

10

SINGLE & PARALLEL
MINI
FERMENTER
BIOREACTOR





IO

This technical proposal describes a Solaris IO. For supervisory control and data acquisition Leonardo 3.0 is included.

The system consists of fermenter/bioreactor (total volume), bench-top, pre-assembled unit, supplied with all necessary tubes, valves and instruments, automation, control panel (HMI).

The system is designed for aerobic and anaerobic cultivations/ fermentations, closed aseptic operations. IO is completely electrical. The thermoregulation (both heating and cooling) is performed through a Peltier Cell, placed on the bottom of the fermenter/bioreactor. This avoids water circulation (no water source is needed in the lab).

The control is based on a SCADA control system.

Multiple operations

up to 24 parallel units

Applications



Process development and optimization



Education



Basic Research



Scale up and scale-down studies



Small production

- Fully electric: no water circulation
- Up to 24 units managed with one HMI with innovative PARALLEL process control

- Different gas mixing strategies with up to 5 TMFC and/or solenoid valves
- Powerful and accurate (1 RPM) brushless motor

- Single-wall borosilicate glass vessel, with thermoregulation performed through a Peltier Cell
- Different configurations available for microbial and cell culture applications, with the choice of Rushton/Marine/Pitched-Blade impellers and fluted/L-shaped sparger

- Wide range of measurement and control options
- Optional integration of up to 4 analog input/output connections, choosing between 0-10 V and 0-20 mA/4-20 mA (e.g. pumps or valves with power supply independent from Solaris electrical cabinet)

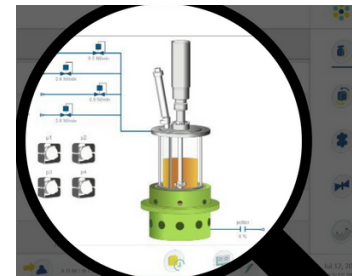


- Modbus digital sensors reduce background noise and guarantee quick response time
- Suitable for batch, fed-batch and continuous processes

- Extremely compact system maximizes lab space
- Additional parameter in modular external boxes for future PCS upgrade including dCO₂, cell density, weight, peristaltic pumps

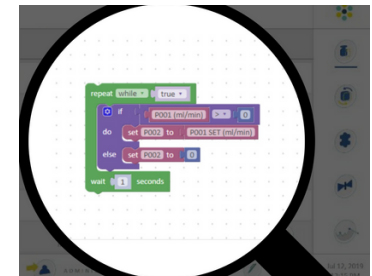
Leonardo

- Innovative SCADA software LEONARDO: a smart and user-friendly controller designed to provide a high level of automated management of the fermentation/cultivation processes
- Full version included in the equipment supply
- Up to 24 units managed in parallel with a unique HMI (24")
- Data extraction in .csv format
- Remote access via PC, tablet or smartphone, with QR code scanning or dedicated portal
- Remote control



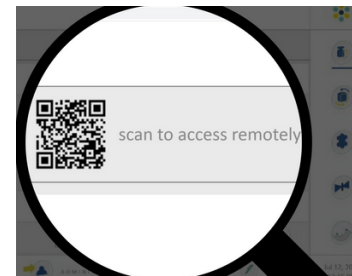
Synoptic

- real time 3D view
- parallel control
- manual control



Logic Parser

- customized logic functions
- parallel logic blocks and funtions



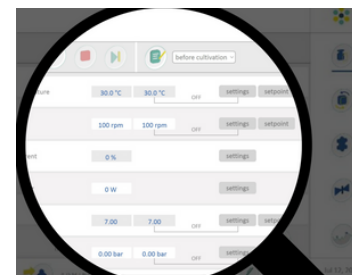
Remote Control

- unlimited number of profiles editor
- unlimited number of devices to be associated



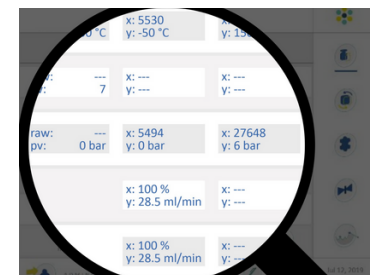
Trends

- custom acquisition time
- up to 6 values simultaneously display
- automatic graph comparison



Workflow

- custom phase manager
- parallel visualization
- cascade settings
- peristaltic pumps function assignable from software



Calibration

- up to three-point calibration
- simultaneous calibration values for parallel work

