AEREKAPROBE

User manual

The eNose company

Version 0.1
15 January 2013

General Warranty

The agreed warranty period is counted from the date of delivery. All damage to parts of the installation within this warranty are rectified by The eNose Company as soon as possible. Consequential damages and damages caused by improper use are not covered by the warranty.

Contents

1 Technical information

1.1 General description

The Aerekaprobe is the measuring part of a so-called 'Electronic Nose' system. An electronic nose is a system composed of one or more non-specific sensors and pattern recognition software. The sensors generate a complex set of measurement features which are analyzed by the recognition software and compared with known samples. In this way the recognition software can qualitatively and quantitative analyze mixtures of volatile substances in air. The known samples are collected during a so-called calibration phase and stored for later use.

The Aerekaprobe in combination with the provided Daemeter software is intended to measure and archive the data, the analysis part needs to be done with other software.

The Aerekaprobe has been specifically developed for laboratory and field use. Normally a unit is fitted with sensor modules in duplicate or triplicate. This allows the evaluation of the inter-sensor differences and the development of sensor-independent calibration models

1.2 Purpose of this manual

The purpose of this manual is to provide the user with information and instructions regarding the Aerekaprobe and its accompanying software (Daemeter).

The manuals of optional parts will be enclosed as appendix if applicable.

The Aerekaprobe is controlled using Daemeter and some maintenance needs to be performed by the user.

If there are any questions left after reading this user manual or if you would like some additional information please contact The eNose Company.

1.3 Technical specifications

1.3.1 Aerekaprobe

Dimensions	220 x 105 x 65 mm (L x B x H)
Weight incl. battery	800 g
Power supply	5V, 1A (max.)
Operational temperature	5° C - 40° C ± 0,2° C
Relative Humidity	Max 90% ± 3%
Type	S063
Back-up battery	Battery pack Li-ion LIP18650, 3,7 V allows operation for more than 3 hours without external power supply.
Communication interface	USB 1.1
Data buffer	Onboard DataFlash™, stores up to 15 hours of continuous measurements
User Interfaces	Pump On/Off switch & signal LED Sample switch & signal LED Backup battery switch Daemeter software

1.3.2 System requirements

For the Daemeter application software

- Windows (version XP or higher)
- Pentium (CPU >1 GHz)
- Available disk space (4 Gbyte, for data storage)
- Microsoft DotNet Framework version 2.0 or higher

2 Safety

2.1 General Safety

2.1.1 Intended use

Aerekaprobe is intended to be used for the measurement of gasses in controlled conditions. It can also be used in unconditioned circumstances but this will affect the pattern recognition of the data. The Aerekaprobe may not be used for anything else then measurement of gasses. The sensor specifications determine which gasses can be measured. In case of doubt always contact The eNose Company.

The Aerekaprobe may not be used in an explosion risk area.

2.1.2 Warning

Read this manual carefully and ensure that all instructions are understood. For your personal safety it is important to understand the consequences of your actions. Do not perform any actions not described in this manual.

Ensure the power supply is disconnected before maintenance. Never open the enclosure without removing the power supply.

Never use alcohol- or ammonia containing liquids to clean the Aerekaprobe. Clean, if needed, with a clean soft cloth moistened with some water.

Contact The eNose Company if the Aerekaprobe is not functioning as intended if all instructions in this manual are observed.

Never place objects on top of or directly besides the Aerekaprobe. Keep a clearance of 10 cm around the Aerekaprobe. All inlets and exhausts need to remain clear at all times. Never put anything inside the enclosure or inlets or exhausts.

Ensure there are no objects placed on top of the tubing or cables and that the cables are no such as to endanger people.

Do not use the Aerekaprobe:

- in a closed or badly ventilated closet;
- directly under or above other equipment;
- on a surface that blocks the Aerekaprobe.

Do not expose the Aerekaprobe to:

- rain or fluids;
- direct sunlight or other heat sources;
- magnetic objects like electrical engines, transformers, loudspeakers, etc.;
- severe vibration.

2.1.3 Electrical safety

When connecting or using electrical equipment, general safety must always be observed to reduce the risk of fire, electric shock and personal injury.

When connecting and disconnecting always beware of ESD (Electrostatic Discharge). Never touch connector pins with unprotected skin.

The unit uses a backup battery to work without power supply. It can be operated for more than 3 hours on this battery. For the real time clock an independent rechargeable battery is used.

2.1.4 Radiation

No radiation emitting components are used in the Aerekaprobe.

2.2 Notation of the safety information

In this user manual blocks of text are indicated with a certain symbol. The symbols used are the following:

> LIFE-THREATENING!
>
> Life of the user is in immediate threat.

> WARNING!
> User can (serious) injure themselves or seriously damage the product. “Warning” indicates harm to user or product, if the user does not follow the procedure carefully.

> CAUTION!
> Product may be at risk. "Caution" indicates damage to the product, if the user does not follow the procedure carefully.

> NOTE!
> Note with additional information for the user. A note alerts the user to possible problems.

> Environmental note!
> Note with additional information which the user makes them aware of instructions and rules to protect the environment.

2.3 Disassembly and disposal of the device

The Aerekaprobe contains materials suitable for recycling.

Special companies can recycle the equipment, so that more material can be used again and less material waste must be processed.

Enquire about the local regulations for disposal of the equipment.

Environmental note! Dispose of packaging in an environmentally responsible manner. Try to separate the packing material as much as possible for re-use.

Environmental note! Remove dead batteries in an environmentally responsible manner. Find out about the local regulations.

3 Content

3.1 Content

The Aerekaprobe consists of

- Aerekaprobe unit with gas sensor system (eNose)
- Mains power adapter
- USB Cable
- HEPA filters (optional)
- Carbon Filter (optional)
- Tubing and fittings (optional)
- Remove the protecting sticky tape from the BATT switch on the front panel. This is intended to secure the switch in the OFF position during transport.

	Aerekaprobe
	Mains power supply
	USB Cable

	HEPA filters (optional)
	Carbon Filters (optional)
	Tubing and fittings (optional)

3.2 Aerekaprobe parts

Fig. 3-1: Aerekaprobe device

1. Reference air inlet
2. Reference air exhaust
3. Sample inlet
4. Sample exhaust
5. Pump switch & indication LED
6. Sample switch & indication LED
7. Backup battery switch
8. 5 Volt DC adapter inlet
9. Indication LEDs
   WA – Wall outlet adapter connected
   PoE – Power over Ethernet available
   SGL – Signal
10. USB connector
11. UTP network connector, for remote support only.

4 Operation

The Aerekaprobe can be operated without the Daemeter software while measuring. To retrieve the data, use the logbook or change the settings the Daemeter software is needed.

4.1 Aerekaprobe

4.1.1 Front panel

The Aerekaprobe has two switches and two signal LED's on the front panel. With these the Aerekaprobe can bet set to 3 distinct states:

1. *Standby*

   In this state the pump and both signal LED's are off. Each sensor module generates one measurement per 15 minutes.

2. *Active - reference*

   Pump is on; air is drawn from the reference inlet [1]. Pump signal LED is either blinking or on. The valve signal LED is off. Each sensor module generates 3 measurements per minute.

3. *Active - sampling*

   Pump is on; air is drawn from the sample inlet [3]. Pump signal LED is on. Valve signal LED is either blinking or on. Each sensor module generates 3 measurements per minute.

