

# QSense Omni

## Effortless QCM-D for an innovative future



# Join the pioneers of QCM-D technology

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QSense® is the world-leading, premium QCM-D solution for nanoscale tracking of interactions at surfaces and interfaces. It can provide you with unique, reproducible, in-depth data with high productivity and ease of use along the way. This enables a fundamental understanding of processes, an early indication of real-life outcome and the ability to optimize products and processes for authentic conditions. By investing in a QSense instrument you put yourself and your team at the forefront of scientific progress and technological innovation.

## By scientists for scientists

In the 1990s, scientists at Chalmers University of Technology in Sweden created the foundation for the first commercial QCM-D instrument. Since then, the QSense community has grown alongside the interest in the possibilities of the technology. The instruments are used at research facilities worldwide and in applications such as pharmaceuticals, biotechnology, energy, electronics and many more.

## QSense in numbers

- In academic and industrial labs since 1999
- More than 1000 installed instruments in 50+ countries
- Mentioned in 3000+ publications
- Over 200 different customized sensor coatings developed for customers



# QSense Omni

QSense Omni is the new, cutting-edge instrument from the pioneers of QCM-D. Based on established technology, which has supported a deeper understanding of surface and interface interactions for decades, QSense Omni gives you sharper QCM-D data and a smooth journey in the lab. Unfold unique insights quicker and base your decisions on reliable results from highly controlled measurements.



## Most suitable when:

### You want ease of use

Get up and running with this out-of-the-box solution. Everything you need to get started is included.

### You want flexibility

Build the system to suit your needs, now and in the future.

### You want automation

Minimize hands-on time and maximize reproducibility.

### You value working with the best

Trust the results you get from the next-generation premium QCM-D instrument.

## 3 reasons to invest

### Easier data interpretation

Through leading signal processing and a fast and reproducible liquid exchange, QSense Omni gives you sharper and more concise data. For easier and more confident data interpretation and analysis.

### Smooth journey

Running successful QCM-D experiments with trustworthy and reproducible results has never been easier. Thanks to intuitive design, smart workflows and clever automation, productivity will increase, and you can spend your working-day more efficiently.

### Grow with your research

With bold design and smart functions, QSense Omni is made for scientific progress and future innovation. By upgrading to more channels, or adding QSense Orbit for complementary measurements, you can go beyond entry capabilities, and grow with your research.

## First impressions from beta testers - BASF SE

*"I observed reduced cross-contamination, which is crucial for obtaining accurate data. I recognize the potential and value of this in our future studies"* - Peter Stengel

*"From my initial experience conducting the experiment, it became evident that it was designed with ease-of-use in mind, making it accessible to multiple users at the same time with no difficulties"* - Franziska Tauber

# What is new

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With the premium QSense technology at the core, QSense Omni features all the benefits of the unique decay technology, leading data quality, robustness and temperature stability. On top of that, QSense Omni provides an intuitive interface, many smart functions, and automation to minimize hands-on time and maximize success rate.

## We guide you through the best new features

- **Improved signal-to-noise**

The leading signal processing broadens the sensitivity range by improving the signal-to-noise ratio at least 5 times compared to any other QCM-D instruments. This lowers the Limit of Detection and enables easier interpretation of the data.

- **Fast and precise liquid exchange**

More control of your measurement, fast and precise liquid exchange with minimal mixing effects. Direct injection fluidics gives a true representation of the interaction under study, you are able to get a better view of what you are measuring and to detect fast processes. Saving sample along the way is a bonus.

- **Correct and repeatable sensor position**

With the new guiding tool it is easier to mount the sensor in the right position. The automated and controlled clamping of the sensor maintain the acoustic fingerprint of the sensor. Correct and repeatable sensor mounting and clamping allowing more successful experiments.

- **Smooth journey to trustworthy data**

The clever automation in QSense Omni gives improved reproducibility and minimum manual handling. With automated cleaning, the instrument is ready for the next experiment in no time.

