



# Field Datalogger Mini Manual



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# 1 WARRANTY AND LIABILITY

This product is for research use only. Not for use in human diagnostic or therapeutic procedures.

## **1.1 Warning**

Microsensors have very pointed tips and must be handled with care, to avoid personal injury, and only by trained personnel.

Unisense A/S recommends users to attend instruction courses to ensure proper use of the products.

## **1.2 Warranty and liability**

The Field DataLogger Mini is covered by a one-year limited warranty.

The warranty does not include repair or replacement necessitated by accident, neglect, misuse, unauthorized repair, or modification of the product. In no event will Unisense A/S be liable for any direct, indirect, consequential or incidental damages, including lost profits, or for any claim by any third party, arising out of the use, the results of use, or the inability to use this product.

## **1.3 Repair or adjustment**

Equipment that is not covered by the warranty will, if possible, be repaired by Unisense A/S with appropriate charges paid by the customer. In case of return of equipment please contact us for return authorization.

For further information please see the documents General Terms of Sale and Delivery of Unisense A/S, and Warranty and Shipping Information as well as the manuals for the respective products.

## **1.4 SensorTrace Suite Software**

Unisense SensorTrace Suite software is checked and validated for the Windows platform as given in the specification. The Customer must ensure PC is fully updated and no conflicting third-party software is installed. Unisense do not warrant compliance with any other operating systems, language settings or third-party software.

For instrumentation and sensors, please refer to our warranty conditions as given in the document "General Terms of Sale and Delivery of Unisense A/S" found on [www.unisense.com](http://www.unisense.com)

### ***1.5 License agreement***

The following terms shall apply to the software provided by Unisense A/S (“Unisense”) relating to the simultaneous sale to you (“Customer”) of a Unisense SensorTrace Suite Software.

All rights, title and interest in the software belong to Unisense. Unisense grants to the Customer a royalty-free, non-exclusive and non-transferable license to use the software solely relating to the Unisense Product purchased from Unisense simultaneously with the purchase of the software. The Customer undertakes not to copy, modify, reverse engineer, disassemble or de-compile all or any part of the software or rent, lease, distribute or sell the software. The Customer shall, however, be entitled to make one copy of the software for backup and recovery purposes for use solely relating to the Unisense Products supplied by Unisense together with the software.

Nothing in this License Agreement or any other agreement between Unisense and the Customer shall be construed as an obligation for Unisense to provide to the Customer updates of the software. This License Agreement shall automatically terminate if the Customer violates the terms of the license. In case of termination of the license the Customer shall immediately destroy the software and any copy thereof.

## 2 CONGRATULATIONS WITH YOUR NEW PRODUCT

### ***2.1 Support, ordering, and contact information***

The Field DataLogger Mini uses Unisense microsensors which are miniaturized Clark-type sensors that facilitate reliable and fast measurements with a high spatial resolution designed for research applications.

If you wish to order additional products or if you encounter any problems and need scientific/technical assistance, please do not hesitate to contact our sales and support team. We will respond to your inquiry within one working day.

E-mail: [sales@unisense.com](mailto:sales@unisense.com)

Unisense A/S Tueager 1

DK-8200 Aarhus N, Denmark

Tel: +45 8944 9500

Fax: +45 8944 9549

Further documentation and support is available at our website [www.unisense.com](http://www.unisense.com)

Note: If you find errors in this manual or have suggestions to improvements, do not hesitate to contact us at [sales@unisense.com](mailto:sales@unisense.com)

### 3 OVERVIEW

The Field DataLogger Mini (FDL Mini) is a digital microsensor amplifier with datalogger capability. It can operate as an autonomous unit that measures and logs data as specified by the user before deployment. After deployment data may be downloaded to a Windows PC using the SensorTrace Logger software. Alternatively, it can be operated from a Windows PC using the SensorTrace Logger software displaying and logging data in real time.

The FDL Mini comes with 2 or 4 sensor channels. Each channel may, at the time of purchase, be configured as either amperometric (O<sub>2</sub>, N<sub>2</sub>O, H<sub>2</sub>S, NO, H<sub>2</sub>) or potentiometric (pH, redox). Furthermore, two different sensor mounting options may be chosen (at the time of purchase):

- a: The sensor is mounted directly on the housing and the amplifier is built into the unit
- b: The sensor is mounted on an in-situ amplifier with cable connection to the housing

The FDL Mini has built-in support for STOX sensors, on channels with internal amplifier, with a detection limit of < 10 nM O<sub>2</sub>. The STOX support may be set individually for each channel and data showing polarization of the front guard is collected together with the signal for O<sub>2</sub> concentration.

The FDL Mini may be integrated with other platforms. It may be powered from a CTD or ADV or other source using a 6 – 28 V power supply, and store and synchronize the measured data on a third-party device via the 0 – 5 V analog output from the FDL Mini.

#### **3.1 Operating and setup conditions**

The Field DataLogger Mini is built for 6000 m water depth.

**Important:** The connectors on the FDL Mini must never be open when the unit is submerged. Each connector on the unit must either be mounted with the appropriate cable or sensor or must be covered with the appropriate protective cap.

