

PreSens Measurement Studio 2

SOFTWARE

● Instruction Manual



PreSens
PRECISION SENSING

PreSens Measurement Studio 2

Software

Specification:

Software for PreSens measurement systems

Version 3.0.3

Document filename: IM_PMS2_dv4

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1 Preface

You have chosen a new, innovative technology for measuring oxygen, pH & CO₂.

PreSens measurement devices are developed especially for small fiber optic 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 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 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

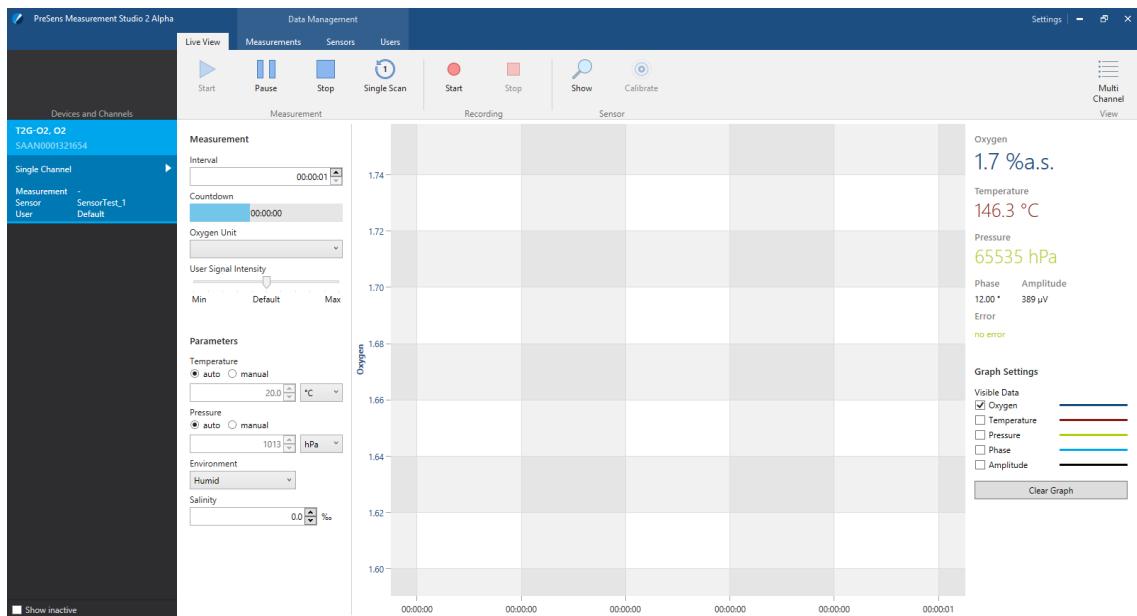


Fig. 1 PreSens Measurement Studio 2 software: Live View.

The PreSens Measurement Studio 2 has been developed and designed to control several PreSens O₂, pH & CO₂ 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 measurements with a multitude of devices simultaneously.

2.1 System requirements

Tab. 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
Hard disk	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 Devices

- OXY-1 SMA / ST (trace) Single Channel
- OXY-2 / -3 / -4 / -10 ... SMA / ST (trace) Multichannel
- OXY-1 SMA-RS232-AO
- OXY-4 SMA (G3)
- EOM-FDM 2.0
- EOM-(t)O2-FDM-ST
- EOM-(t)O2-FOM
- Fibox 4 (trace)
- Microx 4 (trace)
- pH-1 SMA
- CO2-1 SMA
- O3P1

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.

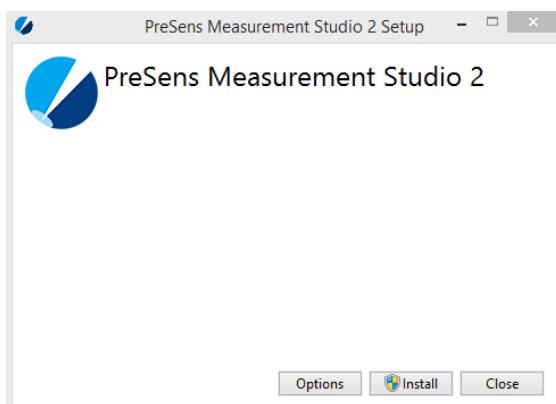


Fig. 2 PreSens Measurement Studio 2 Setup: Start installation

4. The **PreSens Measurement Studio 2 Setup** dialog 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.

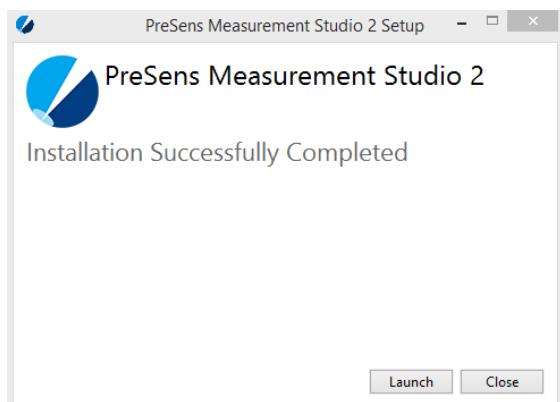


Fig. 3 Launch the software after successful installation

4 Operation

4.1 Starting the Software

1. Connect the PreSens oxygen, pH and / or CO₂ meters to USB ports 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 respective 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 meters are shown in the **Devices and Channels** section.

! Please check all connections in case the software does not detect the devices. See also chapter 5.5 "Troubleshooting".

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.

Disable USB selective suspend:

If you are working with Windows 10, follow these steps to deactivate automatic power saving options for USB:

1. Open the **Control Panel**.
2. Select **Hardware and Sound**.
3. Click on **Power Options**.
4. Click **Change plan settings** under “Preferred plan”. (Make the following changes to the currently active plan on your PC / laptop.)

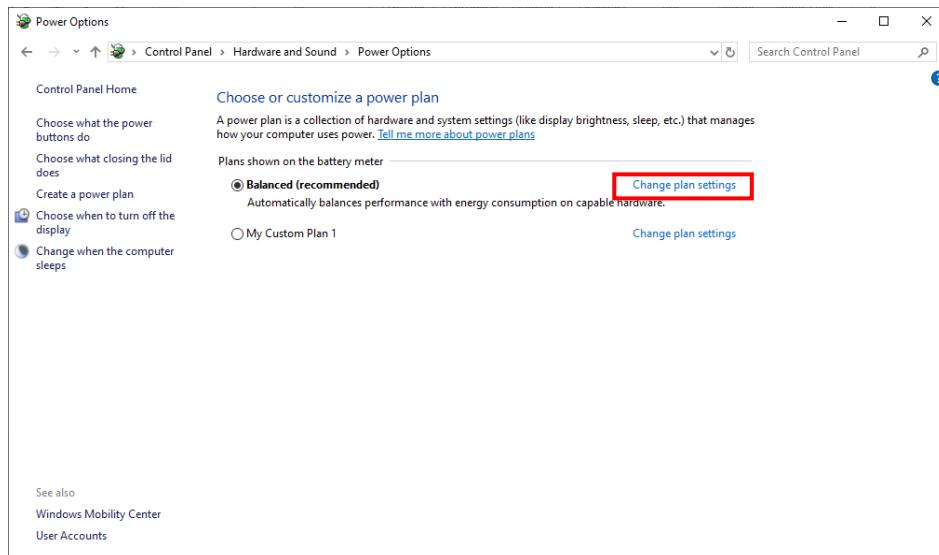


Fig. 4 Control Panel: Power Options

5. Click the **Change advanced power settings** link.

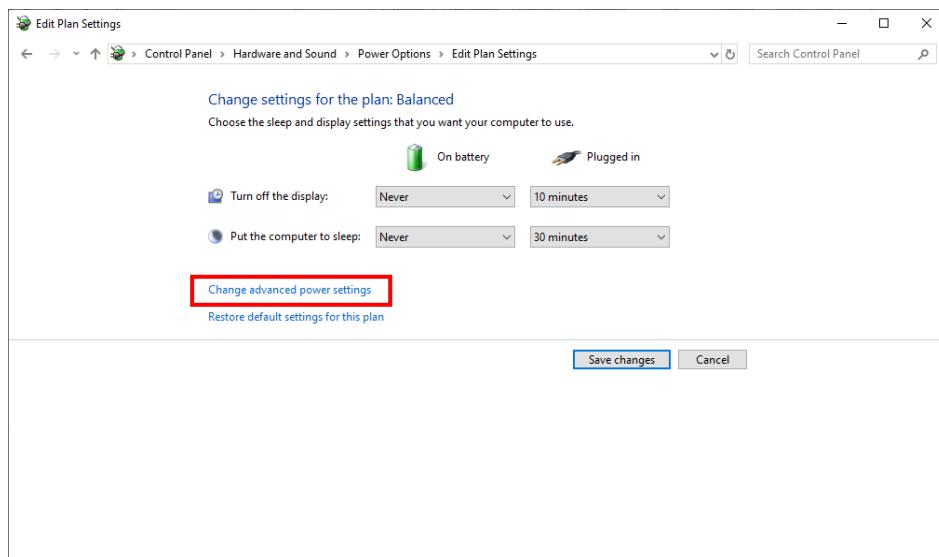


Fig. 5 Control Panel: Edit Plan Settings

6. Expand **USB settings**.
7. Expand **USB selective suspend settings**.
8. Select **Disable** from the drop-down menu. (If you are working with a laptop or tablet, you have to select Disable in both options – **On Battery** and **Plugged in**.)

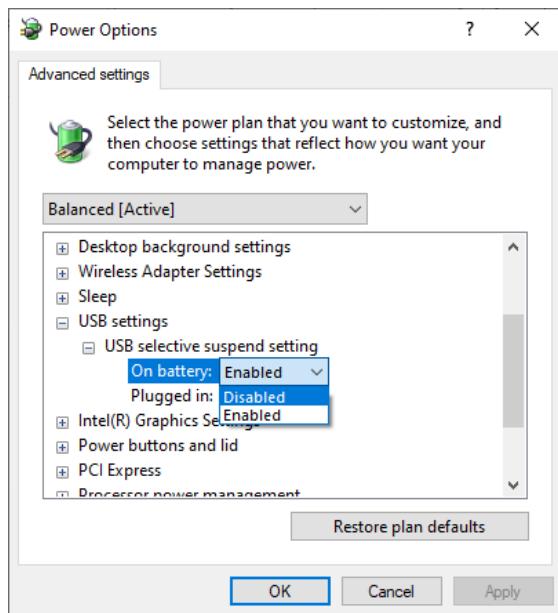


Fig. 6 Power Options: Disable USB selective suspend

Windows 10 will no longer power off USB devices connected to your computer.

4.3 Software Structure

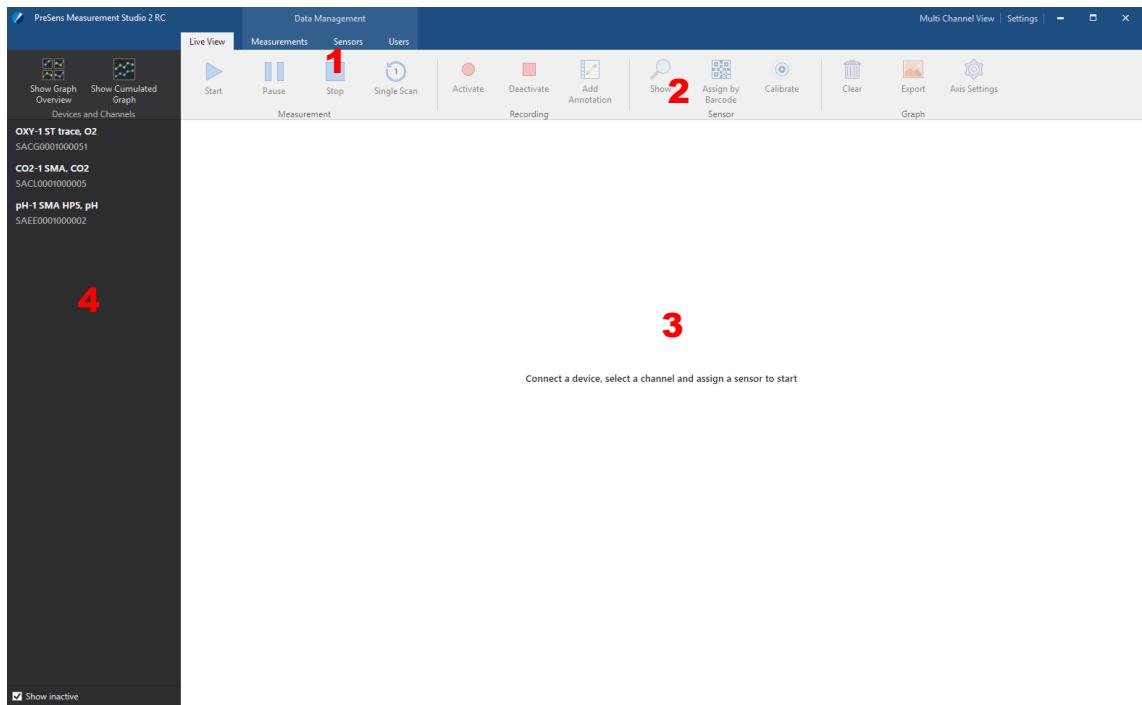


Fig. 7 Software structure; here Live View tab selected

1. **Main menu (tabs):** Each tab is accessible at any time during the operation of the software. They give access to the corresponding data and functions.
2. **Control panel:** 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 (**O₂**), red (**pH**) or green (**CO₂**) 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.

In case you want to select several devices at once and operate those simultaneously, please switch to Multi Channel View, described in chapter 4.9.3.

Devices and Channels	Devices and Channels	Devices and Channels
OXY-1 ST trace, O₂ SACG0001000051	OXY-1 ST trace, O₂ SACG0001000051	OXY-1 ST trace, O₂ SACG0001000051
Single Channel	CO ₂ -1 SMA, CO ₂ SACL0001000005	CO ₂ -1 SMA, CO ₂ SACL0001000005
Measurement - Sensor Sensor O ₂ User default	Single Channel	pH-1 SMA HP5, pH SAEE0001000002
CO ₂ -1 SMA, CO ₂ SACL0001000005	Measurement - Sensor Sensor CO ₂ User default	Single Channel
pH-1 SMA HP5, pH SAEE0001000002	pH-1 SMA HP5, pH SAEE0001000002	Measurement - Sensor Sensor pH User default

Fig. 8 OXY-1 ST trace selected

CO₂-1 SMA selected

pH-1 SMA selected

The other devices are automatically deselected and their 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 channels**. The channels will be deactivated and marked as **inactive**.

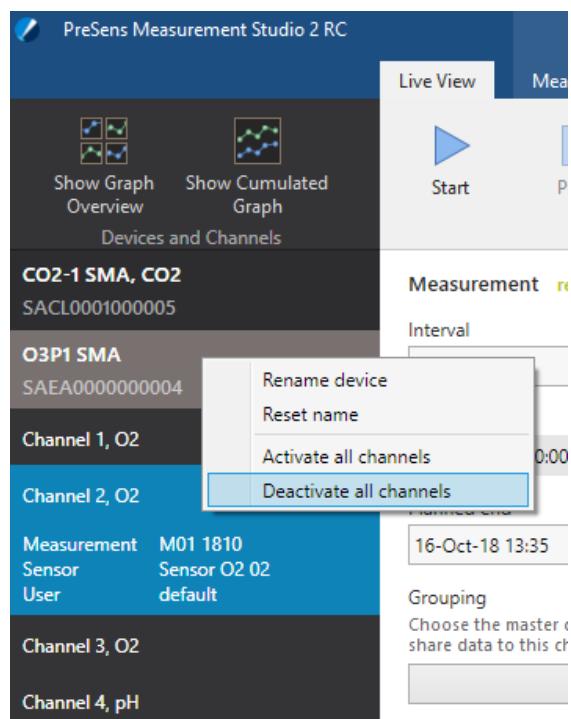


Fig. 9 Deactivating all channels of an O3P1

SACL0001000005
O3P1 SMA
SAEA0000000004
Channel 1, O2 inactive
Channel 2, O2 inactive
Channel 3, O2 inactive
Channel 4, pH inactive

Fig. 10 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.

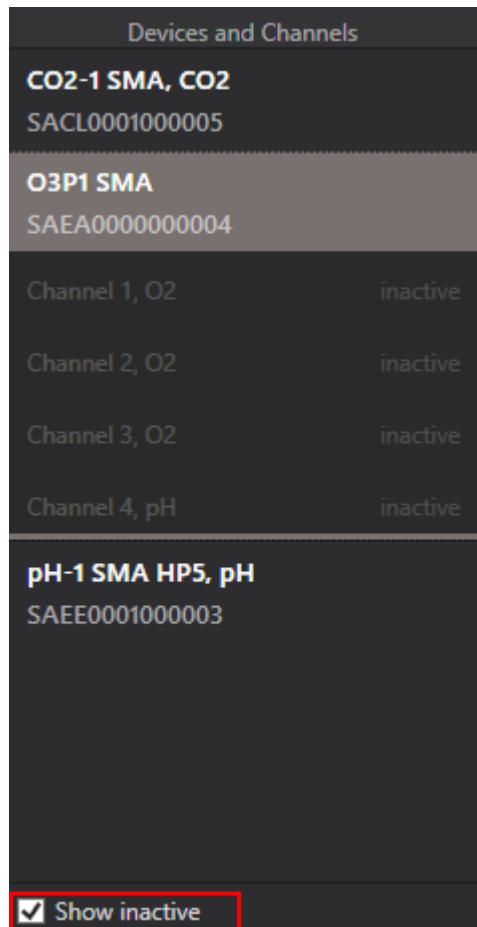


Fig. 11 Use show inactive to display / hide deactivated channels

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.

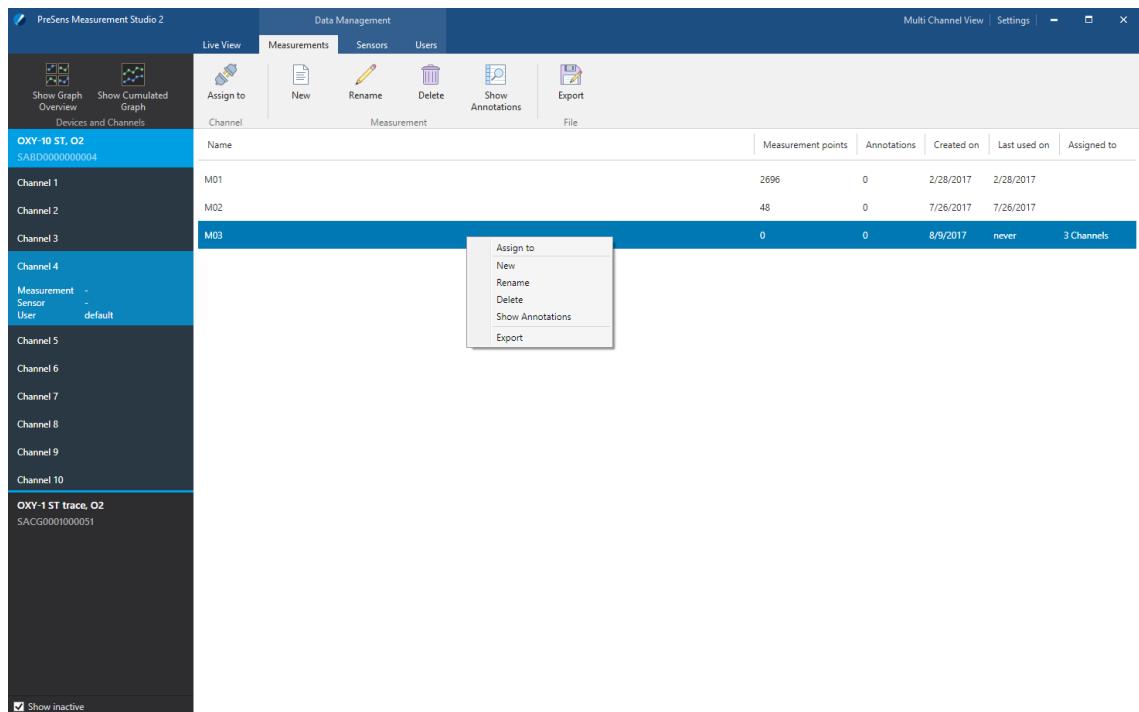


Fig. 12 Measurement Tab: Right click on a measurement opens a list of control functions

You can perform the following actions either by clicking on the corresponding icon in the control panel 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 later on recording of measurement points 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: Opens 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 only be assigned to 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.

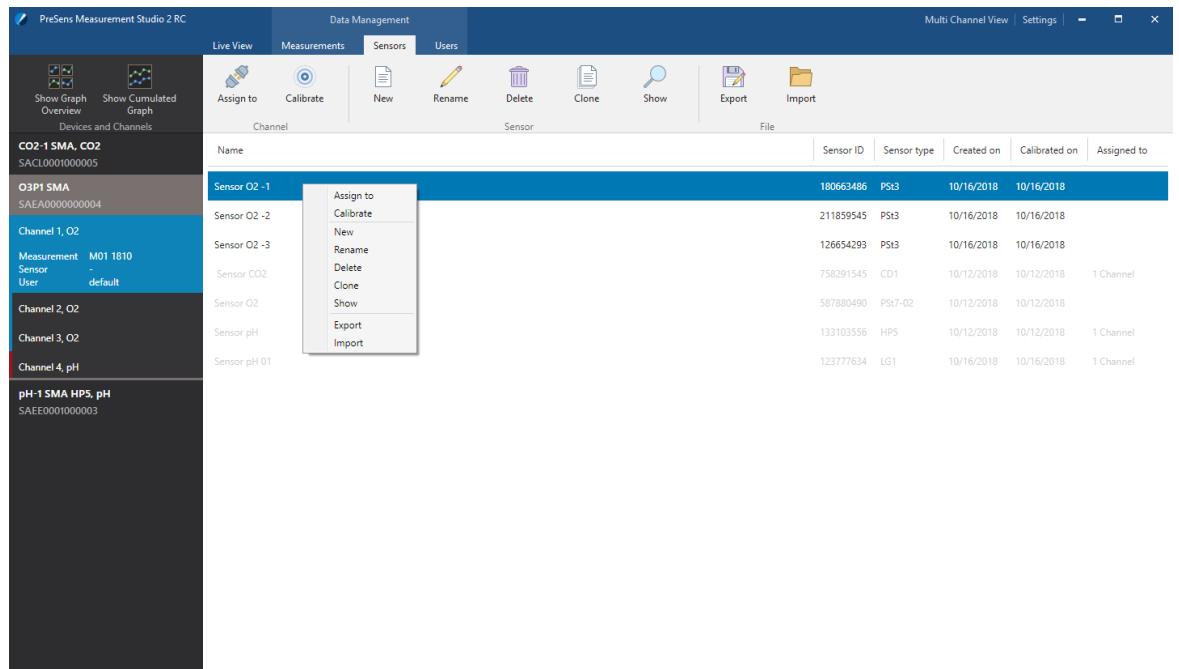


Fig. 13 Sensors Tab: Right click on a Sensor opens a list of control functions

You can perform the following actions either by clicking on the corresponding icon in the control panel 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: Recalibrate the selected sensor.

Please refer to chapter 4.6.3 (for O₂), 4.6.4 (for pH) or 4.6.5 (for CO₂).

New: Create a **New** sensor. This will open a dialog in which sensor data can be entered. Please follow the instructions in 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 you do not have to enter it multiple times.

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

Export: Export the selected sensor's data as OR code.

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.

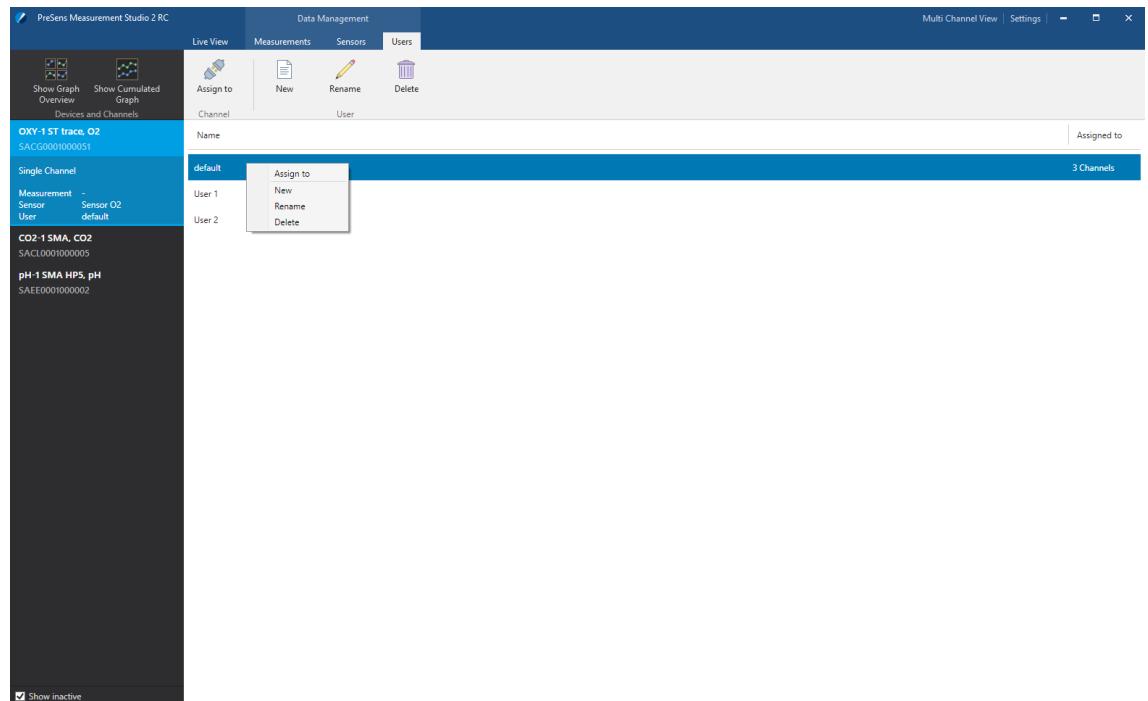


Fig. 14 Users Tab: Right click on a User opens a list of control functions

You can perform the following functions either by clicking on the corresponding icon in the control panel 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.

