

ROBOWORKS
N10 Robot
Educational
Programmable
Mobile Robot



ROBOWORKS N10 Robot Educational Programmable Mobile Robot User Manual

[Home](#) » [ROBOWORKS](#) » ROBOWORKS N10 Robot Educational Programmable Mobile Robot User Manual 

Contents

- 1 ROBOWORKS N10 Robot Educational Programmable Mobile Robot
- 2 Frequently Asked Questions
- 3 Key Component
- 4 Product Specifications
- 5 Introduction of ROS Controllers
- 6 Steering & Driving System
- 7 Robot Chassis Design Diagram:
- 8 Power Management
- 9 Technical Specifications:
- 10 ROS 2 Quick Start
- 11 Pre-installed ROS 2 Humble Packages
- 12 Summary
- 13 Documents / Resources
 - 13.1 References

ROBOWORKS

ROBOWORKS N10 Robot Educational Programmable Mobile Robot



Specifications

Product Name	Motor Reduction Ratio	Max Speed	Weight	Max Payload	Size	Minimal Turning Radius
Robot 2	1:27	1.3m/s	5.92kg	16 kg	445*360*206 mm	0.77m
Rosbot Pro	1:18	1.65m/s	19.54kg	35kg	774*570*227 mm	1.02m
Rosbot Plus	1:18	2.33m/s	35.16kg	22kg	766*671*319 mm	1.29m

Battery Life & Power Supply:

- Robot 2: About 9.5 hours (no load), About 8.5 hours (fully load)
- Robot Pro: About 4.5 hours (no load), About 3 hours (fully load)
- Power Supply: 24v 6000 mAh battery + 3A current smart charger

Steering & Driving System:

Key components include:

- Steering Gear: S20F 20kg torque digital servo
- Wheels: WH060 60kg torque digital servo, 125mm diameter solid rubber wheels for Rosbot 2, 150mm diameter solid rubber wheels for Robot Pro and

- Encoder: 500 line AB phase high precision encoder
- Suspension System: Coaxial Pendulum Suspension System for Robot 2, 4W Independent Suspension System for Robot Pro and
- Control Interface: iOS & Android App via Bluetooth or Wifi, PS2, CAN, Serial Port, USB

Introduction to ROS Controllers:

All RRobots are equipped with an Orbbec Astra Depth Camera for various uses including gesture control, skeleton tracking, and 3D scanning.

STM32 Board:

The board features an STM32F103RC core with various functionalities including Memories, Clock, Reset and Supply Management, Power DMA, Debug Mode, I/O ports, Timers, and Communication Interface.

Frequently Asked Questions

Q: How do I charge the battery?

A: Use the provided 3A current smart charger with the 24v 6000mAh battery to charge the RRobot

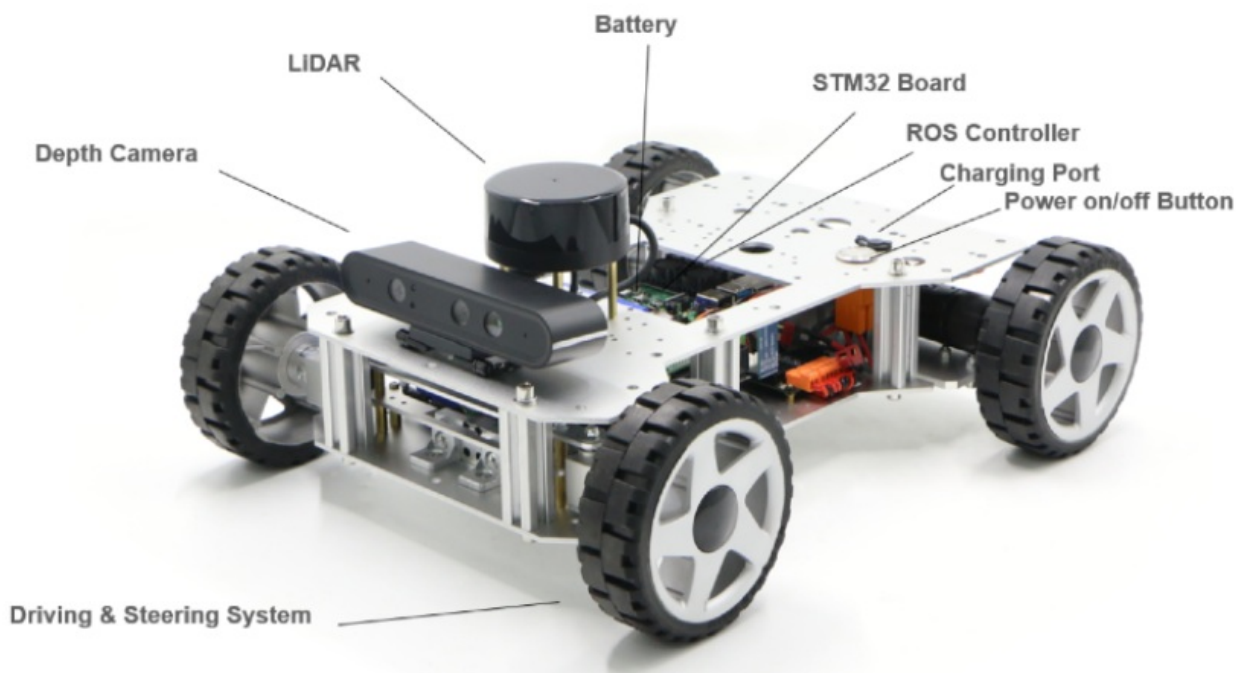
Q: What is the battery life of Rosbot Pro?

