

A close-up photograph of a worker wearing a grey long-sleeved shirt and a black and orange Ironhand exoskeleton. The worker is wearing black gloves with the Bioservo logo and is handling a brown cardboard box. The background is dark and out of focus, suggesting an industrial or warehouse setting.

# Ironhand<sup>®</sup>

Built to keep operators  
strong, healthy and efficient

# Hand-related MSDs – a growing challenge for the industry

Work-related musculoskeletal disorders (MSDs) are an increasing problem for workers all over Europe. Not only is it the most common health-related issue, the yearly cost in the European Union due to work-related upper limb disorders is over 2 billion euros (OSHA)<sup>1</sup>.

Statistics from the European Agency for Safety and Health at Work show that about 60 % of all workers with work-related health problems identify injuries as the biggest risk factor in the workplace. Among these, some of the most prevalent injuries are upper limb related. The bones, muscles and joints of the hand are not anatomically suited for exerting high force<sup>2</sup>.

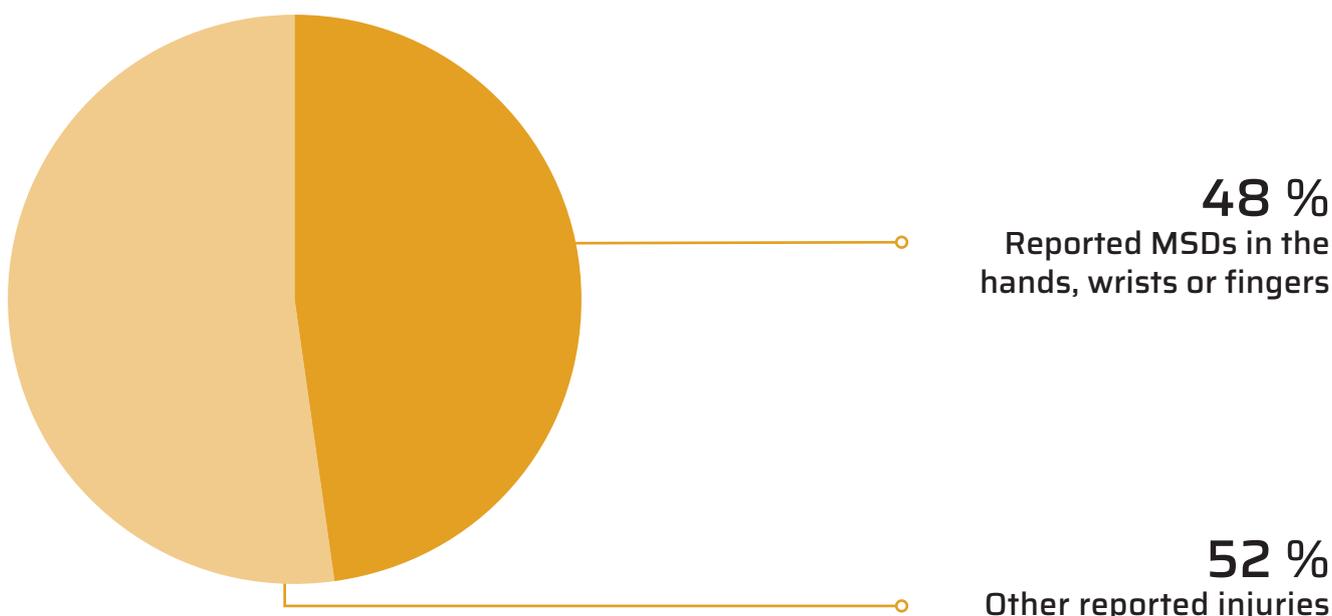
A study from Chalmers University of Technology shows that out of 322 operators in a car factory that were reported as injured, 48 % of the injuries involved MSDs in the hands, wrists or fingers. It was found that 42 % of the injured were men and 57 % women. Further, no significant differences in ages were found from the calculations.

Another study from Chalmers<sup>3</sup> shows that poor ergonomics results in costs, not only from sick leave, but also in lower productivity. In the study an automotive manufacturer reports that the cost for error correction in workstations with poor ergonomics is close to three times higher than in workstations with good ergonomics<sup>3</sup>.

An employee on sick leave is estimated to cost 10 % of his monthly salary per day. And if workers quit and need to be replaced – a new recruitment of a factory worker costs approximately 14.000 EUR including introduction<sup>4</sup>.

According to a report work-related musculoskeletal diseases of the hand and wrist are also associated with the longest absences from work and are associated with greater lost productivity and wages than those of other anatomical regions. Therefore it is of great importance to keep your employees happy and healthy<sup>5</sup>.

## Reported injuries in a factory, 2016–2017



<sup>1</sup> Work-related musculoskeletal disorders: prevalence, costs and demographics in the EU

<sup>2</sup> <https://ec.europa.eu/eurostat/documents/3217494/5718905/KS-31-09-290-EN.PDF/88eef9f7-c229-40de-b1cd-43126bc4a946>

<sup>3</sup> Hand ergonomics in early phases of Production Development – Investigation of risks with early phase ergonomics evaluations, Chalmers University of Technology (2018)

<sup>4</sup> Statistics from Previa Företagshälsovård

<sup>5</sup> Work-Related Musculoskeletal Disorders of the Hand and Wrist: Epidemiology, Pathophysiology, and Sensorimotor Changes



## Ironhand – world's first soft robotic grip strengthening glove

Ironhand is the world's first active soft exoskeleton for the hand. With its sophisticated technology, Ironhand strengthens the human hand, allowing workers to use less grip force when performing repetitive work tasks. Less force used reduces fatigue and prevents strain injuries.

