

Applications Include

- Evoked or Spontaneous Activity (fEPSPs, Spiking)
- Synaptic Plasticity (LTP, LTD)
- Spontaneous Rhythmic Activities and Oscillations
- Pacing and Propagation in Myocytes
- Safety Pharmacology (CNS Toxicity and QT Prolongation)
- Chronic Drug Testing with Cultures
- Stem Cell Research

Amplifier Specifications**MED64 Head Amplifier**

- Number of Channels: 64
- Input Impedance: 100 M Ω
- Output Impedance: 10 k Ω
- Gain: x10 (60 dB)
- Bandwidth: 0.1 Hz to 100 kHz (+0dB to -3dB)

Built-in Stimulator

- Number of Channels: 2
- Output Format: Constant current
- Maximum input voltage: ± 4 V
- Max output current: ± 200 μ A

MED64 Main Amplifier

- Gain: 1-217
- Bandwidth: 0.1 Hz to 10 kHz (+0dB to -3dB)
- Analog Low Cut Filter: 0.1, 1, 10, 100 Hz (-12 dB/oct)

Built-in USB Digitizer

- Resolution: 16 bit
- Sampling rate: 20 kHz

General

- Power supply:
 - AC 100-240V, 50-60 Hz
- Internal power: ± 12 V DC
- Weight: 6.6 + 5.9 kg
- Dimensions: W430 x H74 x D437 mm x two boxes

Watch the whole network without pulling electrodes.

**MED64 Multi-electrode Array**

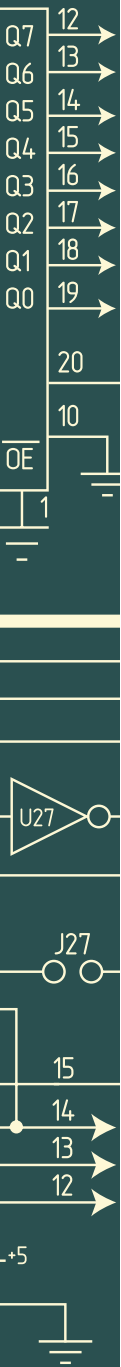
Acquire continuous, reliable, long-term evoked and spontaneous field potentials across 64 channels with two-dimensional, real-time analysis of neuronal/myocardial activity without the difficulties of a patch-clamp rig.

Features**Record extracellular signals across 64 channels without pulling glass electrodes**

- Evoked potentials or spontaneous activity (fEPSPs, spiking) are acquired with 64 planar microelectrodes patterned on the patented MED probe.
- Any of the 64 electrodes can be used for stimulation (up to two at once).
- Can be used with patch clamping, imaging and external stimulation.
- User friendly software guides you through experimental setup, stimulation parameters, drug testing, data recording and analysis.

Low noise and High S/N recording

- Very low impedance planar microelectrodes (typ. 7-10 k Ω at 1 kHz – the lowest on the market) means the MED64 system is relatively unaffected by exogenous noise and does not usually require a Faraday cage.
- High-quality signals can be acquired easily even from acute slices. The low-impedance electrodes result in very low Johnson noise.



Effective stimulation

- The planar microelectrodes coated with platinum black have tremendously high capacitance values enabling high-frequency stimulation with large current amplitudes (up to 200 μA / 0.2 msec).
- Stimulus artifacts have very short durations, so high-quality electrically-evoked signals can be recorded soon after without interference.

Long-term observation without damage to tissue

- Dissociated cells, slices and explants can be cultured directly on the probe.
- The MED probe and connector can be placed in an incubator with 100% humidity. Responses can be recorded for days to months without risking damage to tissue by the planar microelectrodes.

