ELITEMISSION

ELITEMISSION ROBOTS

DC Series User Guide

DC300-06-CE User Manual

Mission Intelligent Robot (Suzhou) Co., Ltd.

2026-06-12

Version: Ver1.0.0

Please read this manual carefully before use.

For product version information corresponding to this version of the user manual, please refer to the version information section of this manual. Please carefully check the actual product version information before use to ensure consistency.

The user manual will be checked and revised regularly, and the updated content will appear in the new version. Changes to the content or information in this manual will not be notified separately.

Mission Intelligent Robot (Suzhou) Co., Ltd. is not responsible for any errors that may appear in this manual.

Mission Intelligent Robot (Suzhou) Co., Ltd. is not responsible for any accidents or indirect damages caused by the use of this manual and the products described herein.

Please read this manual before installing and using the product.

Please keep this manual safe for future reference.

The images in this manual are for reference only; please refer to the actual product received.

Table 1 Version Information

Name	Version
User Manual	Ver1.0.0

Copyright © 2026 ELITEMISSION ROBOTS. All rights reserved.

Table of Contents

1 Precautions Before Use 1

1.1 General Safety Statement 1

1.1.1 Safety Responsibility Statement 1

1.1.2 Personnel Qualification Requirements 1

1.1.3 Safety Labeling Instructions 2

1.1.4 Safety Level Definition 2

1.1.5 Safety Precautions 3

1.1.6 Safety Precautions 6

1.2 Handling and Unpacking 8

1.2.1 Handling Precautions 8

1.2.2 Packaging and Transportation Instructions 8

1.2.3 Handling 8

1.2.4 Packaging and Unloading 9

1.2.5 Packing List 9

1.3 Operating Environment Requirements 9

1.3.1 Site Ground Requirements 9

1.3.2 Network Environment Requirements 11

1.3.3 On-site Operating Environment Requirements 11

1.3.4 QR Code Requirements 12

1.3.5 Robot Transportation and Storage 12

1.4 Battery and Charging Station Related Safety Requirements 13

1.4.1 Precautions for Using Lithium Batteries 13

1.4.2 Safety Requirements for Using Charging Stations 13

1.4.3 How to Dispose of Damaged Lithium Batteries 14

1.4.4 How to Dispose of Waste Lithium Batteries 15

1.5 Forced Movement of the Robotic Arm in Emergency Situations 15

1.6 Noise 15

2 Product Description 16

2.1 Product Introduction 16

2.1.1 Functional Characteristics 17

2.1.2 Application Industries 17

2.1.3 Optional Configurations 17

2.2 Product Structure 18
2.2.1 Dimensions of the Mobile Chassis (including the superstructure) 18
2.2.2 Chassis Component Description 19
2.2.3 Dimensions of the Collaborative Robotic Arm 20
2.2.4 Collaborative Robotic Arm Workspace 21
2.3 Basic Product Functions and Descriptions 21
2.3.1 Function List 21
2.3.2 Technical Parameters 25
2.3.3 Navigation Laser Detection Range 28
2.3.4 Human-Machine Interaction Status Description 28
2.3.5 Load Stability Description 29
2.4 Product Nameplate 29
3 Quick Operation Instructions 31
3.1 Operation Panel 31
3.1.1 Key Switch 32
3.1.2 Power Off Button 32
3.1.3 Emergency Stop Button 32
3.1.4 Brake Release Button 32
3.1.5 Reset Button 33
3.1.6 Display Screen 33
3.1.7 Pre-installed Buttons and Status Lights on the Table 34
3.2 Teach Pendant 35
3.3 Mode Selection 35
3.4 Charging 36
3.4.1 Manual Charging 36
3.4.2 Automatic Charging 36
3.4.3 Quick Battery Swap 36
4 Using the Robot Application Software 38
4.1 Application Software Interface Toolbar 38
4.1.1 Common Toolbar 38
4.1.2 Robot Toolbar 40
4.2 Connecting to the Robot 42

4.3 Drawing a Map 44
4.3.1 Drawing a Non-Reversible Map 44
4.3.2 Drawing a Reversed Map 46
4.3.3 Waypoints 48
4.3.4 Import Map 50
4.3.5 Edit Map, Draw Map Path and Add Obstacle Avoidance Zones 52
4.3.6 Modify Global Map Speed 52
4.3.7 Modify Local Map Path Speed 52
4.4 Robot Control and Navigation 53
4.5 Obstacle Avoidance 53
4.5.1 Testing and Setting Up the Robot Obstacle Avoidance Scheme 53
4.5.2 Configuring Obstacle Avoidance Scheme 54
4.5.3 Applying Obstacle Avoidance Scheme 56
4.6 Positioning 58
4.6.1 Determining Location 58
4.6.2 Accurate Positioning 59
4.6.3 Repositioning 59
4.7 Configuring Wireless IP 61
5 Maintenance and Care 63
5.1 Maintenance Precautions 63
5.2 Maintenance Tools 64
5.3 Maintenance and Care Cycle Instructions 65
5.3.1 Daily Service and Maintenance of the Robot 65
5.3.2 Floor Cleaning Requirements 65
5.3.3 Robot Cleaning Requirements 66
5.3.4 Laser Cleaning Requirements 66
5.3.5 Regular Cleaning Items 66
5.3.6 Monthly Service and Maintenance (i.e., monthly inspection after equipment is put into operation): 67
5.3.7 Annual Service and Maintenance (i.e., annual inspection after equipment is put into operation): 69
5.4 Warranty Information 70
5.5 Simple Troubleshooting 70

5.6 List of Vulnerable Parts 72

5.7 Maintenance Operation Instructions 72

5.7.1 Electrical Component Maintenance 73

5.7.2 Caster Maintenance 73

5.7.3 Drive Component Maintenance 73

5.7.4 Lithium Battery Maintenance 74

6 Appendix 75

6.1 Appendix A: Daily Maintenance and Inspection Checklist 75

6.2 Appendix B: Monthly Maintenance and Inspection Checklist 77

6.3 Appendix C: Annual Maintenance and Inspection Checklist 79

1 Precautions Before Use

Operators are responsible for ensuring that the robot's production environment complies with national and local laws, regulations, and ordinances regarding safety. Robots differ from other equipment; due to their high speed, wide range of motion, and complex posture changes during operation, they may cause personal injury or equipment accidents. Therefore, special attention must be paid to safety to avoid unnecessary losses.

Before installation, operation, or maintenance, please ensure you fully understand the robot's equipment knowledge, safety information, and all precautions.

When referring to robots, HMRs, composite robots, or equipment individually in this document, these are all abbreviations for this particular vehicle model.

Unauthorized disassembly or assembly of the robot is prohibited.

If the robot malfunctions, please contact the manufacturer immediately.

Note: For more detailed safety precautions for collaborative robotic arms, please refer to the "General Robotics" section of Elite Robotics' "CS_User Manual_CS66".

1.1 General Safety Statement

- When installing, operating, or maintaining the product, please read and comply with the safety precautions first.
- To ensure personal and equipment safety, please follow all safety precautions stated on the product label and in the manual when installing, operating, and maintaining the product.
- The "Caution," "Warning," and "Danger" items in this manual do not represent all safety precautions that should be followed, but are only supplementary to all safety precautions.
- This product should be used in an environment that meets the design specifications; otherwise, malfunctions may occur. Functional abnormalities or component damage caused by failure to comply with relevant regulations are not covered by the product quality guarantee.
- Our company will not bear any legal responsibility for personal injury or property damage caused by improper operation of the product.

1.1.1 Safety Liability Statement

The robot strives to provide reliable safety information, but cannot guarantee the completeness of safety information. Even if operations are performed according to safety precautions, it cannot be guaranteed that the robot will not cause personal injury or property damage in complex situations and under uncertain factors.

1.1.2 Personnel Qualification Requirements

The robot may only be installed, debugged, operated, and maintained by qualified professionals.

In addition to the basic mechanical, electrical, commissioning, operation, and maintenance knowledge required for the work described herein, those transporting and handling this product must also possess knowledge of the use of lifting devices and corresponding hoisting tools. To ensure safe use, these tasks may only be performed by qualified personnel or by trainees under the guidance of qualified personnel.

Qualified personnel are those who, based on their professional education, knowledge, experience, and understanding of relevant regulations, can determine the nature of their assigned work, identify potential hazards, and take appropriate safety measures. Qualified personnel must adhere to relevant professional standards and possess

the necessary professional knowledge.

- Mechanical Installation and Commissioning Requirements

Personnel performing mechanical installation and commissioning should possess relevant professional knowledge and experience, have sufficient experience, and be able to assess whether the machine is in a safe operating condition after the use of protective equipment.

- Electrical Installation and Commissioning Requirements

Personnel performing electrical installation and commissioning should possess relevant professional knowledge and experience, have sufficient experience, and be able to assess whether the machine is in a safe operating condition after the use of protective equipment.

- Operation and Maintenance Requirements

Personnel performing operation and maintenance should possess relevant professional knowledge and experience, be familiar with the application of protective equipment on the machine, and be guided by the machine user during operation.

- Personal Protective Equipment Requirements

When using this product, operators should wear appropriate personal protective equipment (such as safety shoes, and avoid wearing long hair loose).

As an equipment operator or operator, you are obligated to prepare suitable protective equipment when using this product.

All components of the personal protective equipment must be complete.

1.1.3 Safety Marking Instructions

Table 1- 1Safety Marking Instructions Table

	Electrical Safety Tips: Pay attention to electrical safety during use.
	Warning Signs: All operations involving such signs and related product safety and user personal safety must be strictly performed in accordance with the requirements; otherwise, product damage or user personal safety may be caused.
	Prohibition Sign: All actions bearing this sign must be prohibited, otherwise they may damage the product or endanger the personal safety of the user.

1.1.4 Security Level Definition

Table 1- 2Security Level Definition Table

 danger	'Danger' means that failure to follow regulations can result in death or serious bodily injury.
 Warning	Warning "indicates that failure to follow the regulations may result in death or serious bodily injury.
 Attention	Attention "means that if not operated according to regulations, it may result in minor bodily injury or equipment damage.

1.1.5 Safety Precautions

Table 1- 3Safety precautions table

Unboxing and acceptance	
 Attention	● Before opening the box, please check whether the outer packaging of the equipment is intact, whether it is damaged, soaked, damp, deformed, etc. ● Please open the packaging in hierarchical order and do not forcefully tap! ● Please check the surface of the equipment and accessories for any damage, rust, scratches, etc. when opening the box. ● After opening the box, please carefully refer to the packing list to check the quantity of equipment and accessories, and whether the information is complete.

 Warning	● When opening the box, if damage, rust, or signs of use are found on the equipment and accessories, please do not install them! ● Do not install if internal water ingress, missing or damaged components are found during unboxing! ● Please carefully compare the packing list. If you find that the packing list does not match the equipment name, please do not install it!
Storage and Transportation	
 danger	● Please have qualified operators carry out handling operations such as rigging, crane lifting, or forklift driving, otherwise it may cause serious injury or significant damage.
 Warning	● Please use cranes and forklifts to transport as much as possible in the original packaging state. ● When using cranes, hoists, and other handling equipment, workers must wear personal protective equipment, and personnel are prohibited from standing or staying around the handling route. ● When lifting equipment, please hold it with your hands to ensure balance. Unstable lifting may cause the equipment to fall, resulting in serious injury or significant damage.
 Attention	● Please store and transport the equipment according to the storage and transportation conditions, and ensure that the storage temperature and humidity meet the requirements. ● Avoid storage and transportation in places with water splashes, direct sunlight, strong electric fields, strong magnetic fields, strong vibrations, etc. ● Avoid storing the equipment for more than 3 months. If the storage time is too long, please perform more rigorous protection and necessary inspections. ● Please strictly package the equipment before transportation by vehicle, and a closed box must be used for long-distance transportation. ● It is strictly prohibited to transport this device together with any equipment or items that may affect or damage it.
use	

 danger	● Please use the system under the specified environmental conditions, otherwise it may shorten the service life of the equipment and cause serious safety issues. ● Please use the system within the specification range, otherwise it may shorten the service life of the equipment and cause serious safety issues.
 Warning	● Before operation, please check if the system is installed correctly, if the cables and air source are connected correctly, and if the peripheral equipment is connected correctly. ● Please do not change the factory settings arbitrarily. ● If the system performs abnormal actions during operation, please immediately press the emergency stop switch, otherwise serious safety issues may occur. ● It is strictly prohibited to transport non-standard items such as flammable and explosive materials, personnel, etc; ● Ensure the correct installation of loads during transportation, as equipment overturning or load dropping can cause personal injury; ● During transportation, efforts should be made to avoid the leakage of fluid loads; ● Using chargers other than those provided by the manufacturer may damage the battery and may cause a fire; ● Do not use HMR equipment to transport people; ● The ground slope grade (ramp, etc.) cannot exceed 5%, as this may cause the robot to slip. ● Can only travel on uniformly dry surfaces, damp and uneven surfaces may cause the robot to slip; ● The robot's maximum effective load is 250kg. Exceeding this may cause tipping, load reduction, and machine damage;
Maintenance and repair	
 danger	● Non professionals are strictly prohibited from installing, wiring, maintaining, inspecting or replacing equipment; ● It is strictly prohibited to perform equipment maintenance or upkeep while powered on, otherwise there is a risk of electric shock; ● Do not disassemble parts not recorded in this manual, or maintain them using methods different from those recorded.

 Warning	● When the equipment malfunctions or is damaged, professional personnel shall troubleshoot and repair the equipment according to the maintenance guidance, and keep a record of the repair. ● Please follow the replacement instructions in the manual for component replacement. ● Do not allow foreign objects to enter the interior and connection terminals of the equipment during maintenance. ● Please do not open the cover of the equipment except for maintenance and upkeep operations. ● After replacing the equipment, please be sure to recheck the wiring and parameter settings of the equipment.
 Attention	● If the HMR is not used for an extended period or during holidays, turn off the power to the HMR unit. If the HMR is not used for more than 2 months, it needs to be charged and maintained. ● When running normally, it is strictly prohibited to modify program parameters. ● The CS66 collaborative robotic arm has brakes installed in its joint modules to maintain the robot's posture when power is off. Do not manually and frequently turn the power supply on and off. It is recommended that the time interval between each power-on and power-off operation be greater than 10 seconds. ● The CS66 collaborative robotic arm features collision detection. When the external force applied to the robot exceeds the user-defined safety limit, the robot automatically stops to prevent injury to the robot or operator. This function is specifically designed for safety in human-robot collaborative work, but it requires the robot system to be within its normal operating range and to be used with a collaborative robotic arm. If other controllers are used, the robot will not have this function, and the user will be responsible for any resulting dangers. ● Ensure that the robot's arms and tools are correctly and safely installed in place. ● Ensure the robot arm has sufficient room to move freely. ● Pay attention to the movement of the robotic arm when using a teach pendant. ● Connecting different mechanisms may increase the risk or create new hazards. If the robot and its accompanying equipment require different levels of safety and emergency stop performance, the higher performance level should be selected.

1.1.6 Safety Precautions

Table 1- 4Safety Precautions Table

	● This product has a high voltage, therefore, non-professionals must not remove its casing to avoid electric shock; ● The grounding terminal of the power socket connected to this product should be reliably grounded, and all sockets, wires, and other components should be qualified products certified by relevant national regulations; ● The power circuit connected to this product should be equipped with an appropriate fuse or other overload protection device; Do not excessively squeeze, bend, or twist the AC power cord to avoid core breakage or short circuit; ● Turn off the power when not in use; ● There should be no short circuit, charging, or incorrect connection of the positive and negative electrodes; ● Do not expose to environments exceeding the specified range, and do not burn the battery; ● Do not squeeze, puncture, or disassemble the battery, as damage may cause the battery to overheat, explode, or burn; ● The battery is recyclable. Do not burn, wet, or discard indiscriminately, but dispose of other waste according to local regulations; ● Only the original charger and battery manual are applicable;
	● This composite robot can only be used indoors, not outdoors; ● Small objects must not be on the floor in the robot's operating area, as the robot cannot detect obstacles smaller than 185 mm; ● Avoid overheating of all components; the robot's operating environment must not exceed 45°C; ● Do not expose the robot to extremely humid or extremely dry environments, and environmental requirements must be met; ● This product should be used away from heat sources and direct sunlight to prevent accelerated aging of plastic and rubber parts, affecting their service life; ● No one should enter the operating area while this product is in operation; ● Do not splash water on the equipment. If water accidentally gets into the product, ventilate and dry it before use; ● This product requires regular maintenance and cleaning according to the instructions in this manual to avoid affecting its service life; ● If the floor, walls, or other environmental conditions no longer meet the environmental requirements of this product, please stop using this product and correct the situation;

	● Untrained personnel must not operate or use this product; ● During the operation of this product, no one is allowed to enter the restricted area, and the safe distance between the robot and personnel must not be less than 500mm; ● It is forbidden for non-company-designated professionals to disassemble or modify the product; ● Do not place open flame sources near the product; ● Do not use this product near flammable or explosive gases and liquids; ● Do not use organic solvents or corrosive liquids to wipe the exterior, plastic parts, and rubber parts of this product; ● Avoid liquid leakage during transportation; ● Do not insert your hands into the gap between the outer shell and the robot shell; ● Do not insert your hands into the gap between the front and rear chassis; ● Do not touch the robot during operation.

1.2 Handling and Unpacking

1.2.1 Handling Precautions

Table 1- 5Handling Precautions Table

 Attention	● The robot's packaging weight is relatively large, therefore, prescribed personal protective equipment should be worn during handling, and reasonable handling methods should be used to avoid personal injury or damage to the robot; ● The robot should be kept dry during transportation or temporary storage to avoid inversion, rain, and high-temperature environments. When hoisting the robot, attention should be paid to secure installation and insertion depth to ensure stability and reliability, prevent collisions with objects and personnel, and prevent the robot from falling off.

1.2.2 Packaging and Transportation Instructions

The robot should be packaged in a wooden crate according to appropriate specifications. The packaging requirements are as follows:

- Wrap the robot in a wooden crate or foam paper to prevent damage during transportation;
- Secure the robot to the base of the wooden crate to ensure it does not move on a flat surface during transportation;

- Due to the robot's heavy weight, it is recommended to use lifting equipment such as a gantry crane to assist in packaging the robot and avoid the danger to personnel caused by manual handling;
- After placing the robot in the wooden crate, secure the robot inside to ensure it does not move; the wo oden crate containing the robot should be transported using specialized equipment. During the transporta tion of the wooden crate, the robot handling requirements should be strictly followed to prevent the crate from getting wet. Stacking more than two wooden crates on top of each other is strictly prohibited, and the crates should be kept flat.

1.2.3 Handling

Handling Preparation: It is recommended to use a 1T forklift.

The packaging box is a steel-edged wooden box. Please prepare a 1T forklift in advance. Unload the pa ckaging box from the transport vehicle according to the direction shown in Figure 1-1 and transport the packa ging box to the equipment installation location.

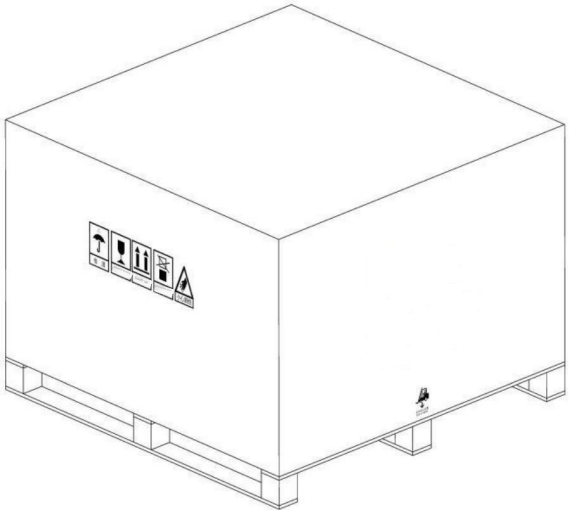


Figure 1- 1Packaging Crate Handling

1.2.4 Packaging and Unloading

The robot is generally placed on a wooden board, as shown in Figure 1-2, and then packed into a crate. However, due to limitations in the actual loading and unloading environment, loading and unloading may be i nconvenient. Therefore, a ramp is recommended.

1.2.5 Packing List

After unpacking, please check the product condition and composition according to the packing list.

Table 1- 6Packing List

Material Name	Quantity (PCS)
Robot Body	1

1.3 Operating Environment Requirements

1.3.1 Site Surface Requirements

Before the robot enters the site, Mission staff should inspect and evaluate the robot's operating area based on its technical requirements for the ground. The customer shall complete the renovation on their own, and after the construction is completed, on-site inspection and acceptance shall be carried out after inspection. The basic requirements for flooring are as follows: Technical requirements for flooring are specially formulated (referring to the national standard GB502092010 Code for Acceptance of Construction Quality of Building Flooring Engineering):

- Undulation: Within a 1 ㎡ area, the maximum allowable value should be less than 3mm (inclusive);

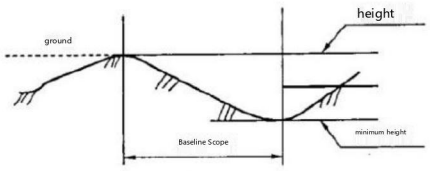


Figure 1- 1Schematic Diagram of Undulation Range

- Road slope: Road slope (H/L) is defined as the maximum ratio of the difference in horizontal height of the road surface to the length of the road surface within a length range of 100mm or more for the robot. The maximum allowable road slope must be less than 0.05 (inclusive), and for parking points requiring precise positioning, it must be less than 0.01 (inclusive).

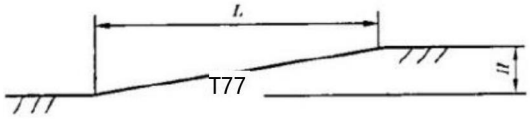


Figure 1- 2Schematic Diagram of Road Slope Range

- Step height: The step height is defined as the maximum difference in road surface level within a length range of 100mm or more. The maximum allowable step height should be less than 5mm (inclusive). Steps are not allowed in HMR parking positions.



Figure 1- 3Schematic Diagram of Step Height Range

- Groove width: The maximum allowable width of road surface cracks should be less than 10 mm (inclusive);

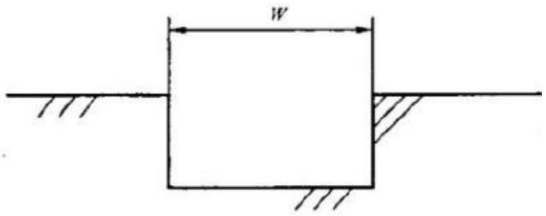


Figure 1- 4Schematic Diagram of Ditch Width Range

- Ground load: The average ground load of the DC300-06-CE composite robot should reach 500kg/m2;
- Floor hardness: The floor hardness should be above C30 (tested with a rebound hammer, the value is g reater than 30MPa);
- Surface Material:

1) Emery floor or hardened cement floor, requiring wear resistance, no static electricity, and no dust generation upon friction;
2) The surface resistivity or volume resistivity of the ground material should not exceed 1.0*10^9 Ω;
3) If epoxy flooring is used, anti-static treatment is required;
4) The operating floor must be free of dust, water, ice, etc. To prevent the machine from slipping during emergency stops or braking;
5) Waxing is prohibited on the floor. The static friction coefficient between the floor and the polyurethane wheels should be no less than 0.55 (generally, unwaxed floors can achieve this value);

There should be no obvious pits or uneven parts on the floor, or residual steel nails, expansion screws, or other items.

