WAVE Bioreactor 200 system

READYTOPROCESS

WAVE Bioreactor™ 200 system (Fig 1) is part of Cytiva's ReadyToProcess™ platform of ready-to-use products. The system is a cell culture device for the production of recombinant proteins in mammalian and insect cell lines in batch, fed-batch, and perfusion culture. Culture medium and cells are loaded into a single-use, presterilized bag known as the Cellbag™ bioreactor. The Cellbag bioreactor is placed on an electric rocking base. The rocking motion of this base induces waves in the cell culture fluid within the Cellbag bioreactor to provide efficient mixing and gas transfer. The resulting environment within the Cellbag bioreactor can easily support 1×10^7 cells/mL. The Cellbag bioreactor requires no cleaning or sterilization, providing easy operation and protection against cross-contamination.

As part of ReadyToProcess platform, the WAVE Bioreactor system brings flexibility and speed to upstream and downstream processing of biologicals. The product range comprises WAVE Bioreactor systems, WAVE Mixer™, tubing sealers and fusers, hollow fiber and normal flow filters, prepacked chromatography columns, and ÄKTA™ ready chromatography system with a disposable flow path, as well as the assemblies and connections in between. The platform is scalable from the lab bench to manufacturing.

WAVE Bioreactor 200 system delivers:

- Convenience: Presterilized, single-use Cellbag bioreactors protect against the risk of cross-contamination, require no cleaning, and involve minimal validation and they are supplied in a ready-to-use format
- Reliability: Cellbag bioreactors, including all fittings and filters, are supplied sterile and ready for use. They are suitable for cGMP commercial production and a biosafety cabinet is not required for inoculation or sampling.
- Flexibility: Multiple instrument configurations for suspension, microcarrier, batch, fed-batch, or perfusion culture
- Versatility: The 200 system is capable of handling culture volumes from 10 to 100 L

Fig 1. The WAVE Bioreactor 200 system is suitable for culture volumes of 10 to 100 L.

System descriptions

The WAVE Bioreactor 200 system comprises integral rocking, temperature, weight, and airflow controllers. The self-contained system is designed for use with working culture volumes of 10 to 100 L in applications such as inoculum scale-up, R&D, commercial production, vaccine production, and antibody manufacture. For additional flexibility, optional modules including DO, CO_2, O_2, weight/perfusion, and pH control can be added while built-in Ethernet and MODBUS data ports allow communication with other software.

Applications

The WAVE Bioreactor system is suitable for use with anchorage-dependent cells in addition to cell suspensions and has applications in:

- Monoclonal antibodies
- Insect cell culture
- Virus production
- Growing pathogens or other high-containment systems
- Inoculum scale-up
- Protein expression
- Primary cell line expansion

Components

Touchscreen

The color touchscreen (Fig 2) located on the control panel of the WAVE Bioreactor 200 system enables the setup, control, and viewing of all cell culture parameters while data can be monitored graphically in real time. The main menu provides an overview of key operating conditions and it is the main access screen for all controls. Different control buttons are displayed depending on the options enabled. Pressing the desired button will take you to the respective control screen. The touchscreen is housed in a stainless steel enclosure and can be tilted and rotated for easier viewing.

Fig 2. The touchscreen provides easy access to all control functions.

Expansion slots

Optional modules such as the dissolved oxygen (DO), O_2, CO_2, pH, and dual system controllers can be added to standard WAVE Bioreactor systems to monitor and control additional parameters as your requirements change. These modules plug into the front and back instrument panels (Fig 3) of the base unit and are enabled via the instrument's configuration and calibration functions in order to display the module variables and controls on the color touchscreen. Spare racks are included for future instrument options.

Fig 3. Expansion slots are provided for the installation of optional instrumentation.

Linear electronic motor

An electric linear motor is used to rock the base units of the WAVE Bioreactor 200 system. Unlike geared motors, this electromagnetic device has only one moving part and provides greater reliability. The linear motor follows a preset and optimal speed and acceleration profile to provide the most effective wave for efficient low-shear mixing.

UNICORN DAQ

UNICORN™ DAQ 1.0 software facilitates real-time data acquisition for the management and evaluation of results from cell cultures performed using up to four different WAVE Bioreactor systems connected to a single PC. The WAVE Bioreactor system can be connected directly or networked to the software providing a common platform and user interface for monitoring and storing result data. A dynamic graphical user interface informs you about the real-time status of the run being monitored. During a run, data is automatically saved to a local hard drive or server in a secure and unalterable result file for added security.

Quick-release bag holder

Rapid release Cam-lock levers secure the Cellbag bioreactor in place on the rocking platform allowing bags to be attached and removed in minutes. The holder design ensures that the Cellbag bioreactor is locked in the optimal position for oxygen transfer and mixing.

Stainless steel construction

The stainless steel housing of WAVE Bioreactor 200 system completely encloses the disposable Cellbag bioreactor and protects it from accidental damage. The housing is capable of containing potential spills. The WAVE Bioreactor 200 system is mounted on casters for mobility.

Optional components

pH monitor

The pH monitor provides amplification, display, and data transmission of pH allowing real-time measurement of pH in the Cellbag bioreactor. The pH monitor was designed for use with pH sensor integrated into the WAVE Cellbag.

