

BIOPROFILE® FLEX2

Up to 16 cell culture tests in one analyzer: chemistries, gases, cdv, and osmolality

11 chemistry tests with maintenance-free sensor card technology

265 µL combined sample size for full test menu

Measures 16 tests in 4.5 minutes

nova® biomedical

BIOPROFILE® FLEX2

Automated Cell Culture Analyzer with Maint

BioProfile FLEX2 combines Nova's groundbreaking MicroSensor Card™ technology with optical measurement and freezing point osmometry for an automated and comprehensive cell culture analyzer that eliminates chemistry biosensor maintenance, increases analyzer speed, and reduces sample volume. The full, 16-test cell culture menu includes:

Gluc, Lac, Gln, Glu, NH_4^+, Na^+, K^+, Ca^{++}, pH, PCO_2, PO_2, total cell density, viable cell density, viability, cell diameter, osmolality

Compared to the previous generation BioProfile FLEX, there is no maintenance for any of the 11 chemistry and gas sensors (Gluc, Lac, Gln, Glu, NH_4^+, Na^+, K^+, Ca^{++}, pH, PCO_2, PO_2), sample volume is reduced by 75% to 265 µl, and test time is reduced by 50% to 4.5 minutes. Automated sampling from 96-well plates, syringes, or a 24-position external "load-and-go" sample tray provides maximum workflow flexibility and efficiency for cell culture monitoring.



Maintenance-free chemistry and gas sensors

Chemistry and gas sensors are combined in the credit-card-sized MicroSensor Card, which uses proven Nova biosensor technology that has been validated in thousands of cell culture processes. Cards are maintenance free, have a minimum use life of 21 days, and are replaceable in seconds.

Cartridge-based reagent management system (RMS)

RMS smart reagent cartridges provide several advantages.

- Cartridge installation date, time, lot number, and expiration data are recorded.
- Reagent usage and status are monitored.
- A self-contained, closed waste receptacle within the cartridge eliminates direct handling of waste and contact with hazardous trypan blue and biological materials. Open systems can pose significant waste handling hazards to operators.



enance-Free Chemistry and Gas Sensors



Fast analysis time

Test results for the complete menu including cell density/viability, pH/gases, and key chemistries are available in 4.5 minutes. Throughput for individual modules is as fast as 120 seconds.

Small sample volume

Sample volume is 265 µL for a full, 16-test profile, enabling comprehensive testing even from low volume culture systems. Individual modules require as little as 135 µL.

Analysis time and sample size when modules are run individually

Module	Analysis Time	Sample Size
Chemistry Module: Gluc, Lac, Gln, Glu, NH_4^+, Na^+, K^+, Ca^{++}	120 sec	135 µL
Osmometer Module: Osmolality	230 sec	135 µL
Cell Density/Viability Module: Total cell density, viable cell density, viability, cell diameter	240 sec	135 µL
Gas Module: pH, PCO_2, PO_2	120 sec	265 µL

Analysis time and sample size when modules are run collectively

All Modules-All Tests	270 sec	265 µL

BIOPROFILE® FLEX2

Maximum Workflow Efficiency

Intuitive user interface

Simple touchscreen operation, a choice of three sampling modes, fast analysis time, and automated quality control (QC) provide simplicity, labor savings, and workflow efficiency for cell culture monitoring.

The color touchscreen is easily operated with intuitive prompts and requires minimal training.

