BIOSTAT® B – The Gold Standard of Benchtop Bioreactors for Cell and Microbial Culture

turning science into solutions

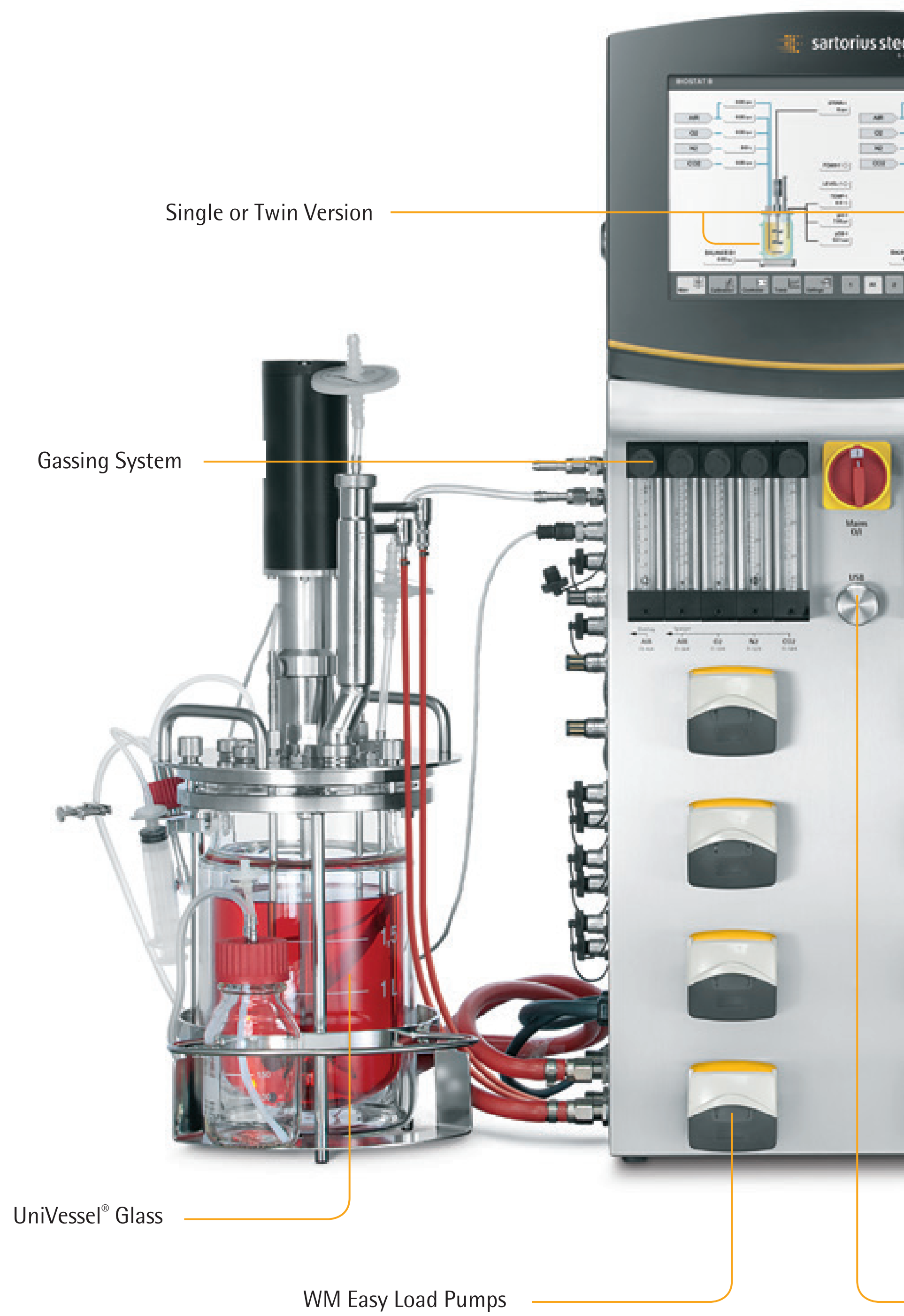
BIOSTAT® B
System Concept

reddot design award
winner 2013

The BIOSTAT® B is a fermenter | bioreactor which has been developed specifically for the varied requirements of biotechnological and biopharmaceutical research and development. With several thousand installations worldwide, BIOSTAT® B is the most successful autoclavable laboratory fermenter system in its class and is now available in the completely re-developed third generation.

