Laser SLAM Safety Lifting Robot

AMB-1000JS

User Guide

Version History

Version	Release Date	Description
V1.0	2023.05	First version
V1.1	2023.08	Replace nameplate
V1.2	2023.09	Update logo and protect area
V1.3	2024.12	Update 3.5 & 3.11.3

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This is the original version of the User Guide.

Before operating the robot, please fully understand this User Guide.

Thank you for your purchase.

Only those who have received training and are qualified can use this product.

This document includes precautions that shall be followed to ensure personal safety and protect this product.

Disclaimer

All content in this document has been verified and confirmed to be as accurate, reliable, and complete as possible. However, it cannot be guaranteed that all content is consistent with the product.

Technical data are subject to change without prior notice.

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1. Foreword

1.1 Reading Tips

The robot, AMR, mobile robot, vehicle, etc. that appears in this document all refer to this product.

Before using the robot, please read the User Guide carefully.

Do not disassemble or assemble the robot without authorization.

Please pay attention to the safety warnings included in the user guide.

If there is any abnormal issues with the robot, please contact the manufacturer promptly.

If you smell any unusual odors while using the robot, immediately stop, power off, and remove the battery.

The User Guide is not a substitute for the Technical Proposal.

1.2 Prohibition of Use

- It is prohibited to use in outdoor environments.
- It is prohibited to use in environments with strong interference to the navigation devices.
- It is prohibited to use in environments full of dust, powder, or other explosive hazards.
- It is prohibited to use in environments with high salt content (marine climate).
- It is prohibited to use in extremely poor environments (extreme climates, freezer warehouses, and strong magnetic fields, etc.).
- It is prohibited to transport flammable or explosive materials.
- It is prohibited to transport liquid materials.
- It is prohibited to run on uneven, obstructed, or ladder.
- It is prohibited to rotate in place on the ramp.
- It is prohibited to carry personnel.
- It is prohibited to operate with load on the shell.
- It is prohibited to run on surfaces with oil or water.

2. Safety

Please read this section carefully before starting and running the robot.

	**Notice** ● We will not be responsible for any problems caused by damage, replacement, or modification of robot or its accessories in any way. ● We will not be responsible for any damages to the robot, accessories, or any other equipment caused by customer programming errors or faults.

2.1 Safety Message Types

This document contains the following safety message types.

	**Warning** ● Indicates a potentially dangerous situation that may result in death or serious injury. ● Appropriate preventive measures should be taken to avoid damage or injuries.
	**Caution** ● Indicates a potential dangerous situation that may cause minor or moderate injuries to personnel. Remind to avoid unsafe behaviors. ● Appropriate preventive measures should be taken to avoid damage or injuries.
	**Notice** ● Indicates important information, including situations that may result in equipment or property damage.

2.2 General Safety Precautions

This chapter contains general safety precautions.

	**Precautions for Robot Rolling Over** ● If the load is not placed or secured correctly, it may result in the load dropping out or the robot rolling over. ● Ensure that the load is placed and secured properly according to the specifications.

	Please refer to chapter 3.4 Effective Load Specifications.
	**Precautions for Personal Injury by Machine** ● The high-speed slewing part of the vehicle body, such as universal wheels and driving wheels, may cause personal injuries. ● Do not overly rely on the vehicle's autonomous avoidance function. Please take the initiative to avoid the vehicle.
	**Operational Precautions** ● The robot can't detect descending stairs and holes on the floor. ● Please mark stairs and holes as restricted areas on the map. ● Please update the map in time.

2.3 Safety Instructions

2.3.1 Qualification Requirements for Personnel

The installation, commissioning, operation and maintenance of the robot is only allowed to be carried out by qualified professionals.

In addition to the basic mechanical, electrical, commissioning, operation, and maintenance knowledge discussed in this document, the handling and transporting of this product requires knowledge of using lifting devices and corresponding hoisting devices. To assure safety, these tasks should only be carried out by professionals or by trained individuals under the guidance of professionals.

A professional refers to an individual who is capable of diagnosing tasks based on their professional education, knowledge and experience, understanding of relevant regulations, to identify potential hazards and implement appropriate safety measures. Professionals must adhere to relevant professional guidelines and possess the necessary professional knowledge.

Mechanical Installation and Commissioning Requirements

The personnel responsible for the mechanical installation and commissioning should possess professional knowledge and experience in related fields, and have sufficient experience to assess whether the machine is in a safe running state after using protective equipment.

Electrical Installation and Commissioning Requirements

The personnel responsible for the electrical installation and commissioning should possess professional knowledge and experience in related fields, and have sufficient experience to assess whether the machine is in a safe running state after using protective equipment.

Operation and Maintenance Requirements

The personnel responsible for the operation and maintenance should possess professional knowledge and experience in related fields, be familiar with the application of protective equipment on the machine and be guided by the machine user.

Personal Protective Equipment Requirements

When using this product, operators should wear appropriate personal protective equipment (such as safety shoes, do not let down long hair, etc.).

As an operator, it is your responsibility to have appropriate protective equipment when using this product.

All components of personal protective equipment must be intact.

2.3.2 Operation Safety

2.3.2.1 Operation Environment Safety

- The ground should be flat, and free from grooves, damages, bumps, oil, adhesives or other contaminants.
- The ground should be free of screws, tack cloth, gloves, thread ends, cables, and other foreign materials that may get caught and tangled in the wheels.
- Do not operate in excessively open areas (beyond the laser sensing distance), such as long corridors.
- When navigating through narrow aisles, a 10 cm clearance should be maintained between the outer edge of the robot and the aisle.
- The sections of the working area shall be protected or marked with warning signs to alert other personnel that robots are operating.

2.3.2.2 Inspection before Operation

Before activation, the operator should inspect the condition of the robot to ensure safe use.

The inspection items include:

- Whether the wheel fasteners are tightened.
- Whether the power system is normal.
- Whether the emergency stop function is normal.
- Whether the payload handling device is damaged (such as bent, cracked or worn).
- Whether the warning device is normal.
- Whether the ambient lamp is normal.
- Whether the function of the laser sensor is normal.
- Whether the battery level is normal.
- Whether the charging function is normal.

2.3.2.3 Operating on Ramp

- It is only allowed to run on ramps that meet the performance parameters; please refer to chapter 3.3 Technical Parameters.
- The upper and lower ends of the ramp should be flat to prevent the load or robot from touching the ground.
- It is prohibited to turn around, run diagonally or stop on the ramp.

2.3.2.4 Operating in Elevator or Lifter

- Ensure that the elevator or lifter can bear the total weight of the robot and its load.
- Ensure that no part of the robot is in contact with the walls of the elevator or lifter.
- Ensure that the robot does not have any accidental movement.
- Ensure that the elevator complies with relevant national standards.

2.3.3 Load Safety

- The robot and its load should not exceed the range permitted by the road surface.
- The load carried must be reliably secured.
- The load carried must be placed within the load center with certain anti-slip measures. Please refer to the chapter 3.4 Effective Load Specifications.

- The weight of the load carried by the upper mechanism must be evenly distributed, and unbalanced loading is not permitted.

2.3.4 Parking Safety

- When the robot stops running, shut down and cut off the power supply.
- Do not park on the ramp.
- Do not park near heat sources or fire sources.
- Do not park in open pits, underground passages, elevator shafts or other similar areas.
- Do not park in the fire escape lanes, stair exits and areas obstructing the passage of firefighting equipment.
- Under special circumstances, take safety measures for the robot, such as using wedges.

2.3.5 Safe Avoidance Range

The maximum rotation diameter of the robot is 1460 mm. Please be cautious to avoid.

2.4 Safety Requirements for the Battery and Charging Station

Battery Use Precautions

- Lithium batteries are high-energy substances and must be used under certain technical conditions. If they are used beyond the limit, the buyer must notify the seller in writing, and the seller's confirmation must be obtained before proceeding. Otherwise, the resulting consequences shall be borne by the party at fault.
- Please use the original charger. Mixing chargers from other brands is prohibited, as it can cause irreversible damage to the battery.

2.4.1 Precautions for Using Lithium Batteries

- The battery has risks such as fire and explosion. Do not disassemble, crush, incinerate, heat, or throw the battery pack into fire.
- Protect the battery from mechanical damage (collision, drop, vibration).
- The use of dropped or damaged batteries is strictly prohibited.
- The use of faulty or damaged batteries is strictly prohibited.

- The use of batteries with damaged cables or contacts is strictly prohibited.
- Do not place the battery in water or get it wet.
- It is strictly prohibited to change the lithium battery in a liquid environment.
- Do not allow the positive and negative terminals of the battery to contact the metal shell at the same time.
- Do not short circuit, overcharge or over-discharge the battery.
- Do not use or store the battery near heat sources (such as fire or heaters).
- Do not reverse the positive and negative terminals of the battery.
- Do not use a nail or other sharp object to pierce the battery case, and do not hammer or step on the battery.
- Do not dismantle or modify the battery in any unauthorized way.
- Do not hit, throw or subject the battery to mechanical vibrations and natural falling.
- Do not mix batteries of different types and brands.
- If the battery emits peculiar smell, heat, deformation, discoloration or any other abnormal phenomenon, it shall not be used, and the battery should be removed from the operating environment.
- If the battery catches fire, extinguish it with dry powder, foam fire extinguisher, sand, etc., and the battery should be removed from the operating environment.
- When storing the battery, please pay attention to the laws and regulations of the relevant country.

2.4.2 How to Handle Damaged Lithium Batteries

- Damaged batteries should be handled and transported only after wearing personal protective equipment that is resistant to alkalis and dissolution.
- If a battery shows signs of overheating, emitting smoke, releasing odors, producing noise, or deformation, please separate the battery from the housing.
- Store the battery in a fire-proof container or maintain a safe distance from combustible materials.
- Do not inhale any smoke that may occur.

2.4.3 Disposal of Lithium Batteries

- Please conduct professional disposal for the batteries.
- Remove the connecting points for proper disposal.
- Store the damaged batteries in a fire-proof container.
- Strictly follow the transportation requirements related to batteries during the transportation.

2.4.4 Safety Requirements for Charging Station

If the operator has purchased our charging stations, the following precautions should be noted:

	**Bridging the charging contacts of the charging station can pose a risk of injury!** Bridging the charging contacts can cause damage, electric arcs, overheating, and pose a fire risk. ● Items, especially conductive or flammable ones, must not be placed in the area in front of the charging contacts at the charging station.
	**Incorrect placement of the charging station can pose a risk of injury!** There is a risk of personnel tripping when charging stations are placed on travel routes and passages. ● Please do not place the charging station on travel routes and passages. **Incorrect installation of a charging station can pose a risk of injury!** ● Anchor the charging station to the workshop ground to avoid functional failures and associated risks. ● Lay connecting cables according to the risk prevention regulations of the relevant countries. **Incorrect usage can pose a risk of injury and possible product damage!** There is a risk of falling and injury, as well as damage to the charging station casing when stepping or climbing on the charging station. ● Do not step on the charging station.

2.5 Risk Assessment

Risk assessment is one of the important steps for the integrator to achieve safe installation. It is usually carried out by on-site commissioners.

Risk assessment not only involves the robot , and also consider peripheral modules, path planning, working environment, etc.

It is recommended to carry out the risk assessment with reference to the guidelines in ISO 12100, including but not limited to:

- Teaching during the installation, development, and use of the robot.
- The robot device works normally.

In article 4 of ISO 3691-4, the major hazards, dangerous situations and events that need to be paid attention to shall be listed.

The risk assessment items should be listed in the technical agreement.

2.6 Residual Risks

The following lists the potential major dangers. Please operate the robot with caution.

- The robot can be set to reverse, but if there are no sensors at the rear of the vehicle, there is a risk of collision when entering the running route of the robots.
- If users accidentally touch the moving parts of the robot, there is a risk of getting their hands caught, feet pressed, or being hit.
- There is a risk of collision or jamming during load transport.

2.7 Environment Safety

2.7.1 Noise

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

2.7.2 Disposal

The robot contains the following materials that affect environment:

- Plastic
- Battery

Disposal requirements: The user of this product and the final disposer should handle it in accordance with relevant national regulations.

