

AUTOLAB

Surface

plasmon

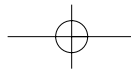
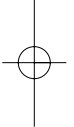
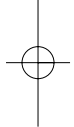
resonance

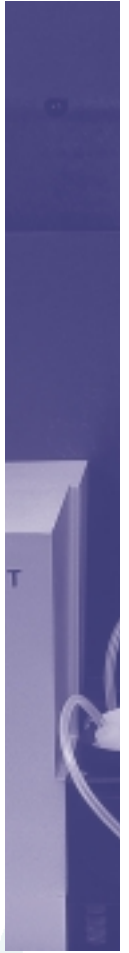
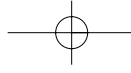
instrument

THE HARDWARE

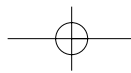
THE SOFTWARE

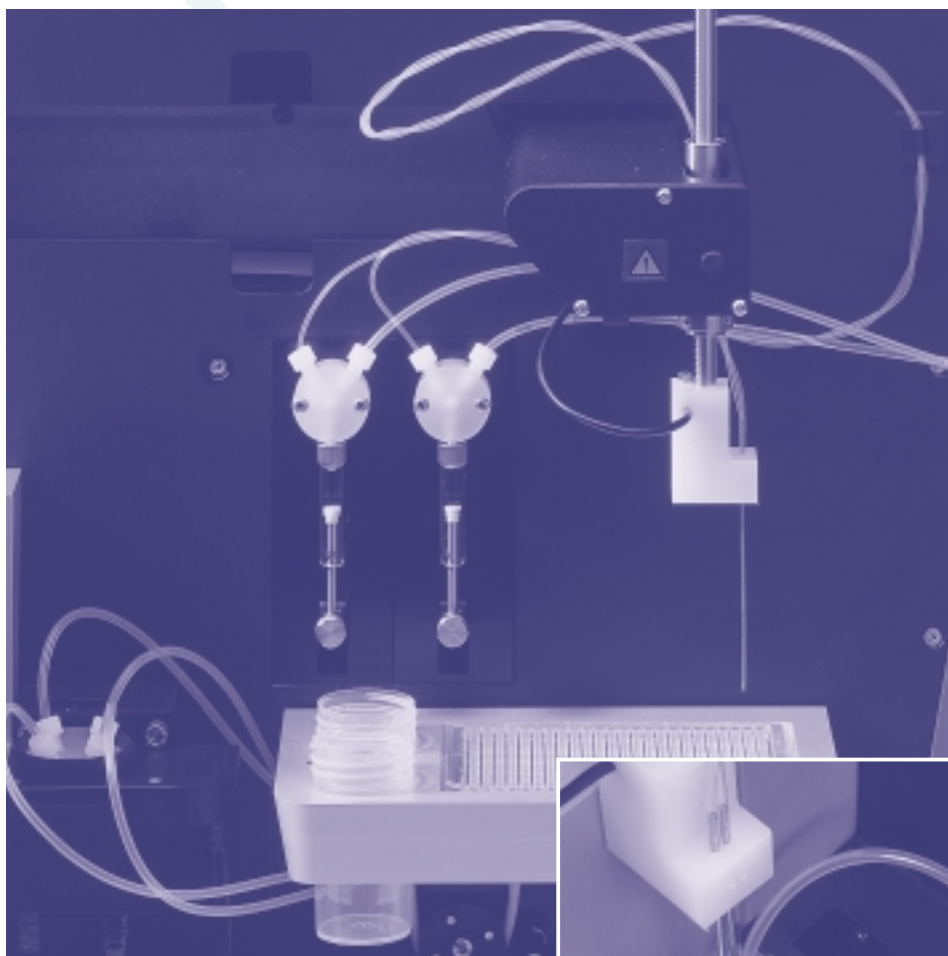
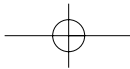
**THE
ESPRIT**



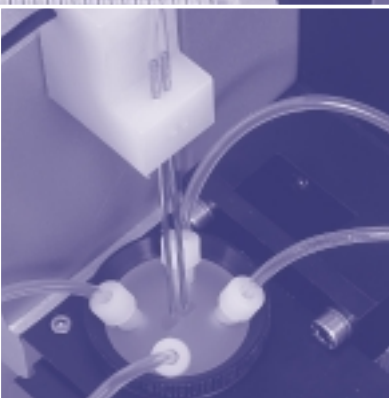


Autolab Esprit
liquid handling
unit.





