



Product Book

ELASTOSENS™ BIO

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

The background of the slide is a teal-colored image of a laboratory. On the right, a computer monitor is visible, displaying a circular graphic. On the left, a pipette is shown. The overall aesthetic is clean and scientific.

ABOUT RHEOLUTION

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

GET THE FULL PICTURE OF YOUR MATERIAL

We design our products and software based on IoT (Internet of Things) principles to provide a high level of modularity, flexibility, and connectivity to our user community. These unique features support the powerful Soft Matter Analytics™ concept that guides our product development.

Soft Matter Analytics™ consists of software tools integrated into our instruments, enabling users to personalize, build, and analyze extensive databases in order to fully characterize a material and its environment from chemical, biological, physical, mechanical, physiological, and functional perspectives.

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



ELASTOSENS™ BIO

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

Samples are contained in removable sample holders that can be disconnected, stored outside the instrument, such as in an incubator, and reconnected for repeated testing over extended periods of time.

ELASTOSENS™ BIO



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



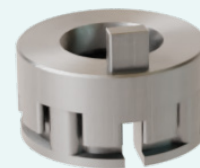
**Connect up to 5
ElastoSens™ Bio
units to control
from a single
software
platform.**

ElastoSens™ Bio is designed using Internet of Things (IoT) principles. Up to 5 instruments can be controlled from a single tablet app using wireless communication. This breakthrough innovation in analytical instrumentation offers unprecedented modularity for users who need to scale up their testing capacity.

SAMPLE HOLDERS



Macro Volume



Micro Volume



Membrane

Sample Volume

~ 0.35 mL to 7 mL

250 μ L

-

Sample Diameter

23 mm

14 mm

16 mm

Sample Height

Up to 19 mm

1.6 mm

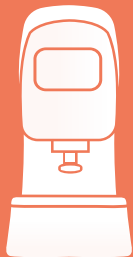
Up to 3 mm

**Sample requirements based on whether the sample is initially loaded as a liquid (volume) or as a soft solid (dimensions, either as a single piece or combined from multiple pieces).*

	Rheometer	ElastoSens™ Bio	Compression Tester
Measures samples without direct contact	✗	✓	✗
Enables non-destructive, long-term viscoelastic testing of samples	~	✓	~
Allows the study of short- and long-term degradation of materials	✗	✓	~
Provides real-time photostimulation of sample	✓	✓	✗
Measures material swelling (volume changes)	✗	✓	✗
Measures dynamic processes (gel formation, coagulation, swelling, etc.)	✓	✓	✗
Fits inside a biological safety cabinet for cell-friendly mechanical testing	✗	✓	✓
Easy-to-use (requires only a few hours of training)	✗	✓	✗
Required level of user expertise	HIGH	LOW	HIGH

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

ElastoSens™ Bio has been specifically designed to characterize soft and complex biomaterials. Monitor the evolution of delicate hydrogels, soft biological tissues, bioengineered tissues, 3D-bioprinted scaffolds, hemostatic agent-induced clots, and coagulating blood. Obtain precise viscoelastic measurements of your biomaterials in a simple and effective way over short or extended periods of time.



Rheometer

Testing of solutions, liquid polymers, homogeneous solid polymers



ElastoSens™ Bio

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



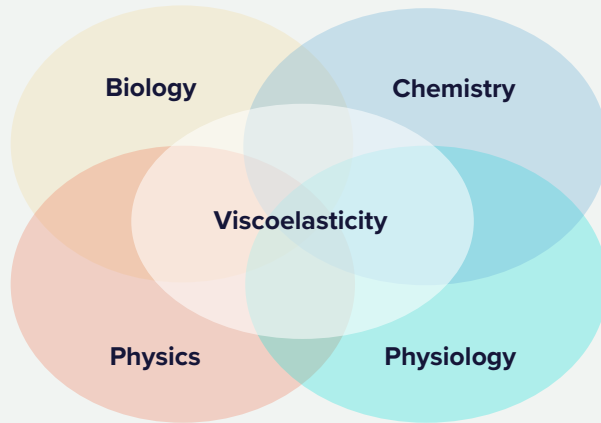
Compression Tester

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



SOFT MATTER ANALYTICS™

Build and analyze your personalized database to uncover relationships between the viscoelastic, chemical, biological, physical, and functional properties of your biomaterials or medical devices.



