Thank you for buying world's first real-time monitoring system
# Table of Contents

1. Introduction...........................................................................................................................................3
2. The Apmon system...................................................................................................................................3
   2.1. Explanation of the sensor: .....................................................................................................................3
   2.2. Explanation of the base unit: ..................................................................................................................5
   2.3. Apmon accessories..................................................................................................................................6
3. Getting Started ..........................................................................................................................................7
   3.1. Connecting the base unit and sensor ......................................................................................................7
   3.2. Configuring the system ..........................................................................................................................8
4. Using the Apmon software........................................................................................................................13
   4.1. Features ..................................................................................................................................................13
   4.2. Real time data and reports ...................................................................................................................14
   4.3. Backing up data ....................................................................................................................................18
   4.4. Apmon smart client ..............................................................................................................................19
   4.5. Software updates ...................................................................................................................................20
5. Particle deposition .......................................................................................................................................21
6. Using the disposable witness cartridge ..................................................................................................22
7. Technical Specifications..............................................................................................................................23
8. Safety, Handling and Support...................................................................................................................25
   8.1. Important safety information ..................................................................................................................25
   8.2. Handling .................................................................................................................................................25
   8.3. Support ..................................................................................................................................................26
9. Frequently asked questions .......................................................................................................................26
1. Introduction

This manual describes the usage and operation of the Apmon (Advanced Particle deposition MONitoring system). The Apmon is an accurate device for measuring particle deposition of particles with a size varying between 15 and 1000 µm. It uses an optical measurement technique which is developed by TNO, the Netherlands Institute for Applied Scientific Research, and perfected by Technology of Sense.

2. The Apmon system

The Apmon system consists of a sensor unit, a base unit and a user interface which comes preinstalled on the base unit. The sensor sends the measurement data to the base unit. The Graphical User Interface visualizes the data using the base unit as a central computer. The only additional accessories needed are a screen, keyboard and mouse.

2.1. Explanation of the sensor:

The image above explains the parts of the sensor that are relevant for the user. The active LED shows the three sensor states of the Apmon:

- **Take image**: Active LED is lit continuously.
- **Awake mode**: Active LED blinks every second. Communication is possible. The base unit will set the sensor in ‘Sleep mode’ after all images are transferred.
- **Sleep mode**: Active LED blinks once every 10 seconds. Energy saving mode, no communication is possible.

The change cartridge LED indicates when the cartridge needs to be changed. The battery warning LED shows when the battery is low on power. The alarm LED shows when an alarm value set by the user is reached.
The Disposable Witness Cartridge collects the particles that are measured. The Apmon sensor can be powered through an adapter but also by battery. The battery lasts around 5 days depending on the configured measurement interval.

The image below shows the battery side of the Apmon Sensor. The on/off switch, network adapter and power adapter connector are placed below the battery compartment. Only use the 9v adapter that is provided.
2.2. Explanation of the base unit:

The base unit comes with a 19v adapter that can be connected to the adapter connector at the back of the base unit. The on/off switch is located at the back of the base unit. To power the base unit on or off press the button for a short time, max 1 second. The connectors for a monitor, Ethernet and USB are also located at the back of the base unit.

At the front of the base unit there are three battery charge compartments. The LEDs located above these compartments show if the battery is being charged (LED is orange) or if the battery is fully charged (green LED). The power LED shows if the base unit is powered on or off.
2.3. Apmon accessories

On delivery the sensor box contains the following items:

- 1x Disposable witness cartridge
- 2x Sensor batteries
- 1x 9 Vdc power adapter
- 1x sensor cable

The APMON base unit box contains the following items:

- 1x APMON base unit
- 1x 19 Vdc power adapter
- 1x user guide
3. Getting Started

The APMON is completely prepared to make the installation as easy as possible. Just follow the steps below to set up and configure the Apmon system.