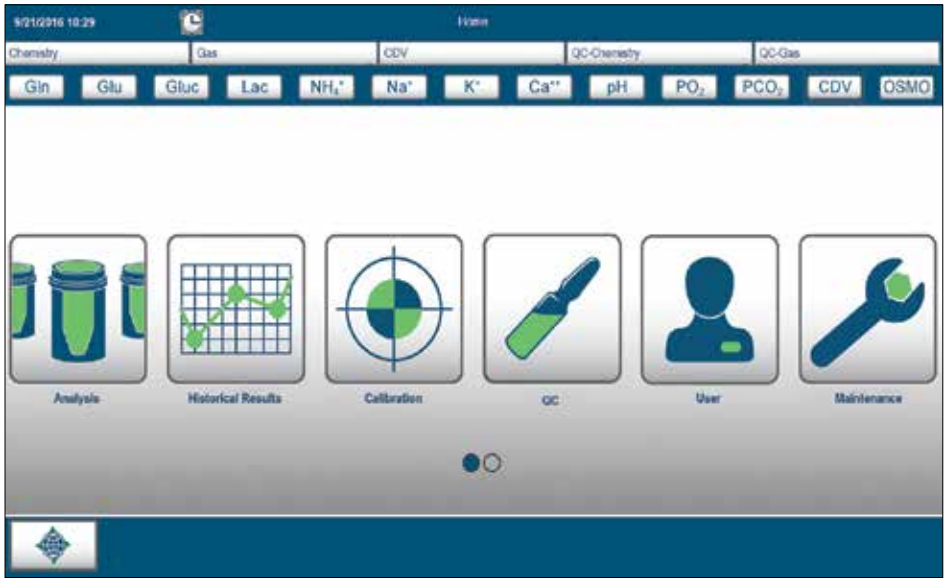
- Navigate the most commonly used function screens with a single click.
- Batch assignment of sample information and test panels makes programming 96-well plates and sample trays fast and eliminates errors in setup.

Onboard automated quality control

Onboard liquid QC provides true verification of FLEX2 performance and saves hours of labor each week compared to manual QC testing. QC cartridges contain up to a 30-day supply of QC material. Controls are run automatically at user-selected intervals.

Supplemental quality monitoring (SQM)

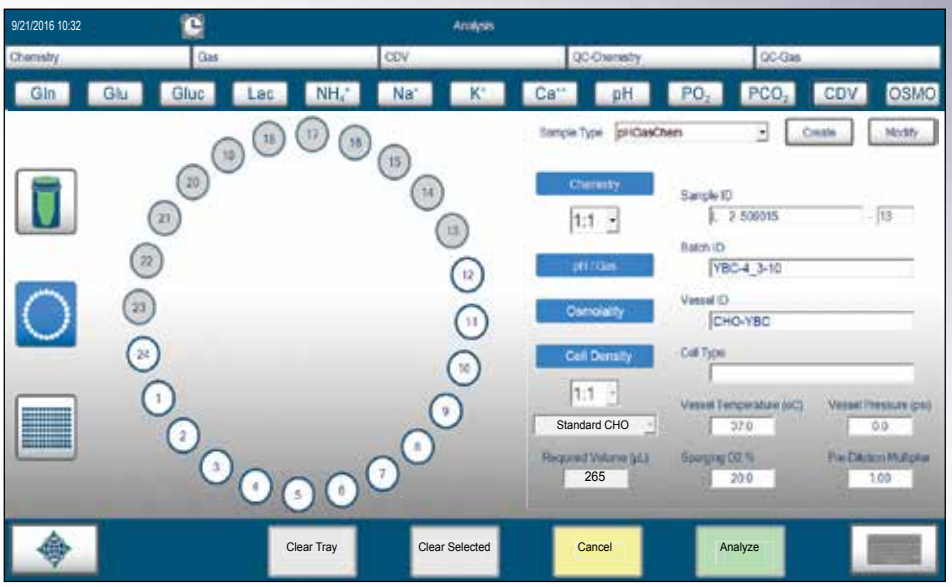
As a supplement to liquid QC, SQM electronically monitors the status and performance of all analytical components (including sensors, reagents, calibrators, sample conditions, software, and electronics) providing real-time, sample-to-sample assurance of analyzer performance.



