

# Attension Theta

Complete Range of Optical Tensiometers

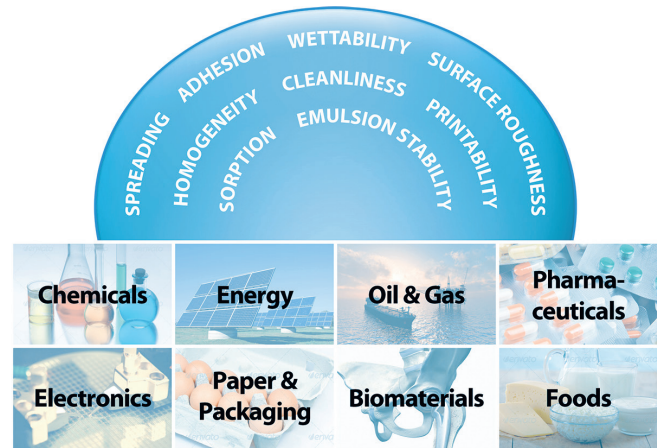
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# Precision Made Simple

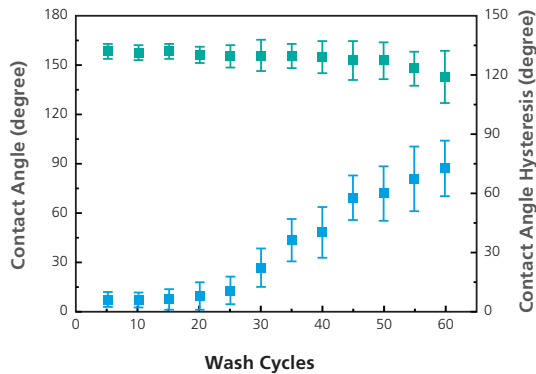
Attension® Optical Tensiometers are used in research, development and quality control for the study of surfaces and interfaces. They will help you characterize your surfaces easily and precisely, saving you valuable time and money.

The Attension Optical Tensiometer offering enables a wide range of applications from advanced research to quick quality control. Thanks to the versatility, you can get the combination of features that best fits your needs.



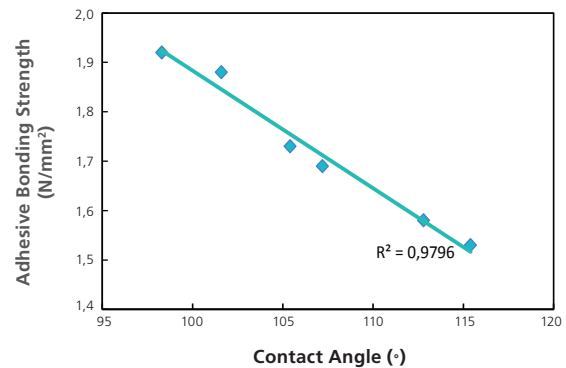
## Application Examples

**Functional surfaces**



Dynamic contact angle measurement giving additional information about the durability of the coating. Ref.: Zhao et al., Langmuir 28, (2012), pp 6328-6335. Adapted with permission from ACS.

**Adhesion in composites**



Adhesion strength and contact angle correlation for composite development. Data from S. Jarusombuti and N. Ayrilmis, European Journal of Wood and Wood Products, 69 (2011) p 375.

# Attension Optical Tensiometers

## 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.

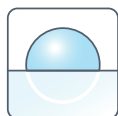
As an optical method, the measurement precision of optical tensiometers depends on the quality of the pictures and the analysis software. Attension Optical Tensiometers utilize a high quality monochromatic cold LED light source to minimize undesirable sample evaporation. Image quality is guaranteed by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

## Measurements

Attension Optical Tensiometers can measure:

- 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)

## Measurement methods



**Sessile drop**  
for static contact  
angle measurement  
of a liquid droplet



**Batch sessile drop**  
for static contact  
angle measurements  
in quality control



**Automatic DCA**  
for dynamic contact  
angle measurement



**Tilted drop**  
for dynamic contact  
angle measurements



**Meniscus**  
for static contact  
angle measurement  
with a fiber/rod



**Captive bubble**  
for static contact  
angle measurement  
of a gas bubble



**Pendant drop**  
for surface and  
interfacial tension



**Reverse pendant drop**  
for surface and  
interfacial tension



**Pulsating drop\***  
for dilational  
interfacial rheology  
measurement



**3D Topography\***  
for roughness  
corrected contact  
angle

\* available only with Theta Flex



# Attension Theta Flex

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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.

