



The Smarter Solution

BioFlo® 320 – Universal controller for cell culture and microbiology research



Highly Evolved

The BioFlo 320 seamlessly combines form and function in one state of the art package regardless of whether your process includes cell culture or fermentation, autoclavable or single-use bioreactors. A robust industrial design, intelligent sensors, Ethernet connectivity, and enhanced software capabilities are only a few of the features that set it apart from the competition. Combined with a sincere commitment to quality, the BioFlo 320 truly is the premium choice in bench-scale bioprocess control systems.

Application Driven

- > Industrial design featuring stainless steel front, back, and utility panels
- > Left- and right-handed orientations to maximize lab space efficiency
- > Hemispherical vessel nest design for minimum footprint
- > Highly configurable gas flow control - Up to 5 configurable Mass Flow Controllers (TMFC) for Overlay and Sparge

Scalability

- > Extensive working volume range of 400 mL – 40 L on a single control platform
- > High-powered direct and magnetic drive motor assemblies
- > Up to six integrated pumps capable of operating in variable speed mode
- > The combination of the BioFlo 320 with the BioFlo 720 provides a perfect connection between R&D and pilot/production suites

Risk mitigation

- > Monitor and control the process directly at the large touch-screen or with our Eppendorf SCADA software
- > Alarm functions automatically stop all running loops if needed
- > Automatic recognition of the connected digital sensors and installed TMFCs
- > Robust protection of sensitive electronic components (IP68-rated connections on utility panel and IP22-rated connection for power entry)
- > Universal connections for analog or digital Mettler Toledo® ISM® sensors reduce sensor complexity

Ease of Use

- > Autoclavable vessels and our comprehensive portfolio of BioBLU® Single-Use Bioreactors provide process customization
- > Eppendorf exclusive packed-bed and cell-lift impeller designs for continuous and perfusion processes
- > Thermal mass flow controllers for sparge and overlay gas can be upgraded in the field
- > Universal gas control strategy for both microbial and cell culture applications removes process limitations
- > Industry standard Ethernet communication for multi-unit control of up to eight systems

Small footprint... big impact

From R&D laboratories to pilot-scale production facilities, space is an important factor when selecting the right equipment. The BioFlo 320 offers flexibility, better control, and maximum functionality while occupying a fraction of the valuable lab space of similar systems. This means greater efficiency and productivity at a lower operating cost for your lab.



Application Driven

Designed for cGMP environments

The next generation of our BioFlo 320 bioprocess control system combines the benefits of a classical industrial design with the power of our improved BioFlo control software.

Developed to be used in cGMP regulated environments, Emerson® and Eppendorf have partnered to develop seamless communication between the DeltaV™ distributed control system and the BioFlo 320 bioprocess control system. Our open communication protocol exposes controller information allowing it to be integrated into broader features and functions of the DeltaV platform, simplifying tech transfer, scale-up, and recipe sharing in bioprocess research and process development.

High-powered direct and magnetic drive motor assemblies; capable of clockwise and counterclockwise rotation

Ultra-compact design with vessel nest for minimum footprint; left- and right-handed orientations to maximize lab space

Sixteen interchangeable autoclavable vessels and the comprehensive line of BioBLU Single-Use Bioreactors

Four universal connections for analog or digital Mettler Toledo ISM sensors

Control up to eight units from a single user interface

Interchangeable TMFC drawers for sparge and overlay gas flexibility

Unique variable/ fixed speed front-mounted pumps capable of clockwise and counterclockwise rotation

Industrial, brushed stainless steel panels provide enhanced corrosion resistance

Single-use bioreactors:
0.40 L – 40 L

Process control:
Cell culture or
Microbiology

Vessel material:
Glass or
Single-Use

Autoclavable bioreactors:
0.6 L – 10.5 L



Scalability

The perfect connection from R&D to production

Seamless transition of your process from 400 mL to 40 L and beyond. In combination with the BioFlo 720 bioprocess control system, we designed a bioreactor control platform that supports one of the widest range of single-use solutions, allowing the scale-up of your process to up to 2,000 L.

The updated and improved BioFlo software ensures a consistent user experience across all BioFlo control systems and comes with new features to improve your process.

