
BIOPROFILE®
FLEX2
Up to 16 cell culture tests in one analyzer chemistry, gases, cdv, and osmolality
11 chemistry tests with maintenance-free sensor card technology
265 µL combined sample size for full test menu
nova® biomedical

Automated Cell Culture Analyzer with Maintenance-Free

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 sensor maintenance, increases analyzer speed, and reduces sample volume. The full 16 cell culture test 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 required 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 four 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.

No-maintenance chemistry sensors

Chemistry and gas biosensors 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. MicroSensor Cards have a maintenance-free, onboard minimum use life of 14 days and are replaceable in seconds.

Cartridge-based reagent management system (RMS)

FLEX2's RMS features smart reagent cartridges that are easy to use with simple snap-in replacement.

- RMS automatically captures cartridge installation date, time, lot number, and expiration.
- RMS monitors reagent usage and provides real-time reagent status and alerts, maximizing analyzer readiness.
- A self-contained waste receptacle within the cartridge eliminates direct handling of waste and direct contact with hazardous trypan blue and biological materials. Other systems can pose significant waste handling hazards to operators.

Chemistry Sensors

Fast analysis time

Comprehensive test results including cell density/viability, pH/gases, and key chemistries are available in four minutes. Throughput for individual modules is as fast as 105 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 120 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
Osmometry Module: Osmolality	120 sec	135 µL
Cell Density/Viability Module: Total cell density, viability, cell diameter	230 sec	135 µL
Gas Module: pH, PCO_2, PO_2	240 sec	265 µL

Analysis time and sample size when modules are run collectively

All Modules-All Tests	240 sec	265 µL

Compact size:
Height: 24 in (60.96 cm)
Width: 17 in (43.18 cm)
Depth: 25 in (63.5 cm)

Maximum Workflow Efficiency

Intuitive user interface

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

The colour touchscreen is easily operated through the use of simple and intuitive prompts and requires minimal training.

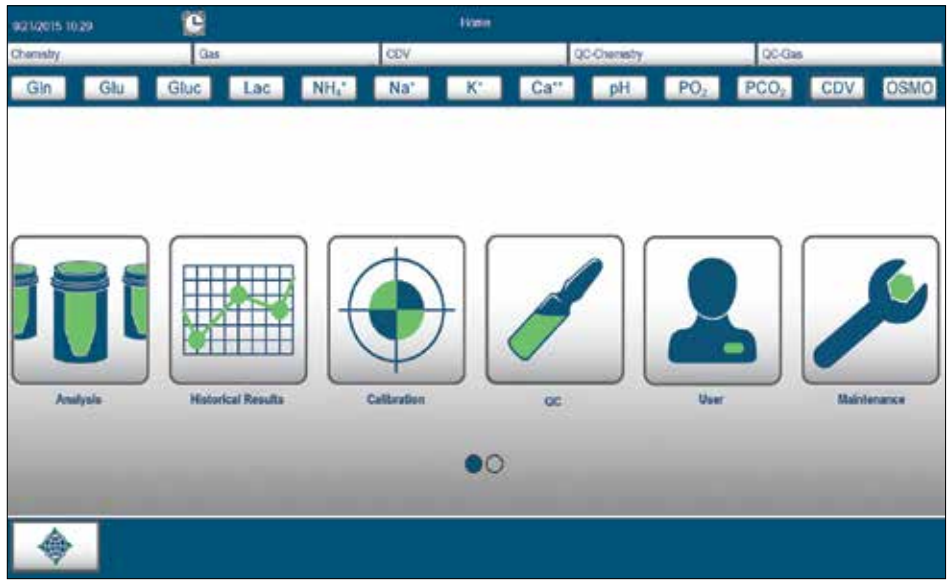
- Navigate with a single click to the most commonly used function screens.
- Batch assignment of sample information and test panels makes programming 96-well plates and sample trays fast, and eliminates errors in sample setup.

