### Specifications

#### BioProfile FLEX Analyzer

**The Power of One**

**Automated Analyzer for Fast Comprehensive Cell Culture Analysis**

<table>
<thead>
<tr>
<th>BioProfile FLEX Analyzer</th>
<th>Specifications</th>
</tr>
</thead>
</table>
| **Sample Retention System (SRS)** | **Sample Rack Capacity**: 2 racks  
Sample Rack Loading: 15 mL centrifugal tubes, 34 tubes per Sample Rack (60 total), 50 mL centrifugal tubes, 10 tubes per Sample Rack (20 total)  
Reframed Sample Volume User Selectable: 0 to 1 mL  
Temperature Control: Mode of Cooling Articulating Arm and Optional 19 inch Touch Screen with Digital Imaging  
**Temperature Range**: 3 to 30 degrees centigrade  
**Dimensions** (Height x Width x Depth): 25.3 x 20.7 x 22.2 inches  
**Weight**: 4 lbs (2 kg) |
<table>
<thead>
<tr>
<th><strong>Chemistry/Gas Module</strong></th>
<th><strong>Assay</strong></th>
<th><strong>Measurement Range</strong></th>
<th><strong>Resolution</strong></th>
<th><strong>Method</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>0.2–80.0 g/L</td>
<td>0.01 g/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>Lactate</td>
<td>0.2–10.0 g/L</td>
<td>0.01 g/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>Glutamine</td>
<td>0.2–12.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>Glutamine</td>
<td>0.2–12.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>Ammonium</td>
<td>0.2–25.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>5.000–8.000</td>
<td>0.010</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>PCO₂</td>
<td>3.0–100.0 mmHg</td>
<td>0.1 mmHg</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>PO₂</td>
<td>3.0–10.0 mmHg</td>
<td>0.1 mmHg</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>40–200 mmol/L</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>25.0–100.0 mmol/L</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>1.0–10.0 mmol/L</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
<tr>
<td><strong>Osmolality</strong></td>
<td><strong>Assay</strong></td>
<td><strong>Measurement Range</strong></td>
<td><strong>Resolution</strong></td>
<td><strong>Method</strong></td>
</tr>
<tr>
<td>Osmolality</td>
<td>Osmolality 0–1500 mOsm/Kg</td>
<td>1 mOsm/Kg</td>
<td>Freezing Point</td>
<td></td>
</tr>
<tr>
<td><strong>Cell Density/Viability Module</strong></td>
<td><strong>Assay</strong></td>
<td><strong>Measurement Range</strong></td>
<td><strong>Resolution</strong></td>
<td><strong>Method</strong></td>
</tr>
<tr>
<td>Osmolality</td>
<td>Osmolality 0–500,000 cells/mL</td>
<td>1000 cells/mL</td>
<td>Freezing Point</td>
<td></td>
</tr>
<tr>
<td><strong>IgG Module</strong></td>
<td><strong>Assay</strong></td>
<td><strong>Measurement Range</strong></td>
<td><strong>Resolution</strong></td>
<td><strong>Method</strong></td>
</tr>
<tr>
<td>IgG</td>
<td>IgG 0.10–10.0 g/L</td>
<td>0.01 g/L</td>
<td>Direct ISE</td>
<td></td>
</tr>
</tbody>
</table>

#### After Sale Support

- **Installation by a Direct, Factory Representative**
- **Advanced Operator Training in Waltham, MA**
- **Telephone Technical Assistance**
- **On-Line Autosampler System Integration Options**
- **Sample Retention Collection System (SRS)**

### Notes

- Specifications subject to change without notice.
- NOVA BIOMEDICAL INDIA, 307, Agra Plaza II, Plot No.1/4, Sector – 10, Dwarka, New Delhi – 110 076 India  
  Tel: +91-11-25810693,+91-11-25075663, Fax: +91-11-25416461, Email: info@novabiomedical.co.in
- NOVA BIOMEDICAL K.K., 3-5 Evans Business Centre, Deeside Industrial Park, Deeside, Flintshire CH5 2JZ United Kingdom  
  Tel: 44 1244 287087, Fax: 44 1244 287080, Email: office@novabiomedical.co.uk
- NOVA BIOMEDICAL AUSTRIA/EASTERN EUROPE/MIDDLE EAST, Laxenburger Strasse 33, 04535 Laxenburg, Germany  
  Tel: (43) 1-603 09 700, Fax: (43) 1-603 09 702, Email: info@novobiomedical.at
BioProfile FLEX is a chemistry/cell viability modular instrument that measures up to 15 key cell culture attributes related to product yield and quality. By combining as many as five separate instruments into one easy-to-use instrument, BioProfile FLEX simplifies workflow and saves time, labor, and operating cost versus multiple instruments.

