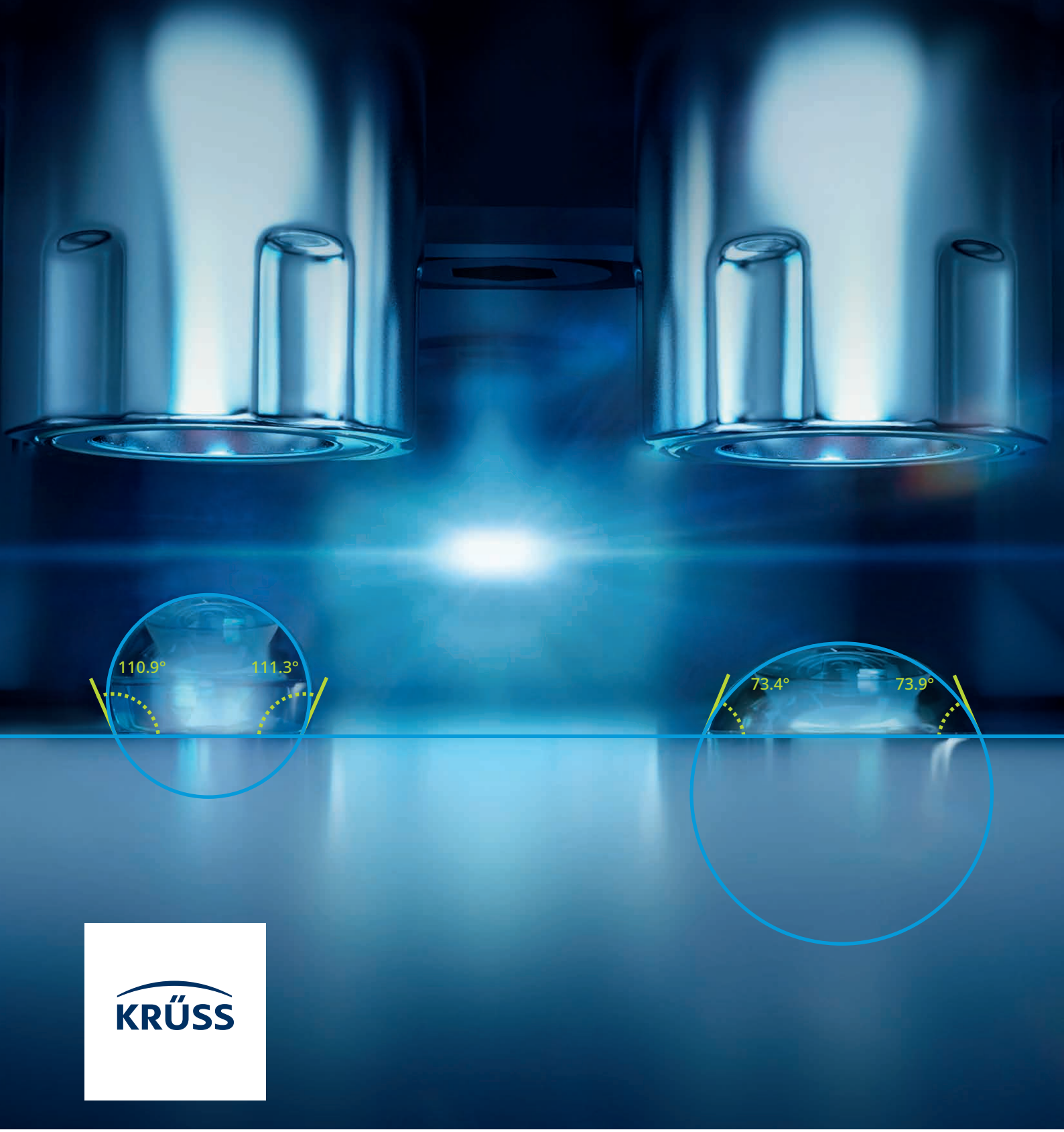
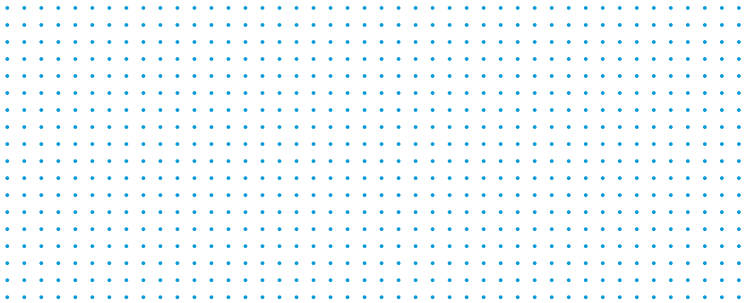


KRÜSS

Product Overview
2020

Drop Shape | Tensiometers | Foam Analysis | Surface Roughness

Advancing your Surface Science



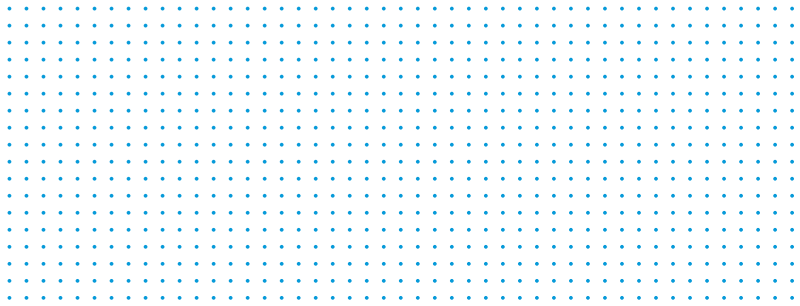
Creating advanced solutions

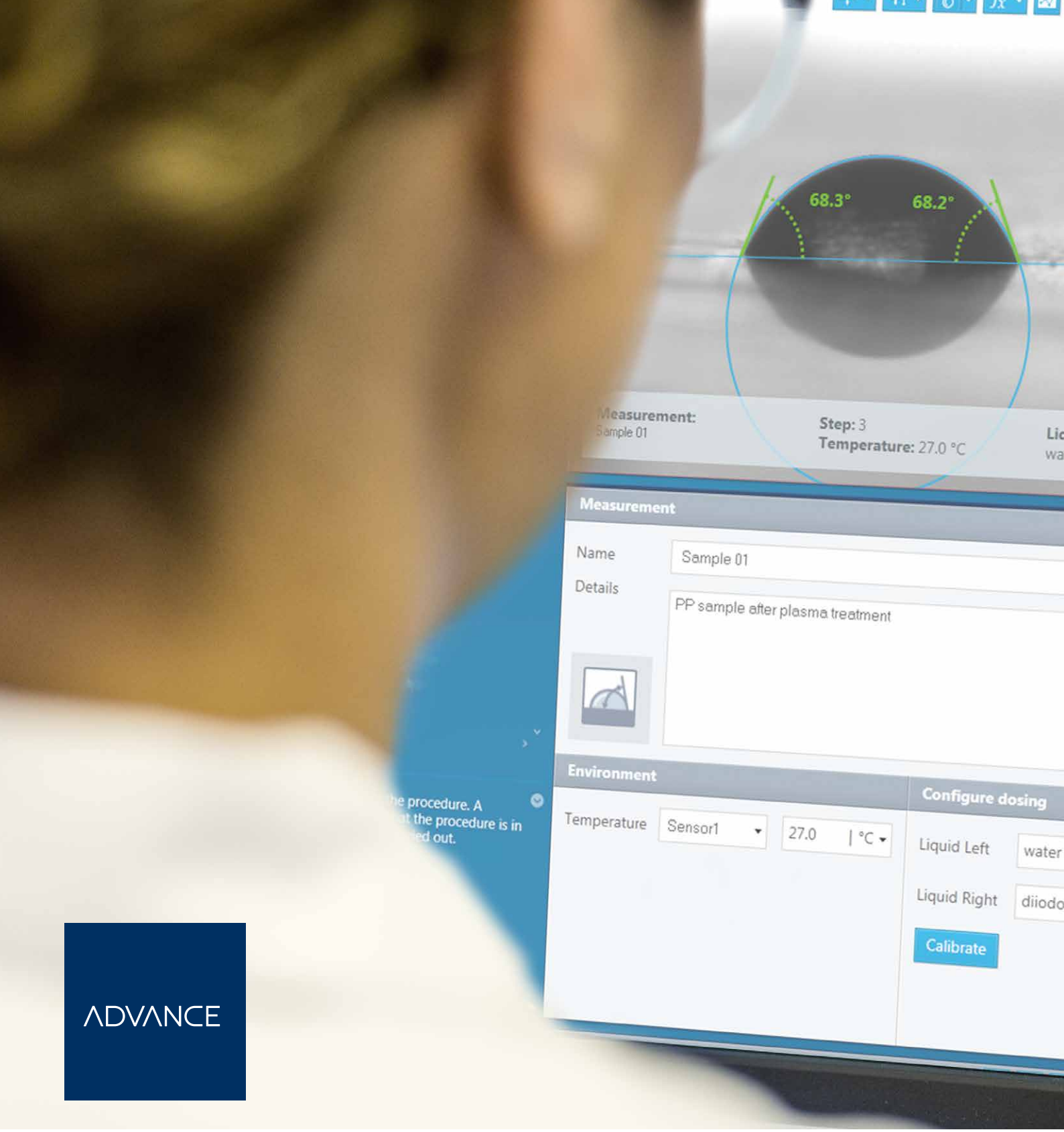
Your potential knowledge about the properties and quality of your materials and liquids is only limited by the technical level of methods and instruments at your disposal. In order to help you to extend this limit, we are constantly expanding our technology further so you can enhance your quality control and research.

Next to the development of solutions for new scientific challenges, our main goal is to make your analysis easy, even if the task you have to solve is complex. This is why we focus on automation and usability while reducing necessary intervention to a minimum.

Based on the versatile modularity of our instruments and software – and our knowledge about how to make the most of it – we provide you with tailor-made solutions that advance your surface science.

Product Overview
2020



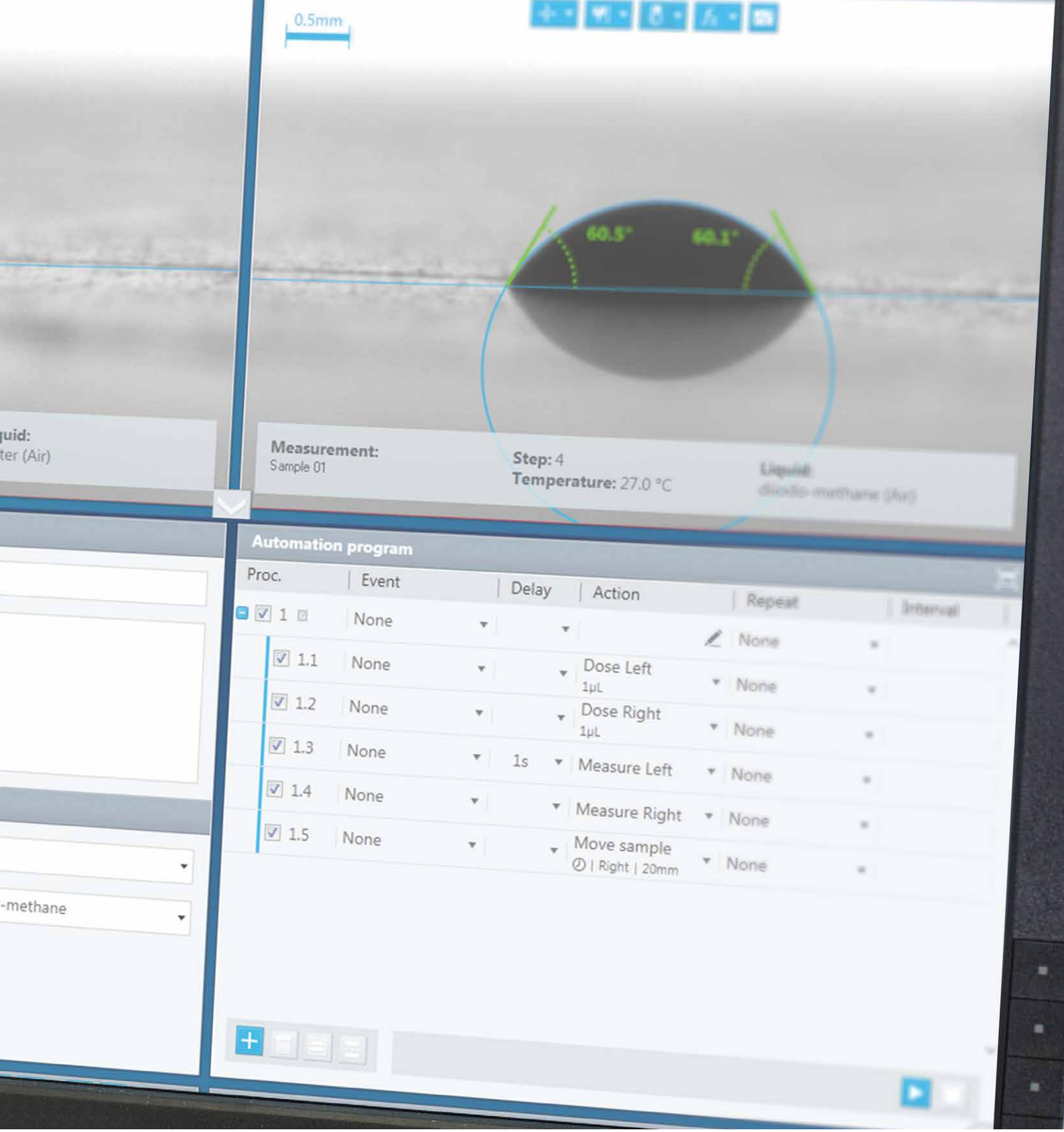


ADVANCE

The software that brings our instruments to life

ADVANCE is our innovative software which maximizes the performance and versatility of our instruments. Users of ADVANCE especially benefit from its outstanding functionality and its new standards in intuitive operability.

By clearly organizing the context-relevant functions in tiles and avoiding menus and pop-ups, ADVANCE eliminates unnecessary clicks and time-consuming searches for hidden elements. Easy-to-create automation programs make analyses repeatable and results user-independent. All modules can also be used in the ADVANCE touch mode with its specially optimized user interface.

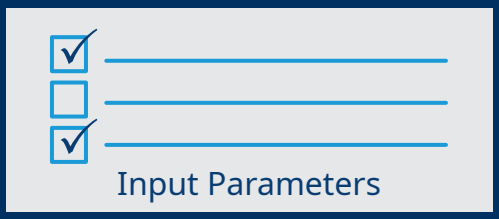

0.5mm
60.5°
60.1°
Measurement:
Sample 01
Step: 4
Temperature: 27.0 °C
Automation program
Proc.
Event
Delay
Action
Repeat
1 None None
1.1 None Dose Left 1µL None
1.2 None Dose Right 1µL None
1.3 None 1s Measure Left None
1.4 None Measure Right None
1.5 None Move sample | Right | 20mm None

ADVANCE

The ADVANCE principle

The operating concept of ADVANCE follows a universal workflow from preparation to evaluation on which every scientific measurement is based in principle. The software mirrors this workflow organically, thus making operation intuitive.

ADVANCE is designed to follow the idea that, however complex a scientific task may be, the tools to solve them should be as easy to use as possible. To master complexity, automation programs can be created using a versatile step-by-step logic with diverse possibilities to group or cycle the steps. To keep ease of use, this logic stays close to the instruments' functionalities without any abstract programming level.

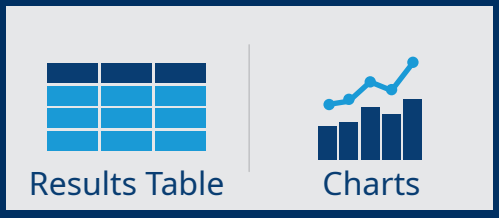


Step 1: Preparing the measurement

The process starts with editing information on the sample as well as setting parameters. Automated procedures make it possible to create measurements for even the most complex tasks in order to carry out analyses without user interference.

Step 2: Performing the measurement

Now the instrument enters the stage. Depending on the degree of automation, ADVANCE takes complete control. During the measurement, displayed raw data and video images, if appropriate, make it easy to monitor the measurement in life view.



Step 3: Reviewing results

The measurement is finished. ADVANCE shows all measuring data in clearly arranged tables and charts. Moreover, the software offers features to re-analyze raw data with new settings to make measurements more flexible and independent from initial decisions.

Step 4: Evaluating and exporting results

Finally, ADVANCE uses scientific models to calculate conclusive results from raw data. With a few clicks, comprehensive reports or export files are created for further processing or archiving. To gain a maximum of information from your results, measurements can be compared at will with just a few clicks.

Be up-to-date with the ADVANCE Software Assurance

The time for acquiring anything high-tech never seems to be right: One doesn't want to miss the next innovation step which is always imminent. ADVANCE is no exception to this rule. With at least one and usually two annual releases we continuously extend the range of functions with new powerful features. With regular upgrades in the framework of the ADVANCE Software Assurance you will never miss a new development and always work with the latest version.

The safe and simple way of staying up-to-date

Upgrading ADVANCE is as easy as the software itself. With no uninstallation necessary, the new version is operational within minutes. Each upgrade is compatible with any results you have collected. In many cases previous raw data can even be reanalyzed with improved algorithms or evaluated with new methods.

Two opportunities, one best choice

The ADVANCE Software Assurance contract has a minimum term of three years. We electively offer it as an alternative to an instant purchase. It is beneficial for you because the annual fee for the first three years is exactly one third of the price for an instant purchase, which comes without upgrades. When canceling the contract, you can still use ADVANCE for an unlimited time, you just don't receive any more upgrades. In spite of the benefits of the Software Assurance, we still offer the instant purchase option for customers who cannot or do not want to enter a time-based contract.

	Software Assurance	Instant purchase
Regular upgrades	at least one, usually two per year	no upgrades
Rates per license	one third of full price per year*	full price in one rate
Payable	rates once a year	instantly
Bug fixes (if any)	whole contract term	one year
License expiration	none	none

*There will be no adaptions of the fee in the first 3 years. After 3 years the fee will be adapted to one third of the price for an instant purchase according to our annually updated price list.

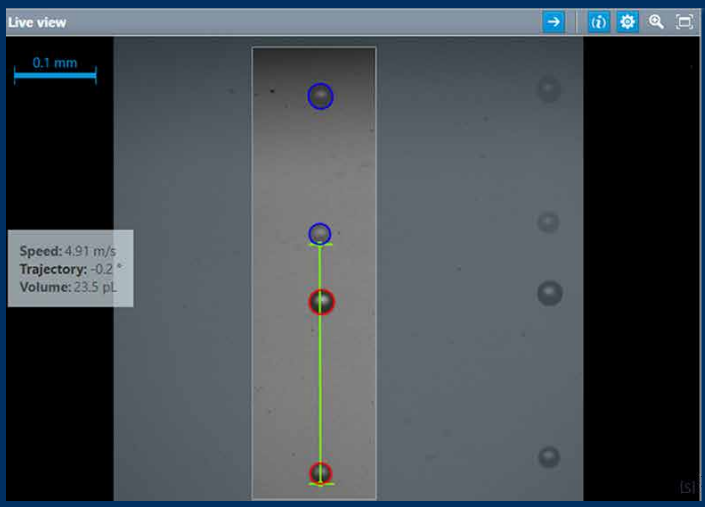
Watch our video: **kruss-scientific.com/v-softwareassurance**

ADVANCE

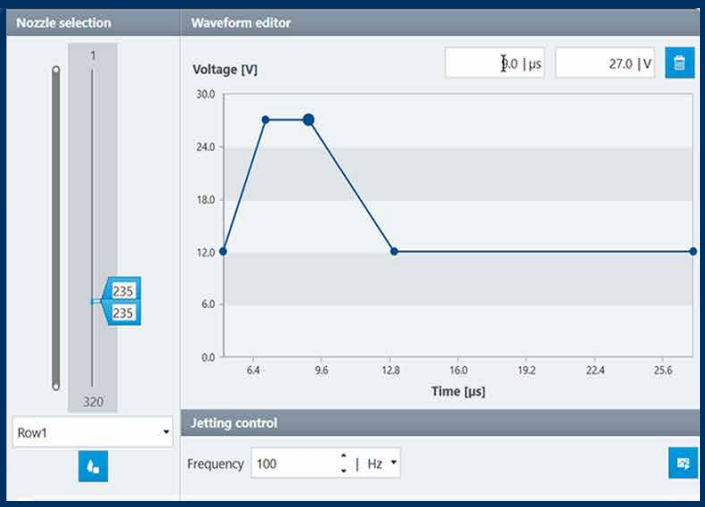
An insight for different instruments

Measure surface free energy (SFE) with just one click: With our Liquid Needle dosing unit, ADVANCE displays and analyzes two dispensed drops in parallel.

