

# Dobot CRA Palletizing Workstation User Guide

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Issue: V1.2

Date: 2024-09-18

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The user has the responsibility to make sure following the relevant practical laws and regulations of the country, in order that there is no significant danger in the use of the robot arm.

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## Preface

### Purpose

This document describes the functions, technical specifications, installation guide of Dobot CRA Palletizing Workstation, making it easy for users to fully understand and use it. The terms “palletizing workstation”, “workstation” used in this document all refer to the Dobot CRA Palletizing Workstation.

### Intended audience

This document is intended for:





- Customer
- Sales Engineer
- Installation and Commissioning Engineer
- Technical Support Engineer

### Revision history

Date	Version	Revised content
2024/09/18	V1.2	Modify <a href="#">Section 6.1 Product nameplate</a> pictures
2024/09/02	V1.2	<ul style="list-style-type: none"><li>• Based on the new version of workstation hardware</li><li>• Based on the palletizing plugin V2-2-0</li></ul>
2024/04/30	V1.1	Based on the palletizing plugin V2-1-0
2024/02/01	V1.0	The first release

### Symbol conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Indicates a hazard with a high level of risk which, if not avoided, could result in death or serious injury.
 WARNING	Indicates a hazard with a medium level or low level of risk which, if not avoided, could result in minor or moderate injury, robot arm damage.
 NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in robot arm damage, data loss, or unanticipated result.
 NOTE	Provides additional information to emphasize or supplement important points in the main text.

# Contents

<b>Preface</b> .....	<b>ii</b>
<b>1. Safety</b> .....	<b>1</b>
1.1 Responsibilities and norms .....	1
1.2 Intended use .....	1
1.3 Safety instructions.....	1
1.4 Safety warning labels.....	2
1.5 Emergencies.....	2
1.5.1 Emergency stop device.....	2
1.5.2 Emergency recovery.....	2
1.6 Safety distance and protective device .....	3
<b>2. Product Introduction</b> .....	<b>4</b>
2.1 Overview.....	4
2.2 Workstation dimensions.....	7
2.3 End-of-arm suction cup (optional).....	8
<b>3. Function Description</b> .....	<b>9</b>
3.1 Workstation workflow.....	9
3.2 Pattern settings.....	10
3.3 Current pallet data.....	10
3.4 Picking point.....	11
3.4.1 Single pick-and-place and Dual pick-and-place .....	11
3.4.2 Picking posture .....	12
3.5 Path planning .....	14
3.6 Interlayer.....	15
3.7 Lifting column .....	16
3.8 Demo mode.....	16
<b>4. Hardware Installation</b> .....	<b>18</b>
4.1 Installation environment .....	18
4.2 Unpacking.....	18
4.3 Handling the workstation.....	18
4.4 (Optional) Installing the robot controller.....	19
4.5 Installing the workstation.....	20
4.6 Installing the conveyor.....	25
4.7 (Optional) Defining the interlayer stacking zone.....	26
<b>5. Software Operation</b> .....	<b>27</b>

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5.1	Compatibility .....	27
5.2	Installing the palletizing plugin.....	27
5.3	Permissions .....	30
5.4	Palletizing workstation settings .....	30
5.4.1	Basic settings.....	31
5.4.2	Coordinates settings.....	33
5.5	New palletizing project.....	39
5.6	(Optional) Setting coordinate system for interlayer.....	42
5.7	Palletizing configuration.....	43
5.7.1	Box parameter .....	43
5.7.2	Pallet parameter .....	44
5.7.3	Point settings .....	45
5.7.4	Pattern settings.....	47
5.7.5	Layer settings.....	54
5.7.6	Interlayer settings .....	54
5.7.7	Motion parameters.....	56
5.7.8	Saving configuration .....	56
5.8	Virtual simulation.....	57
5.9	Debugging and running project.....	58
5.9.1	Debugging panel instructions .....	61
5.9.2	Alarm message and solution.....	67
5.10	Managing palletizing project .....	71
<b>6.</b>	<b>Product specifications.....</b>	<b>72</b>
6.1	Product nameplate.....	72
6.2	Technical specifications .....	73
6.3	Electrical topology .....	74
6.4	Electrical interface .....	74
6.4.1	Overview .....	74
6.4.2	Safety In Interface .....	75
6.4.3	Conveyor Sensor interface.....	76
6.4.4	Control Box interface .....	78
<b>7.</b>	<b>Maintenance .....</b>	<b>81</b>
<b>8.</b>	<b>Warranty .....</b>	<b>83</b>
8.1	Product warranty.....	83
8.2	Disclaimer.....	83

## 1. Safety

### 1.1 Responsibilities and norms

The Dobot CRA Palletizing Workstation (hereinafter referred to as “Palletizing Workstation”) is a palletizing solution developed based on the Dobot CRA series collaborative robot. The installation and use of the Palletizing Workstation must comply with the safety requirements outlined in the standards and regulations of the country in which it is located. All safety information contained in this document should not be regarded as a guarantee by Dobot. Even if all safety instructions are followed, the robot may still pose a risk of injury or damage.

### 1.2 Intended use

The Palletizing Workstation is specifically designed for palletizing scenarios, and any use outside of this intended purpose is not permitted.

### 1.3 Safety instructions

Before using the Palletizing Workstation, users must read and understand all of the following instructions.



#### NOTICE

Before installing and using the Palletizing Workstation, a complete risk assessment must be conducted for the specific field application, and additional safety equipment or mechanisms should be implemented based on the results of the assessment.

Users must fully adhere to the safety instructions provided in the CRA series user guide.

If users need to customize the suction cup component, they should pay special attention to the associated safety risks, including but not limited to:


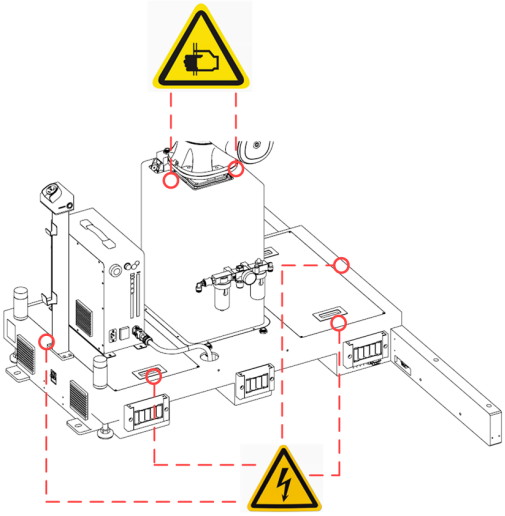

- a) Risk of box shaking or falling due to insufficient suction.
- b) Risk of collision with the Palletizing Workstation due to the shape and size of the suction cup.
- c) Risk of overloading due to the weight of the suction cup.
- d) Risk of deformation or fracture of the bracket due to quality problems of the suction cup bracket.

For the Lifting Palletizing Workstation, the potential safety risks associated with the lifting column must also be fully considered in the application-specific risk assessment:

- a) The lifting column cannot automatically detect collisions and will not stop moving if a collision occurs. This can lead to:
  - Crushing or injuring people or objects in the path of the lifting column, resulting in serious injury, death, or property damage.
  - Collisions with people or objects, resulting in serious injury, death, or property damage.
- b) The lifting column may not stay precisely at the expected position, causing the robot to follow an unintended path, which could lead to serious injury or property damage.

## 1.4 Safety warning labels

The workstation is labeled with the following safety warning signs. Their meanings and locations are as follows:

Label	Meaning	Location
	<p><b>Electrical Hazard.</b></p> <p>Operating here may cause electric shock. Be careful.</p>	
	<p><b>Pinch Point Hazard.</b></p> <p>Operating here may result in injury due to pinch points. Be careful.</p>	

## 1.5 Emergencies

### 1.5.1 Emergency stop device

In case of emergency, you can press the emergency stop switch to immediately halt and lock the robot arm and lifting column. It's important to note that emergency stop devices are not safety guards as defined by IEC 60204-1 and ISO 13850. They serve as supplemental protective measures and are not intended to fully prevent injury.

Based on the results of the risk assessment for your robot application, you can connect additional emergency stop switches, which must comply with IEC 60947-5-5.

#### WARNING

The suction cup will continue to function during an emergency stop, but it may shake due to inertia, potentially causing the box to fall. Please be aware that a falling box could result in damage or injury.

### 1.5.2 Emergency recovery

The emergency stop switch will be locked after you press it. To unlock it, turn the switch in the direction indicated. Once the emergency stop button is reset, you need to clear the alarm in the control software, re-enable the robot arm, and then restart the project.

#### WARNING

1. Make sure that all system hazards are completely eliminated before recovering the robot arm from emergency status.
2. Before resuming operation, make sure that no one is within the workstation's working range and remove any load (box) from the suction cup at the end of the robot arm.

## 1.6 Safety distance and protective device

The workstation should be centered on the base of the robot arm, and a safe space must be reserved according to the motion range of the robot arm (CR20A: 1700mm).

Protective devices, such as fences and safety lasers, should be installed at a safe distance. The control device for the workstation should also be positioned at a safe distance.

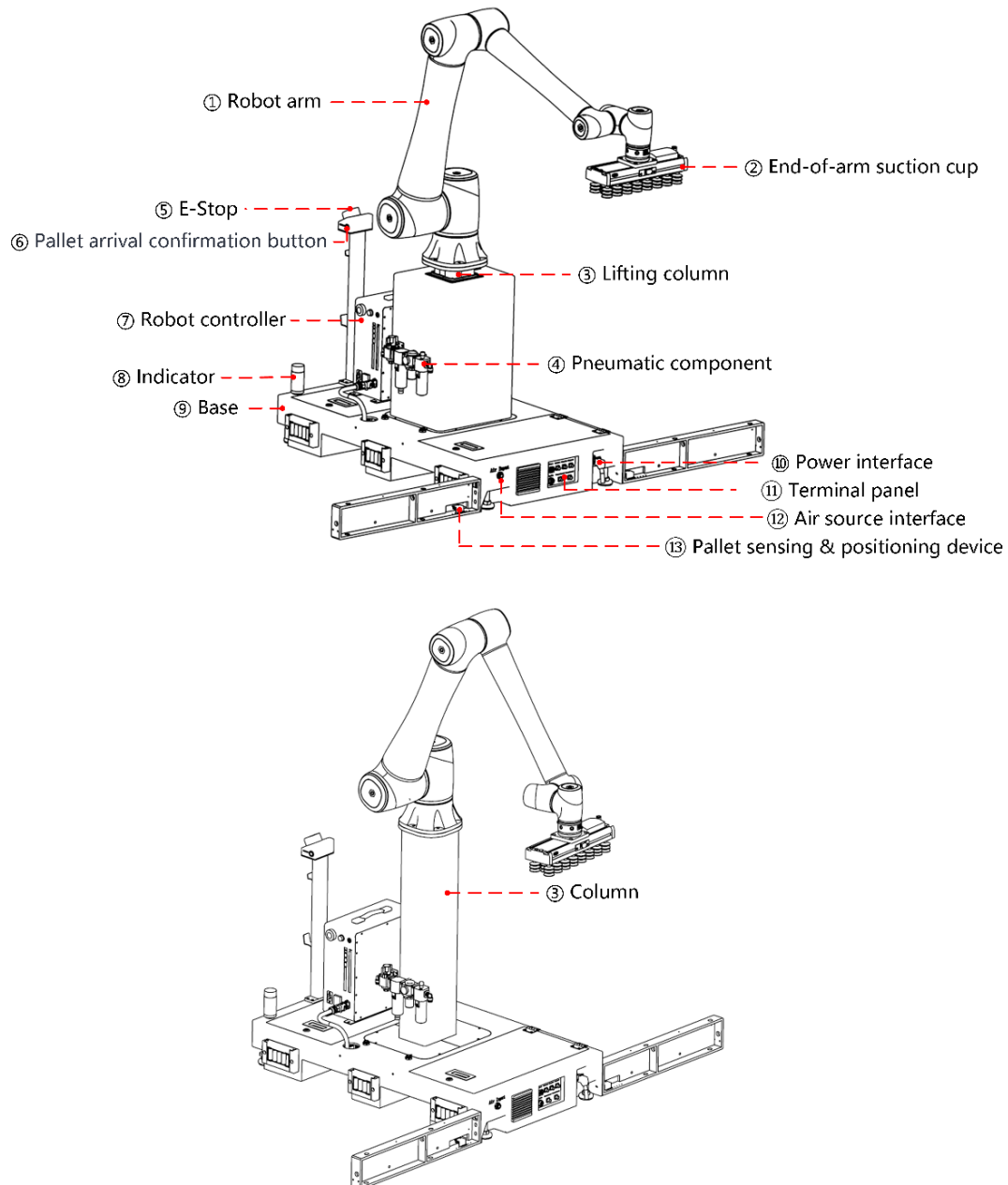
Dobot offers a safety solution based on Safe LiDAR. For more details, please refer to the *Palletizing Safety Function Operation Guide*.



## 2. Product Introduction

### 2.1 Overview

The Palletizing Workstation developed by Dobot is specifically designed for palletizing applications and comes in two types: Columnar and Lifting. The robot arm in the Columnar Palletizing Workstation is mounted on a fixed-height column, offering a simpler system and lower cost. In contrast, the robot arm in the Lifting Palletizing Workstation is mounted on an adjustable-height lifting column, which allows for increased palletizing height and the stacking of more products.



**Figure 2.1 Main components of Palletizing Workstation**

The main components include:

1. **Robot arm:** The main moving part of the workstation.
2. **End-of-arm suction cup:** Used to pick up boxes through vacuum suction.

3. **Column/Lifting column:** Used to support the robot arm. The height of the lifting column is adjustable.
4. **Pneumatic component:** Includes the air source interface, air valve, etc., used to control the suction cup. The air valve switch is set to ON by default and locked with a padlock. To turn off the air valve, remove the padlock using the key provided in the shipping list and turn the air valve switch clockwise.



**Figure 2.2 Pneumatic component**

5. **E-Stop:** Used to stop the workstation in an emergency.
6. **Pallet arrival confirmation button:** Located on the left and right sides of the E-Stop switch, used to confirm that the pallet on the corresponding side has been replaced and is properly positioned, preventing the robot arm from moving before pallet replacement is complete.
7. **Robot controller:** Controller that supplied with the robot arm.
8. **Indicator:** Located on the left and right sides, they indicate the operation status of the workstation. The status indicators are defined as follows:
  - **Green on:** Palletizing.
  - **Yellow on:** No pallet detected on this side.
  - **Yellow flashing:** Palletizing on this side is finished.
  - **Red on:** An alarm occurred during palletizing on this side.
  - **Red flashing:** Abnormal internal communication.
9. **Base:** Some electrical components and cables are installed inside the base, with four leveling feet at the front and rear of the base.
10. **Power interface:** For connecting the external power source to power the workstation.
11. **Terminal panel:** including LAN network interface, safety IO and other external interfaces reserved for users. See [Electrical interface](#) for details.
12. **Air source interface:** For connecting an external air pump to supply air to the suction cup.
13. **Pallet sensing & positioning device:** There is a baffle on the left and right sides for pallet positioning, with a sensor installed on the baffle to detect the pallet's arrival.

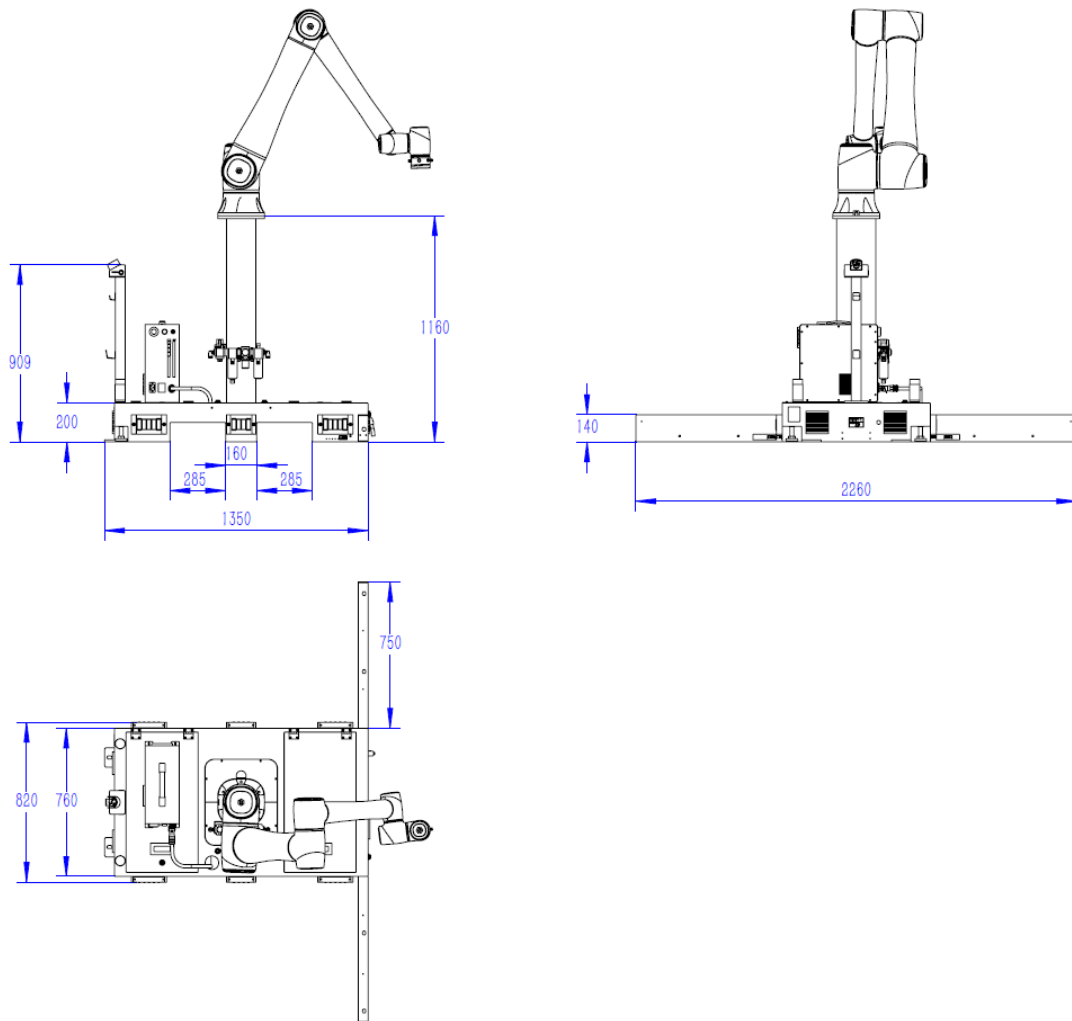
#### Software version requirements:

- Palletizing plugin: V2-2-0 and above

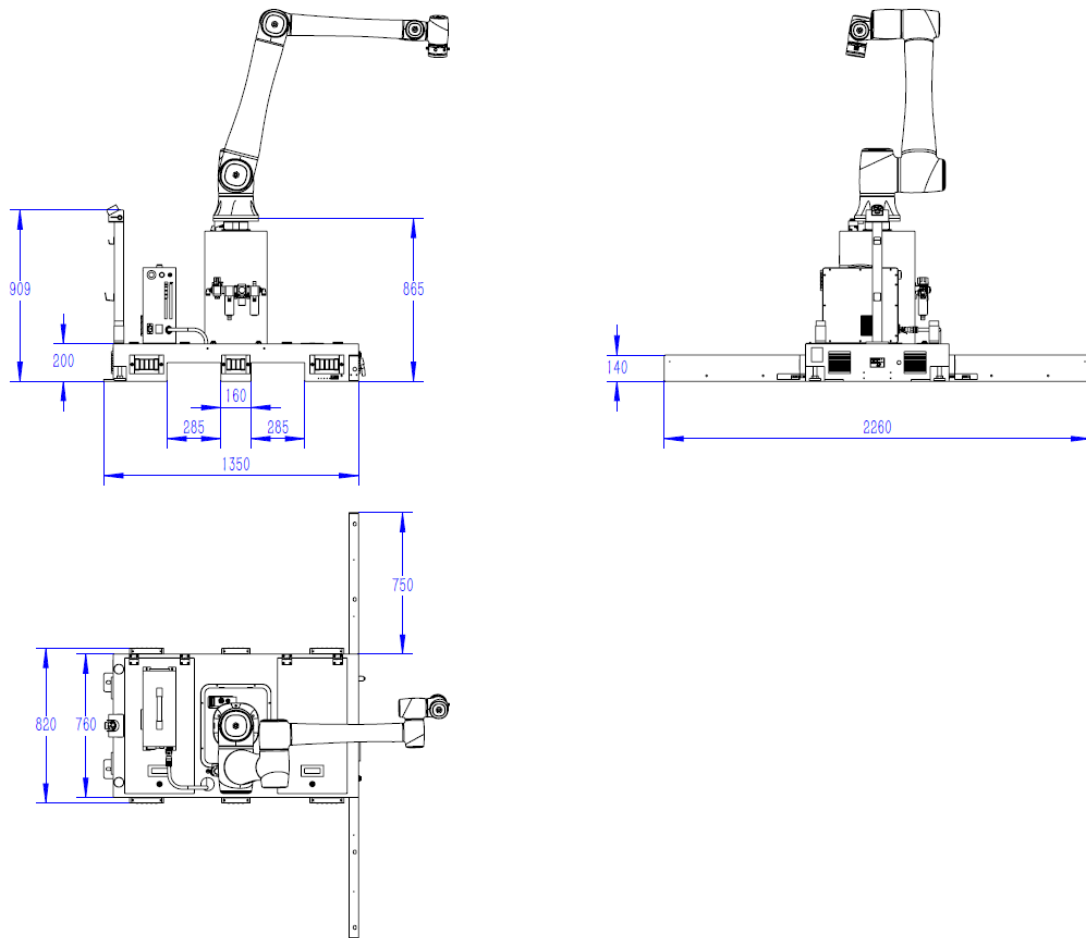
- DobotStudio Pro: V4.5.1.0 and above
- Controller: V4.5.2.0-pal and above

## 2.2 Workstation dimensions

Unit: mm.



**Figure 2.3 Dimensions of Columnar Palletizing Workstation**



**Figure 2.4** Dimensions of Lifting Palletizing Workstation

For the dimensions of the robot arm, please refer to the *Dobot CR A Series Hardware Guide*.

### 2.3 End-of-arm suction cup (optional)

The palletizing workstation can be equipped with the optional **Schmalz FXP-SVK 442 3R54 SPB2-40P** suction cup. When using this suction cup, you need to provide your own air pump, with air flow  $\geq 500\text{L/min}$ .



**Figure 2.5** Schmalz FXP series suction cups

You can also purchase or customize the suction cups according to your specific needs.

### 3. Function Description

#### 3.1 Workstation workflow

After completing the installation and configuration of the palletizing workstation, the typical workflow (using the double pallet as an example) is as follows:

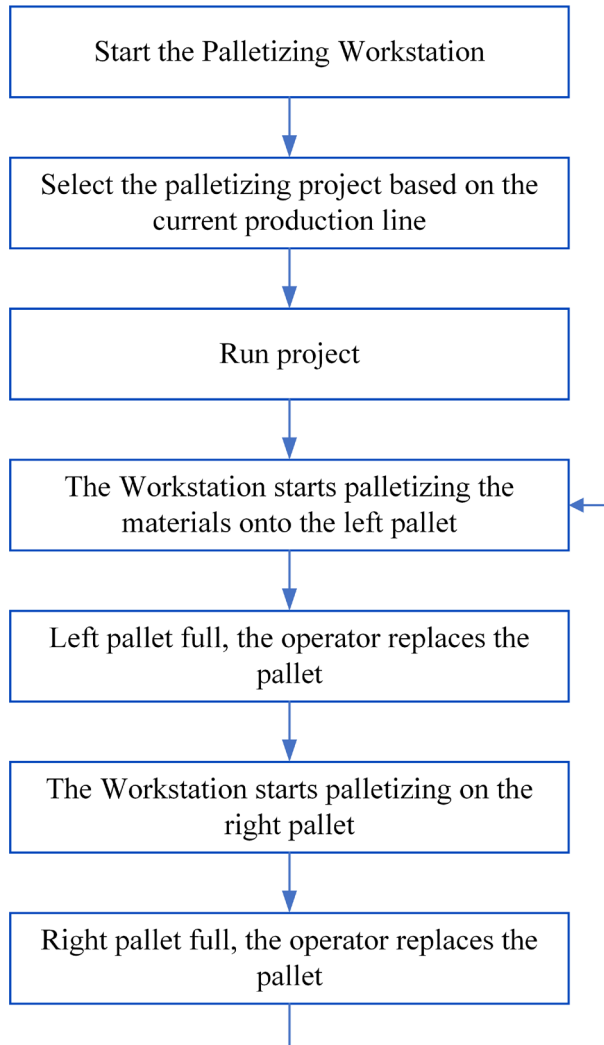


Figure 3.1 Workstation workflow

#### **i** NOTE

When both pallets are in position, if the operation is stopped and then restarted, the system will resume palletizing on the left pallet, even if it was previously working on the right pallet. If you want the system to continue with the right pallet first, you can enable the [Pallet arrival confirmation signal](#) and press the confirmation button for the right pallet after restarting the operation.

In addition to the standard palletizing scenario described above, the workstation also supports the following scenarios:

- **Depalletizing:** Removing boxes from the pallet and placing them onto a conveyor.
- **One-pallet operation:** Operating with just one pallet.

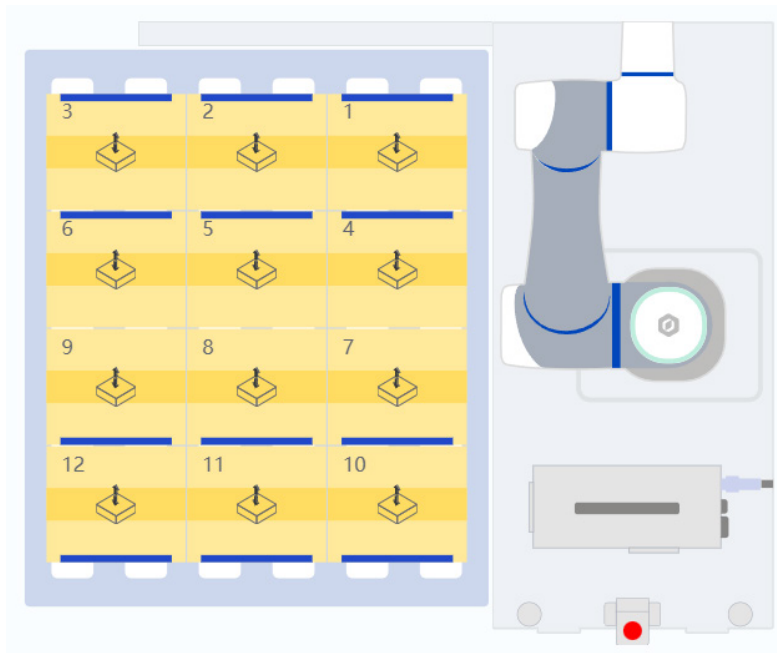
- **Dual-box handling:** Picking up and placing two boxes at a time.
- **Manual adjustment:** Continuing palletizing with an unfinished pattern after manually adjusting the number of boxes on the pallet.
- **Dual-conveyor operation:** Handling boxes of two different sizes on two conveyors, each with its own palletizing pattern.