1. Personalize your Database

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

2. Create and Capture Custom Descriptive Parameters

Create customized buttons within the ElastoSens™ Bio app and capture real-time parameters that characterize your sample's behavior.

3. Build your Database

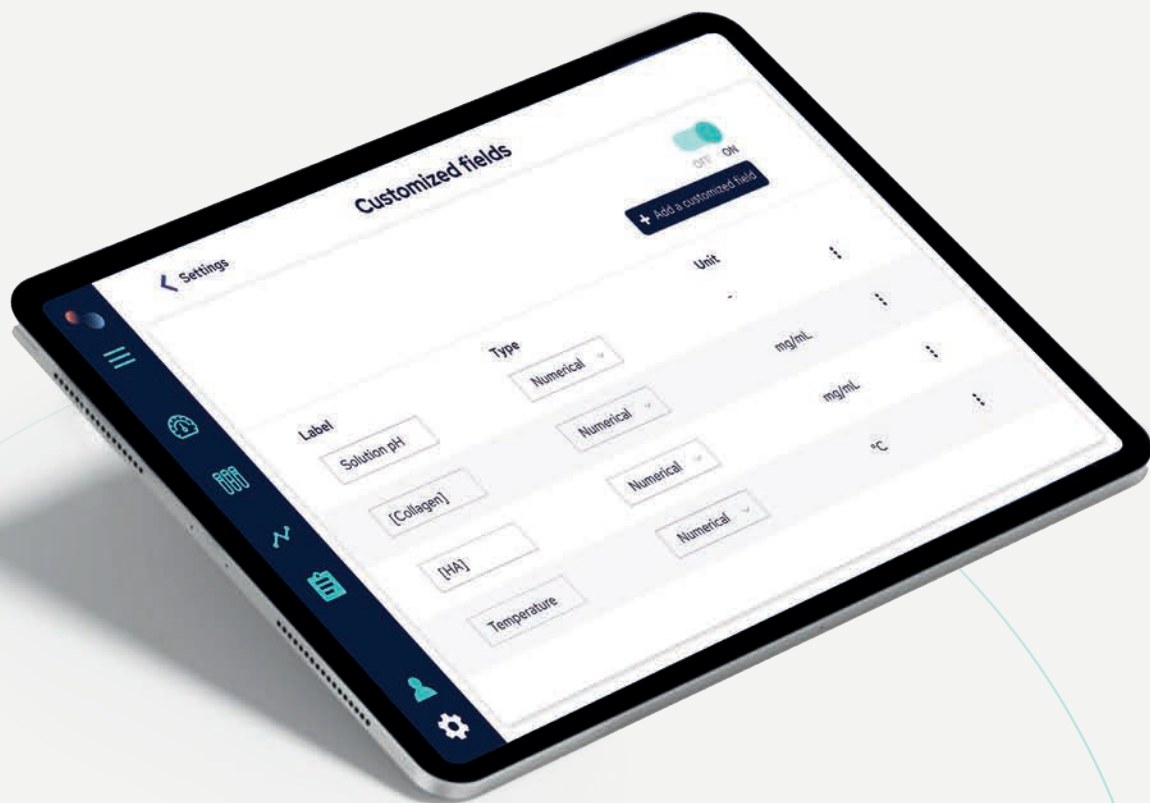
Enter the properties and capture the descriptive parameters of each sample tested on the ElastoSens™ Bio to correlate them with viscoelastic measurements.