- **Optimized measurement conditions**

No need to worry about the set-up. Automated quality controls will make sure the measurement is started with the correct and optimal conditions. Each sensor and channel is automatically checked to make sure the set temperature is reached, all overtones are found and the baseline is stable. A great foundation for successful measurements.

- **Automation for flexibility**

You can now edit and optimize your script while collecting data. Developing an optimal protocol has never been faster. Live script editing provides you with maximum flexibility with all the benefits of automation. Get in the exploratory mood.



## QSense Omni in detail

- **Measurement channels to match your need**

Interested in running identical or different experiments in parallel? Configure your QSense Omni with up to 4 independent measurement channels.

- **Temperature controlled measurement chamber - Patent-pending**

Peek through the glass to the heart of your experiment. The measurement chamber provides a controlled environment for the sensor holder and sample cylinders.

- **Explore more with QSense Orbit**

Each measurement channel has ports for adding a QSense Orbit chamber. Together with QSense modules, it can extend your experimental scope and you can work with complementary technologies.

- **One case to cover it all**

QSense Omni holds electronics, pumps and flow paths within

its curved shell. However, sensor- and sample holders can be ejected and removed for easier sensor mounting and sample addition.

- **Easy-to-access bottles**

Keep track of your liquids through the glass door. The bottle compartment contains easy-to-reach bottles for your cleaning-, and buffer solutions. You can also place larger volumes of samples here.

- **LED light to guide you**

The coloured LED light will guide you through the experiment, and show you when an experiment is running or if something requires your attention.

- **Integrated cleaning**

The QSense Omni flow pathway is short and free from tubing. Pre-programmed protocols make cleaning easy and prepared for the next experiment.

# Easier Data Interpretation

QSense is the market leader of QCM-D. A position based on superior data quality and measurement performance. QSense Omni takes QCM-D data quality to the next level. Through leading signal processing and a fast and reproducible liquid exchange, it will simply give you sharper and more concise data. For easier and more confident data interpretation and analysis.

## Key benefits

- **Benefit from easier data interpretation**

With sharper data we mean sharper shifts, higher signal-to-noise, less drift. Data that is simply easier to interpret.

- **Broaden your sensitivity range**

Improved signal-to-noise ratio and reduced drift lead to improved LOD (Limit of detection).

- **Reveal the process of interest**

The shortened lag phase during liquid exchange, where the studied process may become hidden allows you to detect and quantify faster processes.

- **Extract reliable kinetics data**

The fast and reproducible liquid exchange enables the extraction of trustworthy kinetics data.

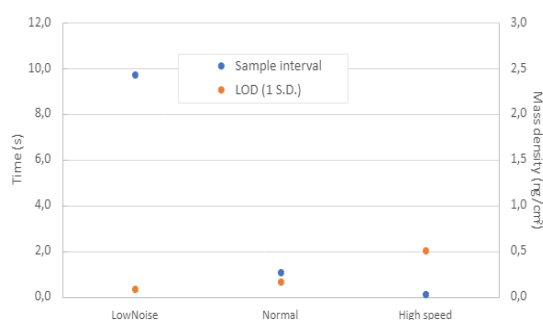
- **Control your molecular concentration**

The fast liquid exchange gives precise control of the concentration over the sensor, preventing unexpected variations in molecule conformation or orientation on the surface.

- **Run high viscosity samples**

With improved signal processing more overtones can be measured in higher viscosity samples. You are able to perform a better quantitative evaluation of the data.

## Real-life performance



Applying a higher sample rate inevitably leads to higher noise and compromised limit of detection (LOD). With significantly improved signal-to-noise, QSense Omni offers improved Limit of Detection. The figure and table below describe the Limit of Detection of QSense Omni at three different sampling intervals.

**Figure 1** Speed and limit of detection (LOD) per acquisition mode. Limit of detection is set to 1 S.D. of the baseline noise.

