

Sensors for Biology & Environmental Research



- Online monitoring of O_2 , pH & CO_2
- O_2 , pH & CO_2 microsensors e. g. for microprofiling
- O_2 , pH & CO_2 imaging
- Robust probes with excellent long-term stability

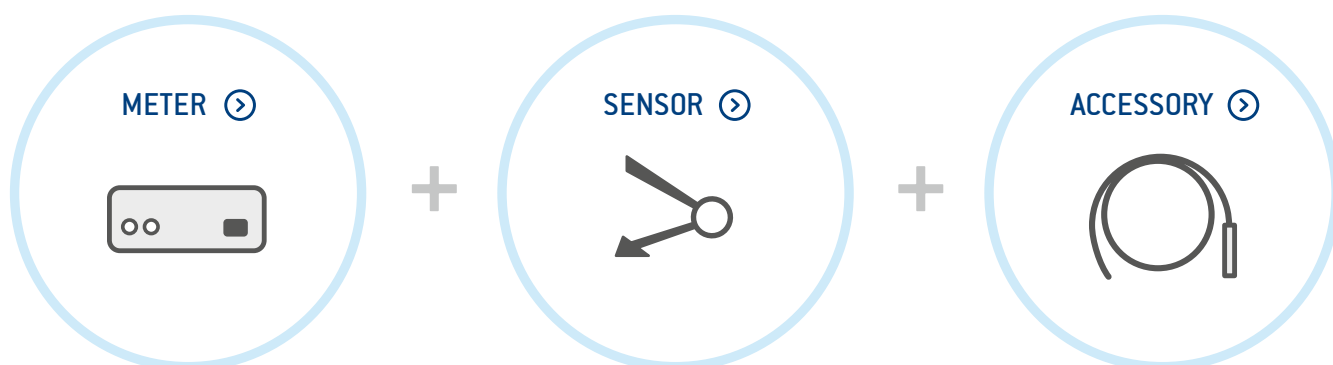


Contact us and we find your customized solution!

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Functional Principle



We bring to light what's inside...



Products Made in Germany

PreSens offers a broad range of sensor systems for end users in Bioprocess Control, Biological & Environmental Research, the Food & Beverage industry as well as other industrial applications.

We offer systems for

- Oxygen measurement in gases and liquids
- Non-invasive online pH, CO₂ and oxygen measurement
- Oxygen and pH sensors for single-use bioreactors
- Microsensors pH, oxygen and CO₂
- Process control in shake flasks incl. biomass monitoring
- Low-maintenance DO measurement for fermentation and bioreactor systems
- Online oxygen and pH measurement in disposables like multiwell plates and plastic bags
- Imaging solutions for 2D-mapping of oxygen-, pH-, and CO₂-distribution

Our product range is constantly expanding.

Company Profile

Based on research activities started in the 1980's PreSens Precision Sensing GmbH was founded in 1997 as a spin-off from the University of Regensburg, Germany.

The company combines long-time experiences of different researchers in the fields of electronic engineering and sensor development. Right from the beginning, microsensor systems were sold to customers in life sciences. Already in its first decade of operation PreSens became one of the leading companies in the field of chemical optical sensor technology. Together with its partners it offers full service in Europe, America and Asia.

Service

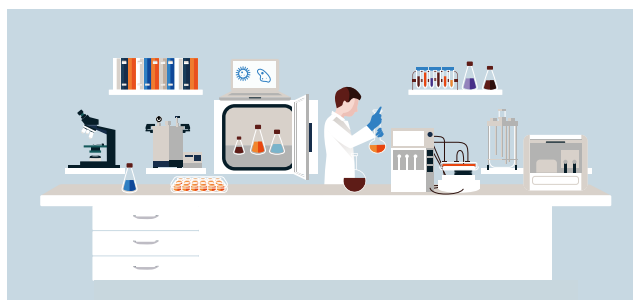
Furthermore, we are developers and manufacturers of optoelectronic OEM sensor components for companies in the field of medical equipment and process control.