**One Fast, 2-8 Minute Analysis**
Saves as much as 30 minutes per sample compared to using multiple instruments.

**One Integrated Data Report**
Simplifies data collection, analysis, archiving, and regulatory compliance.

**One Intuitive, User Interface**
Saves 30 or more operator steps compared to multiple instrument interfaces.

**One Small, 1 mL Sample**
Conserves cell culture mass and end product.

**One Consolidated Workstation**
The compact BioProfile FLEX footprint saves up to 15-20 square feet of valuable bench space and saves hours of maintenance each month and compared to multiple instruments.

**Chemistry and Gas Module**
by Electrochemistry
- Glucose
- Glutamine
- Ammonium
- PO$_4$
- Sodium
- Ionized Calcium

**Osmometer Module**
by Freezing Point Depression
- Osmolality

**IgG Module**
by Photometry
- IgG

**Cell Density, Cell Viability Module**
by Digital Imaging
- Cell Density
- Cell Viability
- Cell Diameter

**Precise Auto Focusing**
Cell inspection and counting is initiated after a single, mono-layer of cells settles in the counting chamber. Precise auto-focusing on a mono-layer of cells allows all cells in the image field to be more accurately inspected and classified.

**Improved Optical Resolution**
Cells remain stationary in the counting chamber as the optics inspect multiple fields. This provides improved resolution compared to inspecting a single field in a flow cell and passing multiple sample aliquots through a flow cell for imaging.

**On-Screen Tagging of Viable and Non-Viable Cells**
On-screen tagging of viable and non-viable cells allows manual, visual review and confirmation of cell counts.

**On-Screen Histograms**
On-screen histograms provide a visual display of cell distribution.

**Stores Images**
Images from the last 30 days can be stored and recalled from memory for re-analysis by new inspection criteria. After 30 days images are stored as jpeg files.

**Reduced Blockages and Flow Cell Maintenance**
BioProfile FLEX counting chamber geometry is designed to eliminate blockages and flow cell maintenance.
Advanced Analytical Modules Integrated by Robotics

The full 15-test BioProfile FLEX menu is configured in discrete analytical modules that are mechanically and fluidically integrated by robotics. Each BioProfile FLEX module utilizes state-of-the-art technology that is well-proven and characterized in cell culture processes. Building from the Chemistry/Gas Base Module, other modules can be added initially or later in the field.

Chemistry/Gas Base Module
by Electrochemistry

The BioProfile FLEX base module consists of state of the art biosensors for glucose, lactate, glutamine, glutamate, ammonium, pH, PCO₂, PO₂, sodium, potassium, and calcium. Nova biosensor technology has been proven in nearly one thousand BioProfile installations, spanning R & D, process development, pilot, and manufacturing applications worldwide.

BioProfile FLEX IgG Module
by Photometry

BioProfile FLEX IgG is a rapid, automated method based on the protein affinity of IgG using a colorimetric endpoint detection. This assay is specific to either human or humanized therapeutic IgG of all subclasses. BioProfile FLEX IgG is accurate throughout the range from 0.10 to 5.00 g/L.

• The analysis time for the IgG module is less than five minutes.
• IgG results can be obtained concurrently with chemistries, cell counts and osmometry on non-centrifuged samples in six minutes.
• BioProfile FLEX reduces the one-day or longer turn around time for a lab analysis of IgG.

Osmometer Module
by Freezing Point Depression

BioProfile FLEX uses the freezing point depression method to measure osmolality. A sophisticated robotic sample aspiration and dispensing mechanism improves BioProfile FLEX performance over other osmometers by eliminating technique-prone manual sample pipetting. Sample aspiration is performed automatically from a syringe or sample cup, and a precise sample aliquot is dispensed into the osmometer tray. By automating this manual step, analytical performance is optimized.

Saves Time Labor, and Eliminates Manual Technique Variation

Once the “Analyze” button is pressed, BioProfile FLEX allows complete walkaway automation. A robotic sampling arm and syringe pump aspirate a precise amount of sample, perform any required dilutions, distribute the sample to the modules, and then rinse and prepare for the next sample.

