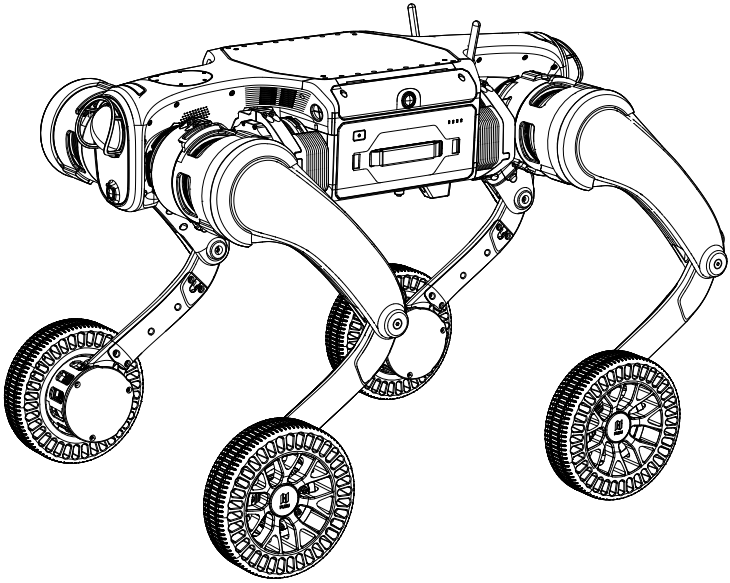
PUDU D5-W

Quadruped Robot User Manual

Applicable Model: D5MM11



PUDU

Contents

1 Safety Instructions 2
2 Product Overview 3
2.1 Overview 3
2.2 How It Works 3
2.3 Key Features 4
3 Robot Specifications 5
3.1 Robot Dimensions 5
3.2 Components 5
3.3 Mounting Surface Specifications 5
3.4 Detailed Specifications 6
3.5 Remote Control Specifications 7
3.6 Electrical Interfaces 8
4 Instructions for Use 10
4.1 Environmental Requirements 10
4.2 Unboxing and Power-On Preparation 10
4.3 Pre-Power-On Check 11
4.4 Starting Up the PUDU D5-W 11
4.5 Powering On and Operating the Remote Control 12
4.6 Shutting Down the PUDU D5-W 13
4.7 Troubleshooting 14
4.8 How to Charge 15
5 Notes 16
6 Routine Maintenance and Care 17
6.1 Cleaning 17
6.2 Storage 17
6.3 Maintenance 18
7 Revision History 20

1 Safety Instructions

The PUDU D5-W is a quadruped robot built for industrial applications. With multi-dimensional precise perception, all-terrain adaptability, multi-scenario operation, and flexible expandability, it delivers efficient and intelligent robotics solutions for users.

1. This product is not a toy and is not intended for use by anyone under 18. Please keep it out of children's reach, and if operating it around children, stay extra alert and exercise caution.
2. Users are responsible for knowing and complying with all applicable local laws and regulations where the product is used.
3. This manual is designed to help first-time users learn the basics of operating the robot with the remote control, so they can get the most out of its movement capabilities. Experienced users are also encouraged to consult it as a reference for key operating points and actions best avoided.
4. Remote control commands remain active even while running your own custom programs in Developer Mode. If high-level API commands and remote controller commands are sent simultaneously, the robot may execute both types of commands at the same time and become unstable. Please judge carefully whether remote control input is needed based on the robot's current operating state.
5. Always keep the robot within sight and maintain a safe distance during operation. Never touch the robot while it's powered on!
6. Keep a safe distance from the PUDU D5-W when powering it on!
7. Before sending complex remote control commands, make sure there are no obstacles and especially no people within a 2-meter-radius semicircle in front of the robot. PUDU accepts no liability for any injuries or property damages resulting from improper operation!
8. Motion control switching: Before switching motion control modes, make sure the robot is lying down and that no one is within a 1-meter radius. PUDU accepts no liability for any injuries or property damages resulting from improper operation!
9. Standing up safely: The robot needs enough clearance to turn over when standing back up. Make sure there are no people or objects within a 2-meter radius to prevent injury or property damage. PUDU accepts no liability for losses resulting from failure to operate as required.
10. When the battery is low, stop operation promptly, power off the robot, and remove the battery for charging. This prevents damage from the robot losing power and falling over.

