FluoMini Pro Optical Algae Sensor

User Manual

System information

FluoMini Pro type: 106

Firmware: v. 210628

Software: v. 2.21

Baudrate: 19200

www.sendot.nl

Contents

1. General

1.1. Product

Product	FluoMini Pro Optische Algen Sensor
Version	1
Software	2.21
Firmware	210628

1.1.1. Delivery

- FluoMini Pro Optical Algae Sensor (handheld, analog or digital)
- Fiber with stainless steel probe
- USB cable (1.0 m)
- Analog cable (1.0 m, for analog sensor only)
- Digital cable (1.0 m, for digital sensor only)
- Algae- calibration cap

1.1.2. Technical specifications

Specifications	**Values**
Measurement range	0 – 0.4 mg/l
Temperature range	+ 5 tot + 45°C
Accuracy	± 0.004 mg/l
Drift/ Stability (operating frequency 0.1 Hz)	≤ 0.1 % per month
Sample Time	≤ 2 sec
Calibration	2 point (using the calibration cap)
Connectivity	Handheld: USB serial interface Digital: USB serial interface Digital output/ TTL seriale port Analog: USB seriale interface 4 – 20 mA output (4 wires) 12 – 24 V AC/DC
Output signal	USB serial interface port

Dimensions (l x g x h in mm)	169 x 62 x 25
Weight (g)	235
Housing material	Aluminium, with ABS-covers
Elektrical connections	Handheld: 1 x M5 4-pole male Digital: 2 x M5 4-pole male Analog: 1 x M5 4-pole male 1 x M5 4-pole female
Probe material	Stainless steel (6mm OD, l = 100) with optical fiber
Protection level	IP53
Power supply	Handheld/digital: USB port (5V, < 200 mA) Analog:12-24 V
Battery lifetime (handheld/digital)	48h at 5 sec interval 2 weeks at 60 sec interval

1.2. Important user instructions

This sensor is suitable for measuring chlorophyll fluorescence of algae. In applications where the probe measures directly in water, the surface of the probe may become contaminated resulting in higher readings. The probe should be cleaned regularly.

1.3. Warranty

This product has a warranty of two years on the mechanics and electronics (excl. battery).

1.4. Delivery conditions

This product is subject to the “GENERAL RESEARCH, ADVICE, SALES, DELIVERY AND PAYMENT CONDITIONS OF SENDOT RESEARCH BV (deposited with no. 62488295 bij KvK Haaglanden)”. It can be downloaded from www.sendot.nl.

2. Installation

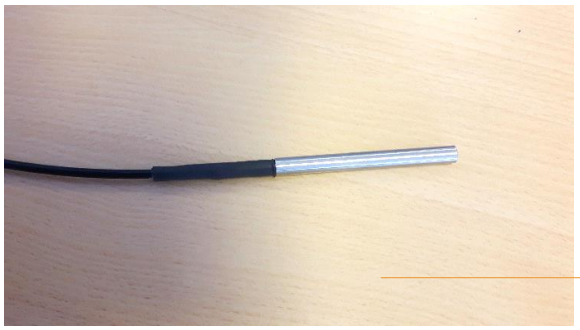
2.1. Unpack and setup

The sensor has been factory calibrated, ready to be used. Before first use, the sensor might need to be charged using the included USB cable. The display is protected with a plastic film that can be removed. The measurement fiber needs to be screwed on the SMA port on the top of the sensor before use.

For the installation of a digital or analog sensor, please read the corresponding manual.

2.2. Type probe

The FluoMini Pro Optical Algae Sensor is provided with a stainless steel probe.



2.3. Connections

2.3.1. Handheld sensor

The sensor can be connected to a Windows or Android system by means of a USB cable. Charging is possible via the USB port. A battery is included, so the sensor does not necessarily need to be attached to a power source for use.

