BioLector® Pro
Microfluidic Bioprocess Control

32/48 Parallel Microbioreactors
pH Control
Continuous Feeding
Online Monitoring
Scalability
Automation
The BioLector® Pro is the advanced microbioreactor system combining the established BioLector® technology with an innovative microfluidic chip.

The system is based on a standard microtiter plate format and operates with non-invasive, optical sensors. The disposable 48 well microtiter plate of the BioLector® Pro features online measurements of biomass, fluorescence, pH and DO and simultaneously controls the pH and feeding rates through microvalves and microfluidic-channels. This unique microfluidic plate allows continuous feeding and pH control in standard MTP formats. There is no tubing and no liquid handling needed anymore; everything is part of the gamma radiated ready-to-use plate!

Applications

- Fed-batch development
- pH profiling
- Feeding rate optimization
- Media screening and optimization
- Fermentation parameter optimization
- Cell line and strain screening
- Anaerobic and microaerophilic fermentations
- Synthetic and systems biology
- Statistical design of experiments (DoE)
- Growth characterization
- High-throughput protein expression
- Enzyme and cell activity tests
- Functional genomics
- Proteomic studies
- Inhibition and toxicity tests
- Quality control

Measurements

- $E.\ coli$ (two triplicates using different P&I settings) WR medium, 37°C, 800 rpm, $\text{pH}_{\text{ini}} = 6.4$, One-sided pH control (NaOH), Feeding rate = 5 µL/h Glucose (500 g/L), Start feed at 5 h, FlowerPlate®

BioLector® Pro – $E.\ coli$ Fed-batch Fermentation
32 Parallel Microbioreactors

Features

Online Measurement
- Biomass concentration
- pH value
- Dissolved oxygen (DO)
- Riboflavins
- Fluorescent molecules (GFP, YFP, DsRed ...)
- Temperature
- Humidity
- O₂ in head space atmosphere
- CO₂ in head space atmosphere

Online Control
- pH value
- Feeding
- Shaking speed
- Temperature
- Humidity
- O₂ in head space atmosphere
- CO₂ in head space atmosphere

System Performance
- Working volume of 800–2400 μL
- 32 parallel microreactions
- 16 reservoir wells
- Individual pH control
- Continuous individual feeding
- Broad range of kLa values (25 – 600 1/h)
- Continuous gas exchange and oxygen supply
- Equal power input to each reactor
- Defined engineering parameters and scalability
- Controlled gas atmosphere (CO₂, O₂ and N₂)
- Feeding modes: constant, linear, exponential or signal triggered

Operating Principle

Microfluidic Control on a FlowerPlate® with Optodes
Smaller and Smarter

Advantages

- Real-time kinetics out of 32 parallel fermentations
- Microfermentation in standard MTP format
- Batch and fed-batch cultivation
- Control of pH on-the-plate
- Continuous controlled feeding on-the-plate
- DO- and signal-triggered feeding
- Low pH measurements in the range of 4-6
- High-throughput and easy automation
- Broad range for biomass detection (equivalent to up to 250 OD600, 50 g/L CDW, measured with E. coli)
- Biomass measurement is online and does not require dilution
- Small volume (800 – 2400 μL)
- No edge effects
- Continuous shaking operation (no artifacts)
- Defined mass transfer conditions
- Reliable scale up to benchtop fermenters
- Industry leading data analysis software
- Fast and easy data analysis included
- A valuable tool for PAT and QbD

Intelligent Software

Data Analysis with the BioLection Software

Watch the video:
www.m2p-labs.com/news-media/videos/
# Technical Specifications

## BioLector® Pro

### System

#### Operation conditions

<table>
<thead>
<tr>
<th>Operation conditions</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate format</td>
<td>48 or 32 reactor/16 reservoir wells (other formats upon request)</td>
</tr>
<tr>
<td>Volume</td>
<td>800 – 2400 μL (depending on microtiter plate)</td>
</tr>
<tr>
<td>Temperature, minimum</td>
<td>On average operating - 5 °C below room temperature.</td>
</tr>
<tr>
<td>Temperature, maximum</td>
<td>50 °C</td>
</tr>
<tr>
<td>pH control</td>
<td>Over the whole measurement range (see below)</td>
</tr>
<tr>
<td>Shaking conditions</td>
<td>3 mm shaker</td>
</tr>
<tr>
<td>Shaking frequencies</td>
<td>400 rpm – 1500 rpm</td>
</tr>
</tbody>
</table>

#### Technical data

<table>
<thead>
<tr>
<th>Dimensions (W × H × D)</th>
<th>BioLector® Pro</th>
<th>Add. valve control unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>795 mm × 333 mm × 470 mm</td>
<td>600 mm × 478 mm × 450 mm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>BioLector® Pro</th>
<th>Add. valve control unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. 40 kg</td>
<td>Approx. 40 kg</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power source</th>
<th>Ethernet</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Rated power</th>
<th>BioLector® Pro</th>
<th>Add. valve control unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>280 W</td>
<td>120 W</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interface</th>
<th>Ethernet</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Ambient conditions</th>
<th>15 – 25 °C, max. &lt; 70 % rH</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Automation</th>
<th>Optionally, the BioLector® can be integrated into the robotic liquid handling module</th>
</tr>
</thead>
</table>

*1 Scattered light detection depends on shaking frequency, filling volume of cavity, microplate type, particle size and particle shape of microorganism and media components.

