



## Embodied Double-Arm Lifting Platform



Realman Intelligent Technology (Beijing) Co., Ltd.

September 2025



## Safety Tips

Thank you for purchasing the products from Realman Intelligent Technology (Beijing) Co., Ltd. After opening the package, please check all accessories against the equipment configuration list. If you find any accessories damaged or missing, contact your dealer or our customer service promptly for assistance.

- Please read the relevant instructions carefully before using the product.
- To ensure your safety and that of the equipment, please confirm that the **power supply voltage** is correct before connecting the charger and charging pile to the power source.
- Before starting the equipment, inspect the surrounding environment to ensure there are no obstacles, unstable ground, or other factors that may **affect the safe operation** of the equipment.
- All operators should receive emergency stop training and understand how to quickly use the **emergency stop button** in case of an emergency to prevent accidents.
- When moving the equipment, ensure that all moving parts are secured to prevent accidents during transportation.
- Strictly observe the equipment's maximum load limit and avoid overloading to prevent equipment damage or safety incidents.
- Operate the device strictly according to the instructions or under professional supervision. Do not operate in violation of guidelines.
- This product contains moving parts. Do not wear jewelry while operating it, and tie up long hair to prevent entanglement and injury.
- If any abnormal situation occurs during operation, please contact a qualified professional immediately.
- After using the equipment, retract both arms and turn off the main power supply.



# Version Statement

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## Revision History:

Version No.	Date	Remarks
V1.0	2024-09-13	Drafted
V1.1	2025-09-04	Revised



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# 1 Foreword

As China's labor force continues to decline and labor costs rise, the replacement of humans with robots has become an inevitable trend for the future. With the rapid advancement of technologies such as multimodal large models and robotic control, integrated robots featuring planning, mobility, perception, and manipulation as their primary functions are increasingly capable of replacing humans in performing a wide range of complex tasks. To meet the growing demand for comprehensive manipulation capabilities across diverse scenarios and tasks, Realman has developed a dual-arm lifting robot.

The embodied dual-arm lifting platform is positioned as a general-purpose hardware development platform, equipped with a mobile chassis, lifting column, global and local depth vision systems, monitoring cameras, a dual-arm system utilizing six-axis robotic arms, and a master control system powered by a high-performance AI edge computer. Based on this hardware platform, users can develop functions such as autonomous navigation, movement, obstacle avoidance, target recognition, large-scale picking and handling operations, teleoperation control, video monitoring, and voice interaction. This enables users to explore the deployment of robots as replacements for human labor in industrial, commercial, and domestic environments.

## 2 Product Overview

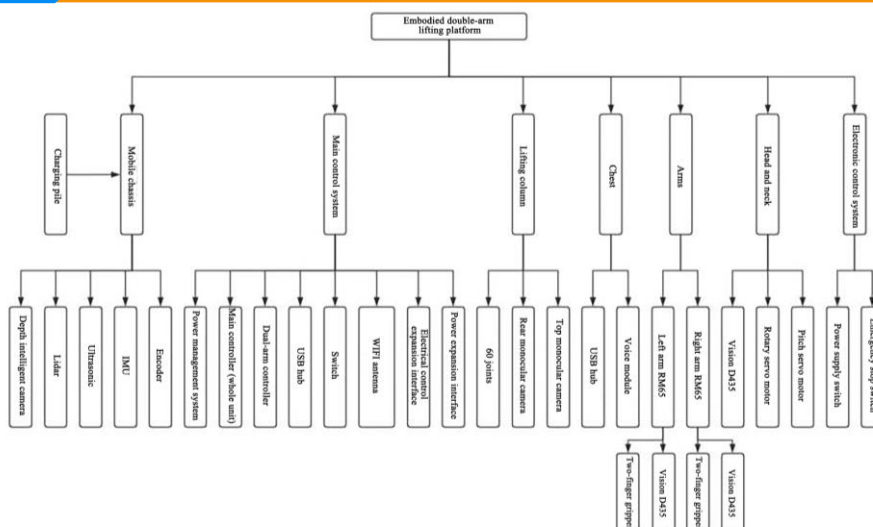
### 2.1 Product Features

Users can leverage the platform to develop data acquisition and model training solutions for wireless teleoperation and dual-arm manipulation. The system enables autonomous planning and execution of inspection and operational tasks across a wide variety of scenarios, with extensive applications in industrial, commercial, domestic, and research environments. The platform has the following features:

- (1) Complete coverage of the operating workspace: The flexible operating range encompasses the full spectrum of human operational space, with a maximum reach of up to 2.4 meters.
- (2) Robust operational capability: The dual arms and grippers offer a rated handling capacity of 8 kg, ensuring strong practicality.
- (3) Open-source ecosystem support: The platform features a well-developed technical ecosystem within an open-source environment, fostering scientific research and scenario exploration.
- (4) Multi-perspective intelligent recognition: Equipped with three depth cameras (D435) for precise 3D vision in object identification and manipulation, and two RGB cameras (USB) for color environmental monitoring, the system meets the demands of multitasking in complex scenarios.
- (5) Data acquisition & model training: The gripper's high real-time responsiveness facilitates efficient data collection and model training for dual-arm operations. Meanwhile, the trained model can also be deployed onto the embodied dual-arm lifting platform for inference and real-world training.

### 2.2 Function Description

The embodied dual-arm lifting platform is composed of a mobile chassis, main control system, lifting column, chest, dual arms, head, electronic control system, and other components. The dual-arm lifting robot is charged via a charging pile. The system layout is shown in Fig. 1.



