DROP SHAPE ANALYZER – DSA100





THE VERSATILE HIGH-END INSTRUMENT FOR ANALYZING COATING AND WETTING PROCESSES

KRÜSS

Advancing your Surface Science

PRECISION AND PERFECTION – QUITE AUTOMATICALLY

- **Options for complete software-controlled surface analysis**
- **Time-saving viewing angle adjustment with stable image height**
- **Robust housing protects components and minimizes vibrations**

When developing our measuring instruments, we at KRÜSS combine high scientific demands with ever simpler operating concepts to ensure the greatest possible user comfort for our customers. Our Drop Shape Analyzer – DSA100 with our ADVANCE software is a very good example in this respect: the system measures the contact angle and surface free energy (SFE) using easy to create measuring procedures with the highest degree of automation possibilities. Thanks to this maximum level of automatization the DSA100 optimizes work processes in quality assurance, especially for the analysis of cleaned, pre-treated or coated solid materials.

More automation – enhanced repeatability

Up to three software-controlled axes for sample positioning mean that samples are moved quickly and with maximum repeatability to any desired measuring position. The software-controlled multi-dosing unit has a capacity for up to eight test liquids and ensures maximum accuracy in the measurement of SFE. Even the settings of the optics can be automated with the aid of a motorized focus and zoom control. Such a fully-automatic measuring process offers great benefits: it prevents errors caused by intervention in the measuring process, saves preparation time and ensures a high sample throughput as well as exact repeatability of the measuring conditions.

Extremely fast determination of the SFE thanks to the innovative double-dosing system

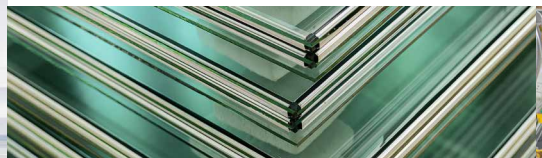
Our optional and newly developed double-dosing system uses two pressure-dosing units arranged in parallel to simultaneously produce one drop of each of the test liquids water and diiodmethane on the sample. This contactless process reliably prevents any possible contamination or damage to the sample that could be caused by inadvertent contact.

The video images of the two drops are displayed and evaluated at the same time. The software ADVANCE calculates the SFE from the two measured contact angles. The complete procedure, from the start of dosing up to the calculation of the SFE, is fully automatic and takes just one second. The high innovative level of this new measuring method is reflected in a filed patent by KRÜSS.

Scientific analysis – also for research and development

Material research means finding answers for always different samples under ever changing conditions. The completely modular design of the DSA100 is ideal in this respect: the experimental setup can be adapted flexibly in just a few simple steps by changing the configuration. Thanks to its versatility and many scientific evaluation methods the instrument provides important services in the field of research and development.











EXCELLENCE TO THE LAST DETAIL – FOR THE QUALITY OF YOUR SURFACES

We share our passion for quality with our customers. It is the guiding principle in the development of our measuring instruments and ensures that perfect surfaces can be created in many different branches of industry. With our Drop Shape Analyzer – DSA100, the quality of every detail contributes to a unique high-end solution for virtually all tasks in the analysis of wetting and adhesion on solid surfaces.

Top optical performance for exact analyses

The high-quality lens and the particularly homogeneous LED lighting ensure a high level of precision when displaying the drop, thus guaranteeing accurate measurement of the contact angle or surface tension. Thanks to the large zoom range even small drops appear with optimum width in the video image and can therefore be analyzed accurately with the aid of an extremely fast high-resolution camera.

The patented prism optics of the instrument is particularly innovative. It makes it possible to change the viewing angle of the camera without having to readjust the height of the sample, as is the case with other instruments. This not only saves time but also contributes to the excellent repeatability of the measuring conditions that can be achieved with the DSA100. In addition, this unique optical arrangement also creates space for large samples.

Precision and protection thanks to a robust housing

The high-resolution camera, the lens, the syringes and the containers for test liquids are mounted in a robust, enclosed housing, focusing the design on the control elements. This robust construction protects the high-value components and makes the DSA100 a low-maintenance instrument. The stable metal construction also increases measuring precision because it minimizes the troublesome effect of vibrations.

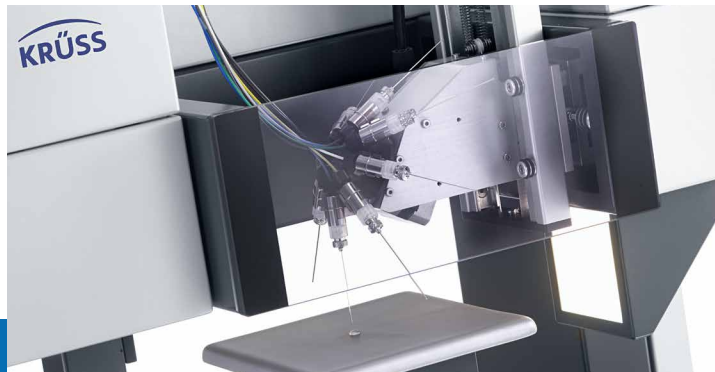
Flexible modular concept that meets all needs

We have adapted the completely modular DSA100 to meet every individual demand – from the manual basic instrument for simple measurements of contact angles right through to the fully-automatic expert version for serial measurements of surface free energy. The DSA100 can be equipped optionally with a long frame for the analysis of especially large samples. In addition, it offers ideal solutions for interfacial analyses of liquids, for measuring under high pressures and temperatures and for special sample types. This diversity makes the DSA100 a universal instrument for interfacial analyses.

