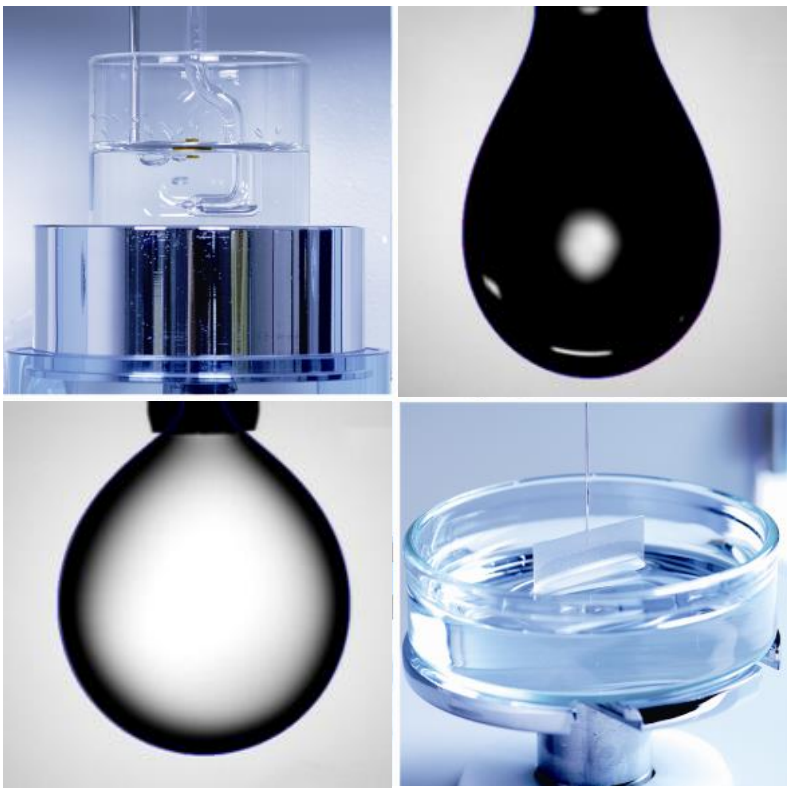
Lineup of Surface Tensiometers

Digest Information



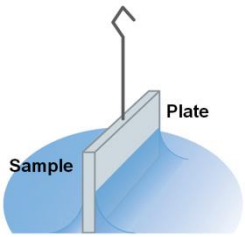
Static / Dynamic Surface Tension
Dynamic Contact Angle
Powder Contact Angle
Lamella length

Intermolecular forces work among molecules, and the liquid voluntarily intends to contract the area of the surface. The forces are fundamental to Surface Tension, which controls the wetting phenomena. To our surroundings, many things have improved their practicalities with controlling surface tension.
KYOWA has various kinds of surface tensiometers to respond to multiple applications.

Measurement techniques of surface/interfacial tension and features:

Wilhelmy plate method

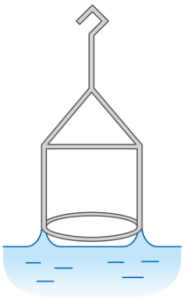
When a platinum plate (Wilhelmy plate) makes contact with the surface of the liquid, the liquid will wet the Wilhelmy plate upwards. In this case, the surface tension acts along the perimeter of the plate, and the liquid pulls in the plate. This method detects the pulling force and determines the surface tension.



Features
- Can observe variations over time and get equilibration of surfactant.
- The most popular for its flexibility of application to various liquid samples.
- No density correction is required if the sample density is 0.6 to 1.4g/cm^3.

du Noüy ring method

First, a platinum ring (du Noüy ring) hanging parallel to the liquid surface is sunk into the liquid. Then, the ring is gradually drawn apart from the surface vertically. In this process, the surface tension of the liquid membrane hanging by the ring generates a force on the ring. This force changes as the ring is drawn farther. Using the maximum value of this force, surface tension is determined.



Features
- Can obtain Lamella length in addition.
- Simple cleaning process by flaming it in a short time
- Several industrial standards adopt the method for its long history

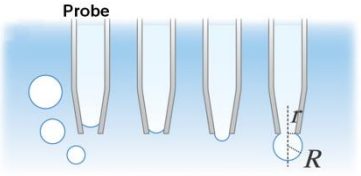
Pendant drop method

When the liquid is pushed out from the needle tip, the droplet hangs from the needle tip. This hanging droplet is called the "pendant drop". Since the amount of liquid depends on the extruded amount of the liquid, density, surface and interfacial tension, the surface and interfacial tension can be determined by analyzing the shape of this pendant drop.

Features
- Can measure with a small amount of liquid (less than 1mL)
- Can measure high viscous liquid samples under high temperature (e.g., molten polymer applications)
- The system can be used in common with contact angle measuring one.

