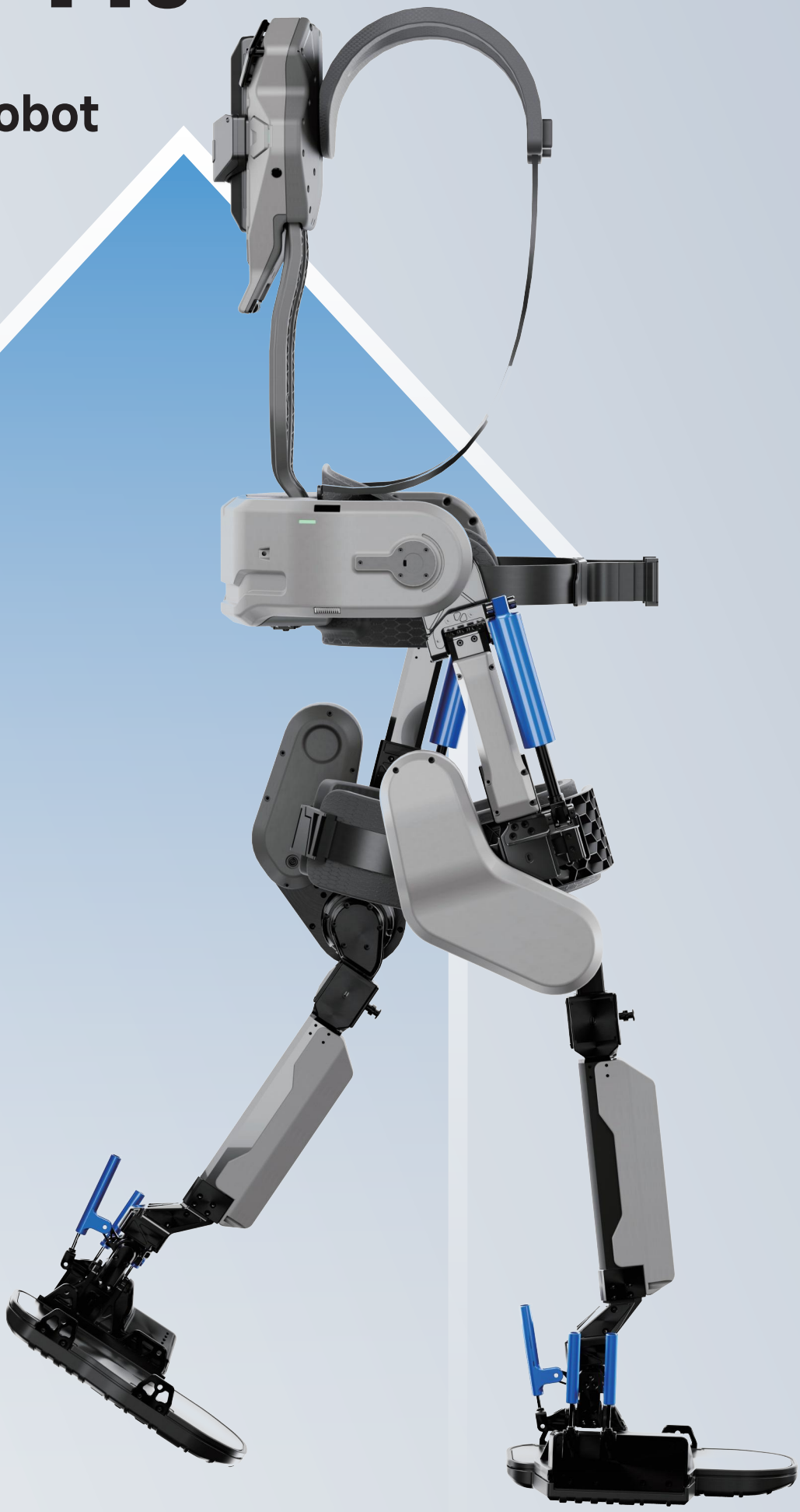
FIT-GS-Pro

Lower Limb Exoskeleton Robot



ULS ROBOTICS

FIT-GS-Pro

Lower Limb Exoskeleton Robots

Product introduction

ULS Robotics, leveraging its expertise in professional - grade product development, has innovatively introduced the FIT - GS - Pro lower - limb driven exoskeleton robot. Specifically designed for universities, research institutions, and medical research entities, it offers a customized platform for secondary development and in - depth research.

