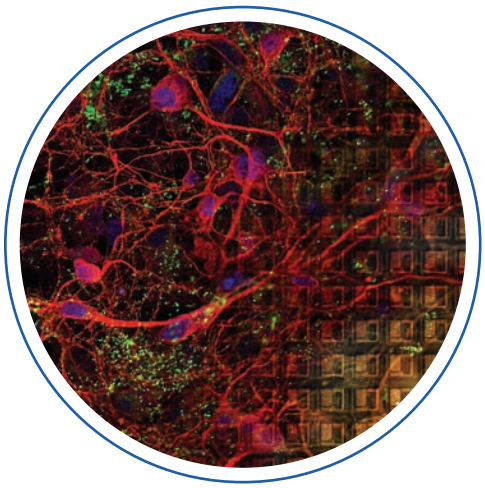
maxwell BIOSYSTEMS

Every Cell Counts.

MaxOne

High-Resolution Functional Imaging

MaxOne HD-MEA



MaxOne, *the most powerful electrophysiology platform for recording and stimulating electrogenic cells in-vitro.*

MaxOne is a CMOS-based high-density microelectrode array (HD-MEA) system. This enables compact yet powerful amplifiers, filters, and digitizers to be integrated within the MEA well—close to the cells under study.

With MaxOne, each cell on the MEA can be accessed by multiple electrodes for recording and stimulation. MaxOne enables long term monitoring of single cell activity, as well as the dynamics of the entire network.

Every cell in the network

- 26,400 electrodes
- 8 mm² sensor area
- 17.5 µm electrode pitch

Flexible stimulation

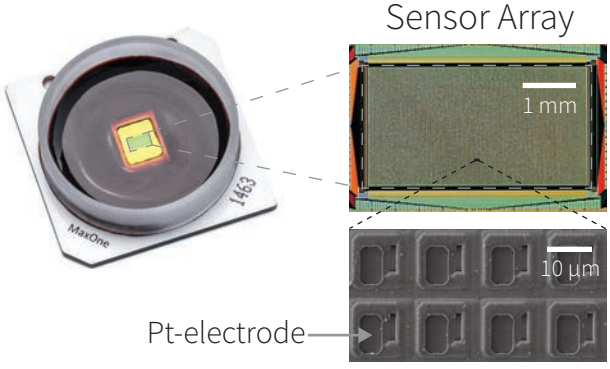
- 32 stimulation units
- Voltage & current mode
- Single cell resolution

Data analysis tools

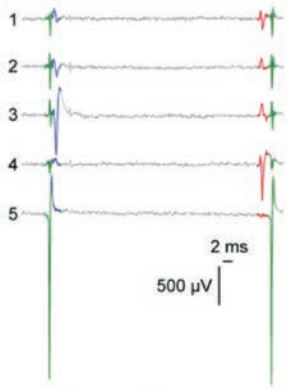
- Preprocessing
- Visualization
- Statistics & reports

High Spatio-Temporal Resolution + High Quality Signals

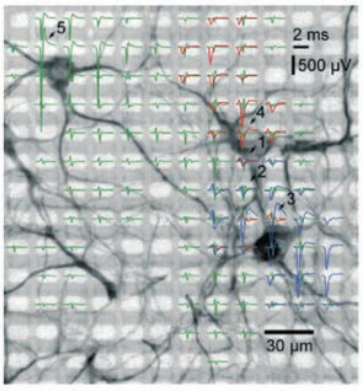
Sensor Array



Raw Traces



Extracellular AP Map



- Allows recording inside cell-culture incubators
- Accessories available for acute tissue experiments
- Perform microscopy using upright objectives
- Tested in different in-vitro preparations (retina, brain slices, cell cultures, etc.)

