

# DropMaster



## Contact Angle Meter

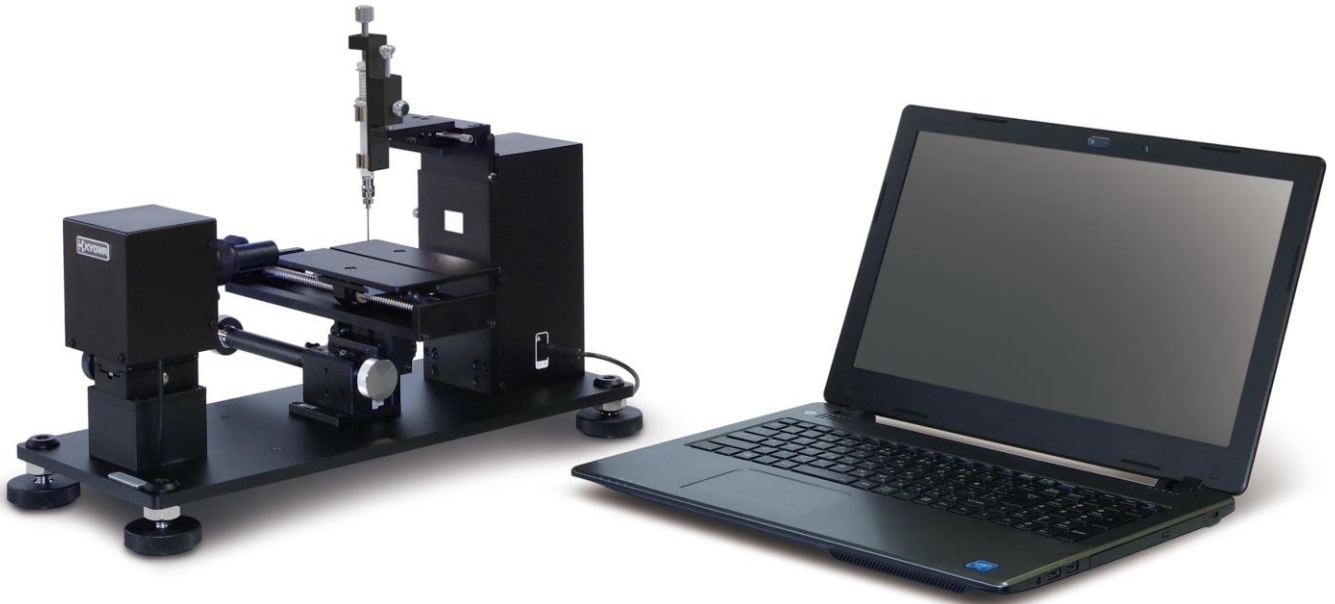
Contact Angle, Liquid Surface Tension, Surface Free Energy

# DMs-401

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The DMs-401 is a compact yet high-performance surface measuring instrument for measuring static and dynamic contact angles, the surface free energy of solids, and the surface and interfacial tension of liquids. Its functions can be easily extended due to its sophisticated modular design.

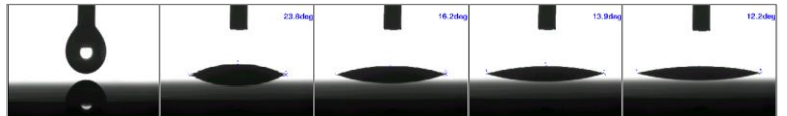
Optional accessories are available, such as software-controlled dispensers, temperature control devices, and an external tilting stage system.



## FEATURES OF THE DMs-401

### Fast image capture with 60fps

Sequential droplet images are captured at a rate of 60 frames per second. That allows the measurement of contact angles and surface & interfacial tensions as a function of time.



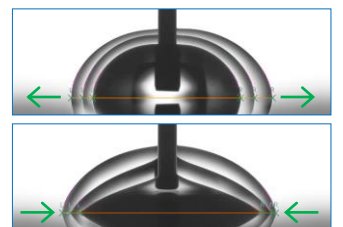
A 2700fps image capture system is available as an option for the demand for higher-speed image capturing.

**Applications:** Initial spreading, absorbing property, the effect of surface-active agents

### Extension/Contraction method

Advancing/Receding Angles are measured by increasing and decreasing the volume of a captive droplet. The optional automatic dispenser system is required to ensure reliable measurements for smooth and precise dynamic motion of the volume change.

**Applications:** Coating property, repellency, characterization of droplet hysteresis



### Sliding method

Advancing/Receding Angles are measured using an external stage, tilting the measuring instrument. The angle at which a droplet starts sliding from the solid surface is determined as Sliding Angle. The Adhesive Energy between the droplet and the solid surface is analyzed at the same time. The optional Sliding method kit is required.

