sierra SPR-32

- 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-32

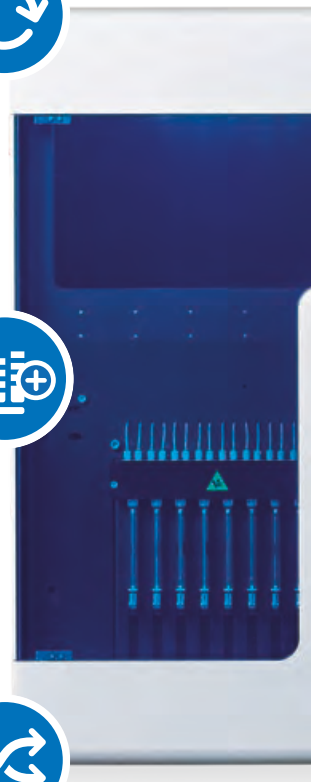
From screening and kinetics, to epitope binding and thermodynamics, Sierra SPR-32 provides industry leading SPR performance and analysis throughput, across the widest range of applications.

Sierra SPR-32 Features

- **3,000+ samples assayed per day**
- **10,000+ control subtracted interactions per day**
- **31 control subtracted analyses per assay cycle**
- **Full kinetic analysis of 3 interactions per assay cycle**
- **8 multi-control analyses per cycle**

Throughput

- Simultaneous 8 channel analysis
- 4 sensors per channel
- Kinetic analysis of 3,000+ samples per day
- 10,000+ control subtracted interactions measured per day



Detection

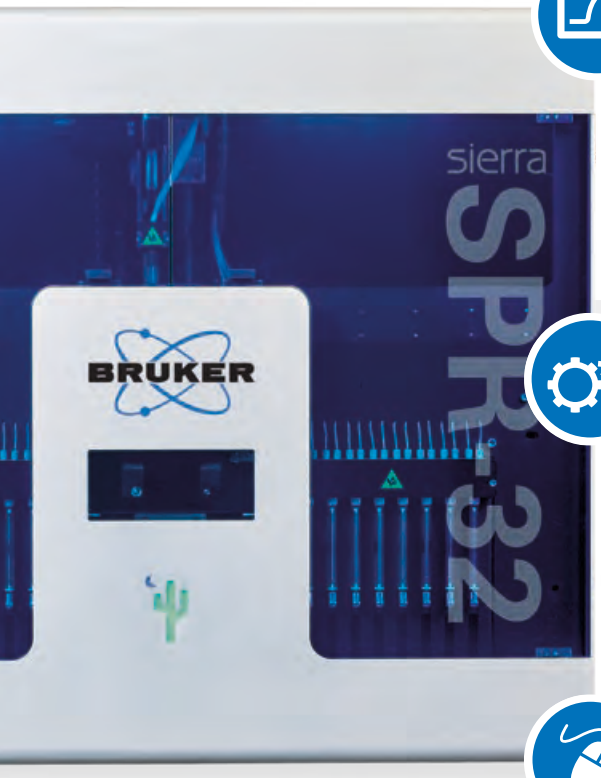
- Fragment binding sensitivity
- Wide dynamic range
- Real-time visual monitoring of flow cells
- Variable rate data acquisition

Flexibility

- Simultaneous processing of up to 8 samples over 32 sensors
- Simultaneous analysis of up to 4 different running buffers
- *Any Sample, Any Sensor, Any Time*™ sensor addressing
- Fully user designated controls with anytime selection

Throughput with Performance

Capable of testing one sample at a time, the Sierra SPR-32 system really shines in high throughput applications where it can process 8 samples simultaneously over 32 sensors. Utilizing Bruker's Hydrodynamic Isolation™ (HI) continuous flow microfluidic technology to address samples as flowing streams onto the 32 spot SPR+ sensor array. When integrated with an optional plate handling robot, the Sierra SPR-32 instrument can assay over 3000 samples per day, generating over 10,000 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

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

- **8 detection flow cells** and an 8 needle sample delivery system, allow up to 8 different samples to be assayed simultaneously.
- **4 sensor spots per flow cell**, enabling up to 4 different targets per analysis cycle.
- **32 different binding interactions** measured per analysis cycle, with cycle run times from 1–10 minutes.
- **Process over 3,000 samples per day,** generating over 10,000 control subtracted binding measurements.
- **In-line analysis** of up to 3 different control interactions per analysis cycle.
- **Generate up to 31 control-subtracted binding measurements** or 3 complete kinetic rate analyses per cycle.

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

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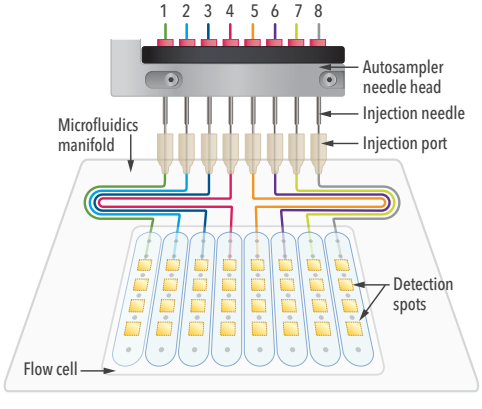
- **Real-time visual monitoring** of flow cells and sensors. Binding and surface creation events can be observed, and assay anomalies investigated in real time.
- **Rate of detection variable from 0.1 – 100 Hz** at any time during analysis.