Quality Management
ISO 9001
ISO 13485
Voluntary participation in regular monitoring

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...and work for the following industries.



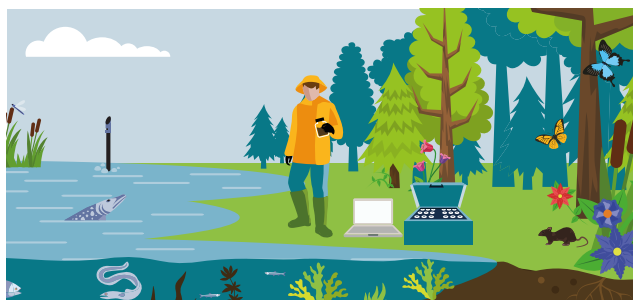
Biotech & Pharma

Our Biotech & Pharma business field helps pharmaceutical companies such as Roche and DSM to improve their bioprocess development with PreSens sensors. With two decades of customer feedback our product development provides efficient solutions for your needs.



Food & Beverage

A cooperation with the market leader for beverage filling systems, Kronen AG, Neutraubling, triggered our Food & Beverage business field in the late 1990's. PreSens supplies sensors for checking the oxygen-tightness of packaging and special systems for determining the penetrability of oxygen in PET bottles at companies such as Nestlé, Heineken or Danisco.



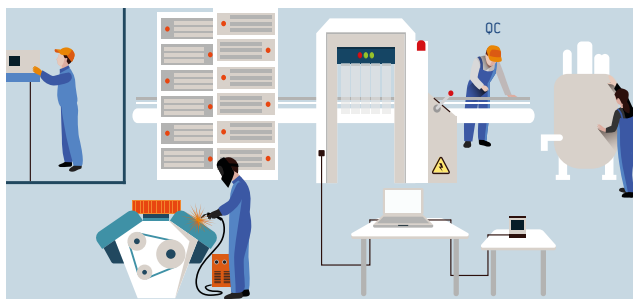
Biology & Environmental

Our worldwide customer base in biological & environmental research has now grown to hundreds of users coming from the University of Alaska in Anchorage to the University of Wellington in New Zealand. For more than two decades we have delivered special sensor systems for various applications such as respirometry, or environmental monitoring.



Medical Research & Life Sciences

Our most recent business field arose from a cooperation with renowned medical technology manufacturers from the medical devices sector. PreSens supplies OEM parts, which are integrated into more complex medical systems. Microsensors, sensor spots, and imaging systems are applied in tissue engineering, microfluidics, and many other medical research fields.



Industry & Technical Applications

Robust probes with excellent long-term stability or sensors for contactless measurement find use in technical or industrial applications. Specially designed flow-through connectors for integration in pipes are already applied to monitor the oxygen content in liquids or gases. We work together with integrators to design OEM sensor components and with our solution, they can be sure to meet the requirements for their risk assessment as an integrator.





SENSORS

Sensor Solutions

Online Monitoring of O₂, pH & CO₂

Our worldwide customer base in biological & environmental research has now grown to hundreds of users coming from the University of Alaska in Anchorage to the University of Wellington in New Zealand. The various optical sensor designs – from microsenors to robust stainless steel probes – make them applicable in a wide range of research fields. Whether it is non-invasive respiration measurements, monitoring in sediment pore water, profiling in biofilms, or 2-dimensional recording of analyte distributions in root systems, PreSens can deliver the right sensor solution for investigations in micro- or macro-scale.

- Versatile splash-proof handheld O₂ outdoor meter
- Robust stainless steel probes for outdoor use and with excellent long-term stability
- O₂, pH & CO₂ microsenors e. g. for microprofiling
- Live-imaging system 2D for O₂, pH & CO₂
- Non-invasive or flow-through respiration measurements

Contact us and we find your customized solution!

