CellScale
biomaterials testing

MECHANOCULTURE SERIES

CATALOGUE

2026

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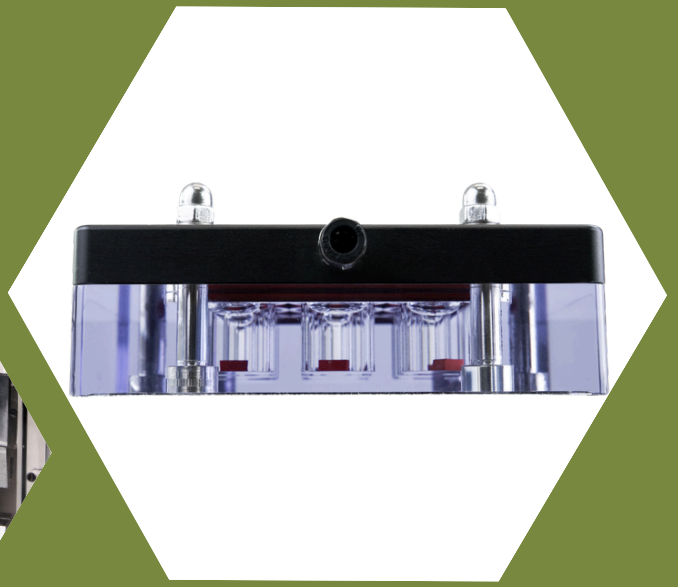
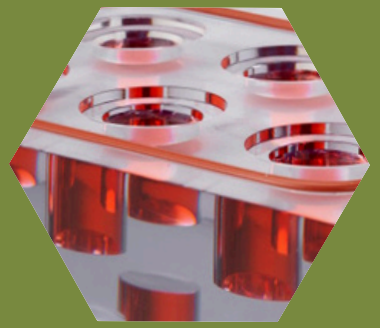
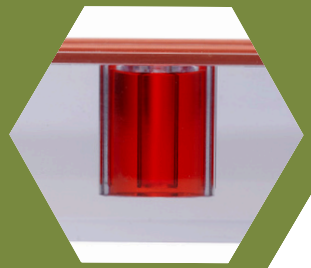
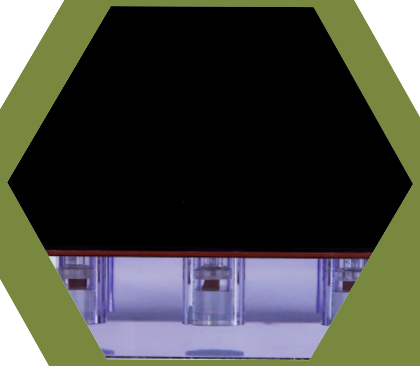
A Mechanical Stimulation Bioreactor

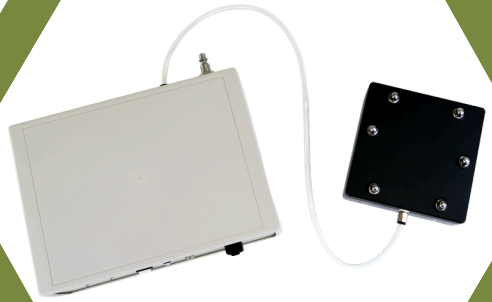


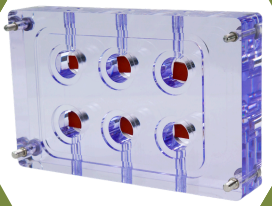


Series for Mechanobiology Research









MechanoCulture Series

Benchtop Mechanical Stimulation Bioreactors

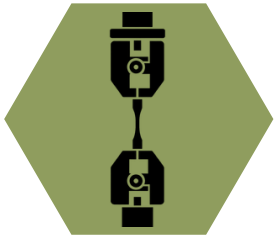
The MechanoCulture Series is a family of incubator-compatible bioreactors designed for controlled mechanical stimulation during culture. It brings together three loading environments within one platform family: tensile conditioning, compression stimulation, and hydrostatic pressure stimulation.

Each system is built for long-duration studies in hydrated, sterile environments and supports programmable mechanical regimens tailored to the specimen or model under study. Across the series, researchers can apply cyclic and time-dependent loading profiles using defined phases such as loading, hold, recovery, and rest.

With model-specific chamber/well formats, parallel sample handling, and application-focused accessories, the MechanoCulture Series provides a practical framework for building repeatable stimulation workflows in mechanobiology, tissue engineering, mechanotransduction, regenerative medicine, and biomaterials research.