Note that the metal screw caps for the sensor connector bulkheads are not waterproof and can not be used for deployment. In stead an in situ connector must be mounted on each sensor connector bulkhead. The in situ connector may be mounted with a sensor or with a sensor dummy, i.e. a closed glass tube. The in situ connector must be filled with oil for all deployments whether mounted with sensor or glass tube (see the “Unisense in situ connector” manual).

Temperature: -10°C - 60°C

Internal battery: 13 Ah @ 7.4 V, deployment time up to 3 months @ 25°C

External battery: 2 x 13 Ah @ 7.4 V, deployment time: up to 6 months @ 25°C (to be purchased separately)

### 3.2 Field DataLogger Mini external features



Two channel (left) and four channel (right) FDL Mini seen from the sensor end. These dataloggers are with built in amplifiers.



FDL Mini with Off-dongle and dummy mounted at the non-sensor end (left). Off-dongle (right)



## 4 SYSTEM FEATURES

The Field DataLogger Mini is an excellent tool for long-term studies with continuous and automated measurements at depths up to 6000 m. The support for the very sensitive O<sub>2</sub> sensors – STOX sensors – also makes it ideal for working in oxygen minimum zones.

The FDL Mini comes with 2 or 4 channels for either amperometric or potentiometric sensors

### ***4.1 Equipment to use with the Field DataLogger Mini***

Included with the Field DataLogger Mini:

- External charger with cable (MDL-CHG001)
- PC communication cable (MDL-COM001)
- Off-dongle (MDL-POWER DOWN001)
- SensorTrace Logger software for check, setup, calibration, and data retrieval
- Built-in battery (13 Ah @ 7.4 V. Deployment up to 3 months @ 25 °C)

Not included (to be ordered separately)

- Unisense in-situ microsensors
- Connectors for in-situ microsensors
- In-situ amplifiers with cable (one for each channel without internal amplifier)
- External battery (2 x 13 Ah @ 7.4 V. Deployment up to 6 months @ 25 °C)

## 5 SOFTWARE FOR THE FIELD DATALOGGER MINI

The FDL Mini comes with the SensorTrace Logger software and the latest version can be downloaded from the Unisense support page: <http://www.unisense.com/support/>

Using the SensorTrace Logger it is possible to run the FDL Mini online with live data, to setup the FDL Mini for autonomous logging and to download data acquired by the FDL Mini in autonomous mode after deployment. Furthermore, it allows calibration of sensors and it is possible to calibrate already collected raw data using a new or any already saved calibration.

## 6 GENERAL FEATURES

### 6.1 *Operating principles*

#### 6.1.1 The *Always on* principle

The FDL Mini is “Always on” meaning that whenever it has power (from external supply or internal battery) and the “Off-dongle” is not connected, it will log data using the settings last specified by the user.

#### 6.1.2 File creation

The FDL Mini will keep logging data to a file until a new file is created. A new file is created when:

- The FDL Mini is switched off and turned on again (e.g. mounting the “Off-dongle” for 5 seconds and removing it again. Wait 30 seconds before connecting to a PC)
- The internal time setting of the FDL Mini is changed
- The FDL Mini sampling rate is changed
- STOX support is either enabled or disabled for one of the data channels

#### 6.1.3 Download of data

The data can be downloaded at any time from the FDL Mini using the SensorTrace Logger software. Downloading data will not interrupt the data logging process. The FDL Mini will continue to store data in the same file and append it to the data that are already stored. Therefore, when data is downloaded at the end of a deployment the file will contain all data from that deployment. Downloading data during a deployment can be used as a sneak peek to see how things are going.

#### 6.1.4 Data calibration

Data are recorded uncalibrated in the FDL Mini. Calibration is performed after download of data to the SensorTrace Logger. Each sensor must be calibrated before or after the deployment. This calibration is imported into the data file retrieved from the FDL Mini and applied to the data retrieved from the FDL Mini.

### 6.2 *Support for STOX sensors*

Sensor channels with built-in amplifiers support the use of STOX sensors for measuring extremely low O<sub>2</sub> concentrations. The timing and the polarization for the on/off cycles of the front guard can be set individually for each channel. The data file will contain both the signal for oxygen concentration and a signal indicating whether the front guard polarization is on or off.

### 6.3 *Sensor connections*

At the time of ordering it is decided for each channel whether the amplifier is internal or external. With internal amplifier the sensor is mounted directly on the bulk-head connector

on the pressure housing. Without internal amplifier the sensors must be connected to the in-situ amplifier which is connected to the bulk-head connector via a cable.

#### **6.4 Sensors for the Field DataLogger Mini**

The FDL Mini can be equipped with sensors for O<sub>2</sub>, H<sub>2</sub>, H<sub>2</sub>S, NO, N<sub>2</sub>O and STOX on amperometric channels and electrodes for pH and redox on potentiometric channels. The sensors can in the standard version be deployed down to 50 m and in the deep-sea version down to 6000 m. Only the N<sub>2</sub>O sensor is not available in a deep-sea version. Furthermore, temperature is logged continuously with all other data from a sensor mounted inside the pressure housing.

