

# Attension Theta

Premium Optical Tensiometers. Progress included.

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# Intuitive tensiometer solutions

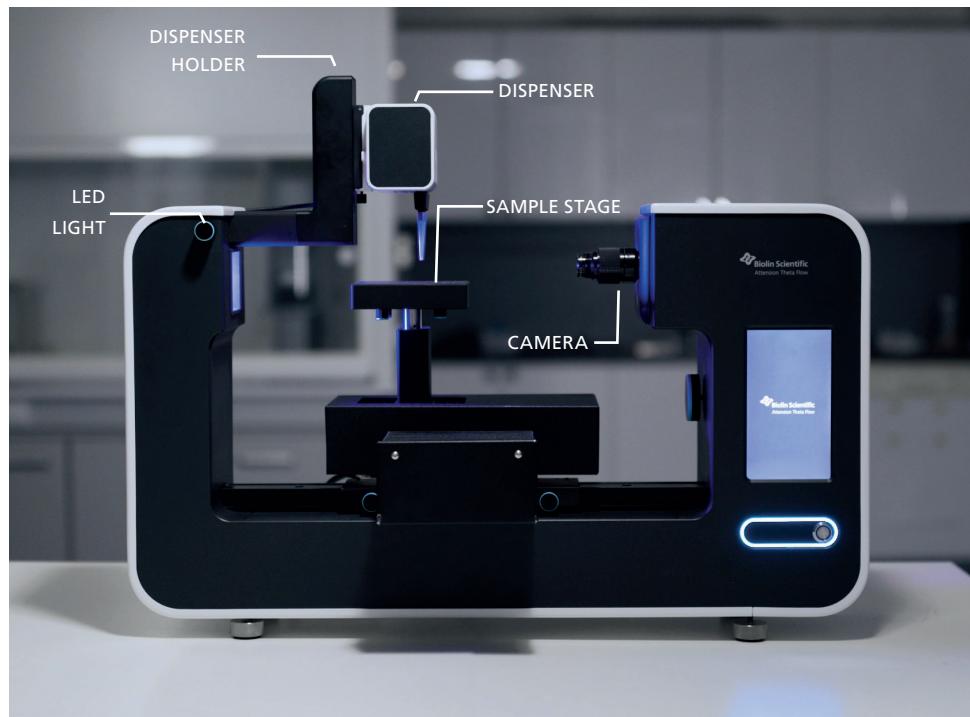
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Attension® tensiometers inspire new discoveries and more confident decisions towards a seamless production and higher quality products. With its intuitive user interface, slick design and all-inclusive software, it is easy to operate with high flexibility and unrivaled automation options. Your investment also includes the support and knowledge from a world-leading surface science company with a proven record to drive progress within surface science worldwide.

## Technology

An optical tensiometer records drop images and analyzes the drop shape automatically. The drop shape is a function of the surface tension of the liquid, gravity and the density. On a solid, the drop shape and the contact angle also depends on the properties of the solid (e.g. surface free energy, topography). The captured image is analyzed with a drop profile fitting method in order to determine contact angle and surface tension. Surface free energy can be calculated by performing contact angle measurements with several known liquids.

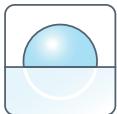
As an optical method, the measurement precision of optical tensiometers depends on the quality of the pictures and the analysis software. Attension Optical Tensiometers utilize a high quality monochromatic cold LED light source to minimize undesirable sample evaporation. Image quality is guaranteed by a high-resolution digital camera, quality optics and the accuracy of the drop fitting method.



## Measurements

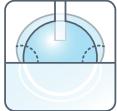
- Static contact angle
- Dynamic contact angle
- Roll-off angle
- Surface free energy (SFE)
- Surface tension
- Interfacial tension
- Batch contact angle
- Roughness corrected contact angle
- Interfacial rheology (viscoelasticity)

