ESTUN
CODROID

Estun Codroid

Palletizing Workstation

User Manual

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Contents

1. Preface

1.1 Safety

Thank you for purchasing and using our company's robot, it only passed two functional safety certifications of EN ISO 13840-1:2023:

1. the performance level of the emergency stop circuit for the above model of robot is Pld.

2. the nennrmance level of the protective stop circuit for the above model of robot is maximum PLd.

1.2 Nameplate

You can find information such as the model of the robot on the robot arm.

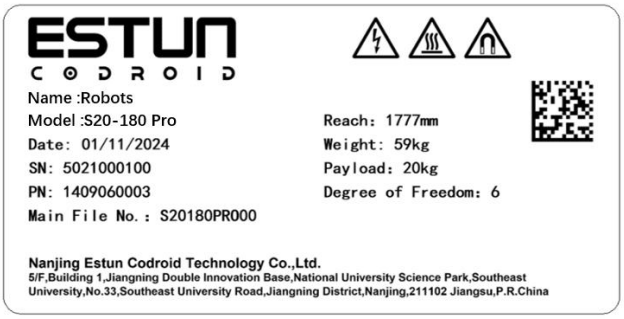


Figure 1-1 Robot body nameplate-

You can find information such as the model of the control cabinet on the control cabinet.

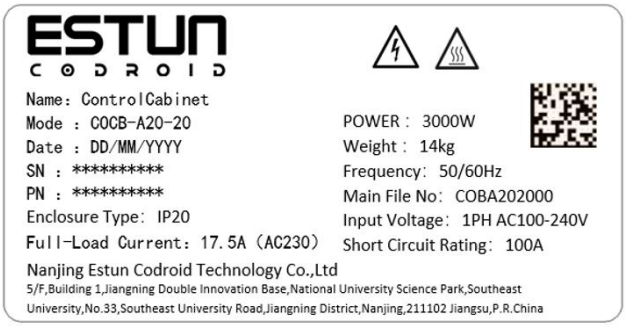


Figure 1-2 Control cabinet nameplate-

1.3 How to use this manual

This manual describes the hardware composition of the Codroid robot and teaches the operation of the control system, which helps users understand and master the functions, technical specifications, installation and use of the Codroid robot.

This manual is intended for customers, sales engineers, installation and commissioning engineers, technical support personnel, etc.

This manual contains methods on how to protect the user and prevent damage to the machine. The user needs to read all relevant descriptions in the manual and be fully aware of safety matters.

In this manual, we try our best to describe various situations. However, due to the abundance of possibilities, it is impossible to record all the situations that do not need to be done or cannot be done.

1.4 Copyright and Trademark Notice

1.5 Disclaimer of the Manual

Before using this product, read this user manual and relevant technical documentation published online in detail and understand the relevant information to ensure that you have a full understanding of the robot and its related knowledge. We recommend that you use this manual under the guidance of a professional. All safety information contained in this manual should not be regarded as a guarantee by Codroid that hazards or losses may still occur during use, even if this manual and related instructions are followed.

1.6 Common terms used in this manual

1.6.1 Robot

Fixed or mobile automatic machinery used in industrial automation that can be automatically controlled, reprogrammed, multi-purpose, and programmed with three or more axes.

1.6.2 Maximum working space

The space that the robot's moving parts can pass over, plus the space that the end effector and the workpiece can pass over when moving.

1.6.3 Precision

Deviation of position and attitude between the command distance and the average of the actual arrival distance.

1.6.4 Repeatability accuracy

The degree of consistency in the actual distance achieved after n repetitions of the same command distance in the same direction.

1.6.5 Trajectory accuracy

The maximum trajectory deviation of the trajectories obtained along the upper edge of position and attitude.

1.6.6 Trajectory repetition accuracy

The degree of consistency of the actual trajectory when the robot repeats the same command trajectory n times.

1.6.7 Tool center point (TCP)

A point set for a particular purpose by referring to the mechanical interface coordinate system. (Refer to GB/T 12643-2013, Definition 4.9)

1.6.8 Load

Refers to all loads mounted on the robot flange without the weight of the tool.

1.6.9 Protective stop

A form of operational interruption that allows motion to terminate in an orderly manner for safety and maintains program logic in order to restart.

1.6.10 Singularity (singular point)

A situation where two or more axes of a robot are collinear, causing uncertainty in the robot's motion and velocity.

1.7 Version history

Version	Release date	Description
V1.0	20250421	Initial version

2. Security Information

2.1.Effectiveness and accountability

The information in this manual does not cover the design, installation, and operation of a complete robotic application, nor does it cover all peripheral devices that may have an impact on the safety of this complete system. The design and installation of the complete system should comply with the safety requirements established in the standards and specifications of the country where the robot is to be installed.
Estun Codroid's integrator is responsible for ensuring compliance with the relevant country's practicable laws and regulations to ensure that there are no major hazards in the complete robot application. This includes but is not limited to the following:

- Conduct a risk assessment of the entire robotic system.
- Connect the other machinery and additional safety equipment as defined by the risk assessment.
- Make appropriate safety Settings in the software.
- Make sure that the user does not modify any security measures.
- Make sure the design and installation of the entire robot system are accurate.
- Specify the instructions for use.
- Mark the relevant logo and contact information of the integrator on the robot.
- Collect all the documents in the technical documentation; Include the risk assessment and this manual.

2.2. Warning signs as stipulated in this manual

The following safety warning signs may appear in this manual and they represent the following meanings:

Warnings

This sign indicates a potentially dangerous electricity usage situation. If not avoided, it can lead to death, serious injury or severe damage to equipment.

Warnings

This sign indicates a situation that may cause danger and, if not avoided, could result in death or serious injury.

Warnings

This sign indicates an electrical situation that could cause danger and, if not avoided, could result in personal injury or serious damage to equipment.

Warnings

This sign indicates a situation that could cause danger and, if not avoided, could result in personal injury or serious damage to equipment.

Warnings

This sign indicates an electrical situation that could cause danger and, if not avoided, could result in personal injury or serious damage to equipment.

Warnings

This sign indicates a hot surface that may cause danger and can cause personal injury in the event of contact.

Be careful

This sign indicates a situation that, if not avoided, can cause serious damage.

2.3. Safety precautions

- Ensure that the robotic arm and tools/end effectors are properly and securely fastened with bolts. Make sure the robot arm has enough space to move freely.
- Ensure that safety measures and/or robot safety configuration parameters have been established as defined in the risk assessment to protect programmers, operators, and bystanders.
- When operating the robot, please do not wear loose clothes and do not wear jewelry. Make sure your long hair is tied at the back of your head when operating the robot.
- Do not use the robot if it is damaged, such as when the joint cap is loose, damaged or removed.
- Do not put your fingers into the control box.

- Do not connect any security devices to the standard IO interface. Only use the secure IO interface.
- Make sure you have the correct installation Settings (e.g. Robot installation Angle, weight in TCP, TCP offset, security configuration).
- Drag-and-drop teaching functionality is only permitted during the installation process after a risk assessment.
- Tools/end effectors and obstacles must not have sharp corners.
- Make sure that warning people's heads and faces remain out of reach of the robot being operated or the robot about to start operating.
- Be aware of the robot's movement when using the teaching box.
- Do not enter the safe range of the robot, or touch the robot while the system is running, if the risk assessment has been determined.
- Linking different machines together may increase the risk or create new risks. Always conduct a comprehensive risk assessment for the entire installation.
- Never modify the robot. Alterations to a robot may pose unpredictable dangers. Robot authorization reorganizations are subject to the latest version of all relevant service manuals.
- Make sure the robot user knows where the emergency stop button is located and is instructed to activate the emergency stop in an emergency or abnormal situation.
- The robot and control box generate heat during operation, so do not touch the robot while it is running or just stopped. You can cool the robot by turning it off and waiting for an hour.
- When a robot is connected to or working with machinery that could cause damage to the robot, it is strongly recommended to test all of the robot's functions and robot programs separately.
- Do not expose the robot to magnetic fields, fire, explosive potential, radio interference, liquids, etc. all the time, otherwise the robot may be damaged.
- Robot systems are not allowed to be used in explosive or potentially explosive environments.
- A state in which the robotic arm appears to have stopped while the device is in operation because it is waiting for a start signal. It should also be regarded as being in motion. Do not approach the robotic arm.
- During the process of moving, installing, operating and maintaining the robot, the operator should wear safety gloves, glasses, anti-crush shoes and other safety protection equipment to avoid danger and injury.

2.4. Safety requirements

Safety features are generally in line with ISO 10218-1 standards, specifically with the

following requirements.

When safety-related control systems are required, safety-related components should be designed as follows:

- A single failure of any component will not result in the loss of safety functionality.
- Where reasonably practicable, a single failure should be detected at or before the next request for safety functionality is made.
- When a single failure occurs, the safety function is always in operation and should remain in safety until the detected failure is repaired.
- All faults that can be reasonably encountered should be checked out.

This requirement is regarded as equivalent to Class 3 structure as described in ISO 13849-1. Class 3 is typically accomplished through redundant circuits. Safety features and robot controllers comply with performance class (PL) d as stipulated in ISO 13849-1.

2.5. Safety disclaimer

This manual does not contain information on how to fully design, install and operate the robot for use with other equipment, nor does it contain the possibility that such use may affect peripheral equipment.

The safety of robot installation depends on how the robot is integrated, and the integrator needs to conduct a risk assessment of the system's design and installation in accordance with the laws, regulations, and safety norms and standards of the country where it is located.

Risk assessment is one of the most important tasks that integrators must complete, and integrators may refer to the following standards to carry out the risk assessment process:

- ISO 12100:2010 Mechanical safety - General Principles of Design - Risk assessment and risk reduction;
- ISO 10218-2:2011 Robots and robot equipment - Safety requirements - Part 2: Industrial robot systems and integration;
- RIA TR R15306-2014 Technical Report on Industrial Robots and Robot Systems - Safety requirements, task-oriented risk assessment methods;
- ANSI B11.0-2010 Mechanical Safety; General requirements with risk assessment.

2.6. Liability limitations

No safety information contained in this manual should be regarded as a guarantee of our robots. Many descriptions of matters may not be exhaustive and can still cause injury or damage.

We are committed to improving the reliability and performance of our products and reserve the right to upgrade them without prior notice. We are not responsible for any errors or omissions in this manual and reserve the right of final interpretation of this manual.

2.7. Stop categories

Class 0 Downtime	Uncontrolled shutdown stops the robot by immediately cutting off the actuator power supply.
Class 1 Downtime	Controlled shutdown, where the actuator actively brakes but does not ensure that the robot stops on the motion trajectory. After the robot stops, cut off the power supply.
Class 2 Shutdowns	Controlled shutdown, where the actuator actively brakes and ensures that the robot stops on the moving trajectory. After the robot stops, the power supply is not cut off.

Referring to the IEC 60204-1 standard, Codroid robots have set three stop categories, namely stop Category 0 (Cat.0), stop category 1 (Cat.1), and Stop Category 2 (Cat.2). Among them, Stop category 0 is an uncontrollable stop, while Stop categories 1 and 2 are controllable stops.

According to IEC 60204-1 and ISO 13850, emergency equipment is not a safety protection device. They are supplementary protective measures and are not intended to prevent injury.

In the event of an emergency, pressing the emergency stop button will immediately halt all movement of the robot and lock it up. Emergency shutdowns should not be used as risk reduction measures. But it can be regarded as a secondary protection device for use only in emergency situations.

If you need to stop the robot's movement under normal circumstances, use other means. After the risk assessment, if an emergency stop button is to be installed, the emergency stop button must comply with IEC-60947-5-5.

When the emergency stop button is pressed, the robot system will cut off the power supply of the robot, and the braking device between the joints of the robot will automatically lock the joints. However, slight movement of the robot body under gravity is normal, but this may also cause the risk of pinching or colliding with the human body.

Stopping classes are achieved by joint drivers, further described in IEC 61800-5-2. Emergency stop and protective stop functions are implemented through a safety interface, refer to Section 5.3.2.

2.8.Risk assessment

Before installing or using this product, the user must conduct the necessary risk assessment based on the conditions of use and read carefully the residual risks that may exist in the Company's declared values. Please read and refer to the corresponding software and hardware version of the manual.

2.9.Security functions

The safety functions of the CoDroid robot are shown in the table below.

Safety features	Instructions
Emergency stop	Activate Stop category 1 when the emergency stop button is pressed.
Protective stop	Start stop category 2 when the relevant signal input is low. This feature requires a manual reset.
Safety rated deceleration control	When the relevant signal input is low, the TCP speed will be reduced to the limit.
Joint position limitation	Set the limit range that allows joint position.
Joint speed limits	Set a limit range that allows joint speed.
Joint torque limitation	Set a limit range that allows joint torque.
TCP position limitation	Set the limit range of allowed TCP locations.
TCP Speed limit	Set the maximum rate of TCP.
TCP torque limit	Set the maximum torque of TCP.
Robot power limit	Limit the maximum power of the robot.
TCP directional limitation	Set the direction limits allowed by the tool.
Safety level monitor downtime	When the relevant signal input is low, start stop category 2. This function resets when the relevant signal input signal is low.
Speed and distance monitoring	Maintain a minimum protective distance between the operator and the robot. When the separation distance is reduced to below the protection distance, the robot system stops. The robot can automatically resume movement when the operator leaves the robot system.
Power torque limitation	Limit the maximum power and torque of the robot.

2.10. Emergency stop and recovery

When the emergency stop button is pressed, it will be locked and you need to rotate the button according to the label on the button to unlock it. After the lock is released, the alarm

can be cleared through control software, then power on, enable, and recover from the emergency state.

2.11. Movement without drive power

In case of an emergency, if it is necessary to move the robot's joints but it is impossible or not necessary to power the robot, a no-power forced drive can be used.

To perform a no-power forced drive, you must push or pull the robot arm forcefully to move the joint. Each joint brake has a grip that allows the joint to move under high intensity of torque.

The movement without electric drive is only for emergency use. And it has an impact on the lifespan of the brake device.

2.12. Storage, use, and transportation conditions

- The ambient temperature during storage and operation should be between 0 and 40°C;
- A place with low humidity and relatively dry. Relative humidity between 10% and 90%, no condensation;
- A place with less dust, dust, fumes and water;
- Flammable and corrosive liquids and gases are not allowed in the work area;
- A place with low vibration or shock energy to the electrical control cabinet (vibration below 0.5G);
- There should be no major electrical noise sources nearby (such as gas shielded welding TIG equipment, etc.);
- There is no potential danger of colliding with mobile devices such as AGVs;
- The control box should be installed outside the robot's range of motion (outside the safety fence);
- The control box should be at least 200mm away from the wall to keep the heat dissipation channels unobstructed.

2.13. Control cabinet and body identification

The following markings, nameplates. Attached to locations where specific dangers may occur. In order to avoid accidents, be sure to follow the instructions and contents of the signs when operating. Do not tear, damage or remove the sign at will. Take extra care when dealing with the parts or units attached to the sign or nameplate and the area around them.

A		Equipment must be operated and maintained by professionals with personal protection. Make sure to follow the hardware setup instructions. Avoid incorrect use of the product causing damage to the machine or other equipment, or injury to personnel
B		Please do not open the control cabinet and the body to touch the electronic devices and circuits inside to avoid electric shock. There is risk of fire or electric shock. Please be sure to use appropriate personal protective devices to prevent the danger of arc flashover. Failure to follow this specification may result in personal injury or death.
C		Hot surfaces that may cause danger can cause personal injury if contact occurs.
D		There is a magnetic field inside the robot body, which may cause harm to the body and electronic devices.
E		Product nameplate, confirming basic product information

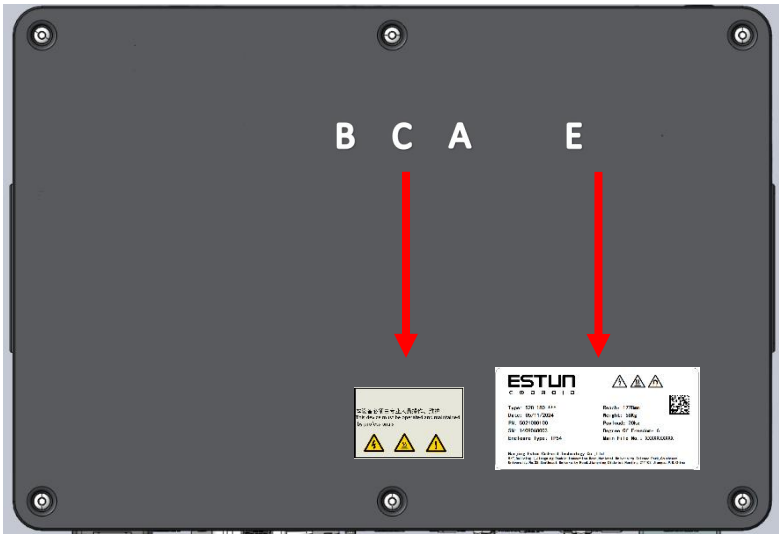


Figure 2-1 Control cabinet identification, nameplate location

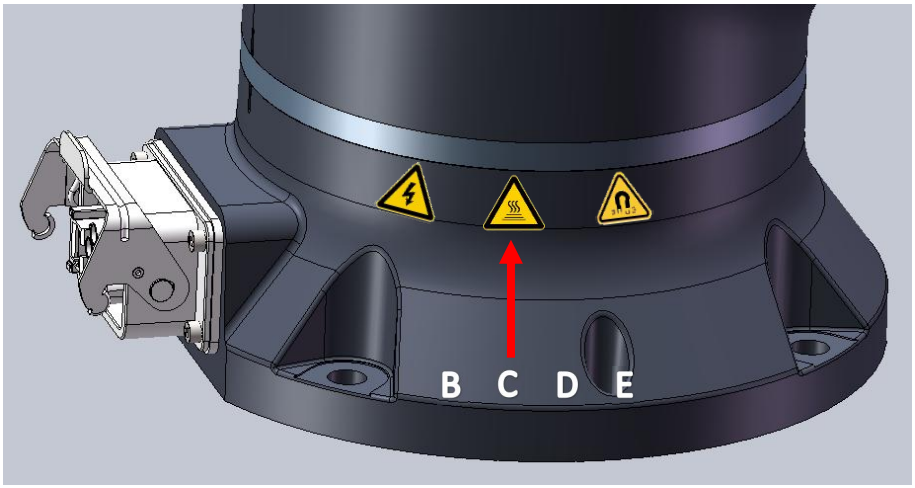


Figure 2-2 Main body identification, nameplate position

3. Quick start

3.1. Confirmation of packing items

Before the robot is used for the first time, the user needs to read and understand the safety information in the manual and the safety configuration parameters in the Settings.

The entire palletizing workstation is dispatched. The standard shipment list includes the following items (optional information will be provided separately), including the robot body, the base of the palletizing workstation (containing the controller and operation plate), suction cups, etc.

Figure 3-1 Packing contents-

3.2. Installation and wiring

3.2.1. Installation

The palletizing workstation leaves the factory with the main parts pre-installed and wired, and users only need to do simple assembly. Place the palletizing workstation on a flat surface and adjust the leveling foot cups if necessary, so that the workstation can be placed smoothly on the ground. Then install the pallets on both sides of the base.

Figure 3-2 Install the baffle

3.2.2. Wiring

For the use of the minimalist workstation, power, gas and incoming signal must be connected:

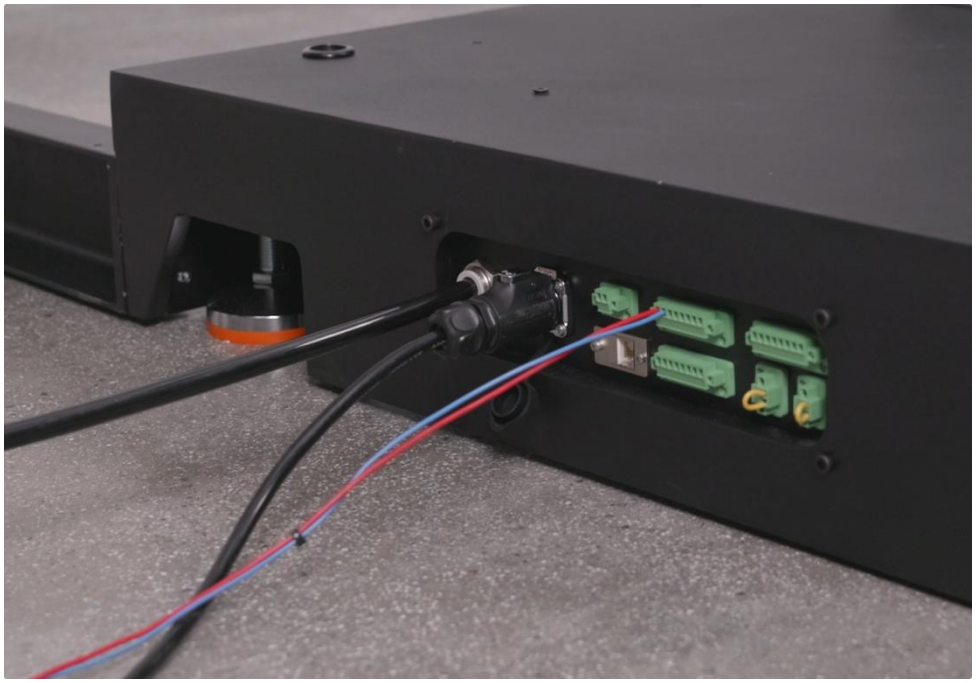
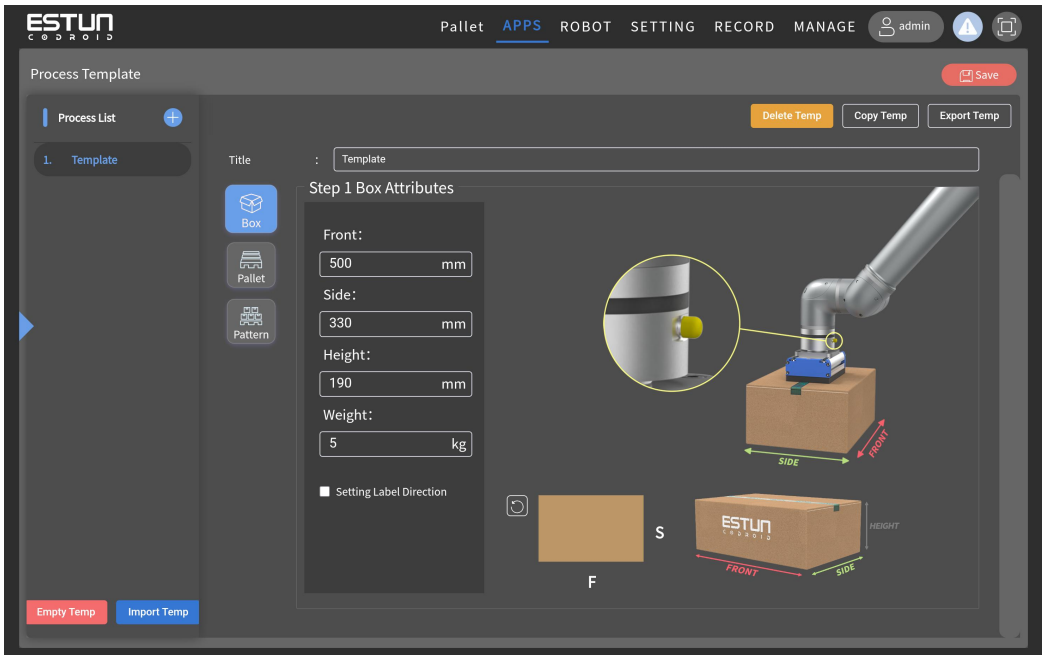


Figure 3-3 Minimalist wiring

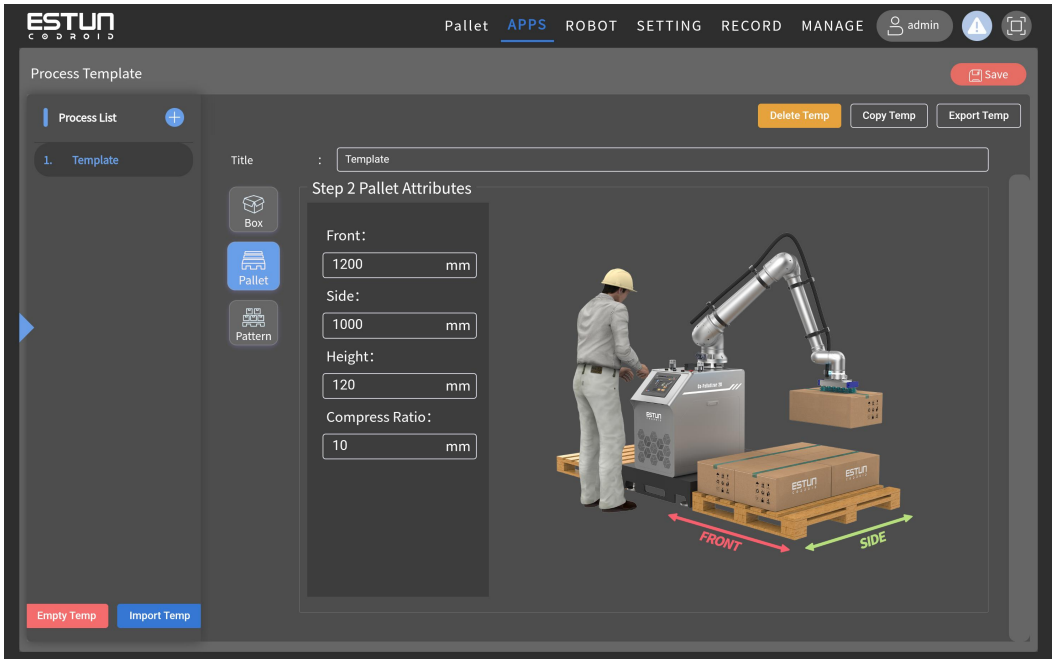
3.3. Startup

3.3.1. Stack type definitions

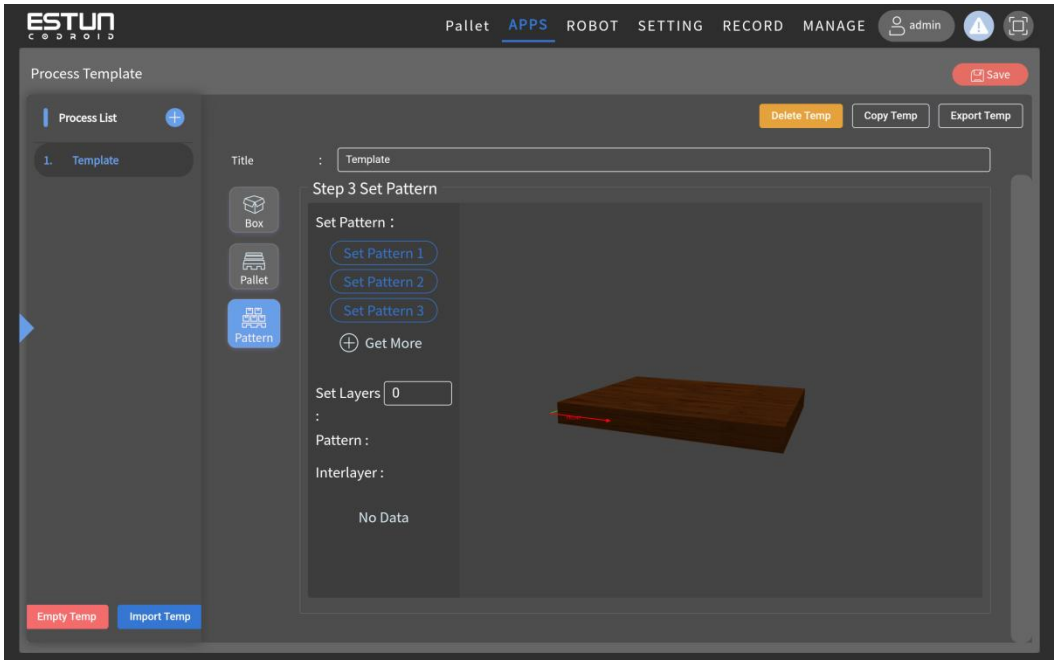
3.3.1.1 Define the box size. Enter the length, width, height of the box and the actual weight of the box. The side corresponding to the yellow button is the long side. You can set the label direction to the box graphic. Add an arrow to determine the label direction.

