云深处科技 DEEP Robotics

Quadruped Robot
Emergency Firefighting Solution

Pioneering Industrial Application of Quadrupedal Robots

01 Policy Background

“Artificial Intelligence +” Initiative

During the National People's Congress, the concept of “Artificial Intelligence +” was officially included in the government work report for the first time. The initiative calls for the deep integration of big data and artificial intelligence technologies, promoting the “AI+” campaign to build internationally competitive digital industrial clusters.

“Robotics +” Initiative

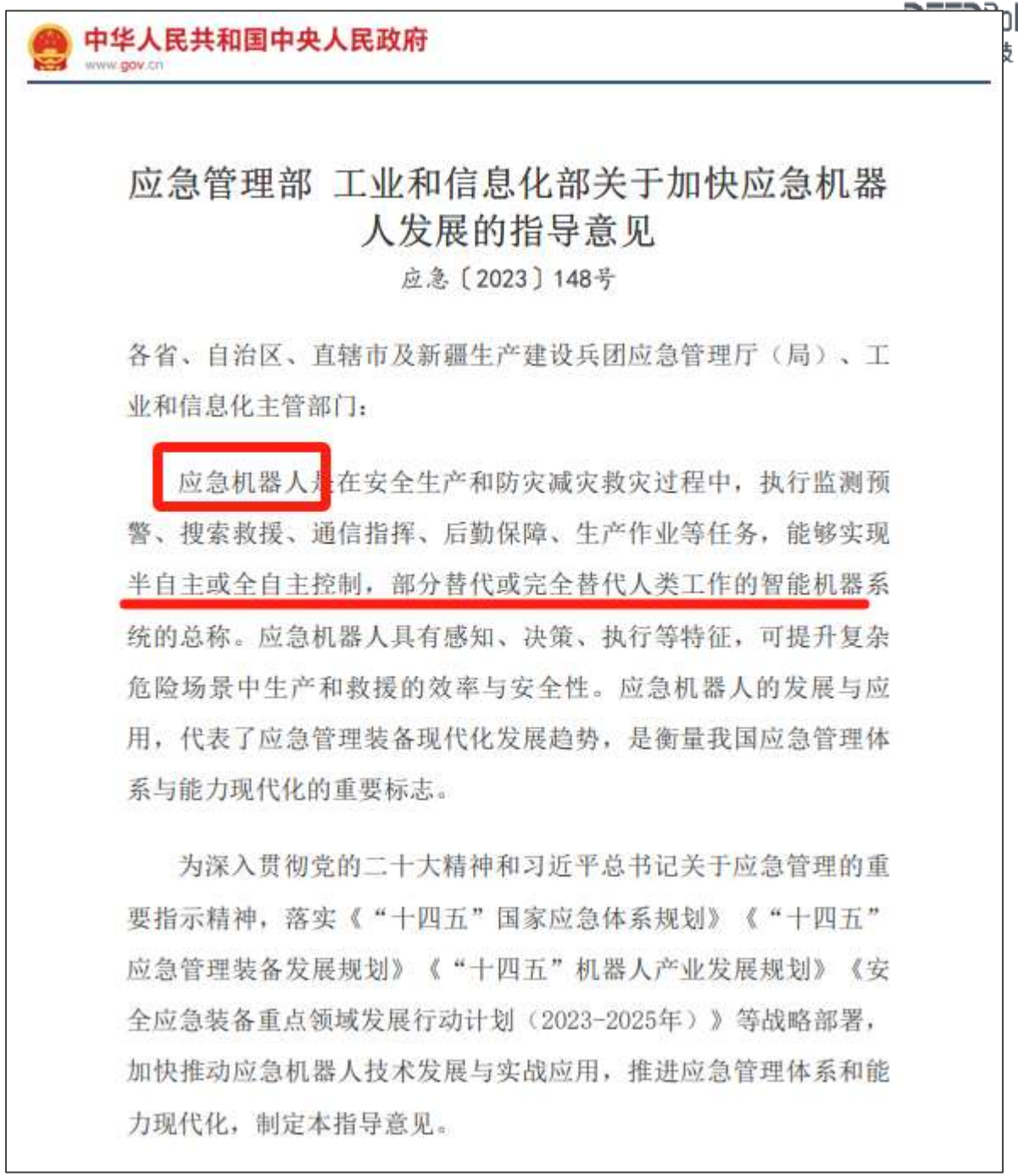
Seventeen ministries and departments, including the Ministry of Industry and Information Technology (MIIT) and the Ministry of Emergency Management (MEM), jointly released policies to accelerate the application of robotics. These initiatives encourage the integration of robotic technologies into emergency management and rescue operations, improving efficiency, safety, and intelligence levels in responding to emergencies.

Guidelines on Accelerating the Development of Emergency Robots

Jointly issued by MEM and MIIT, these guidelines mark the modernization trend of emergency management equipment.
By 2025, China aims to develop a series of advanced emergency robots, significantly improving the scientific, professional, precise, and intelligent capabilities of the national emergency management system..

National Fire and Rescue Administration Announcement

In the revised “Firefighting Product Catalog (2025 Edition)”, quadruped robots are officially included as a new category of firefighting products, with a subcategory added for legged reconnaissance firefighting robots.



