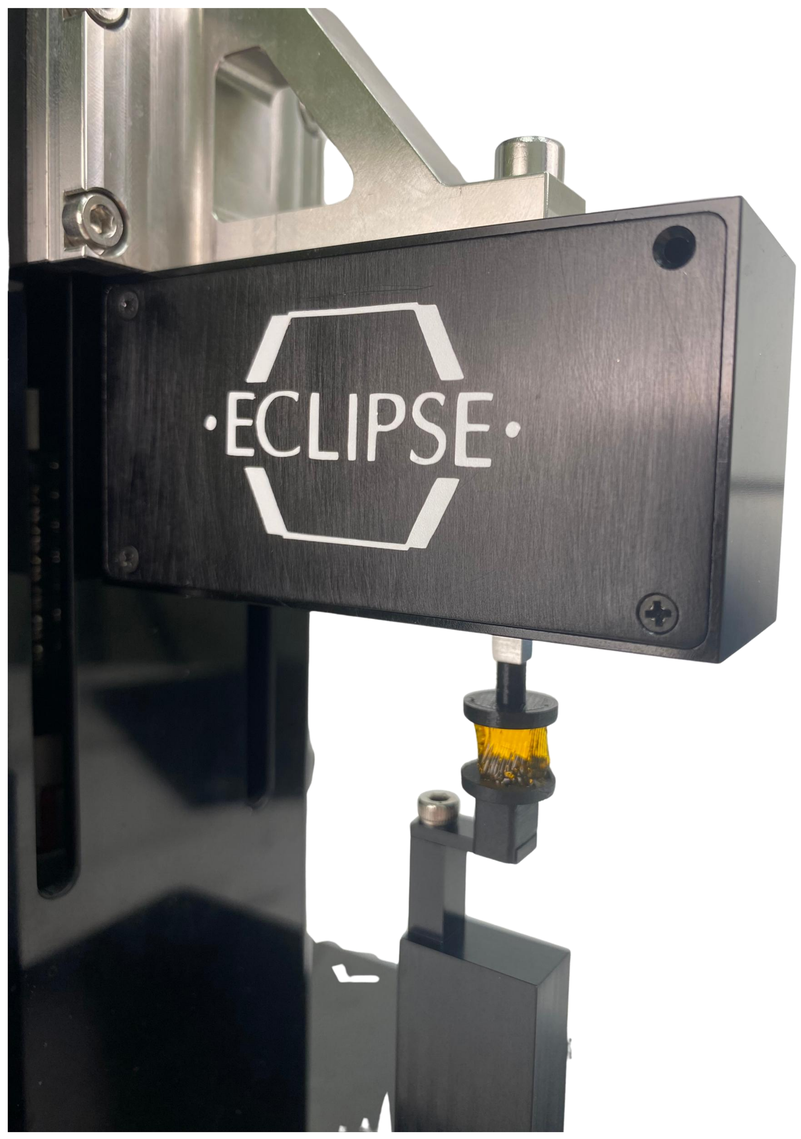
Compression Testing of Soft Gelatin Materials

High Resolution Force Measurement Capabilities with the CellScale Eclipse

Overview

The CellScale Eclipse represents a significant advancement in low-force mechanical testing, offering researchers a patented, high-resolution force sensing solution for materials as delicate as hydrogels, soft tissues, and bioengineered scaffolds. Designed for seamless integration with the CellScale UniVert system, the Eclipse sensor delivers exceptional resolution, repeatability, and robustness, even at force levels previously considered unmeasurable by standard load cells.

To demonstrate the precision and utility of this new sensor, we conducted compression testing on a low-stiffness gelatin sample. With a capacity of just 0.05 N, this Eclipse sensor captured force and displacement data with high fidelity, enabling accurate characterization of soft, compliant materials without compromising sensitivity or durability.