2.3.2. Digital sensor

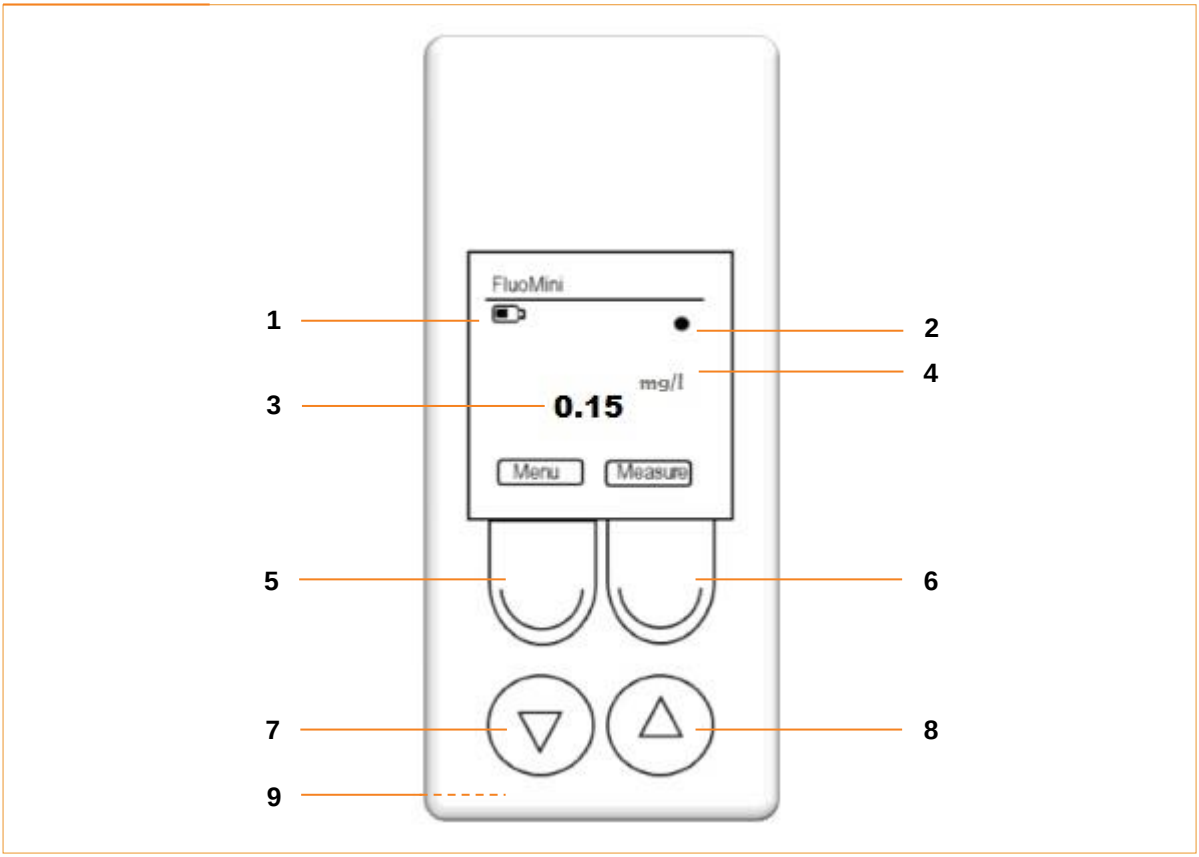
The sensor can be connected to a Windows or Android system by means of a USB cable. Charging is possible via the USB port. A battery is included, so the sensor does not necessarily need to be attached to a power source for use. Additionally, a digital input/output can be used to attach the sensor to an external control device, e.g. a wireless transmitter.

2.3.3. Analog sensor

The sensor can be connected to a Windows or Android system by means of a USB cable. A battery is not included, so the sensor must be attached to a power source via the USB port for use. Additionally, an analog output can be used to attach the sensor to an external control device (e.g. a climate computer). The sensor will also be powered through this port.

2.4. Display and buttons

In the picture below the basic sensor screen is shown, as well as the buttons with their names as being used in this manual.



1	**Battery**
2	**Measurement indicator**
3	**Measured Chlorophyll**
4	**Measurement unit**
5	**Menu/Exit-button** With this button the main menu can be entered, and every menu can be quit. The feature of this button is always visible on the display (bottom left).

6	**Measure (Meet)/Enter-button** This button is used to end the standby mode. This and additional features of this button are always visible on the display (bottom right). This button has several features, but for simplicity, it is named Measure/Enter button throughout this manual.
7	**Down button**
8	**Up button**
9	**Reset button** This button is located on the back of the sensor and resets the sensor to factory settings. It is protected by a white plastic screw which needs to be unscrewed to reach the reset button with a thin device..

3. Measuring with the FlouMini Pro Optical Algae Sensor

3.1. Measurement principles

The FluoMini Chlorophyll Fluorescence (CF) Seed Sensor measures the fluorescence of chlorophyll after excitation with a (blue) light pulse. The fluorescence light from all fluorescing substances emitting at a wavelength of 600 and above will be detected. The light emitted from the sensor is pulsed to separate the fluorescence light from ambient light. The sensor measures the chlorophyll fluorescence which can be calculated to a rough chlorophyll concentration.

