PreSens Measurement Studio 2 for O_2

SOFTWARE

Instruction Manual

PreSens
PRECISION SENSING

PreSens Measurement Studio 2 Software

Specification:

Software for PreSens measurement systems

Version 2.1.0

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Specifications may change without prior notice.

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Table of Contents

1 Preface

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

PreSens measurement devices are developed especially for small fiber optic oxygen sensors, 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 these 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.

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 minisensors, 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 ITEM. WHEN DISREGARDING THESE INSTRUCTIONS THE SAFETY OF THE DEVICE CAN BE IMPAIRED.

2 Description of the PreSens Measurement Studio 2 Software

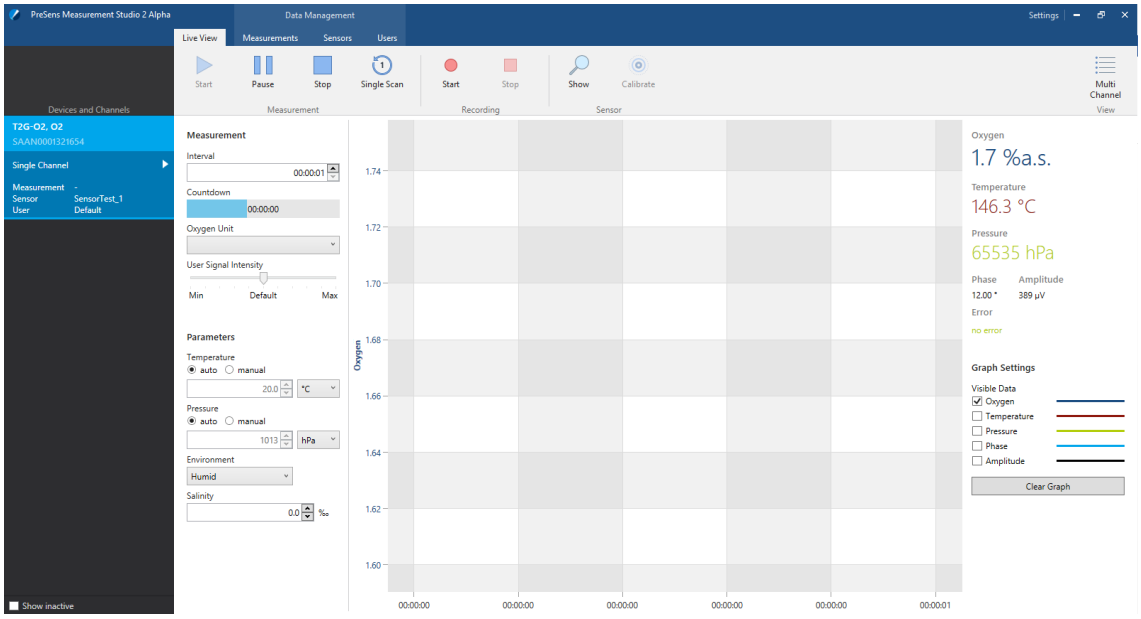


Fig. 1 PreSens Measurement Studio 2 software: Live View.

The PreSens Measurement Studio 2 has been developed and designed to control several PreSens devices connected to a PC with one software. It enables data transfer between device and PC. Easy data management for sensors, measurement files, and users as well as export of files into .csv and .xls format can be realized with just a few clicks. The intuitive measurement control eases performing precise oxygen & pH measurements with a multitude of devices simultaneously. This instruction manual describes in detail how the software is used for control of our PreSens oxygen meters.

2.1 System Requirements

	Minimum System Requirements	Suggested Configuration
Operating system	Microsoft® Windows® 7 **SP1**, 8 or 10 (32 or 64 Bit)	Microsoft® Windows® 10 (64 Bit)
Processor	2.4 GHz Single Core Processor (one device) 2.4 GHz Multi Core Processor (up to 10 devices)	3 GHz Multi Core Processor
RAM	2 GB	4 GB or more
Memory capacity for graphic board	10 GB free memory	40 GB or more free memory
USB	USB 2.0	USB 2.0
Screen resolution	1200 x 800	1920 x 1080 (Full HD) or higher
.NET Framework	.Net Framework 4.6	.Net Framework 4.6

2.2 Supported PreSens Oxygen Devices

- OXY-1 SMA / ST Single Channel
- OXY-2 / -3 / -4 / -10 … SMA / ST Multichannel
- OXY-4 SMA (G3)
- EOM-FDM 2.0
- Fibox 4 (trace)
- Microx 4 (trace)

3 Installation

1. Please close all other applications as they may interfere with the software.
2. Download the software from www.presens.de/support-services/download-center/software.html or insert the supplied USB stick / CD into a USB port / respective drive of your PC. If no dialog opens automatically, use the file browser to open the file menu.
3. Start the PreSens_Measurement_Studio2_Setup.exe from the directory; it will guide you through the installation process.

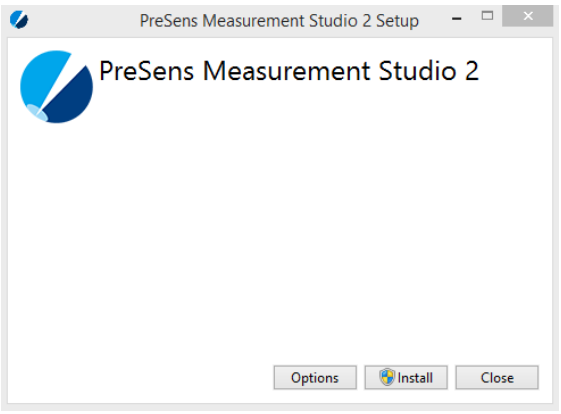


Fig. 2 PreSens Measurement Studio 2 Setup: Start installation

4. The **PreSens Measurement Studio 2 Setup** wizard opens. Under **Options** you will be able to select:
   - a destination folder
   - and shortcut preferences
5. Click **Install** to continue: The installation process will be executed; you may cancel the process and undo changes at any time by clicking **Cancel.**
6. Click **Launch** to start the software.

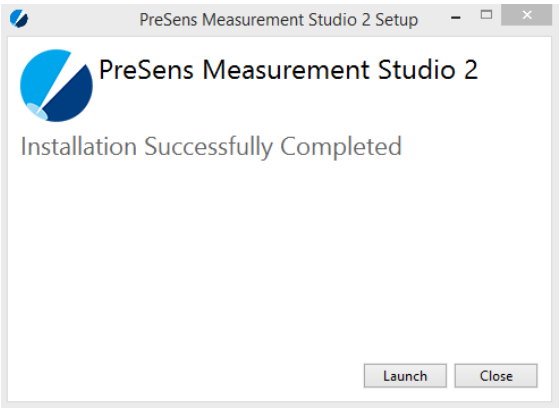


Fig. 3 Launch the software after successful installation

4 Operation

4.1 Starting the Software

1. Connect the respective PreSens O_2 meter (e. g. Fibox 4, OXY-1 SMA, OXY-4 ST …) to a USB port of your PC. It is highly recommended to **disconnect other USB devices** as they **may interfere with the stability of the system**.
   (Please refer to the meter's instruction manual for more information about connecting and handling the device.)

2. Please close all other applications as they may interfere with the software. Start the PreSens Measurement Studio 2 software.

3. After successful initialization the main screen is displayed. The connected meter(s) is shown in the **Devices and Channels** section.

! In case the software detects no devices, please check all connections.

4.2 Important Considerations for USB Handling

! PreSens recommends the use of a dedicated USB 2.0 PCI Card to connect and handle USB PreSens devices with a desktop PC.

! In order to enhance the system stability avoid the use of USB hubs and connect PreSens devices directly to USB Ports of your PC.

! If possible, disconnect all other USB devices that are not in use, as they may reduce or disturb the USB resources of your PC.

! Docking stations may also reduce or disturb the USB resources of your PC and therefore affect correct software functioning.

! It is also recommended to disable the Power Saving Settings of your USB Root controller.

4.3 Software Structure

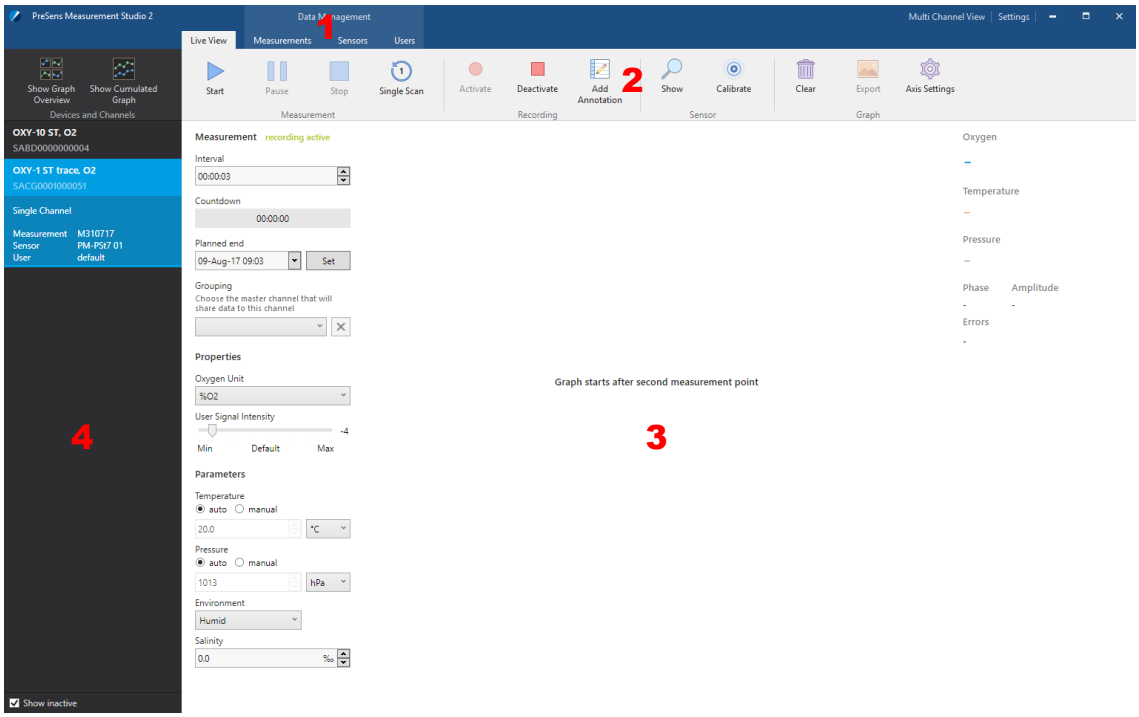


Fig. 4 Software structure; here Live View tab selected

1. **Main menu (tabs):** Each tab is accessible at any time during software operation. The tabs give access to the corresponding data and functions.
2. **Control bar:** Shows available functions that can be performed on the respective tab.
3. **Main screen:** Displays the data and information corresponding to the selected tab.
4. **Devices and Channels:** Displays the connected devices and is updated automatically with connecting and disconnecting PreSens meters.

4.4 Devices and Channels

All connected devices (see list of supported devices in chapter 2.2) and their channels are displayed in the **Devices and Channels** section.

4.4.1 Select & Display

Select a device by clicking on the device name. It will be highlighted in blue and the channel information opens. Once you select a device all other devices will be deselected and their channels collapsed automatically. This allows a better overview during the management of multiple single and multi-channel devices.

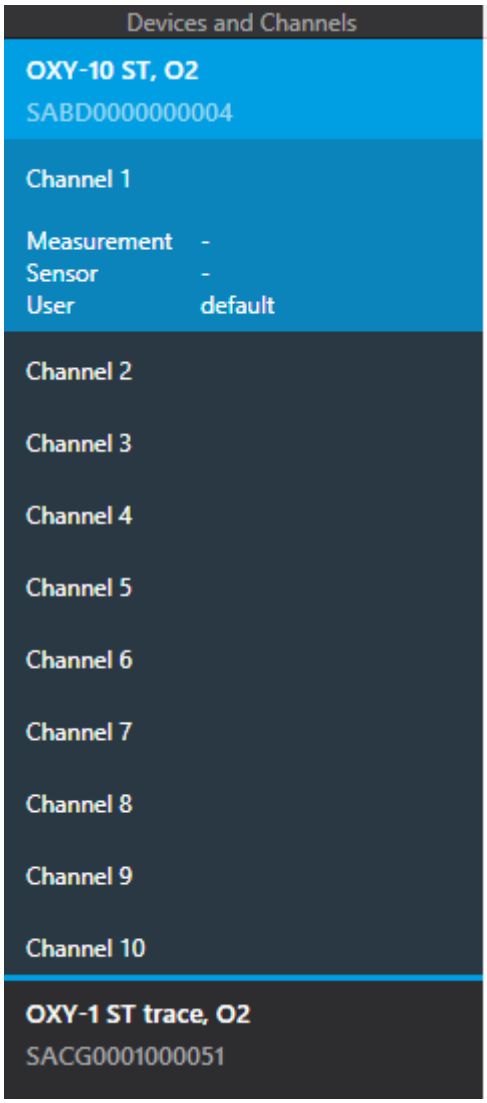


Fig. 6 OXY-10 ST is selected. All channels are displayed and Channel 1 is selected. OXY-1 ST is not selected and its channel collapsed.

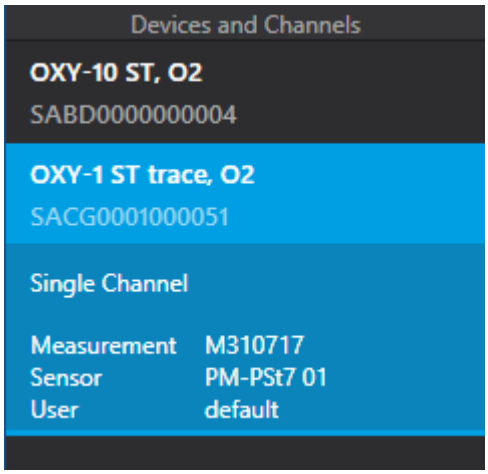


Fig. 5 OXY-1 ST trace is selected. Its single channel is displayed and selected. The OXY-10 ST is not selected and its channels collapsed.

4.4.2 Activate & Deactivate Channels

PreSens Measurement Studio 2 allows to deactivate channels of a device that is not in use, to give a better overview when working with several multi- and single-channel devices simultaneously.

Perform a right click on the respective device name select **Deactivate all channel**. The channel will be deactivated and marked as **inactive**.

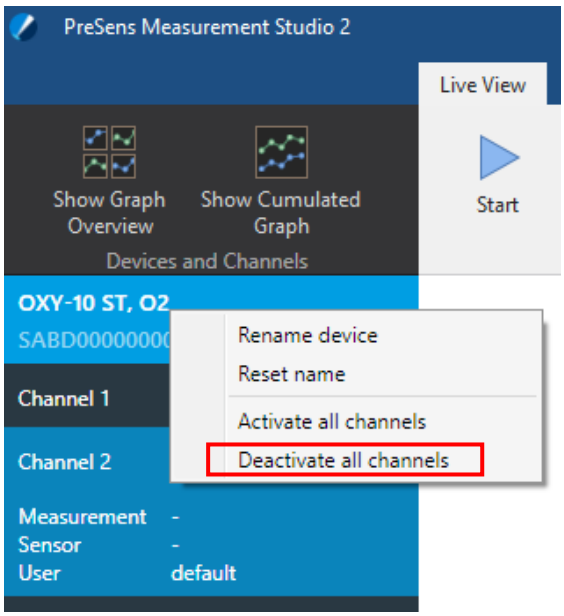


Fig. 7 Deactivating all channels of the OXY-10 ST

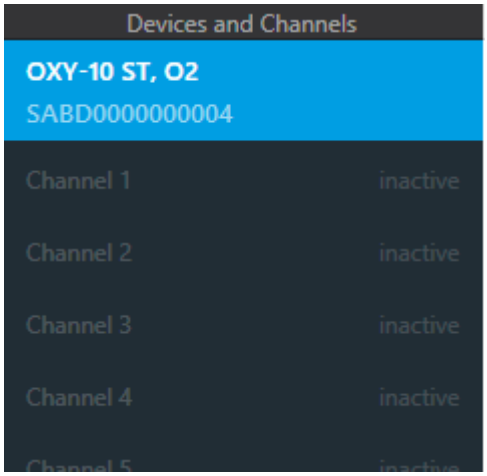


Fig. 8 Device channels marked as inactive.

In order to hide the inactive channels in the list, please deselect the checkbox **Show inactive** at the bottom of **Devices and Channels**. The device with deactivated channels will no longer appear in the list.

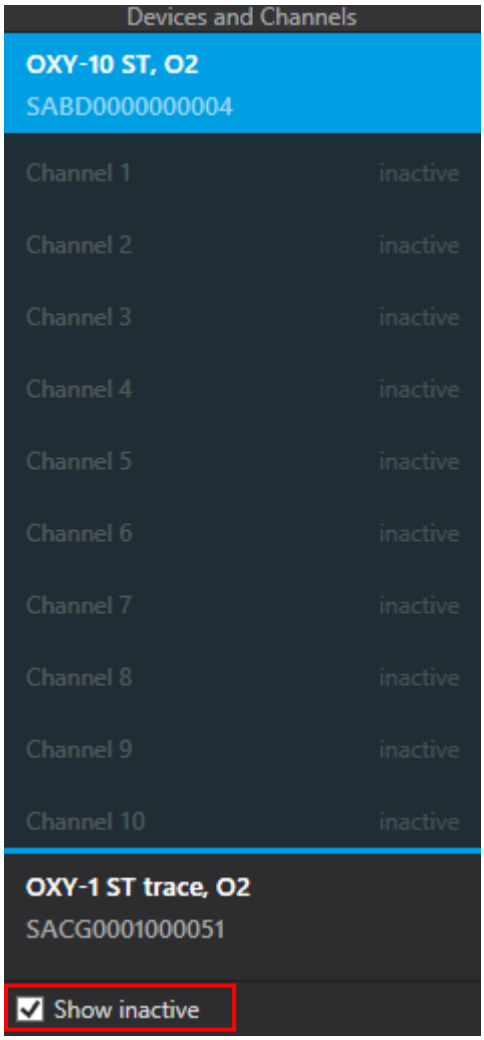


Fig. 9 Use show inactive to display / hide deactivated channels

4.5 Data Management

4.5.1 Measurements Tab

A **Measurement** is a container in which measurement points and associated data of a measurement sessions can be stored. All recorded measurement data are stored in the database - in the assigned **Measurement** - the very moment they are retrieved from the device, assuring no data is lost during experiments.

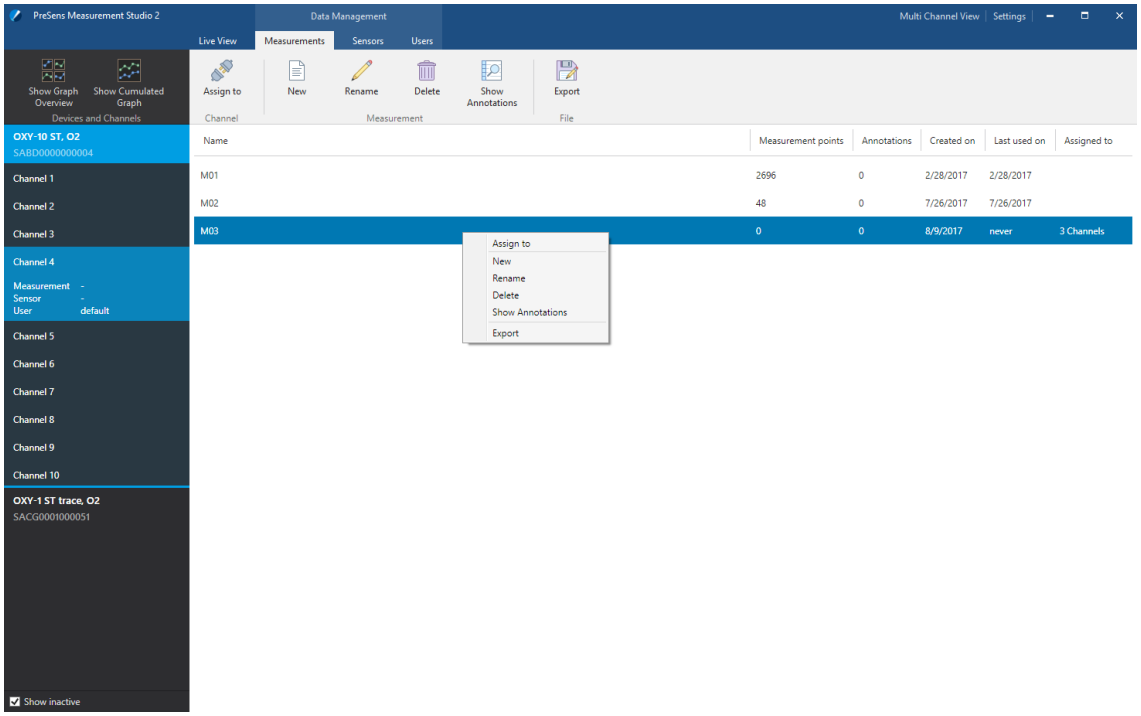


Fig. 10 Measurement Tab: Right click on a measurement opens a list of control functions

You can perform the following actions either by clicking on the corresponding icon in the control bar or by right click with the mouse:

Assign to: Assign the selected measurement to the selected channel (in the Devices and Channels section). This is required so recording of measurement points with this channel can be enabled.

