eppendorf

Every Move, Seamlessly Transferred

BioFlo® 320 plus – Universal controller for cell culture and microbiology applications, building the bridge from research to manufacturing

eppendorf
BioFlo® 320 plus

Seamless Transfer

The BioFlo 320 plus is a universal bench-scale bioreactor system engineered to enable seamless process transfer from R&D to clinical and commercial manufacturing. Powerful technology for precise process monitoring and control, a large working volume range, the interchangeability of glass and BioBLU Single-Use Bioreactors, and software tools that save time, reduce risks, and enable powerful data analysis make it a reliable partner for developing robust processes and scaling them up from R&D to manufacturing. It is suitable for cell culture as well as microbial applications.

Application Driven

> Universal gas control strategy for both microbial and cell culture applications removes process limitations
> Industrial design featuring stainless steel front, back, and utility panels
> Eppendorf exclusive Cell Retention Diptube and packed-bed and cell-lift impellers for continuous and perfusion processes
> Vessel nest design to maximize lab space efficiency
> Highly configurable gas flow control - Up to 5 configurable Mass Flow Controllers (TMFC) for Overlay and Sparge that can be field upgraded
> Validation Guide available to support controller qualification for manufacturing applications[1)]

Scalability

> Autoclavable vessels and our comprehensive portfolio of BioBLU® Single-Use Bioreactors provide process customization
> Extensive working volume range of 420 mL – 40 L on a single control platform
> The combination of the BioFlo 320 plus with the BioFlo 720 provides a perfect connection between R&D and pilot/production suites
> High-powered direct and magnetic drive motors and up to six integrated variable speed pumps for precise stirring and addition control

Simple and Safe Operation

> Alarm functions automatically stop all running loops if needed
> Automatic recognition of the connected digital sensors and installed TMFCs
> Diagnostic screen to view system status, maintenance schedule and pump usage
> Robust protection of sensitive electronic components
> Universal connections for analog or digital Mettler Toledo® ISM® sensors and Hamilton ARC® sensors reduce sensor complexity

Open Communication

> Industry standard Ethernet communication for multi-unit control of up to eight systems
> Monitor and control the process directly at the large touch-screen or with Eppendorf SCADA software
> DASware® control for enhanced efficiency, providing recipe management, scripting, and more
> DASware control plus with 21 CFR part 11 and EudraLex Volume 4 Annex 11 compatibility
> BioNsight® cloud provides comparison of data from different runs and different locations

[1] *BioFlo 320 plus is not a medical device as defined by the Food and Drug Administration or other regulatory authorities.*

Small footprint... big impact

From R&D laboratories to manufacturing facilities, space is an important factor when selecting the right equipment. The BioFlo 320 plus 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

Highly configurable to suit your requirements

The BioFlo 320 plus offers the highest level of application flexibility, made possible by features like universal connections for analog and digital sensors, up to six integrated pumps, a highly configurable gas flow control, and compatibility with a wide range of glass and single-use bioreactors. It is suitable for the cultivation of human and animal cells, including stem cells, as well as microbial fermentation. It supports batch, fed-batch, continuous, and perfusion mode.

Four universal connections for analog or digital Mettler Toledo ISM sensors and Hamilton ARC sensors

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

Control up to eight units at the same time using DASware control SCADA software

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

Interchangeable TMFC drawers for sparge and overlay gas flexibility

Brushless front mounted pumps capable of clockwise and counterclockwise rotation

Industrial, brushed stainless steel panels provide enhanced corrosion resistance

Ultra-compact design with vessel nest for minimum footprint to maximize lab space

Single-use bioreactors:
0.40 L – 40 L

Autoclavable glass bioreactors:
0.6 L – 10.5 L

Intelligent sensors:
Connections for up to four analog or digital Mettler Toledo ISM and Hamilton ARC sensors

Process control:
Cell culture or microbiology

Application Driven

Seamlessly connect R&D to manufacturing

The BioFlo 320 plus bioprocess control system is designed to provide a seamless transfer between research and development and manufacturing. It is suitable for many applications, including the production of cells, secreted proteins, viral vectors, plasmids, and small molecules. By enabling seamless transfer of optimized protocols from R&D to manufacturing, the BioFlo 320 plus ensures consistency and scalability, helping you accelerate your path from innovation to market.