The FIT - GS - Pro is outfitted with an intelligent digital driver independently developed by ULS Robotics. This cutting - edge technology enables a seamless integration of the integrated modular deceleration system and the adaptive intelligent motion control system. By utilizing software - based mechanical impedance and self - learning adaptive gait algorithms, and complemented by AI - powered motion control and pattern recognition techniques, the robot can rapidly adapt to a wide range of complex motion scenarios, thereby fulfilling diverse development requirements.

- Servo power unit
- Force impedance control technology
- Force control integration drive unit
- ULSrobotics's integrated TBG (Twist Belt Gear) deceleration system

- Flexible plantar pressure sensing array with two feet and 32 channels
- Long-term lithium battery management system
- Exoskeleton IoT motion data platform
- HMI highly matched adjustable mechanism and visual rapid height adjustment module

Exoskeleton Software System Architecture

Supports applications in human augmentation, assisted walking and medical research.

Embedded system architecture									
API SDK Function package	Customiz-able gait curve	Non-gait curve	Adaptive force following gait	Force impedance control assistance software package	Position mode control	Torque mode control	Continuous PVT motion control	adjustment of motor controller for hip and knee joints	Phase calibration, etc.
Software language	Unity (C#)		VS (C#, JAVA)			MicroPython		MATLAB	
Communica-tion system	CAN (CANOPEN)	Ethernet	TCP/UDP	WIFI	UART	USB		4G IoT	
Hardware bottom layer	Support EMG			Support OpenBCI			Support Leap Motion		
	Support scalable RTOS			ARM-based hardware driver Lib			BSP		
	Motor drive system	Flexible force sensing array system		Double coding posi-tion feedback system		Digital man-machine interaction interface		Scalable CAN LAN	

NEW

LOWER LIMB EXOSKELETON ROBOTS

ULS ROBOTICS – **FIT-GS-Pro**

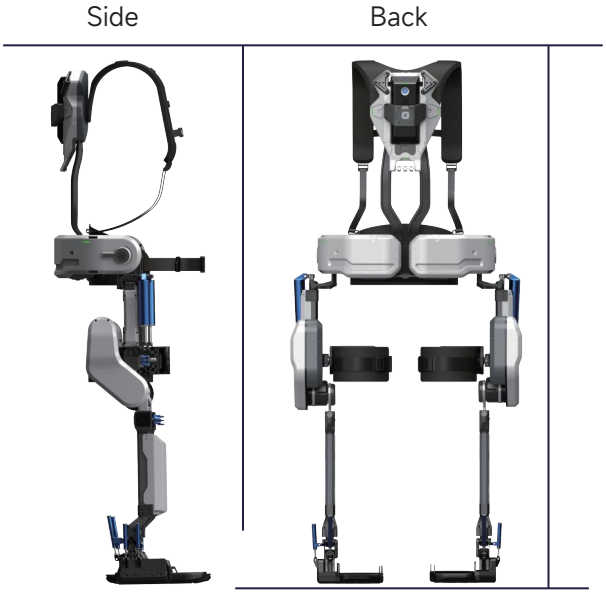
Burden alleviation · Assistance · Walking assistance · Data IoT

Battery life 2-4h

32 channels for plantar pressure

Equipment weight <18kg

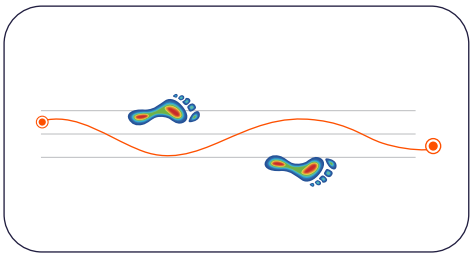
12 degrees of freedom



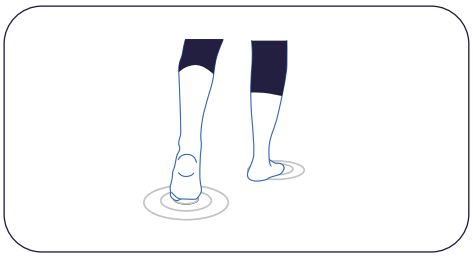
Supports a variety of development function modes

ULSrobotics's unique mechanical impedance software algorithm, self-learning adaptive standard gait, non-standard gait and AI-based motion control algorithm and pattern recognition

