Roboworks Product Guide

Tech Support: www.roboworks.net/support

Training Center: www.roboworks.net/training

App Download: www.roboworks.net/apps

SCAN ME

TABLE OF CONTENTS

1. Product Categories

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

There are four product categories at the moment:

Rosbot- Suitable for outdoor applications.
Mecabot - Suitable for indoor applications.
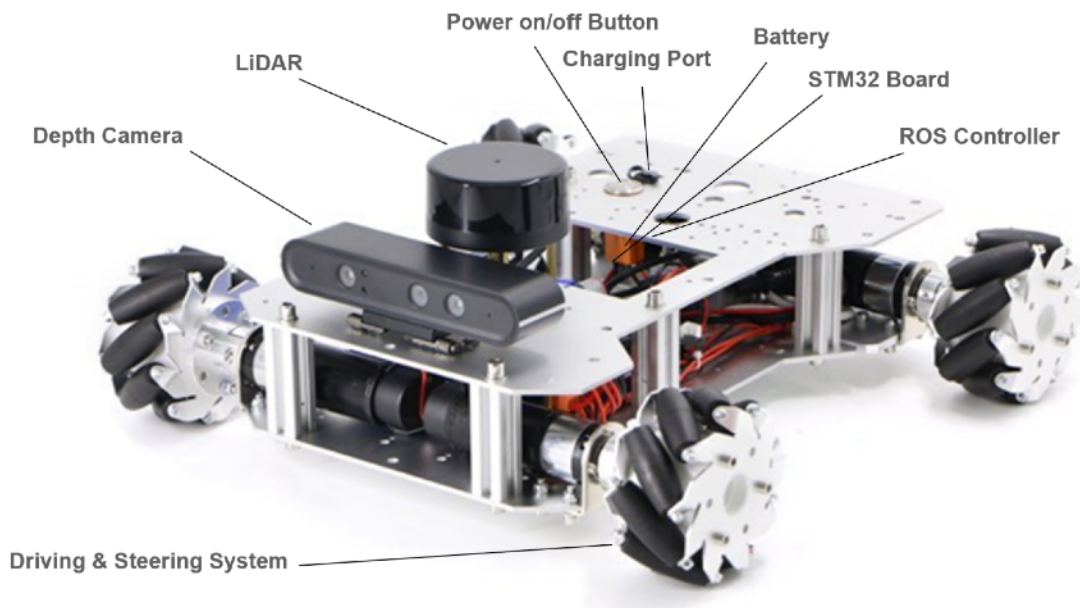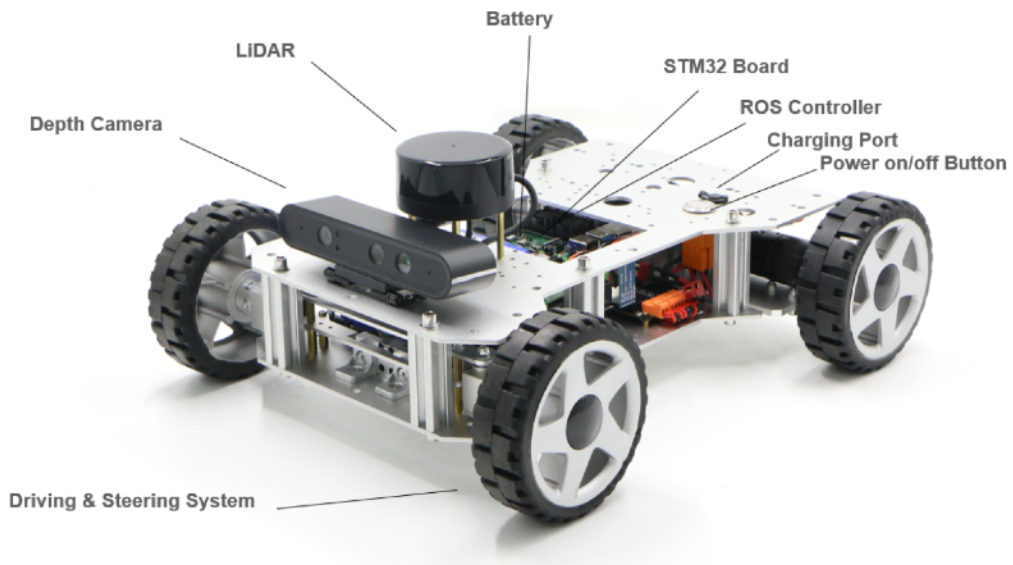**Pickerbot** - Suitable for pick-and-drop applications.
Robofleet - Suitable for swarm robotic applications.

