



BIOLECTOR XT

MICROBIOREACTOR

High-Throughput Bioprocess Development



GET MO₂RE DATA. NOW.
With or without O₂

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

CULTURE
confidence



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

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



ALL THE BEST FEATURES OF THE
BIOLECTOR PRO - AND MO₂RE.

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 beta-radiated ready-to-use plate.

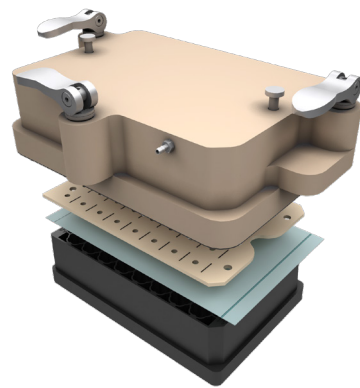
The BioLector XT light array module (LAM) allows cultivation of phototrophic microalgae and cyanobacteria.

Consider the benefits of these additional new features:

- Capability to fully customize cultivation protocols to cover a broader spectrum of applications^{*1}
- Enables free combination of different feeding^{*1} 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 O₂ or CO₂ concentration of ingoing gas can be raised to ≤ 100% or ≤ 12%, respectively
- The light array module (LAM) provides a homogeneous light distribution, which enables phototrophic cultivation

Innovative new gassing lid

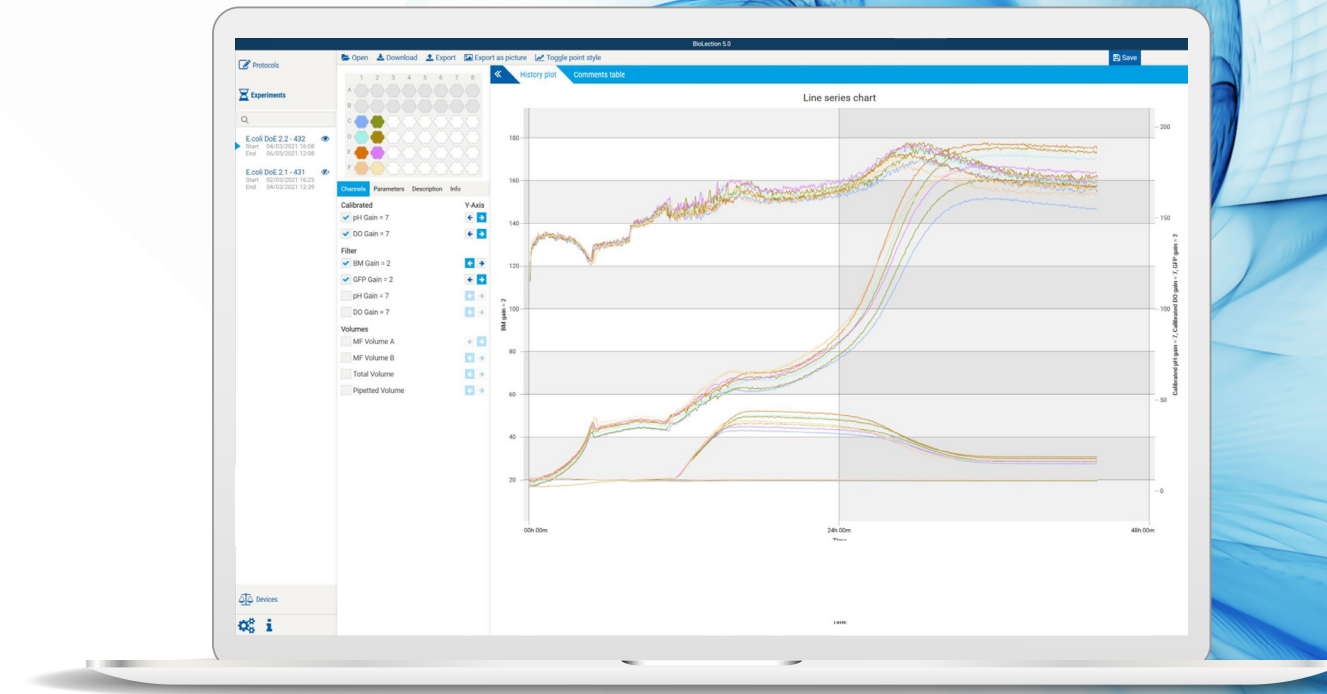
- Enables fed-batch experiments under anaerobic conditions
- Air-tight construction supports strictly anaerobic cultivation without the need to place the entire BioLector XT microbioreactor into an anaerobic chamber
- Gassing with O₂ within a range of 1% to 100%
- Gassing with CO₂ within a range of 0% to 12%
- Reduces gas consumption to a few mL/minute
- Optional humidification of gases reduces evaporation