## Methods



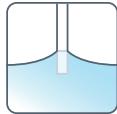
### Sessile drop

for static contact angle measurement of a liquid droplet



### Automatic DCA

for dynamic contact angle measurement



### Meniscus

for static contact angle measurement with a fiber/rod



### Pendant drop

for surface and interfacial tension



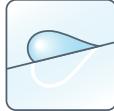
### Pulsating drop\*

for dilatational interfacial rheology measurement



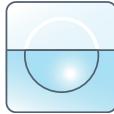
### Batch sessile drop

for static contact angle measurements in quality control



### Tilted drop

for dynamic contact angle measurements



### Captive bubble

for static contact angle measurement of a gas bubble



### Reverse pendant drop

for surface and interfacial tension

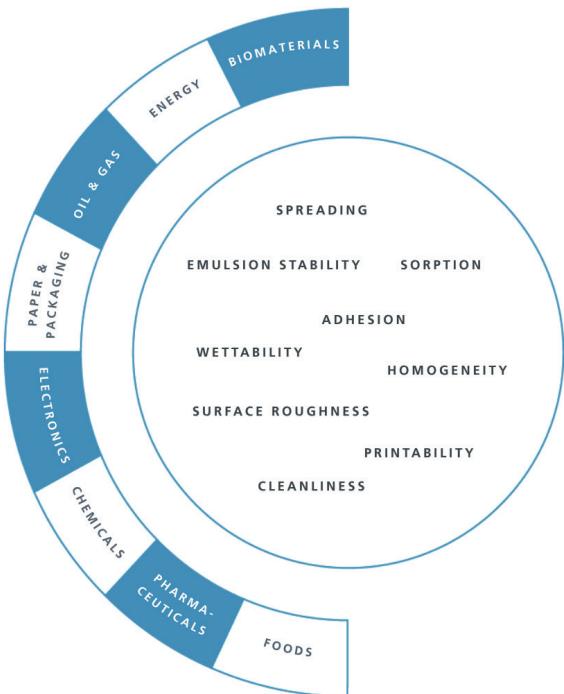


### 3D Topography\*

for roughness corrected contact angle

\* available only with Theta Flex and Theta Flow

## Optical Tensiometers in Industry



Attension optical tensiometers are essential tools for analyzing surface properties such as surface tension, contact angle, wettability, and adhesion.

These instruments provide valuable insights into how liquids interact with solid surfaces, which is crucial for optimizing product formulations and surface treatments. By measuring contact angles, optical tensiometers help determine the wettability of a surface, indicating how easily a liquid spreads across it.

Additionally, they assess adhesion properties, which are vital for ensuring that coatings, paints, and other surface applications adhere properly. This makes optical tensiometers indispensable in research and development, quality control, and various industrial applications where surface interactions play a critical role. With the complete range of optical tensiometers, you can find a perfect fit for your needs from incoming material inspection to development of new innovative solutions.

# Theta Flow

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Attension Theta Flow is a premium contact angle meter suitable for demanding surface research and quality control. Enjoy a user-friendly instrument with a high level of automation and accuracy for user-independent results.



## What you can measure

- **Static contact angle**

Sessile drop, captive bubble and meniscus methods

- **Dynamic contact angle**

Dynamic contact angle, advancing and receding contact angle, contact angle hysteresis and roll-off angle

- **Surface free energy**

Sessile drop, captive bubble and meniscus methods

- **Surface- and interfacial tension**

Pendant drop and reverse pendant drop methods

- **Roughness-corrected contact angle and 3D surface roughness\***

Fringe projection phase shifting method

- **Interfacial dilatational rheology\***

Pulsating drop method

\*Optional features

## 3 reasons to invest

### Automation at an all-time high

Camera autofocus, ensuring the image to always stay clear, automatic surface mapping, where the sample can be moved into different measurement positions, and automatically generated results with the industry-leading OneAttension software. These are the features bringing automation to a new level for optical tensiometers, simplifying the measurements and increasing accuracy.

### Accuracy and user-independence

With a camera resolution at 5 MP, image quality enhancement with DropletPlus technology, and sensors keeping track of the surrounding environment for good traceability, Theta Flow will provide highly accurate results. The reliable data, in turn, is a key component for user-independent measurements.

### Easy to use with touch display

The touch display improves the user experience making measurement preparation super smooth to handle. Everything from filling the liquids to changing your sample can be done easily at the instrument in seconds.

### What our customers say

“The touch display in Theta Flow makes measurement preparation faster and simpler. Actions like changing the sample and sample liquid are greatly facilitated which allows increasingly efficient measurements.”

