



GRYF

Manufacturer of Electronic
Measuring Instruments

Instruction Manual

GRYF XB4-S Optical Sensor

Contact

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Technical parameters	
Power Supply	External source 18 ÷ 35V DC/ 30 mA
Signal Output	4 ÷ 20 mA
Oxygen Measuring Range	0.0 ÷ 200.0 %, 0.00 ÷ 20.00 mg/l
Oxygen Accuracy *	1 % of range; ± 1 dig.
Sensitivity	0.2%
Response Time T98%	< 60 s
Pressure Range	0 to 1 bar (0 ÷ 10 m water column)
Temperature Sensor	Ni 1000
Temperature Compensation	Automatic 0 ÷ 50 °C
Temperature Measuring Range	0 ÷ 50 °C
Temperature Accuracy	± 0.2 °C; ± 1 dig.
Measurement Principle	Oxygen dependent luminescence quenching
Protection Rating	IP 68
Dimensions	239 x 35 mm
Material	Resin, PUR (cable), stainless steel 1.4404
Oxygen Consumption	None
Required Flow	None

* If instrument is used around a strong electromagnetic field with frequency above 100MHz, accuracy will be 2 % of the range.

Description

This sensor is designed to detect oxygen concentration levels in fluids. Sensor cable length can be determined by the customer.



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Properties and function

- Robust sensor head with integrated electronics
- Factory pre-calibrated
- Low maintenance
- Output:
 - Two analogue outputs (A1, A2) – (4-20) mA
 - 1:1 compatible with any measuring system input (4-20 mA)
 - Output options:

Output	Options	Value at 4mA	Value at 20 mA
A1	Oxygen range 0-200 %	0	40 - 200
	Oxygen range 0-20 mg/l	0	4 - 20
	Temperature range 0-100°C	0	20 - 100
A2	Oxygen range 0-200 %	0	40 - 200
	Oxygen range 0-20 mg/l	0	4 - 20
	Temperature range 0-100°C	0	20 - 100

- Robust exposable cap with a minimum lifetime of 12 months
- 3-year-warranty on sensor body and electronics
- Independent from incoming flow
- Minimal operation costs
- No sensitivity towards H₂S or CO

Other version

- Other versions may contain Clark-Sensor simulation option (50nA, galvanic isolation) or RS485 Modbus RTU-interface



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Hardware Description

The GRYF LDO sensor (see Fig. 1) consists of a cable, sensor head with integrated electronics and an exposable cap. The sensor cap is terminated by the optical dissolved oxygen spot, carrying the oxygen sensitive luminophore.



Fig. 1: Electrical connection requirements.

- 1 - **Power supply: +24V (brown)**
- 2 - **Power supply: GND (black)**
- 3 - **Oxygen (4-20 mA) (green)**
- 4 - **Data (calibration) - do not connect! (white)**
- 5 - **Temperature (4-20mA) (yellow)**

