

# C-Stretch

User Manual

*rev. 3*

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**Research Use Only**

This product is intended for research purposes only. It is not certified for clinical applications (including diagnostic purposes). Use of this product in uncertified applications is in violation of FDA regulations.

# Table of Contents

Table of Contents .....	iv
Safety Precautions .....	1
Statement of Conformity .....	1
Intended Use .....	1
Disposal .....	2
Warranty .....	2
Introduction .....	3
Description .....	3
Features .....	3
Specifications-at-a-Glance .....	3
Inputs / outputs .....	3
Disposable Culture Chambers .....	3
Assembly .....	4
Cleaning.....	5
Index.....	6

## Safety Precautions



To ensure reliability and safety, we recommend using the instrument according to the guidelines described in this manual. All safety and operating instructions should be read and understood before use.

Electric shock risk! Do not remove instrument cover. There are no user-serviceable parts inside. Refer servicing to IonOptix technical support ([support@ionoptix.com](mailto:support@ionoptix.com)). Static electricity can damage electronic components. Take care to discharge yourself before handling the device.

Please adhere to the following safety guidelines:

- Unplug the instrument from the wall before cleaning.
- Keep the instrument free from moisture, water, and dust.
- Do not place instrument on unstable surface and do not drop the device.
- If ventilation slots are present on instrument panels, keep clear of obstructions.
- All cables and power supply cords should be routed so as to not cause a hazard. Use only supplied or approved/recommended cables.
- Ensure instrument is not situated near a heat source.

## Statement of Conformity



This instrument carries the CE mark and meets the appropriate EU directives.

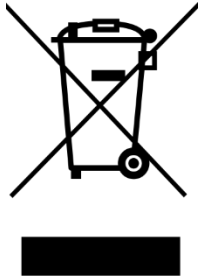
## Intended Use



This product is intended for **research purposes only**. It is not certified for clinical applications (including diagnostic purposes). Use of this product in uncertified applications is in violation of FDA regulations.

IonOptix products are intended to be installed, used, and operated under the supervision of an appropriately qualified life-science researcher.

## Disposal



Forward to recycling center or return to manufacturer. Unwanted equipment bearing the Waste Electrical and Electronic Equipment (WEEE) Directive symbol requires separate waste collection. For a product labeled with this symbol, either forward to a recycling center or contact your nearest IonOptix representative for methods of disposal at the end of its working life.

## Warranty

This IonOptix instrument is warranted for a period of one (1) year from delivery under normal use and conditions, and will operate in material conformance with applicable IonOptix specifications or standards.

This warranty does not apply to any defect caused by failure to provide a suitable operating environment, any other excluded use, or any other abuse, misuse, or neglect off the instrument.

# Introduction

## Description

The IonOptix C-Pace EM stretch and pacing system is designed to enable simultaneous stretch and chronic electrostimulation (“pacing”) of cells in culture. The C-Stretch mechanical and electrode assemblies are composed of a micro-stepping motor driving a tray holding up to 6 PDMS chambers. The motor tray forms the structural support to hold 24 vertical pins (4 per chamber). A circuit board with protruding carbon stimulation electrodes is aligned magnetically in the C-Stretch to position the board and provide electrical contact. The carbon electrodes are attached to the underside of the board, positioning the electrodes in the chamber wells where they sit immersed in the culture media. The 26-pin connector’s plastic housing and pins allow voltage to pass from the C-Pace EM high voltage boards to the C-Stretch via a ribbon cable that can be passed between the tissue culture incubator’s gasketed door and the incubator itself. When the ribbon cable is plugged in, the motor and electrodes are electrically connected to the culture pacer. Current flow in the chamber is guaranteed to be zero between pulses. Temperature probes are positioned in four regions of the C-Stretch to provide feedback of the chamber temperature as well as the temperature of critical areas surrounding the electronics and motor of the device.

## Features

- Physically stable assembly
- Carbon electrodes effectively stimulate cells without releasing toxic electrolysis byproducts into media
- Mechanical, unidirectional stretch
- Temperature monitor probes

## Specifications-at-a-Glance

- Stimulation frequency: 0.01-10 Hz
- Electrical pulse duration: 0.4 - 10 ms
- Pulse voltage: up to +/- 40 V
- Current up to 1150 mA
- Mechanical stretching range: 0 - 20%

## Inputs / outputs

- 26-pin ribbon cable connector

## Disposable Culture Chambers

- We support silicone (PMDS) elastic stretch, available from Strex Inc. They can be found at <https://strexcell.com/cell-stretching-system/stretch-chambers/> listed as part number SC-0040 (formerly ST-CH-04).

## Assembly

The C-Stretch motor tray is comprised of two plates, each with 6 pairs of vertical pins. When in motion, the plate closest to the front of the box will be stationary while the second plate will be driven by a powerful micro-stepping motor to provide linear stretch. The electrode circuit board is held in place over the motor tray via two magnets at either end of the stable motor tray plate.

To facilitate assembly, remove the clear Lexan (plastic) cover. The circuit board is held in place magnetically and can be removed by simply pull up on the board, revealing the plates and pins. After removing the circuit board, align a stretch chamber with the pins as shown below. Repeat for the remaining chambers. Add cells and media to each well\* according to your experimental protocol (\*-chambers will require coating, with laminin or fibronectin, for example, to facilitate cell attachment). Then align the circuit board over the magnets so that the electrode pairs drop appropriately into the chamber wells and submerge into the media. After replacing the top cover, place the entire assembly into the incubator and connect to the C-Pace EM. To connect to the C-Pace EM, plug the ribbon cable in to the ribbon cable connector. Run the ribbon cable through the door opening of the incubator. The door will close tightly around it to maintain a good seal.



## Cleaning

The carbon electrodes absorb salts, electrolysis byproducts and protein from the media, and will need to be cleaned. Toxic chemicals leached from the electrodes into the media will kill cells in culture if the electrodes aren't cleaned regularly. The normal method is simple soaking in distilled water with a stirrer for a couple of days. The water should be changed occasionally until the distilled water stops turning pink from residual pH indicator (phenol red) leaching from the carbon. The electrodes should be soaked in water shallow enough that the circuit board is not submerged, but the electrodes are.

We do not recommend the use of an autoclave for sterilization. Do not use strong alkaline detergents. We prefer that users disinfect their C-Stretch with 70% EtOH as an alternative to sterilization in an autoclave. The compartment of the C-Stretch housing the chambers (as opposed to the compartment housing the motor at the rear of the C-Stretch) can be sprayed with 70% EtOH and wiped clean. This disinfection step can be followed by leaving circuit board with the carbon electrodes up under the UV germicidal lamp in the tissue culture hood. This will prolong the life of the C-Stretch and should be sufficient to suppress microbial growth in combination with antibiotics.

It is also a good idea to buy a soft toothbrush and scrub the surface of the electrodes occasionally, especially if you start to notice a difference in the responsiveness or health of the cells. The electrodes are solid carbon, so don't be concerned about rubbing the surface off. The toothbrush will appear black when you are done.

# Index

## A

Assembly 4

## C

Cleaning 5

Connections 3

## D

Declarations 1

Disposal 2

## F

Features 3

## I

Intended Use 1

## S

Safety 1

## W

Warranty 2