

# Loop One

## User guide

Version 0.5.0

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## Introduction

Welcome to the future of air quality measurement. What you got in your hands is the world's best indoor air quality measurement device. Make sure you read this user guide carefully, because wrong handling or faulty installation of the device can have a negative impact on the measurement results.

Loop One device works autonomously, is automatically calibrated and the only maintenance is a battery charge that needs to be done approximately every 6-18 months, depending on device configuration and radio conditions. A device can be configured remotely via Loopshore cloud service. Contact us for more information.

Device communicates to cloud service via secured and encrypted data channel utilizing 4G/5G networks.

## Safety

Usage	<p>Recommended for indoor use only.</p> <p>Recommended indoor conditions Min.+5°C – max.+40°C min.20%RH – max.85%RH.</p>
Battery	<p>Device can be used as battery operated or as connected to a USB charger. Device can work up to 18 months with a single charge.</p> <p>Full battery charging takes approximately 8 hours in normal indoor conditions.</p> <p>Charging only with a compatible USB-C charger.</p>
Casing	<p>IP-class 20. &gt;12.5mm objects. No liquid protection.</p>
In case of problems	<p>Turn off the device. Contact manufacturer.</p>
Manufacturer contact information	<p>info@loopshore.com, loopshore.com</p>
CE declaration of conformity	<p>Loopshore Oy declares that Loop One respects directive 2014/53/EU on radio equipment. Complete declaration of conformity can be ordered by contacting info@loopshore.com.</p>

## Package contents



Loop One



Magnetic wall mount and  
cover sticker



Screws and plugs

# Installation

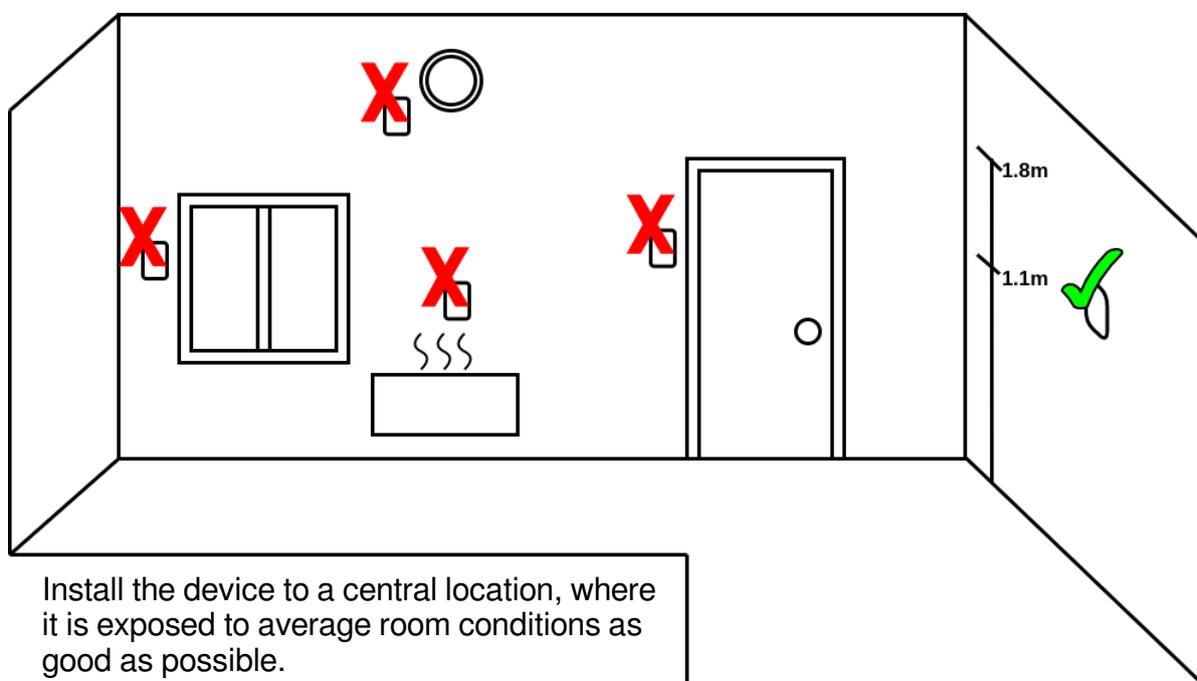
## Warnings

Install indoors only. IP 20.

Do not drop.

If device has been outside of recommended operating conditions (+5°C to +40°C and 20%RH – 85%RH), let it settle in normal indoor conditions for one hour before turning on the power.

## Placement



Avoid installing near

- doors and windows
- air vents
- heat sources
- external walls

Installation height should be **1.1 to 1.8 meters**.