The pump switch [5] controls the internal pump while the sample switch [6] controls the two-way internal sampling valve.

When in standby state the Aerekaprobe can be activated by pressing the pump button [5]; the indicator LED will start blinking for a pre-set period of time. This time is intended to stabilize the sensor readings and during this period it is not possible to initiate a sampling measurement. Once the stabilization period is finished the pump signal LED will stop blinking and be on continuously. This is the active state of the Aerekaprobe in which sampling measurements can be started. In this state the air is drawn from the reference inlet [1] and emitted from the reference exhaust [2].

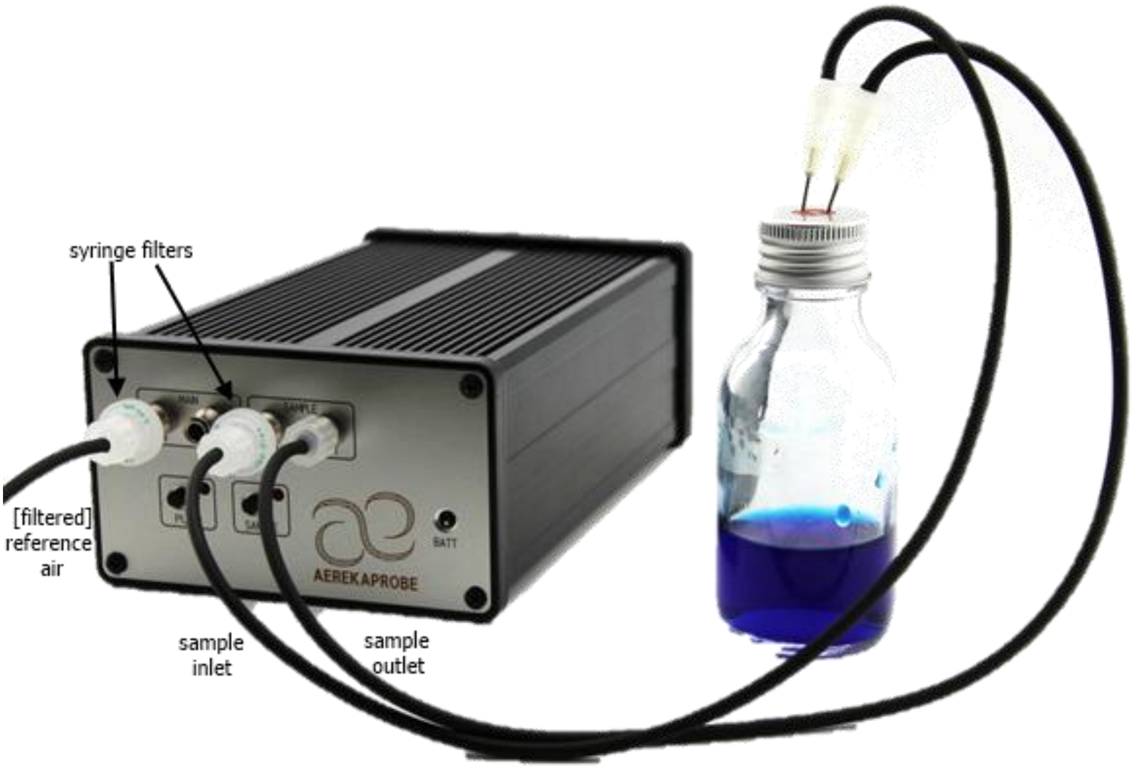
While the Aerekaprobe is in the active state measurements may be started by pressing the sample switch [6]. The sample signal LED will turn on and the internal valve will switch to draw air from the sample inlet [3] and emission will change to sample exhaust [4]. The sample time is pre-set. After this the internal valve switches back to the reference air. The sample signal LED will start blinking for a pre-set time. This is the recovery time and is used to flush the sensors. This recovery is also part of the measurement dynamics and may be useful for pattern recognition. Once the sample signal LED is off again a new measurement may be initiated.

4.1.2 Performing a measurements

A typical measurement setup is given in the figure below. In this setup a relatively large amount of sample is present in a gas sampling bag. The pump will draw approximately 80-130 ml sample per minute. With the standard sample time of 5 minutes, this requires a minimum sample volume of 1 liter to allow a successful measurement.

Typical measurement setup

An alternative setup is given in the next figure. In this setup, the headspace of the sample is re-circulated during the sample phase. In this case small sample volumes can be used; however the sensor will have a small effect on the sample due to the redox reaction occurring which oxidizes a small part of the sample.



Alternative measurement setup

The main air stream can be either ambient air, or preferably 'zero grade air' that has been created by drawing ambient air through an active-carbon filter. An active carbon filter can be easily made up by inserting a wad of cotton-wool, active carbon pellets and another wad of cotton-wool in a large syringe and attaching it to the reference inlet[1].

☞ NOTE!
It is highly advisable to always use standard syringe filters on both inlets, as these prevent fluids or particles from entering the device.

☞ NOTE!
The Aerekaprobe can buffer up to 15 hours of measurements and thus can be used without being connected to the Daemeter software system.
Once connected to the Daemeter software, all measurements in the buffer will be read in by the software and the buffer emptied.
The buffer is Dataflash ™ and is persistent memory.
Power on/off states have no influence on the buffer.

4.2 Software

4.2.1 Installing Daemeter

Start the executable "Daemeter setup.exe" and follow the installation instructions.

> NOTE!
> The first time Daemeter is started a message about port usage might show (especially when using Win7). This is normal and can be safely allowed.

Daemeter is used for 4 purposes:

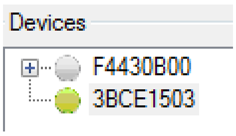
1. Retrieving the measurement data from the Aerekaprobe
2. Maintaining a journal regarding the measurements
3. Exporting the data for data analysis
4. Changing device settings in the Aerekaprobe

All descriptions below assume that Daemeter already has been started and running at its main screen.

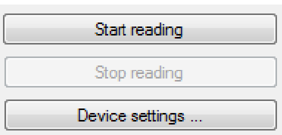
4.2.2 Retrieving data from a Aerekaprobe

Connect the Aerekaprobe to the computer running the Daemeter software.

> NOTE!
> Always ensure the Aerekaprobe is powered on, either by mains or battery, before plugging in the USB cable.



The Aerekaprobe will show in the device list automatically. All Aerekaprobes ever attached are shown in the list. All currently connected Aerekaprobes are marked with a green dot.

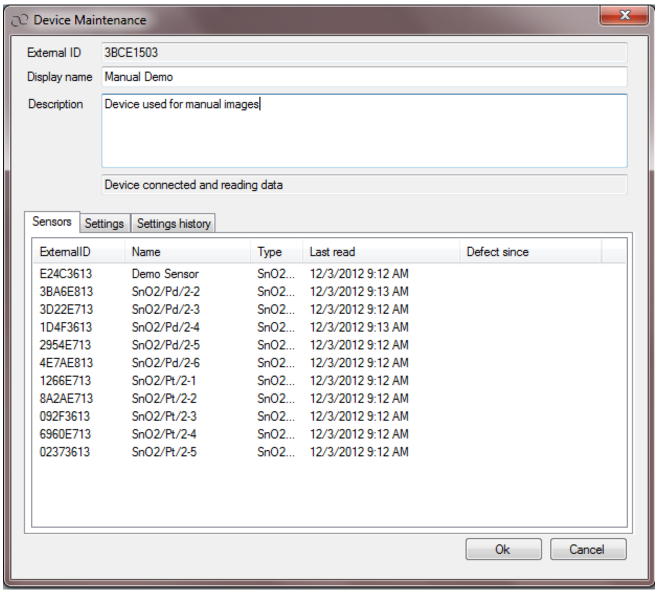


Select the desired device and the [Start Reading] button is enabled. When this button is pressed, all new data will be read from the device.

