not responsible for errors or omissions in this manual and reserve the right of final interpretation of this manual.

Risk

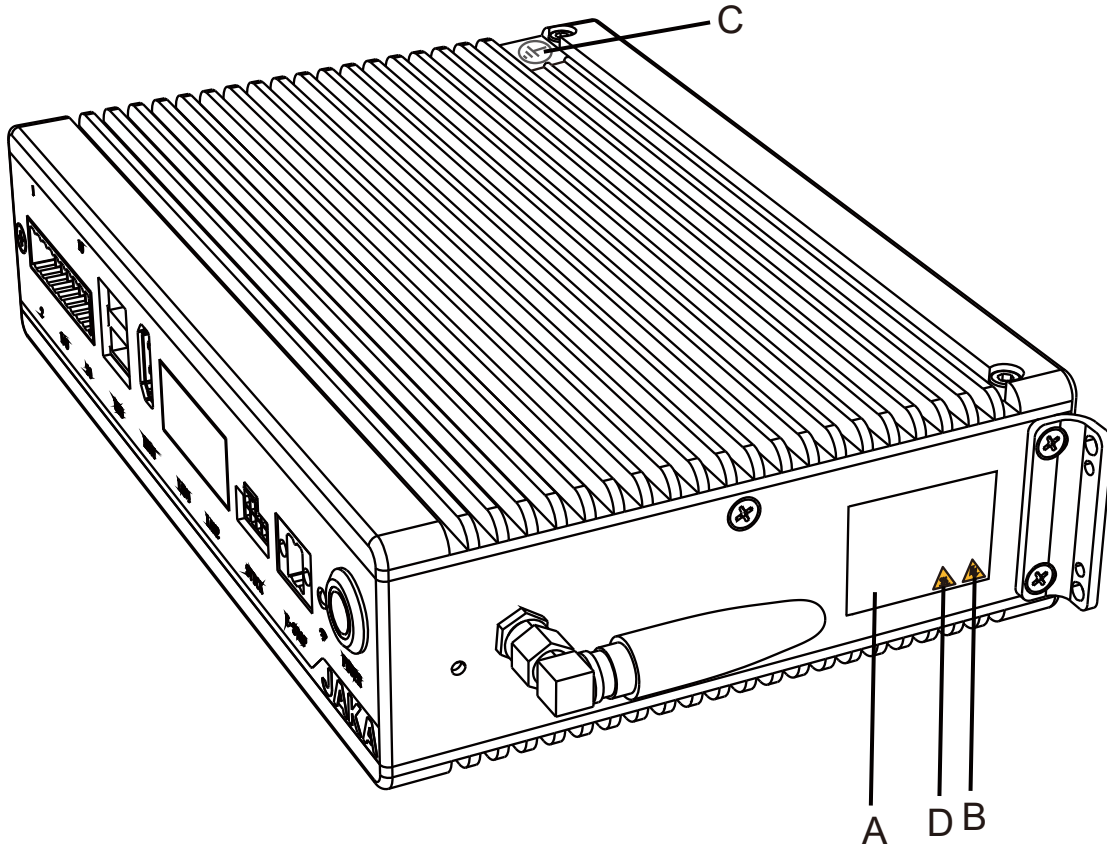
When there is interaction between operators and the robot, there is inevitably direct or indirect physical contact. When touching the robot, users must have sufficient awareness of self-protection. Users need to be cautious when using the robots. Some possible hazards are as follows:

- The robot drops and cause any injury when it is moved;
- The fastening bolts or screws of the robot get loose and cause any injury;
- During the operation, the robot pinches your fingers or collide with you;
- The robot causes any injury due to lack of prompt repair of faults;
- Potential danger when sharp-end actuators or sharp tool coupling ends are used;
- Potential injury when the robot is operated in toxic or corrosive environments;

- Robot in a strong magnetic environment.

2.5 Labels

The following labels are safety warning labels and product label on the control cabinet. During the operation, be sure to follow the instructions and warnings on the labels to ensure safety. Do not remove the labels casually. Handle labeled parts or units and their surrounding area with caution to avoid damage to the labels. Product labels and robot model figures are only for reference.



	Labels	Description
A		Product label
B		Beware of electric shock
C		Grounding
D		Warning hot surface

3 Quick Start Guide

Before reading this chapter, ensure that you have read in detail and fully understood the [2 Safety Standard](#).

This chapter introduces the connection of JAKA robots and the JAKA MiniCab as a preliminary understanding of the MiniCab. For detailed mechanical and electrical specifications, refer to other chapters.

If you need help, you can contact us via our quick counseling hot-line: **400-006-2665**.

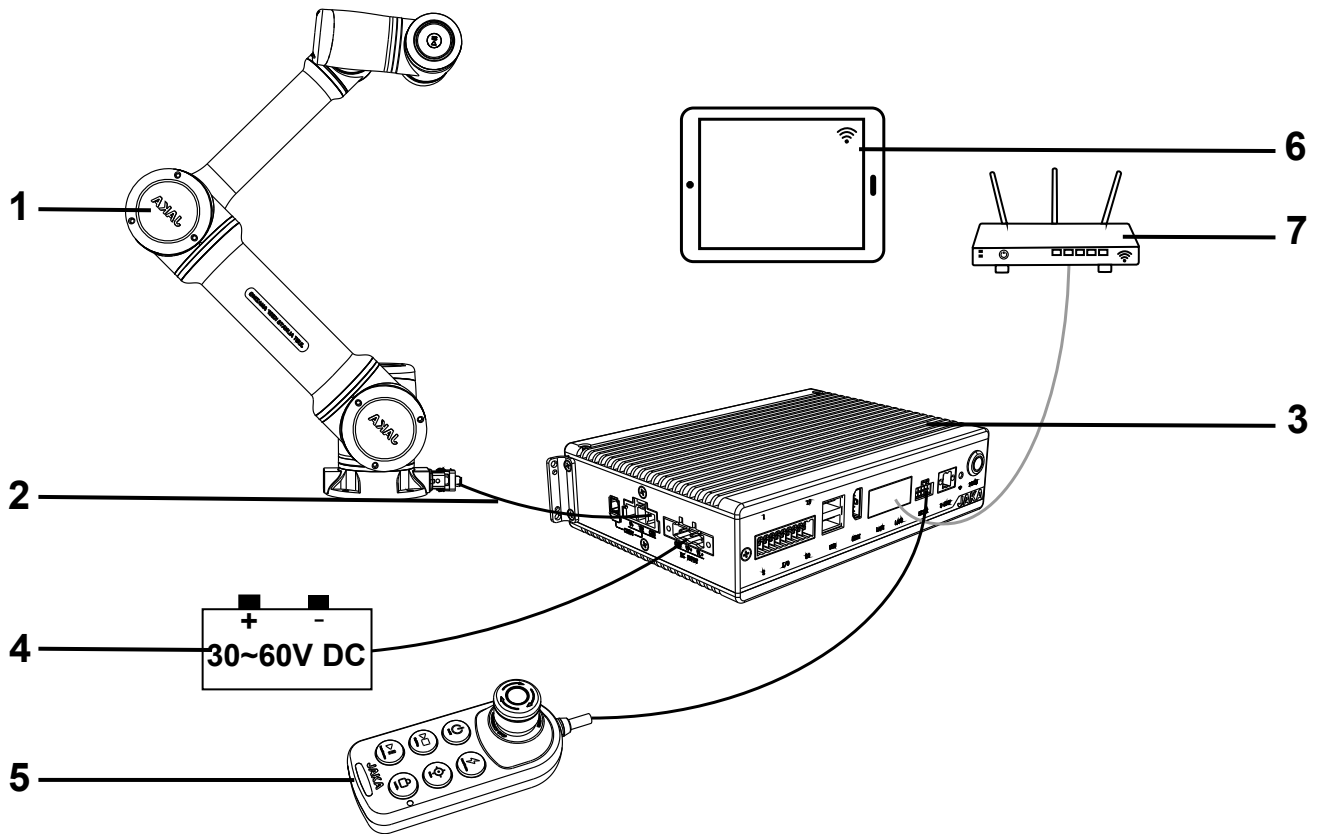
3.1 Compatibility with Robots

Compatibility of JAKA MiniCab with various series of JAKA robots is as follows:

Robot Model	Compatibility	Note
Zu 3	Applicable	
Zu 5 & Pro 5 & S 5	Applicable	
Zu 7 & Pro 7 & S 7	Applicable	
Zu 12 & Pro 12 & S 12	Applicable	The robot should be rerated, the limit is: <ul style="list-style-type: none"> ● Joint speed ≤ 180 °/s ● Joint acceleration ≤ 120 °/s² ● Linear speed ≤ 1800 mm/s ● Linear acceleration ≤ 600 mm/s²
Zu 18 & Pro 18	Applicable	
Zu 20	Inapplicable	
Pro 16	Inapplicable	

3.2 Typical Robot Applications

When the JAKA MiniCab is used with Zu series robots, Pro series robots and S series robots, the required components are as shown in figure below.



1. **Robot:** The main moving component to move as user desires. Ring-shaped light, buttons for dragging and programming, and an I/O interface for connecting tools (the TIO interface) are also arranged at the end of the body to indicate the robot's state.
2. **Robot connection cable:** Connect the robot and the control cabinet.
3. **Control cabinet:** The control cabinet includes the core computing components and various electrical interfaces.
4. **DC power supply:** The control cabinet operates with DC voltage input, supporting a wide voltage range of DC 30-60V. 48V power supply is recommended.
5. **Control stick:** Power on/off and enable on/off the robot, etc.
6. **Operation terminal:** The equipment for users to programming, set parameters, etc.
7. **Router and network cable:** The control cabinet comes with a Wi-Fi module that allows the operation terminal to connect with the control cabinet (the Wi-Fi name is the control cabinet number) to control the robot. It is also accessible to connect the network port of the control cabinet to the router and the operation terminal to the wireless network of this router at the same time. It is recommended to configure a specialized router for the robot to prevent conflicts with other devices.

