PreSens
PRECISION SENSING

# $O_2$, pH and $CO_2$

## Single-use Sensors for Perfusion Bioreactors & Scientific R & D

Dear Max Mustermann

Intensify the manufacturing process with reliable quality monitoring during the production of monoclonal antibodies (mAb) or cellular therapy products. With its oxygen, pH and CO2 sensor sticks (SSTs) PreSens covers important parameters within the DoE. Benefits of the SSTs are very short system stabilization periods of only approx. 30 minutes, there is no need for a validation of sensor integration, a cost-cutting storage as it is no longer necessary to keep bioreactors with integrated sensors in stock and much greater flexibility, since disposables are no longer dependent on the 18 months shelf-life of the sensors. Find technical details and more product information on the different types of sensor sticks for integration in your own perfusion system below.

You would rather like to work with ready-to-use single-use flow-through cells ? All types available including technical specifications are listed below.  And we also invite you to read our exemplary application notes with flow-through cells.

You happen to have varying technical demands on non-invasive sensor sticks or flow-through cells? Get in touch with with our experts at PreSens who will assist finding a customized solution.

We are looking forward to hearing from you!

Your PreSens Team

## Single-use Optical Sensor Sticks for Luer Connectors - O2, pH & CO2 Monitoring in Perfusion Systems

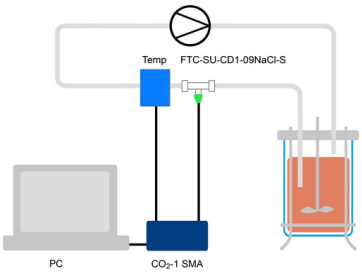
Luer Lock adapters with optical sensors can easily be integrated in any perfusion set-up and allow continuous monitoring of important cell culture parameters. The small electro-optical modules for sensor read-out can directly be installed in monitoring and control units. The separate sensor components allow safe integration in tubing under Laminar flow, before they are connected to the bioreactor and the measurement unit. With this measurement system the sensor shelf life is decoupled from the shelf life of pre-sterilized single-use bioreactors.

**The following types of Sensor Sticks are available:**

- O2 Sensor Stick SST-PSt3 / -PSt7 (measurement range: 0 - 100 % O2, based on a 2 mm or 1 mm fiber)
- pH Sensor Stick SST-HP5 (measurement range: pH 5.5 - 8.5)
- CO2 Sensor Stick SST-CD1 (measurement range: 1 - 25 % CO2 / 8 - 190 mmHg pCO2; this sensor stick is delivered in a squeeze bag with saline solution)

Exemplary Application:

## Online CO2 Monitoring in CHO Cell Culture: Bypass-pCO2 Measurements

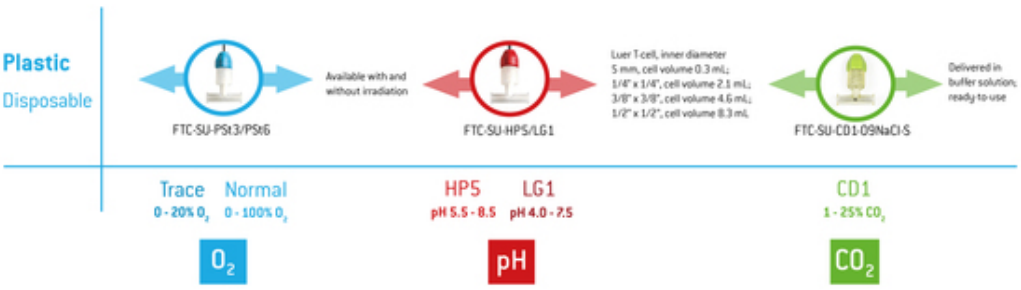



A fed-batch-process with Horizon's glutamine synthetase knockout CHO cell line was carried out in an autoclavable 10L benchtop bioreactor. For online culture monitoring PreSens' novel pCO2 measurement system - with the sensing element installed within a bypass - was applied. The online measurements were in good agreement with gold standard Bioprofiler's offline pCO2 measurements.