Name	Sensor ID	Sensor type	Created on	Calibrated on	Assigned to
161206_458	939513588	PSt7-02	12/6/2016	12/6/2016	
161206_458_1	602007319	PSt7-02	12/6/2016	12/6/2016	
161206_458_2	131140248	PSt7-02	12/6/2016	12/6/2016	
161206_458_3	180319039	PSt7-02	12/6/2016	12/6/2016	
161206_458_4	196121448	PSt7-02	12/6/2016	12/6/2016	
161206_458_5	172845307	PSt7-02	12/6/2016	12/6/2016	
Sens_151209	176992192	PSt7-10	12/6/2016	12/6/2016	
Sens_151209_1	125983655	PSt7-10	12/6/2016	12/6/2016	
Sens_151209_2	182119680	PSt7-10	12/6/2016	12/6/2016	
Sens_151209_3	942707679	PSt7-10	12/6/2016	12/6/2016	
Sens_151209_4	449741195	PSt7-10	12/6/2016	12/6/2016	
ps13_cmy1	520363154	PSG3	12/6/2016	12/6/2016	

Name	Sensor ID	Calibrated on
NFSG_1	42036	6/18/2015
SENSOR1	51809	1/8/2015
160621_006	121025	6/24/2016
Sens_151209_1	125983655	12/6/2016
Sens_151209_2	182119680	12/6/2016

Fig. 15 Measurement management with Microx 4

Control buttons in the middle of the main screen 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.

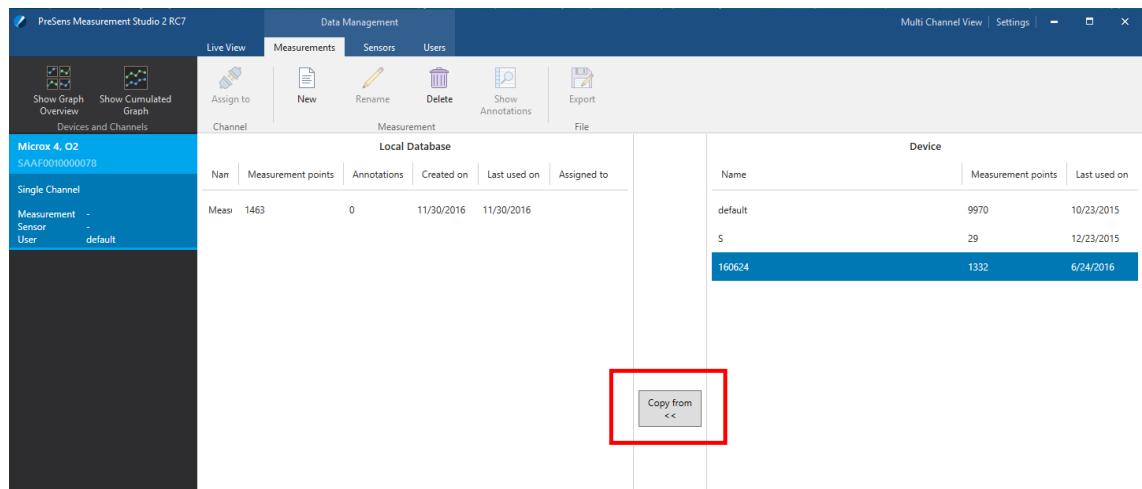


Fig. 16 Selected measurement in the Device section – click Copy from

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**.

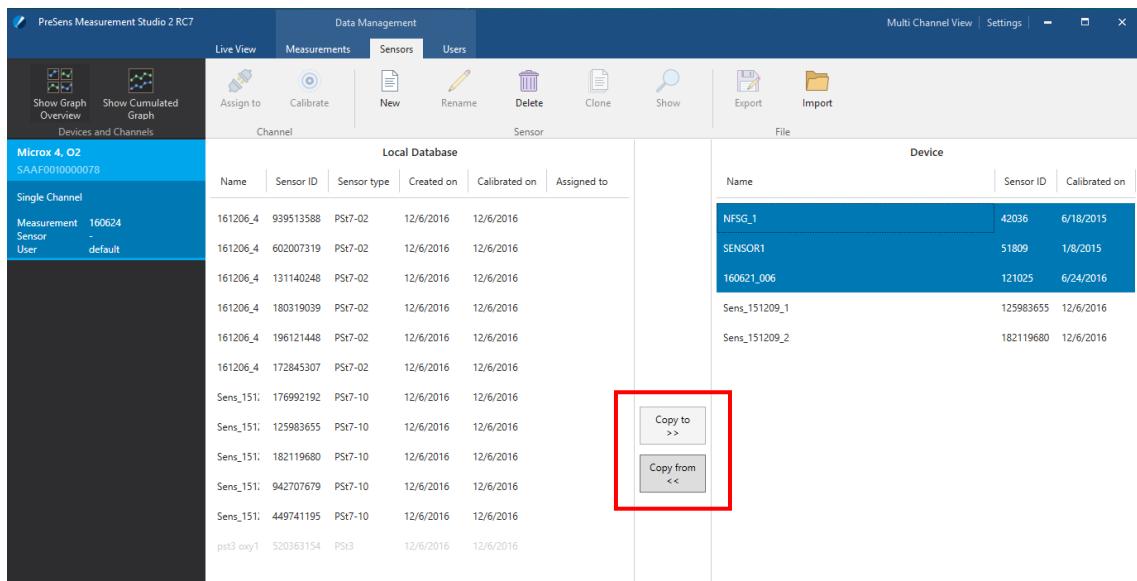


Fig. 17 Selected sensors in the Device section – click Copy from

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**.

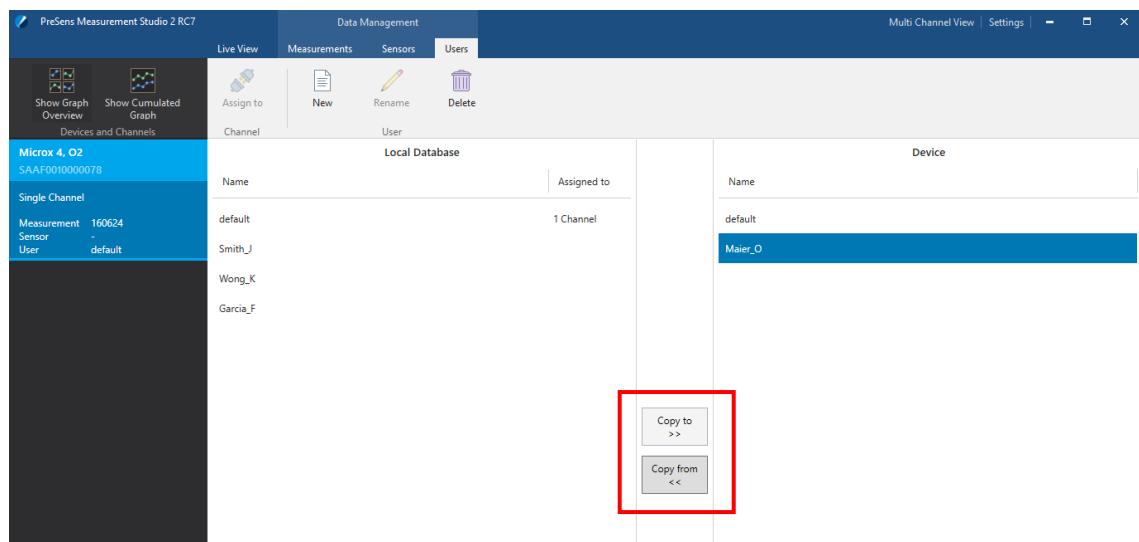


Fig. 18 Selected user in the Device section – click Copy from

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 will be displayed.

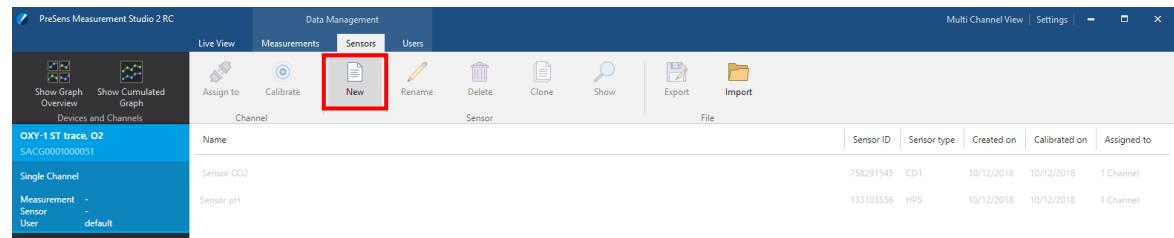


Fig. 19 Create a new sensor

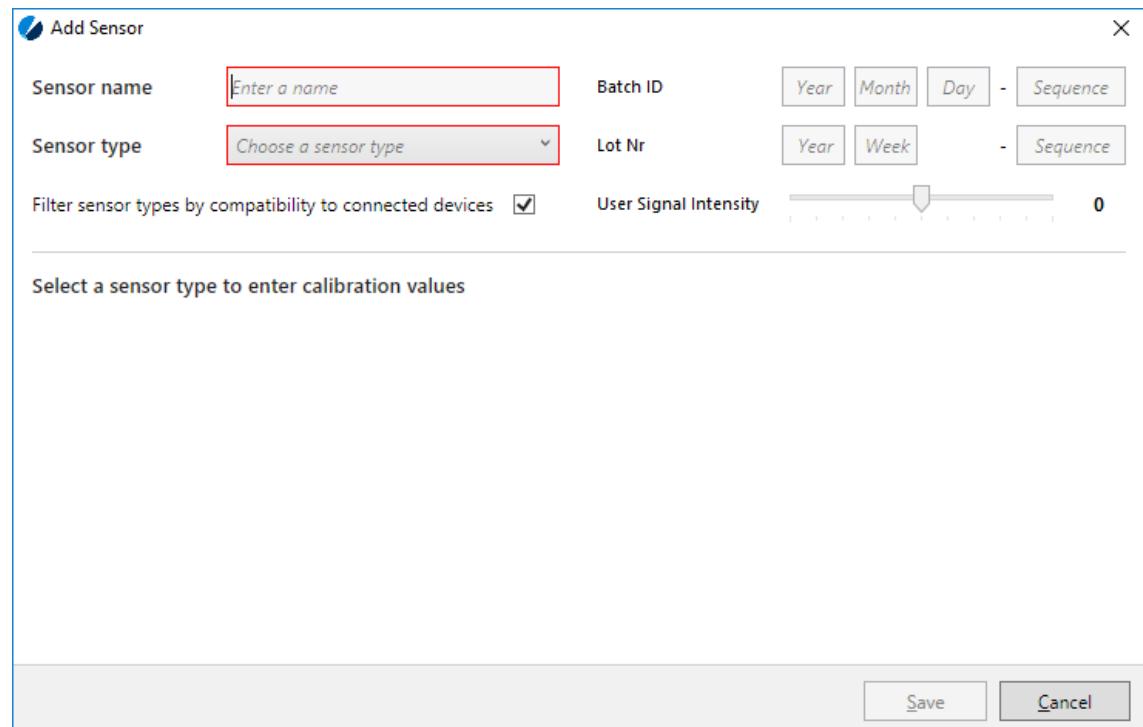


Fig. 20 Add Sensor dialog

The screenshot shows a dialog box titled 'Add Sensor'. It contains three main input fields: 'Sensor name' with a placeholder 'Enter a name', 'Sensor type' with a dropdown menu showing 'Choose a sensor type', and a checkbox labeled 'Filter sensor types by compatibility to connected devices' which is checked. The entire dialog box is highlighted with a red border.

Fig. 21 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 connected devices can be picked from the **Sensor type** drop down menu. The **Calibration Data** and **Sensor Constants** input fields (showing default values) will be displayed.

The screenshot shows the 'Add Sensor' dialog box with more detailed settings. The 'Sensor name' is set to 'Sensor O2', 'Sensor type' is 'PSt7-02', and the 'User Signal Intensity' is set to 0. The 'Batch ID' and 'Lot Nr.' sections show dropdown menus for 'Year', 'Month', 'Day', 'Week', and 'Sequence'. The 'Filter sensor types by compatibility to connected devices' checkbox is checked. The 'Calibration Data' section includes fields for pATM (964), pATM Unit (hPa), Mode (Humid), Cal0 (55.34), T0 (20.0), T0 Unit (°C), Cal2nd (21.61), T2nd (20.0), T2nd Unit (°C), and O2-Cal2nd (100.000). The 'Sensor Constants' section includes fields for f1 (0.883), dPhi1 (-0.01524), dKSV1 (0.000303), m (18.45), dPhi2 (0), and dKSV2 (0.00). At the bottom are 'Save' and 'Cancel' buttons.

Fig. 22 Enter Calibration Data and Sensor Constants of your sensor (here: oxygen sensor)

4. Enter the **Sensor Constants**.

- !** You can find the sensor constants and calibration data on the Final Inspection Protocol delivered with your sensor.
- !** In case there are no sensor constants stated on the FIP, please use the sensor constants default values given in the software.

5. Enter the **Calibration Data**. Change the calibration values to the values stated in the grey highlighted boxes on the sensor's Final Inspection Protocol:**Tab. 2** Calibration data given on the FIP for O₂, pH or CO₂ sensors

For O ₂	For pH	For CO ₂
Mode (Dry / Humid)	pH_min (= lmin)	Cal_A1
Cal0	pH_max (= lmax)	Cal_A2
T0	pH_x0 (= pH0)	Cal_x0
Cal2nd	pH_dx (= dpH)	Cal_dx
T2nd	pH_temp (= Temeprature)	Cal_calT
O2-Cal2nd		Cal_patm
pATM		

- !** Please note that for the O2-Cal2nd, pressure and temperature 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 a New Sensor from Barcode

Click on the **Import** icon in the control panel on the **Sensors** tab, and choose **Barcode** in the dialog that pops up.

(Alternatively, you can use the **Assign by Barcode** button on the Live View tab to scan the barcode of a new sensor (see chapter 4.7). The sensor will be assigned automatically to the selected channel.)

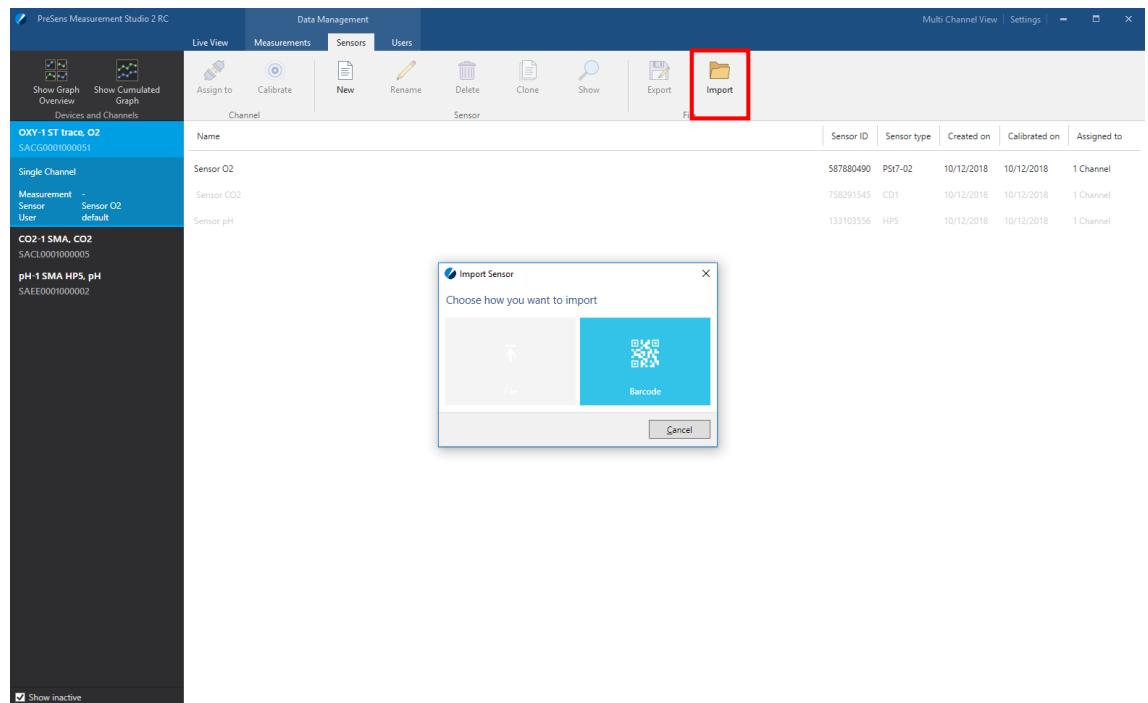


Fig. 23 Import Sensor dialog

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

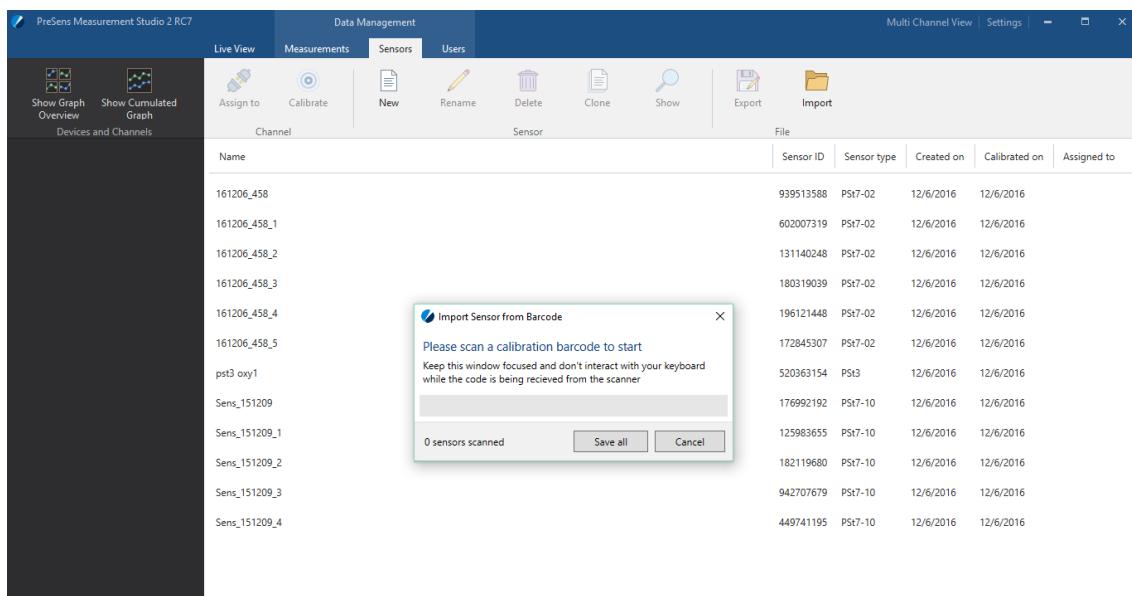


Fig. 24 Import Sensor from Barcode dialog - empty

! Please keep the dialog in focus, you can do that simply by clicking on any part of the dialog.

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.

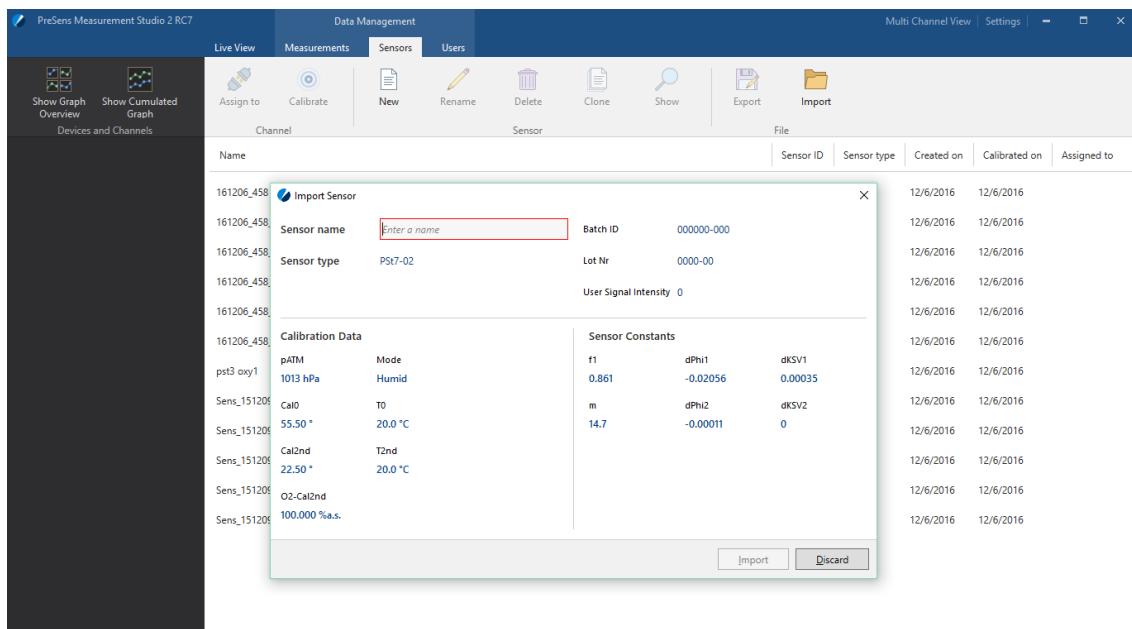


Fig. 25 Import Sensor – enter a sensor name

Repeat the process with as many sensors as you need. The import dialog will show a sensor count in the lower left

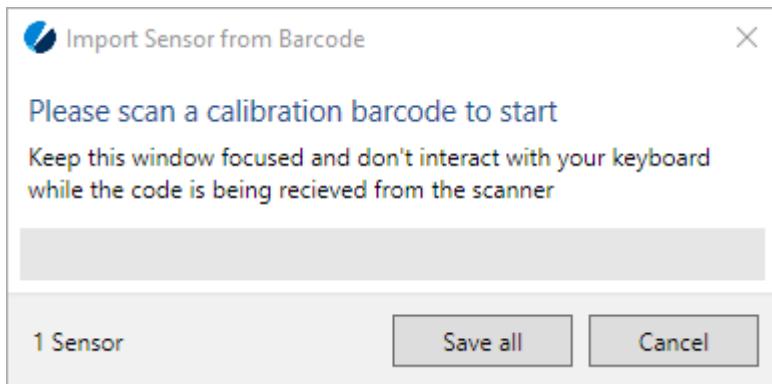


Fig. 26 Import Sensor from Barcode – 1 Sensor scanned

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

The imported sensors are shown in the list now.

A screenshot of the PreSens Measurement Studio 2 software interface. The top navigation bar includes "PreSens Measurement Studio 2", "Data Management" (selected), "Live View", "Measurements", "Sensors" (selected), and "Users". On the far right are "Multi Channel View", "Settings", and close/minimize/maximize buttons. The main area has tabs for "Devices and Channels" (selected) and "Sensor". Under "Devices and Channels", there's a section for "OXY-1 ST trace, O2" with "SACG0001000051" and a "Single Channel" section for "Measurement M03" with "Sensor NTH-PSI8 01" and "User default". Under "Sensor", the "Channel" tab is selected, showing a table of imported sensors. The table has columns: Name, Sensor ID, Sensor type, Created on, Calibrated on, and Assigned to. The table data is as follows:

Fig. 27 Imported sensor is displayed in the sensor list.

4.6.3 (Re-)Calibrate an O₂ Sensor

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

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

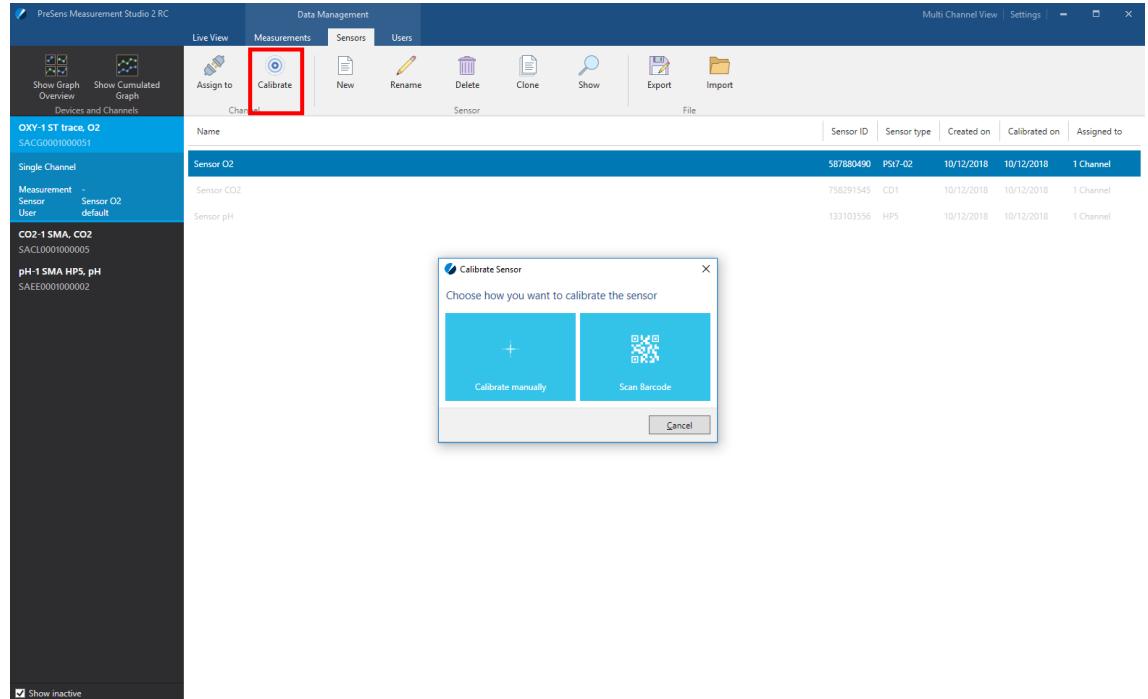


Fig. 28 Calibrate an existing oxygen sensor

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; additionally the **Current phase** values are displayed in a graph at the bottom.

