BIOLECTOR XT

MICROBIOREACTOR

High-Throughput Bioprocess Development

GET MO$_2$RE DATA. NOW.

With or without O_2

High-throughput bioprocessing
that's fast, easy and fits in any lab.

CHARACTERIZED
by ingenuity.

BECKMAN COULTER
Life Sciences

48 / 32 PARALLEL MICROBIOREACTORS
ONLINE MONITORING
CONTINUOUS & FULLY FLEXIBLE FEEDING
ACTIVE pH CONTROL
ANAEROBIC FED-BATCH FERMENTATIONS
SCALABILITY, REPRODUCIBILITY
& AUTOMATION

The BioLector XT high-throughput microbioreactor enables real-time evaluation of biomass, fluorescence, pH, DO, and other key cultivation parameters for aerobes and anaerobes—to quickly provide deep insights into your bioprocess development.

ALL THE BEST FEATURES OF THE BIOLECTOR PRO – AND MO_2RE.

Building on trusted BioLector Pro technology, the BioLector XT microbioreactor is based on a standard ANSI/SLAS (SBS) microtiter plate (MTP) format, and operates with online, pre-calibrated optical sensors.

Disposable 48 well MTPs enable online measurement of biomass, fluorescences, pH and DO, while patented microfluidic technology supports simultaneous pH control and feeding.

The optional microfluidic module eliminates manual liquid handling—no tubing/ pipetting required, as everything is part of the gamma-radiated ready-to-use plate.

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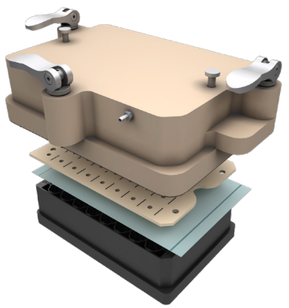
Consider the benefits of these additional new features:

- Capability to fully customize cultivation protocols to cover a broader spectrum of applications
- Enables free combination of different feeding and pH control strategies over one cultivation run
- Updated BioLection software provides an intuitive user interface designed for multi-user environments
- New gassing lid reduces gas consumption and acts as an air-tight anaerobic chamber that can be used with the microfluidic module, eliminating need for anaerobic tents
- Actively regulated O_2 or CO_2 concentration of ingoing gas can be raised to ≤ 100 % or ≤ 12 %, respectively

Innovative new gassing lid

- Enables fed-batch experiments under anaerobic conditions
- Air-tight construction supports strictly anaerobic cultivation without the need to place the entire BioLector XT microbioreactor into an anaerobic chamber

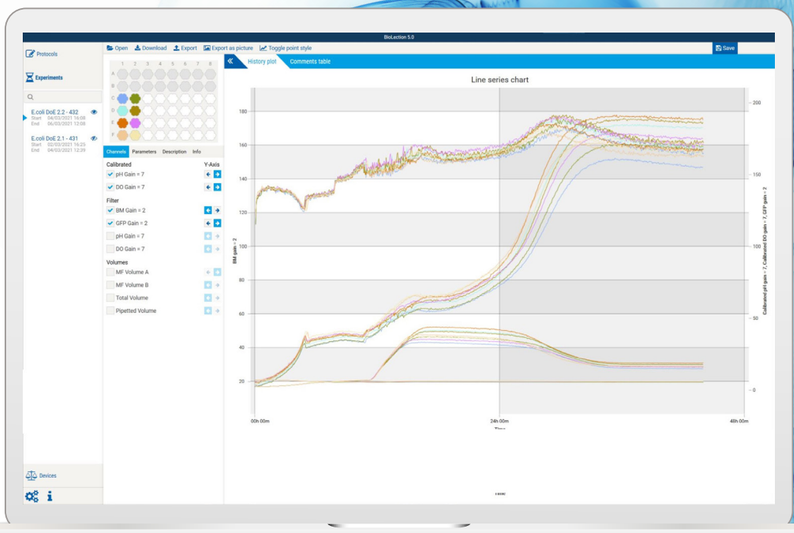


- Gassing with O_2 within a range of 1 % to 100 %
- Gassing with CO_2 within a range of 0 % to 12 %
- Reduces gas consumption to a few mL/minute
- Optional humidification of gases reduces evaporation

MO_2RE flexibility for more applications

- Feeding strategy development
- Feeding rate optimization
- Media screening and optimization
- Cultivation parameter optimization
- pH profiling
- Strictly anaerobic and microaerophilic cultivations in batch and fed-batch mode
- High-oxygen (up to 100 %) and high-carbon dioxide (up to 12 %) cultivations
- Cell line and strain screening
- 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