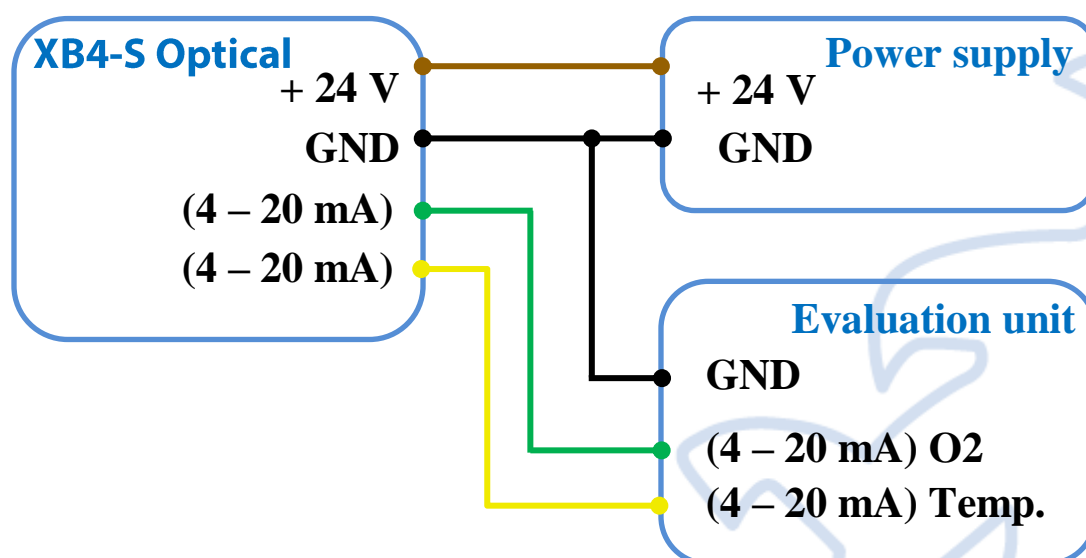


Fig. 2: Wiring diagram for the 4–20 mA outputs.



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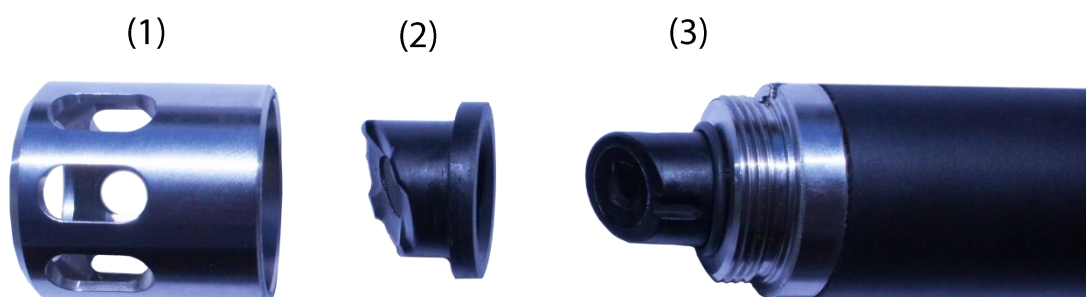
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!!Warning!!

- Do not repair or disassemble the oxygen sensor.
- Avoid accidental mechanical and pressure shocks (such as dropping the sensor cap onto the water surface).
- Do not unscrew the metal swivel-nut (unless changing the exposable cap).

Procedure for replacing exposable cap

Clean and dry the optical sensor. Remove the locking screw from stainless steel head. Now you can enable the metal swivel-nut (1). Carefully slide the exposable cap (2) from probe body (3) and replace it with a new one. Screw metal swivel-nut (1) and secure the swivel-nut by the locking screw.



- (1) Metal swivel-nut
- (2) Exposable cap
- (3) Probe body



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Calibration

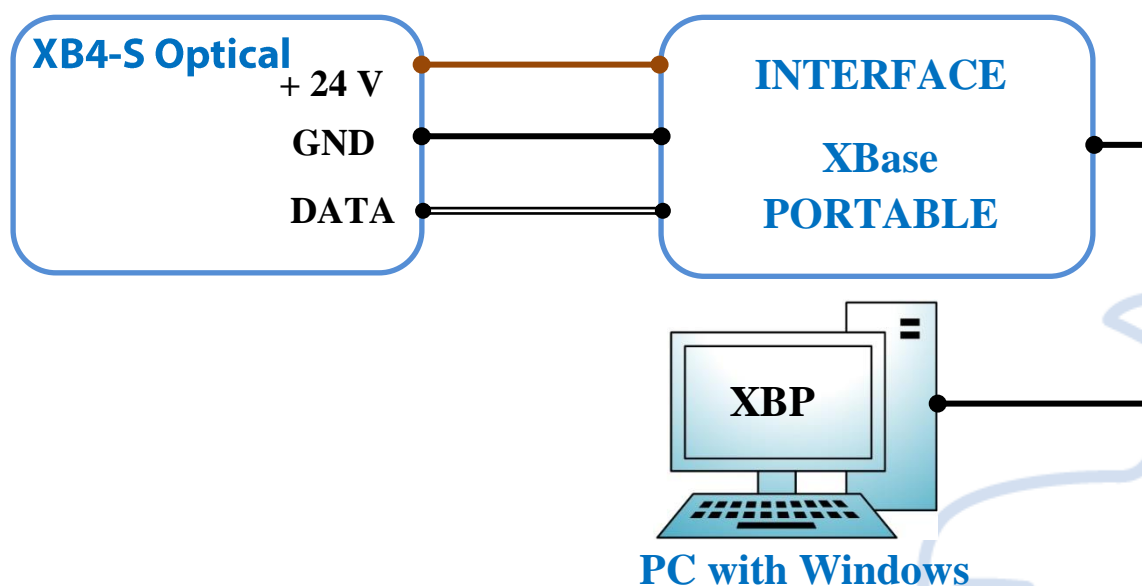
During the exposable cap lifetime period the calibration should not be required. If for any reason the exposable cap is exchanged, then it is necessary to perform the calibration of the sensor in 2 steps (different levels of oxygen concentration).