There are multiple ways to set up the Apmon system:
1. A wired connection (with a network cable) and wired power (with an adapter)
2. A wireless connection (Bluetooth) and the provided battery
3. A combination of wired and wireless.

Please note: during the installation process the wired connection is mandatory. In case of a wireless connection, the sensor cable can be removed afterwards.

3.1. Connecting the base unit and sensor

1. Connect the monitor, keyboard and mouse to the base unit.
2. Use the sensor cable to connect the sensor to the base unit. Use the ‘Sensor’ input on the base unit.
   a) In case of multiple sensors a network switch can be used.
   b) In case of connecting to the company network, connect the base unit to the network by using the ‘Sensor’ input and connect the sensors directly to the company network
3. Connect the adapter to the base unit.
4. Connect the base unit adapter to the power.
5. Power on the base unit.
6. Connect the sensor(s) with the adapter to the power or use a charged battery.
7. Power on the sensor(s).
8. Power on the monitor.

Please wait for a few minutes until the login screen appears, then proceed with the configuration of the system.
3.2. Configuring the system

During the installation process, the wired connection is mandatory. In case of a wireless connection the sensor cable can be removed afterwards.

After starting up the base unit the following login screen will appear:

Step 1. Login:
Default username: 'Admin', please notice the Capital A
Default password: 'admin'
The default user has all the (administration) rights in the software.

Step 2. Add the base unit to the company network (optional):
Go to system settings > base unit
Change the IP address, subnet mask and gateway corresponding to the company network. Make sure to get an IP address reservation from the company's network administrator.
It is mandatory to give the base unit a fixed IP address so the sensor(s) are able to connect.
Step 3. Add room:
Go to system settings > rooms & sensors.
Press “Add room” and name the room.

Step 4. Add Sensor:
Select a room from list of rooms.
Make sure the sensor is turned on and the power LED blinks every second.
Press ‘Add sensor’. The base unit will start searching for sensors via Ethernet.
Step 5. Configure the sensor

For a wireless configuration check ‘Bluetooth enabled’. For a wired connection leave ‘Bluetooth enabled’ unchecked.

You can configure the desired IP, subnet and gateway settings.

Configure the desired measurement sample time in minutes. For a wired connection sample times are minimal 5 minutes per sensor. This means 5 minutes for 1 sensor, 10 for 2 sensors, 20 for 4 sensors etc. For a wireless connection a minimum of 10 minutes per sensor is advised. Maximal 2 sensors can operate in wireless mode simultaneously.

Press Save to apply the changes

To add the sensor to the room; select it and press OK.

Note: the most stable system setting will be a wired system.

All found sensors are displayed in the list above. If the required sensor is not shown, make sure the sensor is switched on and in awake mode and start the search again.

Note: if the sensor is connected as wireless the cable can be removed.

Check the connection between the sensor and base unit.

Please wait a few minutes. If the light on the software is green, the setup is ok.
If the light is not green, and the sensor keeps blinking every second, setup is not ok.
The software will monitor the connection with the sensor. If the sensor does not respond within the configured sample time (e.g. because the battery is low) the software will give an alert.

**Note:** if a sensor cannot be found, turn it off for 30 seconds then power it on again. When the power LED starts blinking every second try to search for the sensor again.

Step 6. Set time schedules (Critical Values)

Time schedules are ideal to set timing of cleaning, shift changing and process planning in general where monitoring is relevant. A maximum of four different schedules can be defined per room. The schedule is build up in hours and divided into 15 minutes segments.

The time of each schedule can be selected at the agenda in the schedule screen.

'It is possible to configure different levels for PDR/PDC (PDR or PDC Critical value) & Number of particles (Particles critical value) per schedule period. When exceeded, an alert can be shown if configured.

Possible alerts are;

- Software alert: a message is added to the Alerts list
- Sensor alert: the dust detection LED on the sensor will turn on to indicate an alert.
Step 7. Configuring users

Users can be configured in system settings > users. Create, edit and delete user names and passwords and specify the desired authentication level of the user.