Attributes

- Simple cleaning through hygienic stainless steel housing
- Space-saving system concept with connections for one or two culture vessels per control unit
- Clearly presented graphic user interface with color display and 12" touchscreen
- Trend display of up to 8 process values with variable display cycles for a quick overview
- UniVessel® culture vessels 1, 2, 5 and 10 liters
- 2 L single-use, polycarbonate culture vessel for cell cultivation
- High-performance agitation motor for all applications and UniVessel® sizes
- Specially configured gassing systems for microbial and cell culture
- Special configuration for the alternate use of a system for fermentation or cell culture
- Control of agitator speed, pH, DO, temperature, foam, filling level, substrate addition, gas mixture and gas volume
- Scalable culture vessels
- Redox and Turbidity measurement
- Off-gas measurement O_2 | CO_2
- Software for external data aquisition (BioPAT® MFCS)



Nothing should come in just one flavor. Various configurations are available for animal, plant and insect cell culture plus microbial fermentation. The system can control one or two vessels, completely independent of each other.

The controller unit can be combined with our stirred glass vessels (UniVessel®) or single-use vessels (UniVessel SU®). The volumes for our UniVessel® range from 1 L through to 2 L and 5 L up to 10 L. The UniVessel SU® is available as a 2 L polycarbonate vessel.

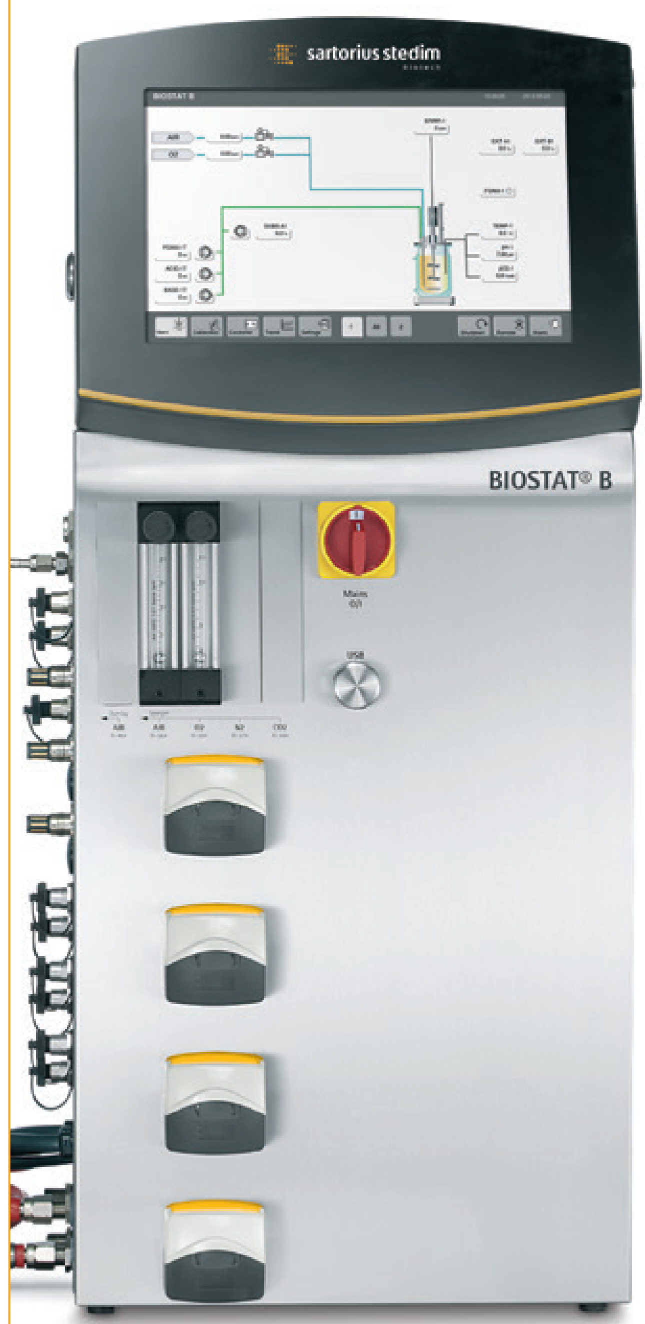
Typical Applications

- Process development for vaccine, recombinant protein and monoclonal antibody production.
- Process strategy development in batch, fed-batch, continuous or perfusion mode.
- Scale-up and scale-down experiments for production scale
- Seed production in small scale
- High cell density fermentation
- Adherent cell culture with microcarriers
- Low-shear cell culture of sensitive organisms
- Cultivation of filamentous organisms
- Biofuel manufacture
- Dual use for both cell culture as well as for microbial applications, e.g. in academic research

The BIOSTAT® B, a product of some of the most forward thinking in the biotech industry, can be supplied as a flexible base unit which is utilized in pre-clinical research up to a completely qualified system that meets the requirements of a validated GMP environment.

