sierra SPR pro Series

High Performance, High Throughput SPR Analytical Biosensor for the Real-Time, Label-Free Characterization of Molecular Interactions

Surface Plasmon Resonance

Innovation with Integrity

Introducing Sierra SPR Pro Series

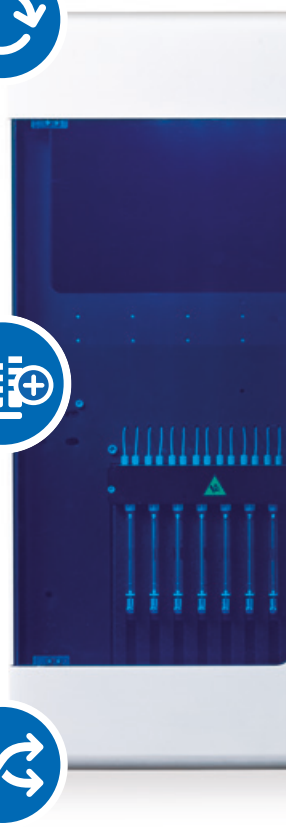
From screening and kinetics, to epitope binning and thermodynamics, the Sierra SPR Pro Series provide industry leading SPR performance and analysis throughput, across the widest range of applications.

Sierra SPR Pro Series Features

- **Highest sample throughput on the market**
- **4400⁺ samples assayed per day**
- **Integration into fully automated environment via its API**
- **Full kinetic analysis of up to 3 interactions per assay cycle**
- **8 multi-control analyses per cycle**

Throughput

- Simultaneous 8 channel analysis
- SPR-24 Pro 3 / SPR-32 Pro up to 4 sensor spots per channel
- Kinetic analysis of 4400⁺ samples per day
- SPR-24 Pro 8800⁺ / SPR-32 Pro up to 13,200⁺ control subtracted interactions measured per day



Detection

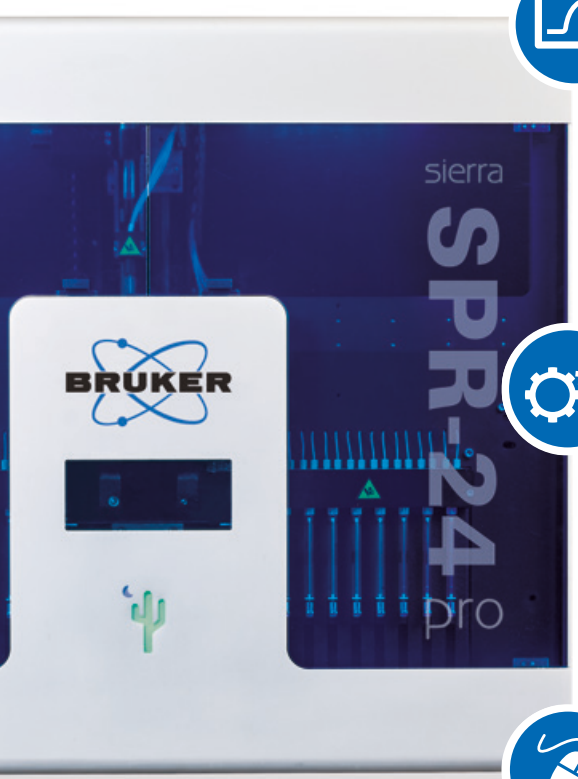
- Fragment binding sensitivity
- Wide dynamic range
- Real-time visual monitoring of flow cells
- Variable rate data acquisition

Flexibility

- Simultaneous processing of up to 8 samples over 24 or 32 sensor spots SPR-24 Pro / SPR-32 Pro
- Simultaneous analysis of up to 8 different running buffers (Frame Inject)
- *Any Sample, Any Sensor, Any Time* sensor spot addressing
- Fully user designated controls with anytime selection

Throughput with Performance

The Sierra SPR Pro series systems really shine in high-throughput applications where it can process 8 samples simultaneously either over 24 or 32 sensor spots. Utilizing Bruker's Hydrodynamic Isolation (HI) continuous flow microfluidic technology to address samples as flowing streams onto the 24 or 32 spot SPR⁺ sensor array. When integrated with an optional plate handling robot, the Sierra SPR Pro instruments can assay over 4400⁺ samples per day, generating over 8800⁺ or 13,200⁺ control subtracted binding measurements.