MO₂RE 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
- Illumination spectra screening for phototrophic algae
- Optogenetics

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



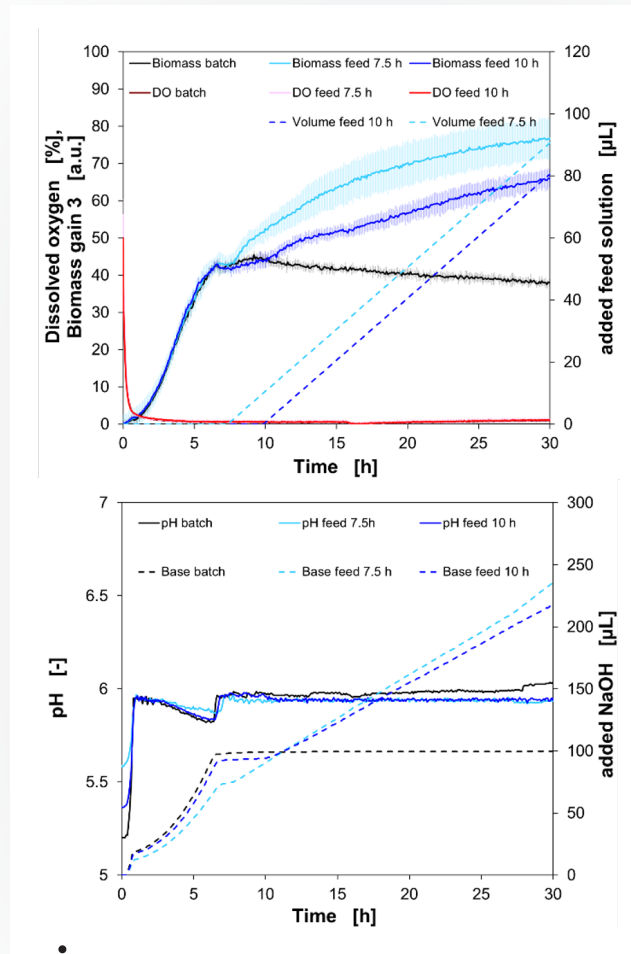
Intelligent Software

- Fully revised BioLection software with intuitive user interface to help support multi-user environments
- Free programming of all control parameters^{*1}
- Open API based on gRPC enables users to monitor live data and change cultivation parameters during a running experiment
- 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
- UI-supported Lua scripting complements standard BioLection 5 protocol creation and provides deeper access to cultivation protocol programming, e.g. combination of feeding profiles

^{*1} This application requires the use of the (UI-supported) Lua scripting functionality.

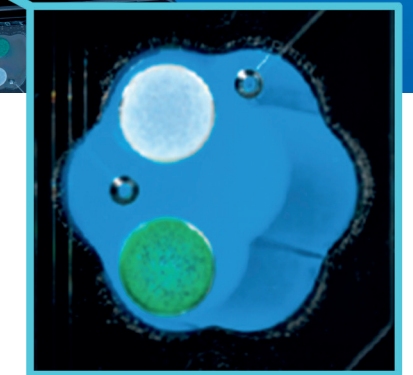
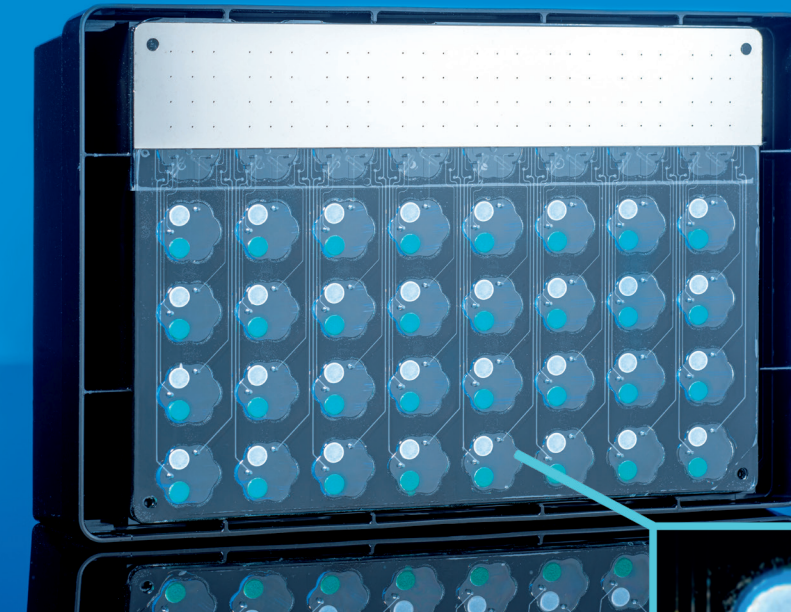
System Performance