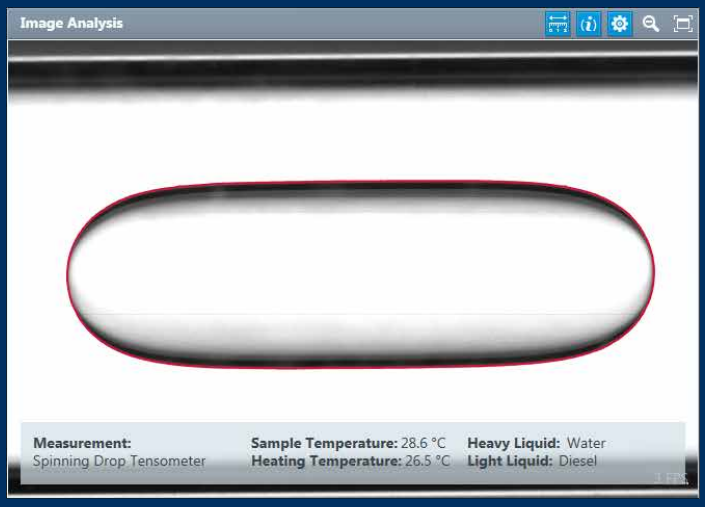
When controlling a fully automated measurement an SFE determination is carried out within a second.



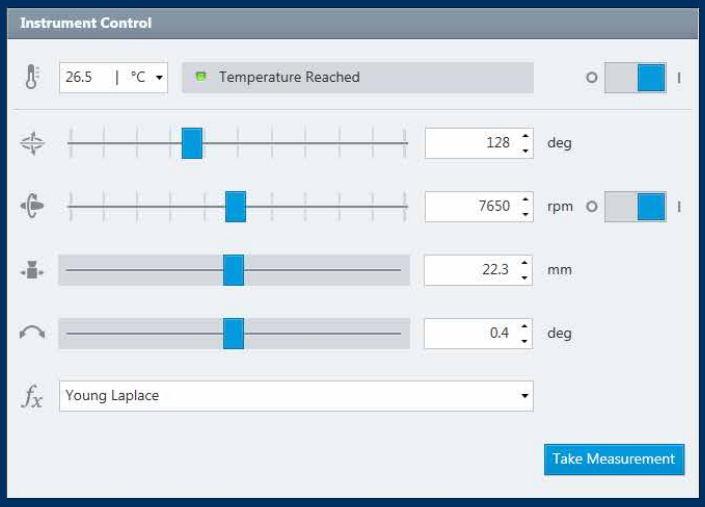
Capture drops in flight for inkjet analysis: ADVANCE calculates the volume and speed as well as many further results and uses an innovative flipbook technique to make the motion of ultrafast droplets visible. Printing



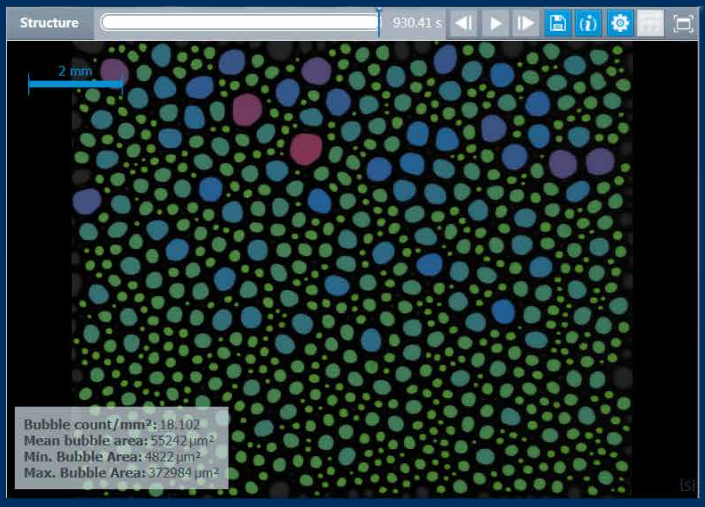
is triggered and exactly synchronized with the analysis. Optionally, an intuitive waveform editor for compatible print heads even leads to a live response of the jetting behavior to the printing parameter settings.



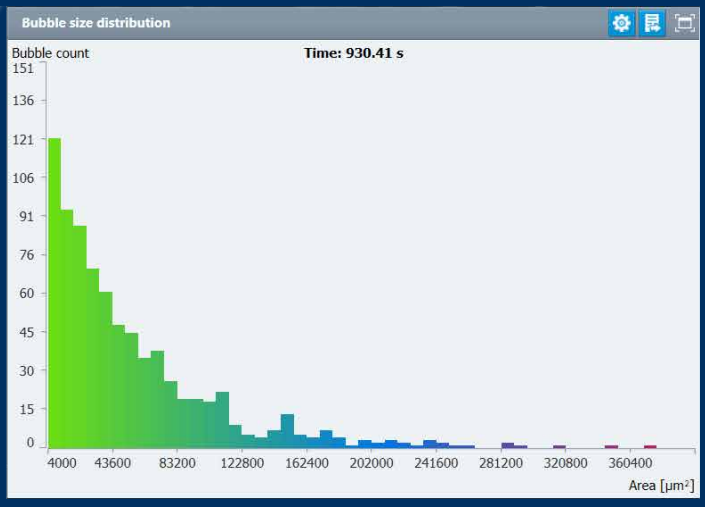
Measure interfacial tension (IFT) down to very small values: With our Spinning Drop Tensiometer – SDT, ADVANCE analyzes an image of a drop in a rotating capillary to determine the IFT using the drop's diameter or curvature.



The panel to the right gives complete control over the instrument, including a fully automated drop positioning feature which keeps the drop in the center of the image on the left.



Analyze several aspects of foam behavior in one measurement: With our Dynamic Foam Analyzer – DFA100, ADVANCE makes it possible to simultaneously measure the amount of foam, its liquid content, and its



bubble structure with respect to time. Here, the foam structure is analyzed in a video and the resulting bubble size distribution is shown in parallel.


Drop Shape

Method Overview | Drop Shape

A single drop of liquid can be very revealing. A drop lying on a coated or pretreated sample tells you everything about its wettability. A drop at a tip of a needle can give you an exact result of the surface or interfacial tension. If it rolls off at slight inclination, the surface has good self-cleaning properties. And when jetted by a print head, the drop's shape and flying behavior is closely linked to the printing quality.

To make drops hand over all this information, our instruments for drop shape analysis provide you with a wide range of methods for dispensing drops, capturing them in video images, and evaluating their shapes with powerful analysis algorithms.

Sessile drop
Contact angle of a drop on a solid surface

Sessile drop mapping
Automated position-dependent contact angle measurement and evaluation

Sessile drop top view analysis
Contact angle of a drop viewed from the top

Double sessile drop
Contact angles of two drops dosed in parallel

Captive bubble
Contact angle using a gas bubble beneath a solid surface in a liquid

Roll-off measurement
Roll-off behavior and advancing/receding contact angle of a drop on a tilted surface

Surface free energy
Surface free energy of a solid using contact angle data

Pendant drop
Surface or interfacial tension using the curvature of a drop or bubble at the tip of a needle

Oscillating pendant drop
Interfacial rheological behavior of a pendant drop or a bubble with periodically alternating volume

Inkjet
Volume, speed, and jetting behavior of drops produced at the nozzle of a print head

Cycle
Carrying out a measurement up to 20 consecutive times and displaying the results together

Adhesion analysis
Calculating adhesion-related scientific parameters for the interfacial contact

Liquid Polarity
Calculating the polar and disperse part of the surface tension from contact angle and surface tension data

Run by ADVANCE
On the following pages, instruments with this icon are supported by our ADVANCE software

Mobile Surface Analyzer – MSA

Tasks and applications

- Measurement on large workpieces and finished products such as automobile parts
- Determination of the wettability of solid materials before coating or bonding
- Quality assurance of cleaning steps as well as pre-treatment and coating processes
- Testing the effectiveness of hydrophobic coatings

Measuring methods and options

- Measurement of contact angle
- Calculation of surface free energy according to Owens-Wendt-Rabel-Kaelble, Wu, Zisman, Fowkes, and van Oss & Good

Measuring surface free energy in a second with only one click

Our innovative Mobile Surface Analyzer – MSA measures surface free energy with two liquids and fully automatically using our new “One-Click SFE” method. Using our twofold Liquid Needle dosing unit, the MSA doses two parallel drops with one click, followed by the direct analysis of the contact angles and the derived results of the surface free energy. All steps are automated and happen within a second. The results enable well-founded statements about wettability by aqueous or organic liquids. The MSA supports you in your quality assurance in the pre-treatment and coating of solid materials in an ideal way.

Non-destructive quality control

Also works on curved samples and even vertically or overhead

Specifications

Camera system	
Connection	USB 3.0
Performance	10 fps at 1000 × 700 px
Illumination	
Type	high power LED, adjustable
Dosing system	
Dosing	twofold Liquid Needle or single syringe
Resolution	0.1 µL

Contact angle	
Range	0 to 180°
Resolution	0.01°
Instrument dimensions	
Footprint	106 mm × 59 mm (W × D)
Height	112 mm
Weight	0.85 kg

Embedding the MSA in a robotic system

To make automated sample analysis complete, the MSA can be equipped with an adapter for using it in portal systems where a robotic arm does the job of positioning the instrument on the sample.

Communication with robotic control systems is easy to set up thanks to a remote control interface (API) of the ADVANCE software. Beyond the mere triggering of a measurement, its results and raw data as well as video images of analyzed droplets can be transferred automatically.

Drop Shape Analyzer – DSA Inkjet

Measuring options

- Triggering jetting of drops and carrying out fully automated image analysis of drops in flight
- Parallel video observation of the nozzles from below
- Fully automated image scale determination
- Long-term measurements and analysis of UV-curing inks
- Setting waveform and frequency for compatible print heads and watching the resulting drop behavior live

Measuring results

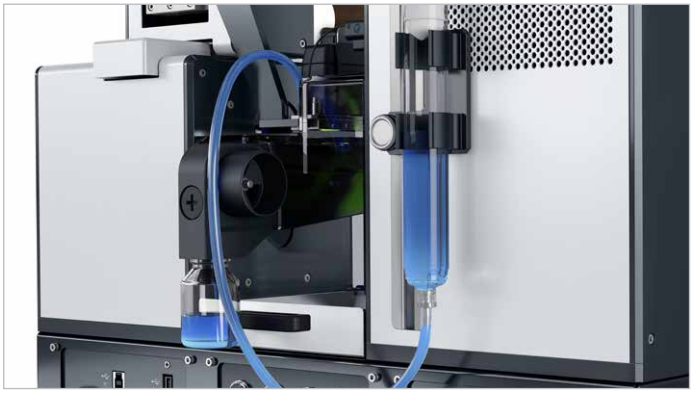
- Drop volume
- Drop dimensions and ligament length
- Speed
- Trajectory
- Number of drop parts

Watching out for precision printing

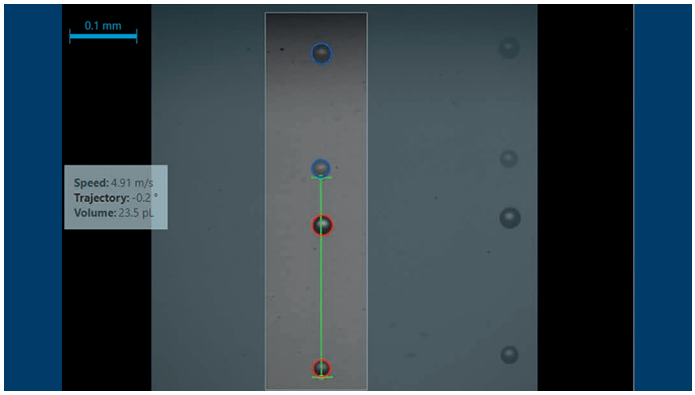
High quality inkjet printing makes the perfect interplay between print head control and the ink indispensable. We have developed the Drop Shape Analyzer – DSA Inkjet to support you in reaching this goal. The instrument incorporates an innovative optical system for analyzing the jet stream of ink droplets produced by the print head. Drop formation and analysis are exactly synchronized by triggering drop generation.

Sophisticated optical system for imaging drops and nozzles

Precise fine-positioning system for the print head



Ink management for long-term measurements



Live view and analysis of jetted drops

Specifications

Camera system	
Performance	CF04C: 25 fps at 1200 × 1200 px
Optics	
Zoom	6.5× microscope zoom, manual
Resolution	CF04C: 0.3 to 1.6 µm
Illumination	
Type	two high power monochromatic LEDs
Drop watcher mode	
Supported print heads	any, size up to 95 × ∞ × 200 mm (W × D × H)
Synchronization options	quadrature signal out in TTL and differential (EIA 422) form

Waveform tuning mode	
Supported print heads	RICOH MH5420/5440, MH5421/5441, MH5220
Waveform	adjustable in ADVANCE waveform editor
Optical measurement	
Image scale determination	fully automatic
Measurement range	
Drop volume	1 to 500 000 pL
Drop speed (center, leading edge)	0 to 40 m/s
Print frequency	drop on demand to 50 kHz
Additional results	

- trajectory (center, leading edge)
- number of drop parts
- drop dimensions (horizontal/vertical)
- drop position (center, leading edge)

Top View Analyzer – TVA100

Tasks and applications

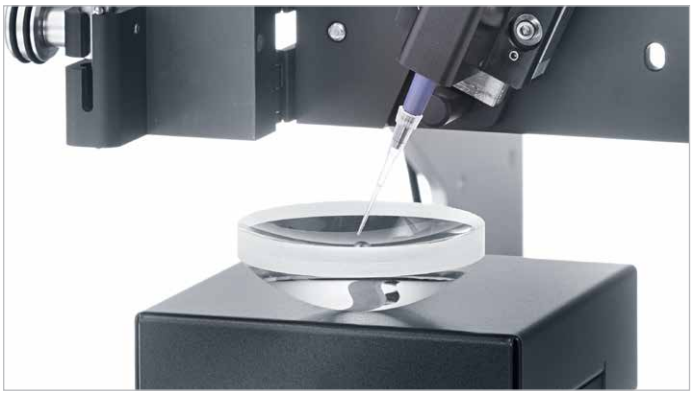
- Measurements in depressions of well plates
- Measurement between electronic components on populated boards
- Measurement on concave optical lenses
- Surface investigations for the interior of tubes and hoses

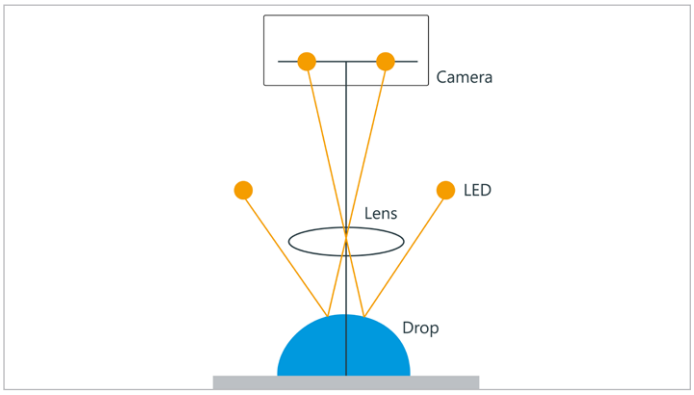
Measuring methods and options

- Measuring the contact angle using our top view distance method
- Special contact angle method for measuring in recesses
- Surface free energy from contact angles of several test liquids using all common models
- Particularly good resolution in the range of small contact angles
- Available as stand-alone instrument or as a measuring head module for DSA100, DSA30, or DSA25
- Easy measurements in patterns such as well plates

Instrument for measurements in depressions and on concave surfaces

Our Top View Analyzer – TVA100 is the only instrument in the world to use the top view distance method for measuring the contact angle of a liquid on a solid from above. The innovative measuring method is particularly suitable for measurements in depressions and on concave surfaces where drops cannot be analyzed using the conventional side view.





Measuring on a concave surface

Our exclusive top view distance method: how it works

With the top view distance method, the curvature of the surface of a drop, which correlates with the contact angle, is determined from the distance of reflected light spots in a video image. These light spots originate from LEDs, which are arranged above the drop.

Calculating the contact angle only requires variables which are determined by the setup: the working distance, the distance of the LEDs from one another, the optical enlargement, and the dosed drop volume.

Specifications

Camera system	
Connection	USB 3.0
Performance	CF03: up to 2000 fps
Optics	
Zoom	6.5× zoom, manual
Illumination	
Type	LED, adjustable

Dosing system	
Dosing	electronic pipette for precise drop generation
Resolution	0.01 µL
Minimum drop volume	0.2 µL
Capacity	10 µL
Contact angle	
Range	3.5° to 75 °
Accuracy	±0.1° (3.5° to 23°) ±1° (23° to 75°)

Drop Shape Analyzer – DSA100

Drop Shape Analyzer – DSA100E
(Expert configuration)

Tasks and applications

- Characterization of surface pre-treatment processes
- Investigation of the adhesion and stability of bonding and coating processes
- Investigation of coating substances in accordance with DIN 55660
- Checking the wettability of plastic, glass, ceramic, wood or metal
- Validating surface cleanliness

Measuring methods and options

- Contact angle between a liquid and a solid
- Surface free energy from contact angles of several test liquids using all common models
- Static contact angle, advancing angle, and receding angle
- Roll-off behavior on hydrophobic and superhydrophobic surfaces
- Measurement of surface tension and liquid-liquid interfacial tension using the pendant drop method
- Temperature-controlled measurements from -30 to 400 °C
- Measurements at controlled humidity
- Measurements on inclined surfaces

The universal, high-quality instrument for analyzing wetting and coating processes

Our Drop Shape Analyzer – DSA100 is our high-quality system solution for almost all tasks in the analysis of wetting and adhesion on solid surfaces. From the basic unit for precise measurement of the contact angle to the fully automatic expert instrument for series measurement of surface free energy (SFE), we have the suitable DSA100 for your special requirements. With our modular product philosophy, we are able to exactly match our instruments and accessories to your needs based on your specific surfaces and processes.

Drop Shape Analyzer – DSA100S
(Standard configuration)

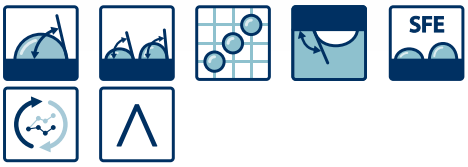
Drop Shape Analyzer – DSA100B
(Basic configuration)

Specifications

Camera system	
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Illumination	
Type	high power monochromatic LED
Dosing system	
Dosing	up to 8× software-controlled
Liquid Needle dosing (optional)	
Resolution	0.1 µL

Internal and external tilting	
Range	0 to 90°
Resolution	internal tilting: 0.01° | external tilting: 0.1°
Contact angle	
Range	0 to 180°
Resolution	0.01°
Interfacial and surface tension	
Range	0.01 to 2000 mN/m
Resolution	0.01 mN/m

Drop Shape Analyzer – DSA100L



Tasks and applications

- Characterization of large, pre-treated surfaces
- Investigation of the cleanliness of windows and frames
- Surface analysis for monitors and touch panels
- Characterization of automobile parts before coating or bonding
- Hydrophobicity analysis of ceramic tiles

Measuring methods and options

- Contact angle between a liquid and a solid
- Surface free energy from contact angles of several test liquids using all common models
- Static contact angle, advancing angle, and receding angle
- Measurement of surface tension and liquid-liquid interfacial tension using the pendant drop method
- Position-dependent surface free energy and contact angle measurement (mapping)

Automated wetting analysis of large samples

With the special version DSA100L of our Drop Shape Analyzer – DSA100, the instrument is fitted in a particularly wide frame and equipped with a large, rotating sample table plus an extra-long movement axis. Thanks to an adapted arrangement of the optics which is above the sample, almost the whole frame width is available for samples with an area of up to 500 × 500 mm.

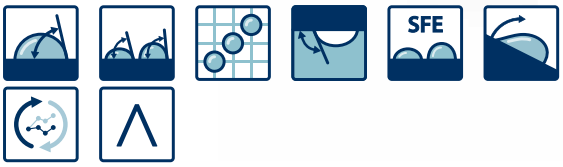
Fast, automated sample mapping of the surface free energy with an optional Liquid Needle dosing unit

Specifications

Camera system	
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Illumination	
Type	high power monochromatic LED
Dosing system	
Dosing	software-controlled syringe
Liquid Needle dosing (optional)	
Resolution	0.1 µL

Contact angle	
Range	0 to 180°
Resolution	0.01°
Interfacial and surface tension	
Range	0.01 to 2000 mN/m
Resolution	0.01 mN/m
Sample dimensions	
Max. sample space	700 × ∞ × 275 mm (W × D × H)
Max. measuring surface	500 × 500 mm
Instrument dimensions	
Footprint (W × D)	1000 × 375 mm
Height	490 mm

Drop Shape Analyzer – DSA100W



Tasks and applications

- Characterization of the cleaning and coating homogeneity of wafers
- Adhesion evaluation between wafer and coating
- Wetting investigation of exposed and unexposed photo varnish
- Ideal for analyzing other round samples, e.g. hard drives or brake disks

Measuring methods and options

- Contact angle between a liquid and a solid
- Surface free energy from contact angles of several test liquids using all common models
- Static contact angle, advancing angle, and receding angle
- Measurement of surface tension and liquid-liquid interfacial tension using the pendant drop method
- Position-dependent surface free energy and contact angle measurement (mapping)

Fully automatic quality testing of wafer surfaces

We have specially geared the DSA100W instrument configuration of our universal Drop Shape Analyzer – DSA100 towards the automatic, standardized quality control of wafer surfaces. Our DSA100W precisely determines the homogeneity of the cleaning of a wafer surface based on the contact angle. It also enables coatings to be characterized, for example by differences in wetting of exposed and unexposed photo varnish.