1.3.2 Network Environment Requirements

Before the robot enters the site, a wireless network environment should be set up in the robot's operatin g area as required. If the network is built by the warehouse operator, it should be inspected and accepted by Mission after construction. The robot's wireless network environment should meet the following requirements:

1) As an industrial production network, HMR requires dedicated frequency bands and independent use of 5 G;
2) The weakest signal at the edge of the covered network environment must be greater than -65dBm;
3) Minimum signal-to-noise ratio: 25 dBm;
4) Network overlap: 10% ~ 20%;
5) Channel overlap: not more than -82dBm;
6) Single-terminal bandwidth not less than 2Mbps;
7) The number of terminals associated with a single AP must be no less than 30;
8) End-to-end latency from robot to server not more than 100 ms;
9) Typical / Maximum roaming time: For wireless client robots, it is necessary to set or negotiate a wireless roaming threshold that supports the corresponding frequency band signal.

1.3.3 On-Site Environmental Requirements During Operation

When the robot is running, the following requirements must be met on-site:

Table 1- 7On-site environmental requirements table

Environment	Indoor environment
Ground conditions	The surface material of the HMR's operating surface is preferably hard cement or conductive plastic;
	The HMR operating surface must be free of iron filings, oil stains, and corrosive liquids;
	Avoid seams in the operating path, the maximum seam should not exceed 30mm;
	Ground slope not greater than 3°, and not greater than 1° at parking points requiring precise positioning
	Based on the requirements of braking safety distance and handling positioning accuracy, the coefficient of friction of the ground should not be less than 0.5
Temperature	Working area temperature: operating area temperature range -10℃~45℃ Charging area temperature: 0℃~45℃ Special customization is required for cold storage environment
Humidity	Relative humidity 10%~90% non-condensing
Signal	Dual-band Wi-Fi 2.4G/5G Wireless signal coverage strength higher than -70dBm
Altitude	Electrical equipment is designed to operate normally in environments at altitudes of 2000 meters and below. For equipment used in high-altitude areas, the following factors must be considered to reduce: ● Dielectric strength; ● Switching capability of the equipment; ● Cooling effect of the air. If the product data does not specify a correction factor, it is recommended to consult the manufacturer for applicable correction factors.

1.3.4 QR Code Requirements

When using QR codes on-site, the following precautions should be taken:

1) The reference code spacing is 1000 * 1000 (mm), supporting unequal spacing layout of QR codes;
2) Do not step on the QR code;
3) Do not use a mop to directly contact the QR code surface;
4) Do not scratch the QR code with foreign objects;
5) Do not use glue, paint, oil, ink, etc. to damage the QR code;
6) Do not use steel wool, dish brushes, laundry brushes, or other hard materials to clean the QR code;
7) Do not clean the QR code directly with water or detergent.

1.3.5 Robot Transportation and Storage

➢ Packaging and Transportation Instructions

The robot should be packaged in a wooden crate according to appropriate specifications. The packaging requirements are as follows:

1) Wrap the robot in a wooden crate or foam paper to prevent damage during transportation;

2) Secure the robot to the base of the wooden crate to ensure it does not move on a flat surface during transportation;

3) Due to the robot's heavy weight, it is recommended to use lifting equipment such as a gantry crane to assist in packaging the robot and avoid the danger to personnel caused by manual handling;

4) After placing the robot in the wooden box, it is necessary to secure the robot inside the box to ensure that it does not move;

5) Wooden boxes with built-in robots should be transported using specialized equipment. During the transportation of wooden boxes, the robot's handling requirements should be strictly followed to prevent the boxes from getting wet. It is strictly prohibited to stack two or more wooden boxes on top of each other, and the wooden boxes should be kept flat.

- Storage instructions

When the robot is stopped for a long time, it should be stored according to the following conditions:

1) Indoor storage, away from dust and flammable, explosive, or corrosive gases and liquids;

2) Temperature: -10~50 ℃;

3) Humidity: not exceeding 80%, no condensation of moisture;

4) The battery should be charged to ≥ 100% of its rated capacity and regularly charged;

5) When stored at room temperature, the battery should be fully charged and discharged at least every 6 months, otherwise it may be damaged.

1.4 Safety Requirements for Batteries and Charging Stations



Precautions for battery use

- Lithium batteries are high-energy substances that must be used under certain technical conditions. If the usage exceeds the limit, the buyer must notify the seller in writing and the seller must confirm before proceeding. Otherwise, the consequences shall be borne by the party at fault.
- Please use the original charger. Do not mix chargers from other brands, otherwise it may cause irreversible damage to the battery.

1.4.1 Precautions for Using Lithium Batteries

- Batteries pose risks such as fire and explosion. Do not decompose, crush, incinerate, heat, or put the battery pack into fire.
- Protect the battery from mechanical damage (collision, drop, vibration).
- It is strictly prohibited to use dropped or damaged batteries.
- It is strictly prohibited to use faulty or damaged batteries.
- It is strictly prohibited to use batteries with damaged connecting cables or contacts.
- It is strictly prohibited to put the battery into water or wet it.
- It is strictly prohibited to replace lithium batteries in liquid environments.
- Do not contact the positive and negative terminals of the battery with the metal casing at the same time.
- Do not short-circuit, overcharge or over discharge the battery.
- Do not use or store batteries near heat sources such as fire or heaters.
- Do not reverse the polarity of the battery.

- Do not pierce the battery housing with nails or other sharp objects, and do not hammer or step on the battery.
- Please do not disassemble or repair the battery in any way without authorization.
- Do not impact, throw, or subject the battery to mechanical vibration or natural drop.
- Do not mix different types and brands of batteries for use.
- If the battery emits an odor, heats up, deforms, discolors, or exhibits any other abnormal phenomena, it shall not be used and the battery shall be transferred out of the operating environment.
- If the battery catches fire, use dry powder, foam extinguisher, sand, etc. to extinguish the fire, and transf er the battery out of the use environment.
- When storing batteries, please pay attention to the relevant laws and regulations of the country.

1.4.2 Safety Requirements for Using Charging Stations

If the operator purchases our charging station, they need to pay attention to the following matters

 Warning	**The charging contacts of the cross charging station may pose a risk of injury!** Jumping charging contacts can cause damage, spark discharge, overheating, and fire hazards. ● Items, especially conductive or flammable materials, must not be placed in the area in front of the charging contact of the charging station.
 Attention	**Incorrect positioning of charging stations can pose a risk of injury!** There is a risk of tripping when placing charging stations on driving routes and passages. ● Do not place the charging station in the driving route and passage. **Improper installation of charging stations can pose a risk of injury!** ● Anchor the charging station on the workshop floor to avoid functional failures and associated risks. ● Lay connecting cables according to the risk prevention regulations of relevant countries. **Incorrect use can pose a risk of injury and may result in product damage!** There is a risk of falling and getting injured when boarding or stepping on the charging station, as well as a risk of damaging the charging station casing. ● Do not use the charging station as a stepping or climbing aid.

1.4.2.1 Usage Requirements

1) Altitude not exceeding 2000m;
2) Charging environment temperature: 0 ℃~45 ℃ (HMR charging environment with heated battery: -20 ℃~ 40 ℃);
3) The maximum relative humidity of the air does not exceed 90%, and the air circulation is good;
4) The operating location should be free from conductive and explosive dust, gases or vapors that corrode metals or damage insulation, and strong electromagnetic interference;
5) The mounting base should be free from severe vibration and impact, and its vertical tilt should not exce ed 1°;
6) Ground requirements: Same as HMR requirements;

1.4.2.2 Electrical Requirements

1) The power supply circuit of a single charging station shall not be less than 3000W;

2) Use a 16A three-hole socket, and each charging pile should be equipped with a circuit breaker or fuse of not less than 16A;

3) The three-hole socket should be installed 30cm off the ground and aligned with the center of the chargi ng station;

4) For charging station wiring, red wires should be connected to red studs, and black wires to black studs. Avoid reverse polarity connection, which may cause short circuits or equipment damage; Note: The clien t is responsible for providing the on-site power supply layout.

1.4.2.3 Installation Requirements

1) Use M12 anchor bolts to fix to the ground, quantity 4 sets;

2) A minimum of 30cm of space must be maintained at the opening on the back of the charging station;

3) During installation, the charging head and the center of the grounding pad should be aligned.

1.4.3 How to Handle Damaged Lithium Batteries

- Damaged batteries should only be handled and transported after wearing alkali-resistant and solvent-resis tant personal protective equipment.
- If the battery shows signs of overheating, smoking, emitting odors, making noise, or deformation, please separate the battery from its casing.
- Store batteries in refractory containers or keep them a safe distance from flammable materials.
- Do not inhale any fumes.

1.4.4 How to Dispose of Used Lithium Batteries

- Please dispose of batteries professionally.
- Remove the contact points for disposal.
- Store damaged batteries in refractory containers.
- Always comply with the hazardous materials transport requirements related to batteries during transport.

1.5 Forced Movement of the Robotic Arm in Emergency Situations

In rare cases, it may be necessary to move one or more robotic arm joints in emergency situations where the power supply to the collaborative robotic arm fails or power is not desired. This can be achieved by forcing the robotic arm joints to move using the following methods:

Forced reverse drive: Use force (at least 500N) to push or pull the mechanical arm body, forcing the joint to move.

Reverse drive function definition: The reverse drive function can be used to release the robotic arm from a stuck state. When entering reverse drive mode, the robotic arm can be dragged directly by hand. When the force reaches a certain level, the servo will automatically release the brake and be pushed.

Triggering condition: When the robotic arm is in standby mode, pressing the drag button will enter reverse drive mode.

Note: Forced manual movement of the robotic arm body is only permitted in emergency situations and may damage the joints.

1.6 Noise

The noise generated during the operation of the robot is ≤ 75 dB.

2 Product Description

2.1 Product Introduction

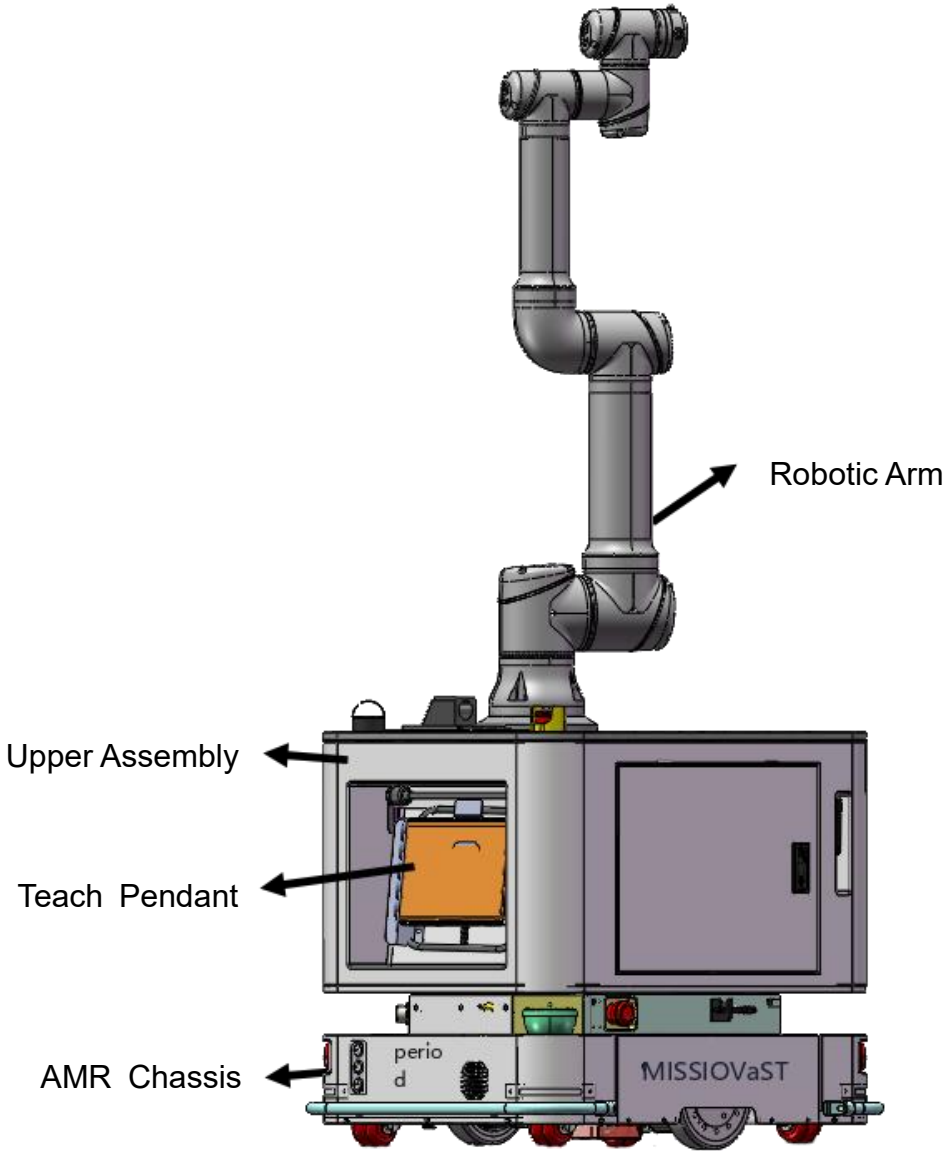


Figure 2- 1Product Image

The DC300-06-CE composite robot mainly consists of a mobile chassis (HMR), a superstructure, and a six-axis robotic arm. The chassis and robotic arm are driven by independent controllers. The chassis uses dual differential wheels as its locomotion mechanism, enabling complex motion trajectories such as forward, backward, and rotation. Based on laser SLAM navigation technology, the chassis integrates a high-performance controller, providing core map building and positioning navigation functions. It also features a 2D camera for QR code navigation and provides abundant I/O, CAN, and RS485 interfaces to help users quickly implement various applications of the composite robot. The integrated six-axis robotic arm is programmed and operated via a dedicated teach pendant or an independent control system. Regarding coordinated operation, although the chassis and robotic arm have different controllers, they are linked by an emergency stop signal: pressing any emergency stop button on either the chassis or the superstructure simultaneously cuts off the power supply to both the chassis drive and the robotic arm servo, ensuring the entire robot immediately stops all movement in abnormal situations.

2.1.1 Functional Characteristics

- Positioning navigation: using integrated navigation technologies such as QR code navigation and laser Slam navigation to achieve precise positioning;
- Motion Control: Adopts dual differential wheel drive, supports multiple motion control modes such as forward, backward, and rotation;
- Power Management: Supports multi-level power threshold control, allows free setting of minimum charging power, and supports idle charging control;
- Safety protection: equipped with multiple safety protection measures such as front and rear dual Xike radar (dual obstacle avoidance in software area and built-in area), contact safety edge touching, omnidirectional five emergency stop button for the overall equipment, and safety PLC;
- Human-Machine Interaction: Button switches, display screen, and standard audible and visual alarms indicate the current operating status of the equipment;
- Control Method: Supports automatic and manual control;
- Network communication: Wi-Fi network communication and seamless roaming, supporting 5G network expansion;
- Robotic Arm Operation: Integrates a six-axis collaborative robotic arm, supporting operations such as gripping, assembly, and palletizing. It can be independently programmed via a teach pendant and achieves emergency stop linkage and safety coordination with the chassis;

2.1.2 Application Industries

E-commerce, 3C electronics, tobacco, pharmaceuticals, and other goods to people handling services support customized execution tools as an extended platform to meet multi scenario applications.

2.1.3 Optional Configurations

Table 2- 1Optional Configuration Table

Accessories	Model	Description
Charging Station	Eh-4850-C1-130	Recommended Optional
Handheld Charger	F1200-58.4V20A	Output Available Under No-Load
Battery Swapping	51.2V/30Ah	-
Battery Swapping Cart	MXCDC-650	-
Downward-Looking Camera	-	Used for QR Code Navigation
2.5D Vision	Standard / Professional	-
3D Vision	-	Optional as Needed

Calibration Board	100/50	Calibration boards come in two types: 100 and 50. 100 is used for hand-eye calibration, and 50 is used for target guidance (related to the number of workstations). They are generally used in conjunction with 2.5D vision.
Packaging	Standard Packaging: Pallet + Ramp	Suitable for domestic short distance road and railway transportation, with relatively controllable environment
	Strengthen packaging: pallet+slope+fully enclosed board	Suitable for long-distance sea transportation, export transportation, or scenarios with higher requirements for moisture and collision prevention

2.2 Product Structure

2.2.1 Dimensions of Mobile Chassis (including Upper)

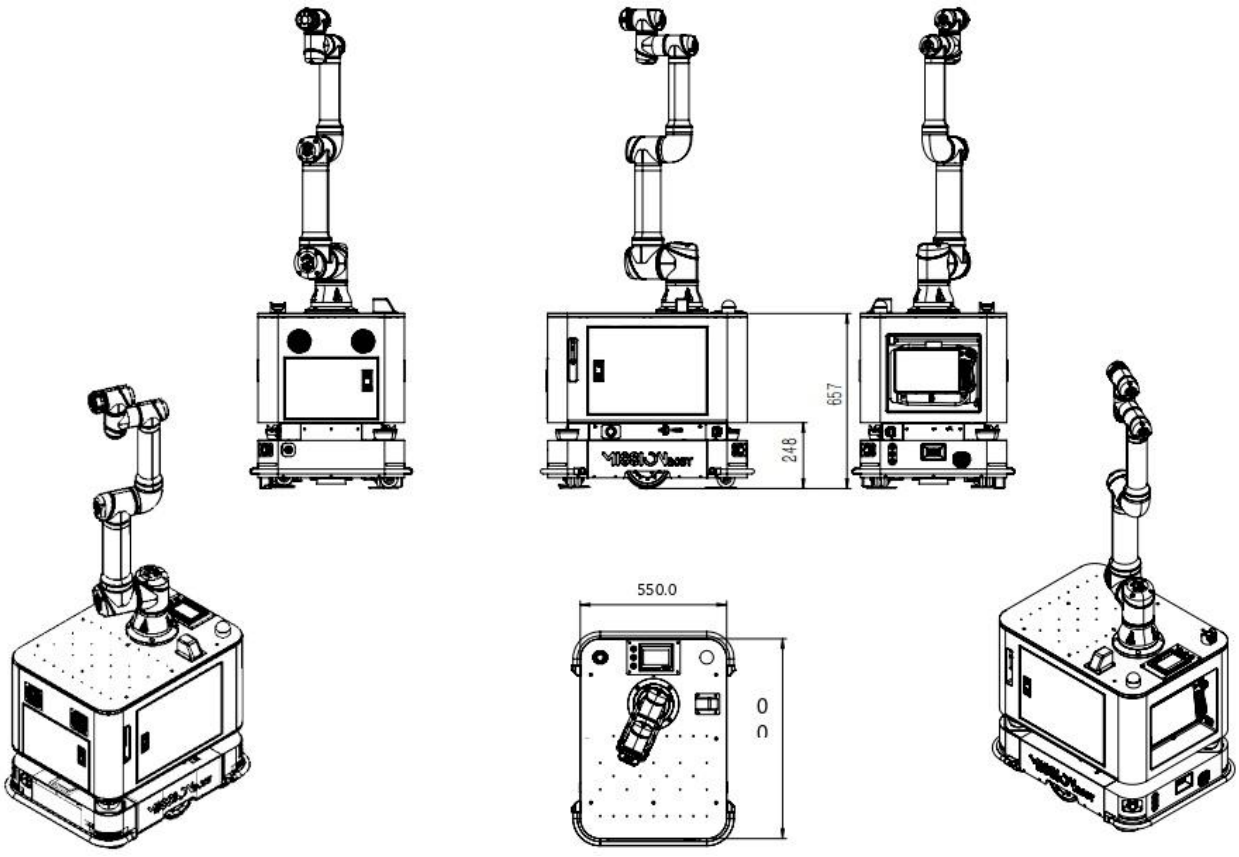


Figure 2- 2Dimensional drawing of mobile chassis (including upper)

Table 2- 2Dimensions Table for Mobile Chassis (Including Upper Installation)

serial number	definition	Numerical values (unit: mm)

serial number	definition	Numerical values (unit: mm)
2	Vehicle length (excluding crash bars)	750.0
4	Vehicle width (excluding anti-collision strips)	550.0
5	vehicle height	657.0
6	Navigation laser scanning area height	185.0
7	Drive wheel track	495.0
8	Drive wheel diameter	160.0
9	Vertical distance from navigation laser to differential axis	301.5

2.2.2 Description of Chassis Components

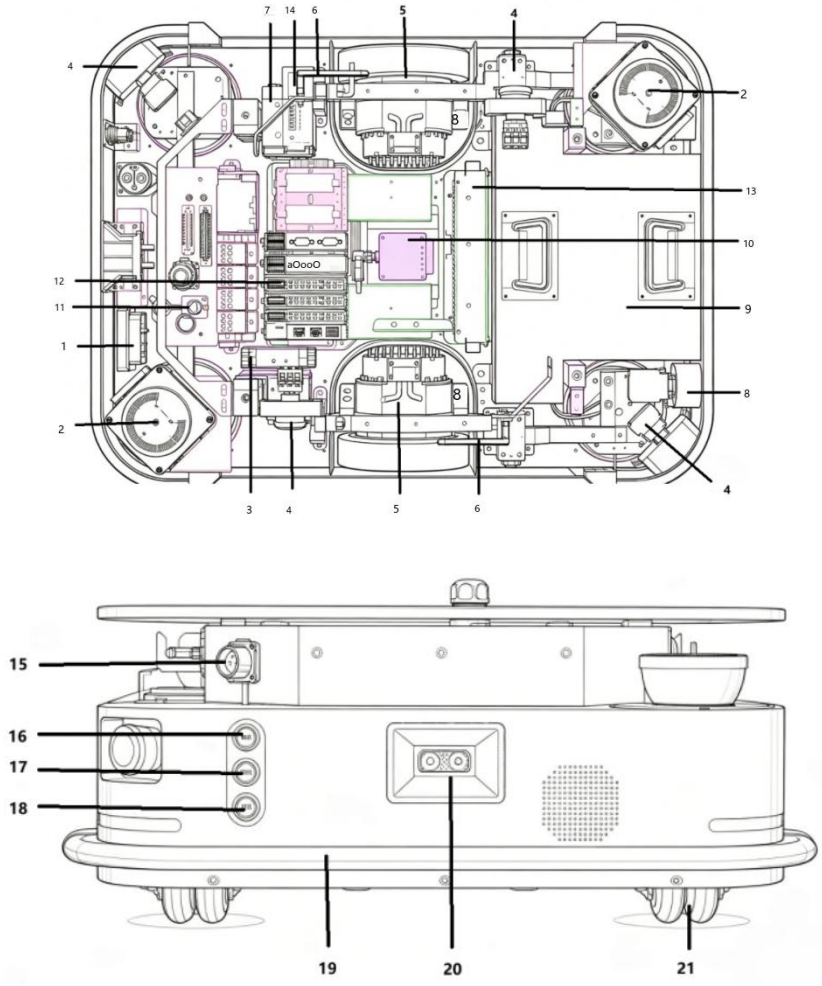


Figure 2- 3Schematic diagram of chassis components

Table 2- 3Chassis Component Specification Table

serial number	Name	Quantity

serial number	Name	Quantity
1	Horn	1
2	Radar (SICK nS3 pro)	2
3	Edge Controller	1
4	Emergency Stop	4
5	Driver	2
6	Antenna	2
7	IO module	1
8	Key Switch Button	1
9	Battery	1
10	Downward-Looking Camera	1
11	Debugging Network Port	1
12	SPC2000 safety PLC	1
13	Switching Power Supply	1
14	AP	1
15	Manual Charging Port	1
16	Reset Button	1
17	Brake Release Button	1
18	Power Off Button	1
19	Anti-collision Strips (One each at the front and rear)	2
20	Automatic Charging Tail Plug	1
21	Casters	4

2.2.3 Collaborative Robotic Arm Dimensions

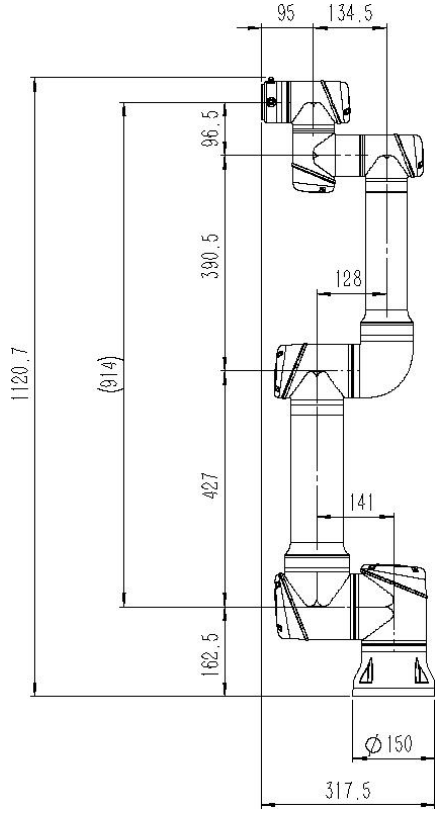


Figure 2- 4Collaborative robotic arm dimension diagram, unit mm

2.2.4 Collaborative Robotic Arm Workspace

The workspace of the CS66 robot is shown in the figure. When the robot moves, the tool center can move within the maximum working range. The goal is to keep the tool center within the recommended working range as much as possible.

