



INDEX

COMPANY PROFILE

2	WELCOME TO SOLARIS
---	--------------------

PRODUCTS

4	R&D BENCHTOP FERMENTERS/BIOREACTORS
6	IO
14	JUPITER
24	VENUS
34	ELARA ST
42	ELARA FLAT
50	GENESIS
58	PILOT AND INDUSTRIAL FERMENTERS/BIOREACTORS
60	M SERIES
68	S-I SERIES
86	MODBUS DIGITAL HAMILTON SENSORS
88	PRODUCTS AND SERVICES
90	PROCESS PLANTS
94	METIS GAS ANALYZER
96	KRONOS TF FILTRATION
104	TYTAN
106	C.I.P. & S.I.P. SYSTEMS
108	EDUCATION & TRAINING
109	FERMENTATION AND BIOTECH DEVELOPMENT

COMPANY PROFILE

WELCOME TO SOLARIS

Solaris is a **dynamic** company founded in 2002 with the mission of helping its customers to define and realize their product in the faster, cheaper and most efficient way, concerning both equipment and processes, based on the capability of offering an **integrated service**, which is probably unique in this field. Our customers are labs, public and private research institutes, small, middle and big manufacturers from the biotech, pharma and food industry.

Solaris has its own production facilities in Italy with local representatives in more than 40 countries around the world.

Fermenters, bioreactors, reactors, gas analysers, CIP/SIP systems and downstream Equipments (Membrane Operations) based on the Tangential Flow Filtration technologies (Microfiltration, Ultrafiltration, Nanofiltration and Reverse Osmosis).

Solaris provides all path required for the design and manufacturing **following the cGMP** of each single equipment up to the complete **Integrated Process Plants**, from the feasibility studies to the Start Up, together with a complete range of services to meet customer's targets.



PRODUCTS

R&D BENCHTOP FERMENTERS/BIOREACTORS

The R&D Benchtop series represent **the ideal solution to satisfy the research, teaching and little scale production necessities** due to their flexibility and simplicity in use. The flexibility is guaranteed by a broad range of alternatives according to the customer needs and requirements.

Autoclavable or SIP, our equipments cover the full range of applications, from bacterial fermentation up to cell cultivation for batch, fed batch and continuous process.

IO



JUPITER



VENUS



ELARA



GENESIS



SINGLE & PARALLEL MINI FERMENTERS/BIOREACTORS

10

IO is a mini fermenter/bioreactor suitable for beginners and experienced users alike.
With total volumes 200ml and 1000ml and two different ratio H/D represents a great innovative device for process development.
PCS is managing up to 24 units with parallel control.



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

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

**WHY TO
INVEST**
IN THIS PRODUCT

Fast and Accurate
thermoregulation
without
Water
Circulation

Parallel control
up to **24 units**

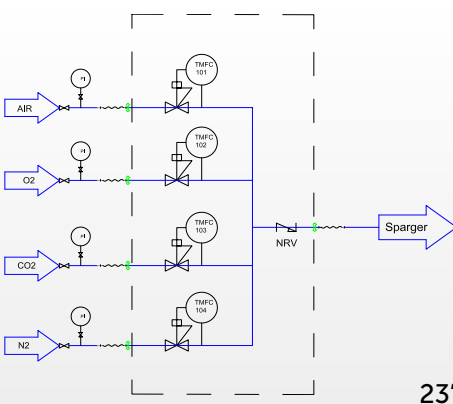


Benefits

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

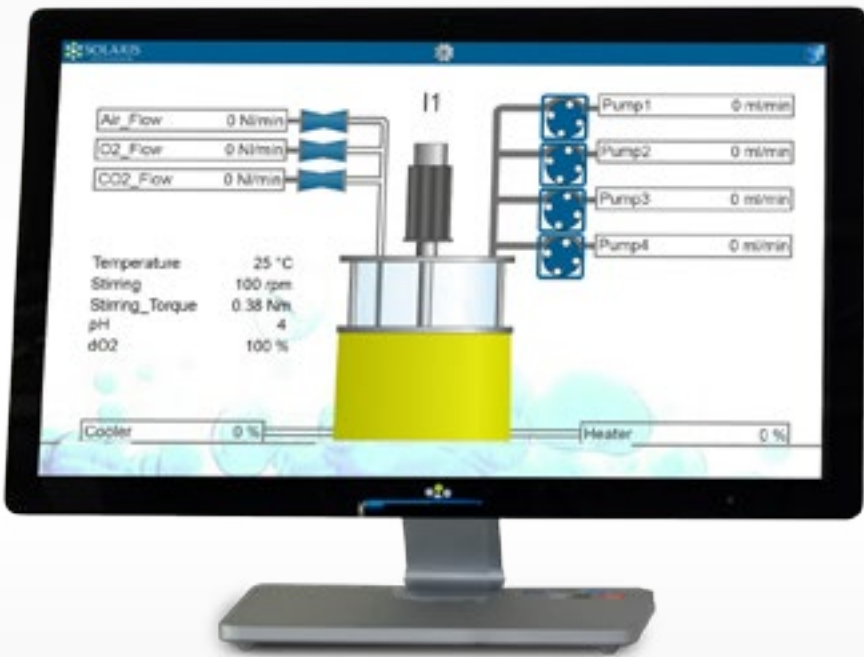
Batch, Fed batch or continous processes

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



LEDA safe sterile sampling system
The needle free 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 guarantees the sterility after sampling until the next use.

Compact and modular PCS (350x350x350 mm)

Additional parameter in modular external boxes for future PCS upgrade Including dCO₂, cell density, weight, peristaltic pumps, ect



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

No water circulation
Thermoregulation performed through Peltier cell



Impressive
Thermoregulation
Ramp

SINGLE & PARALLEL MINI FERMENTERS/BIOREACTORS

Modbus Hamilton sensors

Why a digital sensor?

Hamilton sensors 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.

	Unit	Value	Unit	Value	Unit	Value
pH Temp	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---
pH	0.0 °C	100 %	---	---	---	---

MTU - gbt Phase Info		Unit		Unit	
MTU	Operating hours	1000	h	1000	h
	MTU	1	h	1000	h
	CPH	1	h	1000	h
	Minimum average	1	h	1000	h
Temperature	Calibration accuracy	1	h	1000	h
	Minimum average	1	h	1000	h
MTU	Calibration accuracy	1	h	1000	h
	Minimum average	1	h	1000	h
GPR	Calibration accuracy	1	h	1000	h
	Minimum average	1	h	1000	h
	Quality	100	h	1000	h
	Serial number	1000	h	1000	h
		Close			

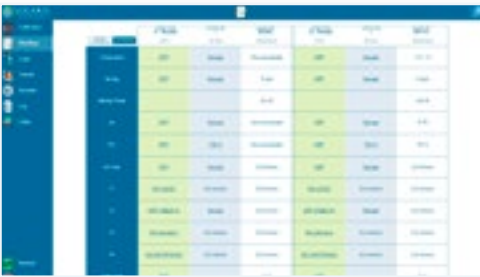
Sensor life
traceability

Reducing
background noise

Leonardo 2.0

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 fermentation data. This software is included in the fermenter supply and can be installed on unlimited number of client's PC or laptop.



Parallel workflow



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 without losing their connection with the running batch.

Data sheet

Vessel		
Solaris Code	IO 200	IO 1000
Total Volume (ml)	200	1000
Ratio H/D	1:1,5	1:2,5
Min. Working Volume (ml)	120	320
Max. Working Volume (ml)	150	750
Max. temperature	70 °C	
Max Operating pres- sure	0,8 bar (g)	
Materials	Borosilicate glass and AISI 316 L	
	n.3 DN12 ports(sensors, multifeed, condenser)	n.5 DN12 ports(sensors,
Headplate Ports	n.3 DN8 ports(gas in sparger, harvest,sampling)	n.3 DN8 ports(gas in sparger,
Sensors lenght (mm)		
lenght	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)	1TMFC (included in entry level)	+4 solenoid valves or + n. of additional TMFC
Sparger type	Fluted with laser microholes provided with 0,2 µm filter	
Exhaust	0,2 µm filter	
Peristaltic Pumps		
up to 4 Watson Marlow 114, speed 0 - 60 rpm, volumetric flow 0,5-51 ml/min, application assignable from software		
Controller		
PCS	from 1 to 24 units - H: 350mm L: 350mm D: 350mm	
HMI with Leonardo software	23" for single units, 27" for multi systems (parallel)	

Controls

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
Actuator	Cascade to peristaltic pumps for the addition of acid/base solutions or gas (CO ₂)
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
Redox (ORP)	
Sensor	Digital Hamilton sensor
Sensitivity	57 to 59 mV/pH
Control system	Measuring resident in Leonardo 2.0 software
Operation temperature	- 10 -130°C
Pressure range	≤ 6 bar
Control range	±2000 mV
Antifoam/Level	
Sensor	Solaris sensor
Control	Measuring resident in Leonardo 2.0 software
Conductivity	
Sensor	Digital Hamilton sensor
Accuracy	±3% at 1 µS/cm to 100 mS/cm, ± 5% at 100 to
Control system	Measuring resident in Leonardo 2.0 software
Operation temp	0 -130°C
Pressure range	0 - 20 bar
Control range	1 - 3000 µS/cm

dCO ₂	
Sensor	Mettler Toledo sensor
Accuracy	±10% (pCO2 10-900 mbar) ≥ ± 10%
Control system	Measuring resident in Leonardo 2.0 software
Operation temperature	-20.0-150°C
Control range	0 - 4 bar(g)
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
Option 1	Total cell density based on turbidity (10^5 to 10^8 mammalian cells/ml- 0.5 to 100 g/L dry weight)
Option 2	Viable cell density based on capacitance (5x10^5to 8x10^8 mammalian cells/ml-5 to 200 g/L dry weight)
Weight	
Sensor	load cells
Accuracy	±0.1 g
Control	Measuring resident in Leonardo 2.0 software
Peristaltic pumps	
WM 313 FDM/D	175 rpm



UP TO 8
FERMENTERS
CONNECTED!

SINGLE & PARALLEL FERMENTERS/BIOREACTORS

JUPITER

JUPITER simply represents the next generation of parallel autoclavable R&D fermenters/bioreactors with a pre-packed high tech innovative solutions, ready out of the box at a terrific price.