3.3 Hybrid Robot Application



The JAKA MiniCab control cabinet can be used with mobile platforms such as AGV and can be powered by the 48V power battery inside the AGV. It is compact in size, making integration convenient and simple.

**NOTICE:**

When the MiniCab is integrated into the hybrid robot, the MiniCab must be connected to isolated power supply to avoid MiniCab burning. Refer to [7.2.1.2 Isolated Power Supply Connection](#) for connection method.

4 Technical Specifications

The technical specifications of the JAKA MiniCab are as follows.

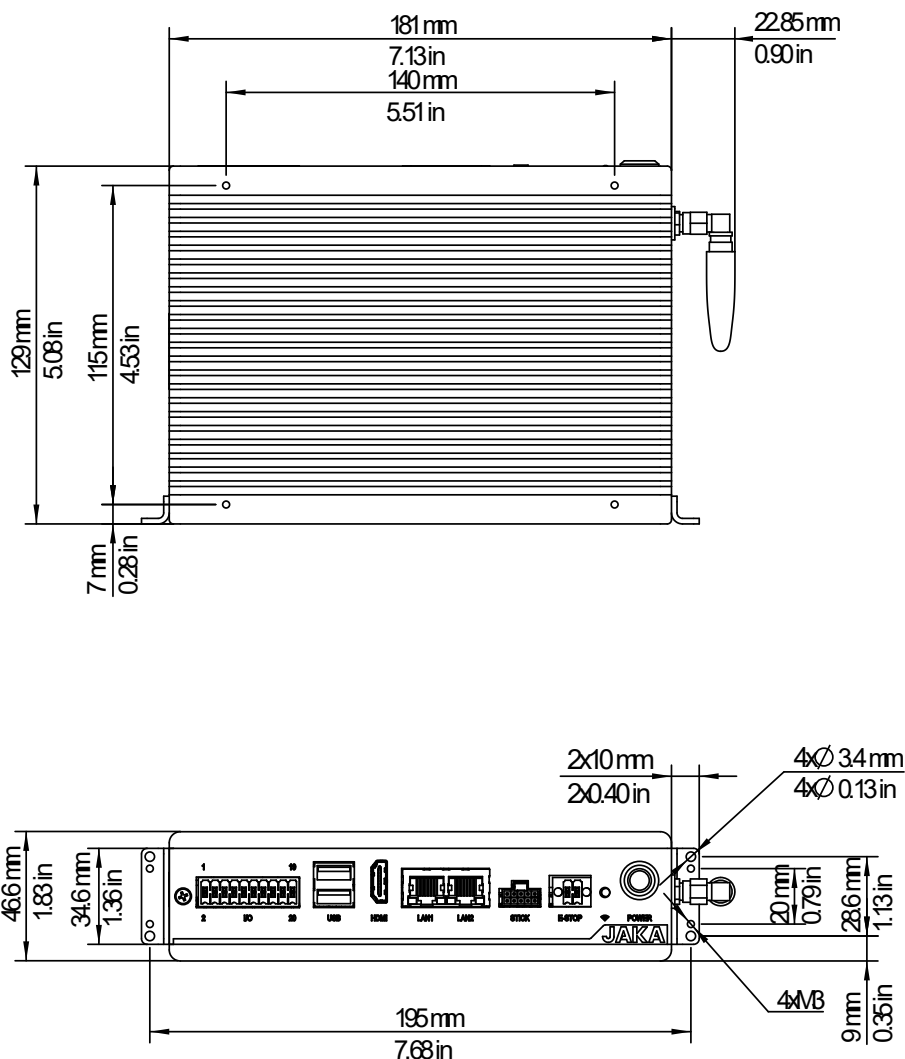
Model	MiniCab
Weight	1.1 kg (2.43 lb)
Dimension (W×H×D)	180×46.6×128 mm (7.09×1.84×5.04 in)
Temperature	0-50°C (32-122°F)
IP classification	IP20
Material	Steel, aluminum alloy
Power supply	DC 30V~60V
Communication mode	TCP/IP, Modbus TCP, Modbus RTU, PROFINET (1.7 App), Ethernet/IP (1.7 App)
I/O port	7 channels I/O multiplexing
I/O power supply	DC 24V

5 Mechanical Specifications

This chapter introduces the outline dimensions of MiniCab, the installation environment requirements, and mounting methods.

5.1 Outline Dimension

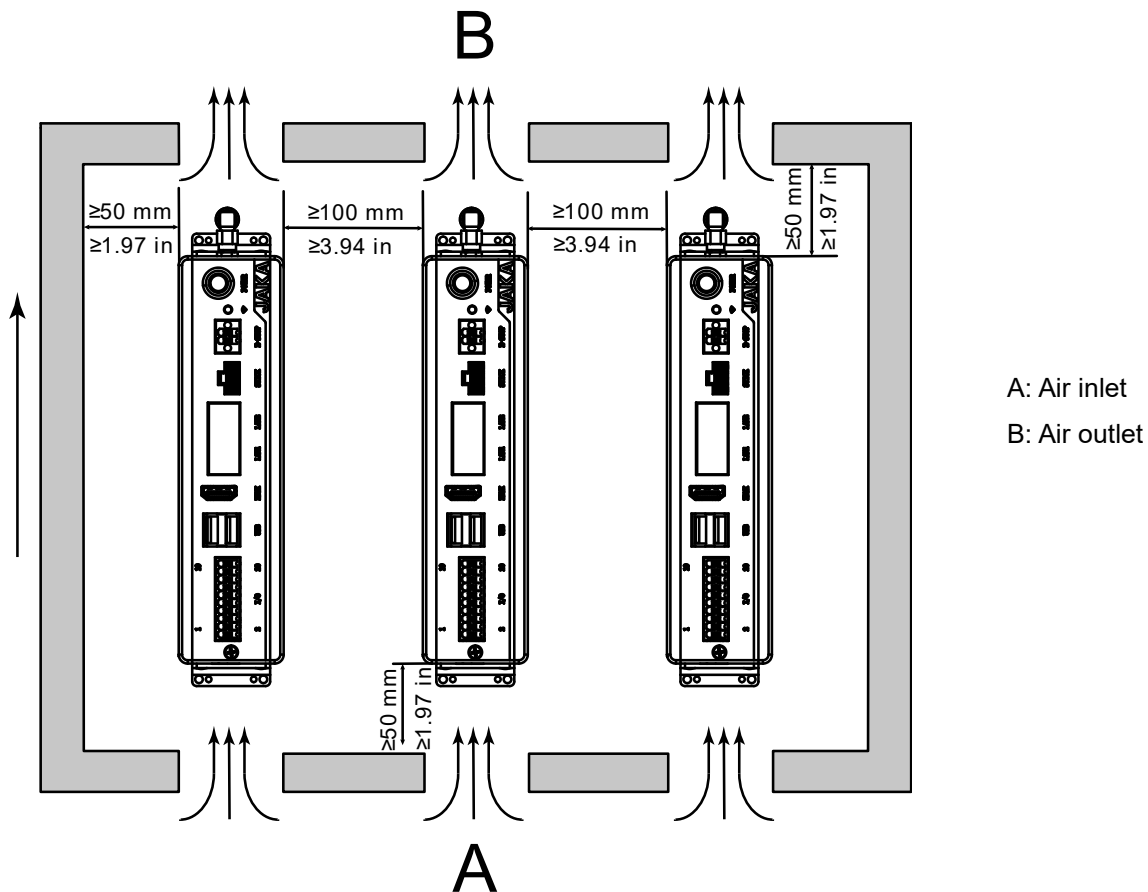
The outline dimension of the MiniCab is shown as follow. The accessories have two brackets by default. The MiniCab can be mounted by bracket mounting, bottom mounting and guide rail mounting. If it is mounted by guide rail mounting, guide rail components should be prepared.



5.2 Installation

5.2.1 Installation Environment

MiniCab needs to be installed in a dry place with good ventilation and cooled by natural convection. In situations where significant heat is generated, such as when the robot operates at high speeds, carries heavy loads, or brakes frequently, an external fan should be used to cool MiniCab. In order to ensure the MiniCab can be cooled by a fan or natural convection, please refer to the distance shown in the diagram for mounting the control cabinet. To meet the cooling requirements of the control cabinet, ensure a gap of at least 100 mm (3.94 in) between two MiniCabs, and a gap of at least 50 mm (1.97 in) on each side of the control cabinet.