Onboard automated quality control

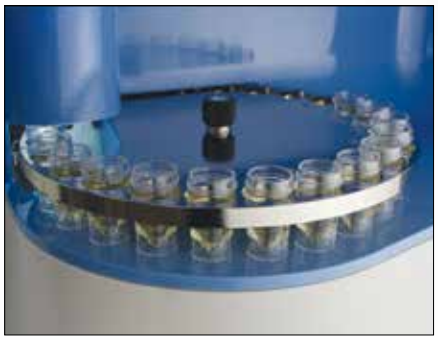
Onboard liquid QC provides true verification of FLEX2 performance and saves hours of labour each week compared to manual QC testing. QC cartridges contain up to a 30-day supply of QC material. Controls are run automatically at user-selected intervals.

Supplemental quality monitoring (SQM)

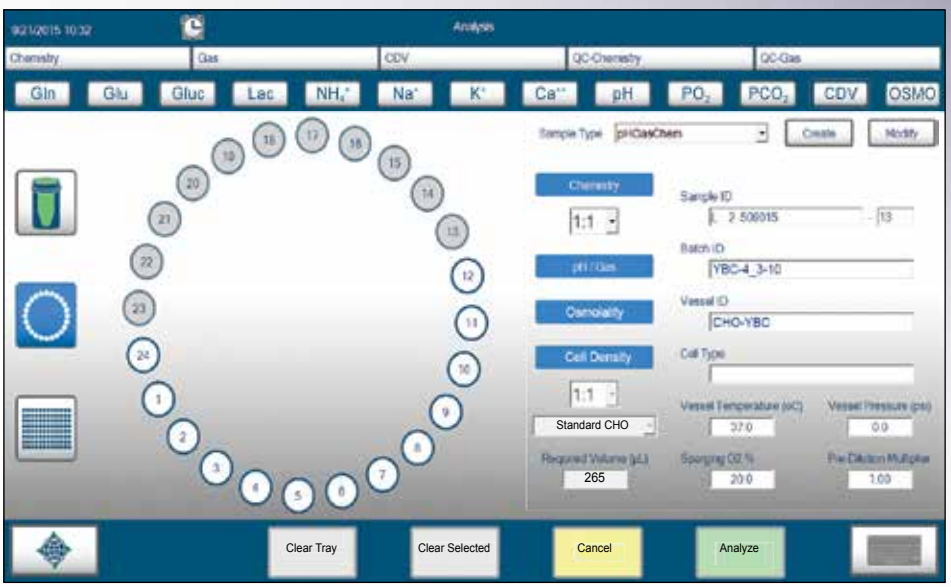
As a supplement to liquid QC, SQM electronically monitors the status and performance of all analytical components (including sensors, reagents, calibrators, sample conditions, software, and electronics) providing real-time, sample-to-sample assurance of analyzer performance.



