

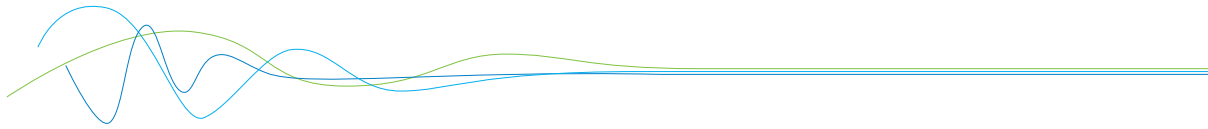


## OPERATING INSTRUCTIONS

# AirSafe PM

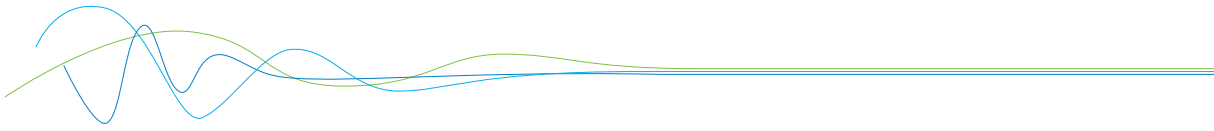
CONTINUOUS, INDOOR MONITOR FOR DUST EXPOSURE





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## 1. System overview

A complete system consist of a AirSafe PM with its optional wall mounting bracket.

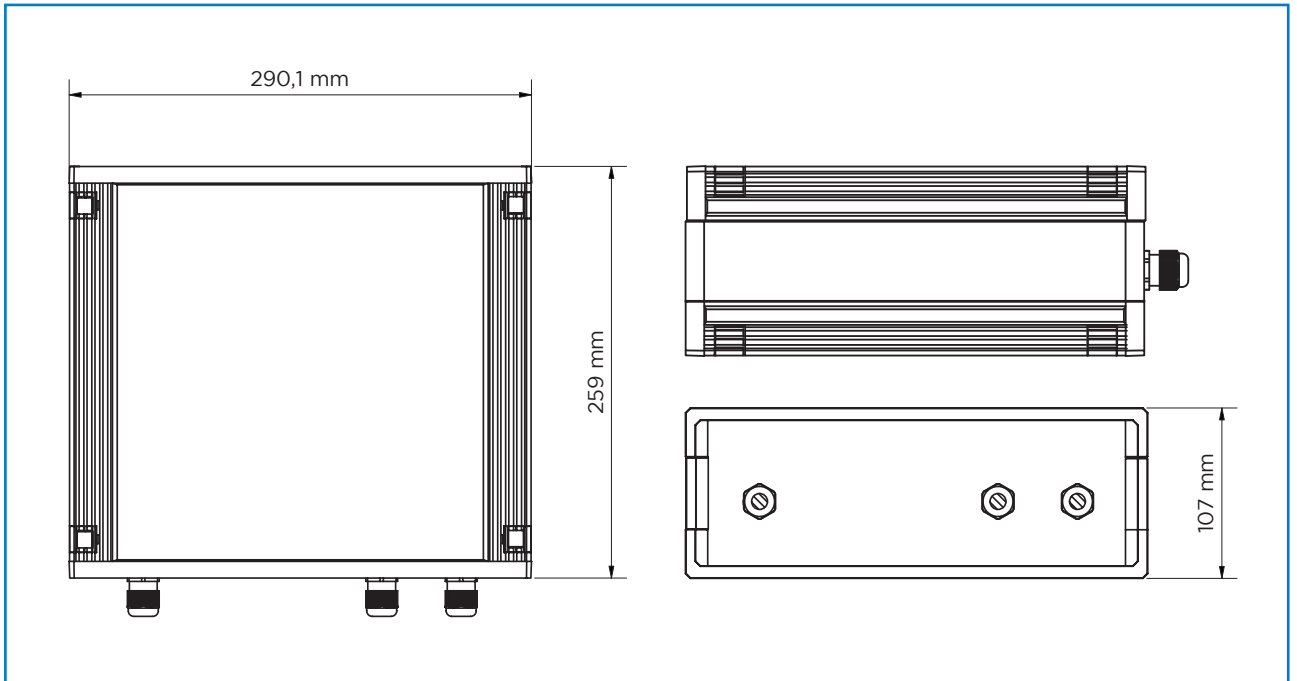


Fig. 1: Drawing of AirSafe PM

## 2. Function

The AirSafe PM uses a high end optical measurement system that is embedded in the sensor. The air flows through the measuring device which counts the particles and defines their size. The raw measurement is processed by a unique algorithm which enables continuous and accurate measurement for the different sizes of particles as well as classification of A or E dust fractions (also known as inhalable and respirable fractions).

### 2.1 Particles size / glossary

PM describe all dust particles smaller than the mentioned size.

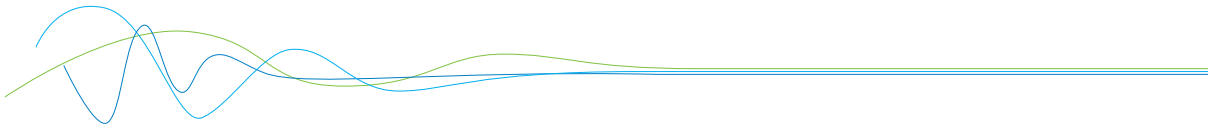
- Example:**
- PM1** include all dust particles smaller than 1  $\mu\text{m}$
  - PM2.5** include all dust particles smaller than 2.5  $\mu\text{m}$
  - PM4.5** include all dust particles smaller than 4.25  $\mu\text{m}$
  - PM10** include all dust particles smaller than 10  $\mu\text{m}$
  - TSP** refer to "Total suspended particles" with is equal to all dust particles equal or smaller than 100  $\mu\text{m}$

European standard EN 481 also separate dust in 2 fractions:

- **E dust:** The respirable fraction – Particles equal or smaller than 100  $\mu\text{m}$
- **A dust:** The inhalable fraction – Particles equal or smaller than 4.25  $\mu\text{m}$

### 2.2 Compliance

This sensor comply with TRGS 900 and EN 481.



### 3. Safety

The sensor was designed, built and tested for safety and is shipped in this condition. Components within the supplied system could be hazardous if not unpacked, installed, connected and commissioned by authorised qualified persons. All operating instructions must be read, and understood, before handling the system. Failure to do so will cause the warranty to be revoked.

#### 3.1 Normal use

- The measuring system may only be installed indoor, in workplace, production area, storage areas, rest areas, rooms, open spaces and in industrial work areas.
- Only original spare parts and accessories from ENVEA must be used.

#### 3.2 Identification of hazards

Possible hazards, when using the measuring system, are marked by the following symbols:



##### Warning!

- This symbolises a situation where personal safety is at risk if used in an improper manner.



##### Attention!

- This symbolises the possible damage to the system, if used in an improper manner.

#### 3.3 Occupational and operational safety

- ⓘ • The measuring system must be installed by trained and authorised personnel only.
- ⚠ • Protective equipment must be worn to avoid injuries caused by possible sharp edges on the measuring device.
- ⓘ • When using a cable with more than 4 cores, unused, open cores may cause sparking. Failure to comply with the specified connection parameters of the cable will result in loss of intrinsic safety. To prevent this, it is mandatory to use a 4-core shielded cable. Always ensure that the connection parameters of the cable are within the specification (Li, Ci). The shield of the cable must not be connected to the housing under any circumstances.
- ⓘ • Improper mechanical stress (e.g. torsion) can cause damage to the device. To avoid this, the device should always be installed in accordance with all the instructions in the operating manual. The measuring device should also not be exposed to any vibrations if possible.
- ⓘ • Improper use of the device will result in a high risk to system safety, therefore the device must only be used as specified in the associated documentation.
- ⚠ • Switch off the power supply for all maintenance, cleaning or inspection works on the sensor or on components. Follow the notes of the chapter maintenance.
- ⓘ • The components and electrical connections must be checked for damages regularly. If a damage is found, it is to be repaired before further operation of the instruments.

