

CO₂ SensorPlug SPL-ML-CD1

○ Instruction Manual



CO₂ SensorPlug SPL-ML-CD1

Specification:

SensorPlug based on Mini Luer for CO₂ monitoring in milli- & microfluidics

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1 Preface

You have chosen a new, innovative technology for measuring CO₂.

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

- They are small.
- 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 CO₂ SensorPlug

The SensorPlug for CO₂ is based on a color coded Mini Luer (green = CO₂) which is carrying a sensor spot of about 2 mm on the tip. The SensorPlug is inserted in an appropriate port on your chip so the spot is in contact with your sample inside the channel (please contact our service team for design details). The channel diameter has to be at least 2 mm at this position so the complete spot is in contact with the sample. When inserted, the SensorPlug is sealing the port and the tip carrying the sensor is slightly protruding into the channel. A polymer fiber connects the SensorPlug to the respective measurement device (e.g. CO₂-1SMA). SensorPlugs come pre-calibrated and beta irradiated. The purpose of the CO₂ SensorPlug is the dissolved carbon dioxide measurement in media of physiological osmolality. Measurements in dry or humid gas stream are not within the scope of application.



Fig. 1 CO₂ SensorPlug SPL-ML-CD1

2.1 Scope of Delivery

The SPL-ML-CD1 are packed in units of 5 plugs in vials filled with physiological saline solution. Two of these vials (10 plugs total) are packed in a lightproof packaging to protect the sensor material. The SensorPlugs are pre-calibrated for the application in media with physiological osmolality. If you wish to apply the product to processes with a constant non-physiological osmolality, please contact the PreSens Team to get a quote for the generation of calibration data reflecting your desired process osmolality and temperature.



Fig. 2 Packed CO₂ SensorPlugs.

The respective polymer optical fiber has to be ordered separately.

Additionally required equipment (not supplied):

- Polymer optical fiber (POF) with ST connector on one side, and an uncovered ending with polymer sleeve, length 2.5 m (for other lengths, please contact our service team)
 - SMA-ST Adapter
 - Fiber optic pH transmitter, CO₂-1 SMA
 - PC / Notebook
- Microfluidic chip with an appropriate port

2.2 Measurement Set-up

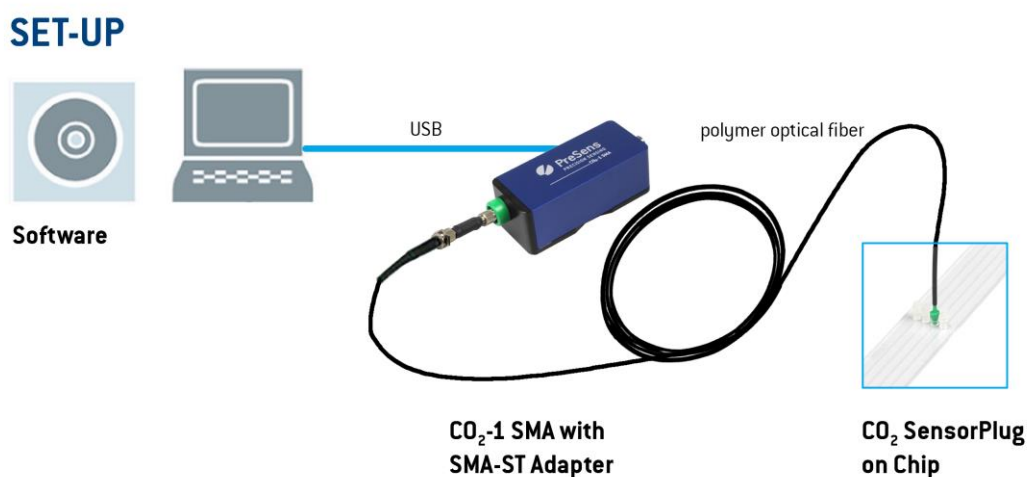


Fig. 3 Set-up for measurement with a CO₂ SensorPlug

A polymer optical fiber, which is connected to CO₂-1 SMA via a SMA-ST Adapter, is attached to the SPL-ML-CD1. The SensorPlug is inserted in the port on your microfluidic chip.

3 Operation

3.1 Unpacking the CO₂ SensorPlugs

The SPL-ML-CD1 are delivered in a lightproof packaging to ensure a long shelf-life, so do not open this packaging immediately at delivery. It is recommended to unpack the SensorPlug just before using it.

- ! Take care when opening the lightproof packaging with scissors. Cut close to the welding seam of the packaging, not to damage the vials inside.



Fig. 4 Opening the lightproof outer packaging.



Inner packaging: 2 vials with 5 CO₂ SensorPlugs each in physiological saline solution

- ! If you want to use the irradiated SensorPlug in cleanroom environment open the vial in a laminar flow box, or in a similar controlled environment, and wear gloves!

