

# Measuring and Modulating Brain Activity

## The new generation!

Improved signal quality  
Extended functionality  
Home use  
tACS EEG



## neuroConn DC-STIMULATOR PLUS

### Programmable direct and alternating current stimulator

The DC-STIMULATOR PLUS is a CE-certified medical device for conducting non-invasive transcranial direct current stimulation (tDCS), alternating (tACS) or random noise (tRNS) current stimulation on people. Transcranial stimulation using weak electric currents over a period of several minutes changes the electrical charge in the nerve cell membranes and has a direct influence on neurotransmitter channels. This serves to strengthen or diminish the excitability of the brain cells. Scientific and clinical studies conducted in recent years have proven transcranial direct current stimulation to be a recognized method of therapy for various disorders of the brain that is applied as a therapeutic component in clinical practice. tACS and tRNS are in the process of research and validation.

#### Advantages of the DC-STIMULATOR PLUS:

- 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 for home use supervised by a physician\*
- Study mode for double-blind active and sham stimulation\*
- Signal output for online-correction of the EEG signal during tDCS or tACS/tRNS\*
- Extension for use of the DC-STIMULATOR PLUS in fMRI scanners\*

\* optional

Moving thought



## DC-STIMULATOR PLUS Features

- 1 channel transcranial stimulator for unipolar (DC) and bipolar (AC) stimulation
- Four different stimulation settings definable
- Active and sham stimulation
- Stimulation modes:
  - „tDCS”: continuous stimulation, adjustable current of 0 up to  $\pm 4,500 \mu\text{A}$ <sup>[1][2]</sup>, duration 15–1,800 s<sup>[1]</sup>, increment 15 s, duration of fade-in / fade-out 1–120 s, increment 1 s
  - „Pulse” stimulation mode: cyclic turning on/off of stimulation, duration of complete pulse cycle/interstimulus interval (ISI) 300–2,000 ms, increment 100 ms, pulse width 200-(ISI-100), number of pulse cycles 1–500
  - „Sinus” stimulation mode: bipolar sinus waves, adjustable current of 0 up to  $3,000 \mu\text{A}$ <sup>[1]</sup> in  $25 \mu\text{A}$  increments, offset  $0-\pm 1,000 \mu\text{A}$ , increment  $10 \mu\text{A}$ , frequencies of 0–250 Hz, increment 0.01 Hz, adjustable phase  $0-360^\circ$  in  $5^\circ$  steps, duration 0–480 min
  - „Noise” stimulation mode: normally distributed broadband low and high frequency noise, adjustable current of 0 up to  $1,500 \mu\text{A}$ <sup>[2]</sup>, offset  $0-\pm 1,000 \mu\text{A}$ , duration 0–1,800 s<sup>[2]</sup> in 5 s increments, fade-in / fade out period of 0–120 s
- Internal time resolution < 1 ms (sample rate 2,048 samples/s)
- Current supply via built-in rechargeable batteries
- Continuous operation time approx. 5 h<sup>[2]</sup>
- Max. 1 % relative direct current fault tolerance in all options

## Optional features:

### Schedule mode to set up a treatment schedule for your patient

For the safe and controlled operation of the device outside a hospital or doctor's surgery. The therapist sets up the parameters of the stimulation and a schedule. The patient can do nothing but start the stimulation at the predefined time. The patient cannot make any changes to the settings. An internal logfile records all actions for later analysis.

### Study mode for double-blind studies

The study mode encodes sham and active stimulation using one out of 200 5-digit codes. There are four settings available to meet even complex study conditions. The parameters can be set individually. As long as the study mode is enabled, only the study manager can change the parameters.

### fMRI Add-on

The DC-STIMULATOR PLUS can be extended with filter boxes and cables for operation within an fMRI scanner. This optional module allows artefact-free MRI images even during EPI sequences. The module has been tested for 1.5 and 3 Tesla scanners. Our devices are the only fMRI-compatible DC-stimulators worldwide that are CE-certified.

### Signal Out for EEG-measurement during tACS / tRNS

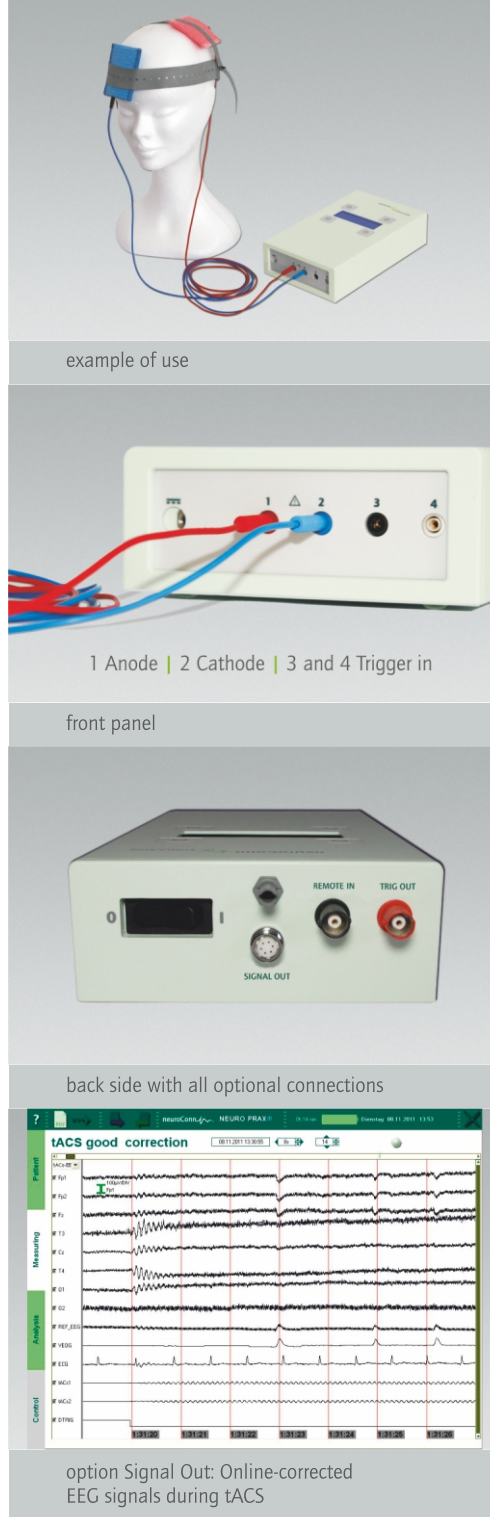
Signal Out allows you to track, analyze and process the voltage waveform the DC-STIMULATOR PLUS sends out to external devices (e. g. Oscilloscope, measuring amplifier, PC). In combination with our EEG-system NEURO PRAX® you can measure online-corrected EEG signals even during tACS/tRNS. This is unique worldwide.

### Further options:

- Operation via externally controlled voltage source (option Remote)
- Trigger module to connect external trigger safely
- Phase-synchronous trigger output when sinus stimulation is used

[1] currents of more than  $2,000 \mu\text{A}$  and application times of more than 20 min for research purpose only

[2] depending on load impedance and features



example of use

1 Anode | 2 Cathode | 3 and 4 Trigger in

front panel

back side with all optional connections

option Signal Out: Online-corrected EEG signals during tACS



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neuroConn supplies equipment for publicly funded multi-center studies into neurofeedback and non-invasive brain stimulation and is also a member of the "National Bernstein Network for Computational Neuroscience".

Made in Germany