BIOSTAT® B
Flexibility Configured to Order

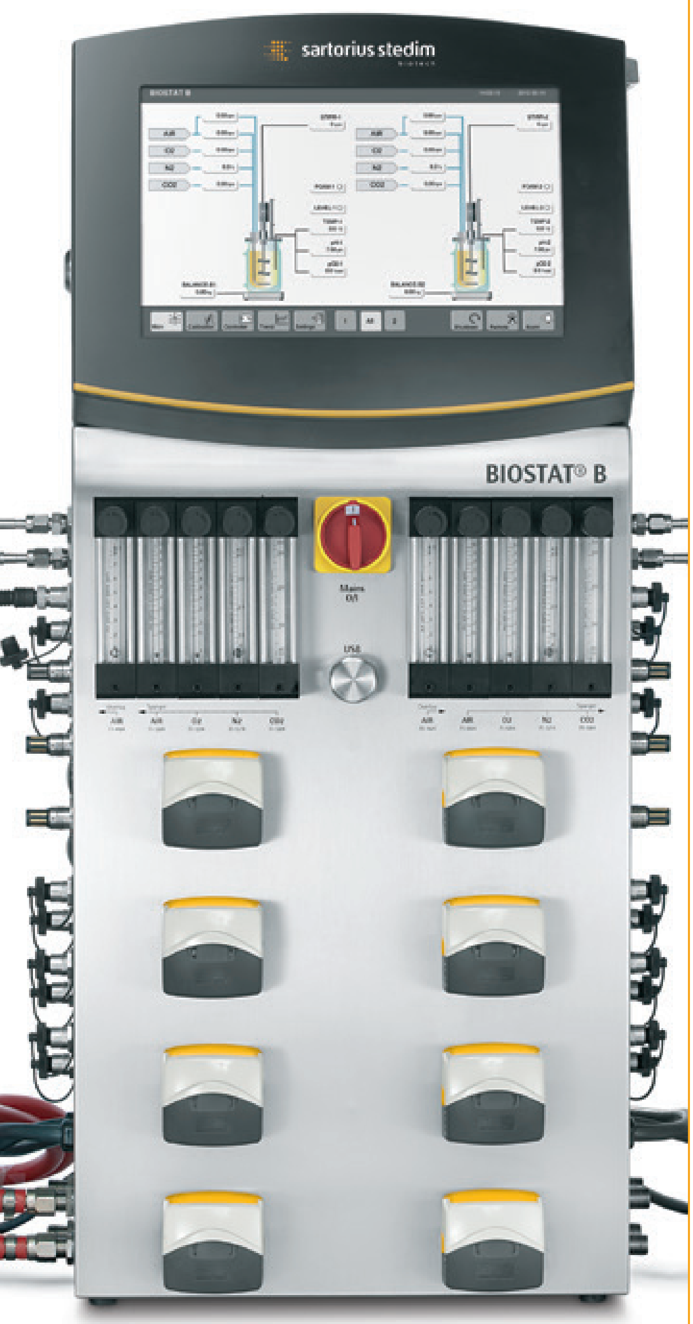
Base Unit Single Version



Easy Load Peristaltic Pumps
It's as easy as open, insert tube, close, finished. No more pinched fingers or torn gloves. Up to six peristaltic pumps can be connected per vessel.

Connections for Sensors & External Devices
All connections for the culture vessels can be made easily with the quick connect couplings. All connections are marked for simple allocation to the culture vessel and as identification in the local control software.

12" Touchscreen
with closed frame; protected against splashing water and dust deposits



Base Unit Twin Version

Control Tower
includes the gassing, pump and temperature control module, saving valuable space in the laboratory

Storage Dish
helps you organize your workstation

New Standards for Interference-Free Measurements
All laboratory inlets for water and gasses are located on the rear of the unit. Mains connection, Ethernet link and a potential-free (common) alarm contact are also positioned on the rear. Complying with the latest standards, the unit is also shielded with a potential equalisation against electromagnetic currents ensuring interference-free measurements during your cultivation process.

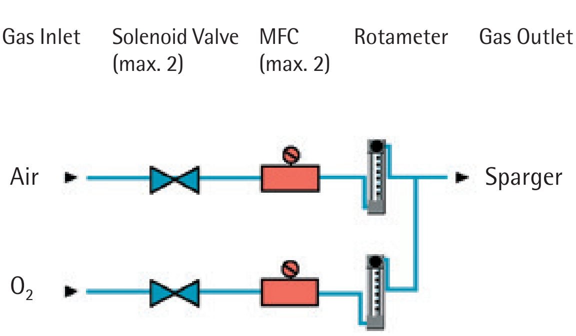
Single | Twin
Need to operate two culture vessels? No problem. One controller can independently control up to two vessels without requiring any extra space. You can freely choose which volumes and culture vessel types should be combined.

BIOSTAT® B
Gassing Strategies

A series of flexible gassing options turn the BIOSTAT® B into a cross-functional system for the most wide-ranging applications from high cell density fermentation with large oxygen demand up to cell cultures which are especially sensitive to shear stress.