Sample is injected in the cuvette.



Electrochemical SPR cuvette.



Sensor disks with slider.



INTRODUCTION

Eco Chemie B.V.

was founded in 1986 by

two *electrochemists*

from the University of

Utrecht, *The Netherlands*,

and has since then

been *focussed* on

the development and

production of *Autolab*

electrochemical instruments

and *accessories*.

More recently, the company also started developing and producing (Electrochemical) Surface Plasmon Resonance instrumentation, which resulted in the Autolab Esprit.

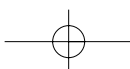
The surface plasmon resonance technique has become a standard tool in life sciences and pharmaceutical research laboratories. It is essential to study and characterize molecular interactions, to explore the structure-function relationships of biomolecules and to understand biological systems in life sciences.

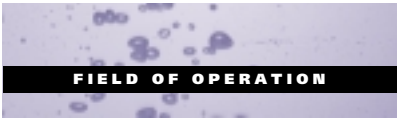
The Autolab Esprit is a surface plasmon resonance (SPR) instrument with the unique possibility of simultaneous electrochemical and SPR measurements.

In order to enable electrochemical SPR measurements, the Autolab Esprit needs to be connected to an Autolab potentiostat/galvanostat. The Autolab Esprit allows the scientist to analyse bi-molecular, such as antigen-antibody, interactions in real time without labelling requirements. Other interactions where a modified surface interacts with molecules in solution can also be studied.

Combining electrochemistry with SPR makes the Esprit perfect for biosensor and DNA- or RNA- or protein chips research.

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FIELD OF OPERATION

Surface plasmon resonance measurement techniques can be used to:

- Obtain quantitative information.
- Total concentration of a biomolecule in solution.
- Determine reaction kinetics.
- Determine affinity constants for molecular interactions.
- Determine the active concentration of biomolecules in solution.
- Discrimination between active and non-active molecules.
- Determine which molecules interact, ligand screening or epitope mapping.
- Perform complex assembly studies;
- Are there any steric/allosteric effects.
- Study biocompatibility of coatings.
- How does a molecule interact with a coating.

The combination of electro-chemistry and SPR can additionally be used to study:

- Enzymes.
- Ion channels.
- Membrane proteins.
- Polymer layers.
- Polymerisation.
- Polymer-biomolecular interactions.
- Preparation of biosensors.
- Combining impedance or amperometric detection with SPR.

The Autolab Esprit is designed with an open cuvette system, giving the user access to the cuvette as well as the gold disk. It comes with a flexible software package allowing the user to fully control the experiments.

- **Electrochemical techniques**

The GPES software package provides the user with almost all electrochemical techniques and is, in combination with one of the Autolab instruments, an electrochemical workstation that can be used in many different areas.

The most commonly used techniques in combination with surface plasmon resonance are:

- Cyclic voltammetry.
- Chrono-amperometry.
- Impedance spectroscopy.