Our products come with the following popular ROS controllers:

- Jetson Nano
- Jetson TX1
- Xavier NX

2. Key Components

The following images illustrate the key hardware components typically included in all of our products across all product categories.

3. Product Specifications

Rosbot Family			
Product Name	Rosbot Mini	Rosbot Pro	Rosbot 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	10kg	35kg	22kg
Size	445*358*125mm	774*570*227mm	766*671*319mm
Minimal Turning Radius	0.77m	1.02m	1.29m
Battery Life	About 8 hours (no load), About 7 hours (fully load)	About 4 hours (no load), About 2.5 hours (fully load)	
Power Supply	22.2v 5000mah battery + 2A current smart charger		
Steering Gear	HWZ020 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		

Mecabot Family				
Product Name	Mecabot	Mecabot Pro	Mecabot Plus	Mecabot X
Independent Suspension	No	Yes	Yes	Yes
Dimension	407x410.5x153 mm	541x225.5x581 mm	636x554x248 mm	60x581x203 mm
Weight	6.1kg	10.8kg	19kg	20.5kg
Payload	15kg	20kg	60kg	60kg
Wheel Size (Diameter)	100mm	152mm		
Max Speed	1.2m/s	1.83m/s	1.39m/s	
Power Supply	22.2V, 5000 mAh battery, 2A charger			
Battery Life	6.5 hours without loading 5.5 hours with 3kg loading		3.5 hours without loading 2.8 hours with 3kg loading	
Motor and Reduction Ratio	MD36N 35W DC Brushed Motor 1:27 Reduction Ratio		MD60 100W DC Brushed Motor 1:18 Reduction Ratio	
Encoder	500-line giant magnetoresistance effect AB phase high-precision encoder			
I/O Interface	CAN, Serial Ports, USB, HDMI			
Remote Control	iOS/Android Apps (default) PS2, Model Aircraft Remote Control (optional and payable)			

Pickerbot Family	Pickerbot Pro	Pickerbot Mini
Product Name	Pickerbot Pro	Pickerbot Mini
Chassis Specs		
Chassis	Mecabot Plus	Mecabot Mini
Chassis Dimension	541x225.5x581mm	407x410.5x153mm
Chassis Weight	10.8kg	6.1kg
Chassis Camera	Orbbec Astra Depth Camera	
Chassis Payload	20kg	15kg
Independent Suspension	Yes	No
Wheel Size (Diameter)	152mm	100mm
Driving System	Mecanum (Omindirectional)	
Power Supply	22.2v, 5000 mAh battery, 2A charger	
Max Speed	1.83m/s	1.2m/s
Battery Life	5.5 ~ 6.5 hours	
Motor	MD60 100W DC Brushed Motor 1:18 Reduction Ratio	MD36N 35W DC Brushed Motor 1:27 Reduction Ratio
Encoder	500-line giant magnetoresistance effect AB phase high-precision encoder	
I/O Interface	CAN, Serial Ports, USB, HDMI	
Remote Control	Mobile Apps PS2, Radio Remote Control	
Arm Specs		
Arm	Unitree Z1	Wheeltec
Arm Weight	4.05kg	3kg
Arm Reach	700mm	120mm

Pickerbot Family		
Degree of Freedom	6	3
Arm Interface	Ethernet	CAN, Serial, USB, SWD
Arm Payload	2kg	0.5kg
Arm Voltage	24v	
Gripper	Electric Gripper	
Gripper Camera	Intel Realsense	Wheeltec
LiDAR	Leishen M10P	

Robofleet Family		
Product Name	Robofleet x 3	Robofleet x 5
Units	3	5
Independent Suspension	No	
Wheel Size (Diameter)	75mm	
Dimension	270x222x187mm	
Weight	2.9kg	
Payload	6kg	
Max Speed	1.4m/s	

Battery Life (speed 0.45m/s)	6.5 hours (no load), 4 hours (1kg payload)
Motor	MG513 Metal Gear Reduction Motor
Encoder	500 line AB phase high precision encoder
Remote Control	iOS/Android Apps (default) PS2, Model Aircraft Remote Control (optional and payable)

4. Introduction of ROS Controllers

There are 3 types of ROS Controllers available based on Nvidia Jetson platform. Jetson nano is suited more towards research and development. Jetson TX is ideal for product prototyping. Jetson Xavier is used more often in research 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 towards advanced robotic applications such as computer vision, deep learning and motion planning.

