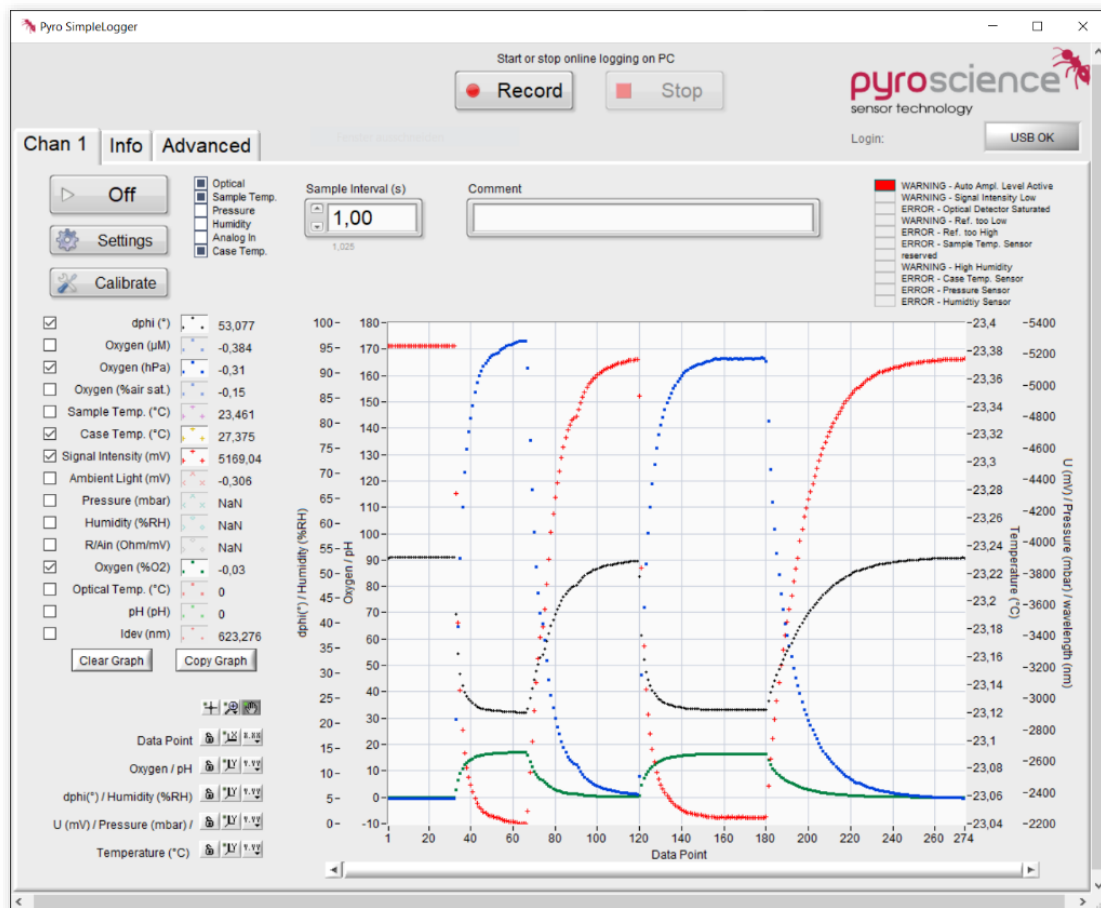


Pyro Developer Tool

PyroScience Logger Software

QUICKSTART MANUAL



Pyro Developer Tool

PyroScience Logger Software

Document Version 1.04

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1 INTRODUCTION

The **Pyro Developer Tool software** is an advanced logger software especially recommended for evaluation purposes of OEM modules. It offers simple settings and calibration procedures, as well as basic logging features. Furthermore, additional advanced settings offer full control on all features of the module.

1.1 Technical Requirements

	Minimal requirements	Recommended requirements
Operating system	Windows 7 / 8 / 10	Windows 10
Processor	Intel i3 Gen 3 (or equivalent) or later	Intel i5 Gen 6 (or equivalent) or later
Graphic	1366 x 768 pixel (Windows scaling: 100%)	1920 x 1080 pixel (Full HD)
Disk space	1 GB	3 GB
RAM	4 GB	8 GB

1.1 Installation

Important: Do not connect the **PyroScience** device to your PC before the **Pyro Developer Tool** has been installed. The software will install automatically the appropriate USB-driver.

Installation steps:

- Please find the correct software in the downloads tab of your purchased device on www.pyroscience.com
- Unzip and start the installer and follow the instructions
- Connect the supported device with the USB cable to the computer.
- After successful installation, a new program short-cut "Pyro Developer Tool" is added to the start menu and can be found on the desktop.

1.2 Supported Devices

This software works with any PyroScience device with firmware version ≥ 4.00 . If the device is equipped with a USB interface, it can be directly connected to a Windows PC and operated with this software. If the module comes with an UART interface, then a separately available USB adapter cable is required for using this software.

Multi-analyte meter FireSting-PRO with

- 4 optical channels (item no.: **FSPRO-4**)
- 2 optical channels (item no.: **FSPRO-2**)
- 1 optical channel (item no.: **FSPRO-1**)

Oxygen meter FireSting-O₂ with

- 4 optical channels (item no.: **FSO2-C4**)
- 2 optical channels (item no.: **FSO2-C2**)
- 1 optical channel (item no.: **FSO2-C1**)