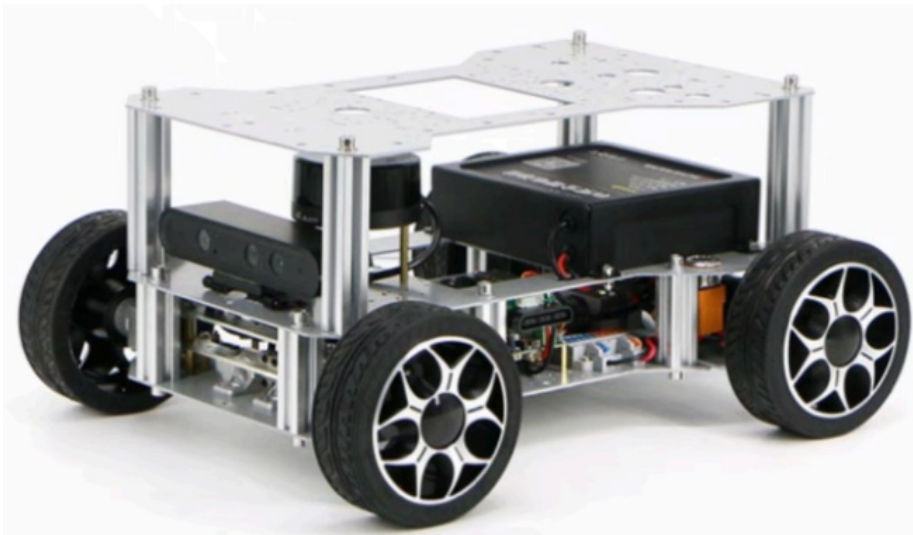
A: The Robot Pro has a battery life of about 4.5 hours with no load and about 3 hours under full load conditions.

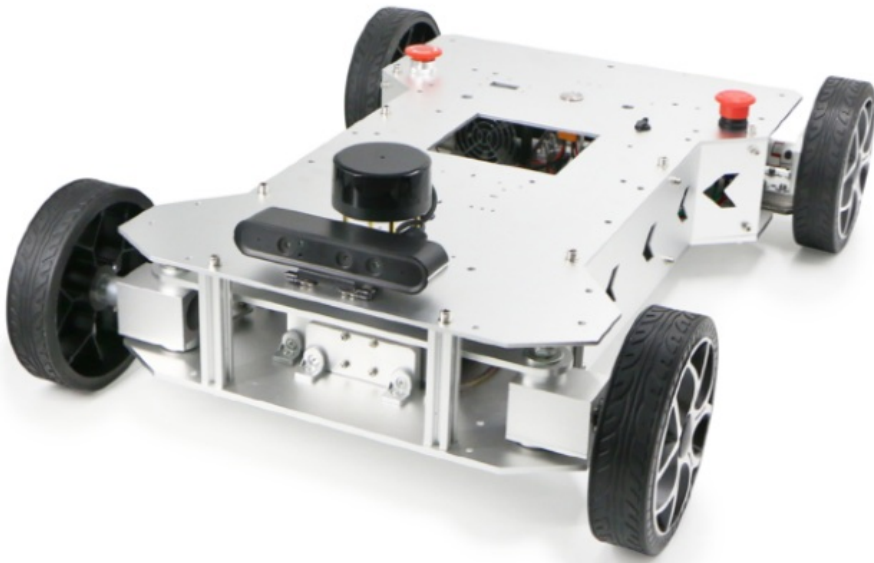
Q: Can I control the Rosbot using a smartphone?

A: Yes, you can control the Rosbot using the iOS & Android app via Bluetooth or Wifi.