- An admin has access to all of the data and can configure the Apmon system.
- A manager has access to all the data and can configure the critical values.
- A user has access to all the data but cannot configure any settings.
4. Using the Apmon software

The Apmon software is designed to be easy to use and give as much information as possible in a single view. There are many possibilities to change graphics, settings and critical values to make it personal and complete.

4.1. Features

The image below shows a screenshot of the Apmon software with the key elements numbered.

1. Base unit name
2. Sensor indicator: Green means connected, Yellow means no connection yet, Red means no connection within a certain period of time
3. Particle Deposition Class available after 20 particles fallen
4. Witness cartridge 0-100%: at 100% witness cartridge needs to be replaced
5. Battery percentage left
6. Sensor location (room name)
7. System indicator - Green: software is running ok
8. Alerts, number of events
9. Log out of the software to exit the application or to login as another user
10. Enable/disable display of moving average PDR/PDC in the graph
11. Graph options: choose a sensor
12. Graph options: show PDR, Cumulative Particle Distribution, Differential Particle Distribution, Coverage
13. Export data, to Excel
14. Real-time data
15. Reports
16. Set critical values and schedules
17. Configure the system settings
4.2. Real time data and reports

The Apmon can show graphs of the number of particles falling over time, the cumulative particle distribution, the differential particle distribution and the coverage. All graphs are available in real-time or as a report that enables the user to select a certain time period to analyze.

**Number of particles / Moving average deposition**

The software is able to show the real-time measurement data in the form of a graph. The image below shows the graph for the number of particles. In this particular case the thick blue line shows the absolute number of particles per measurement sample and the thin dotted blue line shows the moving average PDC.

The image below also shows two red lines that indicate the critical value defined in the time schedule. In this case, the thick red line shows the critical value for ‘Production’ and the dotted red line show the critical value for ‘Rest’.

The green lines show the critical PDC values set for ‘Production’ (thick green line) and ‘Rest’ (dotted green line).

Please note that the PDR and PDC are moving averages over the last 48 hours and are calculated with a maximum of 500 μm, according to the ISO 14644-9 classification.
Cumulative Particle Distribution

The cumulative values of the amount of particles per size shows the sum of all particles larger than a certain size. For example: 10 particles bigger than 50µm, 10 particles bigger than 100µm, and 8 particles bigger than 200µm and 1 particle bigger than 1000µm. This way, at a single glance, you can determine if the particles are mainly large or small of size. The size of particles gives insight in the source of contamination. The graph below shows the amount of particles per dm2.

The thick green line shows the cumulative particle distribution of one sensor. The dotted green line shows the upper PDR limit and the yellow dotted line shows the lower PDR limit. The grey lines show the minimum and maximum PDC (in this case a maximum PDC of 6 and a minimum PDC of 4).
Differential Particle Distribution

The differential particle distribution graph shows the amount of particles that have deposited for each particle size, in the form of a histogram. In this graph it is possible to quickly overview which sensor discovered the most deposition and also which size of particles is most common. This way you can find out about trends and patterns, which leads to new insights in the management of the cleanroom. In each interval the size of the particle is determined in steps of 10 µm (size bin) for particles smaller than or equal to (≤) 100 µm and in steps 100 µm for particles larger (> 100 µm). The data can be shown of the last 12 hours, 1 day, 2 days or 7 days.
Coverage:
The APMON measures the area of the projected surface of each particle. The sum of this area show the total covered area. The coverage is expressed in Parts Per Million (PPM) or Percentage Area Coverage (PAC) of the area of the measured surface of the sensor. 0.1 PAC = 1.000 ppm
The coverage can be compared with Particle Fall Out (PFO) measurements.
4.3. Backing up data

Data can be backed up to and recovered from a USB disk. Not only the raw data but also the raw image data can be stored to a USB disk for analyzing purposes by a third party.

