PreSens
PRECISION SENSING

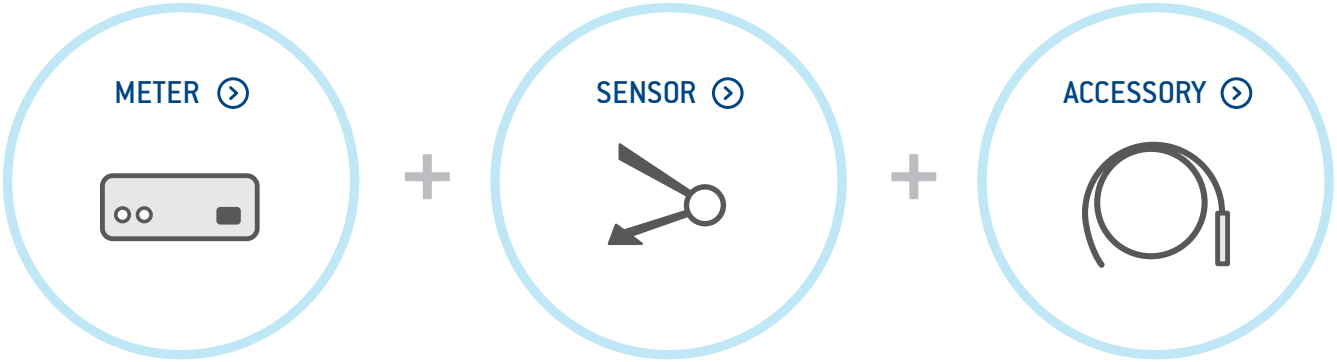
Optical pH Sensors & Meters

- Minimally invasive or even contactless measurement
- Pre-calibrated
- µL up to m^3 range
- For microbial and cell culture
- Insertion in plant and animal tissue

pH

Content

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, CO_2 and oxygen measurement
- Oxygen and pH sensors for single-use bioreactors
- Microsensors pH, oxygen and CO_2
- 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 CO_2-distribution

Our product range is constantly expanding.

Company Profile

Based on research activities in the 1980‘s at the University of Regensburg, Germany, PreSens Precision Sensing GmbH was founded in 1997.

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 opto-electronic OEM sensor components for companies in the field of medical equipment and process control.

DEKRA Certification DEKRA certified

Quality Management
ISO 9001
ISO 13485
Voluntary participation in regular monitoring

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

...and work for the following industries.

Biotech & Pharma

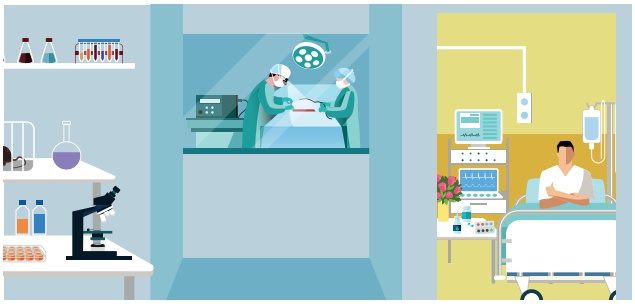
Our Biotech & Pharma business field helps pharmaceutical companies such as Roche and DSM to improve their bioprocess development with PreSens sensors. With two decades of customer feedback our product development provides efficient solutions for your needs.

Food & Beverage

A cooperation with the market leader for beverage filling systems, Krones 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.

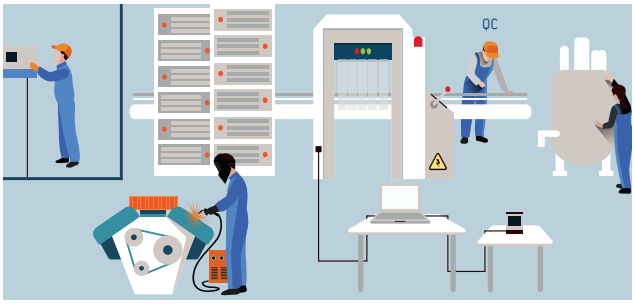
Biology & Environmental

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. OEM sensor components can be designed to be integrated in customer systems.

METERS

pH-1 SMA, pH-micro & EOM-pH Series

pH Meters

The pH-1 SMA LG1, pH-1 SMA HP5, pH-1 micro and EOM-pH-PHB50 are precise fiber optic pH meters. They are used with contactless or micro-invasive optical sensors. A PC is connected to run the easy-to-use software.
An open communication protocol allows to digitally integrate the EOM-pH-PHB50 in control systems.

- Software included
- Simple one-point calibration possible
- One calibration for a multitude of sensor spots
- Ready to use, irradiated and precalibrated probes available
- Software allows to measure with up to 10 single channel instruments simultaneously
- We offer taylored designs so the customer can easily and safely integrate the sensors

Specifications

	pH-1 SMA	pH-1 micro
Specifications		
pH sensors	pH-1 SMA HP5: HP5 / HP8 pH-1 SMA LG1: LG1	HP5
Temperature sensor	1 x Pt100 temperature connector (sensor not included)	1 x Pt1000 temperature connector (sensor included)
Temperature performance	From 0 °C to + 50 °C, resolution: ± 0.1 °C, accuracy: ± 1.0 °C	
Power supply	5 VDC (USB-2.0-Mini-B, cable included)	18 VDC / 5 W (110 – 240 VAC, 50/60 Hz, adapter included)
Temperature: operating / storage	From 0 °C to + 50 °C / from + 5 °C to + 40 °C	From 0 °C to + 50 °C / from + 5 °C to + 40 °C
Relative humidity	0 % to 80 % (non condensing)	
Dimensions	101 mm (with connectors) x 35 mm x 30 mm	210 mm x 120 mm x 50 mm
Weight	128 g	650 g
Digital interface	USB interface (cable included)	RS232 interface (with RJ connector to serial port, cable included)
External trigger	-	TTL-compatible with galvanic isolation (BNC connector)
Analogue output specifications	-	Dual outputs, 0 – 4095 mV, resolution: 12 bit, accuracy ± 10 mV (BNC connectors) 10 mV represent pH 0.1 pH Temperature 1 °C Phase 0.25 °

pH-1 SMA LG1

This small pH meter can be set up almost anywhere. It is compatible with non-invasive sensors, dipping probes and flow-through cells of type LG1 (pH 4.0 - 7.5). The USB-powered pH meter is operated with the PreSens Measurement Studio 2 software. This enables simultaneous control of several PreSens devices, so measurement networks can be set up.

pH-1 SMA HP5

Due to its small outer dimensions pH-1 SMA HP5 can be set up almost anywhere. It is compatible withnon-invasive sensors, dipping probes and flow-through cells of type HP5 & HP8 (measurement range pH 5.5 - 8.5). The USB-powered pH-1 SMA HP5 is operated with the PreSens Measurement Studio 2 software, which enables simultaneous control of several PreSens pH, O_2 and CO_2 devices.

pH-1 micro

The pH-1 micro is a precise micro fiber optic pH meter. It is temperature compensated and used with pH microsensors based on a 140 µm optical fiber. A PC is connected to run the easy-to-use software. The software supports one point calibration as well as multipoint calibration and can handle up to 10 pH-1 micros. It is also compatible with the PreSens Profiling Studio software and the Automated Micromanipulator AM for profiling applications.

EOM-pH-PHB50

The EOM-pH-PHB50 is a precise, single channel module for non-invasive pH measurement. It is compatible with sensor types HP5 & HP8 (pH 5.5 – 8.5). The small outer dimensions and low power consumption make it very easy to integrate this board in custom monitoring and control systems. Also available as LG1 version (pH 4.0 - 7.5).

SENSORS

Non-invasive pH Sensors

Pre-calibrated, Ready-to-use & Contactless Measurements: Look into any Transparent Vessel

The non-invasive pH sensors are optimized for physiological solutions and cell culture media. These so called sensor spots can be mounted in transparent vessels made of plastic or glass. Plastic vessels with already integrated pH sensors are ready-to-use as they are beta-irradiated and pre-calibrated. The pH is measured contactless through the vessel wall. New self-adhesive sensor spots ease the integration process for the user.