Sample Delivery

- Continuous flow microfluidic sample delivery
- Instantaneous solution transitions
- Solvent and crude sample compatible
- Simple, automated maintenance

Sample Processing

- Dual microtiter plate processing
- 96- & 384-well plate compatible
- Optional plate handling robot integration
- Temperature control of samples
- API allows integration into fully automated environment / scheduling software (e.g. ThermoFisher or HighRes Biosolutions)

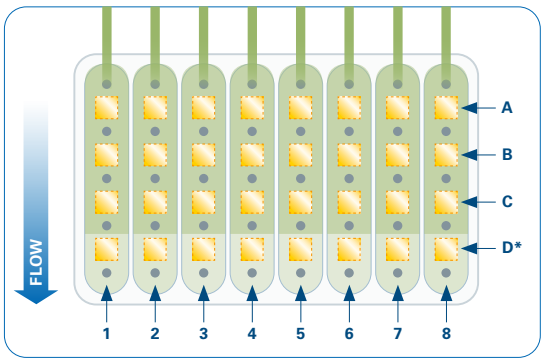
Ease of Use

- Intuitive, automated system control
- Wizard-driven assay method creation
- Proprietary data analysis software
- Template-based data analysis
- Simple maintenance

The Details

Throughput

Sierra SPR-24 Pro	Sierra SPR-32 Pro
8 detection flow cells and an 8 needle sample delivery system allow up to 8 different samples to be assayed simultaneously.	
3 sensor spots per flow cell, enabling up to 3 different targets per analysis cycle.	**4 sensor spots per flow cell**, enabling up to 4 different targets per analysis cycle.
Process over 4400⁺ samples per day, generating over 8800⁺ control subtracted binding measurements.	**Process over 4400⁺ samples per day,** generating over 13,200⁺ control subtracted binding measurements.
In-line analysis of up to 2 different control interactions per analysis cycle.	**In-line analysis** of up to 3 different control interactions per analysis cycle.
Generate up to 23 control-subtracted binding measurements or 2 complete kinetic rate analyses per cycle.	**Generate up to 31 control-subtracted binding measurements** or 3 complete kinetic rate analyses per cycle.



* Sensor Spots D usable only in Sierra SPR-32 Pro

Detection

- **Signal-to-noise ratio of 0.02 RU (RMS)** enables the robust measurement of small molecule interactions such as fragments and compounds.
- **Wide dynamic range** ensures accurate analysis when working with large molecules, high density target surfaces, or high RI buffers.
- **Real-time visual monitoring** of flow cells and sensor spots. Binding and surface creation events can be observed, and assay anomalies investigated in real time.
- **Rate of detection variable from 0.1 – 6 Hz** at any time during analysis.

Sample Delivery

- **Maintaining sample concentration** at the sensor throughout analysis, Bruker's continuous flow Hydrodynamic Isolation™ (HI) microfluidics ensures the most accurate kinetic rate analysis.
- **Extremely fast transitions** between solutions delivered to the sensor spots enables highly accurate kinetic rate analysis for even the weakest (µM) binding interactions.
- **HI microfluidics** are extremely robust and compatible for use with a wide range of sample matrices, buffers, and solvents. The valve-less design enables the robust analysis of crude samples, serums and supernatants, as well as membrane preparations and vesicles.

