AUTOMATED UNIAXIAL CELL STRETCHING SYSTEMS

Stretch the limits of in vitro possibilities

Simulate Physiological Conditions Using Specialized Cell Stretching Systems

The Strex Automated Uniaxial Stretching Systems mechanically stimulates monolayer and cultured cells and tissue in a variety of unique PDMS stretch chambers. Automate your stretch projects with 64 great preprogrammed uniaxial stretch patterns for easy, high-throughput, long-duration stretching in your incubator in 4 cm^2 chambers (ST-1440) or 10 cm^2 chambers (ST-1400) or whole tissue in specialized chambers. Keep the stretch unit in your incubator to control your cells' environment.

Configurable stretch paradigms

Stretch your cells conveniently in your incubator. Apply uniaxial stretch forces in PDMS chambers that fit a variety of applications, from monolayer and cultured cells to spheroids and tissue.

Effortless stretching patterns

Streamline your cell stretching research with 64 pre-programmed stretch patterns that are perfect for your project's needs. Skip the time-consuming process of building patterns from scratch and troubleshooting them.

Ready out of the box

Accelerate your timeline and start stretching as soon as you get your new plug-and-play system, plasma-treated PDMS chambers, and protocols catered to your applications. Forget the trial-and-error phase and start collecting data right away.

Applications

- Stem cell differentiation
- Cell morphology
- Gene and protein expression
- Mechanotransduction and signaling
- Cytoskeleton rearrangements
- Ion mobilization
- Calcium influx
- Nitric oxide production

Automated uniaxial stretching for smaller applications

Automated uniaxial stretch device, for smaller chambers

Model: ST-1440

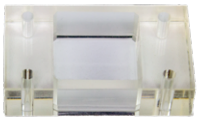
Control unit dimensions (cm): 32 W x 22 L x 13 H

Stretch unit dimensions (cm): 27 W x 24 L x 13 H

Great for high-throughput, parallel uniaxial stretching of up to 8 x 4 cm² chambers.

Ideal for the standard incubator.

Compatible chambers



4 cm² stretch chamber

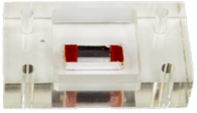
Model: SC-0040

Dimensions (cm): 2.0 x 2.0 x 1.0

4 cm² culture stretch chamber, with pips

Model: SC-1040

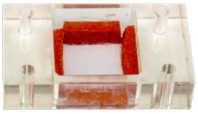
Dimensions (cm): 2.0 x 2.0 x 1.0



2 cm² culture stretch chamber, with sponges

Model: SC-1035

Dimensions (cm): 1.0 x 2.0 x 1.0



4 cm² culture stretch chamber, with sponges

Model: SC-1044

Dimensions (cm): 1.3 x 1.3 x 1.0

Short tissue stretch chamber

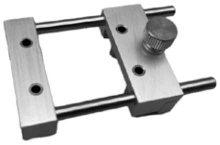
Model: SC-0060

Dimensions (cm): 1.0 x 0.6 x 1.0

Compatible accessories

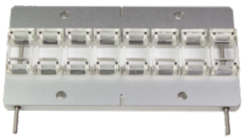
Chamber stand for 4 cm² chamber

Model: SS-0040
Chamber compatibility: SC-0040, SC-1035, SC-1040, SC-1044



Chamber fixing bracket for 4 cm² chambers

Model: SS-1040
Chamber compatibility: SC-0040, SC-1035, SC-1040, SC-1044



Multi-chamber bracket for 4 cm² chambers

Model: SS-0041
Bracket assembly for multiple chamber stretching in parallel in the ST-1440.

Automated uniaxial stretching for larger applications

Automated uniaxial stretch device, for larger chambers

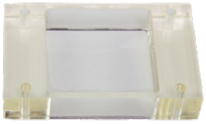
Model: ST-1400

Control unit dimensions (cm): 32 W x 22 L x 13 H

Stretch unit dimensions (cm): 27 W x 24 L x 13 H

Great for high-throughput, parallel uniaxial stretching of up to 6 x 10 cm² or 4-well chambers. Ideal for the standard incubator.

Compatible chambers



10 cm² stretch chamber

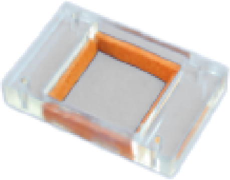
Model: SC-0100

Dimensions (cm): 3.2 x 3.2 x 1.0

4-well stretch chamber

Model: SC-0044

Dimensions (cm): 1.6 x 1.6 x 1.0



10 cm² culture stretch chamber, with sponges

Model: SC-1014

Dimensions (cm): 2.5 x 2.5 x 1.0

Long tissue stretch chamber

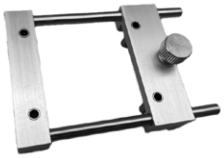
Model: SC-0015

Dimensions (cm): 1.5 x 1.0 x 1.5

Compatible accessories

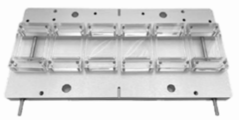
Chamber stand for 10 cm² chamber

Model: SS-0044 (for 4-well chamber),
SS-0100 (for 10 cm² chamber)
Chamber compatibility: SC-0100, SC-0044



Chamber fixing bracket for 10 cm² chambers

Model: SS-1100
Chamber compatibility: SC-0100, SC-0044



Multi-chamber bracket for 10 cm² chambers

Model: SS-0101
Bracket assembly for multiple chamber stretching in parallel in the ST-1400.