3. Product Introduction

3.1 Brief Introduction

This robot is laser SLAM autonomous mobile robot, equipped with SEER Robotics core AMR controller, providing mapping and localization functions. It also reserves abundant I/O, CAN, RS485 and other interfaces, thus helping users to quickly realize different applications of autonomous forklift.

This product is developed and designed by Shanghai Seer Intelligent Technology Corporation.

Certain names in this document and possible other names are not marked with the registered trademark symbol®, but they are registered trademarks of Shanghai Seer Intelligent Technology Corporation, including SEER Robotics, SEER and SRC.

Note: The dimension parameters provided in this document are the most up-to-date data available at the time of document creation. However, slight differences may arise in the subsequent design optimization process, we ask for your understanding and take the actual object as the standard.

3.2 Product Dimensions

No.	Definition	(Unit: mm)
1	Robot length (including bumper strip)	1330
2	Robot length (excluding bumper strip)	1300
3	Robot width (including bumper strip)	952
4	Robot width (excluding bumper strip)	930
5	Robot height	290
6	Navigation laser scanning height	175
7	Spacing between driving wheels	703

8	Radius of driving wheels	90
9	Vertical distance from the navigation laser to the differential axis	477.5

Note: The parameters of the standard product model will change according to the actual selection of components.

3.3 Technical Parameters

Product model	AMB-1000Js
Product name	Laser SLAM Safety Lifting Robot
Basic Parameters	
Navigation type	Laser SLAM
Driving mode	Two-wheel differential
Shell color	Cool Gray
L x W x H (mm)	1330 x 952 x 290
Rotation diameter (mm)	1460
Weight (with battery) (kg)	265
Maximum load capacity (kg)	1000
Lifting platform dimensions (mm)	1300 x 920
Maximum lifting height (mm)	60±1
Lifting time (s)	9±0.5
Navigation laser scanning height (mm)	175
Network	Ethernet / Wi-Fi 802.11 a/b/g/n/ac
Ambient temperature and humidity range (℃ / %)	TEMP: 0℃ to 50℃ / RH: 10% to 90%, no compression, no condensation
IP rating [1]	IP20

Performance parameters	
Passability (slope / step / gap) [1] (% / mm / mm)	≤5% / 5 mm / 10 mm
Minimum aisle width (mm)	1050
Navigation position accuracy [3] (mm)	±5
Navigation angle accuracy [3](°)	±1
Driving speed (m/s)	≤1.5
Map area (single frame) (m²)	≤400000
Battery parameters	
Battery specifications (V / Ah)	48 V / 40 Ah (lithium iron phosphate)
Comprehensive battery life (h)	7
Charging parameters (V / A)	54.6 V / 40 A
Charging time (10% to 80%) (h)	≤2
Charging method	Manual / Automatic
Battery cycle life (times)	>1500
Configurations	
Lidar number	2 (SICK nanoScan3 HV)
Number of low-position obstacle avoidance photoelectric	-
Cargo detection (● / - / ○)	○
E-stop button (● / - / ○)	●
Speaker (● / - / ○)	●
Ambient lamp (● / - / ○)	●
Bumper strip (● / - / ○)	●
HMI display (● / - / ○)	-
Function configurations	

Basic functions [4] (● / - / ○)	●
Wi-Fi roaming (● / - / ○)	●
Automatic charging [5] (● / - / ○)	●
Shelf recognition (● / - / ○)	●
Spin function [6] (● / - / ○)	-
Precise positioning with QR code [7] (● / - / ○)	-
QR code navigation [8] (● / - / ○)	-
Laser reflector navigation (● / - / ○)	○
Certifications	
EMC (● / - / ○)	●
UN38.3 (● / - / ○)	●
MD	●
RED	●

●	Standard
-	None
○	Optional

[1]. The robot is exclusively designed for indoor transportation and is not recommended to be used in outdoor environment.

[2]. The ground surface should be even, clean and without obvious ups and downs. The ramp slope is not more than 5% = arctan (0.05) ≈ 2.8° . The robot cannot stop or turn at the ramps, steps, or gaps, it can only pass quickly perpendicular to them.

[3]. Positioning accuracy usually refers to the repeated accuracy of the robot navigating to the target site. Under the condition that the environment scanned by the robot laser radar is relatively stable (change rate <30%), the repeated positioning accuracy of the robot navigating from a fixed direction to the target site can reach the expected value. When the robot runs along the planned path, it will try to fit the path as much as possible, but repeatability is not guaranteed. That is, the robot can guarantee the accuracy of the point

position, but not the fitting accuracy of the path. The minimum site spacing supported by robot is 1 cm. Therefore, the robot should not be used as a linear guide.

[4]. Basic functions include map editing, model editing, positioning & navigation, basic motion model (differential), and API interface, etc.

[5]. It needs to be used with the automatic charging station of SEER Robotics.

[6]. When the rotary lifting robot is loaded, the spin function can maintain the goods stationary relative to the ground regardless of how the robot rotates. When equipped with the up-view PGV reader, the pose of the shelf can be acquired and adjusted in real-time.

[7]. When the mobile robot needs to precisely position at certain points, accuracy adjustment can be achieved by attaching a QR code at the said point. The addition of down-view PGV reader is required within the robot chassis to achieve this function.

[8]. For pure QR code navigation without laser SLAM, the down-view PGV reader needs to be added to the robot chassis.

3.3.1 Navigation Laser Detection Range

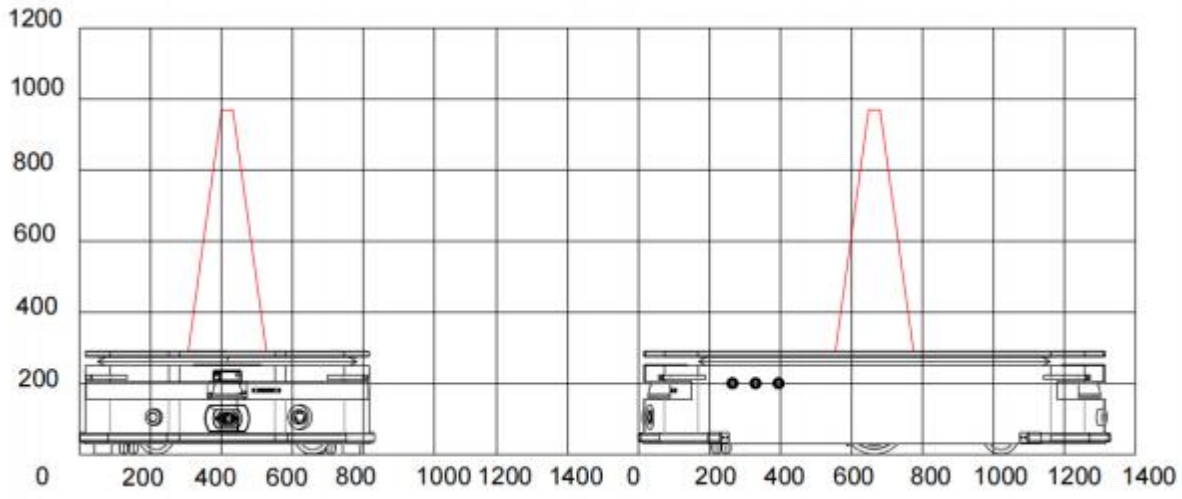
No.	Definition	Value
1	Detection distance (m)	40
2	Scanning angle (°)	270
3	Detection height (mm)	175

3.3.2 Obstacle Avoidance Laser Detection Range

No.	Definition	Value
1	Detection distance (m)	40
2	Scanning angle (°)	270
3	Detection height (mm)	175

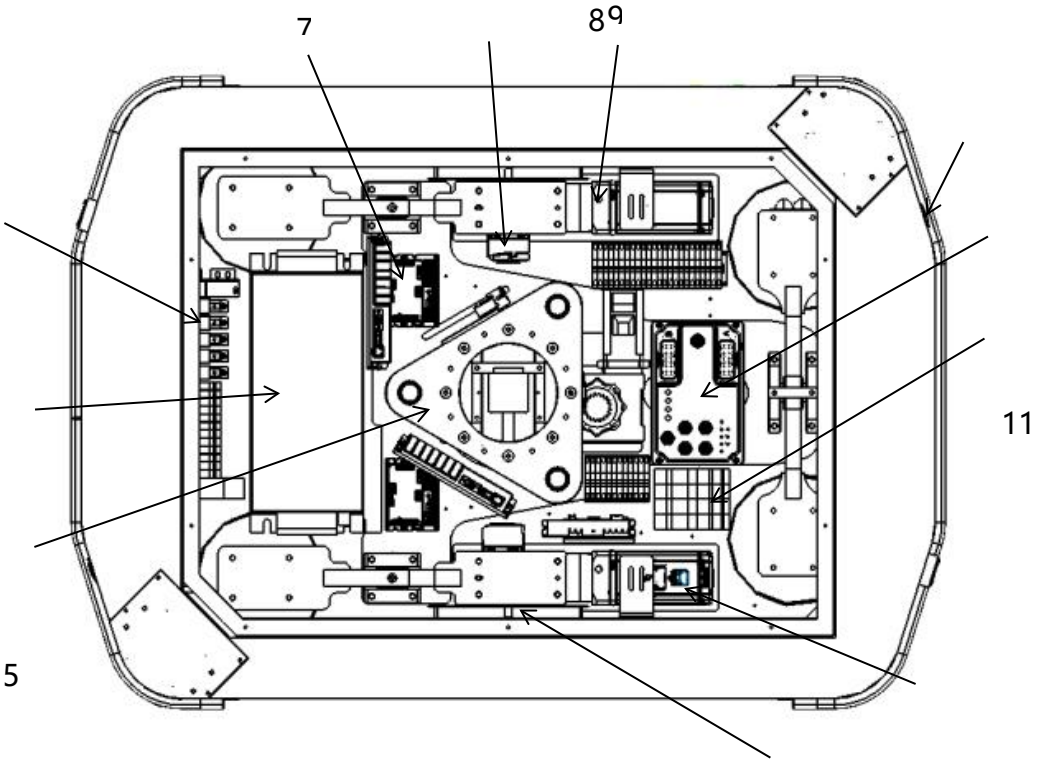
3.4 Effective Load Specifications

The diagram below illustrates the center of gravity specifications for safe operation under full load (1000 KG).



3.5 Main Configuration of Robot

No.	Name	No.	Name
1/11	Laser	7	Antenna
2	Switch/Reset/Release Button	9	Circuit Breaker/Manual Charging Port/BMS Debugging Port
3/10	Emergency Stop Button	12	Ambient Light
4	Automatic Charging Port	13	Debugging Port
5/8	Bumper Strip	14	Drive Wheel
6	Lifting Plate	15	Speaker



No.	Name	No.	Name
1	Relay	7	Driver
2	Motor	8	Encoder
3	Drive Wheel	9	Gear Reducer
4	Lifting Mechanism	10	Emergency Stop Button
5	Battery	11	SRC-3000 FS
6	Fuse		

3.6 Operation Panel

3.6.1 Emergency Stop Button

- The emergency stop button is strictly for use in emergency circumstances, and should not be used to terminate the robot operation.
- After the emergency stop button is pressed, the robot will immediately stop all motion.
- The emergency stop can be disengaged only when the cause of the fault is determined and the fault is eliminated.
- After the emergency stop is pressed, the robot can clear driver errors.
- After the emergency stop is pressed, the robot can be manually pushed.

Precautions for Emergency Stop of Robot

- When using our fleet management system, it is strictly prohibited to move the robot by pushing after pressing the emergency stop button; otherwise, it will cause the robot mission to go wrong.

3.6.2 Interface Debugging

It is mainly used for network cable connection and debugging robot or TP-LINK connection.

3.6.3 Power On/Off Button

- Power on: Press power on button, the green indicator light will light up.
- Power off: Press and hold the power off button for 2s to power off.

3.6.4 Manual Charging Port

- Open the protective cover when using the manual charging port.

3.7 Ambient Lamp

Ambient Lamp Display	Status

Red breathing light	Error alarm
Dark red blinking	Emergency stop
Pink-purple marquee light	Blocked
Orange blinking	Turning[Note1]
Blue breathing light	Moving straight
Orange breathing light	Charging
Dark red marquee light	Low battery mode[Note2]
Green-Dark Red (gradient)	Stationary status[Note3]
Rainbow light strip	Battery abnormal[Note4]

Note 1: Configure (quantity, direction) according to actual needs; when rotating in place, all configured lights flash synchronously.