中华人民共和国中央人民政府
www.gov.cn

应急管理部 工业和信息化部关于加快应急机器人发展的指导意见

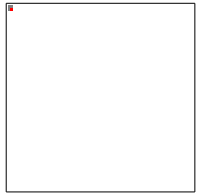
应急〔2023〕148号

各省、自治区、直辖市及新疆生产建设兵团应急管理厅（局）、工业和信息化主管部门：

应急机器人是在安全生产和防灾减灾救灾过程中，执行监测预警、搜索救援、通信指挥、后勤保障、生产作业等任务，能够实现半自主或全自主控制，部分替代或完全替代人类工作的智能机器系统的总称。应急机器人具有感知、决策、执行等特征，可提升复杂危险场景中生产和救援的效率与安全性。应急机器人的发展与应用，代表了应急管理装备现代化发展趋势，是衡量我国应急管理体系与能力现代化的重要标志。

为深入贯彻党的二十大精神和习近平总书记关于应急管理的重要指示精神，落实《“十四五”国家应急体系规划》《“十四五”应急管理装备发展规划》《“十四五”机器人产业发展规划》《安全应急装备重点领域发展行动计划（2023-2025年）》等战略部署，加快推动应急机器人技术发展与实战应用，推进应急管理体系和能力现代化，制定本指导意见。

Current Status of Emergency Firefighting



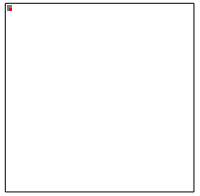
Manual work

- **Operational safety**

In the scenarios of hazardous and disastrous accidents involving inflammable and explosive substances, toxic materials, oxygen-deficient environments, thick smoke, and buildings prone to collapse, the operational risk coefficient is high

- **Information collection**

The environment of disaster site is complex, and it often faces the scene of three cuts--road cut, power cut and network cut, resulting in fragmented information received by rescue personnel and command center on the scene;



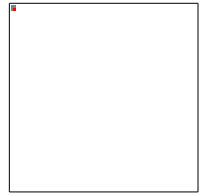
Traditional robot operation

- **Scenario adaptability**

Poor adaptability to complex terrains, including ruins, piles of stones, and staircases. Challenging to traverse tall obstacles and enter deep into indoor spaces

- **Flexibility**

Traditional robots are bulky and heavy, making it difficult for them to turn in complex and unknown environments. They have low flexibility and pose a risk of crushing trapped people or altering the original environment in unknown terrains, which may trigger secondary accidents;



Drone operation

- **Enclosed space**

Outdoor large space search and rescue is widely used, which can be used as a high-altitude perspective to understand the overall situation of the scene, but the application of indoor environment investigation and search and rescue is limited;

- **Environment effects**

Small UAVs have high requirements on meteorological environment. In strong convective meteorological environment such as rainstorm, strong wind, lightning and hail, they are easy to be affected by the environment and cannot work normally;

03 Robotic Emergency and Firefighting Solutions

03 Advantages

All-terrain operation

Able to cross over 20 cm high obstacles and stairs, 45° slopes, and move freely on unstructured surfaces such as ruins, stone piles and grass. Omnidirectional, flexible, and light contact to the surface to avoid changing the environment; lower the chance of secondary accidents.

All-Weather

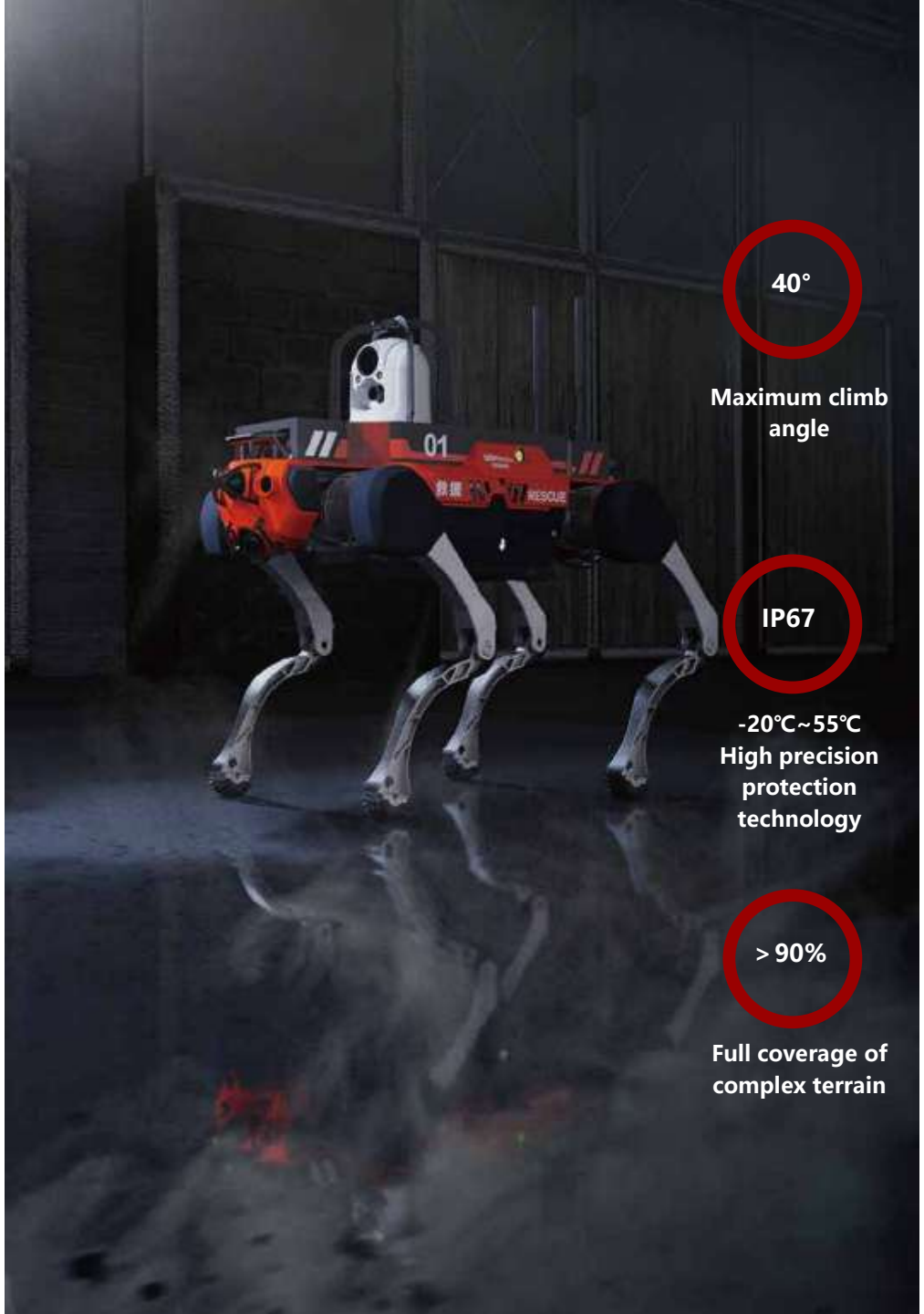
IP67 protection enables seamless indoor-outdoor search and rescue operations, capable of conducting missions in extreme conditions including dense smoke, toxic environments, heavy rain, hailstorms, and extreme cold.