**NOTE:** Polarization of the sensors must be set for each channel individually from within SensorTrace Logger. This must be done BEFORE mounting the sensors! Wrong polarization may destroy the sensor! For setting polarization see 7.3.1 *Setting polarization*

#### **6.5 Charging and battery**

Battery life time is about 3 months at 25 °C

Charging time is about 5 hours

Battery state can be seen in the Unisense Logger software. See 7.3.4 *Checking battery level and storage capacity*.

#### **6.6 Computer connection**

The PC communication cable (MDL-COM001) connected to the communications bulkhead connector at the non-sensor end of the FDL Mini allows communication between the FDL Mini and a computer. Using the SensorTrace Logger software the settings of the FDL Mini may be changed, logged data may be downloaded, and the instrument may be used online.

#### **6.7 Logging capabilities**

The FDL Mini comes with 8 GB (micro SD) of data storage capacity. 24 hours logging of the signal from four sensors at 1 data point per second gives 2.3 MB corresponding to more than 3000 days of data storage capability with 8 GB memory.

The FDL Mini can log data at five different intervals: 1 sec., 10 sec. or 60 sec. All channels will log at the same frequency.

#### **6.8 Connection with external units**

The FDL Mini can send data in real time to external units such as CTD's or ADV's using RS-232 or RS-485 serial protocols. The serial protocol allows that the external unit can poll the FDL Mini for getting the last data point. Only one of these serial standards (RS-232 or RS-485) is supported on one instrument and must be chosen at the time of ordering. Please

contact Unisense if details on the serial communication protocol are needed. Alternatively, the FDL Mini may send data through an analog output at 0 - 5 V.

## **6.9 Cables and connectors**

A PC connection cable is supplied with the instrument.

For channels with internal amplifier the sensors are mounted on the bulk-head connectors on the pressure housing with the in-situ connector (ordered separately). For channels without internal amplifier sensors are mounted using the cable connected in-situ amplifier (ordered separately).

Cables for connecting the FDL Mini with external units are ordered separately.

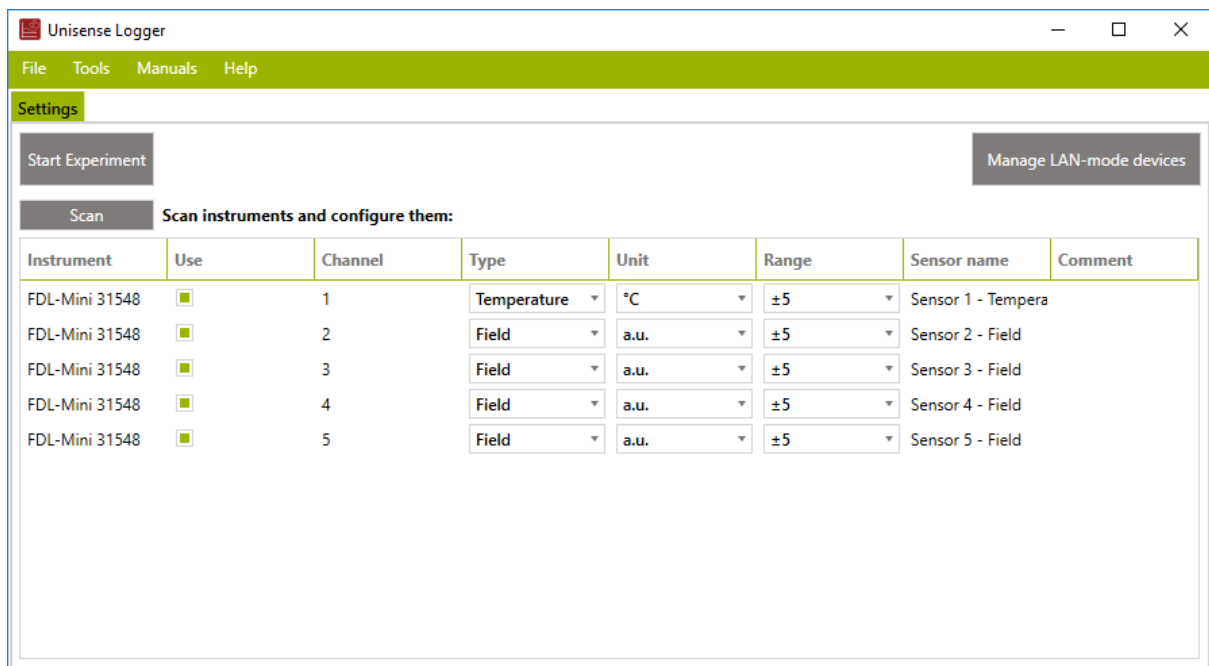
# **7 WORKING WITH THE FIELD DATA LOGGER MINI**

## **7.1 Connecting the Field DataLogger Mini to a PC**

The FDL Mini is connected to a USB port on a Windows PC using the supplied cable. Once connected, start the Unisense Logger software which will automatically detect the instrument and show the available channels. Clicking the *Scan* button will force the Logger software to re-connect to the instrument.

