PROTEIN INTERACTION ANALYSIS

ProteOn™ XPR36 Hardware

- High-throughput SPR optical biosensing
- Real-time, label-free biosensor analysis for concentration, kinetic, and equilibrium data
- Simultaneous analysis of up to 36 interactions on one sensor chip
- Innovative fluidics that support simultaneous parallel injections of 6 samples
- Cooled autosampler with 2 different sample configurations
- Interspot referencing and reference channel normalization

36 Interactions on a Single Chip: Label-Free, in Real Time

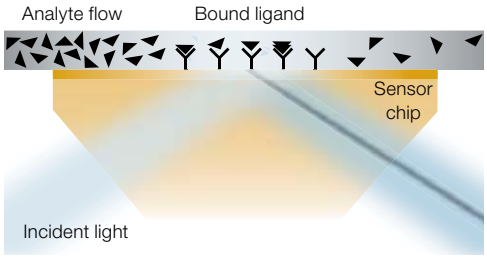
Introduction

The ProteOn XPR36 protein interaction array system combines surface plasmon resonance (SPR) optical biosensing with advanced optics and a high-throughput fluidics system. Without using radiochemical or fluorescent labels, XPR™ technology generates real-time data on the concentration and affinity, specificity, kinetic, and thermodynamic properties of up to 36 simultaneous protein interactions in one rapid experiment. User-friendly software and helpful hardware features (for example, interspot references and a cooled autosampler with two different sample configurations) ensure reproducibility and ease of use.

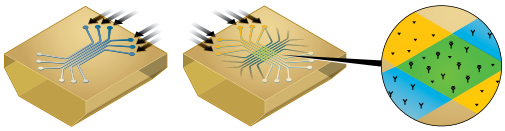
XPR technology overcomes the limitations of more conventional SPR methods by providing high-throughput optimization of experimental conditions in a 6 x 6 array format.

The ProteOn XPR36 protein interaction array system is ideally suited for:

- Antibody screening, ranking, and epitope mapping
- Kinetic characterization of protein-protein, protein-peptide, protein-nucleic acid, and protein-small molecule interactions
- Protein interface mapping
- Small molecule screening



The principle of surface plasmon resonance. Analyte molecules bind to ligands at the surface of the sensor chip, causing a shift in the SPR response curve. The shift is proportional to the mass change near the sensor chip surface.



Step 1
Bind up to 6 ligands.

Step 2
Inject up to 6 analytes perpendicularly.

Step 3
Detail showing one of 36 interaction

XPR technology combines SPR optical biosensing with advanced optics and high-throughput 6 x 6 microfluidics.

The ProteOn XPR36 protein interaction array system.

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The ProteOn XPR36 System

The ProteOn XPR36 system is an SPR optical biosensor that simultaneously measures 36 separate biomolecular interactions. It combines high-efficiency microfluidics with high-sensitivity optics to generate interaction data for up to six ligands with panels of six analytes. Data are collected from the 6 x 6 interaction array in real time, and measurement of the 36 interactions is label-free.

Innovative Optics and Interspot References

The optical system measures high-sensitivity analytical responses over the entire 36-element interaction array. Synchronized sequential scanning illumination is combined with advanced imaging to detect the SPR response with nanomolar sensitivity. The XPR36 optical system scans electronically, has no moving parts, and generates a complete SPR curve for each interaction and reference spot on the sensor chip.

The optical system measures a total of 78 spots: 36 of these spots are the interaction data from the 6 x 6 array; the additional 42 spots are interspots used for signal normalization. These 42 interspot references are regions of the sensor chip located between flow channels, which are adjacent to both sides of every interaction spot in the direction of analyte flow. Interspots are not exposed to activation or ligand immobilization but are exposed to analyte flow. They are thus analogous to a reference channel and conserve one flow channel in the sensor chip for interaction analysis. Both interspot references and reference channel subtraction may be used with the ProteOn XPR36 system.

Chip Docking With Bar Code Recognition

Manual and software-driven chip docking capabilities with bar code recognition provide automatic recognition of sensor chip type, expiration date, and lot number. Bar codes also provide a usage record and permit direct linkage between the sensor chip and its associated protocol and experiment. Once a bar code is recognized by the system, the chip is automatically loaded into the optical unit and aligned with the imaging and fluidics systems within the sensor chip chamber. The sensor chip chamber is thermoelectrically cooled to a preselected temperature range of 15–40°C.

Representation of one flow channel. Interspot references provide convenient signal normalization.

Loading a bar-coded sensor chip.

Status LEDs constantly monitor experimental conditions.

Instrument Status LEDs

A panel of LEDs constantly monitors the experiment, autosampler status, instrument communication with ProteOn Manager™ software, and temperatures of the autosampler and sensor chip chambers. LED status is indicated by color (green, amber, or red) and state (flash or steady).

Autosampler

Two autosampler configurations accommodate sample racks and microplates. Each sample rack holds 72 sample vials with pierceable caps. The microplate layout accommodates two ProteOn standard microplates and two ProteOn deep-well microplates. Two needle holders position the six needles to accurately inject samples from vials or microplates. ProteOn Manager software recognizes the autosampler configuration by sensing the installed needle holder and type of sample holder (rack or microplate) placed in the autosampler chamber.

