

**JAKA® | 节卡**

# **JAKA ROBOTICS**

**User Manual-Hardware**



**JAKA Pro 16**



**JAKA®** | 节卡

# **JAKA ROBOTICS**

## **User Manual**

**JAKA Pro 16**

Robot Serial Number: \_\_\_\_\_

Cabinet Serial Number: \_\_\_\_\_



## CAUTION:

This manual is translated from original version. JAKA is not responsible for any translation errors.

The definition of cooperative robots follows international ISO standards and relevant provisions of national standards to protect the safety of operators. We do not recommend to apply the robot directly to the situation where the object of operation is human body. However, when robot applicants or application developers do need to involve robotic objects as human beings, they need to fully evaluate the safety of personnel and configure a safe and reliable, fully tested and certified security protection system for the robot body to protect the safety of personnel.

The information contained in this manual is the exclusive property of Shanghai JAKA Robotics Co., Ltd. (hereinafter referred to as JAKA), and shall not be reproduced or transmitted without JAKA's prior written approval.

Regular revision and improvement of the JAKA user manual may be made without further notice. JAKA will not be held liable for any mistakes in this manual or for any injury or death resulting from the use of this manual and its product. Please carefully read this manual and other related manuals before installing and using the product.

The pictures in this manual are for reference only, please refer to the actual product.

JAKA will not provide after-sales service for any transformation or disassembly of the product.

JAKA robot owners and operators must be responsible for their own safety. JAKA is not responsible for the safety of using robots.

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

Programmers and other users of JAKA robots must be familiar with JAKA robot programming and system integration.

## How to Read This Manual

This manual mainly contains the safety notice, mechanical and electrical interfaces, installation and maintenance, etc.

This manual will be a big help in both installation and operation to the users who have a basic level of mechanical and electrical training.

### More Information

If you want to know more information about this product, please scan the QR code on the right to visit our website: [www.jaka.com](http://www.jaka.com).





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## Preface

JAKA Pro 16 is at your service. Think what you think and do what you do.



A creative way is used to connect the robot, using the smart mobile terminal plus the APP, so that one mobile terminal can control several robots. Without the need to master professional programming language, the user only needs to manually guide the robot to complete the programming, which greatly improves production efficiency.

JAKA Pro 16 is an intelligent, light weight, 6-DOF, modularized collaborative robot with a payload of 16kg, and belongs to the JAKA Modularized Collaborative Robots Series.

## What Do the Boxes Contain

When you purchase a whole package of JAKA Pro 16, the items you will receive are shown in the table below.

Item	Amount
Robot	1
Electrical cabinet	1
Key to cabinet	1
Power Supply Cable	1
JAKA Certificate of Quality	1
JAKA Pro 16 User Manual	1
Warranty Card	1

# 1 Safety

## 1.1 Introduction

This chapter contains the safety rules and specifications which should be followed when operating the robot or robot system. Users should carefully read the safety-related content of this manual and strictly observe them. Operators should be fully aware of the complexity and hazards of robot system and should pay special attention to the warning symbols.

## 1.2 Warning Symbols Descriptions

The hazard level of operating robot system is specified by the following warning symbols. Please strictly observe them.



DANGER:

This indicates an imminently hazardous electrical situation which, if not avoided, could result in serious injury or death.



DANGER:

This indicates an imminently hazardous situation which, if not avoided, could result in serious injury or death.



WARNING:

This indicates a potentially hazardous hot surface which, if touched, could result in injury.

---

## 1.3 Safety Precautions

This section is mainly for the protection of operators and related matters that need to be paid attention to during the first installation. Users need to carefully read the safety warnings in this manual. We describe various situations as much as possible although the description cannot be exhaustive.



1. Make sure to install the robot and all electrical equipment according to the instructions and warnings in this manual.

2. The power cut-off switch should have a mounting height of 0.6m to 1.9m to ensure that the power can be cut off in a timely and convenient manner in case of emergency.

3. Before using the robot for the first time, the robot's protective system and the integrity of the equipment and system, as well as the safety of the operation should be checked to ensure that there is no damage.

4. A qualified person for robot operation is required to check each safety function and ensure that the parameters and procedures are correct before the robot can be started.

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1. Professional commissioning personnel are required to install and debug the robot according to the specifications.

2. The setting and modification of the safety parameters must be carried out by a licensed person. Unauthorized personnel must not change the parameters.

3. Do not switch the power supply system frequently. The JAKA Pro 16 has a brake in each joint to hold position when the power is off.

4. When the external force exceeds the safety value, the robot will stop moving to prevent damage to the robot or operator injury. This is because JAKA Pro16 has a collision detection function. If the operator uses controllers not approved by JAKA, the potential risks are to be borne by himself.



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1. Make sure the robot and tool are properly and securely bolted in place.

2. Make sure the robot arm has ample space to operate freely.

3. Do not connect any safety equipment to normal I/O. Use safety-related interfaces only.

4. Make sure to use the correct installation settings (e.g. Robot mounting angle, weight in TCP, TCP offset, safety configuration). Save and load the installations file along with the program.

5. Tools and obstacles shall not have sharp edges or pinch points. Make sure that all people keep their heads and faces outside the reach of the robot.

6. Combining different machines might increase hazards or create new hazards. Always make an overall risk assessment for the complete installation.

7. Never modify the robot. A modification might create hazards that are unforeseen by the integrator. **JAKA DISCLAIMS ANY LIABILITY IF THE PRODUCT IS CHANGED OR MODIFIED IN ANY WAY.**



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1. The robot and electrical cabinet generate heat during operation. Do not handle or touch the robot while in operation or immediately after operation. To cool the robot down, power off the robot and wait one hour.

2. Never put hand behind the internal cover of the electrical cabinet.

---



1. When the robot is combined with or working with machines capable of damaging the robot, it is highly recommended to test all functions and the robot program separately. It is recommended to test the robot program using temporary way points outside the workspace of other machines.

2. Do not expose the robot to permanent magnetic fields. Very strong magnetic fields can damage the robot.

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## 1.4 General Warnings and Cautions

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1. Do not wear loose clothing or jewellery when working with the robot. Make sure long hair is tied back when working with the robot.

2. During the operation, even if the robot seems to have stopped, it may be because the robot is waiting for the start signal and is about to move. Even in such a state, the robot should be considered to be in motion.

3. During the operation, make sure the power cables of the electrical cabinet and robot are reliably connected. Do not plug or unplug the power cables or terminals in the working mode.

4. A warning line should be drawn on the floor to identify the working range of the robot, so that the operator can understand the working range of the robot with the end effector (gripper, tool, etc.) mounted.

5. Make sure that safety measures and/or robot safety configuration parameters have been set up to protect both programmers, operators and bystanders, as defined in the risk assessment. The lock should be set as needed so that the non-operator cannot access the robot power supply.

6. In emergency or abnormal situations such as people being pinched or besieged by the robot, after pressing the emergency stop button, the joints can be forced to move by pushing or pulling the robot arm. Manually moving the robot arm without electric drive is limited to emergencies and may result in joint damage.

---

## 1.5 Liabilities and Risks

### Liabilities

This manual does not cover all applications for designing, installing and operating robots, nor does it cover all peripheral equipment that may affect the safety of the robot system.

JAKA's integrators are responsible for ensuring compliance with applicable national laws and regulations to ensure that there are no major hazards in the complete robotic application.

All safety information contained in this manual shall not be considered as a guarantee of JAKA. Even if all safety instructions are observed, the injury or damage caused by the operator may still occur.

JAKA constantly strives to improve the performance and reliability of our robots. JAKA is not responsible for any errors or omissions in this manual, and reserves the right of final interpretation of this manual.

## Risks

A direct or indirect physical contact relationship exists when there is an interaction between the operator and the robot exists. Operators must have sufficient self-protection awareness when contacting, and integrators need to carefully consider the use conditions when using the company's robots. The following are possible dangerous situations:

- Injury caused by the robot dropping during handling;
- Injury caused by the loosening of the robot fixing screw;
- Finger-pinching and collision injury during the operation;
- Injury caused by the unrepaired malfunction robot;
- Danger caused by the usage of a sharp end effector or tool connection;
- Injury caused by the operation in a toxic or corrosive environment.

## 1.6 Usage

JAKA Pro 16 is an industrial collaborative robot suitable for use in industrial environments, for example, for handling tools and fixtures, or for processing or transferring components or products. JAKA Pro 16 is only allowed to be used under specified environmental conditions.

JAKA Pro 16 is equipped with special safety-related features, which are purposely designed for collaborative operation, where the robot operates without fences and/or together with a human. Collaborative operation is only intended for non-hazardous applications, where the complete application, including tool, work piece, obstacles and other machines, is without any significant hazards according to the risk assessment of the specific application.

Any use or application deviating from the intended use is deemed to be impermissible misuse. This includes, but is not limited to the following:

- Use in potentially explosive environments ;
- Use in medical and life critical applications ;
- Use before performing a risk assessment ;
- Use where the rated performance levels are insufficient ;
- Operation outside the permissible operating parameters.

## 1.7 Emergency Stop

When an emergency occurs, press the emergency stop button to stop all movement of the robot immediately. Emergency stop cannot be used as a risk reduction measure, but as a secondary protective device.

## 1.8 Movement without Drive Power

In the unlikely event of an emergency situation where robot power is either not possible or unwanted, the robot joint can be forced to move in two ways:

1. Forced manual drive: By pushing or pulling the robot arm, it can force the joint to rotate. The brake of each joint(except for the joint 1 and joint 2 of JAKA Pro 16) has a friction clutch. When the joint is subjected to a torque greater than the friction torque of the friction clutch, the joint rotates.

2. Manual brake release: Remove the joint cover by removing the screws (four for big joints and three for small joints) that fix it. Press the plunger on the small electromagnet (shown below) to release the brake.

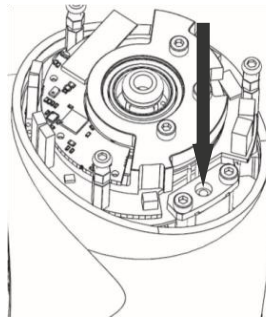


Fig1-1

### Warnings:

1. Moving the robot arm manually is intended for urgent emergencies only and might damage the joints.
2. If the brake is released manually, gravitational pull can cause the robot arm to fall. Always support the robot arm, tool and work item when releasing the brake.

## 1.9 Precautions for Transportation and Handling

Transport the robot in the original packaging. Save the packaging material in a dry place; you may need to pack down and move the robot later on.

Lift both tubes of the robot arm at the same time when moving it from the packaging to the installation place. Hold the robot in place until all mounting bolts are securely tightened at the base of the robot.

### Cautions:

1. Make sure not to overload your back or other bodyparts when the equipment is lifted. Use proper lifting equipment. All regional and national guidelines for lifting shall be followed. JAKA cannot be held responsible for any damage caused by transportation of the equipment.
2. Make sure to follow the installation instructions when installing the robot.

## 2 Welcome from JAKA Robot

Before reading this chapter, please ensure that chapter 1 Safety has been read and fully understood.

In this chapter the basics of JAKA Pro Robots would be introduced , for future hardware specifications and software usages please refer to other chapters.

During using of JAKA Pro robots , if quick help is needed, feel to free to dail our hotline:(+86)400-006-2665.