‘Backup to disk’
A backup of all measurement data can be created on an external connected USB disk. If the disk is recognized and enough free space is available, the button is light gray, otherwise it is dark gray.

‘Restore from disk’
The last created backup is restored from the USB disk. Ensure the sensor is offline during the restore process.

*Note: this will destroy all existing data*

'Images'
Raw image data can be stored to the disk for analyzing purposes by the distributor.

The base unit automatically writes reports at 0:00 each night. The reports are accessible through your network and are located in: '\IP_APMON\reports'. The login name and password are identically to the login name and password of the Apmon software.
4.4. Apmon smart client

The Apmon software can be remotely accessed through the Apmon smart client. The interface has the same look and feel as the Apmon base unit interface.

The smart client connects via the company network with the base unit and can be installed on a windows workstation pc.

Installation:

- Make sure that the Apmon base unit is connected and configured on the company network.
- Copy the executable files to a desirable folder (with read/write access) on the hard drive of the workstation PC
- Make sure the workstation pc has the full .net framework 4 installed (NOT the client version). This can be downloaded from the Microsoft website: http://www.microsoft.com/en-us/download/details.aspx?id=17851
- Optionally create a shortcut to the main executable ‘ApmonViewer.exe’

Communication details:

The software uses the following ports on the base unit;

UDP 4995, 4996  
TCP 4984 – 4994

When logging in a UDP broadcast is send over the network to find all connected base units. It is possible to skip the broadcast and connect to a base unit directly. Configure the shortcut with the IP number of the target base unit in the following way;
4.5. Software updates

Updates for both the base unit and sensor software are installed on the base unit. The software will update automatically after the base unit is updated.

Software update steps:

1. Login to the base unit
2. Make sure the sensor is powered down.
3. Copy the update file to an USB drive.
4. Insert the USB drive into the base unit.
5. Navigate to System Settings->Base unit.
6. Press update and select the correct update file from the USB drive.
7. Wait approximately 1 minute, the system will reboot automatically after the update is installed.
8. After reboot, please log into the system as Admin. The login process will shut down automatically and a blank/white window will appear. After a few seconds the login screen will re-appear.
   The software will update the database automatically on the background. Login will be blocked during this process.
9. Now the system is updated, login to verify the correct version number in the upper left corner.

Note: only sensors that are connected through the network are updated. Bluetooth connected devices are not updated.
5. Particle deposition

Particle Deposition Rate (PDR)
PDR = the Rate of change of surface cleanliness (according to ISO standard 14644-9) by Particle Deposition during the observed time.
The particle deposition rate (PDR) is defined as the cumulative number of particles larger than measured size \( d \) deposited on a surface per unit of time per unit of area, multiplied by \( d \) (size counted particles).

\[
PDR = \frac{d \cdot \Delta n_d}{A \cdot \Delta t}
\]

\( \Delta n_d \) the number of added particles larger than size \( d \) (\( \mu \)m) on sensor

A specific area \( A \) (dm\(^2\))

\( \Delta t \) time or duration of the exposure (h)

Particle Deposition Classes (PDC)
PDC is the level that represents maximum allowable increase of surface concentration by deposition of particles, in particles per square meter per hour, for considered sizes of particle.

The relation between the number of deposited particles, particle sizes and PDC is given in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Particle Deposition Classes</th>
<th>Units in particles per square metre per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDC</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>1,000</td>
</tr>
<tr>
<td>4</td>
<td>2,000</td>
</tr>
<tr>
<td>5</td>
<td>10,000</td>
</tr>
<tr>
<td>6</td>
<td>100,000</td>
</tr>
</tbody>
</table>

Source: Koos Agricola - VCCN

Source: Koos Agricola - VCCN
6. Using the disposable witness cartridge

A maximum coincidence loss of 1% is allowed to ensure that the measurements remains accurate. The time to change will vary in practice due to the condition of the cleanroom, however the cartridge needs to be changed after a maximum of 3 months.