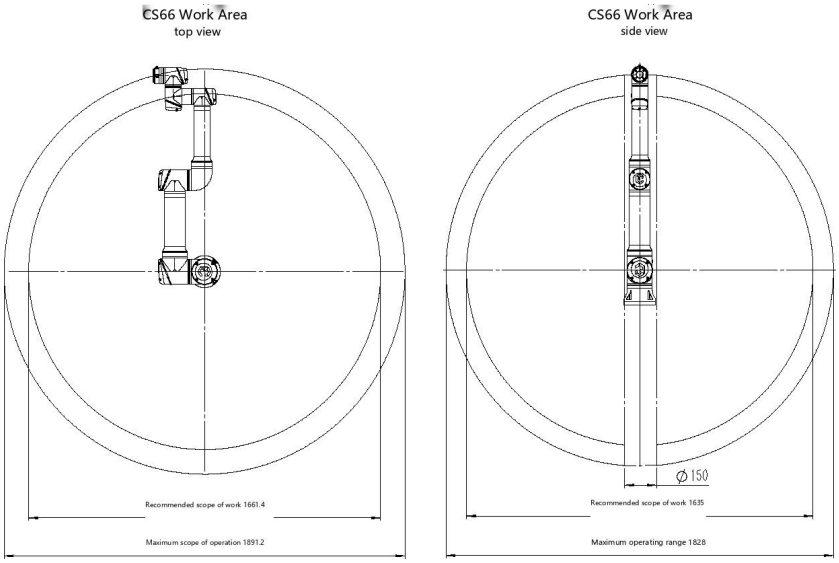


Figure 2- 5Collaborative robotic arm workspace, unit mm

2.3 Basic Product Functions and Descriptions

2.3.1 Function List

Table 2- 4Function List

Basic	Function Name	Function Description
Basic Functions	Control Methods	Automatic, Manual, and Offline Automatic modes execute motion commands; manual mode includes jog control functionality
	Navigation Methods	Laser SLMA and inertial QR code fusion navigation
	Drive Methods	Dual-Wheel Differential
	Communication Methods	WIFI 5G
	Braking method	Electromagnetic braking/Enable braking
Motion Control	run	Robots can follow the trajectory planning and positioning navigation of the motion control system to move to any position, rotate and adjust to any angle, and support forward, backward, rotation, etc
	stop	The robot can stop normally at the designated position according to the scheduling system, and will also start soft parking when the robot encounters regular faults, hard parking when the driver communication fails, fault parking when the driver hardware fails, obstacle avoidance parking when obstacles are detected, and braking parking when emergency stop operation is performed
	reset	After the robot stops, it performs self inspection and self repair, resets and starts the task to run. It will also reset and start the task to run when manually intervened to clear errors or restart

Basic	Function Name	Function Description
	Inspection along the way	The robot can automatically check the status of landmark QR codes and shelf QR codes during operation, and promptly report any abnormalities to the RCS scheduling system and issue an alarm
Transfer control	Sports interlock function	Vehicles should be designed to avoid loading or unloading materials while in motion, and to prevent robots from traveling during loading, unloading, or equipment docking operations
navigation and positioning	Goods code recognition	Real time correction, walking along the designated route
	Driving correction	Real time correction, walking along the designated route
	Correction of lost codes	Robots support certain situations of QR code contamination and loss (continuous loss of 1 code does not affect operation)
Power supply function	self-charging	The robot should be able to automatically detect the battery level. When it falls below the preset threshold, the robot should be able to automatically issue a charging request and run to the charging station under platform scheduling to complete the charging. The online charging system supports shallow charging and shallow discharging methods
	Manual charging	The robot can be charged using a manual charging interface
	Low battery self-protection	When the battery level drops below the preset value, the robot stops running, prompts charging, and alarms, requiring manual operation to continue starting
	Battery Management System	Real time monitoring of battery pack cell voltage, charging and discharging current, sampling point temperature and other information, adjusting charging strategies, and achieving charging balance; Evaluate and calculate the battery's state of charge, lifespan, health status, etc., and automatically output battery maintenance strategies; When an abnormal state occurs (single overvoltage, single undervoltage, overheating, overcurrent), the management

Basic	Function Name	Function Description
		system immediately cuts off charging/discharging and uploads alarm information
safety protection	RCS scheduling	Under the scheduling of the main control system, ensure smooth operation and prevent traffic control incidents such as collisions
	radar detection	Equipped with two SICK nanoScan3 Pro safety radars (front left + rear right), with Type 3 PL d SIL2 functional safety certification. The radars have 16 pre-configured safety zone schemes, which are dynamically switched by the safety PLC according to the HMR driving status. Support two regional systems: After the software configuration area is triggered, the controller will execute deceleration and parking, voice broadcast, and automatically restore; The built-in safety zone scheme has higher priority. When the protection zone is triggered, the safety PLC directly cuts off the STO, requiring manual reset. The OSSD safety output is directly connected to the safety PLC and operates independently of the main controller.
	Safety PLC	The SPC200 safety PLC complies with the ISO 13849 Category 3 PL d standard and operates independently of the main controller. Core Responsibilities: Dynamically notifies the SICK radar to switch the corresponding built-in safety scheme (16 in total) based on the HMR speed, direction, and other driving status; Receives radar OSSD signals and dual-channel signals from 5 emergency stop buttons; Graded response—warning zone detection ensures

Basic	Function Name	Function Description
		compliant deceleration (non-compliant, switch to STO), protection zone/braking zone directly switches to STO, emergency stop button press switches to STO and locks the wheels; Cuts off motor power via STO hardwire. After cutting off, the reset button must be pressed to restore power; automatic restoration is not supported.
	Emergency stop button	Equipped with four omnidirectional emergency stop buttons and one top-mounted emergency stop button, for a total of five prominently positioned emergency stop buttons for emergency stopping of the entire machine, facilitating emergency operations. When any button is pressed, the safety PLC immediately cuts off STO and locks the wheels, and the robot immediately stops and remains stopped. After manual confirmation that the abnormality has been resolved, a two-step reset is required to resume operation: ① Unscrew the pressed emergency stop button; ② Press the reset button. This mechanism prevents unexpected restarts and ensures safety. The teaching pendant is equipped with a dedicated emergency stop button for the robotic arm, which is only effective for the robotic arm and not for the entire machine.
	Automatic locking reporting of fault points	If the robot is connected to the scheduling system, when the robot malfunctions, it will report the location of the malfunction and lock the surrounding area to prevent other robots from approaching the dangerous area
human-computer interaction	power button	Capable of operating power on/off and executing button functions
	indicator light	Various robot states display information through different colored lights
	sound reminder	Define different sound alerts based on different working conditions. A standard sound level of 60dB is recommended, but it can be increased to 80dB, although this will affect

Basic	Function Name	Function Description
		sound quality.
	operating platform	In single machine mode, the robot can be operated through the operating platform
Abnormal control and handling	abnormal alarm	In abnormal conditions, the robot automatically reports warning information to the RCS. The robot body responds according to different error messages. Different sound and light alarm modes
	Operation Status Monitoring	During robot movement, various sensors inside the vehicle will feed data back to the DSP in real time. Absolute coordinates, vehicle attitude angles, tray height, obstacle distance, movement status, vehicle speed, battery level, etc., can be monitored through the host computer software.
	Power-On Self-Test	Before starting operation, the robot checks the operation status of each module and displays different indicator light statuses based on the detection results. If some abnormalities are found, they can be cleared through self-recovery. If clearing the error cannot resolve the robot's abnormality, an error message will be reported and an alarm will be triggered.
	Fault Diagnosis	It can record detailed operation event logs and status logs of the robot and has log data storage function, which can be interpreted by professionals during maintenance or repair. Equipment faults can be automatically alarmed and recorded, and the system can prompt corresponding fault handling methods. Remote fault diagnosis is supported.
Maintenance Operation	Remote Data Download	Remote connection to the robot is possible for downloading local data such as logs.
	Remote Upgrade	The robot can remotely upgrade the lower-level machine and components via the network.

Basic	Function Name	Function Description
	Remote Restart	The robot can be remotely restarted via the network, and the vehicle can perform initialization operations, including sending parameters, etc. Operations such as image deviation and posture initialization
	Remote power on/off	The robot can be remotely powered on/off via network
	One-click homing	The robot can be moved to a designated area for parking via the background

2.3.2 Technical Parameters

Overall Machine Technical Parameters

Table 2- 5 Overall machine technical parameter table

Product model		DC300-06-CE
Body	Weight	250KG
	Dimensions	750*550*650mm
	Load	150KG
	Shell color	White
	Rotation diameter	924.3mm
	Laser scanning height	185mm
	Overall positioning accuracy	±0.2mm (2.5D Vision)
Robotic arm	Working radius	914mm
	Load	6KG
	Degrees of freedom	6
	Repeatability	±0.02mm
Navigation	Navigation Methods	Laser Navigation / QR Code Navigation
	Positioning Accuracy	Reflectorless ±10mm, Reflector ±5mm
	Path Planning	Automatic Path Planning
	Navigation Position Accuracy	±5mm
	Navigation Angle Accuracy	±0.5°
Motion Performance	Direction of Movement	Forward, Backward, Rotation
	Travel Speed	≤1.5m/s
	Maximum Rotation Speed	90°/s
	Vertical Obstacle Clearance	＜5mm

	Ditches Crossing Ability	＜30mm
	Climbing Ability	＜5%
	Drive Methods	Dual Differential Wheels
	Minimum Passing Width	750mm
safety protection	LiDAR	360° Surround
	Collision Detection	Collision Sensor
	Emergency stop button	Chassis Omnidirectional Four-Way Emergency Stop, Superstructure Platform Single Emergency Stop, Teach Pendant Robotic Arm Emergency Stop
	Status Indicator	Four-color LED light strip
Power	Battery Capacity	48V/32Ah
	Charging Parameters	58.4V/15A
	Battery Life	8h
	Charging Time	≤2h
	Battery Life	1500 Full Charge/Discharge Cycles
	Cell Material	Lithium Iron Phosphate
	Charging Method	Manual/Automatic Charging
Protocol/Interface	Wireless Network	Wifi/5G
	Ethernet Port	Yes
	I/O	32/22
	Supported Protocols	CANopen/Modbus_RTU/Modbus_TCP
Drive Wheels	Material	Aluminum Alloy & Polyurethane
Configuration	Number of LiDAR Sensors	2 (SICK nS3 Pro)
	Number of Emergency Stop Buttons	5 Emergency Stops Overall, 1 Robotic Arm Emergency Stop
	Number of Speakers	1
	Number of Indicator Lights	4
	Number of Protective Strips	2
Function Configuration	Basic Functions	Supported
	Wi-Fi roaming function	Supported
	Automatic Charging Function	Supported
	QR Code Precise Positioning Function	Supported
	Laser Reflector Navigation Function	Supported

1) The robot is suitable for flat indoor environments, not for outdoor environments.

2) Navigation accuracy refers to the repeatability of the robot's navigation from a fixed direction to the target station.

3) Basic functions refer to map editing, positioning and navigation, obstacle avoidance configuration, etc.

4) Charging options include charging stations, hand chargers, and battery swapping carts.

5) QR code-related functions require a downward-facing camera, such as QR code navigation and precise QR code positioning.

2.3.2.1 Collaborative Robotic Arm Technical Parameters

Table 2- 6Collaborative robotic arm technical parameters

Product model		CS66
Basic parameters	Degrees of freedom	6
	Load	6KG
	Working radius	914mm
	Repeatability	±0.02mm
	Typical power consumption	250W
	Installation method	any angle
	Weight	20KG
	Base diameter	150mm
Maximum joint speed	Base	150°/s
	Shoulder	150°/s
	Elbow	180°/s
	Wrist 1	230°/s
	Wrist 2	230°/s

	Wrist 3	230°/s
Tool Parameters	Tool I/O	4×DO/4×DI (configurable), 1×AI, 1×AO
	Tool I/O Power Supply	12V/24V, 3A (three-pin mode), 1A (single-pin mode)
	Tool Communication	RS485
	Maximum Tool Speed	2.8m/s
Other	IP protection rating	IP68
	Operating Ambient Temperature	-10℃~50℃
	Operating Ambient Humidity	90% Relative Humidity (Non-condensing)
	Material	Aluminum Alloy, Steel, Plastic, Rubber
	Standard Cable Length	5.5m
	Product Certification	ISO 10218-1, ISO 13849, ISO/TS 15066, RoHS, CE, UL, SEMI, Cleanliness ISO CLASS 5

2.3.2.2 Collaborative Robotic Arm DH Parameters

Denavit-Hartenberg parameters or DH parameters are the traditional way to represent the robot's forward kinematics. These are used to represent the position of the tool center point or TCP in the base coordinate system given a robot joint angle, as shown in the figure.

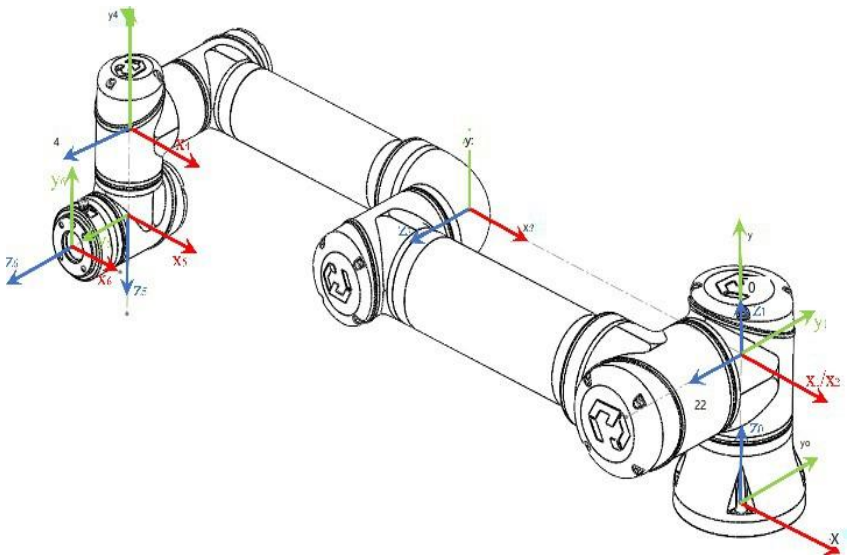


Figure 2- 6Schematic diagram of collaborative robot arm DH

CS66 robot DH parameters are shown in the table.

Table 2- 7 CS66 robot DH parameters

Joints	theta[rad]	a[m]	d[m]	alpha[rad]
Joint 1	0	0	0.1625	0
Joint 2	0	0	0	π/2
Joint 3	0	-0.427	0	0
Joint 4	0	-0.3905	0.1475	0
Joint 5	0	0	0.0965	π/2
Joint 6	0	0	0.095	-π/2

2.3.3 Navigation Laser Detection Range

Table 2- 8Navigation Laser Detection Range Parameter Table

serial number	definition	Parameters
1	Detection distance (m)	40
2	Scanning Angle (°)	275
3	Detection height (mm)	185.0

2.3.4 Human-Machine Interaction Status Description

Table 2- 9Human-Machine Interaction Status Description Table

Indicator Light Display	Status
Solid Red	Emergency Stop Alarm, Collision Alarm, Servo Alarm
Solid Green	HMR is in fault-free state, green when moving straight and waiting in automatic mode
Yellow Breathing	HMR is in manual mode
Flashing Red	HMR is blocked; low battery warning charging alarm
Solid Purple	HMR is charging
Solid White	Battery Fully Charged

2.3.5 Load Stability Description

To ensure load safety, it is recommended that items be distributed as evenly as possible, and heavier items should be placed below lighter items. The placed items need to be fixed in place and there should be no displacement between them. The load weight must not exceed the rated load, and the center of gravity should be kept in the center position as much as possible.

- The robot and its load must not exceed the allowable range of the road surface.
- The transported goods must be reliably secured.
- The transported goods must be placed within the load center and have adequate anti-slip measures.
- The weight of the goods carried by the upper mechanism must be evenly distributed and must not be unevenly loaded.

2.4 Product Nameplate

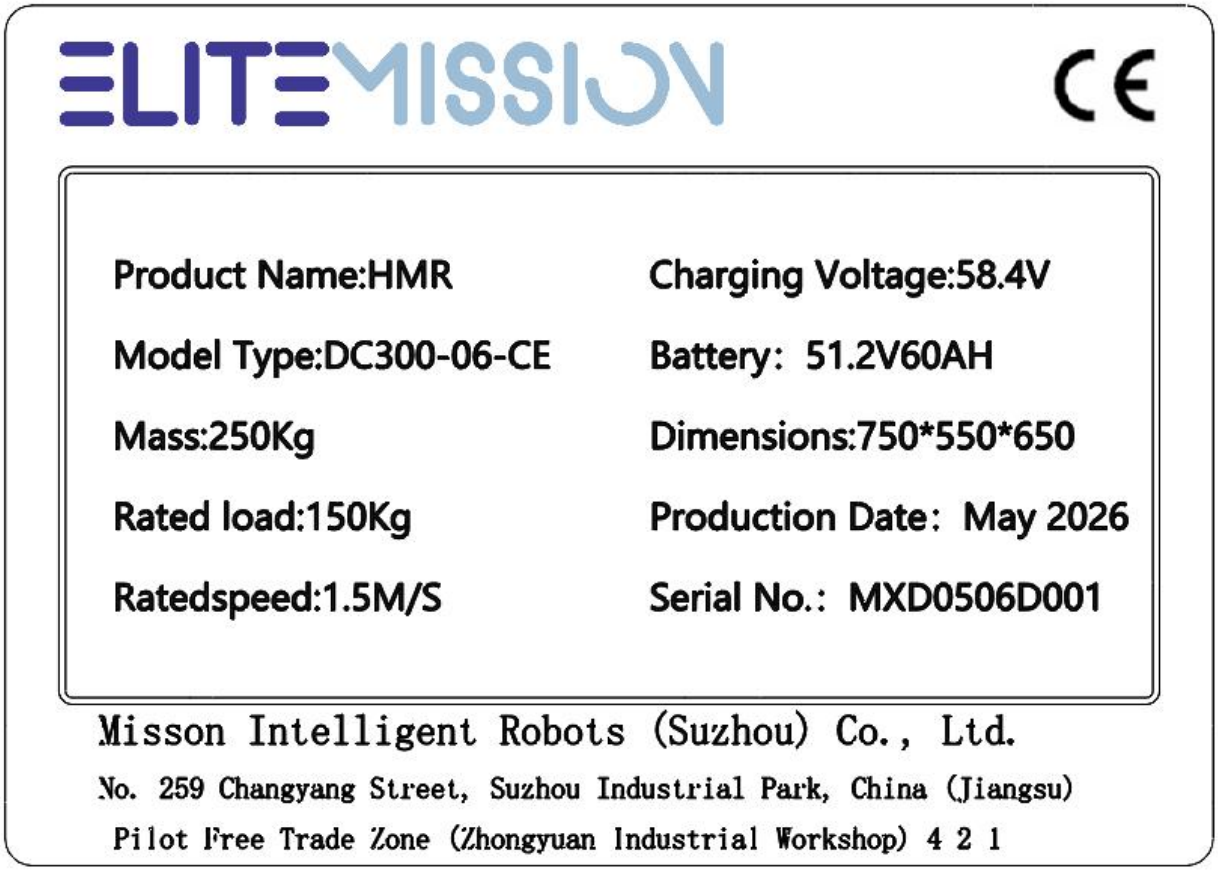


Figure 2- 7Product nameplate

3 Quick Start Instructions

3.1 Control Panel

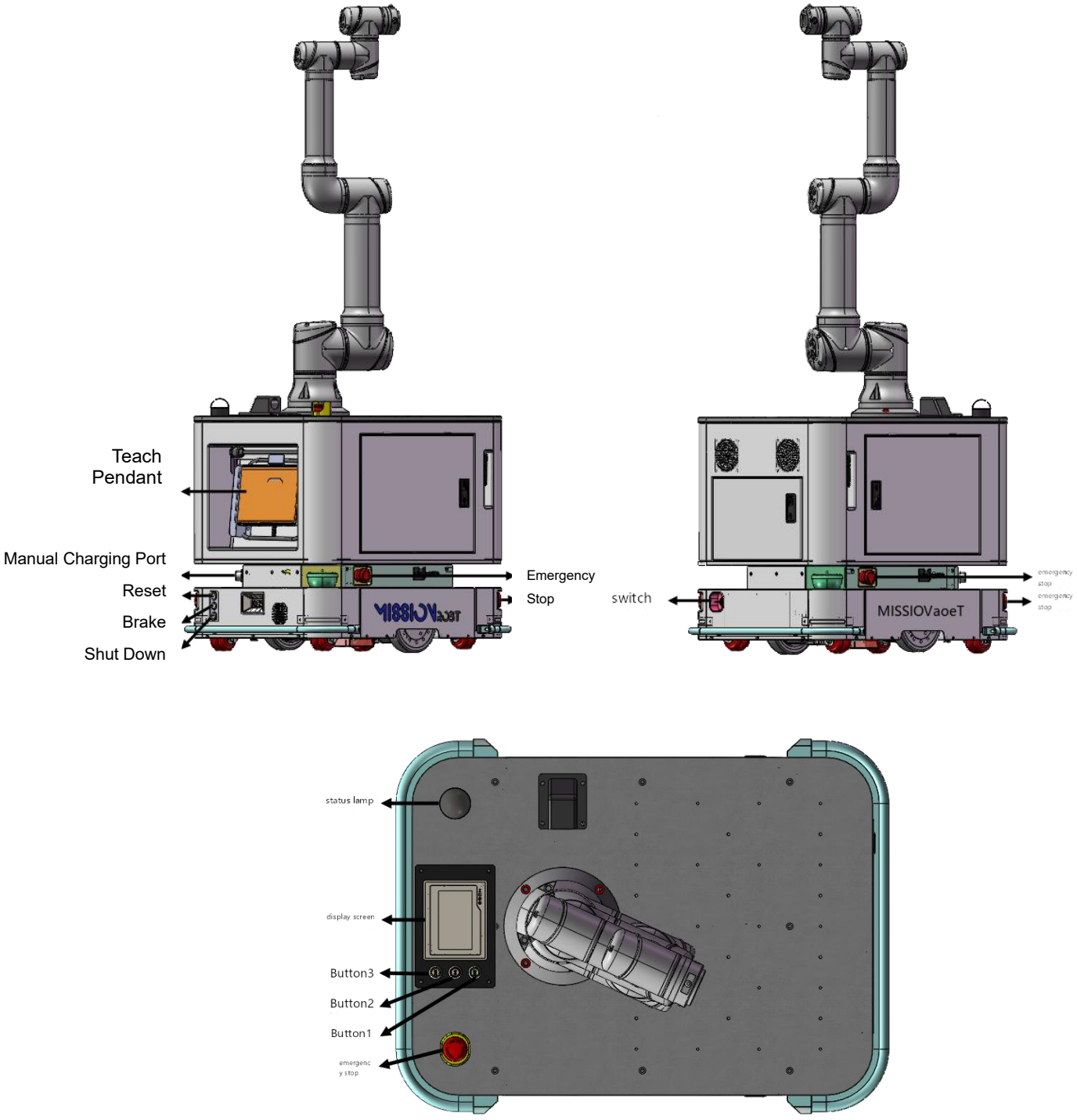


Figure 3- 1Control panel

3.1.1 Key Switch

Table 3- 1Key switch

Mode	Status
power on	Rotate the key switch until the indicator light is on to start the HMR

3.1.2 Power Off Button

Mode	Status
power outage	Press the shutdown button to turn off the indicator light

3.1.3 Emergency Stop Button

Table 3- 2Emergency stop button

Mode	Status
Press the emergency stop button	Emergency braking;
Pull up the emergency stop button	System recovery;

- The emergency stop button is only for use in emergency situations and should not be used to stop the operation of the robot.
- After pressing the emergency stop button, the robot immediately stops all movements.
- Emergency stop can only be activated after determining the cause of the fault and troubleshooting it.
- After pulling up the emergency stop, press the reset button to clear the error and restore STO.
- The chassis and five emergency stop buttons installed are suitable for emergency situations of the entire machine, while the emergency stop button of the teaching pendant is only suitable for emergency stop of the robotic arm and cannot be used for the entire machine.