4. Analyze, Correlate, and Discover

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

5. Generate Reports

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

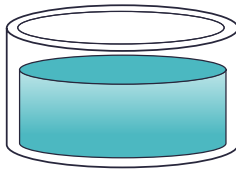




TECHNOLOGY

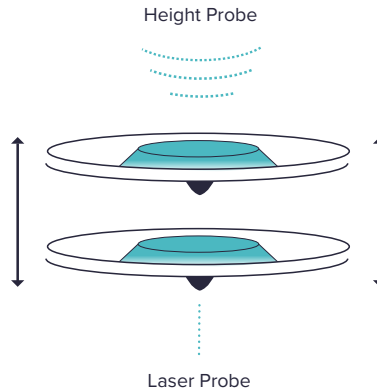
The ElastoSens™ Bio uses vibrations to measure non-destructively and without contact the viscoelasticity of soft materials. At each measurement, a gentle vibration is transmitted to the material through a patented sample holder and the sample response is measured remotely using a laser optical probe. 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



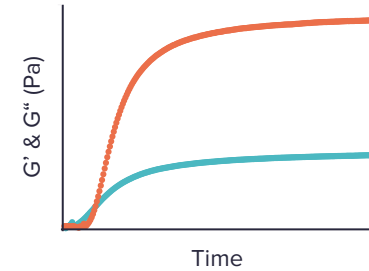
1. Load Sample

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



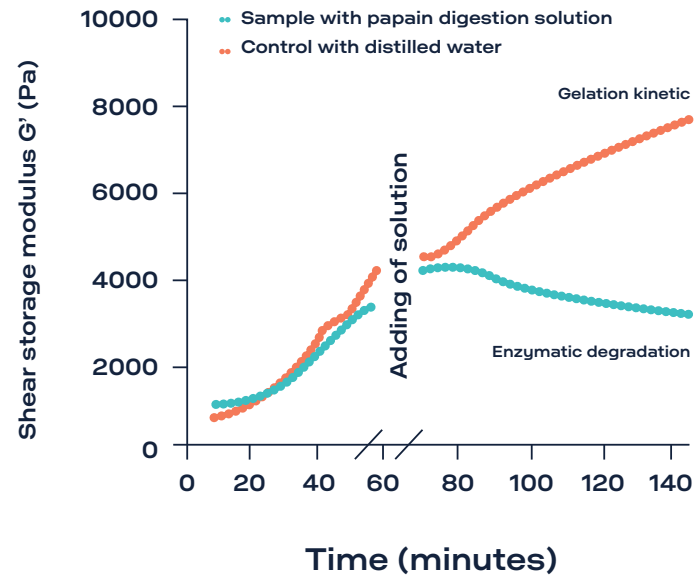
APPLICATIONS

Bringing soft matter to life, one application at a time,
through 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.

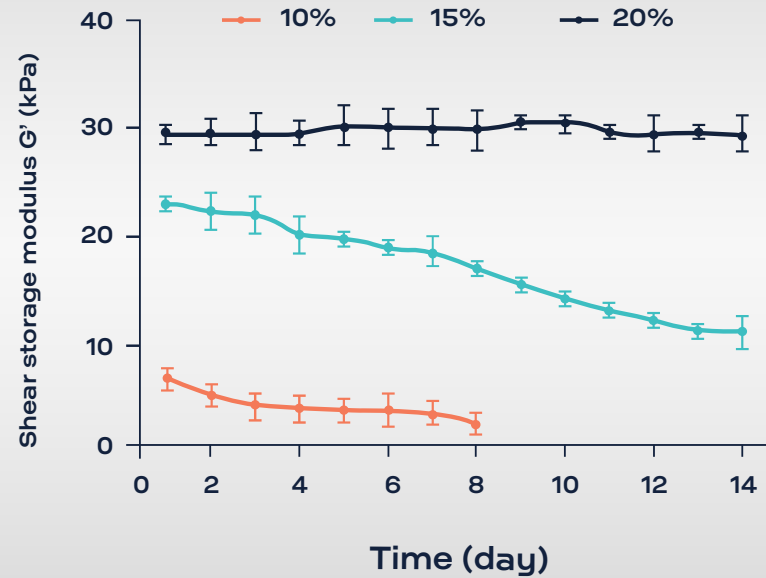


Evolution of the shear elastic modulus of a chitosan gel during gel formation and the enzymatically induced degradation.