Dynamic obstacle avoidance

Equipped with four standard solid-state LiDARs and AI-powered algorithms, it enables dynamic obstacle avoidance.

Intelligent Collection System

Collect all kinds of image information, gas information, sound information and 3D data from the rescue site;



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04 Solution Architecture

Apply scene

Urban Building Fires | Forest & Grassland Firefighting | Earthquake Search and Rescue | Chemical Leak Response | Tunnel Accident | Factory Fire Patrols | ••••••

Application

Reconnaissance	Rescue	Transportation	Modeling	Communication support	Firefighting
Video frequency	Life detection	Material Transport	Real-time point cloud	fibre communication	Smart Water Cannon
Audio frequency					
Gas	voice communication	Tracking system	Point Cloud Mapping	Mesh Self-Organizing Network	high-pressure water jet
Point Cloud					

Task module


Dual-Spectrum PTZ


Gas/temperature /humidity sensor


3D laser scanner


Two-way voice module


Robot Arm


Load Carrier


Optical & Wireless


fire water monitor


high-pressure water jet

Basic module


Jueying X30 Pro


LYNX M20


tele controller

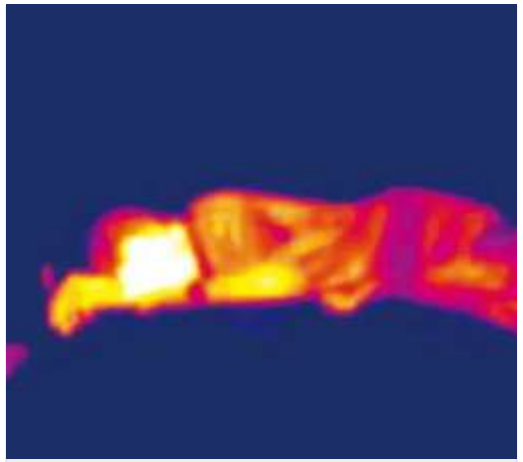

Follow Module


Optical Module


5G Module


Mesh Self-Organizing Network


Positioning Module



Dual Light PTZ

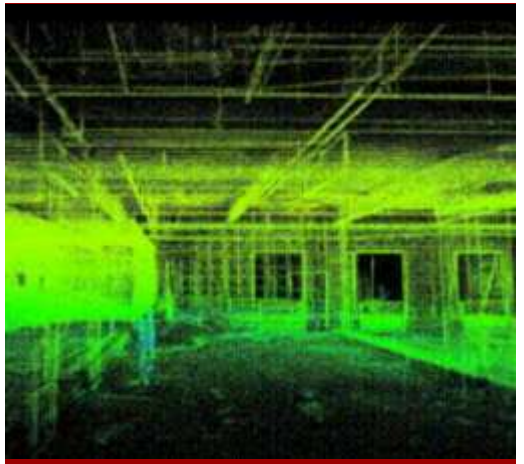
Visible light lens presents the scene of accidents and disasters, while thermal imaging identifies personnel, fire points.
variable zoom+IR light gives more details for investigation.

Gas detection

Detect the concentrations of common gases such as oxygen, carbon dioxide, carbon monoxide, flammable EX and nitrogen oxides (NOX), providing on-site environmental data for rescue team.

