



Biotechnology Industry

Comprehensive analytical
instruments for bioprocess
monitoring and control

**PUSHING
THE
LIMITS
TOGETHER**

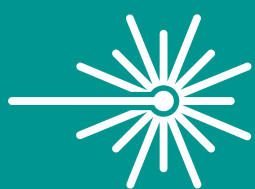
 **Metrohm**
Process Analytics

Biotechnology with Metrohm

Ensuring batch-to-batch consistency and process stability is critical in biopharmaceutical manufacturing. Metrohm offers a comprehensive range of solutions for inline process monitoring, including accuracy sensors and Raman instruments. Our solutions enable precise control over key process parameters, optimize yield, and reduce variability.

Metrohm Process Analytics and Metroglas provide trusted solutions for bioprocess monitoring. For those starting new projects, m-oem provides the components necessary to build a completely customized solution. Metrohm's Laboratory Raman systems help develop and optimize measurements in the QC lab.

- **Raman Process Analyzers** – Real-time, non-destructive analysis of multiple parameters simultaneously. This includes glucose, lactate, glutamine, glutamate, lipids, proteins, cell viability, and metabolic byproducts.
- **i-Raman Laboratory instruments** – High-performance spectroscopy for research and process development.
- **DIY Raman** – Components to build a complete solution for seamless integration.
- **pH Sensors** – For single-use and multiple-use applications, with pre-calibrated, sterilizable designs that integrate seamlessly into standard ports or custom connectors.
- **Dissolved Oxygen (DO) Sensors** – Maintain optimal oxygen levels for cell growth and fermentation.
- **Dissolved CO₂ Sensors** – Based on the Severinghaus principle, providing accurate inline, online, and atline monitoring of CO₂ levels.



In situ monitoring made easy

Every detail counts in biotechnological processes. From the equipment used to observe and analyze reactions, Metrohm's Raman probes and SCHOTT's ViewPort® optical interfaces combine to provide a seamless, powerful solution for in situ monitoring. This ensures the highest levels of precision and reliability.

Made with approved materials, ViewPort® optical interfaces from SCHOTT offer excellent optical performance and reliability, designed to withstand the demanding environments of bioprocess monitoring. ViewPort® optical interfaces are engineered to provide optimal optical access for spectroscopic instruments. This makes them an ideal match for Raman spectroscopy.

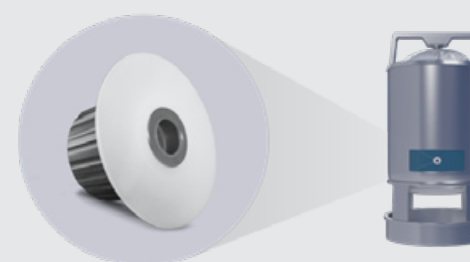
Metrohm's Raman probes are tailored for high-performance spectroscopic analysis. When used in conjunction with SCHOTT's ViewPort® optical interfaces, these probes deliver real-time, non-destructive analysis of bioprocesses without requiring sterilization. Through simultaneous multi-parameter monitoring, our Raman probes ensure that critical data on glucose, lactate, and other key metabolites are accurately captured. This assures consistent process control and optimization.

The combination of ViewPort® optical interfaces from SCHOTT and Metrohm Raman probes integrates easily into existing systems. It enhances both the functionality and the efficiency of bioprocess monitoring setups. This integration supports a robust analytical approach that enables precise control over bioprocess parameters and reducing variability in batch-to-batch production.

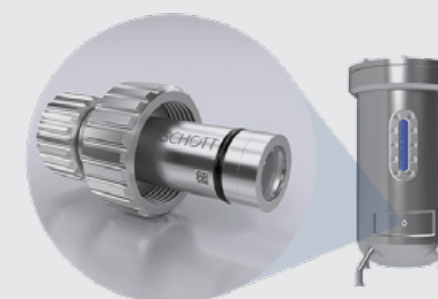
Discover how our combined solutions transform your bioprocess monitoring by delivering clarity, precision, and reliability at every step of your operation.



SCHOTT VIEWPORT® – PRODUCT VARIANTS.



SCHOTT ViewPort® Single-Use for single-use bioreactors or mixing units.



SCHOTT ViewPort® Ingold for multi-use stainless steel bioreactors.



SCHOTT ViewPort® PG13.5 for multi-use glass bioreactors.

SHAFT OPTIONS FOR SCHOTT VIEWPORT® VARIANTS.



Shaft for ViewPort® Single-Use.