## Complete range of measurements

- Static contact angle
- Dynamic contact angles
- Roll-off angle
- Surface free energy
- Surface tension
- Interfacial tension
- Batch contact angle
- Roughness corrected contact angle
- Interfacial rheology (viscoelasticity)
- High pressure and high temperature measurements

## One instrument for all needs

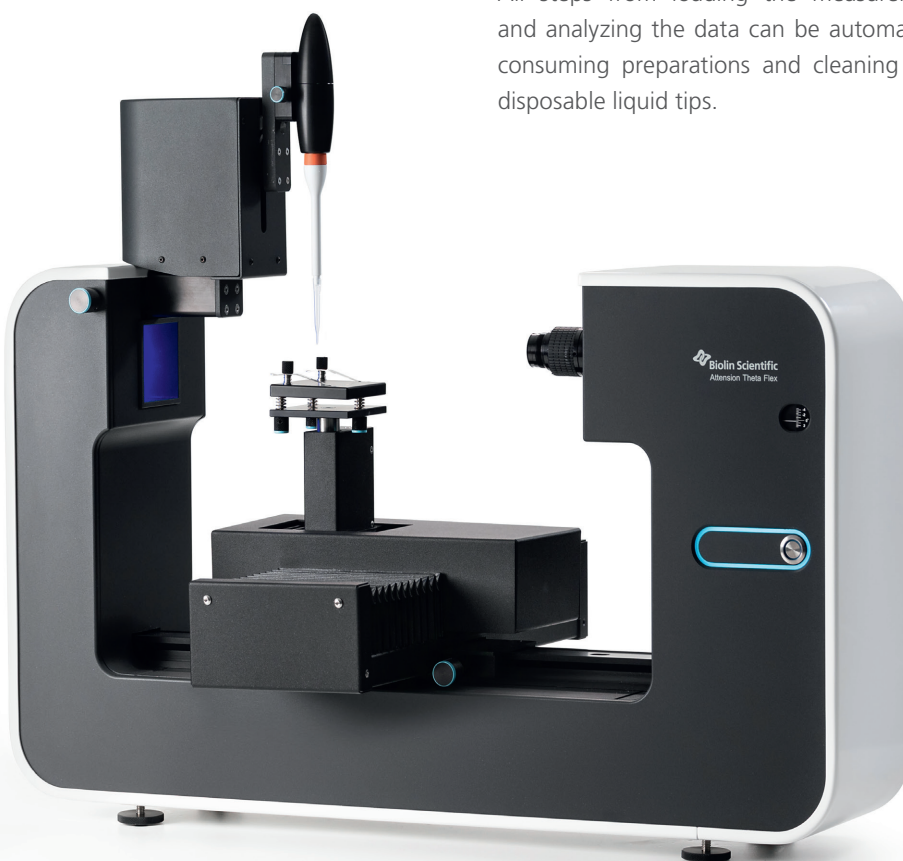
All the measurements are readily included in the software. The modular design enables all applications to be fulfilled with one instrument and the instrument can be tailored for your needs.