Walkie-Talkie

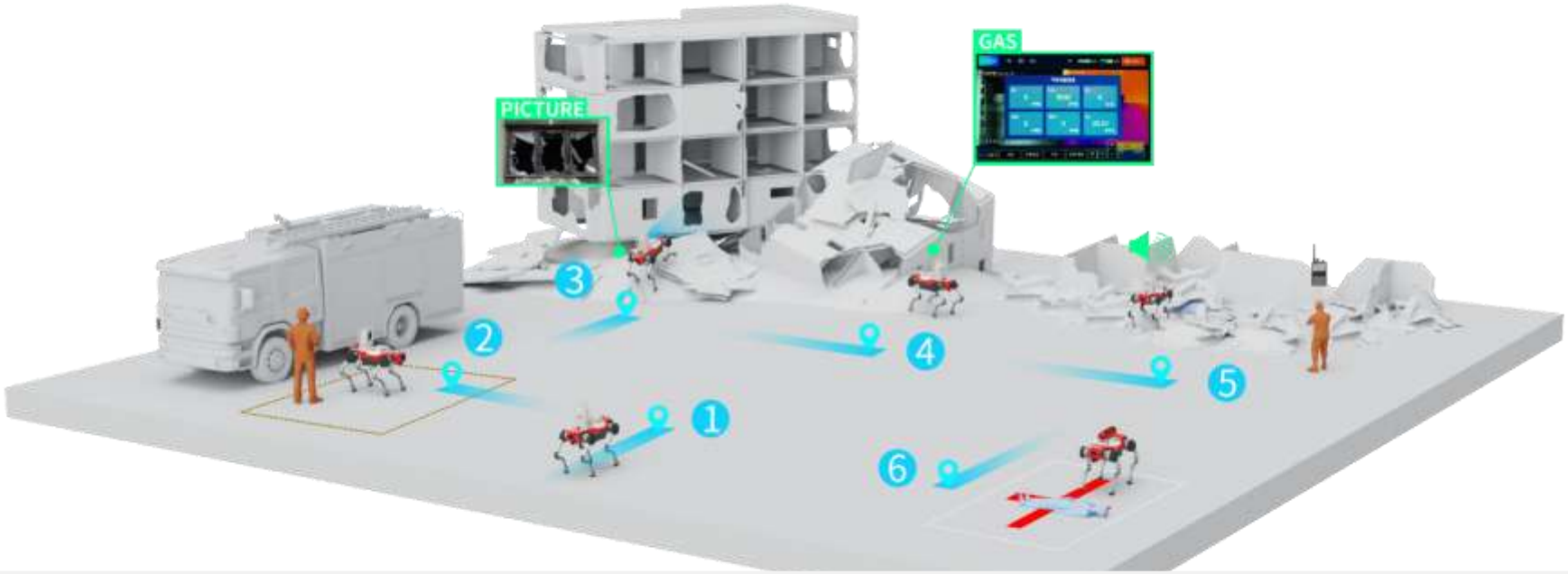
Through the voice communication system, two-way communication with the field operation and trapped personnel, and timely arrangement of rescue plan;



3D Surveying

Real-time point cloud: Acquires real-time point cloud maps to provide fire departments with up-to-date terrain data and the global positioning of robot dogs.
3D modeling: Post-processing generates high-precision point cloud maps.

05 Reconnaissance Solution Work Flow



1 Rescuer receives command, takes X30 to the post-disaster area.

2 Rescuer control X30 from a far distance in a safe operation zone/Command center.

3 Operator makes orders to X30, it goes into the post-disaster area takes images, and sends them back to the digital detection system.

4 X30 detects harmful gases through sensors, and gathers temperature data by thermal imaging; it goes into the danger area and plans the best pathway for safeties retreat.

5 X30 can collect sounds from stranded victims by the Pickup and make calls with them.

6 X30 carries rescue supplies like oxygen bottles to stranded victims and rescuers; it assists in full-retreat by giving useful information .

05 Reconnaissance Solution

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Live from the scene

Dual-Spectrum PTZ

Two-way voice module

Gas/temperature and humidity sensor

3D laser scanner

Mobile base station

5G Module

Optical Module

Mesh Self-Organizing Network

Front Command Center

Mobile base station

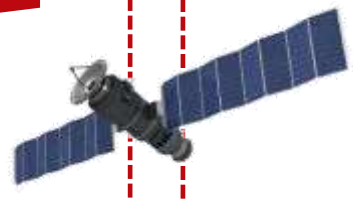
5G Module

Optical Module

Mesh Self-Organizing Network

On-site Command Center

rear command



Mobile base station

satellite ground station

Command Center

06 Fire Fighting Solution - Water Cannon

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Based on the Jueying X30 platform and equipped with an intelligent water cannon, it utilizes its all-terrain mobility to cover accident scenes such as narrow, enclosed or semi-enclosed spaces and ruins that traditional equipment cannot reach. It replaces firefighters in entering high-risk areas for firefighting, ensuring personnel safety.