### 3.4 Maintenance

- ⚠ • For maintenance purposes, it is imperative that the device is de-energised and cooled down, otherwise there is an increased risk of explosion.
- ⚠ • Before working on the device or its components, it is essential to ensure that they are de-energised. Otherwise there is a risk of electric shock.
- ⚠ • The correct tool must be used to open the device, otherwise there is a risk of injury and crushing.
- ⚠ • Before opening the device or its components, it is imperative to ensure that there is no EX zone.
- ⚠ • During cleaning work on the device or in the process, there is an increased risk of explosion due to electrostatic discharges and excessive pressures.

### 3.5 Technical statement

The manufacturer reserves the right to change any technical data concerning technical developments, without prior notice. If any queries arise, ENVEA will be happy to inform customers of any possible changes made.

### 3.6 Reliability

For any additional information concerning product reliability, please contact ENVEA.

### 3.7 Storage conditions

Observe the following instructions during storage:

- To ensure shock resistance, store in original packaging.
- Do not remove protective discs or caps mounted on process connections. They prevent mechanical damage and contamination to the sealing surfaces.
- Protect from sunlight to avoid impermissibly high surface temperatures.
- Store in a dry and dust-free place.
- Do not store outside.

### 3.8 Limits of use

To achieve optimum performance and safe operation, the equipment must be operated within the limits given in this manual. Operation outside these limits can result in damage to the equipment or failure to achieve the performance specified. This product and its variants are not explosive zone approved.

## 4. Mounting and installation

The AirSafe PM can be mounted on any flat surface or on a wall using mounting brackets (ENVEA recommend to install the sensor in a flat position if possible). The sensor is designed for monitoring ambient air in workplaces in industries such as cement plants, foundries, wood workshops, incineration plants or logistic warehouses.

**The AirSafe PM can be easily mounted to most surfaces and areas:**

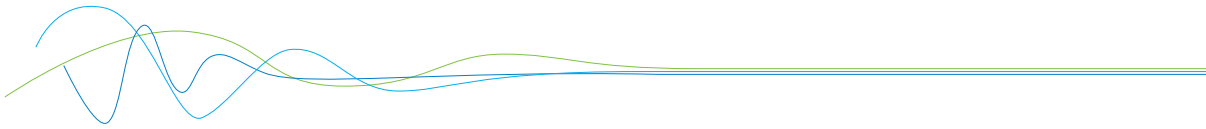
- In or around process areas
- Storage rooms
- Laboratories
- Breakrooms
- Changing rooms
- In or around office areas
- Other footfall areas of health and safety exposure concern
- Areas of air quality monitoring requirements

Install the AirSafe PM as near as possible to air intakes, areas of air movement, and areas of static air/settlement where people work. When positioned near the ventilation and filtration apparatus, the AirSafe PM can be used to monitor the effectiveness of the ventilation and filtration process.



**Attention!**

*AirSafe PM can be used only indoors, DO NOT use outdoors.*



## 5. Electrical connection

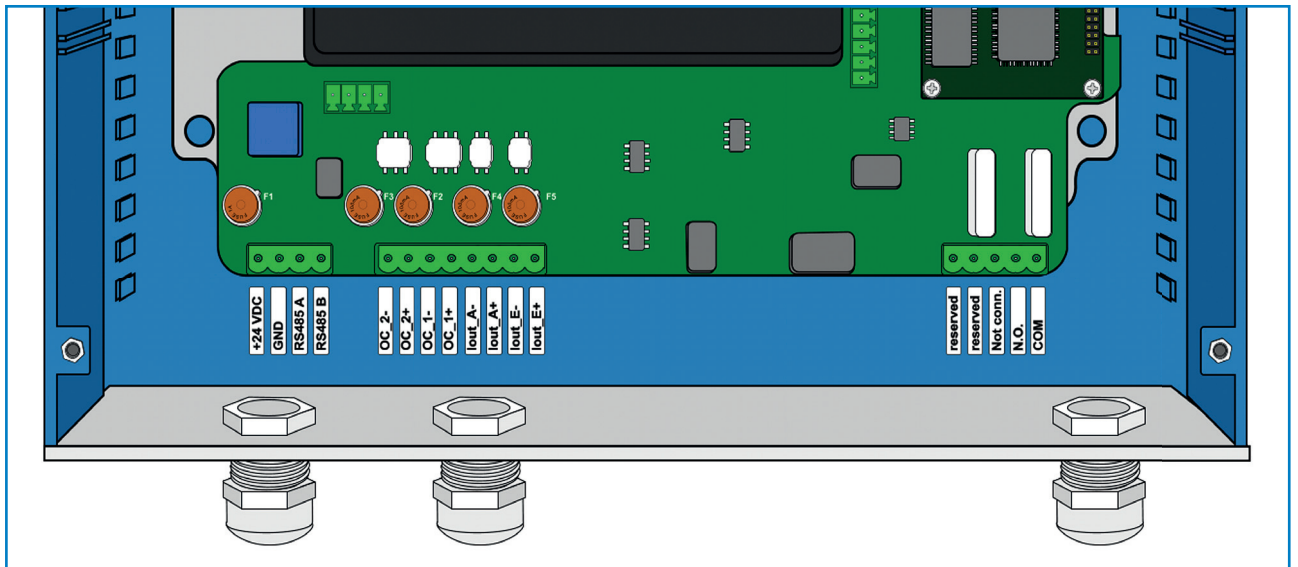


Fig. 2: Electrical connections

+24 V DC	Input power supply 24 V DC
GND	Input power supply 0 V DC
RS485 A	RS 485 interface data A
RS485 B	RS 485 interface data B
OC 2 -	Non attributed
OC 2+	Non attributed
OC 1 -	Non attributed
OC 1+	Non attributed
Iout A -	Current output for A Dust -
Iout A+	Current output for A Dust +
Iout E -	Current output for E Dust -
Iout E+	Current output for E Dust +
N.O	Relay N/O Contact
COM	Relay COM contact



### Attention!

*24 V DC power supply must be protected and stabilized.*



### Attention!

*The sensor doesn't need to be grounded.*



## 6. Setup

To setup AirSafe PM, it is necessary to use a USB connection via the supply cable between the sensor and a PC software running on Windows operating system (WinXP or more recent).

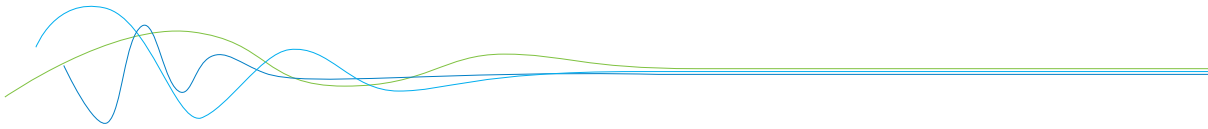
### 6.1 USB connection

For connection via USB, it is necessary to open the sensor.

1. Remove the screw caps on the four corners of the sensor.
2. Remove the screws
3. Open the sensor
4. USB port is located on the main board.
5. Reverse the operation to close the sensor.