One easy-to-use tool
to measure all the parameters you need



Intelligent Software

- Fully revised BioLection software with intuitive user interface to help support multi-user environments
- Free programming of all control parameters
- Open system enables live data downloads
- Fast processor ensures rapid download of experiment data
- Simple up- and download of protocol files and results through an intuitive protocol manager and data transfer
- Integrated Lua scripting (optional) complements UI-supported protocol creation functionality and provides deeper access to cultivation protocol programming

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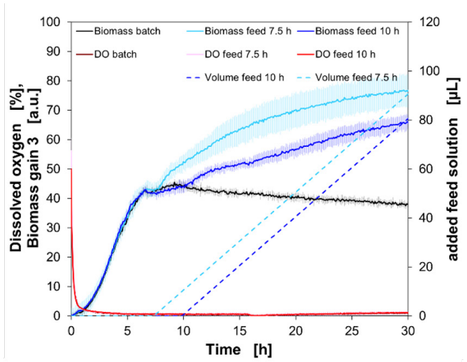
System Performance

- 32/48 parallel microreactions, optionally 16 reservoir wells
- Working volume: 800 – 2400 µL
- Pre-calibrated optical sensors for online pH and DO measurement
- Well-individual pH control and feeding
- Fully flexible feeding options: constant, linear, exponential or signal-triggered, with any combinations possible
- Broad range of k_La values (30 – 600 h^{-1})
- Continuous gas exchange and oxygen supply
- Strictly anaerobic cultivations possible, optionally with active pH control and feeding
- Equal power input into each reactor
- Defined engineering parameters and scalability
- Controlled gas atmosphere (CO_2, O_2)
- Temperature control (8 °C below ambient temperature to 50 °C) with active water cooling



Cultivation of *L. casei* using the gassing lid in the BioLector XT microbioreactor

MO_2RE control & more data for deeper insights

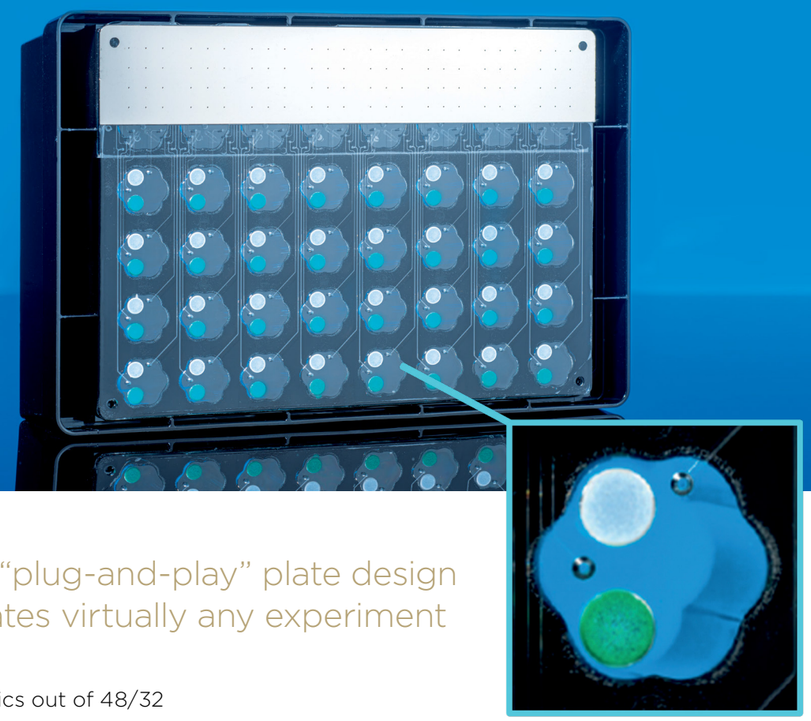
Online Measurement

- Biomass concentration
- pH value
- Dissolved oxygen (DO)
- NAD(P)H and Riboflavins
- Fluorescent molecules (e.g., GFP, YFP, DsRed)
- Shaking speed
- Temperature
- O_2 in head space atmosphere
- CO_2 in head space atmosphere

Online Control

- pH value (well-specific)
- Feeding (well-specific)
- Shaking speed
- Temperature
- Gas flow
- O_2 in head space atmosphere
- CO_2 in head space atmosphere

