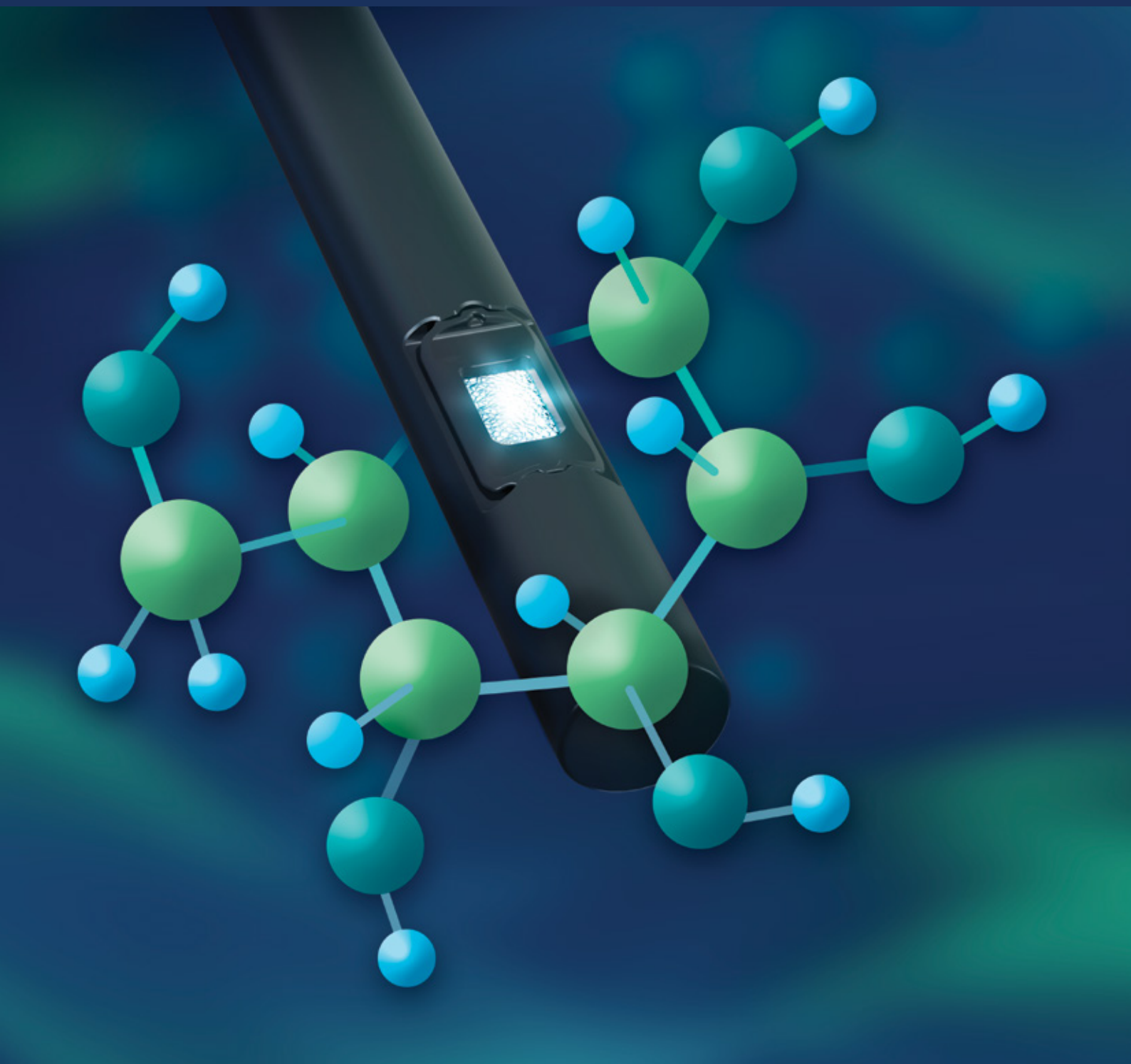
HAMILTON

GlucoSense

Real-Time Optical Glucose Monitoring To Control Your Cell Culture



Innovation for a Better World

From Bioprocessing Needs to PAT Solutions

Over 35 years pioneering sensor solutions in process analytical technology development.