### 2.1 Overview of robot configurations

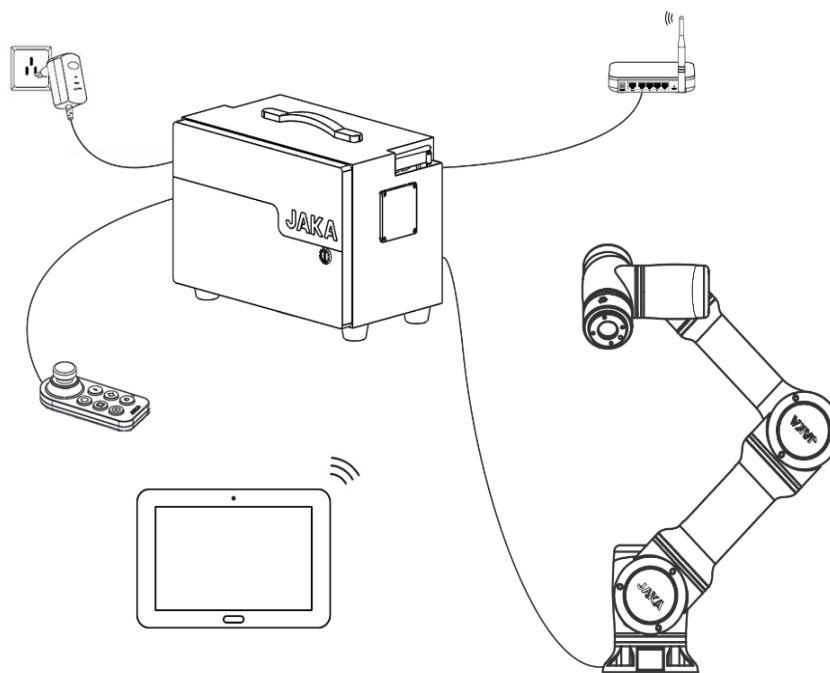


Figure 2-1 Overview of robot configurations

As shown in Figure 2-1, JAKA Pro robots uses wireless connection, and the followings are needed:

**Operation Terminal:** Device used to program and set robot.

**Robot Arm:** The core moving part of robot to achieve designated movements. And at the end of the arm, a ring indicator, buttons used to drag and tech, TIO interface are located.

**Electrical Cabinet and Control Stick:** The cabinet contains the robot controller and many different kinds of electrical interface, And also equipped with a control stick.

**Router and network cables:** The cabinet has a wireless module, which can connect the operation terminal to the wireless LAN of the electric control cabinet (wireless network name is electric control cabinet number) to operate and control the robot. The network port of the cabinet can also be connected to the router, and the operating terminal can also be connected to the wireless network of the router. It is recommended to configure a separate router for JAKA Pro series robots to prevent conflicts with other devices.

## 2.2 Operation Terminal

JAKA Zu APP is provided by JAKA on Android system, and the required configurations are as follows:

Terminal Type	Tablet PC
OS	Android 8.0 or above
CPU	Kirin695or Snapdragon 660
ROM	32GB
RAM	4GB
Screen Size	8.0 inch
Network	WIFI

Table2-1 Operation Terminal Required Hardware Configurations

The operation terminal can be requested during purchasing or provided by user themselves.

## 2.3 Robot Arm

The robot arm is shown as Figure 2-1, and is composed of six rotation joints with two linkages. And at the end of the arm, a ring indicator, buttons used to drag and tech, TIO interface are located.

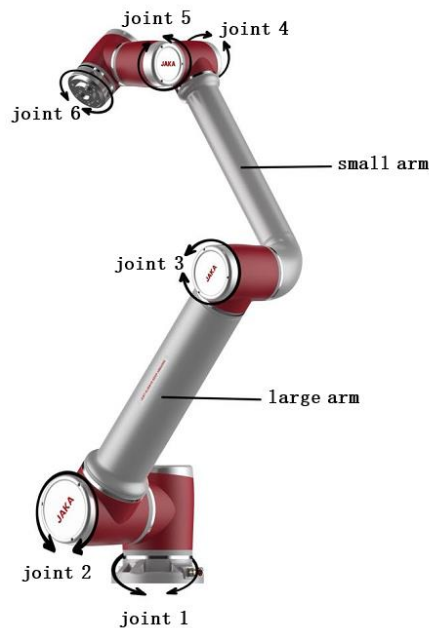


Figure 2-1 JAKA Pro Robot Arm

### 2.3.1 Robot End

At the end of the robot, an indicator and a pause button is located.

The indicator and the pause button is located as Figure 2-2 and the meanings of different color are listed in table 2-2. When the robot is running program, press the pause button could pause and resume the program.



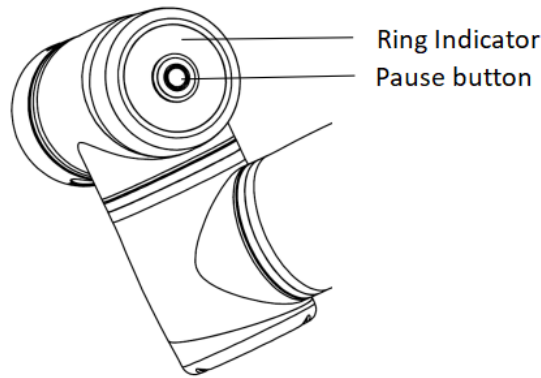


Figure 2-2 Ring Indicator and Pause Button

Color	Robot Status
Blue	Power on
Green	Enabled
Red	Falut
Yellow	Drag Mode
Flashing Yellow	Pause Mode

Table 2-2 Indicator Meanings

**⚠ Warnings:**

The risks related to using of pause button should be evaluated carefully, the contact of robot and personnel could cause server injury of personnel or damage of equipment.

**2.3.2 Flange Buttons and interfaces**

On the side of flange located two buttons and TIO interface. The buttons are FREE button and POINT button respectively, shown as below:

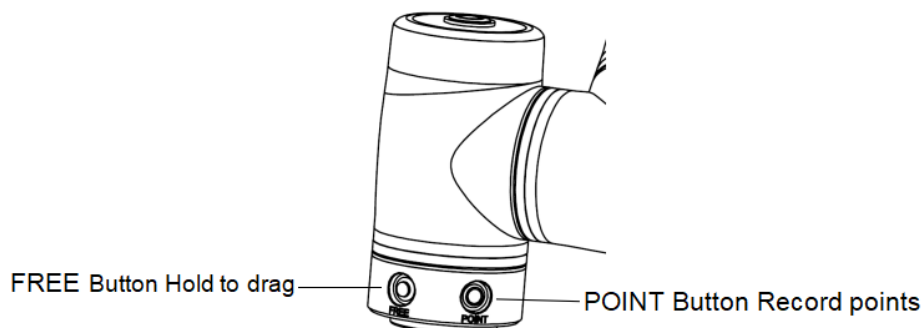


Figure 2-3 FREE button and POINT button

The detailed description of TIO is in chapter 4.

When the free button is pressed, the robot would enter free-drive mode.

The point button could be used with the robot APP, and when this button is pressed the robot position

would be recorded in the APP.

**⚠ Warnings:**

The risks related to using of pause button should be evaluated carefully, the payload、TCP setting should be set properly, otherwise the contact of robot and personnel could cause server injury of personnel or damage of equipment.

**2.4 Electrical Cabinet and Control Stick**

The cabinet of JAKA Pro Robots contains several kinds of interfaces which are described in chapter 4.

Along with the cabinet a stick is provided, and when the programming job is finished , the stick could be sued to control the robot.

Commands can be sent to the robot using buttons on thestick, and are described as follows:

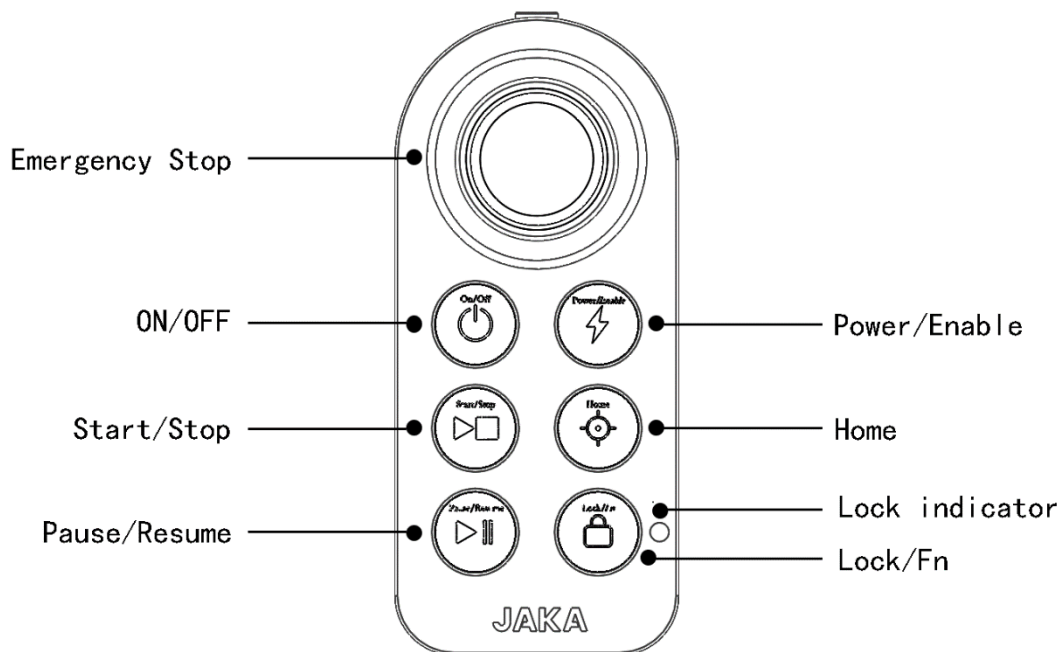


Figure 2-3 Stick Function Description

<p><b>ON/OFF</b></p>	<p><b>ON:</b> Press the power button for 1 second and release it, The buzzer will ring and the electric control cabinet will start up.  <b>OFF:</b> Press and hold the power button for more than 3s, the handle buzzers 6~7 times, and the electric control cabinet is turned off.</p>
<p><b>Power/ Enable</b></p>	<p><b>Turn on robot:</b> When robot turned off, short press the button to turn on the robot.  <b>Turn off robot:</b> When robot turned on, short press the button to turn off the robot.  <b>Enable robot:</b> When robot turned on, short press the lock button and enable button.  <b>Disable robot:</b> When robot enabled, short press the lock button + enable button</p>
<p><b>Start/ Stop</b></p>	<p><b>Run program:</b> press the terminate button to start the default loaded program.          After robot moves to the initial position of the program, execute the default</p>

	<p>program .</p> <p><b>Terminate program:</b> When program operating, short press the button to terminate the program.</p>
<b>Home</b>	<p><b>Reset:</b> After robot enabled, when no program is operating, press continuously to control the robot to run to the set default position. When robot moves to the default position, press continuously and the lock indicator light is blue.</p>
<b>Pause/ Resume</b>	<p><b>Pause:</b> When the robot moving automatically, press to pause the program.</p> <p><b>Recovery:</b> When robot paused, press to recover the program running.</p>
<b>Lock/Fn</b>	<p><b>Locking handle:</b> Press and hold the lock button for 3 seconds, and the lock indicator light will be orange.</p> <p><b>Unlock handle:</b> Press and hold the lock button for 3 seconds, and the lock indicator light will go out.</p> <p><b>Combination function:</b> Other buttons and lock button can be pressed in combination.</p>
<b>Lock indicator</b>	<p><b>Locked state:</b> When locked, the indicator is orange. Except for the unlock and on/off button, other buttons are invalid. APP can control the robot.</p> <p><b>Unlocked state:</b> When unlocked, the indicator is off and the handle can be used. The APP interface is gray and you can not control the robot.</p>
<b>Emergency button</b>	<p><b>For emergency stop.</b></p> <p>Note: The emergency stop button is only used in emergency situations and cannot be used as a general power-off device.</p>

Table 2-3 Stick Function instructions

Note:

After powering on, press any button and the handle will beep at a frequency of 2 times per second.

When using the handle to operate the robot, please ensure that the robot under operating is within the line of sight, and follow the relevant safety rules to prevent injury to the people or equipment around the robot.