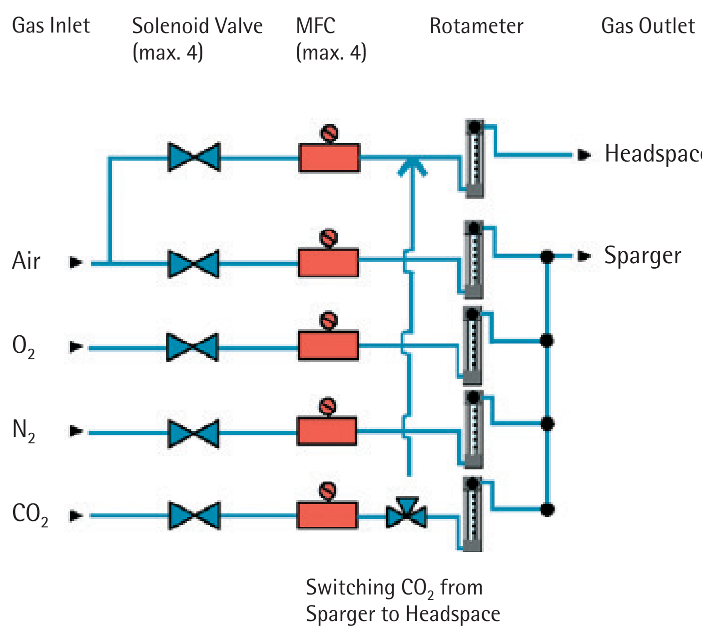
Microbial Applications

Various configurations facilitate gassing with air or oxygen along with the classic O_2 Enrichment function. For anaerobic processes, the air inlet can also be used for nitrogen. The standard installed solenoid valves in combination with a rotameter ensure gas supply for simple applications. Optional mass flow controllers provide an exact dosing of the individual gasses ideal for balancing studies in combination with off-gas analysis.



Cell Culture and Multipurpose Applications

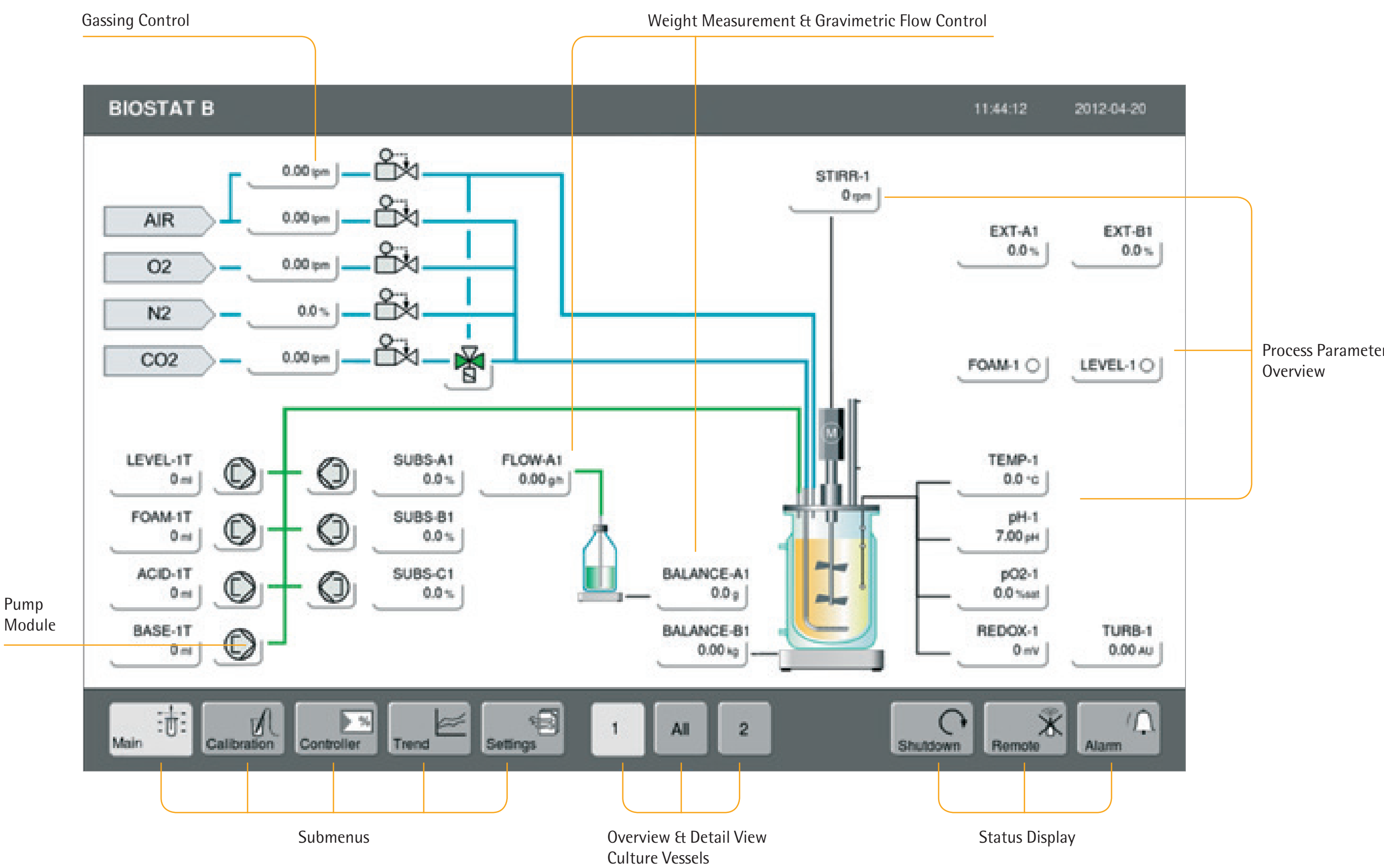
Five different gas paths, equipped with solenoid valves and rotameters or with up to four optional mass flow controllers provide the maximum level of flexibility and precision. Optional switching from sparger to headspace (Overlay) gassing for the CO_2 path facilitates simulating culture conditions with pH control as in an incubator.