> NOTE!
> The first time an Aerekaprobe is attached there will be no sensors in the device list. After the first data is retrieved the sensors will be shown automatically.

4.2.3 Device settings

Select the, connected, device and press the [Device settings] button. This will open the dialog screen.

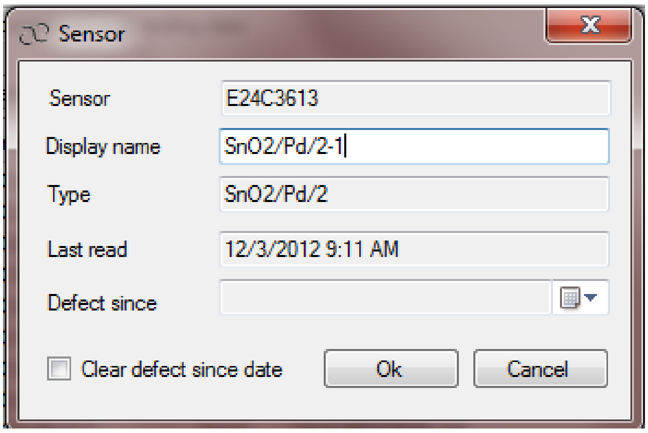


The display name is the name shown in the Daemeter list instead of the default ExternalID. The description field is only shown and used in this screen.

In the lower section 3 tab pages with additional information can be found.

Sensors

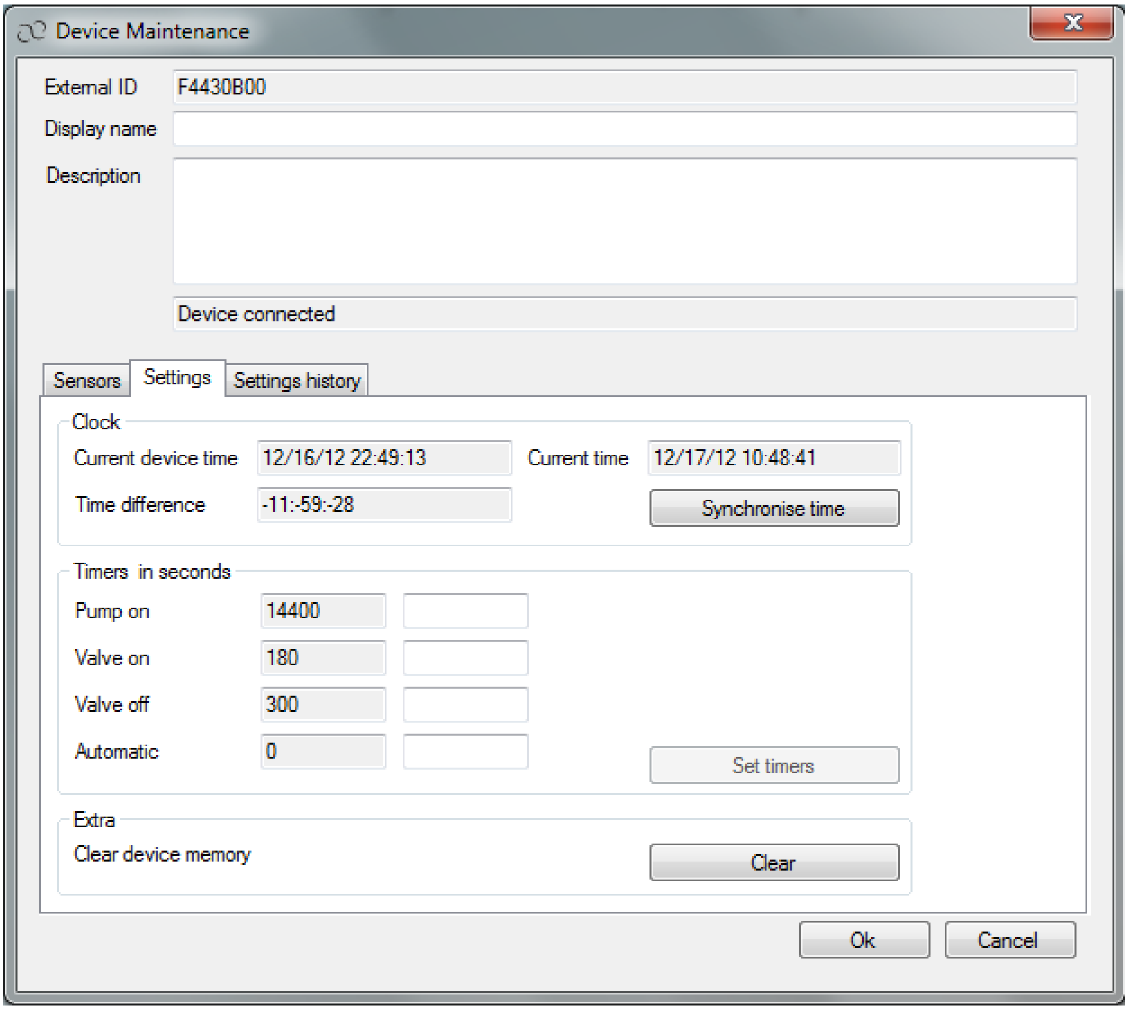
This tab page contains all information about the sensor placed inside the Aerekaprobe, both currently placed and previously placed. When double-clicking on a specific sensor the information about hat sensor can be changed.



The Display name is the name shown in the main list of Daemeter. The last read date contains the most recent read data. The option 'Defect since' can be filled when the sensor does not respon, normally, anymore. This timestamp is used when exporting the data, all information measured after this date is marked as being invalid to avoid invalidating the entire measurement due to a single defective sensor.

Device settings

This tab page controls the operation characteristics of the Aerekaprobe.



NOTE!
It is advised to check the time with the same laptop each time the Aerekaprobe is attached and synchronize if needed to avoid discrepancies in the measurements.

NOTE!
The settings information is NOT available if Daemeter is retrieving the data from the Aerekaprobe. Stop the reading operation before changing the settings.

The Aerekaprobe uses 3 different timers to ensure reliable and interchangeable data.

Pump on: Time between switching the pump on and the moment the first measurement can be started. This period is used to stabilize the sensors after switching from stationary air to flowing air. The default value for this timer is 900 sec. (15 min.)

Valve on: Time that a sample is drawn via the sample inlet. This period is the exposure phase of the measurement and has a default value of 300 sec. (5 min.)

Valve off: Time that clean air is measured after the valve has switched back to the reference inlet. This is the recovery phase of the measurement and has a default value of 300 sec. (5 min.) The Sample button will not respond until this period is finished.

☞ NOTE!
The Pump on timer defines the time before a first sample can be measured.

☞ NOTE!
One measurement duration is the sum of the Valve on and the Valve off timers.

With the button [set timers] the new settings will be stored in the Aerekaprobe and the new settings will be logged.