**i NOTE**

Each pattern is composed of boxes of the same size. Mixing different-sized boxes on the same pallet is not supported.

### 3.2 Pattern settings

Based on the box size and label orientation for each product, users can design how the products are arranged on the pallet. Some products require the same layout for each layer, while others may require different layouts for different layers. This three-dimensional arrangement of boxes is referred to as “palletizing pattern”.

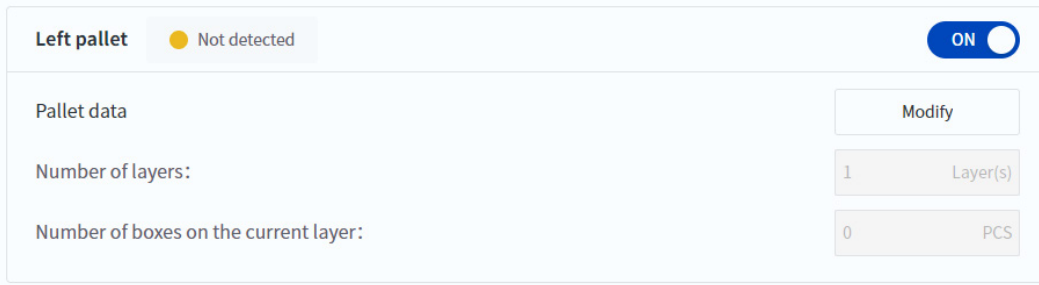


**Figure 3.2 Pattern**

The Dobot Palletizing Process Package allows users to customize the palletizing patterns. One pattern can include up to two different layouts per layer. For more details, refer to [Pattern settings](#).

### 3.3 Current pallet data

During the operation of the palletizing workstation, the software tracks and updates the number of boxes that have been palletized or depalletized in real-time, including the exact layer and position of each box. After each box is placed on the pallet, the software updates the current pallet data.



**Figure 3.3 Pallet data**

If the number of boxes on the pallet is manually altered by an operator during the operation of the workstation, the system will not automatically detect this change. In such cases, the operator must manually adjust the pallet data in the software or restore the correct number of boxes on the pallet. For more details, refer to [Debugging and running project](#).

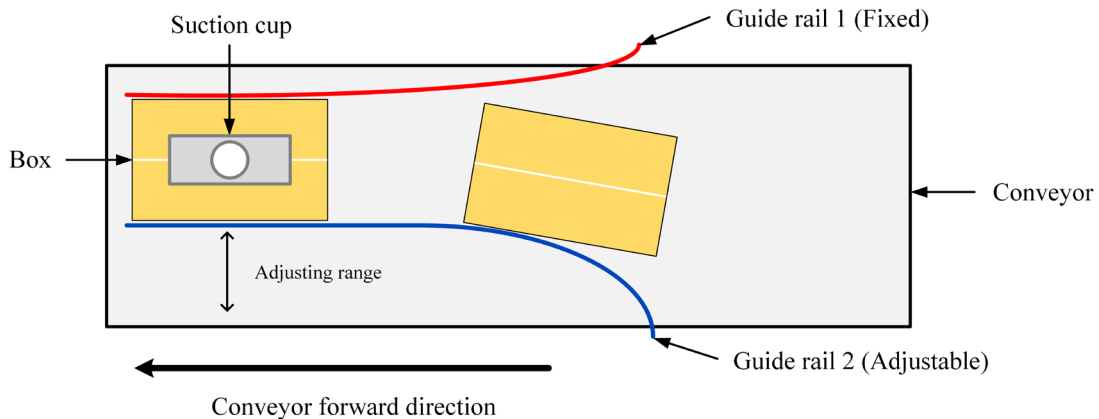
### 3.4 Picking point

The point where the robot arm picks up boxes from the conveyor during palletizing is referred to as the **picking point**. During depalletizing, the corresponding point where boxes are placed onto the conveyor is called the **placing point**. This section will focus on the picking point as an example.

The picking point is a fixed position, so the conveyor must be securely anchored to the floor to prevent any movement. Additionally, barriers and guide rails should be used to ensure that the boxes stop at a fixed position at the end of the conveyor, ready for the robot arm to pick up.

The following figure illustrates an example of using guide rails to fix the position of the boxes:

- One side of the conveyor has a fixed guide rail for aligning the boxes.
- The other side of the conveyor has an adjustable guide rail to guide the boxes into the correct position. The position of this rail should be adjusted based on the actual width of the boxes.



**Figure 3.4 Conveyor guide rail example**

During depalletizing, guide rails are not needed; users just need to ensure that the placing point is on the conveyor.

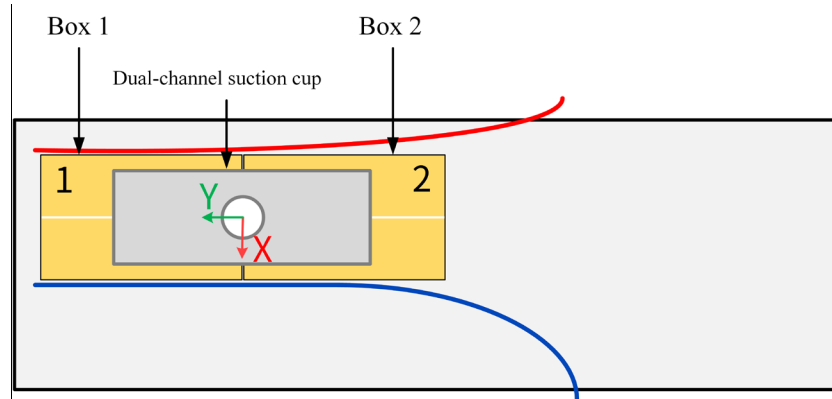
#### 3.4.1 Single pick-and-place and Dual pick-and-place

The default suction cup supplied with the palletizing workstation is single-channel suction cup, which only supports single pick-and-place, meaning it can pick up and place one box at a time. If



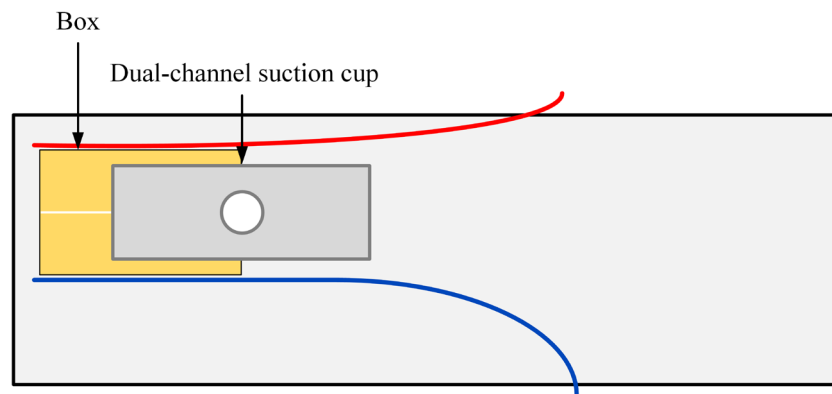
you require a higher work rate, you can contact Dobot technical support to evaluate and customize a dual-channel suction cup. The dual-channel suction cup supports both single pick-and-place and dual pick-and-place (picking up and placing two boxes at a time).

When using the dual pick-and-place mode, you must treat the two boxes as a single unit when determining the picking point and tool coordinate system, as shown in the figure below.



**Figure 3.5 Dual pick-and-place**

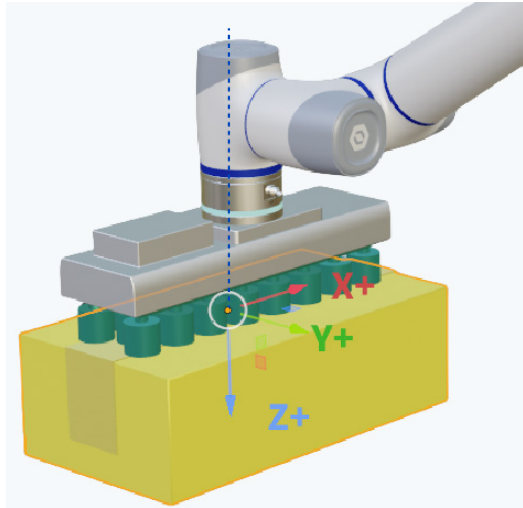
When using a dual-channel suction cup for single-pick-and-place, only one side of the channel is used to pick up a box, as shown in the figure below. There is no need to separately configure the picking point and tool coordinate system for this situation. The system will automatically calculate these based on the box sizes and other parameters.



**Figure 3.6 Single-pick with Dual-channel suction cup**

### 3.4.2 Picking posture

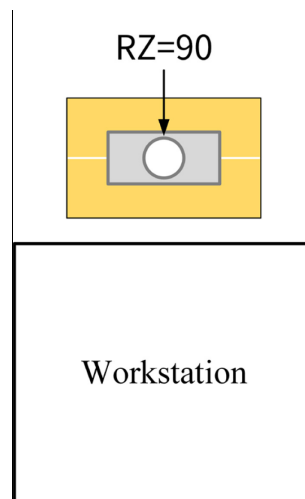
The posture of the robot arm's end effector during each pick will be the same as the posture taught by the user when setting the picking point. Therefore, when teaching the picking point, users must ensure that the center of the suction cup aligns with the center of the box and that the long edge of the suction cup is parallel to the long edge of the box. The specific posture can be referenced in the figure below.



**Figure 3.7 Picking posture**

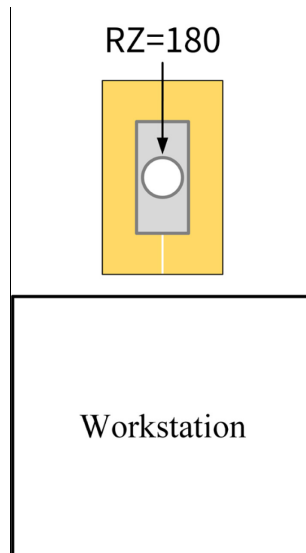
Based on the orientation of the box, the recommended picking posture is as follows (using the left or right pallet user coordinate system):

- When the long edge of the box faces the workstation, set the picking point RZ to 90.



**Figure 3.8 Picking posture 1**

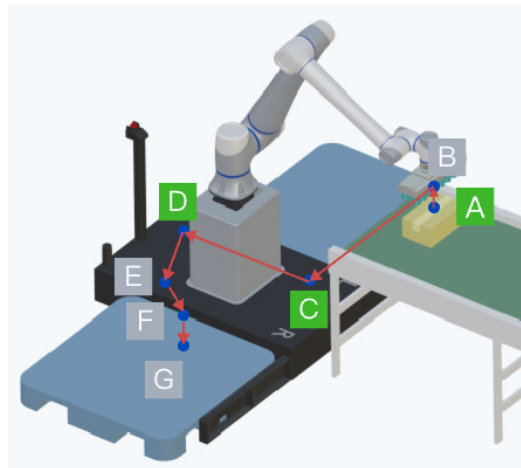
- When the short edge of the box faces the workstation, set the picking point RZ to 180.



**Figure 3.9 Picking posture 2**

### 3.5 Path planning

A typical path during palletizing is as follows:



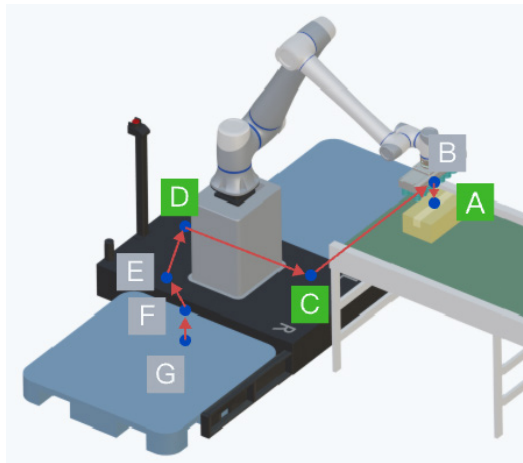
**Figure 3.10 Palletizing path**

1. The robot moves to a position directly above the picking point (B). The height above the picking point (safety height for picking point) can be set in the [basic debugging](#) page of the debugging panel.
2. The robot descends vertically to the [user-taught picking point](#) (A) and picks up the box.
3. The robot returns to the position directly above the picking point (B).
4. The robot moves sequentially to the [user-taught transition points](#) (C and D). Transition points are mainly used to avoid obstacles during movement, with their height automatically adjusted based on the current palletizing layer.
5. The robot moves to the offset point for the placing direction (E). This point is primarily used to avoid interference between the current box being placed and the boxes already on the pallet. For more details, refer to [Placing direction & offset settings](#).
6. The robot moves to a position directly above the placing point (F). The height above the

placing point (placing point height compensation) can be set in the [advanced debugging](#) page of the debugging panel.

7. The robot descends vertically to the placing point (G) and releases the box. The placing point is calculated by the system based on the palletizing pattern and the current palletizing progress.
8. The robot returns along the same path to pick up the next box.

The depalletizing path is the reverse of the palletizing path, using the same points and height settings. A typical depalletizing path is as follows:

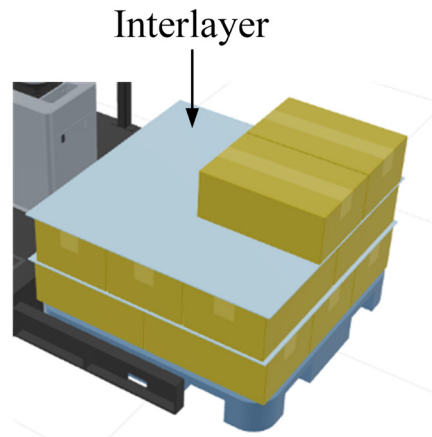


**Figure 3.11 Depalletizing path**

1. The robot moves to the picking point of the first box to be depalletized (G, corresponding to the placing point during palletizing).
2. The robot ascends vertically to the position above the picking point (F).
3. The robot moves to the offset point for the placing direction (E).
4. The robot moves sequentially to the user-taught transition points (D and C).
5. The robot moves to a position directly above the placing point (B).
6. The robot descends vertically to the user-taught placing point (A) and releases the box.
7. The robot returns to the position directly above the placing point (B), then calculates new points C to G based on the location of the next box to be picked, and follows this path to pick up the next box.

### 3.6 Interlayer

Users can add interlayers between layers of boxes based on their specific needs. The palletizing workstation will, according to the user-specified [interlayer parameters](#), automatically pick up an interlayer from the designated stacking area after a certain number of layers have been palletized and place it on top of the completed layers before continuing to palletize the next layer of boxes.



**Figure 3.12 Interlayer**

During depalletizing, the system will automatically remove and place the interlayer back into the stacking area after depalletizing a certain number of layers.

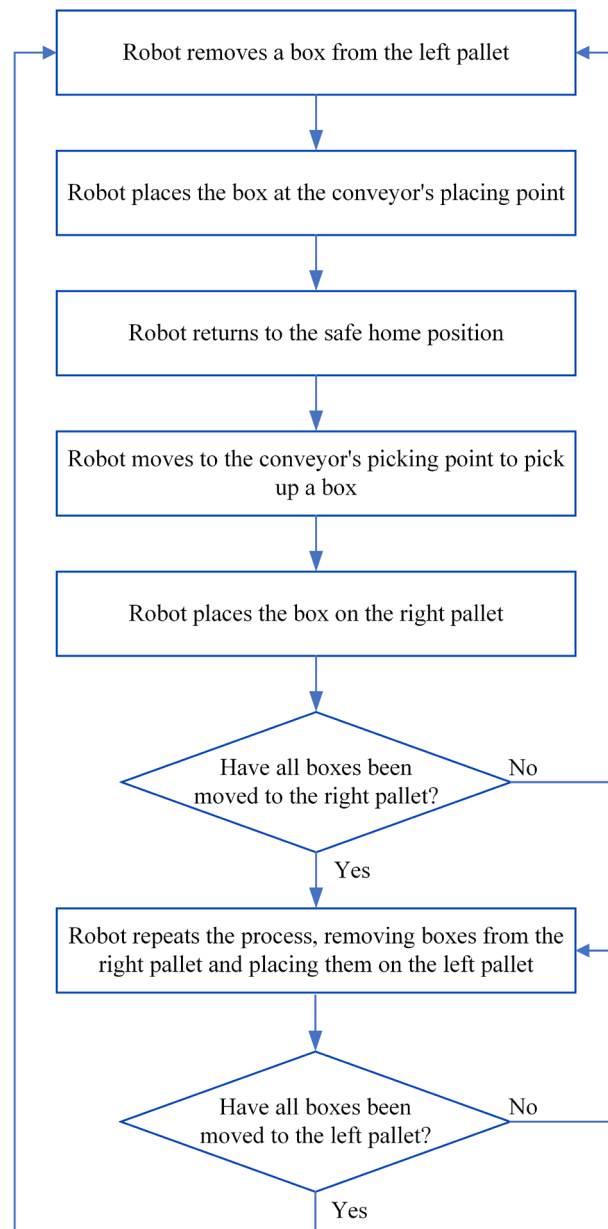
### 3.7 Lifting column

The Lifting Palletizing Workstation includes a lifting column that raises the robot to reach and handle boxes on higher layers. When running a palletizing task, the system automatically calculates the necessary height for the lifting column to pick or place the next box and controls the lifting column's movement accordingly. No manual adjustments are needed from the user.

### 3.8 Demo mode

Demo mode is a special mode designed to demonstrate the function of the palletizing workstation. In this mode, the workstation operates in a continuous loop without requiring manual intervention.

To run the demo mode, first fully load the left pallet with boxes according to the palletizing pattern. Then, start the demo mode process. The workflow is as follows:



**Figure 3.13 Demo mode workflow**

In this process, the placing point and picking point on the conveyor need to be taught separately. Users can first teach the placing point, then move the conveyor a specified distance and teach the picking point to simulate a real production line.

## 4. Hardware Installation

### 4.1 Installation environment

To maintain the workstation performance and to ensure the safety, please place the workstation in an environment with the following conditions.

- Install indoors with good ventilation.
- Keep away from excessive vibration and shock.
- Keep away from direct sunlight and radiant heat.
- Keep away from dust, oily smoke, salinity, metal powder, corrosive gases, and other contaminants.
- Do not use in a closed environment. A closed environment may cause high temperature of the controller and shorten its service life.
- Keep away from flammable.
- Keep away from cutting and grinding fluids.
- Keep away from sources of electromagnetic interference.

### 4.2 Unpacking

Before unpacking, please carefully check the outer packaging for signs of damage in transportation. If any damage is found, please unpack in the presence of shipping company staff.

Handle the packaging box of the workstation with a forklift.

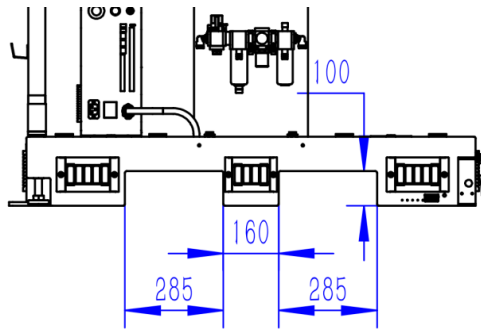


When unpacking, please check the attached shipping list to ensure that all contents are included and intact. If anything is missing or damaged, please contact your supplier.

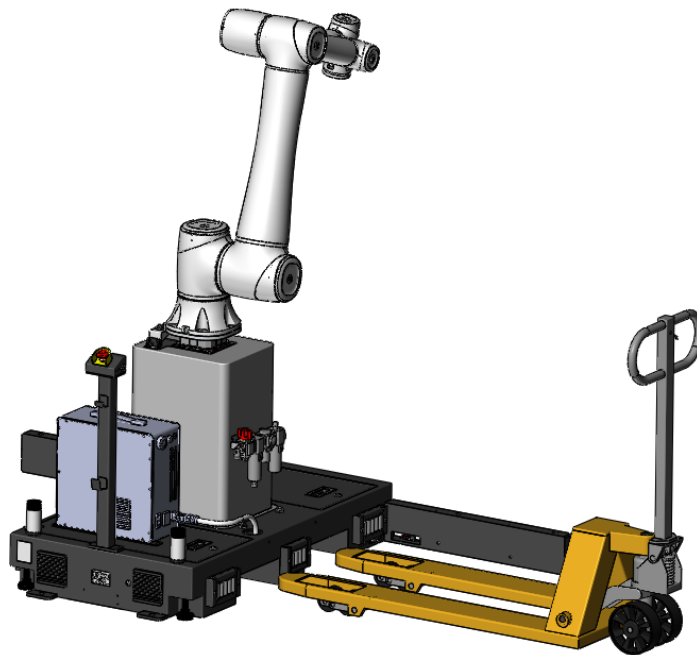
After unpacking, please save all packaging materials for future transportation.

### 4.3 Handling the workstation

To move the workstation, you can use a forklift to enter the palletizing base from the side and lift the workstation, as shown in the figure below.

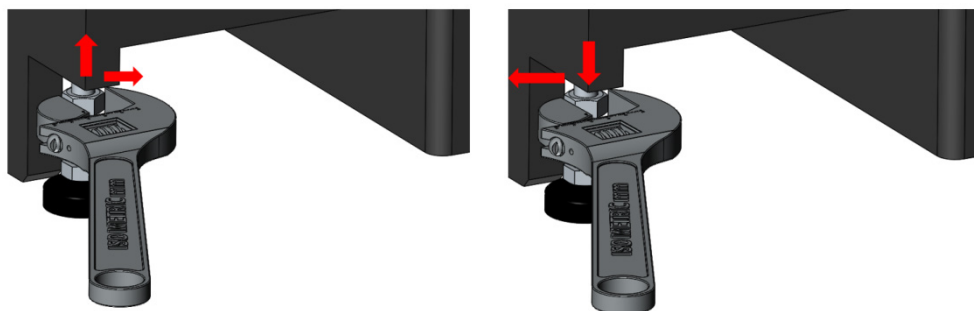


**Figure 4.1** Base slot size



**Figure 4.2** Handle the workstation

If the ground where the workstation is placed is uneven, adjust the leveling feet to prevent the workstation from shaking. The adjustment method of the leveling feet is as follows.



**Figure 4.3** Adjust the leveling feet

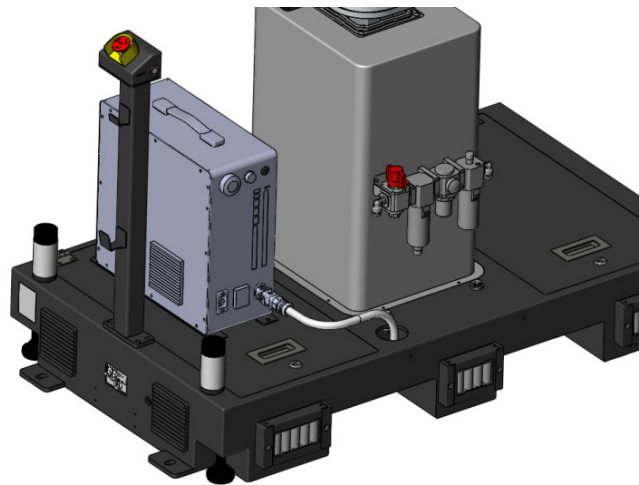
#### 4.4 (Optional) Installing the robot controller

By default, the robot controller is factory-installed on the base of the palletizing workstation, no installation or wiring is required here by the users. If your robot controller is shipped separately,



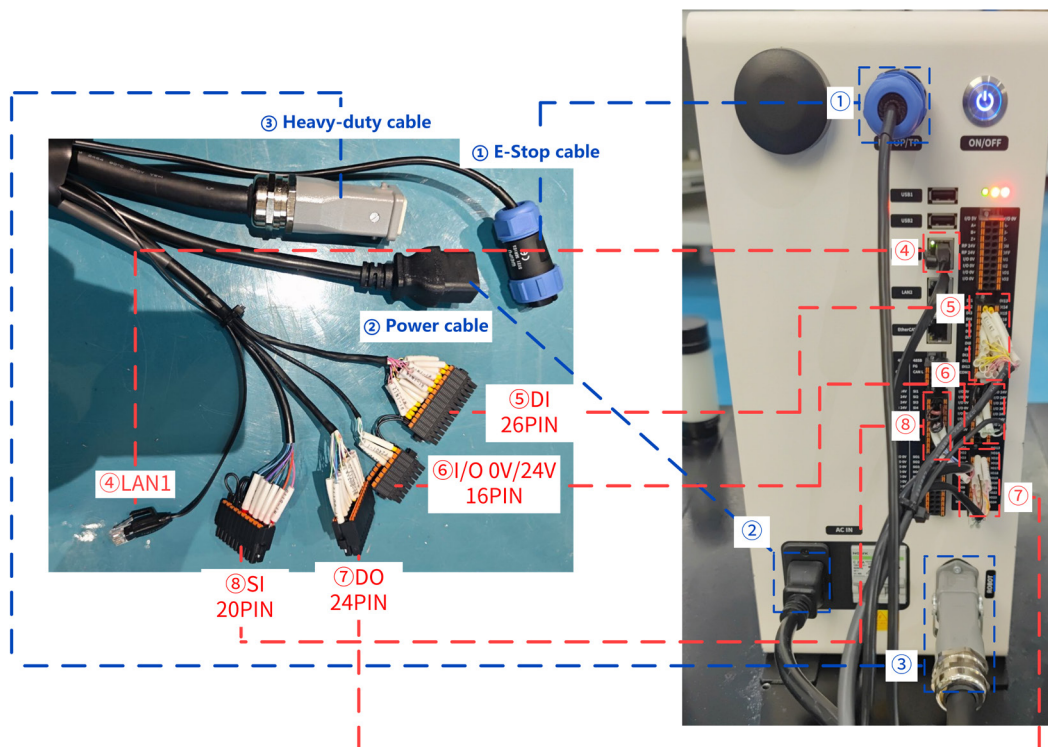
refer to this section for controller installation.

First, install the controller at the position shown in the figure below using four M6\*8 hexagon socket head cap screws.



**Figure 4.4 Controller installation position**

Then, refer to the figure below to complete the wiring of the controller.



**Figure 4.5 Controller wiring**

## 4.5 Installing the workstation

The pre-installation and wiring of the main parts of the Palletizing Workstation have been completed before delivery, and users only need to carry out simple assembly. This document takes the installation of the CR20A Lifting Palletizing Workstation as an example. The other models are installed in a similar way.

