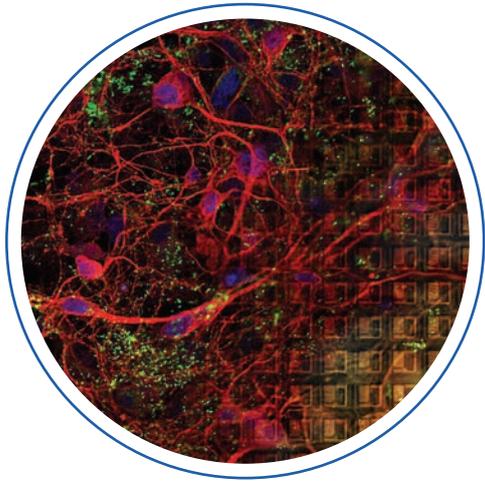


# MaxOne

## 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 mm<sup>2</sup> sensor area
- ⚡ 17.5 μm electrode pitch



Flexible stimulation

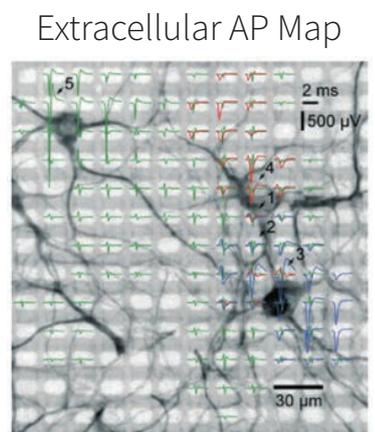
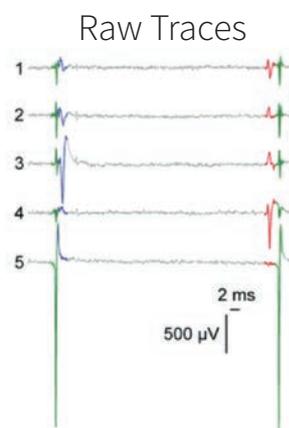
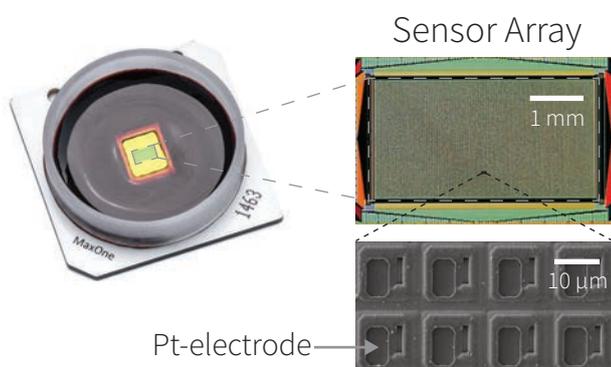
- ⚡ 32 stimulation units
- ⚡ Voltage & current mode
- ⚡ Single cell resolution



Data analysis tools

- ⚡ Preprocessing
- ⚡ Visualization
- ⚡ Statistics & reports

## High Spatio-Temporal Resolution + High Quality Signals



- ⚡ 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

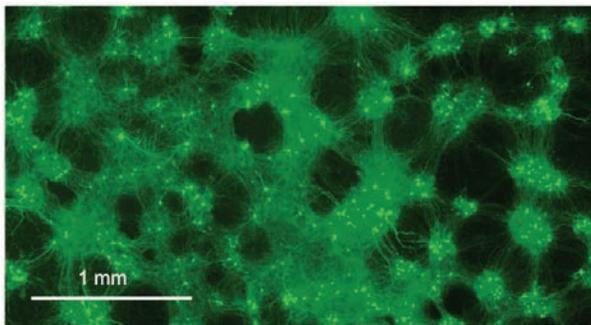


## Whole Sample Electrical Imaging

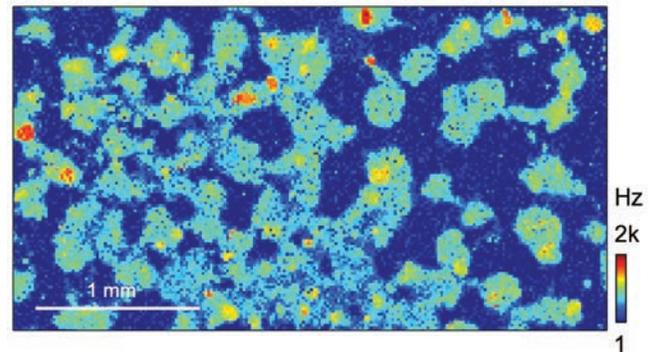
*Localize active cells on the MEA during experiments.*