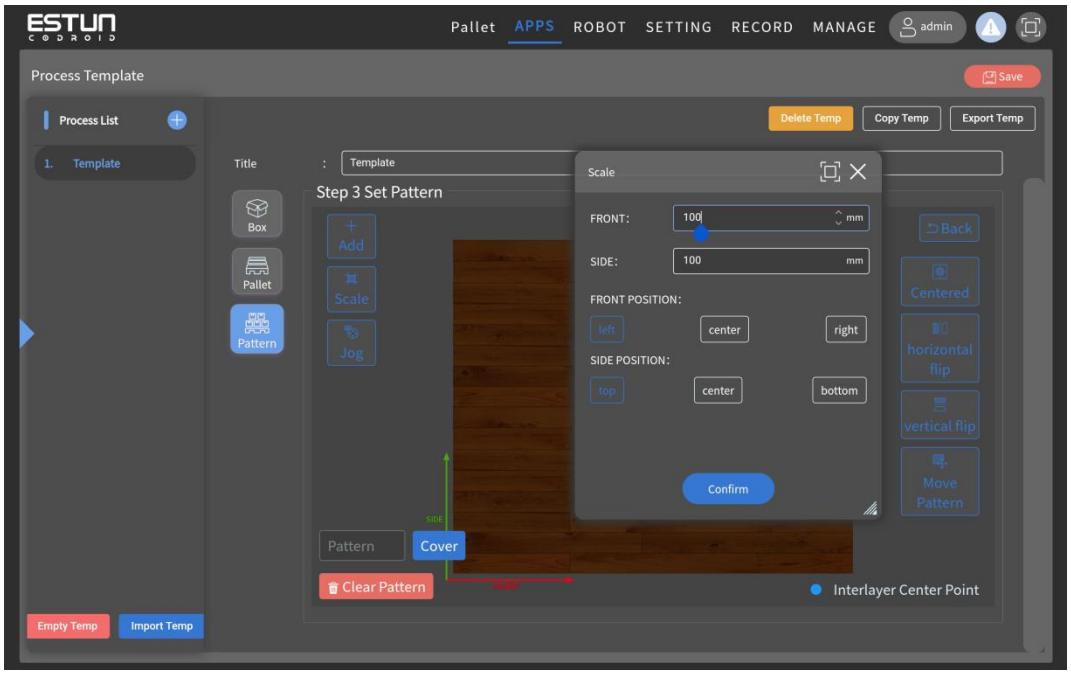


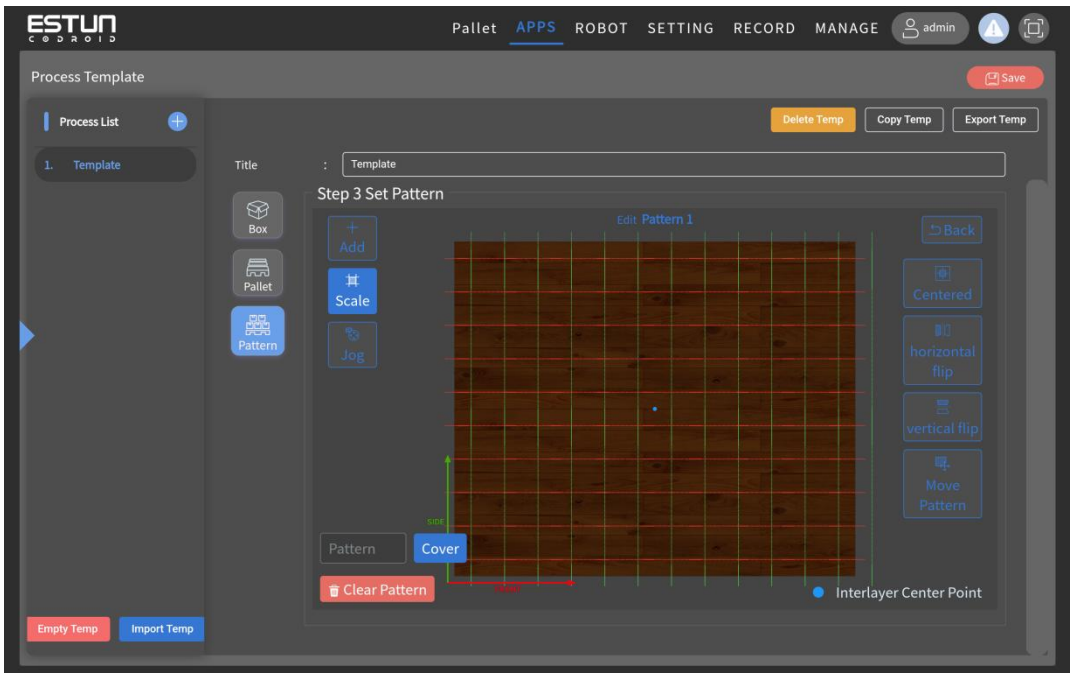
3.3.1.2 Define the size of the pallet. The front side is the length of the front side of the pallet/pallet that the user faces towards the palletizer operation Settings. The side is the user's setting for palletizing operation, the side length of the pallet/pallet. Height is the height of the pallet/pallet.

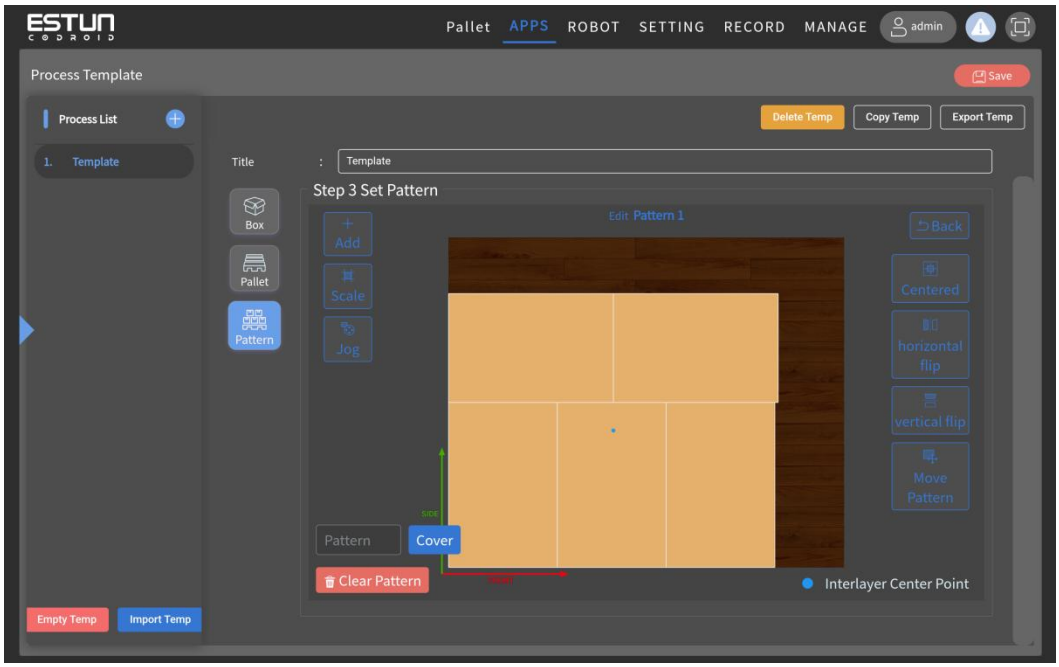


3.3.1.3 Define a single-layer stack type, and define each single-layer stack type used when there are multiple single-layer stack types in the overall stack type.

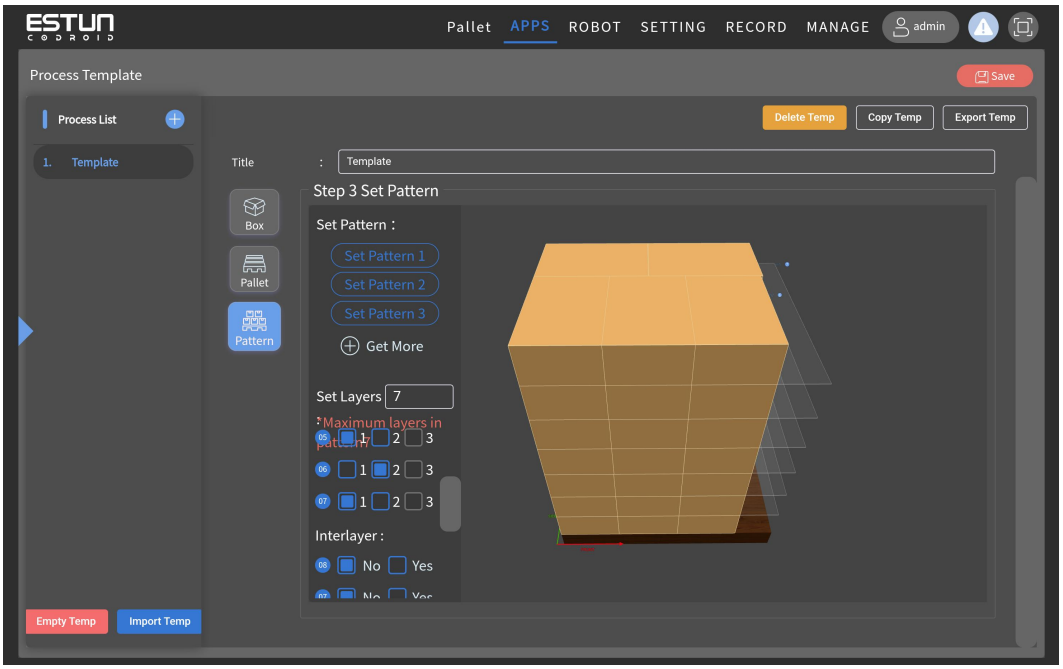






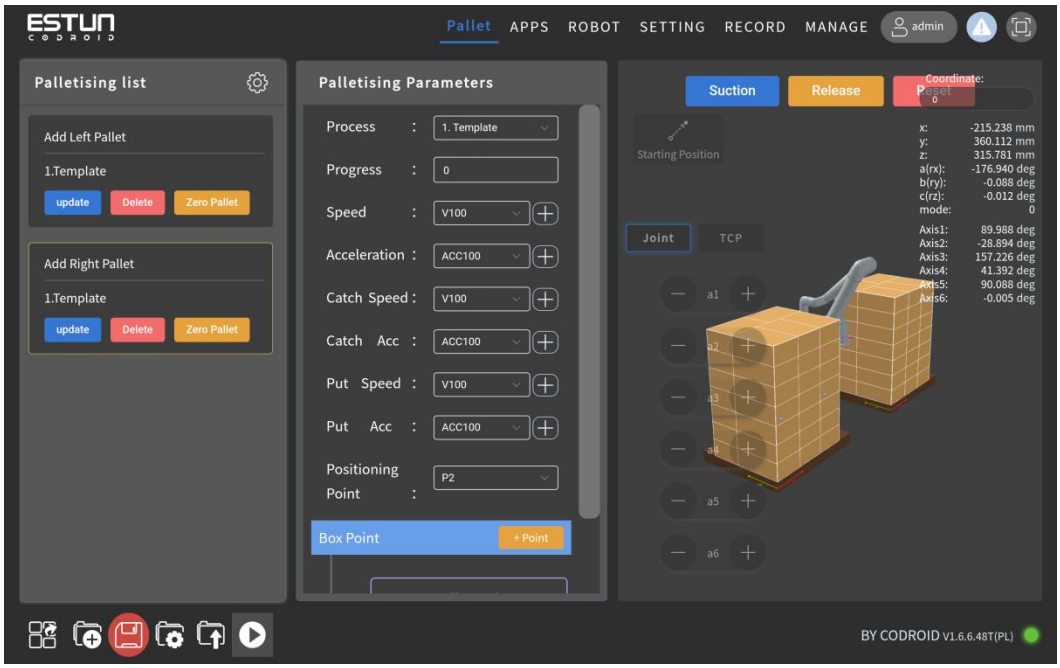


3.3.1.4 Edit the overall stack and define the overall stack by permutations and combinations of single-layer stacks.

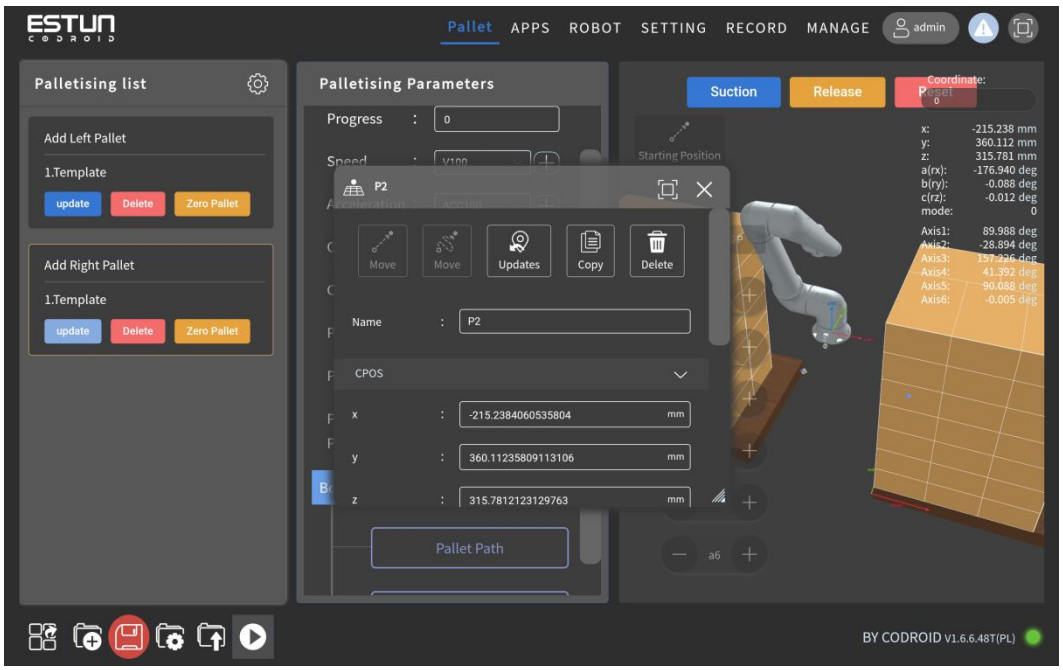


3.3.2. Write a program

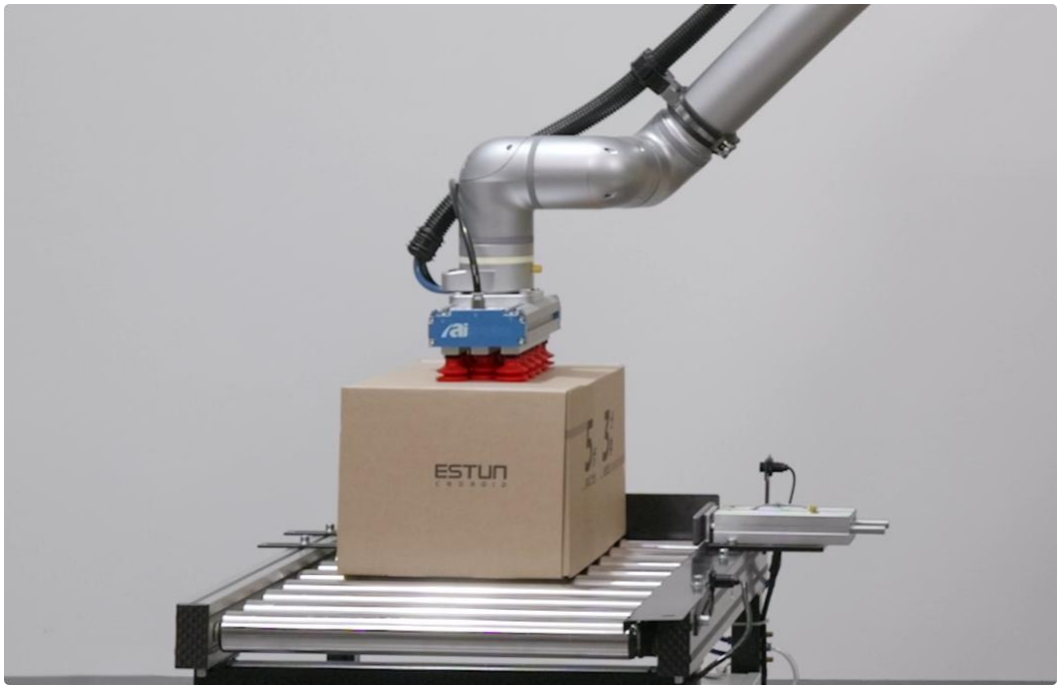
3.3.2.1 Add a left tray or a right pallet.



3.3.2.2 Select the set palletizing process, click "update", and then manually tap the taught incoming point in robot mode.

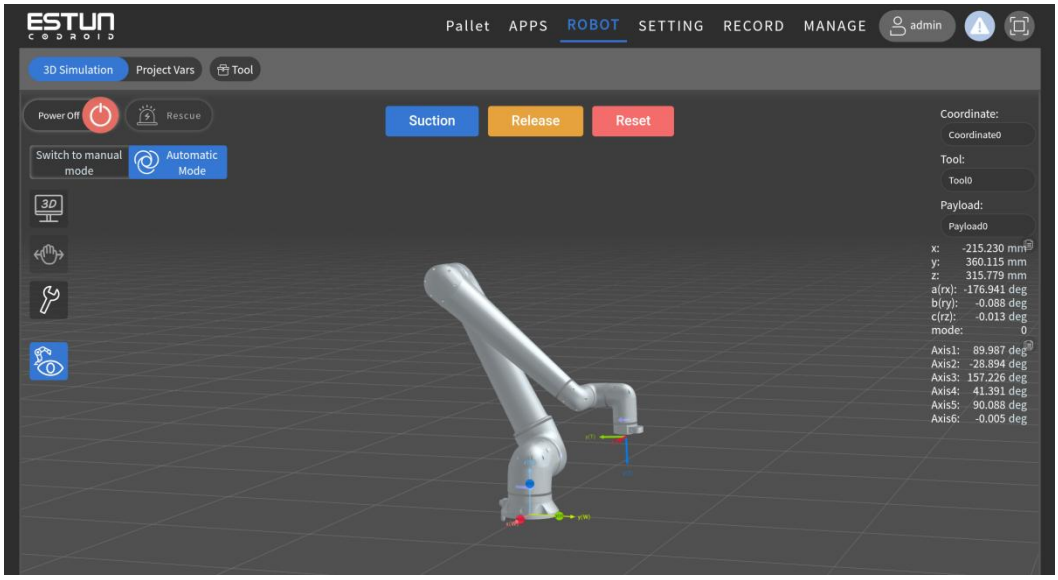


3.3.2.3 The yellow cap at the box incoming point corresponds to the long side of the box, and the suction cups at this point should be fully aligned with the surface of the box.

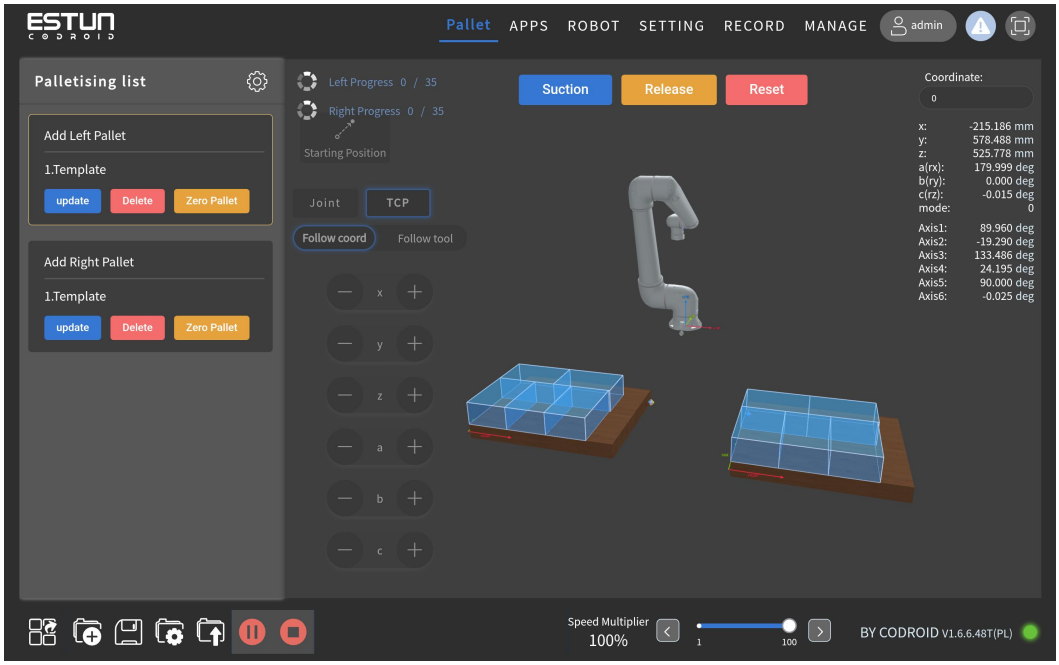


3.3.2. Run the program

3.3.2.1 Robot control, switch to automatic mode.



3.3.2.2 Click "Run" and it will be executed automatically.



4. Mechanical hardware and installation

4.1. Workstation composition

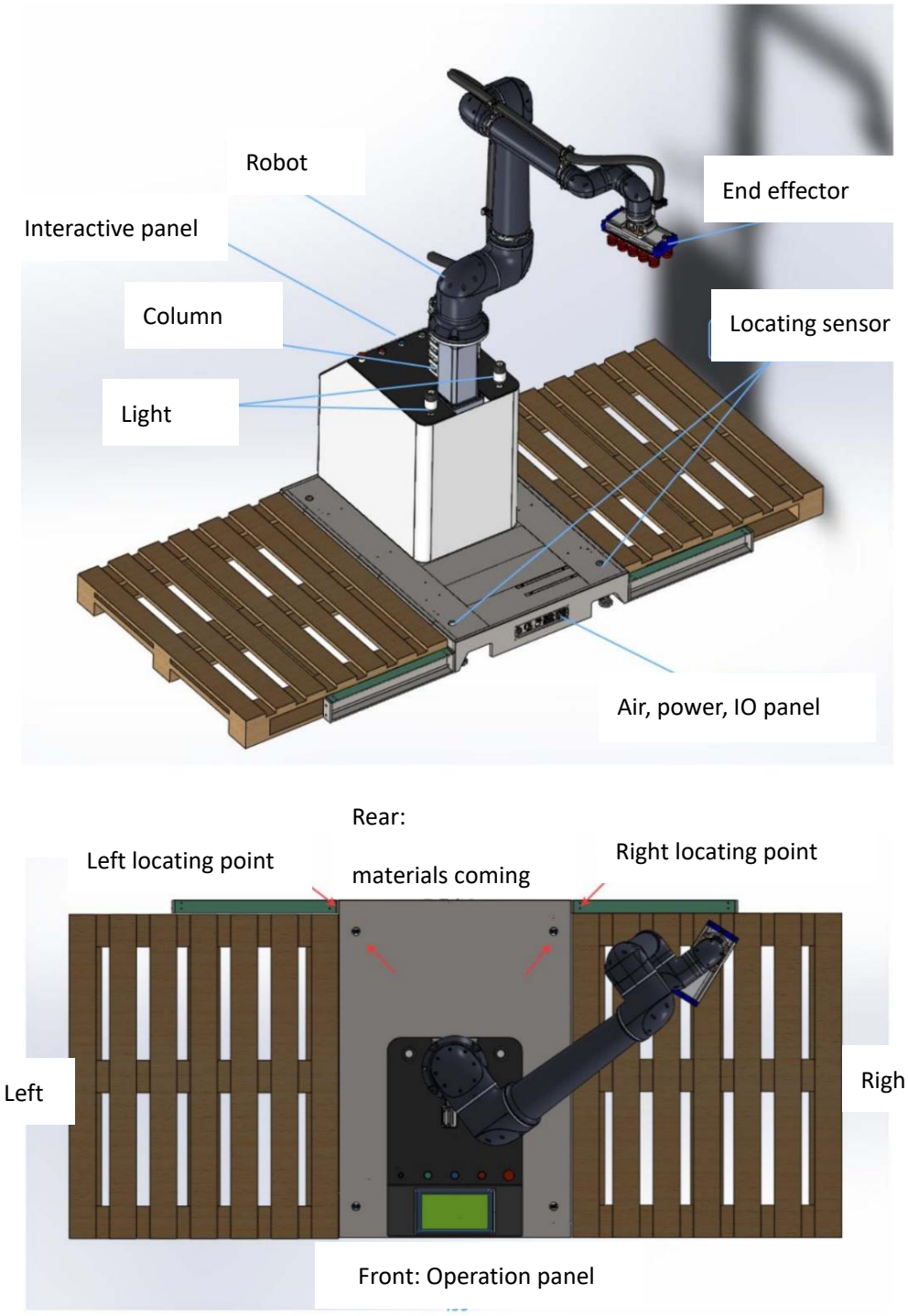


Figure 4-1 Composition of the palletizing workstation

4.2. Mechanical dimensions

For dimensions of the robotic arm body, refer to the robot user manual.

