

# Non-Invasive pH Sensors

# pH



Pre-calibrated, ready-to-use & real conditions:  
Look into any transparent vessel

- Variety of disposables
- Bags & single-use bioreactors
- Microliter to production scale

# Non-Invasive pH Sensors



The non-invasive pH sensors are optimized for physiological solutions and culture media. These sensor spots are mounted in transparent vessels made of plastics or glass for example. Plastic vessels with integrated pH sensors are ready-to-use as they are beta-irradiated and pre-calibrated. The pH is measured in a non-invasive and non-destructive manner from outside.

## Features

- Online monitoring without sampling
- Non-invasive & non-destructive measurement
- Pre-calibrated
- Integrated in beta-irradiated disposables
- Applicable for micro-liter scale to production scale
- Optimized for culture media and physiological solutions



## Sensor Spots

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

## Examples are

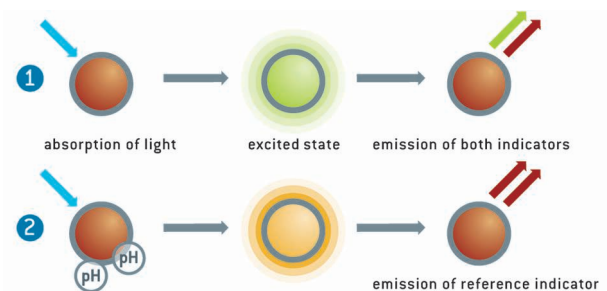
- Shake flasks & spinners
- Tubes & petri dishes
- Cultivation bags

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



## Flow-Through Cell

The flow-through pH minisensor (FTC) is a miniaturized fiber chemical optical sensor integrated in a flow-through cell. It is connected to the transmitter by an optical fiber. The volume of liquid inside the FTC is about 250 microliters. The standard flow cell can be easily connected via Luer-Lock adapters to external tubing. The FTC is beta-irradiated and pre-calibrated.



## Measurement Principle

### The Patented Dual Lifetime Referenced (DLR) Method

The patented DLR method enables internally referenced measurements. A combination of different fluorescent dyes detects intensity changes in the time domain. It is essential for the pre-calibrated measurements and the easy parallelisation of measurement through the identical calibration of large numbers of sensor spots.

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## Examples for Applications

### Pharma Industry: pH Monitoring in Bags

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



### 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 or smaller flow rates are available.



### Bioprocess Development: pH Monitoring in Shake Flasks

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



### 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. Integration into a variety of polymeric surfaces is possible. Immobilisation on ports which are integrated into the reactors at the customer's facilities is a second application.

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

Non-Invasive pH Sensors	
<b>Specifications*</b>	
Measuring range	5.5 - 8.5 pH
Response time ( $t_{90}$ )**	< 120 sec.
Resolution at pH = 7	$\pm 0.01$ pH
Accuracy at pH = 7	$\pm 0.05$ sensor spot calibration $\pm 0.10$ sensor batch calibration
Drift at pH = 7	< 0.005 pH per day (sampling interval of 1 min.)
Temperature range	from 5 °C to 50 °C
<b>Properties*</b>	
Compatibility	Aqueous solutions, ethanol, 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
Storage stability	18 months provided the sensor is stored in the dark
Calibration	pH spots are pre-calibrated; re-calibration is possible
Cleaning	pH spots are delivered either beta-irradiated or untreated; a second irradiation or ethylene oxide treatment is not recommended

\* provided pH spots are used without further handling in physiological solutions

\*\* equilibrated sensor kept in well stirred solution at 37 °C

## Transmitters & Accessories



### pH-1 mini

Fiber optic pH transmitter for use with non-invasive pH sensors.



### Coaster CFG

The coaster CFG is used for shake flasks.



### pH-4 mini

4-channel fiber optic pH transmitter for use with non-invasive pH sensors.



### SOA Adapter

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



### pH-10 mini

10-channel fiber optic pH transmitter for use with non-invasive pH sensors.



### ARC Adapter

The adapter for round containers 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:

PreSens Precision Sensing GmbH  
Josef-Engert-Str. 11  
93053 Regensburg, Germany

Phone +49 941 94272100  
Fax +49 941 94272111  
info@PreSens.de

 [www.PreSens.de](http://www.PreSens.de)