The mission of Solaris is to be for its customers a partner of choice for process solutions concerning both equipment and processes with the capability of offering an integrated service, which is probably unique in this field.
Fermentation and Process Plants from R&D up to the productive industrial scale. Fermenters, bioreactors, reactors, gas analysers, CIP/SIP systems. Downstream equipments: membrane operations based on the tangential flow filtration technologies (microfiltration, ultrafiltration, nanofiltration and reverse osmosis).

Our company is acknowledged as a leading turnkey project executor and consultant for the process world.
Benchtop Bioreactors - Fermenters of Solaris represent the ideal solution for all necessities in the field of research, teaching and little scale production due to their flexibility and simplicity in use. The flexibility is guaranteed by a broad range of alternatives which give the client the opportunity to customise the fermenter according to his needs and requirements. Autoclavable or in situ sterilisable, with mechanic or magnetic agitation, electric thermostating or hot water recirculation loop, for bacteria or cell cultures, batch or continuous, different automatization and process control grade, wide possibility of sensors installation.
JUPITER has shocked the market of R&D fermenters/bioreactors with a pre-packed high tech innovative solution, ready out of the box at a terrific price.

1. TMFC in the entry model.
2. Gas mixing: up to 5 TMFC (Air, CO₂, N₂, O₂ and Overlay).
3. LEONARDO: smart controller designed to provide an high level of automated management of the fermentation processes.
4. Remote Control, 100% assistance from our office.
5. N.4 assignable peristaltic pumps, all speed controlled.
6. Compact master control station, Universal power supply 100-240 V. Rear module with 3 removable technical trays (power, control, process) to facilitate the after sales service.
7. Weight control through load cells as optional.
8. Sterile multiple sampling system.
9. Multiple choice of sensors: pH gel electrodes, polarographic or optical iO₂, traditional analogs or digital with diagnostic analysys. Redox measurement (with digital pH) included in the entry model. Turbidity, CO₂ measurement in option, anyway located in the master control station.
10. 18.5" touch display.
Next generation of SIP R&D bioreactors/fermenters: NOW

1. TMFC in the entry model. Gas mixing: up to 5 TMFC (Air, CO₂, N₂, O₂, and Overlay).
2. 18.5” touch display
3. LEONARDO: smart controller designed to provide an high level of automated management of the fermentation processes.
4. Remote Control, 100% assistance from our office
5. Compact master control station. Universal power supply 100-240 V. Rear module with 3 removable technical trays (power, control, process) to facilitate the after sales service.
6. N.4 assignable peristaltic pumps, all speed controlled.

- Multiple choice of sensors: pH gel electrodes, polarographic or optical DO₂, traditional analogs or digital with diagnostic analysis. Redox measurement (with digital pH) included in the entry model. Turbidity, CO₂ measurement in option, anyway located in the master control station.

- Brushless motors, from 1 to 2000 RPM.

- Weight control through load cells as optional.
<table>
<thead>
<tr>
<th>Vessels</th>
<th>2.0 liters</th>
<th>4.0 liters</th>
<th>6.0 liters</th>
<th>10.0 liters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>225 mm</td>
<td>225 mm</td>
<td>277 mm</td>
<td>277 mm</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>Height: 344 mm</td>
<td>Height Set: 416 mm</td>
<td>Height: 480 mm</td>
<td>Height: 660 mm</td>
</tr>
<tr>
<td>Design:</td>
<td>Borosilicate Glass</td>
<td>Cool-Cut Vessels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials:</td>
<td>18,5” Touch screen PC</td>
<td>software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sparger Type:</td>
<td>Select from: Toro type (ring), Syntered microbubbling, both provided with 0.2µ filter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust:</td>
<td>Stainless Steel condenser placed at the exhaust port in order to avoid the media loss</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control:</td>
<td>Measuring and Control resident in the LEONARDO System (PID)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuators:</td>
<td>Cascade to peristaltic pumps for the addition of acid/basic solution and gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor:</td>
<td>pH, pO2, pCO2, pH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuators:</td>
<td>Digital ISM® Mettler Toledo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control:</td>
<td>Measuring and Control resident in the LEONARDO System (PID)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuators:</td>
<td>Cascade to peristaltic pumps for the addition of acid/basic solution and gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor:</td>
<td>Digital ISM® Mettler Toledo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuators:</td>
<td>Digital ISM® Mettler Toledo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control:</td>
<td>Measuring and Control resident in the LEONARDO System (PID)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuators:</td>
<td>Cascade to peristaltic pumps for the addition of acid/basic solution and gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor:</td>
<td>Digital ISM® Mettler Toledo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuators:</td>
<td>Digital ISM® Mettler Toledo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control:</td>
<td>Measuring and Control resident in the LEONARDO System (PID)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuators:</td>
<td>Cascade to peristaltic pumps for the addition of acid/basic solution and gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor:</td>
<td>Digital ISM® Mettler Toledo</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Utility Station**