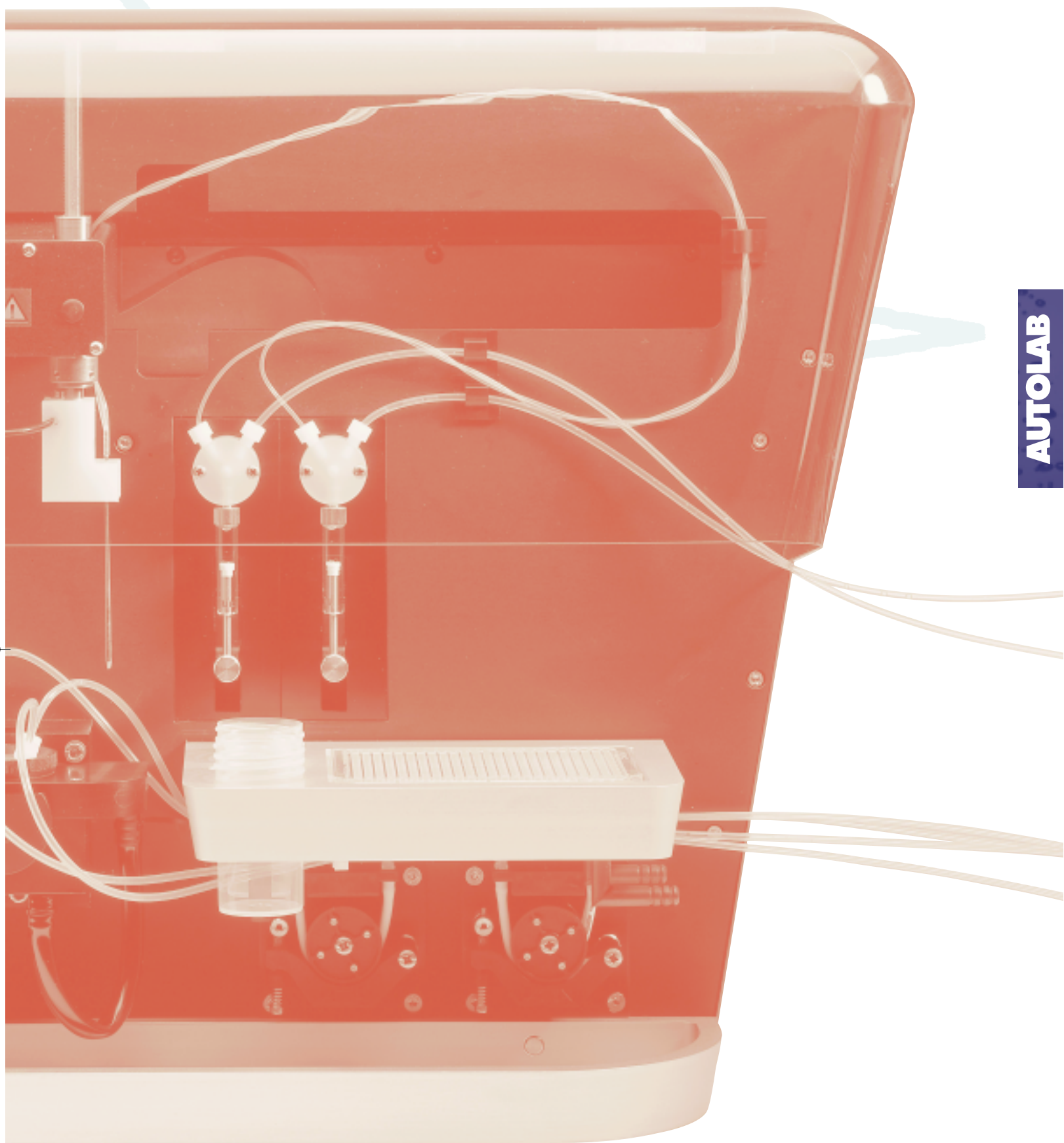
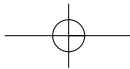

THE HARDWARE

- **Optical unit**

The instrument's optical unit is designed to measure in two channels

simultaneously, one sample channel and one reference channel.

The very fast sampling rate allows averaging of many data points per second, resulting in low noise



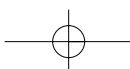
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measurements. The scanning range is 4 degrees around the offset angle.

The offset angle can be manually controlled, providing a large dynamic angle range.

The laser spot has an area of 2 mm² on the gold sensor disk. Measured data will be an average of all events in that area. This has the advantage that any inhomogeneity in,

or defects of any of the additional layers on top of the gold surface will be eliminated.