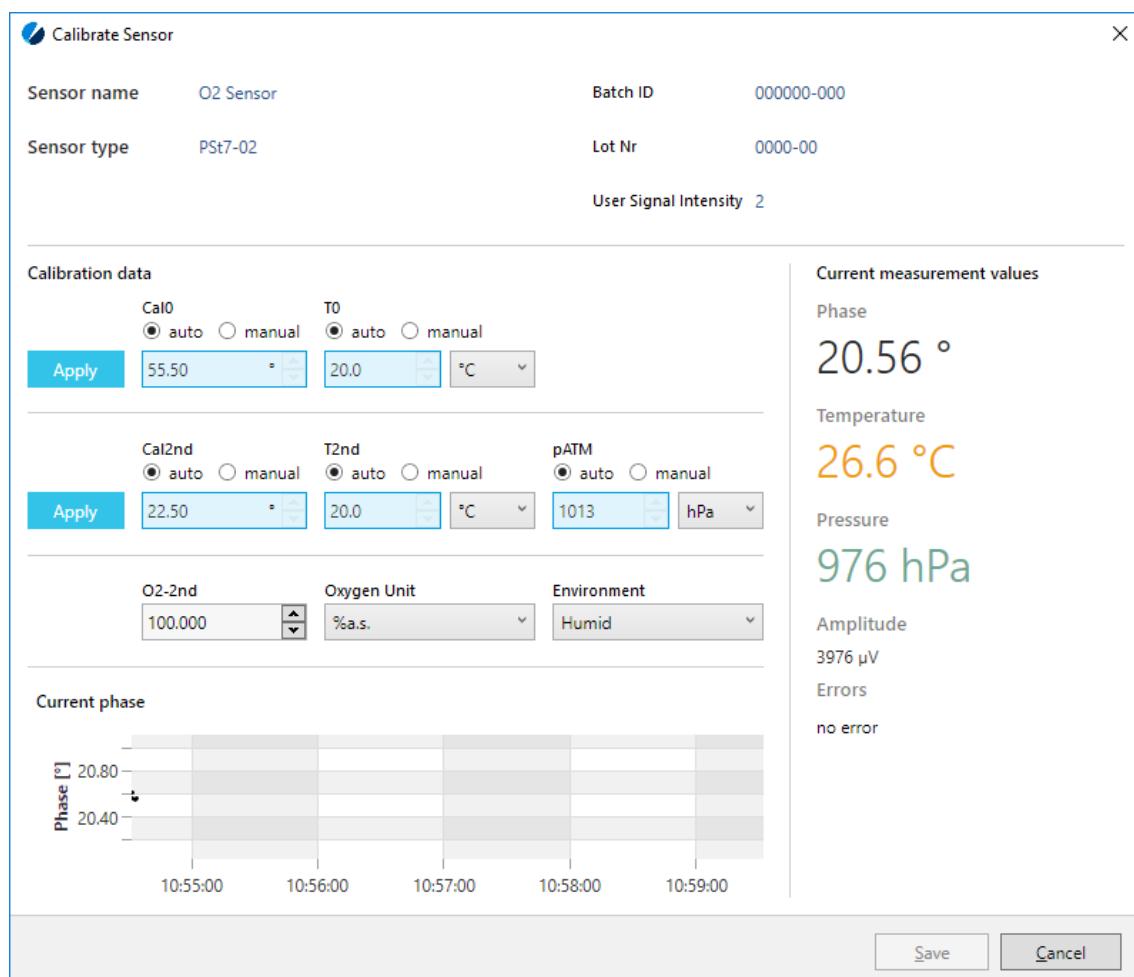


Fig. 29 Calibrate Sensor dialog

Calibration values can be entered manually (select the **manual** checkbox, see Fig. 30) in the respective input fields or collected from the device channel (select the **auto** checkbox, see Fig. 31) by using the **Apply** button next to the Cal0 or Cal2nd input fields. Use the **Current phase** graph to check when the phase values stabilize.

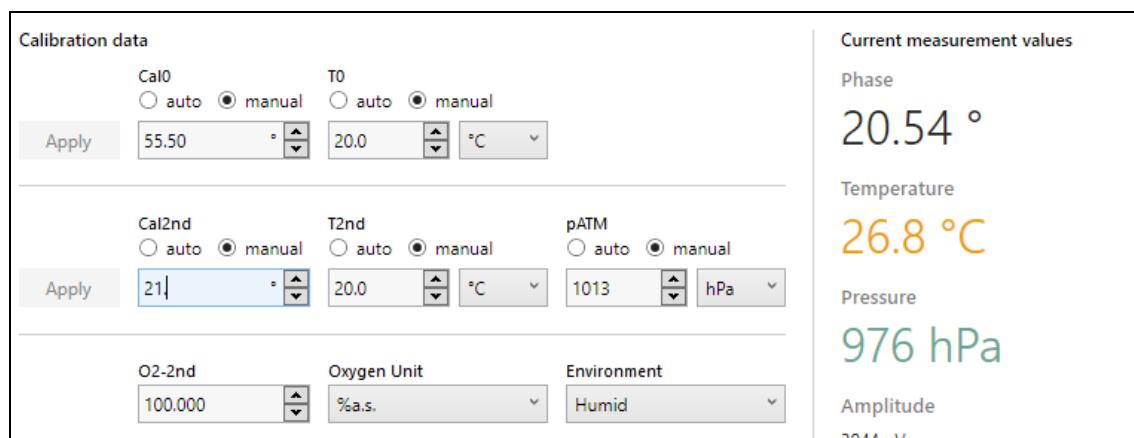


Fig. 30 Calibration data entry: Manual input of calibration values.

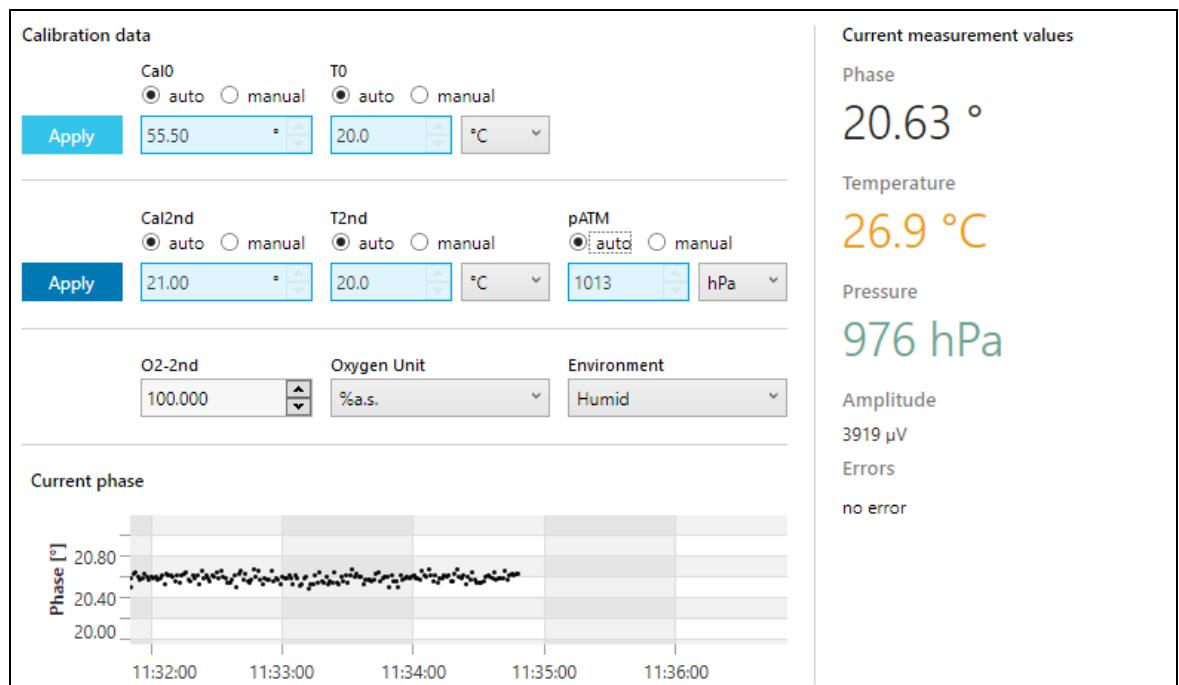


Fig. 31 Calibration data entry: Automatic data collection from the device.

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

4.6.4 (Re-)Calibrate a pH Sensor

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

4.6.4.1 pH One Point Adjustment

You can recalibrate an existing pH sensor with a **One point adjustment** by assigning it to a connected device's channel and clicking on the **Calibrate** icon in the control panel of the Live View or the Sensors tab.

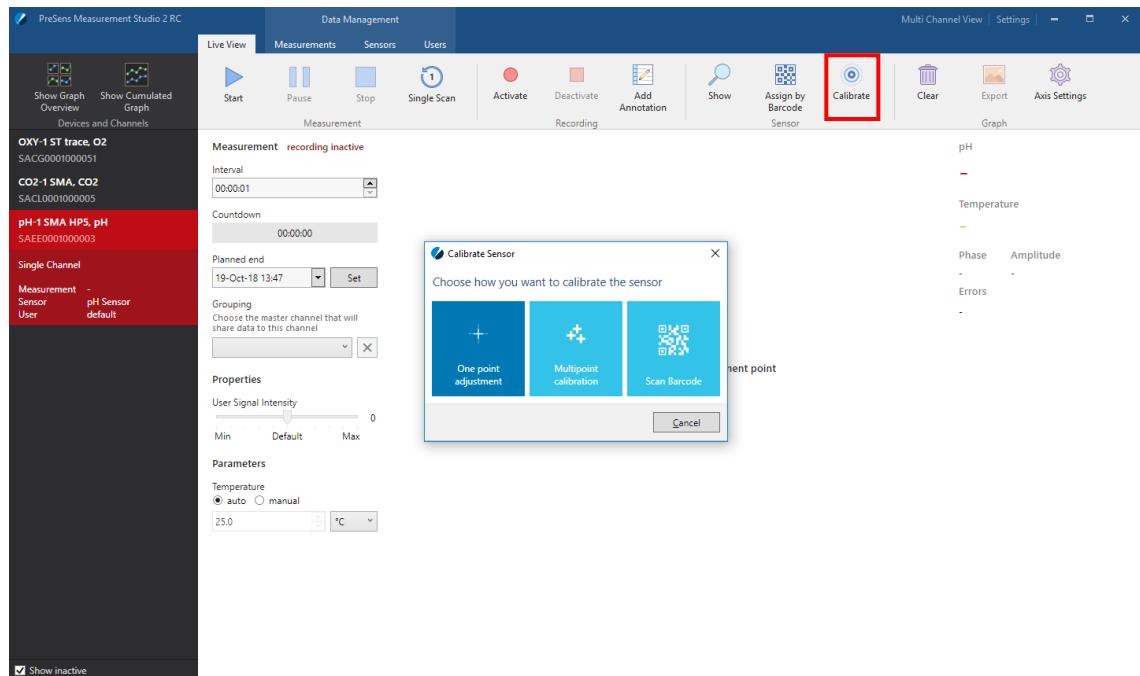


Fig. 32 Calibrate an existing pH sensor – One point adjustment

Settings for the calibration temperature have to be made on the **Live View** tab before the one point adjustment is started. Select **manual**, if the calibration temperature is known, and enter the value in the **Temperature** input field, or select **auto** to measure the temperature with a connected temperature sensor.

Then click on **Calibrate > One point adjustment** 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.

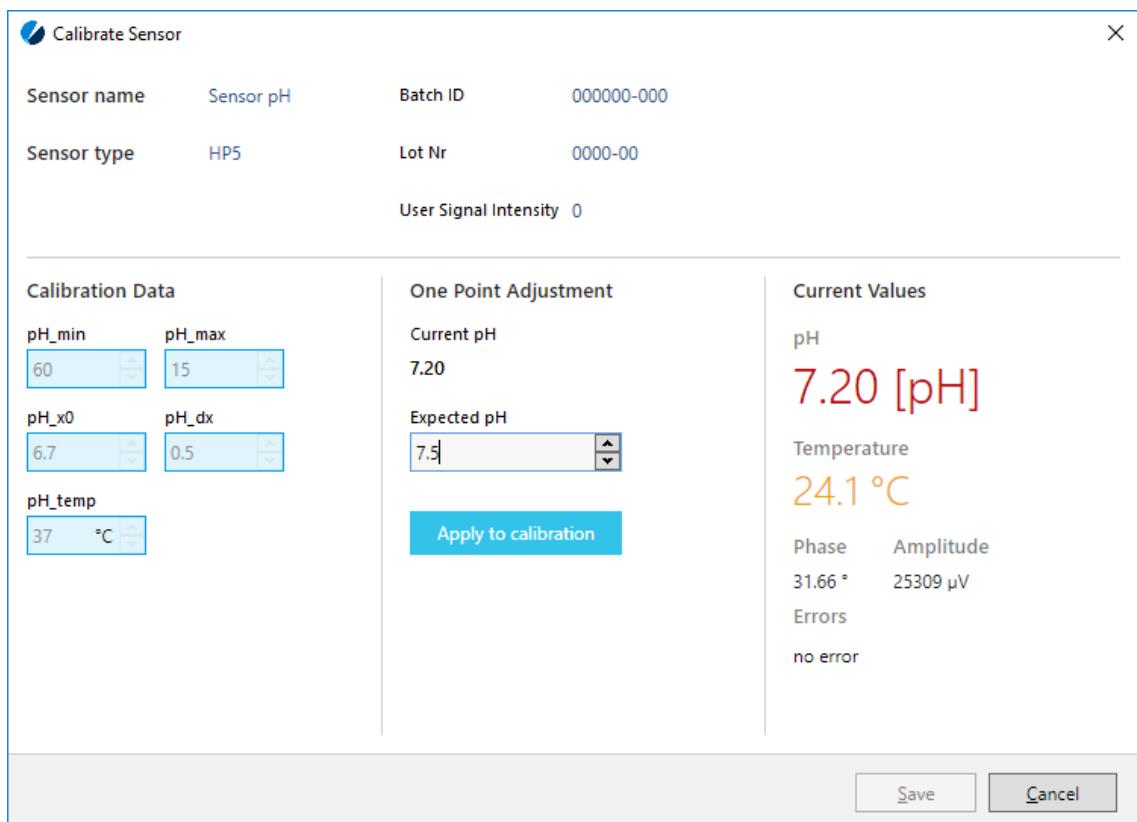


Fig. 33 One point adjustment

Wait until the phase values have stabilized, enter the **Expected pH** value (known pH of the calibration solution the sensor is placed in) and click **Apply to calibration**. The sensor's calibration data will be recalculated accordingly.

4.6.4.2 pH Multipoint Calibration

A multipoint calibration is required to obtain best accuracy. It is necessary especially when working with difficult samples, e.g. with background fluorescence, or after sensor treatment like gamma irradiation.

A multipoint re-calibration is recommended to ensure precise measurements. The pH meter and sensor can only perform optimally by recalibrating the meter in combination with the sensor.

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

You can recalibrate an existing pH sensor with a **Multipoint calibration** by assigning it to a connected device's channel and clicking on the **Calibrate** icon in the control panel of the **Live View** or the **Sensors** tab.

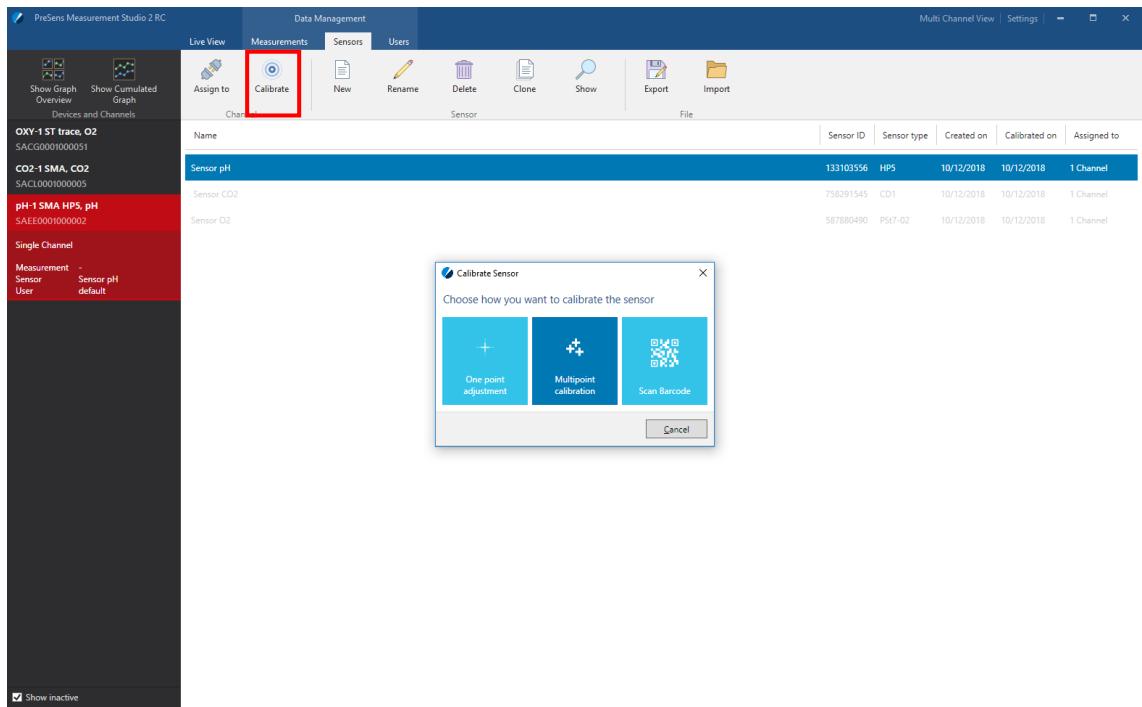


Fig. 34 Calibrate an existing pH sensor – Multipoint calibration

Click on Multipoint calibration and the respective 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.

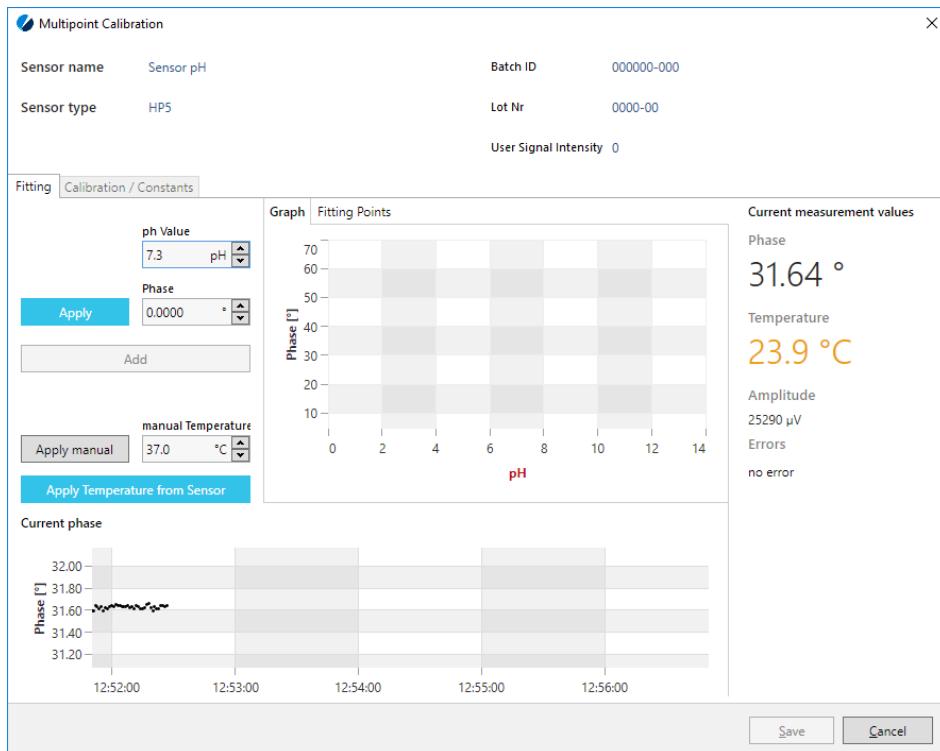


Fig. 35 Multipoint Calibration dialog for pH sensor

1. Enter the temperature of the sample manually in the **manual Temperature** input field and click **Apply manual**, or – in case a temperature sensor is connected to the device – place the temperature sensor in the sample and click on **Apply Temperature from Sensor**.
2. Ensure the sensor is covered completely with the sample of known pH and wait till the measured phase value stabilizes; the measured phase values are displayed in the **Current phase** graph at the bottom of the dialog.
3. Enter the pH of the sample in the **pH Value** input field on top, and click on **Apply** next to the **Phase** input field, once the measured phase values have stabilized. The currently measured phase value is now displayed in the **Phase** input field.
4. Click **Add** to use this value for calibration. It is displayed in the **Graph**.
5. Create at least 5 data couples by changing the pH of the sample repeating steps 2 to 4. Ensure that the pH values cover your pH range of interest. Suitable pH values are 4, 5, 6, 7, 8 and 9.
6. Once you have created at least 4 data couples a fit will be displayed in the graph. On the **Fitting points** tab a table of the pH and corresponding phase values you have determined is displayed. Here you also have the option to **Delete** or **Edit** certain calibration points. Select a data row, so it is highlighted, and click the respective button. (For a detailed description on editing calibration data, please read the following 'Alternative' section.)

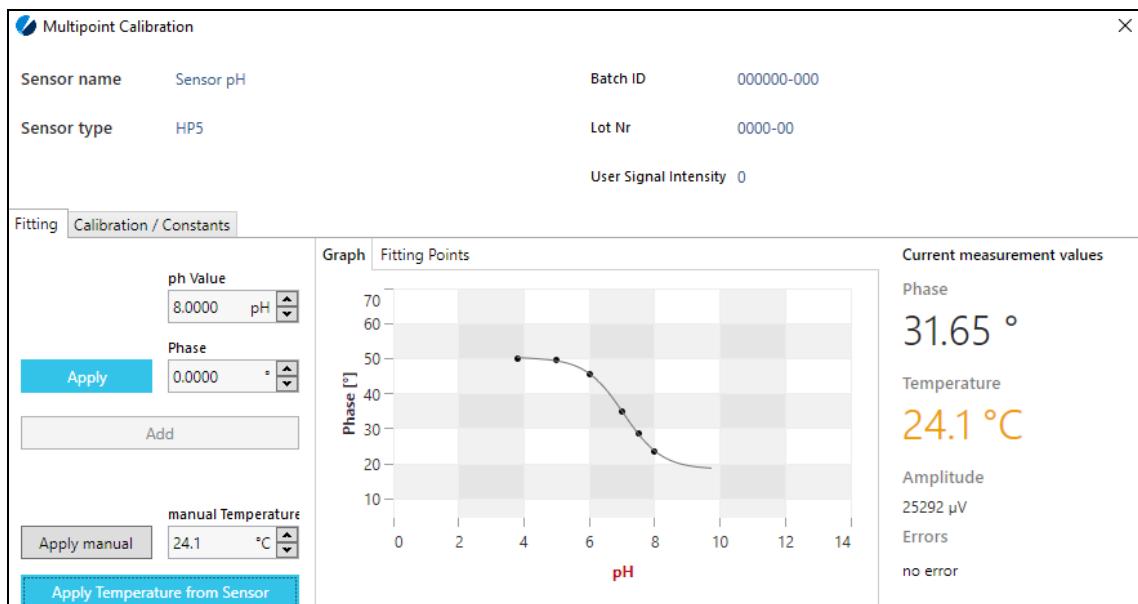


Fig. 36 Multipoint Calibration – 6 pH / phase value data couples have been created

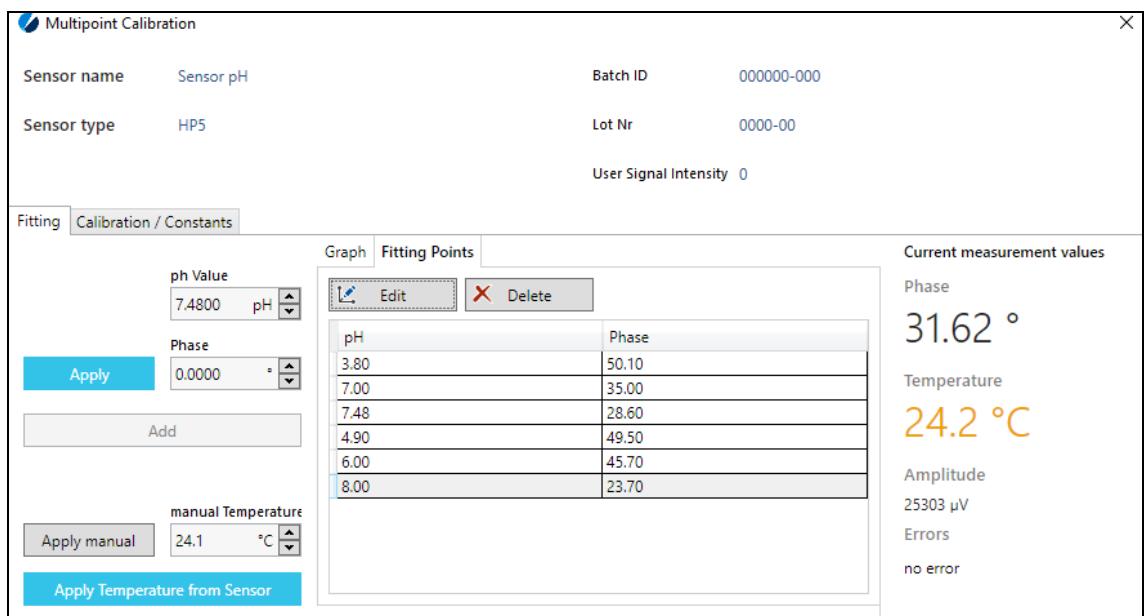


Fig. 37 Multipoint Calibration – 6 pH / phase value data couples listed on the Fitting Points tab

7. Click **Save** at the bottom of the dialog to store the new calibration data.

Alternative:

In case you have determined suitable pH and phase data couples earlier, you can manually enter this data on the **Fitting Points** tab.

1. Click the **Apply** and **Add** button to create a number of rows in the **Fitting Points** list.
2. Click into the first row of the table so it is highlighted. Then click on the **Edit** button above the table.

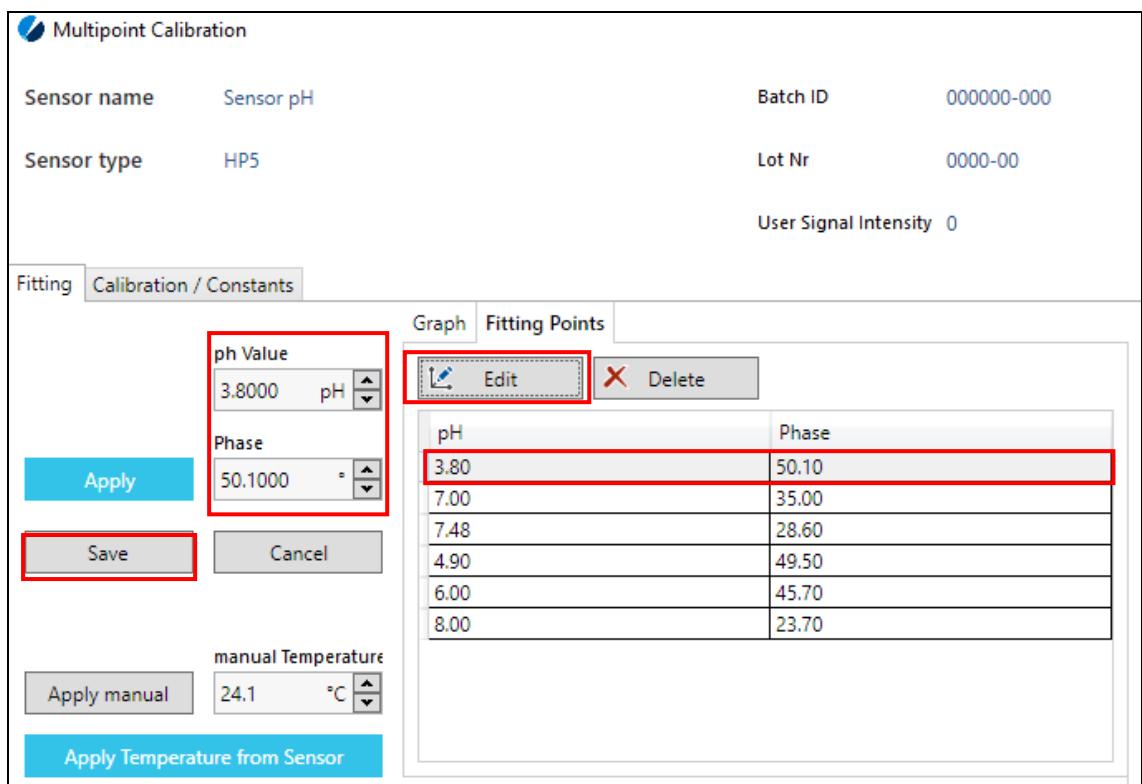


Fig. 38 Entering calibration data on the Fitting Points tab – click edit to change the pH and phase values.