Shaft for ViewPort® Ingold.



Shaft for ViewPort® PG13.5.

ViewPort® is a registered trademark of SCHOTT AG

ProTrode sensors

INLINE pH – PROTRODE 200 AND 300

Maintaining the correct pH level is crucial for the success of any bioprocess. Inline pH sensors offer real-time monitoring and control. This ensures that the pH remains within the desired range. This is vital for processes such as fermentation, where even slight deviations can affect product yield and quality. By providing immediate feedback, inline pH sensors maintain the stability and consistency of the bioprocess environment.

DISSOLVED OXYGEN SENSORS – oDO

Oxygen is a critical parameter in many biotechnological processes, particularly in aerobic fermentation. Optical dissolved oxygen sensors provide precise and continuous measurement of oxygen levels in the culture medium. These sensors use advanced optical technology to deliver accurate readings, which enables better control of the oxygen supply. This ensures that microorganisms or cells have the optimal oxygen concentration needed for growth and productivity, which leads to higher yields and improved product quality.

DISSOLVED CARBON DIOXIDE SENSORS – pCO₂

Carbon dioxide levels can significantly impact cell culture and fermentation processes. Inline pCO₂ sensors monitor the partial pressure of CO₂ in real-time. This allows for precise control of the gas environment. This is essential for maintaining the correct pH and ensuring the metabolic activity of cells. By continuously measuring CO₂ levels, these sensors optimize the conditions for cell growth and product formation, which ultimately enhances the efficiency and outcome of bioprocesses.



ProTrode 200



ProTrode 300



Dissolved oxygen sensor



Carbon dioxide sensor pCO₂

One-system integration

Integrating with existing bioreactors and process control systems has never been easier. The 2060 Process Analyzers, such as the 2060 Raman Analyzer and 2060 Human Interface, serve as powerful central hubs that enable seamless communication between sensors (Raman, pH, oDO, pCO₂), digital transmitters, and control systems. This system not only reads and interprets data (e.g., pH), but it can also take corrective actions when needed. This reduces operational risks and enhances process efficiency.

SMART CONNECTIVITY & DIGITAL INTEGRATION

- SmartConnectors for ProTrove sensors that allow direct connection to a 2060 Process Analyzer, removing the need for external transmitters.
- Analog output and Modbus communication for seamless integration into existing PCS, PLC, and IoT infrastructure.
- Secure and convenient sensor calibration stored in the SmartConnector.

ADVANCED REFERENCE SYSTEM

- **No refilling required** – The reference electrolyte remains stable throughout the sensor's lifespan.
- **Fast response times and low drift** – Consistent and accurate measurements.
- **Prevention of contamination** – For pH sensors, Ag-scavenger technology prevents silver ion leakage into the process environment.

DIGITAL TRANSMITTERS FOR HIGH-SPEED MONITORING

- 100ms sampling rate for ultra-fast measurement of pH, temperature, drift, and impedance.
- Modbus integration allows for seamless communication with IoT devices, microcontrollers, and process control systems (PCS/PLCs).
- Onboard calibration storage ensures accurate and reproducible measurements across multiple bioprocessing batches.



Process monitoring for biotechnology



Downstream processing

Monitor the purification and processing of biotechnological products, such as during chromatography and filtration stages. Some of the most common analytes are proteins, enzymes and other biomolecules. These are isolated and purified, which ensures process efficiency and yield optimization.

Bioprocess monitoring

Continuous monitoring of bioreactors used in the production of biopharmaceuticals, including vaccines and monoclonal antibodies. Some of the most common analytes are glucose, lactate, glutamine, glutamate, and other critical nutrients and metabolites. This allows for the adjustment of feed strategies and the optimization of growth conditions.



Quality control and assurance

Ensure the quality of raw materials, in-process materials, and finished biotech products, particularly in pharmaceutical and agricultural biotechnology. Some of the most common analytes are contaminants, impurities, and product concentration to verify compliance with quality standards and regulatory requirements.

Environmental monitoring

Monitor bioreactors and other processes for environmental compliance, particularly in the production of biofuels and biodegradable materials. Some of the most common analytes are byproducts such as alcohols, acids, and gases. These are important for assessing the environmental impact and sustainability of biotechnological processes.

Cell culture analysis

Analyze and optimize cell culture conditions in research and production environments, particularly for regenerative medicine and tissue engineering. Some of the most common analytes are cell viability indicators, growth factors, and pH levels. These are crucial for maintaining the health and productivity of cell cultures.