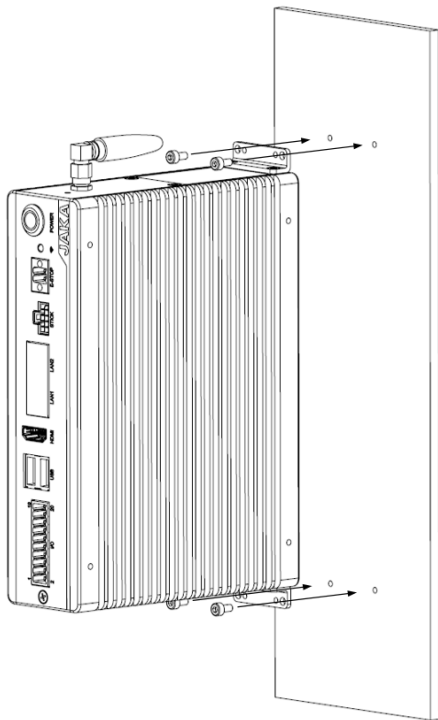
WARNING

1. Do not install in damp or water-splashed environment.
2. Do not use the equipment in enclosed spaces, which will lead to high temperature, shorten the service life, and even damage the equipment.
3. Keep away from heat sources such as stoves.
4. Do not use this product near corrosive and flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gases, acid, alkali, salt, combustible, etc.
5. Use MiniCab below an altitude of 1000 m (39370 in), and please derate if the altitude is above 1000 m (39370 in).

5.2.2 Mounting Methods

MiniCab should be mounted securely before using it. There are three mounting methods available. Refer to [4 Technical Specification](#) for the weight of the MiniCab.

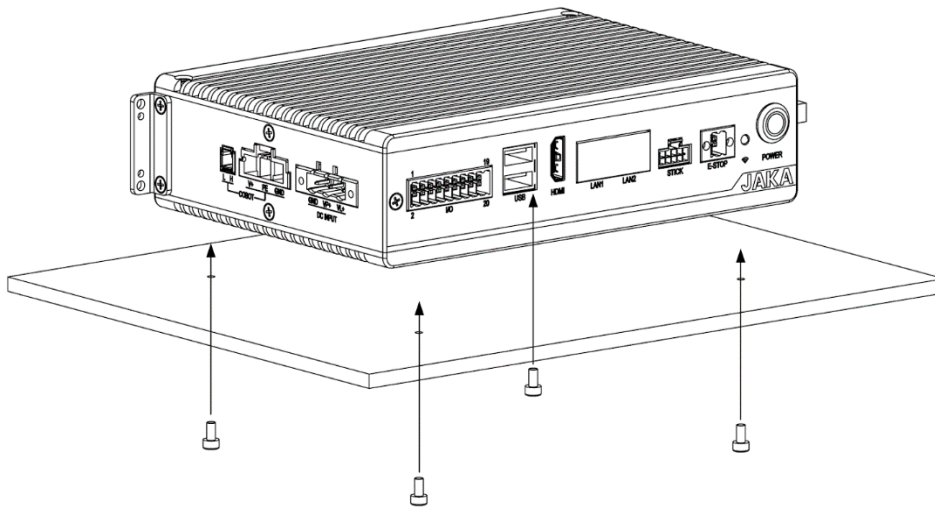
5.2.2.1 Bracket Mounting



The mounting steps are as follows:

	Steps	Tools and Specifications
1	According to the control cabinet's outline dimensions, drill four holes on the mounting plane.	
2	Align the holes of the brackets and mounting plane, and secure two brackets by screws.	Screw type: M3 Screw quantity: 4 pcs Tightening torque: 0.6-0.8 Nm (5.31-7.08 lbf in)
3	Ensure that the mounting surface is smooth and free of vibration and confirm that the control cabinet is securely mounted.	When the mounting plane is mobile, to reduce the impact of vibration on MiniCab during movement, it is recommended to add a rubber gasket between MiniCab and the mounting plane.

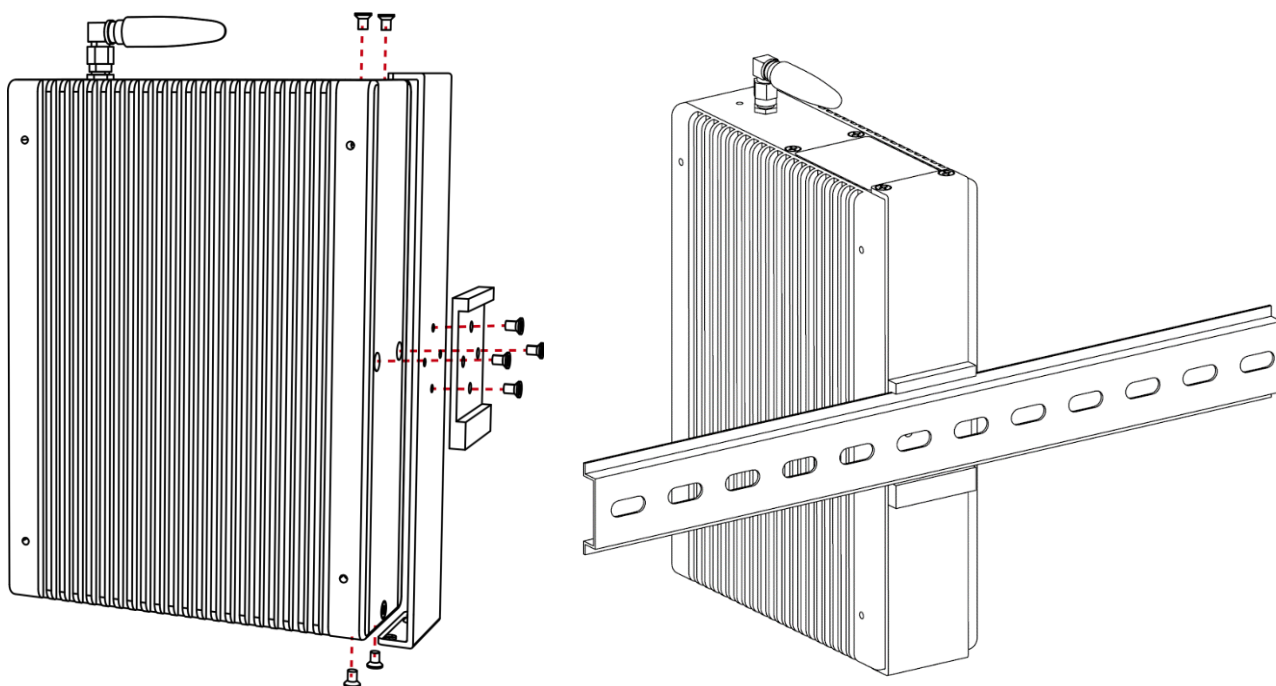
5.2.2.2 Bottom Mounting



The mounting steps are as follows:

	Steps	Tools and Specifications
1	According to the control cabinet's outline dimensions, drill four holes on the mounting plane.	Aperture: 3.4 mm (0.13 in)
2	Align the holes of the control cabinet bottom and mounting plane, and secure the control cabinet by screws.	Screw type: M3 Screw quantity: 4 pcs Tightening torque: 0.6-0.8 Nm (5.31-7.08 lbf in)
3	Ensure that the mounting surface is smooth and free of vibration and confirm that the control cabinet is securely mounted.	When the mounting plane is mobile, to reduce the impact of vibration on MiniCab during movement, it is recommended to add a rubber gasket between MiniCab and the mounting plane.

5.2.2.3 Guide Rail Mounting



The rail mounting accessories and rail clamp are optional accessories. If you need to mount MiniCab on the guide rail, please contact the JAKA technicians to acquire these accessories. The mounting steps are as follows:

	Steps	Tools and Specifications
1	Align the mounting holes on the rail mounting accessories with the four mounting holes on the side panels of the control cabinet, then use screws to secure them together.	Screw type: M3 Screw quantity: 4 pcs Tightening torque: 0.6-0.8 Nm (5.31-7.08 lbf in)
2	Align the mounting holes on the rail clamp with the four mounting holes on the rail mounting accessories, then use screws to secure them together.	Screw type: M3 Screw quantity: 4 pcs Tightening torque: 0.6-0.8 Nm (5.31-7.08 lbf in)
3	Mount the MiniCab with the rail mounting accessories onto the guide rail.	

6 Electrical Characteristics

6.1 Introduction

This chapter mainly introduces the absolute maximum ratings and recommended usage conditions of MiniCab.



WARNING

It is imperative for users to adhere to the recommended electrical parameters when using the robot and MiniCab. Exceeding the maximum ratings may result in hardware damage.

6.2 Absolute Maximum Ratings

		Min.	Max. ⁱ
VL+	Control cabinet power voltage (V)	-0.3	70
VP+	Robot power voltage (V)	-0.3	70
V _{UDIO_COM+}	Integration interface common terminal voltage (V)	-0.3	30
I _{UDIO_24V}	Integration interface output current (A)	0	2.7
I _{UDIOx}	Integration interface single channel output current (A)	0	2
V _{busRS485}	RS485 bus withstand voltage (V) ⁱⁱ	-70	70

i: When the actual value exceeds the maximum value, it may cause permanent damage to the equipment. The maximum value represents the limit, and it is not recommended to use the equipment under this condition or any other condition exceeds the recommended conditions.

ii: Except the bus withstand voltage, all voltage values are related to grounding.

6.3 Recommended Conditions

		Min.	Typ.	Max.
VL+	Control cabinet power voltage (V DC)	18 ⁱ	48	60
VP+	Robot power voltage (V DC)	32 ⁱⁱ	48	58
I _{RMS}	Average operating current (A)			20
I _{peak}	Peak output current (A)		40	60 ⁱⁱⁱ
I _{UDIOx}	I/O interface single channel output current (A)		1	
	Ambient temperature (°C/°F)	0/32		50/122 ^{iv}
	Atmospheric pressure (Bar)		1	
	Altitude (m/in)		1000 / 39370	

		Min.	Typ.	Max.
	Humidity (%RH)	10		90

i: The minimum control cabinet voltage is the voltage that can activate functions of the control cabinet, but the output value of the UDIO_24V depends on the control cabinet supply voltage.

ii: The robot power supply provides power to the robot. Typically, the robot will trigger under voltage protection when the voltage is $\leq 30V$. When selecting a power supply, it is necessary to consider voltage loss and abnormalities caused by voltage drop.

iii: The peak output current value is related to the robot model and operating status. For some robots, derating is required when they are used with the MiniCab, the derating value refers to [3.1 Compatibility with Robots](#).

iv: The surface of the control cabinet is hot during operation, which is required to be used in well-ventilated and heat-dissipating conditions.

