M64-GLx

PLANAR ELECTRODE ARRAYS
GLASS SERIES

Low-cost, *in vitro* microelectrode arrays for network electrophysiology:

- 64 low-noise microelectrodes
- 4 integrated ground electrodes
- 300µm glass substrate
- Polymer or SiO_2 insulation
- Pt black or Au electrodes
- Evaporation-reducing lid
- Automatic plate recognition in Axion Muse™ systems

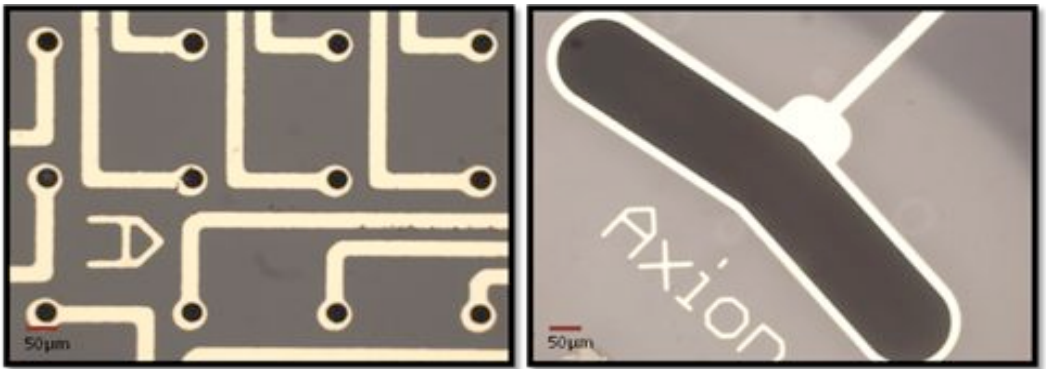
Description

The M64-GLx glass series of microelectrode arrays (MEAs) are ideally suited for the electrophysiological investigation of both neural and cardiac cells. Individual microelectrodes are capable of simultaneously monitoring the activity of a dozen or more cells; the arrangement of multiple electrodes into a grid extends the recording range across a 2x2 mm area, providing concurrent access to both single-cell and network-level activity. The Axion M64-GLx product line is available in a variety of electrode and insulation materials (Pt black and Au electrodes; SiO_2 and SU-8 polymer insulation). Variations in electrode geometry (such as electrode diameter and center-to-center spacing) will be available in the near future.

Features

- 64 microelectrodes in an 8x8 configuration
- 30µm microelectrode diameter
- 200µm electrode spacing (center-to-center)
- 4 GNDs (2 Stimulation & 2 Recording GNDs)
- Platinum black or Gold microelectrodes
- SU-8 polymer or Oxide (SiO_2) insulation
- Ergonomic, clear polystyrene culture well
- Autoplate recognition in Axion Muse™ systems
- 25 KΩ average impedance at 1 khz for platinum black electrodes
- Integrated heating pads & evaporation-reducing lids
- Elevated, bottom-side electrical contacts to prevent residue buildup
- 300µm glass substrate to facilitate inverted microscopy with small working distance objectives
- Alignment features to ensure proper array orientation
- Custom application, specific geometries and materials available

MEA Materials and Variations



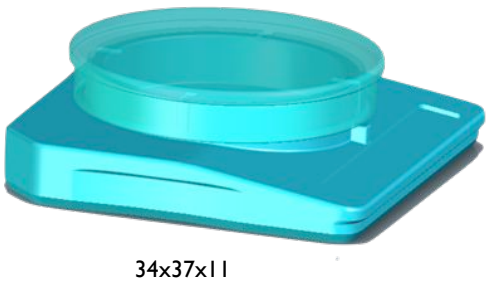
Images of MEAs: Platinum black (low-impedance) electrodes (left) and Ground (right)

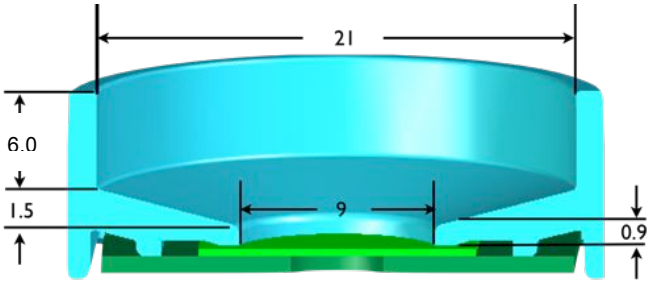
Part Number	Substrate	Electrode Material	Insulation Material
M64-GL1-30Au200	Glass	Gold	SU-8 (Polymer)
M64-GL1-30Pt200	Glass	Platinum Black	SU-8 (Polymer)
M64-GL2-30Au200	Glass	Gold	Silicon Dioxide (SiO_2)
M64-GL2-30Pt200	Glass	Platinum Black	Silicon Dioxide (SiO_2)

