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Venus

AUTOCLAVABLE PRESSURE CONTROLLED FERMENTERS/ BIOREACTORS

SOLARIS
BIOTECH SOLUTIONS

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In addition to control parameters available in standard benchtop systems, the **Venus** platform offers the additional capability of Pressure Control.

In many fermentation product development cycles, over pressurization control is enabled only at pilot plant scales. Utilizing pressure control at the benchtop scale allows this parameter to be studied and better optimized, aiding considerations to gas mass transfer management when scaling up.

Venus greatly adds efficiency to the appropriate product development application.

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

GMP

Pressure controlled up to 2 bar

WHY TO INVEST IN THIS PRODUCT

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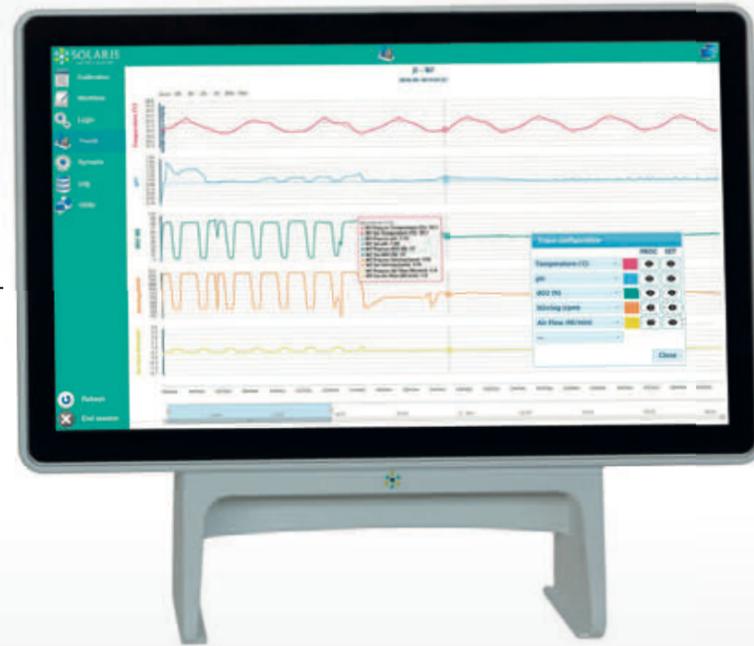**Improved heat transfer**

Higher oxygen transfer

Tel.: +52 (55) 6273-4046 / 6273-4047 / 2465-1016

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Benefits

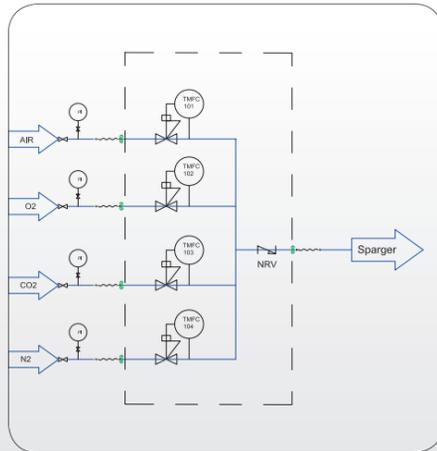**Up to 24 units** managed with one HMI with innovative **PARALLEL process control**
LEONARDO: smart controller designed to provide an high level of automated
management of the fermentation/cultivation processes

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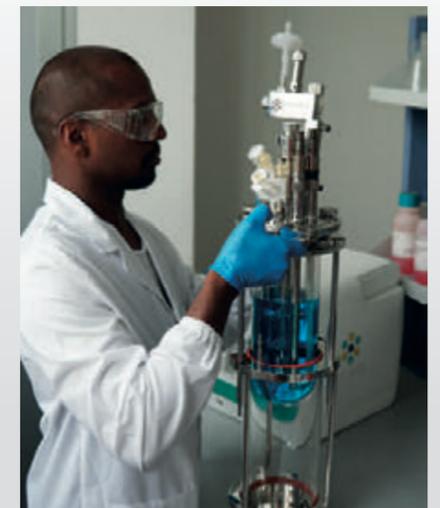obtaining an indirect density indication of the culture broth

Modbus Digital sensors

Pressure controlled
up to 2 bar

Easier scaling up

Higher oxygen trasfer

Batch, Fed batch or continous processes

Different gas mixing strategies with
up to 5 TMFC

Compact and modular PCS

N.4 assignable Watson Marlow pumps
in entry level

24" touch HMI

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

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Modbus Digital sensors

Why a digital sensor?