- **Measurement cuvette**

The hydrodynamic parameters of the cuvette are:

- Mixing volume.
- Mixing rate.
- Distance of the needle to the sensor surface.
- Volume of the solution in the cuvette.
- Diameter of the cuvette.
- Geometry of the needle.
- Viscosity of the solution.
- Temperature of the solution.

Except for the diameter of the cuvette and geometry of the needle, all other parameters can be controlled by the user, making the instrument very suitable for research purposes.

The open cuvette structure and the flexible software give the user a number of benefits:

- Multiple sample addition is easy.
- Cuvette, cuvette slider and sensor disk can be cleaned easily.
- Consumption- and maintenance costs are relatively low.

The electrochemical cuvette has a 3-electrode system;

- Fixed contact point to the gold layer of the sensor disk (working electrode).
- Solid state Ag/AgCl reference electrode.
- Platinum counter electrode.

When SPR is combined with electrochemistry, both signals will be available in the Autolab GPES software.

- **Liquid handling unit**

Liquid or sample handling can be done manually or semi- or full automatically. The two channels of the cuvette use independent syringe pumps to assure reproducible experimental conditions. Chemically inert tubing is used throughout the whole system.

- **Fully automatic**

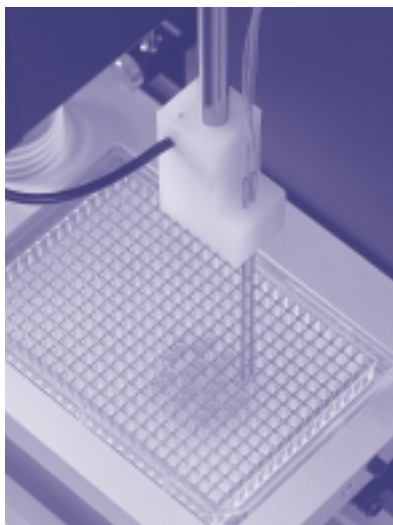
The autosampler is controlled by the software. Samples are taken from the microtiter plate and injected in the cuvette.

The automatic control allows the user to run measurements continuously.

- **Semi automatic control**

The sample is aspirated from the vial into the needle or pipetted in the cuvette manually.

Dispensing, draining, washing, mixing of sample and measurement are performed automatically.



- **Manual control**

After the sample is pipetted into the cuvette, each following step like mixing, draining, washing, starting of measurement, rinsing etc. is controlled from the software.

The general configuration of the liquid handling unit makes sample recovery possible at any time.

- **Spincoater**

The spincoater is an accessory to the Esprit system that can be used to develop customer specific surfaces on gold coated glass disks.



THE SOFTWARE

The Esprit software

package contains a program

for data *acquisition*

and a separate program

for *kinetic* evaluation.

Both programs

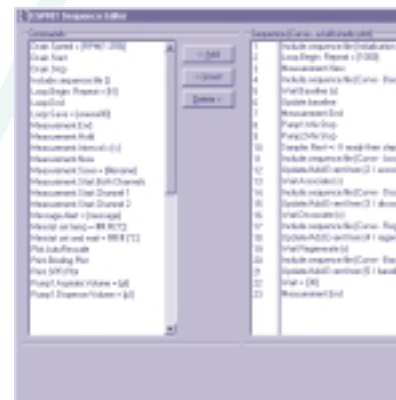
can be *used* with the

operating systems

Windows 98, 2000 *and* XP.

- **The data acquisition software**

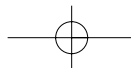
The data acquisition software contains all necessary tools to control the instrument. Automatic control is done through so-called measurement sequences.



The sequencer window allows the user to create new or modify existing sequences. A sequence is a list of commands that is used to automate the control of the instrument.