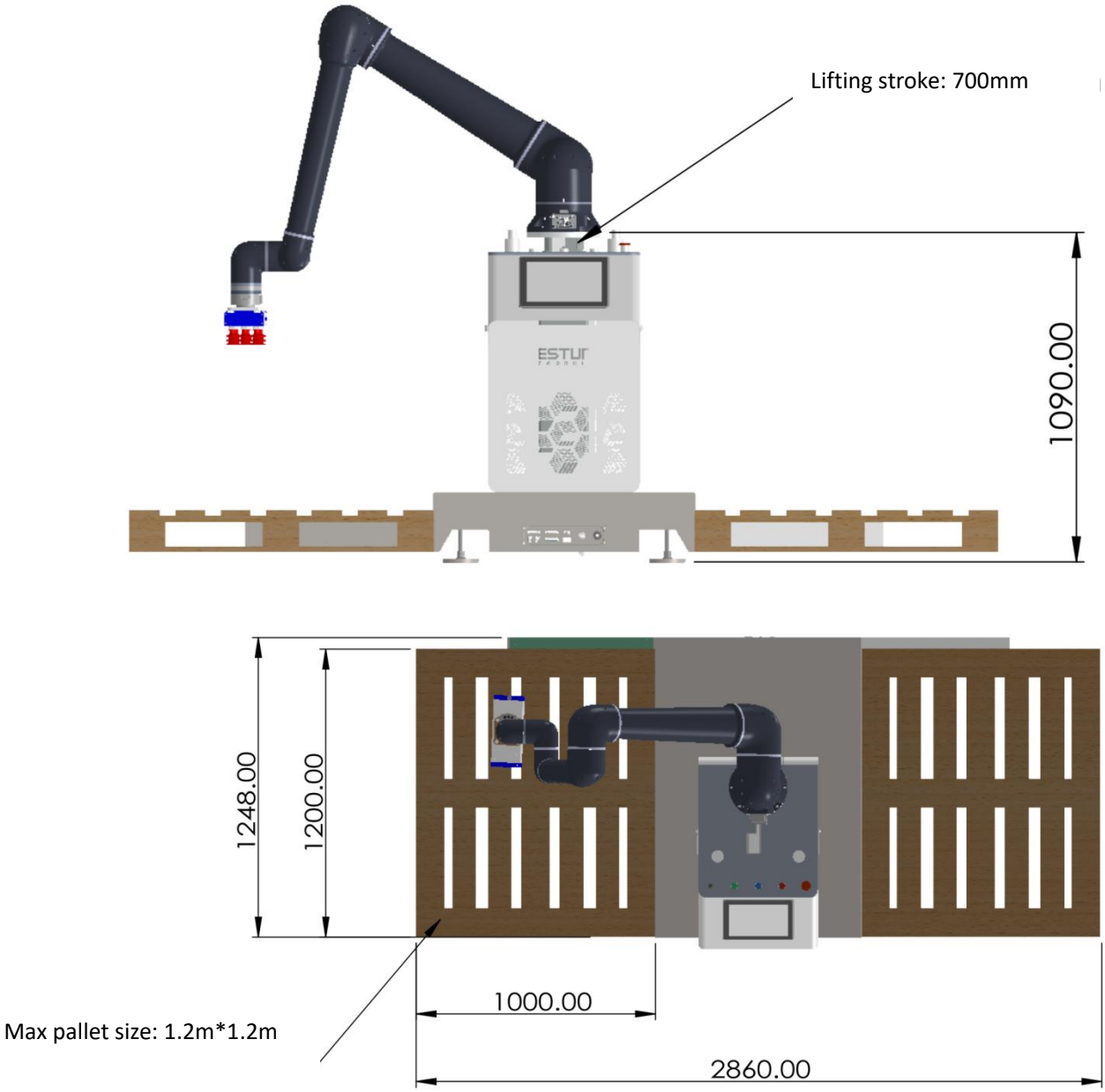


Figure 4-2 Mechanical dimensions of the workstation-

4.3. Load curve

The maximum allowable payload of the robotic arm depends on the center of gravity shift. When the distance from the center of gravity of the load increases, the load the robot bears decrease. Based on the eccentricity distance of the load, take the eccentricity distance on the XY plane as the vertical coordinate and the value of Z as the horizontal coordinate to find the coordinate point corresponding to the eccentric load. Observe which curve is below that point,

and the load indicated by that line is the maximum load the robot can bear under the current working conditions.

The total load of tools and workpieces loaded at the end of the robot must not exceed the maximum load.

Warning

When calculating the load, the weight of the medium flange must be taken into account and it must be ensured that it conforms to the load specifications of the robot. Make sure the system never exceeds the maximum allowable load. The user should conduct a thorough risk assessment of the medium flange and the workpiece to avoid hazards such as shock, vibration, collision, entanglement, puncture, etc. Ensure the overall safety of the system.

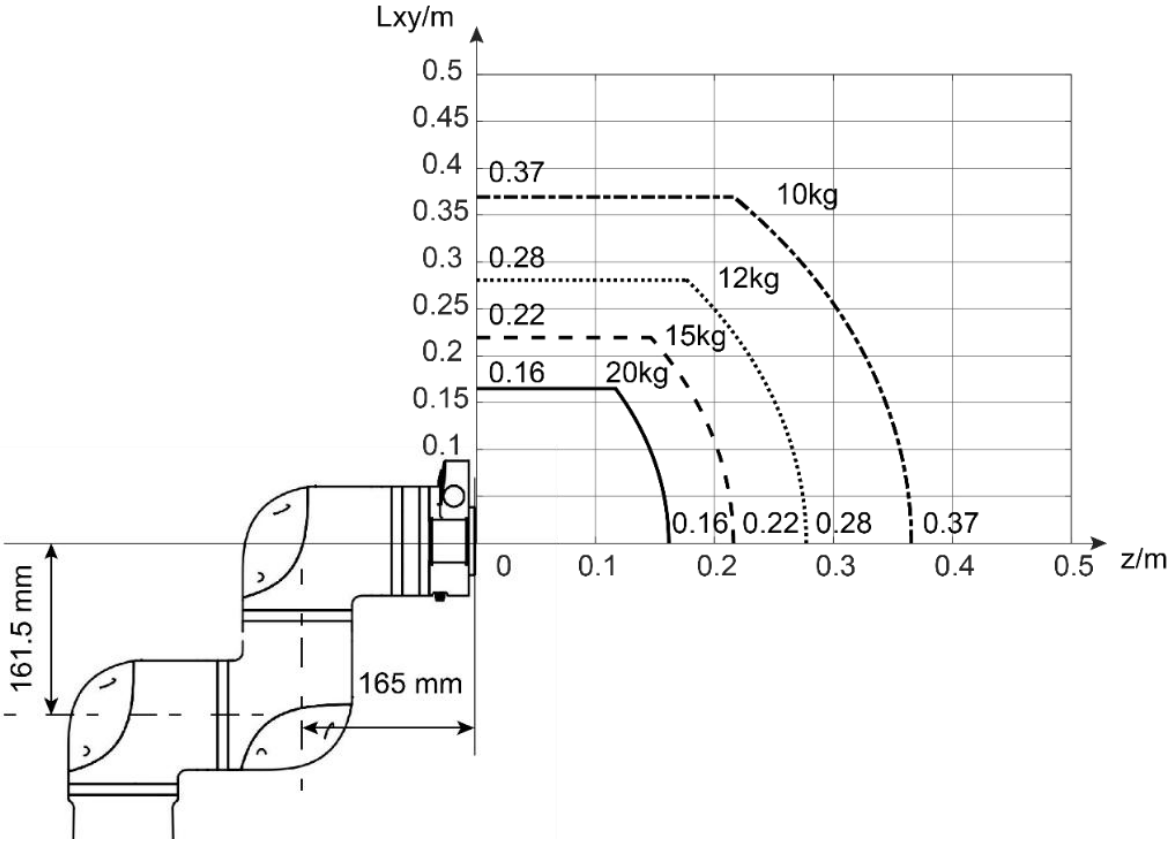


Figure 4-3 S20-180 load curve-

4.4. Technical specifications for palletizing workstations

Parameters	Data

Robot model	S20-180
Degrees of Freedom	6 + Lifting column
Maximum load (kg)	20
Floor area	1530 * 1480
Arm span (mm)	1777
Maximum stacking height (mm)	2400
Repeatability accuracy (mm)	+ / - 0.1
Whole machine weight (kg)	300
Certification	EN ISO 13849-1 PLd Cat.3 & EN ISO 10218-1
Axis operating range	Axis 1/2/4/5/6: ±360° Axis 3: ±160°
Maximum speed of the axis	Axis 1/2:110 °/s Axis 3:150 °/s Axis 4/5/6:180 °/s
Tool end maximum speed (m/s)	3.2
Working voltage (V)	220
Maximum power consumption (W)	3000
Palletizing speed	8-12 per minute
Working pressure (Mpa)	> 0.6Mpa (6bar)
Operating temperature (° C)	0-50 ℃
Working humidity (%RH)	70% RH
Working noise (dB)	≤65dB

4.5. Tricolor light

Figure 4-4 Tricolor light-

Status	Meaning
Yellow light flashing	Palletizing task done
Yellow light always on	No tray was detected at the tray position
Green light flashing	Tray position detects tray
The green light is always on	In palletizing
Red light always on	Call the police
Buzzer	Accompanying alarms (optional)

4.6. Buttons

On the robot operation panel, the five buttons from left to right are the start button, Run button, continue/pause button, stop button and emergency stop button, with their action meanings and corresponding interfaces as follows:

Button Name	Action	Corresponding interface
Boot button (Self-locking)	Device Power on (with light)	Power ON

Run button (Self-reset)	Run the loaded program	D1-1
Continue/Pause button (self-reset)	Continue/pause the running program	D1-2
Stop button (self-resetting)	Stop the running program	D1-2
Emergency stop button 4NC	Emergency stop equipment (robot + lifting column)	Hand controller (robot), safety relay (liting column)

Figure 4-5 Button-

In the off state, you can press the power button to turn on the robot; When powered on, hold down the power button to turn off the robot.

In the event of an emergency, press the emergency stop switch and the robot will disenable it to stop all movements and lock up.

When the emergency stop button is pressed, it will be locked and the button needs to be rotated according to the markings on the button to unlock it. After the lock is released, the alarm can be cleared through the control software and then enabled by the enable switch to recover from the emergency state.

Warnings

1. Additional enabling switches are not allowed, if not avoided, to cause death or serious injury to personnel or serious damage to equipment.
2. It is not allowed to fail the enable switch in any way that, if not avoided, could result in death or serious injury or serious damage to the equipment.
3. It is not allowed to modify or modify the enable switch. If not avoided, it may cause death or serious injury to personnel or serious damage to equipment.

4.7. Operating panel

Figure 4-6 Operation panel-

The all-in-one touch control panel can perform functions such as editing process packages, running/stopping/pausing/programs, clearing alarms, parameter configuration, etc.

5. Electrical hardware and installation

5.1. External interfaces

The workstation base is equipped with interfaces, as shown in **the external interface overview - in Figure 5-1.**

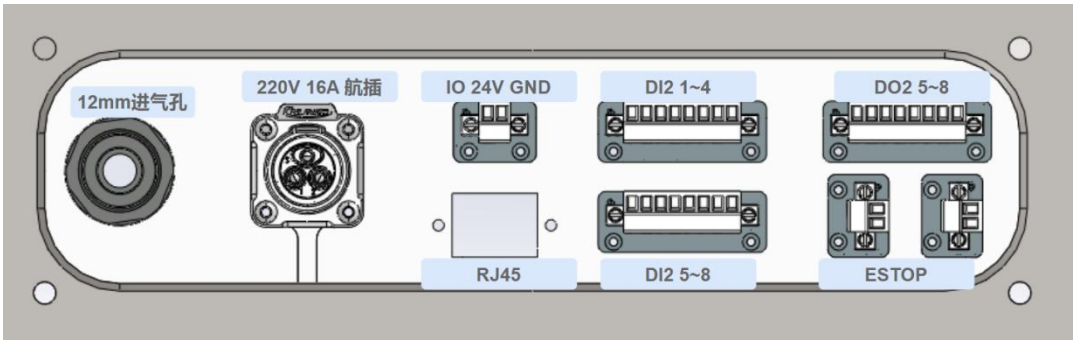


Figure 5-1 Overview of the external interface

Interfaces	Instructions	Uses
12mm tube quick plug	Introduce the air source (flow rate depending on the specific suction cup)	Supply gas
220V 16A air plug	Plug in a 16A plug	Power supply
IO 24V output	Robot controller IO 24V output extended	Provide IO 24v output
RJ45 Ethernet port	Robot controller network port extension	Debug/Upgrade/bus
Terminal block DI2 1~4	Robot controller DI2-0 to DI2-3 extension	External sensor
Terminal block DI2 5~8	Robot controller DI2-4 to DI2-7 extension	External sensor
Terminal block DO2 5~8	Robot controller DO2 1 to DO2-4 extension	Status output DO
Terminal block ESTOP	External emergency stop for equipment (robot + lifting column)	External emergency stop

Some of the IO ports are factory occupied, and the other ports are as follows:

Ports	Uses	Port	Uses
DO1-0	Suction cup suction	DO2-0	
DO1-1	The suction cup breaks the vacuum	DO2-1	
DO1-2	Yellow light _ left	DO2-2	
DO1-3	Yellow light	DO2-3	
DO1-4	Green light _ Left	DO2-4	Red light/alarm _ around
DO1-5	Green light	DO2-5	Running
DO1-6	Buzzer _ Left	DO2-6	Palletizing done
DO1-7		DO2-7	

Port	Uses	Port	Uses
DI1-0	Start button	DI2-0	Conveyor belt sensor
DI1-1	Pause/Resume button	DI2-1	Conveyor belt sensor
DI1-2	Stop button	DI2-2	Start
DI1-3	Drop detection (Check)	DI2-3	Pause/Continue
DI1-4		DI2-4	Stop
DI1-5		DI2-5	The sensor slows down to 30%
DI1-6	* Reserve 2	DI2-6	Sensor pause
DI1-7	* Reserve 3	DI2-7	Loop input

5.2. Workstation electrical topology diagram

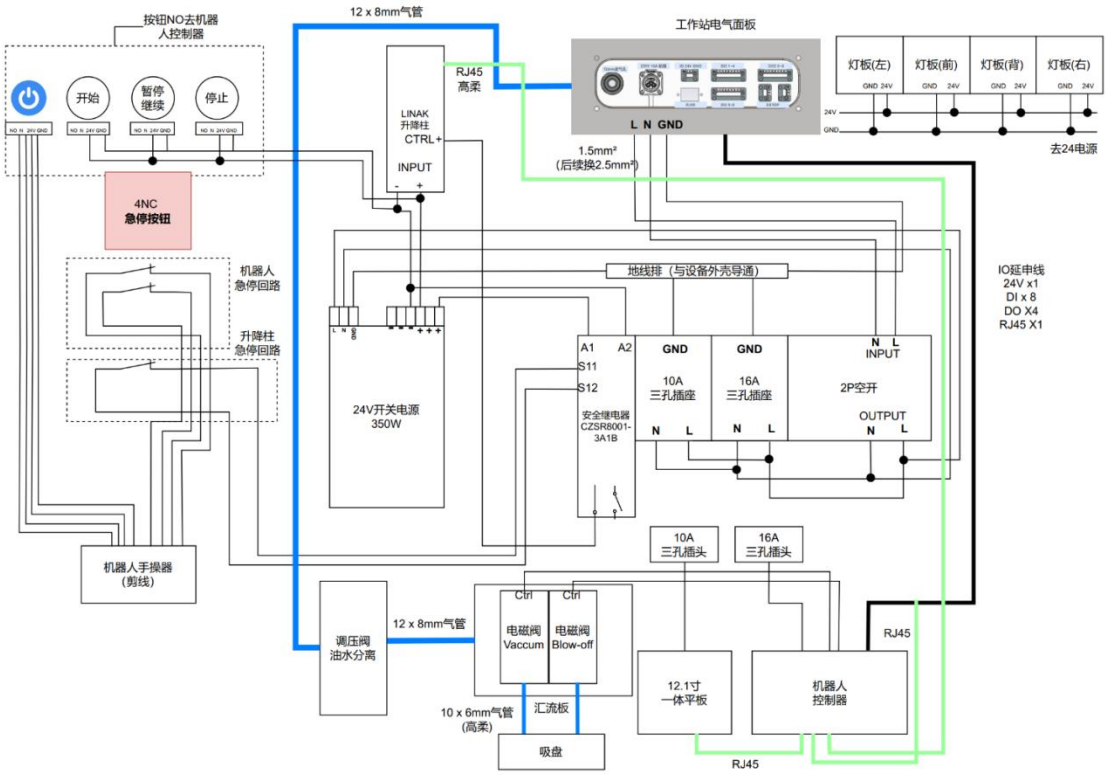


Figure 5-2 Overview of the internal electrical wiring diagram of the palletizing workstation

6. Maintenance and warranty

6.1. Notes

- Maintenance work can only be carried out by Codroid or authorized system integrators.
- Maintenance or repair must be carried out in accordance with all safety instructions in this manual for any visual or work environment inspection.
- Any changes to the control system or robot joints require recalibration of the robot. The method of recalibration operation and result judgment is described in the zero-position calibration manual. Also check the parameter Settings. If there is a backup of the parameters, import the backup parameters. If there is no backup, reset the parameters.

  When operating the robot body or control cabinet, the following safety tasks must be followed:

- Remove the main input cable from the back of the control cabinet to ensure it is completely powered off. Necessary precautions need to be taken to avoid someone else reconnecting the system power during maintenance. Check the system again after the power is cut off to ensure it is disconnected
- Check the ground connection before restarting the system.
- Comply with ESD (Static Discharge) regulations when disassembling the robot body or control cabinet
- Avoid disassembling the power supply system of the control cabinet. After the control cabinet is turned off, its power supply system can still retain high voltage for several hours.
- Avoid water or dust from entering the robot body or control cabinet

6.2. Routine checks

6.2.1. General cleaning

If dust/dirt/oil is observed on the controller or robotic arm, wipe it clean with a cloth dipped in detergent. Cleaning agent: water, isopropyl alcohol, 10% ethanol or 10% naphtha.

In very rare cases, a small amount of grease can be seen in the joints. This does not affect the

designated function or lifespan of the joint.

Note: Do not use compressed air to clean the controller or mechanical arm, otherwise it may damage the seals and internal components.

6.2.2. Control box

Inspection plan

Inspection items	Methods	Monthly	Semi annual	Annual
Emergency stop button	Functional tests	√		
Free-drive mode	Functional inspection		√	
Safe input/Output	Functional tests	√		
Terminals on the control box	Functional tests		√	
Control the main power supply and switch of the cabinet	Functional tests			√
Vacuum suction cup	Functional tests	√		

Highlighting the safety features of the robot, it is recommended to test them monthly to ensure they function properly.

The following tests must be carried out:

6.2.2.1. Test the emergency stop button on the hand controller

- Press the emergency stop button;
- Watch the robot stop and turn off the joint power;
- Restart the robot again.

6.2.2.2. Test the free drag mode

- Remove add-ons or set TCP/ payload according to tool specifications;
- Hold down the free drag button at the end of the robot to set the robot to free drag mode;
- Move the robot to a position where it stretches horizontally to the edge of its workspace;
- While holding down the free drag button, monitor the robot to hold its position without support.

6.2.2.3. Test the safe input and output

- Check which safety inputs and safety outputs are active and test whether they can be triggered.

6.2.2.4. Visual inspection

- Disconnect the power cord from the controller;
- Check if the terminals are properly inserted and if the wires are loose;
- Check if the network cable inside the controller is loose;
- Check for dirt/dust inside the controller and clean it with an anti-static discharge vacuum cleaner if necessary.

6.2.3. Mechanical arm

Inspection Plan

Inspection items	**Methods**	**Monthly**	**Semi annual**	**Annual**
Check the joint cover	Visual inspection		X	
Check the screws on the lid	Functional tests		X	
Check the flat ring	Visual inspection		X	
Check the robot cables and connections	Visual inspection		X	
Check the arm mounting bolts	Functional tests	X		
Check the tool mounting bolts	Functional tests	X		
Check the screws that connect the joints	Functional tests		X	

The purpose of functional inspection is to ensure that screws, bolts, tools and robotic arms are not loose. The screws/bolts mentioned in the inspection plan should be inspected using a torque wrench.

6.3. System update

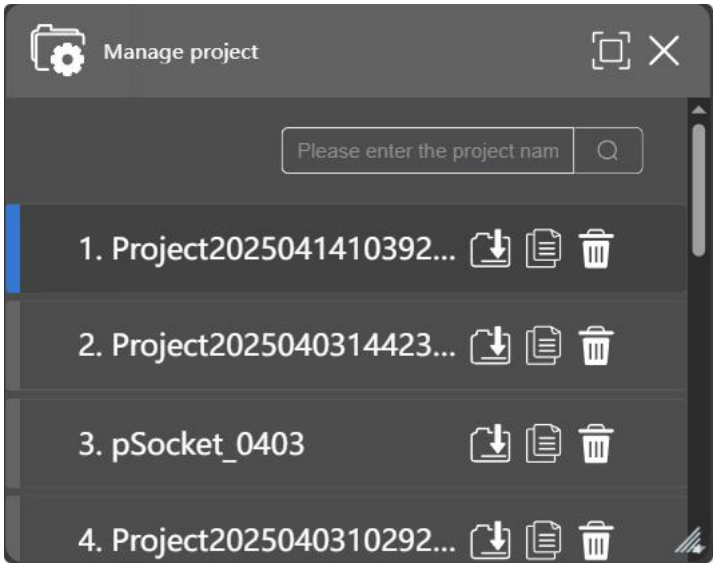
This section describes how to update the CoDroid robot software. The content of this manual is true and valid at the time it was written, and subsequent product update information will not be notified to users in advance.

Please check the following update notes before starting the update

- Be careful to ensure that the power is not turned off or cut off during the update
- Confirm that you have obtained the correct version of the update compressed file
- All programs of the robot have been backed up
- Check the release notes of the version you want to update to before updating. Contact a CoDroid technician for details

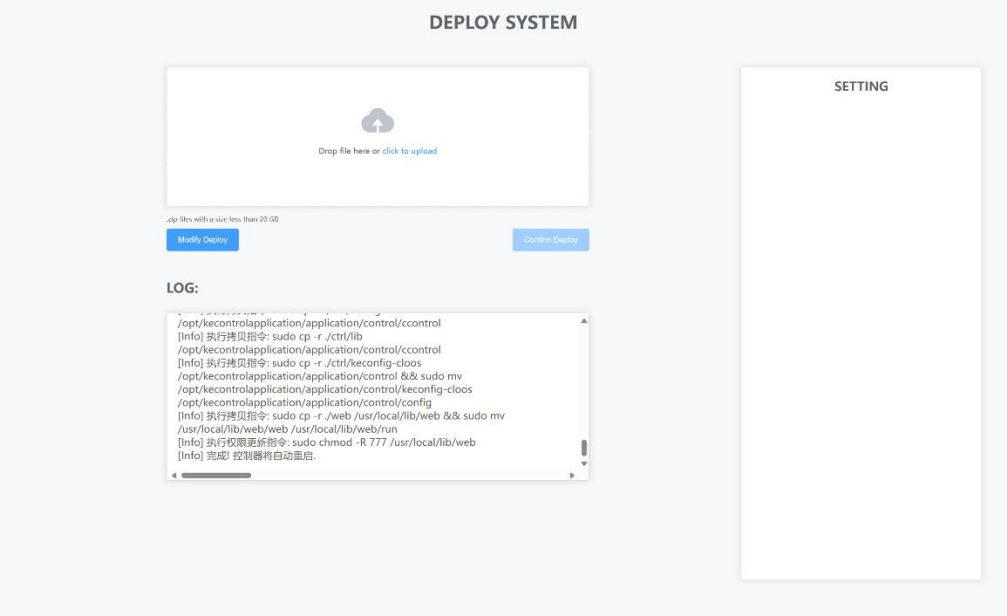
6.3.1. Update steps

6.3.1.1 After booting up, enter the robot control platform, go to the project TAB, click on the Project Management interface, select the program download that needs to be backed up for program backup.