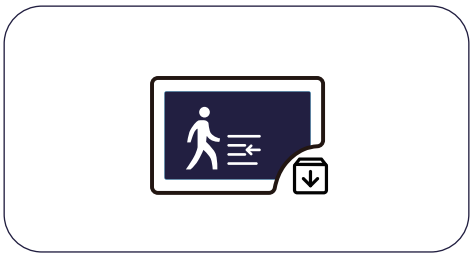
Development function



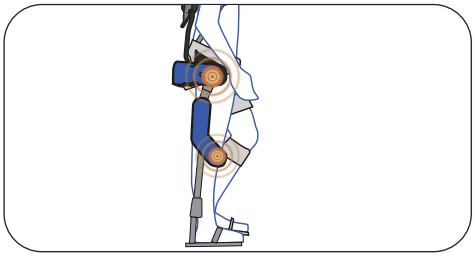
Customizable gait curve



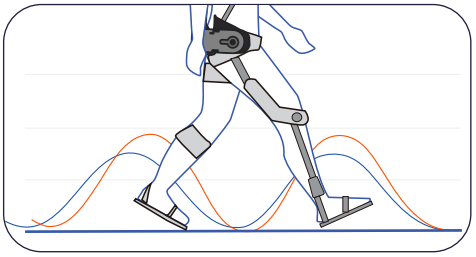
Adaptive force following gait



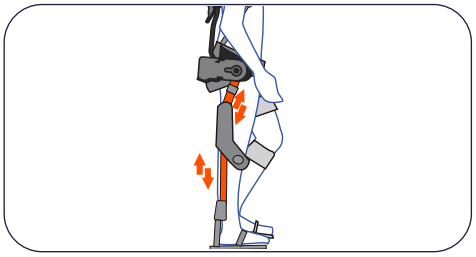
Force impedance control assistance software package



Torque mode control



Continuous PVT motion control



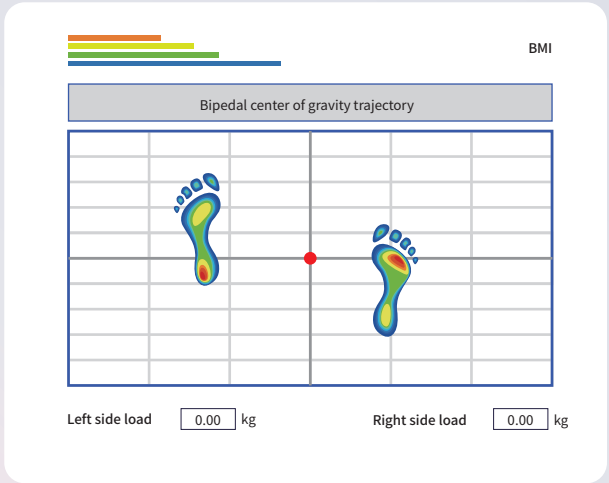
PID adjustment of motor controller for hip and knee joints

Open data and a rich suite of development APIs

The exoskeleton communicates wirelessly to display posture and assistance data in real time, enabling customized data calibration.

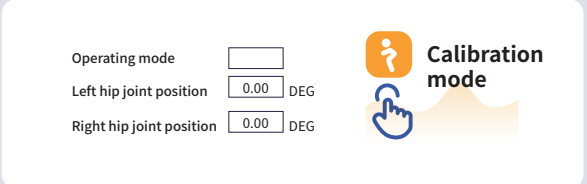
Data function

■ Plantar pressure data



■ Exoskeleton data curve

■ Individualized data calibration



Research Exoskeleton Preferred Teaching Products

Advantages

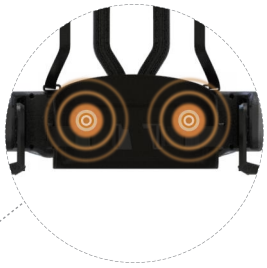
Excellent performance

Rich functions

Open interface

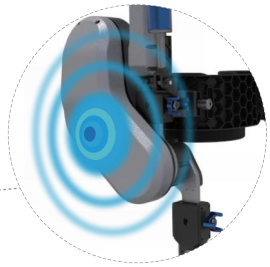
Data support

Quick release smart lithium battery

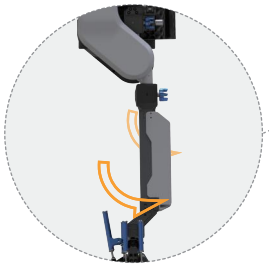


Multiple APIs (support direct control of the position and torque)

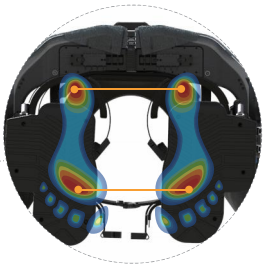
Fast visual adjustment and locking of height and leg length



