Physiological Data Signals

Pulse Oximetry

- Oxygen saturation (SpO2 %): 1Hz
- Photoplethysmography (PPG): 64Hz
- Heart rate: 1Hz

Systolic Blood Pressure (BP)

1Hz (Estimated using Pulse Transit Time computation)

3-lead ECG
256Hz, 6.5uV Resolution

- Heart rate: 30-220 BPM, 1Hz
- QRS event detection: 4ms resolution.
- RR intervals: 4ms resolution
- Quality assessment channels:
    - Disconnection detection
    - 50-60Hz noise detection
    - Saturated ECG signal detection
    - Movement artifact detection
    - RR intervals reliability detection

3-axis Accelerometer
64Hz, +/-16g range, 0.004g resolution.

- Actigraphy: 1Hz
- Step counting: 30-240 SPM: reported at each step detection.
- Cadence: 1Hz (30-240 SPM, calculated on 8 last steps)

Dual Channel Breathing Sensors
(RIP) 128Hz

- Breathing Rate: 3-60 BPM, 1Hz
- Minute Ventilation: 80-65000 mL, 1Hz
- Tidal Volume (last inspiration): 80-10000 mL, 1Hz, 20mL resolution
- Inspiration and Expiration Events: 8ms resolution
- Quality assessment channels:
    - Disconnection detection
    - Noise detection
    - Baseline change detection

Skin Temperature

1Hz, 0.1 Celsius resolution
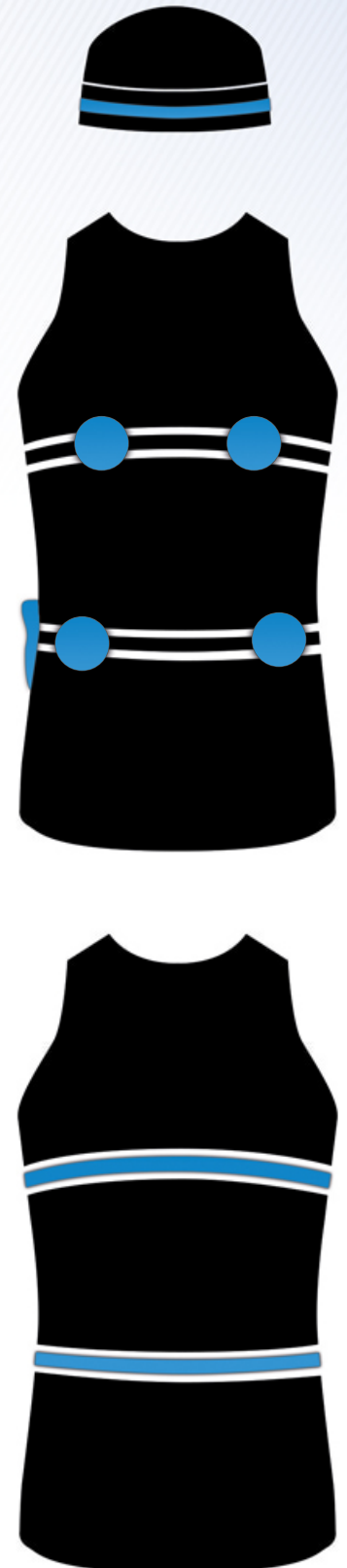
Physical Specifications

Physical Overview

- Dimensions: 85 x 55 x 25 mm
- Device weight: < 100g
- Garment weight: < 90g

Battery

- Li-Ion rechargeable 1000 mAh
- Autonomy: 24h

Embedded Local Data Storage

- Capacity: 1 GB of data
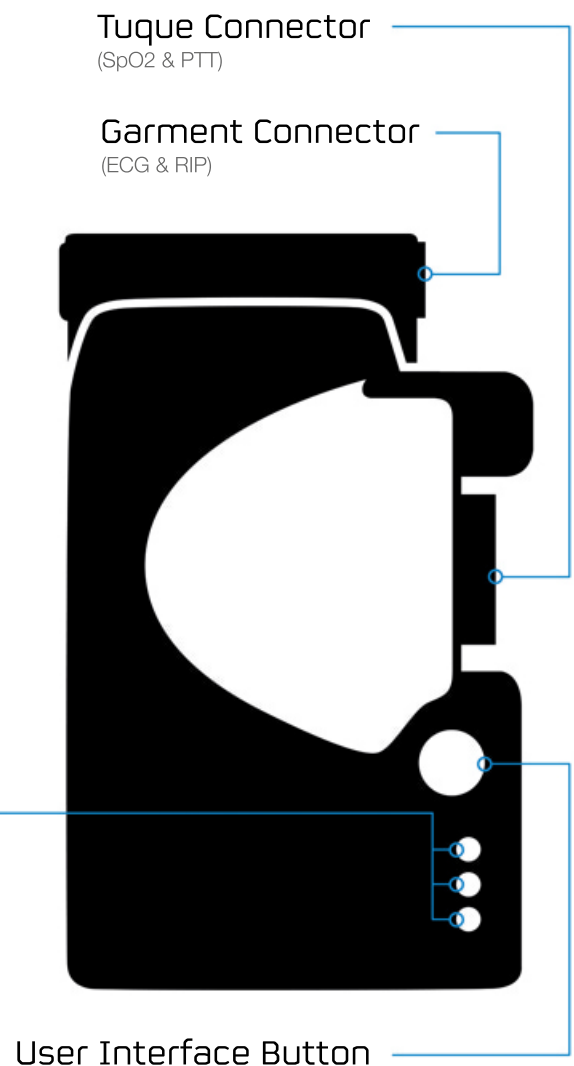- Autonomy: ~140 hours of recording

Physical Dimensions

85 x 55 x 25 mm

Weight

100 g

Tuque Connector
(SpO2 & PTT)

Garment Connector
(ECG & RIP)

LEDs
Power On / Battery Full (Amber)
Recording (Amber)
Bluetooth Pairing and Rx/Tx Activity

User Interface Button

System Integration

Hexoskin is a system to monitor the general health, vital signs, sleep, and activity, using wearable sensors embedded in smart garments. The system can be used for a wide range of research domains including circadian rhythms, cardiology, behavioral and physiological psychology, biofeedback, sleep patterns, effects of aging on physical performance, human energy expenditure, and physical conditioning.

The system has been designed to minimize user setup time and maximize vital signs monitoring over long periods in a non-obtrusive way. Data is synced automatically and wirelessly to local and remote servers for health data management and analysis.

Software tools are available to manage groups of people, including comparison of activities between members of a group. Software for iPhone, iPod and iPad is available (Android version will eventually be developed) for real-time monitoring of vital signs and historical data. The system adds less than 90g to the shirt, and the sensors are washable using normal washing machines.

HEXOSKIN