2 Product Overview

2.1 Overview

Developed by Shenzhen Pudu Technology Co., Ltd., the PUDU D5-W quadruped robot is a high-performance intelligent quadruped robot. Its biomimetic design combines the agility of leg-based locomotion with the efficiency of wheeled movement, letting it adapt to complex terrain with flexible gaits while also gliding quickly and smoothly across flat surfaces for greater mobility. The robot handles challenging environments with ease, including gravel, steep slopes, and stairs.

2.2 How It Works

The quadruped robot's biomimetic motion mechanism, combined with a high-performance computing platform and multi-sensor fusion technology, enables autonomous navigation and intelligent control. Here's how it works:

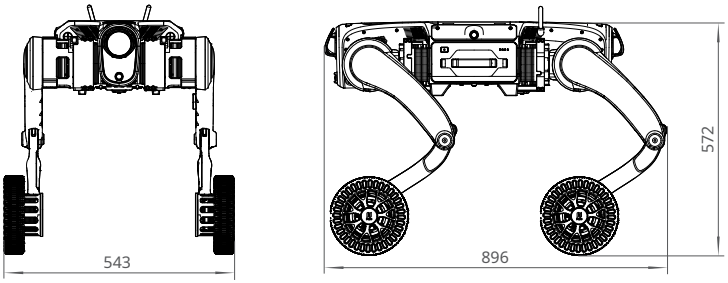
- Perception and modeling: Front and rear LiDAR, cameras, depth sensors, and an IMU gather environmental data, allowing the robot to build maps and pinpoint its own location in real time as it moves.
- Path planning: The robot combines map data with task objectives to plot a safe route, then dynamically adjusts course using obstacle-avoidance algorithms to keep moving safely.
- Motion control: Control algorithms drive stable walking, climbing, and continuous stair navigation.

2.3 Key Features

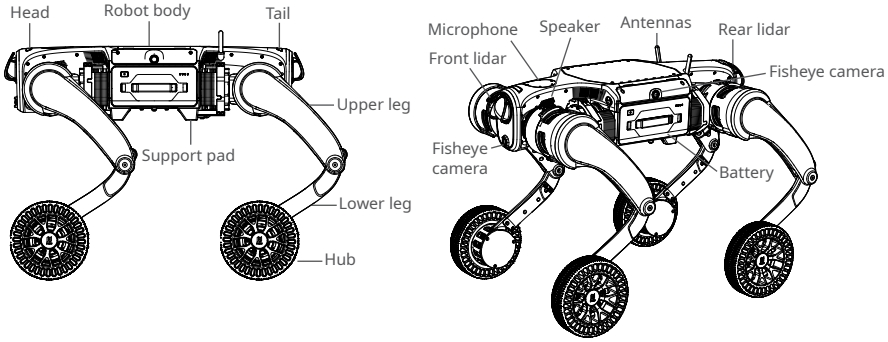
- Remote-controlled mapping: Drive the robot through a 3D environment with the remote control while its 3D radar scans the surroundings and builds a map.
- Autonomous navigation: Using 3D radar and vision sensors for self-localization, the robot navigates 3D environments on its own with proprietary algorithms.
- Remote control operation: Control the quadruped robot remotely with the dedicated remote control and view its live camera feed right on the controller's screen.
- Open platform: The PUDU D5-W comes standard with a high-performance NVIDIA development board delivering up to 275 TOPS of computing power, plus a range of expansion interfaces including RS485, CAN, Gigabit Ethernet, USB, and 12V/24V/42–58.4V power supply to support development across a variety of industries.