Sample Processing

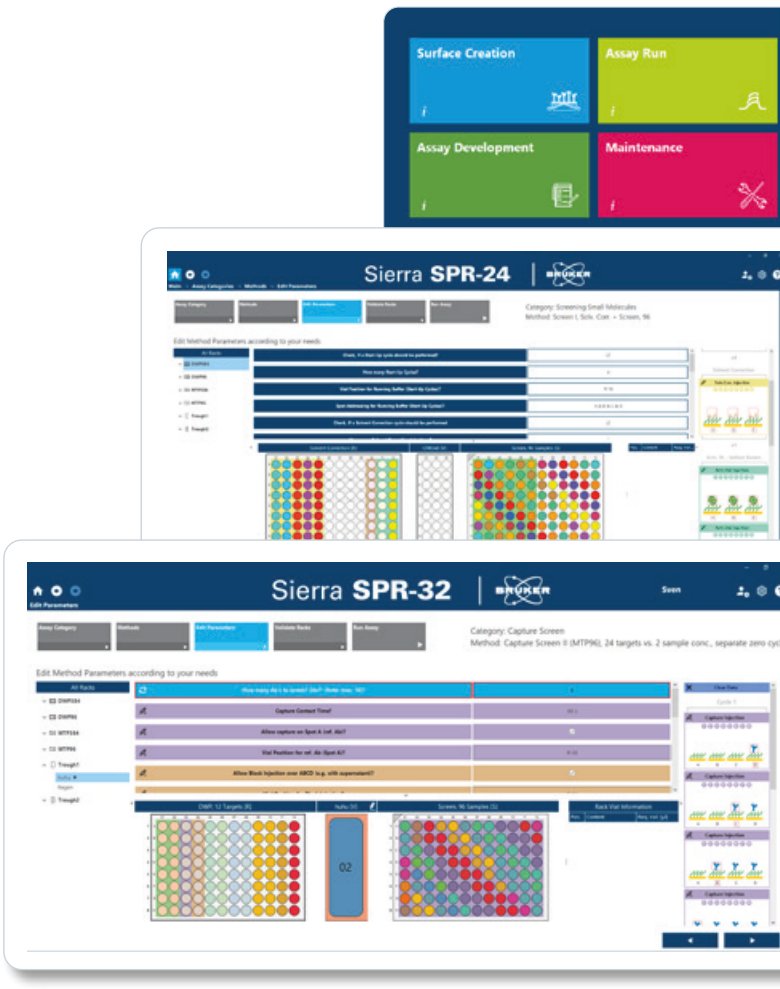
- **Dual microtiter plate** sample processing with reagent station formatted for vials or reagent troughs.
- **Plate-handling robot** can be integrated for long unattended assay runs.
- **API** allows integration into fully automated environment / scheduling software.
- **Process solutions** from standard, medium, or deep well 96- and 384-well microtiter plates using plate sealers.
- **Sample deck temperature** controlled via external circulating water bath.

Flexibility

- **8 channel analysis delivery system** enabling simultaneous testing of 8 different samples.
- **Individual Needle Control (INC)** allows use of any combination of 1-8 needles.
- **Frame Inject** allows investigation of mode of action studies.
- **Hydrodynamic Isolation microfluidics** enables *Any Sample, Any Sensor, Anytime* sample delivery. Assay solutions can be addressed to any individual sensor spots, or group of sensor spots within the same flow cell, at any time.
- **Control sensor designation** can be done at any time and is fully user defined. Any sensor spot can be a control for any other, providing maximum flexibility in assay design.

Ease of Use

- **Easy to use** control and data analysis software.
- **Manual or fully automated instrument** control increases flexibility on demand.
- **Wizard and template driven assay** method design and data analysis focused towards high-throughput applications and maximum user control.
- **Robust microfluidics** and automated cleaning procedures minimize downtime and user maintenance requirements.
- **Sensor and reagent consumables** for a wide range of applications.



Highly intuitive proprietary instrument control and data analysis software.

The Highlights

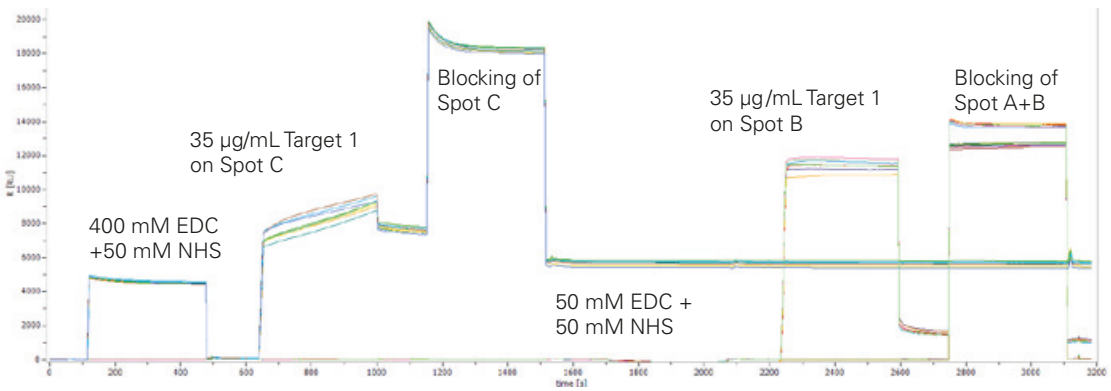
SPR Detection

The Sierra SPR-24 Pro and Sierra SPR-32 Pro employs a 24 or 32 sensor spot detection array laid out in 8 flow cells, each containing 3 or 4 sensor spots. Up to 8 samples can be analyzed simultaneously, generating up to 32 binding measurements per analysis cycle. Each of the 24 or 32 sensor spots can also be addressed fully independently, providing maximum assay design flexibility.