New: Create a **New** measurement. Enter a measurement name and click **OK**; it will be displayed in the list.

Rename / Delete: Rename or delete the selected measurement.

Show Annotations: Open a dialog in which all annotations in the selected measurement are displayed and can be edited or filtered.

Export: Export the selected measurement(s) in .csv or .xls format. Please refer to chapters 4.10 and 5.3 for further information on export options.

4.5.2 Sensors Tab

Sensor data contains the calibration details used to calculate the measurement point values. Each sensor can be assigned to only one channel, as each channel can only read one sensor. A **Sensor** has to be assigned to a channel so a measurement can be started with this channel.

! One sensor can only be assigned to one channel at the time.

! In case a set of sensors with identical properties (from the same batch) is used, each sensor needs an individual sensor name.

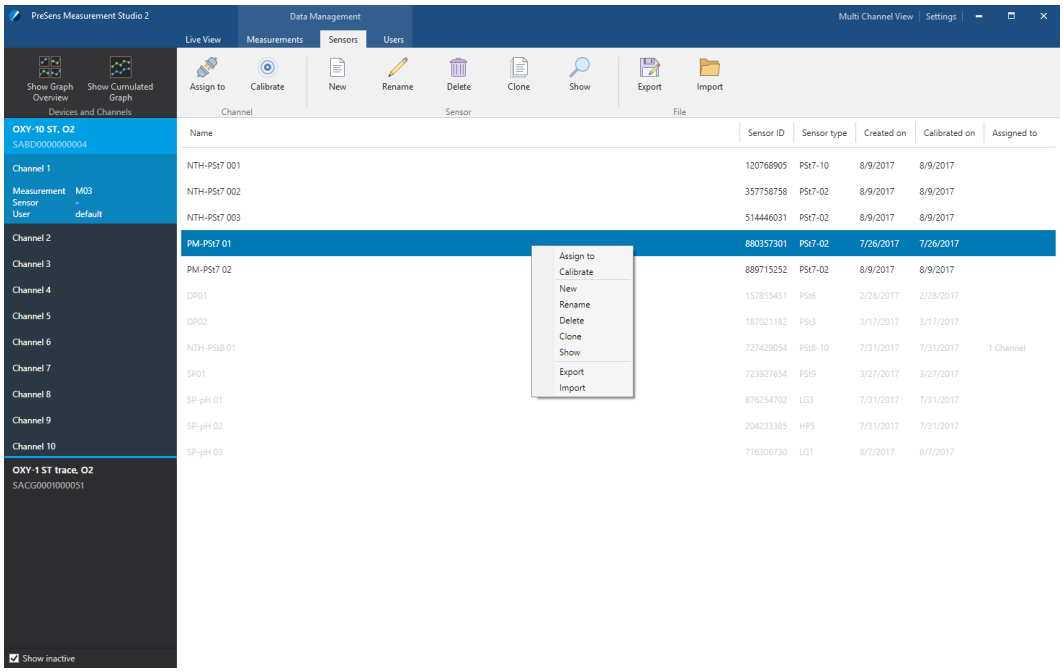


Fig. 11 Sensors Tab: Right click on a Sensor opens a list of control functions

You can perform the following actions either by clicking on the corresponding icon in the control bar or by right click with the mouse:

Assign to: Assign the selected sensor to the selected channel (in the Devices and Channels section). This is required so a measurement can be started with this channel.

Calibrate: Re-calibrate the selected sensor. Please refer to chapter 4.6.3.

New: Create a **New** sensor. This will open a dialog in which sensor data can be entered. Please refer to chapter 4.6.1.

Rename / Delete: Rename or delete the selected sensor.

Clone: This function allows you to create up to 999 copies of the selected sensor. This is useful when working with several sensors from the same batch, which all have the same calibration data, so it does not have to be entered multiple times.

Show: Open a window, in which all corresponding data of the selected sensor is displayed.

Export: Export the selected sensors data as a QR barcode.

Import: Import a new sensor (sensor data) via barcode scan (see chapter 4.6.2).

4.5.3 Users Tab

Users enables assigning recorded measurement data to different users working with the software. Else, a **Default** user is assigned to each channel automatically.

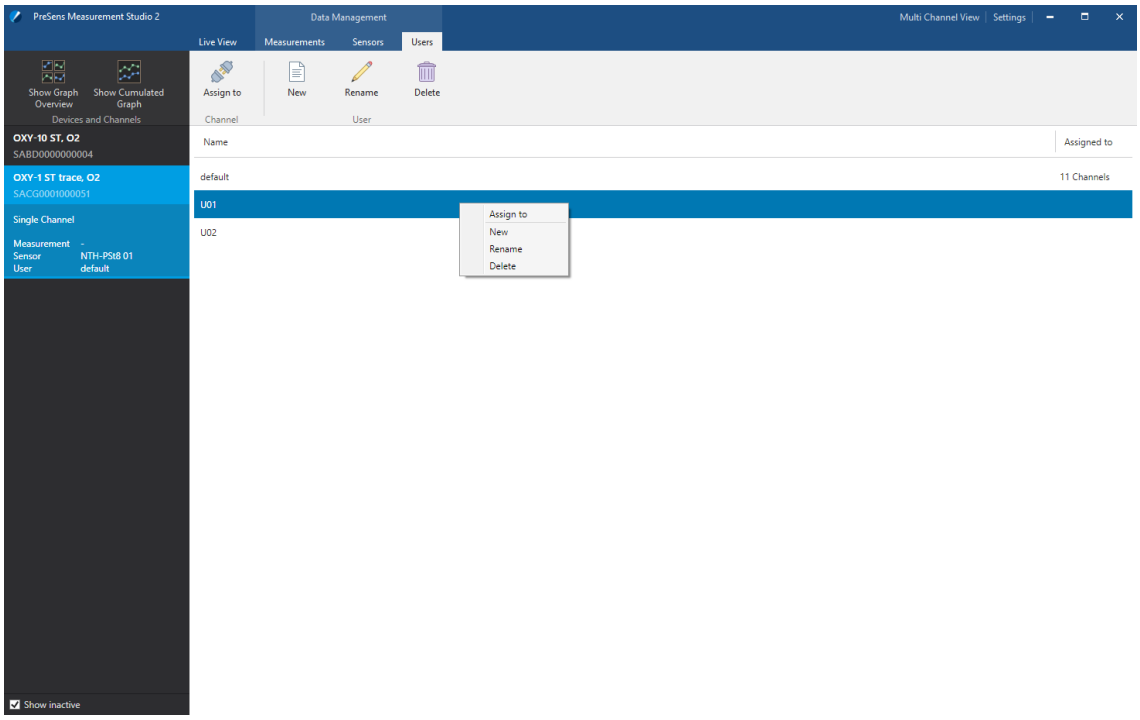


Fig. 12 Users Tab: Right click on a User opens a list of control functions

You can perform the following functions either by clicking on the corresponding icon in the control bar or by right click with the mouse:

Assign to: Assign the selected user to the selected channel (in the Devices and Channels section).

New: Create a new user. Enter a user name, click **OK** and it will show in the list. An already issued user name cannot be used to create a new user.

Rename / Delete: Rename or delete the selected user. The **Default** user cannot be deleted.

4.5.4 PreSens Devices with Internal Data Management

Some of the devices compatible with PreSens Measurement Studio have internal data management. The features described in the following chapters only apply when one of the following devices is connected and selected:

- Fibox 4
- Fibox 4 trace
- Microx 4
- Microx 4 trace

Measurement, sensor and user data are stored in the devices' internal memory for portable, computer-independent use. This data can also be handled in the PreSens Measurement Studio **Data Management** sections.

When a device with internal data management is selected the **Measurements**, **Sensors** and **Users** screens are split: the left side contains the data stored on your computer – **Local Database** – and the right side contains the data stored on the **Device** itself.

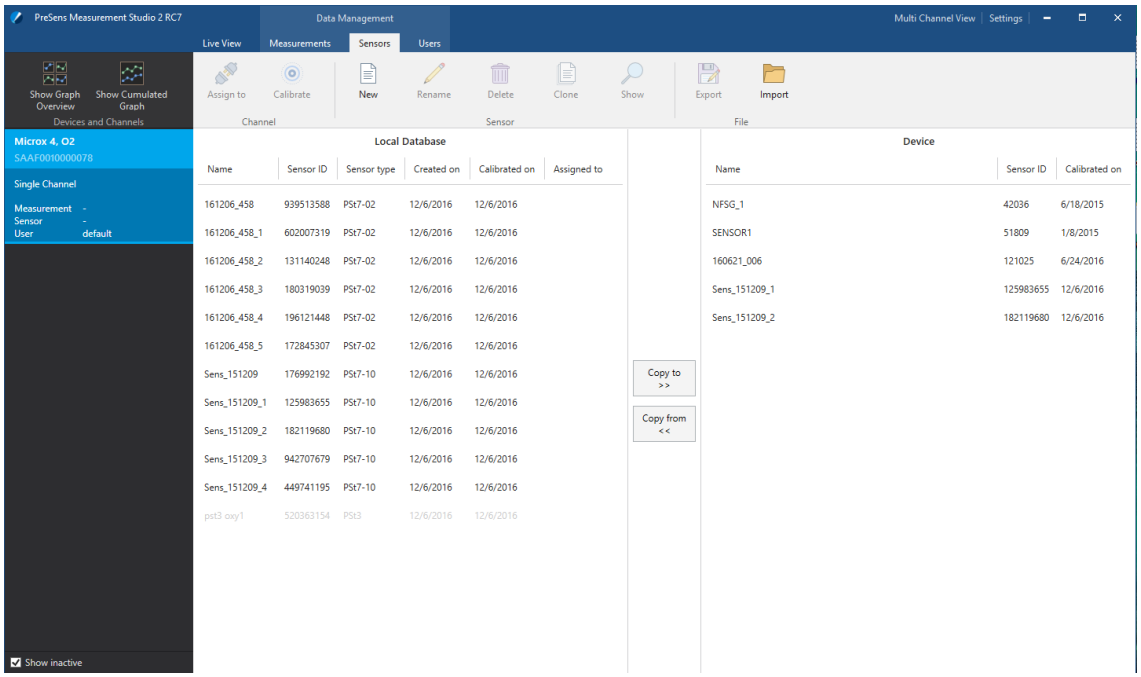


Fig. 13 Measurement management with Microx 4

In the middle of the main screen control buttons allow to **Copy to** or **Copy from** the device.

Handling Measurements from a Device

On the **Measurements** screen the measurements saved on the **Device** can be copied into the **Local Database**. This is required to assign a measurement created with the device to a channel and continue recording measurement data in that same file with the PreSens Measurement Studio software.

! A measurement can only be copied from the **Device** to the **Local Database**, but NOT vice versa.

Select the measurement(s) in the **Device** section and click on the **Copy from** button in the middle of the main screen. A progress bar is displayed. Copying larger measurement files can take a while.

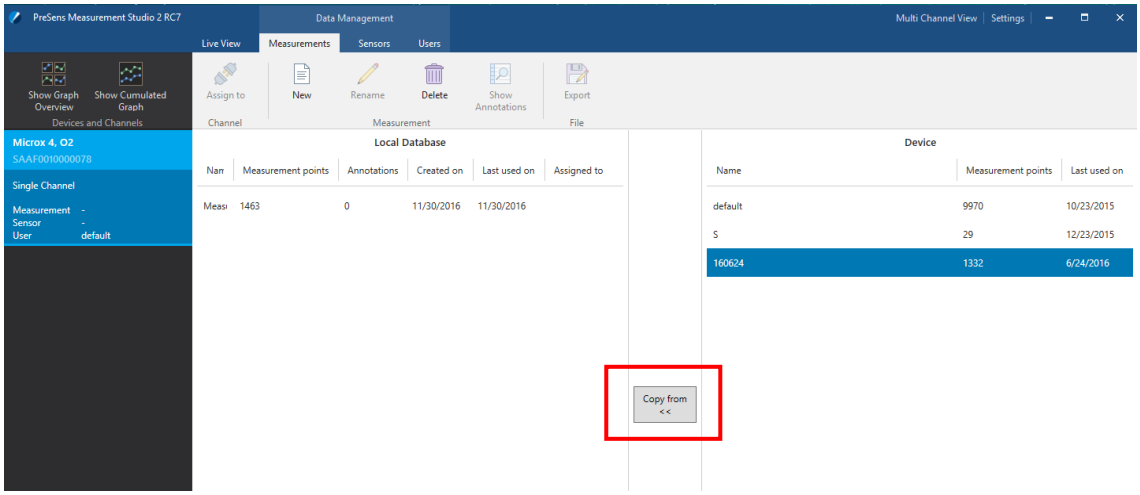


Fig. 14 Selected measurement in the Device section – click Copy from

Now an imported measurement can be assigned to a channel and measurements continued with the PreSens Measurement Studio software. New measurement data will be added to the existing file.

Handling Sensors from a Device

On the **Sensors** screen the sensor data saved on the **Device** can be copied into the **Local Database**. This is required to assign a sensor created with the device to a channel and continue measurements with the PreSens Measurement Studio software with this calibrated sensor. A sensor created locally with the software can also be copied to the Device to use this sensor out in the field.

! A sensor can be copied from the **Device** to the **Local Database** and vice versa.

Select the desired sensor(s) and use the **Copy to** or **Copy from** button in the middle of the main screen to transfer the data between **Local Database** and **Device**.

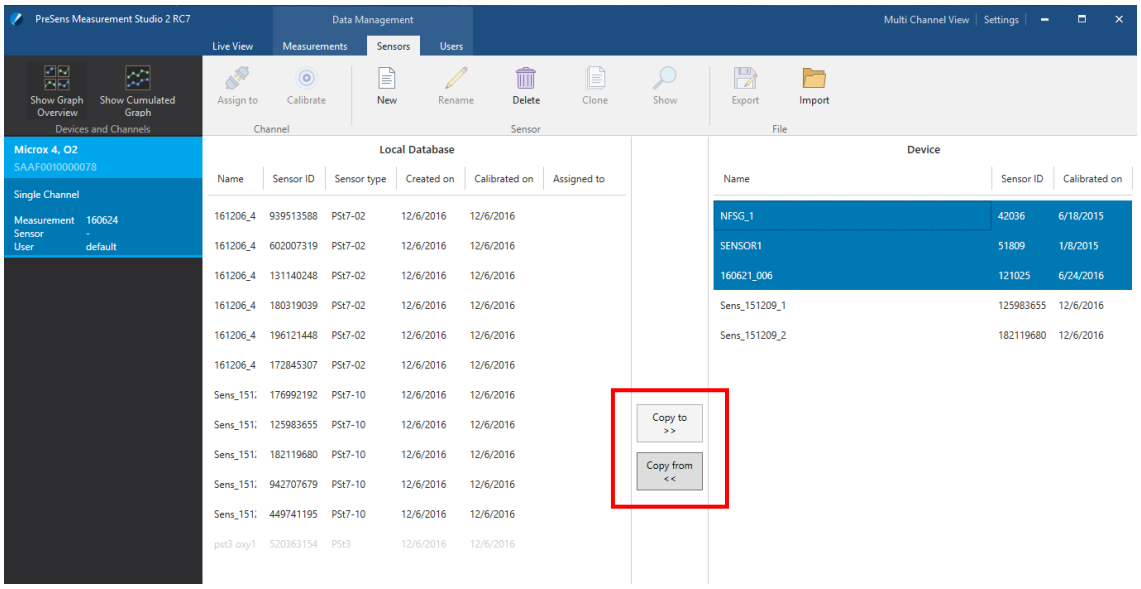


Fig. 15 Selected sensors in the Device section – click Copy from

A progress bar is displayed. Once the process is finished the sensor(s) will be displayed in both the **Local Database** and the **Device** section.

Handling Users from a Device

On the **Users** screen the users stored on the **Device** can be copied to the **Local Database**. This is required to assign a user created with the device to a channel and continue measurements with the PreSens Measurement Studio software with that same user.

The users created locally with the software can also be copied to the device and applied computer independently out in the field with the portable device.

! A user can be copied from the **Device** to the **Local Database** and vice versa.

Select the desired user(s) in the **Device** section and use the **Copy to** or **Copy from** button in the middle of the main screen to transfer the data between **Local Database** and **Device**.

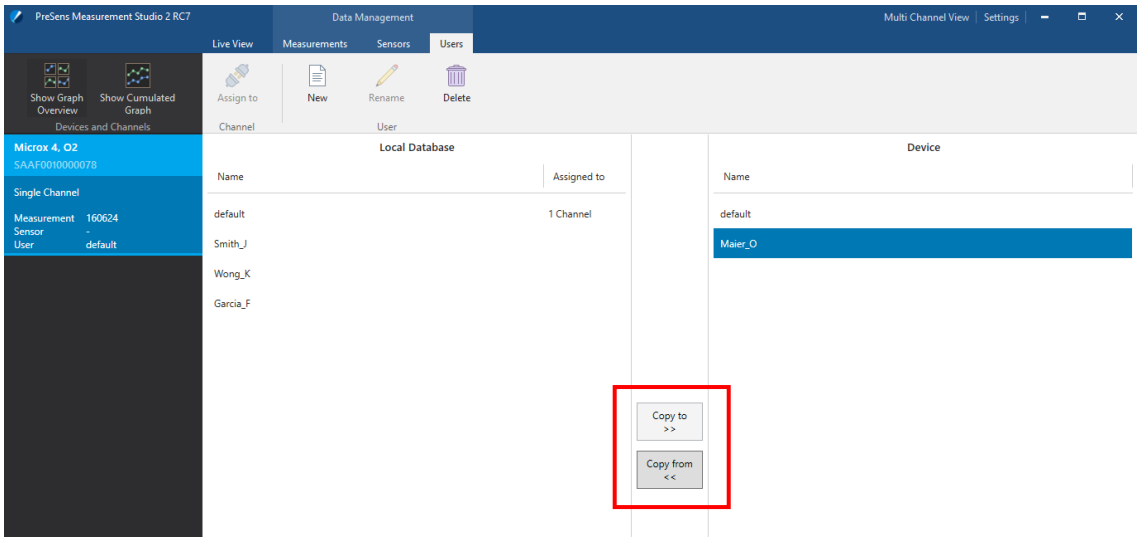


Fig. 16 Selected user in the Device section – click Copy from

A progress bar is displayed. Once the process is finished the user(s) will be displayed in both the **Local Database** and the **Device** section.

4.6 Sensor Management

4.6.1 Create a New Sensor Manually

Click on the **New** icon on the Sensors tab and the **Add Sensor** dialog opens.