2025
NEW Optical Glucose Sensor



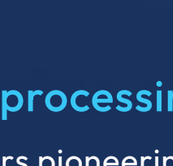
2025
FlowCell
COND + pH



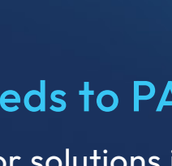
2022
Total Cell
Density



2021
Solid-State Optical
CO_2 Sensors



2014
In-Line Viable
Cell Density



2015
Single-Use
pH



2017
Single-Use
DO



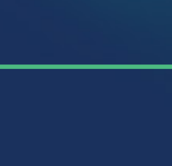
2010
Intelligent
Sensors



2007
Optical Oxygen
Sensors



2004
Pre-Pressurized
pH Sensors



1989
Glass
Formulations

Glucose: A Critical Process Parameter

An Essential CPP for Consistent Bioproduction

Glucose is more than just a nutrient—it's a critical process parameter (CPP) that directly affects cell viability, metabolism, and the quality of biologics like monoclonal antibodies. In biopharmaceutical production, especially with CHO cells, precise control of glucose is essential to maintain optimal growth and product consistency.

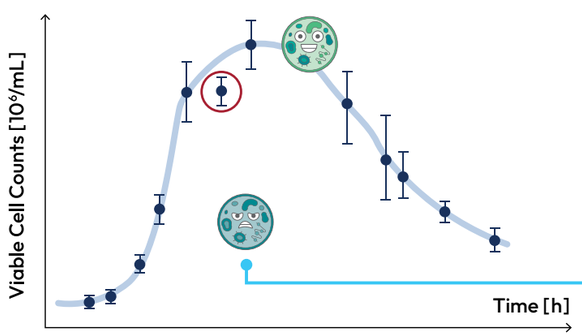
Monitoring Glucose

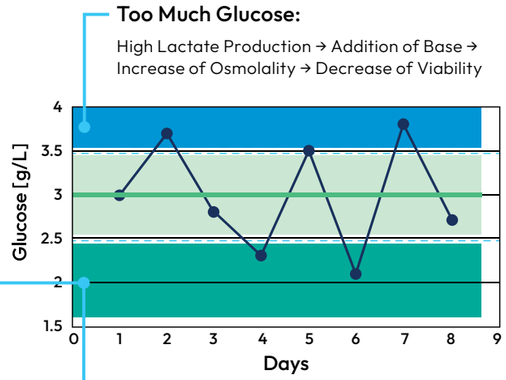
Too little glucose can starve cells and reduce yield.

Too much leads to toxic by-products and cellular stress.

These fluctuations impact protein glycosylation, a key quality attribute for therapeutic efficacy.

With the industry's shift toward real-time control via PAT and QbD, continuous glucose monitoring is no longer optional—**it's essential for robust, high-quality manufacturing**.

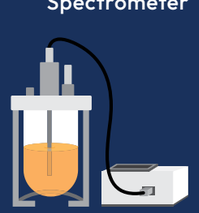




Bioprocess Glucose Monitoring Challenges

Until Now, In-line Glucose Monitoring Has Been a Challenge

Glucose monitoring in bioproduction has long required compromise—between real-time insight, ease of use, and reliable performance.

	Off-Line / At-Line with Cartridges	At-Line Enzymatic	In-Situ Spectrometer	NEW In-Situ Optical
Current Solutions				
Reliable **Enables Process Quality** (Accurate and precise during the entire process)	✓	✗	✓	✓
Real-Time **Applicable for real-time process control** (In-Situ)	✗	✓	✓	✓
Easy to Use **Faster Process Development** (Ready from day one without specific expertise)	✓	✗	✗	✓

The Solution: GlucoSense

Real Time, Ready-to-Use Sensor Pioneering In-line Glucose Measurement

With GlucoSense, Hamilton sets a new benchmark in glucose monitoring for bioproduction.