- Online monitoring without sampling
- Optimized for cell culture media and physiological solutions
- Applicable from microliter to production scale
- Contactless & non-destructive measurement
- Pre-calibrated & ready-to-use
- Integrated in beta-irradiated disposables
- Bags & single-use bioreactors

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

Examples for Applications

Pharma Industry: pH Monitoring in Bags

Bags and single-use bioreactors have revolutionized the way biopharmaceuticals are manufactured. Our non-invasive pH sensors are the tools to turn disposable bags into bioreactors. As non-invasive DO sensors are also available, the two key parameters oxygen and pH can be controlled online.

Customized Micro Reactors and Ports

pH and DO sensor spots are mounted in customized micro reactors. They can be delivered beta-irradiated and pre-calibrated and mounting the sensors to a variety of polymeric surfaces is possible. Immobilization by ports, which are integrated into the reactors at the customer's facilities, is a second application.

Bioprocess Development: pH Monitoring in Shake Flasks

Shake flask cultures are widely applied in academic and industrial bioprocess development. Although pH is one of the major issues in the cultivation of cells, yeast or bacteria, adequate methods for real-time monitoring of pH were not available and cumbersome at-line sampling was used. pH Sensor Spots in combination with non-invasive oxygen sensors integrated in shake flasks now provide new insights into metabolic activity and changes in metabolic pathways.

Optical Sensor Technology for Cell Culture Monitoring

PreSens single-use pH sensors can easily be integrated in cell culture bags. Our Nice Ports can be welded with the bag material, leaving the bag fully closed. The small optical sensor attached to the port is read out non-invasively from outside. Furthermore, small single-use flow-through cells can be integrated in the flow path of perfusion bioreactors to monitor oxygen consumption or media pH. Alternatively, use our Sensor Sticks where the sensor is attached to a Luer Lock adapter, which can be integrated in any cultivation system via Luer connector.

SPECS

MEASUREMENT RANGE HP5	5.5 - 8.5 pH
MEASUREMENT RANGE LG1	4.0 - 7.5 pH
RESPONSE TIME (t_{90})	< 120 sec.*
RESOLUTION	±0,02 at pH = 7

*stirred at + 37°C

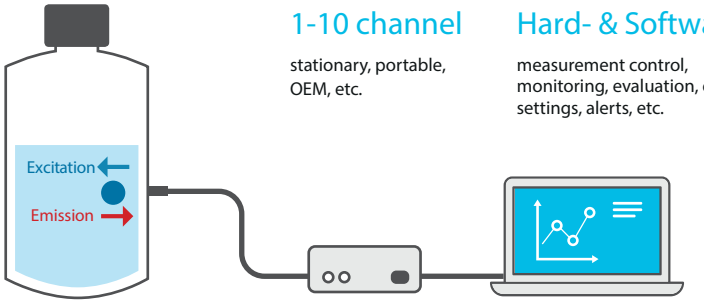
SET-UP

1-10 channel

stationary, portable, OEM, etc.

Hard- & Software

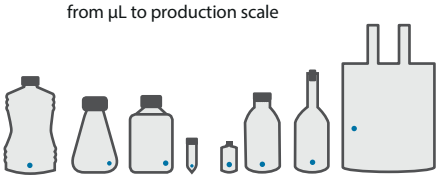
measurement control, monitoring, evaluation, expo settings, alerts, etc.



APPLICATION

Single-use & Reusable

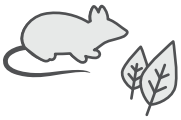
from µL to production scale



Indoor & Outdoor

Research & Industry

Biology & Environment



pH Sensor Spots

The sensor spots are available for normal (5.5 - 8.5 pH, HP5) and a wider pH range (4.0 - 7.5 pH, LG1). The sensors can be attached with silicone glue, and are also available in self-adhesive versions, where no extra glue is needed.

pH SensorPlug

The pH SensorPlugs enable online pH monitoring in millifluidic and microfluidic applications. With the appropriate chip and port design, the SensorPlugs can be integrated on your microfluidic device. An optical sensor is attached to an e.g. Mini-Luer based plug, which can easily be integrated in your chip. The plug is connected to a pH meter via a polymer optical fiber (1 mm diameter) and the sensor is read out non-invasively.

pH Nice Port

This port with integrated sensor is applied in flexible, bag-type bioreactors or containers like storage and mixing bags. The port is made of polyethylene and allows easy welding with the bags. A polymer optical fiber is attached to the port from the outside to read out the sensor.

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

Specifications

	Sensor Spots (SP-HP5)	Sensor Spots (SP-LG1)	pH Nice Port
Specifications*			
Measurement range	5.5 - 8.5 pH	4.0 - 7.5 pH	5.5 - 8.5 pH
Resolution	at pH = 7: ± 0.01 pH	at pH = 6.5: ± 0.01 pH	at pH = 7: ± 0.01 pH
Accuracy**	at pH = 7: ± 0.05 sensor spot calibration at pH = 7: ± 0.10 sensor batch calibration		
Drift	at pH = 7: < 0.005 pH per day (sampling interval of 1 min., may differ depending on system set-up)	at pH = 6: < 0.005 pH per day (sampling interval of 1 min., may differ depending on system set-up)	at pH = 7: < 0.005 pH per day (sampling interval of 1 min., may differ depending on system set-up)
Measurement temperature range	From +5 °C to + 50 °C		
Response time (t_{90})**	< 120 sec.		
Properties*			
Compatibility	Aqueous solutions, ethanol (max. 10 % v/v), methanol (max. 10 % v/v), pH 2 - 10		
Cross-sensitivity	Reduced to ionic strength (salinity); a high concentration of small fluorescent molecules in the visible range can interfere		
Cleaning procedure	pH spots are delivered either beta-irradiated or untreated; a second irradiation or ethylene oxide treatment is not recommended		-
Calibration	pH spots are pre-calibrated; recalibration is possible		Nice Ports are pre-calibrated; single-point calibration is recommended
Sterilization procedure***	Irradiation Ethylene oxide (EtO) Autoclaving (one time)		Irradiation Ethylene oxide (EtO)

* provided pH sensors are used without further handling and in physiological solutions

** calibration and following measurements in the same conditions / system; equilibrated sensor kept in well stirred solution at + 37 °C

***recalibration may be required

OEM Solutions for You

PreSens offers customized sensor technology solutions. Our engineers use up-to-date tequniques for mechanical design, sensor chemistry, measurement electronics and software development. 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

SENSORS

Single-use Flow-through Cells pH

Online Monitoring of pH in Perfusion Systems

Miniaturized chemical optical pH sensors integrated in single-use flow-through cells (FTC-SU) allow non-invasive online monitoring in perfusion systems. The sensors are fixed to color coded sticks, which can be attached to flow-through cells of different size and shape, according to your requirements. A polymer optical fiber connects the sensor inside the flow-through cell to the respective measurement device (e. g. pH-1 SMA LG1/HP5). The single-use cells are made of polycarbonate and can be delivered beta-irradiated or untreated.

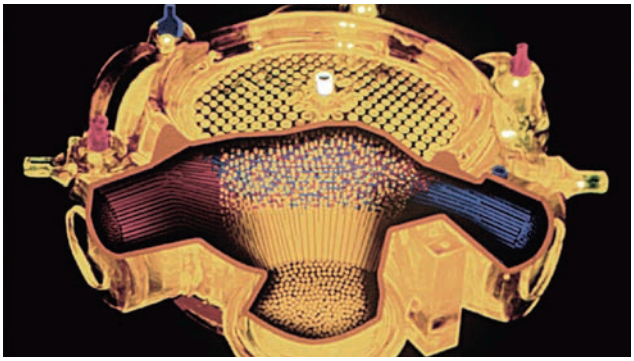
- Single-use flow-through cells
- Precise online monitoring of pH
- Different sizes and shapes for various flow rates
- Easy connection to external tubing
- Beta-irradiated or untreated
- CPC connectors available
- Pre-calibrated - ready to use

