



Product Book

# ELASTOSENS™ BIO

**We are your partner  
for Soft Matter  
Analytics™**



# ABOUT RHEOLUTION

Our mission is to empower users in their quest for innovation, quality and efficiency with our unique Soft Matter Analytics™ platform. Our cutting-edge analytical instruments reproduce real-life environments and capture the dynamic evolution of live and evolving soft materials. We design simple-to-use, highly effective and modular analytical instruments to provide a unique testing experience for our customers in Life Sciences.

## **GET THE FULL PICTURE OF YOUR MATERIAL**

We design our products and software adopting IoT (Internet of Things) principles to provide a high level of modularity, flexibility and connectivity to our community of users. These unique features support the powerful concept of Soft Matter Analytics™ that guides our product development. It consists of software tools that are integrated into our instruments to allow to personalize, build and analyze extensive databases to fully describe a material and its environment from a chemical, biological, physical, mechanical, physiological and functional perspective.

**We're shaping the future of Soft Matter Analytics™, delivering next-gen solutions to help our users bring soft materials to life.**

# ELASTOSENS™ BIO

ElastoSens™ Bio is a compact analytical benchtop instrument that precisely characterizes the viscoelasticity of soft materials in real time, without contact and in a non-destructive way.

Samples are contained into removable sample holders that can be disconnected, stored out of the instrument, such as in an incubator, and re-connected for re-testing over long periods of time.



Instrument 1

# ELASTOSENS™ BIO



Control up to 5 instruments in parallel remotely from a single wireless Tablet App

Test samples while exposed to programmable temperatures and lights

Interact with each unit of the testing system using a built-in touchscreen monitor

Test non-destructively and without contact the viscoelasticity of soft synthetic and natural biomaterials



Advanced Peltier temperature control



3 built-in UV and visible light sources



Built-in ultrasonic volume probe



Built-in gas entries for environmental control



Database with personalized variables and parameters



App-instrument wireless communication



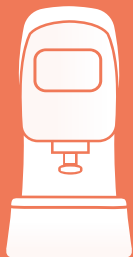
**Connect up to 5  
ElastoSens™ Bio  
units to control  
from a single  
software  
platform.**

The ElastoSens™ Bio uses Internet of Things (IoT) principles. Up to 5 instruments can be controlled from a single tablet App that uses wireless communication. This breakthrough innovation in the field of analytical instrumentation offers an unprecedented modularity to users that need to scale up their testing capacity.

	Rheometer	ElastoSens™ Bio	Compression Tester
Measures samples without contact	✗	✓	✗
Allows non-destructive and long-term viscoelasticity testing of samples	~	✓	~
Allows the study of short- and long-term degradation of materials	✗	✓	~
Expose samples to photostimulation in real time	✓	✓	✗
Measures swelling (volume change) of materials	✗	✓	✗
Measures dynamic processes (gel formation, coagulation, swelling, etc.)	✓	✓	✗
Fits in biological hood for cell-friendly mechanical testing environment	✗	✓	✓
Easy-to-use (few hours of training)	✗	✓	✗
Required level of users' expertise	HIGH	LOW	HIGH

## Bridging the gap in your lab to unlock the full potential of your biomaterials.

ElastoSens™ Bio has been specially designed to test soft and complex biomaterials. Follow the evolution of your fragile hydrogels, soft biological tissues, bioengineered tissues, 3D Bioprinted scaffolds, complex clots induced by hemostatic agents or coagulating blood. Obtain precise viscoelastic measurements of your biomaterials in a simple and effective way over short or long periods of time.



## Rheometer

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Testing of solutions, liquid polymers, homogeneous solid polymers



## ElastoSens™ Bio

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Testing of fragile hydrogels, soft biological tissues, bioengineered tissues, 3D bioprinted scaffolds, complex hemostatic agents with blood, coagulating blood



## Compression Tester

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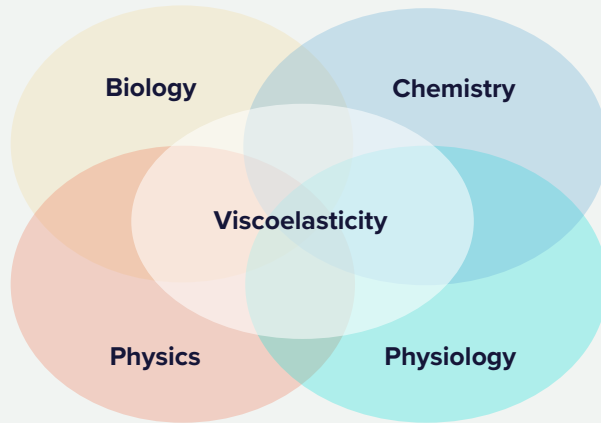
Testing of hard tissues such as bone, metallic implants, ceramics, hard & stiff polymers





# SOFT MATTER ANALYTICS™

Build and analyze your personalized database to understand dependencies between the viscoelastic, chemical, biological, physical and functional properties of your biomaterial or medical device.