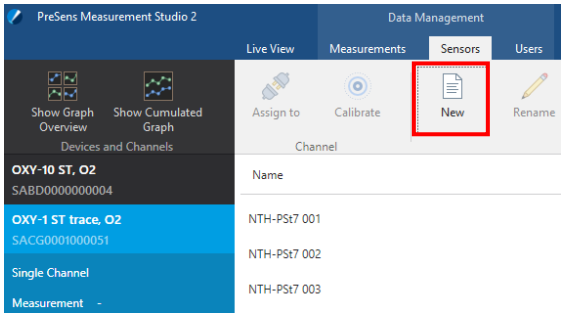


Fig. 17 Create a new sensor

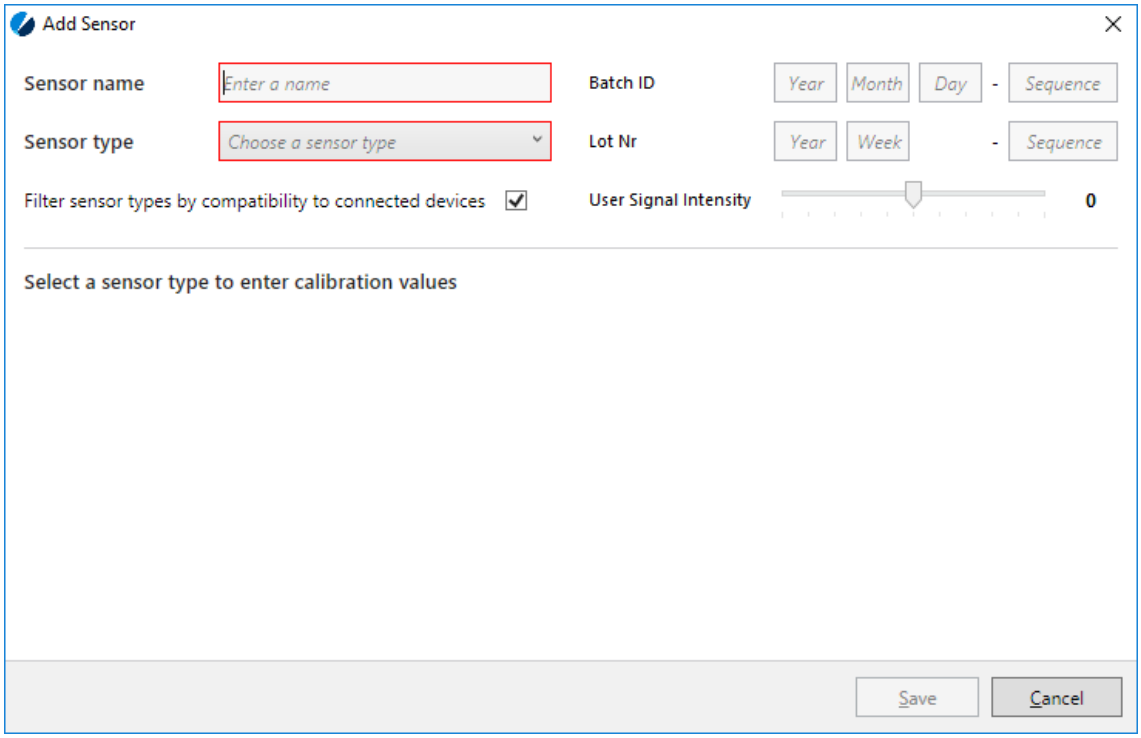


Fig. 18 Add Sensor dialog

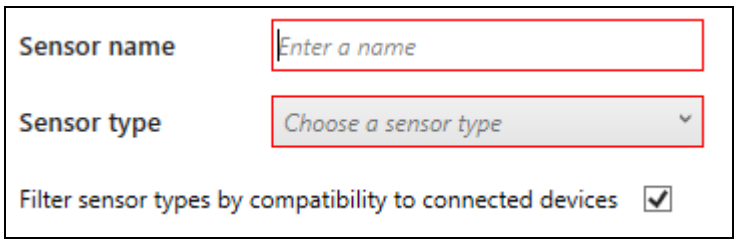


Fig. 19 Enter a Sensor name and select the Sensor type

1. Enter a **Sensor name**, the **Batch ID** and **Lot Nr**. of the connected sensor.

! The Sensor name can have a maximum of twenty characters.

! Batch ID and Lot Nr are not mandatory.

2. Change the **User Signal Intensity** to the value stated on the Final Inspection Protocol by moving the arrow button left or right along the scale.

3. Select the **Sensor type**. By default only sensor types compatible with the selected device can be picked from the **Sensor type** drop down menu. The **Calibration Data** and **Sensor Constants** input fields (showing default values) will be displayed.

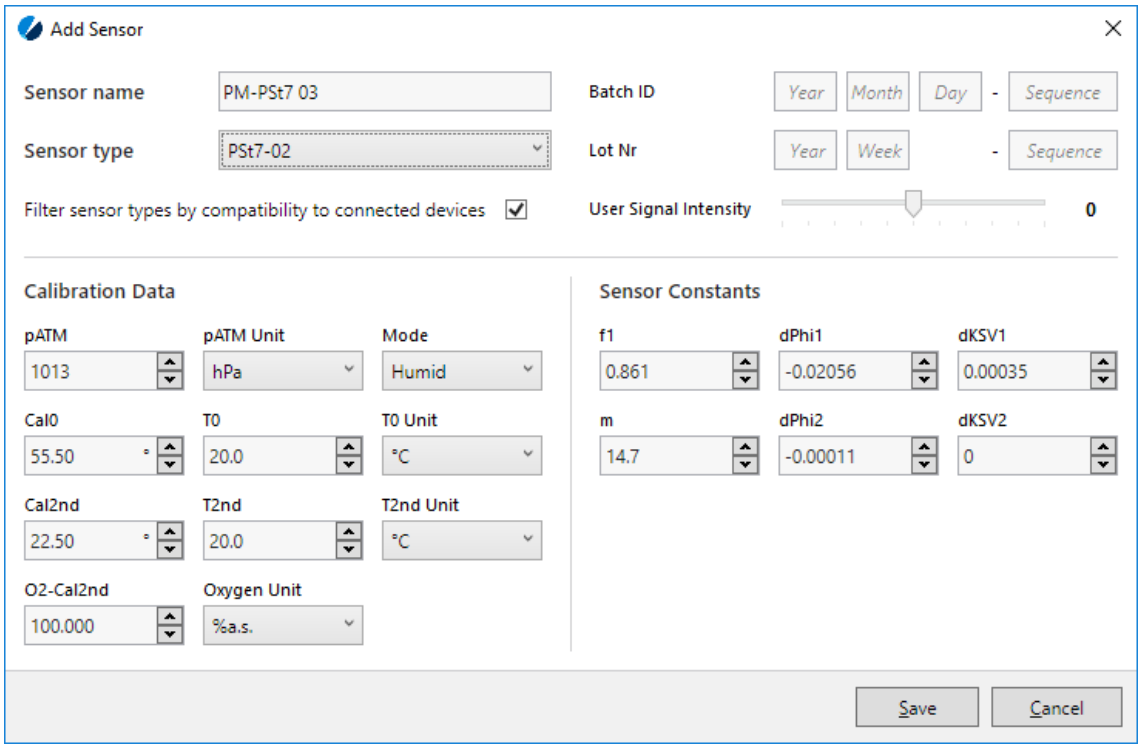


Fig. 20 Enter Calibration Data and Sensor Constants of your sensor

4. Enter the **Sensor Constants**.

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

5. Enter the **Calibration Data**. Select **Dry** or **Humid** according to the conditions under which the calibration data was obtained. Then change the calibration values to the values stated in the grey highlighted boxes 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 point
   - 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.

6. Click **Save** and the new sensor will be added to the **Sensors** list.

4.6.2 Import Sensor from Barcode

Click on the **Import** icon in the control bar on the **Sensors** tab, and choose **Barcode** in the dialog that opens.

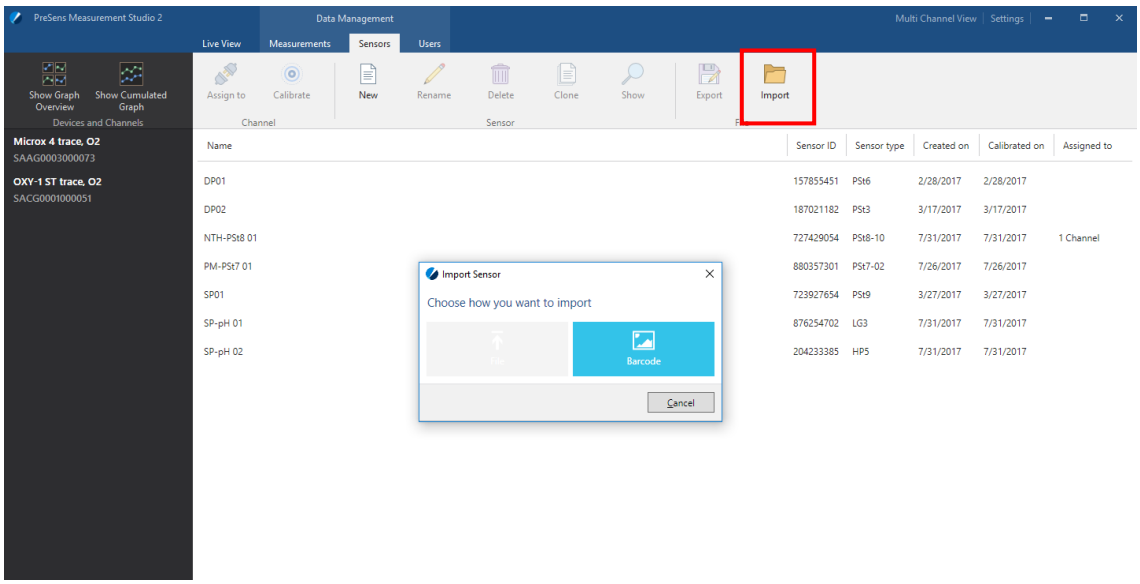


Fig. 21 Import Sensor dialog

The **Import Sensor from Barcode** dialog will then show the details of the import process. Now you can start scanning your sensor barcodes.

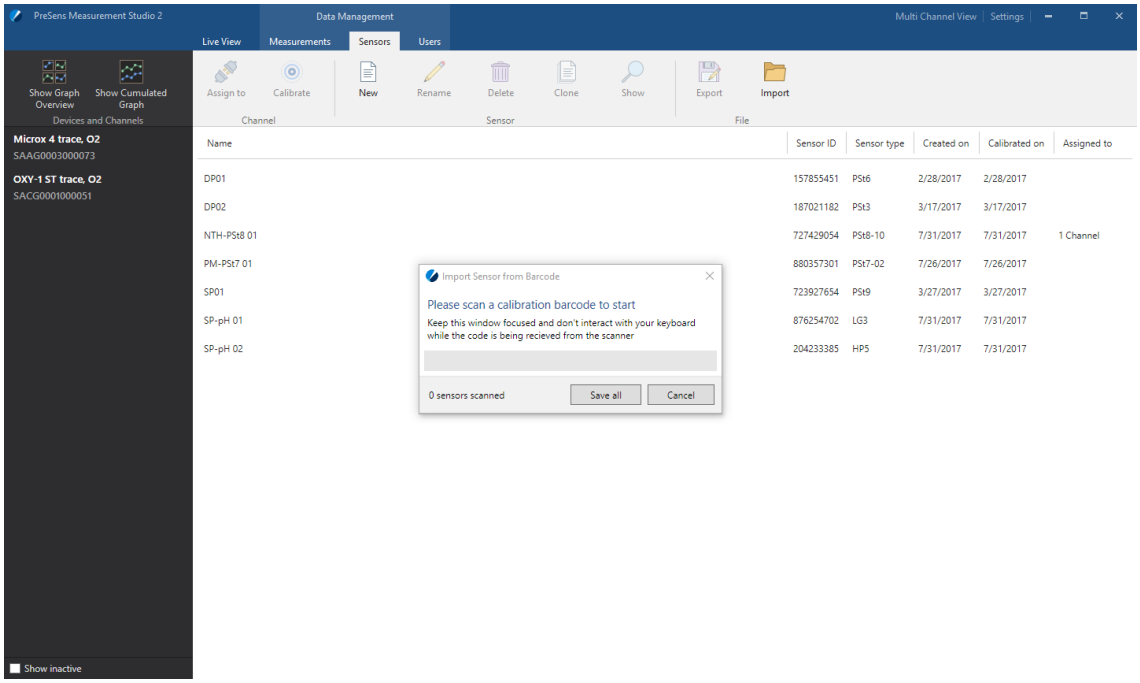


Fig. 22 Import Sensor from Barcode dialog - empty

! Please keep the window focused and do not interact with the keyboard while the code is being received from the scanner.

Once you have scanned a sensor barcode the data will be processed and the sensor details will show in a new window. Enter a sensor name and click the **Import** button at the bottom of the dialog.

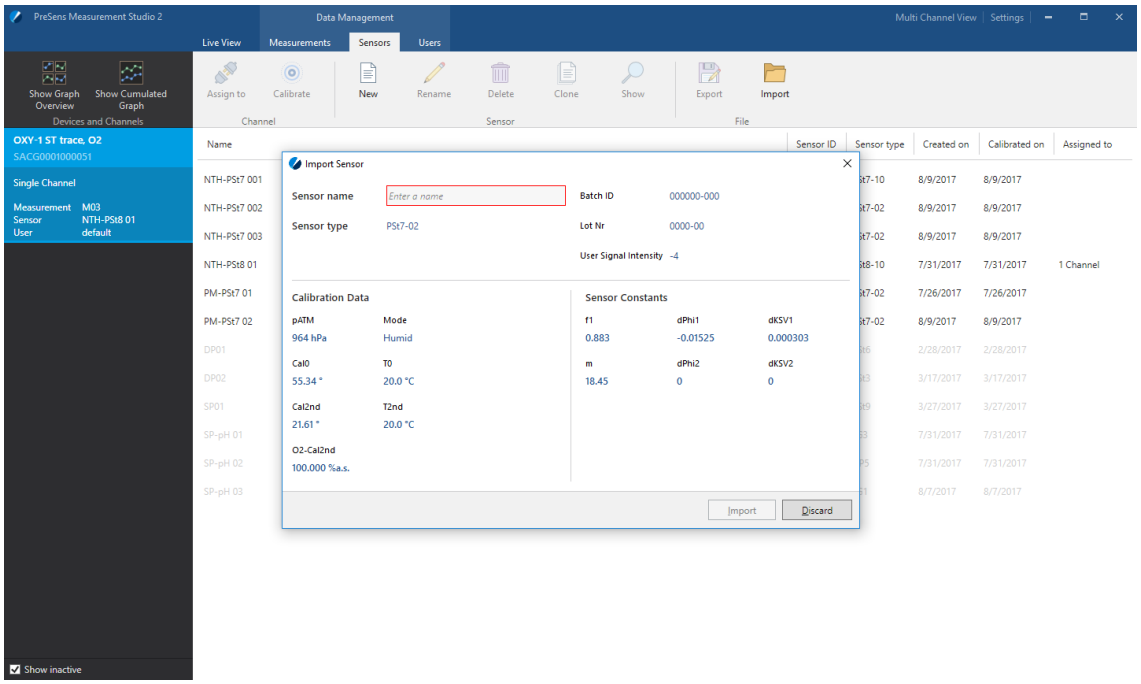


Fig. 23 Import Sensor – enter a sensor name

Repeat the process with as many sensors as you need. After you have imported all your sensors the import dialog will show a sensor count in the lower left.

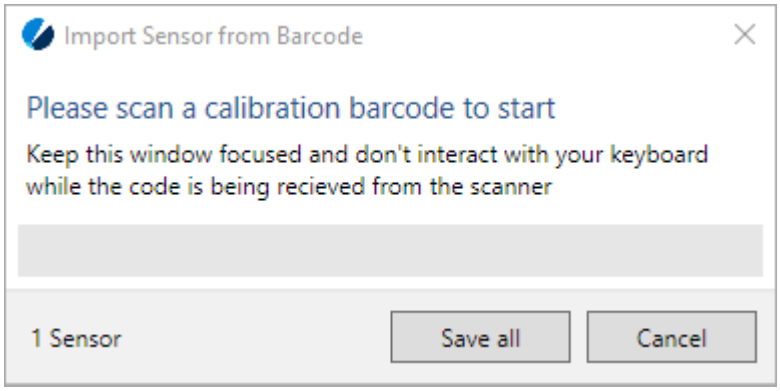


Fig. 24 Import Sensor from Barcode – 1 Sensor scanned

! Click on **Save all** in the **Import Sensor from Barcode** dialog to finish the process.

The imported sensors are shown in the list now.

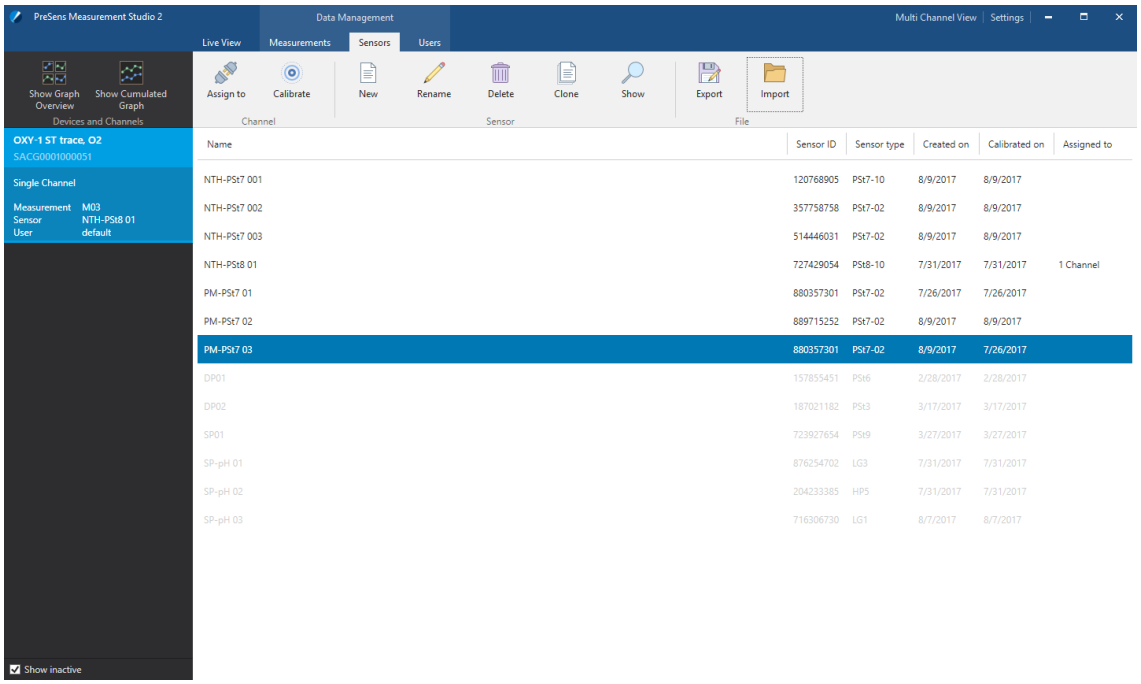


Fig. 25 Imported sensor is displayed in the sensor list.

4.6.3 (Re-)Calibrate a Sensor Manually

For detailed information about preparation of calibration standards and handling the sensor during calibration, please refer to the sensor instruction manual.

You can re-calibrate your sensor by assigning it to a connected device's channel and clicking on the **Calibrate** icon in the control bar of the **Live View** or the **Sensors** tab.

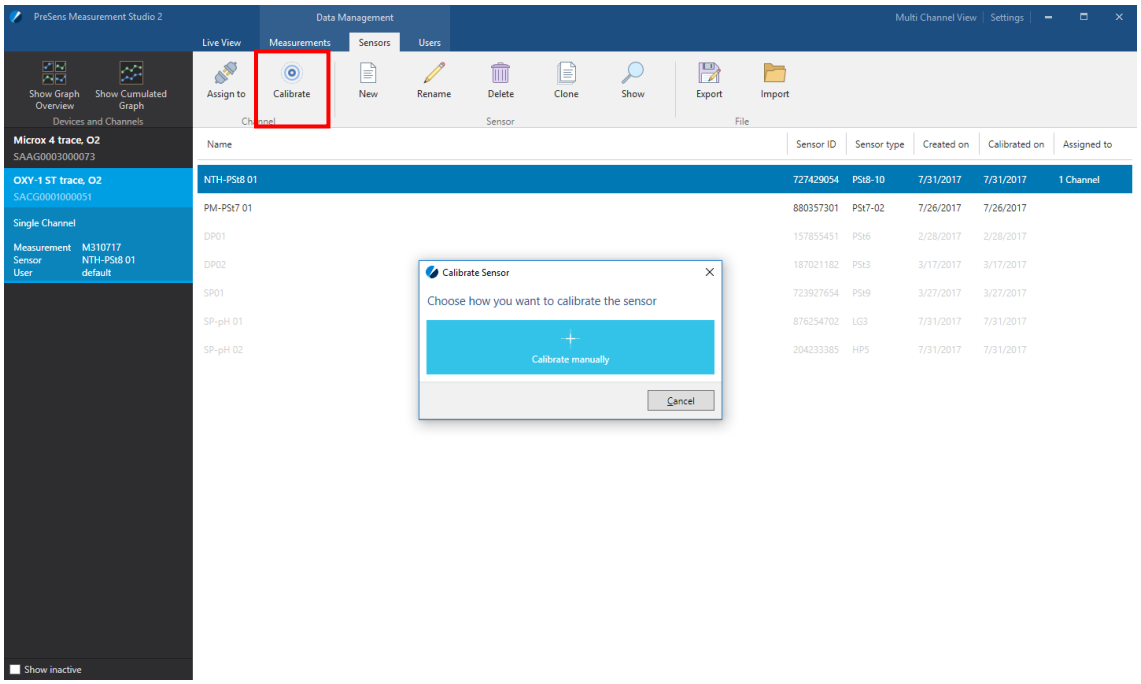


Fig. 26 Calibrate an existing sensor: Choose calibration options

Click on **Calibrate manually** and the **Calibrate Sensor** dialog will be displayed; the selected channel starts taking measurements at 1 second intervals. On the right side of the dialog you can see the currently measured values.