Components

MED64 Integrated Amplifier

- Reliable, low-noise, 64 channel amplifier
- High-bandwidth of 0.1 Hz-10 kHz allows users to record several types of extracellular potentials. Samples at 20 kHz/ch
- Built-in stimulator allows users to study the effects of realistic spatio-temporal stimulation patterns by programming complex induction sequences from any of the two built-in stimulation units
- Fast, easy switching of stimulation sites

MED64 Connector

- Interfaces between the MED64 probe and amplifier
- Provides a stable platform for the MED64 probe
- Multi-layer electrical shielding rejects hum noise and provides excellent signal-to-noise ratios
- No onboard active circuitry, enabling long-term recordings in a humidified incubator
- Heated version available with built-in thermocouple which maintains bath temperature within 1°C (usually < 0.1°C) using a low-noise ThermoClamp controller with or without perfusion.

Comparison of Electrode Impedance

Our proprietary platinum black coating process gives the MED64 probes significantly lower impedance (green line = 20 μm square electrodes, and red line = 50 μm square electrodes in graph to the right) than competing electrodes (purple line = 30 μm round electrodes). This lower impedance means:

- Better signal-to-noise ratio
- Smaller stimulus artifacts. Higher current stimulation (e.g. 200 μA) can also be applied.
- No pre-amplifier required. Connector can be used with long cables and placed in an incubator for long term studies.
- Easy to acquire signals even from acute slices without unnecessary "3D" electrodes or "perforated" dishes.

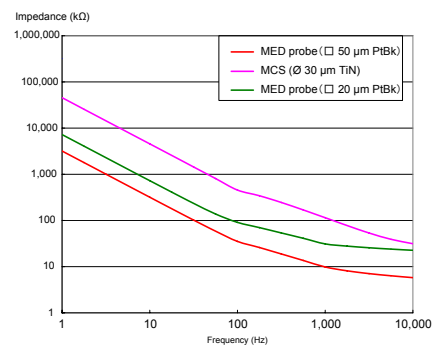
Connector Specifications



- Now available heated
- Probe securing mechanism: Screw down
- Material: Aluminum
- Contact resistance: <30 milliohms
- Printed Wiring: 4 layers (rejects hum noise by a multi-shield structure)
- Dimensions: W174 x H21 x D150mm
- Weight: 480 g



Complete line of specialized perfusion equipment available.



Specifications**Substrate**

Glass Substrate:
50 x 50 x 0.7 mm
Glass cylindrical chamber:
ID=22, OD=25 mm
Conducting layer:
Indium tin oxide (ITO) (0.15 μm)
Insulation layer:
Polyacrylamide (1.4 μm)

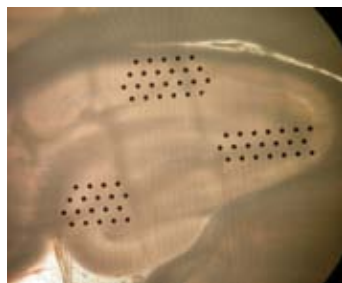
Recording/stimulating electrode

Number of electrodes:
64 (61 for MED-2Hxxx)
Material: ITO + Platinum Black
Size: 50 x 50 μm square
20 x 20 μm (MED-P210x)
Diameter: 20 μm (MED-P2H07x)
50 μm (MED-P5001x & P5002x)
Impedance:
<22 k Ω (MED-P5xxxx)
<40 k Ω (MED-P2xxxx)
(1kHz, 50 mV sine wave)
Maximum voltage: 1 V
Maximum current:
200 μA , 0.1 msec

Reference electrodes

Number of electrodes: 4
Material: ITO + Platinum Black
Size: 200 x 200 μm
Diameter 100 μm x 4 (MED-P2H07x, MED-P5001x)
Impedance:
<2.2 k Ω (1 kHz, 50mV sinusoidal wave)

Available in two chamber depths and four inter-electrode spacings



Hippocampal slice on our MED-P5001A probe designed with electrode groups located at CA1, CA3 and DG.

Effortless electrophysiology.

**MED64 Probes**

Acute or cultured biological preparations are placed or grown directly on a grid of 64 planar microelectrodes, with the capability for stimulation and signal recording.