The entire test profile, up to 15 results, is displayed in one report. Data can be automatically stored on BioProfile FLEX or exported to an Excel spreadsheet or data historian.

In addition to eliminating hours of operator time, BioProfile FLEX automation eliminates operator technique errors due to manual calibrating, pipetting, diluting, or data transcribing. Complete automation assures accurate, consistent results from operator to operator, sample to sample, and instrument to instrument.

BioProfile FLEX Test Menu

CD CV Gln Glu NH₄⁺ Gluc Lac pH PO₂ PCO₂ Na⁺ K⁺ Ca++ Osmolality IgG
FDA defines PAT as a system for ensuring final product quality through timely, on-line or at-line measurement and control of critical attributes of manufacturing materials and processes. BioProfile FLEX can be the heart of an automated PAT system to:

**Measure**
- Provide an understanding of the effects that measurable and controllable attributes such as pH, gases, nutrients, osmolality, IgG, cell density, and cell viability have on final characteristics of the product.

**Communicate**
- Communicate real-time, on-line measurements to other devices such as controllers, plant managers, and data historians.

**Capture**
- Capture cell culture attributes for review, analysis, and record keeping.

**Control**
- Provide feedback for control of critical attributes such as pH, nutrients, gases, osmolality, and toxins through bioreactor feedback loops.

**Process Analytic Technology (PAT) Compatibility**

FDA-regulated Good Laboratory Practice (GLP) and current Good Manufacturing Practice (cGMP) sites that utilize computers for instrument control, data acquisition, data transfer, and archiving must follow 21 CFR Part 11 requirements for electronic records and signatures. BioProfile FLEX provides comprehensive features to assist with meeting these requirements:

**Limited Access**
- Administrative password configuration tools limit access to BioProfile FLEX electronic records through password privilege levels.
- User log-on is secured by both user ID and password.
- Automatic log-off features prevent unauthorized access.
- An automatic password de-activation feature is also available.

**Electronic Record Retention and Retrieval**
- All data are securely and confidentially retained through password access control in both human readable and electronic form.
- Records are readily retrievable throughout their retention period on the BioProfile FLEX analyzer.

**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.

BioProfile FLEX provides a single, user-friendly touchscreen interface for all modules. Having a common interface for all modules simplifies operation.

- For most users, the home screen will be the only screen needed. Everything needed to log in samples and perform an analysis is on the home screen.
- To further simplify analysis, “one button operation” can be activated using predetermined settings for the sample container, test selection, and sample log-in.

**Intuitive, Easy-to-Use Operator Interface**

**Simple 21 CFR Part 11 Compliance**

[Image: BioProfile FLEX Edit Users Screen]
R&D, Process Development and Production Applications

Instrumentation for all three environments must be factory rugged, easy to use, and analytically accurate but production use also requires appropriate interface to the factory control system. BioProfile FLEX can deliver consistent accuracy, reliability, and ease of transfer throughout the bio-product life cycle from R&D to full-scale manufacturing.

Easy to Use
- BioProfile FLEX can be operated using a single button. It is easy to use for scientists and production workers alike.
- Operator technique is removed from the testing process.
- Consistent results are obtained from operator to operator, scientist to production worker.

Simplified Validation, Data Analysis, and Archiving
- Consolidating key cell culture parameters in the BioProfile FLEX analyzer simplifies instrument validation, data analysis, archiving, and regulatory compliance.

Compact, Rugged Design
- The BioProfile FLEX footprint saves valuable space compared to the multiple instruments it replaces.
- Its rugged aluminum exterior is capable of withstanding the potentially harsh environment of production facilities.

OPC Interoperability
- The BioProfile FLEX OPC interface communicates with factory control systems, data historians, or laboratory information systems (LIMS).

Minimal Maintenance
- Minimal maintenance requirements make BioProfile FLEX ideal for R&D and production applications alike.
- Snap-in reagents or sensors are easily replaced in minutes.

User Support
- Nova Biomedical provides comprehensive support for BioProfile analyzers, including:
  - Extensive user training
  - IQ/OQ services
  - 24/7/365 telephone technical assistance
  - Applications assistance
  - Service contracts

Consolidated Data Report Simplifies Data Analysis and Management

A major difficulty in cell culture monitoring is managing data from a variety of instruments and vendors, and consolidating the data into one repository.