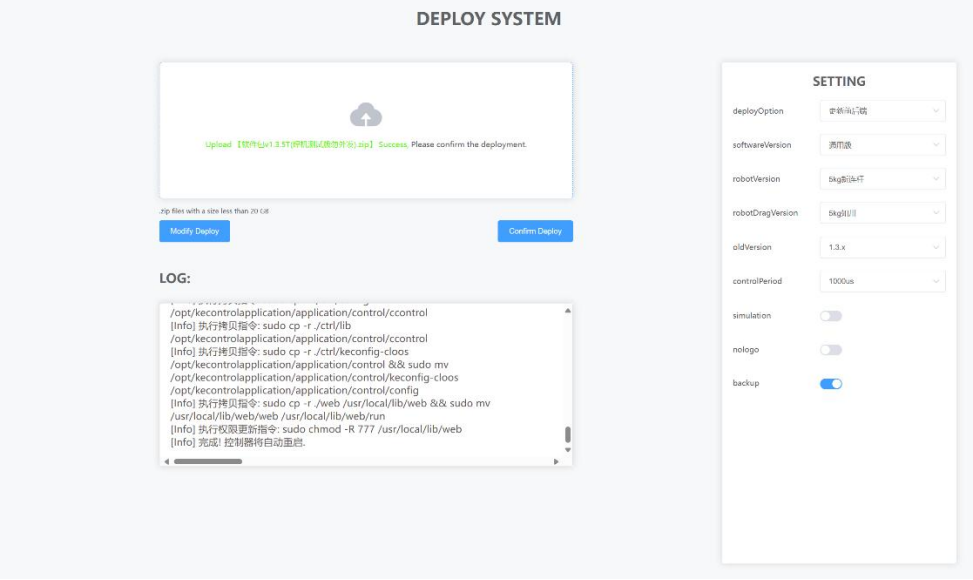
6.3.1.2 Switch the robot to the "power-off" state and press emergency stop.

6.3.1.3 Click on the system version number at the bottom right corner of the page to enter the update interface.

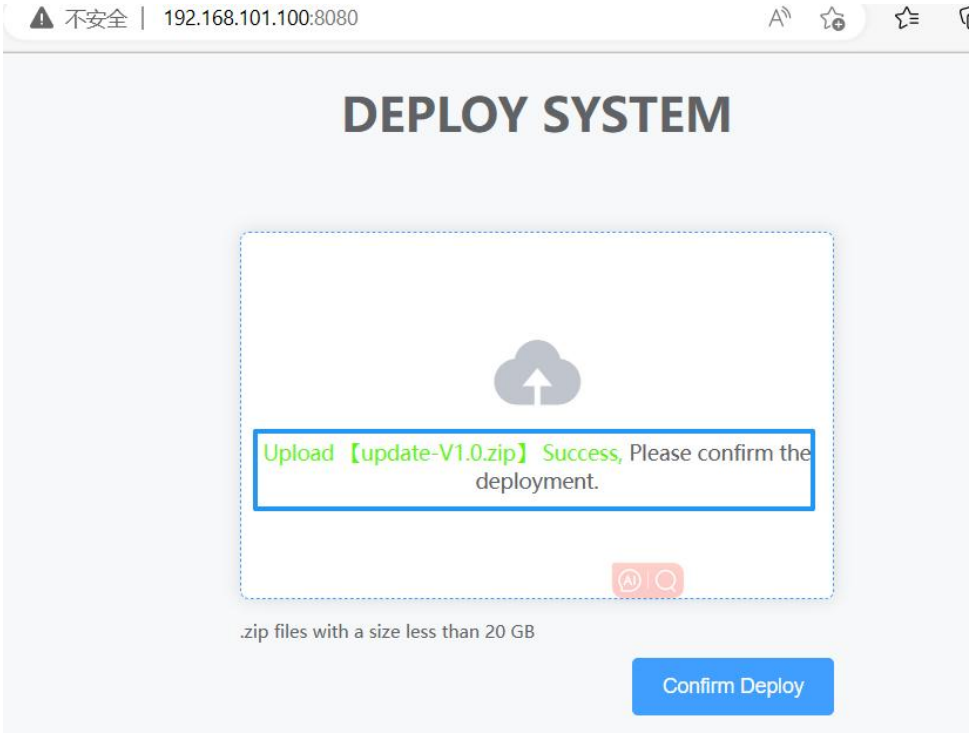


6.3.1.4 Drag the update file into the file selection box, or click the 'click to upload' button to select the file that needs to be updated and wait for the upload to complete.

6.3.1.5 Select the appropriate option based on your model requirements.



6.3.1.6 After confirming the update, wait for the robot software to automatically restart. Once the restart is complete, the update is done.



6.4. Common errors

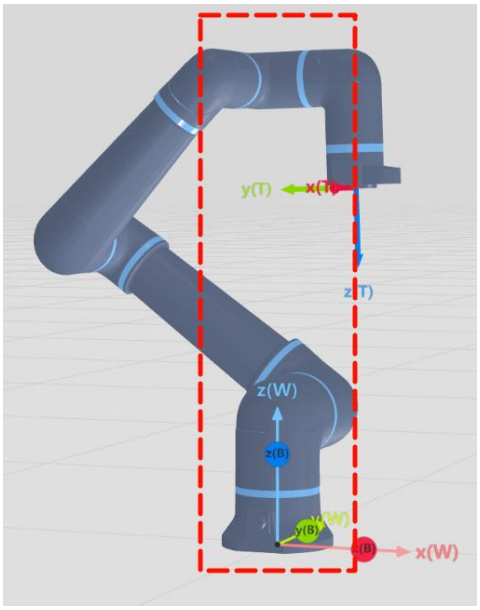
This section lists some common errors that may occur during the use of robots. If other errors cannot be resolved, you can download the robot log file from the log interface and send it to the after-sales personnel for analysis and processing.

6.4.1. Singular point/reverse solution failure

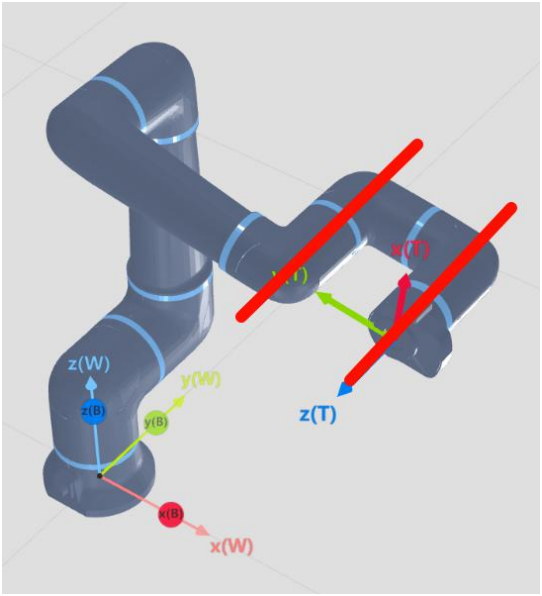
The robot's working range is a spherical space with the radius of the arm span, but there are some special positions and postures that are the robot's singularities and need to be avoided during use.

Here are three typical singularities:

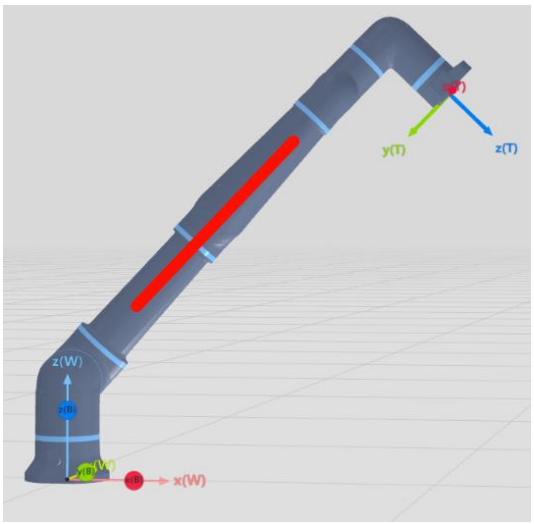
- A cylindrical area with the base of the robot;



- When the a3, a4, a6 joints of the robot are parallel;



- When the angle between the big arm and the forearm of the robot is close to 180°



6.4.2. Trigger collision detection

Torque sensors in the robot's joints detect the force on the robot in real time. When the force exceeds expectations, collision detection is triggered to confirm whether the robot's movement trajectory is correct and whether there is anything hindering the robot's movement.

If the robot's trajectory is correct and the collision detection is still triggered, it is necessary to check whether the tool is set up correctly, whether the load is set up correctly, whether the pipeline of the end tool is normal, etc.

6.4.3. Position/speed out of limit

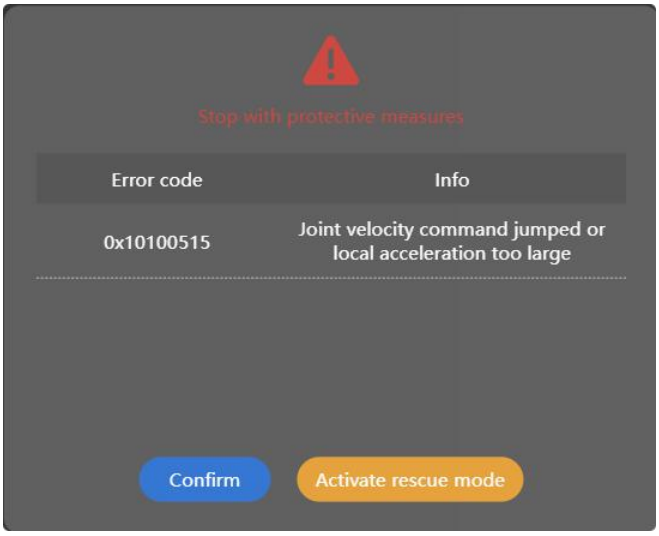
Check that the program is written correctly when position or speed overruns occur while the robot is in motion. If it is correct, modify the corresponding parameter limits in the safety Settings in the Settings.

If the position is out of limit, the joint is still out of limit after clearing the error, and the robot still alarms when powered on again, you can enable the rescue mode to adjust the robot to the appropriate posture.

6.4.4. The joint tracking error is too large

When excessive joint tracking error occurs during the movement of the robot, it is necessary to check whether the speed and acceleration of the movement are reasonable, and whether the robot's load is correct and within the robot's load range.

6.4.5. Alarm release



When an alarm pop-up window appears, you can directly activate the rescue mode or click "OK" and manually reset it to enter the rescue mode. The steps for accessing the alarm in rescue mode are as follows:

1. Click  , then click 

, to clear error;
2. Click 

to activate rescue mode;
3. Click 

to power on the robot;
4. In rescue mode, the overrun joints are rotated to the correct position by jogging clicks.;
5. Click 

to power off the robot;
6. Click 

to exit rescue mode;
7. Repeat step 3 to power on the robot.

6.5. Fault code instructions

There are currently six levels of information for robots, and the fourth digit of the error code indicates the error level.

Serial number	Error at the same level

0	System Occupancy
1	Tips
2	Warnings
3	General mistakes
4	Serious mistake
5	Fatal error

- When a general error or above occurs, the robot will lose power and shut down;
- When a warning level error occurs, the robot slows down and stops;
- If multiple errors occur at the same time, execute according to the highest level of error;
- Errors of the same type will have only one error code, but the specific error content will be displayed on the teaching device.

For specific error codes and details, see the appendix.

6.6. Disclaimer

Estun Codroid is committed to creating a better future of human-machine integration. As we continue to improve the reliability and performance of our products, we reserve the right to upgrade our products without prior notice. Estun Codroid strives to ensure the accuracy and reliability of the contents of this manual, but is not responsible for any errors or omissions therein.

Faults resulting from the following situations are not covered by this warranty:

- Failure to install, wire and connect other control devices as required by the user manual;
- Use beyond the specifications or standards indicated in the user manual;
- Damage to the product due to improper transportation or use;
- Damage resulting from an accident or collision;
- Natural disasters such as fires, earthquakes, tsunamis, lightning strikes, strong winds and floods;
- Changes to system software or internal data;
- Use this product in radioactive equipment, biological testing equipment or hazardous applications;
- The production date or warranty start date cannot be identified.
- Faults not caused by Nanjing Estun Estun Codroid Co., Ltd. other than the above situations.

6.7. Abandoned robot

Abandoned robots must comply with national and local laws and regulations.

7. Overview of the teach pendant interface

7.1. Login interface

The default boot account is admin, the password is 123456, and the mode is custom. If the IP of the connected controller has been changed, you can click the red button to set the IP address and port you need to connect to and save.

Click the Clear Cache button to clear the browser cache, and it is recommended to clear the cache when changing the connected robot.

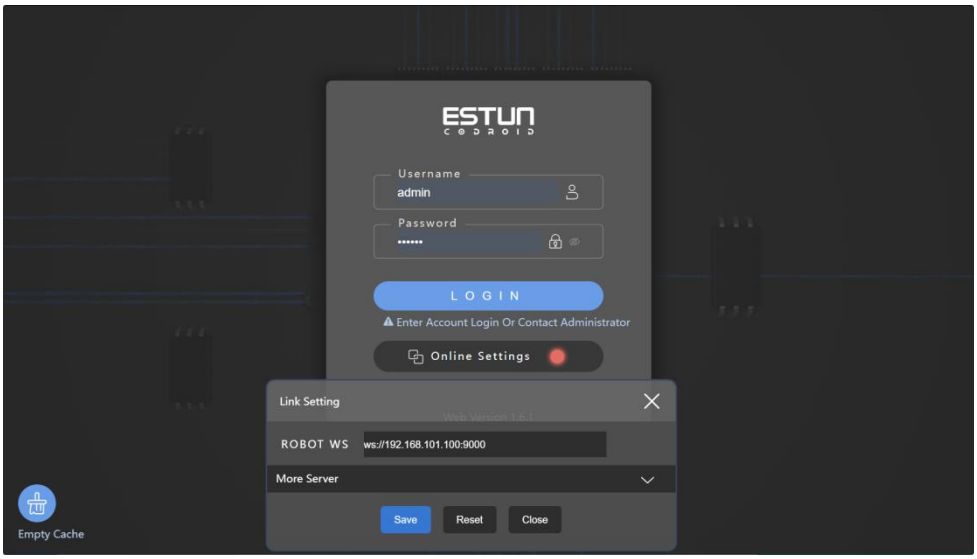


Figure 7-1 Login interface-

7.2. Main Interface

\

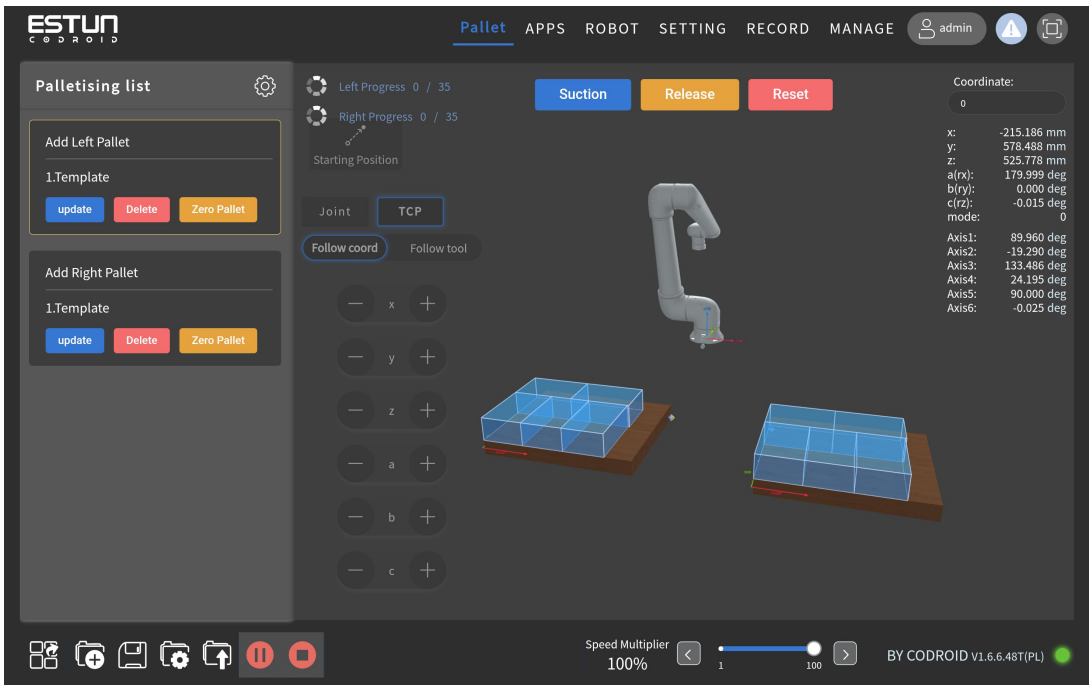


Figure 7-2 The main interface

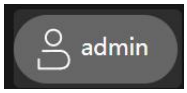
After logging in successfully, you jump to the main interface, which shows the 

TAB contents by default and is divided into four operable areas:

7.2.1. Switch TAB areas

It includes four buttons: "Palletizing", "Palletizing Template", "Robot Control", "Settings", "Log", "Manage", which switch to four different display interfaces respectively.

7.2.2. Account settings button

The button 

shows the currently logged-in account. Clicking it will allow you to Log in again and jump to the password interface.

7.2.3. Error messages and live log window buttons

Click button  to show error messages and live log windows.

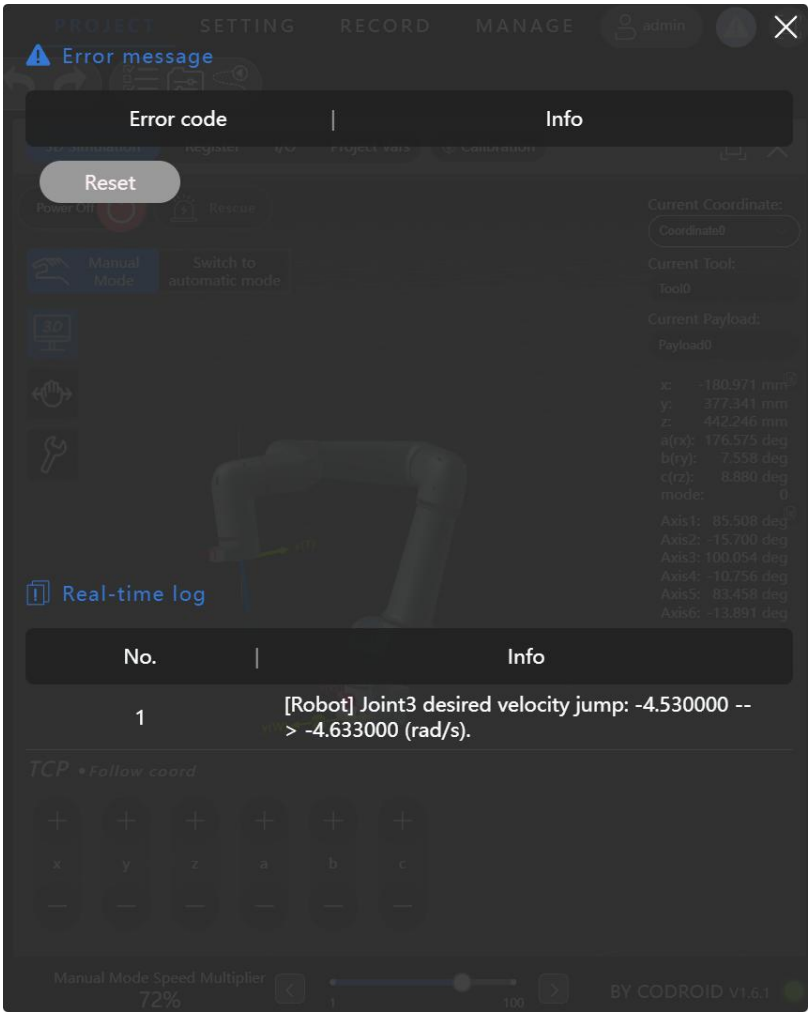


Figure 7-3 Error messages and real-time logs

When the robot reports an error, an error message is displayed here, containing the time of the error, the error code, and a description of the error message. After confirming that the robot's fault status is clear, you can press the “Reset” button to clear the error message, and the

robot can be powered up again after the error status is cleared.

7.2.4. The buttons are displayed in full screen

The button  is for switching between full-screen and non-full-screen web pages (full-screen is recommended).

7.3. Stacking tabs

The palletizing TAB is mainly palletizing list, point management, Project management area, variable list, 3D display area, IO area, speed multiplier adjustment area.

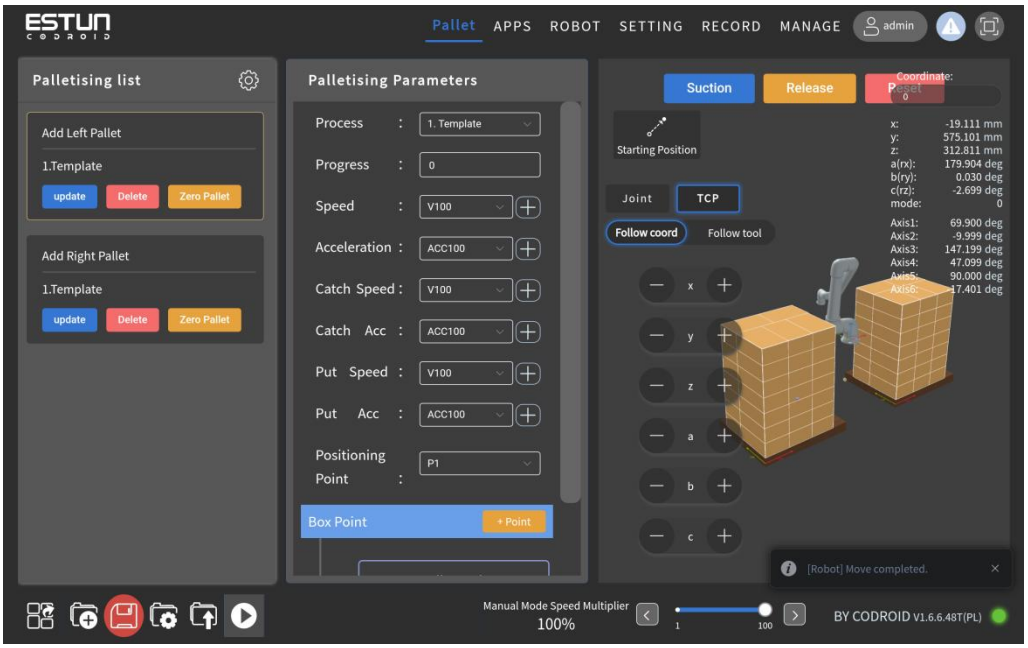
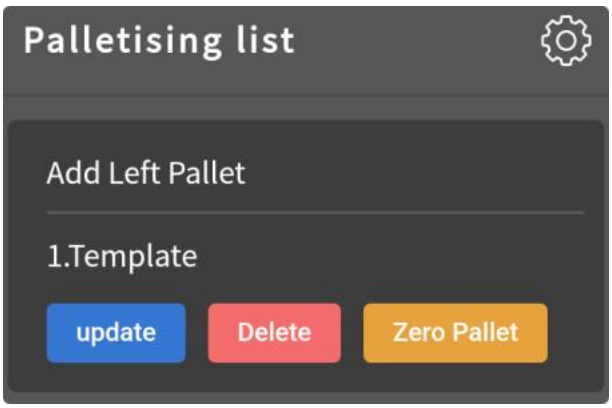


Figure 7-4 Layout of palletizing tabs

7.3.1. Palletizing list



Add pallets

Add a left tray or a right tray.

update

Manage the partition grab points.

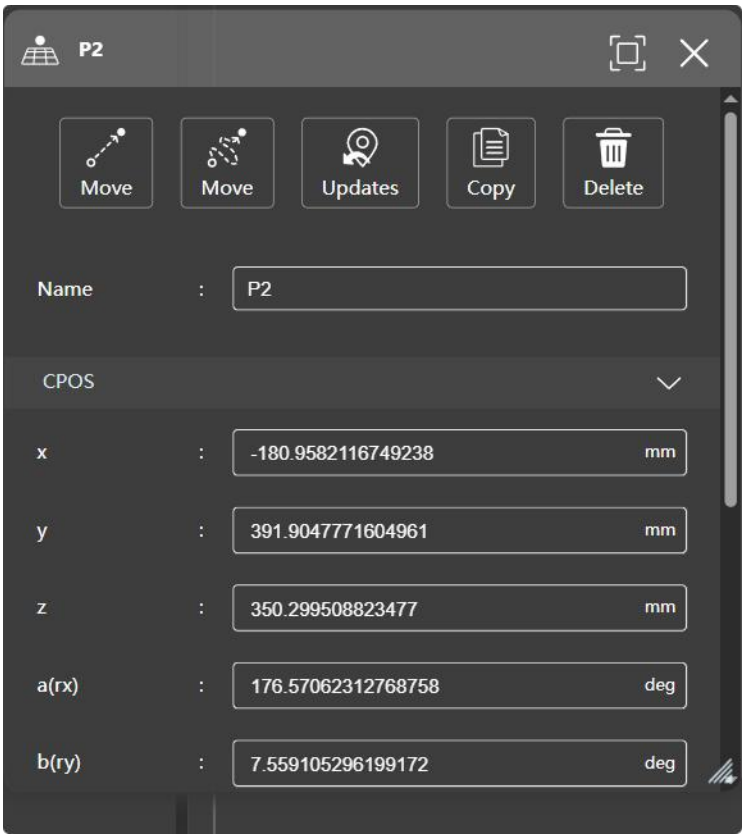
Delete

Remove the left tray or the right tray.