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

Examples for Applications

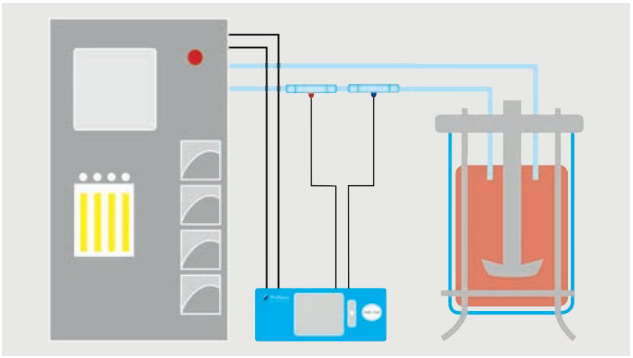
Online Measurement in Perfusion Systems

Beta-irradiated and pre-calibrated pH and DO flow-through sensors can be integrated into perfusion systems. This allows easy control of process parameters in perfusion reactors. Typically, Luer connectors are used, though different sizes for larger flow rates are available as well.



pH Monitoring in Liver Cell Bioreactor

An important aspect of efficient liver cell bioreactors is the automated regulation of physio-chemical culture parameters. A non-invasive pH regulation device for a perfusion bioreactor has been developed. The high performance of the system is based on one of our chemical optical flow-through cells for pH detection and its combination with precision mass-flow controllers for gas. The new controller allows long time stable and contamination-free online pH regulation in complex bioreactor systems – an important technical contribution for future clinical applications.



pH and pO_2 Control in a Bioreactor via FTCs in a Bypass

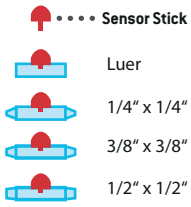
The flow-through cells with oxygen and pH sensors can also be installed in a bypass of a bioreactor. Connected to an oxygen and pH meter their signal can be used for regulation of oxygen and pH levels inside the bioreactor.

pH Fluxes at Sediment-Water Interface

Eastern boundary upwelling systems are characterized by high concentrations of dissolved inorganic carbon (DIC) and low pH in coastal surface waters. The pH FTCs were applied to study the impact of sedimentary organic carbon content on the pH in pore water and the overlaying bottom water on the Namibian shelf. Preliminary 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.

SPECS

Different sizes
for various flow rates



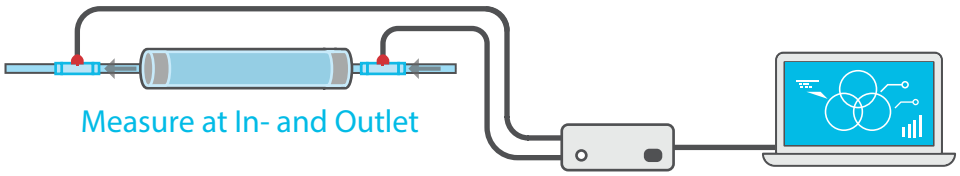
SET-UP

1-10 channel

stationary, OEM, etc.

Hard- & Software

measurement control and monitoring

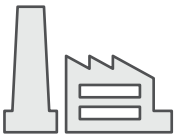


APPLICATION

Cell Culture
Perfusion Bioreactor
Environmental Research
Animal Physiology

Indoor & Outdoor

Research & Industry



Single-use pH Flow-through Cell FTC-SU

A pH sensor is attached to a color coded stick, which is delivered in a T-cell made of polycarbonate. A polymer optical fiber connects the sensor to a pH meter. This single-use FTC can be delivered either beta-irradiated or untreated.

Single-use pH Flow-through Cell 1/4" x 1/4", 3/8" x 3/8", 1/2" x 1/2"

The pH sensor stick is incorporated in a flow-through cell of 1/4" x 1/4" size via Luer connector. The cell is integrated in the tubing with hose barb. The FTC-SU can be delivered either beta-irradiated or untreated.

Sterile Integration

For pH and DO luer flow-through-cells we offer quick connect couplings to ensure sterile integration of our sensor products into your system. In case you need another solution, just contact our service team!

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

Specifications

	FTC-SU-HP5	FTC-SU-LG1
Specifications*		
Measurement range	pH 5.5 - 8.5	pH 4.0 - 7.5
Resolution	at pH = 7: ± 0.01 pH	at pH = 6.5: ± 0.01 pH
Accuracy**	at pH = 7: ± 0.05 sensor spot calibration at pH = 7: ± 0.10 sensor batch calibration	
Drift	at pH = 7: < 0.005 pH per day (sampling interval of 1 min., may differ depending on system set-up)	at pH = 6: < 0.005 pH per day (sampling interval of 1 min., may differ depending on system set-up)
Measurement temperature range	From + 5 °C to + 50 °C	
Response time (t_{90})**	< 120 sec.	
Properties*		
Compatibility	Aqueous solutions, ethanol (max. 10 % v/v), methanol (max. 10 % v/v), pH 2 - 10	
Cross-sensitivity	Reduced to ionic strength (salinity); a high concentration of small fluorescent molecules in the visible range can interfere	
Sterilization procedure***	Irradiation Ethylene oxide (EtO)	
Calibration	FTCs are pre-calibrated; single-point calibration is recommended	
T-Cell formats	1/4" x 1/4", 3/8" x 3/8", 1/2" x 1/2" (Qosina)	

*provided pH sensors are used without further handling and in physiological solution

** calibration and following measurements in the same conditions / system; equilibrated FTC with physiological solution and sufficient flow rate (min. 15 mL/min) at + 37 °C

***recalibration may be required

SENSORS

pH Microsensors

Measuring with High Spatial Resolution – Sensor Tip below 150 µm

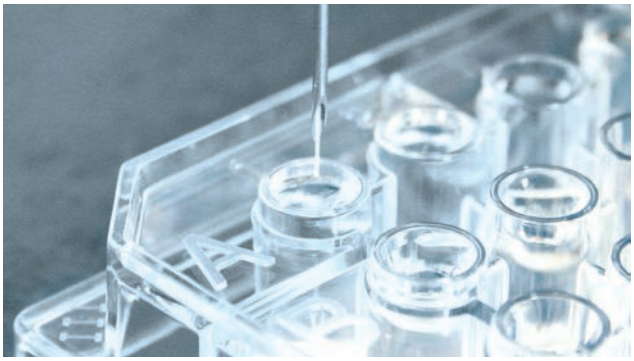
pH Microsensors are miniaturized pH sensors designed for measuring in small volumes and with high spatial resolution. The sensor tip is in the range of 150 µm. The sensors are based on a 140 µm silica fiber which enables integration into various small scale environments. These sensors do not require reference electrodes and there is no leakage of electrolytes, a clear advantage over common electrodes.

- Integration into plant and animal tissue
- Measuring in smallest volumes
- Profiling of pH gradients
- High spatial resolution
- No need for reference electrodes
- Optimized for cell culture media and physiological solutions
- Independent of electromagnetic fields

Examples for Applications

pH Measurement in Plants and Animals

pH Microsensors can be implanted even in small animals. Due to the small size of the probes only a minimal disturbance will occur and new insights in physiological aspects can be obtained.



pH Measurement in Small Volumes

Due to the small dimension of the probe, pH measurements can be done in very small volumes – even in microtiter plates of a higher format like 384 or 1,536. There is no need for reference electrodes – a real step forward. Of course, the measurement is independent of electromagnetic fields – this even allows measuring in NMR spectrometers.

Measurement in Tumor Microenvironments

Medical research on pH levels in tumor microenvironments is technically quite challenging. The Manual Micromanipulator together with a needle-type pH Microsensor offer a simple and effective way to do so. The micromanipulator ensures exact localization of the sensor tip. With its small size the pH Microsensor allows on-the-spot measurements.

pH Dynamics in Salt Marsh Tidal Ponds

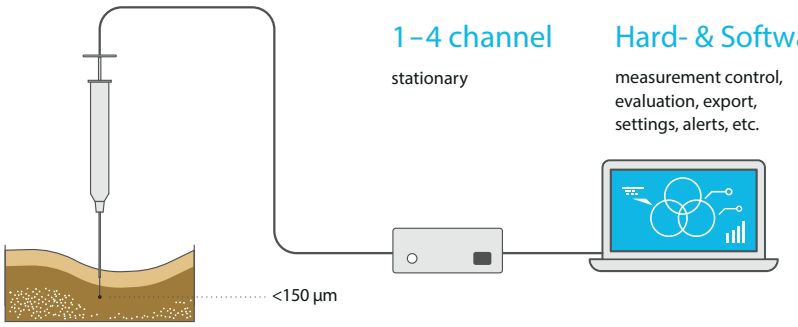
Salt marsh ponds are extreme environments characterized by high microbial activity and strong biogeochemical gradients at the sediment water interface. Using the Automated Micro-profiling System (Automated Micromanipulator AM & Profiling Microsensors PM) profiling of pH can be conducted on marsh pond sediment cores.