3. Enter the first **pH Value** and corresponding **Phase** in the respective input fields on the left and click **Save**. The data will be displayed in the first row of the table now.
4. Click into the second row of the table and repeat the process with another data couple. Do this for at least 5 data couples.
5. When you have entered all data couples manually, click **Save** at the bottom of the dialog to store the new calibration data.

4.6.5 (Re-)Calibrate a CO₂ Sensor

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

4.6.5.1 CO₂ One Point Adjustment

You can recalibrate an existing CO₂ sensor with a **One point adjustment** by assigning it to a connected device's channel and clicking on the **Calibrate** icon in the control panel of the **Live View** or the **Sensors** tab.

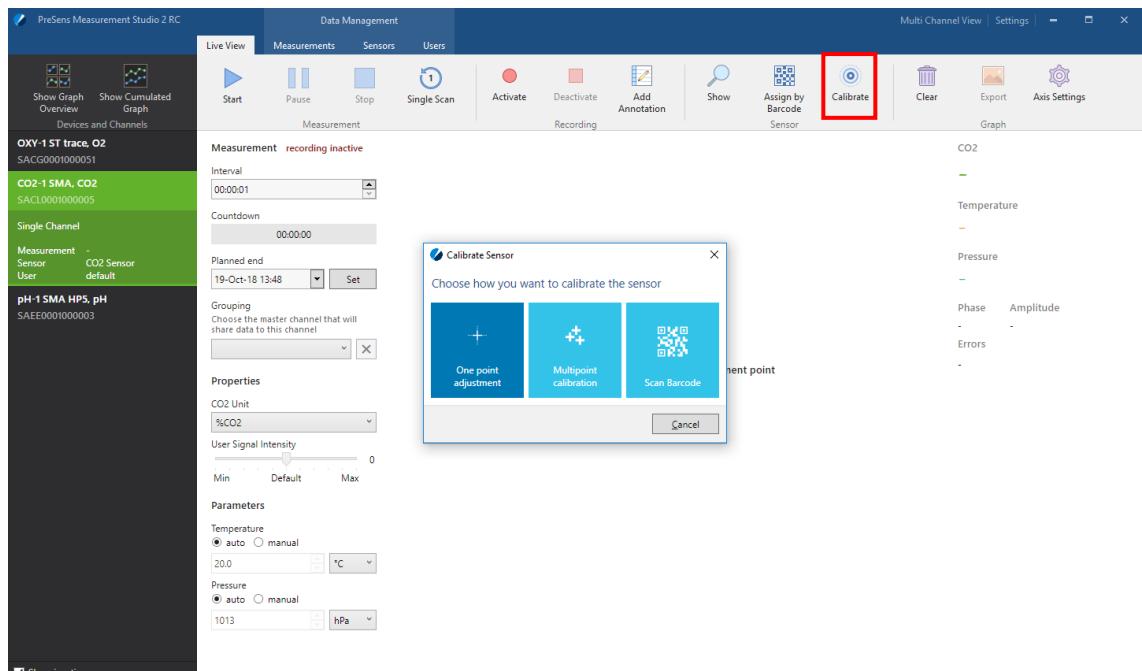


Fig. 39 Calibrate an existing CO₂ sensor – One point adjustment

Settings for the calibration temperature and pressure have to be made on the **Live View** tab before the one point adjustment is started. Select **manual**, if the calibration temperature and pressure are known, and enter these value in the **Temperature** and **Pressure** input fields, or select **auto** to measure the values with a connected temperature sensor and the integrated pressure sensor.

Then click on **Calibrate > One point adjustment** 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.

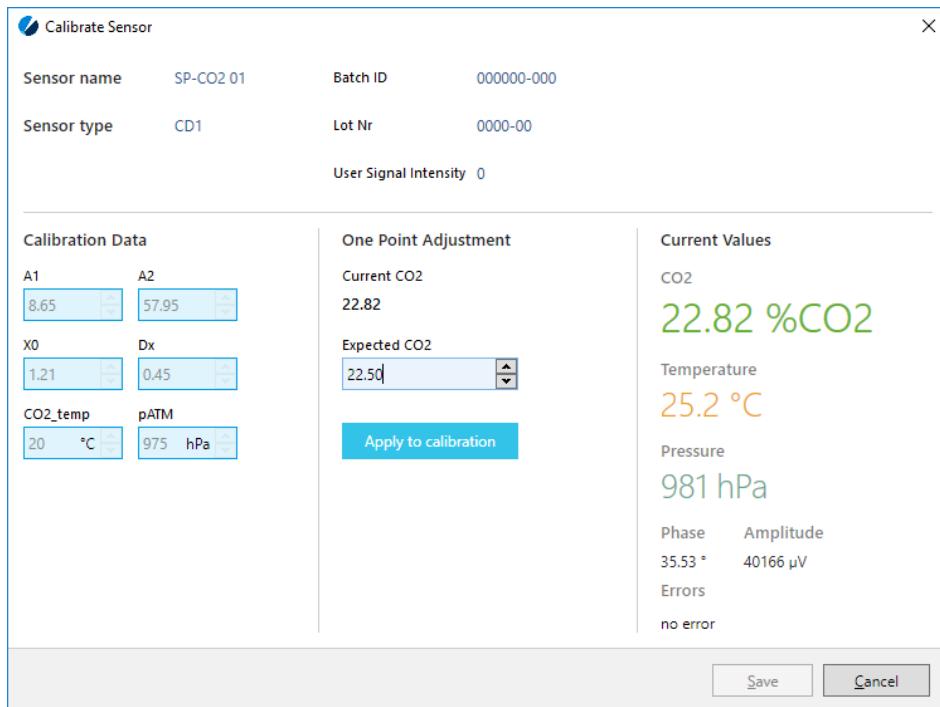


Fig. 40 One point adjustment

Enter the **Expected CO₂** value (known CO₂ of the calibration solution the sensor is placed in) and click **Apply to calibration**. The sensor's calibration data will be recalculated accordingly.

4.6.5.2 CO₂ Multipoint Calibration

A multipoint calibration is required to obtain best accuracy. It is necessary especially when working with difficult samples, e.g. samples of significantly different osmolarity compared to the storage solution (saltwater, deionized water,...) or after sensor treatment like gamma irradiation.

A multipoint re-calibration is recommended to ensure precise measurements. The CO₂ meter and sensor can only perform optimally by recalibrating the meter in combination with the sensor.

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

You can recalibrate an existing CO₂ sensor with a **Multipoint calibration** by assigning it to a connected device's channel and clicking on the **Calibrate** icon in the control panel of the **Live View** or the **Sensors** tab.

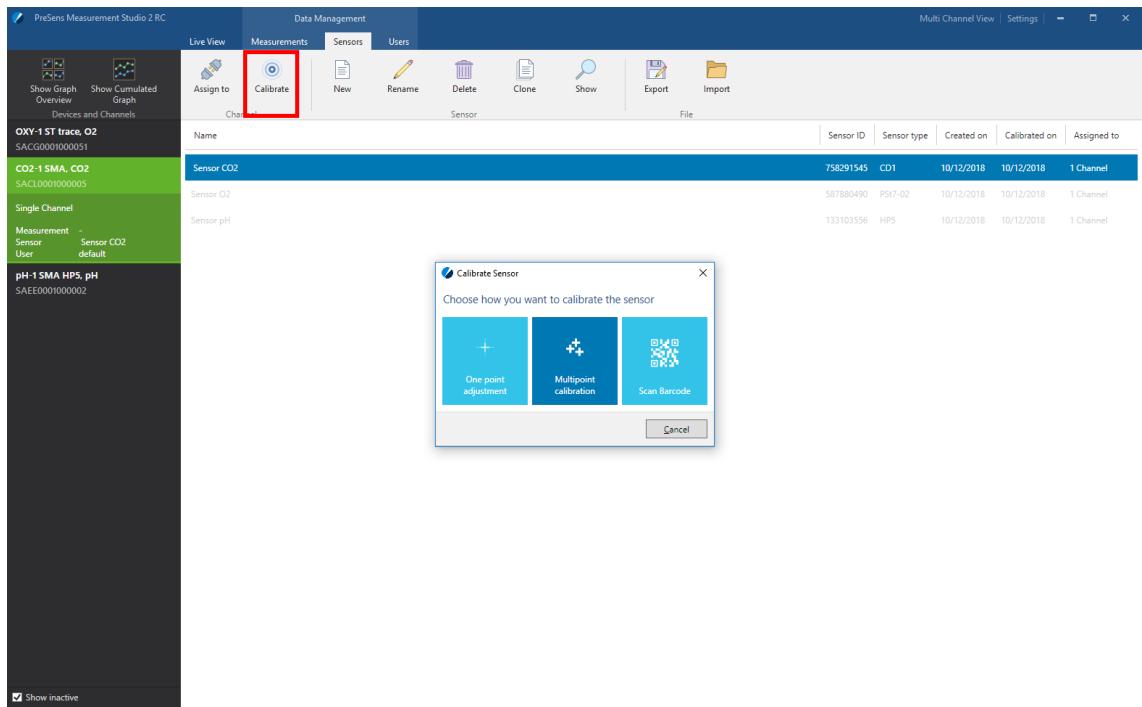


Fig. 41 Calibrate an existing CO₂ sensor – Multipoint calibration

Click on **Multipoint calibration** and the respective 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.

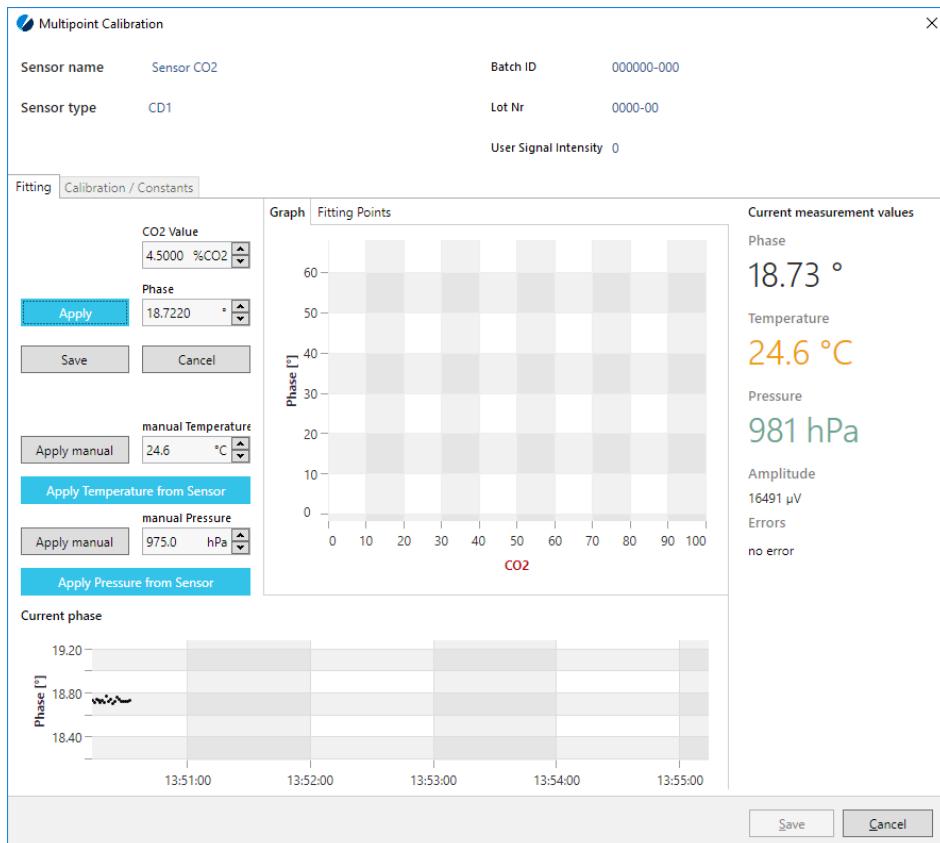


Fig. 42 Multipoint Calibration dialog for CO₂ sensor

1. Enter the temperature of the sample manually in the **manual Temperature** input field and click **Apply manual**, or – in case a temperature sensor is connected to the device – place the temperature sensor in the sample and click on **Apply Temperature from Sensor**. If the atmospheric pressure during calibration is known, enter the value manually in the **manual Pressure** input field and click **Apply manual**. Else click on **Apply Pressure from Sensor** to use values measured with the integrated pressure sensor from the device.
2. Ensure the sensor is inserted properly in the sample of known CO₂ and wait till the measured phase value stabilizes; the measured phase values are displayed in the **Current phase** graph at the bottom of the dialog.
3. Enter the CO₂ of the sample in the **CO2 Value** input field on top, and click on **Apply** next to **Phase** input field, once the measured phase values have stabilized. The currently measured phase value is displayed in the **Phase** input field.
4. Click **Add** to use this value for calibration. It is displayed in the **Graph**.
5. Create at least 5 data couples by changing the CO₂ of the sample repeating steps 2 to 4. Ensure that the CO₂ values cover your range of interest. Suitable CO₂ concentrations are e.g. 0, 2, 6, 10, 20, 50 and 100 % CO₂.
6. Once you have created at least 4 data couples a fit will be displayed in the graph. On the **Fitting points** tab a table of the CO₂ and corresponding phase values you have determined is displayed. Here you also have the option to **Delete** or **Edit** certain calibration points. Select a data row, so it is highlighted, and click the respective button. (For a detailed description on editing calibration data, please read the following 'Alternative' section.)

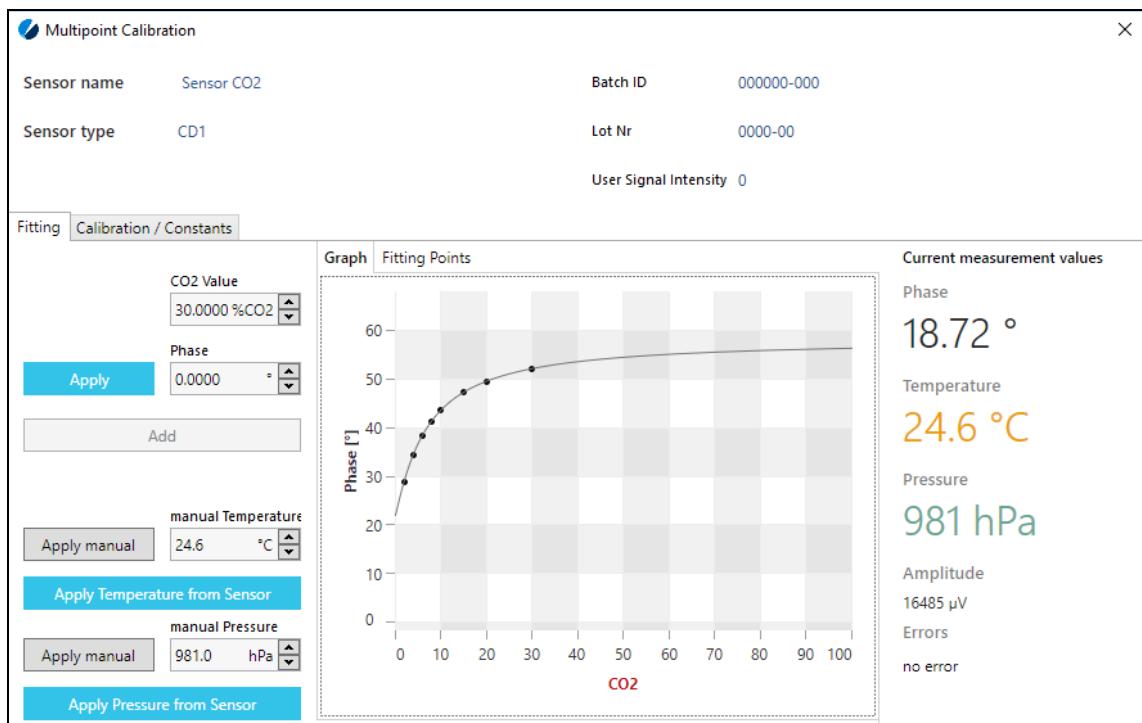


Fig. 43 Multipoint Calibration – 8 CO₂ / phase value data couples have been created

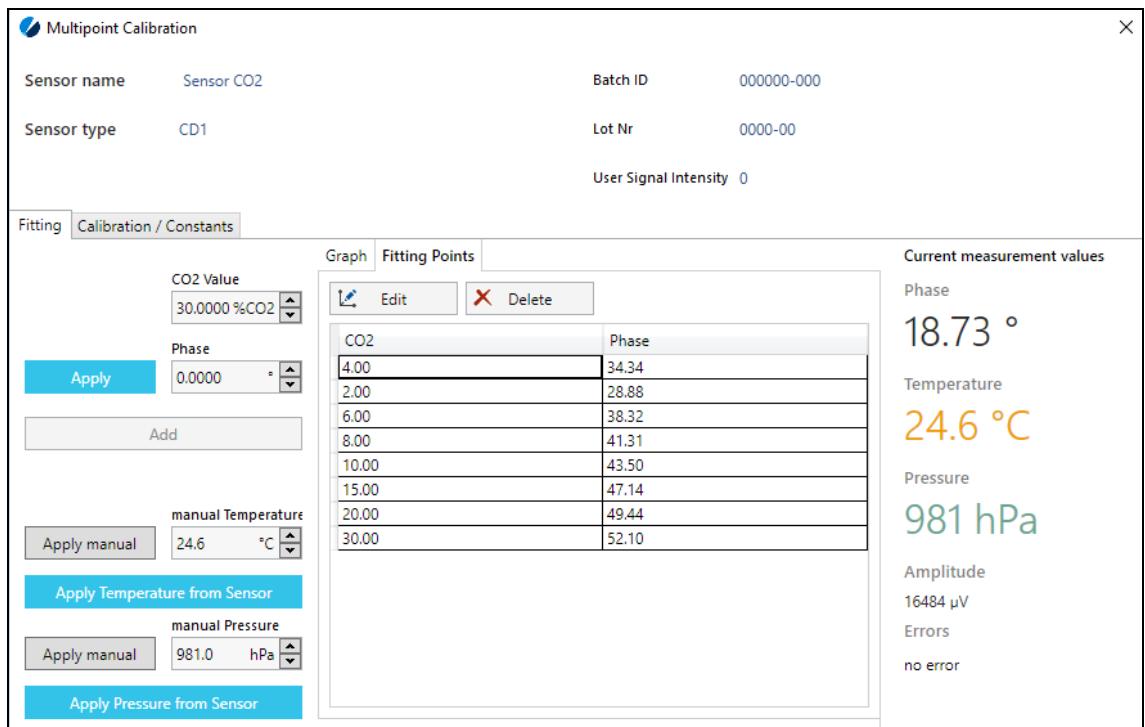


Fig. 44 Multipoint Calibration – 8 CO₂ / phase value data couples listed on the Fitting Points tab

7. Click **Save** at the bottom of the dialog to store the new calibration data.

Alternative:

In case you have determined suitable CO₂ and phase value data couples earlier, you can manually enter this data on the **Fitting points** tab.

1. Click the **Apply** and **Add** button to create a number of rows in the **Fitting Points** list.
2. Click into the first row of the table so it is highlighted. Then click on the **Edit** button above the table.

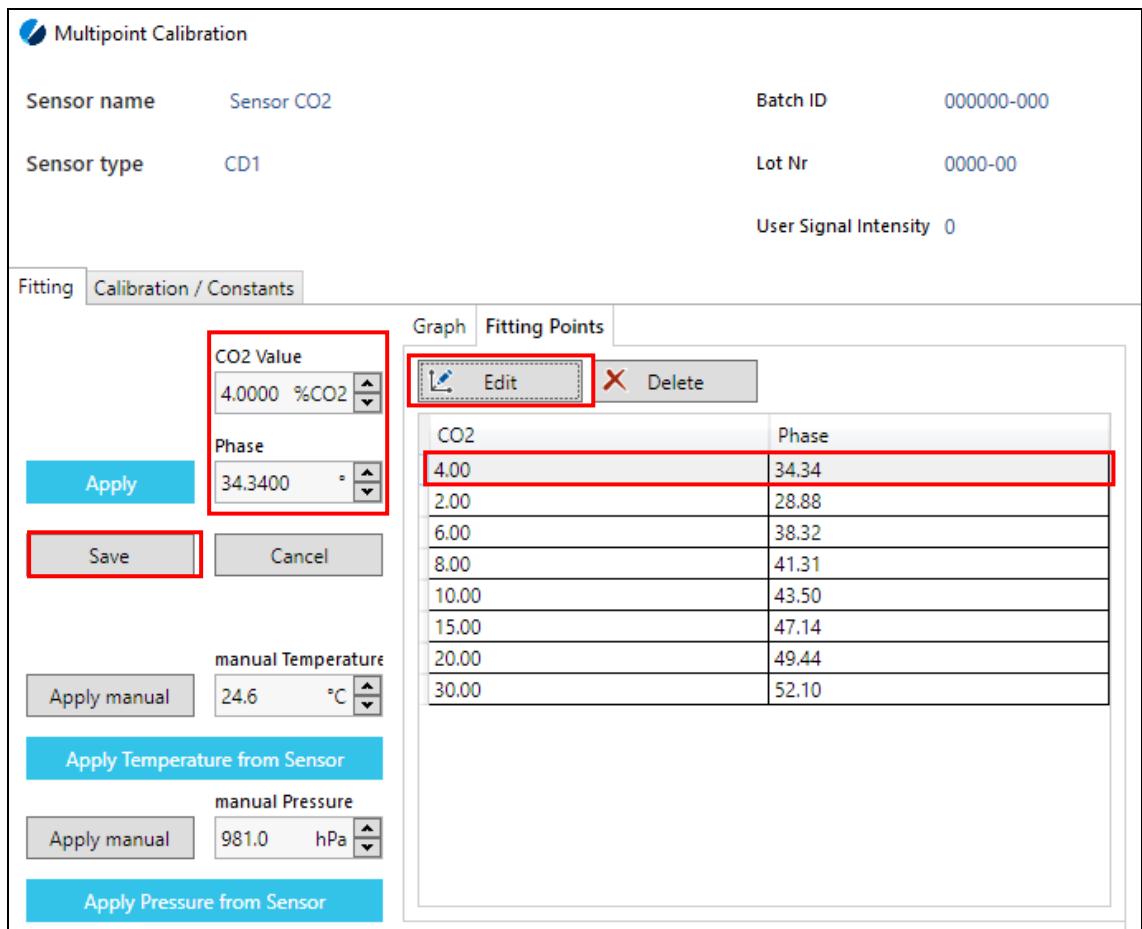


Fig. 45 Entering calibration data on the Fitting Points tab – click edit to change the CO₂ and phase values.

3. Enter the first **CO2 Value** and corresponding **Phase** in the respective input fields on the left and click **Save**. The data will be displayed in the first row of the table now.
4. Click into the second row of the table and repeat the process with another data couple. Do this for at least 5 data couples.
5. When you have entered all data couples manually, click **Save** at the bottom of the dialog to store the new calibration data.

4.7 Measurements

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

1. Select a device in the Devices and Channels list and click on the channel you want to use.
2. Assign a calibrated **Sensor** (see chapter 4.6) to the channel.
3. A **Default User** is assigned to each channel. Assign a specific user to the channel, if required.
4. In case you want to save the measurement data in a file assign a **Measurement** to the channel.
5. Repeat steps 1 – 4 for all devices and device channels with which you want to perform measurements.

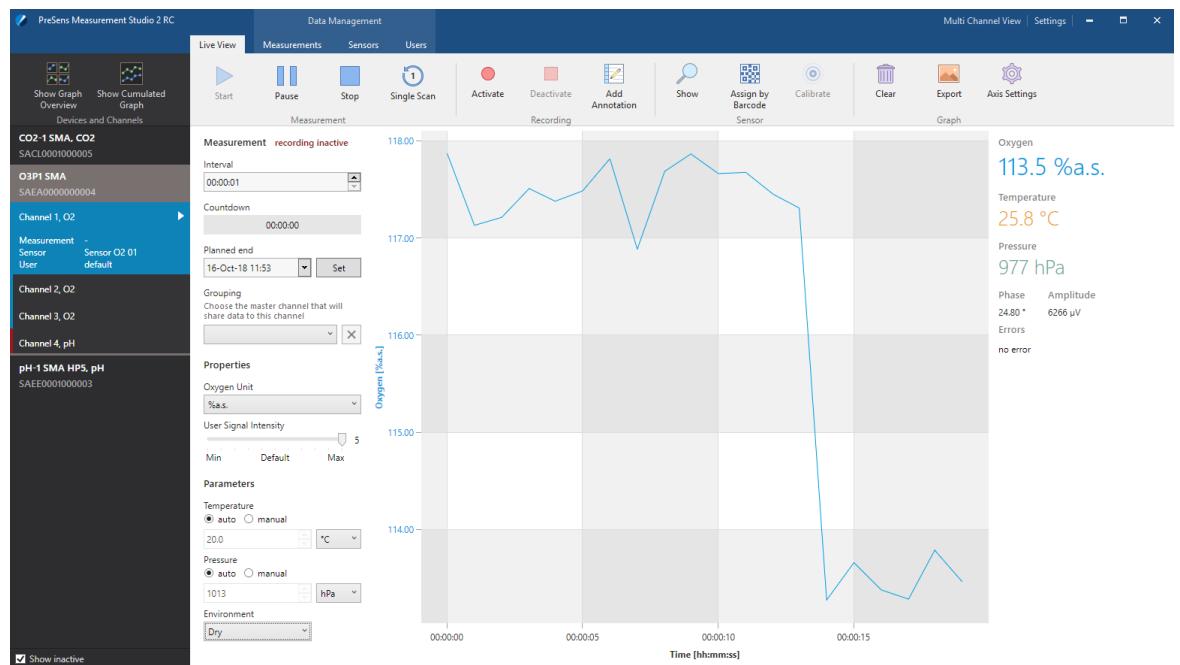


Fig. 46 Live View Tab (during running O₂ measurement)

In the control panel, 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.

