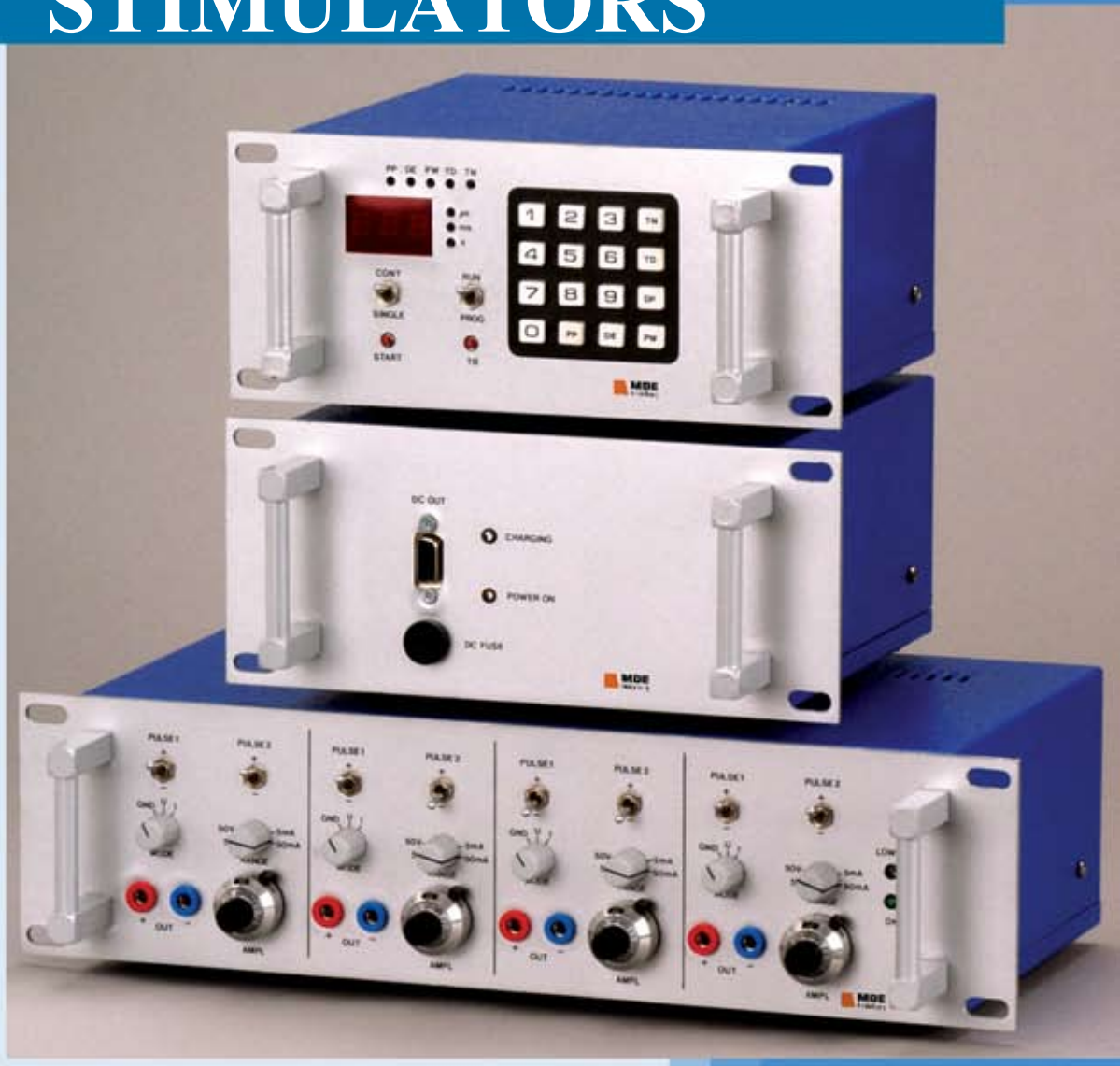
AMPLIFIERS AND STIMULATORS



MDE Heidelberg
BIOLOGICAL RESEARCH

Amplifiers and stimulators

The ***biological amplifier and stimulator product line*** was specially developed for the fields of biological and biomedical research (physiology, pharmacology, neurology). The primary design aspect of the amplifiers and stimulators was the simple management of the measurement units and that they would easily fit to the methodologies. Furthermore, it was considered that any hardware/software system used in this area would be able to receive the signals of each unit.

Therefore, the measuring and stimulating units are manufactured and sold in ***one-, two- and four-channel design***, for similar and complex measurement functions.

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DC bridge amplifier

The unit was developed to receive and amplify the signals from a force/displacement or pressure sensor (e.g. invasive blood pressure transducers, etc.). It is a guaranteed low -noise design with high filtration level.

