Witrox user manual

Wireless fiber optic oxygen instrument for use with chemical optical mini sensors

Version 1.0.1

1.Contents

2.Witrox list of parts

- Witrox instrument
- AC/DC travel adapter
- USB power cable for PC (1.5 m)
- PT1000 sensor (4W,ClassA, 1.9x40mm, 5 m cable)
- Loligo USB memory stick with WitroxView software for Windows XP/Vista/7/8
- Plastic suitcase (345x285x122 mm)
- User manual

NB *Please note, that an oxygen sensor is NOT included*

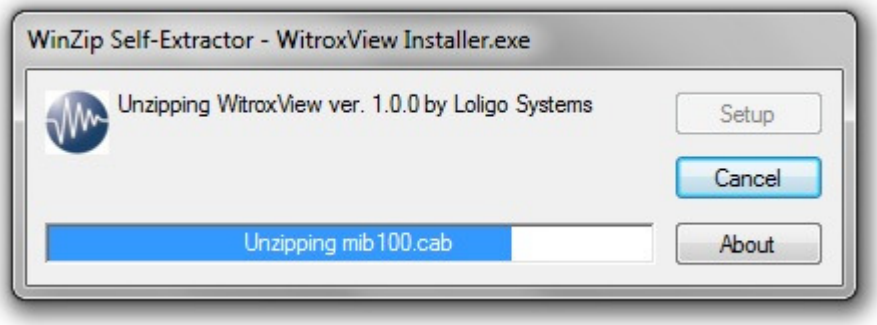
3.Software installation

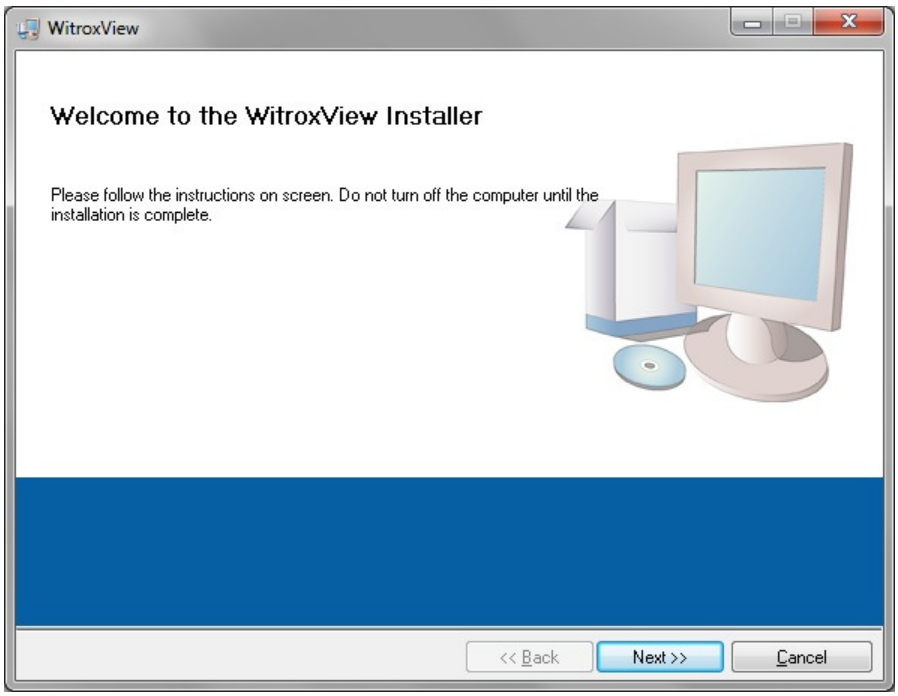
PC requirements:

CPU	Duo core 2,4 GHz or similar
RAM	4 GB
Monitor	1024 x 768
USB port	1
Bluetooth port	1

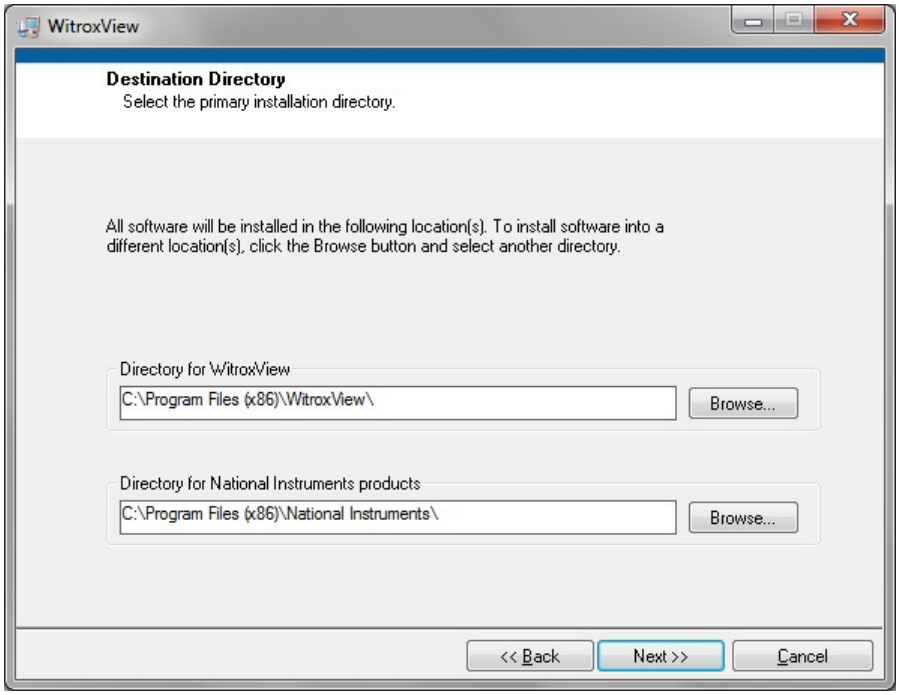
NB *If your PC has no build-in BlueTooth 2.0 then a Bluetooth dongle is required*

Insert the Loligo USB memory stick into an USB port and wait until you see the following screen. If the screen does not appear click the file WitroxView Installer.exe on the memory stick.

