

Microx 4 & Microx 4 trace

Fiber optic oxygen transmitters

TRANSMITTERS

● Instruction Manual



Microx 4 & Microx 4 trace

Specification:

Fiber optic oxygen transmitters for use
with non-invasive oxygen sensors, sensor probes &
oxygen microsensors

Software:

PreSens Datamanager

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1 Preface

You have chosen a new, innovative technology for measuring oxygen.

The Microx 4 & Microx 4 trace are compact, portable, completely stand-alone fiber optic oxygen transmitters. The data management and export is PC supported.

The Microx 4 & Microx 4 trace are developed especially for small fiber optic oxygen sensors, oxygen microsensors, flow-through cells and non-invasive sensors. They are based on a novel technology, which creates very stable, internally referenced measured values. This allows a more flexible use of oxygen sensors in various fields of interest.

Optical oxygen sensors (also called optrodes) have several important features:

- They are small.
- Their signal does not depend on the flow rate of the sample.
- They can be physically divided from the measuring system which allows a non-invasive measurement.
- They can be used in disposables.
- Microsensors allow measurements with high spatial resolution whenever this is required.

Therefore, they are ideally suited for the examination of small sample volumes, for highly parallelized measurements in disposables, and for biotechnological applications. A set of different oxygen mini- and microsensors, flow-through cells and non-invasive sensors is available to make sure you have the sensor which matches your application.

Please feel free to contact our service team to find the best solution for your application.

Your PreSens Team

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE WORKING WITH THIS DEVICE. WHEN DISREGARDING THESE INSTRUCTIONS THE SAFETY OF THE DEVICE CAN BE IMPAIRED.

2 Safety Notes

- ! It is the customer's responsibility to validate the sensor and transmitter under end-user conditions according to safety precautions of the application to ensure that the use of the sensor is safe and suitable for the intended purpose.

PreSens is explicitly not liable for direct or indirect losses caused by the application of these measurement systems. In particular it has to be considered that malfunctions can occur due to the naturally limited lifetime of the sensor depending on the respective application. The set-up of backup measurement stations is recommended when using the sensors in critical applications to avoid consequential losses. It is the customer's responsibility to install a suitable safety system in the event of sensor failure.

3 Description of the Microx 4 & Microx 4 trace Transmitter

The Microx 4 & Microx 4 trace are precise single channel fiber optic oxygen transmitters with temperature compensation, and additional compensation of pressure and salinity. They can be used with small fiber optic oxygen sensors as well as microsensors. The Microx 4 is designed for small fiber optic oxygen sensors with sensor type PSt7-10 and oxygen microsensors type PSt7-02 (limit of detection 0.03 % oxygen, 15 ppb dissolved oxygen). The Microx 4 trace additionally works with PSt8-10 and PSt8-02 type sensors (limit of detection 0.07 % oxygen, 3 ppb dissolved oxygen).

The Microx 4 & Microx 4 trace are portable, completely stand-alone devices with a color display and control buttons designed to be operated even with heavy gloves on. Easy sensor handling and calibration is realized with the implemented barcode reader. The Microx 4 & Microx 4 trace have an integrated, rechargeable battery and built-in memory. Connection to a PC as well as charging the battery is done via USB. For measurement or sensor data transfer the Microx 4 & Microx 4 trace are used with a comfortable PC software. An extended, database supported software version that allows controlling up to 10 Microx 4 / Microx 4 trace simultaneously is also available (please contact our service team for further information!).

	Microx 4	Microx 4 trace
Compatible sensor type	PSt7-10 (1 mm optical fiber) PSt7-02 (200 µm optical fiber)	PSt7-10 (1 mm optical fiber) PSt7-02 (200 µm optical fiber) PSt8-10 (1 mm optical fiber) PSt8-02 (200 µm optical fiber)



Fig. 1 Microx 4 trace, fiber optic trace oxygen transmitter for use with non-invasive oxygen sensors, sensor probes & oxygen microsensors

Features:

- Use with different models of mini- & microsensors
- High precision
- Portable & completely stand-alone device
- Temperature, pressure & salinity compensation
- Sensor handling & calibration via barcode

3.1 Scope of Delivery



Fig. 2 Case with all delivered equipment

- Microx 4 OR Microx 4 trace, fiber optic oxygen transmitter with protection kit
- PreSens Datamanager software (CD)
- USB cable
- USB-Power adapter (5 VDC, min. 1 A) with different connector pieces

Optional:

- Temperature sensor Pt100
- Extended software

Additionally required equipment (not supplied):

- Oxygen-sensitive chemical optical sensor
You can find mini- and microsensors – mounted into different types of housings – on
www.presens.de/products/o2/sensors.html
- PC / Notebook for comfortable data transfer and export:
System requirements:
Microsoft® Windows® XP, Vista™, 7, or 8; Processor power according to minimum requirements of the respective operating system

3.2 Top Panel

The top panel is equipped with a connector for the fiber optic sensor, a connector for the temperature sensor, and the barcode reader.



Fig. 3 Transmitter top panel

ELEMENT	DESCRIPTION	FUNCTION
ST	ST fiber connector	Connect the fiber optic sensor here.
BR	Barcode Reader	Scan sensor barcodes for sensor identification and calibration.
TEMP	Connector for Pt100 temperature sensor	Connect the Pt100 temperature sensor for temperature compensated measurements here.

3.3 Bottom Panel

The bottom panel is equipped with the USB connector for charging the battery or connecting the device to a PC / notebook. A screw cap gives access to the battery compartment.



Fig. 4 Transmitter bottom panel

ELEMENT	DESCRIPTION	FUNCTION
USB	Connector for the USB cable.	Connect the device with an USB cable to the power supply for charging or to your PC / notebook. Use the provided parts only!
BATT	Battery compartment	Open the screw cap to get access to the battery compartment (please refer to chapter 6.3).

3.4 Control Panel



Fig. 5 Control panel of the Microx 4 & Microx 4 trace

The Microx 4 & Microx 4 trace are completely stand-alone devices. The LCD display and the buttons allow operating the transmitter without connection to a PC / notebook. In the lower part of the display the functions of the buttons in the respective menu, submenu or window are shown. Use the buttons for navigating on the screen, and to make settings; pressing the respective button will perform the respective function (see Fig. 5).

3.5 Barcode Reader



Fig. 6 Scanning a sensor barcode

The integrated barcode reader on the top panel of the Microx 4 & Microx 4 trace facilitates sensor handling and management. The barcode reader can be activated in different menus or submenus. As soon as the barcode reader is activated place the Microx 4 / Microx 4 trace about 10 cm from the respective sensor barcode; the target cross has to be aimed at the barcode. Reducing or increasing the distance between barcode and barcode reader can speed up the scanning process. A notification window opens on the screen showing the message “Sensor successfully scanned!” when the scanning process is done. In case the scanning was not successful the screen shows the message “No Barcode recognized”.

! If the battery symbol in the status bar (see chapter 5.1) is flashing the battery status is very low. The barcode reader will not work with very low battery. Connect the Microx 4 / Microx 4 trace to the power supply or a PC / notebook and recharge the batteries.

4 Installation

4.1 Set-up

SET-UP



SET-UP

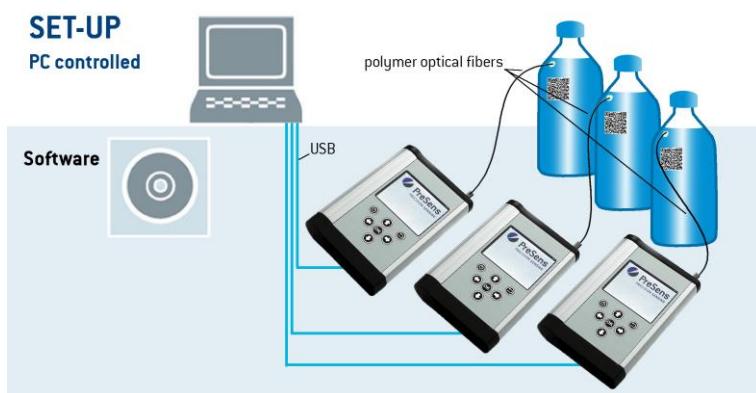


Fig. 7 Set-up for Microx 4 & Microx 4 trace. Top: Stand-alone use with sensor spot; middle: Stand-alone use with needle-type microsensor; bottom: PC controlled use with the extended software, e. g. parallel control of 3 transmitters.

A typical set-up is shown in Fig. 7. After barcode scan and sensor recognition the sensor spot is read out non-invasively via a polymer optical fiber which is connected to the transmitter, or measurements are performed with a connected oxygen microsensor. The Microx 4 & Microx 4 trace are completely stand-alone devices, and have to be connected to a PC / notebook for data transfer only. However the transmitters can be connected to a PC / notebook via USB

and controlled with the extended software version (see Fig. 7, bottom). This software allows operating up to 10 Microx 4 / Microx 4 trace simultaneously (please contact our service team for further information!).

The software is compatible with Microsoft® Windows® XP, Vista™, 7, or 8.

Remove the rubber cap from the optical sensor connector (ST connector) and keep the cap. After measurements or for storing the transmitter the rubber cap should be put back on to keep the optical sensor connector clean.

! It is recommended to clean the ST connector with a dust free cleaning wipe or a cleaning implement for ST connectors before the measurement.

Remove the protective cap from the male plug on the polymer optical fiber or the fiber of the microsensor and insert it in the ST connector of the Microx 4 / Microx 4 trace. The ST plug has to be inserted and slightly turned clockwise to fasten it. Be careful not to snap off the optical fiber, especially when connecting a microsensor; best hold the fiber between forefinger and thumb at the bayonet lock of the male plug.



Fig. 8 Connecting an oxygen microsensor to the ST plug of the transmitter; fasten the ST plug by turning it clockwise.

There is a red mark on the temperature sensor connector of the Microx 4 / Microx 4 trace. The temperature sensor plug has a red mark as well. Match those two marks before inserting the temperature sensor plug into the connector on the transmitter; else the plug might get damaged.

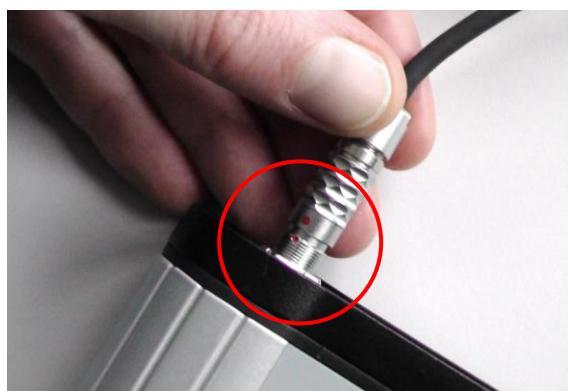


Fig. 9 Connecting a Pt100 temperature sensor to the transmitter

4.2 Software Installation

The Microx 4 & Microx 4 trace are delivered with the PreSens Datamanager software, which allows transferring sensor, user and measurement data between the transmitter and a PC / notebook. Furthermore, barcodes can be created with this software.

(If you require the extended software version, please contact our service team for further information!)

1. Connect the Microx 4 / Microx 4 trace to the PC / notebook via USB.
2. Please close all other applications as they may interfere with the software.
3. Insert the supplied CD-ROM into the respective drive.
4. If no dialog opens automatically, use the explorer to open the file menu on the CD. Click the file "PreSens Datamanager_x.x.x.x_Setup_FW.exe" to start the installation.
5. **Select Setup Language** (English / German) and press **OK**. The **Setup – PreSens Datamanager** window opens; follow the instructions of the PreSens Datamanager Setup Wizard, which will guide you through the installation and press **Next** to proceed. When you have finished installation pre-settings you can press the **Install** button.

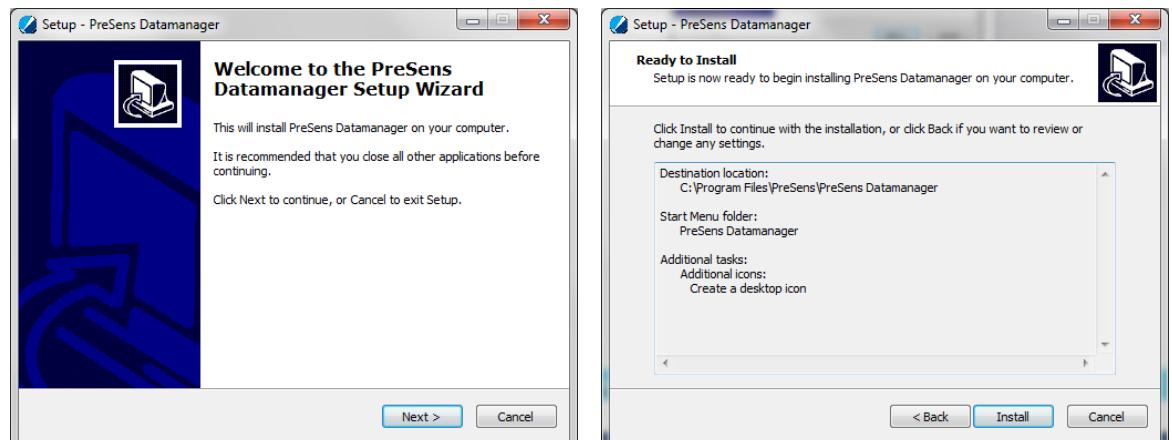


Fig. 10 PreSens Datamanager Setup Wizard

6. Please wait while the PreSens Datamanager software is installed on your PC / notebook.

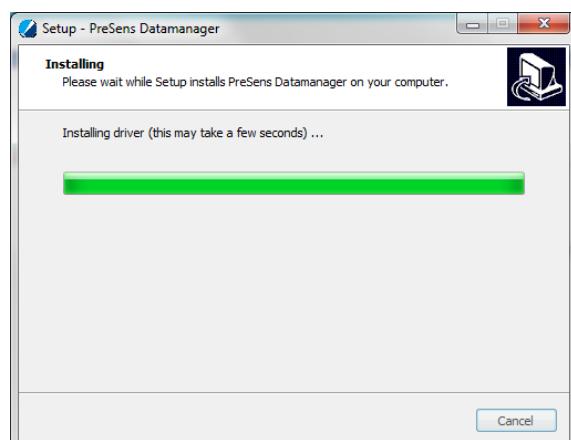


Fig. 11 The software is being installed.

7. In case .NET Framework 4 is not installed on your computer, the installation will start automatically. You will have to accept the license terms to continue, check the box beneath the license window and click **Install**. Installing .NET Framework 4 will require a few minutes.



Fig. 12 .NET Framework 4 license agreement

8. When PreSens Datamanager installation is completed click the **Finish** button.

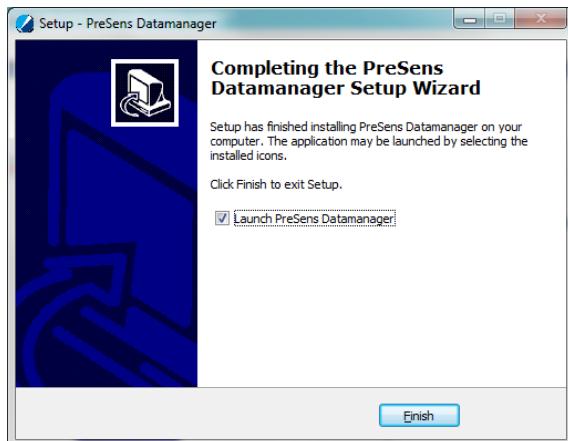


Fig. 13 Installation is completed. Click Finish to close the PreSens Datamanager Setup Wizard

9. Start the software by double clicking the software icon on your desktop or by selecting PreSens Datamanager in your programs list.

4.3 Adjustment of the Regional Settings of the Operating System

To change the regional settings on your PC press **Start** and go to the **Control Panel**. Choose **Regional and Language Options**.



Fig. 14 Control Panel – Classic View

Select the **Regional Options** tab (e.g. English (United States)) and click **Customize**.