Smarter, smaller & scalable, so it fits in any lab today or tomorrow



Proprietary, “plug-and-play” plate design accommodates virtually any experiment

- Real-time kinetics out of 48/32 parallel cultivations
- Fully customizable and freely combinable actively regulated feeding strategies (batch, fed-batch, bolus, continuous)*
- Control of pH on-the-plate with pre-calibrated optical sensors*
- Flexible process control of pH, shaking, temperature and gassing
- Strictly anaerobic cultivations with feeding and pH control*
- Cultivation of highly oxygen-demanding strains with up to 100 % O_2
- DO and signal-triggered feeding*
- Low pH measurements and control* available 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*)
- Online biomass measurement requires no dilution
- Small working volume (800 – 2400 µL)
- No edge effects
- Continuous shaking operation (no artifacts)
- Defined mass transfer conditions
- Reliable scale-up to bench-top fermenters
- A valuable tool for PAT and QbD

*Note: functionality requires the optional microfluidic module

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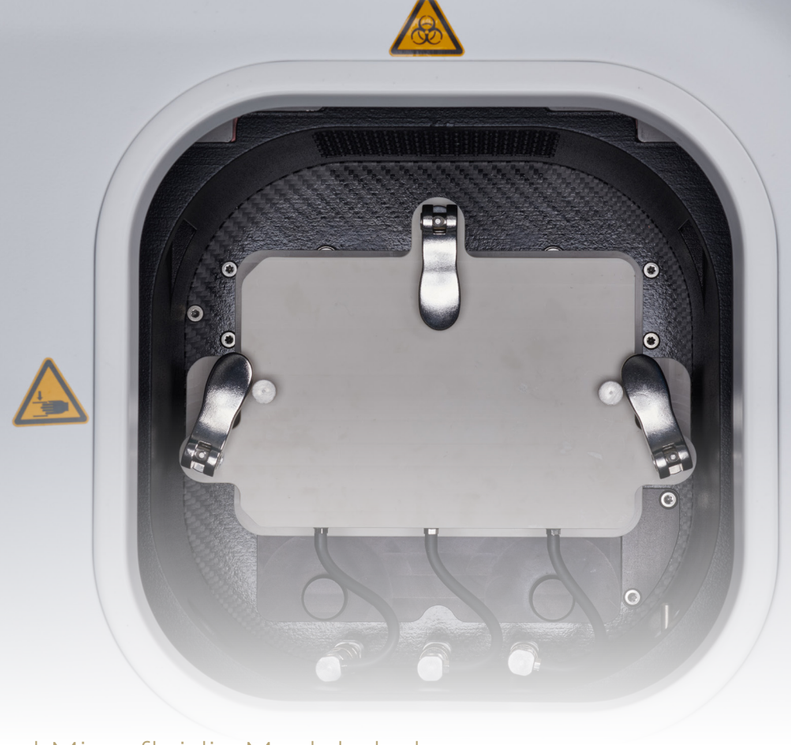
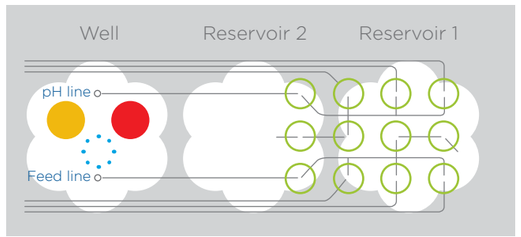


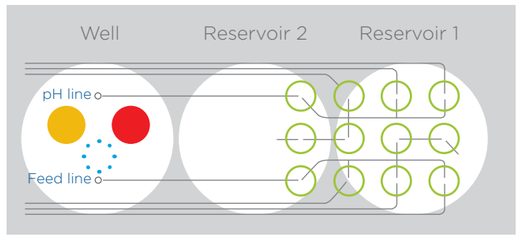
Optional Microfluidic Module helps BioLector XT microbioreactor do even MO_2RE

Microfluidic Control on a FlowerPlate with Optodes



Dissolved oxygen Biomass & fluorescence pH value Micro-valves

Microfluidic Control on a Round Well Plate with Optodes



Dissolved oxygen Biomass & fluorescence pH value Micro-valves

- Unleashes the full potential of the BioLector XT microbioreactor
- Complements online monitoring function with well-specific pH regulation and feeding
- Enables use of 2 reservoir wells per 4 cultivation wells—with either 2 pH-adjusting solutions, 2 feed solutions or 1 of each
- Liquids allotted in nanoliter-scale through microvalves

Technical Specifications

System **Art.-No.: G-BLXT**

Operation conditions

Plate format	48 or 32 reactor/16 reservoir wells
Volume	800 – 2400 µL (depending on microtiter plate type)
Temperature, minimum	On average operating - 8 °C below ambient temperature
Temperature, maximum	50 °C
pH control	Measurement range (see below)
Shaking conditions	3 mm shaker
Shaking frequencies	100 rpm – 1500 rpm