Measuring chlorophyll by its fluorescence can be used to:

- Determine the amount of chlorophyll (fluorescence) in each environment.

3.2. Ending the standby mode

3.2.1. Handheld sensor

To save energy the sensor display automatically turns off after 30 seconds. During battery operation, the sensor will automatically go into standby mode after 1 min. The sensor will wake up again when the Measure/Enter button is pressed. When the sensor is attached to a computer or external power source, it will not turn into standby mode, only the display will turn off. If the sensor is in logging mode, the sensor turns off after each measurement.

3.2.2. Digital sensor

When the sensor is connected to an external control device (e.g. a computer) through the USB port, it will wake up when the Measure/Enter button is pressed. From that moment on, it will respond like a regular handheld sensor. When the sensor is connected through the serial digital port it will operate in a special mode. For more information about running the sensor through the digital port please contact Sendot Research *via* phone (+31 (0)30-636-8477) or e-mail (info@sendot.nl).

3.2.3. Analog sensor

This sensor has no battery, why it always must be attached to a power source to operate. The sensor display automatically turns off after 30 seconds. When the sensor is connected to an external control device (e.g. a computer) through the USB port, it will operate as a regular handheld sensor. When it is connected *via* the analog port it will also never turn into standby

mode. As soon as the sensor is coupled to an external control device it will start measuring with the interval specified in the sensor and output the analog value through the port.

3.3. Measurement

3.3.1. Single measurement

1. Press the Measure/Enter button to activate the sensor.
2. Press the Measure/Enter button again to start a single measurement.

> **Tip:** The sensor will store single measurements not automatically. This can be changed. For further information see chapter 4.2.3.

3.3.2. Continuous measurements

In continuous measurement mode the sensor will perform a measurement every 2 seconds. To activate this mode:

1. Press the Measure/Enter button to activate the sensor.
2. Press the Measure/Enter button for 2 seconds to start continuous measurements.
3. Press the Measure/Enter button for 2 seconds to stop continuous measurements.

> **Tip:** The sensor will store measurements not automatically. This can be changed. For further information see chapter 4.2.3 and 4.3.

3.4. Logger and transmitter function

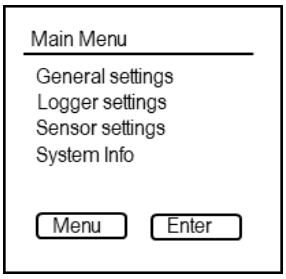
With this sensor it is possible to measure continuously. In case of a handheld and digital sensor, the data is stored on the internal memory (for further information on this function see chapter 4.3). In case of an analog sensor, the data is send to an external device, e.g. a computer (for further information on this function see chapter 4.4).

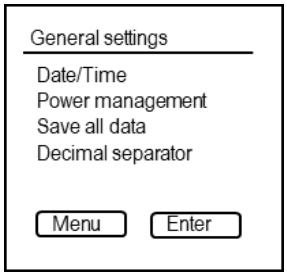
4. Settings

4.1. Main menu

The main menu can be entered by pressing the Menu/Exit button. The screen with the different setting options will be opened.

The main menu consists of four submenus: <General settings>, <Logger settings>, <Sensor settings>, and <System info>. To navigate towards any menu, use the Up and Down buttons and enter a submenu with the Measure/Enter button.





4.2. General settings

The menu <General settings> contains submenus to set date and time, control power management, save data and change the decimal separator. Use the Up and Down buttons to navigate to the desired submenu. To enter a submenu, press the Measure/Enter button.

4.2.1. Date /time

In this menu, date and time can be set manually. Alternatively, date and time can be synchronized with the current date and time on the computer using the FluoMini Sensor Software Suite (for further information see manual for FluoMini Sensor Software Suite). Default, date and time are set to 0:00:00, 01/01/1999 and must be set after a restart due to an empty battery or a hard reset (pressing Menu/Exit button and Measure/Enter button parallel for 30 sec).

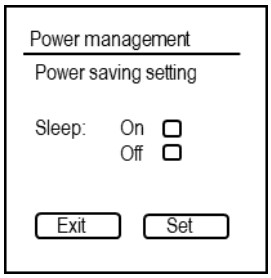
1. Open the menu <General settings>.
2. Open the menu <Date/Time>.
3. Use the Up and Down buttons to set date and time.
4. Use the Measure/Enter button (Next) to navigate to the next position in date and time.