**Fig. 1 Schematic Diagram of Robot System Layout**

**(1) Main Control System:**

The main control system serves as the control center of the entire machine. The core main controller utilizes NVIDIA's AI supercomputer module designed for edge embedded computing in robotics and autonomous systems, specifically the Jetson AGX Orin 64G with 1TB solid-state drive.

**(2) Mobile Chassis:**

The mobile chassis features autonomous navigation, movement, and obstacle avoidance, providing mobility, power supply, support, and other functions for the entire system.

**(3) Lifting Column:**

The lifting column enables vertical movement and is mounted directly on the upper surface of the chassis. To ensure that the operating height of the robotic arm (i.e., the 5th axis) ranges from 0 to 2400mm, the lifting height is set to 600–1500mm, and the lifting stroke is approximately 900mm. The maximum lifting speed is no more than 150mm/s.

**(4) Chest:**

The chest is mounted on the installation base of the lifting platform, facing forward and aligned with the chassis orientation. The chest serves as the mounting support for both the dual-arm system and the head system.

**(5) Dual-arm System:**

The dual-arm system consists of modules including robotic arms, a binocular depth camera, and two-finger parallel grippers, used for operations such as local target recognition, grasping, sorting, and material handling.

**(6) Head:**

The head is composed of pitch joints, rotation joints, and a binocular depth camera.

**(7) Electronic Control System:**

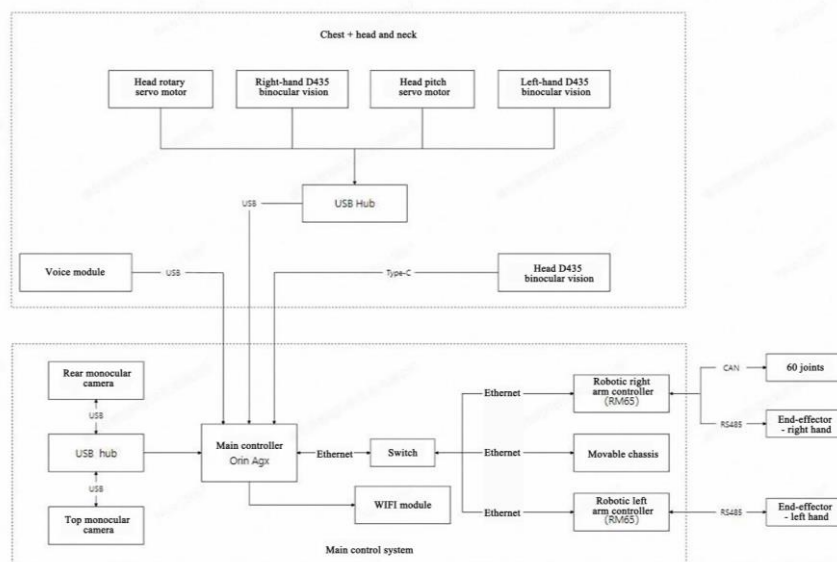
The power switch is shared with the chassis: when the chassis power switch is activated, all



load systems on the chassis are automatically powered on or off. The emergency stop switch is installed at the top of the main control box for easy access and convenient wiring.

## 2.3 System Communication Diagram

The communications for each system are designed as shown in Fig. 2.



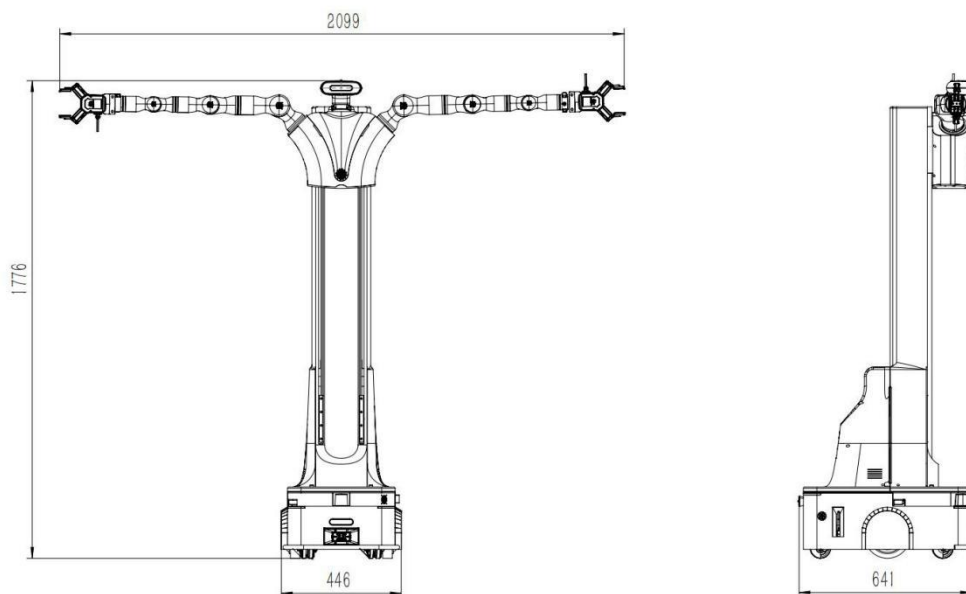
**Fig. 2 Schematic Diagram of Robot System**

## 3 Machine Parameters

Description	Parameter
Dimensions	640 × 450 × 1780mm (retracted), shoulder width 545mm
Total weight	Approximately 157kg
Operation range	Vertical: 0-2400mm (fully extended) Lateral: 790mm beyond the chassis on each side Forward: 0-690mm
Movement speed	≤1.5m/s
Climbing angle	≤5°
Step crossing	20mm
Gap crossing	20mm
Turning radius	Turn in situ
Lifting stroke	900mm
Navigation method	Autonomous navigation based on LiDAR
Obstacle avoidance distance	The obstacle avoidance distance at the front, left, and right sides is consistent, with a maximum range of 3000 mm and adjustable distance settings
Positioning accuracy	Global positioning accuracy: ±10mm/±3°; secondary positioning accuracy: ±5mm/±1°
Working hours	3-4h
Charging duration	2h
Wireless communication	WIFI
Expansion interface	Ethernet port, HDMI, USB 3.0 × 2



The dimensions of the embodied dual-arm lifting platform are shown in Fig. 3.