Tissue Engineering



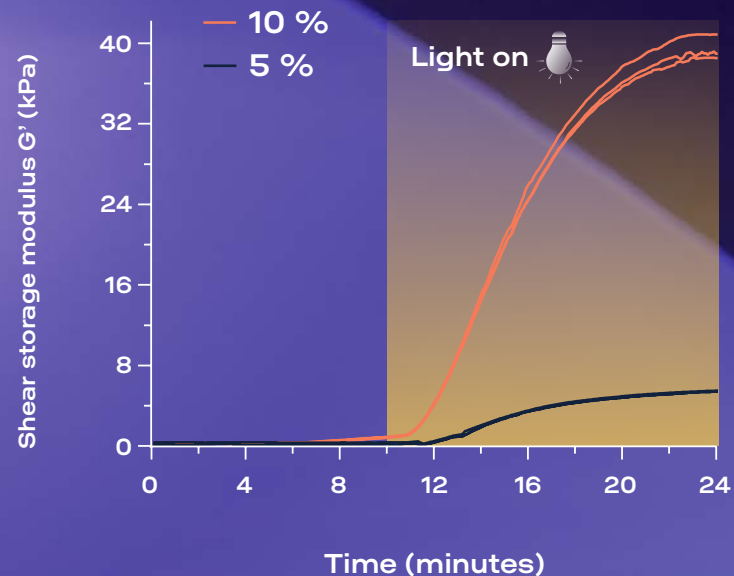
You can now capture how the viscoelasticity of 3D cell cultures evolves over time as cells remodel their environment. We designed the ElastoSens™ Bio to non-destructively measure the viscoelasticity of cellularized scaffolds contained in detachable sample holders. These holders can be placed in an incubator and retested multiple times throughout the culture period. The entire testing system can also be operated inside a biological safety cabinet for measurements under sterile conditions.



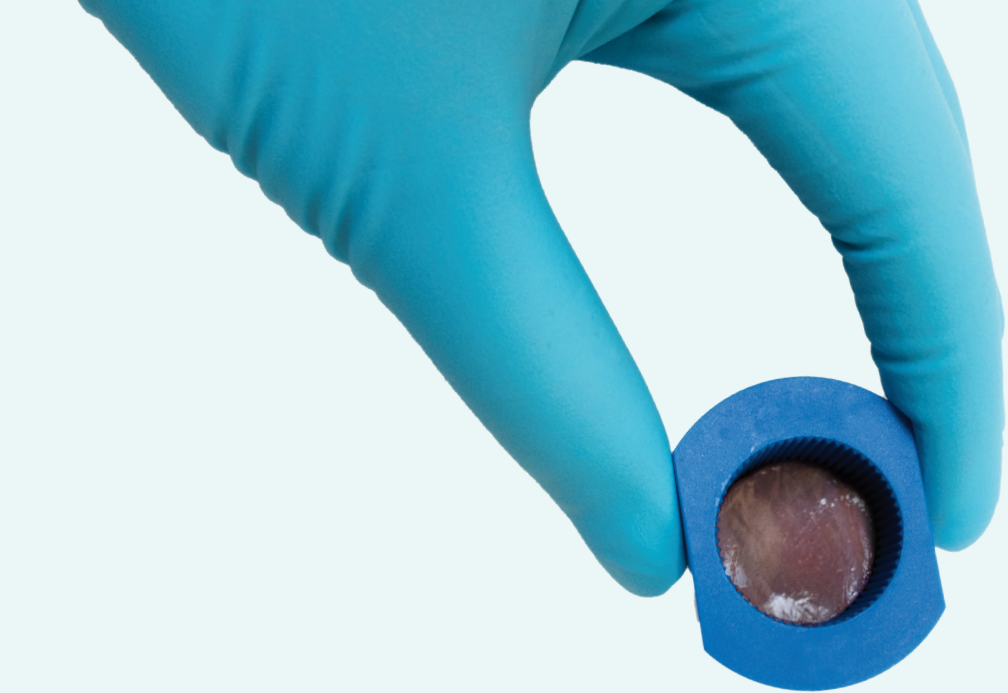
Long-term evolution of keratinocyte-laden gelatin samples measured over 14 days of culture using the ElastoSens™ Bio.