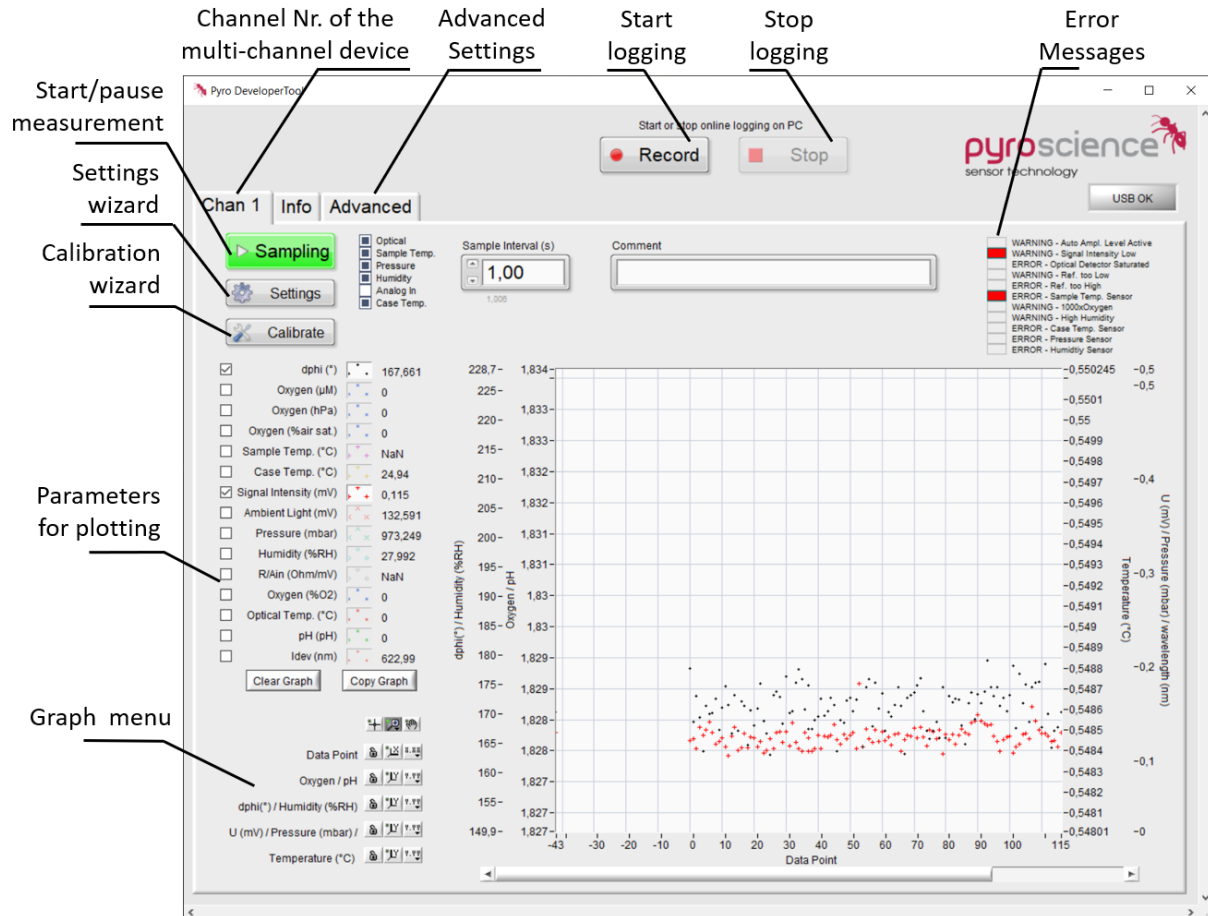
OEM meters

- Oxygen OEM module (item no.: **PICO-O2, PICO-O2-SUB, FD-OEM-O2**)
- pH OEM module (item no.: **PICO-PH, PICO-PH-SUB, FD-OEM-PH**)
- Temperature OEM module (item no.: **PICO-T**)

Underwater AquapHOx meters

- Logger (item no.: **APHOX-LX, APHOX-L-O2, APHOX-L-PH**)
- Transmitter (item no.: **APHOX-TX, APHOX-T-O2, APHOX-T-PH**)

2 OVERVIEW MAIN WINDOW



The main window can look differently depending on the type of device you are using. When using a multi-channel device such as FSPRO-4, each channel is individually adjustable and will be shown in the tabs. When using devices with stand-alone logging function such as AquapHOx Loggers, a new tab for the logging function will be shown.

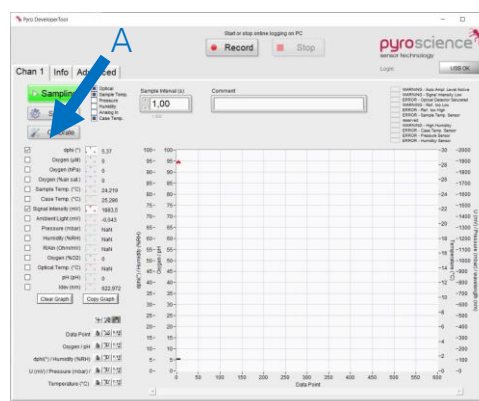
3 OXYGEN SENSORS

3.1 Settings for Oxygen Sensors

Connect your Device to the PC and start the *Pyro Developer Software*.

Adjusting the Settings

Click on Settings (A).



Enter the **Sensor Code** of your purchased sensor.

Please choose your **temperature sensor** for automatic temperature compensation of your measurement:

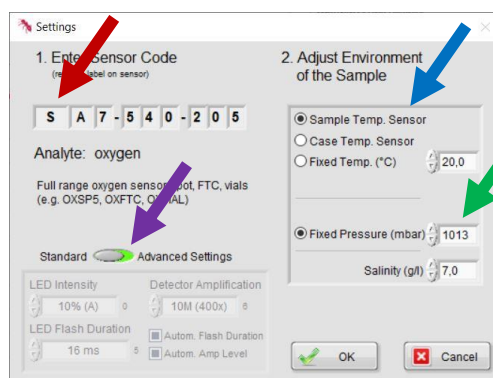
Sample Temp. Sensor: An additional Pt100 temperature sensor is connected to your device.

In case of AquapHOx, the integrated temperature sensor will be used.

In case of PICO devices, a Pt100 temperature sensor need to be soldered to the device (TSUB21-NC).

Case Temp. Sensor: The read-out device has a temperature sensor inside. You can use this temperature sensor if the entire device will have the same temperature as your sample.

Fixed Temp: The temperature of your sample will not change during measurement and will be kept constant using a thermostatic bath.



Please type in the **pressure (mbar)** and the **salinity (g/l)** of your sample.

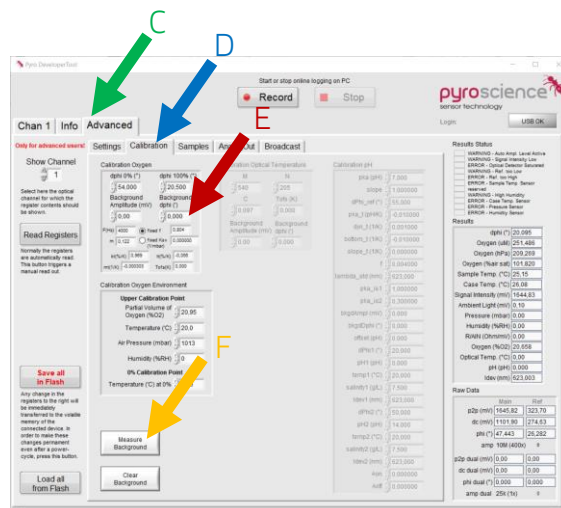
When changing to **advanced device settings**, it is possible to change LED intensity, the detector amplification and then LED flash duration. These values will influence the sensor signal (and the rate of photobleaching). Do not change these values if your sensor signal is sufficient (recommended values: >100mV at ambient air)

Background Compensation

Please click on the register **Advanced** (C) and then on **Calibration** (D).

If you are using a 1m, 2m or 4m optical fiber, please type in these values into the **respective window** (E).

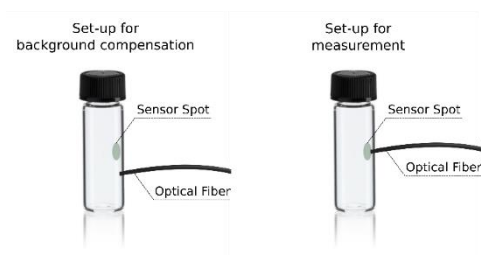
Fiber length	Background Amplitude (mV)	Background dPhi (°)
AquapHOx OXCAP	0.00	0
2cm-5cm (PICO)	0.01	0
1m (PICO)	0.3	0
1m fiber for APHOx or FireSting	0.577	0
2m fiber for APHOx or FireSting	0.811	0
4m fiber for APHOx or FireSting	1.279	0



Advanced Manual Background Compensation

In case you are measuring a sensor spot with a bare fiber (SPFIB), you can also perform a manual background compensation. Please make sure, that your fiber/rod is connected to the device but is NOT connected to the sensor.