**Applications:** Repellency/hydrophobicity, characterization of droplet hysteresis



## Surface Free Energy analysis of solids

Solid surface free energies and their polar and dispersive components are analyzed using contact angle measurements with different probe liquids. Geometric mean, Harmonic mean, acid-base, Interaction analysis (Work of Adhesion, Interfacial Free Energy), Young-Dupr e, and Zisman are available. In addition, an optional surface free energy kit with five probe liquids and a set of needles is available.

**Applications:** Adhesive property, characterization of surface modification, evaluation of hydrophilicity/hydrophobicity

## Surface/Interfacial Tension of liquids

The optional pendant drop kit allows for measuring liquids' surface and interfacial tension using the pendant drop method. The advantages compared to the conventional Wilhelmy plate method and du No y ring method are as follows:

- Measurement with a small liquid amount (less than 1mL)
- High-temperature control, such as molten polymer applications
- Suitable for liquids whose surfaces change quickly after exposure to air

## Automatic recognition of drop deposition

The droplet deposition from the needle tip to the solid surface is recognized automatically, and customers can individually set the time interval between deposition and recognition. This function is beneficial for samples that spread fast after depositing.

## Live image, droplet volume monitoring

The image monitor displays a live image of the actual droplet and its droplet volume in  $\mu\text{L}$ . In addition, the optional automatic dispenser allows software-controlled droplet volume by the FAMAS software.

## Brightness and focus adjustment

With the help of the brightness level indicator and the focusing aid with the index graph and value displayed on the image screen, operators can easily adjust a perfect image for precise measurements.

## Black & white threshold level adjustment

Adjusting the threshold level to determine the binary image before and after measurement helps to distinguish the droplet's contour from its surroundings. Both relative and absolute adjustments are possible to optimize image analysis.

## Data chart & variable data

Besides the contact angle data, the FAMAS software obtains the droplet volume, sessile drop volume, absorbed droplet volume, residual droplet ratio, and droplet height. FAMAS also displays contact angles measured as a function of time in a comparison chart.

## Movie converter

The integrated movie converter easily and quickly converts images of the contact angles measured as a function of time to an MPG-1 or AVI movie file.

## Droplet calibration standard

The droplet calibration standard for the standard view is a basic accessory. The soda-lime glass slide bears one full circle for calibration and three droplet silhouettes of  $5^\circ$ ,  $60^\circ$ , and  $108^\circ$  for periodic inspections of measurement accuracy.

With the help of this tool, users can efficiently perform routine maintenance to ensure the reliability of their measurements over long periods.

An additional droplet calibration standard for calibration of the camera wide-view setting and pendant drop calibration standards for standard and wide-view settings are available.

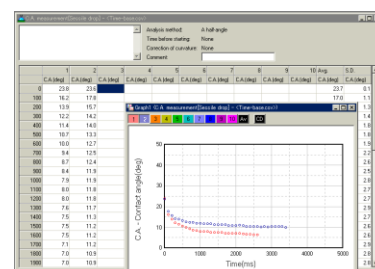
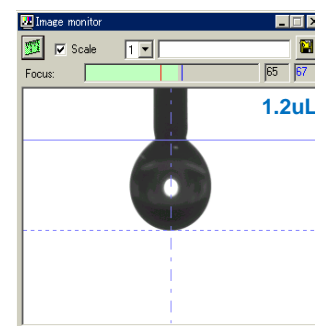
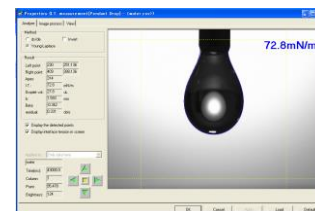
Upon request, we also issue traceable certificates of the accuracy of the full circle and droplet silhouettes.

## STANDARD COMPONENTS

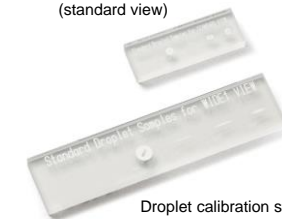
Item	Q'ty	Item	Q'ty
DMs-401 main body*1	1	Manual dispenser	1
Glass syringe set with 22G SUS needle	5	Set of Teflon coated needles, 2x 18G & 2x 22G	1
Droplet calibration standard (standard view)	1	Acrylic plate (for practice)	1
AC/DC adapter	1	USB cable	1
FAMAS software and license key	1	Operation manual (English) *2	1

\*1 Main body features a CMOS camera, LED lamp, stage device, and dispenser holder on its chassis.