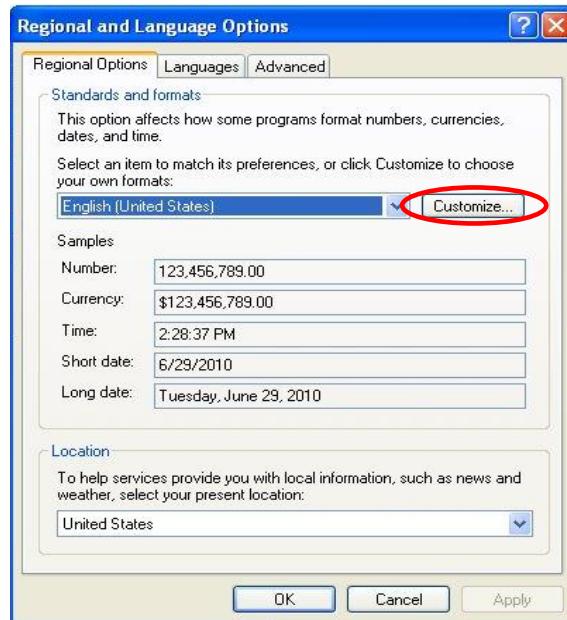


Fig. 15 Regional and Language Options window

A window opens; select the **Numbers** tab and choose the dot `.` in the **Decimal Symbol** drop down menu. In the drop down menu **Digit grouping symbol** you have to choose space ` `. Then press **Apply** and **OK**.

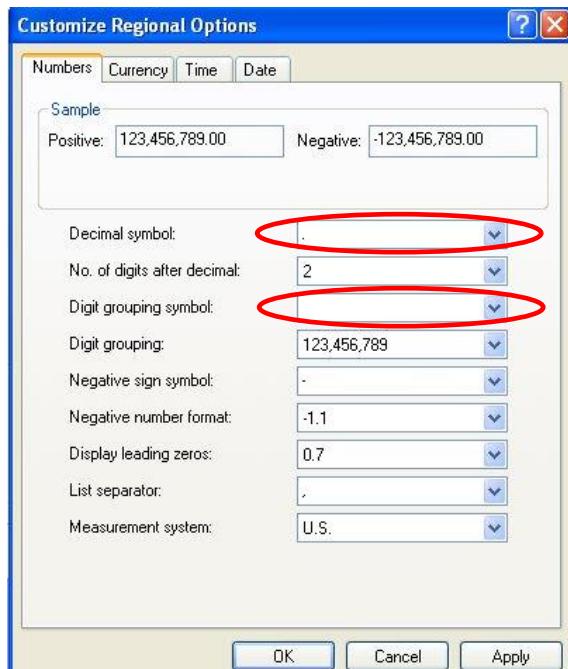


Fig. 16 Customize Regional Options window – Numbers tab

Click **Customize** again and go to the **Date** tab now. In the drop down menu **Short date format** you have to select `dd.MM.yy` and choose the dot `.` in **Date separator**. Again press **Apply** and **OK**.

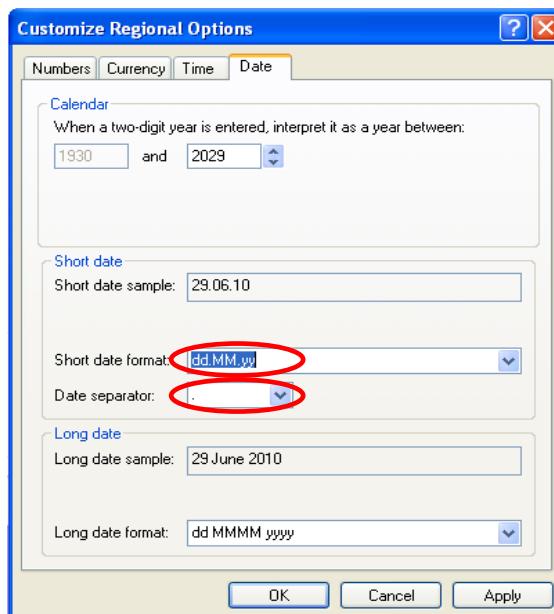


Fig. 17 Customize Regional Options window – Date tab

Press **OK** in the **Regional and Language Options** window, and you have finished adjusting the regional settings.

4.4 Battery Usage & Charging

- ! In order to conserve energy the device will turn off, if not in use for more than 15 minutes. 15 minutes is the default setting, and can be changed to user requirements. (For Energy Management Settings please refer to chapter 5.6.2.)

The Microx 4 & Microx 4 trace comprise rechargeable batteries for self-contained power supply. Rechargeable batteries are subject to normal wear which is more or less pronounced depending on operating and storage conditions. This normal wear is no defect which is covered by the device warranty.

(For battery information, please refer to the Technical Data chapter 5.)

Battery use time (per charge) from fully charged:

- Measurement mode duration approx. 16 hours (3 s Interval measurement, Default LED Intensity, Display backlight OFF)
- Standby Mode (Long Term Measurement mode activated) duration 30 days

The battery status is displayed in the status bar of the screen (see chapter 5.1). For recharging the batteries connect the supplied USB cable to the USB connector on the bottom panel of the Microx 4 / Microx 4 trace.



Fig. 18 Connecting the USB cable to transmitter

Then you can connect the USB cable to an USB port of a PC / notebook. The batteries will be charged when the PC / notebook is turned on.



Fig. 19 Transmitter connected to a notebook

! When connected to a PC the batteries will charge 95 % only, which can result in shorter operating times. If you want to charge the batteries to 100 %, please connect the Microx 4 / Microx 4 trace to the power supply with the USB-power adapter.

Plug the USB cable to the supplied USB-power adapter (5 VDC, min. 1 A) and connect the adapter to the main power grid.



Fig. 20 Transmitter connected to the USB-power adapter

In case the rechargeable batteries are not working properly anymore, you can replace them. Please refer to chapter 6.3 for further information on which replacements can be used and how to change the batteries.

5 Operation

5.1 Starting the Device



Fig. 21 Initial Screen – the transmitter is running a self check

Press the ON / OFF button on the control panel. An initial screen is shown on the display while the device performs a self check (status reports shown in the lower screen). The device switches to the main measurement screen after a few seconds.

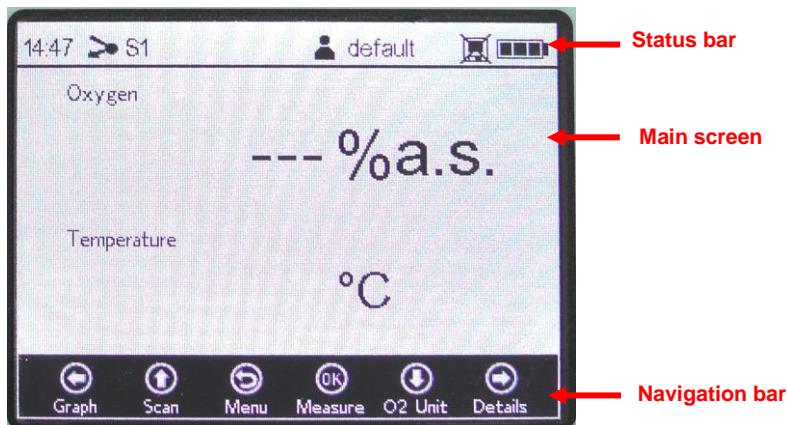


Fig. 22 Main measurement screen

The Microx 4 / Microx 4 trace display is divided into three sections:

1. Status bar: it shows

Time:

Microx 4 & Microx 4 trace have 24 hour clock settings.

Sensor:



Next to the sensor symbol the name of the currently selected sensor is displayed.

User:

Next to the user symbol the name of the currently selected user is displayed.

Logging:

This symbol indicates that logging is activated.



This symbol is displayed when logging is not activated.

Battery status:

The battery symbol on the right indicates the battery status. Three bars show that the battery is fully charged.



This battery symbol indicates that the battery status is low.

! If the battery symbol is flashing the battery status is very low. The barcode reader will not work with very low battery.

2. Main screen: In the main part of the display the selected menu screen is shown.
3. Navigation bar: In the lower screen the function which the respective control button will perform is displayed.

Press the button to get to the main menu screen.



5.2 User

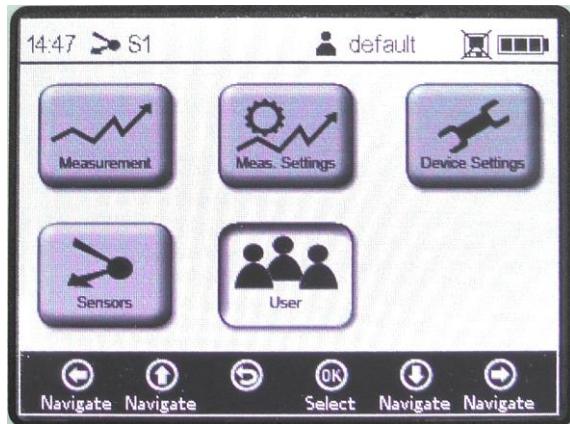


Fig. 23 Main menu – User selected

The **User** management allows selecting or creating / deleting different users. The user information will be stored with every measurement in the respective measurement file.



Fig. 24 User menu – list of all users is displayed

: Navigate up and down in the **User** list.

: Select the highlighted user. The display will switch to the measurement screen automatically; the selected user is shown in the status bar.

: Delete the highlighted user from the list; this will open a window in which you are asked "Really delete this user?". Select **Yes** and the highlighted user will be deleted. The currently activated user - shown in the status bar - cannot be deleted; you will have to select another user first, and then return to deleting the user you want removed. The default user cannot be deleted.

: Create a new user.



Pressing the button will switch to a keyboard screen (see Fig. 25). Use the arrow buttons to move on the keyboard and the **OK** button to select the respective letter or number. The new **User Name** will show in the highlighted box at the bottom.

To get back to the **User** list without saving the new user name use the **Esc** button.

When you have finished typing the name go to the **Done** button and press **OK**. The new user will show in the list now. You have to press **OK** once more to select the new user and the display will switch to the measurement screen automatically.



Fig. 25 Keyboard screen to enter User Name

Esc : Go back to the main menu screen.



5.3 Sensors

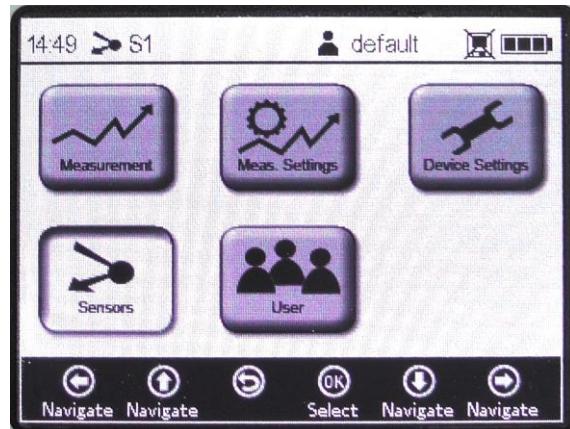


Fig. 26 Main menu – Sensors selected

The **Sensors** management shows a list of all sensors you have used with the Microx 4 / Microx 4 trace, the **Sensor Name**, **Sensor Type**, and the **Calibration Date** of the last calibration. You can add / delete sensors on the list or calibrate a sensor. The activated sensor and its sensor data will be stored with every measurement in the respective measurement file.

Sensor Name	Sensor Type	Calibration Date
HIT	PSt8-02	24 Jan 2014
R	PSt8-10	23 Jan 2014
SENSOR1	PSt7-10	24 Jan 2014
PST7_02	PSt7-10	27 Jan 2014
S	PSt7-02	27 Jan 2014

At the bottom, there are navigation buttons: left, up, down, right, menu, select, navigate, and calibrate.

Fig. 27 Sensors menu – list of all sensors is displayed

: Navigate up and down in the sensor list.

: Select the highlighted sensor. The display will switch to the measurement screen automatically; the selected sensor is shown in the status bar.

: Edit the sensor list.

A window opens in which you can choose whether to add a new sensor to the list, or delete the highlighted sensor from the list. Please refer to chapter 5.3.1 for adding a new sensor.

Select **Delete Sensor** and press to remove the highlighted sensor from the list; this will open a window in which you are asked “Really delete this sensor?”. Select **Yes** and the



highlighted sensor will be deleted. The currently activated sensor - shown in the status bar - cannot be deleted; you will have to select another sensor first, and then return to deleting the sensor you want removed.



Fig. 28 Pop-up, confirm deletion of sensor

: Calibrate the highlighted sensor.

A window opens in which you can choose to perform calibration via **Barcode** or **Manual** calibration. Please refer to chapter 5.3.2 for sensor calibration.

: Go back to the main menu screen.

5.3.1 Add a New Sensor

Go to the sensor management and press the button to edit the sensor list. A window appears; select **New Sensor** and press .

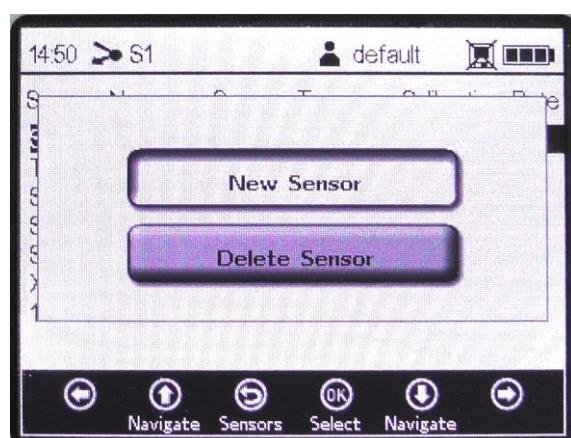


Fig. 29 Add a New Sensor



5.3.1.1 Add a New Sensor via Barcode

! Please note that you do not necessarily have to go to the **Sensors** management menu to add a new sensor. If you have the barcode for your new sensor at hand you can add it directly to the sensor list even while in the **Measurement** menu and can start measurements with the new sensor immediately. Please refer to chapter 5.5.4 for further information.

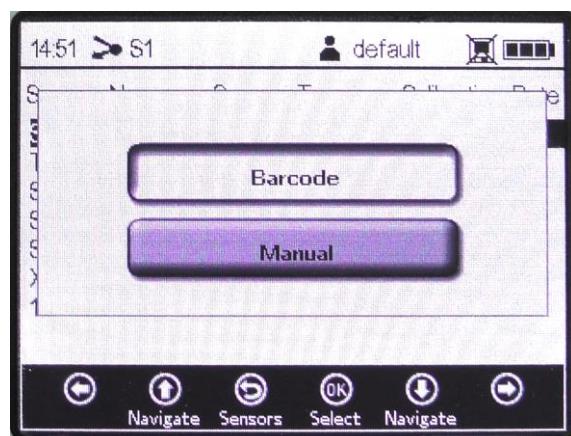


Fig. 30 Select how you want to add a new sensor: via barcode or manually.

If you have the barcode of your new sensor at hand you can select **Barcode**. This will activate the barcode reader. Place the barcode in front of the reader and wait until it is scanned. A notification window opens showing the message “Sensor successfully scanned!”.

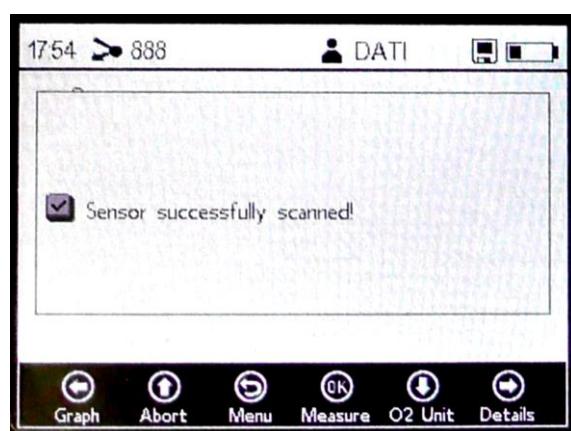


Fig. 31 Notification window shown when barcode scan was successful

If you have scanned a barcode of a sensor that is already in the list the display will show the notification “Sensor ID is already known!”.



As soon as the barcode with the new sensor data is scanned a keyboard screen opens. Use the arrow buttons to move on the keyboard and the **OK** button to select the respective letter or number. The new sensor name will show in the highlighted box at the bottom. To get back to the sensor list without saving the new sensor data use the **Esc** button. When you have finished typing the name go to the **Done** button and press **OK**.



Fig. 32 Keyboard screen to enter Sensor Name

The new sensor is added to the sensor list. If you want to select the new sensor for measurement, press the **OK** button again. The display will switch to the measurement screen automatically and the new sensor is activated and shown in the status bar.

5.3.1.2 Add a New Sensor Manually

If you do not have the barcode for your new sensor at hand or it got lost you can also add the new sensor manually and type in the sensor data. Select **Manual** and press **OK**.

Use the arrow buttons to navigate between input fields. Press **OK** to get into editing mode and change the respective setting or value (one digit at a time) with the **Q** and **W** buttons. To cancel and leave the editing mode press **Esc**. When you have adjusted an input field press the **OK** button again to save the changes.