Two step calibration description:

- „**Zero point calibration**“ – Zero point is the sensor signal at zero oxygen concentration. To perform a zero point calibration you will need water solutions of ($\text{Na}_2\text{S}_2\text{O}_5$) in minimal concentration 0,1g/50ml.
- „**Slope calibration**“ – . The probe is calibrated at a steady concentration of oxygen. Water saturated with min. for 10 min by air is used for this calibration.

For service calibration purposes (with exposable cap change) it is recommended to use the manufacturer's calibration set that consists of:

- INTERFACE XBase PORTABLE
- XBP – calibration and visualization SW for PC



With the use of the manufacturer's calibration set it is possible to change the calibration parameters saved in the sensor's memory.

If you do not have the manufacturer's calibration set available, sensor calibration should be possible on your currently used controlling system that has implemented the 4 – 20 mA signal. 0% of oxygen level needs to be changed on your control unit so it equals to Zero point of 4mA. With steady concentration of oxygen, adjust the Slope, so it shows the true value of oxygen concentration, e.g. 100%.



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Manufacturer's calibration set up:

The sensor must be disconnected from a current loop during calibration. The following signals must be connected: Power supply (brown), GND (black), DATA (white).

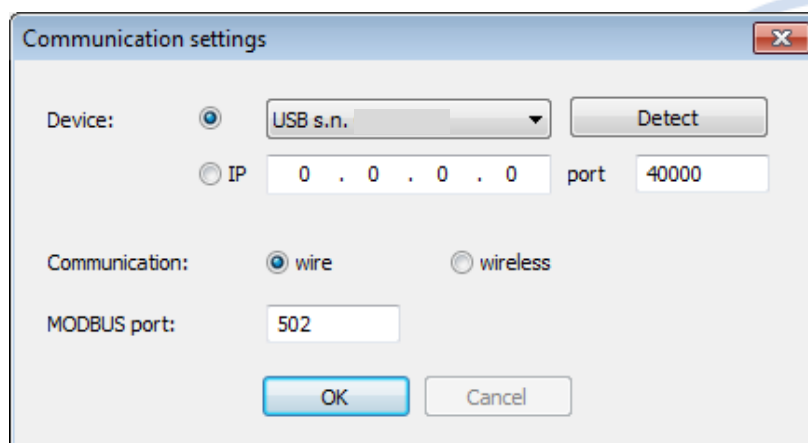
The current loop may be connected during calibration, if the sensor is supplied from an external source. The signals are connected as follows: GND (black), DAT (white).

1. Connect the XBase Portable Interface to a PC USB port and connect the sensor to an interface.
2. Install the Interface driver from the Internet.
3. Launch the XBP.EXE software located in XBP directory. The software is portable and does not require any installation. Therefore, it can be copied to any PC drive.



Choose the administrator profile and confirm by selecting the OK button.

4. The below screen will pop-up. Choose the USB device without a serial number. This will connect the XBase Portable Interface.