Key Component

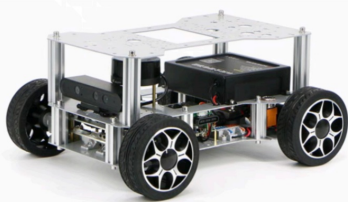




Varia%on	Image
Robot 2	

Robot Pro	
-----------	---

Robot Plus	
------------	--

Product Specifications

Product Matrix			
-----------------------	--	--	---

Product Name	Robot 2	Robot Pro	Robot Plus
Motor Reduction Ratio	1:27	1:18	1:18
Max Speed	1.3m/s	1.65m/s	2.33m/s
Weight	5.92kg	19.54kg	35.16kg
Max Payload	16 kg	35kg	22kg
Size	445*360*206mm	774*570*227mm	766*671*319mm
Minimal Turning Radius	0.77m	1.02m	1.29m
Battery Life	About 9.5 hours (no load), About 8.5 hours (fully load)	About 4.5 hours (no load), About 3 hours (fully load)	
Power Supply	24v 6000 mAh battery + 3A current smart charger		
Steering Gear	S20F 20kg torque digital servo	WH060 60kg torque digital servo	
Wheels	125mm diameters solid rubber wheels	150mm diameters solid rubber wheels	254 mm inflatable rubber wheels
Encoder	500 line AB phase high precision encoder		
Suspension System	Coaxial Pendulum Suspension System		4W Independent Suspension System
Control Interface	iOS & Android App via Bluetooth or Wifi, PS2, CAN, Serial Port, USB		

Introduction of ROS Controllers

There are 2 types of ROS Controllers available for use with the RRobot based on the Vidia Jetson platform. Jetson Orin Nano is suited more towards research and education. Jetson Orin NX is ideal for product prototyping and commercial applications. The following table illustrates the main technical differences between the various controllers available from Roboworks. Both boards allow high-level computation and are suited to advanced robotic applications such as computer vision, deep learning, and motion planning.

Jetson Orin NX series		Jetson Orin Nano series		
Jetson Orin NX 16GB	Jetson Orin NX 8GB	Jetson Orin Nano Developer Kit	Jetson Orin Nano 8GB	Jetson Orin Nano 4GB
100 TOPS	70 TOPS	40 TOPS		20 TOPS
1024-core NVIDIA Ampere architecture GPU with 32 Tensor Cores		1024-core NVIDIA Ampere architecture GPU with 32 Tensor Cores		512-core NVIDIA Ampere architecture GPU with 16 Tensor Cores
918MHz	765MHz	625MHz		

Sensing System: LiDAR & Depth Camera

A Leishen LSLiDAR is installed on all Rosbot variations with either the N10 or M10 model being used. These LLiDARs offer a 3360-3360-degree scanning and surroundings perception and boast a compact and light ESI. They have a high Signal Noise Ratio and excellent detection performance on high/low reflective objects and perform well in strong light conditions. They have a detection range of 30 meters and a scan frequency of 12Hz. This LiDAR integrates seamlessly into the Robots, ensuring all mapping and navigational uses can be easily achieved in your project. The below table summarizes the technical specifications of the sliders:

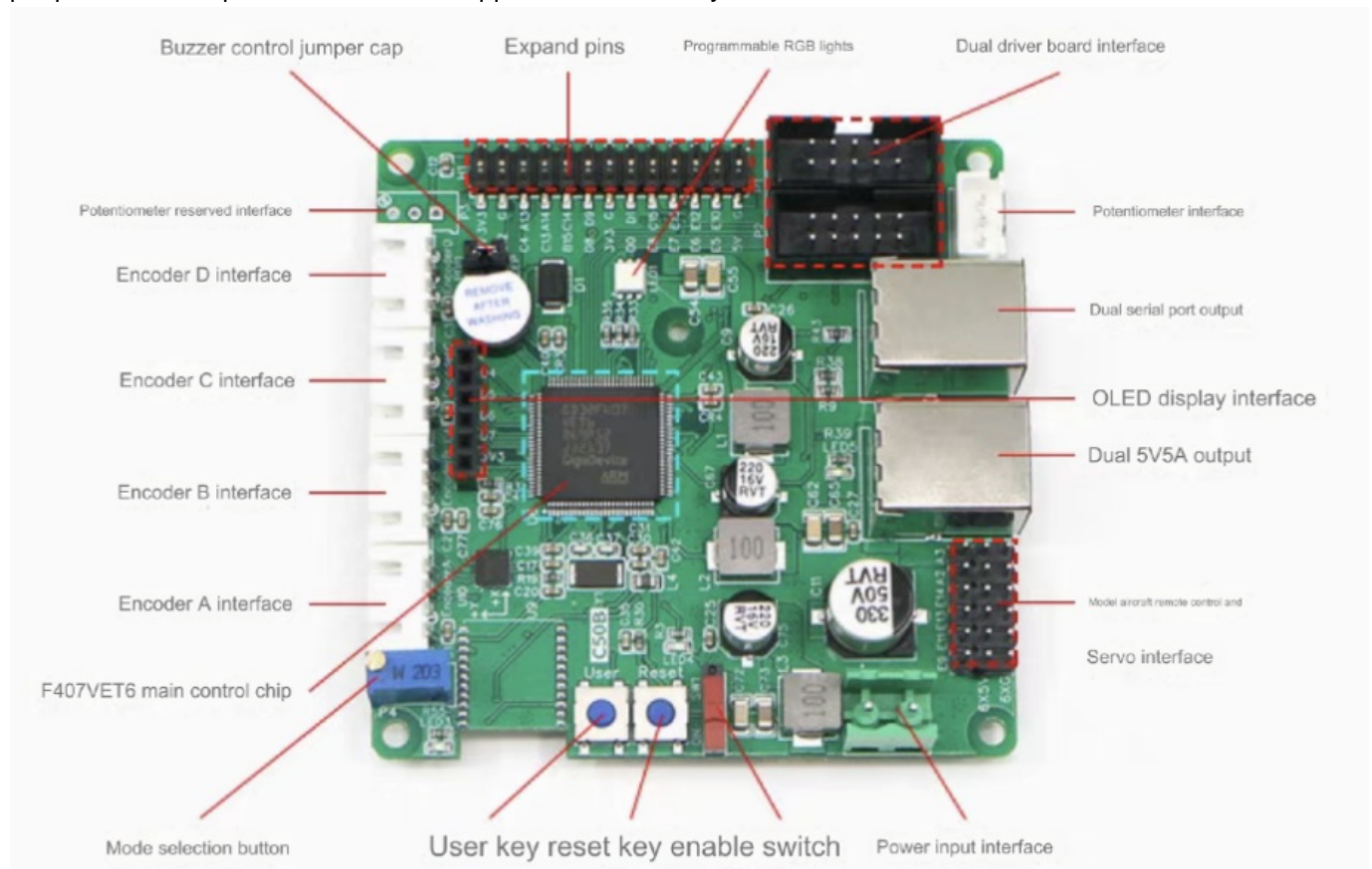
LS LiDAR	N10	M10	C16 (3D)
Detection Range	25m	30m	70/120/150 m
Scan Frequency	10Hz	12Hz	5/10/20Hz
Samples Frequency	4,500Hz	20,000Hz	240,000Hz
Output Contents	Angular, Distant and Light Intensity Data	Angular and Distant Data	Angular, Distant, Time Stamp and Light Intensity Data
Angular Resolution	0,8	0,22	1~2
Interface Type	Serial Port	Ethernet Port	Ethernet Port

Additionally, all Robots are equipped with an Orbbec Astra Depth Camera, which is an RGBD camera. This camera is optimized for a range of uses including gesture control, skeleton tracking, 3D scanning, and point cloud development. The following table summarizes the technical features of the depth camera.

Orbbec Astra Depth Camera	Specs
Depth Resolution	640x480
RGB Resolution	640x480
RGB Sensing Angle	63.1x49.4 degree
Depth Sensing Angle	58.4x45.5 degree
Monocular/Binocular Structural Light	Monocular Structural Light + Monocular RGB
Depth Frame per Second	640x480@30fps
RGB Frame per Second	640x480@30fps
Depth Range	0.6~4m
Data Transfer Interface	USB2.0 or above

STM32 Board (Motor Control, Power Management & IMU)

The STM32F103RC Board is the microcontroller used in all Rosbots. It has a high-performance ARM Cortex-M3 32-bit RISC core operating at a 72MHz frequency along with high-speed embedded memories. It operates in -40°C to +105°C temperature range, suiting all robotic applications in worldwide climates. There are power-saving modes that allow the design of low-power applications. Some of the applications of this microcontroller include motor drives, application control, robotic applications medical and handheld equipment, PC and gaming peripherals, GPS platforms, industrial applications, alarm system video intercoms, and scanners.