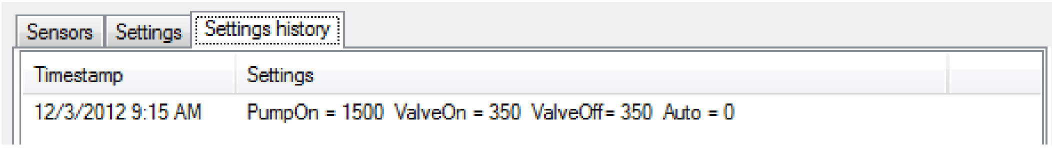
The button [Clear] will clear the internal buffer (memory) of the Aerekaprobe. This button can be used to skip a night of data when the Aerekaprobe has been standing standby or to reset at the start of a new project.

! CAUTION!
When pressing the clear data button al data that has not been retrieved will be lost.

☞ NOTE!
Only skip data by pressing the [clear data] button when there is a need for it. The standby signal does provide insight in the environmental influences and could be useful in case of "strange" results.

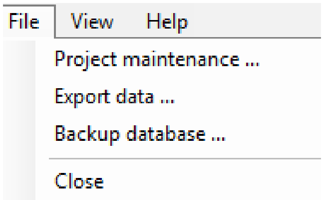
☞ NOTE!
Clearing the memory before a new project is only useful when another instance of Daemeter is used. All data is connected to the device and will show as continuous data within Daemeter.

Settings history



This tab page shows all timer changes applied to the Aerekaprobe. Only data with the same Valve settings may be compared.

4.2.4 Project management



A project defines data belonging together and contains general project information and a collection of measurements belonging to the project.

All project information can be viewed through the project maintenance which is located within the File menu option.

The left side of the screen shows all defined projects. When a project is selected the details of that project will be shown.

> NOTE!
> When starting with Daemeter the option "Add project" is disabled. Select the entry "New name"; fill the information and press save to store the first project. After this the button will be enabled and add a "New name" entry to the list that can be altered and saved.

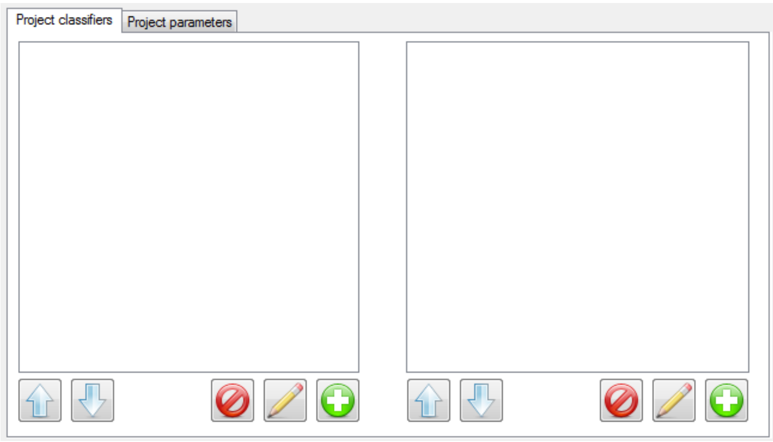
The Name of the project is used in the main screen where the active project is displayed and for the filename of an export.

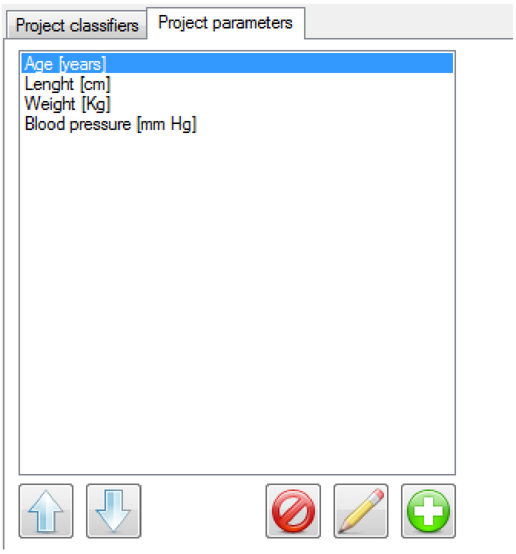
The description field is only shown here and it is also part of the data export. The start and end date can be filled for administrative purposes. These are also used to select the initial setting for a data export.

Within each project classifiers or other information can be assigned to each measurement. The classifiers are shown when adding a measurement and are unique for each measurement. Most common classifier is the absence or presence of the condition being measured. The list can be filled with all information needed, the sequence defined in this list is the same sequence shown when a measurement is defined.

There are two kinds of information that can be defined within a project; classifiers and parameters. A classifier is a variable with a pre-defined list of possible values while a parameter is a variable that can take any value.

A classifier is added by selecting the "project classifiers" tab and pressing the left . Add for example Gender/Condition Diagnose/Alcohol/Smoker. After the classifiers are added the possible values can be added by selecting the desired classifier, for example "Gender" and filling the right sided list with the allowed values by clicking the right , for example "Female" and "Male" . Classifiers and values can be altered by clicking the corresponding and deleted by clicking the corresponding .





Project parameters can be entered by clicking the project parameters tab and using the same buttons as above. A parameter consists of a descriptive name and can also contain the units of that parameter.

Add for example the parameter "Age" with the unit "years", "Weight" with the unit "Kg" or "Height" with unit "cm".

NOTE!
The sequence of the classifiers, parameter and values in the measurement screen will be the sequence defined in this screen.

From the list of available projects an active project can be selected by double clicking it, which will move the selection dot to that project, and close the screen. On the main screen the name of the active project is shown above the chart area.

4.2.5 Measurements

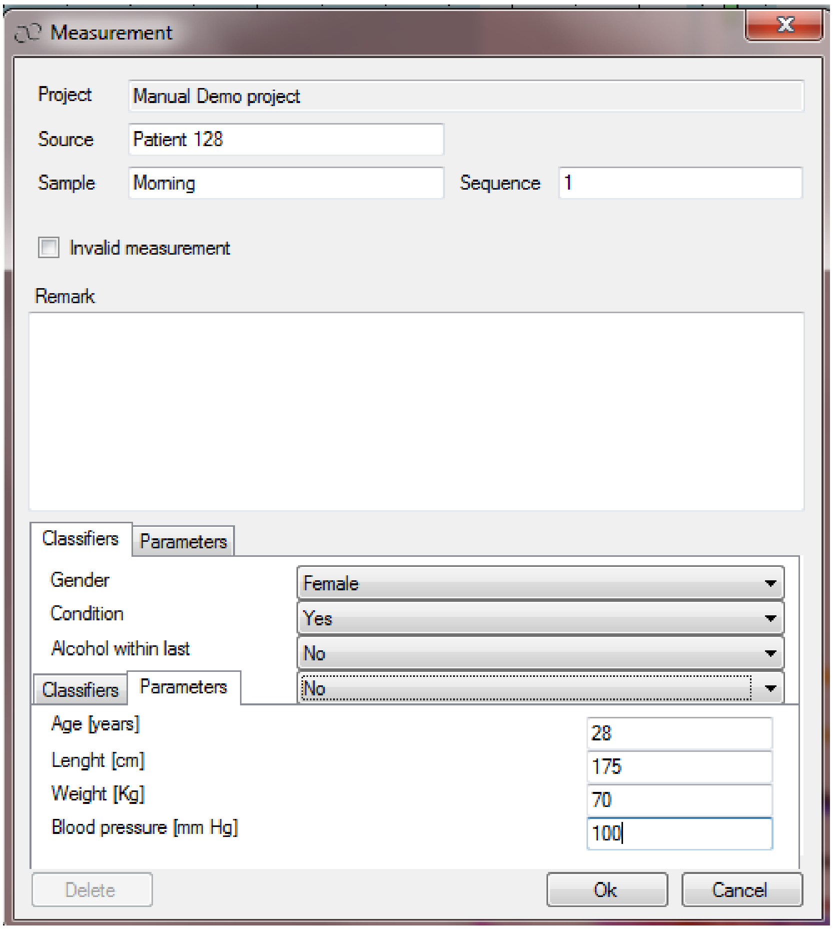
A measurement is the smallest unit within a project and contains all data measured during 1 valve on – valve off cycle for all sensors within a device. Each measurement contains its own set of the defined classifiers and parameters.

