

Physilog[®] 4 Datasheet



Physilog[®] is a Swiss-made wearable standalone measurement unit containing inertial sensors.

The technology was born 10 years ago out of translational research collaborations between Lausanne's University Hospital (CHUV) and the Swiss Institute of Technology of Lausanne (EPFL). Physilog[®] provides objective and quantitative assessment of movement disorders and performance.

Physilog[®] 4, the latest Physilog[®] generation, was designed in 2013 by Gait Up. The Physilog[®] 4 Silver, comes with 10D sensing capabilities, USB charging and wireless functionalities. Physilog[®] 4 Gold has one more recording channel: either GPS, Bluetooth, Droplet or ECG module. In 2015, Physilog[®] sensors have been worn by more than 5000 subjects worldwide and have been validated for various applications in scientific publications.

SENSOR SPECIFICATIONS

Electrical characteristics

Internal Storage	4 Gb – Physilog® Silver: 9 days at 200Hz
Battery	Rechargeable Lithium Ion Polymer Battery life up to 23 hours*
Supply Voltage	DC min: 4.2V – max: 6V min: 125mA – max: 250mA
Port	Micro-USB for charging and data transfer
Operating Temperature	From -40°C to 45°C

* Depending on Physilog® model and configuration, see autonomy table below

Mechanical Characteristics

Dimensions	50 x 37 x 9.2 mm Anatomical curved shape
Weight	19 grams (including battery)
Button	Start/Stop membrane switch with dual-color LED
Material	ABS plastic (same as LEGO®)
Fixation	Double side Velcro or optional buckles with elastic straps

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Physilog[®] 4 Silver Characteristics

Sensor Specifications	10 D Measurement			
	3D Accelerometer	3D Gyroscope	3D Magnetometer	Barometer
Measure	Linear acceleration	Angular Velocity	Magnetic field strength	Atmospheric pressure
Programmable range of measurement	±2g, ±4g, ±8g and ±16g	±250, ±500, ±1000, and ±2000°/sec	±1000 µT	10 mBar to 1200 mBar
Sampling rate	Programmable from 1 to 500 Hz (Magnetometer: max. 50Hz, Barometer: max. 100Hz)			
Wireless Synchronization	Radio frequency synchronization – as many Physilog [®] sensors as you wish			

Physilog[®] 4 sensors do not need yearly recalibration.

Physilog[®] 4 Gold options

In addition to the 10D sensing of the Physilog[®] 4 Silver, the Physilog[®] 4 Gold has one more channel which can be used for either GPS, Droplet or ECG option. A wireless version of the Physilog[®] 4 using Bluetooth exists for real time applications.

GPS module



A GPS module for outdoor localization can be added to the Physilog[®] 4. This option is available with or without an external antenna. The external antenna allows a more accurate and reliable localization. GPS data can be exported to csv using the Research ToolKit described below. The latitude, longitude, elevation and time of each measurement point are given in the csv file.

Antenna specifications:

- Size: 48x40x13mm
- Weight: <105g

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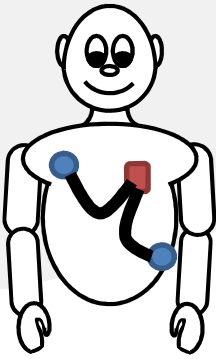
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Droplet

The Physilog Droplet is the smallest inertial sensor available on the market, it can be placed on a fingertip. The droplet is a deported 6D inertial sensor unit containing a 3D accelerometer and a 3D gyroscope. It is possible to add a 3D magnetometer to the droplet to do 9D measurements. Up to two droplets can be added to one Physilog[®] 4 which allows for example to measure finger movements during piano playing.



ECG

The two-electrode ECG module allows to measure the heart rate of the subject synchronized with the other Physilog sensors.

Bluetooth

A Bluetooth option can be added to the Physilog[®] 4 Gold. It allows to stream the sensor data wirelessly to a computer or Android device and display them in real time. The streamed data can be directly saved on the computer as a .csv file at the end of the measurement without connecting the sensor by USB. The data is sent to the computer by UDP protocol which also allows to do real time computation. The wireless data streaming works for distances up to 10m from the sensor module to the receiving device. Sensor data is also stored on the Physilog's internal memory for later transfer to the computer via USB cable.



Synchronization of Physilog with other Systems

It is possible to synchronize a Physilog sensors with other systems such as camera based systems from Vicon or Qualisys. Therefore an additional Physilog is used to receive/send a trigger signal from/to the other system which can be used in data post-analysis to synchronize the signals of the Physilog with data from external systems. Contact us for more information for your specific application!

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Autonomy estimations for Physilog[®] 4 Silver

Measuring channels					Recording frequency	Approx. Autonomy*
3D Accel	3D Gyro	3D Magneto	Barometric Pressure	Radio signal	Hz	Hours
◆	◆	◆	◆	(Master, 1s interval)	50	21
◆	◆		◆	-	100	23
◆	◆		◆	-	125	23
◆	◆	◆	◆	(Master, 1s interval)	200	17
◆	◆		◆	-	200	21
◆	◆			(Master, 1s interval)	200	21
◆	◆	◆	◆	(Master, 1s interval)	500	15
◆	◆			(Master, 1s interval)	500	19

* The autonomy depends on external factors such as temperature

CERTIFICATIONS

Physilog is:

- CE marked
- FCC certified
- RoHS compliant

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SOFTWARE SPECIFICATIONS

File formats & compatible software

- Physilog[®] 4 is compatible with both Mac and PC
- Physilog[®] 4 generates .bin files, which are opened with any Gait Up Software
- Gait Analyser software directly computes gait parameters from .bin files (compatible Windows 7,8,10 and OS X Yosemite and Mavericks)
- Research ToolKit software allows to export .csv files from .bin files for further use in XL, MATLAB, Octave, etc. (compatible Windows 7,8,10)

Research ToolKit

- Visualise the raw data of all sensors
- Zoom on your signals
- Extract segments of interest in CSV format
- Adapt sampling Frequency to your own application
- Program sensor range (acc, gyr) for your own project
- Synchronize wirelessly as many sensors as you wish
- Check battery level of your sensor
- Update to latest firmware
- Return to original configuration



For more information about Research ToolKit software see the RTK user manual. It can be downloaded from Gait Up's website: www.gaitup.com/support

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