For the first time, the sensor combines real-time, in-situ measurement, high reliability, and true ease of integration—overcoming the limitations of all existing technologies. This innovative solution fills a critical gap in the market, enabling more precise control, higher product quality, and greater process efficiency. GlucoSense is not just an evolution—it's a breakthrough designed to transform biopharmaceutical manufacturing.

Performance

Easy to Operate
Accurate measurement with just in-situ process calibration. Safe to use, no laser protection required.

In-Situ
Designed for real-time monitoring, PG 13.5 compatible.

Reliability

Robust
Fiber-optic free, and compatible with autoclavation.

Ready for GMP
IQ/OQ and Standard Operating Procedure (SOP) for Computer System Validation (CSV) available.

Ease of Integration

Ready to Use
Monitor cell cultures from day one.

Small-Footprint
No external spectrometer required.

Plug In.
Measure. Trust.

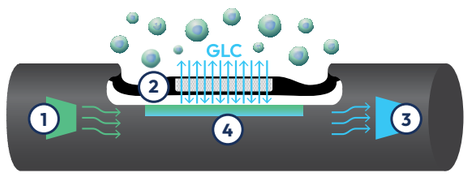
Integrated Intelligence

Arc sensors save space and costs with their integrated micro-transmitters. Calibration data is stored in the sensor head enabling high quality lab calibration.

Process Data

The GlucoSense sensor transmits process data through a hardwired connection. Communication options include modbus RTU and 4-20 mA, with additional compatibility for other communication standards.

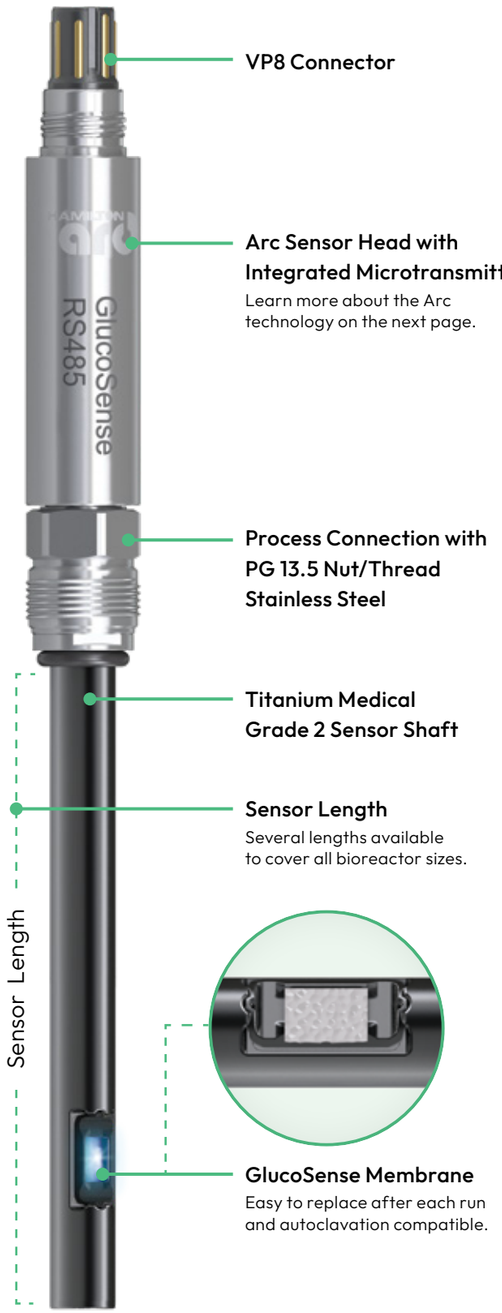
GlucoSense Measuring Principle: Sensing Element



1. Light Source
2. GlucoSense Membrane
3. MIR Detectors
4. Sensing Element

Coming Soon:
GlucoSense membrane suitable for the whole SIP/CIP cycle. Same measurement principle and functionality for easy scale-up validation.

