STREX

Cell Stretching System

Instruments simulate physiological stress in cell cultures

Stretching and Compressing Living Cells

Automated Cell Stretching System

- Capable of stretching cells in culture: functions by applying a stress load to cells growing in the CO_2 incubator.
- Simultaneously stretches cells in multiple chambers to enable comparison between samples.
- The system's mechanical stretching unit operates inside the CO_2 incubator, while the control unit is established outside.
- Detachable stretch chamber mounting unit can be transferred to a clean bench, enabling aseptic operations.

The STREX Cell Stretching System induces mechanical stimuli on living cells in culture media by stretching and compressing them in an environment similar to physiological conditions. The Cell stretching system allows you to elucidate the mechanisms by which cells convert mechanical signals into biochemical responses, in vitro.

High-performance motor and stretch chambers combine to form the innovative, proprietary STREX system

STREX

Automated Cell Stretching System STB-140

Highly versatile standard cell stretching system

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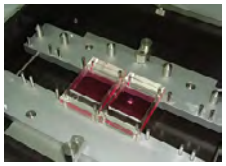
Main Unit

Two versions of the main stretch unit are available, depending on the size of the stretch chamber o be employed: 4 cm^2, 10 cm^2. The smaller 4 cm^2 version supports up to 8 chambers in parallel, whereas the 10 cm^2 version supports up to 6. The larger 10 cm^2 chambers are best suited to biochemical research such as gene and protein expression.



Controller

A preprogrammed one-chip microcomputer is embedded into the controller. The stretch ratio and stretch frequency (the stretch pattern) can be configured using the DIP switch on the controller. The controller also regulates the flow of water that cools the main motor driving the stretch unit.

SYSTEM CONFIGURATION

Stretching System Main Unit:
STB-140-04 (for 4 cm^2 stretch chambers)
STB-140-10 (for 10 cm^2 stretch chambers)
Control Unit: Generates stretching patterns and regulates motor cooling
Cables: The main stretching unit and the controller are connected by signal cable bundled with the tubing used for water cooling the main unit motor.
Coolant tank and coolant tube

SYSTEM SPECIFICATIONS

STB-140-04: Uses 4 cm^2 chambers, supports up to 8 units

STB-140-10: Uses 10 cm^2 chambers, supports up to 6 units

Detachable stretch chamber mounting unit can be covered with a lid and placed in a culture plate.

Stretching patterns: up to 64 patterns

Stretch direction: uniaxial

Stretching ratio: up to 20%

Stretch Chambers

STB-CH-0.02 STB-CH-10 STB-CH-4W STB-CH-04 STB-CH4-G STB-CH-04-XY

The exceptional physical and chemical properties of the silicone elastomer PDMS (polydimethylsiloxane) create a specially flexible thin-membrane chamber.

High reproducibility: Springy PDMS chambers bounce back from stretching and compression with their original properties intact. Thus, the chambers demonstrate good reproducibility in applications requiring continuous mechanical stretching over prolonged periods.

Superior transparency: An optically transparent, ultra-thin (100-200 µm) membrane at the well bottom not only makes stretch chambers compatible with optical microscopy techniques, but with fluorescence detection and microscopy as well.

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Microscope-Mountable Stretching System

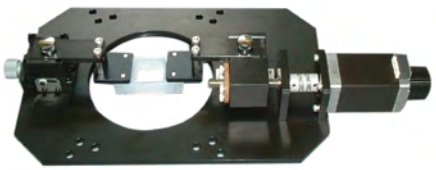
Mounted Unit with control

STB-150

The STB-150 enables real-time observation of morphological changes and ion dynamics of cells under the stress of mechanical stretching. The main stretch unit mounts directly on the microscope stage, while the controller directs the stretch unit to apply the desired automated mechanical stretch stimulus on the cells under observation.

SYSTEM CONFIGURATION
Main Unit: Compatible with Nikon and Olympus (standard). Optional support for Zeiss and Leica.
Control Unit: Actuates the main unit to implement the desired stretching pattern cell-stretching functionality for one cell culture and assay environments (optional)
SYSTEM SPECIFICATIONS
Employs 4 cm² chambers
Stretching patterns: up to 64 patterns
Stretch direction: uniaxial

Main Unit



STB-150B (Basic)

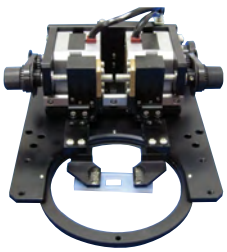
No syncing I/O for camera, manual focus only.