**Fig. 3 Platform Dimension Diagram**

## 4 Introduction to Subsystem

### 4.1 Structural Subsystem

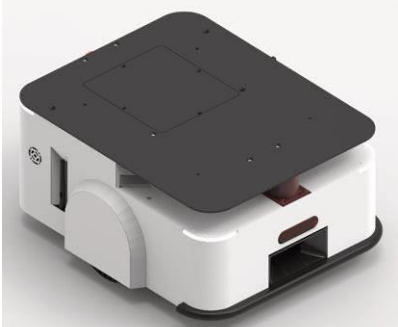
The structural subsystem of the embodied dual-arm lifting platform primarily consists of external components such as the torso and head, as well as internal structural parts and adapters required for integration and installation.

### 4.2 Mobile chassis

The mobile chassis features autonomous navigation, movement, and obstacle avoidance, providing mobility, power supply, support, and other functions for the entire system. Users can access data from the chassis—such as LiDAR, depth camera, ultrasonic sensors, motor encoders, and IMU—via API and HTTP protocols, and adjust parameters as needed. Navigation features can be utilized through interface calls, supporting navigation planning, dynamic obstacle avoidance, autonomous positioning, map creation, automatic charging, etc., enabling users to control and further develop the chassis. The parameters are as follows.


Description	Parameter
Chassis dimensions	640 × 450 × 250 (mm)
Chassis mass	55kg
Vertical load	80kg
Drive mode	Two-wheel differential drive
Speed	1.5m/s
Climbing angle	5°
Turning radius	Turn in situ



Step crossing	20mm
Gap crossing	20mm
Global positioning accuracy	$\pm 10\text{mm}/\pm 3^\circ$
Secondary positioning accuracy	$\pm 5\text{mm}/\pm 1^\circ$
Obstacle avoidance distance	The obstacle avoidance distance at the front, left, and right sides is consistent, with a maximum range of 3000 mm and adjustable distance settings
Operating temperature	5-40°C
Navigation system	Intelligent depth camera $\times 1$ set LiDAR $\times 1$ set Safety edge contact $\times 1$ set Ultrasonic sensor $\times 2$ sets IMU + encoder $\times 1$ set
	

### 4.3 Main control system

The main control system serves as the control center of the entire machine. The core controller utilizes NVIDIA's Jetson AGX Orin 64G module paired with a 1TB solid-state drive—an AI supercomputer module designed for edge embedded computing applications such as robotics and autonomous machines. The specifications are as follows.

Description	Parameter
AI Performance	275TOPS
GPU	2048 NVIDIA CUDA cores NVIDIA Ampere architecture with 64 cores
CPU	12-core Arm Cortex-A78AE v8.2 64-bit CPU (3MB L2 + 6MB L3 cache)
DL Accelerator	2xNVDLA V2.0
Vision Accelerator	PVA v2.0
Storage	64GB eMMC 5.1
Hard disk	1G SSD
	


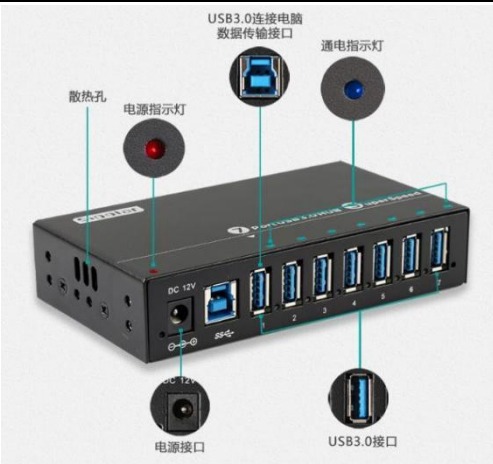
The power management system consists of a switching power supply and a regulated power supply. It draws power from the chassis to supply all upper-mounted loads of the robot. The robotic



arm controller is the standard controller for the RM65-B robotic arm.

The USB interface requirements in this project exceed the number available on the Orin AGX module. To meet these needs and facilitate future expansion of additional USB devices by the customer, a USB expansion dock is provided, featuring USB 3.0 interfaces to ensure high data transfer rates. The selected USB expansion dock model for the main control system is A173.

Description	Parameter
Model	A173
Number of ports	7 ports
Data transmission	USB3.0
Power supply	12V3A
Independent power supply for each port	5V1A
Dimensions	125.6*78.8*27.3mm

## 4.4 Lifting column

The lifting column is equipped with a lifting mechanism and is installed directly on the upper surface of the chassis. To ensure the robotic arm's operating height (i.e., 5th axis) ranges from 0 to 2400 mm, the lifting height is set at 600-1500 mm, with a lifting stroke of approximately 900 mm. The maximum lifting speed is no more than 150mm/s.


A monocular camera is installed on the rear of the lifting column, positioned along the centerline at the back, approximately 1600 mm above the ground. This camera is used for environmental observation and video surveillance when the robot is moving forward or backward.

A monocular camera is mounted at the top of the lifting column. The top monocular camera is primarily used for environmental observation and video monitoring during the robot's forward movement.

The specifications of the monocular cameras on the rear and top are as follows.