- The time and costs of controlling and collating multiple islands of data are reduced.
- A consolidated data source simplifies multivariate data analysis for understanding and identifying process control points.
- Errors due to manual collation of data from multiple instruments are eliminated.
- All BioProfile FLEX data are 21 CFR Part 11 secure. The risk of data loss is reduced. Higher safety and regulatory standards are achieved.

R&D, Process Development and Production Applications

Instrumentation for all three environments must be factory rugged, easy to use, and analytically accurate but production use also requires appropriate interface to the factory control system. BioProfile FLEX can deliver consistent accuracy, reliability, and ease of transfer throughout the bio-product life cycle from R&D to full-scale manufacturing.

Easy to Use
- BioProfile FLEX can be operated using a single button. It is easy to use for scientists and production workers alike.
- Operator technique is removed from the testing process.
- Consistent results are obtained from operator to operator, scientist to production worker.

Simplified Validation, Data Analysis, and Archiving
- Consolidating key cell culture parameters in the BioProfile FLEX analyzer simplifies instrument validation, data analysis, archiving, and regulatory compliance.

Compact, Rugged Design
- The BioProfile FLEX footprint saves valuable space compared to the multiple instruments it replaces.
- Its rugged aluminum exterior is capable of withstanding the potentially harsh environment of production facilities.

OPC Interoperability
- The BioProfile FLEX OPC interface communicates with factory control systems, data historians, or laboratory information systems (LIMS).

Minimal Maintenance
- Minimal maintenance requirements make BioProfile FLEX ideal for R&D and production applications alike.
- Snap-in reagents or sensors are easily replaced in minutes.

User Support
- Nova Biomedical provides comprehensive support for BioProfile analyzers, including:
  - Extensive user training
  - IQ/OQ services
  - 24/7/365 telephone technical assistance
  - Applications assistance
  - Service contracts

Consolidated Data Report Simplifies Data Analysis and Management

A major difficulty in cell culture monitoring is managing data from a variety of instruments and vendors, and consolidating the data into one repository.

- The time and costs of controlling and collating multiple islands of data are reduced.
- A consolidated data source simplifies multivariate data analysis for understanding and identifying process control points.
- Errors due to manual collation of data from multiple instruments are eliminated.
- All BioProfile FLEX data are 21 CFR Part 11 secure. The risk of data loss is reduced. Higher safety and regulatory standards are achieved.
System Integration Options

Direct Sampling, Batch Sampling, or On-Line Autosampling
BioProfile FLEX provides multiple options for sampling. These options include individual, off-line or at-line sampling directly from syringes and cups, batch sampling, or fully automated on-line sampling:

Direct Sampling
- Individual samples can be directly sampled from commonly used sample containers including syringes, sample cups, or micro-centrifuge tubes.
- Anaerobic samples can be aspirated from a syringe.

Automated, Batch Sampling
- Fully automated, walkaway batch sampling can be accomplished with the standard BioProfile FLEX 20-position sample tray.
- The tray accommodates both sample cups and centrifuge tubes.

On-Line Autosampling
- An optional On-Line Autosampler connects BioProfile FLEX to as many as ten bioreactors. Scheduling of sampling into the BioProfile FLEX analyzer is user programmable.
- Individual syringe or cup samples can also be analyzed during periods when on-line autosampling is not scheduled.

Advanced OPC Connectivity
The Nova OPC Connectivity Suite integrates BioProfile FLEX with any OPC compliant devices such as bioreactor controllers, data historians, laboratory information management systems (LIMS), and plant management systems. Nova’s OPC Connectivity Suite features:
- Automated Bi-directional Flow of Data and Control Commands
- Data Archiving (DA) and Historical Data Archiving (HDA) Capability
- Easy “handshake” connection to any OPC compliant device
- Connectivity verification
- BioReactor Feedback Control
- Remote monitoring of BioProfile FLEX status and data

Sample Retain Collection System
The BioProfile FLEX Sample Retain Collection System is used with the On-Line AutoSampler for automated collection and refrigerated storage of bioreactor samples.
- Retained sample volumes are user selectable from 0.1 to 50 mL.
- Removable, insulated sample racks can accommodate thirty-four 15 mL or ten 50 mL conical centrifuge tubes. Two mix or match sample racks can be loaded in the system. The Sample Retain Collector will automatically recognize the type of sample racks loaded in the system.
- Thermo electric temperature storage is user selectable down to a temperature of 3 degrees centigrade.
System Integration Options

Direct Sampling, Batch Sampling, or On-Line Autosampling
BioProfile FLEX provides multiple options for sampling. These options include individual, off-line or at-line sampling directly from syringes and cups, batch sampling, or fully automated on-line sampling:

Direct Sampling
- Individual samples can be directly sampled from commonly used sample containers including syringes, sample cups, or micro-centrifuge tubes.
- Anaerobic samples can be aspirated from a syringe.

