

Mobius® Single-Use Bioreactors

A scalable ergonomic system designed to optimize your fed batch and perfusion process.

The Mobius® Single-Use Bioreactor family is a scalable portfolio which includes benchtop (3 L), pilot scale (50 L and 200 L), and clinical and commercial scale (1000 L and 2000 L) bioreactors that enable cell culturing capabilities for early process development through commercial production. The portfolio provides flexibility with the configuration of software, hardware, and single-use assemblies for fed batch and perfusion processes.

Our bioreactor platform has been designed to ensure that ease-of-use and operational flexibility at small scale can be translated to full scale production.

Benefits

- Simple installation of Flexware® assemblies by a single operator
- 5:1 turndown ratio at process scale
- Works as a standalone system or integrated as part of your facility's automation platform
- Demonstrated scalability of key engineering parameters gives you confidence to scale up your process
- Lynx® Connectors assure critical sterile connections
- Mobius® SensorReady Technology, a novel way to monitor and control the bioreactor



Mobius®
3 L Bioreactor



Mobius®
50 L Bioreactor



Mobius®
200 L Bioreactor



Mobius®
1000 L Bioreactor



Mobius®
2000 L Bioreactor

Consistent process engineering characteristics that provide easy and reliable scale-up

Mobius® Single-Use Bioreactors follow a Quality-by-Design approach, providing end-users with a clear characterization of key engineering parameters, including power input per volume, mixing time, oxygen transfer capabilities and temperature mapping across all scales of the portfolio.

Our characterization of the key engineering parameters, coupled with consistent scaling ratios, gives you confidence that this system will match your process needs for adherent or suspension cell culture. Each Mobius® Bioreactor is characterized at the minimum (20%) and maximum (100%) working volumes run in fed batch or perfusion mode from 10 L – 2000 L, providing the true operational flexibility needed from laboratory to production scale.

Intuitive, ergonomic operations

Mobius® Bioreactors have been designed to provide intuitive and ergonomic operator interactions that simplify workflow at all scales. Each system is comprised of a vessel, Flexware® assemblies and a control box containing mass-flow controllers (MFCs), pumps, a human machine interface (HMI) and Common Control Platform® (CCP®) software.

Mobius® Bioreactors can be built to meet your plant automation requirements. The 50, 200, 1000 and 2000 L Mobius® Bioreactors are all fully jacketed to optimize heating and cooling steps. All systems have doors and viewing windows, providing easy access to expendables and visibility on the status of the working volume and mixing steps. Additionally, they all have integrated load cells for precise volume monitoring and a 2:1 aspect ratio.

Since handling single-use assemblies above 1000 L can be cumbersome, the 1000 L and 2000 L bioreactors have additional features that optimize the experience for the operator, including a vessel drawer, allowing the easy installation and removal of Flexware® assemblies. With the ability to self-deploy and self-deflate using air, the EZ-Fold feature of the Flexware® assembly assures ease-of-use and safety for the operator.

