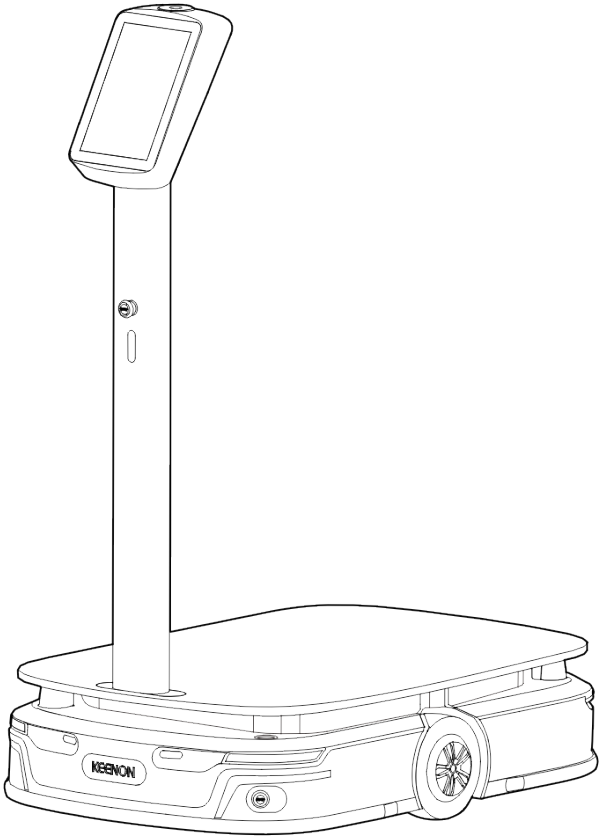
KEENON



KEENON S100

KEENON Smart Delivery Robot User Manual

Declaration

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and use, does not constitute any form of guarantee or binding guarantee on KEENON Robotics.

Contents

Introduction

- Industrial mobile robots operate in indoor environments and are suitable for industrial occasions such as factories, warehouses, etc.
- Industrial mobile robots achieve fully autonomous positioning and navigation as well as intelligent obstacle avoidance through machine vision and LiDAR, enabling them to move independently in industrial settings. They can provide services such as cargo handling, online replenishment, and intermediate material transfer.

Safety Precautions

2.1 About Safety Precautions

Please read the user instructions for this robot before using it, and do not perform any operations beyond the scope of this manual.
This manual provides the safety precautions and correct steps for using the machine and charger, but not all contingencies are addressed in the precautions sections. The safety of the operators, pedestrians, and those who are around shall always be prioritized in any situation (for example, when the machine is not operating properly, or the machine is overturned). Please read the instructions for installation and usage of the machine carefully, and keep this manual in a place where you can access it at any time.

2.2 Interpretation of Symbols

The following symbols represent the severity of injury or damage that may be caused if warnings are disregarded or if the machines and related equipment are used improperly. Please read the following sections of this manual carefully before proceeding.

⚠ WARNINGS	WARNINGS indicate the prohibited operations; otherwise, they may lead to blindness, injury, burn (high or low temperature), electric shock, bone fracture, poisoning, etc., and the consequences will be long-lasting and might require hospitalization or long-term hospitalization.
⚠ CAUTIONS	CAUTIONS indicate actions that could result in injury, burns, electric shock, etc., but if disregarded, do not necessitate hospitalization or long-term hospitalization.
⚠ NOTES	NOTES indicate the instructions that, if not followed, might result in damage to houses and properties, as well as livestock and pets.

2.3 Safety Instructions

⚠ WARNINGS

- Do not step on the power cord or apply excessive force to it, regardless of whether the charger is connected or not, to prevent damage to the charger or electric shock.
- Only use the original charging pile or charger, specially provided by the manufacturer. Do not try to disassemble or modify the robot battery in order to prevent the battery from exploding or the liquid within the battery from leaking. Please contact after-sales service for battery replacement or maintenance.
- This product is equipped with a LiDAR for positioning and navigation. Do not stare directly at the laser with your eyes.
- Do not charge the robot with wet hands.

- Do not use the product in extremely hot (above 40°C) or extremely cold (below 0°C) environments.
- The chemical substances contained in the battery built into this machine will pollute the environment. Please remove the battery from the body of the robot before disposal, and the battery should be handed over to a professional battery recycling station for centralized disposal.
- If the battery leaks, ensure that it does not come into contact with your eyes or skin. In the event of accidental contact, immediately wash your hands with clean water and rinse your eyes. If discomfort persists, seek medical attention immediately.
- Please do not modify the machine to avoid causing damage to the internal circuit. If the robot is damaged, please call the after-sales service hotline for repair.

