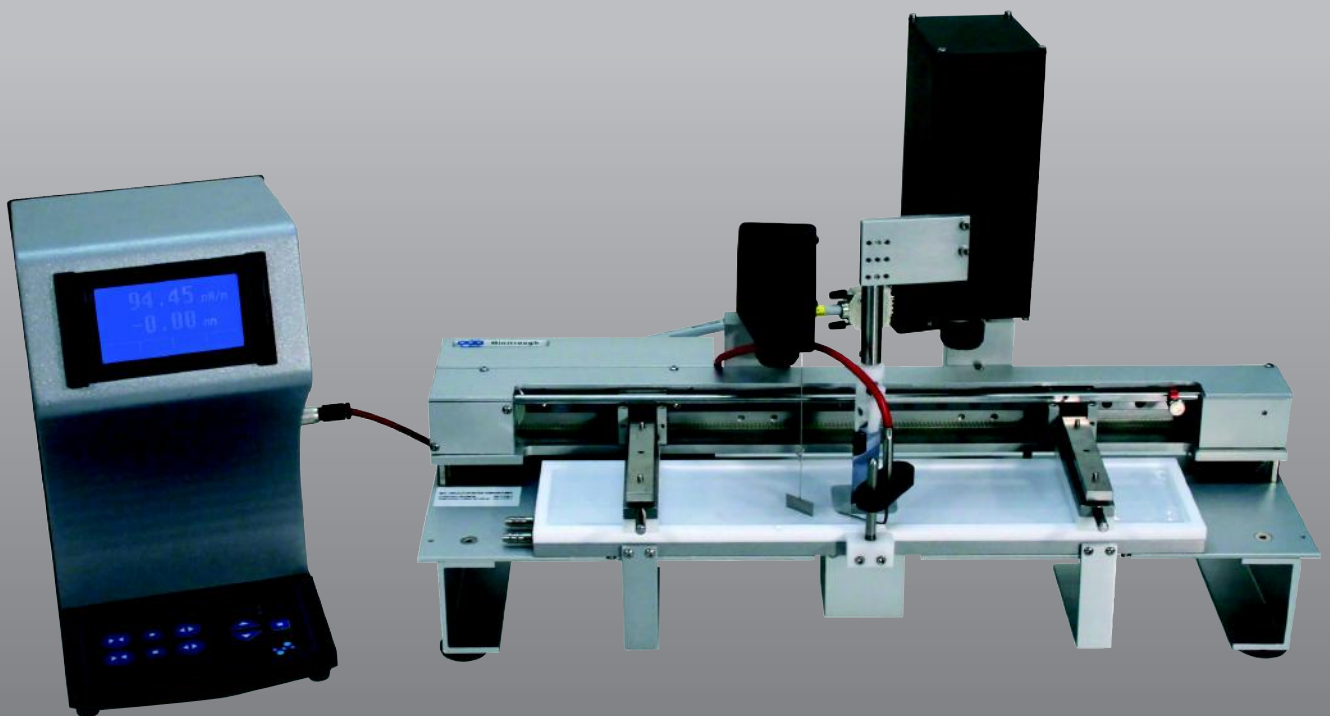




Excellence in Surface Chemistry

# KSV Minitrough

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The Ultimate Langmuir/  
Langmuir-Blodgett System





# KSV Minitrough

## Cost efficiency without compromise

KSV Minitrough is a real power pack in miniature size. Its experimental capabilities and performance exceeds that of many full size LB-apparatuses. Full computer control and Windows™ 2000 and XP compatible software combined to straightforward precision engineered hardware makes the Minitrough a pleasure to work with.