3.2 Equilibration

- ! The sensor needs to be equilibrated before use. In order to do so you have to place the SensorPlug in your medium with physiological osmolality at the intended process temperature and wait for at least 30 minutes so that the sensor can equilibrate. If you apply the sensor to processes with non-physiological osmolality and with custom calibration data, please allow for 24h equilibration at the desired process temperature.

3.3 Connecting the SPL-ML-CD1

The SPL-ML-CD1 can be integrated in a port on your chip.

When the SPL is integrated the chip is closed and the polymer optical fiber can be attached.

- ! Do not attach the polymer optical fiber before closing the flow path, if you want to avoid contamination; the fiber is not irradiated.

Insert the uncoated end of the fiber into the socket of the SensorPlug until the SPL touches the edge of the black fiber coating.

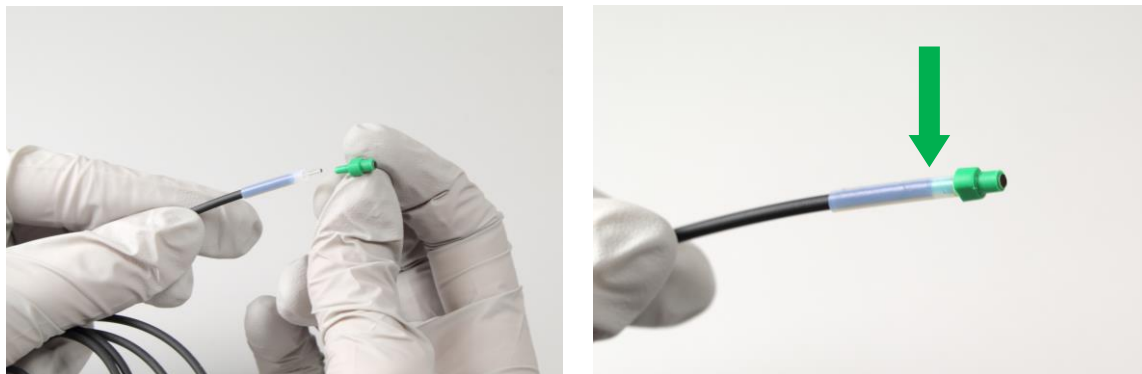


Fig. 5 Insert the uncoated end of the fiber in the SPL until the plug touches the black fiber coating.

- ! Do not remove the polymer sleeve but place it over the junction to avoid breaking the fiber by leverage effects.

Medium can be pumped through the chip now.

3.4 Calibration

The SPL-ML-CD1 is delivered pre-calibrated, but an additional 1-point adjustment is advised for accurate measurements (at $\geq 2\%$ (for optimal results $\geq 5\%$ CO₂)). Follow the instructions in the enclosed Final Inspection Protocol to enter actual calibration data into the software of the fiber optic CO₂ meter you are using. (Please see the device or software instruction manual for more detailed information on pre-calibration input.)

3.5 One point adjustment

CO₂ one point adjustment is mandatory if your media differs from physiological conditions to obtain optimal sensor performance. Ideally the starting CO₂-partial pressure of the sample is known.

As soon as the phase value is constant, follow the instructions for one point adjustment in the device or software instruction manual.

4 Technical Data

Specifications*

Measurement range	1 - 25 % CO ₂ at atmospheric pressure (1013 hPa) 10 - 250 hPa pCO ₂ 8 - 180 mmHg pCO ₂
Resolution at 37 °C	± 0.06 % at 2 % CO ₂ ± 0.15 % at 6 % CO ₂ ± 0.5 mmHg at 15 mmHg pCO ₂ ± 1.2 mmHg at 45 mmHg pCO ₂
Accuracy**	± 5 % of reading or 0.2 % (1.5 mmHg); whichever is higher
Drift at 37 °C	< 0.3 % pCO ₂ per day (4 sec. measurement interval at 5 % pCO ₂)
Measurement temperature range	From + 15 °C to + 45 °C
Response time (t ₉₀) at 20 °C	< 3 min. for change from 2 % to 5 % (15 mmHg to 38 mmHg) pCO ₂
Compatible CO ₂ meters	CO ₂ -1 SMA with SMA-ST Adapter

Properties

Compatibility	Aqueous solutions, pH 4 - 9
Cross-sensitivity	Optical pCO ₂ sensors display reduced cross-sensitivity to ionic strength (salinity); Acid, SO ₂ , HCl vapors
Cleaning procedure	Please ask our experts!
Calibration	CO ₂ SensorPlugs are pre-calibrated; re-calibration is possible
Storage stability	12 months provided the sensor is stored in the dark in its original package at room temperature
Plug type	Male Mini Luer fluid connector

*provided SensorPlugs are used without further handling in physiological solutions

**after multi-point calibration

5 Concluding Remarks

Dear Customer,

With this manual, we hope to provide you with an introduction to work with the CO₂ SensorPlugs (SPL-ML-CD1).

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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