

Non-Invasive Oxygen Sensors

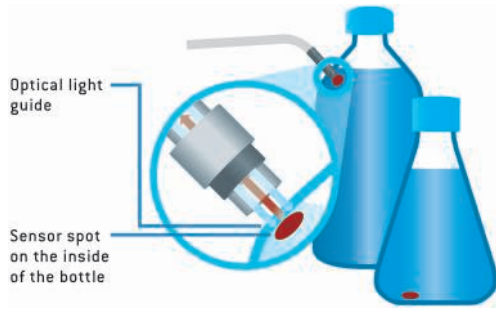
O₂



Robust & real conditions:
Look into any transparent vessel

- Glassware & disposables
- Bags & single-use bioreactors
- PET & glass bottles

Non-Invasive Oxygen Sensors



The non-invasive oxygen sensors measure the partial pressure of both dissolved and gaseous oxygen. These sensor spots are used for glassware and disposables. The sensor spots are fixed on the inner surface of the glass or transparent plastic material and can therefore be measured in a non-invasive and non-destructive manner from outside, through the wall of the vessel. Different coatings for different concentration ranges are available.

Features

- Online monitoring
- Non-invasive & non-destructive measurement
- Measurement range from 1 ppb up to 45 ppm dissolved oxygen
- No consumption of oxygen
- Signal independent of flow velocity
- Measures oxygen in liquids as well as in gas phase
- Autoclavable (SIP: 130 °C / 266°F, 2 atm steam sterilization) & CIP (Cleaning in place)



Sensor Spots

Sensor spots (SP) are the most versatile version of non-invasive oxygen sensors. They are attached to the inner surface of any transparent vessel.

Examples are

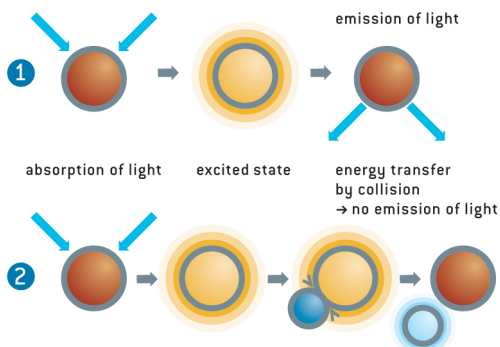
- Cultivation bags
- Spinners
- Glass reactors

The transmitter with its optical fiber can be fixed opposite the sensor spot by using our accessories (see accessories brochure) which can be adapted for nearly all kinds of vessels.



Flow-Through Cell

The flow-through oxygen minisensor (FTC) is a miniaturized fiber chemical optical sensor integrated in a flow-through cell. It is connected to the transmitter by an optical fiber. A glass tube with an inner diameter of 2 mm is coated with an oxygen sensor at its inner wall. The volume for liquid inside the FTC is about 100 (± 10) microliter. The standard flow cell can be easily connected via Luer-Lock adapters to external tubings.



The Smart Measurement Method

The light from the blue LED excites the sensor spot to emit fluorescence. If the sensor spot encounters an oxygen molecule, the excess energy is transferred in a non-radiative way, decreasing or quenching the fluorescence signal. The degree of quenching correlates to the partial pressure of oxygen in the matrix, which is in dynamic equilibrium with oxygen in the sample. The decay time measurement is internally referenced.

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Examples for Applications

Pharma Industry: Oxygen Monitoring in Bags

Bags and single-use bioreactors are in the process of revolutionising the way biopharmaceuticals are manufactured. Our non-invasive oxygen sensors are the tools to make the cultivation vessels fully disposable. As non-invasive pH sensors are also available, the two key parameters oxygen and pH can be controlled online.



Food & Beverage: Oxygen Permeation Measurement in PET Bottles

Non-invasive oxygen sensors measure both in liquid and in gaseous (headspace) phases. They perform through transparent materials up to a thickness of 10 mm and even through slightly opaque packaging. The measurement is carried out by firmly holding the fiber optic probe against the side of a PET bottle where the sensor spot is positioned. Adjustable mountings and bespoke fixtures are available. This system allows even the parallel measurement of different bottles as the fiber can be moved from bottle to bottle.



