# MaxTwo

## Multiwell HD-MEA System

Maximize Your Cell Functional Assays

## Every Cell Has a Story to Tell

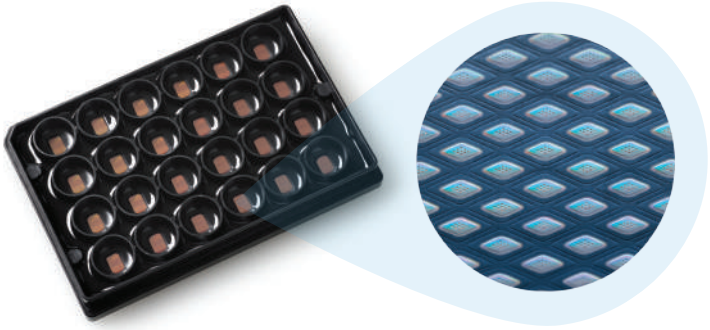
Next-generation multiwell high-density microelectrode array system for functional imaging of your cells.

maxwell BIOSYSTEMS

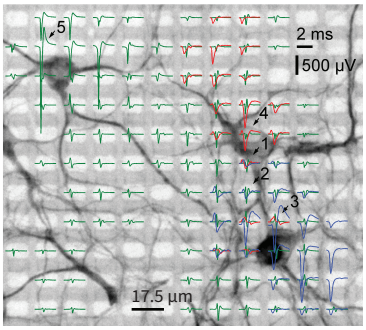
# High-Density Microelectrode Array (HD-MEA)

# MaxTwo

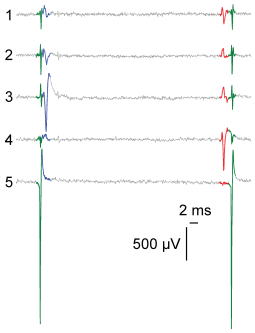
Capturing the intricate dynamics of cellular activity is key for various applications, including phenotype characterization, disease modeling, and drug discovery. With the rapid advancements in in-vitro cell and tissue models, there is an increasing demand for real-time and label-free methods to simultaneously study the function, maturation, connectivity and morphology of cells within the same sample. High-density microelectrode arrays (HD-MEAs) serve as an unparalleled tool for conducting non-invasive in-vitro functional assays.



**MaxTwo HD-MEAs** represent the next-generation electrophysiology platform, featuring densely packed microelectrodes capable of capturing the electrical signature of electrogenic cells with unprecedented precision.




**26'400** Pt-Electrodes Per Well
**3'265** Electrodes/mm²
**Low-Noise** Readouts
**Flexible** Electrical Stimulation




**Readout at different scales**
Network level
Cell level
Subcellular level

Featuring 26'400 electrodes within a large sensor area of 2x4 mm² per well, MaxTwo HD-MEAs meaure the activity of cells across multiple scales – capturing whole network dynamics and identifying single cell function. MaxTwo HD-MEAs' high electrode resolution and low noise ensures that spikes generated by any neuron on the array can be picked up by an electrode in close vicinity. This excellent sensitivity enables to detect cells' small signals, such as in developing induced pluripotent stem cell (iPSC)-derived neurons and propagating action potentials along axonal arbors. MaxTwo HD-MEAs' exceptional data quality enables you to derive fast and meaningful conclusions in your cell-based assays.

# Key Features

### High-Quality Data

Obtain high-resolution and high-quality electrophysiological data while tracking dynamic functional changes at cellular, subcellular, and network levels.

### Sensitivity

Capture the smallest signals (µV) thanks to our low-noise recording channels and the high electrode density, ensuring an electrode in close vicinity to even the weakest signals.

### Throughput

Record from 6 or 24 wells, increasing testing capabilities and decreasing experimental time, while ensuring consistency across wells.

### Reproducibility

Exploit optimized recording strategies to analyze the entire culture at individual neuronal levels, thus enhancing the data reproducibility and statistical power.

### Long-Term Experiments

Assess cell development, maturation, or compound effects by performing longitudinal experiments over the course of days, weeks, and months.

### Integrity

Conduct non-invasive and label-free recordings, eliminating any potential side effects associated with the use of dyes and prolonged exposure to light.

# Applications

Exploring the electrophysiological properties of cells enables to understand functions in healthy and disease states. Additionally, positive or adverse compound effects can be revealed by changes in electrical signatures of cells and networks. An extracellular electrophysiology platform like MaxTwo allows to investigate disease progression, phenotype variations, and the impact of compounds over extended time, all within a multiwell format.


### Phenotyping

Solution for extended cell characterization and longitudinal developmental studies spanning weeks or months.

### Disease Modeling

Versatile platform to study various cellular models of neurodevelopmental and neurodegenerative diseases.

### Drug Discovery

Monitoring of cellular responses to compound administration, ensuring a comprehensive evaluation of drug efficacy.

### Toxicology

Ideal tool to assess safety and toxicity levels of compounds in different cellular models.