**Note:**

This must be made by qualified technician only and in a clean environment.



## 6.2 Service software

### 6.2.1 List

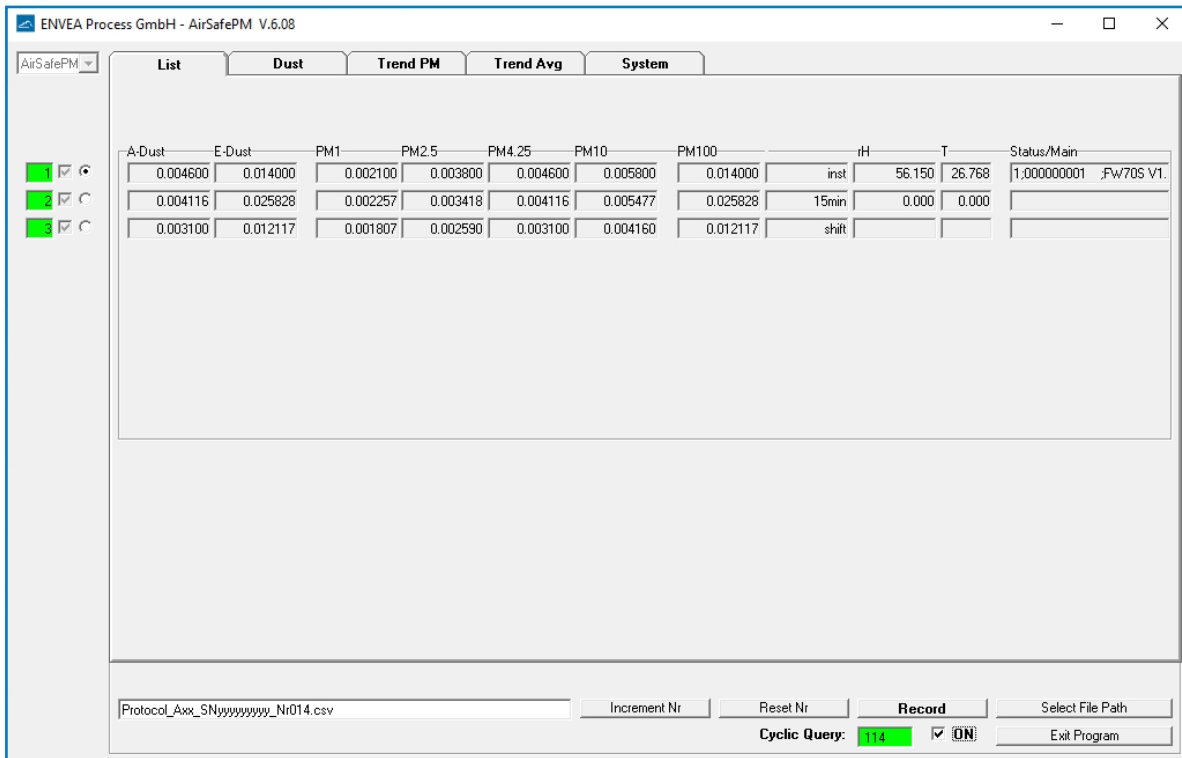


Fig. 3: List Panel



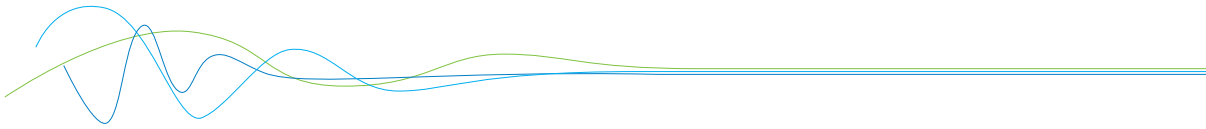
#### Attention!

To start the communication between the PC and the sensor, the "ON" button (beside cyclic query) must be checked.

This panel provide you the different dust value in  $\text{mg}/\text{m}^3$  as well as ambient temperature and air moisture. Firmwire version is also displayed.

- Chanel 1:** Provide instant values
- Chanel 2:** Provide 15 minutes average values
- Chanel 3:** Provide 8 h average values

- Select file path:** You can select and create a .csv file to record the sensor measurement values for up to 2 h.
- Record:** It will start the record of sensor values in the created .csv, for up to 2 h.



## 6.2.2 Dust

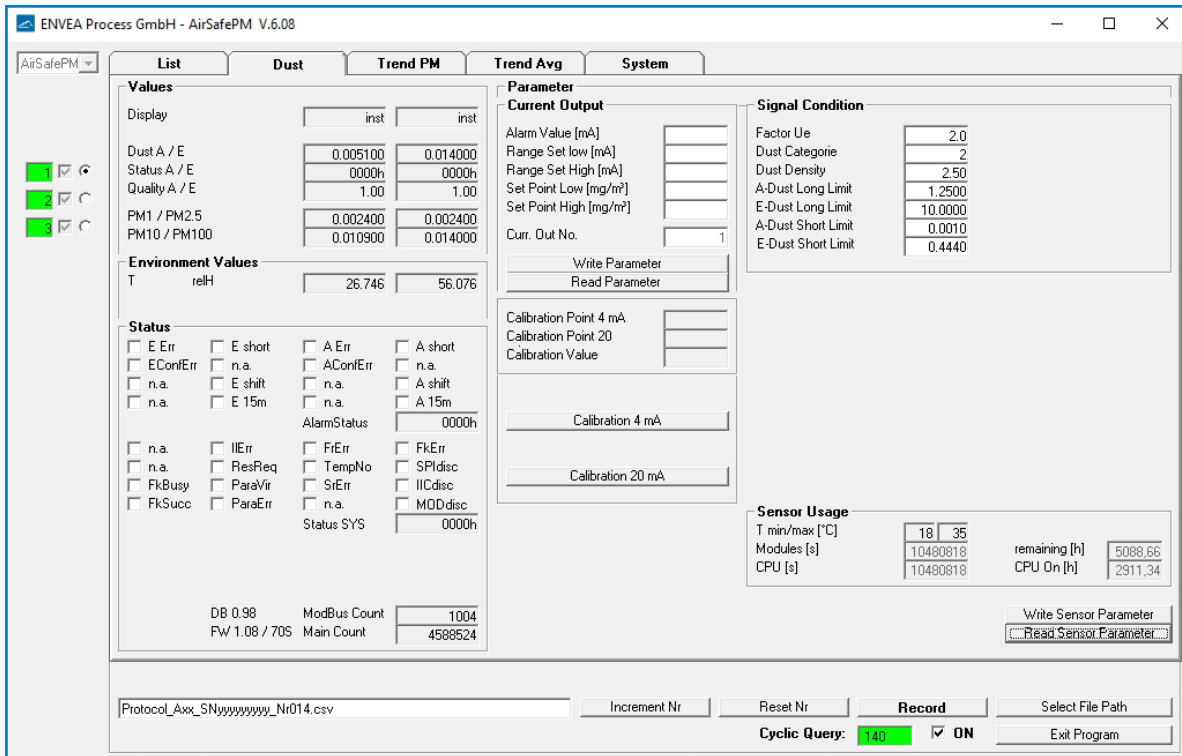


Fig. 4: Dust panel

### Values

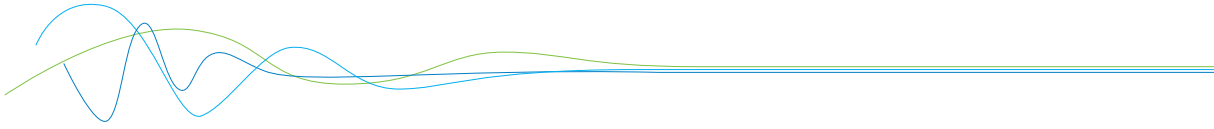
You can see the values of the different size of dust.