Fully automated drop positioning on a wafer

Specifications

Camera system	
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Illumination	
Type	high power monochromatic LED
Dosing system	
Dosing	software-controlled syringe
Liquid Needle dosing (optional)	
Resolution	0.1 µL

Rotation axis	
Control	software-controlled
Resolution	0.1°
Contact angle	
Range	0 to 180°
Resolution	0.01°
Interfacial and surface tension	
Range	0.01 to 2000 mN/m
Resolution	0.01 mN/m

Drop Shape Analyzer – DSA100M

SFE

Tasks and applications

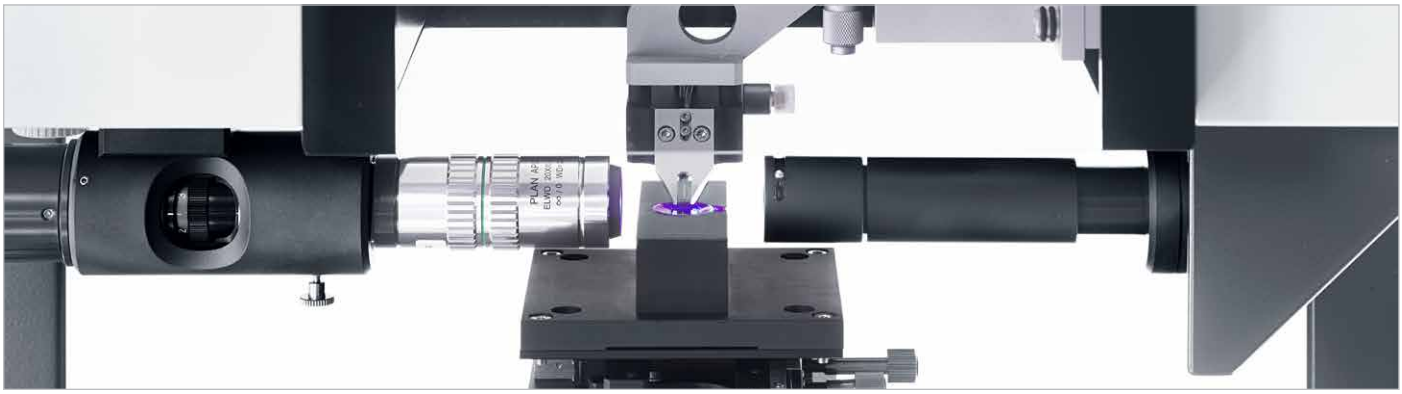
- Wettability measurement on small electronic parts
- Contact angle on hair and synthetic single fibers
- Investigating biocompatibility of dental implants
- Wetting of nozzles of an inkjet print head

Measuring methods and options

- Contact angle between a liquid and a solid
- Surface free energy from contact angles of two test liquids using all common models
- Static contact angle, advancing angle

The precision contact angle measuring instrument for microscopically small samples

Using precise microscope optics and a high-resolution, high-speed camera, the special micro configuration of our versatile DSA100 system solution is well-prepared for analyzing wetting for the smallest samples. The instrument enables drops in the picoliter range to be accurately dosed, which is additionally supported by separate observation optics for accurate positioning. The shape of the droplets is analyzed in order to measure the contact angle precisely. Our DSA100M helps you to optimize wetting and coating processes on very small surfaces such as hair or on microchip contacts.



Dosing and analyzing picoliter drops with DSA100M

Specifications

Camera system	
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Optics	
Zoom	6.5× microscope zoom, manual
Resolution	CF03: 0.1 to 0.8 µm CF06: 0.1 to 0.7 µm
Illumination	
Type	high power monochromatic LED

Dosing system	
Dosing	software-controlled
Resolution	fixed
Contact angle	
Range	0 to 180°
Resolution	0.01°

Drop Shape Analyzer – DSA100HP

Tasks and applications

- Surface tension of flooding solutions and their interfacial tension with oil under reservoir conditions
- Wettability and extraction of oil from oil-bearing rock
- Pressure extraction by means of liquefied gases, e.g. carbon dioxide
- Development of surfactants for liquid gases

Measuring methods and options

- Contact angle measurement using a sessile drop
- Surface tension of a liquid in gas or interfacial tension between two liquids using a pendant drop
- Upside-down pendant drop measurement of an oil drop in water
- Measurements at pressures up to 1750 bar and temperatures between -10 and 250 °C

Wetting and surface tension under extreme pressures and temperatures

The Drop Shape Analyzer – DSA100HP is our high-quality solution for the precise measurement of contact angle as well as surface and interfacial tension under high pressures and temperatures, primarily for tertiary oil recovery. The DSA100HP combines our Drop Shape Analyzer – DSA100 for optical drop shape analysis with a measuring cell for high-pressure applications up to 1750 bar. It determines the surface tension and analyzes the wetting of oil-bearing rock by surfactant solutions under the extreme pressure and temperature conditions found in reservoirs. The results help in the extraction of oil from layers of rock in the most effective manner using enhanced oil recovery (EOR) methods such as steam or surfactant flooding and thereby increase the yield. The instrument also reliably measures the wettability of gases which liquidize under pressure, for example for the optimization of extraction processes with carbon dioxide.

Sample positioning with closed pressure chamber

Either a gas or a liquid can be added as surrounding phase

Specifications

Camera system	
Connection	USB 3.0
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Optics	
Zoom	7× zoom, manual
Pressure control	
Maximum pressure	40 to 1750 bar (580 to 25 000 psi)
Temperature control	
Range	up to 250 °C

Material of pressure chamber	
Type	stainless steel, Hastelloy©, or Inconel©
Contact angle	
Range	0 to 180°
Resolution	0.01°
Interfacial and surface tension	
Range	0.01 to 2000 mN/m
Resolution	0.01 mN/m

Drop Shape Analyzer – DSA High Temperature

Tasks and applications

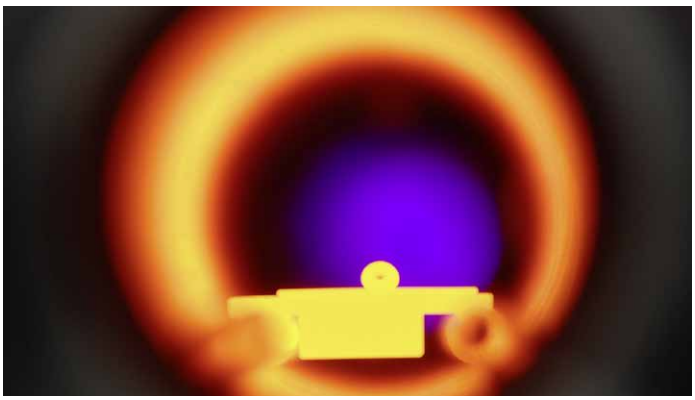
- Measuring adhesion and wetting of metal slags in smelting plants
- Detecting reactions between the glass and refractory bricks in glass production
- Optimizing wetting of the carrier material by enamel coatings
- Investigating the changes of the green body depending on temperature and time in ceramics production

Measuring methods and options

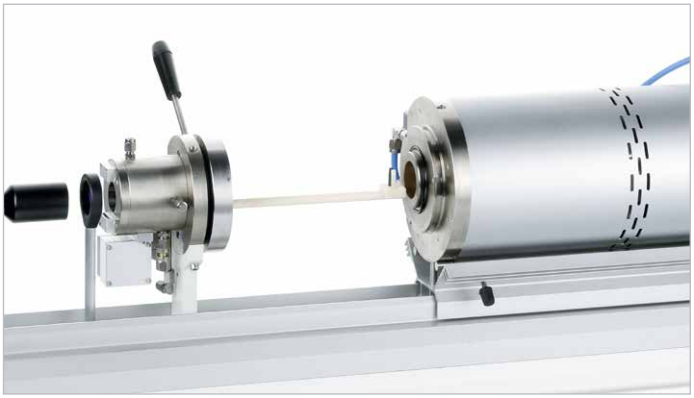
- Contactless wetting analysis using contact angle measurement at temperatures up to 2000 °C
- Observing and recording material deformation as a function of temperature and time
- Measurement in oxidizing or reducing atmosphere, under inert gas, or in vacuum

Get deep insights into the thermal behavior of materials

Our Drop Shape Analyzer – DSA High Temperature goes to the extreme when it comes to wetting and deformation analysis of melts and combustion residues. With temperatures up to 2000 °C in a various range of atmospheric conditions, the instrument analyzes melting solids and helps to understand the interactions that occur when melts come into contact with solid material. This knowledge supports you in optimizing combustion, firing, or coating processes in order to create stable end products, save energy during the process, or prolong the service life of your furnaces.



DSA High Temperature heating chamber



Easy sample loading into the chamber

Specifications

Camera system	
Connection	ethernet
Illumination	
Type	halogen, telecentric
Temperature control	
Heating elements	SiC, MoSi, graphite
Measuring system	Al_2O_3, graphite
Range	up to 2000 °C

Temperature measurement	
Accuracy	± 2.5 °C
Vacuum control	
Final value	down to 10^{-5} mbar
Contact angle	
Range	0 to 180°
Resolution	0.01°

Drop Shape Analyzer – DSA30

Drop Shape Analyzer – DSA30E
(Expert configuration)

Tasks and applications

- Characterization of surface pre-treatment processes
- Investigation of the adhesion and stability of bonding and coating processes
- Checking the wettability of plastic, glass, ceramic, wood or metal
- Validating surface cleanliness

Measuring methods and options

- Contact angle between a liquid and a solid
- Surface free energy from contact angles of several test liquids using all common models
- Static contact angle, advancing angle, and receding angle
- Measurement of surface tension and liquid-liquid interfacial tension using the pendant drop method
- Measurements on inclined surfaces
- Temperature-controlled measurements from -30 to 400 °C
- Measurements at controlled humidity

Contact angle measurement in quality control

Our Drop Shape Analyzer – DSA30 is a robust instrument which can be used flexibly for the precise measurement of contact angle and surface free energy (SFE). With high-quality components and various automation options, the DSA30 analyzes wetting and adhesion on solid surfaces. Fast measurements and simple operation make the instrument a valuable part of your routine quality control.

Drop Shape Analyzer – DSA30S
(Standard configuration)

Drop Shape Analyzer – DSA30B
(Basic configuration)

Specifications

Camera system	
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Illumination	
Type	high power monochromatic LED
Dosing system	
Dosing	up to 4× software-controlled + 1× manual
Liquid Needle dosing (optional)	
Resolution	0.1 µL

Internal tilting	
Range	0 to 90°
Resolution	0.01°
Contact angle	
Range	0 to 180°
Resolution	0.01°
Interfacial and surface tension	
Range	0.01 to 2000 mN/m
Resolution	0.01 mN/m

Drop Shape Analyzer – DSA30R

Tasks and applications

- Emulsions and foams for food or personal care
- Flooding mixtures and foam in enhanced oil recovery
- Demulsifiers
- Defoamers and antifoamers
- Surfactant research

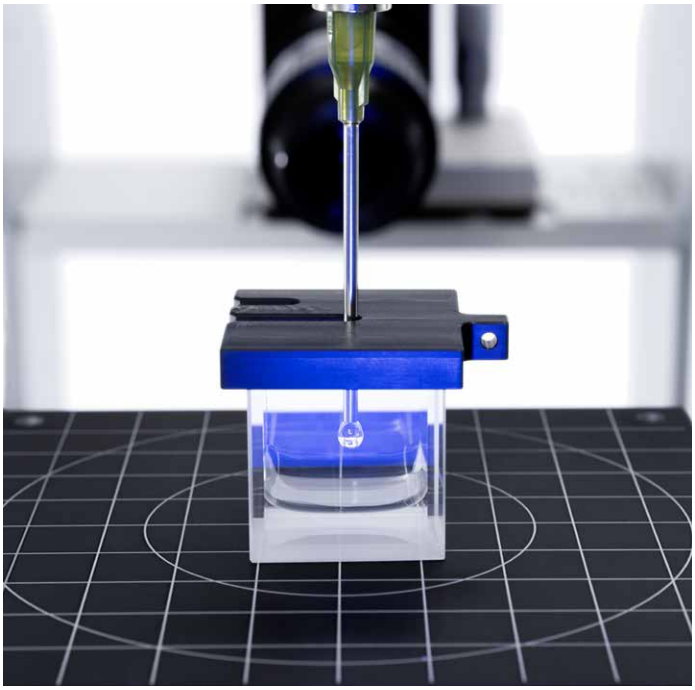
Measuring methods and options

- Measurement of interfacial rheological parameters such as the elastic modulus E' and viscous modulus E''
- Analysis of oscillating pendant or rising drops in a gaseous and liquid surrounding phase
- Measurements on oscillating rising gas bubbles
- Static surface and interfacial tension
- Measurement at temperatures ranging from -10 to 70 °C

Analyses in interfacial rheology – time-saving and reproducible

Emulsions and foams are constantly in motion during production or transport. The interfaces of droplets or bubbles are stretched during these processes. How such deformations impact on the stability of food and personal care products or influence the yield in tertiary crude oil production depends on how the surface tension or interfacial tension (SFT/IFT) responds to the stretching. Interfacial rheology measurements with the Drop Shape Analyzer – DSA30R provide the key to answering this question.

Oscillating Drop Module – ODM of the DSA30R



Analysis of oscillating pendant drop in a solvent-saturated atmosphere

Specifications

Camera system	
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Illumination	
Type	high power monochromatic LED
Dosing system	
Dosing	software-controlled
Maximum volume variation	2.5 µL
Viscosity range	max. 5000 mPas with needle NE45 max. 10 mPas with needle NE44
Frequency	0.001 to 20 Hz

Interfacial and surface tension	
Range	0.01 to 2000 mN/m
Resolution	0.01 mN/m
Oscillating drop	
Results	E, E', E'', phase shift
Programmable waveform	sine
Model	Lucassen

Drop Shape Analyzer – DSA30M

Tasks and applications

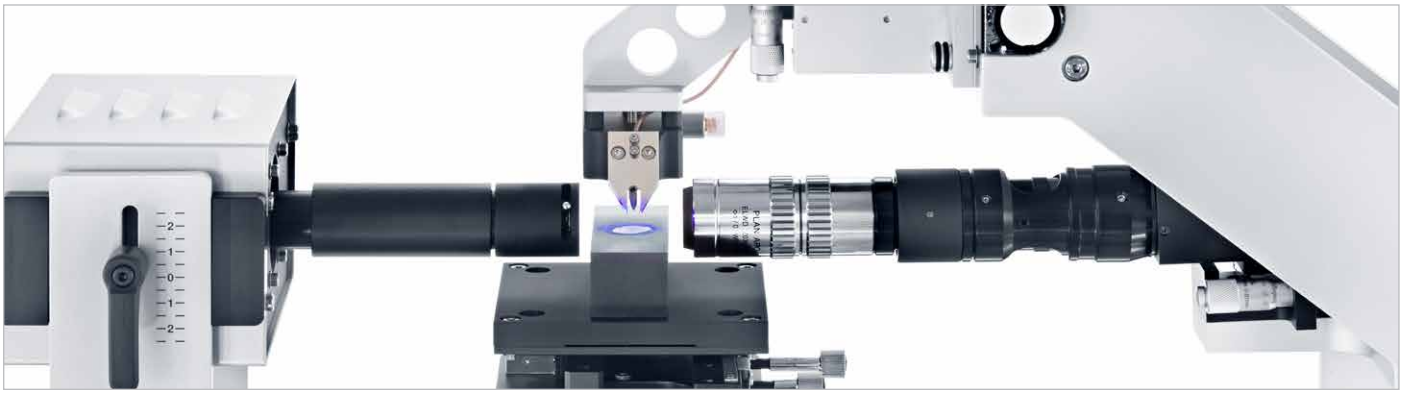
- Wettability measurement on small electronic parts
- Contact angle on hair and synthetic single fibers
- Investigating the biocompatibility of dental implants
- Wetting of nozzles of an inkjet print head

Measuring methods and options

- Contact angle between a liquid and a solid
- Surface free energy from contact angles of two test liquids using all common models
- Static contact angle, advancing angle

Precise wettability analysis on extremely small surfaces

The Micro configuration of our DSA30 was specially designed to investigate the contact angle on surfaces which require very small drops for analyzing them. The DSA30M solves this task with a picoliter dosing system and powerful microscope optics. The result is a versatile instrument that provides precise contact angle and surface free energy results for samples such as hairs or the screw windings of dental implants.



Dosing and analyzing picoliter drops with DSA30M

Specifications

Camera system	
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Optics	
Zoom	6.5× microscope zoom, manual
Resolution	CF03: 0.1 to 0.8 µm CF06: 0.1 to 0.7 µm
Illumination	
Type	high power monochromatic LED

Dosing system	
Dosing	software-controlled
Resolution	fixed
Contact angle	
Range	0 to 180°
Resolution	0.01°

Drop Shape Analyzer – DSA25

Drop Shape Analyzer – DSA25E
(Expert configuration)

Tasks and applications

- Characterization of surface pre-treatment processes
- Checking the wettability of plastic, glass, ceramic, wood or metal
- Validating surface cleanliness

Measuring methods and options

- Contact angle between a liquid and a solid
- Surface free energy from contact angles of several test liquids using all common models
- Static contact angle, advancing angle, and receding angle
- Measurement of surface tension and liquid-liquid interfacial tension using the pendant drop method
- Temperature-controlled measurements from -30 to 400 °C
- Measurements at controlled humidity
- Measurements on inclined surfaces

The basic instrument for wetting investigations

Our Drop Shape Analyzer – DSA25 is an easy-to-use, reliable instrument for measuring contact angle. From a simple wetting test to the accurate measurement of surface free energy (SFE), the robust instrument provides flexible options for analyzing wetting and adhesion on solid surfaces. Its rapid, manual operation makes our DSA25 outstandingly suitable for occasional wetting measurements with changing tasks and sample types.

Drop Shape Analyzer – DSA25S (Standard configuration)

Drop Shape Analyzer – DSA25B (Basic configuration)

SFE measurement with two drops using the Liquid Needle

View on a pendant drop for measuring surface tension

Specifications

Camera system	
Performance	CF04: up to 2300 fps CF06: up to 3400 fps
Illumination	
Type	high power monochromatic LED
Dosing system	
Dosing	up to 3x software-controlled
Liquid Needle dosing (optional)	
Resolution	0.1 µL

External tilting	
Range	0 to 90°
Resolution	0.01°
Contact angle	
Range	0 to 180°
Resolution	0.01°
Interfacial and surface tension	
Range	0.01 to 2000 mN/m
Resolution	0.01 mN/m

Tilting Tables

External tilting tables

DSA100 with External Tilting Table PA3220

DSA25 with External Tilting Table PA4020

Our external tilting devices are special units for the flexible analysis of inclined surfaces. Measuring the resulting drop deformation and the tilt which leads to the drop running off enables conclusions to be drawn relating to roughness and adhesion. The roll-off angle is informative for superhydrophobic samples and is accurately measured with slow tilt movements.

As the whole instrument is tilted, the surface is always in the same position relative to the lens. This makes the video evaluation very easy and changes in the drop can also be tracked visually. Almost all other measuring methods and options provided by your instrument can be used without changing the setup.

- Angle of inclination up to 90° with a resolution of 0.1° for DSA100 and 0.01° for DSA25
- Accuracy of 1.0° for DSA100 and 0.5° for DSA25
- Tilt speed from 0.1°/s to 4.5°/s
- Video recording starts automatically when tilting begins

	DSA100	DSA25
Model name	PA3220	PA4020

Internal tilting table

DSA30 with Internal Tilting Table PA4240

We have developed the internal tilting table for software-controlled wetting analyses on inclined surfaces with high dosing flexibility. With this tilting solution the dosing unit remains vertical, thus enabling drops to be deposited or dropped onto the already inclined surface in a defined way. This is a common method for measuring the roll-off angle. Furthermore, the system also reliably analyzes drop deformation.

