



AUTOCLAVABLE
BIOREACTORS



DiaBench

Autoclavable
Bioreactor
Package

DiaBench bioreactors represent the latest advancements in mechanical, automation and software engineering applied to the bioprocess industry.

Industrial standard technologies, high-flexibility, modularity, easy upgrades and replacements, guaranteed long term spare parts availability and after-sales service distinguish Diachrom Biotechnology from competition.

- ◆ **High Flexibility and Reliability**
via PLC automation and software platforms
- ◆ **Modularity and upgrades** at any time
thanks to our new concept design
- ◆ **Quality without compromise**
only certified materials are selected
- ◆ **Complete documentation.** IQQ, DQ
and components traceability for GLP and cGMP
- ◆ **Service and Maintenance**
with a worldwide network



ADVANCED & INTUITIVE CONTROLLER TECHNOLOGY



PLC CONTROL

The whole control unit is based on PLC hardware and software. Advanced Controller features include simultaneous control and regulation of various parameters in one bioreactor solution.

Controls:

- 2 x pH
- 2 x pO₂
- 2 x temperature
- 2 x level and foam
- 2 x stirrer speed
- 2 x pressure
- up to 8 x variable or fix speed pumps
- up to 8 x MFC's or rotameters
- 2 x load cells
- up to 8 x balances

* extra inputs are available for biomass monitors, optical density, gas analyzer, pCO₂, online automated samplers and others.

DiaBench PLC technology guarantee the best performances, reliability, long term service and spare parts availability unless proprietary systems. The selection of trusted hardware components united with our background in fermentation and cell culture implemented into the **DiaBench** Controller Software ends up into a unique advanced bioreactor.

DiaBench HMI

The **DiaBench** HMI (human interface touch-screen) represents the first complete local interface to fully manage, control and record process parameters in a bioreactor.

Functionalities:

- set-points configuration and modification
- P.I.D. settings
- probes and pumps calibration
- dose monitoring
- up to 4 level of alarms
- up to 4 password protection definition
- sequences programming
- batches and feeding profiles formulations
- cascade controls and exponential equations
- Online recording (memory card and USB/Ethernet output connections)
- Data Visualization with graphic, curves and profiles displays

DiaBench is available with or without Human Interface Touch screen.

Each unit is equipped with:

- Batch
- Feed-batch
- Continuous modes of operation.



Fermentation setting page:

- 1 Preparation parameter setting access
- 2 Pre-inoculum parameter setting access
- 3 Inoculum parameter setting access
- 4 Cultivation (fermentation) parameter setting access
- 5 Alarms parameter setting access
- 6 Pump parameter setting access
- 7 Probe calibration parameter setting access
- 8 Memory data record update command
- 9 Start the "new batch" wizard
- 10 Inoculum start switch
- 11 Stop batch switch

Chosen of leading PLC:

Siemens, Allen Bradley, Schneiders Electric, Mitsubishi, Delta V.

Chosen of communication device:

Canopen, Interbus, Profibus, DeviceNet, ControlNet, ModBus, RS232/485, Ethernet, USB.

MODULAR & FLEXIBLE VESSEL CONCEPT



SMART DESIGN

DiaBench is Modularity and Flexibility at the same time.

As a matter of fact, the homogeneity of our control unit and software beside the vessel's concept, offer full possibilities to work with several types of cells lines and micro-organisms without the need to modify instrument design.

Every unit is composed of:

- PLC module containing electronic elements
- Gas mixing module
- Pumps module
- Thermostatic circuit module with built-in fluidics and actuators for accurate temperature control.

Each module can be replaced or exchanged at any time without the need of an expert technician.

VESSELS:

Total volume	Working min.	Working vol.	Aspect ratio H/D*
1L / Single wall / Jacketed	0,2	0,8	2:1
2L / Single wall / Jacketed	0,4	1,6	2:1
3L / Single wall / Jacketed	0,6	2,4	2:1
5L / Single wall / Jacketed	1,0	4,0	2:1
7L / Single wall / Jacketed	1,4	5,6	2:1
10L / Single wall / Jacketed	2,0	8,0	2:1
15L / Single wall / Jacketed	3,0	12,0	2:1
20L / Single wall / Jacketed	4,0	16,0	2:1

*other available on request

CONFIGURATION

Diachrom Biotechnology offers a wide selection of autoclavable borosilicate glass bioreactors available in the range of 1L to 20L total volume, single wall or jacketed. System concept allow you to interchange vessel's size without any limitation on the system set-up. You can benefit of our classic bioreactors selection either for Microbial fermentation or Cell cultivation.