01

02

03

Wide Coverage

Shooting range: 30 meters when standing, 60 meters when sitting
Max. spray angle: 120°
Horizontal movement angle: ±30°, pitch movement angle: -15° to 75°
The coverage is flexible to respond to fires in different directions
Capable of dragging a 50 m empty water hose

Multi-mode and flow control

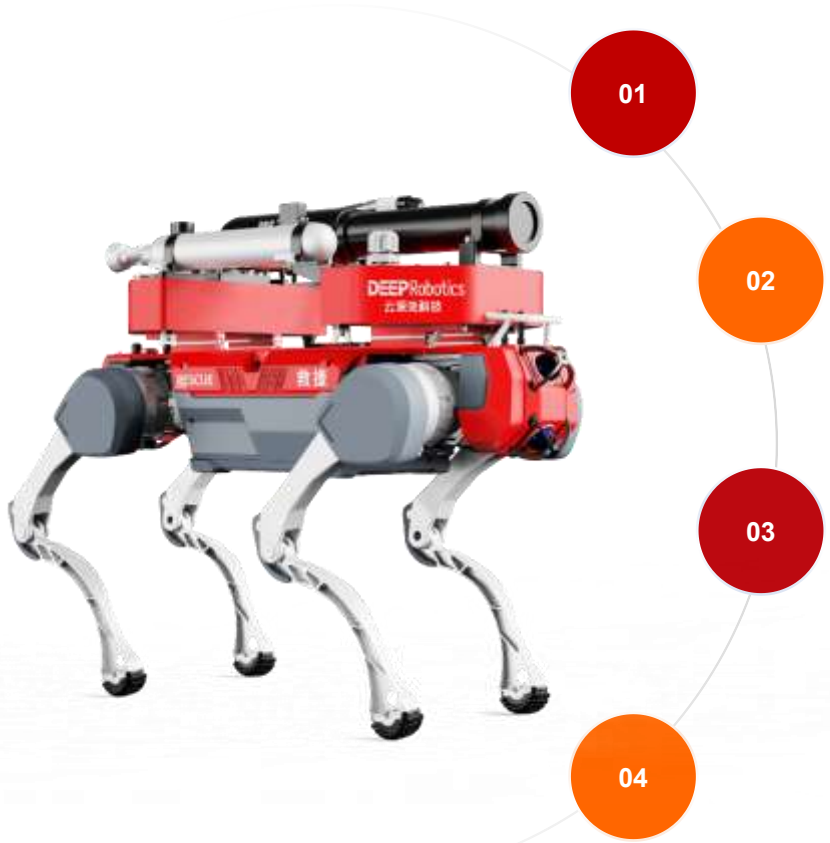
Freely switch between straight stream and spray modes.
Equipped with a quick-connect foam barrel, enabling "dual-use" operation (water/foam firefighting).
Three adjustable flow rates (20 L/s, 30 L/s, 40 L/s).
Standard 65 mm diameter hose, adaptable to 40 mm diameter hose.

Intelligent control and emergency backup

Features dual modes: remote wireless control and manual emergency control.
Supports operations such as horizontal rotation, pitch swing, and jet/spray mode switching.
Inlet pipeline equipped with quick-connect interfaces, automatic hose release device (remote-controlled detachment), or universal regulator.
Remote control of spray cooling function is supported.

06 Fire Fighting Solution -High Pressure Pulse Water Gun

The pulse reconnaissance and firefighting integrated robot dog, developed based on pulse air pressure spraying technology, carries its own water supply without the need for a hose. With all-terrain mobility, it overcomes environmental limitations, achieving efficient firefighting and integrated safety rescue operations.



Fire Fighting Efficiency

Utilizing integrated pulse air-pressure spraying technology, it extinguishes fires through atomization heat absorption, pulse impact, and oxygen isolation. One liter of water is atomized into over 1,700 liters of pulsed mist, ejected at a speed of 400 km/h with a range exceeding 20 meters, reaching directly into the fire core for rapid suppression.

Fire type

Capable of extinguishing Class A (solid), Class B (liquid/oil), and Class C (gas) fires. Thanks to the discontinuous nature of the pulsed mist, it can efficiently extinguish electric fires, including new energy lithium battery fires, while minimizing the risk of electric shock during high-voltage firefighting.

Flexibility and Portability

Equipped with a compact water cannon, it can penetrate disaster zones and ruins inaccessible to humans, addressing the challenges of traditional water cannons that rely on manual transport and are limited by terrain.

Coordinated Rescue

Remotely controlled, it can replace personnel in smoke-filled or toxic environments. The sprayed mist forms a water barrier that rapidly cools and extinguishes fires, reduces smoke concentration, and creates safe escape passages for trapped individuals.

07 Material transportation Solution

Base on quadruped robot platform, through motion control, intelligent following, and modular design, it achieves all-terrain efficient transport and emergency response. Can enhance emergency rescue efficiency, reduce the frequency of personnel entering high-risk areas, and lower secondary accident risks.Focuses on complex rescue scenarios such as high-rise building fires, earthquakes, and geological disasters, solving the bottleneck of rapid transport for key materials and equipment in unstructured terrain.

01

Critical Materials

Specialized vehicles can be used to carry gas cylinders and demolition tools, which can reduce the workload of on-site workers and improve the efficiency of on-site rescue.

02

Communication Equipment

Carries self-organizing (Mesh) network, LTE base stations, and other communication devices to follow relevant personnel, ensuring or restoring on-site communication..

