

## TECHNICAL SPECIFICATION

The Large-Scale Photobioreactor 25 l

The Large-Scale Photobioreactor 100 l

Cultivation Vessel		
Volume	25 or 100 l	
Shape	Flat, rectangular	
Material	Glass	
Lid	Stainless steel, silicon gaskets, gas and electronics fittings	
Aeration tube	Plastic U-tube with porous polyethylene sparger (pore size 50 $\mu\text{m}$ )	
Sterilization	Hot steam or chemical sterilization possible	
Thermoregulation		
Thermoregulation system	1.000 and 2.500 W heater for 25 l and 100 l PBR, respectively	
Cooling Unit (optional)	Water cooling coil + cooling unit	
Range	30 - 60 $^{\circ}\text{C}$ with ambient temperature around 20 $^{\circ}\text{C}$ 15 - 60 $^{\circ}\text{C}$ ambient temperature not exceeding 30 $^{\circ}\text{C}$ (with optional Cooling Unit)	
Illumination – LED Lighting		
Light panel	Bi-color with separately controllable channels	
Color version	Cool White - Red or Cool White - Blue Other color combination on request	
Total intensity	Up to 500, 200 $\mu\text{mol. m}^{-2} \cdot \text{s}^{-1}$ for White and Red light, respectively	Up to 2.000 $\mu\text{mol. m}^{-2} \cdot \text{s}^{-1}$ (with optional Light Upgrade) Available for 25 l PBR
Light path	6.5 cm $\pm$ 5 %	
Light regime	Light / dark cycles Constant, Linear, Sinusoid light mode Cycles from seconds up to days	Java scripting
Aeration System		
Air sparging	Aeration pump	
Aeration tube	Plastic U-tube with porous polyethylene sparger (pore size 50 $\mu\text{m}$ )	
Bubble interruption valve	Bubbling interruption before OD and Chlorophyll-a fluorescence measurement automatically	
Gas Mixing System GMS 150	For precise concentration and flow rate of the required gases, input pressure 3 – 5 bar, gas cylinders not included	
OD and Chlorophyll-a Fluorescence Monitoring (optional)		
Optical module	For OD and Chl-a fluorescence monitoring	
Optical density	Real time measurement of OD at 680 and 720 nm	
Double-modulation fluorometer	Chl-a fluorescence monitoring induced by blue and red excitation light $F_0, F_T, F_M, F'_M, (F'_M - F_T/F'_M)$	
Optical path	10 mm	

<b>Sensors (optional)</b>	
Electrode module	Enables connecting up to four measuring sensors to the Photobioreactor
Temperature sensor	Platinum Pt 1000 sensor
pH module	Digital pH sensor InPro 3253i/SG/325, cable, SW control
dO <sub>2</sub> module	Digital optical O <sub>2</sub> sensor InPro 6860i/325, cable, SW control
dCO <sub>2</sub> module	Digital CO <sub>2</sub> sensor InPro 5000i/325, cable, SW control
<b>Accessories (optional)</b>	
Light Upgrade	For high-illumination cultivation up to 2.000 $\mu\text{mol. m}^{-2} \cdot \text{s}^{-1}$ Available for 25 l PBR
Gas Mixing System GMS 150	For precise concentration and flow rate of the required gases, input pressure 3 – 5 bar (optional), gas cylinders not included
Turbidostat Module	For fully controlled automatic turbidostatic cultivation Two diaphragm pumps and supporting control software
Chemostat Module	For fully controlled automatic pH-stat cultivation Two peristaltic pumps + one diaphragm pump and supporting control software
Pumps	Up to 8 peristaltic pumps + up to 2 diaphragm pumps
<b>Control Unit</b>	
Photobioreactor control software	For online monitoring and visualization of all measured data as well as creation of user-defined protocols through a user-friendly graphical interface
Java scripting	Allows creation of additional user-defined specific protocols
Remote access	Wi-Fi, Ethernet
<b>Others</b>	
Material	Glass cultivation vessel, stainless steel (lid, cooling spiral), aluminum frame, silicon gaskets, plastic fluorometer, polyethylene sparger
Dimension (h x l x d)	25 l cultivator: ca. 115 x 90 x 70 cm 100 l cultivator: ca. 145 x 185 x 80 cm Storing rack: ca. 200 x 60 x 60 cm
Weight	25 l cultivator: 100 kg 100 l cultivator: 300 kg Storing rack: 150 kg
Electrical	90 – 240 V AC