Data capture settings	Time to capture 7 harmonics (s)	f/n-noise (Hz)	mass-noise (ng/cm <sup>2</sup> )	D-noise ( $\cdot 10^{-6}$ )
LowNoise	9.68	0.005	0.080	0.001
Default	1.06	0.009	0.165	0.003
High speed	0.09	0.029	0.504	0.011

Table 1 Performance Characteristics

<sup>a</sup> Measurements were performed with QSX 303 SiO<sub>2</sub> sensors at 20°C temperature, and in deionized water at flow of 15µL/min, using one measurement channel. Each measurement mode was measured for approximately 5 minutes, and data points within 1 minute time range were used to obtain the presented noise levels.

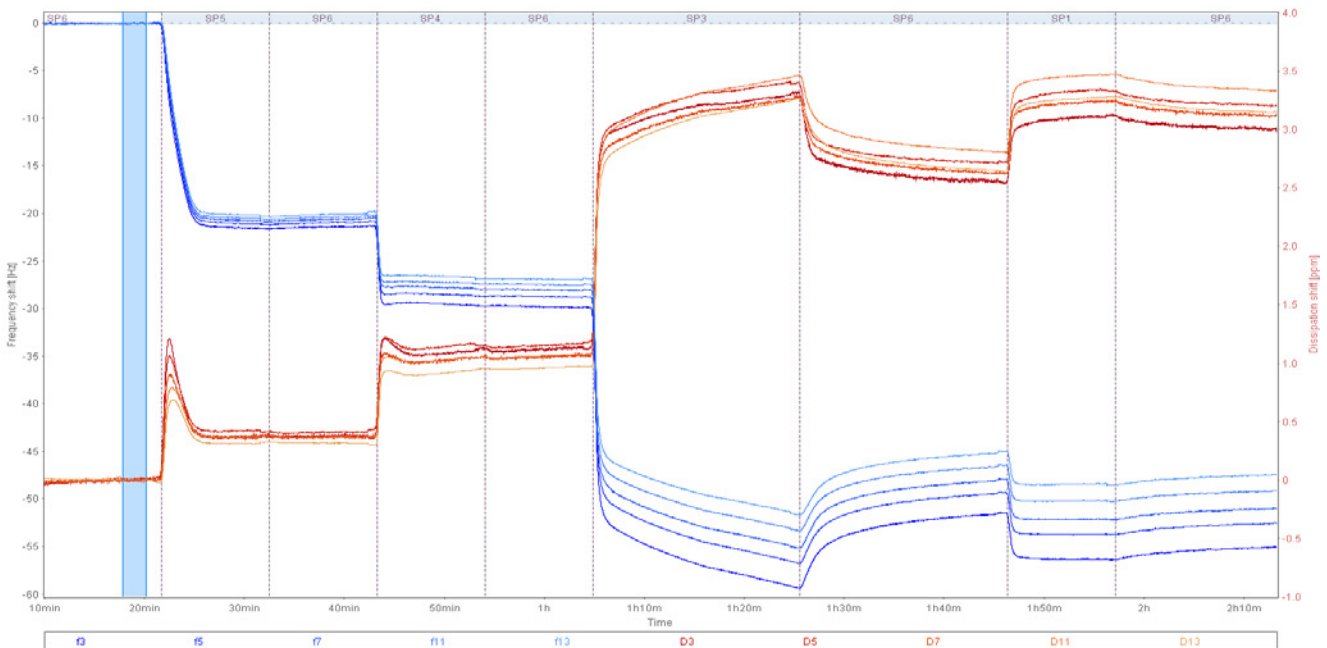


Figure 2 Frequency and Dissipation shifts for an antibody assay build-up: immobilization of coupling molecules, streptavidin, and biotinylated protein A, followed by capturing of anti-BSA and antigen binding, BSA. End of trace shows a pH induced release of the anti-BSA and antigen.