Click on **Measure Background (F)** to perform the manual luminescence background.



3.2 Calibration of Oxygen Sensors

The oxygen sensor calibration can be performed in two ways:

- 1-point calibration (required): upper OR 0% calibration
- 2-point calibration (optional): upper AND 0% calibration; recommended for measurements at low O₂ and high accuracy measurements over the full range.

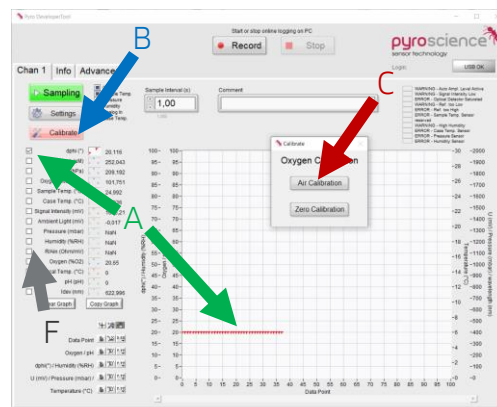
Upper Calibration

Connect your oxygen sensor to your device and let the sensor equilibrate at your calibration conditions (refer to the **oxygen sensor manual** for more detailed description calibration).

To ensure stable signal, please follow 'dPhi (°)' (A) on the graphical interface. dPhi represents the measured raw value.

Once you reached a stable signal of dPhi and the temperature, click on Calibrate (B) and then on 'Air Calibration' (C).

Note: When the calibration window is opened, the last measured dPhi and temperature value



is used. No further measurement is conducted. Open the window only once the value is stable. In the Calibration window, the last measured temperature value will be shown (D). Type in the current air pressure and the Humidity (E). Both values can also be seen on the measured values in the main window (F). If the sensor is submerged in water or if the air is saturated with water, enter 100% Humidity.

Click on 'calibrate' to perform the upper calibration.

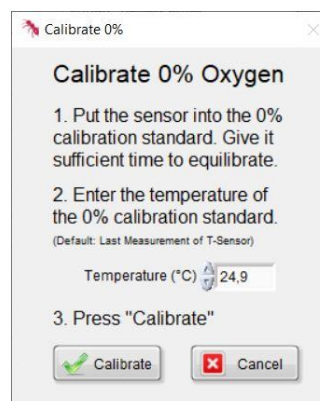
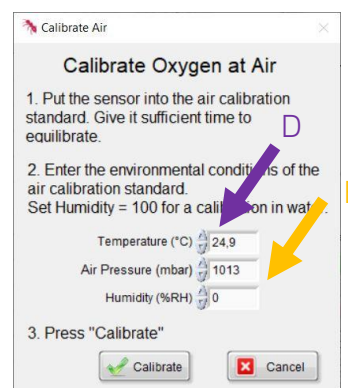
0% Calibration

Put the oxygen and temperature sensor into your oxygen-free calibration solution (item no. **OXCAL**) and wait again until a stable sensor signal (dPhi) and temperature is reached.

After a stable signal is reached, click on 'Calibrate' (B) and then on 'Zero Calibration' (C).

Control the measured temperature and then click on 'Calibrate'.

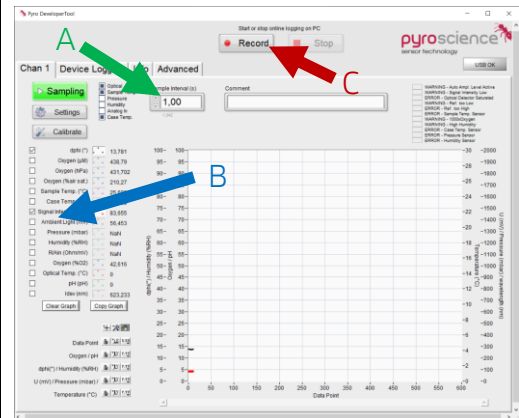
The sensor is now 2-point calibrated and ready to use.



3.3 Oxygen Measurement

In the main window, adjust your sample interval (A). Choose your oxygen unit which should be shown in the graph (B). If you want to save the data into a .csv file, click on Record (C). All oxygen units (also those which are not shown in the graph) and raw values will be recorded.

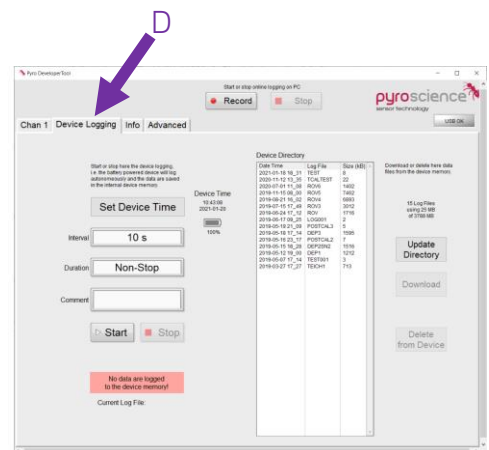
Note: The data file saves the data with a factor of 1000 in order to prevent a comma separator. Divide the data with 1000 to receive commonly used units.



Autonomous Logging

Some devices are capable of autonomous logging (AquapHOx Logger). To start logging, go to “Device Logging” (D) and adjust your settings. After clicking on “Start” and choosing a Filename, you can disconnect the Logger from the PC and logging will continue.

To retrieve the data, connect the Logger, stop logging and download the data from the internal memory.



4 PH SENSORS

4.1 Settings for pH Sensors

Connect your Device to the PC and start the *Pyro Developer Software*.

Click on Settings (A).

Enter the **Sensor Code** of your purchased sensor.

Please choose your **temperature sensor** for automatic temperature compensation of your measurement:

Sample Temp. Sensor: An additional Pt100 temperature sensor is connected to your device.

In case of AquapHOx, the integrated temperature sensor will be used.

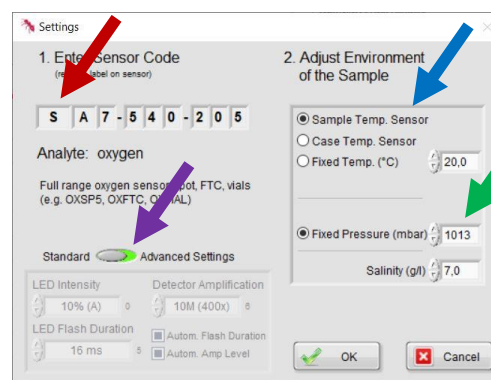
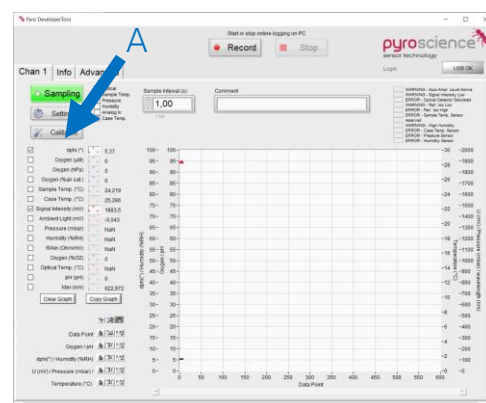
In case of PICO devices, a Pt100 temperature sensor need to be soldered to the device (TSUB21-NC).