	Jetson Nano	Jetson TX1	Xavier Nx
Users	Edu/R&D	R&D/Commercial	R&D/Commercial
CPU	ARM Cortex-A57 64bit@1.43GHz Quad Core	ARM Cortex-A57 MPCore 64bit@1.73GHz Quad Core	6 Core Nvidia Camel ARM v8.2 64bit, 6MB L2 +4MB L3
GPU	128-core Nvidia Maxwell	256-core Nvidia Maxwell	384-core Nvidia Volta
RAM	4GB 64 bit LPDDR4	4GB 64 bit LPDDR4	8GB 128 bit LPDDR4
Storage	64G MicroSD	16G eMMC 5.1 +64G Hard Drive	16G eMMC 5.1 +64G Hard Drive
USB	USB3x4	USB3x1 +MicroUSBx1	USB3.1x4

5. Sensing System: LiDAR & Depth Camera

A Leishen LSLiDAR is installed on all products with either the N10, M10P or C16 (3D LiDAR) model being used. These LiDAR's offer a 360 degree scanning range and surroundings perception and boast a compact and light design. They have a high Signal Noise Ratio and excellent detection performance on high/low reflectivity objects and perform well in strong light conditions. They have a detection range of 30 metres and a scan frequency of 12Hz. This LiDAR integrates seamlessly into the Roboworks products, ensuring all mapping and navigational uses can be easily achieved in your project.

The below table summaries the technical specifications of the LSLiDARs:

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

Orbbec Astra Depth Camera	Specs
Depth Resolution	640x480
RBG 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	0.4~2m
Data Transfer Interface	USB2.0 or above

6. STM32 Board (Motor Control, Power Management & IMU)

The STM32F103RC Board is the micro-controller used in all products. 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 which allow the design of low-power applications. Some of the applications of this micro-controller include: motor drives, application control, robotic application, medical and handheld equipment, PC and gaming peripherals, GPS platforms, industrial applications, alarm system video intercom 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 for RTC and backup registers
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	4x16-bit timers 2 x 16-bit motor control PWM timers (with emergency stop) 2 x watchdog timers (independent and Window) SysTick timer (24-bit downcounter) 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)

7. Steering & Driving System

**7.1 Rosbot Steering & Driving System**

The Steering and Driving system is integrated with the design and build of the Rosbot suitable to a variety of research and development purposes. The wheels on all Rosbots are solid rubber with snow protection grade tires. There is a coaxial pendulum suspension system, and the top range Rosbots are equipped with shock absorbers with independent suspension systems, ensuring it is able to successfully navigate difficult terrain.

Rosbot Chassis Design Diagram:

Unit:mm
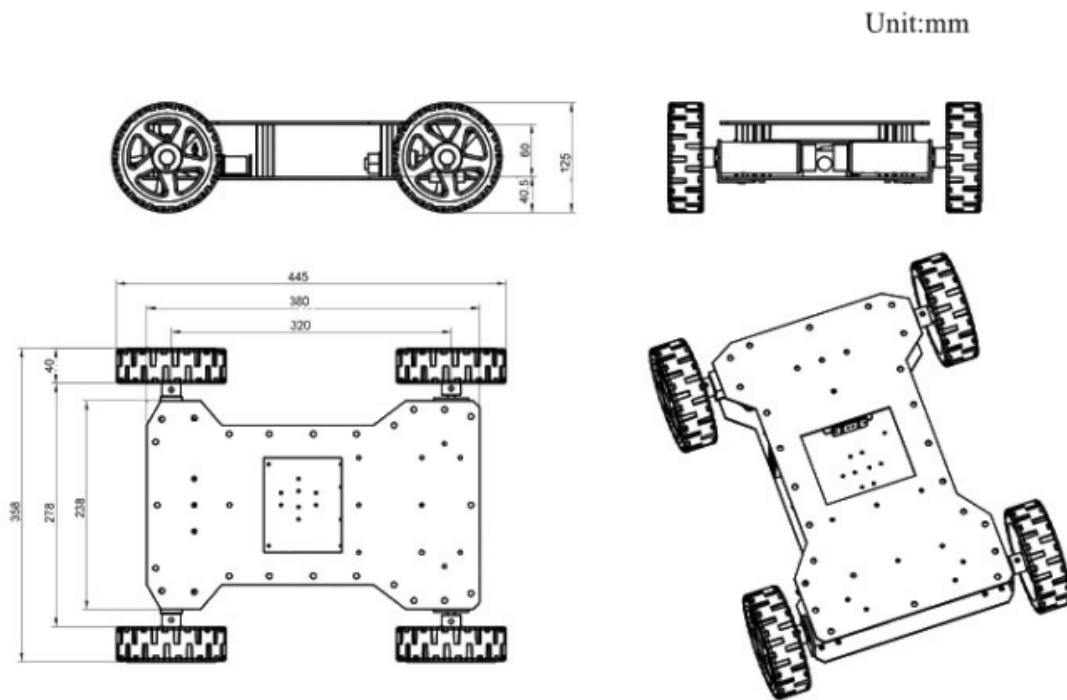
7.2 Mecabot Steering & Driving System