Torque mode control



Adaptive force following gait



Plantar pressure distribution

Application field

Education and teaching

Medical research

Rehabilitation training

Academic research

Product Configuration List

Quantities	Items
1	Lower limb driven exoskeleton robot body
1	Puttee
1	DIU hand controller
1	Power adapter
1	Equipment Hanger
1	Instruction manual, certificate of conformity, warranty card

Technical Parameters

1. Device Dimensions : 700 × 300 × 1500 mm (Length × Width × Height).
2. Weight : Self-weight < 18 kg, including a power battery with a minimum endurance of 2 hours.
3. Power Source : Electric assist drive.
4. Height Compatibility : 160–185 cm (supports height adjustment).
5. Temperature Range : -20°C to 50°C.
6. Battery Endurance : Removable/replaceable lithium battery pack; single battery provides 2–4 hours of operation.
7. Battery Specifications : Lithium battery, rated voltage 36V, capacity ≥ 2500 mAh. Continuous operation: ≥2 hours under load, ≥4 hours unloaded.
8. Battery Replacement : Wearers can replace the battery within 6 seconds without tools or removing the exoskeleton.
9. Degrees of Freedom (DOF :
- ≥12 total DOF, including 4 active DOF (motor-driven) with dual encoder feedback (relative and absolute encoders).
- Each active joint features independent absolute encoding precision ≥19 bits and ≥8 passive DOF.
- Motor-driven joints correspond to human shoulder, hip, and knee joints.

10. Materials : Engineering plastic, aviation aluminum alloy, carbon fiber, titanium alloy.
11. Plantar Pressure Sensing :
- 32-channel dual-sole pressure data support, rated load 0–100 kg.
- Comprehensive accuracy: 0.1% (linearity, hysteresis, repeatability); sensitivity: 1.0–2.0 mV/V.
- Software Interface**: The Data interface of the host computer displays real-time robot data. 16 white blocks on the bottom left/right represent left/right foot pressure sensors, with color changes indicating pressure levels:
  - Blue: 0N < pressure < 100N
  - Yellow: 100N ≤ pressure < 200N
  - Red: pressure ≥ 200N

12. Drive Unit : Integrated low-voltage torque servo motor system with gearbox, each motor power ≥150W.
13. Joint Motion Ranges :
- Hip (sagittal plane) : -30° (rear swing) to 165° (front swing), continuously adjustable.
- Knee : -135° (flexion) to 0°, continuously adjustable.
- Ankle : -90° (dorsiflexion) to 75° (plantarflexion).

14. Shoulder Motion :
- Sagittal plane (at 0° neutral) : Upward lift ≥140°, rear swing ≥30°.
- Frontal plane : Horizontal abduction/adduction range ≥150°.

15. Shoulder Position Sensing : Independent absolute physical position sensors (no battery-based position memory) for left/right shoulders, providing real-time feedback for lift/lower movements. Support force angles/positions can be adjusted on-site by the supplier as needed.
16. SDK & Interfaces :
- Open SDK for independent motor control and sensor data collection.
- Reserved interfaces: EMG, EEG, Ethernet, CAN-open bus, C# driver.
- Supports real-time control/data collection via API in programming software.

17. Supported Languages : C, C++, C#, Java, MATLAB (m).
18. Development Environments : Unity, Visual Studio, MATLAB.
19. Functional Features :
- Motion position control, torque control, PVT continuous curve operation.
- Data reading from joint and force sensors; motor status feedback.

20. Built-in Software Demo Modes : Standing, simulated gait walking, force-following gait, upper limb assist, balance training gait, and impedance mode.
21. WIFI Module : Wireless communication with tablets/phones via debugging software to adjust gait curves/parameters and read data (joint position, motor torque/speed/acceleration), generating reports.
22. Battery Detection : Real-time monitoring of battery level, voltage, and short-circuit status to prevent unexpected power outages and ensure safety.
23. Adjustability :
- Thigh Length : ≥80mm adjustment range (hip joint center to knee joint center).
- Calf Length : ≥120mm adjustment range (knee joint center to ankle joint center).
- Sizes can be customized to the user's body type.

24. Adjustment Precision : All adjustable parts include scale measurements and clear ranges for height/limb length adjustments.
25. Joint Limit Protection : All joints are equipped with mechanical limit protection mechanisms.

ULS ROBOTICS

ULS Robotics Co., Ltd.

Address: No. 8 Jinian Road, Yangpu District, Shanghai
Phone: 021-80158675
Email: info@ulsrobotics.com
Website: https://www.ulsrobotics.com/en/

Follow ULS Robotics account to
learn more information.