# Smooth journey

Effortless QCM-D measurements with QSense Omni let you spend your workday where it matters the most. The intuitive design with clear interaction points will make experimenting very straightforward. Guided workflows simplify the set-up of the experiments, and the LED light will show you the state of the instrument. QSense Omni does not only save your time, via its automated procedures it also reduces the risk of human error and unwanted variations. Prep for productivity and successful measurements with trustworthy data and high reproducibility.

## Key benefits

- **Reproducible results**

Automation and controlled procedures make QSense Omni user-independent, and help make results reproducible and trustworthy.

- **Spend your workday efficiently**

Intuitive design, smart workflows and automated procedures minimize hands-on time and simplify preparing and running experiments.

- **Get started quickly**

QCM-D is an advanced technology, but handling the experiment doesn't have to be. Our guidance get you started quickly.

- **Grow your team of users**

Do you rely on a single resource to run important experiments? QSense Omni provides intuitive and controlled QCM-D so you

can get more users onboard with the technology.

- **Set up for success**

Get optimal set-up conditions for your experiment with our guiding software and quality-controlled procedure. The sensor mounting tool will make sure the sensor is in position and automated clamping will prevent unwanted variations.

- **A fast way to develop and refine scripts**

The drag and drop function makes it easy to set scripts. Live script editing allows you to adjust your script while running the experiment, which means less trial and error to get it right. Use your best protocols over and over with high precision.

- **Small footprint**

With everything integrated under the curved shell, the compact and sleek design of QSense Omni suits most labs.

## Why automation is important

Developing QSense Omni, the Biolin Scientific R&D team put a lot of effort into automation. It is one of the cornerstones of the instrument and can be found everywhere from sensor clamping to liquid management and cleaning protocols. The advantages of automation are many. Firstly, when you minimize manual handling,

the risk of human errors and unwanted variations decrease and you avoid user dependency. Results will be more reproducible. Secondly, it saves time. Experiments can be run unattended and you can enjoy features such as automatic cleaning, which gets the instrument ready for the next round in no time.

## QSoft Omni Software

Discover QSoft Omni software - a new, user-friendly software designed to guide you through experiment set-up and produce successful results. While you prepare your experiment the QSoft Omni software continuously makes quality controls in the background to ensure optimal conditions for your measurement.



Figure 2 QSoft Omni software

### Key features

- Guided workflow takes you through experiment set-up
- Automated quality checks in the background helps ensure optimal experiment outcome
- Drag and drop interface and live script editing ensures both reproducibility and flexibility
- Event log featuring both automated actions and user annotation



# Grow with your research

QSense Omni is made for progress. Whether you work with fundamental science or in product development, your research today might be the foundation of innovation tomorrow. Start by tailoring your QSense Omni for your current needs, and grow with your research. Go beyond entry capabilities and upgrade by adding more channels for higher throughput. You can also get QSense Orbit and suitable modules for complementary measurements.

## Key benefits

- **Run different scripts simultaneously**

With independent measurement channels, you can set and run different protocols for each channel. Vary flow rates, script sequences and data collection rates.

- **Combine QCM-D with other techniques**

Connect the QSense Orbit chamber to couple automated measurements with other techniques. Open a world of opportunities within electrochemistry, ellipsometry, microscopy and more.

- **Automation with flexibility**

QSense Omni is automation and flexibility combined. Explore processes and phenomena as you go. You can edit the script live while running

the measurement, for example waiting to verify your in-situ coating before adding a sample.

- **Add throughput along the way**

Go for a suitable configuration today, and upgrade your system with more channels when you need to increase the throughput.

- **Run experiments with harsh chemicals**

High resistance material provides a system to manage also challenging chemicals.

- **Flexible set-ups and unattended measurements**

The flexible sample management allows you to run up to 8 consecutive samples and supports long experiments requiring litres of sample as well as economic management of high-cost samples.





## Explore more

Have a look at a selection of available modules to expand your experimental set up and possibilities.