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/cm²) 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.

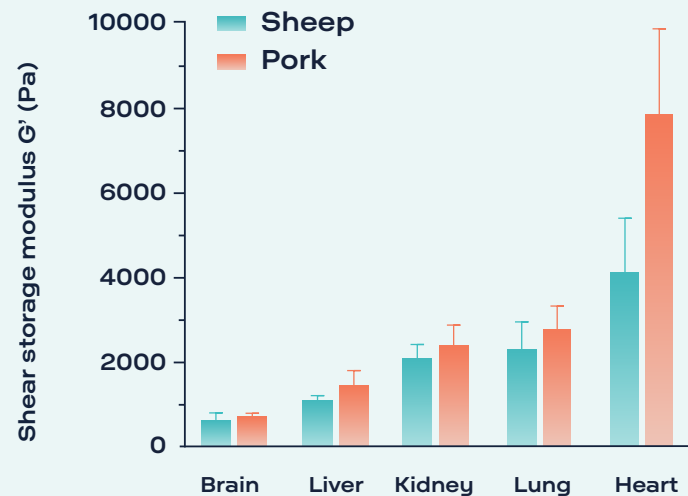


Shear storage modulus (G') as a function of time for two concentrations of PhotoGel® products.

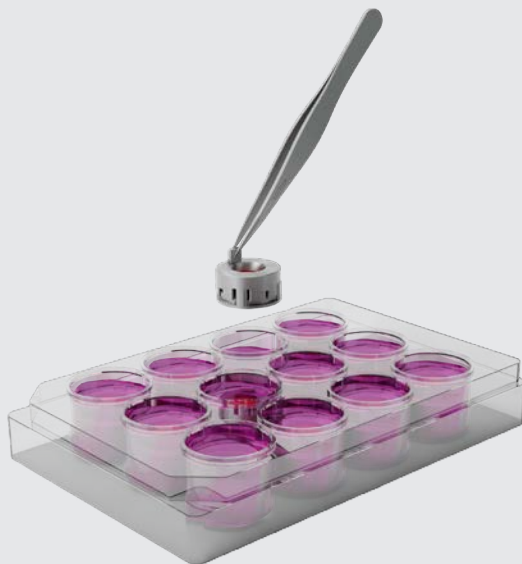


Soft Organs

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.

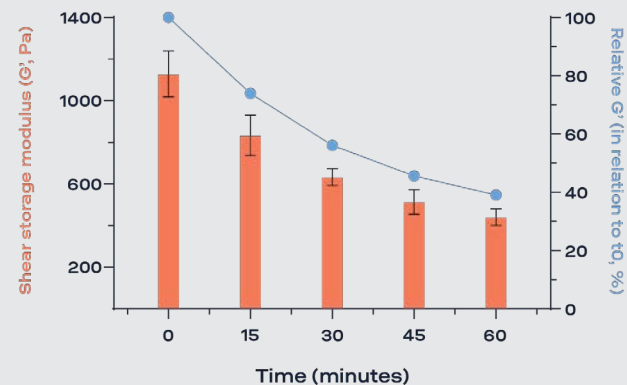


Average shear storage modulus (G') of fresh lung, liver, kidney, heart, and brain from sheep and pork obtained using ElastoSens™ Bio



Micro-Volume Samples

Micro-volume samples, such as limited biological specimens, small beads, or formulations containing scarce bioactive compounds or cells, can be analyzed using the ElastoSens™ Bio with volumes as low as 250 μL . The sample can be introduced as a liquid or solid into the micro-volume sample holder cavity and tested in its final state. Measurements are typically completed in one minute or less, and the sample can be recovered or maintained in the holder for repeated testing to monitor changes over time.