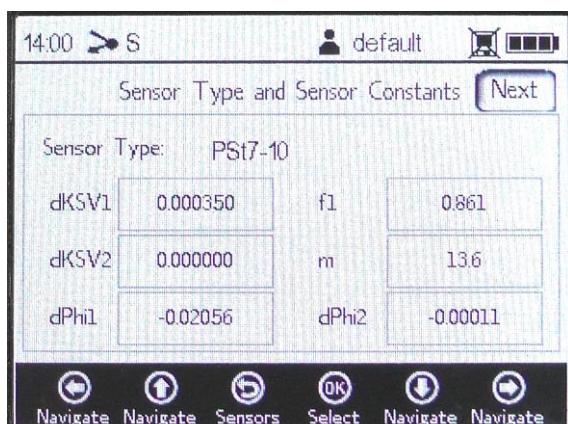


Fig. 33 Sensor Settings screen



1. Sensor Settings

In the **Sensor Settings** you have to choose the **Sensor type** of your new sensor (Microx 4: PSt7-10 or PSt7-02; Microx 4 trace: PSt7-10, PSt7-02, PSt8-10 or PSt8-02) and type in the **Sensor Constants**.

! You can find the sensor constants and calibration data on the Final Inspection Protocol delivered with your oxygen sensor.

Change the values on the display to the values stated on your sensor's Final Inspection Protocol, then move to the upper right of the screen to the **Next** button and press .

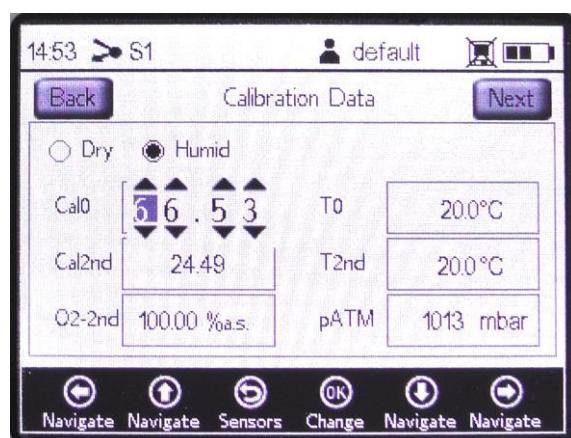


Fig. 34 Calibration Data screen

2. Calibration Data

Select **Dry** or **Humid** according to the conditions under which the calibration data was obtained and press .

Then change the calibration values to the values stated on the sensor's Final Inspection Protocol:

- Cal0 = first calibration point at 0 % oxygen
- T0 = temperature at which the first calibration point was measured
- Cal2nd = second calibration point
- T2nd = temperature at which the second calibration point was measured
- O2-2nd = oxygen concentration of the second calibration standard
- pATM = atmospheric pressure at which the calibration was performed

! Please note that for the O2-2nd and the pATM values the respective unit can be changed as well. Make sure that the selected unit matches the one stated on the Final Inspection Protocol.

When you have adjusted all the calibration values move to the upper right of the screen to the **Next** button and press .



Fig. 35 Keyboard screen to enter Sensor Name

3. Sensor Name

A keyboard screen opens to name the new sensors. Use the arrow buttons to move on the keyboard and the **OK** button to select the respective letter or number. The new sensor name will show in the highlighted box at the bottom. To get back to the sensor list without saving the new sensor data use the **Esc** button. When you have finished typing the name go to the **Done** button and press **OK**.

The new sensor is added to the sensor list. If you want to select the new sensor for measurement right away, press the **OK** button again. The display will switch to the measurement screen automatically and the new sensor is activated and shown in the status bar.

5.3.2 Calibrate Sensors

Go to the **Sensors** management menu and select the respective sensor you want to (re)calibrate from the list, then press the **OK** button. You can choose between calibration via **Barcode** and **Manual** calibration.



Fig. 36 Select calibration via Barcode or Manual calibration



5.3.2.1 Calibration via Barcode

With this function you can take over calibration data of one sensor for another sensor of the same batch, as there is no check for sensor ID.

It is possible to do a sensor calibration and use the obtained calibration values to generate a barcode with the PreSens Datamanager software (see chapter 5.7.1). This barcode can be applied for calibrating all sensors of the same batch as the one you have calibrated.

5.3.2.2 Manual Calibration

If you do not have the barcode for your sensor at hand or you want to recalibrate the sensor you can perform manual calibration. Select **Manual** and press **OK**.

Use the arrow buttons to navigate between input fields. Press **OK** to get into editing mode and change the respective setting or value (one digit at a time) with the **↶** and **↷** buttons. To cancel and leave the editing mode press **Esc**. When you have adjusted an input field press the **OK** button again to save the changes.

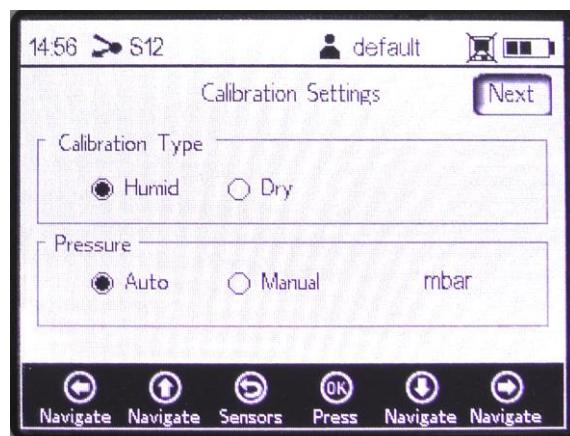


Fig. 37 Calibration Settings screen

1. Calibration Settings

Calibration Type:

Select **Dry** or **Humid** according to the conditions under which the calibration is performed and press **OK**.

Pressure:

Selecting **Auto** the atmospheric pressure is measured automatically with the integrated pressure sensor.

Selecting **Manual** you have to type in the current atmospheric pressure value and the respective unit (hPa, mbar, PSI, atm, or torr). Press **OK** to save your changes.

Move to the upper right of the screen to the **Next** button and press **OK**.

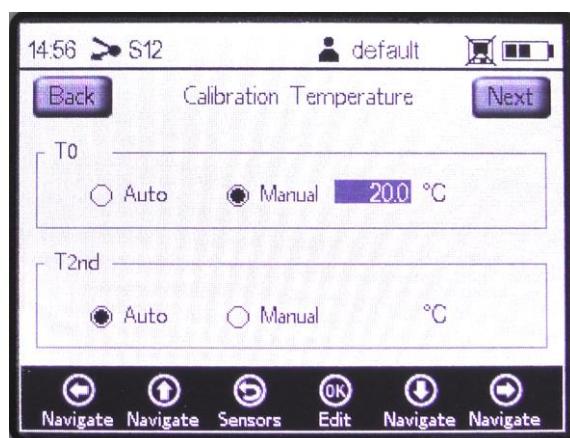


Fig. 38 Calibration Temperature screen

2. Calibration Temperature

T0: Temperature at the first calibration point.

Selecting **Auto** the temperature at the first calibration point will be measured with the Pt100 temperature sensor. Connect the Pt100 temperature sensor to the respective connector on the transmitter's top panel and make sure it is inserted in the medium of the first calibration point.

Selecting **Manual** the current temperature at the first calibration point has to be known; you have to type in the current temperature value and the respective temperature unit (°C, °F, or K) at the first calibration point.

T2nd: Temperature at the second calibration point.

Like at the first calibration point you can select **Auto** for automatic temperature measurement or **Manual** for inserting the calibration temperature yourself.

Move to the upper right of the screen to the **Next** button and press **OK**.

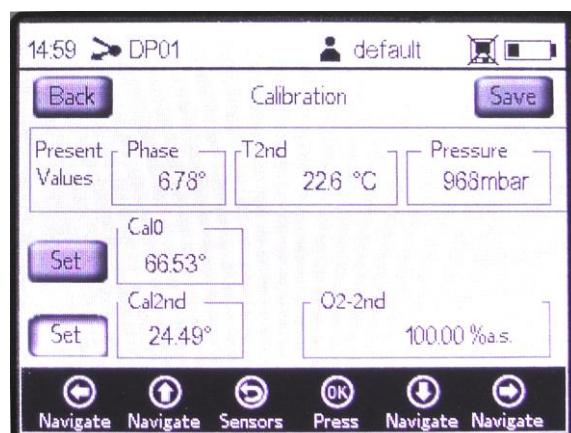


Fig. 39 Calibration screen

3. Calibration

! It is possible to perform a one-point calibration as well as a two-point calibration.



In the upper main screen the **Present Values** measured by the Microx 4 / Microx 4 trace are shown.

Set the first calibration point **Cal0:**

Place the oxygen sensor (and temperature sensor, if you have chosen **Auto** in **Calibration Temperature**) in the medium for the first calibration point. In the **Present Values** the currently measured phase value of the oxygen sensor and the temperature are displayed. Watch the displayed phase value; wait for about 3 minutes until the phase angle is constant (the variation of the phase angle should be smaller than $\pm 0.1^\circ$ and the variation of temperature smaller than $\pm 0.1^\circ\text{C}$); move to the **Set** button left of the **Cal0** value and press .

Set the second calibration point **Cal2nd:**

Place the oxygen sensor (and temperature sensor, if you have chosen **Auto** in **Calibration Temperature**) in the medium for the second calibration point. Go to **O2-2nd** and type in the oxygen value in the respective unit of your second calibration medium. In the **Present Values** the currently measured phase value of the oxygen sensor and the temperature are displayed. Watch the displayed phase value; wait for about 3 minutes until the phase angle is constant (the variation of the phase angle should be smaller than $\pm 0.1^\circ$ and the variation of temperature smaller than $\pm 0.1^\circ\text{C}$); move to the **Set** button left of the **Cal2nd** value and press .

When you have set the calibration values move to the upper right of the screen to the **Save** button and press to store the calibration data for the selected sensor. The display will switch back to the sensor list.



5.4 Measurement Settings

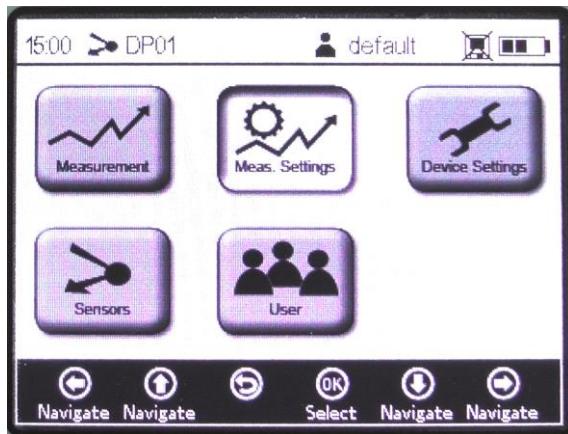


Fig. 40 Main menu – Measurement Settings selected

In the **Meas. Settings** menu you are able to change general settings for your measurements. If you do not change the measurement settings, the settings of your last measurement will be applied.

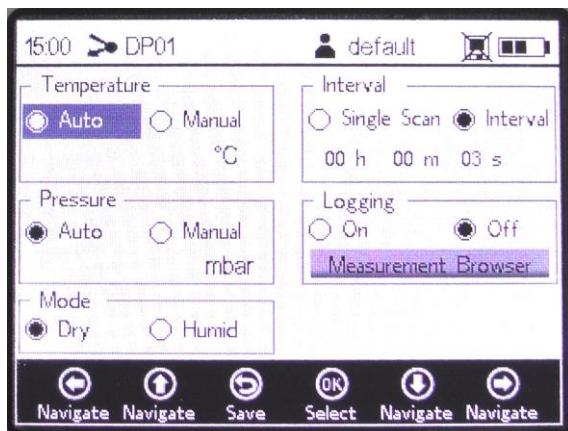


Fig. 41 Measurement Settings screen

Use the arrow buttons to navigate between input fields. Press **OK** to get into editing mode and change the respective setting or value (one digit at a time) with the **1** and **0** buttons. To cancel and leave the editing mode press **Esc**. When you have adjusted an input field press the **OK** button again to save the changes.



5.4.1 Temperature Compensation

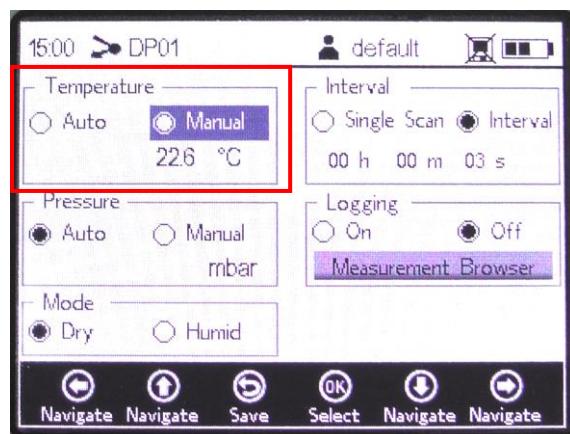


Fig. 42 Measurement Settings – Temperature compensation

Use the navigation buttons to move to the **Temperature** box and select the temperature compensation mode. With **Auto** the measurement temperature is determined with the Pt100 sensor. Connect the Pt100 temperature sensor to the respective connector on the transmitter top panel. Make sure the temperature sensor is in close vicinity to the oxygen sensor or in an environment with the same temperature as the oxygen sensor. Automatically measured temperature values can be displayed in °C, °F, or K. Change the settings to the desired unit in the lower right corner of the **Temperature** box.

Select **Manual** if the temperature at the oxygen sensor during measurement is known and constant throughout the measurement. Temperature values can be inserted in °C, °F, or K. Values will automatically be recalculated in the respective unit. Switch to the desired temperature unit and change the temperature value in the input field to the measurement temperature.

5.4.2 Pressure Compensation

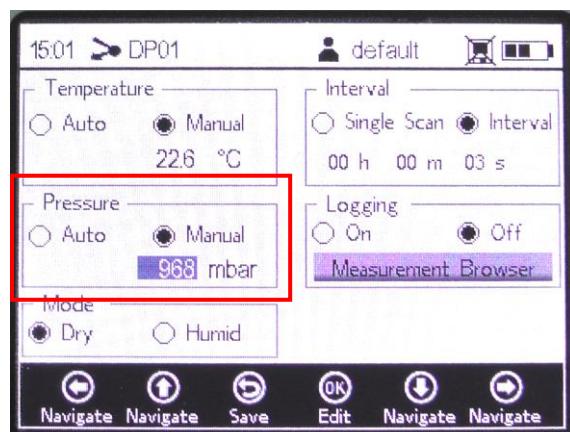


Fig. 43 Measurement Settings – Pressure compensation

Use the navigation buttons to move to the **Pressure** box. With **Auto** selected, the integrated pressure sensor of the Microx 4 / Microx 4 trace will measure the atmospheric pressure and



these values will be used for pressure compensation.

Select **Manual**, if the atmospheric pressure during measurements is known. Pressure values can be inserted in hPa, mbar, PSI, atm, or torr. Switch to the desired pressure unit and change the pressure value in the input field.

5.4.3 Measurement Conditions

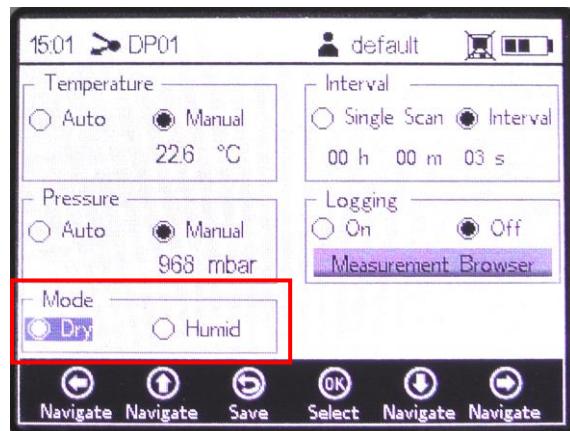


Fig. 44 Measurement Settings – Mode of measurement

Use the navigation buttons to move to the **Mode** box. Select **Dry** or **Humid** (also for aqueous samples) depending on the environmental conditions in which measurements are taken. Selecting **Humid** will open the input field for salinity compensation (see chapter 4.4.4).

