

Basic Benchtop Bioprocess Controller

FERMENTATION

PRODUCT SUMMARY

The Fermentation Model of our Basic Benchtop Bioprocess Controller (BPC) is an innovative solution designed to meet the demands of cell culture applications. Powered by your choice of automation and control software, this controller provides comprehensive regulation and direction for the cell culture process. It offers features with integrated equipment and instrumentation, including precise pH, dissolved oxygen (DO), and temperature control, with the option to add weight measurement for feed and nutrient control and vessel weight monitoring. The controller ensures accurate gas control through mass flow controllers, efficient agitation, and precise liquid delivery with variable speed pumps featuring totalizer and dosing capabilities. The open-architecture mechanical design and flexible hardware options ensure seamless integration and customizable operating ranges to meet specific

process requirements. The BPC system is designed to accommodate working volumes ranging from 2L to 15L and is available in various configurations based on your biomanufacturing needs. This fermentation controller allows for manual and semi-automated operation, offering unparalleled control, flexibility, and efficiency in cell culture processes.

BENEFITS OF THE AES FERMENTATION BASIC BPC:

- Standard integration with Rockwell, with options for stand-alone systems or your preferred DCS.
- Configurable hardware and flexible operating ranges meet specific process needs, supporting various fermentation applications.
- Ensures high-precision workflows, accommodating complex bioprocessing tasks with accuracy and reliability.
- Compatible with various bioreactor vessels, both single- and multi-use, ensuring seamless integration and performance.

APPLICATIONS:

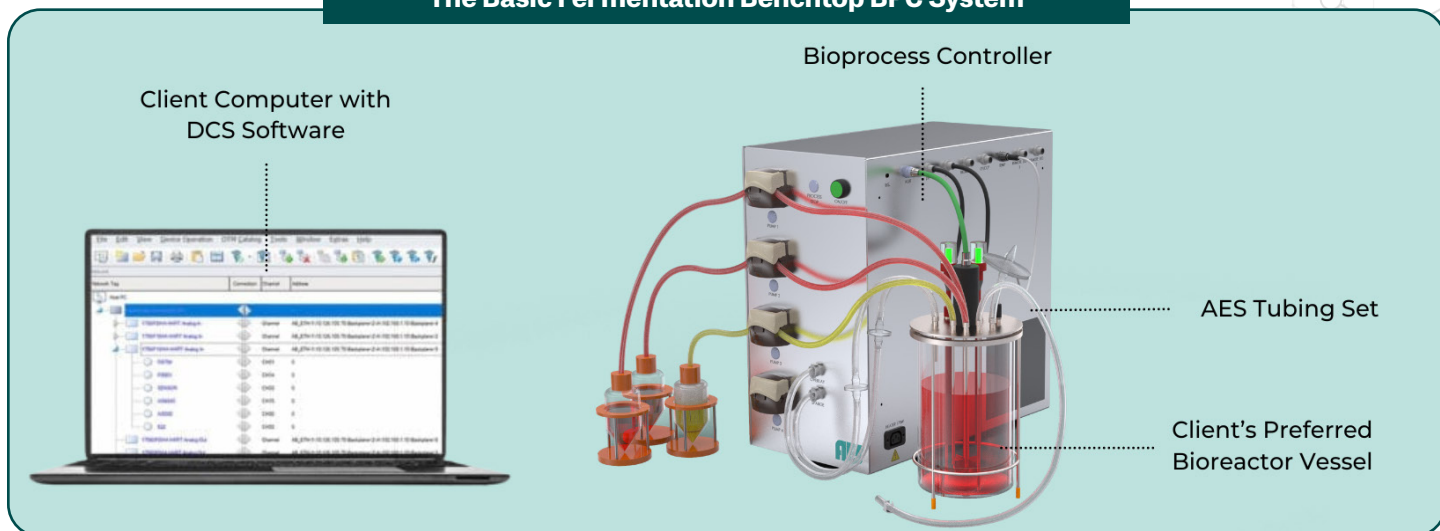
The Fermentation Model of our Basic BPC provides precise control over agitation and aeration, ensuring optimal growth conditions for your fermentation processes. This controller is ideal for a wide range of fermentation applications, empowering users to maximize productivity and achieve optimal results in areas such as:

- Microbial Fermentation
- Expression and Optimization of Recombinant Proteins
- Antibody Screening and Production
- Food and Beverage Fermentation
- Process Development for Biosimilar Production
- Nutrient and Feed Control

SYSTEM OVERVIEW

Users can customize the Fermentation Model of our Basic Benchtop BPC to meet their needs due to its flexibility and adaptability. The system is designed to minimize the benchtop footprint with a compact, ergonomic enclosure, and all components are made of stainless steel panels to resist corrosion and ensure long-term use. The standard offering for this fermentation controller is Rockwell™, allowing for easy control and monitoring from their computer. In addition, users can customize their cell culture process to meet specific requirements by setting up manual or semi-automated sequences.