Assign by Barcode: Assign a sensor to the selected channel by scanning the sensor barcode with the USB-QR Code Scanner. This function is very useful when working with a multitude of sensors, with possibly similar sensor names, as a sensor can be assigned to the channel without having to search the Sensors list. If a new sensor that has not been used before and the sensor barcode are available, you can use this function to scan the barcode and a new sensor will be created and automatically assigned to the selected channel.

Calibrate: (Re-)Calibrate the assigned sensor manually (see chapters 4.6.3 for O_2 , 4.6.4 for pH , or 4.6.5 for CO_2).

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 O₂ Measurement Settings

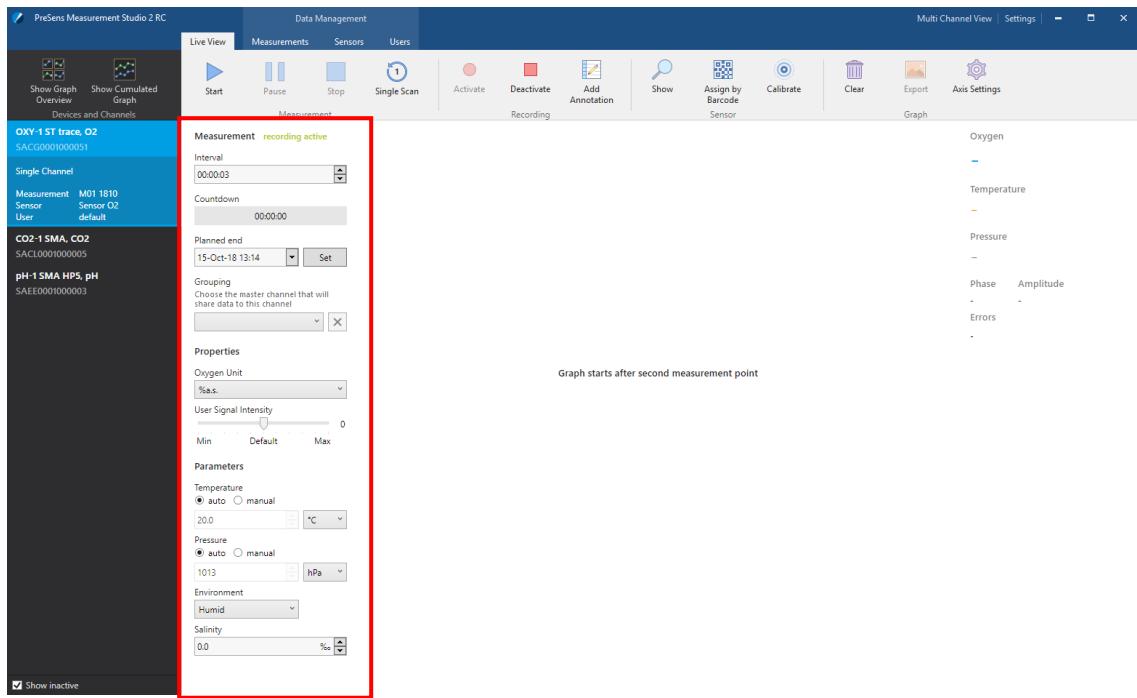


Fig. 47 Live View tab: change O₂ measurement settings

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, PSt7, and PSt8 it is 1 sec., for PSt6 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:

Tab. 3 Possible oxygen units

Sensor Type	PSt3 / PSt7		PSt6 / PSt8		PSt9
Mode	Humid	Dry	Humid	Dry	Dry
	% a. s. (air saturation)	ppmv (gaseous O ₂)			
	% O ₂	% O ₂	% O ₂	% O ₂	
	Torr	Torr	Torr	Torr	
	hPa	hPa	hPa	hPa	
	µmol/L		µmol/L		ppmv (gaseous O ₂)
	ppb (µg/L)		ppb (µg/L)		
			ppmv		

Possible oxygen units

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 °C 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**). 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.

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.

Output: This input field is displayed when a device is selected, for which software extensions have been installed. Please refer to chapter 5.4. Select the respective software extension from the drop-down menu to send data to it.

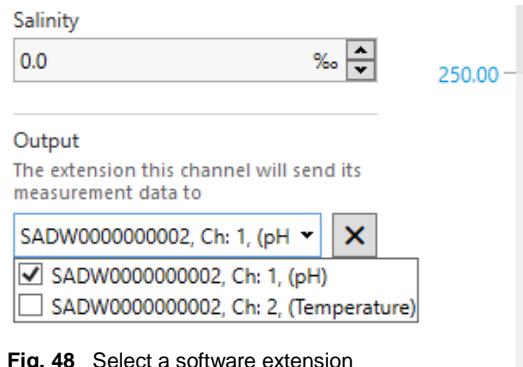


Fig. 48 Select a software extension

4.7.2 pH Measurement Settings

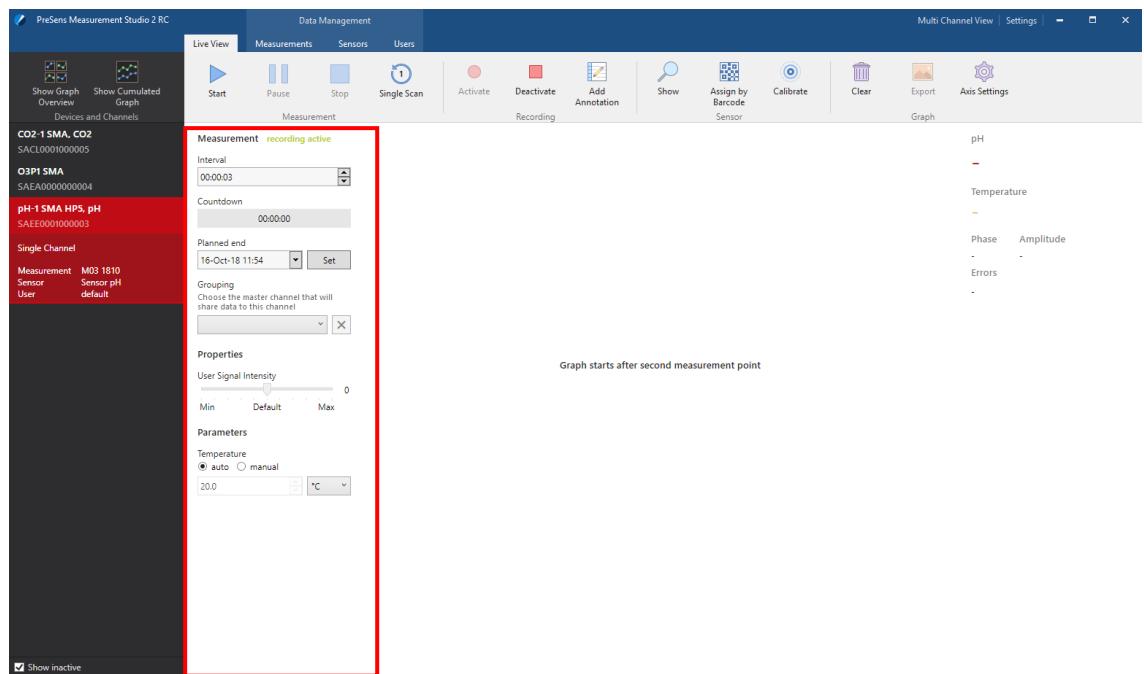


Fig. 49 Live View tab: change pH measurement settings

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 is 1 sec.

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

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

User Signal Intensity: Not available for pH measurements.

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 °C will be set automatically.

Output: This input field is displayed when a device is selected, for which software extensions have been installed. Please refer to chapter 5.4. Select the respective software extension from the drop-down menu to send data to it.

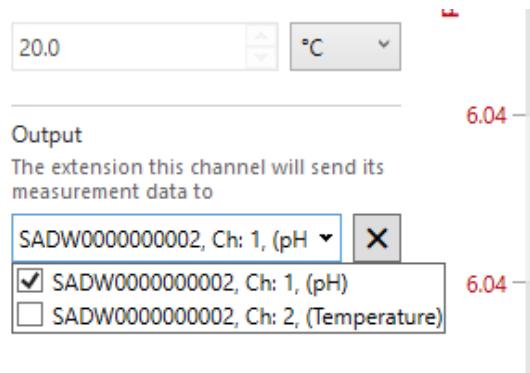


Fig. 50 Select a software extension

4.7.3 CO₂ Measurement Settings

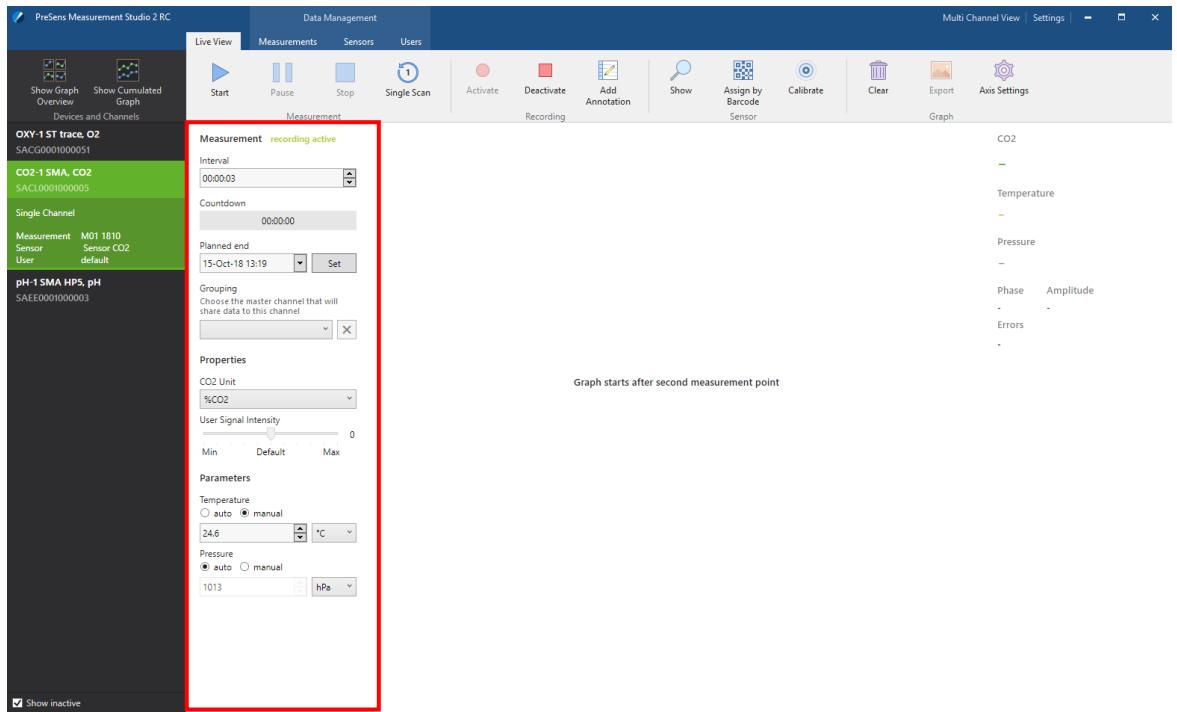


Fig. 51 Live View tab: change pH measurement settings

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 is 1 sec.

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

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

CO₂ Unit: Select the CO₂ unit in which measurements are taken and displayed; this setting can be changed any time, also during a running measurement. Following units are available:

Tab. 4 Possible CO₂ units

Sensor Type	CD1
Possible CO ₂ Units	%CO2
	Torr
	hPa
	ppmv
	μatm

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 °C will be set automatically.

Output: This input field is displayed when a device is selected, for which software extensions have been installed. Please refer to chapter 5.4. Select the respective software extension from the drop-down menu to send data to it.

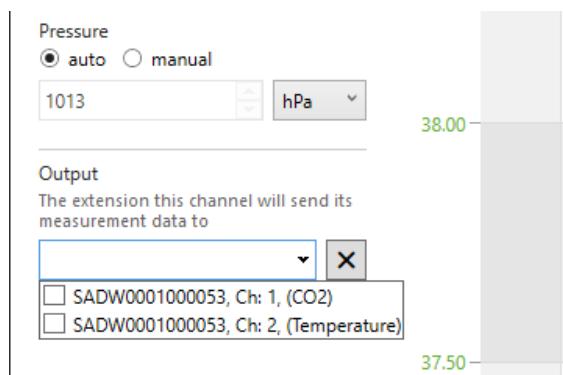


Fig. 52 Select a software extension

4.7.4 Measurement Details & Errors

The measurement details on the right hand side of the main screen show the last measured **Oxygen / pH / CO₂, Temperature, Pressure, Phase** and **Amplitude** value. Any **Errors** registered by the device will be displayed below.

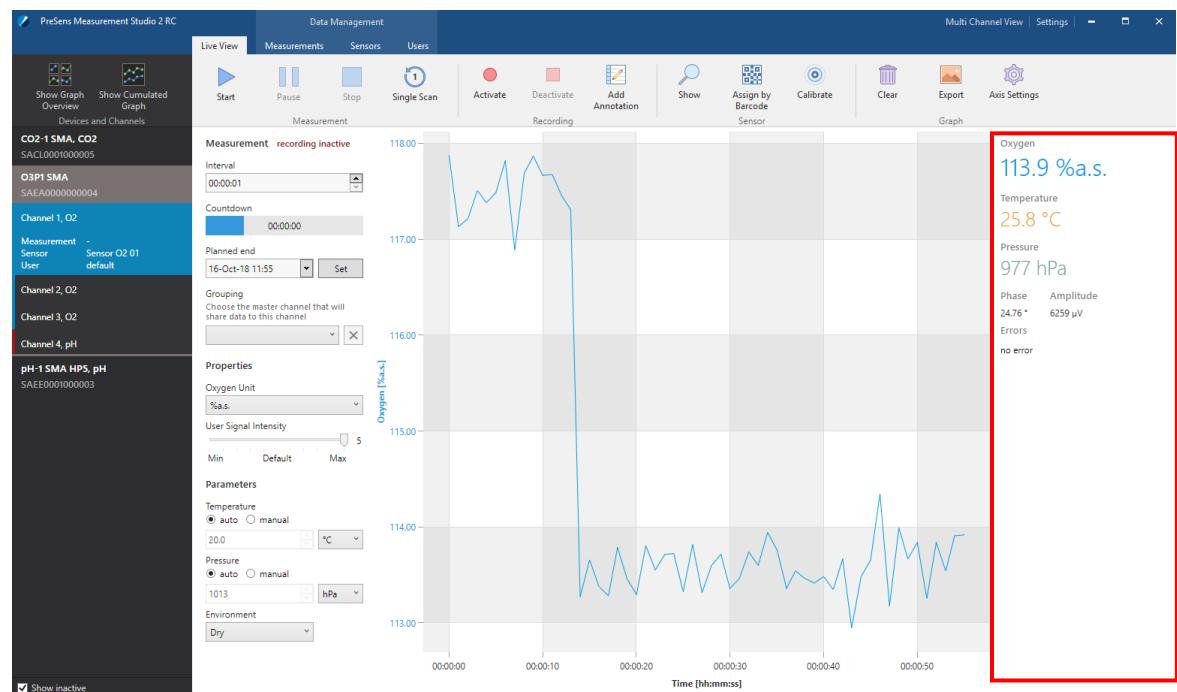


Fig. 53 Measurement details and errors are displayed on the right

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.

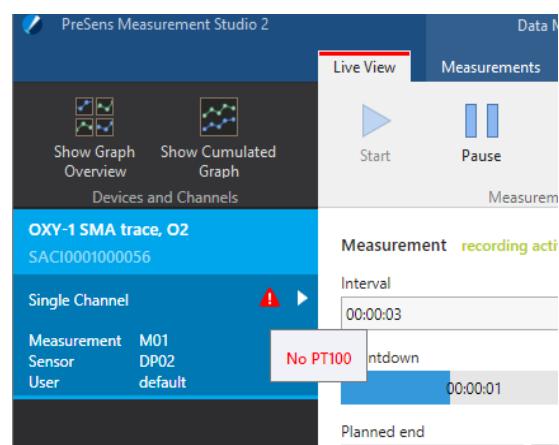


Fig. 54 A warning sign indicates that an error has occurred

4.7.5 Data Recording

Measurements without Recording

In case you have not assigned a **Measurement** to the used channel, you can just click the **Start** button in the control panel 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 panel 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 is 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.

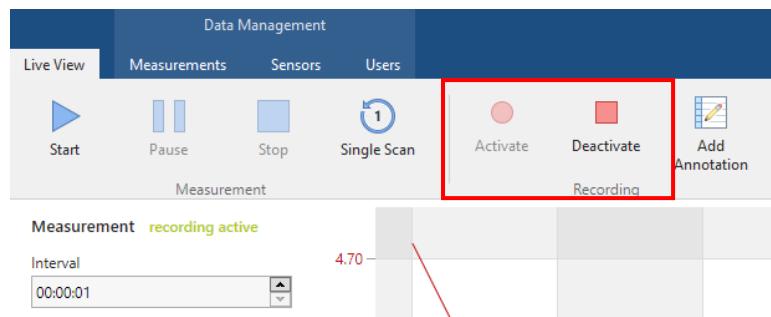


Fig. 55 Activate / Deactivate recording measurement data

4.7.6 Annotations

Annotations can be added at any time during a running measurement. Click the **Add Annotation** button in the control panel 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. It will be 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.

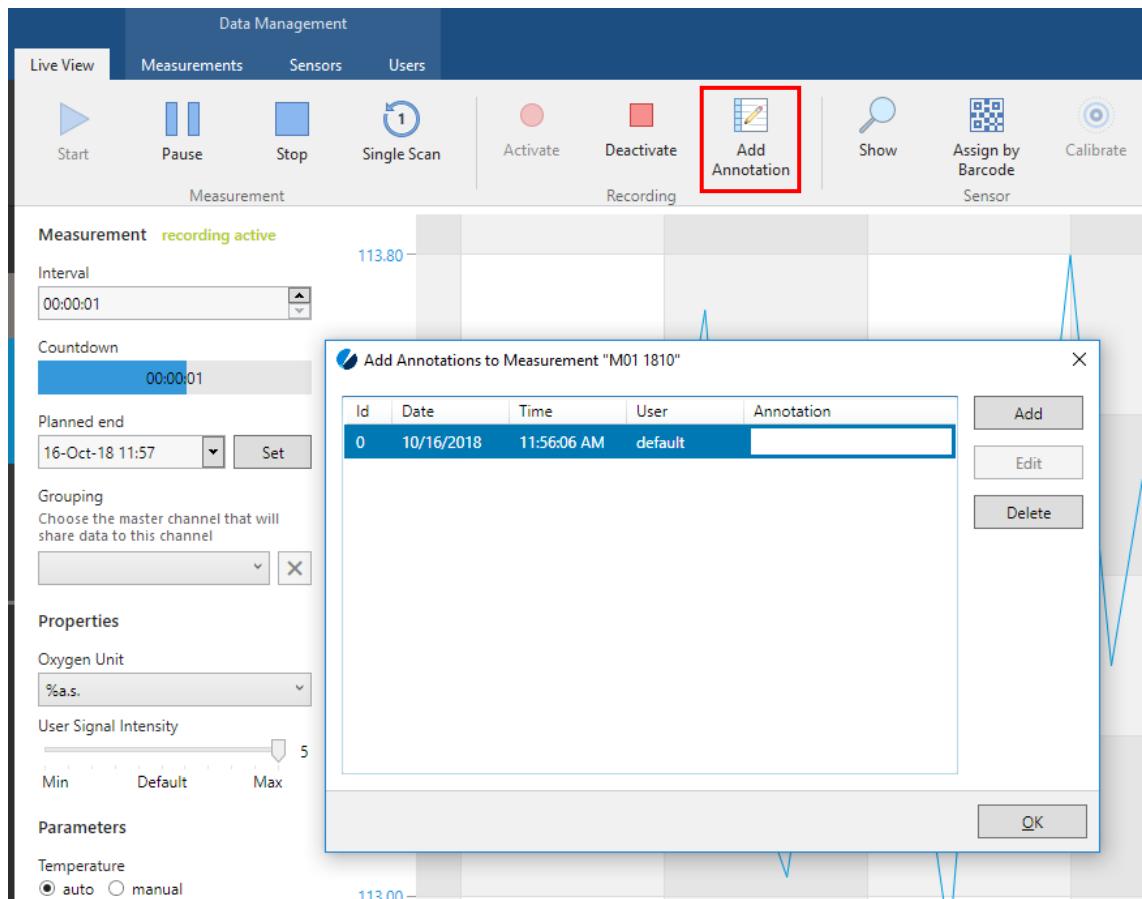


Fig. 56 Annotations manager in Live View

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.

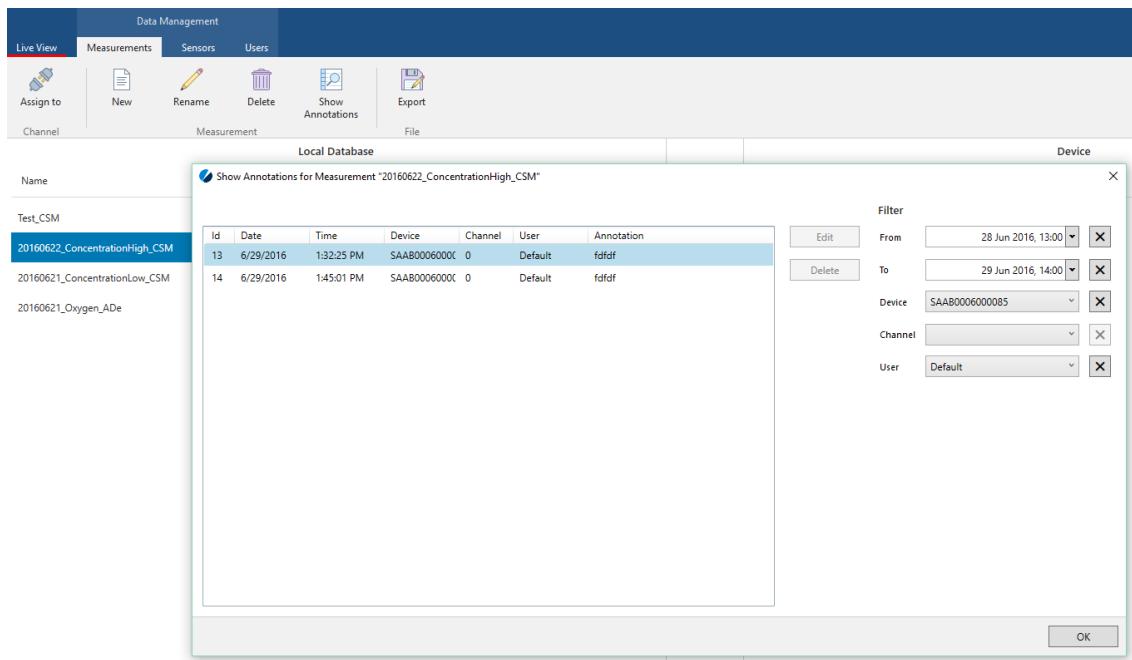


Fig. 57 Annotations dialog on the Measurements screen

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.

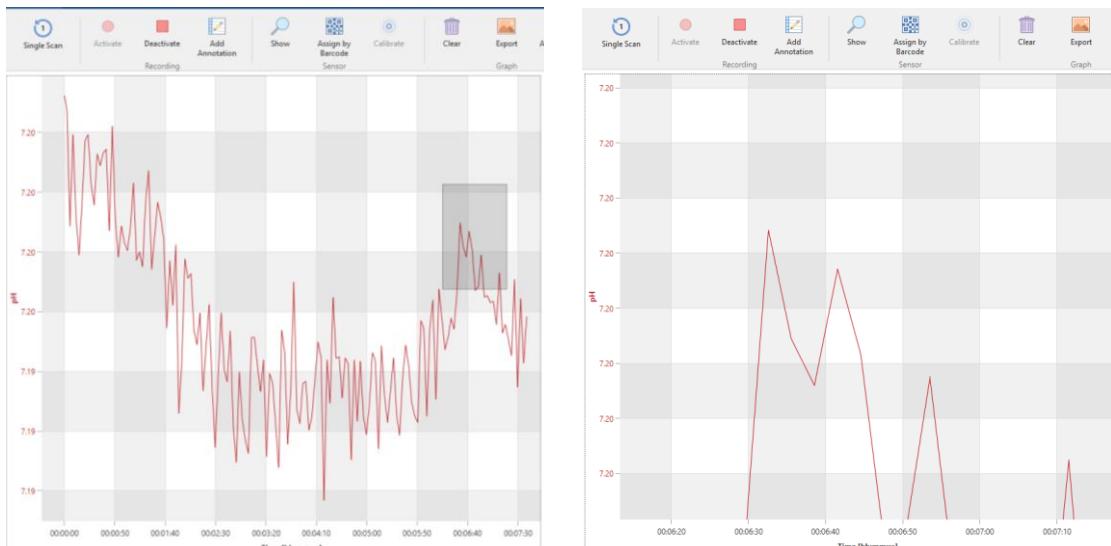


Fig. 58 Mark an area of interest in the graph (left) and it will be enlarged (right).

Axis Settings:

The icon in the control panel 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.

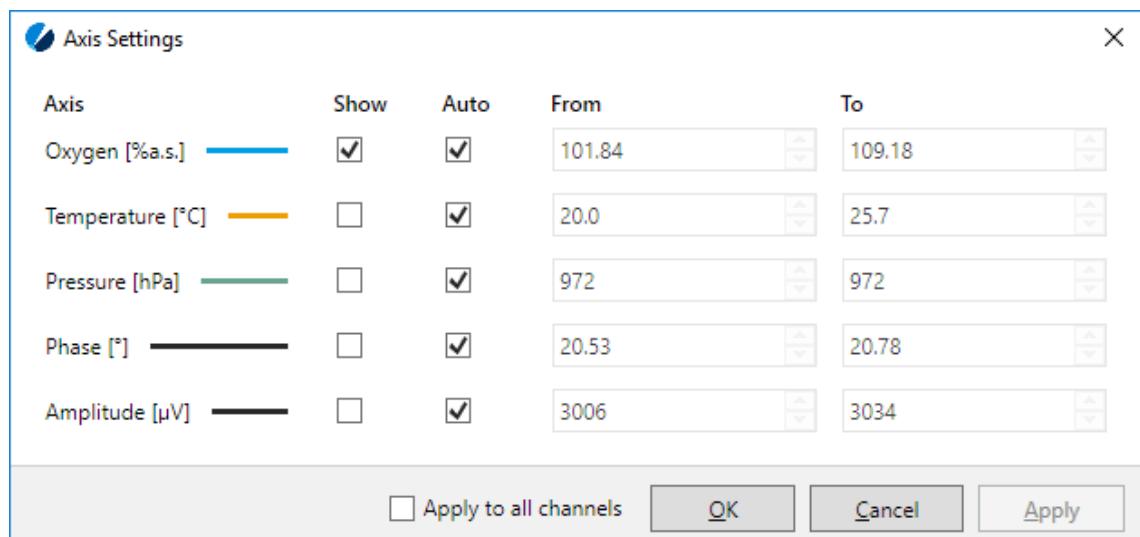


Fig. 59 Axis Settings dialog

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.