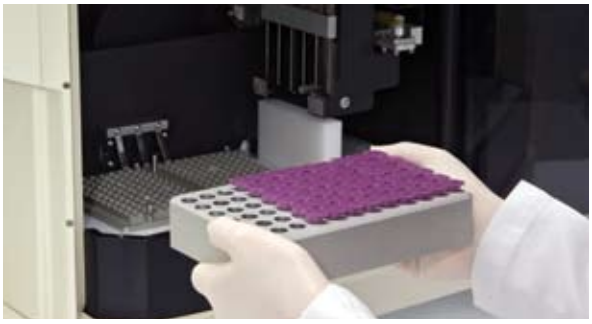
The autosampler chamber is illuminated for easy viewing of samples and the autosampler arm position through the translucent chamber door. Illumination is software-controlled and has two settings, continuous-on or automatic on/off. The autosampler platform is temperature-controlled from 2 to 35°C, and has a needle wash station that rinses and flushes the needles internally and externally.

Efficient Fluidics and Parallel Processing

The fluidics system ensures efficient parallel processing of multiple samples. It is supported by two sets of six 0.5 ml syringe pumps (sample syringes and buffer syringes) that operate in unison for each set of parallel injections of six samples or reagents. Sample syringes aspirate and inject up to six samples or reagents simultaneously. Buffer syringes direct the flow of running buffer through the system to ensure a continuous flow of buffer across the sensor chip surface, and to flush and prime the fluidics network. The fluidics system permits a range of injection quality using variable distances between the sample or reagent of interest and the running buffer. Coinjection or sequential injection of up to three samples in one automated step is also available.

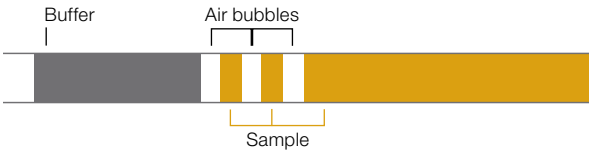
Buffer Management

The buffer compartment holds two 2 L bottles. Valve control between the two buffer bottles is hardware- and software-controlled. Flushing of the fluidics may be performed via analog control or through ProteOn Manager software. Instrument priming is software-controlled and ensures circulation of running buffer throughout the entire system, including the sensor chip chamber. An online degasser removes bubbles from the running buffer as it passes through the fluidics system.



Loading the autosampler.

Parallel syringe system for injection and aspiration.



Schematic cross section of one of 12 fluidics channels. Fluidics channels are primed with small volumes of sample and air prior to analysis. (Maximum injection quality, 3 air bubbles; medium injection quality, 2 air bubbles; minimum injection quality, 1 air bubble.)

Buffer compartment holds two 2 L autoclavable bottles.

Specifications

Number of interaction spots	36
Number of interspot references	42
Response uniformity	<2% CV
Refractive index range	1.33–1.37 refractive index units
Dynamic range	1–40,000 RU (response units)
Baseline noise	<1 RU, 1–20,000 RU <1.5 RU, 20,000–40,000 RU
Baseline drift	<1 RU/min, 15–40°C
Operating temperature range	15–40°C*
Autosampler temperature range	2–35°C
Sample configuration	72 x 1.5 ml vials or 2 x 96-well microplates
CCD	12-bit digital camera
Acquisition rate	3 Hz (3 images/sec), average 3 images/data point
Weight	85 kg
Dimensions (W x H x D)	95 x 58 x 50 cm
Controller with 19" flat panel monitor (1,280 x 1,024 pixels) supplied with instrument	

* Not lower than 15°C below ambient temperature.

Ordering Information

Catalog #	Description
ProteOn System and Software	
176-0100	**ProteOn XPR36 Protein Interaction Array System**, 100–240 V, includes ProteOn XPR36 instrument, 2 licensed copies of ProteOn Manager software, controller and display, communication cable, sample rack, rack needle holder, microplate needle holder, collection tank, choice of 2 sensor chips, one-shot kinetics kit, maintenance kit, 2 bottles of PBS/Tween running buffer, chip normalization solution, 200 sample vials, 25 microplates with standard wells, 50 sheets of microplate sealing film, instructions
176-0200	**ProteOn Manager Software** for ProteOn XPR36 instrument control, experiment design, data collection, and analysis
Sensor Chips	
176-5011	**ProteOn GLC Sensor Chip** for general amine coupling, compact polymer layer with binding capacity of approximately one protein monolayer
176-5012	**ProteOn GLM Sensor Chip**, for general amine coupling, polymer matrix layer with intermediate binding capacity
176-5021	**ProteOn NLC Sensor Chip** for binding of biotinylated molecules, contains NeutrAvidin immobilized to GLC layer
Protocol Development Kits	
176-1010	**ProteOn One-Shot Kinetics Kit**, includes IL-2/IL-2 antibody pair, GLC sensor chip, amine coupling kit, 50 ml acetate buffer, pH 4.5, instructions
176-1020	**ProteOn Multiple Protein Interaction Kit** includes TEM/BLIP protein set, GLC sensor chip, amine coupling kit, 50 ml acetate buffer, pH 4.0, instructions
176-1030	**ProteOn Protein-Small Molecule Kit** includes carbonic anhydrase II/CBS pair, GLM sensor chip, amine coupling kit, 50 ml acetate buffer, pH 5.0, instructions

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