Automated, Batch Sampling
- Fully automated, walk-away batch sampling can be accomplished with the standard BioProfile FLEX 20-position sample tray.
- The tray accommodates both sample cups and centrifuge tubes.

On-Line Autosampling
- An optional On-Line Autosampler connects BioProfile FLEX to as many as ten bioreactors. Scheduling of sampling into the BioProfile FLEX analyzer is user programmable.
- Individual syringe or cup samples can also be analyzed during periods when on-line autosampling is not scheduled.

Advanced OPC Connectivity
The Nova OPC Connectivity Suite integrates BioProfile FLEX with any OPC compliant devices such as bioreactor controllers, data historians, laboratory information management systems (LIMS), and plant management systems. Nova’s OPC Connectivity Suite features:
- Automated Bi-directional Flow of Data and Control Commands
- Data Archiving (DA) and Historical Data Archiving (HDA) Capability
- Easy “handshake” connection to any OPC compliant device
- Connectivity verification
- BioReactor Feedback Control
- Remote monitoring of BioProfile FLEX status and data

Sample Retain Collection System
The BioProfile FLEX Sample Retain Collection System is used with the On-Line AutoSampler for automated collection and refrigerated storage of bioreactor samples.
- Retained sample volumes are user selectable from 0.1 to 50 mL.
- Removable, insulated sample racks can accommodate thirty-four 15 mL or ten 50 mL conical centrifuge tubes. Two mix or match sample racks can be loaded in the system. The Sample Retain Collector will automatically recognize the type of sample racks loaded in the system.
- Thermo electric temperature storage is user selectable down to a temperature of 3 degrees centigrade.
A major difficulty in cell culture monitoring is managing data from a variety of instruments and vendors, and consolidating the data into one repository. BioProfile FLEX provides a unified data source for all test parameters. By combining all tests into a single data report, BioProfile FLEX creates an organized data source from scattered data points. All test data are available together in one place and at one time, for display, analysis, recording, or exporting to a data historian. Scientists are freed from manual methods of data collection and can focus on more important tasks. The time and costs of controlling and collating multiple islands of data are reduced. A consolidated data source simplifies multivariate data analysis for understanding and identifying process control points. Errors due to manual collation of data from multiple instruments are eliminated. All BioProfile FLEX data are 21 CFR Part 11 secure. The risk of data loss is reduced. Higher safety and regulatory standards are achieved.

OPC Interoperability
The BioProfile FLEX OPC interface communicates with factory control systems, data historians, or laboratory information systems (LIMS).

Minimal Maintenance
Minimal maintenance requirements make BioProfile FLEX ideal for R&D and production applications alike. Snap-in reagents or sensors are easily replaced in minutes.

User Support
Nova Biomedical provides comprehensive support for BioProfile analyzers, including:
- Extensive user training
- IQ/OQ services
- 24/7/365 telephone technical assistance
- Applications assistance
- Service contracts

Simplified Validation, Data Analysis, and Archiving
Consolidating key cell culture parameters in the BioProfile FLEX analyzer simplifies instrument validation, data analysis, archiving, and regulatory compliance.

Compact, Rugged Design
The BioProfile FLEX footprint saves valuable space compared to the multiple instruments it replaces. Its rugged aluminum exterior is capable of withstanding the potentially harsh environment of production facilities.

OPC Interoperability
The BioProfile FLEX OPC interface communicates with factory control systems, data historians, or laboratory information systems (LIMS).

Minimal Maintenance
Minimal maintenance requirements make BioProfile FLEX ideal for R&D and production applications alike. Snap-in reagents or sensors are easily replaced in minutes.

User Support
Nova Biomedical provides comprehensive support for BioProfile analyzers, including:
- Extensive user training
- IQ/OQ services
- 24/7/365 telephone technical assistance
- Applications assistance
- Service contracts

Simplified Validation, Data Analysis, and Archiving
Consolidating key cell culture parameters in the BioProfile FLEX analyzer simplifies instrument validation, data analysis, archiving, and regulatory compliance.