## 1. Personalize your Database

Create your own list of parameters to store the chemical, biological, physical and physiological properties of your sample.

## 2. Customize and Capture your own Descriptive Parameters

Create customized buttons in the ElastoSens™ Bio's app and capture parameters that describe how your sample behaves in real time.

## 3. Build your Database

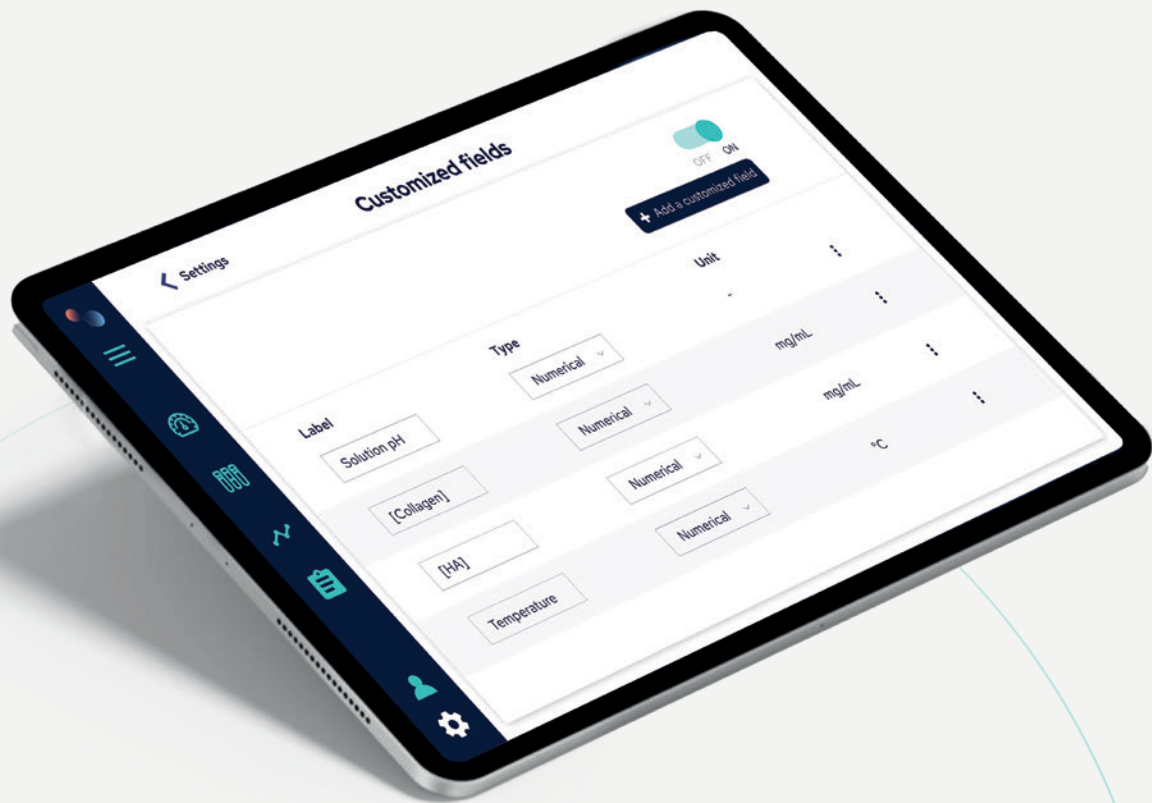
Enter the properties and capture the descriptive parameters of each sample you test on the ElastoSens™ Bio to correlate the viscoelastic measurements to the relevant properties you have decided to collect and analyze.

## 4. Analyze and Extract Knowledge

Analyze your database by filtering and correlating the recorded properties and descriptive parameters to highlight complex dependencies between the viscoelastic, chemical, biological, physical and physiological properties of your biomaterial.

## 5. Generate Reports

Generate personalized reports summarizing the key graphics, statistics and correlations to fully describe the behaviour of your biomaterial.



## Customized fields

< Settings

OFF ON

+ Add a customized field

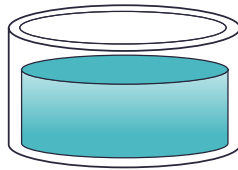
Label	Type	Unit
Solution pH	Numerical	mg/mL
[Collagen]	Numerical	mg/mL
[H <sup>+</sup> ]	Numerical	°C
Temperature	Numerical	

A person wearing a blue nitrile glove is interacting with a tablet device. The tablet screen shows a dark interface with a teal bar at the bottom containing a gear icon and a play button icon. The person is standing next to a piece of scientific equipment, which appears to be a sample holder or measurement device, with a light-colored top surface and a dark interior. The background is a plain, light-colored wall.