- 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 possible¹
- Broad range of $k_L a$ 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 $^\circ\text{C}$ below ambient temperature to 50 $^\circ\text{C}$) with active water cooling
- Cultivation of microalgae and cyanobacteria with up to 3500 $\mu\text{mol}/\text{mm}^2/\text{sec}$ of photon flux density and flexible light spectra (365 -850 nm)



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

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



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

MO₂RE 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
- O₂ in head space atmosphere
- CO₂ in head space atmosphere

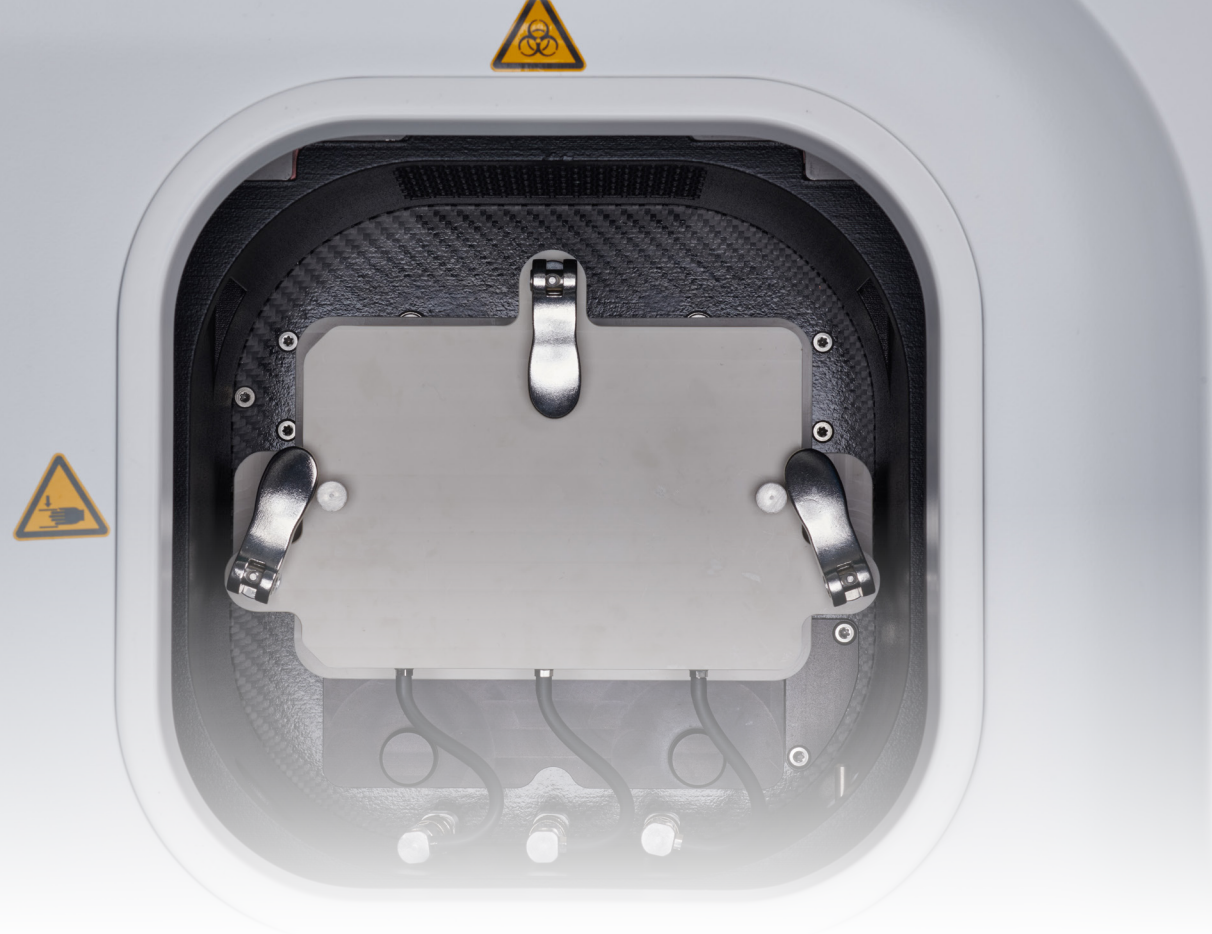
Online Control

- pH value (well-specific)
- Feeding (well-specific)
- Shaking speed
- Temperature
- Gas flow
- O₂ in head space atmosphere
- CO₂ in head space atmosphere
- Photon flux density/irradiation and light spectrum (light array module)

- Real-time kinetics out of 48/32 parallel cultivations