SPECS

MEASUREMENT RANGE	5.5 - 8.5 pH
RESPONSE TIME (t_{90})	30 sec.*
RESOLUTION	±0,02 at pH = 7
TIP SIZE	150 µm

*stirred at + 37°C

SET-UP

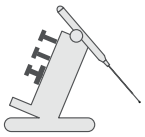


1–4 channel
stationary

Hard- & Software
measurement control, evaluation, export, settings, alerts, etc.

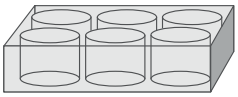
APPLICATION

Profiling

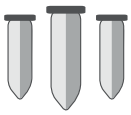


Plant & Animal Tissue

Cell & Microbial Culture



Small Volumes



Indoor & Outdoor
Research & Industry

Implantable pH Microsensor IMP-HP5

The IMP-HP5 is not mounted into any additional housing and therefore ideally suited for implementation in customized applications. The tiny probe has a tip size of 150 µm, while the outer diameter ranges from 150 µm to 900 µm. As the IMP-HP5 is free of metal (except for the connector), it can be used in the presence of high electromagnetic fields.

Needle-type pH Microsensor NTH-HP5

The NTH-HP5 is based on a 140 µm silica fiber which enables integration into manifold small scale environments. With its protective syringe needle housing it can easily penetrate tissue, septum rubber or packaging materials. Combined with the Manual Micromanipulator and its safe-insert function it can securely be located inside a semi-solid sample.

Profiling pH Microsensor PM-HP5

Profiling Microsensors (PM) are the most robust microsensor version PreSens offers – with a firmer fiber construction and a splash-proof metal housing. They are specifically designed for profiling applications and should be used whenever minimally invasive measurements need to be performed, e. g. in sediments, microbial mats or biofilms. They are compatible with all PreSens micromanipulators.

Customized Microsensors

pH Microsensors can be implemented in a broad variety of customized housings. “Catheters” as well as special cannulas or needles will turn the pH Microsensor into the ideal tool for your customized application.

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

Specifications

	pH Microsensors (PM-HP5 / NTH-HP5 / IMP-HP5)
Specifications*	
Measurement range	5.5 - 8.5 pH
Resolution	at pH = 7: ± 0.02 pH
Accuracy**	at pH = 7: ± 0.1 pH with sensor calibration
Drift	at pH = 7: < 0.05 pH per day (sampling interval of 1 min., may differ depending on system set-up)
Measurement temperature range	From + 5 °C to + 50 °C
Response time (t_{90})**	at 25 ° C: 30 sec.
Properties*	
Compatibility	Aqueous solutions, ethanol (max. 10 % v/v), methanol (max. 10 % v/v), pH 2 - 10
No cross-sensitivity	Electrical fields, proteins
Cross-sensitivity	Reduced to ionic strength (salinity); a high concentration of small fluorescent molecules in the visible range can interfere
Sterilization procedure	Ethylene oxide (EtO), recalibration is recommended
Cleaning procedure	Water, Acrylan®, pepsin solution
Calibration	pH sensors are pre-calibrated; recalibration is possible

*provided pH sensors are used without further handling and in physiological solutions

** calibration and following measurements in the same conditions / system; equilibrated sensor kept in well stirred solution at + 37 °C

PROFILING

Profiling Solutions

Vibration-free, High-resolution Control for Your Microsensor

The Automated and Manual Micromanipulators are specifically designed for profiling applications with PreSens microsensors. The systems allow moving the microsensor vibration-free in 3 axes with µm reading accuracy and enable exact localization of the sensor in the sample. Automated profiling can be performed along one dimension in µm resolution. Whenever insertion of a microsensor in semi-solid or hard substrates is required, the micromanipulators are the safest way to do it achieving highest accuracy, spatial resolution and stability.

- Vibration-free micromanipulation in 3D
- Fine drive with µm reading accuracy
- Safe-insert function
- Fully automated or manual system
- No electrical interferences due to optical measurement
- Adaptable to any sample

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

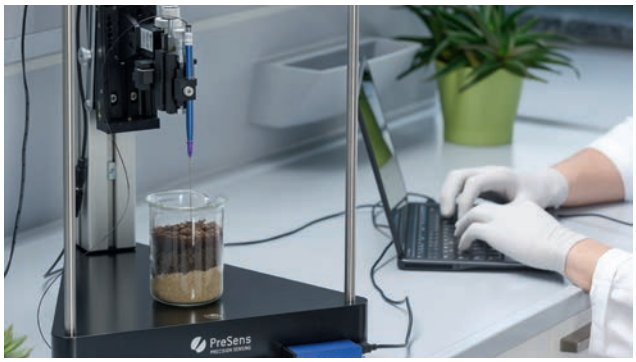
Examples for Applications

Profiling in Biological & Environmental Research

The different types of pH microsensors allow e. g. measurements in smallest sample volumes or inside tissue. The micromanipulators should be applied whenever it is necessary to insert the microsensor safely into semi-solid samples and when exact localization and stabilization of the microsensor tip within the sample is required. Using the safe-insert function the microsensor tip can be securely inserted and localized at the exact position where you want to conduct your measurements.

Microsensor Measurements in Medical & Life Science Research

PreSens microsensors are ideal tools for medical and life science research, as they allow for precise on the spot measurement and profiling inside tissue constructs. The Manual Micromanipulator is the indispensable equipment in these applications for exact localization of the microsensor inside the sample and profiling in step sizes down to 10 µm. PreSens needle-type microsensors are already used in several tissue engineering applications.



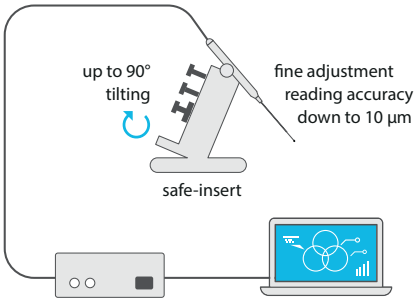
Profiling of Sediments & Biofilms

Together with the specially designed PreSens Profiling Microsensors (PM) the Automated Micromanipulator is the ideal tool for pH measurements in sediment and biofilm applications. With a free choice of step zones and wait times different layers inside the sample can be monitored and assessed in step sizes down to 10 µm. The software visualizes the online measurements, so you can follow gradients and identify boundaries immediately while the sensor is automatically moved inside the sample.

Microprofiling for Field Use

Microprofiling made easy. Use our microprofiling solutions for your next field excursion. With our battery powered transmitters you can work outdoors and indoors according to your needs with just one set-up. Our microprofiling equipment is the ideal tool to confirm your *in vitro* findings *in situ*.

MICROMANIPULATOR SET-UP



single-channel
stationary

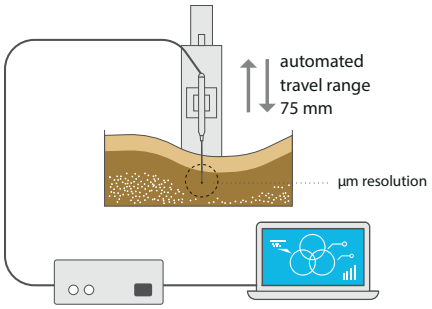
Hard- & Software
measurement control, evaluation, export, settings, alerts, etc.

SPECS

MEASUREMENT RANGE	5.5 - 8.5 pH
RESPONSE TIME (t_{90})	30 sec.*
RESOLUTION	±0,02 at pH=7

*stirred at 37°C

AUTOMATED MICROMANIPULATOR SET-UP

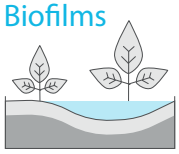


single-channel
stationary

Profiling Studio Software

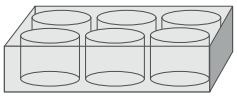
APPLICATION

Sediments & Biofilms



Biology & Environment

Medical Research & Life Science



Indoor & Outdoor
Research & Industry

Manual Micromanipulator MM

The Manual Micromanipulator is specifically designed for PreSens needle-type microsensors (NTH). The system allows moving the microsensor vibration-free in 3 axes with µm reading accuracy. With its solid base plate for a stable set-up the micromanipulator can be tilted safely up to 90°. The safe-insert function enables secure insertion of the microsensor retracted in its steel needle into your area of interest. The sensor tip can then be extended safely. Whenever insertion of a microsensor in semi-solid or hard substrates is required this is the safest way to do it, achieving highest accuracy and spatial resolution.