## 3 Mechanical Specification

The robot consists mainly of six joints and two aluminum tube arms (as shown in Figure 3-1). The base is used to install the robot, and the tool end is used to mount the tool. The tool can perform translational and rotational movements in the robot's working range. The following sections describe the basics to be aware of the installation of various components in the robot system.

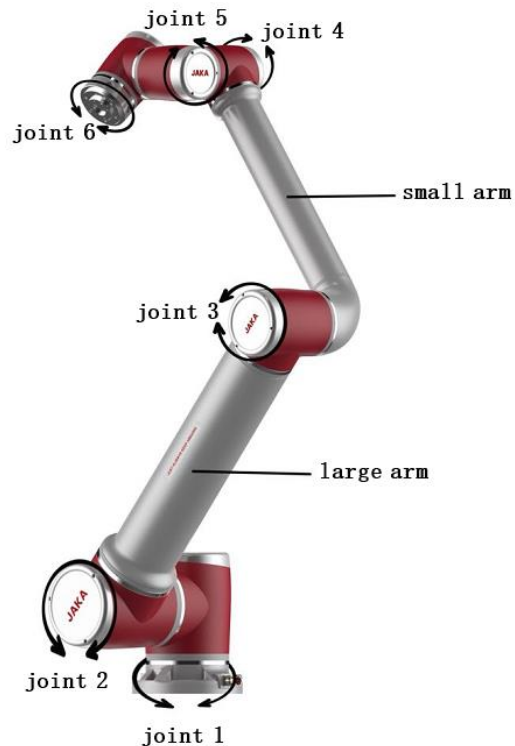


Figure 3-1 Structure of JAKA Pro Robot

### 3.1 Robot Working Range

#### 3.1.1 Robot Dimensions

The photo and dimensions of JAKA Pro 16 robot are shown in Figure 3-2 and Figure 3-3. Make sure to take into account the working range of the robot during installation to avoid injury to people or damage to the equipment.



Figure 3-2 JAKA Pro 16 Robot and cabinet

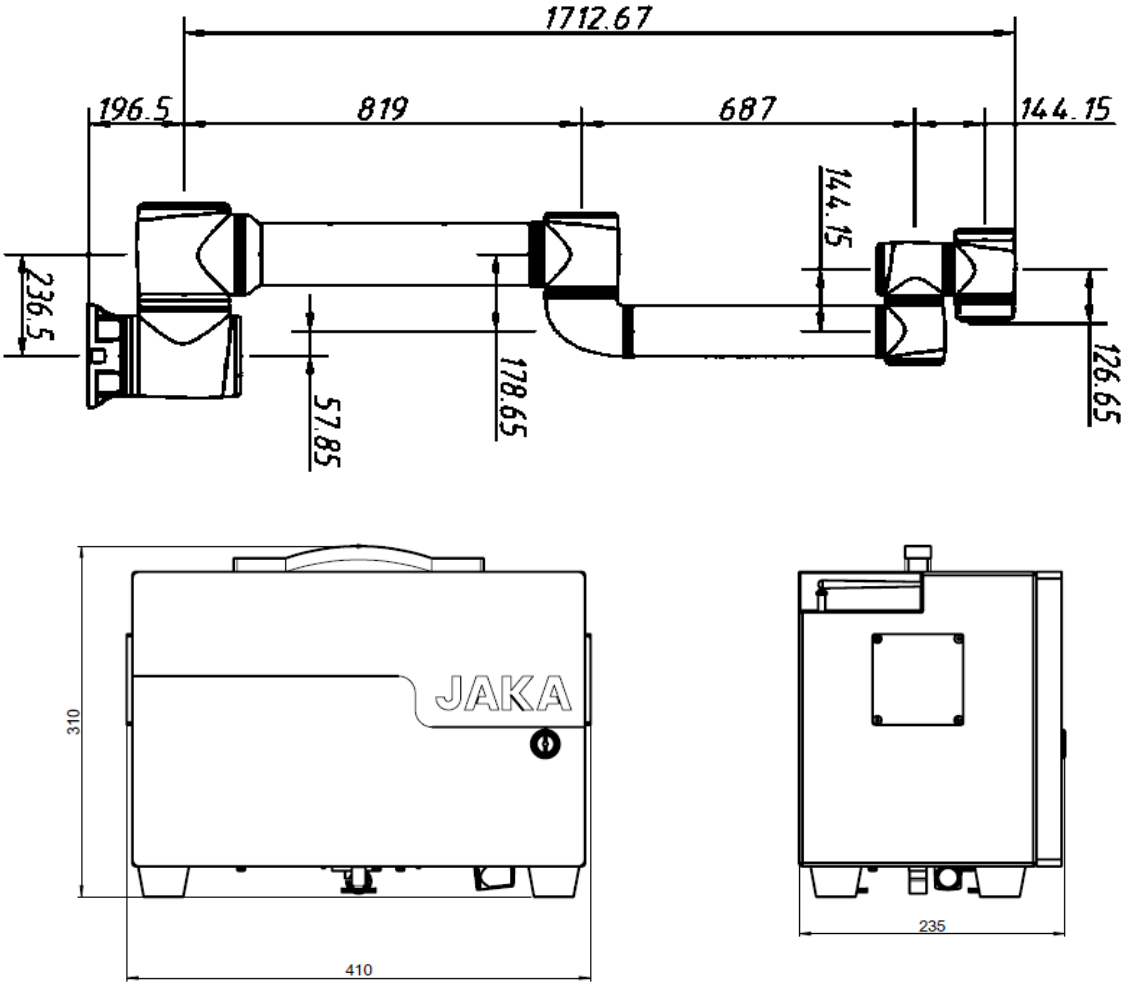


Figure 3-3 Dimensions of JAKA Pro 16 and cabinet

3.1.2 Robot Working Range

The working range of JAKA Pro 16 is shown in Figure 3-4. When choosing the robot installation position, the cylinder space directly above and below the robot must be considered. Moving the tool close to the

cylindrical volume should be avoided if possible, because it causes the joints to move fast even though the tool is moving slowly, causing the robot to work inefficiently and making it difficult to conduct a risk assessment.

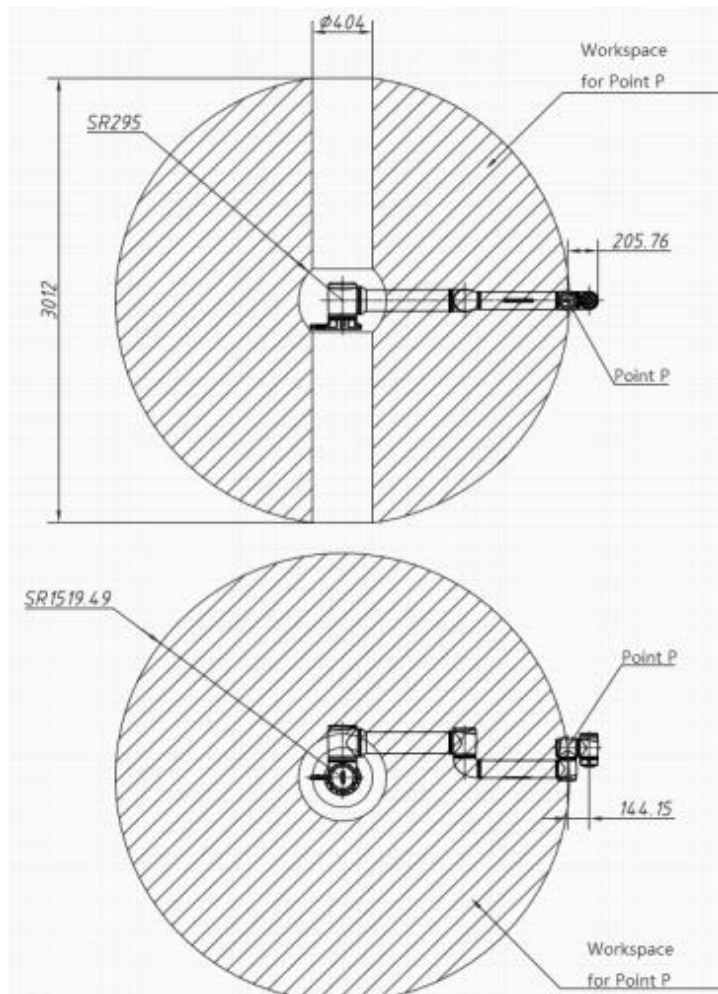


Figure 3-4 JAKA Pro 16 workspace diagram

## 3.2 Installation

### 3.2.1 General installation steps

1. Determine the working range of the robot;
2. Mount the robot on the base;
3. Install the required tools at the end of the robot.

### 3.2.2 Important safety instructions



**DANGER:**

1. Make sure the robot is properly and securely bolted in place.
2. The mounting surface must be shockproof and sturdy.



**DANGER:**

1. Make sure the tool is properly and securely bolted in place.
2. Make sure that the tool is constructed such that it cannot create a hazardous situation by dropping a part unexpectedly.



**DANGER:**

1. Make sure that the electrical cabinet and cables do not come into contact with liquids. A wet electrical cabinet could cause death.
2. The electrical cabinet must not be exposed to dusty or wet environments that exceed IP20 rating. Pay special attention to environments with conductive dust.



**Cautions:**

If the robot is bathed in water over an extended time period it might be damaged. The robots should not be installed in water for work.

### 3.2.3 Robot Body Installation

The robot has an attitude and position adaptation function. It can be mounted in various ways, such as ground, wall, and ceiling mounting. As shown in Figure 3-5:

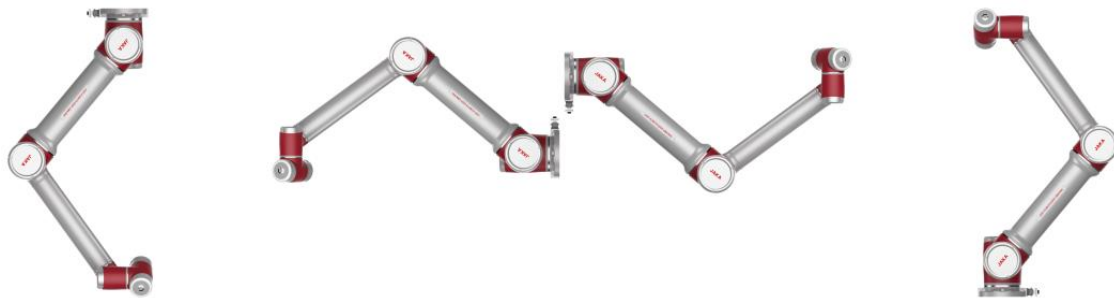


Figure 3-5 Typical installation

Using four M12 bolts to mount the robot through the four  $\varnothing 13\text{mm}$  through holes on the robot base. It is recommended to tighten these bolts with a torque of 130Nm. If you need to adjust the robot installation position very accurately, you can also drill two  $\varnothing 12\text{mm}$  pin holes and fix them with pins. It is also possible to purchase an accurate base counterpart as an accessory. Mount the robot on a sturdy surface that is strong enough to withstand at least ten times the full torque of the base joint and at least five times the weight of the robot arm. Furthermore the surface shall be vibration free. If the robot is mounted on a linear axis or a moving platform then the acceleration of the moving mounting base shall be very low. A high acceleration might cause the robot to stop, thinking it bumped into something. Figure 3-7 shows the robot mounting holes. All measurements are in mm.