### 7.1.1 Powering the FDL Mini on and off.

- Powering off: Connect the Off-dongle
- Powering on: Remove the Off-dongle
- Restarting: Connect the Off-dongle for 5 seconds, then remove it again
- Connect to PC: Wait 30 seconds from powering up the FDL Mini before connecting it to a PC



## 7.2 Charging and battery life

The battery is charged by connecting the external charger with the bulkhead connector on the non-sensor end of the FDL Mini. A full charge will take about 5 hours.

The instrument will run for about 3 months at 25°C on a full charge. Battery life time decreases with decreasing temperature and is about half at 4°C

## 7.3 Configuring the Field DataLogger Mini

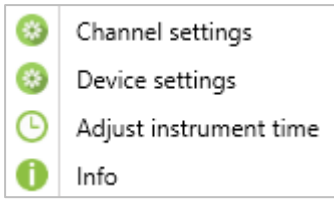
It is important to **configure each channel of the FDL Mini before connecting the sensors** because the polarization must be set correctly and individually for each channel. Wrong polarization may destroy the sensor. The correct polarization for each type of sensor is found in the sensor manual.

Open the SensorTrace Logger software. The FDL Mini must be connected to the PC with the supplied USB cable and the Off-dongle must not be connected.

Logger will now display the available channels. Channel 1 will always be temperature (read from a sensor inside the pressure housing). If you have a 2-channel version channels 1 - 3 will be shown and if you have a 4-channel version channels 1 - 5 will be shown.

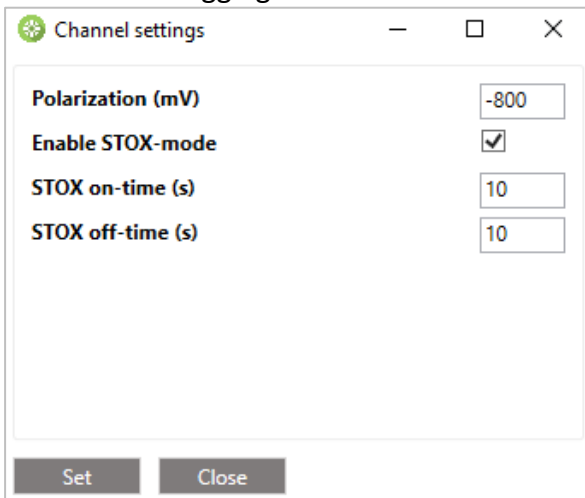
### 7.3.1 Setting polarization

Right click the channel that you wish to change settings and this window will open:



Select *Channel settings* and in the window, that opens, you can set the polarization. If the *Enable STOX-mode* is selected the STOX-timing will be shown and can be changed (see the manual for the STOX sensor for selecting the correct on- and off-time and polarization).

NOTE: If selecting or deselecting *Enable STOX-mode*, the grey *Scan* button in the upper left of the main Logger window must be clicked to apply the changes to the FDL Mini. This will create a new logging file in the FDL Mini.

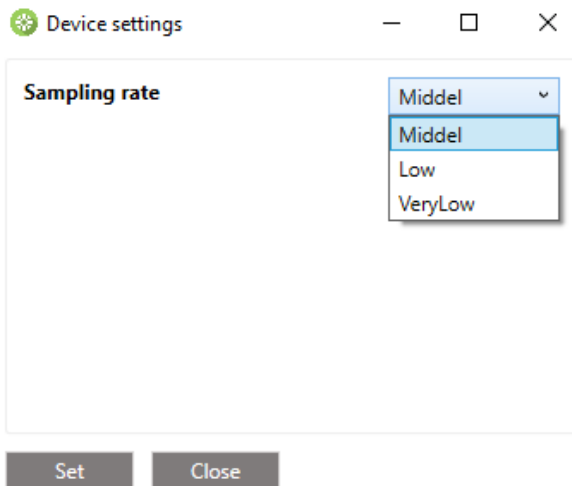


### 7.3.2 Setting sampling rate

Right click one of the channels and select *Device settings*. In the window that opens you may select the datalogging frequency for the FDL Mini. Logging in the FDL Mini may occur at the following intervals: 1 sec. (Middle), 10 sec. (Low) or 60 sec. (Very low). Data from all channels are logged at the same frequency.

NOTE: The *Sampling rate* settings only affect the internal data logging on the FDL Mini.

When the FDL Mini is connected to a PC the data transfer frequency is always 1 Hz but the internal logging in the FDL Mini still runs at the frequency specified in the *Sampling rate* window.