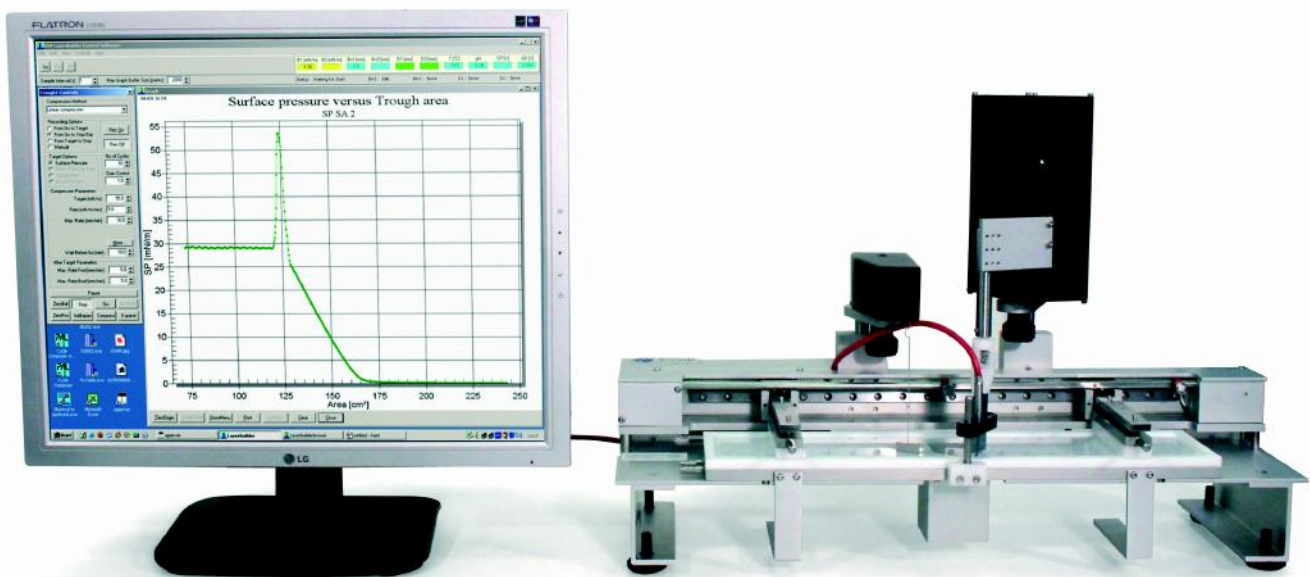
## Modular Minitrough

Minitrough's modular design meets a wide variety of requirements and allows for maximum flexibility in configuring the instrument. The Minitrough expands from a Langmuir-film balance to an LB-film deposition device. It fits into several

monolayer characterization equipment such as optical microscopes, Brewster Angle microscope, ellipsometers, ISR and PM-IRRAS just to name a few. Surface potential measurement, pH and subphase temperature control, stirring and many other additional features make the Minitrough the most versatile small scale Langmuir trough available today.

## Why mini-size

- cost effective – high performance
- portability – easy set up and use
- small subphase volume
- easy tailoring to specific applications
- ideal as a reserve trough system
- simple and sturdy construction – educational use
- microscopy, Brewster Angle, Ellipsometry etc. mountable
- environmental and biological applications



# Three Basic Versions

## Minitrough 1

A basic Langmuir-film balance designed for conventional monolayer analysis. Suitable for biological applications when small amounts of material or small subphase volumes are being required.

- Biomembranes and lipid monolayers
- lung surfactant studies
- binding of drugs
- enzyme kinetics
- penetration of molecules into monolayers
- measurements of changes in surface tension by rod method

## Minitrough 2

Sophisticated Langmuir-Blodgett instrument for unsupervised deposition of multiple monolayers on solid substrates. DC motor driven stepless deposition device and symmetric compression of the monolayer ensure the highest uniformity of molecular orientation during deposition.

- wide selection of substrate holders
- automatic PC controlled operation
- leak proof barriers
- digital displays for measuring parameters
- manual control key pad for operation without a PC
- portable

## Minitrough 3

Microscopic analysis of monolayers are conveniently performed with the Minitrough 3. A quartz window in the bottom of the trough and easily customized

mechanics allow the trough to be fitted in most of the available Microscopes.

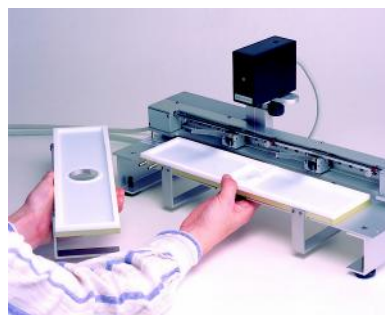
- optical microscopy -air-water, oil-water interfaces
- Brewster-angle microscopy
- ellipsometry
- laser beam and spectroscopic applications
- X-ray reflectivity studies

## Minitrough 4

The Extended Minitrough is particularly useful for use with ISR 400 and PM-IRRAS, where a larger area is required in the compressed state. The trough is available with and without quartz windows for microscopy purposes.

## Exchangeable Troughs

The troughs are made of a cast-molded solid piece of PTFE because it is inert and highly hydrophobic. Cleaning is made easy by rounding all inside corners of the trough. Three standard troughs are available; isotherm trough, dipping trough and microscopy trough. Troughs for biological and custom applications are made to specifications.

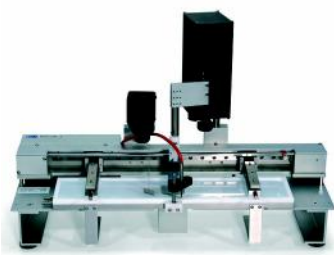


Troughs are easily and rapidly exchanged by hand.