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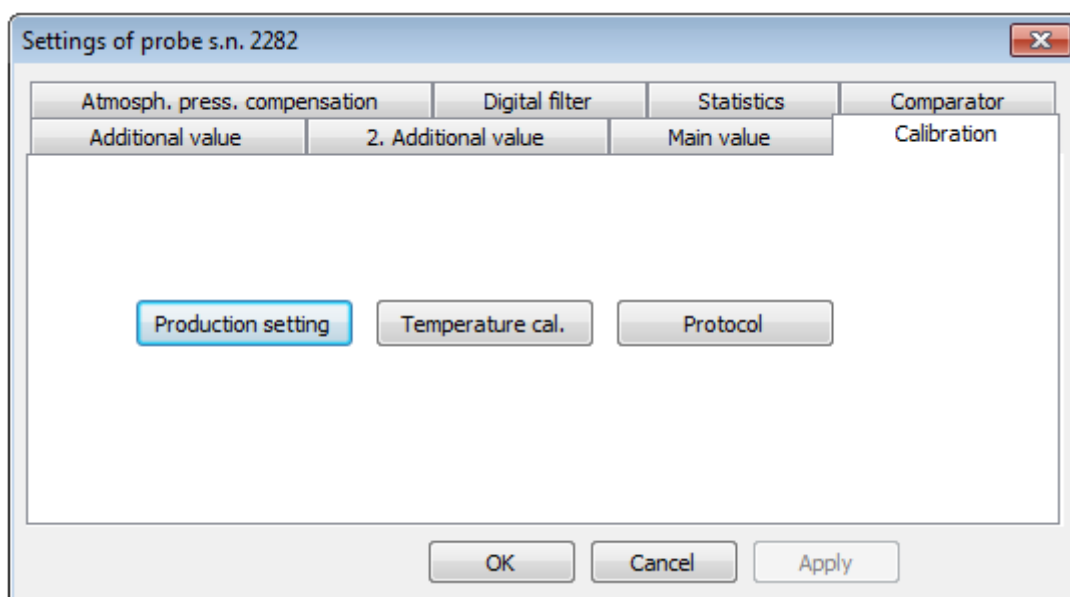
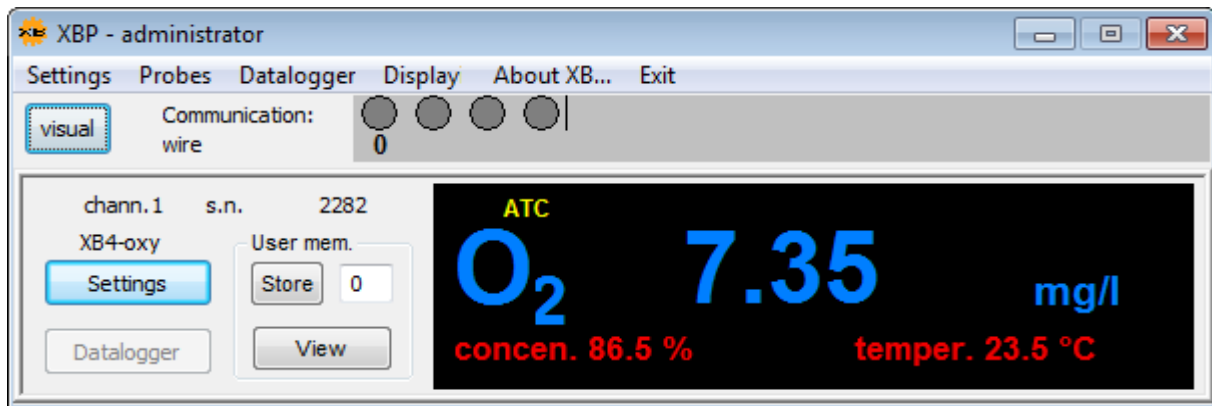
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5. The XBP software screen shows the measured values of connected active sensors (probes).
6. In order to perform the sensor calibration, click on the Settings option in the top left corner and then select the Calibration tab and click option Production setting.



7. „Zero point calibration“ – put the sensor into a solution with zero oxygen concentration. It is recommended to leave the sensor in the solution for at least 1 minute. Then change the zero parameter and log the value with the Record button. Continue doing so until the measured value is at 0% level.



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„Slope calibration“ - put the sensor into a sample with a steady oxygen concentration. It is recommended to leave the sensor in the solution for at least 1 minute. Then change the slope parameter and log the value with the Record button. Continue doing so until the measured value is at 100% level.