Case Temp. Sensor: The read-out device has a temperature sensor inside. You can use this temperature sensor if the entire device will have the same temperature as your sample.

Fixed Temp: The temperature of your sample will not change during measurement and will be kept constant using a thermostatic bath.

Please type in the **salinity (g/l)** of your sample.

This salinity value can be calculated by a simplified approach:



Salinity [g/l] = Conductivity [mS/cm] / 2
 Salinity [g/l] = Ionic Strength [mM] / 20

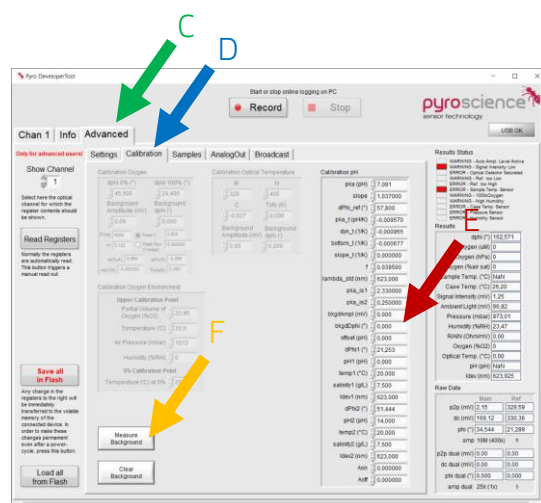
When changing to **advanced device settings**, it is possible to change LED intensity, the detector amplification and then LED flash duration. These values will influence the sensor signal (and the rate of photobleaching). Do not change these values if your sensor signal is sufficient (recommended values: >120mV at pH2, >50mV at pH 10)

Background Compensation

Please click on the register Advanced (C) and then on Calibration (D).

If you are using a 1m, 2m or 4m optical fiber, please type in these values into the **respective window (E)**.

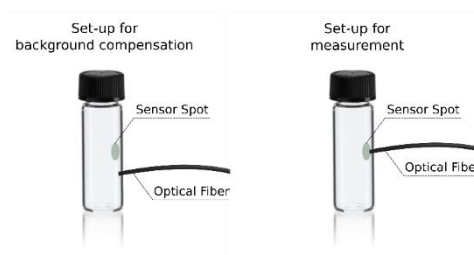
Fiber length	Background Amplitude (mV)	Background dPhi (°)
AquapHOx PHCAP	0.00	0
2cm-5cm (PICO)	0.01	0
1m (PICO)	0.3	0
1m fiber for APHOx or FireSting	0.577	0
2m fiber for APHOx or FireSting	0.811	0
4m fiber for APHOx or FireSting	1.279	0



Advanced Manual Background Compensation

In case you are measuring a sensor spot with a bare fiber (SPFIB), you can also perform a manual background compensation. Please make sure, that your fiber/rod is connected to the device but is NOT connected to the sensor.

Click on **Measure Background (F)** to perform the manual luminescence background.



4.2 Calibration of pH Sensors

Calibration of optical pH sensors can be performed as:

- **A one-point calibration** at pH 2 is obligatory to start measurements
- **A two-point calibration** at pH 10 is highly recommended
- **pH offset-adjustment** is recommended for measurements in complex media (only advanced applications)

Low pH calibration (First calibration point)

Read the **pH sensor manual** for more information on the calibration procedure.

Connect your pH sensor to your device and let the sensor equilibrate in dest. H₂O or a self-made buffer solution for at least **30 min** to facilitate **wetting of the sensor**.

Prepare a pH 2 buffer (item no. **PHCAL2**). Immerse the sensor into the stirred pH 2 buffer and let the sensor equilibrate for at least 30 min.

To ensure stable signal, please follow 'dPhi (°)' (A) on the graphical interface. dPhi represents the measured raw value.

Important: Please check the value of "Signal Intensity". If the value is < 120mV please increase the LED Intensity.

Once you reached a stable signal, click on Calibrate (B).

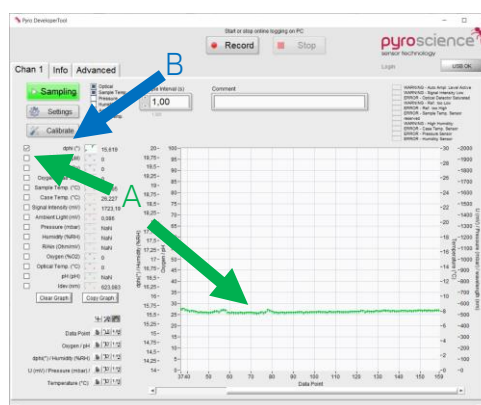
Note: When the calibration window is opened, the last measured dPhi and Temperature value is used and not measured continuously anymore.

In the Calibration window, choose 'low pH' (C), enter the pH value and salinity of your pH buffer and ensure that the correct temperature is displayed.

When using PHCAL2, please type in the pH value at the current temperature. The salinity of the buffer is 2 g/l.

Temperature	pH
10°C	2.40
15°C	2.36
20°C	2.3
25°C	2.26
30°C	2.23

Click on 'calibrate' to perform the low pH calibration.



Calibrate pH

1. Put the sensor into the pH calibration standard. Give it sufficient time to equilibrate.
2. Adjust the calibration parameters
 - Calibration Point: low pH
 - pH (pH): 4.010
 - Temperature (°C): 25.909
 - Salinity (g/l): 7.500
3. Press "Calibrate"

Calibrate Cancel

High pH calibration (Second calibration point)

For the 2nd calibration point prepare a buffer with pH 10.0 (**PHCAL10**) or pH 11 (**PHCAL11**). Rinse the pH sensor with distilled water and immerse the sensor into the pH 10 buffer.

Let the sensor equilibrate for at least 30 min.

After a stable signal is reached, click on 'Calibrate' (B).

In the Calibration window, choose 'high pH' (C), enter the pH value and salinity of your pH buffer and ensure that the correct temperature is displayed.

When using **PHCAL10**, please type in the pH value at the current temperature. The salinity is 7.5 g/l.

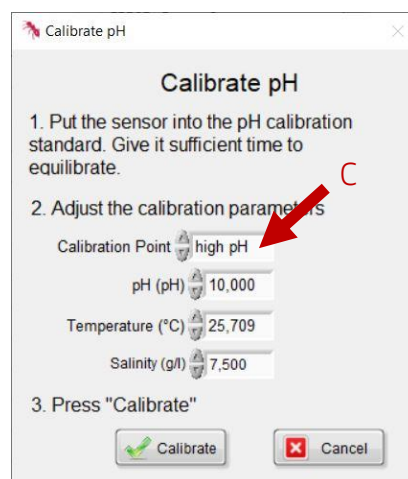
Temperature	pH
10°C	10.18
15°C	10.14
20°C	10.06
25°C	10.00
30°C	9.98

When using **PHCAL11**, please type in the pH value at the current temperature. The salinity is 6 g/l.

Temperature	pH
10°C	10.81
15°C	11.05
20°C	11.14
25°C	11.23
30°C	11.28

Click on 'calibrate' to perform the high pH calibration.

The sensor is now 2-point calibrated and ready to use.