Compact, Rugged Design
The BioProfile FLEX footprint saves valuable space compared to the multiple instruments it replaces. Its rugged aluminum exterior is capable of withstanding the potentially harsh environment of production facilities.

OPC Interoperability
The BioProfile FLEX OPC interface communicates with factory control systems, data historians, or laboratory information systems (LIMS).

Minimal Maintenance
Minimal maintenance requirements make BioProfile FLEX ideal for R&D and production applications alike. Snap-in reagents or sensors are easily replaced in minutes.

User Support
Nova Biomedical provides comprehensive support for BioProfile analyzers, including:
- Extensive user training
- IQ/OQ services
- 24/7/365 telephone technical assistance
- Applications assistance
- Service contracts

Simplified Validation, Data Analysis, and Archiving
Consolidating key cell culture parameters in the BioProfile FLEX analyzer simplifies instrument validation, data analysis, archiving, and regulatory compliance.

Compact, Rugged Design
The BioProfile FLEX footprint saves valuable space compared to the multiple instruments it replaces. Its rugged aluminum exterior is capable of withstanding the potentially harsh environment of production facilities.

OPC Interoperability
The BioProfile FLEX OPC interface communicates with factory control systems, data historians, or laboratory information systems (LIMS).

Minimal Maintenance
Minimal maintenance requirements make BioProfile FLEX ideal for R&D and production applications alike. Snap-in reagents or sensors are easily replaced in minutes.

User Support
Nova Biomedical provides comprehensive support for BioProfile analyzers, including:
- Extensive user training
- IQ/OQ services
- 24/7/365 telephone technical assistance
- Applications assistance
- Service contracts

Simplified Validation, Data Analysis, and Archiving
Consolidating key cell culture parameters in the BioProfile FLEX analyzer simplifies instrument validation, data analysis, archiving, and regulatory compliance.

Compact, Rugged Design
The BioProfile FLEX footprint saves valuable space compared to the multiple instruments it replaces. Its rugged aluminum exterior is capable of withstanding the potentially harsh environment of production facilities.
FDA defines PAT as a system for ensuring final product quality through timely, on-line or at-line measurement and control of critical attributes of manufacturing materials and processes. BioProfile FLEX can be the heart of an automated PAT system to:

Measure
- Provide an understanding of the effects that measurable and controllable attributes such as pH, gases, nutrients, osmolality, IgG, cell density, and cell viability have on final characteristics of the product.

Communicate
- Communicate real-time, on-line measurements to other devices such as controllers, plant managers, and data historians.

Capture
- Capture cell culture attributes for review, analysis, and record keeping.

Control
- Provide feedback for control of critical attributes such as pH, nutrients, gases, osmolality, and toxins through bioreactor feedback loops.

Process Analytic Technology (PAT) Compatibility

FDA-regulated Good Laboratory Practice (GLP) and current Good Manufacturing Practice (cGMP) sites that utilize computers for instrument control, data acquisition, data transfer, and archiving must follow 21 CFR Part 11 requirements for electronic records and signatures. BioProfile FLEX provides comprehensive features to assist with meeting these requirements:

Limited Access
- Administrative password configuration tools limit access to BioProfile FLEX electronic records through password privilege levels.
- User log-on is secured by both user ID and password.
- Automatic log-off features prevent unauthorized access.
- An automatic password de-activation feature is also available.

Electronic Record Retention and Retrieval
- All data are securely and confidentially retained through password access control in both human readable and electronic form.
- Records are readily retrievable throughout their retention period on the BioProfile FLEX analyzer.

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.

Intuitive, Easy-to-Use Operator Interface

BioProfile FLEX provides a single, user-friendly touchscreen interface for all modules. Having a common interface for all modules simplifies operation.

- For most users, the home screen will be the only screen needed. Everything needed to log in samples and perform an analysis is on the home screen.
- To further simplify analysis, “one button operation” can be activated using predetermined settings for the sample container, test selection, and sample log-in.
Once the “Analyze” button is pressed, BioProfile FLEX allows complete walkaway automation. A robotic sampling arm and syringe pump aspirate a precise amount of sample, perform any required dilutions, distribute the sample to the modules, and then rinse and prepare for the next sample.

