

## TECHNICAL SPECIFICATION

The Photobioreactor FMT 150/400

The Photobioreactor FMT 150/1000

The Photobioreactor FMT 150/3000

Cultivation Vessel		
Volume	400 / 1000 / 3000 ml (FMT 150/400, FMT 150/1000, FMT 150/3000)	
Shape	Flat, rectangular	
Dimension (h x l x d) / Weight	23.9 x 19.3 x 3.7 cm / 2.8 kg (FMT 150/400) 23.9 x 19.3 x 7.4 cm / 3.8 kg (FMT 150/1000) 31.7 x 30.3 x 7.4 cm / 6.2 kg (FMT 150/3000)	
Material	Glass, stainless steel bottom, silicon gasket, autoclavable	
Lid	Stainless steel 3 big ports for sensors, 4 small Luer connectors for tubing (Ø 6/3 mm) (FMT 150/400 and FMT 150/1000) 4 big ports for sensors, 8 small Luer connectors for tubing (Ø 6/3 mm) (FMT 150/3000)	
Aeration tubes	Stainless steel U-tube with aeration holes (Ø 1 mm) + silicon connection	
Humidifier	Moistening of the sparging air to avoid evaporation from the cultivation vessel	
Sampling	Through the inlet or outlet tubes	
Thermoregulation		
Thermoregulation system	200 W Peltier element (FMT 150/400 and FMT 150/1000) 400 W Peltier (FMT 150/3000)	
Range (ambient temperature around 23°C)	5 - 75 °C (FMT 150/400) 10 - 75 °C (FMT 150/1000 and FMT 150/3000)	
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 1 500 $\mu\text{mol. m}^{-2} \cdot \text{s}^{-1}$	Up to 3 000 $\mu\text{mol. m}^{-2} \cdot \text{s}^{-1}$ (optional with Light Upgrade)
Light path	24 mm (FMT 150/400) 61 mm (FMT 150/1000 and FMT 150/3000)	
Light regime	Light / dark cycles Constant, Linear, Sinusoid light mode Cycles from seconds up to days	Java scripting (advanced PBR control SW)
External light panel	Mounted on the front side, up two colors (optional)	
Aeration System		
Air sparging	Aeration pump	
Aeration tubes	Stainless steel U-tube with aeration holes (Ø 1 mm) + silicon connection	
Bubble interruption valve	Connectors for silicone tubing (Ø 6/3 mm) Automatic bubbling interruption during OD and Chlorophyll-a fluorescence measurement	
Gas Mixing System GMS 150	For precise concentration and flow rate of the aeration gases, gas cylinders not included (optional)	

<b>Mixing (optional)</b>	
Magnetic stirrer	V-200 (FMT 150/400, FMT 150/1000) V-300 (FMT 150/3000) Mounted on the front side
Teflon-coated magnetic bar	35 mm long (Ø 6 mm) FMT 150/400 and FMT 150/1000 60 mm long (Ø 10 mm) for FMT 150/3000 Placed at the front glass panel inside the cultivation vessel Rotation speed adjustable from 10 – 100% (600 rpm for FMT 150/400 and FMT 150/1000, 400 rpm for FMT 150/3000)
Stepper motor	12 V DC / 2 A
<b>OD and Chlorophyll-a Fluorescence Monitoring</b>	
Optical module	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	Ca. 24 mm
<b>Sensors (optional)</b>	
pH / Temperature module	Analogue pH sensor InPro 3253SG/120/PT1000, cable, electronic module, SW control
dO <sub>2</sub> module	Analogue O <sub>2</sub> sensor InPro 6800/12/120, cable, electronic module, SW
dCO <sub>2</sub> module	Digital CO <sub>2</sub> sensor InPro 5000i/12/120, cable, electronic module, SW
<b>Accessories (optional)</b>	
Light Upgrade	High-illumination and homogenous cultivation up to 3 000 $\mu\text{mol. m}^{-2} \cdot \text{s}^{-1}$
External Light Panel	Mounted on the front side, up two colors
Turbidostat Module	For fully controlled automatic turbidostatic cultivation One Peristaltic Pump PP 600 and supporting control software
Chemostat Module	For fully controlled automatic pH-static cultivation Two Peristaltic Pumps PP 600 and supporting control software
pH-stat / Turbidostat Module	For fully controlled automatic pH-stat that is driven by gaseous CO <sub>2</sub> OR for turbidostatic cultivation One Peristaltic Pump PP 600 with one gas valve and supporting control software
Peristaltic Pump PP 600	Up to 8 Peristaltic Pumps in total, each with a range 0.2 – 50 ml/min
PWM Pump (air or liquid)	For pumping gas or liquid into the cultivation vessel
Enhanced Cultivation Vessel	Bottom from nickel-plated brass covered with ceramic layer
Pipetting Insert to the Top Port	An additional small Luer inlet port for tubing (Ø 6/3 mm) placed into the sensor port
<b>Control Unit</b>	
Photobioreactor control software	For online monitoring and visualization of all measured data as well as for creation of user-defined protocols. Advanced / Basic version
Remote access	Wi-Fi, Ethernet
<b>Others</b>	
BIOS	Upgradeable firmware
Communication port	USB A-B
Material	Glass, stainless steel, silicon gasket
Dimension (h x l x d)	42 x 35 x 31 cm (FMT 150/400 and FMT 150/1000) 50 x 35 x 31 cm (FMT 150/3000)
Weight	15.5 kg (FMT 150/400) 17.5 kg (FMT 150/1000) 28 kg (FMT 150/3000)
Electrical	90 – 240 V AC
Max. power consumption	500 W (FMT 150/400 and FMT 150/1000) 750 W (FMT 150/3000) 50 W (GMS 150) 30 W (PP 600)