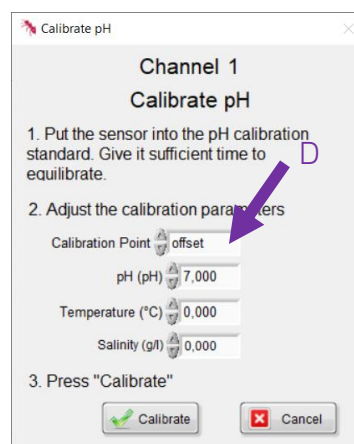
pH offset adjustment (optional, only for advanced applications)

This will perform a pH-offset adjustment to a buffer with exactly known pH value.

This can be used for measurements in highly complex media (e.g. cell culture media) or to perform an offset to a known reference value (e.g. spectrophotometric pH measurement). Please refer to the **pH sensor manual** for more information.

The buffer/ sample for this pH offset calibration must be within the dynamic range of the sensor. This means, the solution must have e.g. a pH between 6.5 and 7.5 for PK7 sensors (or pH 7.5 and 8.5 for PK8 sensors).

Put the sensor into a buffer with known pH value and salinity. After a stable signal is reached, click on calibrate in the main window (A). Choose 'offset' (D) and enter the pH value of the reference.



4.3 pH Measurement

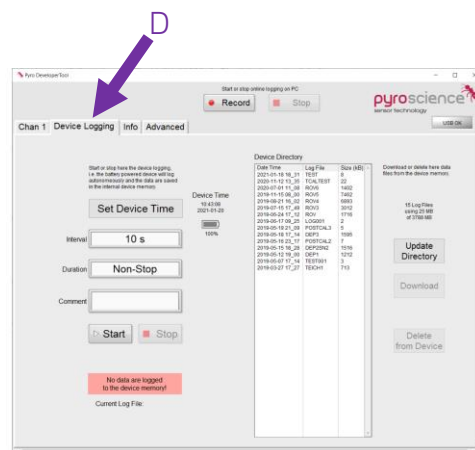
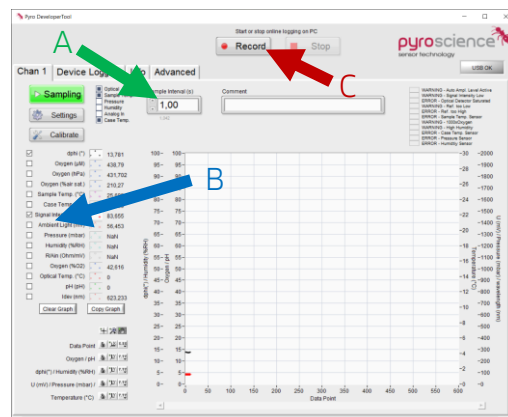
In the main window, adjust your sample interval (A). Choose your parameter which should be shown in the graph (B). If you want to save the data into a .csv file, click on Record (C). All parameters and raw values will be recorded.

Note: The data file saves the data with a factor of 1000 in order to prevent a comma separator. Device the data with 1000 to receive commonly used units. (pH 7100 = pH 7.100)

Autonomous Logging

Some devices are capable of autonomous logging (AquapHOx Logger). To start logging, go to “Device Logging” (D) and adjust your settings. After clicking on “Start” and choosing a Filename, you can disconnect the Logger from the PC and logging will continue.

To retrieve the data, connect the Logger, stop logging and download the data from the internal memory.

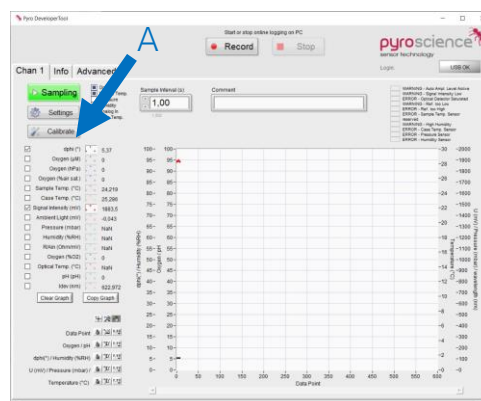


5 OPTICAL TEMPERATURE SENSORS

5.1 Settings for Optical Temperature Sensors

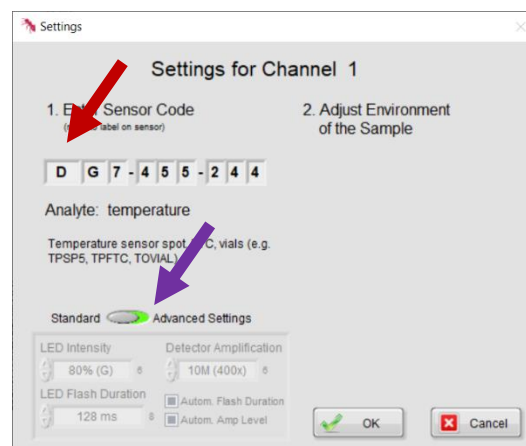
Connect your Device to the PC and start the *Pyro Developer Software*.

Click on Settings (A).



Enter the **Sensor Code** of your purchased sensor.

When changing to **advanced device settings**, it is possible to change LED intensity, the detector amplification and then LED flash duration. These values will influence the sensor signal (and the rate of photobleaching). Do not change these values if your sensor signal is sufficient.

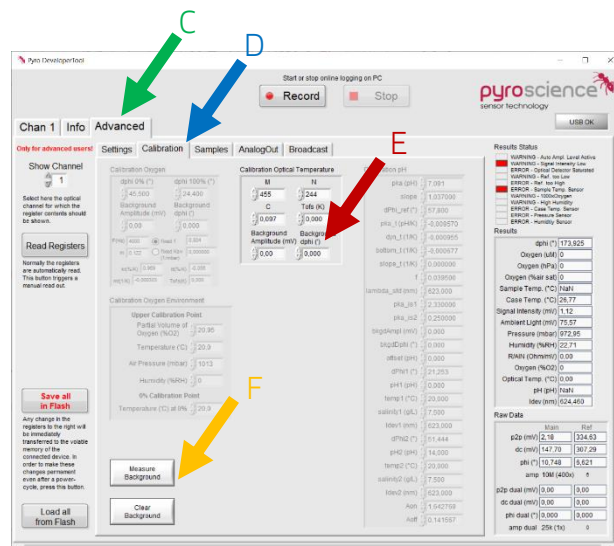


Background Compensation

Please click on the register Advanced (C) and then on Calibration (D).

If you are using a 1m, 2m or 4m optical fiber, please type in these values into the **respective window (E)**.

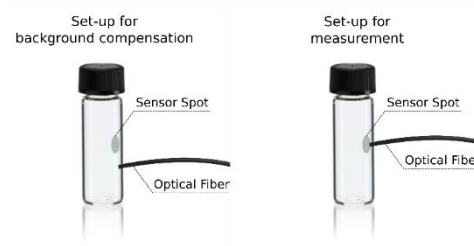
Fiber length	Background Amplitude (mV)	Background dPhi (°)
2cm-5cm (PICO)	0.01	0
1m (PICO)	0.3	0
1m fiber for APHOx or FireSting	0.577	0
2m fiber for APHOx or FireSting	0.811	0
4m fiber for APHOx or FireSting	1.279	0



Advanced Manual Background Compensation

In case you are measuring a sensor spot with a bare fiber (SPFIB), you can also perform a manual background compensation. Please make sure, that your fiber/rod is connected to the device but is NOT connected to the sensor.

