

FUM-HEXA

FUM CARE
CENTER OF ADVANCED
REHABILITATION & ROBOTICS RESEARCH

General Explanation

Undoubtedly, the ability to walk is considered as an important function which directly relates to our physical and psychological wellbeing. Walking abnormalities and impairments not only have a negative impact on our daily lives but could also increase the chances of further medical complications. Patients with walking abnormalities are often required to undergo rehabilitative exercises in order to correct and/or improve their gait.

To this end, the wearable robot **FUM-HEXA** (Hip Exoskeleton Assistance) was designed as an attempt to help patients with lower limb disabilities to restore or improve their walking ability, and also to reduce the burden of the human assist.

FUM-HEXA consists of two 70 watt BLDC motors with a precision gearbox, each driving a link which is placed on the human thigh and fastened with Velcro straps for either hip.

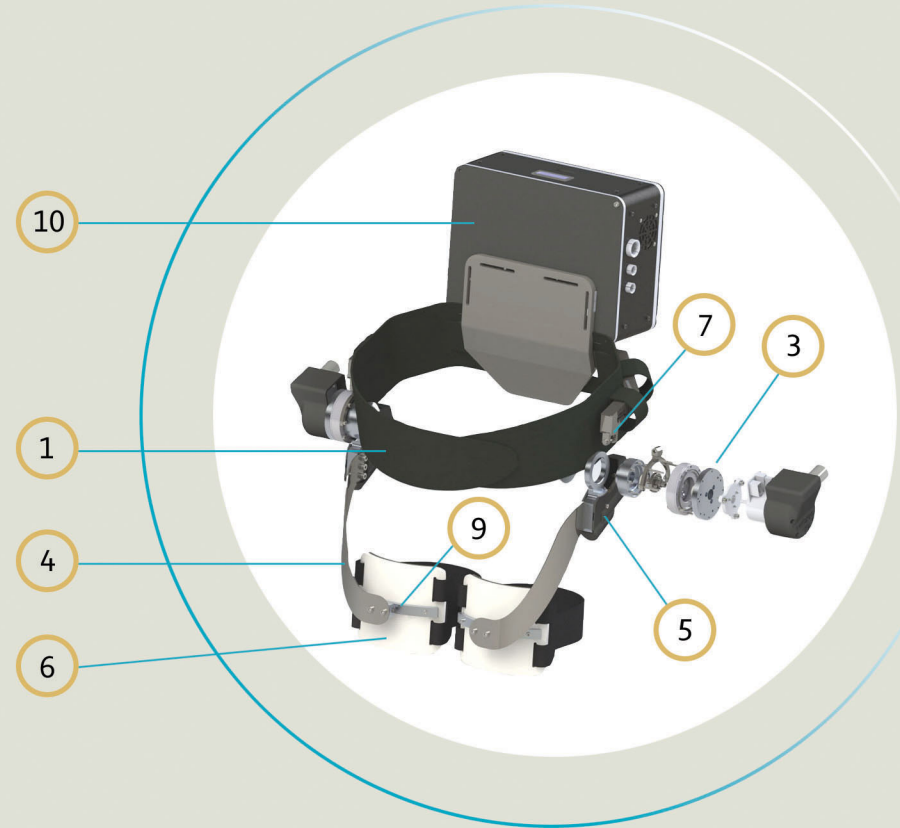
The robot actuators are designed to provide hip flexion torque during the gain cycle.