Mika Latikka, Postdoctoral Researcher, Aalto University, Finland

# Theta Flex

Attention Theta Flex is the contact angle meter that enables all measurements in one instrument. It is designed for reliable and repeatable measurements of wettability and adhesion, even in the most demanding industrial and research applications.



## What you can measure

### • Static contact angle

Sessile drop, captive bubble and meniscus methods

### • Dynamic contact angle

Dynamic contact angle, advancing and receding contact angle, contact angle hysteresis and roll-off angle

### • Surface free energy

Sessile drop, captive bubble and meniscus methods

### • Surface- and interfacial tension

Pendant drop and reverse pendant drop methods

### • Roughness-corrected contact angle and 3D surface roughness\*

Fringe projection phase shifting method

### • Interfacial dilatational rheology\*

Pulsating drop method

\*Optional features

## 3 reasons to invest

### One instrument for all your needs

All the measurements are readily included in the software. The modular design enables all applications to be fulfilled with one instrument and the instrument can be tailored for your needs.

### Results you can rely on

High end imaging together with sophisticated analysis algorithms detect and analyze the contact angle and surface free energy precisely. The effect of roughness to wettability can be measured with the unique 3D Topography module.

### Speed and repeatability

All steps from loading the measurement to performing it and analyzing the data can be automated. The need for time consuming preparations and cleaning are removed with the disposable liquid tips.

### An award-winning instrument

Did you know that Theta Flex is a winner in the world's most renowned design competition? Ground-breaking and intuitive design brings the 2020 Red Dot for Best of the best in Industrial design. The jury states: "This optical measuring instrument for determining surface tension offers an outstandingly user-friendly and extremely precise manner of interaction. Markings with blue accent colour ensure good user guidance, while the differently sized thumb screws allow different parts to be set precisely. In addition, Theta Flex also impresses with its highly practical modular structure. This enables the instrument to be used cost-effectively in both research and industrial areas of application."

# Theta Lite

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Attension Theta Lite is a compact and robust contact angle meter for simple and precise quality control and basic wettability research. The high accuracy is obtained with high quality mechanics combined with an automatic or manual droplet creation.



## What you can measure

- **Static contact angle**

Sessile drop, captive bubble and meniscus methods

- **Dynamic contact angle**

Dynamic contact angle, advancing and receding contact angle, contact angle hysteresis and roll-off angle

- **Surface free energy**

Sessile drop, captive bubble and meniscus methods

- **Surface- and interfacial tension**

Pendant drop and reverse pendant drop methods

- **Roll-off angle**

- **Batch contact angle**

## 3 reasons to invest

### Best-in-class software

OneAttension is an all-inclusive software providing all measurement modes, superior drop shape analysis, live results, and the friendliest user interface available.

### Accuracy

Precise automated or manual droplet deposition will keep the droplet volume the same each time to minimize any result variation. High resolution camera will minimize any optical variation and the software will perform sub-pixel live analysis to give you the results instantly.

