

CO₂



Carbon Dioxide Sensors

Non-invasive & in-process monitoring

- Probes & disposables
- Bags & single-use bioreactors
- Blood-gas monitoring



PreSens
PRECISION SENSING

Carbon Dioxide Sensors



The carbon dioxide sensors measure the partial pressure of dissolved carbon dioxide. The spots are fixed on the inner surface of a glassware or transparent plastic material. The CO₂ concentration can therefore be measured in a non-invasive and non-destructive manner from outside, through the wall of the vessel.

Features

- On-line monitoring
- Non-invasive & non-destructive measurement
- Measurement range from 10 – 250 hPa CO₂ (8 .. 180 mmHg)
- No consumption of carbon dioxide
- Measures carbon dioxide in liquids
- gamma-irradiated sensors available

Sensor Spots

Sensor Spots (SP) are the most versatile version of carbon dioxide sensors. They are attached to the inner surface of any transparent vessel.

Examples are

- respirometric chambers
- aquaria
- flasks

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

Flow-Through Cell

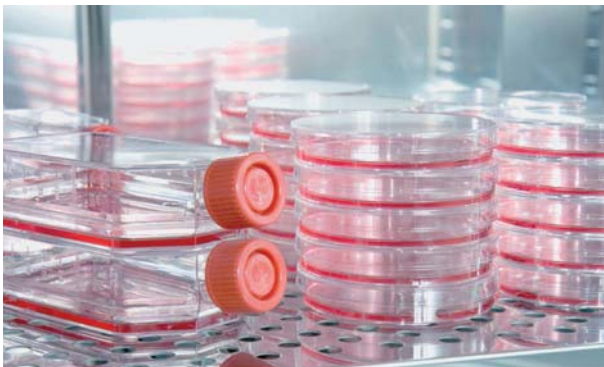
The flow-through carbon dioxide mini-sensor (FTC) is a miniaturized fiber optic chemical sensor integrated in a flow-through cell. It is connected to the transmitter by an optical fiber. The standard flow cell can be easily connected via Luer-Lock adapters to external tubings.

Dipping Probe

The CO₂ dipping probe is a fiber optic chemical sensor based on 2 mm polymer optical fiber (POF). The sensor membrane is fixed at the distal end of the optical fiber connected to the transmitter. It is the solution for invasive measurements and monitoring.



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Potential Applications

Medical Application: On-line Monitoring of pCO₂

On-line monitoring of blood pCO₂ is desirable in hypercapnia (pCO₂ > 45 mmHg) therapy during point-of-care treatment in intensive care units. During surgeries on-line monitoring of pCO₂ provides continuous fast and reliable information on patients' viability enabling faster clinical decision making compared to standard offline laboratory analyses based methods. Chemical-optical sensors and instrumentation can be integrated (OEM) to monitoring systems, like heart-lung machines, blood parameter control units or blood parameter monitors to provide information for fast clinical decision making.

Biotechnology: CO₂ monitoring in process development

In bioprocess development & production, monitoring dissolved carbon dioxide in addition to pH and oxygen provides valuable information. It ensures stress-free cultivation conditions during mammalian cell culture (e.g. CHO cell-line). Constant pH, oxygen supply and sufficient nutrition levels are key parameters to optimise yield. Thereby, excess carbon dioxide can act as a stressor or even a toxin to the culture and has to be controlled. The chemical-optical pCO₂ sensors can enhance performance of process monitoring during cultivation in disposables, leading to process optimisation.

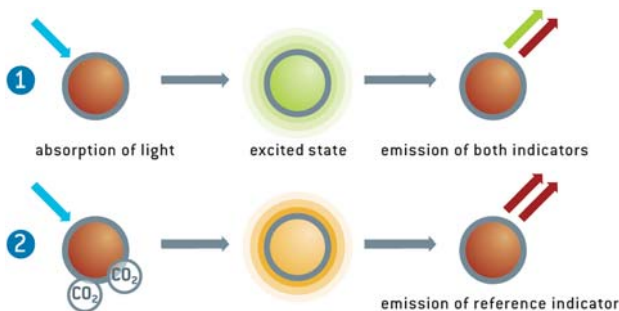
Scientific: Carbon Dioxide Monitoring for Biological Applications

Increased CO₂ uptake from the atmosphere caused by anthropogenic sources is believed to cause ocean acidification, with not yet foreseeable effects on marine life and ecosystem. Monitoring pCO₂ in experimental set-ups simulating future levels of carbon dioxide can help to gain knowledge on the effects of ocean acidification on marine fauna. Besides the marine application, monitoring pCO₂ also allows knowledge to be gained on land-based plant physiology. Monitoring pCO₂ helps increasing yield during aquaculture of fish (fish farming) by providing convenient growth conditions. Excess carbon dioxide levels need to be monitored as this leads to hyperventilation of sea animals.

Measurement Principle

Dual Lifetime Referencing - An Internal Referencing Method

The chemical optical carbon dioxide sensor is based on our patented DLR measurement principle. The light of the blue LED excites the sensor to emit fluorescence. The luminescence lifetime measured is a superposition of the signals of an analyte sensitive indicator and an inert reference indicator, where both indicators exhibit very different luminescence lifetimes and the luminescence of the analytic sensitive indicator can be suppressed by CO₂. The measurement signal correlates to the partial pressure of carbon dioxide.



| Specifications* | | |
|--|---|--|
| Measuring range | 1 – 25 % CO ₂ at atmospheric pressure (1013.15 hPa) 10 – 250 hPa pCO ₂ 8 – 180 mmHg pCO ₂ | |
| Response time (t ₉₀) at 20°C | < 3 min for change from 2 % to 5 % CO ₂ | < 3 min for change from 15 mmHg to 38 mmHg CO ₂ |
| Resolution at 20°C | ± 0.06 % at 2 % CO ₂ ± 0.5 mmHg at 15 mmHg CO ₂ | ± 0.15 % at 6 % CO ₂ ± 1.2 mmHg at 45 mmHg CO ₂ |
| Drift at 37°C ** | > 0.01 % CO ₂ per 7days | |
| Accuracy (Batch-Calibration) | ± 5 % of reading or 0.2 % whichever is greater | |
| Operating temperature | from +15 °C to +45 °C | |
| Properties* | | |
| Compatibility | aqueous solutions, pH 4 – 9 | |
| Cross-sensitivity | Optical pCO ₂ sensors display reduced cross-sensitivity to ionic strength (salinity); acidic acid, SO ₂ , HCl vapours | |
| Stability | or below 4 | |
| Storage | 6 months provided the pCO ₂ sensor is stored in its original package | |
| Sterilization | pCO ₂ Sensors are delivered gamma-irradiated or untreated; re-sterilisation is not recommended | |
| Cleaning | pCO ₂ Sensors are designed as disposables, cleaning is not recommended | |
| Calibration | pCO ₂ spots are pre-calibrated; re-calibration is possible | |

* provided pCO₂ spots are used without further handling in physiological solutions

** in a carbon dioxide incubator with 100 % rel.Hum. at 5 % CO₂; measurement interval of 1 min

Transmitters & Accessories



pCO₂-mini

Single-channel, temperature compensated CO₂ meter.



SOA adapter

The stick-on adapter SOA is used for transparent vessels with planar surface.



Coaster CFG

The coaster CFG is used for shake flasks.



ARC adapter

The adapter for round containments ARC is used for spinner flasks or similar vessels.

Technical data can change without prior notice.

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

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