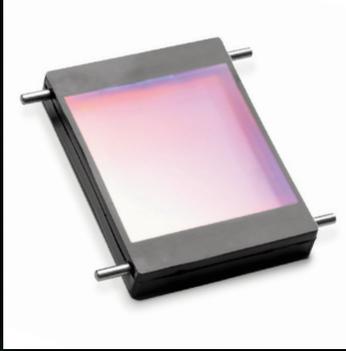
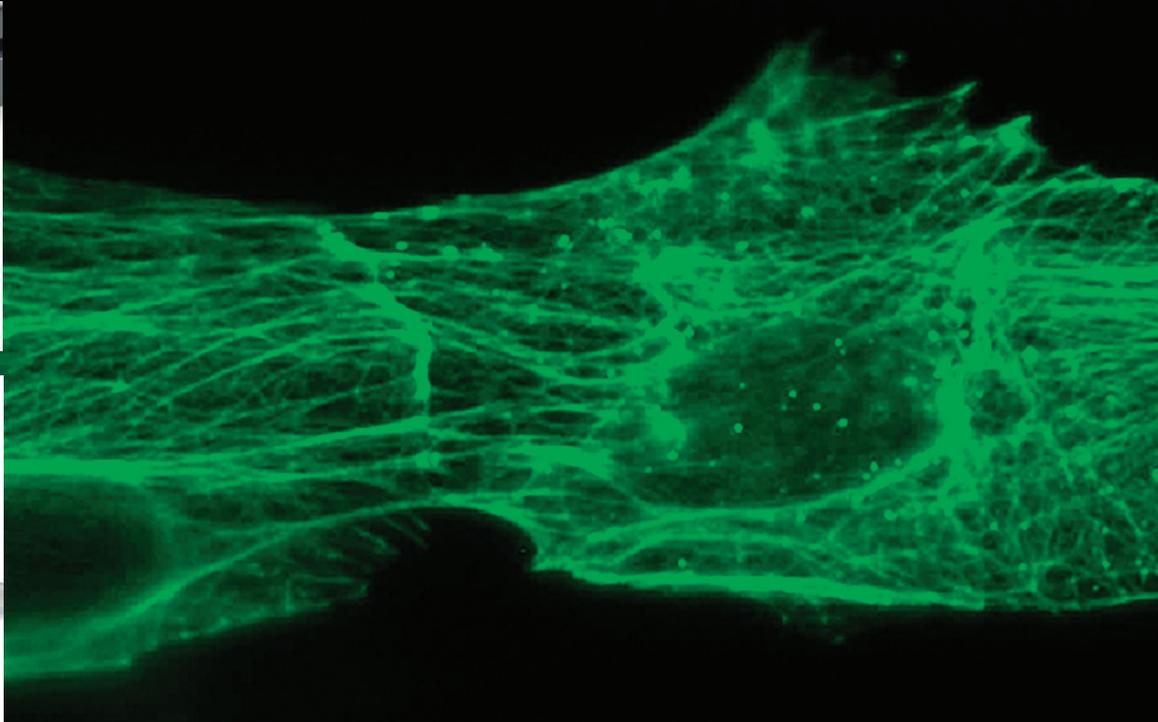




Cell Stretching instruments for biomimetic experiments



**Electron
Microscopy
Sciences**



Live-Cell Mechanical Stimulation Systems

- NanoSurface Cytostretcher & Cytostretcher-LV
- Cell Stretcher CS-10 Series



NanoSurface Cytostretcher & Cytostretcher-LV

All-in-one cell stretching instruments for Biomimetic Experiments

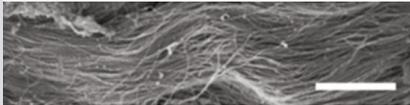
Overview

Understand the Effects of Mechanical and Microenvironmental Cues

The NanoSurface Cytostretcher allows researchers to investigate both tissue-level mechanical strain and microenvironmental cues at the same time.