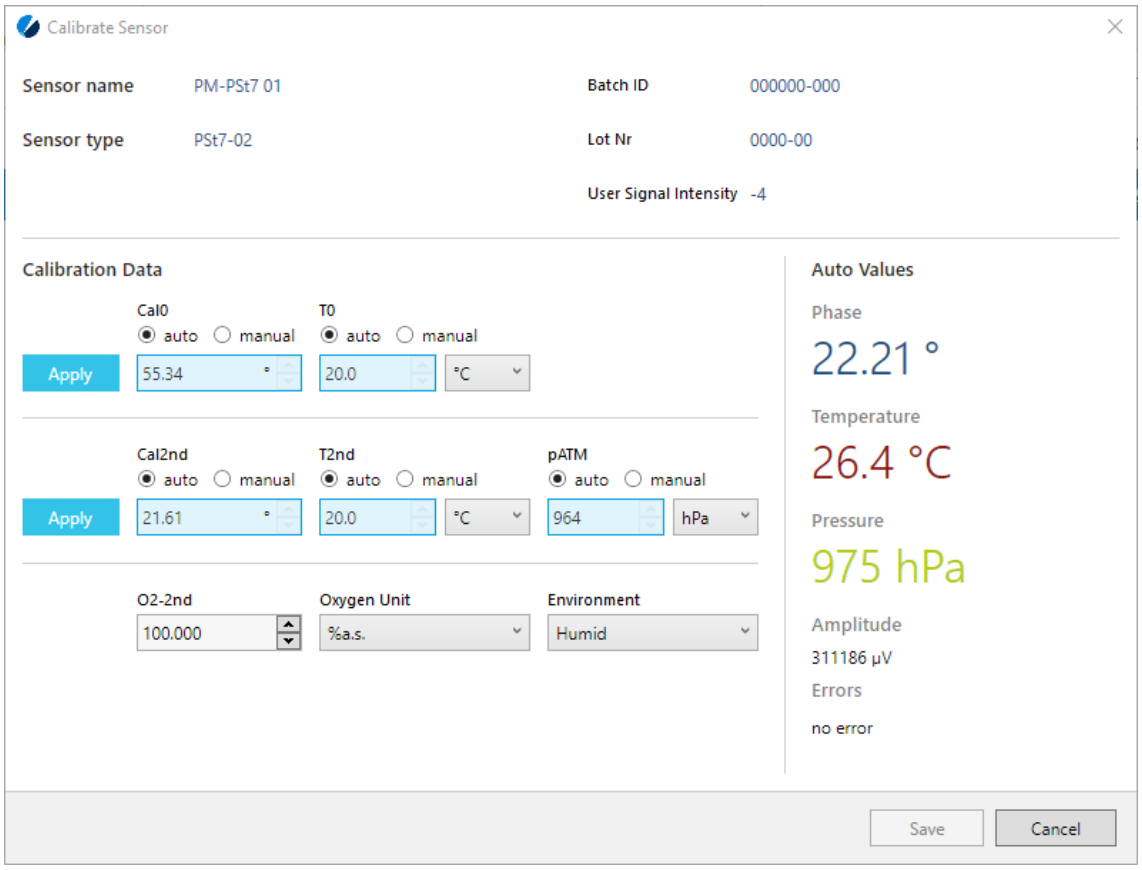


Fig. 27 Calibrate Sensor dialog

Calibration values can be entered manually (select the **manual** checkbox, see Fig. 28) in the respective input fields or collected from the device channel (select the **auto** checkbox, see Fig. 29) by using the **Apply** button next to the Cal0 or Cal2nd input fields.

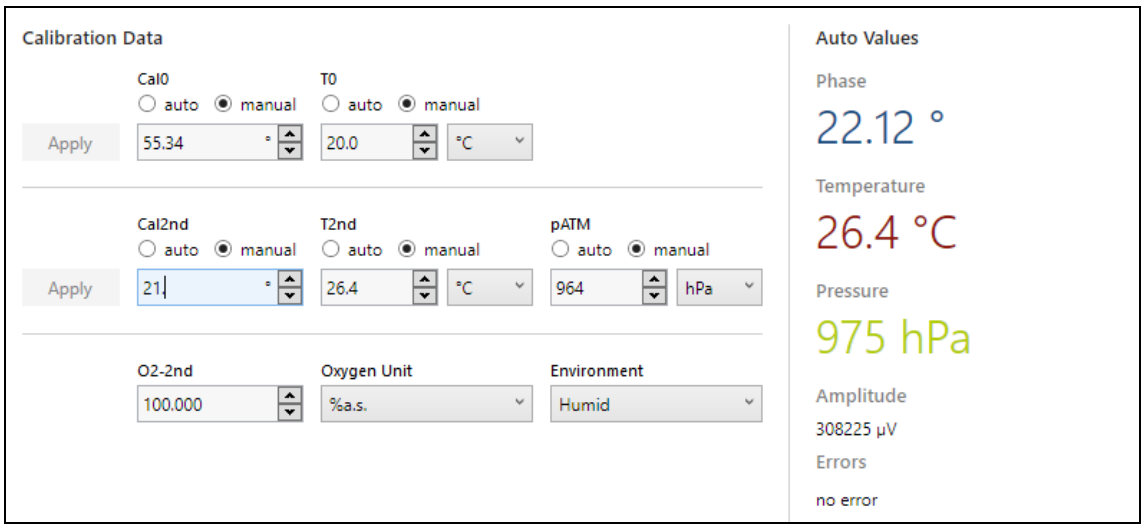


Fig. 28 Calibration data entry: Manual input of calibration values.

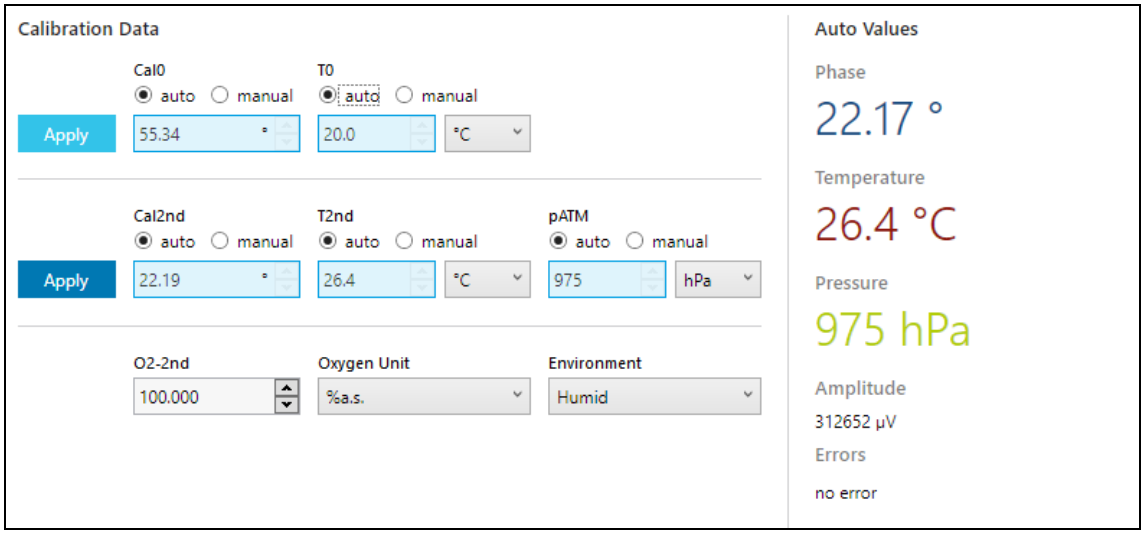


Fig. 29 Calibration data entry: Automatic data collection from the device.

Once the calibration data is updated click the **Save** button to store the changes.

4.7 Measurements

Measurement control is performed on the **Live View** tab.

1. Select the device in the Devices and Channels list and choose the channel(s) you want to use by clicking on it.

2. Assign a calibrated **Sensor** (see chapter 4.6) to each channel you want to measure with.

3. By default, a **Default User** will be assigned to each channel. Assign a user to the respective channel(s), if required.

4. In case you want to save the measurement data in a file assign a **Measurement** to the respective channel(s). Else the measurement data will not be stored.

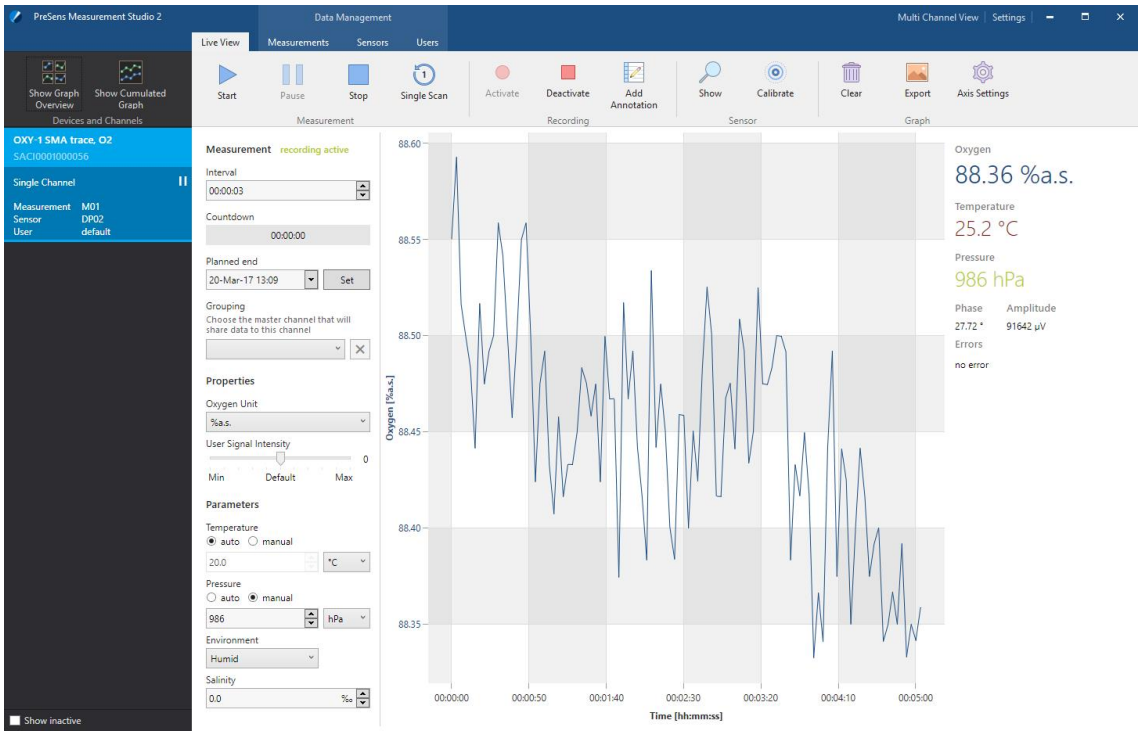


Fig. 30 Live View Tab

In the control bar you can select the standard measurement control functions plus some specific functions for the connected sensor.

Measurement:

Start: If you have assigned a sensor to the channel, you can **Start** a measurement with the respective sensor at any time.

Pause: Pause a running measurement; you will be able to continue with the same measurement right where it was paused at any time.

Stop: Stop the running measurement; your time reference will be reset.

Single Scan: Perform a single measurement; this can be done at any time.

Recording:

Activate: Start recording your measurement points. They will be stored in the assigned measurement.

Deactivate: Stop recording measurement points.

Add Annotation: Add a short text comment to your measurement data. The annotation will be associated with the last taken measurement point.

Sensor:

Show: Details of the assigned sensor will be shown.

Calibrate: (Re-)Calibrate the assigned sensor manually (see chapter 4.6.3).

Graph:

Clear: The current graph will be cleared. This action will not delete any measurement data.

Export: The current graph view can be exported as an image file.

Axis Settings: Personalize the graph axis settings.

4.7.1 Measurement Settings

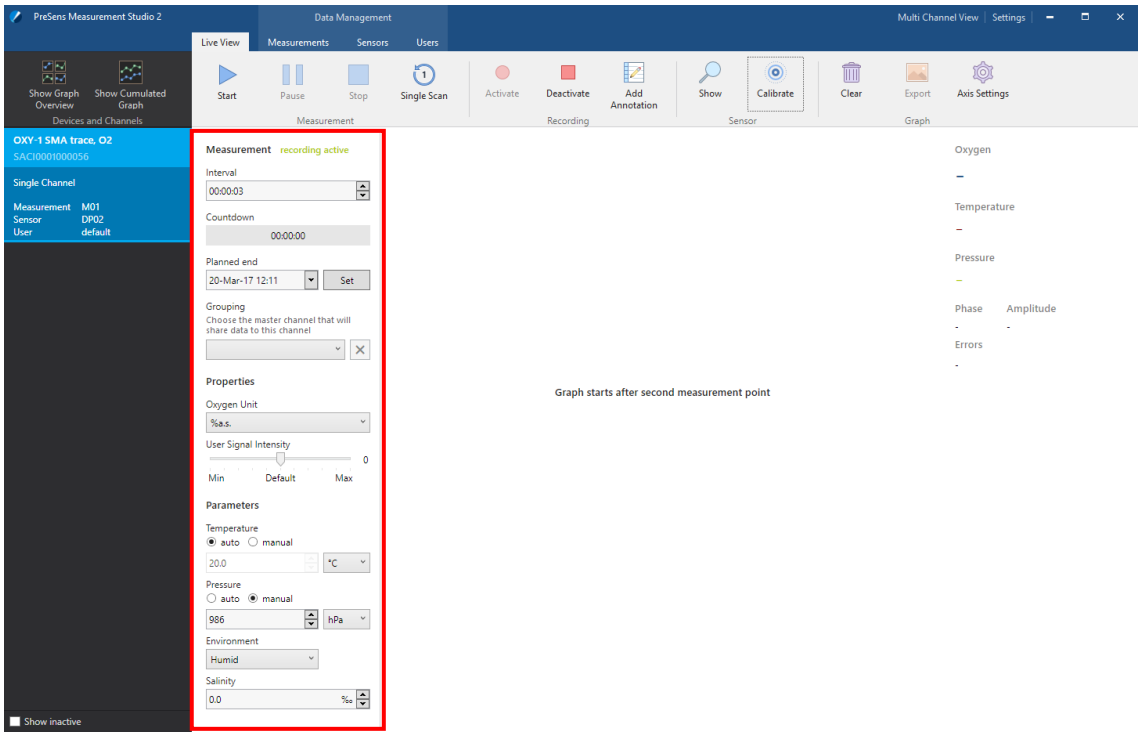


Fig. 31 Live View tab: change measurement settings on the left side of the main screen

You can manage and change measurement settings before and some even during the measurement on the left hand side of the **Live View** main screen. Following measurement parameters can be modified:

Interval: Set the time interval at which measurements are taken; this setting can be changed any time, also during a running measurement. The fastest possible interval depends on the sensor type: for PSt3 and PSt7 it is 1 sec., for PSt6, PSt8 and PSt9 it is 3 sec.

Planned End: Program your measurement to a given date and time by selecting the end time and date in the drop down calendar.

Oxygen Unit: Select the oxygen unit in which measurements are taken and displayed; this setting can be changed any time, also during a running measurement. Following units are available:

For PSt3 and PSt7 sensor in **Dry** conditions

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

For PSt3 and PSt7 sensor in **Humid** conditions

- % a. s. (air saturation)
- % O2
- ppm (mg/L)
- Torr
- hPa
- µmol/L
- ppb (µg/L)

For PSt6 and PSt8 sensor in **Dry** conditions

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

For PSt6 and PSt8 sensor in **Humid** conditions

- % a. s. (air saturation)
- % O2
- ppm (mg/L)
- Torr
- hPa
- µmol/L
- ppmv
- ppb (µg/L)

For PSt9 sensor in **Dry** and **Humid** conditions

- ppmv (gaseous oxygen)

Grouping: Choose a master channel that will share data with this channel (see chapter 4.9.1).

User Signal 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.

Temperature: Set the measurement temperature manually (**manual**) or retrieve it from the temperature sensor connected to the device (**auto**). This temperature value will be used for temperature compensation of the oxygen measurements. If Temperature is set to **auto** and no temperature sensor is connected to the device, a default value of 20 ºC will be set automatically.

Pressure: Set the atmospheric pressure during measurements manually (**manual**) or retrieve it from the pressure sensor integrated in the device (**auto**).

! Pressure measurements with the device's integrated pressure sensor are taken in the device NOT at the sensor site.

This pressure value will be used for pressure compensation of the oxygen measurements.

Environment: Select **Dry** (humidity < 50 %) or **Humid** (humidity ≥ 50 % and in liquids) depending on the environmental conditions in which measurements are taken. Selecting **Humid** will open the input field for salinity compensation.

Salinity: If **Humid** is selected in the **Environment** box the input field for **Salinity** compensation will show in the measurement settings below. Insert your sample's salinity value in ‰ (g/kg) for salinity compensation of your oxygen measurements.

4.7.2 Measurement Details & Errors

The measurement details on the right hand side of the main screen show the last measured **Oxygen**, **Temperature**, **Pressure**, **Phase** and **Amplitude** value. Any **Errors** registered by the device will be displayed below.

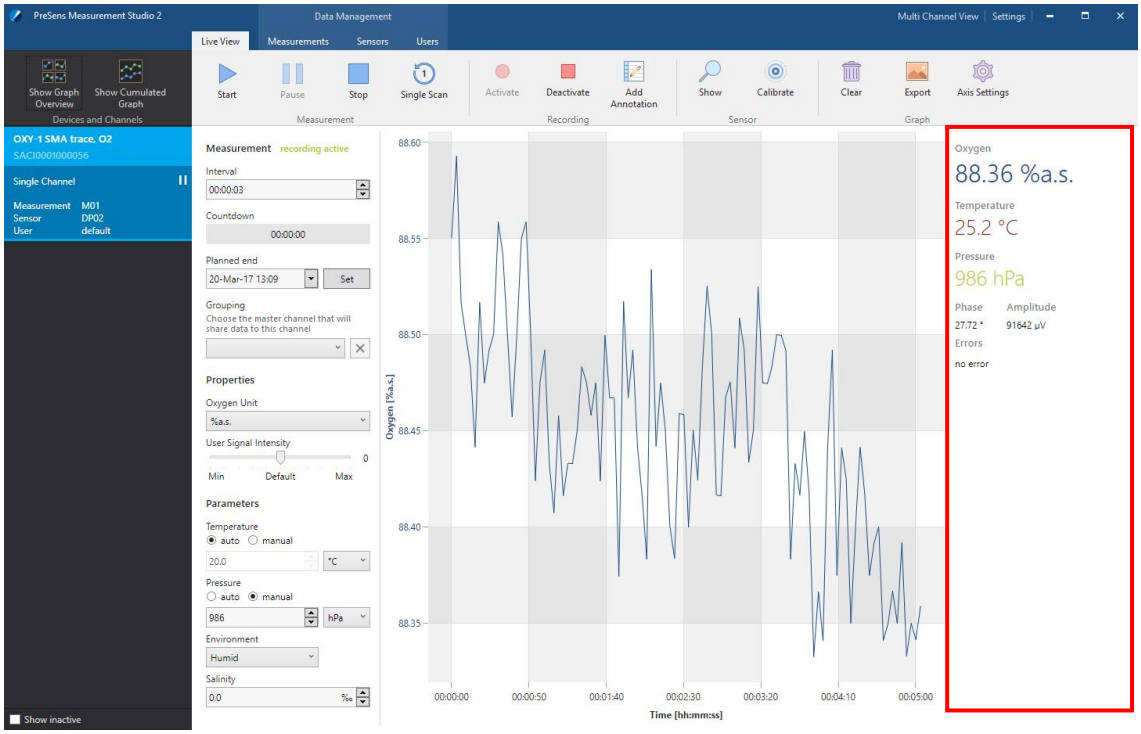


Fig. 32 Measurement details and errors are displayed on the right

In case an error occurs this will also be indicated by a warning sign next to the respective channel in the Devices and Channels section. Place the cursor over the warning sign to get the error information displayed.

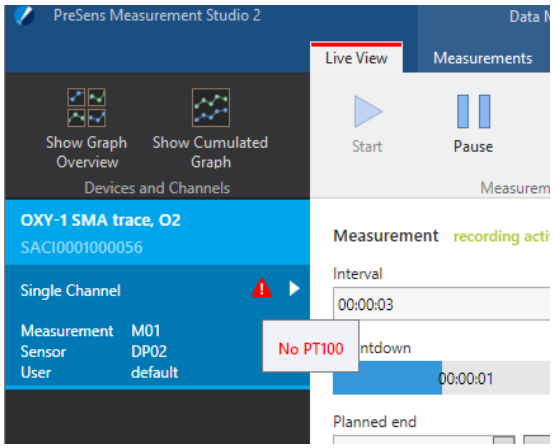


Fig. 33 A warning sign indicates that an error has occurred

4.7.3 Data Recording

Measurements without Recording

In case you have no **Measurement** assigned to the used channel, you can just click the **Start** button in the control bar and measurement points will be shown in the Live View screen without recording the data.
In case a **Measurement** is assigned to the used channel, click the **Deactivate** button in the control bar to disable data recording, and then click **Start**.