⚠ CAUTIONS

- Do not insert your fingers or other objects into the conveyor belt or other rotating parts of the robot to prevent damage when using the robot.
- Please do not attempt to open the robot's shell while it is functioning properly to prevent electric shock or other safety risks.
- Do not deploy the robot near stairs, escalators, or other areas where there may be a risk of falling. Please add protection measures such as fences if deployment is necessary.
- Do not use the robot in places with steps, uneven ground (height difference greater than 1 cm, and angle of inclination greater than 2.8°), thick carpet (carpet thickness greater than 1 cm), or a wet floor.
- Do not use any decorations that might obstruct the sensor and cause the machine to malfunction.
- Do not allow liquids such as beverages or foreign objects to enter the inside of the machine.
- Do not flip over or drop the machine when moving or transporting it.
- This product should not be used by persons with physical, sensory, or intellectual disabilities, as well as those lacking the necessary experience and expertise (including children), unless supervised or instructed by a guardian to ensure that they can use it safely.
- Areas with pure black (such as baseboards), reflective (such as mirrors), or fully transparent (floor-to-ceiling windows, glass doors) objects below the ground height of 22cm may interfere with radar reflection and cause abnormal walking of the robot, where reconstructions may be required (such as placing ornaments).

2.4 Instructions for Use

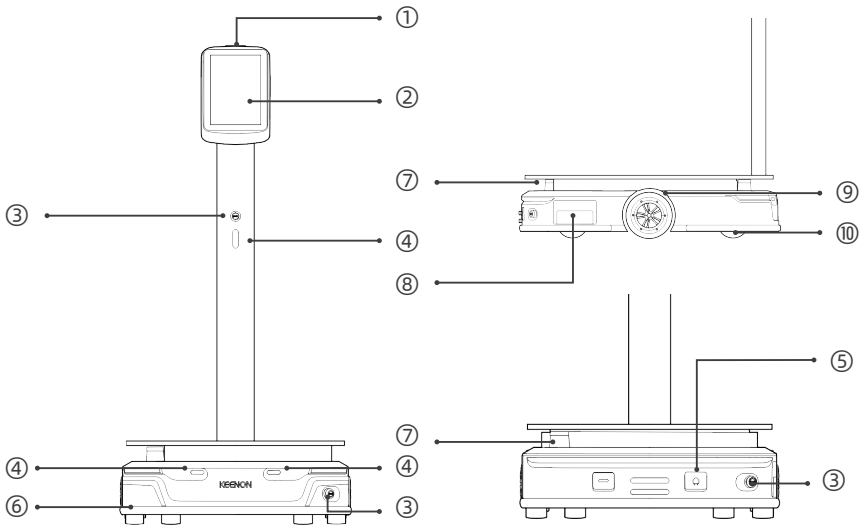
⚠ NOTES

- Prior to using the machine, operators should read this manual and have a comprehensive understanding of its proper operation.
- Do not expose the machine to excessive amounts of dust, sand, snow, ice, water, humidity, a saltwater environment, or salt spray, which may cause the robot to malfunction.
- Do not place items that exceed the load limit on the pallet. Otherwise, it may result in injury, malfunction, loss of use, or damage to surrounding objects.
- Do not use the robot in an area smaller than the robot's operable width (the minimum width for the robot to pass is 0.9m, and the minimum turning diameter is m).
- Do not use pallets or plates that are larger than the machine tray, as this may prevent the hatch from closing.
- Avoid striking or engaging in any forceful actions, as they may result in damage to the robot.
- Ensure that the operators can respond quickly to unforeseen circumstances that occur while the machine is in motion. Press the emergency stop button if you feel any danger. Otherwise, this may cause injury or damage to the user, third parties, or surrounding objects.
- Ensure that the power cord is unplugged from the outlet when performing maintenance or when the battery charger will not be used for an extended period time.

- Please store the machine within the temperature range of -15℃ to 45℃ and the humidity range of 20%RH to 80%RH.
- Re-mapping will be necessary if the indoor environment in which the machine operates has Changed significantly (redecorating,using the machine in a new location,rearranging Interior items such as destinations,chairs,tables,etc.).

Parts of Product

3.1 Appearance & Parts



① Image module
② Operating screen
③ Emergency stop button
④ Stereo vision sensor
⑤ Manual charging port
⑥ Emergency sensing strip
⑦ LiDAR
⑧ Quick-release battery
⑨ Driving wheels
⑩ Omni-directional wheels