Bioprocess Development: Oxygen Monitoring in Shake Flasks

O₂ supply is one of the major issues in the cultivation of aerobic organisms. Shake flask cultures are widely applied in academic and industrial bioprocess development. As adequate methods for real monitoring of dissolved oxygen were missing, sufficient O₂ supply is usually assumed. The non-invasive oxygen sensors in shake flasks now ensure oxygen supply and give new insights into metabolic activity.

Is your application missing?
Contact us and we will find your
customized solution!

Specifications	Sensor Type PSt3		Sensor Type PSt6	
	Gaseous & Dissolved Oxygen	Dissolved Oxygen	Gaseous & Dissolved Oxygen	Dissolved Oxygen
Measurement range	0 – 100 % O ₂ 0 – 1000 hPa	0 – 45 mg/L 0 – 1400 µmol	0 – 4.2 % O ₂ 0 – 41.4 hPa	0 – 1.8 mg/L 0 – 56.9 µmol
Limit of detection	0.03 % oxygen	15 ppb	0.002 % oxygen	1 ppb
Resolution	± 0.01 % O ₂ at 0.21 % O ₂ ± 0.1 % O ₂ at 20.9 % O ₂ ± 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	± 0.0007 % O ₂ at 0.002 % O ₂ ± 0.0015 % O ₂ at 0.2 % O ₂ ± 0.007 hPa at 0.023 hPa ± 0.015 hPa at 2.0 hPa	± 0.010 µmol at 0.03 µmol ± 0.020 µmol at 2.8 µmol
Accuracy	± 0.4 % O ₂ at 20.9 % O ₂ ± 0.05 % O ₂ at 0.2 % O ₂		± 1 ppb or ± 3 % of the respective concentration; whichever is higher	
Drift at 0 % oxygen	< 0.03 % O ₂ within 30 days (sampling interval of 1 min.)		< 2 ppb within 30 days (sampling interval of 1 min.)	
Measurement temperature range	0 – 50 °C		0 – 50 °C	
Response time (τ ₉₀)	< 6 sec.	< 40 sec.	< 6 sec.	< 40 sec.
Properties				
Compatibility	Aqueous solutions, ethanol, methanol			
No cross-sensitivity with	pH 1 – 14 CO ₂ , H ₂ S, SO ₂ Ionic species			
Cross-sensitivity to	Organic solvents, such as acetone, toluene, chloroform or methylene chloride Chlorine gas			
Sterilization procedures	Steam sterilization Ethylene oxide (EtO) Gamma irradiation			
Cleaning procedures	Cleaning in place (CIP, 5 % NaOH, 90 °C, 194 °F) 3 % H ₂ O ₂ Acidic agents (HCl, H ₂ SO ₄), max. 4 – 5 %			
Calibration	Two-point calibration in oxygen-free environment (nitrogen, sodium sulfite) and air-saturated environment		Two-point calibration in oxygen-free environment (nitrogen) and a second calibration value optimally between 1 and 2 % oxygen	
Storage Stability	2 years provided the sensor material is stored in the dark (-10 – 60 °C)			

Transmitters & Accessories



Fibox 3/Fibox 3 trace
Fiber optic oxygen transmitter



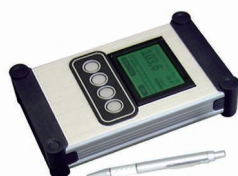
OXY-4 mini/OXY-4 trace
4-channel fiber optic oxygen transmitter



OXY-10 mini/OXY-10 trace
10-channel fiber optic oxygen transmitter



Fibox 3 LCD/Fibox 3 LCD trace
Fiber optic oxygen transmitter with LCD display



LP-1 Control Panel
The control panel is a device for controlling single-channel oxygen transmitters.



Accessories
A variety of accessories like connectors to different vessels is available.

Technical data can change without prior notice.

Bring to light what's inside. Ask our experts:

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