Adding a measurement can be done via the context menu (right button) or by double clicking in the graph. Both actions will locate the nearest measurement and open the measurement detail form.

> NOTE!
> All defined measurement will be added to the currently selected project. A measurement can be added to different projects but not more than once to a specific project.

The project is always the currently selected, active project. The tab pages at the bottom contain the defined classifiers and parameters for the measurement.

The measurement contains 3 fields to uniquely identify the measurement within a project.



Source: This is the source providing the sample, for example a patient or product

Sample ID: Required field, unique sample code or sample# from this source

Sequence: Can be used if a sample is measured more than once.

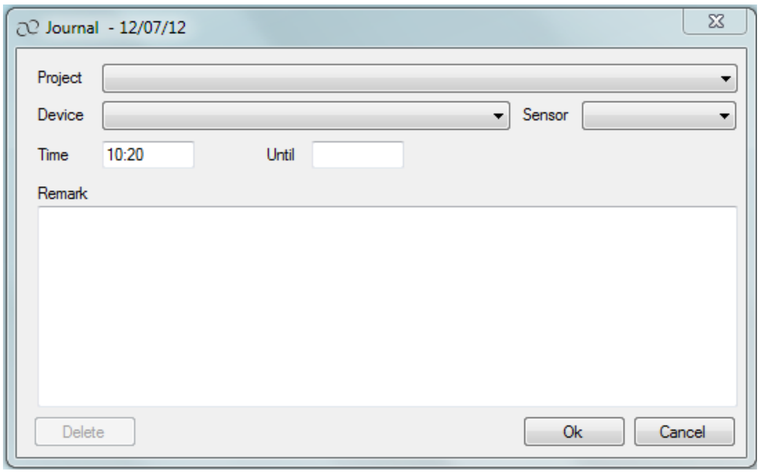
Remark: Free text field where anything that could be of interest can be inserted.

Invalid Measurement: Use this checkbox to mark this measurement as invalid. This can for example be caused by external influences or sensor failure. The data is exported but with the "Valid" value set to false so it can be identified when working with the data in another program. If an experiment is defined an indicator will be visible on the top part of the graph.

4.2.6 Lab journal

Daemeter contains the option to add a so called journal entry. A journal entry is only related to a point in time and not to a specific device or measurement. If something occurs that could affect all data collected e.g. dropping a bottle of alcohol somewhere in the room.

A journal entry can be entered by clicking in the lower part of the graph. The position of the cursor in relation to the time shown on the x-axis determines the time of the event.

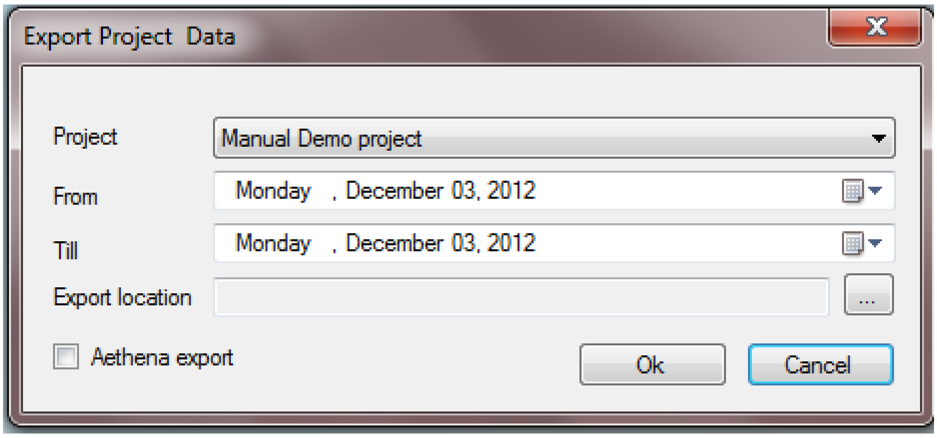


All known Projects, Devices and Sensors aer shown in the dropdown lists and can be used to delimited the scope of the information. If an journal entry is defined an indicator will be visible on the bottom part of the graph.

4.2.7 Exporting data

The data can be exported to either a generic CSV file format or a binary file that can be read by the Aethena© software. The content of both files are equal.

The data can be exported by selecting the export data option in the File menu. This will open an export data dialog.



In this dialog box the project to be exported needs to be selected together with the period of which the data needs to be exported. Select the export location and click [Ok]. The export will only contain defined measurements within the project and not the other data.

The Aethena export is a proprietary binary format to be used with the Aethena© software and cannot be used for other purposes.

The generic CSV file can be used with almost all data handling programs. It's format is described in Appendix 2.

> NOTE!
> Only defined measurement will be exported, not the other data points.

4.2.8 Backup

A backup can be made from the database containing all the data and project definitions by selecting the 'Backup Database'.

> NOTE!
> A backup can only be made when the software is not retrieving data from an Aerekaprobe since this process uses the database.

5 Maintenance

WARNING!
To ensure proper operation the device needs to be serviced periodically.

LIFE-THREATENING!
Risk of electrical shock
Before servicing the device all power supply needs to be removed.

5.1 Inspection

Outer surface needs to be checked weekly.

1. Check the Aerekaprobe for damaged or missing parts. Especially any tubing needs to be checked thoroughly.
2. If any damage is observed please contact The eNose Company.
3. Check the sensor response using the headspace of a 100 ppm alcohol stock solution; this should produce a noticeable raise in signal. Use previous results as reference, if amplitude drops more than 50% please contact The eNose Company

5.2 Cleaning

Outer surfaces need to be cleaned monthly.

NOTE!
When cleaning only use tap water, do not use cleaning agents.

1. Remove the power supply and switch off the battery.
2. Wait at least 10 seconds to avoid possible electrostatic damage.
3. Only use a soft, lint free cloth to clean the Aerekaprobe.
4. The cloth may be moistened with a little tap water
5. Do not use cleaning agents as they might disturb the sensors.
6. Clean as often as needed.