**NOTICE**

1. When the robot is transported, ensure that the robot is stable and kept in proper place.
2. When the robot is hoisted, be sure to take appropriate measures to locate the moving parts so as not to cause accidental movement and harm during hoisting and transportation.
3. When moving the robot from the packaging box to the mounting position, hold the robot until all bolts on the robot base are fastened.
4. When the robot is installed, take corresponding measures to locate it. Be sure to use hex bolts to fix and tighten the robot base.
5. The specifications and installation method of the external cables should comply with local laws and regulations.
6. Do not disassemble the controller by yourself. Otherwise, it may result in electric leakage.
7. The device must be always grounded properly.
8. Do not bend the cable excessively, otherwise it may cause poor contact or cable breakage.
9. When connecting an external device, make sure the power outlet of the control system is disconnected. If not disconnected, may result in electric shock or device failure.
10. Use supporting cables to protect device and personal safety.
11. After wiring, ensure that there are no fallen screws or exposed cables in the device.
12. Do not plug or remove the power cable or communication cable when the device is running normally.
13. Power on the device only after connecting all the cables required.
14. Ensure that the cables are connected correctly, otherwise, it may cause fault in internal modules or external devices.
15. Before connecting, check whether there is breakage in the insulation and shield of the external cables.

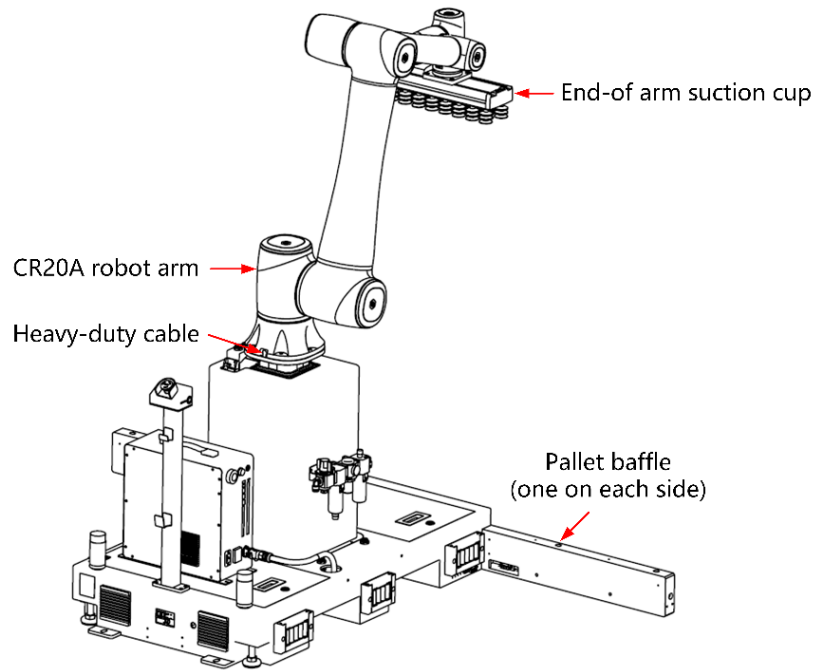


Figure 4.6 Assembly diagram of the workstation

1. Install the pallet baffles on both sides of the base and lock them with four M10\*20 screws.

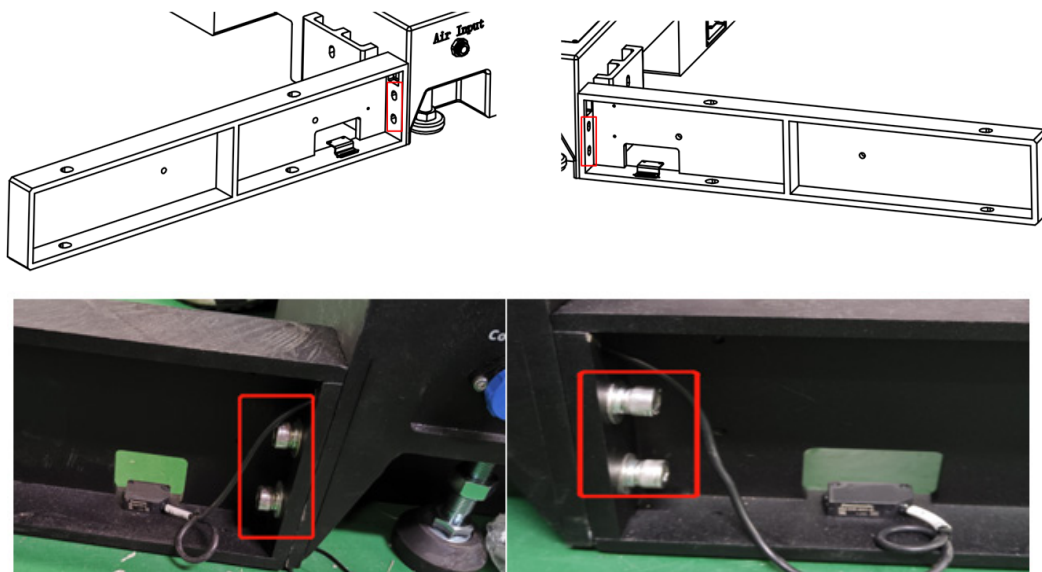
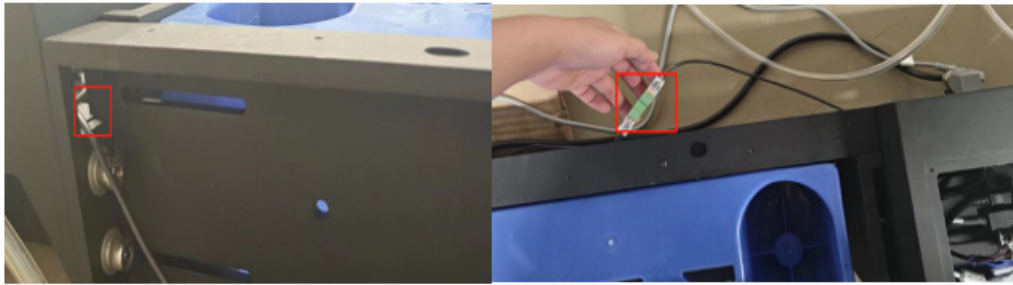


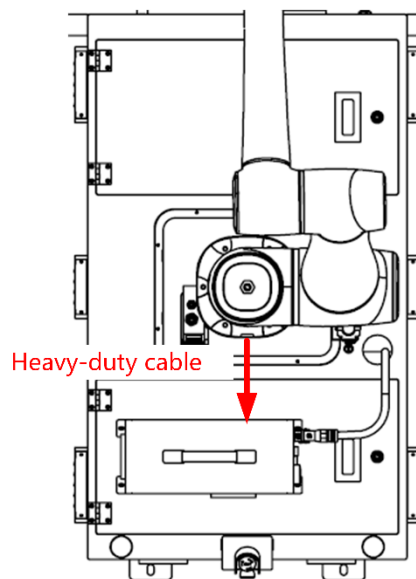
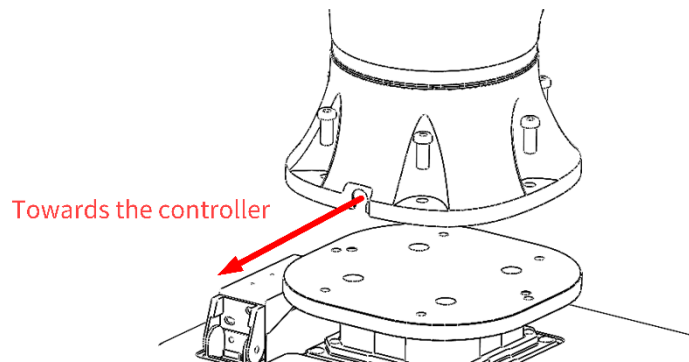
Figure 4.7 Install the pallet baffles

2. Remove the plug of the pallet sensor from the inside of the base, and connect it to the cable of the pallet sensor through the slot.



**Figure 4.8 Connect the pallet sensor**

3. Fix the CR20A robot arm to the top of the lifting column exposed from the top of the main cabinet, **with the heavy-duty cable facing toward the controller**, and lock it with six M10\*25 screws.



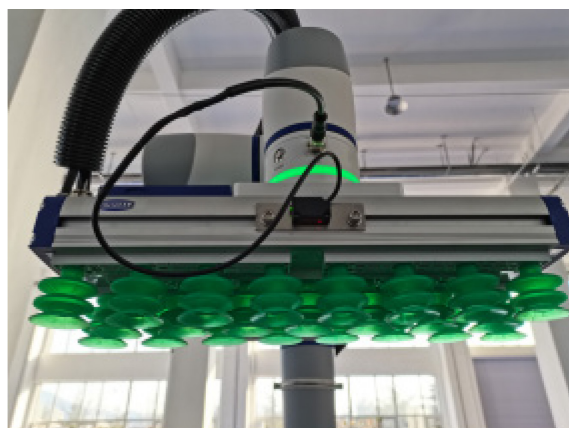
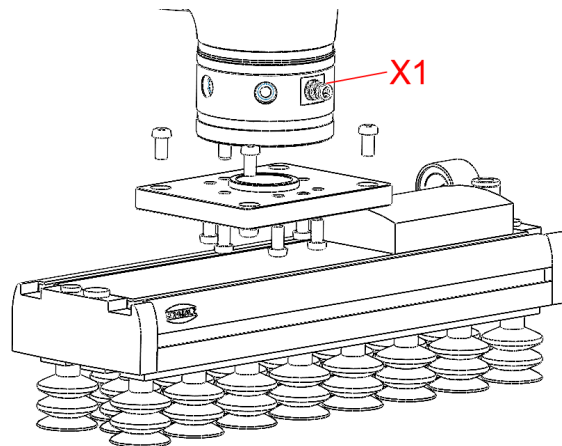
**Figure 4.9 Install the robot arm**

4. Connect the heavy-duty cable placed next to the lifting column with the interface of the heavy-duty cable protruding from the robot base.



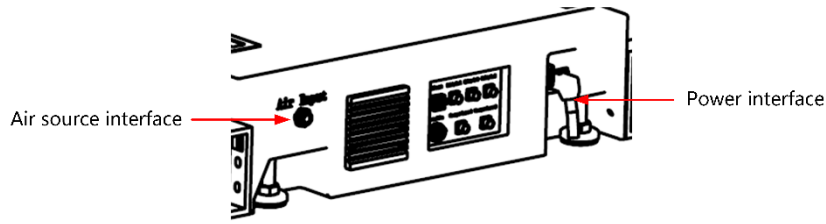
**Figure 4.10** Connect the heavy-duty cables

5. Install the end-of arm suction cup. Lock it with ten M8\*12 screws and one Ø8\*15 pin. Refer to the figure below to install the suction cup. Then, connect the sensor cable attached to the suction cup to the aviation socket (X1) at the end of the robot arm.



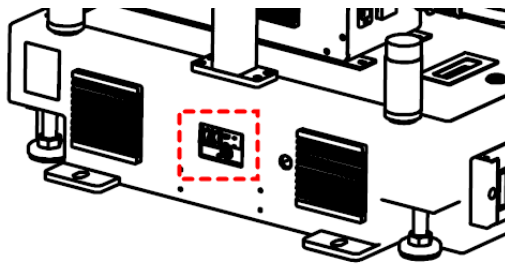
**Figure 4.11** Install the suction cup

6. Connect the air pump (prepared by user, air flow  $\geq 500\text{L}/\text{min}$ , air tube diameter: 12mm) to the air source interface.



**Figure 4.12 Air inlet and power interface**

7. Connect one end of the power cable supplied with the device to the power interface and the other end to the external power.
8. After connection, use the key included in the delivery accessories to unlock the padlock on the main power switch (located below the E-Stop). Then, flip the switch upwards to power on the workstation, as shown in the figure below.



**Figure 4.13 Workstation main power switch**

9. Then press the ON/OFF button (on the top right of the controller) to start the controller.



**Figure 4.14 Controller ON/OFF button**

## 4.6 Installing the conveyor

Install the conveyor on the front of the baffles of the palletizing workstation. The conveyor can be installed vertically or horizontally. It is necessary to use baffles or photoelectric sensors to ensure that the box will stop there when it reaches the picking point, and wait for the robot arm to pick up the box.

The picking point should be within the reach of the end-of-arm suction cup and as close to the workstation as possible. There are no special requirements for the installation height of the conveyor.

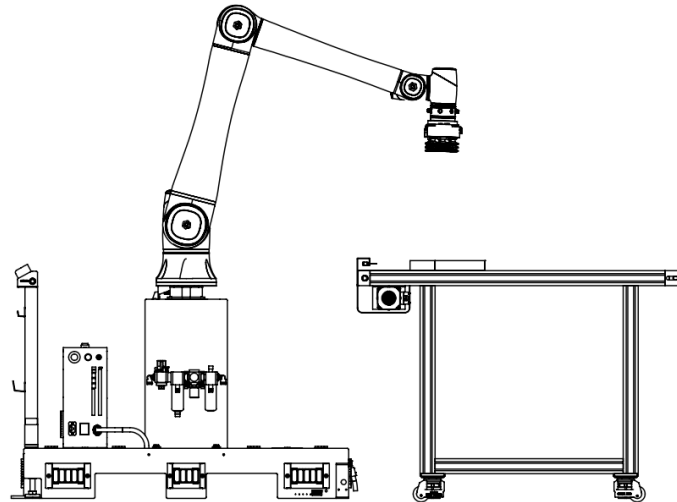


Figure 4.15 Vertical conveyor

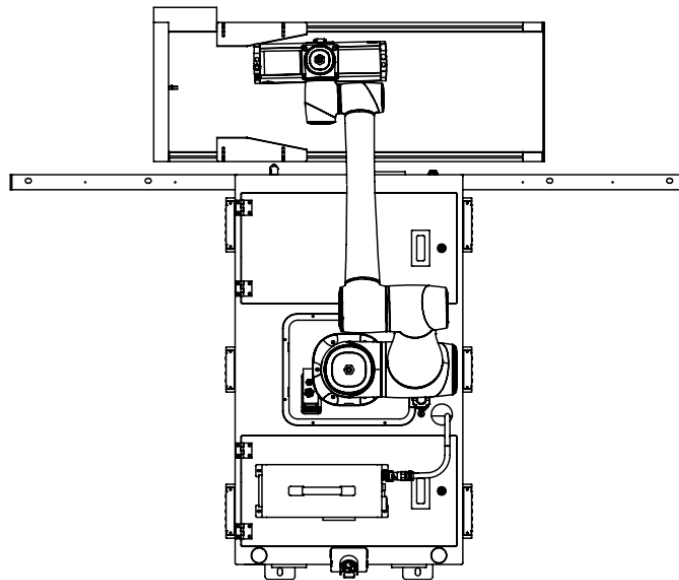


Figure 4.16 Horizontal conveyor

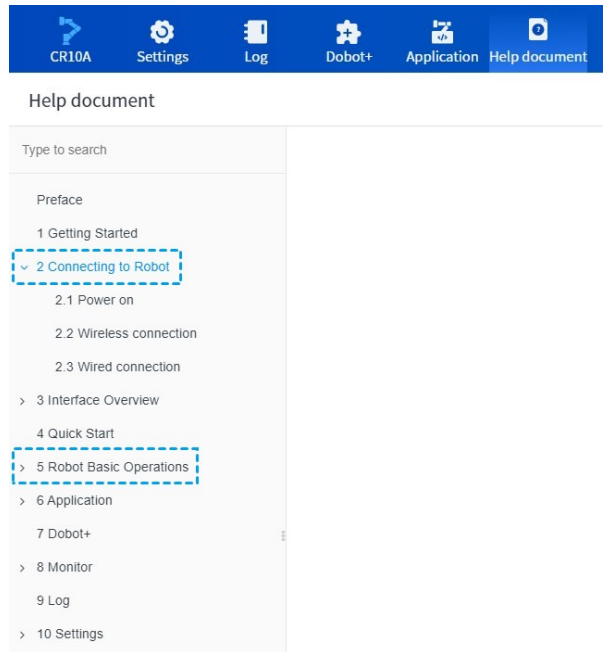
#### 4.7 (Optional) Defining the interlayer stacking zone

If you need to place (palletizing) or remove (depalletizing) an interlayer every few layers (see [Interlayer settings](#)), the interlayer stacking zone needs to be determined. It is recommended to place the interlayers in the designated area first, then jog or drag the robot arm to confirm that the end-of-arm suction cup can grip the topmost and bottommost interlayers.

## 5. Software Operation

This chapter takes the PC control software (DobotStudio Pro) as an example to explain the operation method, which is basically the same as that of the App control software. For basic operations of DobotStudio Pro (such as connecting to the robot, enabling and jogging), please refer to its help document.

The figure below shows the chapters of the document that correspond to the common operations in using the palletizing workstation.



### 5.1 Compatibility

If you have previously installed version 2.1.0 or earlier of the palletizing plugin and configured projects, you will need to complete the [Palletizing workstation settings](#) after upgrading to version 2.2.0. Without this settings, projects from the older version will not run.

### 5.2 Installing the palletizing plugin

1. After connecting the robot with DobotStudio Pro, open the Dobot+ page and import the Palletizing plugin.

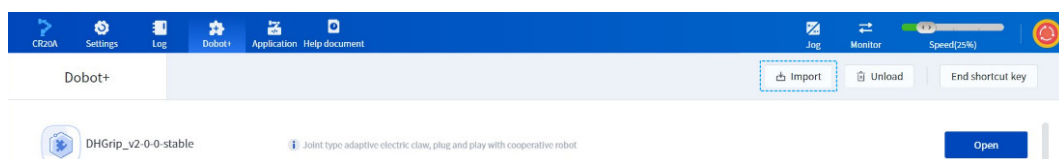


Figure 5.1 Import the plugin

2. Click **Install** for the Palletizing plugin, and an authorization window will pop up.



Figure 5.2 Install the plugin



- Copy the **Device serial number**, visit [dobotplus.dobot-robots.com](https://dobotplus.dobot-robots.com), enter the **Device serial number** and **Activation serial number** (contact Dobot technical support engineer to obtain it) on the webpage, and click **Get registration code**.

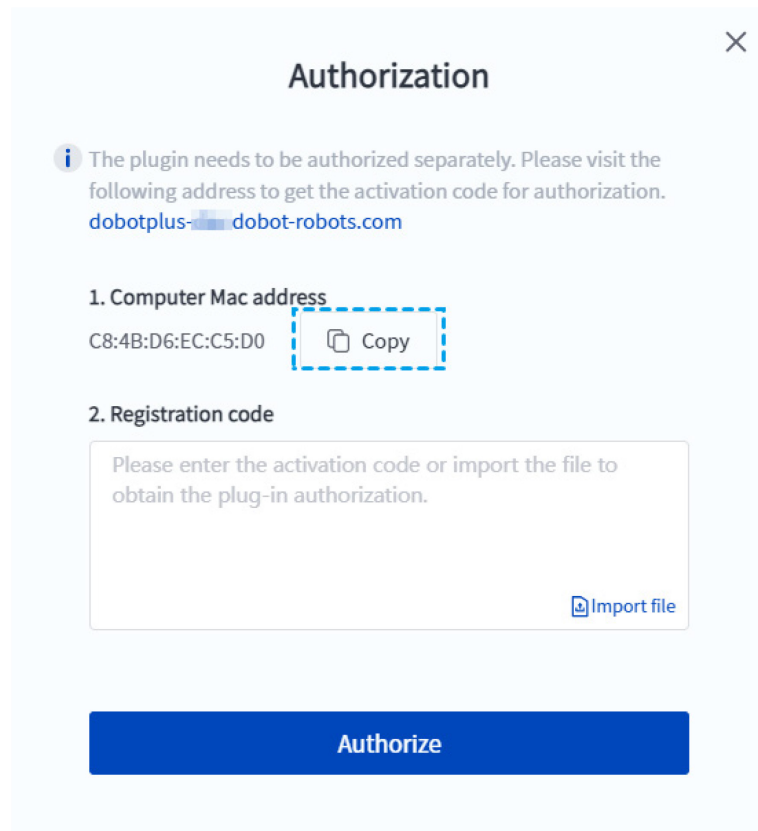


Figure 5.3 Copy the device serial number

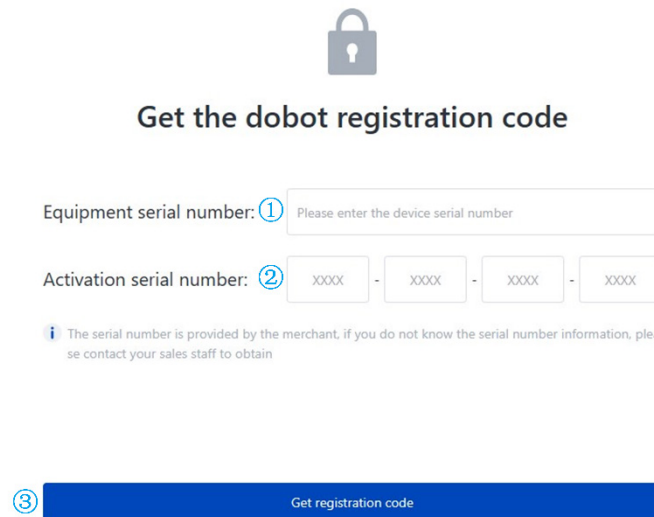


Figure 5.4 Get registration code

- Copy the generated registration code or save the registration code as a file.

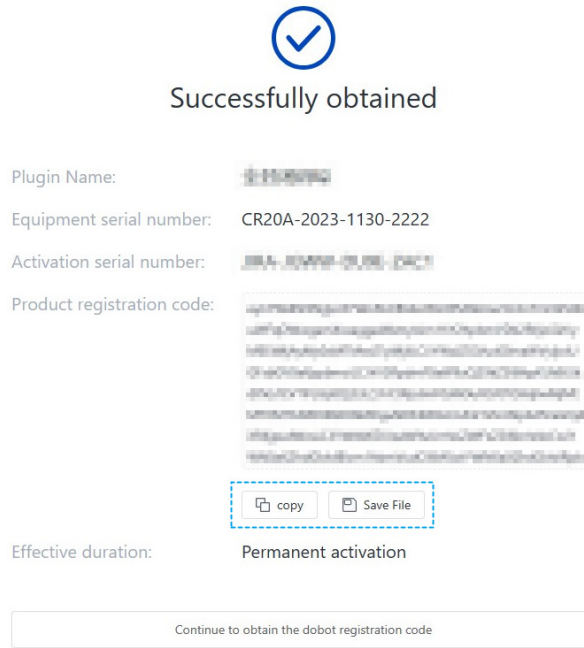


Figure 5.5 Save registration code

5. Back to the plugin authorization page, paste the registration code or import the file, then click **Authorize** and wait for the authorization and plugin installation to be completed.

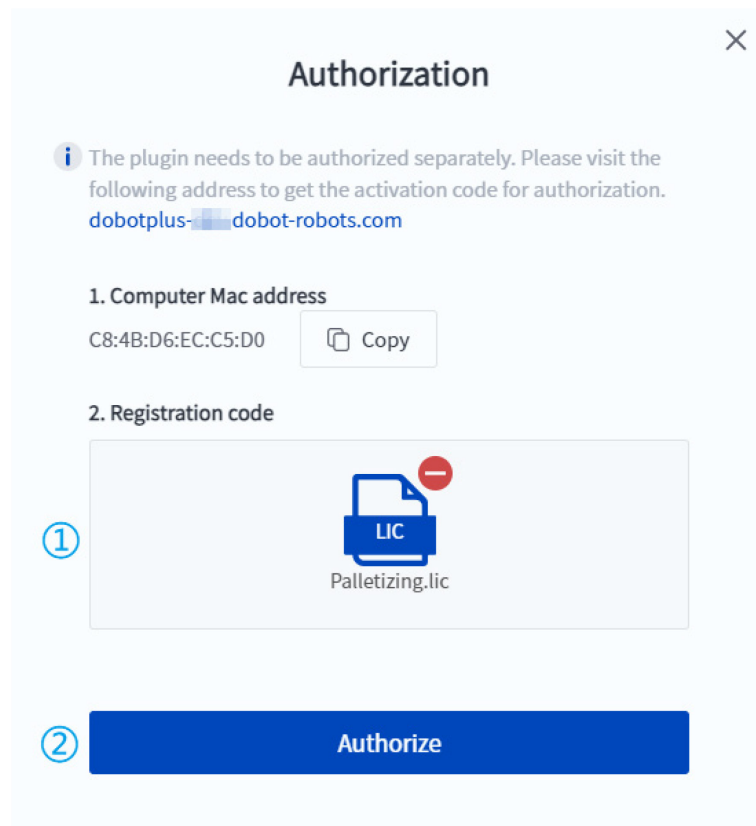
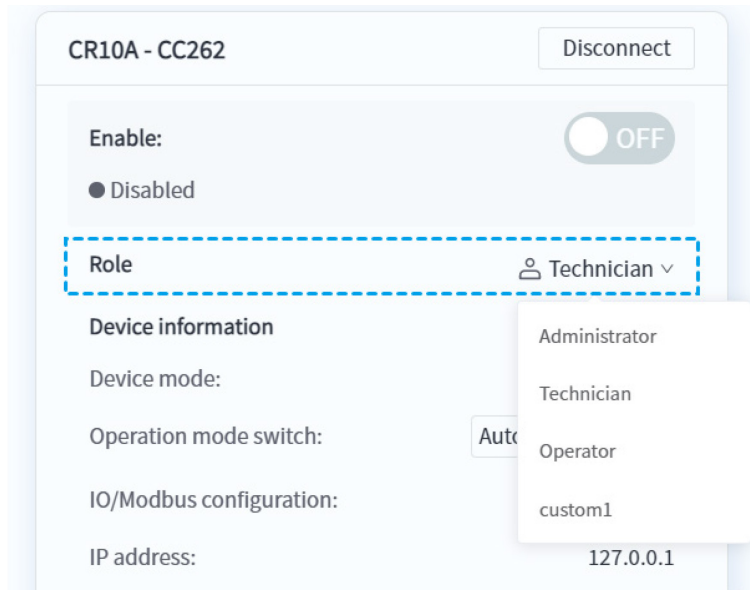


Figure 5.6 Plugin authorization

### 5.3 Permissions

The palletizing process package controls access based on the current login role in DobotStudio, preventing unauthorized personnel from modifying project settings.