Note 2: The power is lower than the maximum value of warningPercentage, errorPercentage, and shutdownPercentage configured in the battery device (When the maximum value is -1, this is not displayed.).

Note 3: The gradient color in the static status, shows the battery level. Dark red: remaining battery level 10%; Green: remaining battery level 100%.

Note 4: When the robot is in stationary status, the battery type is not configured or the battery communication error occurs.

Additional note: The above sequence is the priority of the ambient lamp display, that is, the error alarm takes precedence over the emergency stop display. When the conditions of high priority are met, the corresponding ambient lamp effect is displayed, and the conditions of low priority are no longer judged. The time interval between each update is about 300 ms.

3.8 Main Labels

3.8.1 Warning Labels

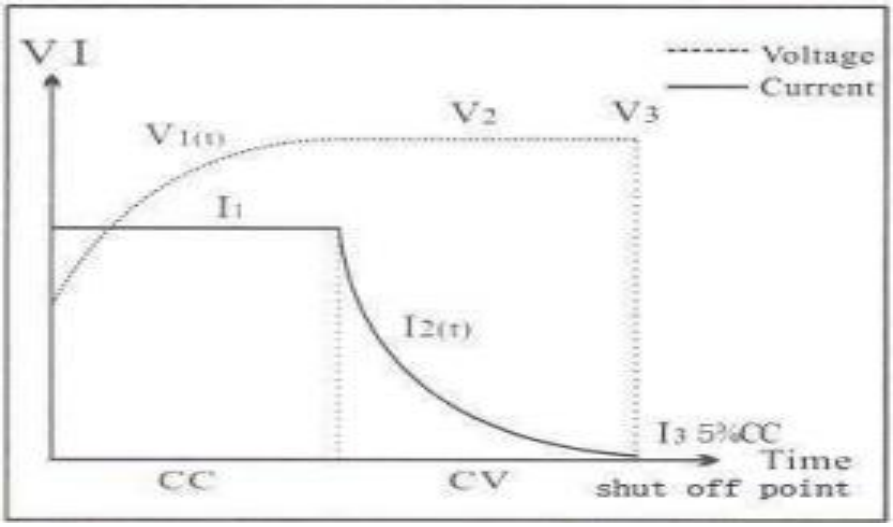
Definition	Label Sticker

Laser product	
Cannot be used to carry people.	
Beware of electric shock	
Beware of hand pinching	
Please read the instruction manual when using it.	
Do not step on it.	
Beware of collision	

3.8.2 Product Nameplate

3.9 Battery and Charging

3.9.1 Robot Automatic Charging Diagram

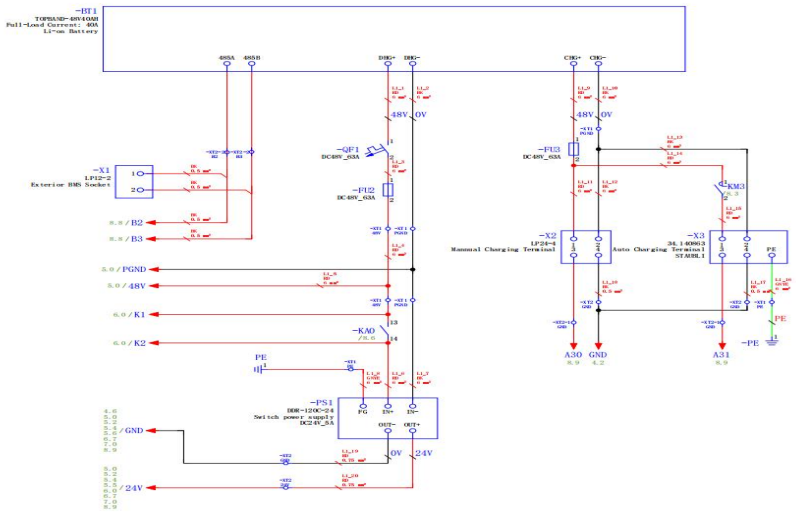


Note: Please refer to the *User Guide of SFL Charging Station* for the usage and configuration of the charging station.

3.9.2 Battery Basic Parameters

No.	Items	Value
1	Material	lithium iron phosphate
2	Rated voltage (V)	48
3	Rated capacity (Ah)	40
4	Battery cycle life (times)	>1500
5	Weight (kg)	About 22
6	Charging temperature (℃)	0-45
7	Discharge temperature (℃)	-20-65
8	Storage temperature (℃)	0-40
9	IP rating	IP 54

3.9.3 Battery Interface Diagram



3.9.4 Battery Storage

- For long-term storage, the battery assembly should be kept in a shaded and well-ventilated area, away from flammable and explosive materials, and protected from direct sunlight to prevent overheating due to prolonged exposure.
- If the storage period exceeds 3 months, it is recommended to charge the battery to 50% of its capacity and store it in a dry warehouse at room temperature. The contact areas of the battery assembly should be protected from moisture, water, and dust to prevent corrosion and short circuits.

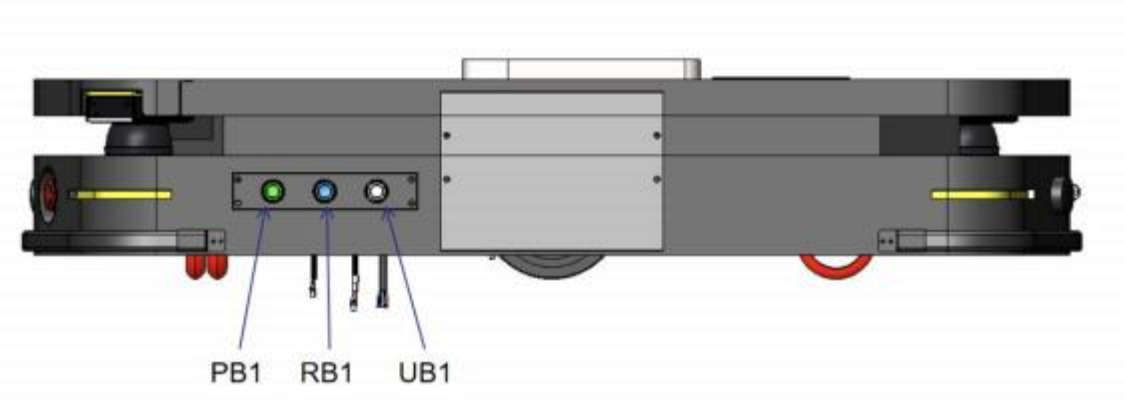
3.10 Quick to Use

3.10.1 In the Box

- The robot
- Manual charger / Automatic charging station (optional single or two pieces)

3.10.2 Startup of Robot

The power on/off button of the robot



1. Press the power on/off button PB1.
2. Until the green power-on light is always on, release the power-on button to complete the power-on process.

Note: If you cannot turn on the robot for the first time, please activate the battery using a charger.

3.10.3 Shutdown of Robot

1. Make sure that the robot currently has no tasks and is in a stopped status.
2. Press on the power on/off button for 2s and then release it; wait for a few seconds until the power-on light goes off to complete the power-off process.

Note: If the robot is being shut down for transportation, maintenance, or repair purposes, the robot battery switch must be turned off.

3.11 Product Maintenance

3.11.1 Maintenance Instructions

Before performing any maintenance or troubleshooting activities, please read the content of this chapter, this manual and other related manual carefully to fully understand the safe maintenance and troubleshooting procedures.

Only authorized personnel who have passed safety training and other related training can maintain the robot. Other related training includes training on robot system and training on maintenance organized by the manufacturers, distributors, and local importers.

Operators shall participate in safety training in accordance with national regulations.

	**Usage Precautions for Robot Parts** ● Only approved parts can be used. ● If unapproved parts are used without authorization, we will not bear any responsibility. We will not responsible for any damage to the robot, accessories or any other equipment caused by the use of unapproved parts.
	**Precautions for Robot Maintenance** ● Perform maintenance in strict accordance with the description in this manual. Do not dismantle or change any parts not described in this manual without authorization. Wrong dismantling, changing parts, or wrong maintenance may cause the robot system to work abnormally and cause serious safety problems. ● When you need to enter the working area of the robot under emergency, stop the robot system. ● Please carry out maintenance and repair activities in the designated maintenance area. Before performing any maintenance, always remove the robot from the system and turn off the power supply for the robot to prevent the robot from moving suddenly when it receives the system instructions.

3.11.2 Maintenance Suggestions for Basic Parts

Part	Maintenance Method	Maintenance Period
Shell	Check for cracks. Check the installation conditions.	Once every month, replace as needed.
Universal wheel	Check the wear of surface texture. Check for tangled debris.	Once every month, replace as needed.
Laser	Check the surface for scratches and cracks.	Once every week, replace as needed.
Emergency stop button	Check whether it can be pressed normally, and rotated to rebound.	Once every three months, replace as needed.
Safety label sticker	Check the wear condition or clear visibility.	Once every six months, replace as needed.
Grounding chain	Check for damage or tangled debris.	Once every month, replace as needed.

3.11.3 List of Spare Parts

AMB-1000JS Main Parts and Spare Parts List

No.	Part Name	Quantity per Vehicle	Description
1	Upper and Lower Limit Proximity Switch	2	Spare Part
2	Drive Wheel	2	Spare Part
3	Universal Wheel	4	Spare Part
4	Contactor	2	Spare Part
5	Emergency Stop Switch	2	Spare Part
6	Green Power On Button	1	Spare Part
7	Blue Reset Button	1	Spare Part
8	White Self-locking Button	1	Spare Part
9	Bumper Strip	2	Spare Part
10	Battery	1	Spare Part

Note: Please refer to the *List of Main Parts & Spare Parts* of the robot for details.

3.11.4 Cleaning Requirements

3.11.4.1 Floor Cleaning Requirements

The driving wheel, bearing wheel and balance wheel of the robot are all made of PU (polyurethane) material, which will inevitably leave marks on the floor after long-term running.

Floor cleaning requirements:

- Check the condition of the floor daily and promptly clean up dust, foreign objects, and liquid contamination to prevent the robot from slipping.
- Clean up the traces left by the universal wheels on the floor in a timely manner to avoid severe marks.
- Do not wax the floor on the path of the robot; otherwise, it may cause the wheels of the robot to slip or become dirty.

3.11.4.2 Robot Cleaning Requirements

Weekly routine cleaning is important to ensure the reliability of the robot operation. Before cleaning, please make sure to unplug the power supply to avoid short circuits that may damage the electrical system.

1. External Cleaning
   - Remove any debris from the wheels daily to keep them rotating smoothly.
   - After cleaning, lubricate the forklift parts specified in the Lubrication Parts Table with lubricating oil.
2. Cleaning Electrical Components
   - Use compressed air to blow away dust from the motor, but do not use a wet cloth to wipe the dust off the circuit.
   - Do not wash the electrical components with a high-pressure washing device.
   - Do not damage the electrical components on the circuit board. Maintain the position of these components to avoid short circuits.
3. Before assembling the vehicle body, use an air gun to clean the dust and debris in the vehicle body. Inspect the vehicle body after cleaning, there should be no defects such as residues and dirt.
4. No residues are allowed in the vehicle body: After the vehicle body is assembled (without shell), check for any screws, cut copper wires, or wire insulation that may have fallen in the vehicle body. If found, it must be cleaned up.
5. Check whether the wiring inside the vehicle body is neat and free from dust or dirt. If any is found, wipe it with alcohol.
6. Install the shell and wipe it clean with a dry rag.

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

3.11.4.3 Laser Cleaning Requirements

Precautions for Laser Cleaning

If the laser is not cleaned or is cleaned improperly, it may cause the following problems:

- The robot can’ t detect the sign/pallet rack.
- The robot enters the emergency stop status without clear reasons.

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

- Keep the laser lens surface clean, and clean up the dust regularly.
- Please use special cleaning cloth.
- Do not dry wipe the laser lens surface. Please use a damp, soft cloth to clean, and add a little detergent if necessary.
- Do not use corrosive solvent-based detergent, such as acetone.
- Do not use alcohol to clean the laser.