8. End the calibration by pressing the OK button.

Calibration constants:		Measured value:	
zero =	61181	Measured value:	8.15 mg/l 97.6 %
slope =	8400	Temperature:	24.4 °C
Measuring interval:	0	Atmosphere pressure:	101.30 kPa
		Signal level:	1671 mV

Reset Current loop:

OK Cancel Record

Note: Current loop settings can be changed in the Production setting.
Production setting also allows change to the Measuring interval which in turn prolongs the life of the luminophore.



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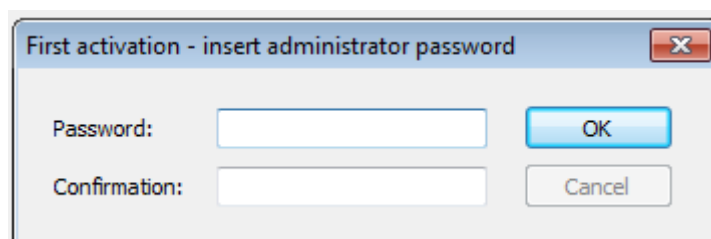
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The first setup of Manufacturer's calibration set:

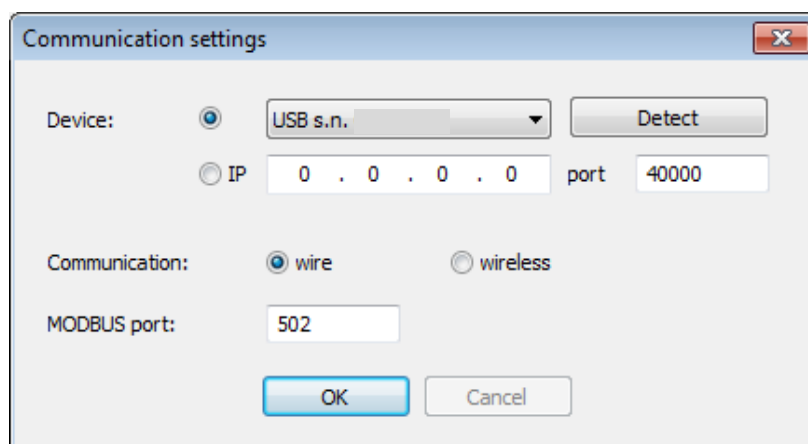
1. Connect the XBase Portable Interface to a PC USB port. Then connect the sensor to an interface.
2. Install the Interface driver from the Internet.
3. Launch the XBP.EXE software located in the XBP directory. The software is portable and does not require any installation. Therefore, it can be copied to any PC drive.

This screen will appear with first software launch:



Password is not necessary, press OK.

4. The below screen will pop-up. Choose the USB device without a serial number as this will connect the XBase Portable Interface.