Stay Updated:
Scale up with confidence—get notified when new features launch.



VP8 Connector

Arc Sensor Head with Integrated Microtransmitter
Learn more about the Arc technology on the next page.

Process Connection with PG 13.5 Nut/Thread Stainless Steel

Titanium Medical Grade 2 Sensor Shaft

Sensor Length
Several lengths available to cover all bioreactor sizes.

GlucoSense Membrane
Easy to replace after each run and autoclavation compatible.

GlucoSense Delivers Reliable Results from Day One

The GlucoSense sensor is built on optical sensing technology—a powerful foundation that enables seamless integration and consistent performance from the moment it's installed. This innovation is made possible by four key technical solutions, further enhancing the performances of optical technology.

Optical Sensing Technology

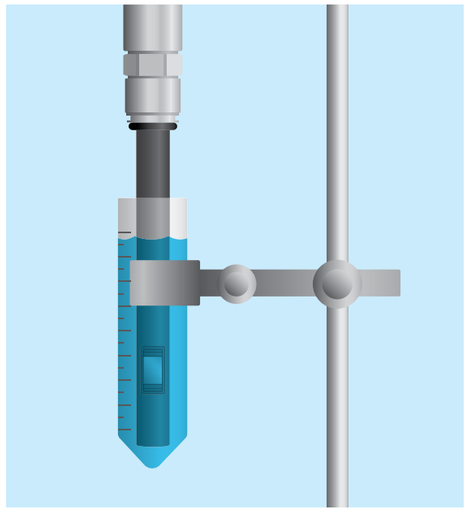
1. **Built-In Algorithm for Cell Culture Media**
Pre-configured for cell culture applications, the sensor's internal algorithm ensures accurate glucose readings without the need for manual tuning or process-specific setup.

2. **Factory Calibration**
Each sensor is delivered fully calibrated from the factory, making it plug-and-play and eliminating time-consuming calibration procedures before use.

3. **Filter Membrane**
A protective filter membrane shields the optical sensor element from process-related interference, increasing measurement stability and long-term reliability. The membrane can be replaced easily after each run.

4. **In-Situ Product Calibration**
The sensor is calibrated under real process conditions, enabling it to deliver highly accurate and meaningful data from the very first batch.

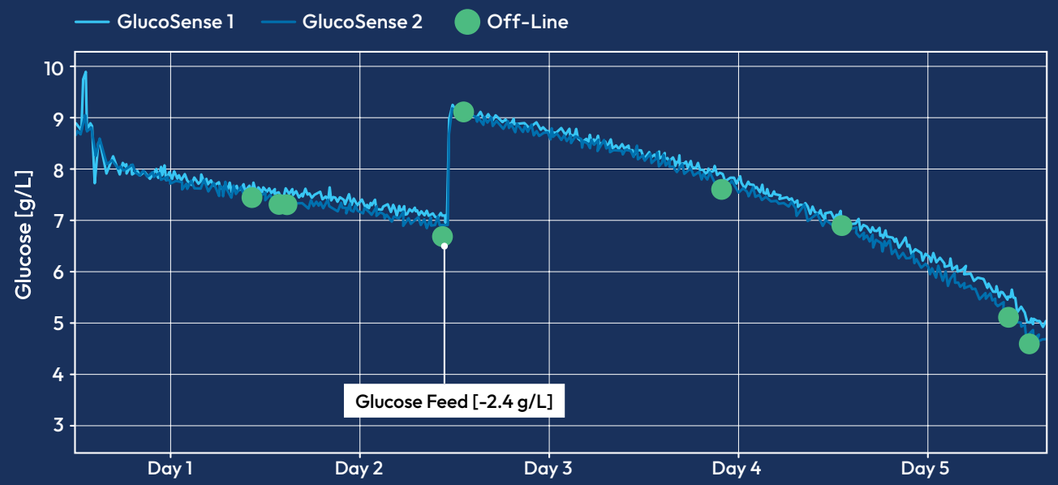
GMP Ready with GlucoSense Verification Kit



Hamilton provides convenient GMP-ready verification kits to ensure quick and reliable sensor validation. Each kit includes a setup solution and a glucose solution, ensuring fast, reliable verification.