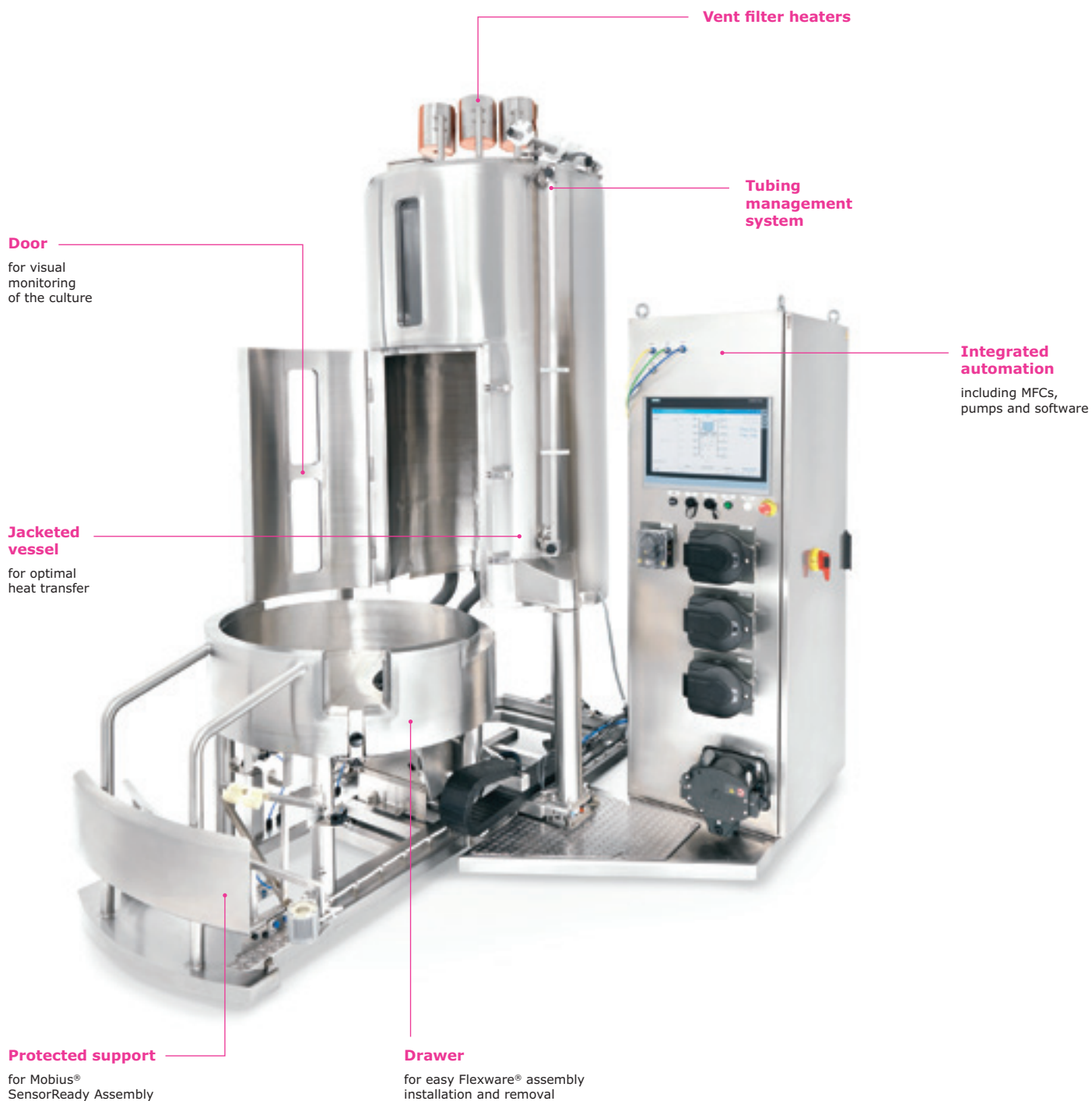
Design Features

The Flexware® assembly for the Mobius® Bioreactor is designed with an internal baffle, which results in homogeneous mixing in under a minute at low power input, while preventing the formation of a vortex during mixing.

In addition, the bottom-mounted impeller maintains gentle agitation during the clarification step down to the minimum working volume without generating foaming, and reduces the time by delivering a consistent harvest to your clarification system. Perfusion flexware assemblies feature multiple ports with connectors for easy connection to cell retention devices. To meet your process needs, Flexware® assemblies are available with microsparger and open pipe, or ring sparger and open pipe. The microsparger or the ring sparger is located directly under the impeller to promote the dispersion of bubbles and provide maximum mass transfer of oxygen (kLa). The open pipe, located adjacent to the impeller, is efficient at delivering macro-bubbles. It can be used on its own or in combination with the microsparger, or the ring sparger, to provide increased process control capabilities such as macro-bubble oxygen delivery, addition of carbon dioxide for pH regulation or as a tool to strip carbon dioxide.

Temperature management is another critical requirement for successful cell culture. Temperature profiles of our Mobius® Bioreactors have been fully characterized at minimum and maximum working volumes to give you confidence that your process can be controlled during all steps of the cell culture run.

Mobius® 1000 L and 2000 L Hardware
Ergonomic Design



Common Control Platform® (CCP®) software for multiple-unit operations

From Mobius® bioreactors to clarification, chromatography, tangential flow filtration and virus filtration, CCP® software can provide you with one familiar interface that simplifies software management and reduces the learning curves of new operators. This software package is available to support all system sizes, accelerating tech transfer and scale-up of your process.

Optimized for fed batch and perfusion cell culture

The user interface, common across multiple unit operations, brings our process know-how into your hands. The home screen is optimized for the Cell Culture unit operation with easy access to all of the relevant information needed to control your fed batch or perfusion process. Procedures can be automated into recipes, and operators can adjust and optimize control loops in just a couple of clicks.

Monitors processes and enables batch reporting

Create process operations using the recipe editor, monitor the process in the home screen, and create reports for the batch using the configurable report generator.

Comprehensive and secure data acquisition

CCP® software was designed to support compliance to 21 CFR part 11 and developed under GAMP5 guidelines; the software includes an accessible audit trail and electronic signatures for verification. CCP® software is designed for development to large-scale manufacturing equipment, and uses industrial computers and controllers for reliability.

