

## BIOTRON 15L bioreactor

PC Compatible Microcontroller based full function electronic unit.

The system consists of two gas control circuits with pressure regulation. Two flow meters are provided one for 0-0.7 liter and other for 0-7 liter for oil free filtered air from compressor. The gas mixing and control are also from the electronic unit.

The system employs a proprietary control algorithm™“REACTIVE LOGIC”© . This offers far superior control as compared to PID or FUZZY logic.

An Integrated tower all Aluminum powder coated cabinet housing the four variable speed Eight roller peristaltic pumps & the central Electronic control unit has a small footprint, saving table space.

Dimensions:

H-52cm X W-23cm X D-30cm

Weight:

Approx 15 Kgs

### 1. Connectors all on rear panel:

#### i. Electronics:

- (a) 9-pin D type RS 232 for Peristaltic pump control
- (b) 9-pin D type RS 232 for PC interface
- (c) pH sensor
- (d) PO<sub>2</sub> sensor
- (e) Temperature
- (f) Antifoam
- (g) 25 pin D-type for (I/O)
- (h) Power cord

#### ii. Mechanical:

- a. Aeration flow meter
  - b. AUX1 gas flow meter
  - c. AUX2 gas flow meter
  - d. AUX3 gas flow meter
- } **Optional to be ordered extra**

### 2. User interface:

20X4 Alphanumeric LCD with backlight & integrated 8-button membrane keyboard with tactile feedback. The system is also supplied with PC software (FREE). A interactive GUI allows easy set-up of the reactor parameters in the PC interface mode

### 3. Electronics: CPU card:

#### Part No: -SCI-FERM-EU/MICRO-M128

High performance ATMEL AVR Mega 128 embedded microcontroller single board computer with...

- (a) Based on ATMEL AVR ATMEGA128 RISC microcontroller with 16 MIPS throughput
- (b) 12 bit bipolar  $\pm 10$  Volt dual 8 channel AD converter based on MAX127 IIC protocol
- (c) Dual port full duplex RS232 interface wired for DAISY chain operation
- (d) Dallas DS1307 RTC with battery backup
- (e) Dual ultra fast FM24c64 IIC EEPROM's
- (f) 2MB on board memory based on AT45DB161 SPI flash memory
- (g) Six ultra fast acting SPDT 3ms response relays
- (h) Hardware interrupt circuitry for keyboard & other interlocks
- (i) In circuit program adapter circuitry for field upgrade
- (j) International standard WAGO connector assembly

#### Signal conditioning:

#### Part No: -SCI-FERM-EU/SGNL-01

- 1. Triple input galvanic isolation for pH, DO, Temp
- 2. Double output optical isolation for pH & DO
- 3. 3 independent DC-DC converters on board
- 4. Based on Burr-Brown operational amplifiers
- 5. Dual channel pressure sensor signal conditioning circuitry
- 6. International standard WAGO connector assembly

#### Active foam probe:

#### Part No: -SCI-FERM-EU/FOAM-01

- (a) Based on trans reflective IR sensor
- (b) PIC 16F819 RISC microcontroller based
- (c) Dynamic response quantifies the foam bubble grain size
- (d) Automatically adjusts the anti foam pump speed to control the dispersal of anti-foam solution
- (e) Interfaces to the central CPU controller or can act independently to control the anti-foam pump

#### Electronic Pump & Stirrer control.

#### Four pump tower for...

- (1) ACID
  - (2) BASE
  - (3) ANTI-FOAM
  - (4) NUTRIENT
- 
- (a) High performance Integrated **FOUR variable speed** uni-polar stepper drive
  - (b) Also houses the stirrer DC motor speed controller
  - (c) 12 volt @ 150 watt SMPS for stepper motor power supply
  - (d) 24 volt @ 250 watts SMPS for stirrer motor power supply
  - (e) 5 volt @ 10 watt SMPS power supply for microcontroller electronics
  - (f) RS232 interface between the EU & PC for standalone pump operation

## Pump specifications:

- (a) Motor: High performance continuous duty hybrid stepper motor 1.8° step angle
- (b) No. of channels : Single
- (c) No. of rollers : 8 MoS<sub>2</sub> filled Nylon rollers
- (d) RPM : Variable speed 10 to 90 RPM
- (e) Direction of rotation : Fixed (clock wise)
- (f) Pump tubing : Platinum cured silicon tubing.  
Two stop fixed length

Recommended bore:

ACID	} 1.5 mm bore		
BASE		} 4 mm dia. Silicone	
ANTIFOAM			} tube.
AUXI			

## Pump Electronics:

- (a) Variable speed 10 to 100 r.p.m in steps of 10
- (b) Eight roller system; rollers made of Molybdenum disulphide
- (c) Individual microcontroller based
- (d) Ultra high pumping precision
- (e) Individual cassette module for each pump head (Sterilizable)

## Stirrer motor: DC brush motor up to 250 W

- (a) Digital speed measurement ±1 r.p.m
- (b) 200-1200 rpm stirrer motor

## FERMWERKS PC software: For BIOTRON Fermentors

- (1) The system can be completely controlled in stand along mode under this mode no PC interface is required. The electronic unit firmware provides all the required functionality.
- (2) PC interface mode: -

In this mode the system provides the user the following options.