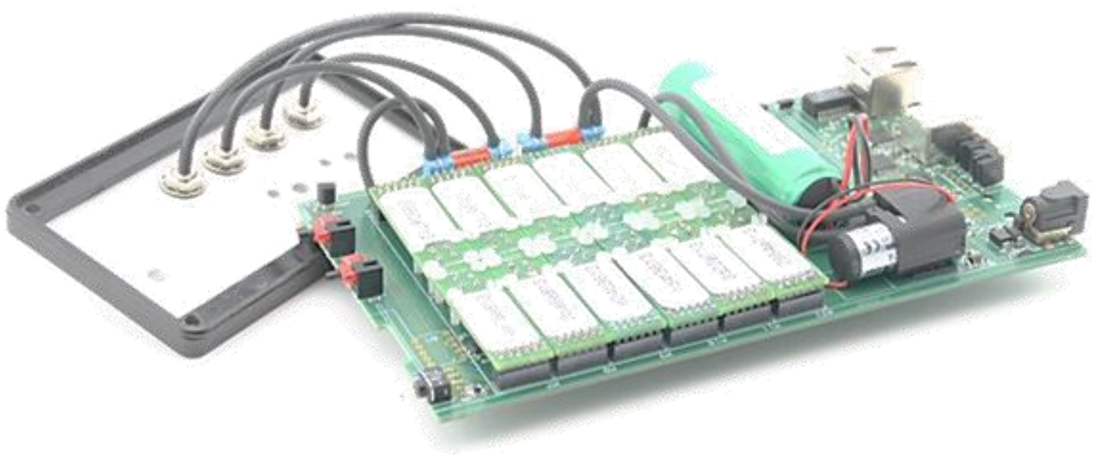
5.4 Replacing a sensor module

⚠ WARNING!
Always remove the power supply and switch off the battery before opening the Aerekaprobe.

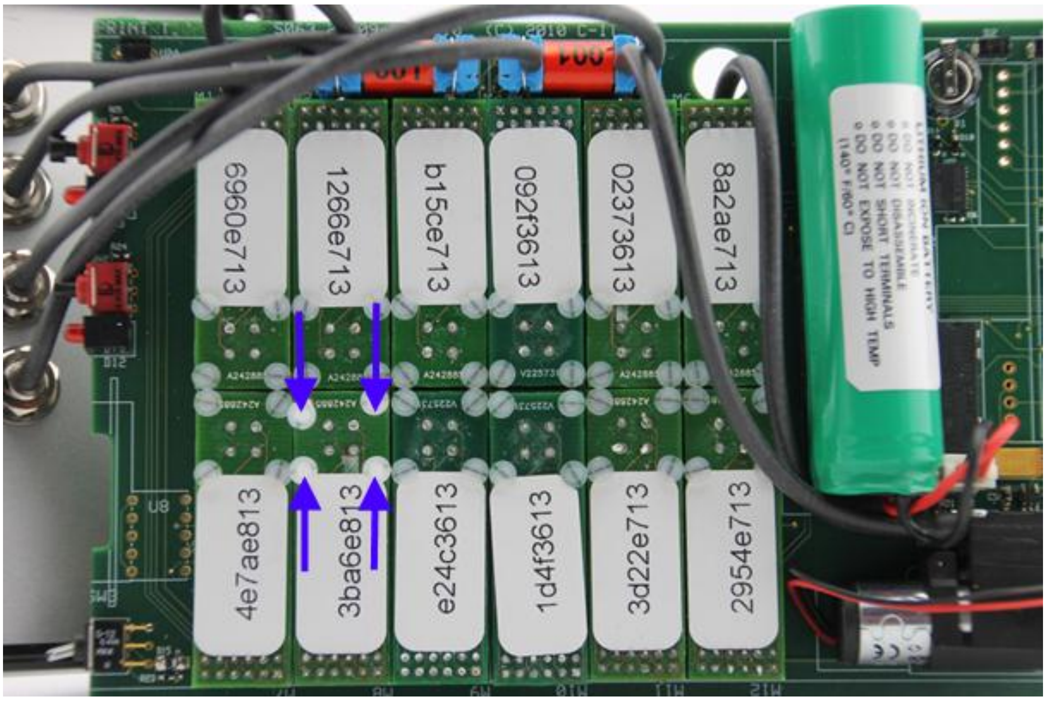
Remove the 4 screws in the corners of the front panel

☞ NOTE!
Watch out for the 2 small caps placed on the Pump and Sample button. These are loosely attached and most likely will fall off.

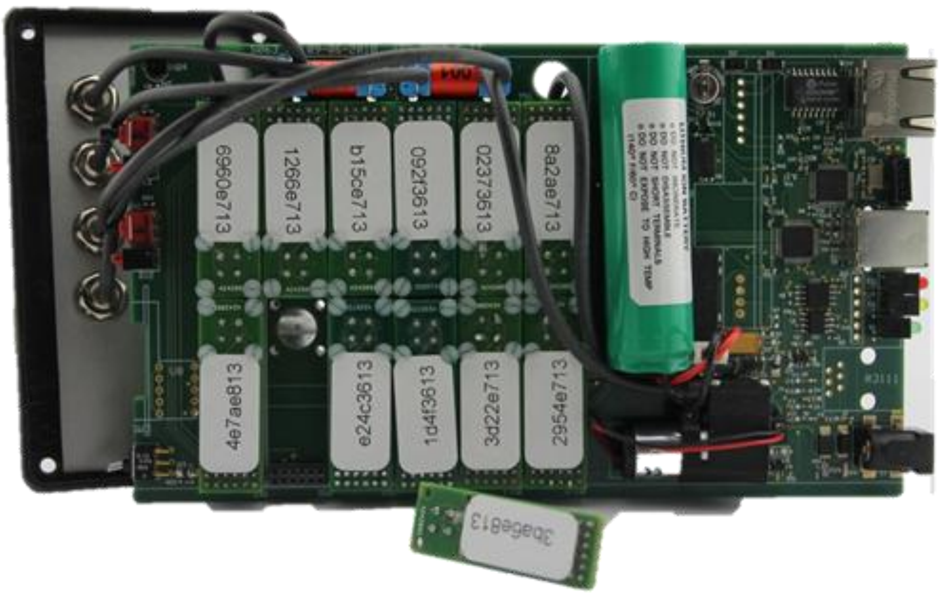
Slide the circuit board out of the enclosure.

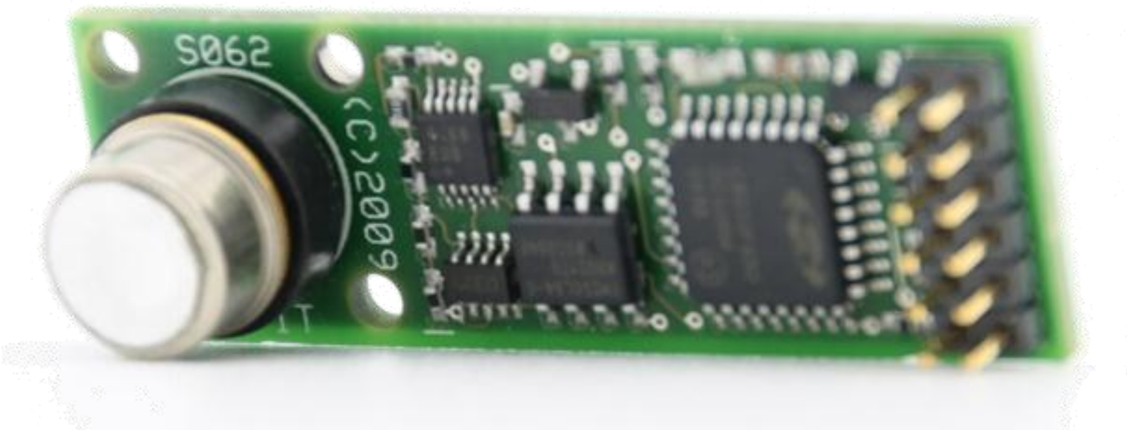


Locate the sensor module to be replaced and loosen the 4 screws

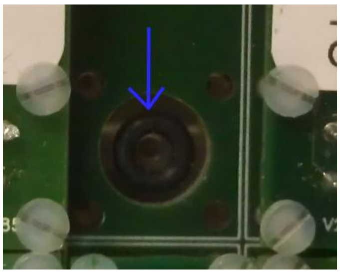


Remove the module by lifting it straight up





Place the O-ring centered on the Perspex part underneath the circuit board in such a manner that the cap of the sensor is placed on top. Insert the new sensor module. Take care that the pins align with the connector on the main board.



