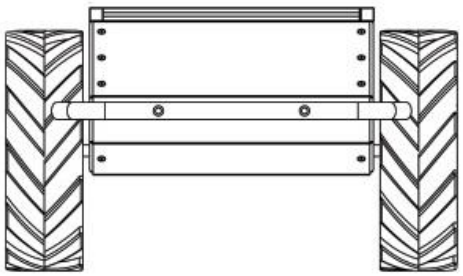
NMR145 Customized Mobile Manipulator Robotic System

NMR145 Customized Mobile Manipulator Robotic System Consists of the following:

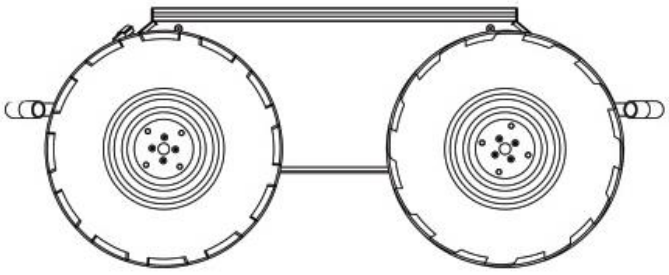
1. Mobile Robot.
2. 7DOF Robotic Arm with 2 Finger Gripper.

And Integration of the robotic arm and other components as described below on to the Mobile Robot.

This datasheet described features of the customized robotic system below.



FRONT



SIDE

NUGENIX

1. Mobile Robot. Specifications in Table below

1.1	**SIZE AND WEIGHT**	
1.1.1	EXTERNAL DIMENSIONS (L x W x H)	**990x670x390 (39x26.4x14.6in)**
1.1.2	INTERNAL DIMENSIONS	296 x 411 x 155 mm (11.7 x 16.2 x 6.1 in)
1.1.3	WEIGHT	50kgs (110lb)
1.1.4	WHEELS	330 mm (13 in) Lug Tread
1.1.5	GROUND CLEARANCE	130 mm
1.2	**SPEED AND PERFORMANCE**	
1.2.1	MAX. PAYLOAD	75 Kg (165 lb)
1.2.2	ALL-TERRAIN PAYLOAD	20 Kg (44 lb)
1.2.3	MAX SPEED	1.0 m/s (2.3 mph)
1.2.4	DRIVETRAIN / DRIVE POWER	4x4 Zero-Maintenance
1.2.5	MAX CLIMB GRADE	45° (100% Slope)
1.2.6	MAX TRAVERSAL GRADE	30° (58% Slope)
1.3	**BATTERY AND POWER SYSTEM**	
1.3.1	BATTERY CHEMISTRY	Sealed Lead Acid
1.3.2	CAPACITY	24 V, 20 Ah
1.3.3	RUNTIME – STANDBY	8 Hours
1.3.4	RUNTIME - NOMINAL USAGE	3 Hours
1.3.5	CHARGE TIME	4 Hours
1.3.6	USER POWER	5 V, 12 V, 24 V Fused at 5 A each. 192 W total available power (upgrade to 480 W optional)
1.4	**INTERFACING AND COMMUNICATION**	
1.4.1	CONTROL MODES	Direct voltage, wheel speed, and kinematic velocity.
1.4.2	FEEDBACK	Battery voltage, motor currents, wheelodometry, and control system output.
1.4.3	COMMUNICATION	RS232 @ 115200 baud
1.4.4	ENCODERS	Quadrature: 78,000 pulses/m
1.4.5	DRIVERS AND APIs	ROS Kinetic, C++, and Python.