3 Robot Specifications

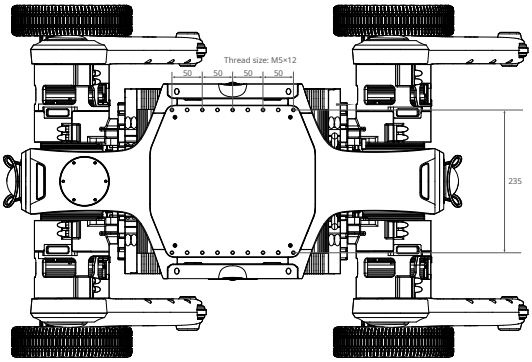
3.1 Robot Dimensions



3.2 Components



3.3 Mounting Surface Specifications



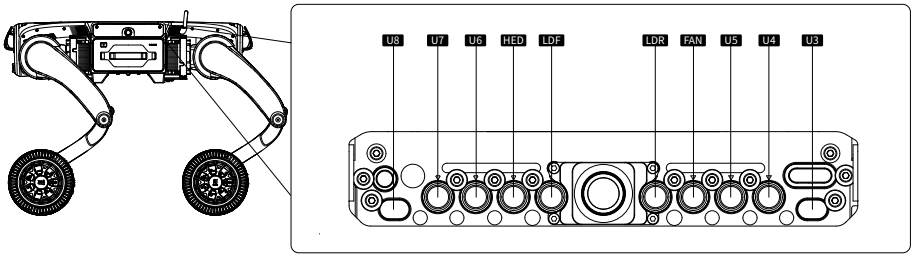
3.4 Detailed Specifications

Parameter	Specifications
Standing dimensions	896 mm (L) x 543 mm (W) x 572 mm (H)
Weight (with battery)	56.5 kg
Control and perception computing	Nvidia Jetson Orin AGX 64G+RK3588
Computing power	275 TOPS (standard)
Memory/storage	ORIN: 64GB LPDDR5+64GB EMMC5.1+256GB SSD; 3588: 8GB LPDDR4X+64GB EMMC5.1
Sensors	3D LiDAR × 2 + Fisheye camera × 4
Microphone	Yes
Speaker	Yes
Maximum joint torque	>165N·m
Battery capacity	1000WH
Battery life (unloaded)	3H
Battery life (loaded)	2H
Continuous walking load	30 kg
Standing load	100 kg
Continuous stair-climbing height	25 cm
Obstacle-climbing height	80 cm
Maximum slope incline	45°
Movement speed	0-1.5 m/s (5 m/s at max)
Operating temperature	-20°C to 55°C
Cold start threshold	Below -10°C
IP rating	IP67
Maximum mapping area	100,000 m^2 per map; supports map merging
Operating system	Ubuntu22.04+Android 11
Custom development	Supported
Warranty period	1 year
Network	4G
GPS	Yes
WIFI	WIFI 6
Bluetooth	Bluetooth 5.2
External interfaces	See electrical interfaces below

3.5 Remote Control Specifications

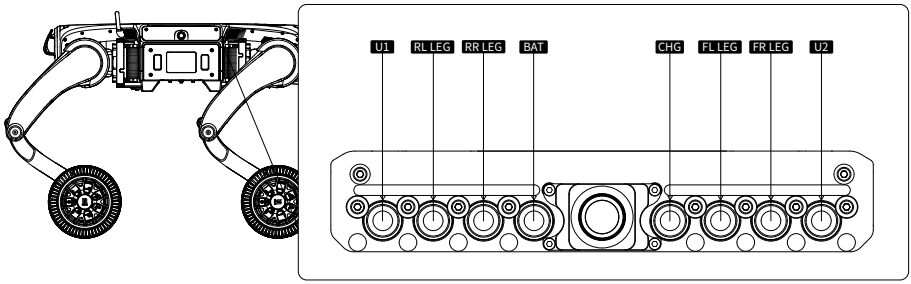
Overall Performance	
Parameter	**Description**
Maximum communication distance	2 km (2.8G/5.4G)
Data channels	MAVLINK + SBUS + Network LAN passthrough
Compatible ground stations (video feed)	QGroundControl and others
Remote Control Parameters	
Parameter	**Description**
Screen	5.5" 1080p high-brightness LCD touchscreen
System	Android 11.0 / Android 13.0
Storage	4GB RAM + 64GB ROM (P4Q-MINI) 4GB RAM + 32GB ROM (K4R-MINI) microSD expandable
Battery	8000 mAh 7.4V 2S lithium battery
Fast charging	PD 30W
Charging time	~3 hours (at 30W)
Battery life	~4 hours
Ports	Type-C / TF card slot/ HDMI (1080P output by default)
IP rating	IP53
Dimensions	200×185×230 mm (antennas upright) 200×340×100 mm (antennas extended)
Weight	700 g
Operating temperature	-10°C to 55°C