Methods

System: CellScale UniVert with Eclipse 0.05 N low-force sensor
Fixtures: Precision 20mm diameter compression platens
Sample: Gelatin cast into an 8 mm × 8 mm × 4 mm block
Protocol: Force-controlled ramp to 45 mN over 15 seconds, followed by recovery and repeat cycles

This protocol was chosen to simulate gentle physiological loads and assess both the elastic response and recovery behaviour of a soft biomaterial analog. The test setup exemplifies the UniVert's modular capabilities and the Eclipse sensor's stable performance across repeated low-load cycles.

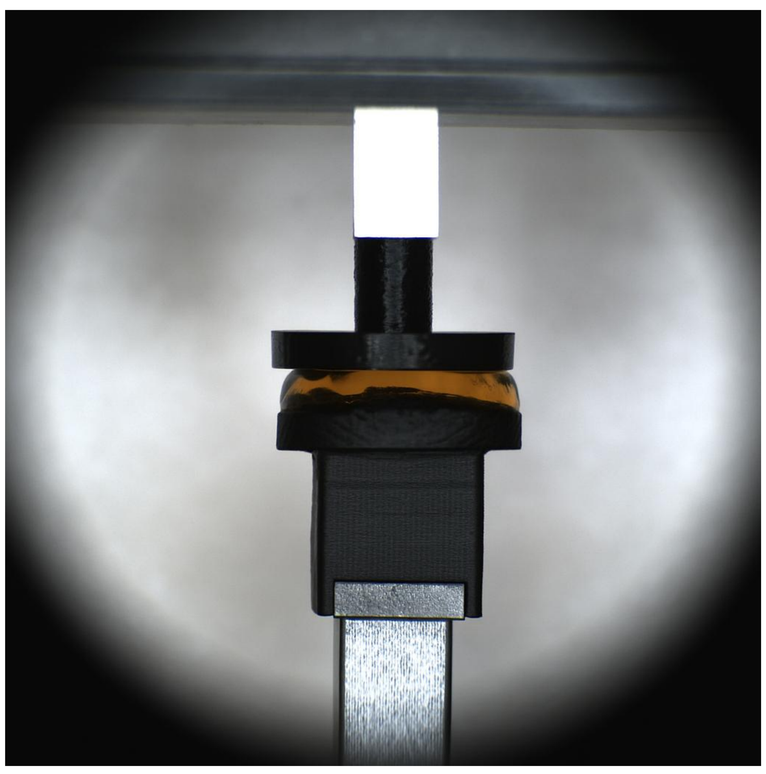


Figure 1: Gelatin sample in compression between two plastic platens.

