Imaging Solutions

Non-invasive mapping of metabolic activities
- Imaging of living samples
- Free choice of measurement conditions
- USB powered & portable device
- One device instead of thousands of individual sensors

Measure and Visualize Oxygen, pH or Carbon Dioxide Distributions in 2D for Life Science Research

PreSens
PRECISION SENSING
Fluorescent chemical optical sensor foils combined with imaging technology allow easy 2D visualization of oxygen, pH or carbon dioxide distributions in heterogeneous samples. For measurement the sample surface is covered with the sensor film, which translates the analyte content into a light signal. The sensor response is recorded pixel by pixel with a digital camera. With VisiSens™ spatial and temporal changes of oxygen, carbon dioxide concentration or pH can be monitored.

**Features**
- Non-invasive mapping of metabolic activity using sensor foils
- Imaging of living samples
- Free choice of measurement conditions
- Reliable addressing regions with low or high O$_2$, CO$_2$ or pH
- More than 100,000 sensing points within one single image
- USB powered & portable
- Easy evaluation via image processing software

**Software**
All software versions, whether for O$_2$, pH or CO$_2$ imaging, have the same user interface, so you only have to get familiar with it once to be able to work with all. The software allows controlling the image recording process, and assists image processing and evaluation. An easy to use camera controlling user interface manages image acquisition and storage. Measurements which belong together can be organized in user defined sessions as separate folders and annotated with a free text comment. Acquired images can be single images or automatically recorded time series.

**Benefits**
- Display the sensor response in false color image
- Display the actual pixel information
- Display ROI statistics of user defined polygon ROIs
- Interactive x- and y-axis profiles
- Z-axis profiles for plotting ROI average at defined coordinates
- Follow kinetics through a time series and display as 2D-plot
- Side-by-side image comparison of selected images
- Alpha blending of false color sensor response with color image

**The Smart Measurement Method**
Fluorescence Ratiometric Imaging (FRIM) is a method for reading out the signal of a fluorescent chemical optical sensor. Ratiometric measuring compensates most of the common interferences, e. g. inhomogeneous lightfields. An optical sensor foil contains an analyte sensitive dye and a reference dye which are immobilized in a permeable polymer matrix layer. The indicator dye is emitting red or green fluorescence, depending on the analyte and respective sensor foil type, which is dynamically quenched by the analyte while the reference dye is giving a constant green or red light signal respectively. These emissions meet exactly the red and green channel sensitivity of a color RGB chip.
**Determination of Oxygen Gradients in Cell Culture and Engineered Tissue**

Monitoring oxygen supply in cell culture or engineered tissue is very important. Especially cells towards the center of a culture can be subject to low oxygen levels. With VisiSens™ continuous, high-resolution oxygen measurements over cross sections of samples can be performed. The sensor foils can easily be applied in test or cultivation vessels, and samples are immobilized on top of the sensor. Measurements are taken non-invasively from outside the vessel, which reduces the risk of contamination. With its small footprint the VisiSens™ system can be mounted inside an incubator without any problems. Detecting oxygen gradients will allow taking measures, or apply new methods to avoid cell death due to hypoxia.

In upcoming studies hydrogels will be tested on their suitability as cell carriers in regenerative therapy. Oxygen releasing additives should sustain constant oxygen supply to the cultured precursor cells. VisiSens™ will be used to monitor the continuity and homogeneity of oxygen release and the actual oxygen supply of the cells.

**2D Imaging in Microfluidic Devices**

Microfluidic devices are an emerging technology in the Biotech sector. Due to many advantages as e.g. low fluid volumes, faster analysis and response times which allow better process control, and the compactness of the chips which enables massive parallelization, these devices gain in importance. With VisiSens™ it is possible to continuously monitor the important culture parameters oxygen, pH, or CO$_2$ now in high resolution over the whole chip surface. During development, this allows determining suitable culture device materials, e.g. for their oxygen permeability, according to application and cell line. Oxygen, pH, or CO$_2$ monitoring with VisiSens™ will improve microfluidic device functionality even further, and it exhibits superior properties compared to similar sensing products.


**pH Imaging in Skin Models**

pH imaging is an innovative method for investigating complex disease processes like e.g. wound healing and tumor biology. The pH of the wound fluid is known to greatly affect the healing process. Measurement techniques used so far have been very difficult to implement. The two-dimensional visualization of pH dynamics with VisiSens™ now allows monitoring spatially heterogeneous processes on skin models, which is a great advantage compared to single-point measurements with probes. Another future application of pH imaging will be tumor research giving insight in spatial and temporal changes of tumor metabolism.
**Imaging Solutions**

### Specifications*

<table>
<thead>
<tr>
<th></th>
<th>Oxygen (blue)</th>
<th>pH (red)</th>
<th>CO₂ (green)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>0 - 100% air saturation</td>
<td>pH 6 - 7.5</td>
<td>0 - 1%</td>
</tr>
<tr>
<td>Response time** (t₉₀)</td>
<td>30 sec.</td>
<td>30 sec.</td>
<td>&lt; 3 min.</td>
</tr>
<tr>
<td>Size of sensor foil**</td>
<td>5 x 5 mm² to 40 x 40 mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of sensing points within one image**</td>
<td>300,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Properties

- **Temperature range**: 5 ℃ to 45 ℃
- **Compatibility**: Aqueous solutions, ethanol (max. 10% V/V), methanol (max. 10% V/V), pH 2 - 10

### Device

- **Camera chip**: Enhanced Color CMOS
- **Image Resolution**: 1.3 megapixel (1280 x 1024 pixels)
- **Magnification**: 10-fold up to 220-fold, depending on adapter tubus used
- **Field of View**: ~2.3 x 2.0 mm² to ~4.1 x 3.3 cm²; typically ~1.5 x 1.2 cm²
- **Output**: 15 fps live video preview (no storage) and 0.5 fps full-resolution picture storage (.png)
- **Interface**: USB 2.0, high speed USB transmission
- **Number of LEDs**: 8
- **Material**: All-aluminum housing
- **Dimensions**: Length 10 cm, diameter 3.8 cm
- **Weight**: 170 g (without adapter tubus)

*VisiSens™ is no approved medical device

**typical data which may strongly differ with adapting the imaging set-up to specific needs

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**SET UP**

**ACCESSORIES**

- **Disposables, e.g. MicroPlates, with Sensor Foil**
- **Sensor Foils**

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*Technical data can change without prior notice.

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**Bring to light what's inside. Ask our experts:**

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