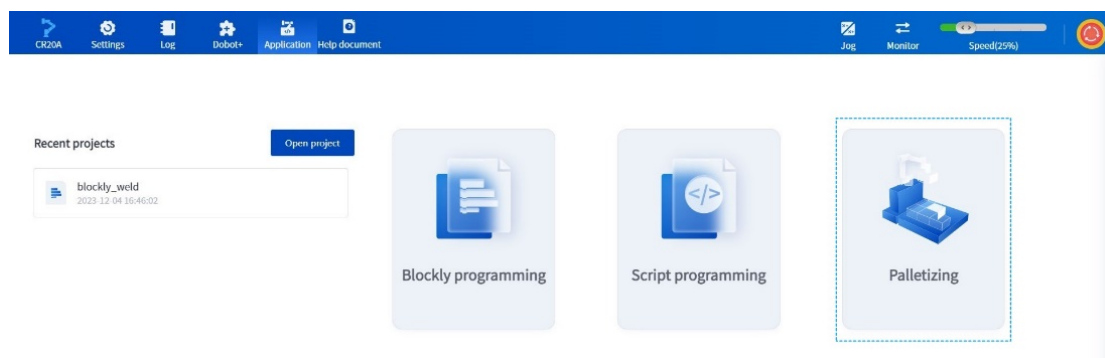
**Figure 5.7 Current login role**

- **Administrator** and **Technician** can access all functions of the palletizing process package.
- **Operator** and **Custom role** can only select, start, pause, or stop projects and modify the number of boxes on the pallet from the process package homepage. They are not permitted to manage, debug, or configure the palletizing workstation.

For detailed permission information, refer to **Workstation settings > Permissions** page in the palletizing process package.

### 5.4 Palletizing workstation settings

Open the **Application** page and select **Palletizing** to access the palletizing process package.



**Figure 5.8 Palletizing**

If you're using the palletizing process package for the first time, or if you've recently replaced or adjusted the workstation hardware, you'll need to configure the workstation settings. Click **Workstation settings** at the top right corner of the palletizing process package homepage to open the settings page.

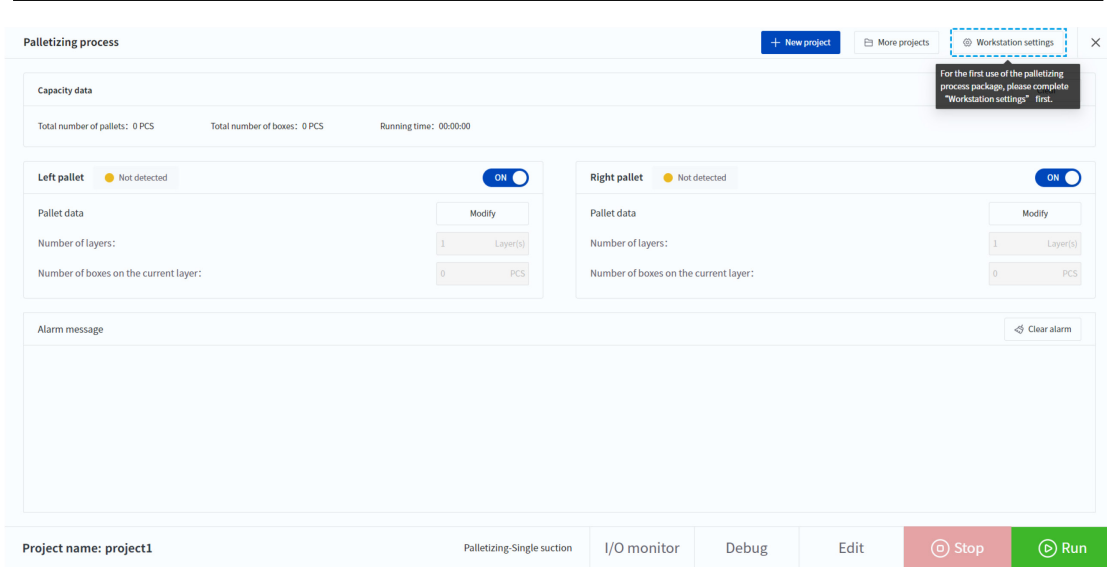
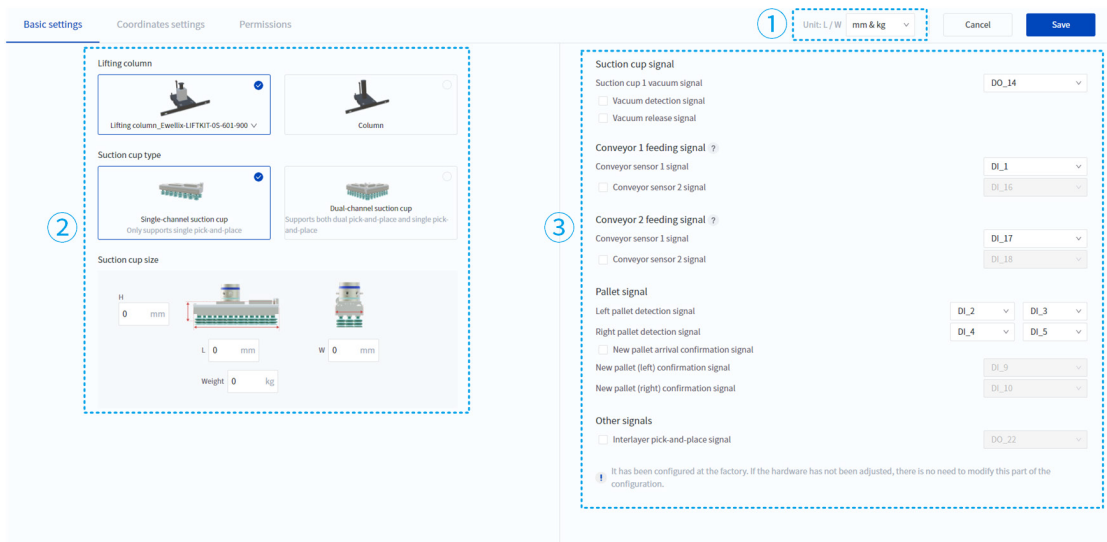


Figure 5.9 Workstation settings

### 5.4.1 Basic settings



#### ① Unit settings

Choose the units for length and weight that will be used for the suction cup, pallet, and box parameters in the palletizing project. You can select either metric units (mm & kg) or imperial units (in & lb). When you change the units, all related parameters in the palletizing project will automatically be converted and updated.

#### ② Workstation hardware settings

- **Lifting column:** Select the type of lifting column based on the actual configuration of your palletizing workstation. Supported models include GeMinG-inovance-900 and Ewellix-LIFTKIT-0S-601-900.
- **Suction cup type:** Select the type of suction cup according to the actual one equipped with your workstation. A single-channel suction cup can pick up only one box at a time, while a dual-channel suction cup can pick up one or two boxes at a time. If you need a

dual-channel suction cup (a custom option), please contact Dobot technical support for an evaluation.

- **Suction cup size:** Set the suction cup size according to the actual size used in your workstation. The height is the distance from the robotic arm's end flange to the top surface of the box after it's picked up (approximately half the height of the suction cup). For more details, refer to the diagram on the interface.

### ③ Signal settings

The CRA palletizing workstation is configured with default signals at the factory. Unless there are changes to the hardware configuration, there is no need to modify the signal settings.

Suction cup signal

- **Suction cup 1/2 vacuum signal:** Signal to control the vacuum function of the suction cup for picking up boxes.

For single-channel suction cup, you only need to configure the signal for Suction cup 1. For dual-channel suction cup, you need to configure both signals to control each channel independently. Select the signal according to the actual situation. The subsequent suction cup related signals follow the same principle, no more details in this document.

DO14 and DO15 by default. If the wiring has been modified, please select according to the actual wiring.

- **Suction cup 1/2 vacuum detection signal:** The signal of the suction cup vacuum detection sensor is used to detect whether the suction cup has successfully picked up the box.

You can configure this signal if you enable vacuum detection; otherwise, you can leave it unchecked.

Tool\_DI1 and Tool\_DI2 by default. If your suction cup supports vacuum release detection, set this signal to the corresponding DI for that function.

- **Suction cup 1/2 vacuum release signal:** Signal to control the vacuum release function of the suction cup for placing boxes.

You can configure this signal if you enable the vacuum release function; otherwise, you can leave it unchecked.

DO16 and DO17 by default. If the wiring has been modified, please select according to the actual wiring.

#### Conveyor feeding signal

The palletizing workstation supports up to two conveyors. If only one conveyor is needed, you can skip the settings for Conveyor 2.

It refers to the conveyor box sensor signal. You can configure up to two sensor signals for each conveyor.

- For one placing method (e.g., all boxes are handled with single pick-and-place or dual pick-and-place), you only need to configure one sensor signal.
- For two placing methods, you need to configure two sensor signals to indicate that Box 1 and Box 2 are arrived respectively.

DI1 when the cable is connected to the Conveyor Sensor 1 interface on the IO panel of the palletizing workstation, DI6 when it is connected to the Conveyor Sensor 2 interface.

#### Pallet signal

- **Left pallet detection signal:** This signal detects whether the left pallet is properly in

place.

DI2 and DI3 by default. If the wiring has been modified, please select according to the actual wiring.

- **Right pallet detection signal:** This signal detects whether the right pallet is properly in place.

DI4 and DI5 by default. If the wiring has been modified, please select according to the actual wiring.

- **New pallet (left/right) confirmation signal:** If selected, when the new pallet is arrived, you need to press the corresponding confirmation button first, then the robot will start working.

It is recommended to enable this function to prevent the robot from moving during pallet replacement.

It is recommended to connect the left and right new pallet confirmation buttons to the Left Ack and Right Ack interfaces on the workstation's IO panel. The corresponding DIs are DI9 and DI10 respectively.

### Other signals

- **Interlayer pick-and-place signal:** If a separate signal is needed to control the suction cup for handling interlayer (e.g., using a dedicated suction nozzle), enable and configure this signal.

If the palletizing pattern does not include interlayer, or if a general suction cup signal can be used, you can leave this signal unchecked.

## 5.4.2 Coordinates settings

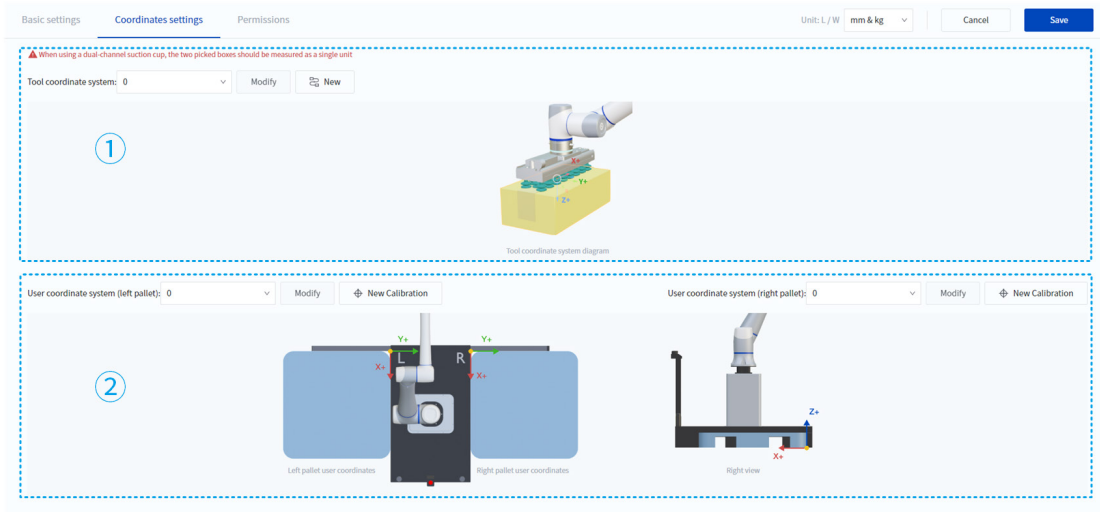


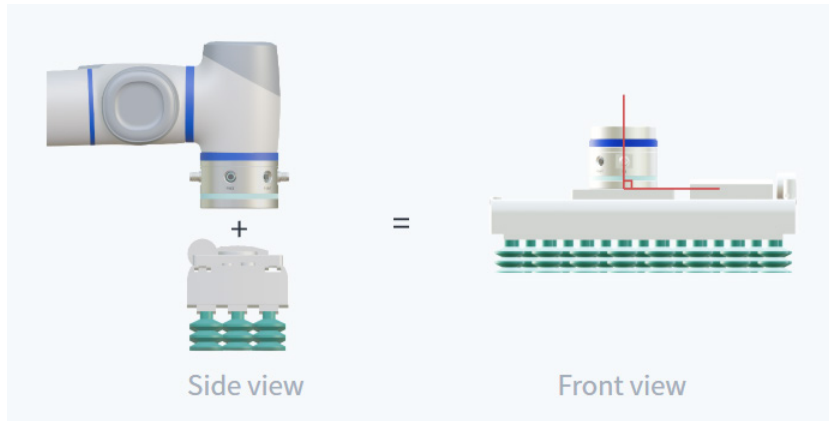
Figure 5.10 Coordinates settings

### ① Tool coordinate system

The tool coordinate system is a reference coordinate system based on the end-of-arm suction cup. Its origin is at the center of the suction cup's contact surface when it picks up a box, and its orientation aligns with the flange tool coordinate system.

For the first use, click **New** to create a tool coordinate system. Follow these steps:

1. Make sure the end-of-arm suction cup is installed correctly, then click **Next**. The J6 joint of the robot arm is at  $0^\circ$  in the diagram.

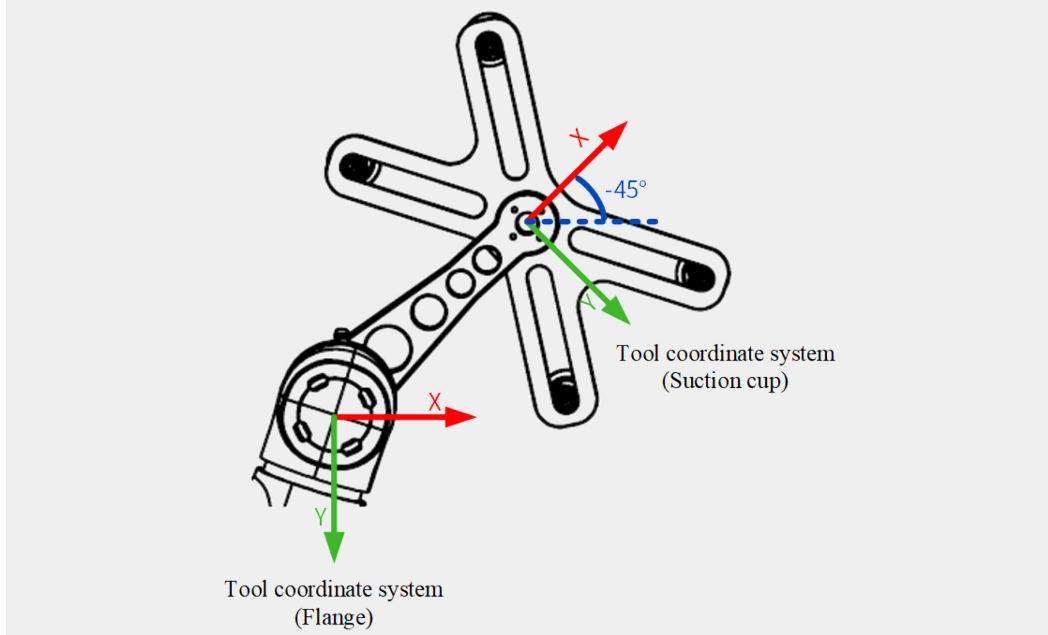


**Figure 5.11 Suction cup installation**

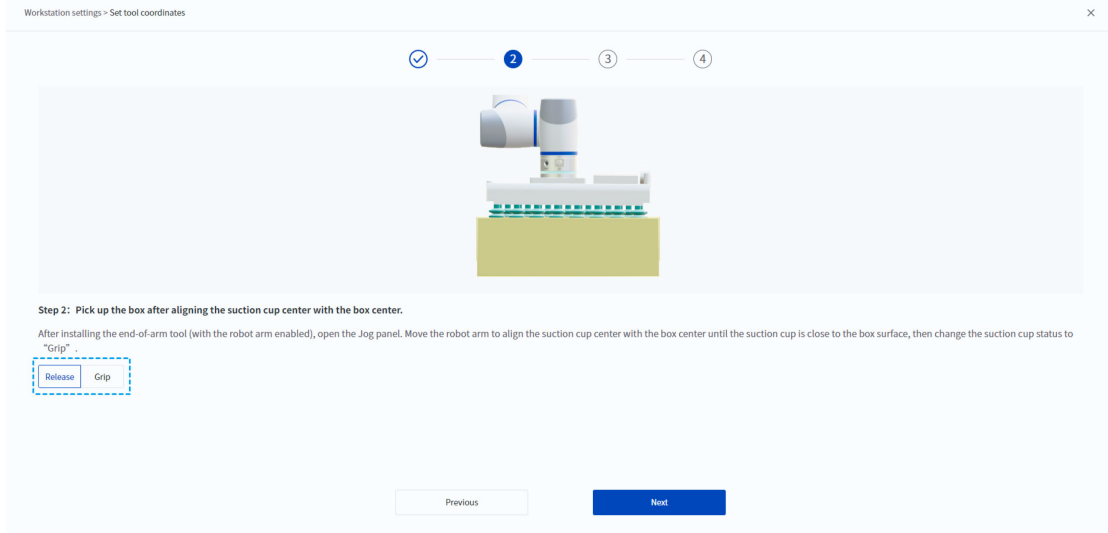
**i NOTE**

This setup process applies only to the installation method mentioned above. If there is a rotation angle between the suction cup and the end of the robot arm, you'll need to measure the rotation and manually adjust it in the tool coordinate system settings in DobotStudio Pro.

Take the installation for suction cup with extra reach bracket (as shown in the figure below), in addition to XYZ offsets, you would also need to set RZ to  $-45^\circ$ .



2. After enabling the robot arm, use the jog function to align the center of the suction cup with the center of the box (for dual-channel suction cup, treat the two boxes as a single unit to calculate the center point). Press the suction cup tightly against the box surface, and click **Grip**. Once the suction cup picks up the box, click **Next**.

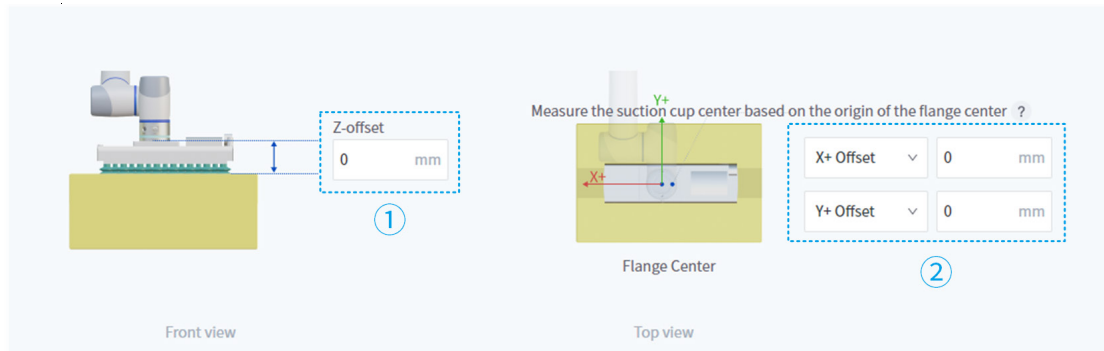


**Figure 5.12 Pick up box**

3. Measure and enter the suction cup offset values.

- ① Measure the vertical distance from the robot arm's end flange to the top surface of the box, and enter this value as the **Z-axis offset** (if using an [optional suction cup](#), this distance is about 110mm).
- ② Measure the offset from the center of the robot arm's end flange to the center of the box and enter it (if there is no offset, enter 0. If using an [optional suction cup](#), set the X-axis offset to -10mm and leave the Y-axis at 0mm).

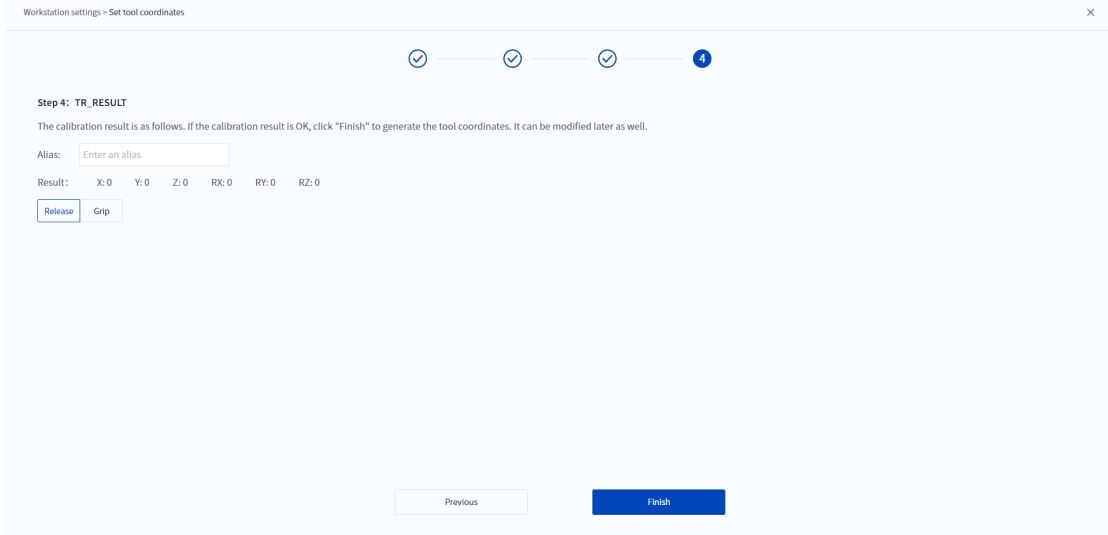
After entering these values, click **Next**.



**Figure 5.13 Set suction cup offset values**

4. Once the calibration is successful, you can release the suction cup on the page, then enter an alias (optional) and click **Finish**. The system will save the tool coordinate system and return to the coordinate system settings page.

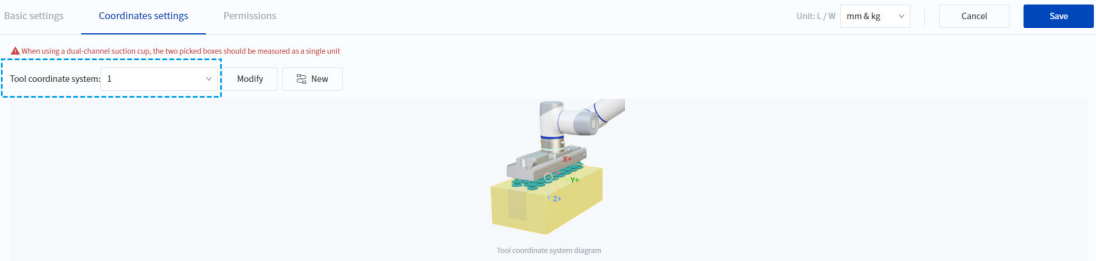




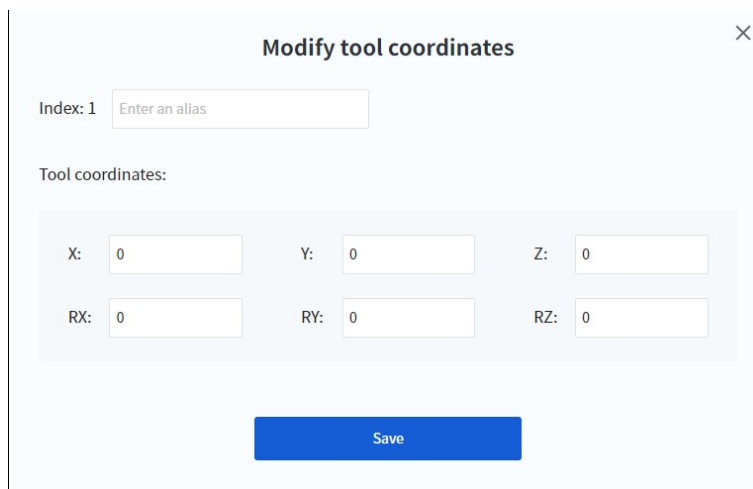
**Figure 5.14 Save tool coordinate system**

After returning to the coordinate system settings page, the system will automatically select the newly created tool coordinate system.

Besides creating a tool coordinate system through the steps above, you can also select a previously added system from the dropdown menu or click **Modify** to view or modify the alias and coordinates of the currently selected system (Tool coordinate system 0 is the flange tool coordinate system and cannot be modified).



**Figure 5.15 Modify tool coordinate system 1**



**Figure 5.16 Modify tool coordinate system 2**

## ② User coordinate system

The CR20A palletizing workstation comes with pre-calibrated pallet coordinate systems. The left pallet coordinate system corresponds to User coordinate system 1 (User1), and the right pallet coordinate system corresponds to User coordinate system 2 (User2). The origin of these coordinate systems is on the ground, with the Z-axis pointing upward, as shown in the figure below.

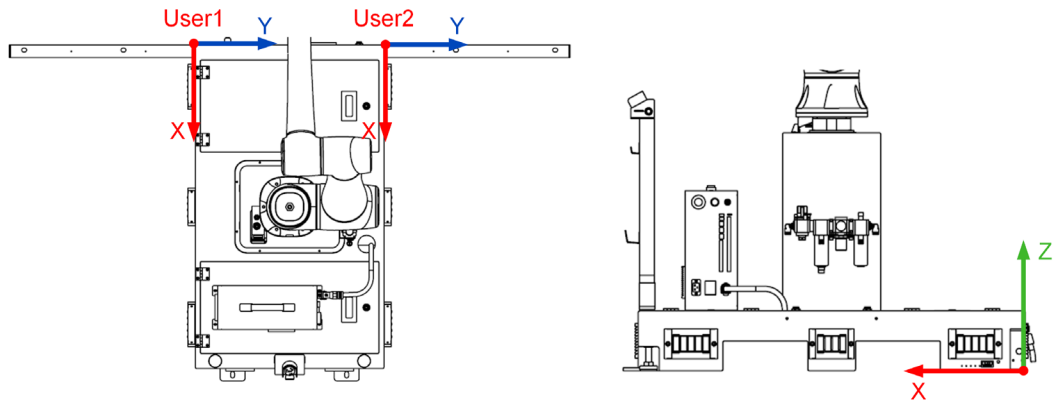


Figure 5.17 Pallet coordinate system

A label with the pallet coordinate system information, similar to the one shown below, is included with the shipping list. Please confirm that the actual values for User coordinate systems 1 and 2 match the values on the label (due to manufacturing variations, the specific coordinate values may differ for each workstation, so always refer to the actual label).