3.6 Electrical Interfaces



No.	Type	Name	Specification
U8	USB3.0 TYPE-C	ORIN expansion TYPEC	Max 10W
U7	PD30RW-F-3Y(12)	Ethernet - Expansion 3	Gigabit + 12V, max 50W
U6	PD30RW-F-3Y(12)	Ethernet - Expansion 2	Gigabit + 12V, max 50W
HED	PD30RW-F-3Y(12)	Head shell signal interface	USB 2.0 + LED + analog audio
LDF	PD30RW-F-3Y(12)	Ethernet - Radar 2	Gigabit + 12V, max 15W
LDR	PD30RW-F-3Y(12)	Ethernet - Radar 1	Gigabit + 12V, max 15W
FAN	PD30RW-F-3Y(12)	Fan interface	
U5	PD30RW-F-3Y(12)	Ethernet - Expansion	Gigabit + 12V, max 15W
U4	PD30RW-F-3Y(12)	Expansion/ debug port	3588 flashing + 3588 serial + ORIN serial + MCU serial + RS485 expansion
U3	USB3.0 TYPE-C	ORIN flashing TYPEC	Max 10W

3.6 Electrical Interfaces (continued)



No.	Type	Name	Specification
U1	PD30RW-F-2P(4)	24V expansion output	24V, 5A
RL Leg	PD30RW-F-2P(4)	Rear-left leg motor	(42-58.4)V, 10A
RR Leg	PD30RW-F-2P(4)	Rear-right leg motor	(42-58.4)V, 10A
BAT	PD30RW-F-2P(4)	Battery input	(42-58.4)V, 10A
CHG	PD30RW-F-2P(4)	Charging dock interface	(42-58.4)V, 10A
FL Leg	PD30RW-F-2P(4)	Front-left leg motor	(42-58.4)V, 10A
FR Leg	PD30RW-F-2P(4)	Front-right leg motor	(42-58.4)V, 10A
U2	PD30RW-F-2P(4)	48V expansion output	(42-58.4)V, 10A

4 Instructions for Use

4.1 Environmental Requirements

1. Please operate the robot within -20°C to 55°C and in good weather conditions. Do not use it during thunderstorms, tornadoes, or other severe weather. If operating in water, be sure to follow the requirements of the IP67 protection rating.
2. Keep the robot within sight at all times during operation, and maintain a safe distance of at least 2 meters from obstacles, complex terrain, crowds, and bodies of water.
3. Do not operate the robot in areas with significant electromagnetic interference. Sources of interference include, but are not limited to, high-voltage power lines, high-voltage substations, cell towers, or TV broadcast towers.
4. Do not operate the robot where Wi-Fi signals are experiencing interference, which is usually caused by other devices on the same frequency. If you notice interference, turn off some or all other wireless devices and Wi-Fi sources before continuing to operate the robot with the remote control.
5. Since operating skill varies from person to person, it is recommended to use the robot on open, unobstructed, and flat ground. Avoid steps higher than 25cm, slopes steeper than 45°, and other obstacles that could cause the robot to fall. On uneven, sloped, or otherwise complex terrain, slow down and operate carefully to prevent the robot from tripping.
6. Legged robots need suitable walking surfaces. Do not use the robot on extremely low-friction surfaces like ice, or soft surfaces like thick foam padding. On smooth surfaces such as glass or tile, operate the robot gently and steadily, avoid abrupt movements, and reduce walking speed to prevent the feet from slipping and causing a fall.

