



VENUS

AUTOCLAVABLE
PRESSURE CONTROLLED
R&D
FERMENTERS/
BIOREACTORS



SOLARIS
BIOTECH SOLUTIONS

AUTOCLAVABLE PRESSURE CONTROLLED FERMENTERS/BIOREACTORS

VENUS

The peculiarity that makes unique fermentation processes is the difficulty and complexity of scale-up.
Successful scale-up means a shortened cycle to full-scale production, competitive advantage, and cost savings.
Currently bench top autoclavable R&D fermenters on the market are largely if not exclusively working at non controlled atmospheric pressure. That represent a substantial limitation in terms of **Oxygen Transfer** for R&D and particularly for future scale up. Solaris has filled the gap with the launch of VENUS.



VENUS typical applications includes the following:
Education & Basic research
Scale-up and scale-down studies
Process development and optimization

VENUS can be used for:
Biopharmaceutical
Biofuels
Food industry
Bioremediation
Bioplastic
Cosmeceutical
Nutraceutical



**WHY TO
INVEST**
IN THIS PRODUCT

Pressure
controlled
up to 2 bar

Removable jacket
before autoclaving:
Lighter & Handling
**improved heat
transfer**

High oxygen
transfer

AUTOCLAVABLE PRESSURE CONTROLLED FERMENTERS/BIOREACTORS

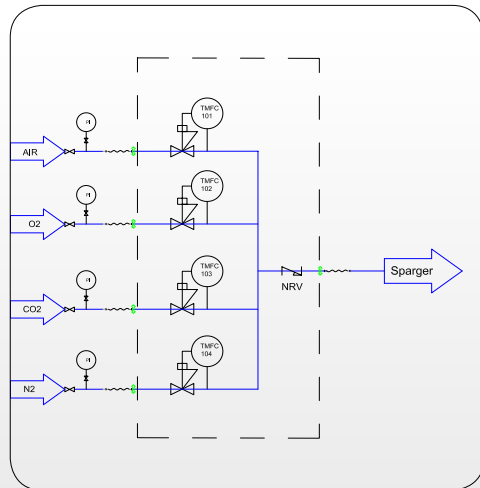
VENUS



Up to 24 units managed with one HMI with innovative **PARALLEL process control**
LEONARDO: smart controller designed to provide an high level of automated management of the fermentation/cultivation processes

Batch, Fed batch or continous processes

Different gas mixing strategies with up to 5 TMFC



23" (single unit) or
27" (multi system) **multi touch HMI**

Remote control via PC, tablet and smartphone for process management and after sale assistance



Powerful/ Accurate **brushless motor**, from 1 to 2000 RPM.
Online absorbed Torques (Nm) and Power (W) measurements obtaining an indirect density indication of the culture broth

Modbus Digital Hamilton sensors



Pressure controlled
up 2 bar
Easier scaling up
High oxygen trasfer

Compact and modular PCS
(350x350x350 mm)

N.4 assignable Watson Marlow pumps,
all speed controlled in entry level

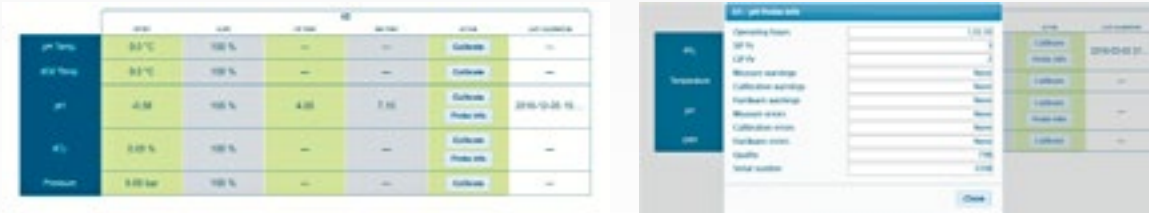
Fully **removable and cleanable glass jacket** for an improved heat transfer during autoclaving



Modbus Hamilton sensors

Why a digital sensor?

Hamilton sensors (including Cell Density) has been integrated into Solaris PCS and Leonardo software giving the user the benefit of having a unique platform.
Fully compensated digital sensors, store and transmit all relevant sensor data, including calibration and diagnostic information directly to Solaris Leonardo software.



Sensor life
traceability

Reducing
background noise

pH

The electrolyte of the EasyFerm Bio sensors is prepressurized to prevent the diffusion of sample into the sensor. The Everef-F reference cartridge ensures that the reference electrolyte remains free of silver and precipitation of proteins.

dO2

The VisiFerm DO is the first optical oxygen sensor with integrated opto-electronics. The visiFerm requires less maintenance than a classical oxygen sensor as it does not have a mechanically sensitive membrane or a corrosive electrolyte.

ORP

The ORP sensor through a pre-pressurized reference electrolyte has a clog-free diaphragm.
The sensor ensures a stable measurement signals after steam sterilization, autoclavation and CIP cleanings qith almost drift-free measurement.