6.4 Typical Power Consumption

Test condition: 25°C, 48V control cabinet power supply, 48V robot power supply, robot and integrated interface not connected, control stick connected.

Parameters	Typ.	Max.
Power down the MiniCab (W)	1	5
Power up the MiniCab (W)	12	30
Power on the robot (W)	25	33

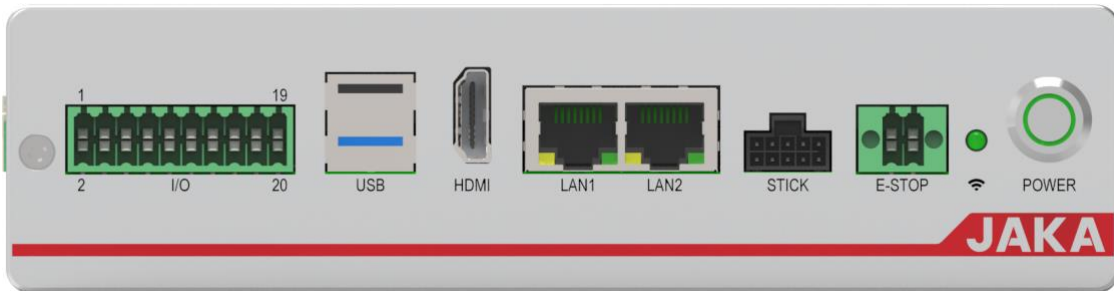
6.5 IPC Characteristics

CPU	Intel(R) Celeron(R) CPU J1900 1.99GHz
RAM	DDR3L 2G
Hard drive	64G
Interfaces	HDMI*1、USB3.0*1、USB2.0*1、Ethernet*2

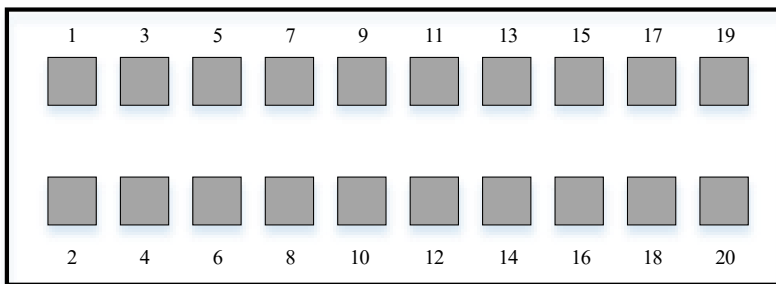
7 Electrical Interface

MiniCab has user interfaces on the front panel and side panel. The front panel includes I/O, two USB, a HDMI, two LAN, a control stick and an E-STOP interface, a Wi-Fi status indicator and a POWER button. The side panel includes a power input interface, a robot connection cable interface, a 2.4G Wi-Fi antenna, and a network reset button.

7.1 Front Panel Interfaces



7.1.1 I/O Interfaces



The front panel of the control cabinet has a 20 PIN I/O interface, the specifications of these PINs are as the table below.

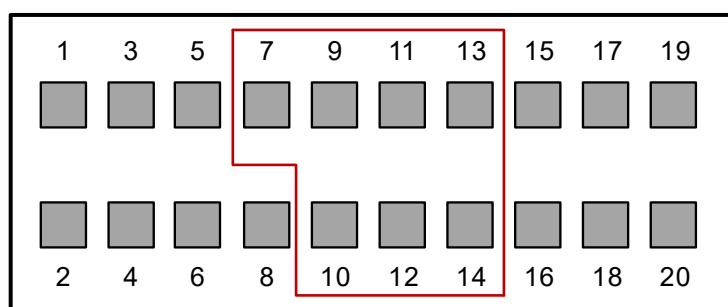
PIN	Signal Name	Signal Type	Description
1	UDIO_24V	PO	Integrated interface 24V power output, internal integrated 2.7A over current protection function
2	VUDIO_COM+	PI	Common terminal of user interface power, default external short connect to PIN1
3	UDIO_24V	PO	Integrated interface 24V power output, same as PIN1
4	GND	PO	User interface power logic ground
5	Remote_OFF	I	Remote powering down input, connecting to 24V to power down the MiniCab
6	GND	PO	User interface power logic ground, same as PIN4
7	I/O_4	I/O	I/O multiplexing channel 4, or safety I/O channel 2 (NPN type)

PIN	Signal Name	Signal Type	Description
8	Remote_ON	I/O	Remote powering up input, connecting to +24V to power up the MiniCab
9	I/O_3	I/O	I/O multiplexing channel 3, or safety I/O channel 2 (NPN type)
10	I/O_7	I/O	I/O multiplexing channel 7, or safety input channel 3 (NPN type)
11	I/O_2	I/O	I/O multiplexing channel 2, or safety I/O channel 1 (NPN type)
12	I/O_6	I/O	I/O multiplexing channel 6, or safety input channel 3 (NPN type)
13	I/O_1	I/O	I/O multiplexing channel 1, or safety I/O channel 1 (NPN type)
14	I/O_5	I/O	I/O multiplexing channel 5, NPN type
15	Reserved_CANH	I/O	For internal debugging only
16	Reserved_CANL	I/O	
17	MasterBus_RS485A	I/O	Master station interface of RS485 that usually used to extend the RS485 interface of I/O board
18	MasterBus_RS485B	I/O	
19	SlaveBus_RS485A	I/O	Slave station interface of RS485 that usually used to communicate with PLC and other external devices
20	SlaveBus_RS485B	I/O	

When wiring, select the wire that matches the terminal. The requirements for the wires are as follows:

Terminal Model	Recommended PIN Connector	Wires
DEGSON: 15EDGKNHB-3.5-20P-14-18A(H)	China: E0512 Overseas: PHOENIX AI1-12RD-Ferrule	0.75 mm ² & 17AWG Length < 30 m (1181 in)

7.1.1.1 Digital I/O Interfaces



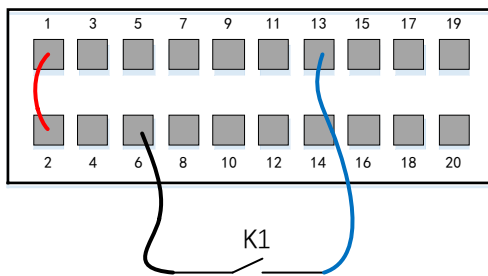
Digital I/O has 7 digital signal interfaces, each I/O channel simultaneously has NPN input and output functions. You can set the function of each interface in the App. Only one interface type can be selected for each channel

at the same time. For example, if I/O_1 is set as DI, it cannot be set as DO at the same time.

1. Digital input:

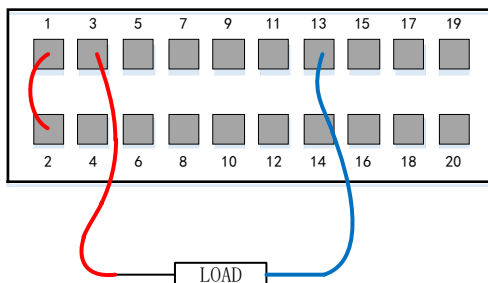
UD IO_COM	Low Level Range
24V	0~7V

When configured as DI, it is an NPN type input, and IO_1 (PIN13) is valid when shorted to GND (PIN6). When using internal UDIO_24V, please short PIN1 and PIN2. Taking DI_1 as an example, the wiring diagram for other DI interfaces is the same. The wiring diagram is as follows:

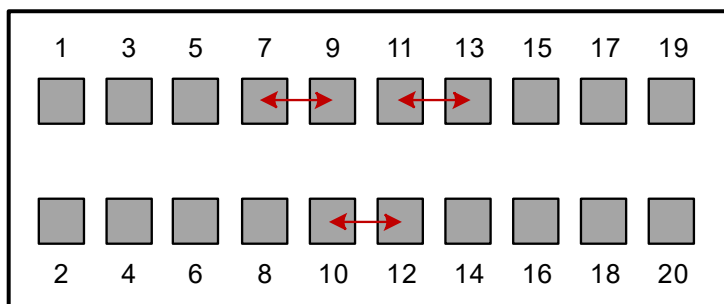


2. Digital output:

When configured as DO, it is an NPN type output, which uses an open collector output internally and is connected with a freewheeling diode. It supports a maximum output current of 1A. When using internal UDIO_24V, please short PIN1 and PIN2. Taking DO_1 as an example, the wiring diagram for other DO interfaces is the same. The wiring diagram is as follows:



7.1.1.2 Safety I/O Interfaces



The safety I/O function is only supported in software versions 1.7.1.37 and above. Therefore, before using the safety I/O function, an upgrade is required. The version requirements are as follows:

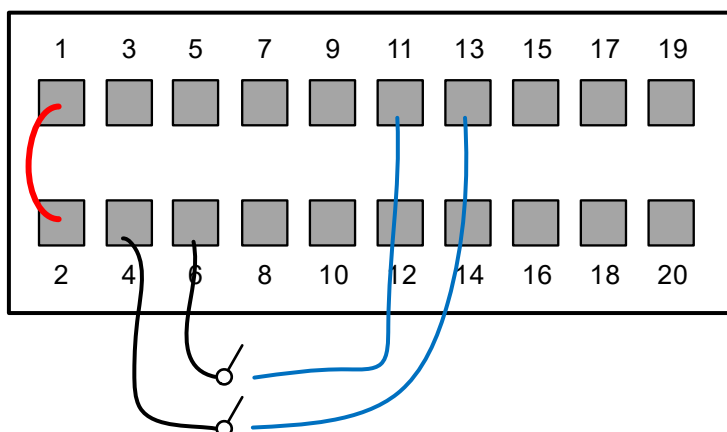
Type	Version
JAKA App	1.7.1.37 and above
Controller	1_7_1_36 and above
PSCB	03_02_PR and above
Servo	R3196 and above

For update steps, please refer to the software user manual. Contact JAKA technician to obtain the update installation package.