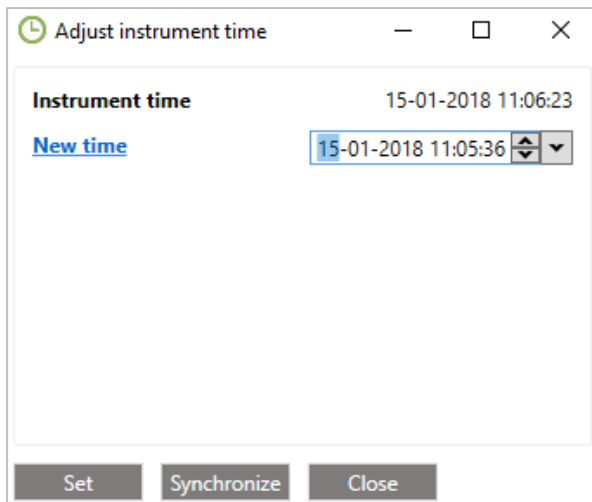


### 7.3.3 Changing the instrument time

Right click one of the channels and select *Adjust instrument time*. In the window that opens the current FDL Mini date and time is displayed. The *New time* line shows the date and time of the PC. Clicking *New time* will update this.

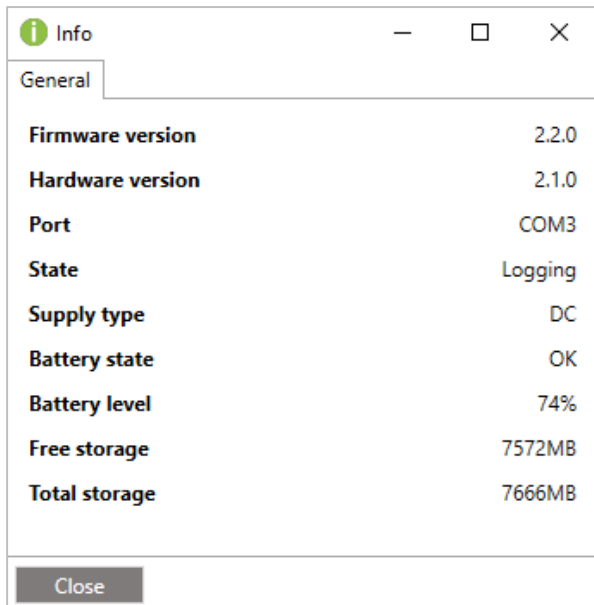
- Click the *Set* button to set the instrument time to the date and time displayed in the *New time* box
- Click the *Synchronize* button to set the instrument time to the current date and time of the connected PC

NOTE: Setting the date and time of the FDL Mini will create a new logging file in the FDL Mini.



### 7.3.4 Checking battery level and storage capacity

Right click one of the channels and select *Info*. Details about the instrument including the battery level and storage capacity are shown.



### 7.3.5 Setting channel information

**Sensor:** Mark the checkboxes for the channels/sensors you want to view and record signals from.

**Type:** Choose sensor type from the drop-down menu if the default type is not correct.

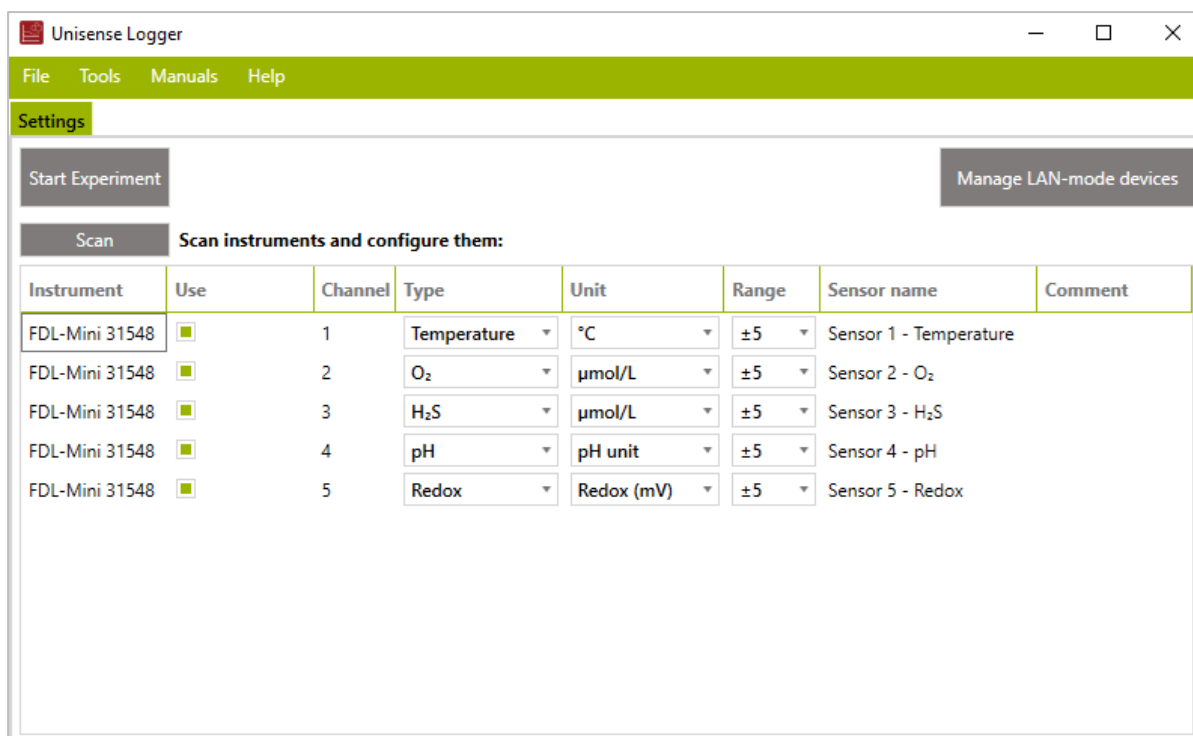
**Unit:** Select an appropriate concentration unit for the sensor signal when calibrated.