Zero Pallet

Reset the progress of palletising.

Point positions



You can double-click in the pose tag button to add a new CPOS pose. For more information about the points, see the Variables section in the robot user manual. You can operate on the points in this window:

- Move straight to the point
- The joint moves to the point
- Update
- Copy
- Delete
- Edit the point name
- Edit point values
- POSCFG configuration

Move into position

In non-automatic mode, the "Move to" function has two buttons:

-  Move to the current point in MovL mode.

-  Move to the current point in the mode of MovJ.

Update pose

Update the current Cartesian pose/joint position to the selected point position using the button  .

Copy pose

Copy the selected points via the  button and paste them afterwards, the point name is the last added point serial number plus 1.

Remove pose

Remove the selected point by pressing the button  .

Edit pose names

Rename the point through the "Name" text editing box.

Edit pose values

The text box can be edited by typing a value to change the value of the selected point.

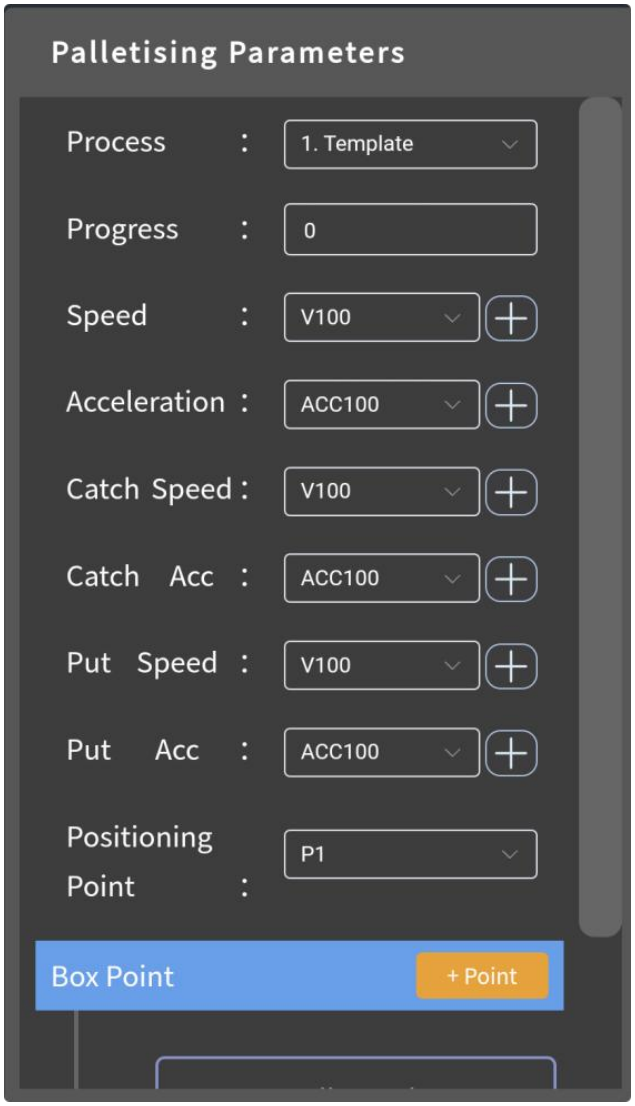
POSCG configuration

In the same Cartesian space position, the robot can have multiple combinations of joint positions (corresponding to multiple solutions of the robot's inverse solution). This property is used to define the morphological configuration data corresponding to the spatial target point.

“mode = -1” indicates continuation of the current configuration. There are eight sets of solutions for the kinematics of the universal six-joint, and the mode value is defined as 0 to 7, meaning as shown in the following table:

Mode	Center of the wrist in relation to the axis of one axis 0: ahead; 1: behind	Axis3(flag3) $(\theta_3 + 90 - arc\tan(S/L3))$ 0: [0,180] 1:(-180,0)	Axis5(flag5) (θ_5) 0: [0,180] 1:(-180,0)
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

7.3.2. Palletizing parameters



Process

The data of the selected palletising template

Progress

Save the serial numbers of the boxes being stacked

Speed

End target velocity at runtime

Acceleration

Save the template data of the current edit

Catch Speed

The speed at which the robot lifts after grasping the box

Catch Acc

The acceleration when the robot lifts after grasping the box

Put Speed

The speed at which the robot descends before releasing the box

Put Acc

The speed at which the robot descends before releasing the box

positioning points

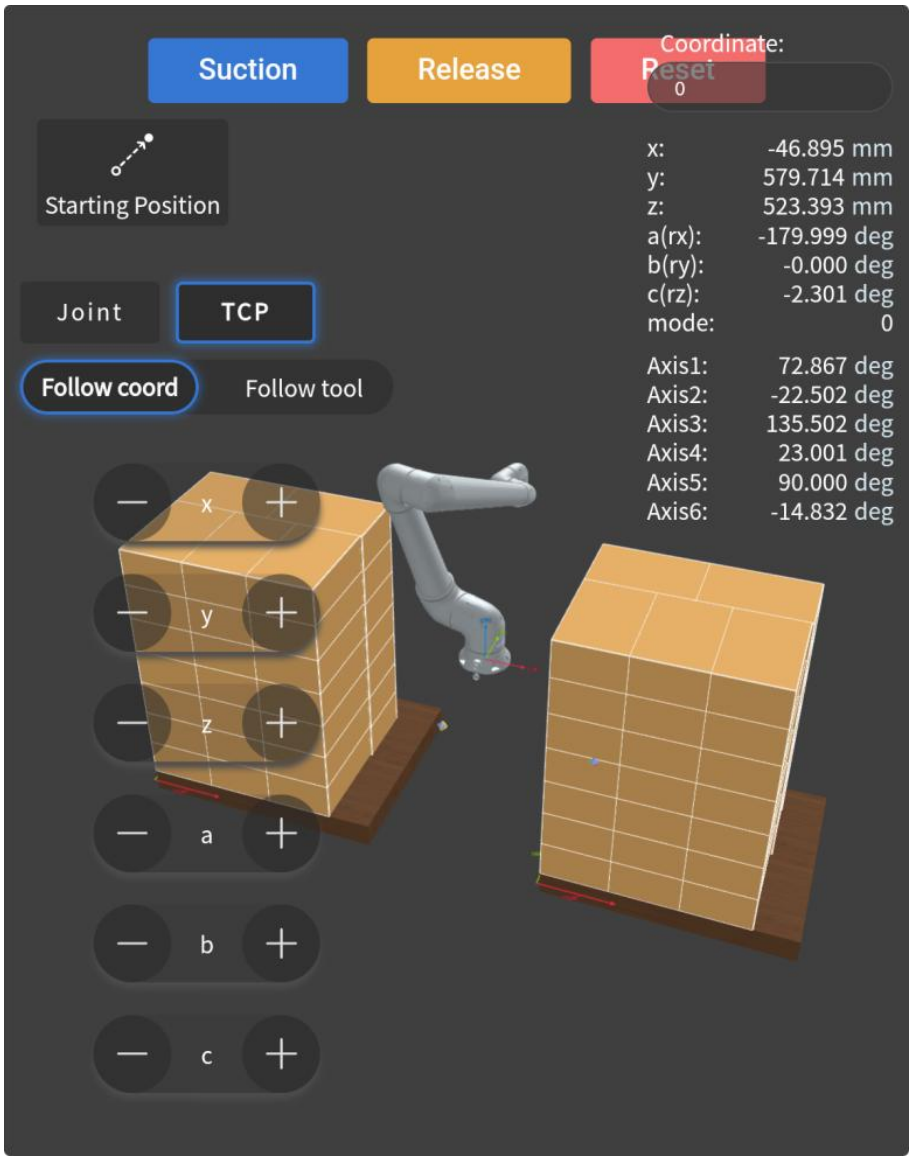
Incoming point grab position

Box point

If it is found that the robot's movement trajectory after grasping the box is not appropriate, transition points can be added. This point will run after the grab point and before the palletising path

7.3.3. 3D simulation

Show real-time robot animation as well as Cartesian coordinate pose and joint position. In this area, the robot can be tapped or the suction cups can be controlled to work.



Starting position

Return to the fixed posture where the robot is ready to stack

Suction

Control the suction cup suction box

Release

Control the suction cup release box

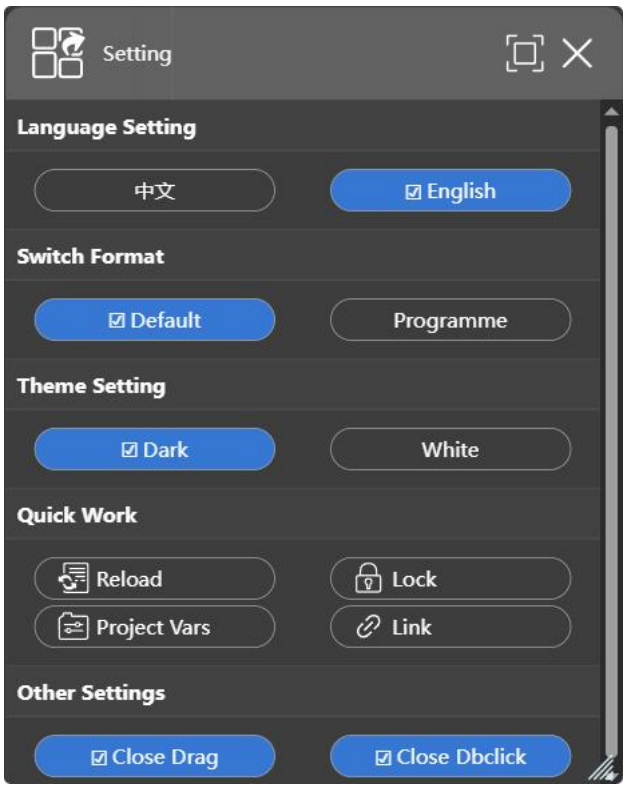
Reset

Reset procedure

7.3.4. Engineering management area

The project can be managed in the project management menu.

 is for project settings, switch languages, switch layouts, switch themes, refresh pages, lock Windows, variable management, and set online options. You can also set whether the program tree allows drag-and-drop commands and whether the teaching interface enables double-click.



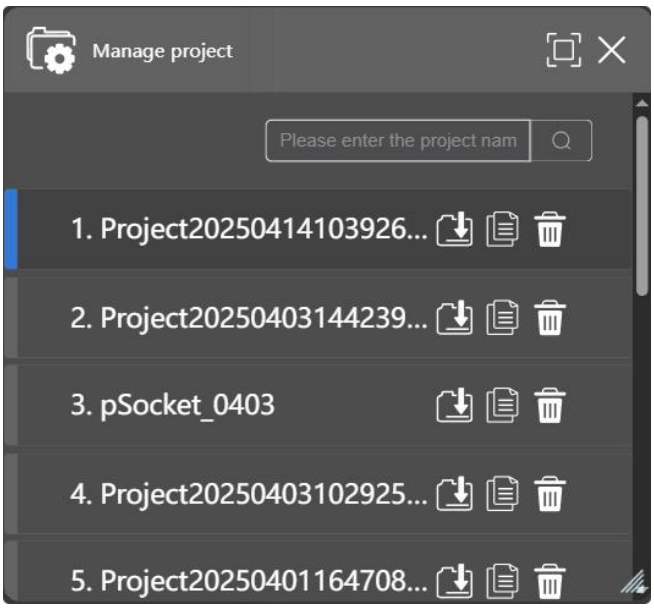
 Create a new project, create a new robot project;

 Save the project, when the Save Project button is "red", changes in the current project have not been saved, when the Save project button is "blue", changes in the current project have been saved;

 Project management, which allows download, copy, and delete operations on saved projects;

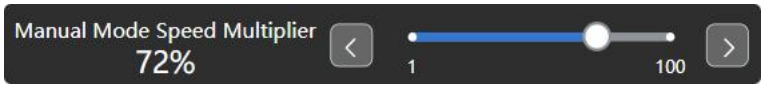
 Import project, import project saved locally;

 Run, run the current project (step by step, Auto), run the project in "Auto Mode".



In the Project Management dialog box, you can click download project, click to copy project and click to delete project.

7.3.5. Speed multiplier adjustment area



The movement speed multiplier bar can adjust the speed multiplier, and the values for manual point mode and automatic run mode are independent. The values range from 1% to 100%.

The actual operating speed of the robot in automatic mode = motion command speed × speed multiple.

In manual mode, the node motion speed is the maximum node motion speed × 100%, the Cartesian point motion linear speed is the maximum Cartesian point motion linear speed × 100%, and the Cartesian point motion rotational angular speed is the Cartesian point motion rotational angular speed × 100%. The values can be modified in the relevant options of the Settings TAB.

7.4. Palletizing template TAB

On this page, you can manage palletizing process templates. Each palletizing template is a monolithic palletizing template, and monolithic palletizing is composed of multiple identical

or different single-layer palletizing.

Save

Save the template data of the current edit.

Delete template

Delete the template data that is currently being edited.

Copy template

Copy the currently edited template data as the new template.

Export template

Export all the template data for use on another machine.

Add 

Add new template data.

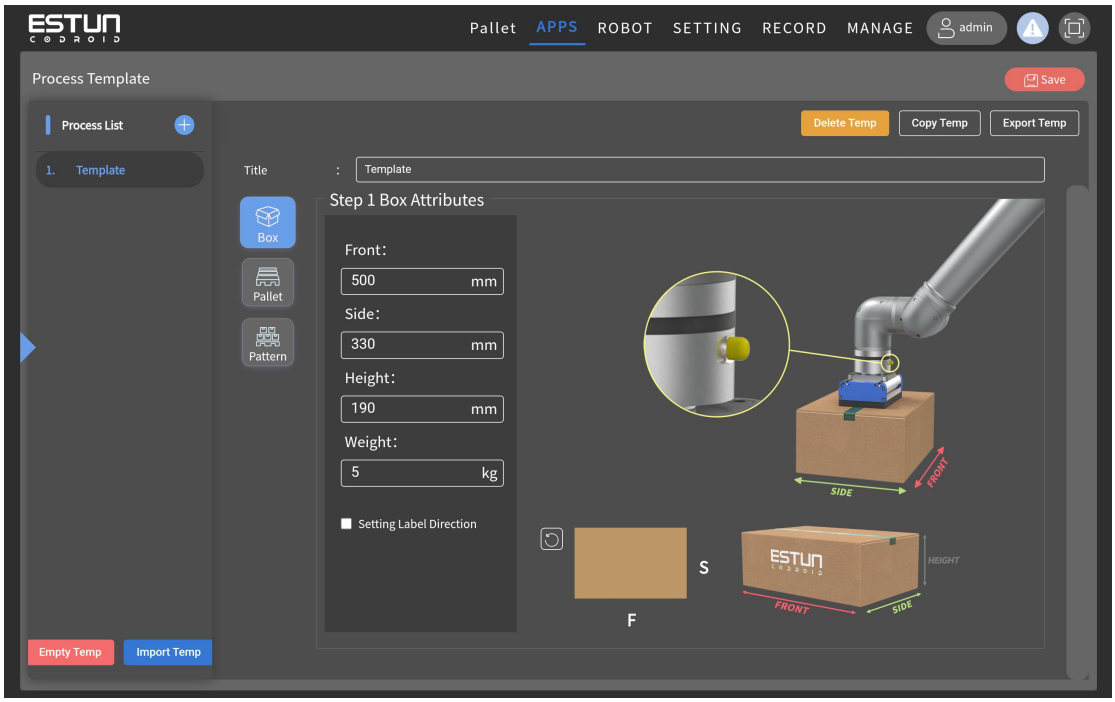
Empty template

Delete all template data.

Import template

Import template data.

7.4.1. Box properties



Front

The user faces the palletizer operating position, the front length of the carton.

Side

The side length of the carton facing the operation position of the palletizer.

Height

Box height.

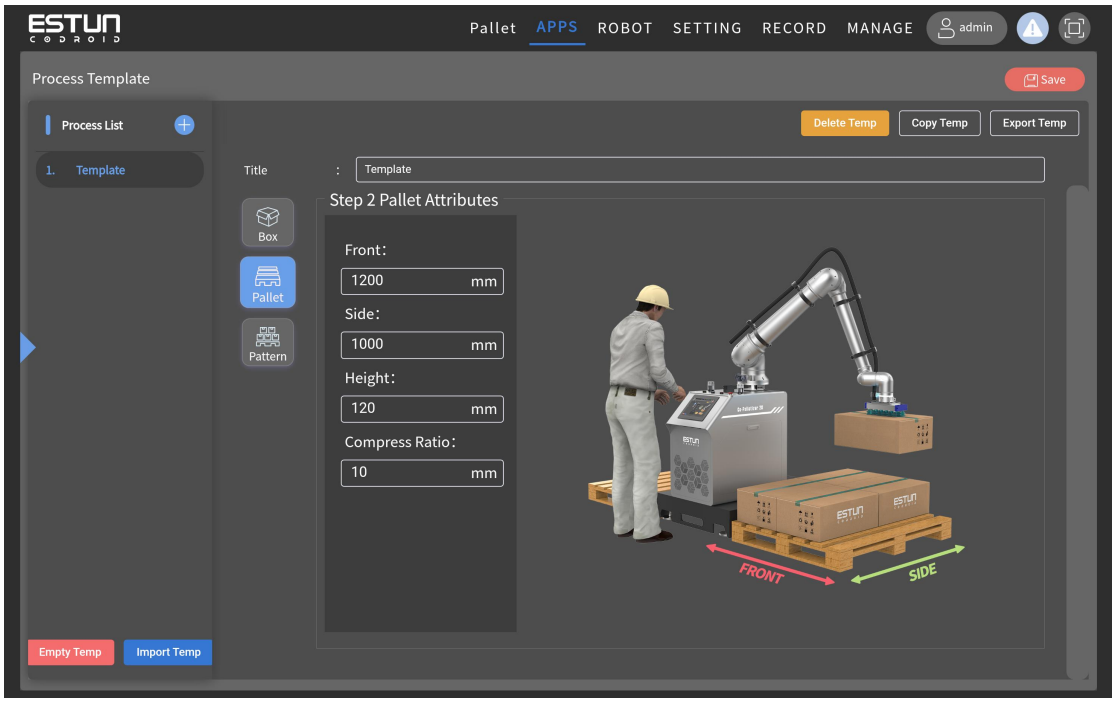
Weight

The weight of the box.

Setting label direction

When palletizing cartons have directionality, add an arrow to the carton pattern to determine the label orientation.

7.4.2. Pallet properties



Front

The user faces the palletizer operation setting, the front length of the pallet/pallet. Pallets support up to 1200*1200.

Side

The user faces the palletizer operation setting, the side length of the pallet/pallet. Pallets support up to 1200*1200.

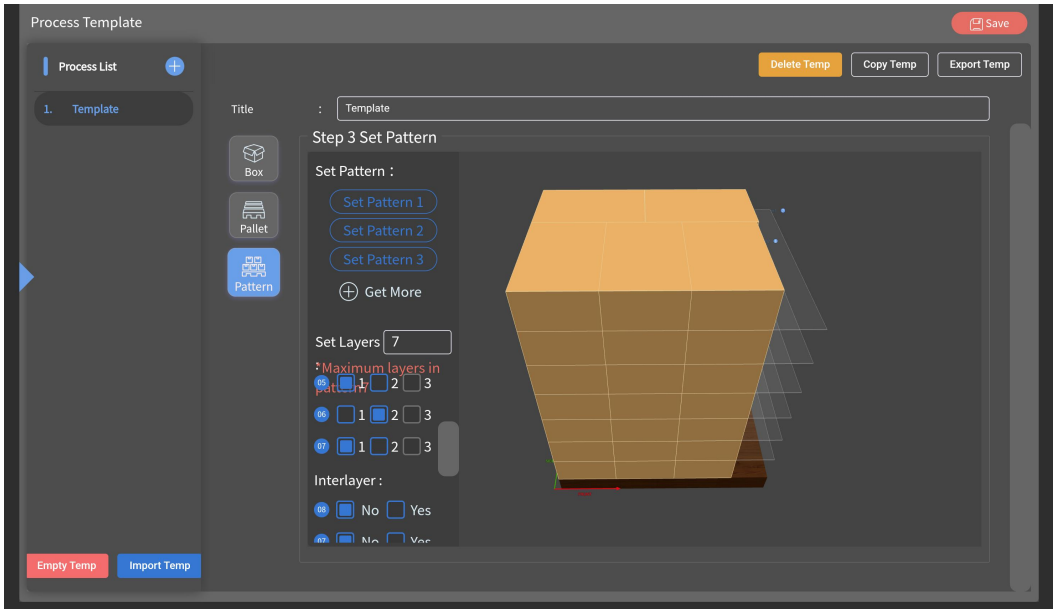
Height

The height of the pallet/pallet.

Compress Ratio

The height that each layer reduced, except frist layer.

7.4.3. Stack type attributes



Set Pattern

The user sets the front length of the pallets/pallets for the palletizing machine operation. Pallets support up to 1200*1200. Edit the screen shows the actual pallet size and carton size scaled proportionally. The arrow direction indicates the set label direction.

Set layers

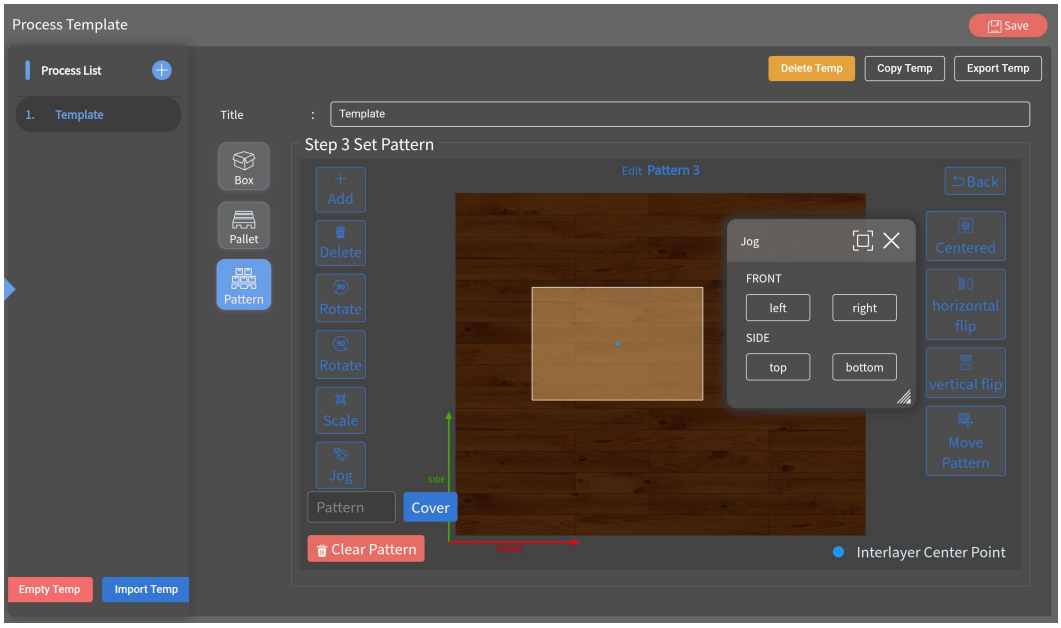
Define the number of palletizing layers and select the corresponding stack type number in each layer of the single menu box.

Interlayer

Select the corresponding single-layer stack for each layer.

Select the partition

Select whether there are partitions for each layer.



Add

Add a new boxes.

Delete

Remove the selected box.

Rotate

Rotate the box counterclockwise or clockwise.

Sacle

Open the size scale to assist with placement.

Jog

Fine-tune the position of the box.

Cover

You can choose whether to use but the money stack covers a certain stack, making it convenient to replicate similar stacks.

Clear Pattern

Delete all box arrangements of the current stack with one click.

Centered

Place the stack as a whole in the center of the pallet.

Horizontal flip

Horizontally mirror the current stack arrangement.

Vertical flip

Vertically mirror the current stack arrangement.

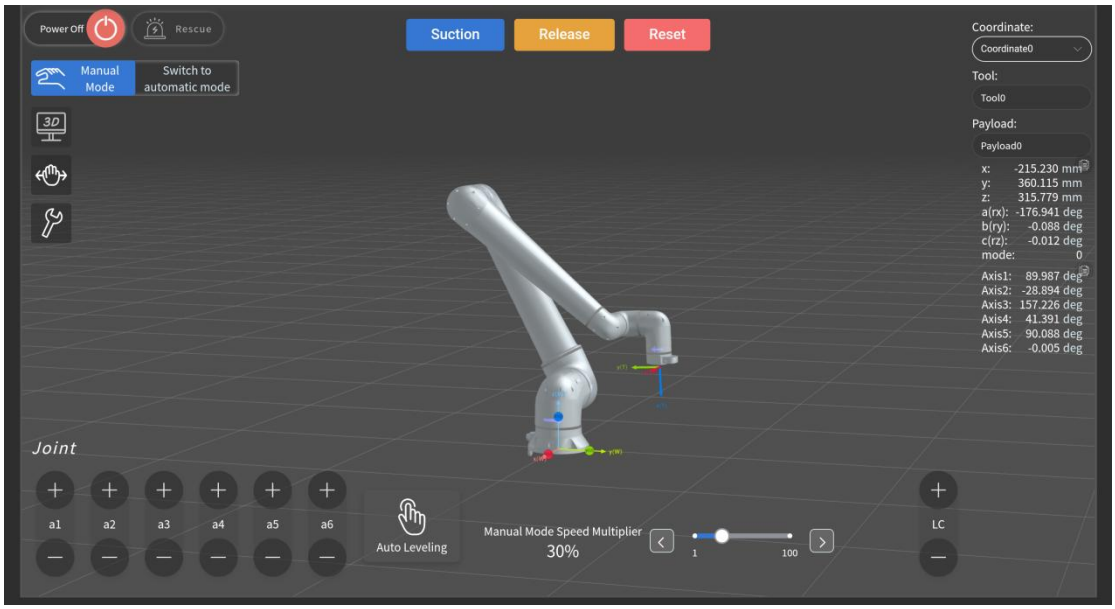
Move Pattern

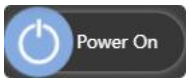
Move the current stack as a whole.

