Higher throughput with flexible multi-well solutions

The MEA2100-System offers the possibility to connect two headstages to one interface board. This way, you can record from up to 240 channels. For example, you can connect two headstages for two 60-electrode MEAs each. If four 6-well MEAs are used in two headstages, it is possible to record from 24 wells in parallel. However, you are not limited to multi-well solutions. By using different MEAs, the setup can be optimized for a completely different application within seconds.

- Integrated stimulation and blanking
- Filter bandwidth adjustable via software
- 24 bit resolution
- Real-time feedback
- Up to 256 recording channels
- Variable contact units for microelectrode arrays with 60, 120 or 256 electrodes

Versatile in vitro recording system: MEA2100-System

The MEA2100-System: Technical Specifications

**General characteristics**
- Dimensions (W x D x H)  Headstage: 250 mm x 151 mm x 25 mm
  Interface board: 250 mm x 83 mm x 25 mm
- Weight  Headstage: 1.5 kg
  Interface board: 0.5 kg

**Amplifier**
- Data resolution  24 bit
- Number of recording channels 60-256 (depending on headstage type)
- Bandwidth  0.1 Hz to 10 kHz

**Stimulus generator**
- Number of stimulation channels 3 independent patterns per MEA slot (2 for MEA2100-HS256)
- Available waveforms  rectangular, sine wave, arbitrary
- Output current  ± 1.5 mA
- Output voltage  ± 12 V

**Data converter and USB interface**
- Control interface  USB 3.0
- Sampling rate per channel up to 50 kHz per channel

**Heating element and temperature sensor**
- Temperature accuracy  ± 0.1 °C
- Temperature sensor type  PT 100 with 4 wire connection

**Software**
- Operating system  Windows 10, 8.1 or 7 (64 bit)
  English and German versions are supported
- Multi Channel Experimenter  Version 2.7.3 and higher
- Multi Channel Analyzer  Version 2.7.3 and higher
- Multi Channel DataManager  Version 2.1.0 and higher
- Data export  HDF5 (*.h5) (Matlab, Python, R, etc.), NeuroExplorer (*.nex),
  Spike2 (*.smr), ASCII file (*.txt), European Data Format (*.EDF+)

In the 6-well microelectrode array, the 60 recording electrodes are divided into 6 independent wells with 10 recording electrodes each. Independent measurements can be performed in each well. These arrays are ideal for toxicology, stem cell research, and safety pharmacology, as they considerably increase the throughput of your system. A maximum of 24 wells on four MEAs can be recorded in parallel with one MEA2100-System.

6-well MEA

In the 6-well microelectrode array, the 60 recording electrodes are divided into 6 independent wells with 10 recording electrodes each. Independent measurements can be performed in each well. These arrays are ideal for toxicology, stem cell research, and safety pharmacology, as they considerably increase the throughput of your system. A maximum of 24 wells on four MEAs can be recorded in parallel with one MEA2100-System.

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, MEA2100-Data-Screen, 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. As a result, you have even more flexibility in switching between possible configurations for your specific research needs. You can expand your experiments for example on 60 or 120 electrodes with the MEA2100-System, then purchase the Multiwell-headstage and start high throughput screening.

It is also possible to use the same interface board for in vitro NIA experiments and wireless in vivo recordings. This new interface board provides flexibility at its best.
Versatile in vitro recording system: MEA2100-System

The MEA2100-System is a versatile in vitro recording system with integrated stimulation, following the tradition of high-quality, low-noise amplifiers. It is the complete setup for extracellular recordings from microelectrode arrays (MEAs), including everything you need for your experimental data acquisition (computer with software; interface board; MEA-headstage with integrated stimulation; MEAs, as well as temperature controller and perfusion heating). Thanks to its compact design, you can position the MEA-headstage on any inverted or upright microscope. It is connected via a single VGA cable to the interface board, which offers various analog inputs and digital in-/outputs for synchronization with other instruments.