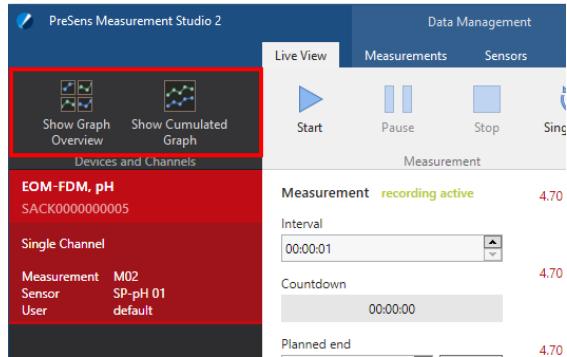


Fig. 60 Show graph options

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.

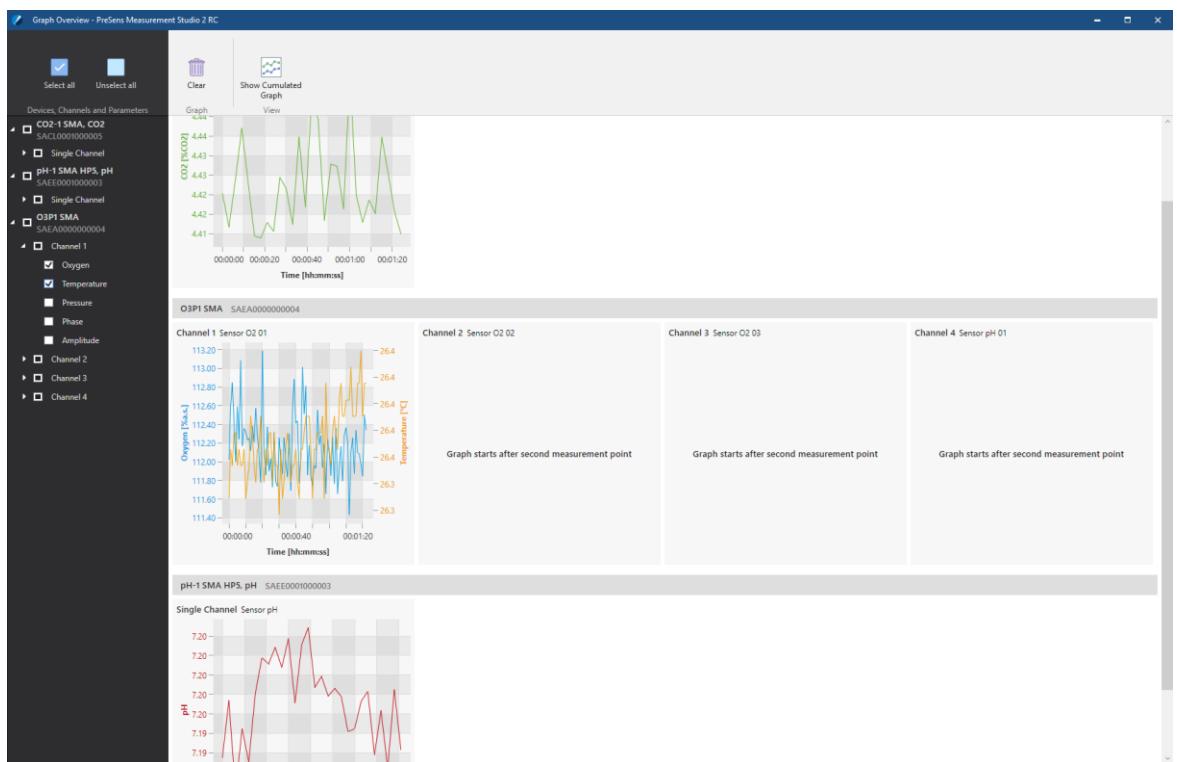


Fig. 61 Graph Overview (here of simultaneous CO₂, O₂ & pH measurements)

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.

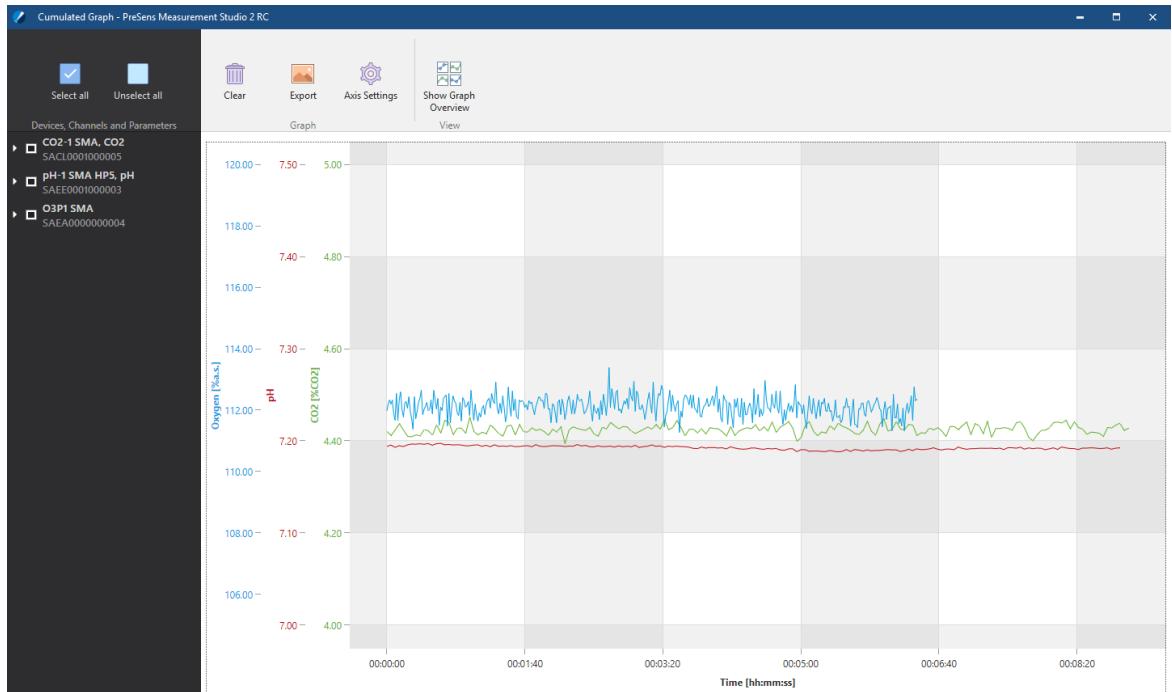


Fig. 62 Cumulated Graph (here of O₂, CO₂ & pH measurements, O₂ measurement started later)

4.9 Channel Management

4.9.1 Grouping: Sharing Temperature & Pressure Inputs

Temperature and (for O₂ & CO₂ devices) 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 (Single Channel of CO2-1 SMA in Fig. 63).
2. Click on the drop down list below **Grouping** on the Live View screen of this channel and select the Master (Device serial number of OXY-1 ST trace in Fig. 63).

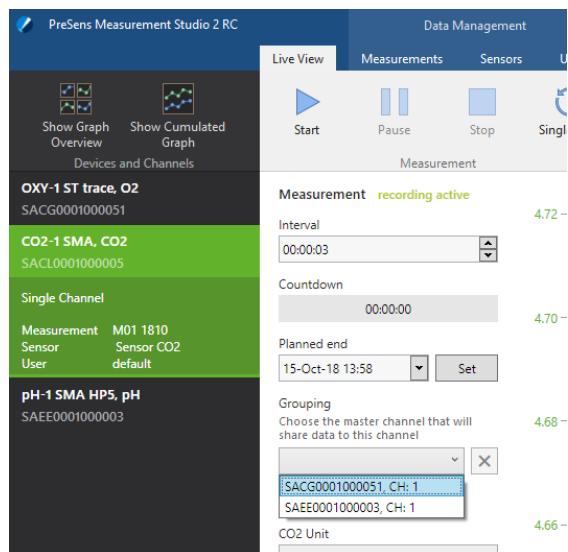


Fig. 63 Setting the Slave channels

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

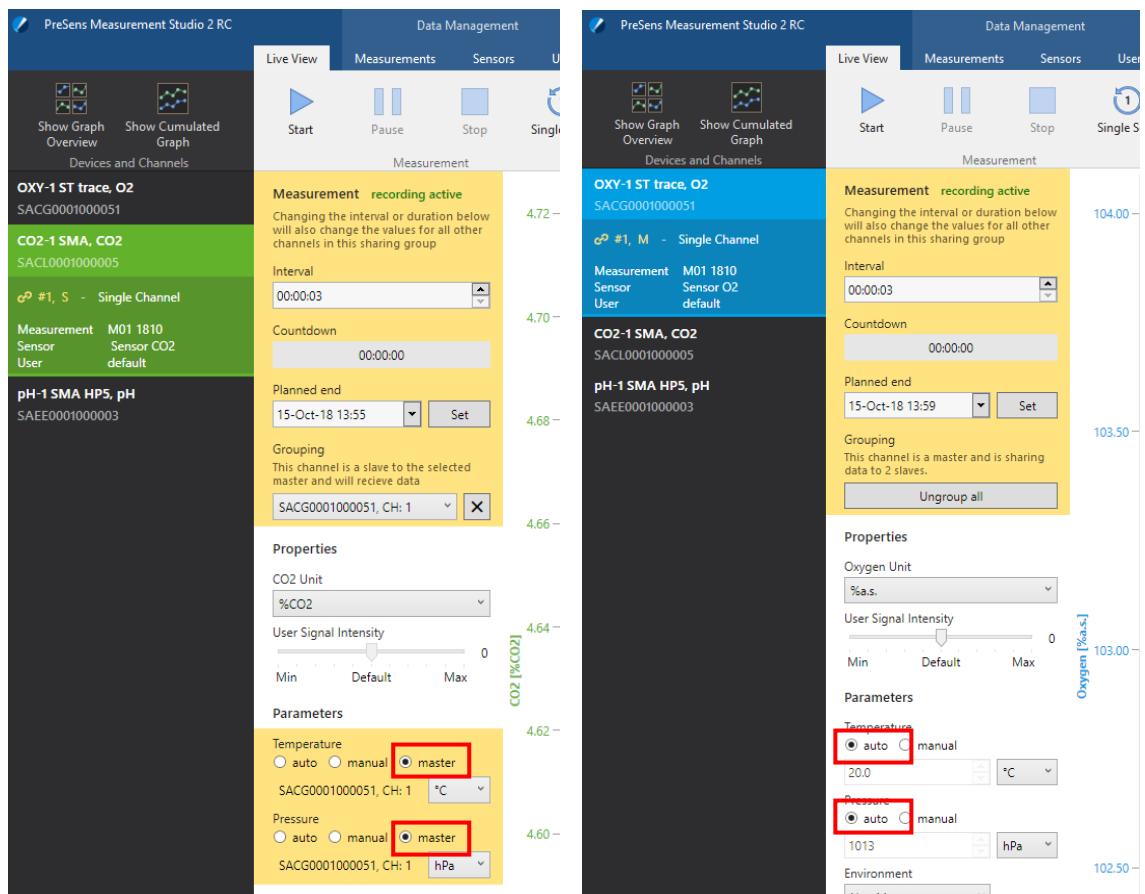


Fig. 64 Setting the Temperature and Pressure modes for the Slaves (left) and the Master (right).

You will be able to distinguish grouped channels by a distinctive yellow background in the Live View of each channel (see Fig. 64) and grouping symbols in the channel list, see Fig. 65.

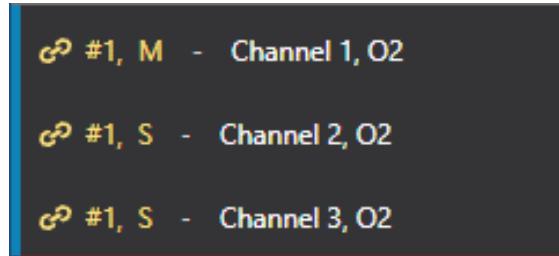


Fig. 65 Grouping symbols: Linked status, group number, M for Master and S for Slave

Starting a Measurement with Grouped Channels

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

Please note:

- The minimum measurement interval is 3 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.

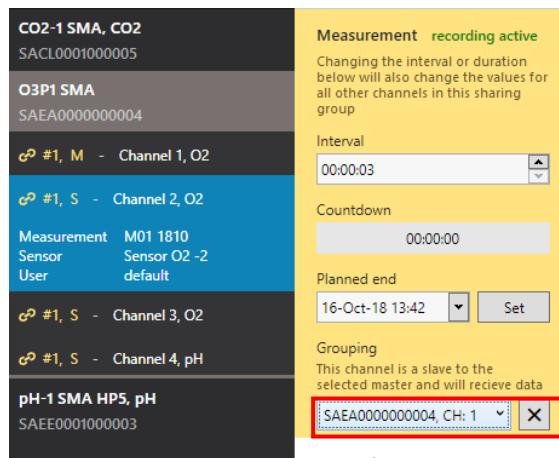


Fig. 66 Remove Slave channel from a group

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.

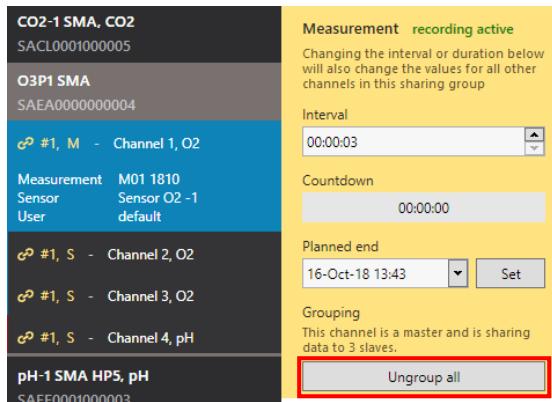


Fig. 67 Dissolve a group

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.

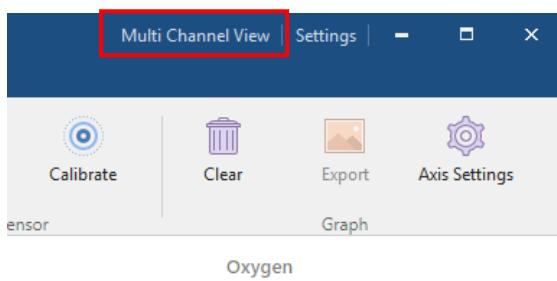


Fig. 68 Switch to Multi Channel View

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. 69 Management tab content

Fig. 70 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 panel, you can show or hide the deactivated channels in the list.

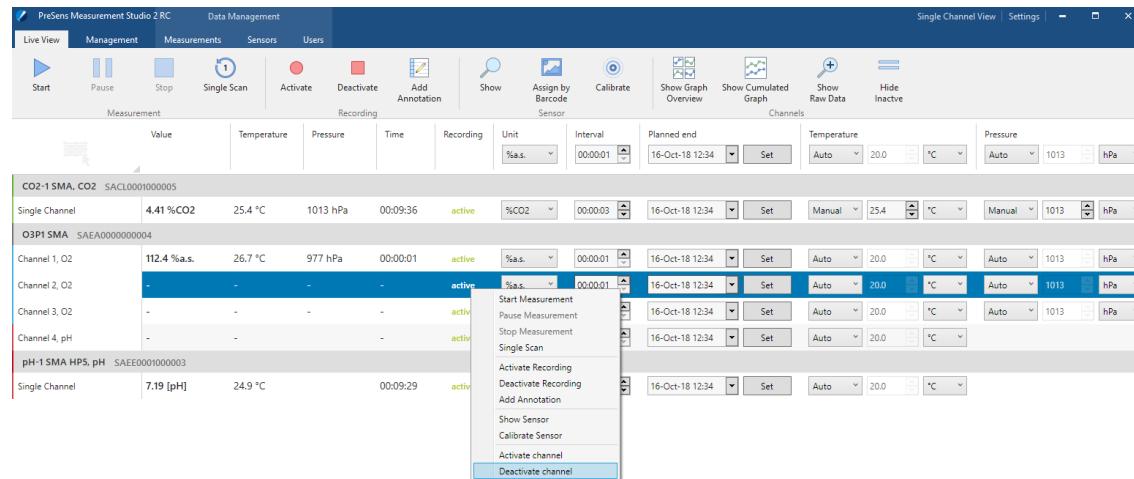


Fig. 71 Deactivate a channel

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

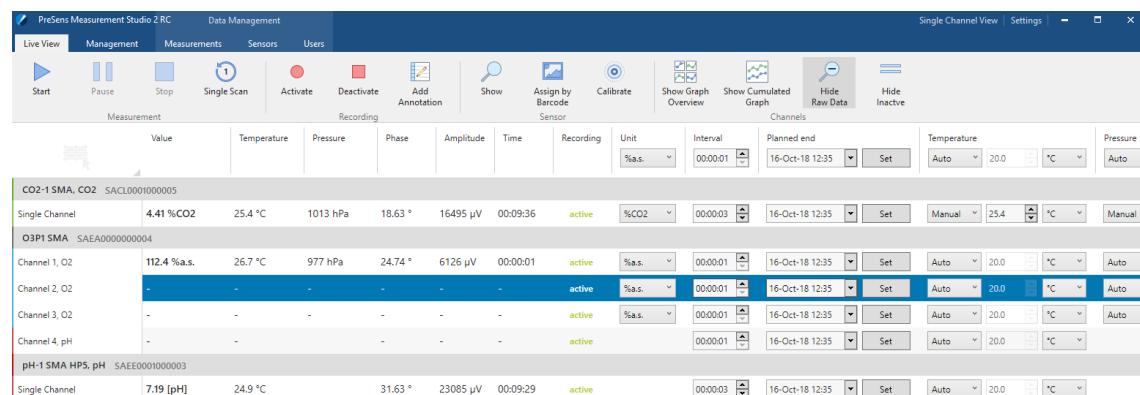


Fig. 72 Raw data is displayed

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.

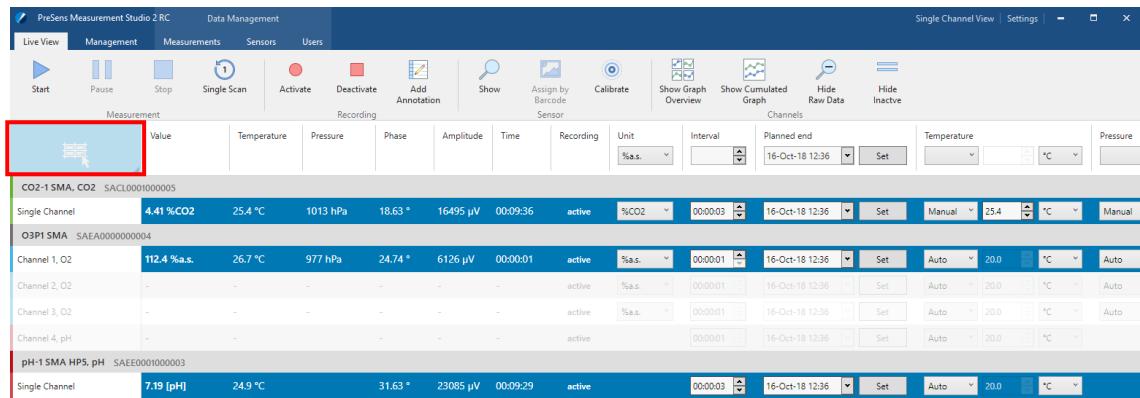


Fig. 73 Live view tab – use the grid button to select all channels

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. 74).

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

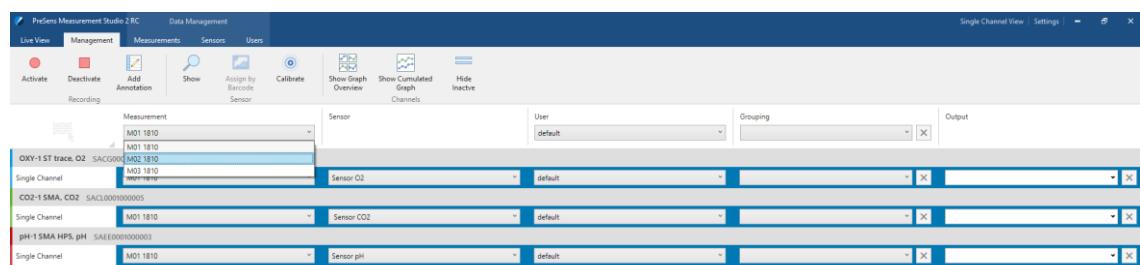


Fig. 74 Bulk measurement assignment

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.

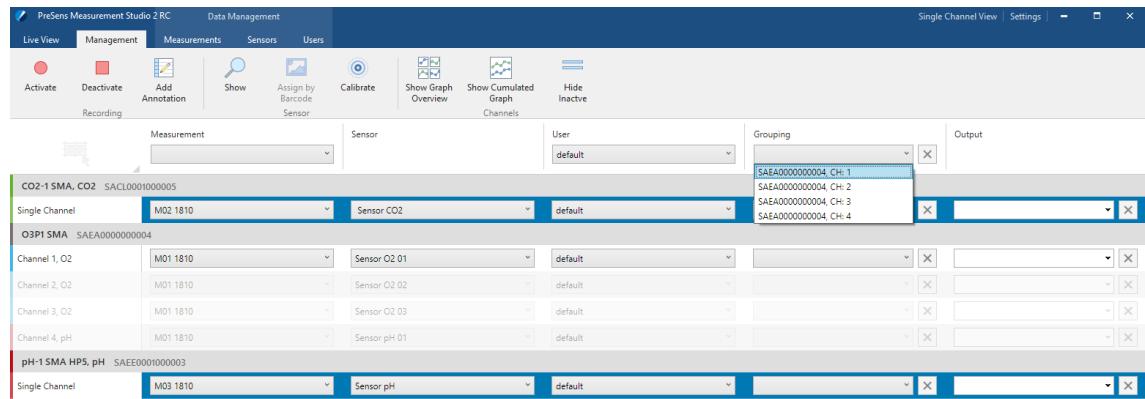


Fig. 75 Set Master device

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

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

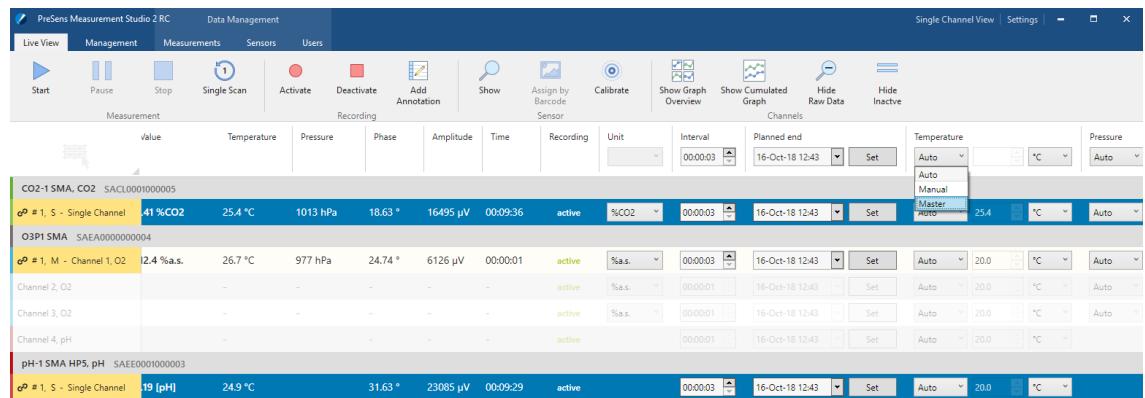


Fig. 76 Set Temperature to Master

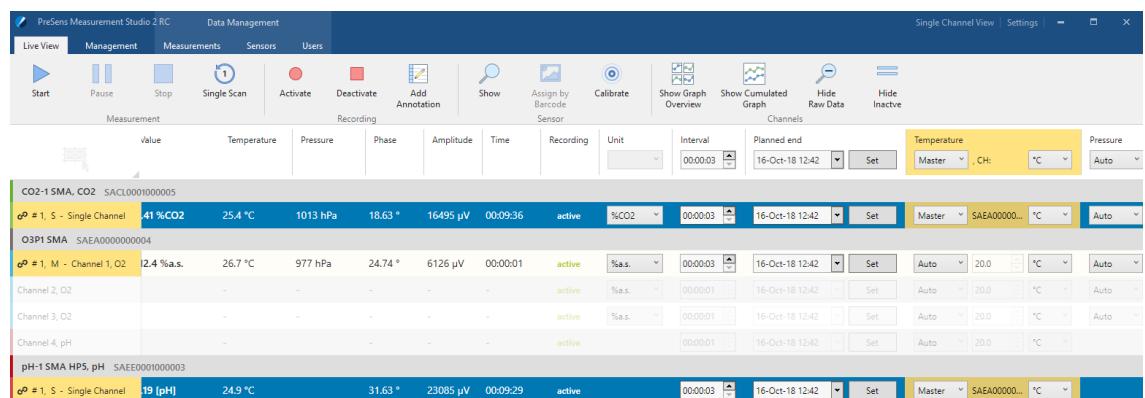


Fig. 77 Group of Slaves using the Master's Temperature

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.

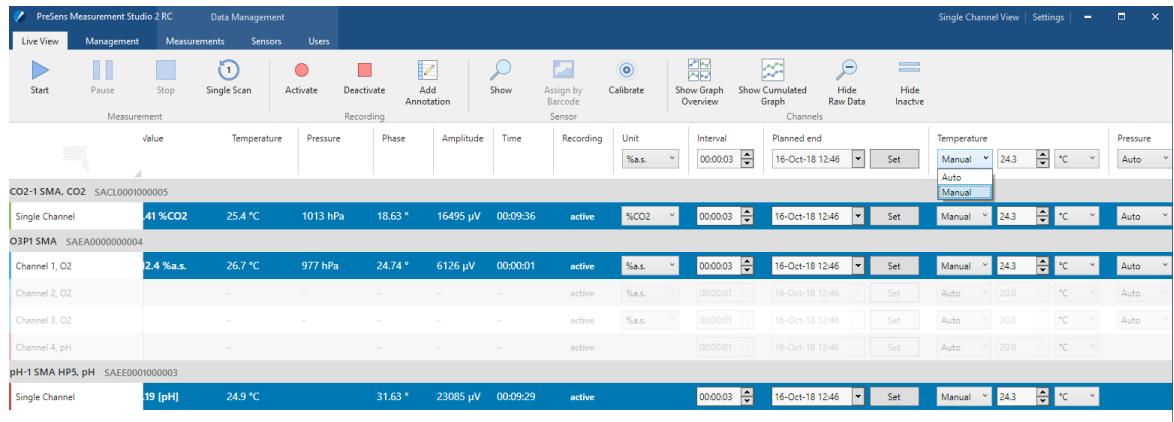


Fig. 78 Setting manual temperature for all active channels

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 recalibrate and click the **Calibrate** icon in the control panel. The **Calibrate Sensor** dialog will open.