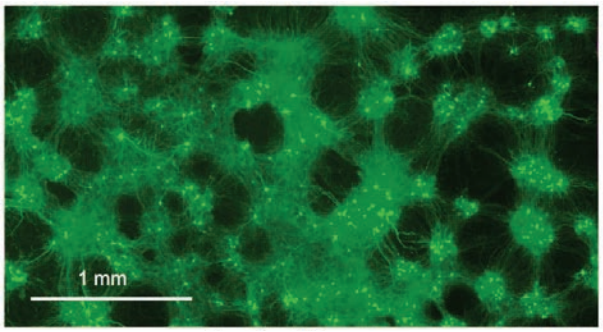
Isolate extracellular action potentials (APs) from individual cells easily.
Electrodes with the best signals from each cell can be selected to facilitate spike sorting.

MaxOne Key Features

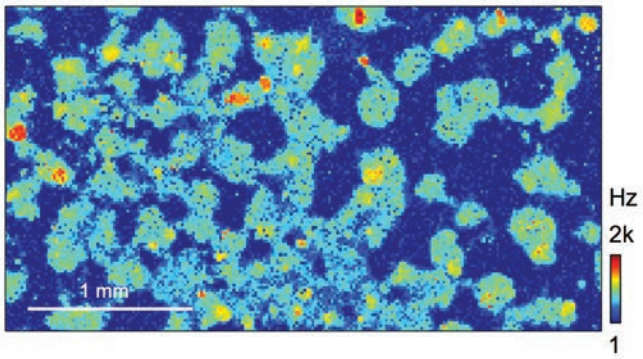
Whole Sample Electrical Imaging

Localize active cells on the MEA during experiments.
The morphological structure of a primary cortical cell culture was imaged using an upright microscope with 10x objective. MAP2 staining was used to visualize the neurons. The optical image closely matches the electrical image obtained using MaxOne. The electrical image provides the location of the cells, as well as information on the activity of the cells, such as spike rate and amplitude.

Optical Image



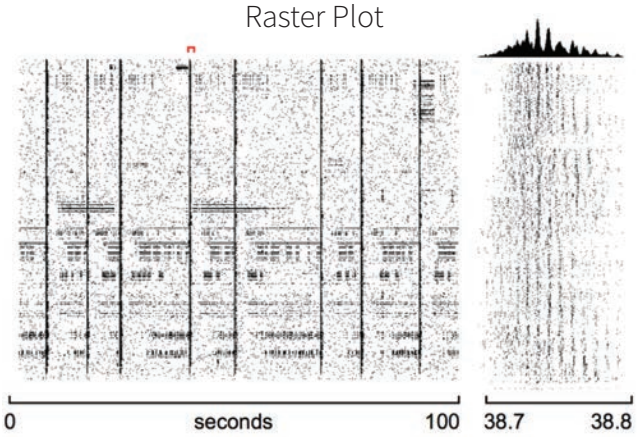
Electrical Image (Spike Rate)



Smart Population Recording

Identify defined cells for long term recording and further analyses.
Different combinations of parameters can be used to automatically select a defined set of cells to be recorded, such as spike rate, amplitude, etc. The raster plot shows the dynamics of the network activity using 1,024 active electrode sites. Burst features can be investigated in detail (one burst zoomed in).