By selecting channel 1/2/3 on the left, you can change the value from instant/15 minutes average / 8 h average. It can also display the temperature and moisture values.

### Current Output

You can set the different parameters of the currents outputs.

- Alarm Value:** It will set the desired alarm point
- Range set Low:** Value for 4 mA
- Range set High:** Value for 20 mA
- Set point Low:**
- Set point High:**
- Curr Out No:** The sensor has **2 analog output: Output 1** for E-Dust / **Output 2** for A-Dust
- Write parameters:** It will save the parameters in the sensors.
- Read parameters:** It will read the parameters from the sensor.



## Signal Condition

**Factor Ue:**

**Dust categorie:** You can modify the dust category according TRGS 900 or local regulation.

**Dust density:** If you know the density of the dust present in your ambient air, you can modify the paramters. It can help increasing the sensor accuracy.

**A-Dust Long limit:** Limit exposure value to A-Dust for 8 h

**E-Dust Long limit:** Limit exposure value to E-Dust for 8 h

**A-Dust Long limit:** Limit exposure value to A-Dust for 15 mins

**E-Dust Long limit:** Limit exposure value to E-Dust for 15 mins

## Status

This code can help for trouble shooting.

In case of sensor malfunction and if any of the boxes are checked, please contact ENVEA or and official representative for help.

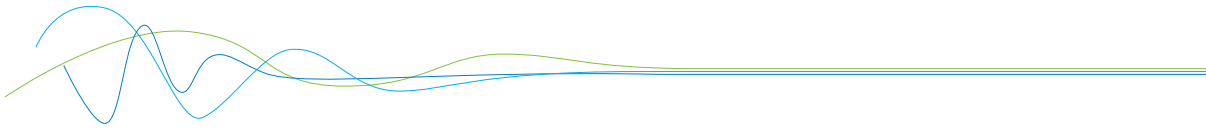
## Sensor Usage

**T min/max:** Minimum and maximum temperature in °C that the sensor has been exposed to.

**Modules:** Time in second that the modules has been in use.

**Remaing:** Expected remaing lifetime of the modules use in normal conditions, in hours.  
This help to schedule maintenance.

**CPU:** Time in seconds and hours that the CPU has been powered on.



### 6.2.3 Trend PM

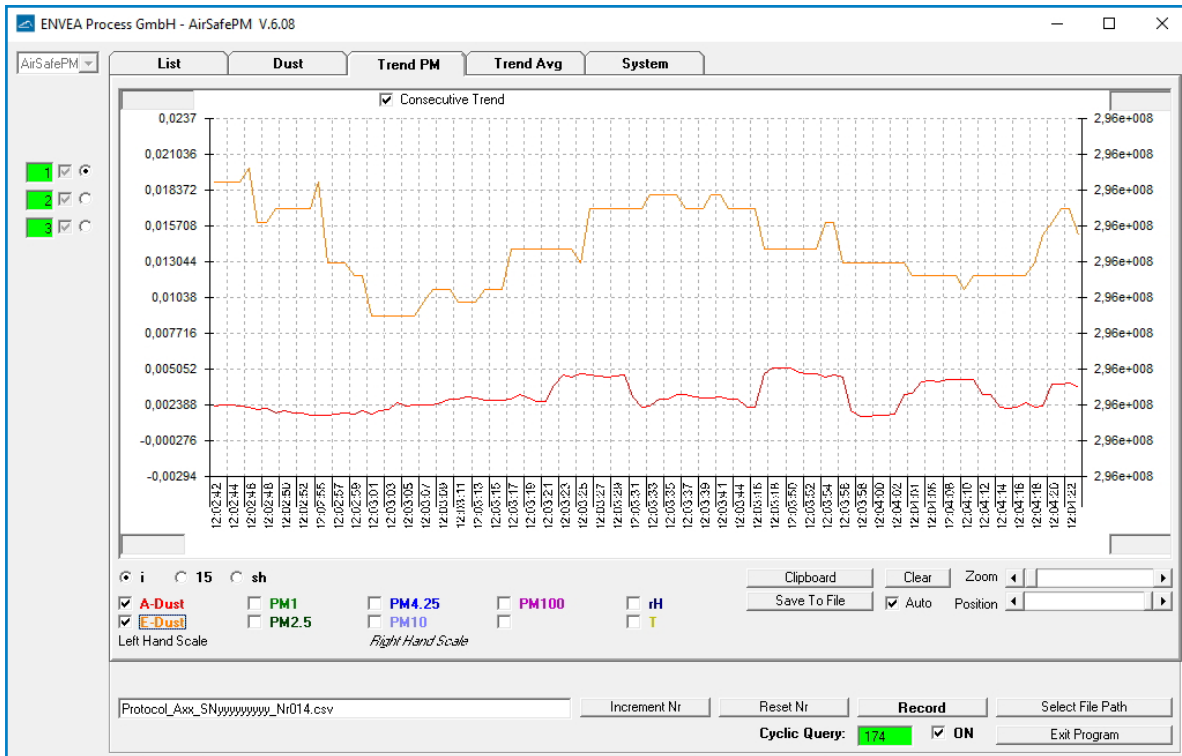


Fig. 5: Trend PM panel

This panel allows you to display as a graph the trend of any selected dust (also temperature and moisture) with 1 times average.

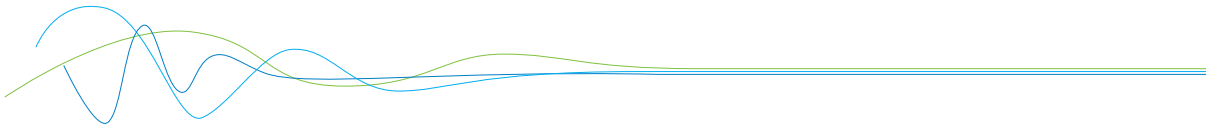
- i:** Instant average
- 15:** 15 minutes average
- sh:** Shift (8 hours) average

