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, pH<sub>ini</sub> = 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
- O$_2$ in head space atmosphere
- CO$_2$ in head space atmosphere

Online Control

- pH value
- Feeding
- Shaking speed
- Temperature
- Humidity
- O$_2$ in head space atmosphere
- CO$_2$ 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 k$_a$ 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 (CO$_2$, O$_2$, and N$_2$)
- Feeding modes: constant, linear, exponential or signal triggered

Operating Principle

Microfluidic Control on a FlowerPlate® with Optodes

Dissolved oxygen  Biomass & fluorescence  pH value  Micro-valves

Well  Reservoir 2  Reservoir 1
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

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

**BioLector® Pro**

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### System

<table>
<thead>
<tr>
<th>Art.-No.: G-BLMF 100</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation conditions</strong></td>
</tr>
<tr>
<td>Plate format</td>
</tr>
<tr>
<td>Volume</td>
</tr>
<tr>
<td>Temperature, minimum</td>
</tr>
<tr>
<td>Temperature, maximum</td>
</tr>
<tr>
<td>pH control</td>
</tr>
<tr>
<td>Shaking conditions</td>
</tr>
<tr>
<td>Shaking frequencies</td>
</tr>
</tbody>
</table>

### Technical data

<table>
<thead>
<tr>
<th>Dimensions (W × H × D)</th>
<th>795 mm × 333 mm × 470 mm BioLector® Pro</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>600 mm × 478 mm × 450 mm add. valve control unit</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 40 kg BioLector® Pro</td>
</tr>
<tr>
<td></td>
<td>Approx. 40 kg add. valve control unit</td>
</tr>
<tr>
<td>Power source</td>
<td>100 – 240 V (50/60 Hz)</td>
</tr>
<tr>
<td>Rated power</td>
<td>280 W BioLector® Pro, 120 W add. valve control unit</td>
</tr>
<tr>
<td>Interface</td>
<td>Ethernet</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>15 – 25 °C, max. &lt; 70 % rH</td>
</tr>
<tr>
<td>Automation</td>
<td>Optionally, the BioLector® can be integrated into the robotic liquid handling module</td>
</tr>
</tbody>
</table>

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### Optical measurements

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

<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</td>
</tr>
<tr>
<td></td>
<td>~ 1.5 min/parameter/48 wells depending on parameter measured and shaking frequency</td>
</tr>
<tr>
<td>Scattered light measurement</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 |
|                | ~4 – 6 (low pH module) with < 0.1 deviation |
| Ranges are broader with less accuracy |
| Measurement range DO | 0 – 100 % oxygen saturation |
| pH control | By acid or/and base |
| Application mode | Disposable technology |

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### 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>

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

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**ORDERING**

Leasing option available

**EUROPE** +49-2401-805-330
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**ASIA** +852-6092-6778
orderAsia@m2p-labs.com
m2p-labs is an internationally leading supplier of microbioreactors.

The company focuses on microreaction 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.

PRODUCT PORTFOLIO

Systems
The BioLector® microbioreactor is a unique high-throughput fermentation system. In up to 48 parallel cultures the essential fermentation parameters such as biomass concentration, pH and DO as well as fluorescent proteins or substrates can be all monitored online. The advanced BioLector® Pro technology is using proprietary microtiter plates with an integrated microfluidic chip. By using the microfluidic technology the system continuously controls the pH of each culture individually as well as the feeding for fed-batch cultivations. The BioLector® microbioreactors are established systems for bacterial, yeast, fungi, plant and insect cells. All systems are suitable for aerobic, microaerophilic and strict anaerobic cultivations.

Disposables
m2p-labs provides worldwide unique microtiter plates with improved oxygen transfer and excellent mixing properties. Due to its design, the FlowerPlate® supplies microbial cultures even with high oxygen demands with a sufficient amount of oxygen. In addition, the proprietary microfluidic plate uses 16 donor wells for online feeding and pH control. The round well plate delivers moderate oxygen transfer for organisms with lower demand in oxygen or organisms sensitive to shear stress. All plates are available with different optical sensors for different applications.

Automation
The RoboLector® provides an unique automated cultivation platform combining the high-throughput fermentation and the online monitoring capability of the BioLector® with the very accurate and reproducible pipetting of a liquid handling robot. The system is used for media preparations, automated sampling and dosing steps, inductions and fed-batch processing.