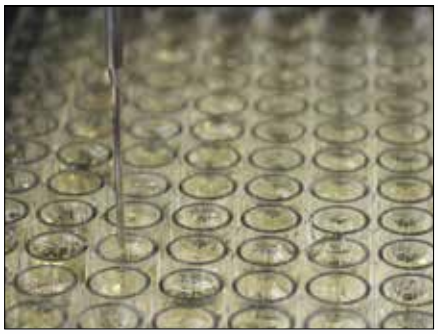
24-position, external load-and-go tray



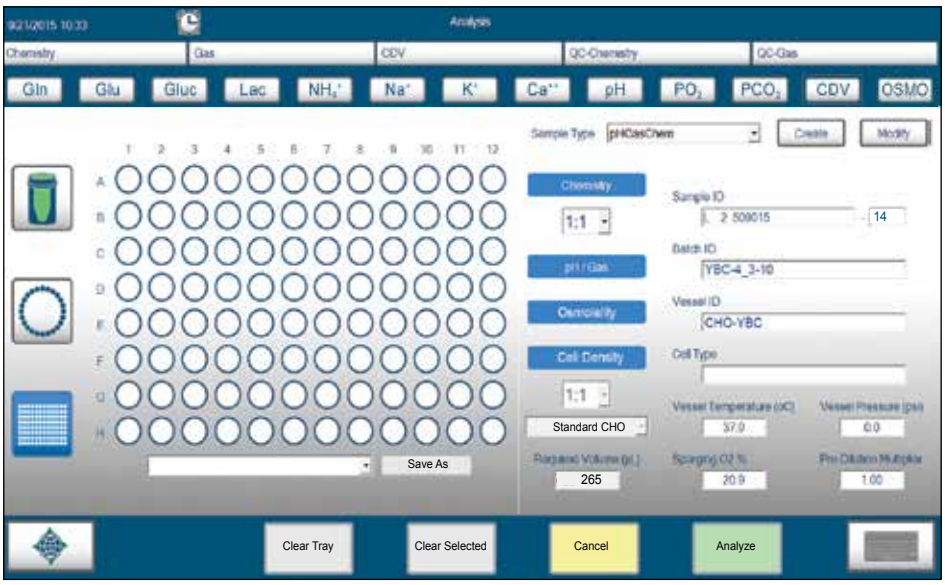
An external load-and-go sample tray allows for continuous loading of cell culture samples for the most flexible and efficient sample throughput.



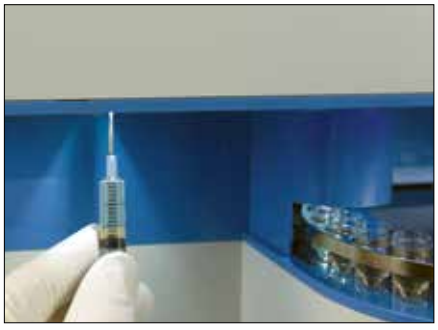
Automated, 96-well plate analysis



FLEX2 is the only cell culture chemistry analyzer to offer automated sampling from 96-well plates. Plate configurations with mixed test panels 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 external “load-and-go” sample tray runs can be interrupted at any time to run critical gas syringe samples.

Advanced Analytical Modules

FLEX2's test menu is configured in discrete analytical modules that are integrated with robotics. Each module utilizes state-of-the-art technology that has been proven and characterized in cell culture processes. Modules can be added initially or at a later time.

Chemistry Module

by electrochemistry

The FLEX2 Chemistry Module consists of electrochemical biosensors for glucose, lactate, glutamine, glutamate, ammonium, sodium, potassium and calcium integrated into one credit card sized replaceable element.

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 onboard, eliminating time-intensive manual dilutions and associated error 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. The BioProfile FLEX2 Chemistry Module 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. This electrochemistry detection method provides absolute specificity for the analyte of interest with minimal interferences from analytes of similar molecular structure.

High throughput chemistry analysis

The Chemistry Module is capable of analyzing a full chemistry panel using 120 µL of sample in 105 seconds. This allows a throughput of over 34 samples per hour in a fully automated sampling mode. Full 96-well plates can be analyzed in under three hours.

Gas Module

by electrochemistry

The Gas Module consists of biosensors for pH, PCO_2, PO_2. Sensors are located in the maintenance-free, MicroSensor Card.

Improved accuracy

Unlike hospital blood gas analyzers that are typically 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. BioProfile FLEX2 ensures accurate pH and gas values even in cultures with high cell density.

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 in both manual samples as well as the external carousel tray.

FLEX2 high resolution optics count cells a small as 4 microns

Cell density, cell viability module

by high resolution digital optics

Cell density and cell viability are measured by the automated trypan blue exclusion method, combined with high resolution digital optics and advanced software algorithms. Cell counting accuracy and precision are demonstrated 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, 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 generated on FLEX2 is never destroyed or automatically removed from the system 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, technique-prone sample pipetting.

Support Services

The purchase of a FLEX2 analyzer is the beginning of a long commitment and responsibility from Nova to you. FLEX2 users are backed by an extensive array of support services to help you 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.