# TECHNOLOGY

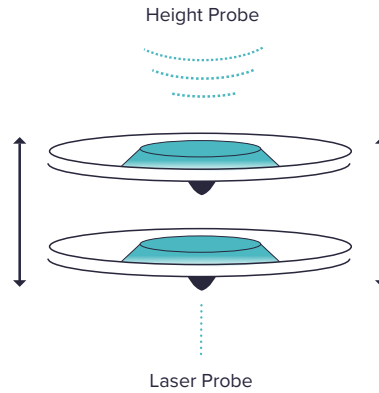
The ElastoSens™ Bio uses vibrations to measure non-destructively and without contact the viscoelasticity of soft materials. At each measurement, a gentle vibration is transmitted to the material through a patented sample holder and the sample response is measured remotely using a laser optical probe. A built-in height probe simultaneously captures the sample height in real time. ElastoSens™ Bio's software then processes the raw data and displays in real time the shear viscoelastic properties of the sample.

# HOW IT WORKS



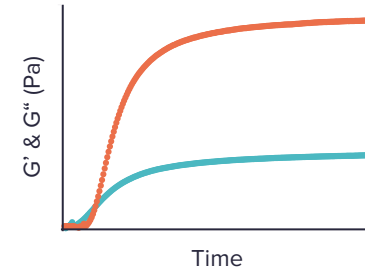
## 1. Load Sample

Sample is loaded into the sample holder



## 2. Vibration

Gentle vibrations are applied and the sample response is measured



## 3. Data processing & display

Raw data is processed and viscoelasticity is displayed in real time



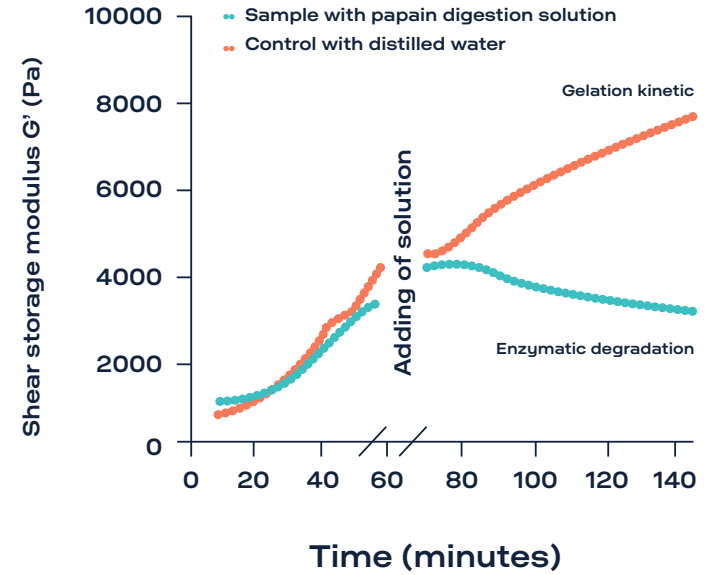
# APPLICATIONS

Bringing soft matter to life one application at a time  
with advanced biomaterials testing and analysis.



# Hydrogels

ElastoSens™ Bio offers an extensive testing platform to formulate, compare, qualify and control the viscoelasticity of hydrogels used in multiple applications such as tissue engineering, 3D bioprinting, drug delivery, hemostatic agents and the like. The sample can be tested in real time under controlled temperature, UV/visible light and, atmospheric inert gases as well as be exposed to physiological solutions.

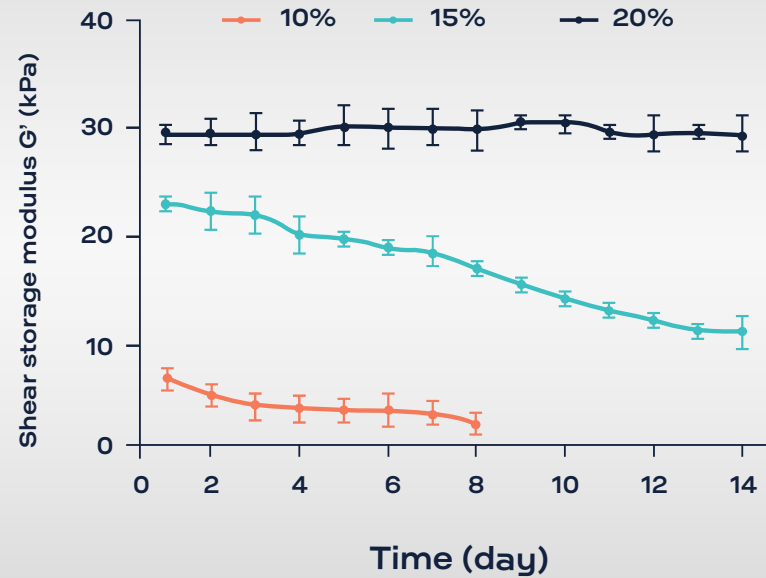


Evolution of the shear elastic modulus of a chitosan gel during the gel formation and the enzymatically induced degradation phases.