3.11.5 Storage Requirements

3.11.5.1 Requirements for Robot Storage

If the robot needs to be stored for a long time, please take the following measures:

- When storing the robot for a prolonged period, adopt measures for corrosion and moisture prevention, and it is necessary to disconnect the connection between the battery and the robot.
- Recharge the battery, and then maintain it according to the daily maintenance method of the battery.
- Perform a charging maintenance every 3 months.

3.11.5.2 Requirements for Charger Storage

- When the charger is not in use, it should be placed in the packing box.
- The warehouse temperature should be within -20℃ to 70℃, with a normal temperature range

of -20℃ to 50℃. The relative humidity should be between 5% to 90%. The warehouse should not contain harmful gases, flammable substances, explosives, corrosive chemicals, strong mechanical vibrations, impacts, or magnetic field influences.

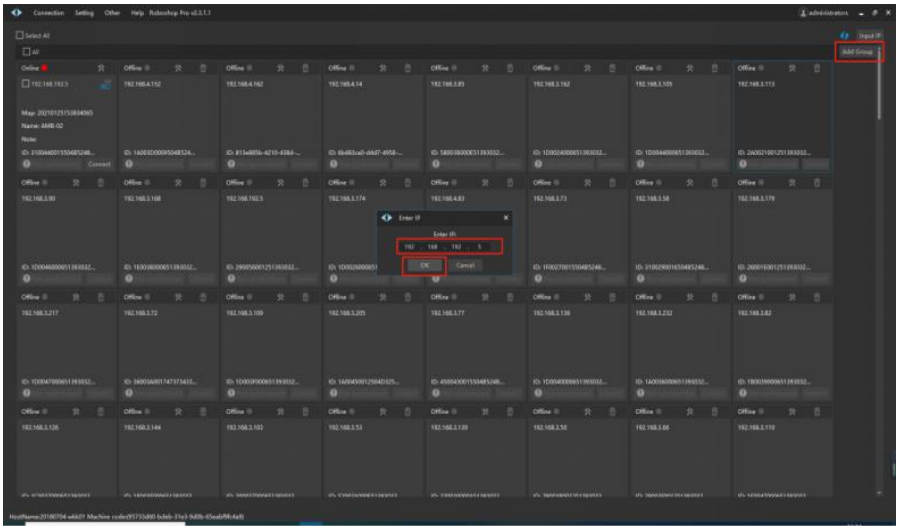
- The packing box should be placed at least 20 cm above the ground and at least 50 cm away from the wall, heat sources, and ventilation openings. Under these conditions for up to two years. After two years, it needs to be retested.
- The charger must be powered on every three months, and the power-on time should be no less than 0.5 hours.

4. Debugging

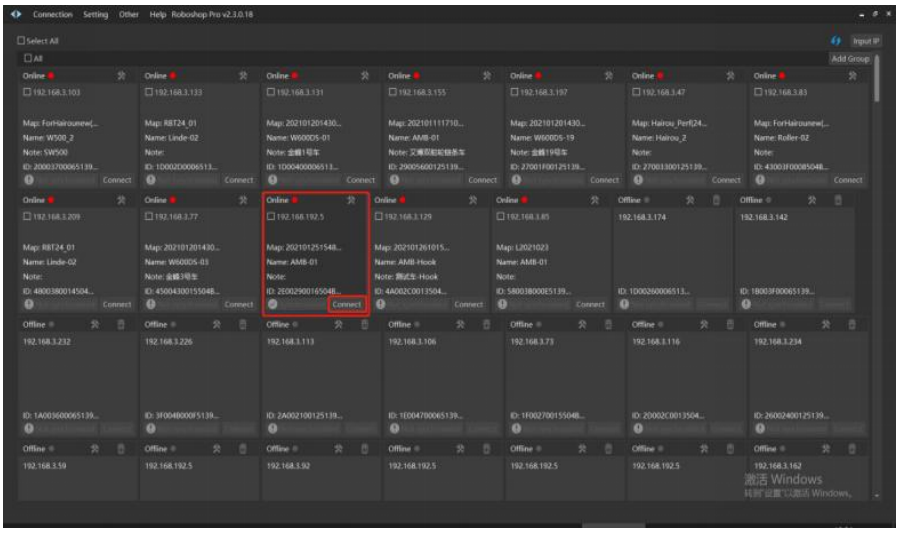
4.1 Connect Robot

To operate the robot, you need to use the latest version of Roboshop:

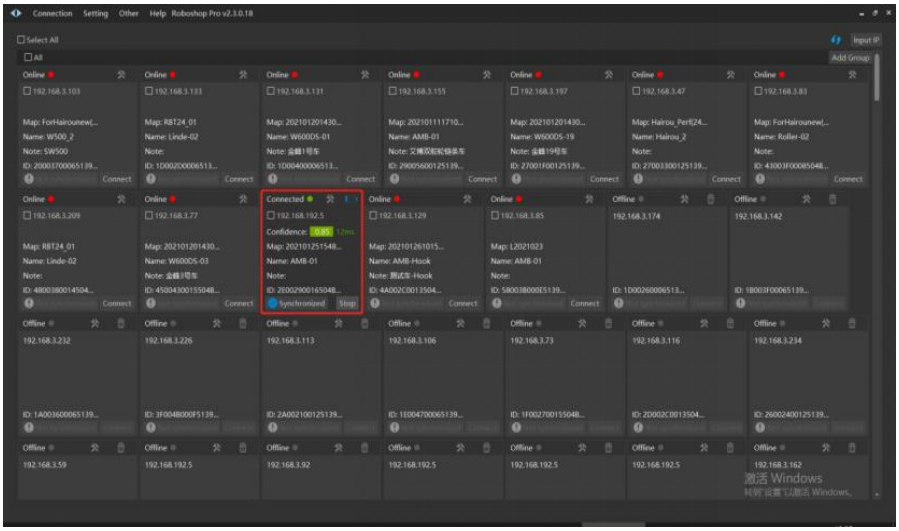
1. Connect the computer to the network port of the robot via a network cable.
2. Set the computer's Ethernet IP to the network segment 192.168.192.xxx (xxx must be more than 200), and the subnet mask as 255.255.255.0, the gateway can be omitted.
3. **Open** Roboshop and click the **Refresh** button on the [Homepage] or manually click **Add Group**, set address as [192.168.192.5] to add the robot.



4. Find the robot with the IP address [192.168.192.5] in the robot list on the [Homepage] and click the button **Connect**.



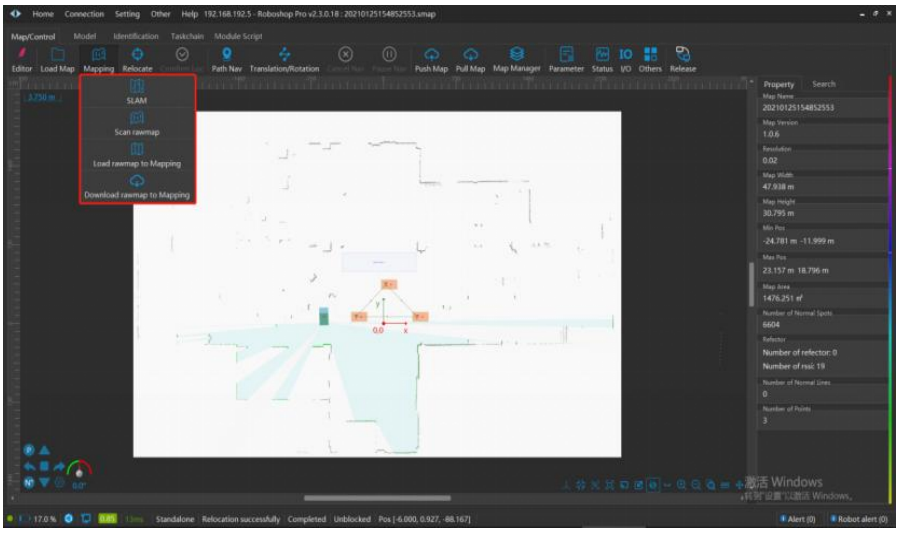
5. It indicates that the robot has been connected successfully when “Confidence”, “Map”, “Name”, “Note”, “ID” and other information of the robot are displayed on the card.



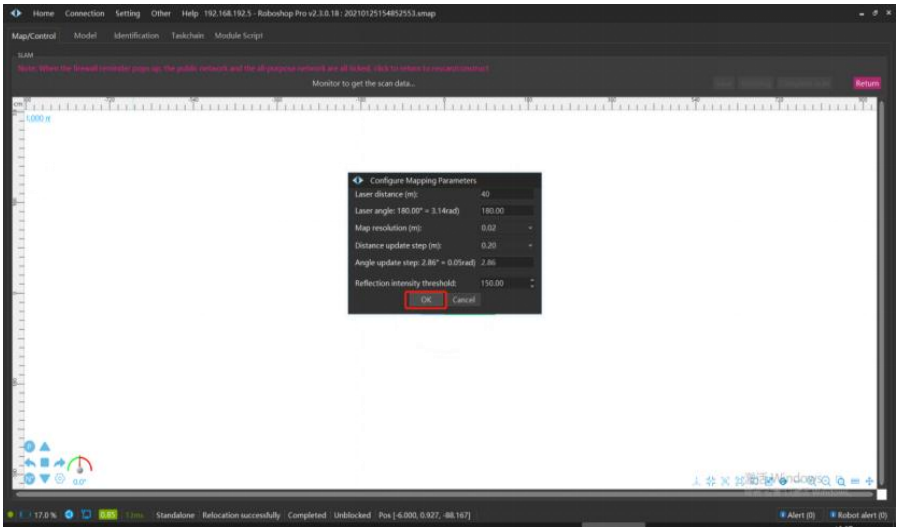
4.2 Mapping and Editing

Precondition: The robot is connected, and the robot model has been successfully configured and synchronized.

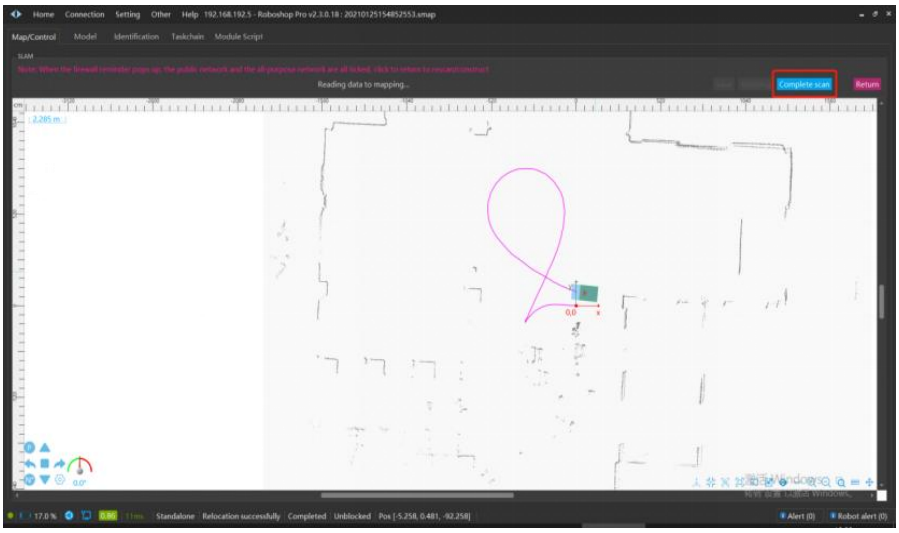
a. Open the Roboshop, after the robot connected successfully, double-click the robot to enter the Map/Control interface. Click **Mapping** in the toolbar, and all methods for [Mapping] will pop up.