**Range (V):** Select the voltage range for the amplifier. Select the smallest range possible to get the most out of the resolution of the amplifier matching the expected signal range of the sensors. It is recommended not to select an unnecessarily high range either, as this may cause loss of resolution. However, the range should not be chosen so small that the signal gets beyond the selected range as this will cause the amplifier to get out of range.

**Name:** Write a name describing your sensor (optional).

**Comment:** Write a comment about your sensor (optional).





## 7.4 Connecting the sensors

The connection of a sensor is different for a channel with and without built-in amplifier.

### 7.4.1 Channel with built-in amplifier

The sensor is connected directly to the bulk head connector on the pressure housing using the In situ Connector. See the separate manual for mounting a sensor in the In Situ Connector: <http://www.unisense.com/manuals/>

### 7.4.2 Channel with external in situ amplifier

The sensor is connected to a Microsensor In Situ Amplifier which is connected to the bulkhead connector on the pressure housing. The sensor needs to be mounted on an In Situ Connector which is then connected to the In Situ Amplifier. See separate manuals for this: <http://www.unisense.com/manuals/>

Note: Most microsensors require some time to stabilize after being connected. Consult the manual or each sensor type for more information. To shorten the time needed after mounting the sensor on the FDL Mini, the sensors may be connected to another meter, e.g. a Unisense Multimeter, for a few hours before being mounted on the FDL Mini.

## 7.5 Downloading data to PC

Connect the FDL Mini to a Windows PC and start the Unisense Logger software. The instrument with all its channels should now be displayed.

- Click *File - Import from instrument*
- Select the relevant file in the dialog box

- Click *Import selected*

### 7.5.1 File size and download time

The time it takes to download data after a deployment depends on the data sampling frequency, the duration of the deployment, the number of channels and whether STOX mode has been active. The file size and download times are:

Expected file sizes:

- 4 sensor channels + one temperature channel, sampling rate 1 Hz, STOX mode not active: 2.3 MB/24 h
- 4 sensor channels + one temperature channel, sampling rate 1 Hz, STOX mode active: 3.7 MB/24 h

Expected download times:

- 2.5 min/MB = 0.4 MB/min

Number of data points

- Sampling at 1 Hz for 24 hours => 86,400 lines in the file

Note: Consider both sampling frequency and duration of a deployment to obtain data files that can be handled by your data processing software. As can be calculated from the above, the download of data from 24 hours of logging, at 1 Hz with four channels with STOX support, will last about 10 min.

## 7.6 Calibration

For calibration of the sensors the FDL Mini must be connected to a PC and the Logger software must be running.

The calibration is only stored in the Logger file on the PC and not on the FDL Mini which will only store raw data. After downloading a file from the FDL Mini data must be calibrated in Logger, using an already stored calibration. This calibration may be made and stored before or after the deployment. However, it is strongly recommended to calibrate the sensors before deployment to make sure the sensors are working as they should. Furthermore, if a sensor breaks during deployment it is not possible to calibrate afterwards. If calibration is done before deployment, it will be possible to get calibrated data until the time when a sensor breaks.

### 7.6.1 Calibration of the sensors

After setting the channel information as explained above, click *Start Experiment* and assign a name to the file. Select the *Calibration* tab. The individual sensor tabs to the left of the window show whether the sensors are calibrated or not. A red cross indicates that the sensor has not been calibrated and a green tag indicates that the sensor has been calibrated.

Detailed information about the calibration procedure is found in the SensorTrace Suite Manual. For information on calibration of a specific sensor consult the individual sensor manuals. The manuals are found here: (<http://www.unisense.com/manuals/>)

Choose the Sensor you wish to calibrate. The sensor name, type and calibration unit are shown for each sensor.

The Sensor signal displays the measured raw sensor signal for the selected sensor. The sensor signal can also be followed continuously in the Live Data graph at the bottom of the screen.