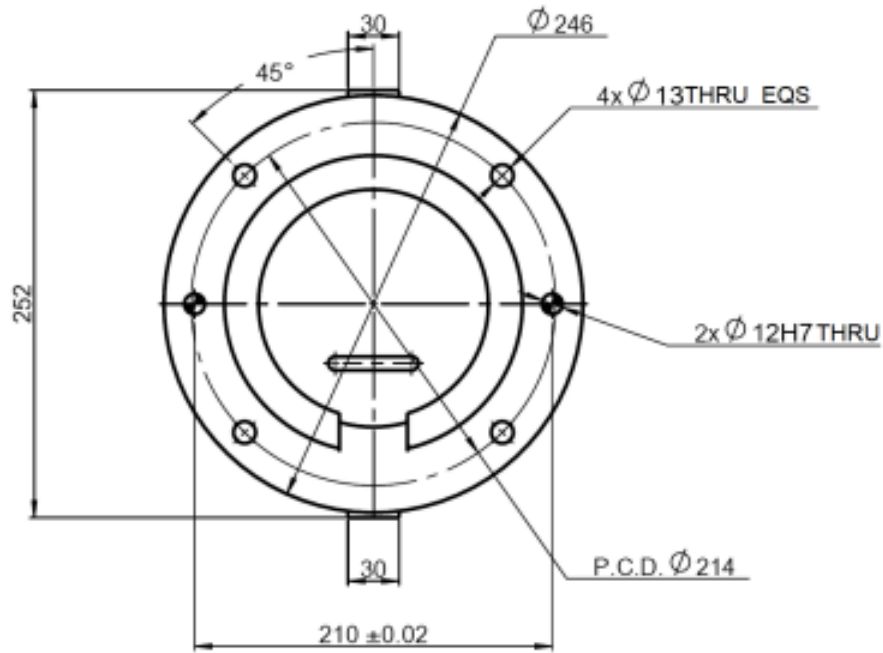


Figure 3-6 Base Dimensions for JAKA Pro 16

### 3.2.4 End effector Installation

The robot end flange has four M6 and six M8 tapped holes to mount the end effector. When screws are installed in these threaded holes, M6 screws need to be tightened with a torque of 16Nm, M8 screws need to be tightened with a torque of 36 Nm. If you need to adjust the tool position very accurately, you can also drill a  $\varnothing 6$ mm or  $\varnothing 8$ mm pin hole and fix it with a pin. Figure 3-7 shows the drilling position and the screw mounting position. All measurements are in mm.

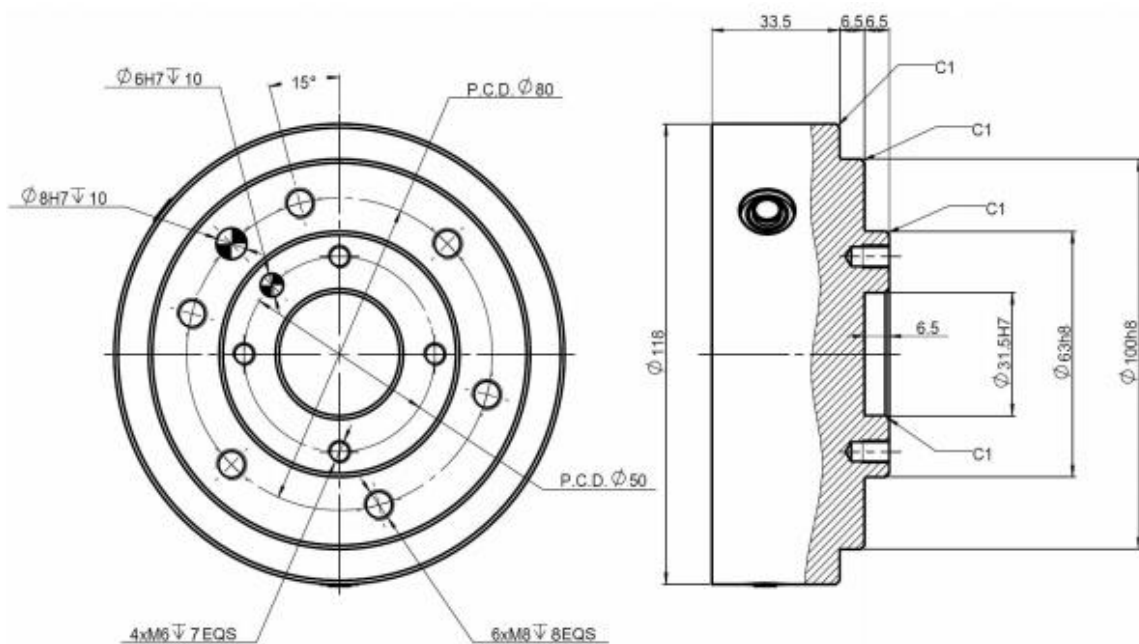


Figure 3-7 End flange for JAKA Pro 16



## 4 Electrical Interface

### 4.1 Introduction

This chapter describes all the electrical interfaces of the robot and electrical cabinet.

These interfaces are divided into three categories, each of which has different purposes and properties:

- Front panel interface of the electrical cabinet
- Bottom interface of the electrical cabinet
- Tool input and output interface(TIO)

These three types of interfaces are described below, and most types of I/O are provided with examples.

### 4.2 Warnings and Cautions

Be sure to observe the following warnings and cautions when designing and installing robotic applications.

These warnings and cautions are also apply for service work.




---

Warning:

1. Never connect a safety signal to a non-safety PLC with an unsuitable safety level. Failure to follow this warning may result in serious injury or death due to the failure of a safety stop function. Be sure to separate the safety interface signal from the normal I/O interface signal.
2. All safety signals are redundant (two independent channels). Keeping the two channels independent ensures that no safety features are lost in the event of a single failure.
3. For an introduction to the I/O functions inside the electrical cabinet, please refer to Section 4.3.




---

Warning:

1. Please ensure that all equipment that is not wet is kept dry. If water enters the product, cut off the power supply in a timely manner, then contact your supplier.
  2. Use only the original cable of the robot. Do not use the robot in applications where the cable needs to be bent. If you need a longer cable or flexible cable, you can contact your supplier.
  3. For protective earthing (PE), use the screw connector marked with a grounding mark in the electrical cabinet. The ground connector should have at least the rated current of the current maximum within the system.
  4. When the cabinet's I / O interface cable when installed, the door is opened to remove the metal plate outlet holes, and to ensure that I / O cable outlet holes to avoid fraying.
-



**Cautions:**

1. The robot has passed the electromagnetic compatibility test specified in the CR certification. Exceeding standard interference signals will cause abnormal behavior of the robot. Extremely high signal levels or exceeding the maximum standards will cause permanent damage to the robot. JAKA is not responsible for any damage caused by out-of-range EMC problems.
2. The length of the I/O cable used to connect the electrical cabinet to other mechanical and industrial equipment must not exceed 30 meters unless it is feasible after extended testing and shielded cables are required if necessary.

**4.3 Front panel of the electrical cabinet**

The front panel interface of the electrical cabinet is arranged on the first floor after the electrical cabinet door is opened, including:

- 16 digital inputs (P1 and P3)
- 16 digital outputs (P2 and P4)
- 2 configurable analog interfaces (P5)
- 1 set of high speed interface (P6)
- Remote ON/OFF and 485 interface (P7)
- Safety function interface (P8)
- USB3.0 interface (P9) and Ethernet interface (P10)

The USB interface and Ethernet interface are reserved for internal use and can be contacted by JAKA technical support personnel if needed. The layout is shown in Figure 4-1.

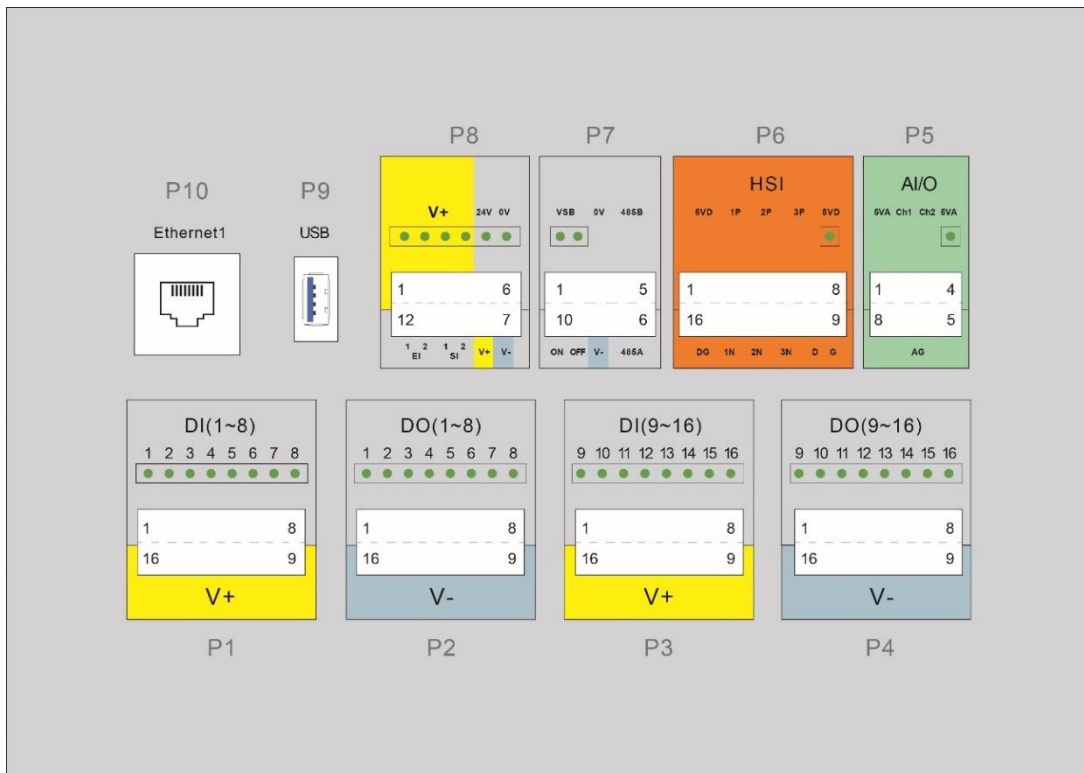


Figure 4-1 Front panel interface of the electrical cabinet

Electrical control cabinet front panel interface definition table:

Index	Name	PIN	Label	Description
P1	DI(1~8) Digital Input	1	DI1	1st digital input, PNP Type, the input is active high
		2	DI2	2nd digital input, PNP Type, the input is active high
		3	DI3	3rd digital input, PNP type, the input is active high
		4	DI4	4th digital input, PNP Type, the input is active high
		5	DI5	5th digital input, PNP Type, the input is active high
		6	DI6	6th digital input, PNP Type, the input is active high
		7	DI7	7th digital input, PNP type, the input is active high
		8	DI8	8th digital input, PNP type, the input is active high
		9~16	V+	The isolated power input is positive, and the factory default is 24V internal.
P2	DO(1~8) Digital Output	1	DO1	1st digital output, PNP Type, $\leq 1A$ continuous current output capability
		2	DO2	2nd digital output, PNP Type, $\leq 1A$ continuous current output capability
		3	DO3	3rd digital output, PNP Type, $\leq 1A$ continuous current output capability
		4	DO4	4th digital output, PNP Type, $\leq 1A$ continuous current output capability
		5	DO5	5th digital output, PNP Type, $\leq 1A$ continuous current output capability
		6	DO6	6th digital output, PNP Type, $\leq 1A$ continuous current output capability
		7	DO7	7th digital output, PNP Type, $\leq 1A$ continuous current output capability
		8	DO8	8th digital output, PNP Type, $\leq 1A$ continuous current output capability
		9~16	V-	Isolated power input negative, default shorting is connected to internal GND
P3	DI(9~16) Digital Input	1	DI9	9th digital input, PNP Type, the input is active high
		2	DI10	10th digital input, PNP Type, the input is active high
		3	DI11	11th digital input, PNP Type, the input is active high
		4	DI12	12th digital input, PNP Type, the input is active high
		5	DI13	13th digital input, PNP Type, the input is active high
		6	DI14	14th digital input, PNP Type, the input is active high
		7	DI15	15th digital input, PNP Type, the input is active high
		8	DI16	16th digital input, PNP Type, the input is active high
		9~16	V+	The isolated power input is positive, and the factory default is 24V internal
P4	DO(9~16) Digital Output	1	DO9	9th digital output, PNP Type, $\leq 1A$ continuous current output capability
		2	DO10	10th digital output, PNP Type, $\leq 1A$ continuous current output capability