3.1.4 Brake Release Button

Table 3- 3Brake Release Button

Mode	Status
Press the brake button	Release the brake

Teach Pendant

- The release brake button is used to push the vehicle body.
- This button is a self-locking button that can be pushed forward when pressed, and the vehicle body needs to have electricity.
- This button is only for use when the vehicle is turned off.

3.1.5 Reset Button

Table 3- 4Reset Button

Mode	Status
reset	System Reset

- After the error message is resolved, press this button for more than 1 second to clear the error message.
- During operation, if a safety alarm is triggered and the STO is interrupted, after error confirmation, pressing the reset button will restart the STO and continue the previous task.

3.1.6 Display Screen

The display screen is a human-machine interface. Operators can monitor the status of the composite robot through the display screen. The display screen has four interfaces: main interface, manual control, IP address, and AGV function settings. The detailed content of the interface is shown in the following image:

- The main interface mainly displays basic robot parameters such as current navigation mode, positioning confidence, task status, cumulative walking distance, cumulative running time, battery parameters, and fault information.



Figure 3- 2Main Interface

- The manual control interface mainly includes options for operating the robot manually, such as linear velocity, angular velocity, manual charging, manual enable, and manual automatic mode switching.



Figure 3- 3manual control

➢ The IP address interface mainly displays the IP address and version number of each component of the robot.

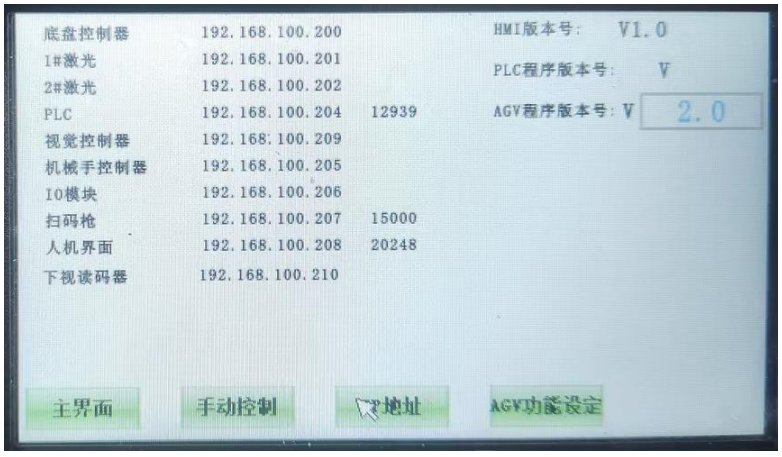


Figure 3- 4 IP address

➢ The AGV function settings interface mainly displays the settings of chassis function parameters such as the maximum cumulative walking distance (k), the maximum number of battery charge/discharge cycles, sensor shielding, edge shielding, abnormal shielding, and voice volume control.

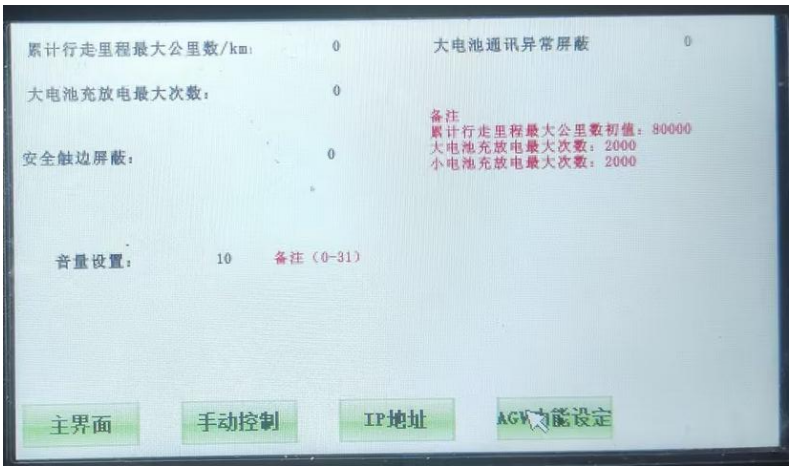


Figure 3- 5 AGV function settings

3.1.7 Reserved Buttons and Status Lights on the Countertop

This product has a status light and three function buttons on the countertop, all of which are currently reserved interfaces without preset functions. Users can read button status and control status lights through the control system to achieve custom operations and instructions.

Warning: The safety and reliability of secondary development are the responsibility of the user.

Name	Status
Button 1	reserve
Button 2	reserve
Button 3	reserve
status light	reserve

3.2 Teaching Pendant

The teach pendant is the operation and display part of the robot system, used to control the robot body and perform programming. The teach pendant consists of the following components: an LCD touchscreen, a power switch, an emergency stop button, a three-position switch, multiple motion control buttons, and a teach pendant connection port. The LCD touchscreen clearly displays details of the robot's motion, such as position, posture, and parameters. Users can directly perform all operations through the touchscreen, facilitating setup and adjustment.

The shell design of the teaching pendant combines aesthetics and ergonomics, with a nylon strap and two hanging loops on the back for easy grip or hanging on the control cabinet.

- For detailed usage instructions, please refer to Elite's "CS_Three-Position Switch Teach Pendant User Manual".

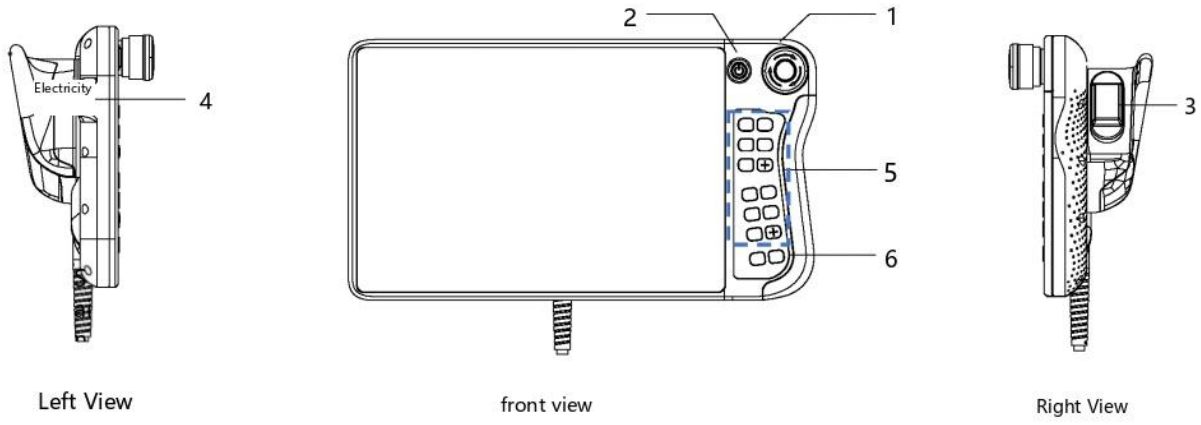


Figure 3- 6Appearance of teaching pendant

Table 3- 5Interface and button description

serial number	description	function
1	Emergency stop button	The emergency stop function is triggered (the light remains on when the emergency stop is not triggered, and the light goes out when the emergency stop is triggered), which is only used for emergency stop of the robotic arm and not applicable to emergency stop of the entire machine.
2	power switch	Turn on/off the teaching pendant
3	Three position switch	Release protection and stop
4	USB Interface	Connecting USB Storage Devices
5	Axis motion control button	Control the movement of each axis of the robot body
6	Speed adjustment button	Increase or decrease speed percentage, adjust current operating speed

3.3 Mode Selection

Table 3- 6Mode Selection

Mode	Status
automatic	Switch to automatic operation mode
Manual	Switch to manual control mode (manual mode warning light yellow breathing)

- Automatic mode: Executes movement commands from the control system.
- Manual mode: Operated by trained personnel;

3.4 Charging

When the HMR battery level is below 20%, a voice prompt will announce "Low battery level, please charge promptly". There are two charging methods: manual charging and automatic charging.

- Manual charging: Use a manual charger with the manual charging port.
- Automatic charging: Use a charging station with the charging tail plug. Automatic charging can be achieved after configuring map stations.
- Quick battery swap: Open the battery compartment and replace the battery.

3.4.1 Manual Charging

To use a manual charger, simply connect it to the HMR's manual charging port. The HMR will be solid white when the battery is fully charged.

3.4.2 Automatic Charging

To connect the HMR to a charging station, set the station number to 500. Once the charging station parameters are set, the robot will automatically navigate to that station and begin charging.

Recommendation: Set a near-charging point before the charging point as shown in Figure 12. Path 12->500 (reverse), 500->12 (forward), set the speed to slow. Set a suitable obstacle avoidance scheme for the area connecting to the charging station, such as using the laser at the rear of the vehicle to reduce the protected area of the scheme, so that obstacle avoidance is not triggered by the charging station.

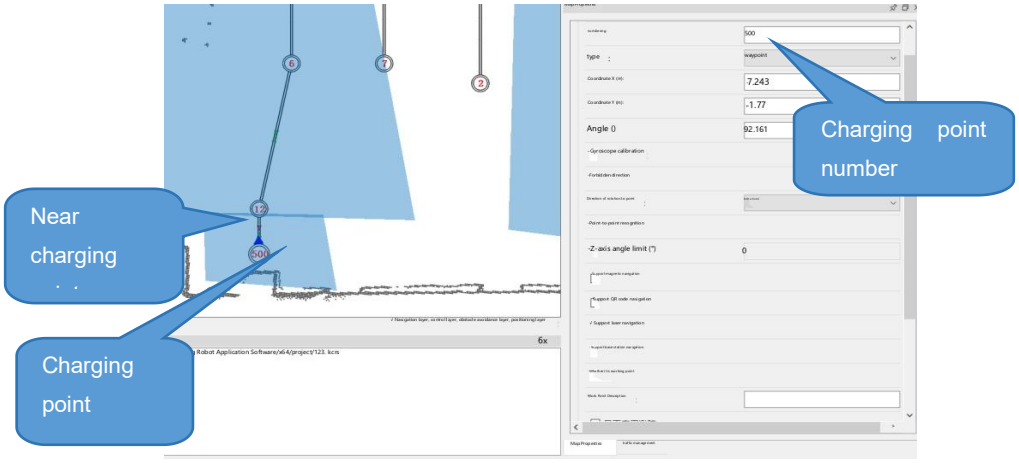


Figure 3- 7Automatic charging

3.4.3 Quick Battery Swapping

Quick battery swapping is achieved by replacing the battery.

1) Open the battery compartment and directly remove the battery. During this process, the small battery discharges to ensure the vehicle's normal standby operation.

2) Replace with a new battery. The new battery automatically discharges and charges the small battery.

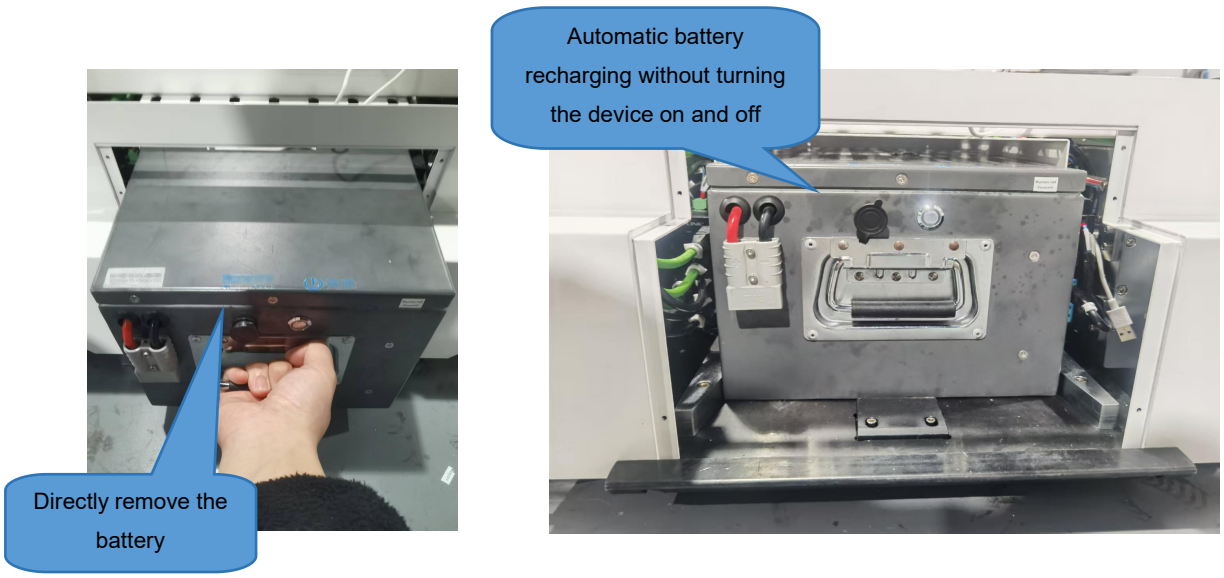


Figure 3- 8Quick Battery Swapping

4 Robot Application Software Usage

This section describes the chassis application software. In this product, all functions of the mobile chassis (such as map building, path planning, task scheduling, status monitoring, etc.) are uniformly managed by the robot application software described in this manual. The collaborative robotic arm mounted on the chassis platform has its motion programming, teaching, parameter setting, and manual operation completed by a separate teach pendant. The two belong to different control systems.

The chassis application software does not participate in the motion control and programming of the robotic arm.

For detailed operation and software usage of the robotic arm, please refer to the Robotics Software Operation section of Elite Robotics' "CS_User Manual_CS66".

4.1 Application Software Interface Toolbar

4.1.1 Common Toolbar

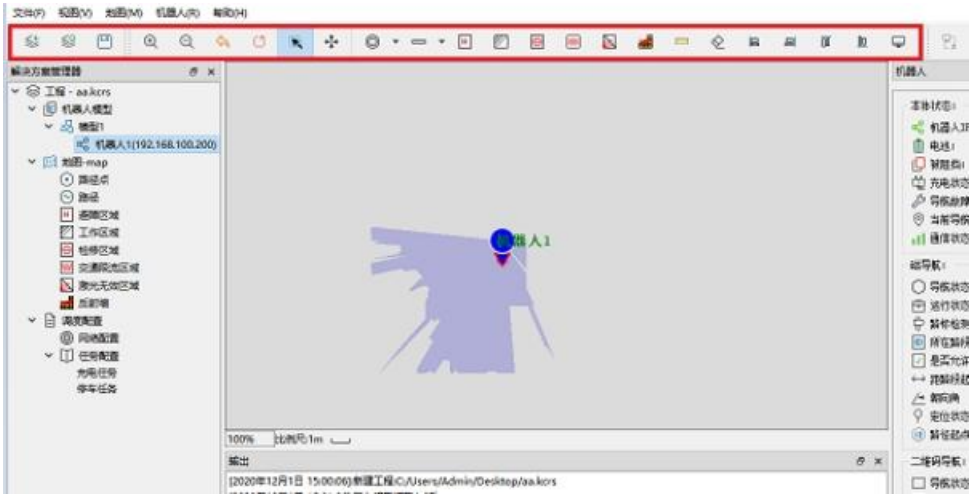


Figure 4- 1Common Toolbar

Table 4- 1Common Toolbar Function Description Table

Function Icons	Function Name	Function Description
	Create Project	Create Project File
	Open Project	Open Local Project File
	Save Project	Save Modified Project File to a Folder in the Local Directory
	Zoom In	Zoom In Map
	Zoom Out	Zoom Out Map Minimum zoom out to 10%

Function Icons	Function Name	Function Description
	Undo	Can choose to undo to a specified map operation, supporting up to 16 operation records
	Redo	Can choose to redo to a specified map operation, supporting up to 16 operation records
	Select	Mouse in select mode can select elements in the map
	move	Set the mouse to move mode to move elements in the map
	Select Map	Mouse in select map mode can move the location map and navigation map
	Waypoints	Mouse in waypoint mode can add waypoints to the map (laser navigation point , magnetic navigation point , QR code navigation point ) Laser + Magnetic Navigation Points, Laser + QR Code Navigation Points, QR Code + Magnetic Navigation Points, Laser + QR Code + Magnetic Navigation Points (mixed navigation path points are uniformly represented by the symbol)
	Supported Models	Supports Model 1 / Model 2 / Model 3 / All Models (Multiple selections possible)
	Paths	Setting the mouse to path mode allows adding paths to the map (laser navigation path, magnetic navigation path, QR code navigation path)
	Obstacle Avoidance Zone	Set mouse to draw obstacle avoidance zone mode. Adds an obstacle avoidance zone to the map; the zone is displayed in gray. Used in conjunction with navigation laser configuration schemes, calling the set obstacle avoidance zone group number.
	Working Area	Set mouse to draw working area mode. Adds a working area to the map; the zone is displayed as Green frame with white background. Used in conjunction with robot monitoring systems, assigning robots to work by area.
	Maintenance Area	Set mouse to draw maintenance area mode. Adds a maintenance area to the map; the zone is displayed in yellow. Can be used to retain map resources, but navigation is not planned; same as the annotation function.
	Traffic Restriction Area	Set the mouse to traffic restriction zone mode. Add a traffic restriction zone to the map; the zone will be displayed in red. This can limit the number of HMRs operating within the zone, and can be used in conjunction with a robot monitoring system.
	Request Area	Set the mouse to the application area mode. Add the application area on the map, and the area will be displayed in pink Color is used for the application and release of third-party path resources.

Function Icons	Function Name	Function Description
	Laser Invalid Area	Set the mouse to laser invalid area mode. Add laser ineffective areas on the map, which are displayed in pink. Laser navigation positioning can shield the positioning reference covered by the area and can be used for Environments with high rates of scene change.
	Laser Enhanced Area	Set mouse to laser enhanced area mode. Add a laser enhanced area to the map, displayed in brown. The default laser enhancement coefficient is 2 (coefficient range 2-10), and the laser navigation positioning program will provide it Calculate the weight of the high area to solve the problem of insufficient positioning reference before and after narrow tunnels.
	Reflective Wall	Set mouse to draw reflective wall mode. Add reflective walls to the map Laser navigation and positioning can shield positioning references blocked by reflective walls, and can be used to ensure that HMRs always operate on one side of the reflective wall or for multi-story map stitching and segmentation.
	Distance Measurement	Setting the mouse to distance measurement mode allows you to roughly obtain the actual distance. After selecting the distance measurement function, click the starting point to be measured, then hold down the mouse and drag to the next endpoint. A straight line will appear on the map. Displays the actual data in the upper left corner of the map
	Eraser	Setting the mouse to erase mode allows you to erase the map background content by area.
	Left Alignment	Left Alignment of Multiple Path Points
	Right Alignment	Right Alignment of Multiple Path Points
	Top Alignment	Top Alignment of Multiple Path Points
	Bottom Alignment	Bottom Alignment of Multiple Path Points
	Legend	Show / Hide Legend

4.1.2 Robot Toolbar

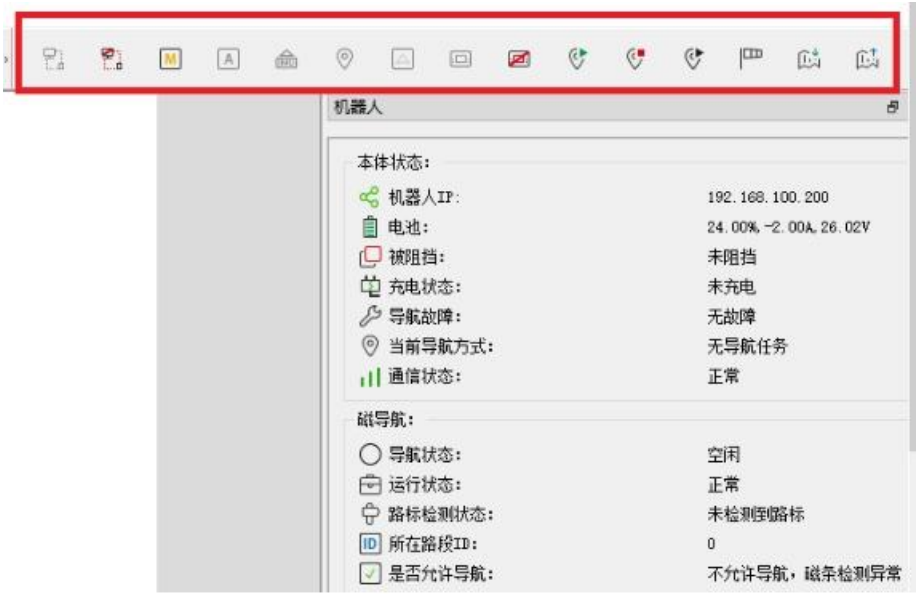


Figure 4- 2Robot Toolbar

Table 4- 2Robot Toolbar Function Description Table

Function Icons	Function Name	Function Description
	Connect	After setting the robot IP, click Connect
	Disconnect	Enable robot connection, disconnect robot connection
	Manual	Switch from automatic mode to manual mode (keyboard control fails in automatic mode, map download fails, relocation fails, navigation function is available) Switch from manual mode to automatic mode
	automatic	Switch from manual mode to automatic mode
	Gyroscope calibration	When the robot gyroscope experiences "zero drift," manifested as the robot not moving, and a blue icon rotating on the software, this function can be used for calibration. (Note: The robot must be kept horizontal and stationary during gyroscope calibration)
	Positioning	Manually perform robot map positioning. The allowable error range for the non-reflective laser positioning point is ±5.0m. ±15°
	Confirm position	Confirm the current location of the robot on the map. Unable to proceed with subsequent operations without confirming the location
	Obtain control	Obtain robot control

Function Icons	Function Name	Function Description
	Release control	Release robot control
	Start Navigation	In automatic mode, after selecting a waypoint and clicking navigation, the robot will automatically navigate to that point
	Stop Navigation	Abort the current navigation activity in automatic mode
	Return to navigation laser path Diameter point	After the robot exits the path and clicks on the return path, the robot automatically returns to the path, only when The robot can be used in automatic mode
	Set path points	Set the current position of the robot as a waypoint, which is effective when the robot is connected to a laser.
	Download map	Uploading maps from the robot to the local area can only be used when the robot is connected. download Map is only valid for laser maps and navigation maps mixed with lasers.
	Upload Map	Map download to robot, only usable when the robot is connected and in manual mode. Upload map is only valid for laser maps and navigation maps mixed with lasers.