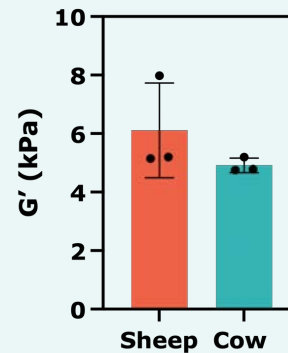


Minced kidney tissue was introduced into the micro-volume sample holder, filling the entire cavity (250 μL , approximately 0.25 g). Samples were tested immediately after loading and throughout incubation with collagenase. The shear storage modulus (G') of the kidney samples decreased as a function of exposure time to the enzyme.



Membrane-Like Samples

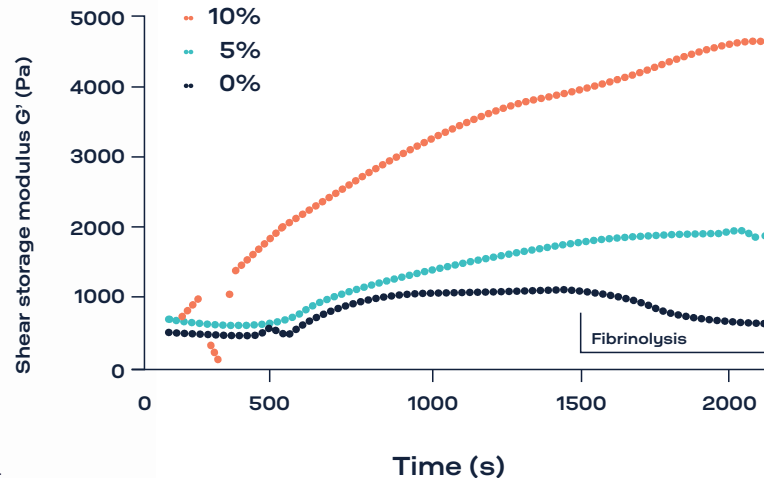
Membrane-like samples, such as membrane tissues, electrospun meshes, wound dressings, and similar materials, can be analyzed using the ElastoSens™ Bio. A biopsy punch is provided to easily cut samples from a larger specimen to the required diameter for insertion into the grips of the membrane sample holder. Once secured, the sample is mounted onto the adapter for testing, which typically takes one minute or less. After testing, the membrane and grips can be stored in a 12-well plate and retested multiple times to monitor changes over time.



Sheep and bovine skin samples were punched and placed into the membrane sample holder of the ElastoSens™ Bio. The shear storage modulus (G') was then measured non-destructively.

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.

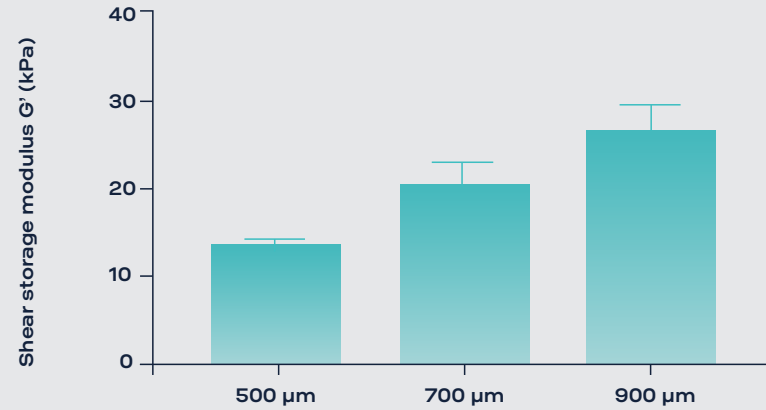


A commercially available hemostatic agent was tested with whole blood at different concentrations to measure how increasing the HA dosage in the blood influences both the clot strength and the clot initiation time.