03

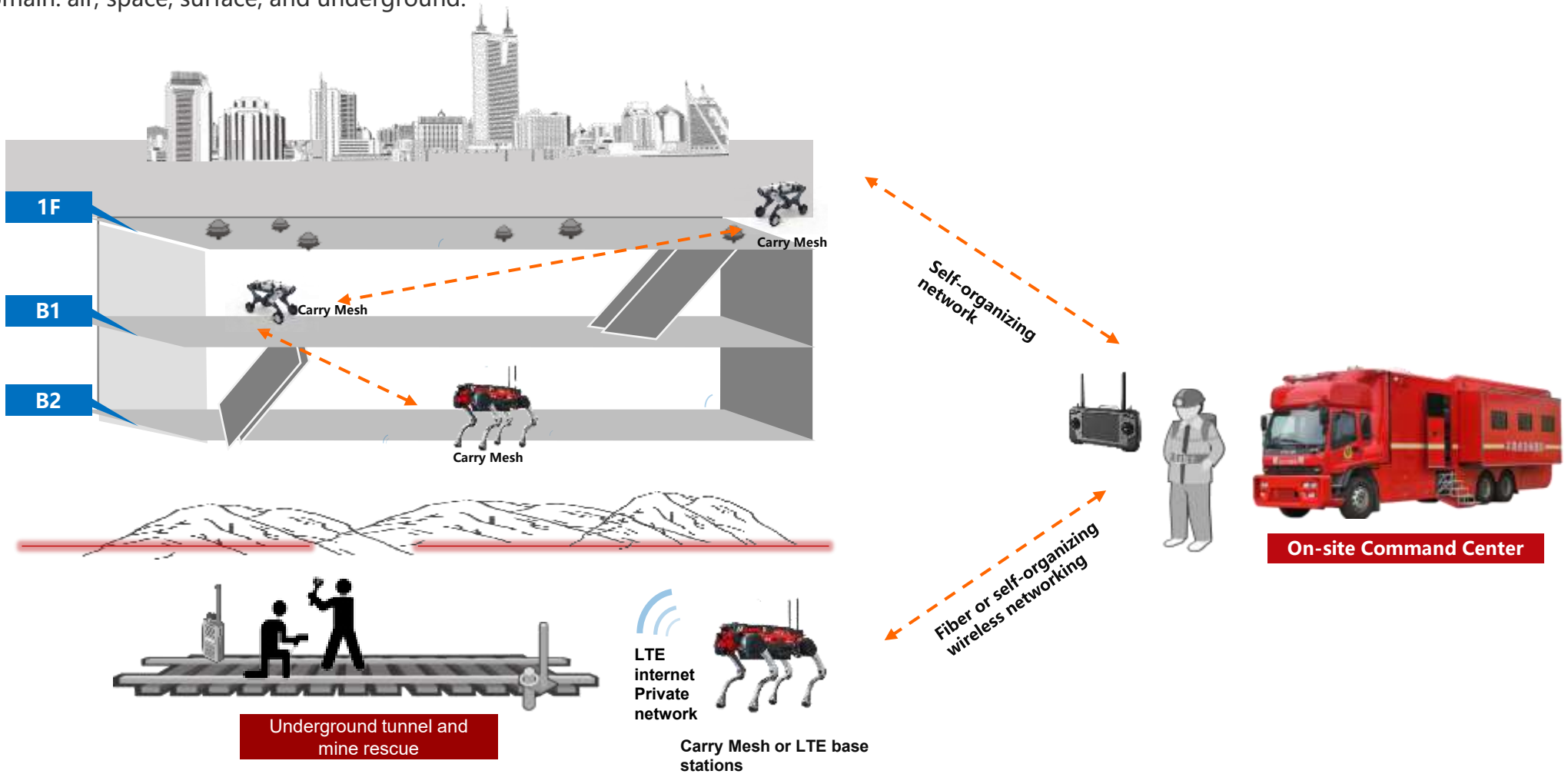
Automatic following

Utilizes UWB base stations and tags for ranging, direction finding, positioning, and following. Max following speed 1.2m/s, following distance 30 meters.

08 Communication Support Plan

Integrates fiber optic communication, self-organizing networks (Mesh), LTE terminals, satellite communication, and other equipment to build a comprehensive emergency communication support system featuring "Mobile Deployment + Wired Backbone + Wireless Extension". It enables rapid deployment of temporary communication networks in confined disaster zones, effectively addressing communication challenges in enclosed environments.

Through deep coordination with mobile communications, UAVs, satellite communication, it utilizes UAVs for aerial networking and coverage filling, relies on mobile communications for ground-wide area coverage, leverages satellite communication for cross-regional transmission, and combines the robotic dog's communication support capability in underground scenarios. This creates an emergency communication support solution covering the entire domain: air, space, surface, and underground.



The Office of the National Flood Control and Drought Relief Headquarters, the Ministry of Emergency Management, and the Zhejiang Provincial Peoples Government jointly conducted the "Emergency Mission·2024" super typhoon prevention and major flood disaster joint rescue drill in Jinhua City, Hangzhou City, and Xiangshan County, Ningbo City, Zhejiang Province. During the exercise, a fire brigade and Yunshenchu collaborated to deploy a "four-legged robot emergency firefighting solution," with robotic dogs and drones working in tandem to conduct reconnaissance of a sudden chemical explosion incident, successfully completing the exercise objectives.

