



MITHRAS

Introducing  
energy autonomous wearables



Get a unique  
selling point with  
energy autonomous  
devices - powered  
by your clients body  
heat.

# What we are doing

## **Extending the battery life of your devices.**

Mithras Technology AG is an ETH Zurich spin-off company founded in 2018 by a group of multidisciplinary experts.

Our company develops thermoelectric systems to harvest the human body heat and turn it into usable electricity for consumer and medical wearable devices. While our technology can extend the battery life of high-consuming devices, it is able to make less consuming devices completely energy autonomous.



# Our vision

**Use the human body's potential and turn it into a unique selling point.**

By harvesting the potential energy of human body heat, we aim to introduce to market the worlds first energy autonomous medical wearables. This form of energy is available everywhere and anytime – and moreover, energy is not getting any cleaner than using your own body's heat.

Constant and reliant energy supply – independent from access to the power grid – is absolutely critical for patients who rely on medical wearables for their well-being. We offer the solution to this problem and will eliminate the need for re-charging or battery changing. While these needs are an inconvenience for users of leisure devices, our technology can be a true life changer for users of medical wearables.



# Our MVP – an energy autonomous biosensor

## Our market-ready proof of concept.

Mithras Patch is an energy-autonomous wearable biosensor to monitor body core temperature without any interruption by recharging. Possible areas of application are hospital care, point-of-care, wellness, recovery, a variety of professions in extreme conditions (e.g. firemen) and sports. Additionally, this product is meant to strategically serve as a demonstrator of the technology in operational environment. Your product could profit as well from this integratable technology.



### Core features

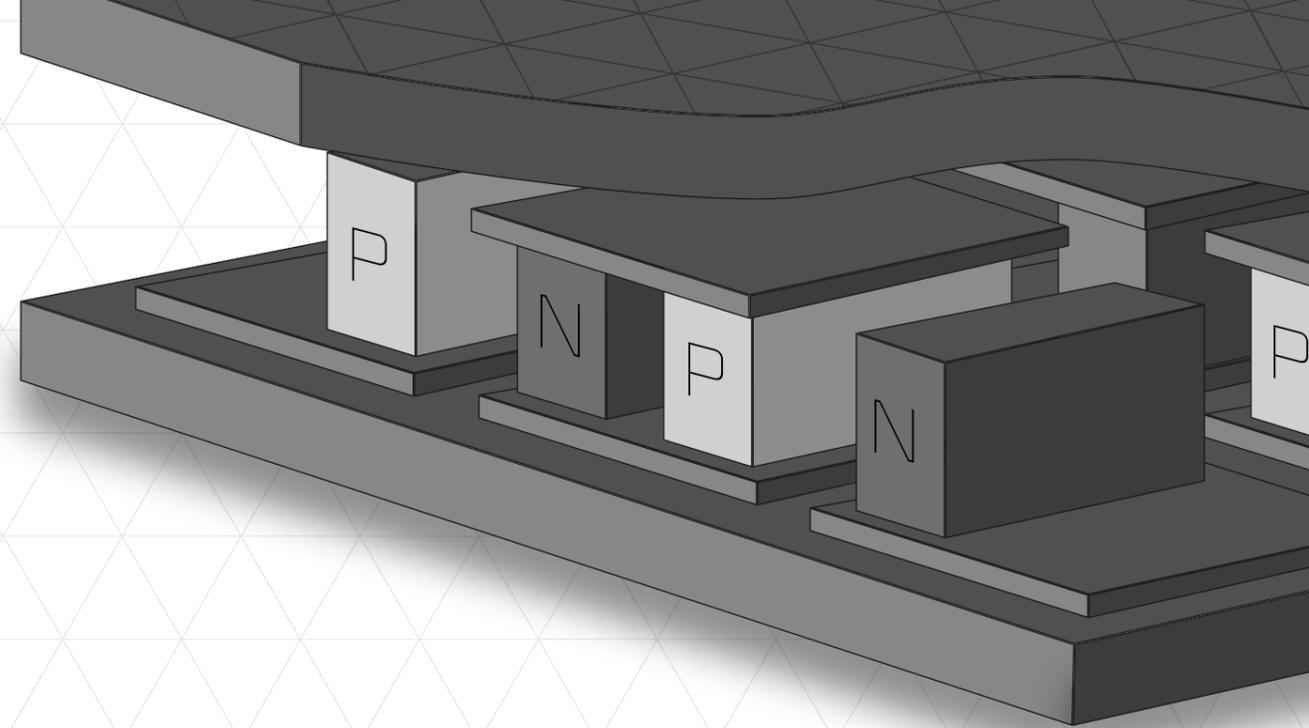
- Energy-autonomous
- Non-invasive
- Unobtrusive
- Monitoring vital signals such as the core body temperature