Description	Parameter
Interface mode	USB 2.0 (standard UVC protocol)
Pixel	200W
Mode of focusing	FF fixed focus



Field of view	120 °																				
Supported systems	Win7/8/10 Linux Ubuntu																				
Frame rate	<table border="1"> <tr><td>1920 × 1080@30fps</td><td>1920 × 1080@5fps</td></tr> <tr><td>1280 × 960@30fps</td><td>1280 × 960@5fps</td></tr> <tr><td>1280 × 720@30fps</td><td>1280 × 720@10fps</td></tr> <tr><td>960 × 720@30fps</td><td>960 × 720@15fps</td></tr> <tr><td>800 × 600@30fps</td><td>800 × 600@20fps</td></tr> <tr><td>640 × 480@30fps</td><td>640 × 480@30fps</td></tr> <tr><td>640 × 360@30fps</td><td>640 × 360@30fps</td></tr> <tr><td>352 × 288@30fps</td><td>352 × 288@30fps</td></tr> <tr><td>176 × 144@30fps</td><td>176 × 144@30fps</td></tr> <tr><td>160 × 120@30fps</td><td>160 × 120@30fps</td></tr> </table>	1920 × 1080@30fps	1920 × 1080@5fps	1280 × 960@30fps	1280 × 960@5fps	1280 × 720@30fps	1280 × 720@10fps	960 × 720@30fps	960 × 720@15fps	800 × 600@30fps	800 × 600@20fps	640 × 480@30fps	640 × 480@30fps	640 × 360@30fps	640 × 360@30fps	352 × 288@30fps	352 × 288@30fps	176 × 144@30fps	176 × 144@30fps	160 × 120@30fps	160 × 120@30fps
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## 4.5 Chest

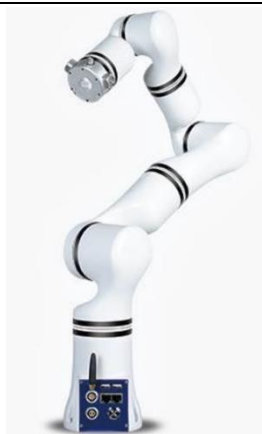
The chest is mounted on the installation base of the lifting platform, facing forward and aligned with the chassis orientation. The chest provides mounting brackets for the dual-arm system and head system, and voice interaction.

## 4.6 Dual-arm System

The dual-arm system consists of modules including robotic arms, a binocular depth camera, and two-finger parallel grippers, used for operations such as local target recognition, grasping, sorting, and material handling.

- (1) Robotic arm: The robotic arm serves as the primary tool for the robot to perform operational tasks. Considering the required degrees of freedom and payload, the RM65-B-V model has been selected. The specifications are as follows.

Description	Parameter
Degree of freedom (DOF)	6
Payload	5kg
Repositioning accuracy	±0.05mm
Operating radius	610mm
Power consumption	Maximum power consumption: 200 W; average power consumption: 100 W
Communication mode	WiFi/Ethernet/Bluetooth/USB serial port/RS485
Joint range of motion	J1 ±178 °, J2 ±130 °, J3 ±135 °, J4 ±178 °, J5 ±128 °, J6 ±360 °
Maximum joint angle	J1–J2: 180 °, J3–J6: 225 °



(2) The binocular depth camera model is D435. To ensure effective target recognition, the camera's main field of view is aligned with the middle section of the gripper fingers. The parameters are as follows.

Description	Parameter
Field of view	87 °(horizontal) × 58 °(vertical)
Ideal working distance	0.3-3m
Depth accuracy	<2% @2m
Depth resolution	1280×720@30fps
Camera principle	Binocular structured light
Connection type	USB Type-C



(3) The two-finger parallel gripper is the primary actuator for operations, with parameters as follows.

Description	Parameter
Overall dimensions	222.5x150.6x45mm
Dead weight	0.8kg
Load	Maximum load 1.4kg
Maximum stroke	90mm
Communication	Modbus RTU, I/O



## 4.7 Head



The head is composed of pitch joints, rotation joints, and a binocular depth camera.

I. Head vision: The head provides a global view and is equipped with a D435 depth camera, enabling users to develop the following functions:

- (1) Global positioning enables the robot to accurately identify distant targets and key features, guiding it to move near the core target object and subsequently directing the robotic arm for target grasping;
- (2) During the robotic arm's gripping process, head vision can detect obstacles around the arm, assisting both the robot and the robotic arm in obstacle avoidance;
- (3) During the robot's movement, the head-mounted vision system can detect elevated obstacles, enabling obstacle avoidance throughout the movement process.

II. Pitch rotation joint: To expand the overall field of view of the robot's head with minimal power consumption and operation complexity, the head is equipped with two degrees of freedom. Pitch motion is implemented using a servo motor, providing a pitch angle range of  $-60^{\circ}$  to  $60^{\circ}$  and a pitch speed of 18 %s. To ensure the head does not interfere with the lifting column during pitch movements, the head should be designed with a forward offset. The specific dimensions depend on the design requirements. The rotation motion is implemented by a servo motor, with a rotation angle of  $\pm 80^{\circ}$ . The rotation speed is 18 %s. The pitch rotation joint is not self-locking.

With the field of view of the D435 binocular camera combined with the pitch and rotation joints, visual coverage can reach a pitch angle of  $-89^{\circ}$  to  $89^{\circ}$ , and a rotation angle of  $-122^{\circ}$  to  $122^{\circ}$ , ensuring the robotic arm is fully within the D435's field of view.