STM32F103RC	Features
Core	ARM32-bit Cortex –M3 CPU Max speed of 72 MHz
Memories	512 KB of Flash memory 64kB of SRAM
Clock, Reset, and Supply Management	2.0 to 3.6 V application supply and I/Os
Power	Sleep, Stop, and Standby modes V supply for RTC and backup registers BAT
DMA	12-channel DMA controller
Debug Mode	SWD and JTAG interfaces Cortex-M3 Embedded Trace Macrocell
I/O ports	51 I/O ports (mappable on 16 external interrupt vectors and 5V tolerant)
Timers	4×16-bit timers 2 x 16-bit motor control PWM timers (with emergency stop) 2 x watchdog timers (independent and Window) SysTick timer (24-bit down counter) 2 x 16-bit basic timers to drive the DAC
Communication Interface	USB 2.0 full-speed interface SDIO interface CAN interface (2.0B Active)

Steering & Driving System

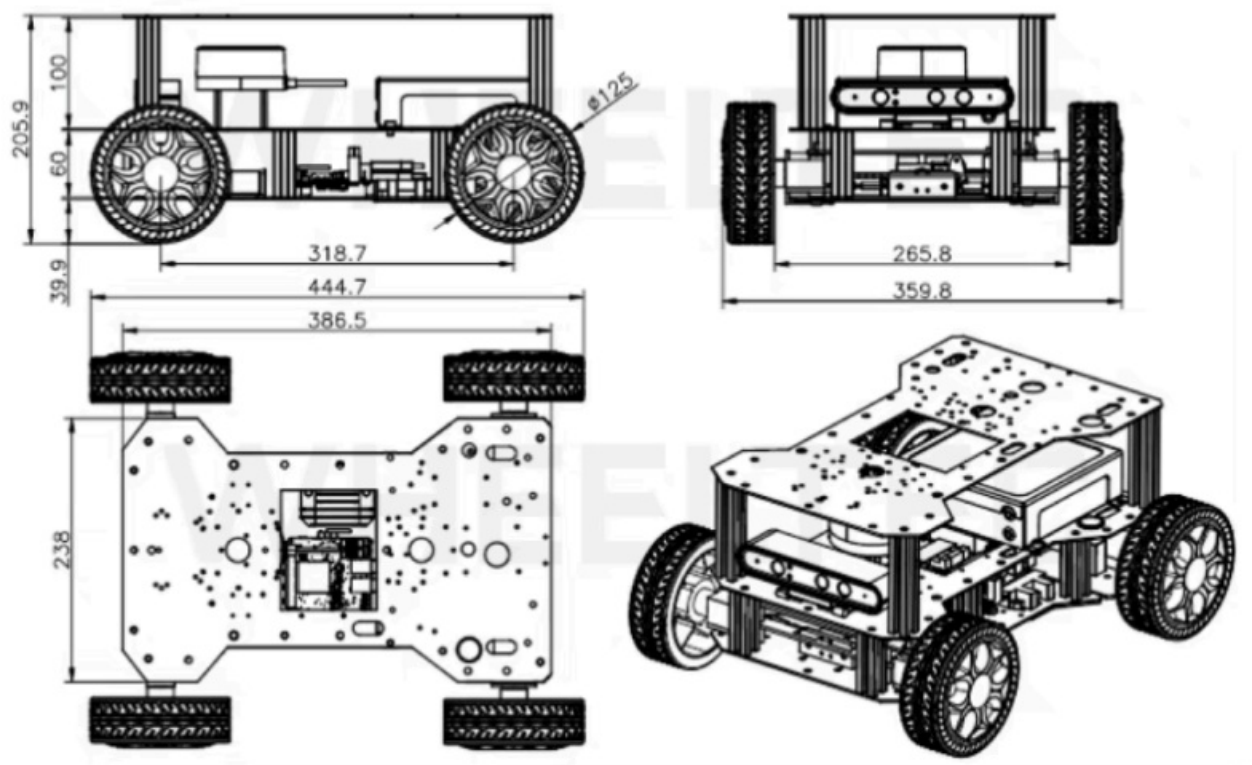
The Steering and Driving system is integrated with the design and build of the Robot. Depending on the model purchased it will be either a 2-wheel or 4-wheel drive, with both options being suitable for a variety of research and development purposes. The wheels on all Robots are solid rubber with snow-protection grade tires. There is a coaxial pendulum suspension system, and the range Robots are equipped with shock absorbers with independent suspension systems, ensuring they can successfully navigate difficult terrain.