>> Read the entire application note!

## Overview of Ready-to-use Single-use Flow-through Cells

Companies, who do not have their own perfusion systems set-up already, might want to take advantage of our broad range of single-use flow-through cells. They are ideally suited for monitoring of perfusion bioreactors or within a bioreactor's bypass. The cells can easily be integrated in the flow path. Control of one or several FTCs and multiparameter monitoring can all be done from one PC with the PreSens Measurement Studio 2 software.



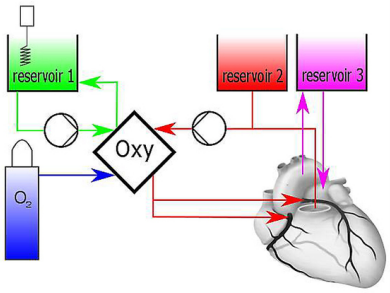

**The following types of single-use Flow-through Cells are available:**

- FTC-SU-PSt3-S (measurement range 0 - 45 mg/L DO, resolution of ± 0.004 mg/L at 0.091 mg/L, beta-irradiated)
- FTC-SU-PSt7-S (measurement range 0 - 45 mg/L DO, resolution of ± 0.005 mg/L at 0.4 mg/L, beta-irradiated)
- FTC-SU-HP5-US (measurement range pH 5.5 - 8.5)
- FTC-SU-HP5-S (measurement range pH 5.5 - 8.5, beta-irradiated)
- FTC-SU-LG1-US (measurement range pH 4.0 - 7.5)
- FTC-SU-LG1-S (measurement range pH 4.0 - 7.5, beta-irradiated)
- FTC-SU-CD1-09NaCl-S (measurement range 1 - 25 % CO2, beta-irradiated)

Exemplary Applications:

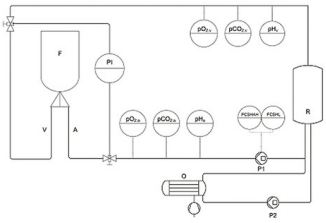
## Monitoring in an Isolated Perfused Heart Test Stand with PreSens Optical Sensors -

O2, CO2 and Glucose Flow-through Cells Integrated in a Blood Perfusion




During long-term application of artificial lungs (Extra Corporeal Membrane Oxygenation - ECMO) different complications, like blood clotting, cell destruction (hemolysis), or bleeding tendency of patients, can occur. Whether these complications are caused by the mechanical blood pump or by the flow in the ECMO is currently unclear. In order to investigate the formation of coagulation and hemolysis, a test stand for an isolated, perfused animal heart, which is an ideal physiological blood pump, is being developed. Thus, the differentiation of fluid mechanical processes, biocompatibility problems as well as pump-induced phenomena is possible.

>> Read the entire application note!



## Ischemia-related Cell Damage in Extracorporeal Preserved Tissue -

Assessing new findings with a novel perfusion model using optical pO2, pCO2 and pH sensors

Tissue undergoing free transfer in transplant or reconstructive surgery always is at high risk of ischemia-related cell damage. This study aims at assessing different procedures using an extracorporeal perfusion and oxygenation system. Flow-through cells with integrated O2, pH and CO2 sensors were implemented in this system for online monitoring before and after the perfusate passed through a free muscle flap. Furthermore, the expression of HIF-1 alpha as marker for hypoxia and of the pro-apoptotic protein Caspase-3 in the skeletal muscle flaps was investigated, to assess improvements in tissue-conservation by the different treatments. Results show that an air saturated solution supplies sufficient oxygen to the free flap, and increased expression of HIF-1 alpha and Caspase-3 can be prevented by procedures conducted in this study.

>> Read the entire application note!

You would like to learn even more about PreSens Precision Sensing? Please visit our homepage www.presens.de and don't hesitate to contact us. Any feedback will be appreciated.

With kind regards

**Christina Schlauderer**
Communications

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