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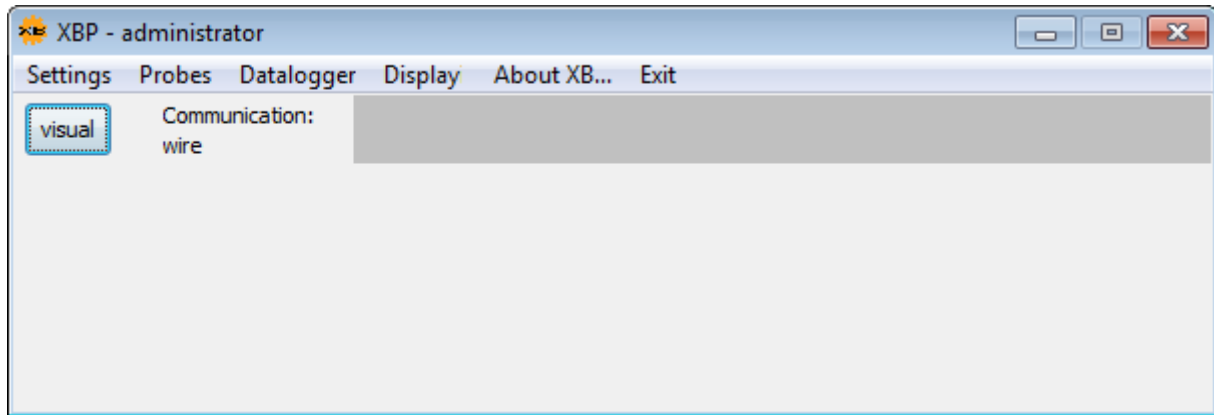
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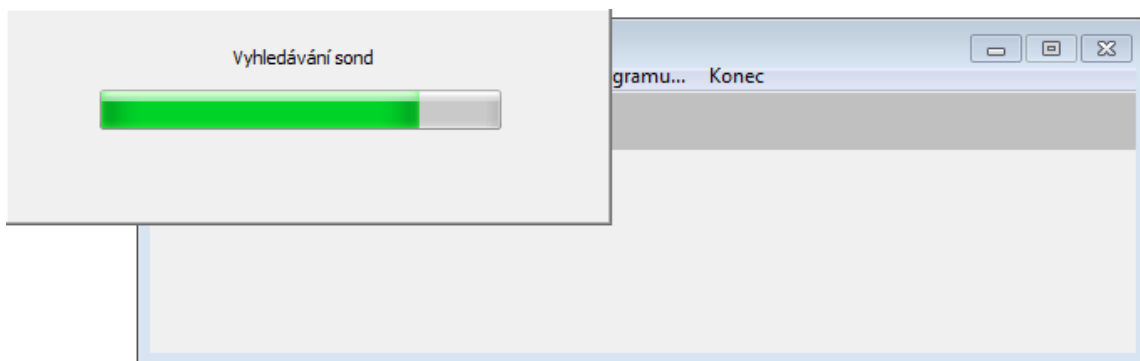
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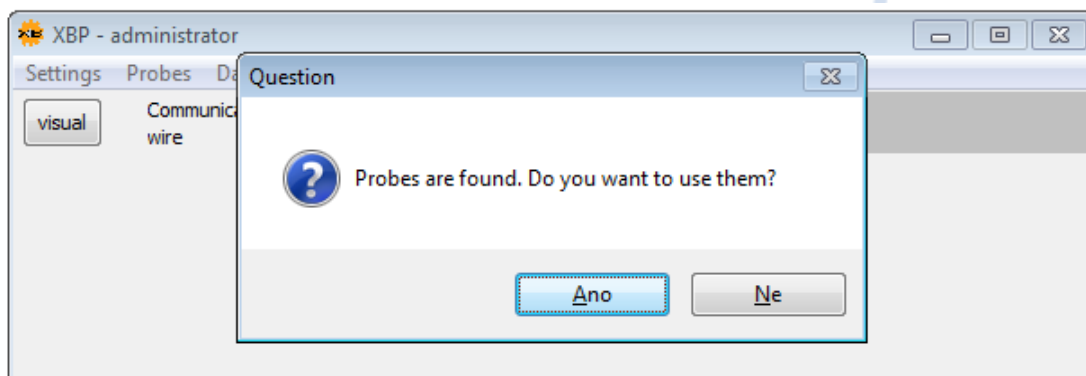
5. The below screen will appear afterwards.



For registering a new sensor (probe) with this software, select the second option in the top left corner: Probes – Automatic Search



6. After the Probe Automatic Search step, confirm you wish to use the found sensor (probe). The probe list will then appear.