The current state of the disposable is shown below as a percentage.

![](image)

The system will automatically give notification for a disposable change using the following methods;
1. The software will generate an alert
2. The disposable state will hit 100%
3. The ‘change cartridge’ LED on the sensor will be illuminated

**Important notice.** If the cartridge has not been replaced in time it can have a negative effect on the measurements.

When renewing the disposable witness cartridge, a vertical line appears in the graph field.

1. Remove the first packaging.
2. Remove the second packaging at the designated location.
3. Place the witness cartridge on the sensor with the circular side to the left when standing in front of the sensor.
4. Make sure the circular area of witness cartridge is pushed towards the circular edge of the sensor.
5. The disposable state will be updated after the next measurement. The disposable state will return to 0% if it is recognized correctly by the system.

To avoid optical filter contamination, a witness cartridge needs to be on the APMON at all times. The blue glass on the sensor can only be cleaned by Technology of Sense, once a year minimum.
7. Technical Specifications

<table>
<thead>
<tr>
<th>Sensor</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Detectable particle sizes</td>
<td>$\geq 15 \mu m \leq 1000 \mu m$</td>
</tr>
<tr>
<td>Measuring surface</td>
<td>25 cm$^2$</td>
</tr>
<tr>
<td>PDR</td>
<td>99% Confidence interval ± 6% (long term)</td>
</tr>
<tr>
<td>Sample time</td>
<td>5 minutes per sensor</td>
</tr>
<tr>
<td>Size</td>
<td>390 x 80 x 150 mm (15.4 x 3.1 x 5.9 inches)</td>
</tr>
<tr>
<td>Weight</td>
<td>Approximately 5 kg (incl. battery)</td>
</tr>
<tr>
<td>Power</td>
<td>Dual: adapter 100-240V AC / 9V DC 550mA or battery 7.2V / 7.8Ah</td>
</tr>
<tr>
<td>Battery type</td>
<td>Lithium Eon Smart battery, rechargeable inside base unit. Flight certificate</td>
</tr>
<tr>
<td>Battery quantity included</td>
<td>Two per sensor</td>
</tr>
<tr>
<td>Battery operating time</td>
<td>&gt; 5 days</td>
</tr>
<tr>
<td>Communication base unit</td>
<td>Bluetooth 2.0 ≈ 15-20m field, depending on local situation or Ethernet</td>
</tr>
<tr>
<td>Optical light source</td>
<td>20mA Laser Diode 406nm</td>
</tr>
<tr>
<td>Method</td>
<td>Holographic imaging</td>
</tr>
<tr>
<td>Laser safety classification</td>
<td>2m according to IEC60825-1</td>
</tr>
<tr>
<td>Calibration</td>
<td>Production approved once a year</td>
</tr>
<tr>
<td>Packaging</td>
<td>In controlled environment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Base unit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>275 x 275 x 165 mm (10.8 x 10.8 x 6.4 inches)</td>
</tr>
<tr>
<td>Weight</td>
<td>Approximately 4 kg (with batteries recharging: 5 kg)</td>
</tr>
<tr>
<td>Coincidence loss</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Data storage</td>
<td>Minimal 10 years of measurement data</td>
</tr>
<tr>
<td>Power</td>
<td>Adapter 100-240V AC 2A / 19V DC</td>
</tr>
<tr>
<td>Cooling</td>
<td>Passive</td>
</tr>
<tr>
<td>Outputs</td>
<td>Ethernet cable UTP / RJ45</td>
</tr>
<tr>
<td>Battery recharge</td>
<td>3 batteries per base unit at the same time</td>
</tr>
<tr>
<td>Battery recharge time</td>
<td>10 hours typical</td>
</tr>
<tr>
<td>Maximum number of sensors</td>
<td>Ethernet 6</td>
</tr>
<tr>
<td></td>
<td>Bluetooth 2</td>
</tr>
</tbody>
</table>
**Interface**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailor made</td>
<td>Adjustable for every situation and requirements</td>
</tr>
<tr>
<td>Size channels</td>
<td>15, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000</td>
</tr>
<tr>
<td>Communication</td>
<td>Automatic report when pc receives data</td>
</tr>
<tr>
<td></td>
<td>Use of Ethernet: approach from distance possible</td>
</tr>
<tr>
<td>Communication protocol</td>
<td>Optional</td>
</tr>
<tr>
<td>Backup</td>
<td>USB drive</td>
</tr>
<tr>
<td>Languages</td>
<td>English, Dutch, Chinese, optional different languages</td>
</tr>
<tr>
<td>System requirements</td>
<td>Windows 7 or higher</td>
</tr>
<tr>
<td>Reports</td>
<td>Alarm date/time, pdr, pac, ppm</td>
</tr>
<tr>
<td></td>
<td>Events</td>
</tr>
<tr>
<td></td>
<td>1 year overview</td>
</tr>
</tbody>
</table>