Multiple headstages

The flexibility of the MEA2100-System is also reflected in the possibility to connect two or more MEA-headstages to one interface board. This way, you can record from up to 240 channels. By using two headstages with 60-electrode MEAs each, you have a high-density recording system and increased throughput. The headstages are controlled independently by opening multiple instances of the data acquisition software.

Stimulation integrated in MEA-headstage

The integrated stimulus generator offers up to 12 different stimulation patterns (monophasic, biphasic, burst) for available MEA. You can choose between current and voltage stimulation and select each electrode for stimulation. All configurations (stimulation patterns, output, and electrodes) are defined via the included Multi Channel Suite data acquisition software, so you can control all parameters of your experiment from within a single program.

Flexible and powerful: Multi Channel Suite

The Multi Channel Suite data acquisition and analysis program is highly adaptable with essentially limitless possibilities. Multi Channel Suite is a brand new software based on more than 20 years of experience.

Real-time signal detection and feedback

Real-time signal detection and feedback is integrated in all MEA2100-40 and -120-Systems. It is an essential feature if you need fast and predictable reactions related to recorded analog signals without time delay. Normally, the signal must be analyzed by the computer, which leads 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 interface board of the MEA2100-System, the delay is abolished and the time delay reduced well below 1 ms. Simply define the condition for the feedback and download it to the interface board (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 generates the stimulus pulse (4).

60-electrode MEAs: The widest range

MEAs with 60-electrodes are available in many variations. They are offered as standard glass as well as perforeted MEAs, with different electrode materials (titanium nitride, gold) and in various layouts. You can choose between different electrode diameters and spacings, with 256 MEAs. Our thin MEAs have an electrode diameter of 160 µm, which makes them ideal wherever high resolution imaging is combined with MEA technology.

In this range, you will definitely find the right MEA for your application. If you need any help in selecting the most appropriate type, please contact our support team.

MEA with 120 electrodes

The MEA2100-System is the only MEA-System that can be operated with MEAs with 120 electrodes. They are arranged in a 12x12 grid, spanning 6- and 9-well MEAs and well suited for imaging. To increase throughput further, there are also 6- and 9-well MEAs available.

MEA with 256 electrodes

MEAs with 256-electrodes are arranged in a 16x16 grid. There are MEAs with 60, 90, 100, or 200 µm electrode spacing and 6, 10, or 20 µm electrode diameter available. 256 MEAs are also available as ThinMEMs, which are as thin as a coverslip (180 µm). This makes them ideally suited for high-resolution imaging. To increase throughput further, there are also 6- and 9-well MEAs available.
**Versatile in vitro recording system: MEA2100-System**

The MEA2100-system is a versatile in vitro recording system with integrated stimulation, following the tradition of high-quality, low-noise amplifiers. It is the complete setup for extracellular recordings from microelectrode arrays (MEAs), including everything you need for your experiment: data acquisition computer with software; interface board; MEA-headstage with integrated stimulation; MEAs, as well as temperature controller and perfusion heating. Thanks to its compact design, you can position the MEA-headstage on any inverted or upright microscope. It is connected via a single WAGO cable to the interface board, which offers various analog inputs and digital in-/outputs for synchronization with other instruments.

**Variable contact unit**

The interface board of the MEA2100-System is flexible. Multi-Channel Systems offer various contact units for the MEA-headstage. Variants for one 60-electrode MEA, one 120-electrode MEA, one 256-electrode MEA, and various contact units for the MEA-headstage can be changed according to your experimental needs.

**Multiple headstages**

The flexibility of the MEA2100-System is also reflected in the possibility to connect two MEA-headstages to one interface board. This way, you can record from up to 240 channels. By using two headstages with 60-electrode MEAs each, you have a complete system and increased throughput. The headstages are controlled independently by opening multiple instances of the data acquisition software.