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)

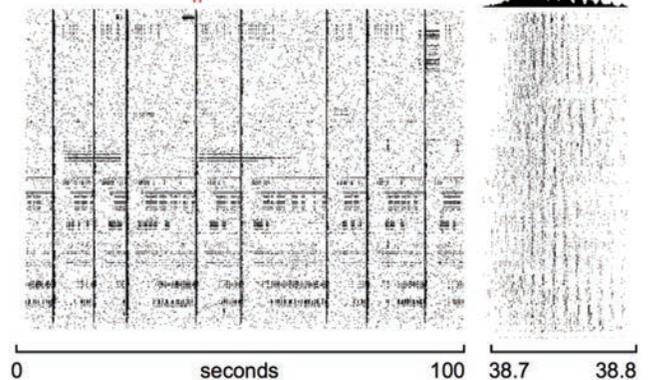


## Smart Population Recording

*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

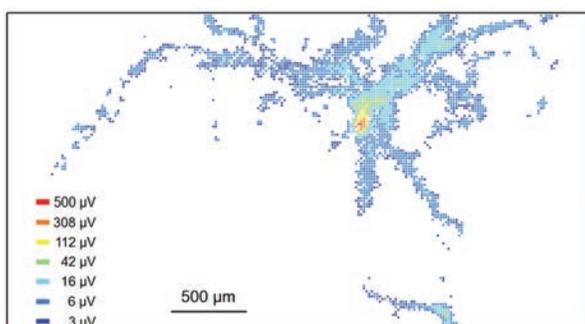


## Axon Tracking

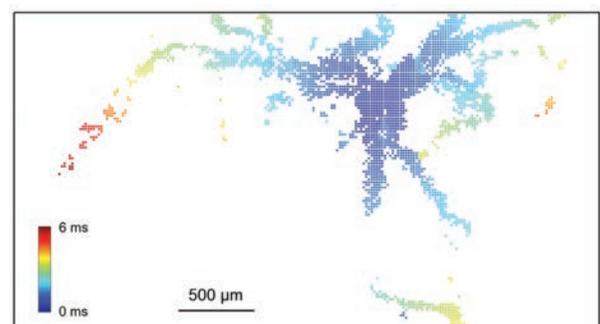
*Analyze subcellular features, such as full axonal arbors in single neurons.*

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 $\mu\text{m}$
Electrode type	Platinum
Electrode sizes	E1: $9.3 \times 5.45 \mu\text{m}^2$ E2: $11.5 \times 9.5 \mu\text{m}^2$
Number of pixels	$220 \times 120$
Active sensing area	$3.85 \times 2.10 \text{ mm}^2$
Electrode density	3,265 els./ $\text{mm}^2$

### 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 $\mu\text{V}_{\text{rms}}$
Application noise**	4.4 $\mu\text{V}_{\text{rms}}$
Routing flexibility	Full: unlimited Basic: 4 options

### Stimulation Units

No. of stimulation units	32
Maximum current stim.	$\pm 1.6 \text{ mA}$
Maximum voltage stim.	$\pm 1.6 \text{ V}$
Amplitude resolution	2 nA
Time resolution	2 $\mu\text{s}$
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)	$92 \times 149 \times 23 \text{ mm}^3$
Weight	495 g
Power consumption	475 mW

### HD-MEA Wells

Dimensions (w × d × h)	$40 \times 40 \times 11 \text{ mm}^3$
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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### 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.

