LightMove 4

Ambient Light and Physical Activity Sensor

Operating and Safety Instructions

movisens

Imprint

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1 Welcome!

Dear customer,

Thank you for choosing the Ambient Light and Physical Activity Sensor **LightMove 4** from movisens. With this sensor, you get the newest technology for mobile monitoring of ambient light and physical activity in everyday life.

Please read this manual completely and thoroughly before bringing the measurement system into service!

In this manual you will find the most relevant operating instructions and the safety instructions.

Please find the full movisens documentation here:

docs.movisens.com

If you have any further questions, don't hesitate to contact us. It is our pleasure to help you:

Phone: +49 721 381344-0
E-Mail: support@movisens.com

2 Intended use

LightMove 4 is a scientific research instrument that captures the ambient light, physical activity and other secondary parameters derivable from these measurement signals. **LightMove 4** is designed and tailored for the use in research applications.

The Ambient Light and Physical Activity Sensor LightMove 4 is not a medical device!

The sensor measures the physical activity of a person based on the acquisition of acceleration in three dimensions and atmospheric air pressure. Moreover the sensor also records the rotation rate and the ambient temperature. The ambient light is detected via a color light sensor. This sensor allows the measurement of illuminance (brightness) over a wide range (darkness to sunlight), color temperature measurement and light source type detection (enabled by an integrated additional IR channel).

The sensor configuration occurs via a USB 2.0 connection to a Windows PC using the **Sensor Manager** software.

3 Explanation of Symbols

⚠	**Caution.** **Read the manual and the safety instructions to find out about possible hazards and the needed actions to avoid these hazards!**

4 Safety Instructions

Please follow these safety instructions. Improper use of the product may impair/affect the protection provided by the product and cause product damage or personal/physical injury:

- **LightMove 4 is not a medical device. Do not use it for a medical purpose.**

- Only use **LightMove 4** for the intended use.

- Carefully read and follow the cleaning instructions.

- For long term measurements (> 1 day) we suggest wearing pauses of at least 20min per day.

- If any problems occur by wearing the sensor, band, belt or attachments (e.g. pressure marks, skin irritations or other discomfort), stop using the system immediately.

- Only use the **LightMove 4** under the specified environmental conditions.

- To charge the battery of **LightMove 4**, only use USB 2.0 standard compatible devices.

- Charge the sensor only at ambient temperatures below 45°C.

- The use of the cradle is only intended for indoor use.

- Never open **LightMove 4**.

- The battery of **LightMove 4** may only be changed by the manufacturer.

5 Scope of Delivery

The following components are included in delivery:

Article	Order No.
LightMove 4 Ambient Light and Physical Activity Sensor, Cradle, Micro USB cable, Belt Clip, Operating and safety instructions	10401

To be able to do measurements a PC is needed in addition to the scope of delivery.

6 Accessories

The following accessories can be ordered optionally:

Article	Order No.
Wrist Band (S) Size: S Wrist Measurement: 13 to 16 cm	30431
Wrist Band (M) Size: M Wrist Measurement: 15 to 18 cm	30432
Wrist Band (L) Size: L Wrist Measurement: 17 to 23 cm	30433
Wrist Band (XL)	30434

Size: XL Wrist Measurement: 20 to 28 cm	
USB Charger USB Charger for 110-240V	30100
USB Hub USB Hub 2.0, 7 Ports	30101
Micro USB Cable	30102
Cradle 4 Cradle with Micro USB interface	30400

7 Consumables

The following consumables can be ordered optionally:

Article	Order No.
Meliseptol Rapid (250 ml) Ready-to-use alcoholic disinfectant for spraying or wiping.	40410

8 Description of the Sensor

LightMove 4 is designed to be worn with a wrist band on the non-dominant arm.

LightMove 4 is also equipped with a Bluetooth Smart interface. The sensor can be used in conjunction with a gateway or a mobile phone for live applications. The Bluetooth Smart interface is activated in the default configuration of the sensor. To deactivate this interface, a firmware update is required.

The axes of the integrated acceleration sensor are described in the following figure:

9 User interface and indicators

LightMove 4 is equipped with a multi-colored LED to show the status of the sensor:

Status-LED	Meaning
Flashing red (once per second)	The sensor is active and records data

Flashing red slowly (every two seconds)	Delayed recording active
Flashing green	The sensor is connected to a PC or a charger. The battery is fully charged.
Flashing blue	The sensor is connected to a PC or a charger. The battery is actually being charged.
Flashing magenta	The sensor is active and records data. It is connected to a charger. The battery is actually being charged.
Flashing yellow	The sensor is active, records data. It is connected to a charger. The battery is fully charged.
Flashing blue fast (three times per second)	The battery is low, sensor will turn off soon.
Flashing red fast (three times per second)	An Error occurred. Reset the sensor with the Reset Sensor Program. If the sensor doesn't stop flashing, please contact the manufacturer.
No LED active	The sensor is inactive.