5.4.4 Salinity Compensation

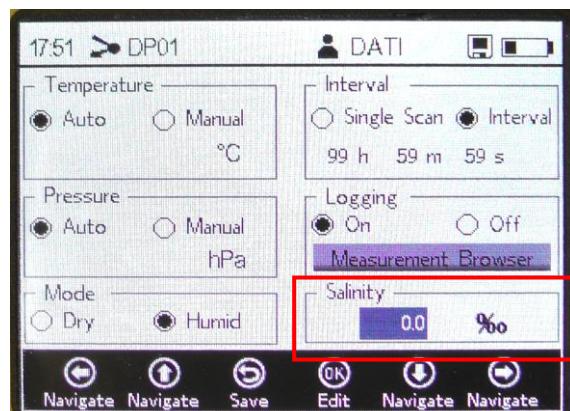


Fig. 45 Measurement Settings – Salinity compensation

If **Humid** is selected in the **Mode** box the input field for **Salinity** compensation will show on the measurement settings screen. Insert the salinity value in ‰ (g/kg) of your sample in the input field for salinity compensation.



5.4.5 Interval

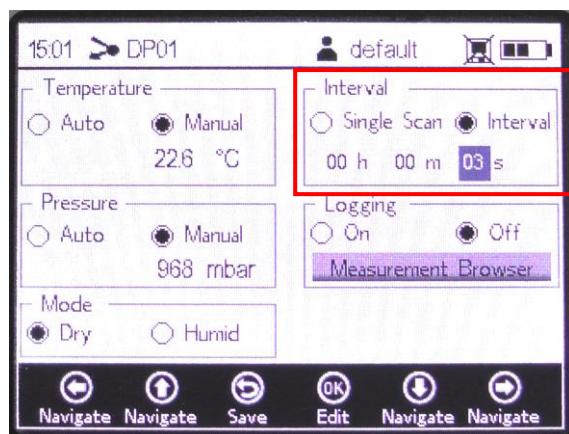


Fig. 46 Measurement Settings – select time Interval

Use the navigation buttons to move to the **Interval** box and select the measurement mode. With **Single Scan** selected one single measurement is taken. Selecting **Interval** you are able to set a certain time interval at which measurements are taken (default value is 3 s, fastest possible is 1 s). Insert the hours, minutes, and seconds for the interval at which you want measurements to be taken.

5.4.6 Logging & Data Management

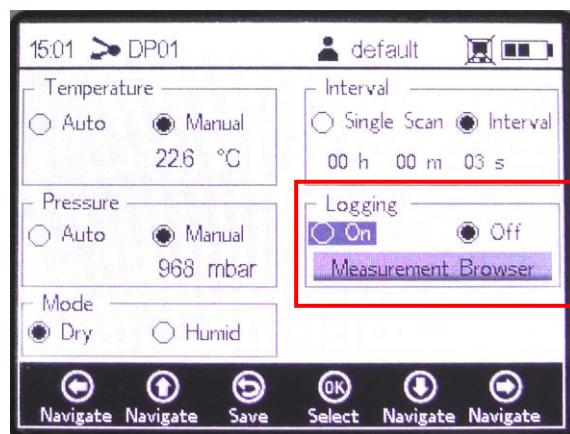


Fig. 47 Measurement Settings - Logging

Use the navigation buttons to move to the **Logging** box. Select **Off** if you do not want to store measurement data.

In the status bar this symbol shows that logging is turned off.

Select **On** if you want to store measurement data. The screen will switch to the **Measurement Browser** automatically. The list shows the **Measurement** file name, the number of measurement **Points** stored in the respective file, and the date the file was **Last Used**.

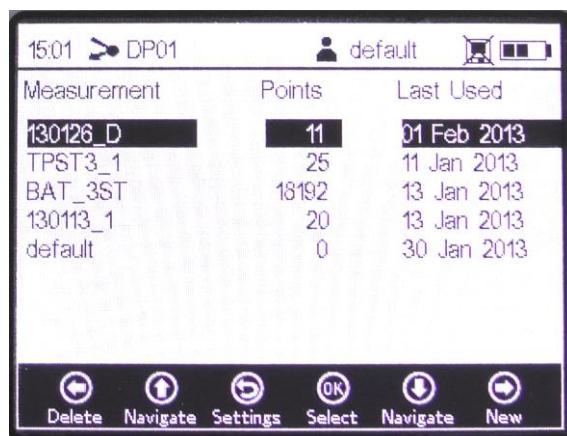


Fig. 48 Measurement Browser – List of measurement files

: Navigate up and down in the measurement file list.

: Select the highlighted measurement file. The new measurement data will be added to the existing file. The display will switch back to the measurement settings automatically.

: In the status bar this symbol shows that logging is turned on and measurement data are going to be stored.

: Delete the highlighted measurement file from the list; this will open a window in which you are asked “Really delete this measurement?”. Select **Yes** and the highlighted measurement file will be deleted. The currently activated measurement file - shown in the status bar - cannot be deleted; you will have to select another measurement file first, and then return to deleting the measurement file you want removed. The default measurement cannot be deleted.



Fig. 49 Keyboard screen to enter Measurement Name

: Create a new measurement file.

A keyboard screen opens to name the new measurement file. Use the arrow buttons to move on the keyboard and the button to select the respective letter or number. The new measurement file name will show in the highlighted box at the bottom. To get back to the



measurement file list without creating the new file use the button. When you have finished typing the name go to the **Done** button and press . The new measurement file will show in the file list. To select the new measurement file for data storage press again; the screen will switch back to the measurement settings automatically.

: Save the changes and go back to the main menu screen.

5.5 Measurement

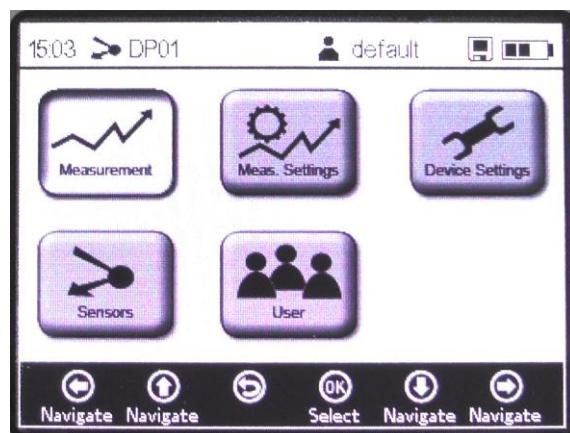


Fig. 50 Main menu – Measurement selected

In the **Measurement** menu the currently measured values and measurement settings can be displayed in simple or detailed view. Furthermore, you can choose graphical presentation of the measurements. Use the and buttons to switch between screens.

The **Measurement** menu also offers the barcode reader function for faster sensor recognition and activation, so measurements can be started immediately.

5.5.1 Simple Screen

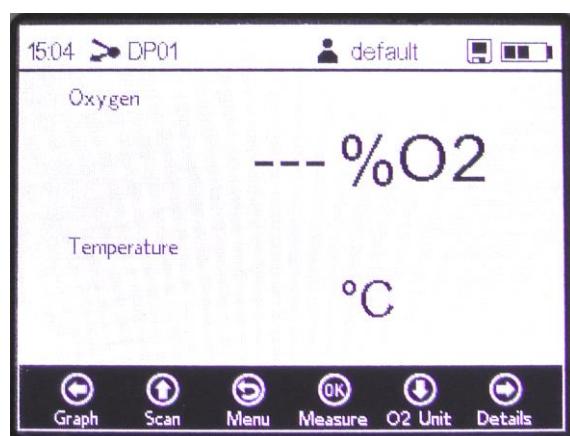


Fig. 51 Simple measurement screen

Selecting **Measurement** will open the simple view screen in which the oxygen and temperature value will be displayed as soon as the measurement is started. If you have set the measurement temperature manually, the temperature value is already shown before



starting the measurement. (In manual mode the temperature unit can be changed in the Meas. Settings, see also chapter 5.4.1.) In case you have selected automatic temperature measurement and the temperature sensor is not connected or not working properly the display will show an error message (see Fig. 52).

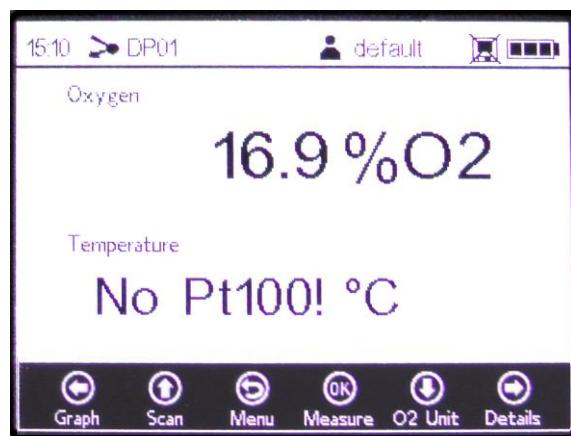


Fig. 52 Temperature sensor error message

In case no sensor is connected, or it is not connected properly, and its signal cannot be read when measurements are started an error message is displayed in the status bar (see Fig. 53).

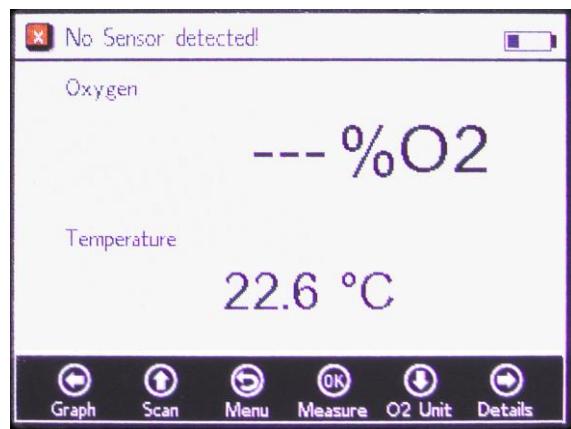


Fig. 53 Error message – the sensor cannot be detected

: Scan sensor barcode for activating the respective sensor.

Pressing the button will activate the barcode reader. Place the barcode in front of the reader and wait until it is scanned. A notification window will open showing the message "Sensor successfully scanned!". The respective sensor will be activated and is shown in the status bar. Now you can start measurements with the sensor.

: Start / Stop the measurement.

According to your measurement settings a single scan or interval measurement will be started. When you are performing interval measurement press the button again to stop the measurement.



: Change the Oxygen Unit.

Pressing the button changes the oxygen unit on the display and the last measurement value will be shown in the respective oxygen unit immediately. You can choose:

For PSt7(-02/-10) sensor in **Dry** conditions

- % a. s. (air saturation)
- % O₂
- hPa
- Torr

For PSt7(-02/-10) sensor in **Humid** conditions

- % a. s. (air saturation)
- % O₂
- hPa
- Torr
- mg/L (ppm) (in case measured value is < 1 mg/L it will be displayed in µg/L (ppb))
- µmol/L

With Microx 4 trace:

For PSt8(-02/-10) sensor in **Dry** conditions

- % a. s. (air saturation)
- % O₂
- hPa
- Torr
- ppm g (gaseous oxygen)

For PSt8(-02/-10) sensor in **Humid** conditions

- % a. s. (air saturation)
- % O₂
- hPa
- Torr
- mg/L (ppm) (in case measured value is < 1 mg/L it will be displayed in µg/L (ppb))
- µmol/L

: Display the detailed measurement screen (see chapter 5.5.2).

: Display the measurement graph (see chapter 5.5.3).

: Go back to the main menu screen.



5.5.2 Details Screen

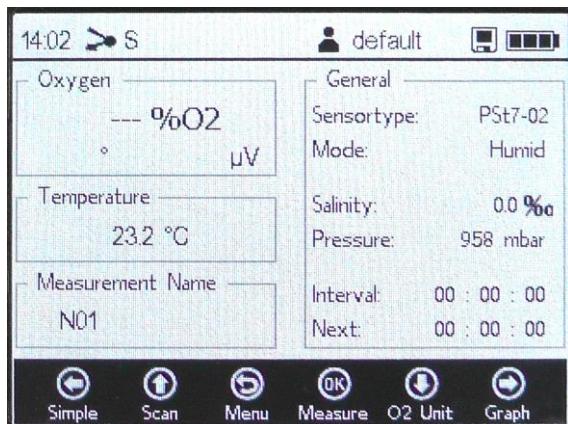


Fig. 54 Details measurement screen

The **Details** screen gives additional information about measurement and measurement settings.

Oxygen:

In the Oxygen box the currently or last measured oxygen value is displayed in the selected oxygen unit. You can change the oxygen unit by pressing the button. Furthermore, it shows the phase angle [°] and amplitude [μ V] values.

Temperature:

In the Temperature box the currently / last measured or manually set temperature value in the selected temperature unit is displayed. (In manual mode the temperature unit can be changed in the Meas. Settings, see also chapter 5.4.1.)

Measurement Name:

The Measurement Name box displays the selected measurement file in which all data is going to be stored, if you have turned on logging. (The measurement file can be changed in the Meas. Settings menu, see chapter 5.4.6.)

General:

The General box shows the **Sensor type** of the currently selected oxygen sensor, and the environmental conditions (**Dry** / **Humid**) set in the Meas. Settings.

The values for **Salinity** and **Pressure** compensation are also displayed.

In the lower right of the screen you can see the time **Interval** at which measurements are taken. If you perform single scan measurement **Interval** will show zero value.

Next gives you the time period – during running measurement a countdown - till the next measurement. If you perform single scan measurement **Next** will show zero value.

: Scan sensor barcode for activating the respective sensor.

Pressing the button will activate the barcode reader. Place the barcode in front of the reader and wait until it is scanned. A notification window will open showing the message "Sensor successfully scanned!". The respective sensor will be activated and is shown in the status bar. Now you can start measurements with the sensor.



: Start / Stop the measurement.

According to your measurement settings a single scan or interval measurement will be started. Pressing the button again will stop the measurement.

: Go back to Simple view.

: Display the measurement graph.

Pressing the button will switch to the graphical presentation of the currently taken measurements (see chapter 5.5.3).

: Go back to the main menu screen.

5.5.3 Graph Screen

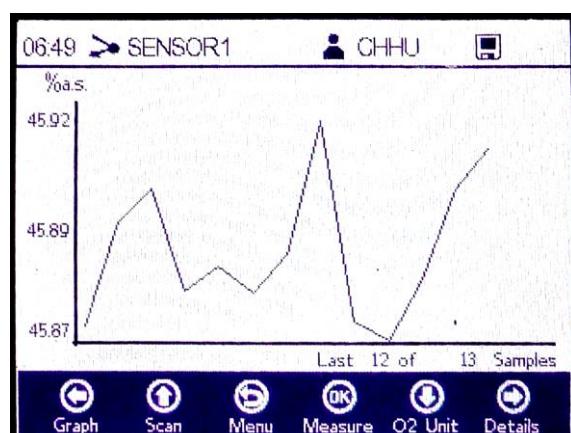


Fig. 55 Graph screen

The oxygen values of the current measurement session are displayed in a graph in the previously selected oxygen unit. In the lower right of the screen you can see how many measurement points of the total number of measurement points are displayed in the graph; in the lower left a progress bar shows (especially with large measurement files) the progress of data being analyzed. In case you are about to display a large measurement file a pop-up window appears (see Fig. 56). Though only the last 248 measurements are displayed it can take some time, as the whole measurement file has to be analyzed to determine which measurement points have been taken with the currently selected sensor. Select **No** to return to the current measurement graph. Selecting **Yes** will show the last 248 measurement points of the currently selected measurement file.



Fig. 56 Pop-up window in graph screen.

You cannot change the oxygen unit while the **Graph** screen is displayed. Switch back to the **Simple** or **Details** screen to change the oxygen unit. In case your measurement values cannot be calculated in the desired unit and represented in the graph (e. g. in the unit mg/L while measurements were taken in dry mode) an error message is shown on top of the graph screen (see Fig. 57).

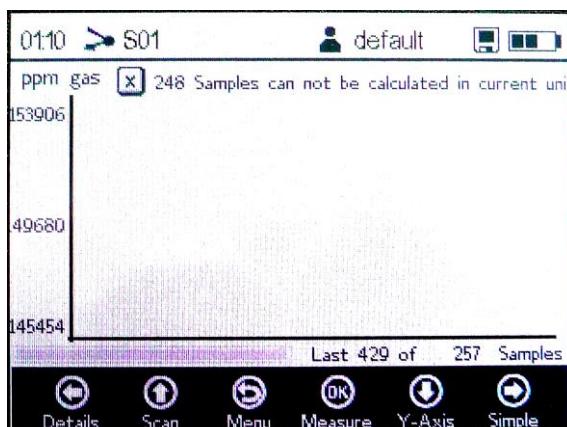


Fig. 57 Error "Samples cannot be calculated in current unit."

: Scan sensor barcode for activating the respective sensor.

Pressing the button will activate the barcode reader. Place the barcode in front of the reader and wait until it is scanned. A notification window will open showing the message "Sensor successfully scanned!". The respective sensor will be activated and is shown in the status bar. Now you can start measurements with the sensor.