### Disclaimer

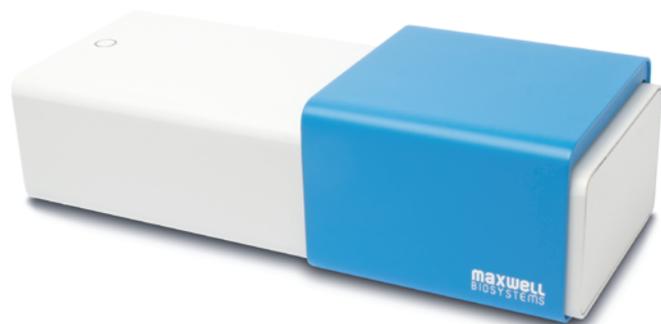
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# MaxTwo

High-Throughput, High-Resolution  
Functional Imaging



### MaxTwo Mainframe



#### Mainframe and Data Transfer

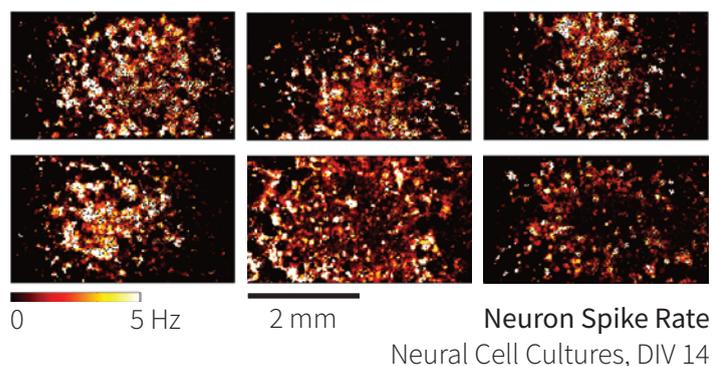
One-button interface	Open / close chamber
Full culture automation	Compatible
Status indicator	LED
Data connection	Gigabit Ethernet
Small outline	40 × 16 × 12 cm <sup>3</sup>

#### Built-in Incubator

Controllable temperature	Ambient + 5°C ~ 60°C
Temp. accuracy	Within 0.1°C
CO <sub>2</sub> control	Yes
Input gas pressure	0.1-0.15 MPa
Humidified	Yes

### Assays

#### Whole Sample Electrical Imaging



### MaxTwo Multi-Well Plate



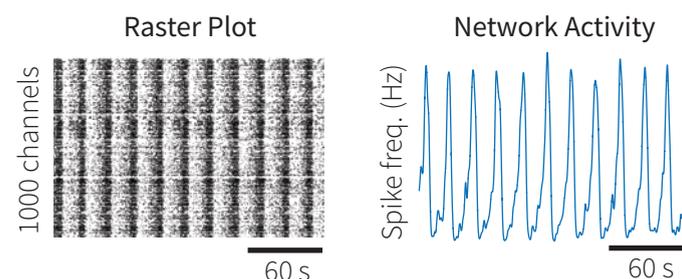
#### Recording and Stimulation Channels Per Well

Programmable gain	up to 78 dB
No. of recording channels	1,024
Sampling rate	20 kHz / electrode
Resolution	10 bit
No. of stim. buffers	32
Stimulation modes	Voltage & Current

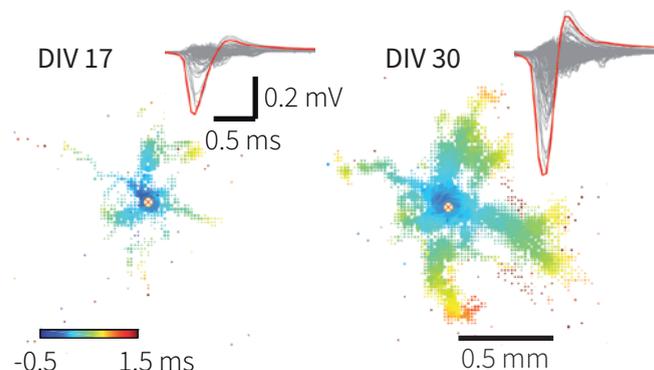
#### Microelectrodes and Sensor Area

Total no. of electrodes	26,400
El. center-to-center dist.	17.5 μm
Electrode type	Platinum
Electrode size	11.5 × 9.5 μm <sup>2</sup>
Active sensing area	3.85 × 2.10 mm <sup>2</sup>

#### Connectivity and Synchronicity Extraction



#### Axonal Conduction Velocity Tracking



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