Steering and Driving Technical Specifications:

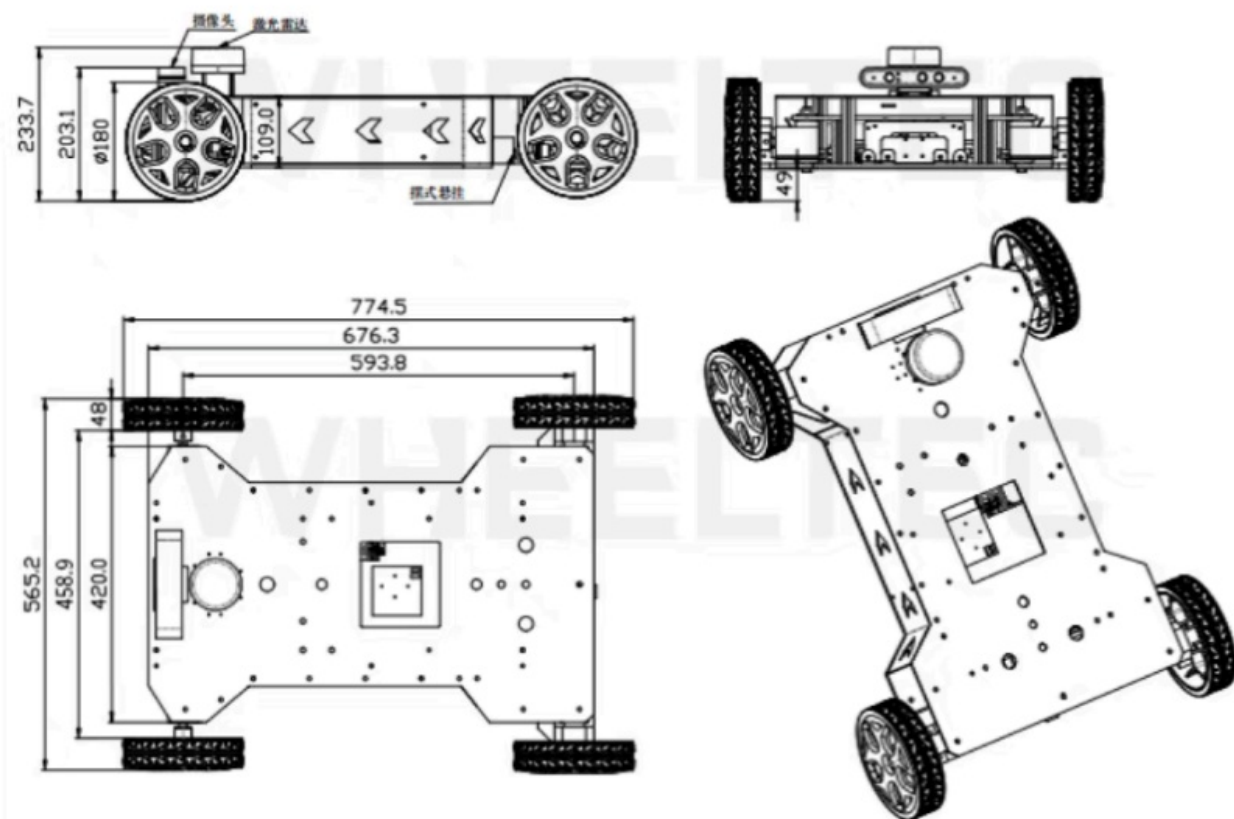
Steering and Driving Aspect	Features
Wheels	4 x 125mm diameter solid rubber wheels Snow protection grade tires
Motors	1 x HWZ020 20kg Torque Digital Servo 2 x MD36N 35W DC Brush Motors
Brackets	2 x Simple L-shaped Motor brackets
Chassis Material	Aluminium Alloy plates
Encoder	2 x 500 Line AB phase Photoelectric Encoders
Linear guide	1 x Mini linear guide
Suspension System	1 x Coaxial pendulum suspension system

Robot Chassis Design Diagram:

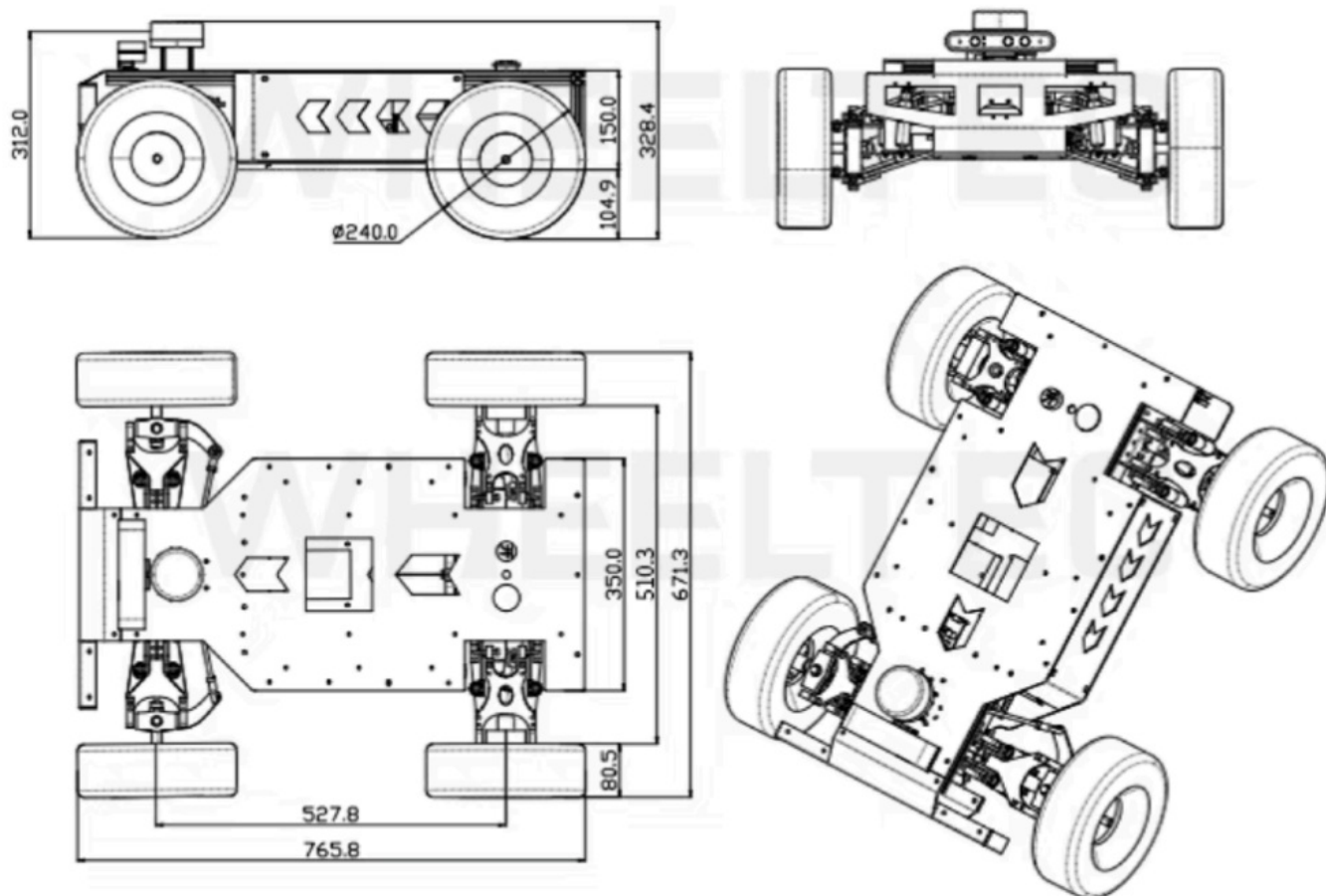
Robot 2



Robot Pro



Robot Plus



Power Management

Power Mag – Magnetic LFP Battery:

All Rosbots come with a 6000 mAh Power Mag, a magnetic LFP (Lithium Iron Phosphate) battery, and a Power Charger. Customers can upgrade the battery to 20000 mAh at an additional cost. LFP batteries are a type of lithium-ion battery known for their stability, safety, and long cycle life. Unlike traditional lithium-ion batteries, which use cobalt or nickel, LFP batteries rely on iron phosphate, offering a more sustainable and less toxic alternative. They are highly resistant to thermal runaway, reducing the risk of overheating and fire. While they have a lower energy density compared to other lithium-ion batteries, LFP batteries excel in durability, with longer lifespan, faster charging, and better performance in extreme temperatures, making them ideal for electric vehicles (EVs) and energy storage systems. Power Mag can be attached to any metal surface of a robot due to its magnetic base design. It makes swapping batteries quick and easy.

Technical Specifications:

Model	6000 mAh	20000 mAh
Battery Pack	22.4V 6000mAh	22.4V 20000mAh
Core Material	Lithium Iron Phosphate	Lithium Iron Phosphate
Cutoff Voltage	16.5 V	16.5 V
Full Voltage	25.55 V	25.55 V
Charging Current	3A	3A
Shell Material	Metal	Metal
Discharge Performance	15A Continuous Discharge	20A Continuous Discharge
Plug	DC4017MM female connector (charging) XT60U-F female connector (discharging)	DC4017MM female connector (charging) XT60U-F female connector (discharging)
Size	177*146*42mm	208*154*97mm
Weight	1.72kg	4.1kg

Battery Protection

Short circuit, overcurrent, overcharge, over-discharge protection, support charging while using, built-in safety

valve, flame retardant board.

Auto Charging Station (Power+):

Auto Charging Station is bundled with the Rosbot 2+ model and can be purchased separately to work with Rosbot 2, Rosbot Pro, and Rosbot Plus.