Capabilities

Incubator-Based
Mechanical Stimulation



Tension
Stimulation

Compression
Stimulation

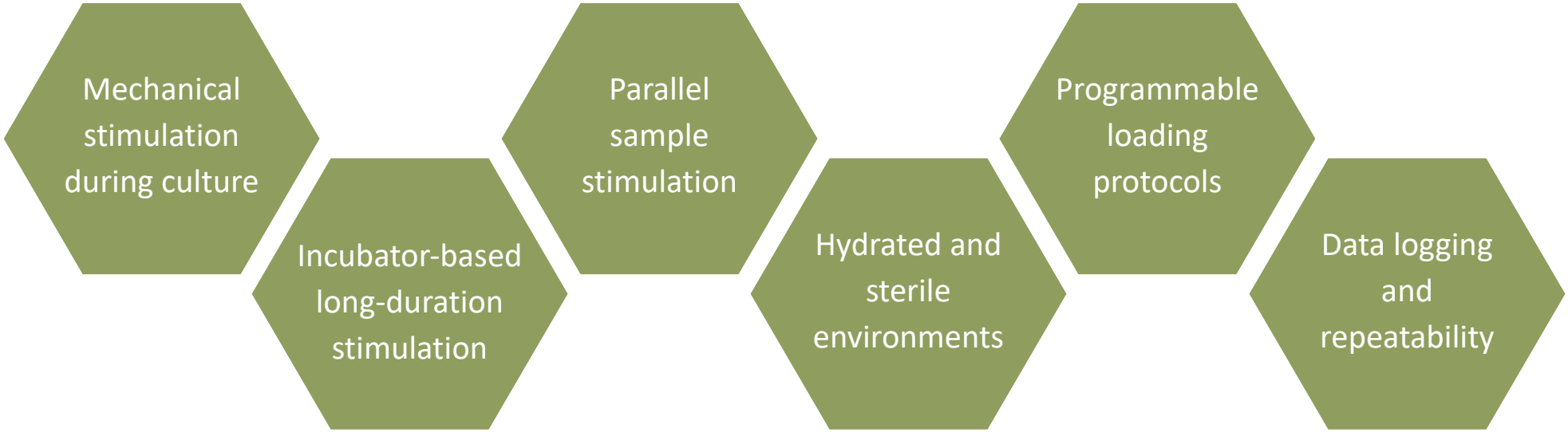
Hydrostatic Pressure
Stimulation

Why Researchers Use MechanoCulture Bioreactors

MechanoCulture instruments help scientists impose mechanical cues on living systems. Researchers use these bioreactors when mechanical environment needs to be part of the culture workflow. These instruments help bring controlled loading into experiments where tissue development, cell response, scaffold conditioning, or mechanotransduction depends on repeated physical stimulation over time.

The series is designed to make mechanobiology workflows easier to run and easier to reproduce. Incubator-based operation supports long-term studies, parallel sample formats improve experimental throughput, and programmable protocols help standardize loading conditions across samples and timepoints.

Depending on the system, MechanoCulture can also log force, displacement, or pressure during stimulation, giving researchers a way to document applied conditions and monitor how constructs respond throughout the study.



Choosing the Right System

The MechanoCulture Series includes four systems for mechanical stimulation during culture, each designed around a different loading environment and specimen workflow. Use this guide to compare loading mode, sample format, control architecture, and data output when selecting the right platform for your research.

MechanoCulture J1 (MCJ1)

Tension stimulation with independent chamber control

- 6 parallel tensile culture chambers
- individual actuators for each chamber for simultaneous protocols
- force and displacement data logging for stiffness tracking

Best for: *tensile stimulation studies where stiffness tracking is needed and where each sample may need its own loading conditions during culture*

MechanoCulture T6 (MCT6)

High-force tension stimulation with single chamber control

- up to 6 specimens loaded together (well separation available)
- one actuator drives all specimens
- longer grip separation and higher-force capacity compared to MCJ1

Best for: *parallel stretch conditioning workflows where the same loading program is applied across multiple specimens*

MechanoCulture TR (MCTR)

Hydrostatic pressure stimulation through media

- 9-well hydrostatic pressure format
- programmable pressure regimens
- sterile fluid-based stimulation environment

Best for: *pressure-driven mechanobiology and tissue culture workflows*

MechanoCulture TX (MCTX)

Compression stimulation with stiffness tracking

- 6 parallel compression wells
- force and displacement data logging
- standard and perfusion well plate options

Best for: *cyclic compression studies of cultured tissues, scaffolds, and hydrogels*

MechanoCulture Comparison




Feature	MCJ1	MCT6	MCTR	MCTX
Primary loading mode	Uniaxial tension	Uniaxial tension	Hydrostatic pressure	Uniaxial compression
Parallel sample format	6 independent chambers	1 chamber, up to 6 specimens	9 wells	6 wells
Sample control style	Individually controlled chambers	Same motion applied across all specimens	Shared pressure program across wells	Independently controlled compression wells
Main workflow	Tensile stimulation with measurement	Tensile stimulation	Pressure stimulation	Compression stimulation with measurement
Logged output	Force, displacement	None	Pressure	Force, displacement
Culture format	6 standard or small tensile chambers	Single-well or 6-well chamber	Sealed 9-well pressure plate	Standard or perfusion 6-well plate
Common use areas	Mechanotransduction, tendon, vascular, cardiac tissues	Tissue conditioning, stretch culture, scaffold maturation	Cartilage, vascular, hydrostatic pressure mechanobiology	Cartilage, bone, hydrogels, scaffold conditioning
Key configuration options	Standard or small chamber and grips	Single- or 6-well chamber, pull rod ranges	Standard or low-pressure sealing membranes	Standard or perfusion plates, spacer heights
Best fit when you need	Multiple tensile stimulation protocols and measured sample response	One shared stretch program across multiple samples	Hydrostatic pressure loading during culture	Compression and stiffness-related monitoring over time

Not sure which system fits your workflow?

Talk with our team about loading mode, specimen geometry, chamber format, culture conditions, and data requirements

MODELS

The MechanoCulture Series includes four bioreactor systems, each designed around a different loading environment and mechanical stimulation workflow. Together, they give researchers the ability to apply controlled tension, compression, and hydrostatic pressure during long-term culture.

MechanoCulture J1

MCJ1

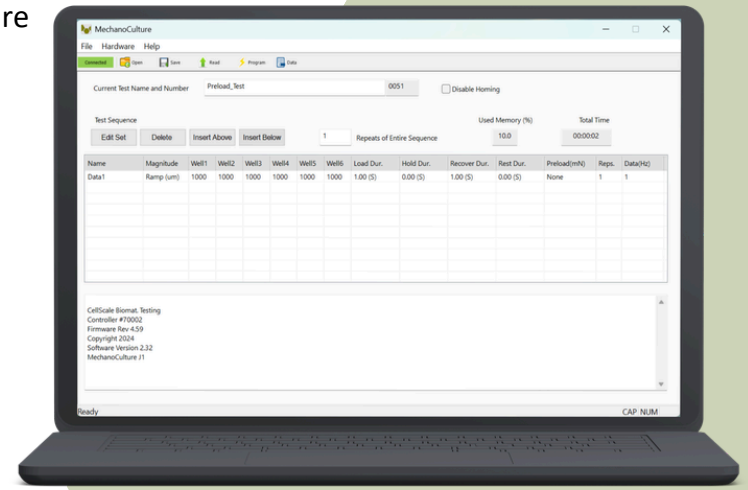
The MechanoCulture J1 is a 6-chamber uniaxial tension stimulation bioreactor designed for long-duration culture studies in which tensile loading is part of the biological model. Each chamber has its own actuator, pull rod, grips, and load cell, allowing up to six different stretch protocols to run simultaneously. The MCJ1 supports parallel tensile stimulation, force measurement, and displacement tracking.