: Start / Stop the measurement.

According to your measurement settings a single scan or interval measurement will be started. Pressing the button again will stop the measurement.

: Y-Axis allows setting minimum and maximum values for scaling the y-axis.

Pressing the button opens the **Y-Axis Setup** window in which you can choose to do **Autoscale** or **Manual** setting of maximum and minimum values displayed on the y-axis. **Autoscale** will set the maximum and minimum values automatically according to your



measurement values.

- !** Measurement values outside the set display range will be displayed as maximum or minimum values respectively.

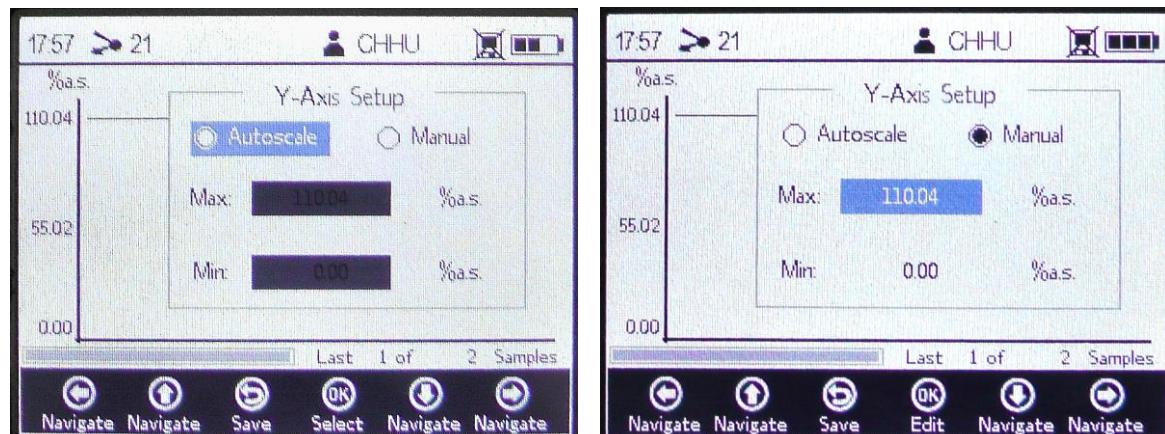


Fig. 58 Y-Axis Setup: Autoscale

and Manual setting

: Go back to Details view.

: Go back to Simple view.

: Go back to the main menu screen.

5.5.4 Scan a New Sensor

Pressing the button on any measurement screen will activate the barcode reader. Place the barcode in front of the reader and wait until it is scanned. A notification window will open showing the message "Sensor successfully scanned!". If the sensor has not been used with Microx 4 & Microx 4 trace before and is not yet stored in the sensor list a keyboard screen opens to name the new sensors.



Fig. 59 Keyboard screen to enter Sensor Name



Use the arrow buttons to move on the keyboard and the **OK** button to select the respective letter or number. The new sensor name will show in the highlighted box at the bottom. To get back to the sensor list without saving the new sensor data use the **Esc** button. When you have finished typing the name go to the Done button and press **OK**.

The screen switches automatically to sensor list, where the new sensor is displayed now and highlighted. Press **OK** again to select the new sensor, this will get you back to the **Measurement** screen automatically.

5.6 Device Settings

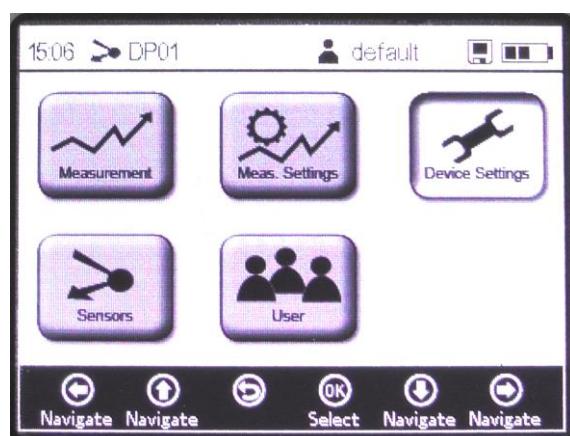


Fig. 60 Main menu – Device Settings selected

The Device Settings menu is divided into four screens: Device Settings, Energy Management, Sensor Details, and About. Use the **OK** and **Esc** buttons to switch between screens.

5.6.1 Device Settings Screen

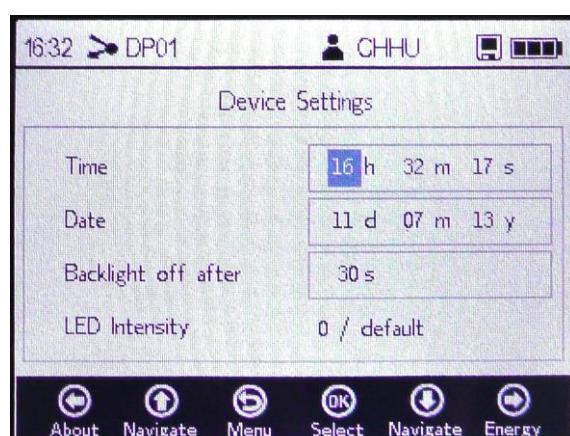


Fig. 61 Device Settings screen

This menu allows changing general settings of the Microx 4 / Microx 4 trace transmitter. **Time** and **Date** will be saved with every measurement in the respective measurement file.

Use the **OK** and **Esc** buttons to navigate between input fields. Press **OK** to get into editing mode and change the respective setting or value (one digit at a time) with the **OK** and **Esc** buttons. To



cancel and leave the editing mode press . When you have adjusted an input field press the button again to save the changes.

Time: Set the current time.

- h = hour
- m = minute
- s = second

! The Microx 4 & Microx 4 trace use 24 hour time settings.

Date: Set the current date.

- d = day
- m = month
- y = year

Backlight off after:

Change the time (in seconds) after which the display backlight will turn off automatically.

LED Intensity:

This function is for more experienced users to change the illumination level of the device. With a higher illumination level the signal-to-noise ratio can be improved, with a lower illumination level sensor bleaching can be avoided and its measurement stability prolonged. The settings can be changed to:

- 5 / lowest
- 4
- 3 / lower
- 2
- 1 / low
- 0 / default
- +1 / high
- +2
- +3 / higher
- +4
- +5 / highest

After changing LED Intensity the measurement parameters of the transmitter will change and the sensor has to be recalibrated.



5.6.2 Energy Management



Fig. 62 Energy Management screen

In the Energy Management menu different settings can be changed to save battery power when using the Microx 4 / Microx 4 trace.

Use the **↑** and **↓** buttons to navigate between input fields. Press **OK** to get into editing mode and change the respective setting or value (one digit at a time) with the **↑** and **↓** buttons. To cancel and leave the editing mode press **OK**. When you have adjusted an input field press the **OK** button again to save the changes.

Turn device off after...:

Set the time after which the transmitter will be turned off if not in use. The default setting is 15 min. The device will not turn off if interval measurements are running.

Long Term Measurement:

This function can be used when performing interval measurements over longer time periods. With this function turned to **on** the transmitter will turn off between measurement points to save energy.

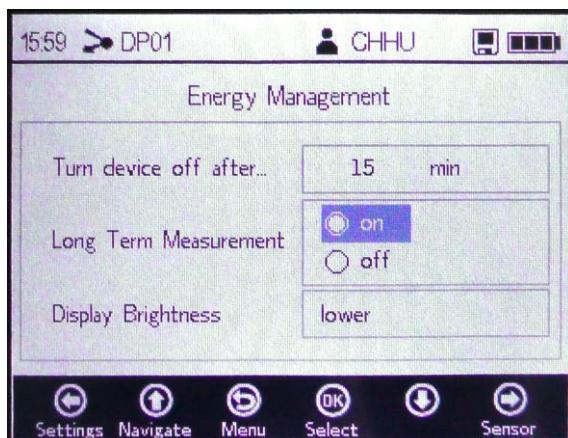


Fig. 63 Long Term Measurement turned on



- ! Long Term Measurement can be used if the measurement interval is set to at least 10 seconds. Logging has to be activated.

As soon as measurements are started you will have to confirm activating this function (see Fig. 64).

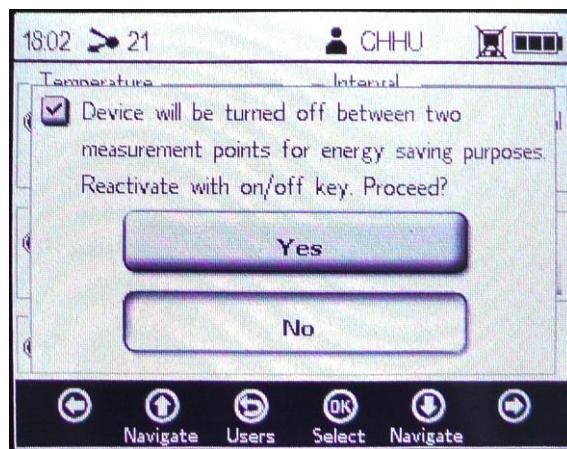


Fig. 64 Activate long term measurement by selecting YES

In case you have not activated logging an information window appears (see Fig. 65). Activate logging (see chapter 5.4.6) and again start your measurements. The Long Term Measurement Mode will work now.

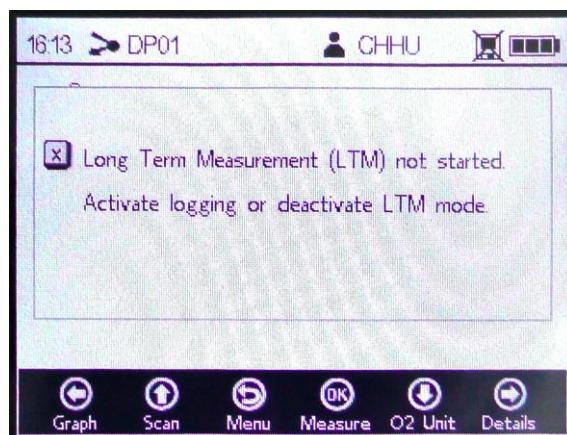


Fig. 65 Information window: LTM not started

The transmitter will turn off after the first measurement. It can be reactivated any time e. g. to check the battery status, or see if measurements are properly running by pressing the key on the control panel. An information window will appear, showing the last measurement value, and date and time of the last measurement. You can choose to continue long term measurement or cancel it.

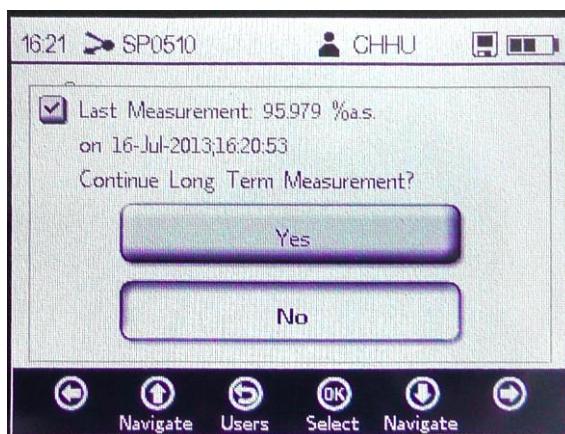


Fig. 66 Transmitter turned on during Long Term Measurement.

Display Brightness:

The display brightness can be set to lowest, lower, medium, higher, or highest. You can see the change in display brightness immediately. Default setting is medium; with lower display brightness energy can be saved.

5.6.3 About Screen

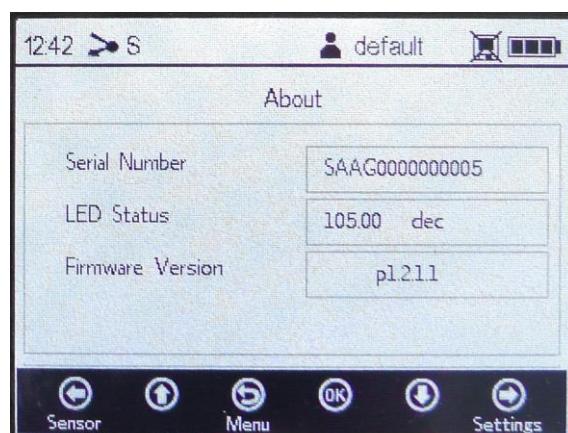


Fig. 67 About screen

Here the serial number, LED Status, and Firmware Version of your Microx 4 / Microx 4 trace is displayed.

- ! In case of any problems with your transmitter please have this information ready when contacting our service team.



5.6.4 Sensor Details Screen

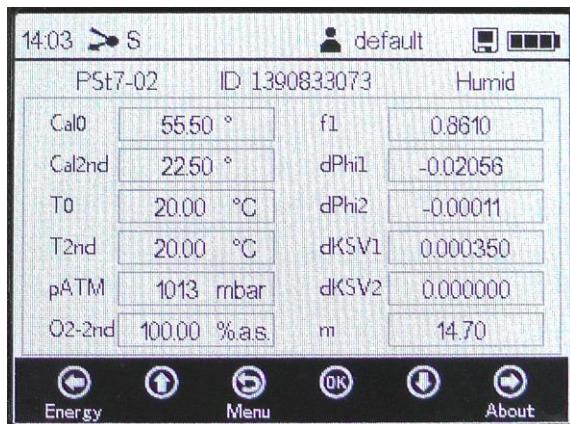


Fig. 68 Sensor details screen

You can see all information about the currently selected sensor.

The sensor type, sensor ID and set measurement conditions (Humid or Dry) are displayed in the upper screen. You can see all calibration data as well as the sensor constants.

5.7 Subsequent Data Handling

Connect the Microx 4 / Microx 4 trace to an USB port of your PC / notebook with the supplied USB cable. Then start the PreSens Datamanager software.

You will be asked to choose a working directory, where data is going to be stored on your PC / notebook, when running the software for the first time. Choose the directory from the list and click **OK**.

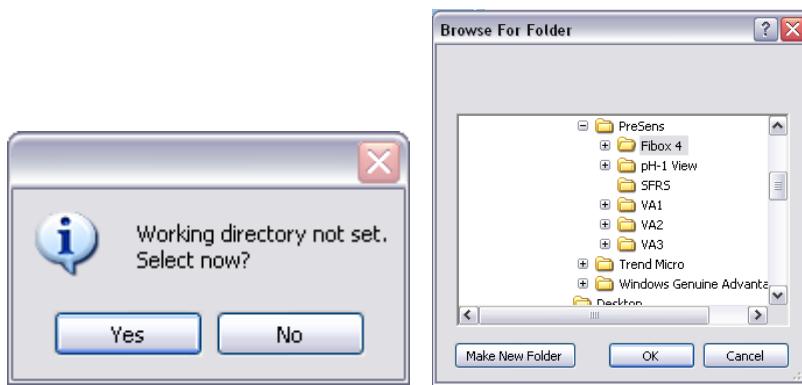


Fig. 69 Selecting the working directory

The PreSens Datamanager allows managing sensors, measurements, and users and transferring this data between transmitter and PC / notebook.

In the menu bar **File** gives you the option to change the working directory or exit the software. The **?** menu will show software information for the PreSens Datamanager.

Data stored on the PC (in the chosen working directory) is displayed on the left in the **Database** box. The data stored on the connected Microx 4 / Microx 4 trace is displayed on the right in the **Device** box. Use the tabs on top for switching between **Sensors**, **Measurements** and **User**. The buttons in the middle of the screen are used to perform the respective actions. With the >> button and << button the selected data can be transferred from the PC / notebook to the device and vice versa.

At the bottom of the software screen the current working directory and a status bar showing the serial number of the currently connected transmitter are displayed.