1.5	**ENVIRONMENTAL**	
1.5.1	OPERATING AMBIENT TEMPERATURE	-10 to 40 °C (14 to 104 °F) Not in direct sunlight
1.5.2	STORAGE TEMPERATURE	-40 to 60 °C (-40 to 140 °F)
1.5.3	RATING	IP 44 (upgrade to IP 55 available)
1.6	**MOBILE ROBOT SPECS**	
1.6.1	Track	555 mm
1.6.2	Wheelbase	512 mm
1.**6.3**	Battery charger	Short-circuit, over-current, over-voltage and reverse voltage protection
1.6.4	Internal Sensing	Battery Status Wheel Odometry Motor currents
1.6.5	Torque force of eachwheel at ground Metric	Fw = Tw/Rw 11.35 N/m / 0.1775 m = 16 N
1.7	**ALUMINUM TOP PLATE INTEGRATION FEATURES**	
1.7.1	Intake & exhaust fan with dust filter for cooling internal electronics	
1.7.2	2 water proof USB 3.0 Ports	
1.7.3	2 water proof Gigabit Ethernet Ports	
1.7.4	PS4 Controller for Tele-Op	
1.7.5	Vertical Aluminum Extrusion Structure for sensor or Antenna	
1.7.6	3 waterproof PG13.5 wire Glands with dummy	
1.7.7	3 waterproof PG11 Wire Glands with dummy	
1.7.8	DIN rail for mounting components	
1.7.9	5 Port gigabit Ethernet Switch	
1.7.10	7 Port USB 3.0 HUB	
1.8	**COMPUTER TO BE INTEGRATED ON THE ROBOT SHOULD HAVE FOLLOWING SPECS:**	
1.8.1	CPU Specification	Intel i5 processors Total core 6 Total Thread 12 Minimum frequency 2.6 GHz Maximum up to 4.4 Ghz RAM 16GB SSD 250GB GPU GTX 1650 Wireless Cards

		Wi-Fi + Bluetooth OPERATING SYSTEM: UBUNTU 20.04 ROS NOETIC JOYSTICK PD4 Dual Shock Controller
1.8.2	Software Control of Robotic Arm	Software and ROS code should be provided inthis computer to control Robotic arm.
1.9	**SYSTEM INTEGRATION REQUIREMENTS**	
1.9.1	System Integration of Top Plate and Electronic Components as required to integrate the robotic arm, controller etc. to the Mobile Robot	
1.9.2	Installation of Ubuntu, ROS Packages to the computer	
1.9.3	Network Configuration and Robot ROS services should be installed.	
1.9.4	Installation of VNC based Desktop Streaming to remote PC.	
10	**COMPATIBILITY AND ADAPTABILITY WITH OTHER ROBOTS**	
1.10.1	The robot will be provided with the necessary adaptation to becompatible with 7DOF Robotic Arm with 2 Finger Gripper described below. The software and hardware integration will be provided for the same.	

2.1:- 7DOF Robotic Arm with Gripper with specs as below:

2.1.1	Degrees of Freedom	7DOF
2.1.2	Payload	(Full-range continuous without gripper) 2.0 kg
		(mid-range continuous without gripper) 4.0 kg
2.1.3	Total weight	8.2 kg
2.1.4	Maximum reach	902 mm
2.1.5	Maximum Cartesian translation speed	50 cm/s
2.1.6	Actuator joint range after start-up (software limitation)	Infinite
2.1.7	Power supply voltage	18 to 30 VDC, 24 VDC nominal
2.1.8	Average power	36 W
2.1.9	Ingress protection	IP33
2.1.10	Operating temperature	-30 °C to 35 °C
2.1.11	Sensors	- Torque, position, current, voltage,

		temperature, accelerometer and gyroscope
INTERFACES		
2.1.12	Internal communications	2 x 100 Mbps Ethernet
2.1.13	API compatibility	WindowS 10, Linux Ubuntu 18.04, ROS Melodic
2.1.14	Programming languages	C++, Python and MATLAB
2.1.15	Base interfaces	USB, Ethernet, HD MI, Wi-Fi, Digital I/O
2.1.16	End effector interfaces	RS-485, Ethernet, GPIO, PC, UART, 24 V supply @1 A
2.1.17	Control system frequency	1kHz
2.1.18	Low-level control	Position, Velocity, Current, Torque
2.1.19	High-level control	Cartesian position/velocity, joint position/velocity, force, torque
2.1.20	Color sensor	Cartesian position/velocity, joint position/velocity, force, torque, Focusing range: 30 cm to infinity
2.1.21	Depth sensor (Intel® RealSense™)	Resolution, frame rates (fps), field of view (FOV): up to 480 x 270 (16:9) @ up to 30 fps; FOV 72 +/- 3° (diagonal), Minimum depth distance (min-Z): 18cm

2.2 :- 2Finger Gripper

	SPECIFICATIONS	
2.2.1	Stroke (adjustable)	85 mm
2.2.2	Grip force (adjustable)	20 to 235 N
2.2.3	Form-fit grip payload	5 kg
2.2.4	Friction grip payload	5 kg
2.2.5	Gripper mass	0.9 kg
2.2.6	Position resolution (fingertip)	0.4 mm
2.2.7	Closing speed (adjustable)	20 to 150 mm/s
2.2.8	Communication protocol	Modbus RTU (RS-485)
2.2.9	Ingress protection (IP) rating	IP40