Better Data Faster

The three-sensor spot or even four-sensor spot per channel design provides maximum control analysis flexibility, enabling high-throughput for even the most complex analyses. Samples can be simultaneously assayed on two or up to three controls as well as the active sensor spot.

In many SPR applications the early analysis of non-specific binding to matrix proteins such as HSA or BSA can be critical. The additional in-line control not only halves the number of assay cycles required vs. two sensor flow cells. It can also improve data quality by eliminating potential variations between multiple sample preparations.



Example of surface creation using Sierra SPR-24 Pro showing high homogeneity across the eight addressed sensor spots.

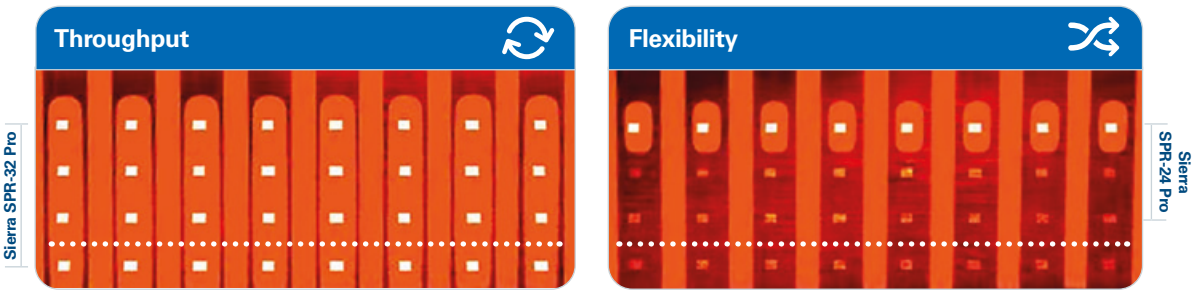
Overview on Immobilization Results

Immobilized Sensor Spot	Immobilization Level [RU]	CV [%]	Immobilized Sensor Spot	Immobilization Level [RU]	CV [%]
C	5618 ± 135 RU	2.4	B	1091 ± 65 RU	5.9

Throughput for all Applications

Throughput improvements can be realized for all SPR applications, from screening assays with a different target on each sensor spot, to the detailed kinetic analysis employing multiple in-line controls.

Real-time Image of Sensor Flow Cell



Throughput: Sample Addressing of all sensor spots

Flexibility: Sample Addressing via sensor spot A within all eight channels

Analysis Throughput

Injection Style	30 SECOND On– / Off–Rate			1 MINUTE On– / Off–Rate		
	Fast	Regen	Default	Fast	Regen	Default
Time Per Cycle	2:35	3:09	3:18	3:36	4:13	4:22
Time Per 96-Well-Plate	31:00	37:48	39:42	43:18	50:36	52:18
Time Per 384-Well-Plate	2:03:00	2:31:12	2:38:48	2:53:12	3:22:24	3:29:12
Sample Solutions Per Day*	**4400**	3600	3400	3100	2700	2600