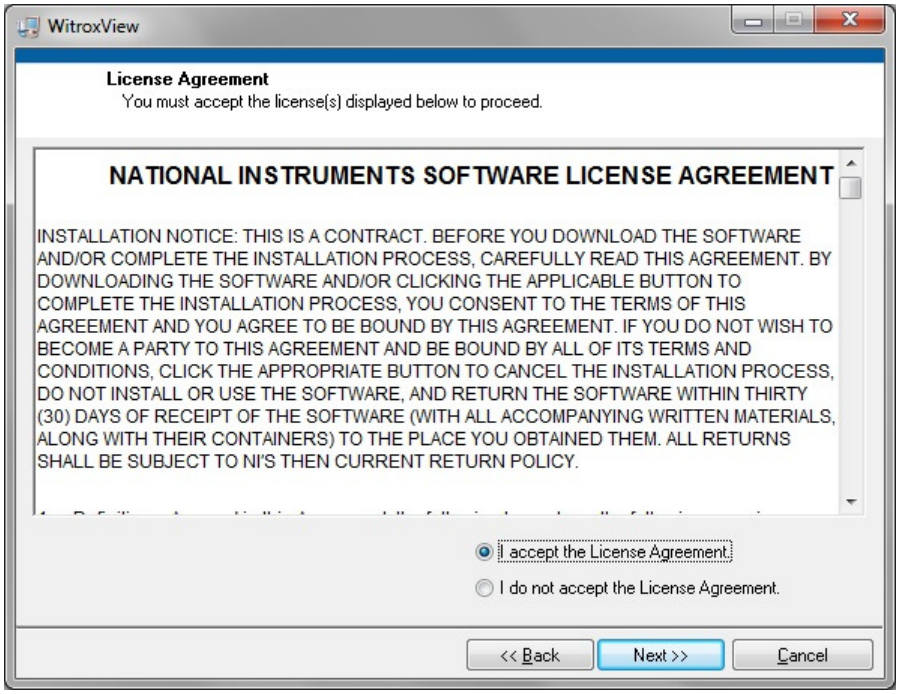




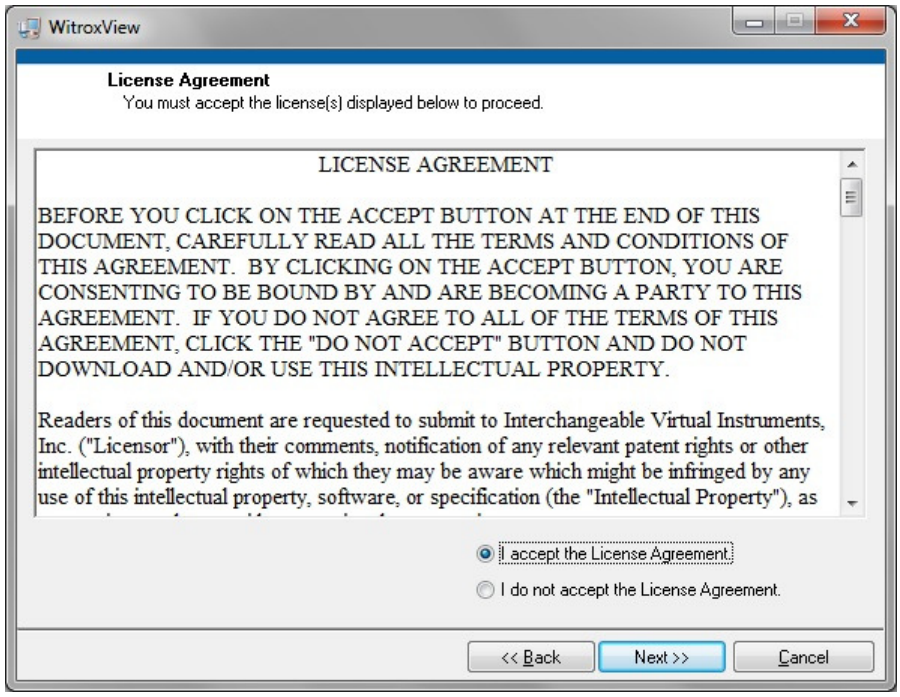
Click Next to start installation of WitroxView.



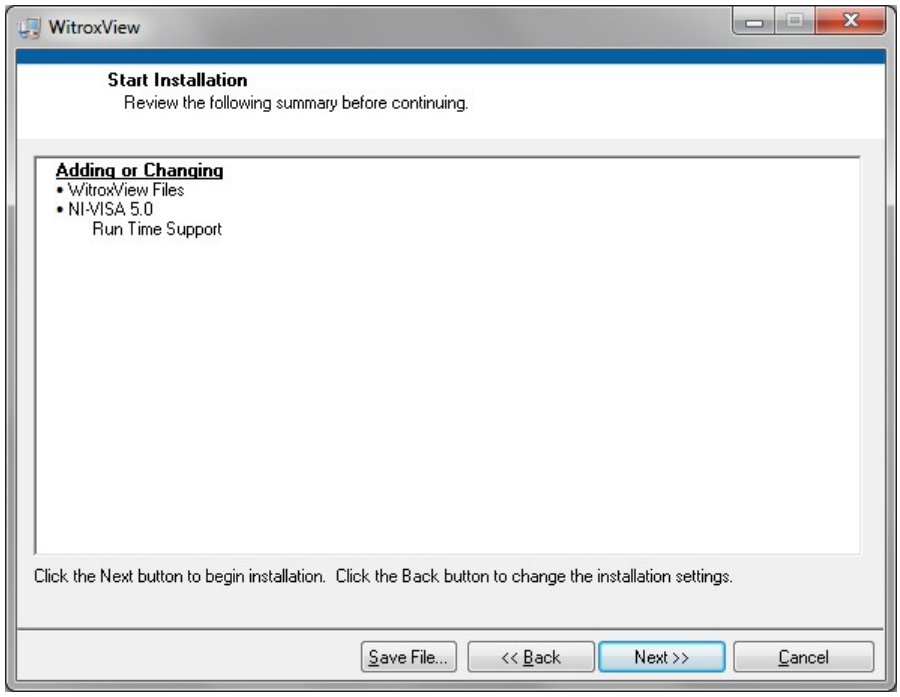
Select destination directory for WitroxView and for the National Instruments driver and then press Next.