7.5. Robot control tabs

7.5.1. 3D simulation

Show real-time robot simulation animations as well as Cartesian coordinate pose and joint positions.





Power-on 

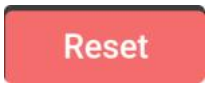
power-off button, used to control the robot to switch power.

Rescue mode, joint jogging without motion range limitation (enter "rescue mode" while the robot is in "down power state", turn on the robot again to point the joint);

Move to recovery point, after the robot program pauses in automatic mode, if the robot is not on the intended trajectory, the robot must be manually moved to recovery point before continuing the program;

Control the suction cup to pick up the box;

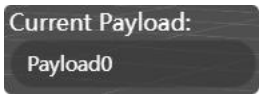
Control the suction cup release box;



Reset procedure;

Current coordinate system. Switch the "User Coordinate" variable currently in use;

Current tools. Switch the "Default Tools" variable in the Settings TAB - Base;



For the current load, switch the "Default Load" variable in the "Base" section of the Settings TAB;

Switch between manual mode and automatic mode;

Simulation/real machine mode switching, switching between robot "simulation mode" and "real machine mode" when powered off, in simulation mode the real machine robot does not move;


Drag sensitivity, adjustable drag teaching sensitivity and whether to turn on the attitude lock;


Toolbox, containing tools for switching view, clearing motion trajectory, zero position calibration, returning to zero position, returning to packing position, etc.

Stop simulation rendering, stop rendering 3D simulation model, this can save teaching device hardware resources.

Switch the perspective, quickly switch the perspective of the 3D simulation;

Clear the trajectory line, clear the trajectory line of the end TCP in the 3D simulation space;

Back to zero position, click and hold down the lower right corner button to return to the robot home point;

Return to the safe position, click and long press the button at the bottom right to return to the robot's safe position posture. This point can be set in the safety of setting the weight;

The robot returns to the vertical pose position;

Return to the packing position, click and hold down the button at the lower right corner to return to the robot packing position;


Target position display, whether to show the target position of the robot's next command in automatic mode;

Point movement mode switch, switch "joint point movement (joint movement)"/" terminal point movement (Cartesian movement) ", and different speeds can be adjusted by speed multiple;

Terminal point coordinate system, which allows you to choose to move the robot along the current coordinate system or the tool coordinate system;

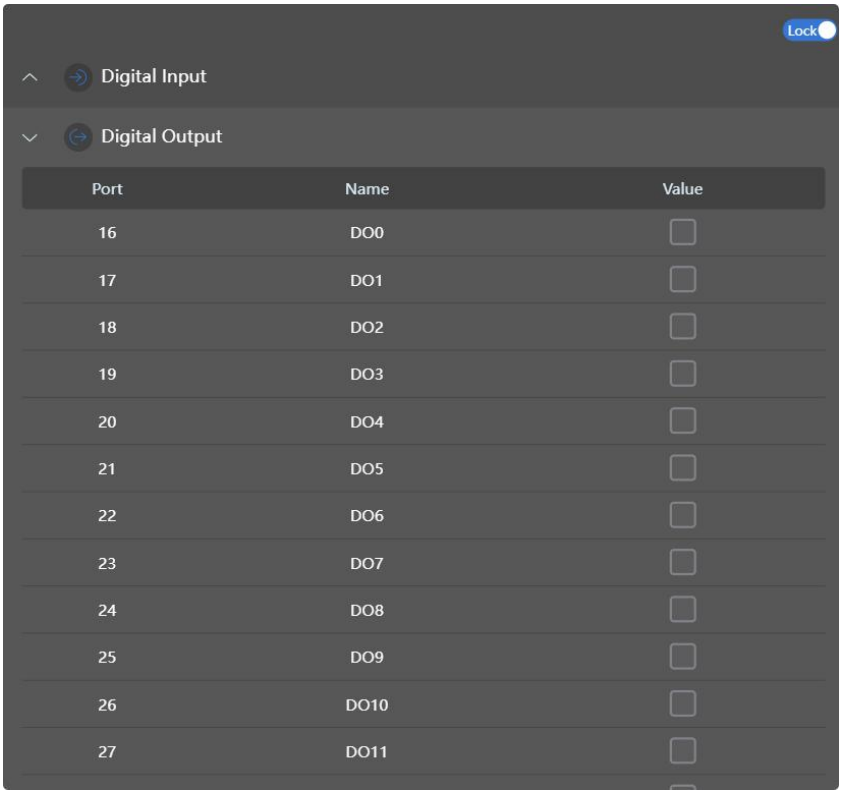
Lifting column control, point movement in manual mode to control the height of the lifting column (the current lifting column has no height display);

 Automatically rotate the suction cup to a position parallel to the ground.

7.5.2. Variable management

Users do not need to pay attention to the variables of the palletizing machine. For specific descriptions of the variables, refer to the robot user manual.

7.5.3. I/O



The I/O interface shows all digital I/O and analog I/O states, and I/O can be manually operated in the "unlocked  " state, while I/O cannot be manually operated in the "locked  " state.

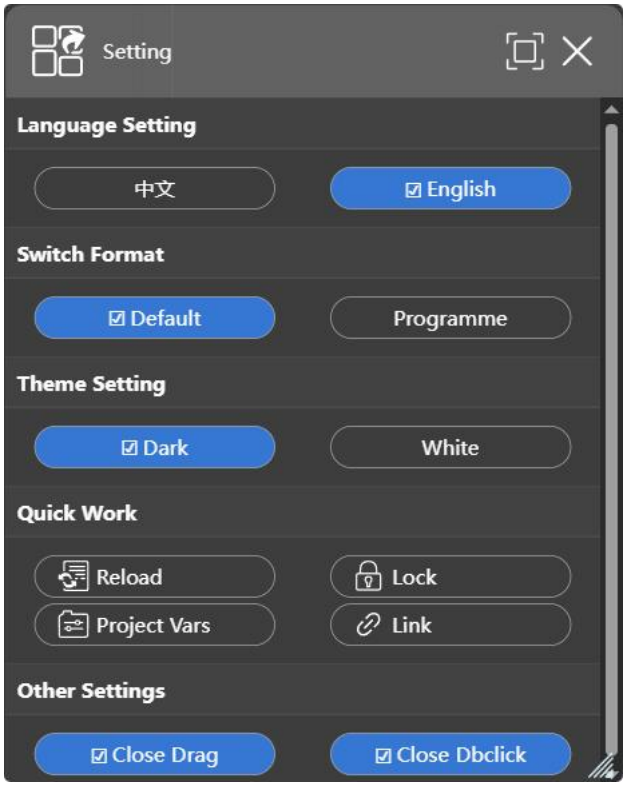
After unlocking, I/O names can be renamed to facilitate programming.

The forced option  can force a change of the corresponding input to a manually selected state.

7.5.4. Engineering management area

You can manage the project in the Project Management menu.

 is for project settings, switch languages, switch layouts, switch themes, refresh pages, lock Windows, variable management, and set online options; You can also set whether the program tree allows drag-and-drop commands and whether the teaching interface enables double-click.



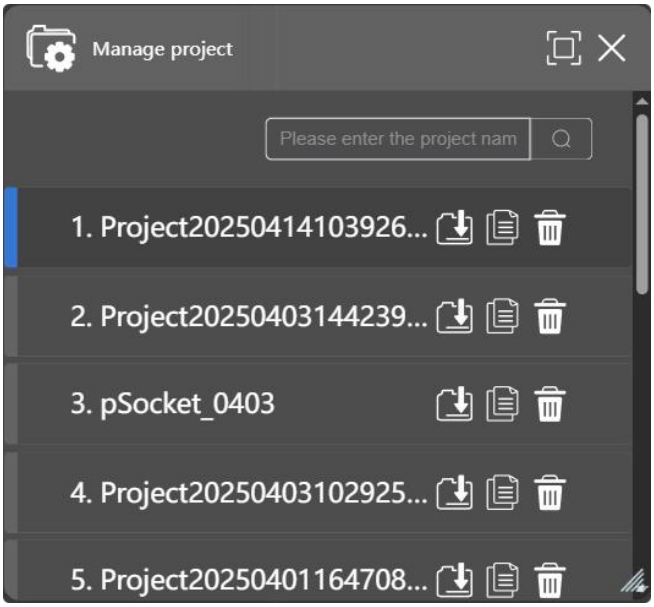
 Create a new project, create a new robot project;

 Save the project, when the Save Project button is "red", changes in the current project have not been saved, when the Save project button is "blue", changes in the current project has been saved;

 Project management, which allows download, copy, and delete operations on saved projects;

 Import project, import project saved locally;

 Run, run the current project (step by step, Auto), run the project in "Auto Mode".



In the Project Management dialog box, you can click  download project, click  to copy project and click  to delete project.

7.5.5. Speed multiplier adjustment zone

The movement speed multiplier bar can adjust the speed multiplier, and the values for manual point mode and automatic run mode are independent. The values range from 1% to 100%.

The actual operating speed of the robot in automatic mode = motion command speed × speed multiple.

In manual mode, the node motion speed is the maximum node motion speed × 100%, the Cartesian point motion linear speed is the maximum Cartesian point motion linear speed × 100%, and the Cartesian point motion rotational angular speed is the Cartesian point motion rotational angular speed × 100%. The values can be modified in the relevant options of the Settings TAB.

7.6. Settings TAB

7.6.1. Basics

When saving parameters, the robot will automatically power off, and when powered on again, the new parameters will be applied.

7.6.1.1. IP address

Double-clicking the IP address can change the robot IP address, which takes effect after the control cabinet is powered off and restarted.

7.6.1.2. Serial number

The whole machine serial number, the control cabinet serial number, the mechanical arm serial number and the joint serial number are the unique identifiers of each part of the robot. The whole machine serial number will also be marked on the labels of the robotic arm and the control cabinet.

7.6.1.3. Default tools

By creating a variable of type TOOL in a variable, you can select the tool you created in the default tool dropdown box.

The TOOL variable contains the position and rotation of TCP relative to the end flange of the robot, the mass of the tool, the centroid of the tool (relative to the TCP coordinate system), and the inertia tensor of the tool.

By default, the tool is the tool parameter that is loaded at startup. Incorrect default tool selection may cause the robot to shut down, and in severe cases, it may damage the robot's joints.

7.6.1.4. Default load

By creating a variable of the PAYLOAD type in a variable, you can select the created payload in the default payload drop-down box.

The PAYLOAD variable contains the load's mass, centroid, and inertial tensor.

The default payload is the payload parameter that is loaded at startup. Incorrect default load selection may cause the robot to shut down, and in severe cases, it may damage the robot's joints.

Among them, load 15 is used to set the load during operation, and the load is dynamically set by the grab box.

7.6.1.5. DH parameters

Users can view the DH parameters for this robot here.

7.6.1.6. Installation

You can choose a preset installation method or customize its installation offset and installation rotation relative to the world coordinate system. After the robot is installed and fixed, the installation rotation and offset will not change.

7.6.1.7. xyz offset

The installation - offset parameter indicates the offset of the robot base relative to the world coordinate system, and this parameter has no practical significance in a single robot system. In a multi-robot system, it can represent the relative positional relationship between robots.

7.6.1.8. abc Rotation

The parameters for installation - rotation are related to the robot's installation posture, and parameters need to be set during installation - rotation when installed at other angles. After setting the parameters, the robot model on the right will rotate in real time according to the input parameters. When the simulated robot pose is consistent with the actual one, click the save button and power on again, and the parameters will take effect.

7.6.2. Tools, load, coordinate system

7.6.2.1. Tools

The robot can store up to 16 tool parameters, of which no. 0 cannot be modified. Tool parameters can be generated by user calibration or freely input values. Tool parameters mean as follows:

Parameters	Parameters	Data type	Parameter meaning
TOOL Used to record tool	x	real	The displacement offset of TCP relative to the flange coordinate system in the x direction, in mm.
	y	real	The displacement offset of TCP relative to the flange coordinate system in the y direction, in mm.

parameters and define the displacement and rotation of the tool's end relative to the robot flange.	z	real	The displacement offset of TCP relative to the flange coordinate system in the z direction, in mm.
	a	real	The Euler Angle of TCP rotation relative to the Z-axis of the flange coordinate system, with the unit of deg.
	b	real	The Euler Angle that TCP rotates relative to the y' axis of the flange coordinate system, in deg.
	c	real	The Euler Angle that TCP rotates relative to the x'' axis of the flange coordinate system, in deg.
Dyn (LoadDyn) Used to store robot end tools and load mass information parameters.	M	real	The quality information of the tool, in kg.
Pos The position of the installed tool or load on the coordinate system OTool-XYZ.	Mx	real	The offset of the center of gravity C of the installed tool or clamped load in the x-direction of the coordinate system OTool-XYZ, with the unit being mm.
	My	real	The offset of the center of gravity C of the installed tool or clamped load in the y-direction of the coordinate system OTool-XYZ, in mm.
	Mz	real	The offset of the center of gravity C of the installed tool or clamped load in the z-direction of the coordinate system OTool-XYZ, in mm.

7.6.2.2. Load

The robot can store up to 16 load parameters, of which no. 0 cannot be modified. Load parameters can be generated by user calibration or freely input values. Load parameters mean as follows:

Parameters	**Parameters**	**Data type**	**Parameter meaning**

Dyn (LoadDyn) Used to store robot end tools and load mass information parameters.	M	real	Quality information of the load.
CenterPos The position of the installed tool or load on the coordinate system OTool-XYZ.	Mx	real	The offset of the center of gravity C of the clamped load in the x-direction of the coordinate system OTool-XYZ, in mm.
	My	real	The offset of the center of gravity C of the clamped load in the y-direction of the coordinate system OTool-XYZ, in mm.
	Mz	real	The offset of the center of gravity C of the clamped load in the z-direction of the coordinate system OTool-XYZ, in mm.

7.6.2.3. Coordinate system

The robot can store up to 16 coordinate system parameters, of which 0 cannot be modified. Coordinate parameters can be generated by user calibration or freely input values.

Coordinate parameters mean as follows:

Parameters	**Data type**	**Parameter meaning**
x	real	The displacement offset of the origin of the user coordinate system relative to the world coordinate system in the x-direction, in mm.
y	real	The displacement offset of the origin of the user coordinate system relative to the world coordinate system in the x-direction, in mm.
z	real	The displacement offset of the origin of the user coordinate system relative to the world coordinate system in the x-direction, in mm.
a	real	The Euler Angle of rotation of the user coordinate system relative to the Z-axis of the world coordinate system, in deg.

b	real	The Euler Angle of rotation of the user coordinate system relative to the y' axis of the world coordinate system, with the unit of deg.
c	real	The Euler Angle of rotation of the user coordinate system relative to the x'' axis of the world coordinate system, in deg.

7.6.3. Security

The master switch can choose whether to enable safety rules, and no rules will take effect when the master switch is off.

7.6.3.1. Joint overspeed protection

Whether the safety overspeed protection is enabled, when it is off, the system does not detect whether the joint speed exceeds the joint overspeed threshold.

7.6.3.2. Joint speed threshold

Tachycardia thresholds for each joint.

7.6.3.3. Terminal overspeed protection

Whether the safety overspeed protection is enabled, when it is off, the system does not detect whether the end speed exceeds the threshold.

7.6.3.4. Joint collision detection sensitivity

The user doesn't need to care about the specific threshold parameters for each axis. The thresholds are dynamic, with 100% being the most sensitive and 0% off. The higher the accuracy of the load configuration, the higher the setting here can be.

7.6.3.5. Joint collision detection threshold

There are torque sensors in each joint of the Codroid S series robots for detecting the torque the joint is subjected to. When the robot is powered on and detects that the torque value is greater than the joint output torque limit threshold, the robot will report an error and power off. At this point, it is necessary to check the cause of the situation, and after resolving the problem, power on the robot again.

The reasons why robots may have torque exceeding the limit:

1. Mismatch between the actual load at the end and the set;
2. The robot collides;
3. The speed and acceleration Settings are not reasonable;

4. Other situations.

Users can modify the threshold appropriately according to the actual application, but it is not recommended to turn off the protection, as security risks may arise.

7.6.3.6. Joint limit

Joint limit is used to restrict the movement of each robot joint in joint space and defines the range of positions for each joint. The customer can modify the threshold according to the actual application. If the threshold is set too small, it will affect the robot's range of motion.

7.6.3.7. End limit

The end limit is used to restrict the movement position of the robot TCP and defines the range of positions in the x,y, and z axes. The customer can modify the threshold according to the actual application. If the threshold is set too small, it will affect the robot's range of motion.

7.6.3.8. Safety points

Set the robot pose for the safety point, and you can add the output signal when the robot is at that point in the set IO.

7.6.3.9. Manual mode end speed limit

The Cartesian maximum speed for tapping the robot in manual mode, which will never be exceeded in any case in manual mode.

7.6.3.10. Load check sensitivity

When the drag robot is enabled, the robot will check if the current load is correct before the function is turned on. If the actual load deviates too much from the theoretical load, the robot will not turn on the drag to protect itself and the operator's safety. Adjusting the sensitivity level limits the deviation threshold.

7.6.3.11. Drag enables the calibration of sensitivity

At the moment the drag button is pressed, the robot will again check if the load configuration is correct to prevent sudden movement of the robot caused by the user turning off collision detection and misconfiguring the load.

7.6.4. Motion

Motion parameters define the speed and acceleration of the robot in either automatic or

manual mode, as well as the maximum acceleration.

Motion performance optimization

When enabled, it optimizes jitter during low-speed movement.

7.6.4.1. Jogging

Joint speed

In manual mode, the maximum joint movement speed is 30°/s, and you can limit the maximum speed of manual point movement of the joint here.

Terminal linear speed

In manual mode, Cartesian point has a maximum linear velocity of 250mm/s, and you can limit the maximum linear velocity of Cartesian manual point here.

End angular velocity

In manual mode, the maximum rotational angular velocity of the Cartesian point end is 30°/s, and the maximum rotational angular velocity of the Cartesian manual point can be limited here.

7.6.4.2. Move to the point

Joint speed

In manual mode, the joint Angle velocity at which joint mode moves to point is 30°/s by default and up to 90°/s.

Terminal linear velocity

Cartesian linear velocity for moving to a point in manual mode, default 250mm/s, maximum 1000mm/s.

End angular velocity

In manual mode, the Cartesian angular velocity for moving to a point in Cartesian mode is by default 30°/s, with a maximum of 90°/s.

7.6.4.3. Auto

Maximum joint speed

The upper limit of speed the robot can reach while moving in automatic mode. After setting the maximum SPEED, the TCP speed setting will be limited to less than that maximum when creating a variable of the speed type.

Maximum joint acceleration

Joint acceleration in automatic mode limits the maximum acceleration. The user can adjust the value of the maximum acceleration appropriately according to the application, which can increase the movement rhythm. However, if the acceleration is set too high, there is a possibility of robot start-stop jitter, and long-term use of an unreasonable acceleration may cause damage to the joint reducer.

Joint plus acceleration

The upper limit of acceleration that can be achieved when the robot moves in automatic mode. The smaller the value, the smoother the movement process, but the longer it takes.

Maximum end speed

The maximum linear velocity of the robot's end movement in automatic mode. After setting the maximum SPEED, the TCP speed setting will be limited to less than that maximum when creating a variable of the speed type.

End maximum acceleration

Robot end line acceleration in automatic mode limits the maximum acceleration. The user can adjust the value of the maximum acceleration appropriately according to the application, which can increase the movement rhythm. However, if the acceleration is set too high, there is a possibility of robot start-stop jitter, and long-term use of an unreasonable acceleration may cause damage to the joint reducer.

Add acceleration at the end

The upper limit of linear acceleration that the robot can achieve when moving in automatic mode. The smaller the value, the smoother the movement process, but the longer it takes.

Pause time

Deceleration time for the robot program to pause in automatic mode.

7.6.5. Register communication

Since ModbusTCP, ProfiNet, and EtherNetIP all act on the same register address, only one communication protocol can be chosen. If no communication protocol is applicable, turn it off and enable. Using ProfiNet, EtherNetIP requires adding physical communication modules. The modified Settings will only take effect after saving and restarting the robot.

7.6.5.1. ModbusTCP

Protocol version

The ModbusTCP software version currently used by the robot.

Port

The port that the ModbusTCP protocol uses when the robot acts as a slave station.

Slave station address

The address when the robot acts as a slave station.

7.6.5.2. ProfiNet

Protocol version

The ProfiNet software version currently used by the robot.

From station name

Robot ProfiNet Slave station name, double-click to modify the name, take effect after restarting the robot.

IP

The IP address of the ProfiNet module of the robot, double-click to modify the name, takes effect after restarting the robot.

Data mode

ProfiNet protocol data modes supported by different brand devices are slightly different, and you can choose big-endian or little-endian mode.

7.6.5.3. EtherNetIP

Protocol version

The current version of the EtherNetIP software used by the robot.

IP

The IP address of the EtherNetIP module of the robot, double-click to modify the name, takes effect after restarting the robot.

Data mode

The EtherNetIP protocol data modes supported by devices of different brands are slightly different, and you can choose big-endian or little-endian mode.

7.6.6. IO

7.6.6.1. DI Function configuration

When the system detects that the corresponding numeric input variable meets the trigger condition, perform the corresponding purpose function. Click to create a new function configuration. Adding multiple operations using the same variable and the same condition can achieve the effect of multiple actions.

Start dragging: Open the manual drag robot mode in Mode;

Stop dragging: Turn off Manual Drag Robot mode in mode;

Power-on: Power-on enable the robot;

Power-on in rescue mode: Power-on the robot in rescue mode, in which safety detection is temporarily off;

Power-off: Enable when the robot is powered off;

Switch to auto mode: The robot switches to auto run program mode;

Switch to manual mode: The robot switches to manual teaching mode;

Run the last saved program: Run the last saved program in the auto-run mode;

Run the specified program: Run the program specified by the drop-down box in auto-run mode;

Stop running: The robot stops running the program;

Pause: The robot pauses running the program;

Continue running: Continue running the paused program;

Error reset: Clear the robot error;

Protective stop: Robot protective emergency stop;

7.6.6.2. DO Function Configuration

When the system detects that a trigger condition is met, perform the corresponding digital output function. Click to create a new function configuration. Only one operation can be added to the same variable.

Anomaly: The robot outputs the corresponding level when an anomaly occurs;

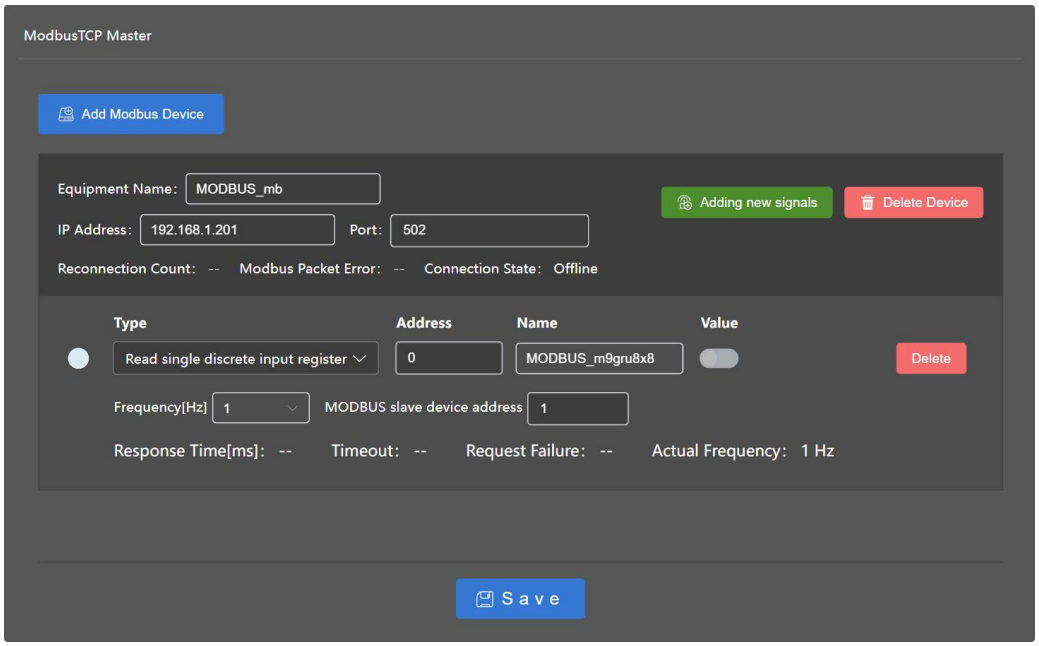
Program running: Output corresponding levels when the robot program is running;

Program pause: Output corresponding levels when the robot program pauses;

At safe point: Output the corresponding level when the robot is at a safe point;

7.6.7. MODBUS master station

MODBUS master (client) parameters can be set here. A connection between the local machine and the MODBUS slave (server) at the target IP address can be created. Each signal has a unique name, so it can be used in the program.



Add devices

This button can add new MODBUS slave station devices.

Remove Device

This button removes MODBUS slave devices and all of their signals.

Device Name

You can set the device name to distinguish each device.

IP address

The IP address of the MODBUS slave device, where the IP address can be changed.

Port

The port address of the MODBUS slave device, where the port address can be changed.

Reconnection count

The number of times a TCP connection is closed and reconnected.