Application Examples

- Tendon and ligament mechanobiology
- Cyclic stretch of cell-seeded membranes and substrates
- Vascular tissue and blood vessel construct conditioning
- Cardiac tissue and myocardial stretch studies
- Fibroblast and myofibroblast mechanotransduction
- Tensile stimulation of tissue-engineered constructs
- Scaffold maturation under uniaxial stretch
- Parallel tensile conditioning with measured sample response

Included with the MCJ1

- MCJ1 Bioreactor Frame, Controller, & Power Supply
- Reusable Culture Well Plate w/ 6 Chambers
- 6 Sets of Grips w/ 6 Pull Rods
- 6 Load Cells (10 N, 20 N, 50 N, or 100 N Capacity)
- Lifetime License to Programming & Data Download Software
- Remote Installation and Training
- Lifetime Technical Support
- 12 Month Warranty

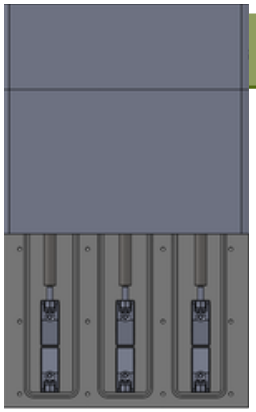


MCJ1 Options

The MechanoCulture J1 is available in two chamber formats to support different specimen sizes and culture workflows. Both configurations provide the same 6-chamber tensile stimulation platform with independent chamber control and force measurement, while the chamber width, grips, and pull rods are matched to the specimen format.

MCJ1 Standard

The MCJ1 Standard uses a 6-chamber sample holder with 39 mm wide chambers (150 mL media capacity) for larger specimens and culture formats that need more working space. It is well suited for tensile stimulation studies involving broader constructs, membranes, and soft tissue samples where specimen size or handling benefits from the larger chamber geometry.



MCJ1 Small

The MCJ1 Small uses a 6-chamber sample holder with 15 mm wide chambers (30 mL media capacity) for smaller specimens and more compact tensile culture workflows. It is well suited for studies involving narrow constructs, smaller membranes, and limited-size samples where a reduced chamber format better matches the specimen geometry.

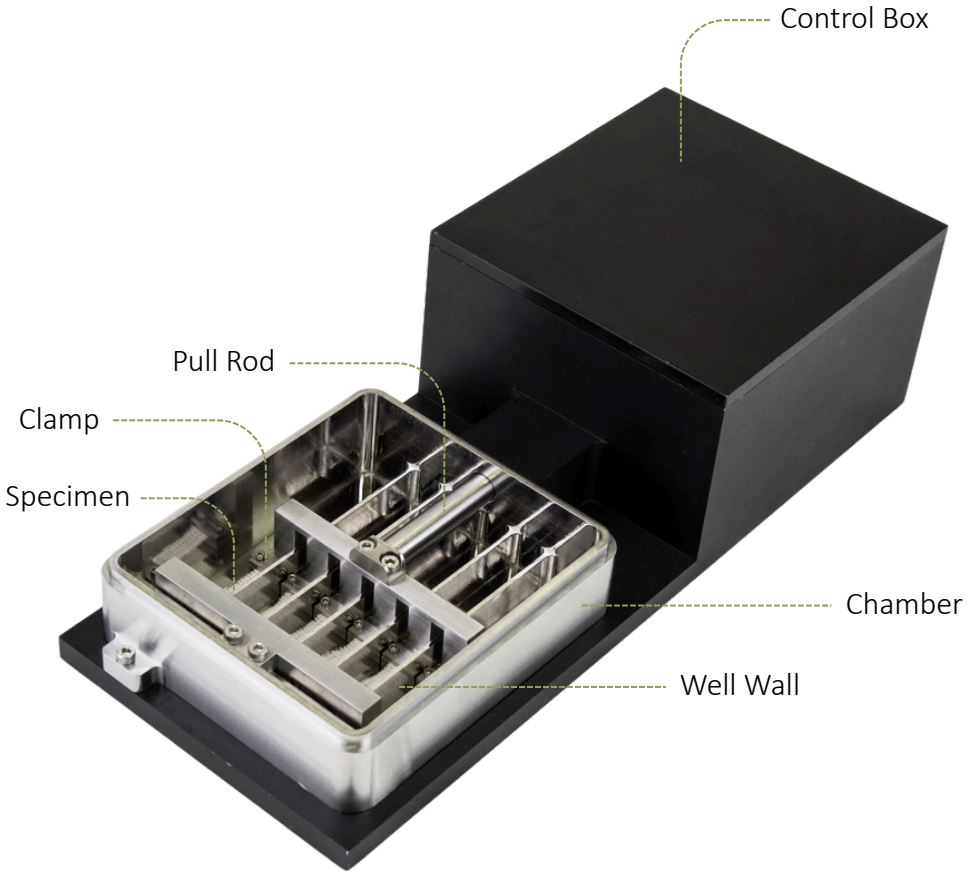
MechanoCulture T6

MCT6

The MechanoCulture T6 is a high-force uniaxial tension stimulation system for long-duration culture experiments where controlled stretch is the stimulus and biological response is the output. It applies one shared loading program across up to six parallel specimens, making it well-suited for repeatable tensile conditioning of larger constructs and grippable tissues.