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 sensors 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.
- **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 simultaneously testing of 8 different samples.
- **Individual Needle Control (INC)** allows use of any combination of 1-8 needles.
- **Hydrodynamic Isolation™ microfluidics** enables *Any Sample, Any Sensor, Anytime*™ sample delivery. Assay solutions can be addressed to any individual sensor, or group of sensors within the same flow cell, at any time.
- **The 4 syringe buffer pump** allows up to 4 different buffers to be assayed simultaneously. Each syringe suppling buffer to 2 of the 8 detection flow cells.
- **Control sensor designation** can be done at any time and is fully user defined. Any sensor 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

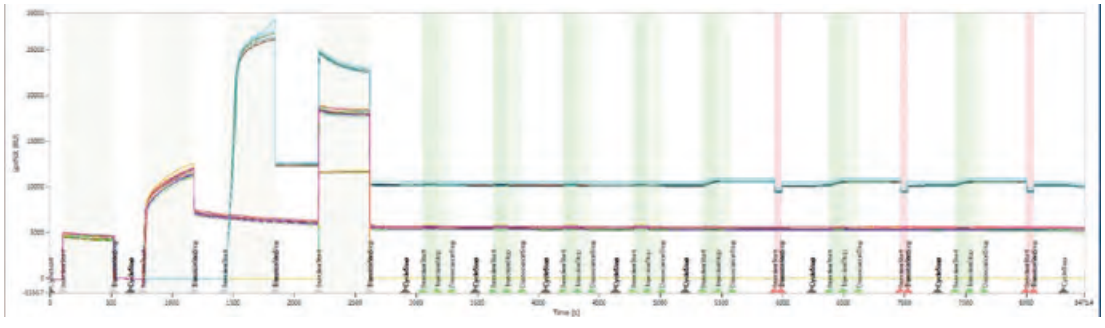
32 Sensor SPR Detection

The Sierra SPR-32 system employs a 32 sensor detection array laid out in 8 flow cells, each containing 4 sensors. Up to 8 samples can be analyzed simultaneously, generating up to 32 binding measurements per analysis cycle. All 32 sensors can also be addressed fully independent of the others, providing maximum assay design flexibility.

Better Data Faster

This four-sensor per channel design provides maximum control analysis flexibility, enabling good throughput for even the most complex analyses. Samples can be simultaneously assayed on three controls as well as the active sensor.

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.

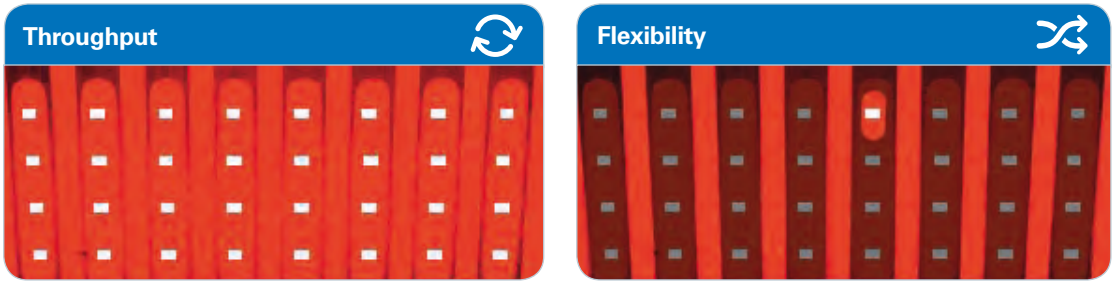


Example of surface creation using the Sierra SPR-32 instrument and additional activity test.

Throughput for all Applications

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

Real-time Image of 32 Sensor Flow Cell



Analysis Throughput

Injection Style	30 SECOND On– / Off–Rate			1 MINUTE On– / Off–Rate		
	Fast	Default	HQ	Fast	Default	HQ
Time Per Cycle	3:24	6:03	6:45	4:24	7:03	7:45
Time Per 96-Well-Plate	40:48	1:12:36	1:21:00	52:42	01:24:36	01:33:06
Time Per 384-Well-Plate	2:43:12	4:52:24	5:24:00	03:30:48	05:38:24	06:12:24
Sample Solutions Per Day*	**3,300**	1,800	1,600	2,600	1,600	1,450
Interactions Per Day*	13,400	7,200	6,500	10,400	6,400	5,800
Control Subtracted Interactions Per Day**	**11,760**	6,384	5,712	9,072	5,376	5,040