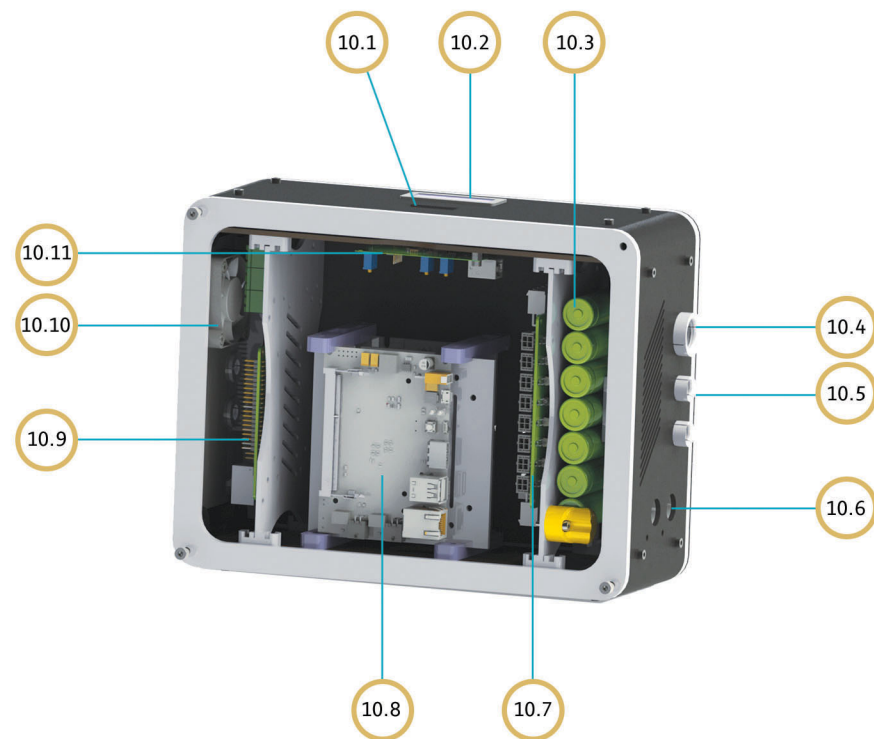
FUM-HEXA can perform all the needed algorithms for the treatment of gait abnormality, and therefore reduce the physiotherapist's physical burden. Moreover, it helps to improve symmetric movement, stride, linear speed, and walking duration.