Application flexibility

> Suitable for the use in all labs, from academia through pilot-scale production
> Universal control for mammalian, stem cell, insect, and microbial cultures
> Suspension or adherent cultures
> Micro-aerobic, anaerobic, exothermic fermentation processes
> Batch, fed-batch, perfusion, and continuous processes
> Scale-up and scale-down modeling
> Specialized impellers for low-shear and zero-shear process needs
> Used in a variety of applications, including the production of monoclonal antibodies, vaccines, viral vectors, plasmids, and stem cells

Explore the range of applications for the BioFlo 320 plus
These application notes, based on the BioFlo 320, remain fully relevant. The BioFlo 320 plus retains all the core capabilities of the previous model and adds new features, enabling you to transfer your process with ease.

Glucose control using Raman spectroscopy in CHO cell culture www.eppendorf.group/AN415	*CHO cell culture scale-up for mAB production* www.eppendorf.group/AN436
HEK 293 suspension cell culture www.eppendorf.group/AN447	*Large-scale manufacturing of hiPSC-derived cardiomyocytes* www.eppendorf.group/AN409
High-density Vero cell perfusion culture www.eppendorf.group/AN359	*Pichia pastoris fermentation* www.eppendorf.group/AN438

Transition seamlessly from R&D to clinical and commercial manufacturing

Translate your R&D upstream bioprocess achievements into clinical and commercial manufacturing success with our integrated solutions.

Aided by Validation Guides to support equipment qualification, the BioFlo 320 plus in combination with BioBLU HNQ Single-Use Bioreactors, DASware control plus SCADA software, and service offerings for qualification and calibration, provides a unified solution to support compliance with GMP requirements.

Learn more on
www.eppendorf.group/commercial-bioprocessing

Scalability

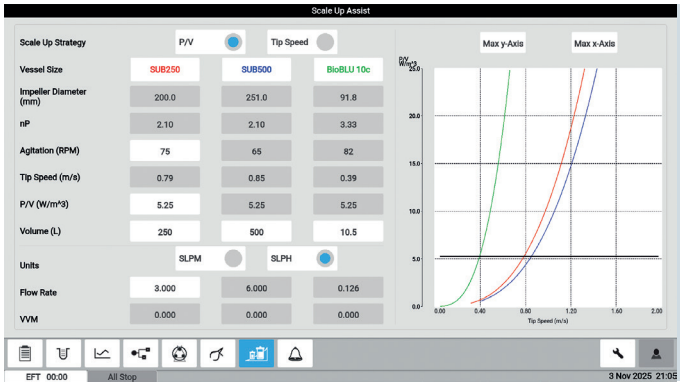
Scale-up from small scale to bench scale

BioFlo 320 plus glass bioreactors provide optimal conditions and flexibility for microbial fermentation and cell culture applications. With a scalable design, ranging from 600 mL to 10 L, they help with the transition from small-scale experiments to bench-scale operations. With specialized impellers for cell culture applications and documentation helping you with the qualification for use in manufacturing environments, they are the perfect tool advancing your R&D projects to the next level.

BioFlo® 320 plus glass bioreactors

> Working volume range of 0.6 – 10.5 L
> Direct drive and magnetic drive agitation options
> Clock-wise and counter clock-wise rotation
> Stainless steel dished bottom vessels for rapid heat transfer
> Water-jacketed vessels for gentle temperature control
> Industry standard headplate ports for sensors and sampling and addition tubes
> Specialized spin filter, cell lift and packed-bed impellers for cell culture applications requiring low-shear or no-shear agitation
> Validation Guide available to help qualify the glass bioreactors for use in manufacturing environments.