5. Confirm settings and close menu with the Measure/Enter button.

4.2.2. Power management

I In this menu, the standby mode can be turned on and off. Default, this function is turned on, so the sensor will turn into standby mode after 30 sec.

1. Open the menu <General settings>.
2. Open the menu <Power management>.
3. Use the Up and Down buttons to choose the desired setting.
4. Confirm setting and close menu with the Measure/Enter button (Set).



4.2.3. Save data

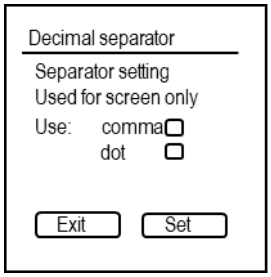
In this menu, automatic storage of every measurement can be turned on and off. Default, this function is turned off.

1. Open the menu <General settings>.
2. Open the menu <Save all data>.
3. Use the Up and Down buttons to choose the desired setting.
4. Close menu with the Measure/Enter button (Set).

4.2.4. Decimal separator

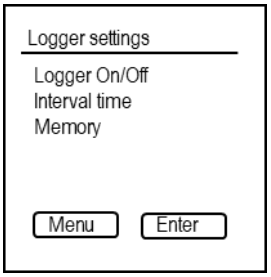
In this menu, the decimal separator for values shown on the screen can be changed.

1. Open the menu <General settings>.
2. Open the menu <Decimal separator>.
3. Use the Up and Down buttons to choose the desired setting.
4. Confirm setting and close menu with the Measure/Enter button (Set).



4.3. Logger settings (handheld/digital)

With the logger function continuous measurements are performed and stored internally. Within the menu <Logger settings> the logger function can be turned on and off, the interval time of the measurements can be set, or the stored data erased. Use the Up and Down buttons to navigate to the desired submenu. To enter a submenu, press the Measure/Enter button.

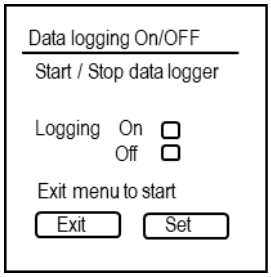


Remark: If the sensor is in logging mode, it is not possible to communicate with the sensor through an external device, e.g. a computer. Logging must be stopped first to communicate with the sensor. Nevertheless, by pressing the Measure/Enter button the last measured value will be visible on the display.

4.3.1. Logger On/Off

In this menu, the logger function can be turn on and off.

1. Open the menu <Logger settings>.
2. Open the menu <Logger On/Off>.
3. Use the Up and Down buttons to choose the desired setting.
4. Confirm the setting with the Measure/Enter button (Set).



5. Exit menu with the Menu/Exit button. Logging will start automatically.

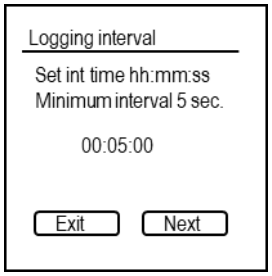
If date and time have not been set in advance, the sensor will show an error (Date & Time not set.). In this case, the logger function can still be started, if wanted. To start the logger function, press the Measure/Enter button (Ignore) or wait for 5 sec. The start date and time will be set to 00:00, 01/01/1999. Another option is to cancel the logger function by pressing the Menu/Exit button (Cancel). Now, date and time can be set before the logging function is started again.

4.3.2. Interval time

In this menu, the time interval between the measurements during logging can be changed. For the most applications, an interval time of 5 min or higher is sufficient. The interval time should be set before the first use of the sensor.

1. Open the menu <Logger settings>.

2. Open the menu <Interval time>.
3. Use the Up and Down buttons to change value.
4. Use the Measure/Enter button (Next) to navigate to the next position in time (hh:mm:ss).

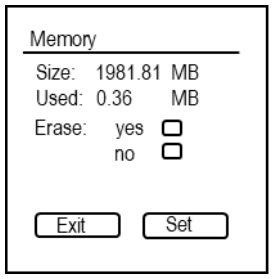


Confirm the setting and close menu with the Measure/Enter button.

4.3.3. Memory

In this menu, the storage volume in total as well as used by stored data can be read. The stored data can be deleted.