Specification:

Amplification: x 10 000, continuously adjustable

Bandwidth: DC, 200Hz*

Calibration levels: GND, 1V (for the adjustment of the signal processing unit)

Bridge voltage: +3V DC*

Offset adjustment: ±6V related to the output

Display: ±LED Bar

Filtering: OFF, 3Hz, 10Hz, 40Hz, (80dB high-pass filter)

Input impedance: 10MW symmetric

Output impedance: 100W asymmetric

Input connector: 9-pole D-SUB (Cannon)

Output connector: 6,3 Jack socket

Power supply: 110V or 220V, 50/60 Hz

* other desired value can be set, but requires prior consultation.

Available models:

- ***EXP-SG-1*** DC bridge amplifier (1-channel)
- ***EXP-SG-2*** DC bridge amplifier (2-channel)
- ***EXP-SG-4*** DC bridge amplifier (4-channel)

Optional accessories:

- ***SEN-03-XX*** Force/displacement transducer
- ***SEN-04-XX*** Implantable force/displacement transducer
- ***SEN-02*** Invasive blood pressure sensor

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DC bridge amplifier designed for invasive blood pressure measurement

The unit has been designed to measure specifically arterial, venous or cardiac ventricular pressure.

Accordingly, it has internal calibration options, and can be connected to any blood pressure sensor in the market (default SEN-02). It is a guaranteed low -noise design with high filtration level.

Specification:

Amplification: x 1 000

Bandwidth: DC, 200Hz

Calibration levels: GND, 10Hgmm / 100Hgmm (for the adjustment of the signal processing unit)

Balance adjustment: ±300Hgmm / 3Hgmm related to the input

Bridge voltage: +5V DC*

Offset adjustment: ±6V related to the output

Display: ±LED-BAR

Input impedance: 10MW symmetric

Output impedance: 100W asymmetric

Input connector: 9-pole D-SUB (Cannon)

Output connector: 6,3 Jack socket

Power supply: 110V or 220V, 50/60Hz

* other desired value can be set, but requires prior consultation

Available models:

- ***EXP-EXT-1*** Broadband amplifier (1-channel)
- ***EXP-EXT-2*** Broadband amplifier (2-channel)
- ***EXP-EXT-4*** Broadband amplifier (4-channel)

Optional accessories:

- Mini banana plug for symmetric/asymmetric connection (3pcs plug/pack)
- ***SEN-15-XX*** Ag/AgCl electrodes
- Glass electrodes
- Metal electrodes

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Amplifier for measuring ECG (from surface leads, for standard I-II-III)

The unit was specifically designed for standard (I-II- III) ECG measurements with derived parameters. It has 1 mV internal calibration. The input time constants and resistance, as well as the amplification and the frequency transmission make possible the measurement of any species (mouse, rat, dog, pig, etc.). The unit has low noise level and features a high-pass notch filter, and input diode defibrillator protection.

Specification:

Amplification: x 1 000

Bandwidth: DC, 1kHz*

Calibration levels: GND, 1mV (for the adjustment of the signal processing unit)

Filtering: 50Hz / 80dB

Input impedance: 100kW symmetric

Output impedance: 100W asymmetric

Input connector: 15-pole D-SUB (Cannon)

Output connector: 9-pole D-SUB (Cannon)

Power supply: 110V or 220V, 50/60Hz

Available models:

- ***EXP-ECG-1*** ECG amplifier I, II, III (1-channel)
- ***EXP-ECG-2*** ECG amplifier I, II, III (2-channel)
- ***EXP-ECG-4*** ECG amplifier I, II, III (4-channel)

Optional accessories:

- **CAB-062** Four-lead body surface patient cable with banana plug (2,5m)
- **CAB-063** Ten-lead body surface patient cable with banana plug (1,5m)
- **CAB-064** Four-lead body surface patient cable with banana plug (1,5m)
- **CAB-067** Four-lead implantable patient cable

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Broadband amplifier for extra- and intracellular measurements

The unit is a broadband, low-noise amplifier, which is suitable for the amplification of intra-/extracellular potentials in the in-vivo conscious, in-vivo anesthetized and in-vitro tissue slice models (e.g.: cardiac map, nerve evoked potentials, etc.). The high quality low/high-pass filters allow to mark the bands of the basic physiological signs (EEG, ECG, EMG, EGIG, etc.) and through which also the accurate transfer of the wave characteristics. The unit consists of two main parts, the low –noise, high input impedance pre-amplifier and the end-amplifier, which contains the high-slope band-pass and notch filters.