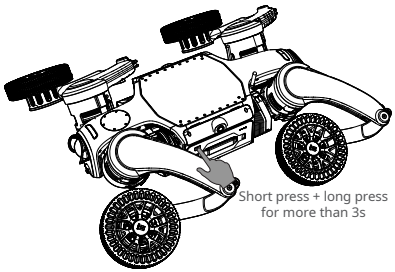
4.2 Unboxing and Power-On Preparation

Place the packaging box on flat ground as indicated (right side up). Open the top of the box and remove in order: the protective foam, the remote control, the power adapter, and the user manual.

4.3 Pre-Power-On Check

1. Please use only genuine PUDU parts and confirm that all components are in good working condition.
2. Make sure the firmware is updated to the latest version.
3. Do not operate the robot while under the influence of alcohol or medication, or if you're unable to focus.
4. Familiarize yourself with the different gait modes and know how to perform an emergency stop if the robot becomes unstable or unresponsive.
5. Check that there's no water, oil, sand, dirt, or other foreign matter inside the robot or its components.
6. Make sure both the remote control and the battery pack have sufficient charge.
7. If using the expansion interfaces, check that all cables are connected properly.

4.4 Starting Up the PUDU D5-W



1. **Powering on while lying down:** Before powering on, place the robot on flat ground. **Make sure the belly support pad is flush with the ground and the body is level with no tilt; the lower legs should be fully tucked in, with all four knees and wheel-feet resting flat on the ground. Also confirm that the upper and lower legs aren't pinned under the body.**

4.4 Starting Up the PUDU D5-W (continued)

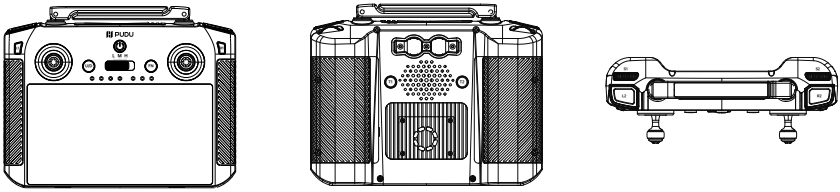
2. Once you've completed the pre-power-on checks and positioned the robot correctly, power it on as follows:
   - Press the power button briefly once, then press and hold it for more than 3 seconds to start the battery. After the battery starts, wait about 2 minutes. Once the status light stays solid and you hear the power-on chime, the robot has started up successfully.

Notes

1. If power-on fails, check that the robot is positioned correctly.
2. The upper or lower legs sticking outward, or lower legs pressed inward, can prevent the PUDU D5-W from powering on.
3. The robot's joints carry a pinch risk. Please handle with care during operation.

4.5 Powering On and Operating the Remote Control

To power on the remote control, press the power button briefly once, then press and hold it for 3 seconds. A beep confirms the remote control has started up. It will then automatically connect to the PUDU D5-W. Once connected, a video feed button will appear on the home screen, confirming the remote control has linked to the video feed module of PUDU D5-W. You can then control the robot using the commands printed on the controller's face.



Please follow the remote control commands shown in the figure above.

4.5 Powering On and Operating the Remote Control (Continued)

Button	Action
Tap U/D	Stand up from lying position
Tap U/D	Lie down from standing position
FN+R1	Emergency stop — motors switch to damping mode (Note: the robot will drop immediately in this state; use only in case of malfunction)
L	Switch forward/backward speed to low
M	Switch forward/backward speed to normal
H	Switch forward/backward speed to high
Left stick up	Move forward
Left stick down	Move backward
Left stick left	Strafe left
Left stick right	Strafe right
Right stick left	Rotate left
Right stick right	Rotate right

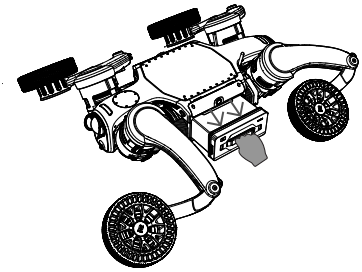
4.6 Shutting Down the PUDU D5-W

Before shutting down, place the robot on flat ground and confirm it's standing still — in its original post-power-on standing position, level, with no joystick input on the remote control.

