

DropMaster



Dynamic Wafer Contact Angle Meter

Contact Angle, Liquid Surface Tension, Surface Free Energy

DMo-WA-series

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 full dia. 305mm stage area is possible by pre-setting coordinates
- The optional multi dispenser system of up to five liquids allows for “one-click” fully automated analysis of the surface free energy
- The optional high capacity dispenser for one liquid allows 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 assuring reliable results under constant 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

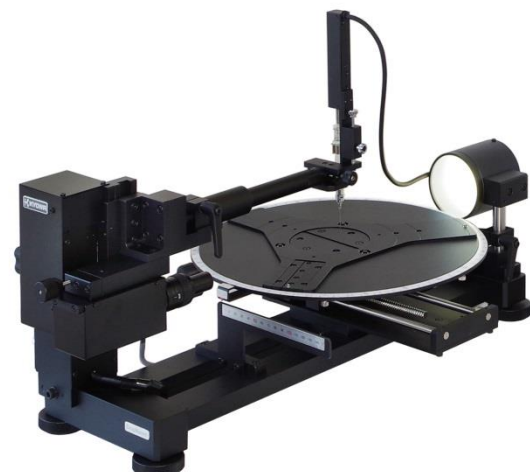
- Rotation sample stage with computer-controlled X translation and manual rotation axis
- Camera/dispenser unit with computer- controlled Z translation
- Automated measurement sequence (droplet generation → droplet deposition → droplet analysis → stage movement) in X-direction is possible by pre-setting 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 “one-click” fully automated analysis of the surface free energy
- The automatic recognition of droplet deposition enables droplet analysis after a pre-set time assuring reliable results under constant 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 manual rotation sample stage can be exactly adjusted to the desired position and the syringe of the dispensing unit can be changed quickly and easily
- 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 assuring reliable results under constant conditions
- Scales along the outer edge of the rotation stage and the X-axis help to determine mapping positions.



■ Features common for all model

- Fast image capturing system USB 3.0 camera max. 1000fps: 400fps at 640x480 full resolution, 500fps at 640x400 and 1000fps at 640x200
- Focusing aid with index graph and value displayed in the image screen helps operators to 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 angles, droplet volume, sessile drop volume, absorbed droplet volume, residual droplet ratio, height and radius of sessile drop are also determined
- Measured results are displayed in a spreadsheet-like table for easy reference and comparison

■ Sample stage

- All models are equipped with a special 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 x-axis and 360° stage rotation allow mapping in radial pattern
 - * DMo-702WA is equipped with motorized x-axis
 - * DMo-902WA is equipped with motorized x-axis and motorized rotary stage
- Scales along the outer edge of the rotation stage and the X-axis help to determine mapping positions



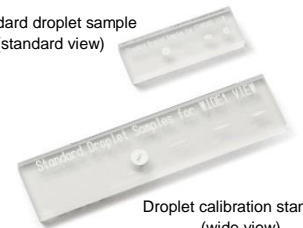
■ Standard components of individual models

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

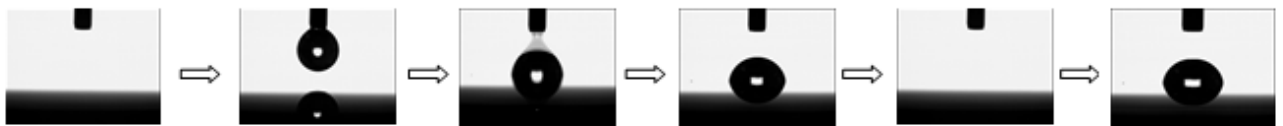
- The droplet calibration standard for standard view is a basic accessory for all models
- It is made of soda-lime glass bearing one full circle for calibration and three droplet silhouettes of 5°, 60° and 108° for periodic inspections of measurement accuracy
With the help of this tool, users can easily perform routine maintenance to ensure reliability of their measurements over long periods of time
- A droplet calibration standard for calibration of the camera wide-view setting can be obtained optionally
- A certificate of accuracy of the full circle and the droplet silhouettes can be obtained optionally

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
- Wetting and de-wetting properties in immersion lithography processes using the sliding method with external tilting stage and/or using the extension/contraction method

■ Specifications

	DMo-902WA	DMo-702WA	DMo-502WA
Camera system	USB 3.0 CCD camera with: 400fps at 640x480 pixels 500fps at 640x400 pixels 1000fps at 640x200 pixels		
Optical system	manual focus with 3 step manual zoom field of view: 6.1x4.7mm, 11.1x8.2mm, 15.8x11.8mm ±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) surface/interfacial tension: Young-Laplace, ds/de surface free energy of solids: 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 115W, 120VA		AC100 to 240V, 50/60 Hz 20W, 35VA
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 manufacturer's calibration standard

■ Optional accessories and customized solutions

The KYOWA DropMaster Wafer series can be easily adapted to meet particular customers' requirements for special applications. We offer a wide range of optional accessories such as manual and automatic multi dispenser systems, large capacity pump dispenser system, external tilting stage for measurements of roll-off angles, and a special module for measurements of roll-off speed and roll-off acceleration.

For detailed information, please contact our sales partner or us directly at +81-48-483-2629 or at overseas-sales@face-kyowa.co.jp.

Specifications and designs are subject to change without notice.

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