# Assays

MaxLab Live Software is a comprehensive and user-friendly tool designed for visualizing, recording, and analyzing data recorded with MaxTwo. Its assays guide the user through automated workflows to the extraction of key metrics at multiple levels, including network, single-cell, and subcellular details.

### ActivityScan

Are the cells active?
Where are they located?

Record whole sample activity through array scanning

Identify the firing activity and location of cells


**Activity Metrics**

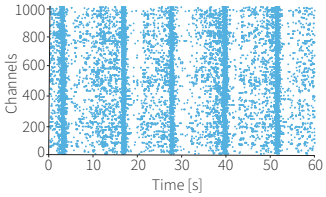
Firing Rate, Spike Amplitude, etc.

### Network

Are the cells interconnected?

Smart electrode selection to record population activity

Identify network-level synchronized activity




**Network Metrics**

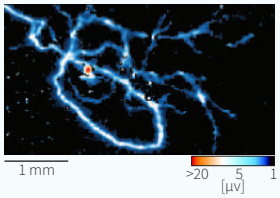
Burst Rate, Burst Duration, etc.

### AxonTracking

Are the axons functional?

Record and automatically identify single neurons

Track axonal arbors and extract action potential conduction velocity




**Axon Metrics**

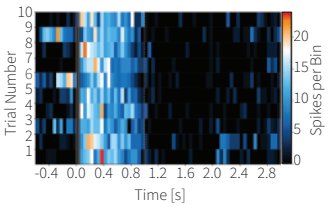
Conduction Velocity, Total Axonal Length, etc.

### Stimulation

How does electrical stimulation affect cells?

Characterize the excitability of cells

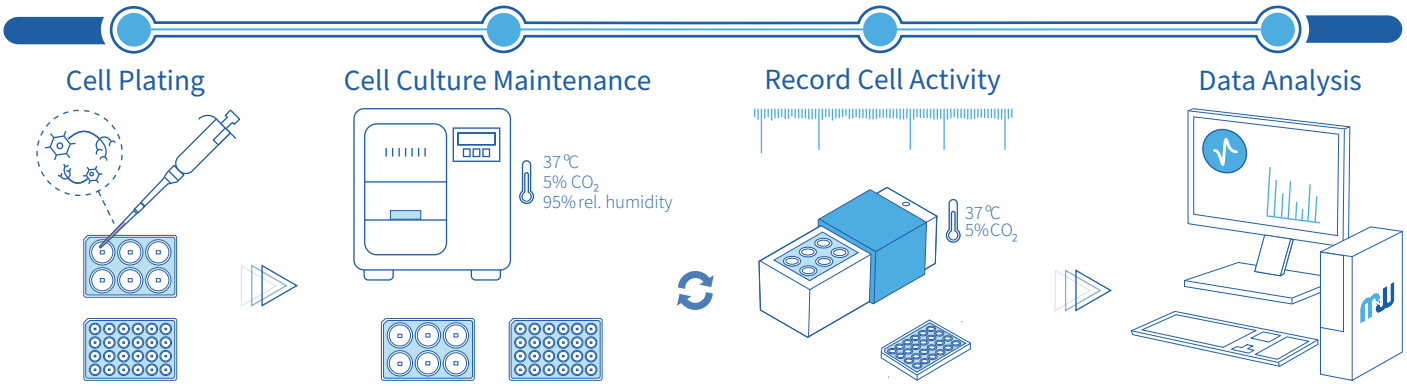
Study stimulation effects on neuronal plasticity