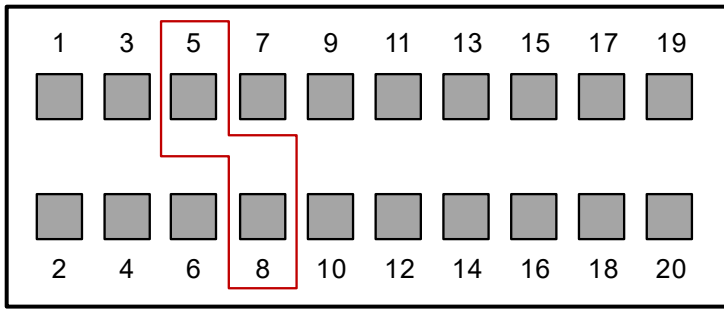
To ensure the safety function of the robot, the digital I/O interfaces I/O_1, I/O_2, I/O_3, I/O_4, I/O_6, and I/O_7 in the control cabinet can be configured as dedicated safety I/O. Among them, I/O_6 and I/O_7 can only be configured as safety DI, and can only be configured for protective stop function. The other four channels can be configured as safety DI or safety DO. The electrical specifications of the safety I/O interfaces are the same as the digital I/O interfaces. The safety I/O is designed with dual redundancy, so if one channel fails, the safety function still works. Therefore, when wiring, a pair of safety I/O should be connected simultaneously. For example, when connecting I/O_1, I/O_2 must be connected at the same time. The pairing relationship of the safety I/O is as follows:

DI	DO	Interface
DI1 & DI2	DO1 & DO2	PIN13 & PIN11
DI3 & DI4	DO3 & DO4	PIN9 & PIN7
DI6 & DI7		PIN12 & PIN10

Taking the DI1 & DI2 as an example, the wiring diagram is as follows (When using internal UDIO_24V, please short PIN1 and PIN2):



7.1.1.3 Remote On/Off

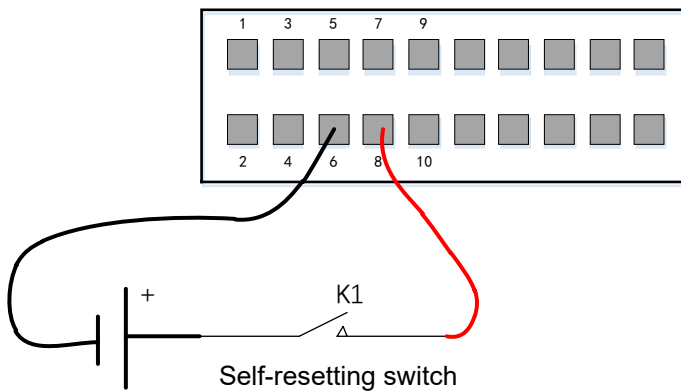


MiniCab can be powered on after power is supplied for 4 seconds. Besides using the power on/off button on the control stick and the POWER button on the front panel of the control cabinet, MiniCab can also be remotely powered on and off by PIN5 and PIN8 of the I/O interface on the front panel of the control cabinet.

When using an external power on/off button, a self-resetting/momentary push button switch must be used, otherwise the remote power on/off operation may be ineffective.

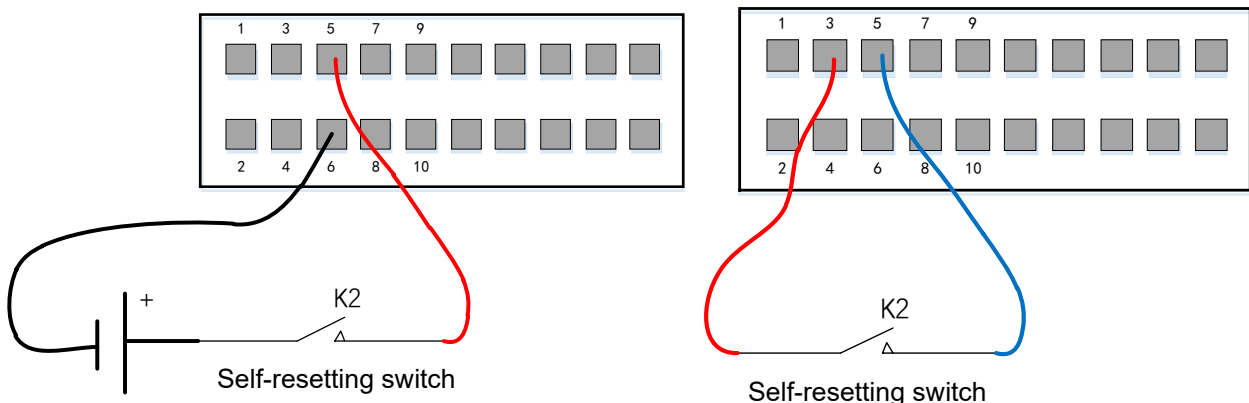
1. Power Up

The external DC 24V power supply is required. Connect the positive of the power supply to the PIN8 (Remote_ON) interface and the negative to PIN6 (GND). The diagram below shows the wiring diagram for remote powering up the MiniCab. Press K1 for about 1 second and release it to power up the control cabinet.



2. Power Down

If the external DC 24V power supply is used, connect the positive of the power supply to the PIN5 (Remote_OFF) interface and the negative to PIN6 (GND). It is also available when using internal UDIO_24V. Press K2 for more than 3 second to power down the control cabinet.



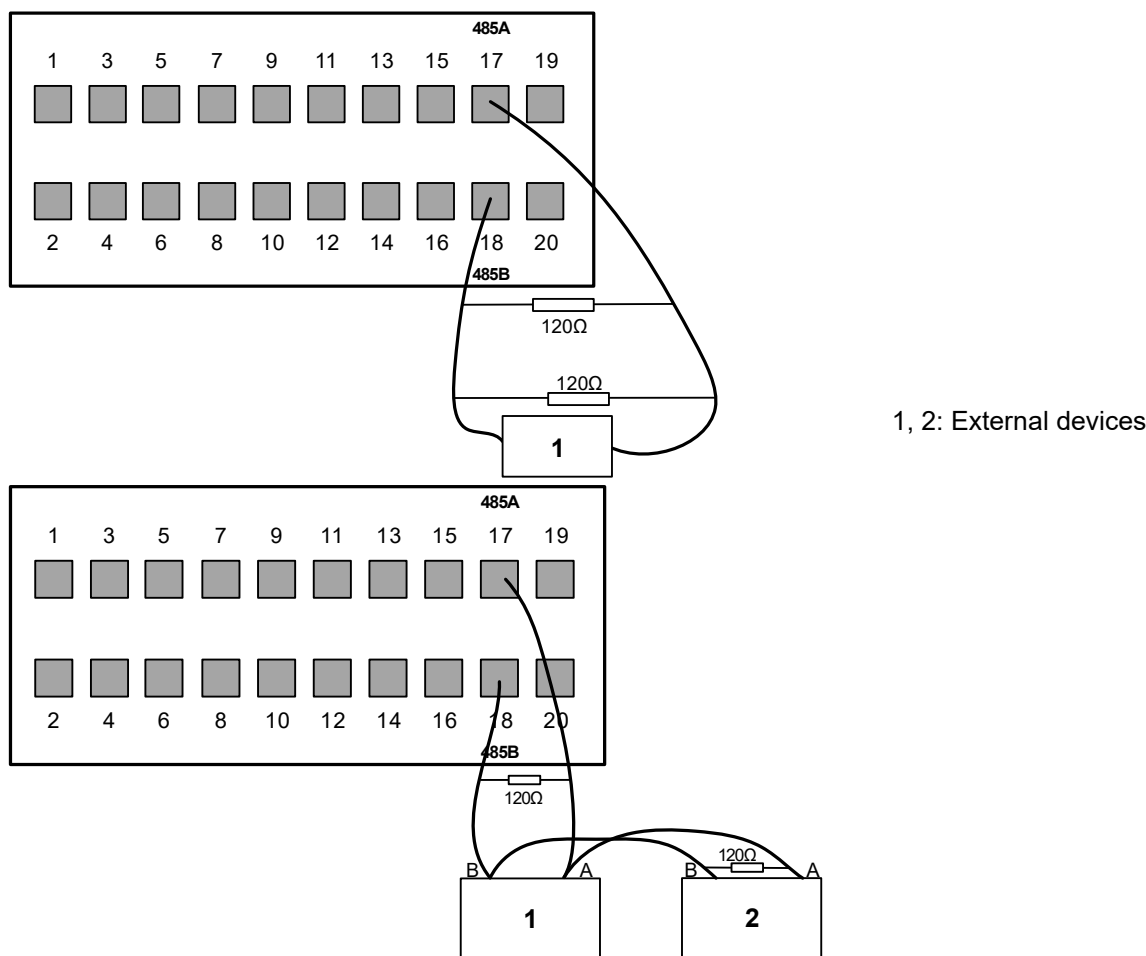
7.1.1.4 RS485 Interface

PIN17 to PIN20 on the MiniCab front panel I/O interface are RS485 communication interfaces, which can be connected to external devices for communication. PIN17 and PIN18 are master interfaces and PIN19 and PIN20 are slave interfaces. Taking PIN17 and PIN18 as an example, the diagram below shows the wiring diagram.