*automation required: either external robot or scheduling environment

The Highlights

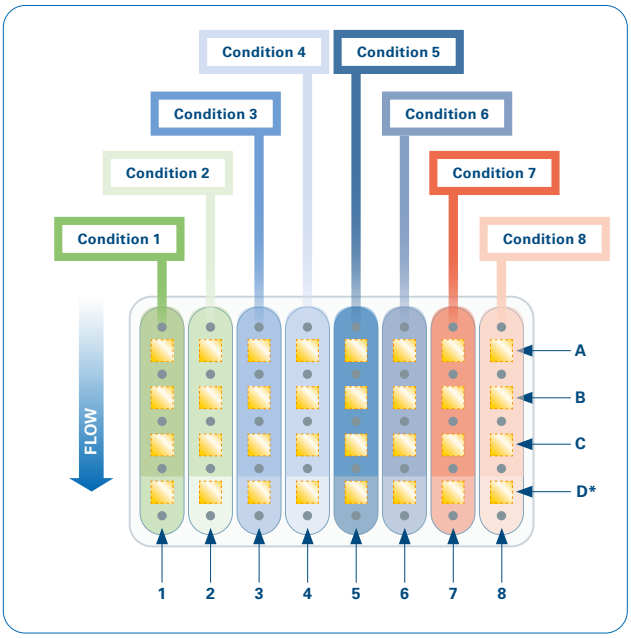
Continuous Flow SPR Analysis

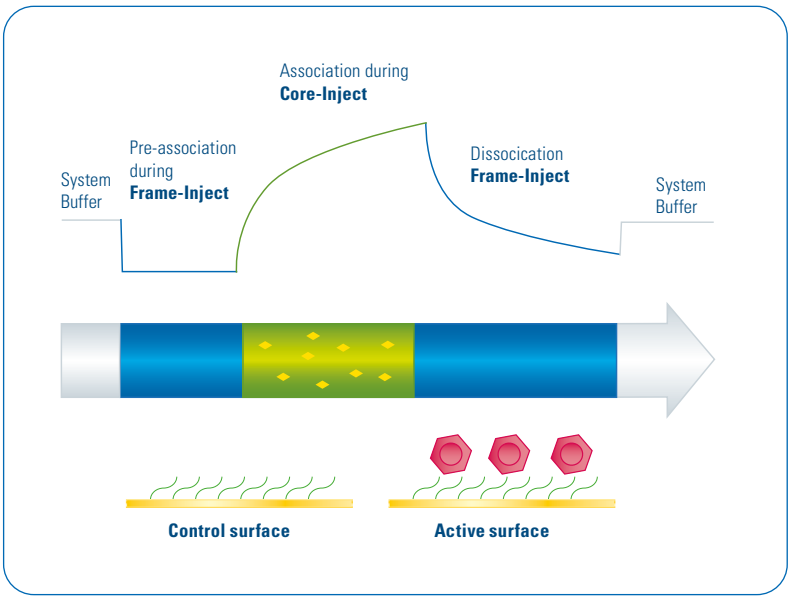
The SPR Pro Series is a continuous flow biosensor, meaning sample and reagents are delivered to the detection sensor spots as continuously flowing streams. When sample or reagent is not being injected "continuous flow buffer" is passed over the sensor spots.

The formulation of the continuous flow buffer in SPR assays can have significant impact on the molecular interactions being measured. In many applications measuring target interactions in a variety of buffer environments is required.

Frame Inject

The Frame Inject feature in the Sierra SPR Pro Series allows the investigation of condition dependent binding / mode of action studies. The feature requires just a fraction of each buffer condition, that replaces the system buffer while usage. The pre-association, as well as the dissociation occurs under the conditions, that should be investigated. After dissociation end, the Frame solution is replaced and system buffer is flowing through the microfluidic system again. Thus experimental time and reagent costs are kept low.





Schematic illustration of the functionality of Frame Inject. The system buffer will be replaced by the Frame solution and flow over active and control surface during pre-association phase. After the Core-Inject (Association), the dissociation is monitored while flowing the Frame solution over active and control surface. After dissociation end, Frame solution is replaced and system buffer is flowing through the microfluidic system again.

* Sensor Spots D usable only in Sierra SPR-32 Pro

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Individual Needle Control (INC)

The Individual Needle Control (INC) feature in the Sierra SPR Pro Series allows the eight sample pick-up needles to be operated independently as well as in unison. Researchers can choose any combination from 1 – 8 needles to design their optimal assay.

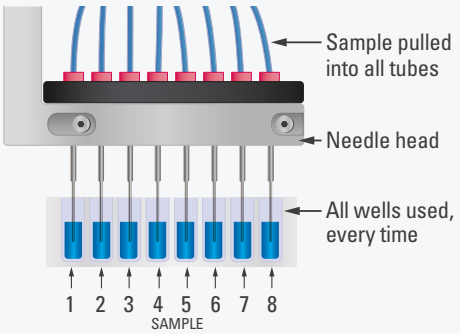
Maximizing Performance with INC

Individual Needle Control maximizes the performance, flexibility, and scope of applications possible with the Sierra SPR Pro Series while also saving time, materials, and resources when throughput is not the main requirement.

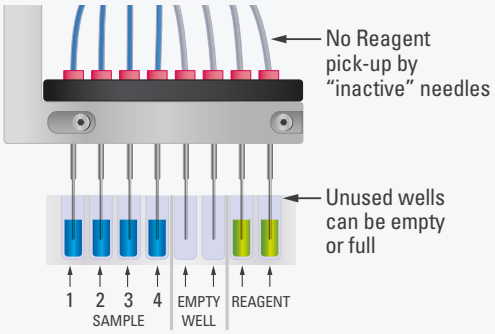
INC Analysis

The eight-needle probe head can simultaneously process 8 sample or reagent solutions. Using the INC feature, users can choose to use any number and/or combination of needles at any time during analysis.