Description	Parameter
Model	LX-224HV High Voltage Bus Servo Motor
Operating voltage	9.6-12.6V
Rotation speed	0.18sec/60°
Rotation range	0~240°
Servo motor accuracy	0.3°
Torque	20kg.cm
Control mode	UART serial port
Communication bit rate	115200
Dimensions	40*51.1*21.4mm
Power-off self-locking feature	None

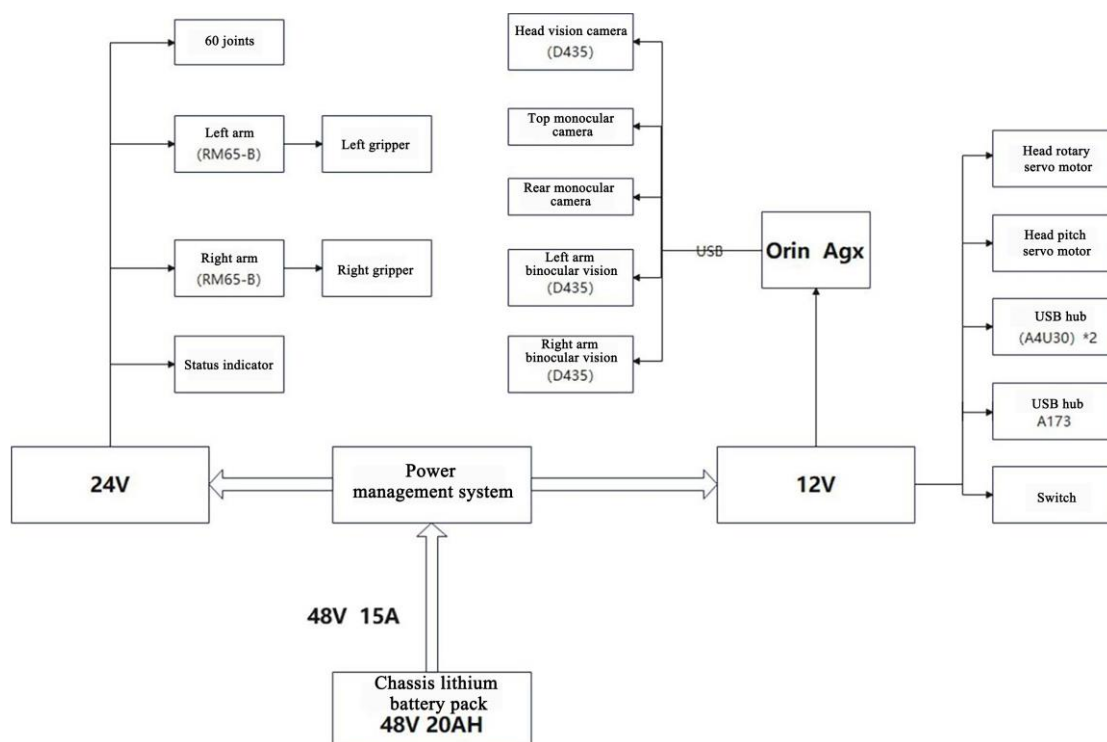


**LX-224 HV舵机**  
 扭矩: 20kg.cm  
 中壳: 阳极氧化铝合金

## 4.8 Electrical System and Other Components



**Power Management System:** The power management system draws a 48V power supply from the chassis and is installed in the main control box located at the back of the lifting column on the chassis. It provides power to the robot's chest, head (including servo motors and vision components), and both arms (including grippers and vision components). The overall power supply configuration is illustrated in Fig. 4.



**Fig. 4 Schematic Diagram of Overall Power Supply**

## 5 Product Configuration

No.	Description	Quantity
1	Mobile chassis	1
2	Main Controller: AGX Orin	1
3	Lifting column	1
4	Monocular monitoring camera (front and rear)	2
5	Robotic Arm RM65-B-V	2
6	Two-finger parallel gripper	2
7	Head servo motor	2
8	Binocular Depth Camera D435 (Head)	1
9	Voice module	1

## 6 Operating Instructions

Please refer to the following instructions for the operation of this embodied dual-arm lifting platform.

### 6.1 Communication Connection

The entire robot platform is interconnected via Ethernet and provides external interfaces. The



IP addresses and default usernames and passwords for each module are configured as follows;

- (1) Mobile platform IP: 169.254.128.2
- (2) Main control module IP: 169.254.128.20
- (3) Mobile platform default username and password: woosh/wooshrobot
- (4) Mobile platform hotspot default password: woosh888
- (5) Main control module default username and password: rm/rm
- (6) Robotic arm teach pendant username and password: root/realman
- (7) Robotic arm (left): IP 169.254.128.18; port 8080
- (8) Robotic arm (right): IP 169.254.128.19; port 8080

## 6.2 Equipment Start

### Step 1: Turn on the robot's main power switch.

The main power switch for the embodied dual-arm lifting platform is located on the mobile chassis (positioned above the right side of the mobile trolley). Press and hold the switch until you hear a continuous sound from the mobile chassis, then release it. The location of the switch is shown in Fig. 5.



**Fig. 5 Main Power Switch of the Embodied Dual-arm Lifting Platform**

### Step 2: Power on the subsystems.

Check if the emergency stop switch is in the normal (released) state. If it is pressed, rotate the button clockwise to release it, then press the power button on the back of the robot. When the robot starts up normally, the status indicator on its back turns blue. The emergency stop switch and the switch/status indicator for the embodied dual-arm lifting platform are shown in Fig. 6.



**Fig. 6 Emergency Stop Switch and Switch/status Indicator Light**

**Step 3: Power off the device.**

To power off the device, press and hold the main power button until you hear a continuous sound, then release it.