Measurements with Recording

In order to record measurement data a **Measurement** file needs to be assigned to the selected channel. Once a Measurement is assigned recording measurement data is activated automatically.
To stop recording click **Deactivate**. Recording can also be started or stopped during a running measurement.

! Once recording was deactivated measurement data will only be recorded again from the time you click **Activate** onwards.
Intermediately measured data will not automatically be stored in the measurement.

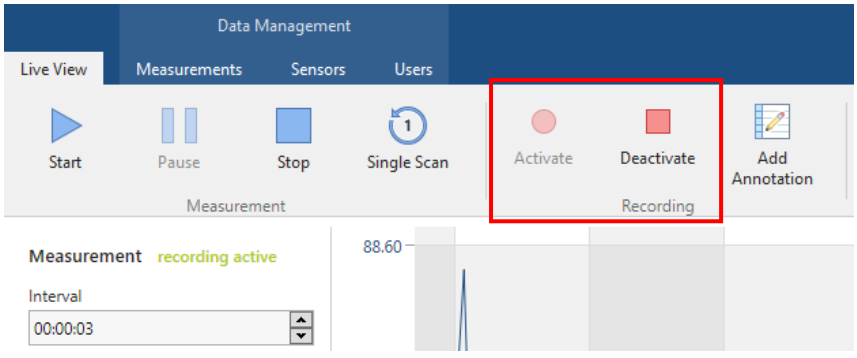


Fig. 34 Activate / Deactivate recording measurement data

4.7.4 Annotations

Annotations can be added at any time during a running measurement. Click the **Add Annotation** button in the control bar and a dialog will open. Enter a short text comment in the input field and click **Add**. The annotation will be added to the ongoing measurement and associated with the last taken measurement point. You can also **Modify** or **Delete** any of the created annotations, just by selecting the desired annotation and clicking on the corresponding button.

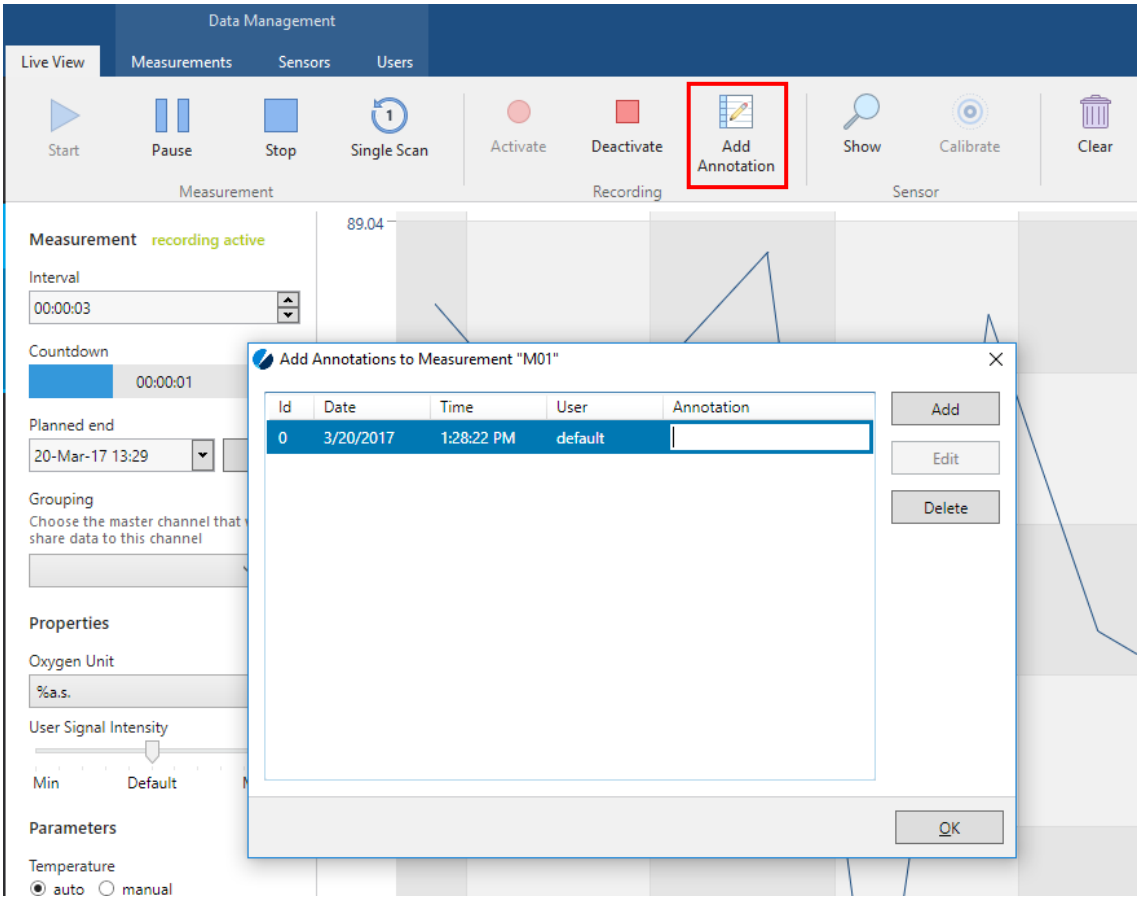


Fig. 35 Annotations manager in Live View

In the software settings you can select the option to "**Force annotations**" (see chapter 5.1). With this function, the **Add Annotations** window will pop up automatically whenever the measurement is started, paused or stopped. Deselect this option in the software settings, if you do not wish to add an annotation to the measurement at all these events.

By selecting a measurement and clicking **Show Annotations**, the annotations dialog pops up and all annotations associated to this measurement are displayed.
In this window the annotations can be sorted by **Date (From / To)**, **Device**, **Channel** and **User** to narrow the results. You also have the options to **Edit** or **Delete** annotations.

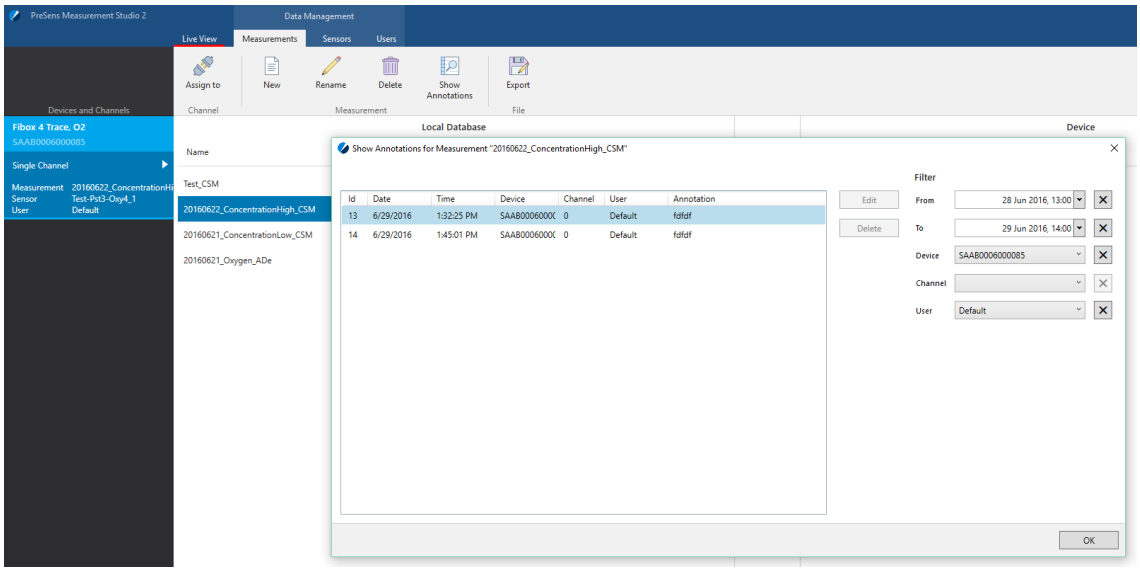


Fig. 36 Annotations dialog on the Measurements screen

4.8 Graphical Display

4.8.1 Single Channel Graphical Display

Zoom: Perform a right click on the graph and select the timespan you want to **Show…** in the graph, e. g. 10 Seconds, 30 Seconds, etc.

Area of interest: Perform a left mouse click on the graph, hold the mouse key and drag a frame around the area of interest; the graph will zoom in on this area when the mouse key is released. Double click on the graph to undo the zoom.

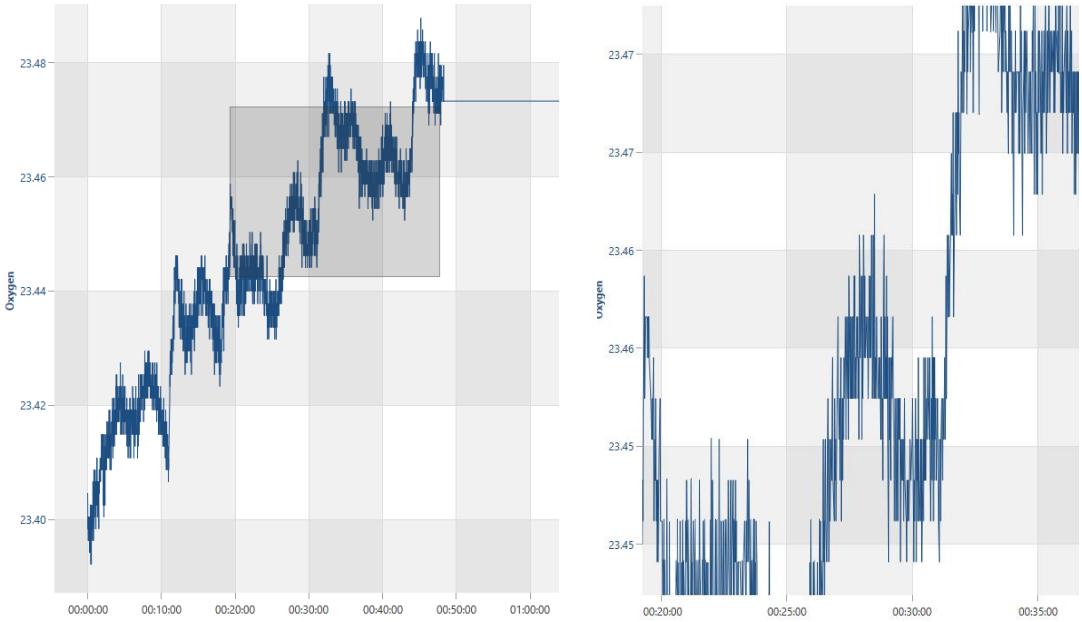


Fig. 37 Mark an area of interest in the graph (left) and it will be enlarged (right).

Axis Settings:
The icon in the control bar opens a dialog, where you can set:

- **Show / Hide** data series: oxygen value, temperature, pressure, phase and amplitude and corresponding axis.
- **From / To**: displayed Min/Max values; all data series are by default set to **Auto**, the graph displays all values between the minimum and maximum received values. By disabling the **Auto** checkbox, the minimum and maximum displayed values can be entered manually.

Click **Apply** button to store your changes and **OK** to close the dialog. You can **Apply to all channels** by checking the corresponding checkbox besides.

Furthermore, the time axis can be displayed either in **relative** or **absolute values**, please refer to chapter 5.1 (Graphs) for more information.

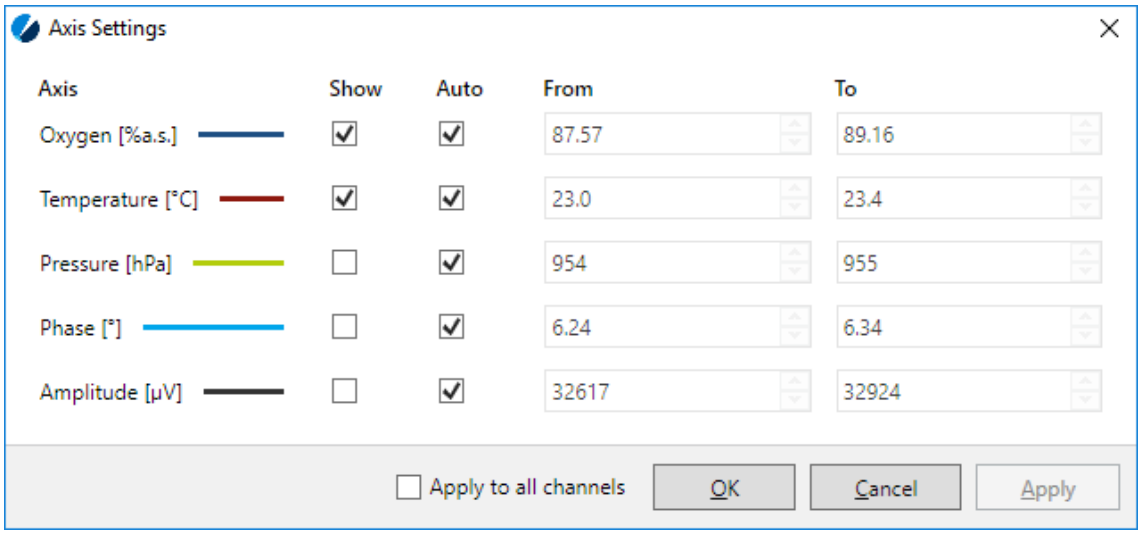


Fig. 38 Axis Settings dialog

Export: Create an image file of the graph. The file browser will open, where you can select a directory, a file name and the image format the graph shall be stored in. Following image formats can be selected:

- JPG
- PNG
- XPS
- BMP

4.8.2 Multi-Channel Graphical Display

Measurement data collected from all active channels can be displayed in two different ways: Above the **Devices and Channels** list you can select either **Show Graph Overview** or **Show Cumulated Graph**. This will open a second software window.

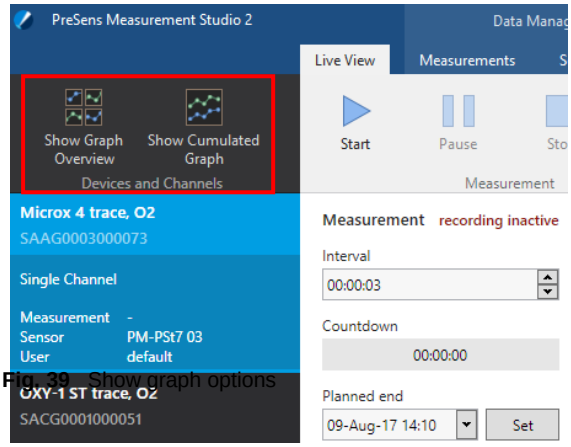


Fig. 39 Show graph options

In **Graph Overview** each active channel's measurement is displayed in an individual graph. All graphs are shown on the main screen one below the other; scroll down to see all graphs. You can select **Devices, Channels and Parameters** you want displayed by checking the respective boxes on the left.

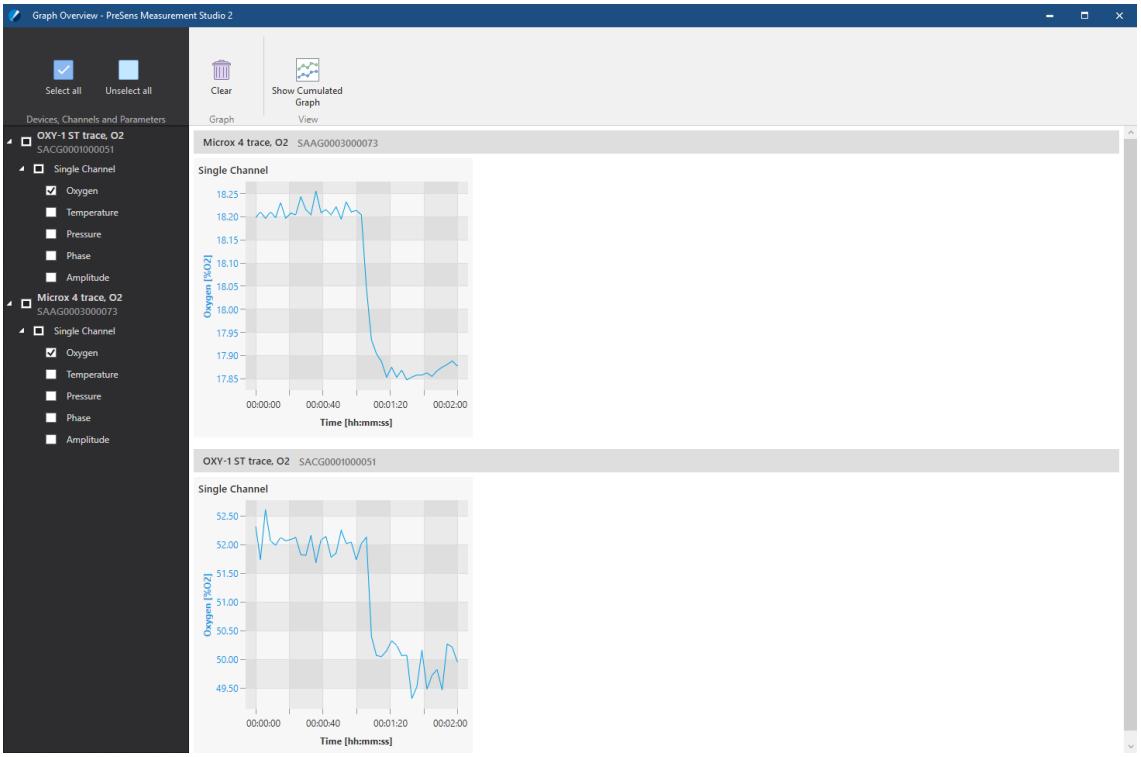


Fig. 40 Graph Overview

The **Cumulated Graph** displays the measurements of all selected channels in a single graph. Each channel is referenced to t = 0 sec. starting position. Therefore, there might not be an absolute time correlation between each channel in this view, if those channels did not start the measurement at the same time. You can select **Devices**, **Channels** and **Parameters** you want displayed by checking the respective boxes on the left.

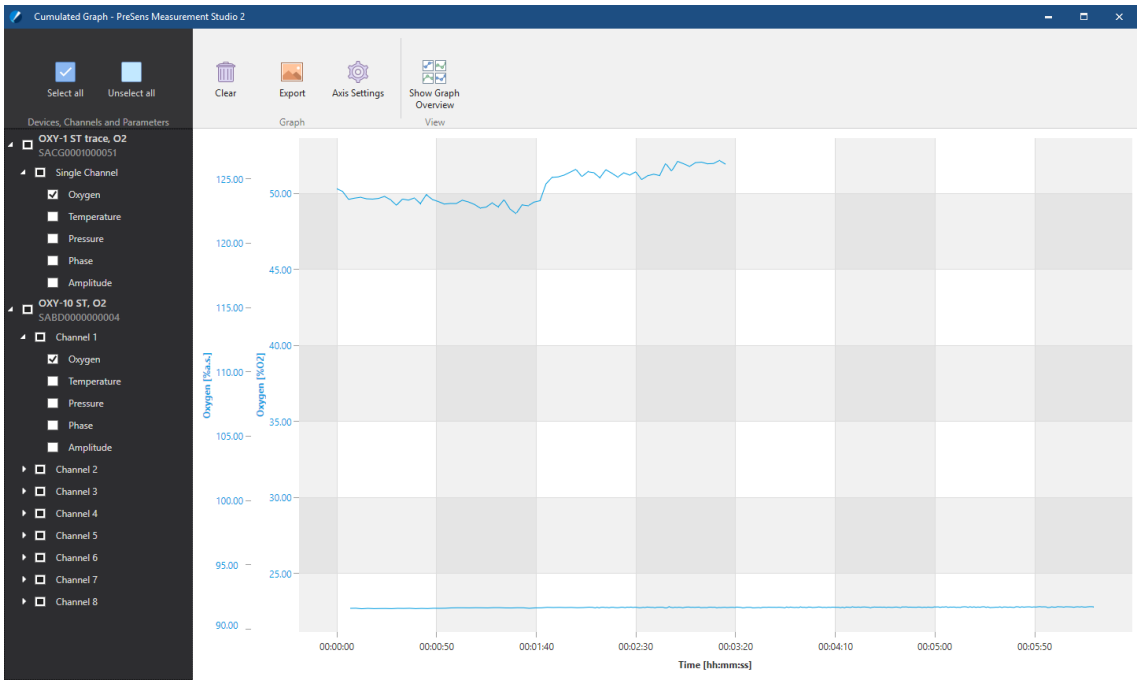


Fig. 41 Cumulated Graph

4.9 Channel Management

4.9.1 Grouping: Sharing Temperature & Pressure Inputs

Temperature and Pressure inputs from one single device can be shared with the rest of the connected devices / channels. To do so, a group of channels with one Master and one / many Slaves has to be created. (It is also possible to create more than one group.)