Applications



Online Monitoring and Profiling in Sediments & Biofilms

PreSens offers several sensor solutions for measurements in biofilms and sediments from micro- to macro-scale: Profiling microsensors together with our micromanipulator systems are the tools for accurate microprofiling. 2-dimensional assessment of gradient development in flume chambers or sediment cores is possible with the VisiSens™ imaging systems. Robust dipping probes can directly be inserted in soil or sediment cores and are well suited for long-term macro-scale investigations.



Respiration & Photosynthesis Measurements

PreSens' non-invasive optical sensors are the ideal tool for respiration measurements. From tiny invertebrates to large aquatic organisms, our O₂ and pH sensors can be integrated in most different respirometry chambers. For investigating the photosynthetic activity of plants, special vials with integrated sensor stripes can be applied to measure the oxygen content in the liquid sample and the headspace simultaneously.



Online Monitoring in Plant & Animal Physiology

Our sensor systems measure non-invasive or minimally invasive, which is of great advantage when working with living samples. Microsensors with a diameter of 250 µm can be inserted into tissue or mounted inside catheters for high resolution measurements. Furthermore, sensor foils can be placed directly on the sample surface or a sample cross section and analyte distributions can be determined 2-dimensionally over time.



Long-term Measurements in Environmental Monitoring

Robust probes with stainless steel fittings can be applied for long-term monitoring in environmental studies. Portable, splash-proof devices with long-lasting batteries and immense storage capacity allow for prolonged computer-independent work out in the field. The Microx 4 series oxygen meters, for example, can be applied with different sensor designs, from microsensors, over tiny sensor spots, to dipping probes, so one device can be used for most different experiments.



Sensor Solutions for Biology & Environmental Research



Contact us and we find your customized solution!

OEM Solutions for you



PreSens offers customized sensor technology solutions. Right from the beginning PreSens can be your partner while finding new approaches: from specifications to implementation up to production of your tool.

Don't hesitate to ask for your individual solution:
engineering@presens.de



- 1 **Oxygen Sensor Spots + Electro-Optical Module EOM-O₂-FOM**
for oxygen monitoring in deep sea research
- 2 **Oxygen Sensor Spots + Microx 4 trace**
for respirometry of small and large aquatic organisms
- 3 **Profiling O₂, pH & CO₂ Microsensors + Manual or Automated Micromanipulator, VisiSens™ A1 or VisiSens™ TD Imaging Systems**
for profiling and monitoring gradient developments in soil and sediments
- 4 **Oxygen Dipping Probe + Fibox 4**
for water sample analysis
- 5 **Sensor Spots + Fibox 4, pH-1 SMA or CO₂-1 SMA**
for non-invasive monitoring in liquid samples
- 6 **Sensor Spots + Electro-Optical Modules**
for non-invasive measurements in customized set-ups, e. g. in closed ecosystems
- 7 **Dipping Probes + Fibox 4, VisiSens™ A1 or VisiSens™ TD**
for long-term measurements in soil or mapping root-soil interactions, the capillary fringe, microbial degradation, etc.
- 8 **O₂, pH & CO₂ Microsensors + Automated or Manual Micromanipulator, VisiSens™ A1 or VisiSens™ TD**
for minimally invasive or contactless measurements in plant & animal physiology



FEATURED SYSTEMS



O₂ Sensor Spot + POF or Profiling Microsensor PM + Microx 4 trace

Sensor Spots can be integrated in transparent vessels and can then be read out non-invasively via polymer optical fiber, while the Profiling O₂ Microsensor allows piercing into semi-solid materials and then take high resolution measurements. Both sensors can be read out with the all-round device Microx 4 trace.



O₂ Dipping Probe + Fibox 4

The robust dipping probe with stainless steel fitting is connected to the portable Fibox 4 oxygen meter. The meter's long-lasting battery and immense storage capacity allow prolonged use out in the field.