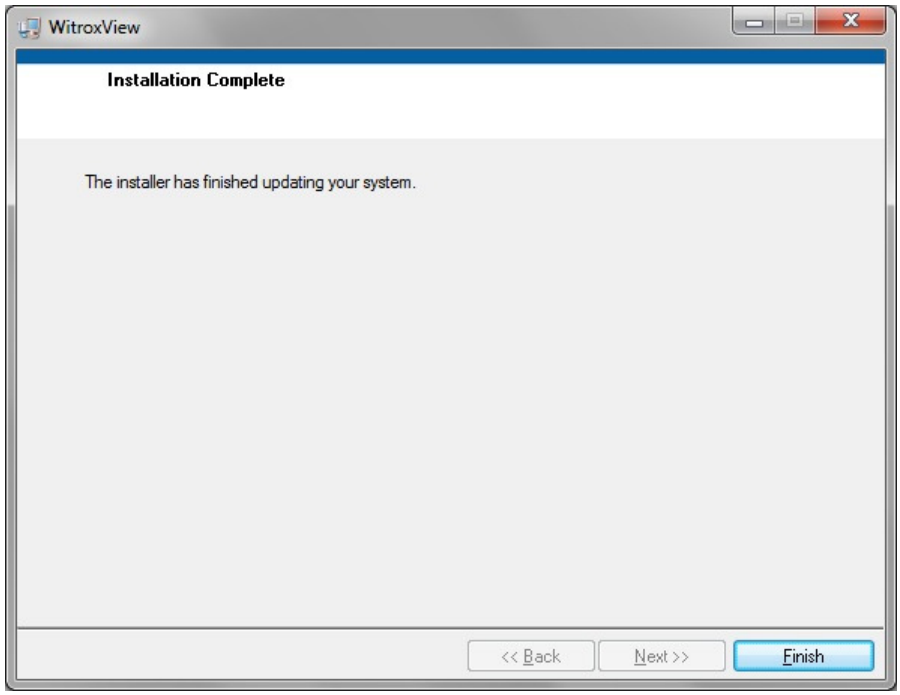
Accept the License Agreement, please select "I accept the License Agreement(s)" and then press Next.



Accept the License Agreement, please select "I accept the License Agreement(s)" and then press Next.



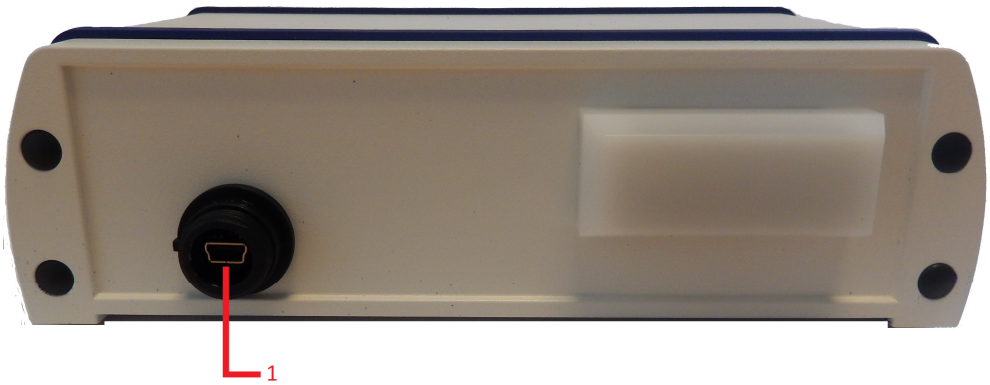
Click Next.



Click Finish. When installation is complete, please restart your computer.

4.Instrument set up

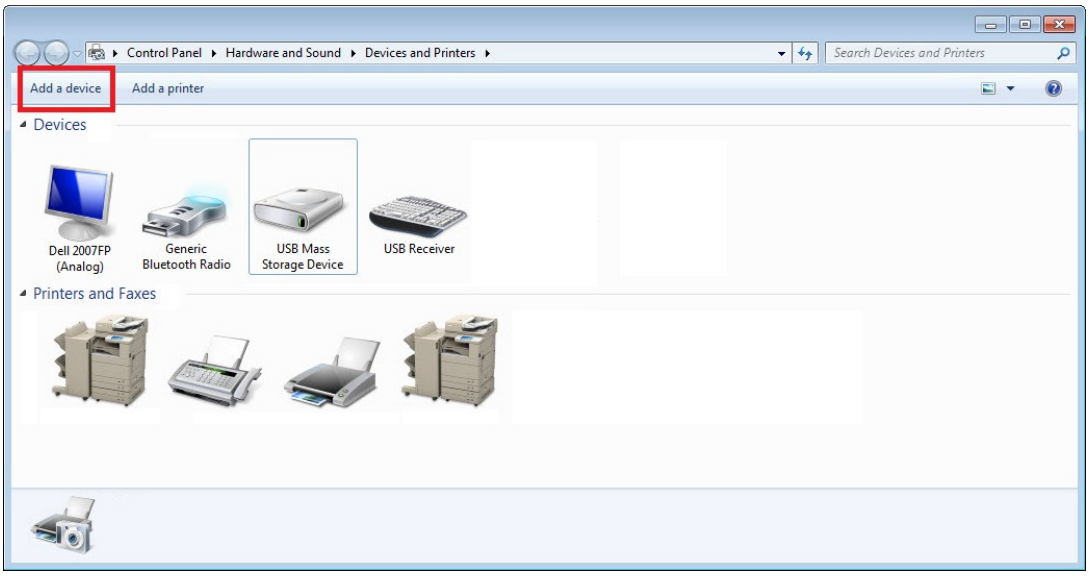
Connect the Witrox instrument to the power adapter by using the Micro-USB cable on the backside of the instrument (1). Connect the power adapter to a wall outlet.



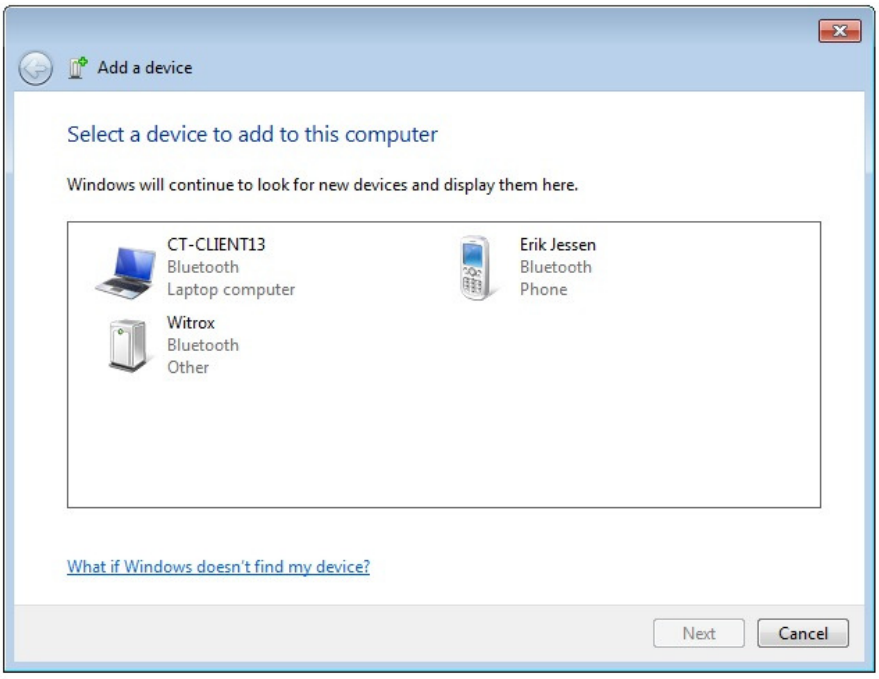
Connect the Pt1000 temperature probe to the TEMP input (2). Connect the chemical optical oxygen sensors to the SMA connectors (3-6).