## Mounting

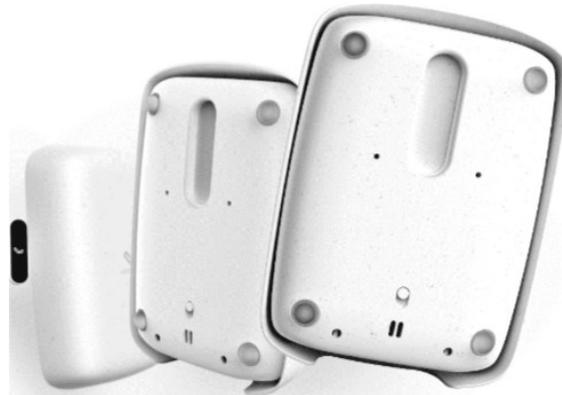
Attach the wall mount to the wall with the screws that are included in the package. Use plugs if necessary. Finalize installation with cover sticker.



Turn the device on from the switch located at the back side.

You'll hear a beep indicating that the device is operational and measuring.

Place the device on the magnetic wall mount.



## Flat surface installation

Alternatively, the device can be placed on a flat surface e.g. on a bookshelf. This might have a slight impact on measured results, because air flow through the device is not optimal. It will however, still give you a very good overview of the room's indoor conditions and might be a good option if you for some reason can't drill holes to the walls.

Note that people are more likely to interact and play with a device that is laid on a surface and you might observe spikes e.g. in temperature and CO2 levels if a human is handling the device.

## About device operation

Device operates autonomously and normally does not need any adjustments. Following chapters describe device's default behavior as well as configuration possibilities.

### Measurement general information

Device's default measurement interval is 10 minutes and this can be adjusted remotely to be anything between 65s to 24h.

There are specific power saving features described in following chapters(SPL and PM). These features can be enabled/disabled remotely if needed.

Note that adjusting measurement interval and power saving features might have a dramatic effect on device's battery life and data usage. Positive or negative effect depending from the configuration.

Contact Loopshore for more information.

### CO<sub>2</sub>(Carbon dioxide)

By default, carbon dioxide is calibrated continuously so that it assumes that it sees outdoor CO<sub>2</sub> levels at least once in a 7.5 day period. This works in 95% of cases and keeps the sensor correctly calibrated for several years (e.g. in schools and in offices CO<sub>2</sub> level usually drops to 400 during weekends).

If the device is placed to conditions where CO<sub>2</sub> level never drops to 400 (e.g. to 24/7 reception, where there are always people present), Calibrating period might need to be adjusted or disabled completely.

### PM(Particulate matter)

Particulate matter measurement has two default measurement intervals. 10 minutes and 60 minutes. A 10 minute interval is used when the device is connected to mains power(USB charger) and 60 minute interval when the device is battery operated. PM measurement is also slightly more accurate when the device is connected to an external power source. This is because of the high power consumption of the PM sensor. PM measurement interval can be configured remotely from 65s to 24h.

## tVOC(total Volatile Organic Compounds)

tVOC sensor is calibrated always when the device has been powered off for more than a few minutes. Calibration takes <24h and can be observed from measured results so that in the first few hours there are no measurement results for tVOC and during the first 24 hours, results might be lower than after the calibration period.

Also note that the tVOC sensor is very sensitive to too low absolute humidity. So if you for example have to transport the device in sub zero winter weather, make sure that device is always powered off and keep it powered off in normal indoor conditions for at least 1 hour before powering on.

## Ambient light

Light sensor receives ambient light information from the back of the device and light is reflected from the walls. Sensor is calibrated so that it is accurate in normal white/light colored wall. If you install the device e.g. to a black wall, you might observe too small light level readings.

## SPL(Sound Pressure Level)

By default, the device has two modes for monitoring ambient SPL. 100% mode that is used when the device is connected to USB power and 50% mode that is used when device is running battery operated. In 50% mode, the device is only listening to ambient sounds for 50% of time. This is merely a power consumption optimization.

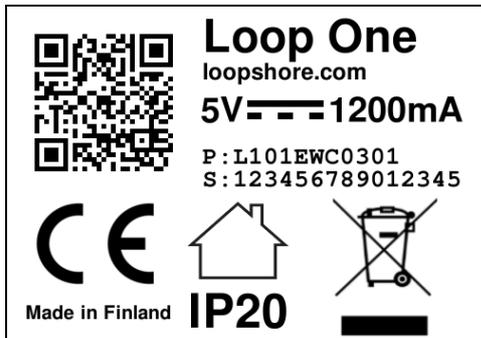
## Movement / Shock detection

Device can detect it's orientation in space, whether it has been moved or not and g-forces applied to it and the structure it is mounted to. See more in Appendix A.