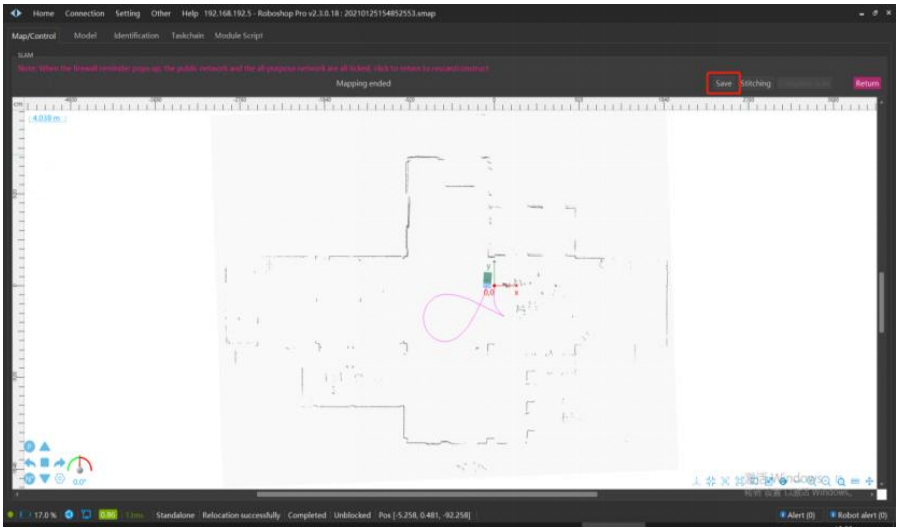
b. Click **Mapping** --> **SLAM**, do not modify any parameters in the pop-up interface (generally, there is no need to modify the parameters of this interface), and click the **OK** button.



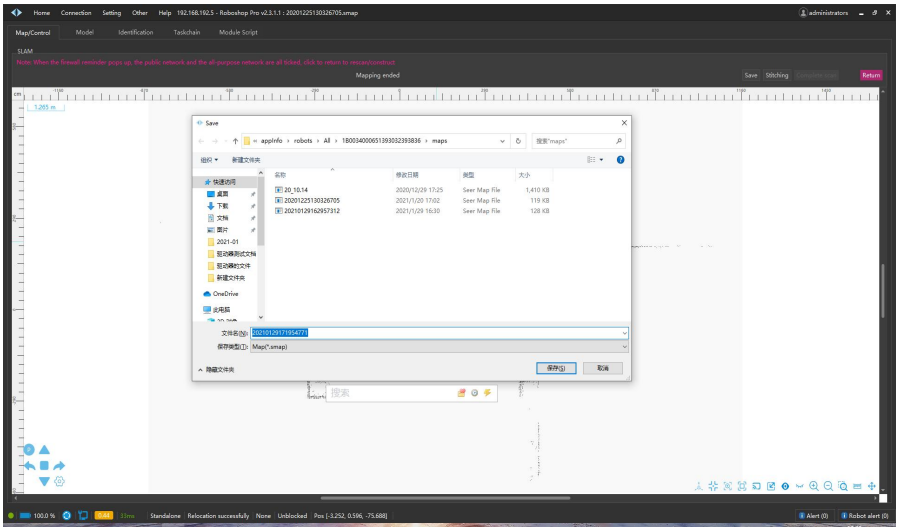
c. Use the keys W (Forward), A (Left turn), S (Reverse), D (Right turn) on the keyboard for robot control to make the robot move in the scene, and click the button **Complete scan** in the upper right corner when you finish scanning the map.



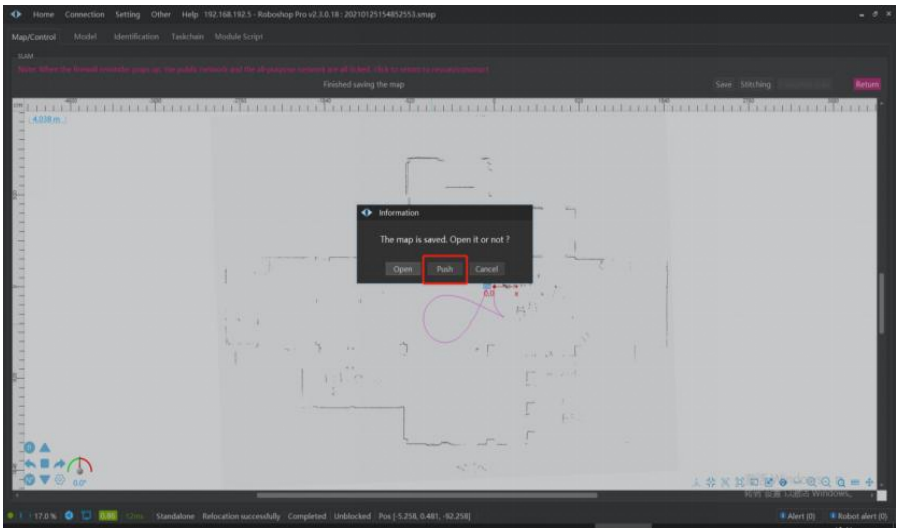
d. Wait for the completion of the map construction, and then click the button **Save** in the upper right corner.



e. Select the desired path and enter the desired name in the pop-up interface to save the map.



f. After it is saved successfully, a dialog box will pop up to ask whether to open it. Then click **Push** to open the map just constructed and synchronize the map, and then used it directly. At this moment, the mapping has been completed.

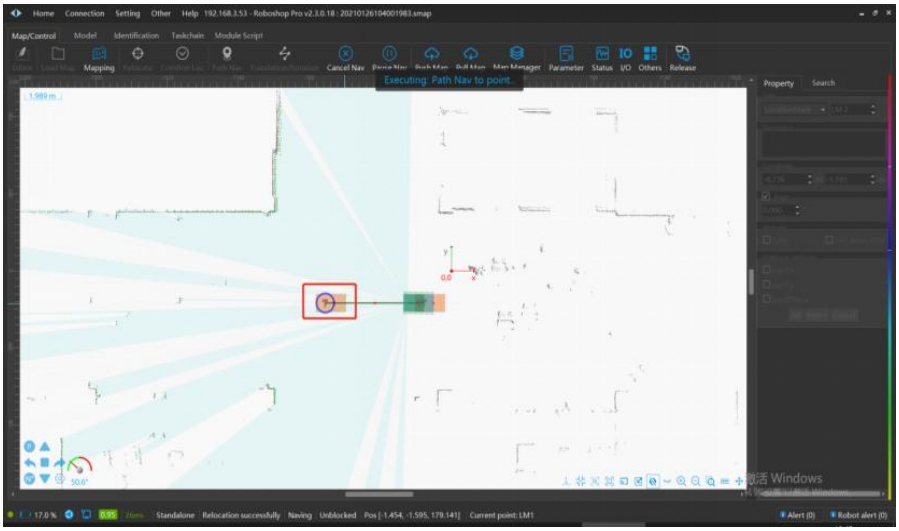


Note: If you click **Open**, the map just constructed will be opened, and a dialog box with "Inconsistent map data" will pop up. Choose **Push**, **Open** or **Cancel** according to your needs.

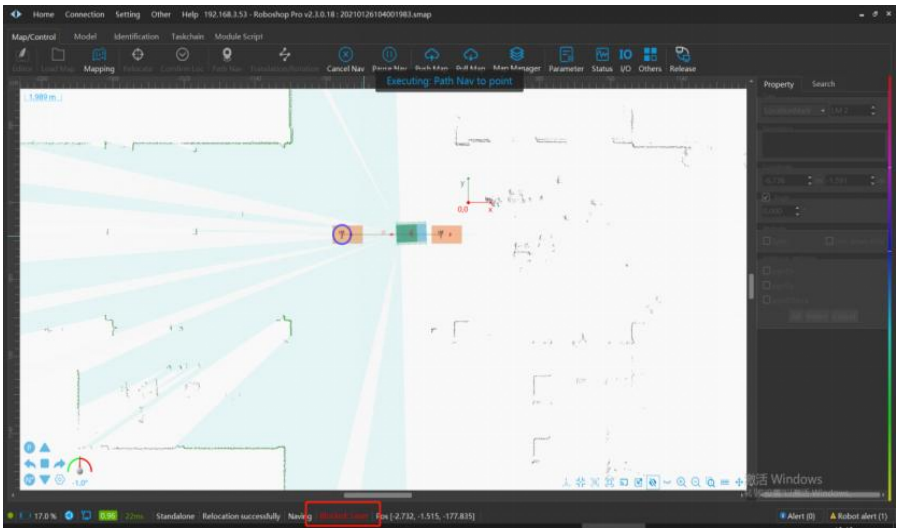
4.3 Path Navigation and Obstacle Stop Verification

Precondition: There are at least two sites on the map which are connected by a Bezier curve.

Robot conducts path navigation on the path: Click **Path Nav** in the toolbar, and then click a site, such as clicking the point LM2, then the robot will perform path navigation along the path to the destination point (point LM2), and the direction of the robot to the point is consistent with the direction of the site, as shown in the figure below.



Note: If there is an obstacle on the path, the robot will stop in front of the obstacle in the navigation process, and will not run further until the obstacle disappears. The blocking reason will be displayed in the status bar.



4.4 Establishment and Configuration of AP Workstation for Lifting Action

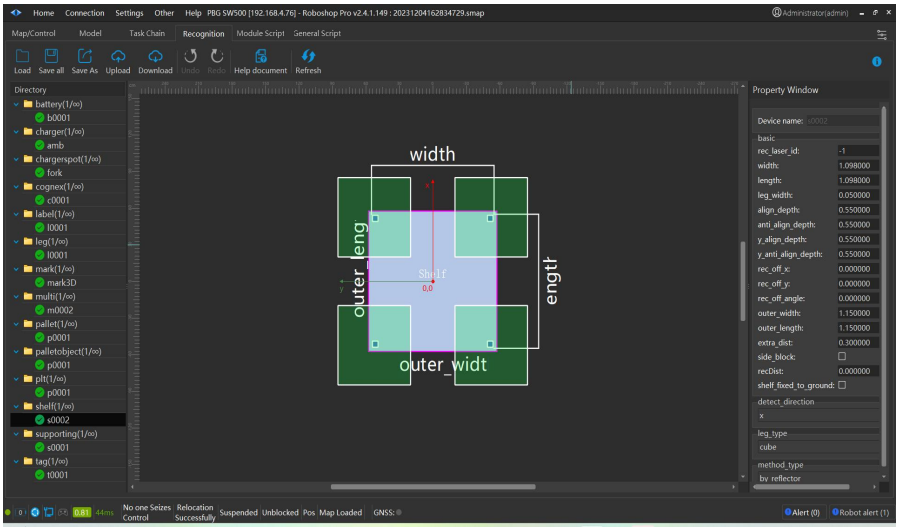
a. Operate the robot to build a map in the area where it needs to work.

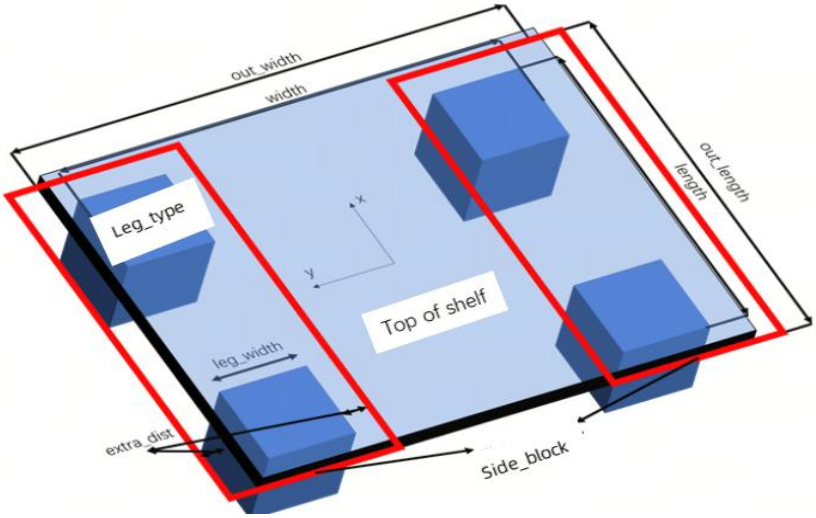
b. Establish the AP point in the position where the shelves are placed daily.

c. Configure the workstation:

Item	Description
Type	ActionPoint (AP)
Executor	jack
Recfile	S0002.shelf, explained in further detail below
Attribute: Use down PGV	Use the down-view PGV scanning the obtained information after it is checked.
Pre Point	Enable the required pre point after it is checked (explained in further detail below)

d. According to the actual shelf dimensions, accurately configure the shelf recognition file.