**Step 4: Charge the device.**

After connecting the charger to a power source, locate the right side of the charging port on the mobile chassis and insert the charging connector at the end of the charger into the port. When the charger (or chassis charging port) displays a red light, it indicates that charging is underway. The charging port and charger are shown in Figs 7 and 8. Note: During charging, the chassis cannot be operated via the chassis movement software. Additionally, the mobile chassis can be charged using a charging pile, as shown in Fig. 9. The mobile chassis (below the camera)

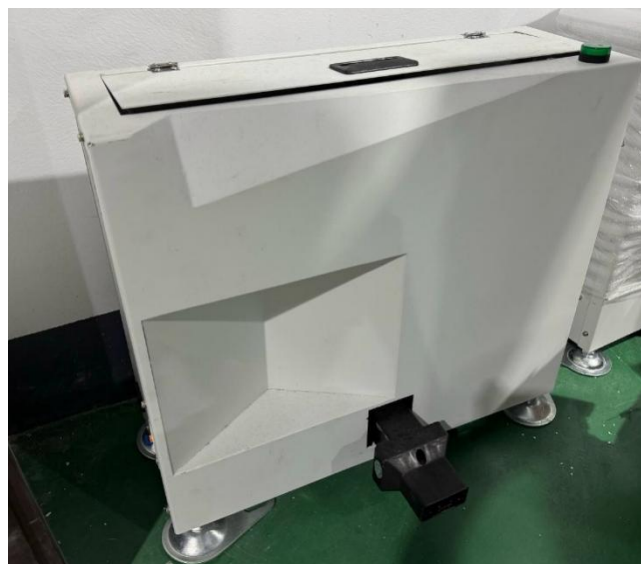
is equipped with an automatic charging port. Insert the black charging connector located at the base of the charging pile into this port. When the charging pile displays a green light, it indicates that charging is in progress.



**Fig. 7 Mobile Chassis Charging Port**



**Fig. 8 Charger**



**Fig. 9 Charging pile**

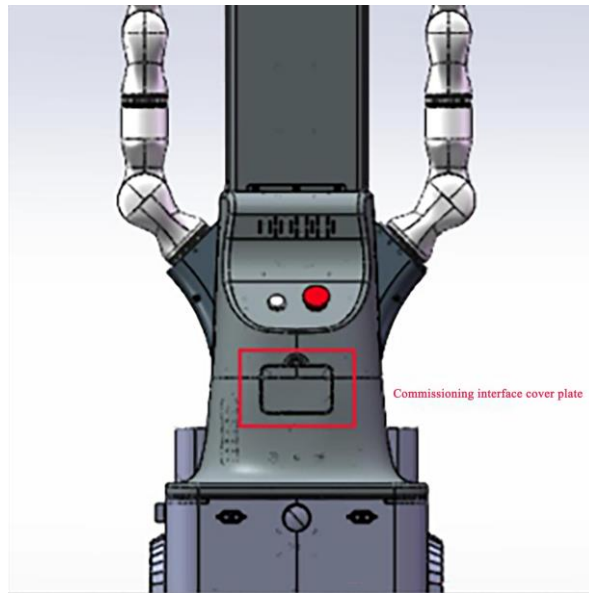
## 6.3 Equipment Commissioning

### Step 1: Open the external debugging interface.

A debugging interface is located at the lower back of the robot. Before connecting, the cover of



the debugging interface must be opened and removed, as shown in Fig. 10.



**Fig. 10 Commissioning interface cover plate**

**Step 2: Connect the external debugging interface.**

The external debugging interface is shown in Fig. 11. There are 4 or 5 external communication ports located under the back of the robot. The socket functions are described as follows:



**Fig. 11 Debugging interface**



- (1) Ethernet port: connectable to the main control module, mobile chassis, and robotic arm
- (2) HDMI port: used to connect to a monitor
- (3) Ten-pin aviation connector for remote control (robots not equipped with a backpack teleoperation device do not have this connector)
- (4) The USB port connects to the main control module
- (5) The USB port connects to the main control module

Note: The internal main control module of the robot is connected via interface ④ and interface ⑤, and comes pre-installed with the Ubuntu operating system. The robotic arm teach pendant software supports both Windows and Ubuntu operating systems. To operate the robotic arm using the teach pendant software on Windows, use an external Windows computer and connect it to Ethernet interface ① with a network cable.

### Step 3: Parameter configuration (using the right robotic arm connection as an example below).

Set the local computer port IP to 169.254.128.33 (any IP in the 10 segment except 10, 11, 18, and 19 is acceptable), as shown in Fig. 12.