DCU
Local Control

Since its introduction in the late 80s, up to today we have installed several thousand digital control units (DCU) in leading companies of the pharmaceutical and biotechnological industry. The DCU controller is one of the best proven, most secure and most flexible control solutions both in the upstream and in the downstream process. Thanks to its continuous development, the control platform is now available in the 4th generation and is the standard automation platform for our BIOSTAT® bioreactors, SARTOFLOW® Crossflow filtration units and FlexAct® configurable production solutions.

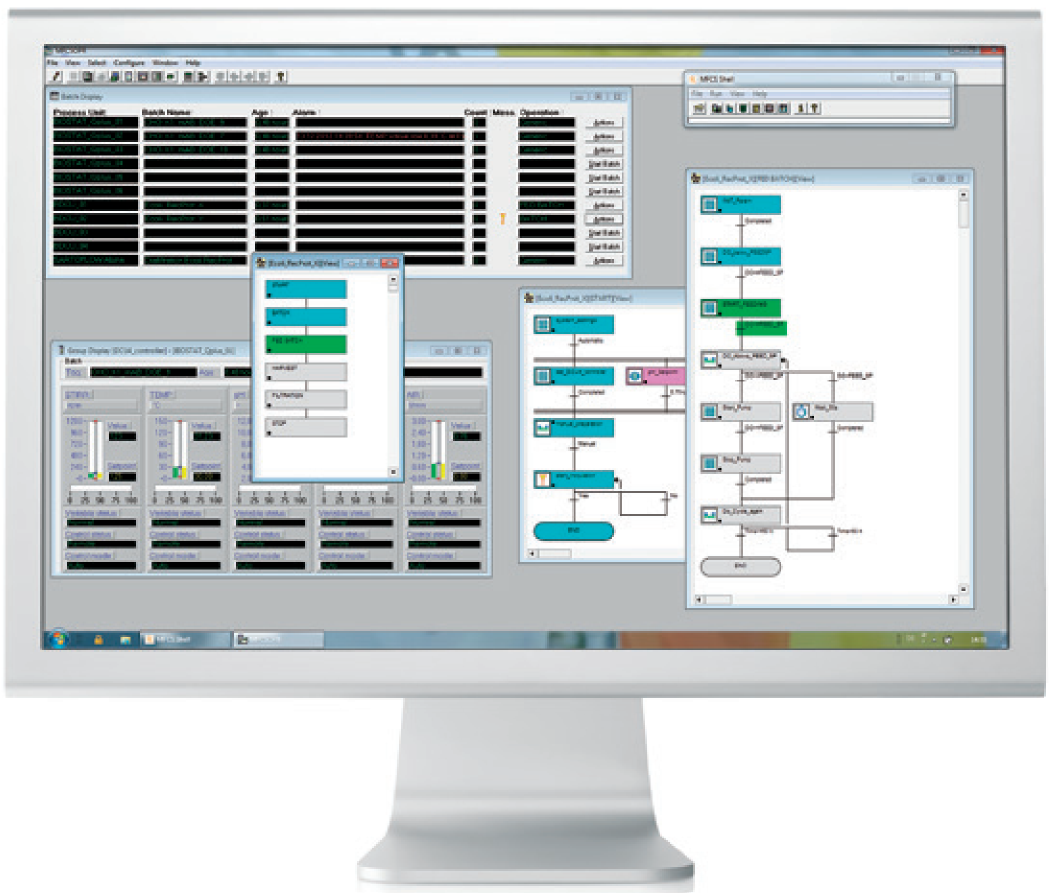
An intuitive touchscreen is used for local process control of BIOSTAT® B:



BioPAT® MFCS
SCADA Process Control

BioPAT® MFCS is the international standard software for the supervisory control and data acquisition of bio-processes. More than 25 years of experience have left their mark on the current version of BioPAT® MFCS. With more than 2,700 installations it is the reliable basis for your individual requirements.