The low weight enables angular resolution, precision, and possible tilt speed to be maximized. The internal table is also ideal when little space is available for the frame of an external tilting device.

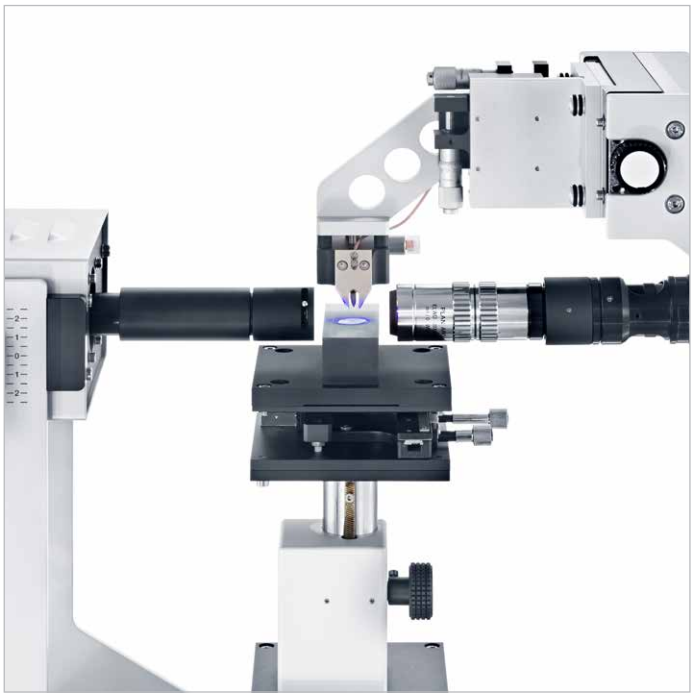
- Angle of inclination up to 90° with a resolution of 0.01°
- Accuracy of 0.3° ± 0.1°
- Tilt speed from 0.5°/s to 50°/s
- Video recording starts automatically when tilting begins
- Optional tilting table support ST13 can be fitted for finely adjusting the dosing position

	DSA100	DSA30
Model name	PA3240	PA4240

Measurement Modules

Micro-drop analysis

DSA100 with Micro-Drop Analysis Module



DSA30 with Micro-Drop Analysis Module

The modules for drop volumes down to 20 pL or down to 60 pL equip your DSA100 and DSA30 for precisely analyzing the wetting of tiny samples. The conversion option enables you to switch the measuring mode from conventional drop dosing to micro-drop analysis without the need for a second instrument frame.

The high-quality microscope lens and the particularly powerful special lighting ensure a clear, sharp image of the drop. The different dosing units of the two modules produce drops from 20 pL and 60 pL respectively, which are placed with pinpoint accuracy with the help of a micro-positioning unit. A micro-sample table supplied with each unit enables the sample to be finely positioned with great accuracy. Both modules also include practical accessories for cleaning and liquid degassing.

Drops	DSA100	DSA30
≥ **20 pL**	CK3232	CK4232
≥ **60 pL**	CK3234	CK4234

Alternatively, we have put the necessary accessories for micro-drop analyses together in the instrument configurations DSA100M and DSA30M.

Interfacial rheology

DSA30 with Oscillating Drop Module

The Oscillating Drop Module for the DSA100 and DSA30 is used for analyzing drops to measure interfacial rheological properties of liquids. In doing so, the change in the surface or interfacial tension is measured as a drop specifically changes in size. The magnitude of the change is mathematically divided into an elastic and viscous component (elasticity and viscosity modulus). The results provide information on the mechanical and time-dependent stability of foams, films, and emulsions.

During the measurement, a pendant drop is produced, the size of which is changed periodically with accurately controlled amplitude and frequency. The piezo unit of the module produces an exactly sinusoidal oscillation which guarantees a reliable evaluation. The camera of the instrument then records a video of the oscillating drop with very high image quality. This video is automatically evaluated, frame by frame, to precisely calculate the elasticity and viscosity modulus.

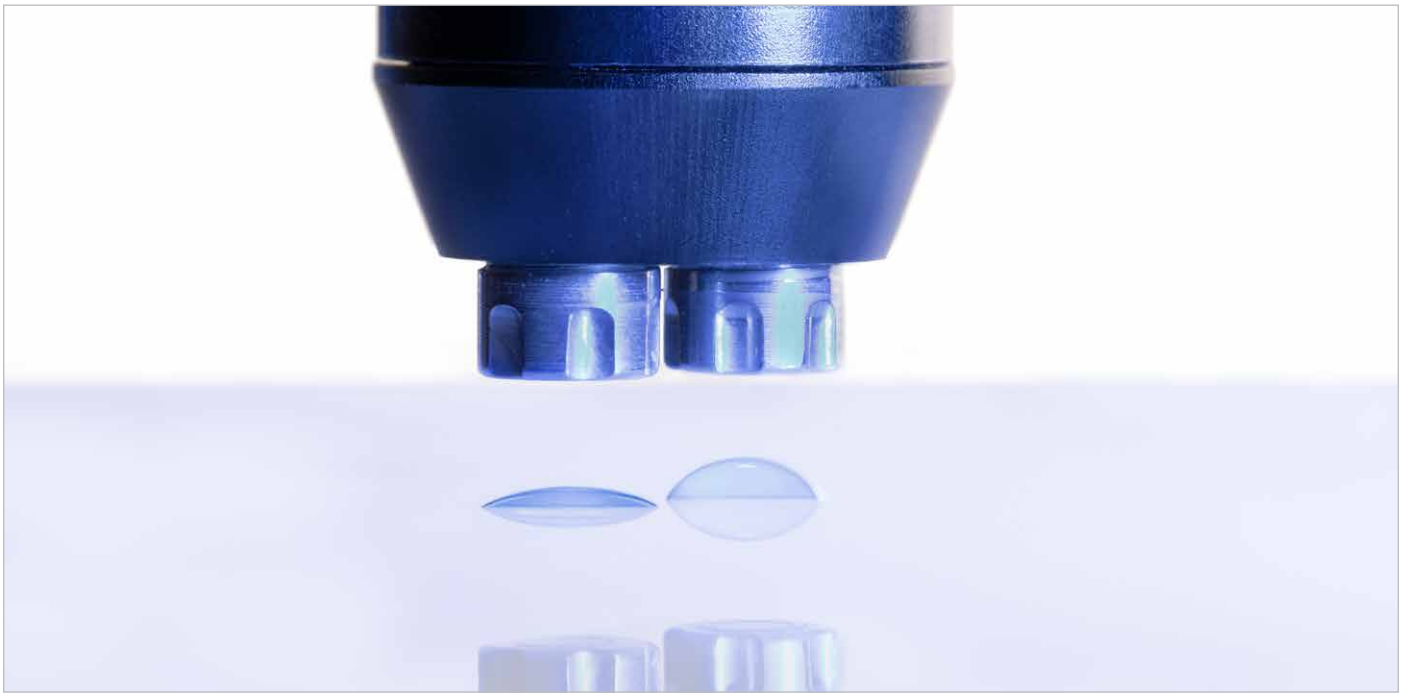
The module includes the following components:

- Piezo unit for dosing drops and specifically changing their size with associated electronics board
- ADVANCE software module for calculating interfacial rheological parameters from the raw data

The module is already included in the instrument configuration DSA30R, which we have specially put together for interfacial rheology.

Dosing Units

Twofold Liquid Needle dosing unit



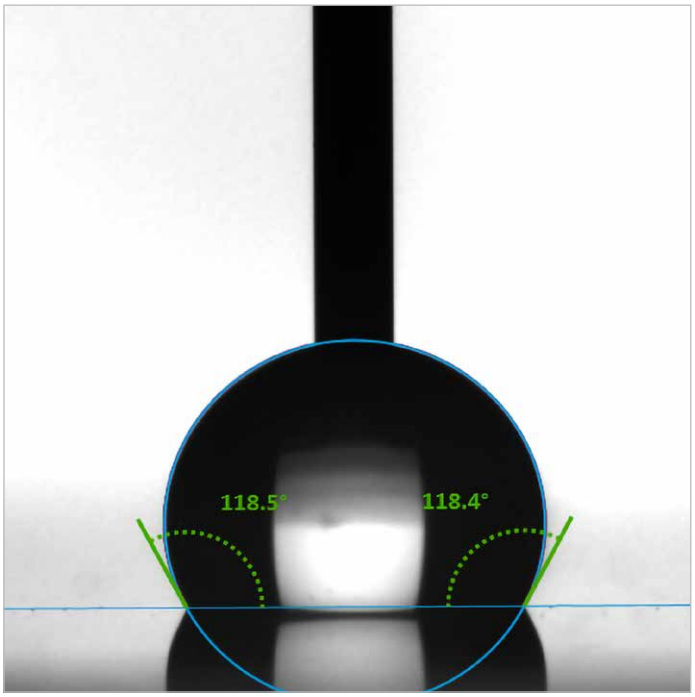
Twofold Liquid Needle dosing unit for extremely fast SFE measurements

Our automatic twofold dosing module performs fully automated surface free energy (SFE) determinations, using our Liquid Needle technology. The dosing unit dispenses and analyzes two drops of different test liquids in parallel. The entire process from dosing start to SFE calculation is fully automatic and complete within a second.

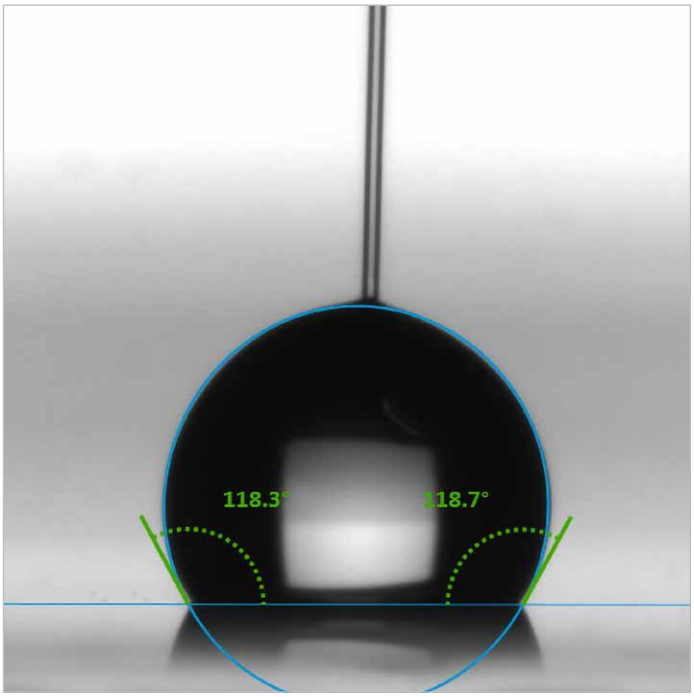
The cartridges of the easy-to-handle unit can be removed quickly and filled directly with test liquids. One filling is enough for approximately 1000 SFE determinations.

- Dosing of two drops in less than 0.1 seconds
- Measuring surface free energy (SFE) in less than 1 second
- Keeps dynamics low to measure contact angles reliably
- 1000 SFE determination with one cartridge filling

	DSA100	DSA30	DSA25
Model name	DS3252	DS3252	DO3252



Dosing with solid needle



Dosing with Liquid Needle

The Liquid Needle: Revolutionary dosing technology with proven validity

The patented Liquid Needle is an extremely thin jet of liquid which is created through a dosing nozzle using pressure. The dynamics are just sufficient to form a continuous stream of liquid while dosing, but small enough to avoid influencing the contact angle.

Dosing can be carried out much faster with the Liquid Needle compared to a solid needle, with the extra benefit of a user-independent dosing process. Furthermore, dosing drops on very hydrophobic samples is easier because the drop does not have to detach from a solid needle.

The validity of the Liquid Needle method was proven in a thorough scientific study in which contact angles were measured on a broad range of samples.

Find out more: **kruss-scientific.com/liquidneedle**

Watch our video: **kruss-scientific.com/v-liquidneedle**

Manual single syringe dosing unit

DSA30 with manual single syringe dosing unit

With the dosing unit, drops of a single liquid can be manually dosed in a simple way. The slowly advancing forward feed ensures gentle dosing so that the shape of the drop is not affected. The high-quality glass syringe SY20 is suitable for almost all substances and also enables low-viscosity liquids to be dosed in a controlled manner. Tubeless direct dosing and the option of using disposable syringes make the dosing unit suitable for hazardous substances and contaminating liquids.

	DSA100	DSA30	DSA25
Model name	DS3205	DS3205	DO3205

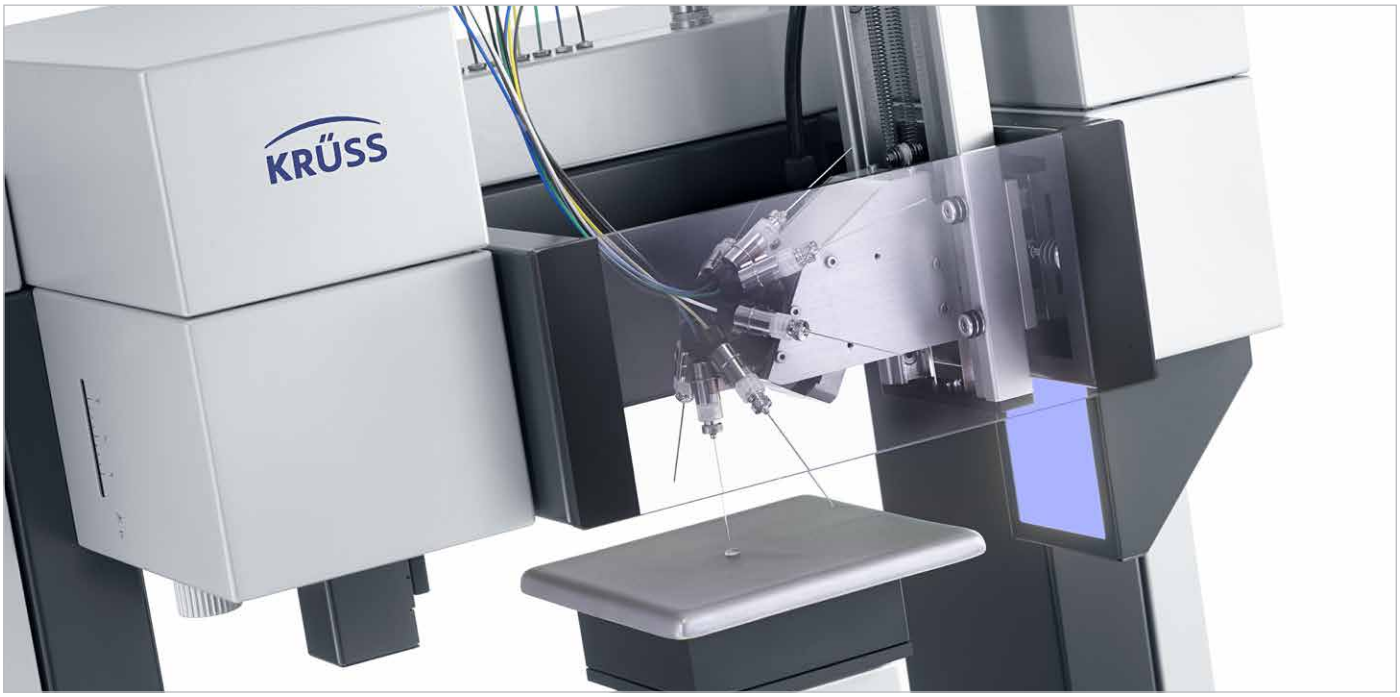
Software-controlled single syringe dosing system

DSA100 with software-controlled dosing unit for one liquid

The software-controlled dosing system produces drops with accurately reproducible volume for measuring contact angle and surface tension. The uniform dosing feed can be set to a very slow speed in order to accurately measure the advancing angle and the receding angle. Tubeless direct dosing and the option of using disposable syringes make the dosing unit suitable for hazardous substances and contaminating liquids.

	DSA100	DSA30	DSA25
Model name	DS3210	DS4210	DO4011

Software-controlled multi syringe dosing system



DSA100 with software-controlled multi-dosing system

Our multi-dosing system equips the DSA100 for the fully automatic dosing of 2 to 8 liquids and the DSA30 of 2 to 4 liquids. The motorized lift automatically actuates the dosing height or places the drop carefully on the sample. The software organizes even highly complex dosing and measuring sequences and, especially when combined with motorized axes. For example, the surface free energy of a solid can be determined using several liquids in a single measuring sequence.

Thanks to the large dynamic range of 10 to 1400 µL/min, the dosing feed can be set to a very slow speed to accurately measure the advancing and receding angle. On the other hand, service functions such as filling a syringe are carried out very quickly. An additional manual syringe can be used for measuring surface tension or analyzing contaminating liquids, for example.

Number of liquids	DSA100	DSA30
2	DS3222	DS4222
3	DS3223	
4	DS3224	DS4224
5	DS3225	
6	DS3226	
7	DS3227	
8	DS3228	

Temperature Control Equipment

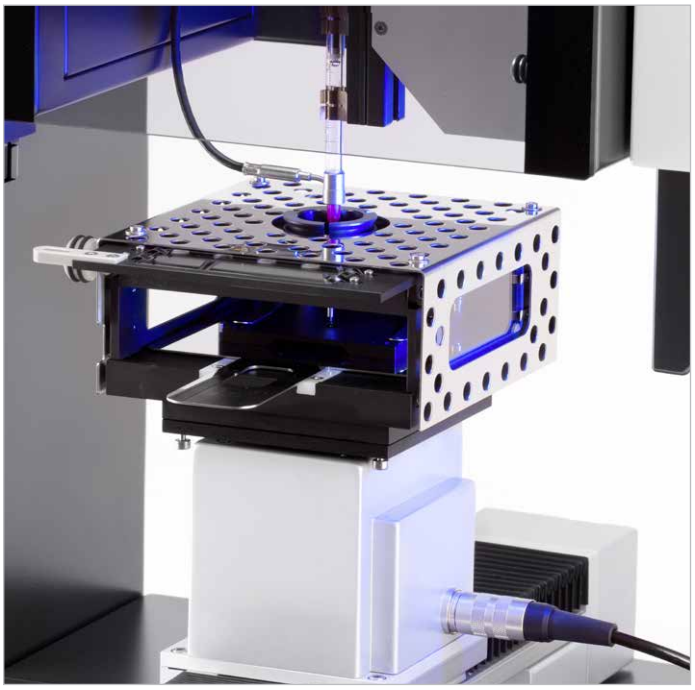
TC21
Temperature-controlled chamber for high temperatures

- Electrically controlled temperature between 50 and 400 °C
- Precision temperature sensor included
- Ideal in combination with the high-temperature dosing unit DS3241/DS4241

The temperature-controlled chamber TC21 enables liquid and solid surfaces to be analyzed at temperatures up to 400 °C. The target temperature is easy to specify and is reliably achieved at defined heating rates. The chamber's excellent insulation ensures stable equilibrium during the measurement. With the help of the accurate temperature sensor, the current value is recorded by the software together with the contact angle or the surface tension.

	DSA25	DSA30	DSA100
TC21	✓	✓	✓

TC11
Temperature-controlled chamber for large samples

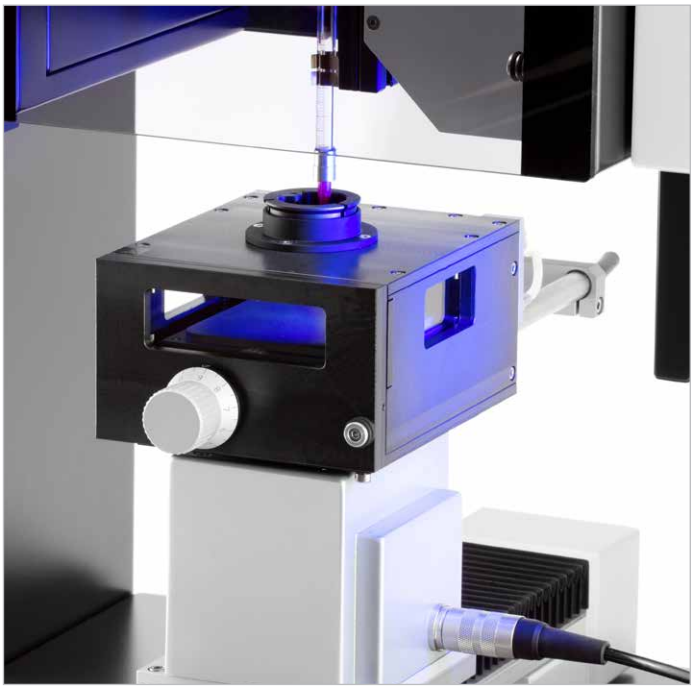


- For sample sizes up to 132 × 132 × 27 mm (W × D × H)
- Temperature range between -10 and 130 °C (suitable thermostats are available)
- Precision temperature sensor included
- Inert gas connector provided

The temperature-controlled chamber TC11 has been specially developed for measuring the contact angle on large samples at temperatures up to 130 °C. The slide-in sample tray is conveniently loaded outside the chamber and can be moved from the outside when the chamber is closed and at the required temperature. Small samples are prevented from shifting by means of removable holding clamps. The front viewing window simplifies dosing in the required sample position.