Push the Power button, the power LED will turn green. The LINK LED will flash blue. As soon as the Witrox instrument is connected to the PC the LINK LED will stop flashing. If an error occurs while connected the ERROR LED will turn red.

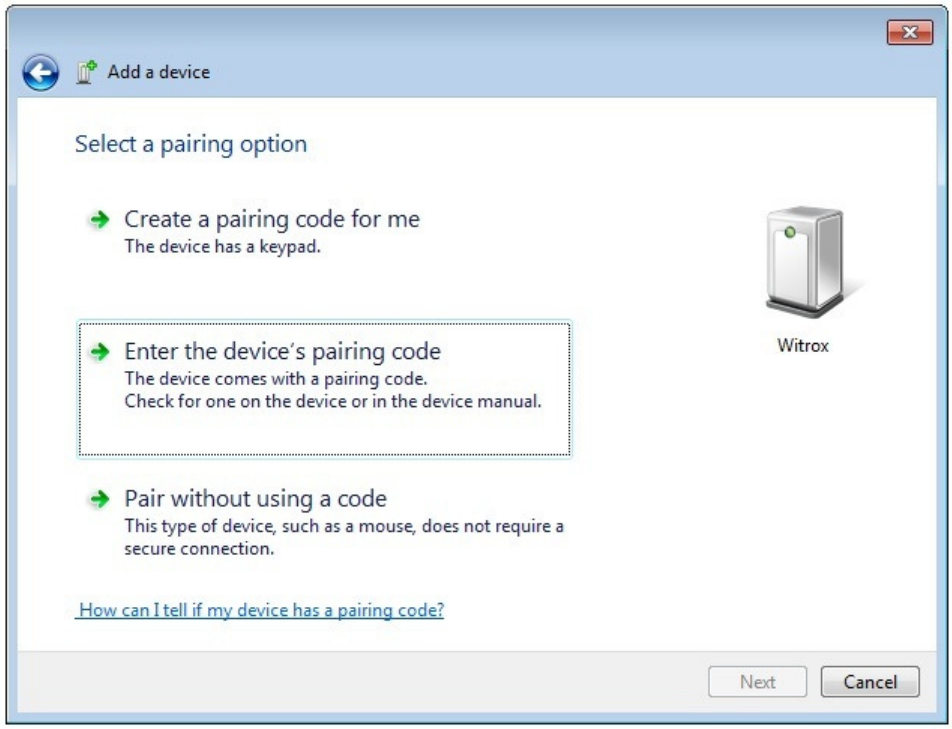
Press the Windows Start button and choose Devices. An overview of the connected devices is listed.



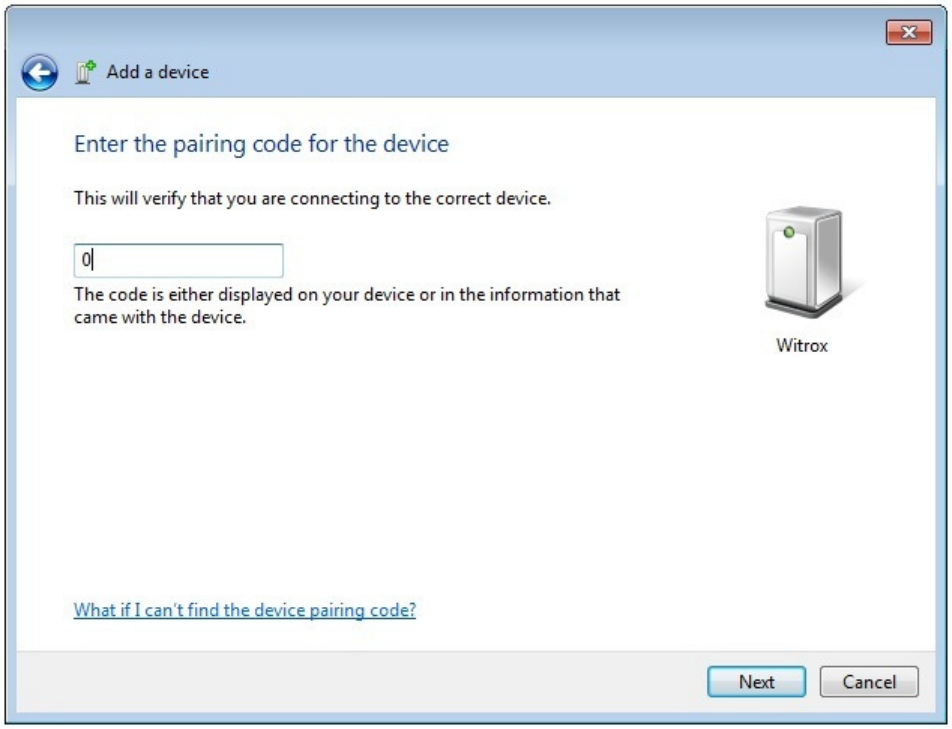
Please click on the "Add a device" button.



Click on the Witrox instrument, then click Next.



Please choose "Enter the device´s pairing code" when necessary, then click Next.



Enter a 0 (zero) in the pairing field, then click Next. The WITROX driver will now be installed.

The instrument is now ready to be used in WitroxView. If using several Witrox instrument, the pairing code is always zero.