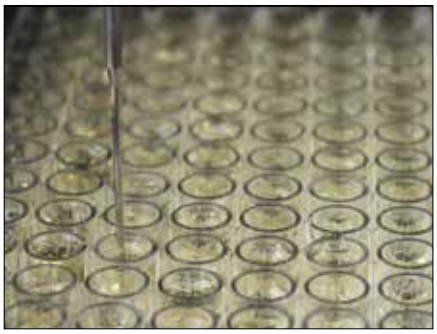
24-position external load-and-go tray



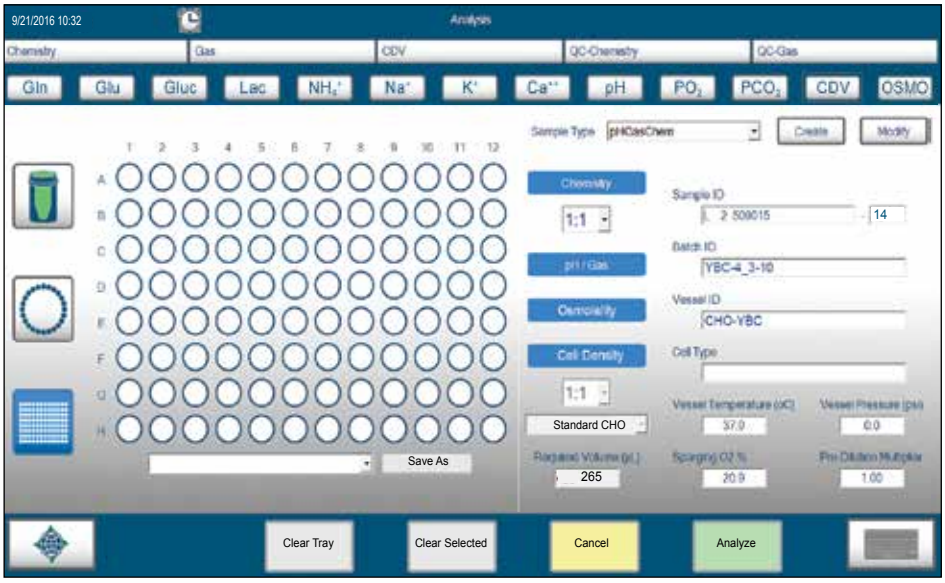
An external load-and-go sample tray allows for continuous loading of cell culture samples for flexible and efficient sample throughput.



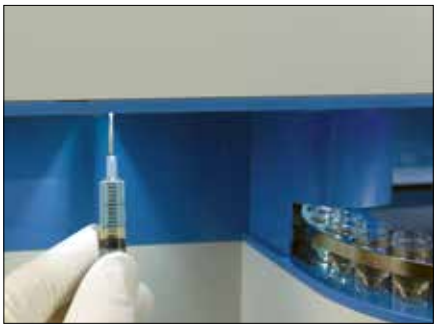
Automated 96-well plate analysis



FLEX2 is the only cell culture chemistry analyzer to offer automated sampling from 96-well plates. Plate configurations may be saved for efficient loading of future plates with the same configuration.



Syringe or cup sampling for critical analysis



Individual samples also can be analyzed directly from syringes or cups. Batch sampling via the 96-well plate and/or the external load-and-go sample tray can be interrupted at any time to run critical samples.

BIOPROFILE® FLEX2

Advanced Analytical Modules

FLEX2's test menu is configured in advanced modules that are integrated with robotics. Each module utilizes state-of-the-art technology that has been proven and characterized in cell culture processes.

Chemistry module

by electrochemistry

The chemistry module consists of electrochemical biosensors for glucose, lactate, glutamine, glutamate, ammonium, sodium, potassium, and calcium, integrated into one credit-card-sized component.

Broad analytical range with improved low end accuracy

The lower analytical range has been extended to provide accurate results down to 0.10 g/L for glucose/lactate and 0.10 mmol/L for glutamine/glutamate.