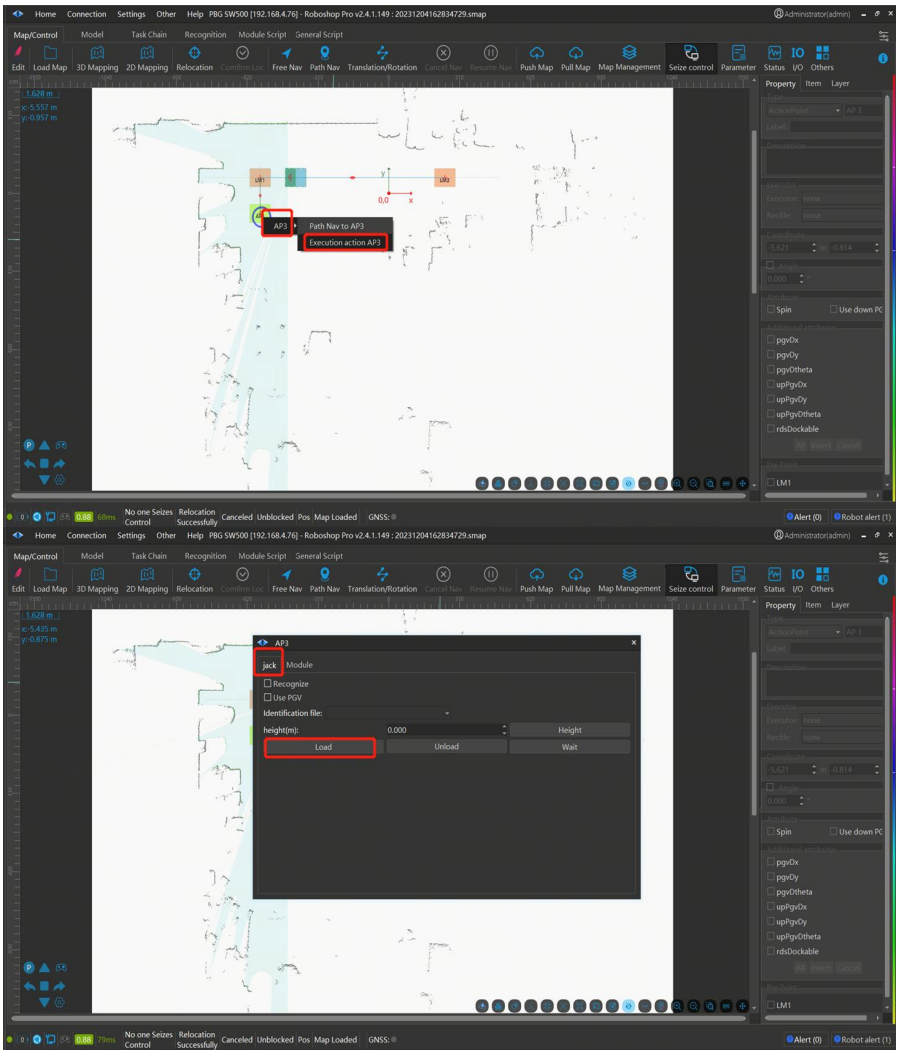
Parameter	Description
width	After modification of the shelf (by attaching reflective strips), the outer width of the two shelf legs(the width of the outermost sides of the two reflective strips), perpendicular to the robot drilling direction.
length	Width of the outermost sides of the two shelf legs, parallel to the robot drilling direction.
leg_width	The width of the reflective strip; if using the standard 3M reflective strip, the width shall be 0.05 m.
align_depth	0.39, the drilling depth of the robot moving backward into the shelf when issuing automatic recognition.

anti_align_depth	The drilling depth of the robot moving forward into the shelf when issuing automatic recognition.
outer_width	Used to configure the case where the top rectangle of the shelf is larger than the rectangle formed by the four shelf legs, that is, the widest width of the shelf.
outer_length	Used to configure the case where the top rectangle of the shelf is larger than the rectangle formed by the four shelf legs, that is, the longest length of the shelf.
extra_dist	Outline dimension expanded outward based on outer_width and outer_length.
Side_block	If there is a side block around the shelf, check this option to deduct the side block around the shelf with the laser.
leg_type	cube, used to configure the shape of the shelf legs; since the reflective strip is rectangular, it is generally configured to be cube (square).

4.5 Path Navigation to the Specified Point and Execute the Corresponding Action

There are two modes for the robot to drill into the shelf: recognition mode and non-recognition mode.

- Recognition mode: This mode uses laser sensors to recognize the shelf in the environment and realize the function of drilling into the shelf; the AP on the map can be set inside the bottom of the shelf, and there is no need to accurately set the AP.
- Non-recognition mode: This mode employs a preset path in the map to realize the function of drilling into the shelf; the AP on the map is the position where the robot stops and lifts the load, and the AP position needs to be accurately set.



a) Load/unload in the non-recognition mode: Click **Path Nav** in the toolbar, left-click on the target point. In the pop-up dialog box, select **Execute Action AP3**, and select the **Load/ Unload** option in the pop-up dialog box; the robot will go to the AP19 and carry out corresponding load/unload action;

b) Load/unload in the recognition mode: Click **Path Nav** in the toolbar, left-click on the target point. In the pop-up dialog box, select **Execute Action AP3**. In the next dialog box, check the option **Recognize**. The robot will automatically go to the pre point of AP3, recognize the shelf and drill into the bottom of the shelf to carry out the lifting action.

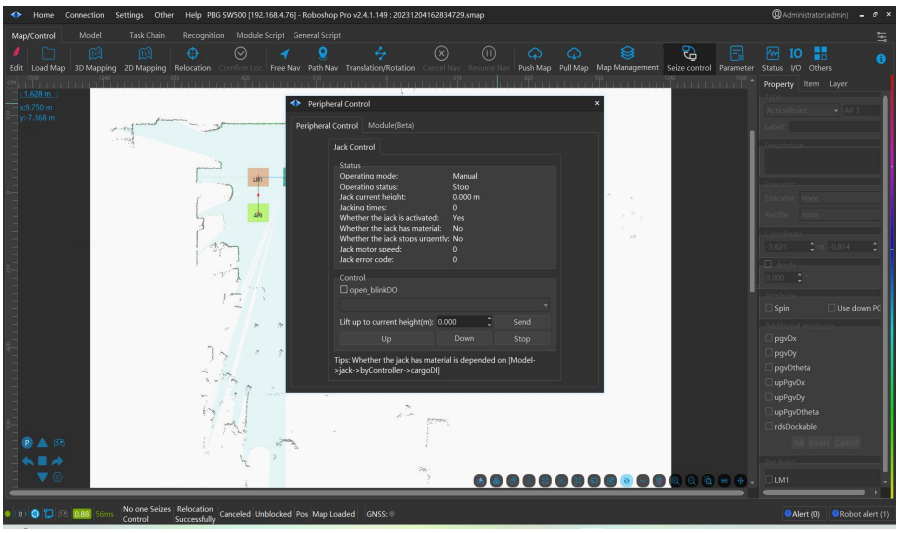
Notice:

1. The AP point must be configured with a recognition file to complete the shelf recognition.
2. When “use Reflector for detecting shelf” is set as “True” in the parameter configuration, it is necessary to stick the reflective stripes on the shelf legs.

3. When “use Reflector for detecting shelf” is set as “False” in the parameter configuration, don’t stick the reflective stripes on the shelf legs.

4.6 Upper Computer Remote Controls the Lifting

Precondition: The positioning status of the robot is normal.



Manually control the robot to lift and lower: Ensure the robot’s repositioning status is normal and click the button **P** on the bottom left corner of Roboshop.

a) Click the button **Up**, the robot’s lifting mechanism will lift from the current position to the highest height ;

b) Click the button **Down**, the robot’s lifting mechanism will lower from the current position to the lowest height;

c) Click the button **Stop**, the robot will stop any movement of the lifting mechanism.

d) In **Lift up to current height (m)**, enter a specified height such as 0.05, and the lifting mechanism will lift to 0.05 m.

4.7 Software Update

1. Open the Roboshop software, and select the robot to be upgraded, then click on **Advanced Configuration**.

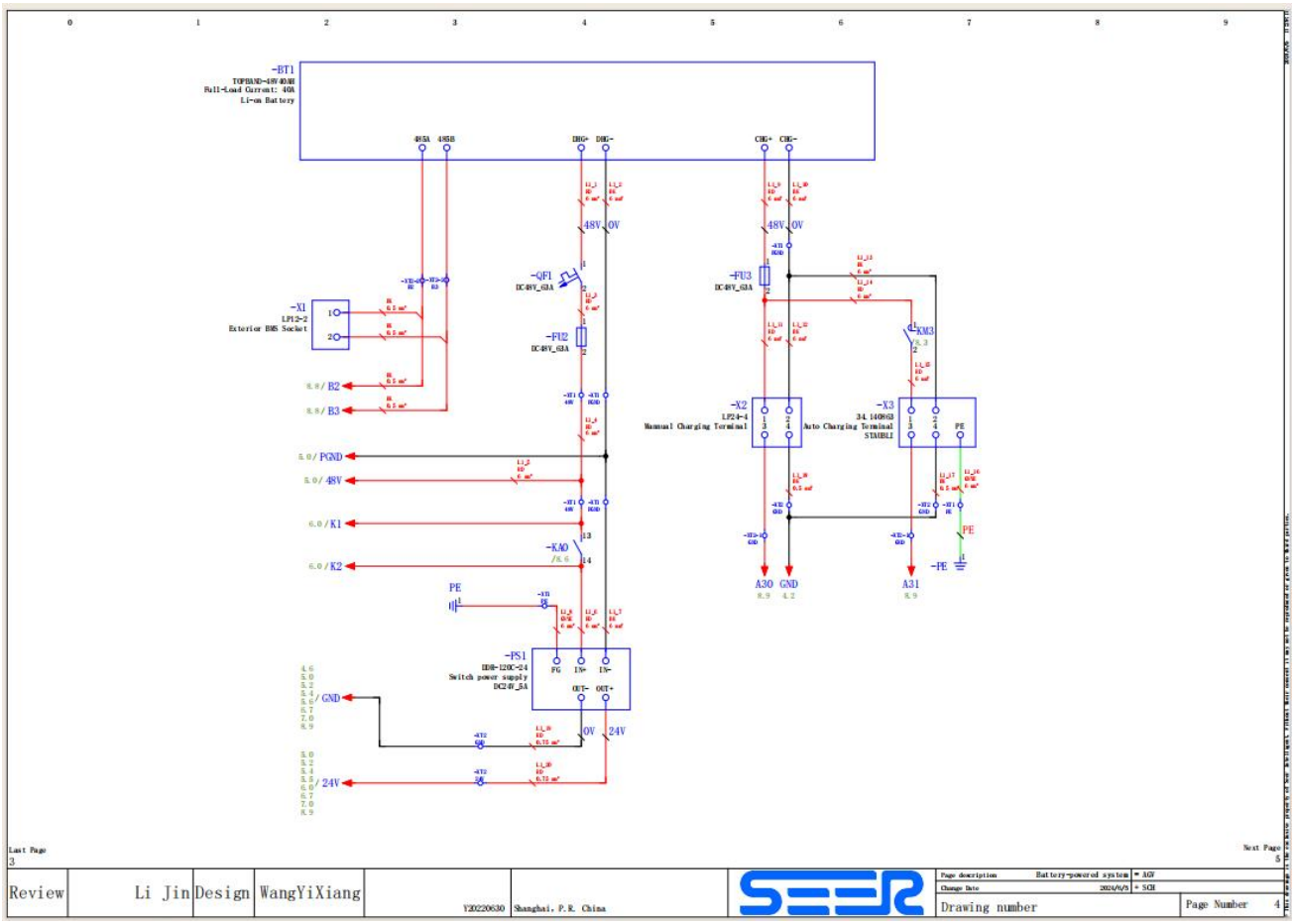
2. Click on the **Upgrade/Backup** interface, and select the files that need to be loaded.

