

Measuring and Modulating Brain Activity



neuroConn DC-STIMULATOR MR

Programmable direct and alternating current stimulator

The DC-**Stimulator** PLUS is a stimulator for use in scientific research that provides a stimulation with weak currents, either direct or alternating, (transcranial Electrical Stimulation tES), within non-invasive Interventional Neurophysiology. The electrical charge and current density applied through a constant current source are far below the threshold for releasing a stimulus. Depending on the duration, the used current, the current density, and the frequency the stimulation has a modular effect on existing neuronal elements by either activating or inhibiting cortical activity.

The DC-**Stimulator** MR allows to apply tES during functional magnetic resonance imaging (fMRI) to localize the exact position of cortical activation.

Advantages of the DC-STIMULATOR MR:

- Highest patient safety standards due to multistage monitoring of the current path, automatic termination of the stimulation as well as continuous monitoring of the electrode impedance
- Intuitive menu navigation via display and four buttons
- Individual setting and saving of the stimulation parameters
- Programmable treatment schedule and limited menu access *
- Study mode for double-blind active and sham stimulation *
- Signal output for online-correction of the EEG signal during tDCS or tACS/tRNS *

* optional

Moving thought

neuroCare 

DC-STIMULATOR MR Features

- Microprocessor-controlled constant current source
- 1 channel, unipolar (DC) and bipolar (AC) stimulation possible
- Use during fMRI, no interference of the fMRI images during EPI sequence
- Suitable for 1,5 and 3 Tesla systems
- High safety standard through multistage monitoring of the current path
- Stimulation mode: tDCS (continuous stimulation, adjustable, fade in and fade out)
- Stimulation mode: pulse (cyclic turning on/off of stimulation, adjustable pulse width and interval)
- Stimulation mode: sinus (bipolar sinus wave, offset, frequency, phase and oscillation period adjustable)
- Stimulation mode: noise (normally distributed broadband, low- and high-frequency noise, offset and duration adjustable)
- Study mode for "blind" operation of real and pseudo stimulation, encoded from a code list of 200 codes, independently adjustable settings (which can be saved in order to avoid accidental modification the study parameters)*
- Schedule mode: for secure and controlled use by the patient without the possibility of parameters being modified*
- External trigger input*, trigger output*
* optional

DC-STIMULATOR MR Specifications

- Adjustable current (DC) up to 4,500 μA in increments of 25 μA
- Adjustable current (AC) up to 3,000 μA (peak-to-peak)
- Additional MRI protective resistor of approx. 5 kOhm in each electrode
- Internal 16bit D/A conversion
- Internal time resolution < 1 ms (sample rate 2,048 sps)
- "tDCS" stimulation mode: duration 15-1,800 s, increment 15 s, duration of fade in / fade out 1-120 s, increment 1 s
- "Pulse" stimulation mode: duration of complete pulse cycle/interstimulus interval (ISI) 300-2,000 ms, increment 100 ms, pulse width 200-(ISI-100), increment 100 s, number of pulse cycles 1-500
- "Sinus" stimulation mode: adjustable current up to 3,000 μA (p-p) in 25 μA increments, offset of 0 to $\pm 1,000 \mu\text{A}$, increment 10 μA , frequencies up to 250 Hz, increment 0.01 Hz, adjustable phase 0-360° in 5° steps, application time adjustable up to 30 min**
- "Noise", "noise LF", "noise HF" stimulation mode: adjustable current up to $\pm 1,500 \mu\text{A}$ (p-p), offset of 0 up to $\pm 1,000 \mu\text{A}$, increment 50 μA , duration 0-1,800 s** in 5 s increments, current adjustable over period of 0-120 s to reach and leave oscillation level
- Max. voltage limitation $\pm 20\text{V}/35\text{V}^*$
- Power supply from built-in rechargeable batteries
- Approx. 6 h stimulation time @ 1 mA, approx. 7 h for complete recharging
- Alphanumeric display with backlight, membrane keypad with 4 keys
- Contact-protected electrode connection in accordance with DIN 42802-2 ($\varnothing 1.5 \text{ mm}$)
- Power consumption approx. 1.2 W (depends on display brightness and applied current)
- Dimensions: 13.5 cm x 22.5 cm x 5.5 cm (W x D x H)
- Weight (incl. batteries): 0.8 kg
* optional

DC-STIMULATOR MR Option

- TRIGGER MODULE to connect external trigger safely
- Phase-synchronous trigger output when sinus stimulation used