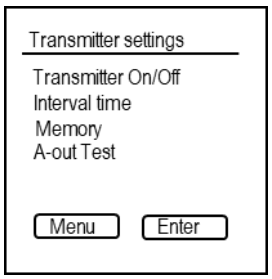
1. Open the menu <Logger settings>.
2. Open the menu <Memory>.
3. Use the Up and Down buttons to choose the desired setting.
4. Confirm the setting and close menu with the Measure/Enter button (Set).



It is advisable to use the FluoMini Sensor Software Suite to store the data on a computer before the data is deleted from the sensor's memory.

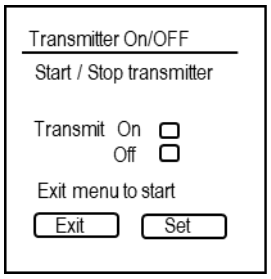
4.4. Transmitter settings (analog)

With the transmitter function continuous measurements are performed and send to an external device, e.g. computer. Within the menu <Transmitter settings> the transmitter function can be turned on and off, the interval time of the measurements can be set, stored data erased and the analog output being tested. Use the Up and Down buttons to navigate to the desired submenu. To enter a submenu, press the Measure/Enter button.



4.4.1. Transmitter On/Off

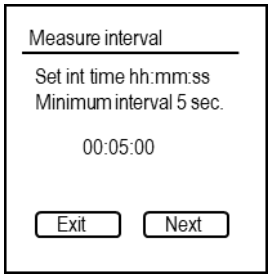
In this menu, the transmitter function can be turned on and off.



1. Open the menu <Transmitter settings>.
2. Open the menu <Transmitter On/Off>.
3. Use the Up and Down buttons to choose the desired setting.
4. Confirm the setting with the Measure/Enter button (Set).
5. Exit menu with the Menu/Exit button. Transmitting will start automatically.

4.4.2. Interval time

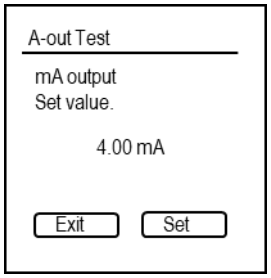
In this menu, the time interval between the measurements transmitted can be changed. For the most applications, an interval time of 5 min or higher is sufficient. The interval time should be set before the first use of the sensor.



1. Open the menu <Transmitter settings>.
2. Open the menu <Interval settings>.
3. Open the menu <Interval time>.
4. Use the Up and Down buttons to change value.
5. Use the Measure/Enter button (Next) to navigate to the next position in time (hh:mm:ss).
6. Confirm the setting and close menu with the Measure/Enter button.

4.4.3. A-out Test

This function only applicable for analog sensors and is to test the analog output signal send to an external device, e.g. computer.



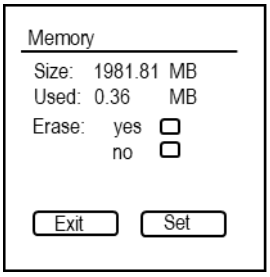
1. Open the menu <Transmitter settings>.
2. Open the menu <A-out Test>.
3. Use the Up and Down buttons to set a value.

4. Confirm the value with the Measure/Enter button (Set). A signal will be sent to the external device, which is translating it into CF.

5. Compare this value with the CF on the external device. Here, 4 – 20 mA are translated to 0 – 50000 counts or 0 – 20 mg/l. Therefore, a change of 1 mA relates to a change of 3125 counts or 1.25 mg/l.

4.4.4. Memory

In this menu, the storage volume in total as well as used by stored data can be read. The stored data can be deleted as followed:

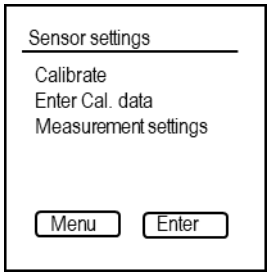


1. Open the menu <Transmitter settings>.
2. Open the menu <Memory>.
3. Use the Up and Down buttons to choose the desired setting.
4. Confirm setting and close menu with the Measure/Enter button (Set).

Remark: It is advisable to use the FluoMini Sensor Software Suite to store the data on a computer before the data is deleted from the sensor's memory.

4.5. Sensor settings

Within this menu, the sensor can be calibrated automatically or manually.