West Lake Forest Firefighting


Zhejiang Forest Firefighting

Internal practical Drill


Flood rescue Drill in Hubei


High-level emergency fire fighting inspection robot

"Emergency Mission 2024" Rescue Drill

The X30 robot dog and the drone collaborated to complete the detection of the sudden flammable and explosive chemical hazard. Through the Bi-spectrum camera and gas detector carried, it detects the temperature of the fire field, the intensity of radiant heat, toxic and harmful gases, and the situation of obstacles, providing valuable information for the rescue personnel .

"Emergency Mission 2022" Earthquake Relief Drill

X20 has participated in a national earthquake relief drill in Gansu, one of the X20 is equipped with a Mesh network and a Bi-spectrum camera, to detect heat sources, intensity of radiation, obstacles, and assist rescuers to search for victims; the other one was installed a gas sensor to detect harmful gases and provide data to the digital operating system.

Tunnel Traffic Accident Drill

Shanxi Transportation Holding Group Co., Ltd. Baiquan company organized an emergency drill for sudden traffic accidents in highway tunnels. This drill used the ‘X20 quadruped robot’ for the first time. In toxic, hypoxic or dense smoke environments, it conducted preliminary investigations of uncertain factors at the accident site, identified harmful gases and real-time concentrations.

Inner Mongolia Drill

Ordos, Inner Mongolia, conducted an emergency drill for a gas pipeline leak explosion. Drones, robots, and robot dogs were deployed for detection, firefighting, and other tasks. In real-life emergency situations, the X20 can improve rescue efficiency by replacing firefighters in dangerous environments.

10 Core Parameters

Parameters

Weight: 56kg	Stand size: 1000*470*715 (mm)
Payload: ≥ 20kg	Endurance: 2.5-4h
Max. climb angle: 30°	Step / Obstacle’ s Ht: ≥ 20cm
Max. walking speed: 1.3m/s	Maximum speed: 4.95m/s (limit test data)
Ingress Protection: IP67	Temperature: -20℃~55℃
Interfaces: Ethernet; WiFi; External power supply (72V BAT)	

Combination Function

01.Composite terrain adaptability

02.Stair Climbing Perception

03.Obstacle stop/avoidance capability

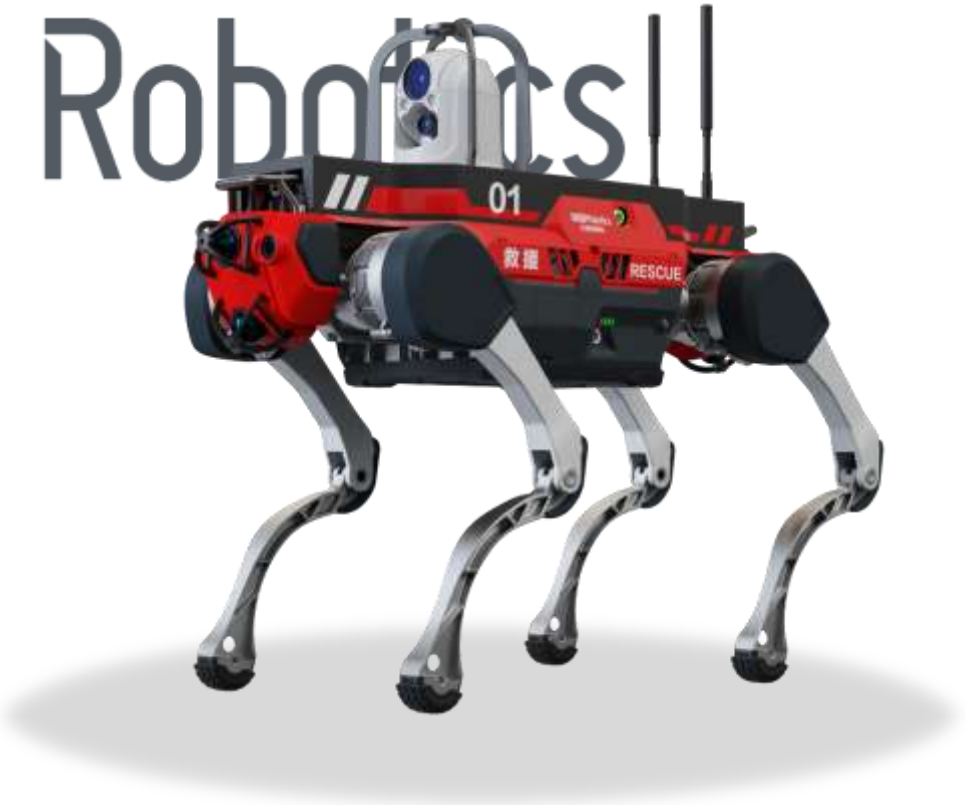
04.Quickly detachable battery

05.High waterproof and dustproof performance

06.Industrial-level Navigation Interface

07.Smart Light Interaction Interface

08.Configure upper mounting devices as needed



10 Core Parameters

Parameters

Standing size	820*430*570 (mm)
Weight	35 kg ((battery Included)
PayLoad	15kg
Endurance	2.5~3h
Battery capacity	4.5Ah (single battery)
Max. work rate	2m/s
Performance	Climb a continuous staircase with steps 25cm high. Can climb a slope of 30° or more, or a staircase of 45°
Sensor Parameters	96-line LiDAR*1, wide-angle camera*2, lighting*2
Ingress Protection	IP66
working temperature	-20℃~55℃

*Protection mode: Equipped with a one-key hard emergency stop button at the rear; the control handle is equipped wih a one-key soft emergency stop protection; supports fall protection, low voltage alarm, and over-temperature alarm.