3D Bioprinting

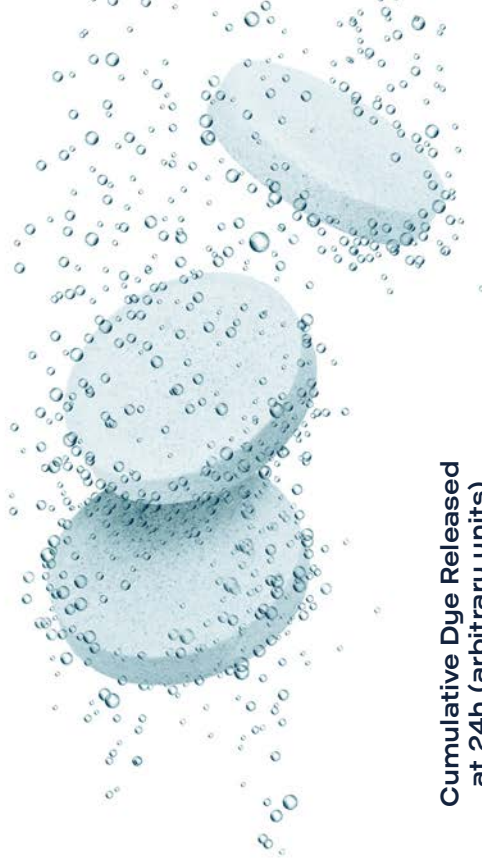


Bioinks can be poured directly in the sample holder and tested during gelation and crosslinked under controlled temperature and UV/Visible light conditions. Scaffolds can either be introduced or directly printed inside the sample holder to be tested on the ElastoSens™ Bio. Real-time changes in the storage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

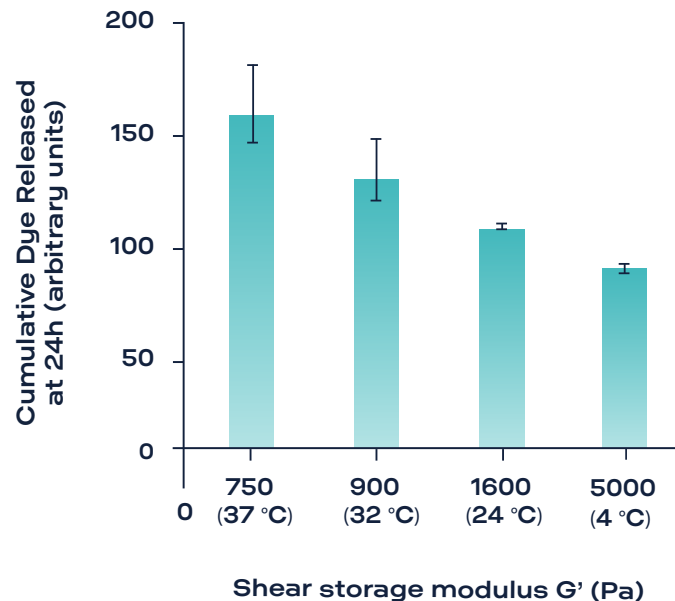


In this example, 3D scaffolds composed of PEGDA/Laponite gels were bioprinted with varying fiber diameters. It is clear that increasing the fiber diameter (and reducing porosity) results in an increase in the overall scaffold elasticity.

Drug Release



The ElastoSens™ Bio measures in real time the degradation of soft polymer-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 modulate the drug release rate.