Network integration

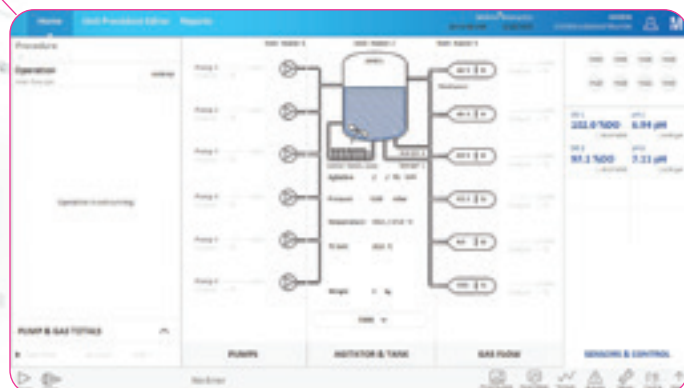
Data transfer to the plant control system or historian enables data collected by CCP® software to be centrally stored and managed.

Backup and restoration

Backup and restoration of data can also be managed via network integration.

Security synchronization

Security synchronization allows user accounts to automatically coordinate with the networked plant control system for faster and simpler user account control and editing.



Innovative and flexible process monitoring

The Mobius® SensorReady technology is used to monitor and control all sizes of Mobius® Bioreactors, providing you with absolute confidence in the reliability of your control strategy. The Mobius® SensorReady assembly is attached via a sterile connection to the bioreactor using Lynx® S2S Connectors. The modular, easy-to-operate design provides the user with ultimate flexibility to monitor and control the bioreactor processes, allowing users to incorporate new sensing technologies as they become available without changing the design of the Flexware® assembly.

Extensive characterization has been performed to demonstrate that the readings in the Mobius® SensorReady assembly are representative of the bulk cell culture environment.

Flexware® Assemblies

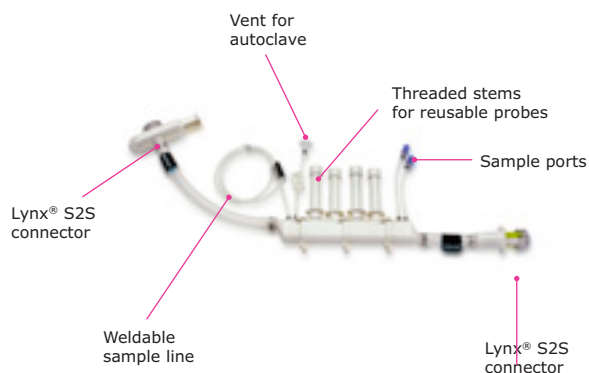
Flexware® assemblies are designed for maximum operational flexibility, ergonomic usability and operational safety. All sizes of the Flexware® assemblies have an off-centered bottom-mounted magnetic levitating impeller with internal baffles, a turndown ratio of 5:1, and integrated pressure sensors with lines for primary and backup vent filter assemblies comprised of the hydrophobic Opticap® XL5 capsule with Aervent® membrane to prevent overpressuring the assembly.

The 50 L and 200 L bioreactors are constructed of PureFlex™ film. At 1000 L and 2000 L volumes, PureFlex™ Plus film is employed for added robustness. The two films have identical product contact layers, maintaining consistent extractables profile and gas barrier properties.

To improve operational safety and ease-of-use, all weldable tubes are labeled for easy identification and all assemblies have a unique layout ensuring correct fit in the jacketed vessel. A combination of silicone and C-Flex® tubing in multiple tubing diameters eliminates the need for separate transfer assemblies. 1000 L and 2000 L Flexware® assemblies feature EZ-Fold technology, which allows for automatic deployment utilizing the on-board MFCs.

Mobius® SensorReady Dual and Quad Reusable Assemblies

- Designed to accommodate conventional probes 100 x 120 mm in length with PG13.5 fittings.
- Available sampling options:
 - Closed-loop sampling option fitted with weldable C-Flex® tubing line capped and designed for sampling via welded connection.
 - Two sample ports fitted with needle-free swabable valves.



For more information on our Mobius® SensorReady technology, please reference the SensorReady Tech Brief: TB5573EN00

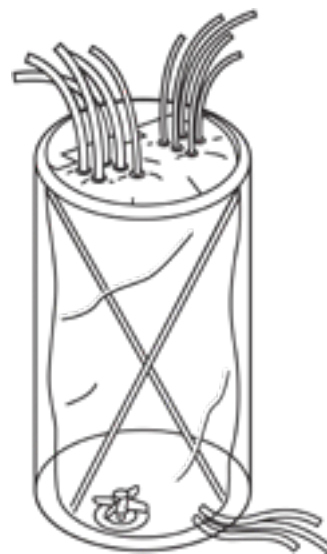


Figure 2.