JUPITER typical applications includes the following:

- Education & Basic research**
- Scale-up and scale-down studies**
- Process development and optimization**

JUPITER can be used for:

- Biopharmaceutical**
- Biofuels**
- Food industry**
- Bioremediation**
- Bioplastic**
- Cosmeceutical**
- Nutraceutical**



**WHY TO
INVEST**
IN THIS PRODUCT

The best ratio
**Quality/
Capability/Price**
on the market

Parallel control
up to **24 units**

SINGLE & PARALLEL FERMENTERS/BIOREACTORS



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
Batch, Fed batch or continous 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 Hamilton sensors



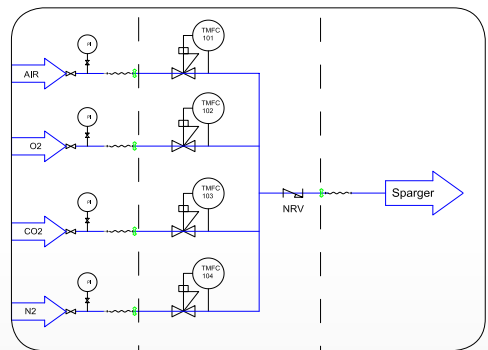
LEDA safe sterile sampling system

Safety: pressure releaf valve included in each unit

Compact and modular PCS (350x350x350 mm)

Additional parameter in modular external boxes for future PCS upgrade Including dCO₂, cell density, weight, peristaltic pumps, ect

Different gas mixing strategies with up to 5 TMFC



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



Remote access via PC, tablet/smartphone
Remote control for after sale assistance

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

Wide range of options, 6 different volumes and 3 different ratio H/D

Fully removable and cleanable jacket





Modbus Hamilton sensors

Why a digital sensor?

Hamilton sensors 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.

	UNIT	VALUE	STATUS	UNIT	UNIT NUMBER
pH Temp	0.0 °C	100 %	---	---	---
pH Temp	0.0 °C	100 %	---	---	---
pH	0.00	100 %	---	---	---
pH	0.00 %	100 %	---	---	---
Pressure	0.00 bar	100 %	---	---	---

	UNIT	VALUE	UNIT	UNIT NUMBER
Temperature	0.0 °C	100 %	---	---
Pressure	0.00 bar	100 %	---	---
pH	0.00	100 %	---	---
pH	0.00 %	100 %	---	---
Pressure	0.00 bar	100 %	---	---
Pressure	0.00 bar	100 %	---	---
Pressure	0.00 bar	100 %	---	---
Pressure	0.00 bar	100 %	---	---
Pressure	0.00 bar	100 %	---	---
Pressure	0.00 bar	100 %	---	---

**Sensor life
traceability**

**Reducing
background noise**

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.

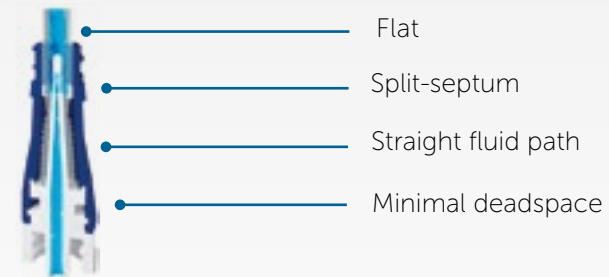
- Thermal Mass Flow Controller in entry model
- Gas mixing through TMFC and solenoid valves or numbers of TMFC
- Automatic gas mixing algorithms
- Toro and sintered spargers



LEDA sterile sampling system

Technical specifications

Material	VALOX resin (external) silicone
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 guarantees the sterility after sampling until the next use**

S Cube



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

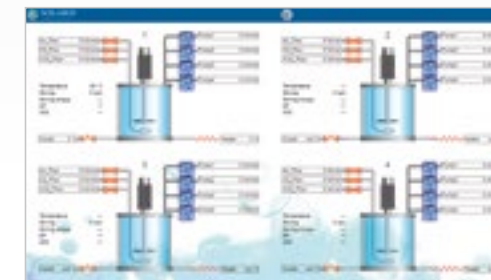
Solaris new modular product design strategy decreases time to market and the number of unique parts in the product architecture increasing the number of product variants. The result is a lean, flexible and smart PCS.



Leonardo 2.0

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 without losing their connection with the running batch.

Data sheet

Vessel						
Solaris Code	Jupiter 2.0	Jupiter 3.1	Jupiter 4.0	Jupiter 6.0	Jupiter 8.0	Jupiter 10.0
Production Code	A1	A2	A3	C2	C3	C4
Total Volume (liters)	2,00	3,10	4,00	6,00	8,00	10,00
Ratio D/H	1:2,0	1:2,5	1:3,0	1:2,0	1:2,5	1:3,0
Min. Working Volume	0,50	0,66	0,60	1,10	1,30	1,50
Max. Working Volume	1,50	2,25	3,00	4,50	6,00	7,50
Max. temperature	65°C					
Operating pressure	< 0,5 bar					
Headplate Ports (14)	n.1 port, Gas Sparger Input n.1 port, Gas overlay n.1 port, Gas out/Con- denser n.1 port, Sampling system		n.1 port, Temperature sensor n.1 port, multiaddition (4) needle free connectors		n.5 ports, spares, n.1 port, single addition needle free connectors, n.1 port, agitation group	
Design	Borosilicate Glass Jacketed Vessel					
Materials	Borosilicate Glass and AISI 316 L					

Sensors lenght (mm)						
pH	225	225	325	225	325	425
dO ₂	225	225	325	225	325	425

Dimensions for autoclave (with Condenser)						
Height (mm)	505	580	655	580	655	760
Diameter (mm)	225	225	225	280	280	280

Stirring	
Drive	Brushless Motor, Direct Assembly , 1-2000 rpm (bacterial), 1-500 (cell cultures)
Power (P _N)	208 W
Impellers	Select from: Rushtons impellers, Marine Impellers, Pitched blade

Thermoregulation	
Control	PID Control - Accuracy 0,1 °C - Jacketed with electrical heaters and cooling valve

Gas Control & Gas Mixing	
Sparger and overlay Gas	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	
n. 1 Watson Marlow 313 FDM/D, speed 45-350 rpm, volumetric flow 1,5-1750 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	23” for single unit , 27” for multi system parallel

Controls

INTEGRATED IN S.CUBE	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
EXTERNAL MODULAR BOX	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
EXTERNAL MODULAR BOX	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
EXTERNAL MODULAR BOX	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))
EXTERNAL MODULAR BOX	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 ⁴ 5 to 10 ⁸ mammalian cells/ml - 0.5 to 100 g/L dry weight)
EXTERNAL MODULAR BOX	Option 2	Viable cell density based on capacitance (Two ranges: 5x10 ⁴ 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

Chiller

- Optionally JUPITER 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) up to Jupiter 5.0 from Jupiter 5.5 to 8.0 Jupiter 10.0	200x350x465 mm 240x400x500 mm 350x480x595 mm

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



Pressure
controlled
up to 2 bar

WHY TO
INVEST
IN THIS PRODUCT

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

High oxygen
transfer

AUTOCLAVABLE PRESSURE CONTROLLED FERMENTERS/BIOREACTORS

VENUS

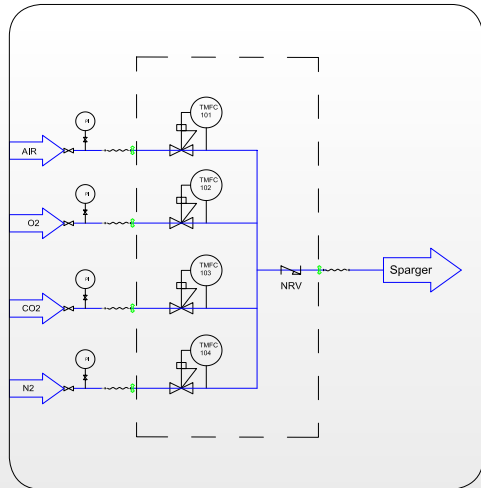
Benefits



Up to 24 units managed with one HMI with innovative **PARALLEL process control** LEONARDO: smart controller designed to provide a 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 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.

Parameter	Value	Unit	Alarm	Calibration	Diagnostic
pH Temp	0.0 °C	100 %	---	Calibrate	---
pH	0.0 °C	100 %	---	Calibrate	---
pH	4.00	100 %	4.00	7.10	2019-10-10 10:10
pH	0.00 %	100 %	---	Calibrate	---
Pressure	0.00 bar	100 %	---	Calibrate	---

Parameter	Value	Unit	Alarm	Calibration	Diagnostic
pH	0.0 °C	100 %	---	Calibrate	---
pH	0.0 °C	100 %	---	Calibrate	---
pH	4.00	100 %	4.00	7.10	2019-10-10 10:10
pH	0.00 %	100 %	---	Calibrate	---
Pressure	0.00 bar	100 %	---	Calibrate	---

**Sensor life
traceability**

**Reducing
background noise**

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



Leonardo 2.0
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 trends comparison between units, current and old batches.



Leonardo 2.0



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

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.



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.



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, Sampling system	n.1 port, multiaddition (4) needle free connectors	n.1 port, agitation group
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 S CUBE	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
EXTERNAL MODULAR BOX	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

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

STIRRED AUTOCLAVABLE PHOTOBIOREACTORS

ELARA ST

ELARAST photobioreactor is ideal for phototrophic organisms as moss, microalgae, bacteria and plant cells under optimum conditions. The spectrum is selectable and the light intensity is dimmable from 0-100% up to 3000 $\mu\text{mol}(\text{photon})/\text{m}^2$. Turbidostat mode via turbidity sensor.

