Flow-Through Cell pH

SENSOR PROBES

Instruction Manual

PreSens
PRECISION SENSING

Flow-Through Cell pH

Specification:

pH sensor integrated in a flow-through cell

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1 Preface

You have chosen a new, innovative technology for measuring pH.

Chemical optical sensors (also called optodes) have several important features:

- They are small.
- Their signal does not depend on the flow rate of the sample.
- They can be physically divided from the measuring system which allows a non-invasive measurement.
- They can be used in disposables.

Therefore, they are ideally suited for the examination of small sample volumes, for highly parallelized measurements in disposables, and for biotechnological applications.
A set of different minisensors, flow-through cells and integrated sensor systems is available to make sure you have the sensor which matches your application.

Please feel free to contact our service team to find the best solution for your application.

Your PreSens Team

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE WORKING WITH THIS ITEM.

2 Description of the Flow-Through Cell pH

The flow-through cell pH (FTC pH) comprises a miniaturized 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 micro-liters. The standard flow cell can be easily connected via Luer-Lock adapters to external tubing.

Fig. 1 Flow-through cell pH

2.1 Scope of Delivery

The FTC pH is delivered in a light-tight package. It is beta-irradiated and pre-calibrated.

Fig. 2 Flow-through cell pH in a light-tight package, and the respective polymer optical fiber. Both items have to be ordered separately.

Additionally required equipment (not supplied):

- The respective polymer optical fiber (POF) for use with the FTC has to be ordered separately. As the FTC is a disposable item and the POF can be kept for further use the two items are not delivered in one packaging unit.
- Fiber optic pH transmitter, e. g. pH-1 mini (more pH transmitters can be found on www.presens.de/products)
- PC / Notebook

2.2 Measurement Set-up

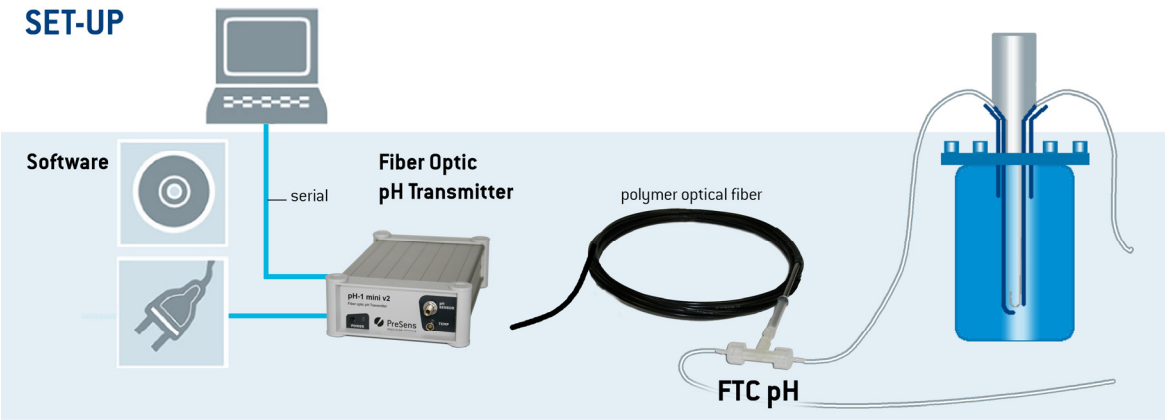

Fig. 3 Set-up for measurement with a FTC pH

A polymer optical fiber, which is connected to a pH transmitter, is attached to the FTC pH. The FTC pH is integrated in the flow path of a perfusion reactor or the bypass of a reactor.

3 Operation

3.1 Unpacking the FTC pH

The FTC is delivered in a light-tight package to ensure a long shelf-life, so do not open this packaging immediately at delivery. It is recommended to unpack the FTC just before using it.

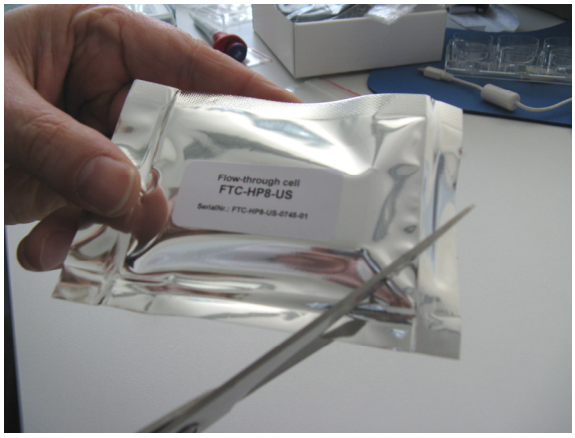

Fig. 4 Opening the light-tight package

Carefully remove the parts from the protective cover and connect the single parts to the flow system. The FTC is delivered beta-irradiated; use gloves and work in a controlled environment to prevent contamination.

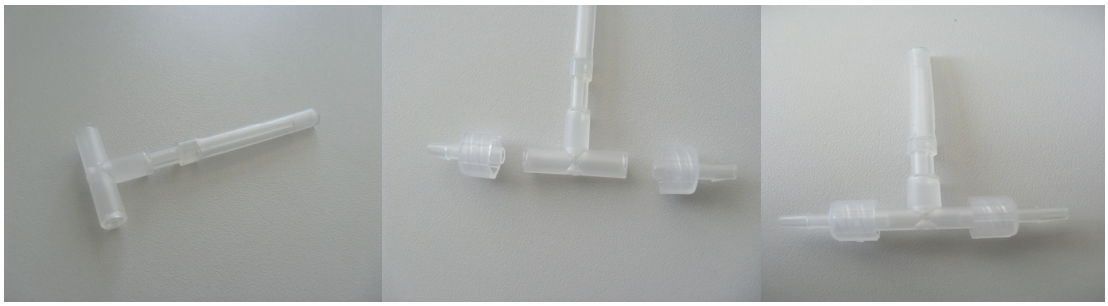

Fig. 5 Single parts of the flow system; assembled FTC pH

3.2 Attaching the Polymer Optical Fiber to the FTC

You can also watch our video about integrating a CO_2 sensor spot into a vessel on www.presens.de/support/presens-tv.html.