4.2 Connect Robot

First, rotate the HMR key switch to turn on the HMR. Next, open the "Robot Application Software," click New Project, create a new project, save and open it. See the image below:

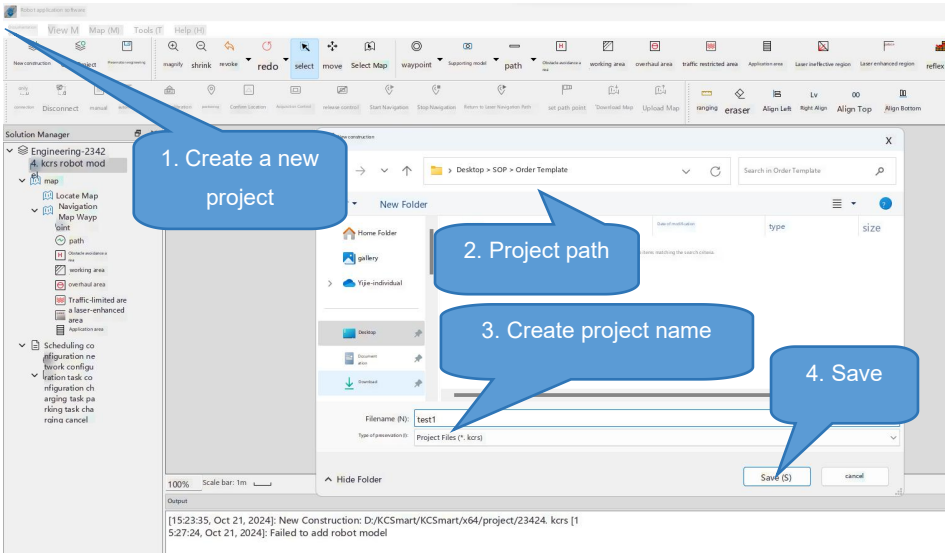


Figure 4- 3Create New Project

Right-click the robot model, click Add Robot Model, click Import Robot Model File and confirm.

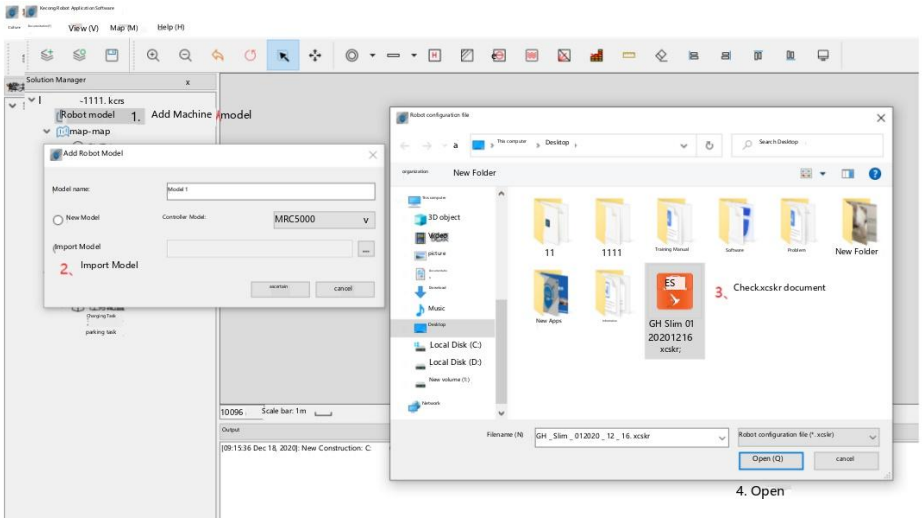


Figure 4- 4Add Robot Model

Set the computer's Ethernet IP to the 192.168.192.xxx network segment, subnet mask 255.255.255.0, gateway can be omitted. Connect the computer to the robot's debugging network port using a network cable.

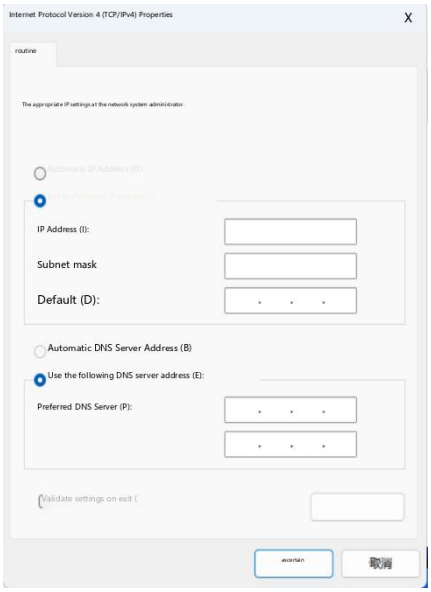


Figure 4- 5Ethernet Settings

Select the robot model, right-click and add robot, fill in the robot IP and name (the name must not be numbers, symbols, or empty names), the IP is 192.168.100.200. This IP is used for wired robot connections.

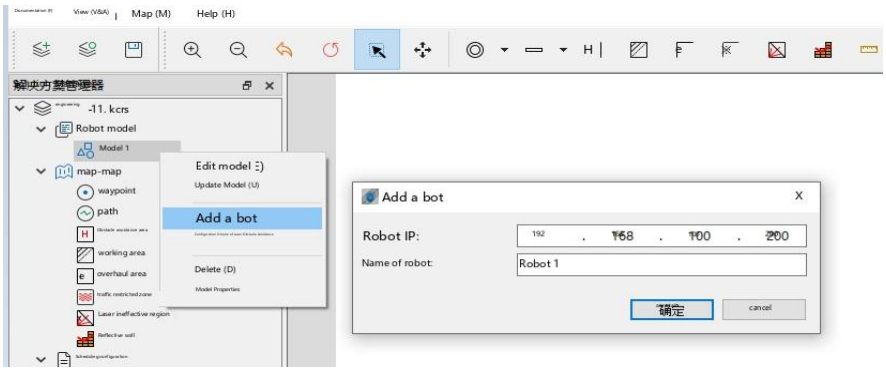


Figure 4- 6Add Robot

Click the robot's IP, click Connect on the homepage, and click Get Control if you need control.

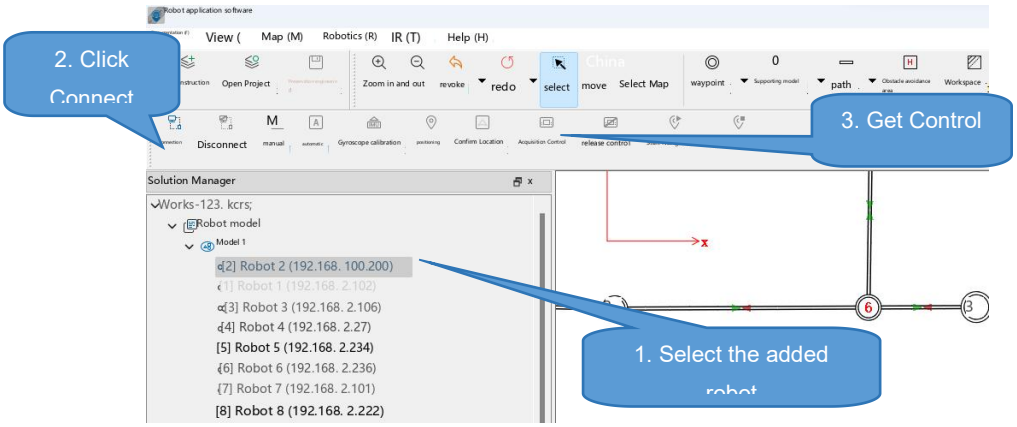


Figure 4- 7Obtain control

The robot IP is displayed in green on the left and the robot status on the right shows the robot IP, battery level, and other information, indicating a successful connection. After connection, the HMR can be manually controlled using "W (forward)," "A (left turn)," "S (backward)," and "D (right turn)."



Figure 4- 8Robot Status

4. 3 Draw Map

4. 3. 1 Draw Mirrorless Map

Set the robot to manual mode, remotely control it to the location where the map needs to be drawn, right-click the map, and click Create Laser Map in the options.

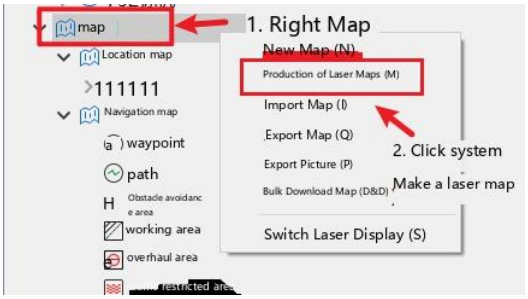


Figure 4- 9Create Laser Map

Enter the map name and click confirm.



Figure 4- 10Enter map name

The software will then automatically redirect to the map management software. In the following 【Cartography Settings】 pop-up window, pay attention to the IP address and file path. It is recommended to use the default parameters for other parameters. Click "Start Cartography" to enter the cartography software.

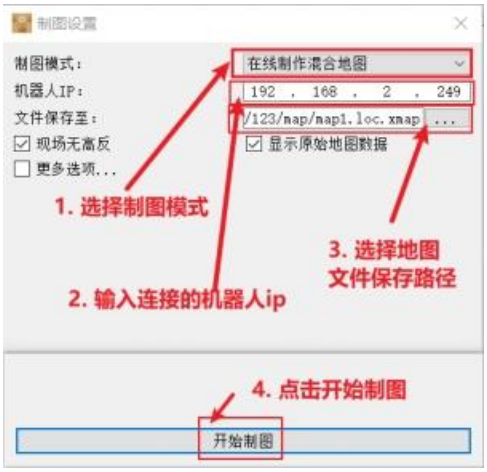


Figure 4- 11Drawing Settings

After entering the drawing interface, control the robot to circle around the drawing area, end to end, and the path is closed loop.

The red circle represents the driving path of the car. Wait for the mapping software to upload data to the map in the bottom left corner. Finally, complete the drawing and exit.

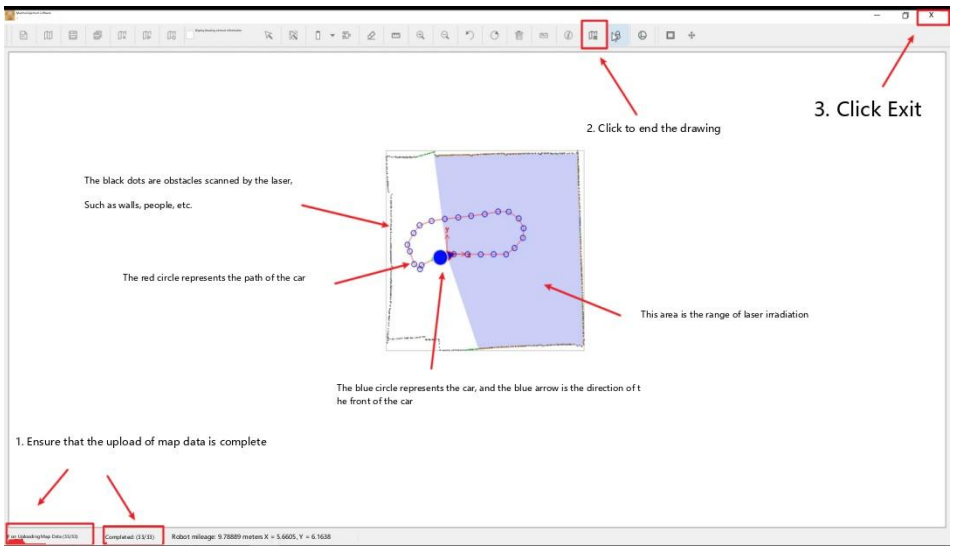


Figure 4- 12Drawing interface and steps

Note: The map is saved to the directory selected when 【Cartography Settings】, containing two files with the extensions .xmap and .brawmap respectively. .brawmap is the map sensor data file; .xmap is the map file that needs to be imported into the application software.

Follow the previous steps to return to the application software, follow the prompts to import the map, and click Yes.



Figure 4- 13Import map

Select the robot whose IP address needs to be downloaded, and click "Download Map" in the top menu.

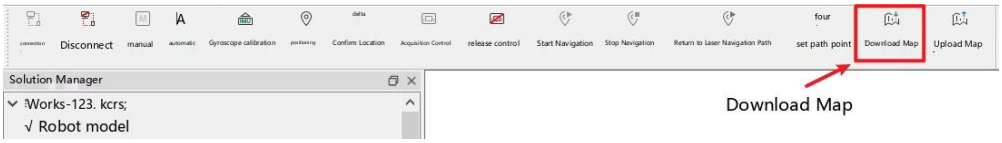


Figure 4- 14Download map

Click to confirm and save, click to download map

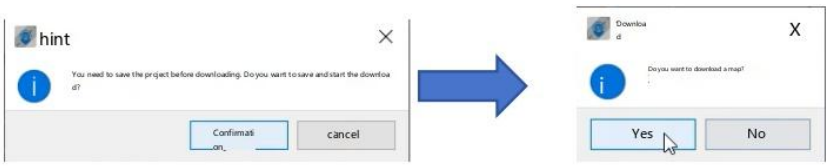


Figure 4- 15confirm

The import was successful as shown in the figure, and it can be seen that the imported map does not overlap with

the actual laser irradiation situation, as further positioning is required. Please refer to the detailed positioning process for details4.6Positioning。

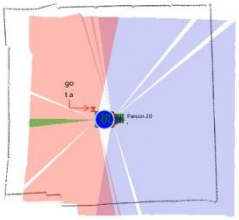


Figure 4- 16Comparison between imported map and actual map illuminated by laser

4.3.2 Draw an Anti Map

There are requirements for reflective columns in reverse mapping:

- The point that needs to be located must be able to detect 4 or more reflective pillars;
- The distance between each reflector should be more than 1m.
- The arrangement of reflective columns must not be symmetrical, and the same number of reflective columns should be avoided on both sides of the path as much as possible;
- Try to ensure that the spacing between reflectors is unequal (the spacing between two adjacent reflectors should not be less than 350mm).

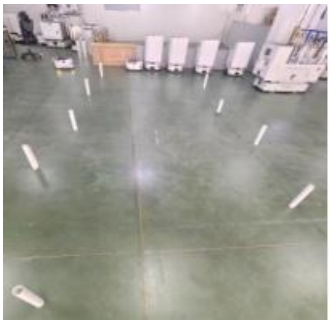


Figure 4- 17Schematic diagram of reflective column layout



Figure 4- 18Parameter Configuration

The preliminary steps are the same as drawing a non-reflective map. Set the vehicle to manual mode, remotely control it to the location where the map needs to be drawn, start creating the laser map, and open the map management software. In【Mapping Settings】, uncheck "No High Reflection", select the type, such as reflective pillars,

check more options, and enter detailed data for reflective objects.



Figure 4- 19Enter Detailed Data for Reflective Objects

Parameter Reference as shown in the following figure:

Parameter name	Instruction	reference value
control linear velocity	vehicle line speed at drawing time	0.5 m/s
control angular velocity	vehicle angular velocity at drawing time	0.5 rad/s
Reflective column type	Diameter of reflector/width of reflector, m	Values 0.6 ~ 0.8, units
Reflective column diameter	Recent laser reflection intensity, pf _ r2000 Recommended value 800 (reflective column)/1100 (Reflector) sicknano Recommended Value 570 (Reflection Column)/550 (reflector)	0.075 m
Reflection intensity threshold	Recommended pf _ r2000/sicknano 500 (needs to be configured with the parameter configuration tool Consistent values)	500
Minimum distance between reflecto rs	Parameter range 0.5-1.5, default is 0.5	0.5

Figure 4- 20Parameter Reference Figure

Click "Start Mapping". After entering the mapping interface, control the robot to circle around the mapping area, connecting the beginning and end to form a closed loop. The blue circle represents the vehicle's path. Wait for the map data to be uploaded to the lower left corner of the mapping software. Finally, end the mapping and exit.

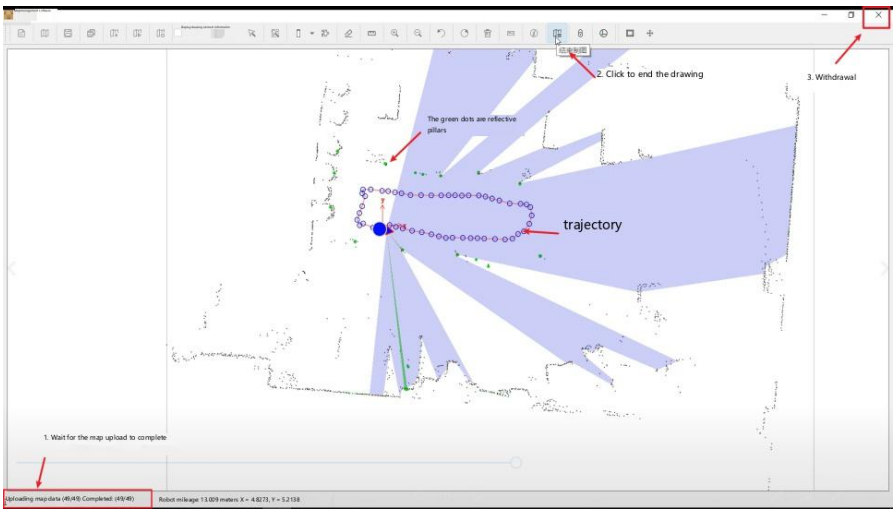


Figure 4- 21Mapping Interface

Select the target car and click "Download Map" in the top menu



Figure 4- 22Download map

Click to confirm and save, click to download map



Figure 4- 23Confirm Map Download

Successful Import (as shown in the image). You can see that the imported map and the actual laser illumination do not overlap because positioning is still required. See the detailed positioning process4.6Positioning。

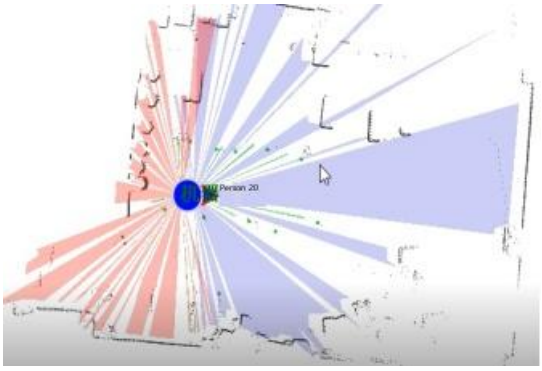


Figure 4- 24Comparison of Imported Map and Actual Laser Illumination

4.3.3 Waypoints

There are two ways to set path points:

➢ Method 1:

Click "Set Path Point" [The point will be directly created below the car on the map; this method directly copies the current car's position and attitude].

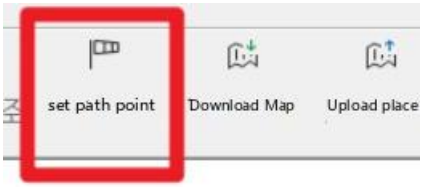


Figure 4- 25Click "Set Path Point"

You can see the point in the Solution Explorer on the left or on the map.

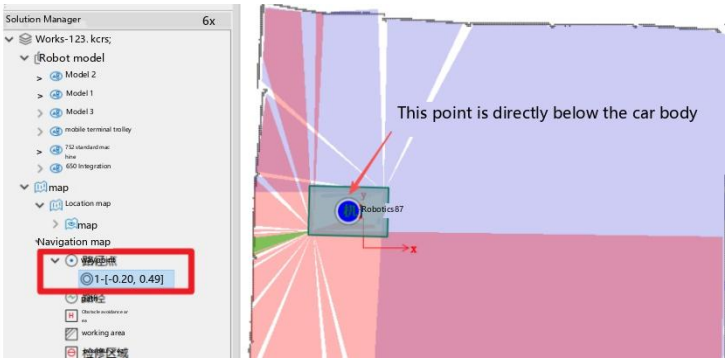


Figure 4- 26Point Map

➢ Method 2:

Click "Path Point"

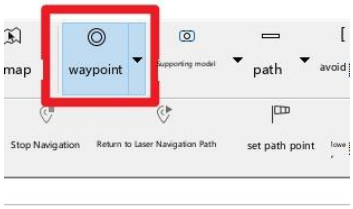


Figure 4- 27Click "Path Point"

Move the mouse to the map and click anywhere on the map. A path point will be generated at the clicked location. You can see the points in the Solution Explorer on the left or on the map.

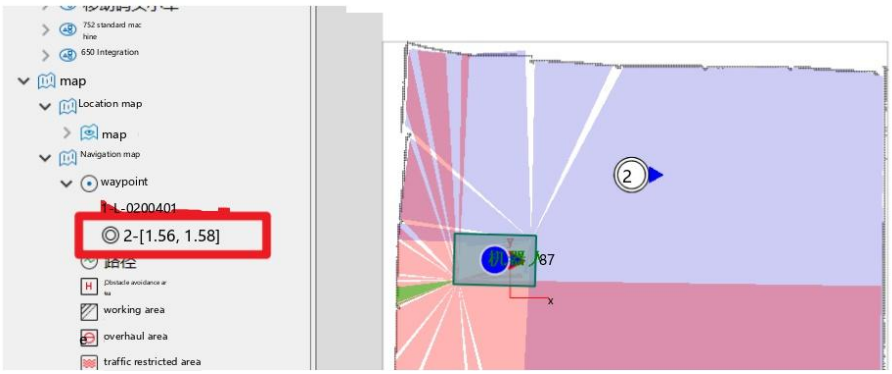


Figure 4- 28Click anywhere on the map to set a path point

Click a path point on the map, or click a point in the Solution Explorer on the left, and you can see the specific properties of that point in the map properties on the right side of the software.

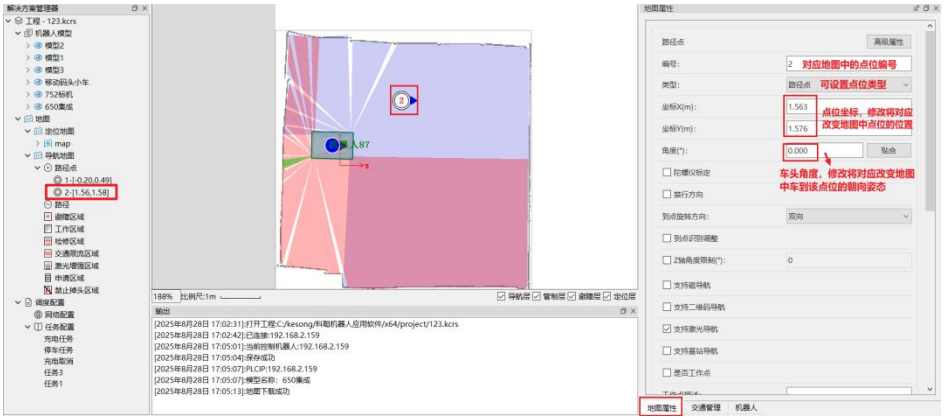


Figure 4- 29Specific properties of the point

Click "Move" in the toolbar, then click a point on the map, and you can drag the point's position while holding down the left mouse button.

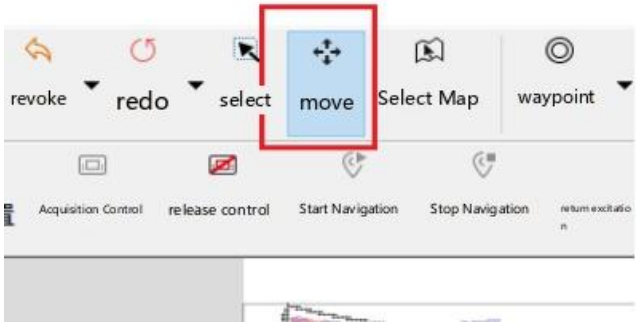


Figure 4- 30Move the point's position

Click "Path" in the toolbar, and at one point on the map, hold down the left mouse button and drag to another point to generate a path on the map. There can only be one path between two points. After creating the path, directly click the path in the Solution Explorer on the left; or click "Select" in the toolbar, then click the path on the map to see the path details in the map properties on the right.