Combinations of red and green blinking as well as red and blue blinking are possible with the appropriate combination of the above described meanings.

LightMove 4 features a vibration alarm. It vibrates two times when a marker is set. During measurement a marker can be set by double tapping on the front of the sensor.

10 Software Installation

Please ensure that your PC fulfills the requirements:

- A PC with Microsoft Windows 7 or higher, 64bit

- USB 2.0 Port

- Administrator rights during installation

- A minimum of 300 MB free space on hard disc

Step 1: Download the SensorManager from the movisens Website

Step 2: Double click the file "movisens_SensorManager_Setup.exe"

✓ The Installation runs automatically in the background. After successful installation, shortcuts are created in the Windows Start Menu under the entry "movisens SensorManager".

Step 3: Download the UnisensViewer from the movisens Website:

Step 4: Double click the file "UnisensViewer_Setup_Full.exe"

✓ The Installation runs automatically in the background. After successful installation, a shortcut "UnisensViewer" is created in the Windows Start Menu.

11 Handling

This chapter describes how to prepare a measurement and how to attach the sensor to a test person. Furthermore you get information on how to save, delete and analyze data from the sensor.

11.1 Charging the Sensor

Step 1: Connect the cradle with the USB cable to a USB 2.0 port (USB port of your computer or another port that conforms to USB standard like USB hub or USB charger). Attach the sensor with the help of the push buttons at the cradle. Please make sure that the 4 contacts are connected (marked red in the picture). To charge multiple sensors at the same time, we suggest using a USB hub.

✓ After connecting the sensor to a USB port, the charging process starts immediately. During charging, the status LED is blinking blue. If the sensor is fully charged, the LED is blinking green. The charging process of the sensor can take up to two hours, depending on the battery status of your sensor.

✓ If the sensor is fully charged, the battery run time during recording is 3 days.

11.2 Preparing a Measurement

Step 1: Start the **SensorManager** by selecting
Windows Startmenu → movisens SensorManager → SensorManager

Step 2: Connect the **LightMove 4** sensor to your PC using the cradle.

The SensorManager application shows information about sensor hardware, sensor state and sensor configuration.

Before you start a measurement please check the charging status of the battery. The maximum measurement duration can only be reached when the battery is fully charged.

11.3 Starting a Measurement

To start a measurement, please perform the following steps:

Step 1: In the **SensorManager** software click on the „Start Recording" button in the lower left of the window.

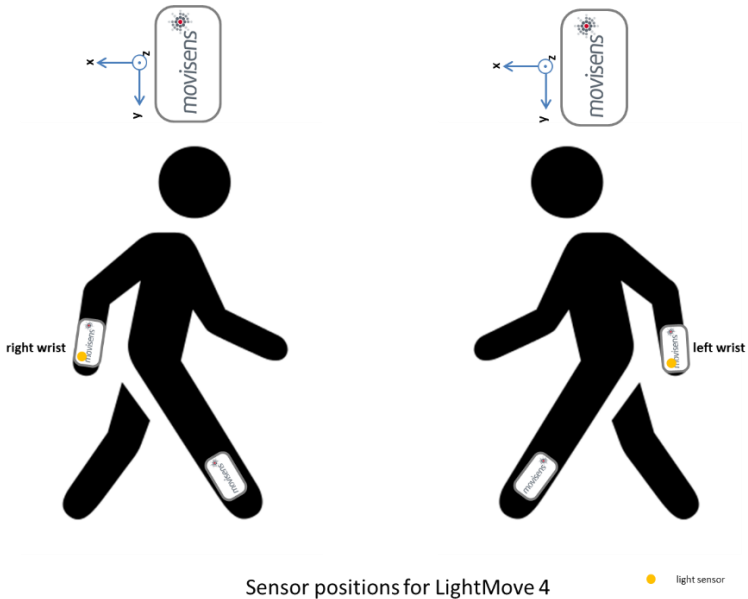**Step 2:** Please supply the requested information into the text fields.

Step 3: Start the measurement by clicking the „Start" button.

Step 4: Please follow the instructions and remove the sensor from the cradle.

✓ The status LED will flash red once per second as soon as the measurement has started and data will be recorded. If a delayed start was configured the LED flashes red every two seconds until the measurement starts.

✓ At the end of the measurement the LED stops flashing.

11.4 Attaching the Sensor to the Test Person

Attach the sensor to one of the following locations:

Sensor positions for LightMove 4   ● light sensor

Use the wrist band to attach the sensor to the non-dominant hand of the test person. At this position, only simple parameters like Movement Acceleration can be measured.

