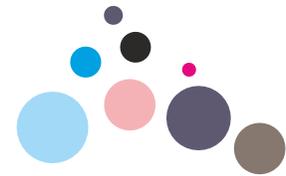


Fermentors Bioreactors

in situ sterilizable
glass auto protocol cell culture
process control stainless steel 316 vessel
lab scale



low cost, compact, easy to use
multi-loop PID process control
modular, upgradeable system
autoclaveable & in-situ systems
16-bit microprocessor controller
configurations suit every budget



2.5 litre fermentor installed in
Indian Institute of Technology

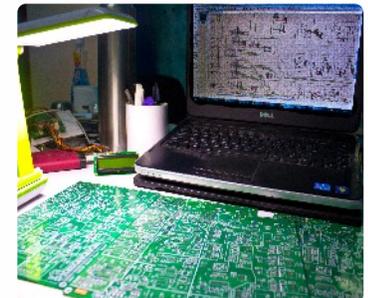
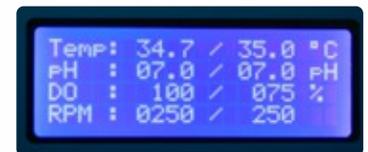
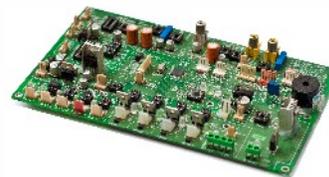
BioFERMA series are low-cost, compact, autoclavable and in-situ sterilizable laboratory fermentors and bioreactors perfect for a range of educational, research and industrial applications.

Using the latest in 16 bit microprocessor technology we offer fermentors and bioreactors that use multi-loop process control techniques to maximize yields in cell-culture and fermentation. At the heart of our fermentors and bioreactors lies 16 bit microcontrollers from Microchip Technology Inc, USA. On board electronics and sensors are sourced from reputed and reliable manufacturers like Texas Instruments, Allegro Micro, National Semi, etc. to give a specialised controller system for these fermentors and bioreactors that works effectively and is extremely reliable.

Systems are available for microbial and cell culture:

- Microbial Culture: Bacterial, Yeast and Fungi culture.
- Cell Culture: Plant, Animal and Insect culture.
- Moving up from a tissue culture flask and shaker.
- Glass culture vessels (2.5 L, 4 L, 7 L).
- Other sizes also available on request.

BioFERMA fermentors and bioreactors have dedicated microprocessor controller system that has been designed specifically for autoclavable and in-situ sterilizable laboratory bioreactor and fermentor control.



UNIQUE FERMENTOR DIAGNOSTIC MODE

Unique diagnostic mode in our fermentors and bioreactors, enables the user to evaluate the health of the system and its various components (like probes, pumps, relays, motors, sensors, calibration, reading etc.) so that off-site diagnosis and service-assistance can be made over the phone and email. This enables the us to give a better after-sales service remotely, often within a few hours of user request.



www.BioZen.co.in

Fermentors Bioreactors

Vessel

Borosilicate Glass	Borosilicate glass vessels of volumes 2.5 L, 4 L, 7 L & 10L. Single walled and double walled vessels available as per customer request. User defined volumes can also be supplied (i.e. 5L). Working volume is 40% to 90% of total volume. D/H ratio of vessel is 1:2 to 1: 3 depending on volume. Design temperature is 150°C.
Stainless Steel 316L	SS316L vessels for volumes of 10L and above. Standard volumes are 10L, 15 L, 35 L, 50 L, 100L. User defined sizes can be supplied too. Design pressure is 3 Bars for SS vessels.

Head Plate

Material	Stainless Steel 316L head plate is supplied with sufficient number of ports. Contact parts are made from SS316L. All ports have been designed to prevent contamination cross-over. Fitting of ports, sensors, tubings, motor etc. is convenient. O-rings are provided in pharma grade silicone.
Ports	Ports are provided on head plate and vessels made of SS 316L for pH sensor, DO sensor, foam sensor, temperature thermowell sensor, air sparger, air exhaust, agitation motor, heater, acid, base/alkali, anti-foam, inoculum feed, harvest, etc. Contact parts are made from SS316L. All ports have been designed to prevent contamination cross-over. Fitting of ports, sensors, tubings, motor etc. is convenient. All ports have O-rings provided in pharma grade silicone.

Stirring & Agitation

Material	Stainless Steel 316L stirring rod with options for Rushton type impellers, propeller type stirrer blade or any user defined option.
Seal	Mechanical seal with PTFE (Teflon) bush and rust-proof stainless steel bearing and o-rings in pharma grade silicone.
Motor	PMDC motor 80W high starting torque. AC motor can be provided in case user requests so.
Control Algorithm	PID control
Sensor	Magnetic gear tooth sensor.
Range	100-1000 RPM.
Accuracy	Measurement and control accuracy of +/- 2 RPM.
Display	Digital display of simultaneous set and actual RPMs on 20x4 backlit LCD.