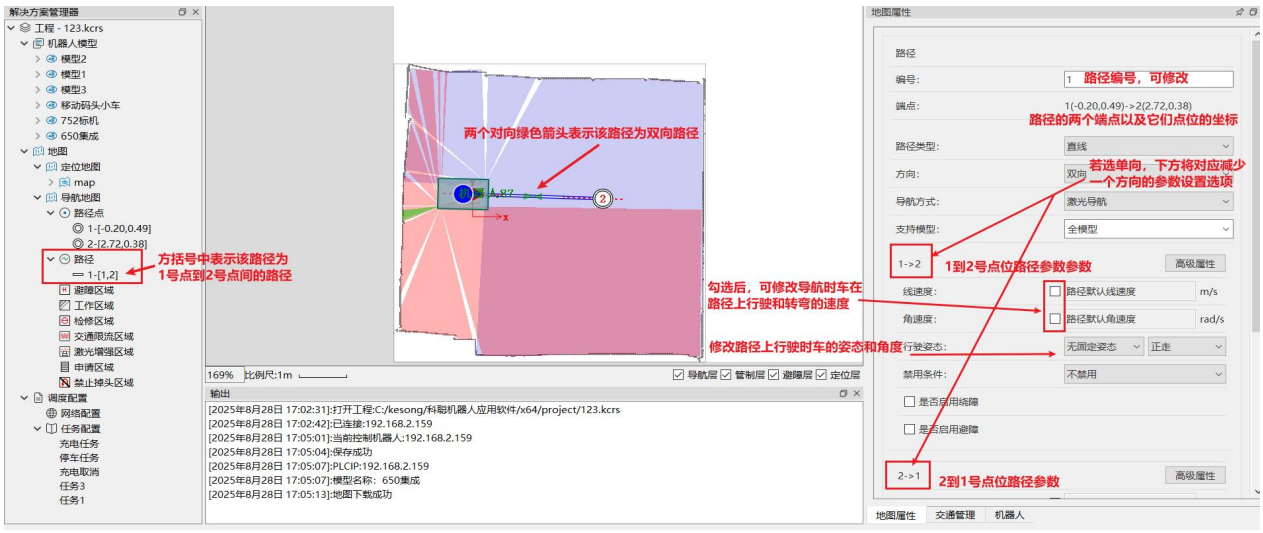


Figure 4- 31Path details

4.3.4 Import Map

Right-click the map, or right-click to locate the map, and select Import Map.



Figure 4- 32Import map

Existing maps will be cleared. Please export and save the existing maps if needed.

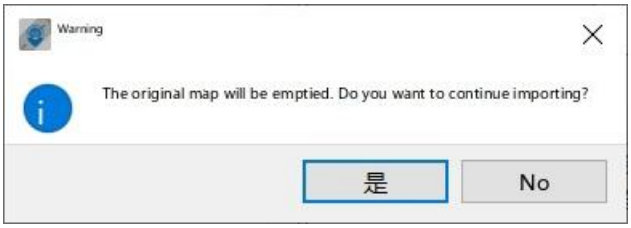


Figure 4- 33Import Warning

Select the target map file and click OK.

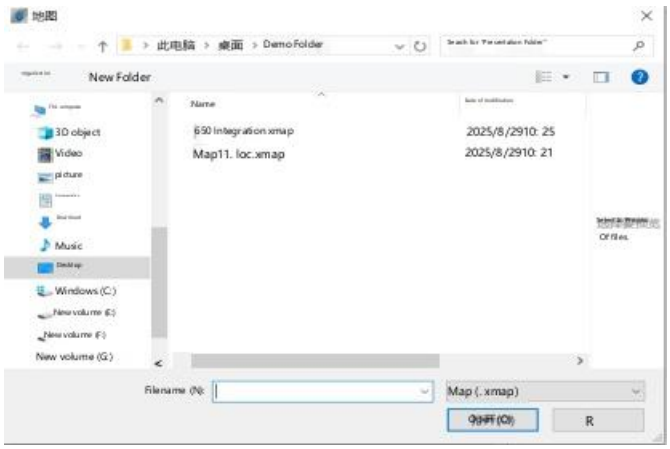


Figure 4- 34Import Target Map File

The exported map file from Method 2 is a compressed file, where:

- xxx.loc.xmap is a pure outline map.
- nav.xmap is a pure path map.
- model1.xmap is a path plus outline.
- If you need to import and retain the path and points, you need to import the file "model_name.xmap".

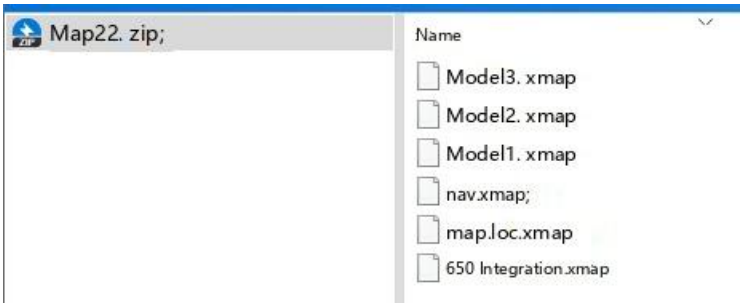


Figure 4- 35Import File Format Instructions

4. 3. 5 Edit the Map, Draw Map Paths, and Add Obstacle Avoidance Areas

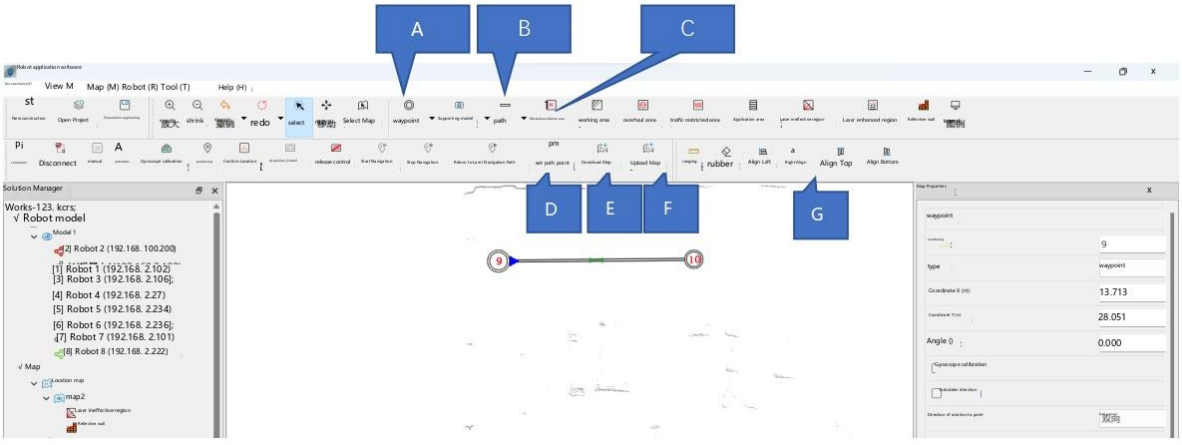


Figure 4- 36Introduction to the main map editing operation functions

A: Path points can be set; map attributes can be modified (number and coordinates)

B: Path used to connect points. Path attributes can be set to forward, backward, curve, etc.

C: Obstacle avoidance area can be set with different obstacle avoidance schemes and obstacle avoidance function on/off according to actual needs.

D: Set the current position of HMR as a path point.

E: Every time the map is modified, it must be downloaded to take effect

F: Read the map from HMR to the computer.

G: Hold down Ctrl or select a batch of points with the mouse for alignment and other operations

4.3.6 Modify the Global Map Speed

The following method can be used to set the maximum linear velocity and maximum angular velocity of HMR in the entire map, without having to modify the speed parameters of each path individually. After setting, all paths will use this global speed value by default. If certain areas need to run at a reduced speed, the speed of the corresponding path segment can be modified individually.

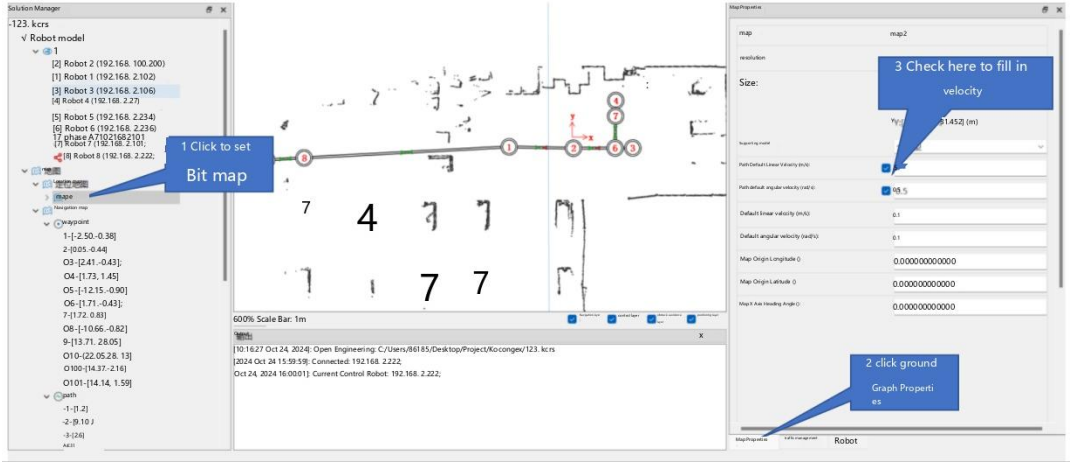


Figure 4- 37Modify the global map speed

4.3.7 Modify the Speed of a Local Map Path

If a local path needs speed limiting, select the path and modify the linear and angular velocities of the current path

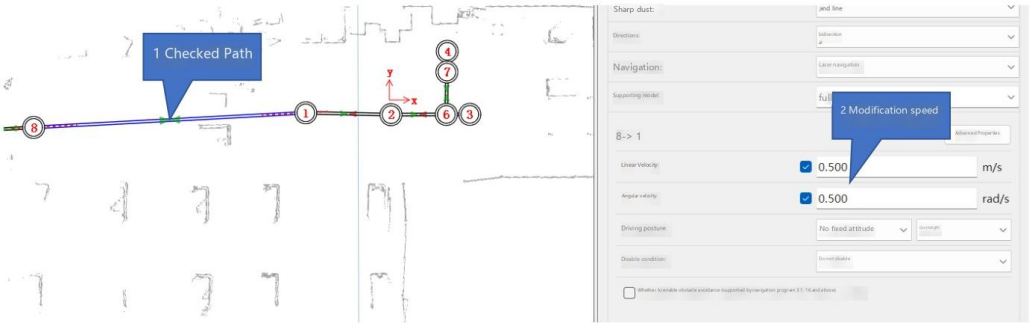


Figure 4- 38Modify the speed of a local map path

4.4 Robot Control Navigation

- Manual/Automatic Switching:

  Navigation needs to be switched from manual to automatic.

  Switching to manual mode during navigation will stop the vehicle.

- How to navigate:

  In automatic mode, click a waypoint on the map, then click Start Navigation.

- Stop navigation:

  Navigation can be stopped at any time during navigation, and the vehicle will stop. You can also press the spacebar.

- Navigation route selection:

  If the route is not unique, the shortest route will be selected as the navigation route.

  Note: If the vehicle stops outside the designed route, manual navigation will cause the vehicle to find and drive to the nearest route before executing the subsequent navigation task.

4.5 Obstacle Avoidance

4.5.1 Testing and Setting up the Robot Obstacle Avoidance Scheme.

When connecting the robot, clicking the test button while the robot is stationary will check whether the robot has detected obstacles in the currently set obstacle avoidance area according to the selected obstacle avoidance scheme. If there are obstacles, it will indicate that an obstacle has been encountered in the area.

There is no need to download the obstacle avoidance scheme during area testing. Simply click the test button after changing the obstacle avoidance area.

Set the range of the obstacle avoidance scheme as needed. Multiple obstacle avoidance schemes can be set. Each scheme should have a deceleration distance, stopping distance, and protection distance set for each area.

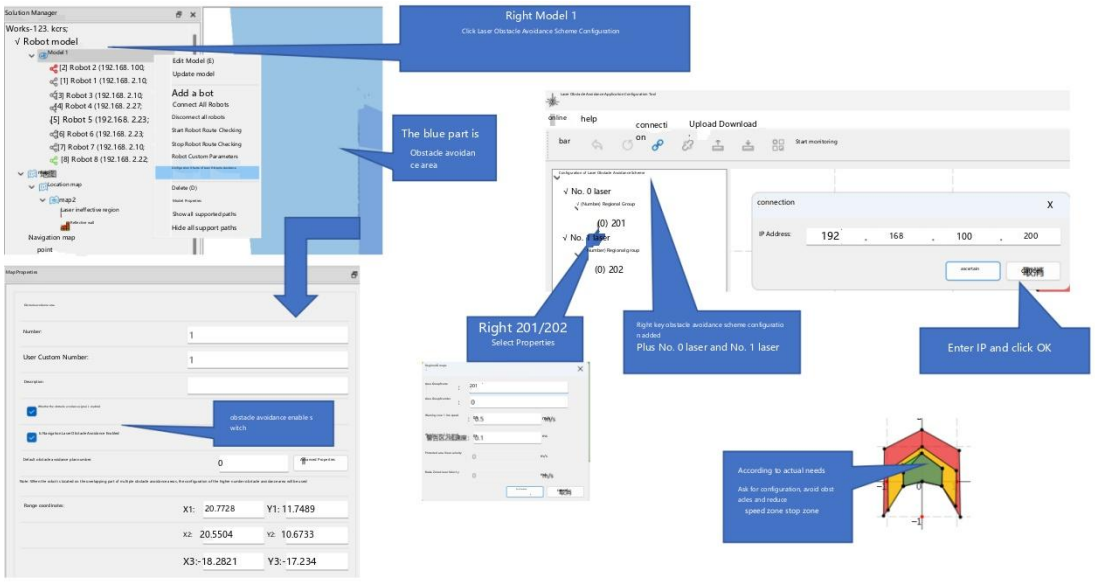


Figure 4- 39Laser obstacle avoidance scheme configuration

Draw the obstacle avoidance area on the map path.

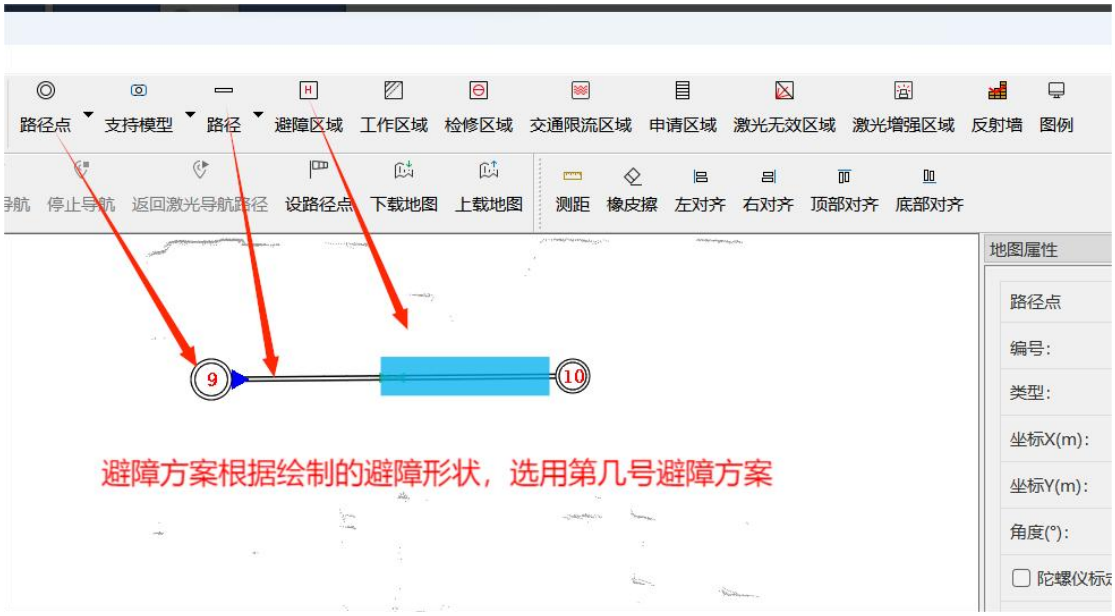


Figure 4- 40Draw the obstacle avoidance area

When an obstacle enters the warning zone, HMR will decelerate to the preset speed. When entering the protection zone and stop zone, HMR will stop in place and simultaneously issue a voice prompt "Please move the obstacle ahead".

4.5.2 Configure the Obstacle Avoidance Scheme

In automatic mode, HMR needs to be configured with an obstacle avoidance scheme to ensure safety during operation. When an obstacle enters the protection zone, HMR will stop and issue an alarm "Please move the obstacle ahead". Different solutions are applied for different road conditions, as shown in the following example:

- Charging station point:

The obstacle avoidance scheme for the rear of the vehicle at the docking position needs to be drawn short.

- Wide passageways for quick passage:

The obstacle avoidance range in all directions needs to be kept at a considerable distance. The deceleration speeds of the two warning zones need to be set appropriately to prevent tail-wagging due to sudden braking.

- Narrower road on one side:

The obstacle avoidance area on the narrower side needs to be drawn shorter.

The obstacle avoidance zone is divided into four layers. The outer two layers are warning zones. When an obstacle appears in the warning zone, the HMR decelerates to the configured speed. The inner layers are braking and protection zones. When an obstacle appears in the inner zone, the HMR stops and issues a voice alarm, and the indicator light flashes red.

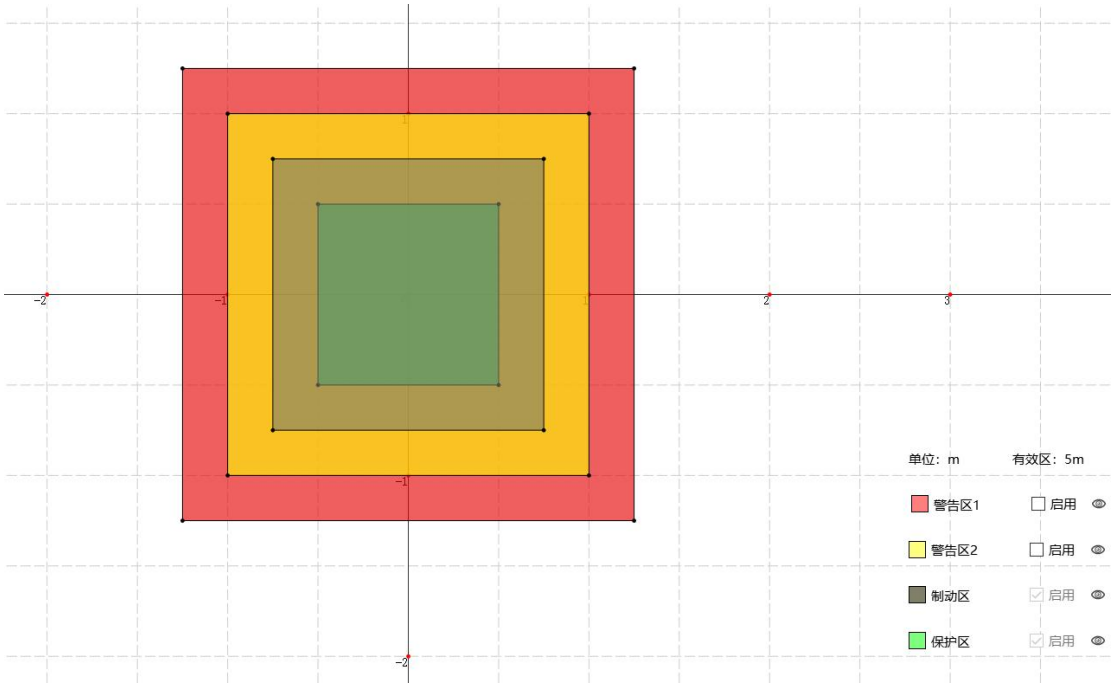


Figure 4- 41Obstacle Avoidance Zone

4.5.2.1 Configuration Steps

In the robot application software, right-click the robot model, select the laser obstacle avoidance scheme, and select "Center on laser." After opening, switch to the old scheme.

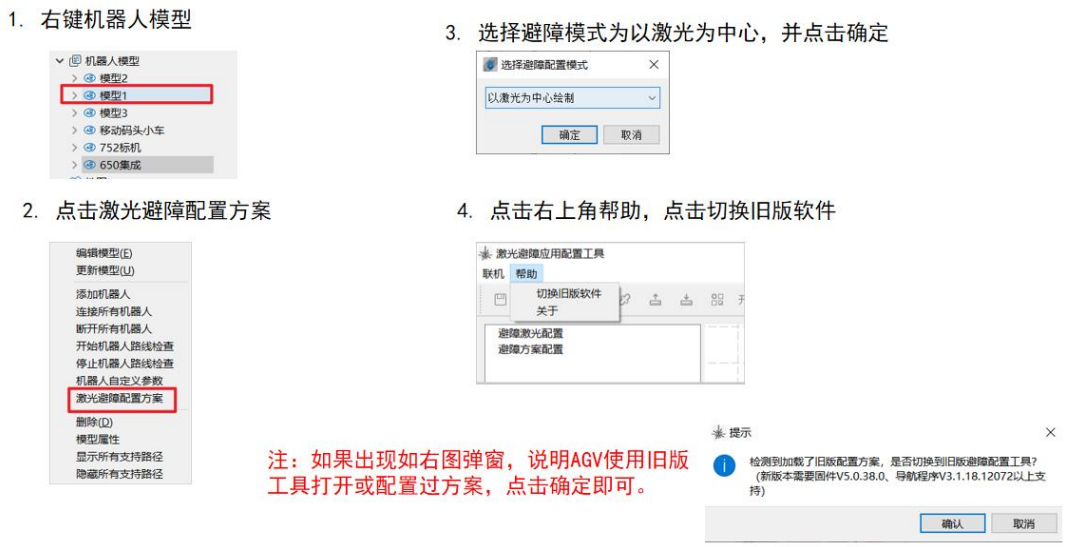


Figure 4- 42Select the robot model for which you want to configure the laser obstacle avoidance scheme

Right-click "Laser Obstacle Avoidance Scheme Configuration" to add lasers. By default, laser number 0 is the front laser, and laser number 1 is the rear laser. Right-click "Area Group" under the laser to add schemes. The "Area Group Number" of the added scheme corresponds to the obstacle avoidance number entered when applying it on the map.

In the map, the front and rear lasers of the HMR will apply the solution corresponding to the same number.

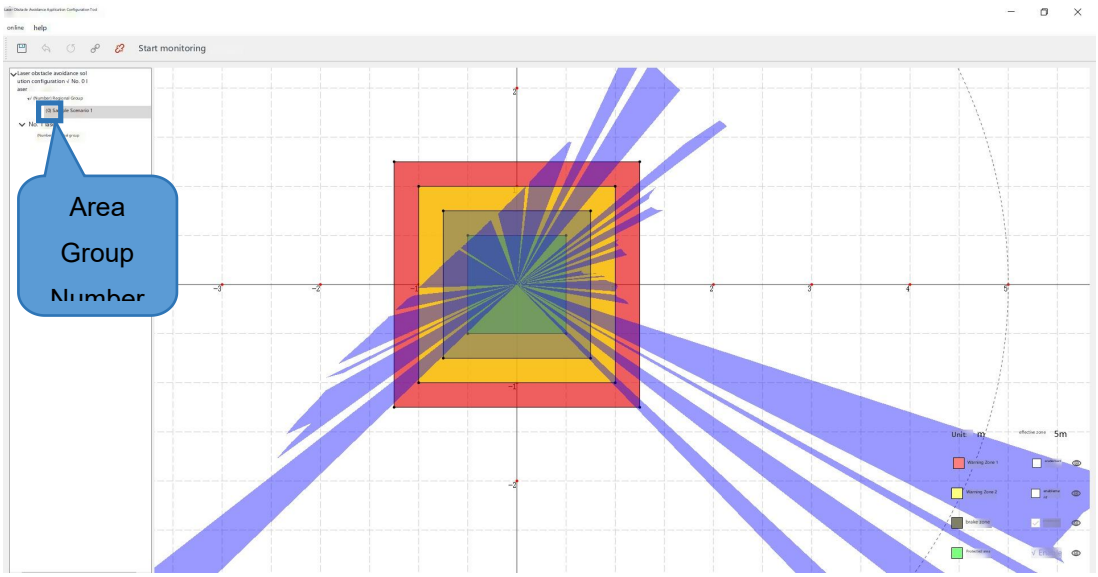


Figure 4- 43Add Laser Obstacle Avoidance Scheme

Double-clicking an edge of an area creates a point. Dragging the point changes its shape. The purple area shows the current real-time laser illumination (in a stationary and normal state, the protected area and braking zone must be within the laser beam to avoid false blocking alarms; the same applies to the warning zone).