### QSense Window module

Giving optical access to the sensor surface, this module enables simultaneous QCM-D and microscopy measurements on the same surface. You can also perform light or irradiation sensitive measurements.

### QSense Electrochemistry module

Want to conduct simultaneous QCM-D and electrochemistry measurements on the same surface? This module supports a wide range of electrochemical methods, for instance cyclic voltammetry and electrochemical impedance measurements to explore polymer behavior, electrostatic interactions, corrosion, etc.

### QSense Window Electrochemistry module

The module enables simultaneous QCM-D and electrochemistry measurements with optical access to the sensor surface. This module is typically used in applications like photovoltaics.

### QSense Open module

The Open module is tubeless with the lowest possible sample volume requirement. You can directly pipette a minimal amount of liquid to cover the sensor. This module will provide for evaporation studies, external triggered reactions such as photo induced reaction and chemically triggered reactions.

### QSense Humidity module

Designed to enable measurements of vapor uptake and release from thin films coated on the sensor.

### QSense ALD holder (Atomic Layer Deposition)

For measurements in vacuum or gas phase.

### QSense PTFE module

Proven to be useful for plasma samples containing components that normally would interact with, and aggregate on, titanium.



QSense Window module



QSense Electrochemistry module



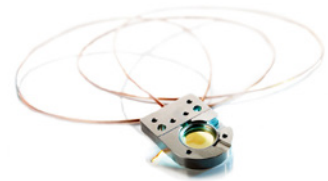
QSense Window Electrochemistry module



QSense Open module



QSense Humidity module



QSense ALD holder



QSense PTFE module

Our application team at Biolin Scientific is performing daily QCM-D measurements with the QSense systems in our laboratory to create reference data and provide support for our customers. They have been instrumental in shaping QSense Omni for easy and successful measurements. We asked two of our super users to share their view on QSense Omni.



**Ph.D. Kenneth Olesen**  
Application Development &  
Senior Staff Scientist  
Biolin Scientific

“QSense Omni is a new era in QCM-D technology. With an intuitive interface and easy handling, the instrument invites a wider audience to explore the technology. Research and development are good examples. With the insights of processes at the surface, you can develop better products and ultimately grow your business.”



**Ph.D. Fredrik Pettersson**  
Senior Application Scientist  
Biolin Scientific

“When studying adsorption processes of complex molecules, it is important to control the molecule concentration over the sensor. The correct concentration needs to be reached quickly and reproducibly, since lower concentrations might initialize different adsorption orientations or conformations. The direct injection together with precise sensor alignment and clamping provides superior control of the liquid environment over the sensor. I get more predictable results, and I can resolve adsorption events that would have been hidden in the liquid exchange kinetics of other instruments.”



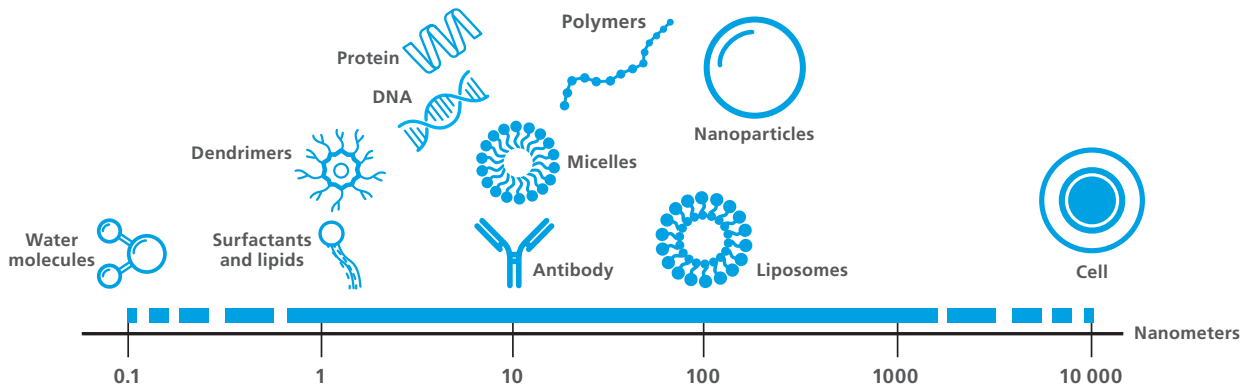
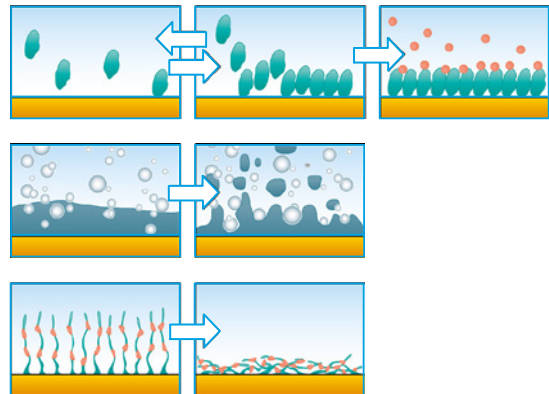


