

# Attension Theta

Premium Optical Tensiometers. Progress included.

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reddot winner 2020  
best of the best industrial design



**Biolin Scientific**  
[ Progress Together ]

# Intuitive tensiometer solutions

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.

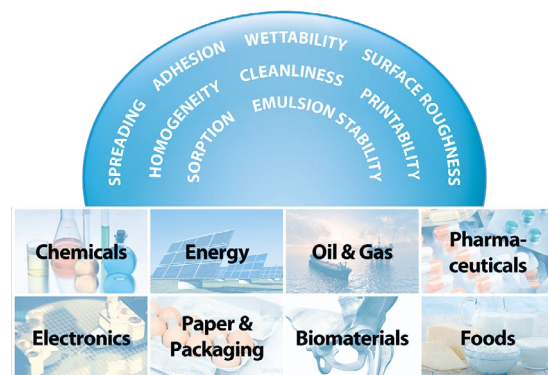
## Measurements

- 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

	<b>Sessile drop</b> for static contact angle measurement of a liquid droplet		<b>Batch sessile drop</b> for static contact angle measurements in quality control
	<b>Automatic DCA</b> for dynamic contact angle measurement		<b>Tilted drop</b> for dynamic contact angle measurements
	<b>Meniscus</b> for static contact angle measurement with a fiber/rod		<b>Captive bubble</b> for static contact angle measurement of a gas bubble
	<b>Pendant drop</b> for surface and interfacial tension		<b>Reverse pendant drop</b> for surface and interfacial tension
	<b>Pulsating drop*</b> for dilational interfacial rheology measurement		<b>3D Topography*</b> for roughness corrected contact angle

\* available only with Theta Flex and Theta Flow



# 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.



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## 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

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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

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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

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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.

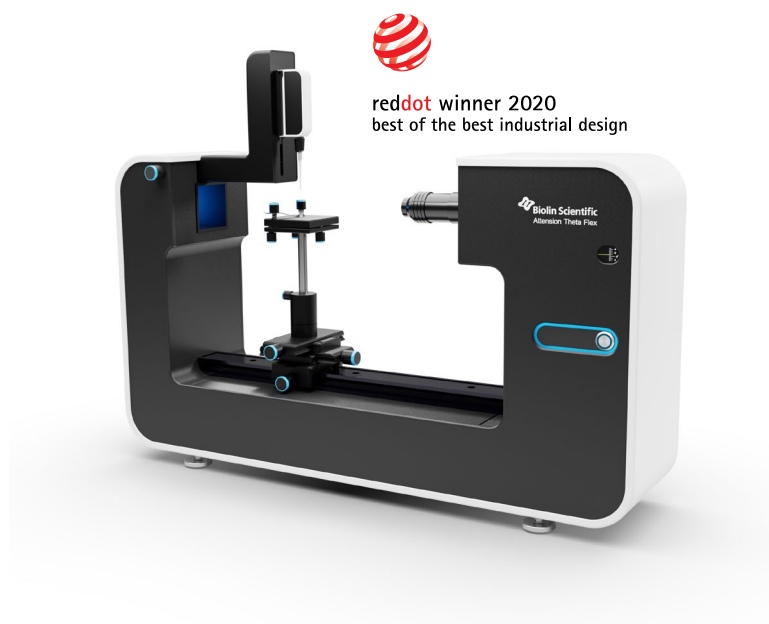
## What our customers say

“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

Attension 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.



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## 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

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### Best-in-class software

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

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### 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.

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### 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

# Modules and Accessories

Our instruments are available from manual configurations to the most advanced completely automated systems. Choose from the readymade configurations or tailor your own!

Configuration	Dispenser	Droplet placement	Sample stage
Theta Flow Auto 5	Auto, 4 liquids	Auto	Auto XYZ
Theta Flow Auto 4	Auto, 2 liquids	Auto	Auto XYZ
Theta Flow Auto 3	Auto, 2 liquids	Auto	Auto X, Manual YZ
Theta Flow Auto 2	Auto, 1 liquid	Auto	Auto X, Manual YZ
Theta Flow Auto 1	Auto, 1 liquid	Auto	Manual XYZ
Theta Flex Auto 4	Auto, 2 liquids	Auto	Auto XYZ
Theta Flex Auto 2	Auto, 2 liquids	Auto	Auto X, Manual YZ
Theta Flex Auto 1	Auto, 1 liquid	Auto	Manual XYZ
Theta Flex Plus	Auto, 1 liquid	Manual	Manual XYZ
Theta Flex Basic	Manual	Manual	Manual XYZ
Theta Lite Auto 2	Auto, 2 liquids	Manual	Manual XZ
Theta Lite Auto 1	Auto, 1 liquid	Manual	Manual XZ
Theta Lite Basic	Manual	Manual	Manual XZ

Complement your system with the additional modules that will enable further capabilities:

## 3D Topography module

Roughness-corrected contact angle measurements automatically with a single click. For studying the effect of surface roughness to contact angle results.

## High Pressure chamber

Enables measurements at pressures up to 400 bars and temperatures up to 200°C. Designed for enhanced oil recovery and supercritical fluid applications.

## Pulsating Drop module – PD 200

Oscillates drop volume for interfacial rheology studies.