- **Group**: A set of channels sharing Temperature and / or Pressure input
- **Master**: The device serving the Temperature and / or Pressure values to the rest of the slave channels in the group.
- **Slave**: The channels receiving the Temperature and / or Pressure values from the Master.

Creating a Group of Channels

1. Select a Slave channel in the **Devices and Channels** section (Channel 2 in Fig. 42).

2. Click on the drop down list below **Grouping** on the Live View screen of this channel and select the Master (Channel 1 in Fig. 42).

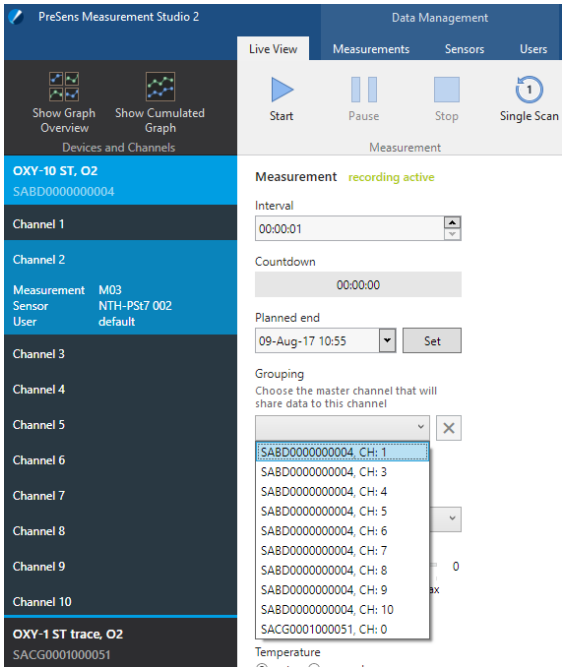


Fig. 42 Setting the Slave channels

3. Repeat this action for all the channels you want to group together.

! You will be able to add and remove channels to a group even after a measurement has been started.

4. Set each Slave channel's **Temperature** and / or **Pressure** input to **master** (see Fig. 43, left).

5. Finally, set the Master channel **Temperature** and / or **Pressure** modes to **auto** to receive the values from the device.

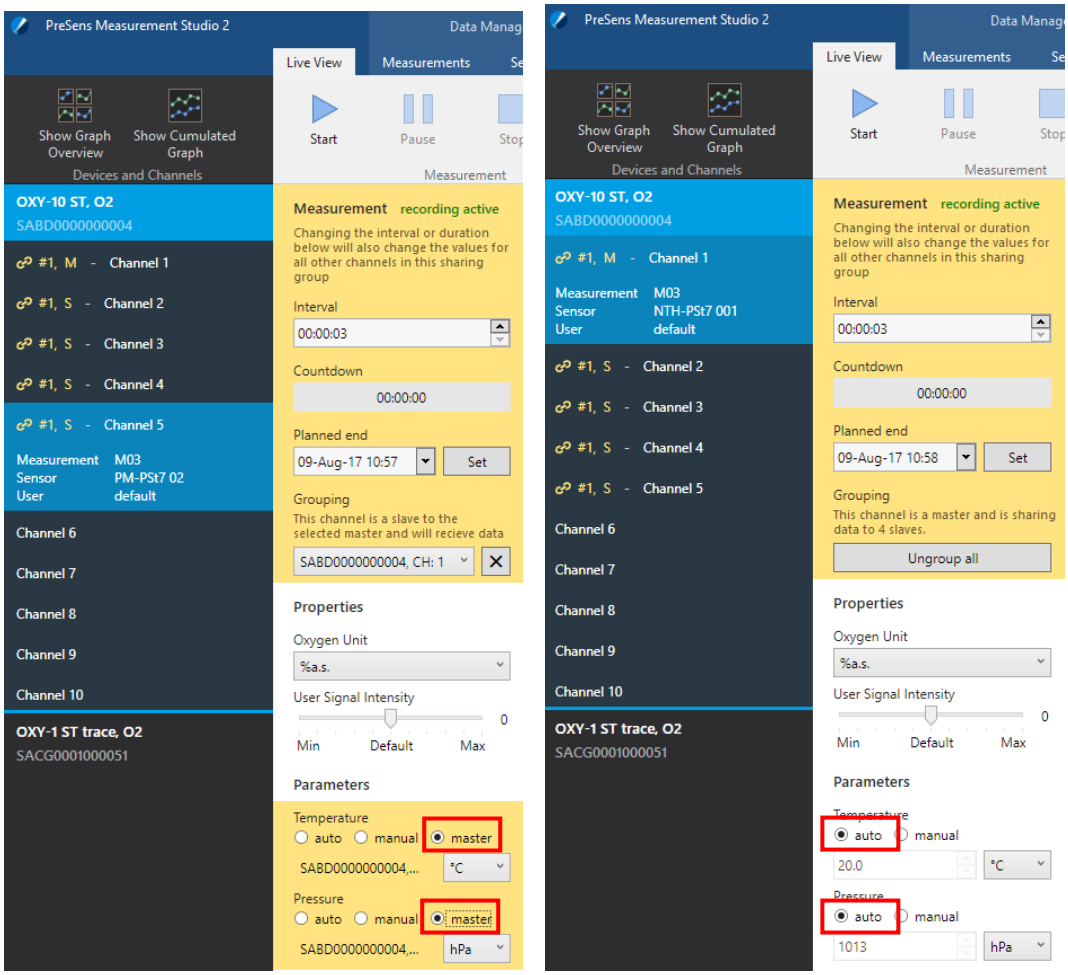


Fig. 43 Setting the Temperature and Pressure modes for the Slaves (left) and the Master (right).

You will be able to distinguish grouped channels by a distinctive yellow background in the Live View of each channel (see Fig. 43) and grouping symbols in the channel list, see Fig. 44.

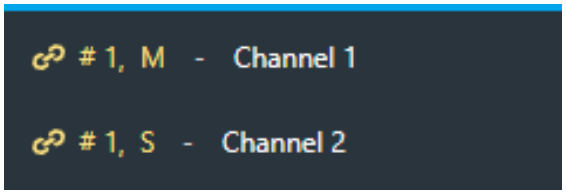


Fig. 44 Grouping symbols: Linked status, group number, M for Master and S for Slave

Starting a Measurement with Grouped Channels

Select any of the grouped channels and click the **Start** button in the control bar.

Please note:

- The minimum measurement interval is 2 seconds for all channels.
- All channels are synchronized and start / pause / stop the measurement at the same time.

! In order to record the measurement points you will have to assign a corresponding **Measurement** to each channel individually.

Add a Slave Channel During Measurement

You can add a channel to a group which is currently measuring at any time.

! This action will force the other channels to stop their current measurement to allow the new incoming channel to synchronize. The graph will be reset.

Remove a Slave Channel from a Group

You can remove a Salve channel from a group using the clear (**X**) button next to the **Grouping** drop down list.

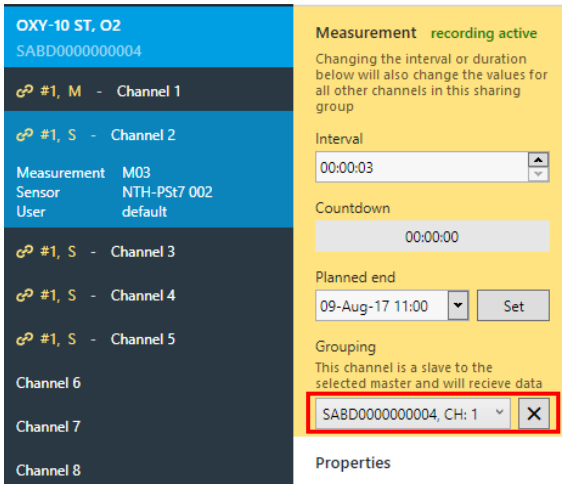


Fig. 45 Remove Slave channel from a group

Ungroup all Channels

Only the Master channel is able to dissolve the group of channels. By clicking the button **Ungroup all** on the Master channel all Slave channels get disassociated from the Master and the measurement is stopped.

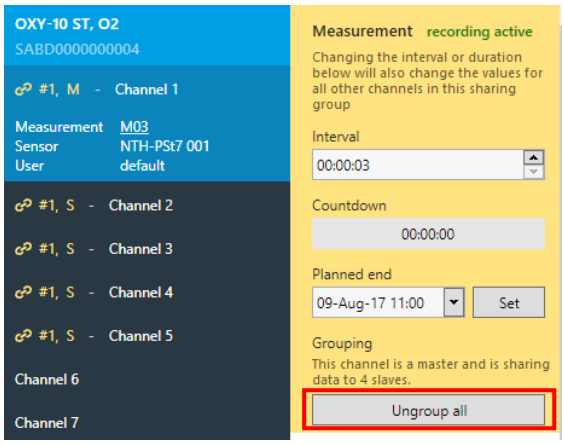


Fig. 46 Dissolve a group

4.9.2 Saving & Restoring Channel Configurations

All channel settings are stored automatically after each modification. After disconnecting and reconnecting a device to the software its channel settings are restored.

A channel's grouping settings are also saved automatically and restored during software initialization. When the software is started, it tries to restore the grouped channels of the last measurement session.

! If the Master channel of a given group is not connected during the booting process the group will be dissolved and the saved grouping settings will be lost.

Due to the nature of the USB connection the relation Master / Slave cannot always be restored when devices are being connected and disconnected (Hot – Plug) during the use of the software.

4.9.3 Multi Channel View

Switch to the **Multi Channel View** (button in the top right of the software window) for managing multiple devices / channels simultaneously and having them all displayed on the main screen.

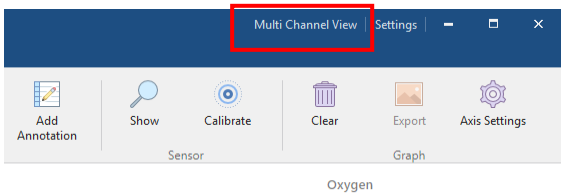


Fig. 47 Switch to Multi Channel View

The **Multi Channel View** provides exactly the same features as the **Single Channel View**, but enables the user to perform bulk actions, so managing numerous channels and / or sensors is easier.

! Both views are independent, but any action performed in either of the views will result in a change in both views.

The **Multi Channel View** is split in two tabs to manage different features:

- **Management Tab** = Measurement configuration: Grouping options; assign sensors, measurements and user to each channel
- **Live View Tab** = Measurement settings: See the numeric measured values all at once, start / stop measurements, modify temperature / pressure modes and units, etc.

The tabular structure of the screens allows good overview of all relevant channel information and you are able to perform actions on just one, multiple or all channels.

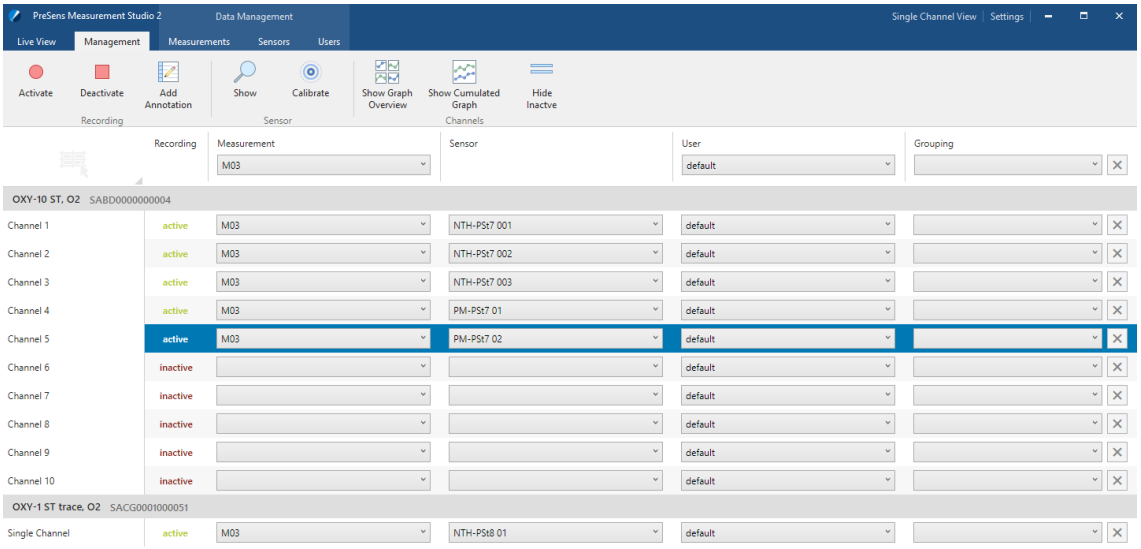


Fig. 48 Management tab content

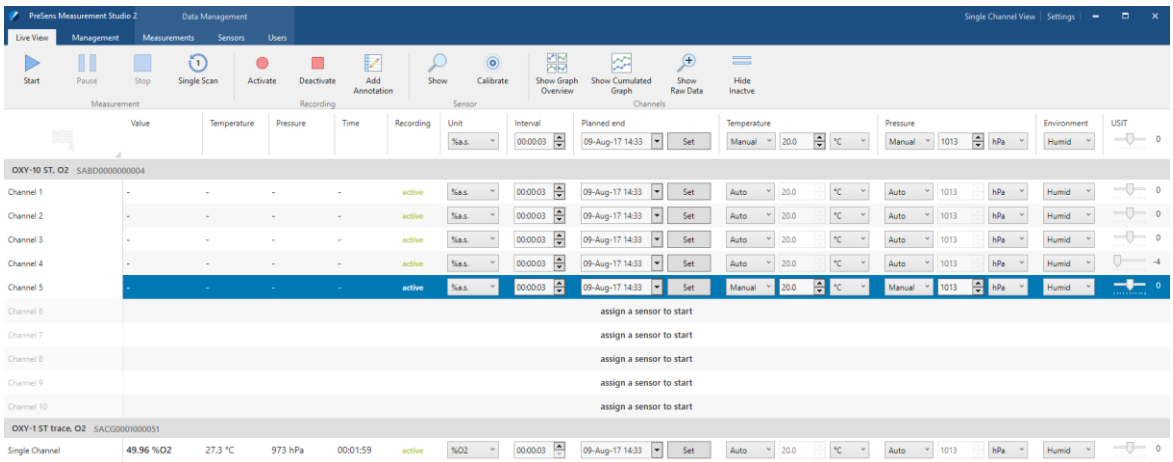


Fig. 49 Live View tab content

For a better overview, it is possible to deactivate channels that are not in use and hide them from view. Perform a right click on the channel and select **Deactivate Channel**. By clicking on **Show / Hide Inactive** in the control bar, you can show or hide the deactivated channels in the list.

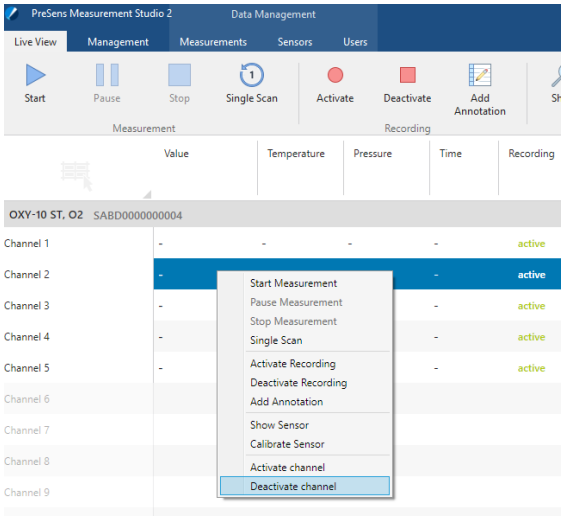


Fig. 50 Deactivate a channel

The visibility of the raw data – Amplitude and Phase – can be selected by clicking the **Show / Hide Raw Data** icon in the control bar.

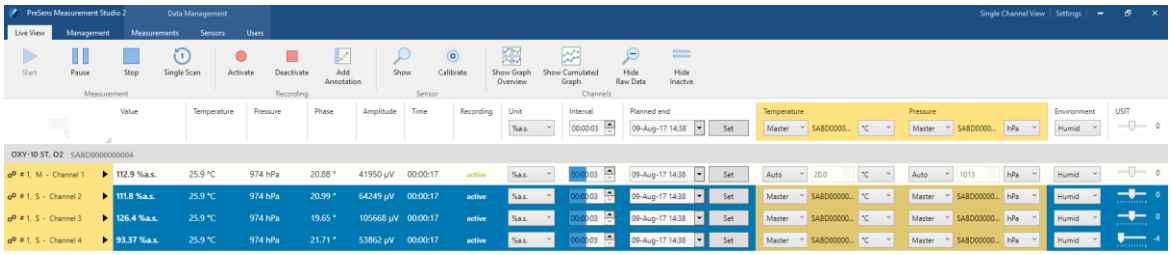


Fig. 51 Raw data is displayed

4.9.4 Bulk Actions

Use the grid button in the top left to select all active channels, or select several channels by clicking on them while holding the ‘Ctrl’ key on your keyboard.

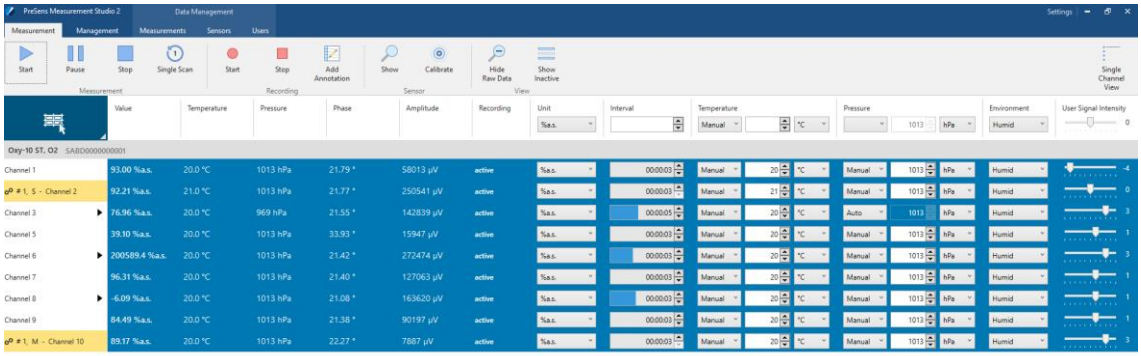


Fig. 52 Live view tab – use the grid button to select all channels

Bulk Assignments

The first row of the Multi Channel View allows you to do bulk assignments.
On the Management tab the measurement and user can be assigned for a selection of channels or all channels at once, just by selecting the respective item in the drop down list in the first row (see Fig. 53 **Bulk measurement assignment**).

! Sensors cannot be assigned in bulk actions as one sensor can only be assigned to and read out with one single channel.

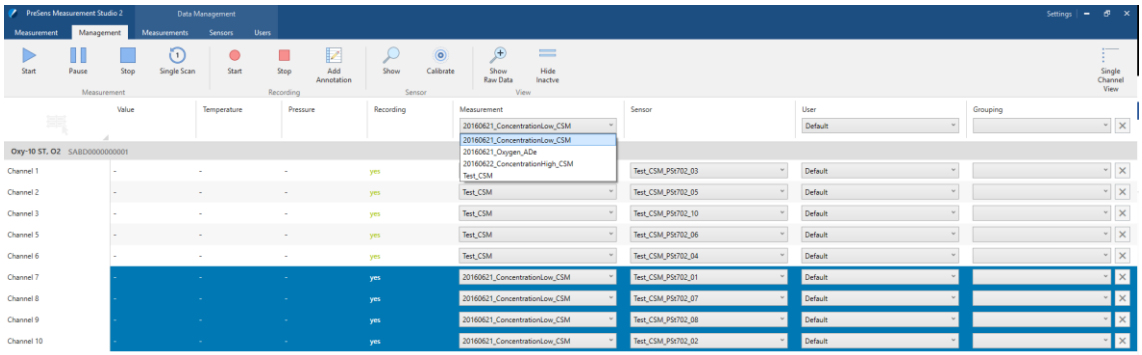


Fig. 53 Bulk measurement assignment

Bulk Grouping

The grouping can also be performed in bulk actions.

1. Select all the Slave channels to be grouped to a Master on the Management tab.
2. Select the Master (1 channel) from the **Grouping** drop down list in the first row.