As standard equipment, we supply a version for data recording (BioPAT® MFCS) with every bioreactor.



BioPAT® MFCS | win

The optional advanced version of BioPAT® MFCS includes, along with a genuine SCADA system for conventional and single-use bioprocess applications, a series of add-on modules:

- Bioprocess optimization with Design of Experiments module (DoE)
- Automation with recipes according to ANSI | ISA-88.01
- 21 CFR, Part 11 compatibility
- Secure integration into company networks
- Flexible device connection facility through OPC
- Expanded data logging and data archiving
- Logging of alarms and transmission to multimedia devices

BIOSTAT® B – Technical Specifications

Weights Control Tower	
Single | Twin	~ 40 | 55 [kg]
Dimensions Control Tower (B × H × T)	
Single | Twin	410 × 810 × 520 [mm]
Utility Connections	
Power Supply	– 230 V (± 10%), 50 | 60 Hz, power consumption 8 A – 120 V (± 10%), 50 | 60 Hz, power consumption 10 A – Device protection class IP 21 – Potential equalisation
Gasses	– Gas supply pressure max. 1.5 barg – Dry, oil and dust-free – Connection hose coupling ∅ external = 6 mm
Water	– Water supply pressure max. 2 barg – Flow rate max. 4 l/min – Temperature min. = 4°C – Discharge pressureless – Connection hose coupling | ∅ external = 10 mm – Degree of hardness: max. 12 dH
Control Tower	
Controller	Single-board computer
Housing	Stainless steel AISI 304
Display	Touchscreen 12"
Resolution	125 dpi
Host communication	Industrial Ethernet
Potential-free (common) alarm contact	•
Safety valve gasses	1 bar
Water inlet pressure reduction value	1.5 bar

Gassing Module

Outlet to culture vessel	Hose coupling ∅ external = 6 mm
MO (Microbial)	**2-Gas mix with sparger outlet**
AIR with O_2 Enrichment or Gas Flow Ratio mixing along with anaerobic fermentation; Max. total flow	2 vvm
CC (Cell Culture)	**4-Gas mix with sparger and headspace outlet**
Additive Flow 4-gas (Air, O_2, N_2, CO_2) mixture	
Flow rates	0.05 – 1 vvm
Dual use	**4-Gas mix with sparger and headspace outlet**
Additive Flow 4-gas (Air, O_2, N_2, CO_2) mixture	
Flow rates	0.05 – 2 vvm
Rotameter	
Precision	± 5 % FS
Various models available	MO (2 Rotameters): 0.1–20 lpm CC (5 Rotameters): Sparger: 5 ccm – 4.2 lpm | Headspace: 0.1-13 lpm
Dual use	5 ccm – 20 lpm

Mass Flow Controller Optional	
AIR | N_2, O_2 or CO_2 calibrated	
Precision	± 1 % FS

Various models available	MO (max. 2 MFCs): 0.03 - 20 slpm CC (max. 4 MFCs): Sparger: 1 sccm – 4.2 slpm | Headspace: 0.03–10 slpm
Dual use	1 sccm – 20 slpm
Drive Motor	
Maintenance-free, quiet direct drive	Power 200 W
Maintenance-free top drive with magnetic motor coupling	Power 200 W

Pump Module

Built-in Pumps	
Fixed speed (on | off controlled)	Watson Marlow 114, easy load pump head
– Speed 40 rpm Flow rate (tubing wall thickness 1.6 mm)	ID: 1,6 mm: 0,17–8,4 ml/min ID: 3,2 mm: 0,56–28,2 ml/min
– Speed 5 rpm Flow rate (tubing wall thickness 1.6 mm)	ID: 1,6 mm: 0,01–0,7 ml/min ID: 3,2 mm: 0,05–2,4 ml/min
Speed controlled	Watson Marlow 114, easy load pump head
– Speed 0.1-200 rpm Flow rate (tubing wall thickness 1.6 mm)	ID: 1,6 mm 0,01–28,0 ml/min ID: 3,2 mm 0,05–94,0 ml/min
External Pumps	
Speed controlled	Watson Marlow 120, easy load pump head
– Speed 0.1-200 rpm Flow rate (tubing wall thickness 1.6 mm)	ID: 1,6 mm: 0,01–28,0 ml/min ID: 3,2 mm: 0,05–94,0 ml/min