Specification:

Amplification: x10^2; 10^3; 10^4, calibrated with a pre-amplifier

Bandwidth: DC, 20kHz

Noise: CMMR<120dB

Calibration levels: GND, 100% (for the adjustment of signal processing unit)

Offset adjustment: ±1V related to the input

High-pass filter: DC, 0.05; 0.1; 0.5; 1; 5; 10; 50; 100Hz / 80dB

Low-cut filter: DC, 0.05; 0.1; 0.5; 1; 5; 10; 50; 100Hz / 80dB

Notch filter: 50Hz 80db

Input impedance: 10MΩ symmetric / 10^9Ω asymmetric

Output impedance: 100Ω asymmetric

Input connector: Mini banana socket (2mm)

Output connector: 6,3 Jack

Power suppl: 110-220 V/12 V 1A DC adapter

Available models:

- **EXP-EXT-1** Broadband amplifier (1-channel)
- **EXP-EXT-2** Broadband amplifier (2-channel)
- **EXP-EXT-4** Broadband amplifier (4-channel)

Optional accessories:

- Mini banana plug for symmetric/asymmetric connection (3pcs plug/pack)
- **SEN-15-XX** Ag/AgCl electrodes
- Glass electrodes
- Metal electrodes

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Amplifier for measuring temperature

The unit is suitable for 0,1°C accuracy continuous temperature measurement of gaseous, liquid and solid substances depending on the connected sensor. Any crystalline or semiconductor sensor can be connected to the unit (thermistor, Pt100, etc.). The high-speed data communication is provided by the set up speed and the 3- digit LED display. In case of sensor replacement, the accuracy of the unit is ensured by the two-point calibration procedure.

Specification:

Measurement range: 20–50°C (expandable: 0–100°C)*

Measuring accuracy: 0,1°C

Display: 3 digit, LED

Internal calibration: GND; 45°C=450mV

Output: 10mV/°C

Input connector: 6,3 Jack

Output connector: 6,3 Jack

Power supply: 110V or 220V, 50/60Hz

* requires prior consultation

Available models:

- ***EXP-TH-1*** Temperature meter amplifier (1-channel)
- ***EXP-TH-2*** Temperature meter amplifier (2-channel)
- ***EXP-TH-4*** Temperature meter amplifier (4-channel)

Optional accessories:

- **SEN-06-XX** Stick thermometer
- **SEN-07-XX** Temperature sensor for organ perfusion or nerve tissue slice systems
- **SEN-09-XX** Catheter temperature sensor
- **SEN-11-XX** Body surface temperature sensor

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Amplifier for measuring respiratory rate

The unit can only be operated on anesthetized species. The external diameter of the tracheal cannula developed to this unit, determines on what species the unit can be used. The present design allows four applications (rat, rabbit, dog, pig). The removable thermo sensor is placed in the cannula, which measures the respiratory rate based on the temperature difference of the air coming from the lungs. The sensor is interchangeable and can be connected to any tracheal cannula. In case of failure the replacement can be performed without calibration.

Specification:

Measurement range: 2–200 respiratory rate/min

Calibration: GND; 100%

Sensitivity: 1V=100%=100 respiratory rate/min

Display: Respiratory rate display with LED diode

Input connector: 6,3 Jack

Output connector: 6,3 Jack

Power supply: 110V or 220V, 50/60Hz

Available models:

- ***EXP-LH-1*** Respiratory rate measurer amplifier (1-channel) with SEN-08-XX sensor

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Amplifier for intracellular measurements

The amplifier is primarily suitable for the examination of the heart cells, but it can also be used for intracellular measurement of other organs (e.g.: spinal cord, brain, etc.). The amplifier is characterized by large input resistance ($10^{12}\Omega$) with a low noise capacity and zero level stability. To achieve these favourable parameters we have chosen linear amplifier solution with reference artificial ground solution. The services of the amplifier (capacity compensation, resistance measurement, DC electrode contact potential cancellation) are controlled by the fixed resistance (1Ω) reference artificial ground.

The amplifier consists of two units; the" INTE" large input resistance pre-amplifier, which can be directly connected with the electrode sleeve (types: WPI, Harvard, Clark etc.), and the end-amplifier, which includes the previously described circuit elements and provides the connection to data visualizing, storing and evaluating hardware/software systems.

Specification:

Input resistance: 10^{12} Ω asymmetric

Input capacity-compensated: 0–25pF

Input leaking current: ±10pA

Input voltage range: ±5V

Amplification: x1, x10

Output resistance: 100Ω, asymmetric

Reference artificial ground: 1Ω

DC positioning (Bucking): ±300mV

Resistance measurement: 1MΩ–100MΩ

Calibration signal: 100mV/200Hz square wave

Display: 3,5 digit

Power supply: 110V or 220V 50Hz

Available models:

- ***EXP-INT-1*** Intracellular amplifier (1-channel)
- ***EXP-INT-2*** Intracellular amplifier (2-channel)
- ***EXP-INT-4*** Intracellular amplifier (4-channel)

Optional accessories:

- **SEN-27** Ag/AgCl reference electrode
- **SEN-12-12** Ball-mounted manipulator (360° movement, self-righting platinum stimulating electrode)
- **MAN-09-XX** Three-plane 1µmm precision manipulator with magnetic base
- **ISO-03-XX** Vibration-free workstation with organ bath (5 or 10ml) with buffer or pump
- **ISO-01-XX** Externally thermostated horizontal organ bath (5 or 10ml)
- **FAR-01-01** Faraday cage (80x50x120cm)
- Glass capillaries

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MCU stimulator controlling unit

MCU controlling unit is designed for programming the stimulators. It cannot be purchased separately, supplied only with stimulators.