		3	DO11	11th digital output, PNP Type, $\leq 1A$ continuous current output capability
		4	DO12	12th digital output, PNP Type, $\leq 1A$ continuous current output capability
		5	DO13	13th digital output, PNP Type, $\leq 1A$ continuous current output capability
		6	DO14	14th digital output, PNP Type, $\leq 1A$ continuous current output capability
		7	DO15	15th digital output, PNP Type, $\leq 1A$ continuous current output capability
		8	DO16	16th digital output, PNP Type, $\leq 1A$ continuous current output capability
		9~16	V-	Isolated power input negative, default shorting is connected to internal GND
P5	AI/O	1、4	5VA	Analog power supply 5V output, 100mA (max)
		2	Ch1	Analog input/output channel 1
		3	Ch2	Analog input/output channel 1
		5~8	AG	Analog ground
P6	HSI	1、8	5VD	Digital power supply 5V output, 100mA (max)
		2、3	1P	Differential signal 1 input positive / encoder A +
		14、15	1N	Differential signal 1 input negative / encoder A-
		4、5	2P	Differential signal 2 input positive / encoder B+
		12、13	2N	Differential signal 2 input negative / encoder B-
		6、7	3P	Differential signal 3 input positive / encoder Z +
		10、11	3N	Differential signal 3 input negative / encoder Z-
		9、16	DG	Digital ground
P7	-	1、2	VSB	Internal power supply 5V, 100mA (max), can be used for remote power on/off
		3	0V	Internal GND (internal 24V, 12V reference ground)
		4、5	485B	RS485 B
		6、7	485A	RS485 A
		8	V-	Isolated power input negative, default shorting is connected to internal GND
		9	OFF	Remote shutdown signal input, high level (5~24V) is valid
		10	ON	Remote power-on signal input, high level (5~24V) is valid
P8	-	1~4、8	V+	Isolated power input is positive, factory default is connected to internal 24V
		5	24V	The internal 24V output is positive and supports a maximum of 1.5A current output

		6	0V	The internal 24V power supply output is negative
		7	V-	The isolated power input is negative, and the factory default is connected to the internal GND
		9	SI2	The protection stop function input 2, the factory default is V+
		10	SI1	The protection stop function input 2, the factory default is V+
		11	EI2	Emergency stop function input 2, the factory default is V+
		12	EI1	Emergency stop function input 1, the factory default is V+.
P9	-	-	USB	USB3.0
P10	-	-	Ethernet1	Fast Ethernet interface

### 4.3.1 All digital I/O common specifications

This section describes the electrical specifications for 24V digital I/O using an electrical cabinet. Can be divided into: V + power selection, security I / O configuration.

The electrical cabinet supports 16 digital inputs and 16 digital outputs, as shown in Figure 4-2.

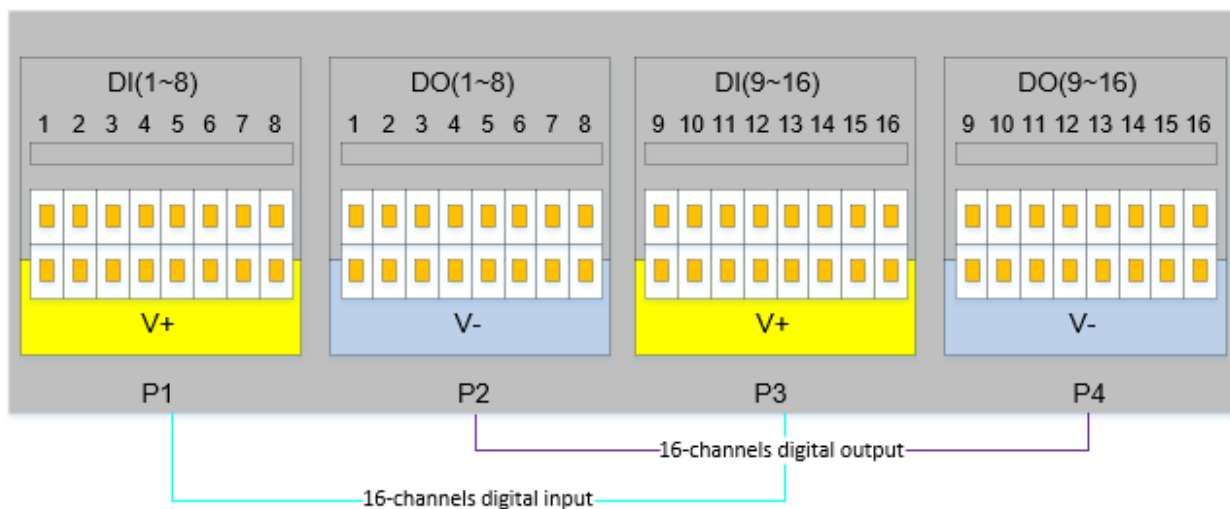


Figure 4-2 Digital inputs and digital outputs

The digital I/O can be powered by a 24V power supply provided inside the control cabinet and supports up to 1.5A output (overload will turn off the output). When the user needs more power output, the V+ power supply can be powered by an external "24V power supply". 24V is the internal power supply and 0V is the internal ground. V+ is the positive pole of the digital I/O interface, and V- is the negative pole of the digital I/O interface. The factory default configuration is internal power, see Figure 4-3 below.

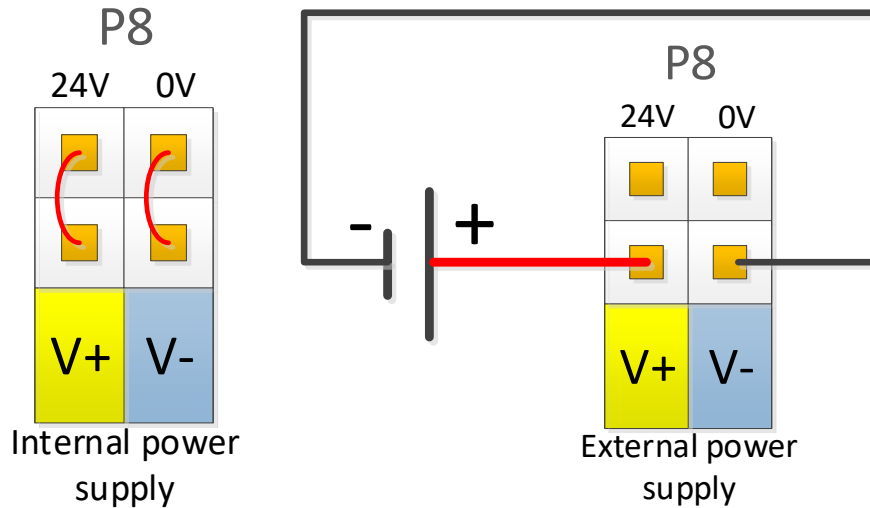


Figure 4-3 Power supply wiring

The electrical cabinet has a dedicated safety I/O interface, and the user can configure two functions: emergency stop and protection stop. The function description is detailed in section 4.3.7. Here are some examples of how safe I / O interface.

1. Factory configuration

Users can use the robot without any additional safety equipment. If EI1~2 and SI1~2 are both connected to V+, V+ is connected to 24V, and V- is connected to 0V, it indicates that 24V power is provided inside the electrical cabinet. As shown in Figure 4-4.

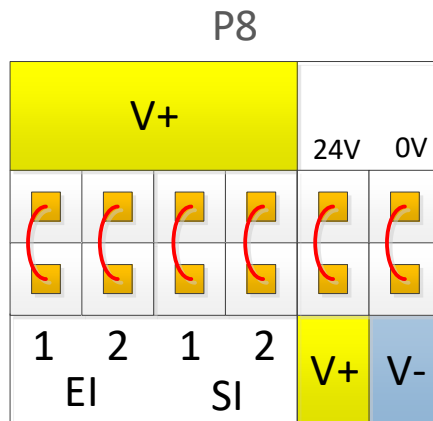


Figure 4-4 Default factory configuration

2. Connect the emergency stop switch

The user needs to use one or more additional emergency stop or guard stop switches, please refer to Figure 4-5 for wiring. Figure 4-5 shows how to use one or more emergency stop switches. The example uses an internal 24V power supply and the user can also use an external 24V power supply.

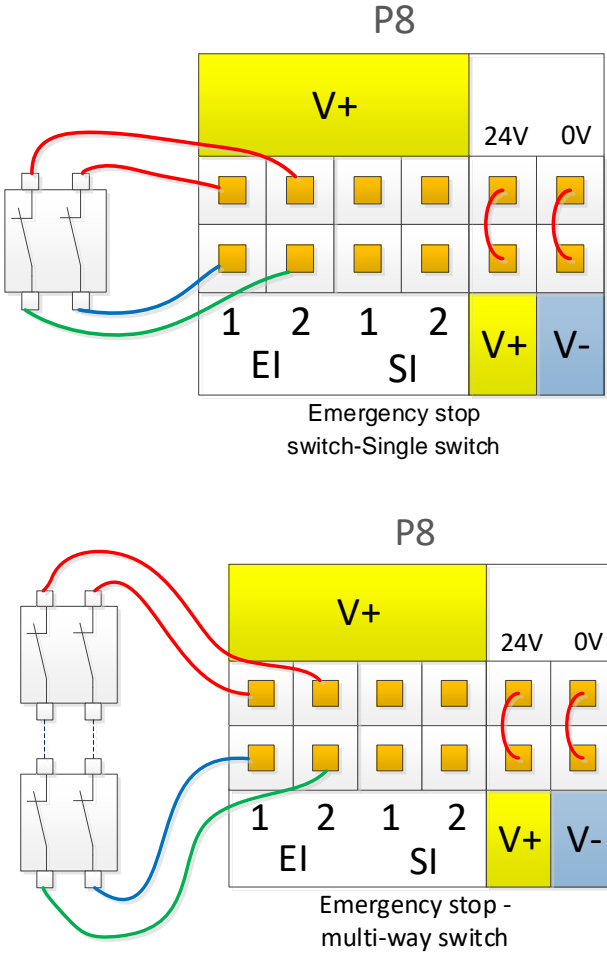
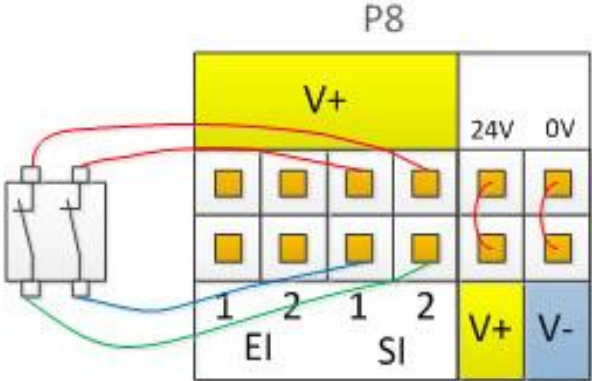


Figure 4-5 Emergency stop switch wiring

3. Connect the protective stop switch

Protective stop function, support automatic recovery. The electrical cabinet door switch is an application case of the protection stop device, and the robot stops when the electrical cabinet door is opened. The wiring diagram is shown in Figure 4-6.