Click on **Measure Background (F)** to perform the manual luminescence background.



5.2 Calibration of Optical Temperature Sensors

Optical temperature sensors are calibrated against an external temperature sensor.

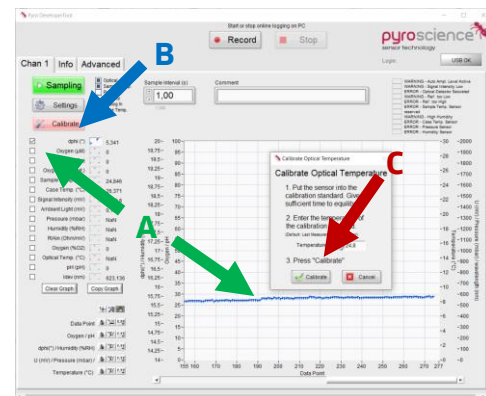
Connect your optical temperature sensor to your device.

To ensure a stable sensor signal, follow 'dPhi (°)' (A) on the graphical interface. dPhi represents the measured raw value.

Once you reached a stable signal, click on Calibrate (B).

Type in the reference temperature and click on 'calibrate' (C).

The sensor is now calibrated and ready to use.



5.3 Optical Temperature Measurement

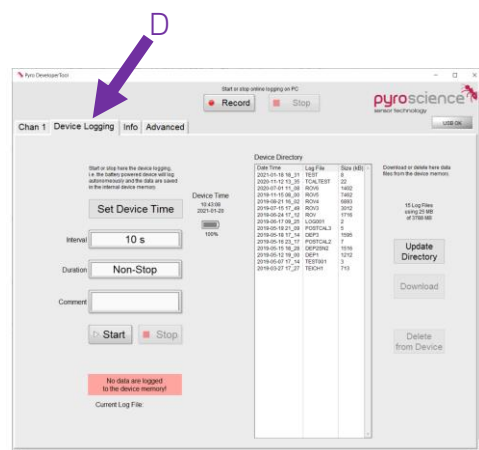
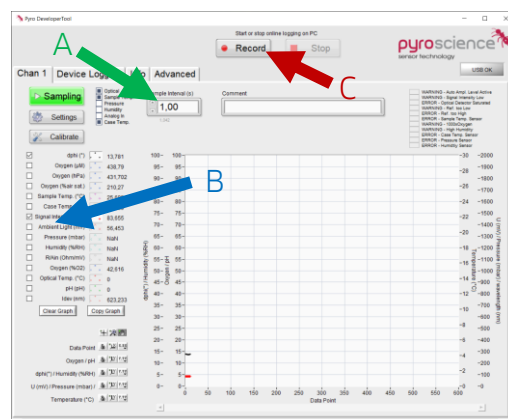
In the main window, adjust your sample interval (A). Choose your parameter which should be shown in the graph (B). If you want to save the data into a .csv file, click on Record (C). All parameters and raw values will be recorded.

Note: The data file saves the data with a factor of 1000 in order to prevent a comma separator. Device the data with 1000 to receive commonly used units.

Autonomous Logging

Some devices are capable of autonomous logging (AquapHOx Logger). To start logging, go to “Device Logging” (D) and adjust your settings. After clicking on “Start” and choosing a Filename, you can disconnect the Logger from the PC and logging will continue.

To retrieve the data, connect the Logger, stop logging and download the data from the internal memory.



6 CUSTOM INTEGRATION OF THE READ-OUT DEVICE

For integration of the read-out device into a custom setup, it is possible to close the software after calibration and disconnecting the device from the PC. After closing the software and flashing the module, the configuration is automatically saved within the internal flash memory of the module. This means that the adjusted settings and the last sensor calibration are persistent even after a power cycle of the module. Now the module can be integrated into a customer specific setup via its UART interface (or via the USB interface cable with its virtual COM port). Please refer to the respective device manual for more information on the communication protocol.

7 ANALOG OUTPUT / BROADCAST MODE

Some devices (e.g. **FireSting pro**, **AquapHOx Transmitter**) offer an integrated **Analog Output**. It can be used for transferring measurement results (e.g. oxygen, pH, temperature, pressure, humidity, signal intensity) as voltage/ current (depending on the device) signals to other electronic equipment (e.g. loggers, chart recorders, data acquisition systems).

Further, some devices can be operated in a so-called **Broadcast Mode**, in which the device performs measurements autonomously without any PC connected. The auto-mode does not possess any integrated logging functionality, but the measured values must be read out via the analog output e.g. by an external data logger. The basic idea behind the auto-mode is that all operations related to sensor settings and sensor calibrations are still performed during the general operation with a PC. When this is done, the broadcast modus can be configured and the device will trigger a Measurement autonomously as long as a power supply is given via the USB or extension port.

And finally, the extension port offers also a complete digital interface (UART) for advanced integration possibilities into custom electronics equipment. This UART interface might be also utilized during auto-mode operation for a digital read-out of the measured values.

7.1 FireSting pro

To enter the Analog Output settings, please go to Advanced – AnalogOut.

The 4 analog outputs are deliberately designated with A, B, C, and D for distinguishing them clearly from the numbering 1, 2, 3, and 4 of the optical channels. The background is that the analog outputs are not fixed to specific channels ensuring highest flexibility.

Chan 1 **Chan 2** **Chan 3** **Chan 4** **Info** **Advanced**

Only for advanced users! **Settings** **Calibration** **Samples** **AnalogOut** **Broadcast**

Show Channel
1
Select here the optical channel for which the register contents should be shown.
Read Registers
Normally the registers are automatically read. This button triggers a manual read out.

AnalogOut A
Channel 1
Register dphi (*)
Mode Standard Analog Out
Lowest output means 0,000
Highest output means 250,000

AnalogOut B
Channel 2
Register dphi (*)
Mode Standard Analog Out
Lowest output means 0,000
Highest output means 250,000

AnalogOut C
Channel 3
Register dphi (*)
Mode Standard Analog Out
Lowest output means 0,000
Highest output means 250,000

AnalogOut D
Channel 4
Register dphi (*)
Mode Standard Analog Out
Lowest output means 0,000
Highest output means 250,000

Save all in Flash
Any change in the registers to the right will be immediately transferred to the volatile memory of the connected device. In order to make these changes permanent even after a power-cycle, press this button.

The output of the analog output is device dependent. In the example above, AnalogOutA offers a voltage output between 0 and 2500 mV. Click on “Save all in Flash” to save the settings.

7.2 AquapHOx Transmitter

To enter the Analog Output settings, please close the Pyro Developer Tool software. The settings window will open automatically.

This device is equipped with 2 voltage/current analog outputs. When using the 0-5V output, please adjust AnalogOut A and B. When using the 4-20mA output, please adjust AnalogOut C and C.

Adjust Analog Outputs - Broadcast Mode - Modbus Slave Address

If your module is equipped with 4 voltage outputs, then adjust AnalogOut A, B, C, and D.
 If your module is equipped with 2 voltage outputs, then adjust AnalogOut A and B.
 If your module is equipped with 2 current outputs, then adjust AnalogOut C and D.