Temperature

Material	Heating finger made from SS316L for contact heating. For cooling, chiller unit with forced water or air circulation. TEM based solid state coolers can also be provided.
Control Algorithm	PID control for regulating temperature.
Sensor	Platinum RTD dipped in SS316L thermowell.
Heating Range	5°C above room temperature to 60°C. Increments of 0.1°C.
Cooling Range	With cooling system: 10°C to 60°C. Dependent on coolant used still lower temperatures possible.
Accuracy	Measurement and control accuracy of 0.1°C.
Display	Digital display of set and actual temperature on 20x4 backlit LCD.

pH

Sensor	Autoclavable gel-filled glass pH electrode, sterilizable at 15 psi.
Control Algorithm	PID control.
Control System	Peristaltic pumps dispense acid or alkali/base, automatically depending on set and actual pH.
Range	Measurement range is 0 pH to 14 pH, increments of 0.1pH.
Accuracy	Measurement and control accuracy of +/- 0.1pH.
Display	Digital display of set and actual pH on 20x4 backlit LCD.

Aeration and Dissolved Oxygen (pO2)

Sensor	Autoclavable galvanic DO probe, sterilizable at 15 psi.
Control System	Controls dissolved oxygen by sparging air or gas. 0-15 LPM rotameters with needle valves are provided on front to control flow of air into unit.
Range	Timer based sparging is standard. Optionally, feed control up to 100%, in increments of 1%.
Display	Digital display of set and actual values on 20x4 backlit LCD.
Filters	0.2 um PTFE membrane inlet and exhaust inline filters to prevent contamination. Filters are autoclaveable to about 20 times.
Compressor	Built-in oil-free diaphragm pump with push-fit connections and inline filters.
Sparger	Ring or straight sparger with inline filter and flexible silicone pipes.

Foam

Sensor	SS316L conductivity probe for foam sensing.
Control System	Peristaltic pumps dispense anti-foam agent.

Peristaltic Pumps

Two peristaltic pumps are with pH control optional module. One with Harvest / Feed optional module. One with Foam control optional module. So up to 4 pumps can be provided on the main control panel. More peristaltic pumps can be provided as individual units.

Software

Datalogging	Software for datalogging and archiving controlled parameters.
Display	Displaying controlled parameters in a set of graphs on PC/laptop screen.
Connectivity	Connection between PC/laptop and fermentor using RS232 serial port.

Sterilization

Glass Vessels	Sterilizing inside autoclaves up to a pressure of 15 psi and 121°C.
SS Vessels	In-situ sterilization with optional steam generator and solenoid valves.

Standard Configurations available in borosilicate glass vessels:

Even our basic units mentioned below are fully functional fermentors and bioreactors. They have been designed in such a way that the units meet your budget yet at the same time are fully upgradeable in the future. So you can add advanced modules to increase functionality of basic systems.

At the same time, the basic unit has systems to control motor speeds and agitation, motor RPM, temperature above ambient, will display pH values and has a 2-gas sparging and aeration system with filters and rotameters.

Model BioFERMA-01-01

Bioreactor basic unit with 1.5 litre working and 2.5 litre total volume.

Model BioFERMA-01-02

Bioreactor basic unit with 3 litre working and 4 litre total volume.

Model BioFERMA-01-03

Bioreactor basic unit with 5 litre working and 7 litre total volume.

Basic unit has systems for · Agitation · Aeration · Temperature control (from 3C above room temp. to 60C) · pH display · Fermentor diagnostics (for remote technical support).

Optional modules can be ordered · For temperatures below room temperature (Cooling System) · pH control (pH Control System) · control Dissolved Oxygen (DO display and control system) · Foam Control · Feed & Harvest · Datalogging Software. (Order these with the basic unit of your choice)

Cooling system:

For attaining temperatures below room temperature: Control range (10C to 60C). In case you need to set temperatures below your normal room temperatures, order this module. For example, if you need to run fermentation at 20C and your room temperature is normally 30C, then order the cooling system.

pH Control system:

The basic unit has an autoclaveable gel filled glass pH electrode that displays the real time pH of the run. If you need to control the pH of the reaction, use this module. The control range is pH 2.0 to 12.0. It uses two peristaltic pumps with acid & base reservoirs which automatically add acid or base depending on the pH set and actual values.

Dissolved Oxygen Display & Control system:

With two gases sparging system. This module consists of a low-maintenance autoclaveable galvanic glass DO electrode to measure and automatically sparge air to control the dissolved oxygen levels of the reaction.

Feed/Harvest Module:

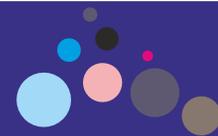
With one bidirectional, variable speed peristaltic pump. Order this if you need to periodically add and remove media, inoculum and samples from the reactor vessel.

Foam Control Module:

With one peristaltic pump and conductivity probe that monitors the foam. Anti-foam agent is automatically added to the vessel in case of excess foam.

Datalogging Software:

MS Windows based software that displays graphs of and logs pH, temperature, DO and RPM values to MS Excel sheets.



USER INTERFACE

LCD 20x4 alpha-numeric LCD with simultaneous display of set and actual values of controlled parameters.

Keypad Feather touch multi-coloured keypad with 16 keys. Separate keys for setting values, entering calibration mode, starting run and performing diagnostic operations on the fermentor.

Control Panel Control panel with less bench space and built-in oil-free compressor, rotameters, peristaltic pumps, connectors for sensors, motor, heater etc. Panel is powder coated MS with keypad, LCD and system on-off switch provided.