Digital sensors (including Cell Density products) have been integrated to the Solaris PCS and Leonardo controlling software, giving the user many benefits over traditional analog sensor outputs. Such benefits include a robust communication protocol not susceptible to signal loss, in-software sensor diagnostic information, parallel calibration/batch calibrations and more.

Sensor life traceability

Reducing background noise

GAS MIXING

Hardware and software adaptability are key to enable the best aeration strategy for each process. Thermal mass flow controllers (TMFC) allow precise flow rate control of individual gasses. Up to 5 TMFC's can be configured within each PCS cube and integrated to the controlling software. The powerful software and control platform allows precise cascade adjustment of multiple parameters to manage gas transfer, OTR, kLa, etc.

• n.1 TMFC included in "entry" level system; additional available as optional.

• Various agitator and baffle designs available

• Automatic gas mixing algorithms

• Toro, sintered and other spargers available

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Leonardo 3.0

USER-FRIENDLY SOFTWARE

Solaris controlling software offers a simply laid out, yet powerful platform for experimental design planning and process control. The graphical user interface enables the intuitive selection and adjustment of control functions.

Extracted data is compatible with Window Excel but, in addition, Solaris offers a platform where fermentation data can be easily exported in real time and thus managed. This software is included in the supply and can be installed on an unlimited numer of the client's PC or laptops.
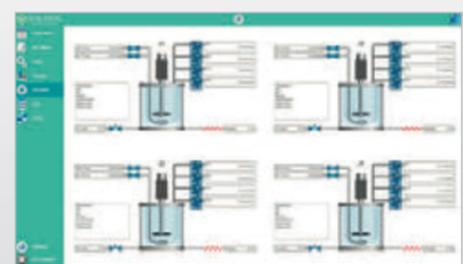
Parallel synoptic

Do it parallel: smarter..faster

Leonardo allows intuitive and time-saving parallel operations. Up to 24 indipendent fermentations/cultivations can be carried out simultaneously.

Leonardo 3.0

Do it wireless!

Increase mobility: users have the option to access the platform remotely via PC, tablet, phone. Remote access is multi-level password protected.

Smart PCS

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, which cn be stacked in case of parallel processes through a dedicated support.

Optimize Lab Space!

Additional parameters in modular external boxes for future PCS upgrade including dCO_2, Cell Density, Weight, Peristaltic pumps, ect.

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Data sheet

Vessel

Solaris Code	Venus 2.0	Venus 4.0
Production Code	vns110300	vns130395
Total Volume (liters)	2,00	4,00
Ratio D/H	1:3,0	1:3,25
Min. Working Volume (liters)	0,35	0,60
Max. Working Volume (liters)	1,40	2,80
Max. temperature	70°C	
Operating pressure	1.6 bar	1.6 bar
Headplate Ports (n.10 Venus 2.0; n.13 Venus 4.0)	Venus 2.0: n.1 Agitation Group, n.1 Gas Sparger, n.1 Gas Overlay, n.1 Gas Out/Condenser, n.1 Sampling/Harvesting, n.1 Temperature, n.1 Multifeed, n.2 Sensors DN12, n.1 Spare Venus 4.0: n.1 Agitation Group, n.1 Gas Sparger, n.1 Gas Overlay, n.1 Gas Out/Condenser, n.1 Sampling, n.1 Harvesting, n.1 Temperature, n.1 Multifeed, n.2 Sensors DN12, n.3 Spare.	
Design	Borosilicate Glass Jacketed Vessel	
Materials	Borosilicate Glass and AISI 316 L	
pH	325	425
dO_2	325	425

Dimensions for autoclave (with Condenser)

Height (mm)	619	705
Diameter (mm)	275	285

Stirring

Drive	Brushless Motor	
Speed (rpm)	1-1900	1-1800
Nominal torque (Nm)	0,9	0,9
Impellers	Select from: Rushtons impellers, Marine Impellers, Pitched blade	