5.Sensors

The Witrox instrument is for use with the following mini sensors manufactured by PreSens, Germany:

Flow-through mini sensor

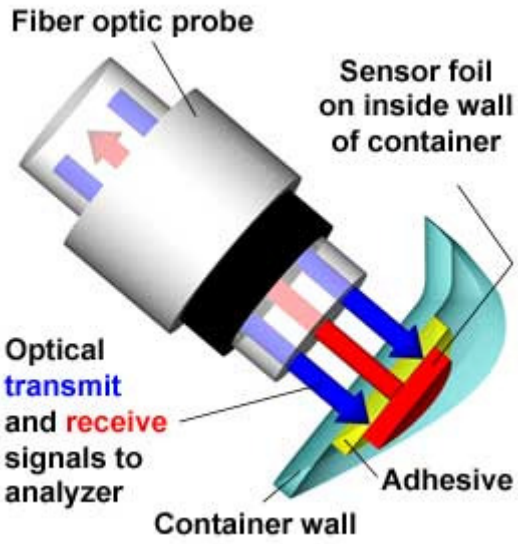
The flow-through oxygen mini sensor (FTC-PSt3) is a miniaturized fiber optic chemical sensor integrated in a T-shape flow through cell. The flow-through cell is connected to the Witrox by a polymer optical fiber (POF) with 2 mm diameter as a light guide. A glass tube with 2mm inner diameter (4mm outer diameter) is coated with oxygen sensor at its inner wall. The volume for liquid inside the FTC cell is about 100 (±10) microliter. The standard T-shape flow cell can be easily connected via Luer-Lock adapters to external tubings. Liquids (like water, blood, etc.) can be pumped through the cell. This type of oxygen sensor has excellent long-term stability.

Dipping probe mini sensor

This dipping probe oxygen mini sensor, consists of a polymer optical fiber (POF) with a polished distal tip which is coated with a planar oxygen-sensitive foil. The end of the polymer

optical fiber is covered with a high-grade steel tube, to protect both the sensor material and the POF. The cable has an outer diameter of 2.8 mm. The inner diameter of the POF is 2.0 mm. The steel tube has an outer diameter of 4 mm. Usually, the fiber is coated with an optical isolated sensor material in order to exclude ambient light from the fiber tip and to increase chemical resistance especially against oily samples as well as to reduce bio-fouling on the sensor membrane. This type of oxygen sensor has an excellent long-term stability.

Sensor spot mini sensor



Sensor spots are tiny (2 or 5 mm) planar oxygen mini sensors immobilized onto either polyester or glass supports. The latter is autoclavable. The sensor spots are glued inside chambers, flasks or disposables with translucent and non-fluorescent walls (e.g. glass, polyester, acrylic etc.). Then oxygen measurements can be done in a non-invasive and non-destructive way from outside and through the wall of your vessel.

With silicone glue the sensor spots can be glued inside chambers, flasks, disposables, etc.

To use the sensor spots a fiber optic instrument and an external fiber cable (light guide) is required. The tip of the fiber cable delivers (blue) light to the backside of the sensor spot though the wall (and transparent glue). The front side of the sensor spot is in contact with the media (liquid or gas), e.g. the light is not passing through the media.

There are two ways of fixing the (external) fiber cable over the centre of the (internal) sensor spot:

1) A bare tip fiber cable (OX11150) is fixed with a special chamber (holder), or run through a Radiometer/Cameron dummy electrode adapter (CH10470) for fiber optic oxygen sensing in Radiometer/Cameron electrode chambers, cuvettes etc.

2) A fiber cable with a threaded SMA connector at the tip (OX11160) is screwed onto a fitting sitting on a velcro band adapter for curved chamber walls (OX11170) or planar walls (OX11180).

6.USER GUIDE

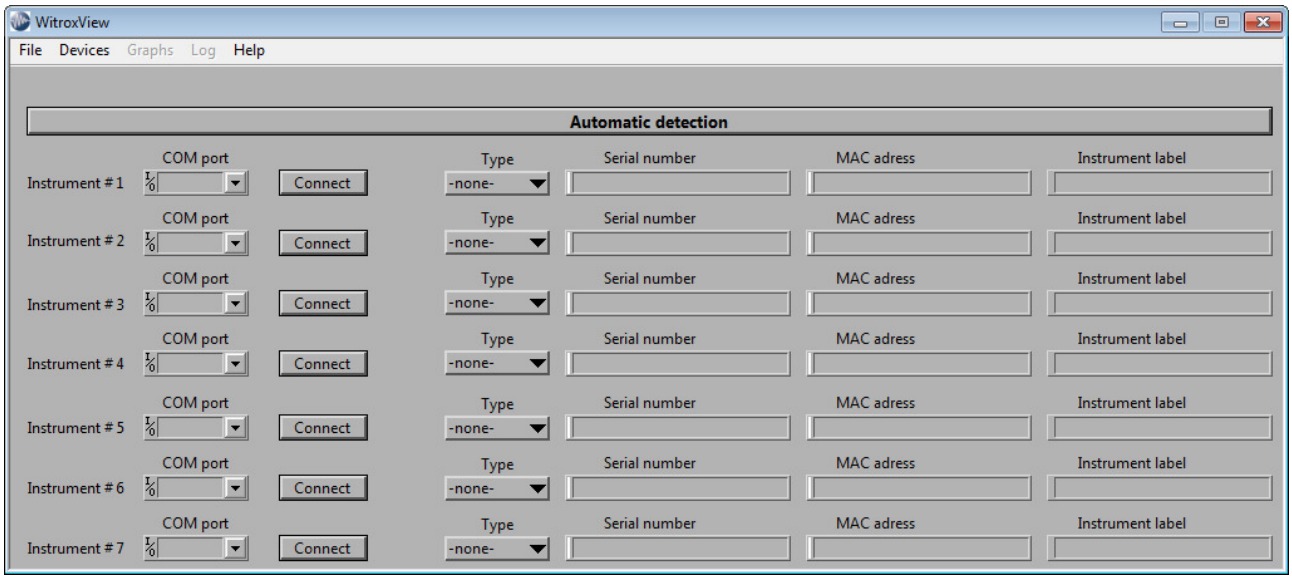
NB *To enjoy all functions in WitroxView it is necessary that the PC user has administrator status.*

PC requirements:

CPU	Duo core 2,4 GHz or similar
RAM	4 GB
Monitor	1024 x 768
USB port	1
Bluetooth port	1

NB *If your PC has no build-in BlueTooth 2.0 then a Bluetooth dongle is required*

Start WitroxView from the start menu in Windows. It might take a few seconds to load the program initially. Watch the Windows task bar. After the program is loaded it will show the Connect screen.