The Cytostretcher family of instruments is a powerful and easy-to-use integrated solution for cell mechanics research. The Cytostretcher and Cytostretcher-LV empower you to gain new insights into the relationship between the cell and its microenvironment – important for nearly all mammalian cell types. NanoSurface's patterning technology provides structural cues that recapitulate the native ECM within flexible stretching chambers. The included NaOMI software provides total experimental control in a clean, intuitive interface.

The flexibility and power of the Cytostretcher family of instruments ensures that every cell stretching experiment can be implemented with ease and precision.



The underlying matrix of the native myocardium has an aligned architecture (scale bar 10µm)

Biomimetic surface architecture meets bulk mechanical strain

Investigate multi-scale mechanical stimulation

NanoSurface nanopatterned culture surfaces provide a cellular microenvironment that mimics the aligned architecture of the native extracellular matrix, promoting cellular structural and functional development. The NanoSurface Cytostretcher integrates flexible NanoSurface culture chambers with the ability to stimulate your cultures with cyclic mechanical stretch. Versatile software enables programming of a wide array of stretch protocols for tremendous investigative flexibility.

NanoSurface culture chambers: biomimetic aligned nanoscale surface topography
Nanotopography orientation: either parallel or perpendicular to applied stretch
Chamber culture area: 2500 mm², 144 mm², or 25 mm²

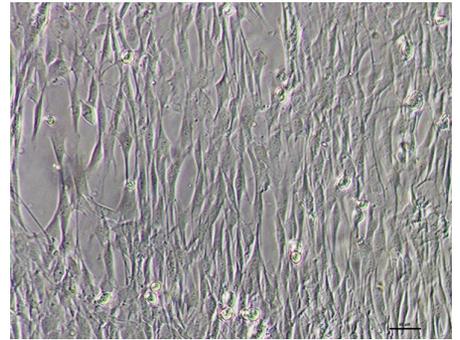
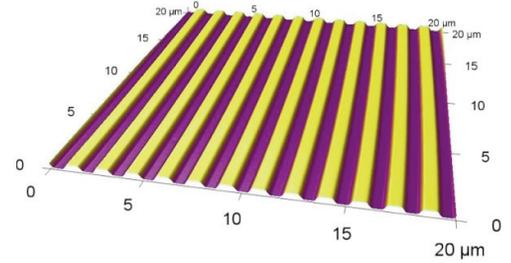
Applications

NanoSurface's Cytostretcher family of instruments stretch flexible cell culture chambers to provide cyclic mechanical strain to cultured cells.

Use the Cytostretcher to stretch cells on the bench-top or in a cell culture incubator.

Use the Cytostretcher-LV to perform stretching experiments on an optical microscope. It features a small footprint and self-contained design without bulky external controllers.

Elastomeric cell culture chambers are available in several sizes. Use standard chambers with unpatterned "flat" surface topography, or NanoSurface chambers, with biomimetic nanoscale surface topography.



C2C12 skeletal myoblasts aligned on a NanoSurface Cytostretcher chamber by parallel nanotopography

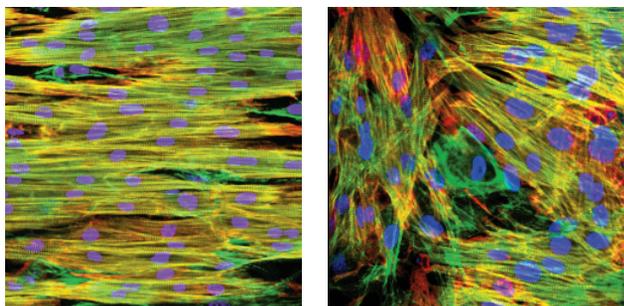


NanoSurface Cytostretcher & Cytostretcher-LV (continued)