Glucose Measurement Vs. Reference

Performances of two GlucoSense sensors in the same bioreactor, fed-batch CHO cell run.



Experiment conducted with FHNW (Fachhochschule Nordwestschweiz) Upstream Biotechnology Group.

Arc Hardware

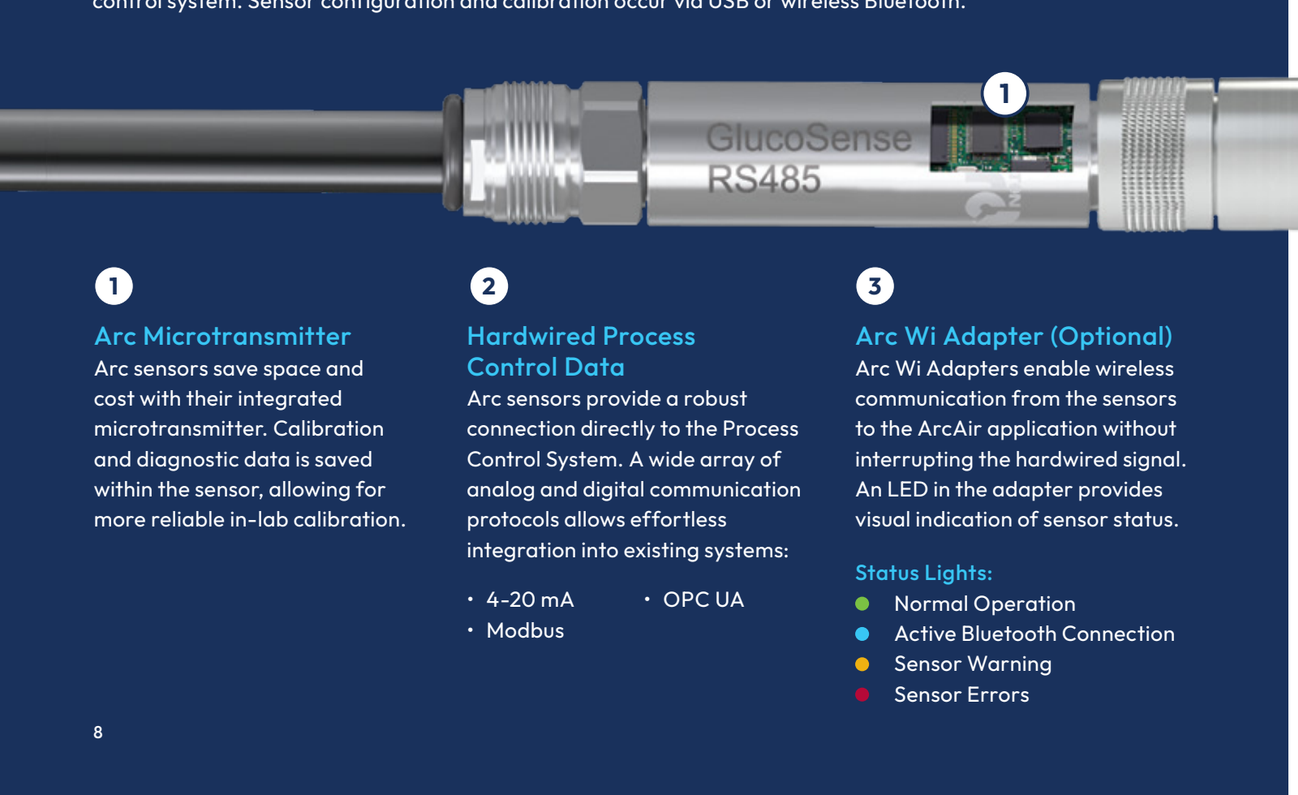
Rethink Sensor Management by Eliminating The Transmitter