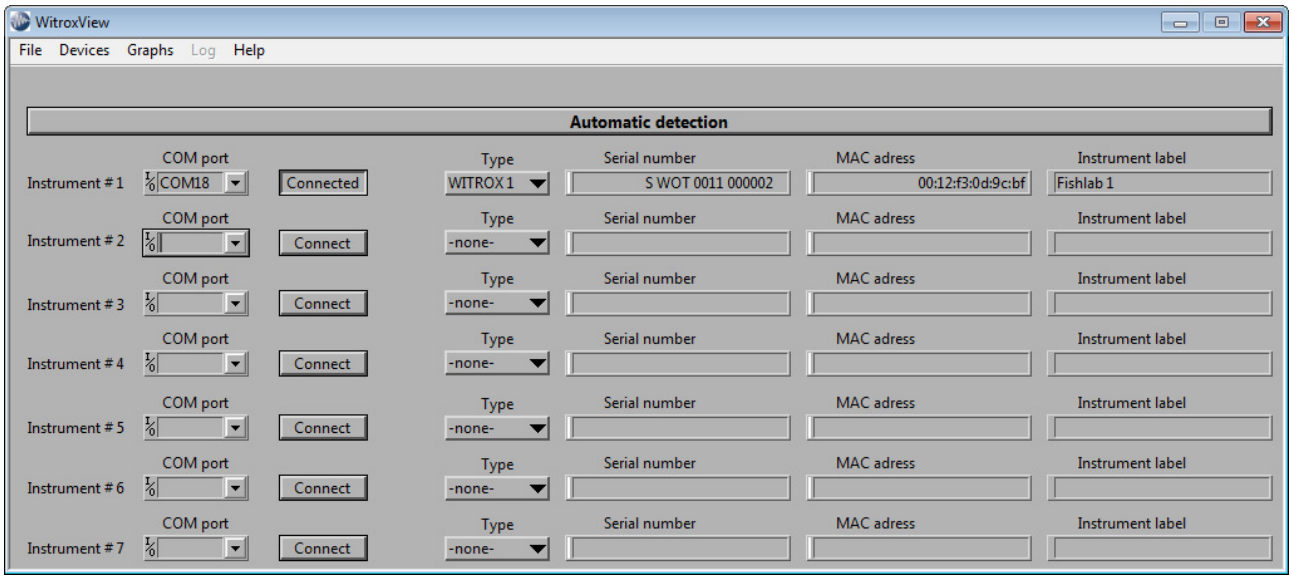


To close WitroxView, choose File→Exit or click the red X in the upper right corner.

To see the version number of WitroxView click Help→About.

Connect

In the Connect screen an user can establish a connection between the PC and up to seven Witrox instruments.



To establish a connection between the PC and a Witrox instrument, turn ON the Witrox instrument, then choose the assigned COM port for the Witrox instrument and then click on the corresponding Connect button

As soon as a connection is established the software will identify the instrument and if it is a Witrox 1 or a Witrox 4 instrument it will show the serial number and the MAC adress.

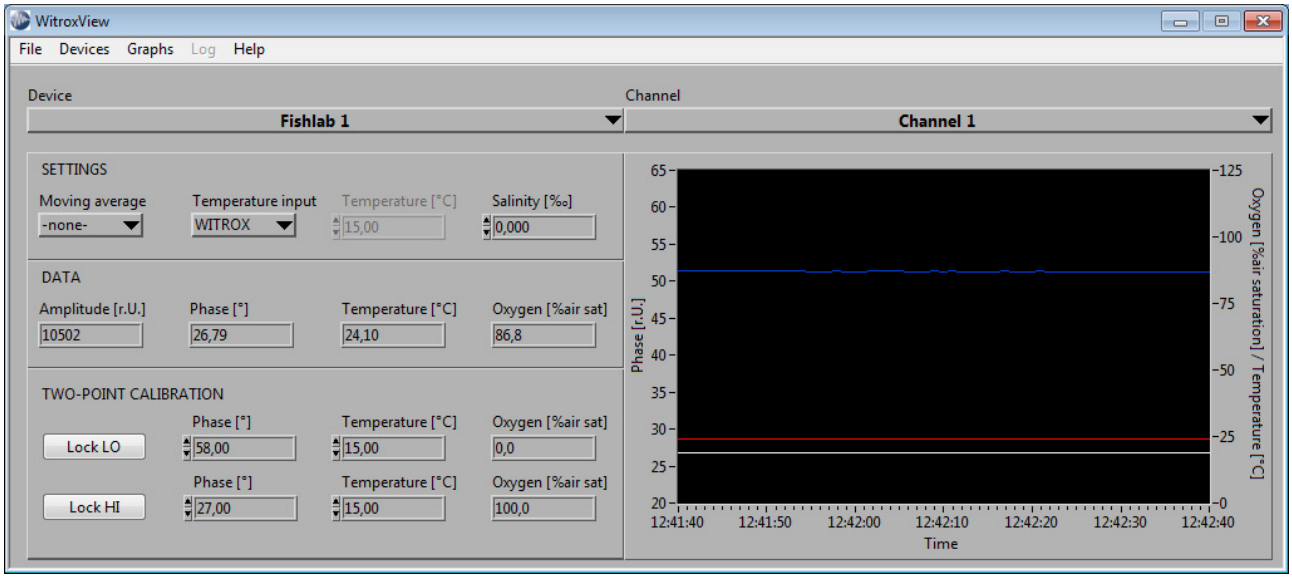
It is also possible to scan the PC ports for all connected instruments. To do this turn all instruments ON and then click on the Automatic detection button. This feature will take several seconds, depending on the number of instruments.

NB *We recommend pressing the Automatic detection button the first time you connect a Witrox*

It is possible to add labels to each Witrox instrument to help identify it. After connecting your Witrox instrument(s), please proceed to sensor calibration. Click Devices→Calibrate.

Calibration

For each sensor connected a 2-point calibration is needed to convert sensor phase[°] values into oxygen units.



On the device list in the upper left corner a list of all connected instruments is shown. On the channel list in the upper right corner a list of all channels for the selected device is shown.

The moving average function can be used to smoothen out oxygen values. Please note that the phase[°] signal will always be shown as raw values.

Since the sensor phase[°] signal is temperature dependent, every oxygen channel must be paired to a temperature input for the software to compensate oxygen values in real-time. Either choose the Witrox temperature channel as temperature input or choose User input and enter the sample temperature value in the temperature field. The entered temperature value will be used for the compensation.

If measuring in salt water please enter the salinity of the water sample in the salinity field. The oxygen solubility is dependent on salinity but by entering the salinity of the water samples the software will calculate the correct oxygen content values (mg/L, mmol and mL/L). The solubility is calculated from Green & Carrit (1967). J. Mar. Biol. 25; 140-147.