**Save to File:** It will generate a .csv file containing the data of the graph display.

**Zoom:** You can zoom on in/out time frame.

**Position:** You can slide the graph on the left or the right.

**Auto:** When checked, the scale of the graph is automatically set.  
When unchecked, you can set desired scaled.



## 6.2.4 Trend Avg

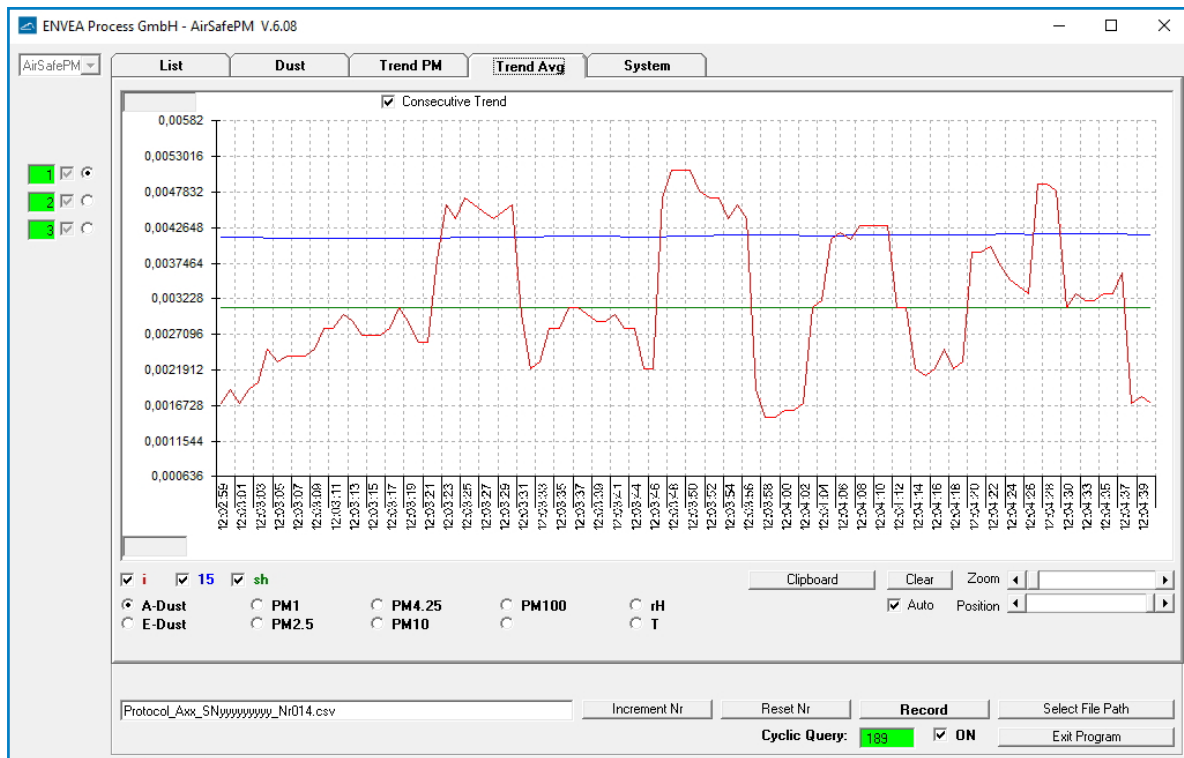
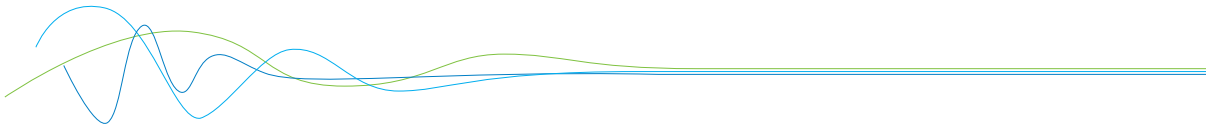


Fig. 6: Trend Avg panel

This panel allows you to display as a graph the trend of 1 type of dust (also temperature and moisture) with up to 3 times average.

- i:** Instant average
- 15:** 15 minutes average
- sh:** Shift (8 hours) average
- Zoom:** You can zoom on in/out time frame.
- Position:** You can slide the graph on the left or the right.
- Auto:** When checked, the scale of the graph is automatically set.  
When unchecked, you can set desired scaled.



## 6.2.5 System

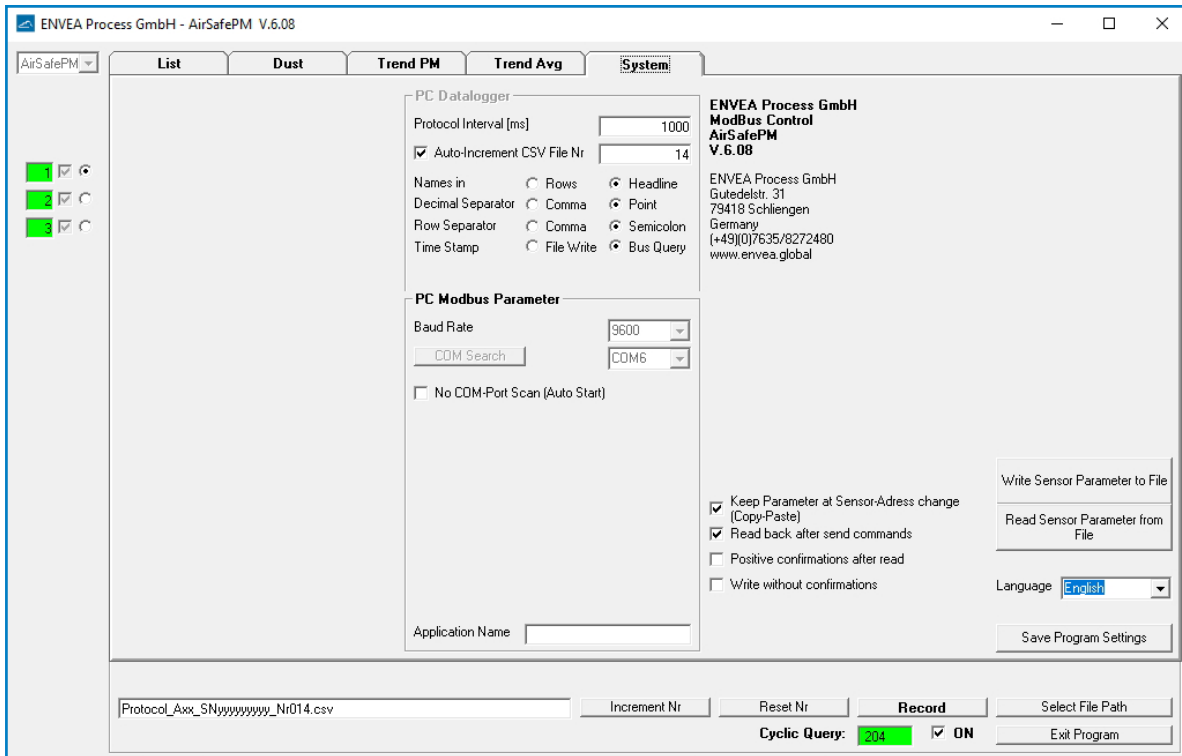


Fig. 7: System panel

The system panel will allow you to change some system parameters:

**Datalogger:** You can here set the parameters of the datalogger. Frequency and .csv file parameters.

**PC Modbus parameters:** You can change the baud rate and the com port.

**Write sensor parameters in file:** This will generate a file with all parameters of the sensor. It can be saved and stored on any support.

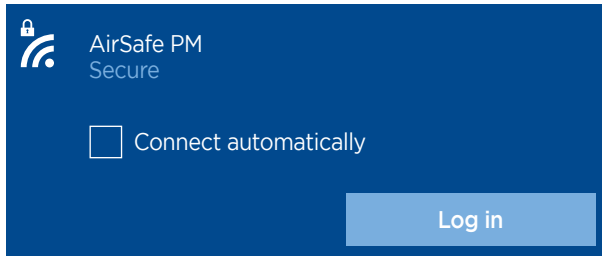
**Read sensor parameter from file:** You can use a backup file to set the sensor parameters from any support.