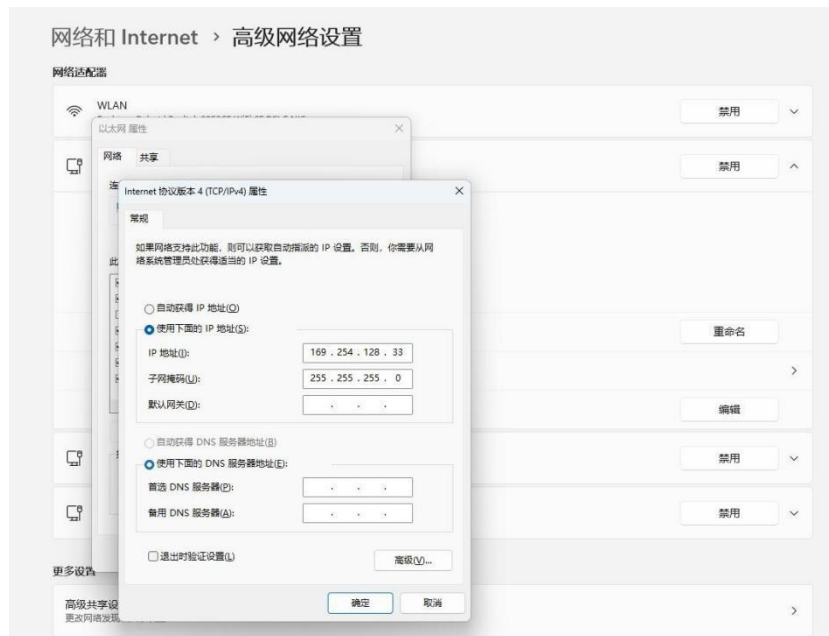


Fig. 12 Computer IP Port Modification

### Step 4: Robotic arm control.

Enter the IP address "169.254.128.18" in Google Chrome, press Enter to open the teach pendant software login page, then log in with the username "root" and password "realman". In the teach pendant interface, select "Robotic Arm Teaching" from the left-side menu, then click the button shown in Fig. 14 to switch to "Real" mode. The robotic arm can now be controlled via the teach pendant. For detailed operating instructions for the teach pendant, please refer to the user manual.

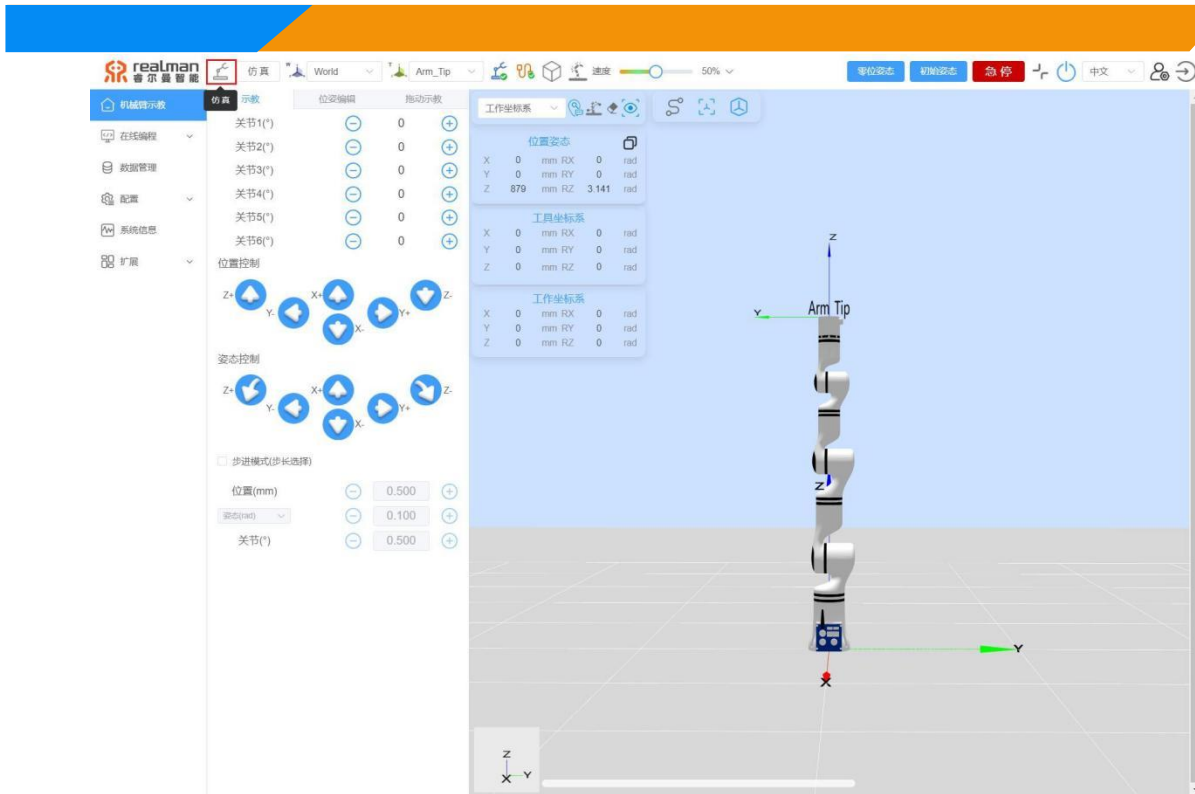


Fig. 13 Robotic Arm Control

### Step 5: Lift control.

After connecting the left arm of the robotic arm, select "**Extension > Lift Control**" from the menu on the left side of the teach pendant. The lift status will then indicate whether it is **enabled** and **online**, or display an error code. Adjust the lift as required, as shown in Fig. 15.

Note: When debugging the lift, it is recommended to reduce the speed to 10%. Increase the speed only after you are familiar with the equipment to prevent accidents.