NOTE:

It is recommended to connect a 120Ω resistor at the terminal during wiring, and the YAGEO MF0207FTE52-120R resistor model is recommended.



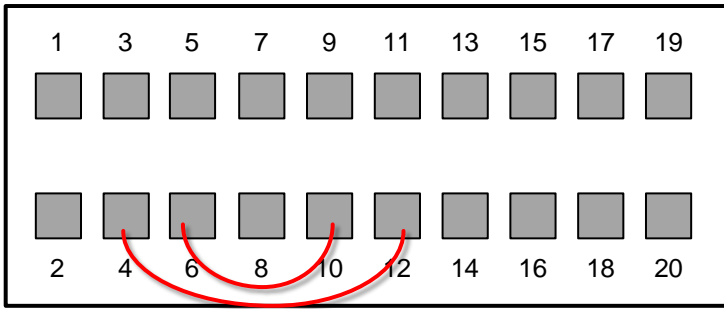
7.1.2 Protective Stop Interface

The MiniCab provides configurable safety function input interfaces in the I/O interfaces, which the protective stop function is valid by configuring the interface. This interface is designed with dual redundancy, and the function can be activated when either signal is valid. If external safety equipment is required, select devices that with dual redundancy.

Users can connect safety doors, safety light curtains, and sensors according to requirements.

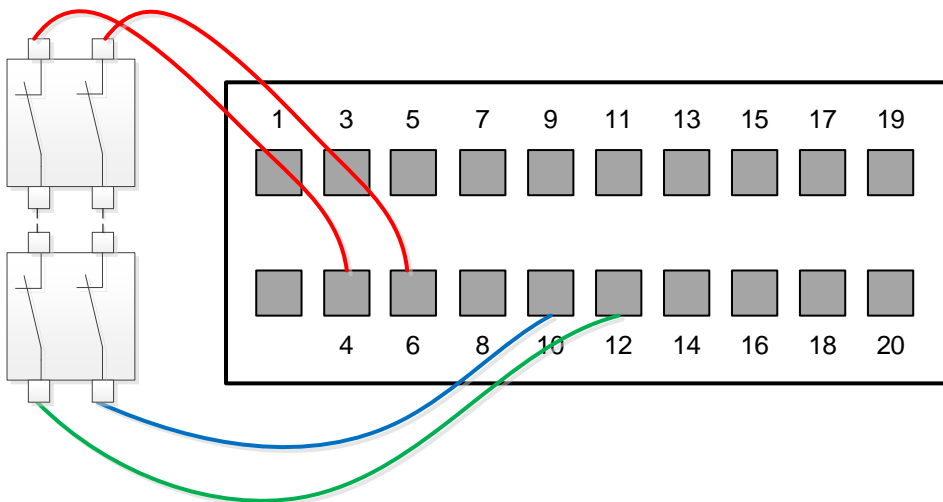
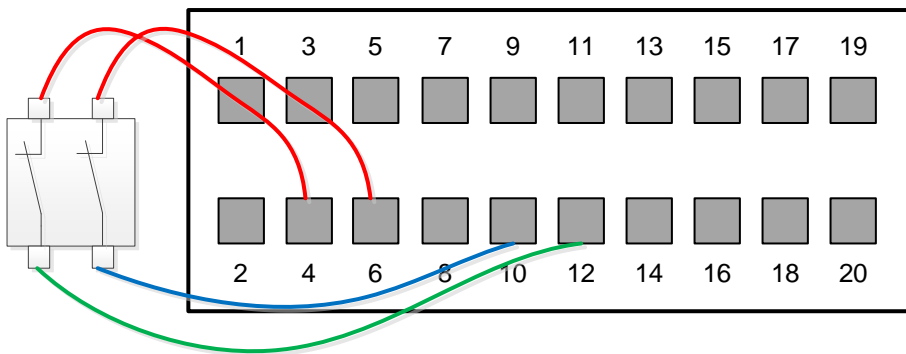
7.1.2.1 Factory Settings

The Pin 4 & Pin 12 and Pin 6 & Pin 10 are shorted by default, which means the protective stop interfaces are shorted to the GND. The wiring diagram is as follows.



7.1.2.2 Connect External Protective Stop Switch

For safe operation, users can remove the jumper and use one or more external protective stop switches. The wiring diagrams for single switch and multiple switch connections are as follows.



NOTE:

Before connecting the protective stop switches, you must configure the DI6 & DI7 as protective stop in the "I/O" page of the JAKA App.

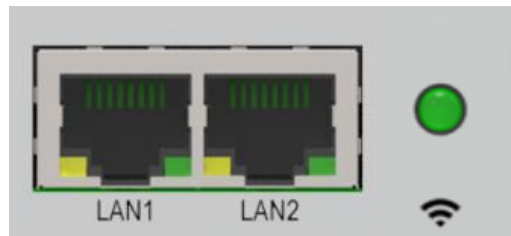
7.1.3 USB Interface

The USB interface on the MiniCab front panel is for internal debugging use only. If you need to use it, please contact JAKA technicians.

7.1.4 HDMI Interface

The HDMI interface on the MiniCab front panel is for internal debugging use only. If you need to use it, please contact JAKA technicians.

7.1.5 Network Interface (LAN)



7.1.5.1 Network Configuration

MiniCab has two network ports on its front panel, LAN1 and LAN2. Insert the network cable into the port to connect. In addition, there is a network status indicator on the front panel, which is used to display the current network status.

1. LAN1

The LAN1 port is a 10M/100M adaptive port, which is configured as 10.5.5.x by default. When connecting to the LAN1, the device's IP address should be configured within the range of 10.5.5.101 to 10.5.5.254, or set the device to obtain an IP address automatically.



NOTE:

If the device used does not support IP modification, it is recommended to connect the device to LAN2 and configure the IP address of LAN2 to be in the same network segment as the device. If the LAN2 is already occupied, please contact JAKA technician to modify the LAN1 network settings.

2. LAN2

The LAN2 port is a 10M/100M/1000M adaptive port, which is configured as obtaining IP address automatically by default. It can be configured as a static IP through the JAKA App. Refer to the software user manual for configuration steps.



NOTE:

The IP for the LAN2 cannot be the 10.5.5.x. If it is configured as this IP, the "The segment is disabled" will pop up.

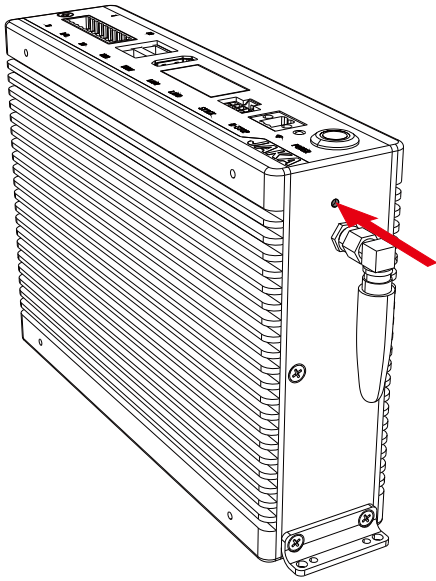
7.1.5.2 Wi-Fi Connection

MiniCab has a Wi-Fi module, with a default setting of no password. Thus, the MiniCab can be connected via Wi-Fi. Once the MiniCab is powered up, the Wi-Fi indicator on the right side of the panel will illuminate. When connected to Wi-Fi, the indicator will flash. The Wi-Fi name is the MiniCab serial number, which is located on the label. If you need to change the Wi-Fi name, add a login password, etc., please contact JAKA technicians.

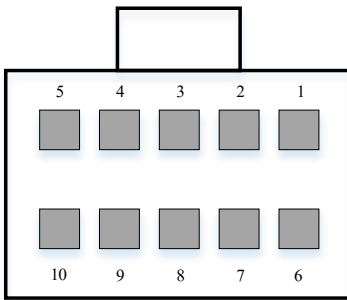
7.1.5.3 Network Reset

The MiniCab supports network reset. The reset button is located on the left side of the antenna (as shown in the figure below). In case you forget the Wi-Fi name and password, press and hold this button for more than 10 seconds to reset the Wi-Fi. At this point, the Wi-Fi gateway address will be restored to factory settings. For

further instructions, please contact JAKA technicians.



7.1.6 Control Stick Interface (STICK)

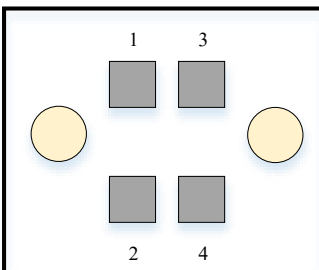


The STICK interface is used to connect the control stick. Simply insert the control stick connection cable into this interface to connect. This interface is only for connecting the JAKA control stick and should not be modified.