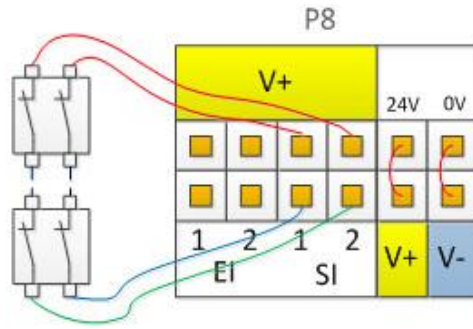


Figure 4-6 Protective stop switch wiring

### 4.3.2 Digital Input (DI)

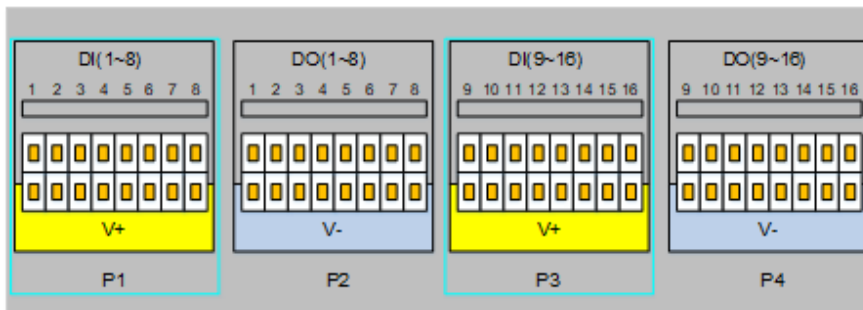


Figure 4-7 Digital inputs

The electrical cabinet is equipped with 16 digital PNP type input (Active high) (DI1 ~ DI16) to support isolated signal input. The level signal satisfies the IEC61131-2 (Type1/2/3) standard and is used to detect the input signal level status.

V+ Voltage	Low range	High range
24V	0~11V	15~24V

The V+ interface supports external 10~35V power input. The factory default uses internal 24V power supply. The high level range is 15~24V, and the low level range is 0~11V.

Users can also connect DIx to V+ directly.

Different types of input signals have different connections. The specific connection methods are as follows:

a) Dry contact signal as input

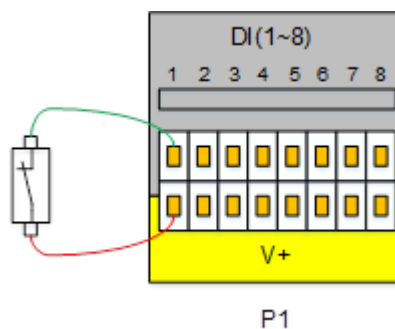


Figure 4-8 Dry contact signal input wiring



During dry contact input, one of the wires is connected to V + and the other wire is connected to DIx. When the circuit is on (as shown in the figure, the switch or relay is closed), the corresponding LED turns on. You can also see the DIx status on the APP interface.

b) PNP type signal as input

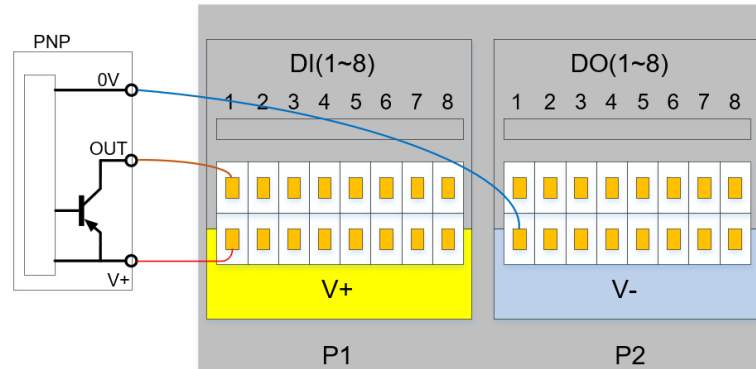


Figure 4-9 PNP type signal input wiring

Figure 4-9 shows the input wiring diagram of the PNP interface. The V + pin is connected to V +, the OUT pin is connected to DIx, and the 0V pin is connected to V-. When the signal is triggered, the LED on the panel turns on, and the DIx status on the APP interface is changed.

### 4.3.3 Digital Output(DO)

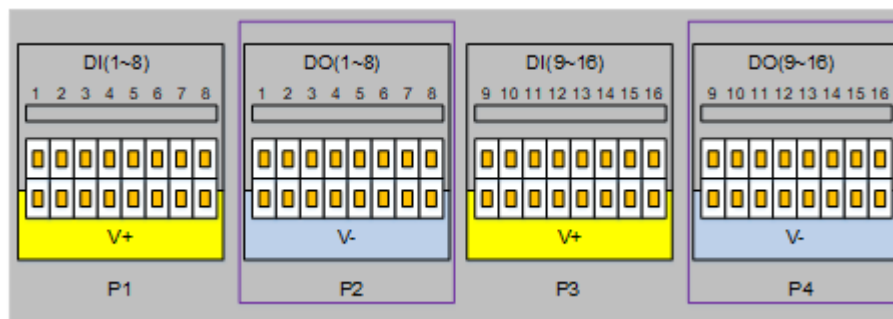


Figure 4-10 Digital outputs

The electric control cabinet has 16 channels PNP type output interface (DO1 ~ DO16) to support isolated signal output.

The digital output uses a high-side output with a single continuous maximum current of 1A. However, when V+ defaults to internal 24V power supply, the 24V power supply is limited to 1.5A. The typical internal circuit diagram is as follows:

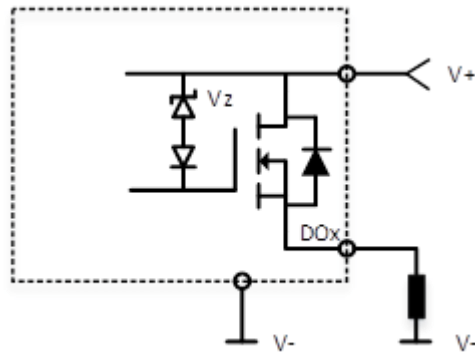


Figure 4-11 Internal circuit

The typical block diagram is as follows:

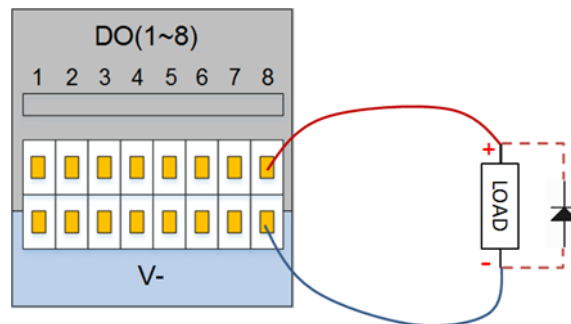


Figure 4-12 Digital output wiring

The digital output module can be controlled by the DO function of the APP. The user needs to control the load power when using it. The single channel should not exceed 1A current, and the DO output current should not exceed the maximum output current of the power supply.

\* Note: It is strongly recommended to use protection DIODES for the inductive loads (such as relays, electromagnets, DC motors, etc.).

#### 4.3.4 Analog Input&Output(AI&AO)

The electrical cabinet has 2 analog input and output interfaces (Ch1, Ch2), the input mode can be configured, and the AI mode is as follows:

- 1) Current signal input: 4~20 mA.
- 2) Voltage signal input: 0~5V, 0~10V, -10V~+10V.
- 3) Current signal output: 0~20mA.
- 4) Voltage signal output: 0~10V.

The wiring method for analog input and output is shown in Figure 4-13.

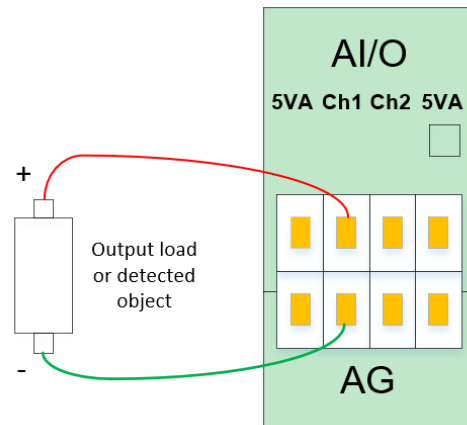


Figure 4-13 Analog wiring

The JAKA CAB V2 AI/O interface can be configured to work in different modes (factory default is 0~10V analog input). The user can set the AI/O working mode through the APP.

For high accuracy, the following instructions are recommended:

- Use the AG terminal closest to the AI/O.
- Use the same GND for equipment and electrical cabinet. The analog AI/O is not isolated from the electrical control cabinet.
- Use shielded cables or twisted pairs. Connect the shield to the "AG" on the "Power".
- The sensitivity of the current signal is lower for the device operating in current mode than the interface.

### 4.3.5 High Speed Interface

The P6 HSI (High Speed Interface) can be connected to an external encoder. Can be used for conveyor tracking and other occasions. For detailed usage, please contact our technical staff for support.

### 4.3.6 Remote ON/OFF

The remote ON/OFF control is used to enable the user to leave the APP and the handle to turn the cabinet on and off. It can usually remotely control the on/off switch of the robotic control cabinet when the user connects to the PLC system.

When ON/OFF receives a 5~24V voltage signal (reference ground is V-), and the "ON/OFF" connector functions the same as the handle switch button.

The user can short-circuit Remote ON/OFF to 12V power supply or VSB interface through the switch.

### 4.3.7 Safety I/O

In order to ensure the safety function configuration of the robot, the electrical cabinet provides two fixed safety function input interfaces. EI is an emergency stop and SI is the user stop. Both EI and SI have a redundant design that can be enabled when any channel signal is active. The emergency stop function is similar to the handle emergency stop button function, and the user stop function belongs to the program pause.

The difference between the two functions is as follows:

	EI	SI
Robot stops moving	Yes	Yes
Joint motor status	Stop	Enable
Robot power supply	OFF	ON
Program execution status	Terminated	Pause
Brake status	OFF	ON

Users can access security doors, security light curtains, sensors and other devices according to actual security requirements.

#### 4.4 Bottom panel of the electrical cabinet

The bottom panel of the electrical cabinet includes the outlet hole, the binding hole, the handle outlet, the Ethernet interface, the robot heavy-duty connector, the standard plug and the switch.

The outlet holes and the tie holes can be used to arrange and fix the wire harness leading to the front panel of the robot. The Ethernet interface is used to connect the robot to the local network. The word plug and switch are used for power connection. The robot heavy-duty connector is used to connect the electric control cabinet to the robot body.

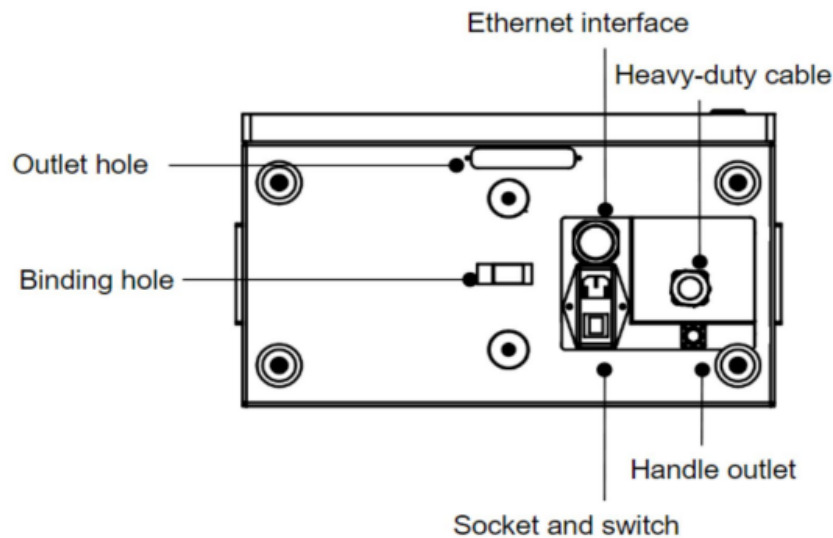


Figure 4-14 Electrical cabinet bottom panel interface

##### 4.4.1 Power Connection

The robot power cable is supplied with the robot. One end of the power cord is plugged into the socket of the bottom panel of the electric control cabinet. The other end of the power cord is a triangular plug that plugs into the corresponding mains socket according to the safety assessment specification. The socket has a switch and a fuse. The socket switch is limited to use when the robot is turned off. The purpose of the outlet switch is to completely disconnect the robot power supply. The type of fuses included in the switch should be selected

according to the working conditions of the robot. It is configured to be 10A at the factory.