Conductivity

All wetted conductivity sensor parts are FDA approved, can be cleaned easily and withstand CIP cleanings and autoclavations. The sensor shows a very good linearity over a broad measuring range.



Optical density sensor (total and viable cell density)

ON LINE MEASUREMENT OF TOTAL CELL DENSITY



- Simple online measurement of cell growth
- Reliable values during the growth phase
- Early detection of process deviations

The Dencytee sensor performs online measurement of total cell density in solution. The sensor is based on optical density, which measures the turbidity of the cell suspension. The measurement is made at NIR (near-infra red) wavelengths so it is insensitive to changes in media color. All particles and molecules that scatter light at 880 nm will be detected, including living and dead cells as well as cell debris. This measurement is effective after inoculation when cells are expanding quickly but concentrations are low, making capacitance-based readings less reliable.

ON LINE MEASUREMENT OF VIABLE CELL DENSITY



- Increase yield and lower production costs
- Detect changes in cell physiology with frequency scanning
- Precisely control harvesting for continuous culturing
- Early detection of process deviations

The Incyte sensor enables real-time, online measurement of viable cells in solution. The measurement is not influenced by changes in the media, microcarriers, dead cells or debris, and is designed for mammalian cell culture, yeast and high-density bacterial fermentation. Online measurement of viable cells makes it possible to detect events and respond in real time without sampling.

GAS MIXING

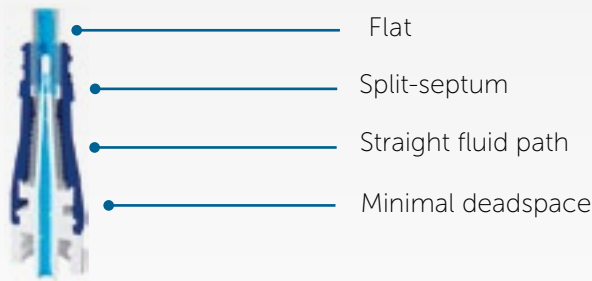
Various controller and hardware configurations enable aeration strategies using air, oxygen, nitrogen or a mixture of these to enrich the air. The mass-flow controller allows the exact flow rate control of individual gases. The flexible aeration options integrated in the fermenter/bioreactor permit a wide range of different application giving to this system a substantial versatility.

- Thermal Mass Flow Controller in entry model
- Gas mixing through TMFC and solenoid valves or numbers of TMFC
- Automatic gas mixing algorithms
- Toro and sintered spargers



LEDA sterile sampling system

Technical specifications	
Material	VALOX resin (external) silicone (internal)
Autoclavable	121-133°C (up to 30 minutes)
Residual volume	0.04 mL
Flow rate	165 mL/minute



- Sterile single use sampling system up to 180 sterile sampling per batch.
- Needlefree connector is designed to reduce the risk of contamination during sampling.
- The sterile combination of a syringe (3-5-10-30 ml) and a non return valve guarantee the sterility after sampling until the next use

S Cube



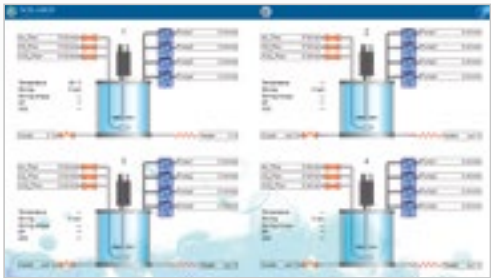
Solaris new modular product design strategy decreases time to market and the number of unique parts in the product architecture increasing the number of product variants. The result is a lean, flexible and smart PCS.

Additional parameters in modular external boxes for future PCS upgrade including dCO₂, Cell Density, Weight, Peristaltic pumps, ect.



USER-FRIENDLY SOFTWARE

The software is the user's best friend in experimental design planning and performing trial runs, as well as analyzing and optimizing media and parameters for cultivation. The graphical user interface enables you to select the software functions intuitively. Data extracted are compatible with Windows Excel. However, Solaris has developed a platform where to easily and quickly manage cultivation data. This software is included in the fermenter/bioreactor supply and can be installed on unlimited number of client's PC or laptop.



Parallel synoptic.



Parallel trends comparison between units, current and old batches.

Do it parallel: smarter..faster

Leonardo can be used for process development (i.e. time-saving · parallel fermentation approaches) Up to 24 independent fermentations/cultivations can be carried out simultaneously.



Do it wireless!

Increased mobility: users can roam around lab or reaching office or home without losing their connection with the running batch.