- Dimensions: Height: 300 mm, Largeness: 450 mm, Depth: 360 mm
- 18.5” Touch screen PC

**Master Control Module**

- Dimensions: Height 250 mm, Largeness: 450 mm, Depth: 360 mm
- 18.5” Touch screen PC

**Master Control Module**

- Dimensions: Height 250 mm, Largeness: 450 mm, Depth: 360 mm
- 18.5” Touch screen PC

**Utility Station**

- Dimensions: Height: 300 mm, Largeness: 450 mm, Depth: 360 mm

---

**Vessels**

- **Working Volume:** 0.75-10.5 liters
- **Height:** 1.6-9 liters
- **Depth:** 3.6-10.5 liters
- **Utility Station:** 0.75-11.36 liters

**Materials**

- Vessels: Borosilicate Glass
- Others: AISI 316L

**Peristaltic Pumps**

- **Gas Mixing:** Air, N2, CO2, O2
- **Dimensions for Autoclave:** Set up your set up your gas mixing (Air, N2, CO2, O2). With LEONARDO Solaris sensor. Measuring and Control resident in the sensor and controls.

**Peristaltic Pumps**

- **Working Volume:** Set up your set up your gas mixing (Air, N2, CO2, O2).
- **Dimensions for Autoclave:** Set up your set up your gas mixing (Air, N2, CO2, O2).
- **Utility Station:**"
This application program is designed to provide a high level of automated management of the fermentation processes.

Esedra series bioreactors/fermenters have been created with the intention to face all the problems related to scaling-up, from the laboratory to the pilot and productive stage, with maximum easiness and flexibility. Esedra series units have the same hardware control configuration of pilot and industrial bioreactors/fermenters, fitted with a measurement and control system based on a PLC and the SCADA supervisory Solaris SBC-12. The system is in accordance with CFR 21 Part 11.

ESEDRA

Vessels from 1 up to 15 L.
Instrumentation (sensors inclusive) for control and measurement of pH, Eh, dO2, CO2, RPM, Gas Mixing, Temperature, Antifoam, Feeds turbidity, weight.
SCADA Control System.
Software management data - trends.
Designed for microbial and cell cultivations.
Complete range of accessories.
Mechanic or magnetic agitation system.
Basic specifications:

- PC (polycarbonate) vessel in 5 different diameters and 4 different height = 13 different sizes
- PC cover with a number of PG13.5 ports according to the diameter
- Rigid design for stable servo motor connection

Benefits

1. Reduced start up costs
2. Cut out downtime of cleaning and autoclaving
3. Reduced validation
4. Reliable scalability (stirred tanks design)
5. Brushless motors.
6. 7 different exhaust methods.
7. 5 different liquid In&Out methods.
9. LEONARDO: smart controller designed to provide an high level of automated management of the fermentation processes. Remote Control, 100% assistance from our office.
10. 1 TMFC in the entry model. Gas mixing: up to 5 TMFC (Air, CO₂, N₂, O₂ and Overlay).
11. 18.5” touch display.
12. Compact master control station. Universal power supply 100-240 V. Rear module with 3 removable technical trays (power, control, process) to facilitate the after sales service.
13. N.4 software assignable peristaltic pumps, all speed controlled.
14. Fully configurable CellVessel™ may be created by selecting components from:
   - A range of impeller(s), any rotation or direction for up-flow / down-flow / axial / radial fluid circulation for any application.
   - Temperature controlled with electrical heating blankets and/or with waterborne heating/cooling blanket.
   - Various aeration methods; such as micro pore spargers, hole spargers, head space gas exchange.
   - Baffled stator for axial vortex mixing, donut shape flow pattern for improved mass transfer for increased productivity.
15. Up to 4 vessels managed with one station.
16. 5 different liquid In&Out methods.
Single-Use, Stirred-Tank Fermenter
an exclusive system fully configurable that meets any design request in a scalable platform ranging 1-25 litre Working-Volume (WV).

BactoVessel™ series of Single-Use-Fermenters (SUF) for batch and fed-batch microbial applications are unique as they are fully configurable and meet any design request in a scalable platform ranging 1-25 litre Working-Volume (WV).