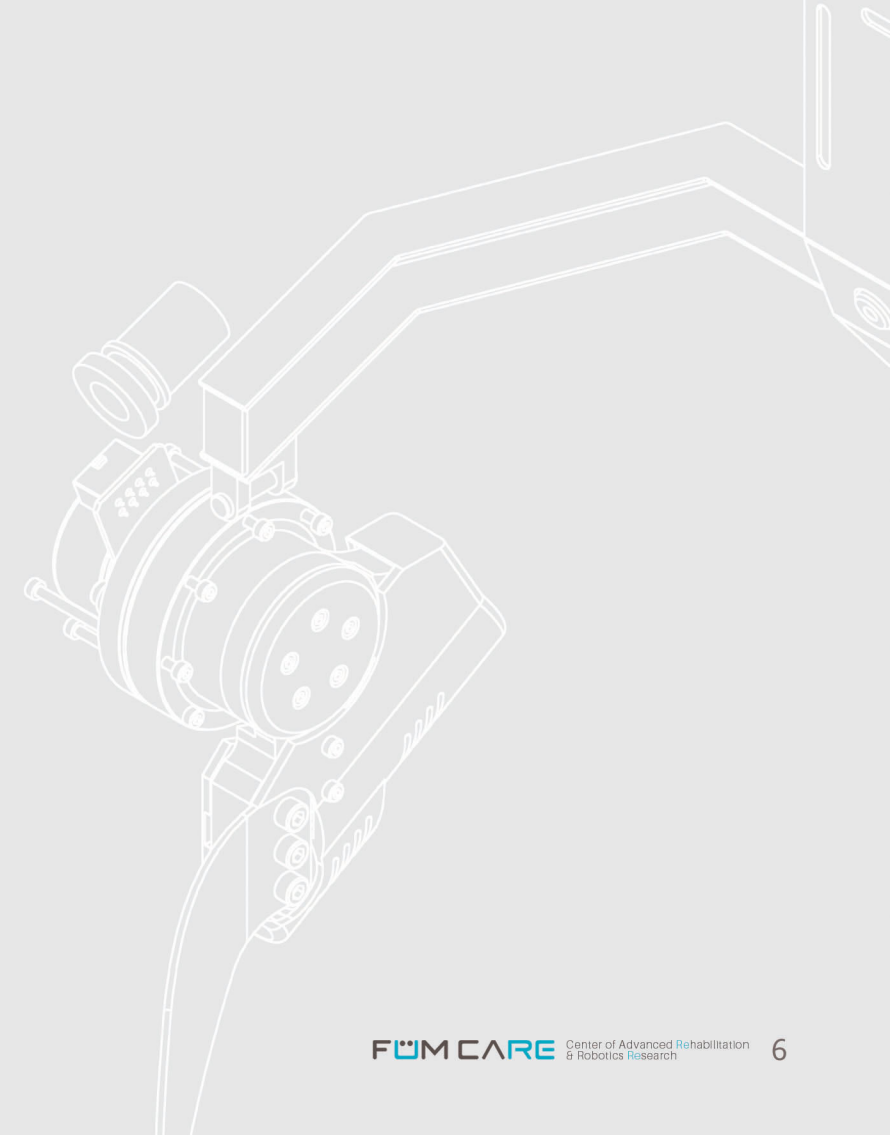
FUM-HEXA Components

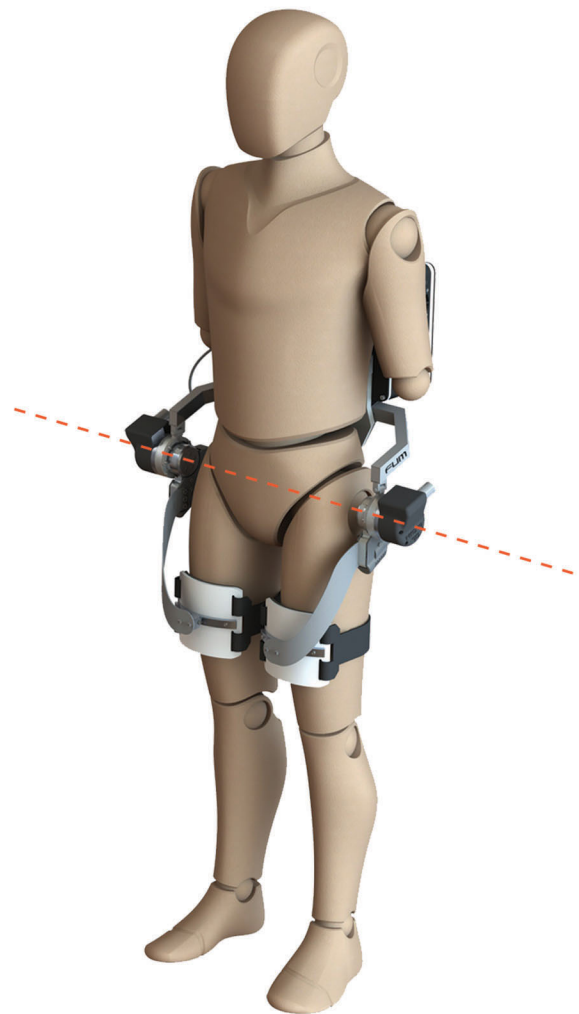
1. Torso Velcro strap
2. Torso adjustable rigid structure
3. Actuator components
4. Ergonomic link
5. Force sensor
6. Thigh Velcro strap
7. Passive degree in frontal plane
8. Active degree in sagittal plane
9. Passive spherical degree (placed on the thigh Velcro strap)
10. Backpack





- 10.1. Power switch
- 10.2. Battery status screen
- 10.3. Battery packet
- 10.4. Actuator wiring
- 10.5. Sensor wiring
- 10.6. Charging socket
- 10.7. Protection Circuit Module (PCM)
- 10.8. Driver
- 10.9. Processor
- 10.10. Cooling fan
- 10.11. Sensor board