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

ELARA St can be used for:
Algae
Phototrophic bacteria
Plant cells



**INNOVATIVE
SOLUTION**
to improve your
microalgae culture

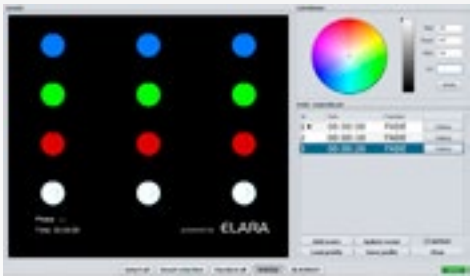
**WHY TO
INVEST**
IN THIS PRODUCT

High power
LED lighting,
spectrum selectable
and
dimmable 0-100%

FLEXIBILITY

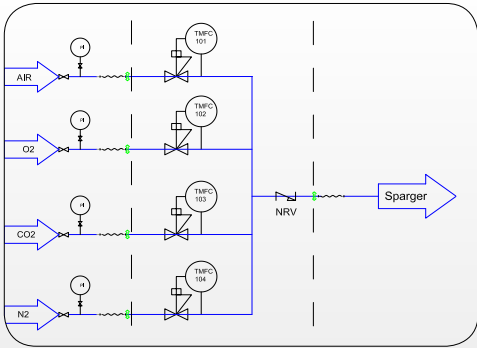
The **fully removable** light
module allows to use Elara
as a traditional fermenter

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 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



Automatic and manual control of RBW light intensity and circadian cycle simulation

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



LEDA safe sterile sampling system
The needle free 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 guarantees the sterility after sampling until the next use.

Safety: pressure releaf valve included in each unit.

Compact and modular PCS (350x350x350 mm)

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

Additional External modular box: OD, dCO2, weight, thermobox, peristaltic pumps

Fully removable and cleanable jacket

Modbus Hamilton sensors

Why a digital sensor?

Hamilton sensors 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.

	UNIT	VALUE	UNIT	VALUE	UNIT	VALUE
pH Temp	0.00 °C	100 %	---	---	Carbonate	---
pH Temp	0.00 °C	100 %	---	---	Carbonate	---
pH	0.00	100 %	6.00	7.00	Carbonate	2019-10-05 16:...
pH	0.00 %	100 %	---	---	Carbonate	---
Pressure	0.00 bar	100 %	---	---	Carbonate	---

	UNIT	VALUE	UNIT	VALUE	UNIT	VALUE
pH	0.00 °C	100 %	---	---	Carbonate	---
Temperature	0.00 °C	100 %	---	---	Carbonate	---
pH	0.00	100 %	6.00	7.00	Carbonate	2019-10-05 16:...
pH	0.00 %	100 %	---	---	Carbonate	---
Pressure	0.00 bar	100 %	---	---	Carbonate	---

Sensor life
traceability

Reducing
background noise

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



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 Leonardo data viewer, a platform where to easily and quickly manage fermentation data. The software is included in the fermenter supply and can be installed on unlimited number of client’s PC or laptop.

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.can be carried out simultaneously. The graphical user interface enables you to select the software functions intuitively. Data extracted are compatible with Windows Excel. However, Solaris has developed Leonardo data viewer, a platform where to easily and quickly manage fermentation data. The software is included in the fermenter 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 wireless!

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



Data sheet

Vessel	
Photobioreactor type	Stirred
Total Volume (liters)	4,00
Ratio D/H	1:3,0
Min. Working Volume (liters)	0,60
Max. Working Volume (liters)	3,00
Max. temperature	135 °C
Operating pressure	< 0,5 bar
Ports	n.1 port, Gas Sparger Input n.1 port, Gas overlay n.1 port, Gas Out n.1 port, Harvesting system n. 1 port, Sampling system n.1 port, Temperature Sensor n.1 port, multi addition (4) needle free connectors n.5 ports, spares probes n.1 port, single addition needle free connector n.1 port, Agitation Group
Design	Borosilicate Glass Jacketed Vessel
Materials	Borosilicate Glass and AISI 316 L
Sensors lenght (mm)	
pH	325
dO ₂	325
Dimensions for autoclave (with Condenser)	
Height (mm)	655
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 Thermobox (flat) / water jacketed with electric heaters (stirred vessel)
Gas Control & Gas Mixing	
Sparger and overlay Gas Control	TMFC
Gas Mixing (Air,CO ₂ ,O ₂ ,N ₂)	n.1 TMFC + n. solenoid valves or n° of TMFC
Aeration system	Toro ring or sintered (microbubbling) sparger with 0,2 µm filter
Exhaust	Condenser and 0,2 µm filter
Peristaltic Pumps	
Peristaltic pumps	4 Watson Marlow 114, fixed speed or speed controlled, application assignable from software
Variable speed	10 – 60 rpm
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 S CUBE	Temperature	
	Sensor	PT100
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0 - 150°C
	pH	
	Sensor	Digital Hamilton sensor
	Control system	Measuring resident in Leonardo 2.0 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)
	dO ₂	
	Sensor	Digital Optical Hamilton sensor
	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
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	±2000 mV
	Operation temperature	- 10 -130°C
EXTERNAL MODULAR BOX	Conductivity	
	Sensor	Digital Hamilton sensor
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	1 - 3000 µS/cm
	Operation temperature	0 -130°C
	dCO ₂	
	Sensor	Mettler Toledo sensor
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0,00-200% saturation
	Operation temperature	-20.0-150°C
	Pressure range	0 - 4 bar
	Weight	
	Sensor	load cells
	Control	Measuring resident in Leonardo 2.0 software
	Peristaltic pumps	
	WM 114	10-60 rpm
	WM 313 FDM/D	45-350 rpm

Chiller

- Optionally ELARA 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

PHOTOBIOREACTORS

ELARA FLAT

INNOVATIVE
SOLUTION
TO IMPROVE
YOUR MICROALGAE
CULTURE

ELARA Flat photobioreactor is ideal for phototrophic organisms as moss, microalgae, bacteria and plant cells under optimum conditions. The light intensity is dimmable from 0-100% up to 3000 $\mu\text{mol}(\text{photon})/\text{m}^2$. Luminostat mode via radiation sensor.

ELARA Flat typical applications includes the following:

- Education & Basic research
- Scale-up and scale-down studies
- Process development and optimization

ELARA Flat can be used for:

- Algae
- Phototrophic bacteria
- Plant cells



Homogeneous
Light distribution

WHY TO
INVEST
IN THIS PRODUCT

High power
LED lighting,
spectrum selectable
and
dimmable 0-100%

Higly resistant
to
salty water

PHOTOBIOREACTORS

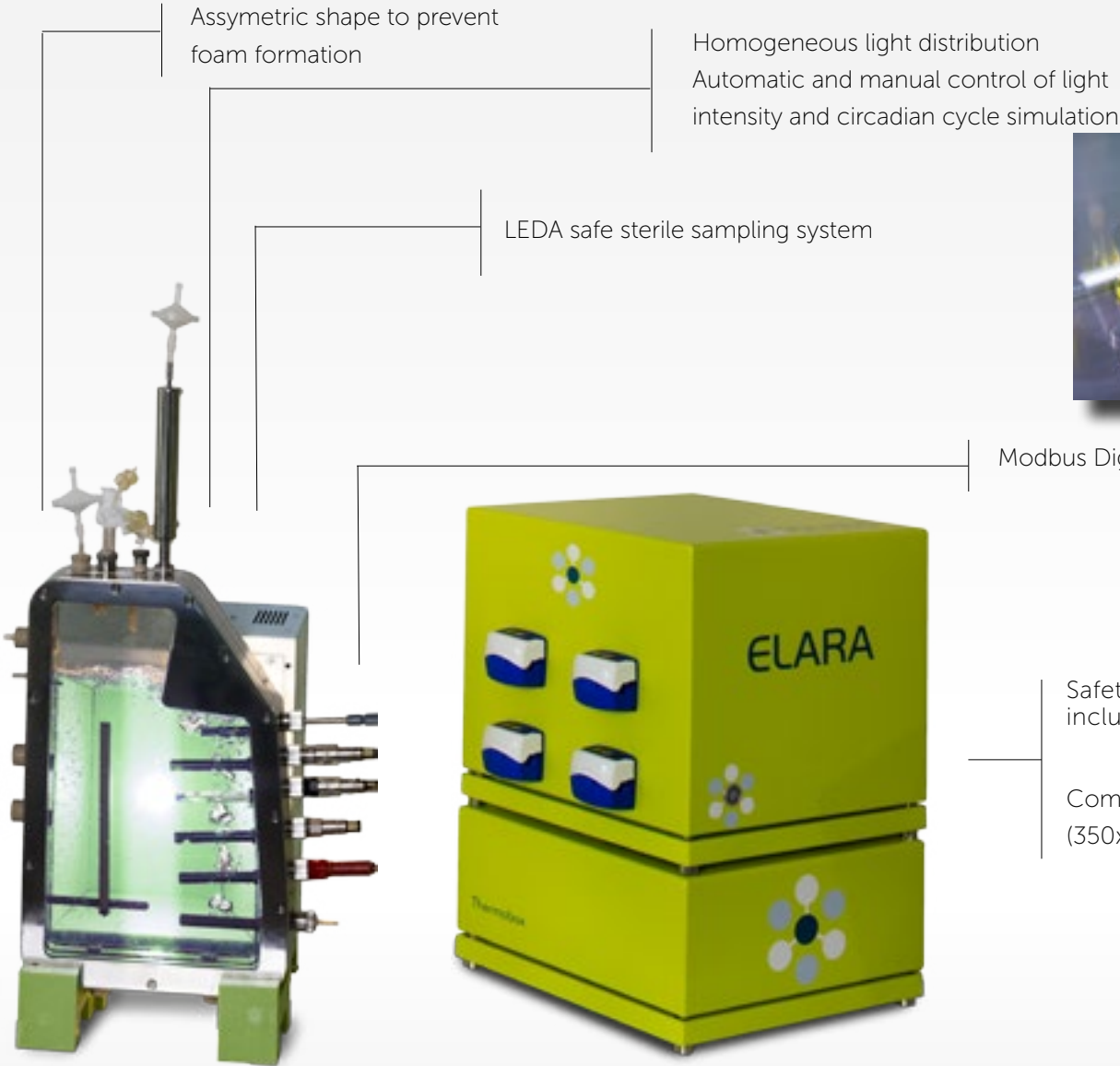
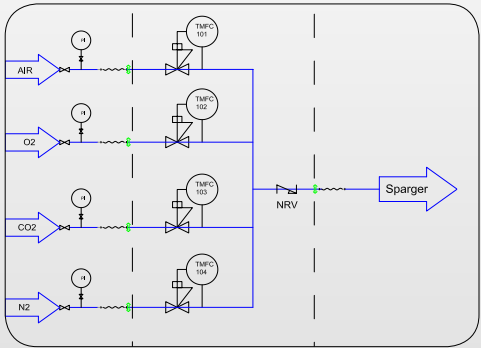
Benefits

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
Batch, Fed batch or continous processes

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



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



Modbus Digital Hamilton sensors

Safety: pressure releaf valve included in each unit.