**Stimulation integrated in MEA-headstage**

The integrated stimulus generator offers up to 12 different stimulation patterns (monopolar, bipolar, biphasic) for available MEA. You can choose between current and voltage stimulation and select each electrode for stimulation. All configurations (stimulation patterns, output, and electrodes) are defined via the included Multi Channel Suite data acquisition software, so you can control all parameters of your experiment from within a single program.

**Flexible and powerful: Multi Channel Suite**

The Multi Channel Suite data acquisition and analysis program is highly adaptable with essentially limitless possibilities. Multi Channel Suite is a brand new software based on more than 20 years of experience.

**Real-time signal detection and feedback**

Real-time signal detection and feedback is integrated in all MEA2100-60 and -120-Systems. It is an essential feature if you need fast and predictable reactions related to recorded analog signals without time delay. Normally, the signal must be analyzed by the computer, which leads 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 interface board of the MEA2100-System, the delay is abolished and the time delay reduced well below 1 ms. Simply define the condition for the feedback and download it to the interface board (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 generates the stimulus pulse (4).

**Stimulation integrated in MEA-headstage**

The integrated stimulus generator offers up to 12 different stimulation patterns (monopolar, bipolar, biphasic) for available MEA. You can choose between current and voltage stimulation and select each electrode for stimulation. All configurations (stimulation patterns, output, and electrodes) are defined via the included Multi Channel Suite data acquisition software, so you can control all parameters of your experiment from within a single program.

**60-electrode MEAs: The widest range**

MEAs with 60 electrodes are available in many variations. They are offered as standard glass as well as perfused MEAs with different electrode materials (titanium, nickel, gold), and in various layouts. You can choose between different electrode diameters and spacings, ball or 4x1 grid, or select a high-density layout. These MEAs are also available as “ThinMEAs”, which are as thin as a coverslip (180 µm). This makes them ideally suited to any high-resolution imaging combined with MEA technology.

In this range, you will definitely find the right MEA for your application. If you need any help in selecting the most appropriate type, please contact our support team.

**MEAs with 120 electrodes**

The MEA2100-System is the only MEA-System that can be operated with MEAs with 120 electrodes. They are arranged in a 12x12 grid, sparing 6 electrodes in each corner. Any electrode is selectable for stimulation via the included software, just click on the respective electrode to select it for stimulation. Currently, 120MEAs are available with 100 µm, 300 µm, or 1000/1500 µm electrode spacing and 10 or 30 µm electrode diameter. There are both standard glass and perforated MEAs. Other configurations are under development. Please contact us if you need a custom layout.

**MEAs with 256 electrodes**

MEAs with 256 electrodes are arranged in a 16x16 grid. There are MEAs with 20 µm, 60 µm, 100 µm, or 200 µm electrode spacing and 8, 10, or 30 µm electrode diameter available. 256MEAs are also available as “ThinMEAs”, which are as thin as a coverslip (180 µm). This makes them ideally suited to any high-resolution imaging combined with MEA technology. To increase throughput further, they are also 6- and 9-well MEAs available.

**Variable contact unit**

The interface board of the MEA2100-System is flexible. Multi-Channel Systems offer various contact units for the MEA-headstage. Variants for one 60-electrode MEA, one 120-electrode MEA, one 256-electrode MEA, and various contact units for the MEA-headstage can be changed according to your experimental needs. The rest of the setup is not affected, so changing the contact unit is simple, quick, and cost-effective.

**Multiple headstages**

The flexibility of the MEA2100-System is also reflected in the possibility to connect two MEA-headstages to one interface board. This way, you can record from up to 240 channels. By using two headstages with 60-electrode MEAs each, you have a complete system and increased throughput. The headstages are controlled independently by opening multiple instances of the data acquisition software.