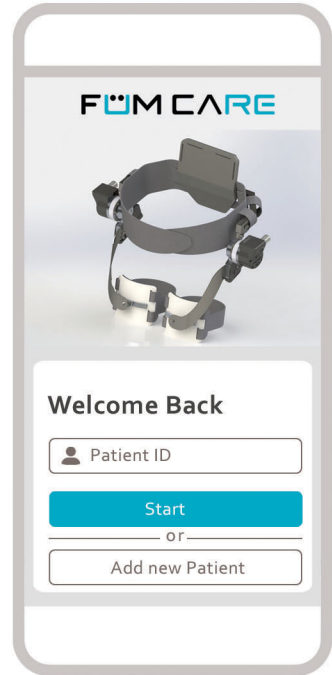


How to Use FUM-HEXA

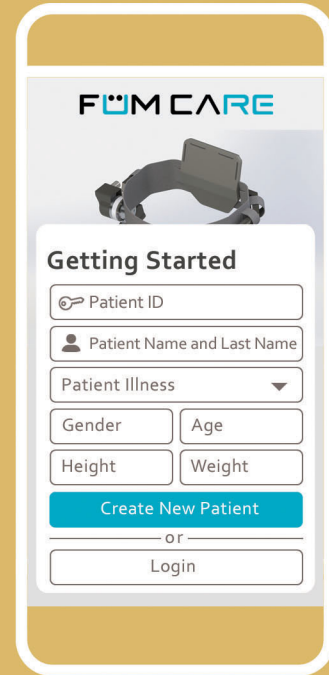
- 1) Wearing the robot and turning it on
(place actuators on the hip joint axis)

2) Entering user ID:

A. Patient ID for registered users is entered and Start button should be pressed

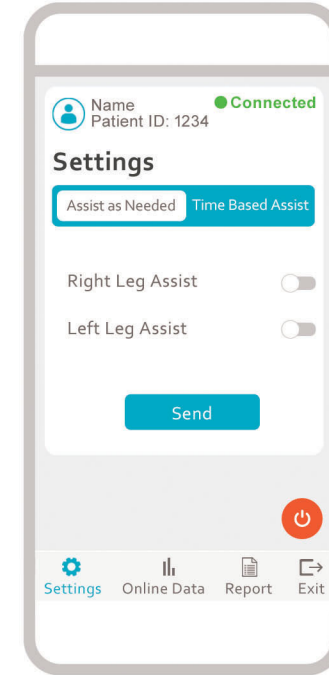


B. For new users, patient ID is first completed and registered

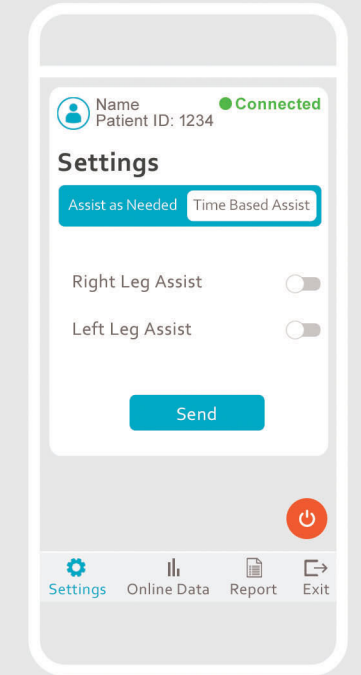


3) Connecting GUI application 4) Choosing the control system

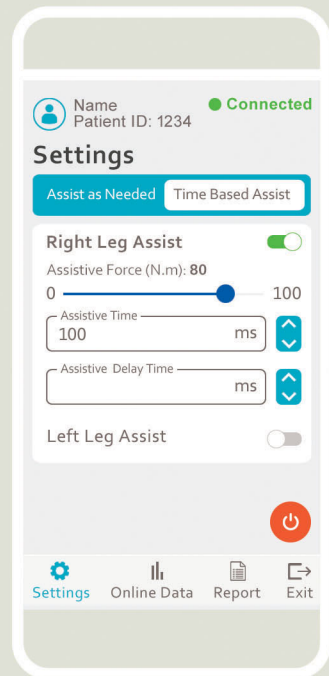
A. Assist as Needed



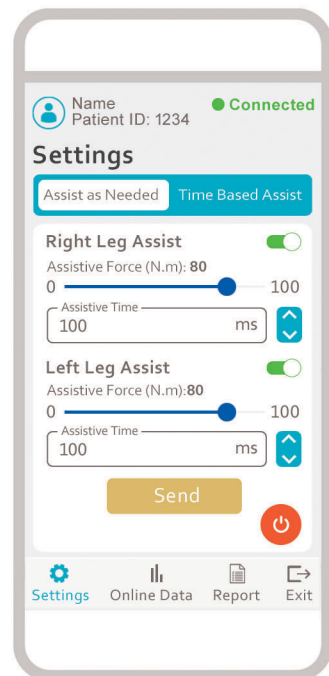
B. Time Based Assist



5) Activating assist for **Each Leg**



6) **Entering** and **Sending** data for Force/Time/Delay Time (Assistive Algorithms) for each leg