The entire test profile, up to 15 results, is displayed in one report. Data can be automatically stored on BioProfile FLEX or exported to an Excel spreadsheet or data historian.

In addition to eliminating hours of operator time, BioProfile FLEX automation eliminates operator technique errors due to manual calibrating, pipetting, diluting, or data transcribing. Complete automation assures accurate, consistent results from operator to operator, sample to sample, and instrument to instrument.

The full 15-test BioProfile FLEX menu is configured in discrete analytical modules that are mechanically and fluidically integrated by robotics. Each BioProfile FLEX module utilizes state-of-the-art technology that is well-proven and characterized in cell culture processes. Building from the Chemistry/Gas Base Module, other modules can be added initially or later in the field.

**Chemistry/Gas Base Module by Electrochemistry**

The BioProfile FLEX base module consists of state of the art biosensors for glucose, lactate, glutamine, glutamate, ammonium, pH, PCO₂, PO₂, sodium, potassium, and calcium. Nova biosensor technology has been proven in nearly one thousand BioProfile installations, spanning R & D, process development, pilot, and manufacturing applications worldwide.

**BioProfile FLEX IgG Module by Photometry**

BioProfile FLEX IgG is a rapid, automated method based on the protein affinity of IgG using a colorimetric endpoint detection. This assay is specific to either human or humanized therapeutic IgG of all subclasses. BioProfile FLEX IgG is accurate throughout the range from 0.10 to 5.00 g/L.

- The analysis time for the IgG module is less than five minutes.
- IgG results can be obtained concurrently with chemistries, cell counts and osmometry on non-centrifuged samples in six minutes.
- BioProfile FLEX reduces the one-day or longer turn around time for a lab analysis of IgG.

**Osmometer Module by Freezing Point Depression**

BioProfile FLEX uses the freezing point depression method to measure osmolality. A sophisticated robotic sample aspiration and dispensing mechanism improves BioProfile FLEX performance over other osmometers by eliminating technique-prone manual sample pipetting. Sample aspiration is performed automatically from a syringe or sample cup, and a precise sample aliquot is dispensed into the osmometer tray. By automating this manual step, analytical performance is optimized.

---

**Advanced Instruments 3900 (m0sm/kg)**

**BioProfile FLEX  (m0sm/kg)**

**CHO Hybridoma**

**Cancer**

**Typical Performance of Photometric Module**

**Typical Performance of Potentiometric Sensor**

**Typical Performance of Osmometers Module**

**Testing With BioProfile FLEX**

- 1-3 operator steps
- 1 minute labor
- 1 mL sample
- 6 minute results for full 15 test panel
- Single data report
- 3 square feet bench space

**Testing Without BioProfile FLEX**

- 30 or more operator steps
- 30 minutes labor
- 5 mL of sample
- 24 hours or more for full 15 test panel
- 6 data reports, manual data collating, manual transcribing
- 20 square feet bench space
Automated, Modular, Multi-Test Analyzer for Fast Comprehensive Cell Culture Analysis

BioProfile FLEX is a chemistry/cell viability modular instrument that measures up to 15 key cell culture attributes related to product yield and quality. By combining as many as five separate instruments into one easy-to-use instrument, BioProfile FLEX simplifies workflow and saves time, labor, and operating cost versus multiple instruments.

One Fast, 2-8 Minute Analysis
Saves as much as 30 minutes per sample compared to using multiple instruments.

One Integrated Data Report
Simplifies data collection, analysis, archiving, and regulatory compliance.

Modular System Field-Upgradable
The modular design of BioProfile FLEX can be customized with one to four analytical modules, to consolidate up to 15 vital cell culture tests. Each module incorporates state-of-the-art measuring technology.

One Intuitive, User Interface
Saves 30 or more operator steps compared to multiple instrument interfaces.

One Small, 1 mL Sample
Conserves cell culture mass and end product.

One Consolidated Workstation
The compact BioProfile FLEX footprint saves up to 15-20 square feet of valuable bench space and saves hours of maintenance each month and compared to multiple instruments.

Chemistry and Gas Module by Electrochemistry
- Glucose
- Lactate
- Glutamine
- Glutamate
- Ammonium
- pH
- PO4
- Sodium
- Pco2
- Potassium
- Ionized Calcium

Cell Density, Cell Viability Module by Digital Imaging
- Cell Density
- Cell Viability
- Cell Diameter

Osmometer Module by Freezing Point Depression
- Osmolality

IgG Module by Photometry
- IgG

Precise Auto Focusing
Cell inspection and counting is initiated after a single, mono-layer of cells settles in the counting chamber. Precise auto-focusing on a mono-layer of cells allows all cells in the image field to be more accurately inspected and classified.