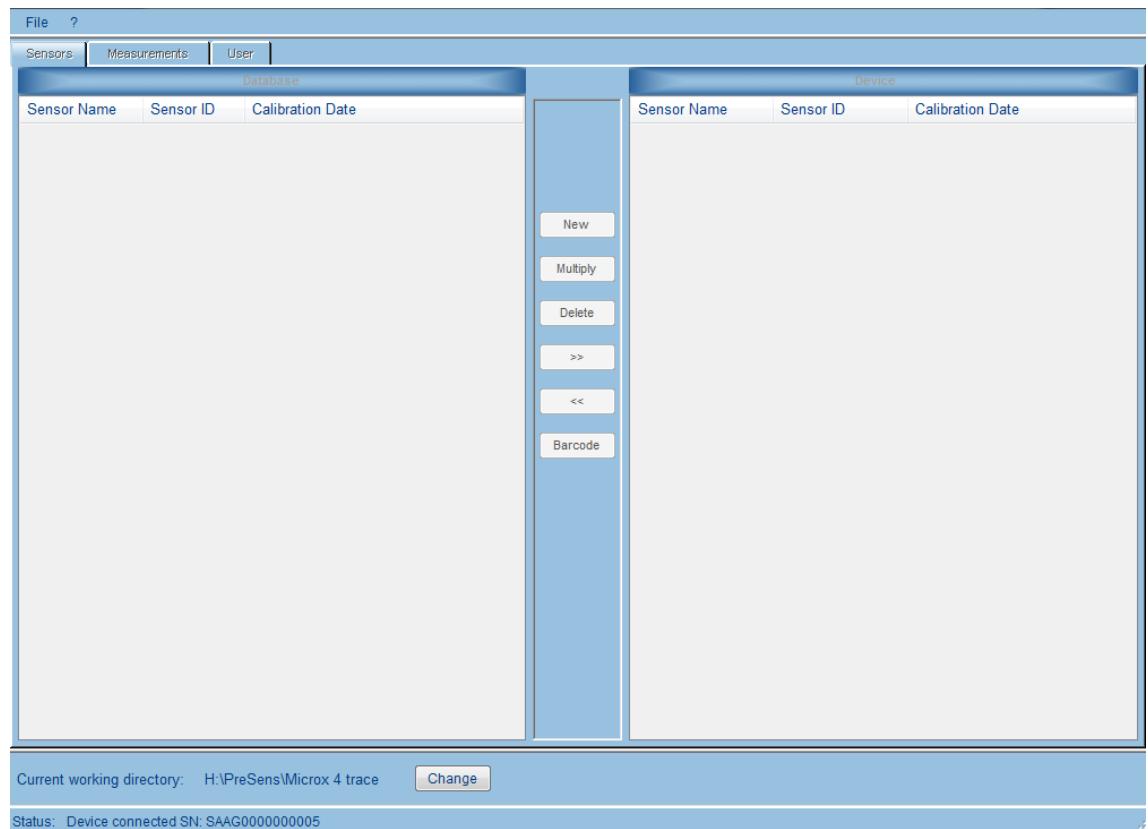


Fig. 70 PreSens Datamanager: Sensors tab

In case no device is connected to the PC / notebook only the Database section is displayed showing all Microx 4 / Microx 4 trace data stored on the computer.

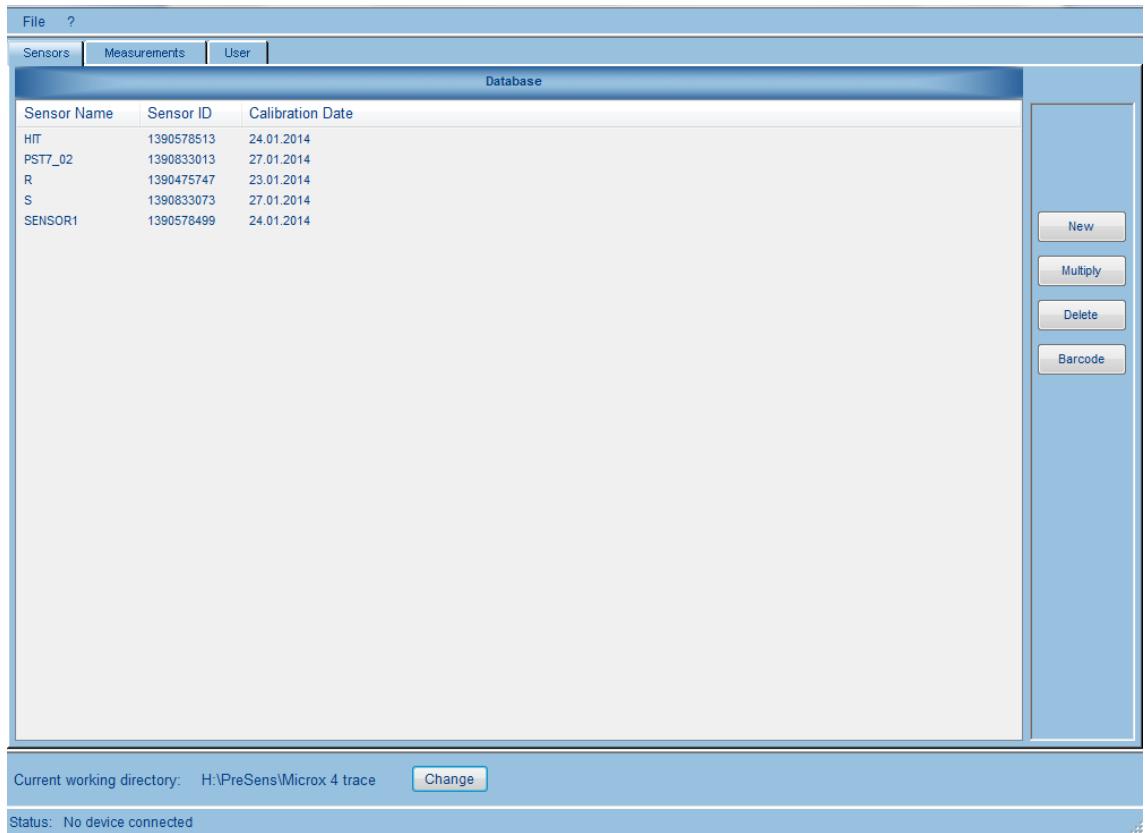


Fig. 71 PreSens Datamanager screen without device connected

Go to **File** (in the menu bar) and choose **Exit** to close the PreSens Datamanager software.

5.7.1 Sensor Data Management

In the **Sensors** menu new sensors can be added and multiplied, existing sensors deleted, sensor data transferred between PC / notebook and device, and a barcode for a specific sensor can be generated (see Fig. 77).

Add a new Sensor:

Click the **New** button to add a new sensor. The **Add Sensor** dialog opens (see Fig. 72).

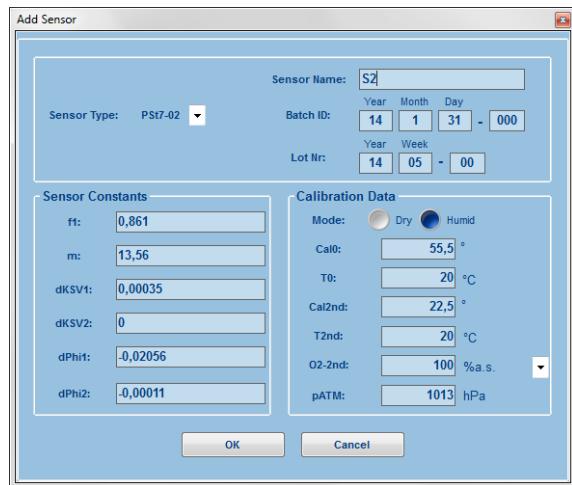


Fig. 72 Add Sensor dialog

Select the **Sensor Type**, and choose a **Sensor name**. Then enter the **Batch ID** and **Lot Nr** (see Fig. 73), as well as the **Sensor Constants** and **Calibration data** for the respective sensor. You can find this information on the Final Inspection Protocol delivered with your sensor.

! Please make sure the value of O2-2nd is entered in the right oxygen unit. To change the oxygen unit, click the arrow next to the O2-2nd input field and choose the desired unit from the drop down menu.

Press the **OK** button to add the new sensor. To exit the **Add Sensor** dialog without creating a new sensor press **Cancel**.

The new sensor will show in the **Database** box; select the sensor and use the button to transfer sensor data to the Microx 4 / Microx 4 trace.

Final Inspection Protocol	
Batch ID	Planar Oxygen-Sensitive Spot
Type of sensor	SP-PST7-10-NAU-D5-YOP
Ordering code	200001522
Article number	140131-000
Serial /Batch number	PSt7 1405-00
Date	01 April 2014
Reference device	SAAG0000000005

Fig. 73 Final Inspection Protocol: Batch ID and Lot Nr

Multiply:

This function eases adding multiple sensors from the same batch to the sensor list. This way sensor constants and calibration data have to be transferred only once for all the sensors from the same batch. Select a sensor from the sensor list and press the **Multiply** button. In the dialog that opens the **Quantity** can be selected.

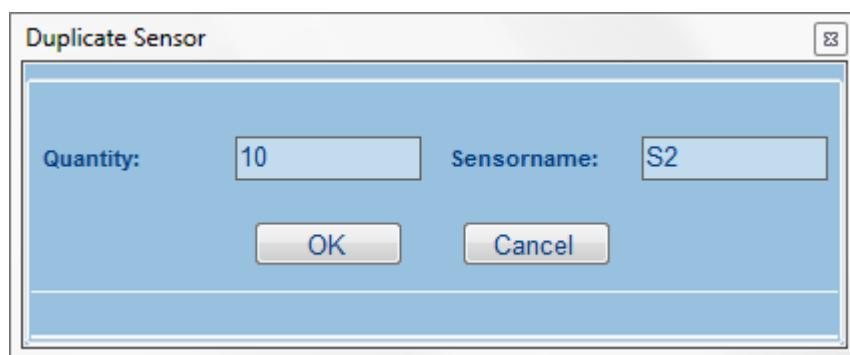


Fig. 74 Duplicate the sensor

The selected number of sensors will be created, all with a unique **Sensor ID** and calibration data according to the selected sensor. The new sensors will be named after the selected sensor and numbered continuously. You are able to edit the **Sensor Name** for each of the newly created sensors (see Fig. 75).

A screenshot of the same "Duplicate Sensor" dialog box, but now it shows a table of ten newly created sensors. The table has two columns: "Sensor ID" and "Sensor Name".

Sensor ID	Sensor Name
105352699	S2001
702155107	S2002
147268303	S2003
112131114	S2004
189183907	S2005
514883353	S2006
163511462	S2007
934039390	S2008
582667499	S2009
135319542	S2010

Fig. 75 Here ten new sensors have been created

After you have created a number of sensors of the same batch you can transfer the sensor data to the device using the button.

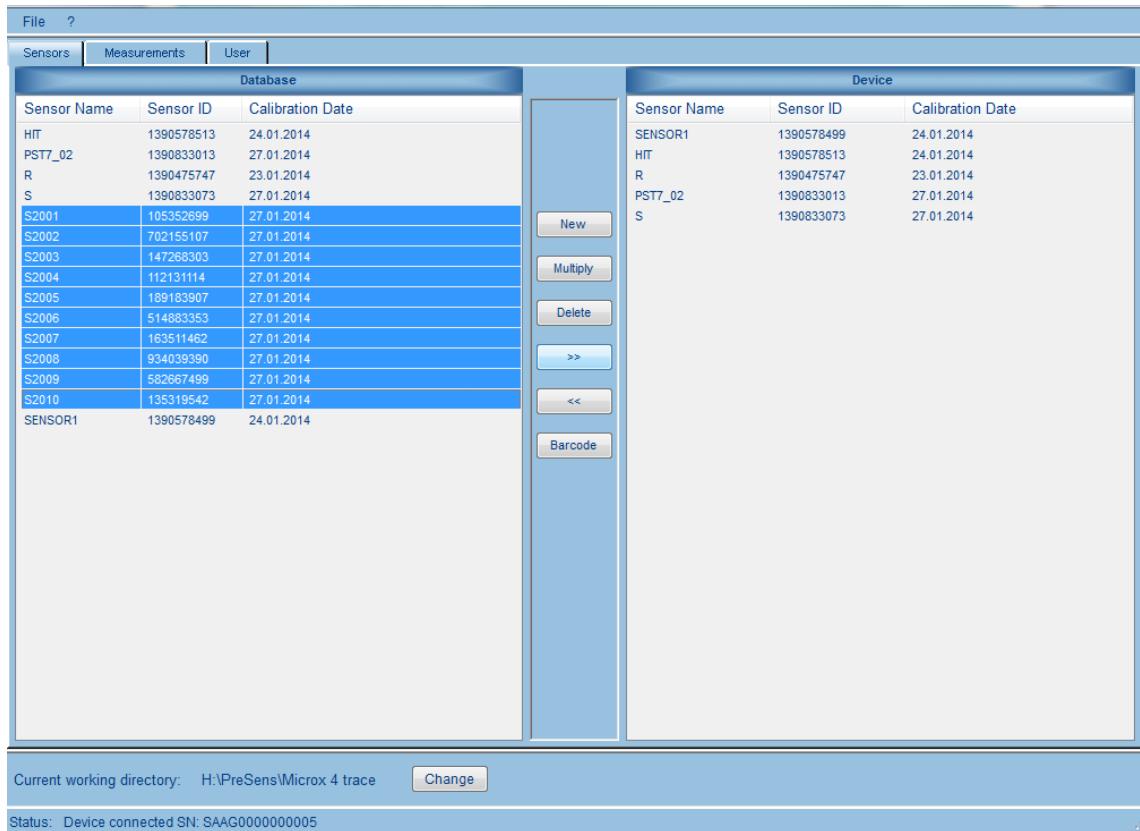


Fig. 76 Transferring newly created sensors to the Device

Delete sensor data:

Click on the respective sensor you want deleted so it is highlighted. You can select a sensor from the **Database** or the **Device**. Then press the **Delete** button. A window appears asking if you really want to delete this sensor data. Click **Yes** and the sensor data will be deleted.

Generate a barcode:

The software allows generating a barcode for any sensor stored on the PC / notebook. Select the respective sensor in the **Database** box and press the **Barcode** button. A window opens showing the generated barcode (see Fig. 77). You can either **Save** the barcode (in .png, .bmp, .jpg, or .pdf format) or press **Close** to exit the **QR Code** window without further actions.

- ! Please make sure the printer resolution is set to at least 600 dpi when printing the barcodes.



Fig. 77 QR Code window

You can also select multiple sensors and press the **Barcode** button to create several barcodes at once.



Fig. 78 Multiple barcodes generated

When saving the generated barcodes in image file format (.png, .jpg, .bmp) each newly generated barcode is stored as an individual file (here, e. g. 11 image files would be created). Saving the generated barcodes in .pdf format, all barcodes will be stored in one single file and can be printed together (see Fig. 79).

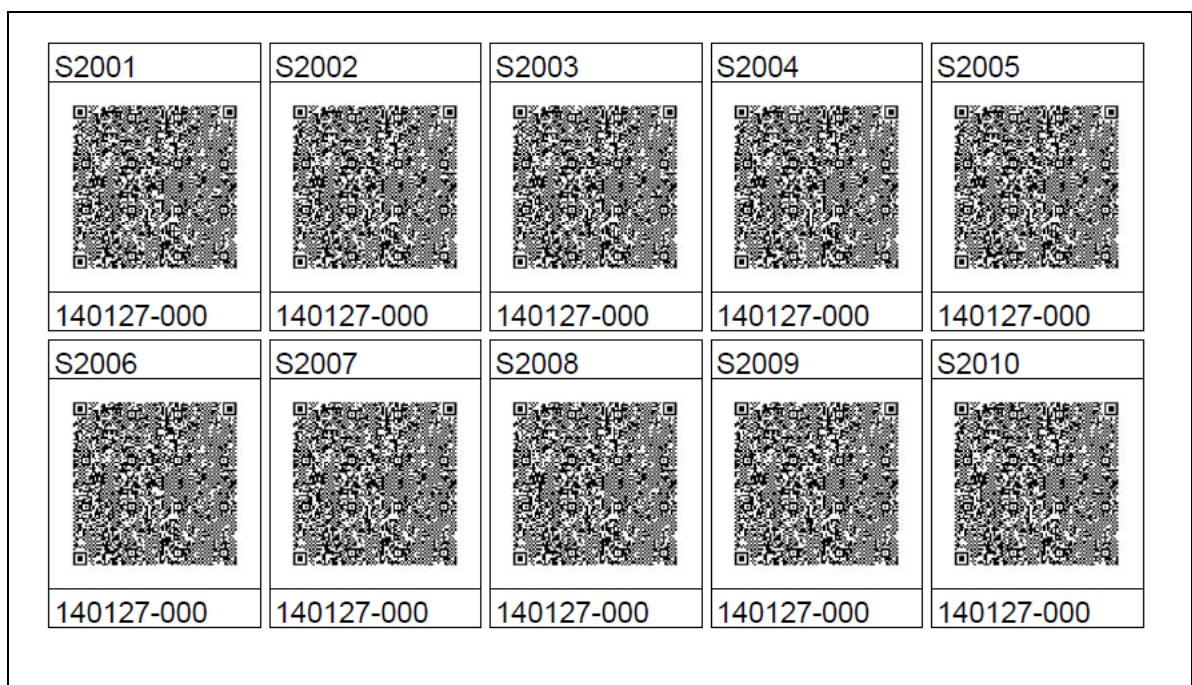


Fig. 79 .pdf file of multiple barcodes

5.7.2 Measurement Data Management

In the **Measurements** menu you are able to delete or export measurement files or to transfer the files from the device to your PC / notebook.