# Tissue Engineering



You can now capture how the viscoelasticity of 3D cell cultures changes over time due to the remodeling of the environment by cells. We have designed the ElastoSens™ Bio to non-destructively test the viscoelasticity of cellularized scaffolds that are contained in detachable sample holders. These sample holders can be placed in an incubator and retested multiple times during culture time. The whole testing system can also be placed in a biological hood for testing under sterile conditions.

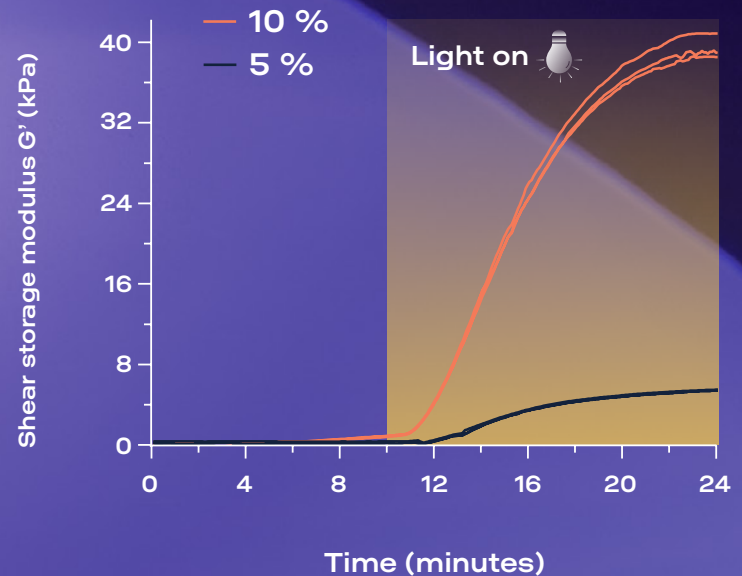


Long-term evolution of the same keratinocytes laden gelatin samples were tested during 14 days of culture using the ElastoSens™ Bio.



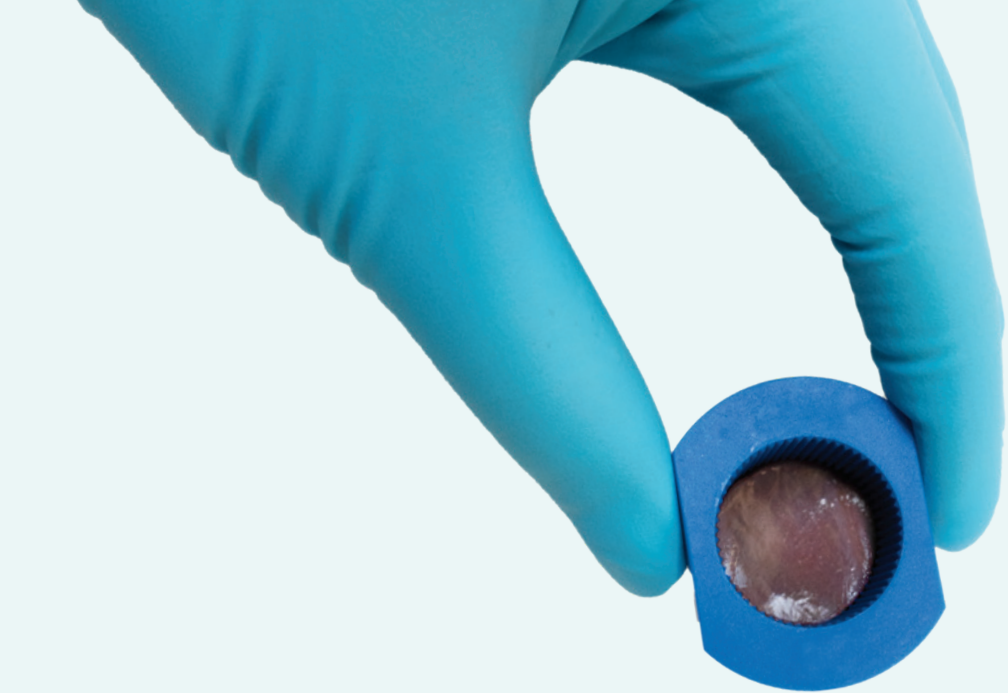
# Photocrosslinking

Photostimulation can be applied inside the measuring chamber of the ElastoSens™ Bio during the test and the UV/visible light effect on the biomaterial can be captured in real time. Light wavelength (365 nm, 385 nm, 405 nm) and intensity (0-24 mW/cm<sup>2</sup>) can be selected according to the sample and the study design. The evolution in the viscoelastic properties during the photostimulation are measured and the photocrosslinking parameters can be easily combined to meet the desired viscoelasticity and/or to optimize the 3D printing process.