Place the screws back and tighten the screws.

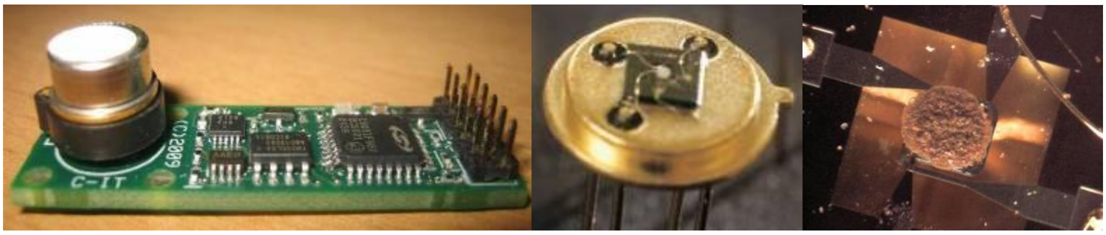
NOTE! First loosely tighten all 4 screws before applying the final tightening.

Slide the circuit board back into the enclosure (4th slot counting from the bottom)

Place the screws back.

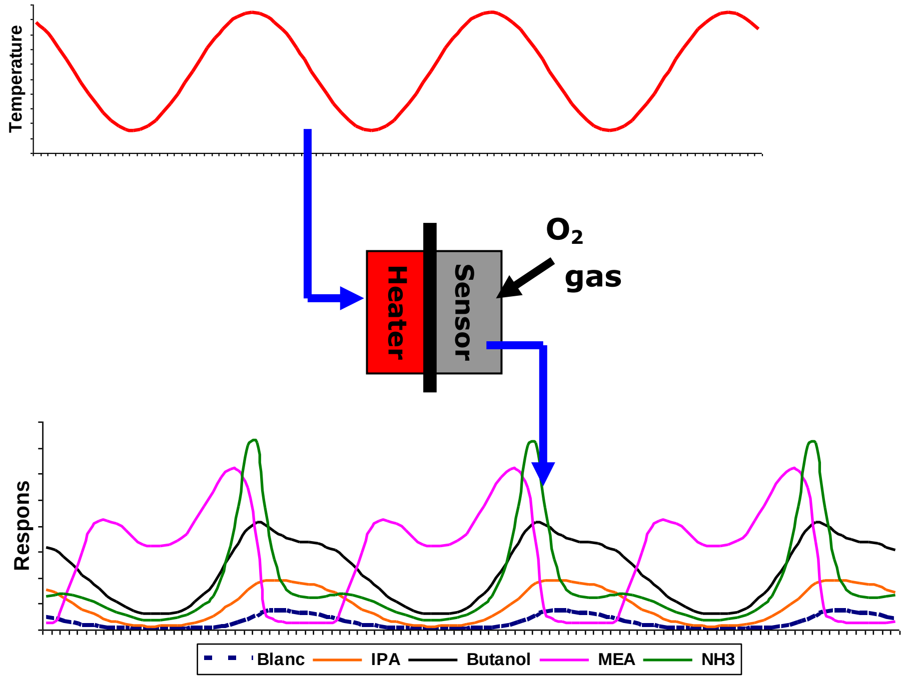
6 Chemical detection principle

The Aerekaprobe employs an array of up to twelve 'intelligent' sensor modules. Each sensor module contains driving electronics, a microprocessor and a unique silicon serial number. The sensors are fitted on a connector. The sensors are micro-hotplate types as illustrated in the figure below. Due to the low thermal mass, temperature regulation is in the millisecond regime.



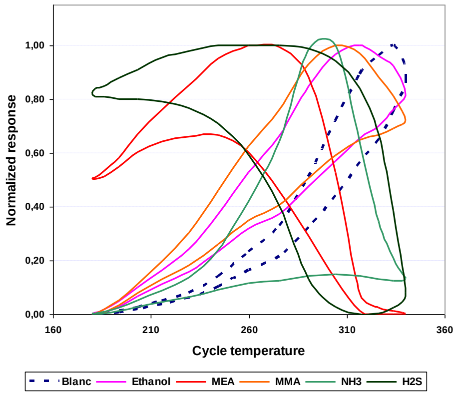
From left to right: The intelligent sensor module, the sensor with cap removed (the white dot is the actual sensor material), close-up of the micro-hotplate.

The metal-oxide sensors are temperature modulated under software control in a working range of typically 180-340 °C. In this range the metal-oxide sensors behave as semiconductors. When oxygen adsorbs and/or ionizes at the sensor surface the conductivity is low. Removal of oxygen due to reaction with other substances (redox reaction) results in a measurable change of conductivity. The change in conductivity is governed by the sensor material (metal-oxide type and catalyst), sensor temperature dynamics and the chemical reaction rates. The latter is determined in turn by the chemical concentrations (related to the adsorbtion/desorbtion rates) and the surface temperature (reaction rate). Features for pattern recognition are generated by recording the conductivity as function of the temperature dynamics. This is illustrated in the figure below.



Principle of thermal modulation. The isolated heater is modulated and the response of the sensor to ambient volatiles is recorded as function of this temperature. The time scales of lower and upper graphs are the same.

In further use, the data is normally visualized as series of one full period in a so-called 'thermal loop'. Examples of these thermal loops (taken from the same data as in the previous figure) are given in the figure below.



Response plotted as function of the heater temperature during a full period.

The electronics and system firmware allow for dynamic precise temperature control with a standard deviation of approximately 1 °C. The combination of the low thermal mass of the micro-hotplates and the dynamic temperature control allows for very fast modulation of the sensor temperatures.

The measurement interval (the time it takes to complete a full thermal cycle) is determined by the chosen modulation scheme. The limiting steps are the physical and chemical reaction rates at the sensor surfaces as the temperature modulation itself is extremely fast. A step from ambient to 350 °C can be achieved in several milliseconds. Modulation schemes are normally in the order of 5 to 30 seconds per full thermal cycle resulting in the same measurement intervals. As standard modulation scheme a sinusoidal period of 20 seconds is used.

Measurable substances

The sensor array of the Aerekaprobe is capable of detecting a very large group of volatile hydrocarbons and a range of inorganic substances.

Due to the detection mechanism the basic requirement is that the substance under investigation will react with oxygen at the sensor surface under the chosen temperature modulation scheme. This rules out substances such as the noble gases Argon, Radon and Neon. Also fully halogenated substances are difficult, but not impossible, to detect.

Note also that detection is governed by the gaseous concentration of the substance in air. Substances with very low volatility will not generate a concentration high enough to meet the lower detection limit of approximately 1 ppm (H_2S and sulphur containing organic substances have a lower detection limit).