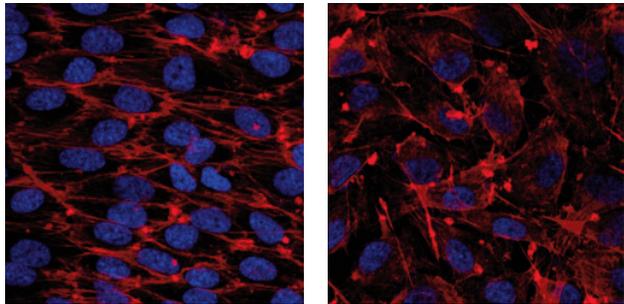
Nanopatterned or Flat Stretch Chambers

Cytostretcher Chambers are available with either NanoSurface topography that mimics the aligned architecture of the native extracellular niche or with traditional unpatterned "flat" surfaces. Patterned chambers feature topography either aligned in parallel or perpendicular to the direction of applied stretch. NanoSurface topography promotes the development of physiologically relevant structures and phenotypes in many cell types:

- Skeletal muscle cells
- Smooth muscle cells
- Neuronal cells
- Cardiomyocytes
- Endothelial cells
- Epithelial cells
- Fibroblasts
- Cancer cells
- Induced pluripotent stem cells
- Mesenchymal stem cells
- Human embryonic stem cells
- And many more



Cardiomyocyte cell culture on a NanoSurface dish (left) vs. a conventional dish (right).



Endothelial cell culture on a NanoSurface dish (left) vs. a conventional dish (right).

Cytostretcher-LV



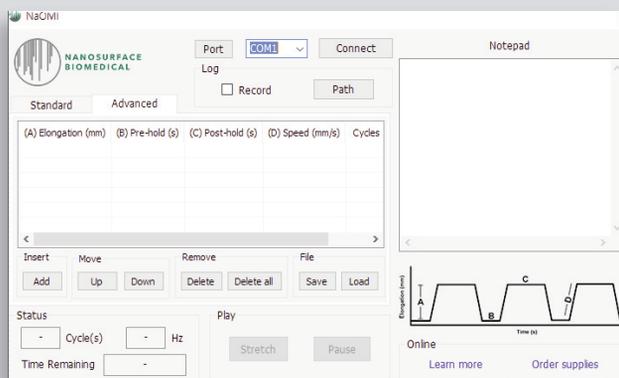
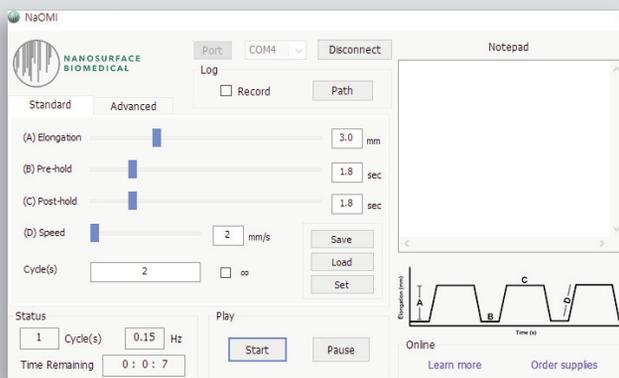
Cytomechanics, unlocked

Flexible Software Allows for Unprecedented Experimental Control

The NanoSurface Operational Mechanics Interface, NaOMI, enables complete control of stretching parameters and cyclic strain protocols for maximum investigative flexibility. Compatible with both Windows and Mac OS, NaOMI software provides a straightforward and powerful user interface for automated operation of the NanoSurface Cytostretcher.

USB connectivity allows for easy operation. Software logging automatically records experimental details. Users can program elongation length, holding time, and stretching speed independently for each stretch cycle.