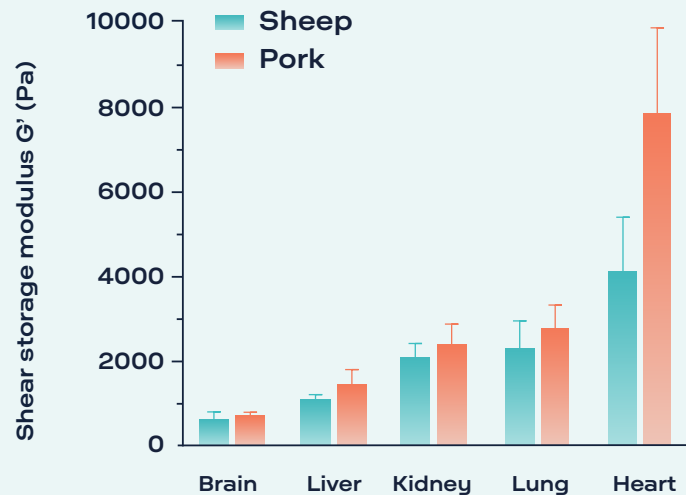
Shear storage modulus ( $G'$ ) as a function of time for two concentrations of PhotoGel® products.





## Soft Organs

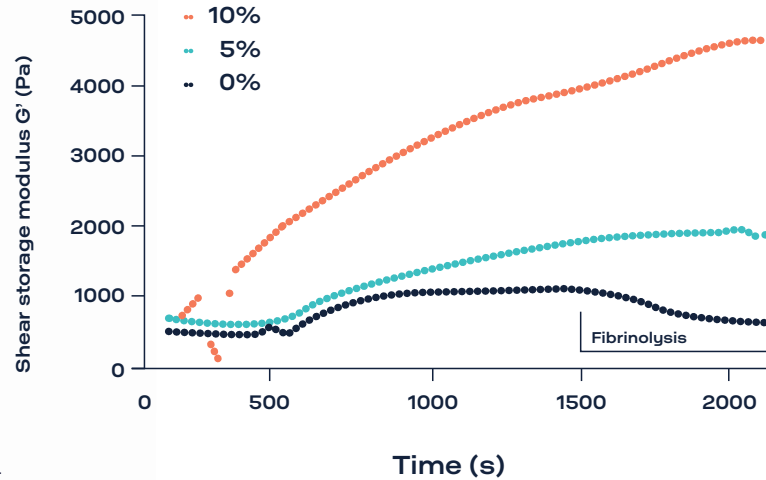
Samples from native tissues and organs can be tested *ex vivo* in the ElastoSens™ Bio. Cylindrical samples can be cut from the organ and inserted into the sample holder. The viscoelastic properties of the tissue can be measured under controlled temperature. These results can be used to understand the mechanical behavior of native tissues and as a reference for the development of biomaterials and tissue engineering products.



Average shear storage modulus ( $G'$ ) of fresh lung, liver, kidney, heart, and brain from sheep and pork obtained using ElastoSens™ Bio

# Hemostatic Agents

The ElastoSens™ Bio is the new state-of-the-art tool for quantitative measurement of the effect of hemostatic agents on blood. The instrument measures and displays the change in strength (shear elastic modulus,  $G'$ ) and viscous behavior (shear loss modulus,  $G''$ ) of the blood/HA complex as a function of time during clot formation.

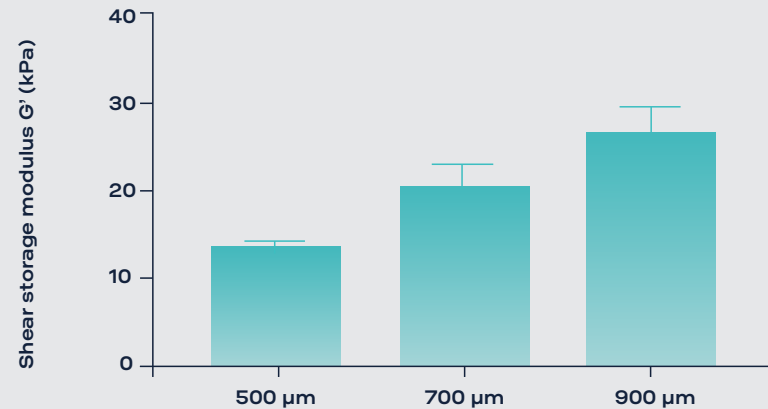


A commercially available hemostatic agent was tested with whole blood at different concentrations to measure how increasing the HA dosage in the blood influences both the clot strength and the clot initiation time.

