

## **SURFTENS**UNIVERSAL

# Measuring instrument for contact angle, surface tension and free surface energy

### **SURFTENS**UNIVERSAL: OVERVIEW

The contact angle meter **SURFTENS**UNIVERSAL is an universal instrument for use in the laboratory as well as in production control. It is characterized by the following features:

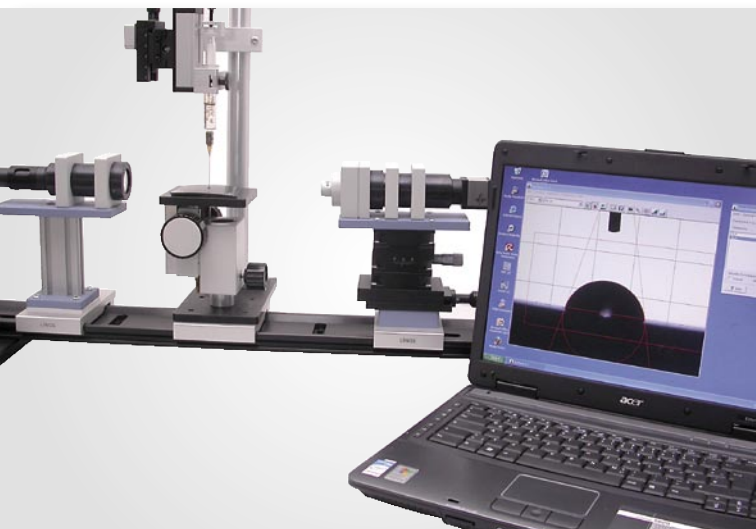
- fast and easy measurement of contact angle
- software with intuitive operation contains different measuring methods

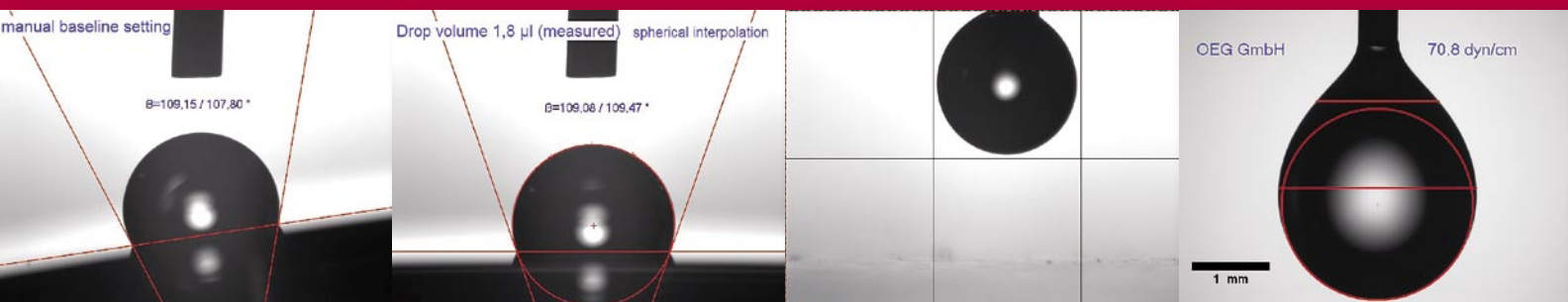
- comfortable documentation of the measuring results in protocols and in the video images
- computation of free surface energy by the theory of Wu
- optional use with laptop or PC (independent from the used camera)
- optional use of digital USB 2.0 camera or standard analogue video camera
- excellent image quality by use of high quality optics
- economically priced solution with all necessarily functions for standard use in laboratory and production
- software extension for measurement of surface tension with the pendant drop method available
- additional modules like thermal chamber or automatic dispensation system available

### **SURFTENS**UNIVERSAL: APPLICATIONS

The modification of the wetting ability of technical surfaces by special surface treatments becomes more and more common in industry and research.

For process characterization, adjustment of technological parameters and production control it is therefore absolutely necessary, to measure the surface





free energy objectively and accurately before and after the modification process.

For this purpose a robust and easy to use contact angle measuring instrument is needed. **SURFTENS** UNIVERSAL was developed to meet the needs in industry and research plus in production control. The operation is simple and for everybody possible after a short training. The manual operation ensures an attractive price.