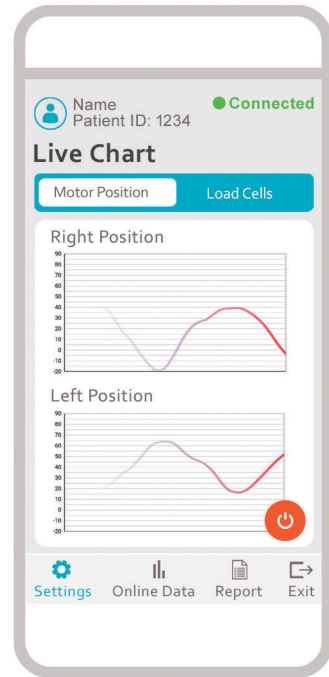


7) Starting the rehabilitation and training

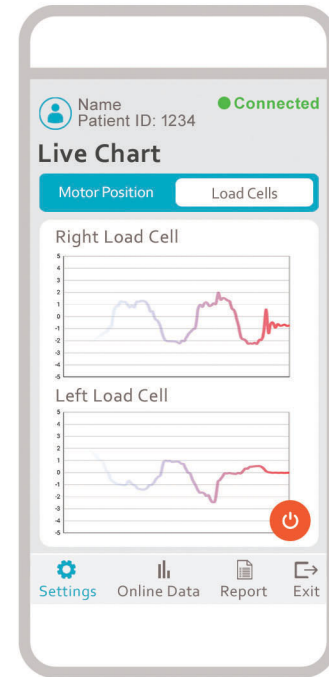


8) Receiving visual feedback

A. Motor Positions

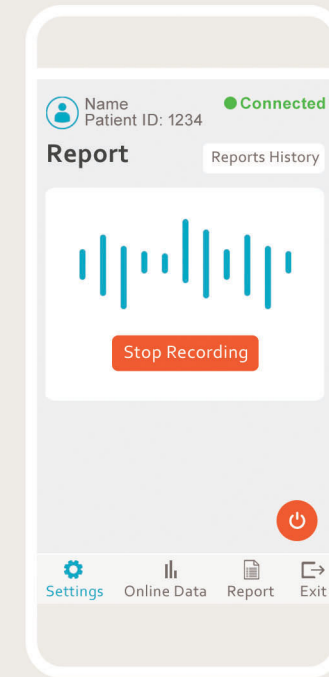


B. Load Cells

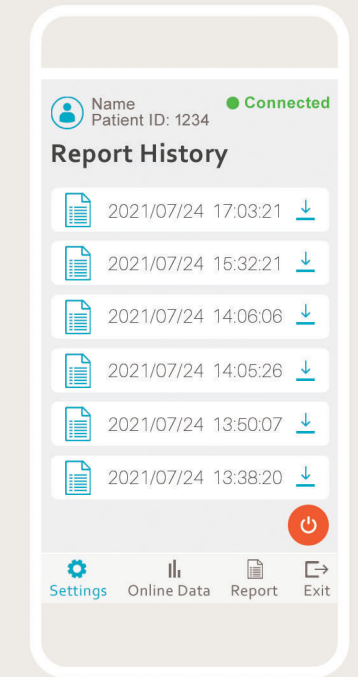


9) Receiving detailed performance report including stride, symmetric movement, and linear speed

A. Reporting data for any period of use



B. Report History



FUM-HEXA



Features

1. Wide range of motion



2. Table of Properties

Weight	6.5 kg
Assistive force	9 Nm
Function duration	1h
Patent number	
User height	thigh>25 cm
User weight	Unlimited