# 3D Bioprinting

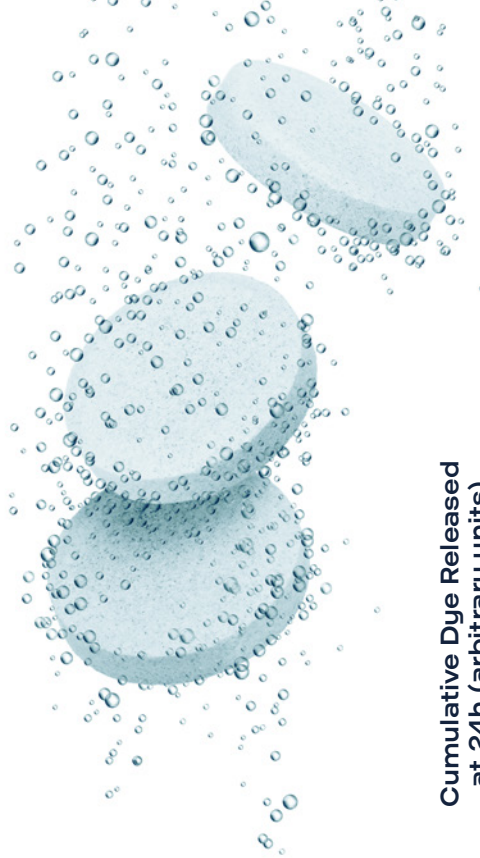


Bioinks can be poured directly in the sample holder and tested during gelation and crosslinked under controlled temperature and UV/Visible light conditions. Scaffolds can either be introduced or directly printed inside the sample holder to be tested on the ElastoSens™ Bio. Real-time changes in the storage ( $G'$ ) and loss ( $G''$ ) shear modull of either the bioink or scaffold are measured and displayed.

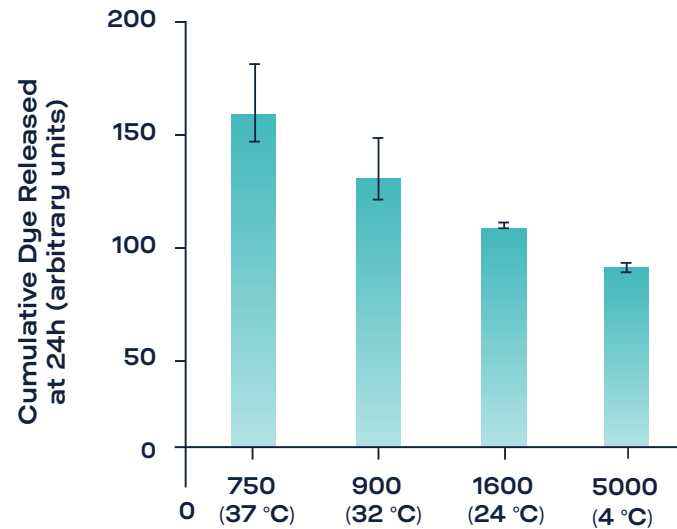


In this example, 3D scaffolds composed of PEGDA/Laponite gels were bio-printed with different porosities. It clearly appears that reducing the porosity results in the increase of the overall scaffold elasticity.

# Drug Release



The ElastoSens™ Bio measures in real time the degradation of soft-polymers based drug delivery systems. The resulting viscoelasticity data can then be correlated to the amount of therapeutic agents released by the drug delivery system. Optimizing the degradation rate of the soft polymer can directly help modulating the drug-release rate.



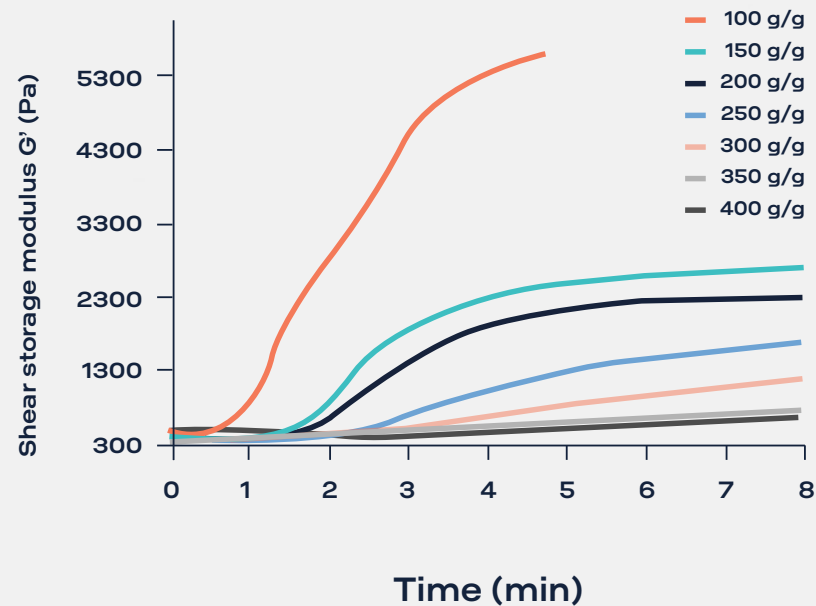
Shear storage modulus  $G'$  (Pa)

The ElastoSens™ Bio was used to characterize the mechanical degradation of an alginate/dye loaded-gelatin gel. The dye release strongly correlates with the gel viscoelastic properties.