3.2 Performance Parameters

Project	Performance indicators	Parameters
Basic parameters	dimensions	925mm*620mm*1282 mm
	Tunnel requirements	1200mm
	Self-weight	<87.5KG
	Human-machine interaction	≥10.1 Inch LCD Screen
	Communication method	4G/WIFI
	Rated load	100kg
Exercise Performance	Driving mode	Dual-wheel differential
	Rated operating speed (empty load)	0.2 ~ 1.0m/s
	Rated operating speed (rated load)	0.2 ~ 1.0m/s
	Driving direction	One-way driving
	Rotation capability	Can rotate 360° in place
Navigation and positioning	Navigation mode	Laser SLAM
	Guidance positioning accuracy	±10cm
	Stop position accuracy	±10cm
	stop angle accuracy(°)	±10°
Power supply mode	Battery type	Trilayer lithium battery
	Battery capacity	48V12Ah
	Rated endurance	8h(Comprehensive working conditions)(<100kg)
	Recharge time	4h（Supports automatic charging, manual charging, and swapping）
	Recharge input power source	100-240V~,2.5A(MAX.)50/60Hz
Through performance	Chassis ground clearance	≤25mm
	Ability to cross ditches	≤30mm
	Ability to climb obstacles	≤10mm
	Climbing ability	≤ 5%（2.8°）

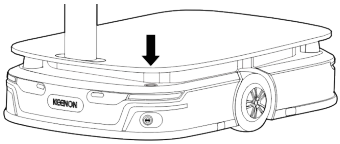
Safety protection	Emergency stop switch	Front/Side/Rear emergency stop button
	Sound and light alarm	Indicator lights
	LiDAR	360° high-precision LiDAR
	Front and rear collision bar detection	20~150N
	3D obstacle avoidance	Stereo vision module *3/ LiDAR *2
Environmental parameters	Operating temperature	0~45℃
	Noise	<60dB
	Storage temperature	-20~50℃
	Humidity requirements	5%~95%, No condensation

Operating

4.1 PowerOn/Off

Power On

When you press the main switch,you will hear a"click"to confirm that it has been pressed.
Release the switch to see the screen light up,indicating that the boot is complete.It takes about 40 seconds to wait for the software to complete loading.



Power Off

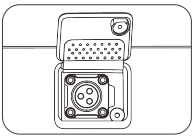
Press the main switch and release the switch when you hear a"click".The shut down is complete when the screen goes out.

4.2 Charging with Charger

NOTES

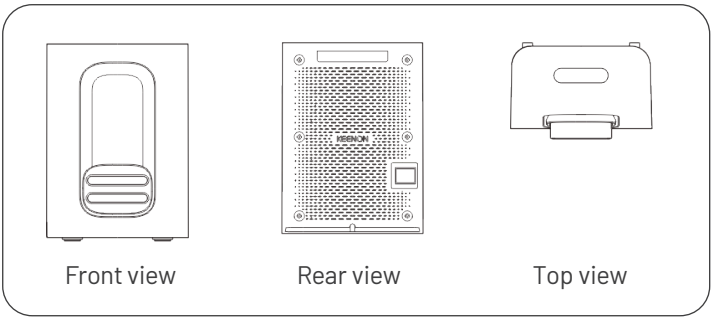
– Please charge the machine fully before using it for the first time.

STEPS



1. Remove the power cover from the manual charging port on the back of the machine and insert the charging plug of the charger into the charging port.
2. The charger light will turn red when the charging process begins.
3. The charging process is complete when the charger indicator turns green.
4. After charging is complete,pull out the charging plug of the charge rand then the charging port on the machine side to close the power cover.

4.3 Charging at Charging Piles



NOTES

- Please place the charging pile on a flat surface,and do not move it after setting it up if not necessary.
- When the robot is not charging,the light of the charging pile is always blue;however,when it is charging,the light of the charging pile is green.
- When the robot's power falls below the set level,it will return to charging itself.

STEPS

1. Fix the charging pile firmly to ensure that it does not move easily.
2. Set the charging pile position in accordance with the KEENON deployment tool's operating procedure.
3.T urn on the switch of the charging pile;
4. The automatic charging time can be set,and the specific steps can be carried out through [Settings-Charging Settings-Settings at Working Hours].

4.4 Emergency Stop

NOTES

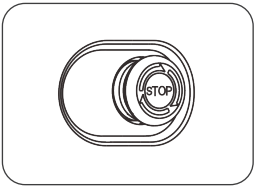
- If the emergency stop button is pressed while the robot is on an incline,it may release kinetic energy,leading to unintended autonomous movement that can cause injuries.Exercise extreme caution when operating the emergency stop buttonon anincline.

The emergency stop button should be pressed in the following situations:

- When manually moving the robot during its operation.
- When the robot is exhibiting abnormal behavior(e.g.,moving in a direction contrary to the indicated direction) and may potentially cause damage to its surroundings.

Position of the Emergency Stop Button and Restoring Normal Operation:

To restore the robot to its normal operational state or verify that it is operating correctly,gently rotate the switch located on the top of the emergency stop button in the direction indicated by the arrow.This action will enable the robot to resume its normal operation.