The standard MED probe has 64 planar microelectrodes arranged in an 8 x 8 grid embedded in the center of a transparent glass plate. The surrounding glass or plastic cylinder makes the MED probe a self-contained recording chamber. Four models with inter-electrode spacings of 100, 150, 300, and 450 μm enable detailed evaluation of network interactions across a sample. Each electrode is 50 μm x 50 μm in size for 150, 300, and 450 μm spacing configuration, or 20 μm x 20 μm for 100 μm spacing configuration.

Also available are probes featuring an electrode pattern specific to hippocampus anatomy and a hexagonal pattern, as well as 2- and 4-well MED probes for increasing throughput.

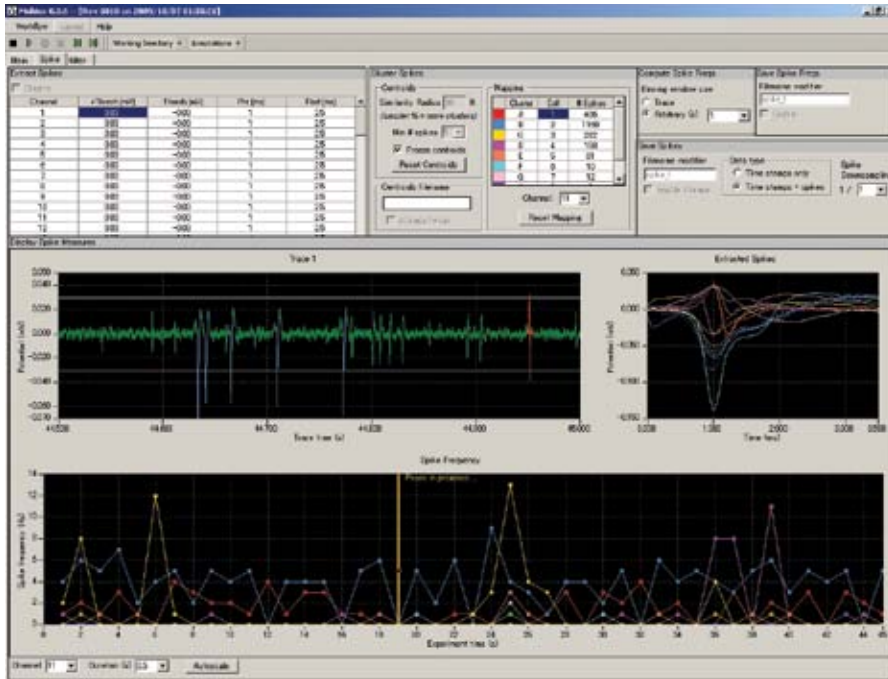
MED64 Ordering Information

Many sizes of probes, electrodes and spacing available. Please see web site for all sizes and part numbers. Minimum order quantity 10 pieces on probes. Please call or email for a quote.

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READY FOR RESEARCH.™

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Highly-sophisticated, user-friendly software.



MED64 Mobius software

Highly-sophisticated, user-friendly software. MED64 Mobius software is a data acquisition and analysis package for the MED64 system, featuring a broad set of analysis functions available both online (i.e. during acquisition) and offline (i.e. post-acquisition). It is designed to be easy for beginners and powerful enough for advanced users. Mobius comes in various application-specific packages including “Evoked Potential Measurements”, “Spike Sorter”, “QT”, as well as combined packages for multi-application users.

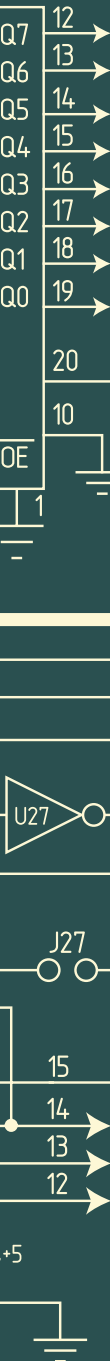
The Mobius user interface consists of various task-specific control panels, which can be quickly combined using a simple workflow editor to create custom experimental protocols and workflows. However, convenient pre-defined “workflow templates” are available for users who want to quickly set-up and run standard types of experiments.