Modbus packet error

The number of packets received containing errors (i.e. Invalid length, lost data, TCP socket error).

Connection status

TCP connection status.

Add signal

This button can add signals to the corresponding MODBUS slave device.

Remove the signal

This button removes the signal from the corresponding MODBUS slave device.

Type

Selectable signal type. Available types include:

Read a single coil register (read output coil), read discrete input register (Read input coil), Read a single hold register (Read output register), Read Input register (Read input register), write a single coil register (write output coil), write a single hold register (write output register).

Address

Display the address on the remote MODBUS slave device, which can be used to select different addresses. The valid address depends on the manufacturer and the configuration of the remote MODBUS slave device.

Name

A name can be assigned to the signal. The signal name will be used when the signal is used in the program

Frequency

An update frequency that can be used to change the signal. Update frequency is the frequency of requests directed to a remote MODBUS slave device that sends a request to read or write a signal value. When the frequency is set to 0, MODBUS requests will be initiated on demand using instructions in the program.

From the device address

This text field can be used to set a specific slave device address for a request corresponding to a particular signal. This value must be within the range of 0 to 255, with the default being 255. To change this value, it is recommended to consult the remote MODBUS device manual first to verify that the function is normal after the change from the device address.

Response time [ms]

The time between sending a MODBUS request and receiving a response, updated only when the communication is active.

Timeout

The number of MODBUS requests that did not receive a response.

Request failed

The number of packets that could not be sent due to an invalid socket status.

Actual frequency

Average frequency of signal status updates for the master station device (client). Recalculate this value each time the signal receives a response from the slave device (server).

Save

Save the Settings and refresh all MODBUS connections. All MODBUS slave devices will be disconnected and reconnected. All statistics are cleared.

7.6.8. Palletizing

Stack height limit

Maximum height limit for stacking stacks.

Height that the robot body can reach

Applicable to the palletizing lift column version, control the height limit of the lift logic, no user concern.

Working mode

Choose the palletizing work mode, palletizing or depalletizing. The rest of the options are for demonstration purposes only, and users need not worry about them.

Tray priority

When starting palletizing, begin with the pallets on the left or right.

Stacking method

Stack in pallet order: Alternate stacking by stacking all the boxes on one side of the pallet before stacking all the boxes on the other side of the pallet.

Left and right pallet layer-by-layer stacking: Stack boxes from one layer on one side of the pallet before a layer on the other side of the pallet in a layer-by-layer manner.

Alternate stacking of left and right pallets by box: Alternate stacking of a box on one side of

the pallet before stacking a box on the other side of the pallet.

Left anchor point

The position from the center of the robot base to the tray positioning point has been set at the factory. Do not modify it unless necessary.

Right anchor point

The position from the center of the robot base to the tray positioning point has been set at the factory. Do not modify it unless necessary.

Remove the left stack grab offset

This parameter is a calibration parameter that has been set at the factory. Do not modify it unless necessary.

Remove the right stack grab offset

This parameter is a calibration parameter that has been set at the factory. Do not modify it unless necessary.

7.6.8.1. Grab Settings

Grab signal

Suction cup working digital output port.

Enable reverse blowing

When backblowing is enabled, air will be blown outward as the suction cup drops the workpiece to prevent the suction cup from sticking to the light weight workpiece.

Backblow signal

Suction cup back-blow working digital output port.

Back-blowing intervals

The interval between the release signal sending and the backblow signal.

Backblow time

Blow back the time.

Enable grab detection

Once enabled, it will detect whether the object has been truly picked up successfully after being picked up. If a failed pick is detected, the robot stops.

Whether to drop signal

Detect the drop feedback signal digital input port.

7.6.8.2. Box detection setup

Enable box (Palletizing arrival/depalletizing available) inspection

Box in place detection signal.

Left box signal

For the incoming material signal when palletizing on the left pallet.

Right box signal

For incoming signal when palletizing on the right pallets.

7.6.8.3. Partition setup

Enable partition detection

Enable the partition detection feature.

Partition in place check

Partition in place signal port.

Partition grabs signal

Partition grab signal port.

7.6.8.4. Tray detection setup

Enable pallet inspection

Enable the pallet in place detection feature.

Detect left pallets arriving at DI port

After enabling the tray in place detection function, check the port corresponding to the left tray.

Detect the arrival of the right pallet at the DI port

After enabling the pallet positioning detection function, detect the corresponding port of the right pallet.

Trigger method

Port trigger conditions when pallet in place detection function is enabled.

7.6.8.5. Loop setup

Loop mode

No loop: The program runs once and does not run again until the user starts the program again.

Infinite loop: Once the user starts the program, it will keep running until the user stops the program.

Loop count: The program stops after a specified number of runs.

DI conditional loop: The program runs until a given condition is met.

Number of loops

The count parameter when the loop mode is selected as loop count.

Detect DI port

The port when the loop mode is selected as DI conditional loop.

Trigger mode

The loop mode is selected as the port trigger condition when the DI condition loop is chosen.

7.6.9. Panel IO

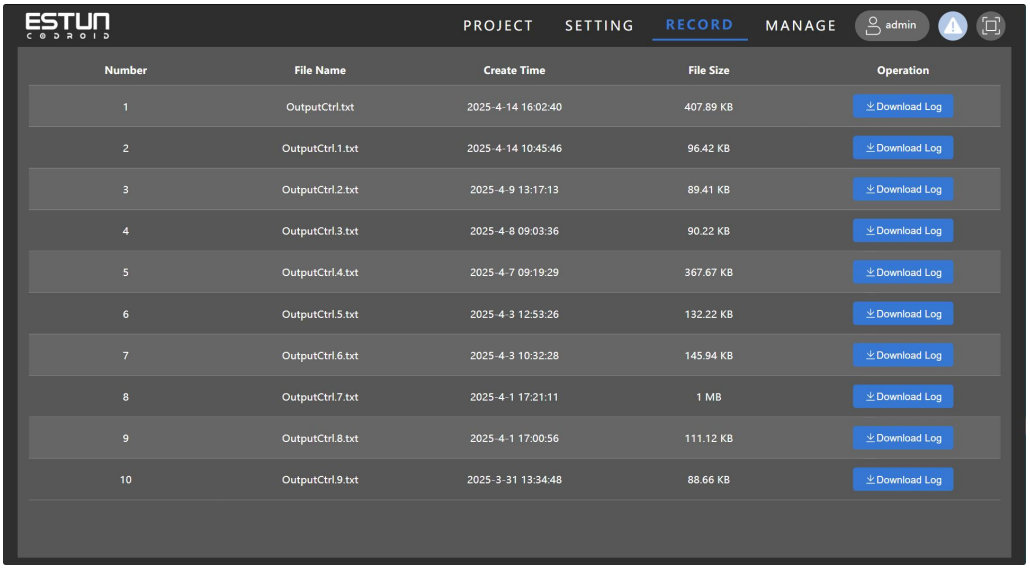
IO Settings can enable analog output on the control cabinet panel and set the analog input mode.

The analog output port must be connected to the load, otherwise the robot will report an error. If not in use, the corresponding port must be closed.

When using the analog input port, you must specify the mode of use, current mode or voltage mode, otherwise the robot will report an error.

7.7. Log TAB

The log module records some operation anomalies of the user, gives relevant prompts, and provides assistance for using the software. At the same time, it provides the corresponding window prompt that can be viewed when problems arise, providing information to professionals for help and problem-solving.



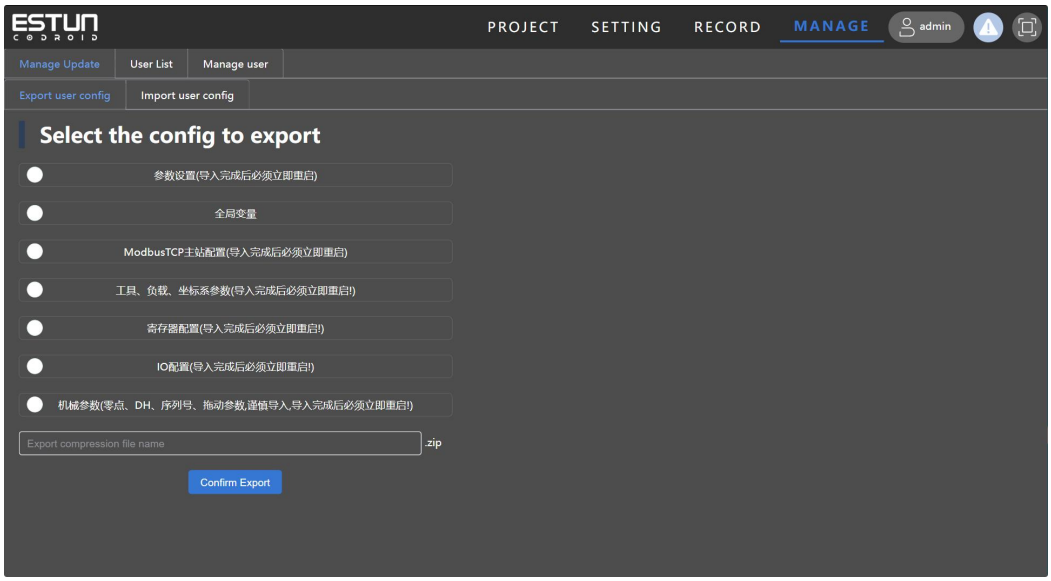
Click the exclamation mark button in the upper right corner of the program to view the error message. If the button flashes, it indicates that there is an error in the program and the program stops running.

The system log retains only the latest 10 entries. Clicking the button 

in the log TAB allows you to download this log information to your local device.

7.8. Manage tabs

The management interface can import or export some Settings or engineering parameters of the controller, as well as manage users.



The configuration meaning of import and export is as follows:

Parameter Settings (Reboot takes effect)

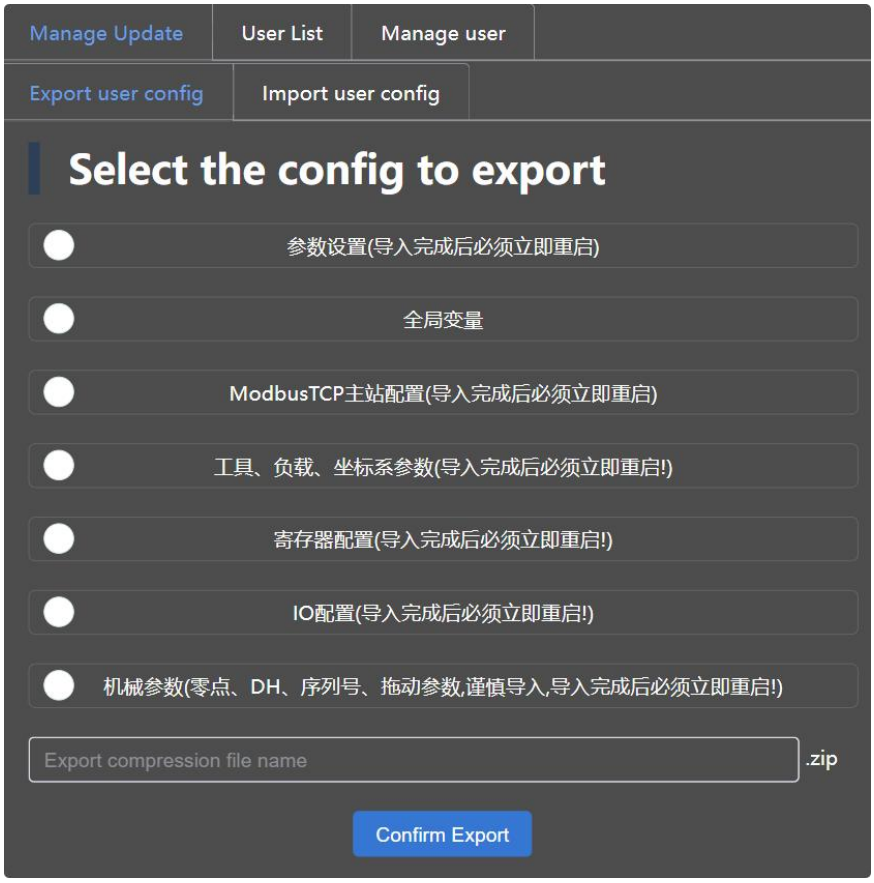
Parameter Settings in the Robot Settings TAB.

Global variables

Global variables in robotics engineering, since global variables are not imported or exported with the import or export of the project, all users can manage them uniformly here.

ModbusTCP master station configuration (reboot takes effect)

ModbusTCP master station configuration set by the user in the Settings TAB.



In the user list, the admin user can create and delete users here.

The initial account and password available are as shown below. Different accounts have different permissions, which can be found in the appendix.

Account	Password	Rank
user	123456	User

admin	123456	Administrator

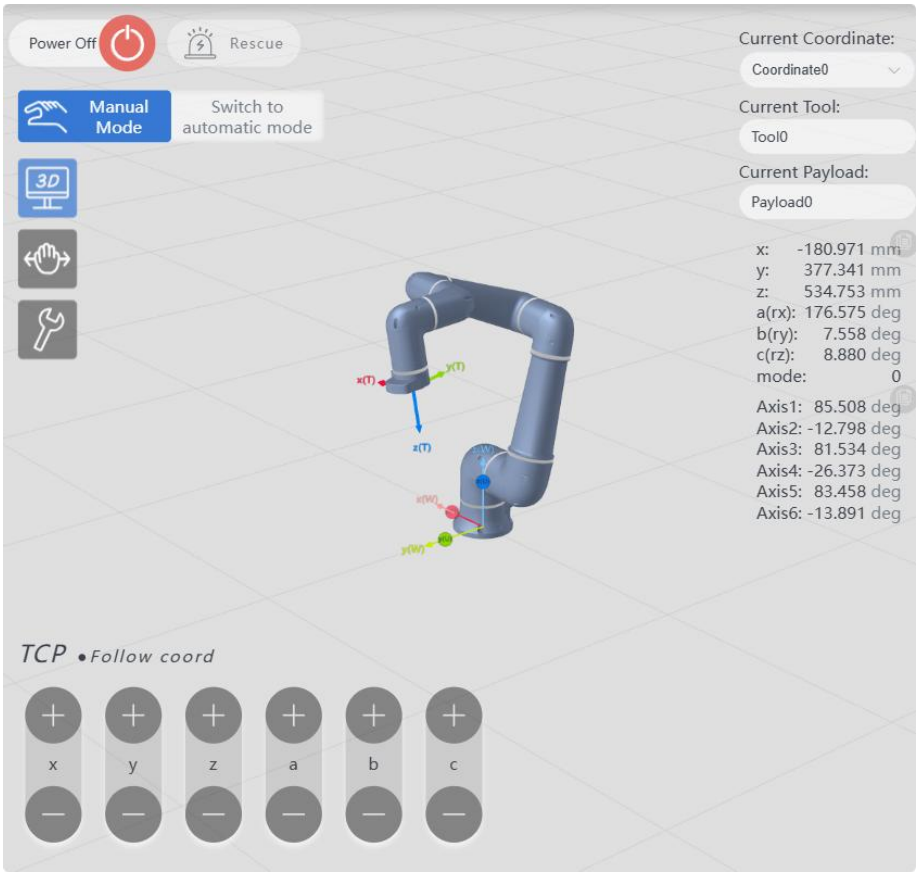
In registered users, you can create new users and assign them usernames and passwords as well as permission levels.

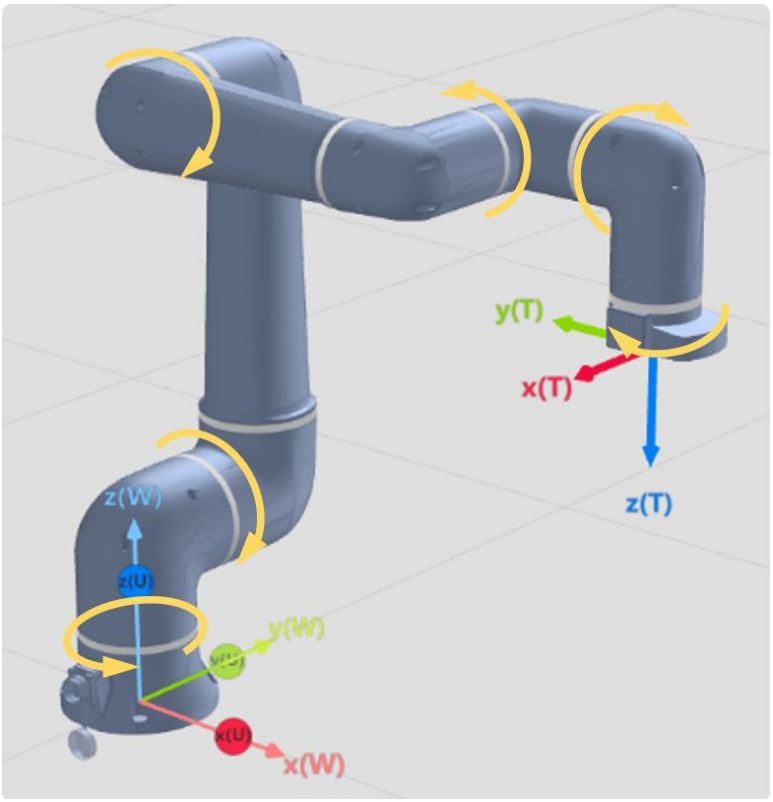
8. Calibration

This section will describe joint coordinate systems, world coordinate systems, tool coordinate systems and their use;

8.1. Joint coordinate system

Joint coordinate system, or joint space, the independent movement of robot joints is joint movement.

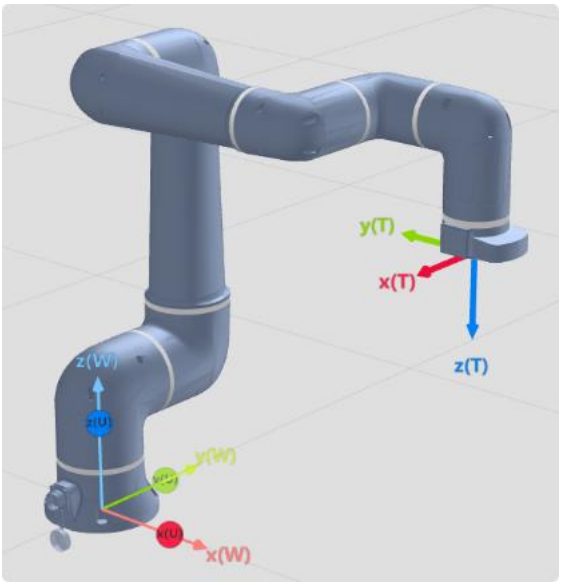




8.2. World coordinate system

The Cartesian coordinate system of the Codroid collaborative robot is right-handed, and its Euler Angle format is X-Y-Z fixed angles. For example, the pose [900mm, 200mm, 1200mm, 20°, 30°, 45°] is interpreted as first moving to x=900mm, y=200mm, z=1200mm in the reference coordinate system and then rotating the end 20° along the X-axis of the reference coordinate system with the TCP point at the end as the rotation center. Then rotate the end 30° along the Y-axis of the world coordinate system, then rotate the end 45° along the Z-axis of the world coordinate system.

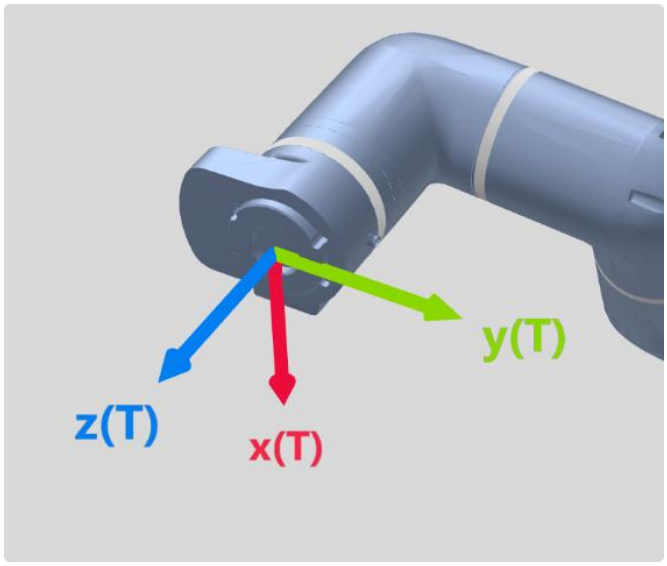
When leaving the factory, the robot is by default at the position of [0, 0, 0, 0, 0, 0] in the world coordinate system, that is, the robot's base coordinate system coincides with its pose in the world coordinate system. The robot base navigation inserts points to the negative Y-axis of the robot base coordinate system, and the positive Z-axis points to the interior of the base.



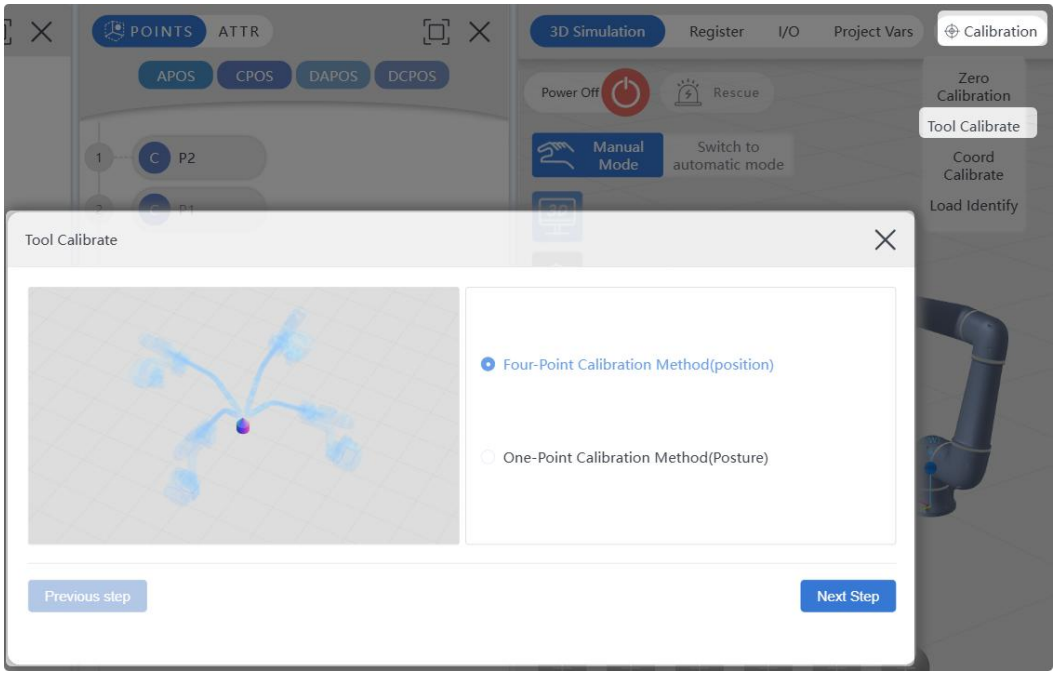
The robot can be mounted either with a preset mounting method or by customizing its mounting offset and mounting rotation with respect to the world coordinate system.

8.3. Tools and calibration

The user can create a new tool variable, and the tool coordinate system is offset based on the default tool coordinate system (NOTOOL) at the end of the flange. The offset values can be entered directly by the user or completed with auxiliary calibration. The origin of the default tool coordinate system is located at the center of the flange end, with the Z-axis pointing outside the flange and the Y-axis pointing to the installation positioning pin hole.

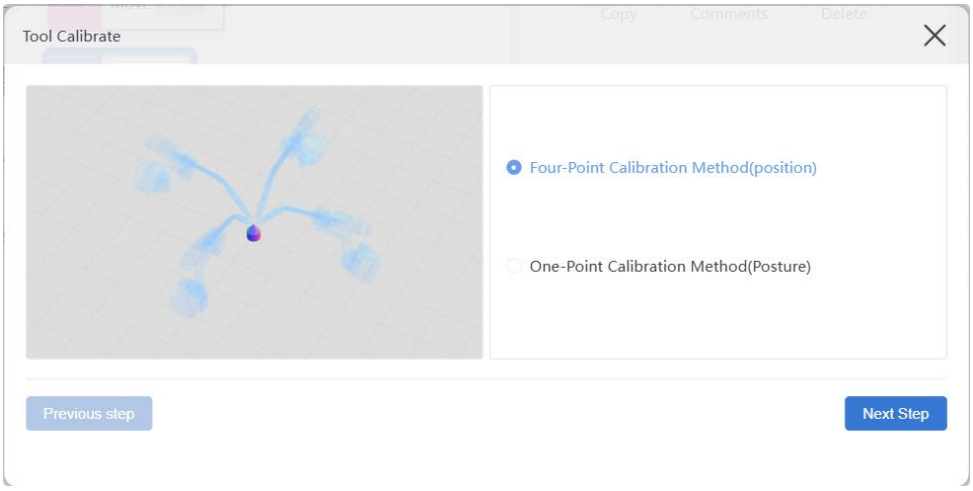


When it is necessary to calibrate the tool coordinate system, use the four-way **calibration** method of "**Tool** calibration" to assist in calculating the position offset or use the one-point calibration method to assist in calculating the rotation Angle.



8.3.1. Four-way calibration method

Move the robot (point or drag) freely to four different poses, each time bringing the tool point to the same needle tip placed in space and clicking the "Direction teaching" button. After performing all four poses, obtain the offset value of TCP relative to the Faran center of the tool output.