## Minitrough 1



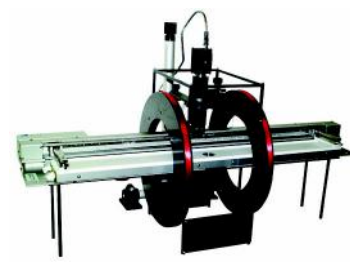
## Minitrough 2



## Minitrough 3



## Minitrough 4 with ISR 400



# Symmetric Compression

Symmetric compression of a monolayer by two inwardly moving barriers offers several advantages over traditional single-barrier film compression systems.

Symmetric compression causes minimal film flow, maximizing the accuracy of the film pressure measurement. The Wilhelmy plate is evenly compressed from both sides and there is no shifting even with the stiffest films.

Substrate dipping is performed at the center of the film compression, where the monolayer is uniformly oriented, which ensures homogeneous transfer of the monolayer from the air/water interface onto the substrate. Both sides of the substrate are evenly coated and no back drag, commonly encountered with single-barrier systems, will occur. In addition, symmetric compression minimizes the parabolic film flow pattern (center moving faster than sides), which often

causes major distortion with single-barrier systems and with condensed films.

Symmetric film compression by two barriers reduces the relative barrier speeds to half of that of one-barrier systems. Reduced barrier speed causes less shear resistance - another important factor with condensed films.

Symmetric compression

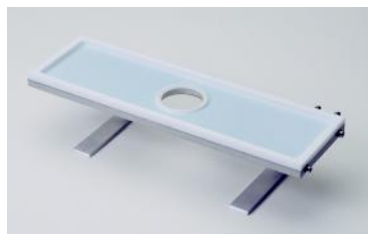
## Standard troughs



Isotherm trough – Minitrough 1

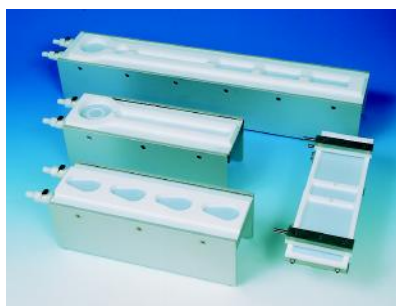


Dipping trough and dipper – Minitrough 2

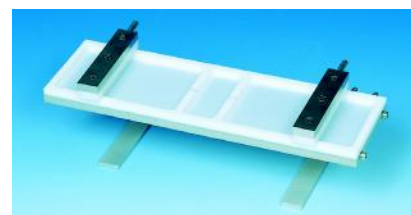


Microscopy trough – Minitrough 3

## Custom made troughs



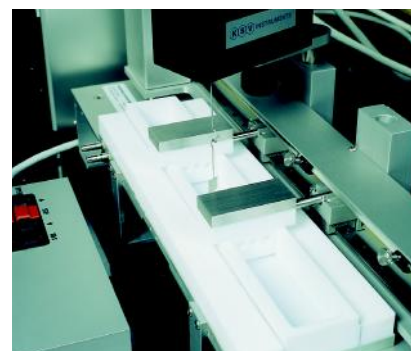
Biological multi compartment troughs



Enzyme kinetics trough



Trough for scattering, diffraction and spectroscopy studies of monolayers



Interfacial, liquid/liquid trough

# Software

KSV Minitrough is run by a powerful 32-bit software written in C++ for Windows™ 2000 and XP. Using the software is easy to learn due to the familiar point and click format of drop down menus, buttons and icons. The software allows the user to perform a variety of pre-programmed experiments covering of the most known Langmuir-film experiments. The programs can be further modified to particular needs. A wide range of datapoints and measuring parameters are stored in a database and can be retrieved, analyzed or exported to another data reduction software.

## Standard Program include

- Compression/relaxation isotherms: surface pressure/area, surface pressure/time, or surface pressure/any desired measurable parameter
- Transfer ratio and deposition profiles
- Analysis of monolayer kinetics (enzyme kinetics, monolayer hydrolysis, polymerization etc.)
- Analysis of monolayer penetration, solubility and binding of biomolecules (enzymes, proteins, peptides etc.)
- Isochores and isobars: constant increase/decrease of surface pressure/area, surface pressure/time, or surface pressure/any desired measurable parameter