- Press the D/N button to bring the robot into a lying-down position.
- Once the robot is lying down, press the battery power button briefly once, then press and hold it for more than 3 seconds to complete shutdown.
- Make sure the robot is lying down (or in damping mode) before shutting it off. Otherwise, it may drop to the ground when power cuts out, causing damage to the robot body or creating a safety hazard. If power-on fails afterward, check if the robot is positioned correctly.
- After shutdown, adjust the robot's upper legs, lower legs, and hip joints according to the placement requirements to prepare for the next power-on.

4.6 Shutting Down the PUDU D5-W (Continued)

- If you won't use the PUDU D5-W for an extended period, please remove the battery pack.



Note: The moving joints carry a pinch risk. Please handle with care!

4.7 Troubleshooting

You may occasionally run into operational issues while using the PUDU D5-W. Most have a straightforward fix. If you run into a problem, stay calm, read through the guidance below, and follow the steps provided.

If you still have questions, please contact PUDU's official technical support.

- Power-on self-test failure

  If the robot doesn't stand up within 2 minutes after powered on from a lying position, it means the self-test has failed. Recheck the robot against the "Pre-Power-On Check" and "Power-On Preparation" sections, then try powering on again.

- Fall protection

  When operating the robot with PUDU's official motion control software (via the remote control), if it loses stability and falls due to insufficient ground friction, other environmental factors, or operation error, it will automatically enter a self-protection state, switching its motors to the damping mode to protect its components.

4.7 Troubleshooting (Continued)

- Shutting down the robot If the remote control fails

  If the remote control stops working (for example, its battery runs out) and you can't use it to bring the robot into a lying standby position, you'll need to force a shutdown using the battery power button instead.

  Forced shutdown: First, make sure the robot is at least 2 meters away from obstacles, complex terrain, crowds, and water. Hold the handle on the back of the robot, press the power button briefly once, then press and hold it for more than 3 seconds to power off. Once the robot is powered off, gently place it on the ground.

4.8 How to Charge

It's normal for the battery to be low or fully drained the first time you use the robot, due to self-discharge during shipping and storage. Please charge it as follows.

1. Plug the charger into an AC power source first, then connect it to the battery.
2. Make sure the battery pack is powered off before charging, otherwise the battery and charger may be damaged.
3. Remove the battery pack from the robot before charging it.
4. While charging, the battery's indicator light will blink at 1Hz (once per second) to show the current charge level.
5. Once all indicator lights light up, it indicates the battery pack is fully charged. Disconnect it from the charger to finish.
6. After the robot has been running, the battery pack may be hot. Let it cool to room temperature before charging.

5 Notes

1. Extended standby: If the robot will be idle for a long time, put it in a lying position first, so it doesn't fall over and get damaged if it powers off automatically due to low battery.
2. Caution! When lifting the robot, keep your hands away from the hip joints and other moving joints to avoid getting pinched.
3. Make sure the robot is lying down before powering it off. Otherwise, it may drop to the ground when power cuts out, causing damage to the robot body or creating a safety hazard.
4. While the robot is standing, avoid sudden movements such as pitching, rolling, yawing, or adjusting body height if ground friction is low or the feet aren't securely planted, as this can cause the robot to lose stability and fall.
5. Operate the robot smoothly on flat ground. On low-friction surfaces, avoid abrupt movements to prevent the feet from slipping and the robot losing its balance.
6. Battery life: Overall runtime is roughly 2-3 hours; about 2 hours with a 30kg load, and up to 3 hours walking continuously unloaded. Actual battery life depends on operating conditions: extended high-speed walking, frequent large posture adjustments while standing, standing with bent legs, carrying a load, walking at a lower body height, and moving over uneven or sloped terrain will all reduce runtime. A lower body height or sharper knee bend increases motor load, which raises power consumption and generates more heat.
7. Steps and uneven terrain: Since operator skill varies, we currently don't recommend having the robot climb steps higher than 25cm to avoid the feet getting caught due to improper handling. Use caution and reduce speed when moving over uneven ground.
8. Wheel-feet: The robot's tires are consumable parts and will wear faster on rough terrain. If you notice visible wear or damage, or a noticeably louder impact noise as the robot walks, replace the tires promptly to prevent damage that could lead to abnormal movement or falls.
9. IP67 protection: Before use, make sure the battery interface, battery compartment interface, and the surfaces of both the battery and compartment are completely dry before inserting the battery.
10. Never touch the robot while it's moving! The knees and other moving joints carry a risk of pinching.