**Disposable witness cartridge**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Combination plastic and glass</td>
</tr>
<tr>
<td>Type</td>
<td>Disposable</td>
</tr>
<tr>
<td>Duration in use</td>
<td>Up to 3 months depending on condition cleanroom</td>
</tr>
<tr>
<td>Size</td>
<td>254 x 74 x 45 mm (10.0 x 10.0 x 1.7 inches)</td>
</tr>
<tr>
<td>Packaging</td>
<td>Packed in two bags in a controlled environment</td>
</tr>
<tr>
<td>Replacement of disposable</td>
<td>Warning by software</td>
</tr>
</tbody>
</table>

**General**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote access</td>
<td>Yes</td>
</tr>
<tr>
<td>Alarm</td>
<td>Sample time plus 2 minutes</td>
</tr>
<tr>
<td>Environment (operating)</td>
<td>10 to 35 degrees Celsius (50 to 95 degrees Fahrenheit)</td>
</tr>
<tr>
<td></td>
<td>10 to 90% relative humidity, non-condensing</td>
</tr>
<tr>
<td>Enclosure material</td>
<td>Easy to clean: aluminium and plastics</td>
</tr>
<tr>
<td></td>
<td>(80% ethanol or IPA cleaning possible)</td>
</tr>
<tr>
<td>In the box</td>
<td>Main articles: 1 sensor, 1 base unit, 2 rechargeable sensor batteries, 1 cartridge, 1 user software, user guide, sensor -and remote access cable, power adapter</td>
</tr>
<tr>
<td>Warranty</td>
<td>See warranty certificate</td>
</tr>
<tr>
<td>ISO</td>
<td>As intended in ISO 14644-3 B.11.2.2. and ISO 14644-9</td>
</tr>
<tr>
<td>Patent</td>
<td>Patent pending</td>
</tr>
</tbody>
</table>

* The 99% confidence interval of the PDR is ± 6% when 10,000 particles have deposited on the APMON.
8. Safety, Handling and Support

8.1. Important safety information

WARNING: Failure to follow these safety instructions could result in fire, electric shock, other injuries, damage to the APMON system or other property. Read all the safety information below before use.

Handling
Handle all parts of the APMON system with care. The system is made of metal, glass and plastic and has sensitive electronic and optical components inside. It can be damaged if dropped, burned, punctured, crushed, or when it comes in contact with liquid. Do not use a damaged system as it may cause injuries.

Repairing
Do not open any part of the APMON system and do not attempt to repair the system by yourself. Disassembling any part of the system may damage it or may cause injury to you. If any part of the APMON system is damaged, malfunctions, or comes in contact with liquid, contact Technology of Sense or your distributor.