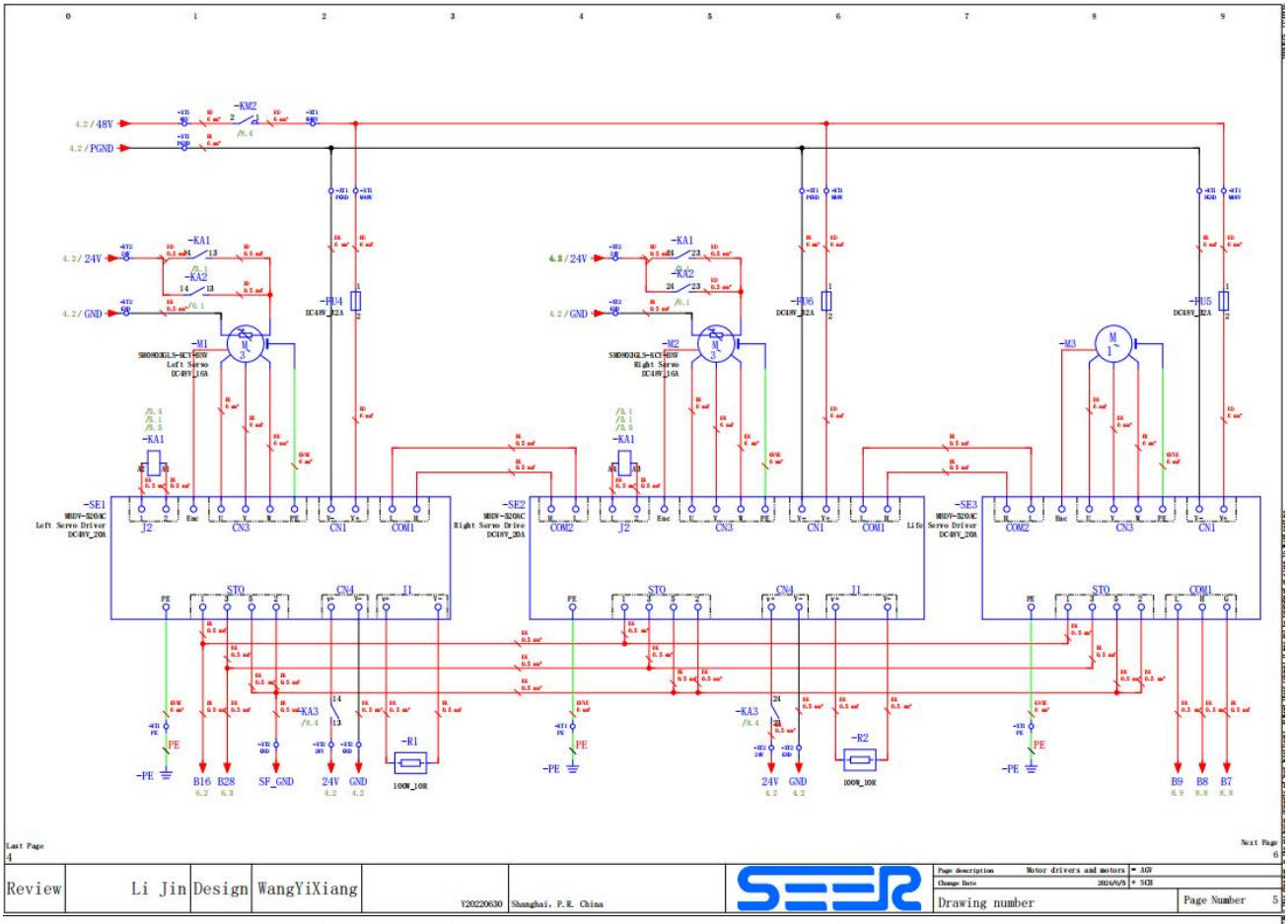
3. Click **Start Upgrade** to begin. After the upgrade is completed, the selected vehicle will automatically power off and restart.

Notice:

- If it prompts that the upgrade fails, please try to upload again or contact our after-sales service for processing.
- If you need other related information about the software, please go to the Help Center (https://support.seer-group.com/en/en/) on the official website of SEER Robotics or contact our after-sales service to obtain it.

Appendix I Electrical Schematic Diagram

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WangYiXiang
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Shanghai, P.R. China
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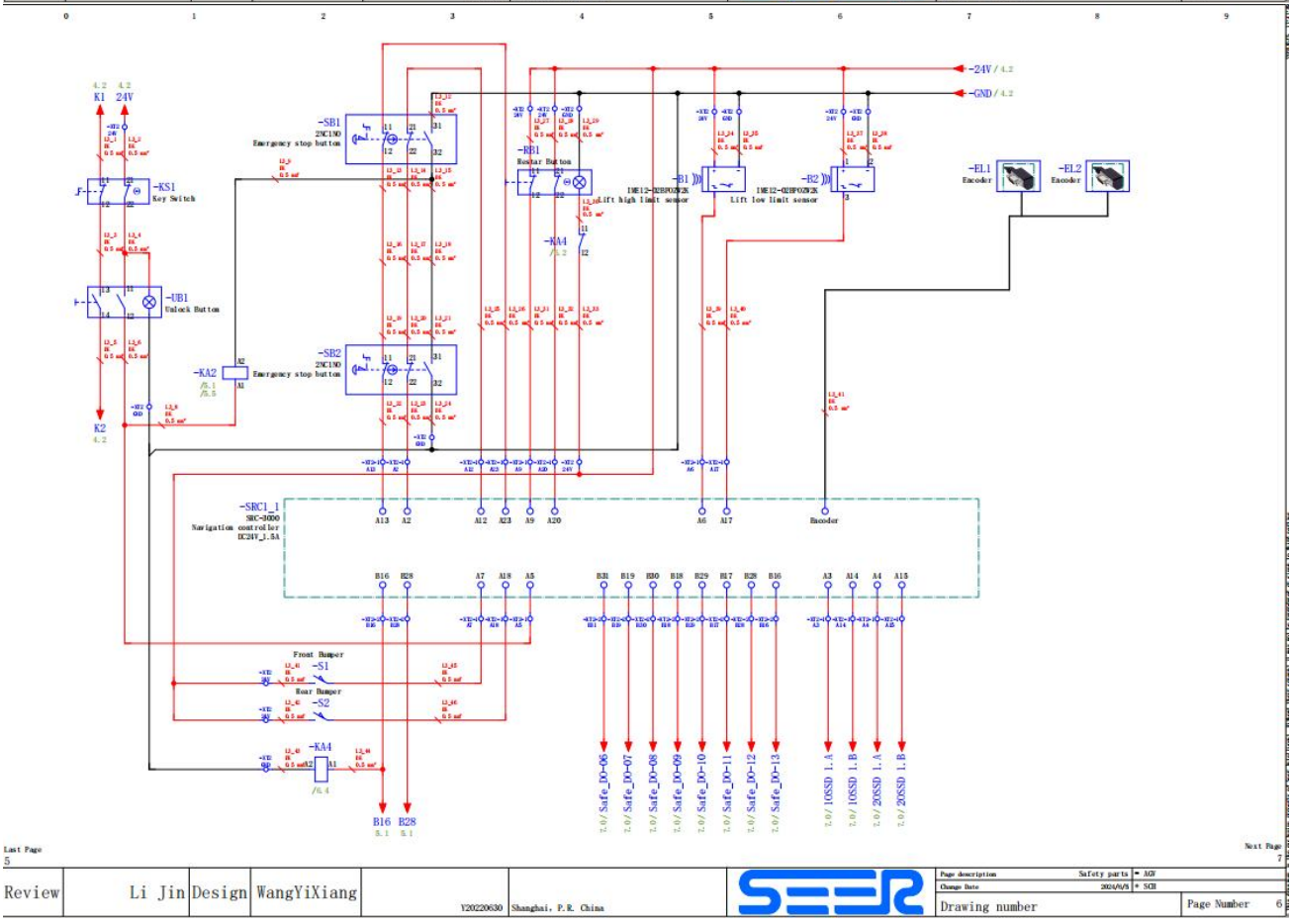
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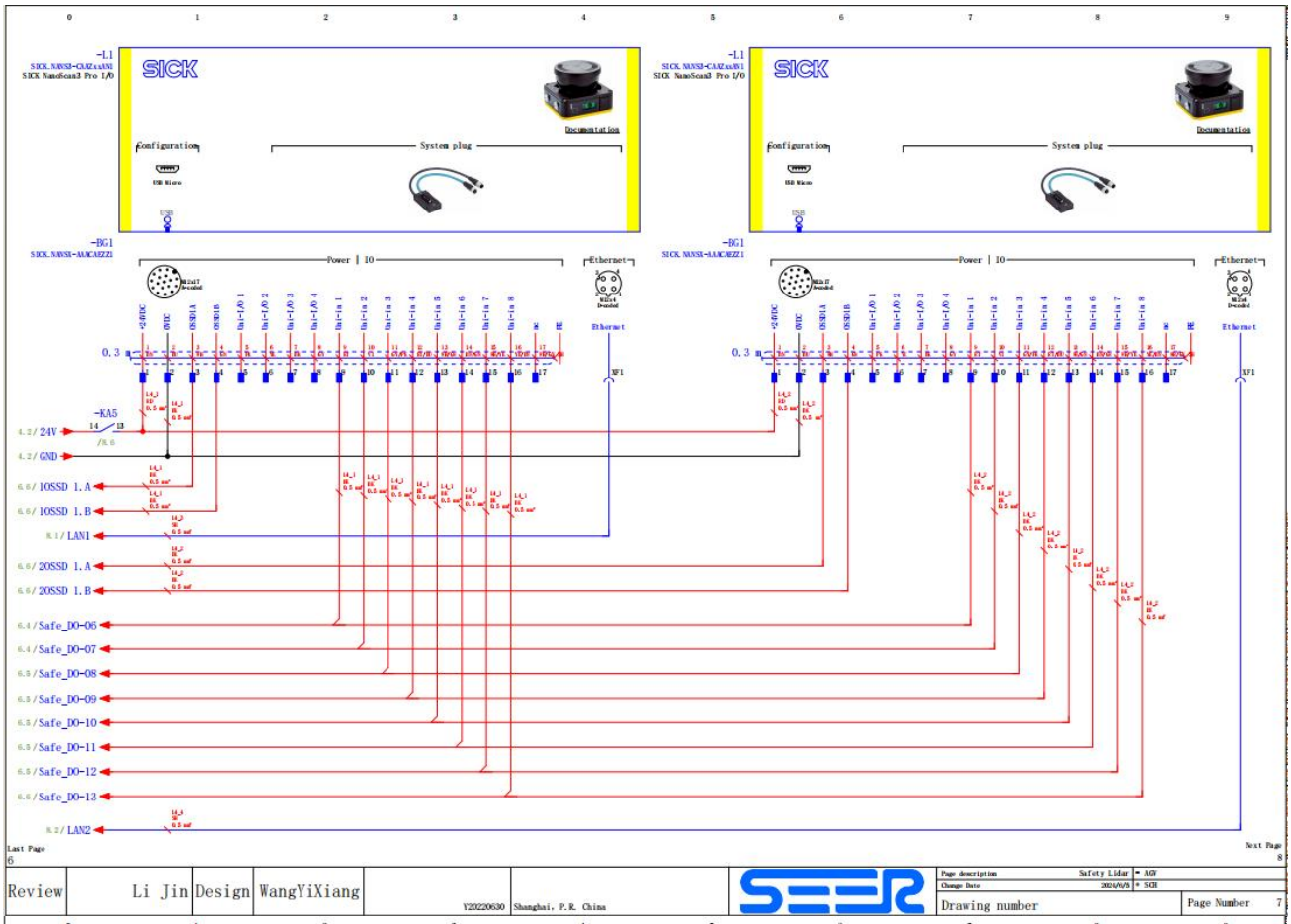
SICK
Configuration
System plug
Documentation
Power | 10
Ethernet
-KA5
4.2 / 24V
4.2 / GND
6.6 / 10SSD 1.A
6.6 / 10SSD 1.B
8.1 / LAN1
6.6 / 20SSD 1.A
6.6 / 20SSD 1.B
6.4 / Safe_DO-06
6.4 / Safe_DO-07
6.5 / Safe_DO-08
6.5 / Safe_DO-09
6.5 / Safe_DO-10
6.5 / Safe_DO-11
6.5 / Safe_DO-12
6.6 / Safe_DO-13
8.2 / LAN2
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Shanghai, P.R. China
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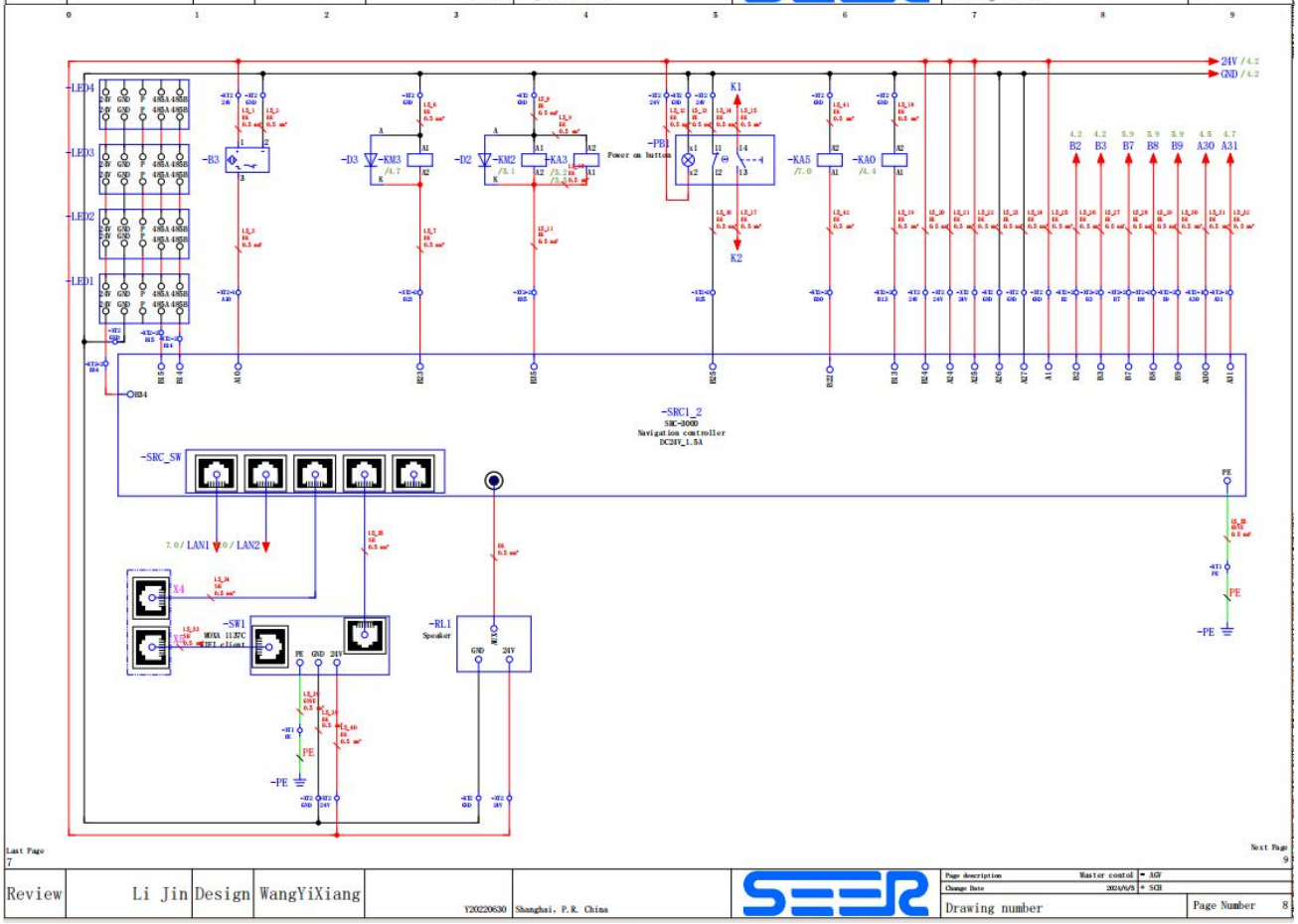
24V / 4.2
GND / 4.2
-LED4
-LED3
-LED2
-LED1
-B3
-D3
-KM3
-D2
-KM2
-KA3
-PB1
Power on button
K1
K2
-KA5
-KA0
B2
B3
B7
B8
B9
A30
A31
-SRC1_2
SRC-2000
Navigation controller
DC24V_1.5A
-SRC_SW
7.0 / LAN1
8.0 / LAN2
-SW1
-RL1
Speaker
PE
-PE
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Y20220630
Shanghai, P.R. China
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Appendix II DOC Statement