**Language:** It allows you to switch the sensor language between German and English.

## 7. ESAM Interface

### 7.1 How to connect to ESAM

Go to you network / wifi menu and select AirSafe PM



Default Password is "123456789"

Use a web browser and input "192.168.43.1/esam", press ENTER



### 7.2 How to connect as ADMIN / profile / languages

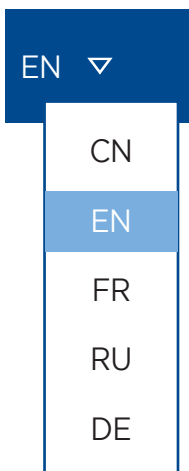
#### 7.2.1 ADMIN

Select "Change Profile"

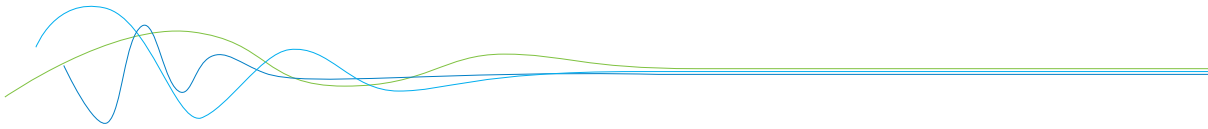


Default login is "admin/admin"

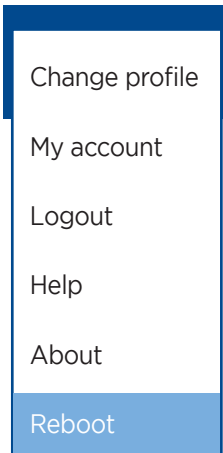
#### 7.2.2 Languages





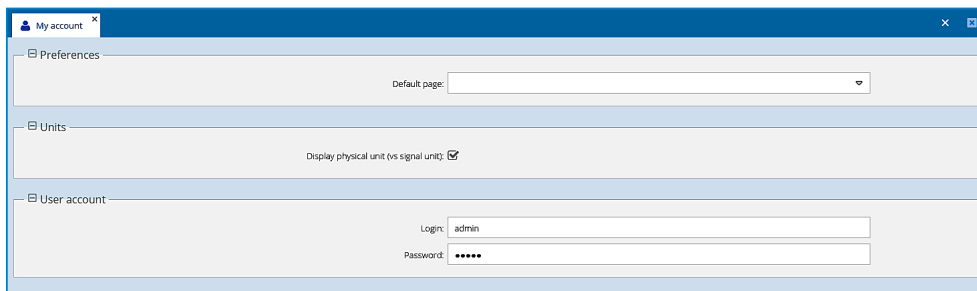


### 7.2.3 Admin menu

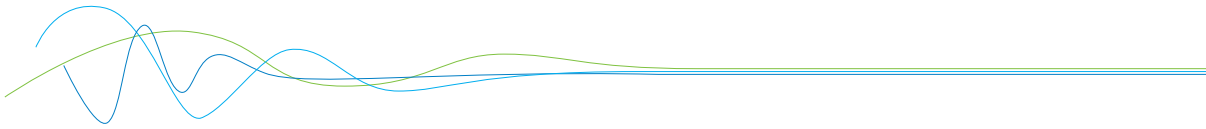


- Change profile:** You can log with a different admin profile.
- My account:** See below
- Logout:** To logout and go back to guest mode.
- Help/About:** Not in use yet.
- Reboot:** You can reboot eSAM interface.

### My account



- Preferences:** You can select the default page that will be displayed at each connection to eSAM.
- Units:** When ticked, the units displayed will be mg/m<sup>3</sup> as standard.
- User account:** You can modify user name and password to access admin menu.



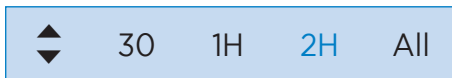
### 7.3 Equipment Status



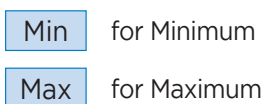
Equipment status menu allows you to see the different available PM size measurement.

You can display them in a graph by selecting desired value (a left click) in the left menu (another click will remove them from chart).

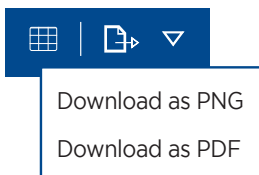
You can select the time period:



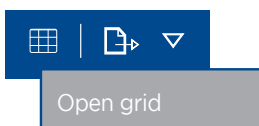
You can adjust the scale:



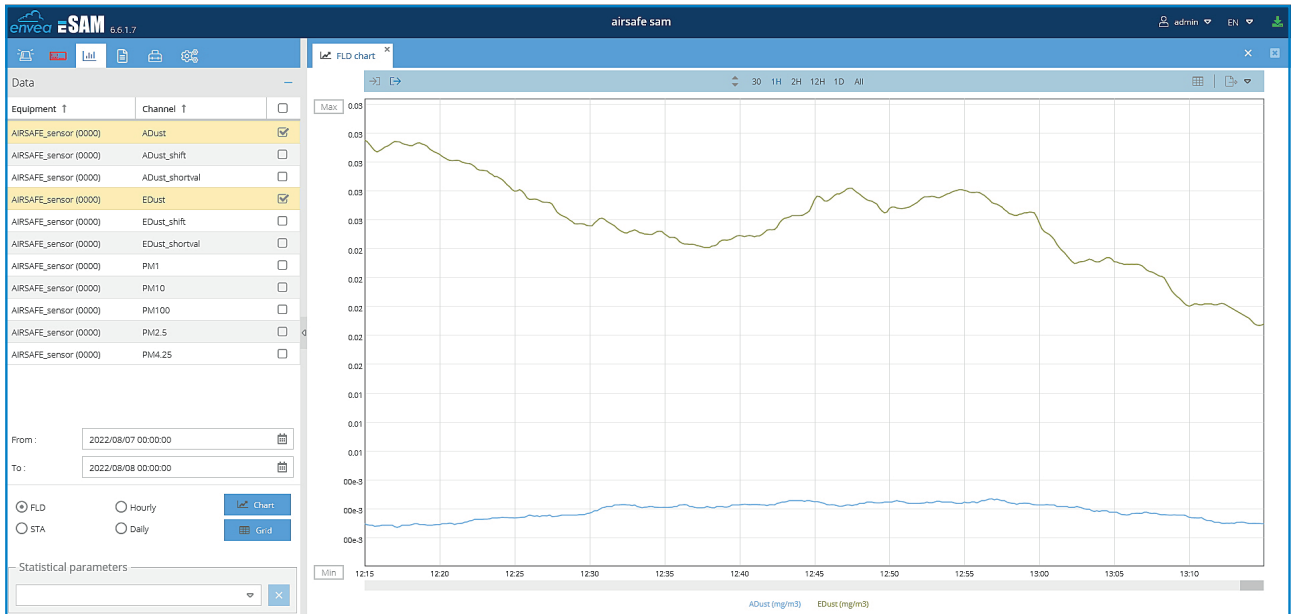
You can quickly export the values seen on the screen by choosing "export", export is available as .PDF or .PNG files:



"Open Grid" button will display value in a table and allow you to export them as a .CSV file:



## 7.4 Historical and datas



This panel allows you to download data stored in the sensor datalogger.

You can select the dust type, the time from and the sampling rate.

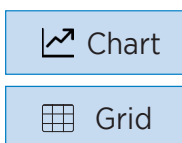
You can export them as a graph or as a chart and a tool can calculate the min/max/average values.

On the left panel you can choose the dust type.

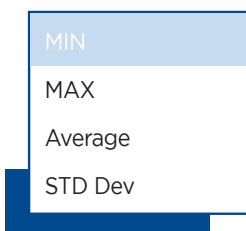
You can select the period of time of data.