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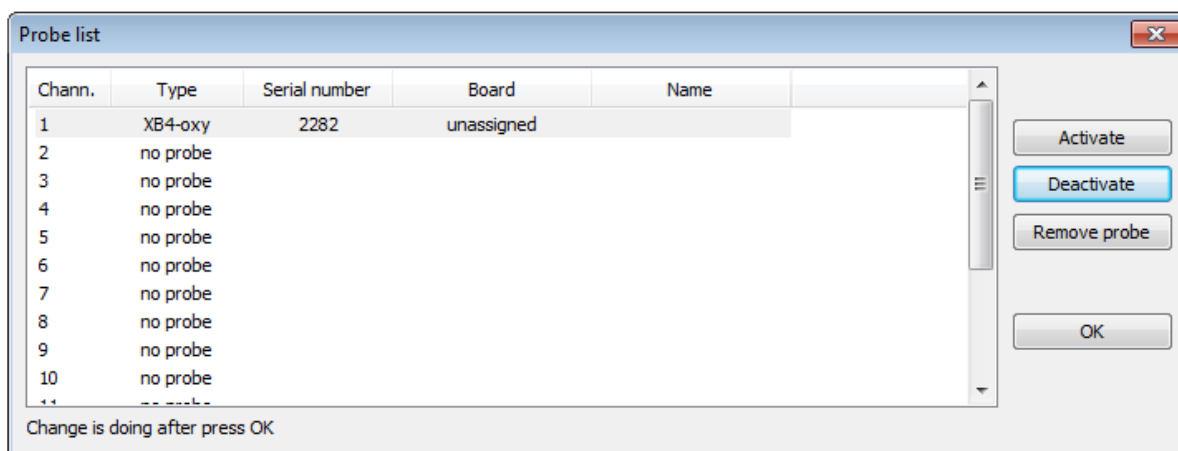
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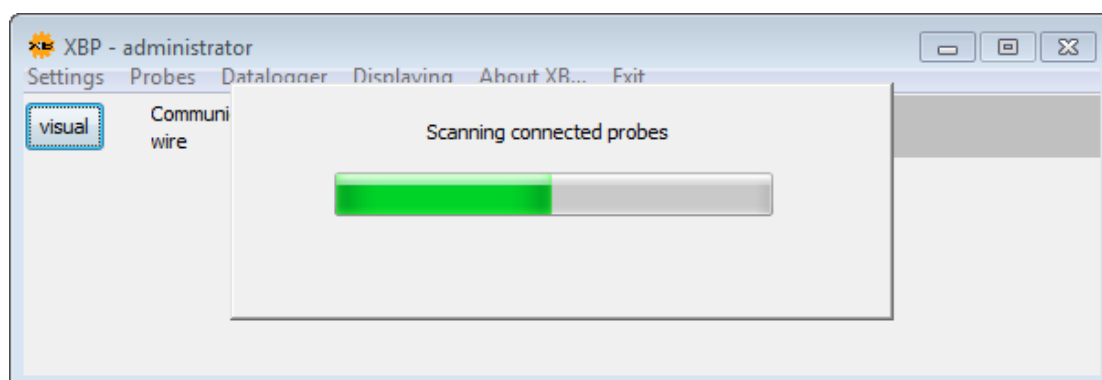


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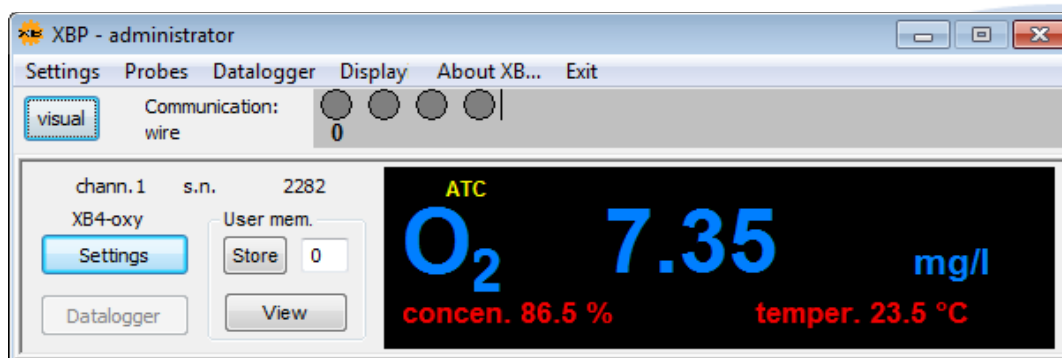


Select the sensor (probe) for which you wish to perform the calibration on and then press the OK button.



7. The XBP software screen shows the measured values of connected active sensors (probes).

8. In order to perform the sensor calibration, click on the Settings option in the top left corner and then select the Calibration tab, then click the option Production setting.