Automated Micromanipulator AM

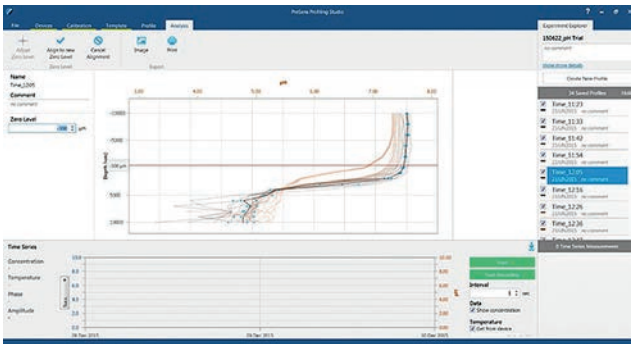
The Automated Micromanipulator AM is specifically designed for microprofiling applications with the PreSens Profiling Micro-sensor (PM), and can also be operated with needle-type housed (NTH) and implantable (IMP) microsensors. The system allows moving the microsensor vibration-free with µm reading accuracy and enables exact localization of the sensor in the sample. Automated microprofiling can be performed along one dimension in µm resolution. The associated database-supported software PreSens Profiling Studio allows complete control of the AM and the respective oxygen, pH or CO_2 meter via USB. Different step zones, variable travel velocities and waiting times can be defined. The AM is compatible with all PreSens oxygen, pH and CO_2 transmitters.

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

Specifications

	Manual Micromanipulator (MM)	Automated Micromanipulator (AM)
Specifications		
Compatibility	Profiling (PM), needle-type housed (NTH) and implantable (IMP) pH microsensors	Profiling (PM), needle-type housed (NTH) and implantable (IMP) pH microsensors
Dimensions	230 mm x 130 mm x 200 mm	275 mm x 95 mm x 220 mm
Weight	Weight w/o base plate: 1.1 kg Weight with base plate: 3.03 kg	Weight of AM: 2.07 kg Weight of Heavy Stand: 14 kg
Travel range automated	-	x-axis: 75 mm
Travel range manual	x-axis: 37 mm, fine drive 10 mm y-axis: 20 mm z-axis: 25 mm	x-axis: 37 mm, fine drive 10 mm y-axis: 20 mm z-axis: 25 mm
Reading accuracy	Coarse adjustment: 0.1 mm Fine adjustment: 0.01 mm	-
Coarse positioning	x-axis: 70 mm	-
Rotatability	360°	-
Material	Aluminium & steel	Aluminium & steel
Resolution	-	1 µm
Repeatability	-	< 2.5 µm
Mounting adapter	M6 screw, 13 mm length	M6 screw, 13 mm length
Power supply	-	100 - 240 VAC, 50/60 Hz. Use supplied power adapter (15 VDC, 2.1 mm center positive plug) only.
Digital interface	-	USB interface (cable included)
Control software	-	PreSens Profiling Studio (compatible with Windows 7, 8, 10 at 32 or 64 bit)

PreSens Profiling Studio Software



This software enables control of the Automated Micromanipulator and connected oxygen, pH or CO_2 meter. PreSens Profiling Studio allows complete control with several step zones, variable travel velocity and waiting times of the AM. It is database supported and offers multiple features from clear data organization and export, annotations, easy creation of profiling templates, to different analysis functions.

SYSTEMS

SFR Shake Flask Reader & SFR vario

Online Monitoring of O_2, pH, Biomass & OUR – Easy Integration in any Shaking Incubator

The SFR Shake Flask Reader monitors oxygen, the oxygen uptake rate (OUR) and pH in up to 9 Erlenmeyer flasks, while the SFR vario can measure in one shake flask and additionally monitors biomass development online. Adapters for e. g. cultivation tubes or T-flasks are available.

The battery-powered readers fit in standard shakers and transfer measurement data wirelessly via Bluetooth.

Corresponding vessels contain oxygen and pH sensor spots which are read out non-invasively through the transparent bottom of the vessels. Disposable plastic flasks are pre-calibrated and irradiated. Glass flasks can be equipped with autoclavable oxygen sensors and one-time autoclavable, removable pH sensors.

- Simultaneous real-time measurement of O_2, OUR, pH, and biomass
- Wireless data transfer enables easy integration
- Compatible with standard shakers
- Pre-calibrated cultivation vessels are ready-to-use
- Glass & plastic flasks in different sizes available
- Contactless measurement through the flask bottom
- For microbial cultivations & cell cultures
- Used in e. g. seed train & bioprocess development

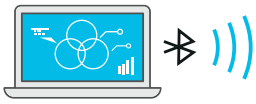
Is your application missing? Contact us and we find your customized solution!

SPECS

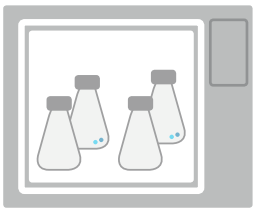
MEASUREMENT RANGE O_2	0 – 100 % O_2
MEASUREMENT RANGE pH HP5	5.5 – 8.0 pH
MEASUREMENT RANGE pH LG1	4 – 7.5 pH*
MEASUREMENT RANGE BIOMASS	OD 1 – 80

* only with SFR vario LG1

SET-UP



software compatible with Win 10
complying with
FDA 21 CFR part 11 (SFR)



easy integration in shakers, rechargeable batteries, low weight

SFR vario for 1 vessel

configurate modules for:

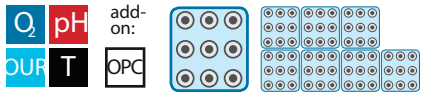
parallel control of up to 4 readers

SFR Shake Flask Reader for 9 vessels

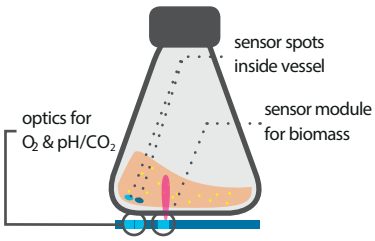
measures:

add-on:

parallel control of up to 7 readers (63 flasks)

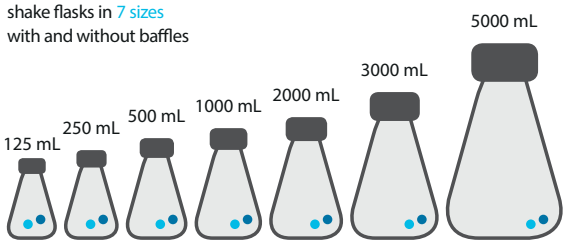


Principle



Sensors

shake flasks in 7 sizes
with and without baffles



adaptable for various disposable and reusable flasks

** CO2 sensor integration only onsite by user

SFR vario

The SFR vario monitors oxygen, OUR, pH, biomass and alternatively CO_2 simultaneously. It also measures temperature and rpm online to have all variables in one data sheet. The device optics can read out pre-calibrated oxygen and pH sensor spots and also comprise a dedicated optical set-up for biomass monitoring. Data transfer is wireless, the reader is powered with rechargeable batteries.

SFR Shake Flask Reader

The SFR Shake Flask Reader offers oxygen, pH, and OUR monitoring in up to 9 shake flasks, cultivation tubes, or T-flasks simultaneously. In addition, temperature is logged. It is powered with rechargeable batteries and data transfer is hosted by a wireless Bluetooth connection.