**Stimulation integrated in MEA-headstage**

The integrated stimulus generator offers up to 12 different stimulation patterns (monopolar, bipolar, biphasic) for available MEA. You can choose between current and voltage stimulation and select each electrode for stimulation. All configurations (stimulation patterns, output, and electrodes) are defined via the included Multi Channel Suite data acquisition software, so you can control all parameters of your experiment from within a single program.

**Flexible and powerful: Multi Channel Suite**

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**Real-time signal detection and feedback**

Real-time signal detection and feedback is integrated in all MEA2100-60 and -120-Systems. It is an essential feature if you need fast and predictable reactions related to recorded analog signals without time delay. Normally, the signal must be analyzed by the computer, which leads 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 interface board of the MEA2100-System, the delay is abolished and the time delay reduced well below 1 ms. Simply define the condition for the feedback and download it to the interface board (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 generates the stimulus pulse (4).
**Stimulation integrated in MEA-headstage**

The integrated stimulus generator offers up to 2 different stimulation patterns per MEA. You can choose between current and voltage stimulation. All configurations (stimulation patterns, output, and electrodes) are defined via the included Multi Channel Suite data acquisition software, so you can control all parameters of your experiment from within a single program.

- **60-electrode MEAs**: The widest range
- **MEAs with 120 electrodes**: The multi-electrode MEAs have a design optimized for high-resolution imaging. They are similar in design and function to the 60-electrode MEAs, with the addition of a second set of electrodes. The second set of electrodes allows for simultaneous stimulation and recording from two independent sets of electrodes.
- **MEAs with 256 electrodes**: MEAs with 256 electrodes are designed for high-resolution imaging and high-throughput experiments. They are capable of recording from up to 256 electrodes simultaneously, making them ideal for large-scale recordings from complex neuronal networks.

### Variable contact unit

The Variable contact unit of the MEA2100-System is essential for flexibility. It allows you to change the contact unit of the MEA-headstage with integrated stimulation, following the tradition of high-quality, low-noise amplifiers. It is the complete setup for extracellular recordings from microelectrode arrays (MEAs), including everything you need for your experiment: data acquisition computer with software, interface board; MEA-headstage with integrated stimulation; MEAs, as well as temperature controller and perfusion heating. Thanks to its compact design, you can position the MEA-headstage on any inverted or upright microscope. It is connected via a single WAGO cable to the interface board, which offers various analog inputs and digital in-/outputs for synchronization with other instruments.

### MEA2100-System

The MEA2100-System is a versatile in vitro recording system with integrated stimulation, following the tradition of high-quality, low-noise amplifiers. It is the complete setup for extracellular recordings from microelectrode arrays (MEAs), including everything you need for your experiment: data acquisition computer with software, interface board; MEA-headstage with integrated stimulation; MEAs, as well as temperature controller and perfusion heating. Thanks to its compact design, you can position the MEA-headstage on any inverted or upright microscope. It is connected via a single WAGO cable to the interface board, which offers various analog inputs and digital in-/outputs for synchronization with other instruments.

### Multiple headstages

The flexibility of the MEA2100-System is also reflected in the possibility to connect two MEA-headstages to one interface board. This way, you can record from up to 240 electrodes simultaneously. By using two headstages with 60-electrode MEAs each, you have a versatile setup and increased throughput. The headstages are controlled independently by opening multiple instances of the data acquisition software.

<table>
<thead>
<tr>
<th>60 channels</th>
<th>120 channels</th>
<th>256 channels</th>
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### Flexible and powerful: Multi Channel Suite

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• Integrated stimulation and blanking
• Filter bandwidth adjustable via software
• 24 bit resolution
• Real-time feedback
• Up to 256 recording channels
• Variable contact units for microelectrode arrays with 60, 120 or 256 electrodes

Versatile in vitro recording system: MEA2100-System

- Multiwell MEA
  - In the 6-well microelectrode array, the 60 recording electrodes are divided into 6 independent wells with 10 recording electrodes each. Independent measurements can be performed in each well. These arrays are ideal for toxicology, stem cell research, and safety pharmacology, as they considerably increase the throughput of your system. A maximum of 24 wells on four MEAs can be recorded in parallel with one MEA2100-System.