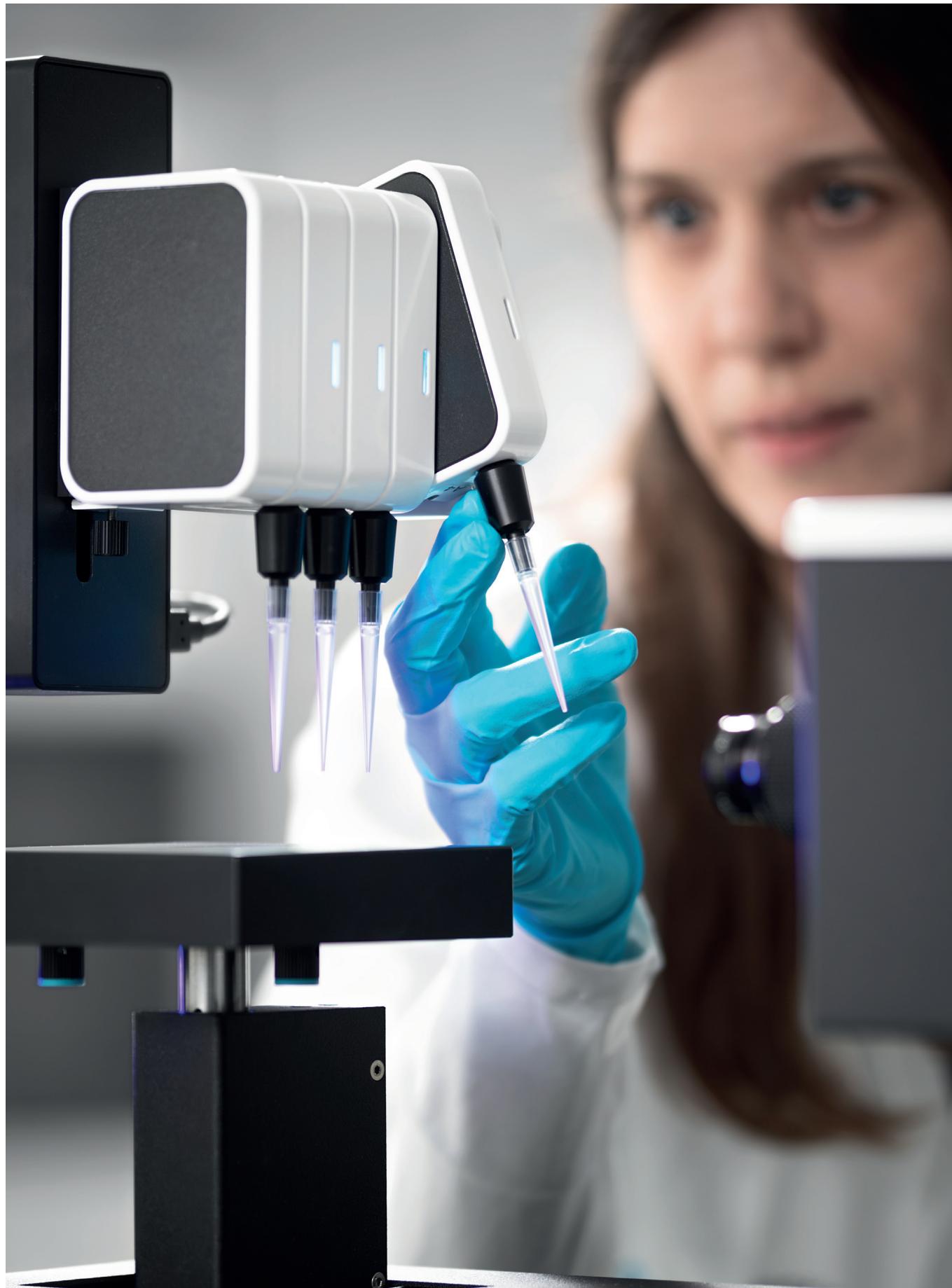
### Ease of use

Simple and quick operation – widely utilized in quality control and research. No complicated adjustments needed, the system comes fully assembled and ready to perform.

## What our customers say

“I'm satisfied with Biolin Scientific customer service, quick response, efficient on-site support to setup the instrument and to train the end-user on how to handle the machine properly.”

Terry Qian, GSM, Apple



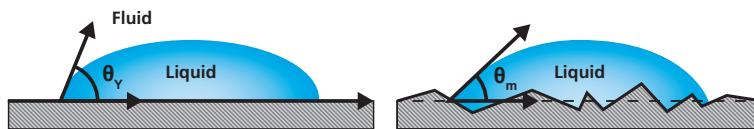
# Attension® Theta Variants

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Our instruments are modular which allows you to choose configuration from manual to completely automated systems. Complement your system with the additional modules that will enable further capabilities:

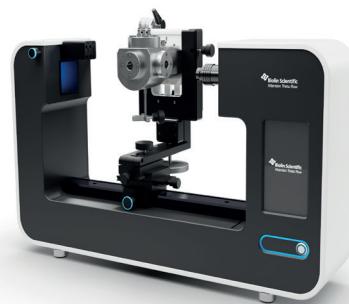
## Theta Topography

The 3D Topography module, available for both Theta Flow and Flex, facilitates roughness-corrected contact angle measurements with ease. It effectively distinguishes the impact of surface chemistry and roughness on wettability, serving as a crucial tool for studying and enhancing coatings and material development.