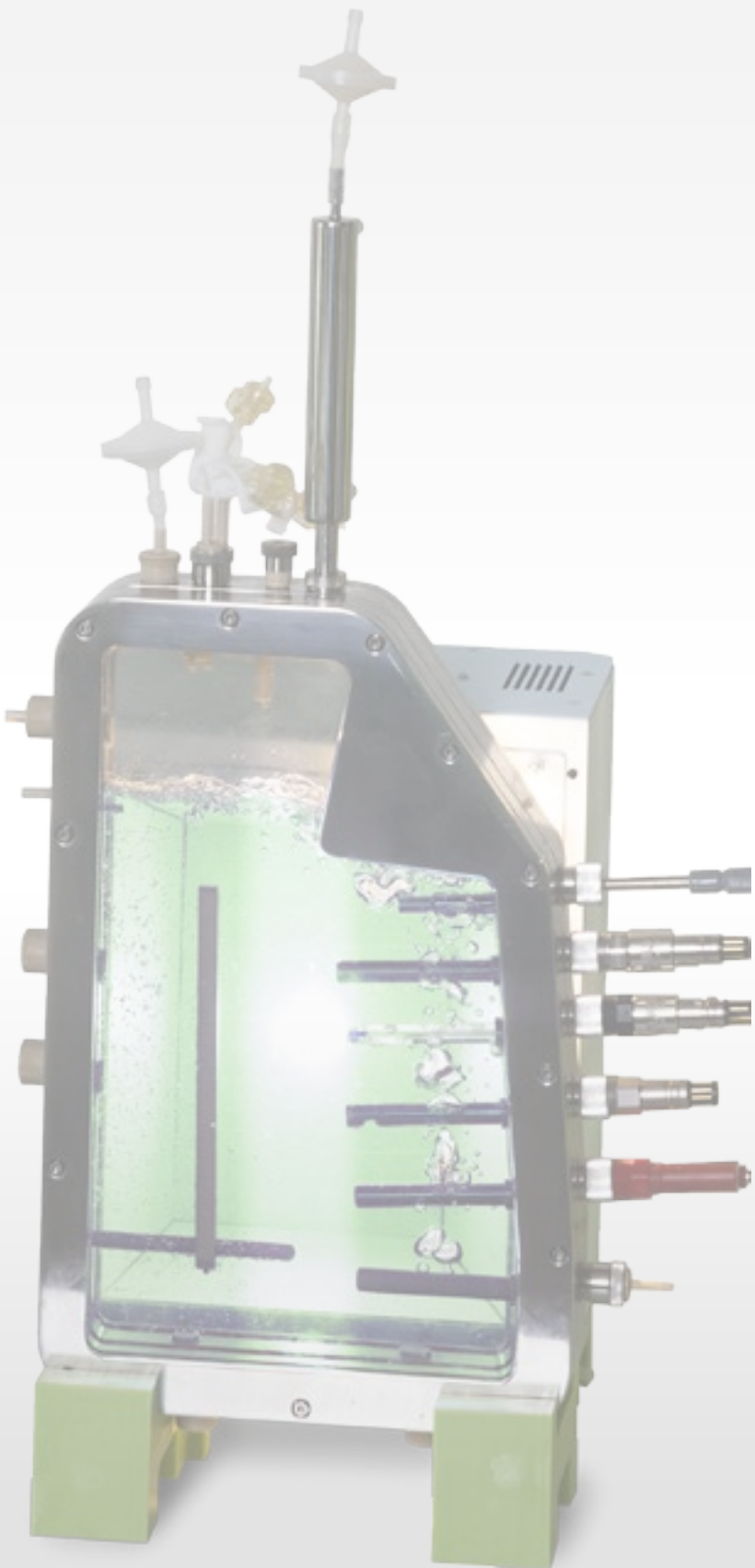
Compact and modular PCS (350x350x350 mm)

Airlift mixing process Different gas mixing strategies with up to 5 TMFC

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

Additional External modular box: OD, dCO2, weight, thermobox, peristaltic pumps

Parts in contact with the culture made in borosilicate glass and Super duplex SAF 2507 highly resistant to salty water



HOMOGENEOUS LIGHT DISTRIBUTION

The flat design with the minimum thickness allows an homogeneous light distribution even at high viscosity.

MATERIAL

Parts in contact with the culture made in borosilicate glass and Super duplex SAF 2507 give high resistant to salty water.

ASYMMETRICAL SHAPE

Facing the foam formation problem the asymmetrical shape is your best ally.

MODBUS DIGITAL SENSORS

Hamilton sensors 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.

AIRLIFT

Gentle mix performed through the air lift prevents the damages at the cell membrane ensuring an efficient homogenization.

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.

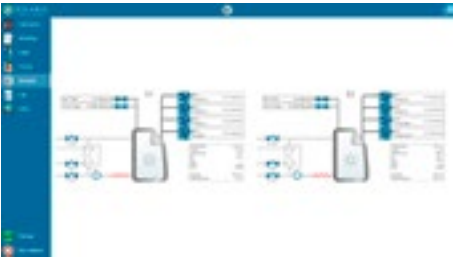
USER-FRIENDLY SOFTWARE

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 Leonardo data viewer, a platform where to easily and quickly manage fermentation data. The software is included in the fermenter supply and can be installed on unlimited number of client's PC or laptop.

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.can be carried out simultaneously. The graphical user interface enables you to select the software functions intuitively. Data extracted are compatible with Windows Excel. However, Solaris has developed Leonardo data viewer, a platform where to easily and quickly manage fermentation data. The software is included in the fermenter 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 wireless!

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



Data sheet

Vessel	
Photobioreactor type	Flat
Total Volume (liters)	1,60
Ratio D/H	1:2,4
Min. Working Volume (liters)	1,30
Max. Working Volume (liters)	1,40
Max. temperature	50 °C
Operating pressure	< 0,5 bar
Ports	n.1 port, Gas out Condenser n.1 port, Antifoam probe n.1 port, multi addition (3) needle free connectors n.1 port, single addition needle free connector n.4 port, Hygienic Socket Solaris, Spare probes n.1 port, temp. housing, PT100 n.2 ports, Sampling system n.1 port, Gas Sparger Input n.1 port, Baffle n.3 ports, Spares (1bottom,2short) n.1 port, Harvest valve
Design	Borosilicate Glass Jacketed Vessel with Super Duplex and AISI316
Materials	Borosilicate Glass, Super Duplex, AISI316
Sensors lenght (mm)	
pH	225
Dimensions for autoclave (with Condenser)	
Height (mm)	660
Diameter (mm)	280
Thermoregulation	
Control	PID Control - Accuracy 0,1 °C Thermobox (flat) / water jacketed with electric heaters (stirred vessel)
Gas Control & Gas Mixing	
Sparger and overlay Gas Control	TMFC
Gas Mixing (Air,CO ₂ ,O ₂ ,N ₂)	n.1 TMFC + n. solenoid valves or n° of TMFC
Aeration system	Micro holes Type with 0,2 µm filter
Exhaust	Condenser and 0,2 µm filter
Peristaltic Pumps	
Peristaltic pumps	4 Watson Marlow 114, fixed speed or speed controlled, application assignable from software
Variable speed	10 - 60 rpm
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 S CUBE	Temperature	
	Sensor	PT100
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0 - 150°C
	pH	
	Sensor	Digital Hamilton sensor
	Control system	Measuring resident in Leonardo 2.0 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)
	dO ₂	
	Sensor	Digital Optical Hamilton sensor
	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
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	±2000 mV
	Operation temperature	- 10 -130°C

EXTERNAL MODULAR BOX	Conductivity	
	Sensor	Digital Hamilton sensor
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	1 - 3000 µS/cm
	Operation temperature	0 -130°C
	dCO ₂	
	Sensor	Mettler Toledo sensor
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0,00-200% saturation
	Operation temperature	-20.0-150°C
	Pressure range	0 - 4 bar
	Weight	
	Sensor	load cells
	Control	Measuring resident in Leonardo 2.0 software
	Peristaltic pumps	
	WM 114	10-60 rpm
	WM 313 FDM/D	45-350 rpm

Chiller

- Optionally ELARA 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

STANDARD STERILIZABLE IN PLACE SOLUTIONS



GENESIS

GENESIS is R&D Sterizable-In-Place Benchtop Fermenter/Bioreactor available from 7,5 up to 20 litres total volume. Automatic sterilization by steam or alternative through electric heaters (steam source not necessary) .



GENESIS is an ideal partner for microbial fermentation as well as animal, plant and insect cell cultivation. Typical applications includes the following:

- Education**
- Basic research**
- Scale-up and scale-down studies**
- Process development and optimization**

- GENESIS** can be used for:
- Biopharmaceutical**
 - Biofuels research and manufacturing**
 - Vaccines**
 - Food and beverage biotechnologies**
 - Bioremediation**
 - Bioplastics**
 - Cosmeceutical**
 - Nutraceutical**

WHY TO INVEST
IN THIS PRODUCT

The best ratio
**Quality/
Capability/Price**
on the market

**Automatic
sterilization**
through electrical heaters
(no need for an
external steam source)
or by steam

Benefits

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.