Profiling O₂ Microsensor PM + Microx 4 or Profiling pH Micro-sensor PM + pH-1 ST + Automated Micromanipulator

The Profiling O₂ or pH Microsensor can be mounted to the Automated Micromanipulator (AM), and is connected to the Microx 4 or pH-1 ST. The meter and AM are connected to a PC and allow automated, long-term microprofiling.



Single-use pH Flow-through Cell + POF + pH-1 SMA

A tiny pH sensor is integrated in a single-use flow-through cell. It is connected to the pH-1 SMA via polymer optical fiber. Online pH measurements in perfusion systems or small liquid volumes can be performed.



VisiSens™ DU01 or VisiSens™ TD Imaging Systems

VisiSens™ sensor foils can be placed directly on a sample surface, a sample cross section or be integrated in transparent experimental vessels. With the respective Detector Unit analyte images can be recorded non-invasively, as single images or time-series recordings, to follow changes in O₂, pH or CO₂ distribution over time.



CO₂ Sensor Spot + POF + CO₂-1 SMA

The CO₂ sensor spots can be integrated in transparent vessels. pCO₂ in liquids can be measured non-invasively through the container wall via polymer optical fiber, which is connected to the CO₂-1 SMA carbon dioxide meter.

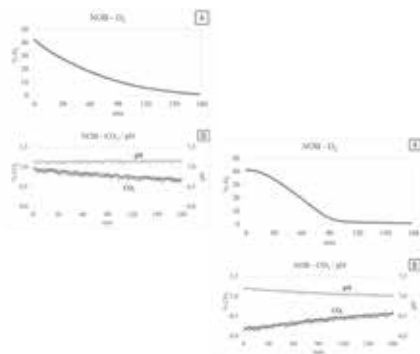


SensorDish® Reader Basic Set + Extension Set + SensorVials SV-PSt5 + SDR-MSV24

SensorVials can be used in ambient light. They are ideally suited for respiration monitoring of small aquatic animals. Together with the SDR-MSV24 shielding mask they can also be applied for photosynthesis experiments. 24 SensorVials can be read out with one SDR SensorDish Reader. For a higher throughput, Extension Sets can be connected.



Featured Applications



Respirometry: Non-invasive Tracking of O_2 , pH & CO_2 as Indicator for Nitrification Activity

Respirometry means measuring microbial activity indirectly, such as nitrification, which is used for biological wastewater treatment. O_2 , pH and CO_2 are key parameters in such systems. Therefore, non-invasive O_2 , pH and CO_2 sensor spots were used to monitor either ammonium oxidizing (AOB) or nitrite oxidizing (NOB) bacteria. Additional information could be gained by combining results of all three parameters and a distinctly different behavior of pH and CO_2 during AOB and NOB batch runs was documented.

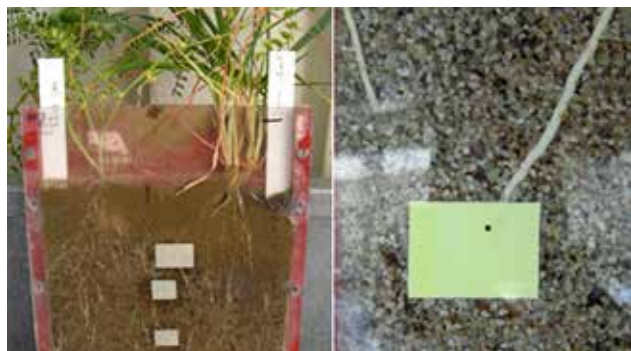
E. M. Gilbert, S. Lackner, Karlsruhe Institute of Technology, Engler-Bunte Institute, Water Chemistry and Water Technology, Germany



pH Fluxes at the Sediment-Water Interface off the South West Coast of Africa

Single-use pH Flow-through Cells (FTC-SU-HP5) were used to study the impact of sedimentary organic carbon content on the pH in pore water and the overlaying bottom water. The FTCs were connected to Rhizons mounted to a sediment core at different depth. First results emphasize the role of sedimentary fluxes not only in generating DIC but also total alkalinity which elevated the capacity to mitigate the drop of pH.