- Intuitive user interface with powerful editing tools
- Build simple stretch protocols, or complex multi-step stretch routines, no programming skills required
- Save protocols for repeated use or later modification
- Control stretch velocity, duration, frequency, magnitude, delay times before and after stretch, and the type of waveform used to drive the stretch protocol
- Computer-free operation after protocol setup
- Protocol graph for easy visualization
- Standard USB connectivity, compatible with Windows 10



Cytostretcher-LV Environmental Control Unit (ECU)



NanoSurface Cytostretcher & Cytostretcher-LV (continued)



NanoSurface Cytostretcher

Compact Design

The Cytostretcher is extremely compact, easily integrating into your existing cell culture workflow. It can be operated on the benchtop or alongside other cultures inside a standard cell culture incubator, saving valuable space.

Convenient Control Unit

The Cytostretcher Control Unit is a small, lightweight module that can be magnetically attached to the exterior of a cell culture incubator.

Run Multiple Experiments in Parallel

Flexible Cytostretcher Chambers are available in a variety of formats, so you can mechanically condition many cultures in parallel. Larger chambers offer more culture area (up to 25 cm²). Smaller chambers offer higher throughput (up to 24 wells).

- Unparalleled experimental flexibility: program highly customized stretch routines.
- Versatile and intuitive NaOMI software makes programming fast and easy. No bulky external controllers.
- Small footprint: 300 x 100 x 60 mm. Use the Cytostretcher alongside other cultures in your cell culture incubator.
- Parallel operation: control many Cytostretchers with a single computer.
- Throughput: 1 CS-2500, 3 CS-0144, or 6 CS-0025 parallel stretching chambers per Cytostretcher.

Specifications

Size (D x W x H)	Instrument: 280 x 102 x 65 mm Control unit: 110 x 64 x 60 mm
Chamber Formats	6 Chambers x (1) 5 x 5 mm well 6 Chambers x (2) 5 x 5 mm wells 3 Chambers x (1) 12 x 12 mm well 1 Chamber x (1) 50 x 50 mm well 1 Chamber x (24) 6 x 6 mm wells 3 Chambers x (2) 5 x 5 mm wells 1 Chamber x (1) 12 x 12 mm well
Biomimetic Nanotopography	Parallel to stretch, orthogonal to stretch, unpatterned flat
Stretch Protocol	Fully customizable: cyclic, ramp, sine wave, etc.
Maximum Strain	>20%
Maximum Velocity	10 mm/s
Maximum Cycle Frequency	5 Hz

Ordering Information

Cat No.	Description	Qty.
1100	NanoSurface Cytostretcher	each

NanoSurface Cytostretcher-LV

Up To 6 Parallel Cultures

Configure with up to six 25 mm² wells or one 144 mm² chamber.

Maintain Focus While Stretching

The Cytostretcher-LV is the only cell mechanical stimulation system that enables consistent sample focus during stretch.

Universal Mounting Frame K

Allows for broad compatibility with many industry standard microscopes and stages. Other mount options are available upon request.

Touch Screen Panel

A touch-panel interface provides easy control of culture conditions.

Environmental Control for Long-Term Imaging

The Environmental Control Unit (ECU) is a microscope stagetop incubator that provides complete control of biological culture conditions, including temperature, humidity, and CO₂ concentration. An included thermal camera allows for quick and continuous monitoring of sample temperature.

Observe Cells While Stretching

Image live cells during your stretch routines. The Cytostretcher-LV and Cytostretcher Chambers are compatible with transmitted light and high-NA fluorescence microscopy, including immersion objectives.