- Fully customizable and freely combinable actively regulated feeding strategies (batch, fed-batch, bolus, continuous)^{1,2}
- Control of pH on-the-plate with pre-calibrated optical sensors²
- Flexible process control of pH, shaking, temperature and gassing
- Strictly anaerobic cultivations with feeding and pH control²
- Cultivation of highly oxygen-demanding strains with up to 100% O₂
- DO and signal-triggered feeding²
- Low pH measurements and control² available 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*)
- 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

^{*1} Combination of different feeding profiles requires the use of the (UI-supported) Lua scripting functionality.

^{*2} Functionality requires the optional microfluidic module.

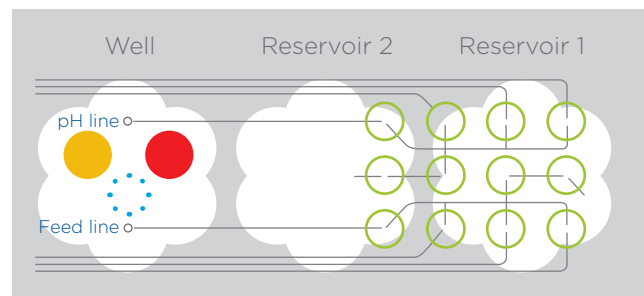


Optional Microfluidic Module helps BioLector XT microbioreactor do even MO₂RE



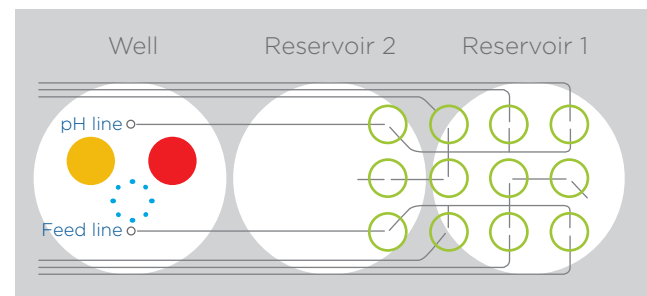
Optional Light Array Module helps to enLIGHTen your BioLector Research

Microfluidic Control on a FlowerPlate MTP with Optodes



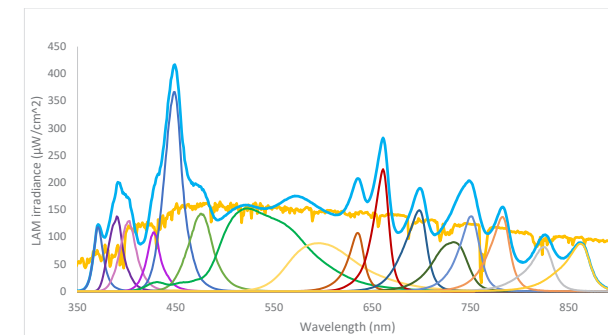
Dissolved oxygen Biomass & fluorescence pH value Micro-valves

