

# FORCE TENSIOMETER – K100



THE HIGH-END SOLUTION FOR  
MEASURING SURFACE  
AND INTERFACIAL TENSION



**KRÜSS**

Advancing your Surface Science



# MAXIMIZING THE VARIETY OF SURFACE AND INTERFACIAL TENSION MEASURING METHODS

- **Determines surface and interfacial tension, contact angles and more**
- **Offers a wide range of methods for individual requirements**

## Success meets flexibility

The close contact we keep with our customers and scientists inspires us to develop measuring solutions that are perfectly designed for versatile and demanding applications – from research and development to quality assurance. One of our most successful results is the Force Tensiometer – K100, a multi-flexible instrument for analyzing surfaces and interfaces. It performs high-precision, automatic, and reliable measurements of surface and interfacial tension as well as critical micelle concentration (CMC) and measures the contact angle on solids, fiber bundles and powders. This versatility makes it the most-sold tensiometer worldwide.

## A uniquely wide range of methods

The K100 is a champion in versatility – offering the greatest flexibility. It provides the world's largest selection of measuring methods for characterizing surfaces and interfaces. The principal methods are based on the precise detection of the force that occurs when wetting a measuring probe or a solid sample. It is easy to measure surface and interfacial tension using standardized methods including the Du Noüy ring, Wilhelmy plate or rod method. But the K100 provides also a series of other central methods for analyzing liquids and the wettability of solids in various forms. Furthermore, the density of solids and liquids can be determined exactly with our accessories.

## Designed for flexible usage and reliable measurements

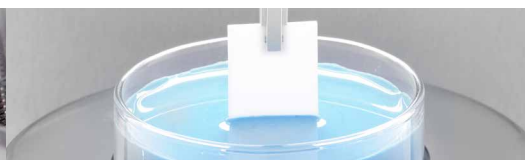
The K100 guarantees highly reliable recordings and fast temperature control from -15 up to 300 °C. This enables thermal process conditions to be simulated or melts to be analyzed. The simple changeover between different measuring methods takes place entirely without reconfiguring the instrument. One of the biggest design advantages of our K100 is the large sample chamber that allows you to load the instrument more quickly, conveniently and safely. Even large-sized samples can be processed with maximum ease of use.

## Fast and easy measurements of single-sided coated samples

The K100 has the option to obtain accurate contact angle results in the course of wetting and de-wetting of a solid, even for one-sided coated samples. With this extension of the dynamic contact angle, the K100 is able to analyze these samples fast and easily.

## Measuring smaller sample volumes with the rod method

Our K100 performs the rod method perfectly. It uses a cylindrical rod with a small diameter instead of a plate. This allows measurements to be carried out in smaller vessels. The advantage, therefore, lies in reduced sample volumes.





## TASKS AND APPLICATIONS

- Determination of the effectiveness and efficiency of surfactants by critical micelle concentration (CMC) measurement
- Wetting behavior of tablets, pharmaceutical active ingredients and excipients
- Wetting of varnishes and paints
- Decomposition product content in oils
- Tank clearance and cleaning validation in the food industry
- Wetting and adhesion of coatings
- Development of cosmetic products
- Wetting properties of inks
- Wetting of fiber bundles and textiles
- Analysis 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, e.g. for measurements in accordance with ASTM D971
- 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

## SECURING CURRENT NORMS AND STANDARDS

With this unique instrument, we place great emphasis on the replicability and standardization of our measuring results. The K100 is designed in accordance with nearly all valid EU, ISO, DIN norms and ASTM standards regarding surface and interfacial tension.