* The robot's thighs and shanks are constructed from aluminum alloy, formed through an integrated molding process that eliminates hollow conduits; the foot tires utilize hard, wear-resistant rubber that resists damage and deformation even when stepping on sharp surfaces.

*Equipped with multiple motion gaits: stationary standing, sliding, walking, combined sliding and walking, obstacle crossing, up/down stairs, forward/backward movement, left/right movement, in-place turning, etc.

* Intelligent Functions: omni-directional obstacle avoidance, staircase perception, multi-floor navigation, and autonomous charging without mapping.

*The company reserves the right to interpret the final product delivery.

11 Load device

Dual-Spectrum PTZ

visible light：
Resolution: 1920*1080
Pixel: 2 megapixels
Zoom: 33x
thermal imaging：
Resolution: 384*288
Temperature range: -20~550℃
Cloud Terrace：
Horizontal: 360°
Vertical: 0~90°
Weight: 2.5kg
Power: 12W
Ingress Protection: IP67
Working temperature: -20℃~50℃

Panoramic capture: 360° laser horizontal capture field of view
True Color in Real Time: 56MP, Real-time True Color Point Cloud
Easy to use: low learning cost, collect as you like

3D laser scanner

Overall performance:
Power input: 12V
Power: <20W
Weight: 760g
Ingress Protection: IP54
working temperature：
Scan performance:
Laser lines: 40 lines
Scan distance: 40m
View range: 360°*-7~+52°
Point cloud frequency: 200,000 points/s
Visual module:
Camera field of view: Color panoramic HDV 360*360°
Camera resolution: 56 megapixels

Lightweight robotic arm

Degrees of freedom: 6
Body weight: 7.2kg
Payload: 5kg
Working radius: 61cm
Rated voltage: DC 24V
Power consumption: maximum power consumption ≤ 200W, total power consumption ≤ 100W
Ingress Protection: IP54
Material: Aluminum alloy
Controller: Integrated
Communication methods: WiFi, network port, Bluetooth, or USB serial port
Control method: Drag-and-drop teaching, teaching device, API, or JSON
Joint range of motion: J1 ±178°, J2 ±130°, J3 ±135°, J4 ±178°, J5 ±128°, J6 ±360°
Maximum joint speed: J1-J2 180 °/s, J3-J6 225 °/s

Gas/temperature and humidity sensor

Detectable gases: Configure 1-6 types of gases as needed, including oxygen, carbon dioxide, carbon monoxide, combustible EX, and nitrogen oxides (NOX).
temperature： -40℃~+70℃
Humidity: 10~95%RH (no condensation)
Alarm mode: sound and light alarm, vibration alarm
Weight: 500g
Ingress Protection: IP67
Explosion-proof type: intrinsically safe type

Two-way voice module

Diameter： 120mm
Net weight: 252g
Microphone：
All-direction microphone
Audio bandwidth: 100-16KHz
Sensitivity: -38dB to 94dB SPL at 1 kHz
Loudspeaker：
2-inch anti-magnetic speaker
4Ω5 W
Environmental requirement：
temperature： 5°~44°
Humidity: 20 ~ 85% (no condensation)
Key：
Mute microphone button
Volume up button
Mute button

Load device

Fire water monitor

Maximum range: ≥ 60m;
Maximum spray Angle: 120°;
Horizontal rotation angle: ±20°;
Elevation angle: 20°~60°;
Control device: remote wireless control;
Fire cannon performance: DC jet, 3 flow rates available: 20L/s, 30L/s, 40L/s;
The standard DC spray gun head with dual control enables seamless switching between DC and spray modes. It supports foam nozzle installation for quick replacement, allowing dual functionality in a single device.

High-pressure pulse water gun

Spray mode: high pressure pulse spray
Direct current spray distance:>20m
Fire extinguishing medium: water or a mixture of water and additives
Water spray per use: less than 1 liter
Water spray diameter: 3-5 meter;
Spray speed: 120 m/s
Total equipment weight: ≤85KG
Effective pulse injection times: ≥10 times
Gun jet length: <630mm
National Standard: Complies with XF534-2005 and CCCF-CPRZ-26:2019 national standards

5G Module

Supports the following frequency bands:
WCDMA: B1/B2/B5/B8、LTE-FDD:B1/B2/B3/B5/B7/B8/B20/B28
LTE:LTE-TDD: B34/B38/B39/B40/B41、DL 2 × 2 MIMO:
B1/B2/B3/B5/B7/B8/B20/B28/B34/B38/B39/B40/B41
5G NR NSA: n41/n78/n79
5G NR SA: n1/n28/n41/n77/n78/n79
5G : DL 4 × 4 MIMO:
n1/n41/n77/n78/n79

Mesh Self-Organizing Network

Wireless features:
Operating frequency: 1400MHz
Carrier bandwidth: 2/5/10/20MHz
Peak rate: 70Mbps at 20MHz
Transmit power: 10W
physical characteristics :
Weight: 2.3kg (backpack) and 220g (airborne terminal)
Working temperature: -40℃~+70℃
Protection rating: IP66
Power consumption: 40W

DEEP Robotics

Pioneering Innovation & Application of Embodied AI

Due to product updates, contents may change. Please consult for final confirmation.