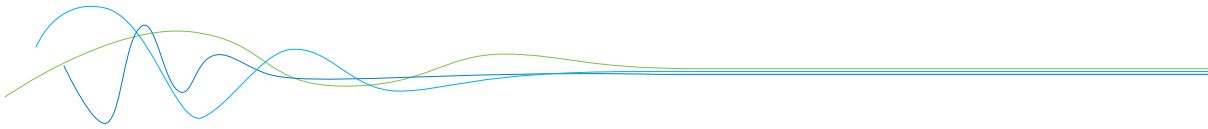
From:    FLD  Hourly  
 To:    STA  Daily

You can select to export data as a graph or a chart (.csv file).

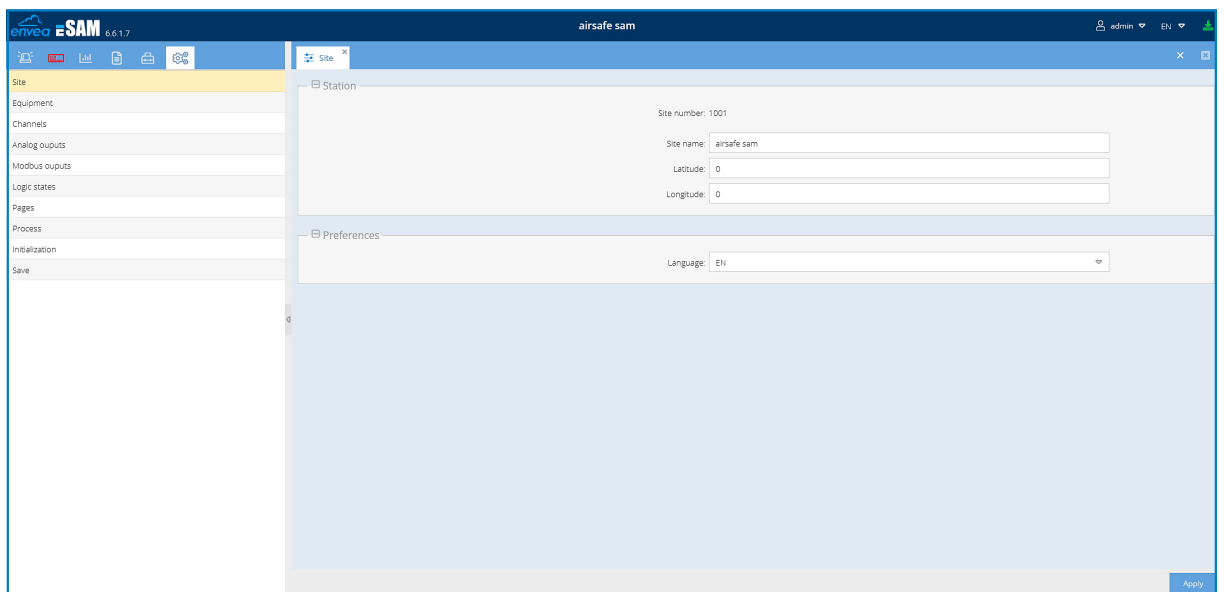
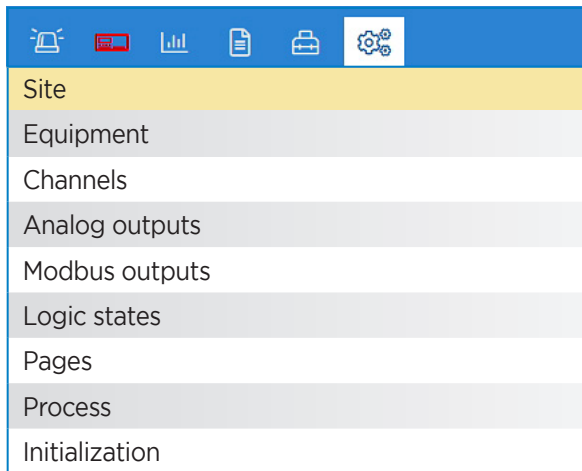


This tool can calculate the min/max/average value of the selected data.



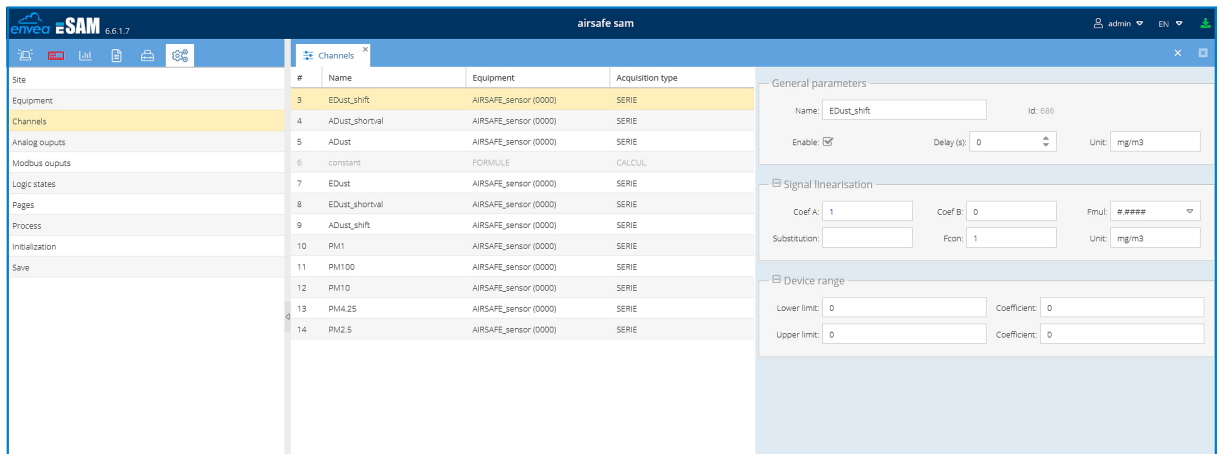
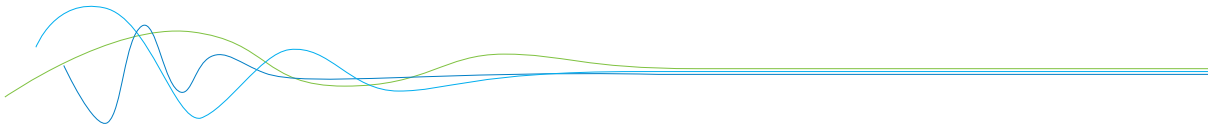