## Analyzing surfaces with QSense

QSense QCM-D offers you a new set of eyes in the studies of molecule-surface interactions. With nanogram precision you can follow events at the surface as they happen, and quantify mass, thickness and structural properties.

- Adsorption / Desorption
- Binding / Release
- Building-up / Degradation
- Cross-linking
- Swelling / Collapse

Any molecule or other object in the range of 1 Å to 1 µm can be studied.



### Build your configuration and get a quote with our tool

Our Instrument Selector will guide you along the way to your new instrument. Just answer a few questions and the tool will provide you with a suitable instrument and accessories based on your specific needs.



Data capture settings	Time to capture 7 harmonics (s)	f/n-noise (Hz)	mass-noise (ng/cm <sup>2</sup> )	D-noise ( $\cdot 10^{-6}$ )
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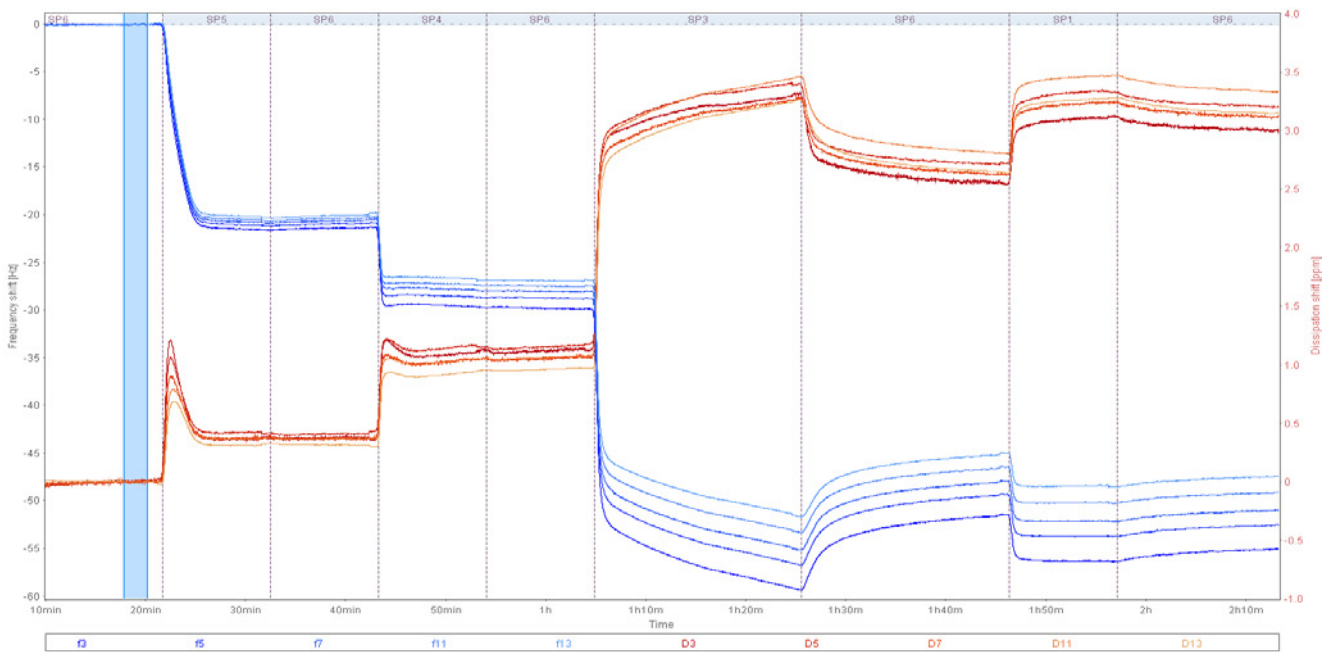