Microfluidic Control on a Round Well Plate with Optodes

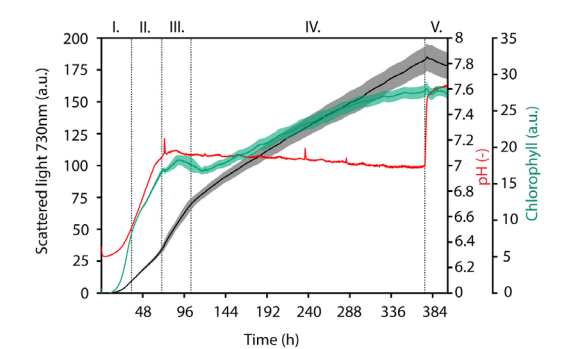


Dissolved oxygen Biomass & fluorescence pH value Micro-valves

Fully flexible illumination spectra



16-day cultivation of *Chlorella vulgaris*



- 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

- Enables cultivation of phototrophic organisms (microalgae and cyanobacteria)
- Customizable, programmable light emission, such as simulated day and night cycles
- Uses up to 16 different LED types with peak wavelengths between 365 and 850 nm
- Homogeneous illumination of the whole microtiter plate

Technical Specifications

System **Part no.: M2P-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)	797 mm × 522 mm × 520 mm Microbioreactor without LAM 797 mm × 557 mm × 520 mm Microbioreactor with LAM 685 mm × 360 mm × 502 mm Valve control unit
Weight	Approx. 61 kg BioLector XT microbioreactor; optional modules: 3 kg MF module, 6.5 kg LAM Approx. 44 kg add. valve control unit (VCU)
Max. power consumption	BioLector XT microbioreactor: < 360 W Valve control unit: < 80 W Light array module: < 240 W LAM chiller unit: < 700 W
Interface	Ethernet
Ambient conditions	15 - 25 °C, max. < 80% rH (non-condensing)
Automation	BioLector XT microbioreactor can be integrated into the Biomek i5 liquid handler

*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% O₂, without O₂ consumption.

*4 Not compatible with LAM due to photo-bleaching of the optodes.

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}	Resolution > 50 NTU, at densities higher than 500 NTU: 10% of measured value
Examples: <i>E. coli</i> in FlowerPlate MTP	(M2P-MTP-48-xxxx), 1-250 OD ₆₀₀ ⁻² , (37 °C, 1000 µL, 800 rpm)
<i>E. coli</i> in Microfluidic MTP	(M2P-MTP-MF32C-xxxx), 2-250 OD ₆₀₀ ⁻² , (37 °C, 1000 µL, 800 rpm)

Ranges, measurement and pH control

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

Light Array Module (LAM)

Max. Photon Flux Density (350 - 900 nm)	3500 µmol/mm ² /s
Max. Irradiance (350 - 900 nm)	700 W/m ²
Operating modes	Pulsed (min. 0.5 Hz / max. 7324 Hz) Non-pulsed
No. of LED types	16
Peak wavelengths LEDs	365, 385, 405, 420, 450, 470, 520, 590, 620, 660, 690, 730, 750, 780, 820 and 850 nm

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

Part no.	Description	Application	Additional feature	Note
M2P-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
C92483	Light array module	Cultivation of microalgae and cyanobacteria	Homogeneous illumination of the microtiter plate	Only for use with MTPs without optodes
M2P-E-O2XT-100	O ₂ up-regulation module	Cultivation with O ₂ enriched air	Control of gas atmosphere: 21 - 100% O ₂	
M2P-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 or N ₂ mixed with up to 12% CO ₂
M2P-E-CO2XT-12	CO ₂ up-regulation module	Cultivation with CO ₂ controlled gas atmosphere	Control of gas atmosphere: 0 - 12% CO ₂	
M2P-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)
M2P-E-OP-501-599	LED/Filter module	Measurement of additional fluorescences in BioLector XT microbioreactor	Measurement at additional wavelengths	Custom made filter modules available
M2P-E-OP-524	Low pH filter module	Cultivation of yeast, Lactobacillus sp., fungi & more	Low pH measurement, range 4 - 6 pH	Upgradable on-site
M2P-E-OP-9xx	Laptop for BioLector device	Laptop for data analysis	Data analysis and visualization on separate computer	

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