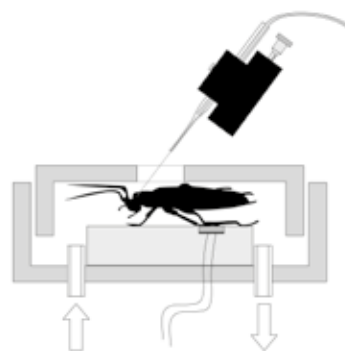
A. Flohr, T. Rixen, M. Birkicht, Leibniz Center for Tropical Marine Ecology, Germany



O_2 , pH & CO_2 Dynamics in the Rhizosphere of Crop Plants

Research on metabolic activity of plant roots and determining cultivation conditions for optimal growth will be important e. g. adjusting water supply and fertilizing. In this study 2D imaging with VisiSens™ visualized O_2 , pH and CO_2 dynamics in complex root systems and the surrounding media. Metabolic processes and how they changed were monitored over long time periods. The acquired analyte maps have a resolution in sub-millimeter range.

Blossfeld et al., Annals of Botany, 2013



Regulation of Gas Exchange and Haemolymph pH in Cockroaches

For measuring pH changes in insect haemolymph, bare fiber pH microensors were implanted into the haemocoel of cockroaches, which were then exposed to different atmospheres. O_2 levels were measured in separate experiments, with an implantable O_2 microsensor. The study revealed that cockroaches control their gas exchange to regulate intratracheal levels of CO_2 and O_2 comparable to most other air-breathing animals.

P. G. D. Matthews and C. R. White, The Journal of Experimental Biology, 2011



Biological Oxygen Demand Measurements: Thermokarst Slumping in Tundra Lakes

Permafrost degradation often occurring directly adjacent to lakes in the high Arctic, has been associated with terrestrial inputs to the lacustrine environment. An in situ mesocosm approach was used to determine the potential impacts of permafrost degradation on basal components of the food web. Biological oxygen demand (BOD) was measured weekly in the pelagic and benthic environments with optical oxygen sensors and a Fibox 4 trace. First results suggest that trophic interactions play a likely important role. But they did not show that the status of these lakes as sources of CO₂ will change because of increased thermokarst slumping.

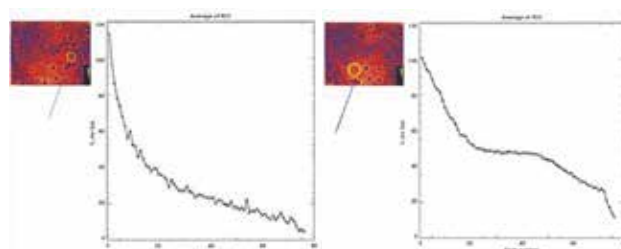
P. Moquin, F. Wrona, University of Victoria, CA



O₂, pH & CO₂ Dynamics in Salt Marsh Tidal Ponds

The Automated Microprofiling system by PreSens was used for profiling marsh pond sediment cores under light exposure. Photosynthetic activity by benthic microalgae and other photoautotrophs resulted in supersaturated oxygen conditions in light. In contrast, pH and CO₂ at the sediment surface was unaffected suggesting a high buffering capacity of the pond water and sediment.

K. Koop-Jakobsen, University of Bremen, Germany and M. Gutbrod, PreSens Precision Sensing GmbH, Germany



Imaging Oxygen Consumption of Microbial Cultures

Oxygen imaging with the VisiSens™ A1 (DU1) allows 2D-mapping of oxygen consumption inside microbial culture. *Escherichia coli* cultures were investigated to demonstrate the capabilities of the imaging device for visualizing oxygen gradients across the culture surface. The oxygen sensor foil was put directly on the culture grown on an agar plate and read out with the DU01 installed inside the incubator. The results show clearly how oxygen gradients evolve around single cultures and how oxygen levels decrease depending on the distance to other cultures over time.