Telephone assistance hotline

We maintain a highly skilled and experienced technical support staff available by phone to assist any time. From basic questions to advanced troubleshooting, our team is highly skilled and able to resolve most problems over the phone without requiring on-site support.

Field service

On those occasions when service is needed, our extensive team of highly-skilled service representatives are available to provide on-site support, resolving issues fast with minimal interruption.

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 assistance.

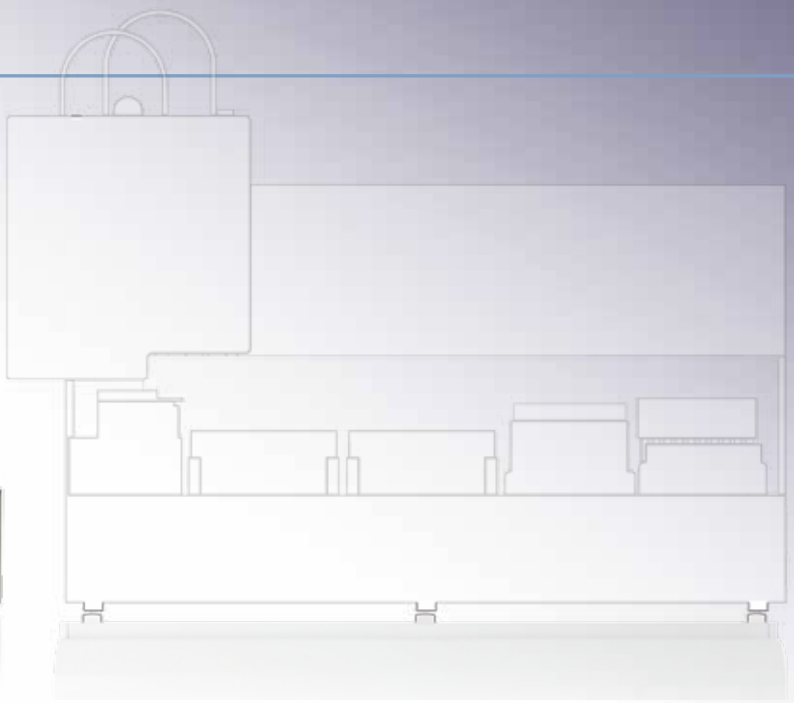
Connectivity and control systems interface support

Nova applications specialists can assist with the interface between FLEX2 and OPC-compliant devices such as bioreactor controllers, data historians, lab information systems, and plant management systems.

System Options

FLEX2 Automated Cell Culture Analyzer

External Sampling Module



Microbioreactor System

Microbioreactor integration

BioProfile FLEX2 offers online auto-sampling. An External Sampling Module (ESM) provides online auto-sampling directly from microbioreactor systems. Scheduling of sampling in the FLEX2 analyzer is user programmable. Individual syringe, tray, or 96-well plate samples can also be analyzed during periods when on-line sampling is not scheduled.

Advanced OPC connectivity

Nova OPC connectivity integrates BioProfile 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
- Easy connection to any OPC-compliant device
- Connectivity verification
- Bioreactor feedback control
- Remote monitoring of status and data

Simple 21 CFR Part 11 compliance

BioProfile FLEX2 provides comprehensive features to assist with meeting these requirements:

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.

GMP compliance

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

BIOPROFILE® FLEX2 Specifications

Sample Analysis Time:
2 minutes (Chemistry only)
2 minutes (Osmolality only)
3.8 minutes (Cell Density/Viability)
4 minutes (Gases only)
4 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: 23.5 in (60 cm), Width: 17 in (43 cm), Depth: 25 in (64 cm)

System Weight:
Analyzer: 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

Compact size:
Height: 24 in (60.96 cm)
Width: 17 in (43.18 cm)
Depth: 25 in (63.5 cm)

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	3.0–200.0 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

Osmolality 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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