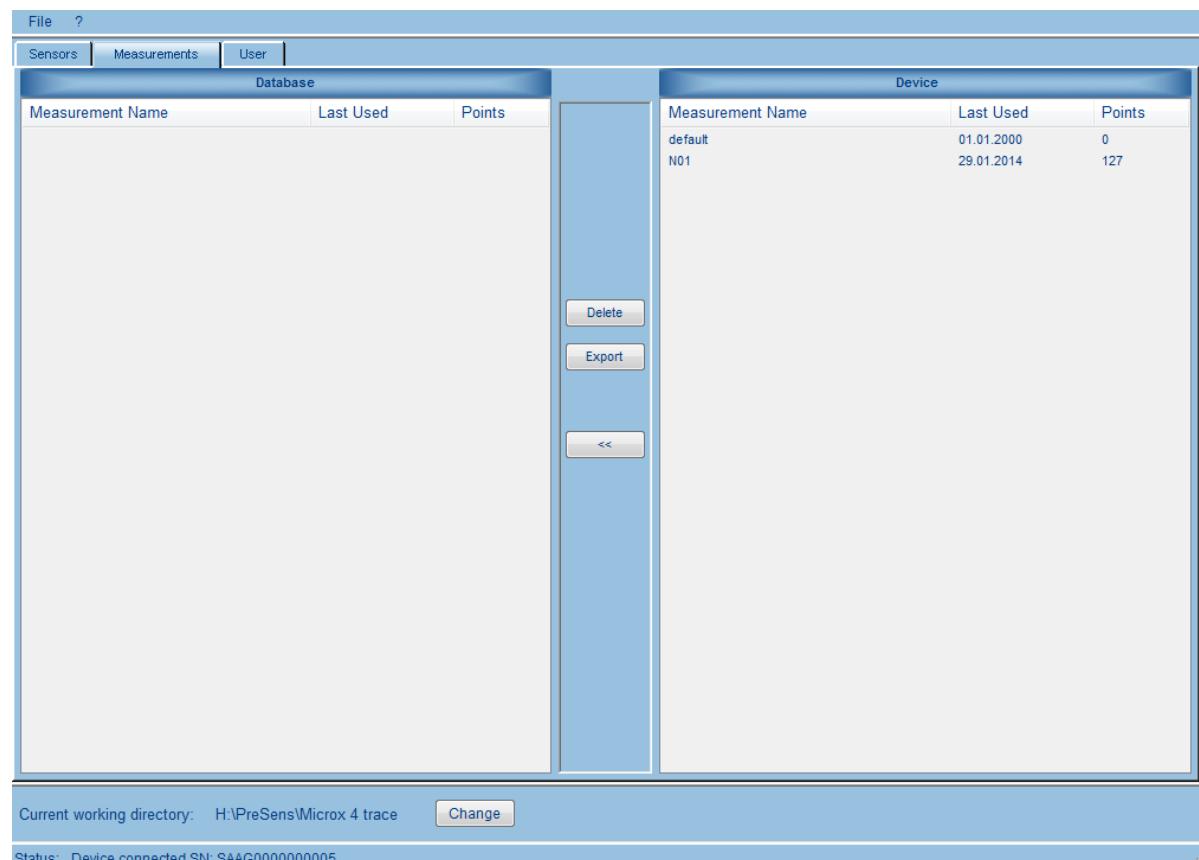


Fig. 80 PreSens Datamanager: Measurements tab

Select the respective measurement file in the **Device** box and click the button to transfer the measurement file to your PC / notebook. Transferring larger measurement files will take some time. The PreSens Datamanager will show a progress bar. You can stop data transfer by pressing the **Cancel** button in the **Processing** window; no measurement data from the selected file will be stored on your PC / notebook then.



Fig. 81 Progress bar: Transferring measurement data

Delete a measurement file:

Click on the respective measurement file you want deleted so it is highlighted. You can select a measurement file from the **Database** or the **Device**. Then press the **Delete** button. A window appears asking if you really want to delete this measurement file. Click **Yes** and the measurement file will be deleted.

Export a measurement file:

Click on the respective measurement file you want to export so it is highlighted. You can select a measurement file from the **Database** or the **Device**. Then press the **Export** button. A dialog opens in which you can choose the directory to save the measurement file in. The measurement file will be saved as .csv file. A window appears informing you when the data export is finished. Now you can open the .csv file with e. g. Excel for further processing and data analysis.

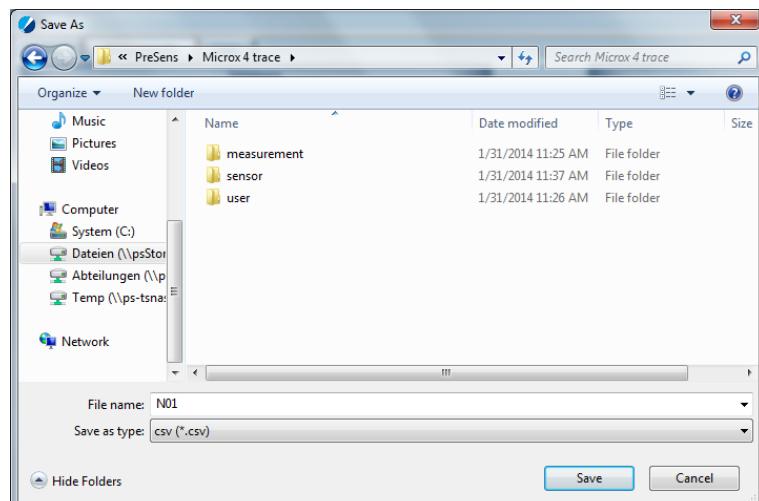


Fig. 82 Exporting a measurement file to the desired directory.

5.7.3 User Management

In the **User** menu you are able to add a new user or delete an existing user and transfer user data between PC / notebook and the device.

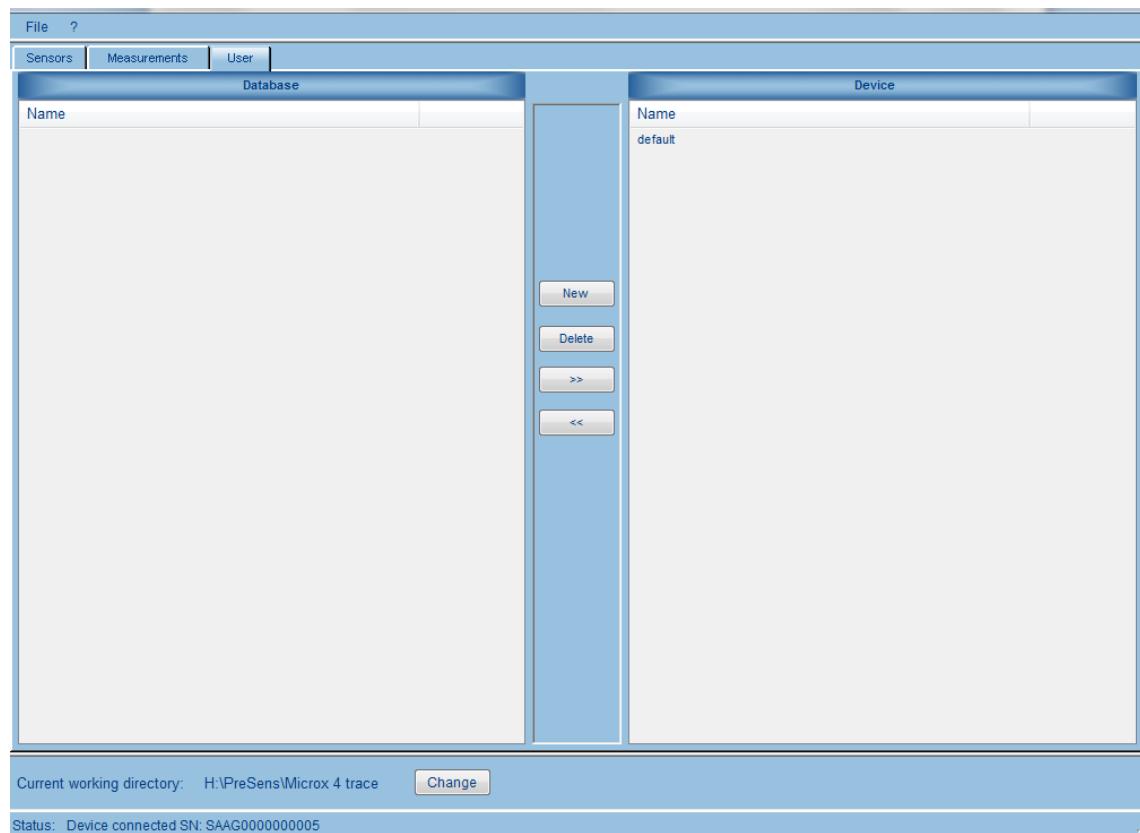


Fig. 83 PreSens Datamanager: User tab

Add a new user:

Click the **New** button to add a new user. This will open a dialog in which you can enter the new **User Name**. Click **OK** to create the new user or **Cancel** to close the window without making changes. The new user will be created on your PC / notebook and appear in the **Database** box; select the user and click the **>>** button to transfer user data to the Microx 4 / Microx 4 trace.

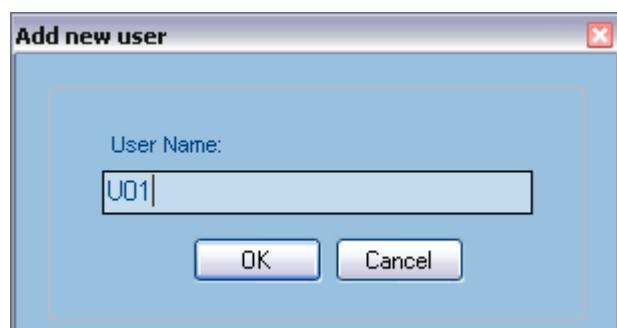


Fig. 84 Add new user window

5.7.4 Change the Working Directory

At the bottom of the software screen the **Current working directory** is shown, in which all the data transferred from the Microx 4 / Microx 4 trace is going to be saved on your PC / notebook. Click on the **Change** button next to it and choose another directory for data storage in the file browser window that opens. You can go to **File** (in the menu bar on top of the software screen) and select **Working Directory** to perform the same action.



Fig. 85 Changing the working directory in the PreSens Datamanager

5.8 Error Notification & Troubleshooting

Error Notification	Error	Troubleshooting
No Sensor detected!	Amplitude < 1000	Check sensor connection or POF for any irregularities.
Signal too low !	Amplitude < 3000	Check sensor connection or POF for any irregularities.
Signal Overflow !		Reduce LED Intensity in the Device Settings menu.
Photo Diode Saturated		Reduce ambient light in the sensor's surroundings, or reduce LED Intensity in the Device Settings menu.
Critical Error C-16 !	Reference signal exceeds specified range.	Contact our service team!
No Pt100 !	Pt100 signal is incorrect or too low.	Check temperature sensor connection.
Critical Error C-256!	Temperature module calculations defective.	Contact our service team!
Critical Error C-512!	Phase detection defective.	Contact our service team!
Critical Error C-1024!	Pressure sensor defective.	Contact our service team!
SD Card Error!	SD card cannot be read or it cannot be written on.	Contact our service team!
Barcode format not known C-8	Barcode scanned, but it is incorrect or of unknown format	Generate a new sensor barcode with the PreSens Datamanager software, print it (see chapter 5.7.1), and repeat the scan.
Barcode Reader not ready. Battery too low!	Barcode reader cannot be operated; there is not enough power left.	Recharge the Microx 4 & Microx 4 trace batteries.
No Barcode recognized! C-2	No barcode could be recognized or scanned.	Check, if the barcode reader is aimed properly at the sensor barcode.
Flash Error!	Writing on Flash not successful.	Contact our service team!

5.9 Device Menu Structure

Main			
Measurement	→ Simple	→ Oxygen → Temperature	
	→ Details	→ Oxygen (+ phase angle, amplitude) → Temperature → Measurement Name → General (measurement settings)	
	→ Graph		
Meas. Settings	→ Temperature	→ Auto → Manual	
	→ Pressure	→ Auto → Manual	
	→ Mode	→ Dry → Humid	
	→ Interval	→ Single Scan → Interval	
	→ Logging	→ On → Off → Measurement Browser	→ Select → Delete → New
	→ Salinity	(displayed when in Humid mode)	
Device Settings	→ Device Settings	→ Time → Date → Backlight off after... → LED Intensity	
	→ Energy Management	→ Turn device off after... → Long Term Measurement → Display Brightness	
	→ Sensor	all sensor data	
	→ About	Serial Number, LED Status, Firmware Version	
User	→ User list	→ Select → Delete → New	
Sensors	→ Sensor list	→ Select → Edit List	→ Delete Sensor
			→ New Sensor → Barcode → Manual
			→ Sensor Settings → Sensor Type → Calibration Data → Sensor Constants → Dry / Humid → Cal0 → T0 → Cal2nd → T2nd → O2-2nd → pATM
			→ Sensor Name
	→ New	→ Barcode	
		→ Manual	→ Calibration Settings → Calibration Type → Pressure → Dry → Calibration Temp. → Humid → T0 → Auto → T2nd → Manual
			→ Calibration → Present Values → T0 → Auto → T2nd → Manual → Set Cal0 → Set Cal2nd Phase Temperature → Set Cal2nd Pressure
			O2-2nd

6 Technical Data

6.1 Specifications

OPTICAL SENSOR	Microx 4	Microx 4 trace
Oxygen sensor	PSt7-10, PSt7-02	PSt7-10, PSt7-02, PSt8-10, PSt8-02
Optical connector	ST compatible, 200 µm – 1 mm PMMA Fiber	
Channels	1	
LED peak wavelength	633 nm	

TEMPERATURE SENSOR		
Potentiometric temperature sensor (PT 100)	Range	0 – 50 °C
	Resolution	± 0.1 °C

PRESSURE SENSOR		
Range	10 – 1200 mbar	
ADC	24 bit	
Resolution (Oversampling Ratio: 256 / 512 / 1024 / 2048 / 4096)	0.13 / 0.084 / 0.054 / 0.036 / 0.024 mbar	
Accuracy (25 °C, 750 mbar)	-1.5 – 1.5 mbar	

BARCODE READER / LASER		
Wavelength	655 ± 10 nm	
Pulse duration	t = 10 sec.	
Power	< 1 W	

POWER SUPPLY

4 AA Nickel-metal hydride cells (min. 2200 mAh)

Use only AC adapter (5 VDC / min. 1 A) supplied for recharging.

Supply voltage 5 VDC

Current / Power max. 900 mA / max. 4.5 W

DIGITAL INTERFACE

USB interface cable to PC Cable included

INTERNAL MEMORY

4 GB memory (~ 10.000.000 data sets)

Export via included software.

ENVIRONMENTAL CONDITIONS

Operating temperature 0 °C to 50 °C

Storage temperature 0 °C to 50 °C

Transport temperature - 20 °C to 70 °C

Relative humidity 0 % to 80 % (non-condensing)

DISPLAY

Color display at the front panel 3,5 " color TFT, 320 x 240 Pixel

DIMENSIONS / WEIGHT

H x L x W About 37 mm x 180 mm x 119 mm

Weight (w/o batteries & protection kit) 650 g
(w/ batteries & protection kit) 780 g

7 Operational Notes

6.1 Optical Output

The ST connector is a high precision optical component. Please keep it clean and dry. Always use the rubber cap to close the output when not in use.

6.2 USB-Power Adapter

Microx 4 & Microx 4 trace always have to be used with the original USB-power adapter (5 VDC, min. 1 A) which is supplied.

6.3 Rechargeable Batteries

6.3.1 Changing the Batteries

When the operating time becomes short, even after the batteries are recharged, please replace the batteries. With normal usage, your batteries should last about one year. The integrated batteries can be replaced by commercially available, **rechargeable Ni-MH** AA batteries.

- ! Do not use non-rechargeable AA batteries with the transmitter! This will damage the device.
- ! Make sure the device is turned off and not connected to any power source via USB.
- ! The information stored in the device's memory will only be retained for 30 minutes after the battery pack is removed. This includes date, time, last measurement parameter, sensor and user data. You will want to replace the batteries as quickly as possible in order to avoid losing your last settings.