The Basic Fermentation Benchtop BPC System



SCALABILITY:

This fermentation controller is a versatile and robust piece of equipment, offering exceptional functionality for process development and seamless integration with advanced manufacturing processes. It provides precise control, allowing optimal cell culture conditions and enhanced productivity. The fermentation controller's vessel geometry, gas transfer capabilities, and mixing performance adhere to industry standards. Whether you're involved in technology transfer, process troubleshooting, or development, this benchtop controller is the ideal tool to drive innovation and efficiency.

AUTOMATED PROCESS MONITORING & REMOTE CONTROL:

Users have the flexibility to configure alerts and set points, tailoring them specifically to their unique application requirements. Monitor trend reports for these process values, gaining valuable insights into the performance of their system. Create, edit, and save methods, enabling them to optimize cell culture protocols according to their needs. This comprehensive suite of features empowers users to effectively manage their operations and identify deviations from the defined culture parameters.

DESIGNED FOR A REGULATED ENVIRONMENT:

The fermentation controller can be designed to meet a regulated environment's rigorous demands and standards if required. In addition, the Basic Benchtop Bioprocess Controller is GMP compliant and can be incorporated to meet 21 CFR Part 11 compliance regulations.

BIOPROCESS CONTROLLER:

The system's main component is the bioreactor module, controlling agitation, liquid management, temperature, pH, DO, and gas. Due to its high-powered drive motor assemblies, it can rotate the agitator clockwise and counterclockwise and operate four integrated pumps with variable speed modes. This control system monitors real-time data from pH and DO probes.

Liquid Management:

The bioreactor module is equipped with four onboard pumps; these pumps control liquid flow rates and volumes, enabling accurate dispensing and sampling of liquids. The peristaltic pump head design ensures gentle handling of shear-sensitive materials, while the bi-directional stepper motor provides excellent accuracy and precision.

Measurement of pH & DO:

The bioreactor module's pH and DO probes provide real-time monitoring and control of pH and DO levels throughout the bioprocessing application. The pH probe uses industry-proven technology and utilizes an optical DO probe with a stainless steel body. The digital probes work with the Benchtop BPC, enabling real-time monitoring and control of pH and DO.

Temperature Control:

The bioreactor module offers precise temperature control, essential for cultivating temperature-sensitive cells or producing heat-sensitive proteins. An optional custom heating jacket is available for the bioreactor vessel,

even heating for optimal cell growth coil also be combined with the heating jacket to create a temperature-controlled environment within the vessel.

Gas Control:

The fermentation controller is equipped with one MFC that allow precise control of Clean Compressed Air (CCA) with the option to add O₂. The system can accommodate up to two MFCs, facilitating the integration of additional gases to diverse overlay and sparging strategies. The gas is controlled to overlay or sparge via three-way valves. By leveraging MFCs and agitation, the controller ensures reliable and accurate bioprocess control, guaranteeing superior outcomes.

Weight Measurement (Optional Instrumentation):

Enhance the functionality of your bioreactor module by configuring it with scales for feed lines, harvest, and vessel weight. This integration enables the controller to cater to various applications, including batch and fed-batch cultures. The fermentation controller automatically delivers the required additions, guaranteeing comprehensive control across all cell culture applications. This streamlined workflow enhances efficiency and productivity.

FLUID HANDLING:

Explore our seamlessly integrated solutions for fluid management, encompassing both our meticulously designed single-use tubing system and a range of vessel options tailored to your processes.

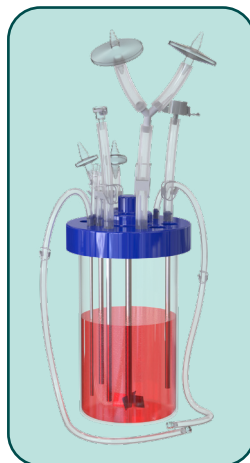
Vessel Selection:

Select from our array of vessel options tailored to your processes. Choose the convenience of single-use consumables, eliminating the need for cleaning and sterilization, or opt for the durability of autoclavable vessels suitable for long-term use or specific experimental conditions. Regardless of your choice, our commitment to supporting your needs with consumables and expertise remains steadfast. Please ensure your vessel is compatible to optimize your processes effectively. Together, our integrated solutions create a seamless workflow, ensuring precision and efficiency in your laboratory endeavors.

AES Tubing Set:

Optimize your bioprocessing operations with our versatile Tubing Sets, engineered for seamless integration with our Fermentation Controller. These tubing sets are designed to be compatible with your chosen vessel, ensuring that no matter your specific requirements, we have the right solution for you. Crafted from premium materials, these tubing sets deliver consistent and reliable performance in fermentation applications. Assembled and packaged in a controlled cleanroom environment, they meet the highest standards of sterility and quality.

With advanced sterilization methods ensuring safety and biocompatibility, our Tubing Sets are the ideal solution for maintaining the integrity of your bioprocessing workflows.