Examples of the inorganic substances are H_2S, NO_x, SO_x, NH_3, Cl_2 en O_3. The group of organic substances is extremely large. An example shortlist (by no means exhaustive) is:

- Light alkanes, alkenes and alkynes
- Light alcohols and aldehydes
- Light amines and mercaptans
- Partly halogenated hydrocarbons
- Volatile acids
- Volatile aromatics

Appendix 1- CE Approval

EC Declaration of Conformity

We The eNose Company

of Marspoortstraat 2 – 7201 JB – Zutphen – The Netherlands

In accordance with the following Directive(s):

2004/108/EC The Electromagnetic Compatibility Directive

Hereby declare that:

Equipment **Aerekaprobe**

Model number **S063**

Is in conformity with the applicable requirements of te following documents

Ref.No	Title	Edition /Date
EN 55011	Conducted emission, test with LISN	[2009]+A1[2010]
EN 55011	Radiation emission up to 1 GHz (SAC)	[2009]+A1[2010]
EN 61000-4-2	ESD	[2009]
EN 61000-4-3	Radiated Immunity	[2006]+A1[2008]+A2[2010]
EN 61000-4-4	EFT	[2004] + A1[2010]
EN 61000-4-5	Surge	[2007]
EN 61000-4-6	Conducted Immunity	[2009]
EN 61000-4-11	Voltage Dips and Interruptions	[2004]

I hereby declare that the equipemt above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable Essential Requirements of the Directives.

Signature

Name: Andre Elands

Position: CEO

On: 01 July 2012

Document reference No.
12C00509RPT01

Appendix 2 – CSV Format descriptor

A2.1 Generic Layout of the file

Items shown in **bold** are always present in the file.
The symbol … means the amount of lines may vary depending on the project information, there are no lines if nothing is declared for that section.

---------CSV Export layout------
##General Project Information
Name : Name of the project as defined within Daemeter
Start : Start point of the project ["Not Defined" if field is not filled within Daemeter]
End : End point of the project ["Not Defined" if field is not filled within Daemeter]
Data Export Start : Start point of data in the export file
Data Export End : End point of data in the export file
Project Description : The description of the project as defined within Daemeter
##Devices used within project
Device : Aerekaprobe display name [Aerekaprobe ID] or Aerekaprobe ID (if no display name defined)
Sensors : Sensor1 display name [Sensor1 ID] or Sensor1 ID (if no display name defined) || rest of sensors…
##Defined Classifiers
Classifier 1 : Value1 / Value2 / Value3
Classifier 2 : Value1 / Value2 / Value3
…
##Defined Parameters
Parameter1 [Unit of parameter1]
Parameter2 [Unit of parameter2]
…
##Measurements *This block is repeated for each defined measurement in the export.*
Sample Code : Sample code as defined within Daemeter
Source : Source as defined within Daemeter
Sequence : Sequence as defined within Daemeter
Start : Start time of the measurement (date time)
Valve On : Time the Valve switched to Sample position (date time)
Valve Off : Time the Valve switched back (date time)
Comments : All Comments entered for this measurement
#Classifiers
Clasifier1;Value selected for Classifier1
Clasifier2;Value selected for Classifier2
…
#Parameters
Parameter1 [unit parameter1];value for parameter1
Parameter1 [unit parameter1];value for parameter1
…
#Specific Journal entries
1 Journal Entries First the amount of entries is shown, followed by the entries.
Starttime entry : text of the entry
…
#Data *This block is repeated for all sensors used for this measurement*
Sensor ID : Identiry of the sensor
Sensor Type : Type of Sensor (Number. 0=xx/1=xx/2=xx/3=xx/4=xx)
Sensor Valid : Indication if the sensor is still operational (Based on Defect since date within Device Settings->Sensor)
Timestamp of the measurement;CycleID [Not used with Aerekaprobe];ConductivityValue01;..;..;..;ConductivityValue32
…

---------End of CSV Export layout------

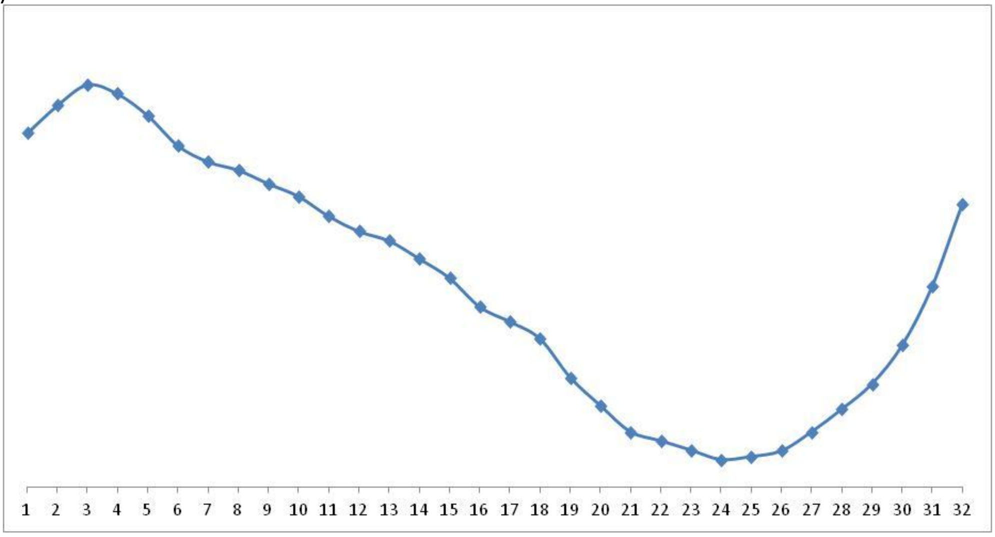
A2.2 Data usage

The data exported are the actual measured conductivity values, 32 in total in accordance with the number of steps within the thermal profile used.

A single measurement can be visualized in 2 different manners, either as a sinoid shape or as a thermal loop. Both of the options are shown below with an explanation how to create these graphs.
The data can be treated in any number of ways, just remember that there is dependence between both the 32 values (through the thermal loop applied) and the rows (through the exposure/recovery dynamics) in a single measurement (1 data-block of 1 sensor). One single measurement is always represented by a 32**m* matrix of values where *m* is dependent on the length of the exposure and recovery phase.

Sinoid shaped representation.

To get a sinoid shaped representation one simply takes the values 1 to 32 as the x-value with the measured conductivity as the y-value.



Thermal loop shaped representation.

To get a thermal loop representation the thermal step size is needed. Due to the shape of the sinoid the needed x-values are not equally distributed like the sinoid shaped representation.

The x-values needed for a thermal loop are:
0.00 ; 0.195 ; 0.383 ; 0.556 ; 0.707 ; 0.831 ; 0.924 ; 0.981 ; 1.00 ; 0.981 ; 0.924 ; 0.831 ; 0.707 ; 0.556 ; 0.383 ; 0.195 ;
0.00 ;-0.195 ;-0.383 ;-0.556 ;-0.707 ;-0.831 ;-0.924 ;-0.981 ;-1.00 ;-0.981 ;-0.924 ;-0.831 ;-0.707 ;-0.556 ;-0.383 ;-0.195

This results, in some programs, not in a fully closed loop, to close the loop simply repeat the first value pair at the end (1^{th} position is equal to the 33^{th})