M64-GLx-30yy200: ***M64*** designates a 64 electrode MEA intended for use in an Axion Muse System; ***x*** denotes insulation material used (S = 5µm thick SU-8 insulation; O = 2µm thick Oxide, SiO_2); ***yy*** denotes the electrode material (Au = gold electrodes; Pt = Platinum black). 30 and 200 indicate the electrode diameter and center-to-center spacing respectively (in microns).

Culture Well Geometry

The M64-GLx microelectrodes are packaged into an ergonomic polystyrene well with a matching lid for reducing media evaporation. A small inner well accommodates reduced liquid volumes, ensuring that surface coatings and suspended cells remain in the vicinity of the electrodes. Electrical connections to external stimulating and recording electronics are located on the bottom-side of the device (not shown).



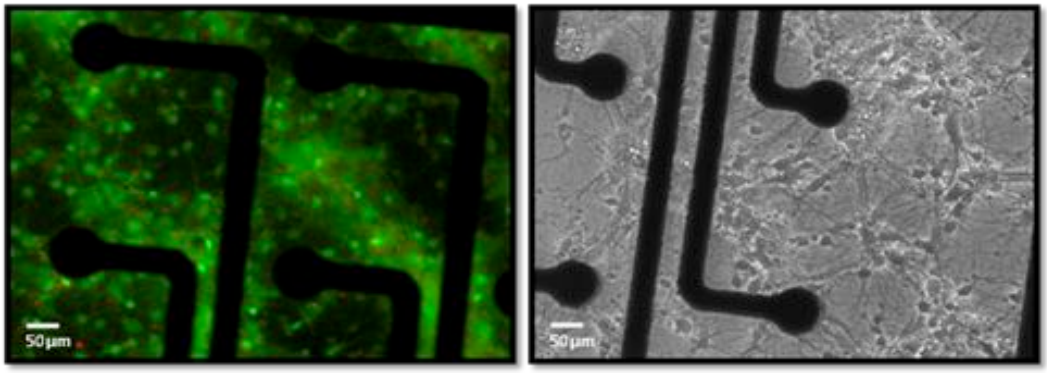


Polystyrene (Blue); Glass chip (Bright Green); Circuit board (Green); Units (mm).

Sample Cell Culture Protocol*

- Treat the surface of the MEA with poly(ethyleneimine) (PEI; 0.05% w/v diluted in sterile 0.1M HEPES, pH 8)
  - Add 75µL directly onto the surface of the MEA.
  - Incubate at 37°C for a minimum of 2hrs.
- Remove PEI solution and rinse three times with sterile deionized water.
- Add 75 µl of laminin diluted in the respective culture media (20 µg/ml)
- Plate cells by adding 50µL of concentrated cells in media directly onto the surface of the MEA. Incubate for 30min at 37°C to allow for cell attachment.
- Add 350µL of media to MEA well.
- Exchange media 24hr post-plating, then every 2-3 days thereafter.

*Protocol has been tested with primary neuronal-astrocytic cocultures (Brain Bits, LLC) cultured at a final plating density of $5x10^5$ cells/cm^2 (Wagenaar et al. J Neurosci Methods 2004; vol. 138, pp.27-37). Culture Medium: high-glucose DMEM, supplemented with 10% horse serum, 1 mM sodium pyruvate, 2.5 µg/ml insulin, and 0.5mM GlutaMax (Invitrogen).



Images of cultures on M64-GLx devices: Live-dead staining of 2-D neuronal cultures growing on the MEAs (left) and high resolution DIC images of cultures using inverted microscopy (right).

Handling Instructions

Do Not Expose SU-8 (M64-GL1) Devices to UV

First use for *non-sterile* MEAs

- Aseptically rinse in sterile ethanol and let it sit for 5 minutes;
- Rinse three times in sterile De-ionized (DI) water for 5 minutes;
- Sterilization: Bake at 56ºC for 6 hours. **Do not exceed 60ºC**.
- Optional: Oxygen plasma treatment for 1 min (may be used to improve cell adhesion to the device)

Reuse

- Soak electrode array in Trypsin at physiologic temperatures (34 - 37 ºC) for 20 minutes
- Sterile ethanol rinse for 5 mins followed by DI rinsing and bake at 56ºC for 6 hours.
- Optional: Oxygen plasma treatment for 1 min