Depending on the position of the sensor, different parameters can be analyzed after the measurement. For more details refer to the user manual of the **DataAnalyzer**.

11.5 Stopping a Measurement

The measurement will automatically be stopped if the configured measurement duration has passed.

A running measurement will also be stopped when:

- The sensor is connect to a PC

- The end of the battery run time has been reached

If the battery is low, this is indicated by fast blue flashing light (three times per second). The sensor will turn off soon.

11.6 Storing Measurement Data

The measurement data of the sensor is stored as raw data (e.g. the acceleration data as it is measured).

To store recorded measurement data on the PC do the following steps:

Step 1: Start the **SensorManager** by selecting
Windows Start menu → movisens SensorManager → SensorManager

Step 2: Connect **LightMove 4** sensor to the PC using the cradle.

Step 3: Click on „Save Data".

Step 4: Please type in the requested information.

Step 5: Finally click on „Save data"

The measurement data will be stored either in the unisens format or as .csv file. Unisens is an open data format for multi sensor data. You can find further information about unisens here: www.unisens.org

12 Cleaning Instructions

It is important to clean the sensor and the wrist bands regularly to avoid possible infections between users.

Clean the sensor and the wrist band at least after each participant.

12.1 Cleaning the Sensor

If you want to clean **LightMove 4** and, please note the following:

- Disconnect the sensor from wrist band and cradle.

- Use fast-acting alcoholic surface disinfectant (e.g. Meliseptol Foam Pure) to clean the complete sensor housing. Respect the instructions of the manufacturer.

12.2 Cleaning the Wrist Bands

To clean the band please observe the following:

- Disconnect the sensor from the band.

- Disinfect the band with fast-acting alcoholic surface disinfectant (e.g. Meliseptol rapid). Respect the instructions of the manufacturer.

- Wash the band by hand and not in the washing machine. Use a mild liquid detergent.

- After washing rinse the band with clear water.

- Directly after washing, air-dry the band before storing or using it for new measurements.

13 Maintenance and Proper Disposal

13.1 Maintenance

Besides charging the batteries, **LightMove 4** does not need any further maintenance. The battery capacity will decrease slowly with charging cycles and age. The battery can only be changed by movisens. Please contact us in the case when a replacement is necessary.

13.2 Proper disposal

For the proper disposal send **LightMove 4** back to movisens. Alternatively contact a licensed, certified electronic scrap disposal merchant. Please consider your local regulations for waste disposal.

14 Troubleshooting

Frequently asked questions related to all of our products can be found here: https://www.movisens.com/en/faq/

15 Technical Data

Power supply	Lithium-Polymer-Battery, 3,7V
Number of charging cycles	300 (with 1 C / 1 C > 80%)
Internal memory	4 GB
Maximum recording capacity	2 weeks
Battery run time	~ 3 days

Recharging time	~ 1 hour
Connectors	USB 2.0 via Micro-USB, 5V, 500mA
Size of sensor (W x H x D)	62,3mm x 38,6mm x 11,5mm
Weight of sensor	26 g
Internal sensors	**Ambient light sensor:** Channels: 5 (red, green, blue, clear, IR) Measurement range: 0 - ~45 000 lux Resolution: Up to ~0,011 lux (at low end) Output rate: 1 Hz **3D acceleration sensor:** Measurement range: +/- 16 g Output rate: 64 Hz **Rotation rate sensor:** Measurement Range: +/-2000 dps Resolution: 70 mdps Output rate: 64 Hz **Pressure sensor:** Measurement range: 300 - 1100 hPa Resolution: 0,03 hPa Output rate: 8 Hz **Temperature sensor:** Output rate: 1 Hz
Live Analysis	Heart Rate, bpmBxB, NN-List, HRV Rmssd, HRV is valid, Movement Acceleration, Step count

Indicators	LED, 3-color Vibration alarm
User Interfaces	Marker (tapping)
Wireless interface	Bluetooth Smart (4.0)
API	Java API for USB (Windows) Java Bluetooth Smart Gatt Library
Wear locations	Chest
Wearing systems	Chest Belt, adhesive Electrodes
Environmental conditions Sensor	indoor/outdoor use, pollution degree 2 Altitude: up to 2000m Ambient Temperature: -20 °C to 55 °C 5°C to 40°C during charging Maximum rel. humidity: 80% for temperatures up to 31°C, linearly decreasing to 50% for temperatures >= 40°C
Environmental conditions Cradle	indoor use only, pollution degree 1, other conditions as above

16 Legal Notes

16.1 Disclaimer

The products this manual describes are subject to change without prior notice. movisens makes no representations or warranties with respect to this manual or with respect to the products described herein.

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