Software Packages EP (Evoked Potential) measurement package

- Evoked local field potentials (e.g. fEPSPs) on all 64 channels can be recorded in response to customizable user-defined stimulation parameters.
- Parameters for acquisition and stimulation including stimulus current amplitude and wave forms are designed easily with a simple control panel.
- Users can design and apply complex stimulation sequences independently for each stimulator. Templates are included for delivery of repetitive (e.g. theta) stimuli.
- Analysis of amplitude, slope and area parameters can be performed automatically during or after acquisition, and graphed independently for each channel. An arbitrary number of measures can be enabled, limited only by the processing power of your PC.

Spike Sorter Package

- Spikes are collected, extracted and sorted on 64 channels on-line and off-line.
- Spike time-stamps, waveforms of extracted spikes, and spike frequency charts can be saved in ASCII text file (csv) format, even WITHOUT saving raw data.
- Raw data can be exported to binary or ASCII text file (csv) formats.



Features

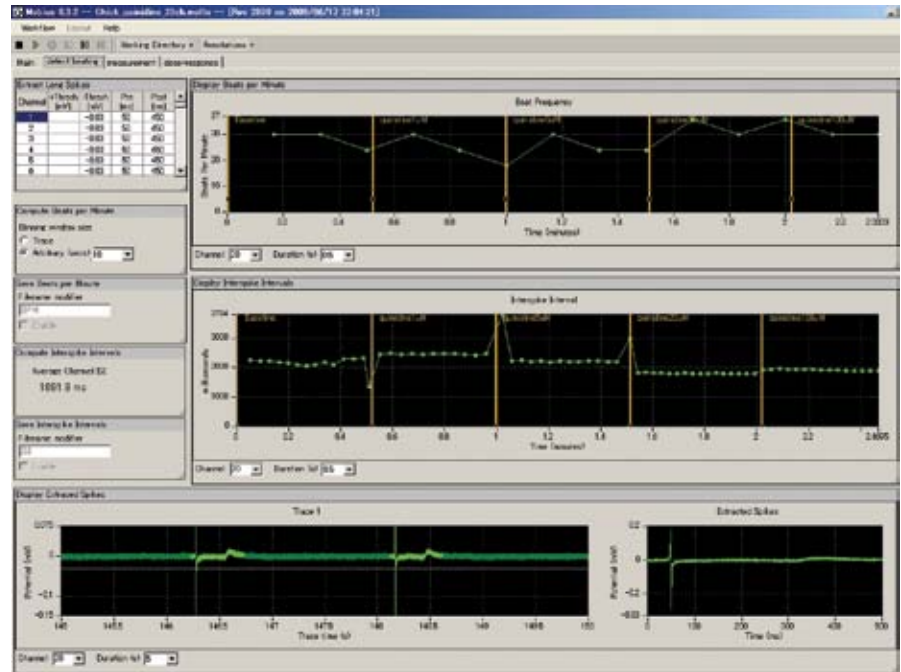
- Ideal for recording and analysis of cardiomyocyte preparations, including iPS/ES cell-derived cardiomyocytes, primary myocyte cultures, and acute heart tissue.
- Signals are recorded at any of 64 channels according to user-defined acquisition parameters.
- Acquisition parameters and channels for analysis are selected easily in a simple control panel.
- Cardiomyocyte signals are automatically extracted according to user-defined thresholds and analyzed for beat frequencies and inter-spike intervals.
- Multiple types of slope, amplitude, time, and area measurements can be performed automatically on extracted signals.
- Field potential duration (FPD) can be also measured from extracted waveforms for studying QT prolongation with the “Time of Amplitude Minimum (or Max) to Minimum (or Max)” measure
- Averages and standard deviations for the beat frequencies, inter-spike intervals, and waveform analyses on all 64 channels can be automatically computed and graphed for each user-defined phase of an experiment. Dose-response curves can thus be easily constructed.