### Valid norms and standards

ASTM D971	Standard Test Method for Interfacial Tension of Oil Against Water by the Ring Method
ASTM D1331	Standard Test Methods for Surface and Interfacial Tension of Solutions of Paints, Solvents, Solutions of Surface-Active Agents, and Related Materials
ASTM D1417	Standard Methods of Testing Rubber Latices – Synthetic
DIN EN 14210	Surface active agents – Determination of interfacial tension of solutions of surface active agents by the stirrup or ring method
DIN EN 14370	Surface active agents – Determination of surface tension
ISO 304	Surface active agents – Determination of surface tension by drawing up liquid films
ISO 1409	Plastics/rubber – Polymer dispersions and rubber latices (natural and synthetic) – Determination of surface tension by the ring method
ISO 4311	Anionic and non-ionic surface active agents – Determination of the critical micellization concentration – Method by measuring surface tension with a plate, stirrup or ring
ISO 6889	Surface active agents – Determination of interfacial tension by drawing up liquid films
OECD 115	OECD Guideline for the testing of chemicals: Surface Tension of Aqueous Solutions



# HIGH PRECISION SURFACE AND INTERFACIAL TENSION MEASUREMENT

- **Highly sensitive force sensor with outstanding resolution**
- **Accurate and stable**
- **Large variety of sample holders**

## High-quality components for precise measurements

The Force Tensiometer – K100 is equipped with a high-precision force sensor leading to a resolution of 0.001 mN/m. Furthermore, all measuring probes such as rings and plates display a high and also certified shape accuracy.

## More stability and smoothness for absolute precision

For maximum reproducibility, we eliminated the troublesome effect of vibration by using a dynamic and smooth running drive. Moreover, we reduced the long-term drift of the force sensor to a minimum.

## A broad range of sample holders for various applications

Depending on the measuring method, a large selection of accurately shaped sample holders can be adapted.

## The right sample holder for your application:

- Sedimentation probe to characterize the sedimentation of dispersions
- Measurement cone to characterize the penetration into sediments
- Sample holder for foils and films
- Sample holder for single fibers
- Glass sample holder and a tool for uniform preparation to measure adsorption and wetting behaviors of powder samples
- Fiber chamber for investigating the wetting properties of fiber bundles, pigments or powders
- Sample holder for solid sample plates





# WE CREATE INTELLIGENT AND TIME SAVING OPTIONS AROUND THE MOST IMPORTANT PART – YOUR APPLICATION

- Features for easy and reliable preparation
- Maximum repeatability
- Intuitive analyses and result management

## Motorized sample stage with high position resolution

The software-controllable sample stage of the Force Tensiometer – K100 moves in a wide speed range and communicates its exact position to the software with a resolution of 0.1  $\mu\text{m}$ . This adds to the accuracy of results where position control is essential, e.g. for Du Noüy ring or contact angle measurements. The option of saving standard positions supports you in preparing the analyses.

## Built-in ionizer against static charge

An ionizer is integrated within the sample chamber and ensures reliable contact angle measurements on solid samples. It automatically eliminates static charge that could falsify the results.

## Stirring without magnetic influence

The integral, automatic stirring function ensures optimum homogenization of solutions and dispersions before each measurement. It works without a permanent magnet, does not affect the sensitive force sensor and allows you to analyze even magnetic samples.

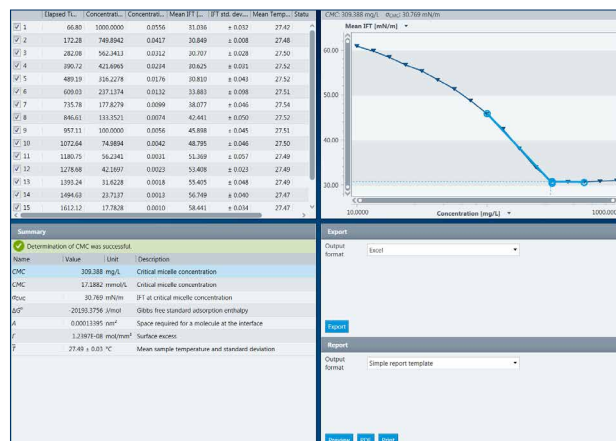
## Illuminated measuring compartment

The illumination unit in the measuring compartment irradiates the sample surface as well as the probe which makes positioning of the sample very easy.