Temperature Control Module

Single-wall Culture Vessels	
Electrical heating system with heating sleeve and optional cooling finger	
Temperature control of 8°C above cooling-water inlet temperature up to 60°C	
Heating capacity 1 L | 2 L | 5 L | 10 L	100 | 170 | 400 | 780 [W]
Connections to exhaust cooler and cooling finger with quick connect couplings	
Double-wall (Jacketed) Culture Vessels	
Open thermostat system with circulation pump and automatic cooling water valve	
Temperature control of 8°C above cooling-water inlet temperature up to 80 °C	
Heating capacity 2 × 300 [W]	
Connections to the culture vessel and exhaust cooler with quick connect couplings	
External Signals per Culture Vessel	
Balance connection RS-232	2
External signal input 0–10 V	2
External pumps	2

Process Control | Sensors

Rotation speed motor, direct coupling 1 | 2 | 5 | 10 [L]	20–2.000 | 20–2.000 | 20–1.500 | 20–800 [rpm]
Sensor | Measurement range | Display accuracy	
Temperature	Pt100 with thermowell | 0–150°C (temperature control 0-80°C) | 0.1°C
Dissolved oxygen	Polarographic or optical | 0–100 % | 0,1 %
pH	Combined measuring electrode | 2–12 pH | 0,01 pH
Foam control	Electrical conductive sensor, stainless steel, ceramic insulated
Mechanical foam control	Anti-foam disk (MO applications): min. stirrer speed 300 rpm | PEEK
Level	Electrical conductive sensor, stainless steel, ceramic insulated
Turbidity	1-channel NIR absorption sensor | 0–6 AU | 0,01 AU
Redox	Combined measurement with pH sensor | -1.000 – 1.000 mV | 1mV
Balance substrate	max. 7 kg | 1 g
Balance culture vessel	max. 60 kg | 2 g

Culture Vessel UniVessel®

Autoclavable single-wall or double-wall (jacketed) glass vessel	1 L	2 L	5 L	10 L
Material	Borosilicate glass, stainless steel ISI 316L, EPDM			
Sizes [L]	1	2	5	10
Total volume [L]	1.6	3	6,6	13
Working volume [L]	0.4–1	0.6–2	0.6–5	1.5 | 5–10
Top port 19 mm | 12 mm | 6 mm	3 | 2 | 6	3 | 2 | 9	3 | 3 | 8	5 | 2 | 9
UniVessel®, single-wall	**1 L**	**2 L**	**5 L**	**10 L**
Weights[1] [kg]	6	7	12	19
Space requirement autoclave [W × H × D mm]	200 × 540 × 270	230 × 600 × 300	260 × 730 × 340	330 × 860 × 420
Space requirement autoclave, reduced[2] [W × H × D mm]		480 × 410 × 300	530 × 510 × 410	540 × 630 × 420
UniVessel®, double-wall	**1 L**	**2 L**	**5 L**	**10 L**
Weights[1] [kg]	7	8	14	23
Space requirement autoclave [W × H × D mm]	330 × 540 × 270	380 × 600 × 300	410 × 730 × 340	450 × 860 × 420
Space requirement autoclave, reduced[2] [W × H × D mm]		480 × 410 × 300	530 × 510 × 410	540 × 630 × 420

[1] With tripod and head plate, without medium
[2] Adapter for exhaust cooler to reduce height in the autoclave optionally available

Possible set-up (freely configurable):
Stirrer shaft with single-mechanical seal and direct coupling
Stirrer shaft with single-mechanical seal and magnetic coupling
3-blade segment impeller | 6-blade disc impeller (Rushton) | Paddle impeller
Addition bottles: 250 ml | 500 ml | 1000 ml
Bottle holder
Aeration filter Midisart® 2000 | Sartofluor capsules
Ring sparger | Micro-sparger | Aeration basket for bubble-free gassing
Inoculation port
Exhaust cooler
Heating blanket for single-wall vessels
Cooling finger for single-wall vessels
4-way addition port | 3-way addition port
Universal adapter ID 3.2 mm
Harvest pipe height adjustable | Harvest pipe bent for complete draining
Baffles
STT Connector 2 mm | 5 mm
Port adapter 19 mm ▶ 12 mm
Manual sampler
Tool set for vessel dismantling
Consumables including filters, O-rings and other accessories
Spin filter for cell retention in perfusion applications

Culture Vessel UniVessel® SU

Single-use vessel made of pre-sterilized polycarbonate for cell culture applications	
Total volume [L]	2.6
Working volume [L]	0.6-2
Max. temperature	50 °C
Operating pressure	< 0.5 barg
Max. stirrer speed	400 rpm