Dissolved oxygen monitor

The DO monitor provides amplification, display, and data transmission of DO concentration allowing real-time measurement of DO concentration inside the Cellbag bioreactor. The DO monitor controller was designed for use with DO sensor integrated into the WAVE Cellbag, and it can increase the rocking rate or gas concentration automatically to maintain online control of DO.

O_2/air mix controller

The O_2/air mix controller connects to a supply of oxygen (and low pressure N_2 supply if required) to provide O_2/air concentrations between 0% and 50% O_2. The instrument controls enriched oxygen levels for insect cell/baculovirus and high culture density applications; it is also useful for maintaining low-oxygen environments for near-anaerobic applications.

CO_2/air mix controller

The CO_2/air mix controller connects to a supply of 100% CO_2 to provide CO_2/air concentrations between 0% and 15% CO_2. The instrument is useful for pH control of bicarbonate buffered cell culture media.

Temperature control

Temperature is regulated for single and dual WAVE Bioreactor systems (Fig 4).

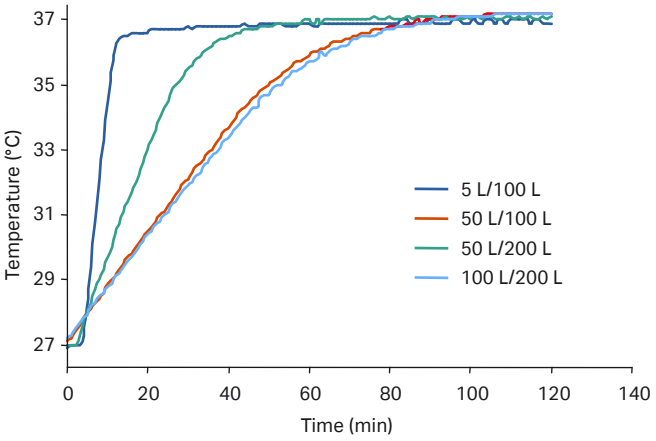

Fig 4. Temperature control from 27°C to 37°C in 5 L, 50 L in 100 L bag, 50 L, 100 L in 200 L bag.

Dual Cellbag control system

The WAVE Bioreactor 200 system can be configured for either single or dual Cellbag bioreactor control. In the dual-bag configuration, the menu on the touchscreen would display left- and right-bag values for certain parameters such as bag pressure and temperature. In the single-bag configuration, only data for the left-hand side bag is shown. Instruments configured as dual bag systems can be set to single-bag operation using the setup screen.

Analog output card

Up to eight channels of analog outputs are available as an option for controlling instrument variables such as rocking speed, weight, airflow, temperature, pH, DO, CO_2, and O_2 within their preset ranges. The DB25-pin analog output connector is located on the rear panel of the rocker base unit. Two analog output cards are required for dual-configured systems.

Loadcell

Electronic loadcell modules provide online measurement of Cellbag bioreactor weight and can be used for automated filling and harvesting of media. A built-in pump controller maintains a constant volume for perfusion operations. Loadcell modules are optional factory-installed accessories for WAVE Bioreactor 200 system.

Technical information and specifications

WAVE Bioreactor 200 system

Features	Touch panel operator interface
	Direct drive electronic linear motor
	Adjustable rocking rate from 4 to 25 rocks/min with acceleration control
	Adjustable rocking angle from 2° to 9°. Integral temperature controller with heater. Integral weight controller
	Integral airflow controller
	Integral PID controller for automatic temperature, O_2, CO_2, DO, and pH adjustment
	Real-time data monitoring
	RS-485 MODBUS communications port
	10Base-T Ethernet communications port. Remote alarm contact and printer interface. Stainless-steel containment enclosure
Dimensions (L × W × H)	Base unit: 1852 × 1096 × 1120 mm (73 × 43 × 44 in)
Weight (empty)	350 kg (780 lb)
Utilities	Voltage: 100-120/220-240 VAC
	Frequency: 50/60 Hz
	Maximum current: 15 A
	Power: 12 KVA
Environmental	This equipment is designed for use under the following conditions:
	• Indoor use
	• 5°C to 40°C
	• Up to 80% maximum relative humidity (rh) at 31°C decreasing linearly to 50% rh at 40°C

Ordering information

Product	Code number
SYSTEM200EH,CO2	28-4115-57
SYSTEM200EH,CO2,O2	28-4115-55
SYSTEM200EH, CO2,O2,AN	28-4115-52
SYSTEM200EH CO2 PHOPT AN	28-9849-54
SYSTEM200EH O2 DOOPT II AN	29-0042-81
SYSTEM200EH CO2 O2 DOOPT II PHOPT AN	29-0016-41
SYSTEM200EHD	28-9366-86
SYSTEM200EHD,CO2,AN	28-4115-45
SYSTEM200EHD,CO2,O2,AN	28-4115-44
SYSTEM200EHD CO2 PHOPT AN	28-9849-53
SYSTEM200EHD O2 DOOPT II AN	29-0042-82
SYSTEM200EHD CO2 O2 DOOPT II PHOPT AN	29-0016-37

Related literature	
Disposable Cellbag bioreactors for the WAVE Bioreactor system, Data file	28-9511-36
ReadyToProcess connectivity, Data file	29-0138-84
WAVEPOD™ II Integrated Controller, Data file	28-9606-57
WAVE Bioreactor 2/10 and 20/50 systems, Data file	28-9520-58
WAVE Bioreactor 500/1000 system, Data file	29-0237-12

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