## Picoliter dispenser

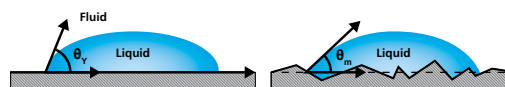
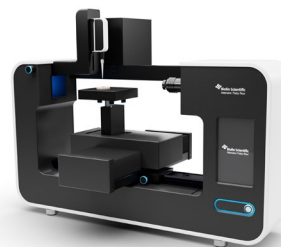
Dispensing of picoliter-sized droplets for small sample areas and inkjet applications.

## Tilting cradle

For fully automatic dynamic contact angle and roll-off angle measurements by the tilted drop method.

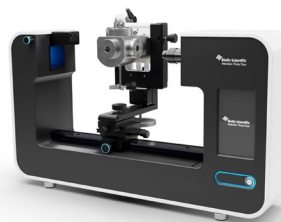
For a complete list of accessories, please visit [biolinscientific.com](http://biolinscientific.com)

## Theta Topography



The 3D Topography module, available for both Theta Flow and Flex, separates the impact from surface chemistry and roughness to wettability in coatings and material development.

## Theta High Pressure



Combine Attension Theta Flow or Flex with High Pressure chamber measuring wettability and interfacial tension in enhanced oil recovery applications. It is designed to facilitate the use despite the harsh conditions mimicking the oil reservoir.

## Theta Pulsating Drop



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.

# OneAttention Software

The OneAttention software comes with all Theta instruments and combines the most intuitive user interface with a high level of functionality. Some of its main features include:

## Best-in-class user interface

The most intuitive user interface is the key for OneAttention. 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.

## 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.

## 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.

## Flexibility for every need

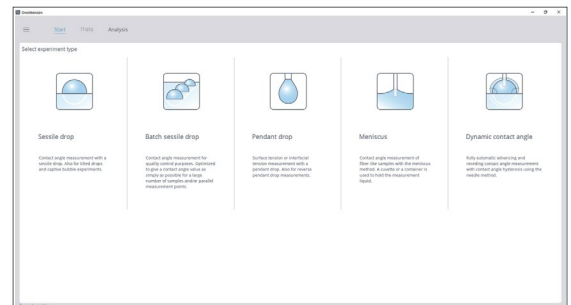
OneAttention has been designed to meet the requirements of almost any applications you may have. You can easily adjust measurement parameters to match your specific application needs. Your optimized measurement recipes can then be saved for further use.

## Data handling and exporting made easy

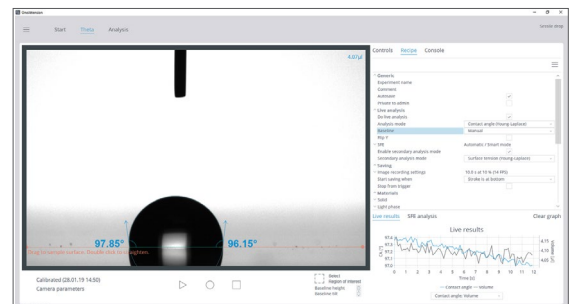
Data analysis, plotting, and statistical analysis can all be done with a few clicks to give you accurate results within seconds. All data can easily be exported further to Excel, for example.

## Optimal for industrial use

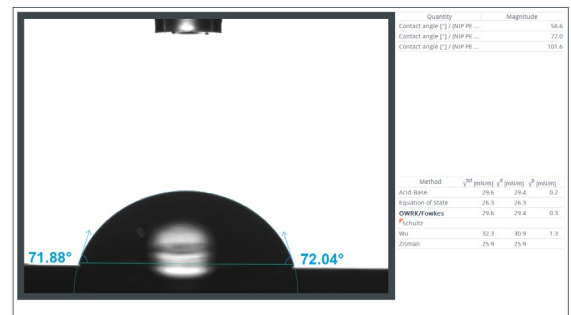
The Batch Sessile Drop measurement makes it simple to measure static contact angle in quality control. Additionally, measurement reports can be created with a few clicks and the user manager conveniently handles all different users – with desired privacy levels.



Intuitive interface with all measurement modes available



Live results during measurement



Automatic analysis and presentation of results

## Not sure which instrument to choose?

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 build the instrument from scratch based on all our frames and accessories. Get started at [biolinscientific.com](http://biolinscientific.com)



# 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			
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)	1984 x 1264 (2.3 MP)	1280 x 1024 (1.3 MP)
Maximum measuring speed (fps)	3422	3009	2068
Camera	CMOS 1" USB 3.0 digital camera with zoom	CMOS 2/3" USB 3.0 digital camera with zoom	CMOS 1/2" 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)	1.44...45.3	1.44...32.3	2.9...12 mm
Measurement indicator LED	√	√	–
Integrated touch display	√	–	–
Environment monitoring	Integrated digital ambient temperature, relative humidity and system levelness sensors	–	–
Disposable tip dispensing	√	√	√
Software	OneAttention, includes all measurement modes	OneAttention, includes all measurement modes	OneAttention, 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			
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> SDD 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. We firmly believe that brilliant minds deserve state-of-the-art instruments and expert support. Let's progress together..

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