- Live View: stretch cells on an optical microscope
- Image living cells while stretching
- Temperature, CO₂, and humidity environmental control directly on the microscope stage
- Programmable using versatile NaOMI software
- Operate with or without computer
- Standard K-frame stage mount



Specifications

Size (D x W x H)	110 x 335 x 122/34/60.5* mm *Micrometer/Body/Enclosure
Chamber Formats	6 Chambers x (1) 5 x 5 mm well 6 Chambers x (2) 5 x 5 mm wells 3 Chambers x (1) 12 x 12 mm well 1 Chamber x (1) 50 x 50 mm well 3 Chambers x (1) 5 x 5 mm well 3 Chambers x (2) 5 x 5 mm wells 1 Chamber x (1) 12 x 12 mm well
Biomimetic Nanotopography	Parallel to stretch, orthogonal to stretch, unpatterned flat
Stretch Protocol	Fully customizable: cyclic, ramp, sine wave, etc.
Maximum Strain	>20%
Maximum Velocity	10 mm/s
Maximum Cycle Frequency	5 Hz

Ordering Information

Cat No.	Description	Qty.
1110	NanoSurface Cytostretcher-LV	each

NanoSurface Cytostretcher & Cytostretcher-LV (continued)

Flexible Culture Chambers

For use with the NanoSurface Cytostretcher. Use these flexible culture chambers to apply mechanical stimulation to cultured cells. Made from flexible elastomer.

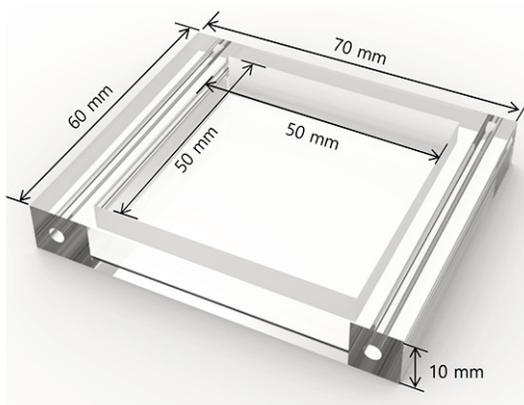
Three sizes available, each available in 3 designs:

- Nanopatterned surface, parallel to applied stretch
- Nanopatterned surface, perpendicular to applied stretch
- Unpatterned "flat" surface



50mm Cytostretcher Chamber

- 50 mm x 50 mm culture area
- Fits a single chamber in each Cytostretcher
- OD: 70 mm L x 60 mm W x 10 mm H
- ID: 50 mm x 50 mm

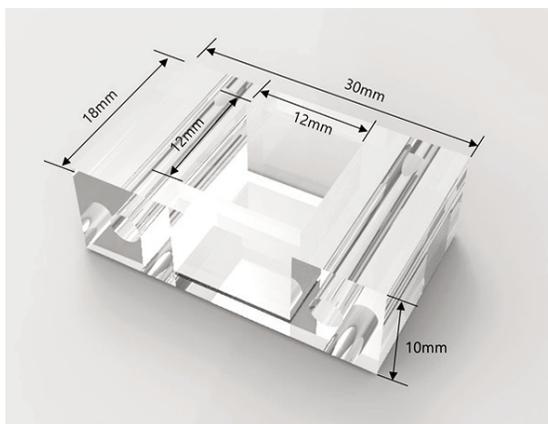


Cat No.	Description	Qty.
1120-1	50 mm Cytostretch Chamber, Nanopattern parallel	each
1120-6	50 mm Cytostretch Chamber, Nanopattern parallel	6/pk
1121-1	50 mm Cytostretch Chamber, Nanopattern perpendicular	each
1121-6	50 mm Cytostretch Chamber, Nanopattern perpendicular	6/pk
1122-1	50 mm Cytostretch Chamber, Unpatterned surface	each
1122-6	50 mm Cytostretch Chamber, Unpatterned surface	6/pk



12 mm Cytostretcher Chamber

- 12 mm x 12 mm culture area
- Fit 3 parallel chambers in each Cytostretcher
- OD: 30 mm L x 18 mm W x 10 mm H
- ID: 12 mm x 12 mm