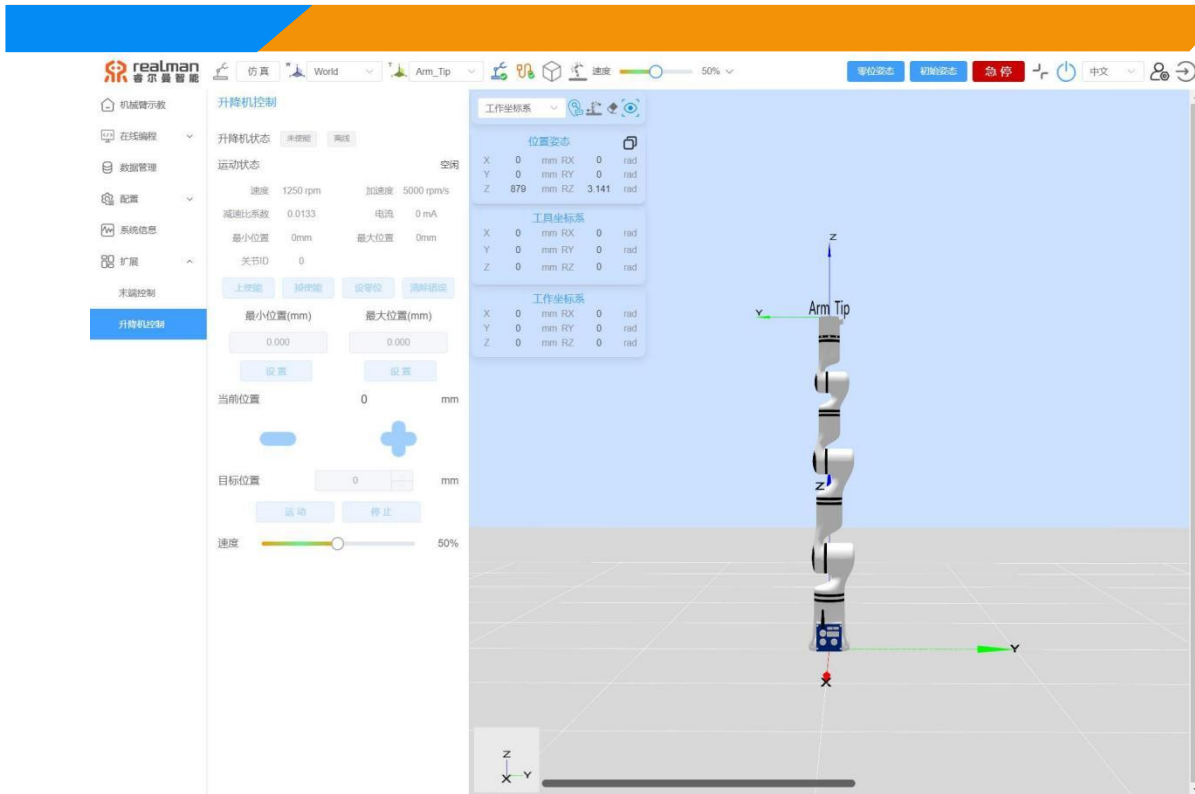


Fig. 14 Lift Control

### Step 6: Online programming.

For the online programming functionality of the robotic arm and lift, please refer to the [Getting Started Guide: Online Programming | Realman Intelligent Technology](#)

### Step 7: Mobile chassis mapping

Use Woosh Mobile software (Windows) and Woosh Design software (Windows) to perform environment mapping and map editing for the mobile chassis.

### Step 8: Debugging other subsystems.

For the development and debugging of other subsystems, please refer to the relevant technical documentation contained in the USB flash drive provided with the equipment.

## 6.4 Precautions for Safe Use

### 6.4.1 Operations prone to accidents or injuries:

#### (1) Three-Dimensional Spatial Clearance

Operation description: When controlling the robotic arm (via online programming or drag teaching), or when operating the lift, the three-dimensional spatial clearance of the robot body and other objects should be considered. Otherwise, the robot housing or robotic arm may be bumped or scratched.

Countermeasures: Before operation, actions should be anticipated to minimize dangerous maneuvers. If risks cannot be avoided, reduce the speed during initial setup to allow more reaction time; additionally, if a risk is anticipated, be ready to press the robot's emergency stop button to prevent accidents.



## (2) Load Range and Power-Off Condition

Behavior description: When using a two-finger gripper to grasp an object, ensure a secure hold and be careful not to exceed the load limits of the robotic arm and the gripper. Additionally, since the 4th, 5th, and 6th axes of the robotic arm are not equipped with brakes, they may move due to external forces after power is cut off (such as when the chassis loses power or the emergency stop is activated). Appropriate measures must be taken after power loss to prevent accidents.

Countermeasures: Comply with equipment requirements when gripping loads and ensure the end effector load is handled in the event of an intentional or accidental power outage. Take steps to prevent axes 4, 5, and 6 of the robotic arm from moving unintentionally under external forces to avoid accidents.

## 7 Transportation, Storage, and Unpacking

### 7.1 Packing list

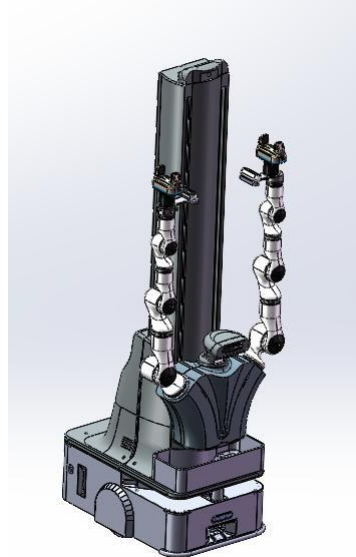
Description	Quantity
Embodied dual-arm lifting platform main body	1
Two-finger parallel gripper	2
Charging pile	1
Material basket	1
Charger	1

### 7.2 Packing Procedure

The following describes the packing and transportation procedures; unpacking should be performed by reversing these steps.

#### Step 1:

During transportation, the robot's posture should be adjusted using drag teaching to the position shown in Fig. 15. Meanwhile, lower the lifting column to its lowest position and retract both arms to maintain the lowest possible center of gravity for the entire machine, thus minimizing impact on the motors during transport.



**Fig. 15 Packing Posture of Embodied Dual-Arm Lifting Platform**

**Step 2:**

Completely wrap the robot with packing foam and protective film. Additionally, use a wooden crate to protect the robot. Note: When manually moving the robot, always lift the chassis sheet metal casing. Do not lift the robot by its arms or other covers to avoid damaging its internal structure.