

# DropMaster

## **DMs-401**



Kyowa Interface Science Co., Ltd.

## DMs-401

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

Optional accessories, such as computer controlled dispenser, temperature control devices, external tilting stage system are available.



### Features of the DMs-401

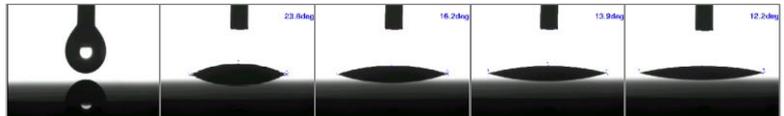


#### Fast image capture with 60fps

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

A 333fps image capture system is available as an option for demand of higher speed image capturing.

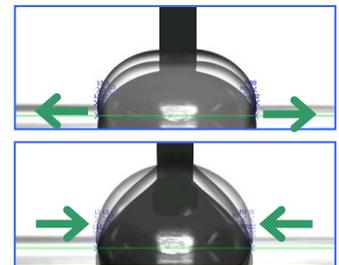
**Applications:** Initial spreading, absorbing property, effect of surface active agents



#### Extension/Contraction method

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

**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 from the results of contact angle measurements with different probe liquids. Geometric mean, Harmonic mean, acid-base, Interaction analysis (Work of Adhesion, Interfacial Free Energy), Young-Dupré, Zisman are available. An optional Surface energy kit with 5 probe liquids and a set of needles is available.

**Applications:** Adhesive property, characterizing surface modification, digitalization of hydrophilicity/hydrophobicity

**Surface/Interfacial Tension of liquids**

Pendant drop method allows for measuring surface and interfacial tension of liquids. The advantages compared to conventional Wilhelmy plate method and du Noüy ring method are as follows:

- measurement with small liquid amount (less than 1mL)
- high temperature control such as molten polymer applications
- suitable for liquids which surfaces change quickly after exposure to air

The optional Pendant drop kit is required.

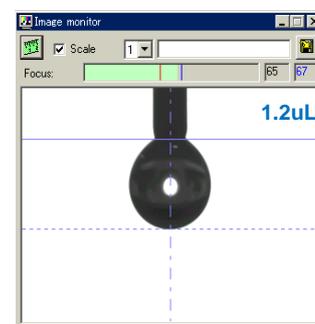


**Automatic recognition of drop deposition**

The droplet deposition from the needle tip to the solid surface is recognized automatically and the time interval between deposition and recognition can be set individually. This function is very useful 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  $\mu$ L. Using the optional automatic dispenser, the droplet volume is controlled by FAMAS software.



**Brightness and focus adjustment**

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

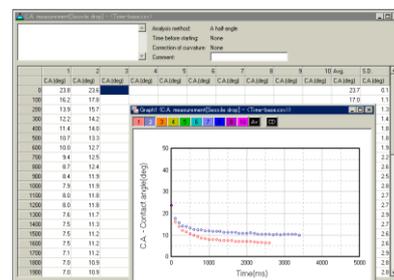
**Black & white threshold level adjustment**

The threshold level to determine the binary image can be adjusted before and after measurement to distinguish to 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 droplet volume, sessile drop volume, absorbed droplet volume, residual droplet ratio, droplet height and radius are obtained at the same time.

Contact angles measured as a function of time can be displayed in a chart.

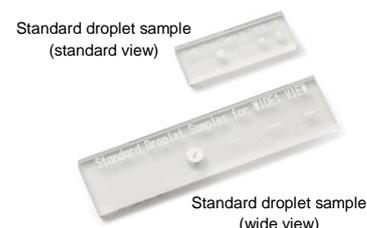


**Movie converter**

The images of the contact angles measured as a function of time can be easily and quickly converted to a MPG-1 or AVI movie file.

**Standard droplet sample**

The standard droplet sample (standard view) is a standard accessory for all models. It is made of soda-lime glass and printed with a circular silhouette for calibration and three droplet silhouettes of 5°, 60° and 108° for periodic inspections. With help of this tool, users can easily perform routine maintenance to ensure reliable measurements. A certificate of accuracy for the silhouettes can be obtained optionally.



**STANDARD COMPONENTS**

DMS-401 main body*1	1	Manual dispenser	1
Glass syringe set with 22G SUS needle	5	Teflon coated needle, 18G, 22G	2 each
Standard droplet sample (standard view)	1	Acrylic plate (for practice)	1
AC/DC adapter	1	USB cable	1
FAMAS software and license key	1	Operation manual (English)*	1

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

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

# 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) Surface and interfacial tension: Young Laplace, $d_g/d_e$ Surface free energy of solids: Owens-Wendt, Kaelble-Uy, Kitazaki-Hata, Wu, acid-base, Zisman
Measuring range	Contact angle: 0.01 to 180°      Surface and interfacial tension: 0.01 to 100mN/m
Display resolution	Contact angle: 0.01°      Surface and interfacial tension: 0.01mN/m
Precision <sup>1)</sup>	Contact angle: 0.2°      Surface and interfacial tension: 0.2mN/m
Optical system	Manual focus with 3 step manual zoom Field of view: 4.0 x 5.3mm, 7.2 x 9.6mm, 10.2 x 13.6mm $\pm 5\%$
Sample stage size	150(W) x 100(D)mm
Applicable sample size	150(W) x 100(D) x 35(H)mm, weight 300g max.
Stage travel range	X-axis: 150mm, manually via rotation knob Z-axis: 20mm, 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)
Power supply	AC100-240V, 50/60Hz, 5.5W 15VA
Instrument dimensions	294(W) x 461(D) x 288(H)mm
Instrument weight	6.0 kg
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> Precision is the repeatability described in standard deviation based on manufacturer's standard.

## A 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 the 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 the 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 PID control system and with two built-in type K thermocouple thermometers is 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 PID control system and with two built-in type K thermocouple thermometers is included.

### AUTOMATIC DISPENSER SET



Computer controlled dispenser unit for quick and precise creation of droplets, inclusive 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.

### PENDANT DROP KIT



Special needles, glass cuvettes and standard pendant drop samples for measurements of surface and interfacial tension.

### SURFACE FREE ENERGY KIT



Special needles and 5 probe liquids for the analysis of surface free energy of solids.

### IMAGE CAPTURE SYSTEM 333



High speed camera for image capturing with a maximum of 333fps.

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

The specifications and designs are subject to change without notice.

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<http://www.face-kyowa.com>

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