Maximum bubble pressure method

When pressurized air is flown continuously through the capillary probe, the pressure inside the probe changes periodically. This method monitors the pressure changes, detects the maximum pressure, and determines surface tension from the pressure relatively.



Features
- Can obtain dynamic surface tension (variations in short time)
- Surface tension lowering ability can be characterized by Rosen fit.
- The most potential method for online measurement

Partial applications

Wettability control	Paint, Ink, Plating, Photo resist, Fountain solution, any coating fluids
Permeability control	Detergent, Cosmetics, Pharmaceuticals, Lubricant, Latex
Emulsification ability	Food products, Cosmetics, Pharmaceuticals
Spreading ability	Extinguishant fluid, Pesticide
Foaming control	Detergent, Ink, Paint, Extinguishant fluid
Quality control	Stability or deterioration of Ink, Plating, Detergent, Extinguishant fluid

DyneMaster series

DyneMaster series are the most popular for their application to various liquid samples, fully automated operations, and various upgradable accessories and software for measuring density, powder wettability, dynamic contact angle, automatic CMC, etc. They adopt the Wilhelmy plate as standard and the du Noüy ring as an option.

Highest Accuracy Surface Tensiometer	High Performance Surface Tensiometer	Automatic Surface Tensiometer
DY-700	**DY-500**	**DY-300**
		
High-end model with precise and high sampling frequency balance system	Basic balance system but available high-end built-in functions and applicable to most options	Basic model for measuring surface and interfacial tension with fully automated operation

Comparison of functions

ST: standard OP: option NA: not available

	DY-700	DY-500	DY-300
Repeatability	0.02 mN/m	0.2 mN/m	0.2 mN/m
Stage working speed	0.002 – 50 mm/s	0.002 – 50 mm/s	0.004 – 5.0 mm/s
Jacket type stage (+10 - 70°C) *1	ST	ST	OP
Heater type stage (ambient - 150°C)	OP	OP	OP
Surface thermometer	ST	ST	OP
Magnetic stirrer	ST	ST	NA
Optional measurements	Density measurement Lamella length Sedimentation Powder contact angle Dynamic contact angle Automatic CMC	Density measurement Lamella length Sedimentation Powder contact angle Dynamic contact angle *2 Automatic CMC	Liquid density Lamella length Sedimentation
Main body size, weight (W * D * H)mm	295*415*452 about 23 kg	295*415*452 about 20 kg	255*309*369 about 12.5 kg

*1 Jacket-type stage needs a hot/cold water circulator bath to control temperature.

*2 DY-500 does not plot a smooth curve when measuring dynamic contact angle with higher speed due to balance sampling speed.

DropMaster series

The DropMaster series are popular among researchers who measure contact angles between solid and liquid samples and surface and interfacial tension because a common unit can measure those.

DropMaster DM-series	
DMo-702/602/502	**DMs-401**
	
Measurement of surface and interfacial tension with software-controlled liquid dispenser.	Measurement of surface and interfacial tension with manual liquid dispenser.

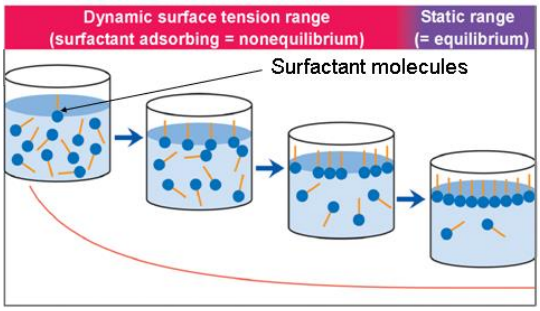
Dynamic Surface Tensiometer BP-series

The BP series are special objective tensiometers to measure dynamic surface tension using the maximum bubble pressure technique. The bubble rates continuously change, and surface tension variations over the lifetime are plotted automatically with a single process.

Dynamic Surface Tensiometer BP-series	
BP-D5	**BP-D5L**
	
Fully automated software-controlled operation with built-in temperature sensor and jacketed stage.	A cost-saving model with manual operation but the capability of data processing equivalent to BP-D5

What is dynamic surface tension?

Surfactants can lower surface tension following the adsorbing behavior of their molecules to the newly created fluid surface. Reaching equilibration is considered *dynamic surface tension,* while equilibrated status is static. Detergents and coating fluids must play roles to spread over target objects successfully. Lowering the surface tension of those fluids is significant under the dynamic status that the fluid boundaries to the objects are constantly changed. Then, data on dynamic surface tension should be effective.



Please inquire us and specify if you need separate brochures for each model.

*The specifications and designs are subject to change without notice. 2310

KYOWA Leading to answers
http://www.face-kyowa.com
Kyowa Interface Science Co., Ltd.
5-4-41 Nobitome, Niiza-City, Saitama 352-0011, Japan
Tel.+81-48-483-2629 Fax.+81-48-483-2702