Vessel	IO 200	IO 1000
Solaris Code		
Total Volume (ml)	200	1000
Ratio D/H	1:1,5	1:2,5
Min. Working Volume (L)	120	250
Max. Working Volume (L)	150	750
Max. temperature		70 °C
Operating pressure		0,9 bar (g)
Materials	Borosilicate Glass and AISI 316 L	
Headplate ports (n.10 in Jupiter 2.0; n.13 in the others)	IO 200: n.3 PG13.5 (sensors, gas out condenser, multifeed), n.2 ports DN8 (gas sparger, harvest/sampling), n.3 DN9 (gas out, antifoam probe, level probe, single feed) IO 1000: n.5 PG13.5 (sensors, gas out condenser, multifeed, level probe), n.5 DN9 (gas in sparger, harvest, sampling, gas out, antifoam probe, single feed)	

Sensors length (mm)		
length	120	225

Dimensions for autoclave (with Condenser)		
Height (mm)	280	380
Diameter (mm)	170	150

Stirring		
Drive	Brushless Motor, 1-2000 rpm	
Power	100 W	
Impellers	Select from: Rushtons impellers, Marine impellers, Pitched blade	

Thermoregulation		
Control	PID Control - Accuracy 0,1 °C - Peltier Cell	

Gas Control & Gas Mixing		
Sparger and overlay Gas Control	TMFC	
Gas Mixing (Air, CO ₂ , O ₂ ,N ₂)	n.1 TMFC (included in entry level) + n.4 solenoid valves or + n. of additional TMFC	
Sparger type	Fluted with laser microholes provided with 0,2 µm filter	
Gas Out	0,2 µm filter	

Peristaltic Pumps		
	n. 4 Watson Marlow type 114, fixed speed, max. 60 rpm, volumetric flow 0,5-51 ml/min, function assignable from software	

Controller		
PCS	From 1 to 24 units - H: 350mm L: 350mm D:350mm	
HMI with Leonardo software	24"	

pH		
Sensor	Digital sensor	
Sensitivity	57 to 59 mV/pH	
Control system	Measuring resident in Leonardo 3.2 software	
Control range	0 - 14	
Operation temperature	0 - 130 °C	
Pressure range	0 - 6 bar	
Actuator	Cascade to peristaltic pumps for the addition of acid/base solutions or gas (CO ₂)	

dO₂		
Sensor	Digital Optical sensor	
Accuracy	±0.05%-vol, 21±0.2%-vol, 50±0.5%-vol	
Control system	Measuring resident in Leonardo 3.2 software	
Control range	0,05 - 300% air saturation	
Operation temperature	-10 - 130 °C	
Pressure range	0 - 12 bar	
Actuator	Cascade to RPM, Gas Control, feedings, ect	

Redox (ORP)		
Sensor	Digital sensor	
Sensitivity	57 to 59 mV/pH	
Control system	Measuring resident in Leonardo 3.2 software	
Operation temperature	-10 - 130 °C	
Pressure range	≤ 6 bar	
Control range	± 2000 mV	

Antifoam/Level		
Sensor	Solaris sensor	
Control	Measuring resident in Leonardo 3.2 software	

Conductivity		
Sensor	Digital sensor	
Accuracy	±3% at 1 µS/cm to 100 mS/cm, ±5% at 100 to 300 mS/cm,	
Control system	Measuring resident in Leonardo 3.2 software	
Operation temperature	0 - 130 °C	
Pressure range	0 - 20 bar	
Control range	1 - 3000 µS/cm	

dCO₂		
Sensor	Analog sensor	
Accuracy	±10% (pCO ₂ 10-900 mbar) ≥ ±10%	
Control system	Measuring resident in Leonardo 3.2 software-	
Operation temperature	-20.0-150 °C	
Control range	0-4 bar(g)	

Cell density		
Sensor	Digital sensor	
Accuracy	Mammalian cells in suspension ±5·10 ⁴ cells/ml	
Control system	Fermentation ±0.05 g/l dry weight	
Option 1	Measuring resident in Leonardo 3.2 software Dencytee:Total cell density based on turbidity	
Option 2	(10 ⁵ to 10 ⁸ mammalian cells/ml - 0.5 to 100 g/L dry weight Incyte: Viable cell density based on capacitance (5x10 ⁵ to 8x10 ⁸ mammalian cells/ml - 5 to 200 g/L dry weight))	

Weight		
Sensor	Digital balance	
Accuracy	±0.1 g	
Control	Measuring resident in Leonardo 3.2 software	

Peristaltic Pumps		
WM 313 FDM/D	175 rpm	