AnalogOut A	AnalogOut B
Register: Oxygen (mbar)	Register: Sample Temp. (°C)
Mode: Standard Analog Out	Mode: Standard Analog Out
Lowest output means: 0.000	Lowest output means: 0.000
Highest output means: 250.000	Highest output means: 50.000

AnalogOut C	AnalogOut D
Register: Pressure (mbar)	Register: Humidity (%)
Mode: Standard Analog Out	Mode: Standard Analog Out
Lowest output means: 0.000	Lowest output means: 0.000
Highest output means: 2500.000	Highest output means: 250.000

If "Broadcast Interval" is set >0, then the module will trigger itself periodic measurements whereby "Broadcast Interval" defines the interval inbetween each measurement in units of milliseconds. For example 50 ms would correspond to a sample frequency of 20 Hz. Set Broadcast Interval to 0 in order to disable the broadcast mode. The maximum possible value is ca. 60000 ms = 60 s.

Broadcast Interval (ms): 0

Modbus Slave Address: 1

OK Cancel

The output of the analog output is device dependent. In the example above, AnalogOutA offers a voltage output between 0 and 2500 mV.

During broadcast modus operation, the measurement results can be read out e.g. by an analog data logger from the analog output. The Broadcast modus is disabled by default: **Broadcast interval [ms]** is set to 0. By changing this, the broadcast modus is automatically activated.

8 ADVANCED SETTINGS

8.1 Changing of Oxygen Factory Calibration

In the calibration register are the factory calibration factors listed. These factors (**F**, **fixed f**, **m**, **fixed Ksv**, **kt**, **tt**, **mt** and **Tofs**) are specific constants to the **REDFLASH** indicators and are automatically adjusted for the selected sensor type in the Sensor Code. It is strongly advised to change these parameters only after communication with PyroScience.

Before changing any calibration factors, please ensure that the correct measurement channel is shown (important for Multi-channel device FireSting pro) and click on '**Read Registers**'.

After adjusting your new calibration factors, it is important to save these new settings on the internal flash memory of the device. Click '**Save all in Flash**' to make these changes permanent, even after a power-cycle.

The screenshot shows the Pyro Developer Tool interface with the 'Calibration' tab selected. The interface is divided into several sections:

- Factory Calibration:** A label pointing to the top of the calibration section.
- Channel Number:** A label pointing to the 'Chan 1' tab and the 'Show Channel' button, with a note '(only for multi-channel devices)'.
- Load current calibration factors:** A label pointing to the 'Read Registers' button.
- Save the new calibration device memory:** A label pointing to the 'Save all in Flash' button.

The 'Calibration' tab contains the following data:

Calibration Oxygen		Calibration Optical Temperature		Calibration pH	
dphi 0% (°)	dphi 100% (°)	M	N	pka (pH)	7.000
54.000	20.500	540	205	slope	1.000000
Background Amplitude (mV)	dphi (°)	C	Tofs (K)	dPhi_ref (°)	55.000
0.00	0.000	0.097	0.000	pka_1 (pH/K)	-0.010000
Fixed f	Fixed Ksv	Background Amplitude (mV)	dphi (°)	dyn_1 (1/K)	0.001000
4000	0.804	0.00	0.000	bottom_1 (1/K)	-0.010000
m	kt (%/K)	Background Amplitude (mV)	dphi (°)	slope_1 (1/K)	0.000000
0.122	0.000000	0.00	0.000	f	0.004000
kt (%/K)	tt (%/K)			lambda_std (nm)	623.000
-0.000303	-0.005			pka_is1	1.000000
	Tofs (K)			pka_is2	0.300000
	0.000			bkgdAmp (mV)	0.000

The 'Calibration Oxygen Environment' section includes:

- Upper Calibration Point:** Partial Volume of Oxygen (%O2) 20.95, Temperature (°C) 20.0, Air Pressure (mbar) 1013, Humidity (%RH) 0.
- 0% Calibration Point:** Temperature (°C) at 0% 20.0.

The 'Results Status' section shows various warnings and errors, and the 'Results' section displays a table of sensor readings.

8.2 Changing of pH Factory Calibration

In the calibration register are the factory calibration factors listed. These factors are specific constants to the **REDFLASH** indicators and are automatically adjusted for the selected Sensor Type in the Sensor Code (e.g. SA, SB, XA, XB). It is strongly advised to change these parameters only after communication with PyroScience.

Before changing any calibration factors, please ensure that the correct measurement channel is shown (important for Multi-channel device FireSting pro) and click on **'Read Registers'**.

After adjusting your new calibration factors, it is important to save these new settings on the internal flash memory of the device. Click **'Save all in Flash'** to make these changes permanent, even after a power-cycle.

The screenshot displays the Pyro Developer Tool interface with the 'Calibration pH' section active. The interface includes a top navigation bar with 'Chan 1', 'Info', and 'Advanced' tabs. Below this is a 'Settings' tab with sub-tabs for 'Calibration', 'Samples', 'AnalogOut', and 'Broadcast'. The 'Calibration pH' section contains various input fields for pH-related parameters, including 'pka (pH)', 'slope', 'dPhi_ref (°)', 'pka_1 (pH/K)', 'dyn_1 (1/K)', 'bottom_1 (1/K)', 'slope_1 (1/K)', 'lambda_std (nm)', 'pka_is1', 'pka_is2', 'bkgd4mpl (mV)', 'bkgdDphi (°)', 'offset (pH)', 'dPhi1 (°)', 'pH1 (pH)', 'temp1 (°C)', 'salinity1 (g/L)', 'ldev1 (nm)', 'dPhi2 (°)', 'pH2 (pH)', 'temp2 (°C)', 'salinity2 (g/L)', 'ldev2 (nm)', 'Aon', and 'Aoff'. On the right, there is a 'Results Status' section with a list of warnings and errors, and a 'Results' section with a table of measured values. At the bottom, there is a 'Raw Data' section with a table of raw data values. Annotations with arrows point to specific elements: 'Channel Number (only for multi-channel devices)' points to the 'Chan 1' tab; 'Load current calibration factors' points to the 'Read Registers' button; 'Save the new calibration device memory' points to the 'Save all in Flash' button; and 'Factory Calibration' points to the 'Calibration pH' section.

8.3 Changing of Optical Temperature Factory Calibration

In the calibration register are the factory calibration factors listed. These factors are specific constants to the **REDFLASH** indicators and are automatically adjusted for the selected Sensor Type in the Sensor Code. It is strongly advised to change these parameters only after communication with PyroScience.

Before changing any calibration factors, please ensure that the correct measurement channel is shown (important for Multi-channel device FireSting pro) and click on **'Read Registers'**.

After adjusting your new calibration factors, it is important to save these new settings on the internal flash memory of the device. Click **'Save all in Flash'** to make these changes permanent, even after a power-cycle.