1. Single-Use Fungus fermenters
2. MOSAIC™ series of Single-Use-Fermenters for batch and fed-batch applications
3. Fully configurable BactoVessel™ may be created by selecting components from:
   1. A range of impeller(s), any rotation or direction for up-flow / down-flow / axial / radial fluid circulation for any application.
   2. Temperature controlled with electrical heating blankets and/or with waterborne heating/cooling blanket.
   3. Various aeration methods: such as micro pore spargers, hole spargers, head space gas exchange.
   4. Baffled stator for axial vortex mixing, donut shape flow pattern for improved mass transfer for increased productivity.
   5. Low maintenance.

Basic specifications:
• PC (polycarbonate) vessel in 5 different diameters and 4 different height = 13 different sizes
• PC cover with a number of PG13.5 ports according to the diameter
• Rigid design for stable servo motor connection

Benefits
1. Reduced start up costs
2. Cut out downtime of cleaning and autoclaving
3. Reduced validation
4. Reliable scalability (stirred tanks design)

N-4 software assignable peristaltic pumps, all speed controlled.

SET UP YOUR

Ask for the Configurator Tool for your own SUB/SUF design!

CellVessel™ and BactoVessel™ frequently requested volumes

<table>
<thead>
<tr>
<th>Vessel volume (ml)</th>
<th>OD110</th>
<th>OD130</th>
<th>OD150</th>
<th>OD200</th>
<th>OD250</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. of PG13.5 ports</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>240 mm height</td>
<td>100</td>
<td>3,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>340 mm height</td>
<td>4,100</td>
<td>5,800</td>
<td>10,300</td>
<td>15,700</td>
<td></td>
</tr>
<tr>
<td>420 mm height</td>
<td>5,100</td>
<td>6,900</td>
<td>13,400</td>
<td>19,300</td>
<td></td>
</tr>
<tr>
<td>520 mm height</td>
<td>8,500</td>
<td>16,500</td>
<td>23,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>620 mm height</td>
<td>10,100</td>
<td>19,600</td>
<td>28,300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The smallest Cell/Bacto Vessel offers WV from 60 ml.
Pilot & Industrial
Bioreactors / Fermenters
M Series are steam in place bioreactors/fermenters available in a range of volumes from 5 up to 200 litres.

FURNISHING:
Instrumentation (sensors inclusive) for control and measurement of pH, Eh, dO2, CO2, RPM, Gas Mixing, Temperature, Antifoam, Feeds, turbidity, weight, etc. SCADA Control System. Software management data - trends. Designed for microbial and cell fermentation. Complete range of accessories. Mechanic or magnetic agitation system.

LEONARDO: smart controller designed to provide an high level of automated management of the fermentation processes. Remote Control, 100% assistance from our office.
S series bioreactors / fermenters 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. All fermenters/bioreactors of this series are compact and flexible (optionally on wheels) with the possibility to be installed even in limited space places.

**FURNISHING:**
- Culture vessels from 5 to 200 L.
- Instrumentation (sensors inclusive) for control and measurement of pH, Eh, \( \text{dO}_2 \), CO\(_2\), RPM, Gas Mixing, Temperature, Antifoam, Feeds, Turbidity, Weight, etc...
- SCADA Control System.
- Software management data - trends.
- Designed for microbial and cell fermentation, for batch, fed-batch and continuous processes.
- Complete range of Accessories.
- Mechanic or magnetic agitation system fitted with a measurement and control system based on a PLC and the SCADA supervisor.

S series bioreactors / fermenters 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. All fermenters/bioreactors of this series are compact and flexible (optionally on wheels) with the possibility to be installed even in limited space places.

**FURNISHING:**
- Culture vessels from 5 to 200 L.
- Instrumentation (sensors inclusive) for control and measurement of pH, Eh, \( \text{dO}_2 \), CO\(_2\), RPM, Gas Mixing, Temperature, Antifoam, Feeds, Turbidity, Weight, etc...
- SCADA Control System.
- Software management data - trends.
- Designed for microbial and cell fermentation, for batch, fed-batch and continuous processes.
- Complete range of Accessories.
- Mechanic or magnetic agitation system fitted with a measurement and control system based on a PLC and the SCADA supervisor.

Completely assembled and tested in the factory, these fermentation units are ready for installation at the user’s site. The control system is based on a PLC and the SCADA supervisory Solaris SBC-12 and is designed to provide an high level of automated management of the fermentation processes, installed from Esedra up to industrial I series facilities the scaling-up procedures. The system is in accordance with CFR 21 Part 11.
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.
- On-line removable and sterilizable sensors permit their replacement during the process without compromising the sterility.
- Steam bridge diaphragm valves to guarantee the sterility during inoculum, sampling, harvesting, and feedings.
- Easy access service lines for performing the maintenance job without any difficulty.