7.1.7 Emergency Stop Interface (E-STOP)

The control cabinet provides safety function input interfaces, which the emergency stop function is valid by configuring the interface. This interface is designed with dual redundancy, and the function can be activated when either signal is valid. If external safety equipment is required, select devices that with dual redundancy.

Users can connect safety doors, safety light curtains, and sensors according to requirements.



The external emergency stop input interface is double row 3.5 mm (0.14 in) pitch pluggable terminal blocks, and the interface definition is as follows.

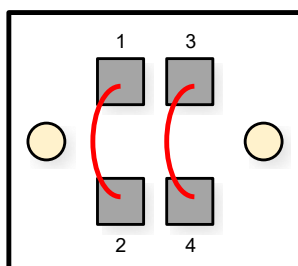
PIN	Signal	Signal Type	Description
1	VCC_24V	PO	Internal logic power 24V output
2	ESTOP1	I	E-STOP input 1, short connected to PIN1 by default
3	VCC_24V	PO	Internal logic power 24V output
4	ESTOP2	I	E-STOP input 2, short connected to PIN3 by default

When wiring, select the wire that matches the terminal. The requirements for the wires are as follows:

Terminal Model	Recommended PIN Connector	Wires
DEGSON: 15EDGKNHBM-3.5-04P-14-01A(H)	China: E0512 Overseas: PHOENIX AI1-12RD-Ferrule	0.75 mm ² & 17AWG Length < 30 m (1181 in)

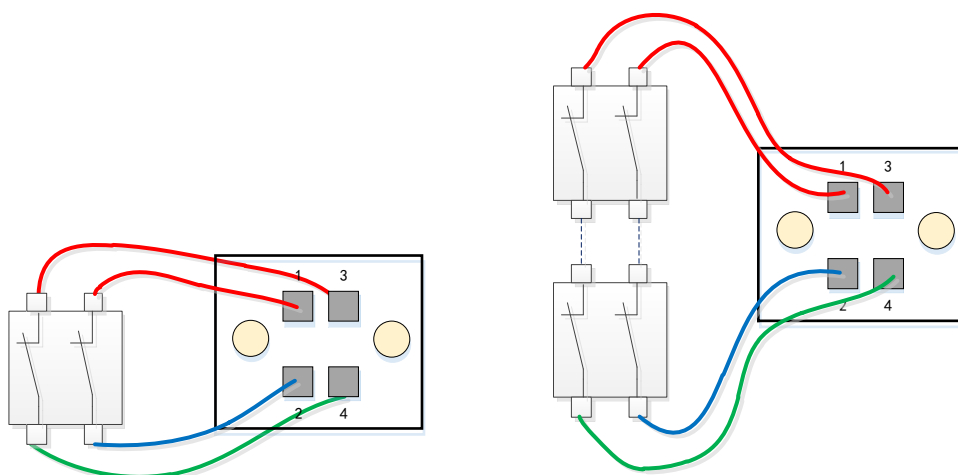
7.1.1.1 Factory Settings

When not connected to an external emergency stop device, pins 1 & 2 and pins 3 & 4 should be shorted. By default, they are shorted to the internal 24V. The wiring diagram is as follows.



7.1.1.2 Connect External E-Stop Switch

For safe operation, users can remove the jumper and use one or more external emergency stop switches. The wiring diagrams for single switch and multiple switch connections are as follows.



The robot can be used without the control stick, in which case additional emergency stop devices need to be connected. This interface can be used to connect an emergency stop switch to ensure safety.



WARNING

If the control stick is disconnected from the robot, the emergency stop button on the control stick will no longer be effective. The disconnected control stick must be moved away from the robot.

7.1.8 POWER Button



The MiniCab can be powered up and powered down by POWER button, the operation steps are as follows.

Power up: Press the POWER button for 1 seconds, and then the control cabinet will be powered up.

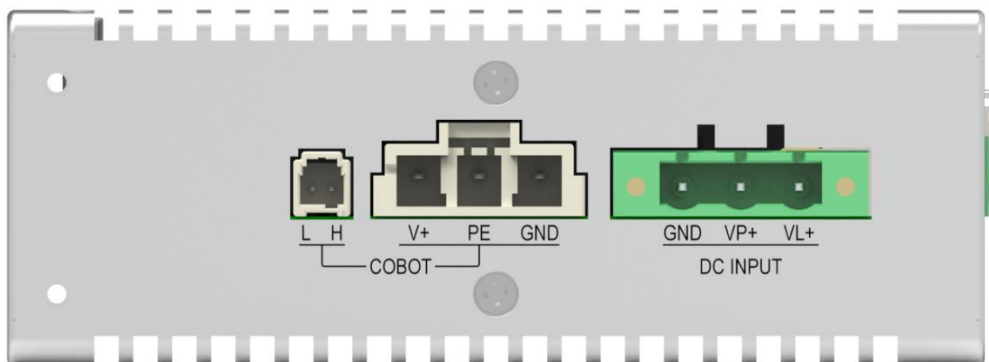
Power down: Press the POWER button for more than 3 seconds, and then the control cabinet will be powered down.

7.1.9 Status Indicator

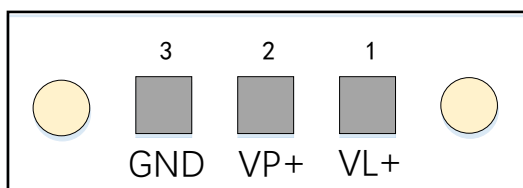
There is a ring of status indicator around the POWER button on the front panel of MiniCab, which used to indicate the robot state.

Color	Robot Status
Blue	Robot is powered on and disabled
Green	Robot is enabled
Red	Robot is in error
Yellow	Robot is in freedrive mode
Flash in yellow	Robot is paused

7.2 Side Panel Interfaces



7.2.1 Power Interface



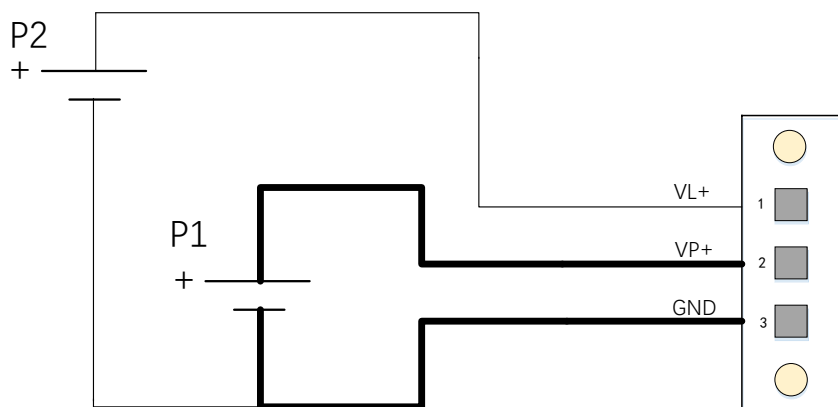
MiniCab power interface contains three input interfaces: control cabinet power input VL+ (PIN1), robot power input VP+ (PIN2) and common negative GND (PIN3). Control cabinet power (VL+) supplies power to the control cabinet, while robot power (VP+) supplies power to the robot. Additionally, VP+ can also supply power to the control cabinet. Interface definitions are as follows.

PIN	Signal	Signal Type	Description
1	VL+	PI	Control cabinet power input
2	VP+	PI	Robot power input
3	GND	PI	0V input

When wiring, select the wire that matches the terminal. The requirements for the wires are as follows:

Terminal Model	Recommended PIN Connector	Wires
DEGSON: 2EDGKM-7.62-03P-14	China: E2508 Overseas: PHOENIX AI2,5-8GY-Ferrule	2 mm ² & 14AWG Length < 30 m (1181 in)

The robot power input (PIN2) supplies power to the robot and can also supply power to the control cabinet. When control cabinet power and robot power do not need to be separated, connect PIN2 and PIN3. If you need to disconnect VP+ in emergency situations while keeping the control cabinet powered, you can separately connect the power supply to VL+. The wiring diagram is as follows.



1. The robot power supply requirements are as follows.

Robot Model		Zu 3	Zu/Pro/S 5 Zu/Pro 7	Zu/Pro/S 12	Zu 18/Pro 18
P1	Rated voltage	DC 48V			
	Voltage range ⁱ	DC 30~ 56V			

Robot Model		Zu 3	Zu/Pro/S 5 Zu/Pro 7	Zu/Pro/S 12	Zu 18/Pro 18
	Current range	0~18.75A	0~37.5A	0~62.5A	
	Peak power consumption	900W	1800W	3000W	
	Recommended model ⁱⁱ	RSP-1000-48*1	RSP-1000-48*2 or RSP-2000-48*1	RSP-1000-48*3 or RSP-3000-48*1	
	Battery	48V lithium battery ⁱⁱⁱ			

2. The control cabinet power supply requirements are as follows.

Robot Model		All
P2	Rated voltage	DC 48V
	Voltage range	DC 18~60V ^{iv}
	Typical power consumption	12 W
	Max power consumption	≤30 W



NOTE:

i: 30V is not included; the robot under voltage threshold is 30V.

ii: The power supply models listed here are only for recommendation, you can purchase power supplies of equivalent specifications. Additionally, peak power consumption is dependent on the robot's load and usage scenario. The values listed here are the maximum value.

iii: When using a 48V lithium battery, it is prohibited to run the robot while charging. In addition, the full battery voltage cannot exceed 56V.

iv: If both VP+ and VL+ inputs are below 26V, the "UDIO_24V" output will be below 24V.