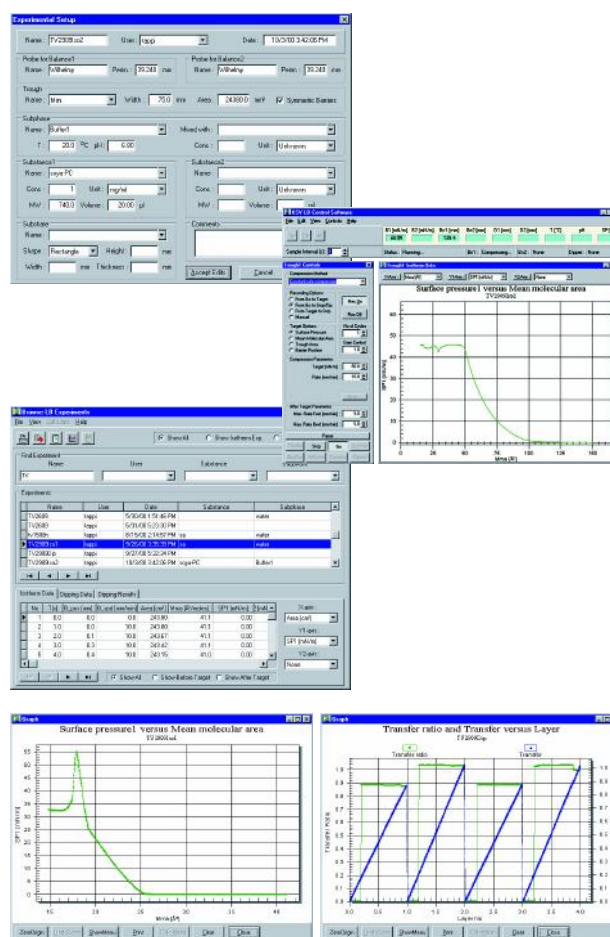
The program is divided into four main sections – Main Menu, Experimental Setup, Measurements, Data Reduction and Analysis. The core of the software is the Main Menu from which all other sections and programs can be accessed.

The Experimental setup includes information which is specific for every measurement. Once an experiment has been chosen various information and parameters are entered into the Experimental Setup window. This helps to keep the data organized and makes it easier to search for a specific measurement afterwards.

To begin a measurement materials and instrument are set ready, Experimental setup window is filled out and Trough Controls are defined. Once the

experiment has been started the PC will take full control of the measurement until completion.

The measurement data is stored in a database and can be retrieved and analyzed – even during a measurement – in the Data Reduction and Analysis section. Since each measurement sequence is named it is easy to retrieve the data and have it displayed by your monitor. A variety of graphs for your data can be displayed and printed. There is an option for viewing and editing the Experimental setup information. This is a helpful feature if the data produced should be recalculated based on a new information about the materials involved. Calculation of additional results are easily done as well as exporting of data to other softwares. Because of Windows™ format of the KSV LB software the data files can also be transferred to other locations within a network or by Internet as digital images.



# The Company

KSV Instruments Ltd, Helsinki, Finland, is the leading global provider of routine, research and characterization instruments to surface chemistry and Langmuir-Blodgett film applications.

## Langmuir film Products

Ranging from manual, educational apparatuses to fully equipped high performance R&D grade multi/alternating layer LB-troughs KSV offers the widest range of Langmuir systems in the world.

## Thin film Characterization

KSV's BAM (Brewster Angle Microscope) and QCM (Quartz Crystal Microbalance) are used for characterization of Thin films and for wide variety of nano-technology applications in biology and molecular engineering.

## Surface Chemistry Products

With Sigma 700 Tensiometer and CAM 100/CAM 200 Drop Shape Analysis contact angle meters and their various modifications KSV covers most of known surface chemistry measuring methods. All instruments utilize the latest technological advances in measurement of surface/interfacial tension of liquids as well as interactions between liquid/solid systems.

# Specifications

### FILM DEPOSITION SYSTEM

Control and operation	Software controlled unsupervised and automatic film depositions
Deposition speed	Standard range 0.1 to 75 mm/min, Speed adjustment increment 0.1 mm
Deposition cycles	1 to unlimited depositions
Dwell times	0 s to unlimited, individual adjustment for upper and lower delay times
Max. size of substrate	60 x 35 mm <sup>2</sup> (100% immersion)
Dipper motor	Servo-controlled DC motor

### FILM PRESSURE MEASURING SYSTEM

Measuring principle	Wilhelmy plate method, platinum or paper sensor element connected to microelectronic feedback system for surface pressure control. Software controlled operation, user programmable process parameters.
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Dynamic range 0 to 250 mN/m

Resolution 4  $\mu$ N/m

### FILM AREA CONTROL SYSTEM

Surface area regulation	Symmetric compression of monolayer by 2 inwardly moving barriers. Software controlled operation and user, programmable process parameters.
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Surface barriers Made of hydrophilic, optionally hydrophobic, material. Leakage proof.

Compression speed 0.02 mm to 200 mm/min

Inaccuracy Less than 1%

Barrier drive Belt drive powered by servo controlled DC motor

### TROUGH

Material Solid, cast-molded PTFE with integrated dipping well. No glue or o-ring seals. Aluminium base plate with built-in water channels for temperature control of the subphase. PTFE thickness at trough bottom 1.15 mm. Trough with very small volume by request.

Size 365 x 75 x 5 mm  
782 x 75 x 5 mm (System 4)  
Dipping well in centre of trough

Volume 0.160 l without dipping well  
0.29 l (System 4)



## Instruments

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