# Product info

## Markings

Product label is found from the back of the device and from the package.



Product's serial number is marked with S: `serial_number`

Product's product code is marked with P: `product_code`

## Interpret product code

XXXXXXXXXXXX

XX----- Product, L1=Loop One, L0=Loop Zero

--XX----- Version, 01

----X----- Approval, E = EU

-----X----- Color, W = White

-----X---- Material, P = Plastic(ABS), C = Durasense(Biocomposite)

-----XX-- Battery, 02 = Li-Ion 1x4900mAh, 03 = Li Ion 2x4900mAh

-----XX Lot, Lot identifier

## Technical data

*Table 1: Operating conditions<sup>1</sup>*

Temperature range	5°C to 40°C
Humidity range	20 to 85%

*Table 2: Device specifications*

Size(WxHxD)	96x132x35mm
Weight	300g
Batteries	1 or 2 pieces Li-Ion 3.63V / 4900mAh
Charging	5VDC, USB-C
Microprocessor	ARM Cortex-M33
Radio	NRF9160
Frequency/Band	B1, B2, B3, B4, B5, B8, B12, B13, B14, B17, B18, B19, B20, B25, B26, B28 and B66 (700-2200 MHz)

*1) Operating the device out of recommended conditions may affect accuracy and lifetime of the device or specific sensors.*

## Measurement ranges and accuracy

*Table 3: Relative humidity*

Range	0 to 100%
Accuracy(typical)	±2%
Accuracy(maximum)	±3%

*Table 4: Temperature*

Range	-40 °C to 85 °C
Accuracy(typical)	±0.2 °C
Accuracy(maximum)	±0.4 °C

*Table 5: Particulate matter*

Concentration range	0 to 1000µg/m <sup>3</sup>
Particle size range	0.3 to 10µm
Accuracy PM1.0, PM2.5 (0-100µg/m <sup>3</sup> )	±10µg/m <sup>3</sup>
Accuracy PM1.0, PM2.5 (100-1000µg/m <sup>3</sup> )	±10%
Accuracy PM4.0, PM10 (0-100µg/m <sup>3</sup> )	±25µg/m <sup>3</sup>
Accuracy PM4.0, PM10 (100-1000µg/m <sup>3</sup> )	±25%

*Table 6: Carbon dioxide*

Range	400 to 5000ppm
Accuracy	±(30ppm + 3%)

*Table 7: Volatile Organic Compounds*

Concentration range	0 to 60000ppb
Accuracy(typical)	15%
Accuracy(maximum)	40%

*Table 8: Atmospheric pressure*

Range	300 to 1100hPa
Relative accuracy	12Pa
Absolute accuracy	±1hPa

*Table 9: Sound pressure level*

Range	35 to 100dB
Accuracy	±3dB

*Table 10: Ambient light*

Concentration range	0 to 100000lx
Accuracy	±20%

*Table 11: Motion*

Range	0 to 16g
Accuracy	N/A

## Device remote monitoring and operation

Note that the device comes with Loopshore's 24/7 remote monitoring and upgrading service. This means that Loopshore will monitor that all devices are working correctly and actions are made if deviations are detected. These actions may include, but are not limited to SW upgrades, configuration changes, default behavior changes and customer communication.

If there are changes that affect this document, this document will be updated accordingly.

# Appendices

## Appendix 1 - Movement and shock detection

Loop One's built-in movement and shock detection can be used to detect various things. These are for example:

- Whether device has been moved.
- What is the device's orientation in space.
- How much g-forces is applied to the device and structures that it is mounted on.<sup>(1)</sup>

For these acceleration measurements, device is constantly monitoring its movement. If device is moved even a bit, it starts a precise acceleration detection for few seconds. The maximum acceleration detected on each axis is then reported to cloud service (in  $m/s^2$ ) along with other measurements. By default device can detect forces up to 8g and uses 100Hz sampling interval.

If a device has not moved since last measurement report was sent, its stationary orientation is measured and reported to the cloud service. After this report is sent, no acceleration data is reported until movement occurs again.

Acceleration report consists of 6 values. Each value is representing maximum acceleration detected for each direction. Picture below shows the direction of acceleration.

### Example of interpreting raw data

- Z- and Z+ are both  $9.8m/s^2$
- Y- and Y+ are  $0m/s^2$
- X- is  $-0.2m/s^2$  and X+ is  $+0.2m/s^2$

This means that device is straight, but upside down and shaking mildly sideways.

*1) Note that using just magnetic mount will affect greatly on the measurement results. If accurate acceleration measurements are desired, glue and/or metal band fix is recommended.*