Sampling system



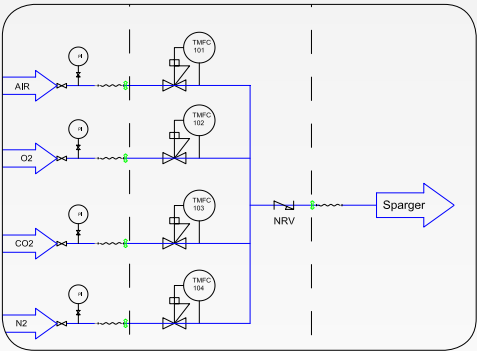
Illuminated side glass

Modbus Digital
Hamilton sensors

Double jacket (side-bottom)
Increased heat transfer
efficiency
It ensures optimal temperature
control and sterilization even at

Harvest valve in entry level
optionally SIP

Different gas mixing strategies with
up to 5 TMFC



External additional boxes parameters for
future PCS upgrade including dCO₂, Cell
Density, Weight, Peristaltic pumps, ect

SBC16: smart controller designed to provide
an high level of automated
management of the fermentation/
cultivation processes
Batch, Fed batch or continous processes

Compact and modular PCS
(350x350x350 mm)

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

Automatic sterilization by steam or
alternative through electric heaters



SALAS – Solaris Sterile Needle Free Additions System

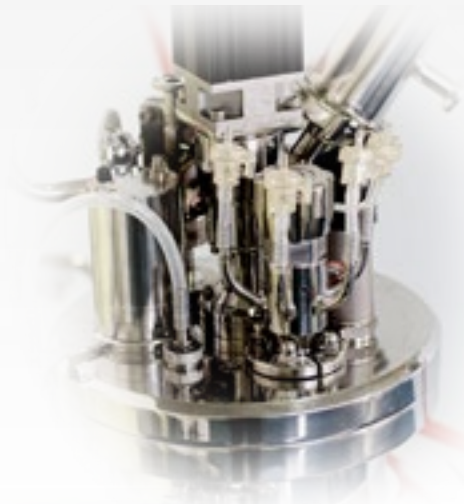
SBC 16

NEEDLE
FREE

EASY & QUICK
OPERATION

Genesis is supplied with **SALAS**, a 4 channels needle free additions system (Inoculums/ Feedings/pH corrective solutions/A.F solution).

SALAS allows an easy and quick connection between the feeding solution and the vessel top lid.



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 fermentation data. This software is included in the fermenter supply and can be installed on unlimited number of client’s PC or laptop.



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.

Sensor life
traceability

Reducing
background noise

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 bioreactor permit a wide range of different application giving to this system a substantial versatility.

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

Data sheet

Vessel				
Solaris Code	Genesis 7.5	Genesis 10.0	Genesis 15.0	Genesis 20.0
Total Volume (liters)	7.5	10.0	15.0	20.0
Ratio D/H	1:2,5	1:2,5	1:2,5	1:2,5
Min. Working Volume (liters)	1.3	1.8	2.7	3.6
Max. Working Volume (liters)	5.6	7.5	11.25	15
Working temperature range	0-135°C			
Working pressure range	2 bar			
Design	Stainless Steel Jacketed Vessel			
Materials	Parts in contact with the culture AISI 316 L - other parts AISI 304			
Finishing	All parts in contact with the culture: Ra < 0,5 µm ; External: Ra < 0,6 µm Mirror polished			
Ports and Connections				
	Connection		Description	
Vessel lid	PG13		Antifoam	
	TC 3/4"		Safety valve	
	TC 3/4"		Gas-out	
	TK 3/4"		SALAS-Solaris Sterile liquid addition	
	TC 1"		Pressure probe	
Upper side wall	DN 52		Stirrer	
	TC 1/2"		Overlay gas inlet	
	TC 1/2"		Sparger	
	In gold		Sight glass	
	In gold		Sight glass	
Lower side wall	Hygenic socket		pH probe	
	Hygenic socket		dO probe	
	Hygenic socket		spare probe	
	Hygenic socket		spare probe	
	Temperature housing		PT100	
Vessel bottom	TC 3/4"		Harvest/sampling valve	
	TC 1/2"		Steam in	
	TC 1/2"		Water in	
Jacket in-out	TC 1/2"		Jacket out	
	1/2" G		Electric heaters	
	1/2" G		Electric heaters	
	1/2" G		Electric heaters	
Stirring				
Drive	Brushless Motor, Direct Assembly, 1-1500 rpm (bacterial), 1-500 (cell cultures)			
Power	208W (7.5-10L) ; 622W (15-20L)			
Impellers	Select from: Rushtons impellers , Marine Impellers, Pitched blade			
Thermoregulation				
Control	PID Control - Accuracy 0,1 °C			
	Jacket steam and electric heaters / cooling source			
Gas Control & Gas Mixing				
Sparger and overlay Gas Control	TMFC			
Gas Mixing (Air,CO ₂ ,O ₂ ,N ₂)	n.1 TMFC + n.4 solenoid valves, n° of TMFC			
Sparger type	Select from: Toro type (ring), syntered microbubbling both provided with 0,2 µm filter			
Exhaust	Condenser and 0,2 µm filter			
Controller				
Master Control Module	Dimensions Height: 350 mm Largeness: 350 mm Depth: 350 mm			
HMI with Leonardo software	23" touchscreen			

Controls

INTEGRATED IN S CUBE	Temperature	
	Sensor	PT100
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0 - 150°C
	pH	
	Sensor	Digital Hamilton sensor
	Control system	Measuring resident in Leonardo 2.0 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)
	dO ₂	
	Sensor	Digital Optical Hamilton sensor
	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
	Redox (ORP)	
	Sensor	Digital Hamilton sensor
	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
	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
	Control system	Measuring resident in Leonardo 2.0 software
	Control range	0,00-200% saturation
	Operation temperature	-20.0-150°C
	Pressure range	0 - 4 bar
	Cell density	
	Sensor	Hamilton-Fogale sensor
EXTERNAL MODULAR BOX	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
	Control	Measuring resident in Leonardo 2.0 software
	Peristaltic pumps	
	WM 114	10-60 rpm
	WM 313 FDM/D	45-350 rpm

Chiller

- Optionally GENESIS 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	±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.

PRODUCTS

PILOT AND INDUSTRIAL FERMENTERS/BIOREACTORS

The pilot and industrial fermenters have been created with the intention to face the problems related to the scaling up, from the laboratory to the productive stage, with maximum easiness. All the fermenters of these series are compact and flexible.

Sterilizable in situ solution, thermoregulation through water jacket with electrical heaters or heat exchangers, automatic sterilization system through electrical heater or steam, different automatization and process control grade, wide possibility of sensors installation.

Our equipments cover the full range of applications, from bacterial fermentation up to cell cultivation for batch, fed batch and continuous process.

M SERIES



S SERIES



I SERIES



STANDARD STERILIZABLE IN PLACE SOLUTIONS



M SERIES

M series are standard SIP Fermenters/Bioreactors available in a range of **six differt volumes** **volumes** from 30 up to 200 litres with a wide range of options and accessories.

M Series typical applications includes the following:

- Scale-up and scale-down studies
- Pilot plant
- Small productions

M series can be used for:

- Biopharmaceutical
- Biofuels
- Food industry
- Bioremediation
- Bioplastic
- Cosmeceutical

M Series
your
scaling up guide

30 liters

50 liters

75 liters

100 liters

150 litres

200 liters



TK connection rather than TC ensures a better cleanability and easier sterilization



Automatic mechanical seal lubrication with steam condensate loop

Multiple sensors options
pH, dO2, Redox, Total Cell density,
Viable Cell density, Conductivity,dCO2

Double jacket (side/bottom)
Increased heat transfer efficiency
It ensures optimal temperature control and
sterilization even at minimum volumes

Top or bottom 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.



Tri-Clamp stainless steel piping cGMP designed to provide a smooth, and non-contaminating environment. Provides leak-tight connections and it is flexible and adaptable to other forms of piping.



Different gas mixing strategies with up to 5 TMFC

Pneumatic cover lift

Re-sterilizable addition system (steam bridge)

19" coloured touch screen industrial HMI
SBC16: smart controller designed to provide an high level of automated management of the fermentation/ cultivation processes
Customizable PID or factory default

N.4 Watson Marlow speed controlled valves
Pumps totalizer integrated in the software

N.2 heat exchangers and recirculating pump

Separate drains
cooling return,condense to waste,hot condense return

Compact design



Modbus Hamilton sensors

Why a digital sensor?

Hamilton sensors 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.



Sensor life
traceability

Reducing
background noise

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 bioreactor permit a wide range of different application giving to this system a substantial versatility.

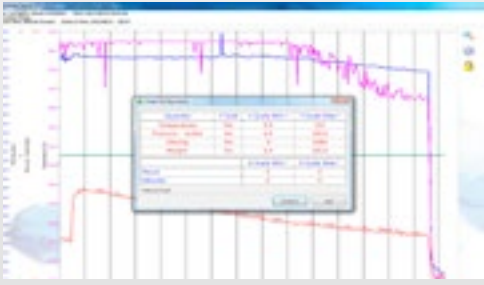
- Thermal Mass Flow Controller in entry model
- Gas mixing through TMFC and solenoid valves or numbers of TMFC
- Automatic gas mixing
- Toro and sintered spargers



SBC-16

USER-FRIENDLY SOFTWARE

Smart controller for pilot and industrial plants. This program is designed to provide a high level of automated management of the cultivation processes.