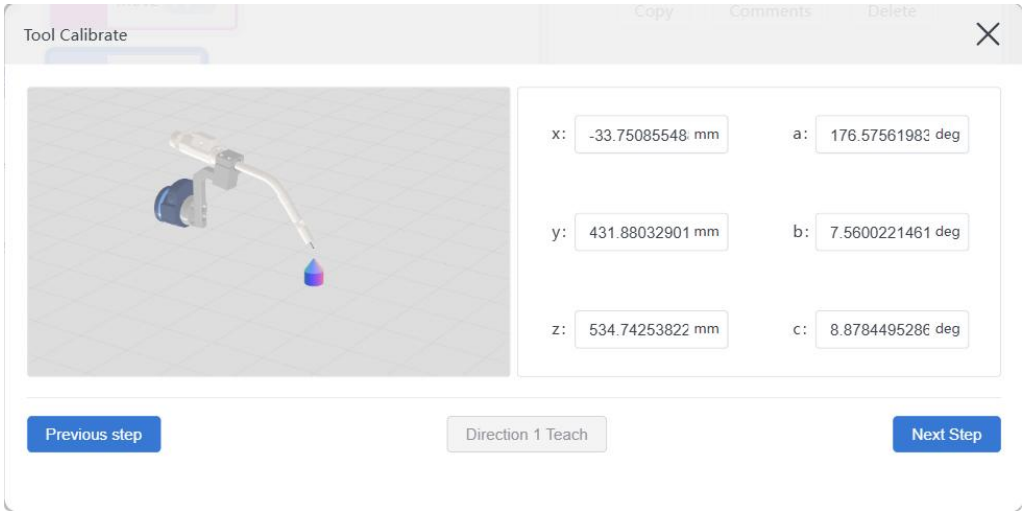


8.3.1.1. Start calibration

1. Move the robot to bring the TCP (tool center point) into contact with the

needle tip placed in space

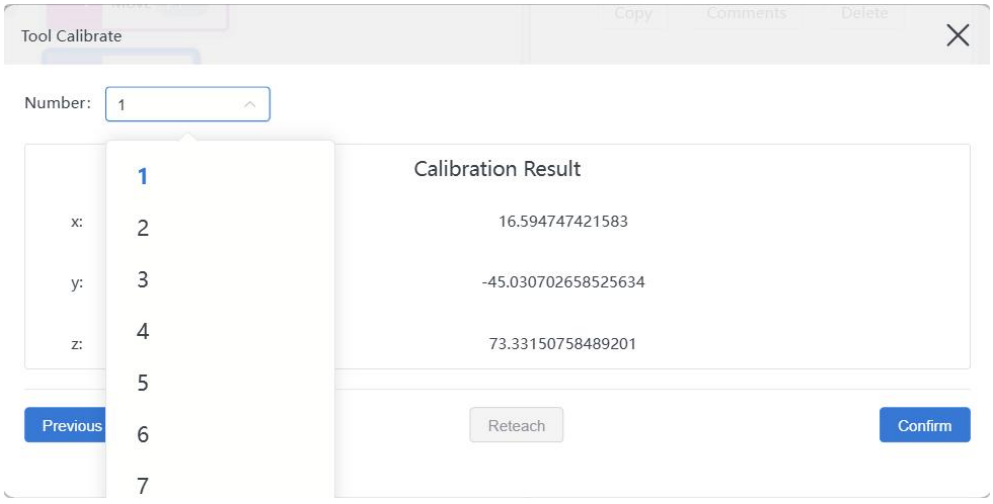
2. Click the teaching button to record the actual pose of the current robot.



3. Click the button Next Step to repeat step 1, step 2 until the fourth point, then click the button Confirm to complete the teaching.

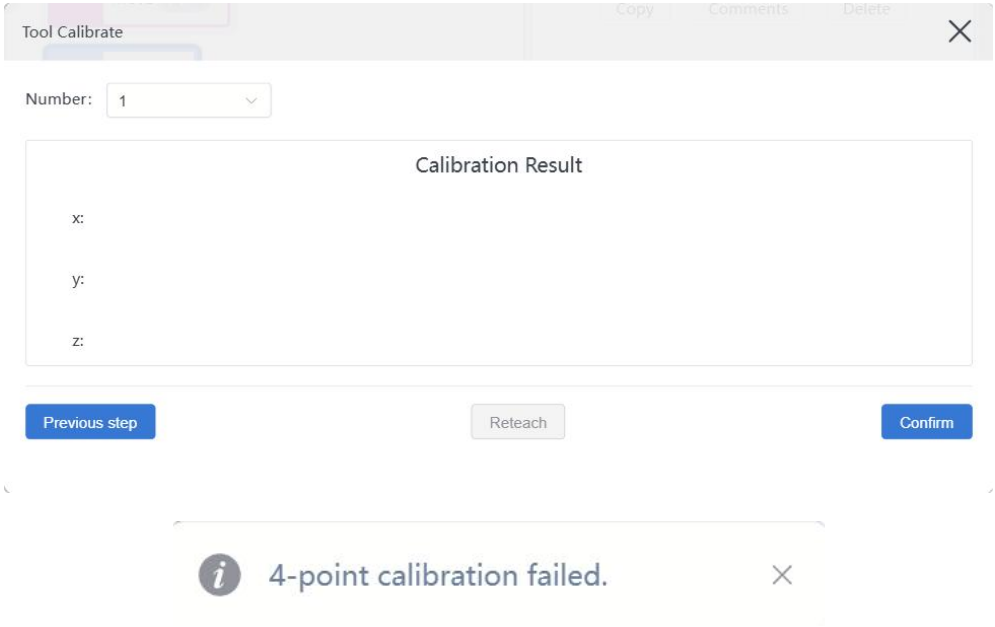
8.3.1.2. Calibration successful

After clicking the confirm button, the x,y, and z values of the successfully calibrated tool will be automatically filled into the selected tool number.



8.3.1.3. Calibration failed

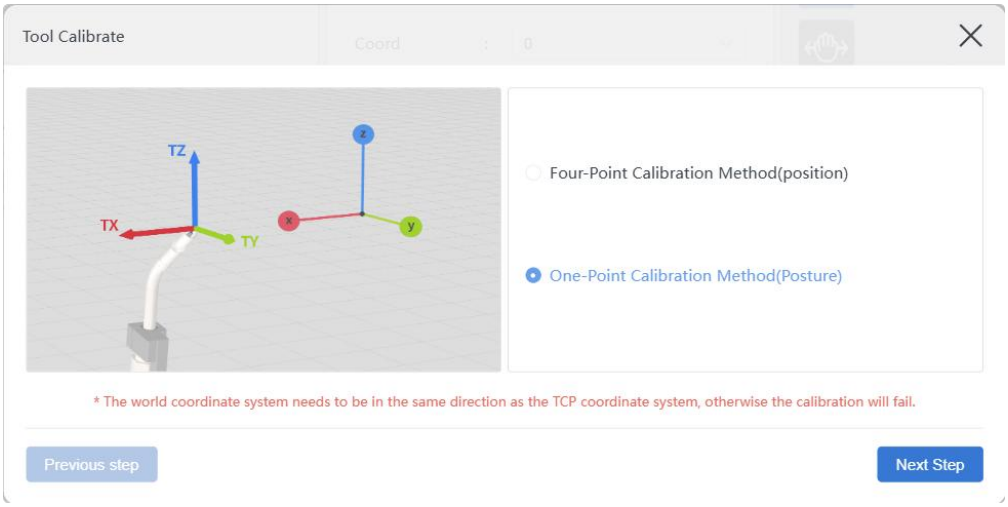
Calibration failed if the "Calibration TOOL" window has no result and prompts "4-point calibration failed".



Please restart the calibration and note that the four pose changes need to be large enough and tip to tip (the tool center point has enough contact with the tip in the space).

8.3.2. One-point calibration method (attitude)

After completing the four-way calibration (obtaining the translation relationship of TCP relative to the center of the tool output flange), you can start the certain calibration (attitude) to obtain the rotation relationship of TCP relative to the center of the tool output flange.



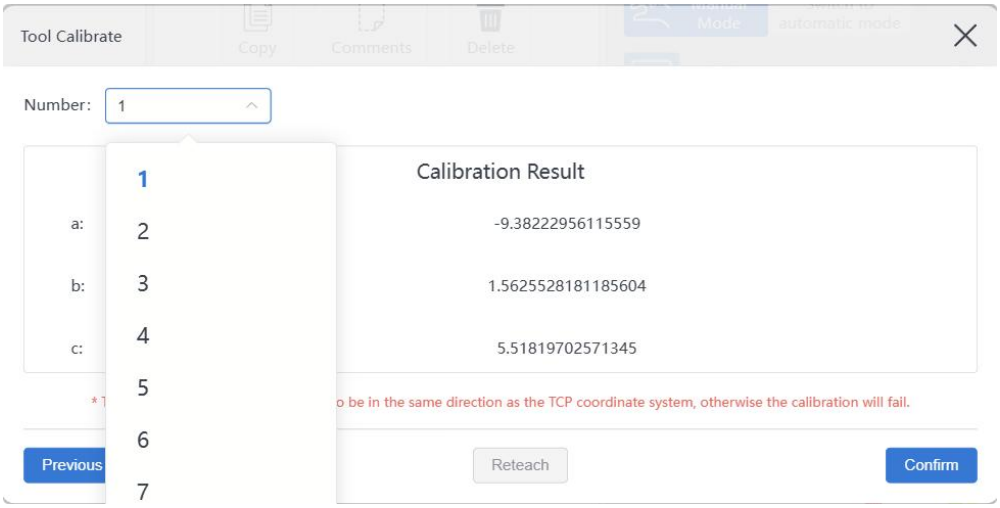
8.3.2.1. Start the calibration

Move the robot to align the desired tool coordinate system orientation with the robot's world coordinate system orientation, and click the button to complete the orientation instruction.

8.3.2.2. Calibration results

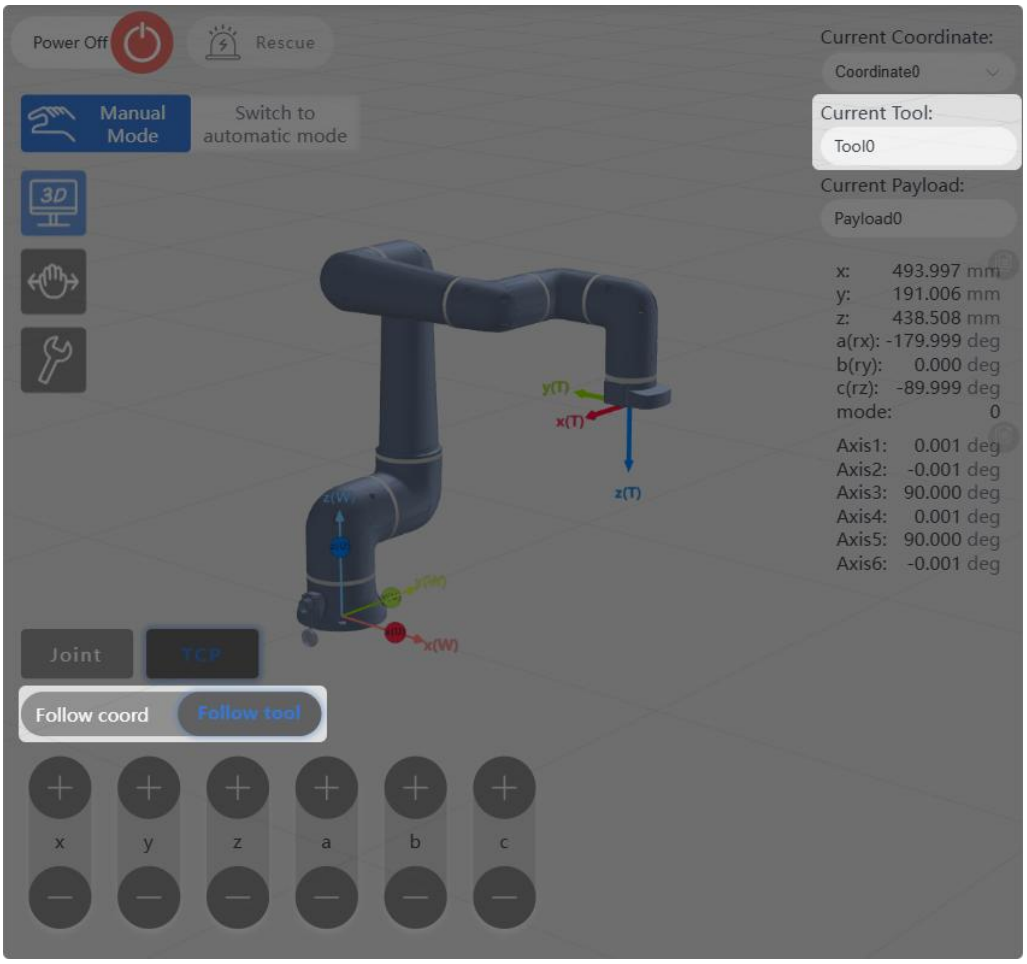
When calibrating the attitude, the robot cannot verify whether it is accurate, which can be judged visually by the user pointing the tool coordinate system.

Calibration is completed when a complete tool coordinate system is obtained after performing the "four-way calibration method" and the "one-point calibration method (attitude)" to obtain the translation and rotation of TCP (tool center point) relative to the center of the tool output flange.



8.3.3. Use the tool coordinate system

8.3.3.1. Use the tool coordinate system when pointing



When pointing the robot at the end, you can choose to move along the tool coordinate system. When the current tool is selected as the target tool coordinate system, you can move along the tool coordinate system. The current tool can be switched on the Settings TAB.

9. Appendices

9.1. Error code

There are currently six levels of information for robots, and the fourth digit of the error code indicates the error level.

Serial number	Error Level
0	System Occupancy
1	Hint
2	Warnings
3	General mistakes
4	Serious error
5	Fatal error

- When a general error or above occurs, the robot will lose power and shut down;
- When a warning level error occurs, the robot slows down and stops;
- If multiple errors occur at the same time, execute according to the highest level of error;
- Errors of the same type will have only one error code, but the specific error content will be displayed on the teaching device.

Error code	Error description
FFF10000	Undefined hints
FFF20000	Undefined warnings
FFF30000	Undefined error
FFF40000	Undefined serious errors
50010000	Robot power-on prompt
50010001	Robot power-off prompt
50010002	Robot encoder calibration prompt
50030003	Robot state transition timeout
50040004	Abnormal axis status
50030005	The position is strange when tapped

50010006	Reset
50030007	Reset timeout
50030008	Joint position overlimit
50030009	Over-limit at the end
5003000A	Joint desired position jump
5003000B	Joint output torque jump
5003000C	Joint tracking error is too large
5003000D	Joint speed is out of limit
5003000E	Joint collision detection triggered
5003000F	The joint collision detection cannot be effectively calculated
50030010	No effective calculation for end collision detection
50030011	End collision detection triggers
50030012	End speed exceeds limit
50030013	Error in drag
50030014	Error occurred when the drag stopped
50030015	End dotting is not allowed
50020016	Error occurred when resetting the motion planner
50020017	The motion planner set the initial position wrong
50020018	Motion planner add command error
50030019	Emergency stop
5002001A	Parameter configuration in progress, do not operate
5003001B	The parameter configuration process went wrong
5002001C	Press the emergency stop button when powered on
5002001D	Joint expected speed jump
5002001E	Drag over Speed
5002001F	Change configuration parameters while moving
58020000	There is an illegal situation with IO configuration
58020001	There is an illegal situation with the bus configuration
59020000	The current setting of the welding machine is incorrect
59020001	The voltage setting of the welding machine is incorrect
60020000	The path calculation of the motion planner is incorrect

60020001	The motion planner is running incorrectly
60020003	Node data to json failed
60020004	Failed to get the shared memory node
60030003	The inverse matrix of the robot's speed Jacobian matrix cannot be obtained
60030004	The inverse matrix of the robot's force Jacobian matrix cannot be obtained
60030005	The forward kinematic position of the robot cannot be obtained
60030006	The forward kinematic velocity of the robot cannot be obtained
60030007	The inverse kinematic position of the robot cannot be obtained
60030008	The inverse kinematic velocity of the robot cannot be obtained
60030009	The wrong robot was set up
6003000A	Joint over-limit
6003000B	Robot inverse dynamics cannot be obtained
6003000C	The equivalent inertial moment of the robot joint cannot be obtained
6003000D	The equivalent moment of gravity of the robot joint cannot be obtained
6003000E	The equivalent torque of the robot joint cannot be obtained
6003000F	The inertia matrix of the robot dynamics model cannot be obtained
60030010	The gravity matrix of the robot dynamics model cannot be obtained
60030011	The Koch force matrix of the robot dynamics model cannot be obtained
60030012	The rotation matrix from the base coordinate system to the flange coordinate system of the robot cannot be obtained
61010000	Unknown file
61010001	File parsing error
61010002	File loading error
61010003	File conversion error in a specific format
61010004	Write error to a specific format file
70020000	The fitting matrix is less than rank
70020001	The calibrated three points are collinear
71020000	The initial position of the robot is unknown
71020001	Initial conditions are insufficient, waiting to be supplemented, no error

71020002	When in relative motion, the type of reference coordinate system input does not exist
71020003	Transition type unknown
71020004	The type of the point is unknown
71020005	Arc type unknown
71020006	The Move instruction queue is full
71020007	Speed is not positive
71020008	Unable to create a path
71020009	Index out of range
7102000A	Solution failed
7102000B	Trajectory planning failed
7102000C	The "Move" type does not exist
7102000D	Move type does not match
7102000E	Trigger type mismatch
7102000F	The trigger corresponding Move instruction Id does not exist
71020010	The path attribute does not exist
71020011	Trigger type mismatch
71020012	The Move instruction Id corresponding to the trigger does not exist
71020013	Pose point does not exist
71020014	The movement magnification is out of range
71020015	The number of points exceeds the maximum
71020016	Parameter error
71020017	Spline interpolation failed
71020018	Index update failed
71020019	The acquisition of the arm profile Angle failed
76020000	Swing type does not exist
76020001	The swing amplitude is negative
76020002	Swing frequency is negative
76020003	Swing Angle is negative
76020004	The operating Angle is negative
76020005	Left stay time is negative
76020006	Right stay time is negative

76020007	Too low frequency
76020008	Too high frequency
76020009	Stay for too long
7602000A	The azimuth is too large
7602000B	The path type does not exist
7602000C	The weld seam direction is consistent with the Z direction of the current tcp, and the swing direction cannot be determined
7602000D	Compensation methods do not exist
7602000E	Compensation value update failed
7602000F	The number of periods not sampled is incorrect
76020010	The number of sampling periods used for the baseline value calculation is incorrect
76020011	Pose correction failed
76020012	Point update failed
76020013	Surfacing error
78030000	Input parameter dimensions do not match the robot
78030001	External force estimator initialization failed
78030002	The external force estimator did not set the initial state
78030003	The built-in Kalman filter of the force estimator is unable to update the output
78030104	The joint force estimated by the force estimator cannot be obtained
78030105	The joint acceleration estimated by the external force estimator cannot be obtained
78030106	The collision detector failed to initialize successfully
78030107	The status of the collision detection cannot be obtained
78030108	The admittance controller was not initialized successfully
78030109	The parameters of the admittance controller are set incorrectly
7803010A	The output of the joint admittance teaching program cannot be updated
7803010B	The end space axis lock was not initialized successfully
7803010C	Unable to set the end lock axis direction
7803010D	The end impedance of the end shaft lock cannot be obtained
7803010E	The impedance of the end lock shaft conversion to the joint end cannot be obtained
7803010F	The output of the teaching program cannot be updated
78030110	Beyond the joint limit of the drag-and-drop mode

78030111	The external force of the six-dimensional force sensor cannot be obtained
78030112	Constant force tracking & compliant force control is enabled simultaneously during force control, not allowed
80030000	Joint tracking error over-limit trigger
80030001	Joint collision detection trigger
80030002	Joint position limit trigger
80030003	Joint speed limit trigger
91010000	The expression of the WHILE control is empty
91010001	The IF control expression is empty
91010002	ELSEIF control expressions are empty
91010003	The ELSE control is followed by ELSEIF
91010004	Unknown operator
91010005	The variable name of the data is not of string type
91010006	The waiting time parameter is not an integer
91010007	Control parameters are not valid
91010008	The control type is illegal
91021007	Failed to open the profile
91011008	Save global variables failed
91011009	Failed to get the global variable
9101100A	Failed to save the project variable
9101100B	Failed to obtain engineering variables
9101100C	Save project failed
9102100D	Failed to read the project file
9102100E	Failed to read the lua file
92020000	The array variable index is out of range
92020001	Failed to find a variable by its name
92020002	Unknown variable type
92020003	Failed to find the IO port
92020004	Request parameters error

93010000	Failed to set up a shared memory node
93010001	CPOS to APOS failed
93010002	Failed to convert APOS to CPOS
93010003	Point data calculation failed
93010004	Motion kernel state error
93010005	Calibration failed
94010002	The subscription topic does not exist
94010003	Failed to open the topic profile
94010004	Parsing the topic profile failed
94010005	topic name duplication
94010006	The memory node corresponding to the topic was not found
96010000	Parse to unknown instructions
96020001	Failed loading instruction
96020003	The motion kernel state does not support this instruction
96020004	The engineering state does not support this instruction
96020005	Invalid engineering control instructions
96020006	Engineering data loading failed
96020007	Project loading failed
96020008	The control ID that starts running the project is invalid
91010009	Project Start running
9101000A	Project stopped running
9101000B	Task status error
97020000	Too many addDo directives
97020001	The jump control doesn't exist
97020002	The IO port number parameter is invalid
97020003	lua failed to execute the expression
97020004	Invalid task control instructions
97020005	The AddDo instruction failed to execute
97020006	The instruction waiting to execute the instruction queue failed

97020007	Execute an unknown instruction
97020008	The lua loading instruction failed
97020009	lua failed to execute the instruction
9702000A	Failed to write instructions to the moving kernel
9702000B	Failed to update the AddDo directive status
9702000C	Failed to register a variable to lua
9702000D	lua initialization failed
9702000E	lua configuration script loading initialization failed
9702000F	Unknown type of user variable
97020010	Failed to create Path
97020011	Failed to calculate the Path
97020012	Failed to run Path
97020013	OnDistance cannot be associated with the MovJ instruction
97020014	Parameters invalid

9.2. User levels and permissions

Categorization	Functions	user	admin
Engineering	New construction	✔	✔
	Switch	✔	✔
	Save	✔	✔
	Copy	✔	✔
	Download	✔	✔
	Delete	✔	✔
	Import	✔	✔
	Auto-run	✔	✔
	Stop	✔	✔
	Single-step run	✔	✔
	Run the pointer	✔	✔
	Switch between single-task and	✔	✔

	multi-task		
Visual Programming	Control View	✔	✔
	Drag-and-drop commands	✔	✔
	Add Command	✔	✔
	Command selected	✔	✔
	Command Property Editing	✔	✔
	Command Copy	✔	✔
	Instruction Deletion	✔	✔
	Tree command expansion and contraction	✔	✔
	Instruction property editing check	✔	✔
	Conditional expression validation	✔	✔
	goto class instruction target value validation	✔	✔
	Check result prompt message	✔	✔
Pose	Add pose	✔	✔
	Delete Pose	✔	✔
	Copy pose	✔	✔
	Add poses from mov class controls	✔	✔
	Update the pose from the mov class control	✔	✔
Variables	Add variables	✔	✔
	Remove variables	✔	✔
	Edit variables	✔	✔
	Variable Display	✔	✔
	Real-time running variables	✔	✔
	Add the specified type variable from the control properties	✔	✔
Settings	Basics	Youdaoplac	Youdaoplace

		eholder0 (Without permission)	holder0 (Without permission)
	Mechanical - Installation	Youdaoplaceholder0 (No permission)	✔
	Mechanical - relative to world coordinate system	Youdaoplaceholder0 (Not authorized)	✔
	Mechanical-DH	Youdaoplaceholder0 (No entry)	Youdaoplaceholder0 (No entrance)
	Safety - Joint/end limit	Youdaoplaceholder0 (No permission)	✔
	Security - Others	Youdaoplaceholder0 (Without permission)	✔
	Motion - Auto Mode	Youdaoplaceholder0 (No permission)	✔
	Sport - Manual mode	Youdaoplaceholder0 (No permission)	✔

	Motion-Servo	Youdaoplaceholder0 (No entry)	✘
	Debugging	✘	✘
3D simulation	Simulation demonstration	✔	✔
	Switching perspectives	✔	✔
	Clear the trajectory lines	✔	✔
	Return to zero position	✔	✔
	Back to the packing position	✔	✔
	Switch coordinate system	✔	✔
	Teaching mode configuration	✔	✔
	Automatic mode	✔	✔
	Manual mode	✔	✔
	Shut-off point Action	✔	✔
	End point movement	✔	✔
	I/O configuration	✔	✔
	Peripherals	✔	✔
Log	View	✔	✔
	Download	✔	✔
Plugins	List of welding process templates	✔	✔
	Adding templates	✔	✔
	Edit the template	✔	✔
	JOB number selection	✔	✔
Surveillance	Surveillance system	✘	✘
	Specify the monitoring data	✘	✘
Debugging	path data Sending	✘	✘
	Debug data caching	✘	✘
Configuration	Change configuration values	✘	✘

	Change configuration structure	✘	✘
User	Register a new user	✘	✔
	Delete a user	✘	✔
Bus	Register Editing	✘	✔
Error message	Clear errors	✔	✔
	Reset	✔	✔
	Real-time log	✔	✔
Other functions	Undo and redo	✔	✔
	Reloading configuration	✔	✔
	Refresh the page	✔	✔
	Module Window Maximization	✔	✔
	Close the module window	✔	✔
	Online Settings	✔	✔
	Online status	✔	✔
	Lock window	✔	✔
	Switch between Chinese and English	✔	✔
	Trace ID-related features	✘	✘

10. Contact information

- **Company Address:**

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The specifications, ratings and dimensions of this product are subject to change for the purpose of improving the product without notice.

For inquiries about the contents of this information, please contact our business department.