! Only sensors measuring the same parameter can be calibrated simultaneously.

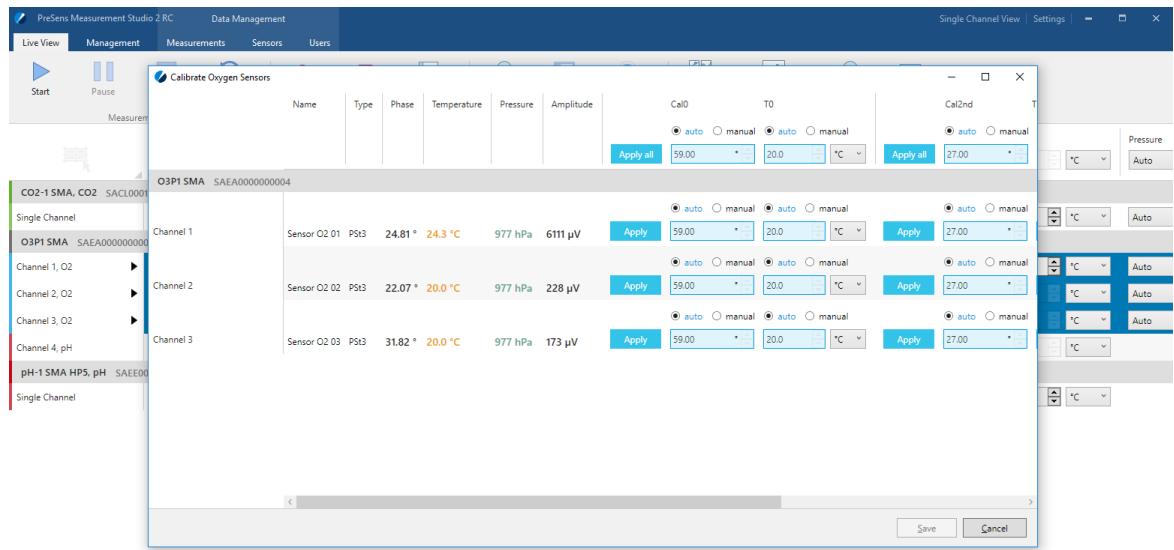


Fig. 79 Multi Channel View – Calibrate Sensors dialog (for calibration of 3 O₂ sensors)

For O₂ Sensors: 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. Finally, click the **Save** button.

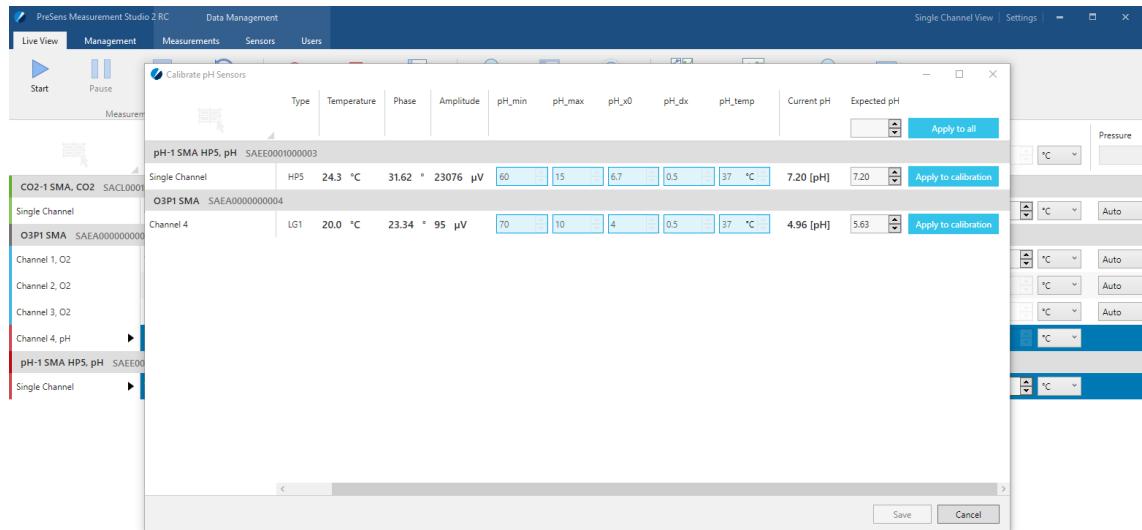


Fig. 80 Multi Channel View – Calibrate Sensors dialog for calibration of 2 pH sensors)

For pH or CO₂ Sensors: Type the **Expected pH** or **Expected CO₂** into the input field, click **Apply to calibration** and then **Save**.

! 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 recalibrated.

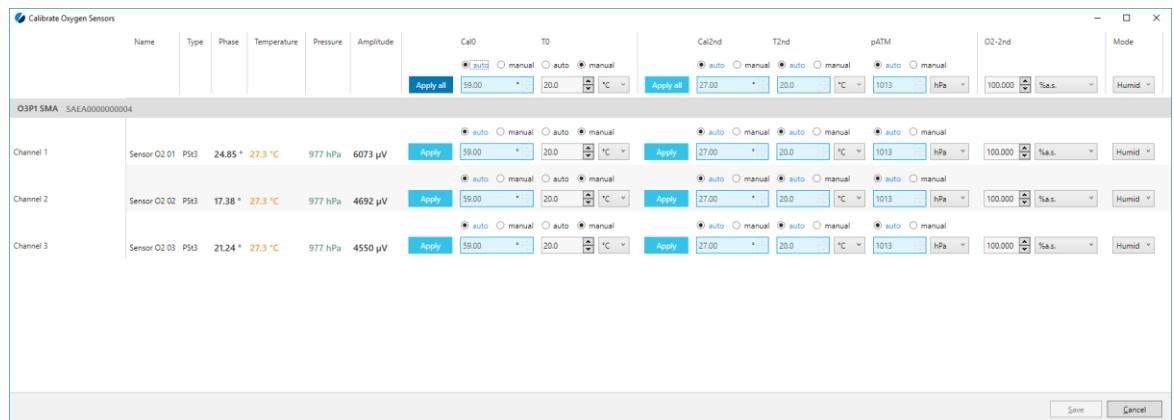


Fig. 81 Multi Channel View – Apply calibration data changes in Auto mode

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 panel, all selected channels will start / pause / stop measuring and activate / deactivate recording.

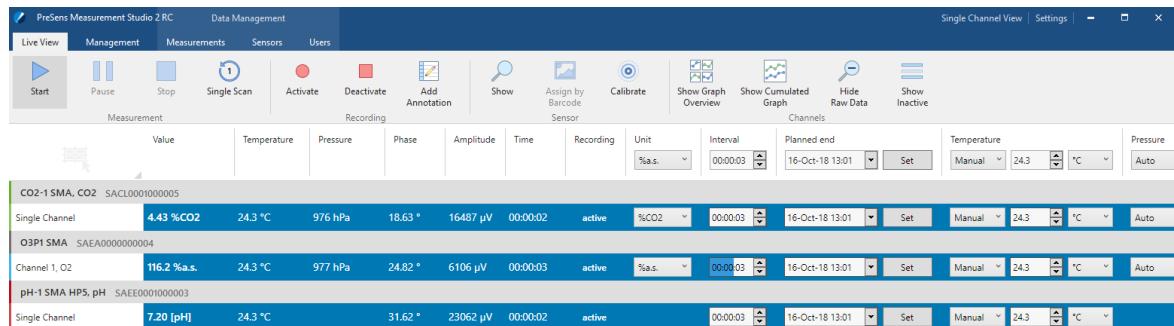


Fig. 82 Start a measurement with multiple selected channels

4.10 Export Measurement Results

Measurements can be exported in .csv and .xls format. In .csv format a separate file will be created for O₂, pH & CO₂ measurements, in case data of more than one parameter was stored in one measurement. In .xls format data of all analytes is exported into one file with oxygen, pH and CO₂ 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 holding the 'Ctrl' key on your keyboard.

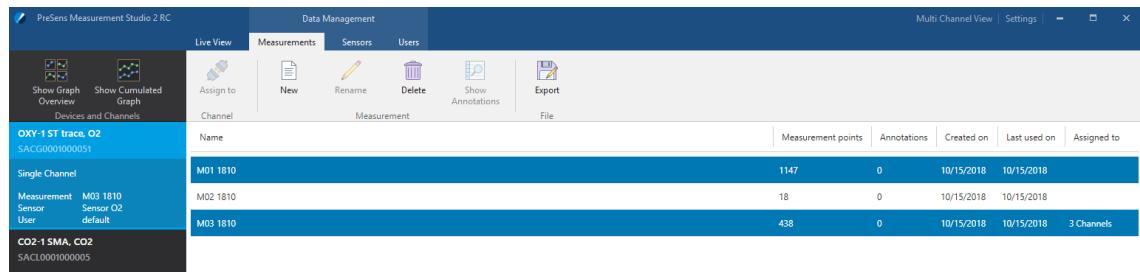


Fig. 83 Multiple measurements selected

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

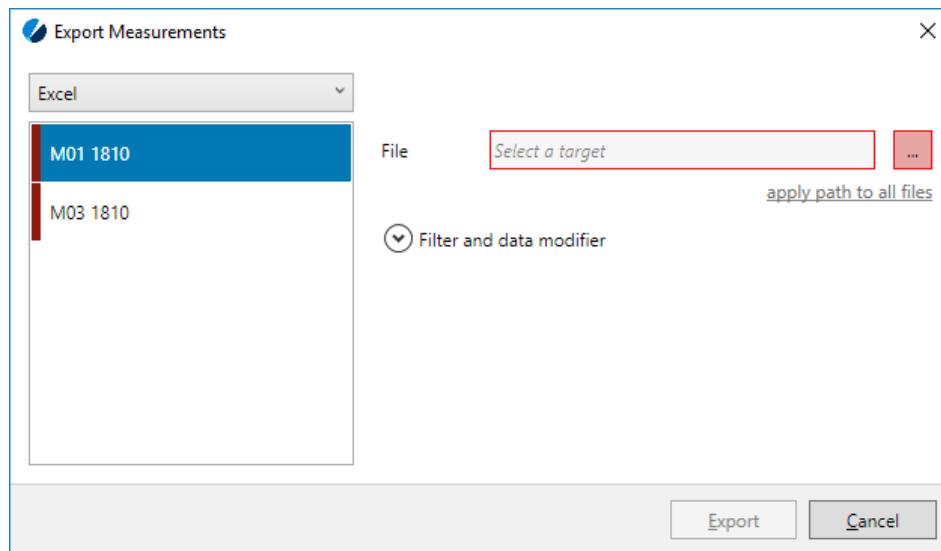


Fig. 84 Export dialog

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 e.g. O₂ 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 **Select a target** place for each measurement; by clicking browse icon next to the input field the file browser will open, and you can choose a destination folder

for the file. Use **apply path to all files** to export all selected measurements to the same folder.

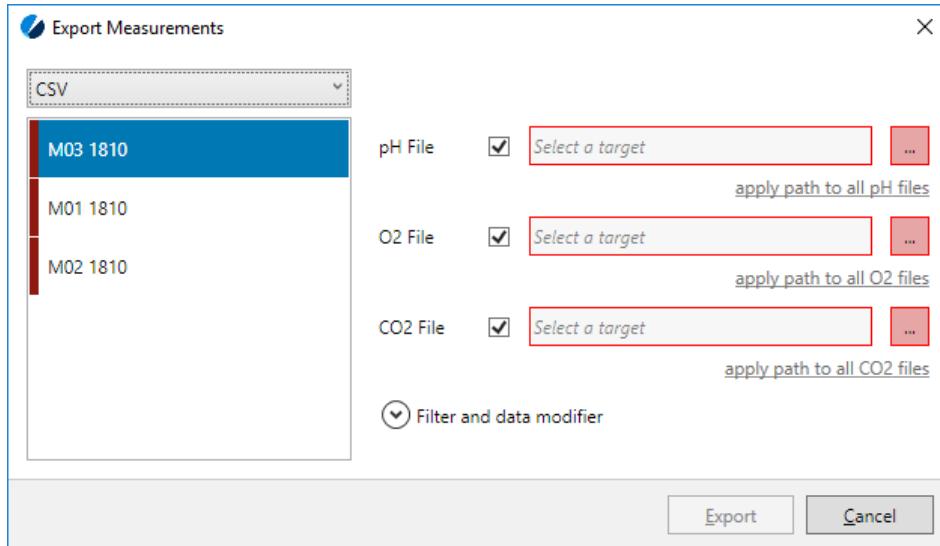


Fig. 85 Export to .csv format – select the parameter files

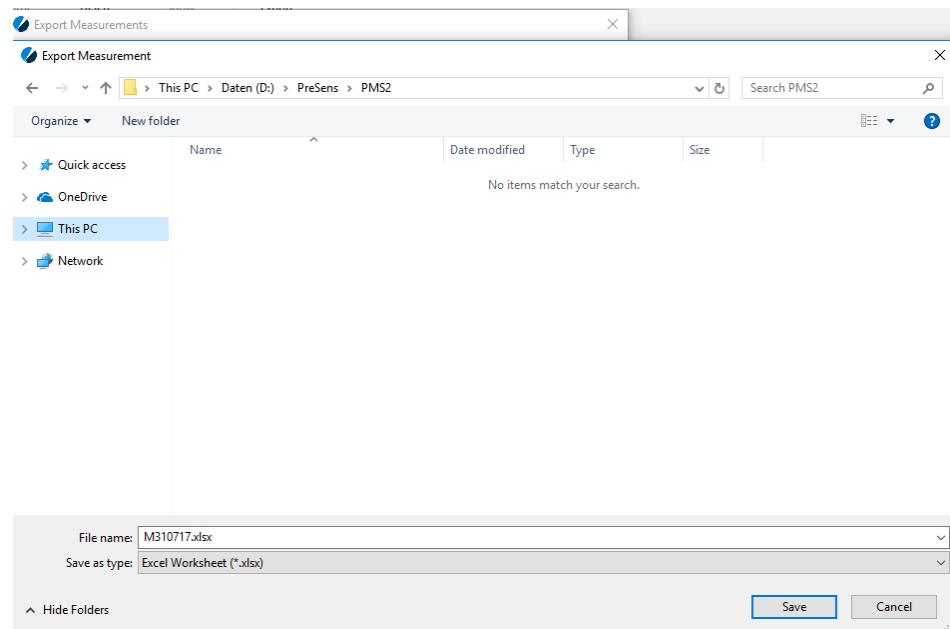


Fig. 86 File manager

4. Click on **Filter and data modifier** to open further export options.

In the **Oxygen / CO₂ modifier** section, you can select an oxygen or CO₂ unit in which the 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.

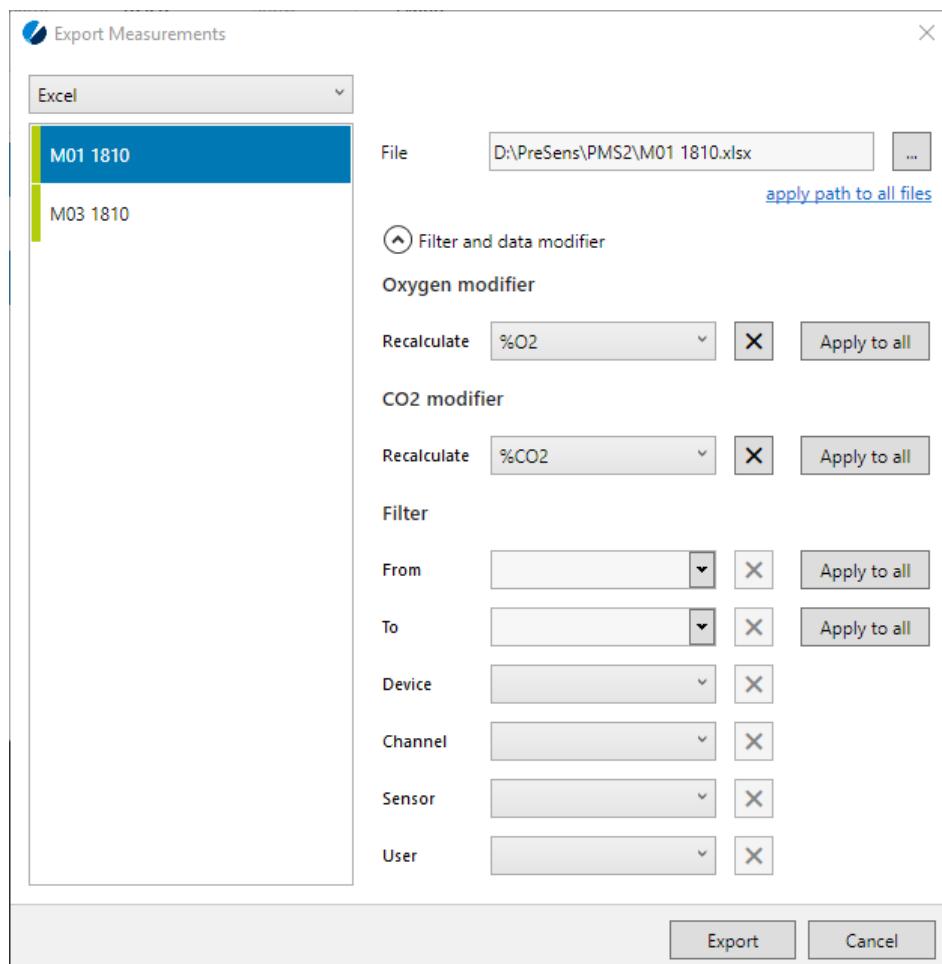


Fig. 87 Oxygen modifier: Recalculate the measurement data to another O₂ unit.

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

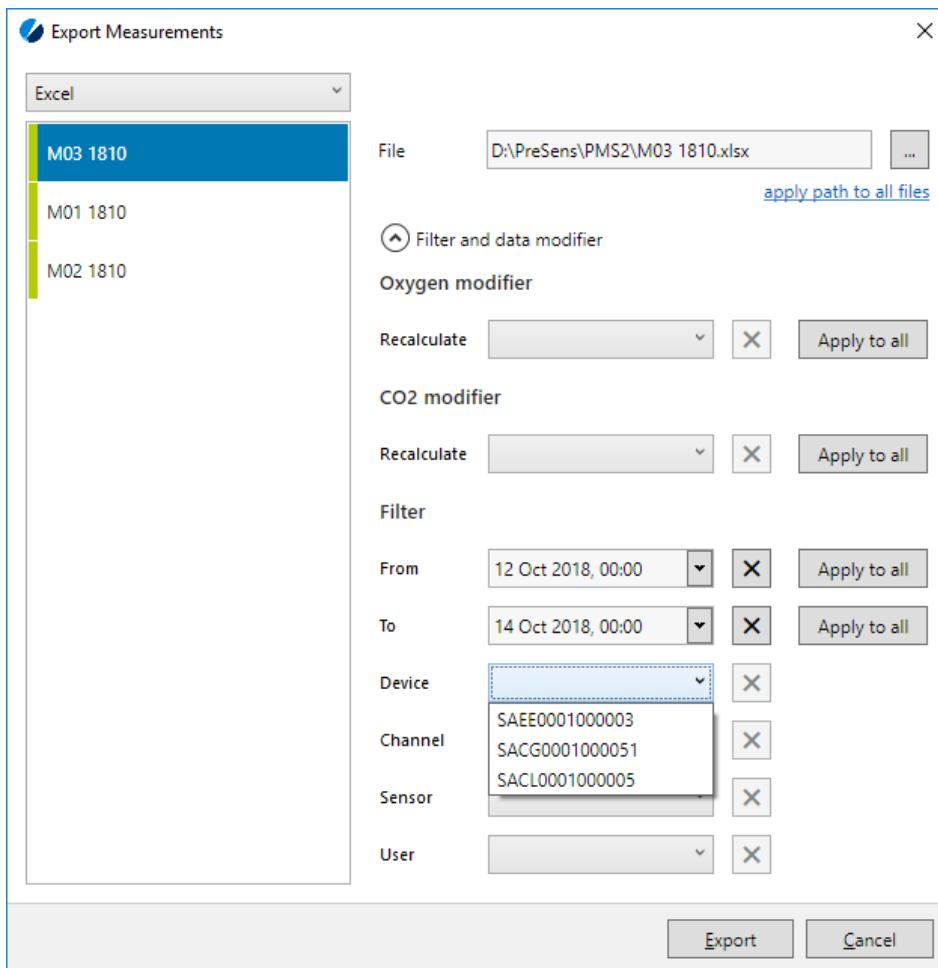


Fig. 88 Apply filters

5 General Software Settings & Extensions

On the top right side of the software window you can find the **Settings** menu. There you are able to open the Settings dialog (chapters 5.1 - 5.3) or manage software extensions (chapter 5.4).

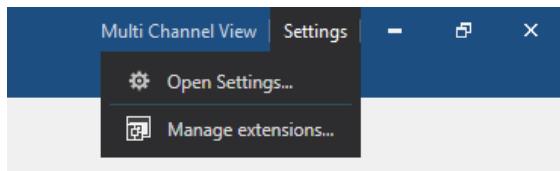


Fig. 89 Settings button on the top right

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.

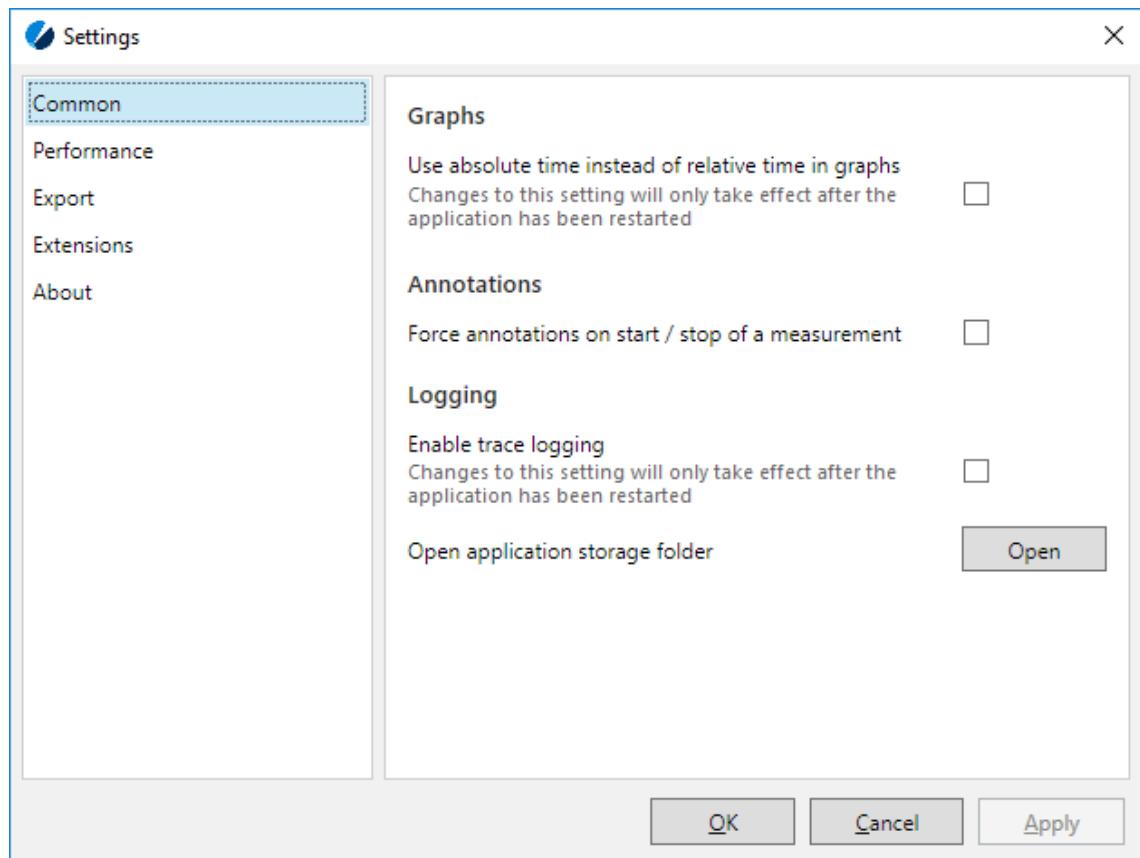


Fig. 90 Common software settings

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

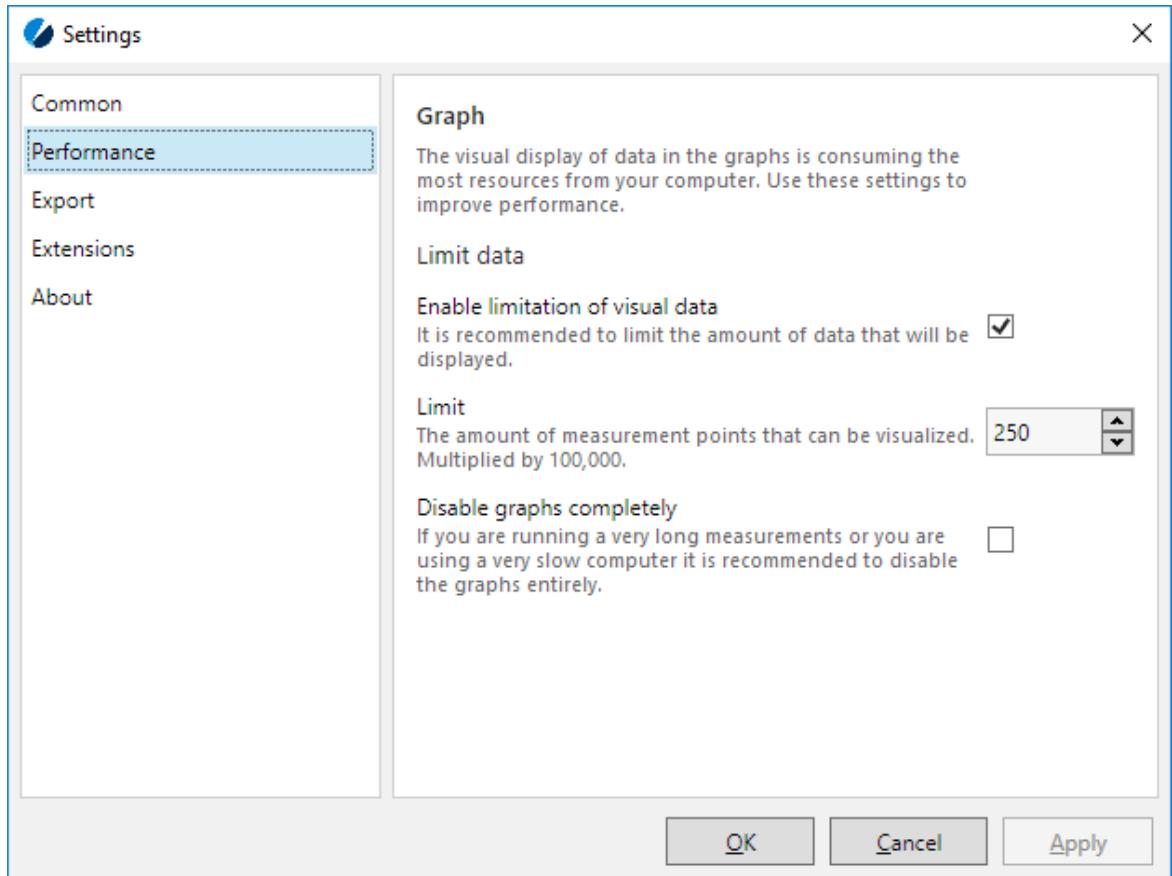


Fig. 91 Performance settings

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. 92) – 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.