Battery
Do not attempt to open the battery yourself since you might damage it, which could cause overheating and injuries. In case the battery does not work properly, contact Technology of Sense or your distributor.

Charging
Charge with the included cable and power adapter. Using damaged cables or chargers, or charging when moisture is present can cause an electric shock. Make sure that the AC plug or AC power cord is fully inserted into the adapter before you plug it into a power outlet. Power adapters may become warm during normal use and prolonged contact may cause injury. Always allow adequate ventilation when using power adapters.

8.2. Handling

Cleaning
Clean the APMON immediately if any parts come in contact with anything that may cause stains. To clean:
Disconnect all cables and turn system off safely.
If possible, clean with special cleanroom cleaning materials to prevent later contamination. It is possible to clean the system with 80% ethanol. Avoid getting moisture in (electronic) openings. Do not clean the blue glass (filter) or the disposable witness cartridges, this will affect the measurement.

Using connectors, ports and buttons
Never force a connector into a port or apply excessive pressure to a button, this may cause damage that is not covered under the warranty. If the connector and port do not join with reasonable ease, they probably do not match. Check for obstructions and make sure that the connector matches the port and that you have positioned the connector correctly in relation to the port.

Operating temperature
The APMON system is designed to work in ambient temperatures between 50° and 95° F (10° and 35° C). Avoid exposing to dramatic changes in temperature or humidity. When you are using the APMON system or charging the battery, it is normal for the base unit to get warm. The sensor(s) will not spread any heat.
8.3. Support

The APMON comes with one year of technical support and hardware repair warranty. Visit www.apmon.eu for technical support. Or call +31 53 737 02 92.

9. Frequently asked questions

Q: I've configured the sensor in **ETHERNET MODE** and I get:

"Alarm – Sensor 'APMON xxxx' had no connection within the specified time" OR
The link indicator LED on the base unit is RED, what should I do?

A: Check if the sensor cable is correctly connected between sensor and base unit (sensor input).

Give the sensor a power cycle. After starting up, the sensor power LED should start blinking every second.

If the sensor link indicator on the base unit does not become GREEN after 1 minute re-install the sensor.

Make sure that 'Bluetooth enabled' is not selected during the installation process:

![Bluetooth enabled](image1)

Q: I've configured the sensor in **BLUETOOTH MODE** and I get:

"Alarm – sensor 'APMON xxxx' had no connection within the specified time" OR
The link indicator LED on the base unit is RED, what should I do?

A: Give the sensor a power cycle. After starting up, the sensor power LED should start blinking every second.

If the sensor link indicator on the base unit does not become GREEN after 1 minute re-install the sensor.

To re-install the sensor via Bluetooth the sensor cable has to be connected during the installation process. After installation is successful, the sensor cable can be removed. Make sure that 'Bluetooth enabled' is selected during the installation process:

![Bluetooth enabled](image2)

Q: What is the maximum Bluetooth distance between the base unit and the sensor?
A: A maximum distance of 10-15mtr clear sight between sensor and base unit is recommended. If there are obstructions (e.g. walls/doors) the distance drops. Because of the wireless nature of Bluetooth distance between different sites may vary.

Q: What is the reaction time of the system?

A: The sensor will take images at the specified measurement interval.

Images are sent to the base unit for processing. Transfer time over Ethernet is < 30 seconds, Bluetooth transfer time is between 2-5 min depending on the distance between sensor and base unit.

After the base receives the image it will start processing it, this will take about 1.5min.

Q: What is the battery operating time?

A: Battery operating time is about 5 days @ a measurement interval of 10 min.

When operating over Bluetooth, the greater the distance between base unit and sensor, the longer the sensor needs to be online. This will decrease battery operating time.

To save battery time the sensor will go to sleep, when it has successfully transferred the image, until it is time to take the next image.

Battery operating time can be increased by setting a longer measurement interval.

It’s possible to use Bluetooth in combination with an adapter instead of the battery.