Diachrom Biotechnology supply multi purpose Bioreactors and Fermenters for microbial, cell cultures or other non conventional applications. Our offer include Photo-Bioreactors, Air-Lift, Gas-Lift, MBR/SBR systems. Diachrom Biotechnology customize bioreactors according to specific detailed requirements.



FEATURES & SPECIFICATIONS



FEATURES

- Smart pH and D.O. probes allow monitoring of all sensor functions making substantial advantages in bioprocess monitoring and control
- pH sensor empower fully integrated accuracy monitoring
- Monitoring of all sensor functions, status of the sensor quality (glass resistance, reference resistance, Checkref potential).
- D.O. optical sensors demonstrate a number of substantial advantages because of a symbiosis of sensor and measurement amplifier- an smart sensor.
- Variable or fix speed peristaltic pumps, autoclavable type
In an embodiment, the present solution provides a new and improved liquid metering pump adapted for pumping sterile fluids and/or foodstuffs.
- Diachrom Biotechnology introduce onto his Bioreactors liquid metering pumps to avoid contamination problems caused by manual handling.

SPECIFICATIONS

Agitation system	Direct drive, mechanical or magnetically coupled drive
Stirrer speed (rpm)	Standard range is 1 – 2000 rpm adjustable according to required configuration either bacterial, cell culture or both
Impellers	Rushton, Marine, Pitched Blade, adjustable and removable type impellers. Special impellers are also available.
Gas sparger	Porous sparger, L-type sparger, Sinterized sparger, fixed or removable type
Gas overlay	Included as standard feature
Gas mixing	Standard set-up include Air, O ₂ , CO ₂ and N ₂ gas mixing station, our unit can hold up to 8 gasses. Standard set-up include Flowmeters with on/off automatic solenoid valve for gas flow regulation or Massflow controllers for automatic gas flow control and data recording
Exhaust gas	Water cooled exhaust gas Condenser
Sampling	Sanitary sampling system with Fixed height or Height adjustable sampling pipe including contained sample bottles available with various volumes
Harvesting	Sanitary Drain pipe or Dip tube Fixed height or Height adjustable
Liquid additions	Triple or single inlet ports for chemicals additions (optional micro liquid injectors)
pH	Optical or classic pH sensor, 12mm, 19mm or 25mm Ingold connectors, (various length). PLC and SCADA Software Control: via acid pump or CO ₂ gas (Flowmeter or MFC) in combination with alkali pump and/or other actuators.
D02	Optical or classic DO sensor, 12mm, 19mm or 25mm Ingold connectors, (various length). PLC and SCADA Software Control: via or in combination with N ₂ , Air, O ₂ (Flowmeter or automation MFC) and agitation or nutrient addition pump or other actuators
Temperature	Pt-100 sensor in thermo well in top plate. PLC and SCADA Software Control: cooling and/or heating jacket via bioreactor wall or via internal heat exchanger, cooling via tap water or chilled water
Foam	Height adjustable conductivity based foam and level sensor, High/Low foam sensors are also available. PLC and SCADA Software Control: Anti foam addition pump or other actuators.
Level	Height adjustable conductivity based level sensor. PLC and SCADA Software Control: pump for liquid addition or removal
Pressure	Pressure sensor top plate mounted. PLC and SCADA Software Control: modulated pressure valve, combined with air inlet, Flowmeters/MFC, agitation and other actuators
Weight	Load cells and balances are available. PLC and SCADA Software Control: pump for liquid addition or removal
Probes and sensors available	Online Biomass probes, optical density sensors, CO ₂ /O ₂ /NH ₄ /SO ₂ gas analyser, pCO ₂ sensor, conductivity, methanol/ethanol analyzers, Automated samplers PLC and SCADA Software Control integrations, OPC compliance.
Photo-Bioreactors	Special accessories for photo syntetic and photo trophic microorganisms, variable LED light set and other .