AUTOCLAVABLE PRESSURE CONTROLLED FERMENTERS/BIOREACTORS

VENUS

Data sheet

Vessel			
Solaris Code		Venus 2.0	
Total Volume (liters)		2,00	
Ratio D/H		1:2,0	
Min. Working Volume (liters)		0,33	
Max. Working Volume (liters)		1,50	
Max. temperature		65°C	
Operating pressure		< 2 bar	
Headplate Ports (14)	n.1 port, Gas Sparger Input	n.1 port, Harvesting system	n.5 ports, spares
	n.1 port, Gas overlay	n.1 port, Temperature sensor	n.1 port, single addition needle free connectors
	n.1 port, Gas out/Condenser	n.1 port, multiaddition (4) needle free connectors	n.1 port, agitation group
	n.1 port, Sampling system		
Design		Borosilicate Glass Jacketed Vessel	
Materials		Borosilicate Glass and AISI 316 L	
Sensors lenght (mm)			
pH		225	
dO ₂		225	
Dimensions for autoclave (with Condenser)			
Height (mm)		505	
Diameter (mm)		225	
Stirring			
Drive		Brushless Motor, Direct Assembly , 1-2000 rpm (bacterial), 1-500 (cell cultures)	
Power (P _N)		266 W	
Impellers		Select from: Rushtons impellers, Marine Impellers, Pitched blade	
Thermoregulation			
Control		PID Control - Accuracy 0,1 °C - Jacketed with electrical heaters	
Gas Control & Gas Mixing			
Sparger and overlay Gas Control		TMFC	
Gas Mixing (Air,CO ₂ ,O ₂ ,N ₂)		1TMFC (included in entry level)	+4 solenoid valves or + n. of additional TMFC
Sparger type		Select from: Toro type (ring), syntered microbubbling both provided with 0,2 µm filter	
Exhaust		Condenser and 0,2 µm filter	
Peristaltic Pumps			
up to 4 Watson Marlow 114, speed 10 - 60 rpm, volumetric flow 0,5-51 ml/min, application assignable from software			
Controller			
Master Control Module		from 1 to 24 units - Dimensions Height: 350 mm Largeness: 350 mm Depth: 350 mm	
HMI with Leonardo software		23'' for single unit , 27'' for multi system parallel	

Controls

INTEGRATED IN SCUBE	Temperature	
	Sensor	PT100
	Accuracy	0,1 °C
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0 - 70°C
	pH	
	Sensor	Digital Hamilton sensor
	Sensitivity	57 to 59 mV/pH
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0 - 14
	Operation temperature	0 - 130°C
	Pressure range	0 - 6 bar
	dO ₂	
	Sensor	Digital Optical Hamilton sensor
	Accuracy	±0.05%-vol, 21±0.2%-vol, 50±0.5%-vol
	Control system	Measuring resident in Leonardo 2.0 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
	Antifoam/Level	
	Sensor	Solaris sensor
	Control	Measuring resident in Leonardo 2.0 software
	Redox (ORP)	
	Sensor	Digital Hamilton sensor
	Sensitivity	57 to 59 mV/pH
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	±2000 mV
	Operation temperature	- 10 -130°C
	Pressure range	≤ 6 bar
	Conductivity	
	Sensor	Digital Hamilton sensor
	Accuracy	±3%
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	1 - 3000 µS/cm
	Operation temperature	0 -130°C
	Pressure range	0 - 20 bar
	dCO ₂	
	Sensor	Mettler Toledo sensor
	Accuracy	±10% (pCO ₂ 10-900 mbar) ≥ ±10%(pCO ₂ > 900 mbar))
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0,00-200% saturation
	Operation temperature	-20.0-150°C
	Cell density	
	Sensor	Hamilton-Fogale sensor
	Accuracy	Mammalian cells in suspension ±5·10 ⁴ cells/ml - Fermentation ±0.05 g/l dry weight
	Control system	Measuring resident in Leonardo 2.0 software
	Pressure range	0-3 bar (option 1) 0-10 bar (option 2)
	Operation temperature	0-60°C (option 1) 0-80°C (option 2) (max. sterilization temperature 135°C)
	Option 1	Total cell density based on turbidity (Two ranges: 10^5 to 10^8 mammalian cells/ml - 0.5 to 100 g/L dry weight)
	Option 2	Viable cell density based on capacitance (Two ranges: 5x10^5 to 8x10^8 mammalian cells/ml - 5 to 200 g/L dry weight)
	Weight	
	Sensor	load cells
	Accuracy	±0.2 g
	Control	Measuring resident in Leonardo 2.0 software
	Peristaltic pumps	
	WM 114	10-60 rpm

EXTERNAL MODULAR BOX

Chiller

- Optionally VENUS can be equipped with a chiller for heat removal from your culture minimizing lab water usage

- Using this system you don't need a water supply line in your lab

- Cost-effective cooling of fermenters

- Easy operation

- Refregerant level monitoring



Chiller data sheet	
Working temperature range	-10°C / +40°C
Temperature stability	±0.5
Power consumption	0.7 kW
Filling volume range	2-8 L
Cooling output at 20°C measured with ethanol	0.25-0.60 kW
Cooling output at 10°C measured with ethanol	0.20-0.50 kW
Cooling output at 0°C measured with ethanol	0.15-0.36 kW
Cooling output at -10°C measured with ethanol	0.09-0.15 kW
Pump pressure max.	0.35-1.30 bar
Pump flow max.	16-35 L/min.
Dimension (WxDxH)	200x350x465 mm



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