Columnar Palletizing Workstation  
User Coordinates

id	X	Y	Z	Rx	Ry	Rz
0	0	0	0	0	0	0
1 Left	416.0538	437.5421	-1266.9	0.029962	0.16133	92.372885
2 Right	-341.3144	-669.3046	-1265.96	-0.55313	0.323632	92.466579

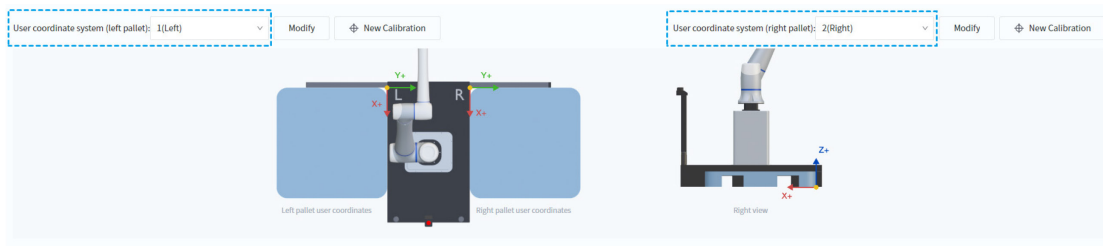
Lifting Palletizing Workstation  
User coordinates

id	X	Y	Z	Rx	Ry	Rz
0	0	0	0	0	0	0
1 Left	393.88	408.66	-1266.9	0.029962	0.16133	92.372885
2 Right	-341.3144	-669.3046	-1265.96	-0.55313	0.323632	92.466579



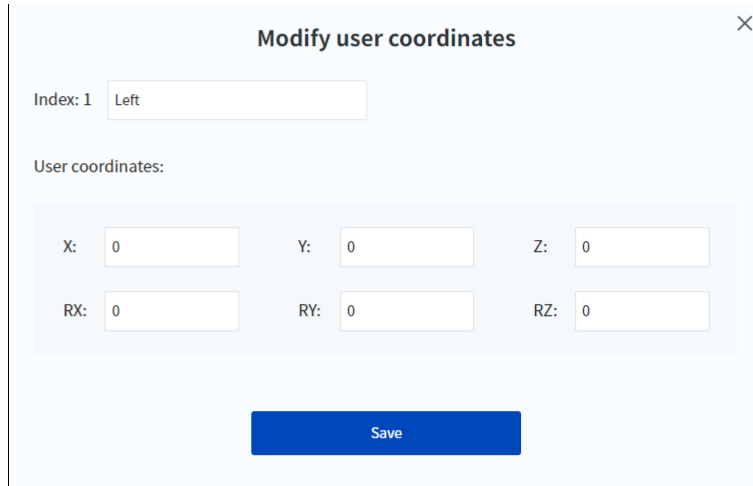
Figure 5.18 Pallet coordinate system label

In most cases, you simply need to select **1 (Left)** for the **User coordinate system (left pallet)** and **2 (Right)** for the **User coordinate system (right pallet)** on the coordinate system settings page.



**Figure 5.19 User coordinate system (left/right pallet)**

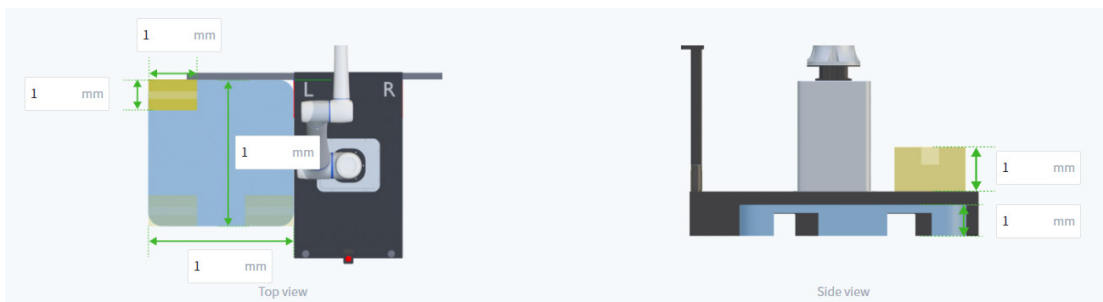
You can click **Modify** to view or edit the alias and coordinates of the currently selected user coordinate system.



**Figure 5.20 Modify user coordinates**

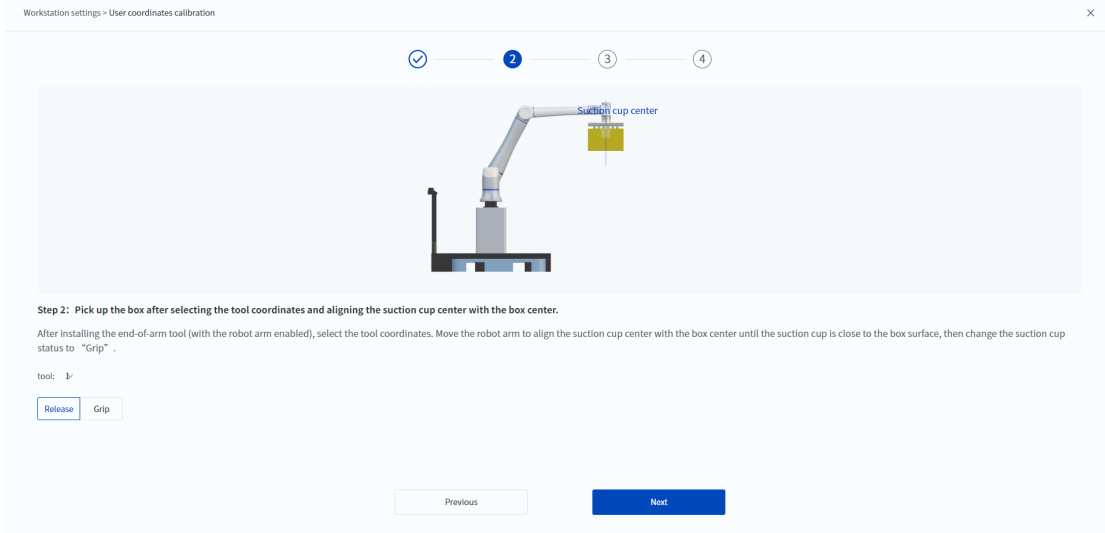
If you need to recalibrate the user coordinate system due to inaccuracies in the factory default pallet coordinate system, click **New Calibration** next to the relevant coordinate system. Follow the following steps to create and calibrate a new user coordinate system:

1. **Prepare the pallet and boxes that you will use in the actual application.** Refer to the diagram on the page and enter the sizes, then click **Next**. If you're using a dual-channel suction cup, prepare two boxes and treat them as a single unit to calculate the sizes.



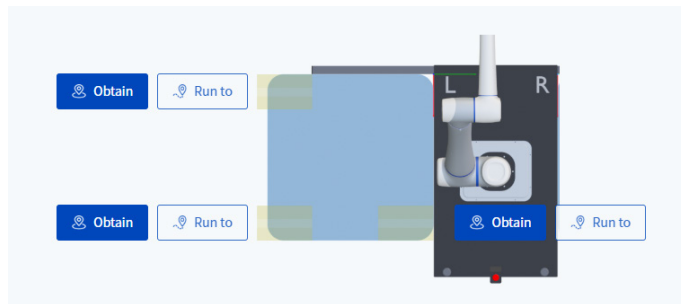
**Figure 5.21 Fill in Box and Pallet sizes**

2. After selecting the tool coordinate system for the suction cup, use the jog function to align the center of the suction cup with the center of the box (for dual-channel suction cup, treat the two boxes as a single unit to calculate the center point). Press the suction cup tightly against the box surface, and click **Grip**. Once the suction cup picks up the box, click **Next**.



**Figure 5.22 Pick up box**

3. Jog the robot arm and place the box in the position shown in the diagram (ensure that the pallet is placed exactly as it will be in actual use, and there is no need to release the suction cup after the box is in place). Then, click **Obtain**. Once all three points are obtained, click **Next**.



**Figure 5.23 Get points**

4. Once the calibration is successful, you can release the suction cup on the page, then enter an alias (optional) and click **Finish**. The system will save the user coordinate system and return to the coordinate system settings page.

After returning to the coordinate system settings page, the system will automatically select the newly created user coordinate system.

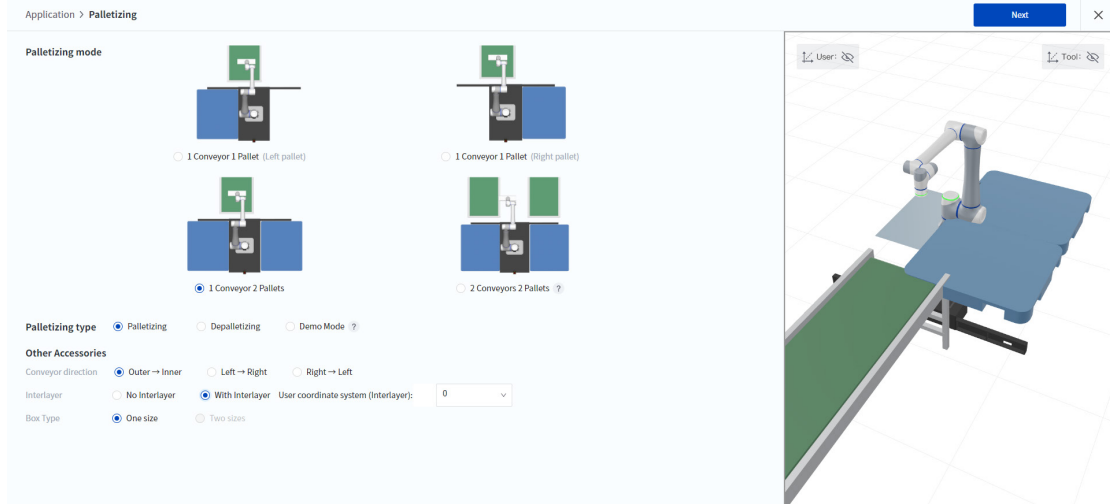
## 5.5 New palletizing project

1. Click **New project** on the upper right of the page to create a new project (if you need to import a project, click **More projects** and use the import option on the Project list page).



**Figure 5.24 New palletizing project**

2. Configure the basic parameters of the project based on your actual application scenario. You can preview the configuration in real-time through the 3D model on the right side of the interface.



**Figure 5.25 Project basic parameters**

- Palletizing mode:** Select the palletizing mode based on the number of pallets and conveyors used in the actual application. In **2 Conveyors 2 Pallets** mode, each conveyor is paired with a specific pallet. When palletizing, boxes from Conveyor 1 will be palletized on the left pallet, and boxes from Conveyor 2 will be palletized on the right pallet. The same logic applies to depalletizing.

**NOTE**

- In **1 Conveyor 2 Pallets** mode, when both pallets are ready, the workstation will finish the palletizing of the left pallet before carrying out the palletizing of the right pallet.
- 2 Conveyors 2 Pallets** mode is ideal when the production capacity and box sizes on both conveyor lines are similar. In this mode, it's recommended to have a buffer zone on the conveyors to handle incoming boxes.
- In **2 Conveyors 2 Pallets** mode, when both pallets are ready, the workstation will carry out the palletizing on both pallets alternately. For more details, see the [2 Conveyors 2 Pallets Debugging](#) section.
- The dual-channel suction cup is not compatible with the “2 Conveyors 2 Pallets” mode.

- Palletizing type:**
  - Palletizing:** Pick up boxes from the conveyor and stack them onto the pallet.
  - Depalletizing:** Remove boxes from the pallet and place them onto the conveyor. The parameters need to be configured are similar to palletizing, with only some point definitions differing.
  - Demo mode:** This mode is only available when using **1 Conveyor 2 Pallets**. It is designed to demonstrate the palletizing workstation at events. For more details, see the [Demo mode](#) section.
- Other Accessories:**
  - Conveyor direction:** Set the direction of the conveyor relative to the workstation based on your actual application. In **2 Conveyors 2 Pallets** mode, only the **Outer → Inner** option is available.

- **Outer → Inner:** The conveyor is perpendicular to the workstation, with boxes moving from far to near, approaching the robot arm.

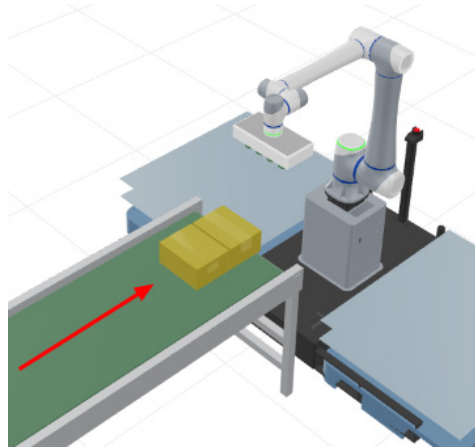


Figure 5.26 Outer → Inner

- **Left → Right:** The conveyor is parallel to the workstation, with boxes moving from left to right, approaching the robot arm.

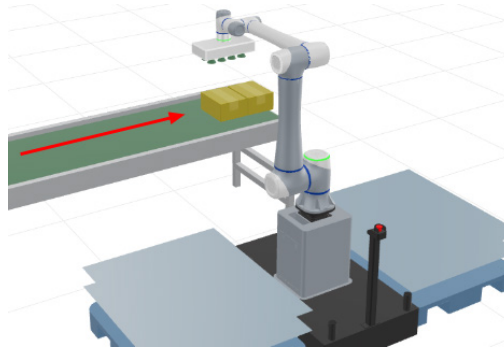


Figure 5.27 Left → Right

- **Right → Left:** The conveyor is parallel to the workstation, with boxes moving from right to left, approaching the robot arm.

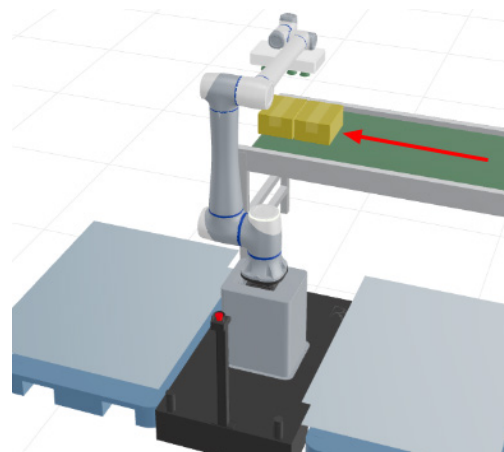


Figure 5.28 Right → Left

- **Interlayer:** When palletizing, choose this option if you need to place interlayers between certain layers of boxes. When depalletizing, choose this option based on

whether there are interlayers to be removed. If you select **With Interlayer**, refer to the [\(Optional\) Setting coordinate system for interlayer](#) section and select the appropriate user coordinate system.

- **Box type:** The **Two sizes** option is available only in **2 Conveyors 2 Pallets** mode. Each box size is paired with one specific conveyor and one pallet. For example, the boxes arriving on Conveyor 1 must be of the same size and are only stacked onto the left pallet.

After setting the basic parameters, click **Configuration** to enter the palletizing configuration page.

### 5.6 (Optional) Setting coordinate system for interlayer

If your palletizing or depalletizing process requires placing or removing an interlayer every few layers, you'll need to set the user coordinate system for the interlayer. The setting method is as follows:

1. Click **Settings > Coordinate system > User coordinate system** to enter the user coordinate system page, where you can add or modify the user coordinate system.

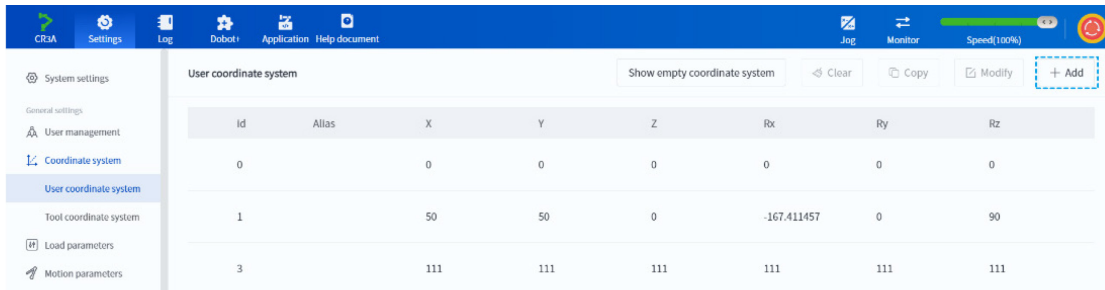


Figure 5.29 User coordinate system page

2. Click **Three-point setting** on the **Add user coordinate system** page.

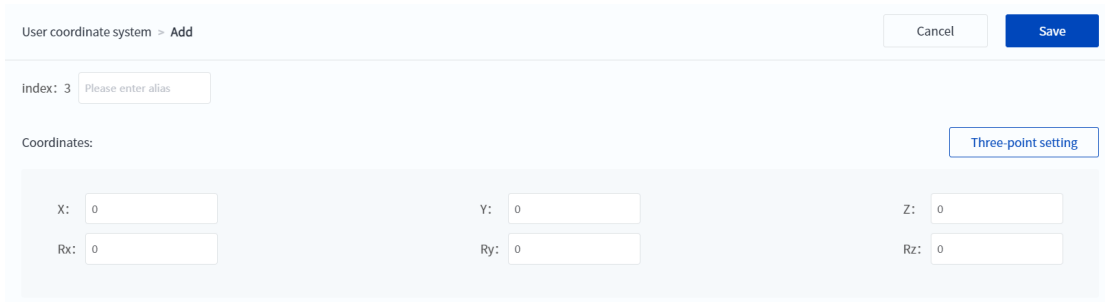
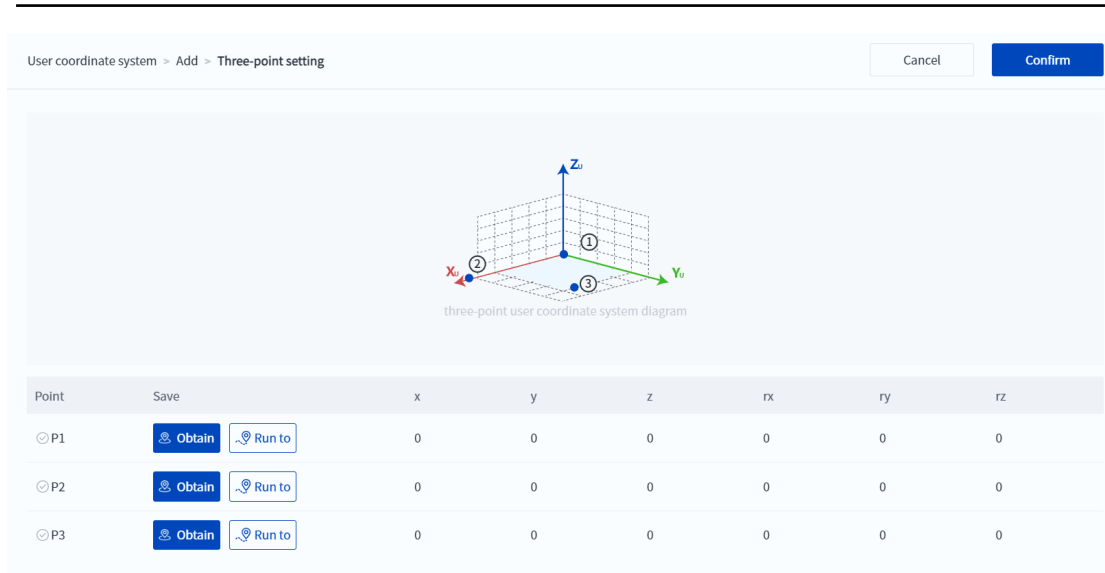


Figure 5.30 Add user coordinate system

3. In the **Three-point setting** page, teach the system and obtain any three non-collinear points on the plane of the interlayer stacking zone (as shown in the the figure below, the Z-axis should be oriented towards the interlayer stacking direction), then click **Confirm**.



**Figure 5.31 User coordinate system - Three-point setting**

- The system automatically returns to the **Add user coordinate system** page and the coordinate system values are updated to the calibrated values. Click **Save** to complete the user coordinate system settings for the interlayer.

## 5.7 Palletizing configuration

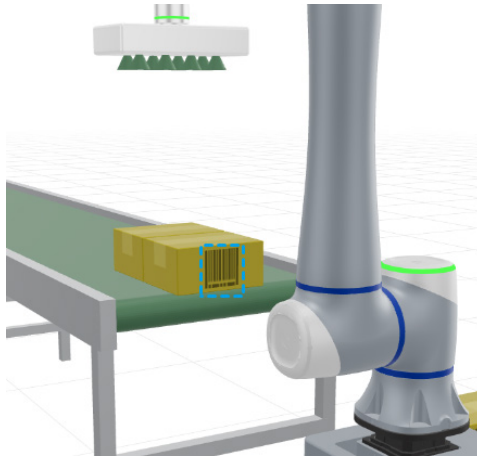
### 5.7.1 Box parameter



**Figure 5.32 Box parameter**

- Box size:** Enter the actual sizes of the box (length should be greater than width).
- Weight:** Enter the actual weight of the box.
- Box direction:** Based on the actual posture of the box when it arrives on the conveyor (long side faces forward / short side faces forward), click **Rotate 90°** to make adjustments. You can preview the effect in the 3D model on the right of the page.
- Label direction:** If you need to design the palletizing pattern based on the label's position on the box, you can select the direction of the label on the box here. The direction options (Front/Right/Back/Left) are based on the conveyor's forward direction. After making a selection, you can see the updated direction in the 3D model on the right and in the subsequent palletizing pattern editor.





**Figure 5.33 Label direction (front)**

It needs to be configured separately when there are two box sizes. **Box 1 size** corresponds to the size of the box to be palletized on the left pallet, **Box 2 size** corresponds to the size of the box to be palletized on the right pallet.

Box parameter	
Box 1 size (Left pallet) (Box length should be $\geq$ width)	
L $\times$ W $\times$ H	0 mm $\times$ 0 mm $\times$ 0 mm
Weight	0 kg
Box direction	Rotate 90°
Label direction	No label
Box 2 size (Right pallet) (Box length should be $\geq$ width)	
L $\times$ W $\times$ H	0 mm $\times$ 0 mm $\times$ 0 mm
Weight	0 kg
Box direction	Rotate 90°
Label direction	No label

**Figure 5.34 Box parameter\_Two sizes**

## 5.7.2 Pallet parameter

Pallet parameter	
Pallet size	Custom
L $\times$ W $\times$ H	1200 mm $\times$ 1000 mm $\times$ 140 mm

**Figure 5.35 Pallet parameter**

You can select the corresponding pallet size from the drop-down menu, or select **Custom** and manually enter the length, width, and height of the pallet.

**NOTE**

Pallet size affects the minimum palletizable box size. For more details, refer to the [recommended minimum box size in Technical specifications](#).

### 5.7.3 Point settings

#### Point settings

A: Picking point. B: Point above picking point. It is recommended to set two transition points (e.g., T1 and T2) on each pallet, one outside the pallet and one inside the pallet. C: Placing offset point. D: Point above placing point. E: Placing point. BCDE are all automatically generated by the system. The red line represents the motion trajectory.

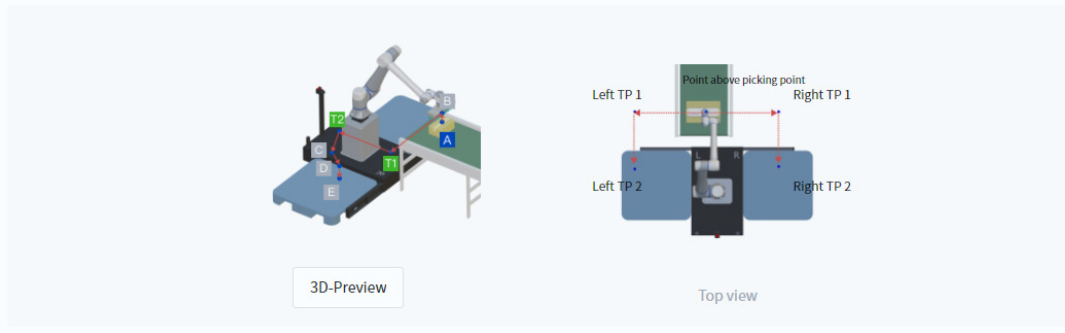


Figure 5.36 Point settings

You need to follow the instructions and illustrations on the page to set the picking point (or placing point during depalletizing) and transition points. By clicking **3D-Preview**, you can view the recommended point locations in the 3D model on the right of the page. Click this button again to hide the points in the 3D model.

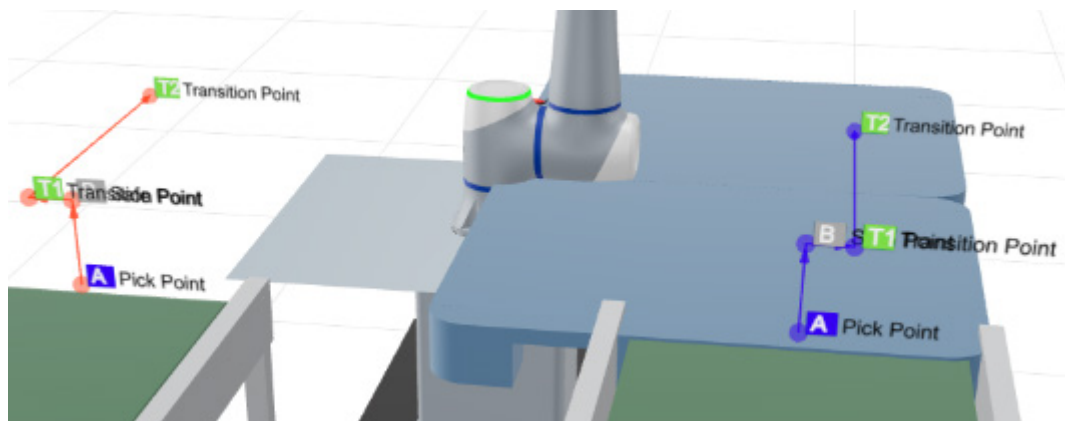


Figure 5.37 Preview 3D illustration

#### Setting picking/placing point

In palletizing mode, this point is the picking point, while in depalletizing mode, this point is the placing point. The setting method is the same for both modes.

The displayed coordinates of the picking/placing point are based on the left pallet coordinate system.

Place the box on the conveyor, then move the robot arm so that the suction cup is aligned with and flush against the box, ensuring that the box center and suction cup center are vertically aligned (for dual-suction cup, treat the two boxes as a single unit to calculate the center). Once the robot

arm is in position, click **Obtain**.

① Picking point

Conveyor 1

Picking point	Operate	X	Y	Z	RX	RY	RZ
A	<input type="button" value="Obtain"/> <input type="button" value="Run to"/>	0	0	0	0	0	0

**Figure 5.38 Set picking point**

In **2 Conveyors 2 Pallets** mode, you need to set the picking/placing points for both conveyors separately.

① Picking point

Conveyor 1

Picking point	Operate	X	Y	Z	RX	RY	RZ
A	<input type="button" value="Obtain"/> <input type="button" value="Run to"/>	0	0	0	0	0	0

Conveyor 2

Picking point	Operate	X	Y	Z	RX	RY	RZ
A	<input type="button" value="Obtain"/> <input type="button" value="Run to"/>	0	0	0	0	0	0

**Figure 5.39 Set picking point\_2 conveyors**

During palletizing, boxes picked from Conveyor 1 will only be stacked onto the left pallet, and boxes from Conveyor 2 will only be stacked onto the right pallet. The same principle applies to depalletizing. Please set the points according to your on-site configuration.

In **Demo mode**, you need to set the placing and picking points separately. For details on point usage, refer to the [Demo mode](#) section.