The power source used by the robot should be equipped with at least:

- grounding
- mains fuse
- Residual current circuit breaker

It is recommended to install a power switch for the power supply of all devices in the robot's environment.

**⚠ Warning:**

1. Make sure that the robot is grounded correctly (Electrical connection to earth).
2. Make sure that the input power to the electrical cabinet is protected with a RCD (Residual Current Device) and a correct fuse.
3. Lockout and tagout all power for the complete robot installation during service. Other equipment shall not supply voltage to the robot when the system is locked out.
4. Make sure that all cables are connected correctly before the electrical cabinet is powered. Always use an original and correct power cord.

**4.4.2 Robot Connection**

Be sure to connect the robot to the control cabinet using the robotic connection cable provided by JAKA. Be sure to lock the connector before starting the robot. Before disconnecting the cable robot, the robot must cut off the power supply. Figure shows the interface definition of heavy duty connector.

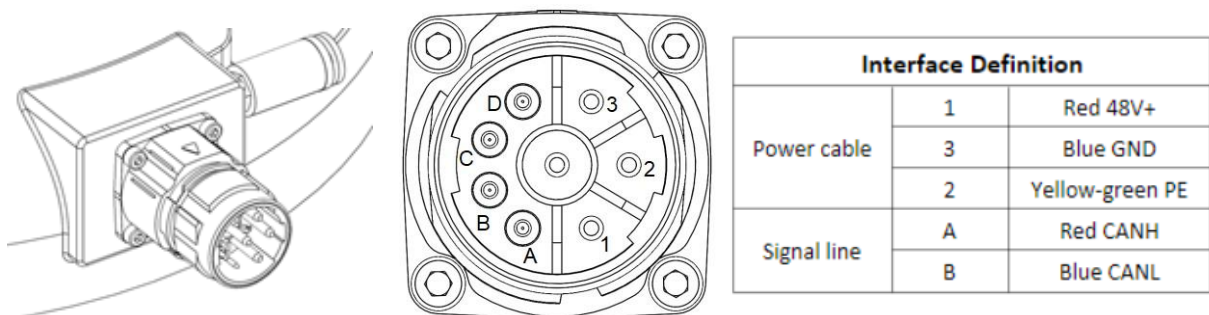


Figure 4-15 Connector interface definition

**⚠ Caution:**

1. Do not disconnect the robot cable when the robot is turned on.
2. Do not extend or modify the original cable.

**4.5 Tool Input and Output**

The tool input and output position is on the side of the robot tool flange. Includes two digital inputs, two digital outputs and one analog input.

If the customer needs to choose the TIO external cable, please call 400-006-2665. Figure 4-16 shows the cable specifications.

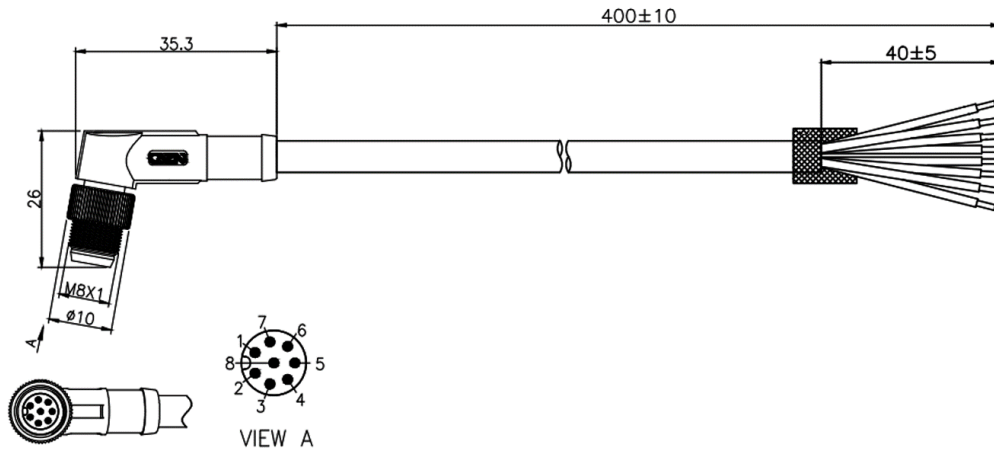


Figure 4-16 Cable specifications

**4.5.1 TIO function description**

The TIO interface function is described in the following table:

PIN	DEFINE	I/O	Line color	DESCRIPTION
1	+24V	-	red	24V positive. Maximum continuous current to 1.0A
2	DI1	I	blue	Digital input 1. NPN type. Optocoupler Cathode input. Internal connect 4.7k resistor.
3	DI2	I	green	Digital input 2. NPN type. Optocoupler Cathode input. Internal connect 4.7k resistor.
4	DO1	O	yellow	Digital output 1. NPN type. Open Drain output. Current ≤0.5A per channel.
5	DO2	O	Pink	Digital output 2. NPN type. Open Drain output. Current ≤0.5A per channel.
6	AIN_P	I	brown	Analog input. Supports -10V~+10V voltage input. Decouple with the AIN_N pin.
7	AIN_N	I	white	Analog input: Negative. Decouple with the AIN_P pin.
8	GND	-	gray	GND. 24V Power Ground.

1. TIO analog input interface

Analog input AI1 supports -10V~+10V high precision voltage range input.

2. TIO digital input interface

The digital input uses the optocoupler cathode input and is active low. Internally connected 4.7k resistors.

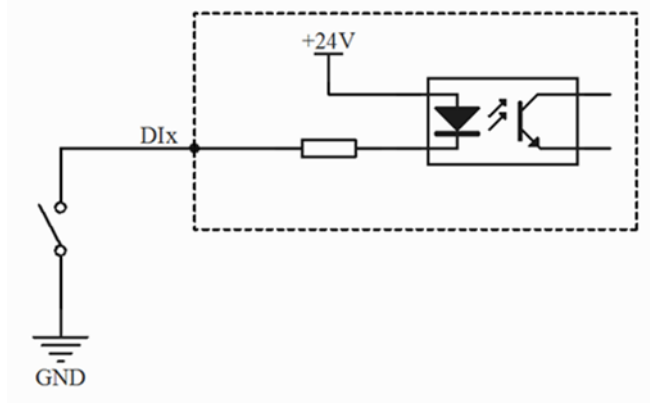


Figure 4-17 TIO digital input interface circuit

a) Type of the dry contact input:

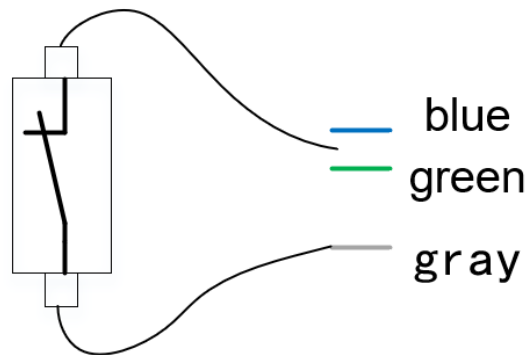


Figure 4-18 Dry contact input wiring

The dry contact input (ie, switch input) is connected to the negative pole of the 24V power supply in TIO (gray wire), and the other end is connected to the DI digital input (blue or green wire), as shown in Figure 4-18.

b) The input type is NPN

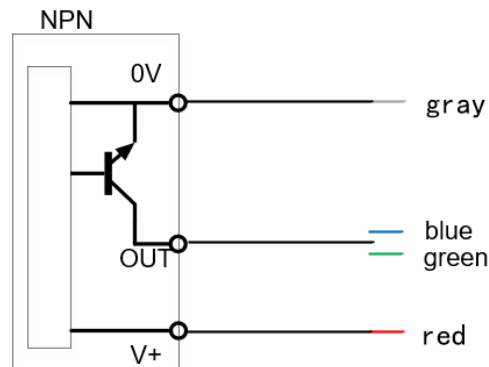


Figure 4-19 NPN input wiring

Figure 4-19 shows the block diagram of the NPN input device connection: the V + pin is connected to + 24V (red wire), the 0V pin is connected to the negative pole (gray wire), and the OUT pin is connected to DIx (blue or green wire).

### 3. TIO digital output interface

The digital output interface uses an open collector output that supports up to 500mA of current capability.

Note: If an inductive load (such as a relay, electromagnet, DC motor, etc.) requires an external freewheeling diode.

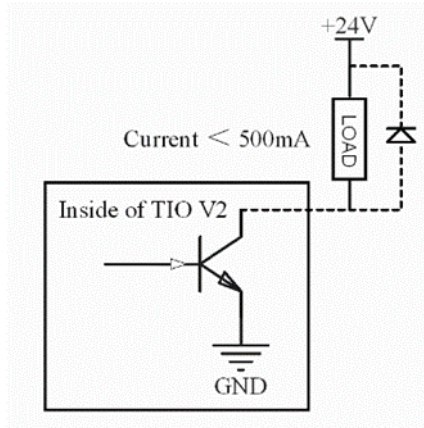


Figure 4-20 TIO digital output interface circuit

\* Note: It is strongly recommended to use protection DIODES for the inductive loads (such as relays, electromagnets, DC motors, etc.). Otherwise, this port may damage the hardware circuit

### 4.6 Technical Specifications

1.JAKA Pro 16 Robot Technical Specifications:

Robot type:JAKA Pro 16			
Product Features	Maximum payload	16kg	
	Weight (including cable)	73.9kg	
	Working radius	1712.67mm	
	Repeatability	±0.03mm	
	Degrees of freedom	6	
	Programming	Graphical drag-and-drop programmin	
	FlexPendant Type	Mobile device (PAD/mobile)	
	Collaborative operation	Cooperative operation according to GB11291.1-2011 standard	
Working range and speed	Robot joint	Working range	Max speed
	Joint1	±360°	120°/s
	Joint 2	-85°~+265°	120°/s
	Joint 3	±175°	120°/s
	Joint 4	-85°~+265°	180°/s
	Joint 5	±360°	180°/s
	Joint 6	±360°	180°/s
	Maximum speed of the tool end	/	3.5m/s
Physical properties and others	Power consumption	Average 750W	
	Temperature	0-50°C	
	IPclassification	IP68	
	Robot installation posture	Install at any angle.	
	TIO Ports	2 digital input 2 digital output 1 analog input	
	TIO Power	24V	
	Base diameter	246mm	
	Material	Aluminum alloy, PC	
	TIO Size	M8	



	Robot connection cable length	6m
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2. Electrical cabinet technical specifications:

Electrical cabinet	IP classification	IP44
	I/O ports	16 digital input 16 digital output 2 analog input/output
	I/O power	24V
	Communication	TCP/IP, Modbus TCP, Modbus RTU
	Power	100-240VAC, 50-60Hz
	Size	410×307×235 (mm)(W*H*D)
	Weight	18kg
	Material	Powder-coated SPCC

## 5 Maintenance and Repair

Maintenance and repairing must be performed in compliance with all safety instructions in this manual.

Repairing must be performed by an authorized system integrator or JAKA staff.

Parts returned to JAKA should be returned as specified in the Service Manual.。

### 5.1 Safety Instructions

After maintenance and repair, product must be checked to ensure the required safety level. The valid national or regional work safety regulations must be observed for this check. The correct functioning of all safety functions shall also be tested.