Thermoregulation

Control	PID Control - Accuracy 0,1 °C - Jacketed with n. 2 Electric Cartridge Heaters	
Total Heater Power (W)	400	600

Gas Control & Gas Mixing

Sparger and overlay Gas Control	TMFC with 0,22 µm sinterized filter
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 (up to 4)
Sparger type	Select from: Toro type (ring), syntered microbubbling both provided with 0,2 µm filter
Exhaust	Condenser and 0,22 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
	(optional) Watson Marlow type 313 FDM/D, max. speed 350 rpm, volumetric flow 1,5-1750 ml/min, function assignable from software

Controller

Master Control Module	From 1 to 24 units - 35x37xh36 cm
HMI with Leonardo software	Operate interface 58x15xh48 cm with 24" monitor

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Controls

INTEGRATED IN THE PCS

Temperature
Sensor	PT100
Accuracy	0,1 °C
Control system	Measuring resident in Leonardo 3.0 software
Control range	0 - 70°C

pH
Sensor	Digital sensor
Sensitivity	57 to 59 mV/pH
Control system	Measuring resident in Leonardo 3.0 software
Control range	0 - 14
Operation temperature	0 - 130°C
Pressure range	0 - 6 bar

dO_2
Sensor	Digital Optical sensor
Accuracy	$\pm$0.05%-vol, 21$\pm$0.2%-vol, 50$\pm$0.5%-vol
Control system	Measuring resident in Leonardo 3.0 software
Control range	0,05 - 300% air saturation
Operation temperature	-10 - 130°C
Pressure range	0 - 12 bar

Antifoam/Level
Sensor	Solaris sensor
Control	Measuring resident in Leonardo 3.0 software

Redox (ORP)
Sensor	Digital sensor
Sensitivity	57 to 59 mV/pH
Control system	Measuring resident in Leonardo 3.0 software
Control range	$\pm$2000 mV
Operation temperature	- 10 -130°C
Pressure range	< 6 bar

Conductivity
Sensor	Digital sensor
Accuracy	$\pm$3%
Control system	Measuring resident in Leonardo 3.0 software
Control range	1 - 3000 µS/cm
Operation temperature	0 -130°C
Pressure range	0 - 20 bar

dCO_2
Sensor	Analog sensor
Accuracy	$\pm$10% (pCO_2 10-900 mbar) $\geq$ $\pm$10%(pCO_2 > 900 mbar))
Control system	Measuring resident in Leonardo 3.0 software
Control range	0,00-200% saturation
Operation temperature	-20.0-150°C

Cell density
Sensor	Digital sensor
Accuracy	Mammalian cells in suspension $\pm$5·10^4 cells/ml - Fermentation $\pm$0.05 g/l dry weight
Control system	Measuring resident in Leonardo 3.0 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	Dencytee: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	Incyte: 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	Digital Balance
Accuracy	$\pm$0.2 g
Control	Measuring resident in Leonardo 2.0 software

EXTERNAL MODULAR BOX

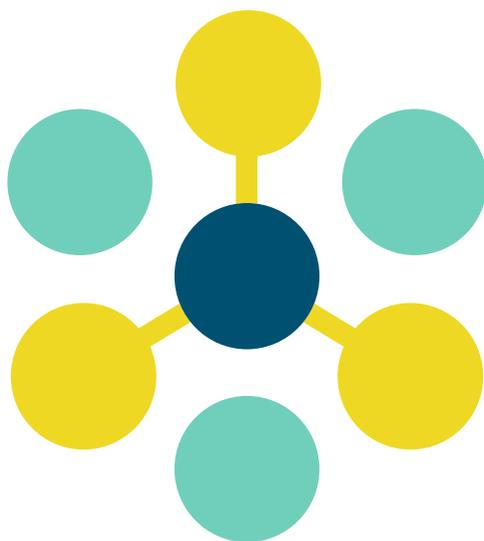#### Peristaltic pumps
WM 114	10-60 rpm

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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

- Refrigerant level monitoring

Chiller data sheet

Working temperature range	-10°C / +40°C
Temperature stability	$\pm$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.

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