\*2 A windows PC is required to operate the instrument and can be ordered optionally.



Droplet calibration standard  
(standard view)



Droplet calibration standard  
(wide view)

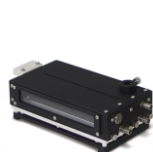
# DMs-401

## SPECIFICATIONS

Measuring methods	Sessile drop, Advancing/receding angle, Pendant drop, Sliding angle (option)	
Analysis methods	Contact angle: $\theta/2$ , Tangent, Curve fitting (ellipse, circle), Young Laplace	Surface and interfacial tension: Young Laplace, $d_s/d_e$
	Surface free energy of solids: OWRK, Owens-Wendt, Kaelble-Uy, Kitazaki-Hata, Wu, acid-base, Zisman	
Measuring range	Contact angle: 0 to 180 °	Surface and interfacial tension: 0 to 2000 mN/m
Display resolution	Contact angle: 0.01 °	Surface and interfacial tension: 0.01 mN/m
Accuracy <sup>1)</sup>	Contact angle: 0.2 °	Surface and interfacial tension: 0.2 mN/m
Optical system	Manual focus with 3-step manual zoom Field of view: 4.0 x 5.3 mm, 7.2 x 9.6 mm, 10.2 x 13.6 mm $\pm 5$ %	
Sample stage size	150(W) x 100(D) mm	
Applicable sample size	150(W) x 100(D) x 35(H) mm, weight 300 g max.	
Stage travel range	X-axis: 150 mm, manually via rotation knob Z-axis: 20 mm, manually via rotation knob, additional 20mm via lockable sliding device	
Droplet dispensing	Standard: Manual dispenser Option: Computer-controlled dispenser	
Dispensing resolution	0.1 $\mu$ l	
Droplet deposition	Manually via stage up/down movement	
Measuring temperature	Standard: Ambient Option: Jacket type temperature-controlled (+5 to +90 °C) Heater type temperature-controlled (ambient to +180 °C and ambient to +380 °C)	
Instrument dimensions	294(W) x 461(D) x 288(H) mm	
Instrument weight	6.0 kg	
Power supply	AC100 to 240V, 50/60 Hz, 5.5 W 15 VA	
Operating environment	Temperature: +10 to +35 °C, humidity: 30 to 80 %RH (non-condensing) Positioned away from sources of electrical noise and vibration	

<sup>1)</sup> Accuracy is the repeatability in terms of standard deviation based on the manufacturer's calibration standard.

## SELECTION OF OPTIONAL ACCESSORIES



### JACKET-TYPE STAGE SET

For contact angle measurements in a temperature range from about +5 to +90 °C.

A refrigerated/heated circulator is required for temperature control, and a surface thermometer is required to measure the solid's surface temperature.



### JACKET-TYPE CHAMBER SET

For surface and interfacial tension measurements in a temperature range from about +5 to +90 °C.

A refrigerated/heated circulator is required for temperature control, and a surface thermometer is needed to measure the liquid's surface temperature.



### HEATER-TYPE STAGE PACKAGE

For contact angle measurements in a temperature range from ambient to +180 °C.

The temperature controller 202E with a PID control system and two built-in type K thermocouple thermometers are included.



### HEATER-TYPE CHAMBER PACKAGE

For surface and interfacial tension measurements in a temperature range from ambient to +380 °C.

The temperature controller 402E with a PID control system and two built-in type K thermocouple thermometers are included.



### AUTOMATIC DISPENSER SET

Software-controlled dispenser unit for quick and precise creation of droplets, including a control box.



### SURFACE THERMOMETER

Portable thermometer with a built-in platinum resistance sensor.



### THREE-STATE MEASUREMENT KIT

Set for contact angle measurements of a liquid on a solid surface while immersed in a liquid. Liquids and air bubbles can also be deposited on the solid surface from beneath.



### PD KIT

Set of SUS needles, glass cuvettes, and standard pendant drop samples to measure the surface and interfacial tension using the pendant drop method.



### FE KIT

Set of 5 probe liquids and 4 Teflon coated needles for the analysis of surface free energy of solids.



### IMAGE CAPTURE SYSTEM 2700

A high-speed camera for image capturing with a maximum of 2700fps.

For detailed information, please get in touch with our sales partner or us directly at +81-48-483-2629 or [overseas-sales@face-kyowa.co.jp](mailto:overseas-sales@face-kyowa.co.jp).

Specifications and designs and designs are subject to change without notice.

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