Plastic & Glass Flasks with Integrated Sensors SFS

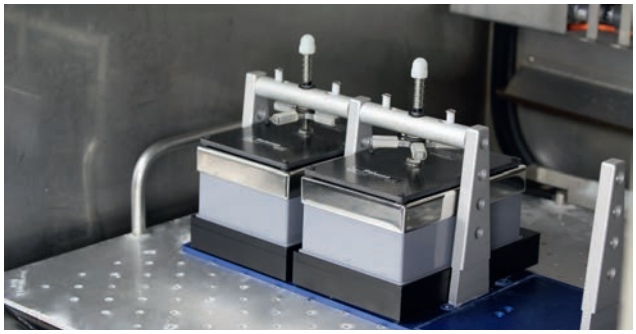
Shake flasks with integrated oxygen, pH and optionally with CO_2 and LG1 (measuring from pH 4 to pH 7.5) sensors are available from 125 - 5000 mL with and without baffles. The plastic flasks come irradiated. All sensors are pre-calibrated. Special clamps align the sensor flasks in the right orientation on the readers.

SYSTEMS

SDR SensorDish® Reader

Online Monitoring of O_2 & pH in Multiwell Plates and glass vials

The SDR SensorDish® Reader is a small 24-channel reader for non-invasive detection of oxygen and pH in multidishes (SensorDishes®). These multi-dishes contain a sensor spot at the bottom of each well and are read out non-invasively through the transparent bottom. SensorDishes® for oxygen (OxoDish®) and pH (HydroDish®) are available in 24- and 6-well format. Deep well plates with integrated oxygen (OxoDish®-DW) or pH sensors (HydroDish®-DW) allow measurements in shaken cultures. Read-out of oxygen sensors integrated in glass vessels for respiration monitoring and photosynthesis is also possible. The SensorDish® Reader can be used in incubators and on shakers and is therefore the ideal tool for cell, bacterial and yeast cultivation.



- Measurement under real conditions in incubator atmosphere
- Parallel online monitoring in disposable 24- or 6-well plates
- Deep well plates (for monitoring in shaken cultures) & low well plates available
- Pre-calibrated & ready-to-use
- For microbial & cell culture
- Non-invasive & non-destructive measurement
- Monitoring of respiration and photosynthesis in small glass vials

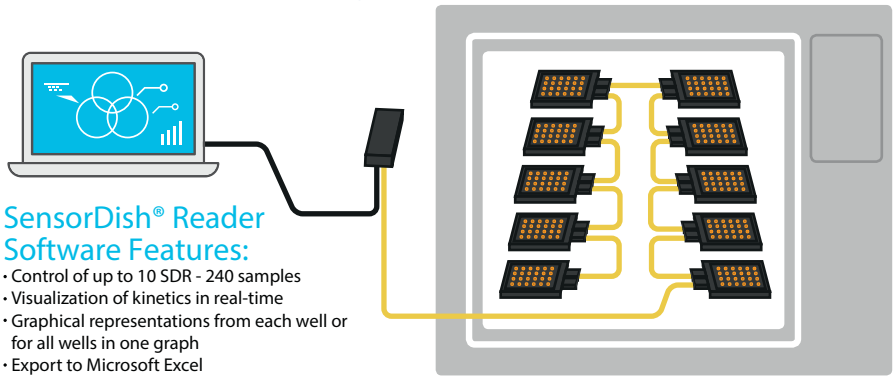
Is your application missing? Contact us and we find your customized solution!

SPECS

NORMAL RANGE O_2	0 – 50% O_2
RESOLUTION O_2	±0.4% O_2
NORMAL RANGE pH	6.0 - 8.5
RESOLUTION pH	± 0.05 pH at pH = 7

SET-UP

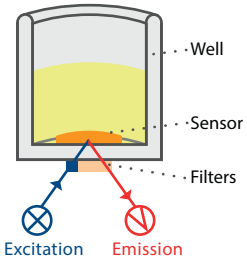
Multi-channel set-up (240 samples)



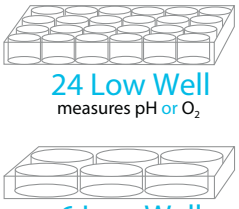
SensorDish® Reader Software Features:

- Control of up to 10 SDR - 240 samples
- Visualization of kinetics in real-time
- Graphical representations from each well or for all wells in one graph
- Export to Microsoft Excel

SDR Principle



Low Well

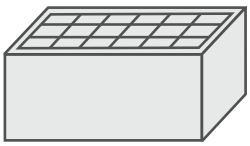


24 Low Well
measures pH or O_2

6 Low Well
measures pH and O_2

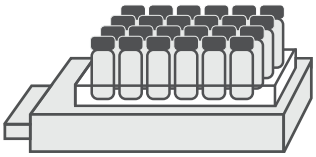
Deep Well

measures pH or O_2



Respirometry

measures O_2



SDR SensorDish® Reader Basic Set

The SDR Basic Set contains the SDR reader and all necessary accessories. It can be combined with OxoDishes® as well as HydroDishes® in low and deep well format. The SDR is compatible with 6- and 24-well plates. Furthermore, it can be used with glass vials with integrated oxygen sensors (SensorVials) of different sizes.

HydroDish® (low and deep well)

These SensorDishes® are coated with pH sensors type HP8 and can be bought as 24-well dishes. Deep well dishes in 24-well format are available for shaken cultures as well. HydroDishes® are irradiated and pre-calibrated.

IMAGING

VisiSens TD – 2D Mapping Solution for O_2, pH or CO_2

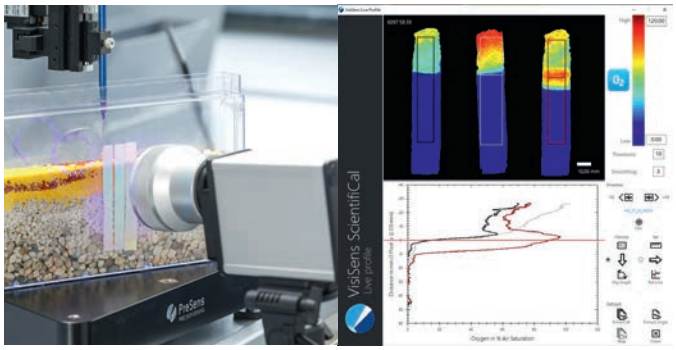
2D Contactless Read-out System for High Resolution, Large Area, Multi-parameter or Multi-spot Sensing of O_2, pH and CO_2

VisiSens™ TD enables simultaneous 2D read-out of optical O_2, pH and CO_2 sensor foils within one set-up. For measurement, the sample surface is covered with the sensor foil, which translates the analyte content into a light signal. The sensor response is recorded pixel by pixel with a digital camera. With VisiSens™ TD spatial and temporal analyte changes can be monitored. VisiSens™ TD gives an overview over your sample area and allows you to freely choose the region of interest for investigation of spatial and temporal gradients.

- Three analytes – one system
- Read-out of oxygen, pH and CO_2 sensor foils
- Multiple sensor types combinable in one field of view
- Variable sensor and measurement geometry
- No analyte consumption or electric potential
- Read-out through transparent vessel walls
- Customized 2D sensor systems
- 12-bit detector
- Adaptable field of view, microscopic, 6 x 4 cm^2 or up to 30 x 25 cm^2
- Single- and multi-analyte operation modes
- Time-lapse slide shows of recordings

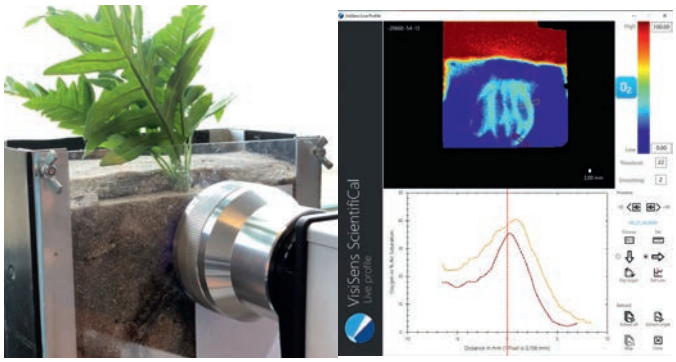
Is your application missing? Contact us and we find your customized solution!