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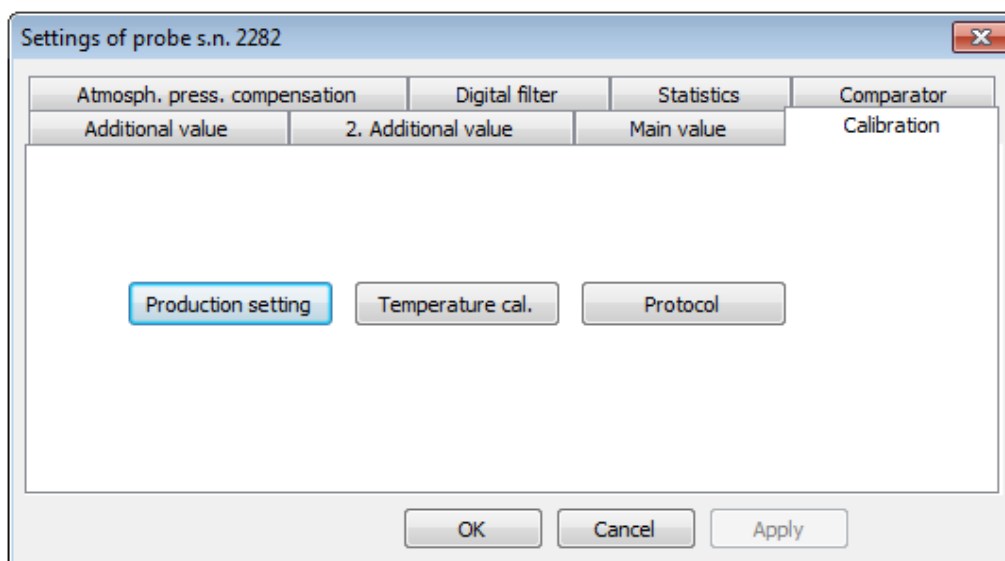
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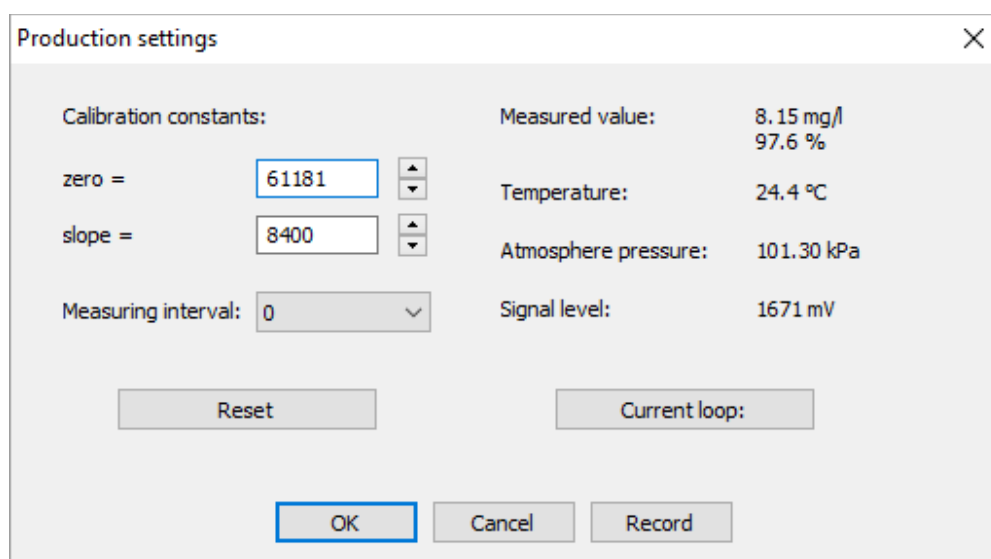
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9. „Zero point calibration” – put the sensor into a solution with zero oxygen concentration. It is recommended to leave the sensor in the solution for at least 1 minute. Change the zero parameter and log the value with the Record button. Continue doing so until the measured value is at 0% level.

„Slope calibration” - put the sensor into a sample with a steady oxygen concentration. It is recommended to leave the sensor in the solution for at least 1 minute. Change the slope parameter and log the value with the Record button. Continue doing so until the measured value is at 100% level.

10. End the calibration by pressing the OK button.



Note: Current loop settings can be changed in the Production setting.
Production setting also allows change to the Measuring interval which in turn prolongs the life of the luminophore.



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