The amplitude value is an indication of how much light is transmitted back to the Witrox reciever from the sensor and thus the performamnce of the sensor, i.e. if the this value gets too low the sensors need to be replaced.

The software will use measured phase[°] and temperature values to calculate %air saturation values based on the 2-point calibration values.

Each oxygen channel has to be calibrated in order for the software to convert sensor phase values into different oxygen values compensated for temperature, salinity and barometric pressure.

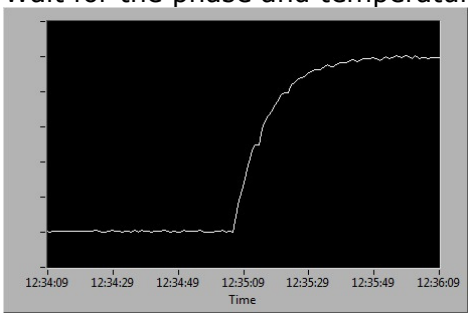
Standard two-point calibration procedure

1. Prepare a mixed air-equilibrated water sample. This can be achieved by purging atmospheric air into sample water, *e.g.* with an air pump and air stone.

2. Prepare an oxygen free water sample. This can be achieved by purging nitrogen gas into sample water or by dissolving approximately 10 grams of Na_2SO_3 in 500 mL of distilled water.

3. Place the tip of the oxygen probe in the mixed air-equilibrated water sample. Place the tip of the temperature probe in the same water sample.

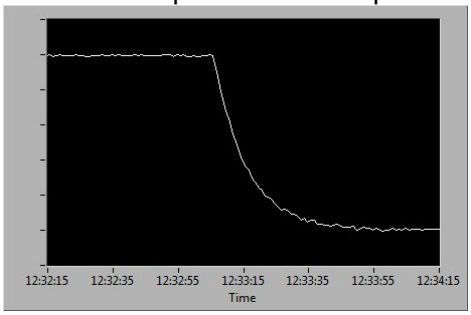
4. Wait for the phase and temperature readings to stabilize.



Then press the LOCK HI button. Now the current phase and temperature values are saved and used as 100% air saturation calibration point.

5. Place the tip of the oxygen probe in the oxygen free water sample. Place the tip of the temperature probe in the same water sample.

6. Wait for the phase and temperature readings to stabilize.



Then press the LOCK LO button. Now the current phase and temperature values are saved and used as 0% air saturation calibration point.

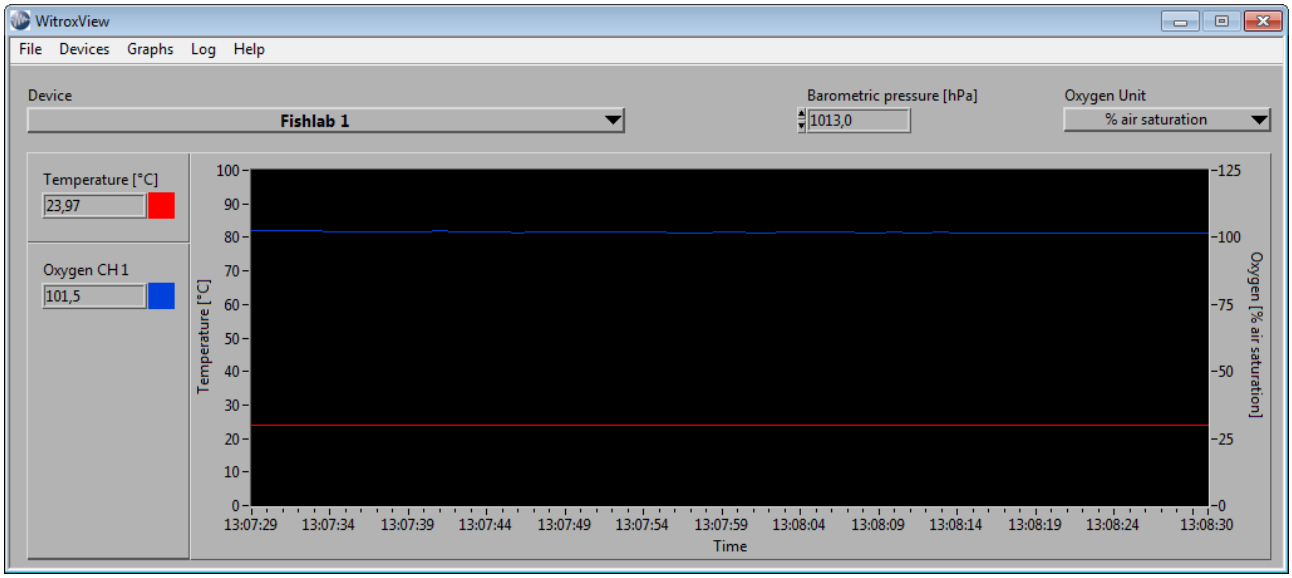
6. Rinse the oxygen and temperature probes with distilled water.

Your WITROX channel is now calibrated. Repeat step 3-6 for every WITROX channel for every WITROX instrument.

Once all sensors have been calibrated, click Graphs to view data in real time.

Graphs

Via the Graphs screen you can monitor and log data from all connected Witrox instruments.

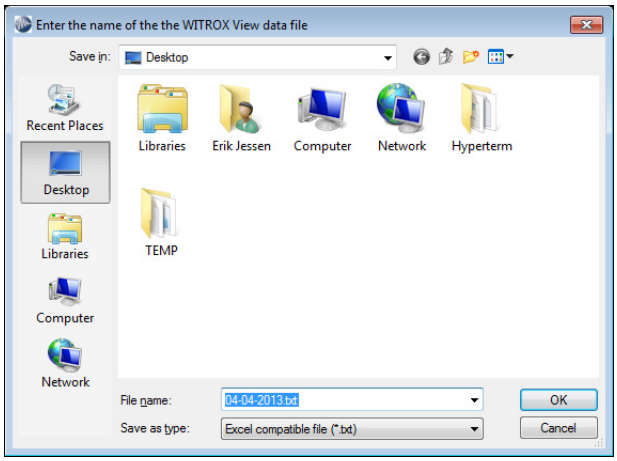


Click "Device" to see a list of all connected instruments. Use the barometric pressure field to compensate for changes in barometric pressure and allow the software to calculate oxygen partial pressure in kPa or Torr, and oxygen content values in mg/L, mmol and mL/L.

Oxygen units can be chosen from the list (Oxygen unit).