Examples for Applications



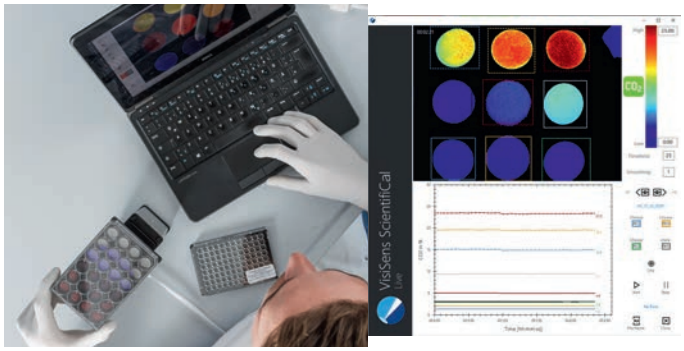
O_2, pH and CO_2 Mapping in Sediments

O_2, pH, and CO_2 are key factors for microbial activity and various geochemical processes in sediments. They highly vary locally, e.g. at interfaces or different depths. Spatial and temporal analyte dynamics over long time periods can be visualized. Various regions can be compared within one measurement. VisiSens™ enables non-invasive 2D-mapping over cross-sections or on sample surfaces.



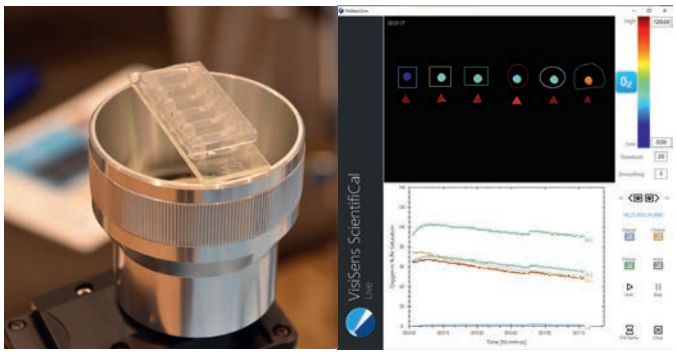
Spatial and Temporal Analyte Changes in Plants and Soil

O_2, pH and CO_2 play a crucial role in plant and soil processes, e. g. in photosynthesis, respiration, in rhizospheres or in microbiological processes. Metabolic processes can be monitored. This planar optical sensor technique allows non-invasive read-out through glass walls of rhizotrons. Studying metabolic activity of roots and determining the cultivation optimum is important for sustainable agriculture, e. g. for adjustment of water and fertilizer supply.



O_2 or pH in Cell Culture and Engineered Tissue

Cellular metabolism critically depends on local O_2 supply and pH values. Especially in 2D and 3D cell culture or engineered tissue, cells located in diffusion limited regions (e. g. in scaffolds or spheroids) can be subject to low oxygen levels and pH changes. Non-invasive, continuous 2D-mapping can be performed directly in the incubator under growth conditions. Furthermore, 2D analyte distributions in living samples can be visualized.

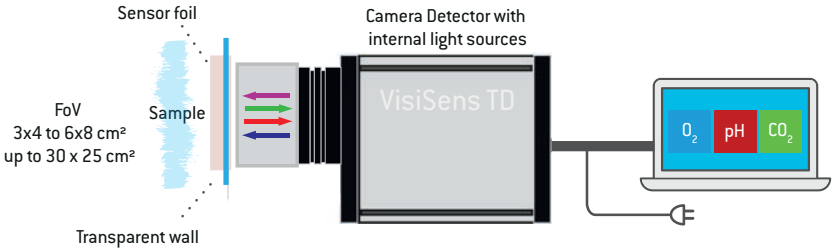


Non-invasive 2D Analyte Mapping in Microfluidics

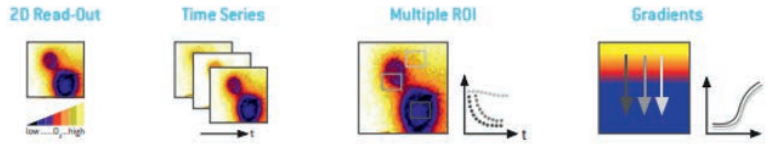
VisiSens™ enables 2D visualization of important culture parameters inside microfluidic chips. You can continuously monitor in 2D, with high resolution at specific positions or over the whole chip surface in a non-contact read-out mode. Detect metabolic hotspots, record time-series, and monitor hypoxia, cellular growth, or O_2 supply inside the chip. You can gain new insights on metabolic activity and natural or artificially produced gradients.

SPECS

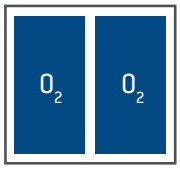
O_2	0 -100% a.s. ($0 - 20.9\ \% O_2$)	
pH	2.5 - 4.5	5.5 - 7.5
pCO_2	0 - 1%	1 - 25 %



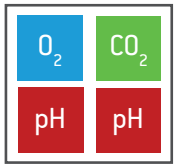
Exemplary Results



Multi-sensor Set-up

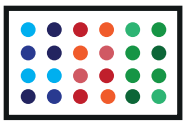


Multi-analyte Set-up



Operational modes

Modular accessories



VisiSens™ TD Basic System

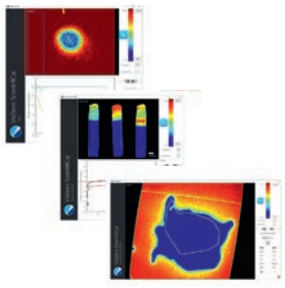
The basic imaging device consists of a 12-bit detector with integrated light sources and mode operation units. It is prepared for reading out O_2, pH and CO_2 sensor foils, even simultaneously in one experiment. The modular concept allows to choose the modalities that are required for the specific application.

Sensor Foils

The sensor foil can be attached directly on the sample or behind a transparent vessel wall. A sensor film translates the analyte content into a light signal. Foils are available for O_2, pH or CO_2. They can be cut in any desired size or shape.

VisiSens™ ScientifiCal Software

VisiSens TD includes a modular control and evaluation software. One can choose between different operation modes from single- to multi-analyte modes. Images can be recorded as snapshots or automatic time series. Furthermore, the software offers different evaluation functions for image analyses.



VisiSens™ Software Plugins

These software extensions for the VisiSens ScientifiCal software and the VisiSens TD imaging system will assist you in processing your O_2, pH and / or CO_2 images and evaluating the data. The plugins are small programs that enable easy access to data from previously recorded or live measurement images.

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

Specifications

	VisiSens™ TD*	
	SF-LV1R	SF-HP5R
Specifications		
Measurement range	pH 2.5 - 4.5	pH 5.5 - 7.5
Response time (t_{90})**	< 30 sec.	< 30 sec.
Precision (temporal)****	± 0.01 pH at pH 4	± 0.01 pH at pH 7
Precision (spatial)*****	± 0.1 pH at pH 4	± 0.1 pH at pH 7
Properties		
Compatibility	Aqueous solutions, pH 2 - 9, ethanol (max. 10 % v/v)	
General sensor temperature working range	from + 5 °C to + 45 °C	
Device		
Camera chip	Type 1/3 Global shutter	
Image Resolution	1.25 megapixel (1292 x 964 pixels)	
Field of View	Standard VisiSens TD Basic System configuration: adaptable about 3 x 4 cm² to 8 x 6 cm²	
Number of LEDs	7 + 8 (internal ring light)	
Dimensions (L x W x H)	Body: 160 x 108 x 58 mm³ Basic System light source tube: 90 - 140 mm length 80 mm diameter	
Weight	1150 g	
Material	Aluminum housing	
Digital Interface	Ethernet cable (PoE)	

* Prototype component. Please contact our service team!

** depends on the chosen imaging modalities

*** Typical data of LOD of a defined ROI (> 6,000 pixles) over time in dark lab conditions at 20 °C, FoV 8 cm x 6 cm

**** Typical data of accuracy in a defined ROI (> 6,000 pixles) over time in dark lab conditions at 20 °C, FoV 8 cm x 6 cm; strongly depends on used sensor foil batch

***** Typical data of spatial standard deviation in defined ROI (> 6,000 pixels) in dark lab conditions at 20 °C, FoV 8 cm x 6 cm

ACCES-
SORIES

Accessories for Optical pH Sensors & Meters

Extensions and Add-ons for pH Measurement

We offer numerous accessories for our measurement devices. They extend the application possibilities of PreSens measurement systems. Optical sensor adapters allow our sensors to be used in a wide variety of containers.

