BioLector® Pro

Microfluidic Bioprocess Control

32/48 Parallel Microbioreactors
pH Control
Continuous Feeding
Online Monitoring
Scalability
Automation

Full Bioprocess Control On-the-Plate
BioLector® Pro

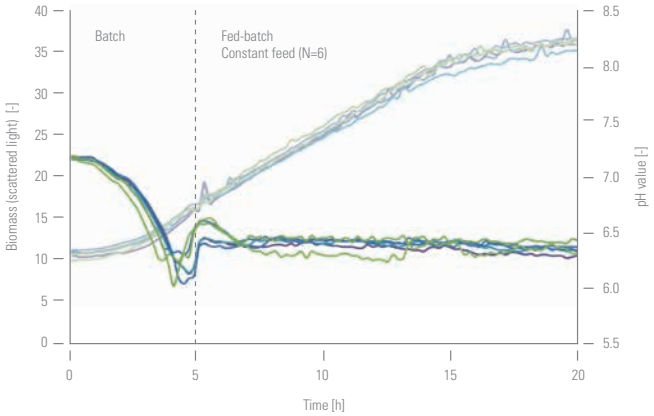
The BioLector® Pro is the advanced microbioreactor system combining the established BioLector® technology with an innovative microfluidic chip.

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

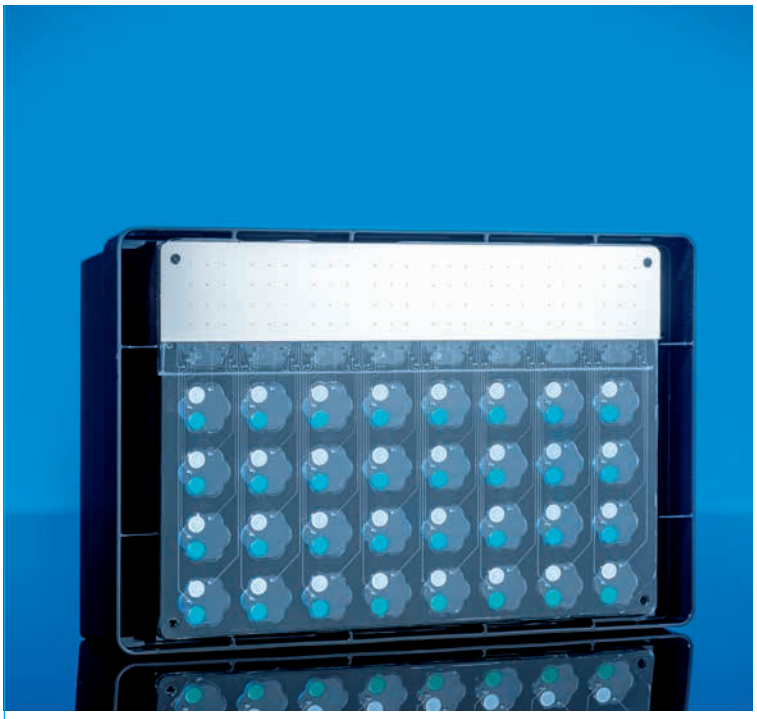
Measurements



E. coli (two triplicates using different P&I settings) WR medium, 37 °C, 800 rpm, pH_{set} = 6.4, One-sided pH control (NaOH), Feeding rate = 5 uL/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

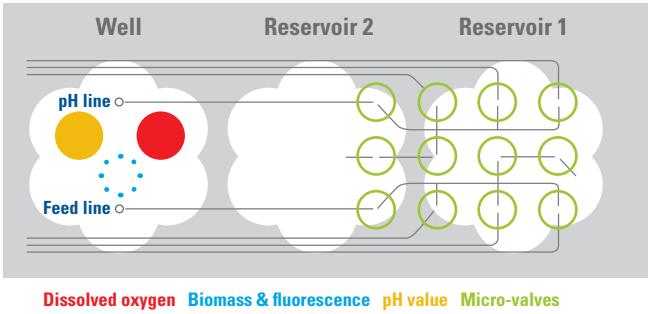
Online Control

- 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_La 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

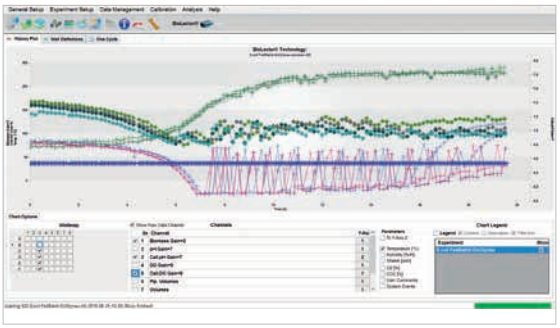
Smaller and Smarter

BioLector® Pro | m2p-labs

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 OD_{600}, 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 Art.-No.: G-BLMF 100

Note: The BioLector® Pro includes the BioLection software.

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

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

*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

Optical measurements	
Filter configuration	up to 6 different filters
Preinstalled filters	Biomass, Riboflavin, pH and DO
Wavelengths	365 nm – 950 nm
MTP read time	~1 min/parameter/32 wells ~1.5 min /parameter/48 wells depending on parameter measured and shaking frequency
Scattered light measurement*1	Resolution > 50 NTU, at densities higher than 500 NTU: 10 % of measured value
for example	
E. coli in FlowerPlate®	(MTP-48-xx), 1 – 250 OD_{600} *2, 37 °C, 1000 µL, 800 rpm)
E. coli in Microfluidic Plate	(MTP-MF32-xx), 2 – 250 OD_{600}, 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

Optional modules

Art.-No.	Module description	Application	Additional feature	Note
E-O2-100	O_2-upregulation module	Fermentation with O_2 enriched air	Control of gas atmosphere: 21 – 35 % O_2	Only one O_2 sensor can be installed in the device;
E-O2-25	O_2-downregulation module	Fermentation at O_2 reduced air, microaerophilic conditions	Control of gas atmosphere: 2 – 21 % O_2	Only one O_2 sensor can be installed in the device
E-CO2-10	CO_2-upregulation module	Fermentation with CO_2 controlled gas atmosphere	Control of gas atmosphere: 0 – 10 % CO_2	
E-AN-200	BL-Module for anaerobic cultivation	Strict anaerobic fermentation + low, control led gas flow	Gassing with pure N_2 or CO_2 or other defined gases	Operates only with standard 48 well plate
E-OP-401-499	LED/Filter module	Measurement of additional fluorescences in the BioLector®	Measurement at additional wavelengths	Custom made filter modules available
E-OP-424	Low pH Filter module	Fermentation of yeast, lactobacillus, fungi & more	Low pH measurement, range 4 – 6 pH	upgradable onsite
E-OP-9xx	Laptop for BioLector® system	Laptop for data analysis	Data analysis and visualization on a separate computer	

It is possible to combine optional modules (O_2, CO_2) in one device.

ORDERING
Leasing option available

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The Company

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.

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