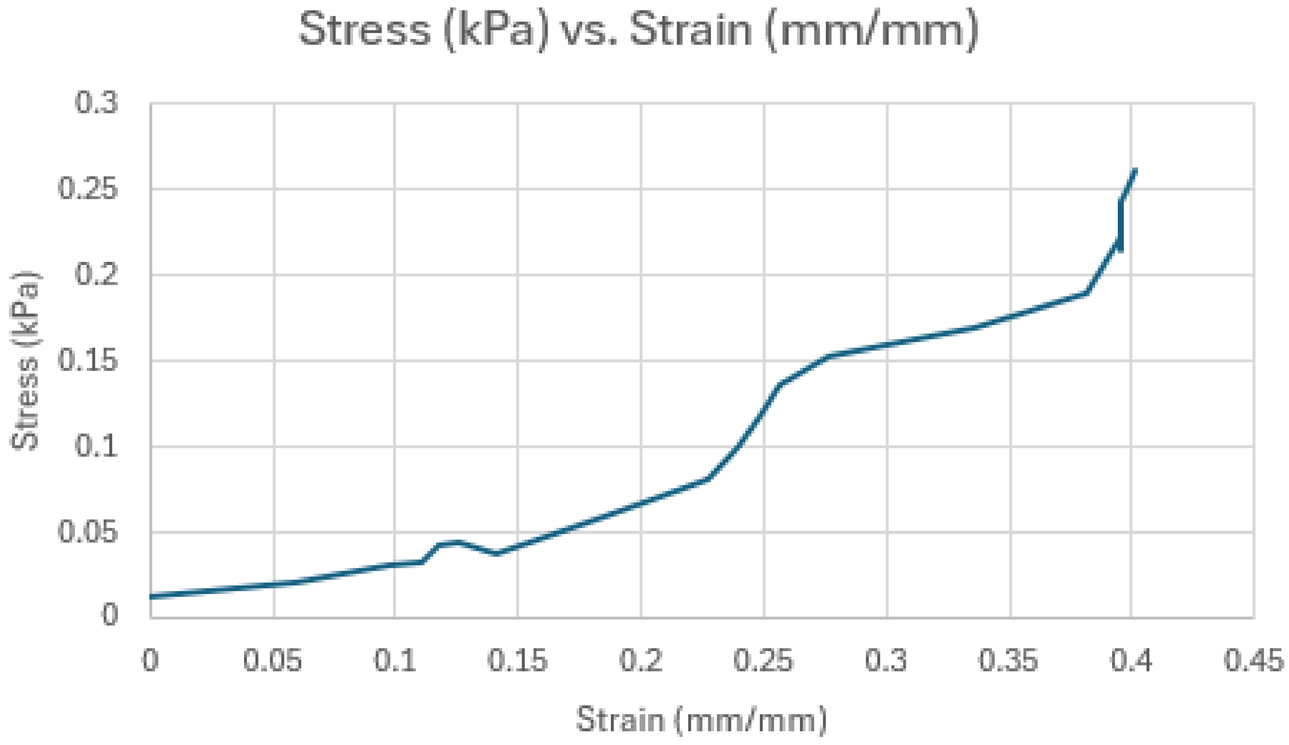


Figure 2: Stress-strain graph of sample 1, up to 40% strain. Modulus was determined from the slope between 10-15% of the compressive curve

CELLSCALE | 5 – 564 Weber Street N., Waterloo, ON N2L 5C6 Canada | 519-342-6870 | info@cellscale.com | **www.cellscale.com**

Compression Testing of Soft Gelatin Materials

Results and Analysis

The Eclipse sensor enabled clear analysis of mechanical behavior in all test samples:

Maximum Load: ~45 mN
Maximum Grip Strain: 11.0–13.4%
Modulus of Elasticity: 0.45–0.54 kPa
Maximum Stress: 0.58–0.66 kPa
Standard Deviations: Low across all parameters, indicating excellent repeatability

The data quality allowed for detailed stress-strain analysis and modulus calculations, supporting applications in hydrogel characterization, soft polymer R&D, and cell-laden construct validation. Repeatability and noise performance were strong throughout, even in the sub-100 mN range.

