Technical specifications

- **Data resolution**: 24 bit
- **Input voltage**: ± 250 mV
- **Number of recording channels**: up to 256
- **Digital input channels**: 16
- **Digital output channels**: 16
- **Bandwidth**: 0.1 Hz to 10 kHz, software controlled
- **Control interface**: USB 3.0
- **Sampling rate per channel**: up to 50 kHz per channel, software controlled
- **Software Compatibility**: with Multi Channel Suite

Computer and software

The last component of the system is the computer with the software package Multi Channel Suite. The computer is not included in the scope of delivery; however, you can use any computer with a USB connector. What is included, is the Multi Channel Suite software.

It consists of three programs and updates are available for free.

- **Multi Channel Experimenter** is the data acquisition and online analysis tool. With an easy-to-use drag’n’drop interface, you simply create your virtual experiment with e.g. data source, filters, spike detection, and recorder.
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- **Multi Channel DataManager** facilitates the data export for analysis with third-party programs. It supports all files generated with the Multi Channel Experimenter and then exports the data into HDF5 (*.h5) (Matlab, Python, R, etc.), NeuroExplorer (*.neo), Spike2 (*.smr), ASCII file (*.txt), or European Data Format (*.EDF+).
- **Coming soon**: The Multi Channel Experimenter already allows spike detection in real time. To complete this tool, MCS is currently working on unsupervised on-line spike sorting, which is going to be released in spring 2019.
**Tethered in vivo recording system with 16-256 channels: ME2100-System**

The ME2100-System is a tethered in vivo recording system. It is the complete setup for anesthetized/head-fixed animals, including everything you need for your experiment. The system consists of a signal collector unit for up to four headstages, which also controls up to four optical stimulation units including high power LED (not included). The recording headstage is connected via eSATA cable to the interface board. Up to two signal collectors can be connected to one interface board. Headstages have up to 32 recording channels plus ground and reference inputs. Stimulators and amplifier are all directly on the headstage, which allows low-noise, high quality data acquisition.

**ME2100-µPA-Headstages - Powerful stimulation**

The integrated stimulation capabilities of the ME2100-System allow high quality acute recordings with direct closed loop stimulation, either by electrical or optical stimulation. A freely programmable on board DSP allows stimulation latencies as short as 1ms.

Two independent stimulators per headstage can be connected to any recording electrode, or one or two external stimulation electrodes connected to the headstage, by software command. Apart from the stimulation options, the headstages guarantee very exact data, because they sample the incoming signals at 50 kHz per channel (24bit resolution), at an ultra-low noise level (1µVRMS) and a large signal input range (±500mV).

**ME2100-µPA-Headstages - Small footprint recording**

The micro preamplifier (µPA) with 16 or 32 electrode inputs is connected to the microelectrode probes for providing the initial tenfold amplification stage. Signal integrity is safeguarded and noise pick up significantly reduced by this compared to the use of signal buffers with gain 1. The recording headstages have the benefit of being very small in size (from 17 mm x 17 mm x 2.5 mm) and situated in a lower price range. Like their bigger counterpart the µPA-Headstages sample incoming signals at 50 kHz per channel (24bit resolution), at an ultra-low noise level (1µVRMS) and a large signal input range (±250mV).

**Signal collector unit**

The signal collector unit receives data from up to four headstages. Two signal collector units can be connected to one interface board. Apart from receiving and transferring data, the SCU is also able to control up to four optical stimulation units, including high power LED.

**Interface board multiboot**

The interface board receives data from the signal collector unit via a high speed eSATA cable. In the interface board, you find a freely programmable digital signal processor, which can be used for real-time signal detection and feedback. Moreover, you find various analog and digital in- and outputs for synchronization with other instruments. The interface board connects to the computer via USB 3.0 SuperSpeed.

The MCS-IFB 3.0 multiboot is a new generation of interface boards, which enables you to operate a wide range of MCS in vitro and in vivo headstages: MEA2100-HS, MEA2100-Mini-HS, Multiwell-MEA-HS, CMOS-MEA-HS, W2100-RE, and ME2100-HS. This allows cost-effective combinations with only one interface board and multiple recording systems.

**Real-time signal detection and feedback**

The real-time signal detection/feedback is an advantageous feature if you need fast and predictable reactions related to recorded analog signals with minimum time delay. Before, the signal had to be analyzed by the computer, which led to an unpredictable time delay of the stimulus of at least 100 ms. By moving the analysis from the PC to the DSP (Digital Signal Processor) integrated in the ME2100-System, the detour is obsolete and the time delay is now far below 1 ms. All you need to do is to define the condition for the feedback and download it to the ME2100-System (1). During recording (2), the DSP filters the data and detects spikes (3), checking whether your condition is fulfilled. When a designated event is detected, the integrated stimulus generator produces the stimulus pulse (4).

**Higher channel count with eight headstages**

The ME2100-System offers the possibility to record from up to 8 headstages. You can connect two signal collector units to one interface board. Each signal collector unit can receive data from up to four headstages. Thereby, you can build a system with 8 headstages, recording from up to 256 channels.

The interface board and signal collectors are equipped for this high channel count from the beginning. This way, you can start with one headstage (16 or 32 channels) and add-on more as you go. This gives you the flexibility to adjust the system to your changing experimental needs.

**Electrode arrays**

The ME2100-System can be operated with most commercially available probes. MultiChannel Systems offers flexible MEAs, made of polyimide foil. The FlexMEA32 and EcoFlexMEA36 can be connected directly to the ME2100-headstage. You can also use other electrode arrays, for example probes from Neuronexus Technologies or ATLAS Neuroengineering. Probes with Omnetics connector can be connected via an adapter. We have a wide range of adapters available. If you do not find the one you need, please contact us. We will certainly find a solution that fits your needs.
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• Up to eight 32 channel headstages
• 24 bit resolution
• Filter bandwidth adjustable via software
• Integrated stimulation and real-time feedback
• Programmable output for optical stimulation

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Multi Channel Systems MCS GmbH
Aspenhaussr. 21
72770 Reutlingen
Germany
Phone +49-7121-909 25-25
Fax +49-7121-909 25-11
sales@multichannelsystems.com
www.multichannelsystems.com

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