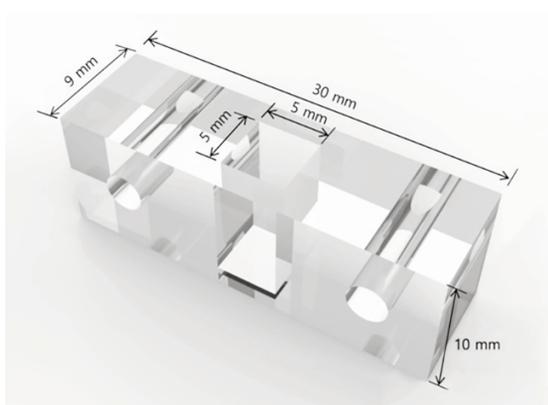


Cat No.	Description	Qty.
1130-1	12 mm Chamber, Nanopattern parallel	each
1130-6	12 mm Chamber, Nanopattern parallel	6/pk
1131-1	12 mm Chamber, Nanopattern perpendicular	each
1131-6	12 mm Chamber, Nanopattern perpendicular	6/pk
1132-1	12 mm Chamber, Unpatterned surface	each
1132-6	12 mm Chamber, Unpatterned surface	6/pk

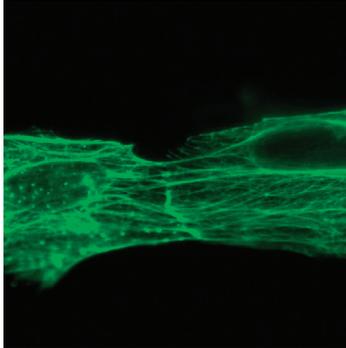
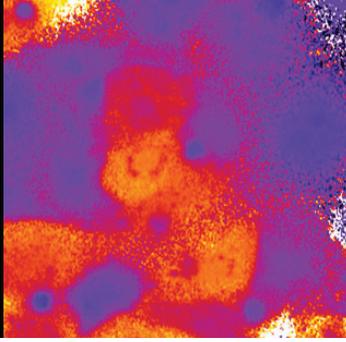


5 mm Cytostretcher Chamber

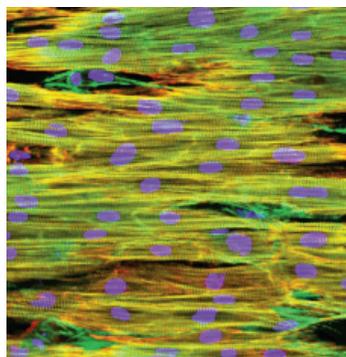
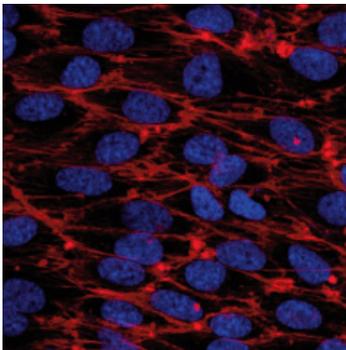
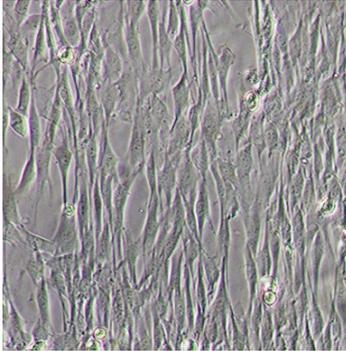
- 5 mm x 5 mm culture area
- Fit 6 parallel chambers in each Cytostretcher
- OD: 30 mm L x 9 mm W x 10 mm H
- ID: 5 mm x 5 mm



Cat No.	Description	Qty.
1140-1	5 mm Chamber, Nanopattern parallel	each
1140-6	5 mm Chamber, Nanopattern parallel	6/pk
1141-1	5 mm Chamber, Nanopattern perpendicular	each
1141-6	5 mm Chamber, Nanopattern perpendicular	6/pk
1142-1	5 mm Chamber, Unpatterned surface	each
1142-6	5 mm Chamber, Unpatterned surface	6/pk



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