# Superabsorbent Polymers

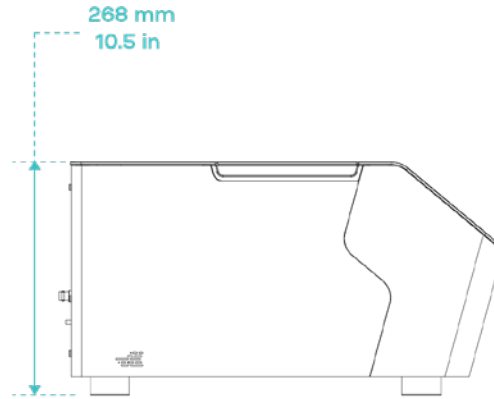
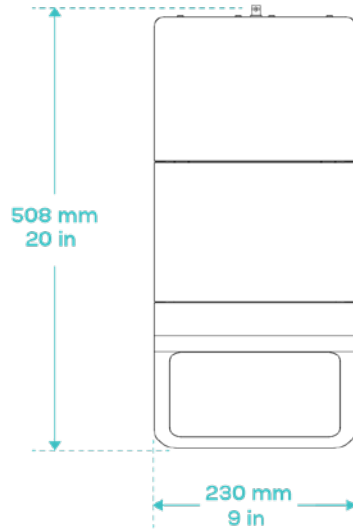
ElastoSens™ Bio measures in real time how superabsorbent polymers (SAP) absorb a liquid solution by measuring the elastic modulus of the forming gel during absorption. The instrument measures the exact time when absorption starts, the speed of absorption (speed of swelling) as well as the final gel elastic modulus. ElastoSens™ Bio can also characterize how SAPs react to multiple/sequential intakes and how porosity evolves at low absorption rates.



The ElastoSens™ Bio measures the absorption capacity of superabsorbent polymers as a function of the water-to-superabsorbent ratio.

# ELASTOSENSTM BIO SPECS

Shear storage modulus (G') measurement range	1 Pa to 1 MPa (repeatability: $\pm 1\%$ )
Loss tangent (Tan( $\delta$ )) measurement range	0 to 1 (repeatability: $\pm 1\%$ )
Sample height measurement range	1.0 mm to 20.0 mm (precision: $\pm 0.20$ mm)
Sample volume range	0.35 mL to 7.0 mL. The required sample volume depends on the sample's shear storage modulus
Temperature range	RT+2 °C to 50 °C (precision: $\pm 0.1$ °C)
Extended temperature range	4.0 °C to 70.0 °C (precision: $\pm 0.1$ °C)
Temperature profiles	Programmable temperature profiles with multiple ramps and sequences
Wavelengths for photostimulation	365 nm, 385 nm and 405 nm with adjustable intensities (can be combined)
Custom time steps between measurements	2 seconds to 60 minutes
Custom total measurement time	10 seconds to 240 hours
Custom sequences	build and run custom sequences by alternating thermo- and photostimulations
Power Requirements	100-240 VAC ( $\pm 10\%$ ), 50 – 60 Hz, 370 W max
10.5" Windows tablet with protective cover	9.65 in x 6.9 in x 0.04 in (245 mm x 175 mm x 8 mm)



weight: 16 kg (34 lbs)

### **Advanced, Wireless connectivity Windows Tablet App**

Displayed measurements and built-in calculations: steady viscoelastic properties of materials, transient viscoelastic properties of materials, calculation of gel formation and degradation rate ( $dG'/dt$ ) and real-time sample height. Allows for complete test setting, measurements, real-time data visualization, data archiving, data comparison, report creation, data and reports transfer.

### **Touchscreen Interface on the ElastoSens™ Bio**

Change thermal chamber temperature, display instrument status and main results and open the chamber using a digital button.

### **Advanced Temperature control and Photostimulation**

Basic temperature control covers a range going from Room Temperature +2 °C to 50 °C (absolute precision:  $\pm 0.1$  °C). The optional extended temperature control ranges between 4 °C and 70 °C (absolute precision:  $\pm 0.1$  °C) with programmable temperature profiles. Optional advanced photostimulation with 3 different wavelengths: 365 nm, 385 nm and 405 nm and adjustable intensities may be included.