Preprogrammed stretch patterns

Stretch extent

Extent (%)	Distance (mm)
2	0.64
4	1.28
5	1.60
8	2.56
10	3.20
12	3.84
15	4.80
20	6.40

Modeling different kinds of force

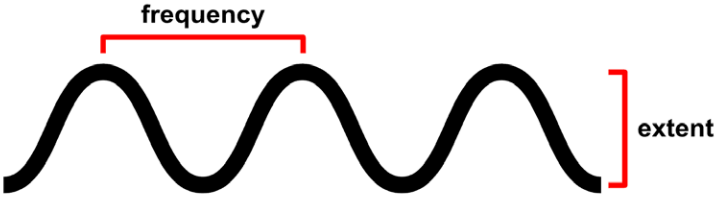
Take advantage of the preprogrammed cyclic, square wave, or static stretching patterns with stretch extents of 2-20%.

Long duration studies

Apply uniaxial stretch over hours or even days, with the water pump cooling the step motors in the stretch unit.

Cyclic (sine wave) stretching

Frequency (Hz)	Cycles/min
1.00	60
0.50	30
0.25	15
0.17	10



Stretch-and-hold (square wave) stretching

Stretch time (s)	Hold time (s)	Cycles/min
1	0.5	20
1	2	10
1	29	10

Static stretching

Stretch time (s)	Hold time (s)
1	Indefinite

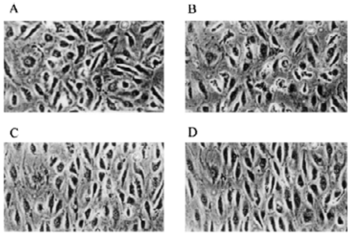
Pattern customization available upon request.

Sample Publications

Involvement of SA channels in orienting response of cultured endothelial cells to cyclic stretch

Naruse at al., Am J Physiol 1998; May; 274 (5Pt 2):H 1532-8

Endothelial cells from human umbilical cord vein were stretched to determine the role of calcium and stretch-activated (SA) channels in the orienting response in cells. Stretch-induced morphological changes were observed after subjecting cells to sinusoidal cyclic (20% stretch, 1 Hz). The cells begun to orient perpendicular to the stretch axis 15 minutes after the onset of stretch and 90% of the cells aligned almost perfectly perpendicular after 120 minutes.



Direction of applied stimulus

Fig. 1 - Stretch-induced morphological changes in vascular endothelial cells.

Uni-axial cyclic stretch induces the activation of transcription factor nuclear factor κB in human fibroblast cells

Inoh et al., FASEB J 2002; 16:405-407

The effects of uniaxial cyclic stretching on translocation of NF-κB into the nucleus of fibroblasts cells. The figures show the translocation of NF-κB into the nucleus and the degradation of its inhibitor IκB in the cytosol. A. Immunoblot stained with RelA mAb and actin mAb. B. After the onset of cyclic stretching, NF-κB translocation was observed at 2 minutes and peaked at 4 minutes. After 10 minutes, NF-κB returned to basal level. C. Immunoblot stained with IκB mAb and actin mAb. D. Significant degradation of IκB in the cytosol was observed at 1 min and reached its minimum after 4 minutes in response to stretching. For figures B and D the data was normalized by actin content.

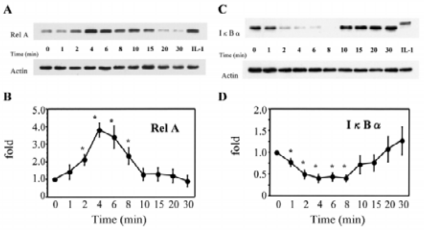
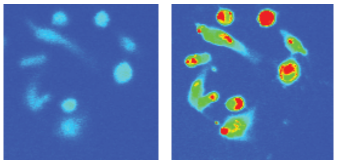


Fig. 2 - Activated NFkB translocation

Bi-phasic activation of eNOS in response to uni-axial cyclic stretch is mediated by differential mechanisms in BAECs

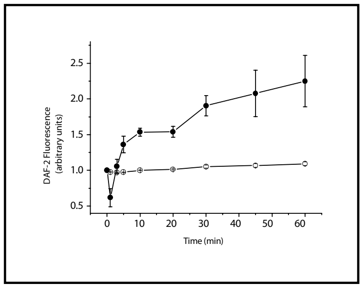
Takeda et al., Life Sci 2006; Jun 13; 79(3):223-9

The authors investigated the signaling mechanism of stretch-induced nitric oxide(NO) production. When bovine arterial endothelial cells were uni-axial cyclic stretched (20%, 1 Hz),NO production peaked at 5 and 20 minutes after the initiation of stretch, The early peak is mediated by Ca+2 influx and the later peak is due to activation of Akt.



Nitric Oxide measured with fluorescent reagent DAF2

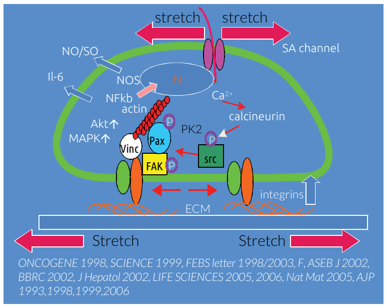
Fig. 3 - Stretch-induced nitric oxide production



Application Notes: Stretch-activated channels (SACs)

The ability to sense mechanical stress and translate it into biochemical signals is known as mechanotransduction. Stretch-activated ion channels (SACs) are found in species ranging from bacteria and yeast to mammals, and play a key role in mechanotransduction. SACs function through exteroreceptors such as the sensory cells of the skin and inner ear, and in tissues, joints, and skeletal and cardiac muscle.

Mechanotransduction



ONCOGENE 1998, SCIENCE 1999, FEBS letter 1998/2003, F, ASEB J 2002, BBRC 2002, J Hepatol 2002, LIFE SCIENCES 2005, 2006, Nat Mat 2005, AJP 1993,1998,1999,2006