## 7.6.2 Calibration of recorded data

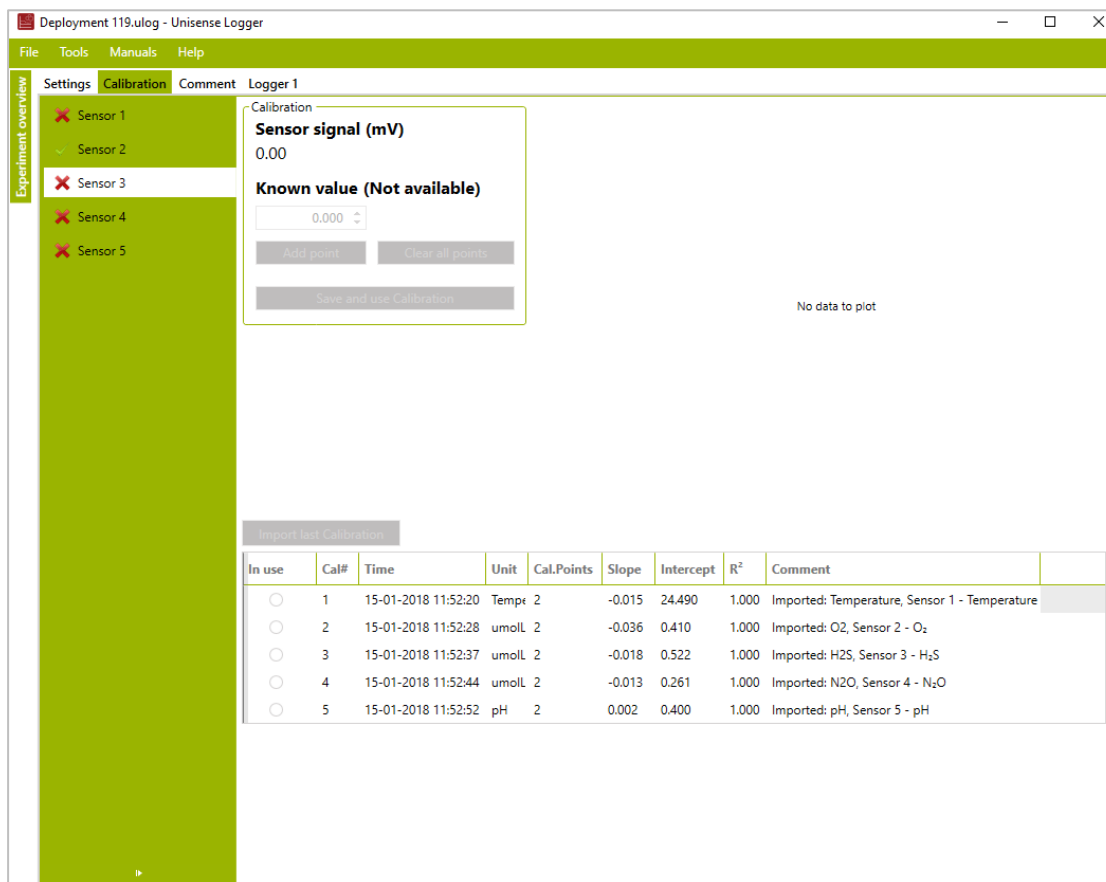
The FDL Mini only stores raw data. The calibration data are stored in a Logger file on a PC and are applied to the FDL Mini datafile after logging is completed.

Open the data file in Logger using *File - Open* dialog. Make the dataset active by double-clicking the appropriate experiment name in the *Experiment overview* column. The uncalibrated data will now be shown in a new tab.

Import the calibration by opening the Logger file containing the calibration data using the *File - Import calibration* dialog.

Select a sensor in the green column to the left and click the radio button in the *In use* column to select the appropriate calibration. Click OK in the pop-up box to apply the selected calibration. Repeat this for each sensor.

**NOTE:** Calibration of large datasets may take some time: Ca. 1.5 min for 100,000 data points



## 7.7 Data export and processing

After download of data from the FDL Mini and applying a calibration using stored calibration data, you can now export the data in Excel or CSV format.

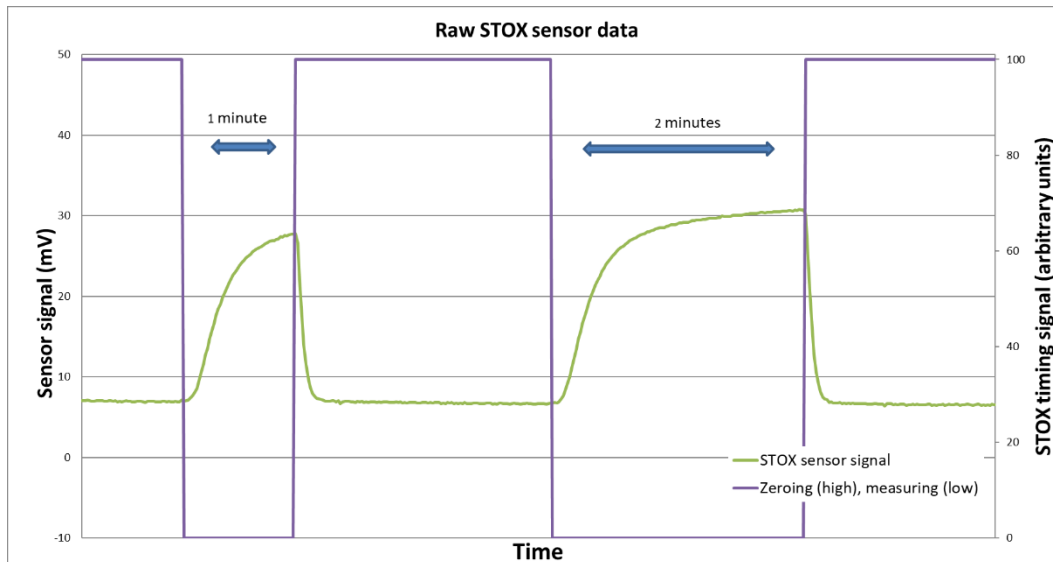
- Load the data file into Logger
- Double click the relevant experiment in the *Experiment overview* window to the left
- Select the data tab - name identical to the Experiment name
- Click the *Export* button
- Choose the file format (Excel or CSV) and click OK
- Give the data file a name and click Save

## 7.8 Using STOX sensors

STOX sensors can only be mounted on channels with built-in amplifier and not those using the in-situ amplifiers. Before mounting STOX sensors the STOX mode must be activated (see 7.3.1 above)

As the STOX sensors have a built-in zeroing it is only necessary to do a one-point calibration, but it may be reassuring also to do a zero calibration in an ascorbate solution.