Onboard auto-dilutions

Robotic automation and a precise, metering syringe pump perform all dilutions on board, eliminating time-intensive manual dilutions and error associated with manual techniques. The use of onboard auto-dilutions provides the broadest analytical range of any cell culture analyzer.

Chemistries are unaffected by cell concentration

Photometric detection methods used by other analyzers often require time-consuming, manual pre-dilution of the sample to avoid poor measurement accuracy due to high cell concentrations. FLEX2 provides accurate results regardless of cell concentration.

Analyte specificity

Nova's biosensors are developed specifically for cell culture applications, where processes typically utilize extremely complex media formulations. These electrochemistry detection methods provide excellent specificity for the analyte of interest.

High throughput chemistry analysis

The chemistry module is capable of analyzing a full chemistry panel using 135 µL of sample in 120 seconds, or a throughput of 30 samples per hour. Full 96-well plates can be analyzed in about three hours.

Gas module

by electrochemistry

The gas module consists of biosensors for pH, PCO_2, PO_2. They are located in the MicroSensor Card.

Improved accuracy

Unlike hospital blood gas analyzers, which are often used for cell culture analysis, Nova's algorithms for measuring pH, PCO_2, and PO_2 were specifically developed for cell culture applications. These algorithms are optimized for mammalian cultures that typically exhibit much higher oxygen consumption and carbon dioxide production rates compared to human blood cells. FLEX2 ensures accurate pH and gas values even in cultures with high cell densities.

Gas and pH values available in manual and load-and-go tray analysis modes

FLEX2 allows the user to configure the gas module to provide gas and pH results from both manual samples and the external carousel tray.



FLEX2's high resolution optics count cells as small as 4 microns

Cell density, cell viability module

by high resolution digital optics

Cell density and cell viability are measured by an automated trypan blue exclusion method combined with high resolution digital optics and advanced software algorithms. Cell counting accuracy and precision are optimized in several ways:

Automated dilutions

FLEX2 requires no manual dilutions for cell density analysis up to 80,000,000 cells/mL. The optics maximize precision and accuracy by eliminating manual dilution steps, which can add variability to cell counting results.

Wide range

A wide range of cell densities from 100,000 to 80,000,000 cells/mL can be counted, even with cells as small as 4 microns.

Counts up to 45 optical fields

FLEX2 counts up to 30 times more cells than other commonly used counting methods. Accuracy and validity of the cell count is improved by the larger number of cells counted.

Automated cell staining and mixing

A fully automated, robotic sample and liquid handling system ensures precise and accurate sample aspiration, trypan blue staining, and homogeneity of the cell culture sample.

Broad range of cell types

Multiple, adjustable inspection criteria allow for the counting of a broad range of cell types and morphologies, including CHO, hybridoma, and insect cell lines.

Image of histogram

On-screen histograms provide a visual display of live cell diameter distribution.

Stores images

Images from the last 60 days can be stored and recalled for review or re-analysis. After 60 days, images are stored as jpeg files but remain available indefinitely for viewing. Data is never destroyed or automatically removed from the system's database.

Osmometer module

by freezing point depression

Freezing point depression osmometry is considered the gold standard for measuring osmolality in cell culture processes. FLEX2's sophisticated robotic sample aspiration and dispensing mechanism improves performance over other osmometers by eliminating error associated with manual sample pipetting.

BIOPROFILE® FLEX2

Connectivity and Compliance

Advanced OPC connectivity

Nova's OPC connectivity integrates FLEX2 with any OPC-compliant devices, such as bioreactor controllers, data historians, laboratory information management systems (LIMS), and plant management systems. Nova's OPC connectivity features:

- Automated bidirectional data and control commands
- Data archiving
- Connection to any OPC-compliant device
- Connectivity verification
- Bioreactor feedback control
- Remote monitoring of status and data

GMP compliance

FLEX2 meets GMP manufacturing requirements through installation qualification (IQ) and operational qualification (OQ) documentation and validation support from Nova specialists.

