

DropMaster



Dynamic Wafer Contact Angle Meter

Contact Angle, Liquid Surface Tension, Surface Free Energy

DMo-WA series

■ Product lineup

DMo-902WA

Fully automated computer-controlled contact angle measuring system with dia. 335mm 360° rotation stage

- Rotation sample stage with computer-controlled X-translation and rotation axis
- Camera/dispenser unit with computer-controlled Z translation
- Fully automated mapping sequence (droplet generation → droplet deposition → droplet analysis → stage movement) over the entire dia. 305mm stage area is possible by pre-setting coordinates
- The optional multi dispenser system of up to five liquids allows for a “one-click” fully automated analysis of the surface free energy
- The optional high-capacity dispenser for one liquid provides for fully automated measurement of contact angles for applications with high liquid volume requirements
- The automatic recognition of droplet deposition enables droplet analysis after a pre-set time, ensuring reliable results under consistent conditions
- Scales along the outer edge of the rotation stage and the X-axis help to determine mapping positions



DMo-702WA

Fully automated computer-controlled contact angle measuring system with manual dia. 335 mm 360° rotation stage

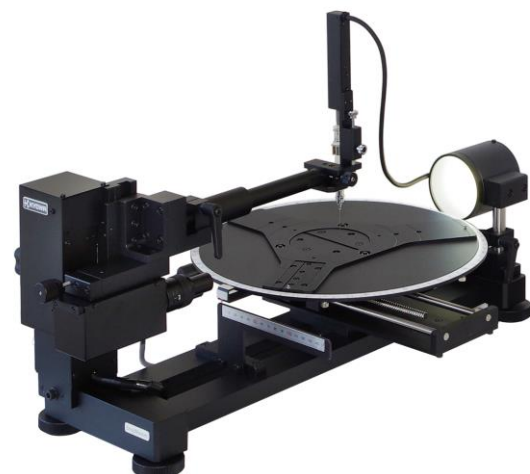
- Rotation sample stage with computer-controlled X translation and manual rotation axis
- Camera/dispenser unit with computer-controlled Z translation
- Automated measurement sequence (droplet generation → droplet deposition → droplet analysis → stage movement) in X-direction is possible by pre-setting commands
- The automatic dispenser unit generates droplets with high accuracy and assures precise measurements of advancing and receding angles through its constant volumetric flow rate
- The optional multi dispenser system of up to five liquids allows for a “one-click” fully automated analysis of the surface free energy
- The automatic recognition of droplet deposition enables droplet analysis after a pre-set time, ensuring reliable results under consistent conditions
- Scales along the outer edge of the rotation stage and the X-axis help to determine mapping positions



DMo-502WA

Automated computer-controlled contact angle measuring system with manual dia. 335 mm 360° rotation stage

- Rotation sample stage with manual X and rotation axis
- Camera/dispenser unit with manual Z-axis
- The precise manual sample stage is adjustable to the desired position, and the dispensing unit allows for a quick and easy exchange
- The automatic dispenser unit generates droplets with high accuracy and assures precise measurements of advancing and receding angles through its constant volumetric flow rate
- The automatic recognition of droplet deposition enables droplet analysis after a pre-set time, ensuring reliable results under consistent conditions
- Scales along the outer edge of the rotation stage and the X-axis help to determine mapping positions.



■ Standard features for all model

- USB 3.0 camera for fast image processing with 400 fps at 640x480 pixel full resolution and a maximum of 2700fps at 640x64 pixel.
- Focusing aid with an index graph and the value displayed in the image screen helps operators achieve perfect focus.
- Movie converter converts data images to MPEG-1 or AVI movie format
- The black & white threshold level to determine the binary image can be adjusted before and after measurement to optimize droplet analysis.
- During analysis of the sessile drop, besides the contact angle data, the FAMAS software determines the droplet volume, sessile drop volume, absorbed droplet volume, residual droplet ratio, height, and radius of the sessile drop.
- A spreadsheet-like table displays the measured results for easy reference and comparison.

■ Sample stage

- All models offer a particular rotary stage for disk-like samples like wafers with a diameter of up to 300mm
- Maximum load capacity of 400g
- 150mm stage travel distance in the x-axis and 360° stage rotation allow mapping in a radial pattern
 - * DMo-702WA is equipped with a motorized X-axis
 - * DMo-902WA is equipped with a motorized X-axis and a motorized rotary stage
- Scales along the outer edge of the rotation stage and the X-axis help to determine mapping positions



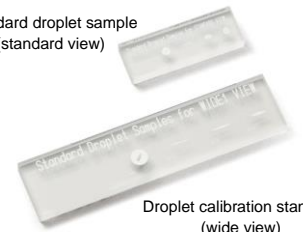
■ Standard components of individual models