Maintenance

5.1 Cleaning

> ⚠ CAUTION
> Before cleaning the device,Ensure you turn off its power and unplug the power cord from the power outlet. When wiping the exterior surfaces and cabin interior to remove oil stains with alcohol,benzene,or any other flammable cleaners,caution should be taken to use a damp cloth after wards to prevent cleaner from seeping in, which could result in fire or electric shock.

Sensor

Wipe the robot sensor with a soft,dry cloth.

①Gently wipe the image positioning module in a clockwise direction(refer to Section3.1①image module for the position)
②Gently wipe the stereo vision sensor area in the same direction(refer to Section3.1 ④stereo vision sensor for the position)
③Wipe the surface and interlayer of the radar(refer to Section3.1⑦LiDAR for the position)

Exterior surfaces and cabins

1.Soak a piece of cloth with water, wring it out, and wipe the outer surface of the machine.
2.Then use a dry cloth to fully dry the surface.

Wheels

1.Place the robot on its side on a flat surface covered with a soft protective pad.
2.Take down the omni-directional wheels to remove hair and dirt from the wheels,and wipe with a damp cloth.
3.Assemble the wheels and lock them securely.
*Disassembly and assembly of the machine should be performed by professionals,otherwise the robot maybe damaged.

Battery

- For battery maintenance,you must contact our company's professionals for after-sales maintenance and replacement.
- When the robot is not used for a long time,it must be charged every three months to avoid battery damage.

5.2 Transportation

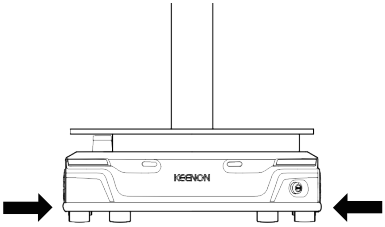
> ⚠ CAUTION
> This product is an electronic product.Please keep transportation safety in mind when transporting.

Please strictly follow the instructions below if moving the robot manually is necessary to prevent damage to the machine.

Lifting

- Two people on both sides of the machine, holding the bottom area of the robot upright and lifting the machine at the same time.

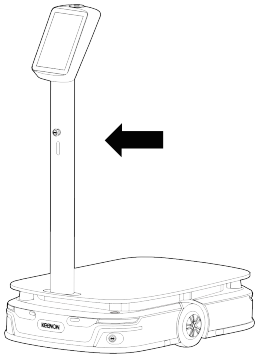
* Do not lift other areas;otherwise,the robot may be damaged.



Pushing

- Make sure the emergency stop button is pressed, and use both hands to push the mast handle to move the robot.

* Do not pull other areas of the robot violently, as this may cause damage.



Transportation

- Please check the integrity of the packaging box when moving the product in order to prevent product damage due to handling.
- Do not stack when handling. Do not stack other items on the outer packaging.
- Please keep the direction of the arrow on the box during transportation. Do not flip over, side lay or upside down the machine.

5.3 Maintenance and Maintenance Interval

The main purpose of robot host maintenance is to check the remnants inside the cabin,the Foreign objects around the stereo vision sensor camera and LiDAR,the foreign objects around the driving wheels and omni-directional wheels,the charging pile,etc.The maintenance period can be adjusted appropriately according to the environment,frequency,intensity,and temperature of the machine.

Robot maintenance Schedule			Interval			
No.	Unit	Level	Year	Month	Week	Day
1	LiDAR	Wipe			1 time	
2	Stereo vision sensor	Wipe			1 time	
3	Omni-directional wheel	Clean		1time		
4	Driving wheels	Clean	2times			
5	Charging pile	Wipe		1time		

Troubleshooting

6.1 Troubleshooting of Exceptions and Faults

Faults	Possible Causes and Solutions
Failure to boot properly	• Low battery.Use the charging pile or the Charger to charge the robot.
Failure to charge properly	• Repositioning of the charging pile. Please return the charging pile to its original position. • The charging pile is not connected to the power supply.Please connect the charging pile to the power supply. • The charging pile is blocked.Please verify that there are no obstructing objects within 0.5m in front of the charging pile and on all sides.
The robot is unable to move properly	• Robot positioning has been lost.Please move the robot to the charging pile to charge,and it will be reset automatically. • Image module failure. Make sure that the image module is not obscured or defaced. • Failure of LiDAR.Please check whether the LiDAR is dirty. • The robot collision switch is malfunctioning. Please check if the collision switch is being squeezed.

Failure to play the voice	• The voice of the robot is turned off or the volume is too low.Please reset the voice or volume.
Failure to take the elevator	• Elevator failure.Please check to see whether the elevator itself is faulty or anomalous. • Network abnormality.Please check whether the robot network and elevator box network are online. • Disconnection of the elevator box's power supply.Please connect the E-BOX power cable to the power supply.

*Please contact customer service personnel for further assistance if the aforementioned steps did not help.

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