BioFlo 320 glass bioreactors	1 L	3 L	5 L	10 L
Total volume	2.5 L	5.0 L	7.5 L	14.0 L
Working volume	0.6 – 1.9 L	1.3 – 3.8 L	1.9 – 5.6 L	3.5 – 10.5 L
Heating/cooling	Stainless steel dish bottom or water-jacketed			
Agitation	Direct drive or magnetic drive			



Scale Up Assist **– integrated into the BioFlo software**

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

Scalability

The perfect connection from R&D to manufacturing using BioBLU Single-Use Bioreactors

The BioFlo 320 plus can seamlessly operate with our BioBLU Single-Use Bioreactors in R&D as well as in manufacturing. Our BioBLU HNQ Single-Use Bioreactors come with a Validation Guide, just like the BioFlo 320 plus controller to help with the qualification of the systems for manufacturing applications. Combined with the BioFlo 720, this provides scale-up possibilities from 420 mL to 500 L with single-use vessels.

BioBLU® Single-Use Bioreactors

How BioBLU Single-Use Bioreactors benefit you:

> Scalability: Working volume range 65 mL to 40 L
> Risk mitigation: Reduced contamination and cross-contamination risk
> Productivity: Reduced turn-around times; less cleaning effort
> Flexibility: Several bioreactor versions meet the different process needs of microbes and human and animal cells, including stem cells
> Reduce capital investment: by using your existing bioprocess controller
> Validation Guide available to help qualify the BioBLU HNQ Single-Use Bioreactors for use in manufacturing environmnent

Find out more about at
www.eppendorf.group/single-use-bioreactors

Cell Culture Scale-Up Using Single-Use Bioreactors

Find out more, how we streamlined cell culture scale-up:

> Read about the characterization of the BioBLU c Single-Use Bioreactor portfolio
> Discover the Scale Up Assist software feature
> Find a case study for scale-up of mAB production in CHO cells from 3 L to 150 L

www.eppendorf.group/cell-culture-scale-up

Simple and Safe Operation

Monitoring and control of critical parameters

The BioFlo software ensures a consistent user experience across all BioFlo control systems and helps you simplify your process, mitigate risk, and save time. The control software gives valuable insights into your process, such as current process parameters, status of connected sensors, and any alarms that require attention.
Eight units of the BioFlo 320 plus bioprocess control system can be connected to each other and controlled via a single DASware control SCADA software installation. This enables parallel processing, which is highly valuable for optimizing processes efficiently and producing reproducible results.

Simplify process control

The control software gives valuable insights into critical process parameters. Software features such as the *Auto Calibrate* and *Scale Up Assist* function simplify your process and help to save time.

Powerful process control

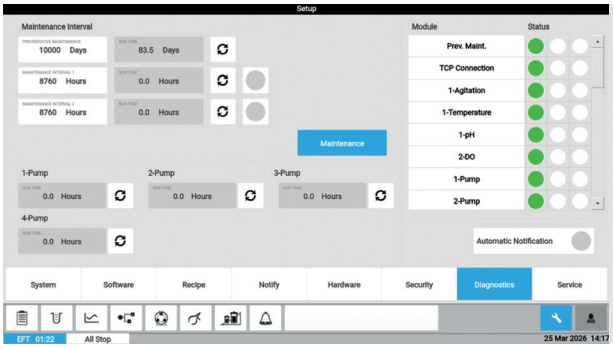
> Automatic gas mixing algorithms for simplified control (4-gas, 3-gas, O_2 enrichment, N_2 enrichment)
> Ten-point cascade feature for sophisticated control strategies
> Built-in elapsed process timer for batch management
> Trend display with up to twelve process values within a single view

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 N_2)
> System completes calibration when slope stabilizes

Mitigate risks to protect your process

Monitoring the controller and the process is key to successful process development. The BioFlo 320 plus software is 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
> Real-time diagnostics of digital sensors anticipate sensor failure

