Multiwell-MEA-System

High throughput electrophysiology

- 24- and 96-well plates
- Up to 50 kHz sampling rate
- Integrated electrical and optional optical stimulation
- Different well plate variants
- 24 bit data resolution
- Available with liquid handling

www.multichannelsystems.com
**High throughput electrophysiology for screening**

Featuring a 24- and 96-well plate format, the Multiwell-MEA-System from Multi Channel Systems is the perfect tool for medium and high throughput electrophysiology. Being based on the MEA2100-technology, it includes high-quality, low-noise amplifiers and freely-programmable stimulators.

One big advantage of the Multiwell-MEA-System is the high sampling rate. Your data is sampled at up to 50 kHz per channel. Thus, the accuracy of your data is guaranteed, whether you record from cardiac or neuronal samples.

The Multiwell-MEA System has been used to generate action potential (AP) waveforms simultaneously recorded from several independent hiPSCcardiomyocyte (hiPSC-CM) constructs for longitudinal studies.*

**Set up**

The Multiwell-MEA-System from Multi Channel Systems consist of 4 components:

- **Well plates**
  - Available with 24 or 96 wells

- **Headstage**
  - Amplifier & stimulator

- **Interface Board**
  - Connection to computer, various in- and outputs for synchronization

- **PC & Software**
  - Data visualization and analysis

**Well plates**

Multi Channel Systems offers two kinds of well plates. The 24-well plate has 12 electrodes per well, arranged in a 4x4 grid. The 96-well plate features 3 electrodes per well. In all well plates, there is an internal reference electrode in each well and each electrode can be selected for stimulation.

The base of the well plates is made of an opaque epoxy substrate or a transparent glass base, with substrate-integrated gold electrodes. In the 24-well plate version, there are also well plates with a transparent glass base with PEDOT-coated gold electrodes available.

On the bottom of the well plates, you will see the contact pads, which connect to the contact pins of the headstage.

While we generally recommend to always use new multiwell plates for your recordings our customers have successfully established repeated use paying attention to the cleaning and sterilization procedures.*
**Multiwell headstage**

The headstage is the core element of the system. It houses the well plate, amplifies and digitizes the signals, and has an integrated stimulus generator.

The brackets can be opened and closed either by pushing the buttons on the housing or with a single mouse click in the software. By closing the brackets, the contact pads of the well plate connect to the contact pins.

The built-in amplifier makes sure that the recorded signals are amplified close to the signal source, thereby minimizing noise. The data is then sampled at up to 50 kHz/channel, ensuring an excellent data quality.

The headstage also provides an integrated stimulator, which can generate voltage stimulation signals. You can select any electrode for stimulation and design the signal shape via the included software Multiwell-Screen.

The recording chamber can be covered and has an inlet for CO₂. A climate chamber with integrated Faraday cage allows for noise-free recordings and control of pH, temperature, and humidity. Additionally, the headstage has an integrated temperature controller which regulates the temperature of the heating plate right below the wellplate.

**Optical stimulation - MW-opto-STIM**

- 24 or 96 well LED stimulation
- Choose from 5 different wavelengths
- Easy illumination pattern definition with Multiwell-Screen software

Our 24 and 96 well LED-stimulators allow for independent light activation and inhibition protocols in each well which allows the devices to optically trigger opsin-expressing pacemaker cells in cardiac cultures, or perform functional-, reporter- and expression readouts in diverse cell model systems.

Three (or one) selectable high intensity LED in varying colors are available per well which are configured according to your specific experimental conditions. The plates minimize well-to-well cross-talk using opaque casting materials, which are highly reflective to gain optimum light output.

Light pulse patterns are automatically recorded for easy data interpretation. Light triggered PSTH plots are also possible.

The device can also be used independently from the MCS Multiwell-MEA amplifier, making it an ideal tool for all non-ephys-related optogenetic approaches run on a multiwell plate format.

**Interface board 3.0 multiboost**

The MCS-IFB 3.0 multiboost is a new generation of interface boards, which is able to receive data from multiple MCS in vivo and in vitro recording systems, which makes cost-effective combinations with only one interface board and multiple recording systems possible.

As a result, you have even more flexibility in switching between possible configurations for your specific research needs. You can establish your experiments for example on 60 or 120 electrodes with the MEA2100-System, then purchase the Multiwell-headstage and start high throughput screening.

This perfectly combines both high resolution and high throughput electrophysiology.

* For further information please refer to Customer App Notes on MEA AP Measurements and Multiwell MEA repeat use.
**Data analysis with Multiwell-Screen software**

The Multiwell-Screen software package is designed specifically for the needs of screening experiments with the Multiwell-MEA-System. In the beginning, you select whether you record from neuronal or cardiac cells, and then have a tool set specialized for your application.

With both tool sets, you can display your data in real-time on the entire well plate, zoom into one single well and see the signal on one single electrode. You can also filter the data (high-pass, low-pass, Butterworth, Notch etc.) and record digital events.

The software gives you the option to input information on the applied compounds and then calculates the corresponding dose-response curves automatically. Thereby, you can choose if you want to analyze your data for:

- Field-potential duration
- Slope
- Peak-to-peak
- RR-Interval
- Spike count

Within the same software, you can design the stimulation patterns and decide when and where you want to stimulate.

The separate analysis software (Multiwell-Analyzer), which is also included in the system, provides further tools for detailed offline analysis.

Both tools are designed for repeated screening experiments, so saving your settings and experimental layout is quick and easy.