*2 Determined in triplicates, resolution is given when the span between the arithmetic averages of the values is bigger than three times of the bigger standard deviation.

### Optional modules

<table>
<thead>
<tr>
<th>Art.-No.</th>
<th>Module description</th>
<th>Application</th>
<th>Additional feature</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-O2-100</td>
<td>O₂-upregulation module</td>
<td>Fermentation with O₂ enriched air</td>
<td>Control of gas atmosphere: 21 – 35 % O₂</td>
<td>Only one O₂ sensor can be installed in the device.</td>
</tr>
<tr>
<td>E-O2-25</td>
<td>O₂-downregulation module</td>
<td>Fermentation at O₂ reduced air, microaerophilic conditions</td>
<td>Control of gas atmosphere: 2 – 21 % O₂</td>
<td>Only one O₂ sensor can be installed in the device.</td>
</tr>
<tr>
<td>E-CO2-10</td>
<td>CO₂-upregulation module</td>
<td>Fermentation with CO₂ controlled gas atmosphere</td>
<td>Control of gas atmosphere: 0 – 10 % CO₂</td>
<td></td>
</tr>
<tr>
<td>E-AN-200</td>
<td>BL-Module for anaerobic cultivation</td>
<td>Strict anaerobic fermentation + low, control led gas flow</td>
<td>Gassing with pure N₂ or CO₂ or other defined gases</td>
<td>Operates only with standard 48 well plate</td>
</tr>
<tr>
<td>E-OP-401-499</td>
<td>LED/Filter module</td>
<td>Measurement of additional fluorescences in the BioLector®</td>
<td>Measurement at additional wavelengths</td>
<td>Custom made filter modules available</td>
</tr>
<tr>
<td>E-OP-424</td>
<td>Low pH Filter module</td>
<td>Fermentation of yeast, lactobacillus, fungi &amp; more</td>
<td>Low pH measurement, range 4 – 6 pH</td>
<td>Upgradable onsite</td>
</tr>
<tr>
<td>E-OP-9xx</td>
<td>Laptop for BioLector® system</td>
<td>Laptop for data analysis</td>
<td>Data analysis and visualization on a separate computer</td>
<td></td>
</tr>
</tbody>
</table>

It is possible to combine optional modules (O₂, CO₂) in one device.

### Note:
The BioLector® Pro includes the BioLection software.

### Optical measurements

<table>
<thead>
<tr>
<th>Filter configuration</th>
<th>up to 6 different filters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preinstalled filters</td>
<td>Biomass, Riboflavin, pH and DO</td>
</tr>
<tr>
<td>Wavelengths</td>
<td>385 nm – 950 nm</td>
</tr>
<tr>
<td>MTP read time</td>
<td>~ 1 min/parameter/32 wells, ~ 1.5 min/parameter/48 wells depending on parameter measured and shaking frequency</td>
</tr>
<tr>
<td>Scattered light measurement*1</td>
<td>Resolution &gt; 50 NTU, at densities higher than 500 NTU: 10 % of measured value</td>
</tr>
</tbody>
</table>

#### for example

- *E. coli* in FlowerPlate® (MTP-48-xx), 1 – 250 OD₆₀₀, 37 °C, 1000 μL, 800 rpm
- *E. coli* in Microfluidic Plate (MTP-MF32-xx), 2 – 250 OD₆₀₀, 37 °C, 1000 μL, 800 rpm

### Ranges, measurement and pH control

| Calibration | Precalibrated plates |
| Measurement and control range pH | 5.5 – 7.5 |
| pH control | By acid or/and base |

#### Application mode

- Disposable technology

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**ORDERING**

**Leasing option available**

**EUROPE** +49-2401-805-330

**order@m2p-labs.com**

**N. & S. AMERICAS** +1-631-501-1878

**orderUS@m2p-labs.com**

**ASIA PACIFIC** +852-6092-6778

**orderAsia@m2p-labs.com**
m2p-labs is an internationally leading supplier of microbioreactors.

The company focuses on microbioreaction and automated solutions for screening and bioprocess development. The microfermentation technology enables customers to conduct experiments with great efficiency and excellent quality at low costs. More knowledge from small scale leads to more rational and reliable decisions in the development of bioprocesses.