1. Setup a new experiment.
2. Recall a previously created experiment.

Under setup, the user can configure the system hardware such as the pumps and stirrer. However when the user opts for fully automatic control, the acid pump, the base pump and the anti foam pumps are directly under the control of the unique reactive logic control. The user can then only control the fourth, fifth and the sixth pumps.

These pumps may be operated in two modes.

1. Burst mode
2. Continuous mode

Under burst mode, the user can specify the precise volume to be dispensed. Once the user commands burst mode dispense, the system dispenses the quantity and automatically shuts itself off. Under continuous mode, the user can start and stop the pump. He can select at what rpm the pump should run.

The software also facilitates calibration of the following:

1. Pumping systems

- (a) ACID pump
- (b) BASE pump
- (c) Antifoam pump
- (d) Feeder (fourth) pump
- (e) Aux1 pump
- (f) Aux 2 pump

2. Sensor system:

- 1. pH (Single standard or three standard)
- 2. DO

The run screen displays all process parameters such as...

- 1. pH
- 2. DO
- 3. Temperature
- 4. Stirrer rpm
- 5. Initial Volume
- 6. Current volume
- 7. Fermentation start time
- 8. Fermentation elapsed time
- 9. Fermentation start date
- 10. Fermentation current date
- 11. Totalizes for additions (optional accessory required)
  - a. ACID added till current
  - b. BASE added till current
  - c. Antifoam added till current
  - d. Feed added till current
  - e. Aux 1 added till current
  - f. Aux 2 added till current

Part No:-

SCI-FERM-VESL-15L dia 200mm, height 500mm

**Jacket & support frame:**

- (a) Jacket SS-316 with top flange
- (b) Two spouts for circulation
- (c) Heavy base plate (BP) SS-316
- (d) Solid hex rods screwed to BP support the entire vessel assembly.
- (e) 3 or 4 support rods for vessel

**Glass vessel:**

- (a) Economical & easily available Borosil / Corning glass vessels
- (b) Standard vessels available with most catalogue companies
- (c) Autoclave & In-situe sterilizable
- (d) Easier to clean & maintain than all SS-316 vessels

## **Teflon collar & jacket:**

- (a) Unique molded gasket seals the vessel & jacket
- (b) Single seal system between the jacket & glass vessel  
Works like the pressure cooker gasket under in-situe sterilization

## **Head plate & Ports:**

### **All SS-316 Head plate, with provision for baffles & number of port options...**

- (a) 15L vessel 8; 1/2" ports (Four as in 2-3L vessel & rest additional)
- (b) 15L vessel 8; 1/4" ports (Four as in 2-3L vessel & rest additional)
- (c) 15L vessel spare 1/4" port may be used for inoculums
- (d) All ports have thread stop in the top plate so that no crevices exist.

## **O-rings:**

- (a) Silicon
- (b) Viton

## **Stirrer assembly shaft seals: Magnetic seal**

## **Sparger:**

- (a) Tube-in tube construction
- (b) Outer Teflon; bore 1/8" dia 1/4"
- (c) Inner SS-316; OD 1/8"
- (d) Circular construction, with close pin prick holes for ultra fine bubbling

## **Impeller:**

- (a) All Teflon 6 element RUSTON turbine
- (b) Four impellers for 15L vessel

## **Protection Hood:**

- (a) Available for all vessels
- (b) Perforated SS-316 construction
- (c) Hinged & detachable

**Note:** *This is optional and requires to be ordered separately if in-situe sterilization with steam generator is desired.*

## **Filter & tube & shell condenser:**

- (a) All SS-316 tube & shell condenser for exit gas
- (b) 0.2 micron filters (47mm & 13mm). 13mm filters have dismountable shells.  
The inner membrane is from "PALL"; can easily be changed as required.

## **Probes:**

Ordering options:

**(1) pH probe:**

SCI-FERM-PROB-PH/425-STER

**(2) DO probe: Phonix**

SCI-FERM-PROB-DO/PHNIX-425-STER

**(3) Foam probe**

A revolutionary antifoam probe that quantifies the foam bubble size, common across all vessel sizes, External glass shell changes and Part Nos given below...

SCI-FERM-PROB-AF/GLS-15L

**(4) Temperature probe**

The system employs a total of three temperature probes. A dual PT100 probe for broth temperature monitoring & pH auto temperature compensation. The third probe is for monitoring the circulation water temperature. The third probe is common to all vessel sizes. However the dual temperature probe length is dependent on the vessel size. Ordering options are...

SCI-FERM-PROB-DT/PT100-15L

**Common probe**

SCI-FERM-PROB-ST/PT100