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# Specifications

Measurement range and capacity					
Measurement channels	1 - 4				
Temperature range	4 to 70 °C				
Sensors (frequency range)	5 MHz (1-72)				
Number of measured harmonics	7, allows for full viscoelastic modeling				
Sample and fluidics					
Minimum sample volume	~ 90 µl				
Flow rates	Typical flow rate 20 µl/min. Settable Flow speed range 1-200 µl/min				
Performance Characteristics					
Maximum time resolution	300 datapoints per second (each datapoint represents an <i>f</i> and <i>D</i> value)				
Sensitivity / LOD and Noise <sup>a</sup>	Minimum frequency noise: 0.0045 Hz. Please refer to the real-time performance on page 7				
Long-term stability <sup>b c</sup>	Temperature: << 0.01°C    Frequency: << 1 Hz/h    Dissipation: << 0.15·10 <sup>-6</sup> /h				
Software		QSoft Omni	Dfind Analysis Software		
Data output		Time resolved Frequency and Dissipation for 7 harmonics	Thickness (or mass), viscosity, shear modulus and the frequency dependence of the viscosity and shear modulus. Kinetics, slope, rise time and more		
Computer requirements		USB 2.0 or higher with type C connector Intel Core i5 processor (or equivalent) with 8 GB of RAM or better > 1920 x 1080 px screen resolutions	PC with 64-bit > 1366x768 px screen resolution, > 4 GB RAM		
Operating system	Windows 10 or later (earlier Windows versions may not fully work and support cannot be guaranteed)				
Import/export		SQLite	pdf, xps, png, svg, gif, csv, xls, ogv		
Electrical data					
Instrument input	24 V DC, 10 A				
External power supply input	100-240 V AC, 50-60 Hz, 12.5 A				
Dimensions and weight		Height (cm)	Width (cm)	Depth (cm)	Weight (kg) <sup>d</sup>
Omni 1 channel system		32	21,5	36	14
Omni 2 channel system		32	28,5	36	21,5
Omni 3 channel system		32	35,5	36	29
Omni 4 channel system		32	42,5	36	37

All specifications are subject to change without prior notice

## About us

We are Biolin Scientific. A worldwide company making state of the art instruments and smart solutions for scientists. Knowledge is our greatest resource and an essential part of everything we do. In collaboration with leading universities and industries, we solve challenges to simplify everyday life in the lab. Our customers are experts in surface science, and we have the tools for them to progress.

<sup>b</sup> The temperature stability depends on variations in how the ambient affects the warming or cooling of the chamber. The specified temperature stability may not be reached if the room temperature changes more than ± 1° C, if there is a draft or a heat source nearby.

<sup>c</sup> Values taken after 1 h measurement in DI water at 25 deg C. Flow 20 µl/min and a data rate of 1 datapoint/s. Data interval used for analysis: 2 min. Even better stability can be achieved by waiting longer than 1 hour.

<sup>d</sup> weight excluding external power supply.