### Layer transition point settings

② Layer transition point ?

Left pallet

Transition point	Operate	X	Y	Z	RX	RY	RZ
T1	<input type="button" value="Obtain"/> <input type="button" value="Run to"/>	540.9539	-659.8427	518.0882	-180	0	-180
+ Set Left Transition point							

Right pallet

Transition point	Operate	X	Y	Z	RX	RY	RZ
T1	<input type="button" value="Obtain"/> <input type="button" value="Run to"/>	-454.1075	-721.8523	518.0842	-180	0	180
+ Set Right Transition point							

**Figure 5.40 Set layer transition point**

**Layer transition point:** The transition point that the robot arm passes through when moving

from the picking point to the placing point. It is generally used to control the robot trajectory to avoid obstacles. After the robot arm moves to the specified point, click **Obtain** to set the transition point. The left and right transition points need to be set separately, with each side allowing a minimum of 1 and a maximum of 5 transition points.

The displayed coordinates for transition points are based on the corresponding pallet coordinate system (left or right).

In **depalletizing** mode, the order in which the transition points are added is opposite to the order in which the robot arm moves.

**NOTE**

The height of the transition point set here is the height of the transition point corresponding to the first layer of boxes. During actual operation, the system automatically adjusts the height of the transition point based on the number of layers being palletized or depalletized.

If there is more than one transition point on one side, selecting any transition point will display a **Delete** button, allowing you to delete the selected transition point by clicking it.

Left pallet

Transition point	Operate	X	Y	Z	RX	RY	RZ
T1	<input type="button" value="Obtain"/> <input type="button" value="Run to"/>	540.9539	-659.8427	518.0882	-180	0	-180
T2	<input type="button" value="Obtain"/> <input type="button" value="Run to"/>	0	0	0	0	0	0
<input type="button" value="Delete"/>		<input type="button" value="+ Set Left Transition point"/>					

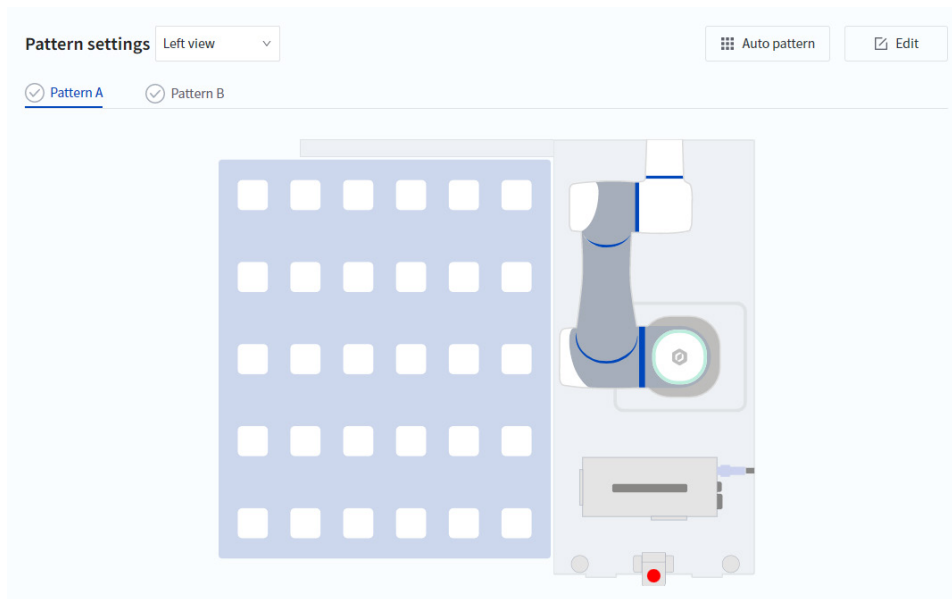
**Figure 5.41 Delete the transition point**

It is recommended to set two transition points for each pallet, one outside the pallet and another inside the pallet, with a height higher than the picking point. Please set these points based on the actual scenario to ensure that the robot arm runs smoothly and no collision occurs. While the specific settings may vary slightly depending on the conveyor installation method, the overall principles remain the same. It's recommended to refer to the 3D illustration for guidance.

### 5.7.4 Pattern settings

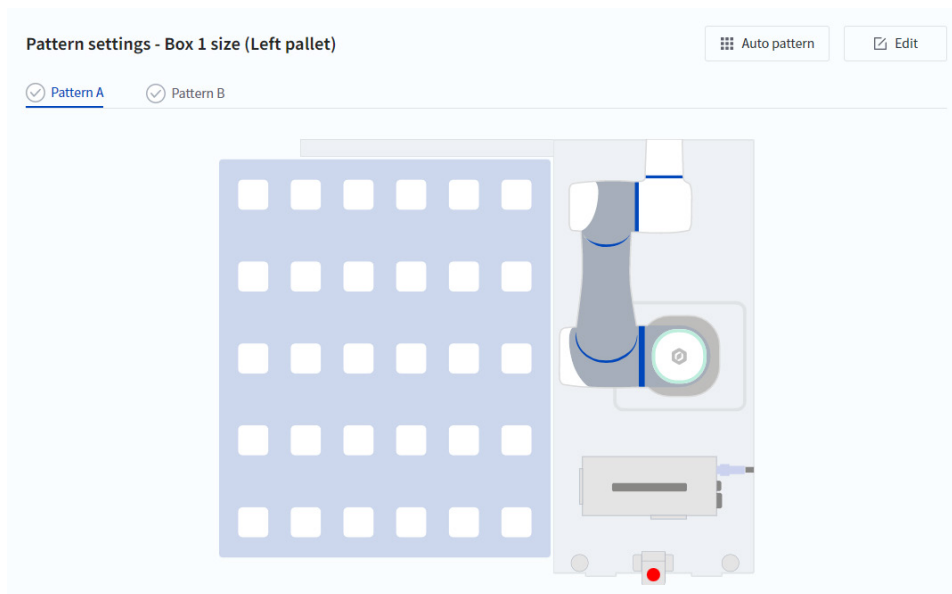
The pattern settings is used to define how boxes are arranged on the pallet.

- For one box size: The palletizing pattern is the same for both left and right pallets. You can switch the perspective of the diagram through the drop-down menu to view the pattern on the left or right pallet.

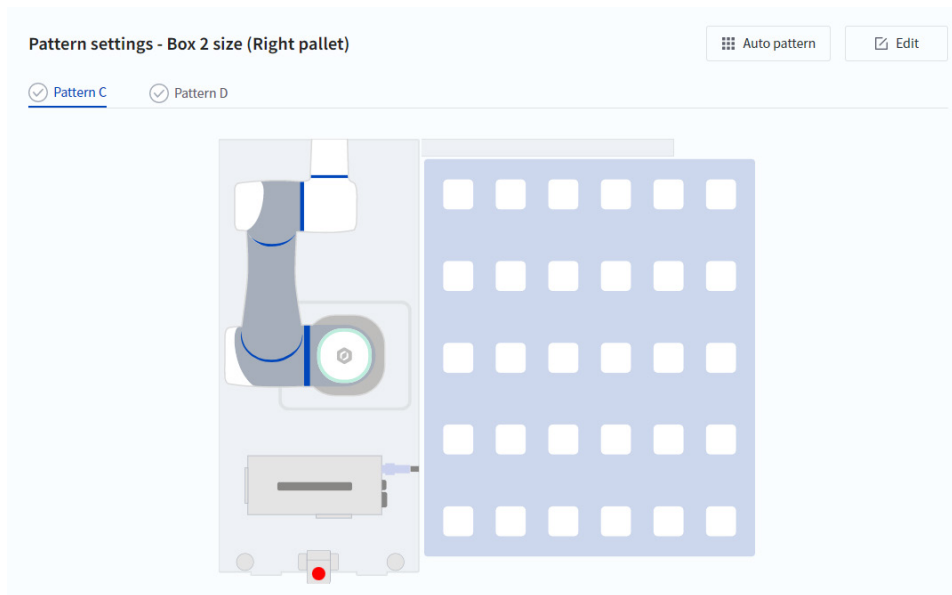


**Figure 5.42 Pattern settings (One box size)**

- For two box sizes: You need to set the palletizing patterns for the left and right pallets separately. Set the left pallet's pattern based on the size of Box 1, and the right pallet's pattern based on the size of Box 2.



**Figure 5.43 Pattern settings (Two sizes - Left pallet)**

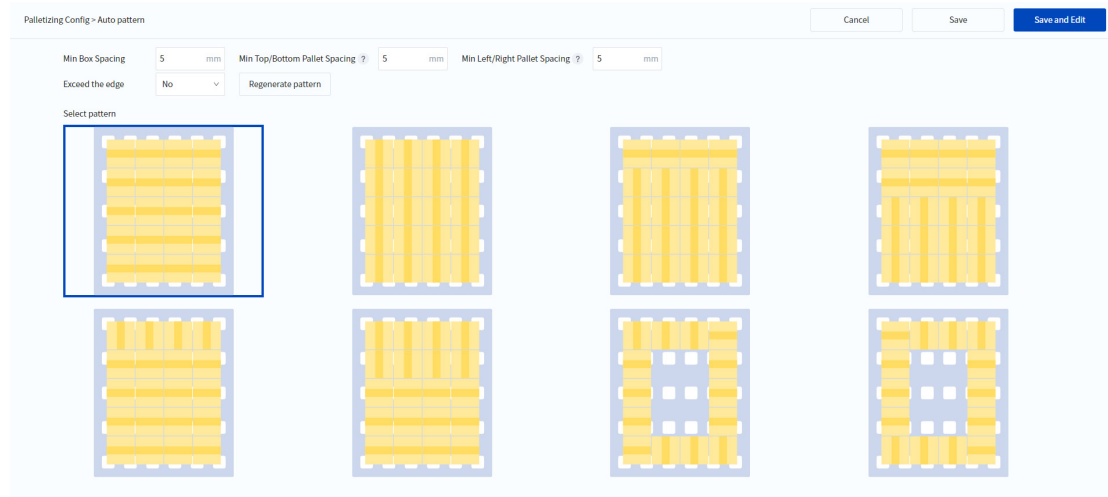


**Figure 5.44 Pattern settings (Two sizes - Right pallet)**

There are two patterns for you to choose, each representing the arrangement of boxes in one layer. When setting the palletizing method, you can set the number of layers and the pattern used for each layer.

Clicking **Auto pattern** allows you to choose from system-generated recommended patterns, while clicking **Edit** lets you modify the current pattern.

### Auto pattern



**Figure 5.45 Recommended pattern**

- **Min Box Spacing:** The minimum distance between boxes. Unit: mm. Default: 5mm.
- **Min Top/Bottom Pallet Spacing:** The minimum distance between the boxes and the top/bottom edges of the pallet. Unit: mm. Default: 5mm.
- **Min Left/Right Pallet Spacing:** The minimum distance between the boxes and the left/right edges of the pallet. Unit: mm. Default: 5mm.
- **Exceed the edge:** If selected **Yes**, boxes can extend beyond the edges of the pallet. The

maximum overhang is 40% of the box’s short side.

The system will automatically generate recommended patterns based on the parameters you’ve set. If you change any of these parameters, click **Regenerate pattern** to update the recommended patterns accordingly.

After selecting a pattern, you can click **Save**, and the selected pattern will be saved as the current pattern. Click **Save and Edit**, you will enter the pattern editing page, where you can modify the selected pattern to suit your needs.

### Edit pattern

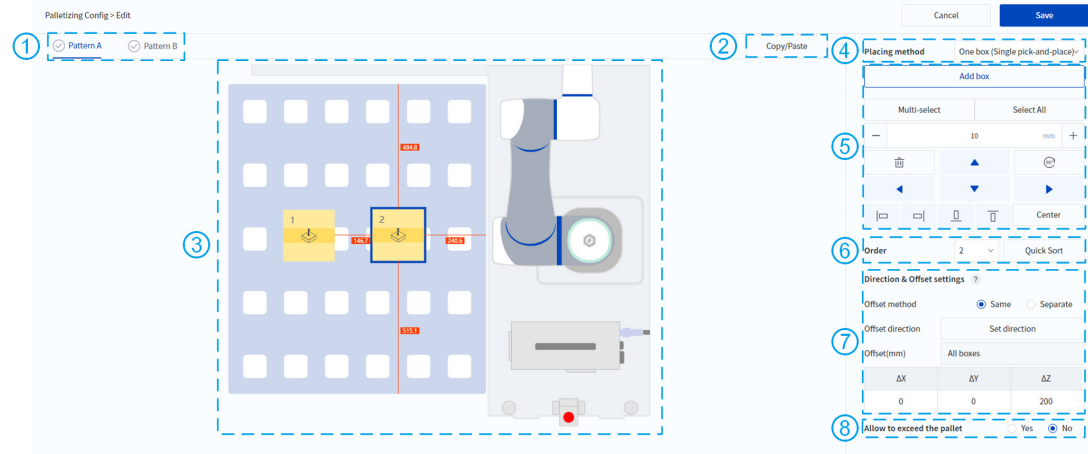


Figure 5.46 Edit pattern

① Pattern A / Pattern B: The pattern to be edited.

② **Copy/Paste** button: Used to copy the current pattern to another one.

Clicking the button opens a menu with the following options:

- **Copy**: Copy the current pattern.
- **Copy and mirror**: Copy the current pattern and mirror it (flip it left and right).
- **Copy and rotate 180°**: Copy the current pattern and rotate it 180°.
- **Paste**: This option is only available if you have previously copied a pattern in the current editing page. It pastes the last copied pattern to the current pattern, overwriting the original one.
- **Undo**: This option is only available if you have pasted a pattern in the current editing page. It undoes the last paste action.

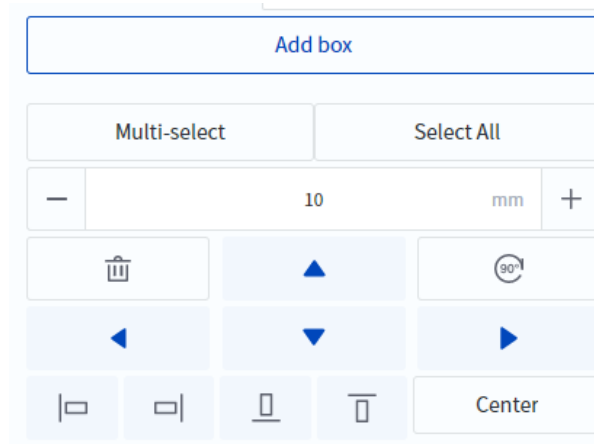
③ Display area: Displays a preview of the current pattern.

④ Placing method

Set the way the suction cup picks and places the boxes:

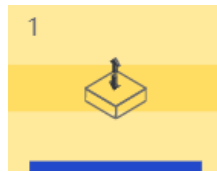
- **One box (Single pick-and-place)**: Pick up and place one box at a time.
- **Two boxes (Dual pick-and-place)**: Pick up and place two boxes at a time. The alignment of the two boxes is determined by the box direction set in [Box parameter](#).

⑤ Edit box placement



**Figure 5.47** Box placement

Click **Add box** to add a box to the pallet area in the diagram (for dual pick-and-place mode, two boxes are added at a time, but they are regarded as a whole). You can add up to 30 boxes.



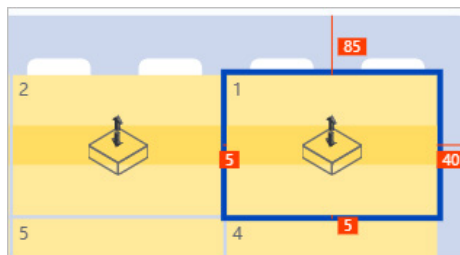
**Figure 5.48** Box icon

- The blue line next to the box indicates the box label (if set to **No label**, there will be no blue line).
- The number on the top left indicates the box placement order.
- The icon in the center of the box indicates the placement direction, explained further below.

You can select a box through the following methods:

- Click a box in the pallet area to select it when not in Multi-select mode.
- Click **Multi-select** to enter the Multi-select mode, and the button changes to **Cancel Multi-select**, then you can click the boxes in the pallet area to select or deselect them. Click **Cancel Multi-select**, you can exit the Multi-select mode.
- Click **Select All** to select all boxes on the current pallet.

When a box is selected, a blue border will appear around it, and the distance to the nearest box or pallet edge will be displayed.



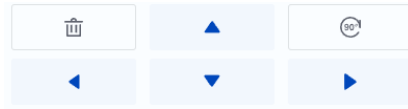
**Figure 5.49** Box selected



The following controls are used to adjust the box placement pattern.

 mm

: Set the jogging distance for the box, unit: mm.



: The direction keys are used to jog the selected box.



: Delete the selected box.



: Rotate the selected box 90° clockwise, along with its label.



: Align the selected boxes in the specified direction (left/right/down/up). The selected box will align with the nearest box in the chosen direction. If there is no other box in that direction, it will align with the pallet edge.

**Center:** Move all boxes in the current pattern as a whole to the center of the pallet.

If any boxes overlap, the corresponding box icon will turn red.

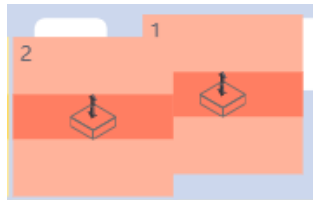


Figure 5.50 Boxes overlap

#### ⑥ Order

Order  Quick Sort

Figure 5.51 Order

Drop down to set the placing order of the currently selected box (single selection only), and the robot arm will place the boxes one by one in numerical order.

Click **Quick Sort**, system will automatically sort all boxes in the pallet area.

#### ⑦ Direction & Offset settings

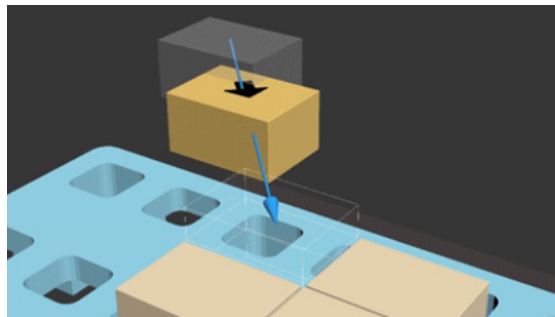


Figure 5.52 Placement direction diagram

When unloading, the robot arm will approach the point directly above the placing point from a specified direction, and then place down the boxes. You can click on the right of the **Direction**

& **Offset settings** to view a dynamic demonstration.

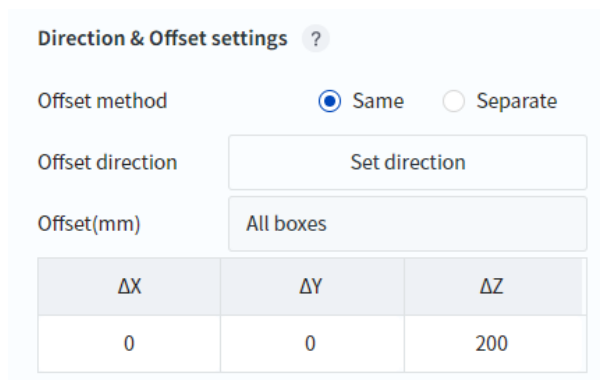
**Direction & Offset settings** is used to set the direction and distance of the approach point relative to the point directly above the placing point.

**i NOTE**

For double pallets, the direction and offset you set here will apply to the pallet from your current viewpoint. The direction and offset for the pallet on the opposite side will be automatically mirrored by the software.

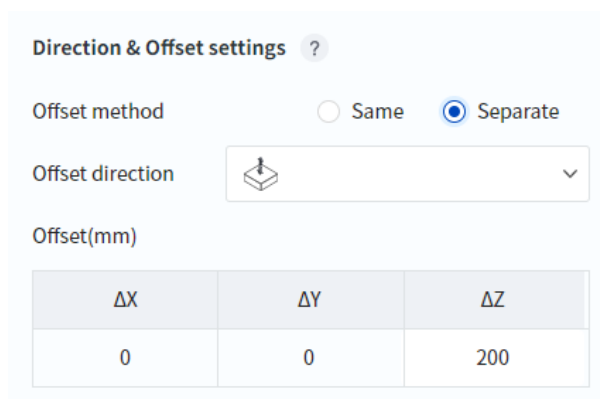
The direction settings are generally used to prevent interference between boxes during unloading, which could affect the palletizing quality. It is recommended to start with the default settings and fine-tune them based on the actual palletizing results during system debugging.

- When **Offset method** is set to **Same**, all boxes approach the placing point from the same direction. You can set the offset direction and offset value for all boxes.



**Figure 5.53 All boxes**




- If you need different offset directions and offset values for individual boxes, select **Separate** for the **Offset method**, then select the box you want to configure and set its specific direction and offset value.




**Figure 5.54 One box**

**Offset** represents the absolute value of the offset between the approach point and the point directly above the placing point, unit: mm, value range: [0, 1500]. The required offset varies depending on the approach direction; offsets that do not need to be set are locked and cannot be modified.

Example:

- For the box approaching from , all offsets (X, Y, Z) can be set.
- For the box approaching from , only Y and Z offsets can be set.
- For the box approaching from , only the Z offset can be set.

Before you set the Direction and Offset, the system defaults the placing direction of all boxes to  (directly above) and the offset to 0mm.

After completing the pattern settings, click **Save** to save the current settings.

#### ⑧ Allow to exceed the pallet

**Allow to exceed the pallet**

Yes  No

- When **Yes** is selected, boxes can extend beyond the edges of the pallet, with a maximum overhang of 40% of the box's shorter side.
- When **No** is selected, any boxes that already extend beyond the edges of the pallet will be automatically adjusted to align flush with the edges of the pallet.

### 5.7.5 Layer settings

**Layer settings**

Layer(s) - 3 +

Layer(s)	Pattern
Layer 1	<input checked="" type="radio"/> A <input type="radio"/> B
Layer 2	<input type="radio"/> A <input checked="" type="radio"/> B
Layer 3	<input checked="" type="radio"/> A <input type="radio"/> B

**Figure 5.55 Layer settings**

Set the number of layers and the pattern used for each layer according to your palletizing or depalletizing needs.

When there are two box sizes, you need to set the palletizing / depalletizing method separately for the left and right pallets.

### 5.7.6 Interlayer settings

If you have selected **With interlayer** when creating the project, you'll need to set the following parameters according to your actual needs.

### Interlayer settings

① Add interlayer between 1 ▾

② Total interlayers at interlayer-picking point 0 PCS

③ Interlayer thickness 0 mm

④ Interlayer picking point settings

Name	Operate	X	Y	Z	RX	RY	RZ
Interlayer picking point	<span>Obtain</span> <span>Run to</span>	0	0	0	0	0	0

⑤ Interlayer placing point settings - Right pallet

Name	Operate	X	Y	Z	RX	RY	RZ
Interlayer picking point	<span>Run to</span>	0	0	0	0	0	0
Transition point 1	<span>Obtain</span> <span>Run to</span>	0	0	0	0	0	0
+ Transition point							
Interlayer placing point	<span>Obtain</span> <span>Run to</span>	0	0	0	0	0	0

**Figure 5.56 Interlayer parameter (palletizing)**

### Interlayer settings

① Remove interlayer between 1 ▾

② Maximum number of interlayers 0 PCS

③ Interlayer thickness 0 mm

④ Interlayer placing point settings

Name	Operate	X	Y	Z	RX	RY	RZ
Interlayer placing point	<span>Obtain</span> <span>Run to</span>	0	0	0	0	0	0

⑤ Interlayer picking point settings - Right pallet

Name	Operate	X	Y	Z	RX	RY	RZ
Interlayer placing point	<span>Run to</span>	0	0	0	0	0	0
Transition point 1	<span>Obtain</span> <span>Run to</span>	0	0	0	0	0	0
+ Transition point							
Interlayer picking point	<span>Obtain</span> <span>Run to</span>	0	0	0	0	0	0

**Figure 5.57 Interlayer parameter (depalletizing)**

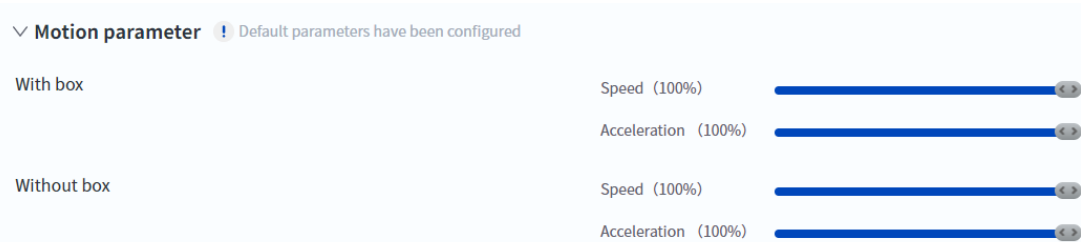
- Add an interlayer after every few layers (palletizing) / Remove an interlayer after every few layers (depalletizing).

- Number of interlayers (palletizing) / Maximum number of interlayers (depalletizing). Unit: PCS, range: [0,100].
  - **For palletizing:** When the system detects that the interlayers are used up, it will pause and prompt you to replenish them. Make sure the new stack matches the previous one in both placement and quantity.
  - **For depalletizing:** When the system detects that the interlayer stack is full, it will pause and prompt you to remove them. After resuming running, the system will keep placing interlayers in that spot.
- Thickness of the interlayer, unit: mm, range: [0,200]
- Interlayer picking point, interlayer placing point, and any number of transition points (at least 1, up to 5).
  - **For palletizing:** Set the first point as the interlayer picking point, which should be at the bottommost interlayer in the stacking zone. The system will automatically calculate the picking points for the remaining interlayers based on the number of interlayers already used and their thickness.  
  
The interlayer placing point is where the first interlayer will be placed on each pallet.
  - **For depalletizing:** Set the first point as the interlayer placing point, which should be at the bottommost interlayer in the stacking zone. The system will automatically calculate the placing points for the remaining interlayers based on the number of interlayers already placed and their thickness.  
  
The interlayer picking point is where the first interlayer will be picked up from each pallet.

When there are more than 1 transition points, select any transition point and a **Delete** button will appear on the interface. Clicking it will delete the bottom transition point.

The coordinates for the picking/placing points are based on the interlayer coordinate system, while the coordinates for the transition points are based on the left or right pallet coordinate system.

### 5.7.7 Motion parameters



**Figure 5.58 Motion parameters**

Set the speed and acceleration percentage for the robot's movements, with separate settings for when it is carrying a box (with box) and when it is not (without box). The system is configured with default parameters at the factory, and modifications are not recommended unless there are specific requirements.