**Stimulation Metrics**

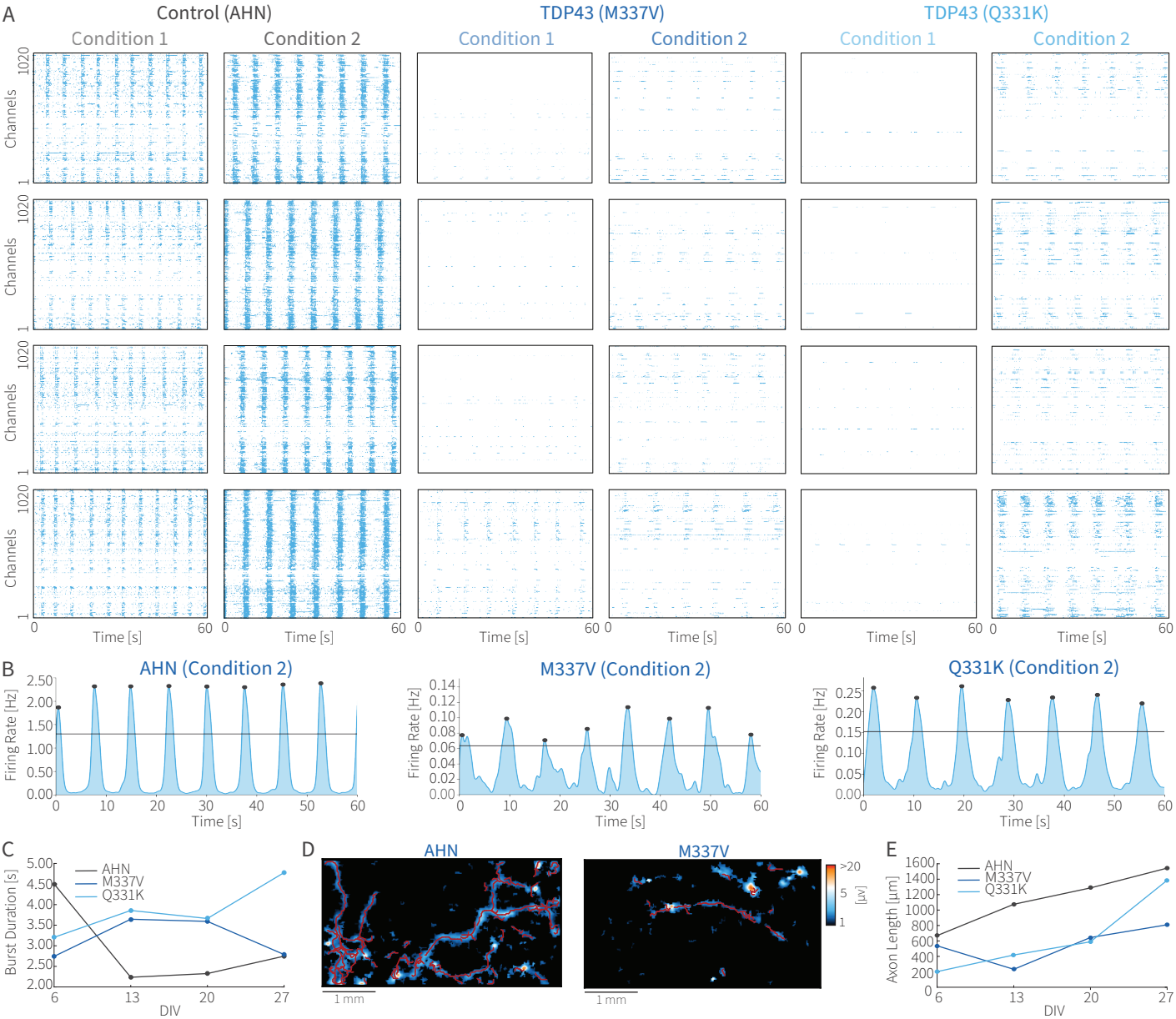
Evoked Total Spikes, Evoked Activity Peak, etc.

# Experimental Workflow




# Case Study

24-Well Plate




**ALS Disease Modeling with iCell Motor Neurons**: Control (AHN) and disease models TDP43 (M337V), TDP43 (Q331K). A), B), D) show data recorded at days in vitro (DIV) 21 from cells co-cultured with iCell Astrocytes 2.0 (C1249) on a MaxTwo 24-Well Plate. **A)** Raster plot of each well highlights well-to-well consistency (conditions grouped by column). **B)** Representative Network Activity plots (left to right: AHN, M337V and Q331K). Please note the y axis difference. **C)** Burst duration plotted over 4 weeks for AHN, M337V and Q331K. **D)** Example Axon Traces (left, AHN; right, M337V). **E)** Total Axon Length over 4 weeks for AHN, M337V and Q331K. Data courtesy: Fujifilm Cellular Dynamics, Inc.

# MaxTwo System

## MaxTwo System Features

| | |
|---|---|
| One-button interface | Open/close the cover<br>Turn on/off the system<br>Lock the well plate |
| System status indicator | LED |
| Dimension (LxWxH) | 40x16x12 $cm^3$ |
| Well-Plate compatibility | 6- and 24-Well Plate |
| Temperature control | Yes |
| $CO_2$ control | Yes, via gas mixer |

# MaxTwo 6-Well Plate

# MaxTwo 24-Well Plate

| MaxTwo Plate Features | 6-Well | 24-Well |
|---|---|---|
| Well-Plate dimension (L x W x H) | 127.8 x 85.8 x 16.1 $mm^3$ | 127.8 x 85.8 x 16.1 $mm^3$ |
| Number of wells | 6 | 24 |
| Well (inner) diameter | 29.0 mm | 15.3 mm |
| Active sensing area | 3.85 x 2.10 $mm^2$ | 3.85 x 2.10 $mm^2$ |
| Total number of electrodes | 6 x 26'400 | 24 x 26'400 |
| Electrode density | 3'265 electrodes/$mm^2$ | 3'265 electrodes/$mm^2$ |
| Electrode center-to-center distance | 17.5 µm | 17.5 µm |
| Electrode size | 12.0 x 8.8 $µm^2$ | 12.5 x 12.5 $µm^2$ |
| Electrode material | Platinum black | Platinum |
| Surface topography | <2.0 µm | <0.3 µm |
| Sampling rate | 10.0 kHz/channel | 10.0 kHz/channel |
| Number of recording channels | 1'020/well | 1'020/well |
| Electrical stimulation | Yes | No |
| Simultaneous recordings | All 6 wells in parallel | 6 wells in parallel, row by row |
| Sterilization | No | EtO treatment according to EN ISO 11737-2 |

## Disclaimer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