- Optical adapters for connecting sensors to the meters
- Polymer optical fibers in different variations and lengths
- Tools for easy sensor handling

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

Specifications

	POF	Coaster for Shake Flasks (CFG)	Centrifuge Tube Adapter (CTA)
Specifications			
Compatibility		All devices with SMA connectors	
Dimensions	Optical diameter is 2 mm; outer diameter including the black cladding is approx. 2.8 mm	Approx. 93 mm x 41 mm x 16 mm	Approx. 65 mm x 40 mm x 65 mm
Length of fiber	Available lengths for the POF are 1.0, 2.5 and 5.0 m (for lengths of more than 5 m, please contact our service team)	2.5 m	2.5 m
Connector type	SMA connectors on one or both sides available for use with SOA and ARC	SMA socket	SMA socket
Details	Temperature stability: The POF is resistant to temperatures up to 70 °C	Compatible with shake / culture flasks up to 1 L	Compatible with culture tubes of 50 mL volume

	Adapter for Round Containers (ARC)	Stick-On Adapter (SOA)
Specifications		
Compatibility		All devices with SMA connectors
Dimensions (D x W x H)	Velcro© strip 1000 mm x 22 mm x 4 mm	20 mm x 20 mm x 7 mm 12 mm total height w/ SMA socket
Connector type		SMA socket

	Pt100 Temperature Sensor
Specifications	
Outer diameter	Luer T-cell (delivered); inner diameter 5 mm, cell volume 0,3 mL
Integration length	15 mm
Cable length	2 m
Cable coating	Silicone

Polymer Optical Fiber POF

For all our meters with SMA sockets, a polymer optical fiber is needed as a light guide between the device and the sensor. We offer different standard lengths, e. g. 2.5 m, and fibers with SMA connectors on one or both sides.

Adapters ARC & SOA

The adapter for round containers ARC and stick-on adapter SOA are used to attach the polymer optical fiber (POF) to a container opposite the sensor spot. The ARC is suitable for round containers, the SOA for planar transparent surfaces.

FTC-SU-Pt100

Enables continuous measurement of temperature in perfusion systems. Irradiated, ready to use versions available. Ideal in combination with FTC-SU for DO, pH and CO_2.

Coaster CFG

Allows convenient read-out of sensor spots integrated at the container bottom.

Integration Set Sensor Spots IS-SP

The integration set is a suction pump that comes with fitting tips for easy handling and integration of PreSens self-adhesive sensor spots, but can also be applied to integrate our other sensor spots using liquid glue.

Product Matrix

		Meters				Imaging
		pH-1 SMA		EOM-pH	pH-1 micro	VisiSens™ TD
		pH-1 SMA HP5	pH-1 SMA LG1	EOM-pH-PHB50	pH-1 micro	VisiSens TD
Sensors	**Non-Invasive pH Sensors**					
	pH Niceport	x		x		
	SP-HP5	x		x		
	SP-HP5-SA	x		x		
	SP-LG1-SA		x			
	pH SensorPlug	x		x		
	pH Flow-Through Cells					
	FTC-SU-HP5-S / -US	x		x		
	FTC-SU-LG1-S / -US		x			
	SST-HP5-US	x		x		
	pH Microsensors					
	PM-HP5				x	
	NTH-HP5				x	
	IMP-HP5				x	
	Disposables with integrated pH Sensors					
	SFS-HP5-PSt3 (Shake Flask)	x		x		
	SPS-HP5-PSt3 (Spinner Flask)	x		x		
	Sensor Foils for Imaging					
	SF-HP5R					x
	SF-LV1R					x

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

Product Range

Meters

pH

pH-1 SMA LG1

Fiber optic pH meter for use with pH sensor spots, dipping probes and flow-through cells of type LG1

pH-1 SMA HP5

Fiber optic pH meter for use withnon-in-vasive sensors, dipping probes and flow-through cells of type HP5 & HP8

pH-1 micro

Micro fiber optic pH meter for use with pH Microsensors

EOM-pH-PHB50

The EOM-pH-PHB50 is a precise, single channel module for non-invasive pH measurement.

Systems

pH

SFR Shake Flask Reader

Oxygen and pH monitoring in shake flasks, T-flasks, and culture tubes

SFR vario

Online oxygen, pH, biomass, OUR and optional CO_2 monitoring in shake flasks, T-flasks, and culture tubes

SDR SensorDish® Reader Basic Set

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

Sensors

pH

pH Sensor Spots SP-HP5

The most versatile version of non-invasive pH sensors

pH Nice Port

Port with pH sensor for customized application in cultivation bags

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

Online monitoring in perfusion systems; single-use FTCs for various flow rates. T-Cells of 1/4“ x 1/4”, 3/8” x 3/8”, 1/2” x 1/2” size with integrated pH Sensor Stick

Implantable pH Microsensor IMP-HP5

Bare fiber microsensor without additional housing

Spinner Flask with Integrated Sensor SPS-HP5-PSt3

Spinner flask with integrated pH & O_2 sensors for contactless culture monitoring

HydroDish® (low well) HD24

Multidish with integrated pH sensors available in 24-well format, irradiated and pre-calibrated

Self-adhesive pH Sensors SP-HP5-SA & SP-LG1-SA

Easy sensor integration for contactless pH monitoring

pH SensorPlug

SensorPlugs enable online pH monitoring in milli- and microfluidic applications and are attached to an e.g. Mini-Luer based plug

Needle-type pH Microsensor NTH-HP5

This pH Microsensor is protected by its robust housing

Profiling pH Microsensor PM-HP5

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

Sensor Flasks SFS-HP5-PSt3

Plastic or glass flasks with integrated pH and O_2 sensors, available with or without baffles in sizes from 125 mL up to 5 L

Deep Well HydroDishes® HD24-DW

For shaken applications, available with pH sensors in 24-well format

Profiling Solutions

pH

Manual Micromanipulator MM

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

Automated Micromanipulator AM

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

Safe-Insert

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

Heavy Stand

The Heavy Stand ensures save vertical mounting and operation of the Micro-manipulators.

Transport Case

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

Imaging Solutions

pH

VisiSens™ TD

Modular imaging detector unit that can be equipped with various imaging modalities for read-out of O_2, pH or CO_2 sensor foils

pH Sensor Foils SF-HP5R & SF-LV1R

Sensor for pH imaging in a range of pH 5.5 – 7.5 (SF-HP5R) and pH 2.5 - 4.5 (SF-LV1R)

Adapter Tubes

Tubes in different sizes to adjust the field of view

Accessories

pH

Polymer Optical Fiber POF

They serve 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.

Integration Set for Sensor Spots IS-SP

Vacuum tweezers for easy integration of self-adhesive sensor spots

Coaster CFG

Allows convenient read-out of sensor spots integrated at the container bottom

Sterile Integration

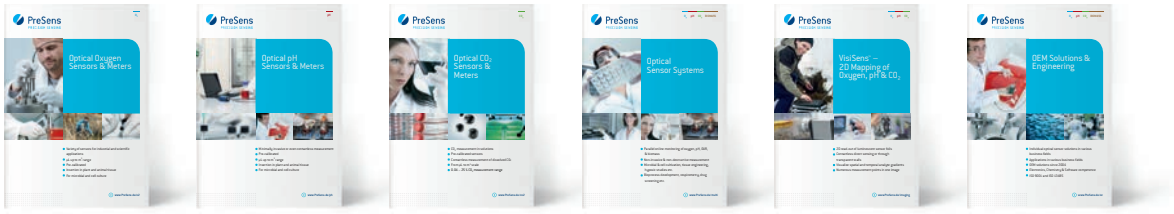
Quick connect couplings to ensure sterile integration of our sensor products into your system

FTC-SU-Pt100

For continuous measurement of temperature in perfusion systems

Discover the complete PreSens portfolio

Products



Optical Oxygen Sensors & Meters

Optical pH Sensors & Meters

Optical CO_2 Sensors & Meters

Optical Sensor Systems

VisiSens™ Imaging Systems

OEM Solutions & Engineering

Industries

Biology & Environmental

Industry & Technical

Biotech & Pharma

Medical & Life Sciences

Food & Beverage

Bring to light what's inside.

PreSens comes from PRECISION SENSING and offers:

- precise and simple measurement of O_2, pH, CO_2 and biomass
- systems for Pharma, Biotech, Food & Beverage, Biological & Environmental Research, Technical or Industrial Applications and Medical Devices
- sensors thinner than a hair, non-invasive and online
- optimum advice and support
- more than 1,000 items in stock
- prompt delivery worldwide

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