The purpose of maintenance and repairing is to ensure that the system is kept operational or, in the event of a fault, to return the system to an operational state. Repairing includes troubleshooting in addition to the actual repair itself.

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

---

**DANGER:**



1. Do not change anything in the safety configuration of the software. If any safety parameter is changed, the complete robot system shall be considered as a new system, which means that the overall safety approval process, including risk assessment, shall be updated accordingly.
2. Replace faulty components using new components with the same article numbers or equivalent components approved by JAKA for this purpose.
3. Reactivate any deactivated safety measures immediately after the work is completed.
4. Document all repairs and save this documentation in the technical file associated with the complete robot system.。

---

**DANGER:**



1. Remove the main input cable from the bottom of the electrical cabinet to ensure that it is completely unpowered. Deenergize any other source of energy connected to the robot arm or control box. Take necessary precautions to prevent other persons from powering on the system during the repair period.
  2. Check the earth connection before re-opening the system.
  3. Observe ESD regulations during the disassembly of the parts of the robot or electrical cabinet.
  4. Avoid disassembling the power supply inside the electrical cabinet. High voltages can be present inside these power supplies for several hours after the electrical cabinet has been switched off.
-

5.Prevent water and dust from entering the robot or electrical cabinet.

## 5.2 Overhaul Project and Cycle

In order for the robot to maintain high performance for a long time, a maintenance check must be carried out. The person in charge of overhaul must prepare an overhaul plan and carry out an inspection. Please refer to the table below for overhaul items.

In addition, overhauls are required every 20,000 hours of operation time or every 4 years. If you are not clear about the maintenance processes, please contact our service department.

Cycle			Overhaul Items	Overhaul essentials	Part
daily	3month	Every year			
●			Robot body	confirm that whether the stored location of the program is deviated	All Parts
	●		Cleaning the robot body	Wipe off dirt, etc., remove accumulated spatter, ash, dust, cutting residue, etc.	All Parts
	●		Main bolts	All the bolts exposed on the outside of the robot need to be tightened and marked (see the specified tightening torque table), including the tool mounting bolts are also implemented.	All Parts
●			Motor	Abnormal heating or sound confirmation	All Axis
●			Brake	Check when the servo power is turned ON/OFF, whether the robot arm or tool will fall.	All Axis
	●		Reducer	Check for abnormal vibration, noise, and oil leakage	All Axis
	●		Tools	Apply force to the tool to make sure it is properly and securely bolted in place.	The 6th Axis

Bolted tightening torque table

Bolt Size	Hexagon bolt	SUS bolt with hexagon hole
M3	2.4 Nm	1.47 Nm
M4	5.4 Nm	3.4 Nm
M5	9 Nm	6.9 Nm
M6	15.3 Nm	11.8 Nm
M8	37 Nm	28.4 Nm

The tightening torques will vary depending on the type of base metal or bolt. When not specified, please





follow the tightening torques above.






Verification number	Inspection cycle			Maintenance			Inspecting Parts	Inspecting Content	Inspection/processing method
	Daily	Every 3 months	Every 1 year	4 year	5 year	8 year			
1	●						Surfaces	Whether there is splashes, dust, etc.	Visual confirmation, cleaning
2	●						Filters	Whether there is dirt or blockage	Visual confirmation, cleaning, replacement
3		●		●		●	Cables	Confirm whether there is any damage or fragmentation •Confirm whether the connectors are loosed.	Visual confirmation, tightening. Replace the cable when it is obviously damaged.
4						●		Overhaul	

(Note) Use a soft cloth to remove dusts when cleaning. Do not blow off dust with equipment such as air blowers. Wind pressure will cause the dusts to enter the inside of the fan and the blades rotate at a speed exceeding the rated speed, which may cause the fan to malfunction or affect its life. Only use the vacuum cleaner on the blade section. Do not vacuum the rotating part or the main body, which can cause the fan to malfunction or reduction of the fan's service life.

### 5.3 Parts Replacement and Preservation

When replacing the parts of the robot control unit, please observe the following precautions and work safely.

	<ol style="list-style-type: none"> <li>1. Do not carry out any modification of our products.</li> <li>2. Fire, malfunction, and wrong movements caused by modification may result in personal injury or damage to the robot.</li> <li>3. Any loss caused by the user's own modification of JAKA's products is not covered by JAKA's warranty.</li> </ol>
	<ol style="list-style-type: none"> <li>1. To prevent electric shock, when replacing parts, please turn off the circuit breaker, and then turn off the main power supply.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Turn off the main power, wait for 5 minutes, and then the parts could be replaced if needed.</li> <li>2. There is a risk of electric shock, due to residual charge in the electronic components.</li> <li>3. Do not use wet hands for work.</li> <li>4. In case of electric shock, it will result in serious injury or death.</li> </ol>
	<ol style="list-style-type: none"> <li>1. The replacement must be carried out by the specified operator.</li> <li>2. Electric shock or being caught by a robot accidentally can result in serious injury or death.</li> </ol>

	<ol style="list-style-type: none"> <li>1. There are a large number of connection interfaces between the printed circuit boards. Keep cautious when replacing parts to avoid mis-insertion or omission.</li> <li>2. If it causes electric shock or fire, it will result in serious injury or death.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Do not damage the wiring or pull the connector when it is replaced.</li> <li>2. Do not touch the electronic components of the printed circuit boards and the contact parts of the wiring or interface when replacing. Hold the edge of the printed circuit board when replacing.</li> <li>3. If you accidentally touch them, it may cause electric shock, resulting in serious injury or death.</li> </ol>
	<ol style="list-style-type: none"> <li>1. In order to carry out maintenance and inspection work, the power should be turned on once while the electrical cabinet's door is ope. Do not let the inside of the electrical cabinet be exposed to direct sunlight or searchlights, otherwise it will cause malfunction or wrong movements.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Before performing maintenance, the operator should discharge static electricity in advance.</li> <li>2. Antistatic wrist straps are very effective.</li> <li>3. Failure to take any precautions when touching electrical components directly, electrical components may malfunction.</li> </ol>
	<ol style="list-style-type: none"> <li>1. After the maintenance is completed, check if there is any gap or if any cable is caught. After that, reinstall the case. If there is a gap, it may cause dirt, dust, etc. to enter the inside of the electrical cabinet, which will cause malfunctions.</li> </ol>

### 5.3.1 Filter cleaning and replacement

1. Power off the electrical cabinet.

2. Remove the nut from the filter housing.

3. Clean the dust adhering to the filter by blowing it out. Dust should be blown from the inside of the electrical cabinet during cleaning. When there is dirt, etc., apply warm water or a neutral detergent. And if it still cannot be cleaned, it should be replaced.

4. Installation should be carried out in the reverse order of removal.

When cleaning with warm water or a neutral detergent, it should be fully dried before installation.

### 5.3.2 Part preservation

According to the life and frequency of use of the components, the recommended spare parts are divided into two categories: A and B.

Maintenance parts • A: Main maintenance parts for daily maintenance and inspection

- A-1: Important backup parts
- A-2: Regular replacement parts / recommended spare parts

Maintenance parts • B: Maintenance parts prepared when purchasing multiple robots

- B-1: Parts purchased from JAKA

In order to maintain normal operation, the A-1 and A-2 are the minimum necessary important parts. It is recommended to prepare one whole set. In addition, the printed circuit board uses highly reliable components, so please pay attention to the following points during storage.

- Preservation temperature -10°C ~ +50°C

In order to maintain its reliability during long-term storage, it is recommended to maintain the temperature within 25°C±10°C. Please avoid sharp temperature changes (10°C/ h or more).

- Preservation humidity 20~85%RH

In order to maintain its reliability during long-term storage, it is recommended to maintain the humidity within 45%-65%. Avoid condensation or mold during storage.

- anti-static measure

Static electricity is easy to generate in extremely dry conditions, and the shock during electrostatic discharge may damage the semiconductor. Please put it in an anti-static bag.

- Other environmental conditions

Please store it in an environment where no toxic gases, dirt, or dust are generated. Do not place heavy objects on it during storage.

## 5.4 Service Commitment

I. JAKA will provide users with the following equipment warranty and maintenance services:

Equipment provided by JAKA: from the day of acceptance of the equipment, the equipment enters the warranty period. The warranty period is 1 year. During the warranty period, if the equipment is faulty, JAKA will be responsible for repairing and maintenance. After receiving the user's equipment failure report, if the fault is caused by JAKA's equipment, JAKA is responsible for providing the warranty and promptly repairing. If the fault is caused by one of the following situations, it is not included in the free warranty, and the user should pay for the cost of equipment. JAKA should assist in troubleshooting as soon as possible to restore the equipment back to normal:

1. User does not operate according to the operating procedures;
2. User damages the equipment on purpose;
3. Other failures caused by force majeure factors (such as lightning strikes, earthquakes, and floods, etc.)

Our company JAKA provides free maintenance services to users during the one-year warranty period.

After the expiration of After the warranty period expires, our company JAKA will continue the after-sales service procedures:

1. By negotiating with the user unit, the content and format of the service application form and the support service implementation report are will be determined, and the user unit and the company JAKA will respectively designate the related personnel respectively.

2. If the user needs support services, it is required to fill out the service application form and fax it to JAKA. If the situation is urgent, user can call directly to request the service.

II. Range and content of support service

1. Our company JAKA promises to provide maximum technical services in all dimensions throughout the project, including: hardware maintenance support service and software training support service.

2. Hardware maintenance support service: We JAKA promises to be responsible for maintenance of any equipment during the equipment warranty period, and the user does not have to pay any fees (except for mechanical injuries or malfunction caused by incorrect operation of user unit). After the expiration of After the equipment warranty expires, we will sign the relevant agreement with the user to confirm the charging method, maintenance responsibility, and maintenance method to ensure the performance fulfillment of maintenance responsibility.

### III. Service call hotline and contact information

- Email: support@jaka.com
- Telephone: 400-006-2665
- Information required
- Robot serial number
- Software version
- Detailed fault description
- Attached log files

## 6 Warranty

### 6.1 Product Warranty

Without prejudice to any claim the user (customer) may have in relation to the dealer or retailer, the customer shall be granted a manufacturer's warranty under the conditions set out below: Based on the principle without detriment to any claim agreement between users (customers) and dealers or retailers, manufacturers shall provide customers with warranty in accordance with the following articles: In the case of new devices and their components exhibiting defects resulting from manufacturing and/or material faults within 12 months of entry into service, JAKA shall provide the necessary spare parts, while the user (customer) shall provide labor to replace the spare parts, either replace the part with another part reflecting the current state of the art, or repair the said part. This Warranty shall be invalid if the device defect is attributable to improper treatment and/or failure to comply with information contained in this manual. If the equipment defect is caused by improper handling and/or failure to follow the relevant information described in the user manual, the warranty is void. This Warranty shall not apply to or extend to services performed by the authorized dealer or the customer themselves (e.g. installation, configuration, software downloads). The purchase receipt, together with the date of purchase, shall be required as evidence for invoking the Warranty. The user (customer) must provide purchase receipt and date of purchase as valid evidence of the warranty. Claims under the Warranty must be submitted within two months of the Warranty default becoming evident. Ownership of devices or components replaced by and returned to JAKA shall vest in JAKA. The ownership of equipment or components replaced or returned to JAKA belongs to JAKA. Any other claims resulting out of or in connection with the device shall be excluded from this Warranty. Any other claims caused or related to equipment are not covered by the warranty. Nothing in this Warranty shall attempt to limit or exclude neither a Customer's Statutory Rights 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. The warranty period shall not be extended by the services the articles provided. 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.

### 6.2 Disclaimer

JAKA is devoted to improve the reliability and performance of product, and reserve the right to upgrade our products without prior notice. JAKA strives to ensure the accuracy and reliability of the contents of this manual, but is not responsible for any errors or omissions.





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