	DSA25	DSA30	DSA100
TC11	✓	✓	✓

TC30
Temperature-controlled chamber up to 90 °C

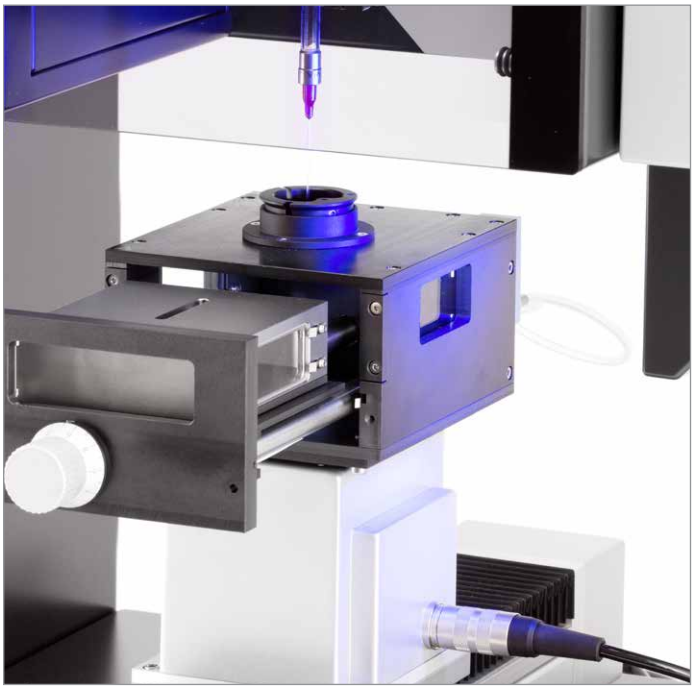


- Temperature range between 5 and 90 °C (suitable thermostats are available)
- Precision temperature sensor included
- Inert gas connector provided
- Can be ideally combined with the humidity chamber HC10

The wettability of solid samples can be reliably analyzed at temperatures up to 90 °C with the help of the temperature-controlled chamber TC30. The well-sealed and insulated plastic housing and a copper heat-conducting hood ensure stable thermodynamic equilibrium. Gas purging of the viewing windows is effective against condensation. The dosing position can be conveniently adjusted from the outside when the chamber is closed and at the required temperature.

	DSA25	DSA30	DSA100
TC30	✓	✓	✓

TC40
Temperature-controlled chamber for rapid changes



- Fast electrical temperature control between -30 and 160 °C
- Precision temperature sensor included
- Inert gas connector provided
- Can be combined with the humidity chamber HC10 between 5 and 90 °C

With rapid temperature changes between -30 and 160 °C, the temperature-controlled chamber TC40 is our versatile solution for wettability analyses under different thermal conditions. The insulating plastic housing and a heat-conducting copper hood ensure a uniform, stable internal temperature. A gas flow can be connected in order to avoid condensation and icing of the viewing windows. The dosing position can be conveniently adjusted from the outside when the chamber is closed and at the required temperature.

	DSA25	DSA30	DSA100
TC40	✓	✓	✓

TC3213
Temperature-controlled unit for liquids

- Temperature range -10 to 130 °C (suitable thermostats are available)
- Precision temperature sensor included
- Also suitable in combination with temperature-controlled chambers TC11, TC30, and TC40

The unit TC3213 brings liquids for measuring contact angle or surface tension to the required temperature of up to 130 °C. Embedded in a heat-conducting metal sleeve, the filled syringe (additionally available) quickly reaches the desired temperature. With the help of a sensor, the temperature is measured directly at the syringe and assigned to the measurement in the software. The unit is easy to fit and ideally complements your software-controlled or manual single dosing unit.

	DSA25	DSA30	DSA100
TC3213	✓	✓	✓

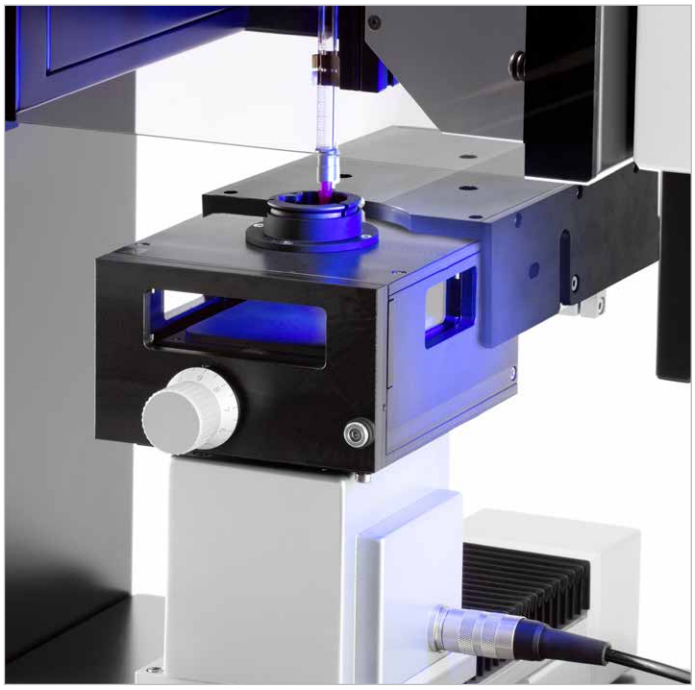
DS3241/DS4241
High-temperature dosing units

- Large temperature range of 50 to 400 °C
- For polymers, hotmelts or any other melts
- Exchangeable melting chamber for easy cleaning

We have designed the dosing units DS3241 for DSA100 and DS4241 for DSA30 specially for analyzing the wetting and surface tension of melts at temperatures between 50 and 400 °C. The melting cylinder is conveniently filled in the cold state and then heated rapidly in a controlled way. Dosing is carried out precisely with the help of a micrometer screw, thus easily producing a drop of the desired size. The DS3241 or DS4241 are ideal when used in combination with the temperature-controlled chamber TC21 for temperature control of samples to measure the contact angle.

	DSA30	DSA100
DS3241	-	✓
DS4241	✓	-

HC10
Humidity chamber



- Relative humidity (without insulating hood): 15 to 85% at 22 °C, up to 89% at 10 to 15 °C, up to 5% at 70 to 90 °C
- Time to achieve target value: 20 to 300 s
- External compressed air supply required (3 to 6 bar, very dry air), a suitable compressor is available
- Temperature range between 5 and 90 °C (suitable thermostats are available)

The wettability of a surface is affected by the climatic ambient conditions. Using the humidity chamber HC10 in combination with the temperature-controlled chamber TC30 or TC40 enables you to measure contact angles at precisely controlled humidity and temperature. At temperatures above 50 °C and humidities above 65%, we recommend using the insulating hood TC3200. Inserted into the temperature-controlled chamber, this enables the target humidity to be reached even more quickly and maintained with increased stability.

	DSA25	DSA30	DSA100
HC10	✓	✓	✓

Tensiometers

Method Overview | Tensiometers

As the provider with the largest portfolio in the area of tensiometry, we are not just keepers of a collection of methods. Each of our many approaches for determining surface and interfacial tension as well as the contact angle illuminates another aspect of the behavior of interfaces in general and surfactants in particular.

Let us show you around and discover methods for analyzing the static and dynamic behavior of surfactants, the stability of emulsions and dispersions, or the circumstances under which the interfacial tension becomes small enough for a microemulsion.

Bubble pressure
Dynamic surface tension using the Laplace pressure of a gas bubble at a capillary in a liquid

Sorption
Contact angle between a liquid and porous material using the capillary force

Liquid density
Density determination of a liquid using the buoyancy of a probe immersed in the sample

Solid density
Density determination of a solid using the buoyancy of the sample immersed in a liquid

Sedimentation
Sedimentation speed of a dispersion

Drop volume
Dynamic surface or interfacial tension using the volume of a drop when it detaches from a capillary

Penetration
Penetration resistance of a sediment against a probe

Wilhelmy contact angle
Contact angle using the wetting force of a liquid at a solid sample

Spinning drop IFT
Interfacial tension using the diameter or curvature of a drop of a light phase inside a heavy phase in a rotating capillary

CMC
Automated determination of the critical micelle concentration by measuring the SFT at different concentrations

Ring SFT/IFT
Surface/interfacial tension using the tensile force of a lamella underneath a ring

Lamella tear-off SFT/IFT
Surface/interfacial tension using the tensile force of a lamella which is stretched until it disrupts

Wilhelmy SFT/IFT
Surface/interfacial tension using the wetting force of a liquid at a platinum plate or rod

Liquid Polarity
Calculating the polar and disperse part of the surface tension from contact angle and surface tension data

Surface free energy
Surface free energy of a solid using contact angle data

Adhesion analysis
Calculating adhesion-related scientific parameters for the interfacial contact

Special purpose
Using a force sensor and a software-controlled sample stage for freely defined procedures

Cycle
Carrying out a measurement up to 20 consecutive times and displaying the results together

Run by ADVANCE
On the following pages, instruments with this icon are supported by our ADVANCE software

Bubble Pressure Tensiometer – BPT Mobile

Tasks and applications

Checking the content of cleaner or wetting agent in a bath is an important QC task in many industrial processes:

- Cleaning as a preparation step before coating or bonding
- Electroplating
- Coating of solar cells
- Etching, e.g. for circuit boards

Measuring methods and options

- Bubble Pressure method: SFT is measured using the internal pressure of a bubble at an immersed capillary
- Monitoring at a single surface age with evaluation based on pre-defined limits
- Determination of surfactant concentration based on SFT
- Continuous measurement of SFT while changing the concentration
- Determination of the SFT dependent on surface age between 10 and 30 000 ms
- Temperature measurement and documentation

Mobile quality control for cleaning and coating baths

Industrial quality assurance is about reliability, speed, and ease of use. When it comes to regular checks of the cleaner or wetting agent content in a bath, our Bubble Pressure Tensiometer – BPT Mobile is prepared for these demands.

Immerse – click – read out: Capture the surfactant content of your bath within seconds using surface tension with our BPT Mobile. The quality inspector using it knows immediately whether the bath is okay thanks to an ad-hoc evaluation. Moreover, for proactive adjustment of the bath, the BPT Mobile shows how the surfactant content decreases over time. With the intuitive touch display, working with the BPT Mobile is almost like doing quality tests with a smartphone.

The touch display responds reliably even when using gloves

The instrument works independently from the immersion depth

Specifications

Pressure measurement	
Maximum pressure	1.25 kPa
Temperature measurement	
Range	0 to 100 °C
Surface tension	
Surface tension range	10 to 100 mN/m
Resolution	0.1 mN/m
Surface age range	10 to 30 000 ms

Touch display	
Integrated color IPS display	480 × 854 px, size 5“
Power supply	
Battery	10 h operating time
Dimensions	
Size	85 mm × 55 mm (W × D)
Height	220 mm
Weight	600 g

Bubble Pressure Tensiometer – BP100

Tasks and applications

- Surfactant development
- Optimization of spray processes
- Development of washing and cleaning processes
- Optimization of painting and printing processes
- Checking the surfactant content in galvanic and cleaning baths

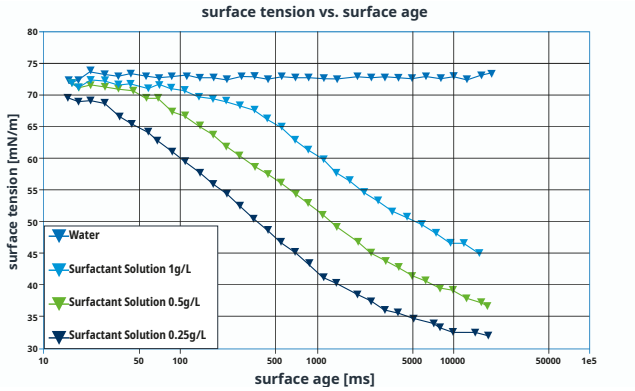
Measuring methods and options

- Measurement of surface tension as a function of surface age
- Long-term measurement of surface tension at constant surface age
- Determination of adsorption coefficient and diffusion coefficient
- Calculation of the surface tension of the solvent and the equilibrium surface tension (extrapolation in accordance with Hua & Rosen)
- Temperature control from -10 to 130 °C, temperature measurement with internal sensor

Analysis of surfactant solutions for dynamic processes

Our Bubble Pressure Tensiometer – BP100 measures dynamic surface tension with high accuracy. It reliably analyzes the mobility of surfactants, thus enabling high-speed processes such as spraying, coating, printing, and cleaning to be optimized. Our BP100 covers a wide speed range as part of a single, fully automatic measuring process. This enables you to find out how quickly a surfactant acts and when the required surface tension has been reached. In this way, the BP100 assists in the development, selection and dosing of surfactants optimized for your process.

Sample stage with intergrated temperature control



Dynamic behavior of a surfactant at different concentrations

Specifications

Pressure measurement	
Maximum pressure	3000 Pa
Measurement rate	20 kHz
Sample stage	
Travel distance	>110 mm
Travel speed	0.1 to 500 mm/min

Temperature control	
Range	-10 to 130 °C
Surface tension	
Surface tension range	10 to 100 mN/m
Resolution	0.01 mN/m
Surface age range	5 to 200 000 ms

Drop Volume Tensiometer – DVT50

Tasks and applications

- Development of emulsifiers in the pharmaceutical and cosmetics industry
- Emulsion stability in food production
- Emulsion formation and demulsification in enhanced oil recovery (EOR)
- Mobilization of oily dirt during cleaning
- Testing the aging status of insulating oils as specified in IEC 62961:2018

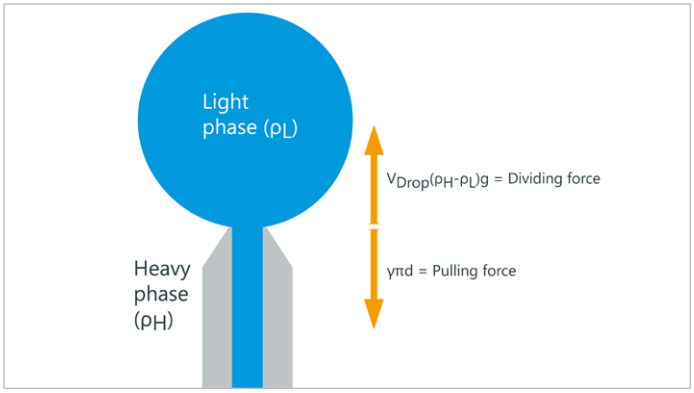
Measuring methods and options

- Dynamic interfacial tension using rising drops of the lighter liquid
- Dynamic interfacial tension using descending drops of the heavier liquid
- Dynamic surface tension using falling drops
- Temperature control from -10 to 90 °C, temperature measurement with internal sensor

Analysis of emulsions under dynamic conditions

Surfactants as emulsifiers reduce the interfacial tension between liquids which otherwise do not easily mix. As this takes a certain time, the effect of an emulsifier depends on the mixing dynamics. With our Drop Volume Tensiometer – DVT50, you can measure the speed with which emulsifiers act at the interface. The wide speed range of the analysis enables the dynamic mixing behavior as well as the stability of an emulsion to be determined. The analyses help you to precisely optimize and dose emulsifiers and to evaluate phase interactions at different speeds.

Fully automatic liquid dosing for investigating two-phase systems



Measuring principle of a drop volume tensiometer

How the drop volume method of the DVT50 works

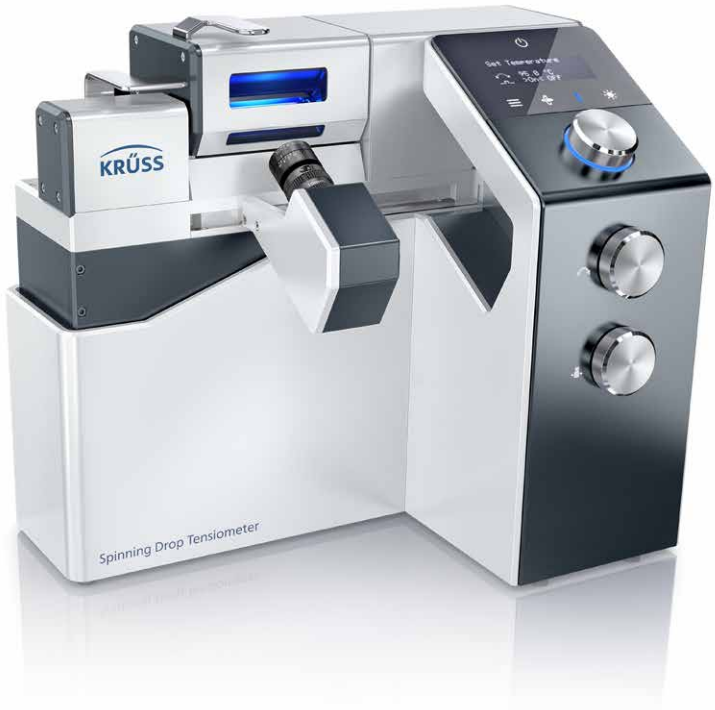
In the drop volume method, a liquid is introduced into a bulk phase through a capillary. As a result of the interfacial tension, the drop tries to keep the interface with the bulk phase as small as possible. As a new interface comes into being when the drop detaches from the capillary outlet, it is necessary to overcome the corresponding interfacial tension. The drop does not detach until the lifting force or weight compensates the interfacial tension. This means that, knowing the density difference between the phases, the interfacial tension can be calculated from the volume. Drop detachment is detected using a light barrier and the volume is known due to the precisely set flow rate.

Specifications

Volume measurement	
Maximum volume	220 µL
Resolution	1 nL
Measurement rate	4 Hz
Syringe drive	
Syringe volume	50 to 2500 µL
Flow rate	0.265 to 1985 µL/min
Resolution	0.001 µL
Automation	
Fully automatic refill	yes

Interfacial and surface tension	
Range	0.1 to 100 mN/m
Resolution	0.001 mN/m
Temperature control	
Range	-10 to 90 °C
Flow-through thermostat	optional
Temperature measurement	
Range	-20 to 150 °C
Resolution	0.1 °C

Spinning Drop Tensiometer – SDT



Tasks and applications

- Development of emulsions
- Enhanced oil recovery (EOR)
- Bioavailability of drugs
- Surfactant research
- Adsorption properties at phase boundaries

Measuring methods and options

- Measurement of interfacial tension in a wide range starting from 10^{-6} mN/m
- Analysis using the drop diameter according to Vonnegut
- Analysis using the drop shape curvature according to Young-Laplace
- Long-term measurement for analyzing surfactant dynamics
- Temperature-dependent analyses

Measurement of interfacial tension in an extremely wide range with especially simple sample exchange

Our Spinning Drop Tensiometer – SDT measures interfacial tension with a high degree of accuracy and a particularly wide measuring range. The SDT is the ideal solution for the quality control and development of emulsions and surfactants thanks to its enormous bandwidth, small sample volumes, and simple handling during preparation. Exact capture of extremely low interfacial tensions also makes the SDT an instrument particularly well-suited for analyzing the interfacial behavior of mini- and micro-emulsions, for example for tertiary oil recovery or the pharmaceutical industry.