## Impressive instrument control and data management with our ADVANCE software

ADVANCE is our innovative, universal software designed to work with all KRÜSS instruments based on a common, intuitive approach. The relevant functions for each working 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 K100 measuring methods run with pre-prepared templates that standardize the fully automated procedures down to the smallest detail, thus providing maximum repeatability. All raw data and results are clearly shown in several tiles that are custom-made for each method. Functions for comprehensive reports and data export as well as a fast access to result comparisons of up to 20 measurements make ADVANCE a powerful tool for managing and evaluating your data.



# WE HAVE COMBINED SMART DESIGN WITH OUTSTANDING USABILITY

- Automated calibration
- Robust housing and components
- Made in Germany

The Force Tensiometer – K100 is not only a universal measurement instrument – it satisfies a market that needs perfect lab solutions for highly demanding everyday applications.

## Automated calibration

The K100 eliminates complicated or time-consuming calibrations. When setting-up the instrument, automatic adjustment of the force sensor provides for reliable measurement data. Our K100 stores the adjustment data internally and immediately uses them when measuring. This concept avoids what is typical for other tensiometers: the need for adjustments on a daily basis or after changing the measuring probe.

## Practically equipped

The large sample chamber has magnetically locked glass swinging doors, which shield it from troublesome air currents. A built-in spirit level helps you to adjust the sample stage precisely to enable accurate force measurements.

## Easy and intuitive operation with our control pad

Intuitive operation by means of the control pad as an addition to software control is a unique feature of our K100. It makes it easy to control the sample stage and other components before and during the measurement.

## Designed to perform under intense daily use

All components of the K100 are robustly designed and engineered for your daily laboratory needs. They provide an excellent oil and solvent resistance.

## Protected force sensor

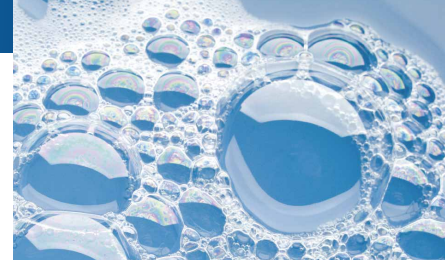
The high sensitive force sensor is protected at all times by a lock mechanism that only releases the force sensor during measurements and activates itself automatically after the measurement.

## Designed and engineered in Germany

Every K100 was completely engineered, hand-built, assembled, and tested in Germany. Every instrument that leaves our production center is a commitment to outstanding quality with a highly scientific approach.







## PERFECTLY EQUIPPED FOR TEMPERATURE CONTROL AND CMC MEASUREMENT

- Temperatures from -15 up to 300 °C
- Fully automated concentration series for CMC

### TJ50 – Peltier temperature control unit from -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 up to 300 °C

With our high temperature solution 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.

### Micro Dispenser for fully automated CMC measurements

Our Micro Dispenser equips the Force Tensiometer – K100 for measuring the critical micelle concentration (CMC). The surfactant concentration range is set up and measured fully automatically. Working with two micro dispensers – one for dispensing the liquid and the other one to aspirate the same volume – enables a very wide concentration range. A high density of measuring points can be created in order to measure the CMC very accurately. Failed measurements due to an overly concentrated parent solution are virtually ruled out, as it can be diluted by several orders of magnitude to find the CMC.



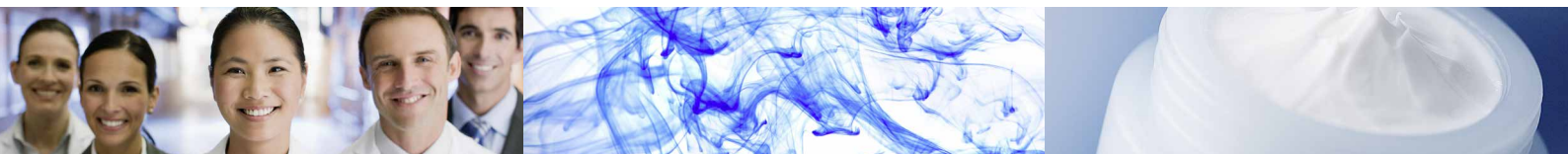
TJ60 – high temperature control unit up to 300 °C

Force Tensiometer – K100 with Micro Dispensers

# 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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