Data sheet

Vessel						
Solaris Code	M serie 30	M serie 50	M serie 75	M serie 100	M serie 150	M serie 200
Total Volume (liters)	30,00	50,00	75,00	100,00	150,00	200,00
Ratio D/H	1:2,5	1:2,5	1:2,5	1:2,5	1:2,5	1:2,5
Min. Working Volume (liters)	4,50	7,50	11,00	15,00	22,00	30,00
Max. Working Volume (liters)	21,00	36,00	55,00	75,00	110,00	145,00
Working temperature range	0-135°C					
Working pressure range	up to 2 bar					
Design	Stainless Steel Jacketed Vessel					
Materials	Parts in contact with the culture AISI 316 L - other parts AISI 304					
Stirring						
Drive	Brushless Motor, Top or Bottom Direct Assembly					
Impellers	Select from: Rushtons impellers, Marine Impellers, Pitched blade					
Thermoregulation						
Control	PID Control - Accuracy 0,1 °C					
	Jacket steam and electric heaters / cooling source					
Gas control & gas mixing						
Sparger and overlay Gas Control	TMFC					
Gas Mixing (Air,CO ₂ ,O ₂ ,N ₂)	n.1 TMFC + n.4 solenoid valves, n° of TMFC					
Sparger type	Select from: Toro type (ring), syntered microbubbling both provided with 0,2 µm filter					
Exhaust	Condenser and 0,2 µm filter					

Mechanical options

Double mechanical seal
Electrical heaters
Pneumatic cover lift
Reflux cooler

Controls

Temperature	
Sensor	PT100
Control system	Measuring resident in SBC-15 software
Control range	0 - 150°C
pH	
Sensor	Digital Hamilton sensor
Control system	Measuring resident in SBC-15 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)
dO ₂	
Sensor	Digital Optical Hamilton sensor
Control system	Measuring resident in SBC-15 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
dCO ₂	
Sensor	Mettler Toledo sensor
Control system	Measuring resident in SBC-15 software
Control range	0,00-200% saturation
Operation temperature	-20.0-150°C
Pressure range	0 - 4 bar
Cell density	
Sensor	Hamilton-Fogale sensor
Control system	Measuring resident in SBC-15 software
Pressure range	0-3 bar (option 1) , 0-10 bar (option 2)
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)
Redox (ORP)	
Sensor	Digital Hamilton sensor
Control system	Measuring resident in SBC-15 software
Control range	±2000 mV
Operation temperature	- 10 -130°C
Pressure range	≤ 6 bar
Conductivity	
Sensor	Digital Hamilton sensor
Control system	Measuring resident in SBC-15 software
Control range	1 - 3000 µS/cm
Operation temperature	0 -130°C
Pressure range	0 - 20 bar
Weight	
Sensor	n.3 load cells
Control	Measuring resident in SBC-15 software
Antifoam/Level	
Sensor	Solaris sensor
Control	Measuring resident in SBC-15 software

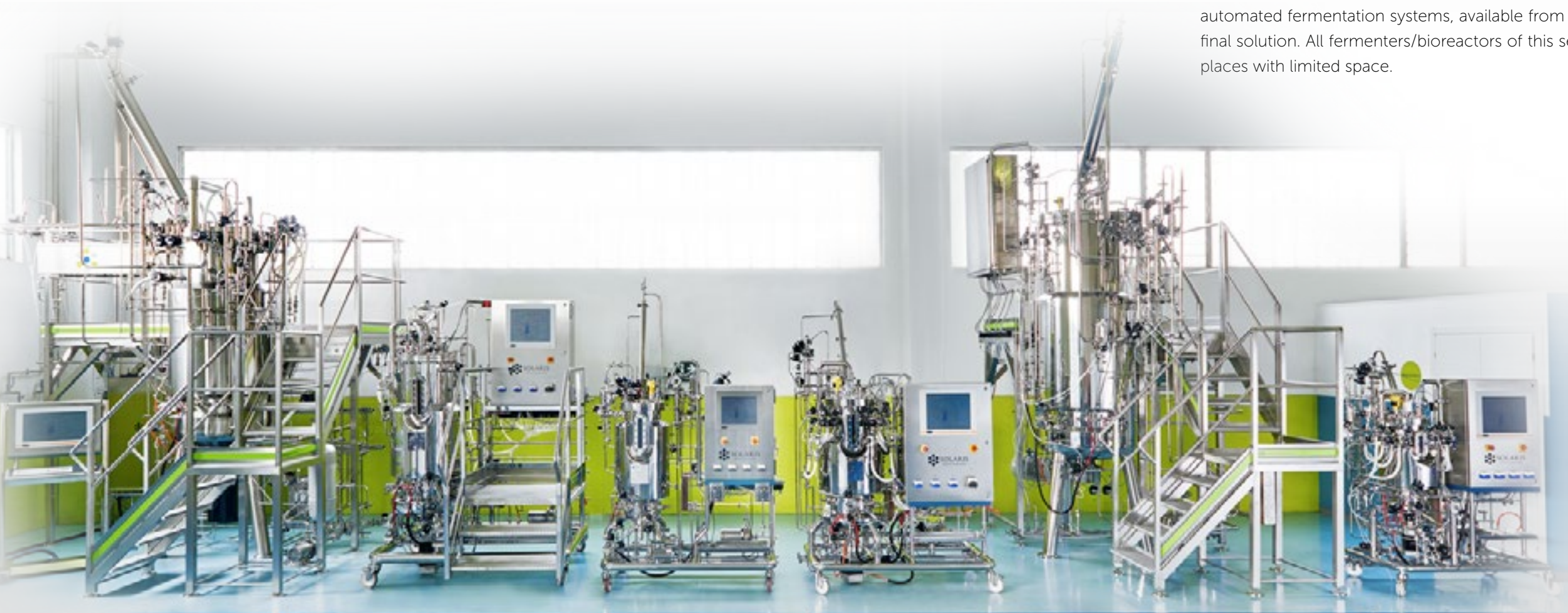
Set up your M series



SIP & CIP CUSTOMIZABLE
PILOT & INDUSTRIAL SCALE
FERMENTERS/BIOREACTORS

S-I SERIES

S-I SERIES Fermenters/Bioreactors have been created with the intention to face all the problems related to the scaling-up, from the laboratory to the productive stage, with maximum easiness. Fermenters/Bioreactors of the **S-I SERIES** are highly automated fermentation systems, available from 250 litres up to 30 m³, fully customized starting with the URS up to the final solution. All fermenters/bioreactors of this series are compact and flexible with the possibility to be installed even in places with limited space.



High quality
meets most sophisticated
international standards

WHY TO
INVEST
IN THIS PRODUCT



100%
customized solutions

Benefits

SBC-16

- Customizable culture vessels from 5 to 30 m³
- Instrumentation for control and measurement of pH, Eh, dO₂, CO₂, RPM, Gas Mixing, Temperature, Antifoam, Feeds, Total Cell Density and Viable Cell Density measurement, Weight, Redox, Conductivity, Level, etc...
- SCADA Control System SBC-16.
- Software management data - trends.
- Designed for microbial and cell fermentation, for batch, fed-batch and continuous processes.
- Complete range of Accessories.
- Brushless motor for agitation system.

Smart controller for pilot and industrial plants. This program is designed to provide a high level of automated management of cultivation/fermentation processes.



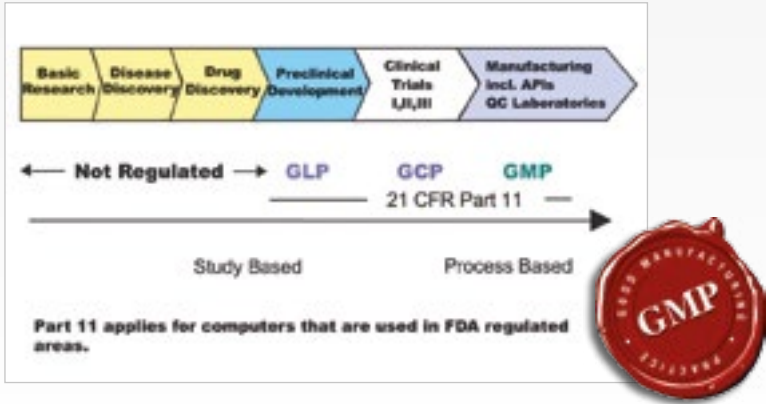
Hamilton
RetractoFit Bio 25



SIP & CIP CUSTOMIZABLE
PILOT & INDUSTRIAL SCALE
FERMENTERS/BIOREACTORS

S-I SERIES

Completely assembled and tested in the factory, these fermentation units are ready for installation at the user' site. The control system is based on a PLC and the SCADA supervisory Solaris SBC-15 and is designed to provide an high level of automated management of the cultivation processes; installed from **S SERIES** (5-200l) up to **I SERIES** facilitating the scaling-up procedures. The system is in accordance with CFR 21 Part 11.



Front view
Illuminated sideglass



Integrated videocamera

GMP customized solutions

Fully automated, strongly engineered to fulfill the customer needs of compactness and operability. Top quality stainless steel with excellent finishing, high technology and italian design.

Steam bridge diaphragm valves to guarantee the sterility during inoculum, sampling, harvesting and feedings. Easy to access service lines for performing the maintenance job without any difficulty.



Internal vessel design.



SIP Sampling bottle.





Front view side glass



Automatic mechanical
seal lubrication with steam
condensate loop



Tri clamp connection
ensure a better cleanability
and easier sterilization









Top view with illuminated side glass



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.



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.

Sensor life
traceability

Reducing
background noise



ON LINE MEASUREMENT OF TOTAL CELL DENSITY

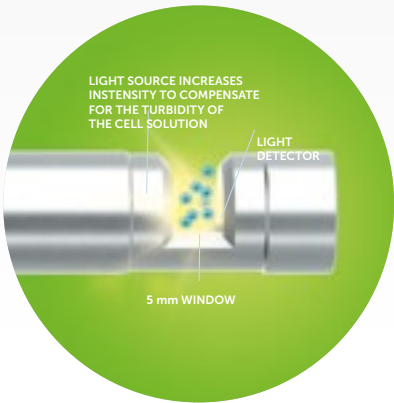


- Simple online measurement of cell growth
- Reliable values during the growth phase
- Early detection of process deviations

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.

HOW IT WORKS

The Dencytee sensor emits light through a 5 mm window onto a light detector. Cells in suspension absorb and scatter light so less light is read by the detector. To compensate, the sensor increases the amount of light emitted by the light source to maintain a constant reading at the detector. By reading the amount of light that is increased at the light source, the Dencytee sensor can measure solutions with high cell densities.



ON LINE MEASUREMENT OF VIABLE CELL DENSITY

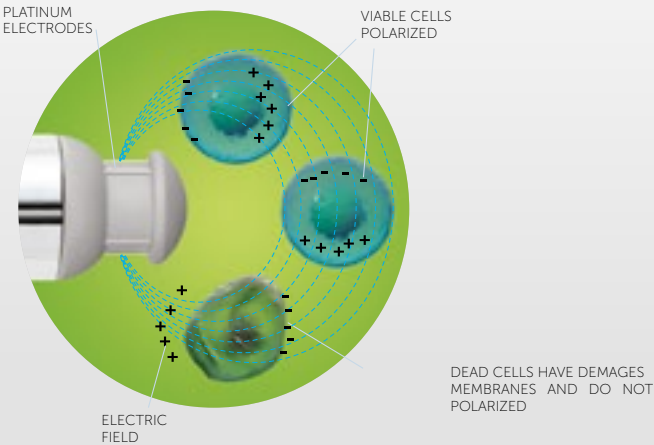


- Increase yield and lower production costs
- Detect changes in cell physiology with frequency scanning
- Precisely control harvesting for continuous culturing
- Early detection of process deviations

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.