Specification:

Synchronous output signals:

- Output signal level: 0 ±5V (TTL-levels)
- Max. load ability: 1 TTL inlet
- Length of synchronous signals: 25µsec
- Active signal edge: Falling edge

Timing parameters of the impulse:

- period time(PP): 500 µsec–999 µsec
- delay (DE): 0,1 µsec–999 µsec
- width (PW): 10 µsec–999 µsec
- train delay (TD): 10 µsec–999 µsec
- number of trains: 1–999

Output connector: 9-pole D-SUB (Cannon)

Programming input connector: USB, 9-pole D-SUB (Cannon, RS232)

Power supply: 110V or 220V, 50/60Hz

Available models:

- **EXP-MCU** stimulator controlling unit*

*it cannot be purchased separately, supplied only with stimulators

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Non-isolated stimulators

The devices (EXP-ST-0X products) are produced in one-, two- and four-channel designs. The mutual characteristics of the devices are the identical stimulus impulse and performance parameters. They are without isolation, operating from the electrical system.
The MCU controlling unit is built into one rack with the one- or two-channel stimulators and supplied separately in case of four-channel stimulator.

Specification:

Max. output performance: 10 W/ch

Impulse rise/fall: 10µsec/100V

Voltage output:

- Max output voltage ±10V, ±100V
- Max. current load: ±100mA
- Output protection: Short-circuit protected

Current output:

- Max. output current: ±10mA, ±100mA
- Max output voltage: ±100V
- Output protection: Short-circuit protected

Output connector: Banana plug (4mm)

Input connector: 9-pole D-SUB (Cannon)

Power supply: 110V or 220V, 50/60Hz

Available models:

- **EXP-ST-01** One-channel non-isolated stimulator with built-in MCU controlling unit
- **EXP-ST-02** Two-channel non-isolated stimulator with built-in MCU controlling unit
- **EXP-ST-04** Four-channel non-isolated stimulator with MCU controlling unit

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Battery-operated, isolated stimulators

The devices (EXP-ST-AX products) are produced in one-, two- and four-channel designs. The mutual characteristics of the devices are the identical stimulus impulse and performance parameters. They are isolated, operating from rechargeable batteries (accumulators).
The MCU controlling unit is built into one rack with the one- or two-channel stimulators and supplied separately in case of four-channel stimulator.

Specification:

Max. output performance: 2,5 W/ch

Impulse rise/fall: 10µsec/50V

Voltage output:

- Max. output voltage: ±5V, ±50V
- Max. current load: ±50mA
- Output protection: Short-circuit protected

Current output:

- Max. output current: ±5mA, ±50mA
- Max output voltage: ±50V
- Output protection: Short-circuit protected

Output connector: Banana plug (4mm)

Input connector: 9-pole D-SUB (Cannon)

Power supply: 110V or 220V, 50/60Hz

Available models:

- **EXP-ST-A1** One-channel battery-operated, isolated stimulator with built-in MCU controlling unit
- **EXP-ST-A2** Two-channel battery-operated, isolated stimulator with built-in MCU controlling unit
- **EXP-ST-A4** Four-channel battery-operated, isolated stimulator with MCU controlling unit

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High-current stimulator

The unique high-current device is produced only in one-channel design. The mutual characteristics of the device are the identical stimulus impulse and performance parameters. They are without isolation, operating from the electrical system.
The MCU controlling unit is built into one rack with the one- or two-channel stimulators and supplied separately in case of four-channel stimulator.

Specification:

Max. output performance: 50 W

Impulse rise/fall: 10µsec/100V

Voltage output:

- Max. output voltage: ±10V, ±100V
- Max. current load: ±500mA
- Output protection: Short-circuit protected

Current output:

- Max. output current: ±10mA, ±100mA
- Max output voltage: ±100V
- Output protection: Short-circuit protected

Output connector: Banana plug (4mm)

Input connector: 9-pole D-SUB (Cannon)

Power supply: 110V or 220V, 50/60Hz

Available models:

- **EXP-ST-P1** One-channel high-current stimulator with built-in MCU controlling unit

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