

D3.4 Product instructions



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AMBIENT ASSISTED LIVING

JOINT PROGRAMME

AAL-2013-6-134

Document history

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1 Introduction

This deliverable documents detailed product instructions, which consists of a written user manual and a video manual that has been made to ease the usage of the ironHand (iH) Assistive System. The written manual is supposed to be read by the user and the therapist before usage. Some sections are only for the therapist. The video has been made to facilitate the usage of the ironHand Assistive System. The video explains donning and doffing and how to set up the system.

2 Description D3.4 Product instructions

The written instruction is divided into eight sections. These are the different sections;

- *Important health and safety regulations*

This section is describing the safety regulations in the iH Assistive System for reducing risk of injuries and damaging the system. Things that are being listed is what the user should observe before / while / after using the system.

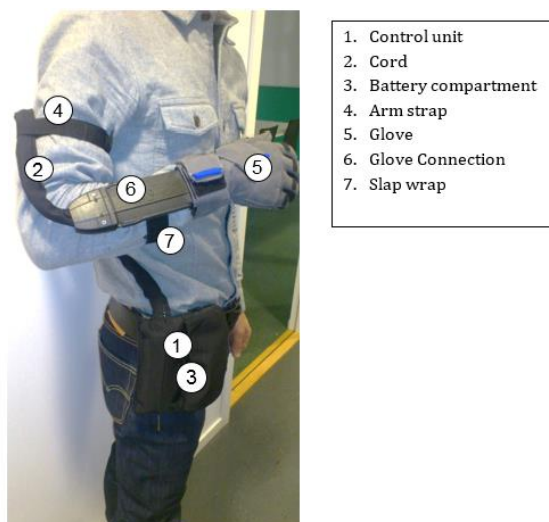
- Use caution when handling fire or burning objects when you wear the iH Glove.
- Always use the accompanying straps to keep the iH Assistive System in place.
- Only use the iH Glove on the hand it is intended for.
- Do not perform any service on your own on the product, service should only be performed by qualified technicians or suppliers. In addition, it is not allowed to modify the prototype in any way.
- Only use the battery specified in this documentation.
- Avoid exposing the iH Assistive System to fluids or small particles that can penetrate the prototype.
- Only use the iH Assistive System under the environmental conditions given in the technical specification included in this user manual.
- Always follow your therapist's instructions. Take extra care on the occasion of hand disorders such as deformity of joints, hyper-mobility etc.
- Do not use the iH Glove without an inner protective glove if you have open wounds or other injuries on the hands.
- Always keep the iH Glove clean.
- The iH Assistive System is a technical aid and should not be used as a toy.
- Do not inflame the batteries as the risk of explosion exists.
- Do not use the batteries at temperatures over 60°C (140°F).
- Do not disassemble the batteries.

- *Introduction*

This section is a briefly introduction to the system; where the intended use of the system and an explanation of the different parts in the system is described. This is an abstract of what is written in this chapter;

- The iH Assistive System is intended to improve the hand grip strength and endurance following the users grip intention and to improve the agility of the fingers. It can be used when additional grip strength and endurance is desired, for rehabilitative purposes and for therapeutic training and monitoring when coupled to external medical software.
- The iH Assistive System can be used in 2 modes, orthotic mode or therapeutic mode. In orthotic mode, the iH Assistive system will be used by itself improving *i)* the hand grip strength and endurance following the users grip intention, and *ii)* the agility of the fingers. It can be used when additional grip strength and endurance is desired, for training on everyday activities and to monitor the user's performance.

In therapeutic mode, the iH Assistive System will be used in combination to the iH Therapeutic System to provide specific hand movement therapy and assessments.
- The main purpose of the glove is to apply the forces generated by the motors in the control unit and to provide the control unit with sensory input from touch sensors at the fingertips. The forces are applied by artificial tendons that are sewn into the glove along the length of the fingers. The glove works together with the control unit that is placed on the arm or on the back of the user. The glove has a slim design and the same look and feel as a regular glove; therefore, it can be worn as any other glove.
- The control unit contains a battery for power source, one motor for each finger that receives extra force and a microcontroller that controls the iH Assistive System functionality. A cord connects the control unit with the glove and holds the artificial tendons as well as electrical cables for sensors. Close to the glove there is a connection that can be opened, separating the glove from the control unit. This gives the possibility to change between gloves or replace an old glove. An embedded software in the control unit adjusts the amount of assistive force to help the user open or close the hand. When an object is held with the aid of the iH Assistive System, the touch sensors on the finger tips signal to the control unit which pulls the tendons such that the force in the grip becomes larger.