Technical data

Dimensions (W×H×D)	795 mm × 541 mm × 514 mm BioLector XT microbioreactor 685 mm × 360 mm × 502 mm add. valve control unit
Weight	Approx. 58 kg BioLector XT microbioreactor, including MF module 61 kg Approx. 44 kg add. valve control unit (VCU)
Power source	100 - 240 VAC
Max. Output Power	400 W BioLector XT microbioreactor
Rated power VCU	120 W (EU/ROW) / 90 W (US/Canada)
Interface	Ethernet
Ambient conditions	15 – 25 °C, max. < 80 % rH (non-condensing)
Automation	BioLector XT microbioreactor can be integrated into robot liquid handling modules

Optical measurements

Filter configuration	up to 6 different filters
Preinstalled filters	Biomass, Riboflavin, pH and DO
Wavelengths	365 nm–800 nm
MTP read time	~1.8 min/parameter/32 wells ~2.7 min/parameter/48 wells depending on parameter measured and shaking frequency
Scattered light measurement*1 Examples: E. coli in FlowerPlate E. coli in Microfluid Plate	Resolution > 50 NTU, at densities higher than 500 NTU: 10 % of measured value (MTP-48-xxxx), 1–250 OD_{600} *2, (37 °C, 1000 µL, 800 rpm) (MTP-MF32-xxxx), 2–250 OD_{600} *2, (37 °C, 1000 µL, 800 rpm)

Ranges, measurement and pH control

Calibration	Precalibrated plates
Measurement range pH	~5.0 – 7.5 or ~4 – 6 (low pH module) with < 0.1 deviation Ranges are broader with less accuracy
Measurement range DO	0 – 100% oxygen saturation*3
pH control	By acid or/and base
Application mode	Disposable technology

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

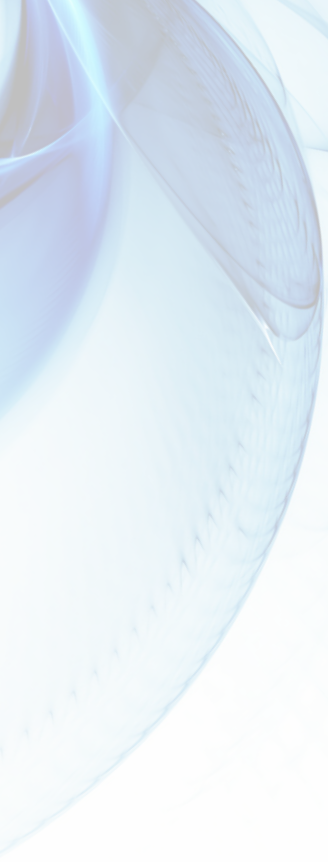
*2 determined in triplicates; resolution is given when the span between the arithmetic averages of the values is larger than three times the larger standard deviation.

*3 100 % corresponding to the DO level reached while gassing with 100 % O_2 without O_2 consumption

Optional Modules

Note: You can combine all optional modules in one device.

Art.-No.	Module Description	Application	Additional feature	Note
E-MFXT	Microfluidic module	Feeding and pH control	Active pH control according to online signals & continuous feeding of up to 2 solutions	Proprietary MTP with microvalves & microfluidic channels required
E-O2XT-100	O_2 up-regulation module	Cultivation with O_2 enriched air	Control of gas atmosphere: 21 – 100 % O_2	
E-O2XT-25	O_2 down-regulation module	Cultivation with O_2 reduced air, microaerophilic conditions	Control of gas atmosphere: 1 – 21 % O_2	Use only with N_2
E-CO2XT-12	CO_2 up-regulation module	Cultivation with CO_2 controlled gas atmosphere	Control of gas atmosphere: 0 – 12 % CO_2	
E-AN-300	Module for anaerobic cultivation	Strict anaerobic fermentation + low controlled gas flow	Gassing with pure N_2	Operates with standard 48-well MTP & 32-well MTP in microfluidic mode (feeding)
E-OP-501-599	LED/Filter module	Measurement of additional fluorescences in BioLector XT microbioreactor	Measurement at additional wavelengths	Custom made filter modules available
E-OP-524	Low pH filter module	Cultivation of yeast, Lactobacillus sp., fungi & more	Low pH measurement, range 4 – 6 pH	Upgradable on-site
E-OP-9xx	Laptop for BioLector system	Laptop for data analysis	Data analysis and visualization on separate computer	



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