DMo-902WA	DMo-702WA	DMo-502WA	Common accessories for all models
<ul style="list-style-type: none"> • Motorized camera and dispenser unit (Z-axis) and motorized stage with X translation and rotation-axis • Automatic single dispenser • Control box 	<ul style="list-style-type: none"> • Motorized camera and dispenser unit (Z-axis) and motorized stage with X translation • Automatic single dispenser • Control box 	<ul style="list-style-type: none"> • Automatic single dispenser, incl. dispenser controller 	<ul style="list-style-type: none"> • Manual single dispenser • Syringe set 22G (5x each/set) • Teflon-coated needles 18G, 22G (2x each) • Droplet calibration standard (standard view)

■ Droplet calibration standard

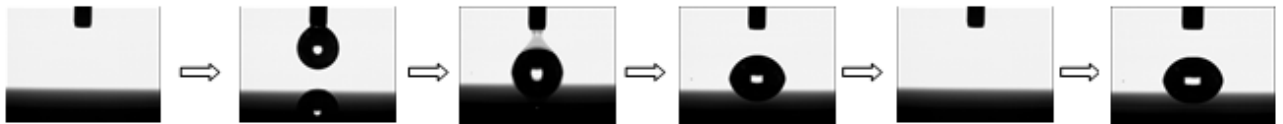
- The droplet calibration standard for the standard view is a basic accessory for all models
- The soda-lime glass slide bears one full circle for calibration and three droplet silhouettes of 5°, 60° and 108° for periodic inspections of measurement accuracy
With the help of this tool, users can efficiently 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 issue traceable certificates of the accuracy of the full circle and droplet silhouettes

Standard droplet sample (standard view)



Droplet calibration standard (wide view)

■ Measuring process



DMo-model	Positioning of first measurement point	Generation of droplet	Deposition of droplet (control/recognition)	Analysis of droplet	Positioning of next measurement point	Full-scale continuous measurements
902WA	●	●	● / ●	●	●	●
702WA	▲ by command button	●	● / ●	●	●	▲
502WA	▲ by rotary knob	●	▲ / ●	●	▲	▲

● automatic ▲ manual

■ Applications

- Surface cleanliness and homogeneity after cleaning processes (typically for removal of organic contamination)
- Surface properties such as wettability and adhesion of modified surfaces and thin film coatings
- Dynamic wetting and de-wetting properties in immersion lithography processes using the roll-off method with an external tilting stage or by increasing and decreasing the droplet's volume

■ Specifications

	DMo-902WA	DMo-702WA	DMo-502WA
Camera system	USB 3.0 CMOS camera with: 400 fps at 640x480 pixels 500 fps at 640x400 pixels 1000 fps at 640x200 pixels 2700 fps at 640x64 pixels		
Optical system	manual focus with a 3-step manual optical zoom of 2.6x field of view: 6.1 x 4.7mm, 11.1 x 8.2mm, 15.8 x 11.8mm ±6%		
Measuring methods	contact angle: sessile drop (static), advancing/receding angle (dynamic) sliding angle (dynamic) ¹⁾ surface/interfacial tension: pendant drop (static and dynamic) surface free energy of solids: sessile drop (static)		
Analysis methods	contact angle: $\theta/2$, tangent, curve fitting (ellipse, circle), Young-Laplace surface/interfacial tension: Young-Laplace, ds/de surface free energy of solids: OWRK, Owens-Wendt, Kaelble-Uy, Kitazaki-Hata, Wu, acid-base, Zisman		
Measuring range	contact angle: 0 to 180° surface/interfacial tension: 0 to 2000mN/m		
Resolution	contact angle: 0.01° surface/interfacial tension: 0.01mN/m		
Accuracy ²⁾	contact angle: 0.2° surface/interfacial tension: 0.2mN/m		
Maximum sample size	diameter 300 mm		
Maximum sample weight	400g		
Sample stage operation			
X-axis	150mm (automatic)	150mm (automatic)	150mm (manual)
Y-axis	---	---	---
Z-axis	---	---	---
Rotation axis	360°(automatic)	360° (manual)	360° (manual)
Dispenser operation			
Z-axis (droplet deposition)	35mm (automatic)		35mm (manual)
Droplet generation	automatic		automatic
Dispensing resolution	0.1 μ l		0.1 μ l
Measuring temperature	ambient		
Instrument dimensions	375(W)x684(D)x432(H)mm		
Instrument weight	12.5kg	11kg	10kg
Control box dimensions	290(W)x240(D)x100(H)mm		260(W)x200(D)x70(H)mm
Control box weight	4.3kg		1.6kg
Power supply	AC100 to 240V, 50/60 Hz 60W 125VA		AC100 to 240V, 50/60 Hz 25W 103VA
Operating environment	temperature: +10 to +35°C, humidity: 30 to 80%RH (non-condensing) positioned away from sources of electrical noise and vibration		

¹⁾ Optional

²⁾ Accuracy is the repeatability in terms of standard deviation based on the manufacturer's calibration standard

■ Optional accessories and customized solutions

The KYOWA DropMaster Wafer series quickly adapts to meet particular customers' requirements for special applications. In addition, we offer a wide range of optional accessories, such as automatic multi-dispenser systems, a high-capacity pump dispenser system, an external tilting stage for roll-off angles, and a particular module for roll-off speed and roll-off acceleration.

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.

Specifications and designs are subject to change without notice.

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