Arc seamlessly connects with existing R&D, pilot, and production infrastructure and reduces startup costs and integration footprint on new projects and expansions. ArcAir software reduces operational costs with:

- Laboratory Calibration
- Predictive Diagnostics
- Automated Documentation
- User Roles & Process Assignment

Anatomy of an Arc Sensor

Arc's integrated microtransmitter amplifies sensor signal for direct connection to the control system. Sensor configuration and calibration occur via USB or wireless Bluetooth®.



1 Arc Microtransmitter

Arc sensors save space and cost with their integrated microtransmitter. Calibration and diagnostic data is saved within the sensor, allowing for more reliable in-lab calibration.

2 Hardwired Process Control Data

Arc sensors provide a robust connection directly to the Process Control System. A wide array of analog and digital communication protocols allows effortless integration into existing systems:

- 4-20 mA
- Modbus
- OPC UA

3 Arc Wi Adapter (Optional)

Arc Wi Adapters enable wireless communication from the sensors to the ArcAir application without interrupting the hardwired signal. An LED in the adapter provides visual indication of sensor status.

Status Lights:

- Normal Operation
- Active Bluetooth Connection
- Sensor Warning
- Sensor Errors

ArcAir Software

Sensor Verification – Ready for GMP

4 Step Workflow - Using ArcAir, Arc Wi Adapter and Certified Standards.

ArcAir Connection	Verification Setup	Verification with Standard	Verification Report
The sensor is connected through the Arc Wi Adapter to ArcAir. User follows ArcAir step-wise verification SOP.	Sensor baseline in Hamilton Setup Solution.	Sensor verified in Hamilton Glucose Solution.	ArcAir generates a verification report for GMP purposes.

Wireless Configuration, Process Calibration, and Diagnostics

Arc Wi Adapter provides wireless communication to any Bluetooth 4.0 and higher enabled device. Configure and calibrate sensors from the convenience of a mobile phone, tablet, or computer. Sensor diagnostics are also transmitted wirelessly, providing the ability to trouble-shoot sensors from the palm of your hand.

Eliminate Costly Transmitters

Less Work:

Only ArcAir Product Calibration Needed

Time To Upgrade Your Glucose Monitoring

Get in Touch with Our Team To Bring Smarter Glucose Monitoring Into Your Process.



Explore Hamilton's Field Services

We offer various Hamilton field service options to fit your facility's needs. Our Field Service Team is factory trained and ready to help you at any stage, from installation to long-running maintenance. See which Hamilton field service fits your needs.

Installation Support

Installation, set-up, and calibration support directly on-site. Our field service team ensures your sensors and cables are installed and functioning correctly.

Maintenance and Calibration Services

Preventative maintenance and regular service contracts. Schedule on-site service dates to ensure your sensors are properly maintained and your process is optimized.

Qualification IQ/OQ

Support for the installation qualification (IQ) and operational qualification (OQ) of Hamilton equipment including complete documentation. Readying your process for GMP manufacturing activities.

On-site Training

User trainings and on-site trainings for technicians. Tailored training ranging from basic operation to advanced calibration and maintenance.

Learn More: www.hamiltoncompany.com/field-services

Note: Hamilton sensors are made to last. To increase sensor lifetime and avoid down-times, Hamilton suggests maintaining your sensors at least once a year by a Hamilton factory trained technician.