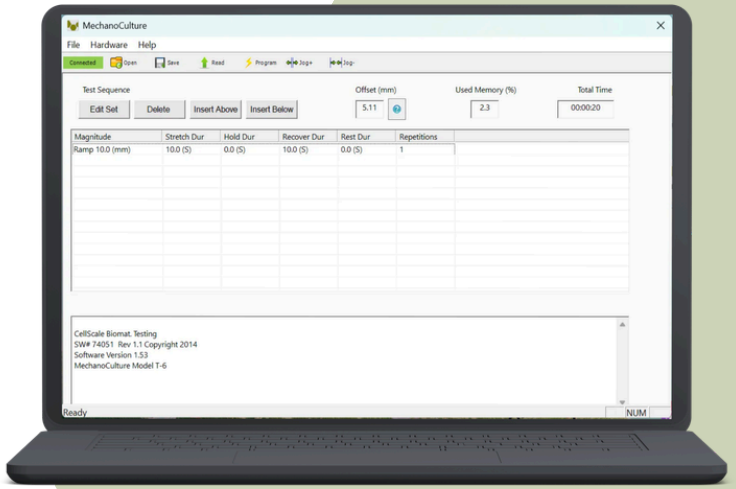
Application Examples

- Tensile conditioning of larger tissue-engineered constructs
- Long-duration stretch culture of membranes and 3D matrices
- Scaffold maturation under shared cyclic stretch
- Ligament, tendon, and musculoskeletal construct conditioning
- Intermittent stretch regimens for engineered tissues
- High-force uniaxial conditioning during culture
- Parallel tensile loading under a shared loading program
- Stretch-based preconditioning prior to downstream analysis



Included with the MCT6

- MCT6 Bioreactor Frame, Chamber, & Power Supply
- 6 Sets of Grips w/ Pull Rod
- Lifetime License to Programming Software
- Remote Installation and Training
- Lifetime Technical Support
- 12 Month Warranty



MCT6 Options

The MechanoCulture T6 is available in two chamber formats to support different tensile stimulation workflows during long-term culture. Both configurations use the same high-force uniaxial loading platform and shared-actuator architecture, while the chamber format changes how specimens are organized and cultured during stimulation.

Standard Well

The MCT6 Standard uses a shared chamber format for parallel tensile stimulation of up to six specimens under one loading program. It is well suited for workflows where multiple samples are conditioned together in a common culture environment using the same stretch regimen.

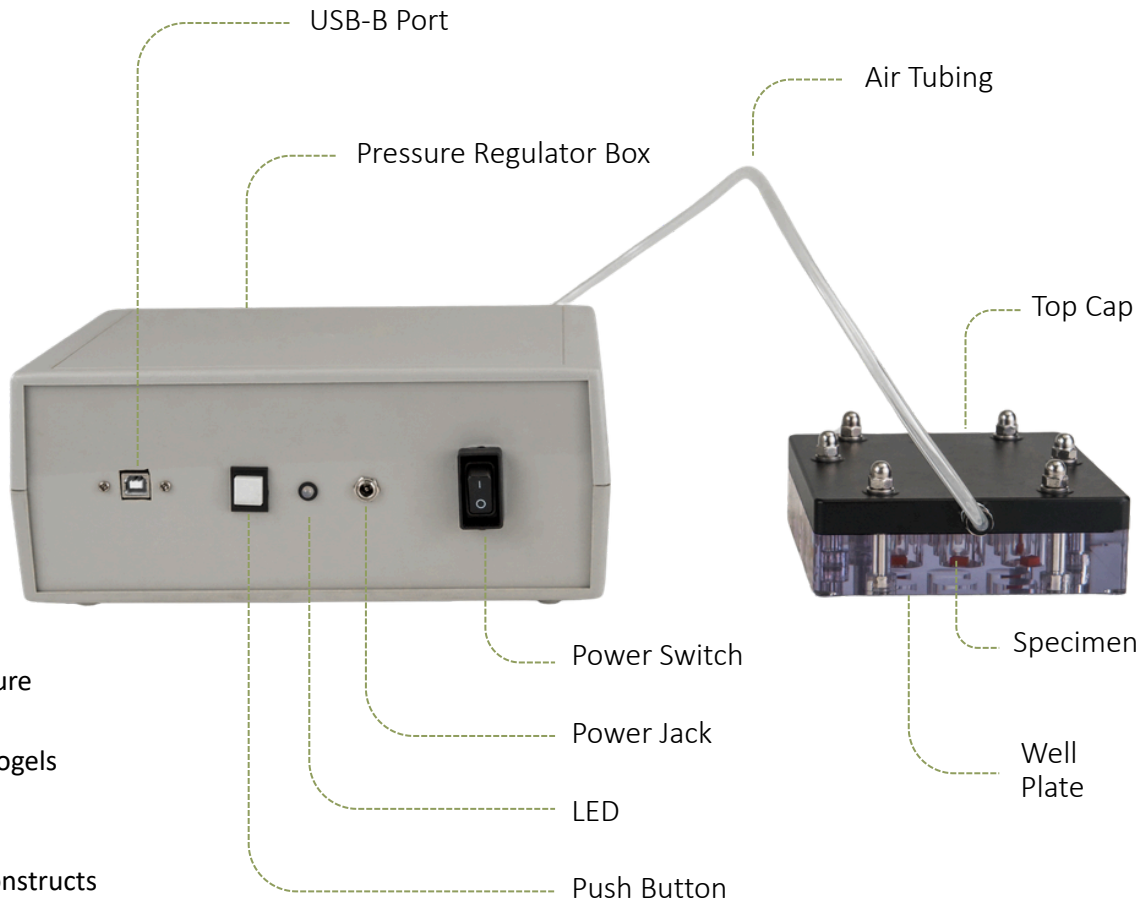
6 Well

The MCT6 6 Well uses six individual wells for parallel tensile stimulation while maintaining the same shared-actuator loading approach. It is well suited for workflows that benefit from physical separation between specimens, such as studies requiring separate culture environments, media conditions, or sample handling by well.