HOW IT WORKS

The Incyte measurement principle is based on capacitance. In an alternating electrical field, viable cells behave like small capacitors. The charge from these small capacitors is measured by the sensor and reported as permittivity (capacitance per area).



PRODUCTS AND SERVICES

PROCESS PLANTS
METIS GAS ANALYZER
DOWNSTREAM EQUIPMENT
C.I.P. & S.I.P. SYSTEMS
EDUCATION & TRAINING
FERMENTATION AND BIOTECH DEVELOPMENT

PROCESS PLANTS



METIS GAS ANALYZER



DOWNSTREAM EQUIPMENT



C.I.P. & S.I.P. SYSTEMS



EDUCATION & TRAINING



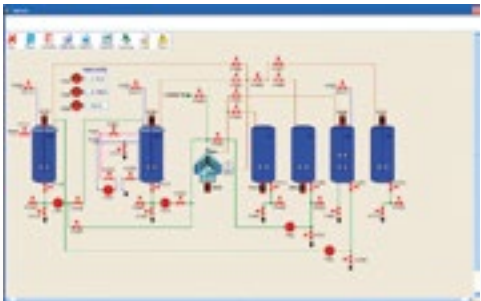
FERMENTATION AND BIOTECH DEVELOPMENT



Single process equipment, engineering and turnkey projects



Solaris provides all path required for the design and realization of complete integrated process plants, from the feasibility studies to the start up.



- CONSULTANCY**
- GMP audit
 - Project URS preparation
 - Feasibility Study
 - Conceptual Design
 - Process Simulation

ENGINEERING & MANUFACTURING

- HANDOVER**
- Commissioning
 - Qualification /Validation
 - Start-up & training

	THOUGHT		FEASABILITY STUDY
PROJECT		MANUFACTURING	
	DELIVERY		PERSONNEL TRAINING
	INSTALLATION & VALIDATION		



Atmospheric, under pressure and under vacuum tanks. Excellent finishing guaranteed by high tech automatic polishing machines, different kinds of heat exchangers, mixing system solutions, taylor made systems for different products and applications, PED, ATEX, SVTI certifications.





O₂ concentration in the sample is measured by means of a transducer based on the zirconium dioxide properties of this gas, whereas CO₂ determination is based on the measurement of absorption of infrared (IR) radiation. **SOLARIS METIS GA** is equipped with an inlet line selector (multiplex) that allows the unit to be connected with up to 8 fermenters/bioreactors. The concentration values of two gases are visualised on the monitor, analysed and represented graphically ON LINE, with subsequent calculation of the respiration coefficient.

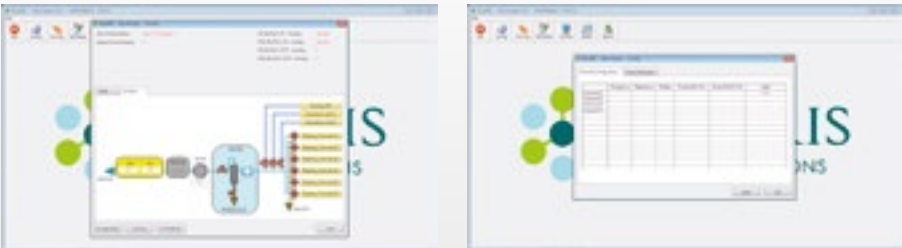
- Acquisition of data in real time and conversion of the signals from the sensors applied to the process into values expressed in the specific units of measurement of each variable.
- Continuous graphic representation of the behaviour of O₂, CO₂, OUR, RQ, with possibility of changing configuration, scale, dynamic zoom and exporting graphs on a printer.
- Channel Configuration with possibility to set the reading parameters of gas to analyse.
- Probes Calibration
- Temperature Compensation
- Calculation of:
 - OUR (Oxygen Uptake Rate)
 - CER (Carbon Dioxide Evolution Rate)
 - RQ (Respiratory Quotient)

UP TO 8
FERMENTERS
CONNECTED!

Solaris METIS Gas Analysers are a combined CO₂ and O₂ analyser, specifically designed to be used in cultivation processes.

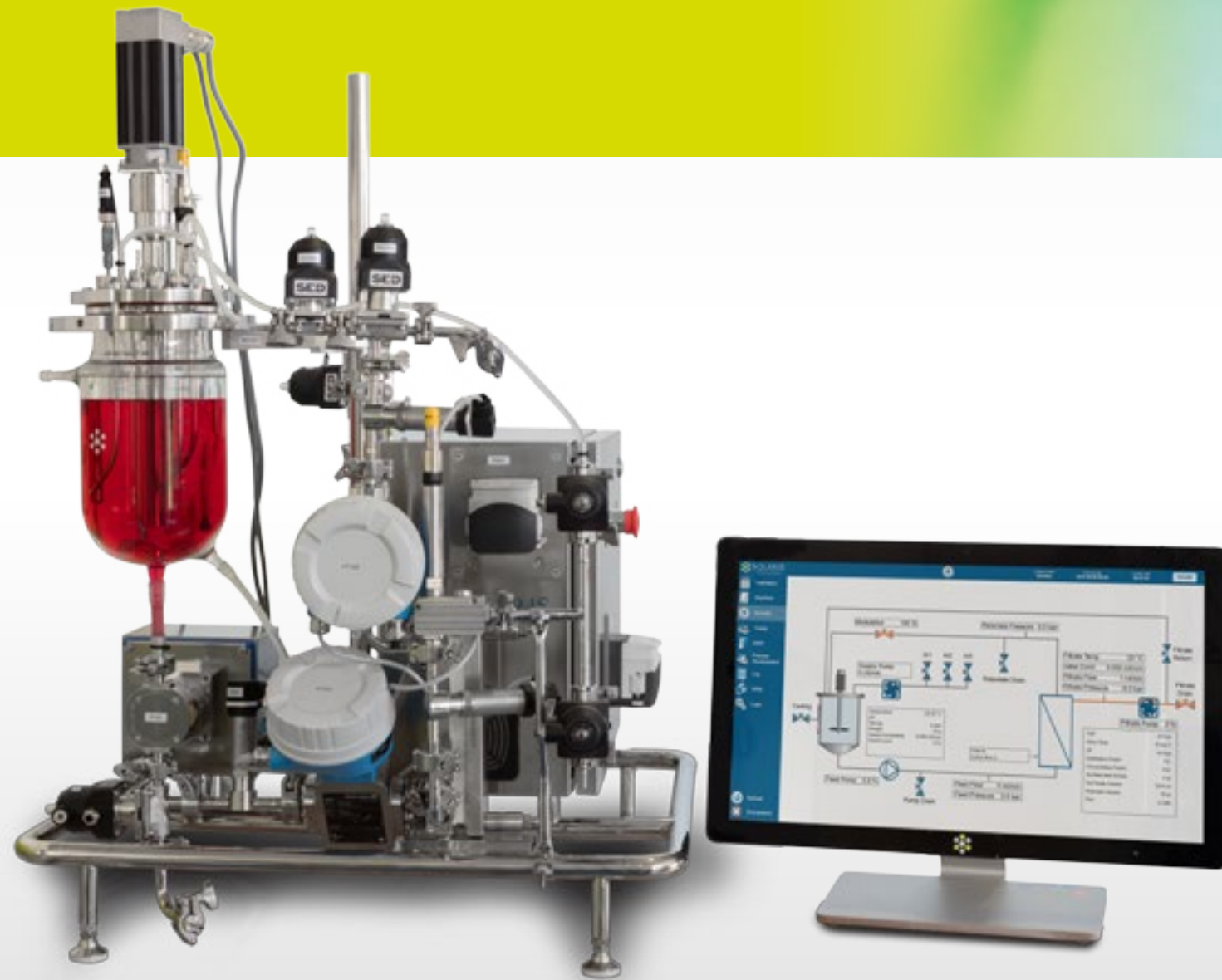


O₂ and CO₂ are the gases whose rates of consumption or production are most frequently measured for the purposes of study and process control (energetic metabolism, substract utilisation, etc.). The measuring ranges of the METIS GA analyser (0÷10 or 15% for CO₂, and 21÷10% for O₂) have been chosen specifically for your application. The system is based on well-proven, high quality transducers, and is characterised by an extremely reduced internal volume, to reduce overall response times.



AUTOMATIC AND FLEXIBLE TANGENTIAL FLOW FILTRATION SYSTEM

KRONOS



KRONOS is a benchtop automatic Tangential Flow Filtration (TFF) system suitable for beginners and experienced users alike. **KRONOS** can handle up to 0.5 m² total filtration area and is equipped with multiple modules make it so the ideal system for innovative process development as long as for automatic process sequence.

Kronos meets your specific needs, it covers a wide range of applications such batch and fed batch ultrafiltration, microfiltration and diafiltration.

Typical applications includes the following:

- Basic research**
- Scale-up and scale-down studies**
- Process development and optimization**

KRONOS can be used for:

- Biopharmaceutical**
- Biofuels research and manufacturing**
- Vaccines**
- Food and beverage biotechnologies**
- Bioremediation**
- Bioplastics**
- Cosmeceutical**
- Nutraceutical**

Flexibility
the best membrane
for each separation
process

OPTIMIZING
The ratio
cost/profit

AUTOMATIC AND FLEXIBLE TANGENTIAL FLOW FILTRATION SYSTEM

KRONOS

Benefits

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

Available in 3 different volumes:
2L, 5L, 10L.
Removable vessel

Integrated NPW test

Automatic process sequence
Filtrate flow control

Flexibility
the best membrane
for each separation
process

Modbus Digital Hamilton sensors

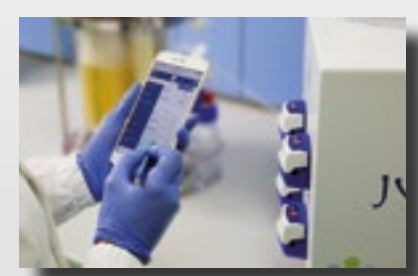
Fully removable and
cleanable jacket

Small foot print to maximize lab
space efficiency

Safety: pressure releaf valve
included in each unit

Remote access via PC, tablet/smartphone
Remote control for after sale assistance

User-friendly process management
Innovative filter history management



KRONOS

Flexibility

Kronos can be equipped with **several type of membranes** (hollow fiber, cassettes, ceramic) and is designed following the most updated criteria of cGMP.