Standard Operating Mode
All 8 Needles Drawing Sample



Individual Needle Control Mode
Only 4 Needles Drawing Sample



Specifications

Sierra SPR Pro Series

Name	Sierra SPR-24 Pro System Sierra SPR-32 Pro System
Type	Analytical Biosensor
Detection Technique	Surface Plasmon Resonance Imaging (SPR+)
Analysis Style	Continuous flow sample addressing
Number of Analysis Flow Cells	8
Number of Detection Sensor spots	Sierra SPR-24 Pro: 24 – three sensor spots per flow cell Sierra SPR-32 Pro: 32 – four sensor spots per flow cell
Sensor Addressing	Sierra SPR-24 Pro: Individually – any of 24 sensor spots in combination per flow cell: A+B+C, A+B, B+C, A, B, C Sierra SPR-32 Pro: Individually – any of 32 sensor spots in combination per flow cell: A+B+C+D, A+B+C, B+C+D, A+B, B+C, C+D, A, B, C, D

System Performance

Analysis Flow Rates	5 – 100 µL/min
Injection Volumes	2-200 µL
Sample Consumption	Assayed volume + 10-35 µL dead volume (injection style dependent)
Kinetic Rate Analysis	Association: Typically k_a: 10^3 - 10^7 M^{-1} s^{-1} Dissociation: Typically k_d : 10^{-6} - 10^{-1} s^{-1}
Affinity Analysis	1 mM – 1 pM
In-line Controls	Sierra SPR-24 Pro: up to 2 per flow cell Sierra SPR-32 Pro: up to 3 per flow cell
Real-time Control Subtraction	Yes
Sample Temperature Control	ART, or 4˚ – 30˚C with optional external chiller

Detection

Technology	SPR+ Imaging
Refractive Index Range	1.33 – 1.40
Data Collection Rate	0.1 to 6 Hz
Baseline Noise	< 0.02 RU (RMS|10 sec, 2 Hz, 25 ˚C, no ligand)
Baseline Drift	< 0.15 RU/min
Molecular Weight Detection Limit	No lower limit for organic molecules
Sample Concentration	≥ 10 pM
Flow Cell Height	50 µm
Flow Cell Volume	0.03 µL (effective volume)
Analysis Temperature	10 - 37 °C (max. 15 °C below ambient)
Sample Temperature	4 - 30 °C (chiller required)

Throughput and Sample Handling

Sample Throughput	Sierra SPR-24 Pro: 4400+ samples per 24 hours* Sierra SPR-32 Pro: 4400+ samples per 24 hours*
Analysis Throughput	Sierra SPR-24 Pro: 8800+ control subtracted interactions per 24 hours* Sierra SPR-32 Pro: 13,200+ control subtracted interactions per 24 hours*
Cycle Throughput	From 1 – 8 solutions per injection cycle
Sampling Flexibility	Any combination from 1 – 8 needles can be active per injection cycle
Sampling Capacity (system only)	Two microtiter plates plus one reagent rack
Sampling Configurations	Microtiter plates: 96-well (standard, medium or deep), 384-well (standard or deep) Reagent rack: 24 x 0.8 mL vials, 40 mL or 2x19 mL troughs
Robotics Integration	Up to two plate handling robots – optional
Multi-buffer Analysis	Simultaneous analysis of up to 8 different continuous flow buffers (Frame Inject)
Automation platform-agnostic	API available for any automation vendor (e.g. ThermoFisher, HighRes Biosolutions)
In-line buffer degassing	Yes
Unattended operation	unlimited, when integrated in fully automated environment

Physical Characteristics

System Dimensions (W x H x D)	90 x 75 x 50 cm
Bench Space Requirements (W x H x D)	170 x 90 x 90 cm – system and PC only, 270 x 90 x 90 cm – with plate handling robot
System Weight	100 kg
Mains Requirements	100-240 V, 10 A, 50-60 Hz
PC Operating System	Windows 10 Pro, x64
Interfacing	Sample data import and results export to .txt file, Excel, Scrubber3, GeneData, more on request

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