Unlock The Secrets of Bioprocessing Excellence

Download and Find Out More

Glucose White Paper

Upstream White Paper

BioPharma Brochure

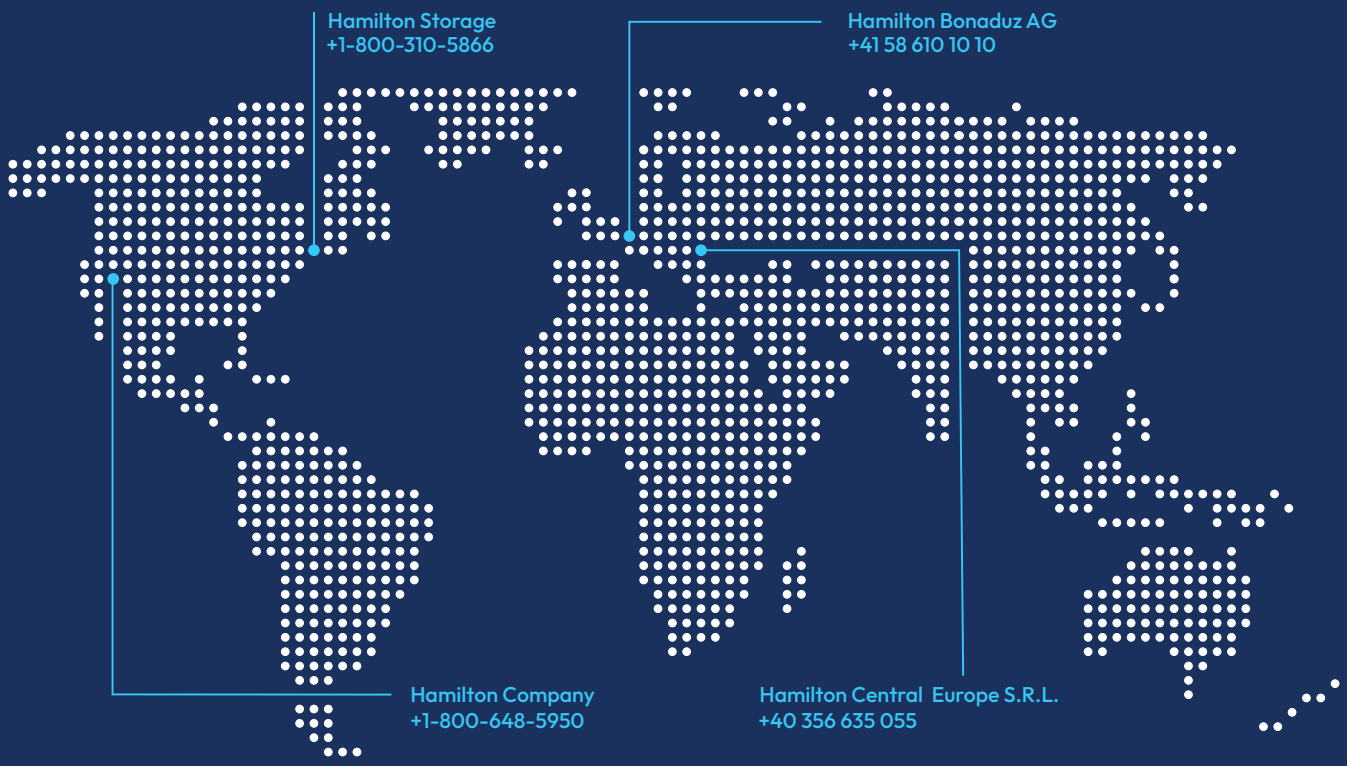
Process Analytics Catalog

Cultivated Meat White Paper

Arc Intelligent Sensors Brochure

We invite you to join us in our commitment to environmental responsibility by embracing digital documentation.

At Hamilton Company, we value sustainability and strive to minimize our impact on the environment by reducing paper waste, conserving natural resources, and minimizing our collective carbon footprint.



Years of Experience
75+

Locations Worldwide
22+

Employees Internationally
3,000+

To find a representative in your area, please visit:
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