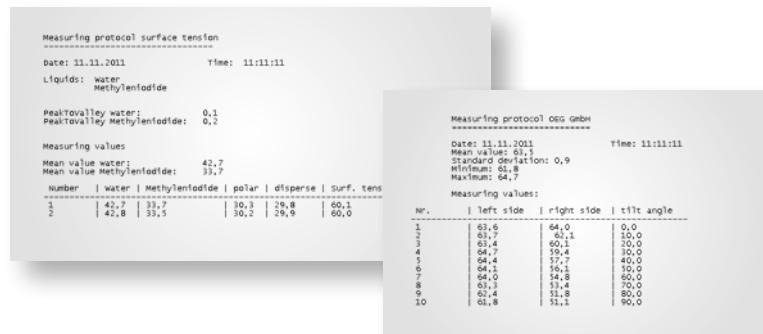
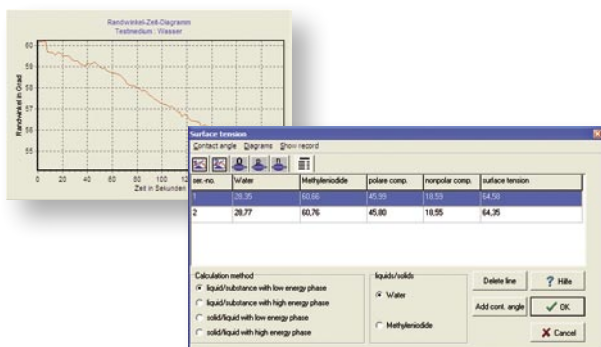
Thus **SURFTENS** UNIVERSAL is used as well as in standard process control as well as in research and development. In connection with the software **SURFTENS** the contact angle and the free surface energy of solids can be measured. The comfortable documentation functions are a powerful help in quality assurance and research.

## SURFTENS: THE MEASURING SOFTWARE

Basically the measuring software **SURFTENS** makes possible the fully automatic measurement of the contact angle of a sessile drop by different fitting methods of the drop shape. The drop is automatically detected by image processing methods.

Specimen-dependent the contrast of the drop image can be critical for an automatic detection.

For such cases the software offers additional options for the drop detection like the manual setting of the



baseline and the completely manual measurement of the contact angle by setting of measuring points on the monitor.

The scope of services is extended by additional measuring and service functions like:

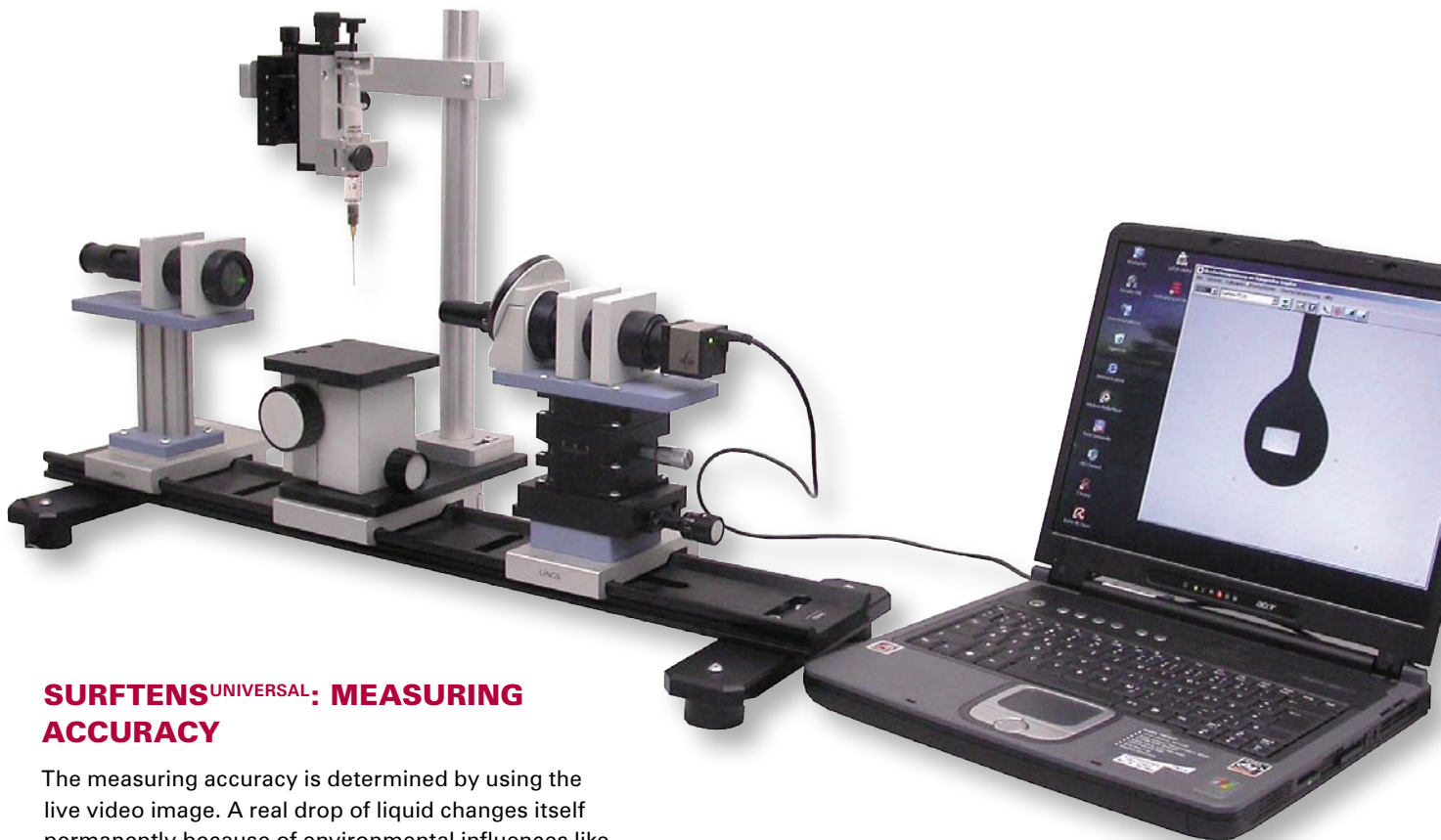
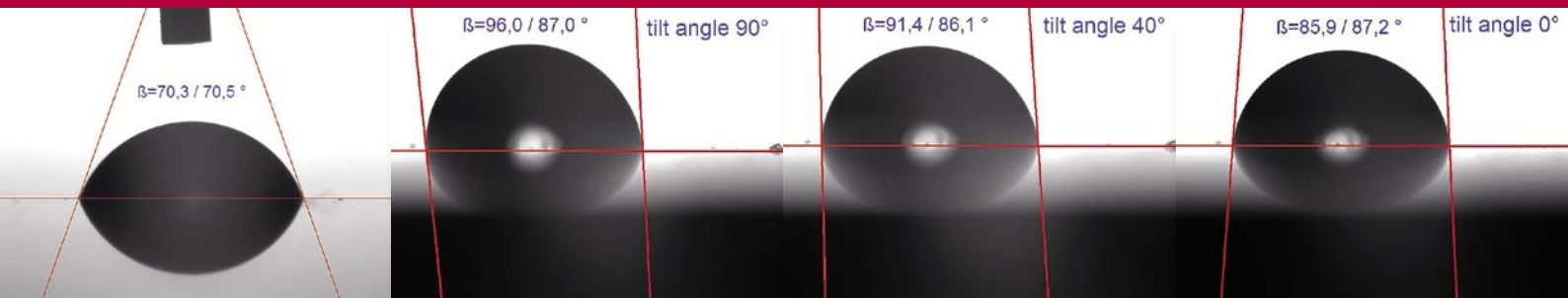
- real time display of current contact angle at the live video image
- automatic measurement of the time dependent contact angle and display in diagrams (cycle time freely selectable, minimum cycle time 50 ms)
- measurement of advancing and receding contact angle at the live video image
- simultaneous measurement of left and right side contact angle
- measurement on curved surfaces with angular baseline

The software contains an evaluation module (theory by Wu) for computation of the free surface energy of solids from the measured contact angles of two known measuring liquids.

By special software functions the drop volume is reproducible by 0.1  $\mu</math>l also with a manual dispensation system. As additional option the drop volume can be measured by the software.$

A very useful feature is the acquisition of AVI-files from the live video stream. All measuring and documentation functions are afterwards applicable to the complete film or any single image of the film.

The measuring results can be stored comfortable in protocols or the video image.