Ordering information for connection to BIOSTAT® B Control Tower	
DUO002LL-SS----V	UniVessel® SU 2l culture vessel, 2× pack
DZ-------MB	Motor adapter BIOSTAT® B, direct coupling
DZ-------VHB	UniVessel® SU holder, basic
DZ002L---VHI	UniVessel® SU holder adapter ring 2l
DZ-------FH1	Filter heater UniVessel® SU

Basic Configurations

The BIOSTAT® B is a highly flexible and modular system that can be individually adapted to the demands and requirements of your application. Below please find an overview of the basic equipment which can be expanded with diverse options. Please contact your Sartorius Stedim Field Representative or Application Specialist for additional information.

Microbial Packages – Ordering Information

Volume	1 L	2 L	5 L	10 L
Single	RBB1M01L	RBB1M02L	RBB1M05L	RBB1M10L
Twin	RBB2M01L	RBB2M02L	RBB2M05L	RBB2M10L

Digital controller, color display with touchscreen	•
Control temp, pH, DO, stirrer speed	•
Maintenance-free, quiet motor	•
Storage dish for accessories	•
Gassing module with 2 solenoid valves	•
2 rotameters for manual flow-rate control (AIR | N2, O_2)	•
Software configured for microbial applications	•
4-stage DO cascade	•
BioPAT® MFCS software for data acquisition	•
2 integrated pumps for pH control (Acid | Base)	•
Temperature control module for double-wall vessels	•
2 external signals 0–10V	•
Standard test and documentation	•
Installation set for the gas and water connections	•
Mains cable	•
Double-wall culture vessel	•
Stirrer shaft with single-mechanical seal and direct coupling	•
2 addition bottles for correction agents	•
Exhaust cooler	•
Aeration filters	•
Rushton impellers	•
Ring Sparger	•
4-way addition port	•
Inoculation port	•
Harvestpipe, height-adjustable	•
Manual sampler	•
Tool set for vessel dismantling	•
Pt100 temperature sensor	•
pH sensor	•
DO sensor, amperometric	•

Cell Culture Packages – Ordering Information

Volume	**1 L**	**2 L**	**5 L**	**10 L**
Single	RBB1C01L	RBB1C02L	RBB1C05L	RBB1C10L
Twin	RBB2C01L	RBB2C02L	RBB2C05L	RBB2C10L
Digital controller, colour display with touchscreen	•			
Control temp, pH, DO, stirrer speed	•			
Maintenance-free, quiet motor	•			
Storage dish for accessories	•			
Gassing module with 4 solenoid valves	•			
5 rotameters for manual flow-rate control (AIR Overlay, AIR Sparger, N_2, O_2, CO_2)	•			
Software configured for cell culture applications	•			
4-stage DO cascade	•			
BioPAT® MFCS software for data acquisition	•			
1 integrated pump for pH control (Base)	•			
Temperature control module for single-wall vessels	•			
2 external signals 0–10V	•			
Standard test and documentation	•			
Installation set for the gas and water connections	•			
Mains cable	•			
Single-wall culture vessel with tripod	•			
Heating blanket 120 | 230 V	•			
Stirrer shaft with single-mechanical seal and direct coupling	•			
1 addition bottle for correction agent	•			
Exhaust cooler	•			
Aeration filters	•			
3-blade segment impeller	•			
Micro-sparger	•			
4-way addition port	•			
Harvest pipe, height-adjustable	•			
Manual sampler	•			
Tool set for vessel dismantling	•			
Pt100 temperature sensor	•			
pH sensor	•			
DO sensor, amperometric	•			

Options

Control System	
Advanced DO controller	•
Flexible switching CO_2 from sparger to headspace	•
Software for dual use MO | CC	•
Massflow controller	•
Antifoam control via sensor	•
Mechanical foam destroyer (MO applications)	•
Level control via sensor	•
Weight measurement substrates | culture vessel	•
Gravimetric feed | level control	•
Substrate addition via time profile	•
Redox measurement	•
Turbidity measurement	•

O_2 | CO_2 off-gas analysis	•
System IQ | OQ	•
BioPAT® MFCS SCADA system	•
Culture Vessel	
Magnetic coupling for drive motor	•
STT connectors for safe inoculation and media transfer	•
Cooling finger (single-wall culture vessels)	•
Spinfilter for perfusion mode	•
Aeration basket for shear stress sensitive organisms	•
Paddle impeller | Rushton impellers | 3-blade segment impellers	•
Baffles	•
Bottle holder	•
Adapter for height reduction of exhaust cooler for the autoclave	•
Inoculation port	•
Consumables set	•
Double-wall culture vessel	•
UniVessel® SU single-use culture vessel (CC applications)	•

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