The Steering and Driving system is integrated with the design and build of the Mecabot suitable to a variety of research and development purposes. The wheels on all Mecabots are omnidirectional mecanum wheels with all varieties besides the standard Mecabot inclusive of an independent suspension system. The Mecabot family of robots are ideal for a wide variety of research and commercial applications making it the perfect robot for your next project. Please note Pickerbot and Robofleet product families have the same steering & driving system as the Mecabot.
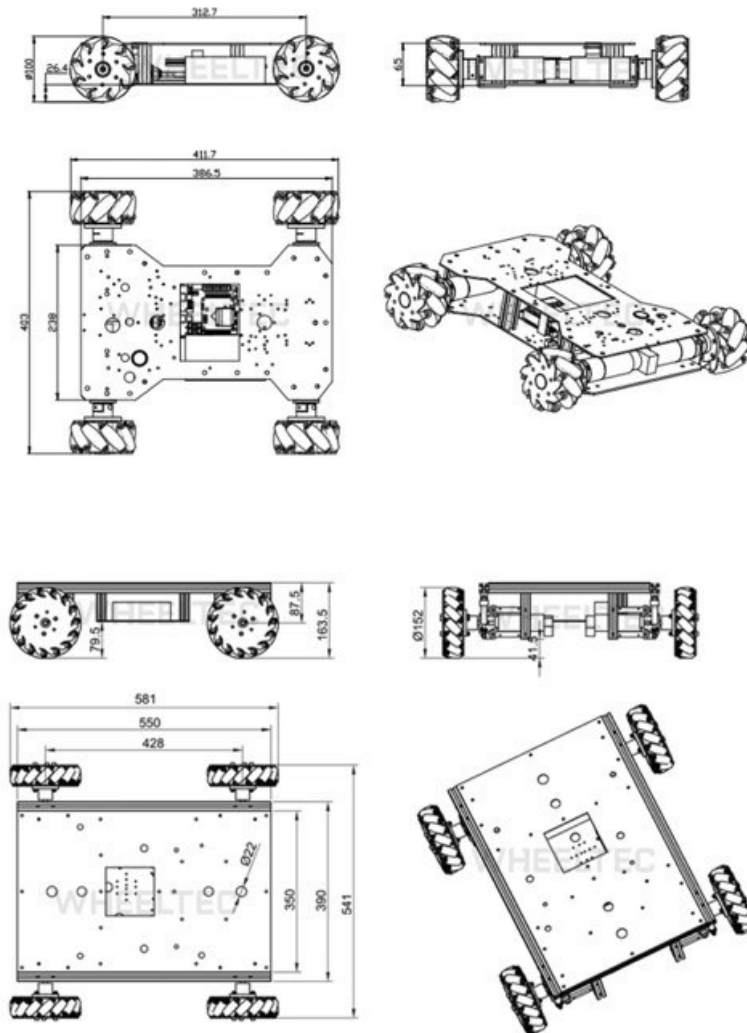
8. Battery Technical Specifications

All products come with a 5000 mAh battery and a Power Charger. Customers can upgrade the battery to 10,000 mAh or 20,000 mAh with additional cost. The 20,000 mAh battery is too large to house within the enclosure of any products. It can only be installed on the top of the chassis.

Battery parameter	Features		
	5000mAh	**10000mAh**	**20000mAh**
Battery Voltage	22.2V	22.2V	22.2V
Size	124*71*42mm	124*71*71mm	156*122*71mm
Power Charger	DC 5.5 Charging plug T-shaped discharge plug	DC 5.5 Charging plug T-shaped discharge plug	DC 5.5 Charging plug T-shaped discharge plug
Performance	15A continuous discharge	30A continuous discharge	60A continuous discharge
Weight	0.66kg	1.25kg	2.4kg