Patented capillary concept for quick sample exchange

Clearly arranged display

SDT with tilted measuring unit

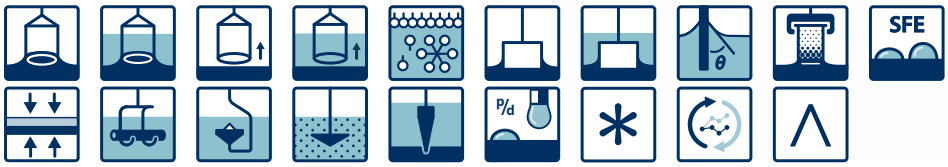
Camera parking position of the SDT

Specifications

Camera system	
Performance	15 fps
Illumination	
Type	high power monochromatic LED and stroboscope
Sample stage	
Tilting	±20°
Capillary drive	
Resolution	0.1 rpm

Temperature	**control**	**measurement**
Range	-10 to 120 °C	-10 to 180 °C
Interfacial tension		
Range	10^{-6} to 2000 mN/m	
Resolution	10^{-6} mN/m	

Force Tensiometer – K100



Tasks and applications

- Determination of the effectiveness and efficiency of surfactants by CMC measurement
- Wetting behavior of tablets, pharmaceutical active ingredients, and excipients
- Wetting of varnishes and paints
- Analyzing the aging status of oils according to ASTM D 971 and IEC 62961
- Wetting and adhesion of coatings
- Development of cosmetic products
- Wetting properties of inks
- Wetting of fiber bundles and textiles
- Sedimentation and ductility of dispersions
- Checking of surface modifications

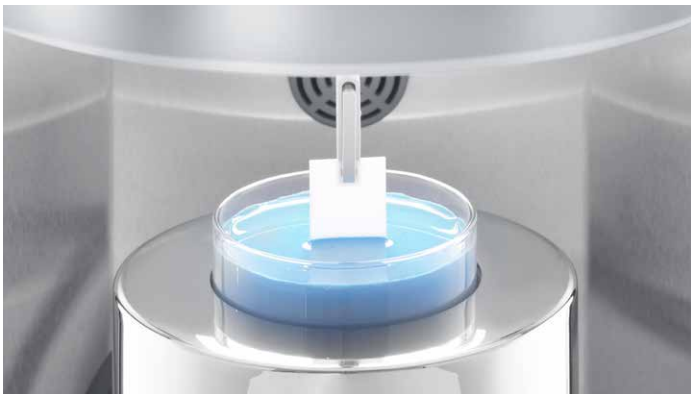
Measuring methods and options

- Surface tension and interfacial tension using the ring, plate, and rod method
- Surface tension and interfacial tension using the ring tear-off method
- Critical micelle concentration (CMC) of surfactants
- Contact angle and surface free energy of solids, powders or fiber bundles
- Density of liquids and solids
- Sedimentation behavior of dispersions
- Penetration resistance of sediments
- Measurement from -15 to 300 °C, temperature measurement with internal or external sensor

The universal instrument for analyzing surfactants and solid surfaces

Our universal Force Tensiometer – K100 performs high-precision, automatic and reliable measurements of surface tension and interfacial tension, critical micelle concentration (CMC) and contact angle on solids, fibers, and powders. With high-quality components and a uniquely wide range of methods, the instrument carries out many tasks in the fields of surfactant analysis and wetting measurement for your quality assurance or research.

Washburn method for powder contact angle measurement



Dynamic contact angle at a solid using the wetting force

Specifications

Force measurement	
Maximum load	210 g
Resolution	10 µg
Measurement rate	50 Hz
Locking mechanism	automatic

Sample stage	
Travel distance	>110 mm
Travel speed	0.1 to 500 mm/min

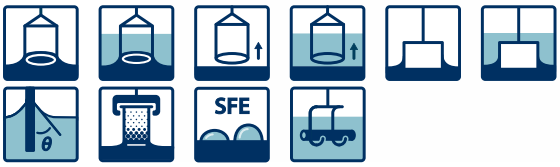
Temperature	control	measurement
Range	-15 to 300 °C	-60 to 450 °C

Interfacial and surface tension	
Range	1 to 2000 mN/m
Resolution	up to 0.001 mN/m

Contact angle	Washburn	Wilhelmy plate
Range	0 to 90°	0 to 180°
Resolution	0.01°	0.01°

Density	liquid	solid
Range	1 to 2200 kg/m³	1000 to 20000 kg/m³
Resolution	1 kg/m³	1 kg/m³

Force Tensiometer – K100SF



Tasks and applications

- Characterization of natural and synthetic fibers
- Development of carbon and glass fiber coatings
- Predicting the interaction between fibers and matrix
- Optimization of hair care products

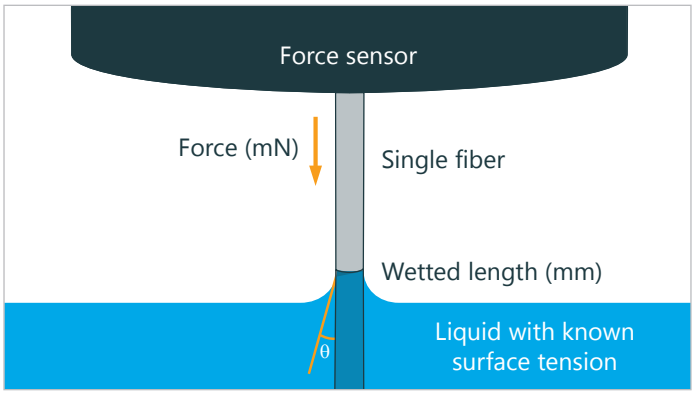
Measuring methods and options

- Contact angle and surface free energy of fibers and fiber bundles, powders, or other solids
- Surface tension and interfacial tension using the ring, plate, and rod method
- Surface tension and interfacial tension using the ring tear-off method, for example for measurements in accordance with ASTM D 971
- Density of liquids
- Measurement from -10 to 50 °C, temperature measurement with internal or external sensor

The high-precision tensiometer for measuring contact angle on single fibers

Our high-precision Force Tensiometer – K100SF is specially designed for analyzing the wettability of single fibers by measuring the contact angle. Our K100SF is fitted with a particularly high-resolution force sensor. The instrument therefore reliably measures the wetting forces on even very thin fibers, for example on single carbon fibers which are just a few microns thick.

Single fiber measurement with K100SF



The force at an immersed fiber depends on the contact angle

Specifications

Force measurement	
Maximum load	6 g
Resolution	0.1 µg
Measurement rate	50 Hz
Locking mechanism	automatic

Sample stage	
Travel distance	>110 mm
Resolution	0.1 µm
Travel speed	0.1 to 500 mm/min

Temperature	control	measurement
Range	-15 to 50 °C	-60 to 450 °C

Interfacial and surface tension	
Range	up to 2000 mN/m
Resolution	up to 0.0001 mN/m

Contact angle	Washburn	Wilhelmy plate
Range	0 to 90°	0 to 180°
Resolution	0.01°	0.01°

Liquid density	
Range	1 to 2200 kg/m³
Resolution	1 kg/m³

Micro Dispenser for CMC Measurements

Our specially developed Micro Dispensers equip the K100 for measuring the critical micelle concentration (CMC) with the utmost precision, using one or two dispenser units (DS0810 or DS0820). The surfactant concentration range is set up and then measured fully automatically.

- Using one Micro Dispenser to add liquid
- Using two Micro Dispensers to add and then remove liquid so that the concentration range is not limited by the vessel's capacity
- Adding surfactant to the solvent or diluting a stock solution (reverse CMC)

Two Micro Dispensers for an extended concentration range

Specifications

Dispensing accuracy (10 mL syringe)	
Resolution	0.1 µL
Dosing rates (software-controlled)	
10 mL dosing cylinder	5 to 100 mL/min
25 mL dosing cylinder	5 to 250 mL/min

Measuring methods and funtionality	DS0810 Single Micro Dispenser	DS0820 Double Micro Dispenser
Maintaining constant liquid level	-	yes
Forward CMC	yes	
Reverse CMC	yes	
Definition of concentration range	upper and lower limit	
Ring method	yes	
Plate method	yes	

Temperature Control Units

TJ50
Peltier temperature control unit

- Quickly attains the target temperature between -15 to 130 °C and keeps it stable
- Measurement of temperature dependence as well as analysis under standard conditions

In a range between -15 to 130 °C, our Peltier temperature control unit approaches the desired measuring temperature quickly and precisely. Next to measurements at high or low temperatures, the unit is especially suitable for analyses at accurately defined thermal standard conditions, which are hard to achieve with a simple liquid thermostat. Excellent insulation and an integrated stirrer provide for thermal stability and homogeneity.

TJ60
High temperature control unit for up to 300 °C

- Reliable analysis of samples such as polymer melts or bitumen
- Heats up fast to the desired temperature
- Disposable aluminum sample vessels avoid laborious cleaning

With the high temperature solution for our K100, precise surface tension and dynamic contact angle data of hot liquids such as polymer melts or bitumen are easily accessible. The unit quickly heats up the sample to reach and keep a stable target temperature. Disposable sample vessels made of the good heat conductor aluminum solve the issue of persistent contaminations. Moreover, inert gas can be connected to prevent oxidation.

Force Tensiometer – K20

Tasks and applications

- Determination of the effectiveness of wetting agents
- Checking the surfactant content in solutions below the critical micelle concentration (CMC)
- Tank clearance and cleaning validation in the foodstuffs industry
- Measurement of interfacial tension for the quality assurance and optimization of emulsifiers
- Analyzing the aging status of oils according to ASTM D 971 and IEC 62961

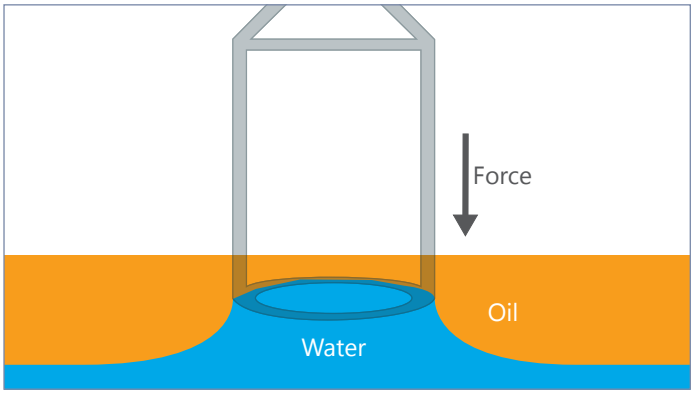
Measuring methods and options

- Surface tension using the ring and plate method
- Interfacial tension using the ring and plate method
- Surface tension and interfacial tension using the ring tear-off method
- Measuring the density of liquids
- Measurement from -10 to 130 °C, temperature measurement with internal sensor

The flexible tensiometer for basic quality assurance

Our Force Tensiometer – K20 is a robust, semi-automatic instrument for the precise measurement of surface tension and interfacial tension. Using the ring and plate method as the main tensiometric methods, it produces reliable measurements for the routine quality assurance of your surfactant solutions and interfacial processes.

Preset parameters for computer-independent measurements



ASTM D 971: Measuring interfacial tension of insulating oils

Specifications

Force measurement	
Maximum load	50 g
Resolution	100 µg
Measurement rate	5 Hz
Sample stage	
Travel distance	90 mm
Travel speed	2.4 to 14 mm/min

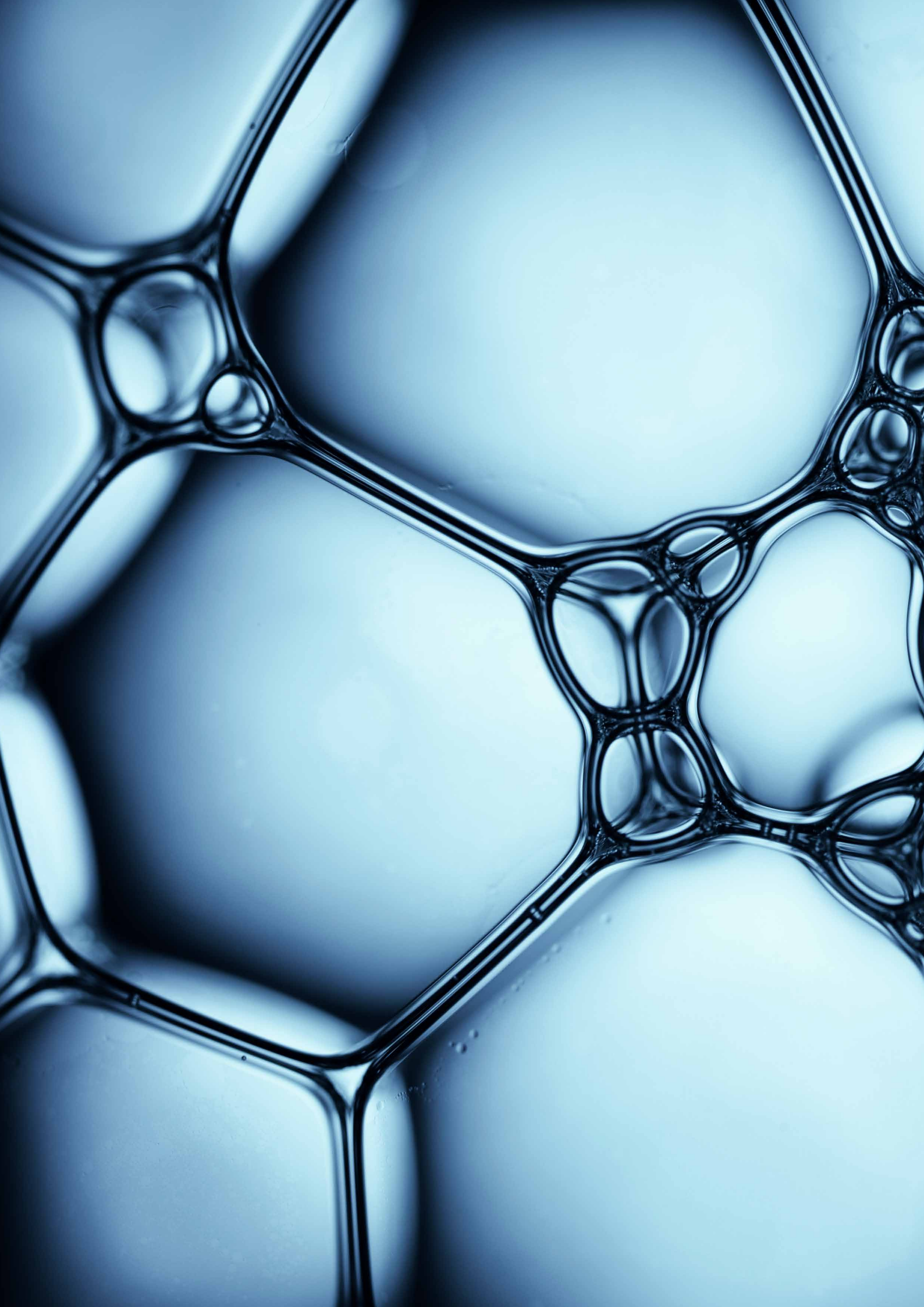
Temperature	control	measurement
Range	-10 to 130 °C	-20 to 150 °C
Interfacial and surface tension		
Range	1 to 999 mN/m	
Resolution	up to 0.01 mN/m	
Liquid density		
Range	1 to 2200 kg/m³	
Resolution	1 kg/m³	

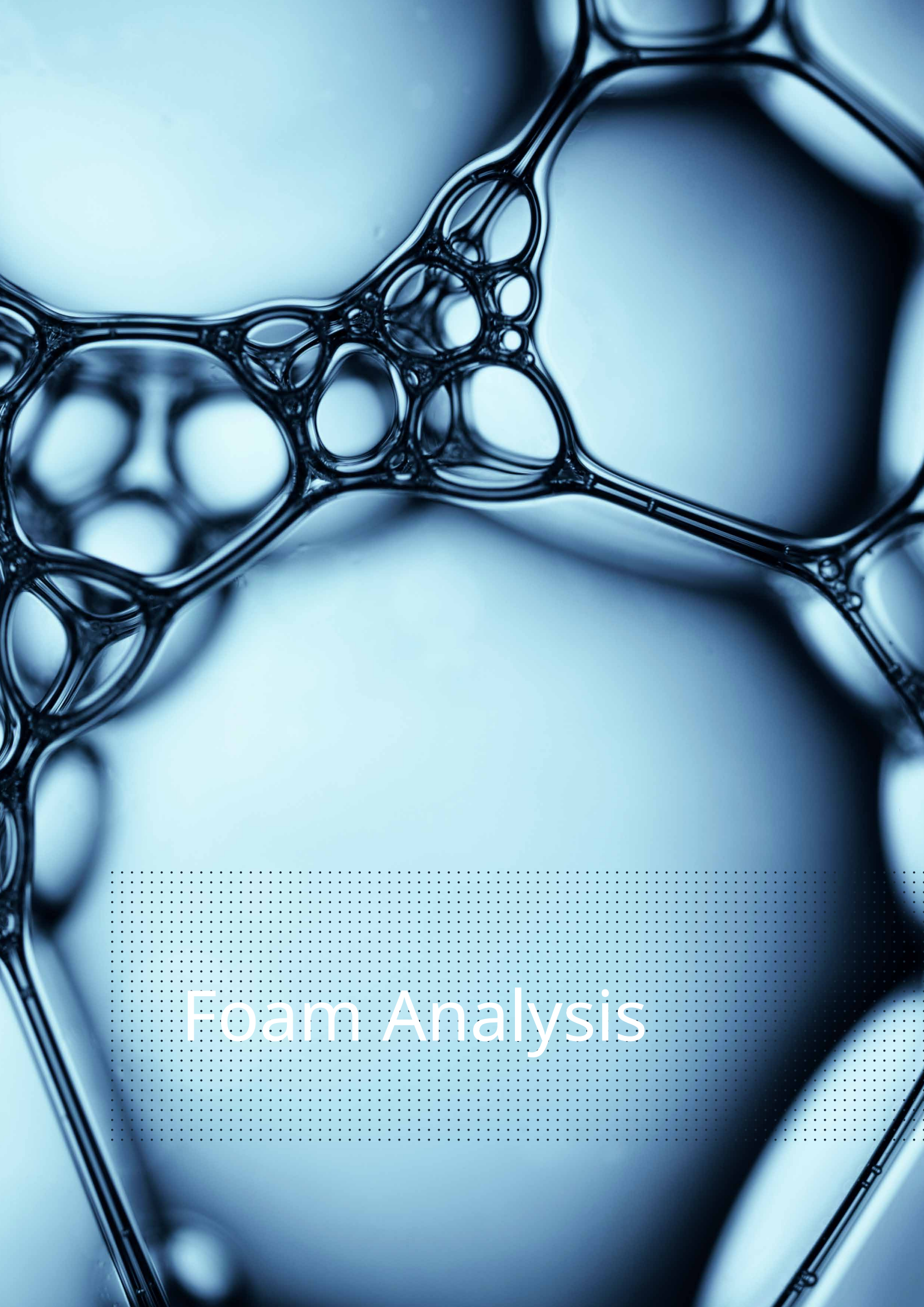
FORCE TENSIOMETER – K6

The manual tensiometer for clear and reliable basic measurements

Our Force Tensiometer – K6 is a robust and reliable manual instrument for measuring surface tension and interfacial tension using the ring method. As a quality product from our precision mechanical workshop, it produces fast, easy and accurate measurements for surfactant solutions and solvents.

As well as simple investigations of liquid and liquid-liquid interfaces, our K6 is also suitable for training purposes in schools and universities for demonstrating the action of the surface tension force in a comprehensible manner.





Foam Analysis

Method Overview | Foam Analysis

Just like the speed at which an apple falls from a tree, the behavior of foam created from a particular liquid with a certain method follows the laws of nature. But studying these laws, producing foam with certain properties, and controlling its quality requires reproducible means of foam creation and analysis.

Powered by our ADVANCE software, our instruments are capable of performing foam measurements under accurately repeatable conditions and winning results using precise sensors and sophisticated image analysis. Get acquainted with our innovative methods for analyzing the foam forming capacity of liquids and all aspects of foam behavior.