The signal for oxygen concentration is the difference between sensor signal with the front guard polarized and unpolarized - the  $\Delta$ -signal. Calibration of the STOX sensor should not be performed using the calibration function in Logger, instead it is recommended to record uncalibrated data and to do the calibration in a spreadsheet.



If you are measuring low  $O_2$  concentrations with the STOX sensor it is best to calibrate in that range and not at atmospheric saturation as you would normally do with  $O_2$  sensors. This may be done by injecting a known small volume of air saturated water into a larger known volume of water with low  $O_2$  concentration while recording the STOX sensor signal.

The STOX sensor is sensitive to temperature and calibration should be done at the same temperature as the measurements. If temperature varies during the deployment the calibration should be done at both the highest and lowest encountered temperature. It may then be assumed that sensitivity varies linearly between the two temperatures.

The  $O_2$  concentration in air saturated water at a given temperature and salinity may be calculated with the  $O_2$ -calculator tool in the Logger software: *Tools -  $O_2$  calculator*.

#### Example:

##### Procedure:

- 300 ml of  $N_2$  bubbled water is transferred to a conical flask. The STOX sensor is placed in the water and at least two full polarization - depolarization cycles are recorded
- 3.0 ml air saturated water is added to the conical flask and gently mixed. At least two full polarization - depolarization cycles are recorded
- The amendment of air saturated water may be repeated to obtain several estimates of the sensitivity

This procedure may at best be performed before deployment and with the FDL Mini online with the Logger software to see the response of the  $\Delta$ -signal to the  $O_2$

concentrations. The raw data will be saved in the Logger file and may be exported for doing manual calibration.

Calculation of calibration concentrations:

- Air saturated water at 10°C and a salinity of 30 = 291.2  $\mu\text{M}$
- 3.0 ml air saturated water added to 300 ml water gives an increase in concentration of:  $291.2 \times (3/303) = 2.88 \mu\text{M}$

Note that it is not necessary to know the  $\text{O}_2$  concentration of the  $\text{N}_2$  bubbled water. The  $\Delta$ -signal for zero  $\text{O}_2$  is per definition zero and the  $\Delta$ -signal increases linearly with  $\text{O}_2$  concentration. Therefore, it is only necessary to estimate the slope of the calibration curve ( $\mu\text{M}/\text{mV}$ ) i.e. the increase in  $\Delta$ -signal for a given increase in  $\text{O}_2$  concentration.

See the STOX sensor manual for more details (<http://www.unisense.com/manuals/>)

## 7.9 Making a deployment

To make a deployment with the FDL Mini the following is needed:

- Remove the *Off-dongle*. Wait 30 seconds and connect the instrument to a PC and start SensorTrace Logger
- Make sure the FDL Mini has power and storage capacity
  - See 7.3.4 *Checking battery level and storage capacity*
- For each channel set the correct polarization voltage for the sensor to be connected
  - See 7.3.1. *Setting polarization*
- Set the Sampling rate
  - See 7.3.2. *Setting sampling rate*
- Connect the sensors
  - See 7.4 *Connecting the sensors*
- Set the appropriate sensor type and unit for each channel
  - See 7.3.5. *Setting channel information*
- Let the sensors stabilize
  - See 7.4 *Connecting the sensors* for advice regarding minimizing this period
- Calibrate each sensor
  - See 7.6.1 *Calibrating the sensors*
- Remove the PC to FDL Mini cable and place a dummy on the bulkhead connector
- Make sure all bulkhead connectors on both ends of the pressure housing are either connected or capped with a dummy.
  - **NOTE:** The metal screw caps for the sensor connector bulkheads are not waterproof and cannot be used for deployment. Instead an in situ connector must be mounted on each sensor connector bulkhead. The in situ connector may be mounted with a sensor or with a sensor dummy, i.e. a closed glass tube. The in situ connector must be filled with oil for all deployments whether mounted with sensor or glass tube.
- The FDL Mini is now ready for deployment

### **7.10 Using the Field DataLogger Mini online with a PC**

The FDL Mini may be used online with a PC running the Unisense Logger software. Consult the Logger part of the SensorTrace Suite manual (<http://www.unisense.com/manuals/>) for details on how to log data directly on a PC. Note that the delivery of data from the FDL Mini to the PC will always occur with a frequency of 1 Hz no matter which sampling rates that are selected in the Logger software and on the FDL Mini.



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