Data Output

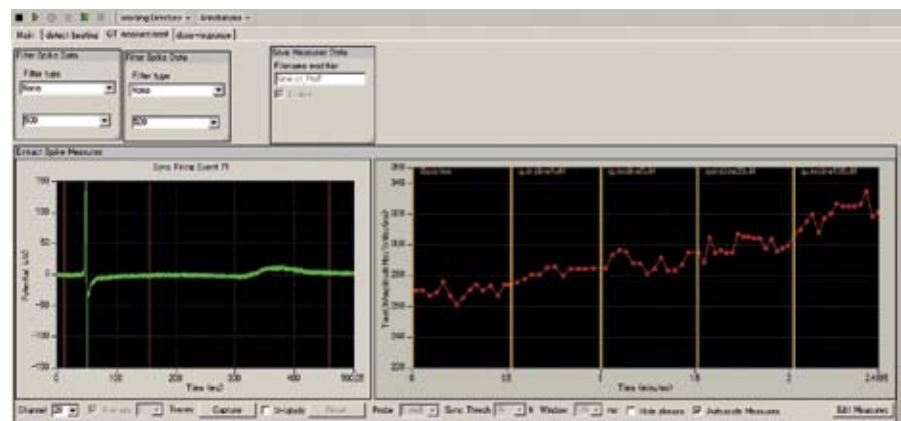
- Raw data can be exported in binary or ASCII text file (csv) format.
- Extracted spikes and all measurement charts can be saved as “csv” formatted text files.

Mobius QT

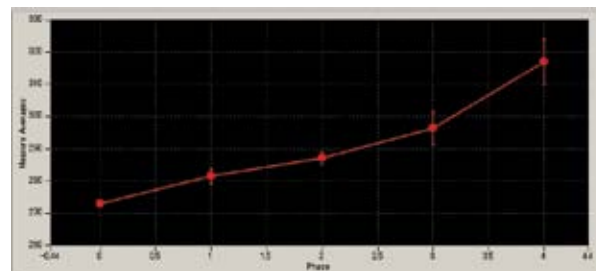
Mobius QT software allows MED64 users to acquire and analyze myocardial signals online and offline. It is the perfect solution for QT screening with iPS/ES cell derived cardiomyocytes.



Beat frequency and inter-beat interval are measured. Myocardial signals are detected (highlighted in bright green).



The time between peaks (i.e. QT interval) is measured and plotted over time.



A dose-response curve is generated.

Perfusion is our specialty.



Keep your cells happy with heated, continuous perfusion

AutoMate Scientific offers a wide array of perfusion options and accessories for the Alpha MED64 system. The Perfusion Cap shown above is ideal for both gas and solution delivery and removal. For applications requiring an open top such as imaging or conventional microelectrode electrophysiology, the Perfusion Pipes shown in the side column make perfusion inflow and outflow easy. Both of these options can be used with AutoMate Scientific's widely-used perfusion systems and ThermoClamp inline heater.

Choose a complete multi-channel drug delivery system with rapid valve switching under computer control, or just a single heated solution line into your probe. We can configure gravity, air pressure or peristaltic pump driven liquid delivery and removal. Take a look at the Perfusion System chapter of our catalog or visit http://www.autom8.com/build_your_own.html. Take the guesswork out of your multielectrode array system with AutoMate Scientific's perfusion experience.

Perfusion Pipes



The Perfusion Pipes are ideal for liquid delivery and extraction when you need the top of the MED64 probe open for imaging or microelectrode electrophysiology.

Peristaltic Pump



Dual-channel peristaltic pump for solution delivery and removal.

ThermoClamp Inline Heater



Inline solution heater pre-heats liquids as they enter the probe. Available with multiple tubes for rapid switching. Internal tubes are all plastic to protect your cells. See the ThermoClamp page.

Incubator



Culture cells on MED64 probes in our incubator. With our modification, you can even record from MED64 probes while inside the incubator. Alpha MED is the only commercially available MEA system suitable for recording while incubating.