Compliance with 21 CFR Part 11

Limited access

User log-on is secured by both user ID and password. Automatic log-off features prevent unauthorized access.

Electronic record retention and retrieval

- All data are securely retained through password access control in both human-readable and electronic forms.
- Records are readily retrievable throughout their retention period.

Audit trails

- Time-stamped audit trails record the date and time of operator entries and actions that create, modify, or delete electronic records.
- Record changes do not obscure previously recorded information.
- Records are maintained in original and audited form.

Support Services

The purchase of a FLEX2 analyzer is just the beginning of a long commitment from Nova to you. There is an extensive array of support services to help maintain peak analyzer performance.

Installation

Performed by a Nova field specialist, installation consists of analyzer setup and performance verification.

Validation assistance

Nova installation staff can perform extended precision and reference analyzer correlation studies. Nova performs all tests and provides complete documentation to verify compliance to regulatory standards. In addition to IQ/OQ support, we can assist with performance qualification (PQ) protocol development and implementation.

Field service

On those occasions when service is needed, a team of field service representatives, located throughout the country, is available to provide on-site support, resolving issues with minimal downtime.

Comprehensive applications services

A knowledgeable applications staff with significant industry experience is available to help with custom optimizations, IQ/OQ, process automation support, and other site-specific needs.

Telephone assistance hotline

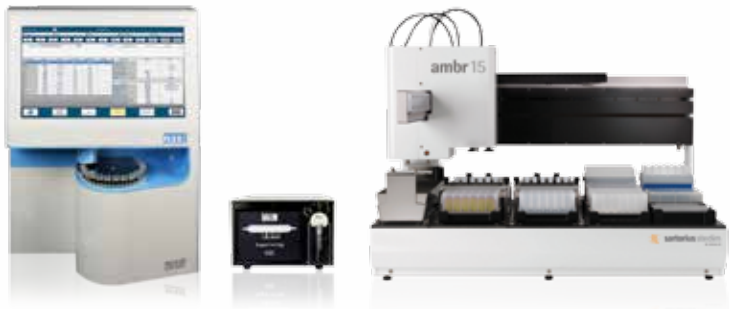
We maintain a highly skilled and experienced technical support staff available by phone or email. From basic questions to advanced troubleshooting, they are able to resolve most problems over the phone without requiring on-site support.

BIOPROFILE® FLEX2

Fully Automated Sampling

BioProfile FLEX2 is the only cell culture analyzer designed for both online sampling of bench-scale bioreactor systems and intergration with the automated ambr® 15 cell culture Microbioreactor System. FLEX2's optional External Sampling Module (ESM) automatically delivers cell culture samples from ambr® 15 microbioreactor systems to FLEX2 for analysis. For bench-scale bioreactor systems, the Flownamics Seg-Flow® integrates seamlessly with FLEX2, providing automated sampling from 500 mL bench-scale bioreactors up to commercial SIP/CIP bioreactors. FLEX2's automation streamlines experimental setup and allows for remote access of all system configurations during an experiment.

FLEX2 and ESM integration with ambr® 15 cell culture



FLEX2 Automated Cell Culture Analyzer and External Sampling Module

ambr® 15 cell culture Microbioreactor System

A single ESM is all that is required to fully automate sampling of a complete ambr® 15 cell culture system (up to 48 microbioreactors). At just eight inches wide, the ESM adds very little additional bench space. While configured with an ESM, FLEX2 can still be used for manual and tray sampling for other culture systems.

FLEX2 integration with Flownamics Seg-Flow®



FLEX2 Automated Cell Culture Analyzer

Seg-Flow® Online Autosampler

FLEX2 integrates seamlessly with the Flownamics Seg-Flow® online autosampler to provide automated sampling for up to eight bench-scale bioreactors as well as automating sampling from commercial size SIP/CIP systems.