# SERVICES



## Calibration & Qualification

We provide calibration services as well as Installation & Operation qualification services (IQ/OQ)



## Lifetime support

We offer our users life time access to our application specialists for support.



## Installation and training

Instrument installation and training of users on the use of our instruments and software.



## Certification & Documentation

We provide certificates and documentation that comply with your industry regulations.



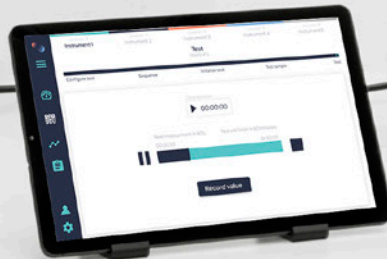
## Extended warranties

We offer extended warranties on top of the standard 12 months full warranty period.

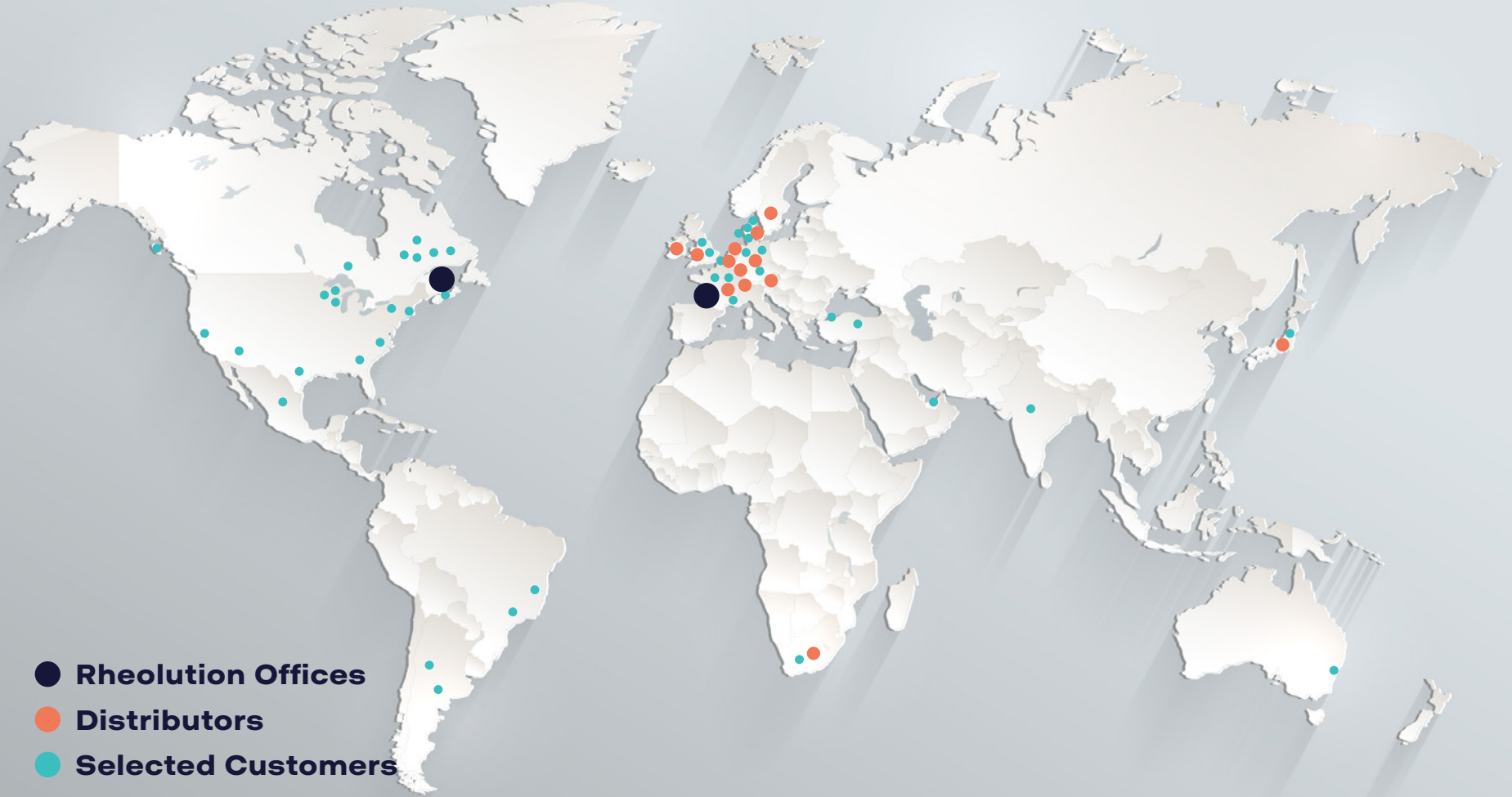


## Methods & Protocols

We work with you and your team on the development of custom protocols and methods.









## Contact us to start your Soft Matter Analytics™ journey

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