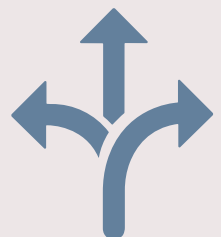
BioBLU® Single-Use Bioreactors



- > Compatible with 400 mL – 40 L BioBLU Single-Use Bioreactors, including the BioBLU 5p, the first single-use bioreactor to utilize the exclusive packed-bed impeller
- > Built-in optical pH sensor technology
- > Vessel and exhaust heat blanket connections provide precise temperature control and exhaust gas treatment
- > Bench-scale single-use bioreactors specifically designed for microbial fermentation
- > Rigid-walled, stirred-tank design provides many advantages over single-use bag design
- > Eliminates potential for tears, pits, and folds during installation
- > Single-layer polymer removes both uncertainty for leachable and extractable data and the need for unnecessary preventative actions, like pre-process media wash

Application flexibility

- > Suitable for the use in all labs, from academia through pilot-scale production
- > Batch, fed-batch, perfusion, and continuous processes
- > Universal control for mammalian, stem cell, insect, microbial, plant, and algae cultures
- > Secreted product, vaccine, and monoclonal antibody production
- > Biofuels research and manufacturing
- > Scale-up and scale-down modeling
- > Suspension or adherent cultures
- > Micro-aerobic, anaerobic, exothermic fermentation processes
- > Specialized impellers for low-shear and zero-shear process needs
- > Food and beverage
- > Fine chemical processes





Risk Mitigation

Monitoring and control of critical system parameters

Parallel processing is key to efficiently optimizing a process or to producing reproducible results. Eight units of the BioFlo 320 bioprocess control system can be connected to each other and controlled by a single unit. The control software gives valuable insights into all processes, such as current process parameters, and the lifetime of connected digital sensors.



Monitoring the controller and the process is key to successful process development. The BioFlo 320 software features screens, designed to provide you with the status of both.

- > Alarm functions automatically inform about the status of the process, with automatic loop shutdown if needed
- > Receive alarm notifications via email or text message directly to your mobile device
- > The diagnostic screen provides information on the hardware status and upcoming maintenance

Intelligent Sensors



- > Integrated Mettler Toledo Intelligent Sensor Management (ISM) platform
- > Universal connections for up to four analog or digital (ISM) sensors
 - > pH: analog or digital (ISM)
 - > DO: analog or digital (ISM)
 - > Optical DO: digital (ISM)
 - > Redox: analog or digital (ISM)
 - > CO₂: digital (ISM)
- > Real-time sensor diagnostics anticipate sensor failure

Full integration of bioprocess software and data into Emerson's DeltaV™ system

Eppendorf and Emerson have collaborated to integrate Emerson's DeltaV™ distributed control system (DCS) with the BioFlo 320 bioprocess control system.

- > Full integration of bioprocess software and data into Emerson's DeltaV system
- > Simplified tech-transfer, scale-up, and recipe sharing in bioprocess research
- > Manage data and use the same automation systems throughout the product development process, from bioprocess research to manufacturing

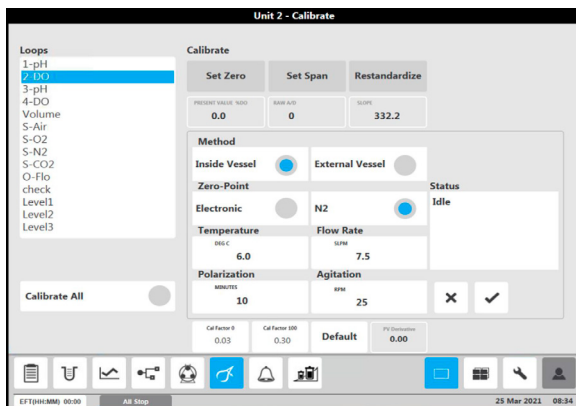




Ease of Use

Advanced software making life easier

The new release of the BioFlo software ensures a consistent user experience across all BioFlo control systems and comes with new features to improve your process. Develop your process with the BioFlo 320 and seamlessly scale-up from 50 L – 2,000 L with the BioFlo 720 bioprocess controller. New software features such as the *Auto Calibrate* and *Scale Up Assist* function simplify your process, mitigate risk, and help to save time.