Rapid analysis, real-time data collection, accelerated timelines

With throughput three times faster than traditional manual sampling practices, an integrated FLEX2 provides more accurate comparison between culture stations by shortening the analysis time between cultures. Data is available immediately after each analysis, allowing for instant data review and the ability to make process modifications in real time. Automation results in accelerated timelines and bringing products to market much faster.

Feedback control

FLEX2's automation enables full feedback control of all measureable parameters including pH. With algorithms specifically developed for cell culture, real-time pH adjustments can be enabled to provide the most accurate pH control for automated culture systems. Feedback control utilizing glucose to maintain a specific target concentration, or ramping perfusion or media addition rates based on viable cell density, are just a few of the many possibilities with a FLEX2 automated cell culture system.

Hours of labor and cost savings per day

BioProfile FLEX2's automation saves up to eight hours per day of manual sampling, sample analysis, data collection, and data management. Errors are virtually eliminated by automating all sample handling, sampling and analysis steps, and data management. A single FLEX2 instrument replaces several, separate analyzers that were previously required to achieve the same test menu, saving thousands of dollars each year in reagent, maintenance, and service costs.

BIOPROFILE® FLEX2

Specifications

Sample Analysis Time:
2.0 minutes (Chemistry only)
2.0 minutes (Gas only)
3.8 minutes (Osmolality only)
4.0 minutes (Cell Density/Viability)
4.5 minutes (All 16 tests run simultaneously)
Operating Temperature Range.....10–30°C (50–86°F)
Operating Relative Humidity Range.....20–85%
Sample Size .....135 to 265 µL

Sample Options:
Individual via syringe/cup
Automated batch using 24-position tray or 96-well plates

Operating System.....Windows 7
Electrical Requirements.....90-264 VAC, 50 to 60 Hz
(Universal Power Supply)

System Size:
Height: 24 in (61 cm), Width: 17 in (43 cm), Depth: 25 in (64 cm)
With optional osmometer module:
H: 24 in (61 cm), W: 25 in (64 cm), D: 25 in (64 cm)

System Weight:
94 lb (42.6 kg) without reagents packs

Safety Certifications: IEC 61010-1:2001, Quality Systems Certification: ISO 9001:2008

OPC Compliant, PAT Compatible, 21 CFR Part 11 Compliant



Chemistry/Gas Module

Assay	Measurement Range	Resolution	Method
Glucose	0.10–30.0 g/L*	0.05 g/L	Biosensor
Lactate	0.10–12.0 g/L*	0.05 g/L	Biosensor
Glutamine	0.10–12.0 mmol/L*	0.05 mmol/L	Biosensor
Glutamate	0.10–12.0 mmol/L*	0.05 mmol/L	Biosensor
Ammonium	0.2–25.0 mmol/L	0.01 mmol/L	Direct ISE
pH	5.000–8.000	0.001	Direct ISE
PCO_2	3.0–300.0 mmHg	0.1 mmHg	Direct ISE
PO_2	3.0–500.0 mmHg	0.1 mmHg	Clarke Electrode
Sodium	40–300 mmol/L	0.1 mmol/L	Direct ISE
Potassium	1.0–100.0 mmol/L	0.01 mmol/L	Direct ISE
Calcium	0.10–10.0 mmol/L	0.01 mmol/L	Direct ISE

Calculated Tests:
O_2 Saturation; CO_2 Saturation; HCO_3 -(bicarbonate), Temp. Corrected pH, PCO_2, PO_2

*Ranges reflect user selectable 1:2 dilution

Osmometer Module

Assay	Measurement Range	Resolution	Method
Osmolality	0–2000 mOsm/kg	1 mOsm/kg	Freezing Point

Cell Density/Viability Module

Assay	Measurement Range	Resolution	Method
Cell Diameter	4–70 µm	N/A	Digital Imaging
Density	100,000–80,000,000 cells/mL	N/A	Digital Imaging
%Viability	0–100%	N/A	Digital Imaging

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Specifications subject to change without notice.