As a policy at Multi Channel Systems, updates of the Multiwell Screen software package will be available online and free of charge, so you are always up-to-date with recent developments.

**Key features**

- Automated report generation (dose-response data, raw data plots and overlay plots)
- CiPA compliant plate layout as predefined template
- Flexible export of results and raw data – Direct export into CiPA reporting forms
- Software supports single and cumulative dosing
- Automated locking mechanism – Easy to integrate into MEA Xpress liquid handling platform
- Definition of independent illumination patterns for opto-STIM device

![Data analysis with Multiwell-Screen software](image)
Add liquid handling to your electrophysiology recording

With MEA Xpress: the complete solution for multiwell microelectrode array (MEA) recordings for 24- and 96-well plates and automated liquid handling.

What does the MEA Xpress do?

- Automates dilution series preparation
- Houses the multiwell plate with your samples
- Automates compound application
- Records electrophysiological data from 288 channels; for cardiac and neuronal samples and compound screening
- Delivers data files with electrophysiological data and meta information ready for analysis in the Multiwell-Analyzer

Your benefits:

- Completely automatic experiments
- Use pre-defined pipetting scripts or customize your own
- Fast drug application: Fills 96-well plate within 20 seconds
- Two pipette mounts (any combination of single- and 8-channel)
- Set up in advance, no user-interference mid experiment
- Noise free electrophysiological recordings
- Highest data accuracy with up to 50 kHz sampling rate
- Atmosphere lid: Keeps physiological conditions in wells consistent
- Various plate types for your sample available (all SBS-compliant): Solution for cardiac and neuronal samples, medium or high throughput
- Tools for liquid handling and MEA recording in one software
- Liquid handling robot can be utilized separately as stand-alone
## SPECIFICATIONS MULTIWELL-MEA-SYSTEM

<table>
<thead>
<tr>
<th>Amplifier:</th>
<th>Heating element and temperature sensor:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data resolution</strong></td>
<td><strong>Accuracy of regulation</strong></td>
</tr>
<tr>
<td>24 bit</td>
<td>± 0.1 °C</td>
</tr>
<tr>
<td><strong>Number of recording channels</strong></td>
<td><strong>Temperature sensor type</strong></td>
</tr>
<tr>
<td>288</td>
<td>PT 100 with 4 wire connection</td>
</tr>
<tr>
<td><strong>Bandwidth</strong></td>
<td><strong>Software:</strong></td>
</tr>
<tr>
<td>0.1 Hz - 10 kHz</td>
<td><strong>Operating system</strong></td>
</tr>
<tr>
<td><strong>Stimulus generator:</strong></td>
<td>Windows 8.1 (64 bit) (English and German versions supported)</td>
</tr>
<tr>
<td><strong>Current stimulation</strong></td>
<td><strong>Data acquisition</strong></td>
</tr>
<tr>
<td>± 500 µA</td>
<td>Multiwell-Screen</td>
</tr>
<tr>
<td><strong>Voltage stimulation</strong></td>
<td><strong>Analysis software</strong></td>
</tr>
<tr>
<td>± 10 V</td>
<td>Multiwell-Analyzer</td>
</tr>
<tr>
<td><strong>Data converter and USB interface:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Control interface</strong></td>
<td><strong>USB 3.0</strong></td>
</tr>
<tr>
<td><strong>Sampling rate</strong></td>
<td></td>
</tr>
<tr>
<td>up to 50 kHz per channel</td>
<td></td>
</tr>
</tbody>
</table>

## WELL PLATE VARIANTS

<table>
<thead>
<tr>
<th>Type of well plate</th>
<th>Base material</th>
<th>Diameter of electrodes</th>
<th>Interelectrode distance (center to center)</th>
<th>Electrodes per well</th>
</tr>
</thead>
<tbody>
<tr>
<td>24W300/30G-288</td>
<td>Glass</td>
<td>30 µm</td>
<td>300 µm</td>
<td>12 + 4 reference</td>
</tr>
<tr>
<td>24W700/100F-288</td>
<td>Epoxy</td>
<td>100 µm</td>
<td>700 µm</td>
<td>12 + 1 reference</td>
</tr>
<tr>
<td>96W700/100F-288</td>
<td>Epoxy</td>
<td>100 µm</td>
<td>700 µm</td>
<td>3 + 1 reference</td>
</tr>
<tr>
<td>96W700/100G-288</td>
<td>Glass</td>
<td>100 µm</td>
<td>700 µm</td>
<td>3 + 1 reference</td>
</tr>
</tbody>
</table>

## SPECIFICATIONS MEA XPRESS

<table>
<thead>
<tr>
<th>Speed</th>
<th>20 seconds/96-well plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>1 - 100 µl</td>
</tr>
<tr>
<td>Accuracy(systematic error) for default pipette models</td>
<td>5 - 50 µl: 1 - 5 %, 30 - 300 µl: 0.6 - 5 %</td>
</tr>
<tr>
<td>Precision(random error) for default pipette models</td>
<td>5 - 50 µl: 0.4 - 5 %, 30 - 300 µl: 0.3 - 2.5 %</td>
</tr>
<tr>
<td>Number of pipette mounts</td>
<td>2 (for any combination of 1- and 8-channel pipettes)</td>
</tr>
<tr>
<td>Protocols</td>
<td>Pre-defined or customizable</td>
</tr>
</tbody>
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The Smart Source for All Your Ephys Needs

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