Flexware® Assembly for the Mobius® 200 L Bioreactor

Comprehensive services and support

Implementation services

Our field service engineers have unique internal knowledge of the equipment and years of experience. Qualification and service of our equipment is a core competency. Save time and lower costs by using standardized services executed by trained engineers.

Benefits of our service engineers:

- Priority access to parts, system designers, application scientists, and testing equipment
- Up-to-date training, service protocols and practices
- A global installed base gives us the best understanding of the equipment, and helps you save costs with standardized protocol development

Installation and qualification (IQ/OQ)

Our qualification services ensure that all specifications are met from design and manufacture through to installation and operation. We use a standardized, risk-based approach to ensure nothing is missed, maintain consistency between tests, and maximize efficiency.

- Repeated testing is done based on risk to balance efficiency and safety
- Our engineers are trained on our products and save valuable time on qualification and documentation
- The IQ/OQ protocol and final report provided are compliant with cGMP requirements

Operator training

Designed for pharmaceutical and biotechnology manufacturing personnel who operate upstream processing equipment, our interactive course provides an overview of the Mobius® Bioreactors. Installation of Flexware® assemblies and upstream CCP® software use are also described and practiced in hands-on sessions. To satisfy cGMP requirements, course graduates will receive a certificate upon completion.

With us as your guide, your operators will be better prepared to operate and manage your Mobius® Bioreactors with greater confidence.

CCP® recipe creation service

Every process is unique and, to ensure that your system is optimized to deliver the best performance, our biomanufacturing engineers will translate your process into your own CCP® software recipe in order to maximize the performance of your bioreactor system within your process.

CCP® software training

If your system will be used in process development and needs to adapt to varying process characteristics, our biomanufacturing engineers can also provide you with specific training, including a hands-on session, so that you are able to create and manage your own recipes and system.

Support for performance qualification

Performing process qualification with new equipment can be challenging. To help with this step, our biomanufacturing engineers can assist you with targeted advice and support, in order to allow you to focus on your own process.

The support includes one on-site visit by a trained biomanufacturing engineer to assist you while you perform your qualification, preparation of the equipment, dry run your process recipe, and support for qualification runs, for which you will remain the owner.

Preventive maintenance

Preventive maintenance delivers the most cost-effective approach to ensure consistently reliable performance of your Mobius® Bioreactor. Regularly scheduled maintenance of your Mobius® Bioreactor significantly reduces potential downtime and costly repair.



Mobius® MyWay Program

User configured single-use assemblies for transferring into and out of your bioreactor

The Mobius® MyWay program is a 3-tiered design and delivery program, developed to help drug manufacturers implement flexible manufacturing with greater speed and enhanced supply security. Rather than selling pre-configured standard designs that may not meet your needs, we have developed a program in which users have the flexibility to choose their configuration, as well as their delivery speed, based on their manufacturing needs. This allows users to cut the traditional lead time of 12 - 14 weeks down to as little as 24 hours.



Mobius® Stock (24 hrs.)

- Standard catalog items
- On-demand high volume custom items

Off-the-shelf availability



Mobius® Select (6 wks.)

- Ideal balance of off-the-shelf speed and custom flexibility
- Monitored component supply for reliable delivery
- Emprove® dossiers to aid material qualification and easy implementation

Fast and custom



Mobius® Choice (12-14 wks.)

- Expansive component library for even greater customization
- Designs for critical and complex applications backed by our technical expertise

Ultimate design flexibility

Mobius® Select:

Optimized and comprehensive component library to fit diverse process needs



2D &
3D Bags



Single-Use
Mixing



Sterile
Sampling



Aseptic
Connectors



Sterile
Filters



Pre-Cut
Tubing

Learn more at mobiustool.com to view all components within the Mobius® Select Library

Related resources

- **Mobius® Bioreactors Specification & Ordering Information Sheet, SP1237EN00**
- **Scalability Application Note: AN1258EN00**
- **SensorReady Tech Brief: TB5573EN00**
- **3L Bioreactor Data Sheet: DS4476000**
- **3L Bioreactor Specification Sheet: SS2345000**

For more information on Mobius® bioreactors, including additional documentation, videos and animations, please visit **MerckMillipore.com/bioreactor**

To Place an Order or Receive Technical Assistance

For other countries across Europe and the world, please visit

MerckMillipore.com/contactPS

For additional information, please visit

MerckMillipore.com

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