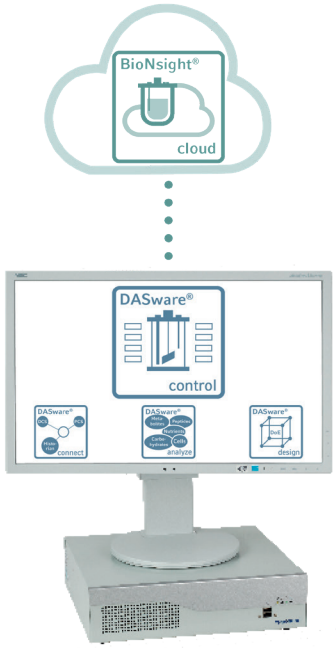
Open Communication

Bioreactor systems and software solutions – Orchestrated for bioprocess control, automation, and analysis

The BioFlo 320 plus fits seamlessly into our upstream bioprocess portfolio of bioreactor systems, control software, data analysis tools, and automation solutions. The products work in harmony to provide a complete upstream bioprocessing solution, enabling controlled cell cultivation, process automation for increased efficiency, and reduced manual labor. Additionally, our solutions help generating and best using valuable bioprocess data, empowering you to develop better processes faster.

Reduce complexity
DASware® control serves as the central software solution, thereby eliminating the need to learn multiple tools.

Integrate your devices
DASware control and the Eppendorf bioprocess control systems facilitate the full integration of lab devices such as the Bioprocess Autosampler and third-party sensors.



Simplify data sharing
Easily share your bioprocess data with your team and collaboration partners enabled by DASware control and BioNsight cloud software.

Improve data analysis
Contexualize data across devices, runs, and sites with BioNsight cloud software.

Expand the BioFlo 320 plus functionality with the Eppendorf bioprocess software solutions

Visit our eshop to find more information about our bioprocess software solutions:

www.eppendorf.group/bioprocess-software

Automate 24/7 sampling with the Bioprocess Autosampler

The BioFlo 320 plus connects seamless with the Bioprocess Autosampler. Find out more about this system here:
www.eppendorf.group/bpautosampler

Technical Data

BioFlo 320 plus 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	39.6 cm (15.6 in) wide screen 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		
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: 5 – 500 rpm 10 L: 5 – 150 rpm		
Magnetic drive (single-use vessels)	BioBLU 1f: 10 – 1200 rpm; BioBLU 3f: 25 – 1200 rpm 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		
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 and Hamilton ARC	2 – 12	
Optical pH	Digital (Presens)	6 – 8	
DO	Analog or digital Mettler Toledo ISM and Hamilton ARC	0 – 200 %	
Optical DO	Digital Mettler Toledo ISM and Hamilton ARC	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**	
Pumps 1, 2, & 3	Watson-Marlow 114DVP	0.1 – 25 rpm	
Pump 4	Watson-Marlow 314DV	0.1 – 150 rpm	
Pump 4 (dual pump head)	Watson-Marlow 314X	0.1 – 125 rpm	
External pumps 1 & 2	Watson-Marlow 120U/DV	0.1 – 220 rpm	
	Watson-Marlow 323U/314D	3 – 400 rpm	
	Watson-Marlow 530U/520R2	0.1 – 220 rpm	
	Watson-Marlow 630U/620R	0.1 – 265 rpm	

Specifications subject to change.

Get in Touch

Would you like to get more information about the BioFlo 320 plus or discuss your individual requirements? Get in touch, we are all ears!

Visit our eshop to find more detailed product information or inquire a product:
www.eppendorf.group/bioflo320plus-system

Or simply mail to **bioprocess-info@eppendorf.com** with any question.

Eppendorf Bioprocess Products – application in GMP regulated environment

Download document to find out which features you can expect at minimum from Eppendorf products that are deemed suitable or compatible for GMP.

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www.eppendorf.group/bioflo320plus-system

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