Process conditions simulated exactly

Thanks to exactly controlled tempering and humidity chambers or a high-temperature system for smelting, the DSA100 can realistically reproduce individual process conditions. High-tech solutions for optical components enable analyses of extremely fast wetting processes and allow measurements to be made on microscopically small samples. Our special sample tables optimize the examination of wafers and hydrophobic surfaces in tilting experiments.

8-fold dosing unit of the DSA100





TASKS AND APPLICATIONS

- Characterization of surface pre-treatment processes
- Investigation of the adhesion and stability of bonding and coating processes
- Testing of the wettability of plastic, glass, ceramic, paper, wood or metal
- Quality control for wafers and microelectronics
- Testing of surface cleanliness
- Analyses in accordance with a large number of international standards

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, advancing and receding contact angle
- Roll-off angle 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 under controlled humidity
- Wetting measurements on microscopically small surfaces
- Interfacial rheology measurements



DSA100 with external tilting table





OUR ADVANCE SOFTWARE – INTUITION AT FIRST GLANCE

- **Workflow-based user guidance**
- **Simple definition of fully-automatic measuring sequences**
- **Analyses based on proven scientific models**

Novel user concept for simple handling

ADVANCE is our innovative software for drop shape analysis. It sets new standards in intuitive operability. The relevant functions for each particular step are arranged in tiles which display all elements necessary in the context. By avoiding the use of menus and pop-ups, ADVANCE saves any unnecessary clicks and time-consuming searches for hidden elements. The ADVANCE software is the common platform for all our instruments for analyzing wetting.

Particularly simple is the programming of automatic sequences that integrate the software-controlled components of the DSA100 in the complete sample analyses with maximum flexibility. This includes the automatic calculation of the SFE based on proven and meaningful scientific models. Thanks to the simple measuring process and the clear user guidance of ADVANCE, measurement errors due to incorrect operation are virtually ruled out.

User-friendly image management and innovative background recording

The analysis of the video image of a drop on a solid surface is the most important step in contact angle measurement. That is why, for ADVANCE, we have optimized the performance of the image evaluation even further. So images with low contrast, with reflections or interference caused by other objects can be analyzed reliably and accurately. The software evaluates the image fully automatically thus ensuring objective results which are independent of any user intervention.

ADVANCE automatically assigns every measured value to the corresponding drop image and displays these when presenting the results. The image can be subsequently re-evaluated at any time using different parameters or methods. There is no need for the inconvenient saving, loading and management of image files.

A very special innovation is the automatic background recording of the camera image. This takes place even when no measurement is running. The live image can be paused at any time in order to analyze the preceding period or to save it as a video file. This prevents valuable information from being lost – for example if no measurement was started at the instant of wetting.

Diverse scientific evaluation methods

ADVANCE works with all common, scientific models for calculating the SFE from contact angles. The results supply reliable information about the polarity of a surface, for example, or the effect of an activating pre-treatment of the material. The necessary physical liquid data are stored in an extensive, integrated substance database which can be expanded at will.



PERFORMANCE AND DIVERSITY IN LINE WITH YOUR APPLICATIONS

The modular design of our Drop Shape Analyzer – DSA100 is focused on the individual requirements of our customers. From the uncountable number of possible combinations we have put together three standard configurations: Basic, Standard and Expert. These vary in the degree of automatization and their software facilities – from manual measurement of wetting right through to fully-automatic solutions with maximum software scope for solid and liquid surfaces. There is also nothing to prevent subsequent upgrading of the functional scope.

Features of the standard configurations



DSA100B – Basic



DSA100S – Standard



DSA100E – Expert

Horizontal axes (x-/y-axes) and lift table (z-axis)	▪ Manuel z-axis	▪ Manual x-, y- and z-axes	▪ Software-controlled x-, y- and z-axes
Dosing unit	▪ Single-dosing unit ▪ Manual	▪ Single-dosing unit ▪ Software-controlled	▪ 4-fold dosing unit ▪ Software-controlled ▪ Expandable for up to eight liquids
Lens	▪ Manual focus and zoom setting (7-times)	▪ Manual focus and zoom setting (7-times)	▪ Software-controlled focus and zoom setting (7-times)
Scope of the ADVANCE software	▪ Contact angle	▪ Contact angle ▪ Surface free energy of solids	▪ Contact angle ▪ Surface free energy of solids ▪ Interface and surface tension of liquids









TWO SPECIAL INSTRUMENTS FOR SPECIAL SAMPLES

DSA100M

We have designed the DSA100M micro configuration for measuring wetting on the smallest of samples. It enables very exact dosing and shape analysis of drops in the picoliter range, whereby contact angle measurements analyze wetting and coating processes on extremely small surfaces. The diverse areas of application of the DSA100M include artificial and natural fibers for composites, clock and watch mechanics, contact points for semiconductors, hair for the assessment of hair care products, micromechanical components and applications of microfluidics, just to name a few.

The high-precision dosing unit works with drops from 20 picoliter upwards that are placed with pinpoint accuracy thanks to additional high-quality observation optics. Even ultra-small drops that evaporate quickly are analyzed accurately thanks to the interaction of the high-speed camera and high-quality microscope optics of the DSA100M.

- Dosing and analysis of drops in a range from 20 picoliter upwards
- High-quality microscope optics and high-speed camera
- Optional observation optics for exact positioning of the drops

DSA100W

Developed especially for the fully-automatic, standardized quality control of wafers and other round samples, the DSA100W calculates the homogeneity of surface cleaning. It also enables coatings to be characterized accurately, for example exposed and unexposed photo varnish.

- Fast measuring process and high sample throughput thanks to fully-automatic measuring procedures
- Software-controlled and accurate analysis of any desired position on the sample
- Position-dependent measuring of the contact angle



DSA100M



DSA100W

Analyzing microscopically small samples



Quality testing of wafer surfaces



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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