S150, 150 liters
Bioreactors - Fermenters of the I series are highly automated fermentation systems, available from 200 litres up to 30 m³ fully customised. The control system technology permits the linking of several units by ETHERNET, for the eventual connection to the supervision system.

This option particularly results in being effective in case of installation of the line composed of different productive units, also when complete production lines are realized, in which different parts can be placed in connection, thus being globally automated.
I Series

I1500, 1500 liters
I6000, 6000 liters
Solaris develops advanced software systems for managing fermentation and downstream processes, local or remote control, from the single equipment up to the productive industrial plant.
In accordance with 21 CFR Part 11
This applications program is designed to provide a high level of automated management of the fermentation processes.

**LEONARDO**

**SBC-12**

**SBC-12 smart controller for pilot and industrial plants**

- Multi-level password protection
- User-friendly fermentation management
- Controller page to view setpoints, process values and control mode, to set up customized PID (or use factory defaults) and alarm limits
- Continuous trends representation to track, print and export data.
- Different dynamic zooms and configurations.
- On line parameters calibration
- Events log and alarm register
- Possibility of saving recipes for repeat usage
- Remote control for after sale assistance

**Solaris Fermentation Manager Software Release 2013**

Data extracted from SBC-12 are compatible with Window Excel. However, Solaris has developed a platform where to easily and quickly manage fermentation data.

This software is included in the fermenter supply and it can be installed on unlimited number of client’s PC.
The concentration values of two gases are visualised on the monitor, are 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 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)

Solaris GA is equipped with an inlet line selector (multiplex) that allows the unit to be connected with up to 12 bioreactors, and includes a pump for gas sampling and a gas drying device.

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 Gas Analysers are a combined CO₂ and O₂ analyser, specifically designed to be used in fermentation 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, substrate utilisation, etc.). The measuring ranges of the 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.
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.
Thought Feasability Study Project
Manufacturing Delivery Installation & Validation Personnel Training
Process Plants
Single Process Equipment, Engineering and Turnkey Projects

Atmospheric, under pressure and under vacuum tanks. Excellent finishing granted by high tech automatic polishing machines, different kinds of heat exchanging, mixing solutions, taylor made systems for varied products and applications, PED, ATEX, SVTI certifications.
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
Solaris biotechnologies posses the know how for choosing 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 choosing the most suitable membrane

In summary, optimizing the ratio cost/profit.

The innovation drive of Solaris Biotechnology has created two new series of equipments, based on the technology of Tangential Flow Filtration. These equipments are devoted to the Recovery of biotechnological products in Downstream Operations.

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 series

TYTAN 100
Micro / Ultrafiltration Unit
Equipped with ceramic tubular membranes

TYTAN 500
Microfiltration Unit

Downstream Equipment
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-tanks 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 Operations 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 fluid, washing pressure, purge (drainage of process equipment and CIP/SIP unit with compressed air), total times.
Varied range of agitation groups for the mixing of liquids with different possibilities of impellers: scrubbers, anchors, propellers, rushtons, marine blades, ribbons, turbines, etc. Fully customized solutions in close collaboration with our clients.
High quality process piping installation for the pharmaceutical, food processing, biotech and cosmetic industries.

Our approach utilizes preassembly, modularization, and offsite fabrication, skilled technicians and high tech instrumentation like laser cutting and orbital welding machines.
Solaris proposes total or partial solutions, with mechanical, piping, automation and control revamping. We have developed special software possible to adapt to fermenters of different brands and our staff is ready to be at your service in order to find the best solution possible to satisfy your needs.

Solaris Biotechnology has designed a series of accessories for the functional implementation on its own equipment and general ones. Solaris produces and distributes valves, mechanical seals, sterile sampling systems, agitation groups, impellers, heat exchangers, weighting systems, reflux coolers, etc., developed on customers specifications.

**Accessories**

**Revamping**

**Other Products**

FDA compliant multi bioreactors system under laminar flow

Advanced bioreactor for R&D on Biotissues Cultivation

60 liters glass bioreactor for Bioremediation Cultivations
MICRO MUNDI is a discovery-led R&D and an advanced structure focused on microbiology, analysis, and up-to-date recovery. Our experience and background refer to the production at an 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, 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 Group, 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 industries. This experience gives full confidence in the successful implementation of technologies. We cooperate with worldwide reputed private companies and public research institutes in the development of new technologies and also in the improvement of the existing one.