## 7.5 Settings



**Site name:** You can rename the sensor.

**Languages:** You can switch sensor language.



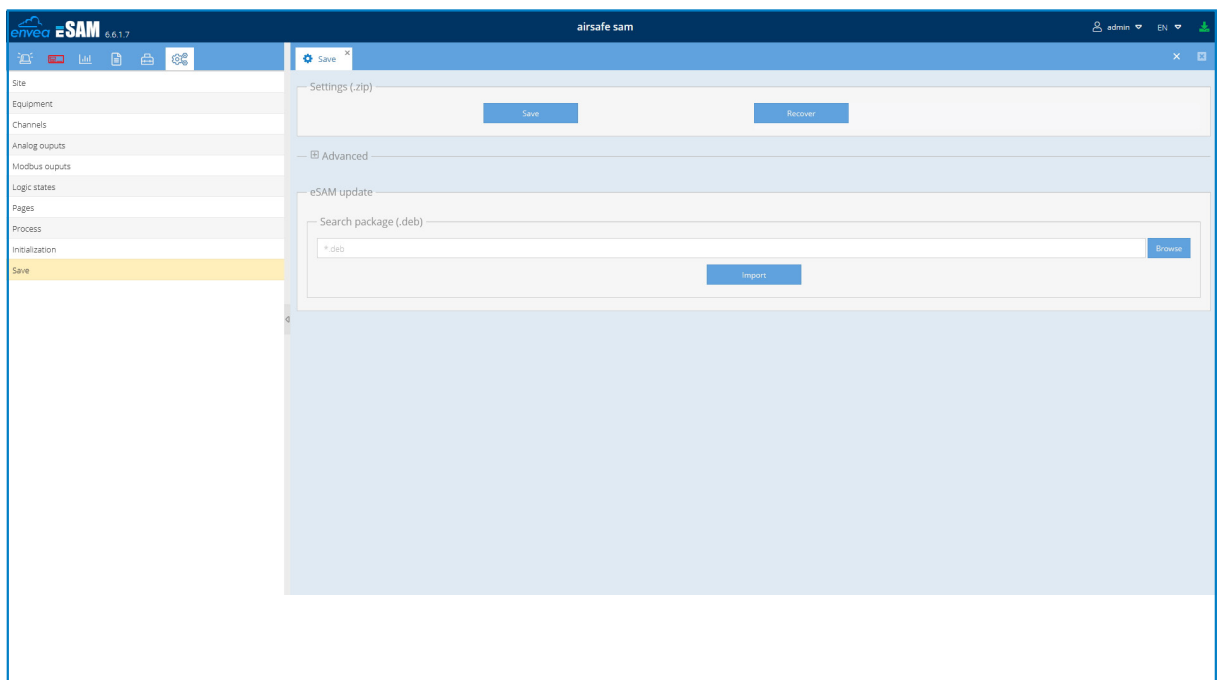
In the panel, you can select each type of dust separately and rename them if necessary.

**Name:** Name of the dust, you can rename it if necessary.

**Unit:** You can change the unit.

**Attention:** It only change the unit name and not the value.  
You need to use „Coef A“ to modify the value.

**Coef A:** As the standard unit is  $\text{mg}/\text{m}^3$ , the Coef is 1.  
If for exemple you want to have an output in  $\mu\text{g}/\text{m}^3$ , you will ne to have a Coef A = 1000

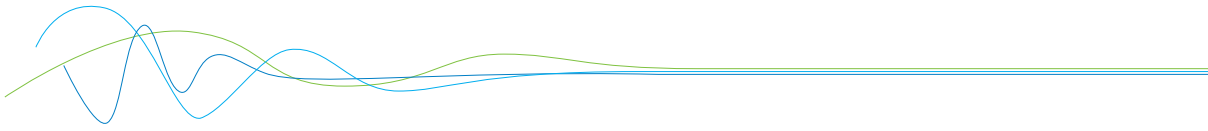


The save panel offer you the possibility to save sensor settings and to update eSAM interface.

**Save:** It will save sensor parameter in a file that can be stored.

**Recover:** You can recover sensor parameter from a previsously save file.

**Update:** In case of major update of the system, you will receive it.  
You can then browse your system to the file and make the update.



## 8. Maintenance

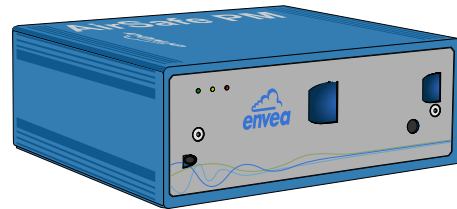
A regular maintenance of the optical modules is necessary.

The optical module block can be ordered from ENVEA or and official distributor.

The maintenance must be done by a qualified technician in a clean environment.

Dust level in operating environment	Suggested maintenance schedule
up to 5 mg/m <sup>3</sup>	every 12 months
up to 10 mg/m <sup>3</sup>	every 6 months
11 mg/m <sup>3</sup> or above	every 3 months

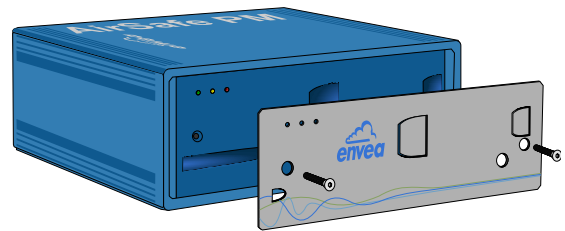
**Step 1:** Remove the 2 screws on the front panel using an allen wrench size 3.



**Step 2:** Remove the metallic protective plate.

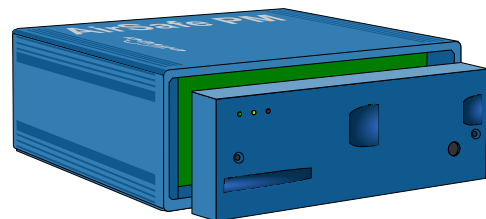
**Step 3:** Remove the modules block.

**Step 4:** Insert the new modules block. Pay attention to the connector position and make sure it is connected.



**Step 5:** Place the protective metallic cover.

**Step 6:** Install the 2 screws.

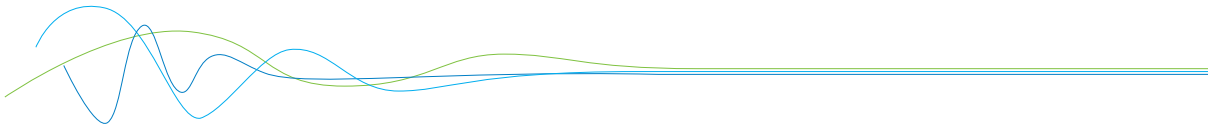


## 9. Warranty

ENVEA provides a warranty of 1 year from the date of delivery.

In the event of a defect during the warranty period, defective components will be replaced or repaired at ENVEA free of charge at the discretion of ENVEA. Replaced parts will become the property of ENVEA. If the customer requests that parts be repaired or replaced at its plant, the customer must pay the travel expenses for ENVEA service personnel.

ENVEA cannot accept any liability for damage not suffered by the goods themselves and in particular ENVEA cannot accept liability for loss of profit or other financial damages suffered by the customer.



## 10. Technical data

Sensor	
Particulate matter measurement range	Mass concentration of E Dust Volume concentration of A Dust <ul style="list-style-type: none"> <li>• PM1</li> <li>• PM2.5</li> <li>• PM4.25</li> <li>• PM10</li> <li>• TSP</li> </ul>
PM level range	E Dust: 0 ... 20 mg/m <sup>3</sup> A Dust: 0 ... 2 mg/m <sup>3</sup>
Data processing	Long term value: Mean value of 8 h Short term value: Mean value of 15 min Instantaneous value: Only sampling time
Tracking of limit violations	Counting of phases with violations of long term limits Counting of recovery phases inbetween them
Humidity compensation	Yes
Dust material density adjustment	Yes
Limits for dust concentration	<ul style="list-style-type: none"> <li>• Long term dust concentration limit for E Dust</li> <li>• Long term dust concentration limit for A Dust</li> <li>• Instantaneous dust concentration limit for E Dust</li> <li>• Instantaneous dust concentration limit for A Dust</li> </ul>
Datalogger	Yes (on AirSafe PM WIFI version)
Communication	2 x 4 ... 20 mA analog output (active) Modbus 485 RTU or TCP/IP WLAN (on AirSafe PM WIFI version)
Relay	1
Voltage	24 V DC
Power	12 W
Current	0.5 A
IP rating	Sensor: IP20; Electronic: IP40
Ambient temperature	-10 ... +50 °C
Dimensions	290,1 x 259 x 107 mm (L x W x H)
Weight	Approx. 2.5 kg



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