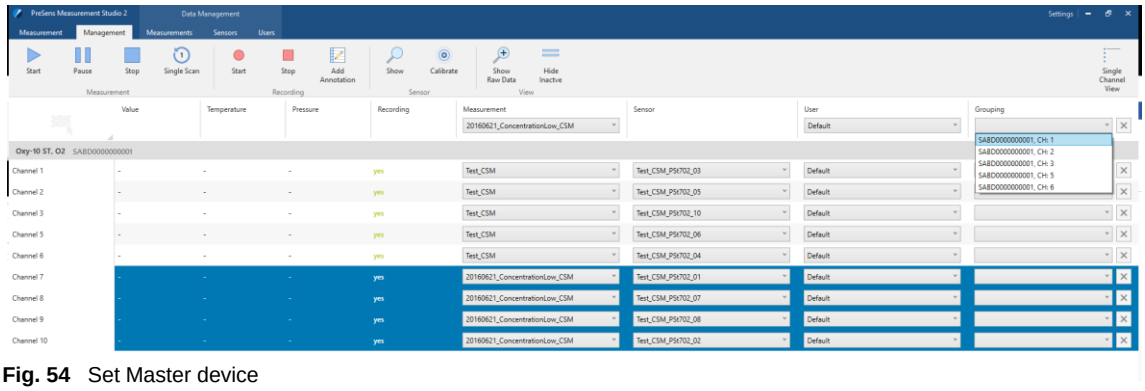


Fig. 54 Set Master device

3. Got to the Live View screen and select all grouped Slave channels.

4. Select **Other** for Temperature and / or Pressure in the first row.

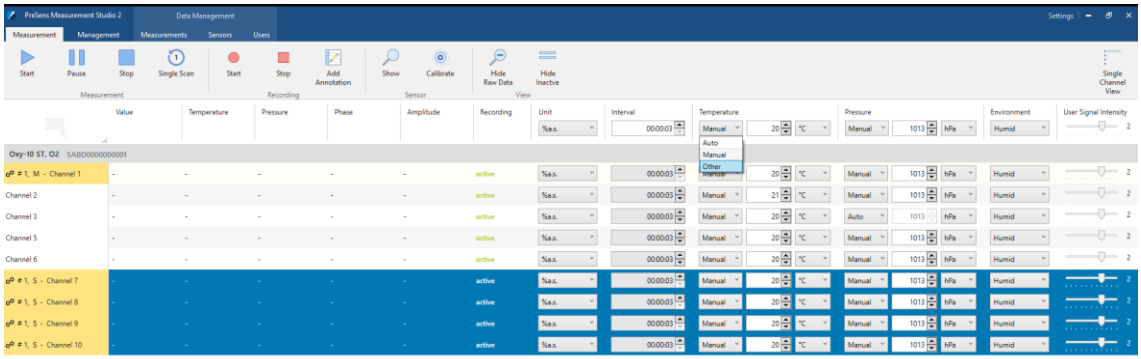


Fig. 55 Set Temperature to Other

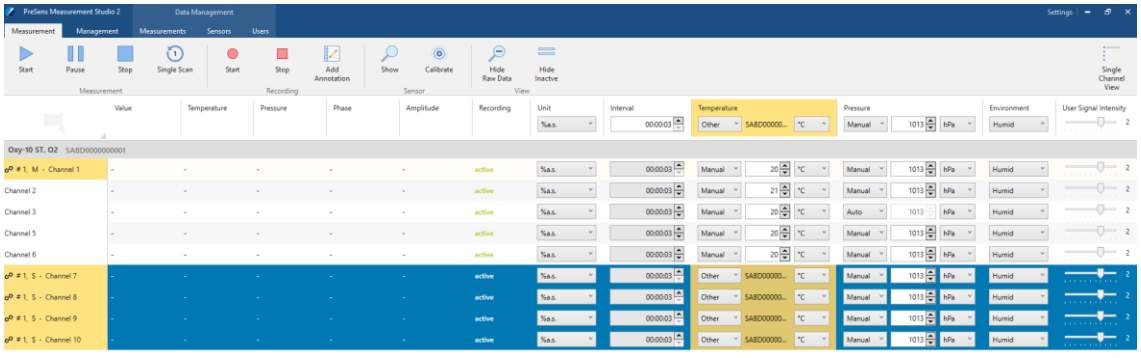


Fig. 56 Group of Slaves using the Master's Temperature

Bulk Measurement Settings

On the Live View screen all the measurement settings can be adjusted individually for each channel and also in bulk action.

Select all channels for which you want to perform setting changes. Modify the respective settings in the first row and the changes will be applied to all selected channels at once.

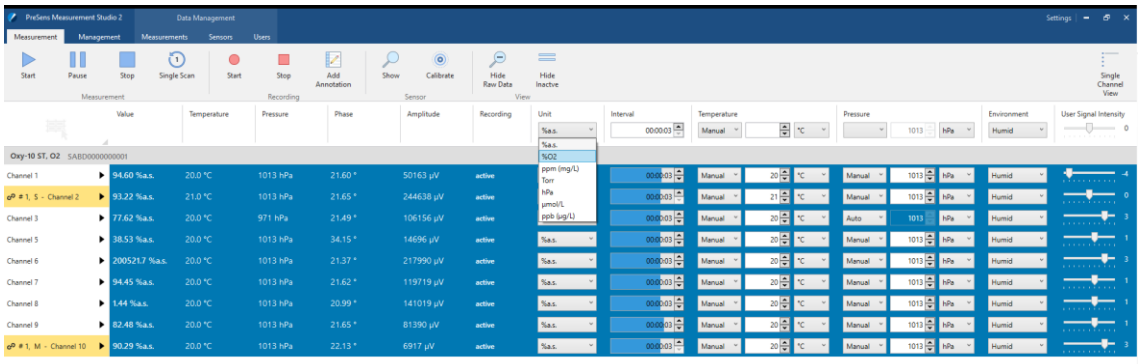


Fig. 57 Setting the measurement unit for all channels

Bulk Calibration

A bulk calibration can be performed either on the Live View or on the Management tab. To start a bulk calibration select the channels with assigned sensors you want to re-calibrate and click the **Calibrate** icon in the control bar.

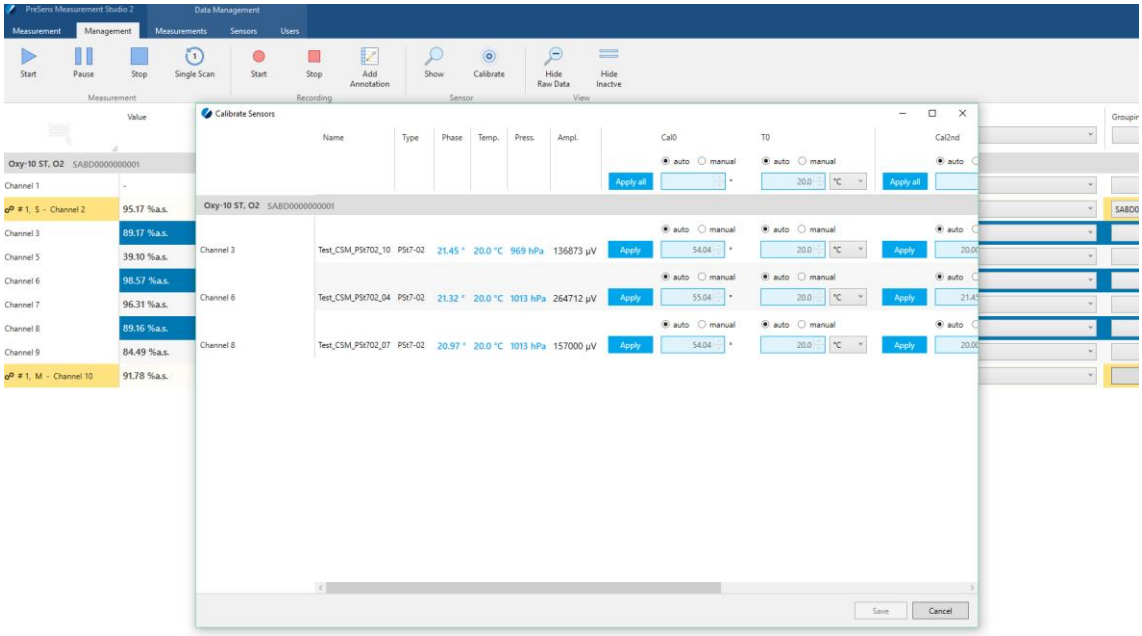


Fig. 58 Multi Channel View – Calibrate Sensors dialog

Select **auto** to receive the respective values directly from the device. Click on **Apply** next to each input field to set the last retrieved values as your new calibration values. Alternatively, you can select **manual** and type the calibration values manually into the respective input fields. Then click on **Apply** to set the typed in values as your new calibration values. Then click the **Save** button.

! The new calibration values will not be stored until the **Save** button is clicked.

Use the first row of the Multi Channel **Calibrate Sensor** dialog to perform modifications on all channels / sensors at once. This can be used, when a large number of sensors from the same batch should be re-calibrated.

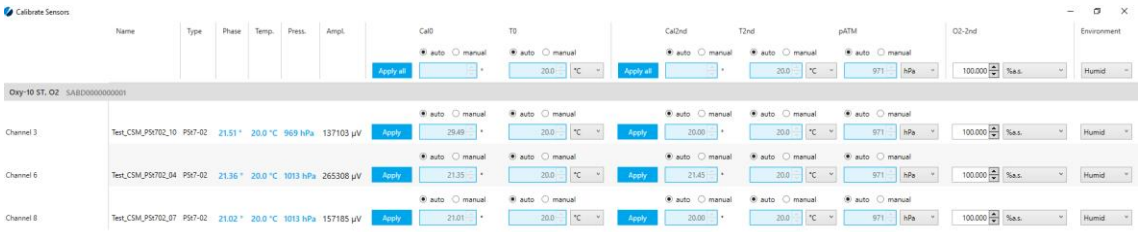


Fig. 59 Multi Channel View – Apply calibration data changes in Auto mode

Bulk Measurement

All measurement control – start, pause, stop, recording, annotations – can be managed in bulk actions.

By creating a selection of channels and clicking the respective button in the control bar, all selected channels will start / pause / stop measuring and activate / deactivate recording.

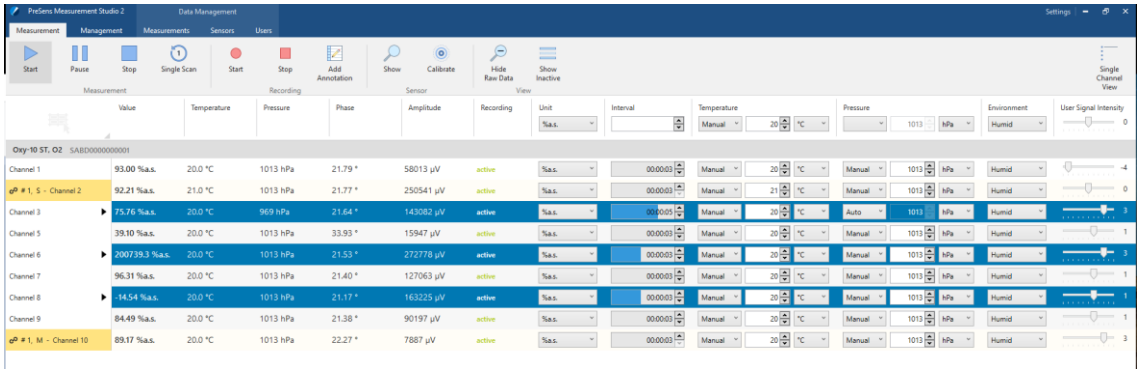


Fig. 60 Start a measurement with multiple selected channels

4.10 Export Measurement Results

Measurements can be exported in .csv and .xls format. In .csv format a separate file will be created for O_2 and pH measurements, in case data of both parameters was stored in one measurement. In .xls format data of both analytes is exported into one file with oxygen and pH measurements showing on separate work sheets.

Please also refer to chapter 5.3 for general export settings.

1. Select a measurement by clicking on the measurement name in the list. In case you want to export more than one measurement, you can select multiple measurements by holing the ‘Ctrl’ key on your keyboard.

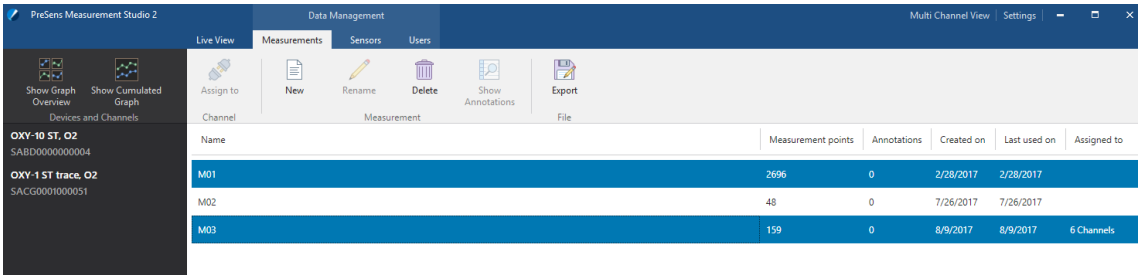


Fig. 61 Multiple measurements selected

2. Then click on the **Export** icon in the control bar and the export dialog will open.

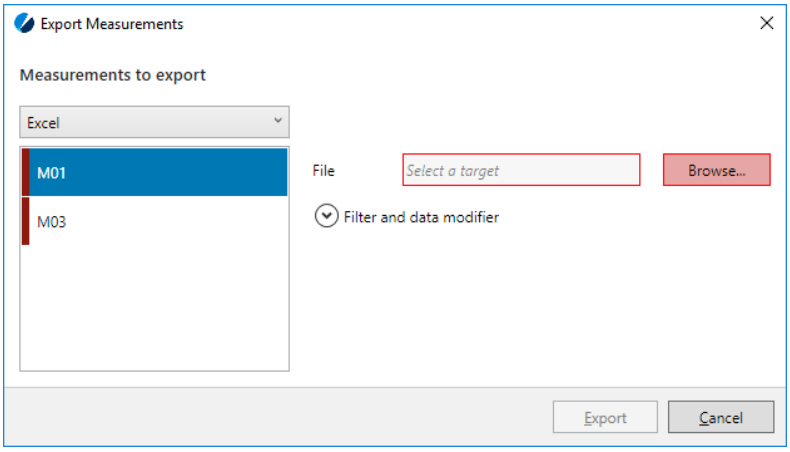


Fig. 62 Export dialog

3. Select the file type in the drop down menu on top (either **Excel** or **CSV** format). In case you select .csv format for a measurement containing O_2 and pH measurements, you can also select which analyte data you want exported by checking the box next to **pH File** or **O2 File**. Then choose a **Target** place for each measurement; by clicking **Browse** the file browser will open, and you can choose a destination folder for the file.

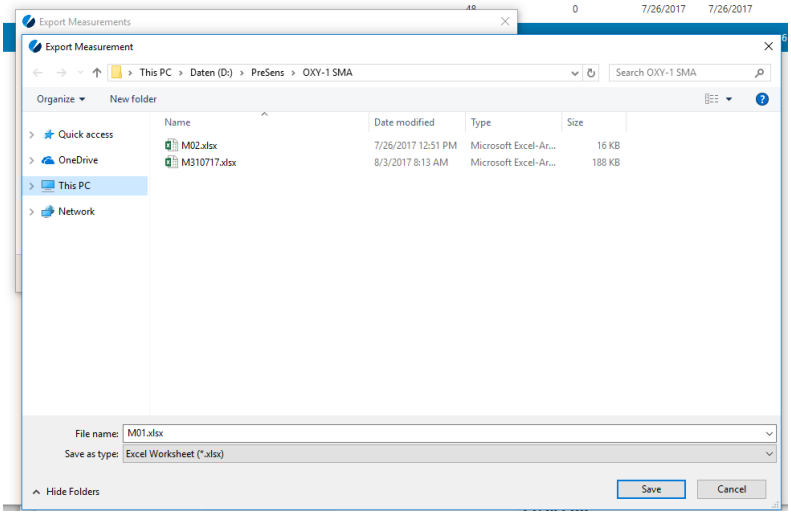


Fig. 63 File manager

4. Click on **Filter and data modifier** to open further export options.
   In the **Oxygen modifier** section, you can select an oxygen unit in which the O_2 measurements will be exported (values will be recalculated to the respective unit). You can click **Apply to all** to use this setting for all measurements selected for export.

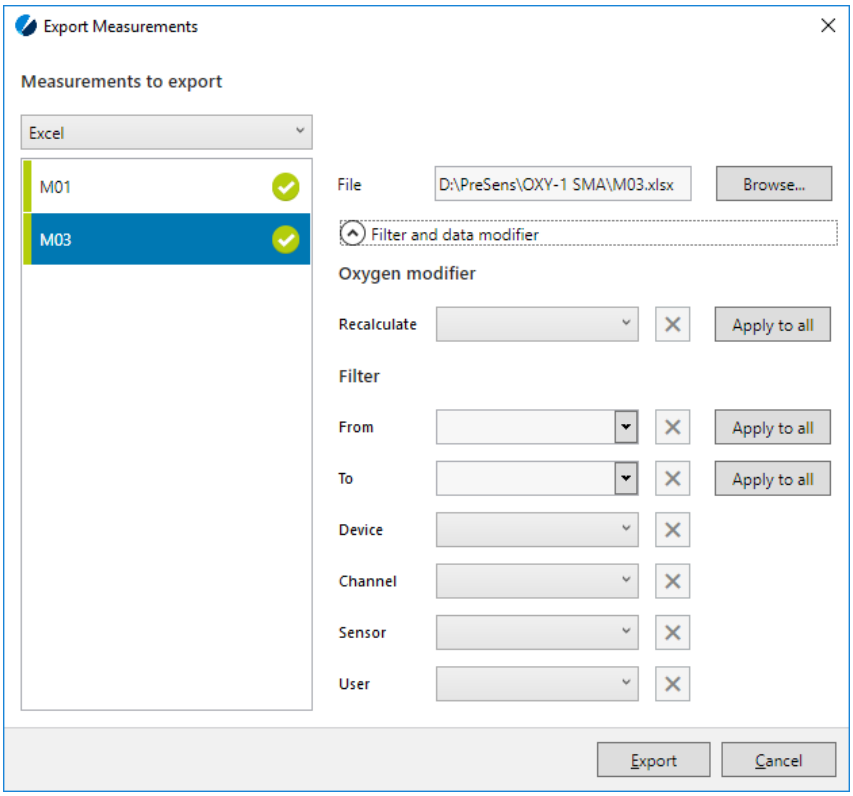


Fig. 64 Oxygen modifier: Recalculate the measurement data to another O_2 unit.

Furthermore, it is possible to narrow or adjust the measurement data in the listed measurement files by applying filters:

- Date Range – only measurement data recorded between a range (From / To) of dates; click **Apply to all** to use this setting for all measurements selected for export
- Device – only measurement data recorded with the selected device are displayed
- Channel – only measurement data recorded with a certain channel of the previously selected device
- Sensor – only measurement data recorded using the selected sensor
- User – only measurement data from a certain user

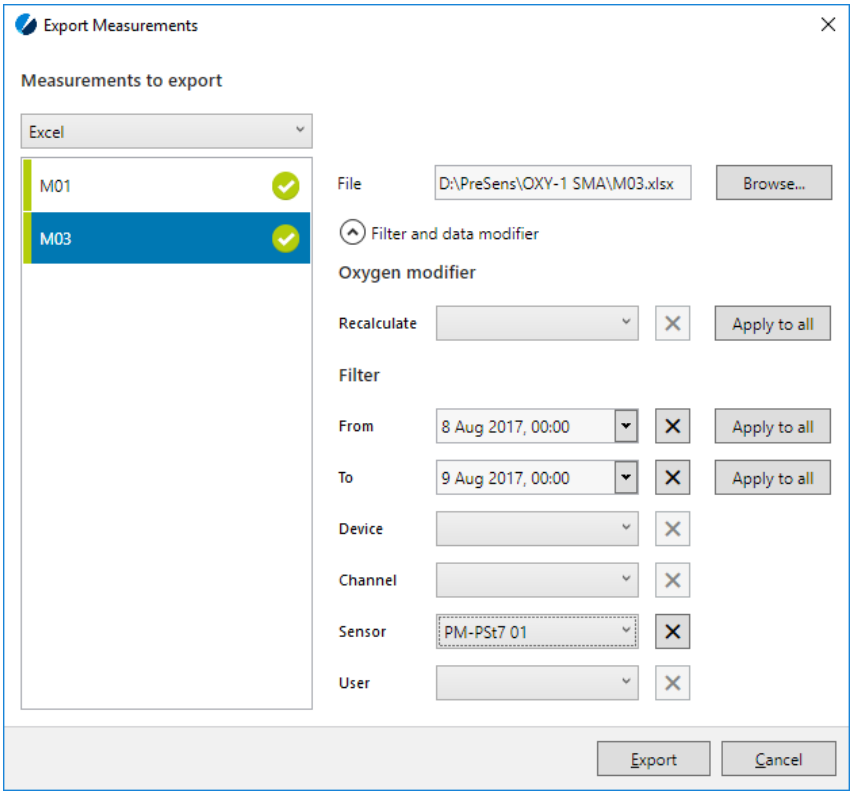


Fig. 65 Apply filters

5 General Software Settings

On the top right side of the software window you can find the **Settings** button. In the **Settings** dialog you will be able to manage the following features:

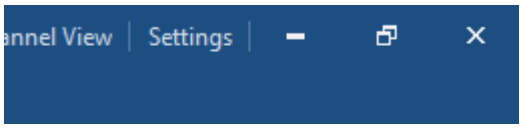


Fig. 66 Settings button on the top right

5.1 Common

In the **Common** section of the settings dialog, you can change the visualization of the **Graphs** either to absolute or relative time values by selecting / unselecting the checkbox.