Open the battery compartment on the bottom panel using a screw driver or other tool that fits in the notch.



Fig. 86 Open battery compartment and battery pack;



remove the battery connector.

Take out the battery pack as far as the connection wires allow; then remove the battery connector. Now you are able to remove the battery pack. You can exchange the 4 AA rechargeable batteries. Make sure to position the batteries the right way in the holder.



Fig. 87 Battery pack;



push the connection wires down when putting the battery holder back in the battery compartment.

When you are done, put the battery pack back in the battery compartment and connect it to the battery connector again. Make sure the connector is attached correctly to the battery pack. Push the wires down so they will not be caught in the thread when putting the screw cap back on. Tighten the screw cap and make sure the sealing ring fits properly to avoid moisture entering the battery compartment.

Recycling Nickel-Metal Hydride batteries:

Ni-MH batteries must be disposed of properly. Please take your used Ni-MH batteries to a store that recycles this type of batteries.

6.3.2 Safety Instructions

Caution:

- ! To avoid the risk of personal injury or property damage from fire or electrical shock, only use the specified batteries.
- ! Do not remove the batteries from the device to charge them. Use the AC power adapter (5 VDC, min. 1 A) received with your transmitter.
- ! Never throw the batteries into a fire, disassemble them, or heat them.
- ! Do not remove or damage the battery casing.
- ! Do not short-circuit the batteries.
- ! When the charging terminals become dirty wipe them with a dry cloth or a pencil eraser, if necessary.

6.4 Barcode Reader

6.4.1 Specifications

BARCODE READER / LASER

Wavelength	655 ± 10 nm
Pulse duration	t = 10 sec.
Power	< 1 W

6.4.2 Safety Instructions

- ! The integrated Class II laser of the barcode reader has sufficient power output to cause damage to your eyes if you look into the beam continuously. Do not stare into the laser beam directly.



6.5 Pt100 Configuration

For using the Microx 4 / Microx 4 trace with another temperature sensor than the one that can be provided by PreSens, a fitting connector has to be attached to the desired temperature sensor. The tables below list recommended connector configurations.

Collet Chuck System

Min. Outer Cable Diameter in mm	Max. Outer Cable Diameter in mm	Connector Key for Silicon Bend Relief
> 3.0	4.2	S20L0C-P05MFG0-420S
> 4.0	5.2	S20L0C-P05MFG0-520S

Silicon Bend Relief (black)

Min. Outer Cable Diameter in mm	Max. Outer Cable Diameter in mm	Key
> 3.0	3.5	702 023 208 965 030
> 3.5	4.0	703 023 208 965 035
> 4.0	4.5	704 023 208 965 040
> 4.5	5.0	704 023 208 965 045

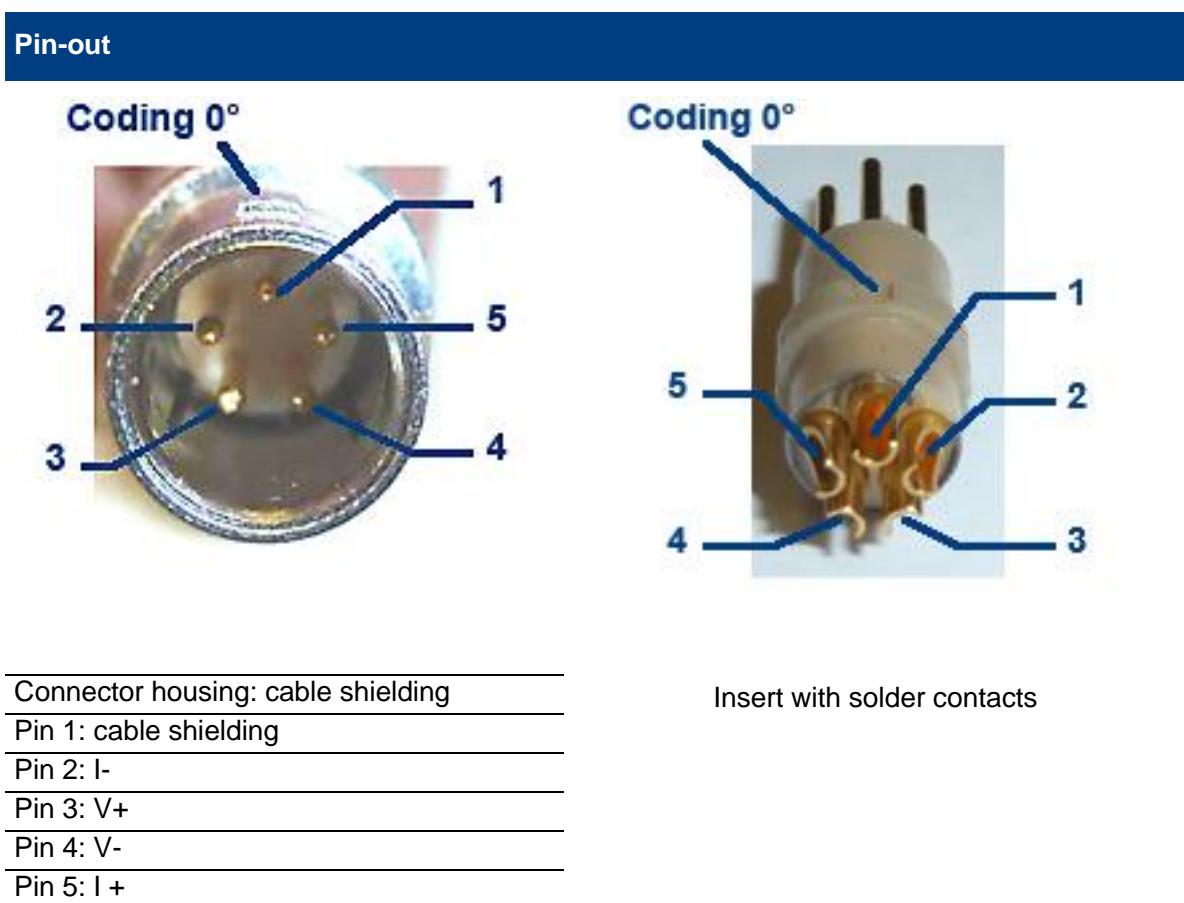


Fig. 88 All connector parts

Prepare your temperature sensor and all connector parts:

1. Put the bend relief, clamping nut, and collet chuck over the cable of your temperature sensor.



Fig. 89

2. Strip the wire; preferably tin the strands.



Fig. 90

3. Solder the wires to the insert contacts according to pin-out.



Fig. 91

4. Form part of the shielding into a strand and tin it, then solder it to the insert contact according to pin-out.

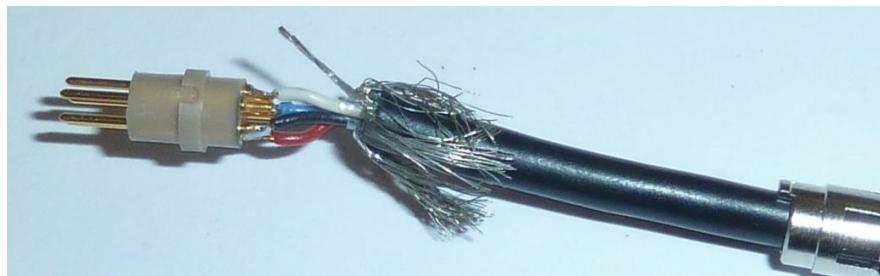


Fig. 92

5. Attach the half-shells to the insert.

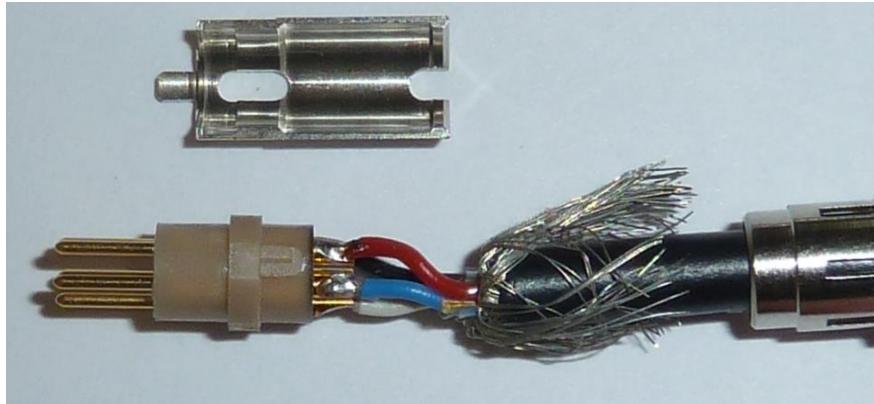


Fig. 93



Fig. 94

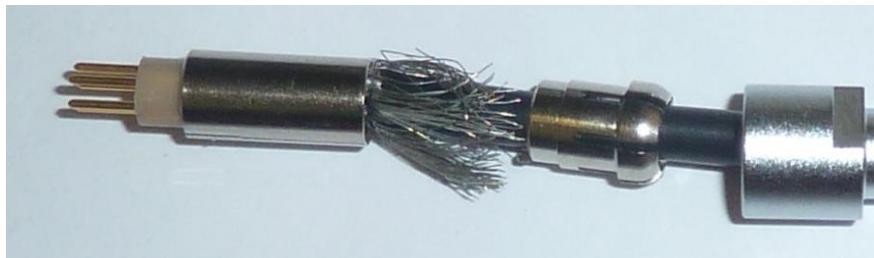


Fig. 95

6. Cut the shielding and push the collet chuck toward the half-shells, so the shielding is entrapped between half-shells and collet chuck.



Fig. 96

7. Push the connected cable along the guide rail into the housing.

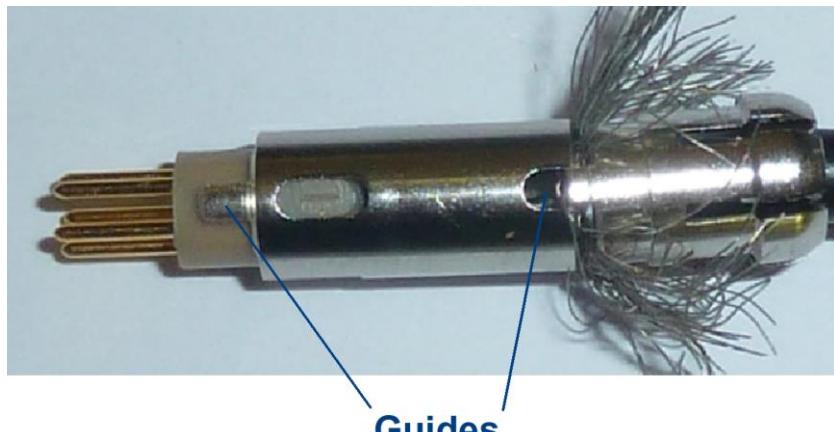


Fig. 97

8. Now screw the clamping nut to the housing. Use a fitting open-end wrench to hold the housing (at SW-8; fitting open-end wrenches can be obtained at ODU: SW-8mm ordering number 598.700.001.000, SW-7mm ordering number 598.700.001.011.000, status 07/2013).

! Please note the max. turning moment is 60 Ncm.



Fig. 98

9. Push the bend relief over the clamping nut and you have finished attaching the connector to your temperature sensor. Now it can be used with the Microx 4 / Microx 4 trace.



Fig. 99

6.6 Maintenance

The transmitter is maintenance-free.

The housing should be cleaned with a cloth only. Avoid any moisture entering the housing.
Never use benzine, acetone, alcohol or any other organic solvents.

The ST fiber connector of the sensor can be cleaned with lint-free cloth or a cleaning implement for ST connectors only.

6.7 Service

Alignment, rework or repair work may only be carried out by the manufacturer:

**PreSens
Precision Sensing GmbH**

Am BioPark 11
93053 Regensburg
Germany

Phone +49 941 94272100
Fax +49 941 94272111

info@PreSens.de
www.PreSens.de

Please contact our service team in case of any question. We look forward to helping you and are open for any proposition or criticism.

8 CE and FCC Conformity

CE Conformity

The equipment is confirmed to comply with the requirements set out in the Council Directive relating to Electromagnetic Compatibility (2004/108/EEC) and for Low Voltage (2006/95/EEC). For the evaluation of above mentioned Council Directives following harmonized standards were consulted:

EMC: EN 61326-1: 2006

LVD: EN 61010-1: 2010

Verification of FCC Rules

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

9 Concluding Remarks

Dear Customer,

With this manual, we hope to provide you with an introduction to work with the Microx 4 / Microx 4 trace fiber optic oxygen transmitter.

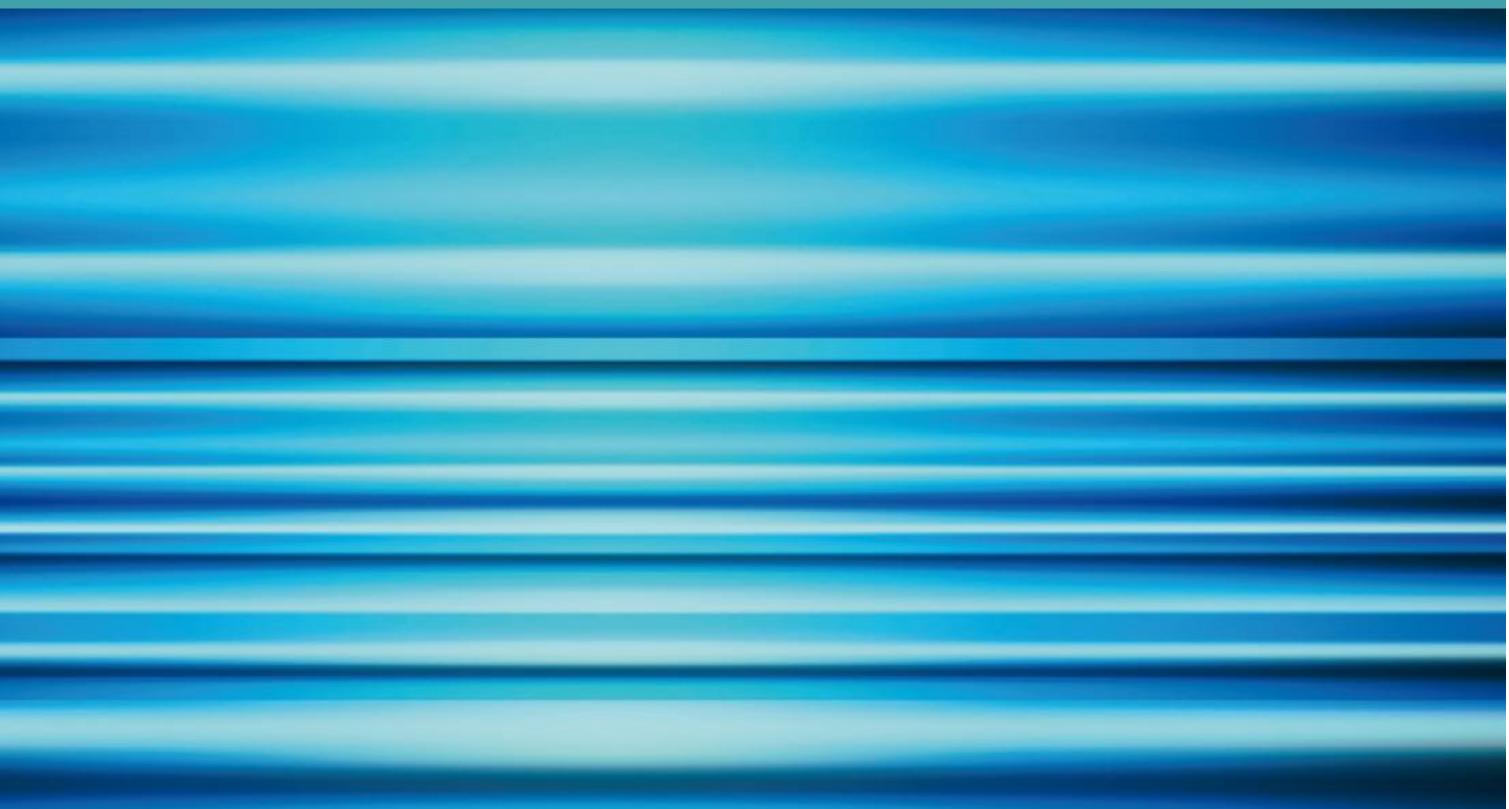
This manual does not claim to be complete. We are endeavored to improve and supplement this version.

We are looking forward to your critical review and to any suggestions you may have.

You can find the latest version at www.PreSens.de.

With best regards,

Your PreSens Team



Manufacturer

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