6 Routine Maintenance and Care

6.1 Cleaning

After using the PUDU D5-W in harsh conditions such as rain, sand, dust, or wet terrain, clean the robot's exterior promptly. Power it off first, then wipe the body down with a clean soft cloth, making sure to thoroughly clean the camera lenses. Never use metal brushes, sandpaper, or similar tools, as they can scratch surfaces. Once cleaned, dry the body with a soft cloth, and use a fan or air blower to dry off any water on the robot's surface and in the joints and crevices to prevent water spots from forming.

6.2 Storage

The PUDU D5-W should be stored indoors in a dry and cool location, away from direct sunlight and rain, to prevent corrosion and extend its service life. Remove the battery pack before any extended storage period. It is recommended to perform a routine inspection and maintenance check before and after each use to improve reliability, reduce safety risks, and extend service life.

6.3 Maintenance

Structure and wheel-foot component inspection

Inspection item	What to check	Acceptance criteria / Recommended actions
Robot exterior	Check whether the body surface is clean with no damage or deformation	If any damage or deformation is found, repair or replace the affected parts promptly
Camera	Check the camera lenses for any foreign matter	If there are any stains or foreign matter, clean promptly to avoid affecting the image quality
Structural components	Visually inspect and touch-check the body, joints, connection points, and components for integrity	If any cracks or damage are found, replace the affected parts promptly
Fasteners	Check whether the screws on connecting parts are tight, especially at joint connectors and the battery lock knob	If any are loose, tighten or replace them immediately
Cooling fan	Check whether the fan's air inlet and outlet are blocked by foreign objects	Clear any blockages promptly
Wheel-feet	Check tires for visible damage or heavy wear	If tires are damaged or impact noise has increased, replace them promptly
Battery interface	Check the battery interface on the body for foreign objects or deformation	If any foreign object or deformation is found, stop use and have it serviced
Battery installation	Check whether the battery pack is securely seated and won't come loose during operation	If not secure, reinstall and confirm it's properly locked in place
Battery casing	Check the battery pack casing for visible damage	Never use a battery pack with a visibly damaged casing

6.3 Maintenance (Continued)

Remote control inspection

Inspection item	What to check	Acceptance criteria / Recommended actions
Joystick position	Check whether the joystick sits in the neutral position and is free of sand or other foreign objects	If it's off-center or foreign objects are present, clean and reset it
Button response	Check each button for sticking during use	If a button sticks, check for foreign objects or a possible fault
Basic functions	Check that the joystick's basic functions work as expected	If any function is abnormal, stop use and have it serviced
Battery level	Check that the remote control has enough charge	Charge it promptly if the battery level is low
Cooling fan	Check whether the fan runs normally, with no clicking or other unusual noise	If you notice any unusual noise, have it inspected or serviced promptly

Battery pack care and storage

Category	Instructions / Requirement	Recommendations / Restrictions
Charging temperature	Don't charge the battery pack in environments that are too hot or too cold	It is recommended to charge the battery pack indoors at a suitable temperature
Storage temperature	Do not store the battery pack in environments where the room temperature exceeds 40°C	Long-term storage in high heat can damage the battery
Charging practices	Do not overcharge the battery pack as this can cause damage	Please use only the matching charger following the instructions provided
Long-term storage battery level	If not using the robot for an extended period, check the battery level periodically; if it drops below about 30%, charge it to around 70% before continuing storage	This helps prevent damage from over-discharge

It is recommended to complete the checks above before every outdoor use. If you find any damaged accessories that need to be replaced, please contact PUDU after-sales service in time.

7 Revision History

Version	Time	Revision
1.0	07-30-2026	Initial Release