## **SURFTENS<sup>UNIVERSAL</sup>: MEASURING ACCURACY**

The measuring accuracy is determined by using the live video image. A real drop of liquid changes itself permanently because of environmental influences like evaporation. Therefore the accuracy can be specified only by help of a contact angle standard.

The software has the following parameters:

- resolution of contact angle measurement: 0.05°
- reproducibility of contact angle measurement: ±0.1°
- accuracy of contact angle measurement: ±0.5°

## **SURFTENS PD: ADDITIONALLY SOFTWARE MODULE FOR MEASUREMENT OF SURFACE TENSION OF LIQUIDS**

An optional extension is the software **SURFTENS PD**.

This software measures the surface tension of liquids using the pendant drop method.

The **SURFTENS<sup>UNIVERSAL</sup>** standard configuration is sufficient for this measurement. Only the additional software module is necessary, which is offered as bundle in connection with the standard software.

## **SURFTENS<sup>UNIVERSAL</sup>: ADDITIONAL HARDWARE**

The basic configuration can be extended by different hardware moduls. Currently the following additional modules are available:

### **1) Double dispenser**

The double dispenser consists of two manual dispensation systems and is useful, if two measuring liquids are permanently used.

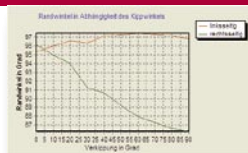
### **2) Automatic dispensation system**

The automatic dispensation system provides a motorized and software controlled dispensation and setup of the drop.

The drop volume is programmable. It can be combined with a motorized x/y-stage, which allows contact angle mappings of large specimen.

### 3) Tilting stage

In combination with **SURFTENS<sup>UNIVERSAL</sup>** a tilting stage is available. The specimen is tilted together with the drop of the measuring liquid (sessile drop). Not only the specimen is tilted, but the complete instrument. Therefore the live video image shows only a change of the left and right side contact angle dependent from the tilting angle. Starting with a horizontal positioned drop and symmetric contact angles on both sides, the drop contour shifts with advancing tilting angle. The drop changes its form because of the gravitation proportional to the tilting angle. In connection with the measuring software this effect can be logged and displayed graphically and in a protocol. The tilting stage is operated manually with a reproducibility of 1°. The input of the tilting angle in the software is made manually. Finally the software provides a graphic of the left- and right-side contact vs. tilting angle. The tilting stage can also be used for testing the roll-angle of a sessile drop.



### 4) Contact angle standard

The contact angle standard is a glass substrate, on which by use of a photolithographic process several contact angle pictures are displayed. The design data (CAD-data) provide

the contact angle for each picture. Because of the high accuracy of the manufacturing method the images have exactly the estimated contact angles without any error. Therefore the contact angle standard is a perfect specimen for verifying the accuracy of the measuring instrument.



### 5) Thermal chamber

The thermal chamber enables contact angle measurements with temperatures up to 80°. The temperature is software controlled and is transferred in the measuring results automatically.



## SURFTENS<sup>UNIVERSAL</sup>: TECHNISCHE DATEN

	SURFTENS <sup>UNIVERSAL</sup>
specimen table	standard 100 mm × 100 mm other sizes on inquiry
specimen thickness (height adjustment range of the table)	max. 50 mm
contact angle measuring range	1°—180°
resolution/accuracy of contact angle measurement	±0.05°/±0.5° on the live video but with contact angle standard
optics (standard equipment)	micro objective 0.8× long working distance
alternative measuring optics	micro objective 1.6×/3.2× long working distance
drop placement	by table movement upwards
camera (standard)	b/w USB 2.0 CMOS camera, 1.3 megapixels
alternative cameras	USB 2.0 cameras up to 5 megapixels and analogue video cameras
tilting angle of measuring optics	defined adjustable 0°—6°
dispensation system (standard)	manual single dispensation system
dispensation system (alternative)	manual double dispenser or fully automatic system
drop volume reproducibility	0.1 μm (by measurement of the live video image)
light source	long live high power LED illumination with special condenser optics
software	<b>SURFTENS</b> , for Windows (all versions)
software for pendant drop measurement	<b>SURFTENS PD</b> as additional option/bundle
computer	for all camera types optional laptop or standard PC
tilting stage	manually, resolution 1°, max. tilting angle 90°

This features are for the standard equipment and can be adapted to other technical requirements. The technical parameters are subject to change without notice. Binding are the technical specifications as per quotation.