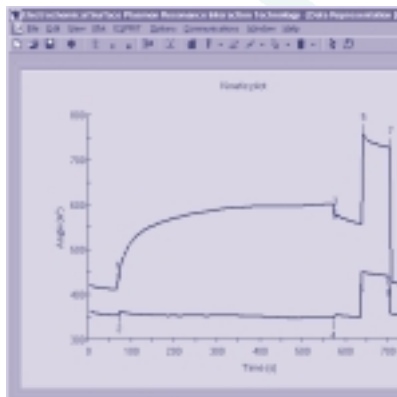


Sample positions on the microwell plate and incubation times can be selected in the autosampler control window.



TECHNICAL SPECIFICATIONS

The data presentation window shows all measured data; the association, dissociation and regeneration phase. The temperature is also recorded at the same interval.



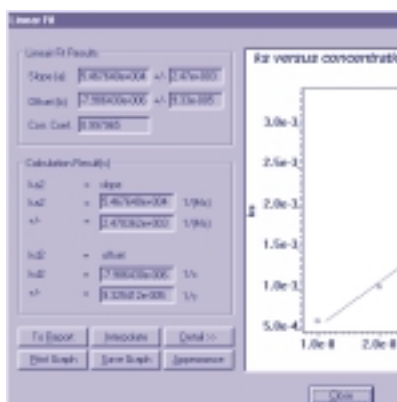
The user can add markers to any datapoint on the plot, so that comments on special events or specific areas of interest can be marked and logged into an event recorder.

• **The kinetic evaluation software**

Data generated by the data acquisition software can be analysed with the kinetic evaluation software.

With the kinetic evaluation software the following parameters can be determined:

- Kinetic rate constants.
- Affinity constant.
- Thermodynamic parameters.



Using multiple curves measured with different concentrations allows the user to obtain kinetic constants.

Actual curves can be fitted to different kinetic models.

AUTOLAB ESPRIT

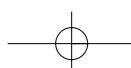
<ul style="list-style-type: none"> • Measuring principle • Transducer principle • Liquid handling • Parallel channels • Fixed wavelength 	surface plasmon resonance scanning mirror cuvette system 2 670 nm
<ul style="list-style-type: none"> • Sample loading and injection 	manual-, semi-automatic-, or automatic control
<ul style="list-style-type: none"> • Mixing 	continuous with autosampler needles
<ul style="list-style-type: none"> • Autosampler • Pumps • Flow rate range • Sample volume 	integrated syringe and peristaltic pumps 0.8 - 227 µl/s 20 - 100 µl
<ul style="list-style-type: none"> • Offset of SPR angle by spindle • Dynamic range • Angle resolution 	68° - 78° 4000 m° < 0.5 m°
<ul style="list-style-type: none"> • Refractive index • Refractive index resolution • Measuring frequency • Time interval range • Baseline noise 	1.33 - 1.43 < 2 · 10 ⁻⁶ 76 Hz 0.1 s - 300 s 0.05 m° (0.5 RU)
<ul style="list-style-type: none"> • Sensor disk • Individual surfaces modification 	gold coated glass disk (25 mm Ø) easy
<ul style="list-style-type: none"> • Standard supplied cuvette • Additional cuvette • Biacore® sensor chip adaptor 	combined Electrochemistry-SPR cuvette (ESPR) optional for normal SPR optional
<ul style="list-style-type: none"> • Weight • Dimensions (H × W × D) • Interface • Power requirements 	40 kg 51 × 60 × 45 cm ³ RS 232 C 170 W, 100 ... 240 V, 50/60 Hz

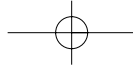
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SPINCOATER

<ul style="list-style-type: none"> • Standard sample size • Motor speed range • Manual speed setting • Acceleration/deceleration 	25 mm Ø disk 100 - 10,000 RPM 100 - 10,000 RPM in 100 RPM steps 4000 RPM/s
<ul style="list-style-type: none"> • Weight • Dimensions (H × W × D) • Power requirements 	2.8 kg (controller) 1.0 kg (spincoater) 77 × 196 × 245 mm ³ 100 ... 240 V, 50/60 Hz

Specifications are subject to change without notice.





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ECO CHEMIE 05/2003

THE HARDWARE

THE SOFTWARE



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