7.2.1.1 Brake Voltage Settings

MiniCab has a voltage braking circuit, which is used to bleed the electromotive force generated by the robot during deceleration and braking. When using an external power supply, it is necessary to set the braking voltage value in the JAKA App to avoid that the control cabinet is powered down by over voltage protection or damage to the control cabinet. For specific operations, please refer to the software user manual.

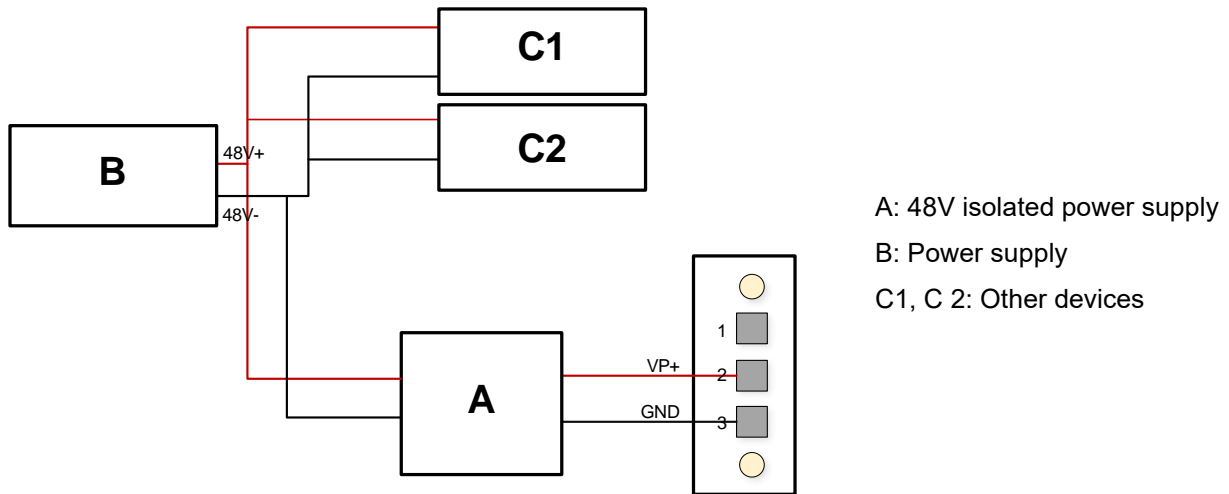


NOTE:

Before setting the braking voltage, the robot needs to be powered off and disabled.

7.2.1.2 Isolated Power Supply Connection

When the MiniCab is integrated into the hybrid robot, the MiniCab must be connected to 48V isolated power supply to avoid MiniCab burning. The connection method is as follows.



When the robot used with Minicab are Zu, Pro or S series robots, the recommended isolated power supply model is SD-1000L-48.

7.2.2 Robot Connection Interface

The COBOT interface is used to connect the robot. This interface features a foolproof design with a locking mechanism. JAKA provides compatible cables for connection.

8 Transportation

Please use the original packaging for transporting the control cabinet. If you want to move the control cabinet later, please keep the original packaging.



WARNING

1. Ensure that the back or other body parts of operators are not overloaded when the equipment is lifted. Use appropriate lifting equipment. JAKA is not responsible for damage incurred during the transport of the equipment.
2. Please comply with the relevant lifting regulations in each region and country.
3. Ensure that installation instructions are strictly followed when the robot is installed.



NOTICE:

If the control cabinet is transported without using its original packaging, all warranties will be voided.

9 Maintenance

All safety instructions in this manual must be strictly followed for maintenance work. For more detailed maintenance instructions, please refer to the JAKA Service Manual.

The repair must be performed by an integrator authorized by JAKA or by JAKA's personnel.

After-sales service contact information: E-mail: support@jaka.com; Tel: 400-006-2665.

9.1 Safety Instructions

After the maintenance, check to ensure the safety level required by the service. Valid national or local safety laws and regulations must be observed during the check. At the same time, check if all safety functions are functioning properly.

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

The following safety procedures and warnings must be followed during the operation of the robot or the control cabinet:



WARNING

1. It is forbidden to modify any information in the software safety configuration. If the safety parameters are changed, the entire robot system should be considered as a new system, which means that all safety examination processes, such as risk assessment, must be updated.
2. Replace a failed component with a new one with the same component number or an equivalent approved by JAKA.
3. Reactivate all disabled safety measures immediately after the work is completed.
4. Record all maintenance operations and save them in technical documents related to the entire robot system.



WARNING

1. Remove the power cord from the side of the control cabinet to ensure that it is completely powered down. Disconnect other energy sources connected to the robot or the control cabinet. Take necessary precautions to prevent others from energizing the system during maintenance.
2. Check the ground connection before re-powering the system.
3. Observe the ESD regulations when disassembling the robot or the control cabinet.
4. Avoid disassembling the power supplies inside the control cabinet. High voltage may remain in the power supply system for several hours after the control cabinet is powered down.
5. Avoid water or dust entering the robot or the control cabinet.

9.2 Storage Conditions

1. Storage temperature: $-10\sim 50^{\circ}\text{C}$ ($14\sim 122^{\circ}\text{F}$)

For long-term storage, in order to maintain its reliability, it is recommended to keep the temperature within $25\pm 10^{\circ}\text{C}$ ($59\sim 95^{\circ}\text{F}$). Avoid such a sudden temperature change if possible. (10°C/h (50°F/h) and above).

2. Storage humidity: 20% RH~85% RH

For long-term storage, to maintain its reliability, it is recommended to keep the humidity within 45%~65%. Keep away from dew condensation or mildew.

3. Anti-static

It is easy to generate static when kept in extremely dry conditions. The shock of electrostatic discharge may damage the semiconductor. Please store it in an anti-static bag.

4. Other environmental conditions

Please keep it in an environment that does not produce poisonous gas, dirt and dust. Do not place heavy objects on it during storage.

10 Disposal

This section contains information to handle potentially dangerous components and potentially hazardous materials.

JAKA robots and control cabinets contain components in different materials. During decommissioning, all materials should be dismantled, recycled, or reused responsibly, according to the relevant laws and industrial standards.

1. EU RoHS

JAKA robots and control cabinets are produced with restrictions on the use of hazardous substances to protect the environment; they comply with the definition of the EU RoHS Directive 2011/65/EU. The substances restricted by RoHS include mercury, cadmium, lead, chromium VI, polybrominated biphenyls and polybrominated diphenyl ethers.

2. EU WEEE

Fee for disposal and handling of electronic waste of JAKA robots sold on the German market is prepaid to DPA-system by JAKA. Importers in countries covered by the European WEEE Directive 2012/19/EU must make their own registration to the national WEEE register of their country. A list of national registers can be found here: <https://www.ewrn.org/national-registers/national-registers>.

The following symbol indicates that the product must not be disposed of as common garbage. Handle each product according to local regulations for the respective content.



3. EU RoHS

The following symbol shows the information to hazardous substances and the environmental protection use period of JAKA robots according to Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products (SJ/T 11364-2014).



The orange icon indicates that this product contains certain hazardous substances. The '20' in the icon represents the environmental protection period. It can be used during the environmental protection period, and should be recycled after exceeding that time.

The table below shows the name and content of toxic and hazardous substances in the product.

Part Name	Pb	Hg	Cd	Cr (VI)	PBB	PBDE
Metal parts	x	o	o	o	o	o
Plastic parts	o	o	o	o	o	o
Electronic	x	o	o	o	o	o
Electrical contacts	o	o	o	o	o	o

Part Name	Pb	Hg	Cd	Cr (VI)	PBB	PBDE
Cables & cabling accessories	o	o	o	o	o	o



NOTE:

The table is made according to SJ/T 11364.

o indicates that the concentration of hazardous substance in all of the homogeneous materials for this part is below the limit as stipulated in GB/T 26572.

x indicates that the concentration of hazardous substance in at least one of the homogeneous materials for this part is above the limit as stipulated in GB/T 26572.

11 Warranties

11.1 Product Warranty

Without prejudice to any indemnity agreement that the user (customer) may reach with the distributor or retailer, the manufacturer shall give the user (customer) “product warranty” according to the following terms: If there is any defect due to manufacturing and/or material faults within the warranty period promised under the contract signed by JAKA, JAKA shall provide necessary spare components, the user (customer) shall send personnel to replace spare components, and replace or repair related components with new ones that reflect the latest technical level. If the equipment defect is caused by improper treatment and/or failure to follow the relevant information described in the user manual, this “Product Warranty” is invalid. This “Product Warranty” does not apply to or extend to maintenance carried out by authorized distributors or users (customers) themselves (e.g. installation, configuration, software download). The purchase receipt, together with the date of purchase, shall be required as evidence for invoking the Warranty. The warranty must be submitted within two months of the Warranty default becoming evident. JAKA has the ownership of the equipment or components that are replaced or returned to JAKA. Any other claim arising out of or relating to the equipment is excluded from the scope of the Warranty. Nothing in this Warranty shall attempt to limit or exclude a Customer’s Statutory Right, nor the manufacturer’s liability for death or personal injury resulting from its negligence. The duration of the Warranty shall not be extended by services rendered under the terms of the Warranty. Insofar as no Warranty default exists, JAKA reserves the right to charge the customer for replacement or repair. The above provisions do not imply a change in the burden of proof to the detriment of the customer.

11.2 Disclaimer

JAKA is committed to continuously improving the reliability and performance of the products, and therefore reserves the right to upgrade them. The products may be changed without notice. JAKA strives to ensure the accuracy and reliability of the contents in this manual, but is not responsible for any error or omission herein.



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