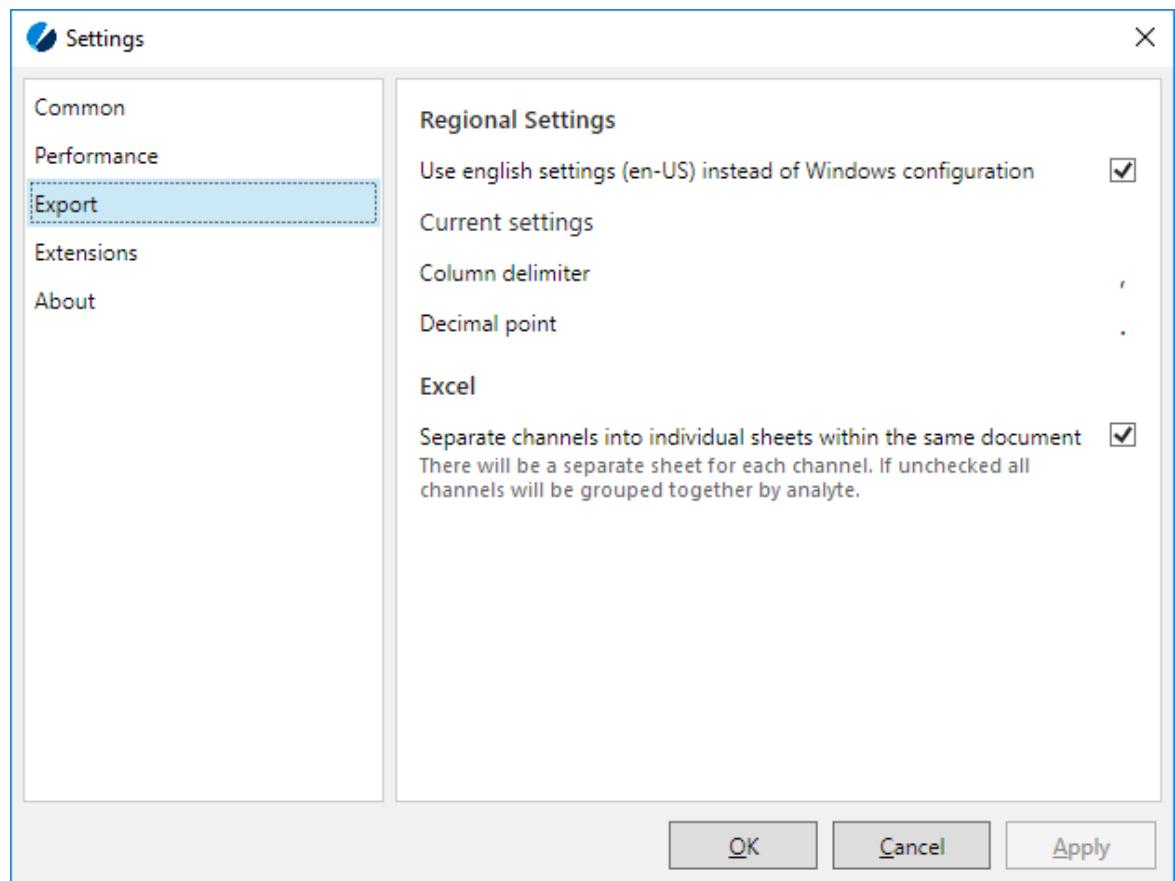


Fig. 92 Regional Settings

5.4 Extensions

PreSens will deliver software extension files together with the PreSens Measurement Studio 2 software, in case an extension is necessary for your application.

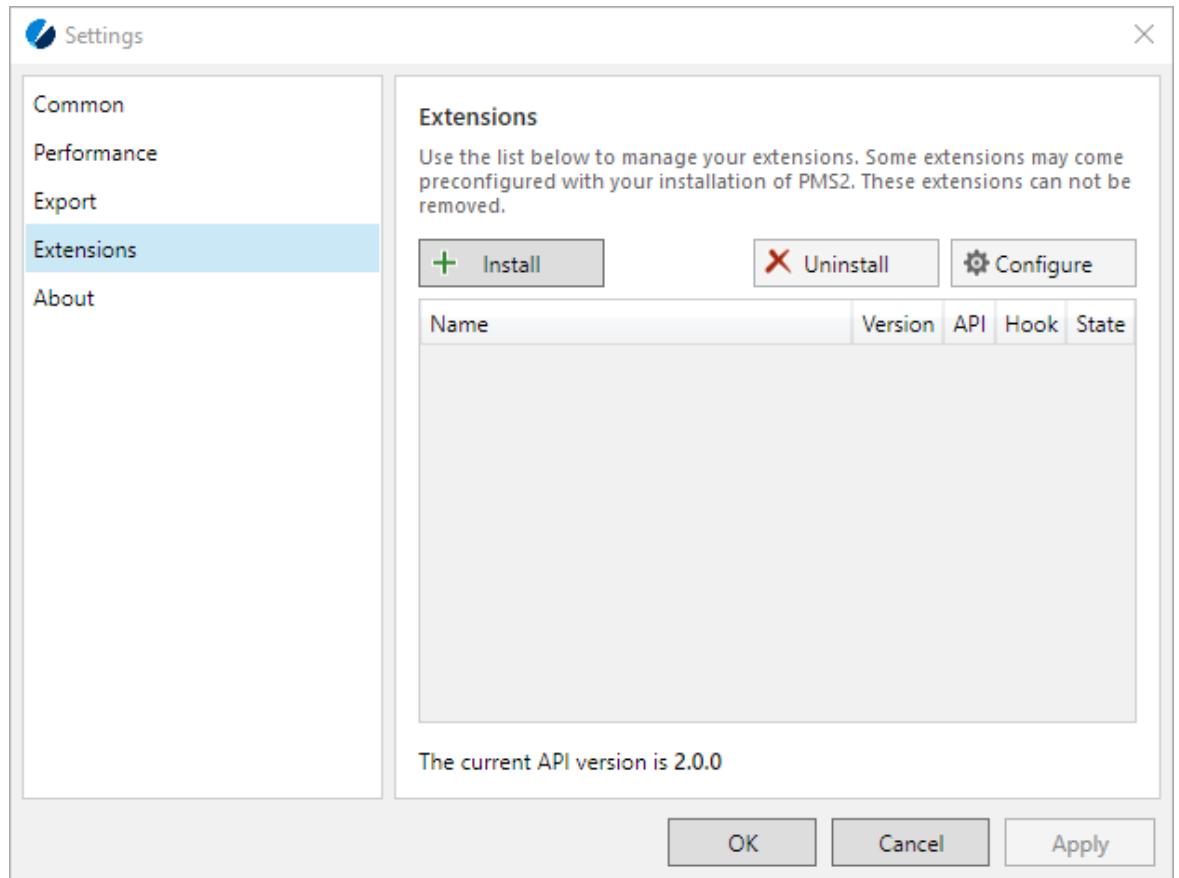


Fig. 93 Manage extensions

On the **Extensions** screen you are able to **Install**, **Uninstall** or **Configure** your software extension.

Click the **Install** button and choose the respective extension in the file explorer that opens. PreSens Measurements Studio 2 will require a restart when a new extension is installed. Once the software is restarted, you can go back to the **Extensions** screen, select the respective extension in the list so it is highlighted, and click **Configure**. In the **Configure Extension** dialog, you can then select the device you want to apply the settings on and perform the necessary configurations. For a detailed description on how to configure an individual software extension, please refer to the respective Extension Configuration sheet.

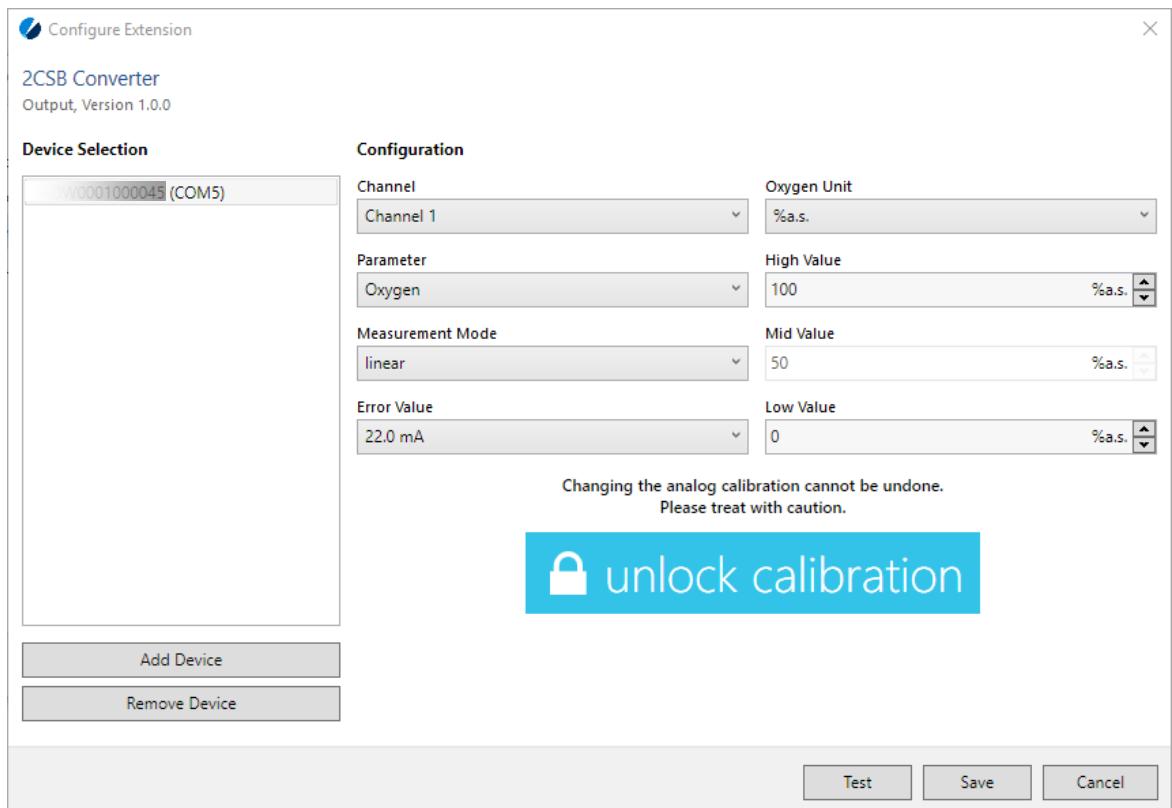


Fig. 94 Example for extension configuration (here: 2CSB Converter extension)

If a software extension is no longer needed or outdated you can remove it by clicking the **Uninstall** button.

In order to send data from a device to the respective software extension it has to be selected in the **Output** section on the Live View screen. Please refer to chapters 4.7.1, 4.7.2 or 4.7.3.

5.5 Troubleshooting

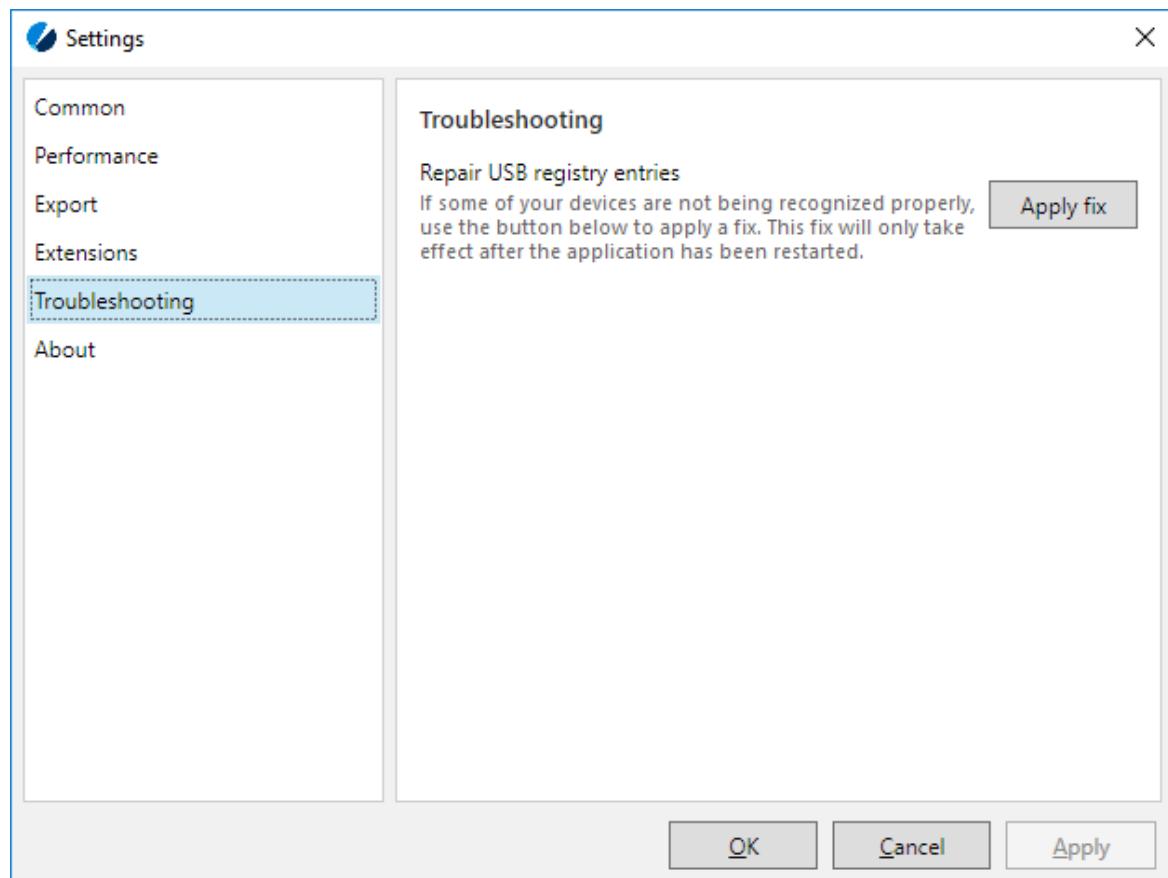


Fig. 95 Troubleshooting

In case the software does not recognize some of the connected devices or device channels properly, a fix can be applied. Restart the software after you have clicked the **Apply fix** button, the respective devices or device channels should be displayed now.

5.6 About

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

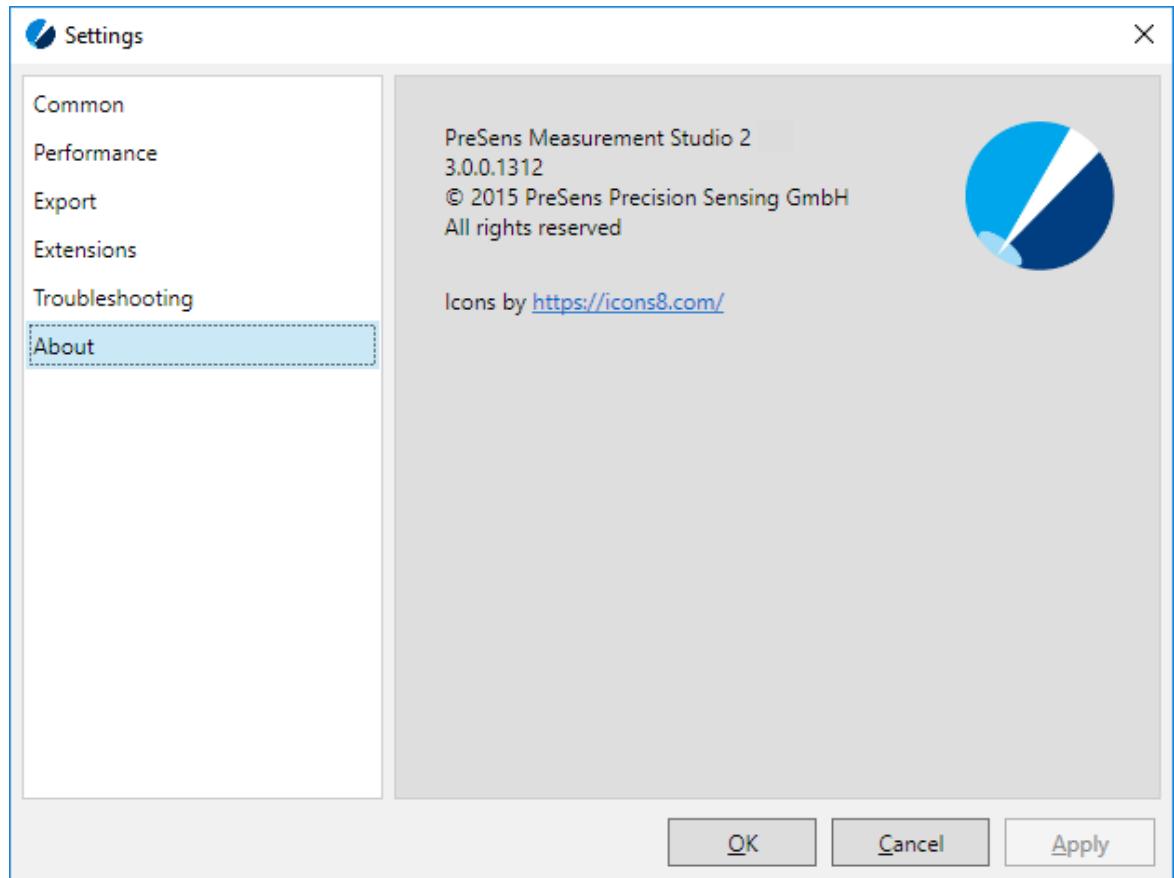


Fig. 96 About – general information about the software

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 Appendix

7.1 Support Guide

To support you properly our service team needs two PreSens Measurement Studio 2 files:

- the Log-file that contains crash information
- the Database-file that contains the stored data

Log-file:

To find the Log-file please open the Windows explorer and copy & paste the following path into the address bar: **%appdata%\PreSens\PM2**

Next press Enter.

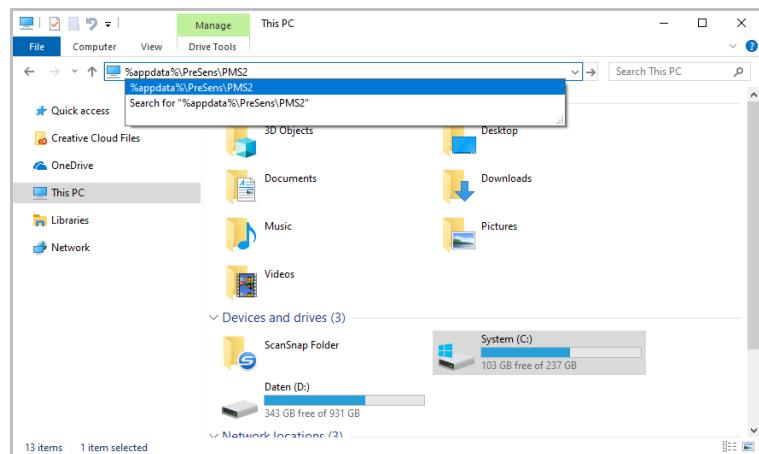


Fig. 97 Find the Log-file: Copy & paste the path into Explorer

In the folder that you have just opened, you will find the **log.txt** -file. Please send us this document so we can find out why your application crashed.

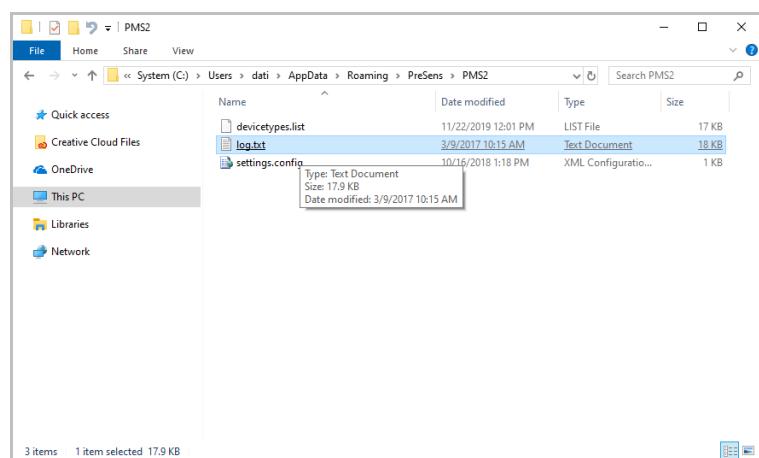


Fig. 98 Send log.txt to our service team

Database-file:

To find the Database-file, please open the Windows explorer and copy & paste the following path into the address bar: **C:\ProgramData\PreSens\PMs2**
Next press Enter.

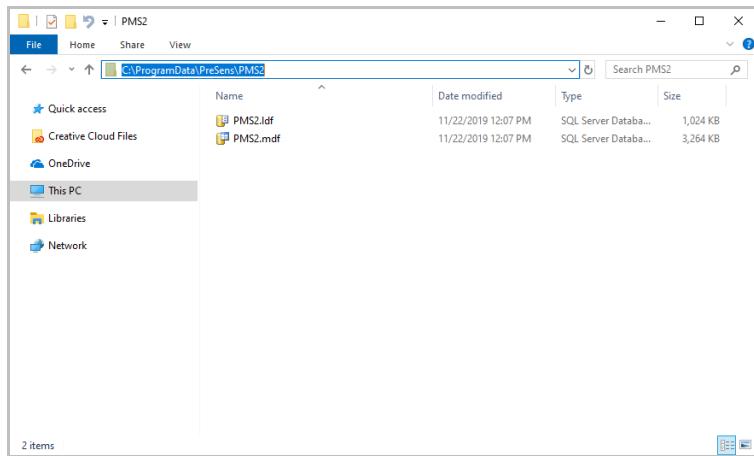


Fig. 99 Find the Database-file: Copy & paste the path into Explorer; send both files in the folder to our service team

In the folder that you have just opened, you will find two files, **PMS2.ldf** and **PMS2.mdf**. Please send us both files, so we can restore your database, find out why your application crashes and maybe even save your data.

8 Concluding Remarks

Dear Customer,

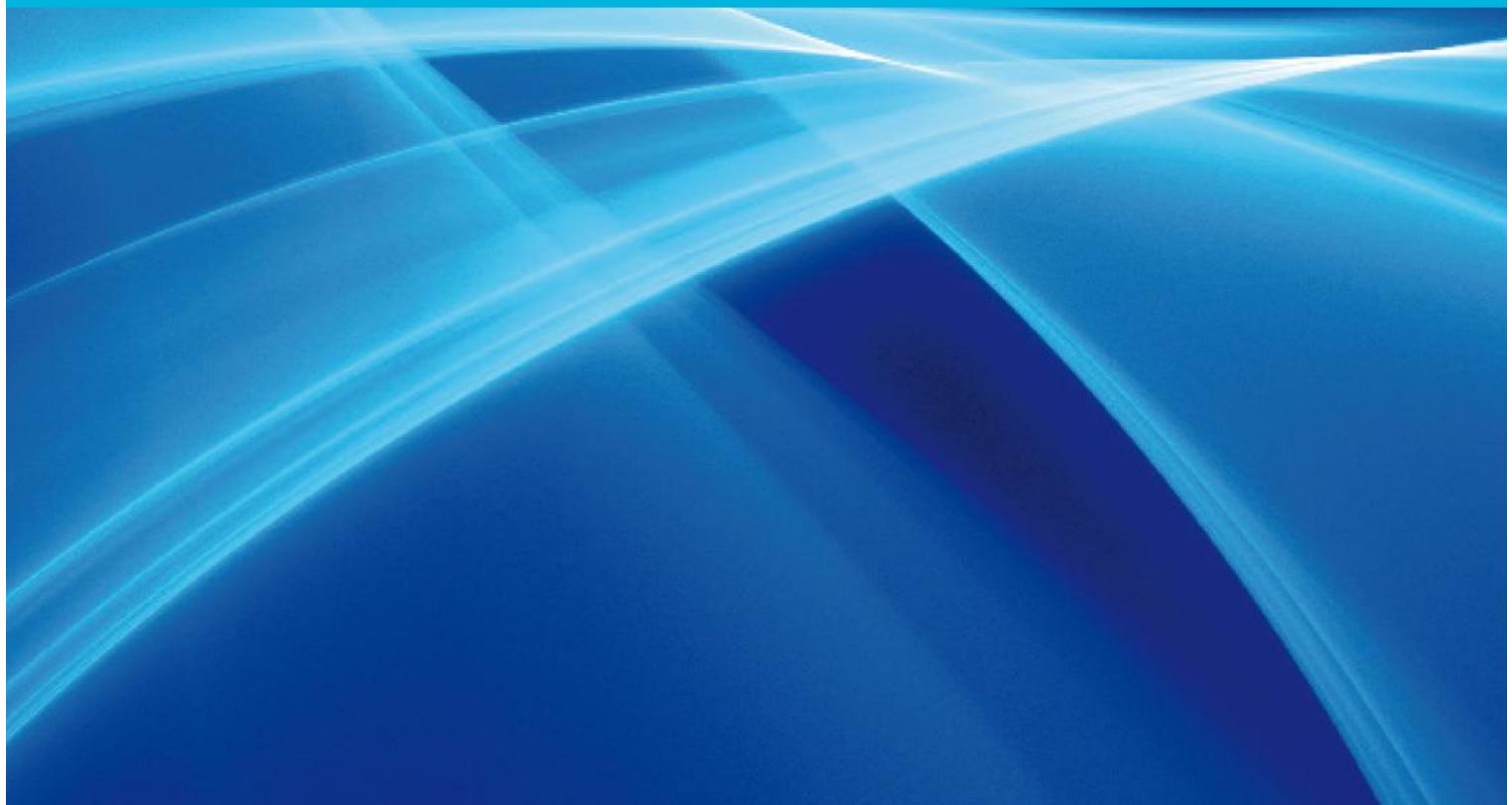
With this manual, we hope to provide you with an introduction to control oxygen and pH meters simultaneously with the PreSens Measurement Studio 2 software.

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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