The control cabinet includes all the functions for parameters measurement and control: intelligent sensors, wireless connection, easy load pumps, recirculation vessels and valves module conveniently located.

Solaris technicians are on tap to evaluate together with the customer the best membranes available on the market (in terms of materials, geometrical configuration and operative parameters), for:

- concentrating with the best efficiency
- avoiding the problem of the gel layer
- increasing the efficiency in Diafiltration choosing the most suitable membrane.

A large, solid blue circle containing the text "Flexibility" in a large, bold, white sans-serif font. Below it, in a smaller white sans-serif font, are the words "the best membrane for each separation process" arranged in three lines.

Flexibility
the best membrane
for each separation
process

Modbus Hamilton sensors

Why a digital sensor?

Hamilton sensors 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.

	H ₂					
	2017	2018	2019	2020	2021	2022 (forecast)
jet Temp.	0.0 °C	000 %	---	---	Outbreak	---
jet Temp.	0.0 °C	000 %	---	---	Outbreak	---
jet	0.00	0.00 %	0.00	7.10	Outbreak Rapid info	2018-10-08-19
H ₂	0.00 %	000 %	---	---	Outbreak Rapid info	---
Phosphate	0.00 %	000 %	---	---	Outbreak	---

[illegible]

Sensor life traceability

Reducing
background noise

Data sheet

Kronos 0.5			
Total Volume (liters)	2,00	5,00	10,00
Hold up volume	70 ml		
Pump output	4-180 l/h		
Max. operating pres- sure	4 bar (g)		
Membranes available	Cassettes, Hollow fiber, Spiral wound, Ceramic		

Vessel Data	
Design	Borosilicate Glass Vessel with conical bottom
Materials	Vessel: Borosilicate Glass Lid: AISI 316L
Drive	Brushless Motor Direct Assembly
RPM	1-2600 RPM, Accuracy 1RPM
Impeller	Marine impeller
Weight	Load cell

PCS and Software

PCS	S.S Cabinet AISI 304
HMI	23" Touch screen
Software	SCADA Solaris Software Control Galileo
Data Extraction	Through USB port or Ethernet
Graph trends, On line displaying and Printing	
On line parameter calibration	
Alarms Management	
Event recording	
Multipasswords level	
Integrated NPW test	

Options

Tranfer module	
Supply pump	Peristaltic pump. For diafiltration and large volume ultrafiltration.
Triple inlet valve	Automated valves for highly automated filtration process

Permeate module	
Filtrate pressure flow control pump Included flow meter	Prevent membrane fouling in microfiltration
pH measurement	Inline pH sensor
Conductivity measurement	Inline conductivity sensor

Vessel upgrade options	
pH measurement	
Weight measurement throught load cell	
Conductivity measurement	
Temperature measurement	
Level control via Sensor	Extra safety during manual operation

Holder option	
Hollow fiber holder	For single hollow fiber cartridge
Manifold for 3 hollow fiber cartridges	
Cassette holder	From various manufacturers

Chiller

- Optionally KRONOS 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.
Dimensions (WxDxH)	200x350x465 mm



Solaris possesses the know-how to choose between the best membrane available on the market (in terms of materials, geometrical configuration and operative parameters), for:

- concentrating with the best efficiency
- avoiding the problem of the gel layer
- increasing the efficiency in Diafiltration.

In summary, optimizing the cost/profit ratio. The innovation way of Solaris Biotechnology has created two new series of equipments, based on the technology of Tangential Flow Filtration. These equipments are applied to the Recovery of biotechnological products in Downstream Operations.

TYTAN series



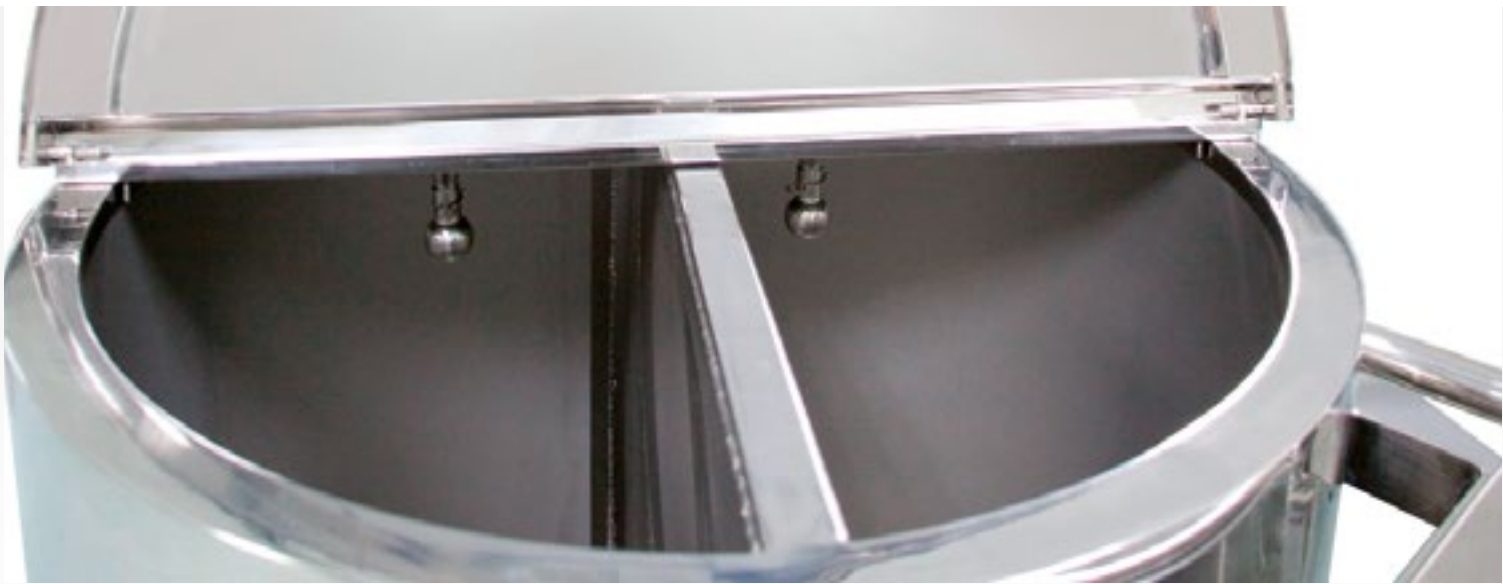
TYTAN 100
Micro/
Ultrafiltration Unit
Equipped with
ceramic tubular
membranes

The **TYTAN series** are based on Microfiltration and Ultrafiltration techniques and operate in the ranges of low pressures (1-5 bar). Geometrical configurations of membranes available on the market:

- spiral wound
- hollow fiber
- cassettes
- tubular ceramic



TYTAN 500
Microfiltration Unit



Solaris develops **C.I.P. / S.I.P. SYSTEMS** for reliable and repeatable processes that covers strong hygiene regulations demanded by the food, dairy, biotechnology and pharmaceutical industries.

Single or Multi-tank configuration, with independent stainless steel tanks used to hold water of different quality, Deionized water (DI), hot or cold water for injection (WFI) and water from reverse osmosis units (RO). Washing Cyclic Operatios in sequences: Wash down rinse, Acid wash, Alkaline wash, Wash down, Final wash. Fully automated or manual as well.



Washing processes controlled via the operation panel of the CIP/SIP unit. Touch screen HMI to set up washing processes: number of tasks / repetitions of tasks, amount of litres (water, WFI), dosage of detergents, temperature of the CIP fl uid, washing pressure, purge (drainage of process equipment and CIP/SIP unit with compressed air), total times.

The approach and the type of practice which we are proposing are not just providing with relevant data or bibliographic research, but giving the opportunity of practical experiments which consist in a small scale realisation and verification of fermentation processes.

Our collaborators are strongly present in Italian and foreign market in the field of research and development of industrial biotechnological processes, also our products are being utilised in many famous research universities both in Italy and abroad. In particular, Solaris is providing: Training courses in biotechnology for teaching staff and students. Manual practicum in biotechnology concerning the procedure, microorganisms and culture media. Training period for

scholars in our pilot plant. The possibility to use our research laboratories for various training programs. Lectures and conferences on contemporary biotechnology.



MICRO MUNDI's discovery-led R&D is a technologically advanced structure focused on microbiology, analysis and up-to-date recovery. Our experience and background are referred to the production at industrial scale and our main skill is the knowledge of the issues involved in the commercial scale production, substantially different from the lab scale process. The R&D center is fully equipped for successful product and process development from bench to pilot scale and it is concerned with 4 major areas:

1. Strain selection and maintenance
2. Fermentation
3. Downstream processing
4. Analytical development

The development of technologies is based on:

1. Strain selection, maintenance and improvement
2. Process development, considering all metabolic, chemical and physical parameters useful to optimize the bioproduction.

We develop technologies which are strictly confidential and all biological and intellectual results are the property of our clients. MICRO MUNDI has already experience in different fields like:

- Classical fermentation (API, anti-tumorals, vitamins, etc)
- Biofuel
- Cell plant fermentation
- Bioremediation
- Mammalian cells



MICRO MUNDI is a department of Solaris, mainly involved in research and development of fermentation processes. Process scale-up from research and development up to the production at industrial scale. **MICRO MUNDI** brings a wealth of additional experience to your project, our staff have matured many years of experience in managerial and technical positions in the biotech and pharmaceutical industry. This experience gives full confidence in the successful implementation of technologies. We cooperate with world-wide reputed private companies and public research institutes, in the development of new technologies and also in the improvement of the existing one.

Lined area for notes.