Improved Optical Resolution
Cells remain stationary in the counting chamber as the optics inspect multiple fields. This provides improved resolution compared to inspecting a single field in a flow cell and passing multiple sample aliquots through a flow cell for imaging.

On-Screen Tagging of Viable and Non-Viable Cells
On-screen tagging of viable and non-viable cells allows manual, visual review and confirmation of cell counts.

On-Screen Histograms
On-screen histograms provide a visual display of cell distribution.

Stores Images
Images from the last 30 days can be stored and recalled from memory for re-analysis by new inspection criteria. After 30 days images are stored as jpeg files.

Reduced Blockages and Flow Cell Maintenance
BioProfile FLEX counting chamber geometry is designed to eliminate blockages and flow cell maintenance.
BioProfile FLEX
The Power of One

Automated Analyzer for Fast Comprehensive Cell Culture Analysis

Specifications

BioProfile FLEX

Chemistry/Gas Module

<table>
<thead>
<tr>
<th>Assay</th>
<th>Measurement Range</th>
<th>Resolution</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>0.2–80.0 g/L</td>
<td>0.01 g/L</td>
<td>Biosensor</td>
</tr>
<tr>
<td>Lactate</td>
<td>0.2–10.0 g/L</td>
<td>0.01 g/L</td>
<td>Biosensor</td>
</tr>
<tr>
<td>Glutamine</td>
<td>0.2–12.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>Glutamine</td>
<td>0.2–12.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>Ammonium</td>
<td>0.2–25.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>pH</td>
<td>5.00–8.00</td>
<td>0.01</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>pCO2</td>
<td>3.0–300.00</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>pCO2</td>
<td>3.0–300.00</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>PO2</td>
<td>40–220.00</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>Sodium</td>
<td>5.00–10.00</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>Potassium</td>
<td>1.0–100.00</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.10–10.00</td>
<td>0.1 mmol/L</td>
<td>Direct ISE</td>
</tr>
</tbody>
</table>

*Ranges May Be Extended By User Selectable 1:2, 1:4, 1:10 Dilutions

Osmolality Assay

<table>
<thead>
<tr>
<th>Assay</th>
<th>Measurement Range</th>
<th>Resolution</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osmolality</td>
<td>0–1500 mOsm/kg</td>
<td>N/A</td>
<td>Digital Imaging</td>
</tr>
</tbody>
</table>

Measurement Range: 0.10–5.0 g/L

*Range Reflects Sample Auto-Dilution

Cell Density/Viability Module

<table>
<thead>
<tr>
<th>Assay</th>
<th>Measurement Range</th>
<th>Resolution</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Density</td>
<td>5.000–8.000</td>
<td>N/A</td>
<td>Digital Imaging</td>
</tr>
<tr>
<td>Viability</td>
<td>50,000–10,000,000 cells/mL</td>
<td>N/A</td>
<td>Digital Imaging</td>
</tr>
</tbody>
</table>

Viable Range: 0–100%

**Ranges May Be Extended By User Selectable 1:2, 1:4, 1:5, 1:10 Dilutions

IgG Module

<table>
<thead>
<tr>
<th>Assay</th>
<th>Measurement Range</th>
<th>Resolution</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>IgG</td>
<td>0.2–25.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>IgG</td>
<td>0.2–12.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>IgG</td>
<td>0.2–12.0 mmol/L</td>
<td>0.01 mmol/L</td>
<td>Direct ISE</td>
</tr>
<tr>
<td>IgG</td>
<td>0.2–30.0 g/L</td>
<td>0.01 g/L</td>
<td>Digital Imaging</td>
</tr>
</tbody>
</table>

Measurement Range: 0.10–5.0 g/L

*Range Reflects Sample Auto-Dilution

After Sale Support

- Installation by a Direct, Factory Representative
- IQ/OQ Services
- Advanced Operator Training in Waltham, MA
- Telephone Technical Assistance
- Immediate Delivery of Reagents and Consumables
- Preventive Maintenance

Biological and Genomic Information

BioProfile FLEX

BioProfile FLEX

BioProfile FLEX

BioProfile FLEX

BioProfile FLEX