MechanoCulture TR

MCTR

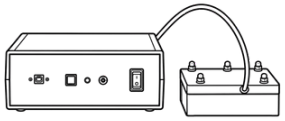
The MechanoCulture TR is a 9-well hydrostatic pressure stimulation bioreactor designed for mechanobiology and tissue engineering studies where pressure is the primary mechanical cue. It enables programmable hydrostatic loading that drives a compressive force in a sterile fluid environment, supporting parallel culture workflows for pressure-responsive cells, tissues, and biomaterials.



Application Examples

- Cartilage mechanobiology under hydrostatic pressure
- Bone and osteogenic differentiation studies
- Hydrostatic pressure stimulation of cell-laden hydrogels
- Pressure-based mechanotransduction research
- Chondrogenic culture under dynamic pressure
- Fluid-mediated stimulation of engineered tissue constructs
- Parallel pressure conditioning studies
- Pressure-responsive biomaterial and tissue model research

Included with the MCTR



MCTR Bioreactor Frame, Pressure Regulator, & Power Supply

1 Reusable Sealed Well Plate

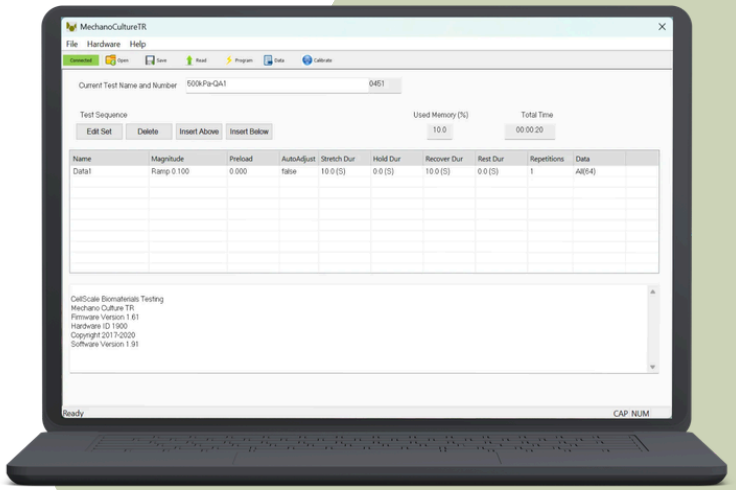
10 Sealing Membranes + 3 Sealing O-Rings

Lifetime License to Programming & Data Download Software

Remote Installation and Training

Lifetime Technical Support

12 Month Warranty



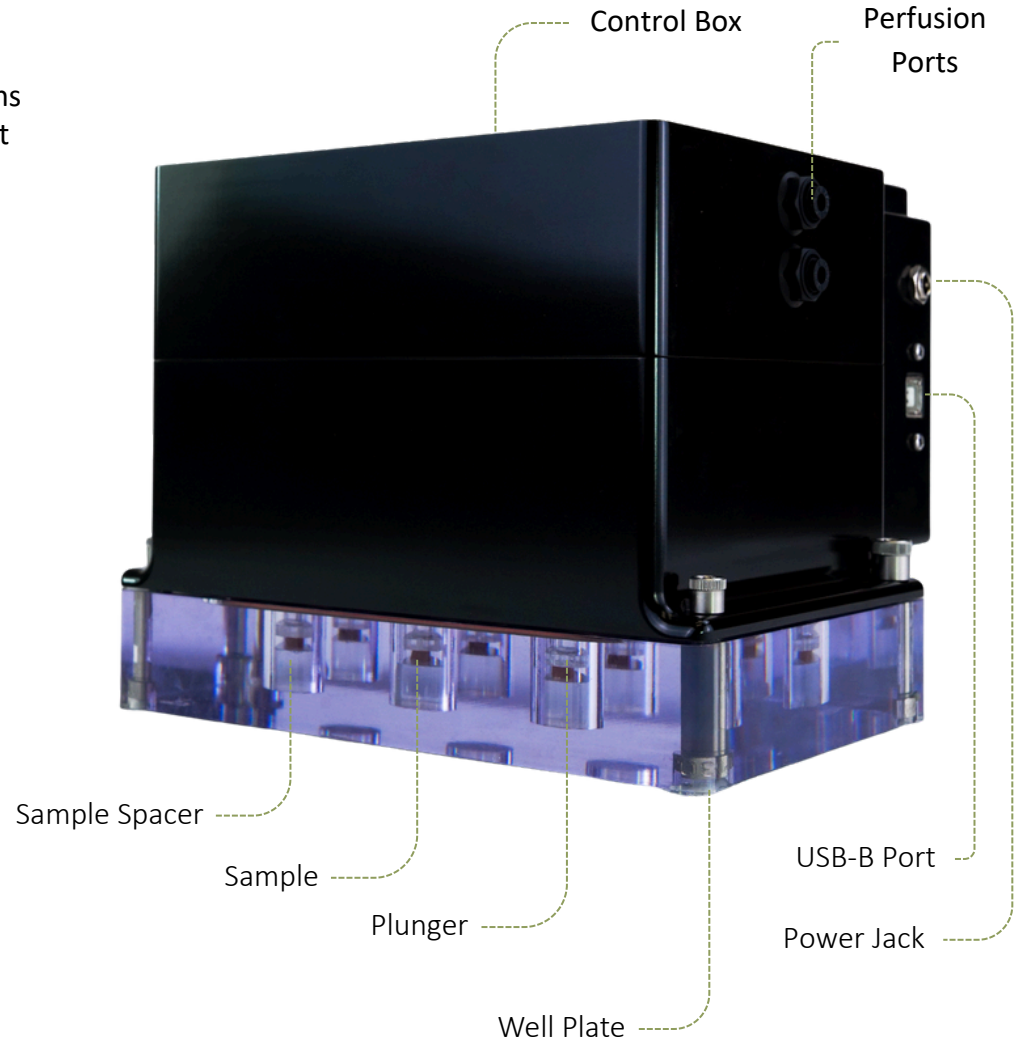
MechanoCulture TX

MCTX

The MechanoCulture TX is a 6-well uniaxial compression stimulation bioreactor for cyclic compression of 3D specimens in long-duration culture. With logged force and displacement data, it supports stiffness tracking over time during mechanobiology and tissue conditioning studies.