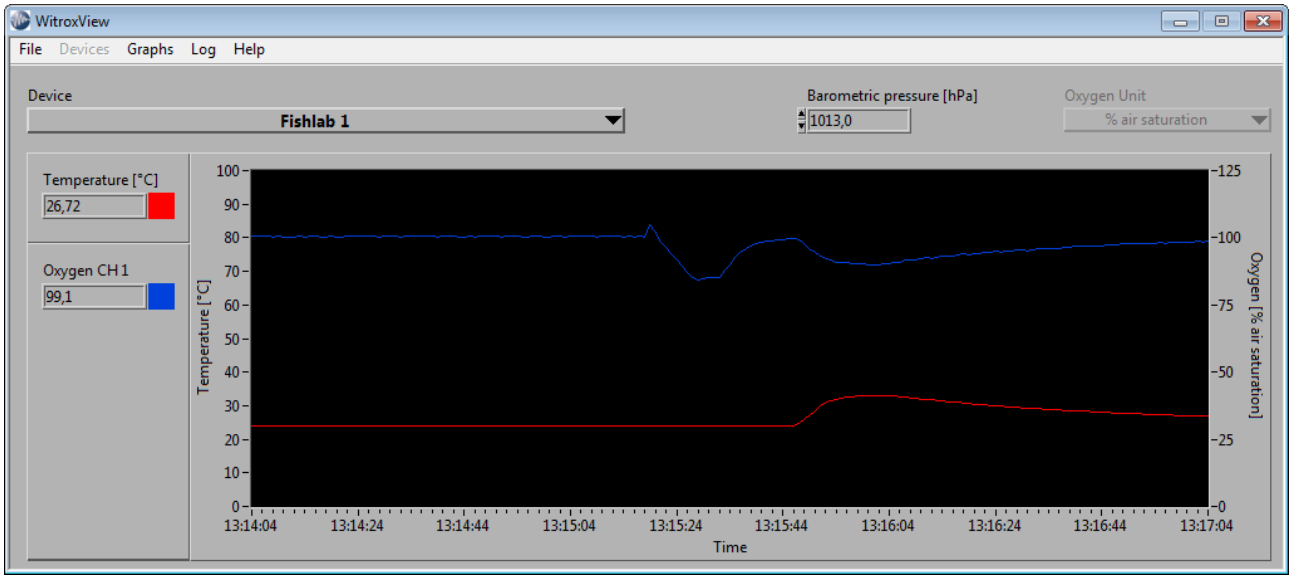
NB *Please note, that WitroxView is not yet logging data to a file.*

Choose Log→Start to start logging data. Choose a file name and path:.



Logging

While logging data WitroxView remains in the Graphs screen and the oxygen unit cannot be changed. Neither can the calibration screen be accessed. The barometric pressure [hPa] can always be changed.



To stop logging click Log→Stop.

7. Safety Information

Power adapter

Only the original manufacturer's power adapter (LPS) and accessories should be used.

Incompatible accessories can damage and endanger the user and the device.

Special skills and responsibilities of the user

The device and sensors can only be used by qualified personnel.

The device and sensors have been designed only for use in laboratories.

It is therefore assumed that the users will, from their professional training and experience, be aware of the necessary safety precautions, such as the correct handling of chemicals, personal, protective equipment or statutory accident prevention regulations.

8. Appendix

Specifications	Fiber optic instrument	
	Witrox 1	Witrox 4
Compatible oxygen sensor	Flow through, dipping probe & sensor spots	
Oxygen channels	1	4
Temperature sensor (included)	Pt1000 Class (B 1/3 DIN) +/- 0.15°C	
Temperature channels	1	
Power supply	5 V	
Power consumption	max. 2.5W	
Environmental conditions	Operating temperature = 0° to 50° C	
Power adapter	100-240V AC in; 5V DC out	
Communication interface	Bluetooth 2.0	
Protection class (with/without connections)	IP64 / IP30	
Certified	CE	
Dimensions [mm]	190 x 135 x 60	
Weight [g]	1130	1250
Windows version	XP, Vista, WIN7, WIN8	
Warm up time	5 min	
Oxygen unit	% oxygen saturation, % air saturation, kPa, Torr, mg/L, mmol or ml/L.	
Measurement range	0 – 100 % oxygen saturation 0 – 475 % air saturation 0 – 100 kPa 0 – 750 Torr 0 – 45 mg/L 0 – 1400 µmol 0 – 45 ml/L	
Limit of detection	0.03 % oxygen 0.15 % air saturation 15 ppb	
Resolution	± 0.01 % O2 at 0.21 % O2 ± 0.1 % O2 at 20.9 % O2 ± 0.1 hPa at 2 hPa ± 1 hPa at 207 hPa ± 0.14 µmol at 2.83 µmol ± 1.4 µmol at 283.1 µmol ± 0.0475 % air saturation at 1 % air saturation ± 0.475 % air saturation at 100 % air saturation	
Accuracy	± 0.4 % O2 at 20.9 % O2 ± 0.05 % O2 at 0.2 % O2 ± 2 % air saturation at 100 % air saturation ± 0.25 % air saturation at 1 % air saturation	
Drift at 0 % oxygen (sampling interval 1 min)	< 0.03 % O2 within 30 days < 0.15 % air saturation within 30 days	
Temperature measuring range	0 – 50 °C	
Response time (T90)	< 6 sec. (gas) < 40 sec. (liquid)	
Precision	± 0.5 % air saturation ± 0.105 % O2 ± 1.05 hPa ± 1.5 µmol ± 0.105 % O2 ± 0.05 mg/L	
Sensor properties	**MINI**	
Compatibility	Aqueous solutions, ethanol, methanol	
No cross-sensitivity with	pH 1 – 14 CO2, H2S, SO2 Ionic species	
Cross-sensitivity to	Organic solvents, such as acetone, toluene, chloroform or methylene chloride Chlorine gas	
Sterilization procedures	Ethylene oxide (EtO) Steam sterilization Gamma irradiation	
Cleaning procedures	3 % H2O2 Cleaning in place (CIP, 5 % NaOH, 90 °C, 194 °F) Acidic agents (HCl, H2SO4), max. 4 – 5 %	
Calibration	Two-point calibration in oxygen-free environment (nitrogen, sodium sulfite) and air-saturated environment	
Storage Stability (dark room, 20°C +/- 5°C)	2 years	

9. Concluding Remarks

Dear customer,

With this manual, we hope to provide you with an introduction to work with the Witrox.

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

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

You can find the latest version at www.loligosystems.com Support/User manuals.

With best regards,

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