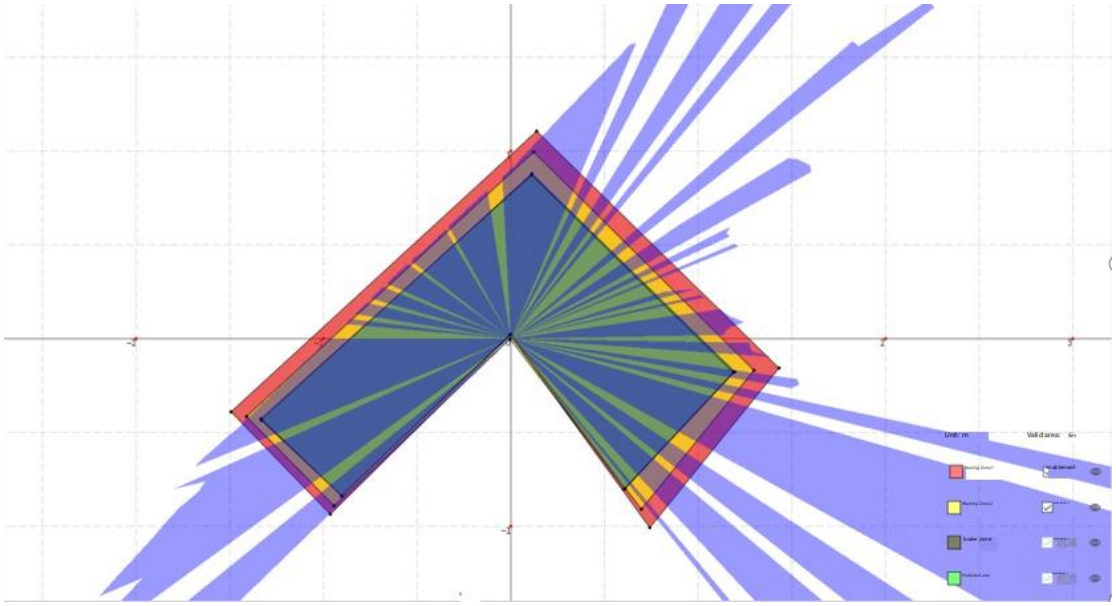


Figure 4- 44Real-time Laser Illumination

4.5.3 Apply Obstacle Avoidance Scheme

There are two ways to apply an obstacle avoidance scheme: selecting the obstacle avoidance area and setting the site path attributes. When both exist, the latter has higher priority.

4.5.3.1 Obstacle Avoidance Zone

Click on the obstacle avoidance area, select the target area on the map, click on the area, enter the applied scheme number, and then download the map.

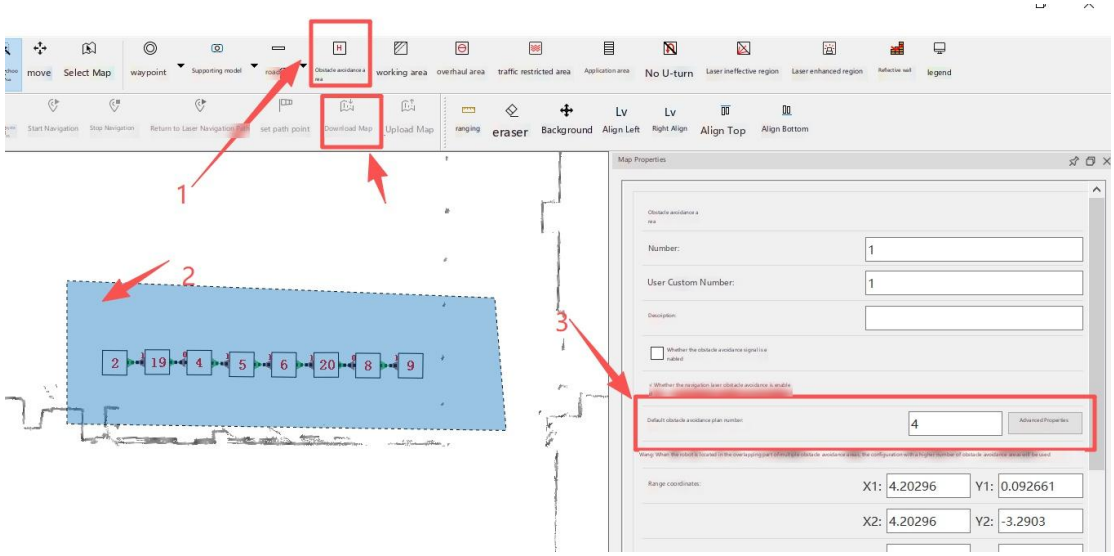


Figure 4- 45Select the Obstacle Avoidance Area

4.5.3.2 Path and Point Obstacle Avoidance

Click on the target point, check "Enable Obstacle Avoidance" in the properties, enter the target scheme number,

modify it, and then download the map.

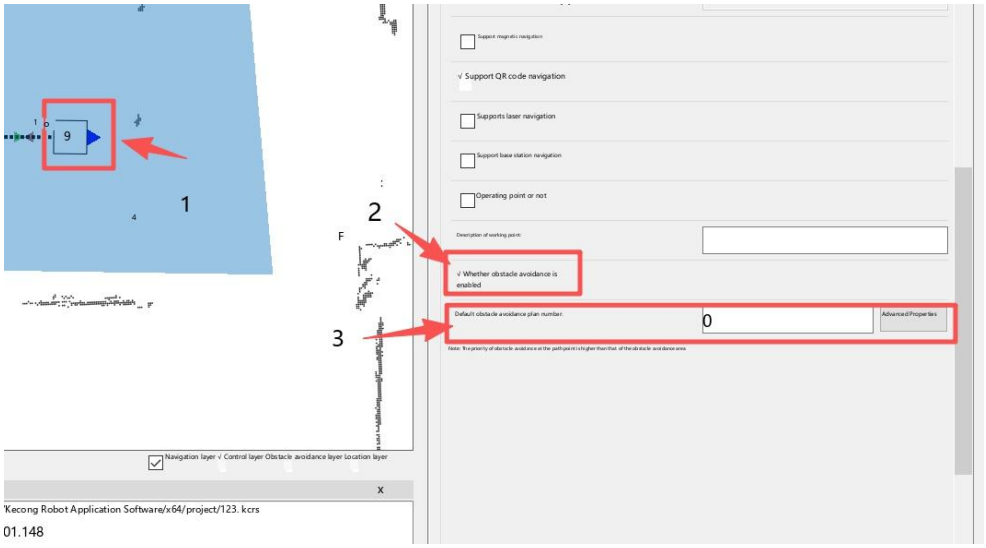


Figure 4- 46Enable Obstacle Avoidance at Points

Click the target path, check "Enable Obstacle Avoidance" in the properties, enter the target scheme number, modify it, and download the map. Note: When the path is bidirectional, both directions need to be configured; different schemes can be configured for the return trip.

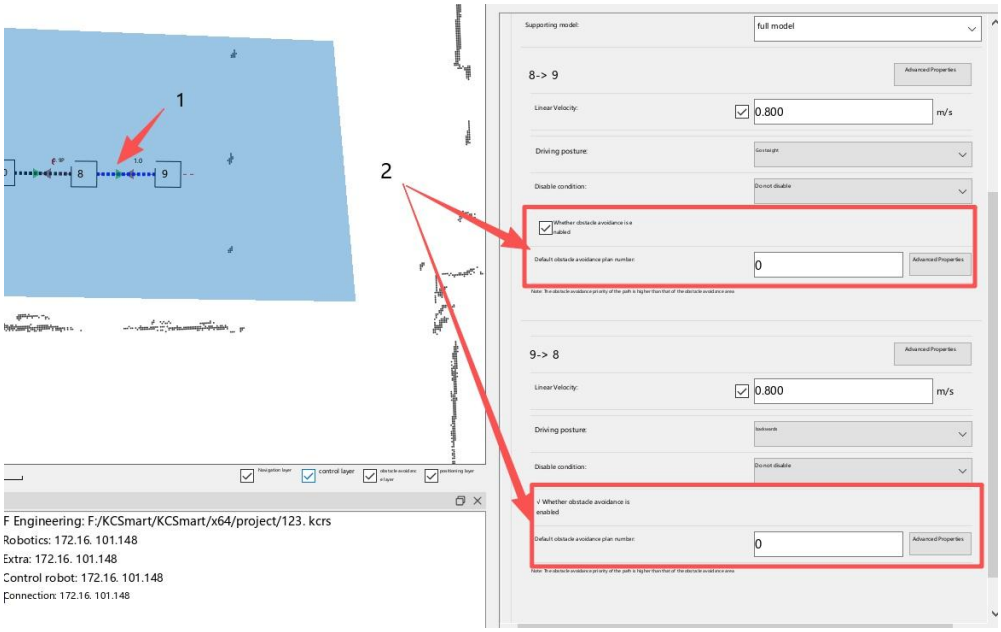


Figure 4- 47Enable Obstacle Avoidance on Paths

4. 6 Positioning

The first thing to do after each power-on is to open the application software to confirm the positioning; if the current positioning status is failed, or the laser does not match the map, or the confidence level is very low, you need to click this button to confirm that the positioning is correct.

If the HMR's positioning is incorrect, it will cause the HMR to be unable to navigate, or even move incorrectly and cause a collision!

4.6.1 Confirm Location

If the current position is correct, click "Confirm Location" to confirm the robot's current position on the map. Subsequent operations cannot be performed without confirming the position.

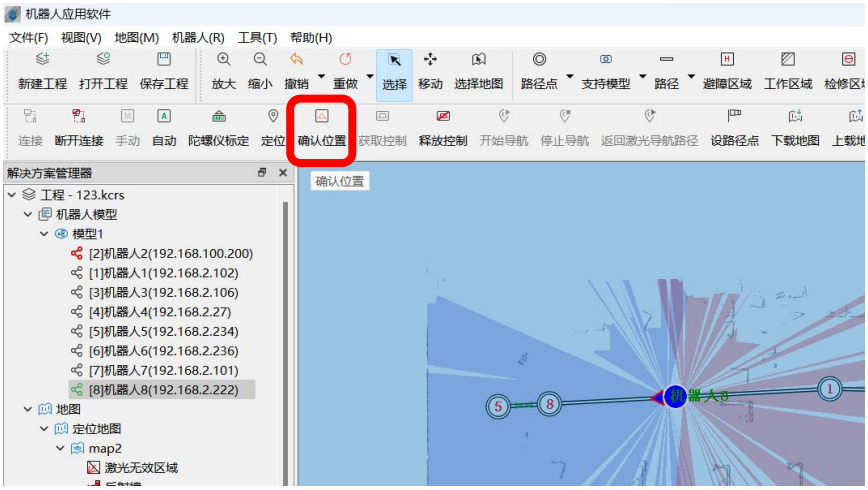


Figure 4- 48Confirm position

The positioning confidence level is 0-1, which is of reference value. The closer it is to 1, the higher the positioning confidence level. A low level may indicate lost positioning or positioning errors. Do not only look at the confidence level, but also at the actual matching between the HMR and the map.



Figure 4- 49Positioning Confidence

4.6.2 Accurate Positioning

Check if the purple and red laser point clouds overlap with the black wall; if they do not overlap in either the X or Y

direction, it indicates a positioning error, requiring repositioning until all directions completely overlap to complete positioning.

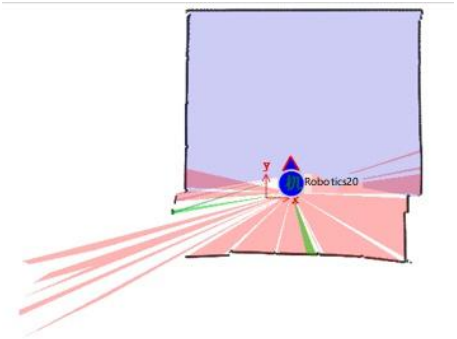


Figure 4- 50Accurate Positioning

4.6.3 Repositioning

If the current robot position does not match a regular point on the map, you can click the "Position" button to allow the robot to reposition itself on the map.

Switch the HMR to manual mode and click positioning.

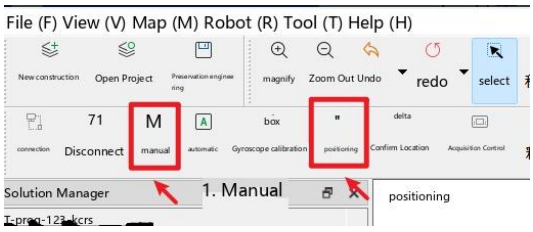


Figure 4- 51Switch to manual positioning

Observe the map outline. In the map below, the actual position of the car should be located at the bottom of the map with its front facing upwards. The blue triangle arrow in the image below indicates the direction of the car's front.

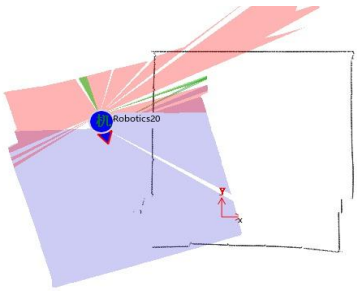


Figure 4- 52Laser point cloud does not match the actual map

Operation illustration: Click and hold the left mouse button on the actual position, then drag the mouse towards the direction the car's front is facing (as shown by the black arrow in the image below). Release the mouse and observe the car automatically calibrating its positioning.

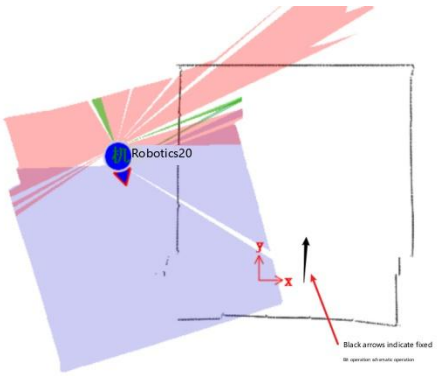


Figure 4- 53Automatic positioning calibration

After the operation is completed, the HMR will automatically identify and calibrate the position. Successful calibration is shown in the following figure.

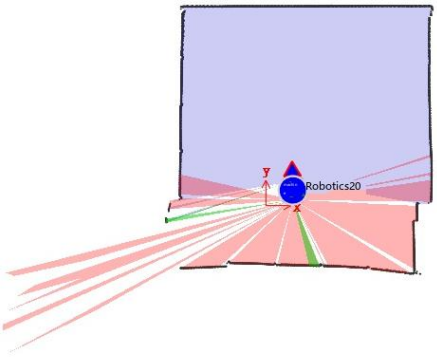


Figure 4- 54Calibration successful

Repositioning operation steps:

Click the "Position" button. Use the mouse to drag the black circle representing the car body to the approximate position of the car body (actual location). Click and drag the mouse arrow to make the black circle point in the actual direction the car body is facing. After releasing the arrow, wait for the process to complete. During this time, the green square representing the vehicle may jump, and the green point cloud will attempt to align with the gray walls or obstacles shown on the map.

Note: If repeated repositioning fails, try the following methods:

- Manually move the HMR to a location with more reference points on the map and try again.
- Download the map and try again.
- The objects on the map have changed too much from the actual scene; a redraw is required.

4.7 Configure Wireless IP

Configuring the wireless IP requires configuring the HMR to connect to a local area network and assigning an IP address. Afterwards, as long as the computer and HMR are on the same local area network, you can wirelessly connect to and operate the HMR using that IP address.

Connect the HMR via network cable and enter 192.168.100.1 in your browser. Enter your username and password to log in. Username: admin, Password: 12345678.

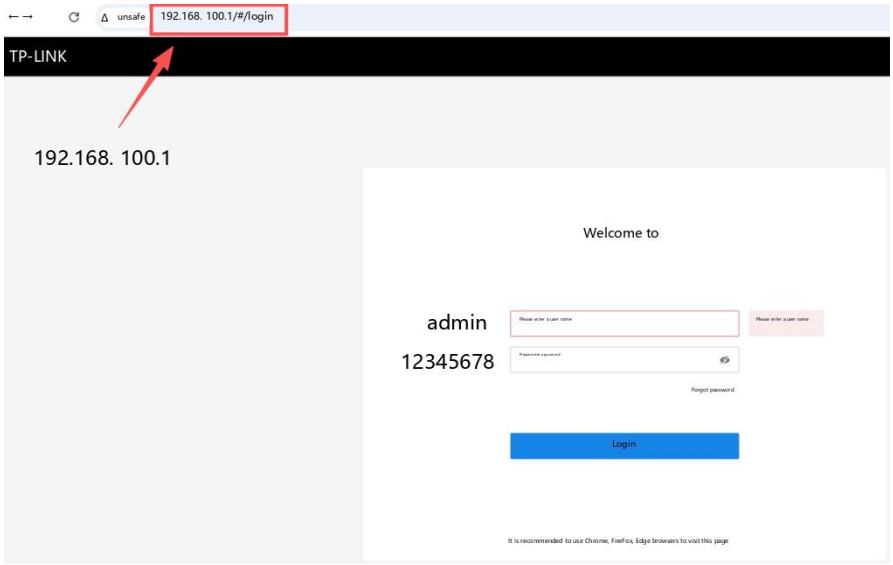


Figure 4- 55Log in

In the wireless settings, click Scan, connect to the target wireless network, and then click Save.

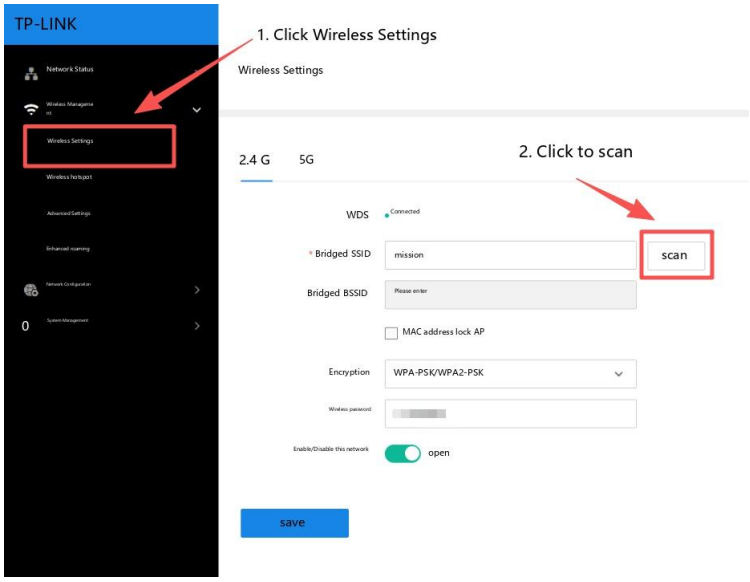


Figure 4- 56Connect to the target wireless network

In the network configuration, set an unused static IP address within the same network segment as the currently connected local area network. If permission is required, contact the factory IT department to allow access to that IP address.

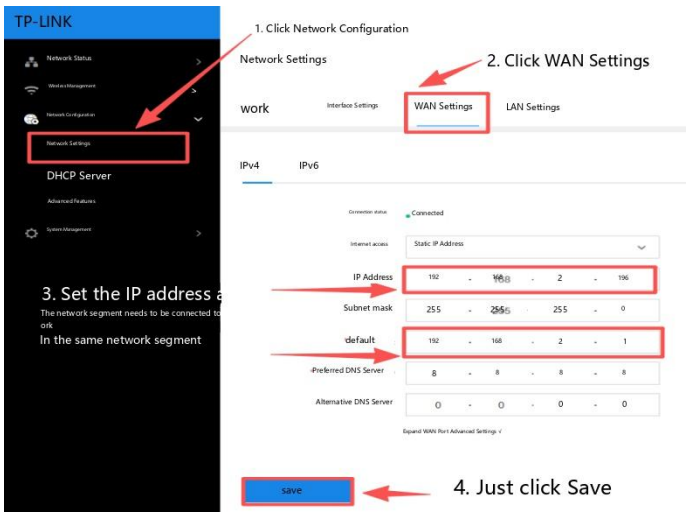


Figure 4- 57Network settings

Return to the robot application software and add the robot with that IP address.

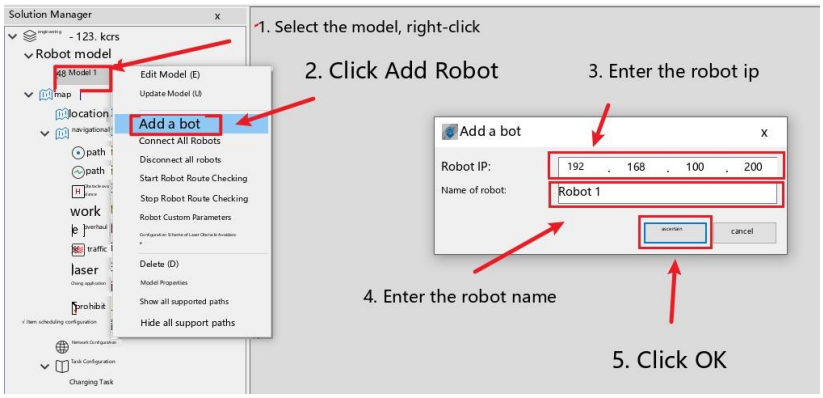


Figure 4- 58Add Robot

5 Maintenance

5.1 Maintenance Precautions

Maintenance is essential for the safe, normal, and reliable operation of the equipment. To ensure the safe and stable operation of the equipment and extend its service life, inspection and maintenance are indispensable. Therefore, we should perform regular maintenance on the unit. The maintenance methods are based on this manual. Please contact our after-sales service personnel to perform regular maintenance as required.

At the end of the maintenance, please ensure that the maintenance personnel manually fill in the maintenance record for this product. At the end of the maintenance, please start the machine together with the maintenance personnel to verify that the product functions normally.

When the robot malfunctions, the maintenance personnel need to enter the operating site for maintenance and need to maintain communication with off-site personnel. Additionally, the system will be paused and an alarm will sound when maintenance personnel enter the site. The system will only return to normal and the alarm will stop after the maintenance personnel have completed operation and left the area. When repairing or replacing robot parts, only parts approved by Mission must be used.

Before maintenance, please carefully read the "Maintenance Precautions" and perform equipment maintenance only after fully understanding the safe maintenance methods.

Note: For detailed maintenance and upkeep of collaborative robots, please refer to the Maintenance and Quality section of Elite Robotics' "CS_User Manual_CS66".

 danger	● It is strictly forbidden for non-professionals to install, wire, maintain, inspect, or replace parts of the equipment! ● It is strictly forbidden to perform equipment maintenance or repair while the power is on, otherwise there is a risk of electric shock! ● Do not disassemble parts not recorded in this manual, or maintain them using methods different from those recorded. ● Before entering normal operation, please ensure that the emergency stop switch is working properly; otherwise, the system will not be able to perform its safety function in an emergency, which may lead to serious injury or major damage.
 Warning	● Please report equipment repairs in accordance with the product warranty agreement. ● Please perform daily and periodic inspections and maintenance on the equipment in accordance with the equipment maintenance and upkeep requirements, and keep records. ● When the equipment malfunctions or is damaged, professional personnel shall troubleshoot and repair the equipment according to the maintenance guidance, and keep a record of the repair. ● Please follow the replacement instructions in the manual for component replacement. ● Do not allow foreign objects to enter the interior and connection terminals of the equipment during maintenance. ● Please do not open the cover of the equipment except for maintenance and upkeep operations. ● After replacing the equipment, please be sure to recheck the wiring and parameter settings of the equipment.