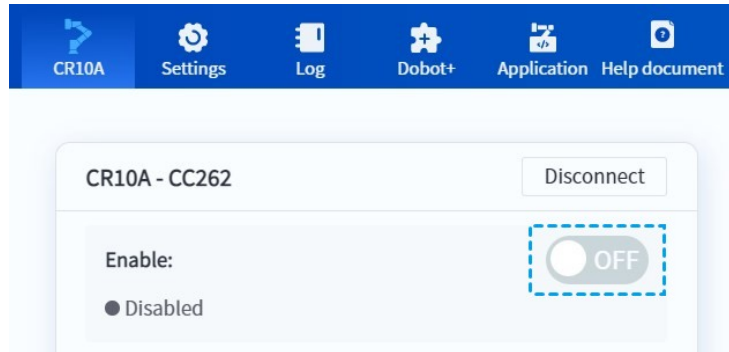
### 5.7.8 Saving configuration

After configuring the parameters, you can set the project name at the top of the interface and perform a **reachability detection** (to ensure all points in the palletizing pattern are accessible). Once the reachability detection is successful, you can either run a virtual simulation or click **Save** to

complete the palletizing configuration.

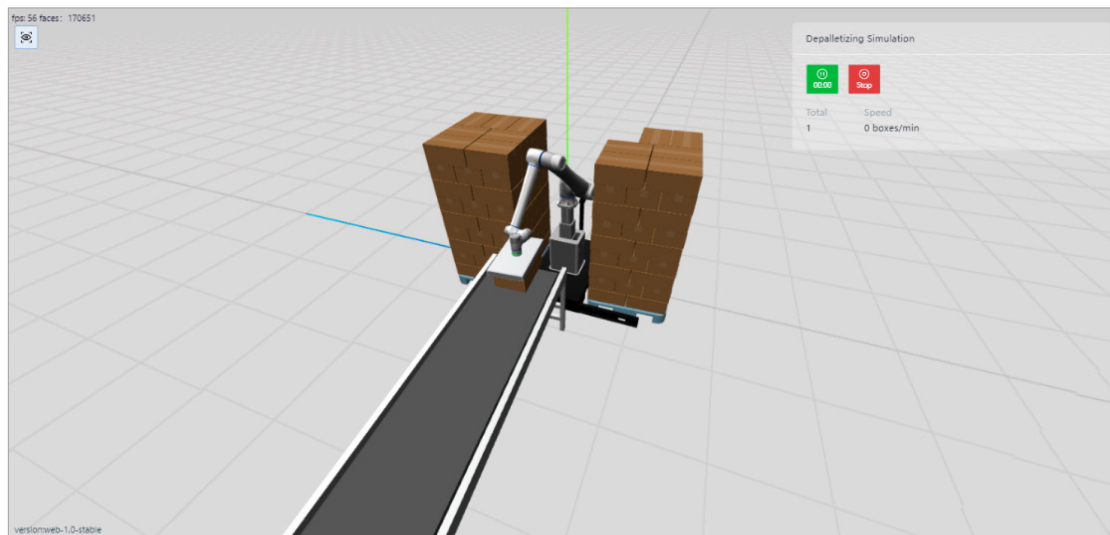
### 5.8 Virtual simulation

Virtual simulation is available only when the robot arm is in the disabled status. You can turn on the Enable switch on the DobotStudio Pro homepage.



**Figure 5.59 Enable switch**

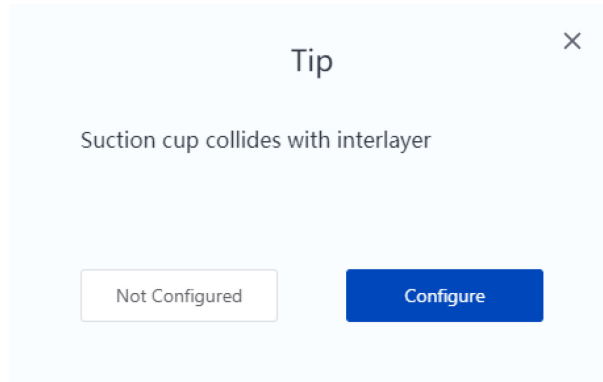
Once you enter the simulation page, the simulation project will start automatically.



**Figure 5.60 Virtual simulation**

During the simulation, you can pause or stop the project at any time. The number under the pause button indicates the runtime of the current simulation.

If a collision or other abnormal situation occurs during the simulation, the project will stop, and a pop-up window will inform you of the issue.

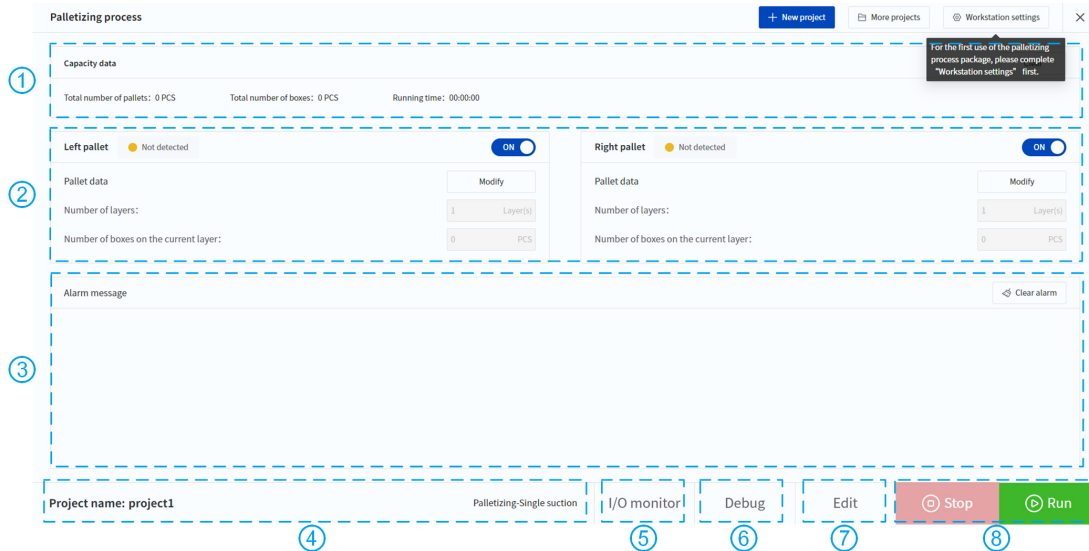


**Figure 5.61 Simulation error**

- Clicking **Configure** will take you back to the [Palletizing configuration](#) page, where you can adjust the settings based on the errors encountered during the simulation.
- Click **Not Configure** or the **X** at the top right to close the pop-up window, stay on the simulation page and check the status of the 3D model when the anomaly occurs. After an error, a **Restart** button will appear on the control panel, allowing you to restart the palletizing project from the beginning.

After stopping the simulation project, an **Quit simulation** button will appear, you can click it to exit the simulation page.

## 5.9 Debugging and running project



**Figure 5.62 Palletizing monitoring page**

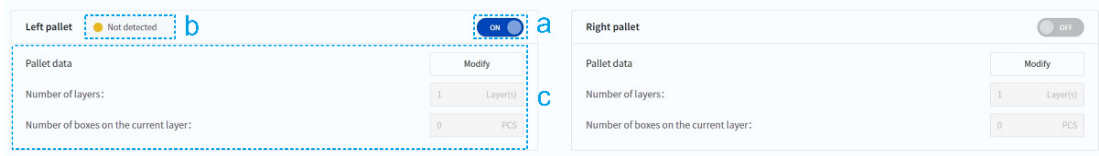
### ① Capacity data

It displays the running data of the current project, indicating the overall productivity of the palletizing workstation.

- **Total number of pallets:** The total number of pallets that have been palletized or depalletized by the workstation.
- **Total number of boxes:** The total number of boxes that have been palletized or depalletized by the workstation.

- **Running time:** The duration for which the workstation has been running the project. Click **Clear** to clear the capacity data and re-count it.

## ② Pallet monitoring



**Figure 5.63 Pallet monitoring**

If you selected the **1 Conveyor 1 Pallet** palletizing mode when creating the project, the unselected pallet will be locked in a disabled status and cannot be enabled or modified.

### a. Pallet ON/OFF switch

You can enable or disable the left/right pallet as needed. The workstation will only perform palletizing on the enabled pallet.

### b. Pallet status

It indicates the current status of the pallet by color and text, with the following statuses:

- No status: The pallet is not enabled.
- Yellow: No pallet detected.
- Yellow: Idle.
- Green: Palletizing.
- Yellow: The pallet is full.
- Red: Alarm.

### c. Pallet data

It displays the number of layers being stacked on the pallet and the number of boxes already on that layer. For example, if the system is currently palletizing the 3rd box on the 1st layer, the number of layers displayed is 1, and the number of boxes is 2; after the current box is palletized, the number of layers remains 1, and the number of boxes updates to 3.

Before starting the palletizing project, if the actual number of boxes on the pallet differs from what is displayed on this page, you need to click **Modify** and manually adjust the data to make it the same as the actual number to avoid errors during palletizing.

## ③ Alarm message

It displays the alarm messages when the palletizing project is running. See [Alarm message and solution](#) for details. Clicking **Clear alarm** can clear the alarm message.

## ④ Project information

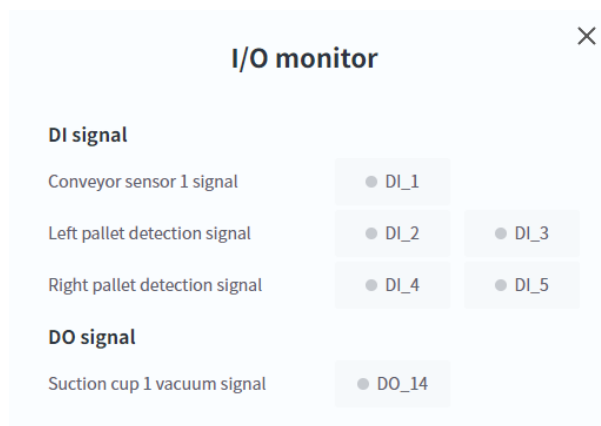
The name and type of the currently open project.

## ⑤ I/O monitoring button

Clicking this button can open the I/O monitoring page, where you can view the I/O signals



configured in [Palletizing workstation settings](#).



**Figure 5.64 I/O monitoring page**

⑥ Debug panel

Clicking this button can open the debugging panel, where you can manually control the lifting column and suction cup, as well as set debugging-related parameters. For more details, see [Debugging panel instructions](#).

⑦ Edit button

Clicking **Edit** can enter the palletizing project configuration page and modify the current project settings.

⑧ Run/Stop button



**Figure 5.65 Stop/Run button**

- Clicking **Run** will start the current project, and the button will change to **Pause**.
- Clicking **Pause** will pause the project, and the button will change to **Continue**.
- Clicking **Continue** will continue the paused project, and the button will change back to **Pause**.
- Clicking **Stop** will stop the current project, and the button on the right will change back to **Run**.

While the project is running, the data and information on the interface will update in real time.

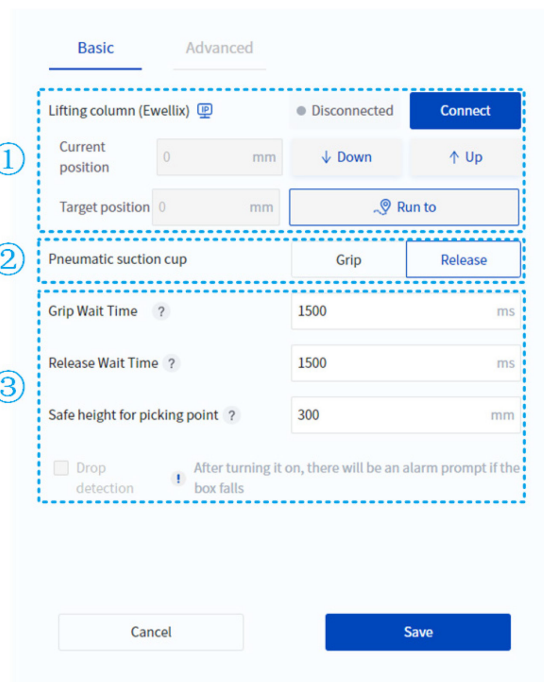
**NOTICE**

If the project is stopped during palletizing (either by an alarm or manually), the workstation must be manually reset before restarting the project. The reset steps are as follows:

1. If there is a box gripped by the suction cup, hold the box and manually release the suction cup, then place the box to a safe area.
2. Use the jog function to move the robot arm to a safe position near the first hovering point where the arm will move to after the project starts.

### 5.9.1 Debugging panel instructions

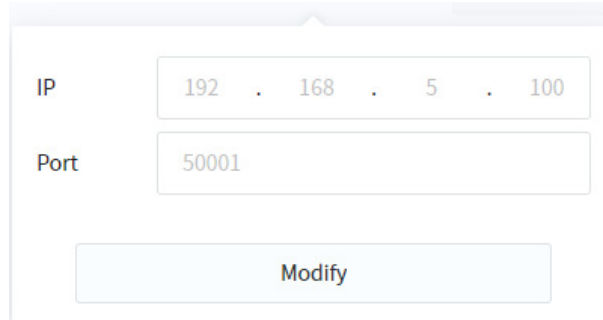
#### Basic debugging



**Figure 5.66 Debugging Popup (Basic debugging)**

#### ① Debugging for lifting column

If the lifting column is not connected, click to view and modify the IP and port settings for the lifting column you want to connect. Typically, the default IP of the lifting column matches the preset IP in the palletizing process package when the workstation is shipped, so no changes are needed. However, if you've modified the lifting column's IP or are using a different lifting column, you'll need to update the IP and port here.



**Figure 5.67 Lifting column IP**

Click **Connect**, the system will start connecting to the lifting column.

Once connected, the current position of the lifting column (relative to the initial position, with a maximum height of 900mm) will be displayed. You can manually control the lifting column by long-pressing the **Down** or **Up** buttons.

You can also enter a target position and then long-press the **Run to** button to move the lifting column to the specified position (a prompt will appear once the target position is reached). If an unexpected situation occurs during movement, releasing the **Run to** button can stop the lifting column.

After debugging, click **Disconnect** to disconnect from the lifting column.

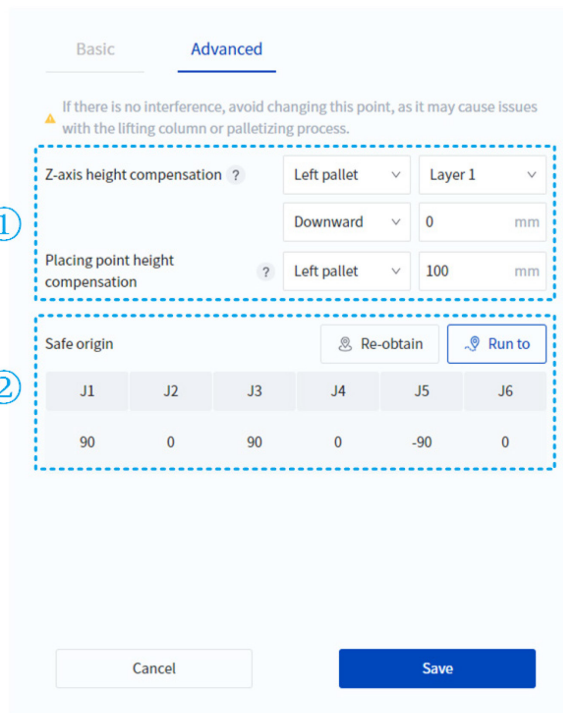
## ② Debugging for pneumatic suction cup

You can click **Grip** or **Release** to change the status of the suction cup for debugging.

## ③ Basic debugging parameter settings

- **Grip Wait Time:** The time to wait for the suction cup to securely grip the box. Reducing the wait time can increase palletizing speed, but it may cause the box to be inadequately gripped. Adjust according to the actual situation. Unit: ms, Range: (0,5000], Default: 1500.
- **Release Wait Time:** The time to wait for the suction cup to place the box. Reducing the wait time can increase palletizing speed, but it may cause the robot arm to disturb the box when moving away, affecting the palletizing result. Adjust according to the actual situation. Unit: ms, Range: (0,5000], Default: 1500.
- **Safe height for picking point:** The vertical height the robot arm moves to before and after picking up a box. Unit: mm, Range: (0,1000], Default: 300.
- **Drop detection:** This function can only be enabled if the **vacuum detection signal** has been activated in [Palletizing workstation settings](#). When enabled, the system will trigger an alarm and stop the project if it detects that a box has fallen during palletizing.

## Advanced debugging



**Figure 5.68 Debugging Popup (Advanced debugging)**

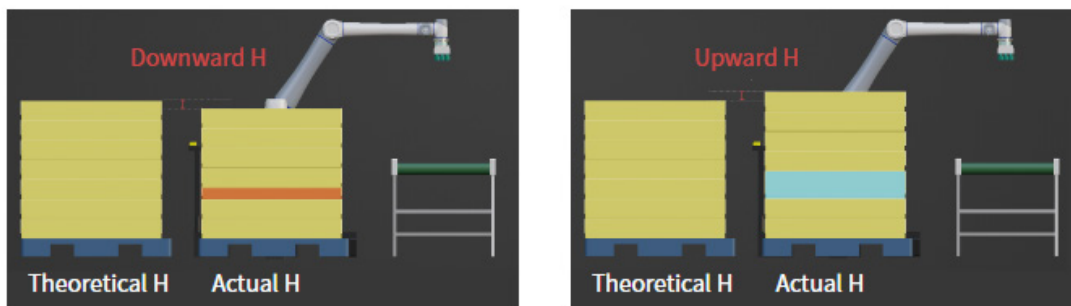
### ① Compensation

You can set the compensation based on the problems that occur during palletizing. For double pallets, you need to set the compensation for the left pallet and the right pallet separately.

- Z-axis height compensation:** During palletizing, discrepancies in the actual box sizes or deformation of lower layers due to compression can lead to significant differences between the actual height and the calculated theoretical height after stacking several layers, impacting the palletizing quality.

To address this, identify the layer where the significant differences occurs. If the actual height of that layer is lower than the theoretical height, choose **Downward**; if it is higher, choose **Upward**. Then calculate the compensation height (maximum: 200mm) using the following formula:

$$\text{Compensation height} = \text{Theoretical height} \times \text{Number of layers} - \text{Actual height}$$

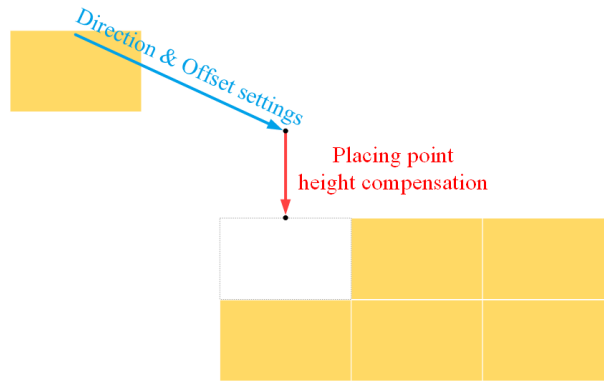


**Figure 5.69 Z-axis height compensation**

In the actual palletizing process, as shown in the figure, if height deviation starts from the third layer, you should begin compensating from that layer. If, after adjusting and

continuing, further height deviations occur in the upper layers, you need to add the required compensation for each layer to form a new compensation value.

- Placing point height compensation:** It corresponds to the height at which the box is vertically placed during palletizing, i.e., the height difference between the “point directly above the placing point” and the “placing point” itself. The box will approach the point directly above the placing point from a specified direction according to **direction & offset settings**, and then be lowered vertically, as shown in the figure below.

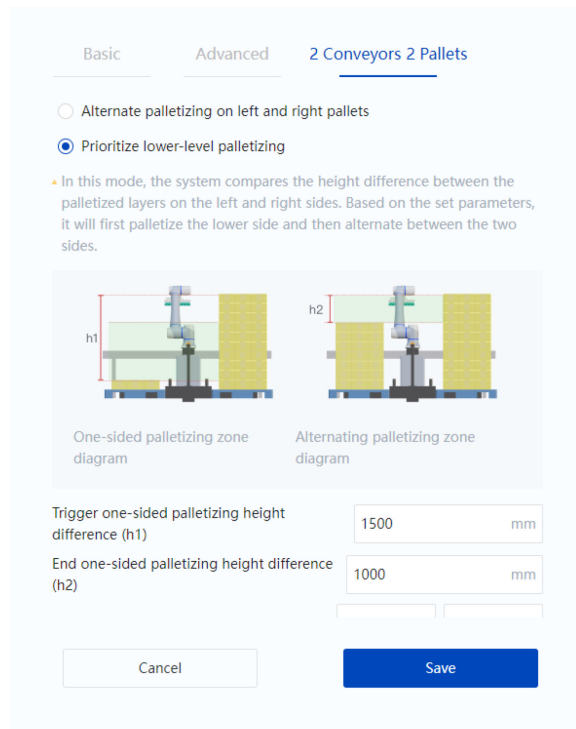


**Figure 5.70** Placing point height compensation

## ② Safe home position

When the palletizing project starts running (or restarts after being stopped), and after completing each pallet, the robot arm will return to the safe home position. If the posture at this position does not cause any interference, it is advisable not to alter this point, as changes could result in abnormal movements of the lifting column or robot arm.

## “2 Conveyors 2 Pallets” debugging



**Figure 5.71** “2 Conveyors 2 Pallets” debugging

This tab is only displayed when the current project is in “2 Conveyors 2 Pallets” mode.

First, you need to select the specific palletizing mode based on the actual conditions of the production line:

**Alternate palletizing on left and right pallets**

In this mode, the workstation alternates palletizing between the left and right pallets, following the sequence: Left box 1 => Right box 1 => Left box 2 => Right box 2.

If the system finishes palletizing Left box 1 and the right conveyor’s feeding signal is inactive while the left conveyor’s signal is active, the workstation will continue palletizing on the left pallet until the right conveyor’s signal is activated, and vice versa.

This mode is suitable for scenarios where the production capacities of both conveyors are similar, and the box sizes are comparable. If the production capacities or box sizes vary greatly, it may lead to a significant height difference between the boxes on the left and right pallets during palletizing.

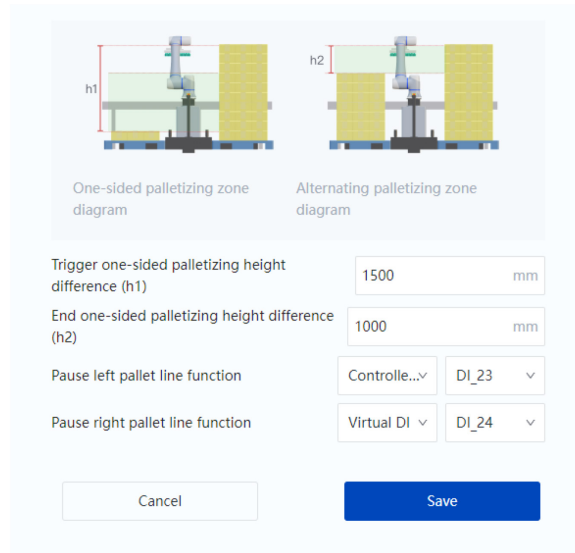
This could result in frequent raising and lowering of the lifting column, slowing down the palletizing speed and potentially damaging the lifting column.

**Prioritize lower-level palletizing**

This mode calculates the height difference between the boxes on the left and right pallets in real time on the basis of the alternating palletizing mode. When the height difference reaches or exceeds a trigger value (h1), the workstation enters one-sided palletizing mode, continuing to palletize only on the side with the lower height until the height difference falls below the ending value (h2), and then resumes the alternating palletizing mode.

**NOTE**

When the workstation is in one-sided palletizing mode, it may cause material to accumulate on the other side. Users should set up a buffer zone on the conveyor based on the actual situation of the production line.



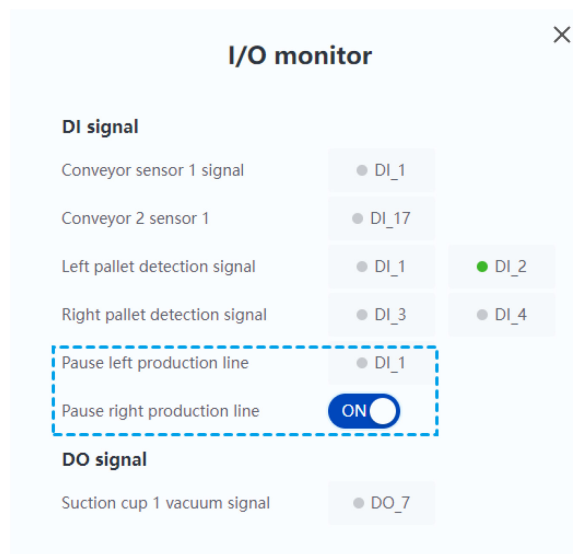
**Figure 5.72 Settings for Prioritize lower-level palletizing**

- **Trigger one-sided palletizing height difference (h1):** When the height difference between the two sides is greater than or equal to this value, one-sided palletizing mode is activated. Range: [0,2200].

- **End one-sided palletizing height difference (h2):** When the height difference between the two sides is less than this value, one-sided palletizing mode ends. Range: [0,2200].
- **Pause left/right pallet line function:** When the corresponding DI is set to ON, the workstation will pause palletizing on that side and only continue palletizing on the other side, ignoring the height difference. If both DI signals are ON, the workstation will stop operating. When both DI signals are OFF, the workstation will resume normal palletizing operations.

The line pause function is only effective in **Prioritize lower-level palletizing** mode and can be configured to be triggered by either **Controller DI** or **Virtual DI**:

- **Controller DI:** Triggered by real Controller DI. The user needs to connect a trigger source, such as a toggle switch, to the corresponding DI on the controller.
- **Virtual DI:** Triggered by virtual DI from the control software. When configured as virtual DI, the corresponding DI on the I/O monitoring page will appear as ON/OFF button (as shown in the figure). The user can only control the DI status through the software, and the real status of the DI interface on the controller will be ignored.



Typical application scenarios for the line pause function (using a physical switch to trigger the DI as an example):

- **Scenario 1:** If the left pallet's production line experiences an issue and no material is fed, the workstation will continue palletizing on the right pallet. If no action is taken, once the right pallet reaches a certain height, the height difference will trigger one-sided palletizing, causing the workstation to stop and wait for material from the left conveyor.

In this case, the operator should press the left line's pause switch to have the workstation palletize only on the right pallet. Once the left line is back to normal, the operator can reset the switch.

- **Scenario 2:** When replacing the left pallet, if only a few boxes remain to complete the right pallet and no action is taken, the height difference could trigger one-sided palletizing. This may cause the workstation to ignore the nearly completed right pallet and continue palletizing on the new left pallet.

To prevent this, the operator can press the left line's pause switch during pallet replacement, allowing the workstation to first complete the right palletizing. Once the right palletizing is finished, the operator can reset the switch.

### 5.9.2 Alarm message and solution

1. **Alarm message:** Communication between the robot and the lifting axis failed.

**Project status:** Stop

**Solution:**

- ① Restart the palletizing workstation.
- ② If the problem persists after restarting, check the connection of the cables related to the lifting column:
  - a. Check if the network cable connection of the robot controller is secure.