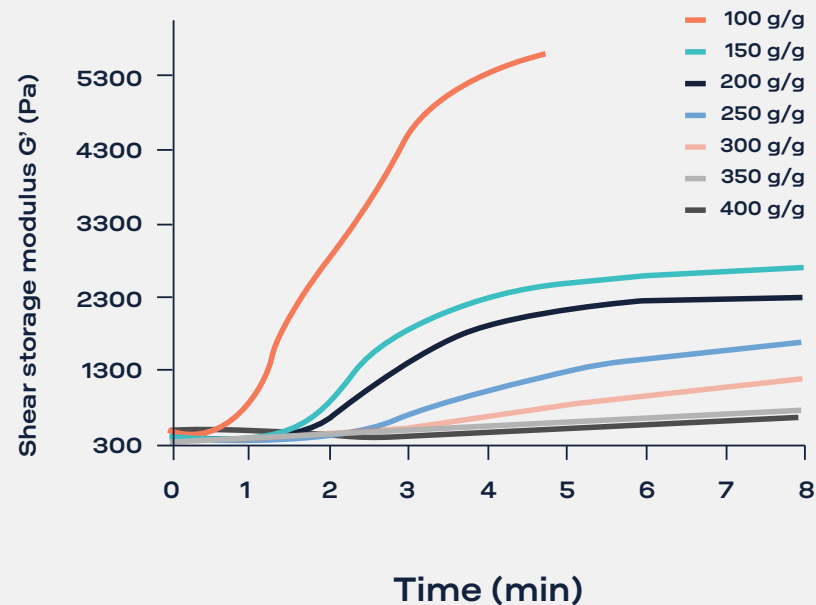


The ElastoSens™ Bio was used to characterize the mechanical degradation of an alginate/dye-loaded gelatin gel. The dye release strongly correlates with the viscoelastic properties of the gel.



Superabsorbent Polymers

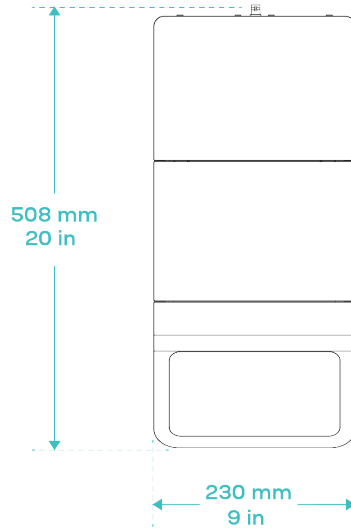
ElastoSens™ Bio measures in real time how superabsorbent polymers (SAP) absorb a liquid solution by measuring the elastic modulus of the forming gel during absorption. The instrument measures the exact time when absorption starts, the speed of absorption (speed of swelling) as well as the final gel elastic 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.

ELASTOSENS™ 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: $\pm 1\%$)
Height measurement range	1.0 mm to 20.0 mm (precision: ± 0.20 mm)
Sample specification	Macro holder: up to 7 mL; up to 19 mm height; 23 mm diameter Micro-volume holder: 250 μ L; 1.6 mm height; 14 mm diameter Membrane holder: up to 3 mm height; 16 mm diameter
Temperature range	RT+2 °C to 50 °C (precision: ± 0.1 °C)
Extended temperature range	4.0 °C to 70.0 °C (precision: ± 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 with Windows Tablet App

Displayed measurements and built-in calculations include steady-state and transient viscoelastic material properties, gel formation and degradation kinetics (dG'/dt), and real-time sample height monitoring. The platform enables complete test configuration, real-time measurements and data visualization, data archiving and comparison, report generation, and seamless data and report transfer.

Touchscreen Interface on the ElastoSens™ Bio

Adjust the thermal chamber temperature, monitor instrument status and key results in real time, and open the chamber using a digital control interface.

Advanced Temperature Control and Photostimulation

Basic temperature control covers a range from room temperature $+2\text{ }^{\circ}\text{C}$ to $50\text{ }^{\circ}\text{C}$ (absolute precision: $\pm 0.1\text{ }^{\circ}\text{C}$). The optional extended temperature control expands the range from $4\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ (absolute precision: $\pm 0.1\text{ }^{\circ}\text{C}$). Programmable temperature profiles are available for both configurations.

Optional advanced photostimulation is available with three different wavelengths (365 nm, 385 nm, and 405 nm) and adjustable light intensities.

SERVICES



Calibration & Qualification

We provide calibration services as well as Installation and Operational Qualification (IQ/OQ) services.



Installation and Training

Installation of instruments and comprehensive user training on our instruments and software.



Extended Warranties

We offer extended warranty options in addition to the standard 12-month full warranty coverage.



Lifetime Support

Our users benefit from lifetime access to our application specialists for continuous support and guidance.



Certification & Documentation

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



Methods & Protocols

We collaborate with you and your team to develop tailored protocols and methods adapted to your applications.





- **Rheolution Offices**
- **Distributors**
- **Customers**



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

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