STB-150W (Double Motor)

Stretches from both sides of the chamber to enable cells to remain inside the viewing area at 10x magnification in real time. In order to capture an image at maximum resolution (up to 40x), the motor must be turned off briefly.

STB-150W

Main Unit



Control Unit

Optional Microincubator

SYSTEM CONFIGURATION
Separate gas cylinder required (Air 95% + CO_2 5%)
SYSTEM SPECIFICATIONS
Temperature: 37° C
Humidity conditions: Saturated humidity

Microscope-Mountable Biaxial Stretching System STB-190-XY

Stage-mountable system with biaxial stretching and compression functionality

Main Unit

Control Unit

SYSTEM CONFIGURATION
Main Unit: Compatible with Nikon and Olympus (standard). Optional support for Ziess and Leica.
Control Unit: Actuates the main unit to implement the desired stretching pattern
SYSTEM SPECIFICATIONS
Employs 4 cm² chamber designed for XY bidirectional stretching
Stretching patterns: up to 64 patterns
Stretch direction: XY biaxial; also supports uniaxial stretching

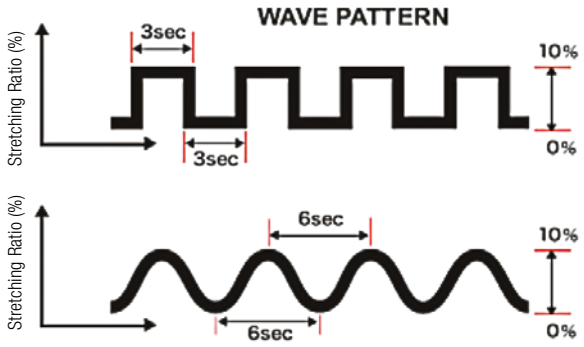
STREX

System Features:

- **Wide range of stretch patterns:**
  The system can be configured for eight different settings for the stretch ratio – the degree of stretch desired – and eight for the repetition frequency of the stretch movement. There are 64 possible stretching patterns in all.
- **Stretch chamber:**
  Specially developed silicone film chamber facilitates a variety of lab analysis techniques, including cell fixation and fluorescent imaging.
- **Uniform load:**
  Every cell is subjected to uniform strain along the stretch axis. In the non-axial direction, the secondary load is much weaker.
- **High reproducibility:**
  The high-precision, high-torque stepping motor in the stretch unit enables stable motion at a range of speeds, from extremely low velocity to high velocity. This motion stability, combined with the superior characteristics of the silicone film chamber, produces mechanical stretching that is highly reproducible.

How Are The Stretch Patterns Configured?

- **Stretch Ratio** (Degree of stretch applied)
- **Stretch Frequency** (Repetition frequency/interval of stretch) -
  - **Cyclic**: Samples subjected to mechanical stretching and relaxation at fixed interval
  - **Continuous**: Samples subjected to sustained stretching for a predetermined period



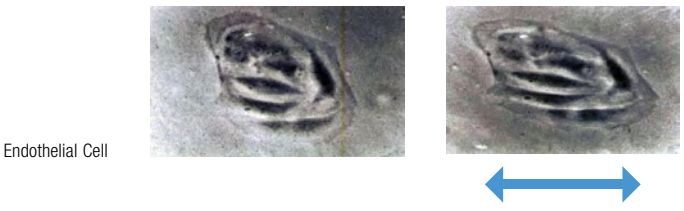
With sustained time: square-wave pattern
10% Stretching > Retention for 3 seconds > Relax to resume the original state > Retention for 3 seconds > (Repeat)

With sustained time: sinewave pattern
Stretch gradually in 3 seconds > 10% Stretching > Loose gradually in 3 seconds > (Repeat)

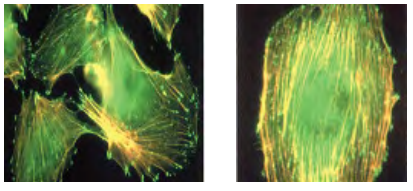
Example: with continuous stretching of 10%, 10 cycles/min.

How It Works

Extracellular matrix coatings applied to the stretch chamber promote cell adhesion and facilitate cell culture. The adhered cells are then stretched and compressed in culture. Versions of the system that mount on microscope stages enable real-time observation of the changes that the cells manifest in response to these applied stress loads.



Endothelial Cell



Cytoskeletal reorganization induced by cell stretching

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