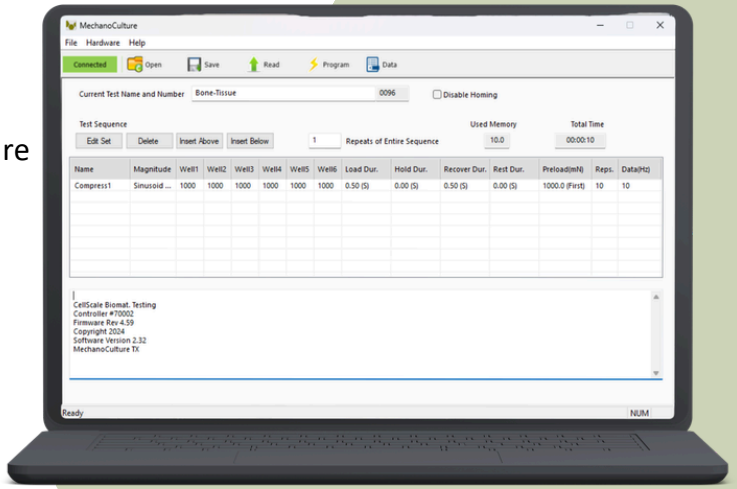
Application Examples

- Cyclic compression of hydrogels and soft biomaterials
- Compression conditioning of tissue-engineered scaffolds
- Cartilage and osteochondral construct stimulation
- Bone mechanobiology under compressive loading
- Stiffness tracking during long-term culture
- Cell-seeded scaffold maturation under dynamic compression
- Parallel compression stimulation of 3D tissue models
- Compression studies with perfusion workflows



Included with the MCTX

- MCTX Bioreactor Frame & Power Supply
- 1 Reusable Sealed Well Plate
- 3 Sealing Membranes + 3 Sealing O-Rings
- Spacers For Sample Thickness (1 mm, 2 mm, 5 mm, 10 mm)
- 6 Load Cells (10 N, 20 N, 50 N, or 100 N Capacity)
- Lifetime License to Programming & Data Download Software
- Remote Installation and Training
- Lifetime Technical Support
- 12 Month Warranty



MCTX Options

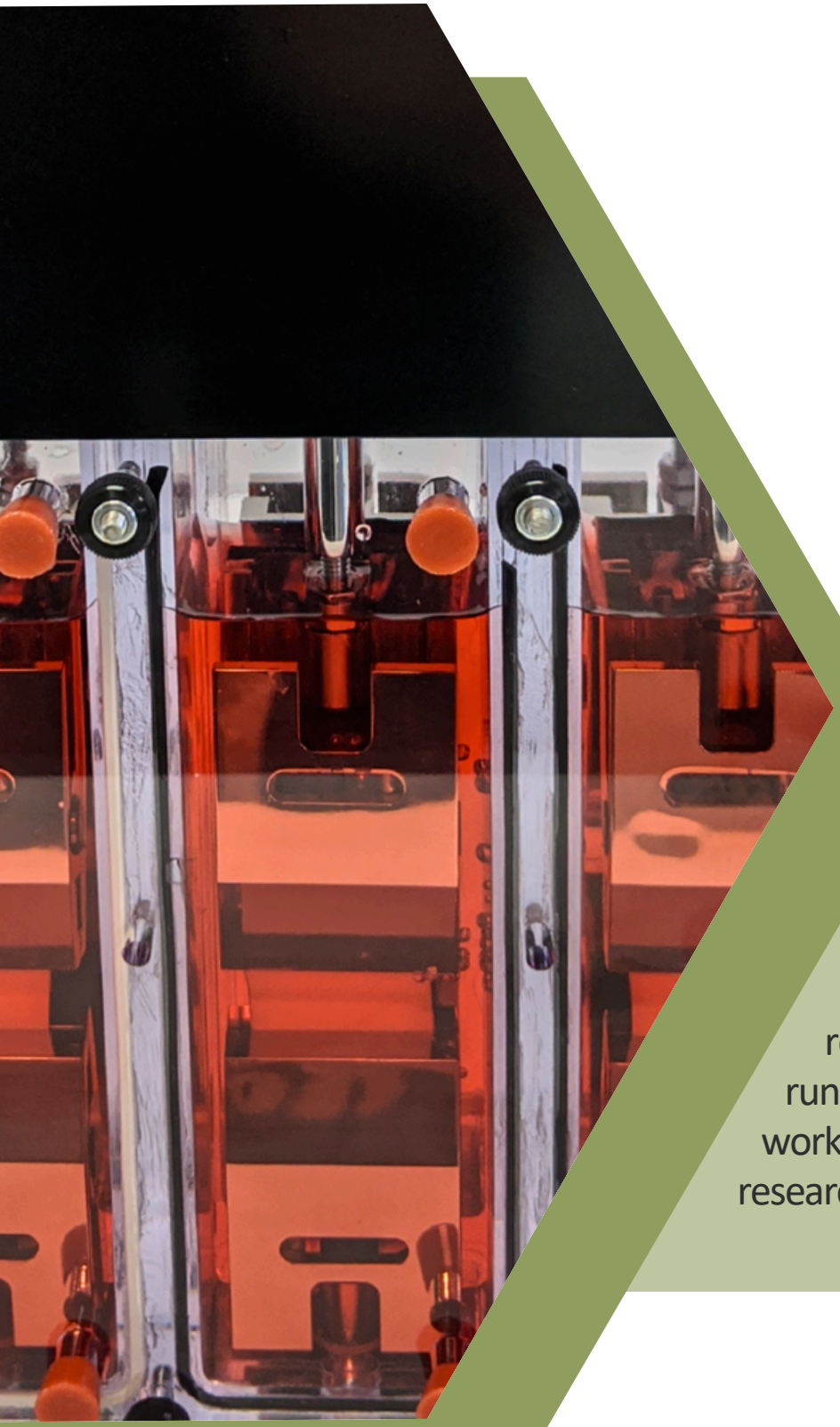
The MechanoCulture TX is available with either a standard well plate or a perfusion well plate to support different compression culture workflows. Both configurations provide the same 6-well compression stimulation platform with load cells, force-displacement data logging, and programmable long-duration loading protocols, while the well plate format changes how media is handled during culture.