### MIMICS AND ENHANCES THE USER'S GRASP MOVEMENTS

The pressure sensors in the glove activate the sophisticated control system in the Powerpack and pull artificial tendons in the fingers, creating a strong and natural grasping motion. The Smart Assist function uses machine learning and adopts the behavior of the glove based on how the operator is using the glove.

### EASY TO USE FOR DIFFERENT WORK TASKS

In addition to the Smart Assist function, the operator can also configure the system manually and adjust force, sensitivity, locking tendency, force balance, etc. Via the remote control or the IronConnect app, the operator can easily adjust the glove's behavior if necessary.

### AN ERGONOMIC SOLUTION FOR ALL

To ensure an ergonomic solution for both women and men, as well as different body types, and working positions, the Powerpack can be worn on the back or on the hip. In addition to different sizes of gloves, different sizes of armstraps and carrying solutions are also available. Easy donning and doffing has been considered when designing the system and we have made sure that the Ironhand system is easy to put on and take off.

### DIGITAL ERGONOMIC RISK ASSESSMENTS

The most commonly used hand related risk assessment methods are integrated in the system, making it easy for ergonomists to automatically assess workstations and work tasks, creating ergonomic risk reports showing risk levels and how Ironhand can reduce the risk for strain injuries.

### ALWAYS CONNECTED

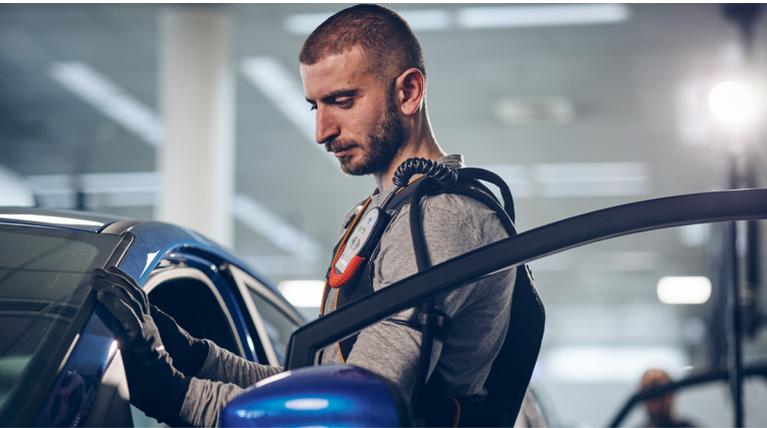
Ironhand has the option to always be connected, via 4G through the built-in sim card, or via Wifi. This means that high-resolution data can be sent to ensure that the system functions as intended and that data for risk reports is continuously collected. Should connection not be available, data is stored locally in the device for later upload.

### KEEP TRACK OF YOUR IRONHAND SYSTEMS

Through the IronConnect Pro app, you can get an overview of all Ironhand equipment at a site, assign gloves to operators, access diagnostics, and create ergonomic risk reports.



# Ironhand provides extra strength and endurance



## APPLICATIONS IRONHAND

Ironhand is suitable for grip-intensive work tasks where the hands are exposed to high forces, repetitive and/or static work. It allows workers to use less grip force. Less force used reduces fatigue, prevent strain injuries, and reduces the number of sick leave days. The Ironhand system has been tested in many applications, below are some examples of applications where the system is beneficial.

## MANUALLY GUIDED TOOLS

All devices, tools and power tools that must be held static for a longer period of time, for example:

- Grinder
- Drilling machine
- Polishing machine
- Welding machine
- Hammer
- Pop rivet gun

## ASSEMBLY

Manual assembly work, for example pressing in, clipping or compressing.

## WAREHOUSING

Lift, hold and carry loads where a secure grip is important

## CONSTRUCTION

The construction industry is labour intensive due to the high amount of manual work tasks involved. The operators often have a few different tasks throughout a workday, however most of them are grip intensive and repetitive or static work tasks.

### EXAMPLES OF INDUSTRIES WITH SUITABLE WORK TASKS:

- Aerospace
- Automotive
- Construction
- Waste management
- Steel structure
- Manufacturing of household appliances
- Butchers

**Bioservo Technologies AB** is a world leading company in wearable muscle strengthening systems for people in need of extra strength and endurance. All our innovative products and systems are designed to keep people strong, healthy and efficient.

The company combines medical science with modern robotics and has a unique global position within soft exoskeleton technology for the hand, both for industrial applications to improve the health for workers and to improve quality of life for people with reduced muscle strength.

Bioservo Technologies was founded in 2006 with the vision to help people with impaired hand function and prevent occupational strain injuries. Today Bioservo Technologies is a Swedish public limited company with headquarters in Stockholm.