Foam height
Foamability and foam stability using the optically detected height of foam created reproducibly

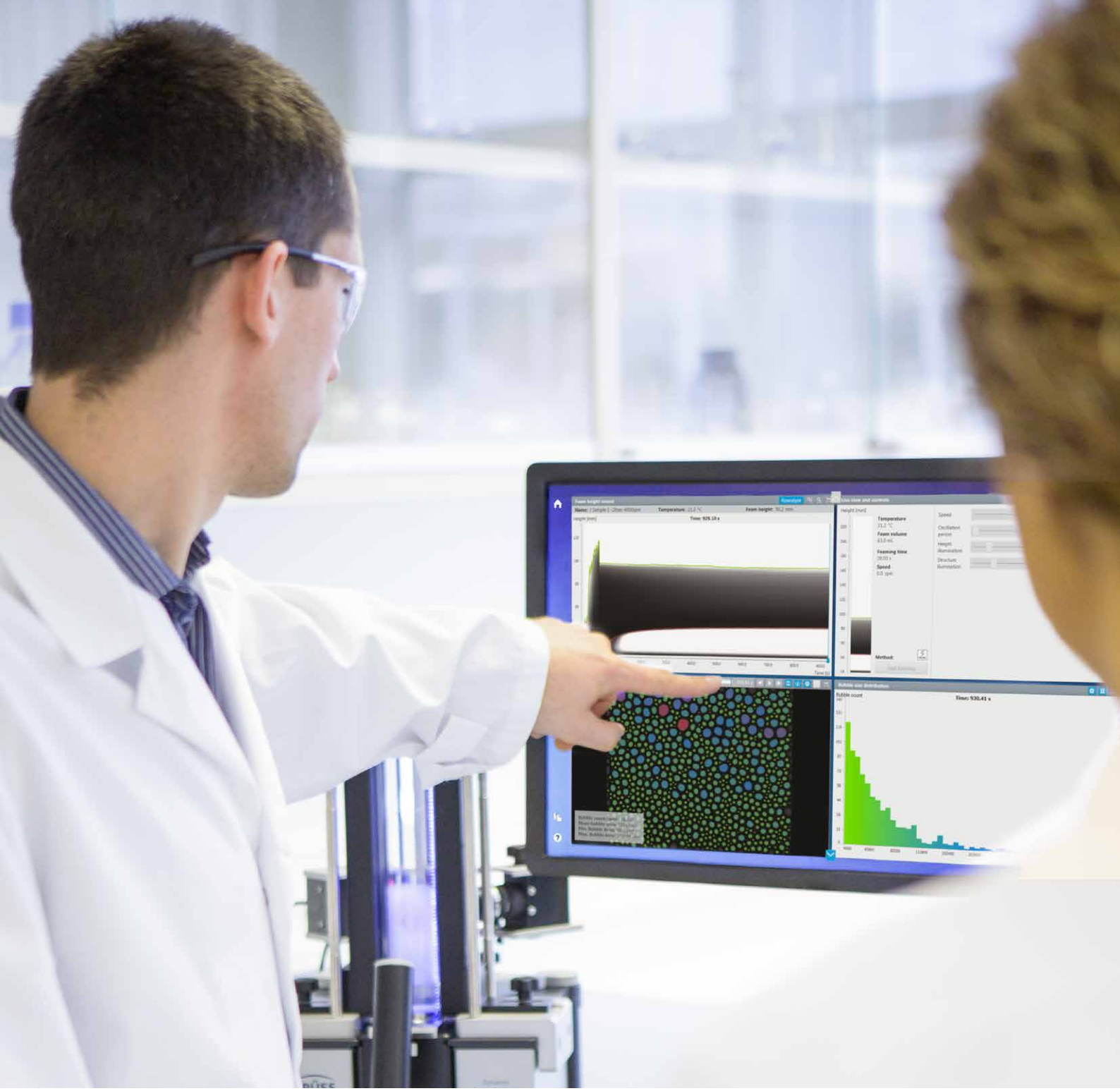
Foam structure
Optically detected foam bubble sizes and their statistical distribution

Foam flash
Foam formation behavior of heavily foaming liquids using stirring cycles

Liquid content
Moisture and drainage behavior of foam using its electrical conductivity

High pressure foam
Foam height and foam structure simultaneously analyzed under high pressure

Ross Miles
Foamability and foam stability according to ASTM D 1173



Cycle
Carrying out a measurement up to 20 consecutive times and displaying the results together

Run by ADVANCE
On the following pages, instruments with this icon are supported by our ADVANCE software

Dynamic Foam Analyzer – DFA100

Tasks and applications

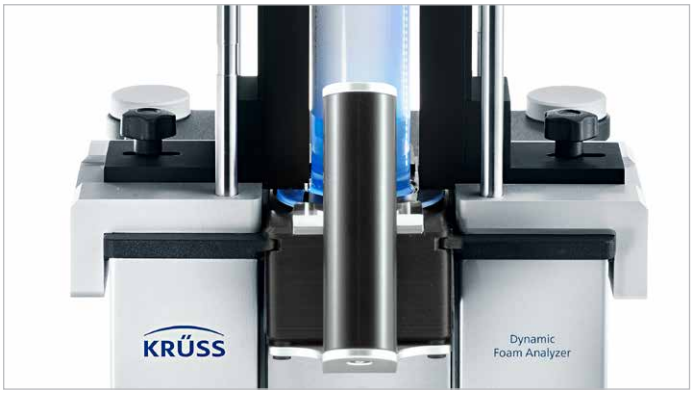
- Foams for washing and cleaning
- Firefighting foams
- Foams in foodstuffs and personal care products
- Surfactant development
- Flotation as a method for separating solids
- Foam-inhibiting and foam-reducing agents (antifoamers/ defoamers)
- Foam prevention for paints and varnishes, process and waste water, and cooling lubricants

Measuring methods and options

- Measurement of foamability of liquids and foam decay
- Determination of total height, foam height, and liquid height
- Foaming by means of sparging or stirring
- Investigations of externally produced foams
- Foamability parameters, including maximum height, foam capacity, and foam density
- Temperature-controlled measurements at up to 90 °C
- Foaming with externally connected gases

Scientific analysis of liquid foams

Our Dynamic Foam Analyzer – DFA100 measures the foamability of liquids and the foam stability based on precise measurements of the foam height. With optional modules, it also measures the liquid content of the foam or analyzes the foam structure with regard to bubble size and distribution. The DFA100 assists you in the optimization of foam-forming products or, in the case of unwanted foam formation, helps with specific foam prevention.



Ergonomic sample holder

Detection of liquid-foam-boundary

Specifications

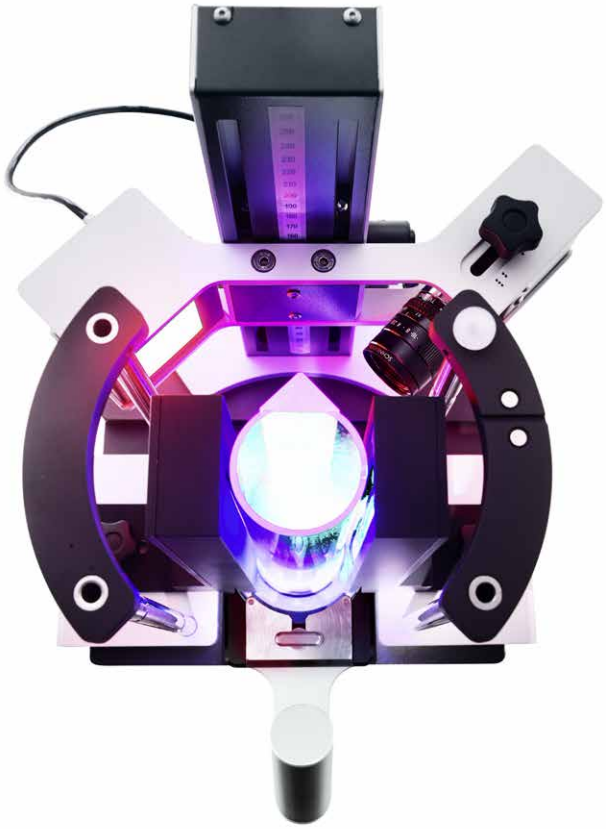
Line sensor	
Sensor resolution	1728 × 1 px
Height resolution	200 dpi | 0.125 mm
Temporal resolution	20 fps
Scanning length	216 mm

Operating system	
Gas flow rate (internal)	0.2 to 1.0 L/min
Gas flow rate (external)	0.05 to 1.0 L/min
Approved gases	air, nitrogen, carbon dioxide
Approved pressure	5 ± 0.5 bar
Stirring speed	up to 8000 rpm
Approved temperature	4 to 90 °C

Illumination	
Type	LED
Wave length, dominant	469 nm (IR: 850 nm)

Analyzed foam characteristics	foamability and foam stability
Results	■ foam height ■ liquid height ■ total height ■ foam capacity ■ maximum foam density ■ expansion rate ■ foam half life time ■ drainage half life time ■ sample temperature

Foam Structure Module – FSM for DFA100



Tasks and applications

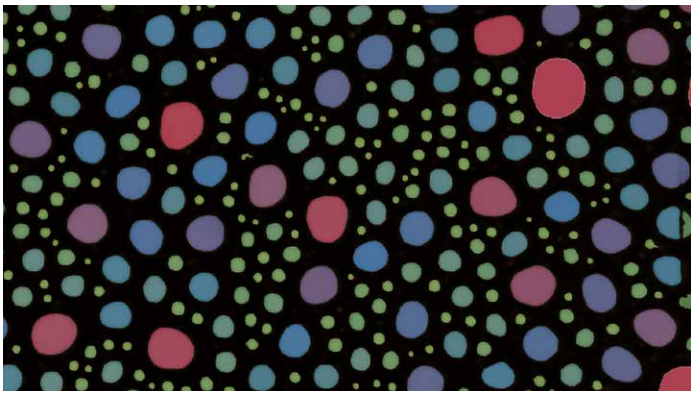
- Foams for washing and cleaning
- Foams in foodstuffs and personal care products
- Surfactant development
- Flotation as a method for separating solids

Measuring methods and options

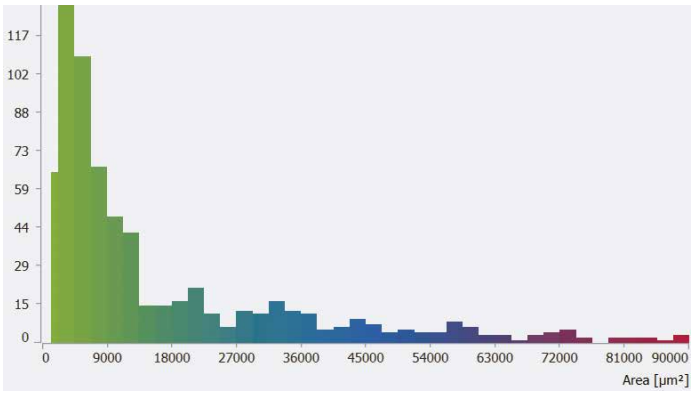
- Live analysis of foam structure in software ADVANCE
- Foam structure analysis at any position of column
- Measurement of bubble size distribution and the change in this distribution in different resolution ranges
- Calculation of mean bubble size and standard deviation
- Output of a histogram for each individual image in the series of measurements
- Simultaneous measurement of foam height and liquid content possible

Time-dependent analysis of bubble size in liquid foams

The Foam Structure Module – FSM of DFA100 reliably analyzes the size distribution of bubbles of liquid foam and the variation of this distribution with respect to time. The measuring method helps you to quantify and specifically optimize the consistency of a foam based on precise and intelligent video image analysis.



Foam structure analysis



Bubble size distribution histogram

Specifications

Illumination	
Type	LED
Wave length, dominant	633 nm
Camera system	
Connection	USB 3.0
Performance	2 fps at 1280 × 1024 px
Diameter of minimum detectable bubble	50 µm
Mean field of view size	position 1: 285 mm² position 2: 140 mm² position 3: 85 mm²
Focus	manual

Analyzed characteristics	foam structure: homogeneity, stability, and aging
Results	■ mean bubble area ■ bubble count per mm² ■ standard deviation of mean bubble area ■ bubble size distribution ■ bubble count half life ■ Sauter mean radius ■ initial foam structure ■ final foam structure

Liquid Content Module – LCM for DFA100

Tasks and applications

- Foams for washing and cleaning
- Foams in foodstuffs and personal care products
- Surfactant development
- Flotation as a method for separating solids
- Firefighting foams

Measuring methods and options

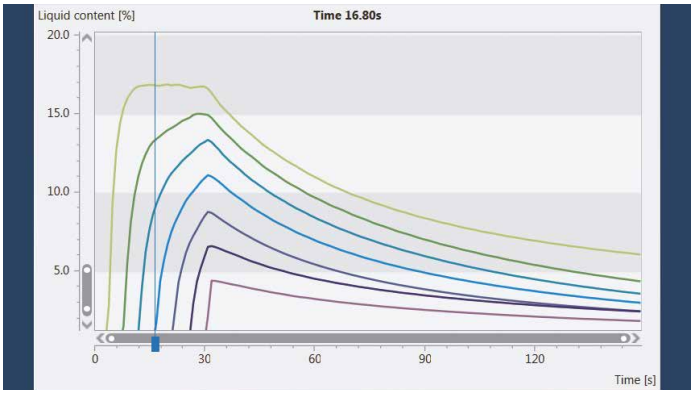
- Simultaneous measurement of moisture content at up to seven levels
- Maximum moisture content at every level
- Half life (time for the liquid content to reduce to one-half) at every level
- Simultaneous measurement of foam height and structure possible

Analyzing the liquid content of foams

The Liquid Content Module – LCM for our DFA100 measures the liquid content of foams and its change with respect to time by evaluating the conductivity of foam. The results provide information on the foam formation and help you to specifically optimize the liquid content and stability of foams.

The liquid content is measured simultaneously at up to seven height increments of the foam. This accurate height resolution shows how uniform the foam is and how the homogeneity changes with time.

Conductivity sensors for analyzing liquid content



Time-dependent liquid content measured at seven levels

Specifications

Electrodes	
Material	35 µm copper, finish: chemical gold
Highest sensor position	185 mm
Measured entity	electrical resistance in Ω
Theoretical measurement range	10 Ω to 2 MΩ

Analyzed foam characteristics	liquid content, drainage, and foam stability
Results	■ liquid content at 7 sensor positions ■ resistance at 7 sensor positions ■ 25%, 50%, and 75% liquid content time

Ross Miles Foam Analyzer – RMFA

Tasks and applications

- Foams for washing and cleaning
- Foams in personal care products
- Surfactant development
- Foaming beverages

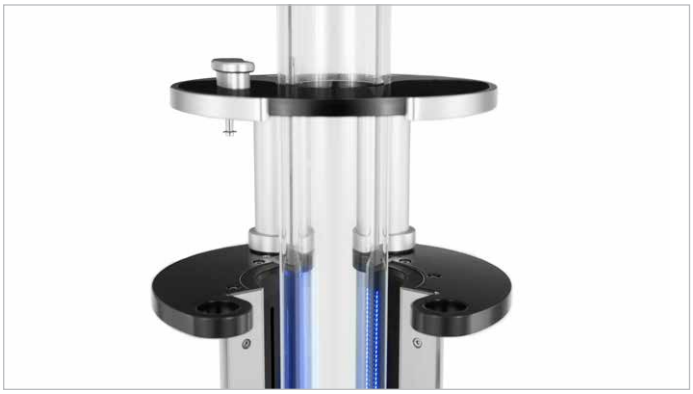
Measuring methods and options

- Automatic foam height measurement in accordance with ASTM D 1173 with a resolution of 0.4 mm
- Automatic measurement of time-dependent values after initial foam height was detected
- Exact measurement of foam height after 60, 180, and 300 seconds
- Recording of the entire height curve
- Recording of the liquid level for measuring drainage
- Quick compilation of multiple measurements in comparison tables and charts

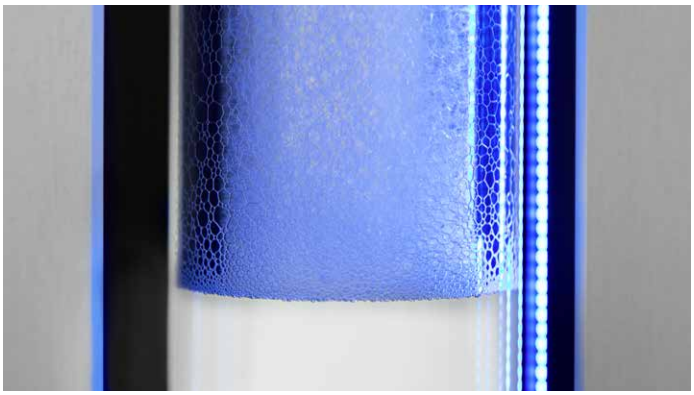
Analysis of foaming agents – following the standard and going beyond

Our Ross Miles Foam Analyzer – RMFA is the world's first instrument for automatic measurements of foamability and foam stability in accordance with ASTM D 1173. But instead of just providing results for the total height as required by the standard, it also detects the liquid level beneath the foam. In this way, the RMFA extracts additional information about the moisture and drainage of the foam created, providing a more conclusive picture of the sample.

The instrument uses standardized vessels in a set-up for electronic, optical height analysis, which includes automatic detection of the starting point for height evaluation. Thanks to narrowly observed measuring times as per Ross-Miles and a resolution that can hardly be reached by manual height detection, analyses by standard achieve precision that was previously unheard of.



Easy-to-use and safe column support



Additional liquid height detection

Specifications

Line sensor	
Maximum measurable height	620 mm
Sensor resolution	1654 × 1 px
Height resolution	67 dpi | 0.375 mm
Temporal resolution	10 fps
Scanning length	620 mm

Illumination	
Type	LED
Wave length, dominant	469 nm

Sample volume	
Minimum required sample volume	250 mL

Instrument dimensions	
Footprint	245 mm × 275 mm (W × D)
Height	1360 mm
Weight (without accessories)	18.5 kg

Analyzed characteristics	electronic foam height detection
Foaming and measurement	according to ASTM D 1173

High Pressure Foam Analyzer – HPFA

Tasks and applications

- Foam-assisted gas flooding
- Foam as fracking and stimulation liquid

Measuring methods and options

- Measurement of foamability and foam stability based on the foam height and volume with respect to time
- Analysis of foam structure and its variation with respect to time based on the number, size, and statistical size distribution of the foam bubbles
- Measurements at pressures up to 350 bar and temperatures up to 120 °C
- Foaming with a diverse range of gases such as air, N_2, or CO_2
- Option of adding liquids during the measurement

Our innovative solution for foam analysis under oil and gas reservoir conditions

Our High Pressure Foam Analyzer – HPFA is the world's only measuring instrument for simultaneously analyzing the amount and structure of liquid foams under high pressure. The instrument provides various options for investigating foam behavior under the real process conditions of foam-assisted flooding methods in EOR as well as hydraulic fracturing.

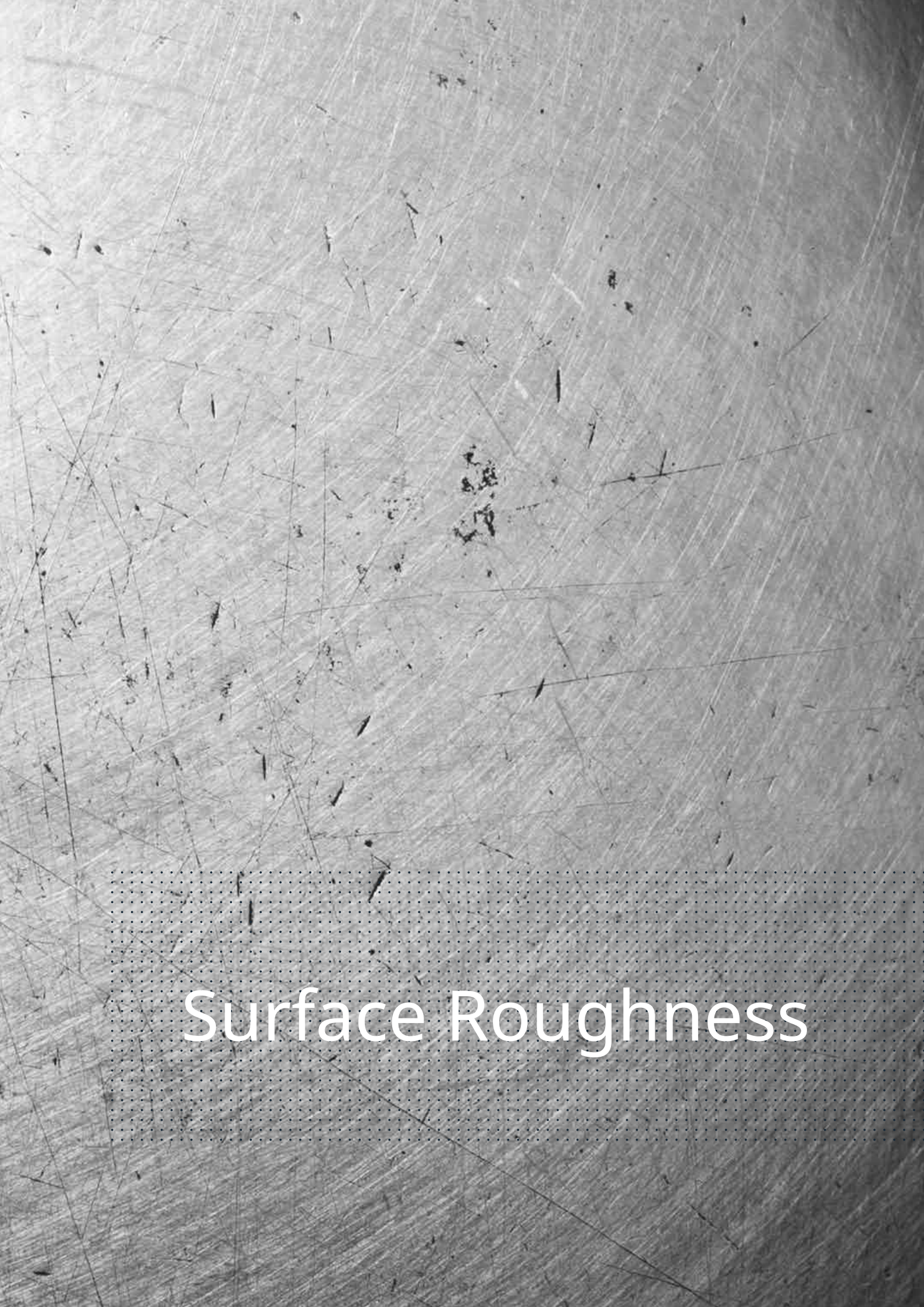
Camera recording foam structure

Mini Dosing System for adding liquids during measurements

Specifications

Measuring technique	
Type	foam height foam structure
Pressure measurement	
Maximum pressure	350 bar (5000 psi)
Temperature control	
Temperature range	room temperature up to 120 °C

Mini dosing system	
Dosing	manual
Temperature	maximum 180 °C
Environment	
Temperature	operating: 10 to 40 °C
Interfaces	
PC	1 × USB 3.0



Surface Roughness

Surface Roughness Analyzer – SRA

Tasks and applications

- Coatings and other surface modifications
- Biocompatibility of implants
- Bonding processes
- Construction and building material
- Evaluation of how surface roughness contributes to wettability

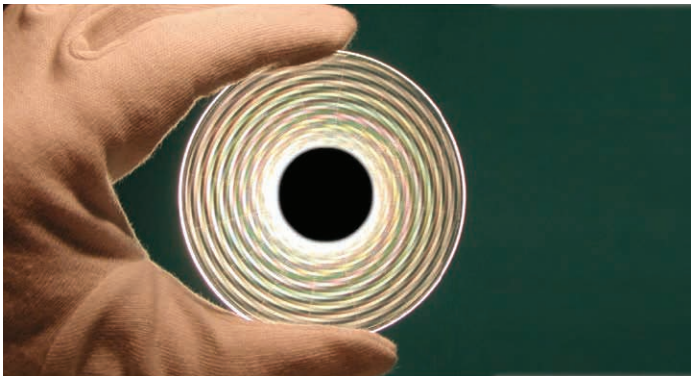
Measuring methods and options

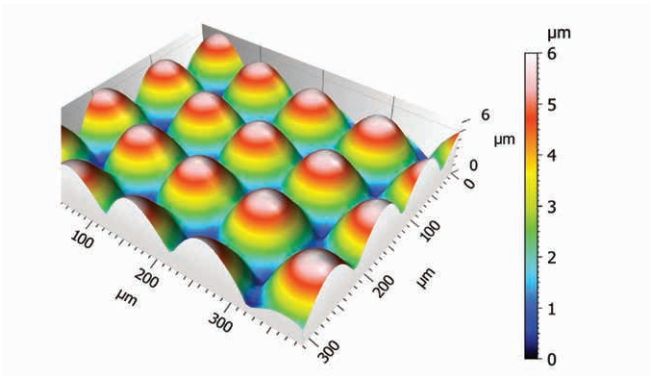
- Displaying the topography of samples on a wide scale from surface roughness up to the shape of whole workpieces
- Calculation of sample parameters such as dimensions, angles, radii
- Analyses according to different standards, such as ISO 25178
- Roughness factor according to Wenzel
- Direct data evaluation in optional MountainsMap® software

Comprehensive analysis of your material's texture

Whether your surface must be very smooth or show a certain texture and degree of roughness, our Surface Roughness Analyzer – SRA supports you in optimizing your material or production process. Based on confocal microscopy, the SRA quickly gives you an accurate 3D presentation of your sample's surface and provides you with data which exactly describe its topography. The innovative ultrasonic drive and magnifications of up to 100-fold provide for an extremely high resolution.