## 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.





# Modules and Accessories

Theta Flex is available from a fully manual configuration all the way up to the most advanced fully automated system. Choose from the readymade configurations or tailor your own:

Configuration	Dispenser	Droplet placement	Sample stage
Theta Flex Auto 5	Auto, 4 liquids	Auto	Auto XYZ
Theta Flex Auto 4	Auto, 2 liquids	Auto	Auto XYZ
Theta Flex Auto 3	Auto, 1 liquid	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

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

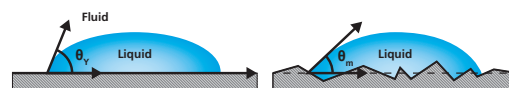
For fully automatic dynamic contact angle and roll-off angle measurements by the tilted drop method.

## Environmental Chambers

To control the measurement environment including the temperature.

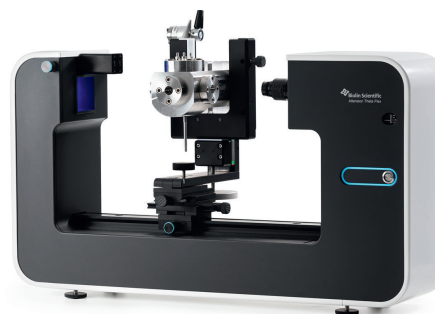
For a complete list of accessories, please visit the Theta Flex product page at [biolinscientific.com/product/theta-flex](https://www.biolinscientific.com/product/theta-flex).

## Theta Topography

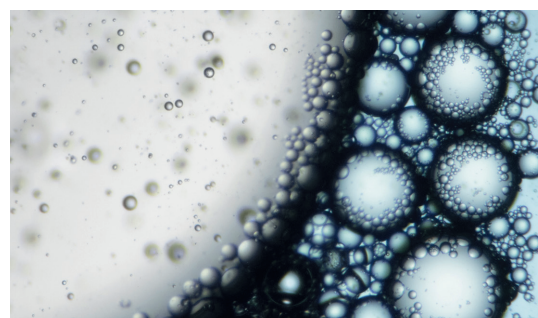


Attention Theta Flex with 3D Topography Module separates the impact from surface chemistry and roughness to wettability in coatings and material development.

## Theta High Pressure



Attention Theta Flex with High Pressure Chamber measures wettability and interfacial tension in enhanced oil recovery applications. It is designed to facilitate the use despite the harsh conditions mimicking the oil reservoir.



# Attension Theta Lite

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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. OneAttension software makes the contact angle analysis as simple as it gets to save precious measurement time.

## Accurate measurements of

- Static contact angle
- Dynamic contact angle
- Roll-off angle
- Surface free energy
- Surface tension
- Interfacial tension
- Batch contact angle

## 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.

For a complete accessory description, please visit .  
[biolinscientific.com/product/theta-lite](https://biolinscientific.com/product/theta-lite).



# 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 Attention. 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

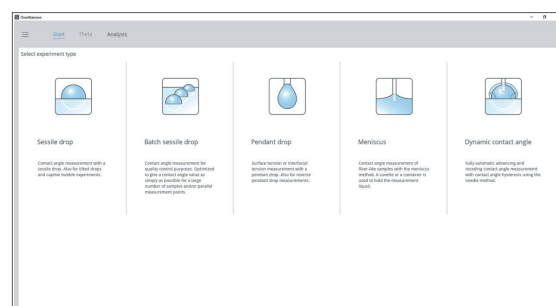
OneAttention has been designed to meet the requirements of almost any applications you may have. You can easily adjust measurement parameters to match your specific application needs. Your optimized measurement recipes can then be saved for further use.

## Data handling and exporting made easy

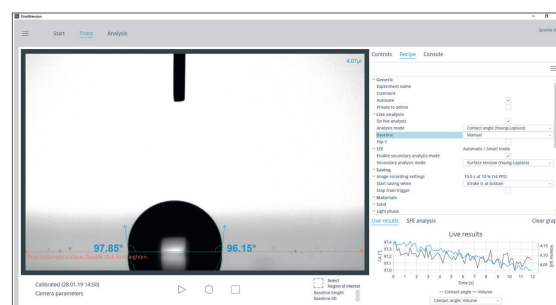
Data analysis, plotting, and statistical analysis can all be done with a few clicks to give you accurate results within seconds. All data can easily be exported further to Excel, for example.