* Plate stacker required
** 31 active sensors per injection cycle

The Highlights

Continuous Flow SPR Analysis

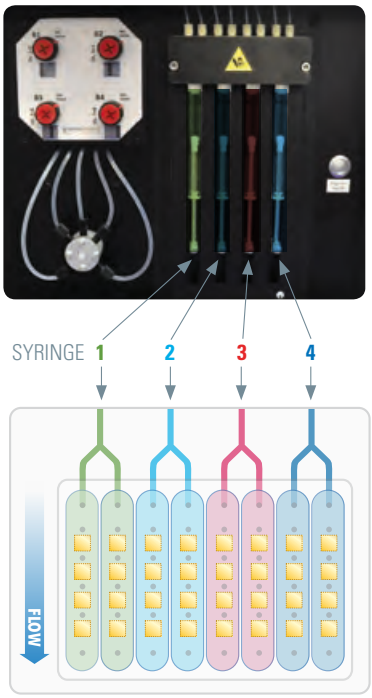
The SPR-32 system is a continuous flow biosensor, meaning sample and reagents are delivered to the detection sensors as continuously flowing streams. When sample or reagent is not being injected "continuous flow buffer" is passed over the sensors.

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.

Four Buffer Analysis

The SPR-32 system is fitted with a four syringe buffer pump, with each syringe suppling continuous flow buffer to two flow cells. The same buffer can be directed to all flow cells, or up to four different buffers can be assayed simultaneously.

Four Syringe Buffer Pump



Simultaneous Multi-buffer Evaluation: Ideal for SPR Analysis

FEATURE	BENEFIT
Range of pH	Faster assay development
Different salts and detergents	Simpler assay designs
Co-factors and inhibitors	Higher analysis throughput
	Reduced sensor consumption

Individual Needle Control (INC)

The Individual Needle Control (INC) feature in the Sierra SPR-32 system allows the eight sample pickup needles to be operated independently as well as in unison. Researchers can choose any combination from 1 – 8 needles to design their optimal assay.

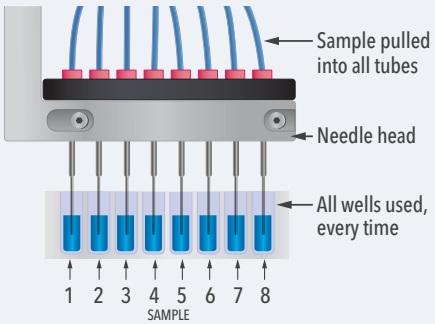
Maximizing Performance with INC

Individual Needle Control maximizes the performance, flexibility, and scope of applications possible with the Sierra SPR-32 instrument, while also saving time, materials, and resources when throughput is not the main requirement.

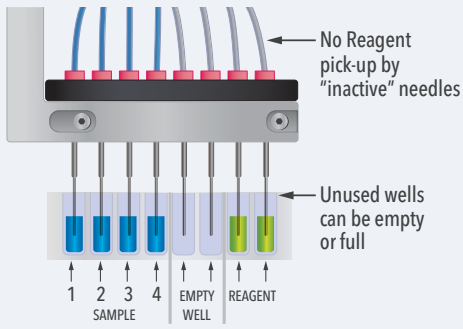
INC Analysis

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-32

Name	Sierra SPR-32 System ver. 2.0
Type	Analytical Biosensor
Detection Technique	Surface Plasmon Resonance Imaging
Analysis Style	Continuous flow sample addressing
Number of Analysis Flow Cells	8
Number of Detection Sensors	32 – four sensor spots per flow cell
Sensor Addressing	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

System Performance

Analysis Flow Rates	10 – 100 µl/min
Injection Volumes	10-200 (higher volumes on request)
Sample Consumption	Assayed volume + 10-35 µl dead volume (injection style dependent)
Kinetic Rate Analysis	Association k_a: 10^3 - 10^7 M-1 s^{-1} Dissociation k_d : 10^{-6} - 10^{-1} s^{-1}
Affinity Analysis	0.1 mM – 1 pM
In-line Controls	Yes – 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	100 to 0.1 Hz
Baseline Noise	<0.02 RU (RMS, 2 Hz, 25 ˚C)
Baseline Drift	< 0.15 RU/min
Molecular Weight Detection Limit	≥ 100 Daltons
Sample Concentration	≥ 10 pM
Flow Cell Height	50 µm
Flow Cell Volume	0.03 µl (effective volume)
Analysis Temperature	10 – 40 ˚C (or 15 ˚C below ambient)

Throughput and Sample Handling

Sample Throughput	3.300+ samples per 24 hours*
Analysis Throughput	10,400+ 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, 40ml or 2x19ml troughs
Robotics Integration	Up to two plate handling robots – optional
Multi-buffer Analysis	Simultaneous analysis of up to 4 different continuous flow buffers
In-line buffer degassing	Yes
Unattended operation	Up to 120 hours

Physical Characteristics

System Dimensions (W x H x D)	90 x 75 x 50 cm
Bench Space Requirements (W x H x D)	200 x 90 x 80 cm – system and PC only, 300 x 90 x 90 cm – with plate handling robot
System Weight	70 kg
Mains Requirements	100-240V, 10A, 50-60Hz
PC Operating System	Windows 10 Pro, x64

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