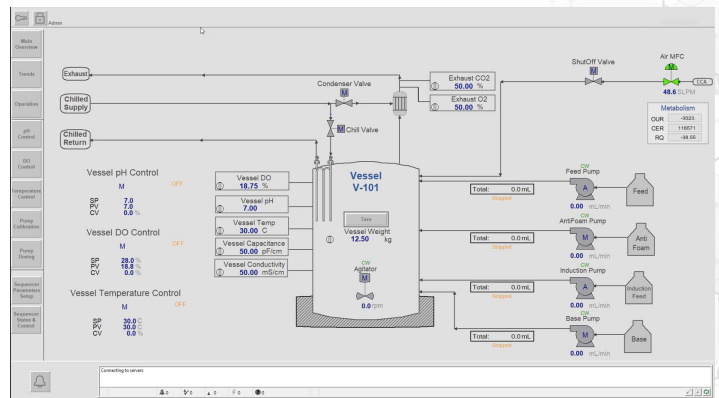


AUTOMATION & CONTROL SYSTEMS:

The Fermentation Model of the Basic Benchtop BPC's automation and control software offers flexible integration into your setup, supporting PC laptop control and Ethernet communication standards. The standard offering for the controller is Rockwell™, providing real-time data acquisition and enabling accurate process control. Convenient trend analysis further enhances the capabilities of this controller. With streamlined tech transfer, scale-up, and recipe sharing, the Basic Bioprocess Controller simplifies research and facilitates seamless automation across different stages of the product development process.

DATA & COMMUNICATION:

This fermentation controller is an innovative piece of lab equipment that provides precise data and control functions during fermentation operations. The user-friendly interface displays real-time and historical data and can meet the specific needs of each experiment. Additionally, the platform includes advanced features such as remote monitoring and control, data logging, and alarm notifications, allowing for efficient and reliable operation.



The featured overview screen exhibits sample numbers exclusively and is subject to variation based upon the client's operational process workflow.

TECHNICAL SPECIFICATIONS

Bioreactor Module		
Enclosure Specifications		
Enclosure Rating	IP-21 Available	
Power Requirements	120 - 230 VAC, 50/60 Hz, 1200 Watts	
Vessel Compatibility	Eppendorf**, Sartorius**, Applikon**	
Agitation		
Agitation Direction Control	Bi-Directional	
Motor Speed (Maximum Range)	0 - 1200 RPM	
Liquid Control		
On-Board Pumps	(4) pumps with Bi-Directional Stepper Motors	
Pump Head Type	Peristaltic, Flip-Top Pump Heads	
Pump Speed Range	0.2 - 200 RPM	
Tubing Compatibility	AES Tubing Set or L/S -13, -14, -16, -25, -17, -18	
Process Analytics		
Temperature	0 – 100° C ± 0.15° C	
pH	2 – 12 pH	
DO	0 – 100% Air Saturation ± 1% reading	
Gas Control		
MFC Quantity & Gas Type	(1) to (2) MFCs: CCA (clean compressed air), O ₂ *	
Instrument Range	0.003 – 50 SLPM, ± .09% (operating ranges and flowrate units are user configurable)	
Communication Protocol	Digital – RS485 communication	
External Equipment and Instrumentation Specifications*		
Weight Measurement		
Vessel Scale	Platform Scale	50 lb Scale Capacity ± 0.01 Readability, Ethernet/IP
Auxiliary Weight Measurement (up to 4)	Platform Scale	50 lb Scale Capacity ± 0.01 Readability, Ethernet/IP
	Hanging Load Cells	3 kg Scale Capacity ± 0.05 g Readability, Analog
Temperature Control Applications		
Heating Jacket	Custom Designed Based on Vessel Size	
Heating Jacket Power	Controlled Power from Bioreactor Module (600 W) using an IEC C13 plug and cable adapter	
Cooling Coil	Custom Designed Based on Vessel Size	
Cooling Coil Enclosure	Mounted Automatic Valve to Supply Chilled Water from Customer TCU	
Automation & Control Software		
Standard Offering	AES Library Rockwell™, Rockwell™ configuration of auxiliary I/O signals or custom ancillary equipment/instrumentation	

*Optional Instrumentation if configured

** Speak with your Sales Rep to Determine Specific Compatibility

TUBING SPECIFICATIONS

Production Specifications	
Tubing Materials	Platinum-cured Silicone, Thermoplastic Elastomer
Adapter Materials	Polypropylene

Pinch Clamp Materials	Polypropylene
Sanitary Materials	Gasket: Polycarbonate Clamp: Nylon End Cap: Polypropylene
Environmental Requirement	ISO 14644-1 Class 7 Cleanroom Environment
Shelf Life	2 Years from the Date of Manufacture
Sterilization Method	Gamma Irradiation
Compliance/Biocompatibility	USP Class VI and ISO 10993 Standards