MCTX Standard

The MCTX Standard uses a reusable 6-well plate for compression stimulation in a sealed culture environment. It is well suited for studies where samples are cultured and mechanically stimulated under static media conditions with straightforward setup and sample handling.

MCTX Perfusion

The MCTX Perfusion uses a reusable 6-well perfusion plate that allows media exchange through each well during culture. It is well suited for workflows where nutrient exchange is important alongside mechanical loading.

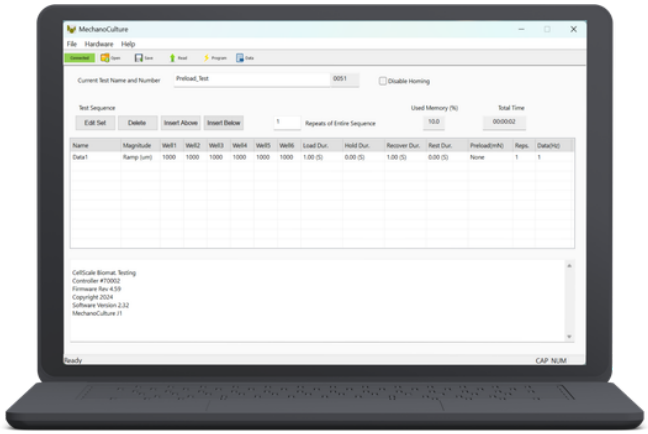


SHARED FEATURES

The MechanoCulture Series shares a common approach to programmable mechanical stimulation during long-term culture. Across the platform family, researchers can build repeatable stimulation protocols, run studies inside an incubator, and support hydrated, sterile workflows designed for tissue engineering and mechanobiology research.

Software and Protocols

MechanoCulture systems use dedicated programming software to define stimulation protocols on a PC, then execute them inside an incubator without a continuous computer connection. The software is built around repeatable multi-phase protocol design for long-duration mechanical stimulation studies, while data outputs vary by model.



What The Software Does:

- Defines and stores programmable stimulation protocols for MechanoCulture bioreactors
- Supports PC-independent incubator operation after protocol saved to instrument
- Enables repeatable long-duration stimulation workflows across the MechanoCulture Series
- Retrieves logged data after a run for documentation, comparison, and analysis where applicable

Protocol Design and Control:

- Builds protocols from sets, phases, and cycles for repeatable experimental design
- Supports common sequence elements such as stretch, compress, pressurize, hold, recover, and rest, depending on model
- Enables cyclic and intermittent regimens using waveform, magnitude, repetitions, and timing settings
- Keeps protocol design consistent across tension, compression, and hydrostatic pressure workflows

Data Logging & Export:

MCJ1: logged force and displacement for construct monitoring and stiffness tracking over time

MCTX: logged force and displacement for construct monitoring and stiffness tracking over time

MCTR: logged pressure-over-time data for protocol review and documentation

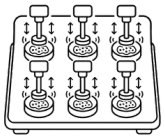
MCT6: no logged data

Long-Term Culture Workflows

The MechanoCulture Series is designed to support repeatable mechanical stimulation during long-duration culture, with features that help researchers maintain controlled environments, consistent protocols, and efficient parallel workflows.

Incubator-Ready Operation

MechanoCulture systems are designed to run inside a standard laboratory incubator after protocols are programmed and saved. This supports long-duration studies without requiring a continuous PC connection during stimulation.

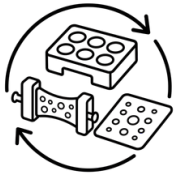


Parallel Sample Stimulation

The MechanoCulture Series supports parallel workflows to improve throughput and cohort comparison during long studies. Depending on the model, this may involve independent chamber control, independent wells, shared parallel loading, or multi-well hydrostatic pressure stimulation.

Data Logging and Repeatability

Repeatable protocol execution is central to the MechanoCulture workflow, with model-specific data outputs available after each run. MCJ1 and MCTX log force and displacement for stiffness tracking, while the MCTR records pressure over time.



Reusable Components

Reusable chambers, plates, grips, and other core hardware support repeated experimental use, while replaceable components such as pull rods, membranes, O-rings, spacers, and related accessories help maintain workflow continuity over time. This makes the series practical for ongoing research programs and long-term lab use.

HARDWARE & CONSUMABLES

The MechanoCulture Series uses user-replaceable components to support repeatable long-term culture workflows, sterile operation, and day-to-day lab use. Across the series, these include geometry-matching components, sterile barrier components, and replacement hardware selected to match specimen setup, loading mode, and workflow requirements.