## Optimal for industrial use

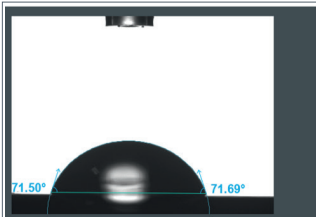
The Batch Sessile Drop measurement makes it simple to measure static contact angle in quality control. Additionally, measurement reports can be created with a few clicks and the user manager conveniently handles all different users – with desired privacy levels.



Intuitive interface with all measurement modes available



Live results during measurement



	Quantity	Magnitude
Contact angle [°] / CA 106 (Water)		105.830
Contact angle [°] / CA 72 (Ethylene glycol)		72.298
Contact angle [°] / CA 53 (Di-iodomethane)		52.592

	Method	$\gamma^{\text{td}}$ [mJ/m <sup>2</sup> ]	$\gamma^{\text{d}}$ [mJ/m <sup>2</sup> ]	$\gamma^{\text{m}}$ [mJ/m <sup>2</sup> ]
Acid-Base		32.76	32.82	-0.06
Equation of State		26.50	26.50	
OWRK/Fowkes		33.05	33.05	0.00
F.Schultz				
Wu		34.09	34.14	-0.05
Zisman		30.66	30.66	

Automatic analysis and presentation of results

Available Measurements		Theta Flex	Theta Lite
Static contact angle		√	√
Dynamic contact angle		Automatic	Automatic
Surface/interfacial tension		√	√
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	
Available Measurement Methods			
Sessile drop		√	√
Batch sessile drop		√	√
Captive bubble		√	√
Pendant drop		√	√
Reverse pendant drop		√	√
Meniscus		√	√
Dynamic contact angle		Automatic	Automatic
Pulsating drop		√	–
3D Topography		√	–
Hardware			
Measuring range (°, mN/m)		0...180, 0.01...2000	0...180, 0.01...2000
Accuracy (°, mN/m)		± 0.1, ± 0.01	± 0.1, ± 0.01
Maximum sample size (mm)		Unlimited x 100 x 320 (w. stage)	Unlimited x 45 x 200 (w. stage)
Integrated sample holders		Yes	Yes
Frame interval		0.33 ms ... 1000 s	0.48 ms...1000 s
Maximum resolution (pixels)		1984 x 1264	1280 x 1024
Maximum measuring speed (fps)		3009	2068
Camera		USB3 digital camera	USB3 digital camera
Camera protection		Inside instrument covers	Inside instrument covers
Camera view angle (°)		-4.5...2.5	-2...2
Light source and size		High power monochromatic LED, 62x62 mm	LED based background lighting, Ø 20 mm
Field of view (diagonal in mm)		1.44...32.3	2.9...12 mm
Measurement indicator LED		Yes	No
Disposable tip dispensing		√	√
Dimensions (basic frame) (mm)		L 765 x H 435 x W 230	H 310 x W 130 x L 495
Weight (basic frame) (kg)		26	5
Power supply (VAC)		90...264	100...240
Frequency (Hz)		47...440	50...60
Drop Profile Fitting Method			
Young-Laplace (ca, st/it, m)		√	√
Bashforth-Adams (st/it)		√	√
Circular (ca)		√	√
Polynomial (ca, m)		√	√
Software			
Provided Software		OneAttention	OneAttention
All-inclusive		√	√
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 7, 8 or 10 (32 or 64 bit).	

√ : available – : not available/not applicable

CA: contact angle st/it: surface tension and interfacial tension M: meniscus

All specifications are subject to change without notice.

## About Us

Biolin Scientific is a leading Nordic instrumentation company with roots in Sweden and Finland. Our customers include companies working with life science, energy, chemicals, and advanced materials development, as well as academic and governmental research institutes. Our precision instruments help develop better solutions for energy and materials, and perform research at the frontiers of science and technology.



# Biolin Scientific

[ Progress Together ]

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