**Figure 5.73 Network cable connection for robot controller**

- b. Remove the robot controller, use the triangular key provided in the shipping list to open the cover of the workstation base, and then check if the network cables are securely connected to the lifting column control box (Figure 5.75 highlighted in red at the upper left) and the switch (Figure 5.75 highlighted in red at the lower right).



**Figure 5.74 Base cover (under the controller)**





**Figure 5.75** Check network cables

③ If none of the above methods can solve the problem, contact Dobot technical support engineer for troubleshooting.

2. **Alarm message:** The alarm message will specify the exact unreachable point and provide a solution, e.g., “Cannot reach the placing point for Box 3 on Layer 2. Please check the palletizing pattern settings.”

**Project status:** Stop

**Solution:** Modify the project configuration according to the alarm message.

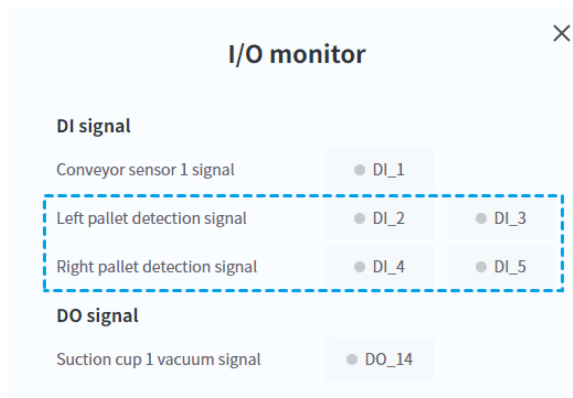
3. **Alarm message:** Missing pallet detected.

**Project status:** Stop

**Solution:**

① Place the pallet in the correct position.

② Check if the pallet sensors are working properly: Open the I/O monitoring window on the palletizing monitoring page, block each pallet sensor with your hand and see if the corresponding I/O signal turns green. If any sensor is not functioning properly, contact Dobot technical support engineer for troubleshooting.



**Figure 5.76** Pallet detection signal

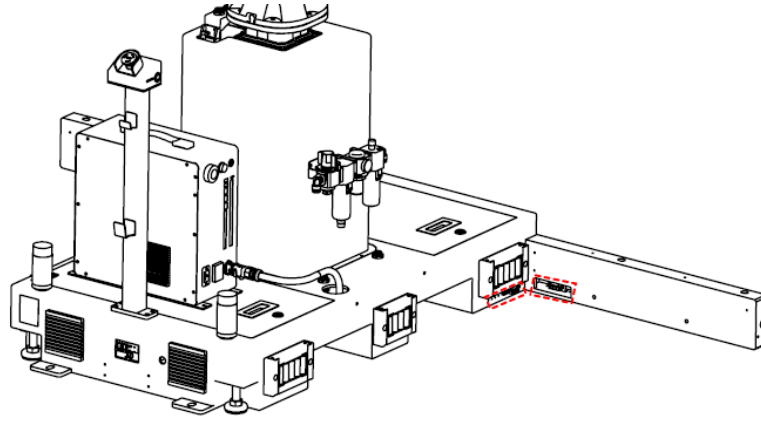


Figure 5.77 Pallet sensor position (same on other side)

4. **Alarm message:** Both production lines and the corresponding pallets have been paused by a DI signal. Please adjust the DI status to resume normal operation.

**Project status:** Pause

**Solution:** Change the DI status according to the actual state of the production line. Refer to [2 “Conveyors 2 Pallets” debugging](#) for more details.

5. **Alarm message:** Box dropped.

**Project status:** Stop

**Solution:**

- ① Adjust the suction cup or pump to increase suction flow.
- ② Adjust the picking point to make the suction cup and the box fit better.

6. **Alarm message:** The box is not released.

**Project status:** Pause

**Solution:** Manually release the box via the [Debug window](#), then continue running the project.

7. **Alarm message:** Insufficient interlayers / The space for interlayers is full.

**Project status:** Pause

**Solution:**

- When palletizing, add interlayers and continue running the project.
- When depalletizing, remove interlayers and continue running the project.

8. **Alarm message:** Failed to create Modbus communication, please check the Modbus address!

**Project status:** Stop

**Solution:**

- ① Restart the robot controller.
- ② Check if the IP in the ModbusCreate command in the project script is set to the robot's IP.

9. **Alarm message:** The lifting column has exceeded the maximum limit of 35 lifts per hour. Please stop for half an hour before running again, otherwise there is risk of burning out the lifting column!

**Project status:** Stop

**Solution:**

- ① Stop the project for half an hour before resuming.
- ② Refer to [2 Conveyors 2 Pallets” debugging](#) to set up the **Prioritize lower-level palletizing** function to avoid triggering this alarm.

10. **Alarm message:** Lifting column status abnormal.

**Project status:** Stop

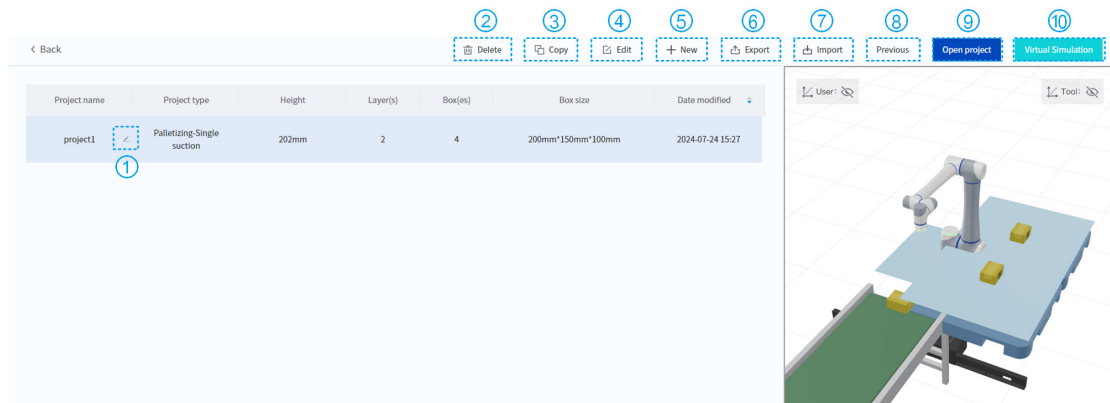
**Solution:** This alarm indicates that communication between the robot and the lifting column is normal, but the lifting column is not functioning properly. Try restarting the workstation. If the error persists, contact Dobot technical support engineer for troubleshooting.

## 5.10 Managing palletizing project



**Figure 5.78 Manage project**

Click **More projects** on the palletizing monitoring page, you can open the project list.



**Figure 5.79 Project list**

- ① Click next to the project name to rename the project.
- ② Select a project and click **Delete** to delete the selected project.
- ③ Select a project and click **Copy** to generate a copy of the selected project.
- ④ Select a project and click **Edit** to modify the configuration of the selected project.
- ⑤ Click **New** to create a new palletizing project.
- ⑥ Select a project and click **Export** to export the selected project in “json” format to your local system.
- ⑦ Click **Import** to import a palletizing project in “json” format from your local system.
- ⑧ Click **Previous** to return to the palletizing monitoring page.
- ⑨ Select a project and click **Open project** to set the selected project as the current project.
- ⑩ Select a project and click **Virtual simulation** to simulate the running of the selected project.

## 6. Product specifications

### 6.1 Product nameplate



Figure 6.1 Nameplate of CR20A Columnar Palletizing Workstation

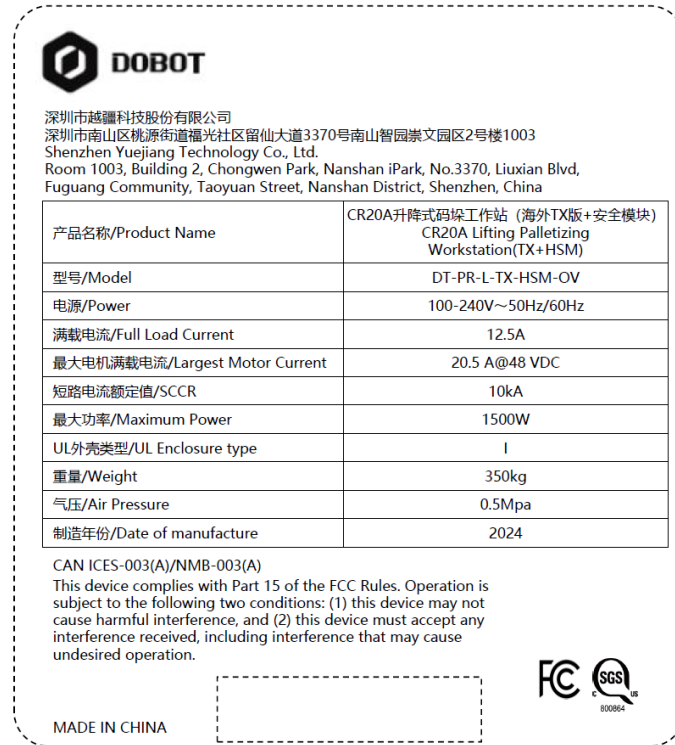


Figure 6.2 Nameplate of CR20A Lifting Palletizing Workstation

## 6.2 Technical specifications

**Table 6.1 Palletizing workstation technical specifications**

Product name	CR20A Columnar Palletizing Workstation (HSM)	CR20A Lifting Palletizing Workstation (TX+HSM)
Model	DT-PR-C-HSM-OV	DT-PR-L-TX-HSM-OV
Maximum payload*1	20 kg	
Maximum palletizing pace*2	Single pick-and-place: 8 pieces/minute	
	Dual pick and Single/Dual place: 12 pieces/minute	
Maximum palletizing height*3	1740 mm	2100 mm
Working radius	1700 mm	
Occupied area*4	1350 mm * 2260 mm	
Complete machine weight*5	350 kg	
Power	100V – 240V, 50Hz / 60Hz	
Short circuit current rating (SCCR)	10kA	
Maximum power	1300W	1500W
Temperature range	0°C – 50°C	10°C – 50°C
Protection level	Robot body: IP54; Palletizing workstation: IP20	
Certification	US&CAN: SGS NA Listed Mark, FCC, ISED	

- \*1: Include the weight of the end-of-arm suction cup.
- \*2: The actual palletizing speed depends on the weight, size, and layout of boxes.
- \*3: The size and layout of boxes may affect the actual palletizing height.
- \*4: Does not include the pallet area.
- \*5: Does not include the weight of the robot arm and end-of-arm suction cup.

### NOTICE

When the ambient temperature is lower than 10°C, the viscosity of the lubricant increases, which may trigger false alarms if the robot arm performs high-speed and high-load movements immediately after powering on. It is recommended to first perform a few minutes of low-speed movements to warm up the device.

### Recommended minimum box size

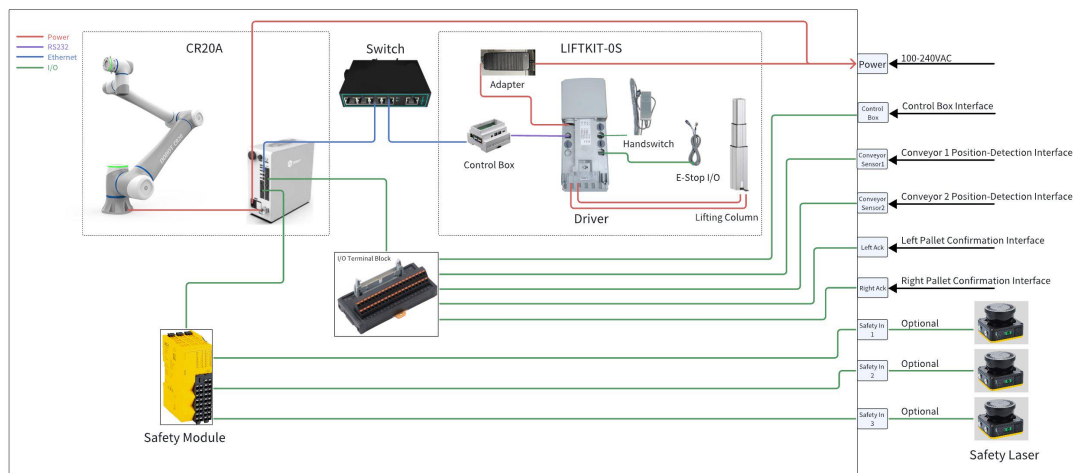
The minimum size of the box depends on the workstation model and the pallet size. As shown in the table below.

**Table 6.2 Minimum box size**

Pallet size Length*Width*Height (mm)	Minimum box size – Length*Width*Height (mm)	
	CR20A Columnar-type	CR20A Lifting-type
1000*1200*138	110*110*110	20*20*20
1200*1000*140	110*110*110	20*20*20
1220*1020*140	130*130*130	40*40*40
1067*1067*110	170*170*170	90*90*90
1100*1100*140	190*190*190	110*110*110
1140*1140*110	230*230*230	150*150*150
1200*1200*110	290*290*290	210*210*210

## 6.3 Electrical topology

The figure below takes the CR20A Lifting Workstation as an example. The CR20A Columnar Palletizing Workstation has no lifting-column-related parts.

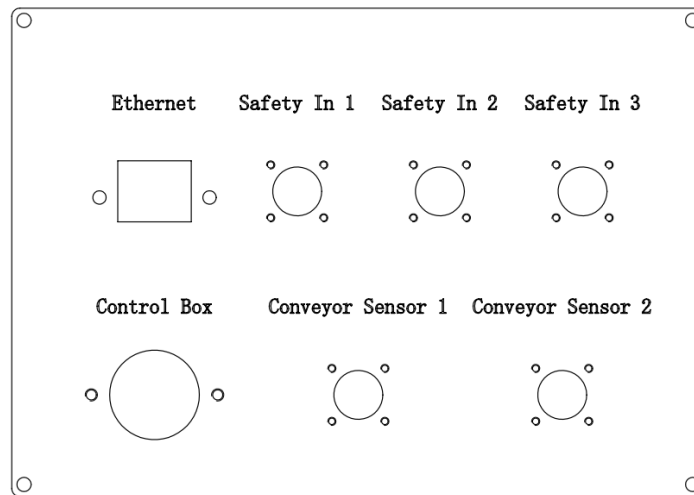


**Figure 6.3 Electrical topology of palletizing workstation**

## 6.4 Electrical interface

### 6.4.1 Overview

The electrical interfaces of the palletizing workstation are concentrated on the front terminal panel, as shown in the figure below.



Silkscreen	Description
Ethernet	The LAN interface used to connect the debugging device has no fixed IP and the network segment is 192.168.5.xxx. During debugging, you need to change the IP of the debugging device to the IP of the network segment other than 5.1 and 5.100.
Safety In 1	Safety laser interface (reserved), see <a href="#">Safety In Interface</a> for details.
Safety In 2	
Safety In 3	
Conveyor Sensor 1	Conveyor incoming signal interface, see <a href="#">Conveyor Sensor interface</a> for details.
Conveyor Sensor 2	
Control Box	Control button box interface (reserved), see <a href="#">Control Box interface</a> for details. There is an aviation socket for this interface included in the accessories list of the palletizing workstation, and the cable is loose and labeled.

#### 6.4.2 Safety In Interface



Figure 6.4 Safety In interface



Safety laser interface. Take the SICK NanoScan3 safety laser as an example, the wiring is defined below.

Safety In 1 / Safety In 2			
Pin	Definition	NanoScan3 I/O	Description
1	N2401-1	Blue 0V DC	Internal power 0V
2	P2401-1	Brown +24V DC	Internal power +24V
3	S1-OSSD1A	White OSSD 1.A	The safety laser protection zone outputs dual channels and needs to be configured with SI3 and SI4 as protective stop. When only using a single laser, the other interface needs to be short-circuited with +24V.
4	S1-OSSD1B	Green OSSD 1.B	
5	S1-OSSD2A	Yellow OSSD 2.A (Universal I/O 02)	The safety laser protection zone outputs dual channels and needs to be configured with SI5 and SI6 as reduced mode. When only using a single laser, the other interface needs to be short-circuited with +24V.
6	S1-OSSD2B	Black OSSD 2.B (Universal I/O 03)	

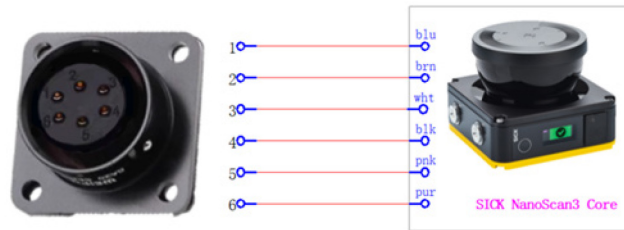


Figure 6.5 SICK NanoScan3 wiring

### 6.4.3 Conveyor Sensor interface



Figure 6.6 Conveyor Sensor interface

Conveyor feeding signal interface, support PNP and NPN inputs.

Conveyor Sensor1 / Conveyor Sensor 2			
Pin	Definition	Description	Remark
1	Sensor 1 / Sensor 2	Arrival signal	1: DI1, 2: DI6.
2	Com1 / Com2	Arrival signal common	For PNP input, the pin is connected to N2401-1. For NPN input, the pin is connected to P2401-1.
3	N2401-1	Internal power 0V	-
4	P2401-1	Internal power +24V	-

When using an PNP-type sensor, Com is short-circuited to the internal power 0V:

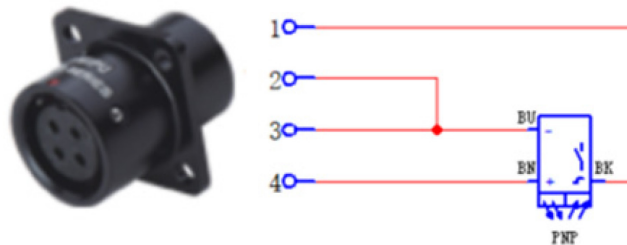


Figure 6.7 Wiring diagram for PNP-type feeding detection sensor

When using an NPN-type sensor, Com is short-circuited to the internal power +24V:

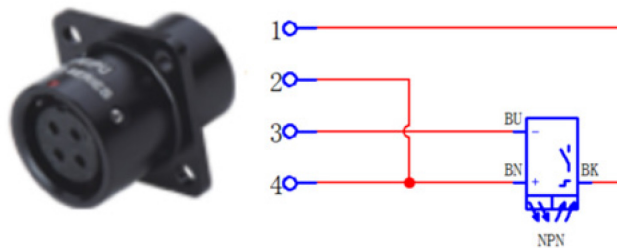


Figure 6.8 Wiring diagram for NPN-type feeding detection sensor

When the external input is a relay passive input:

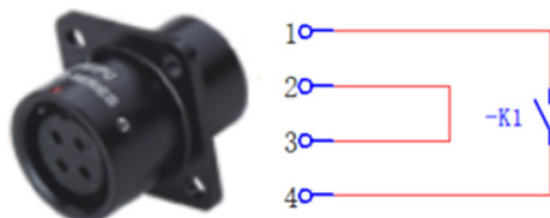


Figure 6.9 Relay passive input wiring diagram

When the external input is a relay active input:

- When the external input is PNP, EXTcom is 0V.

- When the external input is NPN, EXTcom is 24V.

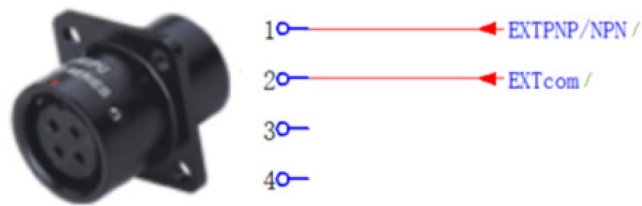


Figure 6.10 Relay active input wiring diagram

#### 6.4.4 Control Box interface

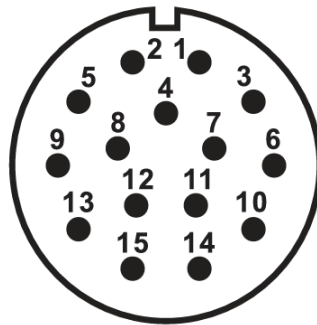


Figure 6.11 Control Box interface

User control box interface, used to connect the user's own control box to realize the project start and stop and protective stop reset function.

Control Box			
Pin	Definition	Description	Remark
1	P2401-1	Internal power +24V	-
2	N2401-1	Internal power 0V	-
3	EM01	External emergency stop 1	Normally closed, short-circuited by default
4	EM02		
5	EM011	External emergency stop 2	Normally closed, short-circuited by default
6	EM012		
7	R1_IN11	Start button input	Used to run the palletizing project. DI11 needs to be configured as Start. For DI configuration method, please refer to DobotStudio Pro help document.
8	R1_IN12	Stop button input	Used to stop the palletizing project. DI12 needs to be configured as Stop.

Control Box			
Pin	Definition	Description	Remark
9	R1_IN13	Reset button input	Used to clear the robot alarms. DI13 needs to be configured as Clear alarm.
10	R1_OUT11	Running status output	Used to connect the Running indicator light.
11	R1_OUT12	Stop status output	Used to connect the Stop indicator light.
12	R1_OUT13	Alarm status output	Used to connect the Alarm indicator light.
13	R1_SI24V	Safety input power +24V	Used for safety I/O.
14	R1_SI9	Protective stop reset	Used for protective stop reset function. SI9 needs to be configured as Protective stop reset. For SI configuration method, please refer to DobotStudio Pro help document.
15	R1_SII0	Protective stop reset	

If an external emergency stop switch is required (dual-channel normally closed), connect it as follows.

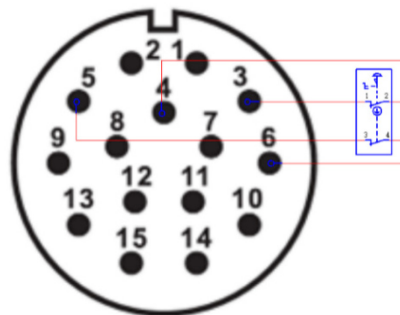


Figure 6.12 External emergency stop switch wiring

If an external control button is required, connect it as follows.

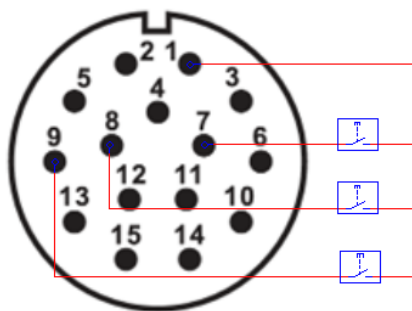
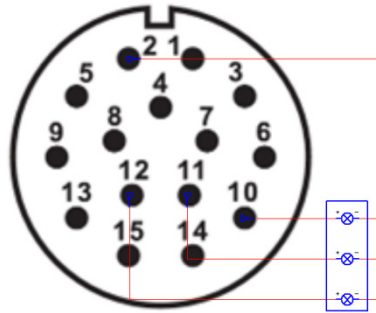


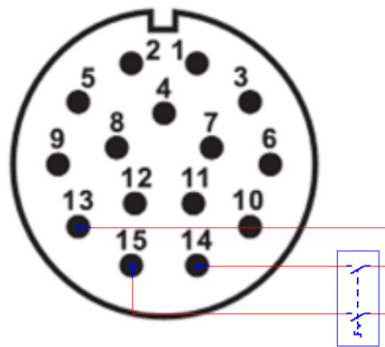
Figure 6.13 External control button wiring

If an external status indicator is required, connect it as follows.



**Figure 6.14 External status indicator wiring**

If an external protective stop reset button is required, connect it as follows (use a dual control button).



**Figure 6.15 External protective stop reset button wiring**

## 7. Maintenance

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

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

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

Robots or parts returned to Dobot should follow the instructions below:

- Remove all parts that do not belong to Dobot.
- Before returning to Dobot, please make a backup copy of the files. Dobot will not be responsible for the loss of programs, data or files stored in robot.
- The robot should move to the package point before returning to Dobot.

To maintain high performance for the robot over a long period of time, , maintenance checks must be carried out. The personnel in charge of the maintenance must prepare a maintenance plan and carry out the maintenance. The maintenance items are shown below.

**Table 7.1 Maintenance item**

Period			Maintenance item	Maintenance essential
1 week	1 months	3 months		
√			Suction cup	Make sure the suction cups and air tubes are free of any cracks, defects, wear and deformation, and replace if necessary.
√			Safety signs	Make sure all safety signs are securely attached and clearly marked, and replace if necessary.
	√		Emergency stop button	Press the emergency stop button and observe whether the workstation is powered off.
		√	Screws	Refer to the screw tightening torque table to confirm the torque.

The bolt tightening torques are shown in the table below.

**Table 7.2 Bolt tightening torques**

Nominal diameter of thread	Outer hexagonal bolt (joint)	Inner hexagonal bolt (12.9)	Inner hexagonal bolt (rear cover)
3 mm	2 Nm	2.4 Nm	0.7 Nm
4 mm	4 Nm	4.5 Nm	-

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Nominal diameter of thread	Outer hexagonal bolt (joint)	Inner hexagonal bolt (12.9)	Inner hexagonal bolt (rear cover)
5 mm	7.5 Nm	9 Nm	-
6 mm	15 Nm	18 Nm	-
8 mm	-	37 Nm	-

The tightening torques vary depending on the type of base metal or bolt. When it is not specified, please contact Dobot technical support engineer.

## 8. Warranty

### 8.1 Product warranty

Without prejudice to any claim agreement that the user (customer) may reach with the distributor or retailer, the manufacturer shall guarantee the quality of the products to the customer in accordance with the terms and conditions below:

If defects caused by manufacturing and/or improper material occur in a new device and its components within 12 months (15 months at most if the shipping time is included) after the device is put into use, Dobot shall provide the necessary spare part, and the user (customer) shall offer personnel to replace the spare part, using another part that represents the latest technology level to replace or repair the related part.

If the device defects are caused by improper handling and/or failure to follow the relevant information set out in the User Guide, the warranty is invalid.

This warranty does not apply to or extend to maintenance (e.g. installation, configuration, software download) performed by the authorized distributor or customer.

The user (customer) must provide the purchase receipt and the purchase date as valid evidence for the warranty. Claims under this warranty must be made within two months of the apparent failure to perform the product warranty.

The ownership of the device or components that are replaced or returned to Dobot shall remain with Dobot. Any other claims arising from or related to the device are not covered by this warranty.

Any items in this product warranty do not intend to limit or exclude the legal rights of the customer or to limit or exclude the liability of the manufacturer for the personnel casualty resulting from its negligence. The duration of this product warranty shall not be extended due to the services provided under the product warranty terms. Under the principle of not violating the warranty, Dobot reserves the right to charge customers for the replacement or maintenance. The foregoing does not imply a change in the burden of proof to the detriment of the client. If there are defects on the device, Dobot shall not be liable for any damage or loss arising therefrom, including but not limited to loss of production or damage to other production device.

### 8.2 Disclaimer

Dobot is committed to improve the reliability and performance of its products, and as such reserves the right to upgrade products without prior notice. Dobot strives to ensure the contents of the User Guide are precise and reliable, but takes no responsibility for any errors or missing information.