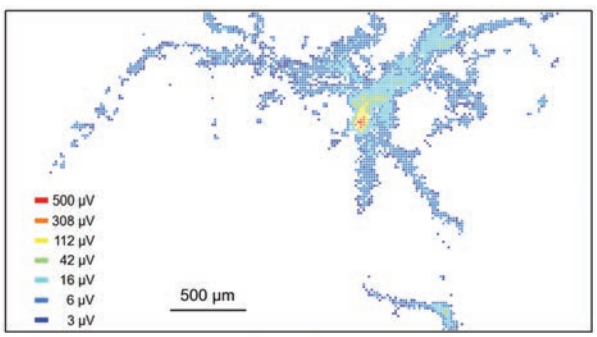
Raster Plot



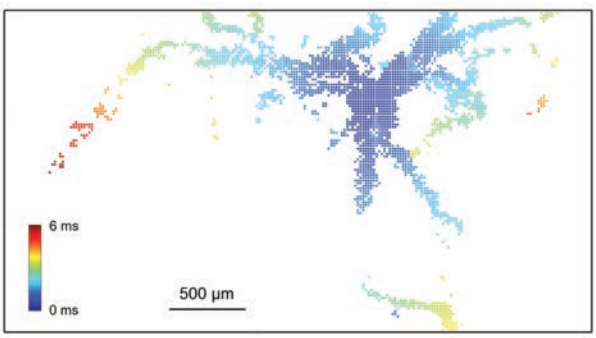
Axon Tracking

Analyze subcellular features, such as full axonal arbors in single neurons.
Electrical signals tracked along neurites enable to investigate novel parameters. High-resolution tracking of axonal action potential propagation allows for investigating changes in axonal conduction velocity.

Full Neuronal Axon Arbor (Amplitude Map)



Full Neuronal Axon Arbor (Delay Map)



MaxOne Specifications

MaxOne HD-MEA

Microelectrodes and Sensor Area

Total no. of electrodes	26,400
El. center-to-center dist.	17.5 µm
Electrode type	Platinum
Electrode sizes	E1: 9.3 × 5.45 µm^2 E2: 11.5 × 9.5 µm^2
Number of pixels	220 × 120
Active sensing area	3.85 × 2.10 mm^2
Electrode density	3,265 els./mm^2

Recording Channels

Total amplification gain	up to 78 dB
No. of recording channels	Full: 1024 Basic: 256
Sampling rate	20 kHz / electrode
ADC Resolution	10 bit
Amplifier noise*	2.4 μV_{rms}
Application noise**	4.4 μV_{rms}
Routing flexibility	Full: unlimited Basic: 4 options

Stimulation Units

No. of stimulation units	32
Maximum current stim.	± 1.6 mA
Maximum voltage stim.	± 1.6 V
Amplitude resolution	2 nA
Time resolution	2 µs
Pattern generation	Programmable

* Action potential (AP) frequency range (300 Hz - 10 kHz)
** Measured with primary cell culture at AP frequency range

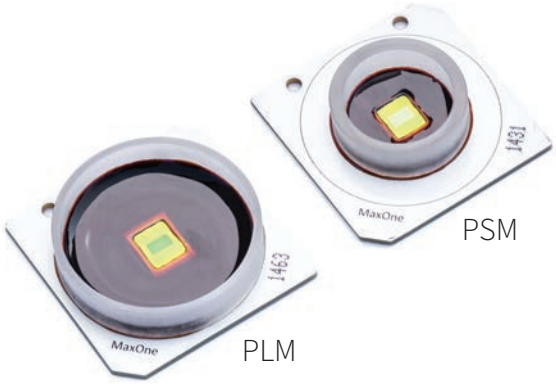
General

Recording Unit

Dimensions (w × d × h)	92 × 149 × 23 mm^3
Weight	495 g
Power consumption	475 mW

HD-MEA Wells

Dimensions (w × d × h)	40 × 40 × 11 mm^3
Weight	8 g
Well size (inner diameter)	PSM: 19 mm PLM: 32 mm
Volume of media	PSM: 1 ml PLM: 2 ml



Software

Data acquisition / analysis	MaxLab Live
Raw data file format	HDF5 (*.h5)
Toolboxes for analysis and visualization	Matlab™ Python®

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MaxWell Biosystems AG
Mattenstrasse 26
4058 Basel, Switzerland
info@mxwbio.com
www.mxwbio.com
+41 61 551 1070

About MaxWell Biosystems
MaxWell Biosystems develops and markets advanced electrophysiology instrumentation for cell assays. Our toolset, consisting of an integrated microelectrode array, acquisition hardware and software, is used in preclinical drug discovery, safety pharmacology, and basic research. MaxOne allows to record and stimulate electrogenic cells, such as neurons and cardiomyocytes, at unprecedented spatial and temporal resolution—providing higher fidelity data, enabling future research, and accelerating drug discovery and development.