When combined with contact angle measurements, analyses with the SRA help you evaluate the contribution of roughness to the wettability of your sample or to the adhesion of coatings. This is particularly important for optimizing coating or bonding processes by roughening the surface.





Microlens disc and the image from an SRA measurement

Specifications

Camera system	
Performance	60 fps at 1280 × 1024 px

Optics	
Lens magnification	2.5× up to 100× nominal magnification
Field of view	0.2 mm × 0.16 mm to 8.0 mm × 6.4 mm
Resolution	lateral, pixel based: 0.16 µm to 6.25 µm axial: 10 nm to 2.6 µm

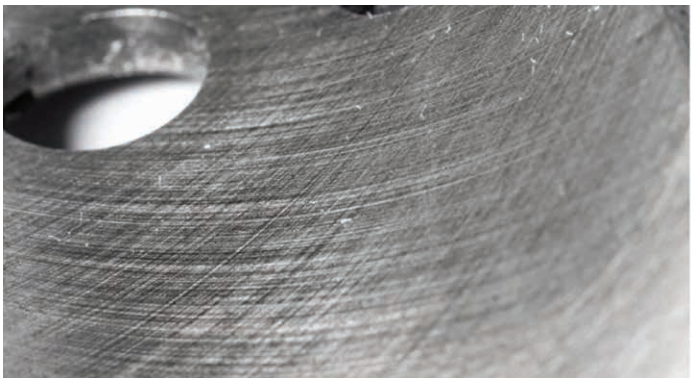
Illumination	
Type	laser diode, 450 nm

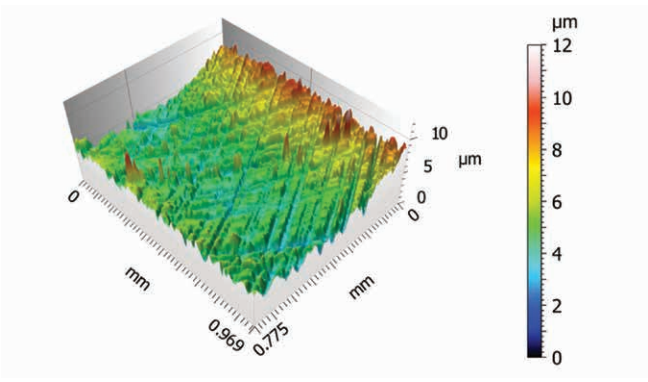
Analyzed characteristics	topography	surface-related roughness	profile-related roughness
Texture and shape:	■ spike-filter ■ median-filter ■ Gauss-filter ■ clip values ■ cut borders ■ region of interest ■ mirror/ rotate values ■ fill invalid pixels ■ step height	■ waviness parameters: W_a, W_q, WZ_{10}, W_v, W_p, W_z, W_{ku}, W_{sk}, W_{dr} ■ roughness parameters: S_a, S_q, S_{Z10}, S_v, S_p, S_z, S_{ku}, S_{sk}, S_{dr} ■ roughness factor according to Wenzel: r	■ waviness parameters: W_a, W_q, W_z, W_p, W_v, W_t, W_{sk}, W_{ku}, W_{dq}, W_{da}, W_{dc} ■ roughness parameters: R_a, R_q, R_z, R_p, R_v, R_t, R_{sk}, R_{ku}, R_{dq}, R_{da}, R_{dc}

Surface Roughness Analyzer – SRA Head

Ready for in-line quality control

The SRA Head is a special setup for our Surface Roughness Analyzer created for integrating versatile roughness and texture analysis in fully automated processes. Thanks to its small size and weight, positioning of the head can be easily done by a robotic system. The software can be linked to programs such as Matlab® in order to integrate it in information systems. All this makes reliable in-line QC checks of work pieces possible.





Cylinder running surface and its 3-dimensional representation

Tasks and applications

- Automated analysis of industrial grinding or polishing processes
- Roughness control before bonding or coating
- Monitoring shape accuracy of workpieces after production
- In-line check of compliance with workpiece-related roughness specifications

Measuring methods and options

- Robotic movement of the SRA Head for analysis at specific positions
- Displaying the topography of samples on a wide scale from surface roughness up to the shape of whole workpieces
- Calculation of sample parameters such as dimensions, angles, radii
- Analyses according to different standards, such as ISO 25178
- Very fast measurements making it optimal for QC
- Integratable in information systems for data-to-sample assignment

Specifications

Camera system	
Performance	60 fps at 1280 × 1024 px
Optics	
Lens magnification	2.5× up to 100× nominal magnification
Field of view	0.2 mm × 0.16 mm to 8.0 mm × 6.4 mm
Resolution	lateral, pixel based: 0.16 µm to 6.25 µm axial: 10 nm to 2.6 µm

Illumination	
Type	laser diode, 450 nm
Dimensions	
Size (W × D × H)	110 mm × 55 mm × 180 mm
Weight	2.0 kg
Analyzed characteristics	
Texture and shape	according to SRA lab instrument


KRÜSS
Surface Roughness Analyzer

Surface Roughness Tester – SRT

Tasks and applications

- Quality control of industrial grinding or polishing processes
- Roughness control before bonding or coating
- Checking compliance with workpiece-related roughness specifications

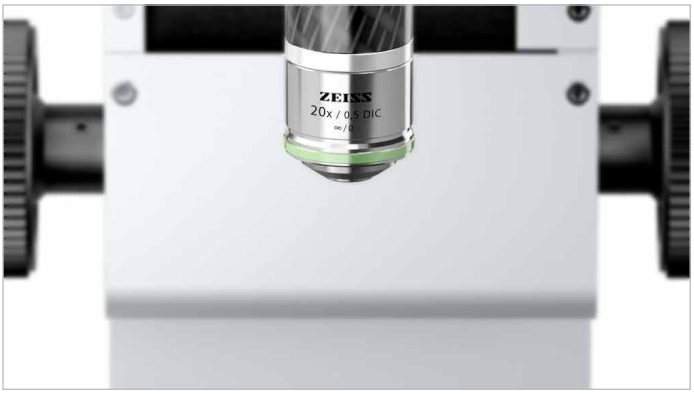
Measuring methods and options

- Roughness control according to different standards
- A wide scale of profile- and surface-related roughness parameters
- Very fast measurements making it optimal for QC
- Available as a high-resolution version

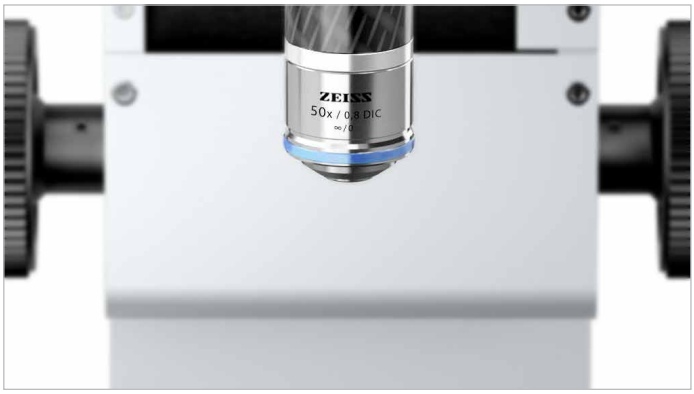
Fast and reliable roughness control according to standard

Our Surface Roughness Tester – SRT quickly and reliably measures profile-related roughness parameters according to relevant standards. The quality control instrument is ideal for checking whether your surface shows the specified roughness after grinding or polishing or before surface processing, such as coating.

Equipped with high-quality optics and a microlens disc which optimizes the light yield, the SRT reliably measures a vast number of instructive roughness results. Important measurement parameters, such as brightness and measuring range, are adjusted automatically.



Available for different roughness ranges with 20× lens



or with 50× lens (SRT Hi-Res)

Specifications

Camera system		
Performance	60 fps at 1280 × 1024 px	
Optics	**SRT**	**SRT Hi-Res**
Lens magnification	20× nominal magnification	50× nominal magnification
Field of view	1.0 mm × 0.8 mm	0.4 mm × 0.32 mm
Resolution	lateral, pixel based: 0.78 µm axial: 30 nm	lateral, pixel based: 0.31 µm axial: 10 nm
Illumination		
Type	laser diode, 450 nm	
Analyzed characteristics	**surface-related roughness**	**profile-related roughness**
Roughness parameters:	S_a, S_q, S_{Z10}, S_v, S_p, S_z, S_{ku}, S_{sk}, S_{dr}	R_a, R_q, R_z, R_p, R_v, R_t, R_{sk}, R_{ku}, R_{dq}, R_{da}, R_{dc}


KRÜSS
Dynamic
Foam Analyzer

Services

Technical Services

Ensuring your investment is our personal concern

Precision, quality, and long-term functional reliability is the standard for our Technical Support. We take care of you and your instrument from the very beginning, ensure its operational readiness with regular maintenance, and act quickly and dependably whenever you need our support.

We maintain the reliability of our measuring instruments constantly – significantly longer than is normal in the industry. Even when we have long since developed a successor for your instrument, we will make every technical effort to repair and even modernize it.

Installation and training (IAT/RIAT)

Do you want to use your instrument with maximum efficiency and expert knowledge from day one? We will arrange this and provide an installation and training (IAT/RIAT) for you and your staff.

Maintenance contract

Do you want to maintain the precision and reliability of your instrument at the same high level in the long term? We will maintain, adjust, and calibrate it as part of regular service visits.

Remote support

Are you facing a technical issue and relying on a quick solution?
We will provide direct support from screen to screen.

On-site service

Are you confronted with a failure of your instrument, or do you want to move it, recommission it or train new staff to use it? We will respond quickly and flexibly with our on-site service.

Qualification (IQ/OQ)

Do you want to use your instrument and its methods as part of a standardized quality management system? We will carry out Installation/Operation Qualification (IQ/OQ) and create documentation tailored to your purpose.

Extended warranty

Would you like our promise of long-term functional reliability in writing?
We can offer you an extension of the legal warranty.

Learn more: **kruss-scientific.com/service**

Application Services

Draw from our vast resources

As the probably biggest power users of our instruments, our own Applications and Science team has enormous experience when it comes to carrying out precise analyses and finding solutions to complex tasks. With our diverse application services, we would like to support your with our know-how and resources – at our own premises or with a visit in your own lab.

Application measurements:
Let us take care of your samples

Our application labs carry out analyses of your samples and provide application-related advice. Having the whole portfolio of equipment and methods you find in this product overview at hand, we can solve virtually any task in the area of interfacial and foam analysis. This comprises measurements in accordance with all relevant international standards, but also complex questions which require a combination of methods and activate the scientific creativity of our application team.

Lab consultancy visit:
Let us support you in your premises

Do you have challenging measurement tasks to solve with your instrument or would you like to receive a comprehensive training for different methods? The members of our application team would be happy to visit you in your lab. You can introduce our surface science expert to your regular procedures and together you can carry out measurements in accordance with these routines and find the best way of integrating our measurement methods.

Surface science lab day:
Let us dedicate our resources to your tasks

The complete range of our instruments and methods: for one day, it's all yours. On a laboratory day planned for your specific needs, we give you the opportunity to familiarize yourself with our measuring instruments, run analyses supported by our team of experts and work with them to evaluate your results. Together, we find optimal solutions for analyzing your samples and mastering your application tasks.

Learn more: **kruss-scientific.com/application-services**

Seminars and Training Courses

Expertise you can use

Our seminar team is made up of experienced scientists who love sharing what they know. They provide individual support and offer their services as expert contacts for theoretical and practical questions. Our seminars also leave plenty of room for sharing and dialog.

We regularly host respected guest speakers with relevant insights into interfacial chemistry. Their presentations shed light on technical content by offering practical examples from the latest research and development.

Overview seminars

Get an outline of the most important measuring methods and instruments for surface tension, contact angle, and foam analysis.

Focus seminars

Our focus seminars concentrate on one application area in an intensive two-day course. Together with our seminar team, an internationally recognized specialist carries out the respective seminar, covering scientific and measurement technical aspects of the subject in depth.

Methodology seminars

Deepen your knowledge in the areas of surface tension, contact angle measurement, and foam analysis on one day each. Attend illustrative talks covering theory and applications and become familiar with the most important analysis methods in practical sessions.

Certificate course

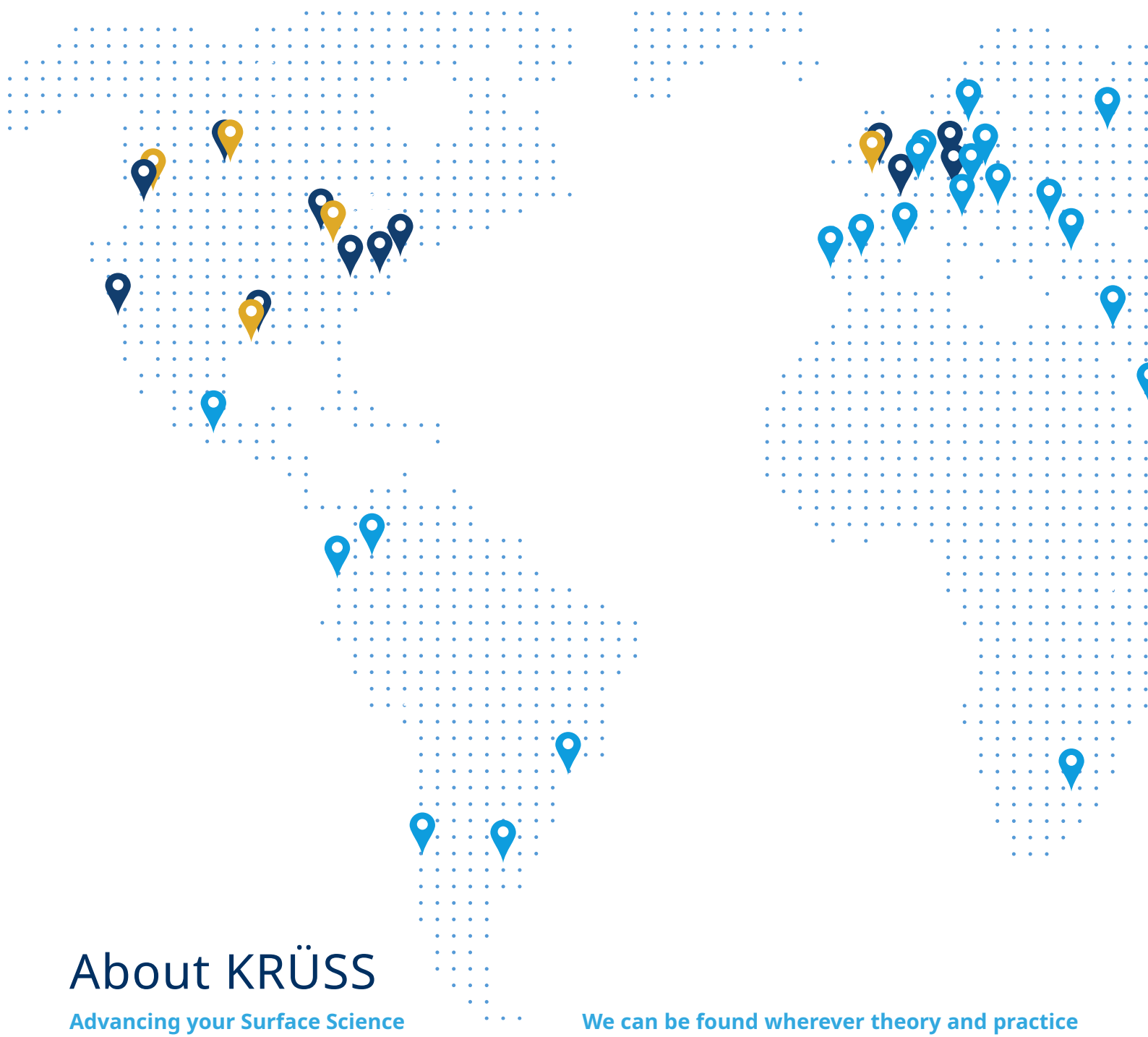
You, as a user of our instruments, are the focus of our one-day certificate courses. You learn how to make optimum use of your instrument for different applications. You will apply the acquired knowledge in practical hands-on sessions and receive a certificate on completion of the course.

Practical seminars

Attend professionally supported measuring exercises at the center of an intensive training course and receive helpful tips and tricks for successful measurements.

Entry level
Intermediate level
Expert level

Learn more: **kruss-scientific.com/seminars**



About KRÜSS

Advancing your Surface Science

At KRÜSS, we see ourselves as a company which generates something new from technical know-how, scientific expertise and an abundance of passion every single day. In this way, we help our partners to optimize and make better use of their technologies.

Technology meets science

With our internally produced, high-precision mechanical systems and innovative technical solutions and services, we satisfy in a highly complex market. We help people in research, development, and industrial quality control in a wide variety of company sectors and with the most diverse requirements.

Global market leader thanks to innovation and know-how

The combination of unique products and highly qualified advice has made us the global market leader in the field of surface tension and interfacial tension measurement. But we also know that we cannot rest on our laurels: for this reason, we are always searching for better solutions together with our customers.

We can be found wherever theory and practice meet

Our responsibility does not stop with the delivery of our measuring systems. Installation, instruction, and training are just as important to us as continuous contact and interaction with our customers – worldwide.

We‘re always close to you

We are based in Hamburg (Germany) and have further subsidiaries in the USA, China, the United Kingdom, and France in order to be as close as possible to our customers. Furthermore, we have a dense distributor network which works flexibly and quickly to ensure that our products and our expertise are always close at hand.

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Always close to you

At KRÜSS, we combine technical know-how and scientific expertise with plenty of passion. That is why we not only produce high-quality measuring instruments for surface and interfacial chemistry – we offer a unique combination of product and scientific consulting. Our continuous know-how transfer ensures that not only we at KRÜSS keep pace with scientific developments, but also our customers.

In this way, we help you to optimize and make better use of your technologies. This has made us the global market leader in the field of surface and interfacial tension measurement. As a matter of course, we will gladly support you with further information as well. Feel free to ask us about publications, application cases, and helpful information about other KRÜSS products. We are always close to you.

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