Factory Calibration

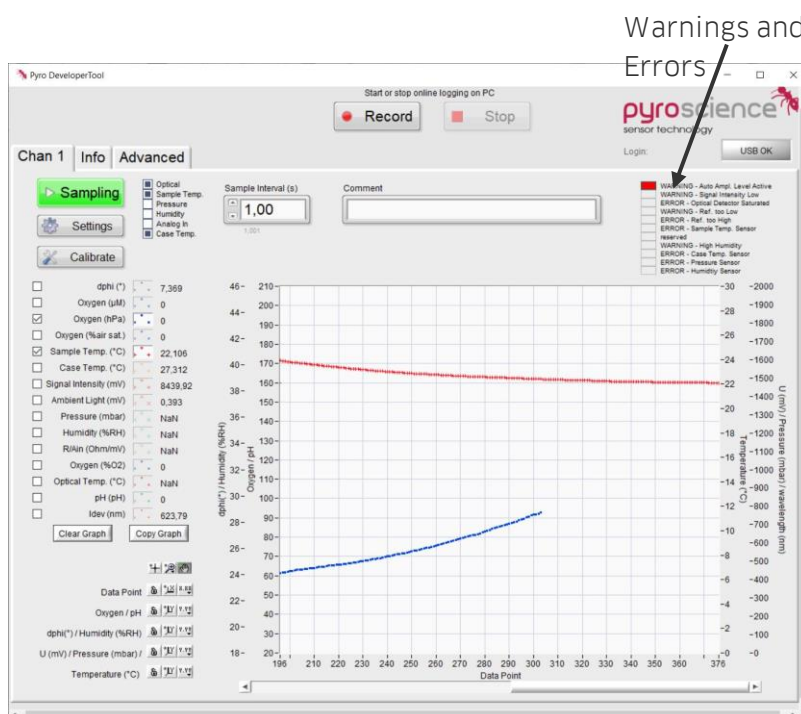
The screenshot displays the Pyro Developer Tool interface, specifically the Calibration tab. The interface is divided into several sections:

- Channel Selection:** On the left, under the 'Chan 1' tab, there is a 'Show Channel' button and a 'Read Registers' button. An annotation 'Channel Number (only for multi-channel devices)' points to the 'Show Channel' button.
- Calibration Oxygen:** This section contains various input fields for oxygen calibration, including 'dphi 0% (°)', 'dphi 100% (°)', 'Background Amplitude (mV)', and 'Background dphi (°)'. An annotation 'Load current calibration factors' points to the 'Read Registers' button.
- Calibration Optical Temperature:** This section contains input fields for 'M', 'N', 'C', 'Tofs (K)', 'Background Amplitude (mV)', and 'Background dphi (°)'. An annotation 'Factory Calibration' points to this section.
- Calibration pH:** This section contains input fields for 'pka (pH)', 'slope', 'dPhi_ref (°)', 'pka_1 (pH/K)', 'dyn_1 (1/K)', 'bottom_1 (1/K)', 'slope_1 (1/K)', 'f', 'lambda_std (nm)', 'pka_1s1', 'pka_1s2', 'bkgdAmpl (mV)', 'bkgdDphi (°)', 'offset (pH)', 'dPhi1 (°)', 'pH1 (pH)', 'temp1 (°C)', 'salinity1 (g/L)', 'ldev1 (nm)', 'dPhi2 (°)', 'pH2 (pH)', 'temp2 (°C)', 'salinity2 (g/L)', 'ldev2 (nm)', 'Aon', and 'Aoff'.
- Calibration Oxygen Environment:** This section contains input fields for 'Upper Calibration Point', 'Partial Volume of Oxygen (%O2)', 'Temperature (°C)', 'Air Pressure (mbar)', 'Humidity (%RH)', and '0% Calibration Point', 'Temperature (°C) at 0%'. An annotation 'Save the new calibration device memory' points to the 'Save all in Flash' button.
- Results Status:** This section displays various status messages and results, including 'dphi (°)', 'Oxygen (uM)', 'Oxygen (hPa)', 'Oxygen (%air sat)', 'Sample Temp. (°C)', 'Case Temp. (°C)', 'Signal Intensity (mV)', 'Ambient Light (mV)', 'Pressure (mbar)', 'Humidity (%RH)', 'R/AIN (Ohm/mV)', 'Oxygen (%O2)', 'Optical Temp. (°C)', 'pH (pH)', and 'ldev (nm)'.
- Raw Data:** This section displays raw data for 'p2p (mV)', 'dc (mV)', 'phi (°)', 'amp 5M (200x)', 'p2p dual (mV)', 'dc dual (mV)', 'phi dual (°)', and 'amp dual 25k (1x)'.

Buttons at the bottom include 'Measure Background', 'Clear Background', 'Load all from Flash', and 'Save all in Flash'.

9 WARNINGS AND ERRORS

The warnings are shown on the right upper corner of the main measurement window of Pyro Developer Tool.



Warning or Error	Description	What to do ?
Auto Ampl. Level Active	Detector of the device is saturated due to too much signal intensity. The amplification is reduced automatically to avoid oversaturation of the detector.	Reduction of ambient light (e.g. lamp, sunlight) recommended. Or decrease the LED intensity and/or the detector amplification (refer to Settings). IMPORTANT: this requires a new sensor calibration.
Signal Intensity Low	Sensor intensity low. Elevated noise in sensor readings.	For contactless sensors: check the connection between fiber and sensor. Alternatively, change the the LED intensity under advanced settings. IMPORTANT:

		this requires a new sensor calibration.
Optical Detector Saturated	Detector of the device is saturated due to too much ambient light.	Reduction of ambient light (e.g. lamp, sunlight) recommended. Or decrease the LED intensity and/or the detector amplification (refer to Settings). IMPORTANT: this requires a new sensor calibration!
Ref. too Low	Reference signal intensity low (<20mV). Increased noise in optical sensor reading.	Contact info@pyroscience.com for support
Ref. too High	Reference signal too high (>2400mV). This can have a strong negative effect on the accuracy of the sensor reading.	Contact info@pyroscience.com for support
Sample Temp. Sensor	Failure of sample temperature sensor (Pt100).	Connect a Pt100 temperature sensor to the Pt100 connector. If a sensor is already connected, the sensor might be broken and needs to be replaced.
Case Temp. Sensor	Failure of case temperature sensor.	Contact info@pyroscience.com for support
Pressure Sensor	Failure of pressure sensor.	Contact info@pyroscience.com for support
Humidity Sensor	Failure of humidity sensor.	Contact info@pyroscience.com for support

10 SAFETY GUIDELINES

In case of problems or damage, disconnect the device and mark it to prevent any further use! Consult **PyroScience** for advice! There are no serviceable parts inside the device. Please note that opening the housing will void the warranty!

Follow appropriate laws and guidelines for safety in the laboratory, like EEC directives for protective labor legislation, national protective labor legislation, safety regulations for accident prevention and safety data-sheets from manufacturers of chemicals used during the measurements and of **PyroScience** buffer capsules.

Handle the sensors with care especially after removal of the protective cap! Prevent mechanical stress to the fragile sensing tip! Avoid strong bending of the fiber cable! Prevent injuries with needle-type sensors!

The sensors are not intended for medical, aerospace, or military purposes or any other safety-critical applications. They must not be used for applications in humans; not for in vivo examination on humans, not for human-diagnostic or any therapeutic purposes. The sensors must not be brought in direct contact with foods intended for consumption by humans.

The device and the sensors must be used in the laboratory by qualified personnel only, following the user instructions and the safety guidelines of the manual.

Keep the sensors and the device out of reach of children!

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