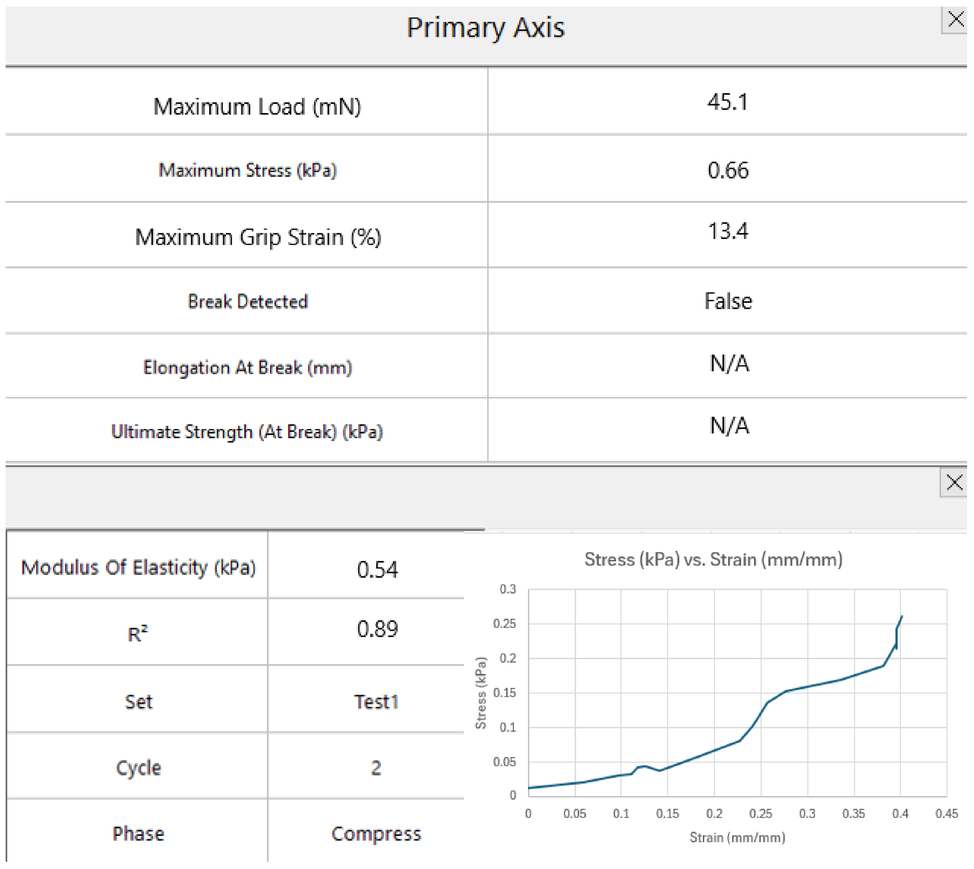


Figure 3: Report for a single test from Data Analysis

Table 1: Material properties for sample size of 3

	Average (Mean)	Standard Deviation	Minimum Value	Maximum Value
Modulus Of Elasticity (kPa)	0.5	0.05	0.45	0.54
Maximum Load (mN)	42.2	2.8	39.4	45.1
Maximum Stress (kPa)	0.62	0.04	0.58	0.66
Maximum Strain (%)	12.2	1.2	11	13.4

Conclusions

This test demonstrates the effectiveness of our low-force sensor in capturing precise force measurements during the compression of soft, compliant samples. With a 0.05 N sensor, accurate detection of forces as low as 45 mN is possible, yielding consistent results across trials. This makes the sensor well-suited for applications involving delicate materials.

The Eclipse model has capacities as low as 20 mN. These low-force sensors offer the precision needed for delicate testing. Unlike many alternatives, they're also robust and repairable, offering a practical, long-lasting solution.

Applications

Compression testing of gelatin is more than a materials exercise—it mimics the behaviour of hydrated biological tissues, providing critical insights for:

Tissue engineering – measure scaffold compliance under physiological forces
Mechanobiology – understand how cells interact with soft substrates
Drug delivery systems – characterize gel stiffness and behaviour over time
Food and cosmetics R&D – evaluate texture, recovery, and fatigue properties

CellScale biomaterials testing

CellScale Biomaterials Testing is the industry leader for precision biomaterial and mechanobiology test systems. Our products are being used at world-class academic and commercial organizations in over 30 countries around the globe.

Our mechanical test systems allow researchers to characterize the mechanical properties of biomaterials. Our mechanobiology technologies provide insights into the response of cells to mechanical stimulation.

CellScale's technologies are improving human health by helping researchers discover the causes of disease, improve medical treatments and devices, and advance regenerative medicine and other basic science research.

Visit our website or contact us to learn how our innovative products can help you achieve your research and development goals.

CELLSCALE | 5 – 564 Weber Street N., Waterloo, ON N2L 5C6 Canada | 519-342-6870 | info@cellscale.com | **www.cellscale.com**