DIACHROM SPECIAL CONFIGURATIONS



PARALLEL BIOREACTORS

- **TWIN-BENCH**
1 tower, 2 vessel
- **QUAD-BENCH**
1 tower, 4 vessel
- **MULTI-BENCH**
1 tower, 6 or more vessel

Diachrom Biotechnology as new generation of parallel bioreactors offers advanced controller functionalities designed for meeting demanding requirements in both research and process development as well as for media optimization and screening studies.

DiaBench Parallel Bioreactor Systems can be used for microbial and cell cultivation applications in research and development allow for advanced screening of bacteria, yeasts, fungi, Cell Culture, Stem Cell, Biofuels and Phototrophic organisms.

Our systems guarantee high precision monitoring and control for each bioreactor with a trusted parallel hardware and software PLC based which result in high information output and easy comparative analysis.

SPECIAL BIOREACTORS

- **Photo bioreactors**
- **Air-lift**
- **Gas-lift**
- **MBR-SBR**
3, 5, 7, 10, 15, 20 litres
total volume available

Diachrom Biotechnology Photobioreactors **Dia**pbr, can contain and grow algae, cyanobacteria and other photosynthetic organisms under heterotrophic and mixotrophic conditions. Our PBR system is a controllable environment in which to grow algae, and where the supply of light, nutrients, carbon dioxide, air, and temperature can be controlled and regulated.

Diachrom Biotechnology experiences applied to airlift / gaslift reactors geometry improved hydrodynamic variables like gas velocity and physical properties of the fluids. In fact, the geometry of the reactor has a strong influence on the hydrodynamics and this factor is a source of difficulty in comparing different results. Major advantages of the Diachrom Biotechnology solution were founded in gas hold-up, liquid circulating velocity, heat transfer, mass transfer and dispersion coefficients. SBR sequential batch reactors are industrial processes for the treatment of wastewater. SBR reactors treat waste water such as sewage or output from anaerobic digesters or mechanical biological treatment facilities in batches. Oxygen is bubbled through the waste water to reduce biochemical oxygen demand (BOD) and chemical oxygen demand (COD) to make suitable for discharge into sewers or for use on land.

MINI BIOREACTORS

- **1000 ml total volume**
(200ml - 800ml working volume)
- **500 ml total volume**
(100ml - 400ml working volume)
- **250 ml total volume**
(50ml - 200ml working volume)

Diachrom Biotechnology has a policy of constant and never ending progresses for bioprocess equipment's. The target is to improve fermentation, cell culture and renewable processes for the best efficiency, quality and economy. Following the development full range of Bioreactors from Laboratory to Production Plants with the latest technologies and components available on the market .

Diachrom Biotechnology R&D team is now working on :

- New Disposable Bioreactors for microbial and cell cultivation
- New Concept of Micro-Bioreactors for products optimization
- Biofuel and Biomass Transformation
- On line automated integrations

1

DiaBench HMI

Full local control
touch-screen interface

2

DiaBench Advanced Controller

Guaranteed flexibility and upgrades
at any time

3

Gas Mixing Station

Up to 8 Rotameters
or Mass flow controllers

4

Interchangeable Vessels

Available range of 1L-20L
total volume

5

Easy Load Pumps

Up to 8 pumps fix or variable
speed fully autoclavables

6

Contained Box

All fluidics and electronics
are properly isolated as by
international safety standards



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Diachrom Biotechnology

and his partners design and realise machineries for the pharmaceutical industry. Our firm's develop guideline is based on research and project of new solutions in full compliance with the quality and safety rules.

With a worldwide distribution network Diachrom Biotechnology guarantees full local support and after-sales services.

The production catalogue includes over 100 machine models and a line of accessories and complements according to current GMP and FDA rules.

Our production line includes:

Bioreactors & Fermenters

Filtration Units

Isolators & Glove Testers

Sanitary Tanks

Sterilizing & Depirogenizing Units

Washing Machines

Confectioning & Final Confectioning Machines

Cryoplants

Automation & Software

Fornitures & Accessories

Turnkey Projects



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