H. Tschiersch, Leibniz Institute of Plant Genetics and Crop Plant Research, Germany



Examples for Meters, Sensors & Accessories

Meters



Fibox 4 & Fibox 4 trace

Portable fiber optic oxygen meters for measurements in normal, trace and ultra-low oxygen range



Microx 4 & Micox 4 trace

Portable oxygen meters for use with microsensors, sensor spots and probes



pH-1 SMA

Fiber optic pH meter for use with sensor spots and flow-through cells



pH-1 ST

Micro fiber optic pH meter for use with pH microsensors



CO₂-1 SMA

Fiber optic carbon dioxide meter for use with sensor spots, flow-through cells and dipping probes applied in liquid samples



CO₂-1 ST

Micro fiber optic carbon dioxide meter for use with CO₂ microsensors



SDR SensorDish® Reader Basic Set

Non-invasive online culture monitoring of oxygen & pH in multiwell plates



SDR SensorDish® Reader Extension Set

Up to 9 SDR Extension Sets can be combined with one Basic Set



VisiSens™ Detector Unit DU01

USB powered and portable 2D detection device for oxygen imaging



VisiSens™ TD

2D detection device for oxygen or oxygen, pH and CO₂ imaging

Sensors



O₂ Sensor Spots

Versatile, small oxygen sensors for measurement in different oxygen ranges



Self-adhesive O₂ Sensors

Easy integration into transparent vessels, for contactless measurement in normal oxygen range (0 – 100 % O₂, 0 – 45 mg/L)



pH Sensor Spots

Versatile, small carbon dioxide sensors for integration into transparent vessels



Self-adhesive pH Sensors

Easy integration into transparent vessels, for contactless pH monitoring



CO₂ Sensor Spots

Versatile, small carbon dioxide sensors for integration into transparent vessels



VisiSens™ Sensor Foils

Fluorescent sensor foils for oxygen imaging from 0 – 100 % air saturation, pH imaging in a range of pH 2.5 – 4.5 or 5.5 – 7.5, and CO₂ imaging from 0 – 1 % or 1 – 25 % CO₂



O₂ Flow-through Cells

T-cells with integrated oxygen sensor; different sizes for various flow rates available



Single-use O₂ Flow-through Cell

Single-use FTC for oxygen monitoring (0 – 45 mg/L, 0 – 1400 µmol/L); can be delivered beta-irradiated or untreated



Autoclavable O₂ Flow-through Cell

FTC for monitoring in normal or trace oxygen range (0 – 45 mg/L, 0 – 1400 µmol/L or 0 – 5 % O₂, 0 – 2 mg/L)



Single-use pH Flow-through Cell FTC-SU-HP5

Polycarbonate T-cell with integrated pH sensor for online monitoring in perfusion systems



Single-use pH Flow-through Cells for Different Flow Rates

T-Cells with integrated pH sensor; different sizes for various flow rates available



Single-use CO₂ Flow-through Cell FTC-SU-CD1

Polycarbonate T-cell with integrated integrated CO₂ sensor





Needle-type Oxygen Microsensors NTH-PSt7/PSt8

On-the-spot measurement of oxygen; compatible with Microx 4 or Microx 4 trace



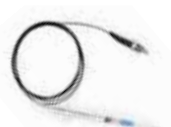
Implantable Oxygen Microsensors IMP-PSt7/PSt8

Bare fiber microsensor for use with Microx 4 & Microx 4 trace



Profiling Oxygen Microsensors PM-PSt7/PSt8

Microsensor for oxygen profiling; compatible with Microx 4 & Microx 4 trace



Needle-type pH Microsensor NTH-HP5-ST-low/-high

This pH Microsensor is protected by its robust housing.



Implantable pH Microsensor IMP-HP5-ST-low/-high

Bare fiber microsensor without additional housing



Profiling pH Microsensor PM-HP5-ST-low/-high

Metal-housed microsensor with extendable fiber & mechanical interlock for profiling applications



Needle-type CO₂ Microsensor NTH-CDM1

Protected by its syringe needle housing this sensor can be pierced through material.



