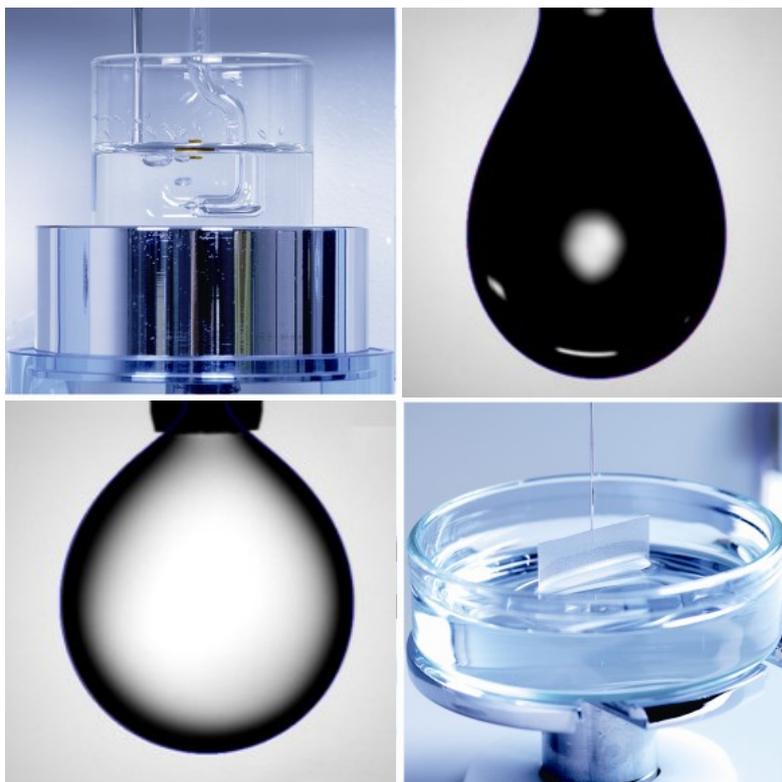


Lineup of Surface Tensiometers

Digest Information



Static / Dynamic Surface Tension

Dynamic Contact Angle

Powder Contact Angle

Lamella Length

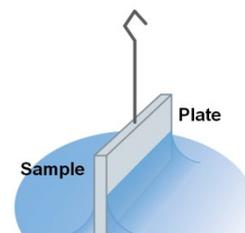
Intermolecular forces work among molecules, and the liquid voluntarily intends to contract the area of surface. The forces are fundamental of Surface Tension, which controls the wetting phenomena. To our surroundings, there are many things that have improved their practicalities with the control of surface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

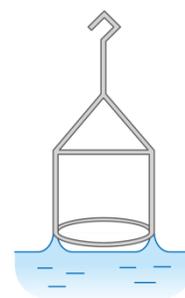
- Features**
- Can observe variations over time and get equilibration of surfactant.
 - The most popular for its flexibility of application to variety of liquid samples.
 - No density correction is required if sample density is from 0.6 to 1.4g/cm³.



du Noüy ring method

First, a platinum ring (du Noüy ring) that is hanging parallel to the liquid surface is sunk into the liquid. Then, the ring is gradually drawn apart from the surface in a vertical direction. In this process, the surface tension of the liquid membrane that is 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 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.

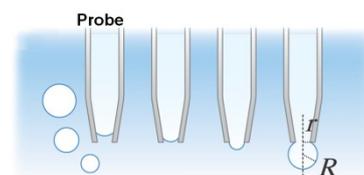
- Features**
- Can measure with small amount of liquid (less than 1mL)
 - Can measure high viscous liquid samples under high temperature (e.g. molten polymer applications)
 - The system can be used in common with contact angle measuring one.



Maximum bubble pressure method

When pressurized air is flown continuously through the probe of capillary, 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 on-line measurement



Partial applications

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

DyneMaster series

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

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	0.1 – 1.0 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 Powder contact angle Dynamic contact angle	Density measurement Lamella length Powder contact angle Dynamic contact angle * ²	Density measurement Lamella length
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 smooth curve when measuring dynamic contact angle with higher speed due to balance sampling speed.

DropMaster series

DropMaster series are popular among the researchers who measure contact angle between solid and liquid samples as well as surface and interfacial tension because those can be measured by a common unit.

DropMaster DM-series	
DMo-701/601/501	DMs-401
	
It measures surface and interfacial tension with computer control dispenser.	It measures surface tension and limited interfacial tension with manual 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 are continuously changed and variations of surface tension over life time are plotted automatically with single process.

Dynamic Surface Tensiometer BP-series

BP-D5



Fully automated operation by computer control
Temp sensor and jacket stage are built in.

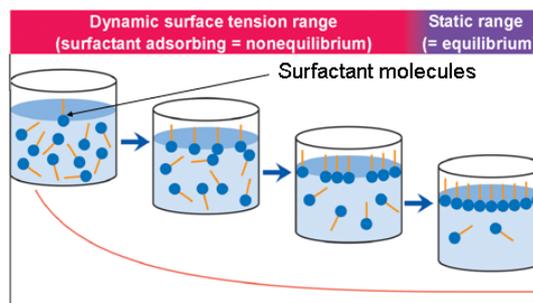
BP-D5L



Cost saving model with manual operation but
capability of data processing equivalent to BP-D5

What is dynamic surface tension?

Surfactants have function to lower surface tension in accordance with adsorbing behavior of their molecules to the newly created fluid surface. The process to reach equilibration is said *dynamic surface tension* while equilibrated status is said static one. Detergents and coating fluids have to play rolls to spread over target objects successfully. Lowering surface tension of those fluids is significant under the dynamic status that the fluid boundaries to the objects are constantly changed. Then, data of 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.

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