## Theta High Pressure

Combine the Attension Theta Flow or Flex with a High Pressure Chamber to measure wettability and interfacial tension in enhanced oil recovery applications. This setup is engineered to withstand harsh conditions that simulate oil reservoirs, enabling measurements at pressures up to 400 bars and temperatures up to 200°C. It is specifically designed for enhanced oil recovery and supercritical fluid applications.



## Theta Wafer

Theta Wafer offers a premium optical tensiometer for fully automated contact angle measurements on silicon wafers. Special instrument for contact angle and surface free energy measurements to enable characterization of surface cleanliness and homogeneity



## Theta Pulsating Drop

This module Oscillates drop volume for interfacial rheology studies. Theta Pulsating Drop can be based on the optical tensiometers Theta Flex or Theta Flow. The system supports measurements of interfacial rheology with the pulsating drop method.



## Theta Pico

Dispensing of picoliter-sized droplets for small sample areas and inkjet applications. Designed for precise contact angle measurements on small areas, such as single fibers and miniature components. It utilizes high magnification optics and a best-in-class camera enhanced with DropletPlus technology to accurately visualize droplets with diameters less than 100 micrometers.



## Theta with Tilting Cradle

Designed for automated dynamic contact angle measurements. cradle tilts the entire instrument within a range of 0 to 90 degrees, with a fine resolution of 0.1 degrees, enabling precise analysis of advancing and receding contact angles. The tilting method is particularly effective for assessing surface homogeneity and understanding wetting behaviors under dynamic conditions.



## Build your own Theta

Customize your Theta instrument to suit your research needs by exploring the available accessories for the Attention Theta range on our website. Our tool InstruMentor will guide you along the way to your new instrument. You can easily create your configuration based on what you would like to measure or what is suitable for your specific application area. Or you can built the instrument from scratch based on all our frames and accessories.

Get started at [biolinscientific.com](http://biolinscientific.com)

# OneAttension Software



Every Attension Optical Tensiometer is enhanced by the seamlessly integrated OneAttension software, which offers sophisticated features to support your experimental needs. This, all-inclusive software provides unlimited licenses, ensuring that all users have access to its full range of capabilities without additional costs. Moreover, software updates are automatic and free, guaranteeing that you always have the latest version available.

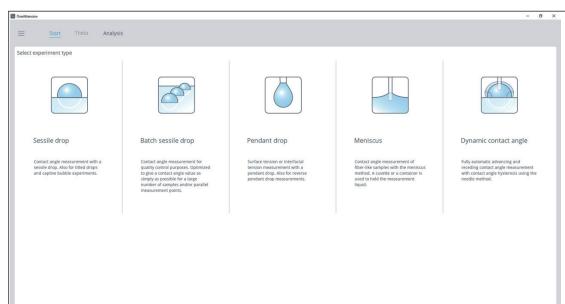
The OneAttension software is designed to make your experience in the lab smoother. Some of its main features include:

#### **Best-in-class user interface**

The most intuitive user interface is the key for OneAttension. The software is easy to learn, and the logical interface allows even complex measurements to be performed with ease.

#### **Superior analysis accuracy**

Subpixel analysis accuracy using the industry-standard Young-Laplace equation, first brought to optical tensiometry by Attension. For the most versatile capability, other methods such as Bashforth-Adams and Polynomial are also included.



Intuitive interface with all measurement modes available

## Live analysis

The results are shown real-time during the measurement. You can conveniently monitor your results without the need to switch between measurement and analysis tabs.



Live results during measurement

## Full automation

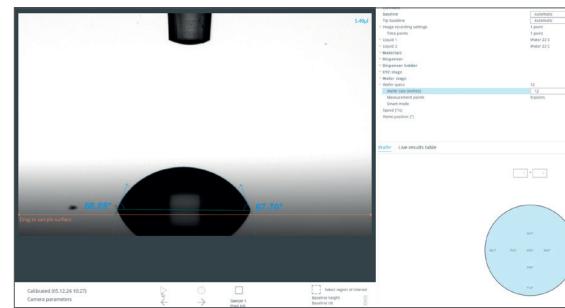
OneAttention supports fully automatic measurements. In order to make your result analysis as convenient and accurate as possible, OneAttention also features automatic baseline detection combined with automatic drop fitting.