Interface board 3.0 multiboard

The MCS-IFB 3.0 multiboard 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, MEA2100-Data-Screen, Multwell-MEA4-HS, MEA2100-2HS, and ME2100. This allows cost-effective combinations with only one interface board and multiple recording systems. As a result, you have even more flexibility in switching between possible configurations for your specific research needs. You can establish your experiments for example on 60 or 120 electrodes with the MEA2100-System, then purchase the Multiwell-headstage and start high throughput screening.

It is also possible to use the same interface board for in vitro NIA experiments and wireless in vivo recordings. This new interface board provides flexibility at its best.

MEA2100-System: Technical Specifications

General characteristics
- Dimensions (W x D x H) Interface board: 250 mm x 85 mm x 25 mm
- Headstage: 200 mm x 151 mm x 25 mm
- Weight Interface board: 0.5 kg
- Headstage: 1.5 kg
- Amplifier
  - Data resolution: 24 bit
  - Bandwidth: 0.1 Hz to 10 kHz
  - Number of recording channels: 60-256 depending on headstage type
  - Stimulus generator
    - Number of stimulation channels: 3 independent patterns per MEA slot (2 for MEA2100-HS256)
    - Available waveforms: rectangular, sine wave, arbitrary
    - Output current: ± 1.5 mA
    - Output voltage: ± 12 V
  - Data converter and USB interface
    - Control interface: USB 3.0
    - Sampling rate per channel: up to 50 kHz per channel
  - Heating element and temperature sensor
    - Temperature accuracy: ± 0.1 °C
    - Temperature sensor type: PT 100 with 4 wire connection

Software
- Operating system: Windows 10, 8.1 or 7 (64 bit)
- English and German versions are supported
- Version: 2.7.3 and higher
- Multi Channel Experimenter
- Multi Channel Analyzer
- Multi Channel DataManager
- Data export: HDF5 (*.h5) (Matlab, Python, R, etc.), NeuroExplorer (*.nex), Spike2 (*.smr), ASCII file (*.txt), European Data Format (*.EDF+)

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### MEA2100-System: Technical Specifications

#### General characteristics
- **Dimensions (W x D x H):**
  - Headstage: 250 mm x 151 mm x 25 mm
  - Interface board: 250 mm x 83 mm x 25 mm
- **Weight:**
  - Headstage: 1.0 kg
  - Interface board: 0.3 kg
- **Amplifier**
  - Data resolution: 24-bit
  - Number of recording channels: 60-256 (depending on headstage type)
  - Bandwidth: 0.1 Hz to 10 kHz
- **Stimulus generator**
  - Number of stimulation channels: 3 independent patterns per MEA slot (2 for MEA2100-HS256)
  - Available waveforms: rectangular, sine wave, arbitrary
  - Output current: ± 1.5 mA
  - Output voltage: ± 33 V
- **Data converter and USB Interface**
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#### 6-well MEA

In the 6-well microelectrode array, the 60 recording electrodes are divided into 6 independent wells with 10 recording electrodes each. Independent measurements can be performed in each well. These arrays are ideal for toxicology, stem cell research, and safety pharmacology, as they considerably increase the throughput of your system. A maximum of 24 wells on four MEAs can be recorded in parallel with one MEA2100-System.

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The MCS-IFB 3.0 multiboard 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, MEA2100-Data-Screen, Multwell-MEA-HS, CVDG-MEA-HS, ME2100-HS, and ME2100HS. This allows cost-effective combinations with only one interface board and multiple recording systems. As a result, you have even more flexibility in switching between possible configurations for your specific research needs. You can establish your experiments for example on 60 or 120 electrodes with the MEA2100-System, then purchase the Multwell-headstage and start high-throughput screening.

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