5.2 Maintenance Tools

Before maintenance, the content of this maintenance should be clearly defined. Bring the corresponding maintenance sheet, and prepare protective equipment, maintenance tools, and oils. Different maintenance types may not require all the tools listed in the table below. You can choose according to the maintenance content.

serial number	Tool Name	Purpose / Specifications	Remarks
Tool List			
1	Small Gantry Crane	Used for lifting the HMR, inspecting casters and drive wheels	
2	Handheld Charger	For Manual Battery Charging	
3	2m Suspension Strap	HMR lifting	
4	M12 Eye Screw	HMR lifting	
5	Hand torque wrench 50Nm		
6	Allen Wrench		
7	Small Phillips Screwdriver		
8	Large Phillips Screwdriver		
9	Ratchet Tool Assembly		
10	Digital Multimeter		
Consumables			
1	Grease		
2	Thread tightening adhesive		
3	cotton fabric		
Background Tools			

1	Laptop Computer		
2	1m Network Cable	Local connection to the HMR	
3	Motor Serial Cable	Local Connection to Motor Driver	

5.3 Maintenance and Repair Schedule

The maintenance intervals specified in the maintenance and inspection checklist are only for 8-hour work days and normal operating conditions. If the intensity of operating conditions is higher than normal, such as high dust levels, large temperature fluctuations, acidic or alkaline environments, or other operating conditions where the HMR operates on a 24-hour cycle, the maintenance intervals should be appropriately shortened.

Based on the classification method of regular maintenance intervals, equipment maintenance work is divided into three types: daily inspection, monthly maintenance, and annual maintenance.

5.3.1 Daily Service and Maintenance of the Robot

Keep the robot's overall surface clean and free of dirt, and ensure the top-view lens is free of obvious dust and foreign objects (dust and particles must not enter the equipment, as there are delicate electronic components under the camera lens that are easily damaged by scattered dust and particles);

1) Routine maintenance requires regular visual inspection and noise checks;

2) Keep the entire vehicle surface clean and free of dirt, and check the barcode reader for scratches that may affect reading;

3) Ensure the robot's warning lights are functioning normally, and the panel display and operation are working properly;

4) Check the casters and drive wheels for the integrity of the rubber coating, and for cracks or peeling;

5) The robot should not make abnormal noises;

6) Check the top plate anti-slip pad for damage, warping, or peeling;

7) Check the lidar sensor for proper function, and ensure the obstacle avoidance lidar is working normally;

8) The robot's shell should be free of defects; Check that the left and right drive wheels are securely mounted on the wheel carrier and that the wheel carrier screws are locked;

9) Check if the charging pins and CAN communication pins of the charging port are tilted, and if the charging sensor is retracted;

10) Keep the charging port clean and free of foreign objects and dust.

11) The emergency stop button, key switch, reset button, power off button, and brake release button should function properly;

12) The robot's shell should be free of defects; Check that the left and right drive wheels are securely mounted on the wheel carrier and that the wheel carrier screws are locked;

5.3.2 Floor Cleaning Requirements

- Check the ground condition daily, promptly clean up dust, foreign objects, and liquid pollutants to prevent the robot from slipping.
- Timely clean up the marks left by the swivel wheel on the ground to avoid producing severe marks.
- Do not wax the ground along the robot's path, as it may cause the robot's wheels to slip or become dirty.

5.3.3 Robot Cleaning Requirements

Regular cleaning every week is important to ensure the reliability of robot operation. Please remove the power socket before cleaning to avoid short circuit and damage to the electrical system.

1) External cleaning

Clean the attachments on the wheels every day to keep them rotating smoothly.

After cleaning, lubricating oil should be added to the parts of the forklift that need to be lubricated according to the lubrication part table.

2) Clean electrical components

Use compressed air to blow away the dust from the motor, and do not wipe the dust in the circuit with a damp cloth.

Electrical components cannot be flushed with high-pressure flushing devices.

Do not damage the electrical components on the circuit board. Keep the position of the electrical components to avoid short circuits.

3) Before assembling the car body, clean the dust and debris inside the car body with an air gun. After cleaning, check the car body for any residue, dirt, or other debris.

4) No residue is allowed inside the car body: After the car body is assembled (without the outer shell), check whether there are any screws, cut copper wires, wire skins, or other residues inside the car body. If any are found, they must be cleaned up.

5) Check whether the wiring inside the vehicle is neat, and there should be no dust or dirt on the wires. If any is found, it needs to be wiped clean with alcohol.

6) After installing the shell, it needs to be wiped clean with a dry cloth.

7) If there is still dirt after cleaning with a dry cloth, dip it in a little alcohol to clean the surface until it is completely clean.

5.3.4 Laser Cleaning Requirements

 Attention	**Precautions for laser cleaning** Unclean or improper cleaning of the laser may result in the following issues: ● Robots are unable to detect signs/pallet shelves. ● The robot enters an emergency stop state without a clear reason.

Please clean the laser according to the following instructions, otherwise it may cause damage or functional failure of the laser lens:

- Keep the laser glass surface clean and regularly remove dust.
- Please use a specialized cleaning cloth.
- Do not dry wipe the laser glass surface. Please use a damp soft cloth to clean, and add a small amount of cleaning agent if necessary.
- Do not use corrosive solvent based cleaning agents such as acetone.

- Do not use alcohol to clean the laser.

5.3.5 Regular Cleaning Project

project	content	Precautions	Interval/Cycle
HMR body	Use a damp cloth to clean the outer surface of the equipment	NOTICE! Be careful not to use compressed air Be careful not to use corrosive cleaning agents Be careful not to use abrasive cleaners	as needed
wheel	Clean the dirt and ensure that there is no entanglement on the surface of the wheel and the pivot		2-3 weeks
Laser Scanner	Clean the optical component cover of the laser scanner to achieve optimal performance.	NOTICE! Avoid using corrosive or abrasive cleaning agents; Static charges cause dust particles to be attracted to the optical device cover, and you can use anti-static plastic cleaner to reduce this effect.	Weekly/as needed
3D camera	Clean the surface of the 3D camera for optimal performance		Weekly/as needed
QR code reader	Clean the surface of the barcode reader lens to achieve optimal performance		Weekly/as needed

5.3.6 Monthly Service and Maintenance (i.e. Monthly Inspection After Equipment Is Put Into Operation):

After the equipment is installed and debugged, daily maintenance work must be adhered to, and a system of daily inspection, monthly inspection, and annual overhaul must be established.

project	Inspection Items	Maintenance Interval	Maintenance Method/Basis	Specifications/Parameters

project	Inspection Items	Maintenance Interval	Maintenance Method/Basis	Specifications/Parameters
Casters	Check Bearings and Bolts Check Wheel Wear	1 Month / As Needed	Tool inspection—wear exceeding 10 mm requires replacement;	Outer diameter 65mm
indicator light	Check Indicator Lights for Integrity and Functionality	3-4 Months	Visual Inspection	
Emergency stop button	Check Emergency Stop Button for Functionality	3-4 Months	Press the Red Button and Check if the Reset Button Lights Up	Emergency stop button
Bolts/Fasteners	Check for Loose Bolts at All Equipment Connections	1 Month	Tool Inspection—Tighten to the required torque; apply threadlocker if necessary. See Appendix 1 for details.	
Laser Scanner	Check for functional defects.	as needed	NOTICE! Wheels must be recalibrated after replacement.	
Drive Wheels	Check wheel wear. Check wheels for foreign objects	as needed	Replace severely worn wheels. Remove foreign objects from wheel surfaces. NOTICE! Wheels must be recalibrated after replacement.	Drive wheel: outer diameter 165mm
Lithium battery	Check battery range or discharge rate	as needed		Lifespan: 1500 full charge/discharge cycles

project	Inspection Items	Maintenance Interval	Maintenance Method/Basis	Specifications/Parameters
Wiring / Sensors	Check photoelectric switches, proximity switches, junction boxes, and cable installation for secure mounting	1 Month	Troubleshooting	
	Check connector connections for secure mounting			
Vehicle exterior cover	Check vehicle exterior cover for dents and deformation	as needed	Repair or replace	

5.3.7 Annual Service and Maintenance (i.e., Annual Inspection After Equipment Is Put Into Operation):

Annual maintenance requires a comprehensive vehicle inspection. This work is unrelated to the total equipment time and must be performed even if the equipment is not in operation;

project	Inspection Items	Maintenance Interval	Maintenance Method/Basis	Specifications/Parameters
Code reader	Check the readout lens for damage	Annual	Replace immediately if damaged;	
Tighten screws	Check the fixing bolts of the drive wheel, reducer, and motor	Annual	Disassemble the vehicle and check if the fixing bolts of the drive wheel, reducer, and motor are secure;	
Drive Wheels	Check wheel wear.	Annual	Replace severely worn wheels. Remove foreign objects from wheel surfaces. NOTICE! Wheels must be recalibrated after replacement.	Drive wheel: outer diameter 165mm
	Check wheels for foreign objects			

project	Inspection Items	Maintenance Interval	Maintenance Method/Basis	Specifications/Parameters
Casters	Replace casters	Annual / As needed	Replace casters that have been in operation for more than one year to avoid misalignment caused by caster problems. Specific conditions can be determined based on the site conditions	
Lithium battery	Check battery SOC and cycle count	Annual	If the number of cycles (SOC) of the battery exceeds 1500, the battery needs to be replaced	Lifespan: 1500 full charge/discharge cycles
Wiring / Sensors	Wiring harness inspection	Annual	Check the wiring harness for aging or damage; Check if the terminal connections are secure;	
	Connector inspection			

5.4 Warranty Instructions

The warranty of this product does not include the following situations:

1) Damage caused by improper transportation, installation, operation, and management by the user;

2) Damage caused by unauthorized disassembly of the product by the user;

3) Damage caused by external factors such as abnormal voltage and fire;

4) Damage caused by non-compliance with the instructions, indicative markings on the product body, and other necessary precautions;

5.5 Simple Troubleshooting

Before entrusting product maintenance, please check and confirm according to the following checklist. If it is indeed a malfunction, please contact our after-sales service personnel and do not repair it without authorization. Before inspection, please ensure that the product is powered off.

When the robot malfunctions, it will trigger the corresponding protection mechanism and display the corresponding error code in the interface bar of the upper computer monitoring end.

The list of common fault types and troubleshooting methods is as follows:

serial number	Fault manifestation	cause of failure	solution measures

serial number	Fault manifestation	cause of failure	solution measures
1	The robot has been running Shutdown or deviation during the process	To ensure safety, the robot will automatically stop running when it encounters two consecutive ground QR codes that cannot be recognized.	● Switch to manual mode, or push the robot to move to the designated QR code, then switch the robot to automatic mode, and finally press the reset button. The robot can automatically clear errors and go online; ● Observe whether the QR code is damaged after the robot passes by, and whether there is dirt that cannot be recognized by the robot. If there is, please clean it with a cloth or replace the soiled QR code;
2	Robot abnormal obstacle avoidance	Radar malfunction or incorrect parameter configuration.	● Firstly, check the parameter settings to ensure that the radar data changes correctly with the range of obstacles. If there is no change in the radar data, please replace the radar. ● Clean the dust on the surface of the LiDAR or replace it with a new LiDAR;
3	Motor failure	Emergency stop or edge touching trigger causes the motor power to be cut off.	Check if the emergency stop button is pressed and if the edge switch is triggered;
4	Congestion caused by occupied routes	Traffic control and deadlock.	If the deadlock persists for a long time, switching one of the robots to manual mode and moving it to another location to reconnect can release the deadlock.
5	Path error	The path between the initial point and the target point of the task is discontinuous	Check if the task is correct or if the map has been changed.
6	The congestion caused by the occupied route resulted in the robot being shut down due to insufficient battery power	Robots that are not outside the map have not been removed from the system.	Check the number of robots parked in front of the robot, select the blocked robot, push the robot to the charging station for charging, and then drag the faulty robot away from the scene through the upper system.
7	Report error during robot lifting operation	Rack tilt or rack QR code tilt	Select the camera with an upward view and check if the rack code is tilted. If so, please adjust the rack or reconnect the rack code.

serial number	Fault manifestation	cause of failure	solution measures
8	Charging error	Poor insertion of the charging interface due to incorrect positioning or displacement of the charging station	● Reset the charging station to its initial fixed position; ● Check if there is any contamination on the QR code near the charging station;
9	Robot with load slide	skid	Check if the slippery floor is flat, if the left and right drive wheels of the robot are stuck, and if the limit block screws fixing the wheel frame are loose. Quick recovery process: First switch to manual mode and use a wired controller to reset the error. Then enter the code, switch to automatic mode, press the reset and start buttons, and the robot returns to online.
10	Robot empty load error	Code loss or slippage	The recovery process is the same as the above recovery process
11	Robot network lost contact	If the robot is disconnected from the server for more than 30 seconds, it indicates a malfunction in the Wi-Fi module or poor contact at the Wi-Fi module's network port.	● Re plug and unplug the WiFi module network cable; ● Check if the WiFi network at the venue is communicating properly; Check if the server network connection is normal;

5.6 List of Vulnerable Parts

serial number	Name	Quantity
1	Battery	1
2	Drive Wheels	2
3	Casters	4
4	Anti-collision strips	2
5	CD550CE-M01-048-X1 Front housing	1
6	CD550CE-M01-056-X1 Rear charger housing	1
7	CD550CE-M01-055-X1 Left side housing	1
8	CD550CE-M01-054-X1 Right side housing	1

5.7 Maintenance Operation Instructions

 Warning	Power must be disconnected before disassembling any part!

5.7.1 Electrical Component Maintenance

Before product repair, please check and confirm according to the following list. If it is indeed a fault, plea se contact our after-sales service personnel. Before inspection, please ensure that the product is powered off. See the component allocation details2.2.2Description of chassis components。

1) Check if the power switch is loose and if the button pops up normally.
2) Check if the piezoelectric contact signal is normal and check its electrical wiring.
3) Check the drive motor cable to see if the connection is secure.
4) Check if the communication cable connectors between the driver modules are securely connected.
5) Check if the buzzer connection cable and communication cable are normal.
6) Check if the 12V, 24V, and 48V aviation plugs on the power management module are securely connecte d, if the signal connectors are securely connected, and if the debugging port is secure.
7) Check if the laser sensor signal is normal by connecting to the backend and placing obstacles for detect ion.
8) Check if the charging connector at the charging port is loose.

5.7.2 Caster Maintenance

Casters	Maintenance methods
Screw tightening inspection and maintenance	Tighten the caster fixing bolts with a socket wrench assembly.
Caster condition inspection and maintenance	Flip the HMR over and check if the rotating wheels are running smoothly without any a bnormal noise. Check if there are any entanglements at the wheel bearings and visually inspect if the wheels are damaged or detached.
Replacement of faulty casters	Replace casters that have been in operation for more than one year. Remove the caster fixing nuts and replace them. When reinstalling, apply thread-locking adhesive to all re moved bolts and tighten them. Mark the bolts after ensuring they are properly tightened.

5.7.3 Drive Component Maintenance

Drive Component	Maintenance methods
Drive Motor Mounting Bolt Maintenance	Use a hand torque Allen wrench to retighten the mounting bolts of the integrated drive wheel, ensuring they are tight and marking them.

Drive Motor Status Inspection and Maintenance	● Check the inside of the drive wheel for any tangled material and clean it. ● Check that the left and right drive wheel motors and wiring harness connectors are securely plugged in. ● Tighten the screws securing the drive wheel.

5.7.4 Lithium Battery Maintenance

5.7.4.1 Lithium Battery Screw Fixing Maintenance

Lithium battery	Maintenance methods
Lithium Battery Screw Fixing Maintenance	Use a hand torque Allen wrench to retighten the screws securing the lithium battery, ensuring they are tight and marking them.
Lithium Battery Cable Connection Maintenance	Check the charging/discharging and communication cable connectors from the lithium battery to ensure a secure connection.
Charging Maintenance	● Perform a full charge maintenance operation on the lithium battery using a manual charger. ● Check the charging/discharging and communication cable connectors from the lithium battery to ensure a secure connection.

6 Appendix

6.1 Appendix A: Daily Maintenance and Inspection Record

Daily Maintenance and Repair Record Checklist					
Maintenance Level	Equipment Model			Inspection Personnel	
	Equipment Number			Date	
	Inspection Items		Method	Inspection Results	Remarks
Daily Maintenance and Repair Items	Visual Inspection (Check for damage to the casing, loose or missing screws)		Visual Inspection	☐Normal □Abnormal	
	Noise Inspection (Check for abnormal noises during operation)		Auditory Inspection	☐Normal □Abnormal	
	Check for damage to the barcode reader		Inspection	☐Normal □Abnormal	
	Check the emergency stop switch, power button switch, and lidar for proper function		Inspection	☐Normal □Abnormal	
	Check the anti-collision contact edges for integrity and proper function		Inspection	☐Normal □Abnormal	
	Check the top anti-slip pad for integrity, and for any damage or peeling		Inspection	☐Normal □Abnormal	
	Check for damage to the charging port		Inspection	☐Normal □Abnormal	
	Check the status indicator lights for proper function		Inspection	☐Normal □Abnormal	
	HMR surface hygiene and cleaning		Cleaning	☐Cleaned □Not Cleaned	
Abnormal Situation Record Form					
Equipment Number	Abnormal Situation	Handling Measures	Person in Charge	Handling Date	Remarks

Remarks:

1. The inspection personnel shall make records in the record column after completing maintenance. If the situation is normal, mark "√" in the corresponding place of the table. If it is abnormal, indicate "NG". If there is no need to check this item, mark "/".
2. If there is an abnormal situation, please fill in the abnormal situation information in the abnormal situation record form and report it to the Equipment Department. If the problem cannot be resolved, please contact Mission Intelligent Robot after-sales personnel in a timely manner.
3. Daily maintenance is to be performed by the operator before starting work each day (except for equipment marked "Idle"). Monthly and quarterly maintenance is to be performed by the equipment maintenance personnel according to the usage and production status. Annual maintenance is to be performed by professional personnel or institutions.

6.2 Appendix B: Monthly Maintenance and Inspection Record

Daily Maintenance and Repair Record Checklist				
Maintenance Level	Equipment Model		Inspection Personnel	
	Equipment Number		Date	
	Inspection Items	Method	Inspection Results	Remarks
Monthly Maintenance Items	Control operation through configuration software and observe whether the process is smooth; Whether the sensor can be effectively triggered;	Inspection	☐Normal □Abnormal	
	Check the upper-view barcode reader for damage and whether the image is normal;	Inspection	☐Normal □Abnormal	
	Check the wear of the drive wheels and whether there are any foreign objects wrapped around them;	Measurement / Visual Inspection	☐Normal □Abnormal	Normal Wheel Diameter 165mm
	Check whether the casters rotate smoothly, their wear, and whether there are any foreign objects wrapped around them;	Measurement / Visual Inspection	☐Normal □Abnormal	Normal Wheel Diameter 65mm
	Check whether the controller terminal connection is secure and whether it is loose;	Inspection / Visual Inspection	☐Normal □Abnormal	
	Check whether the power management module terminal connection is secure and whether it is loose;	Inspection / Visual Inspection	☐Normal □Abnormal	
	Check whether the emergency stop, switch, and other electrical components are functioning normally;	Inspection	☐Normal □Abnormal	
	Check whether the lidar is functioning normally and perform surface cleaning;	Inspection / Wiping	☐Normal □Abnormal	
	Check the charging horn for damage, and check for broken or blackened pins;	Inspection / Visual Inspection	☐Normal □Abnormal	
	HMR surface hygiene and cleaning	Cleaning	☐Cleaned □Not Cleaned	
Abnormal Situation Record Form				

Equipment Number	Abnormal Situation	Handling Measures	Person in Charge	Handling Date	Remarks

Remarks:

1. The inspection personnel shall make records in the record column after completing maintenance. If the situation is normal, mark "√" in the corresponding place of the table. If it is abnormal, indicate "NG". If there is no need to check this item, mark "/".
2. If there is an abnormal situation, please fill in the abnormal situation information in the abnormal situation record form and report it to the Equipment Department. If the problem cannot be resolved, please contact Mission Intelligent Robot after-sales personnel in a timely manner.
3. Daily maintenance is to be performed by the operator before starting work each day (except for equipment marked "idle"). Monthly and annual maintenance are to be performed by the equipment maintenance personnel according to the usage and production status. Annual maintenance is to be performed by professional personnel or organizations.

6.3 Appendix C: Annual Maintenance and Inspection Record

Daily Maintenance and Repair Record Checklist				
Maintenance Level	Equipment Model		Inspection Personnel	
	Equipment Number		Date	
	Inspection Items	Method	Inspection Results	Remarks
Annual Maintenance Items	Control operation through configuration software and observe whether the process is smooth; Whether the sensor can be effectively triggered;	Inspection	☐Normal □Abnormal	
	Check the barcode reader for damage and image quality; replace if damaged.	Inspection	☐Normal □Abnormal	
	Check the wear of the drive wheels and whether there are any foreign objects wrapped around them;	Measurement / Visual Inspection	☐Normal □Abnormal	Normal Wheel Diameter 165mm
	Check whether the casters rotate smoothly, their wear, and whether there are any foreign objects wrapped around them; Replace casters older than one year as needed.	Measurement / Replacement	☐Normal □Abnormal	Normal Wheel Diameter 65mm
	Check all connectors for secureness and tighten.	Inspection / Tightening	☐Normal □Abnormal	
	Check battery connection cables for aging and damage.	Inspection	☐Normal □Abnormal	
	Battery Inspection (Check battery SOC and cycle count) Replace after 1500 cycles.	Inspection / Replacement	☐Normal □Abnormal	
	Check whether the lidar is functioning normally and perform surface cleaning;	Inspection / Wiping	☐Normal □Abnormal	
	Check the charging port for damage, broken pins, and blackening.	Inspection / Visual Inspection	☐Normal □Abnormal	
	HMR surface hygiene and cleaning	Cleaning	☐Cleaned □Not Cleaned	
Abnormal Situation Record Form				

Equipment Number	Abnormal Situation	Handling Measures	Person in Charge	Handling Date	Remarks

Remarks:

1. After completing the maintenance, the inspector should record the information in the record column. Mark "√" for normal conditions, "NG" for abnormal conditions, and "/" for items that do not require inspection.
2. If there is an abnormal situation, please fill in the abnormal situation information in the abnormal situation record form and report it to the Equipment Department. If the problem cannot be resolved, please contact Mission Intelligent Robot after-sales personnel in a timely manner.
3. Daily maintenance is to be performed by the operator before starting work each day (except for equipment marked "Idle"). Monthly and quarterly maintenance is to be performed by the equipment maintenance personnel according to the usage and production status. Annual maintenance is to be performed by professional personnel or institutions.

ELITEMISSION

Contact Us

Business Cooperation:market@elibot.cn
Technical Consultation:tech@elibot.cn

Shanghai R&D Center

No. 18, Lane 36, Xuelin Road, Zhangjiang Science City, Pudong New Area, Shanghai

Suzhou Production Base

1F, Building 4, Zhongxin Zhongyuan Industrial Park, No. 259 Changyang Street, Suzhou Industrial Park

+86-400-189-9358

+86-0512-83951898

Beijing Branch

Room 1102, Building 6, No. 2, Ronghua South Road, Beijing Economic and Technological Development Area, Beijing

Shenzhen Branch

Room 202, Building 1A, Taihua Wutong Island Science and Technology Innovation Pai Road, Bao'an District, Shenzhen

Follow our official WeChat account for more information