EU DECLARATION OF CONFORMITY

According to the following EU Directives

- Machinery Directive: 2006/42/EC

- Electromagnetic Compatibility Directive: 2014/30/EU

-Radio Equipment Directive 2014/53/EU

Shanghai Seer Intelligent Technology Corporation / Building 11, Lane 2777, East Jinxiu Road, Shanghai, P.R.China, declares that the machine described hereafter:

Product name: LASER SLAM Autonomous Mobile Robot

Model: AMB-1000JS，AMB-500JS-V1，AMB-500JS-V2，AMB-1000S

Provided that it is used and maintained in accordance with the general accepted codes of good practice and the recommendations of the instructions manual, fulfill the essential safety and health requirements of the above Directives and the product standards mentioned bellow. Person authorised to compile the technical file:

Name: SEER Robotics Europe GmbH
Add: Mahdentalstraße 104 71065 Sindelfingen Germany

For the most specific risks of this machine, safety and compliance with the essential requirements of the Directive has been based on elements of:

•EN ISO 3691-4:2023 Industrial trucks-Safety requirements and verification-Part 4:Driverless industrial trucks and their system
•EN ISO 12100:2010 Safety of machinery-General principles for design-Risk assessment and risk reduction
•EN 60204-1:2018 Safety of machinery - Electrical equipment of machines-Part 1:General requirements
•EN 1175:2020 Safety of industrial trucks-Electrical/Electronic requirements
•EN IEC 61000-6-2:2019 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
•EN IEC 61000-6-2:2019 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
•EN IEC 61000-6-4:2019 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
•EN 12895:2015+A1: 2019 Industrial trucks - Electromagnetic compatibility
•EN 300 328 V2.2.2(2019-07) Wideband transmission systems;Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum
•EN 301 893 V2.1.1(2017-05) 5GHz RLAN; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
•EN 300 440 V2.2.1(2018-07) Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Harmonised Standard for access to radio spectrum
•EN 301 489-1 V2.2.3(2019-11) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility
•EN 301 489-17 V3.2.4(2020-09) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility

Signed for and on behalf of (Signature) :

Position title : Controller of the SRC Product Solution Department

Place : Shanghai

Date of issue : 2024.8.9

M-710*i*C/70

Max. load capacity at wrist: 70 kg

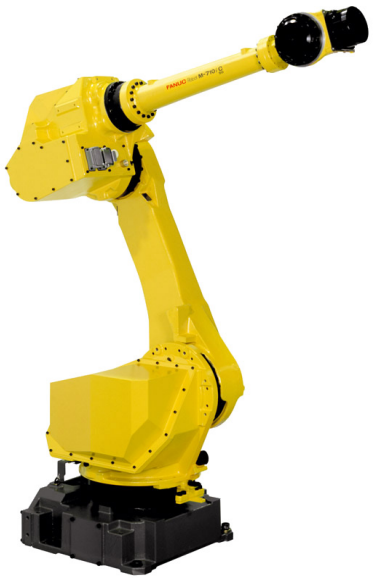
Max. reach: 2050 mm

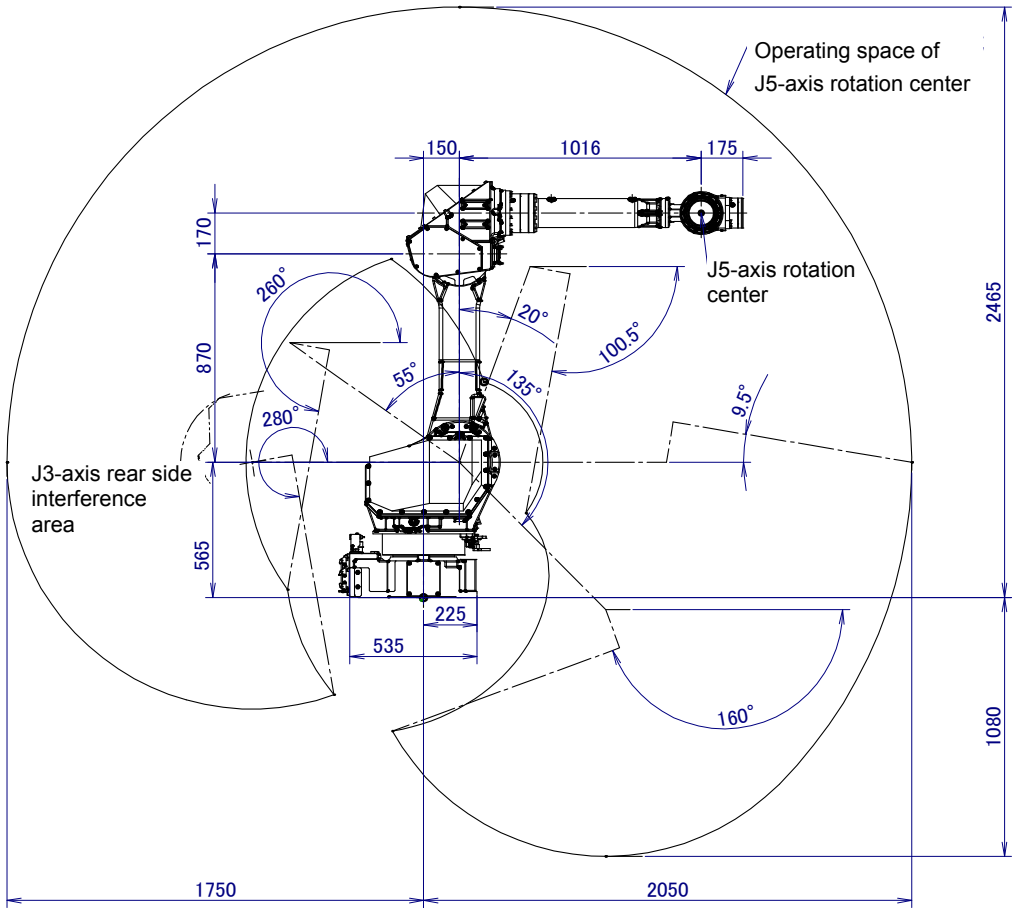
FANUC

Robot			Max.load capacity at wrist (kg)	Reach (mm)	Controlled axes	Repeatability (mm)	Mechanical weight (kg)	Motion range (°)						Maximum speed (°/s)						Moments (N·m)/Inertia (kg·m²)			Average Power consumption (kW)	Protection	
Series	Version	Type						J1	J2	J3	J4	J5	J6	J1	J2	J3	J4	J5	J6	J4 Moment/ Inertia	J5 Moment/ Inertia	J6 Moment/ Inertia		Body standard/optional	Wrist & J3 arm standard/optional
M-710	*i*C	70	70	2050	6	± 0.04**	560	360	225	440	720	250	720	160	120	120	225	225	225	294/ 30	294/ 30	147/ 15	2.5	IP54/ IP67	IP67

● standard ○ on request - not available v ** Based on ISO9283

M-710*i*C/70 6-axis





M-410*i*C/185

Max. load capacity at wrist: 185 kg

Max. reach: 3143 mm

FANUC

Robot			Max.load capacity at wrist (kg)	Reach (mm)	Controlled axes	Repeatability (mm)	Mechanical weight (kg)	Motion range (°)						Maximum speed (°/s)						Moments (N·m)/Inertia (kg·m²)			Average Power consumption (kW)	Protection	
Series	Version	Type						J1	J2	J3	J4	J5	J6	J1	J2	J3	J4	J5	J6	J4 Moment/ Inertia	J5 Moment/ Inertia	J6 Moment/ Inertia		Body standard/optional	Wrist & J3 arm standard/optional
M-410	*i*C	185	185	3143	4	±0.05**	1600 (1330)	360	144	136	720	-	-	140	140	140	305	-	-	88	-	-	3	IP54	IP54

(no pedestal) ● standard ○ on request - not available ** Based on ISO9283

M-410*i*C/185 Hollow wrist