OVERVIEW OF THE IH ASSISTIVE SYSTEM

- *Usage*

This is an instruction step by step how to use the system. Also what kind of preparations that needs to be done before usage.

A small selection of what is described in chapter "usage";

- Make sure that the batteries are fully charged.
- Connect the glove with the unit by mating the connection parts at the joint. Close the connection by folding the parts towards each other. The closing is usually confirmed by a snap. To open, press the buttons on the side and unfold the connection.



- Put the control unit on the hip and secure the glove around your upper arm with the arm strap. Then put the glove on the hand as in the picture below.



- Start the electronics by holding the on/off button until the green LED lights up.
- The Glove functionality also consists of a hand opening function performed by the use of passive (leaf) springs attached to the top of the hand. The springs cover the fingers and the back of the hand. Therapists will decide the number of springs that each user should use. This depends on how much force the fingers needs for the opening function. More springs will give a stronger support for the opening function. Maximum number of springs is five.

- *Indicators*

The iH Assistive System has got some LED light indicators. They are acting differently in several situations. These situations are described below.

Signal	Meaning
Led 1 Green light, a slowly pulsating light.	The iH Assistive System Glove is ready for use.
Led 1 and Led 2 is off	<ul style="list-style-type: none"> • The iH Assistive System is off. • The Bluetooth connection to the Therapeutic system is off.

Signal	Meaning
Led 1 Green light, High frequently flashing	<p>The iH Assistive System is in setup mode (starting up to go to ready mode or in preparation for shutting off).</p> <p>This is usually happening when the mechanical connection is open. If the connection is not closed within 20s the system will be shut down.</p>
Led 1, Orange light, A steady light	<p>Info/error message</p> <ul style="list-style-type: none"> • The mechanical connection needs to be opened and closed to initialize the system. • If opening and closing the connection does not remove the orange light, one or more sensors are malfunctioning. This could lead to individual fingers becoming disabled. Contact the supplier.
Led 1, Red light, flashing with an interval 0,2 sec	Battery level critically low. The iH Assistive System will be closed down very soon. Release any object in a safe way as soon as possible.
Led 1, Orange light, flashing with an interval 0,93 sec	The battery level is low. Please shut down the iH Assistive system and connect the charger to the system.
Led 2, Blue light, stable	The connection via Bluetooth is on and the iH system can now be connected to the Therapeutic system.

- *Tips and advice*

Here are some recommendations for the system;

- Placement

The control unit is designed to be placed on the hip (in the belt). However, nothing prevents you from putting it on other places, e.g. it can be put on a table next to you or be strapped to a wheelchair. However, always make sure the cord does not have any loops that can get stuck in your surroundings.

- Usage time

Do not use the iH Assistive system if you feel tendency of fatigue or uneven load from the iH Assistive system; this might cause discomfort.

- *Problem solving*

For trouble shooting when unintended things are happening with the system; some common scenarios and solutions are described in this section. Here comes two example of problem scenarios;

- **1) My iH Assistive system will not start:** Check that the batteries are fully charged.
- **2) Nothing happens when I grip something with my iH Assistive system:** Make sure that the object you grip is in contact with the touch sensors on the inside of the finger tips. If nothing happens when you put pressure on the sensors, contact the supplier for service.

- *Technical specification*

This section is a technical specification over the system, including what environment the system can stand, specification for the battery, weight of the system etc. As an example; the system is working fine in temperatures between -5°C to $+30^{\circ}\text{C}$, battery life is about 8 hours depending on usage, the total weight of the system is about 800 g and the system comes in a set number of sizes.

- *Labelling*

Labelling in the system is presented in this section. There are two different type of labels in the system. One label is placed both in the glove and in the control unit and is telling that it is a prototype with the text "Prototype Not for medical use". The label in the glove is marked with the glove size (for example LL; means Left Large) and an individual name. The other label is a specification of the battery, also marked as a prototype. This label is placed right on the battery.