ROS 2 Quick Start

When the robot is first powered on, it is controlled by ROS by default. Meaning, the STM32 chassis controller board accepts commands from the ROS 2 Controller – The Jetson Orin. Initial setup is quick and easy, from your host PC (Ubuntu Linux recommended) connect to the robot's Wi-Fi hotspot. The password by default is "Dongguan". Next, connect to the robot using SSH via the Linux terminal. The IP address is 192.168.0.10 and 0, and the default password is Dongguan.

```
passoni@passoni:~$ ssh wheeltec@192.168.0.100
```

With terminal access to the robot, you can navigate to the ROS 2 workspace folder, under "wheeltec_ROS 2". Before running test programs, navigate to wheeltec_ROS 2/turn_on_wheeltec_robot/ and locate wheeltec_udev.sh – This script must be run, typically only once to ensure proper configuration of peripherals. You are now able to test the robot's functionality, to launch the ROS 2 controller functionality, run: "relaunch turn_on_wheeltec_robot turn_on_wheeltec_robot.launch"

```
wheeltec@wheeltec:~$ roslaunch turn_on_wheeltec_robot turn_on_wheeltec_robot.launch
```

In a second terminal, you can use the keyboard_teleop node to validate chassis control, this is a modified version of the popular ROS 2 Turtlebot example. Type: "relaunch wheeltec_robot_rc keyboard_teleop.launch"

```
wheeltec@wheeltec:~$ roslaunch wheeltec_robot_rc keyboard_teleop.launch
```

```
Control Your Turtlebot!
-----
Moving around:
  u      i      o
  j      k      l
  m      ,      .

q/z : increase/decrease max speeds by 10%
w/x : increase/decrease only linear speed by 10%
e/c : increase/decrease only angular speed by 10%
space key, k : force stop
anything else : stop smoothly

CTRL-C to quit

currently:      speed 0.2      turn 1
```

Pre-installed ROS 2 Humble Packages

Below are the following user-oriented packages, whilst other packages may be present, these are dependencies only.

- **turn_on_wheeltec_robot**

This package is crucial for enabling robot functionality and communication with the chassis controller. The primary script “turn_on_wheeltec_robot.launch” must be used upon each boot to configure ROS 2 and the controller.

- **wheeltec_rviz2**

Contains launch files to launch viz with custom configuration for Pickerbot Pro.

- **wheeltec_robot_slam**

SLAM Mapping and localization package with a custom configuration for Pickerbot Pro.

- **wheeltec_robot_rrt2**

Rapidly exploring random tree algorithm – This package enables Pickerbot Pro to plan a path to its desired location, by launching exploration nodes.

- **wheeltec_robot_keyboard**

Convenient package for validating robot functionality and controlling using the keyboard, including from remote host PC.

- **wheeltec_robot_nav2**

ROS 2 Navigation 2 node package.

- **wheeltec_lidar_ros2**

ROS 2 Lidar package for configuring Leishen M10/N10.

- **wheeltec_joy**

The joystick control package contains launch files for Joystick nodes.

- **simple_follower_ros2**

Basic object and line following algorithms using either laser scan or depth camera.

- **ros2_astra_camera**

Astra depth camera package with drivers and launch files.

Summary

Robot is designed for ROS (Robot Operating System) developers, educators, and students. The heart of Rosbot is the fully programmable software framework and configurable hardware architecture based on the most popular robotic platform – ROS.


The robot comes in three categories:

- **Robot 2** – Suitable for ROS beginners and low-budget projects.
- **Robot Pro** – Suitable for ROS developers and educators who need a versatile system for rapid prototyping or teaching.
- **Rosbot Plus** – This is the 4WD version of Rosbot with Independent Suspension Systems. This category is serious enough to be considered for industrial and commercial development. The robot comes with popular ROS controllers such as:
 - Jetson Orin Nano
 - Jetson Orin NX

Prepared by: Wayne Liu, Reilly Smithers & Tara Hercz 30 September 2024

Version #: 20240930

Documents / Resources

 <p>Robot User Manual</p>	<p>ROBOWORKS N10 Robot Educational Programable Mobile Robot [pdf] User Manual</p> <p>N10 Robot Educational Programable Mobile Robot, N10, Robot Educational Programable Mobile Robot, Educational Programable Mobile Robot, Programable Mobile Robot, Mobile Robot, Robot</p>
--	--

References

- [User Manual](#)

Manuals+, Privacy Policy

This website is an independent publication and is neither affiliated with nor endorsed by any of the trademark owners. The "Bluetooth®" word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. The "Wi-Fi®" word mark and logos are registered trademarks owned by the Wi-Fi Alliance. Any use of these marks on this website does not imply any affiliation with or endorsement.