Hardware

Reusable hardware help reduce downtime and support repeatable workflows over time. Culture hardware can be supplemented with extra plates, chambers, grips, pull rods, and related components to keep long-term studies moving efficiently.

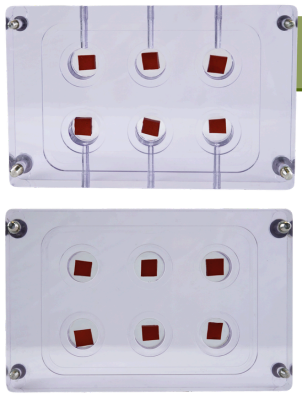
MCJ1

The MCJ1 includes one reusable sample holder with six chambers, six sets of grips, and six pull rods with purchase. Replacement sample holders, grips, and pull rods are available to support ongoing use and reduce interruption between studies.

An optional cooling pump is also available.

MCT6

The MCT6 includes one reusable chamber (6-well or standard), one chamber lid, six sets of grips, and one pull rod with purchase. Replacement pull rods with different grip separation ranges, extra chambers, extra lids, and replacement grips are available to support different specimen configurations and long-term use.



MCTX

The MCTX includes one reusable well plate (perfusion or standard) with purchase. Replacement well plates can be purchased to support ongoing compression stimulation workflows and reduce downtime between studies.

An optional cooling pump is also available.

MCTR

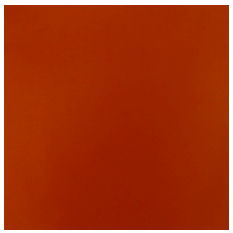
The MCTR includes one reusable standard sealed well plate and top cap with purchase. Extra well plates and top caps can be purchased to support continued use and workflow flexibility.

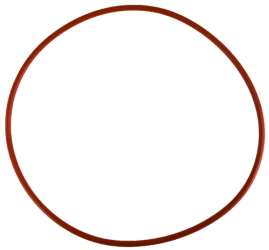
Consumables

Sealing Membranes & O-Rings

Sealing membranes and O-rings for the MCTR and MCTX bioreactors

- MCTR: Standard-pressure and low-pressure membrane options are available





Sample Spacers

Sample spacers for the MCTX bioreactor to ensure proper compression stimulation based on your sample geometry

- 1 mm, 2 mm, 5 mm, and 10 mm spacer thicknesses

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RESEARCH APPLICATIONS

The MechanoCulture Series supports research across mechanobiology, tissue engineering, biomaterials, and long-duration culture workflows where controlled mechanical stimulation is part of the experimental design. With tension, compression, and hydrostatic pressure platforms, MechanoCulture systems are used to study how tissues, cells, scaffolds, and other biomaterials respond to repeatable loading in incubator-compatible culture environments.

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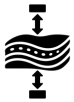
Applications & Sample Types

The MechanoCulture Series is used in peer-reviewed mechanobiology, biomaterials, and tissue engineering studies where controlled tension, compression, or hydrostatic pressure is applied during culture. Across the four systems, common workflows include mechanotransduction, long-term construct conditioning, scaffold and hydrogel stimulation, and parallel culture studies in physiological conditions.

Mechanotransduction and Cell Mechanical Stimulation

Cell-seeded constructs, flexible substrates, scaffold-based cultures, hydrogels, pressure-responsive culture models



Tissue Engineering and Construct Conditioning

Tendon and ligament constructs, cardiac tissues, vascular constructs, musculoskeletal engineered tissues, scaffold-based tissues

Hydrogel, Biomaterial, and Regenerative Matrix Stimulation

Cell-laden hydrogels, injectable biomaterials, regenerative matrices, ECM-derived scaffolds, compliant biomaterial systems

Compression and Hydrostatic Culture Workflows

Hydrogels, porous scaffolds, cartilage-like constructs, osteochondral models, tissue mimetics, pressure-loaded biomaterial samples

Stem Cell, Remodeling, and Maturation Studies

Stem cell systems, remodeling constructs, maturing engineered tissues, fibrosis-related culture models, long-duration mechanically conditioned samples

Parallel Comparative Culture Studies

Multi-condition cohorts, donor-to-donor comparisons, protocol optimization studies, parallel treatment groups, side-by-side loading comparisons

MechanoCulture Use Cases

Researchers use the MechanoCulture Series when mechanical stimulation needs to be integrated directly into the culture workflow rather than applied only as an endpoint test. Across published and product-supported use cases, the platform family is commonly used to deliver repeatable tensile, compressive, or hydrostatic stimulation while maintaining physiologic-type conditions for cells, biomaterials, and natural & engineered tissues.

Parallel Tensile Stimulation Workflows & Screening

MCJ1 to compare multiple loading conditions side by side in six independent chambers, especially for mechanotransduction, substrate stretching, scaffold-based culture, and soft tissue stimulation workflows.

Tensile Conditioning of Structural Constructs

MCT6 for parallel high-force stretch conditioning where multiple gripped samples are run under one shared protocol. This is a strong fit for tendon, ligament, musculoskeletal, and structural tissue engineering workflows.

Parallel Compression Stimulation of 3D Constructs

MCTX to apply cyclic compression for hydrogels, scaffolds, engineered tissues, and other 3D samples where long-duration stimulation and stiffness tracking are important.

Hydrostatic Pressure Mechanobiology

MCTR when pressure is the stimulus and biological response is the readout, especially in vascular, cartilage-like constructs, hydrogels, 3D matrices, and tissue mimetic systems.

Stem Cell and Remodeling Studies

Models used in studies where cyclic mechanical input influences differentiation, remodeling, fibrosis-related response, or long-term biological adaptation in cultured constructs.

Long-Duration Incubator-Based Culture Workflows

Models used for experiments that run over hours, days, or weeks in hydrated sterile environments, where programmable phases, repeatable loading, and parallel sample handling are central to the study design.

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