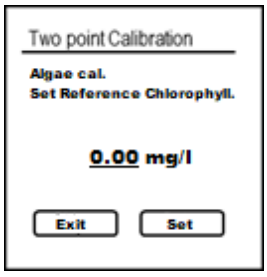


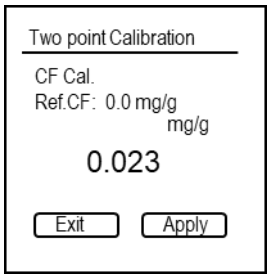
4.5.1. Calibration

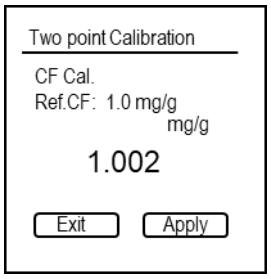
The FluoMini Pro CF Sensor will be delivered fully calibrated. Nevertheless, to calibrate the sensor the included calibration cap is needed.

1. Open the menu <Sensor settings>.
2. Open the menu <Calibrate>.

For a 2-point calibration:



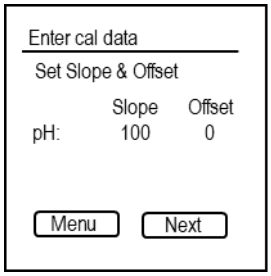




1. Use the Up and Down buttons to set the reference value (noted on the calibration cap).
2. Confirm the setting with the Measure/Enter button (Set).
3. Ensure that no calibration cap is applied.
4. Wait until the measured value on the display is stable and press the Measure/Enter button (Apply).
5. Apply the calibration cap.
6. Wait until the measured value on the display is stable and press the Measure/Enter button (Apply).

4.5.2. Enter Cal. data

In this menu, you can add an offset and slope to the measured CF value. These values are set automatically during the automatic calibration (see chapter **Fout! Verwijzingsbron niet gevonden.**).



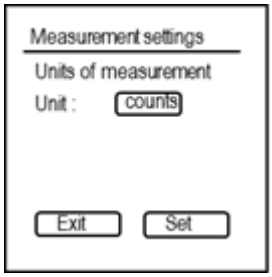
1. Open the menu <Sensor settings>.
2. Open the menu <Enter Cal. data>.
3. Use the Up and Down buttons to adjust slope and offset.
4. Use the Measure/Enter button (Next) to navigate to the next position.
5. Confirm settings and close the menu with the Measure/Enter button.

4.5.3. Measurement settings

Within this menu, the measurement units and the sensitivity of the measurement can be changed. For the units it is possible to switch between counts and mg/g. In case of the sensitivity, it can be switched between three intensities.

Remark: The unit mg/l stands for mg chlorophyll per g dried material originating from the measurement spot. Counts is the raw fluorescence intensity obtained during the measurement.

1. Open the menu <Sensor settings>.
2. Open the menu <Measurement settings>.
3. Use the Up and Down buttons to choose the desired unit.
4. Confirm settings and close the menu with the Measure/Enter button.



4.6. System information

The menu System info contains information about the FluoMini type, the installed firmware, the battery voltage and the baud rate necessary to communicate with the sensor. Additionally, the sensor can be named using the FluoMini Software Suite (for further info see manual for FluoMini Software Suite). In this menu, the given name is visible.

5. Troubleshooting

The display stays black and the sensor is not reacting anymore.

1. Recharge the sensor using the included USB cable. The battery might be empty.
2. If the sensor is still not responding, reset the sensor by pressing the Up and Down button at the same time for 2 sec.
3. If the sensor still not reacts, the sensor can be reset to factory settings by pressing the Up and Down button at the same time for 30 sec.
4. If the sensor still not reacts, press the reset button on the back of the sensor. Therefore, screw of the white plastic screw on the back of the sensor. Use a thin plastic or metal device, e.g. an open paper clip, to carefully press the button. Close the hole with the screw again.
5. If there is still no response, please contact Sendot Research *via* phone (+31 (0)30-636-8477) or e-mail ((info@sendot.nl).

The following errors can be visible on the display:

Error opening logfile

1. Check if the sensor is properly attached to the computer. Reattach the sensor and press refresh in the menu Sensors in the FluoMini Software Suite.
2. If date & time of the logging strongly changes, reading the logfile might not be possible. This can happen, if the time has been changed between two log sessions or if the sensor logged once without a set time & date, followed by logging with set time & date. It is advisable to set time & date before the first log. If the time changes (e.g. different time zone), the memory should be emptied in between.

No SD card

1. The communication between the sensor and the internal memory is interrupted. Please contact Sendot Research *via* phone (+31 (0)30-636-8477) or e-mail ((info@sendot.nl).

Red battery icon

This icon is showing that the battery is empty. In this case the sensor needs to be recharged with the included USB cable.