Inside the FTC you can see a piece of bare fiber with the sensor tip on its end. The other end of this fiber has to be placed inside the metal cylinder of the polymer optical fiber.
Hold the FTC at the silicon tube and carefully push it over the metal cylinder.

Fig. 6 Mounting the FTC on the polymer optical fiber

! Do not hold the FTC at the base between the connection points when connecting the FTC to the polymer optical fiber. This way the fiber with the sensor tip might get pushed into the flow chamber and the sensor might give wrong readings or even get damaged.

Fig. 7 Wrong handling of the FTC – held at base between connection points

For connecting and disconnecting the parts hold the unit at the silicon tube only.

Fig. 8 Correct handling of the FTC – held at the silicon tube for connecting and disconnecting it

Gently push the silicon tube over the fixture ring. The FTC should be attached firmly to the polymer optical fiber now. If the FTC is not bouncing anymore when touched, it is attached correctly.

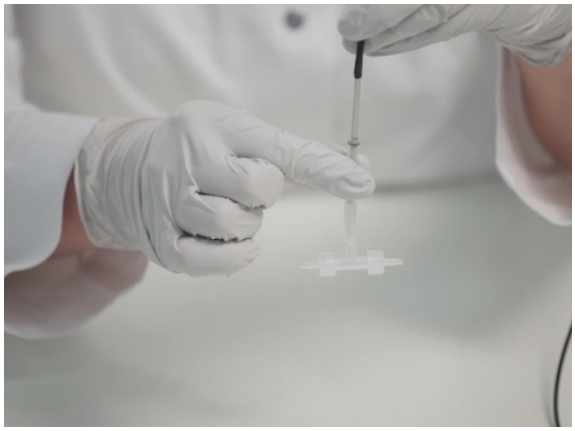

Fig. 9 The silicon tube is pushed over the fixture ring

Now the FTC can be integrated in the flow path of a perfusion reactor or the bypass of a reactor. According to your tube size you can use the end caps or remove them. Attach the tubes at the inlet and outlet of the FTC.

Fig. 10 Connection of the FTC to tubes

The polymer optical fiber is attached to a fiber optic transmitter. Medium can be pumped through the FTC now.

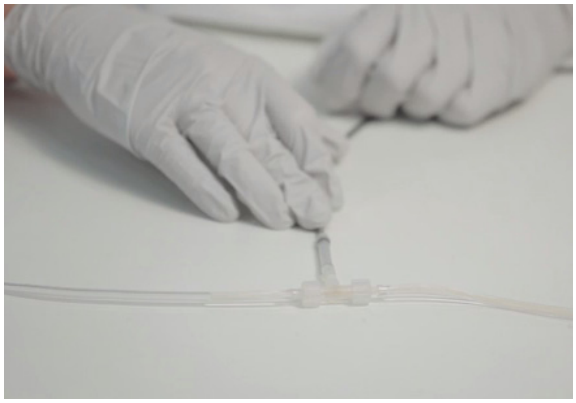

Fig. 11 Medium is pumped through the FTC

3.3 Measurement

3.3.1 Calibration

The FTC is delivered pre-calibrated. The enclosed Final Inspection Protocol contains the calibration values, which have to be entered into the software of the fiber optic pH transmitter you are using. (Please see the respective transmitter instruction manual for more detailed information on calibration.)

In case of samples differing significantly from physiological buffers a multi-point calibration is recommended. Prepare at least five solutions, of similar composition like the sample and different pH, covering the range of interest. Place the FTC in the vessels containing the solutions of known pH or pump the solutions through the FTC – one after another - and perform the multi-point calibration like described in the respective transmitter instruction manual.

If the vessel is large enough to place a pH electrode, we recommend titrating directly in the vessel and following the instructions for multi-point calibration in the transmitter manual.

3.3.2 Equilibration

! The sensor needs to be equilibrated before usage. In order to do so you have to fill the FTC with your medium and wait for at least 15 minutes so that the sensor can equilibrate.

3.3.3 One point adjustment

pH one point adjustment is advised if your media differs from physiological conditions to obtain optimal sensor performance. Ideally the starting pH of the sample is known.

If the phase value is constant, follow the instructions for auto zero in the transmitter manual.

4 Technical Data

Specifications*	
Measuring range	5.5 – 8.5 pH
Response time (t_{90}) at 37 °C**	120 sec.
Resolution at pH = 7	± 0.01 pH
Accuracy at pH = 7	± 0.05 sensor spot calibration ± 0.10 sensor batch calibration
Temperature range	From 5 °C to 50 ° C
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
Storage stability	18 months provided the sensor is stored in the dark
Calibration	pH spots are pre-calibrated; re-calibration is possible
Cleaning procedure	The FTC-pH is delivered either beta-irradiated or untreated; a second irradiation or ethylene oxide treatment is not recommended

*provided pH sensor is used without further handling in physiological solutions
**dependent of flow rate

5 Concluding Remarks

Dear Customer,

With this manual, we hope to provide you with an introduction to work with the flow-through cell pH (FTC pH).

This manual does not claim to be complete. We are endeavored to improve and supplement this version.

We are looking forward to your critical review and to any suggestions you may have.

You can find the latest version at www.PreSens.de.

With best regards,

Your PreSens Team

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