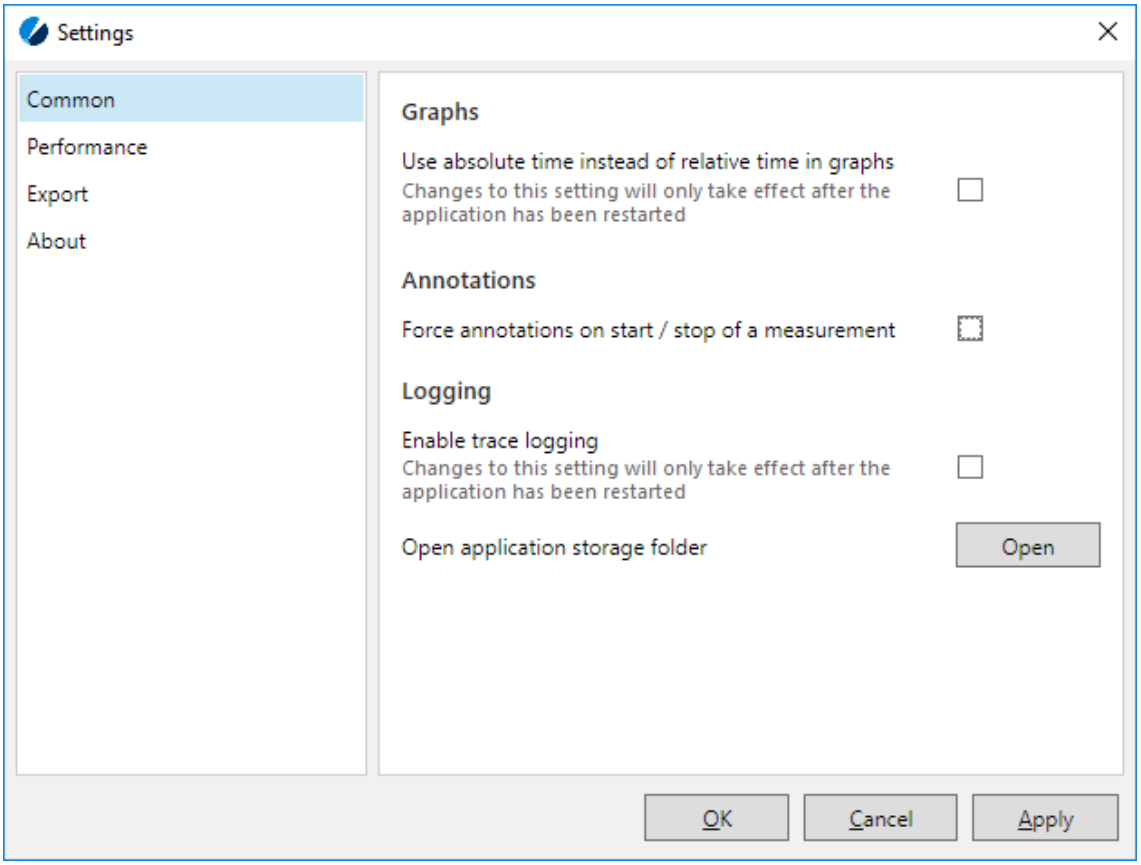


Fig. 67 Common software settings

If you wish to add an annotation to a measurement whenever it is started, paused or stopped check the box for **Annotations**. The annotations dialog will open automatically at any of these events, so the user is forced to enter a comment.

Furthermore, you can activate **Trace Logging**. Trace Logging enables the software to record the internal actions and possible errors produced by handling the software into a log file. Keep it unchecked; only use it for troubleshooting with PreSens Customer Service.

! The data you produce as a result of your experiments is NOT collected in this log file.

To access this file you can click the **Open** button and the folder where it is stored will be opened.

! You will have to restart the software to apply the changes.

5.2 Performance

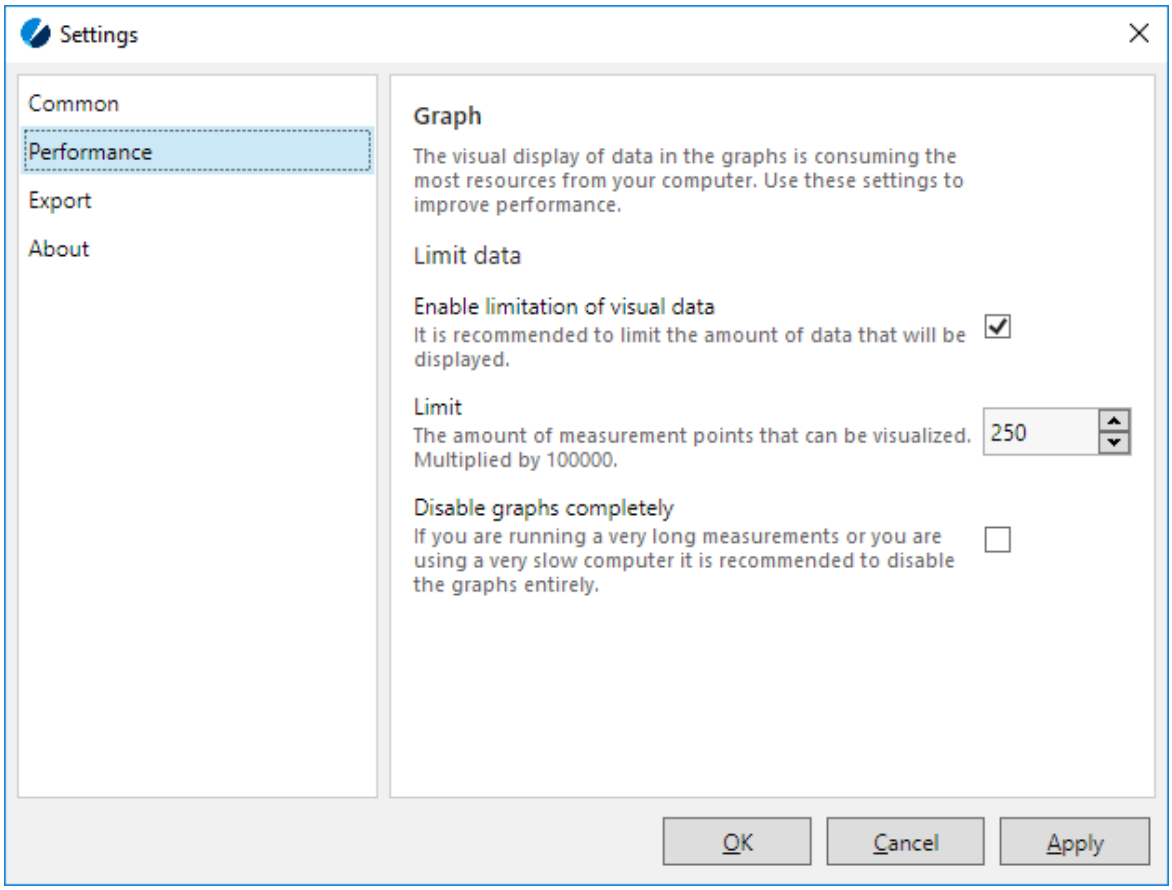


Fig. 68 Performance settings

As the visual display of the graphs is consuming most resources further settings for the graphical display can changed to enhance the performance of the software on your computer.

You have the option to **Limit** the data that is shown in the graphs to a certain amount of measurement points. Type in the number of measurement points you want visualized in the input field.

Furthermore, you can **Disable graphs completely**, if you are performing long-term measurements (several weeks with fast sampling rate) or your computer is very slow. This way the performance can be enhanced.

5.3 Regional Settings & Export Options

Measurement points can be exported as a .csv file. In order to select which kind of format fits your system please select one of the following options:

- Use your Windows configuration: Column delimiter and decimal point are set according to your Windows Region & language settings.
- **Use english settings (en-US)**: Check the box as in the following example (Fig. 69) – the **Column delimiter** is set to “comma” and **Decimal point** to “point” with disregard of your Windows Region & language settings.

Furthermore, measurement data for separate channels is stored on individual sheets in the Excel file. If you do not wish to have the data separated on individual sheets deselect the checkbox.

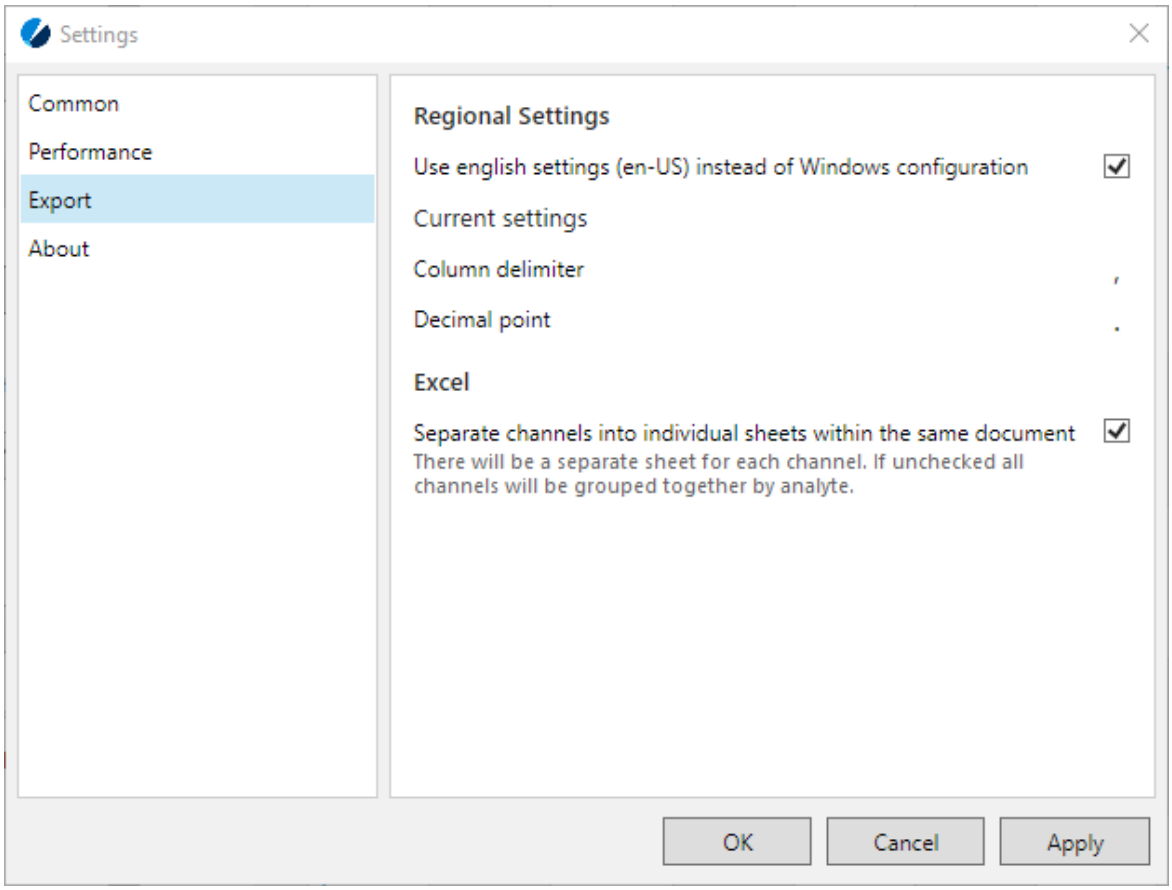


Fig. 69 Regional Settings

5.4 About

In the **About** section you can find all software related information including the software version.

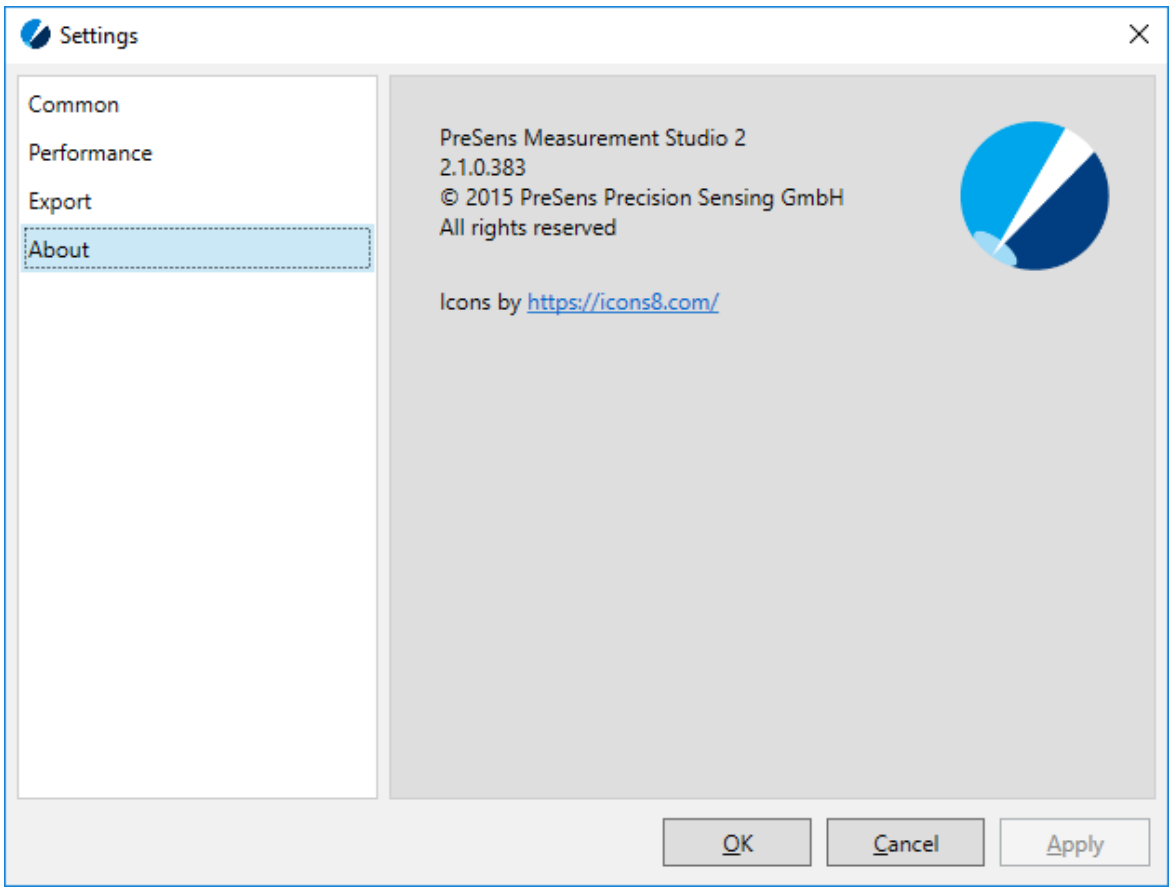


Fig. 70 About – general information about the software

6 Error Notifications

Error Notification	Error	Troubleshooting
No PT100	No temperature sensor connected or its signal is too low	Connect a temperature sensor or check sensor connection for any irregularities.
No sensor detected	No sensor connected or its signal is too low	Connect a sensor or check sensor connection and POF for any irregularities.
Amplitude too low	Amplitude < 3000 µV	Connect a sensor, increase the signal intensity or replace the connected sensor.
Reference amplitude out of range	Reference signal exceeds specific range	Contact our service team!
Photo diode saturation	Too much ambient light or signal amplitude too high	Reduce ambient light or signal intensity
ACD overflow (Reference)	Too much ambient light or reference amplitude too high	Reduce ambient light or signal intensity
ACD overflow (Signal)	Too much ambient light or signal amplitude too high	Reduce ambient light or signal intensity
PME error		Contact our service team!
SD card full		Delete measurement data from SD card of device
SD card failure		Contact our service team !

7 Concluding Remarks

Dear Customer,

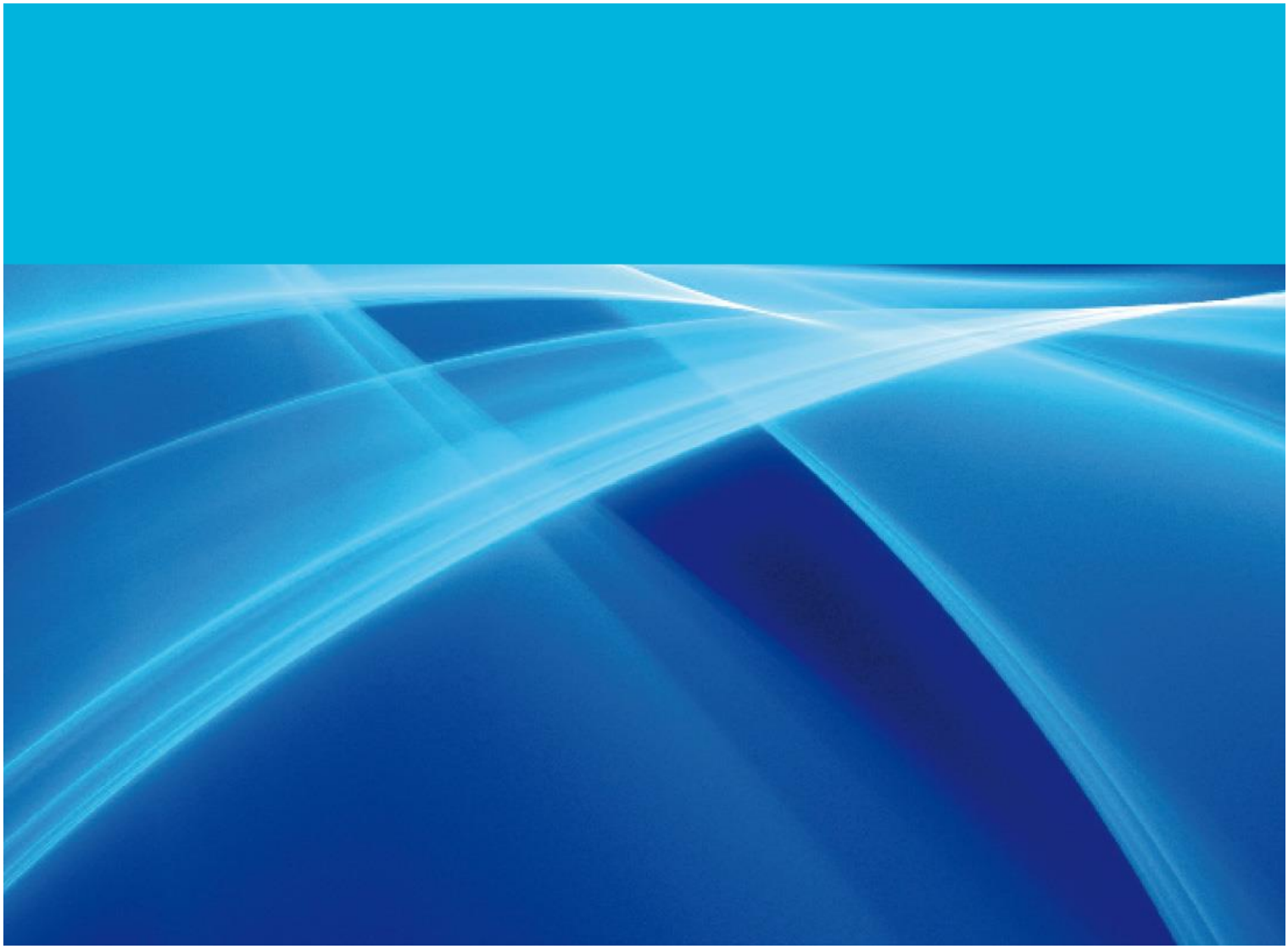
With this manual, we hope to provide you with an introduction to work with the PreSens Measurement Studio 2 software for controlling your O_2 measurements.

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.

With best regards,

Your PreSens Team



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