Implantable CO₂ Microsensor IMP-CDM1

This sensor is not integrated in any additional housing and ideally suited for customized measurement set-ups



O₂ Dipping Probes DP-PSt7/PSt8

Robust oxygen probe for measurements with the all-round devices Microx 4 & Microx 4 trace



O₂ Dipping Probes DP-PSt3/PSt6/PSt9

Oxygen probe with steel fitting for normal range, trace, or ultra-low oxygen measurements



CO₂ Dipping Probe DP-CDM1 or DP-CDM1-ST

Probes with or without stainless steel fitting for CO₂ measurements in liquids



20 mL SensorVial SV-PSt3-20mL

Vial with sensor stripe for measurement in headspace and liquid or different depths; also autoclavable version available



SensorVials SV-PSt5

2 mL and 4 mL glass vials with integrated oxygen sensors PSt5 for read-out with the SDR, can be cleaned with ethanol and are re-usable



OXYBase® Series

Robust electro-optical module combined with a sensor in a stainless steel housing



Oxygen Exchange Cap

OEC-PSt3-NAU / OEC30-PSt3-NAU

Replacement caps for OXYBase®, available with different coatings, e. g. safe for food applications

Profiling Solutions



Manual Micromanipulator MM

Vibration-free, high-resolution control for microsensors and dipping probes



Manual Micromanipulator MM33

Vibration-free, high-resolution control for microsensors and dipping probes. To be used for manual profiling with the Heavy Stand



Automated Micromanipulator AM

Fully automated, high-resolution control for microsensors and dipping probes



Heavy Stand

The Heavy Stand ensures safe vertical mounting and operation of the Micromanipulators.



Transport Case

High-quality transport case for one AM and one Heavy Stand



Safe-insert

This accessory can be attached to the Automated Micromanipulator and the Manual Micromanipulator for safe insertion of NTHs in semi-solid and hard substrates.



Accessories



Polymer Optical Fiber POF

The POF serves as a versatile connection from meter to sensor.



Adapter for Round Containers ARC

The ARC is used for round containers with a diameter of 2.5 to 20 cm (1 – 8 inches).



Stick-on Adapter SOA

The Stick-on Adapter (SOA) is used for planar containers.



Vial Adapter for 20 mL SensorVials VA

Adapter for attaching a polymer optical fiber to a 20 mL SensorVial



Integration Set Sensor Spots IS-SP

Vacuum tweezers for easy integration of self-adhesive sensor spots



Mask for SensorVials SDR-MSV24

Designed for use with the SDR and SensorVials (2 mL and 4 mL format) to shield the reader optics from light exposure during photosynthesis experiments



Dipping Probe Weights DW

Stabilizes the probe in underwater applications

Notes



Discover the complete PreSens portfolio



**Optical Oxygen
Sensors & Meters**



**Optical pH
Sensors & Meters**



**Optical CO₂
Sensors & Meters**



**Optical Sensor
Systems**



**VisiSens™
Imaging Systems**



**OEM Solutions &
Engineering**

Products



**Biology &
Environmental**



**Industry &
Technical**



**Biotech &
Pharma**



**Medical &
Life Science**



**Food &
Beverage**

Industries

Bring to light
what's inside.

**PreSens comes from
PRECISION SENSING
and offers:**

- precise and simple measurement of O₂, pH, CO₂ and biomass
- systems for Pharma, Biotech, Food & Beverage, Biological & Environmental Research, Technical or Industrial Applications and Medical Research
- sensors thinner than a hair, non-invasive and online
- optimum advice and support
- more than 1,000 items in stock
- prompt delivery worldwide

PreSens Precision Sensing GmbH reserves the right to make changes in specifications and features shown herein, or discontinue the products described at any time without notice or obligation. Contact info@presens.de for the most current information.

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