Automatic analysis and presentation of results

## Flexibility for every need

OneAttention has been designed to meet the requirements of almost any applications you may have. You can easily adjust measurement parameters to match your specific application needs. Your optimized measurement recipes can then be saved for further use.



Measurement on wafer stage

## Want to read more about Attension Tensiometers?

Visit our website to learn more about Attension premium optical tensiometer range

# Specifications

Available measurements	Theta Flow	Theta Flex	Theta Lite
Static contact angle and captive bubble	√	√	√
Batch contact angle	√	√	√
Dynamic contact angle	√	√	√
Meniscus contact angle	√	√	√
Surface/interfacial tension	√	√	√
3D surface roughness and roughness-corrected contact angle	√	√	–
Interfacial rheology	√	√	–
Surface free energy	Zisman Plot, OWRK/Extended Fowkes, van Oss Acid-Base, Wu, Neumann's Eq. of State, Schultz 1 and 2		
Software and hardware	Theta Flow	Theta Flex	Theta Lite
Measuring range (°, mN/m)	0...180, 0.01...2000	0...180, 0.01...2000	0...180, 0.01...2000
Accuracy (°, mN/m)	± 0.1, ± 0.01	± 0.1, ± 0.01	± 0.1, ± 0.01
Maximum sample size (mm)	Unlimited x 100 x 320 (w. stage)	Unlimited x 100 x 320 (w. stage)	Unlimited x 45 x 200 (w. stage)
Integrated sample holders	√	√	√
Maximum resolution (pixels)	2592 x 2048 (5 MP)	1936 x 1912 (2.3 MP)	1936 x 1912 (2.3 MP)
Maximum measuring speed (fps)	3422	2247	2247
Camera	CMOS 1" USB 3.0 digital camera with zoom	CMOS1/2.3" USB 3.0 digital camera with zoom	CMOS1/2.3" USB 3.0 digital camera with fixed zoom
Image focusing	Software-controlled autofocus, manual fine focus in optics	Manual fine focus in optics	Manual fine focus by optical rail
Image quality	Enhanced with DropletPlus technology, Native	Native	Native
Camera protection	Inside instrument covers	Inside instrument covers	Inside instrument covers
Camera view angle (°)	-4...2.5, with digital scale	-4.5...2.5, with mechanical scale	-2...2
Light source and size	High power monochromatic LED, 62 x 62 mm	High power monochromatic LED, 62x62 mm	LED based homogeneous background lighting, Ø 20 mm
Field of view (diagonal in mm)	1.35 ... 52.9	0.95 ... 26	2.3 ... 7.8
Measurement indicator LED	√	√	–
Integrated touch display	√	–	–
Environment monitoring	Integrated digital ambient temperature, relative humidity and system levelness sensors	–	–
Disposable tip dispensing	√	√	√
Software	OneAttension, includes all measurement modes	OneAttension, includes all measurement modes	OneAttension, includes all measurement modes
Dimensions - Basic frame (LxWxH, mm)	765 x 230 x 435	765 x 230 x 435	495 x 130 x 310
Weight — Basic frame (kg)	29	26	5
Power supply (VAC)	100...240	100...240	100...240
Frequency (Hz)	50...60	50...60	50...60
System requirements	Theta Flow	Theta Flex	Theta Lite
Recommended system requirements	2 GHz processor, 2 GB RAM, 120 GB hard disk drive <sup>1</sup> , 1920 x 1080 resolution, 1 USB 3.0 port In addition 1 x USB 3.0 or 1 x USB 2.0 port for Theta Lite <sup>1</sup> SSD hard disk (min. 500 MB/s) needed for high speed recording with high resolution		
Operating system requirements	Windows 10 (32 or 64 bit).		

√ : Available – : Not available/Not applicable  
All specifications are subject to change without notice.

## About us

At Biolin Scientific we are committed to empower professionals in Surface and Interface science and engineering to reach outstanding results faster and easier. Our instruments and sensors are tailored for advanced analysis of thin film properties and surface and interface phenomena at the nanoscale. Trusted by top universities and industrial labs worldwide, our premium solutions help solve complex challenges and drive progress in scientific research and product development.

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