### Areas of application

- Hospital care
- Point-of-care
- Recovery
- Wellness
- Professional athletes

# This is how it works

**Specifically designed and optimized for human body energy harvesting.**



## Thermoelectrical generator

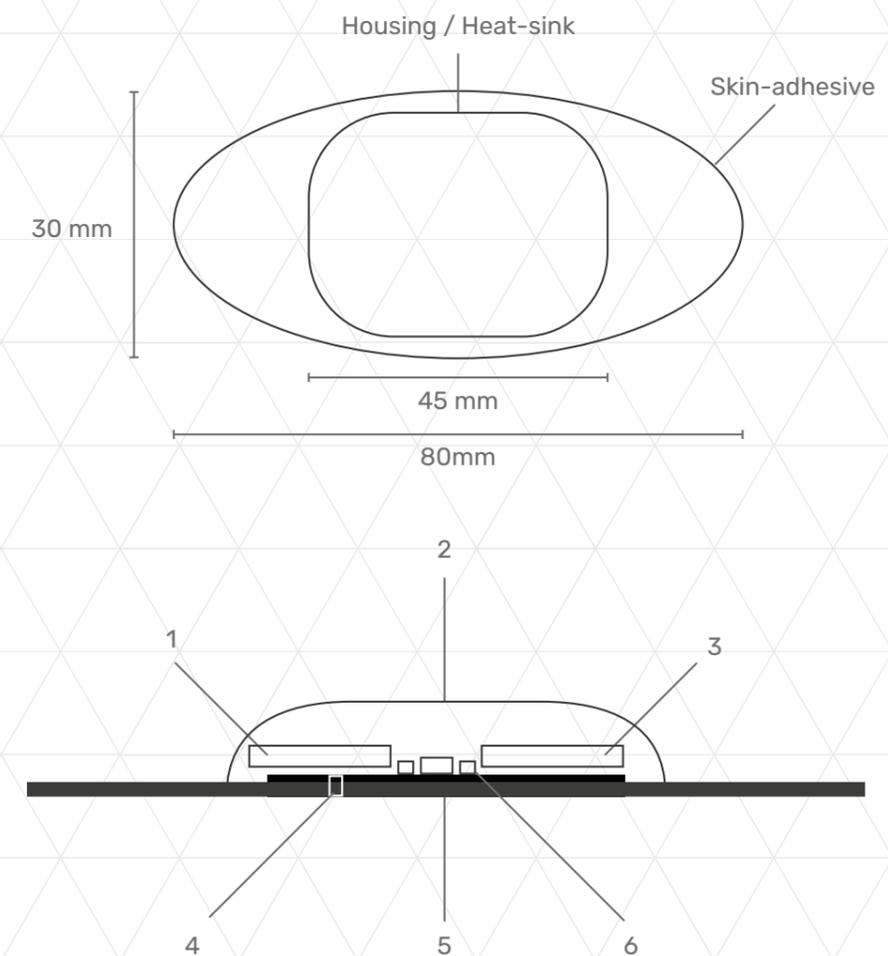
- Mini thermo-electric generator
- High thermo-couple density
- High voltage
- Flip-chip bonding

## Advanced electronics

- Ultra low power DC-DC conversion
- Battery management
- High density energy storage
- Visual interface

## Custom software

- Custom firm-ware
- Low power protocol NFC
- Display control
- Charge indicator
- Data acquisition
- Custom soft-ware
- UX-friendly



1. Energy management and buffer
2. Housing / Heat-sink
3. Data (Processing, Storage, Communication)
4. Temperature sensor
5. Skin interface (hot side)
6. Thermoelectric generator

# Possible applications of our technology

Medical wearables

## MVP

### Energy Generation

0.1mW-1.0mW

### Impact on battery\*

Energy Autonomous

### Area needed by TEG

11 cm<sup>2</sup>



Implants

## Cochlea

### Energy Generation

0.5 - 4 mW

### Impact on battery\*

Depending on energy consumption 50% - 100%

### Area needed by TEG

12 cm<sup>2</sup>



Consumer wearables

## Bracelet

### Energy Generation

11.25 mW

### Impact on battery\*

Depending on energy consumption 50% - 100%

### Area needed by TEG

30 cm<sup>2</sup>



Integration costs of our technology largely depend on the individual circumstances of your application, in particular integration complexity as well as production sizing. It is our intention to provide our technology in exchange for a license-based reward model linked to the forecasted gross margin of your product.

\* Assuming a 24 hour period with temperature difference between skin and surrounding air of 5° celsius

# The potential

## **Our modular technology can be integrated in nearly every device - how about yours?**

Potential application scenarios include hospital care, point-of-care diagnostics, recovery, wellness, certain professions under extreme conditions (e.g. firemen) and sports. Also, in the current Covid-19 crisis, body core temperature measurement is the most relevant data collection to prevent a further spread of the virus and detect symptoms early.

Core temperature measurements are relevant in a multitude of devices across several industries: health tracking in consumer devices, athlete monitoring in sports, professionals in high-risk jobs and environments, astronauts, divers, firemen, etc. Besides a smart patch, Mithras technology can also be integrated in other wearables such as

smart watches, activity trackers or point-of-care diagnostic devices.

The amount of energy that can be produced and the related functionality of the device is highly application specific. High activity applications where the wearer is active and/or there is high air convection allow for close monitoring with high sample rates and frequent communication to a peripheral device.

Other applications on stationary subjects in warm environments require duty cycling and reduced status updates. Although energy profiles might vary, there is typically a highly promising match between use case

and required sample rate and data communication requirement.

Body core temperature measurements can bring benefits to many applications, but the real added value is generated in combination with energy autonomy. The energy budget in wearables is limited and often extra sensors cannot be integrated without reducing battery lifetime dramatically. In contrast, our solution is zero-power and does not affect the energy budget. This is particularly of interest in applications where the wearer/patient is not able to follow regular recharging intervals.



# What we are looking for

Currently, we are developing our MVP together with ETH Zurich, one of the most renowned tech-universities in the world, and Innosuisse, Switzerland's governmental instrument of innovation support. We are seeking potential partners for this development process, who are willing to implement our MVP technology into their own devices in pilot projects.

If your company is producing a product that could be improved by our thermoelectric solution, we would be happy to discuss a possible collaboration.

We are looking forward to hearing from you!