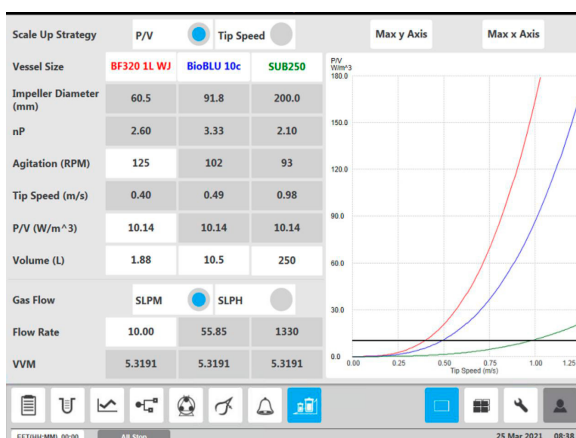


Auto Calibrate

- > Automated calibration for all attached DO sensors at once
- > DO sensors can be run through an automatic calibration sequence reducing touch time and ensuring consistency
- > User specifies calibration scheme, process conditions, and zero-point method (electronic or N₂)
- > System completes calibration when slope stabilizes

Parallel Control

- > Control eight units from a single user interface
- > Automatic gas mixing algorithms for simplified control (4-gas, 3-gas, O₂ enrichment, N₂ enrichment)
- > Ten-point cascade feature for sophisticated control strategies
- > Built-in elapsed fermentation timer for batch management
- > Trend display with up to twelve process values within a single view



Scale Up Assist

- > Scale Up modeling software for the calculation of important process parameters
- > The integrated *Scale Up Assist* of the BioFlo software calculates all parameters based on either constant P/V or constant tip speed
- > Up to 3 different vessel sizes can be selected from
- > The software contains vessel specific data from the Eppendorf vessel portfolio and the Thermo™ Scientific HyPerforma™ 5:1 Single-Use Bioreactors (SUBs).

Technical Data

BioFlo 320 Specifications

Control Station			
Dimensions (W x D x H)	40.6 x 40.6 x 66.0 cm (16 in x 16 x 26 in)		
Net weight	32 kg (70 lb)		
Touchscreen	38.1 cm (15 in) projected capacitive touchscreen		
Communication	2 x USB (software updates, serial communication) Ethernet (SCADA, IP Network) 3 x Analog Input/Output (defined as 4 – 20 mA or 0 – 5 V or 0 – 10 V)		
Utility	Connection	Requirement	
Electrical	IEC (with regional plug types)	100 – 120/208 – 240 VAC, 50/60 Hz, 2270 VA, Single Phase	
Water	Stainless steel quick-connect	10 psig (0.69 barg)	
Gas supply (Air, O ₂ , N ₂ , CO ₂)	Push-connect	Autoclavable	Single-use
		10 psig (0.69 barg)	6 psig (0.44 barg)
Exhaust	0.5 psig (0.035 barg)		
Operating conditions	10 – 30 °C, up to 80 % RH, non-condensing		
Altitude limit	2000 m		
Agitation			
Direct drive	1 L, 3 L: 25 – 1500 rpm 5 L, 10 L: 25 – 1200 rpm		
Magnetic drive (autoclavable vessels)	1 L, 3 L, or 5 L: 10 – 500 rpm 10 L: 10 – 150 rpm		
Magnetic drive (single-use vessels)	BioBLU 1f: 10 – 1200 rpm; BioBLU 3f: 25 – 1200 BioBLU 1c: 10 – 500 rpm BioBLU 3c, 5c, 5p, 10c & 14c: 10 – 200 rpm BioBLU 50c: 10 – 150 rpm		
Temperature			
Water-jacketed	5 °C above coolant to 55 °C above ambient (80 °C max)		
Stainless steel dish-bottom	5 °C above coolant to 65 °C above ambient (90 °C max; 85 °C max for 10 L)		
Single-use	5 °C above ambient to 40 °C (60 °C max for BioBLU 1)		
Sensor type	PT100		
Gas supply			
Sparge	1, 3, or 4 TMFC; ring or micro-sparger		
Overlay	1 TMFC; headspace addition		
Sensors	Communication	Control range	
pH	Analog or digital Mettler Toledo ISM	2 – 12	
Optical pH	Digital (Presens)	6 – 8	
DO	Analog or digital Mettler Toledo ISM	0 – 200 %	
Optical DO	Digital Mettler Toledo ISM	0 – 200 %	
Redox	Analog or digital Mettler Toledo ISM	(-)2000 mV – (+)2000 mV	
CO ₂	Digital Mettler Toledo ISM	0 – 100 %	
Pumps	Pump Head	Variable Speed	Fixed Speed
Pumps 1, 2, & 3	Watson-Marlow 114DV	5 – 25 rpm	25 rpm (0 – 100 % Duty Cycle)
Pump 4	Watson-Marlow 314D	20 – 100 rpm	100 rpm (0 – 100 % Duty Cycle)
External pumps 1 & 2	Watson-Marlow 120U/DV	0.1 – 200 rpm	N/A

Specifications subject to change.

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